2021 REGION D WATER PLAN
VOLUME II: APPENDICES

Prepared for

The North East Texas Regional Water Planning Group

October 14, 2020

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Appendix C5 – Chapter 5:

IDENTIFICATION, EVALUATION, AND SELECTION OF WATER MANAGEMENT STRATEGIES BASED ON NEEDS

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APPENDIX C5

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EVALUATION OF WATER MANAGEMENT STRATEGIES FOR MEETING THE PROJECTED WATER SUPPLY NEEDS OF HICKORY CREEK SUD IN HUNT COUNTY

Description of Water User Group:

Hickory Creek SUD provides water in northwestern Hunt County and small areas of eastern Collin and southern Fannin counties from four wells in the Woodbine Aquifer in Hunt County, having a total rated capacity of 1402 gpm, or 754 ac-ft/yr. The projected water groundwater availability limits this supply to approximately 349 ac-ft/yr based on Modeled Available Groundwater (MAG) results. Over 90% of the SUD's demand is located in Region D (Hunt County), with less than 10% in Region C (Collin and Fannin Counties). In both regions, the system is projected to serve a total of 4,673 people in 2020 and 26,582 people by the year 2070. The population and demand projections for the system are shown in the table below. In Hunt County, Hickory Creek SUD is projected to have a water supply deficit of 105 ac-ft/yr by 2020 increasing to 2,030 ac-ft/yr by 2070 In Collin and Fannin Counties the projected deficit totals 11 ac-ft in 2020 increasing to 85 ac-ft by 2070.

Water Supply and Demand Analysis:

	2020	2030	2040	2050	2060	2070
Population	4,673	6,721	9,477	13,289	18,715	26,582
Projected Water Demand	465	641	888	1,234	1,735	2,463
Water Demand from other entities	0	0	0	0	0	0
Current Water Supply	369	368	369	368	369	368
Projected Supply Surplus (+) / Deficit (-)	**-96**	**-273**	**-519**	**-866**	**-1,366**	**-2,095**

Projected Supply Surplus (+) / Deficit (-) by Basin	2020	2030	2040	2050	2060	2070
Sabine	-32	-114	-228	-393	-629	-977
Sulphur	-36	-91	-172	-285	-451	-692
Trinity	-17	-45	-85	-142	-223	-341
Total	**-96**	**-273**	**-519**	**-866**	**-1,366**	**-2,095**

Evaluation of Potentially Feasible Water Management Strategies:

The multiple alternative strategies considered to meet Hickory Creek SUD's water supply shortages are listed in the table below. Advanced conservation was not selected since per capita use is less than 140 gpcd. There are no significant current water needs that could be met by water reuse. Groundwater from the Woodbine Aquifer was considered because the SUD is currently using this aquifer as the source of supply for the system. Although the MAG indicates limited supply (349 ac-ft/yr by 2020), the existing production capacity of the Hickory Creek SUD is 810 ac-ft/yr (502 gpm as noted in the TCEQ PWS database). Full use of the existing system (up to an additional 462 ac-ft/yr) could meet projected demands through 2030; however, due to the limited availability of this groundwater source and lack of supporting available technical information, this aquifer is not projected to have sufficient supply to meet all of Hickory Creek SUD's shortage over the 2040-2070 period. Similarly, there are potentially available supplies from the Nacatoch Aquifer, however supplies are limited and insufficient considering other WUG's which may also seek to develop the supply. Additional supplies are limited from the Trinity Aquifer in Hunt County to satisfy the remainder of Hickory Creek SUD's needs.

Although the SUD has previously indicated that it would continue adding wells to meet future demands, given the aforementioned present limitations regarding groundwater source availability, surface water sources were investigated to meet long-term projected water needs for the SUD. Another potentially feasible regional groundwater strategy evaluated herein is the Wood County Pipeline, which could supply groundwater from Wood County.

Strategy	Firm Yield (ac-ft)	Total Capital Cost	Total Annual Cost	Unit Cost	Environmental Impact
Drill New Wells (Woodbine Aquifer, Sabine Basin)	**75**	**$763,000**	**$120,000**	**$1,600**	**1**
Drill New Wells (Woodbine Aquifer, Trinity Basin)	**230**	**$2,358,000**	**$348,000**	**$1,513**	**1**
Greenville Tie-In Pipeline	**2,095**	**$8,553,000**	**$2,595,000**	**$1,239**	**2**
Wood County Pipeline Tie-in	**2,095**	**$11,862,000**	**$4,030,000**	**$1,924**	**2**

Recommendations:

	2020	2030	2040	2050	2060	2070
Unmet Need	**96**	**273**	**519**	**866**	**1,366**	**2,095**

Communications with Hickory Creek SUD have indicated that this WUG intends to meet projected water needs through the construction of additional well(s) as needed. This WUG is not currently in the regulatory area of a Groundwater Conservation District, and thus has the legal capability to pursue such a strategy.

In its' evaluation of potentially feasible strategies, the NETRWPG determined that the amounts needed would exceed the amounts identified by MAG amounts for aquifer sources proximate to the WUG. A subsequent process was then performed whereby the NETRWPG exercised its' authority to determine groundwater availability within the RWPA as established by Senate Bill 1101 (passed by the 84th Texas Legislature in 2015). Broadly, this law allows a RWPG to define all groundwater availability as long as there are no GCDs within the RWPA. As noted previously, this applies only to Region D.

Through this process, the TWDB's review identified modeled estimates of compatible groundwater availability for desired future conditions for relevant aquifers which in some instances limited the determined availability. These instances were identified by TWDB's modeling to potentially result in an impact to an adjacent area outside the RWPA that does have established DFCs.

While technically this has been identified as an unmet municipal need for the purposes of the 2021 Region D Plan, it is recognized by the NETRWPG that this WUG intends to meet its' regulatory requirements through a legally implementable WMS. This groundwater strategy is not recommended for the purposes of this 2021 Region D Plan due to the aforementioned limitations in the planning process.

To meet all applicable planning requirements, the NETRWPG considered all potentially feasible strategies including drought management and conservation, which are not recommended as they each would be insufficient to meet the projected needs while meeting TCEQ regulatory minimums. In the event of a repeat of the drought of record, the NETRWPG recognizes that the groundwater approach identified by the WUG is within their legal capability to meet projected needs in a manner that ensures public health, safety, and welfare over the planning horizon. It is further recognized that as the Joint Planning Process continues, future adjustments to availability may allow the opportunity to amend this Plan if deemed necessary in the future to address all or a portion of this unmet need.Given the increasing costs to comply with more stringent regulations and the decreasing reliability of groundwater as a future supply source, it is recommended that groundwater supply systems consider combining resources and/or soliciting future water supply from neighboring systems and/or major water providers in the region. If a feasible alternative becomes available, then the recommendations previously discussed should be disregarded and a re-evaluation completed. The NETRWPG supports any efforts and/or studies to further evaluate and characterize groundwater availability in Hunt County, and such efforts should be considered consistent with the purposes of the 2021 Region D Plan.

EVALUATION OF WATER MANAGEMENT STRATEGIES FOR MEETING THE PROJECTED WATER SUPPLY NEEDS OF IRRIGATION IN HUNT COUNTY

Description of Water User Group:

Irrigation in Hunt County has a demand that is projected to remain constant at 355 ac-ft/yr for the planning period. The Irrigation WUG in Hunt County is supplied by groundwater from the Nacatoch Aquifer and run-of-river diversions from the Sabine and Sulphur Rivers. A deficit of 230 ac-ft/yr is projected to occur throughout the planning period.

Water Supply and Demand Analysis:

	2020	2030	2040	2050	2060	2070
Projected Water Demand	355	355	355	355	355	355
Current Water Supply	125	125	125	125	125	125
Projected Supply Surplus (+)/Deficit(-)	**-230**	**-230**	**-230**	**-230**	**-230**	**-230**

Projected Supply Surplus (+)/Deficit(-) by Basin	2020	2030	2040	2050	2060	2070
Sabine	-151	-151	-151	-151	-151	-151
Sulphur	-79	-79	-79	-79	-79	-79
Trinity	0	0	0	0	0	0
Total	**-230**	**-230**	**-230**	**-230**	**-230**	**-230**

Evaluation of Potentially Feasible Water Management Strategies:

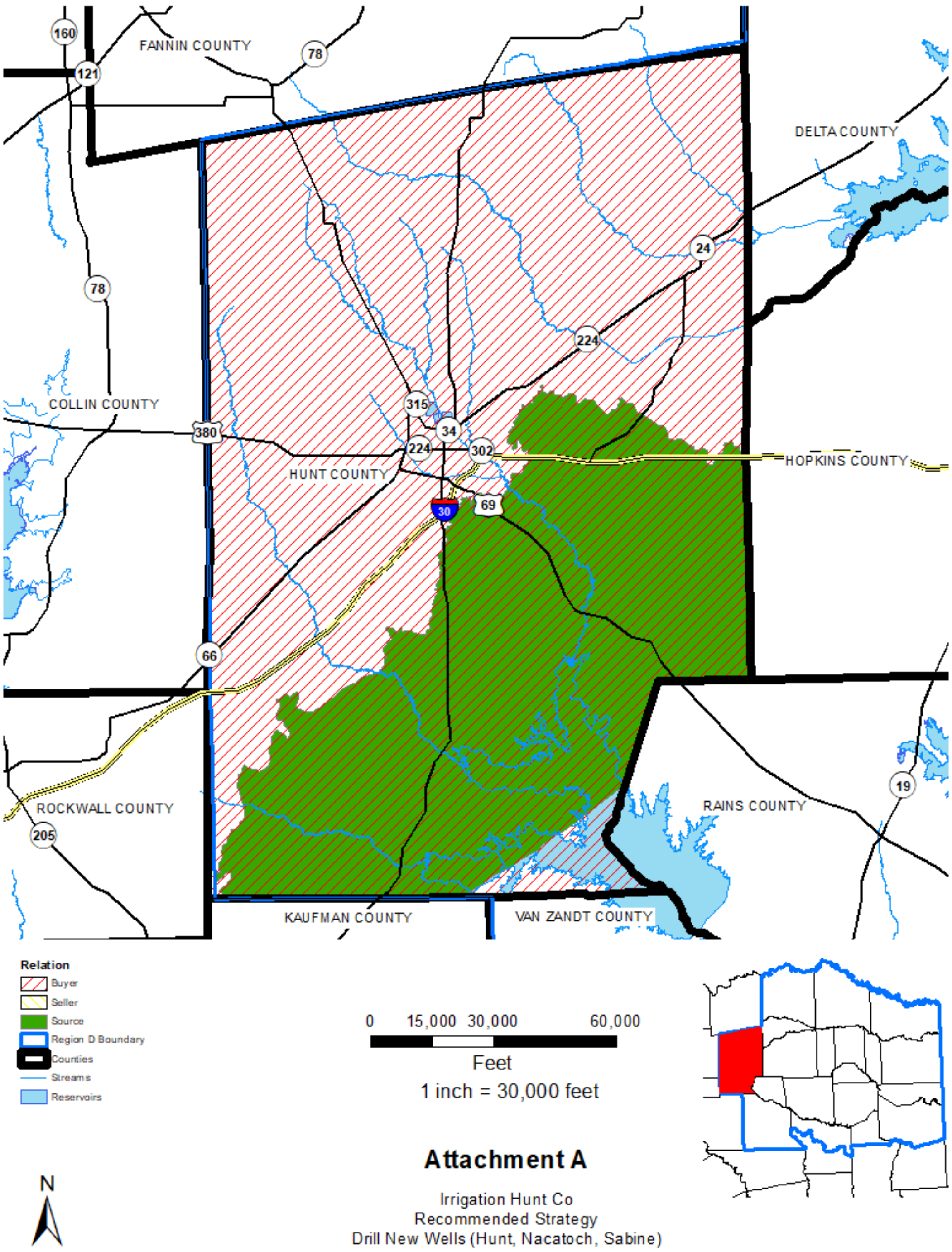
Three alternative strategies were considered to meet the Hunt County Irrigation WUG's water supply shortages. Advanced water conservation for irrigation practices were not considered in this planning effort, as present irrigation practices likely already incorporate many BMPs to extend water supplies, thus no additional conservation would be feasible. The use of reuse water from nearby municipalities is not considered feasible as it would not be effective to deliver reuse water to farm irrigation systems. Groundwater has been identified as a potential source of water for irrigation in Hunt County.

Strategy	Firm Yield (AF)	Total Capital Cost	Total Annualized Cost	Unit Cost	Env. Impact
Drill New Wells (Nacatoch, Sabine)	**230**	**$1,249,000**	**$226,000**	**$983**	**1**

Recommendations:

	2020	2030	2040	2050	2060	2070
Drill New Wells (Nacatoch, Sabine; ac-ft/yr)	**230**	**230**	**230**	**230**	**230**	**230**

The recommended strategy for the Hunt County Irrigation to meet their projected deficit of 230 ac-ft/yr from 2020 to 2070 would be to construct three water wells rated at 75 gpm prior to 2020. The recommended supply source will be the Nacatoch Aquifer in Hunt County. The Nacatoch Aquifer in Hunt County, in the Sabine River Basin, is projected to have sufficient supply availability to meet the needs of the Irrigation in Hunt County for the planning period.



Attachment A

Irrigation Hunt Co
Recommended Strategy
Drill New Wells (Hunt, Nacatoch, Sabine)

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices

Irrigation Hunt County - Drill New Wells (Hunt, Nacatoch Aquifer, Sabine Basin)

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 201.9 for September 2018

Item	***Estimated Costs for Facilities***
Well Fields (Wells, Pumps, and Piping)	$841,000
TOTAL COST OF FACILITIES	**$841,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$294,000
Environmental & Archaeology Studies and Mitigation	$55,000
Land Acquisition and Surveying (5 acres)	$25,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$34,000
TOTAL COST OF PROJECT	**$1,249,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$88,000
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$8,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (187561 kW-hr @ 0.08 $/kW-hr)	$15,000
Purchase of Water (230 acft/yr @ 500 $/acft)	$115,000
TOTAL ANNUAL COST	**$226,000**
Available Project Yield (acft/yr)	230
Annual Cost of Water ($ per acft), based on PF=1	$983
Annual Cost of Water After Debt Service ($ per acft), based on PF=1	$600
Annual Cost of Water ($ per 1,000 gallons), based on PF=1	$3.02
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1	$1.84

JMP *9/30/2019*

EVALUATION OF WATER MANAGEMENT STRATEGIES FOR MEETING THE PROJECTED WATER SUPPLY NEEDS OF LIVESTOCK IN HUNT COUNTY

Description of Water User Group:

Livestock in Hunt County has a demand that is projected to remain constant at 1,095 ac-ft/yr for the planning period. The Livestock WUG in Hunt County is supplied by groundwater from the Trinity Aquifer and local livestock supply in the Sabine, Sulphur, and Trinity basins. A deficit of 2 ac-ft/yr is projected to occur in 2020 decreasing to 1 ac-ft/yr by 2070 in the Trinity basin. No deficits are projected for within the Sabine and Sulphur basins.

Water Supply and Demand Analysis:

	2020	**2030**	**2040**	**2050**	**2060**	**2070**
Projected Water Demand	1,095	1,095	1,095	1,095	1,095	1,095
Current Water Supply	1,146	1,146	1,146	1,146	1,147	1,147
Projected Supply Surplus (+)/Deficit(-)	**51**	**51**	**51**	**51**	**52**	**52**

Projected Supply Surplus (+)/Deficit(-) by Basin	**2020**	**2030**	**2040**	**2050**	**2060**	**2070**
Sabine	41	41	41	41	41	41
Sulphur	12	12	12	12	12	12
Trinity	-2	-2	-2	-2	-1	-1
Total	**51**	**51**	**51**	**51**	**52**	**52**

Evaluation of Potentially Feasible Water Management Strategies:

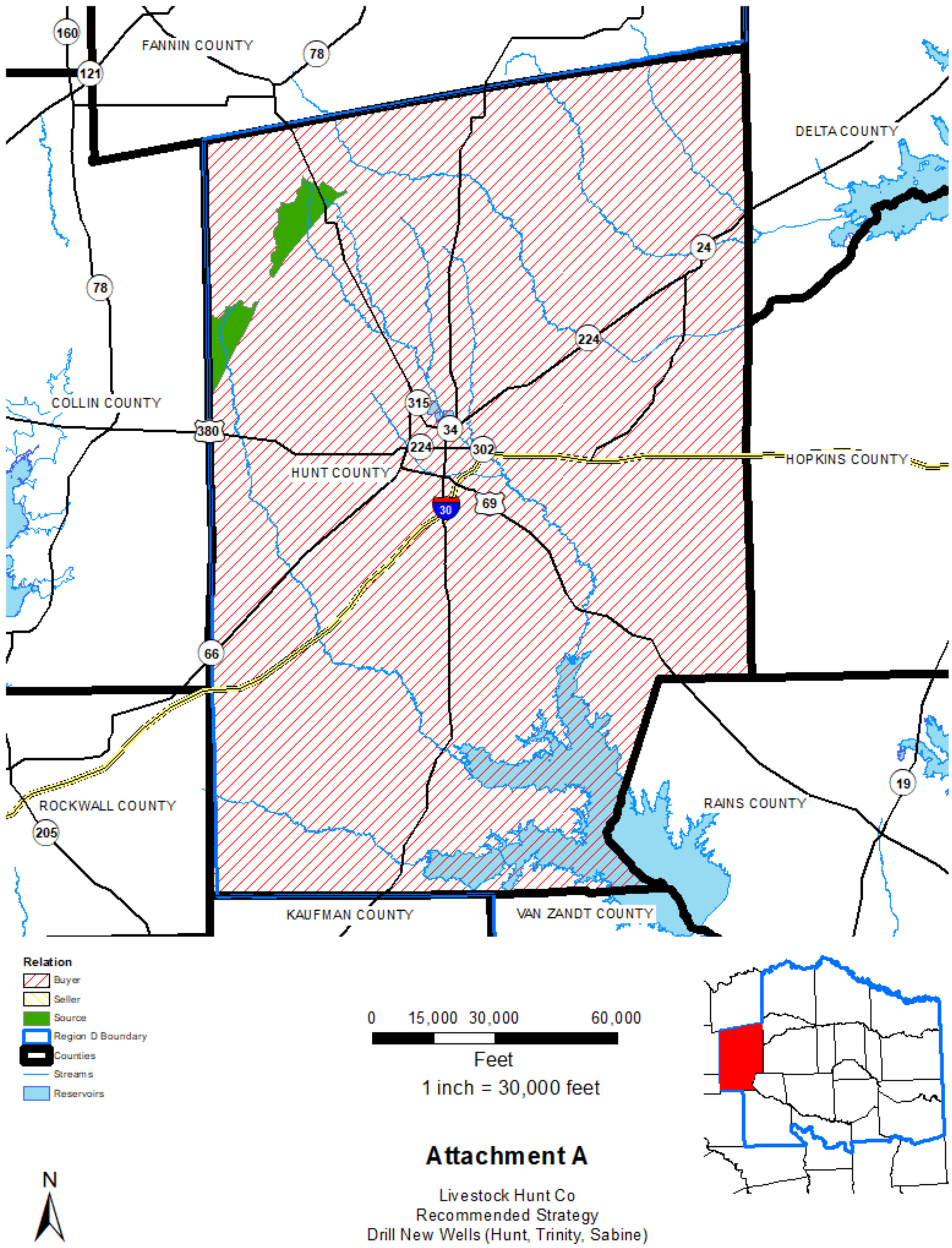
Three alternative strategies were considered to meet the Hunt County Irrigation WUG's water supply shortages. Advanced water conservation for livestock practices was not considered, as present livestock practices likely result in sale of the livestock to reduce demand and extend water supply. The use of reuse water from nearby municipalities is not considered feasible as the water may be used for livestock consumption. Groundwater has been identified as a potential source of water for livestock in Hunt County.

Strategy	**Firm Yield (AF)**	**Total Capital Cost**	**Total Annualized Cost**	**Unit Cost**	**Env. Impact**
Drill New Wells (Trinity Aquifer, Sabine Basin)	**2**	**$407,000**	**$33,000**	**$16,500**	**1**

Recommendations:

	2020	**2030**	**2040**	**2050**	**2060**	**2070**
Drill New Wells (Trinity Aquifer, Sabine Basin; ac-ft/yr)	**2**	**2**	**2**	**2**	**2**	**2**

The recommended strategy for the Hunt County Livestock to meet their projected deficit of 2 ac-ft/yr from 2020 to 2070 would be to construct one water well prior to 2020. The recommended supply source is the Trinity Aquifer in Hunt County. The Trinity Aquifer in Hunt County, in the Sabine River Basin, is projected to have sufficient supply availability to meet the needs of the Livestock in Hunt County for the planning period.



Attachment A

Livestock Hunt Co
Recommended Strategy
Drill New Wells (Hunt, Trinity, Sabine)

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices

Livestock Hunt County - Drill New Wells (Hunt, Trinity Aquifer, Sabine Basin)

Cost based on ENR CCI 11170.28 for September 2018 and
a PPI of 201.9 for September 2018

Item	*Estimated Costs for Facilities*
Well Fields (Wells, Pumps, and Piping)	$286,000
TOTAL COST OF FACILITIES	**$286,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$100,000
Environmental & Archaeology Studies and Mitigation	$6,000
Land Acquisition and Surveying (1 acres)	$4,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$11,000
TOTAL COST OF PROJECT	**$407,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$29,000
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$3,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (1592 kW-hr @ 0.08 $/kW-hr)	$0
Purchase of Water (2 acft/yr @ 500 $/acft)	$1,000
TOTAL ANNUAL COST	**$33,000**
Available Project Yield (acft/yr)	2
Annual Cost of Water ($ per acft), based on PF=1	$16,500
Annual Cost of Water After Debt Service ($ per acft), based on PF=1	$2,000
Annual Cost of Water ($ per 1,000 gallons), based on PF=1	$50.63
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1	$6.14

JMP *9/30/2019*

EVALUATION OF WATER MANAGEMENT STRATEGIES FOR MEETING THE PROJECTED WATER SUPPLY NEEDS OF MINING IN HUNT COUNTY

Description of Water User Group:

Mining in Hunt County has a demand that is projected to decrease from 128 ac-ft/yr in 2020 to 47 ac-ft/yr in 2070. Mining in Hunt County is currently supplied by groundwater from the Nacatoch Aquifer and water purchased from the City of Greenville from Lake Tawakoni.

Water Supply and Demand Analysis:

	2020	2030	2040	2050	2060	2070
Projected Water Demand	128	118	88	71	58	47
Current Water Supply	55	54	53	52	51	50
Projected Supply Surplus (+)/Deficit(-)	**-73**	**-64**	**-35**	**-19**	**-7**	**3**

Projected Supply Surplus (+)/Deficit(-) by Basin	2020	2030	2040	2050	2060	2070
Sabine	-41	-35	-16	-5	0	3
Sulphur	-30	-27	-18	-13	-7	0
Trinity	-2	-2	-1	-1	0	0
Total	**-73**	**-64**	**-35**	**-19**	**-7**	**3**

Evaluation of Potentially Feasible Water Management Strategies:

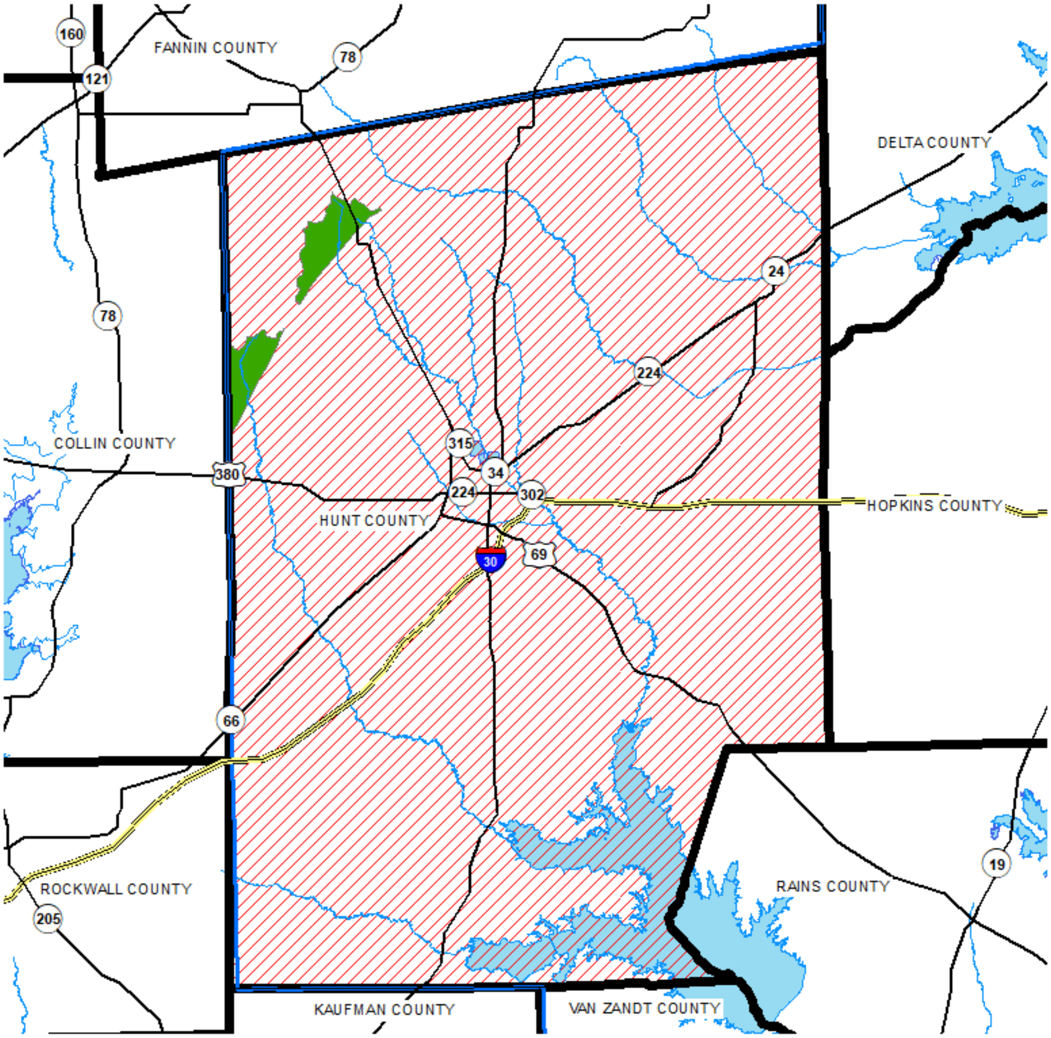
Twelve alternative strategies were considered to meet the Hunt County Mining water supply shortages as summarized in the following table. Advanced conservation and water reuse were not considered because operational procedures for the existing mines are not available. Groundwater has been identified as a potential source of water for mining in Hunt County, with focus given to accessible sources with availability within MAG estimates. Surface water via contracting with the City of Sulphur Springs was also considered as a viable alternative to meet projected demands. Another potentially feasible strategy is the Wood County Pipeline.

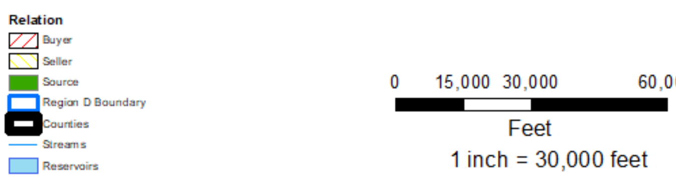
Strategy	Firm Yield (AF)	Total Capital Cost	Total Annualized Cost	Unit Cost	Env. Impact
Drill New Wells (Trinity, Sabine Basin)	**73**	**$766,000**	**$101,000**	**$1,384**	**1**
New Contract with Sulphur Springs	**73**	**$560,000**	**$133,000**	**$1,822**	**1**
Wood County Pipeline Tie-in	**73**	**$560,000**	**$152,000**	**$2,082**	**2**

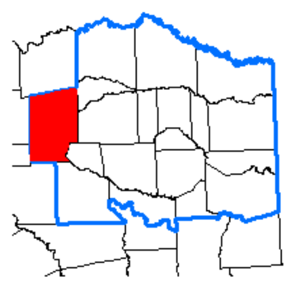
Recommendations:

	2020	2030	2040	2050	2060	2070
Drill New Wells (Trinity, Sabine Basin; (ac-ft/yr)	**73**	**64**	**35**	**19**	**7**	**0**

The recommended strategy for the Hunt County Mining WUG to meet their projected deficit of 73 ac-ft/yr in 2020 is to construct two additional water wells similar to existing wells, with a production capacity of 75 gpm. The recommended supply source is the Trinity Aquifer in Hunt County, Sabine River Basin. The Trinity Aquifer in Hunt County, Sabine River Basin is projected to have sufficient availability to meet mining needs in Hunt County for the planning period.







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Attachment A

Mining Hunt Co
Recommended Strategy
Drill New Wells (Hunt, Trinity, Sabine)

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices

Mining Hunt County - Drill New Wells (Hunt, Trinity Aquifer, Sabine Basin)

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 201.9 for September 2018

Item	**_Estimated Costs for Facilities_**
Well Fields (Wells, Pumps, and Piping)	$523,000
TOTAL COST OF FACILITIES	**$523,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$183,000
Environmental & Archaeology Studies and Mitigation	$26,000
Land Acquisition and Surveying (2 acres)	$13,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$21,000
TOTAL COST OF PROJECT	**$766,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$54,000
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$5,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (58389 kW-hr @ 0.08 $/kW-hr)	$5,000
Purchase of Water (73 acft/yr @ 500 $/acft)	$37,000
TOTAL ANNUAL COST	**$101,000**
Available Project Yield (acft/yr)	73
Annual Cost of Water ($ per acft), based on PF=1	$1,384
Annual Cost of Water After Debt Service ($ per acft), based on PF=1	$644
Annual Cost of Water ($ per 1,000 gallons), based on PF=1	$4.25
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1	$1.98

JMP *9/30/2019*

EVALUATION OF WATER MANAGEMENT STRATEGIES FOR MEETING THE PROJECTED WATER SUPPLY NEEDS OF NORTH HUNT SUD IN HUNT COUNTY

Description of Water User Group:

North Hunt SUD provides water service in Hunt, Fannin, and Delta counties. It is projected North Hunt SUD will have a shortage in 2020. The WUG population is projected to be 4,333 in 2020 and 16,222 by the year 2070. The SUD has a contract for water supply with the City of Commerce for 147 ac-ft/yr, a well in Hunt County with a rating of 170 gpm, and a well in Fannin County that is rated at 318 gpm. In Hunt County, the SUD is projected to have a deficit of 72 ac-ft in 2020 increasing to 831 ac-ft by 2070. The remainder of the SUD is projected to have a deficit of 17 ac-ft in 2020 increasing to 57 ac-ft by 2070.

Water Supply and Demand Analysis:

North Hunt SUD in Hunt County	**2020**	**2030**	**2040**	**2050**	**2060**	**2070**
Population	4,333	5,469	6,976	9,035	11,973	16,222
Projected Water Demand	291	367	468	607	805	1,090
Water Demand from other entities	0	0	0	0	0	0
Current Water Supply	202	202	202	202	202	202
Projected Supply Surplus (+) / Deficit (-)	**-89**	**-165**	**-266**	**-405**	**-603**	**-888**

Evaluation of Potentially Feasible Water Management Strategies:

The six alternative strategies considered to meet North Hunt SUD's water supply shortages are listed in the table below. Advanced conservation was not selected because the per capita use per day was less than the 140 gpcd threshold set by the water planning group. Reuse is not a feasible option because water supply is mainly used for public consumption. Groundwater from the Woodbine Aquifer was considered because North Hunt SUD is currently using this aquifer as a source of supply for the system. However, due to the limited availability of this groundwater source, this aquifer will not be able to meet all of North Hunt SUD's shortage. Additional groundwater supplies are available from the Nacatoch Aquifer has been evaluated as well.

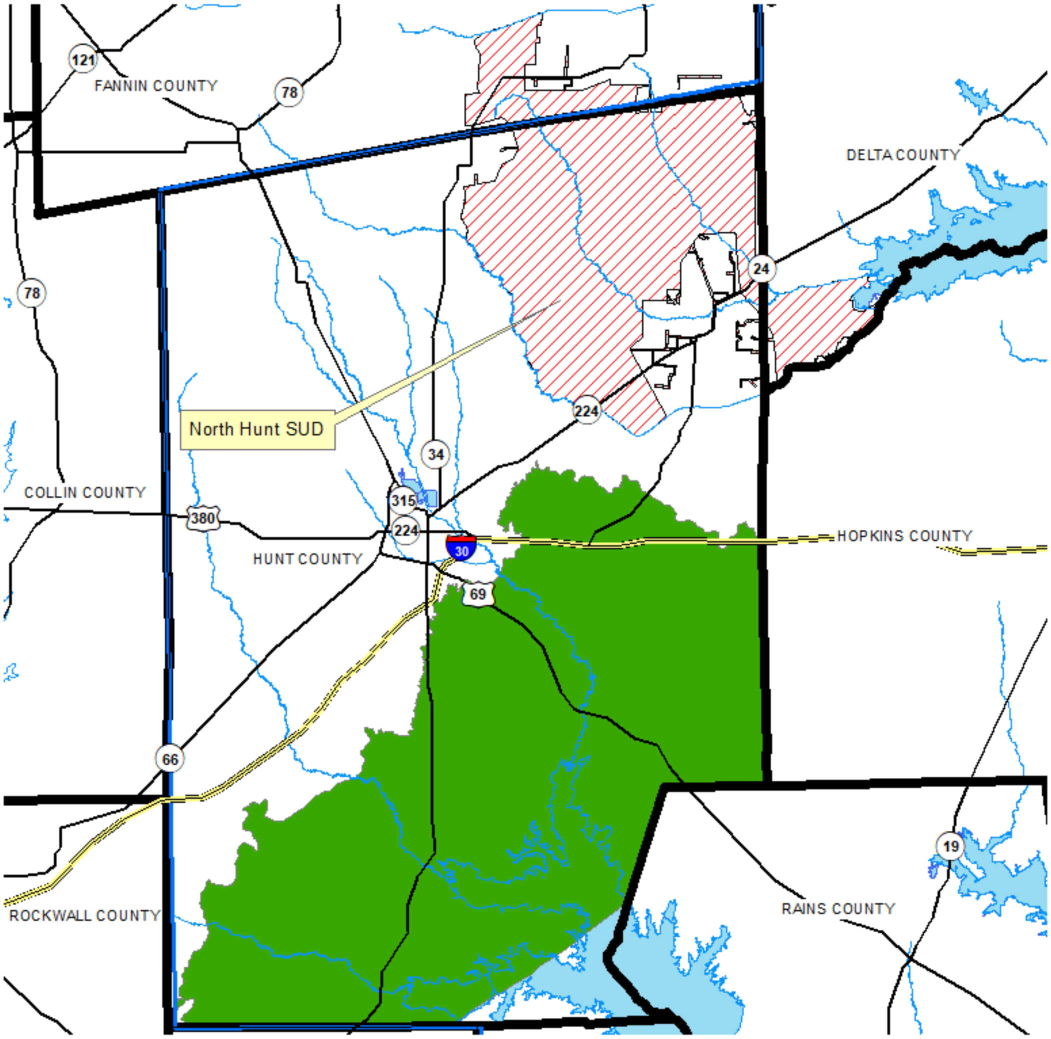
Additional purchase of water from the City of Commerce is another alternative; however, Commerce has only a limited volume, potentially available only if existing supplies to the Manufacturing WUG and the Delta County-Other WUG can be reallocated. A separate feasible strategy was considered to utilize surplus supply from Delta County MUD. The North Hunt SUD service area is contiguous with the service area for Delta County MUD, which purchases Big Creek Lake supply from the City of Cooper. North Hunt SUD could contract with the City of Cooper for water supplies from Big Creek Lake, transported via the existing connection between the City of Cooper and Delta County MUD. This strategy would require a pipeline connecting the two systems of sufficient size to provide available supplies and may require a permit amendment for additional yield potentially available from Big Creek Lake. Another potentially feasible strategy is the Wood County Pipeline which could supply groundwater from Wood County.

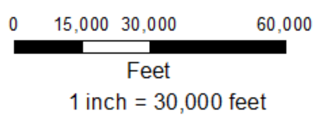
Strategy	Firm Yield (ac-ft)	Total Capital Cost	Total Annualized Cost	Unit Cost	Env. Impact
Drill New Wells (Nacatoch Aquifer, Sabine Basin)	**888**	**$10,998,000**	**$1,458,000**	**$1,642**	**1**
Increase Contract w/ Commerce contingent on Commerce Seller Strategy	**888**	**$0**	**$963,000**	**$1,084**	**1**
Delta County Pipeline contingent on purchase from Delta County MUD for supply from Big Creek	**100**	**$6,058,000**	**$601,000**	**$6,010**	**3**
Wood County Pipeline Tie-in	**888**	**$6,777,000**	**$1,845,000**	**$2,078**	**2**

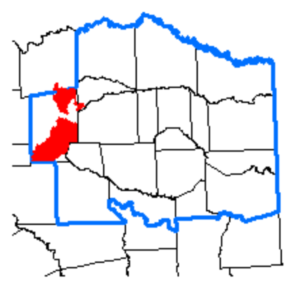
Recommendations:

	2020	2030	2040	2050	2060	2070
Drill New Wells (Nacatoch Aquifer, Sabine Basin; ac-ft/yr)	89	165	266	405	603	888

The recommended strategy to meet North Hunt SUD's needs is to construct twenty three (23) additional groundwater wells sufficient in capacity prior to the projected decadal need. The source of the groundwater supply is the portion of the Nacatoch Aquifer located in the Sabine Basin in Hunt County. Twenty three wells with rated capacity of 75 gpm each would provide approximately 40 acre-feet each. Availability of groundwater supplies in the Nacatoch Aquifer located in the Sabine Basin in Hunt County are projected to be adequate to meet North Hunt SUD's projected needs over the planning period.







Attachment A

North Hunt SUD
Recommended Strategy
Drill New Wells (Hunt, Nacatoch, Sabine)

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices

North Hunt SUD - Drill New Wells (Hunt, Nacatoch Aquifer, Sabine Basin)

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 201.9 for September 2018

Item	***Estimated Costs for Facilities***
CAPITAL COST	
Well Fields (Wells, Pumps, and Piping)	$7,440,000
Water Treatment Plant (2.4 MGD)	$162,000
TOTAL COST OF FACILITIES	**$7,602,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$2,661,000
Environmental & Archaeology Studies and Mitigation	$294,000
Land Acquisition and Surveying (28 acres)	$146,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$295,000
TOTAL COST OF PROJECT	**$10,998,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$774,000
Reservoir Debt Service (3.5 percent, 40 years)	$0
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$74,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$97,000
Advanced Water Treatment Facility	$0
Pumping Energy Costs (856999 kW-hr @ 0.08 $/kW-hr)	$69,000
Purchase of Water (888 acft/yr @ 500 $/acft)	$444,000
TOTAL ANNUAL COST	**$1,458,000**
Available Project Yield (acft/yr)	888
Annual Cost of Water ($ per acft), based on PF=1	$1,642
Annual Cost of Water After Debt Service ($ per acft), based on PF=1	$770
Annual Cost of Water ($ per 1,000 gallons), based on PF=1	$5.04
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1	$2.36

JMP *9/30/2019*

EVALUATION OF WATER MANAGEMENT STRATEGIES FOR MEETING THE PROJECTED WATER SUPPLY NEEDS OF POETRY WATER SUPPLY CORPORATION

Description of Water User Group:

Poetry Water Supply Corporation (WSC) is located in southwestern Hunt County and northern Kaufman County and is situated in the Sabine and Trinity River Basins. Poetry WSC is projected to serve 3,212 people by 2020, and the population is expected to increase to 11,937 by the year 2070. The WSC's current source of supply is treated water purchased from the City of Terrell. Poetry WSC is projected to have a deficit of 4 ac-ft/yr in 2020, up to 564 ac-ft/yr in 2070. There is a small supply that is not utilized by the WSC and could postpone supply deficits until 2030.

Water Supply and Demand Analysis:

	2020	2030	2040	2050	2060	2070
Population	3,212	4,045	5,070	6,595	8,868	11,937
Projected Water Demand	353	430	528	681	913	1,228
Water Demand from other entities	0	0	0	0	0	0
Current Water Supply	355	364	413	481	583	718
Projected Supply Surplus (+) / Deficit (-)	**2**	**-66**	**-115**	**-200**	**-330**	**-510**

Evaluation of Potentially Feasible Water Management Strategies:

Listed in the table below are the five strategies that were considered to meet the water supply needs of Poetry WSC. There are no significant current water needs that could be met by water reuse. Advanced conservation was not selected because the per capita use per day was less than the 140 gpcd threshold set by the water planning group; however, preliminary coordination with the Region C Planning Group indicates that conservation is a potential strategy for that portion of the WUG within the Region C planning area, thus conservation amounts identified by the Region C Planning Group have been incorporated herein for this WUG. An identified feasible strategy is to increase the existing contract with Terrell via Sabine River Authority voluntary reallocation of Combined Consumers SUD surplus. The City of Terrell obtains a portion of its supply from Lake Fork via purchase from the Sabine River Authority. Combined Consumers SUD also purchases Lake Fork supply from the Sabine River Authority. A second feasible strategy is that since the City of Terrell also obtains a portion of its supply from the NTMWD reservoir system via purchase from the NTMWD, Cash SUD could increase its contract with the City of Terrell contingent upon a City of Terrell seller strategy to increase its contract with NTMWD, contingent upon recommended Region C NTMWD seller strategies. Development of groundwater supplies from the Nacatoch Aquifer, Sabine River Basin, was evaluated as a potentially cost effective approach for this entity. Another potentially feasible strategy is the Wood County Pipeline which could supply groundwater from Wood County.

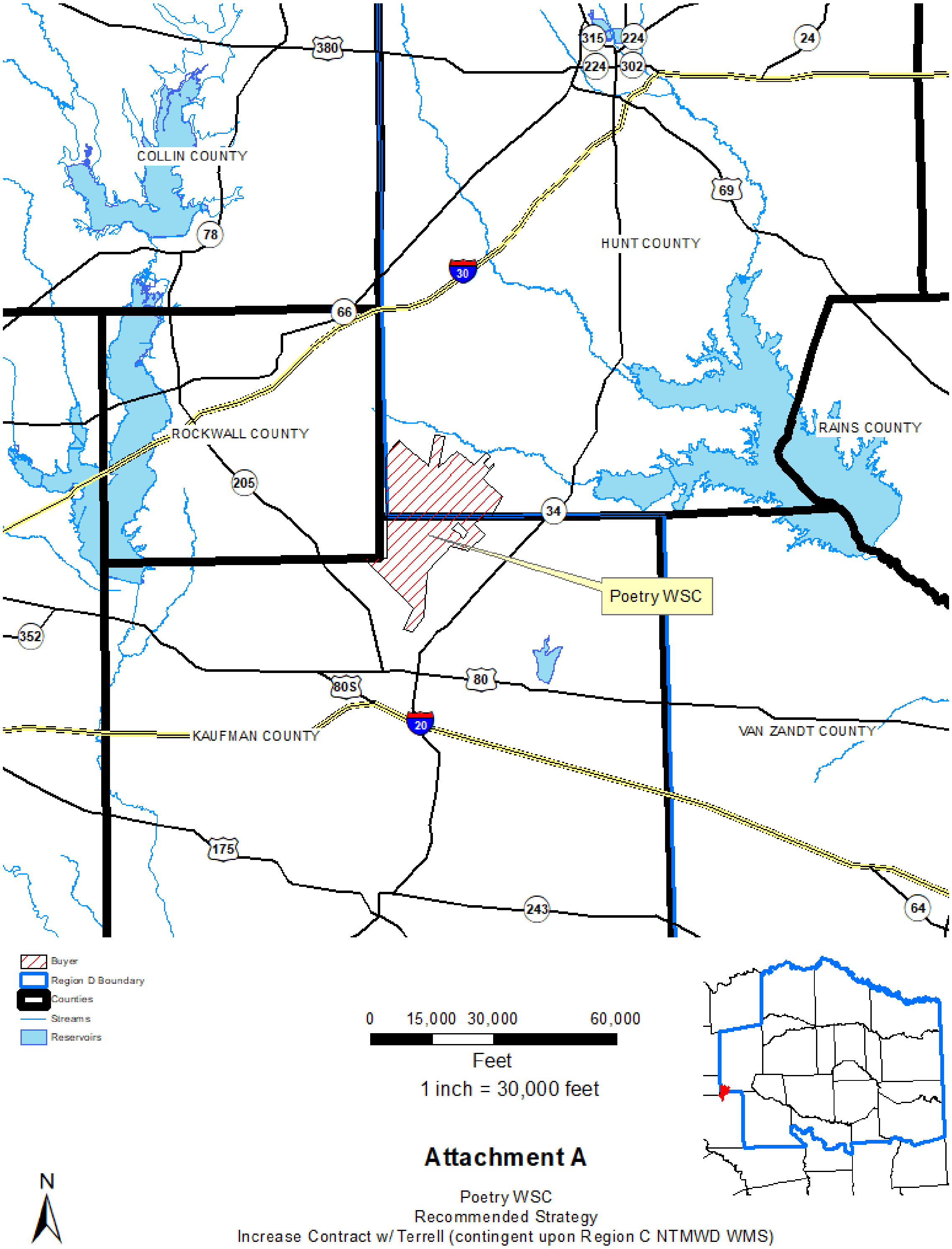
Strategy	Firm Yield (ac-ft)	Total Capital Cost	Total Annual Cost	Unit Cost	Environmental Impact
Advanced Water Conservation (Region C Portion)	**7**		**$0**	**$0**	**1**
Increase contract w/ Terrell (contingent upon Region C NTMWD WMS)	**503**		**$864,000**	**$1,718**	**1**
Increase contract w/ Terrell (contingent upon Voluntary Reallocation of Combined Consumers SUD Surplus)	**503**		**$864,000**	**$1,718**	**1**
Drill Wells (Nacatoch Aquifer, Sabine Basin)	**564**	**$1,689,000**	**$449,000**	**$796**	**1**
Wood County Pipeline Tie-in	**510**	**$5,705,000**	**$1,191,000**	**$2,335**	**2**

Recommendations:

	2020	2030	2040	2050	2060	2070
Advanced Water Conservation	**1**	**2**	**1**	**3**	**4**	**7**
Increase contract w/ Terrell (contingent upon Region C NTMWD WMS)	**0**	**64**	**114**	**197**	**326**	**503**

The recommended strategy for Poetry WSC to meet their projected deficit of 4 ac-ft/yr in 2020 and 534 ac-ft/yr in 2070 would be to implement advanced water conservation at the amounts identified herein. Secondly, it is recommended that Poetry WSC increase their existing contract with the City of Terrell, contingent upon a Region C seller strategy for the City of Terrell to increase its' contract with the NTMWD for supply from the NTMWD System, which would be contingent upon recommended Region C seller strategies for the NTMWD. Preliminary communication with Region C indicates NTMWD WMS will be sufficient to meet the projected needs identified herein for Poetry WSC over the 2020-2070 planning period.

It is noted, however, that the City of Terrell (primarily located in Region C) could elect to increase its contract with SRA utilizing SRA supplies. Such an approach, if implemented by the City of Terrell and the SRA and/or recommended by Region C and/or Region I, should be considered consistent for this recommended WMS for the Poetry WSC for the purposes of the 2021 Region D Plan.



Attachment A

Poetry WSC
Recommended Strategy
Increase Contract w/ Terrell (contingent upon Region C NTMWD WMS)

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices

Poetry WSC - Increase Contract with NTMWD

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 201.9 for September 2018

Item	***Estimated Costs for Facilities***
ANNUAL COST	
Operation and Maintenance	
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (0 kW-hr @ 0.08 $/kW-hr)	0
Purchase of Water (503 acft/yr @ 1717 $/acft)	$864,000
TOTAL ANNUAL COST	**$864,000**
Available Project Yield (acft/yr)	503
Annual Cost of Water ($ per acft), based on PF=1	$1,718
Annual Cost of Water After Debt Service ($ per acft), based on PF=1	$1,718
Annual Cost of Water ($ per 1,000 gallons), based on PF=1	$5.27
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1	$5.27

JMP *10/3/2019*

EVALUATION OF WATER MANAGEMENT STRATEGIES FOR MEETING THE PROJECTED WATER SUPPLY NEEDS OF THE CITY OF WOLFE CITY

Description of Water User Group:

The City of Wolfe City is located in northern Hunt County and is situated in the Sulphur River Basin. Wolfe City is bound on the west side by the Hickory Creek SUD, and the City of Commerce is located southeast of the City. The system is projected to serve 1,810 people by 2020, and the population is expected to increase to 6,547 by the year 2070. Wolfe City's current source of supply comes from two city lakes located on Turkey Creek in the South Sulphur River Basin. The City also has a 150 gpm well in the Woodbine formation, Sulphur River Basin, which has been brought back for use. Yield from the local lakes is calculated as 200 ac-ft/yr through 2070. Based on these yields, the quantity of water from the lakes will not be sufficient to meet projected demands. Wolfe City is projected to have a deficit of 54 ac-ft/yr in 2050, up to 308 ac-ft/yr in 2070.

Water Supply and Demand Analysis:

	2020	2030	2040	2050	2060	2070
Population	1,810	2,249	2,846	3,669	4,842	6,547
Projected Water Demand	178	209	256	327	431	581
Water Demand from other entities	0	0	0	0	0	0
Current Water Supply	274	273	274	273	274	273
Projected Supply Surplus (+) / Deficit (-)	**96**	**64**	**18**	**-54**	**-157**	**-308**

Evaluation of Potentially Feasible Water Management Strategies:

Listed in the table below are the multiple strategies that were considered to meet water supply needs in Wolfe City. Advanced conservation was not selected since per capita use is less than 140 gpcd. There are no significant current water needs that could be met by water reuse. The system has a number of surface water options, including connection to the City of Commerce, City of Greenville, and the proposed Ralph Hall Reservoir in Region C. Groundwater from the Woodbine Aquifer, Sulphur River Basin, was evaluated as a potentially cost effect approach for this entity. Another potentially feasible strategy is the Wood County Pipeline which could supply groundwater from Wood County.

Strategy	Firm Yield (ac-ft)	Total Capital Cost	Total Annual Cost	Unit Cost	Environmental Impact
Greenville Tie-In Pipeline (contingent on Seller Strategies)	**308**	**$7,124,000**	**$846,000**	**$2,747**	**3**
Wood County Pipeline Tie-In	**308**	**$7,124,000**	**$1,018,000**	**$3,305**	**2**

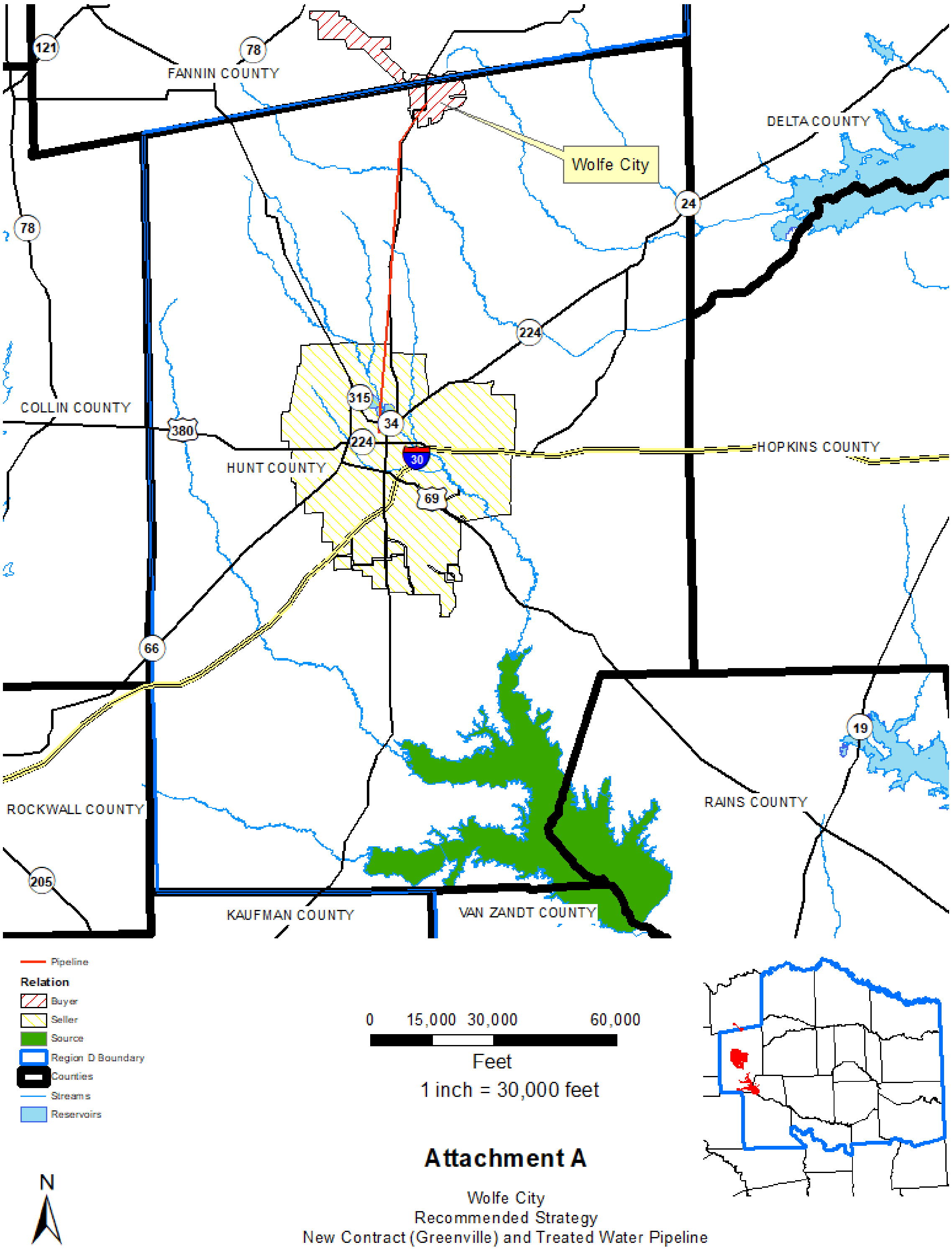
Recommendations:

	2010	2020	2030	2040	2050	2060
Greenville Tie-In Pipeline (contingent on Seller Strategies)	0	0	0	54	157	308

The recommended strategy for the City of Wolfe City to meet their projected deficit of 54 ac-ft/yr in 2050 up to 308 ac-ft/yr in 2070 is to secure a contract with the City of Greenville by 2050 and construct a tie-in pipeline for treated supply from the City. This strategy is contingent upon the City of Greenville's recommended seller strategies.

This recommendation is made based on limited knowledge of firm yield of the Wolfe City lakes. No in-depth studies were available indicating either the current firm yield of the reservoirs, or whether dredging or similar enhancements to the storage capacity could improve the firm yield. It is recommended that the City pursue such a study. The City currently operates its own surface water treatment to treat water from the existing local lakes. The firm yields were calculated using the approved WAM, Run 3, for the Sulphur River Basin, reflecting full demand from existing water rights and no return flows.

Given the increasing costs to comply with more stringent regulations and decreasing reliability of groundwater as a future supply source due to quality issues in this region, the NETRWPG supports efforts for this WUG evaluating the consideration of purchasing treated surface water from regional water providers in the future. Further study of this system is warranted, and supported by the NETRWPG for the purposes of the 2021 Plan.



Attachment A

Wolfe City
Recommended Strategy
New Contract (Greenville) and Treated Water Pipeline

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices

Wolfe City - Treated Water Line connection to Greenville

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 201.9 for September 2018

Item	*Estimated Costs for Facilities*
Primary Pump Station (0.55 MGD)	$987,000
Transmission Pipeline (8 in dia., 16 miles)	$3,881,000
TOTAL COST OF FACILITIES	**$4,868,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$1,510,000
Environmental & Archaeology Studies and Mitigation	$415,000
Land Acquisition and Surveying (44 acres)	$140,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$191,000
TOTAL COST OF PROJECT	**$7,124,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$501,000
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$39,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$25,000
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (113938 kW-hr @ 0.08 $/kW-hr)	$9,000
Purchase of Water (308 acft/yr @ 883 $/acft)	$272,000
TOTAL ANNUAL COST	**$846,000**
Available Project Yield (acft/yr)	308
Annual Cost of Water ($ per acft), based on PF=2	$2,747
Annual Cost of Water After Debt Service ($ per acft), based on PF=2	$1,120
Annual Cost of Water ($ per 1,000 gallons), based on PF=2	$8.43
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=2	$3.44

JMP *10/5/2019*

REGION D
EVALUATIONS OF WATER MANAGEMENT STRATEGIES
FOR MEETING PROJECTED WATER SUPPLY NEEDS
TO YEAR 2070

LAMAR COUNTY

WUGs:

Lamar County-Other
Lamar County Irrigation
Lamar County Livestock

EVALUATION OF WATER MANAGEMENT STRATEGIES FOR MEETING THE PROJECTED WATER SUPPLY NEEDS OF COUNTY-OTHER IN LAMAR COUNTY

Description of Water User Group:

Lamar County-Other is comprised of M-J-C, Pattonville and Petty WSCs. The WUG population is projected to be 3,103 in 2020 and 3,508 by the year 2070. The entities comprising this WUG are supplied by groundwater from the Trinity and Woodbine Aquifers, and purchased surface water from Lamar County WSD. In Lamar County, the County-Other WUG is projected to have a deficit of 204 ac-ft in 2020 and increasing to a deficit of 244 ac-ft by 2070.

Water Supply and Demand Analysis:

	2020	2030	2040	2050	2060	2070
Population	3,103	3,225	3,315	3,395	3,458	3,508
Projected Water Demand	479	485	498	508	516	524
Water Demand from other entities	0	0	0	0	0	0
Current Water Supply	275	281	286	284	282	280
Projected Supply Surplus (+) / Deficit (-)	**-204**	**-204**	**-212**	**-224**	**-234**	**-244**

Projected Supply Surplus (+) / Deficit (-) by Basin	2020	2030	2040	2050	2060	2070
Red	-120	-121	-124	-127	-129	-131
Sulphur	-84	-83	-88	-97	-105	-113
Total	**-204**	**-204**	**-212**	**-224**	**-234**	**-244**

Evaluation of Potentially Feasible Water Management Strategies:

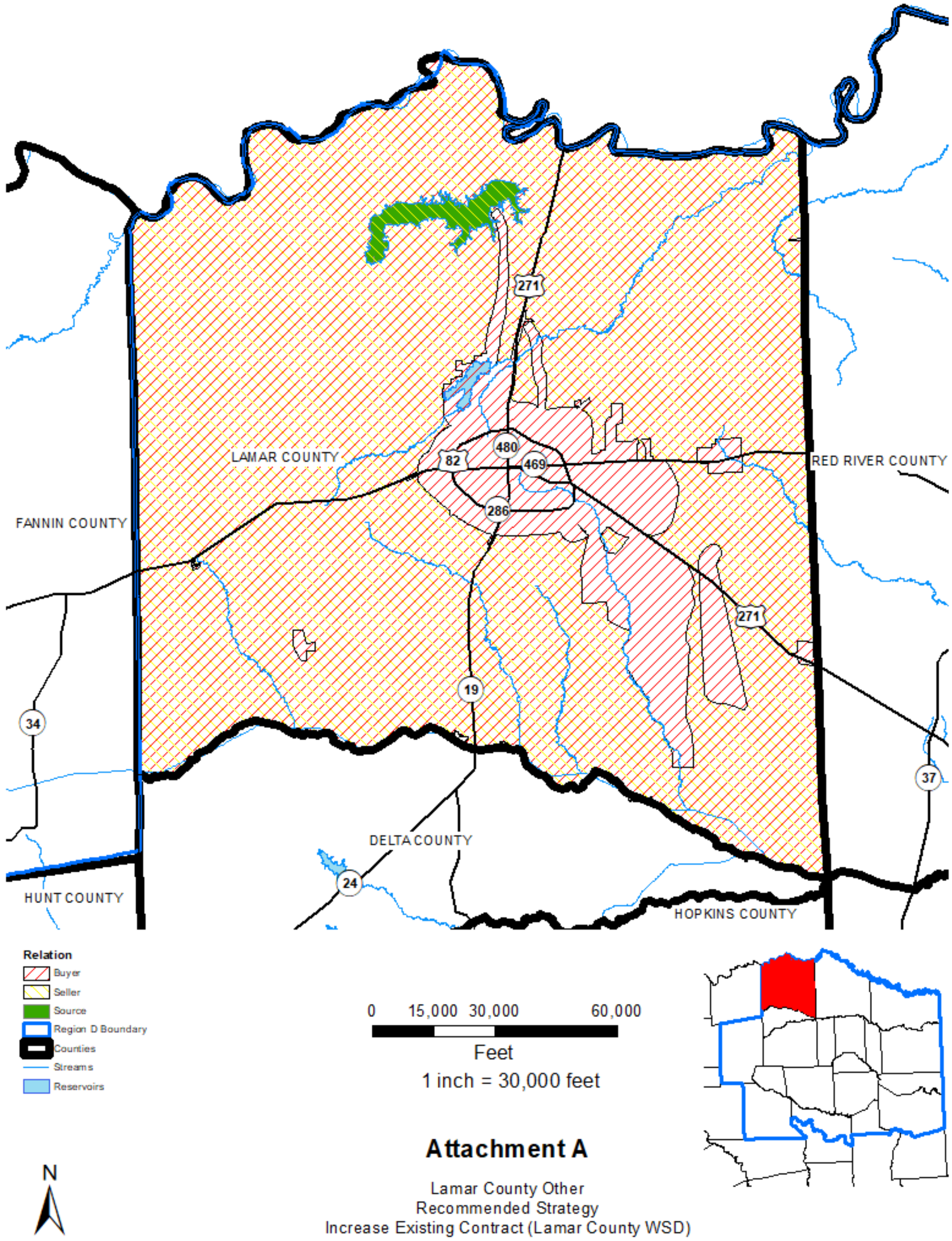
Six alternative strategies were considered to meet the WUG's water supply shortages. Advanced conservation was not selected because the WUG's overall supply is not projected to meet TCEQ regulatory minimums. Reuse is not a feasible option because water supply is mainly used for public consumption. Groundwater from the Trinity and Woodbine Aquifers has been identified as a potential source of water for Lamar County Other, although a local hydrogeological assessment performed by Region D did not identify sufficient available technical information to identify sufficient groundwater availability from these aquifers to meet the projected County-Other needs in Lamar County over the 2020-2070 planning period. The purchase of surface water from Pat Mayse from Lamar County WSD has also been identified as a potential water supply source.

Strategy	Firm Yield (ac-ft)	Total Capital Cost	Total Annualized Cost	Unit Cost	Environmental Impact
Increase Existing Contract (Lamar County WSD)	**244**	**$0**	**$398,000**	**$1,631**	**1**

Recommendations:

	2020	2030	2040	2050	2060	2070
Increase Existing Contract (Lamar County WSD; ac-ft/yr)	204	204	212	224	234	244

The recommended strategy to meet Lamar County-Other needs is to increase the existing contract amounts with Lamar County WSD to meet projected Lamar County-Other needs over the 2020-2070 planning period.



Attachment A

Lamar County Other
Recommended Strategy
Increase Existing Contract (Lamar County WSD)

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices

Lamar County-Other - Increase Existing Contract from Lamar Co WSD

Cost based on ENR CCI 11170.28 for September 2018 and
a PPI of 201.9 for September 2018

Item	***Estimated Costs for Facilities***
ANNUAL COST	
Operation and Maintenance	
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (0 kW-hr @ 0.08 $/kW-hr)	$0
Purchase of Water (244 acft/yr @ 1629.14 $/acft)	$398,000
TOTAL ANNUAL COST	**$398,000**
Available Project Yield (acft/yr)	244
Annual Cost of Water ($ per acft), based on PF=1	$1,631
Annual Cost of Water After Debt Service ($ per acft), based on PF=1	$1,631
Annual Cost of Water ($ per 1,000 gallons), based on PF=1	$5.01
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1	$5.01

JMP *9/27/2019*

EVALUATION OF WATER MANAGEMENT STRATEGIES FOR MEETING THE PROJECTED WATER SUPPLY NEEDS OF IRRIGATION IN LAMAR COUNTY

Description of Water User Group:

Irrigation WUG in Lamar County is projected to be supplied by surface water from run-of-river diversions from the Red River and groundwater from wells the Trinity and Woodbine Aquifers. Irrigation in Lamar County has a demand that is projected to be a constant 10,126 ac-ft/yr for the planning period 2020 through 2070. A deficit of 18,312 ac-ft/yr is projected to occur in 2020, decreasing slightly to 18,302 ac-ft/yr by 2070.

Water Supply and Demand Analysis:

	2020	2030	2040	2050	2060	2070
Projected Water Demand	10,126	10,126	10,126	10,126	10,126	10,126
Current Water Supply	8,658	8,658	8,658	8,658	8,658	8,658
Projected Supply Surplus (+)/Deficit(-)	**-1,468**	**-1,468**	**-1,468**	**-1,468**	**-1,468**	**-1,468**

Projected Supply Surplus (+)/Deficit(-) by Basin	2020	2030	2040	2050	2060	2070
Red	-1,140	-1,140	-1,140	-1,140	-1,140	-1,140
Sulphur	-328	-328	-328	-328	-328	-328
Total	**-1,468**	**-1,468**	**-1,468**	**-1,468**	**-1,468**	**-1,468**

Evaluation of Potentially Feasible Water Management Strategies:

Multiple alternative strategies were considered to meet the Lamar County Irrigation WUG's water supply shortages. Advanced water conservation for irrigation practices were not considered in this planning effort, as present irrigation practices likely already incorporate many BMPs to extend water supplies, thus no additional conservation would be feasible. The use of reuse water from nearby municipalities is not considered feasible as it would not be effective to deliver reuse water to farm irrigation systems.

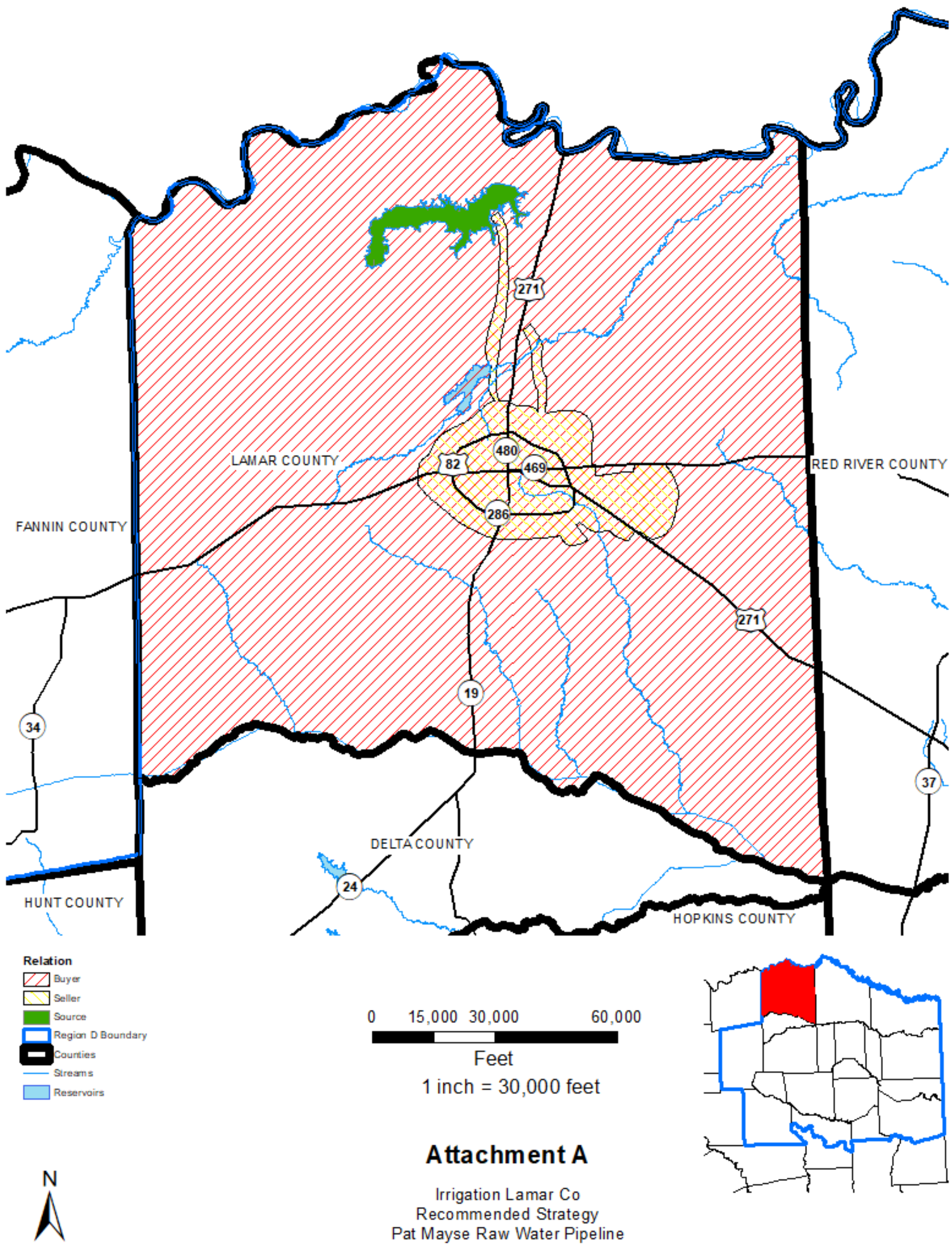
Groundwater was identified as a potential source of water for irrigation in Lamar County. Due to limitations of availability, the Woodbine and Trinity aquifers will not cover all shortages. A local hydrogeological assessment performed by Region D did not identify sufficient available technical information to determine additional groundwater source availability. New surface water rights were also evaluated as a potentially feasible strategy, however no firm supply could be identified. A purchase of raw water from the City of Paris was evaluated as a viable supplement to groundwater in order to meet projected demands. Alternatively, a purchase of all needed water from the City of Paris along with necessary construction of raw water conveyance infrastructure was evaluated as potentially feasible strategy. Lastly, purchase of treated water from surplus supply from Lamar County WSD was identified and evaluated as a potential strategy.

Strategy	Firm Yield (AF)	Total Capital Cost	Total Annualized Cost	Unit Cost	Env. Impact
New Surface Water Right	**0**	**-**	**-**	**-**	**-**
Pat Mayse Raw Water Pipeline from Paris	**1,468**	**$12,021,000**	**$1,317,000**	**$897**	**1**
Treated Surface Water from Lamar Co WSD	**1,468**	**$12,021,000**	**$3,374,000**	**$2,298**	**1**

Recommendations:

	2020	2030	2040	2050	2060	2070
Pat Mayse Raw Water Pipeline from Paris (ac-ft/yr)	1,468	1,468	1,468	1,468	1,468	1,468

The recommended strategy for the Lamar County Irrigation WUG to meet projected demands during the planning period is to purchase raw water from Pat Mayse and Crook Reservoirs through the City of Paris. Given the distribution of the Irrigation WUG, the recommended raw water pipeline is an assumed 18-mile long 14 inch pipeline from The City of Paris's raw water intake line. Construction of a project for Daisy Farms in southern Lamar County is a development of water supply consistent with this recommended strategy.



Cost Estimate Summary
Water Supply Project Option
September 2018 Prices

Lamar County Irrigation - Raw Water Pipeline (Paris)

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 201.9 for September 2018

Item	***Estimated Costs for Facilities***
Primary Pump Station (1.38 MGD)	$997,000
Transmission Pipeline (14 in dia., 18.7 miles)	$7,470,000
TOTAL COST OF FACILITIES	**$8,467,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$2,590,000
Environmental & Archaeology Studies and Mitigation	$481,000
Land Acquisition and Surveying (50 acres)	$161,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$322,000
TOTAL COST OF PROJECT	**$12,021,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$846,000
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$75,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$25,000
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (445000 kW-hr @ 0.08 $/kW-hr)	$36,000
Purchase of Water (1468 acft/yr @ 228 $/acft)	$335,000
TOTAL ANNUAL COST	**$1,317,000**
Available Project Yield (acft/yr)	1,468
Annual Cost of Water ($ per acft), based on PF=1	$897
Annual Cost of Water After Debt Service ($ per acft), based on PF=1	$321
Annual Cost of Water ($ per 1,000 gallons), based on PF=1	$2.75
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1	$0.98

JMP *9/27/2019*

EVALUATION OF WATER MANAGEMENT STRATEGIES FOR MEETING THE PROJECTED WATER SUPPLY NEEDS OF LIVESTOCK IN LAMAR COUNTY

Description of Water User Group:

Livestock WUG in Lamar County is projected to be supplied by groundwater from wells the Trinity and Woodbine Aquifers and local surface water supplies. Livestock in Lamar County has a demand that is projected to be constant demand of 1,469 ac-ft/yr for 2020 through 2070. A deficit of 617 ac-ft/yr is projected to occur throughout the planning period in the Red River Basin. A surplus of 772 ac-ft/yr is projected for the Sulphur Basin throughout the planning period.

Water Supply and Demand Analysis:

	2020	2030	2040	2050	2060	2070
Projected Water Demand	1,469	1,469	1,469	1,469	1,469	1,469
Current Water Supply	1,624	1,624	1,624	1,624	1,624	1,624
Projected Supply Surplus (+)/Deficit(-)	**155**	**155**	**155**	**155**	**155**	**155**

Projected Supply Surplus (+)/Deficit(-) by Basin	2020	2030	2040	2050	2060	2070
Red	-617	-617	-617	-617	-617	-617
Sulphur	772	772	772	772	772	772
Total	**155**	**155**	**155**	**155**	**155**	**155**

Evaluation of Potentially Feasible Water Management Strategies:

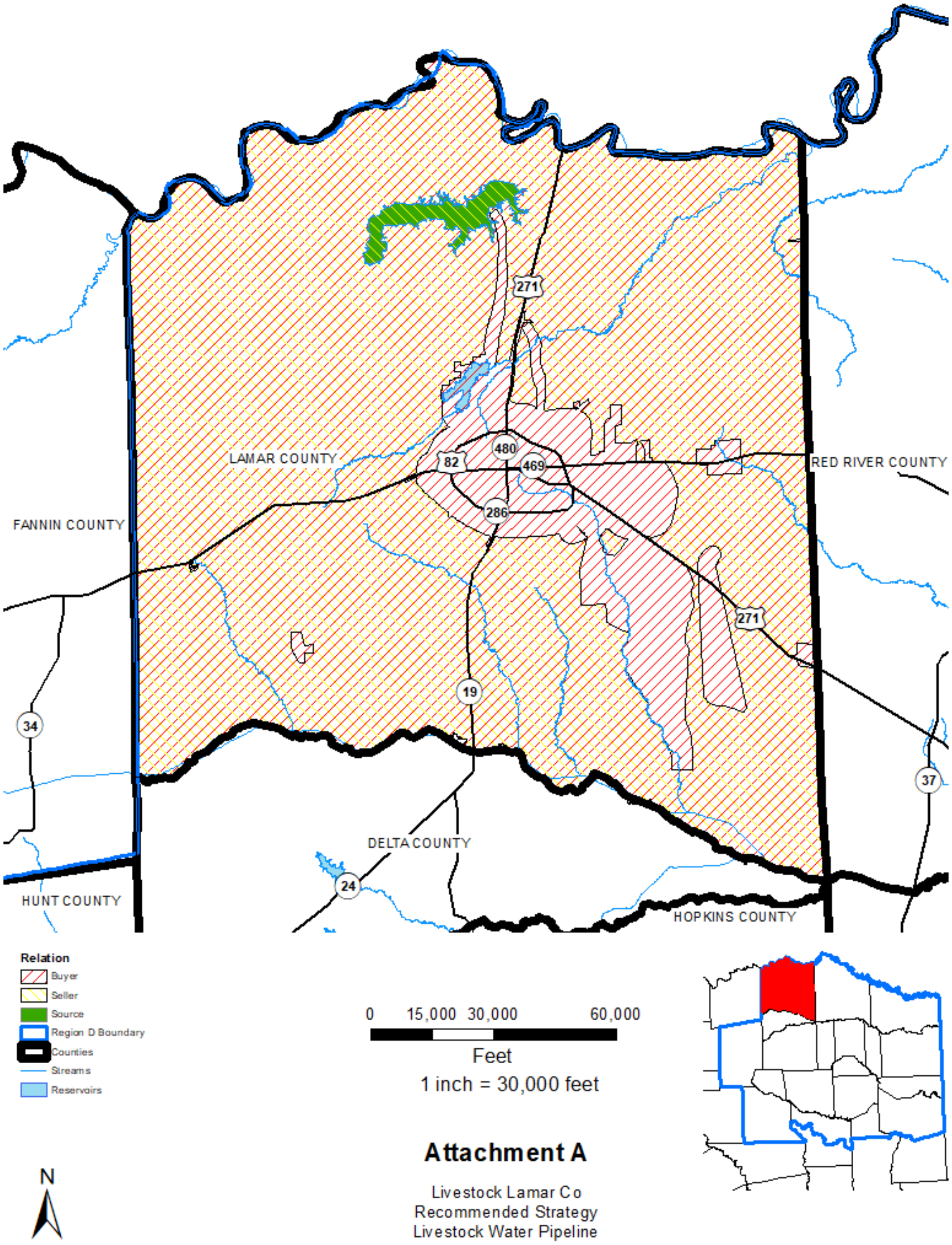
Multiple alternative strategies were considered to meet the Lamar County Livestock WUG's water supply shortages. Advanced water conservation for livestock practices was not considered, as present livestock practices likely result in sale of the livestock to reduce demand and extend water supply. The use of reuse water from nearby municipalities is not considered feasible as the water may be used for livestock consumption. Groundwater was identified as a potential source of water for livestock in Lamar County; however, a local hydrogeologic assessment did not identify sufficient available information to justify additional groundwater source availability in Lamar County in adequate amounts to meet the identified projected needs in the Red River Basin. New surface water rights were also evaluated as a potentially feasible strategy but no firm run-of-river supply was identified. Purchase of raw water from the City of Paris or the Lamar County WSD were evaluated as potentially feasible strategies for the WUG.

Strategy	Firm Yield (AF)	Total Capital Cost	Total Annualized Cost	Unit Cost	Env. Impact
New surface water rights	**0**	**-**	**-**	**-**	**1**
Raw Water Pipeline from Paris	**617**	**$14,574,000**	**$1,373,000**	**$2,225**	**1**
Water Pipeline from Lamar Co WSD	**617**	**$14,574,000**	**$2,237,000**	**$3,626**	**1**

Recommendations:

	2020	2030	2040	2050	2060	2070
Water Pipeline from Lamar Co WSD	**617**	**617**	**617**	**617**	**617**	**617**

The recommended strategy for the Lamar County Livestock WUG to meet projected demands during the planning period is to purchase water from Lamar County WSD. Given the distribution of the Livestock WUG, an assumed 18-mile long 8-inch diameter pipeline to meet the projected needs was developed using the UCM to represent a proximate raw water pipeline. If an alternative characterization of a raw water pipeline for this WUG is contemplated (e.g., alternative location, routing, sizing), it should be recognized as consistent with the 2021 Region D Plan.



Attachment A

Livestock Lamar Co
Recommended Strategy
Livestock Water Pipeline

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices

Lamar County Livestock - Purchase surface water from Lamar Co WSD

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 201.9 for September 2018

Item	Estimated Costs for Facilities
Primary Pump Station (0.58 MGD)	$3,103,000
Transmission Pipeline (8 in dia., 18.7 miles)	$3,592,000
Transmission Pump Station(s) & Storage Tank(s)	$3,469,000
TOTAL COST OF FACILITIES	**$10,164,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$3,377,000
Environmental & Archaeology Studies and Mitigation	$481,000
Land Acquisition and Surveying (50 acres)	$161,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$391,000
TOTAL COST OF PROJECT	**$14,574,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$1,025,000
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$53,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$122,000
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (401142 kW-hr @ 0.08 $/kW-hr)	$32,000
Purchase of Water (617 acft/yr @ 1629.14 $/acft)	$1,005,000
TOTAL ANNUAL COST	**$2,237,000**
Available Project Yield (acft/yr)	617
Annual Cost of Water ($ per acft), based on PF=1	$3,626
Annual Cost of Water After Debt Service ($ per acft), based on PF=1	$1,964
Annual Cost of Water ($ per 1,000 gallons), based on PF=1	$11.12
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1	$6.03

JMP *9/23/2019*

REGION D
EVALUATIONS OF WATER MANAGEMENT STRATEGIES
FOR MEETING PROJECTED WATER SUPPLY NEEDS
TO YEAR 2070

MARION COUNTY

WUGs:

Marion County Mining

EVALUATION OF WATER MANAGEMENT STRATEGIES FOR MEETING THE PROJECTED WATER SUPPLY NEEDS MINING IN MARION COUNTY, CYPRESS

Description of Water User Group:

The Mining WUG in Marion County is a split entity and has a demand that is projected to be decreasing from 489 ac-ft/yr in 2020 to 393 ac-ft/yr in 2070. Mining in Marion County has a current water supply consisting of water wells from the Carrizo-Wilcox Aquifer. The total rated available supply from these sources is 116 ac-ft/yr. Mining in Marion County is projected to have a water supply deficit of 373 ac-ft/yr in 2020 increasing to 645 in 2030 then decreasing to a deficit of 265 ac-ft/yr in 2070 for the Marion Cypress.

Water Supply and Demand Analysis:

Mining Marion Cypress	2020	2030	2040	2050	2060	2070
Projected Water Demand	489	764	712	595	478	393
Current Water Supply	116	119	122	124	126	128
Projected Supply Surplus (+)/Deficit(-)	-373	-645	-590	-471	-352	-265

Evaluation of Potentially Feasible Water Management Strategies:

Three alternative strategies were considered to meet the Marion County Mining water supply shortages as summarized in the following table. Advanced conservation and water reuse was not considered because operational procedures for the existing mines is not available. Surface water alternatives were omitted since they are currently on groundwater and the demands are manageable. A groundwater worksheet is included as Attachment B.

Strategy	Firm Yield (AF)	Total Capital Cost	Total Annualized Cost	Unit Cost	Environmental Impact
Groundwater	**645**	**$767,000**	**$78,000**	**$121**	**Minimal**

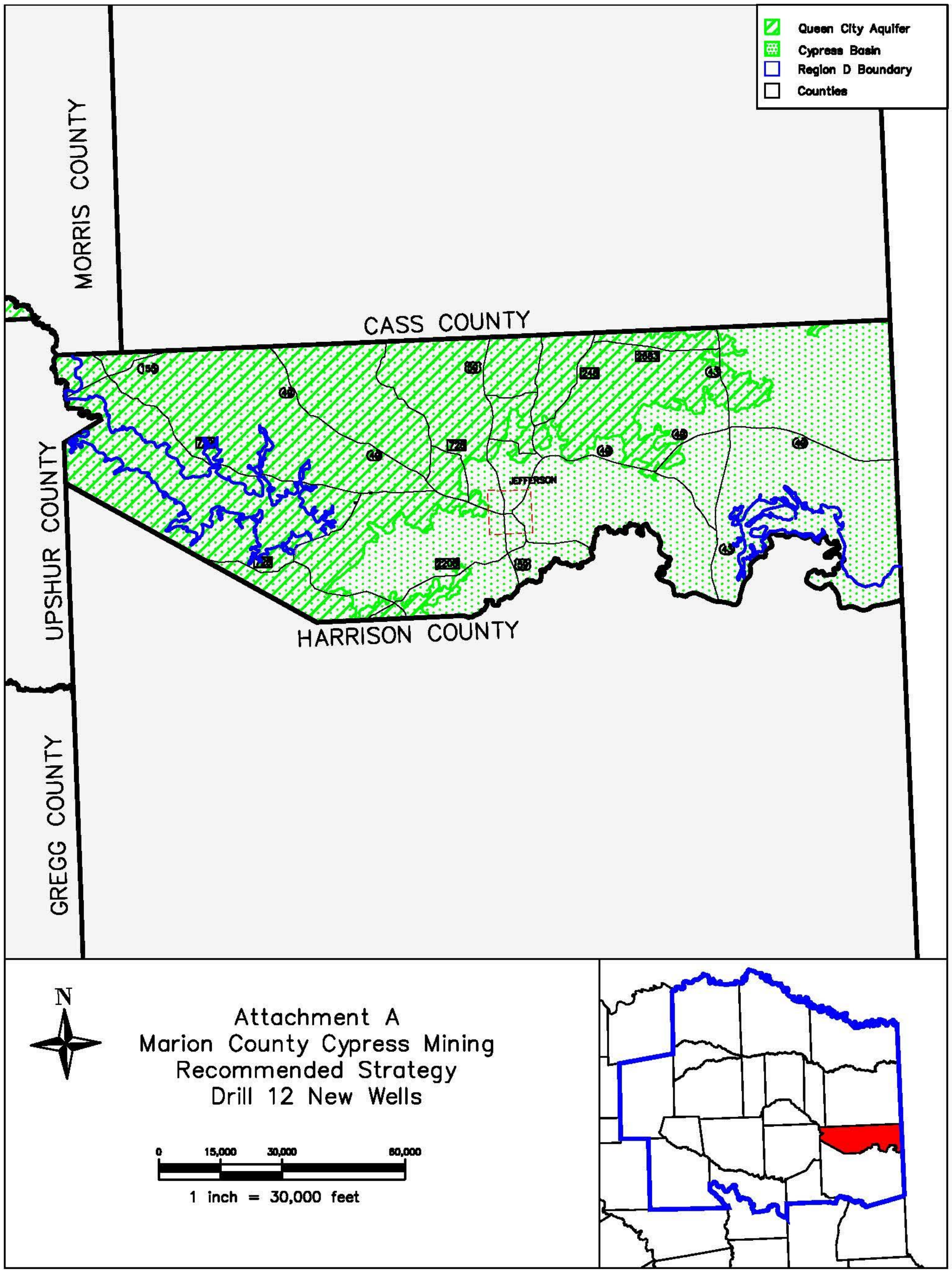
Recommendations:

	2020	2030	2040	2050	2060	2070
Groundwater (ac-ft/yr)	432	645	645	645	645	645

The recommended strategy for the Marion County Mining to meet their projected deficit of 373 ac-ft/yr in 2020 and 645 ac-ft/yr in 2030 would be to construct four additional water wells similar to their existing wells just prior to each decade as the deficits occur till 2030. The recommended supply source will be the Queen City Aquifer in Marion County Cypress. Four wells with rated capacity of 100 gpm each would provide approximately 161 acre-feet each or 645 ac-ft/yr. The Queen City Aquifer in Marion County Cypress is projected to have a more than ample supply availability to meet the needs of the Mining in Marion County Cypress for the planning period.

Given the increasing costs to comply with more stringent regulations and the decreasing reliability of groundwater as a future supply source due to quality issues in this region, it is recommended that groundwater supply systems consider combining resources and/or soliciting future water supply from neighboring systems and/or major water providers in the region. If a feasible alternative becomes available, then the recommendations previously discussed should be disregarded and a re-evaluation completed.

Cost Estimate Summary Water Supply Project Option September 2018 Prices Mining Marion Cypress - Drill New Well Queen City Aquifer Marion Cypress	
Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 202.4 for September 2018	
Item	***Estimated Costs for Facilities***
CAPITAL COST	
Dam and Reservoir (Conservation Pool acft, acres)	$0
Off-Channel Storage/Ring Dike (Conservation Pool acft, acres)	$0
Terminal Storage (Conservation Pool acft, acres)	$0
Primary Pump Station (0 MGD)	$0
Transmission Pipeline (6 in dia., miles)	$0
Transmission Pump Station(s) & Storage Tank(s)	$0
Well Fields (Wells, Pumps, and Piping)	$551,000
Storage Tanks (Other Than at Booster Pump Stations)	$0
Water Treatment Plant (0 MGD)	$0
Advanced Water Treamtent Facility (MGD)	$0
Conservation (Leaking Pipe/Meter Replacement)	$0
Integration, Relocations, & Other	$0
TOTAL COST OF FACILITIES	**$551,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$193,000
Environmental & Archaeology Studies and Mitigation	$2,000
Land Acquisition and Surveying (2 acres)	$0
Interest During Construction (3% for 1 years with a 0.5% ROI)	$21,000
TOTAL COST OF PROJECT	**$767,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$54,000
Reservoir Debt Service (3.5 percent, 40 years)	$0
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$6,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (224594 kW-hr @ 0.08 $/kW-hr)	$18,000
Purchase of Water (acft/yr @ $/acft)	$0
TOTAL ANNUAL COST	**$78,000**
Available Project Yield (acft/yr)	645
Annual Cost of Water ($ per acft), based on PF=1	$121
Annual Cost of Water After Debt Service ($ per acft), based on PF=1	$37
Annual Cost of Water ($ per 1,000 gallons), based on PF=1	$0.37
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1	$0.11
Stanley Hayes	*10/3/2019*


Queen City Aquifer
Cypress Basin
Region D Boundary
Counties
MORRIS COUNTY
CASS COUNTY
UPSHUR COUNTY
HARRISON COUNTY
GREGG COUNTY
JEFFERSON
N
Attachment A
Marion County Cypress Mining
Recommended Strategy
Drill 12 New Wells
0
15,000
30,000
60,000
1 inch = 30,000 feet

REGION D
EVALUATIONS OF WATER MANAGEMENT STRATEGIES
FOR MEETING PROJECTED WATER SUPPLY NEEDS
TO YEAR 2070

MORRIS COUNTY

WUGs:

Morris County Livestock

EVALUATION OF WATER MANAGEMENT STRATEGIES FOR MEETING THE PROJECTED WATER SUPPLY NEEDS LIVESTOCK IN MORRIS COUNTY

Description of Water User Group:

The Livestock WUG in Morris County, Cypress Basin, is a split entity and has a demand that is projected to be a constant 836 ac-ft/yr from 2020 to 2070. Livestock in Morris County, Cypress has a current water supply consisting of water wells from the Carrizo-Wilcox Aquifer, Queen City Aquifer, and Local Supplies. The total rated available supply from these sources is 326 ac-ft/yr in 2020 thru 2070. Livestock in Morris County, Cypress is projected to have a water supply deficit of 510 ac-ft/yr in 2020 thru 2070.

The Livestock WUG in Morris County, Sulphur Basin, is a split entity and has a demand that is projected to be a constant 769 ac-ft/yr from 2020 to 2070. Livestock in Morris County, Sulphur has a current water supply consisting of water wells from the Carrizo-Wilcox Aquifer, Queen City Aquifer, and Local Supplies. The total rated available supply from these sources is 300 ac-ft/yr in 2020 thru 2070. Livestock in Morris County, Sulphur is projected to have a water supply deficit of 469 ac-ft/yr in 2020 thru 2070.

Water Supply and Demand Analysis:

Livestock Morris Cypress	**2020**	**2030**	**2040**	**2050**	**2060**	**2070**
Projected Water Demand						
Cypress	836	836	836	836	836	836
Sulphur	769	769	769	769	769	769
Total	**1,605**	**1,605**	**1,605**	**1,605**	**1,605**	**1,605**
Current Water Supply						
Cypress	326	326	326	326	326	326
Sulphur	300	300	300	300	300	300
Total	**626**	**626**	**626**	**626**	**626**	**626**
Projected Supply Surplus (+)/Deficit(-)						
Cypress	-510	-510	-510	-510	-510	-510
Sulphur	-469	-469	-469	-469	-469	-469
Total	**-979**	**-979**	**-979**	**-979**	**-979**	**-979**

Evaluation of Potentially Feasible Water Management Strategies:

Five alternative strategies were considered to meet the Morris County, Livestock water supply shortages as summarized in the following table. Advanced conservation and water reuse were not considered because the demands are very rural in nature. Surface water alternatives were not utilized due to the rural nature of livestock demands. Local supply was used because it is available. Groundwater wells in the Queen City Aquifer (Cypress Creek River basin) were identified as a potentially feasible strategy for the WUG.

Strategy	Firm Yield (AF)	Total Capital Cost	Total Annualized Cost	Unit Cost	Environmental Impact
Groundwater Queen City Sulphur Basin	**483**	**$ 539,000**	**$ 47,000**	**$ 97**	**1**
Groundwater Queen City Cypress Basin	**644**	**$ 767,000**	**$ 78,000**	**$ 121**	**1**

Recommendations:

	2020	**2030**	**2040**	**2050**	**2060**	**2070**
Drill New Wells (Queen City, Sulphur Basin; ac-ft/yr)	483	483	483	483	483	483
Drill New Wells (Queen City, Cypress Creek Basin; ac-ft/yr)	644	644	644	644	644	644

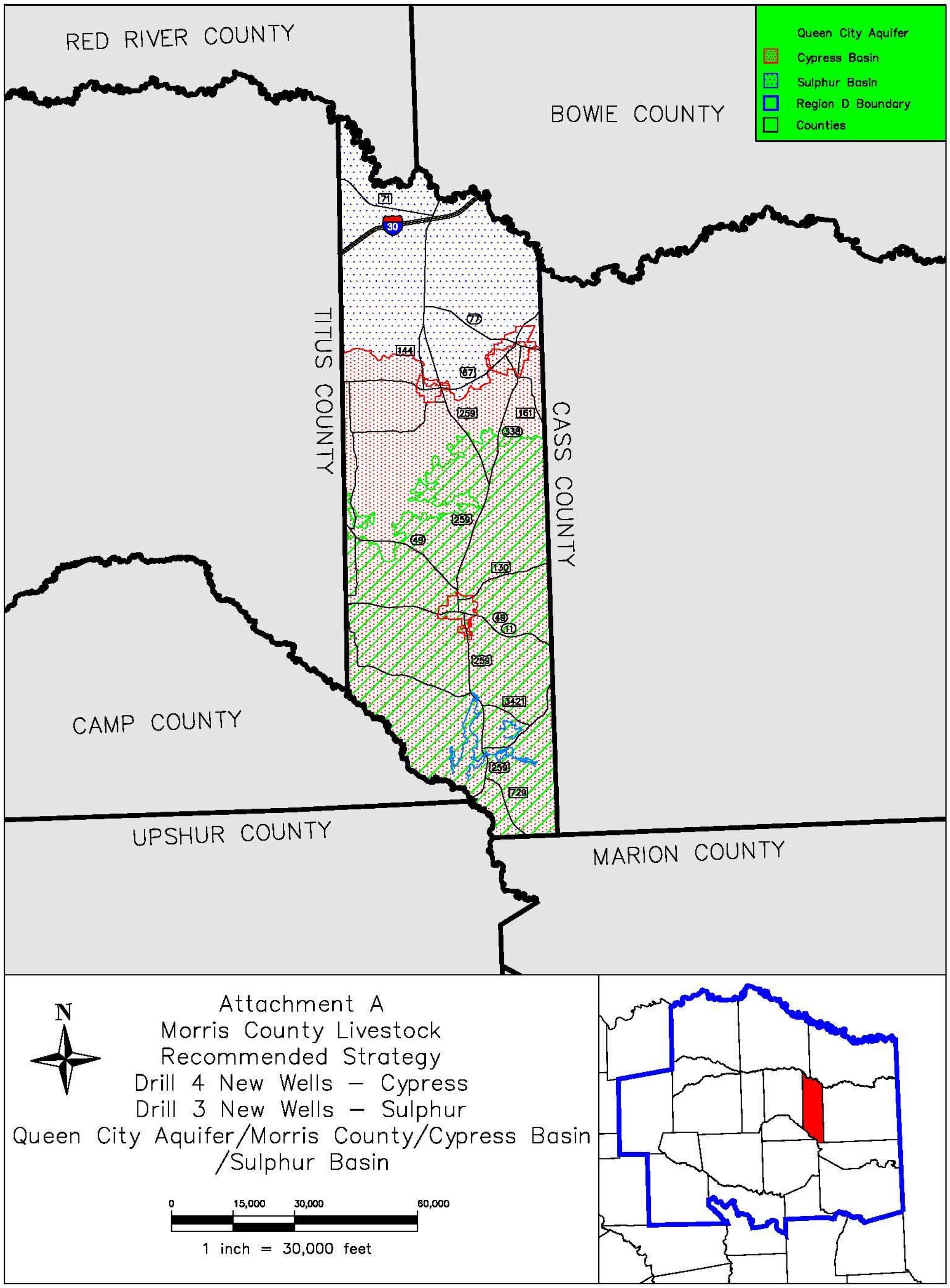
The recommended strategy for the Morris County, Livestock, Cypress to meet their projected deficit of 510 ac-ft/yr in 2020 thru 2070 would be to construct four water wells prior to 2020. The recommended supply source will be the Queen City in Morris County, Cypress Basin. One well with rated capacity of 100 gpm would provide approximately 161 ac-ft/yr. Four new wells will be needed to provide the 510 ac-ft/yr needed.

The recommended strategy for the Morris County, Livestock, Sulphur to meet their projected deficit of 469 ac-ft/yr in 2020 thru 2070 would be to construct three water wells prior to 2020. The recommended supply source will be the Queen City Aquifer in Morris County Cypress Basin. One well with rated capacity of 100 gpm each would provide approximately 161 ac-ft/yr. Three new wells will be needed to provide the 469 ac-ft/yr needed. The Queen City Aquifer in Morris County Cypress is projected to have a more than ample supply availability to meet the needs of the Livestock in Morris County for the planning period.

Given the increasing costs to comply with more stringent regulations and the decreasing reliability of groundwater as a future supply source due to quality issues in this region, it is recommended that groundwater supply systems consider combining resources and/or soliciting future water supply from neighboring systems and/or major water providers in the region. If a feasible alternative becomes available, then the recommendations previously discussed should be disregarded and a re-evaluation completed.

Cost Estimate Summary Water Supply Project Option September 2018 Prices Livestock Morris Cypress - Drill New Well Queen City Aquifer Morris Cypress	
Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 202.4 for September 2018	
Item	***Estimated Costs for Facilities***
CAPITAL COST	
Dam and Reservoir (Conservation Pool acft, acres)	$0
Off-Channel Storage/Ring Dike (Conservation Pool acft, acres)	$0
Terminal Storage (Conservation Pool acft, acres)	$0
Primary Pump Station (0 MGD)	$0
Transmission Pipeline (6 in dia., miles)	$0
Transmission Pump Station(s) & Storage Tank(s)	$0
Well Fields (Wells, Pumps, and Piping)	$551,000
Storage Tanks (Other Than at Booster Pump Stations)	$0
Water Treatment Plant (0 MGD)	$0
Advanced Water Treamtent Facility (MGD)	$0
Conservation (Leaking Pipe/Meter Replacement)	$0
Integration, Relocations, & Other	$0
TOTAL COST OF FACILITIES	**$551,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$193,000
Environmental & Archaeology Studies and Mitigation	$2,000
Land Acquisition and Surveying (2 acres)	$0
Interest During Construction (3% for 1 years with a 0.5% ROI)	$21,000
TOTAL COST OF PROJECT	**$767,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$54,000
Reservoir Debt Service (3.5 percent, 40 years)	$0
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$6,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (224177 kW-hr @ 0.08 $/kW-hr)	$18,000
Purchase of Water (acft/yr @ $/acft)	$0
TOTAL ANNUAL COST	**$78,000**
Available Project Yield (acft/yr)	644
Annual Cost of Water ($ per acft), based on PF=1	$121
Annual Cost of Water After Debt Service ($ per acft), based on PF=1	$37
Annual Cost of Water ($ per 1,000 gallons), based on PF=1	$0.37
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1	$0.11
Stanley Hayes	*10/4/2019*

Cost Estimate Summary Water Supply Project Option September 2018 Prices	
Livestock Morris Sulphur - Drill New Well Queen City Aquifer Morris Sulphur	
Cost based on ENR CCI 11170.28 for September 2018 and	
a PPI of 202.4 for September 2018	
Item	***Estimated Costs for Facilities***
CAPITAL COST	
Dam and Reservoir (Conservation Pool acft, acres)	$0
Off-Channel Storage/Ring Dike (Conservation Pool acft, acres)	$0
Terminal Storage (Conservation Pool acft, acres)	$0
Primary Pump Station (0 MGD)	$0
Transmission Pipeline (6 in dia., miles)	$0
Transmission Pump Station(s) & Storage Tank(s)	$0
Well Fields (Wells, Pumps, and Piping)	$385,000
Storage Tanks (Other Than at Booster Pump Stations)	$0
Water Treatment Plant (0 MGD)	$0
Advanced Water Treamtent Facility (MGD)	$0
Conservation (Leaking Pipe/Meter Replacement)	$0
Integration, Relocations, & Other	$0
TOTAL COST OF FACILITIES	**$385,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$135,000
Environmental & Archaeology Studies and Mitigation	$4,000
Land Acquisition and Surveying (2 acres)	$0
Interest During Construction (3% for 1 years with a 0.5% ROI)	$15,000
TOTAL COST OF PROJECT	**$539,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$38,000
Reservoir Debt Service (3.5 percent, 40 years)	$0
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$4,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (56392 kW-hr @ 0.08 $/kW-hr)	$5,000
Purchase of Water (acft/yr @ $/acft)	$0
TOTAL ANNUAL COST	**$47,000**
Available Project Yield (acft/yr)	483
Annual Cost of Water ($ per acft), based on PF=1	$97
Annual Cost of Water After Debt Service ($ per acft), based on PF=1	$19
Annual Cost of Water ($ per 1,000 gallons), based on PF=1	$0.30
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1	$0.06
Stanley Hayes	*10/4/2019*


RED RIVER COUNTY
BOWIE COUNTY
Queen City Aquifer
Cypress Basin
Sulphur Basin
Region D Boundary
Counties
TITUS COUNTY
CASS COUNTY
CAMP COUNTY
UPSHUR COUNTY
MARION COUNTY
N
Attachment A
Morris County Livestock
Recommended Strategy
Drill 4 New Wells – Cypress
Drill 3 New Wells – Sulphur
Queen City Aquifer/Morris County/Cypress Basin
/Sulphur Basin
0
15,000
30,000
60,000
1 inch = 30,000 feet

REGION D
EVALUATIONS OF WATER MANAGEMENT STRATEGIES
FOR MEETING PROJECTED WATER SUPPLY NEEDS
TO YEAR 2070

RAINS COUNTY

WUGs:

None

REGION D
EVALUATIONS OF WATER MANAGEMENT STRATEGIES
FOR MEETING PROJECTED WATER SUPPLY NEEDS
TO YEAR 2070

RED RIVER COUNTY

WUGs:

The City of Clarksville
Red River County Irrigation
Red River County Livestock

EVALUATION OF WATER MANAGEMENT STRATEGIES FOR MEETING THE PROJECTED WATER SUPPLY NEEDS OF CITY OF CLARKSVILLE

Description of Water User Group:

The City of Clarksville is located in Red River County. The system is projected to serve 3,315 people through the planning period. The current sources of supply are wells into the Blossom Aquifer. Groundwater had previously been mixed with surface water from Langford Lake, however sedimentation has hindered its use as a water supply. Water quality issues with the groundwater (TDS) and surface water (turbidity) necessitate mixing of the supplies to meet Texas drinking water standards. The groundwater has over 1,000 ppm of dissolved solids including high levels of sodium, sulfate, and chloride. The City provides water to its own customers in the Sulphur basin and is projected to have a water supply deficit of 237 ac-ft/yr in 2020, due to sedimentation issues in Langford Lake. As the surface water supply for the City diminishes, the capability to mix the surface supply with the groundwater supply commensurately diminishes as well. Thus as surface supply diminishes, so too does the capability to utilize the City's existing groundwater supply. As noted in a 4 October, 2013 memorandum from the City's consultant, Murray, Thomas & Griffin, Inc. (MTG):

> "Clarksville has no available surface water when a water level of 417.0 (2006 low water level) and a sediment level at 415.0 (2013 lake bottom) are considered. Each of these conditions has occurred during the past ten years. The surface water is necessary to address total volume needs as well as for blending with the ground water."

For the current regional plan the City's water supply is solely from groundwater, thus the estimated deficit is reflective of the current groundwater production and treatment capacity without mixing of surface water. The system does have a water conservation and drought management plan in place.

Water Supply and Demand Analysis:

	2020	2030	2040	2050	2060	2070
Population	3,315	3,315	3,315	3,315	3,315	3,315
Projected Water Demand	620	602	593	592	590	590
Water Demand from other entities	0	0	0	0	0	0
Current Water Supply	383	371	371	371	371	371
Projected Supply Surplus (+) / Deficit (-)	**-237**	**-231**	**-222**	**-221**	**-219**	**-219**

Evaluation of Potentially Feasible Water Management Strategies:

The various feasible strategies considered to meet Clarksville's water supply shortages are listed in the table below. Advanced conservation was not selected because Clarksville's supply would not be projected to meet TCEQ regulatory minimums. Furthermore, reduction in demand would not alleviate the aforementioned water quality issues with the City's projected supplies. There are no significant current water needs in Clarksville that could be met by water reuse. Additional groundwater pumping from the Blossom Aquifer in the Sulphur River Basin and Reverse Osmosis treatment of all of the City's existing groundwater supplies has also been considered. The City's existing surface water supply has been made unavailable due to sedimentation issues in Langford Lake, the City's sole existing surface water supply. The City has requested the consideration of multiple potential surface water strategies to meet Clarksville's water supply needs. Potentially feasible strategies evaluated include:

- Treated Water Pipeline to DeKalb - purchasing water from the City of Texarkana's available supply from Wright Patman Reservoir;
- Dredging of sediment from Langford Lake;
- Construction of a new surface water reservoir, Dimple Reservoir;
- Construction of a raw water pipeline tying into to Region C's proposed Marvin Nichols Reservoir.

- Treated Water Pipeline to Detroit - purchasing water from the City of Paris (via Lamar County WSD) from Paris available supply.

The projected amount of firm supply necessary to meet the above projected demands differ due to the City's current methodology of mixing their surface and groundwater supplies at a ratio of 51%.

Strategy	Firm Yield (ac-ft)	Total Capital Cost	Total Annual Cost	Unit Cost (During Debt Service)	Unit Cost (After Debt Service	Env. Impact
Drill Additional Wells and RO Treatment	**388**	**$10,537,000**	**$1,673,000**	**$4,312**	**$2,402**	**1**
Contract with Lamar County WSD	**303**	**$12,255,000**	**$1,518,000**	**$5,010**	**$2,165**	**2**
Contract with Riverbend WRD and Treated Water Pipeline to DeKalb (ac-ft/yr)	**303**	**$11,702,000**	**$1,171,000**	**$3,865**	**$1,149**	**2**
Dredge Langford Lake (ac-ft/yr)	**303**	**$36,200,000**	**$2,807,000**	**$5,398**	**$0**	**5**
Dimple Reservoir (ac-ft/yr)	**303**	**$38,489,000**	**$2,415,000**	**$7,970**	**$1,099**	**5**

Description of evaluated projects

Raw Water Pipeline to Marvin Nichols Reservoir – The City of Clarksville has requested that their top priority for consideration as a water management strategy be a pipeline tying into Region C's water management strategy for the construction of Marvin Nichols Reservoir (as it is reported in the Sulphur River Basin Feasibility Study, SRBA 2014, that 20% of the water potentially available from Marvin Nichols Reservoir would be available for local use in Region D). Preliminary communications with Region C have indicated that this strategy is currently under consideration as a Proposed or Alternative Water Management Strategy for implementation by the year 2060 in the 2021 Region C Water Plan. As Region D has identified that the City of Clarksville has needs as early as 2020, Marvin Nichols as currently envisioned by Region C would not be available to meet the City's identified needs. Furthermore, the North East Texas Regional Water Planning Group opposes the construction of any reservoir in the Sulphur River Basin, and does not recommend this as a Recommended or Alternative Water Management Strategy. However, the City of Clarksville has noted that should this source be available during the planning period, it has reserved the right to work with the Sulphur River Basin Authority and to utilize this source once available.

New Groundwater Wells and Treatment Facility – A planning level analysis was performed to evaluate a strategy including the addition of new wells into the Blossom or Nacatoch Aquifer, Sulphur River Basin, in Red River County, and additional treatment of all of the City's groundwater supplies to address the aforementioned water quality issues. The available yield from the project was determined to be 237 ac-ft/yr. This was the amount calculated to be necessary to meet the projected future demands for the City, once added to Clarksville's existing groundwater supplies. It is thus critical to note that consideration of this strategy is for the entire 620 ac-ft/yr of supply necessary to meet the City's projected demands. The planning process strictly considers the amount of supply necessary to meet the projected shortage, i.e., 237 ac-ft/yr, and uses this amount as the basis for cost estimation purposes. Nevertheless, the strategy would be for the development of sufficient groundwater sources to meet the full 620 ac-ft/yr of projected City demands. It has been assumed for this strategy that existing groundwater wells of the City's are maintained.

Additional assumptions for this analysis included assuming Total Dissolved Solids (TDS) of 1,275 mg/L, and that two Reverse Osmosis (RO), Level 4 treatment plants would be located at the end of a 5-mile, 8-inch transmission line sized sufficiently to carry the full flow of pre-treated water, since when brackish water is treated, approximately 20% of the supply is lost as concentrate. An average of nearby depth (650 ft.) and head (250 ft.) of wells was utilized to calculate the potential number of wells needed (six new wells). For an assumed distance between wells of 1,500 ft., a total length of 7,500 ft. of 6-in. diameter well field piping was estimated. For the pipeline, 30 psi was assumed for the residual head at the end of the pipe, with a maximum pipeline pressure of 150 psi. Difference in elevation was assumed to be 50 ft. The treatment facilities would be of sufficient size (0.7 mgd) to treat the entirety of Clarksville's groundwater supply, both existing and proposed wells.

The TWDB's Unified Costing Model (UCM) was used to develop costs for this strategy. The total capital cost of the project is calculated to be approximately $10,537,000, with an annual cost of $1,598,000, for a unit cost during debt service of $2,577 per ac-ft ($7.91 per 1,000 gallons). After debt service, the unit cost would be approximately $1,382 per ac-ft.

Contract with Lamar County WSD and Treated Water Pipeline to Detroit - A strategy requested by the City of Clarksville is the construction of a 16" diameter pipeline from Clarksville to Detroit, and the purchase of up to 2 MGD of treated water from the Lamar County WSD. This strategy would be contingent upon the Lamar County WSD purchase of equivalent supply from the City of Paris. Cost estimates are based upon the TWDB's Unified Costing Model (UCM). The project is estimated to provide 303 ac-ft/yr by constructing a pipeline to Detroit, whereby the City of Clarksville would enter into a contract with the Lamar County WSD (contingent upon the District contracting for available supply from the City of Paris). This amount provides the surface water supply necessary for mixing with the City's existing groundwater supply, for a total project cost of $12.3 million, an annual cost of $1.5 million, and a unit cost for the additional supply of $5,010 per ac-ft. during debt service and $2,165 per ac-ft after debt service. Identifying uses for the additional production capability of the pipeline (up to 2 MGD) would likely lower the unit cost for this strategy.

Contract with Texarkana and Treated Water Pipeline to De Kalb – Another strategy previously requested by the City of Clarksville is the construction of a 16" diameter pipeline from Clarksville to De Kalb, and the purchase of up to 2 MGD of treated water from Texarkana. This project is based on a cost estimate developed by Riverbend Water Resources District, along with a similar project cost estimate from MTG Engineers. The total cost, annual cost, and unit cost of water from the project has been estimated based upon the results of these studies, as entered into the TWDB's Unified Costing Model (UCM). The project is estimated to have a total yield of 2,240 ac-ft/yr of supply by constructing a pipeline to De Kalb, whereby the City of Clarksville would enter into a contract with the City of Texarkana (or alternatively Riverbend Water Resources District) for up to 593 ac-ft/yr (0.53 MGD). The amount necessary to meet Clarksville's projected needs is 303 ac-ft/yr (0.27 MGD). This amount provides the surface water supply necessary for mixing with the City's existing groundwater supply, for a total project cost of $11.7 million, an annual cost of $1.2 million, and a unit cost for the additional supply of $3,865 per ac-ft. during debt service and $1,149 per ac-ft after debt service. Identifying uses for the additional production capability of the pipeline (up to 2 MGD) would likely lower the unit cost for this strategy.

Concerns about this strategy are with regard to present issues entailing the supply of Wright Patman Reservoir to Texarkana and the remaining Member Cities of Riverbend Water Resources District. Concerns regarding the priority of a new contract for Clarksville for treated water supply from Texarkana/Riverbend are somewhat ameliorated due to the fact that in times of drought, Texarkana's 2012 Water Conservation & Drought Contingency Plan specifies that curtailment of water deliveries to wholesale customers will be done by a pro-rata method as provided in Texas Water Code, §11.039. Furthermore, the amounts of supply considered within the 2021 North East Texas Regional Water Plan are based upon firm yields developed employing the TCEQ Water Availability Model, and reflect legal and infrastructure constraints to identify the amount of available supply. It is expected that costs associated with this strategy would be negotiated between the City of Clarksville and Texarkana/Riverbend WRD, as the City of Clarksville has expressed a potential interest in entering into a water supply relationship as a partner with these entities. This strategy, if implemented, would be contingent upon water management strategies identified for Riverbend WRD and its Member Entities.

Dredge Langford Lake – The firm yield of Langford Lake decreases over time due to sedimentation in the reservoir reducing the total volume of conservation capacity. This strategy would entail the dredging of sediment from Langford Lake to restore storage capacity within the reservoir which has been lost due to this sedimentation. This project utilizes a 24" dredge to remove an estimated 3,000 ac-ft of sediment over a one-year calendar period. The unit cost of reservoir dredging, in units of dollars per ac-ft of sediment removed, has been calculated based upon a formula from the World Bank, as presented in the TWDB Report *Dredging vs. New Reservoirs* (2004). The resultant calculated cost was entered into the UCM to determine the debt service cost. The project is estimated to yield 520 ac-ft of firm supply by dredging an estimated total of 3,000 ac-ft of sediment from Langford Lake over one year, for a total project cost of $36.2 million, an annual cost of $2.8 million, and a unit cost of $5,398 per ac-ft. during debt service and $0 per ac-ft after debt service.

Concerns with this strategy include the location and impacts from disposition of dredged material, the efficiency of removal of the dredged material, and the potential need to repeat the effort in the future since dredging does not remove the source of sedimentation issues in the contributing watershed. As noted in TWDB (2005), issues with regard to dredging fall into four general categories: removal of the sediment, transportation, disposal, and re-use.

For the removal of sediment, dredging reservoirs, particularly at the shallow headwaters and reservoir margins can destroy habitats and affect wetland birds, etc. If the water sustains flora or fauna of particular value, or if fish issues are important, then issues exist regarding lowering the water level. Dredging may also result in a temporary loss of reservoir water quality, through removal of organic material, although there may be long-term improvements in the reservoir water quality through removal of such organic material. Downstream water quality may also be temporarily impacted due to dredging. There may also be a loss of land for containment areas to drain/treat the sediment.

Regarding transportation, reservoirs are often in remote areas. The impact of additional transportation during dredging can place pressure on local communities (e.g., noise/air pollution and physical damage to roads), although these impacts may be reduced if the sediment can be effectively dewatered at or near the reservoir site using, for example, a hydrocyclone and/or a filter bed press. The viability of disposal to land depends on the level of contaminants, whereby there may be risks to groundwater supplies from contamination by leaching.

Opportunities for the re-use of dredged material include sand/gravel/bricks for the construction industry, fertilizer, usage for filling abandoned quarry areas or mines, and usage for capping landfill sites.

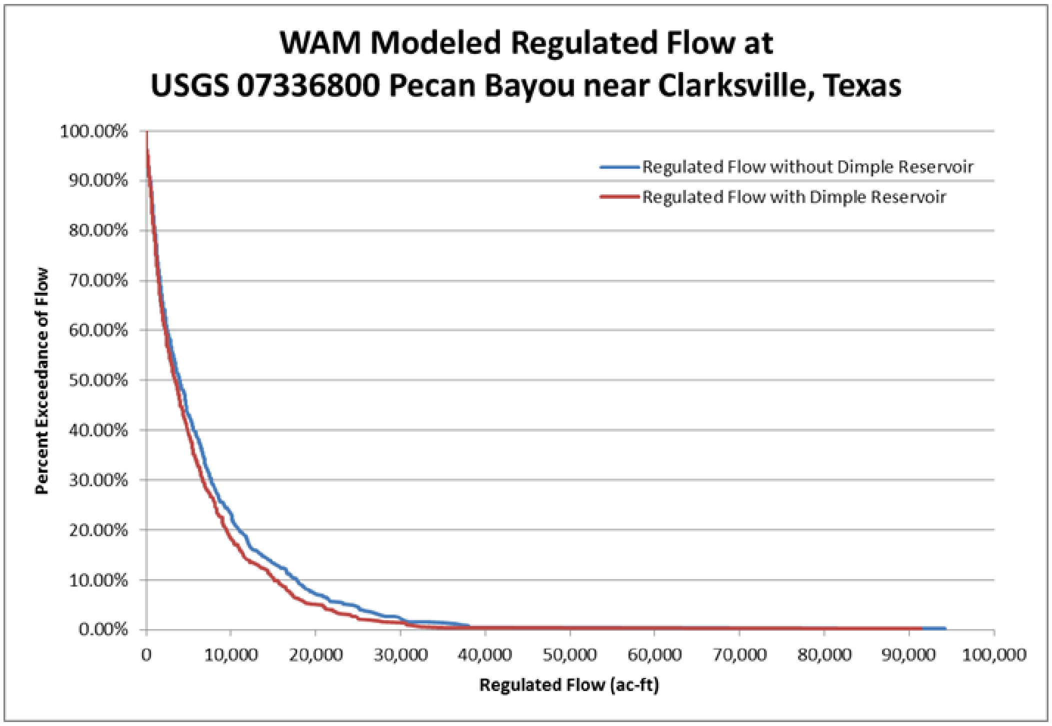
Dimple Reservoir – The City has also identified a feasible strategy to meet future water supply needs as being the construction of a new 28,541 ac-ft reservoir with a projected surface are of 2,230 acres on White Oak Bayou, a tributary of Pecan Bayou, to be utilized as an interbasin transfer from the Red River Basin to the Sulphur River Basin. This reservoir project was originally described in a 1986 report from HDR to the Red River Authority and project participants, entitled *Preliminary Engineering Report for Proposed Dimple Reservoir Project on White Oak Bayou*. The 1986 report identified a potential project site, reservoir area capacity, drainage area, and estimated construction costs for the reservoir and intake structure without equipment. Intake structure equipment and water pipelines from the reservoir were not included in the report, nor was a cost estimate. This site is described in Section 8.9.5 of the 2021 Region D Plan, although it has not been recommended as a unique reservoir site by the NETRWPG for the present round of regional planning.

The reservoir construction costs from the 1986 report have been adjusted to September 2018 costs using the ENR Construction Cost Index (CCI) and entered into the UCM. Intake equipment and a raw water pipeline from the reservoir to the City of Clarksville's water treatment plant have also been preliminarily identified and included in the UCM. The raw water pipeline in the UCM is modeled to deliver the estimated firm yield with a peaking factor of 2. The project pipeline is 8" diameter, and approximately 8 miles long, following existing roadways with an elevation increase of 40 feet. The pipeline costing utilizes the UCM's assumption of 15 psi for the residual head at End of Pipe for raw water and assumes a maximum pipeline pressure of 250 psi. UCM calculations for pump and power requirements provide the cost estimate for the intake equipment. For the 2021 planning process, the reservoir has been modeled in the Red River WAM (Run 3), subject to consensus environmental criteria at a junior priority date, and modeled considering the full demand of existing water rights in the Red River Basin. The results of this WAM analysis indicate the project has a firm yield of 10,200 ac-ft per year, although Clarksville needs only 303 ac-ft/yr to have adequate supply to mix with the City's groundwater supplies to meet its projected needs beyond 2020. However, the City intends to use up to 593 ac-ft/yr to meet its full projected demands. This strategy includes constructing a new 28,541 ac-ft reservoir and 8" pipeline to Clarksville's WTP, for a total project cost of $38.5 million with an annual cost of $2.4 million and a unit cost for the needed supply of $7,970 per ac-ft. with debt service and $1,099 per ac-ft without debt service. It should be noted, however, that Dimple Reservoir, as envisioned herein, is based on existing studies (from 1986) and characterizations of the impoundment. Studies investigating alternative configurations, perhaps using a smaller footprint, are encouraged. Furthermore, needs from additional entities, if identified as willing participants to such an effort, could improve the unit costs calculated for Clarksville herein.

Concerns with this strategy include the potential need for obtaining a surface water permit for an interbasin transfer from the Red River Basin to the Sulphur River Basin. However, there is the potential that this could be waived given the project is located within the same county as the proposed use. The Texas Water Code §11.085 identifies factors to be considered in the applicable regional water plans to address the following:

(A) the availability of feasible and practicable alternative supplies in the receiving basin to the water proposed for transfer;
(B) the amount and purposes of use in the receiving basin for which water is needed;
(C) proposed methods and efforts by the receiving basin to avoid waste and implement water conservation and drought contingency measures;
(D) proposed methods and efforts by the receiving basin to put the water proposed for transfer to beneficial use;
(E) the projected economic impact that is reasonably expected to occur in each basin as a result of the transfer; and
(F) the projected impacts of the proposed transfer that are reasonably expected to occur on existing water rights, instream uses, water quality, aquatic and riparian habitat, and bays and estuaries that must be assessed under Sections 11.147, 11.150, and 11.152 of this code in each basin. If the water sought to be transferred is currently authorized to be used under an existing permit, certified filing, or certificate of adjudication, such impacts shall only be considered in relation to that portion of the permit, certified filing, or certificate of adjudication proposed for transfer and shall be based on historical uses of the permit, certified filing, or certificate of adjudication for which amendment is sought;

The other alternatives considered herein present available alternatives in the receiving basin to the water proposed for transfer. The water would be used for municipal purposes. The City maintains its Water Conservation and Drought Contingency Plan, implementing measures identified therein to avoid waste and conserve water during times of drought. Minimal economic impact is expected in the Red River Basin, whereas positive economic benefits may occur by maintaining the City's municipal supply. As noted above, minimal impacts are expected on existing water rights, as the WAM has been utilized to maintain priorities of these water rights. There exists significant concern with regard to potential environmental impacts of the proposed reservoir considering that the reservoir's contributing watershed represents approximately 25% of the watershed contributing to Pecan Bayou, a stream segment conditionally recognized in the 2021 Region D Plan and by the Texas Parks and Wildlife Department as being an ecologically unique stream segment in the North East Texas Region. Presented below is a monthly flow frequency chart depicting the variation in flows in Pecan Bayou for with- and without project conditions. Significant impacts to agricultural and natural resources would also be expected within the footprint of the reservoir as well. Furthermore, mitigation and compensation may be necessary to the basin of origin.



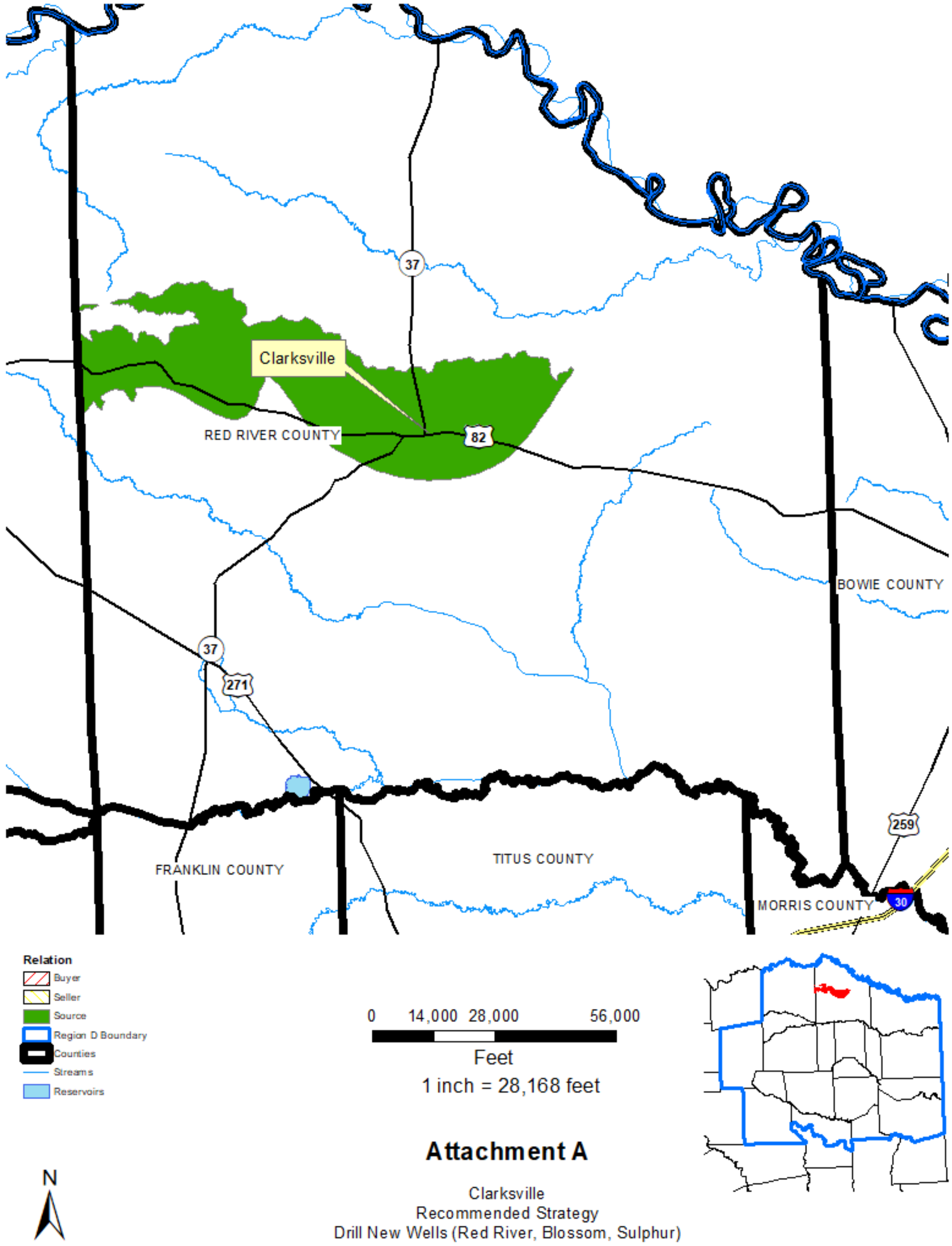
Flow Frequency Distribution of Regulated Flows at USGS Gage #07336800, Pecan Bayou near Clarksville, Texas, with- and without Dimple Reservoir.

Recommendations:

	2020	2030	2040	2050	2060	2070
Drill Additional Wells and RO Treatment (ac-ft/yr)	388	388	388	388	388	388

To meet the City's projected deficit in 2020 it is recommended that Clarksville develop additional groundwater wells in the Blossom Aquifer and the associated water treatment capacity.

At present, considerable uncertainty exists in each of the identified feasible water management strategies for the City of Clarksville. The NETRWPG supports any efforts by the City of Clarksville to further study all potential strategies to identify the best approach for the City to meeting all of its future water supply needs, and such a study should be considered consistent with the 2021 North East Texas Regional Water Plan.



Attachment A

Clarksville
Recommended Strategy
Drill New Wells (Red River, Blossom, Sulphur)

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices
Clarksville - Drill New Wells (Red River, Blossom Aquifer, Sulphur Basin) and RO Treatment

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 201.9 for September 2018

Item	*Estimated Costs for Facilities*
Well Fields (Wells, Pumps, and Piping)	$1,917,000
Water Treatment Plant (0.7 MGD)	$3,590,000
TOTAL COST OF FACILITIES	**$7,421,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$2,545,000
Environmental & Archaeology Studies and Mitigation	$208,000
Land Acquisition and Surveying (25 acres)	$80,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$283,000
TOTAL COST OF PROJECT	**$10,537,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$741,000
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$30,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$22,000
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$670,000
Advanced Water Treatment Facility	$0
Pumping Energy Costs (202540 kW-hr @ 0.08 $/kW-hr)	$16,000
Purchase of Water (388 acft/yr @ 500 $/acft)	$194,000
TOTAL ANNUAL COST	**$1,673,000**
Available Project Yield (acft/yr)	388
Annual Cost of Water ($ per acft), based on PF=2	$4,312
Annual Cost of Water After Debt Service ($ per acft), based on PF=2	$2,402
Annual Cost of Water ($ per 1,000 gallons), based on PF=2	$13.23
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=2	$7.37

JMP *9/30/2019*

EVALUATION OF WATER MANAGEMENT STRATEGIES FOR MEETING THE PROJECTED WATER SUPPLY NEEDS OF IRRIGATION IN RED RIVER COUNTY

Description of Water User Group:

The Irrigation WUG in Red River County has a demand that is projected to be 3,867 ac-ft/yr in 2020 through 2070. Irrigation in Red River County is projected to be supplied by existing surface water from run-of-river diversions from the Red and Sulphur Rivers. A deficit of 2,154 ac-ft/yr is projected to occur in 2020 through 2070 in the Sulphur Basin. In the Red River Basin, a surplus of 810 ac-ft/yr is projected for the planning period of 2020 through 2070.

Water Supply and Demand Analysis:

	2020	2030	2040	2050	2060	2070
Projected Water Demand	3,867	3,867	3,867	3,867	3,867	3,867
Current Water Supply	2,523	2,523	2,523	2,523	2,523	2,523
Projected Supply Surplus (+)/Deficit(-)	**-1,344**	**-1,344**	**-1,344**	**-1,344**	**-1,344**	**-1,344**

Projected Supply Surplus (+)/Deficit(-) by Basin	2020	2030	2040	2050	2060	2070
Sulphur	-2,154	-2,154	-2,154	-2,154	-2,154	-2,154
Red	810	810	810	810	810	810
Total	**-1,344**	**-1,344**	**-1,344**	**-1,344**	**-1,344**	**-1,344**

Evaluation of Potentially Feasible Water Management Strategies:

Multiple alternative strategies were considered to meet the Red River County Irrigation WUG's water supply shortages. Advanced water conservation for irrigation practices were not considered feasible, as amounts potentially saved would not provide sufficient savings to meet the projected needs over the planning period. The use of reuse water from nearby municipalities is not considered feasible as it would not be effective to deliver reuse water to farm irrigation systems.

Groundwater was identified as a potential source of water for irrigation in Red River County. A local hydrogeologic assessment was performed by Region D to assess source groundwater availability, as there is no GCD located within the Region. The assessment is based on source availabilities identified using availabilities identified and approved by the TWDB and the NETRWPG. Based on a relatively low average annual water level decline and the potential for high-productivity wells in the portion of the Nacatoch Aquifer located in the Sulphur River Basin in Red River County, it has been determined that most of the future projected needs can likely be met with additional irrigation wells. For the portion of the Trinity Aquifer located in the Sulphur River Basin in Red River County, the local hydrogeologic assessment did not identify sufficient available data to determine potential productivity.

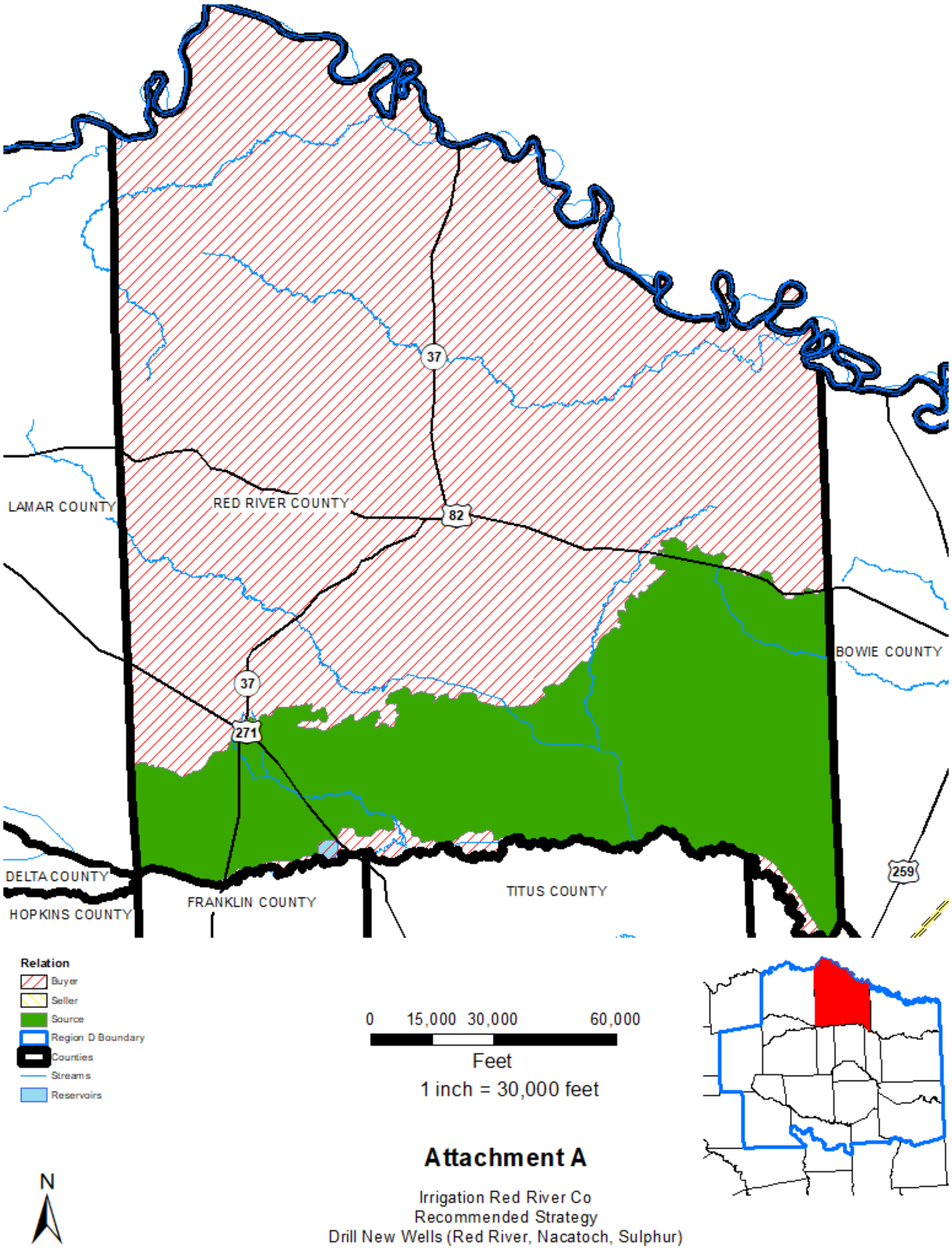
Treated surface water purchased from Lamar County WSD was considered as a viable supplement to the additional groundwater in order to meet projected demands. Thus, purchasing sufficient treated surface water from Lamar County WSD to meet the entirety of the need was also considered as a possible strategy. Purchasing raw water from the City of Paris has also been considered as a possible strategy, with a higher capital cost but an anticipated lower annual cost. The City's surface water permit for Pat Mayse Reservoir, as amended, allows for the interbasin transfer and use of water in both the Red and Sulphur River basins. However, the use of water via this permit would require a minor amendment to add irrigation as a permitted use.

Strategy	Firm Yield (AF)	Total Capital Cost	Total Annualized Cost	Unit Cost	Env. Impact
Drill New Wells, (Nacatoch Aquifer, Sulphur Basin)	**2,057**	**$6,551,000**	**$1,709,000**	**$831**	**1**
Drill New Wells (Trinity Aquifer, Sulphur Basin)	**97**	**$425,000**	**$88,000**	**$907**	**1**
Pat Mayse Treated Water Pipeline from Lamar County WSD	**2,154**	**$23,769,000**	**$5,619,000**	**$2,609**	**2**
Pat Mayse Raw Water Pipeline from Paris	**2,154**	**$45,682,000**	**$4,535,000**	**$2,105**	**2**

Recommendations:

	2020	2030	2040	2050	2060	2070
Drill New Wells (Nacatoch Aquifer, Sulphur Basin)	**2,057**	**2,057**	**2,057**	**2,057**	**2,057**	**2,057**
Unmet Need	**97**	**97**	**97**	**97**	**97**	**97**
Total	**2,154**	**2,154**	**2,154**	**2,154**	**2,154**	**2,154**

As no regulatory entity exists within Region D to enforce the MAG limitations, and no Groundwater Conservation District presently exists within the Region D planning area, Region D performed a local hydrogeologic assessment to determine availability. The assessment is based on source availabilities identified using availabilities identified and approved by the TWDB and the NETRWPG. Based on this assessment, it is recommended that by 2020 the Red River County Irrigation WUG drill new wells in the portions of the Nacatoch Aquifer in Red River County located in the Sulphur River Basin to meet 2,057 ac-ft/yr of projected needs for the WUG over the planning period. The Region D analysis indicates that 2,057 ac-ft/yr is available from the Nacatoch Aquifer in the Sulphur Basin in Red River County. In the Nacatoch Aquifer, it is recommended that nine wells with a rated capacity of 200 gpm to meet most of the needs, while the remaining 97 ac-ft remains unmet. Construction of wells with the capability to produce these amounts would be sufficient to meet the majority of projected needs for the WUG. An alternative strategy reflecting more groundwater wells to access the additional supply beyond the source availability determined by the MAG has been developed to meet the remaining 97 ac-ft/yr for the purposes of the 2021 Region D Plan.



Attachment A

Irrigation Red River Co
Recommended Strategy
Drill New Wells (Red River, Nacatoch, Sulphur)

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices

Irrigation Red River - Drill New Wells (Red River, Nacatoch Aquifer, Sulphur Basin)

Cost based on ENR CCI 11170.28 for September 2018 and
a PPI of 201.9 for September 2018

Item	***Estimated Costs for Facilities***
CAPITAL COST	
Well Fields (Wells, Pumps, and Piping)	$4,580,000
TOTAL COST OF FACILITIES	**$4,580,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$1,603,000
Environmental & Archaeology Studies and Mitigation	$131,000
Land Acquisition and Surveying (12 acres)	$61,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$176,000
TOTAL COST OF PROJECT	**$6,551,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$461,000
Reservoir Debt Service (3.5 percent, 40 years)	$0
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$46,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (2158148 kW-hr @ 0.08 $/kW-hr)	$173,000
Purchase of Water (2057 acft/yr @ 500 $/acft)	$1,029,000
TOTAL ANNUAL COST	**$1,709,000**
Available Project Yield (acft/yr)	2,057
Annual Cost of Water ($ per acft), based on PF=1	$831
Annual Cost of Water After Debt Service ($ per acft), based on PF=1	$607
Annual Cost of Water ($ per 1,000 gallons), based on PF=1	$2.55
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1	$1.86

JMP *10/5/2019*

EVALUATION OF WATER MANAGEMENT STRATEGIES FOR MEETING THE PROJECTED WATER SUPPLY NEEDS OF LIVESTOCK IN RED RIVER COUNTY

Description of Water User Group:

The Livestock WUG in Red River County has a demand that is projected to be constant at 1,532 ac-ft/yr for the period 2020 through 2070. Livestock in Red River County is projected to be supplied by groundwater from the Blossom, Nacatoch, and Woodbine Aquifers and surface water supply from local livestock supplies in the Red and Sulphur river basins. A deficit of 184 ac-ft/yr is projected to occur in 2020 through 2070 in the Red River Basin. In the Sulphur Basin, a surplus of 179 ac-ft/yr is projected to occur in 2020 through 2070.

Water Supply and Demand Analysis:

	2020	2030	2040	2050	2060	2070
Projected Water Demand	1,532	1,532	1,532	1,532	1,532	1,532
Current Water Supply	1,527	1,527	1,527	1,527	1,527	1,527
Projected Supply Surplus (+)/Deficit(-)	**-5**	**-5**	**-5**	**-5**	**-5**	**-5**

Projected Supply Surplus (+)/Deficit(-) by Basin	2020	2030	2040	2050	2060	2070
Sulphur	179	179	179	179	179	179
Red	-184	-184	-184	-184	-184	-184
Total	**-5**	**-5**	**-5**	**-5**	**-5**	**-5**

Evaluation of Potentially Feasible Water Management Strategies:

Multiple alternative strategies were considered to meet the Red River County Livestock WUG's water supply shortages. Advanced water conservation for livestock practices were not considered as present livestock practices likely result in sale of the livestock to reduce demand and extend water supply. The use of reuse water from nearby municipalities is not considered feasible as the water may be used for livestock consumption. Groundwater was identified as a potential source of water for livestock in Red River County.

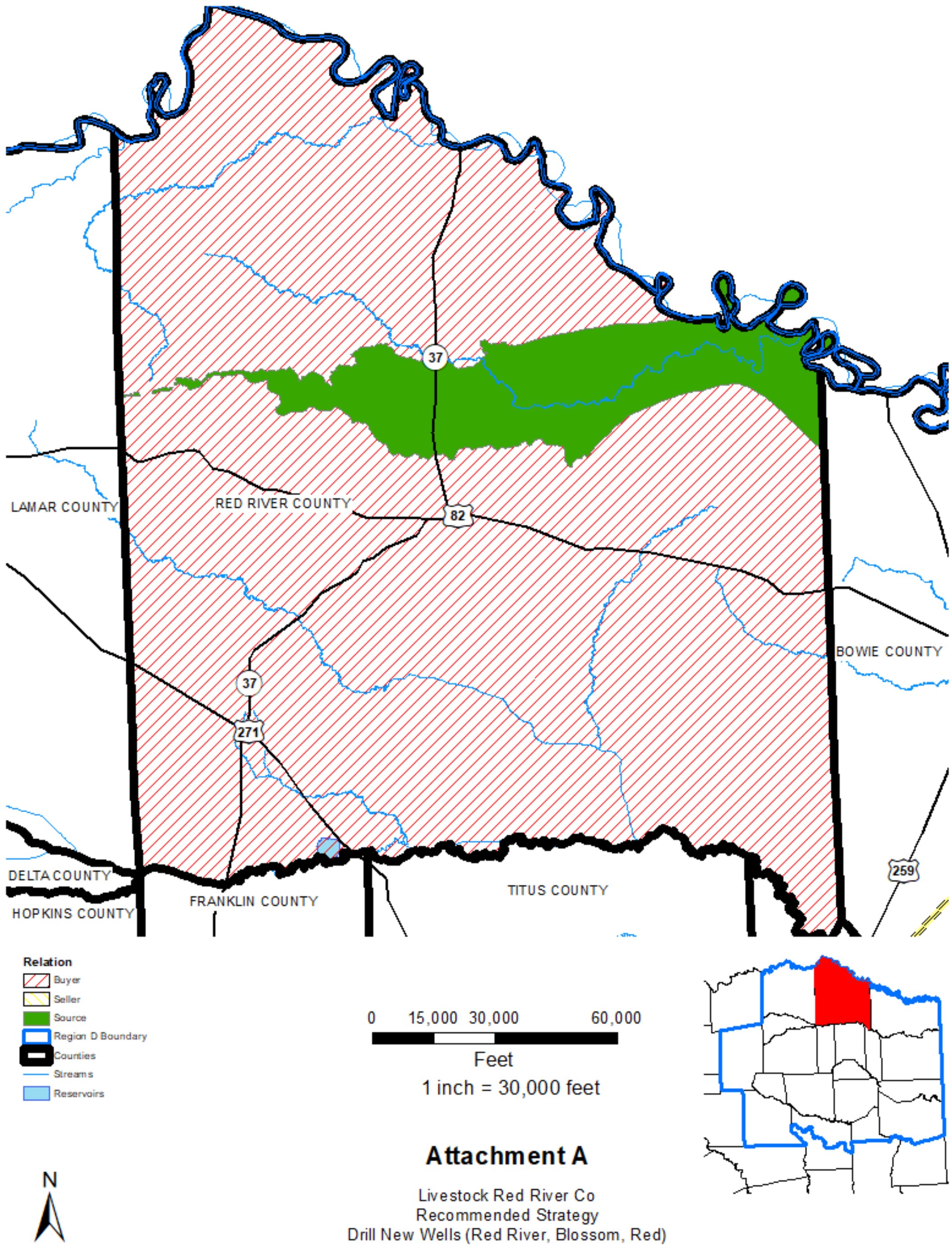
Treated surface water purchased from Lamar County WSD was considered as a potential supplement to the additional groundwater in order to meet projected demands. Purchasing sufficient treated surface water from Lamar County WSD to meet the entirety of the need was also considered as possible strategy. Purchasing raw water from the City of Paris has also been considered as a possible strategy, with a higher capital cost but an anticipated lower annual cost. The City's surface water permit for Pat Mayse Reservoir, as amended, allows for the interbasin transfer and use of water in both the Red and Sulphur River basins. However, the use of water via this permit could require a minor amendment to add livestock as a permitted use.

Strategy	Firm Yield (AF)	Total Capital Cost	Total Annualized Cost	Unit Cost	Env. Impact
Drill New Wells (Blossom Aquifer, Red Basin)	**11**	**$425,000**	**$40,000**	**$3,636**	**1**
Drill New Wells (Trinity Aquifer, Sulphur Basin)	**174**	**$1,436,000**	**$210,000**	**$1,207**	**1**
Pat Mayse Treated Water Pipeline from Lamar County WSD	**184**	**$10,147,000**	**$1,143,000**	**$6,212**	**2**
Pat Mayse Raw Water Pipeline from Paris	**184**	**$13,323,000**	**$1,131,000**	**$6,147**	**2**

Recommendations:

	2020	2030	2040	2050	2060	2070
Drill New Wells (Blossom Aquifer, Red River Basin)	**10**	**11**	**10**	**11**	**10**	**11**
Drill New Wells (Trinity Aquifer, Sulphur Basin)	**174**	**173**	**174**	**173**	**174**	**173**
Total	**184**	**184**	**184**	**184**	**184**	**184**

The recommended strategy for the Red River County Livestock WUG to meet the projected deficit of 184 ac-ft/yr from 2020 - 2070 would be to construct additional water wells similar to existing wells. The recommended supply sources are the portion of the Blossom Aquifer in the Red River Basin, and the portion of the Trinity Aquifer in the Sulphur Basin, both in Red River County. One well in the Blossom Aquifer with rated capacity of 75 gpm would provide approximately 11 ac-ft/yr, while three wells in the Trinity Aquifer with a rated capacity of 75 gpm would provide a combined total of approximately 174 ac-ft/yr. These aquifers are projected to have sufficient supply availability to meet the needs of the Red River County Livestock WUG for the planning period.



Attachment A

Livestock Red River Co
Recommended Strategy
Drill New Wells (Red River, Blossom, Red)

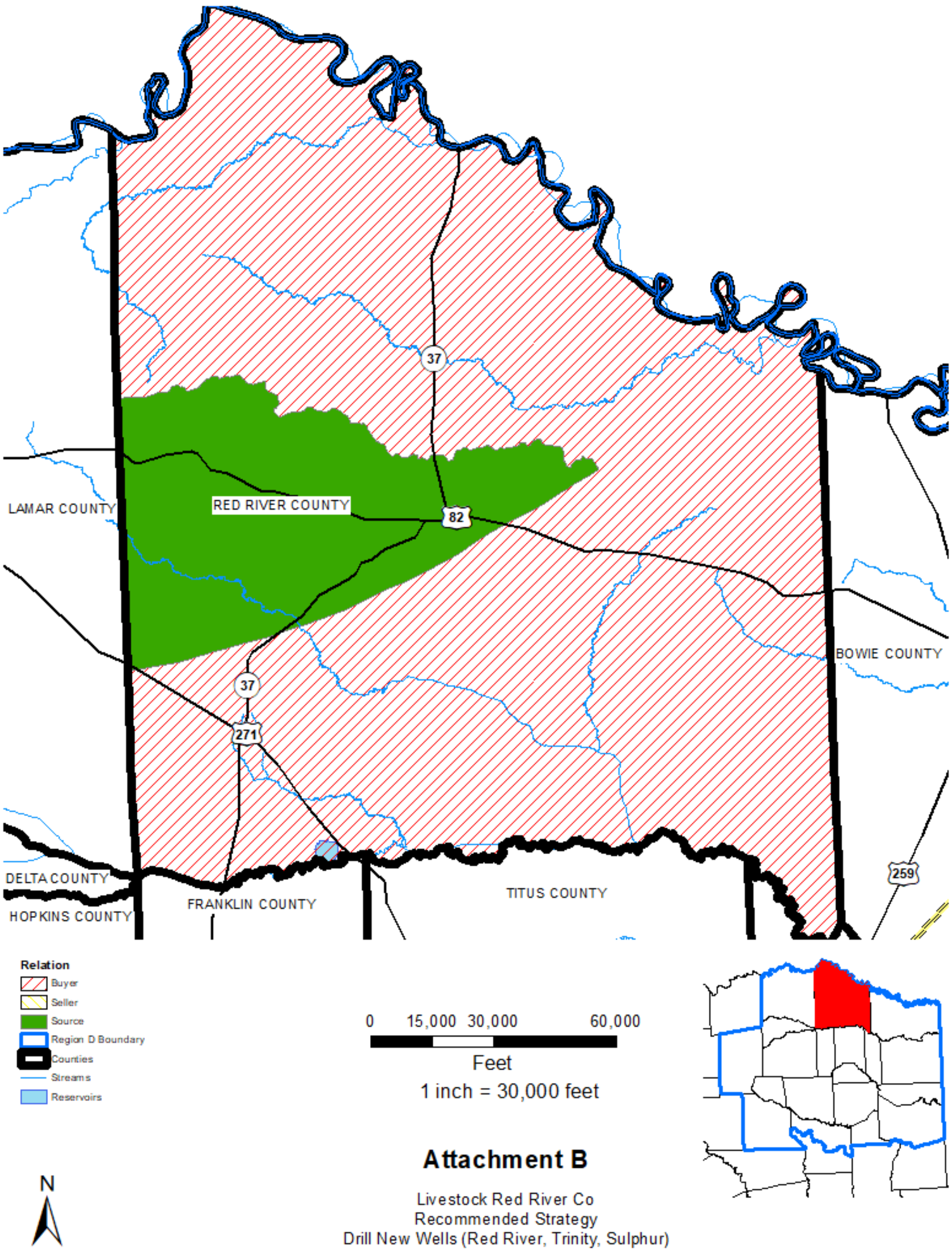
Cost Estimate Summary
Water Supply Project Option
September 2018 Prices

Livestock Red River - Drill New Wells (Red River, Blossom Aquifer, Red Basin)

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 201.9 for September 2018

Item	***Estimated Costs for Facilities***
Well Fields (Wells, Pumps, and Piping)	$298,000
TOTAL COST OF FACILITIES	**$298,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$104,000
Environmental & Archaeology Studies and Mitigation	$8,000
Land Acquisition and Surveying (1 acres)	$3,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$12,000
TOTAL COST OF PROJECT	**$425,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$30,000
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$3,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (8762 kW-hr @ 0.08 $/kW-hr)	$1,000
Purchase of Water (11 acft/yr @ 500 $/acft)	$6,000
TOTAL ANNUAL COST	**$40,000**
Available Project Yield (acft/yr)	11
Annual Cost of Water ($ per acft), based on PF=1	$3,636
Annual Cost of Water After Debt Service ($ per acft), based on PF=1	$909
Annual Cost of Water ($ per 1,000 gallons), based on PF=1	$11.16
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1	$2.79

JMP *9/30/2019*



Attachment B

Livestock Red River Co
Recommended Strategy
Drill New Wells (Red River, Trinity, Sulphur)

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices

Livestock Red River - Drill New Wells (Red River, Trinity Aquifer, Sulphur Basin)

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 201.9 for September 2018

Item	***Estimated Costs for Facilities***
Well Fields (Wells, Pumps, and Piping)	$990,000
TOTAL COST OF FACILITIES	**$990,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$347,000
Environmental & Archaeology Studies and Mitigation	$45,000
Land Acquisition and Surveying (5 acres)	$15,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$39,000
TOTAL COST OF PROJECT	**$1,436,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$101,000
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$10,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (152178 kW-hr @ 0.08 $/kW-hr)	$12,000
Purchase of Water (174 acft/yr @ 500 $/acft)	$87,000
TOTAL ANNUAL COST	**$210,000**
Available Project Yield (acft/yr)	174
Annual Cost of Water ($ per acft), based on PF=1	$1,207
Annual Cost of Water After Debt Service ($ per acft), based on PF=1	$626
Annual Cost of Water ($ per 1,000 gallons), based on PF=1	$3.70
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1	$1.92

JMP *9/30/2019*

REGION D
EVALUATIONS OF WATER MANAGEMENT STRATEGIES
FOR MEETING PROJECTED WATER SUPPLY NEEDS
TO YEAR 2070

SMITH COUNTY

WUGs:

Crystal Systems
The City of Lindale
Smith County MUD 1
Star Mountain WSC
Starrville Friendship WSC
The City of Winona

EVALUATION OF WATER MANAGEMENT STRATEGIES FOR MEETING THE PROJECTED WATER SUPPLY NEEDS OF CRYSTAL SYSTEMS TEXAS, INC.

Description of Water User Group:

The Crystal Systems Texas, Inc. system is located in northwestern Smith County and serves the un-incorporated area surrounding Hideaway Lake. In 2018, the system had 2050 residential connections. The population is projected to increase from 4,343 persons in 2020 to 8,881 persons in 2070. The System is included as a W.U.G. in Smith County. The system's current water supply consists of five water wells from the Carrizo-Wilcox Aquifer. The total rated capacity of these wells is 3,560 GPM, or 1,914 ac-ft/yr. The system is bounded on the north and southeast by the Lindale Rural WSC and on the east by the City of Lindale. The System does have a water conservation plan. The System is projected to have a water supply surplus of 558 ac-ft/yr in 2020 decreasing to a deficit of 816 ac-ft/yr in 2070.

Water Supply and Demand Analysis:

Sabine River Basin

	2020	2030	2040	2050	2060	2070
Population	3026	3384	3812	4324	4950	5715
Projected Water Demand	945	1045	1175	1331	1522	1757
Current Water Supply	1334	1285	1256	1236	1230	1232
Projected Supply Surplus (+)/Deficit(-)	**389**	**240**	**81**	**-95**	**-292**	**-525**

Neches River Basin

	2020	2030	2040	2050	2060	2070
Population	1317	1657	2000	2372	2758	3166
Projected Water Demand	411	512	616	730	848	973
Current Water Supply	580	629	658	678	684	682
Projected Supply Surplus (+)/Deficit(-)	**169**	**117**	**42**	**-52**	**-164**	**-291**

Evaluation of Potentially Feasible Water Management Strategies:

Four alternative strategies were considered to meet the Crystal System's water supply shortages as summarized in the following table. Advanced conservation was not considered because the per capita use per day was below the 140 gpcd threshold set by the planning group. Water reuse was not considered because the system does not have a sewer collection system. Surface water alternatives were omitted since there is not a supply source within close proximity to the system and surface water treatment is not economically feasible for a system of this size. Wells in the Carrizo-Wilcox Aquifer (Sabine and Neches River Basins) were identified as a potentially feasible strategy for the WUG.

Strategy	Firm Yield (AF)	Total Capital Cost	Total Annualized Cost	Unit Cost	Environmental Impact
Groundwater (Sabine)	**538**	**$ 2,531,000**	**$ 231,000**	**$ 429**	**1**
Groundwater (Neches)	**538**	**$ 2,531,000**	**$ 231,000**	**$ 429**	**1**

Recommendations:

	2020	2030	2040	2050	2060	2070
Drill New Wells (Carrizo-Wilcox Aquifer, Sabine; ac-ft/yr)	0	0	0	135	269	538
Drill New Wells (Carrizo-Wilcox Aquifer, Neches; ac-ft/yr)	0	0	0	135	269	538

The recommended strategy for Crystal Systems to meet their projected deficit of 147 ac-ft/yr in 2050 and 816 ac-ft/yr in 2070 would be to construct four additional water wells similar to their existing wells just prior to each decade as the deficits occur. The recommended supply source will be the Carrizo Wilcox Aquifer in Smith County. Four wells with rated capacity of 500 gpm each would provide approximately 269 acre-feet each. The Carrizo Wilcox Aquifer in Smith County is projected to have a more than ample supply availability to meet the needs of Crystal Systems for the planning period. During the planning period two wells will be drilled in the Carrizo Wilcox formation of the Sabine River Basin while two wells will be drilled into the Carrizo Wilcox formation of the Neches River Basin.

Given the increasing costs to comply with more stringent regulations and the decreasing reliability of groundwater as a future supply source due to quality issues in this region, it is recommended that groundwater supply systems consider combining resources and/or soliciting future water supply from neighboring systems and/or major water providers in the region. If a feasible alternative becomes available, then the recommendations previously discussed should be disregarded and a re-evaluation completed.

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices
Crystal Systems Sabine - Drill New Well Carrizo Wilcox Aquifer Smith Sabine

Cost based on ENR CCI 11170.28 for September 2018 and
a PPI of 202.4 for September 2018

Item	*Estimated Costs for Facilities*
CAPITAL COST	
Dam and Reservoir (Conservation Pool acft, acres)	$0
Off-Channel Storage/Ring Dike (Conservation Pool acft, acres)	$0
Terminal Storage (Conservation Pool acft, acres)	$0
Primary Pump Station (0 MGD)	$0
Transmission Pipeline (6 in dia., miles)	$0
Transmission Pump Station(s) & Storage Tank(s)	$0
Well Fields (Wells, Pumps, and Piping)	$1,805,000
Storage Tanks (Other Than at Booster Pump Stations)	$0
Water Treatment Plant (0 MGD)	$0
Advanced Water Treamtent Facility (MGD)	$0
Conservation (Leaking Pipe/Meter Replacement)	$0
Integration, Relocations, & Other	$0
TOTAL COST OF FACILITIES	**$1,805,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$632,000
Environmental & Archaeology Studies and Mitigation	$22,000
Land Acquisition and Surveying (1 acres)	$4,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$68,000
TOTAL COST OF PROJECT	**$2,531,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$178,000
Reservoir Debt Service (3.5 percent, 40 years)	$0
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$18,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (436149 kW-hr @ 0.08 $/kW-hr)	$35,000
Purchase of Water (acft/yr @ $/acft)	$0
TOTAL ANNUAL COST	**$231,000**
Available Project Yield (acft/yr)	538
Annual Cost of Water ($ per acft), based on PF=1	$429
Annual Cost of Water After Debt Service ($ per acft), based on PF=1	$99
Annual Cost of Water ($ per 1,000 gallons), based on PF=1	$1.32
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1	$0.30

Stanley Hayes *10/4/2019*

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices
Crystal Systems Neches - Drill New Well Carrizo Wilcox Aquifer Smith Neches

Cost based on ENR CCI 11170.28 for September 2018 and
a PPI of 202.4 for September 2018

Item	Estimated Costs for Facilities
CAPITAL COST	
Dam and Reservoir (Conservation Pool acft, acres)	$0
Off-Channel Storage/Ring Dike (Conservation Pool acft, acres)	$0
Terminal Storage (Conservation Pool acft, acres)	$0
Primary Pump Station (0 MGD)	$0
Transmission Pipeline (6 in dia., miles)	$0
Transmission Pump Station(s) & Storage Tank(s)	$0
Well Fields (Wells, Pumps, and Piping)	$1,805,000
Storage Tanks (Other Than at Booster Pump Stations)	$0
Water Treatment Plant (0 MGD)	$0
Advanced Water Treamtent Facility (MGD)	$0
Conservation (Leaking Pipe/Meter Replacement)	$0
Integration, Relocations, & Other	$0
TOTAL COST OF FACILITIES	**$1,805,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$632,000
Environmental & Archaeology Studies and Mitigation	$22,000
Land Acquisition and Surveying (1 acres)	$4,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$68,000
TOTAL COST OF PROJECT	**$2,531,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$178,000
Reservoir Debt Service (3.5 percent, 40 years)	$0
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$18,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (436149 kW-hr @ 0.08 $/kW-hr)	$35,000
Purchase of Water (acft/yr @ $/acft)	$0
TOTAL ANNUAL COST	**$231,000**
Available Project Yield (acft/yr)	538
Annual Cost of Water ($ per acft), based on PF=1	$429
Annual Cost of Water After Debt Service ($ per acft), based on PF=1	$99
Annual Cost of Water ($ per 1,000 gallons), based on PF=1	$1.32
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1	$0.30

Stanley Hayes *10/4/2019*

EVALUATION OF WATER MANAGEMENT STRATEGIES FOR MEETING THE PROJECTED WATER SUPPLY NEEDS OF CITY OF LINDALE

Description of Water User Group:

The City of Lindale is located in northern Smith County and serves the incorporated city limits and an area immediately northwest of the City of Lindale. The population is projected to increase from 5,806 persons in 2020 to 13,985 persons in 2070. The City is included as a W.U.G. in Smith County. The system's current water supply consists of four water wells from the Carrizo-Wilcox Aquifer. The total rated capacity of these wells is 2,320 GPM, or 1,247 ac-ft/yr. The system is bounded on the west, north, and east by the Lindale Rural WSC and on the south by the City of Tyler. The City does have a water conservation plan. The City of Lindale is projected to have a water supply deficit of 70 ac-ft/yr in 2020 increasing to a deficit of 1,833 ac-ft/yr in 2070.

Water Supply and Demand Analysis:

Sabine River Basin	**2020**	**2030**	**2040**	**2050**	**2060**	**2070**
Population	3707	4499	5396	6107	7280	8674
Projected Water Demand	841	1005	1195	1347	1607	1910
Current Water Supply	796	779	773	756	762	773
Projected Supply Surplus (+)/Deficit(-)	**-45**	**-226**	**-422**	**-591**	**-842**	**-1137**

Neches River Basin	**2020**	**2030**	**2040**	**2050**	**2060**	**2070**
Population	2099	2704	3311	3964	4629	5311
Projected Water Demand	476	604	733	875	1020	1170
Current Water Supply	451	468	474	491	485	474
Projected Supply Surplus (+)/Deficit(-)	**-25**	**-136**	**-259**	**-384**	**-535**	**-696**

Evaluation of Potentially Feasible Water Management Strategies:

Four alternative strategies were considered to meet the City of Lindale's water supply shortages as summarized in the following table. Advanced conservation was not considered because the per capita use per day was below the 140 gpcpd threshold set by the planning group. Water reuse was not considered because the City does not have a demand for non-potable water. Surface water alternatives were omitted since there is not a supply source within close proximity to the City and surface water treatment is not economically feasible for a system of this size. Groundwater wells in the Carrizo-Wilcox Aquifer in the Neches Basin were identified as a potentially feasible strategy for the City.

Strategy	**Firm Yield (AF)**	**Total Capital Cost**	**Total Annualized Cost**	**Unit Cost**	**Environmental Impact**
Groundwater	**1,932**	**$ 7,592,000**	**$ 714,000**	**$ 370**	**1**

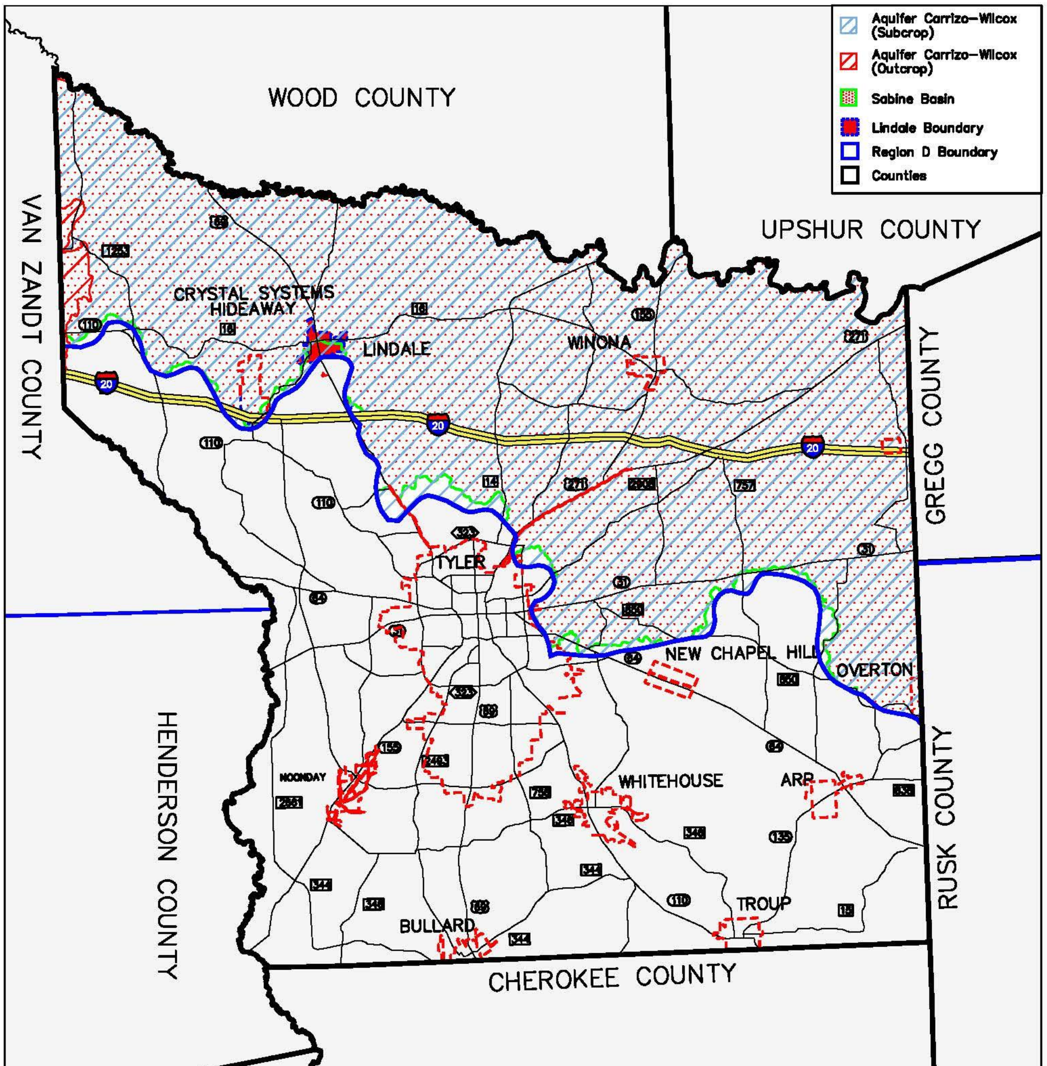
Recommendations:

	2020	**2030**	**2040**	**2050**	**2060**	**2070**
Drill New Wells (Carrizo-Wilcox Aquifer, Neches; ac-ft/yr)	322	644	966	1288	1610	1932

The recommended strategy for the City of Lindale to meet their projected deficit of 70 ac-ft/yr in 2020 and 1,833 ac-ft/yr in 2070 would be to construct six additional water wells similar to their existing wells just prior to each decade as the deficits occur. The recommended supply source will be the Carrizo Wilcox Aquifer in Smith County. Six wells with rated capacity of 600 gpm each would provide approximately 322 acre-feet each. The Carrizo Wilcox Aquifer in Smith County (Neches River Basin) is projected to have a more than ample supply availability to meet the needs of the City of Lindale for the planning period.

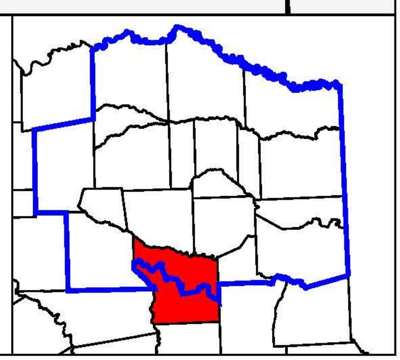
Given the increasing costs to comply with more stringent regulations and the decreasing reliability of groundwater as a future supply source due to quality issues in this region, it is recommended that groundwater supply systems consider combining resources and/or soliciting future water supply from neighboring systems and/or major water providers in the region. If a feasible alternative becomes available, then the recommendations previously discussed should be disregarded and a re-evaluation completed.

Cost Estimate Summary Water Supply Project Option September 2018 Prices Lindale - Drill New Well Carrizo Wilcox Aquifer Smith Sabine	
Cost based on ENR CCI 11170.28 for September 2018 and	
a PPI of 202.4 for September 2018	
Item	***Estimated Costs for Facilities***
CAPITAL COST	
Dam and Reservoir (Conservation Pool acft, acres)	$0
Off-Channel Storage/Ring Dike (Conservation Pool acft, acres)	$0
Terminal Storage (Conservation Pool acft, acres)	$0
Primary Pump Station (0 MGD)	$0
Transmission Pipeline (6 in dia., miles)	$0
Transmission Pump Station(s) & Storage Tank(s)	$0
Well Fields (Wells, Pumps, and Piping)	$5,415,000
Storage Tanks (Other Than at Booster Pump Stations)	$0
Water Treatment Plant (0 MGD)	$0
Advanced Water Treamtent Facility (MGD)	$0
Conservation (Leaking Pipe/Meter Replacement)	$0
Integration, Relocations, & Other	$0
TOTAL COST OF FACILITIES	**$5,415,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$1,895,000
Environmental & Archaeology Studies and Mitigation	$67,000
Land Acquisition and Surveying (3 acres)	$11,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$204,000
TOTAL COST OF PROJECT	**$7,592,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$534,000
Reservoir Debt Service (3.5 percent, 40 years)	$0
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$54,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (1577898 kW-hr @ 0.08 $/kW-hr)	$126,000
Purchase of Water (acft/yr @ $/acft)	$0
TOTAL ANNUAL COST	**$714,000**
Available Project Yield (acft/yr)	1,932
Annual Cost of Water ($ per acft), based on PF=1	$370
Annual Cost of Water After Debt Service ($ per acft), based on PF=1	$93
Annual Cost of Water ($ per 1,000 gallons), based on PF=1	$1.13
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1	$0.29
Stanley Hayes	*10/4/2019*



Attachment A
Smith County
City of Lindale
Recommended Strategy
Drill 6 New Wells
Carrizo Wilcox Aquifer/Smith County/Sabin Basin

0 15,000 30,000 60,000
1 inch = 30,000 feet



EVALUATION OF WATER MANAGEMENT STRATEGIES FOR MEETING THE PROJECTED WATER SUPPLY NEEDS OF SMITH COUNTY MUD 1

Description of Water User Group:

The Smith County MUD 1 system is located in north Smith County and serves the unincorporated area of the County northeast of the City of Tyler. The population is projected to increase from 2,033 persons in 2020 to 4,008 persons in 2070. The MUD is included as a WUG. in Smith County. The system's current water supply consists of four water wells from the Carrizo-Wilcox Aquifer and two water wells from the Queen City Aquifer. The total rated capacity of these wells is approximately 1,864 GPM, or 1,156 ac-ft/yr. The system is bounded on the north by the Lindale Rural WSC, on the south and west by the City of Tyler, and on the east by the Starrville-Friendship WSC. The System does have a water conservation plan. The System is projected to have a water supply surplus of 246 ac-ft/yr in 2020 decreasing to a deficit of 609 ac-ft/yr in 2070.

Water Supply and Demand Analysis:

	2020	2030	2040	2050	2060	2070
Population	2033	2320	2646	3025	3476	4008
Projected Water Demand	910	1030	1169	1334	1531	1765
Current Water Supply	1156	1156	1156	1156	1156	1156
Projected Supply Surplus (+)/Deficit(-)	**246**	**126**	**-13**	**-178**	**-375**	**-609**

Evaluation of Potentially Feasible Water Management Strategies:

Four alternative strategies were considered to meet the WSC's water supply shortages as summarized in the following table. Advanced conservation was not considered because the per capita use per day was below the 140 gpcd threshold set by the planning group. Water reuse was not considered because the system does not have a demand for non-potable water. Surface water alternatives were omitted since surface water treatment is not economically feasible for a system of this size. Groundwater wells in the Queen City Aquifer (Sabine Basin) were identified as a potentially feasible strategy for the WUG.

Strategy	Firm Yield (AF)	Total Capital Cost	Total Annualized Cost	Unit Cost	Environmental Impact
Groundwater (Sabine)	**648**	**$ 3,948,000**	**$ 348,000**	**$ 537**	**Minimal**

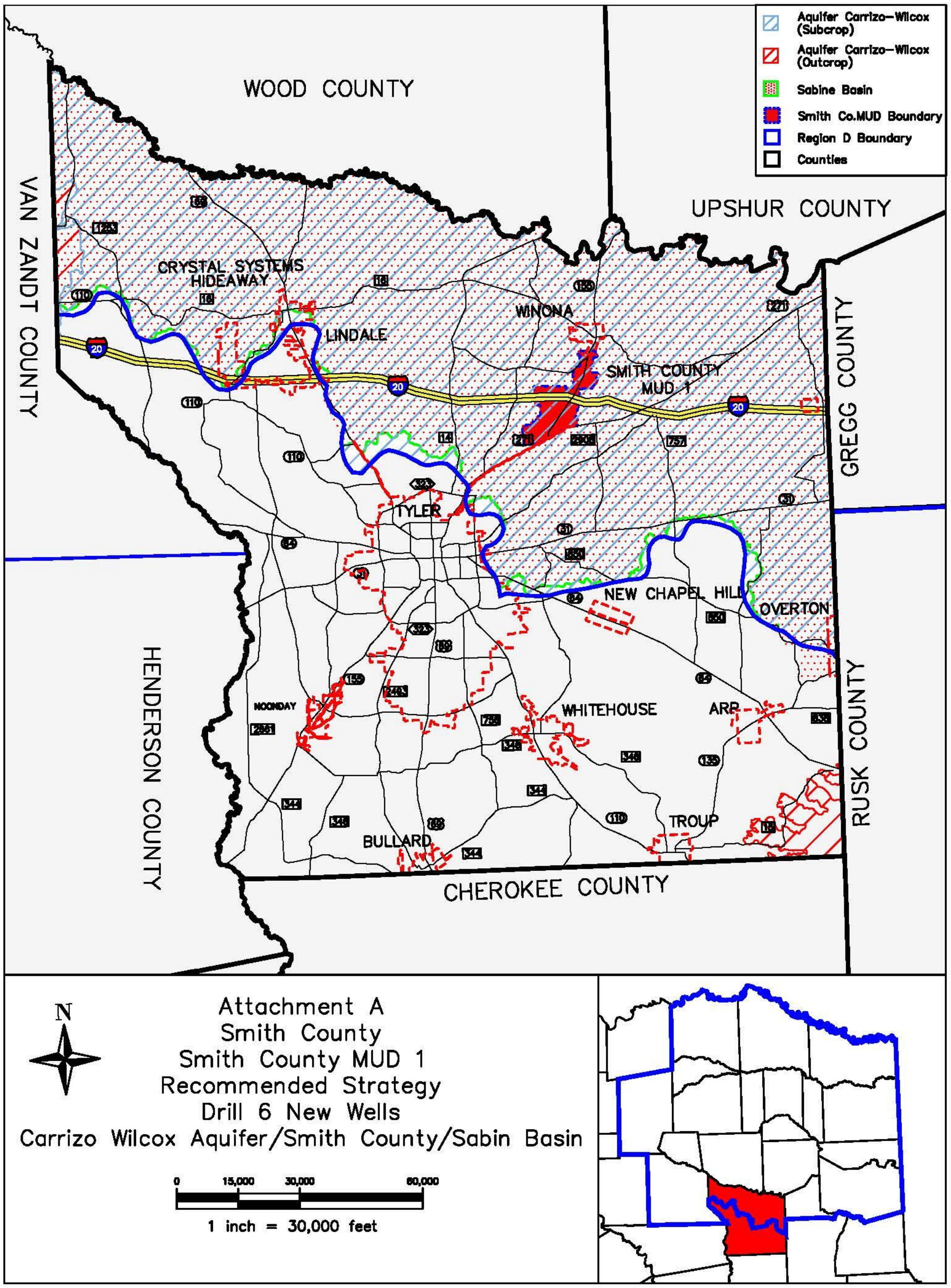
Recommendations:

	2020	2030	2040	2050	2060	2070
Drill New Wells (Queen City Aquifer, Sabine Basin; ac-ft/yr)	0	0	108	216	432	648

The recommended strategy for the Smith County MUD 1 to meet their projected deficit of 13 ac-ft/yr in 2040 and deficit of 609 ac-ft/yr in 2070 would be to construct six additional water wells similar to their existing wells just prior to each decade as the deficits occur. The recommended supply source will be the Queen City Aquifer in Smith County. One well with rated capacity of 200 gpm each would provide approximately 108 acre-feet each. The Queen City Aquifer in Smith County is projected to have a more than ample supply availability to meet the needs of Smith County MUD 1 for the planning period.

Given the increasing costs to comply with more stringent regulations and the decreasing reliability of groundwater as a future supply source due to quality issues in this region, it is recommended that groundwater supply systems consider combining resources and/or soliciting future water supply from neighboring systems and/or major water providers in the region. If a feasible alternative becomes available, then the recommendations previously discussed should be disregarded and a re-evaluation completed.

Cost Estimate Summary Water Supply Project Option September 2018 Prices Smith County MUD 1 - Drill New Well Queen City Aquifer Smith Sabine	
Cost based on ENR CCI 11170.28 for September 2018 and	
a PPI of 202.4 for September 2018	
Item	***Estimated Costs for Facilities***
CAPITAL COST	
Dam and Reservoir (Conservation Pool acft, acres)	$0
Off-Channel Storage/Ring Dike (Conservation Pool acft, acres)	$0
Terminal Storage (Conservation Pool acft, acres)	$0
Primary Pump Station (0 MGD)	$0
Transmission Pipeline (6 in dia., miles)	$0
Transmission Pump Station(s) & Storage Tank(s)	$0
Well Fields (Wells, Pumps, and Piping)	$2,788,000
Storage Tanks (Other Than at Booster Pump Stations)	$0
Water Treatment Plant (0 MGD)	$0
Advanced Water Treamtent Facility (MGD)	$0
Conservation (Leaking Pipe/Meter Replacement)	$0
Integration, Relocations, & Other	$0
TOTAL COST OF FACILITIES	**$2,788,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$976,000
Environmental & Archaeology Studies and Mitigation	$67,000
Land Acquisition and Surveying (3 acres)	$11,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$106,000
TOTAL COST OF PROJECT	**$3,948,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$278,000
Reservoir Debt Service (3.5 percent, 40 years)	$0
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$28,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (522832 kW-hr @ 0.08 $/kW-hr)	$42,000
Purchase of Water (acft/yr @ $/acft)	$0
TOTAL ANNUAL COST	**$348,000**
Available Project Yield (acft/yr)	648
Annual Cost of Water ($ per acft), based on PF=1	$537
Annual Cost of Water After Debt Service ($ per acft), based on PF=1	$108
Annual Cost of Water ($ per 1,000 gallons), based on PF=1	$1.65
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1	$0.33
Stanley Hayes	*10/4/2019*


Aquifer Carrizo-Wilcox (Subcrop)
Aquifer Carrizo-Wilcox (Outcrop)
Sabine Basin
Smith Co.MUD Boundary
Region D Boundary
Counties
WOOD COUNTY
UPSHUR COUNTY
VAN ZANDT COUNTY
GREGG COUNTY
HENDERSON COUNTY
RUSK COUNTY
CHEROKEE COUNTY
CRYSTAL SYSTEMS HIDEAWAY
LINDALE
WINONA
SMITH COUNTY MUD 1
TYLER
NEW CHAPEL HILL
OVERTON
NOONDAY
WHITEHOUSE
ARP
TROUP
BULLARD
N
Attachment A
Smith County
Smith County MUD 1
Recommended Strategy
Drill 6 New Wells
Carrizo Wilcox Aquifer/Smith County/Sabin Basin
0
15,000
30,000
60,000
1 inch = 30,000 feet

EVALUATION OF WATER MANAGEMENT STRATEGIES FOR MEETING THE PROJECTED WATER SUPPLY NEEDS OF STAR MOUNTAIN WSC

Description of Water User Group:

The Star Mountain WSC system is located in northeastern Smith County and serves the unincorporated area of the County northeast of the City of Tyler. The WSC reported 588 connections in 2018. The population is projected to increase from 1,392 persons in 2020 to 2,269 persons in 2070. The WSC is included as a W.U.G. in Smith County. The system's current water supply consists of three water wells from the Carrizo-Wilcox Aquifer. The total rated capacity of these wells is approximately 397 GPM, or 213 ac-ft/yr. The system is bounded on the north by the Sabine River, on the west by the City of Winona, on the south by the City of Tyler and on the east by the Starrville Friendship WSC. The System does not have a water conservation plan. The System is projected to have a water supply deficiency of 20 ac-ft/yr in 2020 decreasing to a deficit of 148 ac-ft/yr in 2070.

Water Supply and Demand Analysis:

	2020	2030	2040	2050	2060	2070
Population	1392	1546	1705	1882	2068	2269
Projected Water Demand	233	252	274	300	329	361
Current Water Supply	213	213	213	213	213	213
Projected Supply Surplus (+)/Deficit(-)	**-20**	**-39**	**-61**	**-87**	**-116**	**-148**

Evaluation of Potentially Feasible Water Management Strategies:

Four alternative strategies were considered to meet the WSC's water supply shortages as summarized in the following table. Advanced conservation was not considered because the per capita use per day was below the 140 gpcd threshold set by the planning group. Water reuse was not considered because the system does not have a central sewer collection system. Surface water alternatives were omitted since there is not a supply source within close proximity to the system and surface water treatment is not economically feasible for a system of this size. Groundwater wells in the Queen City Aquifer (Sabine River Basin) were identified as a potentially feasible strategy for the WUG.

Strategy	Firm Yield (AF)	Total Capital Cost	Total Annualized Cost	Unit Cost	Environmental Impact
Groundwater (Queen City Aquifer, Sabine Basin)	**216**	**$ 1,521,000**	**$ 132,000**	**$ 611**	**1**

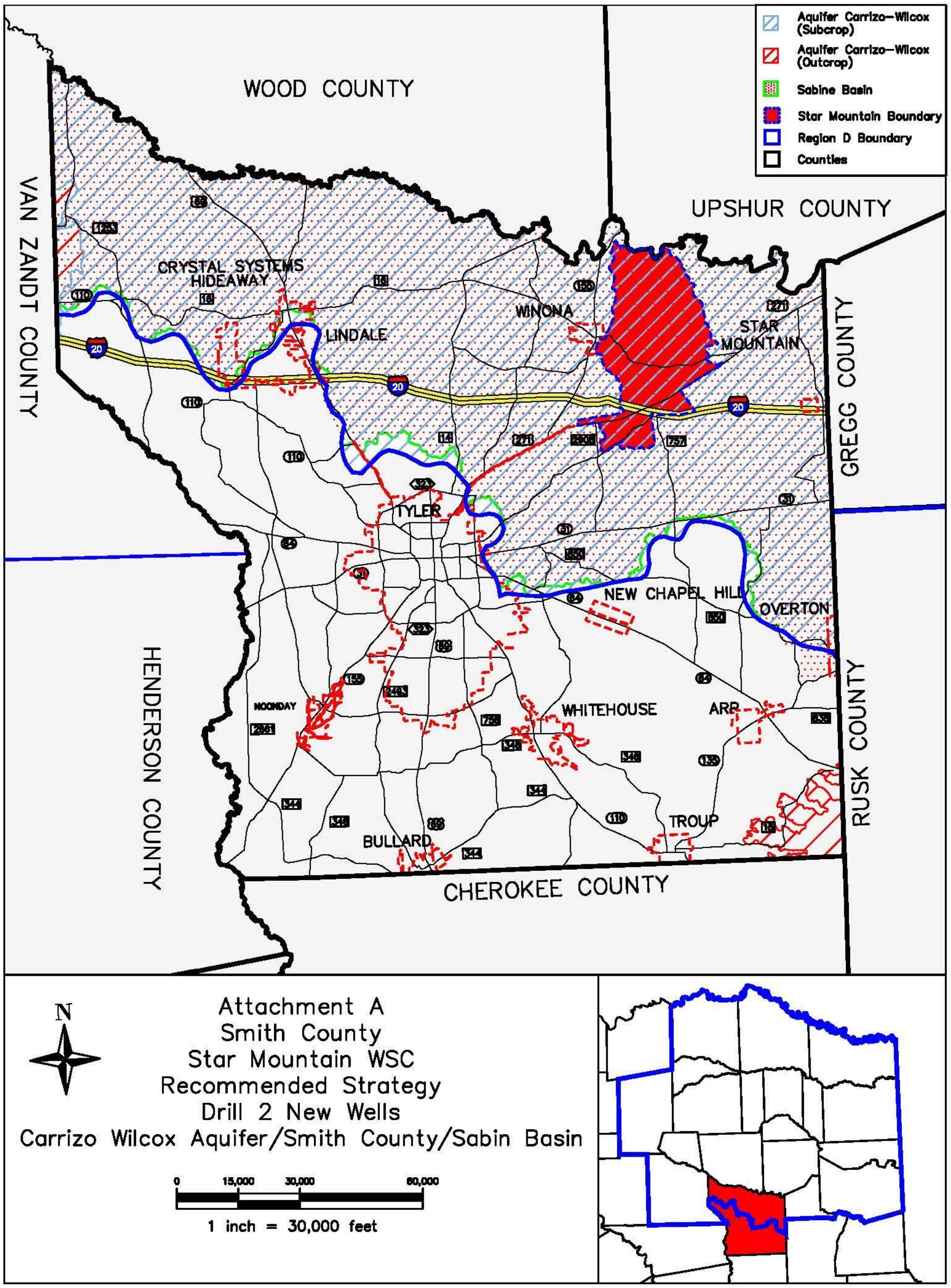
Recommendations:

	2020	2030	2040	2050	2060	2070
Drill New Wells (Queen City Aquifer, Sabine Basin; ac-ft/yr)	108	108	108	108	216	216

The recommended strategy for the Star Mountain WSC to meet their projected deficit of 20 ac-ft/yr in 2020 and deficit of 148 ac-ft/yr in 2070 would be to construct two additional water well similar to their existing wells just prior to each decade as the deficits occur. The recommended supply source will be the Queen City Aquifer in Smith County (Sabine River Basin). One well with rated capacity of 200 gpm each would provide approximately 108 acre-feet each. The Queen City Aquifer in Smith County (Sabine River Basin) is projected to have a more than ample supply availability to meet the needs of Star Mountain WSC for the planning period.

Given the increasing costs to comply with more stringent regulations and the decreasing reliability of groundwater as a future supply source due to quality issues in this region, it is recommended that groundwater supply systems consider combining resources and/or soliciting future water supply from neighboring systems and/or major water providers in the region. If a feasible alternative becomes available, then the recommendations previously discussed should be disregarded and a re-evaluation completed.

Cost Estimate Summary Water Supply Project Option September 2018 Prices Star Mountain WSC - Drill New Well Carrizo Wilcox Aquifer Smith Sabine	
Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 202.4 for September 2018	
Item	***Estimated Costs for Facilities***
CAPITAL COST	
Dam and Reservoir (Conservation Pool acft, acres)	$0
Off-Channel Storage/Ring Dike (Conservation Pool acft, acres)	$0
Terminal Storage (Conservation Pool acft, acres)	$0
Primary Pump Station (0 MGD)	$0
Transmission Pipeline (6 in dia., miles)	$0
Transmission Pump Station(s) & Storage Tank(s)	$0
Well Fields (Wells, Pumps, and Piping)	$1,077,000
Storage Tanks (Other Than at Booster Pump Stations)	$0
Water Treatment Plant (0 MGD)	$0
Advanced Water Treamtent Facility (MGD)	$0
Conservation (Leaking Pipe/Meter Replacement)	$0
Integration, Relocations, & Other	$0
TOTAL COST OF FACILITIES	**$1,077,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$377,000
Environmental & Archaeology Studies and Mitigation	$22,000
Land Acquisition and Surveying (1 acres)	$4,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$41,000
TOTAL COST OF PROJECT	**$1,521,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$107,000
Reservoir Debt Service (3.5 percent, 40 years)	$0
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$11,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (174277 kW-hr @ 0.08 $/kW-hr)	$14,000
Purchase of Water (acft/yr @ $/acft)	$0
TOTAL ANNUAL COST	**$132,000**
Available Project Yield (acft/yr)	216
Annual Cost of Water ($ per acft), based on PF=1	$611
Annual Cost of Water After Debt Service ($ per acft), based on PF=1	$116
Annual Cost of Water ($ per 1,000 gallons), based on PF=1	$1.88
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1	$0.36
Stanley Hayes	*10/4/2019*


Aquifer Carrizo–Wilcox (Subcrop)
Aquifer Carrizo–Wilcox (Outcrop)
Sabine Basin
Star Mountain Boundary
Region D Boundary
Counties
WOOD COUNTY
UPSHUR COUNTY
VAN ZANDT COUNTY
GREGG COUNTY
HENDERSON COUNTY
RUSK COUNTY
CHEROKEE COUNTY
CRYSTAL SYSTEMS HIDEAWAY
LINDALE
WINONA
STAR MOUNTAIN
TYLER
NEW CHAPEL HILL
OVERTON
NOONDAY
WHITEHOUSE
ARP
TROUP
BULLARD
Attachment A
Smith County
Star Mountain WSC
Recommended Strategy
Drill 2 New Wells
Carrizo Wilcox Aquifer/Smith County/Sabin Basin
N
0
15,000
30,000
60,000
1 inch = 30,000 feet

EVALUATION OF WATER MANAGEMENT STRATEGIES FOR MEETING THE PROJECTED WATER SUPPLY NEEDS OF STARRVILLE FRIENDSHIP WSC

Description of Water User Group:

The Starrville Friendship WSC system is located in northeastern Smith County and western Gregg County. The WSC serves the unincorporated area northeast of the City of Tyler and west of the City of Gladewater. The WSC reported 631 connections in 2018. The population is projected to increase from 2,122 persons in 2020 to 3,454 persons in 2070. The WSC is included as a split WUG in Gregg and Smith Counties. The system's current water supply consists of four water wells from the Carrizo-Wilcox Aquifer. The total rated capacity of these wells is approximately 626 GPM, or 337 ac-ft/yr. The system is bounded on the north by the Sabine River, on the west by the Star Mountain WSC, on the south by the Starrville WSC and on the east by the West Gregg SUD. The System does have a water conservation plan. The system is projected to have a water supply surplus of 89 ac-ft/yr in 2020 decreasing to a deficit of 37 ac-ft/yr in 2070.

Water Supply and Demand Analysis:

Starrville Friendship, Gregg, Sabine	2020	2030	2040	2050	2060	2070
Population	618	684	753	831	915	1,006
Projected Water Demand	72	77	83	90	99	109
Current Water Supply	98	98	98	98	98	98
Projected Supply Surplus (+)/Deficit (-)	**26**	**21**	**15**	**8**	**-1**	**-11**

Starrville Friendship, Smith, Sabine	2020	2030	2040	2050	2060	2070
Population	1,504	1,665	1,834	2,023	2,226	2,448
Projected Water Demand	176	187	202	220	241	265
Current Water Supply	239	239	239	239	239	239
Projected Supply Surplus (+)/Deficit (-)	**63**	**52**	**37**	**19**	**-2**	**-26**

Evaluation of Potentially Feasible Water Management Strategies:

Four alternative strategies were considered to meet the WSC's water supply shortages as summarized in the following table. Advanced conservation was not considered because the per capita use per day was below the 140 gpcpd threshold set by the planning group. Water reuse was not considered because the system does not have a central sewer collection system. Surface water alternatives were omitted since there is not a supply source within close proximity to the system and surface water treatment is not economically feasible for a system of this size. Groundwater wells in the Carrizo-Wilcox Aquifer (Sabine Basin) in Gregg County were identified as a potentially feasible strategy for the WSC.

Strategy	Firm Yield (AF)	Total Capital Cost	Total Annualized Cost	Unit Cost	Environmental Impact
Groundwater (Carrizo-Wilcox, Sabine Basin)	**108**	**$ 761,000**	**$ 62,000**	**$ 574**	**Minimal**

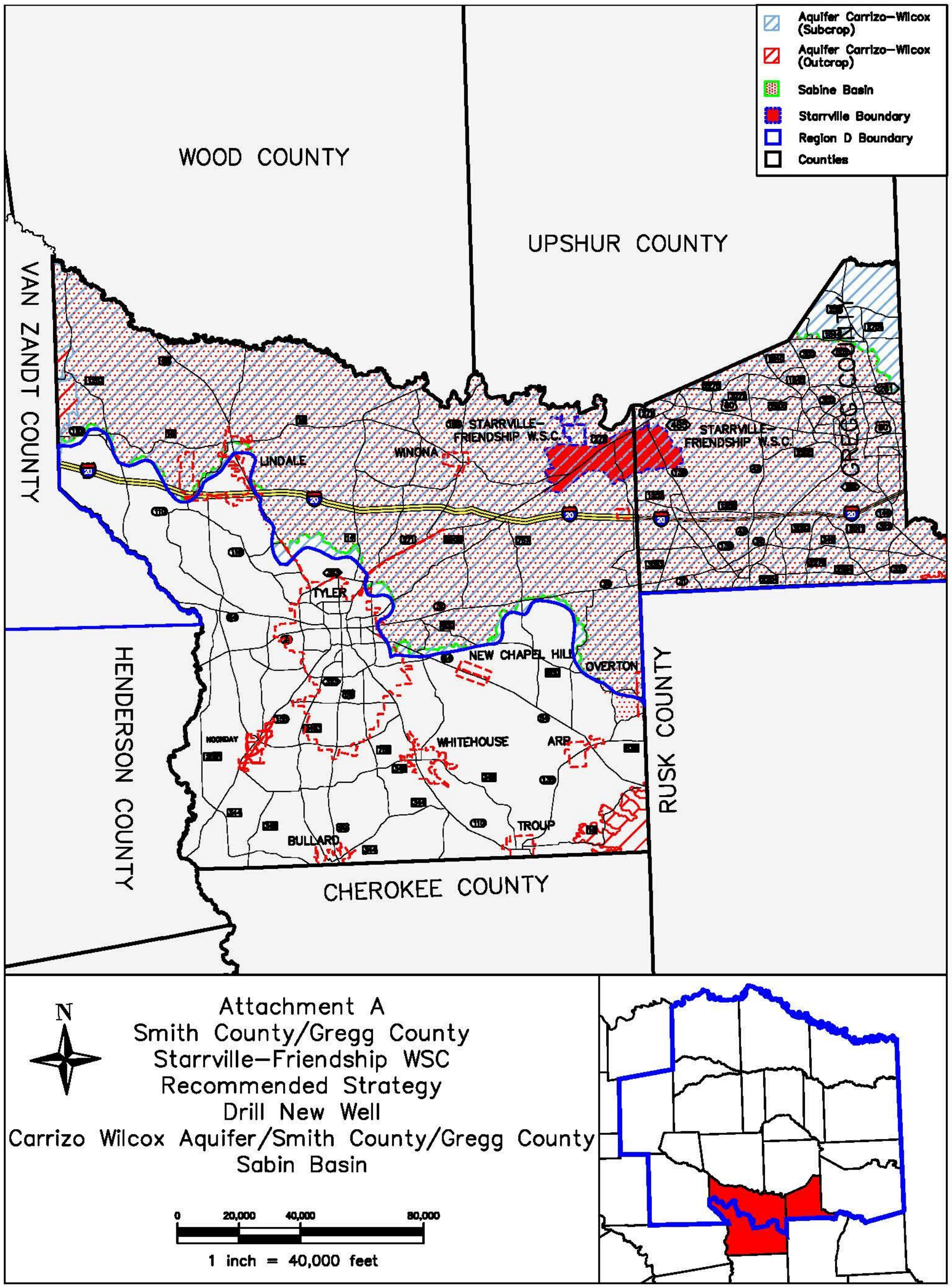
Recommendations:

	2020	2030	2040	2050	2060	2070
Drill New Wells (Carrizo-Wilcox Aquifer, Sabine Basin; ac-ft/yr)	0	0	0	0	108	108

The recommended strategy for the Starrville Friendship WSC to meet their projected deficit of 3 ac-ft/yr in 2060 and deficit of 37 ac-ft/yr in 2070 would be to construct one additional water well similar to their existing wells just prior to each decade as the deficits occur. The recommended supply source will be the Carrizo Wilcox Aquifer in Gregg County. One well with rated capacity of 200 gpm would provide approximately 108 acre-feet. The Carrizo Wilcox Aquifer in Gregg County is projected to have a more than ample supply availability to meet the needs of Starrville Friendship WSC for the planning period.

Given the increasing costs to comply with more stringent regulations and the decreasing reliability of groundwater as a future supply source due to quality issues in this region, it is recommended that groundwater supply systems consider combining resources and/or soliciting future water supply from neighboring systems and/or major water providers in the region. If a feasible alternative becomes available, then the recommendations previously discussed should be disregarded and a re-evaluation completed.

Cost Estimate Summary Water Supply Project Option September 2018 Prices	
Starrville-Friendship WSC - Drill New Well Carrizo Wilcox Aquifer Gregg sabine	
Cost based on ENR CCI 11170.28 for September 2018 and	
a PPI of 202.4 for September 2018	
Item	***Estimated Costs for Facilities***
CAPITAL COST	
Dam and Reservoir (Conservation Pool acft, acres)	$0
Off-Channel Storage/Ring Dike (Conservation Pool acft, acres)	$0
Terminal Storage (Conservation Pool acft, acres)	$0
Primary Pump Station (0 MGD)	$0
Transmission Pipeline (6 in dia., miles)	$0
Transmission Pump Station(s) & Storage Tank(s)	$0
Well Fields (Wells, Pumps, and Piping)	$539,000
Storage Tanks (Other Than at Booster Pump Stations)	$0
Water Treatment Plant (0 MGD)	$0
Advanced Water Treamtent Facility (MGD)	$0
Conservation (Leaking Pipe/Meter Replacement)	$0
Integration, Relocations, & Other	$0
TOTAL COST OF FACILITIES	**$539,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$188,000
Environmental & Archaeology Studies and Mitigation	$11,000
Land Acquisition and Surveying (1 acres)	$2,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$21,000
TOTAL COST OF PROJECT	**$761,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$54,000
Reservoir Debt Service (3.5 percent, 40 years)	$0
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$5,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (38784 kW-hr @ 0.08 $/kW-hr)	$3,000
Purchase of Water (acft/yr @ $/acft)	$0
TOTAL ANNUAL COST	**$62,000**
Available Project Yield (acft/yr)	108
Annual Cost of Water ($ per acft), based on PF=1	$574
Annual Cost of Water After Debt Service ($ per acft), based on PF=1	$74
Annual Cost of Water ($ per 1,000 gallons), based on PF=1	$1.76
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1	$0.23
Stanley Hayes	*9/30/2019*



Attachment A
Smith County/Gregg County
Starrville–Friendship WSC
Recommended Strategy
Drill New Well
Carrizo Wilcox Aquifer/Smith County/Gregg County
Sabin Basin

EVALUATION OF WATER MANAGEMENT STRATEGIES FOR MEETING THE PROJECTED WATER SUPPLY NEEDS OF CITY OF WINONA

Description of Water User Group:

The City of Winona system is located in northeastern Smith County and serves the incorporated area of the City. In 2018, the system had 284 residential connections. The population is projected to increase from 645 persons in 2020 to 1,273 persons in 2070. The City is included as a WUG. in Smith County. The system's current water supply consists of two water wells from the Carrizo-Wilcox Aquifer. The total rated capacity of these wells is approximately 320 GPM, or 169 ac-ft/yr. The system is bounded on the north, west, and south by the Sand Flat WSC and on the east by the Star Mountain WSC. The System does not have a water conservation plan. The system is projected to have a water supply surplus of 36 ac-ft/yr in 2020 decreasing to a deficit of 81 ac-ft/yr in 2070.

Water Supply and Demand Analysis:

	2020	2030	2040	2050	2060	2070
Population	645	737	839	961	1103	1273
Projected Water Demand	133	149	166	189	217	250
Current Water Supply	169	169	169	169	169	169
Projected Supply Surplus (+)/Deficit(-)	**36**	**20**	**3**	**-20**	**-48**	**-81**

Evaluation of Potentially Feasible Water Management Strategies:

Four alternative strategies were considered to meet the City's water supply shortages as summarized in the following table. Advanced conservation was not considered because the per capita use per day was below the 140 gpcd threshold set by the planning group. Water reuse was not considered because the system does not have a demand for non-potable water. Surface water alternatives were omitted since there is not a supply source within close proximity to the system and surface water treatment is not economically feasible for a system of this size. Groundwater wells in the Carrizo-Wilcox Aquifer (Sabine River Basin) were identified as a potentially feasible strategy for the City.

Strategy	Firm Yield (AF)	Total Capital Cost	Total Annualized Cost	Unit Cost	Environmental Impact
Groundwater (Carrizo-Wilcox Aquifer, Sabine Basin)	**108**	**$ 761,000**	**$ 66,000**	**$ 611**	**Minimal**

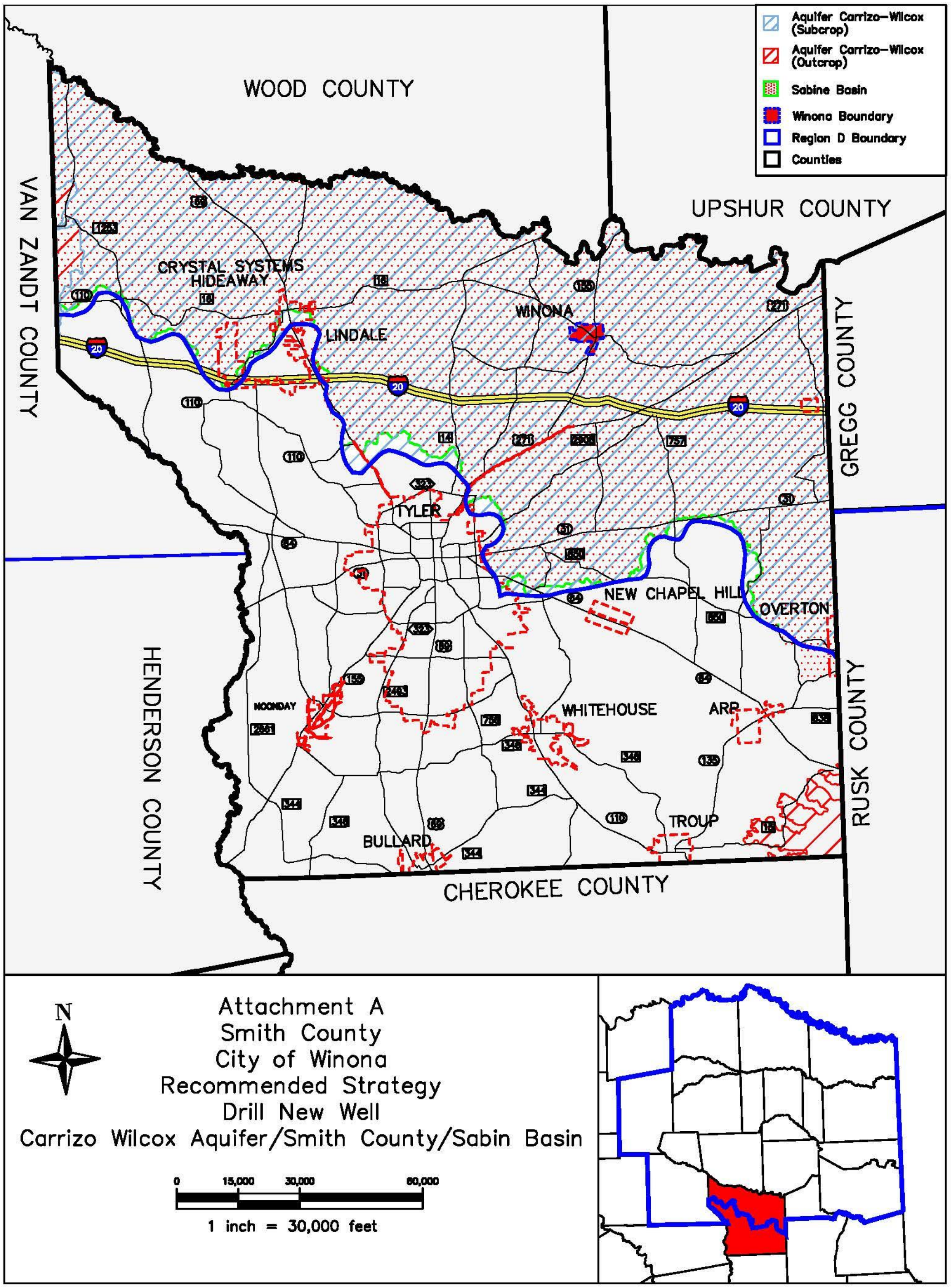
Recommendations:

	2020	2030	2040	2050	2060	2070
Drill New Wells (Carrizo-Wilcox Aquifer, Sabine Basin; ac-ft/yr)	0	0	0	108	108	108

The recommended strategy for the City to meet their projected surplus of 36 ac-ft/yr in 2020 and deficit of 81 ac-ft/yr in 2070 would be to construct one additional water well similar to their existing wells just prior to each decade as the deficits occur. The recommended supply source will be the Carrizo Wilcox Aquifer in Smith County. One well with rated capacity of 200 gpm each would provide approximately 108 acre-feet each. The Carrizo Wilcox Aquifer (Sabine River Basin) in Smith County is projected to have a more than ample supply availability to meet the needs of Winona for the planning period.

Given the increasing costs to comply with more stringent regulations and the decreasing reliability of groundwater as a future supply source due to quality issues in this region, it is recommended that groundwater supply systems consider combining resources and/or soliciting future water supply from neighboring systems and/or major water providers in the region. If a feasible alternative becomes available, then the recommendations previously discussed should be disregarded and a re-evaluation completed.

Cost Estimate Summary Water Supply Project Option September 2018 Prices	
Winona - Drill New Well Carrizo Wilcox Aquifer Smith Sabine	
Cost based on ENR CCI 11170.28 for September 2018 and	
a PPI of 202.4 for September 2018	
Item	***Estimated Costs for Facilities***
CAPITAL COST	
Dam and Reservoir (Conservation Pool acft, acres)	$0
Off-Channel Storage/Ring Dike (Conservation Pool acft, acres)	$0
Terminal Storage (Conservation Pool acft, acres)	$0
Primary Pump Station (0 MGD)	$0
Transmission Pipeline (6 in dia., miles)	$0
Transmission Pump Station(s) & Storage Tank(s)	$0
Well Fields (Wells, Pumps, and Piping)	$539,000
Storage Tanks (Other Than at Booster Pump Stations)	$0
Water Treatment Plant (0 MGD)	$0
Advanced Water Treamtent Facility (MGD)	$0
Conservation (Leaking Pipe/Meter Replacement)	$0
Integration, Relocations, & Other	$0
TOTAL COST OF FACILITIES	**$539,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$188,000
Environmental & Archaeology Studies and Mitigation	$11,000
Land Acquisition and Surveying (1 acres)	$2,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$21,000
TOTAL COST OF PROJECT	**$761,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$54,000
Reservoir Debt Service (3.5 percent, 40 years)	$0
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$5,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (87139 kW-hr @ 0.08 $/kW-hr)	$7,000
Purchase of Water (acft/yr @ $/acft)	$0
TOTAL ANNUAL COST	**$66,000**
Available Project Yield (acft/yr)	108
Annual Cost of Water ($ per acft), based on PF=1	$611
Annual Cost of Water After Debt Service ($ per acft), based on PF=1	$111
Annual Cost of Water ($ per 1,000 gallons), based on PF=1	$1.88
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1	$0.34
Stanley Hayes	*10/4/2019*


Aquifer Carrizo-Wilcox (Subcrop)
Aquifer Carrizo-Wilcox (Outcrop)
Sabine Basin
Winona Boundary
Region D Boundary
Counties
WOOD COUNTY
UPSHUR COUNTY
VAN ZANDT COUNTY
GREGG COUNTY
HENDERSON COUNTY
RUSK COUNTY
CHEROKEE COUNTY
CRYSTAL SYSTEMS HIDEAWAY
LINDALE
WINONA
TYLER
NEW CHAPEL HILL
OVERTON
NOONDAY
WHITEHOUSE
ARP
TROUP
BULLARD
N
Attachment A
Smith County
City of Winona
Recommended Strategy
Drill New Well
Carrizo Wilcox Aquifer/Smith County/Sabin Basin
0
15,000
30,000
60,000
1 inch = 30,000 feet

REGION D
EVALUATIONS OF WATER MANAGEMENT STRATEGIES
FOR MEETING PROJECTED WATER SUPPLY NEEDS
TO YEAR 2070

TITUS COUNTY

WUGs:

Titus County Livestock
Titus County Manufacturing
Titus County Steam Electric Power Generation

EVALUATION OF WATER MANAGEMENT STRATEGIES FOR MEETING THE PROJECTED WATER SUPPLY NEEDS OF LIVESTOCK IN TITUS COUNTY

Description of Water User Group:

Livestock in Titus County has a demand that is projected to be 2,947 ac-ft/yr in 2020 through 2070. Livestock in Titus County is currently supplied by groundwater from the Carrizo-Wilcox Aquifer and surface water from the Sulphur run-of-river and local supplies. A deficit of 1,939 ac-ft/yr is projected to occur in 2020 and increase to 2,005 ac-ft/yr by 2070.

Water Supply and Demand Analysis:

	2020	2030	2040	2050	2060	2070
Projected Water Demand	2,947	2,947	2,947	2,947	2,947	2,947
Current Water Supply	1,008	1,008	1,008	1,008	963	942
Projected Supply Surplus (+)/Deficit(-)	**-1,939**	**-1,939**	**-1,939**	**-1,939**	**-1,984**	**-2,005**

Evaluation of Potentially Feasible Water Management Strategies:

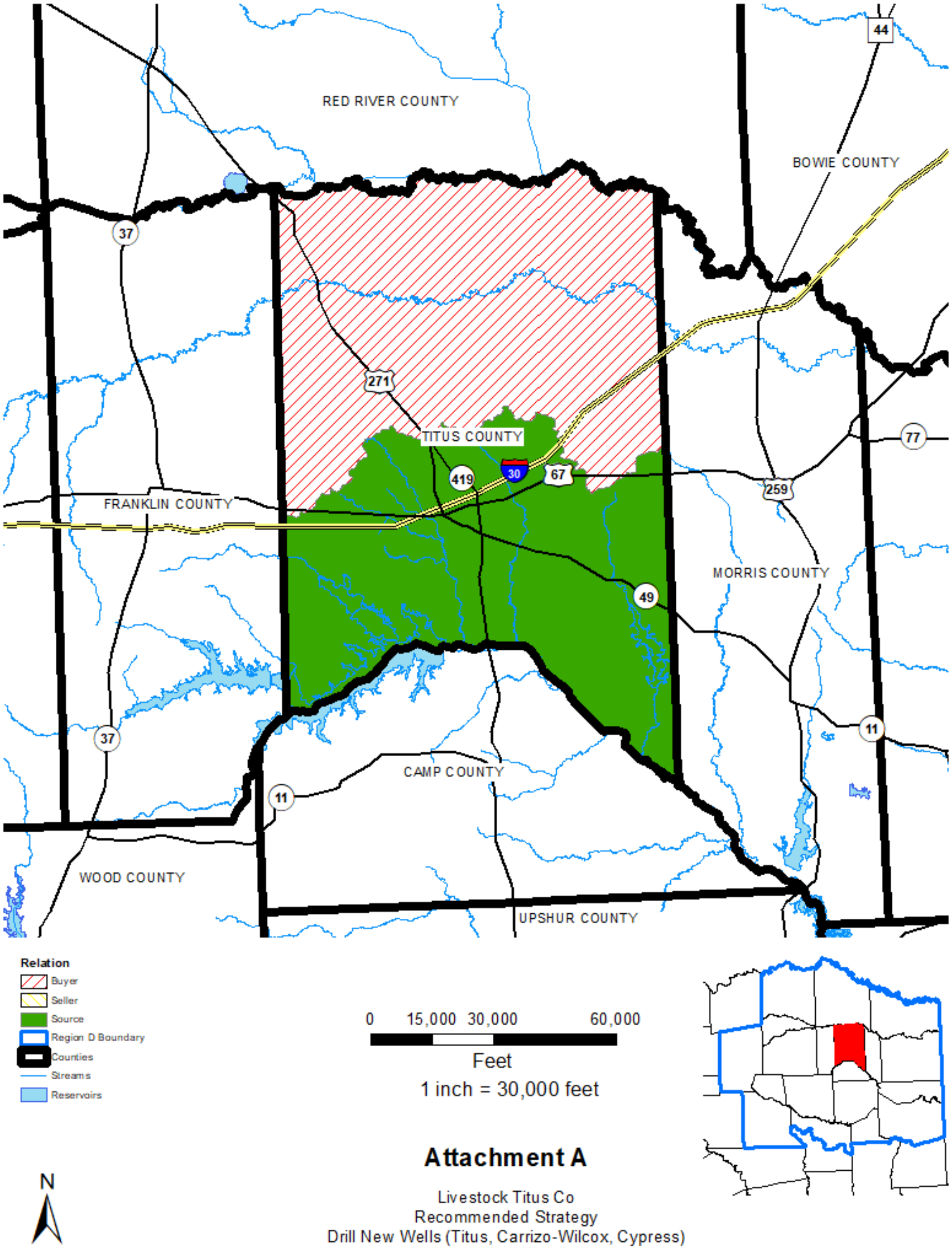
Five alternative strategies were considered to meet the Titus County Livestock WUG's water supply shortages. Advanced water conservation for livestock practices was not considered, as present livestock practices likely result in sale of the livestock to reduce demand and extend water supply. The use of reuse water from nearby municipalities is not considered feasible as the water may be used for livestock consumption. Groundwater has been identified as a potential source of water for livestock in Titus County; however, livestock needs potentially exceed the availability of groundwater in the basin based on the modeled available groundwater estimates by 2060. Purchase of surface from NETMWD was additionally considered as a potential alternative to meet projected demands.

Strategy	Firm Yield (AF)	Total Capital Cost	Total Annualized Cost	Unit Cost	Environmental Impact
Drill New Wells (Carrizo-Wilcox Aquifer, Cypress Basin)	**560**	**$2,253,000**	**$496,000**	**$886**	**1**
Drill New Wells (Carrizo-Wilcox Aquifer, Sulphur Basin)	**1,664**	**$5,215,000**	**$1,362,000**	**$819**	**1**
New Contract (NETMWD)	**2,005**	**$0**	**$201,000**	**$100**	**1**

Recommendations:

	2020	2030	2040	2050	2060	2070
Drill New Wells (Carrizo-Wilcox Aquifer , Cypress Basin)	**275**	**334**	**379**	**425**	**517**	**560**
Drill New Wells (Carrizo-Wilcox Aquifer, Sulphur Basin)	**1,664**	**1,605**	**1,560**	**1,514**	**1,467**	**1,445**

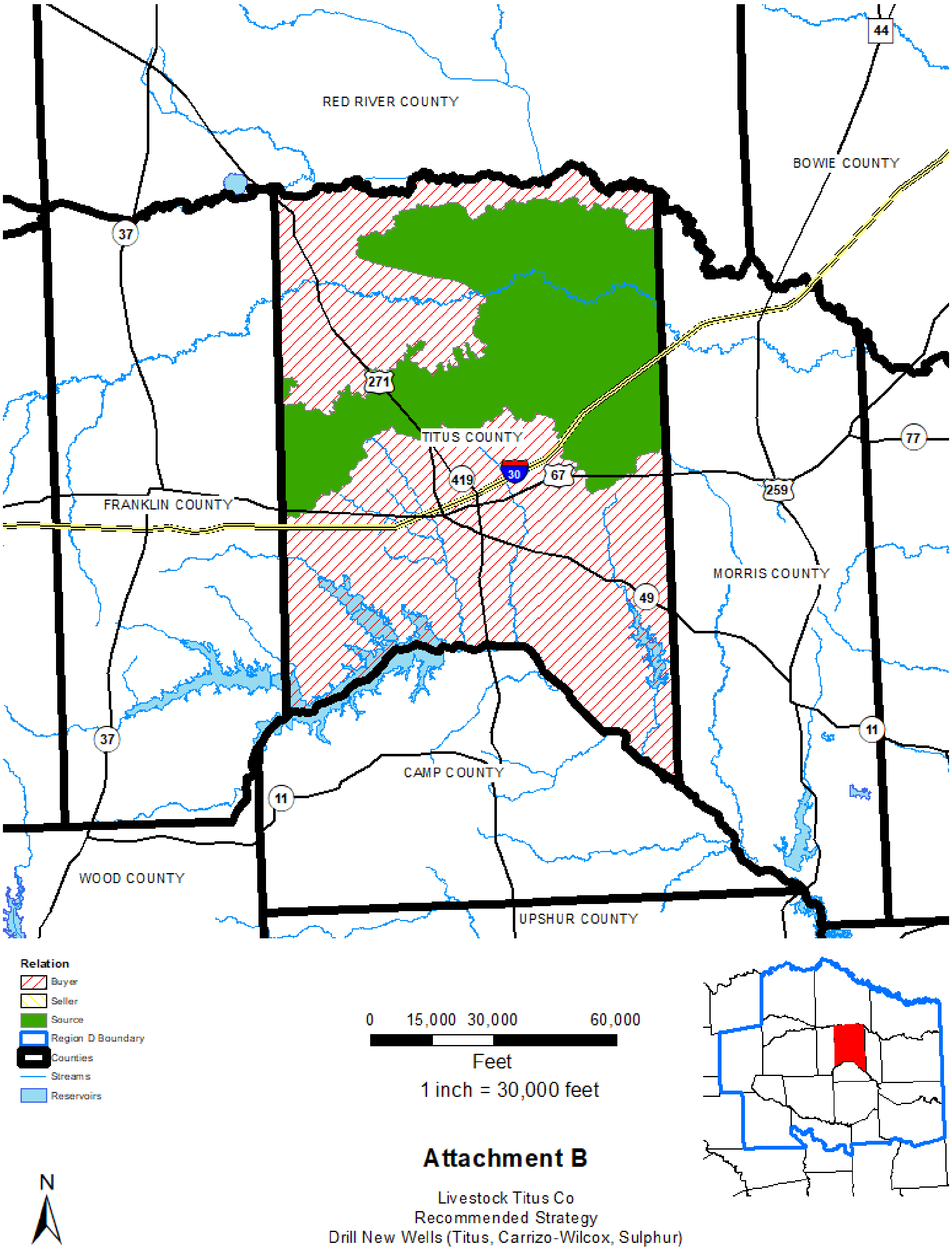
The recommended strategies for the Titus County Livestock WUG to meet projected demands starting in 2020 is to construct additional water wells as needed by decade prior to increased needs over the 2020-2070 planning period. The recommended supply source will be the Carrizo-Wilcox Aquifer in Titus County, three wells in the Cypress Basin and seven wells in the Sulphur Basin all rated at 200 gpm. The portion of the Carrizo-Wilcox Aquifer in Titus County within these basins is projected to have adequate supply availability to provide this amount of supply over the planning period.



Attachment A

Livestock Titus Co
Recommended Strategy
Drill New Wells (Titus, Carrizo-Wilcox, Cypress)

Cost Estimate Summary Water Supply Project Option September 2018 Prices Livestock Titus County - Drill New Wells (Titus, Carrizo-Wilcox Aquifer, Cypress Basin)	
Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 201.9 for September 2018	
Item	***Estimated Costs for Facilities***
CAPITAL COST	
Well Fields (Wells, Pumps, and Piping)	$1,566,000
TOTAL COST OF FACILITIES	**$1,566,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$548,000
Environmental & Archaeology Studies and Mitigation	$54,000
Land Acquisition and Surveying (5 acres)	$24,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$61,000
TOTAL COST OF PROJECT	**$2,253,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$158,000
Reservoir Debt Service (3.5 percent, 40 years)	$0
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$16,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (530935 kW-hr @ 0.08 $/kW-hr)	$42,000
Purchase of Water (560 acft/yr @ 500 $/acft)	$280,000
TOTAL ANNUAL COST	**$496,000**
Available Project Yield (acft/yr)	560
Annual Cost of Water ($ per acft), based on PF=1	$886
Annual Cost of Water After Debt Service ($ per acft), based on PF=1	$604
Annual Cost of Water ($ per 1,000 gallons), based on PF=1	$2.72
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1	$1.85
JMP	*10/15/2019*



Attachment B

Livestock Titus Co
Recommended Strategy
Drill New Wells (Titus, Carrizo-Wilcox, Sulphur)

Cost Estimate Summary **_Water Supply Project Option_** **_September 2018 Prices_** **_Livestock Titus County - Drill New Wells (Titus, Carrizo-Wilcox Aquifer, Sulphur Basin)_**	
Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 201.9 for September 2018	
Item	**_Estimated Costs for Facilities_**
CAPITAL COST	
Well Fields (Wells, Pumps, and Piping)	$3,639,000
TOTAL COST OF FACILITIES	**$3,639,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$1,274,000
Environmental & Archaeology Studies and Mitigation	$111,000
Land Acquisition and Surveying (10 acres)	$51,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$140,000
TOTAL COST OF PROJECT	**$5,215,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$367,000
Reservoir Debt Service (3.5 percent, 40 years)	$0
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$36,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (1581333 kW-hr @ 0.08 $/kW-hr)	$127,000
Purchase of Water (1664 acft/yr @ 500 $/acft)	$832,000
TOTAL ANNUAL COST	**$1,362,000**
Available Project Yield (acft/yr)	1,664
Annual Cost of Water ($ per acft), based on PF=1	$819
Annual Cost of Water After Debt Service ($ per acft), based on PF=1	$598
Annual Cost of Water ($ per 1,000 gallons), based on PF=1	$2.51
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1	$1.83
JMP	_10/15/2019_

EVALUATION OF WATER MANAGEMENT STRATEGIES FOR MEETING THE PROJECTED WATER SUPPLY NEEDS OF MANUFACTURING IN TITUS COUNTY

Description of Water User Group:

Manufacturing in Titus County has a demand that is projected to increase from 4,063 ac-ft/yr in 2020 to 4,155 ac-ft/yr by 2030 remaining constant through 2070. Manufacturing in Titus County is currently supplied by groundwater from the Carrizo-Wilcox Aquifer, direct reuse, and surface water from Tankersley and Bob Sandlin purchased from the City of Mount Pleasant. A deficit of 1,418 ac-ft/yr is projected to occur in 2030 and increase to 1,694 ac-ft/yr by 2070. The water supply contract with the City of Mount Pleasant for water from Bob Sandlin expires in 2028.

Water Supply and Demand Analysis:

	2020	2030	2040	2050	2060	2070
Projected Water Demand	4,063	4,155	4,155	4,155	4,155	4,155
Current Water Supply	5,392	2,737	2,860	2,850	2,591	2,461
Projected Supply Surplus (+)/Deficit(-)	**1,329**	**-1,418**	**-1,295**	**-1,305**	**-1,564**	**-1,694**

Evaluation of Potentially Feasible Water Management Strategies:

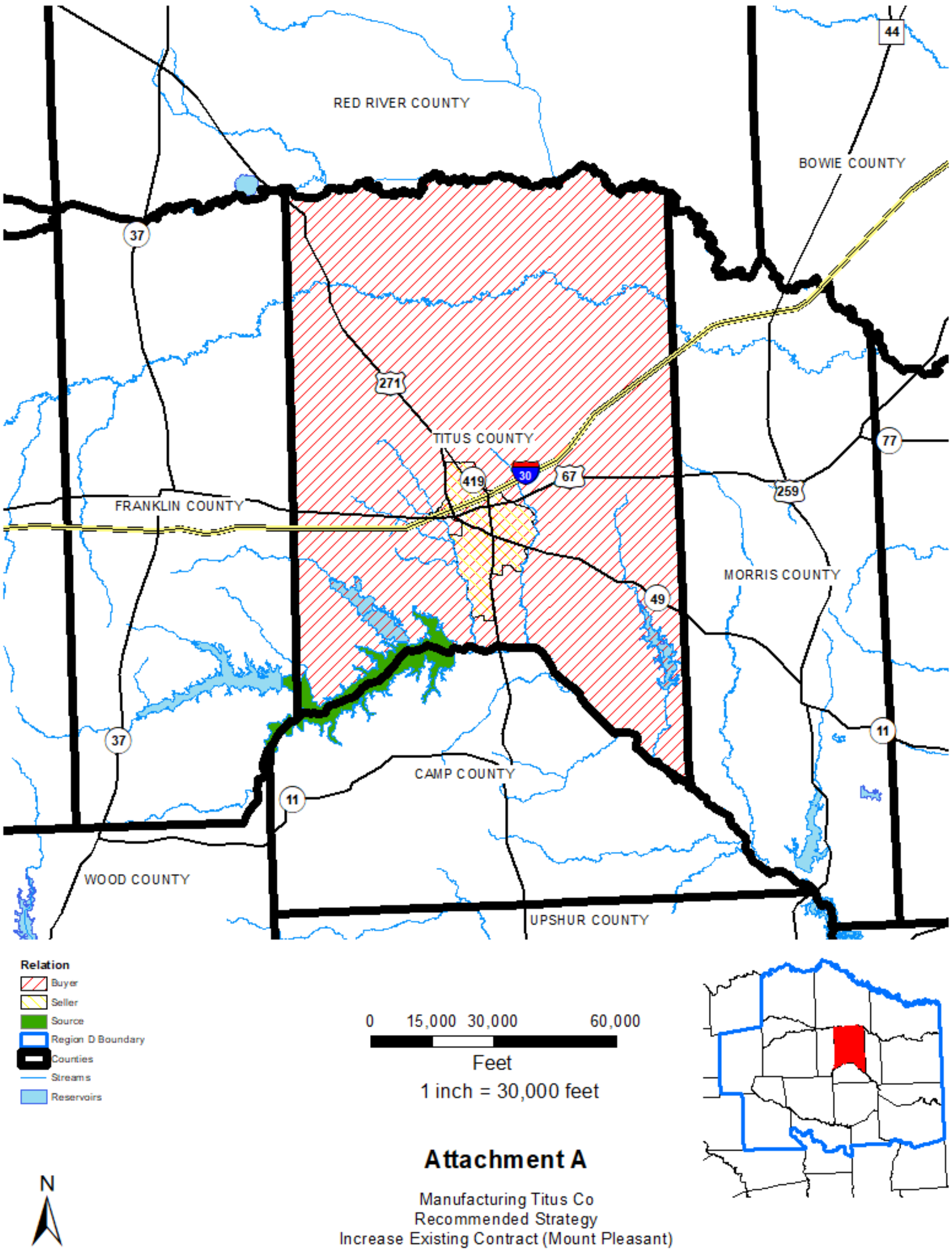
Multiple alternative strategies were considered to meet the Titus County Manufacturing WUG's water supply shortages. Advanced water conservation for manufacturing was considered in this planning effort to reduce overall demands; however, it does not resolve all identified needs. The use of reuse water from nearby municipalities was not considered in this planning period beyond those amounts currently reported by manufacturing entities in the county. Groundwater has been identified as a potential source of water for manufacturing in Titus County; however, manufacturing needs exceed the availability of groundwater in the basin based on the modeled available groundwater estimates. Surface water was considered as a potential alternative to meet projected demands, both individually, and in conjunction with drilling new wells.

Strategy	Firm Yield (AF)	Total Capital Cost	Total Annualized Cost	Unit Cost	Environmental Impact
Advanced Water Conservation	**415**	**$0**	**$0**	**$0**	**1**
Drill New Wells (Carrizo-Wilcox Aquifer, Sulphur Basin)	**1,279**	**$3,679,000**	**$1,006,000**	**$787**	**1**
Renew and Increase Existing Contract (Mount Pleasant)	**1,279**	**$0**	**$1,000,000**	**$782**	**1**

Recommendations:

	2020	2030	2040	2050	2060	2070
Advanced Water Conservation (ac-ft/yr)	**0**	**415**	**415**	**415**	**415**	**415**
Renew and Increase Existing Contract (ac-ft/yr)	**0**	**1,003**	**880**	**890**	**1,149**	**1,279**

The recommended strategies for the Titus County Manufacturing WUG to meet projected demands starting in 2030 is to implement advanced conservation measures (via industrial water audits). It is projected that advanced conservation could produce up to 415 ac-ft of savings by the year 2070. The other recommended strategy, and most significant in terms of supply, is for the renewal and increase of the existing contract(s) with the City of Mount Pleasant for raw water supply from Bob Sandlin Reservoir.



Attachment A

Manufacturing Titus Co
Recommended Strategy
Increase Existing Contract (Mount Pleasant)

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices

Titus County Manufacturing - Renew Contract with Mount Pleasant

Cost based on ENR CCI 11170.28 for September 2018 and
a PPI of 201.9 for September 2018

Item	***Estimated Costs for Facilities***
ANNUAL COST	
Operation and Maintenance	
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (0 kW-hr @ 0.08 $/kW-hr)	$0
Purchase of Water (1279 acft/yr @ 782 $/acft)	$1,000,000
TOTAL ANNUAL COST	**$1,000,000**
Available Project Yield (acft/yr)	1,279
Annual Cost of Water ($ per acft), based on PF=1	$782
Annual Cost of Water After Debt Service ($ per acft), based on PF=1	$782
Annual Cost of Water ($ per 1,000 gallons), based on PF=1	$2.40
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1	$2.40

JMP *9/23/2019*

EVALUATION OF WATER MANAGEMENT STRATEGIES FOR MEETING THE PROJECTED WATER SUPPLY NEEDS OF STEAM ELECTRIC POWER IN TITUS COUNTY

Description of Water User Group:

Steam Electric Power in Titus County has a demand that is projected to be a constant 61,931 ac-ft/yr for 2020 through 2070. Steam Electric Power in Titus County is currently supplied by groundwater from the Carrizo-Wilcox Aquifer, and surface water from Monticello, Lake O' the Pines, and Welsh purchased from Northeast Texas MWD and surface water from Bob Sandlin purchased from Titus County FWD #1. A deficit of 30,066 ac-ft/yr is projected to occur in 2020 and increase to 33,083 ac-ft/yr by 2070.

Water Supply and Demand Analysis:

	2020	2030	2040	2050	2060	2070
Projected Water Demand	61,931	61,931	61,931	61,931	61,931	61,931
Current Water Supply	31,865	31,065	30,165	29,365	29,117	28,848
Projected Supply Surplus (+)/Deficit(-)	**-30,066**	**-30,866**	**-31,766**	**-32,566**	**-32,814**	**-33,083**

Evaluation of Potentially Feasible Water Management Strategies:

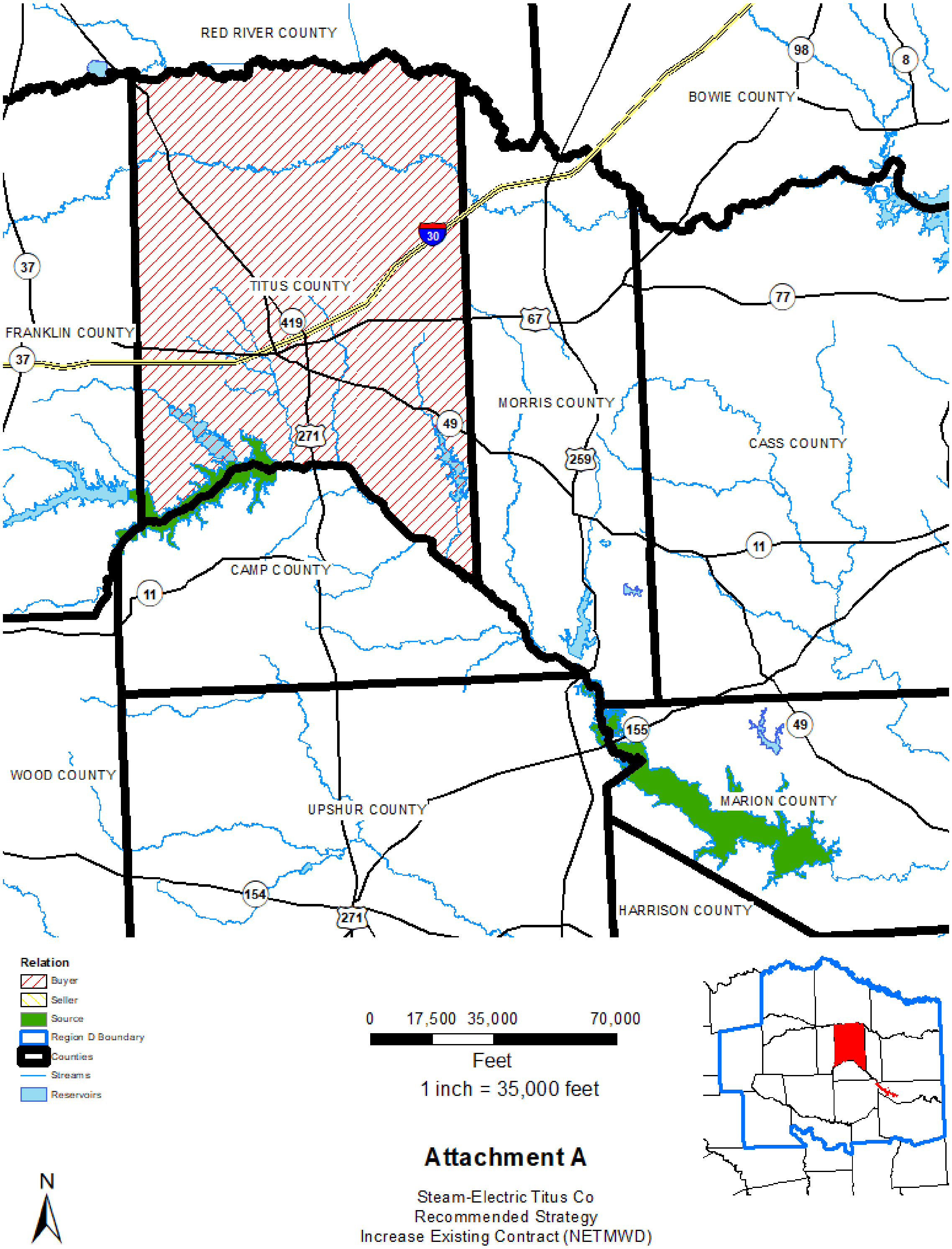
Five alternative strategies were considered to meet the Titus County Steam Electric Power WUG's water supply shortages. Advanced water conservation for steam electric power was considered in this planning effort to reduce overall demands, assuming conservation amounts based on the available literature for Business as Usual (BAU) for power generation derived from a BEG study. The use of reuse water from nearby municipalities was not considered in this planning period beyond those amounts currently reported by manufacturing entities in the county. It is assumed that reuse from the steam electric power WUG is already utilized. Groundwater has been identified as a potential source of water for steam electric power in Titus County; however, steam electric power needs significantly exceed the availability of groundwater in the basin based on the modeled available groundwater estimates. While historical water levels have remained relatively stable, and the MAG values may be conservative estimates, there is not enough data available to determine whether the aquifer can sustain a yield that is 14 to16 times greater than the MAG without additional modeling. Surface water from increasing existing contracts was considered as a potential alternative to meet projected demands.

Strategy	Firm Yield (AF)	Total Capital Cost	Total Annualized Cost	Unit Cost	Environmental Impact
Advanced Water Conservation	**33,083**	**$0**	**$0**	**$0**	**1**
Increase Existing Contract (NETMWD)	**33,083**	**$0**	**$3,308,000**	**$100**	**1**

Recommendations:

	2020	2030	2040	2050	2060	2070
Increase Existing Contract (NETMWD)	**30,066**	**30,866**	**31,766**	**32,566**	**32,814**	**33,083**

The recommended strategies for the Titus County Steam Electric WUG to meet projected demands starting in 2020 is to purchase additional supply from the NETMWD, which has sufficient surplus supplies in excess of existing and projected customer demands to meet these projected needs. Existing generation facilities in Titus County are presently served by Lake Bob Sandlin and Lake O' the Pines, so major infrastructure is already in place. Unit costs have been calculated for the purchase of these supplies based on presently available information, and are utilized herein to present an order of magnitude estimation of present potential cost.



Attachment A

Steam-Electric Titus Co
Recommended Strategy
Increase Existing Contract (NETMWD)

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices

Titus County Steam Electric Power - Increase Existing Contract with NETMWD

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 201.9 for September 2018

Item	***Estimated Costs for Facilities***
ANNUAL COST	
Operation and Maintenance	
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (0 kW-hr @ 0.08 $/kW-hr)	$0
Purchase of Water (33083 acft/yr @ 100 $/acft)	$3,308,000
TOTAL ANNUAL COST	**$3,308,000**
Available Project Yield (acft/yr)	33,083
Annual Cost of Water ($ per acft), based on PF=1	$100
Annual Cost of Water After Debt Service ($ per acft), based on PF=1	$100
Annual Cost of Water ($ per 1,000 gallons), based on PF=1	$0.31
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1	$0.31

JMP *10/5/2019*

REGION D
EVALUATIONS OF WATER MANAGEMENT STRATEGIES
FOR MEETING PROJECTED WATER SUPPLY NEEDS
TO YEAR 2070

UPSHUR COUNTY

WUGs:

The City of Gilmer
Upshur County Livestock
Upshur County Manufacturing

EVALUATION OF WATER MANAGEMENT STRATEGIES FOR MEETING THE PROJECTED WATER SUPPLY NEEDS OF CITY OF GILMER

Description of Water User Group:

The City of Gilmer system is located in central Upshur County and serves the incorporated area of the City. In 2018, the City had 2529 residential connections. The population is projected to increase from 5,695 persons in 2020 to 7,673 persons in 2070. The City is included as a W.U.G. in Upshur County. The system's current water supply consists of seven water wells from the Carrizo-Wilcox Aquifer. The total rated capacity of these wells is approximately 2280 GPM, or 1,226 ac-ft/yr. The system is bounded on the west and south by the Pritchett WSC, the east by Bi-County WSC, and the north by Sharon WSC. The System does have a water conservation plan. The System is projected to have a water supply surplus of 103 ac-ft/yr in 2020 decreasing to a deficit of 206 ac-ft/yr in 2070.

Water Supply and Demand Analysis:

	2020	2030	2040	2050	2060	2070
Population	5695	6154	6548	6953	7325	7673
Projected Water Demand	1123	1184	1237	1301	1368	1432
Current Water Supply	1226	1226	1226	1226	1226	1226
Projected Supply Surplus (+)/Deficit(-)	**103**	**42**	**-11**	**-75**	**-142**	**-206**

Evaluation of Potentially Feasible Water Management Strategies:

Four alternative strategies were considered to meet the City's water supply shortages as summarized in the following table. Advanced conservation was not considered because the per capita use per day was below the 140 gpcpd threshold set by the planning group. Water reuse was not considered because the system does not have a demand for non-potable water. Surface water alternatives were omitted since surface water treatment is not economically feasible for a system of this size with available groundwater. Groundwater wells in the Carrizo-Wilcox Aquifer (Cypress Creek River Basin) were identified as a potentially feasible strategy for the City.

Strategy	Firm Yield (AF)	Total Capital Cost	Total Annualized Cost	Unit Cost	Environmental Impact
Groundwater (Carrizo-Wilcox Aquifer, Cypress Basin)	**216**	**$ 801,000**	**$ 69,000**	**$ 319**	**Minimal**

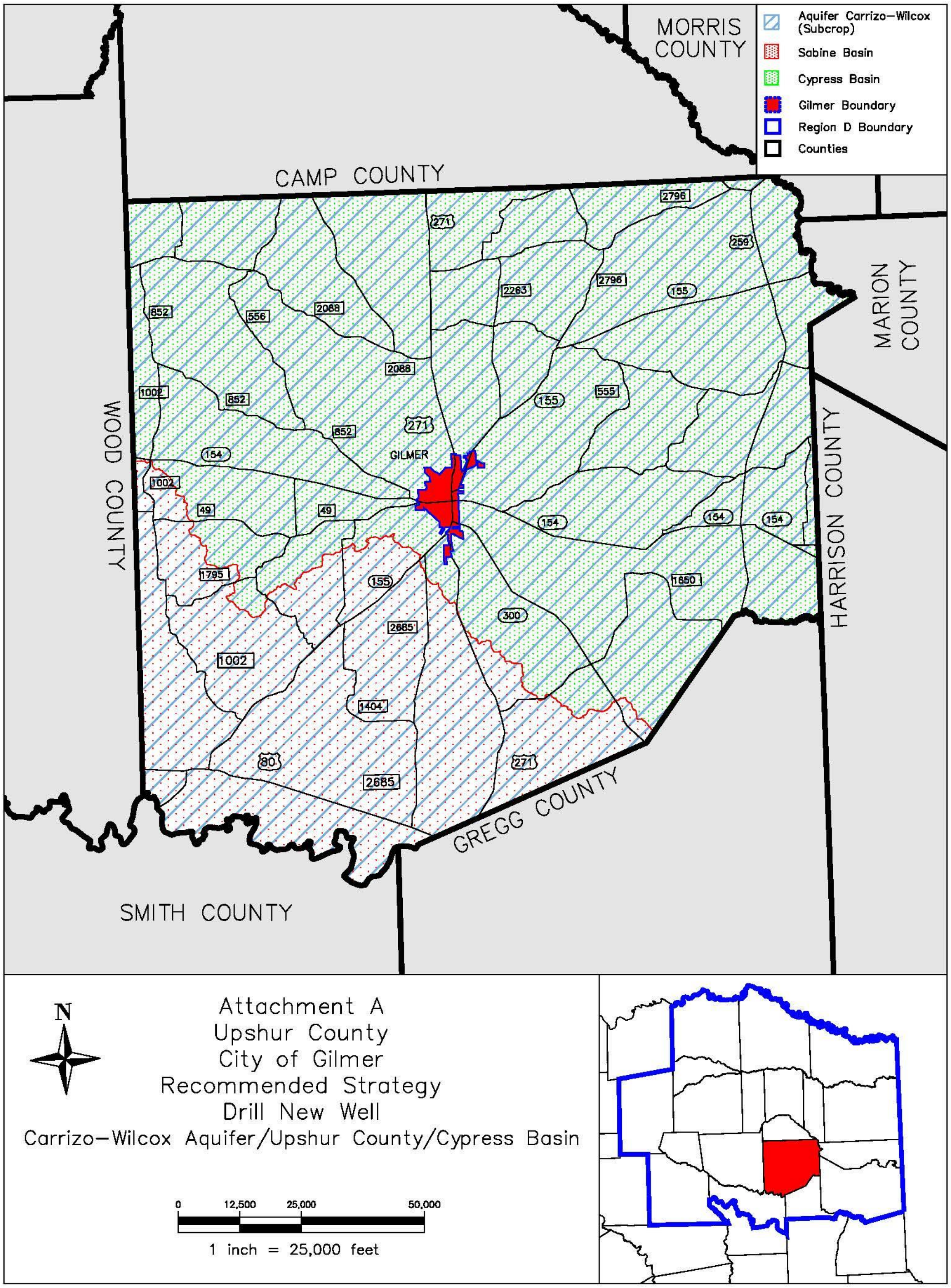
Recommendations:

	2020	2030	2040	2050	2060	2070
Drill New Wells (Carrizo-Wilcox Aquifer, Cypress Creek River Basin; ac-ft/yr)	0	0	216	216	216	216

The recommended strategy for the City to meet their projected deficit of 11 ac-ft/yr in 2040 and deficit of 206 ac-ft/yr in 2070 would be to construct one additional water well similar to other wells within their system just prior to each decade as the deficits occur. The recommended supply source will be the Carrizo Wilcox Aquifer in Upshur County. One well with rated capacity of 400 gpm would provide approximately 216 acre-feet/yr. The Carrizo Wilcox Aquifer (Cypress Creek River Basin) in Upshur County is projected to have a more than ample supply availability to meet the needs of Gilmer for the planning period.

Given the increasing costs to comply with more stringent regulations and the decreasing reliability of groundwater as a future supply source due to quality issues in this region, it is recommended that groundwater supply systems consider combining resources and/or soliciting future water supply from neighboring systems and/or major water providers in the region. If a feasible alternative becomes available, then the recommendations previously discussed should be disregarded and a re-evaluation completed.

Cost Estimate Summary Water Supply Project Option September 2018 Prices Gilmer - Drill New Well Carrizo Wilcox Aquifer Uoshur Cypress	
Cost based on ENR CCI 11170.28 for September 2018 and	
a PPI of 202.4 for September 2018	
Item	**Estimated Costs for Facilities**
CAPITAL COST	
Dam and Reservoir (Conservation Pool acft, acres)	$0
Off-Channel Storage/Ring Dike (Conservation Pool acft, acres)	$0
Terminal Storage (Conservation Pool acft, acres)	$0
Primary Pump Station (0 MGD)	$0
Transmission Pipeline (6 in dia., miles)	$0
Transmission Pump Station(s) & Storage Tank(s)	$0
Well Fields (Wells, Pumps, and Piping)	$567,000
Storage Tanks (Other Than at Booster Pump Stations)	$0
Water Treatment Plant (0 MGD)	$0
Advanced Water Treamtent Facility (MGD)	$0
Conservation (Leaking Pipe/Meter Replacement)	$0
Integration, Relocations, & Other	$0
TOTAL COST OF FACILITIES	**$567,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$199,000
Environmental & Archaeology Studies and Mitigation	$11,000
Land Acquisition and Surveying (1 acres)	$2,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$22,000
TOTAL COST OF PROJECT	**$801,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$56,000
Reservoir Debt Service (3.5 percent, 40 years)	$0
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$6,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (87005 kW-hr @ 0.08 $/kW-hr)	$7,000
Purchase of Water (acft/yr @ $/acft)	$0
TOTAL ANNUAL COST	**$69,000**
Available Project Yield (acft/yr)	216
Annual Cost of Water ($ per acft), based on PF=1	$319
Annual Cost of Water After Debt Service ($ per acft), based on PF=1	$60
Annual Cost of Water ($ per 1,000 gallons), based on PF=1	$0.98
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1	$0.18
Stanley Hayes	*10/4/2019*



Attachment A
Upshur County
City of Gilmer
Recommended Strategy
Drill New Well
Carrizo-Wilcox Aquifer/Upshur County/Cypress Basin

EVALUATION OF WATER MANAGEMENT STRATEGIES FOR MEETING THE PROJECTED WATER SUPPLY NEEDS LIVESTOCK IN UPSHUR COUNTY

Description of Water User Group:

The Livestock WUG in Upshur County is a split entity and has a demand that is projected to be a constant 1,222 ac-ft/yr from 2020 to 2070. Livestock in Upshur County, Cypress has a current water supply consisting of water wells from the Carrizo-Wilcox Aquifer and Local Supplies. The total rated available supply from these sources is 1,158 ac-ft/yr in 2020 thru 2070. Livestock in Upshur County, Cypress is projected to have a water supply deficit of 64 ac-ft/yr in 2020 thru 2070. Livestock in Upshur County, Sabine is projected to have a water supply deficit of 76 ac-ft/yr in 2020 thru 2070.

Water Supply and Demand Analysis:

Livestock Upshur Cypress	**2020**	**2030**	**2040**	**2050**	**2060**	**2070**
Projected Water Demand	1,222	1,222	1,222	1,222	1,222	1,222
Current Water Supply	1,158	1,158	1,158	1,158	1,158	1,158
Projected Supply Surplus (+)/Deficit(-)	-64	-64	-64	-64	-64	-64

Livestock Upshur Sabine	**2020**	**2030**	**2040**	**2050**	**2060**	**2070**
Projected Water Demand	429	429	429	429	429	429
Current Water Supply	353	353	353	353	353	353
Projected Supply Surplus (+)/Deficit(-)	-76	-76	-76	-76	-76	-76

Evaluation of Potentially Feasible Water Management Strategies:

Four alternative strategies were considered to meet the Upshur County, Livestock, Cypress and Sabine water supply shortages as summarized in the following table. Advanced conservation and water reuse were not considered because the demands are very rural in nature. Surface water alternatives were utilized where currently available but increase in permit amounts are not available. Groundwater wells in the Queen City Aquifer (Cypress Creek and Sabine River basins) were identified as a potentially feasible strategy for the WUG.

Strategy	**Firm Yield (AF)**	**Total Capital Cost**	**Total Annualized Cost**	**Unit Cost**	**Environmental Impact**
Groundwater (Cypress)	**161**	**$ 172,000**	**$ 17,000**	**$ 106**	**1**
Groundwater (Sabine)	**161**	**$ 172,000**	**$ 17,000**	**$ 106**	**1**

Recommendations:

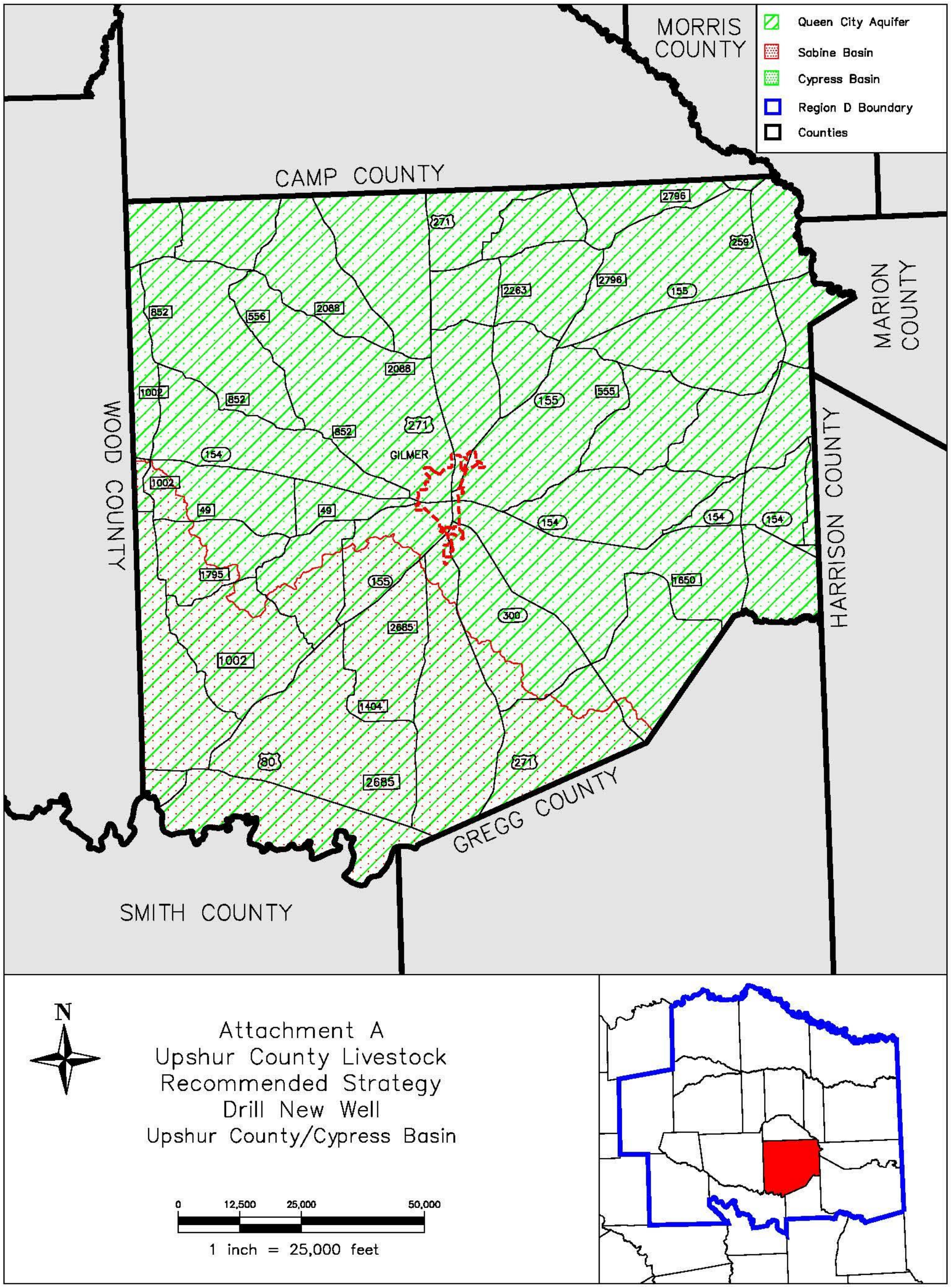
	2020	**2030**	**2040**	**2050**	**2060**	**2070**
Drill New Wells (Queen City Aquifer, Cypress Creek Basin; ac-ft/yr)	161	161	161	161	161	161
Drill New Wells (Queen City Aquifer, Sabine Basin; ac-ft/yr)	161	161	161	161	161	161

The recommended strategy for the Upshur County, Livestock, Cypress to meet their projected deficit of 64 ac-ft/yr in 2020 thru 2070 would be to construct one water well prior to 2020. The recommended supply source will be the Queen City Aquifer in Upshur County. Two wells with rated capacity of 100 gpm each would provide approximately 161 ac-ft/yr. One new well will be needed to provide the 64 ac-ft/yr needed. The Queen City Aquifer in Upshur County is projected to have a more than ample supply availability to meet the needs of the Livestock in Upshur County for the planning period.

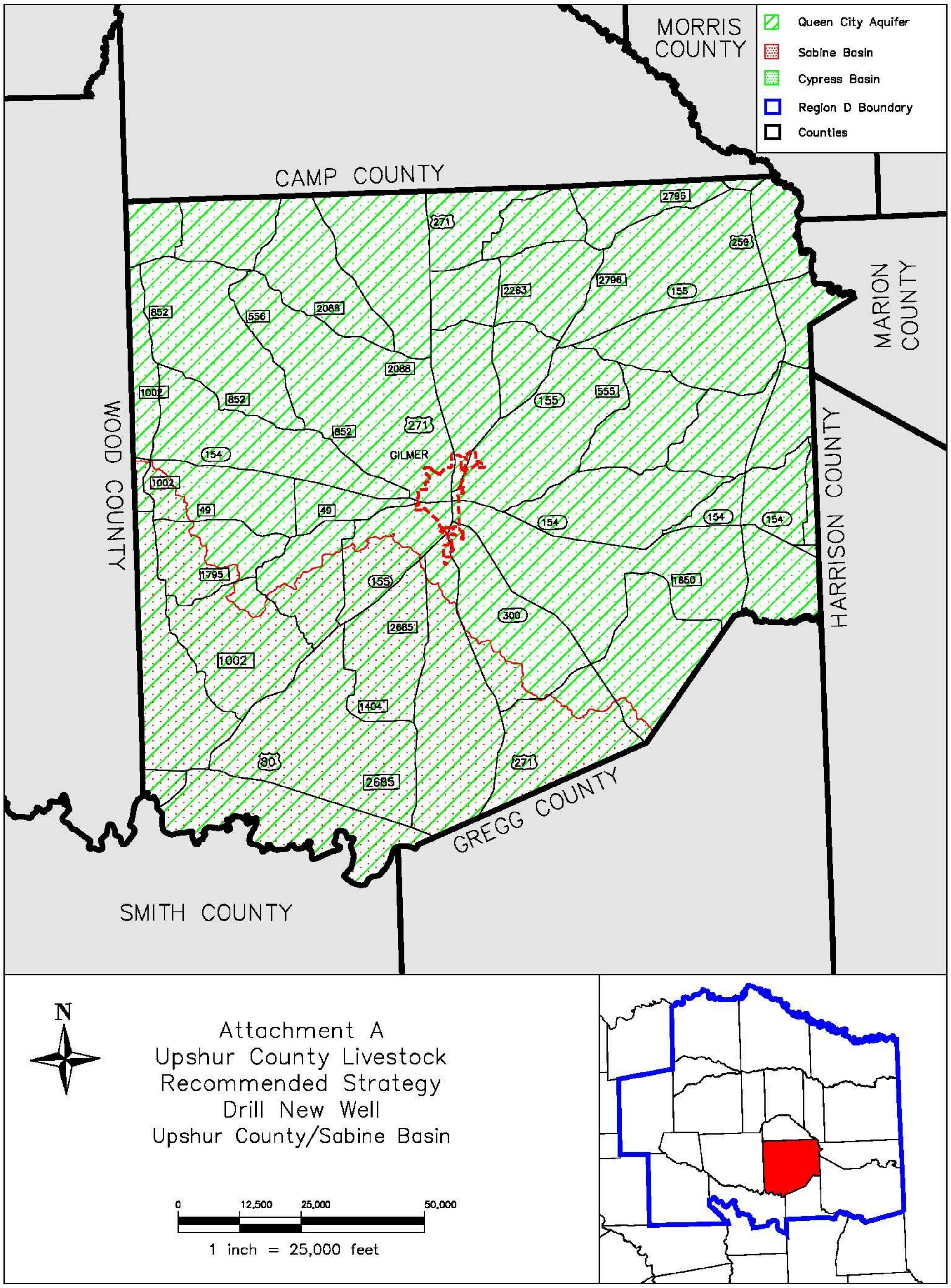
The recommended strategy for the Upshur County, Livestock, Sabine to meet their projected deficit of 76 ac-ft/yr in 2020 thru 2070 would be to construct one water well prior to 2020. The recommended supply source will be the Queen City Aquifer in Upshur County. One well with rated capacity of 100 gpm each would provide approximately 161 ac-ft/yr. One new well will be needed to provide the 76 ac-ft/yr needed. The Queen City Aquifer in Upshur County is projected to have a more than ample supply availability to meet the needs of the Livestock in Upshur County, Sabine for the planning period.

Given the increasing costs to comply with more stringent regulations and the decreasing reliability of groundwater as a future supply source due to quality issues in this region, it is recommended that groundwater supply systems consider combining resources and/or soliciting future water supply from neighboring systems and/or major water providers in the region. If a feasible alternative becomes available, then the recommendations previously discussed should be disregarded and a re-evaluation completed.

Cost Estimate Summary ***Water Supply Project Option*** ***September 2018 Prices***	
Livestock Upshur Cypress - Drill New Well Queen City Aquifer Upshur Cypress	
Cost based on ENR CCI 11170.28 for September 2018 and	
a PPI of 202.4 for September 2018	
Item	***Estimated Costs for Facilities***
CAPITAL COST	
Dam and Reservoir (Conservation Pool acft, acres)	$0
Off-Channel Storage/Ring Dike (Conservation Pool acft, acres)	$0
Terminal Storage (Conservation Pool acft, acres)	$0
Primary Pump Station (0 MGD)	$0
Transmission Pipeline (6 in dia., miles)	$0
Transmission Pump Station(s) & Storage Tank(s)	$0
Well Fields (Wells, Pumps, and Piping)	$124,000
Storage Tanks (Other Than at Booster Pump Stations)	$0
Water Treatment Plant (0 MGD)	$0
Advanced Water Treamtent Facility (MGD)	$0
Conservation (Leaking Pipe/Meter Replacement)	$0
Integration, Relocations, & Other	$0
TOTAL COST OF FACILITIES	**$124,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$43,000
Environmental & Archaeology Studies and Mitigation	$0
Land Acquisition and Surveying (1 acres)	$0
Interest During Construction (3% for 1 years with a 0.5% ROI)	$5,000
TOTAL COST OF PROJECT	**$172,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$12,000
Reservoir Debt Service (3.5 percent, 40 years)	$0
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$1,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (56044 kW-hr @ 0.08 $/kW-hr)	$4,000
Purchase of Water (acft/yr @ $/acft)	$0
TOTAL ANNUAL COST	**$17,000**
Available Project Yield (acft/yr)	161
Annual Cost of Water ($ per acft), based on PF=1	$106
Annual Cost of Water After Debt Service ($ per acft), based on PF=1	$31
Annual Cost of Water ($ per 1,000 gallons), based on PF=1	$0.32
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1	$0.10
Stanley Hayes	*9/30/2019*


Queen City Aquifer
Sabine Basin
Cypress Basin
Region D Boundary
Counties
MORRIS COUNTY
CAMP COUNTY
MARION COUNTY
WOOD COUNTY
HARRISON COUNTY
GREGG COUNTY
SMITH COUNTY
GILMER
N
Attachment A
Upshur County Livestock
Recommended Strategy
Drill New Well
Upshur County/Cypress Basin
0
12,500
25,000
50,000
1 inch = 25,000 feet

Cost Estimate Summary Water Supply Project Option September 2018 Prices Livestock Upshur Sabine - Drill New Well Queen City Aquifer Upshur Sabine	
Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 202.4 for September 2018	
Item	***Estimated Costs for Facilities***
CAPITAL COST	
Dam and Reservoir (Conservation Pool acft, acres)	$0
Off-Channel Storage/Ring Dike (Conservation Pool acft, acres)	$0
Terminal Storage (Conservation Pool acft, acres)	$0
Primary Pump Station (0 MGD)	$0
Transmission Pipeline (6 in dia., miles)	$0
Transmission Pump Station(s) & Storage Tank(s)	$0
Well Fields (Wells, Pumps, and Piping)	$124,000
Storage Tanks (Other Than at Booster Pump Stations)	$0
Water Treatment Plant (0 MGD)	$0
Advanced Water Treamtent Facility (MGD)	$0
Conservation (Leaking Pipe/Meter Replacement)	$0
Integration, Relocations, & Other	$0
TOTAL COST OF FACILITIES	**$124,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$43,000
Environmental & Archaeology Studies and Mitigation	$0
Land Acquisition and Surveying (1 acres)	$0
Interest During Construction (3% for 1 years with a 0.5% ROI)	$5,000
TOTAL COST OF PROJECT	**$172,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$12,000
Reservoir Debt Service (3.5 percent, 40 years)	$0
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$1,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (43978 kW-hr @ 0.08 $/kW-hr)	$4,000
Purchase of Water (acft/yr @ $/acft)	$0
TOTAL ANNUAL COST	**$17,000**
Available Project Yield (acft/yr)	161
Annual Cost of Water ($ per acft), based on PF=1	$106
Annual Cost of Water After Debt Service ($ per acft), based on PF=1	$31
Annual Cost of Water ($ per 1,000 gallons), based on PF=1	$0.32
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1	$0.10
Stanley Hayes	*10/4/2019*


Queen City Aquifer
Sabine Basin
Cypress Basin
Region D Boundary
Counties
MORRIS COUNTY
CAMP COUNTY
MARION COUNTY
WOOD COUNTY
HARRISON COUNTY
GREGG COUNTY
SMITH COUNTY
GILMER
N
Attachment A
Upshur County Livestock
Recommended Strategy
Drill New Well
Upshur County/Sabine Basin
0
12,500
25,000
50,000
1 inch = 25,000 feet

EVALUATION OF WATER MANAGEMENT STRATEGIES FOR MEETING THE PROJECTED WATER SUPPLY NEEDS MANUFACTURING IN UPSHUR COUNTY

Description of Water User Group:

The Manufacturing WUG in Upshur County has a demand that is projected to be increasing from 69 ac-ft/yr in 2020 to 76 ac-ft/yr in 2070. Manufacturing in Upshur County has a current water supply consisting of water wells from the Carrizo-Wilcox Aquifer. The total rated available supply from these sources is 6 ac-ft/yr. Manufacturing in Upshur County is projected to have a water supply deficit of 63 ac-ft/yr in 2020 increasing to a deficit of 70 ac-ft/yr in 2070.

Water Supply and Demand Analysis:

	2020	2030	2040	2050	2060	2070
Projected Water Demand	69	76	76	76	76	76
Current Water Supply	6	6	6	6	6	6
Projected Supply Surplus (+)/Deficit(-)	-63	-70	-70	-70	-70	-70

Evaluation of Potentially Feasible Water Management Strategies:

Three alternative strategies were considered to meet the Upshur County Manufacturing water supply shortages as summarized in the following table. Advanced conservation and water reuse was not considered because operational procedures for the existing mines is not available. Surface water alternatives were omitted since the deficiency is not significant enough to warrant surface supply. Groundwater wells in the Queen City Aquifer (Cypress Creek River Basin) were identified as a potentially feasible strategy for the WUG.

Strategy	Firm Yield (AF)	Total Capital Cost	Total Annualized Cost	Unit Cost	Environmental Impact
Groundwater (Queen City Aquifer, Cypress Creek River Basin)	**161**	**$ 172,000**	**$ 17,000**	**$ 106**	**1**

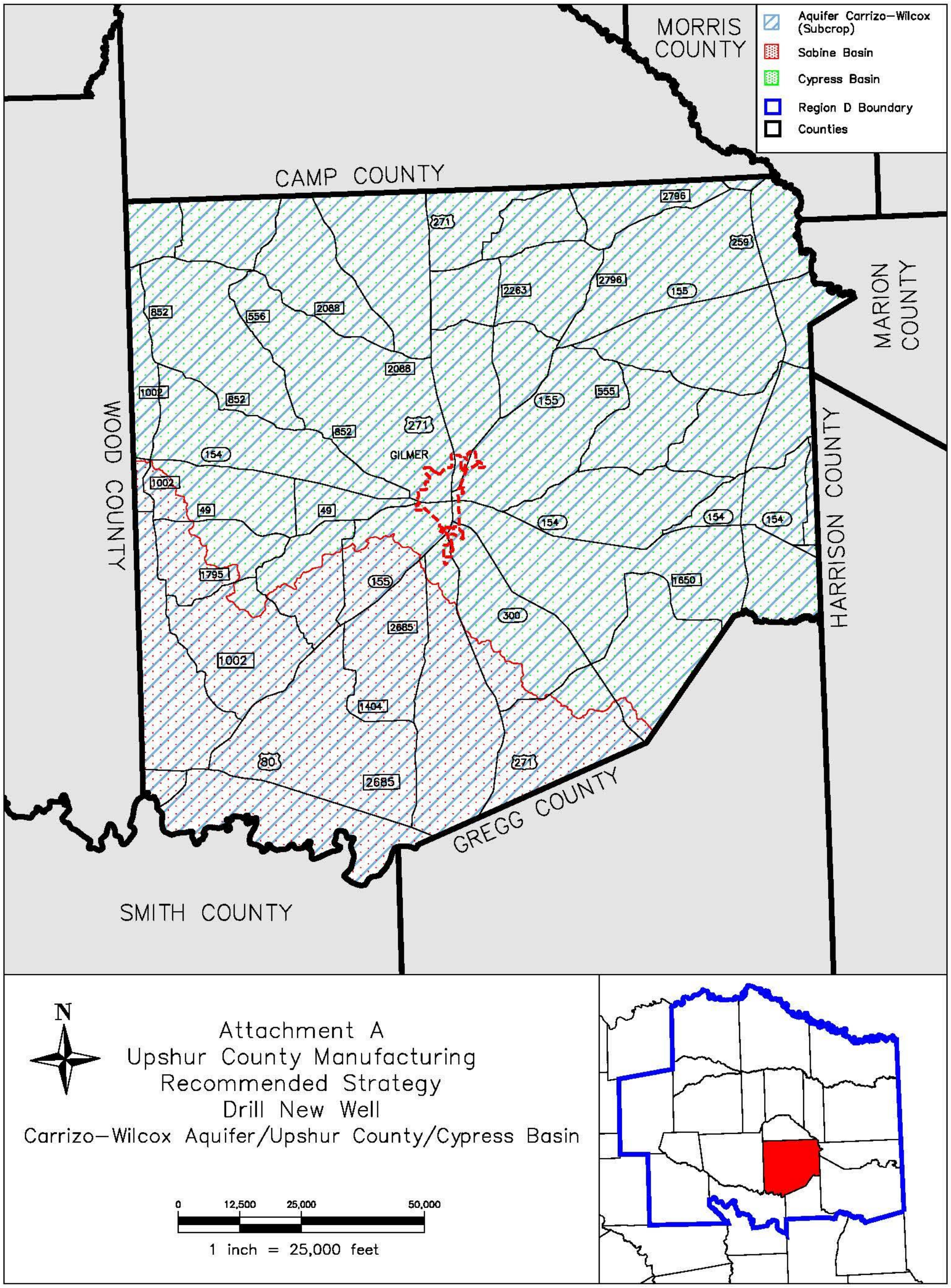
Recommendations:

	2020	2030	2040	2050	2060	2070
Drill New Wells (Queen City Aquifer, Cypress Creek River Basin; ac-ft/yr)	161	161	161	161	161	161

The recommended strategy for the Upshur County Manufacturing to meet their projected deficit of 63 ac-ft/yr in 2020 and 70 ac-ft/yr in 2070 would be to construct one additional water well in the area just prior to the deficit. The recommended supply source will be the Queen City Aquifer in Upshur County. One well with rated capacity of 100 gpm would provide approximately 161 ac-ft/yr. The Carrizo Wilcox Aquifer in Upshur County (Cypress Basin) is projected to have a more than ample supply availability to meet the needs of the Manufacturing in Upshur County for the planning period.

Given the increasing costs to comply with more stringent regulations and the decreasing reliability of groundwater as a future supply source due to quality issues in this region, it is recommended that groundwater supply systems consider combining resources and/or soliciting future water supply from neighboring systems and/or major water providers in the region. If a feasible alternative becomes available, then the recommendations previously discussed should be disregarded and a re-evaluation completed.

Cost Estimate Summary Water Supply Project Option September 2018 Prices	
Manufacturing Upshur Cypress - Drill New Well Queen City Aquifer Upshur Cypress	
Cost based on ENR CCI 11170.28 for September 2018 and	
a PPI of 202.4 for September 2018	
Item	***Estimated Costs for Facilities***
CAPITAL COST	
Dam and Reservoir (Conservation Pool acft, acres)	$0
Off-Channel Storage/Ring Dike (Conservation Pool acft, acres)	$0
Terminal Storage (Conservation Pool acft, acres)	$0
Primary Pump Station (0 MGD)	$0
Transmission Pipeline (6 in dia., miles)	$0
Transmission Pump Station(s) & Storage Tank(s)	$0
Well Fields (Wells, Pumps, and Piping)	$124,000
Storage Tanks (Other Than at Booster Pump Stations)	$0
Water Treatment Plant (0 MGD)	$0
Advanced Water Treamtent Facility (MGD)	$0
Conservation (Leaking Pipe/Meter Replacement)	$0
Integration, Relocations, & Other	$0
TOTAL COST OF FACILITIES	**$124,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$43,000
Environmental & Archaeology Studies and Mitigation	$0
Land Acquisition and Surveying (1 acres)	$0
Interest During Construction (3% for 1 years with a 0.5% ROI)	$5,000
TOTAL COST OF PROJECT	**$172,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$12,000
Reservoir Debt Service (3.5 percent, 40 years)	$0
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$1,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (56044 kW-hr @ 0.08 $/kW-hr)	$4,000
Purchase of Water (acft/yr @ $/acft)	$0
TOTAL ANNUAL COST	**$17,000**
Available Project Yield (acft/yr)	161
Annual Cost of Water ($ per acft), based on PF=1	$106
Annual Cost of Water After Debt Service ($ per acft), based on PF=1	$31
Annual Cost of Water ($ per 1,000 gallons), based on PF=1	$0.32
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1	$0.10
Stanley Hayes	*9/30/2019*



Attachment A
Upshur County Manufacturing
Recommended Strategy
Drill New Well
Carrizo–Wilcox Aquifer/Upshur County/Cypress Basin

REGION D
EVALUATIONS OF WATER MANAGEMENT STRATEGIES
FOR MEETING PROJECTED WATER SUPPLY NEEDS
TO YEAR 2070

VAN ZANDT COUNTY

WUGs:

The City of Canton

Edom WSC

Van Zandt County Irrigation

Little Hope Moore WSC

Van Zandt County Manufacturing

R-P-M WSC

EVALUATION OF WATER MANAGEMENT STRATEGIES FOR MEETING THE PROJECTED WATER SUPPLY NEEDS OF CITY OF CANTON

Description of Water User Group:

The City of Canton provides water service in Van Zandt County. The city's population is projected to be 3,981 by 2020 and increasing to 5,352 by 2070. The City of Canton utilizes groundwater from the Carrizo-Wilcox aquifer, and surface water from Mill Creek Reservoir and a run of river water right for water supplies. The City of Canton is not projected to have a shortage during the planning period.

Water Supply and Demand Analysis:

	2020	2030	2040	2050	2060	2070
Population	3,981	4,352	4,636	4,919	5,153	5,352
Projected Water Demand	965	1,036	1,089	1,148	1,201	1,247
Water Demand from other entities	0	0	0	0	0	0
Current Water Supply	1,611	1,611	1,611	1,611	1,568	1,568
Projected Supply Surplus (+) / Deficit (-)	**646**	**575**	**522**	**463**	**367**	**321**

Projected Supply Surplus (+) / Deficit (-) by Basin	2020	2030	2040	2050	2060	2070
Sabine	645	574	522	463	367	321
Trinity	1	1	0	0	0	0
Total	**646**	**575**	**522**	**463**	**367**	**321**

Evaluation of Potentially Feasible Water Management Strategies:

In 2008, the Canton City council authorized the appropriation of $70,000 to prepare a long-term water plan. The project evaluated four (4) reservoir sites in Van Zandt County. Two of the four proved to be feasible from a technical standpoint. The City spent an additional $30,000 in 2009 and 2010 to address questions and provide additional information requested by the committee members. In addition to these two long-term strategies, two additional water wells were included to satisfy short-term needs. These two additional wells have been completed. Additional groundwater supply is a potentially feasible strategy. Water reuse is a potentially feasible water supply strategy, as the City currently has a water rights application pending at the Texas Commission on Environmental Quality for the authorization of indirect reuse. At the request of the City of Canton, the construction of an additional water well by 2020 was identified as a feasible strategy because the City of Canton is planning on developing additional groundwater supply to supplement existing supplies. Also at the request of the City, a potential new reservoir on Grand Saline Creek was also considered as a feasible strategy for the City.

Strategy	Firm Yield (ac-ft)	Total Capital Cost	Total Annualized Cost	Unit Cost	Environmental Impact
Indirect/Direct Reuse	**323**	**$8,381,000**	**$1,063,000**	**$3,291**	**2**
Drill New Well (Carrizo-Wilcox, Sabine Basin)	**100**	**$716,000**	**$142,000**	**$1,420**	**1**
New Reservoir on Grand Saline Creek	**1,810**	**$62,966,000**	**$3,896,000**	**$2,152**	**5**

New Reservoir on Grand Saline Creek – The City has identified a feasible strategy to meet future water supply needs as being the construction of a new 1,845 acre (24,980 ac-ft) reservoir on Grand Saline Creek, a tributary of Sabine River. This reservoir project was originally described in a 2008 report from Gary Burton Engineering, Inc. to the City of Canton, entitled *Long-Term Water Study Surface Water Supply.* The 2008 report identified the project site, reservoir surface area, drainage area, and estimated construction costs for the reservoir, intake structure, transmission pipeline, and water treatment plant expansion.

The construction costs associated with the new reservoir, raw water transmission line, and water treatment plant expansion are based on calculations from the UCM. For the 2021 planning process, the reservoir has been modeled in the Sabine River WAM (Run 3), subject to SB 3 environmental flow criteria at a junior priority date, and modeled considering the full demand of existing water rights in the Sabine River Basin. The results of this WAM analysis indicate the project has a firm yield of 1,810 ac-ft per year. The project is estimated to yield 1,810 ac-ft/yr of supply by constructing a new 24,980 ac-ft reservoir and 14" pipeline to Canton's WTP and expanding the WTP, for a total project cost of $63 million with an annual cost of $3.9 million and a unit cost for the additional supply of $2,152 per ac-ft. with debt service and $265 per ac-ft without debt service.

Recommendations:

	2020	2030	2040	2050	2060	2070
Drill New Wells (Carrizo-Wilcox, Sabine) (ac-ft/yr)	100	100	100	100	100	100
Indirect/Direct Reuse	323	323	323	323	323	323

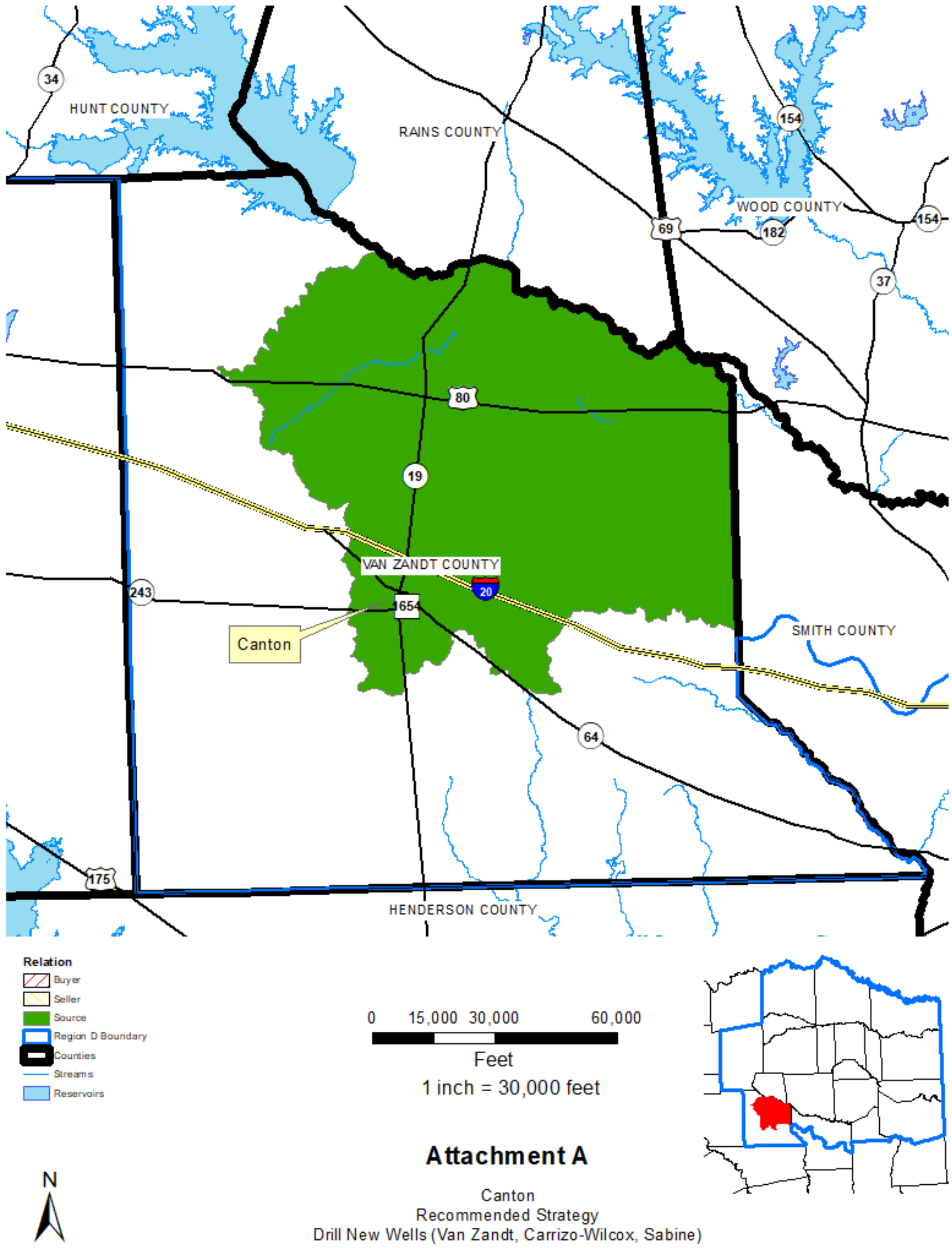
The recommended strategy for the City of Canton is to construct by 2020 an additional water well similar to existing wells in the area. The recommended supply source will be the Carrizo-Wilcox Aquifer in the Sabine Basin in Van Zandt County. One well with rated capacity of 180 gpm would provide approximately 100 ac-ft/yr. The Carrizo-Wilcox Aquifer in Van Zandt County is projected to have sufficient supply availability to provide this supply for the planning period.

A second recommended water strategy option is the utilization of both direct and indirect water reuse. The City of Canton has submitted an application to the TCEQ to secure a water right for indirect reuse and may also seek to secure an authorization for direct reuse. These recommendations are based upon current NETRWPG population projections for the City of Canton.

Because of substantial disagreement over future population and water demands, the City has requested the following alternate strategy:

> The strategy to meet future needs "is with surface water from a proposed reservoir on Grand Saline Creek. The City of Canton has provided to NETRWPG resolutions from three other cities in Van Zandt County supporting the reservoir project. This show of support indicates that a regional surface water reservoir could possibly replace the groundwater strategies for other Van Zandt County public water supplies with projected deficits. However, due to the time typically required to obtain the necessary permits to impound surface water, the City plans to construct one or two additional wells, or implement a reuse option in the interim to meet increasing demands due to population growth and the First Monday influence."

This alternative wording should be considered consistent with this plan in the event that population growth in the potential service area significantly exceeds current NETRWPG projections.



Attachment A

Canton
Recommended Strategy
Drill New Wells (Van Zandt, Carrizo-Wilcox, Sabine)

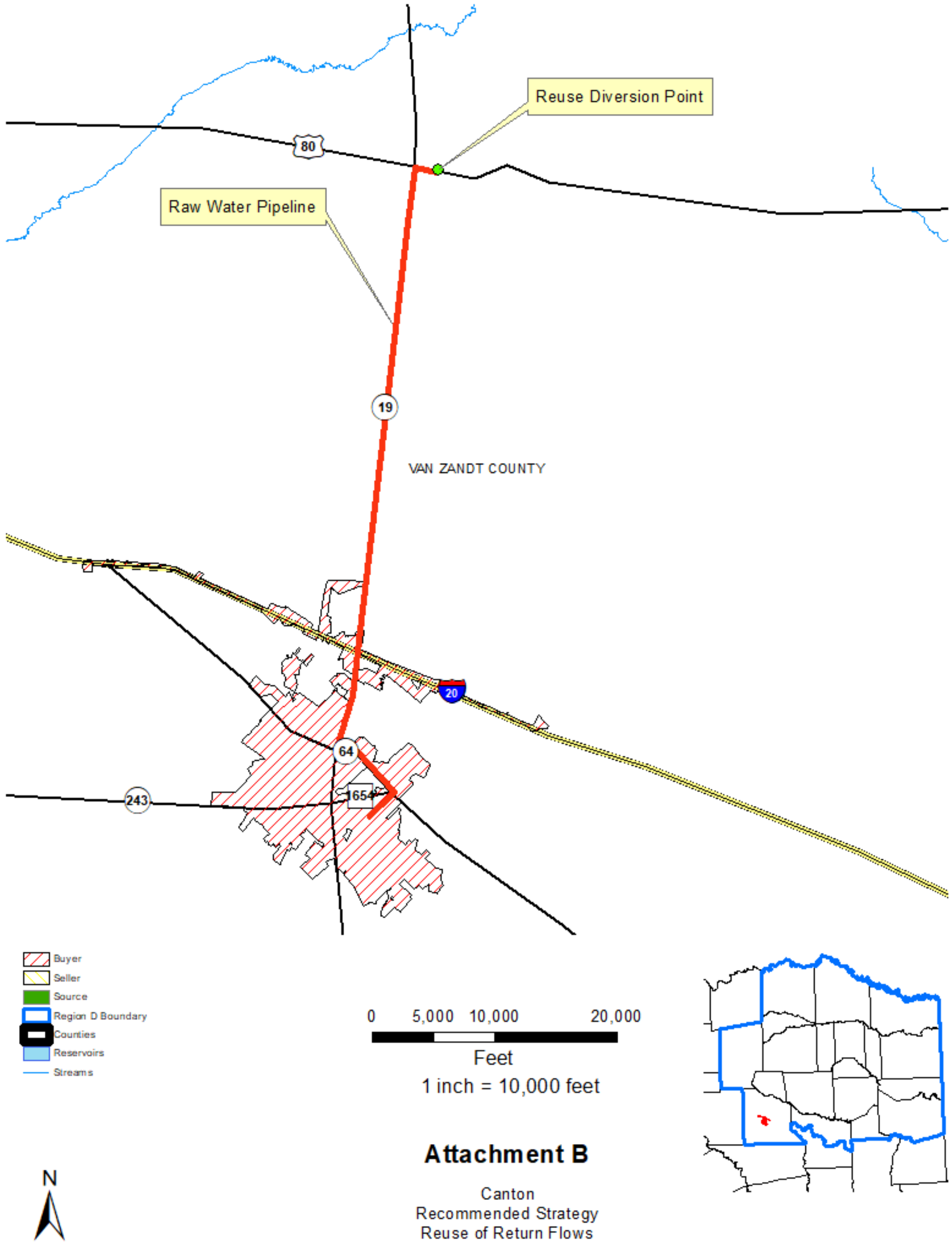
Cost Estimate Summary
Water Supply Project Option
September 2018 Prices

Canton - Drill New Wells (Van Zandt Sabine Carrizo Wilcox

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 201.9 for September 2018

Item	*Estimated Costs for Facilities*
Well Fields (Wells, Pumps, and Piping)	$450,000
Water Treatment Plant (0.5 MGD)	$52,000
TOTAL COST OF FACILITIES	**$502,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$176,000
Environmental & Archaeology Studies and Mitigation	$11,000
Land Acquisition and Surveying (1 acres)	$7,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$20,000
TOTAL COST OF PROJECT	**$716,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$50,000
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$4,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$31,000
Advanced Water Treatment Facility	$0
Pumping Energy Costs (88891 kW-hr @ 0.08 $/kW-hr)	$7,000
Purchase of Water (100 acft/yr @ 500 $/acft)	$50,000
TOTAL ANNUAL COST	**$142,000**
Available Project Yield (acft/yr)	100
Annual Cost of Water ($ per acft), based on PF=1	$1,420
Annual Cost of Water After Debt Service ($ per acft), based on PF=1	$920
Annual Cost of Water ($ per 1,000 gallons), based on PF=1	$4.36
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1	$2.82

JMP *10/6/2019*



Attachment B

Canton
Recommended Strategy
Reuse of Return Flows

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices
Canton - Indirect Reuse

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 201.9 for September 2018

Item	Estimated Costs for Facilities
Primary Pump Station (0 MGD)	$3,437,000
Transmission Pipeline (0 in dia., miles)	$2,336,000
TOTAL COST OF FACILITIES	**$5,773,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$1,904,000
Environmental & Archaeology Studies and Mitigation	$304,000
Land Acquisition and Surveying (32 acres)	$175,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$225,000
TOTAL COST OF PROJECT	**$8,381,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$590,000
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$23,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$86,000
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$356,000
Pumping Energy Costs (99064 kW-hr @ 0.08 $/kW-hr)	$8,000
Purchase of Water (acft/yr @ $/acft)	$0
TOTAL ANNUAL COST	**$1,063,000**
Available Project Yield (acft/yr)	323
Annual Cost of Water ($ per acft), based on PF=1.8	$3,291
Annual Cost of Water After Debt Service ($ per acft), based on PF=1.8	$1,464
Annual Cost of Water ($ per 1,000 gallons), based on PF=1.8	$10.10
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1.8	$4.49

JMP *11/15/2019*

EVALUATION OF WATER MANAGEMENT STRATEGIES FOR MEETING THE PROJECTED WATER SUPPLY NEEDS OF EDOM WATER SUPPLY CORPORATION IN VAN ZANDT COUNTY

Description of Water User Group:

Edom WSC provides water service in Van Zandt and Henderson Counties. The WUG population is projected to be 1,395 by 2020 and increases to 2,025 by 2070. Edom WSC supplies its customers with groundwater from the Carrizo-Wilcox aquifer with water wells in Van Zandt County. Edom WSC is projected to have a total deficit of 13 ac-ft/yr in 2020 and increasing to a deficit of 64 ac-ft/yr by 2070; the shortage projected to occur in Van Zandt County is 11 ac-ft/yr in 2020 increasing to 55 ac-ft/yr by 2070. The shortage in Henderson County is 2 ac-ft/yr in 2020, increasing to 9 ac-ft/yr in 2070.

Water Supply and Demand Analysis:

Edom WSC	**2020**	**2030**	**2040**	**2050**	**2060**	**2070**
Population	1,395	1,526	1,631	1,740	1,878	2,025
Projected Water Demand	152	160	166	176	188	203
Water Demand from other entities	0	0	0	0	0	0
Current Water Supply	139	139	139	139	139	139
Projected Supply Surplus (+) / Deficit (-)	**-13**	**-21**	**-27**	**-37**	**-49**	**-64**

Projected Supply Surplus (+) / Deficit (-) by County	**2020**	**2030**	**2040**	**2050**	**2060**	**2070**
Van Zandt	-11	-18	-23	-32	-42	-55
Henderson	-2	-3	-4	-5	-7	-9
Total	**-13**	**-21**	**-27**	**-37**	**-49**	**-64**

Evaluation of Potentially Feasible Water Management Strategies:

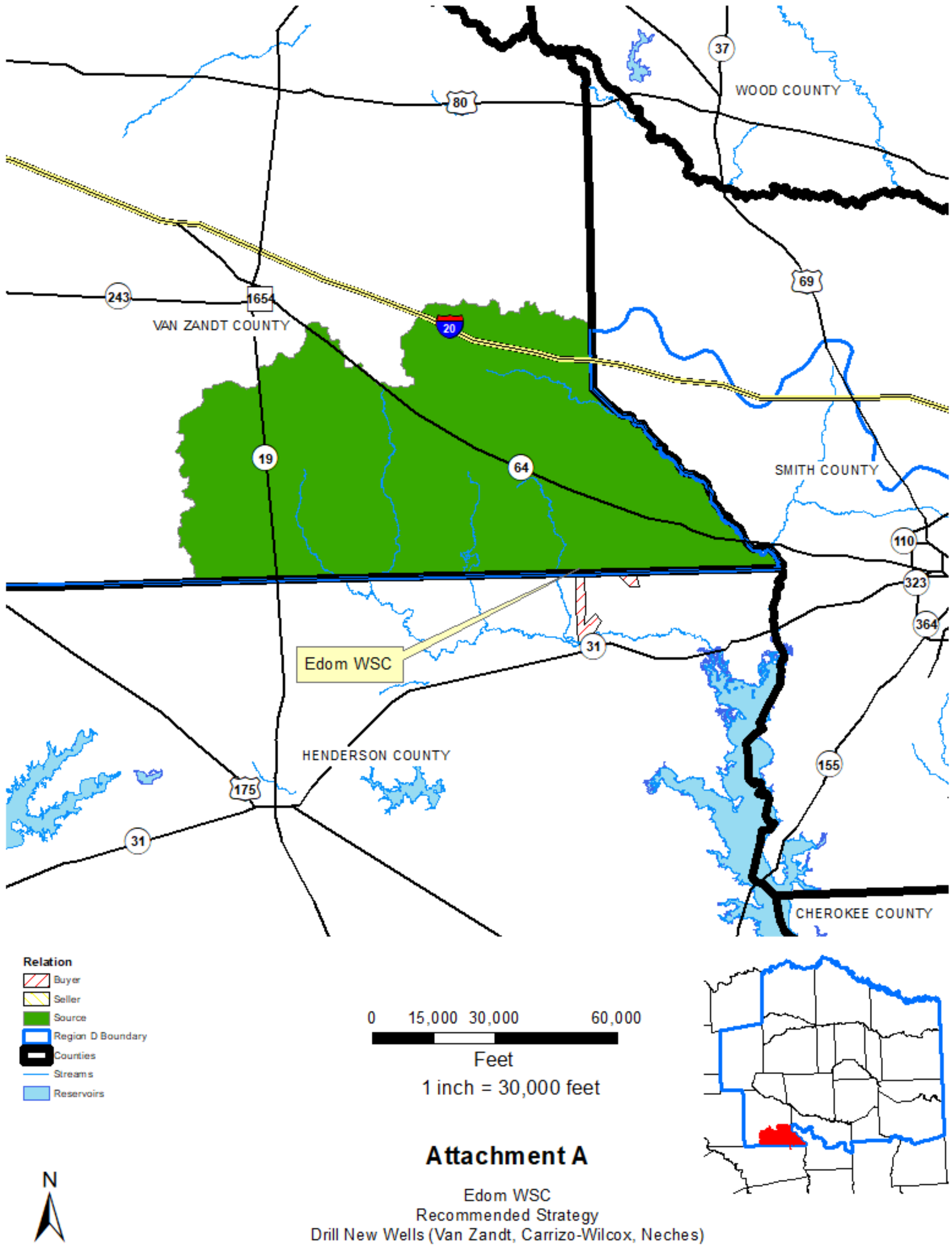
Four alternative strategies were considered to meet the WSC's water supply shortages as summarized in the following table. Advanced conservation was not selected because the per capita use per day was less than the 140 gpcd threshold set by the water planning group. Water reuse was not considered because the WSC does not have a demand for non-potable water. Surface water was not considered because the WSC does not currently have surface water treatment. Groundwater has been identified as a potential strategy for Edom WSC.

Strategy	**Firm Yield (ac-ft)**	**Total Capital Cost**	**Total Annualized Cost**	**Unit Cost**	**Environmental Impact**
Drill New Wells (Carrizo-Wilcox Aquifer, Neches Basin)	**64**	**$1,088,000**	**$136,000**	**$2,125**	**1**

Recommendations:

	2020	**2030**	**2040**	**2050**	**2060**	**2070**
Drill New Wells (Carrizo-Wilcox, Neches Basin; ac-ft/yr)	13	21	27	37	49	64

The recommended strategy for Edom WSC to meet their projected deficit of 13 ac-ft/yr in 2020 up to 64 ac-ft/yr in 2070 would be to construct three additional water wells similar to their existing wells just prior to each decade as the deficits occur. The recommended supply source will be the Carrizo-Wilcox Aquifer in the Neches Basin in Van Zandt County. One well with rated capacity of 50 gpm each, pumping at an approximately depth of 560 ft., would provide approximately 27 acre-feet each.


WOOD COUNTY
VAN ZANDT COUNTY
SMITH COUNTY
HENDERSON COUNTY
CHEROKEE COUNTY
Edom WSC
37
80
69
243
1654
20
19
64
110
323
364
31
155
175
Relation
Buyer
Seller
Source
Region D Boundary
Counties
Streams
Reservoirs
0 15,000 30,000 60,000
Feet
1 inch = 30,000 feet
N
Attachment A
Edom WSC
Recommended Strategy
Drill New Wells (Van Zandt, Carrizo-Wilcox, Neches)

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices

EDOM WSC - Drill New Wells (Van Zandt, Carrizo-Wilcox Aquifer, Neches Basin)

Cost based on ENR CCI 11170.28 for September 2018 and
a PPI of 201.9 for September 2018

Item	***Estimated Costs for Facilities***
Well Fields (Wells, Pumps, and Piping)	$715,000
Water Treatment Plant (0.2 MGD)	$28,000
TOTAL COST OF FACILITIES	**$743,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$260,000
Environmental & Archaeology Studies and Mitigation	$36,000
Land Acquisition and Surveying (3 acres)	$19,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$30,000
TOTAL COST OF PROJECT	**$1,088,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$77,000
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$7,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$17,000
Advanced Water Treatment Facility	$0
Pumping Energy Costs (41446 kW-hr @ 0.08 $/kW-hr)	$3,000
Purchase of Water (64 acft/yr @ 500 $/acft)	$32,000
TOTAL ANNUAL COST	**$136,000**
Available Project Yield (acft/yr)	64
Annual Cost of Water ($ per acft), based on PF=1	$2,125
Annual Cost of Water After Debt Service ($ per acft), based on PF=1	$922
Annual Cost of Water ($ per 1,000 gallons), based on PF=1	$6.52
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1	$2.83

JMP *9/30/2019*

EVALUATION OF WATER MANAGEMENT STRATEGIES FOR MEETING THE PROJECTED WATER SUPPLY NEEDS OF IRRIGATION IN VAN ZANDT COUNTY

Description of Water User Group:

The Irrigation WUG in Van Zandt County has a demand that is projected to remain constant at 500 ac-ft/yr for the planning period. The Irrigation WUG in Van Zandt County is currently supplied by groundwater from the Carrizo-Wilcox Aquifer and run-of-river diversions on the Sabine and Neches Rivers. A deficit of 68 ac-ft/yr is projected to occur in throughout the planning period.

Water Supply and Demand Analysis:

	2020	2030	2040	2050	2060	2070
Projected Water Demand	500	500	500	500	500	500
Current Water Supply	457	439	437	436	434	432
Projected Supply Surplus (+)/Deficit(-)	**-43**	**-61**	**-63**	**-64**	**-66**	**-68**

Evaluation of Potentially Feasible Water Management Strategies:

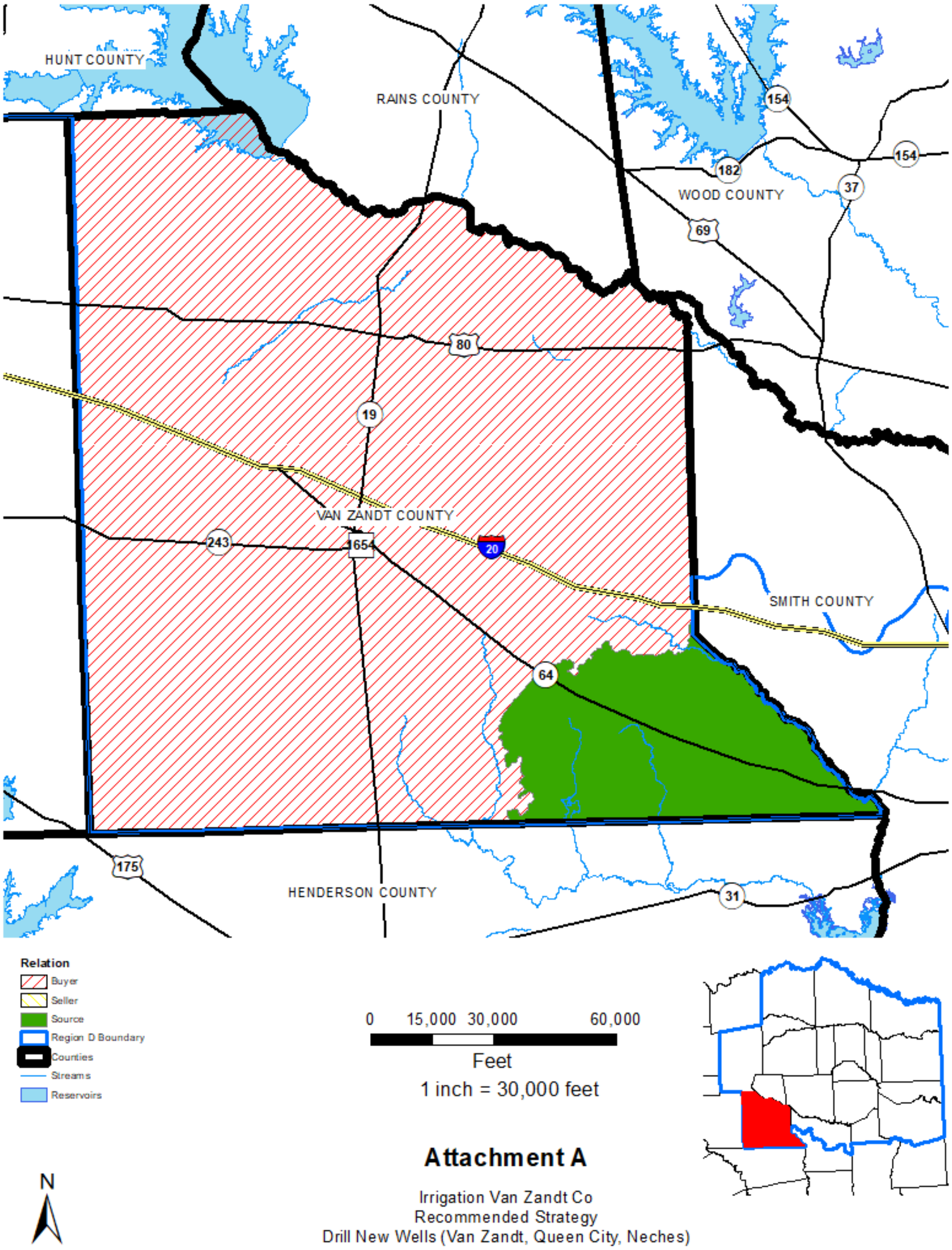
Six alternative strategies were considered to meet the Van Zandt County Irrigation WUG's water supply shortages. Advanced water conservation for irrigation practices were not considered in this planning effort for irrigation. The use of reuse water from nearby municipalities is not considered feasible as it would not be effective to deliver reuse water to farm irrigation systems. Groundwater from the Carrizo-Wilcox and Queen City aquifers has been identified as a potential source of water for irrigation in Van Zandt. Surface water has been evaluated as a potential water source.

Strategy	Firm Yield (AF)	Total Capital Cost	Total Annualized Cost	Unit Cost	Environmental Impact
Drill New Wells (Queen City Aquifer, Neches Basin)	**68**	**$825,000**	**$103,000**	**$1,515**	**1**
New Surface Water Right in Sabine Basin	**0**	**-**	**-**	**-**	**-**
New Surface Water Right in Neches Basin	**0**	**-**	**-**	**-**	**-**

Recommendations:

	2020	2030	2040	2050	2060	2070
Drill New Wells (Queen City, Neches) (ac-ft/yr)	**43**	**61**	**63**	**64**	**66**	**68**

The recommended strategy for Irrigation in Van Zandt County is to construct by 2020 two additional water wells similar to existing wells in the area. The recommended supply source will be the Queen City Aquifer in the Neches River Basin in Van Zandt County. Two wells with rated capacity of 50 gpm would provide the needed 68 ac-ft/yr. The Queen City Aquifer in Van Zandt County is projected to have sufficient supply availability to provide this supply for the planning period.



Attachment A

Irrigation Van Zandt Co
Recommended Strategy
Drill New Wells (Van Zandt, Queen City, Neches)

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices
Irrigation Van Zandt - Drill New Wells (Van Zandt, Queen City Aquifer, Neches Basin)

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 201.9 for September 2018

Item	***Estimated Costs for Facilities***
Well Fields (Wells, Pumps, and Piping)	$562,000
TOTAL COST OF FACILITIES	**$562,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$197,000
Environmental & Archaeology Studies and Mitigation	$29,000
Land Acquisition and Surveying (3 acres)	$14,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$23,000
TOTAL COST OF PROJECT	**$825,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$58,000
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$6,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (57307 kW-hr @ 0.08 $/kW-hr)	$5,000
Purchase of Water (68 acft/yr @ 500 $/acft)	$34,000
TOTAL ANNUAL COST	**$103,000**
Available Project Yield (acft/yr)	68
Annual Cost of Water ($ per acft), based on PF=1	$1,515
Annual Cost of Water After Debt Service ($ per acft), based on PF=1	$662
Annual Cost of Water ($ per 1,000 gallons), based on PF=1	$4.65
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1	$2.03

JMP *9/30/2019*

EVALUATION OF WATER MANAGEMENT STRATEGIES FOR MEETING THE PROJECTED WATER SUPPLY NEEDS OF LITTLE HOPE MOORE WATER SUPPLY CORPORATION IN VAN ZANDT COUNTY

Description of Water User Group:

Little Hope Moore WSC provides water service in Van Zandt County. The WUG population is projected to be 1,480 by 2020 and increases to 2,012 by 2070. Little Hope Moore WSC supplies its customers with groundwater from the Carrizo-Wilcox aquifer in Van Zandt County. Little Hope Moore WSC is projected to have a total deficit of 3 ac-ft/yr in 2050 and increasing to a deficit of 17 ac-ft/yr by 2070.

Water Supply and Demand Analysis:

Little Hope Moore WSC	**2020**	**2030**	**2040**	**2050**	**2060**	**2070**
Population	1,480	1,625	1,734	1,843	1,935	2,012
Projected Water Demand	147	155	160	168	176	182
Water Demand from other entities	0	0	0	0	0	0
Current Water Supply	165	165	165	165	165	165
Projected Supply Surplus (+) / Deficit (-)	**18**	**10**	**5**	**-3**	**-11**	**-17**

Evaluation of Potentially Feasible Water Management Strategies:

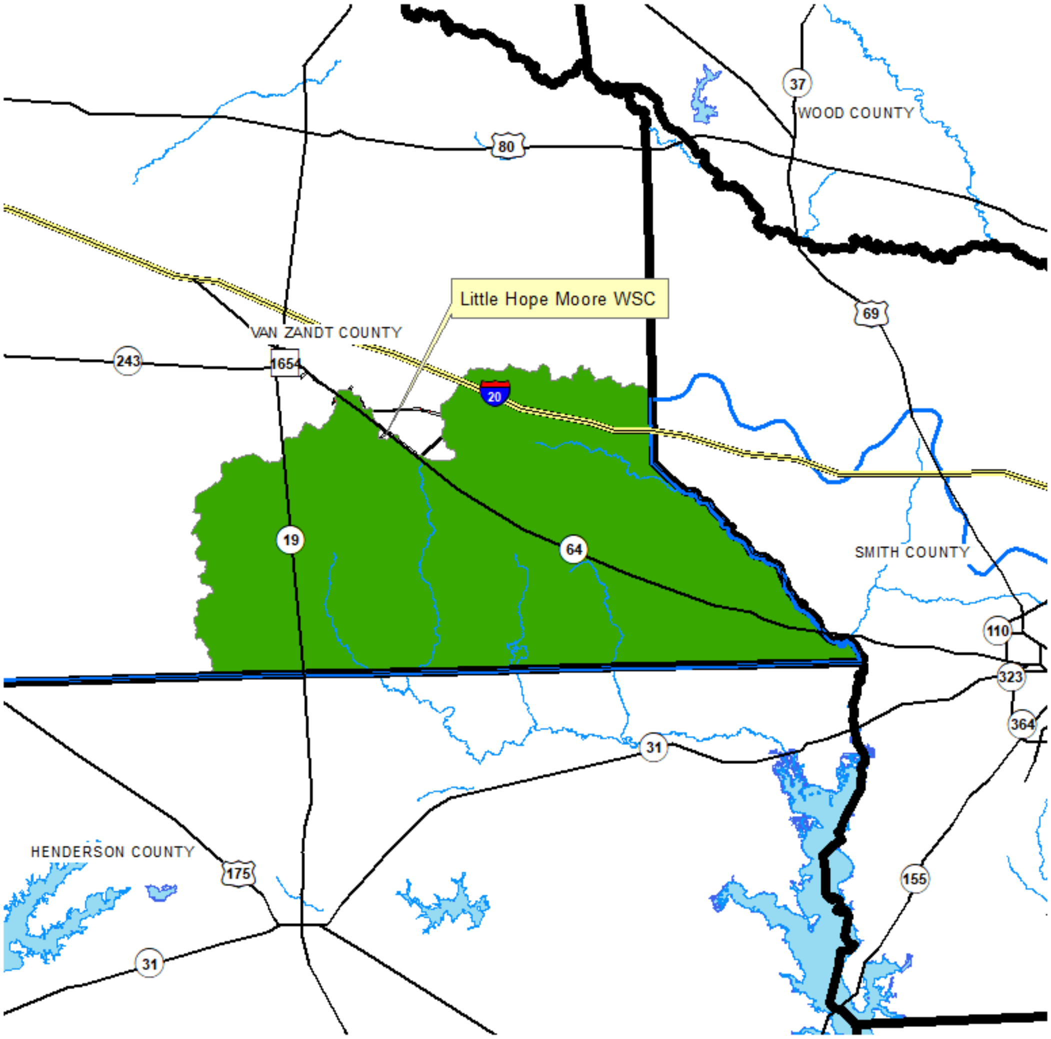
Four alternative strategies were considered to meet the WSC's water supply shortages as summarized in the following table. Advanced conservation was not selected because the per capita use per day was less than the 140 gpcd threshold set by the water planning group. Water reuse was not considered feasible because the WSC does not have a demand for non-potable water. Surface water was not considered cost effective because the WSC does not currently have surface water treatment. Groundwater has been identified as a potential strategy for Little Hope Moore WSC.

Strategy	**Firm Yield (ac-ft)**	**Total Capital Cost**	**Total Annualized Cost**	**Unit Cost**	**Environmental Impact**
Drill New Wells (Carrizo-Wilcox Aquifer, Neches Basin)	**17**	**$371,000**	**$44,000**	**$2,588**	**1**

Recommendations:

	2020	**2030**	**2040**	**2050**	**2060**	**2070**
Drill New Wells (Carrizo-Wilcox, Neches Basin; ac-ft/yr)	0	0	0	3	11	17

The recommended strategy for Little Hope Moore WSC to meet their projected deficit of 3 ac-ft/yr in 2050 and 17 ac-ft/yr in 2070 would be to construct an additional water well similar to their existing wells. The recommended supply source will be the Carrizo-Wilcox Aquifer in the Neches Basin in Van Zandt County. One well with rated capacity of 50 gpm each, pumping at an approximately depth of 560 ft., would provide approximately 27 acre-feet each.



Relation
Buyer
Seller
Source
Region D Boundary
Counties
Streams
Reservoirs

0 15,000 30,000 60,000
Feet
1 inch = 30,000 feet

Attachment A

Little Hope Moore WSC
Recommended Strategy
Drill New Wells (Van Zandt, Carrizo-Wilcox, Neches)

N

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices
Little Hope Moore - Drill New Wells (Van Zandt, Carrizo-Wilcox Aquifer, Neches Basin)

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 201.9 for September 2018

Item	***Estimated Costs for Facilities***
Well Fields (Wells, Pumps, and Piping)	$249,000
Water Treatment Plant (0.05 MGD)	$11,000
TOTAL COST OF FACILITIES	**$260,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$91,000
Environmental & Archaeology Studies and Mitigation	$6,000
Land Acquisition and Surveying (1 acres)	$4,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$10,000
TOTAL COST OF PROJECT	**$371,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$26,000
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$2,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$6,000
Advanced Water Treatment Facility	$0
Pumping Energy Costs (13530 kW-hr @ 0.08 $/kW-hr)	$1,000
Purchase of Water (17 acft/yr @ 500 $/acft)	$9,000
TOTAL ANNUAL COST	**$44,000**
Available Project Yield (acft/yr)	17
Annual Cost of Water ($ per acft), based on PF=1	$2,588
Annual Cost of Water After Debt Service ($ per acft), based on PF=1	$1,059
Annual Cost of Water ($ per 1,000 gallons), based on PF=1	$7.94
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1	$3.25

JMP *9/30/2019*

EVALUATION OF WATER MANAGEMENT STRATEGIES FOR MEETING THE PROJECTED WATER SUPPLY NEEDS OF MANUFACTURING IN VAN ZANDT COUNTY

Description of Water User Group:

The Manufacturing WUG in Van Zandt County has a demand that is projected to increase from 506 ac-ft/yr in 2020 to 757 ac-ft/yr by 2030, remaining constant through 2070. Manufacturing in Van Zandt County is supplied by groundwater from the Carrizo-Wilcox Aquifer, purchased groundwater from Golden WSC and Grand Saline, and surface water from run-of-river permits on the Sabine River, a permit for diversion from Lake Tawakoni. A deficit of 208 ac-ft/yr is projected to occur in 2030, decreasing to 116 ac-ft/yr by 2070.

Water Supply and Demand Analysis:

	2020	2030	2040	2050	2060	2070
Projected Water Demand	506	757	757	757	757	757
Current Water Supply	264	264	264	264	253	253
Projected Supply Surplus (+)/Deficit(-)	**-242**	**-493**	**-493**	**-493**	**-504**	**-504**

Projected Supply Surplus (+)/Deficit(-) by Basin	2020	2030	2040	2050	2060	2070
Sabine	-242	-492	-492	-492	-503	-503
Trinity	0	-1	-1	-1	-1	-1
Total	**-242**	**-493**	**-493**	**-493**	**-504**	**-504**

Evaluation of Potentially Feasible Water Management Strategies:

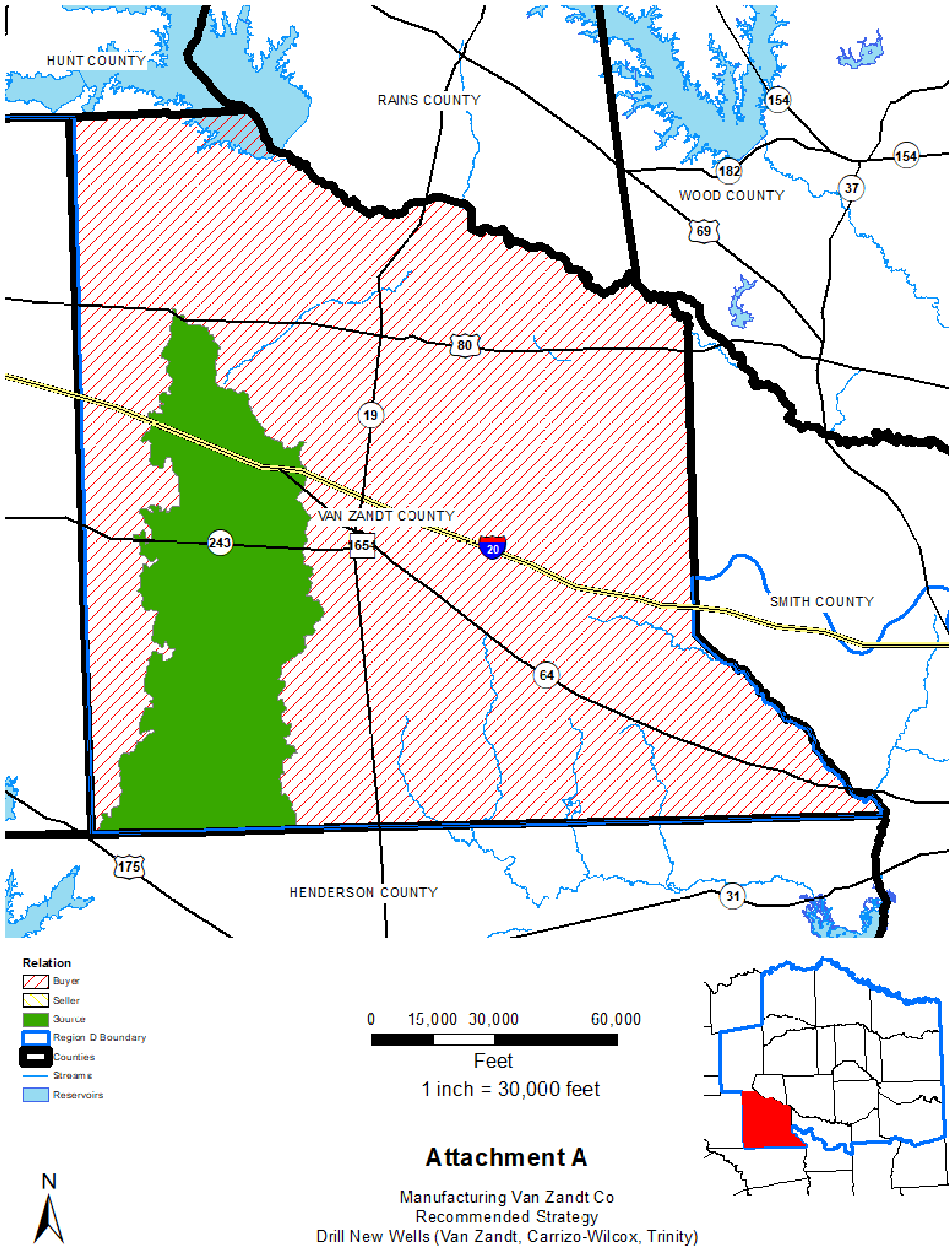
Eight alternative strategies were considered to meet the Van Zandt County Manufacturing WUG's water supply shortages. Advanced water conservation for manufacturing was considered in this planning effort to reduce overall demands; however, it does not resolve all identified needs. The use of reuse water from nearby municipalities was not considered to be feasible at present. Surface water was not considered as a viable alternative to meet projected demands because no supplies are readily available in the proximity of the identified needs. Groundwater has been identified as a potential source of water for manufacturing in Van Zandt County. In addition, groundwater supplies can be contracted from the City of Grand Saline and Golden WSC. Another potentially feasible strategy is the Wood County Pipeline which could supply groundwater from Wood County.

Strategy	Firm Yield (AF)	Total Capital Cost	Total Annualized Cost	Unit Cost	Environmental Impact
Advanced Water Conservation	**75**	**$0**	**$0**	**$0**	**1**
Drill New Wells (Carrizo-Wilcox Aquifer; Trinity Basin)	**504**	**$2,852,000**	**$506,000**	**$1,004**	**1**
Drill New Wells (Carrizo-Wilcox Aquifer; Sabine Basin)	**1**	**$292,000**	**$24,000**	**$24,000**	**1**
Increase Existing Contract for Carrizo-Wilcox from Grand Saline	**72**	**$0**	**$202,000**	**$2,806**	**1**
Increase Existing Contract for Carrizo-Wilcox from Golden WSC	**214**	**$0**	**$279,000**	**$1,304**	**1**
Wood County Pipeline Tie-in	**504**	**$0**	**$619,000**	**$1,442**	**2**

Recommendations:

	2020	2030	2040	2050	2060	2070
Advanced Water Conservation (ac-ft/yr)	50	75	75	75	75	75
Drill New Wells (Carrizo-Wilcox, Trinity) (ac-ft/yr)	242	504	504	356	238	143
Increase Existing Contract for Carrizo-Wilcox from Golden WSC	0	0	0	62	191	214
Increase Existing Contract for Carrizo-Wilcox from Grand Saline	0	0	0	0	0	72

The recommended strategy for Manufacturing in Van Zandt County is implementation of advanced water conservation (via industrial water audits) by 2020. Implementation of this water management strategy is estimated to conserve approximately 75 ac-ft/yr (i.e. 10% of projected demand). Additionally, it is recommended that by 2020 the Manufacturing WUG in Van Zandt County construct an additional six water wells. The recommended supply source will be the Carrizo-Wilcox Aquifer in the Trinity River Basin in Van Zandt County. Six wells with rated capacities of 75 gpm each would provide up to approximately 504 ac-ft/yr. The Carrizo-Wilcox Aquifer in Van Zandt County is not projected to have sufficient supply availability to provide this supply throughout the planning period. Additional groundwater supplies will be needed via increasing existing contracts with Golden WSC by 2050 and Grand Saline by 2070.



Attachment A

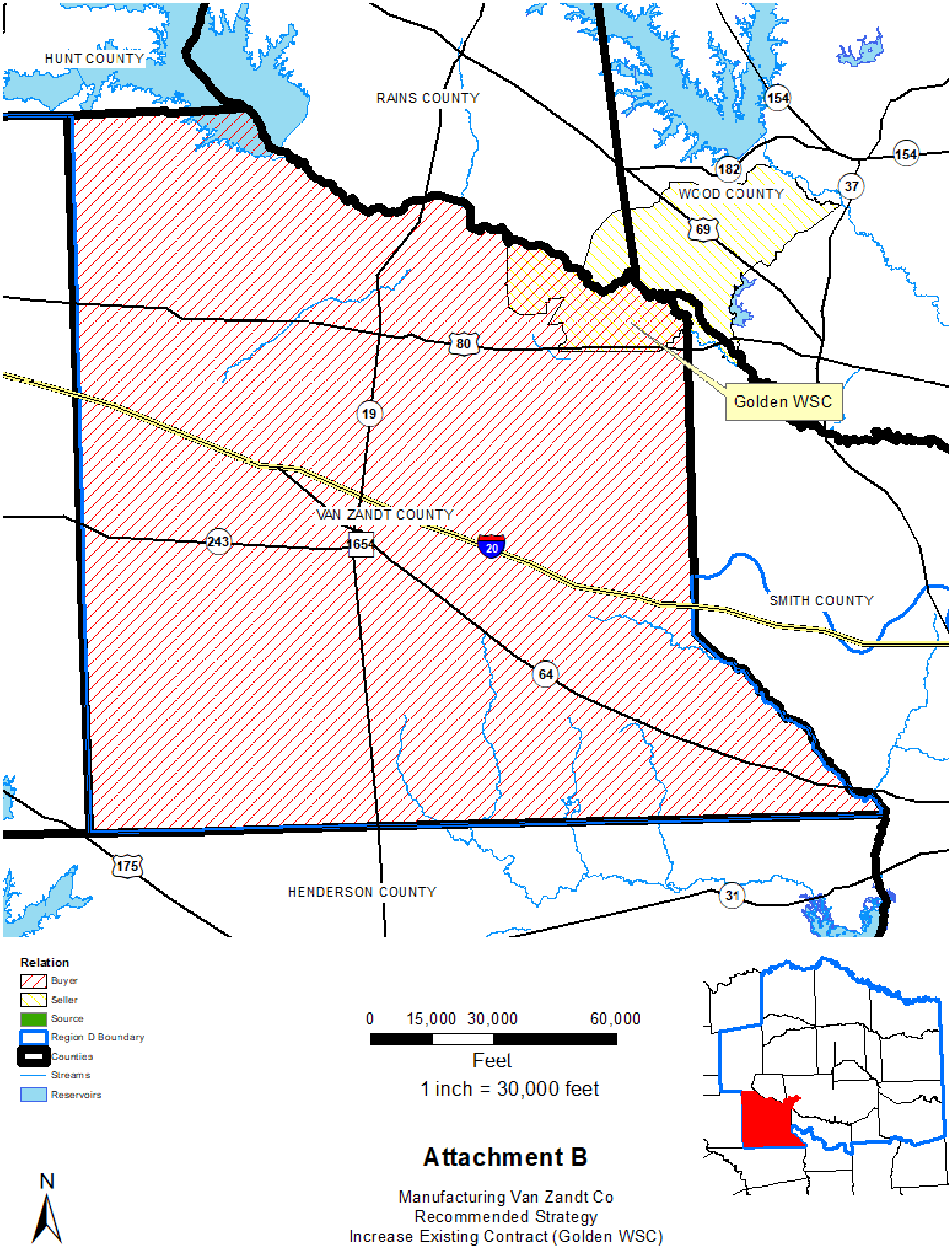
Manufacturing Van Zandt Co
Recommended Strategy
Drill New Wells (Van Zandt, Carrizo-Wilcox, Trinity)

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices
Manufacturing Van Zandt - Drill New Wells (Van Zandt, Carrizo-Wilcox Aquifer, Trinity Basin)

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 201.9 for September 2018

Item	***Estimated Costs for Facilities***
Well Fields (Wells, Pumps, and Piping)	$1,957,000
TOTAL COST OF FACILITIES	**$1,957,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$685,000
Environmental & Archaeology Studies and Mitigation	$90,000
Land Acquisition and Surveying (8 acres)	$43,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$77,000
TOTAL COST OF PROJECT	**$2,852,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$201,000
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$20,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (416665 kW-hr @ 0.08 $/kW-hr)	$33,000
Purchase of Water (504 acft/yr @ 500 $/acft)	$252,000
TOTAL ANNUAL COST	**$506,000**
Available Project Yield (acft/yr)	504
Annual Cost of Water ($ per acft), based on PF=1	$1,004
Annual Cost of Water After Debt Service ($ per acft), based on PF=1	$605
Annual Cost of Water ($ per 1,000 gallons), based on PF=1	$3.08
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1	$1.86

JMP *9/30/2019*



Attachment B

Manufacturing Van Zandt Co
Recommended Strategy
Increase Existing Contract (Golden WSC)

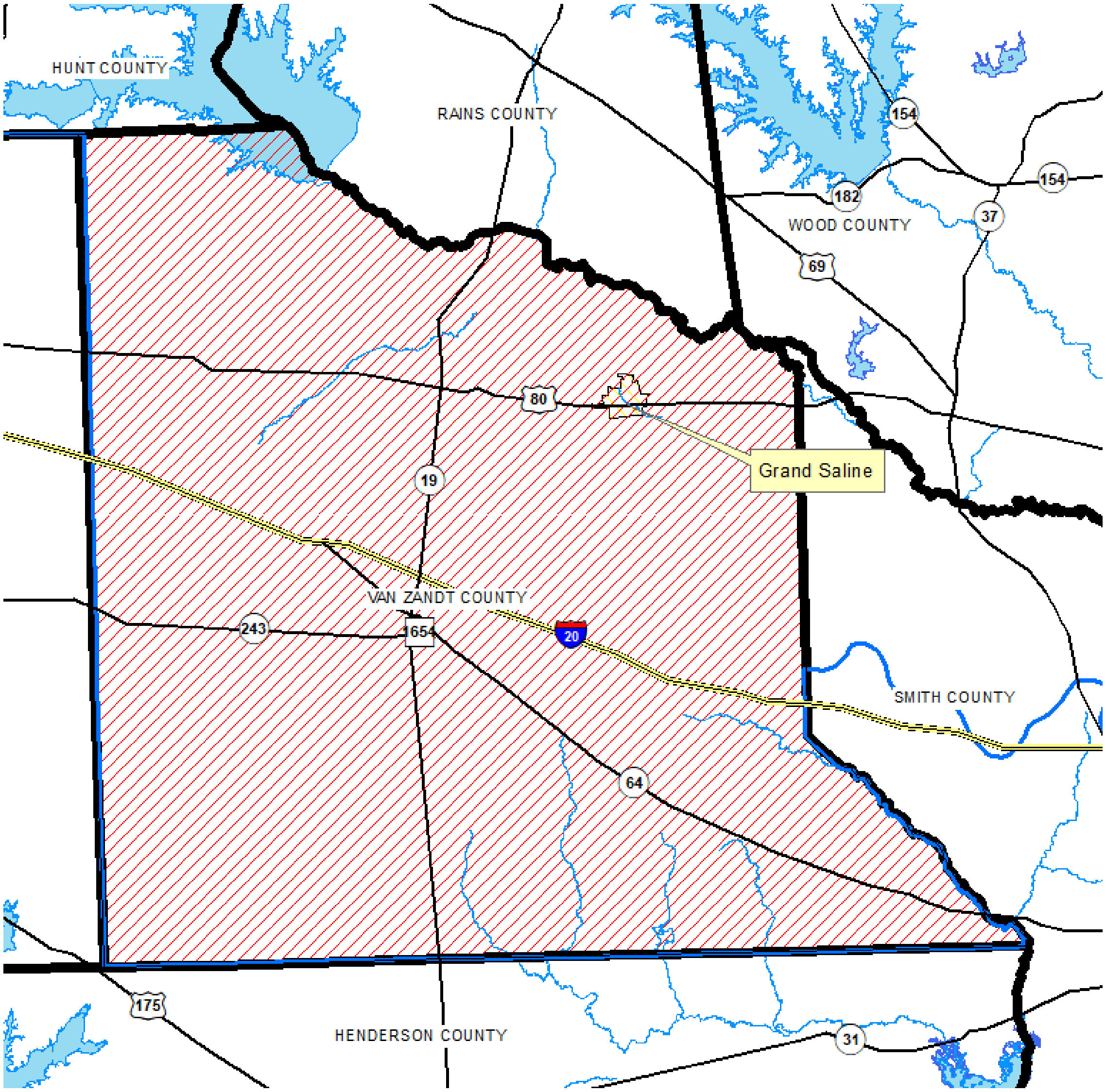
Cost Estimate Summary
Water Supply Project Option
September 2018 Prices

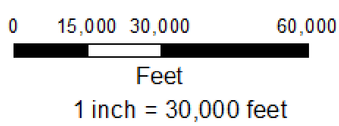
Manufacturing Van Zandt - Increase Existing Contract from Golden WSC

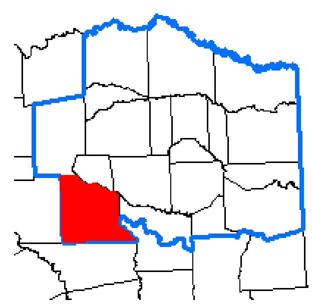
Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 201.9 for September 2018

Item	Estimated Costs for Facilities
ANNUAL COST	
Operation and Maintenance	
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (0 kW-hr @ 0.08 $/kW-hr)	$0
Purchase of Water (214 acft/yr @ 1303 $/acft)	$279,000
TOTAL ANNUAL COST	**$279,000**
Available Project Yield (acft/yr)	214
Annual Cost of Water ($ per acft), based on PF=1	$1,304
Annual Cost of Water After Debt Service ($ per acft), based on PF=1	$1,304
Annual Cost of Water ($ per 1,000 gallons), based on PF=1	$4.00
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1	$4.00

JMP *9/20/2019*







Attachment C

Manufacturing Van Zandt Co
Recommended Strategy
Increase Existing Contract (Grand Saline)

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices

Manufacturing Van Zandt - Increase Existing Contract from Grand-Saline

Cost based on ENR CCI 11170.28 for September 2018 and
a PPI of 201.9 for September 2018

Item	***Estimated Costs for Facilities***
ANNUAL COST	
Operation and Maintenance	
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (0 kW-hr @ 0.08 $/kW-hr)	$0
Purchase of Water (72 acft/yr @ 2803 $/acft)	$202,000
TOTAL ANNUAL COST	**$202,000**
Available Project Yield (acft/yr)	72
Annual Cost of Water ($ per acft), based on PF=1	$2,806
Annual Cost of Water After Debt Service ($ per acft), based on PF=1	$2,806
Annual Cost of Water ($ per 1,000 gallons), based on PF=1	$8.61
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1	$8.61

JMP *9/20/2019*

EVALUATION OF WATER MANAGEMENT STRATEGIES FOR MEETING THE PROJECTED WATER SUPPLY NEEDS OF RPM WATER SUPPLY CORPORATION IN VAN ZANDT COUNTY

Description of Water User Group:

R-P-M WSC provides water service in Van Zandt, Henderson and Smith Counties. The WUG population is projected to be 2,957 by 2020 and increases to 5,530 by 2070. R-P-M WSC supplies its customers with groundwater from the Carrizo-Wilcox and Queen City aquifers with five water wells in Van Zandt County. R-P-M WSC is projected to have a total deficit of 34 ac-ft/yr in 2030 increasing to a deficit of 217 ac-ft/yr by 2070; the shortage projected to occur in Van Zandt County is 25 ac-ft/yr in 2030 increasing to 152 ac-ft/yr by 2070. The shortage in Henderson County is 7 ac-ft/yr in 2030, increasing to 48 ac-ft/yr in 2070. Shortages in Smith County range from 2 ac-ft/yr in 2030 up to 17 ac-ft/yr in 2070.

Water Supply and Demand Analysis:

RPM WSC	2020	2030	2040	2050	2060	2070
Population	2,957	3,602	4,112	4,653	5,116	5,530
Projected Water Demand	323	378	423	475	519	561
Water Demand from other entities	0	0	0	0	0	0
Current Water Supply	344	344	344	344	344	344
Projected Supply Surplus (+) / Deficit (-)	**21**	**-34**	**-79**	**-131**	**-175**	**-217**

Projected Supply Surplus (+) / Deficit (-) by County	2020	2030	2040	2050	2060	2070
Van Zandt	14	-25	-58	-93	-124	-152
Henderson	5	-7	-16	-27	-38	-48
Smith	2	-2	-5	-11	-13	-17
Total	**21**	**-34**	**-79**	**-131**	**-175**	**-217**

Evaluation of Potentially Feasible Water Management Strategies:

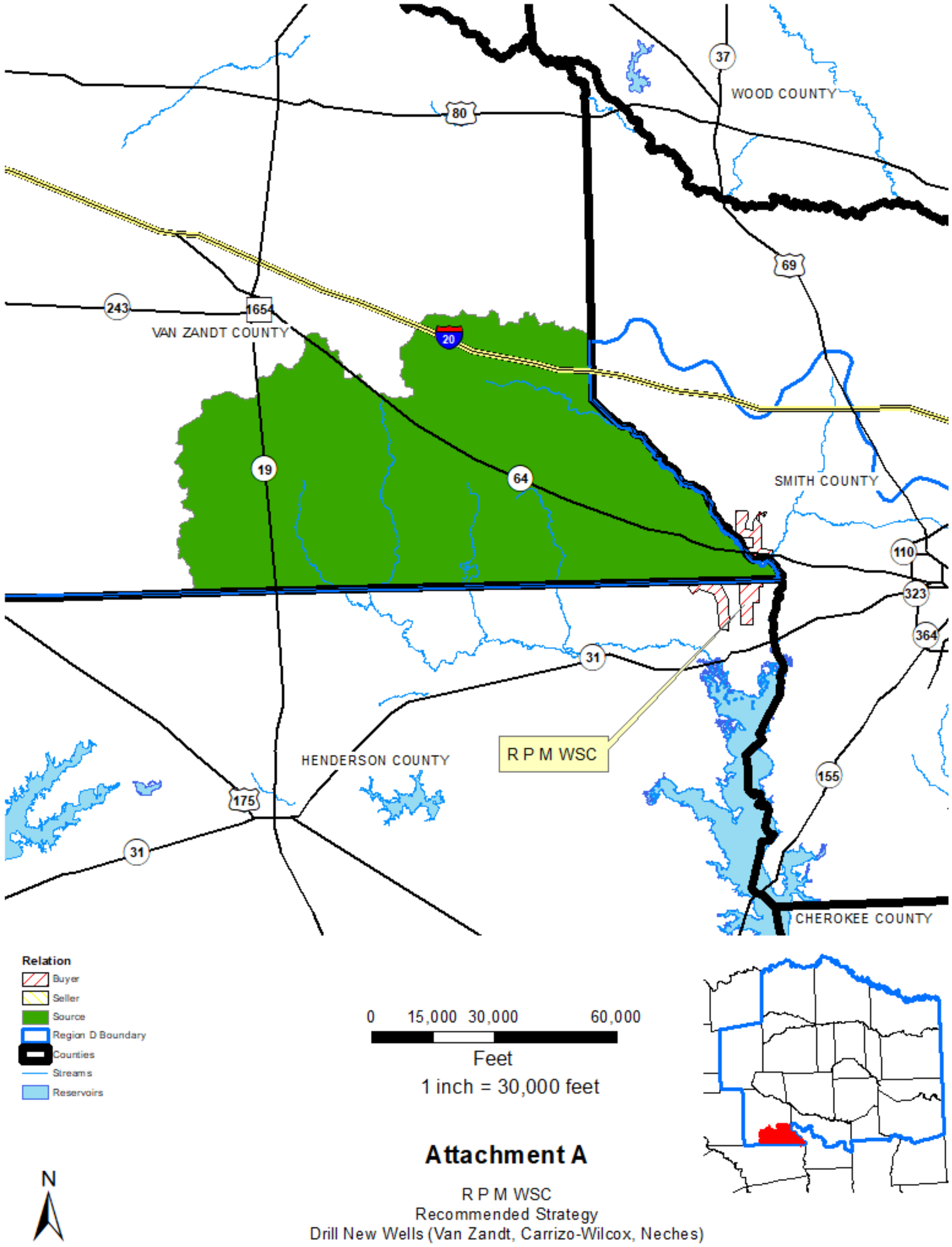
Four alternative strategies were considered to meet the WSC's water supply shortages as summarized in the following table. Advanced conservation was not selected because the per capita use per day was less than the 140 gpcd threshold set by the water planning group. Water reuse was not considered because the WSC does not have a demand for non-potable water. Surface water was not considered because the WSC does not currently have surface water treatment. Groundwater has been identified as a potential strategy for R-P-M WSC.

Strategy	Firm Yield (ac-ft)	Total Capital Cost	Total Annualized Cost	Unit Cost	Environmental Impact
Drill New Wells (Carrizo-Wilcox Aquifer, Neches Basin)	**217**	**$3,469,000**	**$422,000**	**$1,945**	**1**

Recommendations:

	2020	2030	2040	2050	2060	2070
Drill New Wells (Carrizo-Wilcox, Neches Basin; ac-ft/yr)	0	34	79	131	175	217

The recommended strategy for R-P-M WSC to meet their projected deficit of 34 ac-ft/yr in 2030 and 217 ac-ft/yr in 2070 would be to construct nine additional water wells similar to their existing wells just prior to each decade as the deficits occur. The recommended supply source will be the Carrizo-Wilcox Aquifer in the Neches Basin in Van Zandt County. Nine wells with rated capacity of 50 gpm each, pumping at an approximately depth of 560 ft., would provide approximately 27 acre-feet each.



Attachment A

R P M WSC
Recommended Strategy
Drill New Wells (Van Zandt, Carrizo-Wilcox, Neches)

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices

R P M WSC - Drill New Wells (Van Zandt, Carrizo-Wilcox Aquifer, Neches Basin)

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 201.9 for September 2018

Item	***Estimated Costs for Facilities***
Well Fields (Wells, Pumps, and Piping)	$2,290,000
Water Treatment Plant (0.6 MGD)	$58,000
TOTAL COST OF FACILITIES	**$2,348,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$822,000
Environmental & Archaeology Studies and Mitigation	$139,000
Land Acquisition and Surveying (12 acres)	$67,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$93,000
TOTAL COST OF PROJECT	**$3,469,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$244,000
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$23,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$35,000
Advanced Water Treatment Facility	$0
Pumping Energy Costs (207025 kW-hr @ 0.08 $/kW-hr)	$17,000
Purchase of Water (217 acft/yr @ 500 $/acft)	$109,000
TOTAL ANNUAL COST	**$428,000**
Available Project Yield (acft/yr)	217
Annual Cost of Water ($ per acft), based on PF=1	$1,972
Annual Cost of Water After Debt Service ($ per acft), based on PF=1	$848
Annual Cost of Water ($ per 1,000 gallons), based on PF=1	$6.05
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1	$2.60

JMP *9/30/2019*

REGION D
EVALUATIONS OF WATER MANAGEMENT STRATEGIES
FOR MEETING PROJECTED WATER SUPPLY NEEDS
TO YEAR 2070

WOOD COUNTY

WUGs:

Wood County Livestock
Wood County Manufacturing

EVALUATION OF WATER MANAGEMENT STRATEGIES FOR MEETING THE PROJECTED WATER SUPPLY NEEDS LIVESTOCK IN WOOD COUNTY

Description of Water User Group:

The Livestock WUG in Wood County is a split entity and has a demand that is projected to be a constant 483 ac-ft/yr from 2020 to 2070. Livestock in Wood County, Cypress has a current water supply consisting of water wells from the Carrizo-Wilcox Aquifer and Local Supplies. The total rated available supply from these sources is 449 ac-ft/yr in 2020 thru 2070. Livestock in Wood County, Cypress is projected to have a water supply deficit of 34 ac-ft/yr in 2020 thru 2070.

The Livestock WUG in Wood County Sabine is a split entity and has a demand that is projected to be a constant 2,741 ac-ft/yr from 2020 to 2070. Livestock in Wood County Sabine has a current water supply consisting of water wells from the Carrizo-Wilcox Aquifer and Local Supplies. The total rated available supply from these sources is 1,643 ac-ft/yr in 2020 thru 2070. Livestock in Wood County, Sabine is projected to have a water supply deficit of 1,098 ac-ft/yr in 2020 thru 2070.

Water Supply and Demand Analysis:

Livestock Wood Cypress	2020	2030	2040	2050	2060	2070
Projected Water Demand	483	483	483	483	483	483
Current Water Supply	555	555	555	555	555	555
Projected Supply Surplus (+)/Deficit(-)	72	72	72	72	72	72

Livestock Wood Sabine	2020	2030	2040	2050	2060	2070
Projected Water Demand	2,741	2,741	2,741	2,741	2,741	2,741
Current Water Supply	1,643	1,643	1,643	1,643	1,643	1,643
Projected Supply Surplus (+)/Deficit(-)	-1,098	-1,098	-1,098	-1,098	-1,098	-1,098

Evaluation of Potentially Feasible Water Management Strategies:

Six alternative strategies were considered to meet the Wood County, Livestock, Sabine water supply shortages as summarized in the following table. Advanced conservation, water reuse, and surface water alternatives were not considered because the livestock demands are very rural in nature. Groundwater from the Queen City Aquifer (Sabine River Basin) was identified as a potentially feasible strategy for the WUG. Groundwater from the Wood County Pipeline has also been identified as a potentially feasible strategy.

Strategy	Firm Yield (AF)	Total Capital Cost	Total Annualized Cost	Unit Cost	Environmental Impact
Groundwater (Sabine)	**1,129**	**$ 1,210,000**	**$ 125,000**	**$ 111**	**1**
Wood County Pipeline Tie-in	**1,132**	**$2,479,000**	**$787,000**	**$695**	**2**

Recommendations:

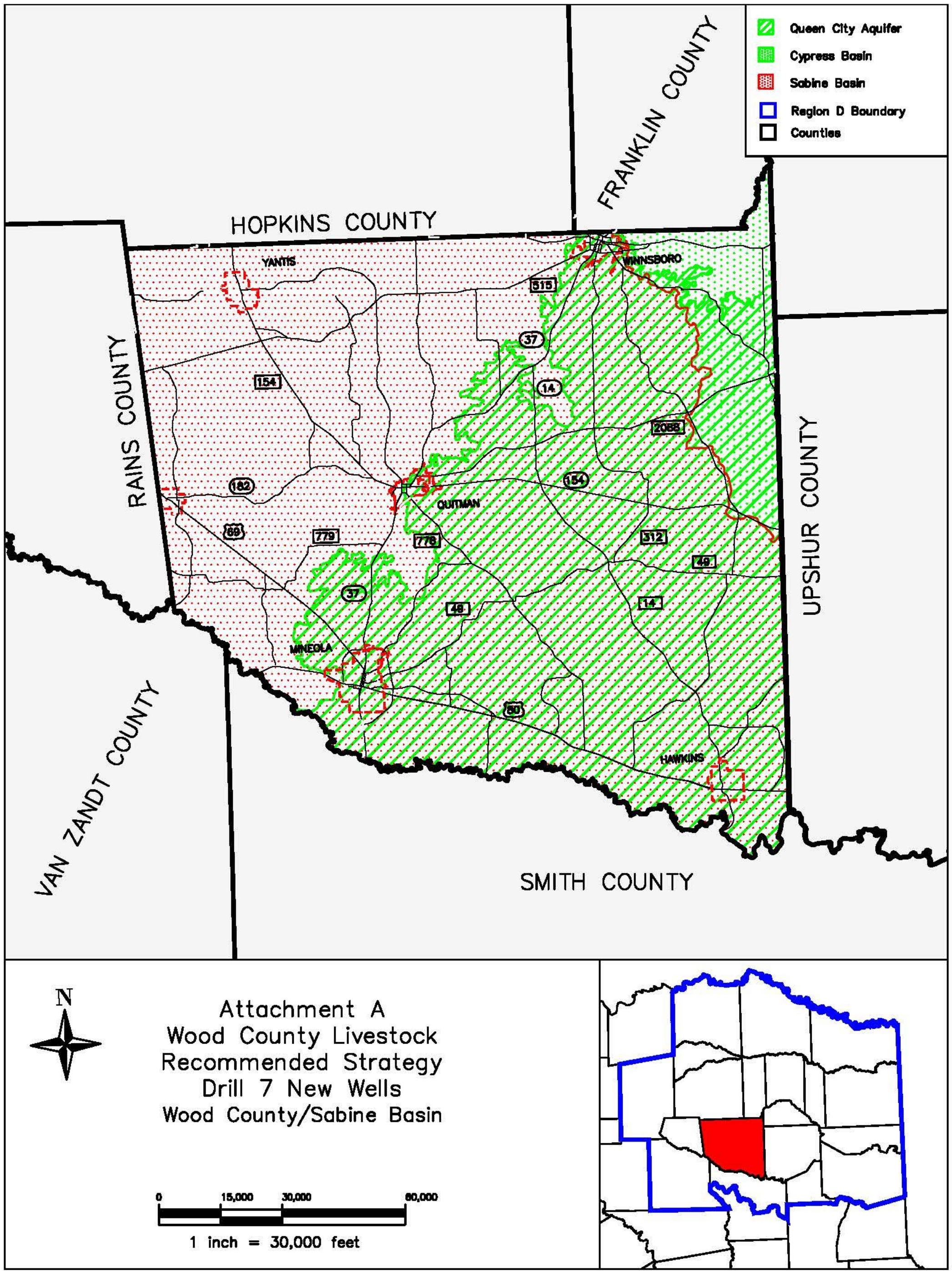
	2020	2030	2040	2050	2060	2070
Local Supply (ac-ft/yr)	34	34	34	34	34	34
Drill New Wells (Queen City Aquifer, Sabine Basin; ac-ft/yr)	1,129	1,129	1,129	1,129	1,129	1,129

The Wood County, Livestock, Cypress has a surplus of 72 ac-ft/yr in 2020 thru 2070 of existing local supply. The local supply in Wood County Cypress is projected to have a more than ample supply availability to meet the needs of the Livestock in Wood County Cypress for the planning period.

The recommended strategy for the Wood County, Livestock, Sabine to meet their projected deficit of 1,098 ac-ft/yr in 2020 thru 2070 would be to construct seven water wells prior to 2020. The recommended supply source will be the Queen City Aquifer in Wood County. Seven wells with rated capacity of 100 gpm each would provide approximately 1,129 ac-ft/yr. Seven new wells will be needed to provide the 1,098 ac-ft/yr needed. The Queen City Aquifer in Wood County is projected to have a more than ample supply availability to meet the needs of the Livestock in Wood County Sabine for the planning period.

Given the increasing costs to comply with more stringent regulations and the decreasing reliability of groundwater as a future supply source due to quality issues in this region, it is recommended that groundwater supply systems consider combining resources and/or soliciting future water supply from neighboring systems and/or major water providers in the region. If a feasible alternative becomes available, then the recommendations previously discussed should be disregarded and a re-evaluation completed.

Cost Estimate Summary Water Supply Project Option September 2018 Prices Livestock Wood Sabine - Drill New Well Queen City Aquifer Wood Sabine	
Cost based on ENR CCI 11170.28 for September 2018 and	
a PPI of 202.4 for September 2018	
Item	***Estimated Costs for Facilities***
CAPITAL COST	
Dam and Reservoir (Conservation Pool acft, acres)	$0
Off-Channel Storage/Ring Dike (Conservation Pool acft, acres)	$0
Terminal Storage (Conservation Pool acft, acres)	$0
Primary Pump Station (0 MGD)	$0
Transmission Pipeline (6 in dia., miles)	$0
Transmission Pump Station(s) & Storage Tank(s)	$0
Well Fields (Wells, Pumps, and Piping)	$870,000
Storage Tanks (Other Than at Booster Pump Stations)	$0
Water Treatment Plant (0 MGD)	$0
Advanced Water Treamtent Facility (MGD)	$0
Conservation (Leaking Pipe/Meter Replacement)	$0
Integration, Relocations, & Other	$0
TOTAL COST OF FACILITIES	**$870,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$304,000
Environmental & Archaeology Studies and Mitigation	$3,000
Land Acquisition and Surveying (4 acres)	$0
Interest During Construction (3% for 1 years with a 0.5% ROI)	$33,000
TOTAL COST OF PROJECT	**$1,210,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$85,000
Reservoir Debt Service (3.5 percent, 40 years)	$0
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$9,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (392309 kW-hr @ 0.08 $/kW-hr)	$31,000
Purchase of Water (acft/yr @ $/acft)	$0
TOTAL ANNUAL COST	**$125,000**
Available Project Yield (acft/yr)	1,129
Annual Cost of Water ($ per acft), based on PF=1	$111
Annual Cost of Water After Debt Service ($ per acft), based on PF=1	$35
Annual Cost of Water ($ per 1,000 gallons), based on PF=1	$0.34
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1	$0.11
Stanley Hayes	*9/30/2019*


Queen City Aquifer
Cypress Basin
Sabine Basin
Region D Boundary
Counties
HOPKINS COUNTY
FRANKLIN COUNTY
RAINS COUNTY
UPSHUR COUNTY
VAN ZANDT COUNTY
SMITH COUNTY
YANTIS
WINNSBORO
QUITMAN
MINEOLA
HAWKINS
N
Attachment A
Wood County Livestock
Recommended Strategy
Drill 7 New Wells
Wood County/Sabine Basin
0
15,000
30,000
60,000
1 inch = 30,000 feet

EVALUATION OF WATER MANAGEMENT STRATEGIES FOR MEETING THE PROJECTED WATER SUPPLY NEEDS MANUFACTURING IN WOOD COUNTY

Description of Water User Group:

The Manufacturing WUG in Wood County has a demand that is projected to be increasing from 2,532 ac-ft/yr in 2020 to 3,085 ac-ft/yr in 2070. Manufacturing in Wood County has a current water supply from Carrizo-Wilcox Aquifer. The total rated available supply from this source is 1,502 ac-ft/yr. Manufacturing in Wood County is projected to have a water supply deficit of 1,030 ac-ft/yr in 2020 increasing to a deficit of 1,583 ac-ft/yr in 2070.

Water Supply and Demand Analysis:

	2020	2030	2040	2050	2060	2070
Projected Water Demand	2532	2085	3085	3085	3085	3085
Current Water Supply	1502	1502	1502	1502	1502	1502
Projected Supply Surplus (+)/Deficit(-)	**-1,030**	**-1,583**	**-1,583**	**-1,583**	**-1,583**	**-1,583**

Evaluation of Potentially Feasible Water Management Strategies:

Five alternative strategies were considered to meet the Wood County Manufacturing water supply shortages as summarized in the following table. Advanced conservation and water reuse was not considered because operational procedures for the existing mines is not available. Surface water alternatives were omitted since there is not a supply source within close proximity to the county with available supply. Groundwater wells in the Queen City Aquifer (Sabine River Basin) were identified as a potentially feasible strategy for the WUG. Groundwater from the Wood County Pipeline has also been identified as a potentially feasible strategy.

Strategy	Firm Yield (AF)	Total Capital Cost	Total Annualized Cost	Unit Cost	Environmental Impact
Groundwater (Queen City Aquifer, Sabine Basin)	**1,610**	**$ 1,210,000**	**$ 125,000**	**$ 78**	**1**
Wood County Pipeline Tie-in	**1,583**	**$2,722,000**	**$1,038,000**	**$656**	**2**

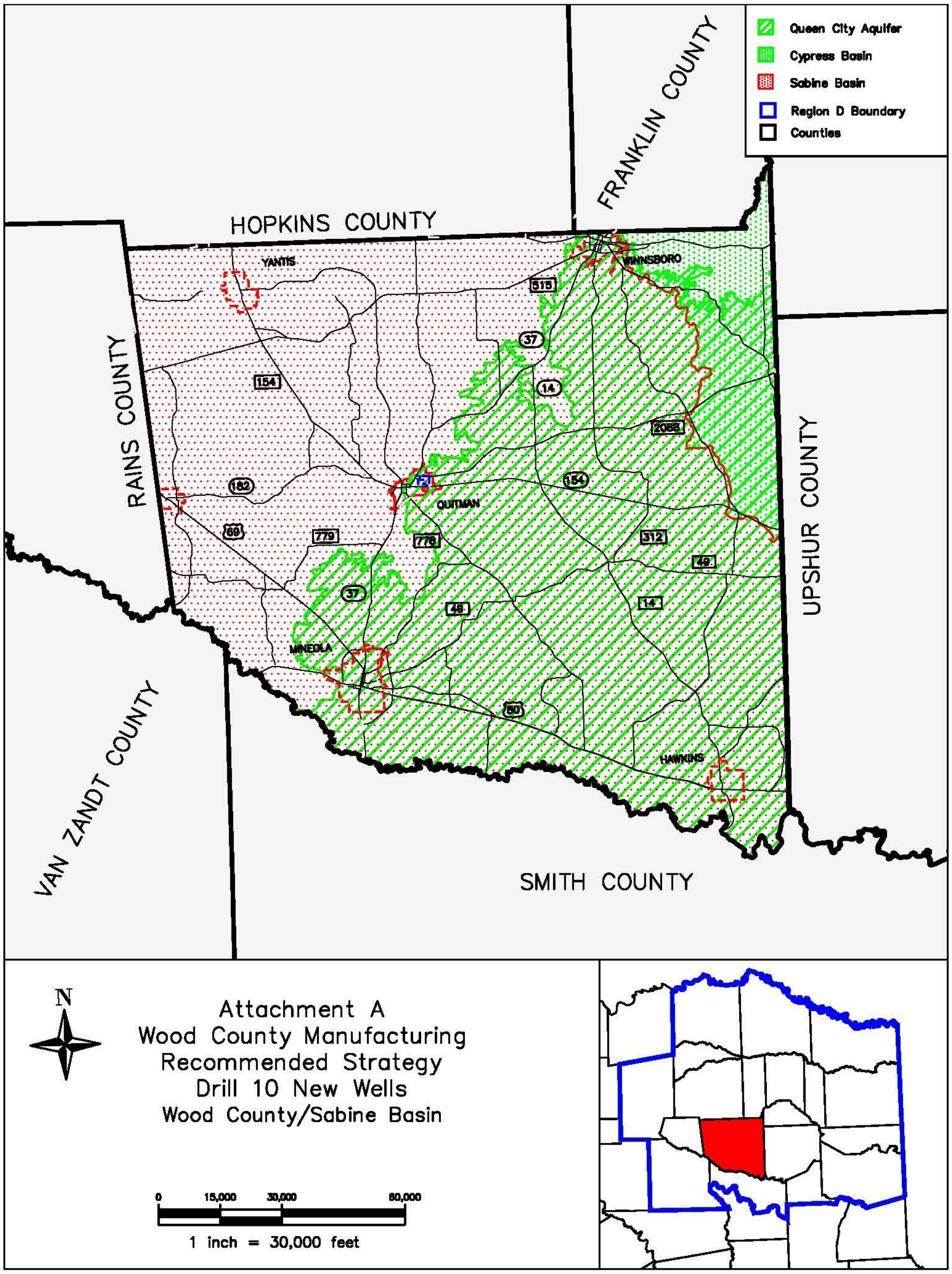
Recommendations:

	2020	2030	2040	2050	2060	2070
Drill New Wells (Queen City Aquifer, Sabine River Basin; ac-ft/yr)	1129	1610	1610	1610	1610	1610

The recommended strategy for the Wood County Manufacturing to meet their projected deficit of 1,030 ac-ft/yr in 2030 and 1,583 ac-ft/yr in 2070 would be to construct ten additional water wells similar to other wells in the area just prior to each decade as the deficits occur. The recommended supply source will be the Queen City Aquifer in Wood County. Ten wells with rated capacity of 100 gpm each would provide approximately 161 acre-feet each or 1,610 ac-ft/yr. The Queen City Aquifer in Wood County is projected to have a more than ample supply availability to meet the needs of the Manufacturing in Wood County for the planning period.

Given the increasing costs to comply with more stringent regulations and the decreasing reliability of groundwater as a future supply source due to quality issues in this region, it is recommended that groundwater supply systems consider combining resources and/or soliciting future water supply from neighboring systems and/or major water providers in the region. If a feasible alternative becomes available, then the recommendations previously discussed should be disregarded and a re-evaluation completed.

Cost Estimate Summary Water Supply Project Option September 2018 Prices Manufacturing Wood Sabine - Drill New Well Queen City Aquifer Wood Sabine	
Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 202.4 for September 2018	
Item	***Estimated Costs for Facilities***
CAPITAL COST	
Dam and Reservoir (Conservation Pool acft, acres)	$0
Off-Channel Storage/Ring Dike (Conservation Pool acft, acres)	$0
Terminal Storage (Conservation Pool acft, acres)	$0
Primary Pump Station (0 MGD)	$0
Transmission Pipeline (6 in dia., miles)	$0
Transmission Pump Station(s) & Storage Tank(s)	$0
Well Fields (Wells, Pumps, and Piping)	$870,000
Storage Tanks (Other Than at Booster Pump Stations)	$0
Water Treatment Plant (0 MGD)	$0
Advanced Water Treamtent Facility (MGD)	$0
Conservation (Leaking Pipe/Meter Replacement)	$0
Integration, Relocations, & Other	$0
TOTAL COST OF FACILITIES	**$870,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$304,000
Environmental & Archaeology Studies and Mitigation	$3,000
Land Acquisition and Surveying (4 acres)	$0
Interest During Construction (3% for 1 years with a 0.5% ROI)	$33,000
TOTAL COST OF PROJECT	**$1,210,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$85,000
Reservoir Debt Service (3.5 percent, 40 years)	$0
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$9,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (392309 kW-hr @ 0.08 $/kW-hr)	$31,000
Purchase of Water (acft/yr @ $/acft)	$0
TOTAL ANNUAL COST	**$125,000**
Available Project Yield (acft/yr)	1,610
Annual Cost of Water ($ per acft), based on PF=1	$78
Annual Cost of Water After Debt Service ($ per acft), based on PF=1	$25
Annual Cost of Water ($ per 1,000 gallons), based on PF=1	$0.24
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1	$0.08
Stanley Hayes	*10/4/2019*


Queen City Aquifer
Cypress Basin
Sabine Basin
Region D Boundary
Counties
HOPKINS COUNTY
FRANKLIN COUNTY
RAINS COUNTY
UPSHUR COUNTY
VAN ZANDT COUNTY
SMITH COUNTY
YANTIS
WINNSBORO
QUITMAN
MINEOLA
HAWKINS
515
37
154
14
2088
182
69
779
778
154
312
49
37
48
14
80
N
Attachment A
Wood County Manufacturing
Recommended Strategy
Drill 10 New Wells
Wood County/Sabine Basin
0
15,000
30,000
60,000
1 inch = 30,000 feet

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County	Entity	Projected Deficit (-) / Recommendation (ac-ft/yr) by Decade 2020	2030	2040	2050	2060	2070	Strategy	Contingency	Seller (if applicable)	Supply Source Ground-water	Surface Water	County	Basin	Reliability of Source	Total Capital Cost ($)	Total Annual Cost ($)
CASS	MANUFACTURING CASS	0	0	0	0	0	0	VOLUNTARY REALLOCATION (QUEEN CITY)	NEW 2.5 MGD PACKAGE WTP AND TRANSMISSION LINE AND RIVERBEND WMS	RIVERBEND WATER RESOURCES DISTRICT		WRIGHT PATMAN LAKE /RESERVOIR	RESERVOIR	SULPHUR	HIGH	$ -	$ -
		0	251	244	243	243	243										
CASS	QUEEN CITY	0	251	244	243	243	243	NEW CONTRACT	NEW 2.5 MGD PACKAGE WTP AND TRANSMISSION LINE, RIVERBEND WMS, AND VOLUNTARY REALLOCATION (CASS MANUFACTURING)	RIVERBEND WATER RESOURCES DISTRICT		WRIGHT PATMAN LAKE /RESERVOIR	RESERVOIR	SULPHUR	HIGH	$ -	$ 121,000
HOPKINS	BRINKER WSC	0	0	0	-12	-47	-83	DRILL NEW WELLS			CARRIZO-WILCOX AQUIFER		HOPKINS	SULPHUR	HIGH	$ 1,405,000	$ 175,000
		0	0	0	12	47	83										
RED RIVER	CLARKSVILLE	-237	-231	-222	-221	-219	-219	DIMPLE RESERVOIR				DIMPLE RESERVOIR	RESERVOIR	RED	HIGH	$ 38,489,000	$ 2,415,000
		303	303	303	303	303	303										
RED RIVER	CLARKSVILLE	-237	-231	-222	-221	-219	-219	CONTRACT WITH RIVERBEND WRD AND TREATED WATER PIPELINE TO DEKALB	RIVERBEND WMS	RIVERBEND WATER RESOURCES DISTRICT		WRIGHT PATMAN LAKE /RESERVOIR	RESERVOIR	SULPHUR	HIGH	$ 11,702,000	$ 1,171,000
		237	231	222	221	219	219										
RED RIVER	CLARKSVILLE	-237	-231	-222	-221	-219	-219	PAT MAYSE TREATED WATER PIPELINE TO DEROIT AND CONTRACT		LAMAR COUNTY WSD		PAT MAYSE LAKE /RESERVOIR	RESERVOIR	RED		$ 12,255,000	
		303	303	303	303	303	303										
RED RIVER	IRRIGATION RED RIVER	-2,154	-2,154	-2,154	-2,154	-2,154	-2,154	DRILL NEW WELLS			TRINITY AQUIFER		RED RIVER	SULPHUR	HIGH	$ 425,000	$ 88,000
		97	97	97	97	97	97										
VAN ZANDT	CANTON	0	0	0	0	0	0	GRAND SALINE RESERVOIR				GRAND SALINE RESERVOIR	VAN ZANDT	SABINE	HIGH	$ 62,966,000	$ 3,896,000
		1,810	1,810	1,810	1,810	1,810	1,810										
WOOD COUNTY PIPELINE (REGIONALIZATION)		0	0	0	0	0	0	WOOD COUNTY PIPELINE			CARRIZO-WILCOX AQUIFER		WOOD	SABINE	HIGH	$ 232,728,000	$ 31,010,000
		8,973	10,485	12,090	14,174	17,142	21,803										
HOPKINS	BRINKER WSC	0	0	0	-12	-47	-83	WOOD COUNTY PIPELINE TIE-IN	WOOD COUNTY PIPELINE		CARRIZO-WILCOX AQUIFER		WOOD	SABINE	HIGH	$ 3,567,000	$ 409,000
		0	0	0	12	47	83										
HOPKINS	CUMBY	-13	-29	-44	-58	-77	-88	WOOD COUNTY PIPELINE TIE-IN	WOOD COUNTY PIPELINE		CARRIZO-WILCOX AQUIFER		WOOD	SABINE	HIGH	$ 4,809,000	$ 511,000
		13	29	44	58	77	88										
HOPKINS	IRRIGATION HOPKINS	-4,627	-4,627	-4,627	-4,627	-4,627	-4,627	WOOD COUNTY PIPELINE TIE-IN	WOOD COUNTY PIPELINE		CARRIZO-WILCOX AQUIFER		WOOD	SABINE	HIGH	$ 13,522,000	$ 7,181,000
		4,627	4,627	4,627	4,627	4,627	4,627										
HOPKINS	LIVESTOCK HOPKINS	-1,068	-1,090	-1,140	-1,143	-1,196	-1,219	WOOD COUNTY PIPELINE TIE-IN	WOOD COUNTY PIPELINE		CARRIZO-WILCOX AQUIFER		WOOD	SULPHUR	HIGH	$ 8,273,000	$ 706,000
		1,068	1,090	1,140	1,143	1,196	1,219										
HOPKINS	MARTIN SPRINGS WSC	0	0	0	0	0	-29	WOOD COUNTY PIPELINE TIE-IN	WOOD COUNTY PIPELINE		CARRIZO-WILCOX AQUIFER		WOOD	SABINE	HIGH	$ 1,574,000	$ 166,000
		0	0	0	0	0	29										
HOPKINS	MILLER GROVE WSC	-8	-16	-23	-29	-40	-52	WOOD COUNTY PIPELINE TIE-IN	WOOD COUNTY PIPELINE		CARRIZO-WILCOX AQUIFER		WOOD	SABINE	HIGH	$ 1,587,000	$ 200,000
		8	16	23	29	40	52										
HOPKINS	MINING HOPKINS	-227	-283	-360	-444	-533	-639	WOOD COUNTY PIPELINE TIE-IN	WOOD COUNTY PIPELINE		CARRIZO-WILCOX AQUIFER		WOOD	SABINE	HIGH	$ 5,367,000	$ 1,365,000
		227	283	360	444	533	639										
HUNT	B H P WSC	0	-72	-125	-209	-333	-505	WOOD COUNTY PIPELINE TIE-IN	WOOD COUNTY PIPELINE		CARRIZO-WILCOX AQUIFER		WOOD	SABINE	HIGH	$ 1,086,000	$ 823,000
		2	72	125	209	333	505										
HUNT	CADDO BASIN SUD	-7	-220	-406	-722	-1,202	-1,866	WOOD COUNTY PIPELINE TIE-IN	WOOD COUNTY PIPELINE		CARRIZO-WILCOX AQUIFER		WOOD	SABINE	HIGH	$ 4,037,000	$ 3,059,000
		7	220	406	722	1,202	1,866										
HUNT	CADDO MILLS	0	-1	-36	-68	-108	-254	WOOD COUNTY PIPELINE, INCREASE CONTRACT	GREENVILLE WMSs, WOOD COUNTY PIPELINE		CARRIZO-WILCOX AQUIFER		WOOD	SABINE	HIGH	$ -	$ 366,000
		0	1	36	68	108	254										
HUNT	CASH SUD	89	-361	-1,009	-1,346	-1,346	-695	WOOD COUNTY PIPELINE TIE-IN	WOOD COUNTY PIPELINE		CARRIZO-WILCOX AQUIFER		WOOD	SABINE	HIGH	$ 1,926,000	$ 2,114,000
		330	394	1,009	1,346	1,346	1,346										
HUNT	CELESTE	-29	-52	-86	-136	-209	-316	WOOD COUNTY PIPELINE TIE-IN	WOOD COUNTY PIPELINE		CARRIZO-WILCOX AQUIFER		WOOD	SABINE	HIGH	$ 5,076,000	$ 867,000
		29	52	86	136	209	316										
HUNT	COUNTY-OTHER, HUNT	862	449	-166	-703	-1,817	-3,834	WOOD COUNTY PIPELINE, INCREASE CONTRACT	GREENVILLE WMSs, WOOD COUNTY PIPELINE		CARRIZO-WILCOX AQUIFER		WOOD	SABINE	HIGH	$ -	$ 5,529,000
		0	0	166	703	1,817	3,834										
HUNT	GREENVILLE	-3,239	-4,626	-6,531	-9,183	-12,913	-18,266	WOOD COUNTY PIPELINE TIE-IN	GREENVILLE WMSs, WOOD COUNTY PIPELINE		CARRIZO-WILCOX AQUIFER		WOOD	SABINE	HIGH	$ -	$ 9,360,000
		96	274	721	1,691	3,448	6,491										
HUNT	HICKORY CREEK SUD	-96	-273	-519	-866	-1,366	-2,095	WOOD COUNTY PIPELINE TIE-IN	GREENVILLE WMSs, WOOD COUNTY PIPELINE		CARRIZO-WILCOX AQUIFER		WOOD	SABINE	HIGH	$ 11,862,000	$ 4,030,000
		96	273	519	866	1,366	2,095										
HUNT	MINING HUNT	-73	-64	-35	-19	-7	0	WOOD COUNTY PIPELINE TIE-IN	WOOD COUNTY PIPELINE		CARRIZO-WILCOX AQUIFER		WOOD	SABINE	HIGH	$ 560,000	$ 152,000
		73	64	35	19	7	0										
HUNT	NORTH HUNT SUD	-89	-165	-266	-405	-603	-888	WOOD COUNTY PIPELINE TIE-IN	WOOD COUNTY PIPELINE		CARRIZO-WILCOX AQUIFER		WOOD	SABINE	HIGH	$ 6,777,000	$ 1,845,000
		89	165	266	405	603	888										

County	Entity	Projected Deficit (-) / Recommendation (ac-ft/yr) by Decade						Strategy	Contingency	Seller (if applicable)	Supply Source				Reliability of Source	Total Capital Cost ($)	Total Annual Cost ($)
		2020	2030	2040	2050	2060	2070				Ground-water	Surface Water	County	Basin			
HUNT	POETRY WSC	2	-66	-115	-200	-330	-510	WOOD COUNTY PIPELINE TIE-IN	WOOD COUNTY PIPELINE		CARRIZO-WILCOX AQUIFER		WOOD	SABINE	HIGH	$ 1,103,000	$ 836,000
		0	66	115	200	330	510										
HUNT	WOLFE CITY	0	0	0	-54	-157	-308	WOOD COUNTY PIPELINE TIE-IN	GREENVILLE WMSs, WOOD COUNTY PIPELINE		CARRIZO-WILCOX AQUIFER		WOOD	SABINE	HIGH	$ 7,124,000	$ 1,018,000
		0	0	0	54	157	308										
VAN ZANDT	MANUFACTURING VAN ZANDT	-242	-493	-493	-493	-504	-504	WOOD COUNTY PIPELINE TIE-IN	WOOD COUNTY PIPELINE		CARRIZO-WILCOX AQUIFER		WOOD	SABINE	HIGH	$ -	$ 619,000
		242	418	418	418	429	429										
WOOD	LIVESTOCK WOOD	-1,098	-1,098	-1,098	-1,098	-1,098	-1,098	WOOD COUNTY PIPELINE TIE-IN	WOOD COUNTY PIPELINE		CARRIZO-WILCOX AQUIFER		WOOD	SABINE	HIGH	$ 2,479,000	$ 787,000
		1,132	1,132	1,132	1,132	1,132	1,132										
WOOD	MANUFACTURING WOOD	-1,030	-1,583	-1,583	-1,583	-1,583	-1,583	WOOD COUNTY PIPELINE TIE-IN	WOOD COUNTY PIPELINE		CARRIZO-WILCOX AQUIFER		WOOD	SABINE	HIGH	$ 2,722,000	$ 1,038,000
		1,030	1,583	1,583	1,583	1,583	1,583										

Region D Alternative Projects Associated with Water Management Strategies

SPONSOR NAME	SPONSOR IS WWP?	ONLINE DECADE	PROJECT NAME	PROJECT DESCRIPTION	CAPITAL COST
B H P WSC	NO	2020	ALT WOOD COUNTY PIPELINE TIE-IN (B H P, CADDO BASIN SUD, POETRY WSC)	CONVEYANCE/TRANSMISSION PIPELINE	$1,038,000
BRINKER WSC	NO	2050	ALT WOOD COUNTY PIPELINE TIE-IN (BRINKER WSC)	CONVEYANCE/TRANSMISSION PIPELINE	$3,567,000
BRINKER WSC	NO	2050	DRILL NEW WELLS (BRINKER WSC, CARRIZO-WILCOX, SULPHUR)	MULTIPLE WELLS/WELL FIELD; WATER TREATMENT PLANT EXPANSION	$1,405,000
CADDO BASIN SUD	NO	2020	ALT WOOD COUNTY PIPELINE TIE-IN (B H P, CADDO BASIN SUD, POETRY WSC)	CONVEYANCE/TRANSMISSION PIPELINE	$3,860,000
CANTON	NO	2020	ALT CANTON GRAND SALINE RESERVOIR	CONVEYANCE/TRANSMISSION PIPELINE; NEW SURFACE WATER INTAKE; NEW WATER RIGHT/PERMIT NO IBT; PUMP STATION; WATER TREATMENT PLANT EXPANSION; RESERVOIR CONSTRUCTION	$45,373,000
CASH SUD	YES	2020	ALT WOOD COUNTY PIPELINE TIE-IN (CASH SUD)	CONVEYANCE/TRANSMISSION PIPELINE	$1,926,000
CELESTE	NO	2020	ALT WOOD COUNTY PIPELINE TIE-IN (CELESTE)	CONVEYANCE/TRANSMISSION PIPELINE	$5,076,000
CLARKSVILLE	NO	2020	ALT CLARKSVILLE TREATED PIPELINE PAT MAYSE WATER	CONVEYANCE/TRANSMISSION PIPELINE; NEW CONTRACT; PUMP STATION	$12,255,000
CLARKSVILLE	NO	2020	CONTRACT WITH TEXARKANA AND TREATED WATER PIPELINE TO DEKALB (CLARKSVILLE, SULPHUR)	CONVEYANCE/TRANSMISSION PIPELINE; NEW CONTRACT; PUMP STATION; STORAGE TANK	$11,702,000
CLARKSVILLE	NO	2020	DIMPLE RESERVOIR	CONVEYANCE/TRANSMISSION PIPELINE; DIVERSION AND CONTROL STRUCTURE; NEW WATER RIGHT/PERMIT NO IBT; RESERVOIR CONSTRUCTION	$38,489,000
COUNTY-OTHER, WOOD	NO	2020	ALT WOOD COUNTY PIPELINE AND REGIONAL WELL FIELD	CONVEYANCE/TRANSMISSION PIPELINE; MULTIPLE WELLS/WELL FIELD; STORAGE TANK	$232,728,000
CUMBY	NO	2020	ALT WOOD COUNTY PIPELINE TIE-IN (CUMBY)	CONVEYANCE/TRANSMISSION PIPELINE	$4,809,000
HICKORY CREEK SUD	NO	2020	ALT WOOD COUNTY PIPELINE TIE-IN (HICKORY CREEK	CONVEYANCE/TRANSMISSION PIPELINE	$11,862,000
IRRIGATION, HOPKINS	NO	2020	ALT WOOD COUNTY PIPELINE (IRRIGATION HOPKINS)	CONVEYANCE/TRANSMISSION PIPELINE	$13,522,000
IRRIGATION, RED RIVER	NO	2020	ALT DRILL NEW WELLS (IRRIGATION RED RIVER, TRINITY AQUIFER, SULPHUR)	MULTIPLE WELLS/WELL FIELD	$425,000
LIVESTOCK, HOPKINS	NO	2020	ALT WOOD COUNTY PIPELINE TIE-IN (HOPKINS	CONVEYANCE/TRANSMISSION PIPELINE	$8,273,000
LIVESTOCK, WOOD	NO	2020	ALT WOOD COUNTY PIPELINE TIE-IN (WOOD CO LIVESTOCK)	CONVEYANCE/TRANSMISSION PIPELINE	$2,479,000
MANUFACTURING, WOOD	NO	2020	ALT WOOD COUNTY PIPELINE TIE-IN (WOOD CO MANUFACTURING)	CONVEYANCE/TRANSMISSION PIPELINE	$2,722,000
MARTIN SPRINGS WSC	NO	2070	WOOD COUNTY PIPELINE TIE-IN (MARTIN SPRINGS)	CONVEYANCE/TRANSMISSION PIPELINE	$1,574,000
MILLER GROVE WSC	NO	2020	ALT WOOD COUNTY PIPELINE TIE-IN (MILLER GROVE WSC)	CONVEYANCE/TRANSMISSION PIPELINE	$1,587,000
MINING, HOPKINS	NO	2020	ALT WOOD COUNTY PIPELINE TIE-IN (HOPKINS MINING)	CONVEYANCE/TRANSMISSION PIPELINE	$5,367,000
MINING, HUNT	NO	2020	ALT WOOD COUNTY PIPELINE TIE-IN (HUNT CO MINING)	CONVEYANCE/TRANSMISSION PIPELINE	$560,000
NORTH HUNT SUD	NO	2020	ALT WOOD COUNTY PIPELINE TIE-IN (NORTH HUNT SUD)	CONVEYANCE/TRANSMISSION PIPELINE	$6,777,000
POETRY WSC	NO	2020	ALT WOOD COUNTY PIPELINE TIE-IN (B H P, CADDO BASIN SUD, POETRY WSC)	CONVEYANCE/TRANSMISSION PIPELINE	$1,055,000
WOLFE CITY	NO	2040	ALT WOOD COUNTY PIPELINE TIE-IN (WOLFE CITY)	CONVEYANCE/TRANSMISSION PIPELINE; NEW CONTRACT	$7,124,000

REGION D ALTERNATIVE CAPITAL COST TOTAL	**$425,555,000**

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Region D Alternative Water User Group (WUG) Water Management Strategies (WMS)

						WATER MANAGEMENT STRATEGY SUPPLY (ACRE-FEET PER YEAR)					
WUG ENTITY NAME	WMS SPONSOR REGION	WMS NAME	SOURCE NAME	UNIT COST 2020	UNIT COST 2070	2020	2030	2040	2050	2060	2070
B H P WSC*	D	ALT WOOD COUNTY PIPELINE	D | CARRIZO-WILCOX AQUIFER | WOOD COUNTY	$2345	$1550	2	60	103	177	288	446
BRINKER WSC	D	ALT DRILL NEW WELLS (BRINKER WSC)	D | CARRIZO-WILCOX AQUIFER | HOPKINS COUNTY	N/A	$916	0	0	0	12	47	83
BRINKER WSC	D	ALT WOOD COUNTY PIPELINE	D | CARRIZO-WILCOX AQUIFER | WOOD COUNTY	N/A	$1904	0	0	0	12	47	83
CADDO BASIN SUD*	D	ALT WOOD COUNTY PIPELINE	D | CARRIZO-WILCOX AQUIFER | WOOD COUNTY	$1711	$1486	5	172	315	561	946	1,502
CADDO MILLS	D	ALT WOOD COUNTY PIPELINE	D | CARRIZO-WILCOX AQUIFER | WOOD COUNTY	N/A	$1441	0	1	36	68	108	254
CANTON	D	ALT CANTON GRAND SALINE RESERVOIR	D | GRAND SALINE LAKE/RESERVOIR	$3087	$1264	1,810	1,810	1,810	1,810	1,810	1,810
CASH SUD*	D	ALT WOOD COUNTY PIPELINE	D | CARRIZO-WILCOX AQUIFER | WOOD COUNTY	$1571	$1470	330	394	978	1,297	1,285	1,321
CELESTE	D	ALT WOOD COUNTY PIPELINE	D | CARRIZO-WILCOX AQUIFER | WOOD COUNTY	$2744	$1614	29	52	86	136	209	316
CLARKSVILLE	D	ALT CLARKSVILLE TREATED PIPELINE PAT MAYSE WATER	D | PAT MAYSE LAKE/RESERVOIR	$5010	$2165	303	303	303	303	303	303
CLARKSVILLE	D	DIMPLE RESERVOIR	D | DIMPLE LAKE/RESERVOIR	$8399	$5789	303	303	303	303	303	303
CLARKSVILLE	D	RIVERBEND STRATEGY	D | WRIGHT PATMAN LAKE/RESERVOIR	$3865	$1149	303	303	303	303	303	303
COUNTY-OTHER, HUNT	D	ALT WOOD COUNTY PIPELINE	D | CARRIZO-WILCOX AQUIFER | WOOD COUNTY	N/A	$1442	0	0	166	703	1,817	3,834
CUMBY	D	ALT WOOD COUNTY PIPELINE	D | CARRIZO-WILCOX AQUIFER | WOOD COUNTY	$5807	$1966	13	29	44	58	77	88
HICKORY CREEK SUD*	D	ALT WOOD COUNTY PIPELINE	D | CARRIZO-WILCOX AQUIFER | WOOD COUNTY	$1924	$1525	88	254	489	822	1,306	2,012
IRRIGATION, HOPKINS	D	ALT WOOD COUNTY PIPELINE	D | CARRIZO-WILCOX AQUIFER | WOOD COUNTY	$1552	$1346	4,627	4,627	4,627	4,627	4,627	4,627
IRRIGATION, RED RIVER	D	ALT DRILL NEW WELLS (IRRIGATION RED RIVER, TRINITY AQUIFER, SULPHUR)	D | TRINITY AQUIFER | RED RIVER COUNTY	$845	$536	97	97	97	97	97	97
LIVESTOCK, HOPKINS	D	ALT WOOD COUNTY PIPELINE	D | CARRIZO-WILCOX AQUIFER | WOOD COUNTY	$2021	$1544	1,068	1,090	1,140	1,143	1,196	1,219
LIVESTOCK, WOOD	D	ALT WOOD COUNTY PIPELINE	D | CARRIZO-WILCOX AQUIFER | WOOD COUNTY	$695	$542	1,132	1,132	1,132	1,132	1,132	1,132
MANUFACTURING, VAN ZANDT	D	ALT WOOD COUNTY PIPELINE	D | CARRIZO-WILCOX AQUIFER | WOOD COUNTY	$1443	$1443	242	418	418	418	429	429

*A single asterisk next to a WUG's name denotes that the WUG is split by two or more planning regions.

Region D Alternative Water User Group (WUG) Water Management Strategies (WMS)

						WATER MANAGEMENT STRATEGY SUPPLY (ACRE-FEET PER YEAR)					
WUG ENTITY NAME	WMS SPONSOR REGION	WMS NAME	SOURCE NAME	UNIT COST 2020	UNIT COST 2070	2020	2030	2040	2050	2060	2070
MANUFACTURING, WOOD	D	ALT WOOD COUNTY PIPELINE	D | CARRIZO-WILCOX AQUIFER | WOOD COUNTY	$656	$535	1,030	1,583	1,583	1,583	1,583	1,583
MARTIN SPRINGS WSC	D	ALT WOOD COUNTY PIPELINE	D | CARRIZO-WILCOX AQUIFER | WOOD COUNTY	N/A	$5724	0	0	0	0	0	29
MILLER GROVE WSC	D	ALT WOOD COUNTY PIPELINE	D | CARRIZO-WILCOX AQUIFER | WOOD COUNTY	$3846	$1692	8	16	23	29	40	52
MINING, HOPKINS	D	ALT WOOD COUNTY PIPELINE	D | CARRIZO-WILCOX AQUIFER | WOOD COUNTY	$2136	$1545	227	283	360	444	533	639
MINING, HUNT	D	ALT WOOD COUNTY PIPELINE	D | CARRIZO-WILCOX AQUIFER | WOOD COUNTY	$2082	N/A	73	64	35	19	7	0
NORTH HUNT SUD*	D	ALT WOOD COUNTY PIPELINE	D | CARRIZO-WILCOX AQUIFER | WOOD COUNTY	$2078	$1541	78	148	243	376	567	846
POETRY WSC*	D	ALT WOOD COUNTY PIPELINE	D | CARRIZO-WILCOX AQUIFER | WOOD COUNTY	N/A	$1549	0	47	83	143	236	365
QUEEN CITY	D	ALT RIVERBEND STRATEGY CASS	D | WRIGHT PATMAN LAKE/RESERVOIR	N/A	$483	0	251	244	243	243	243
WOLFE CITY*	D	ALT WOOD COUNTY PIPELINE	D | CARRIZO-WILCOX AQUIFER | WOOD COUNTY	N/A	$1679	0	0	0	51	149	293
					REGION D ALTERNATIVE WMS SUPPLY TOTAL	11,768	13,437	14,921	16,870	19,688	24,212

*A single asterisk next to a WUG's name denotes that the WUG is split by two or more planning regions.

REGION D
EVALUATIONS OF ALTERNATIVE WATER MANAGEMENT STRATEGIES
FOR MEETING PROJECTED WATER SUPPLY NEEDS
TO YEAR 2070

CASS COUNTY

WUGs:

City of Queen City

EVALUATION OF WATER MANAGEMENT STRATEGIES FOR MEETING THE PROJECTED WATER SUPPLY NEEDS OF QUEEN CITY

Description of Water User Group:

The City of Queen City provides water service in Cass County. The City's population is projected to be 1,701 in 2020 and 1,714 in the year 2070. The City primarily utilizes groundwater supply from the Carrizo-Wilcox Aquifer, although it has the capability to use water supply from the City of Texarkana from Lake Wright Patman that it has used in the past. The City is not expected to have shortages as sufficient groundwater supplies are projected over the 2020 – 2070 planning period. However, the City's full demands have been considered in evaluation of strategies for the purposes of the 2021 Region D Plan as the City's demands were included as part of the evaluation of strategies within the Riverbend WRD's Regional Water Master Plan.

Water Supply and Demand Analysis:

	2020	2030	2040	2050	2060	2070
Population	1,701	1,714	1,714	1,714	1,714	1,714
Projected Water Demand	258	251	244	243	243	243
Current Water Supply	269	269	269	269	269	269
Projected Supply Surplus (+) / Deficit (-)	**11**	**18**	**25**	**26**	**26**	**26**

Evaluation of Potentially Feasible Water Management Strategies:

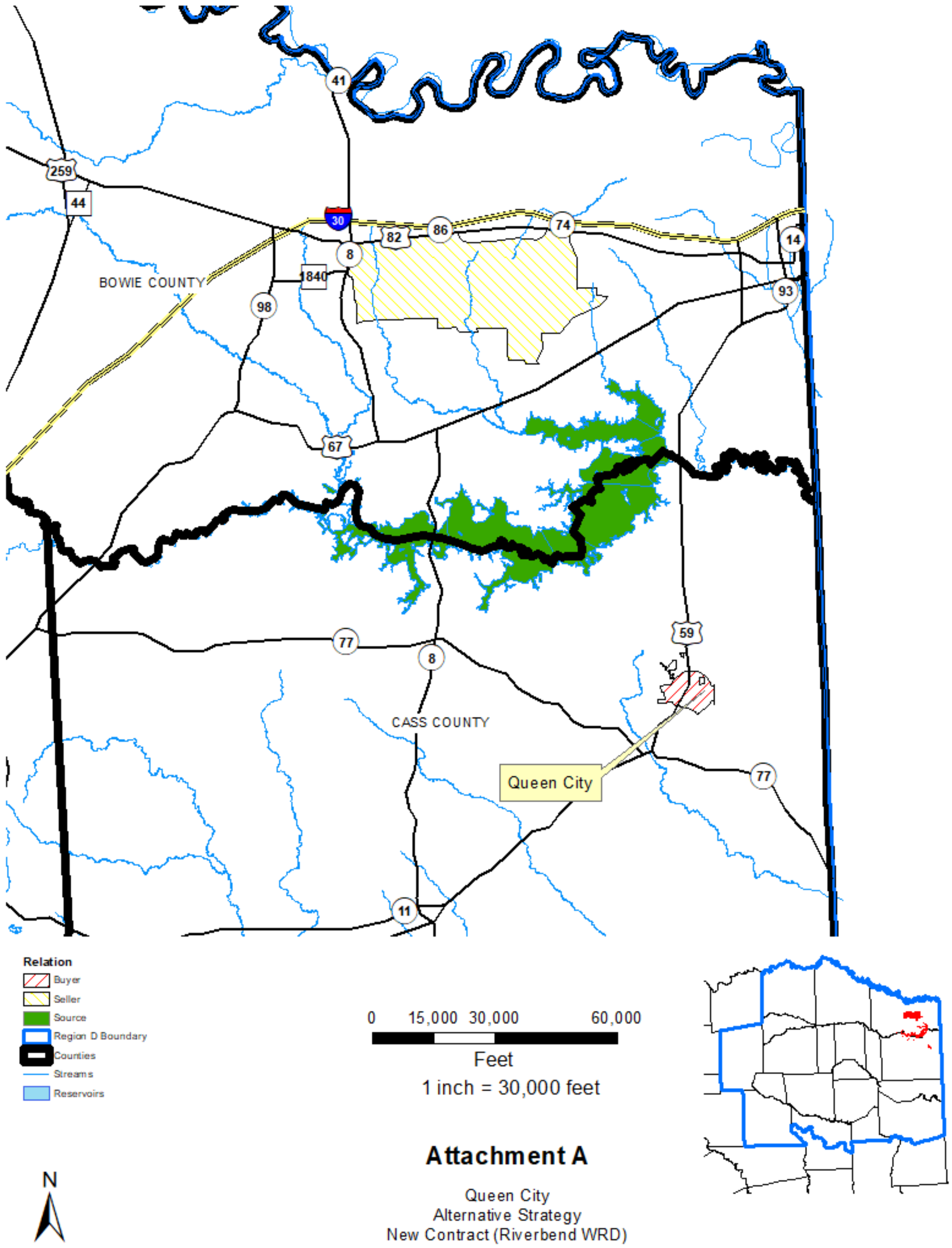
There were five alternative strategies considered to meet the City's water supply shortages as summarized in the Table below. Advanced conservation was not considered because the per capita use per day would be less than the 140 gpcd threshold set by the water planning group. Reuse is not a feasible option because water supply is mainly used for public consumption. Existing groundwater supply is sufficient to meet the City's needs, and is expected to continue to meet projected future demands for the City. Voluntary reallocation of manufacturing supply was identified in order to account for the fact that the Riverbend WRD Regional Master Plan indicates that supply could be provided via diversion of supply for GPI at Lake Wright Patman, a part of the Cass Manufacturing WUG, thus the amount for voluntary reallocation does not affect the 120,000 ac-ft/yr of contracted supply between Texarkana and GPI. Further, a request was submitted by Riverbend Water Resources District to consider a new 2.5 MGD package water treatment plant and transmission line for supply from Wright Patman Reservoir. Thus, a new contract with Texarkana/Riverbend has been considered herein.

Strategy	Firm Yield (ac-ft)	Total Capital Cost	Total Annualized Cost	Unit Cost	Environmental Impact
Voluntary Reallocation (from Cass Manufacturing)	**251**	**$0**	**$0**	**$0**	**1**
New Contract	**251**	**$0**	**$121,000**	**$482**	**1**

Identified Alternative WMS and WMSP:

	2020	2030	2040	2050	2060	2070
Voluntary Reallocation (from Cass Manufacturing)	**0**	**251**	**244**	**243**	**243**	**243**
New Contract (ac-ft/yr)	**0**	**251**	**244**	**243**	**243**	**243**

The alternative WMS identified for the City of Queen City is for a new contract surface water purchase from Texarkana/Riverbend WRD contingent upon voluntary reallocation of supply from Cass Manufacturing and Riverbend WRD's recommended strategy for a new 2.5 MGD package water treatment plant and transmission line.



Attachment A

Queen City
Alternative Strategy
New Contract (Riverbend WRD)

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices

Queen City - New Contract with Riverbend WRD

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 201.9 for September 2018

Item	***Estimated Costs for Facilities***
ANNUAL COST	
Operation and Maintenance	
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (0 kW-hr @ 0.08 $/kW-hr)	$0
Purchase of Water (251 acft/yr @ 482.28 $/acft)	$121,000
TOTAL ANNUAL COST	**$121,000**
Available Project Yield (acft/yr)	251
Annual Cost of Water ($ per acft), based on PF=1	$482
Annual Cost of Water After Debt Service ($ per acft), based on PF=1	$482
Annual Cost of Water ($ per 1,000 gallons), based on PF=1	$1.48
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1	$1.48

JMP *10/2/2019*

REGION D
EVALUATIONS OF ALTERNATIVE WATER MANAGEMENT STRATEGIES
FOR MEETING PROJECTED WATER SUPPLY NEEDS
TO YEAR 2070

HOPKINS COUNTY

WUGs:

Brinker WSC
City of Cumby
Hopkins County Irrigation
Hopkins County Livestock
Martin Springs WSC
Miller Grove WSC
Hopkins County Mining

EVALUATION OF ALTERNATIVE WATER MANAGEMENT STRATEGIES FOR MEETING THE PROJECTED WATER SUPPLY NEEDS OF BRINKER WATER SUPPLY CORPORATION IN HOPKINS COUNTY

Description of Water User Group:

Brinker WSC provides water service in Hopkins County. It is projected that the users in the WUG will have a shortage in 2050. The WUG population is projected to be 2,369 by 2020 and increases to 4,198 by 2070. The WSC utilizes groundwater from the Carrizo-Wilcox aquifer and has a contract for water supply with City of Sulphur Springs for 77 ac-ft/yr. Brinker WSC is projected to have a deficit of 12 ac-ft in 2050, increasing to a deficit of 83 ac-ft by 2070.

Water Supply and Demand Analysis:

	2020	2030	2040	2050	2060	2070
Population	2,369	2,737	3,071	3,456	3,825	4,198
Projected Water Demand	253	281	307	341	377	413
Water Demand from other entities	0	0	0	0	0	0
Current Water Supply	329	328	328	329	330	330
Projected Supply Surplus (+) / Deficit (-)	**76**	**47**	**21**	**-12**	**-47**	**-83**

Evaluation of Potentially Feasible Water Management Strategies:

Five alternative strategies considered to meet the WSC's water supply shortages as summarized in the table below. Advanced conservation was not selected because the per capita use per day was less than the 140 gpcd threshold set by the water planning group. Reuse is not a feasible option because water supply is mainly used for public consumption. Additional use of groundwater has been identified as a likely source of water for Brinker WSC in Hopkins County; however, projected needs exceed the availability of groundwater in the Sulphur basin based on the modeled available groundwater (MAG) estimates and review of available information from a local hydrogeological assessment. A potential regionalization strategy is the Wood County Pipeline where in the City could construct an 8 inch diameter pipeline that ties into a branch of the Wood County Pipeline near Sulphur Springs. Purchase of additional surface water from Sulphur Springs Lake under the existing contract from the City of Sulphur Springs was also considered.

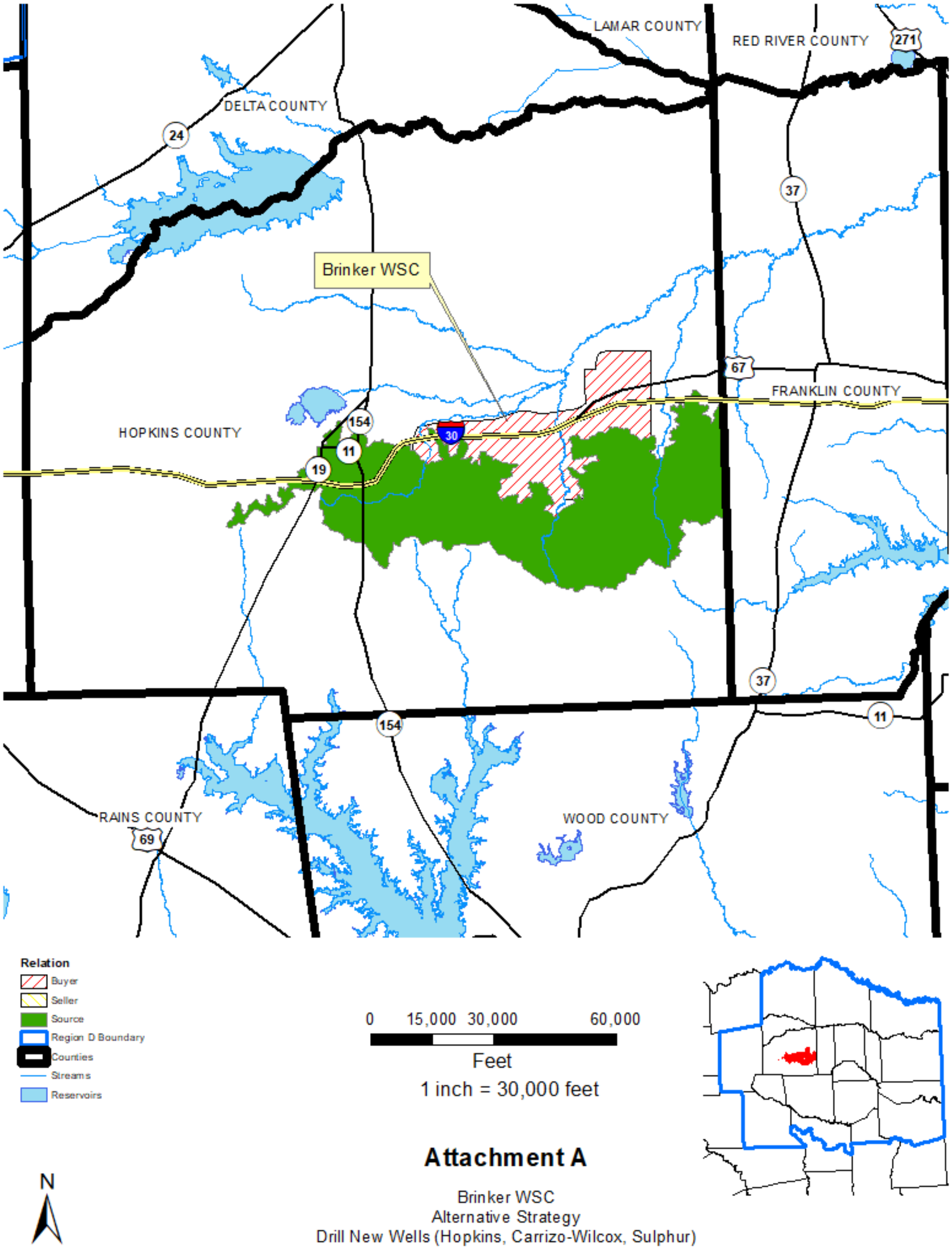
Strategy	Firm Yield (ac-ft)	Total Capital Cost	Total Annualized Cost	Unit Cost	Environmental Impact
Drill New Wells (Carrizo-Wilcox, Sulphur Basin)	**83**	**$1,405,000**	**$175,000**	**$2,108**	**1**
Increase Existing Contract w/ Sulphur Springs	**83**	**$0**	**$95,000**	**$1,145**	**1**
Wood County Pipeline Tie-in	**83**	**$3,567,000**	**$409,000**	**$4,928**	**2**

Identified Alternative WMS and WMSP:

	2020	2030	2040	2050	2060	2070
Drill New Wells (Carrizo-Wilcox, Sulphur Basin) (ac-ft/yr)	0	0	0	12	47	83
Wood County Pipeline Tie-in	0	0	0	12	47	83

Two alternative water management strategies have been identified for Brinker WSC.
The first identified alternative water management strategy for Brinker WSC to meet their projected deficit of 12 ac-ft/yr in 2050 and 83 ac-ft/yr in 2070 would be to construct three additional water wells similar to their existing wells just prior to 2050. The recommended supply source will be the Carrizo-Wilcox Aquifer in the Sulphur Basin in Hopkins County. One well with rated capacity of 75 gpm would provide approximately 40 acre-feet each. The Carrizo-Wilcox Aquifer is projected to have sufficient supply availability to meet the needs of Brinker WSC for the planning period.

A second alternative water management strategy for Brinker WSC identified to potentially meet their projected water needs is the Wood County Pipeline Strategy, of which an Alternative Water Management Strategy Project is for Brinker WSC to construct a tie-in to the proposed Wood County Pipeline. While this strategy is contingent upon the development of the Wood County Pipeline and Well Field, Brinker WSC could construct an 8” pipeline to tie into the proposed raw water pipeline and deliver additional water supplies for treatment and use.



Attachment A

Brinker WSC
Alternative Strategy
Drill New Wells (Hopkins, Carrizo-Wilcox, Sulphur)

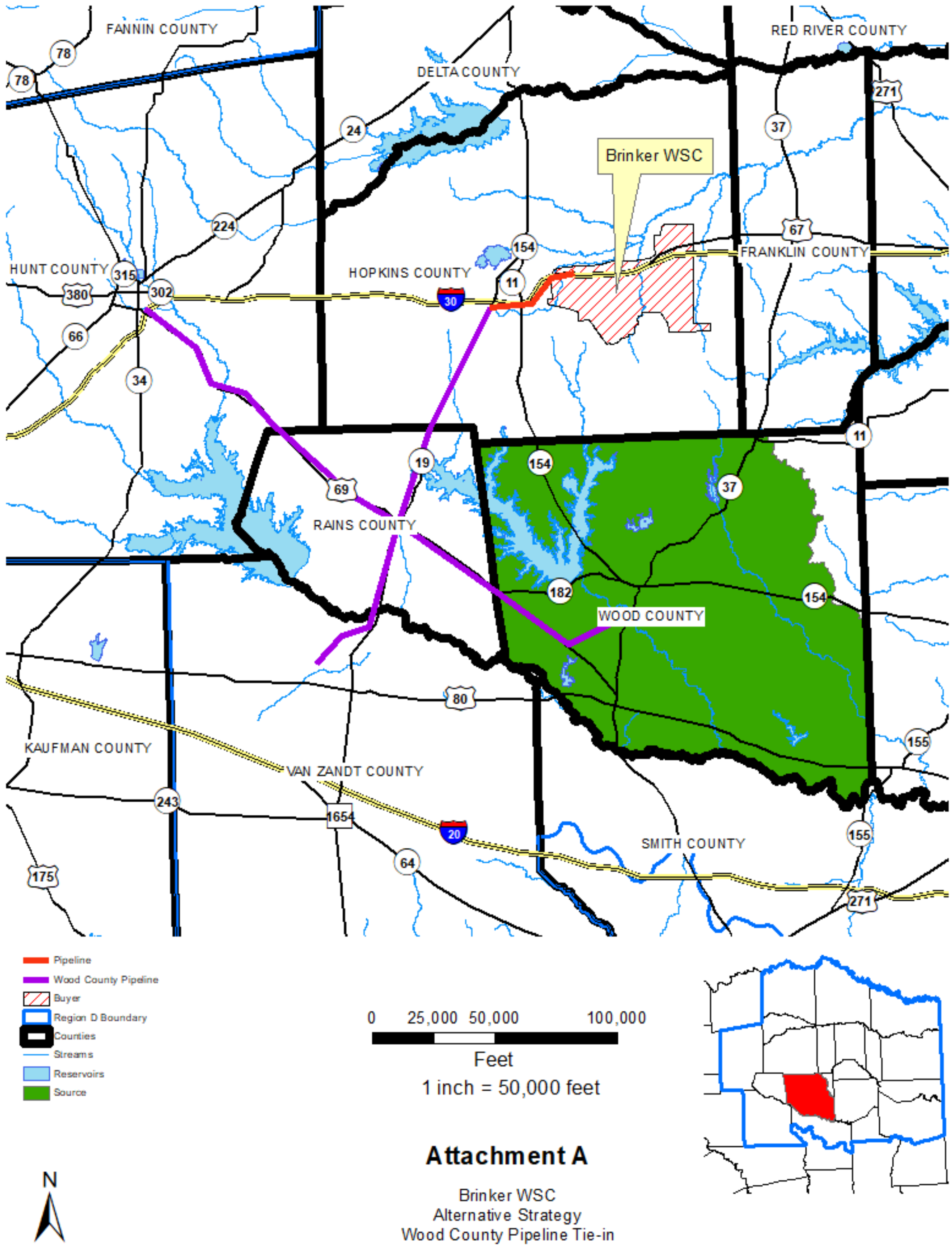
Cost Estimate Summary
Water Supply Project Option
September 2018 Prices

Brinker WSC - Drill New Wells (Hopkins, Carrizo-Wilcox Aquifer, Sulphur Basin)

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 201.9 for September 2018

Item	***Estimated Costs for Facilities***
Well Fields (Wells, Pumps, and Piping)	$946,000
Water Treatment Plant (0.2 MGD)	$32,000
TOTAL COST OF FACILITIES	**$978,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$342,000
Environmental & Archaeology Studies and Mitigation	$35,000
Land Acquisition and Surveying (4 acres)	$12,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$38,000
TOTAL COST OF PROJECT	**$1,405,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$99,000
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$9,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$19,000
Advanced Water Treatment Facility	$0
Pumping Energy Costs (69326 kW-hr @ 0.08 $/kW-hr)	$6,000
Purchase of Water (83 acft/yr @ 500 $/acft)	$42,000
TOTAL ANNUAL COST	**$175,000**
Available Project Yield (acft/yr)	83
Annual Cost of Water ($ per acft), based on PF=1	$2,108
Annual Cost of Water After Debt Service ($ per acft), based on PF=1	$916
Annual Cost of Water ($ per 1,000 gallons), based on PF=1	$6.47
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1	$2.81

JMP *9/30/2019*



Attachment A

Brinker WSC
Alternative Strategy
Wood County Pipeline Tie-in

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices

Brinker WSC - Wood County Pipeline Tie-in

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 201.9 for September 2018

Item	***Estimated Costs for Facilities***
Primary Pump Station (0.15 MGD)	$801,000
Transmission Pipeline (8 in dia., 7.5 miles)	$1,577,000
TOTAL COST OF FACILITIES	**$2,378,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$753,000
Environmental & Archaeology Studies and Mitigation	$213,000
Land Acquisition and Surveying (23 acres)	$127,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$96,000
TOTAL COST OF PROJECT	**$3,567,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$251,000
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$16,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$20,000
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (20964 kW-hr @ 0.08 $/kW-hr)	$2,000
Purchase of Water (83 acft/yr @ 1442 $/acft)	$120,000
TOTAL ANNUAL COST	**$409,000**
Available Project Yield (acft/yr)	83
Annual Cost of Water ($ per acft), based on PF=2	$4,928
Annual Cost of Water After Debt Service ($ per acft), based on PF=2	$1,904
Annual Cost of Water ($ per 1,000 gallons), based on PF=2	$15.12
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=2	$5.84

JMP *10/6/2019*

EVALUATION OF ALTERNATIVE WATER MANAGEMENT STRATEGIES FOR MEETING THE PROJECTED WATER SUPPLY NEEDS OF CITY OF CUMBY

Description of Water User Group:

The City of Cumby provides water service in Hopkins County. It is projected that the users in the WUG will have a shortage in 2020. The WUG population is projected to be 1,044 by 2020 and increases to 1,755 by 2070. The City of Cumby utilizes groundwater from the Nacatoch aquifer through 4 wells with a combined production capacity of 223 gpm. The City of Cumby is projected to have a deficit of 13 ac-ft in 2020 and increasing to a deficit of 88 ac-ft by 2070.

Water Supply and Demand Analysis:

	2020	2030	2040	2050	2060	2070
Population	1,044	1,212	1,363	1,496	1,660	1,755
Projected Water Demand	133	149	164	178	197	208
Water Demand from other entities	0	0	0	0	0	0
Current Water Supply	120	120	120	120	120	120
Projected Supply Surplus (+) / Deficit (-)	**-13**	**-29**	**-44**	**-58**	**-77**	**-88**

Projected Supply Surplus (+) / Deficit (-) by Basin	2020	2030	2040	2050	2060	2070
Sabine	-13	-27	-41	-54	-71	-81
Sulphur	0	-2	-3	-4	-6	-7
Total	**-13**	**-29**	**-44**	**-58**	**-77**	**-88**

Evaluation of Potentially Feasible Water Management Strategies:

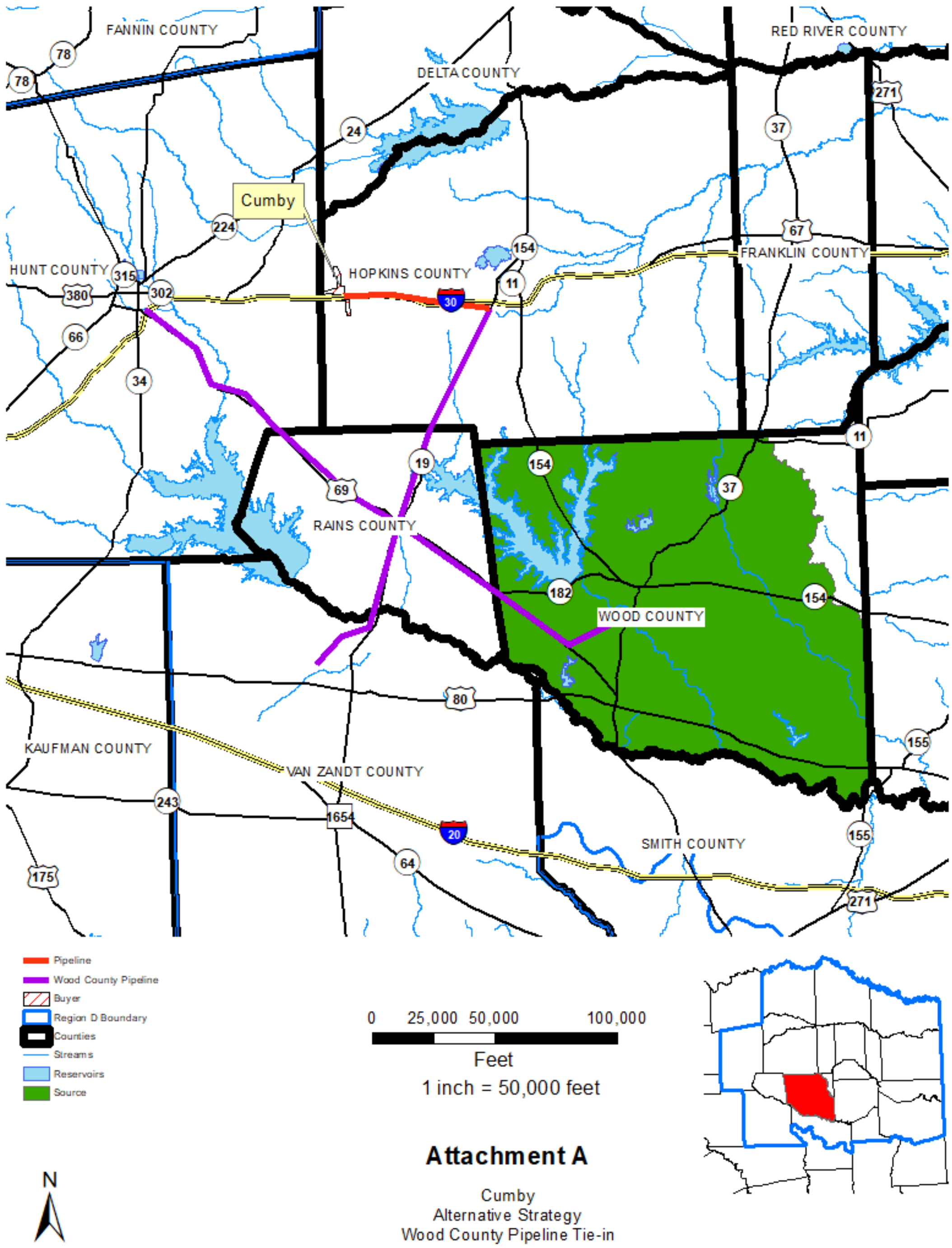
There were five alternative strategies considered to meet the WSC's water supply shortages as summarized in the table below. Advanced conservation was not selected because the per capita use per day was less than the 140 gpcd threshold set by the water planning group. Reuse is not a feasible option because water supply is mainly used for public consumption. The system is not presently large enough to treat surface water in a cost-effective manner. Additional groundwater from the Nacatoch Aquifer has been considered as a potential water management strategy. A potential regionalization strategy considered is the Wood County Pipeline where in the city could construct an eleven (11) mile long 8-inch diameter waterline that ties into a branch of the Wood County Pipeline near Sulphur Springs .

Strategy	Firm Yield (ac-ft)	Total Capital Cost	Total Annualiz ed Cost	Unit Cost	Environmental Impact
Drill New Wells (Nacatoch Aquifer, Sabine Basin, Hopkins County)	**88**	**$938,000**	**$142,000**	**$1,614**	**1**
Wood County Pipeline Tie-in	**88**	**$4,809,000**	**$511,000**	**$5,807**	**2**

Identified Alternative WMS and WMSP:

	2020	2030	2040	2050	2060	2070
Wood County Pipeline Tie-in	13	29	44	58	77	88

The identified Alternative Water Management Strategy for the City of Cumby to meet their projected deficit of 13 ac-ft/yr in 2020 and 88 ac-ft/yr in 2070 is the Wood County Pipeline Strategy, of which an Alternative Water Management Strategy Project is for the City to construct an eleven (11) mile long 8-inch diameter waterline that ties into a branch of the Wood County Pipeline near Sulphur Springs. This alternative strategy is contingent upon the development of a regionalized groundwater well field and conveyance pipeline in Wood County.



Cost Estimate Summary
Water Supply Project Option
September 2018 Prices
Cumby - Wood County Pipeline Tie-in

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 201.9 for September 2018

Item	*Estimated Costs for Facilities*
Primary Pump Station (0.16 MGD)	$809,000
Transmission Pipeline (8 in dia., 11.4 miles)	$2,385,000
TOTAL COST OF FACILITIES	**$3,194,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$998,000
Environmental & Archaeology Studies and Mitigation	$310,000
Land Acquisition and Surveying (33 acres)	$178,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$129,000
TOTAL COST OF PROJECT	**$4,809,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$338,000
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$24,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$20,000
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (21889 kW-hr @ 0.08 $/kW-hr)	$2,000
Purchase of Water (88 acft/yr @ 1442 $/acft)	$127,000
TOTAL ANNUAL COST	**$511,000**
Available Project Yield (acft/yr)	88
Annual Cost of Water ($ per acft), based on PF=2	$5,807
Annual Cost of Water After Debt Service ($ per acft), based on PF=2	$1,966
Annual Cost of Water ($ per 1,000 gallons), based on PF=2	$17.82
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=2	$6.03

JMP *10/6/2019*

EVALUATION OF ALTERNATIVE WATER MANAGEMENT STRATEGIES FOR MEETING THE PROJECTED WATER SUPPLY NEEDS OF IRRIGATION IN HOPKINS COUNTY

Description of Water User Group:

The Irrigation WUG in Hopkins County has a demand that is projected to remain constant at 4,769 ac-ft/yr for the planning period. The Irrigation WUG in Hopkins County is supplied by groundwater from the Carrizo-Wilcox Aquifer and run-of-river diversions from the Sabine and Sulphur Rivers. A deficit of 4,627 ac-ft/yr is projected to occur throughout the planning period.

Water Supply and Demand Analysis:

	2020	2030	2040	2050	2060	2070
Projected Water Demand	4,769	4,769	4,769	4,769	4,769	4,769
Current Water Supply	144	144	144	144	144	144
Projected Supply Surplus (+)/Deficit(-)	**-4,627**	**-4,627**	**-4,627**	**-4,627**	**-4,627**	**-4,627**

Projected Supply Surplus (+)/Deficit(-) by Basin	2020	2030	2040	2050	2060	2070
Sabine	2	2	2	2	2	2
Sulphur	-4,627	-4,627	-4,627	-4,627	-4,627	-4,627
Cypress	0	0	0	0	0	0
Total	**-4,625**	**-4,625**	**-4,625**	**-4,625**	**-4,625**	**-4,625**

Evaluation of Potentially Feasible Water Management Strategies:

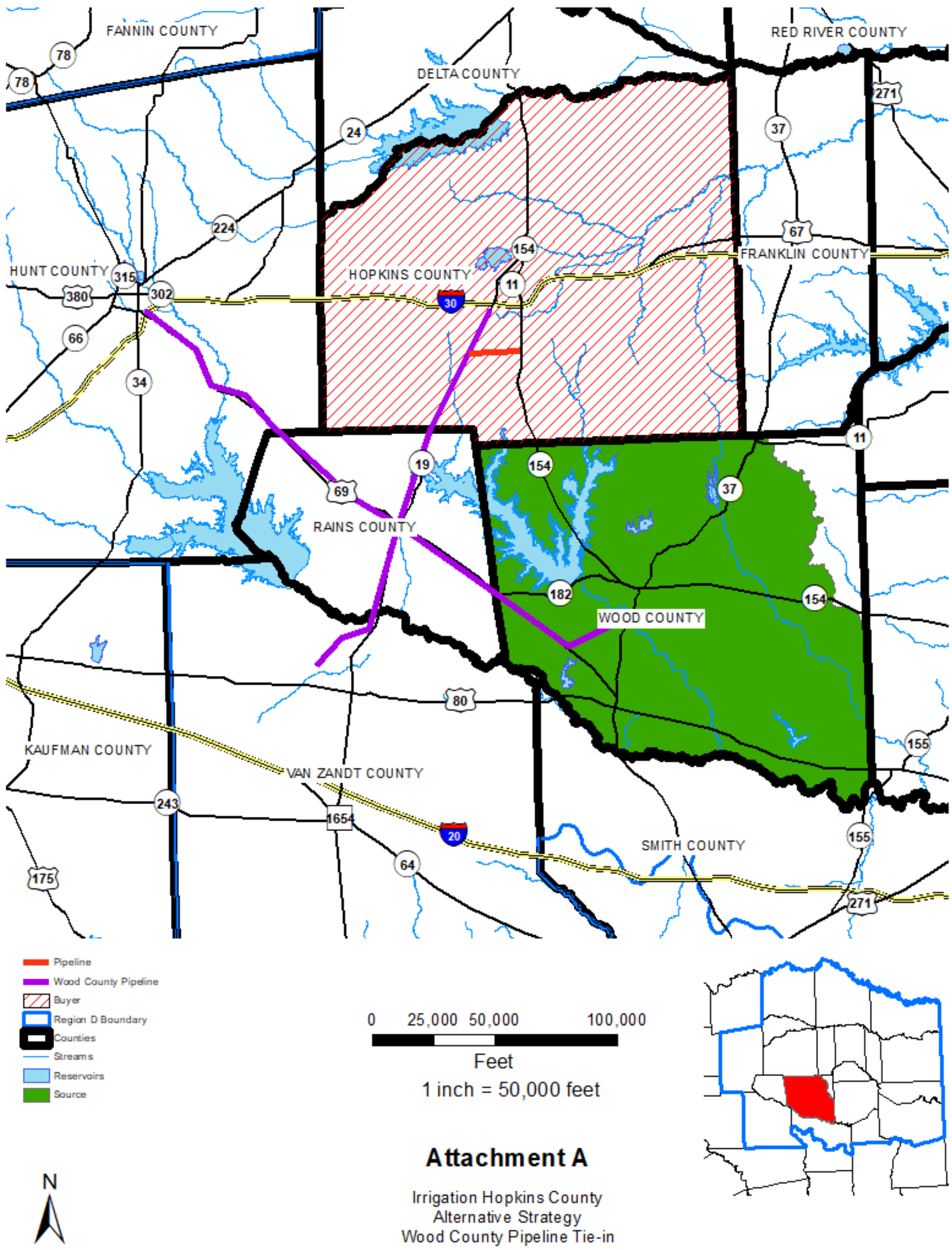
Three alternative strategies were considered to meet the projected shortages for Hopkins County Irrigation. Advanced water conservation for irrigation practices was not considered, as present irrigation practices likely already incorporate many BMPs to extend water supplies, thus no additional conservation would be feasible. The use of reuse water from nearby municipalities is not considered feasible as it would not be effective to deliver reuse water to the distributed farm irrigation systems. Groundwater from the Carrizo-Wilcox and Nacatoch aquifers has been identified as a potential source of water for irrigation in Hopkins County. The construction of a pipeline to convey raw surface water from Sulphur Springs Lake purchased via the City of Sulphur Springs was also considered as a potential alternative to meet projected demands. A potential regionalization strategy that was considered is the Wood County Pipeline which the WUG could tie-in to a branch of the Wood County Pipeline routed toward Sulphur Springs, Tx.

Strategy	Strategy Yield (AF)	Total Capital Cost	Total Annualize d Cost	Unit Cost	Environmental Impact
Drill New Wells (Carrizo-Wilcox, Sabine Basin)	**931**	**$2,814,000**	**$748,000**	**$803**	**1**
Drill New Wells (Carrizo-Wilcox, Sulphur Basin)	**4,627**	**$10,927,000**	**$3,511,000**	**$759**	**1**
Sulphur Springs Raw Water Pipeline	**4,627**	**$38,392,000**	**$9,039,000**	**$1,954**	**2**
Wood County Pipeline Tie-in	**4,627**	**$13,522,000**	**$7,181,000**	**$1,552**	**2**

Identified Alternative WMS and WMSP:

	2020	2030	2040	2050	2060	2070
Wood County Pipeline Tie-in	**4,627**	**4,627**	**4,627**	**4,627**	**4,627**	**4,627**

The identified Alternative Water Management Strategy for the Hopkins County Irrigation WUG to meet their projected deficit of 4,627 ac-ft/yr is the Wood County Pipeline Strategy, of which an Alternative Water Management Strategy Project is to construct a 24" diameter tie-in to the 30" transmission line of the Wood County Pipeline routed toward Sulphur Springs, Tx. This alternative strategy is contingent upon the regionalized development of a groundwater well field in Wood County and a conveyance pipeline from Wood County to Hopkins County.



Attachment A

Irrigation Hopkins County
Alternative Strategy
Wood County Pipeline Tie-in

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices

Hopkins County Irrigation - Wood County Pipeline Tie-in

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 201.9 for September 2018

Item	***Estimated Costs for Facilities***
Primary Pump Station (8.26 MGD)	$3,577,000
Transmission Pipeline (24 in dia., 7.6 miles)	$6,146,000
TOTAL COST OF FACILITIES	**$9,723,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$3,096,000
Environmental & Archaeology Studies and Mitigation	$214,000
Land Acquisition and Surveying (23 acres)	$127,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$362,000
TOTAL COST OF PROJECT	**$13,522,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$951,000
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$61,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$89,000
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (1336827 kW-hr @ 0.08 $/kW-hr)	$107,000
Purchase of Water (4627 acft/yr @ 1291 $/acft)	$5,973,000
TOTAL ANNUAL COST	**$7,181,000**
Available Project Yield (acft/yr)	4,627
Annual Cost of Water ($ per acft), based on PF=2	$1,552
Annual Cost of Water After Debt Service ($ per acft), based on PF=2	$1,346
Annual Cost of Water ($ per 1,000 gallons), based on PF=2	$4.76
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=2	$4.13

JMP *10/6/2019*

EVALUATION OF ALTERNATIVE WATER MANAGEMENT STRATEGIES FOR MEETING THE PROJECTED WATER SUPPLY NEEDS OF LIVESTOCK IN HOPKINS COUNTY

Description of Water User Group:

The Livestock WUG in Hopkins County has a demand that is projected to remain constant at 5,498 ac-ft/yr for the planning period. The Livestock WUG in Hopkins County is supplied by groundwater from the Carrizo-Wilcox and Nacatoch Aquifers, livestock local supplies from the Cypress, Sulphur, and Sabine basins and surface water purchased from Sulphur Springs. A deficit of 1,068 ac-ft/yr is projected to occur in 2020 increasing to 1,219 ac-ft/yr by 2070 in the Sulphur basin. In both the Cypress and Sabine basins a surplus of 424 ac-ft/yr is projected by 2020 increasing to 577 ac-ft/yr by 2070.

Water Supply and Demand Analysis:

	2020	2030	2040	2050	2060	2070
Projected Water Demand	5,498	5,498	5,498	5,498	5,498	5,498
Current Water Supply	4,854	4,854	4,854	4,854	4,855	4,856
Projected Supply Surplus (+)/Deficit(-)	**-644**	**-644**	**-644**	**-644**	**-643**	**-642**

Projected Supply Surplus (+)/Deficit(-) by Basin	2020	2030	2040	2050	2060	2070
Sabine	366	387	433	436	486	508
Sulphur	-1,068	-1,090	-1,140	-1,143	-1,196	-1,219
Cypress	58	59	63	63	67	69
Total	**-644**	**-644**	**-644**	**-644**	**-643**	**-642**

Evaluation of Potentially Feasible Water Management Strategies:

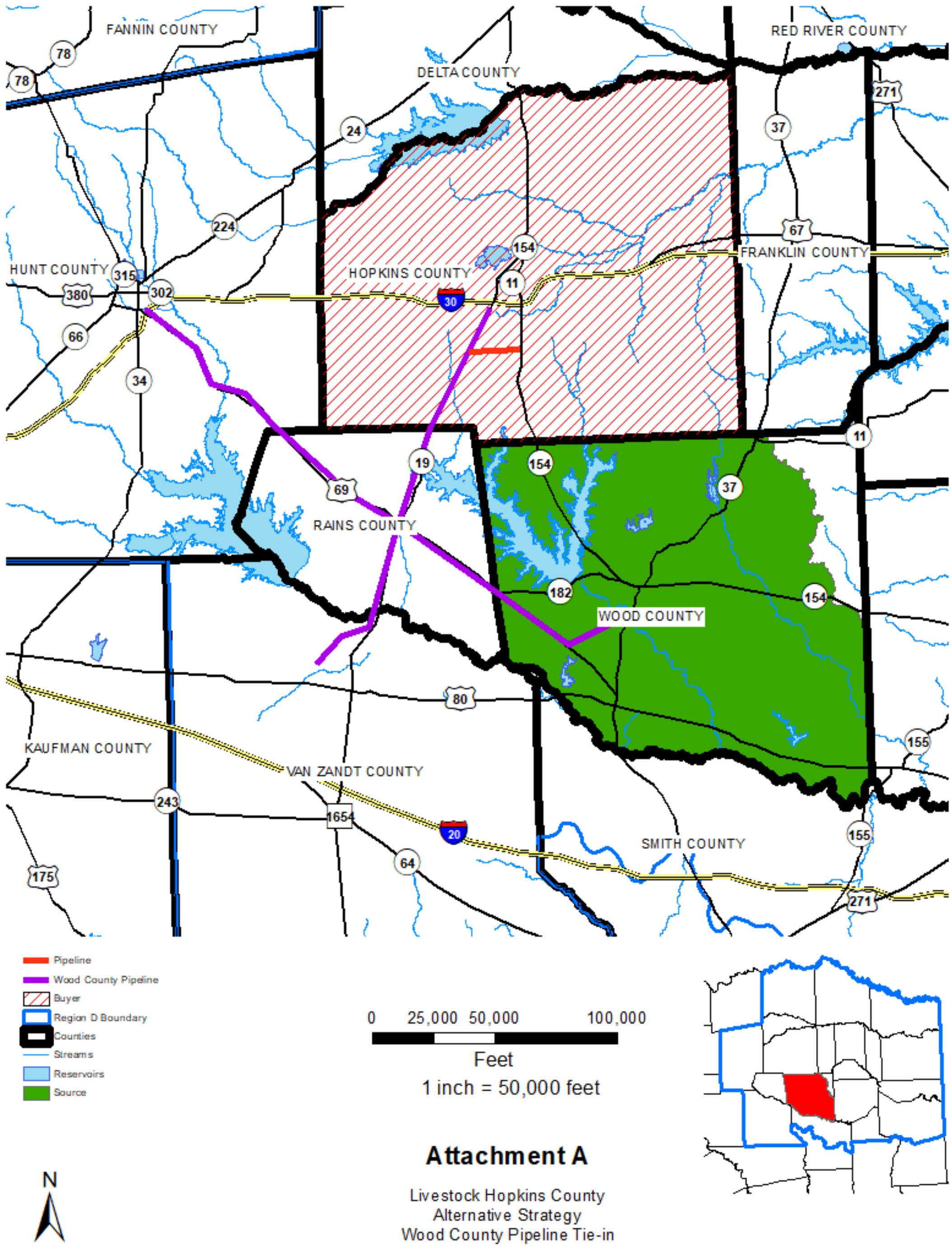
Eight alternative strategies were considered to meet the projected shortages for Hopkins County Livestock. Advanced water conservation for livestock practices was not considered, as present livestock practices likely result in sale of the livestock to reduce demand and extend water supply. The use of reuse water is not considered feasible as there is no centralized water supply. Groundwater from the Carrizo-Wilcox and Nacatoch aquifers has been identified as a potential source of water for irrigation in Hopkins County; however, the total needs exceed the availability of groundwater in the Nacatoch Aquifer based on the modeled available groundwater (MAG) estimates. Increasing the existing contract with the City of Sulphur Springs was also considered as a potential alternative to meet projected demands. A potential regionalization strategy that was considered is the Wood County Pipeline which the WUG could tie-in to a branch of the Wood County Pipeline routed toward Sulphur Springs, Tx.

Strategy	Strategy Yield (AF)	Total Capital Cost	Total Annualized Cost	Unit Cost	Environmental Impact
Drill New Wells (Carrizo-Wilcox, Sulphur Basin)	**1,219**	**$6,373,000**	**$1,198,000**	**$983**	**1**
Increase Contract w/ Sulphur Springs	**1,219**	**$0**	**$1,434,000**	**$1,176**	**1**
Wood County Pipeline Tie-in	**1,219**	**$8,273,000**	**$2,464,000**	**$2,021**	**2**

Identified Alternative WMS and WMSP:

	2020	2030	2040	2050	2060	2070
Wood County Pipeline Tie-in	**1,068**	**1,090**	**1,140**	**1,143**	**1,196**	**1,219**

The identified Alternative Water Management Strategy for the Hopkins County Livestock WUG to meet their projected deficit of 1,219 ac-ft/yr is the Wood County Pipeline Strategy, of which an Alternative Water Management Strategy Project is to construct a 12" diameter tie-in pipeline to the 30" transmission line of the Wood County Pipeline routed toward the City of Sulphur Springs. This alternative strategy is contingent upon the regionalized development of a groundwater well field in Wood County and a conveyance pipeline from Wood County to Hopkins County.



Attachment A

Livestock Hopkins County
Alternative Strategy
Wood County Pipeline Tie-in

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices

Hopkins County Livestock - Wood County Pipeline Tie-in

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 201.9 for September 2018

Item	*Estimated Costs for Facilities*
Primary Pump Station (2.18 MGD)	$1,067,000
Transmission Pipeline (12 in dia., 7.6 miles)	$2,725,000
Transmission Pump Station(s) & Storage Tank(s)	$2,020,000
TOTAL COST OF FACILITIES	**$5,812,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$1,898,000
Environmental & Archaeology Studies and Mitigation	$214,000
Land Acquisition and Surveying (23 acres)	$127,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$222,000
TOTAL COST OF PROJECT	**$8,273,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$582,000
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$37,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$53,000
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (426528 kW-hr @ 0.08 $/kW-hr)	$34,000
Purchase of Water (1219 acft/yr @ 1442 $/acft)	$1,758,000
TOTAL ANNUAL COST	**$2,464,000**
Available Project Yield (acft/yr)	1,219
Annual Cost of Water ($ per acft), based on PF=2	$2,021
Annual Cost of Water After Debt Service ($ per acft), based on PF=2	$1,544
Annual Cost of Water ($ per 1,000 gallons), based on PF=2	$6.20
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=2	$4.74

JMP *10/6/2019*

EVALUATION OF WATER MANAGEMENT STRATEGIES FOR MEETING THE PROJECTED WATER SUPPLY NEEDS OF MARTIN SPRINGS WATER SUPPLY CORPORATION

Description of Water User Group:

Martin Springs WSC provides water service in Hopkins County. It is projected that the users in the WUG will have a shortage in 2070. The WUG population is projected to be 3,502 by 2020 and increases to 6,214 by 2070. Martin Springs WSC utilizes groundwater from the Carrizo-Wilcox aquifer and has a contract with the City of Sulphur Springs for surface water supply from Lake Chapman. Martin Springs WSC is projected to have a deficit of 29 ac-ft in 2070.

Water Supply and Demand Analysis:

	2020	2030	2040	2050	2060	2070
Population	3,502	4,097	4,641	5,130	5,715	6,214
Projected Water Demand	424	478	529	578	642	698
Water Demand from other entities	0	0	0	0	0	0
Current Water Supply	668	667	666	668	669	669
Projected Supply Surplus (+) / Deficit (-)	**244**	**189**	**137**	**90**	**27**	**-29**

Projected Supply Surplus (+) / Deficit (-) by Basin	2020	2030	2040	2050	2060	2070
Sabine	204	158	113	75	22	-27
Sulphur	40	31	24	15	5	-2
Total	**244**	**189**	**137**	**90**	**27**	**-29**

Evaluation of Potentially Feasible Water Management Strategies:

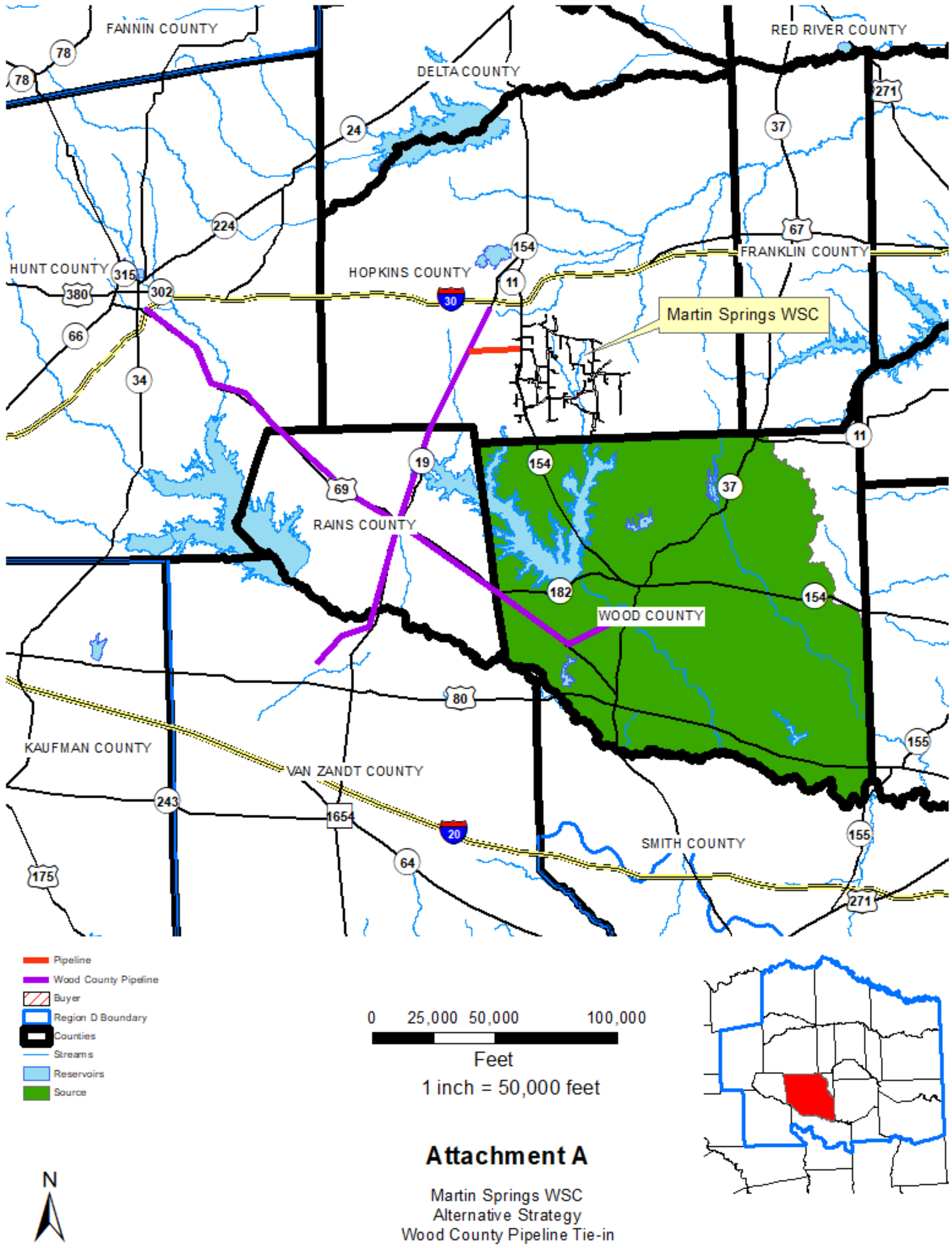
Six alternative strategies were considered to meet the WSC's water supply shortages as summarized in the table below. Advanced conservation was not selected because the per capita use per day was less than the 140 gpcd threshold set by the water planning group. Reuse is not a feasible option because water supply is mainly used for public consumption. Additional use of groundwater has been identified as a potential source of water for Martin Springs WSC in Hopkins County. A potential regionalization strategy that was considered is the Wood County Pipeline. Increasing the existing contract with Sulphur Springs was identified and considered as a potentially feasible strategy.

Strategy	Firm Yield (ac-ft)	Total Capital Cost	Total Annualized Cost	Unit Cost	Env. Impact
Drill New Wells (Carrizo-Wilcox Aquifer, Sulphur Basin)	**29**	**$360,000**	**$55,000**	**$1,897**	**1**
Increase Existing Contract w/ Sulphur Springs	**29**	**$0**	**$34,000**	**$1,172**	**1**
Wood County Pipeline Tie-in	**29**	**$1,574,000**	**$166,000**	**$5,724**	**2**

Identified Alternative WMS and WMSP:

	2020	2030	2040	2050	2060	2070
Wood County Pipeline Tie-in	**0**	**0**	**0**	**0**	**0**	**29**

The identified Alternative Water Management Strategy for Martin Springs WSC to meet their projected deficit of 29 ac-ft/yr by 2070 is the Wood County Pipeline Strategy, of which an Alternative Water Management Strategy Project is to construct an 8" tie-in pipeline to the Hopkins County branch of the Wood County Pipeline. This alternative strategy is contingent upon the regionalized development of a groundwater well field in Wood County and a conveyance pipeline from Wood County to Hopkins County.



Attachment A

Martin Springs WSC
Alternative Strategy
Wood County Pipeline Tie-in

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices

Martin Springs WSC - Wood County Pipeline

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 201.9 for September 2018

Item	***Estimated Costs for Facilities***
Primary Pump Station (0.05 MGD)	$182,000
Transmission Pipeline (8 in dia., 4 miles)	$832,000
TOTAL COST OF FACILITIES	**$1,014,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$313,000
Environmental & Archaeology Studies and Mitigation	$124,000
Land Acquisition and Surveying (15 acres)	$80,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$43,000
TOTAL COST OF PROJECT	**$1,574,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$111,000
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$8,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$5,000
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (2949 kW-hr @ 0.08 $/kW-hr)	$0
Purchase of Water (29 acft/yr @ 1442 $/acft)	$42,000
TOTAL ANNUAL COST	**$166,000**
Available Project Yield (acft/yr)	29
Annual Cost of Water ($ per acft), based on PF=2	$5,724
Annual Cost of Water After Debt Service ($ per acft), based on PF=2	$1,897
Annual Cost of Water ($ per 1,000 gallons), based on PF=2	$17.56
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=2	$5.82

JMP *10/6/2019*

EVALUATION OF WATER MANAGEMENT STRATEGIES FOR MEETING THE PROJECTED WATER SUPPLY NEEDS OF MILLER GROVE WATER SUPPLY CORPORATION

Description of Water User Group:

Miller Grove WSC provides water service in Hopkins County. It is projected that the users in the WUG will have a shortage in 2020. The WUG population is projected to be 1,451 by 2020 and increases to 1,896 by 2070. Miller Grove WSC utilizes groundwater from the Carrizo-Wilcox aquifer. Miller Grove WSC is projected to have a deficit of 8 ac-ft by 2020 increasing to 52 ac-ft by 2070.

Water Supply and Demand Analysis:

	2020	2030	2040	2050	2060	2070
Population	1,451	1,559	1,649	1,706	1,802	1,896
Projected Water Demand	200	208	215	221	232	244
Water Demand from other entities	0	0	0	0	0	0
Current Water Supply	192	192	192	192	192	192
Projected Supply Surplus (+) / Deficit (-)	**-8**	**-16**	**-23**	**-29**	**-40**	**-52**

Evaluation of Potentially Feasible Water Management Strategies:

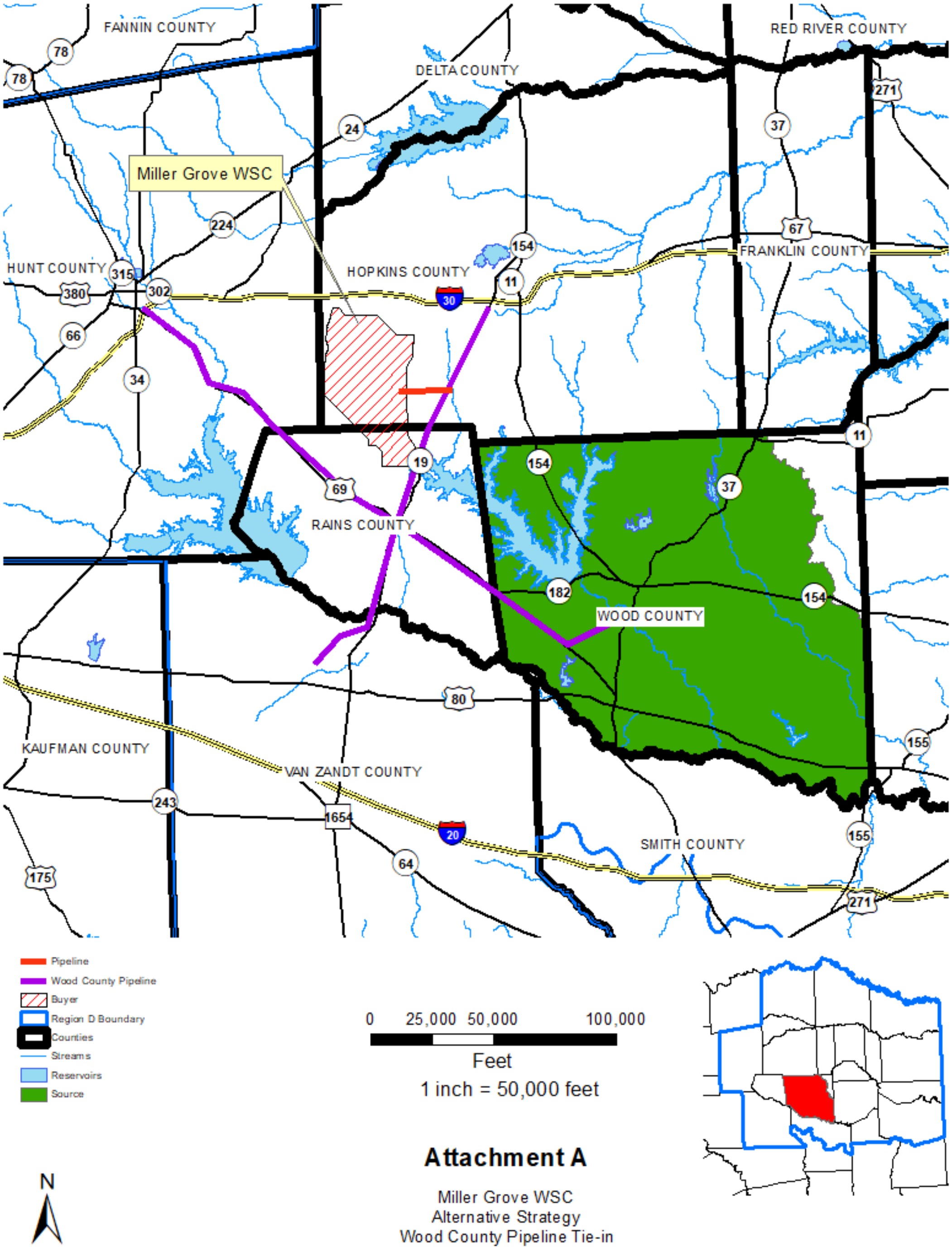
Five alternative strategies were considered to meet the WSC's water supply shortages as summarized in the table below. Advanced conservation was not selected because the per capita use per day was less than the 140 gpcd threshold set by the water planning group. Reuse is not a feasible option because water supply is mainly used for public consumption. Additional use of groundwater has been identified as a potential source of water the WSC. Purchase of surface water from Chapman Lake under contract from Sulphur Springs was also considered. A potential regionalization strategy that was considered is the Wood County Pipeline.

Strategy	Firm Yield (ac-ft)	Total Capital Cost	Total Annualized Cost	Unit Cost	Env. Impact
Drill New Wells (Carrizo-Wilcox Aquifer, Sulphur Basin)	**52**	**$886,000**	**$113,000**	**$2,173**	**1**
New Contract (Chapman, Sulphur Springs)	**52**	**$2,319,000**	**$242,000**	**$4,654**	**1**
Wood County Pipeline Tie-in	**52**	**$1,587,000**	**$200,000**	**$3,846**	**2**

Identified Alternative WMS and WMSP:

	2020	2030	2040	2050	2060	2070
Wood County Pipeline Tie-in	**8**	**16**	**23**	**29**	**40**	**52**

The identified Alternative Water Management Strategy for Miller Grove WSC to meet their projected deficit of 8 ac-ft/yr in 2020 and 52 ac-ft/yr in 2070 is the Wood County Pipeline Strategy, of which an Alternative Water Management Strategy Project is to construct an 8" raw water pipeline to tie into the Hopkins County Branch of the Wood County Pipeline. This alternative strategy is contingent upon the regionalized development of a groundwater well field in Wood County and a conveyance pipeline from Wood County to Hopkins County.



Attachment A

Miller Grove WSC
Alternative Strategy
Wood County Pipeline Tie-in

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices

Miller Grove WSC - Wood County Pipeline

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 201.9 for September 2018

Item	*Estimated Costs for Facilities*
Primary Pump Station (0.09 MGD)	$159,000
Transmission Pipeline (8 in dia., 4.1 miles)	$861,000
TOTAL COST OF FACILITIES	**$1,020,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$314,000
Environmental & Archaeology Studies and Mitigation	$128,000
Land Acquisition and Surveying (15 acres)	$82,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$43,000
TOTAL COST OF PROJECT	**$1,587,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$112,000
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$9,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$4,000
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (2288 kW-hr @ 0.08 $/kW-hr)	$0
Purchase of Water (52 acft/yr @ 1442 $/acft)	$75,000
TOTAL ANNUAL COST	**$200,000**
Available Project Yield (acft/yr)	52
Annual Cost of Water ($ per acft), based on PF=2	$3,846
Annual Cost of Water After Debt Service ($ per acft), based on PF=2	$1,692
Annual Cost of Water ($ per 1,000 gallons), based on PF=2	$11.80
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=2	$5.19

JMP *10/6/2019*

EVALUATION OF WATER MANAGEMENT STRATEGIES FOR MEETING THE PROJECTED WATER SUPPLY NEEDS OF MINING IN HOPKINS COUNTY

Description of Water User Group:

Mining in Hopkins County has a demand that is projected to increase from 1,031 ac-ft/yr in 2020 to 1,577 ac-ft/yr in 2070. This WUG is projected to be supplied by groundwater from Nacatoch Aquifer and a nominal amount of surface water purchased from Sulphur Springs for potable use. A deficit of 227 ac-ft/yr is projected to occur in 2020 and increase to 639 ac-ft/yr by 2070.

Water Supply and Demand Analysis:

	2020	2030	2040	2050	2060	2070
Projected Water Demand	1,031	1,124	1,222	1,329	1,446	1,577
Current Water Supply	804	841	862	885	913	938
Projected Supply Surplus (+)/Deficit(-)	**-227**	**-283**	**-360**	**-444**	**-533**	**-639**

Projected Supply Surplus (+)/Deficit(-) by Basin	2020	2030	2040	2050	2060	2070
Sulphur	-149	-186	-236	-293	-352	-422
Sabine	-71	-89	-112	-138	-166	-198
Cypress	-7	-8	-12	-13	-15	-19
Total	**-227**	**-283**	**-360**	**-444**	**-533**	**-639**

Evaluation of Potentially Feasible Water Management Strategies:

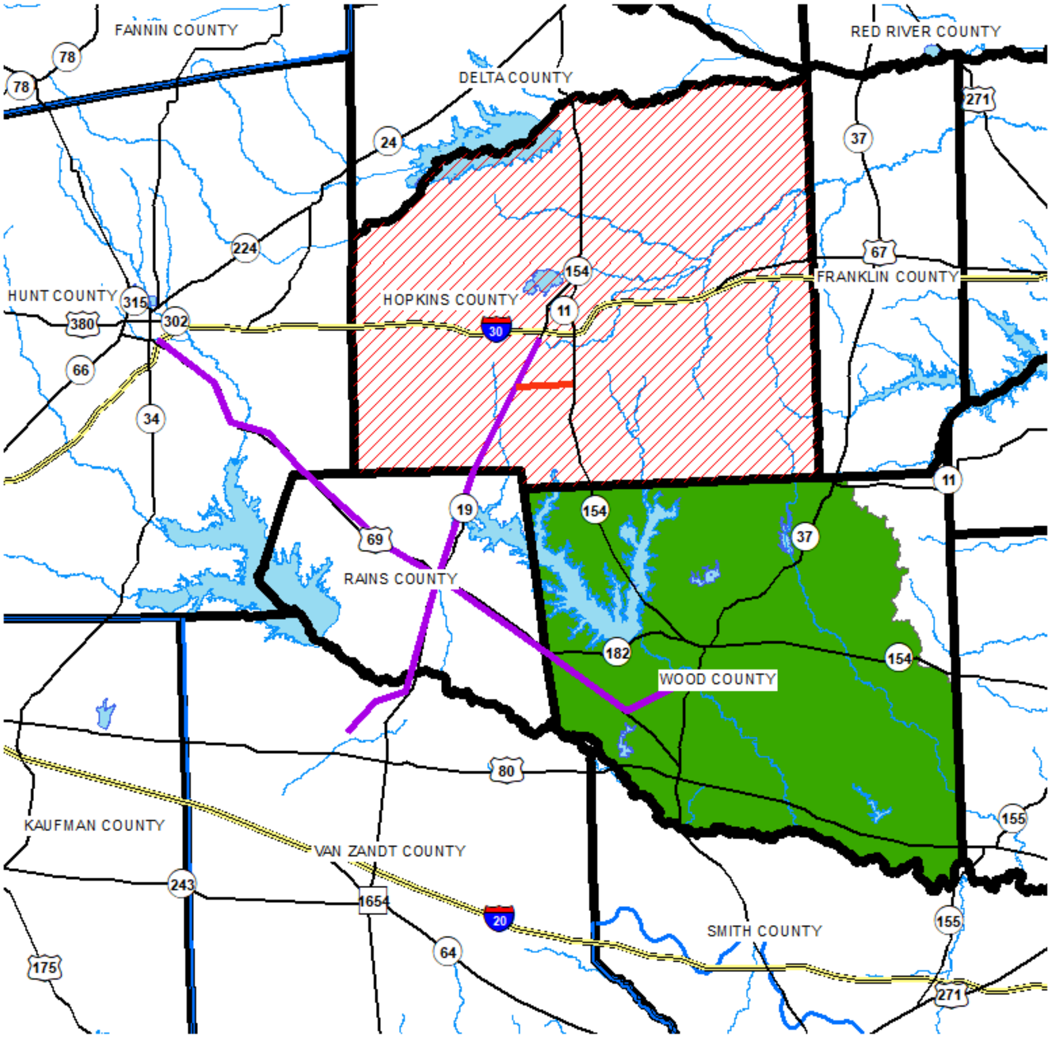
Advanced water conservation for mining practices was not considered, as present operations of the facilities are not available. The use of reuse water from nearby municipalities was not considered feasible as it would not be effective to deliver reuse water to the mining locations. Since the projected demands for mining in Hopkins County are primarily due to overburden dewatering, it was assumed that projected needs would likely be met by additional groundwater pumping. Increasing the existing contract from Sulphur Springs could provide additional supply. Additionally, the Wood County Pipeline regional strategy was evaluated as a feasible supply source.

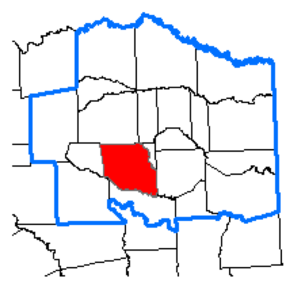
Strategy	Firm Yield (ac-ft)	Total Capital Cost	Total Annualized Cost	Unit Cost	Env. Impact
Drill New Wells (Carrizo-Wilcox Aquifer, Sulphur Basin)	639	$3,376,000	$628,000	$983	1
Increase Existing Contract from Sulphur Springs	639	$0	$751,000	$1,175	1
Wood County Pipeline Tie-in	639	$5,367,000	$1,365,000	$2,136	2

Identified Alternative WMS and WMSP:

	2020	2030	2040	2050	2060	2070
Wood County Pipeline Tie-in	**227**	**283**	**360**	**444**	**533**	**639**

The identified Alternative Water Management Strategy for the Hopkins County Mining to meet their projected deficit of up to 639 ac-ft/yr is the Wood County Pipeline Strategy, of which an Alternative Water Management Strategy Project is to construct a 12" raw water line to tie into the Hopkins County Branch of the Wood County Pipeline. This alternative strategy is contingent upon the regionalized development of a groundwater well field in Wood County and a conveyance pipeline from Wood County to Hopkins County.





Attachment A

Mining Hopkins County
Alternative Strategy
Wood County Pipeline Tie-in

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices

Hopkins County Mining - Wood County Pipeline Tie-in

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 201.9 for September 2018

Item	***Estimated Costs for Facilities***
Primary Pump Station (1.14 MGD)	$992,000
Transmission Pipeline (12 in dia., 7.6 miles)	$2,725,000
TOTAL COST OF FACILITIES	**$3,717,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$1,165,000
Environmental & Archaeology Studies and Mitigation	$214,000
Land Acquisition and Surveying (23 acres)	$127,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$144,000
TOTAL COST OF PROJECT	**$5,367,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$378,000
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$27,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$25,000
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (177940 kW-hr @ 0.08 $/kW-hr)	$14,000
Purchase of Water (639 acft/yr @ 1442 $/acft)	$921,000
TOTAL ANNUAL COST	**$1,365,000**
Available Project Yield (acft/yr)	639
Annual Cost of Water ($ per acft), based on PF=2	$2,136
Annual Cost of Water After Debt Service ($ per acft), based on PF=2	$1,545
Annual Cost of Water ($ per 1,000 gallons), based on PF=2	$6.55
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=2	$4.74

JMP *10/6/2019*

REGION D
EVALUATIONS OF ALTERNATIVE WATER MANAGEMENT STRATEGIES
FOR MEETING PROJECTED WATER SUPPLY NEEDS
TO YEAR 2070

HUNT COUNTY

WUGs:

B H P WSC
Caddo Basin SUD
Caddo Mills
Cash SUD
The City of Celeste
Hunt County-Other
The City of Greenville
Hickory Creek SUD
Hunt County Mining
North Hunt SUD
Poetry WSC
The City of Wolfe City

EVALUATION OF WATER MANAGEMENT STRATEGIES FOR MEETING THE PROJECTED WATER SUPPLY NEEDS OF B H P WATER SUPPLY CORPORATION IN HUNT COUNTY

Description of Water User Group:

B H P WSC provides water service in western Hunt County, southeastern Colin County and northeastern Rockwall County. The WUG population is projected to be 5,233 people in 2020 and 18,110 by the year 2070. The water supply for this WSC is treated surface water purchased from Royse City, the source of whose supplies derive from the NTMWD system (i.e., indirect reuse via Lake Lavon and the NTMWD reservoir system) and the Sabine River Authority's system (i.e., Lake Fork and Lake Tawakoni). The WSC is projected to have a deficit of 72 ac-ft/yr in 2030 increasing to a deficit of 505 ac-ft/yr by 2070.

Water Supply and Demand Analysis:

	2020	2030	2040	2050	2060	2070
Population	5,233	6,647	8,426	10,583	13,664	18,110
Projected Water Demand	391	467	571	711	918	1,216
Water Demand from other entities	0	0	0	0	0	0
Current Water Supply	391	395	446	502	585	711
Projected Supply Surplus (+) / Deficit (-)	**0**	**-72**	**-125**	**-209**	**-333**	**-505**

Evaluation of Potentially Feasible Water Management Strategies:

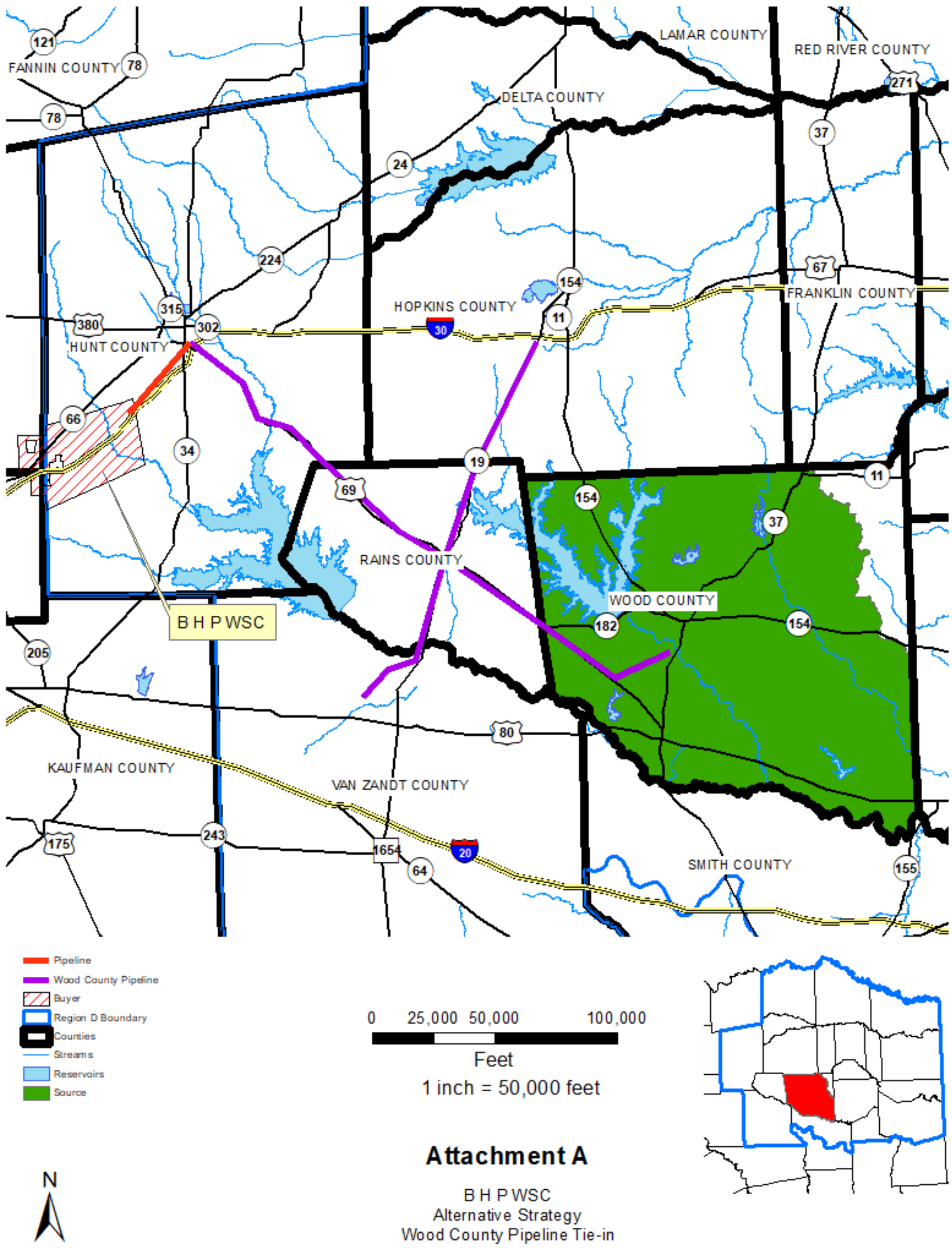
Multiple alternative strategies considered to meet B H P WSC's water supply shortages are listed in the table below. Advanced conservation was not selected because the per capita use per day was less than the 140 gpcd threshold set by the water planning group; however, coordination with the Region C Planning Group indicates that conservation is a potential strategy for that portion of the WSC within the Region C planning area, thus conservation amounts identified by the Region C Planning Group have been incorporated herein for this WUG. Reuse is not a feasible option because water supply is mainly used for public consumption. Potentially feasible strategies include increase of the existing contract with Royse City, or alternatively establishing a new water supply contract with North Texas Municipal Water District. Another potentially feasible strategy is the Wood County Pipeline which could supply groundwater from Wood County. Groundwater use from the portion of the Nacatoch Aquifer located in the Sabine River Basin in Hunt County was also evaluated as a potentially feasible strategy.

Strategy	Firm Yield (ac-ft)	Total Capital Cost	Total Annual Cost	Unit Cost	Environmental Impact
Advanced Water Conservation	**3**	**$0**	**$0**	**$0**	**1**
Drill New Wells (Hunt, Nacatoch Aquifer, Sabine Basin)	**505**	**$1,689,000**	**$416,000**	**$824**	**1**
Increase Contract (Royse City)	**502**	**$0**	**$251,000**	**$500**	**1**
Wood County Pipeline Tie-in	**502**	**$1,086,000**	**$823,000**	**$1,639**	**2**

Identified Alternative WMS and WMSP:

	2020	2030	2040	2050	2060	2070
Wood County Pipeline Tie-in	2	72	125	209	333	505

The identified Alternative Water Management Strategy for BHP WSC is the Wood County Pipeline Strategy, of which an Alternative Water Management Strategy Project is to construct, in association with Caddo Basin SUD and Poetry WSC, a 14" raw water line to tie into the Hunt County Branch of the Wood County Pipeline proposed to end near the City of Greenville. Cost estimates presented herein represent to total capital cost of the pipeline, which would be proportionally shared with Caddo Basin SUD and Poetry WSC. The total annual cost and unit cost represent the debt service of the project as well as annual operation costs for conveyance of up to 505 ac-ft per year. This alternative strategy is contingent upon the regionalized development of a groundwater well field in Wood County and a conveyance pipeline from Wood County to Hunt County.



Cost Estimate Summary
Water Supply Project Option
September 2018 Prices

B H P WSC, Caddo Basin SUD, Poetry WSC - Wood County Pipeline Tie-in

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 201.9 for September 2018

Item	***Estimated Costs for Facilities***
Primary Pump Station (0.47 MGD)	$1,176,000
Transmission Pipeline (14 in dia., 7.3 miles)	$3,184,000
TOTAL COST OF FACILITIES	**$4,360,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$1,367,000
Environmental & Archaeology Studies and Mitigation	$208,000
Land Acquisition and Surveying (23 acres)	$124,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$167,000
TOTAL COST OF PROJECT	**$6,226,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$438,000
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$32,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$29,000
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (867231 kW-hr @ 0.08 $/kW-hr)	$69,000
Purchase of Water (2878 acft/yr @ 1442 $/acft)	$4,150,000
TOTAL ANNUAL COST	**$4,718,000**
Available Project Yield (acft/yr)	2,878
Annual Cost of Water ($ per acft), based on PF=1	$1,639
Annual Cost of Water After Debt Service ($ per acft), based on PF=1	$1,487
Annual Cost of Water ($ per 1,000 gallons), based on PF=1	$5.03
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1	$4.56

JMP *10/6/2019*

EVALUATION OF WATER MANAGEMENT STRATEGIES FOR MEETING THE PROJECTED WATER SUPPLY NEEDS OF CADDO BASIN SUD IN HUNT COUNTY

Description of Water User Group:

Caddo Basin SUD provides water service in western Hunt County and eastern Collin County. The WUG population is projected to be 10,115 in 2020 and 43,698 by the year 2070. The SUD purchases treated water from North Texas MWD and Farmersville. The SUD is projected to have a shortage beginning in 2020 based on the availability of current firm supplies from North Texas MWD. The SUD is projected to have a deficit of 8 ac-ft in 2020 increasing to a deficit of 1,866 ac-ft by 2070.

Water Supply and Demand Analysis:

	2020	2030	2040	2050	2060	2070
Population	10,115	13,263	17,792	23,883	32,195	43,698
Projected Water Demand	1,128	1,417	1,855	2,465	3,314	4,493
Water Demand from other entities	0	0	0	0	0	0
Current Water Supply	1,121	1,197	1,449	1,743	2,112	2,627
Projected Supply Surplus (+) / Deficit (-)	**-7**	**-220**	**-406**	**-722**	**-1,202**	**-1,866**

Evaluation of Potentially Feasible Water Management Strategies:

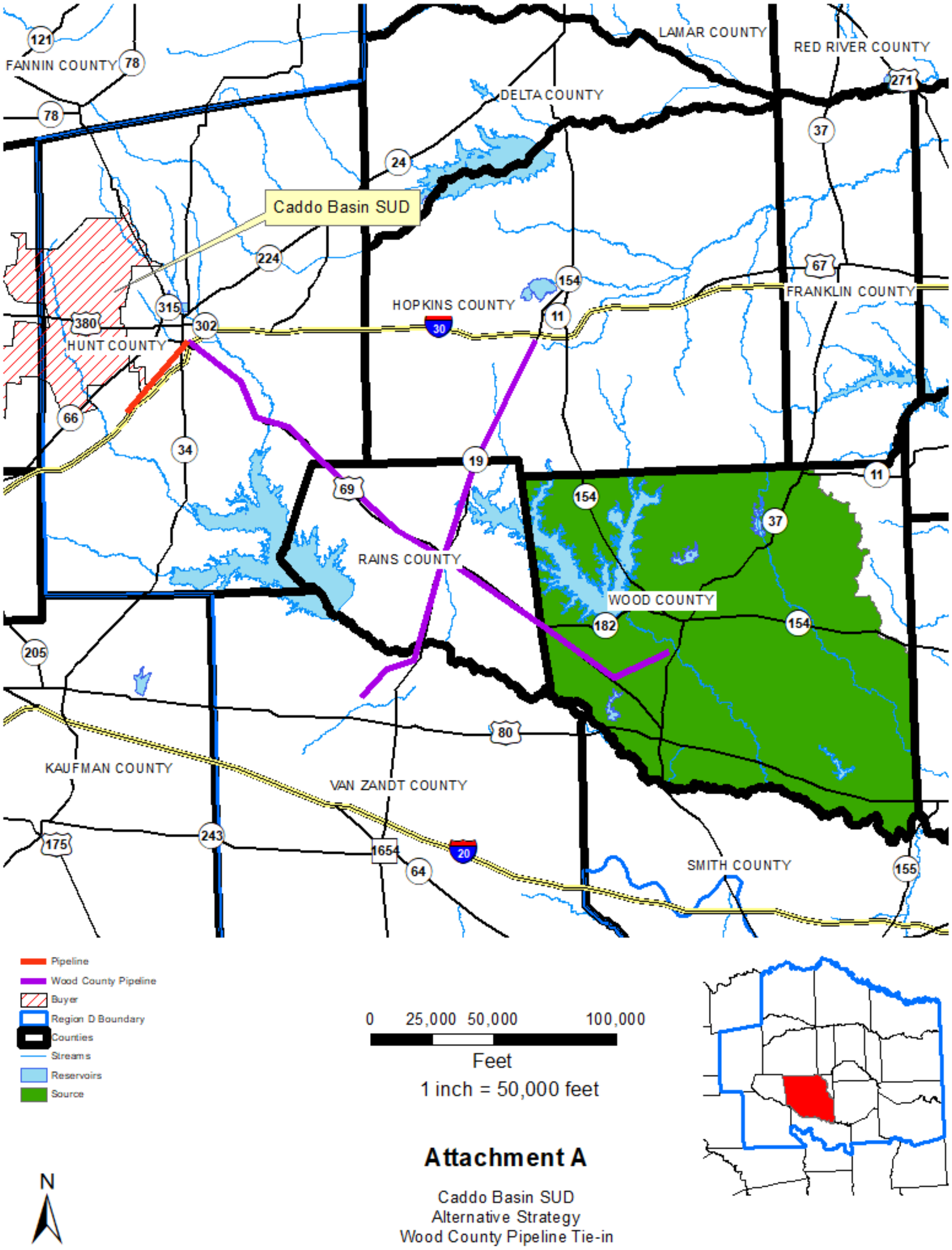
Seven alternative strategies were considered to meet the SUD's water supply shortages as summarized in the following table. Advanced conservation was not selected because the per capita use per day was less than the 140 gpcd threshold set by the water planning group; however, preliminary coordination with the Region C Planning Group indicates that conservation is a potential strategy for that portion of the WUG within the Region C planning area, thus conservation amounts identified by the Region C Planning Group have been incorporated herein for this WUG. Water reuse was not considered because the SUD does not have a demand for non-potable water. Groundwater was considered, but the SUD has previously indicated that it currently purchases treated water from NTMWD and is planning to meet its future needs from water purchases. Thus, the SUD could potentially increase existing contracts with NTMWD. Another potentially feasible contract increase could be from the City of Farmersville. The SUD also has an existing emergency interconnect with the City of Greenville, thus, a contract with the City of Greenville was considered. Another potentially feasible strategy is the Wood County Pipeline which could supply groundwater from Wood County.

Strategy	Firm Yield (ac-ft)	Total Capital Cost	Total Annualized Cost	Unit Cost	Environmental Impact
Advanced Water Conservation (Region C Portion)	**18**	**$0**	**$0**	**$0**	**1**
Water Reuse	**0**	**-**	**-**	**-**	**-**
Ground Water (Hunt, Woodbine Aquifer, Trinity)	**0**	**-**	**-**	**-**	**-**
Increase Existing Contract (NTMWD)	**1,848**	**$0**	**$421,000**	**$228**	**1**
Increase Existing Contract (Farmersville)	**1,848**	**$0**	**$421,000**	**$228**	**1**
New Contract (Greenville)	**1,866**	**$2,473,000**	**$1,889,000**	**$1,012**	**1**
Wood County Pipeline	**1,866**	**$4,037,000**	**$3,059,000**	**$1,639**	**2**

Identified Alternative WMS and WMSP:

	2020	2030	2040	2050	2060	2070
Wood County Pipeline Tie-in	7	220	406	722	1,202	1,866

The identified Alternative Water Management Strategy for Caddo Basin SUD is the Wood County Pipeline Strategy, of which an Alternative Water Management Strategy Project is to construct, in association with B H P WSC and Poetry WSC, a 14" raw water line to tie into the Hunt County Branch of the Wood County Pipeline proposed to end near the City of Greenville. Cost estimates presented herein represent to total capital cost of the pipeline, which is to be proportionally shared with B H P WSC and Poetry WSC. The total annual cost and unit cost represent the debt service of the project as well as annual operation costs for conveyance of up to 1,866 ac-ft per year. This alternative strategy is contingent upon the regionalized development of a groundwater well field in Wood County and a conveyance pipeline from Wood County to Hunt County.



Attachment A

Caddo Basin SUD
Alternative Strategy
Wood County Pipeline Tie-in

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices

B H P WSC, Caddo Basin SUD, Poetry WSC - Wood County Pipeline Tie-in

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 201.9 for September 2018

Item	Estimated Costs for Facilities
Primary Pump Station (0.47 MGD)	$1,176,000
Transmission Pipeline (14 in dia., 7.3 miles)	$3,184,000
TOTAL COST OF FACILITIES	**$4,360,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$1,367,000
Environmental & Archaeology Studies and Mitigation	$208,000
Land Acquisition and Surveying (23 acres)	$124,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$167,000
TOTAL COST OF PROJECT	**$6,226,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$438,000
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$32,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$29,000
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (867231 kW-hr @ 0.08 $/kW-hr)	$69,000
Purchase of Water (2878 acft/yr @ 1442 $/acft)	$4,150,000
TOTAL ANNUAL COST	**$4,718,000**
Available Project Yield (acft/yr)	2,878
Annual Cost of Water ($ per acft), based on PF=1	$1,639
Annual Cost of Water After Debt Service ($ per acft), based on PF=1	$1,487
Annual Cost of Water ($ per 1,000 gallons), based on PF=1	$5.03
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1	$4.56

JMP *10/6/2019*

EVALUATION OF WATER MANAGEMENT STRATEGIES FOR MEETING THE PROJECTED WATER SUPPLY NEEDS OF CADDO MILLS IN HUNT COUNTY

Description of Water User Group:

The City of Caddo Mills provides water service in Hunt County. This City's population was 1,338 in 2010 and is projected to increase to 1,710 by 2020 and 7,147 by 2070. The City purchases treated water from the City of Greenville and is projected to have a shortage beginning in 2030 based on the availability of current supplies to Greenville. Caddo Mills is projected to have a deficit of 1 ac-ft in 2030 increasing to a deficit of 254 ac-ft by 2070.

Water Supply and Demand Analysis:

	2020	2030	2040	2050	2060	2070
Population	1,710	2,214	2,898	3,843	5,190	7,147
Projected Water Demand	152	187	237	310	417	573
Water Demand from other entities	0	0	0	0	0	0
Current Water Supply	178	186	201	242	309	319
Projected Supply Surplus (+) / Deficit (-)	**26**	**-1**	**-36**	**-68**	**-108**	**-254**

Evaluation of Potentially Feasible Water Management Strategies:

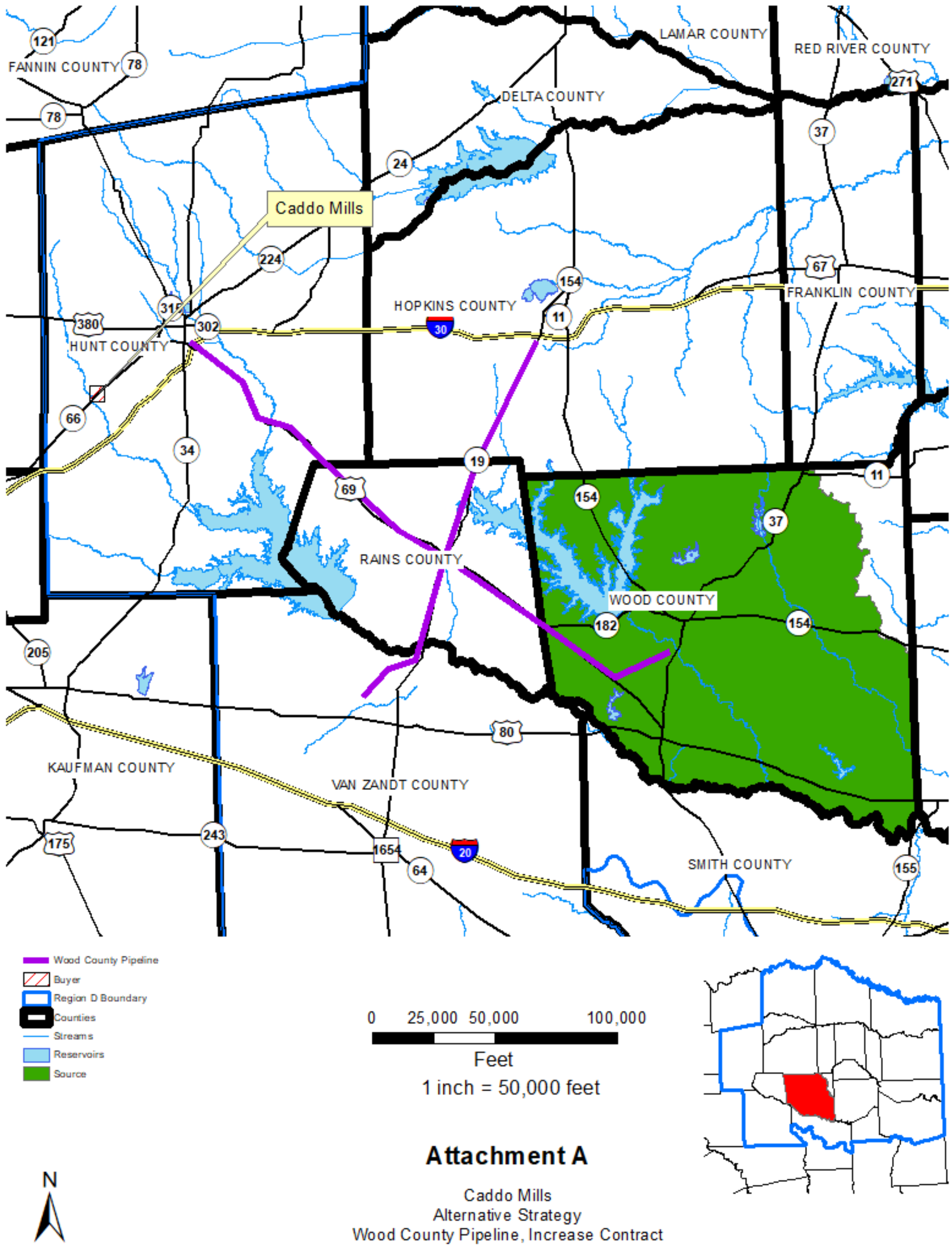
Four alternative strategies were considered to meet the City of Caddo Mills water supply shortages as summarized in the following table. Advanced conservation was not considered because the per capita use per day was below the 140 gpcd threshold set by the planning group. Water reuse was not considered because the City does not have a demand for non-potable water. Groundwater was considered, although the City has previously indicated that it plans to meet its future needs from water purchase from the City of Greenville. Another potentially feasible strategy is the Wood County Pipeline which could supply groundwater from Wood County via existing infrastructure from Greenville.

Strategy	Firm Yield (ac-ft)	Total Capital Cost	Total Annualized Cost	Unit Cost	Environmental Impact
Drill New Wells (Hunt, Nacatoch Aquifer, Sabine Basin)	**254**	**$1,014,000**	**$221,000**	**$870**	**1**
Increase Existing Contract (Greenville)	**254**	**$0**	**$224,000**	**$882**	**1**
Wood County Pipeline, Increase Contract	**254**	**$0**	**$366,000**	**$1,442**	**2**

Identified Alternative WMS and WMSP:

	2020	2030	2040	2050	2060	2070
Wood County Pipelime, Increase Contract	0	1	36	68	108	254

The identified Alternative Water Management Strategy for the City of Caddo Mills to meet their projected deficit of 1 ac-ft/yr in 2030 and 254 ac-ft/yr in 2070 is the Wood County Pipeline Strategy, of which an Alternative Water Management Strategy Project is to increase the volume of treated surface water purchased from the City of Greenville via pass-through of the additional supply from this strategy to the City. This alternative strategy is contingent upon the regionalized development of a groundwater well field in Wood County and a conveyance pipeline from Wood County to Hunt County, as well as the recommended seller strategies of increased WTP capacity for the City of Greenville.



Attachment A

Caddo Mills
Alternative Strategy
Wood County Pipeline, Increase Contract

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices

Caddo Mills - Wood County Pipeline, Increase Contract from Greenville

Cost based on ENR CCI 11170.28 for September 2018 and
a PPI of 201.9 for September 2018

Item	*Estimated Costs for Facilities*
ANNUAL COST	
Operation and Maintenance	
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (0 kW-hr @ 0.08 $/kW-hr)	$0
Purchase of Water (254 acft/yr @ 1442 $/acft)	$366,000
TOTAL ANNUAL COST	**$366,000**
Available Project Yield (acft/yr)	254
Annual Cost of Water ($ per acft), based on PF=1	$1,441
Annual Cost of Water After Debt Service ($ per acft), based on PF=1	$1,441
Annual Cost of Water ($ per 1,000 gallons), based on PF=1	$4.42
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1	$4.42

JMP *10/3/2019*

EVALUATION OF WATER MANAGEMENT STRATEGIES FOR MEETING THE PROJECTED WATER SUPPLY NEEDS OF CASH SUD IN HUNT COUNTY

Description of Water User Group:

Cash SUD provides water in the south-central portion of Hunt County and small areas of northwestern Rains County, western Hopkins County, and eastern Rockwall County from purchased surface water supplies from the North Texas Municipal Water District (NTMWD) and the Sabine River Authority for supplies out of Lake Fork and Lake Tawakoni. Over 90% of the SUD's demand is located in Region D (Hunt County), with less than 10% in Region C (Rockwall County). In both regions, the system is projected to serve a total of 20,491 people in 2020 and 50,195 people by the year 2070. Cash SUD is projected to have a supply deficit of 361 ac-ft/yr by 2030 increasing to 1,346 ac-ft/yr by 2050.

Water Supply and Demand Analysis:

In coordination with Cash SUD and Region C, the below summarization of Cash SUD supplies and demands has been developed.

Cash Special Utility District (Region C & D)

(Values in Ac-Ft/Yr)	Projected Population and Demand					
	2020	**2030**	**2040**	**2050**	**2060**	**2070**
Projected Region Population (C&D)	**20,491**	**24,592**	**29,451**	**35,192**	**42,044**	**50,195**
Projected Region Population (D)	19,271	23,012	27,462	32,789	39,180	46,841
Projected Region Population (C)	1,220	1,580	1,989	2,403	2,864	3,354
Projected Water Demand						
Municipal Demand (Region D)	2,213	2,560	2,998	3,548	4,228	5,049
Municipal Demand (Region C)	140	176	217	260	309	362
Total Projected Total Demand	***2,353***	***2,736***	***3,215***	***3,808***	***4,537***	***5,411***
Currently Available Water Supplies						
North Texas Municipal Water District	1,120	1,120	1,120	1,120	1,120	1,120
Sabine River Authority (current and future)	1,322	1,255	1,086	1,342	2,071	3,596
Total Current Supplies	***2,442***	***2,375***	***2,206***	***2,462***	***3,191***	***4,716***
Need (Demand - Current Supply)	***0***	***361***	***1,009***	***1,346***	***1,346***	***695***
Water Management Strategies						
Water Conservation	5	8	10	11	14	18
Increase Contract with NTMWD	332	688	1,025	1,353	1,352	1,343
Additional Delivery Infrastructure from NTMWD	*332*	*688*	*1,025*	*1,353*	*1,352*	*1,343*
Wood County Pipeline (Alt Region D Needs)	330	394	1,009	1,346	1,346	1,346
Total Water Management Strategies	***337***	***696***	***1,035***	***1,364***	***1,366***	***1,361***

Evaluation of Potentially Feasible Water Management Strategies:

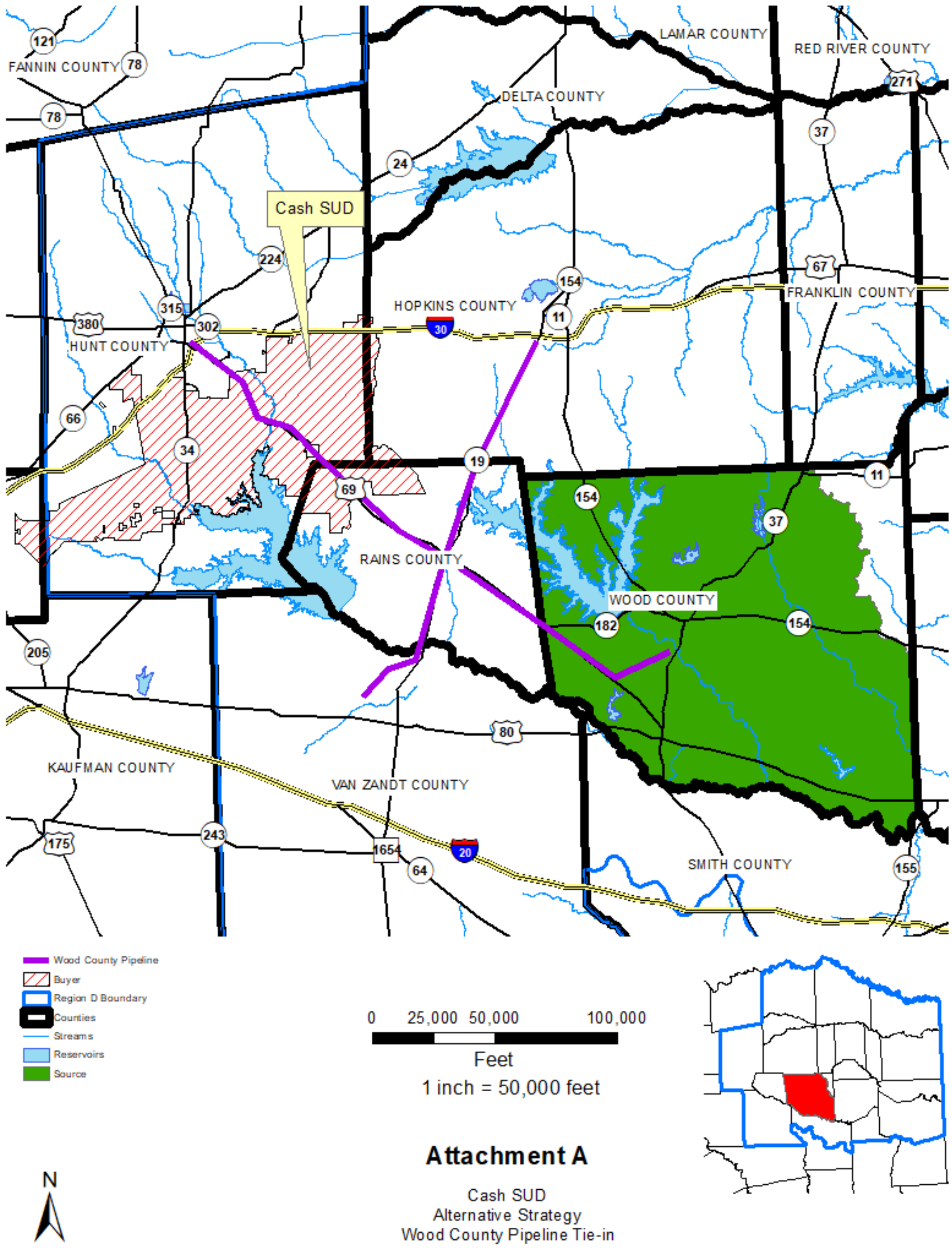
Cash SUD has a contract with NTMWD for 2.2 MGD (2,466 ac-ft/yr). Additional supply comes from the SRA. Cash SUD operates its own water treatment plant within Region D to treat the supply from SRA. The water management strategies for Cash SUD include conservation, acquisition of additional supplies from NTMWD, including additional delivery infrastructure. Another potentially feasible strategy is the Wood County Pipeline which could supply groundwater from Wood County.

Strategy	Firm Yield (ac-ft)	Total Capital Cost	Total Annual Cost	Unit Cost	Environmental Impact
Advanced Water Conservation (Region C Portion)	**18**		**$0**	**$0**	**1**
Increase contract w/ NTMWD (contingent upon Region C NTMWD WMS)	**1,353**	**$8,272,000**	**$2,965,000**	**$2,198**	**1**
Wood County Pipeline Tie-in	**1,346**	**$1,926,000**	**$2,114,000**	**$1,571**	**2**

Identified Alternative WMS and WMSP:

	2020	2030	2040	2050	2060	2070
Wood County Pipeline Tie-in	**330**	**394**	**1,009**	**1,346**	**1,346**	**1,346**

The identified Alternative Water Management Strategy for Cash SUD is the Wood County Pipeline Strategy, of which an Alternative Water Management Strategy Project is the construction of a 14" diameter raw water tie-in pipeline to the Hunt County Branch of the Wood County Pipeline. This alternative strategy is contingent upon the regionalized development of a groundwater well field in Wood County and a conveyance pipeline from Wood County to Hunt County.



Attachment A

Cash SUD
Alternative Strategy
Wood County Pipeline Tie-in

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices

Cash SUD - Wood County Pipeline Tie-in

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 201.9 for September 2018

Item	*Estimated Costs for Facilities*
Primary Pump Station (2.4 MGD)	$975,000
Transmission Pipeline (12 in dia., 1 miles)	$360,000
TOTAL COST OF FACILITIES	**$1,335,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$449,000
Environmental & Archaeology Studies and Mitigation	$50,000
Land Acquisition and Surveying (7 acres)	$40,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$52,000
TOTAL COST OF PROJECT	**$1,926,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$136,000
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$4,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$24,000
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (112769 kW-hr @ 0.08 $/kW-hr)	$9,000
Purchase of Water (1346 acft/yr @ 1442 $/acft)	$1,941,000
TOTAL ANNUAL COST	**$2,114,000**
Available Project Yield (acft/yr)	1,346
Annual Cost of Water ($ per acft), based on PF=2	$1,571
Annual Cost of Water After Debt Service ($ per acft), based on PF=2	$1,470
Annual Cost of Water ($ per 1,000 gallons), based on PF=2	$4.82
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=2	$4.51

JMP *10/6/2019*

EVALUATION OF WATER MANAGEMENT STRATEGIES FOR MEETING THE PROJECTED WATER SUPPLY NEEDS OF CITY OF CELESTE

Description of Water User Group:

The City of Celeste is a small public water supply located in northwest Hunt County. The system is projected to serve 1,012 people in 2020 and 3,658 people by the year 2070. The current sources of supply are two wells into the Woodbine Aquifer with production capacities of 150 gpm and 200 gpm. The City provides water to its own customers in the Sabine River Basin and is projected to have a water supply deficit of 29 ac-ft/yr in 2020 increasing to 316 ac-ft/yr by 2070.

Water Supply and Demand Analysis:

	2020	2030	2040	2050	2060	2070
Population	1,012	1,257	1,590	2,051	2,706	3,658
Projected Water Demand	124	147	181	231	304	411
Water Demand from other entities	0	0	0	0	0	0
Current Water Supply	95	95	95	95	95	95
Projected Supply Surplus (+) / Deficit (-)	**-29**	**-52**	**-86**	**-136**	**-209**	**-316**

Evaluation of Potentially Feasible Water Management Strategies:

Multiple alternative strategies considered to meet Celeste's water supply shortages are listed in the table below. Advanced conservation was not selected since per capita use is less than 140 gpcd. The purchase of surface water from the City of Greenville and construction of a treated water pipeline was identified as a potentially feasible strategy and evaluated. Additional supplies from the City of Greenville would be contingent upon City of Greenville water strategies. Pumping of additional groundwater from the Woodbine Aquifer was also considered as an alternative for this entity. There is sufficient source availability in the Woodbine Aquifer through 2060, but if this alternative were to be implemented availability would be insufficient by 2070, which would necessitate a smaller contract and infrastructure for treated supply from the City of Greenville by 2070. Such an approach would be contingent upon recommended seller strategies for the City of Greenville. Another potentially feasible strategy is the Wood County Pipeline which could supply groundwater from Wood County.

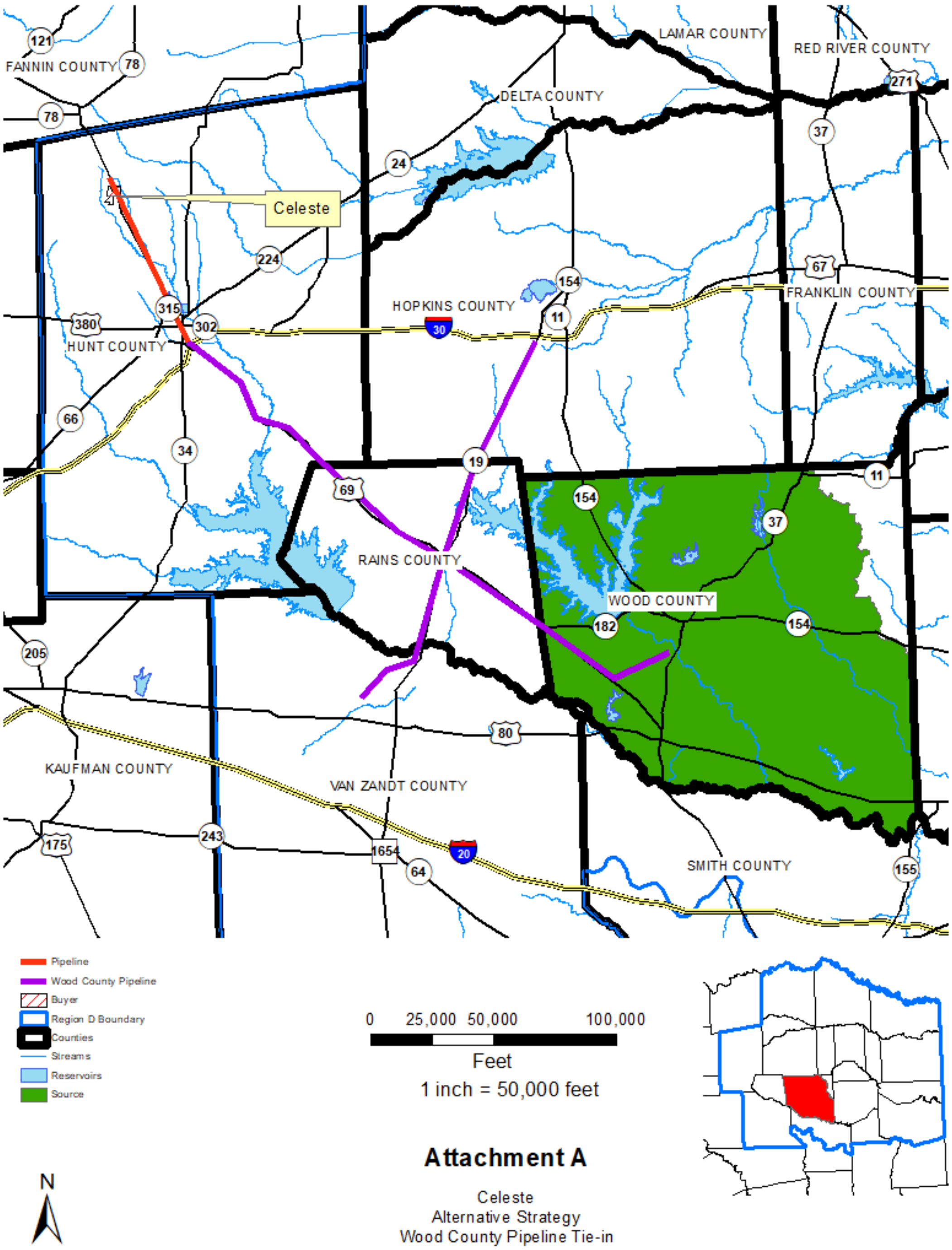
Strategy	Firm Yield (ac-ft)	Total Capital Cost	Total Annual Cost	Unit Cost	Environmental Impact
Drill New Wells (Woodbine, Trinity Basin)	**229**	**$1,686,000**	**$292,000**	**$1,275**	**1**
New Contract and Treated Water Pipeline (Greenville, contingent on Seller WMS)	**87**	**$3,342,000**	**$341,000**	**$3,920**	**1**
New Contract and Treated Water Pipeline (Greenville contingent on Seller WMS)	**316**	**$5,076,000**	**$690,000**	**$2,184**	**1**
Wood County Pipeline Tie-in	**316**	**$5,076,000**	**$867,000**	**$2,744**	**2**

Identified Alternative WMS and WMSP:

	2020	2030	2040	2050	2060	2070
Wood County Pipeline Tie-in	**29**	**52**	**86**	**136**	**209**	**316**

The identified Alternative Water Management Strategy for the City of Celeste to meet their projected deficit of 29 ac-ft/yr in 2020 and 316 ac-ft/yr in 2070 is the Wood County Pipeline Strategy, of which an Alternative

Water Management Strategy Project is to construct an 8" treated water pipeline from the City of Greenville's system to the City of Celeste and contracting for pass-through water supplies from the Wood County Pipeline delivered to the City of Greenville. This alternative strategy is contingent upon the regionalized development of a groundwater well field in Wood County and a conveyance pipeline from Wood County to Hunt County, as well as the recommended seller strategies of increased WTP capacity for the City of Greenville.



Attachment A

Celeste
Alternative Strategy
Wood County Pipeline Tie-in

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices

Celeste - Wood County Pipeline Tie-in via Greenville

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 201.9 for September 2018

Item	***Estimated Costs for Facilities***
Primary Pump Station (0.3 MGD)	$865,000
Transmission Pipeline (8 in dia., 12 miles)	$2,509,000
TOTAL COST OF FACILITIES	**$3,374,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$1,055,000
Environmental & Archaeology Studies and Mitigation	$325,000
Land Acquisition and Surveying (34 acres)	$186,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$136,000
TOTAL COST OF PROJECT	**$5,076,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$357,000
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$25,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$22,000
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (85412 kW-hr @ 0.08 $/kW-hr)	$7,000
Purchase of Water (316 acft/yr @ 1442 $/acft)	$456,000
TOTAL ANNUAL COST	**$867,000**
Available Project Yield (acft/yr)	316
Annual Cost of Water ($ per acft), based on PF=1	$2,744
Annual Cost of Water After Debt Service ($ per acft), based on PF=1	$1,614
Annual Cost of Water ($ per 1,000 gallons), based on PF=1	$8.42
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1	$4.95

JMP *10/3/2019*

EVALUATION OF WATER MANAGEMENT STRATEGIES FOR MEETING THE PROJECTED WATER SUPPLY NEEDS OF COUNTY-OTHER IN HUNT COUNTY

Description of Water User Group:

The County-Other WUG in Hunt County comprises all or portions of Campbell WSC, Jacobia WSC, City of Lone Oak, Maloy WSC, and Aqua Texas within Hunt County. The WUG population is projected to be 6,342 in 2020 and 58,270 by the year 2070. The WUG is supplied by groundwater from the Nacatoch, Trinity, and Woodbine Aquifers and purchases surface water from Cash SUD, City of Cooper, and City of Greenville. In Hunt County, the County-Other WUG is projected to have a deficit of 20 ac-ft in 2020 increasing to 283 ac-ft by 2070 within the Sulphur River Basin. Within the Sabine River Basin a deficit of 65 ac-ft is projected by 2040 increasing to 3,426 ac-ft by 2070. In the Trinity River Basin a deficit of 2 ac-ft is projected by 2030 increasing to 125 ac-ft by 2070.

Water Supply and Demand Analysis:

	2020	2030	2040	2050	2060	2070
Population	6,342	11,000	17,951	23,690	36,034	58,270
Projected Water Demand	790	1,326	2,130	2,792	4,238	6,846
Water Demand from other entities	0	0	0	0	0	0
Current Water Supply	1,652	1,775	1,964	2,089	2,421	3,012
Projected Supply Surplus (+) / Deficit (-)	**862**	**449**	**-166**	**-703**	**-1,817**	**-3,834**

Evaluation of Potentially Feasible Water Management Strategies:

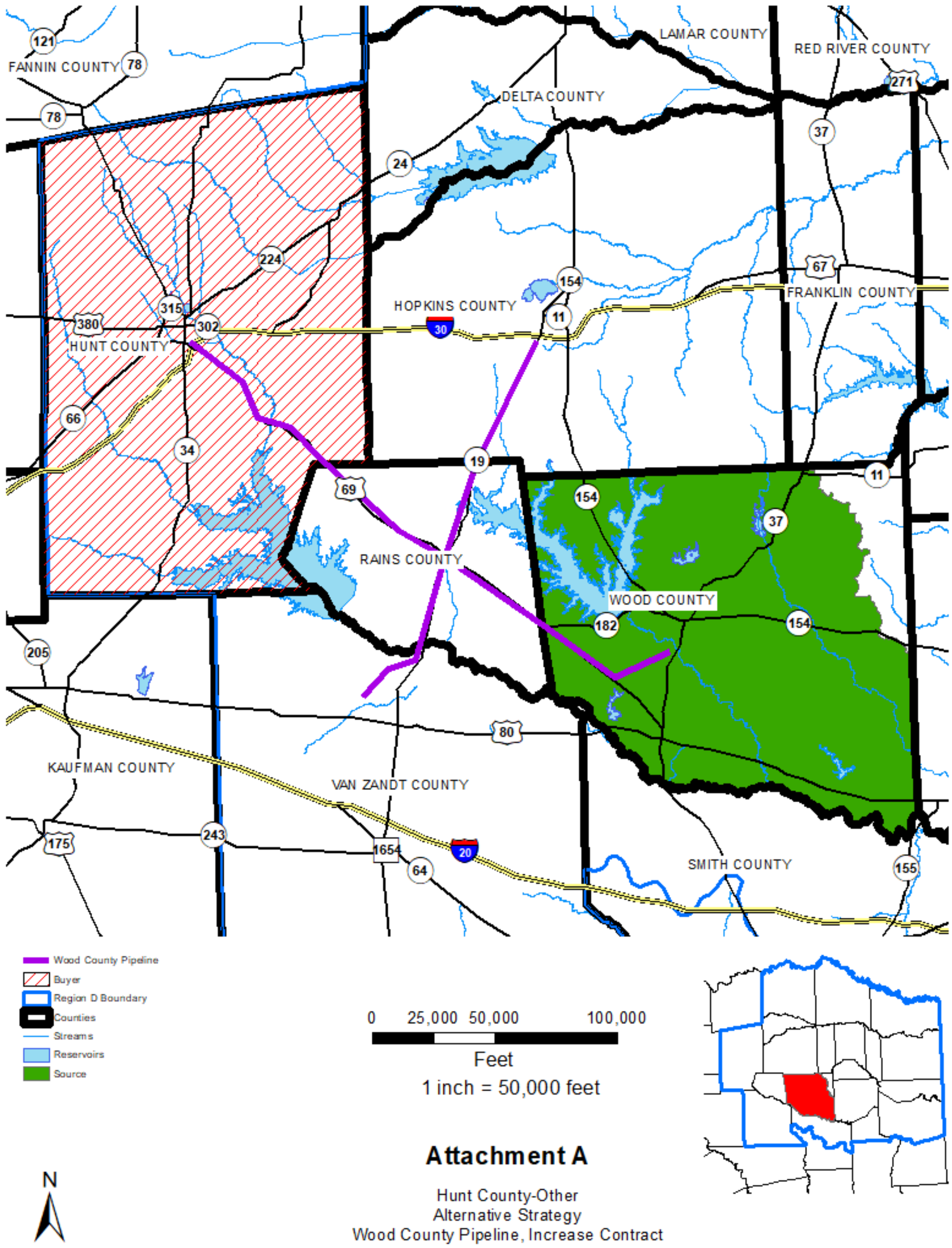
Multiple alternative strategies were considered to meet the WUG's water supply shortages as summarized in the following table. Advanced conservation was not considered because the per capita use per day was below the 140 gpcpd threshold set by the planning group. Water reuse is not a feasible option because water supply is mainly used for public consumption. Groundwater was identified as a potential source of water for Hunt County-Other, but the Nacatoch aquifer does not have sufficient availability to cover all shortages. Various sources of treated surface water are available to the entities in the County-Other WUG based on proximity and availability. Potential sources for contracted surface water include the City of Greenville, City of Commerce, Combined Consumers SUD, and City of West Tawakoni. Another potentially feasible strategy is the Wood County Pipeline which could supply groundwater from Wood County via existing infrastructure with the City of Greenville.

Strategy	Firm Yield (ac-ft)	Total Capital Cost	Total Annualized Cost	Unit Cost	Environmental Impact
Drill New Wells (Nacatoch Aquifer, Sabine Basin)	**703**	**$8,609,000**	**$1,150,000**	**$1,636**	**1**
Increase Existing Contract with City of Greenville (contingent upon Greenville WMSs)	**3,834**	**$0**	**$3,385,000**	**$883**	**1**
Wood County Pipeline, Increase Contract	**3,834**	**$0**	**$5,529,000**	**$1,442**	**2**

Identified Alternative WMS and WMSP:

	2020	2030	2040	2050	2060	2070
Wood County Pipeline, Increase Contract	0	0	166	703	1,817	3,834

The identified Alternative Water Management Strategy for the Hunt County-Other WUG to meet their projected deficit of 166 ac-ft/yr in 2040 and 3,834 ac-ft/yr in 2070 is the Wood County Pipeline Strategy, of which an Alternative Water Management Strategy Project is to increase the volume of treated surface water by contracting for pass-through water supplies purchased from the City of Greenville, contingent upon additional supplies from the Wood County Pipeline delivered to the City of Greenville. This alternative strategy is contingent upon the regionalized development of a groundwater well field in Wood County and a conveyance pipeline from Wood County to Hunt County, as well as the recommended seller strategies of increased WTP capacity for the City of Greenville.



Attachment A

Hunt County-Other
Alternative Strategy
Wood County Pipeline, Increase Contract

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices

Hunt County Other - Wood County Pipeline, Increase Contract from Greenville

Cost based on ENR CCI 11170.28 for September 2018 and
a PPI of 201.9 for September 2018

Item	***Estimated Costs for Facilities***
ANNUAL COST	
Operation and Maintenance	
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (0 kW-hr @ 0.08 $/kW-hr)	$0
Purchase of Water (3834 acft/yr @ 1442 $/acft)	$5,529,000
TOTAL ANNUAL COST	**$5,529,000**
Available Project Yield (acft/yr)	3,834
Annual Cost of Water ($ per acft), based on PF=1	$1,442
Annual Cost of Water After Debt Service ($ per acft), based on PF=1	$1,442
Annual Cost of Water ($ per 1,000 gallons), based on PF=1	$4.42
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1	$4.42

JMP *10/4/2019*

EVALUATION OF WATER MANAGEMENT STRATEGIES FOR MEETING THE PROJECTED WATER SUPPLY NEEDS OF CITY OF GREENVILLE

Description of Water User Group:

The City of Greenville provides water service in Hunt County. The WUG population is projected to be 29,871 in 2020 increasing to 77,705 by the year 2070. The City of Greenville uses surface water from Greenville's city lake and purchases surface water out of Lake Tawakoni from the Sabine River Authority. The City of Greenville sells water to the City of Caddo Mills, Shady Grove WSC and entities within Hunt County-Other, Manufacturing, Mining and Steam Electric WUGs in Hunt County. The City of Greenville is projected to have a deficit of -3,618 ac-ft by 2070. When incorporating projected treated water demands of existing and potential customers, the projected deficit increases from -3,239 ac-ft in 2020 to 24,844 ac-ft in 2070.

Water Supply and Demand Analysis:

	2020	**2030**	**2040**	**2050**	**2060**	**2070**
Population	29,871	34,309	40,330	48,645	60,491	77,705
Projected Water Demand	9,271	10,481	12,187	14,624	18,163	23,319
Existing Water Demand from other entities	2,431	2,608	2,807	3,022	3,213	3,410
Current Total (Raw & Treated) Water Supply	13,718	23,783	23,615	23,448	23,300	23,111
Projected Supply Surplus (+) / Deficit (-)	**2,016**	**10,694**	**8,621**	**5,802**	**1,924**	**-3,618**

Treated Supply Analysis	**2020**	**2030**	**2040**	**2050**	**2060**	**2070**
Projected Greenville WUG Water Demand	9,271	10,481	12,187	14,624	18,163	23,319
Existing Treated Water Demand from other entities	2,058	2,235	2,434	2,649	2,840	3,037
Existing Customer Projected Needs	0	1	202	771	1,925	4,088
Potential Customer Projected Needs	96	273	519	920	1,523	2,490
Current Treated Water Supply	8,090	8,090	8,090	8,090	8,090	8,090
Projected Treated Supply Surplus (+) / Deficit (-)	**-3,239**	**-4,626**	**-6,531**	**-9,183**	**-12,913**	**-18,266**
Projected Treated Supply Surplus (+) / Deficit (-) with Projected Additional Customer Needs	**-3,335**	**-4,900**	**-7,252**	**-10,874**	**-16,361**	**-24,844**

Evaluation of Potentially Feasible Water Management Strategies:

Multiple alternative strategies have been identified and evaluated to meet the City of Greenville's water supply shortages as summarized in the below table. Advanced conservation is recommended as the gpcd associated with the projected population and demand is approximately 277 gpcd. The City of Greenville's 2019 water conservation plan utilizes a base per capita water use of 156 gpcd. Thus, the recommended advanced water conservation strategy is to achieve the identified per capita water use of 156 gpcd. Water reuse was not considered because the City has not presently indicated an identified a demand for non-potable water. Groundwater was not determined to be feasible due to limited availability and the City's current utilization of surface water supplies.

Potentially feasible surface water strategies include the purchase of water out of Chapman Lake from either the City of Sulphur Springs and/or NTMWD, and purchase of raw water from the Sabine River Authority's proposed Toledo Bend Transfer. To utilize the City of Sulphur Springs supply from Chapman Lake, one strategy would necessitate that the City construct an intake structure, pump station, pipeline, and new Water Treatment Plant (WTP) to bring water from Chapman Lake to the City. The City is also presently evaluating the feasibility of a water swap whereby the City would obtain NTMWD supply from Chapman Lake (via construction of a tie-in pipeline to NTWMD's existing raw water line) in a 1-to-1 exchange for Greenville's supply from Lake Tawakoni. Since this strategy would not produce additional supply for the City, it has not been included herein as a feasible strategy to produce additional supply. However, given the identified need, a strategy to purchase supply from NTMWD and construct a tie-in pipeline has been identified and evaluated. Additionally, according to preliminary discussions with Region C, Phase 1 of the Toledo Bend Transfer is currently not being considered until 2070, and was thus not considered a feasible alternative for Greenville until 2070.

Because the City of Greenville currently provides wholesale water to a number of entities in the surrounding area, shortages for Caddo Mills, Hunt County-Other, Hickory Creek SUD (a potential new customer), the City of Wolfe City (a potential new customer) and the City of Celeste (a potential new customer) were included in the analysis of needed supply for Greenville under the assumption that Greenville could sell treated and untreated water, as needed, to these other entities.

The City of Greenville's existing water treatment plant was expanded in 1993-1994 to a capacity of 13 MGD. Based on TWDB projections, the City will need to expand the WTP by 2030 to accommodate projected demand for the City and its customers. With an assumed peaking factor of 1.8, expanding the WTP to include an additional 15 MGD of capacity will ensure adequate capacity through 2060. By 2070, the City will need to construct an additional new WTP with a total production capacity of 15 MGD to meet projected demands of the City and its customers.

To meet projected demands for the City along with the other existing and potential customers, the City of Greenville would need to implement a voluntary reallocation of surplus supplies to Hunt County Manufacturing.

Because of the uncertainty in steam-electric power generation water demand, for the purposes of the 2021 Plan, Steam Electric demands have not been included in the strategy for the City of Greenville. Depending on the actual demand, the City may need to construct a pipeline to other water resources earlier than the 2070 planning horizon.

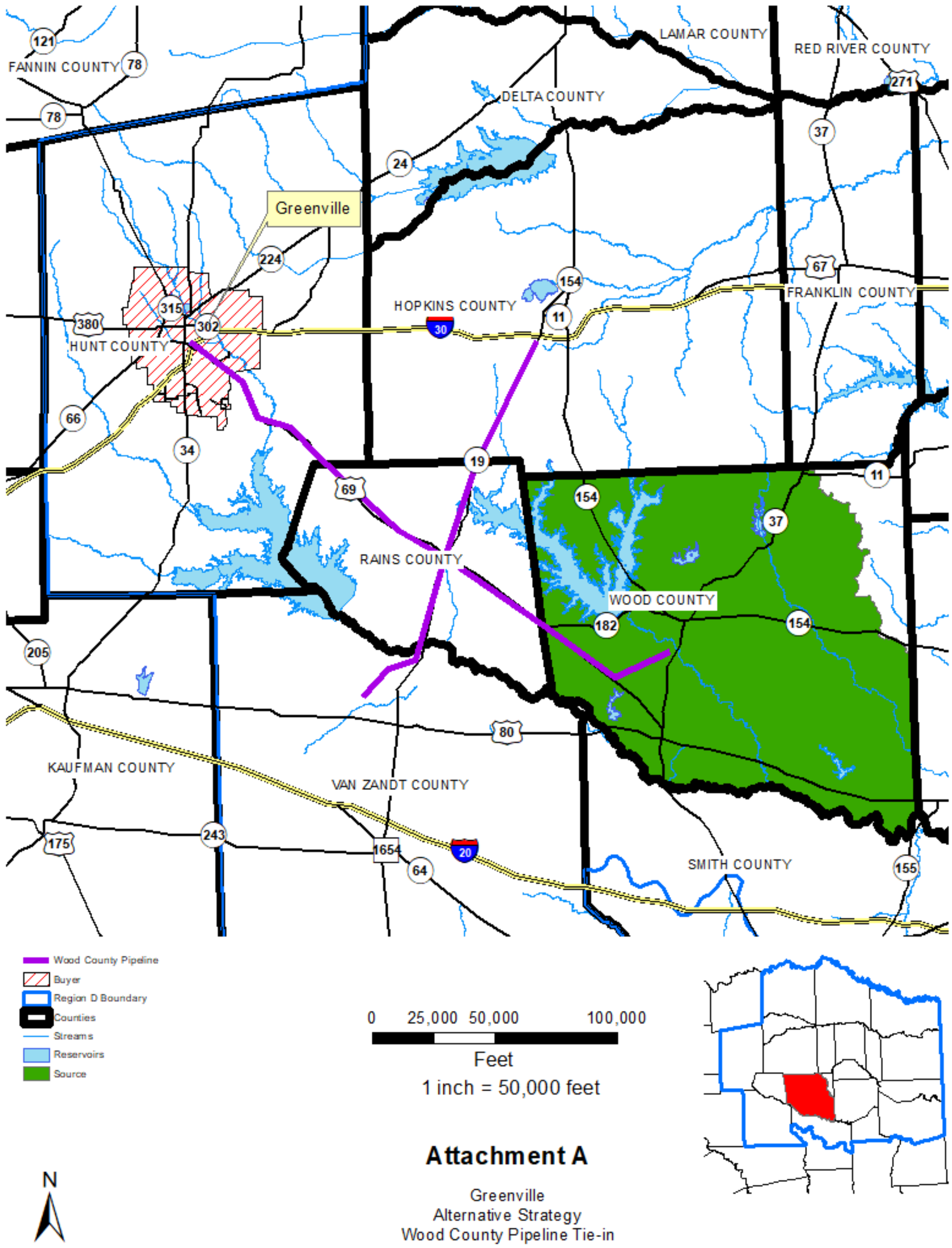
Another potentially feasible strategy is the Wood County Pipeline which could supply groundwater from Wood County.

Strategy	Firm Yield (ac-ft)	Start Year	Total Capital Cost	Total Annualized Cost	Unit Cost	Env. Impact
Advanced Water Conservation	**9,741**	**2020**	**0**	**$6,633,000**	**$681**	
Voluntary Reallocation of Hunt County Other Surplus purchased from Greenville (purchased from SRA Tawakoni; ac-ft/yr)	354	2020	$0	$0	$0	1
Voluntary Reallocation of Hunt Manufacturing Surplus purchased from Greenville (purchased from SRA Tawakoni; ac-ft/yr)	455	2070	$0	$0	$0	1
WTP Expansion (15 MGD)	9,335	2030	$43,955,000	$5,309,000	$569	2
New WTP (15 MGD)	9,335	2070	$81,786,000	$9,880,000	$1,058	2
Chapman Intake, Pump Station, and Raw Water Pipeline (contingent on City of Sulphur Springs Strategies)	500	2070	$60,235,000	$4,851,000	$9,702	3
Toledo Bend Tie-In Pipeline	500	2070	$12,559,000	$1,112,000	$2,224	3
Chapman Raw Water Tie-In Pipeline (purchase from NTMWD)	500	2070	$10,389,000	$945,000	$1,890	3
Wood County Pipeline Tie-in	6,491	2020	$0	$9,360,000	$1,442	2

Identified Alternative WMS and WMSP:

	2020	2030	2040	2050	2060	2070
Wood County Pipeline Tie-in	**96**	**274**	**721**	**1,691**	**3,448**	**6,491**

The identified Alternative Water Management Strategy for the City of Greenville is the Wood County Pipeline Strategy, whereby the City would potentially serve as a delivery junction for existing and potential future customers throughout Hunt County. The identified Alternative Water Management Strategy Project is to tie into the Hunt County Branch of the Wood County Pipeline. The strategy volumes identified herein represent supplies sufficient to meet the needs of Caddo Mills, Hunt County-Other, Hickory Creek SUD, and Wolfe City. Needs for the City of Greenville itself do not necessitate additional source availability. This alternative strategy is contingent upon the regionalized development of a groundwater well field in Wood County and a conveyance pipeline from Wood County to Hunt County, as well as the recommended seller strategies of increased WTP capacity for the City of Greenville.



Attachment A

Greenville
Alternative Strategy
Wood County Pipeline Tie-in

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices

Greenville Area - Wood County Pipeline Tie-in

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 201.9 for September 2018

Item	***Estimated Costs for Facilities***
ANNUAL COST	
Operation and Maintenance	
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (0 kW-hr @ 0.08 $/kW-hr)	$0
Purchase of Water (6491 acft/yr @ 1442 $/acft)	$9,360,000
TOTAL ANNUAL COST	**$9,360,000**
Available Project Yield (acft/yr)	6,491
Annual Cost of Water ($ per acft), based on PF=1	$1,442
Annual Cost of Water After Debt Service ($ per acft), based on PF=1	$1,442
Annual Cost of Water ($ per 1,000 gallons), based on PF=1	$4.42
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1	$4.42

JMP *10/6/2019*

EVALUATION OF WATER MANAGEMENT STRATEGIES FOR MEETING THE PROJECTED WATER SUPPLY NEEDS OF HICKORY CREEK SUD IN HUNT COUNTY

Description of Water User Group:

Hickory Creek SUD provides water in northwestern Hunt County and small areas of eastern Collin and southern Fannin counties from four wells in the Woodbine Aquifer in Hunt County, having a total rated capacity of 1402 gpm, or 754 ac-ft/yr. The projected water groundwater availability limits this supply to approximately 349 ac-ft/yr based on Modeled Available Groundwater (MAG) results. Over 90% of the SUD's demand is located in Region D (Hunt County), with less than 10% in Region C (Collin and Fannin Counties). In both regions, the system is projected to serve a total of 4,673 people in 2020 and 26,582 people by the year 2070. The population and demand projections for the system are shown in the table below. In Hunt County, Hickory Creek SUD is projected to have a water supply deficit of 105 ac-ft/yr by 2020 increasing to 2,030 ac-ft/yr by 2070 In Collin and Fannin Counties the projected deficit totals 11 ac-ft in 2020 increasing to 85 ac-ft by 2070.

Water Supply and Demand Analysis:

	2020	2030	2040	2050	2060	2070
Population	4,673	6,721	9,477	13,289	18,715	26,582
Projected Water Demand	465	641	888	1,234	1,735	2,463
Water Demand from other entities	0	0	0	0	0	0
Current Water Supply	369	368	369	368	369	368
Projected Supply Surplus (+) / Deficit (-)	**-96**	**-273**	**-519**	**-866**	**-1,366**	**-2,095**

Projected Supply Surplus (+) / Deficit (-) by Basin	2020	2030	2040	2050	2060	2070
Sabine	-32	-114	-228	-393	-629	-977
Sulphur	-36	-91	-172	-285	-451	-692
Trinity	-17	-45	-85	-142	-223	-341
Total	**-96**	**-273**	**-519**	**-866**	**-1,366**	**-2,095**

Evaluation of Potentially Feasible Water Management Strategies:

The multiple alternative strategies considered to meet Hickory Creek SUD's water supply shortages are listed in the table below. Advanced conservation was not selected since per capita use is less than 140 gpcd. There are no significant current water needs that could be met by water reuse. Groundwater from the Woodbine Aquifer was considered because the SUD is currently using this aquifer as the source of supply for the system. Although the MAG indicates limited supply (349 ac-ft/yr by 2020), the existing production capacity of the Hickory Creek SUD is 810 ac-ft/yr (502 gpm as noted in the TCEQ PWS database). Full use of the existing system (up to an additional 462 ac-ft/yr) could meet projected demands through 2030; however, due to the limited availability of this groundwater source and lack of supporting available technical information, this aquifer is not projected to have sufficient supply to meet all of Hickory Creek SUD's shortage over the 2040-2070 period. Similarly, there are potentially available supplies from the Nacatoch Aquifer, however supplies are limited and insufficient considering other WUG's which may also seek to develop the supply. Additional supplies are limited from the Trinity Aquifer in Hunt County to satisfy the remainder of Hickory Creek SUD's needs.

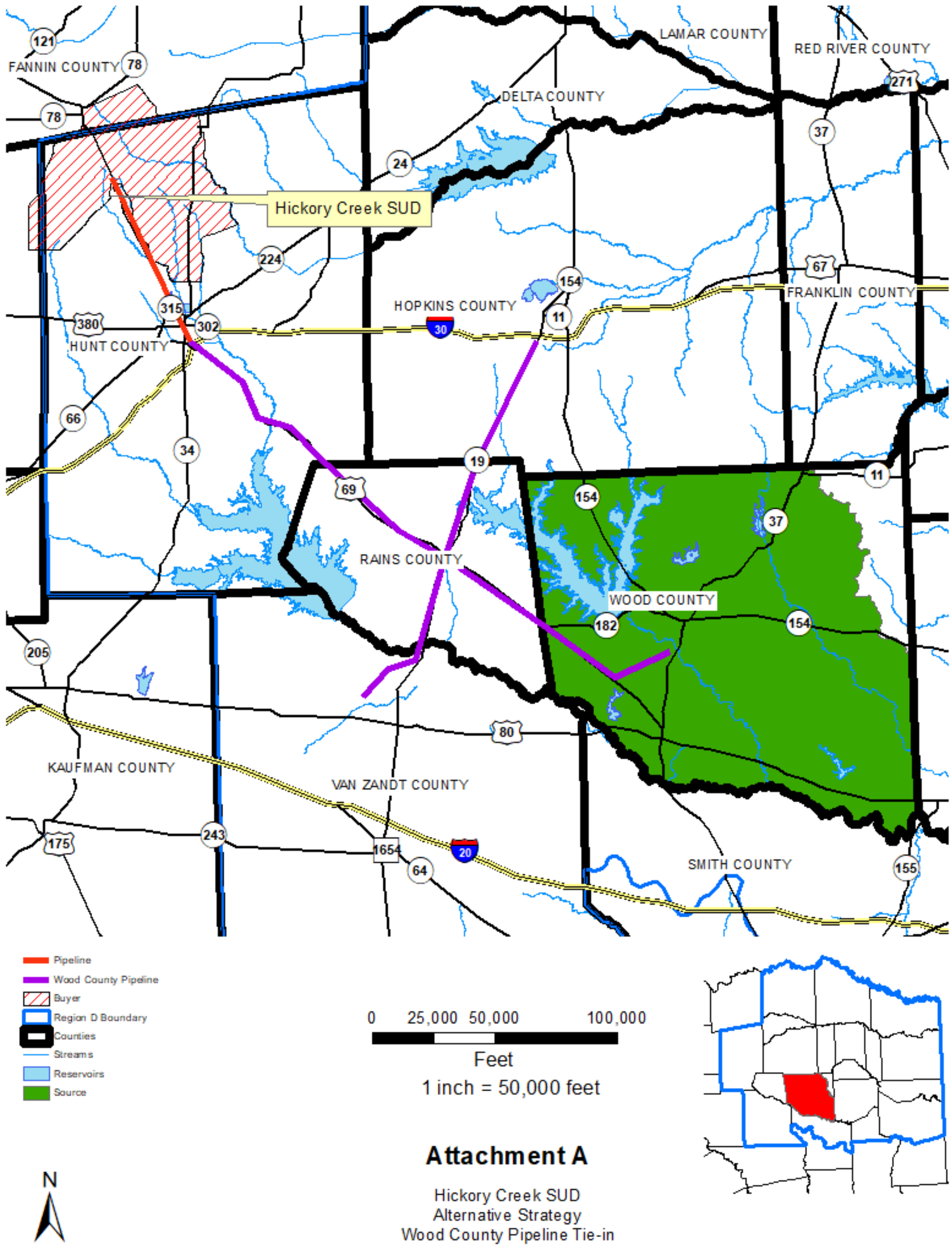
Although the SUD has previously indicated that it would continue adding wells to meet future demands, given the aforementioned present limitations regarding groundwater source availability, surface water sources were investigated to meet long-term projected water needs for the SUD. Another potentially feasible regional groundwater strategy evaluated herein is the Wood County Pipeline, which could supply groundwater from Wood County.

Strategy	Firm Yield (ac-ft)	Total Capital Cost	Total Annual Cost	Unit Cost	Environmental Impact
Drill New Wells (Woodbine Aquifer, Sabine Basin)	**75**	**$763,000**	**$120,000**	**$1,600**	**1**
Drill New Wells (Woodbine Aquifer, Trinity Basin)	**230**	**$2,358,000**	**$348,000**	**$1,513**	**1**
Greenville Tie-In Pipeline	**2,095**	**$8,553,000**	**$2,595,000**	**$1,239**	**2**
Wood County Pipeline Tie-in	**2,095**	**$11,862,000**	**$4,030,000**	**$1,924**	**2**

Identified Alternative WMS and WMSP:

	2020	2030	2040	2050	2060	2070
Wood County Pipeline Tie-in	**96**	**273**	**519**	**866**	**1,366**	**2,095**

The identified Alternative Water Management Strategy for the Hickory Creek SUD to meet their projected deficit of 96 ac-ft/yr in 2020 and 2,095 ac-ft/yr in 2070 is the Wood County Pipeline Strategy, of which an Alternative Water Management Strategy Project is to construct a 16" treated water pipeline to the City of Greenville's system and contracting for pass-through water supplies from the Wood County Pipeline delivered to the City of Greenville. This alternative strategy is contingent upon the regionalized development of a groundwater well field in Wood County and a conveyance pipeline from Wood County to Hunt County, as well as the recommended seller strategies of increased WTP capacity for the City of Greenville.



Attachment A

Hickory Creek SUD
Alternative Strategy
Wood County Pipeline Tie-in

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices

Hickory Creek SUD - Wood County Pipeline Tie-in

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 201.9 for September 2018

Item	***Estimated Costs for Facilities***
Primary Pump Station (1.97 MGD)	$1,178,000
Transmission Pipeline (16 in dia., 14.1 miles)	$7,202,000
TOTAL COST OF FACILITIES	**$8,380,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$2,573,000
Environmental & Archaeology Studies and Mitigation	$378,000
Land Acquisition and Surveying (39 acres)	$213,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$318,000
TOTAL COST OF PROJECT	**$11,862,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$835,000
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$72,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$29,000
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (909484 kW-hr @ 0.08 $/kW-hr)	$73,000
Purchase of Water (2095 acft/yr @ 1442 $/acft)	$3,021,000
TOTAL ANNUAL COST	**$4,030,000**
Available Project Yield (acft/yr)	2,095
Annual Cost of Water ($ per acft), based on PF=1	$1,924
Annual Cost of Water After Debt Service ($ per acft), based on PF=1	$1,525
Annual Cost of Water ($ per 1,000 gallons), based on PF=1	$5.90
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1	$4.68

JMP *10/6/2019*

EVALUATION OF WATER MANAGEMENT STRATEGIES FOR MEETING THE PROJECTED WATER SUPPLY NEEDS OF MINING IN HUNT COUNTY

Description of Water User Group:

Mining in Hunt County has a demand that is projected to decrease from 128 ac-ft/yr in 2020 to 47 ac-ft/yr in 2070. Mining in Hunt County is currently supplied by groundwater from the Nacatoch Aquifer and water purchased from the City of Greenville from Lake Tawakoni.

Water Supply and Demand Analysis:

	2020	2030	2040	2050	2060	2070
Projected Water Demand	128	118	88	71	58	47
Current Water Supply	55	54	53	52	51	50
Projected Supply Surplus (+)/Deficit(-)	**-73**	**-64**	**-35**	**-19**	**-7**	**3**

Projected Supply Surplus (+)/Deficit(-) by Basin	2020	2030	2040	2050	2060	2070
Sabine	-41	-35	-16	-5	0	3
Sulphur	-30	-27	-18	-13	-7	0
Trinity	-2	-2	-1	-1	0	0
Total	**-73**	**-64**	**-35**	**-19**	**-7**	**3**

Evaluation of Potentially Feasible Water Management Strategies:

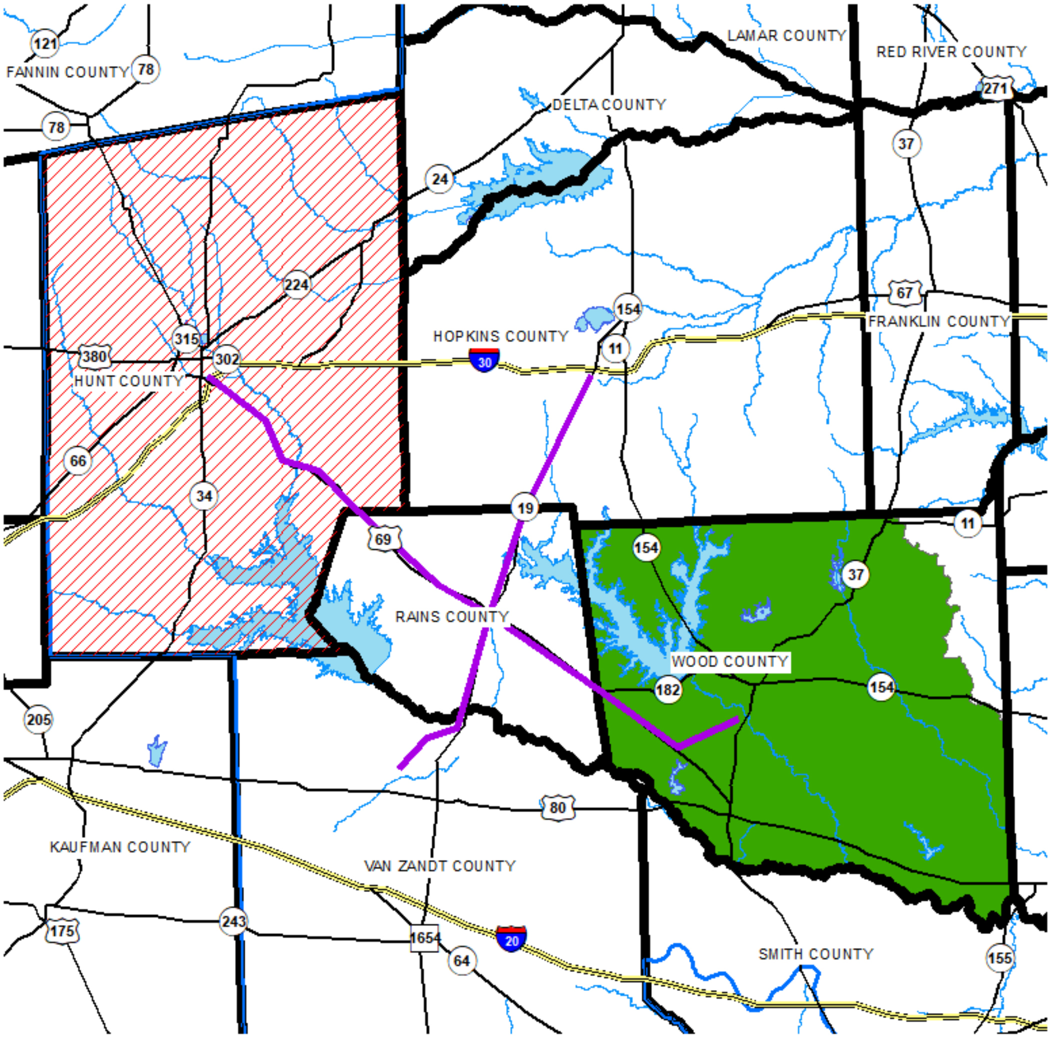
Twelve alternative strategies were considered to meet the Hunt County Mining water supply shortages as summarized in the following table. Advanced conservation and water reuse were not considered because operational procedures for the existing mines are not available. Groundwater has been identified as a potential source of water for mining in Hunt County, with focus given to accessible sources with availability within MAG estimates. Surface water via contracting with the City of Sulphur Springs was also considered as a viable alternative to meet projected demands. Another potentially feasible strategy is the Wood County Pipeline.

Strategy	Firm Yield (AF)	Total Capital Cost	Total Annualized Cost	Unit Cost	Env. Impact
Drill New Wells (Trinity, Sabine Basin)	**73**	**$766,000**	**$101,000**	**$1,384**	**1**
New Contract with Sulphur Springs	**73**	**$560,000**	**$133,000**	**$1,822**	**1**
Wood County Pipeline Tie-in	**73**	**$560,000**	**$152,000**	**$2,082**	**2**

Identified Alternative WMS and WMSP:

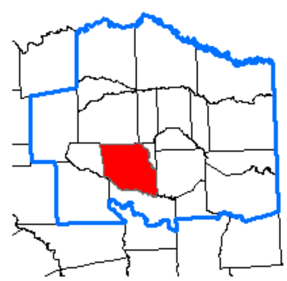
	2020	2030	2040	2050	2060	2070
Wood County Pipeline Tie-in	**73**	**64**	**35**	**19**	**7**	**0**

The identified Alternative Water Management Strategy for the Hunt County Mining WUG to meet their projected deficit of 73 ac-ft/yr in 2020 is the Wood County Pipeline Strategy, of which an Alternative Water Management Strategy Project is to construct a 6" raw water pipeline to tie into the Wood County Pipeline. This WMSP assumes the need for a one mile long pipeline to transport water supply from the Wood County Pipeline to the use location. This alternative strategy is contingent upon the regionalized development of a groundwater well field in Wood County and a conveyance pipeline from Wood County to Hunt County.



Wood County Pipeline
Buyer
Region D Boundary
Counties
Streams
Reservoirs
Source

0 25,000 50,000 100,000
Feet
1 inch = 50,000 feet



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Attachment A

Mining Hunt County
Alternative Strategy
Wood County Pipeline Tie-in

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices

Hunt County Mining - Wood County Pipeline Via Greenville

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 201.9 for September 2018

Item	***Estimated Costs for Facilities***
Primary Pump Station (0.07 MGD)	$227,000
Transmission Pipeline (6 in dia., 1 mile)	$134,000
TOTAL COST OF FACILITIES	**$361,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$120,000
Environmental & Archaeology Studies and Mitigation	$40,000
Land Acquisition and Surveying (7 acres)	$24,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$15,000
TOTAL COST OF PROJECT	**$560,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$39,000
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$1,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$6,000
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (7553 kW-hr @ 0.08 $/kW-hr)	$1,000
Purchase of Water (73 acft/yr @ 1442 $/acft)	$105,000
TOTAL ANNUAL COST	**$152,000**
Available Project Yield (acft/yr)	73
Annual Cost of Water ($ per acft), based on PF=1	$2,082
Annual Cost of Water After Debt Service ($ per acft), based on PF=1	$1,548
Annual Cost of Water ($ per 1,000 gallons), based on PF=1	$6.39
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1	$4.75

JMP *9/30/2019*

EVALUATION OF WATER MANAGEMENT STRATEGIES FOR MEETING THE PROJECTED WATER SUPPLY NEEDS OF NORTH HUNT SUD IN HUNT COUNTY

Description of Water User Group:

North Hunt SUD provides water service in Hunt, Fannin, and Delta counties. It is projected North Hunt SUD will have a shortage in 2020. The WUG population is projected to be 4,333 in 2020 and 16,222 by the year 2070. The SUD has a contract for water supply with the City of Commerce for 147 ac-ft/yr, a well in Hunt County with a rating of 170 gpm, and a well in Fannin County that is rated at 318 gpm. In Hunt County, the SUD is projected to have a deficit of 72 ac-ft in 2020 increasing to 831 ac-ft by 2070. The remainder of the SUD is projected to have a deficit of 17 ac-ft in 2020 increasing to 57 ac-ft by 2070.

Water Supply and Demand Analysis:

North Hunt SUD in Hunt County	2020	2030	2040	2050	2060	2070
Population	4,333	5,469	6,976	9,035	11,973	16,222
Projected Water Demand	291	367	468	607	805	1,090
Water Demand from other entities	0	0	0	0	0	0
Current Water Supply	202	202	202	202	202	202
Projected Supply Surplus (+) / Deficit (-)	**-89**	**-165**	**-266**	**-405**	**-603**	**-888**

Evaluation of Potentially Feasible Water Management Strategies:

The six alternative strategies considered to meet North Hunt SUD's water supply shortages are listed in the table below. Advanced conservation was not selected because the per capita use per day was less than the 140 gpcd threshold set by the water planning group. Reuse is not a feasible option because water supply is mainly used for public consumption. Groundwater from the Woodbine Aquifer was considered because North Hunt SUD is currently using this aquifer as a source of supply for the system. However, due to the limited availability of this groundwater source, this aquifer will not be able to meet all of North Hunt SUD's shortage. Additional groundwater supplies are available from the Nacatoch Aquifer has been evaluated as well.

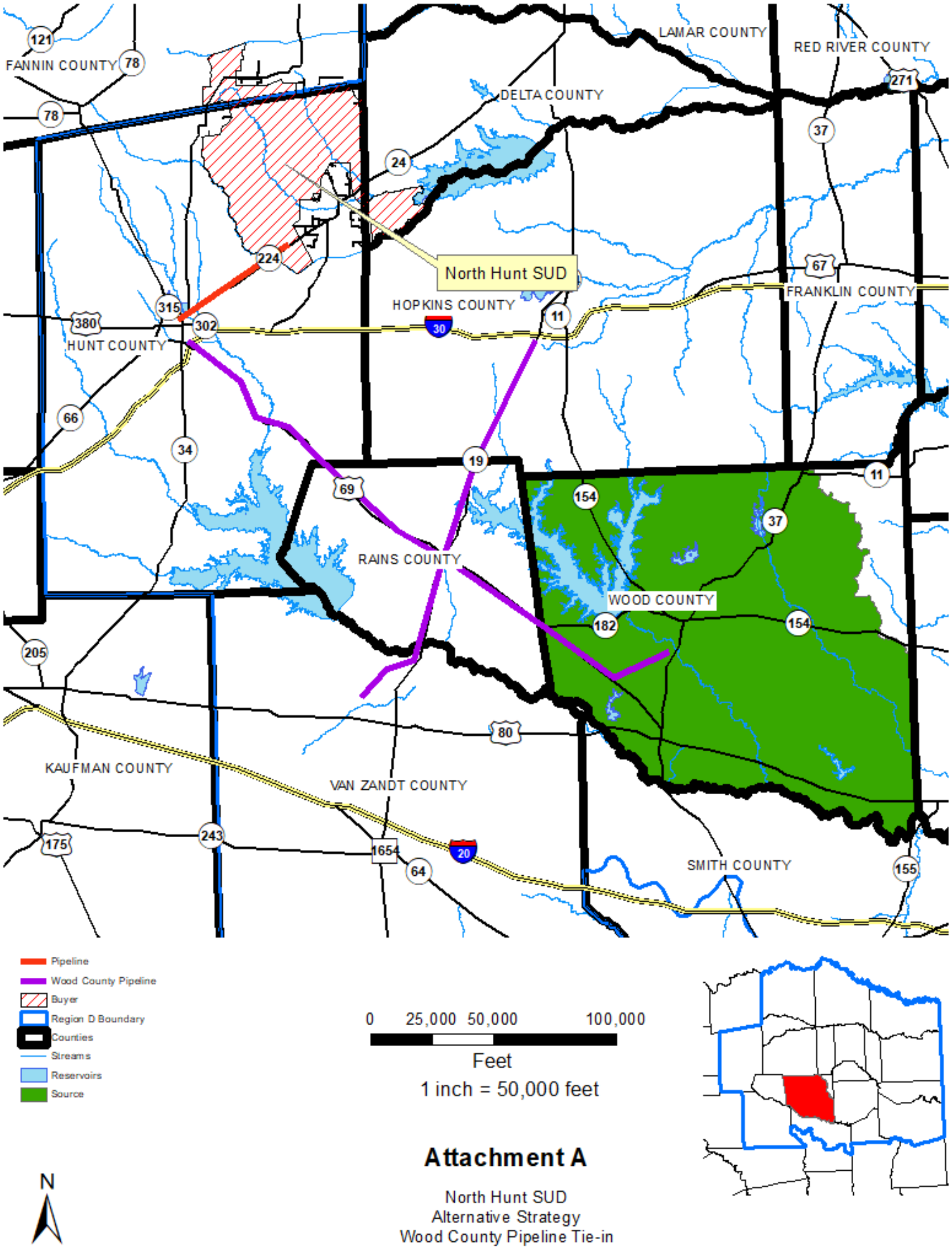
Additional purchase of water from the City of Commerce is another alternative; however, Commerce has only a limited volume, potentially available only if existing supplies to the Manufacturing WUG and the Delta County-Other WUG can be reallocated. A separate feasible strategy was considered to utilize surplus supply from Delta County MUD. The North Hunt SUD service area is contiguous with the service area for Delta County MUD, which purchases Big Creek Lake supply from the City of Cooper. North Hunt SUD could contract with the City of Cooper for water supplies from Big Creek Lake, transported via the existing connection between the City of Cooper and Delta County MUD. This strategy would require a pipeline connecting the two systems of sufficient size to provide available supplies and may require a permit amendment for additional yield potentially available from Big Creek Lake. Another potentially feasible strategy is the Wood County Pipeline which could supply groundwater from Wood County.

Strategy	Firm Yield (ac-ft)	Total Capital Cost	Total Annualized Cost	Unit Cost	Env. Impact
Drill New Wells (Nacatoch Aquifer, Sabine Basin)	**888**	**$10,998,000**	**$1,458,000**	**$1,642**	**1**
Increase Contract w/ Commerce contingent on Commerce Seller Strategy	**888**	**$0**	**$963,000**	**$1,084**	**1**
Delta County Pipeline contingent on purchase from Delta County MUD for supply from Big Creek	**100**	**$6,058,000**	**$601,000**	**$6,010**	**3**
Wood County Pipeline Tie-in	**888**	**$6,777,000**	**$1,845,000**	**$2,078**	**2**

Identified Alternative WMS and WMSP:

	2020	2030	2040	2050	2060	2070
Wood County Pipeline Tie-in	89	165	266	405	603	888

The identified Alternative Water Management Strategy for the North Hunt SUD is the Wood County Pipeline Strategy, of which an Alternative Water Management Strategy Project is to construct a 12" water line to tie into the Hunt County Branch of the Wood County Pipeline near the City of Greenville. This alternative strategy is contingent upon the regionalized development of a groundwater well field in Wood County and a conveyance pipeline from Wood County to Hunt County.



Attachment A

North Hunt SUD
Alternative Strategy
Wood County Pipeline Tie-in

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices

North Hunt SUD - Wood County Pipeline Tie-in

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 201.9 for September 2018

Item	***Estimated Costs for Facilities***
Primary Pump Station (0.83 MGD)	$979,000
Transmission Pipeline (12 in dia., 10.3 miles)	$3,713,000
TOTAL COST OF FACILITIES	**$4,692,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$1,457,000
Environmental & Archaeology Studies and Mitigation	$283,000
Land Acquisition and Surveying (30 acres)	$163,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$182,000
TOTAL COST OF PROJECT	**$6,777,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$477,000
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$37,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$24,000
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (340634 kW-hr @ 0.08 $/kW-hr)	$27,000
Purchase of Water (888 acft/yr @ 1442 $/acft)	$1,280,000
TOTAL ANNUAL COST	**$1,845,000**
Available Project Yield (acft/yr)	888
Annual Cost of Water ($ per acft), based on PF=1	$2,078
Annual Cost of Water After Debt Service ($ per acft), based on PF=1	$1,541
Annual Cost of Water ($ per 1,000 gallons), based on PF=1	$6.38
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1	$4.73

JMP *10/6/2019*

EVALUATION OF WATER MANAGEMENT STRATEGIES FOR MEETING THE PROJECTED WATER SUPPLY NEEDS OF POETRY WATER SUPPLY CORPORATION

Description of Water User Group:

Poetry Water Supply Corporation (WSC) is located in southwestern Hunt County and northern Kaufman County and is situated in the Sabine and Trinity River Basins. Poetry WSC is projected to serve 3,212 people by 2020, and the population is expected to increase to 11,937 by the year 2070. The WSC's current source of supply is treated water purchased from the City of Terrell. Poetry WSC is projected to have a deficit of 4 ac-ft/yr in 2020, up to 564 ac-ft/yr in 2070. There is a small supply that is not utilized by the WSC and could postpone supply deficits until 2030.

Water Supply and Demand Analysis:

	2020	2030	2040	2050	2060	2070
Population	3,212	4,045	5,070	6,595	8,868	11,937
Projected Water Demand	353	430	528	681	913	1,228
Water Demand from other entities	0	0	0	0	0	0
Current Water Supply	355	364	413	481	583	718
Projected Supply Surplus (+) / Deficit (-)	**2**	**-66**	**-115**	**-200**	**-330**	**-510**

Evaluation of Potentially Feasible Water Management Strategies:

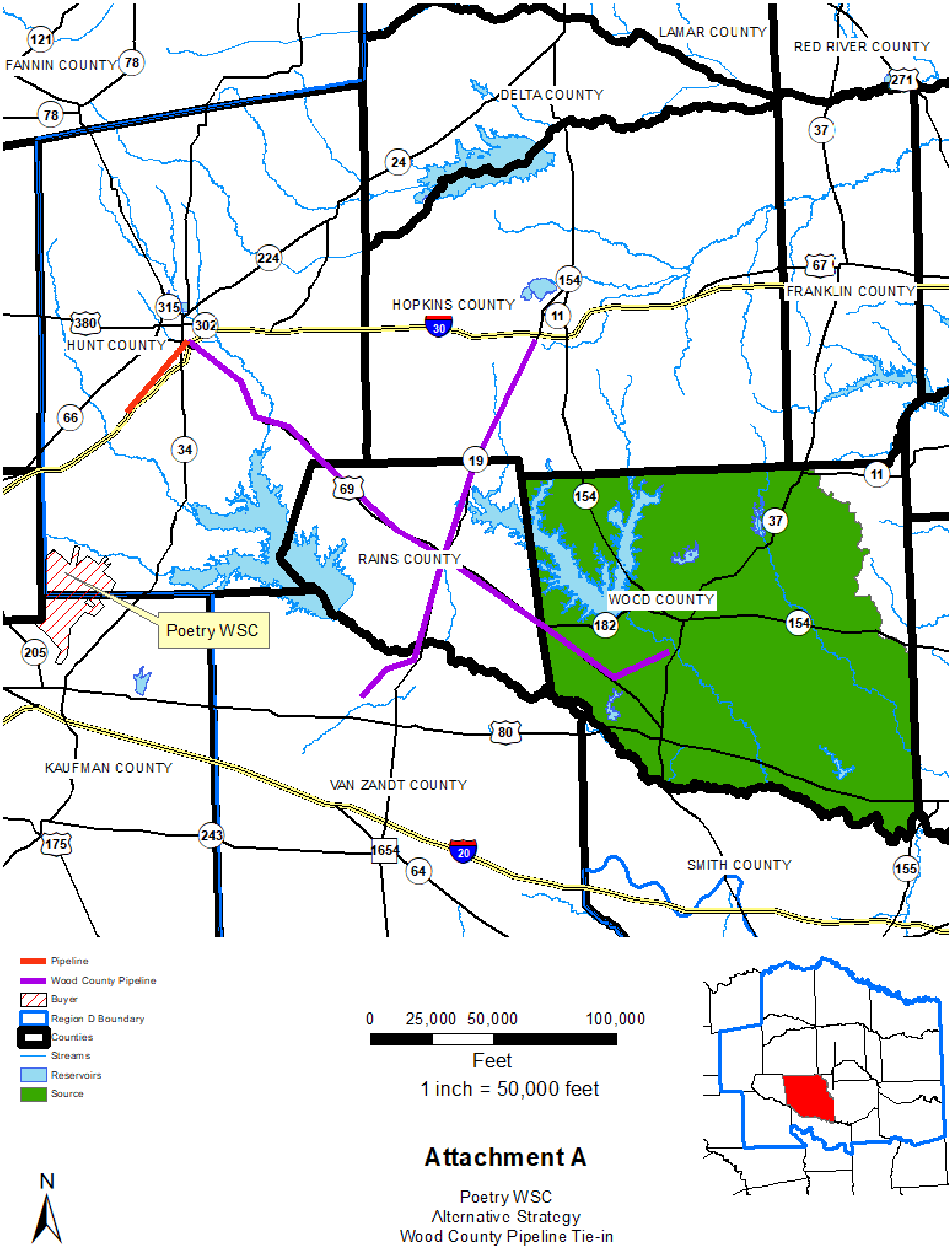
Listed in the table below are the five strategies that were considered to meet the water supply needs of Poetry WSC. There are no significant current water needs that could be met by water reuse. Advanced conservation was not selected because the per capita use per day was less than the 140 gpcd threshold set by the water planning group; however, preliminary coordination with the Region C Planning Group indicates that conservation is a potential strategy for that portion of the WUG within the Region C planning area, thus conservation amounts identified by the Region C Planning Group have been incorporated herein for this WUG. An identified feasible strategy is to increase the existing contract with Terrell via Sabine River Authority voluntary reallocation of Combined Consumers SUD surplus. The City of Terrell obtains a portion of its supply from Lake Fork via purchase from the Sabine River Authority. Combined Consumers SUD also purchases Lake Fork supply from the Sabine River Authority. A second feasible strategy is that since the City of Terrell also obtains a portion of its supply from the NTMWD reservoir system via purchase from the NTMWD, Cash SUD could increase its contract with the City of Terrell contingent upon a City of Terrell seller strategy to increase its contract with NTMWD, contingent upon recommended Region C NTMWD seller strategies. Development of groundwater supplies from the Nacatoch Aquifer, Sabine River Basin, was evaluated as a potentially cost effective approach for this entity. Another potentially feasible strategy is the Wood County Pipeline which could supply groundwater from Wood County.

Strategy	Firm Yield (ac-ft)	Total Capital Cost	Total Annual Cost	Unit Cost	Environmental Impact
Advanced Water Conservation (Region C Portion)	**7**		**$0**	**$0**	**1**
Increase contract w/ Terrell (contingent upon Region C NTMWD WMS)	**503**		**$864,000**	**$1,718**	**1**
Increase contract w/ Terrell (contingent upon Voluntary Reallocation of Combined Consumers SUD Surplus)	**503**		**$864,000**	**$1,718**	**1**
Drill Wells (Nacatoch Aquifer, Sabine Basin)	**564**	**$1,689,000**	**$449,000**	**$796**	**1**
Wood County Pipeline Tie-in	**510**	**$1,103,000**	**$836,000**	**$1,639**	**2**

Identified Alternative WMS and WMSP:

	2020	2030	2040	2050	2060	2070
Wood County Pipeline Tie-in	**0**	**66**	**115**	**200**	**330**	**510**

The identified Alternative Water Management Strategy for the Poetry WSC is the Wood County Pipeline Strategy, of which an Alternative Water Management Strategy Project is to construct, in association with B H P WSC and Caddo Basin SUD, a 14” raw water line to tie into the Hunt County Branch of the Wood County Pipeline proposed to end near the City of Greenville. Cost estimates presented herein represent to total capital cost of the pipeline, which is to be proportionally shared with B H P WSC and Caddo Basin SUD. The total annual cost and unit cost represent the debt service of the project as well as annual operation cost for conveyance of up to 510 ac-ft per year. This alternative strategy is contingent upon the regionalized development of a groundwater well field in Wood County and a conveyance pipeline from Wood County to Hunt County.



Attachment A

Poetry WSC
Alternative Strategy
Wood County Pipeline Tie-in

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices

B H P WSC, Caddo Basin SUD, Poetry WSC - Wood County Pipeline Tie-in

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 201.9 for September 2018

Item	***Estimated Costs for Facilities***
Primary Pump Station (0.47 MGD)	$1,176,000
Transmission Pipeline (14 in dia., 7.3 miles)	$3,184,000
TOTAL COST OF FACILITIES	**$4,360,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$1,367,000
Environmental & Archaeology Studies and Mitigation	$208,000
Land Acquisition and Surveying (23 acres)	$124,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$167,000
TOTAL COST OF PROJECT	**$6,226,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$438,000
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$32,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$29,000
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (867231 kW-hr @ 0.08 $/kW-hr)	$69,000
Purchase of Water (2878 acft/yr @ 1442 $/acft)	$4,150,000
TOTAL ANNUAL COST	**$4,718,000**
Available Project Yield (acft/yr)	2,878
Annual Cost of Water ($ per acft), based on PF=1	$1,639
Annual Cost of Water After Debt Service ($ per acft), based on PF=1	$1,487
Annual Cost of Water ($ per 1,000 gallons), based on PF=1	$5.03
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1	$4.56

JMP *10/6/2019*

EVALUATION OF WATER MANAGEMENT STRATEGIES FOR MEETING THE PROJECTED WATER SUPPLY NEEDS OF THE CITY OF WOLFE CITY

Description of Water User Group:

The City of Wolfe City is located in northern Hunt County and is situated in the Sulphur River Basin. Wolfe City is bound on the west side by the Hickory Creek SUD, and the City of Commerce is located southeast of the City. The system is projected to serve 1,810 people by 2020, and the population is expected to increase to 6,547 by the year 2070. Wolfe City's current source of supply comes from two city lakes located on Turkey Creek in the South Sulphur River Basin. The City also has a 150 gpm well in the Woodbine formation, Sulphur River Basin, which has been brought back for use. Yield from the local lakes is calculated as 200 ac-ft/yr through 2070. Based on these yields, the quantity of water from the lakes will not be sufficient to meet projected demands. Wolfe City is projected to have a deficit of 54 ac-ft/yr in 2050, up to 308 ac-ft/yr in 2070.

Water Supply and Demand Analysis:

	2020	2030	2040	2050	2060	2070
Population	1,810	2,249	2,846	3,669	4,842	6,547
Projected Water Demand	178	209	256	327	431	581
Water Demand from other entities	0	0	0	0	0	0
Current Water Supply	274	273	274	273	274	273
Projected Supply Surplus (+) / Deficit (-)	**96**	**64**	**18**	**-54**	**-157**	**-308**

Evaluation of Potentially Feasible Water Management Strategies:

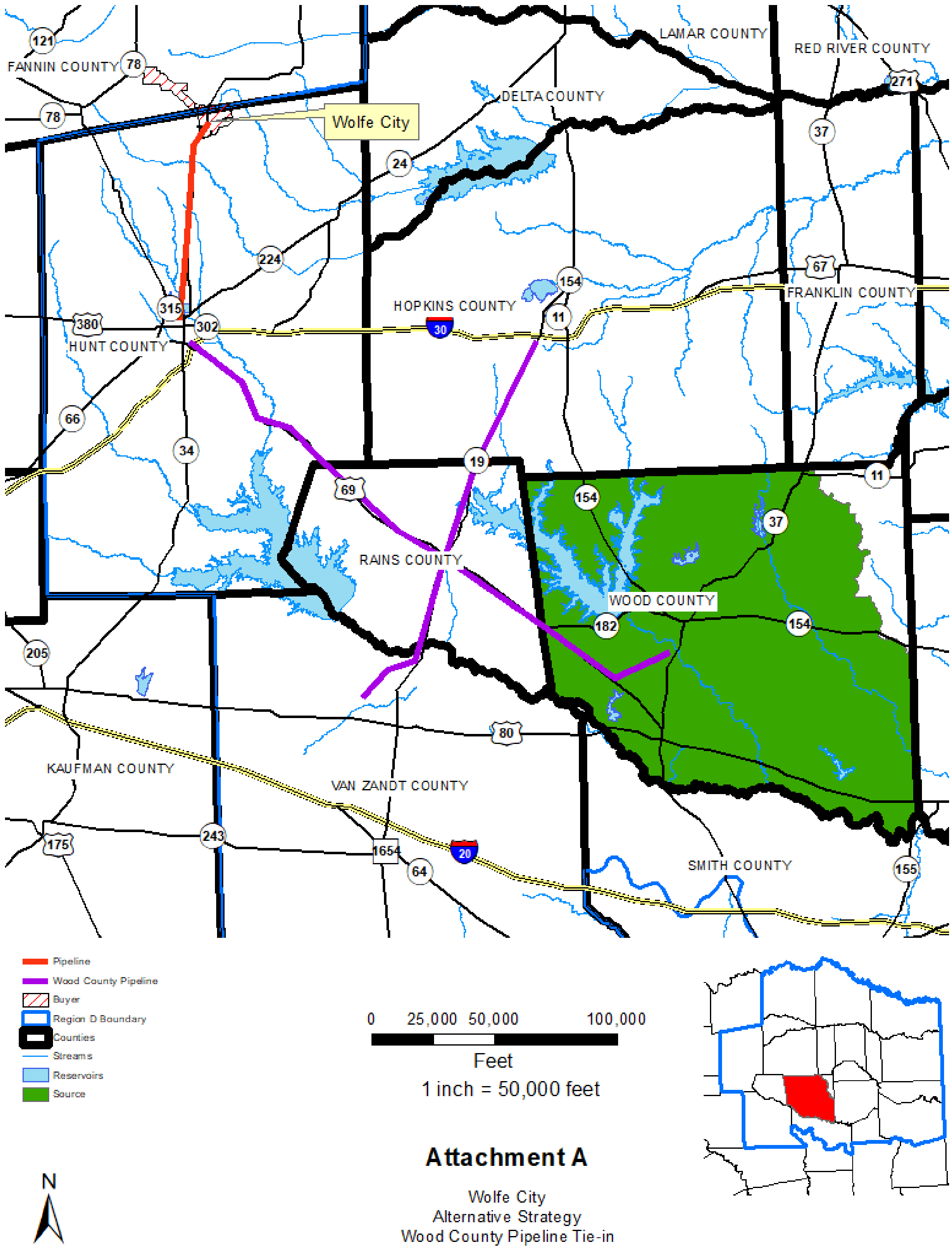
Listed in the table below are the multiple strategies that were considered to meet water supply needs in Wolfe City. Advanced conservation was not selected since per capita use is less than 140 gpcd. There are no significant current water needs that could be met by water reuse. The system has a number of surface water options, including connection to the City of Commerce, City of Greenville, and the proposed Ralph Hall Reservoir in Region C. Groundwater from the Woodbine Aquifer, Sulphur River Basin, was evaluated as a potentially cost effect approach for this entity. Another potentially feasible strategy is the Wood County Pipeline which could supply groundwater from Wood County.

Strategy	Firm Yield (ac-ft)	Total Capital Cost	Total Annual Cost	Unit Cost	Environmental Impact
Greenville Tie-In Pipeline (contingent on Seller Strategies)	**308**	**$7,124,000**	**$846,000**	**$2,747**	**1**
Wood County Pipeline Tie-In	**308**	**$7,124,000**	**$1,018,000**	**$3,305**	**2**

Identified Alternative WMS and WMSP:

	2010	2020	2030	2040	2050	2060
Wood County Pipeline Tie-In	0	0	0	54	157	308

The identified Alternative Water Management Strategy for the City of Wolfe City to meet their projected deficit of 54 ac-ft/yr in 2050 up to 308 ac-ft/yr in 2070 is the Wood County Pipeline Strategy, of which an Alternative Water Management Strategy Project is to construct a tie-in pipeline to the City of Greenville for the purchase of pass-through supplies made available from the Wood County Pipeline. This alternative strategy is contingent upon the regionalized development of a groundwater well field in Wood County and a conveyance pipeline from Wood County to Hunt County, as well as the recommended seller strategies of increased WTP capacity for the City of Greenville.



Attachment A

Wolfe City
Alternative Strategy
Wood County Pipeline Tie-in

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices

Wolfe City - Wood County Pipeline Tie-In

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 201.9 for September 2018

Item	***Estimated Costs for Facilities***
Primary Pump Station (0.55 MGD)	$987,000
Transmission Pipeline (8 in dia., 16 miles)	$3,881,000
TOTAL COST OF FACILITIES	**$4,868,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$1,510,000
Environmental & Archaeology Studies and Mitigation	$415,000
Land Acquisition and Surveying (44 acres)	$140,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$191,000
TOTAL COST OF PROJECT	**$7,124,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$501,000
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$39,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$25,000
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (113938 kW-hr @ 0.08 $/kW-hr)	$9,000
Purchase of Water (308 acft/yr @ 1442 $/acft)	$444,000
TOTAL ANNUAL COST	**$1,018,000**
Available Project Yield (acft/yr)	308
Annual Cost of Water ($ per acft), based on PF=2	$3,305
Annual Cost of Water After Debt Service ($ per acft), based on PF=2	$1,679
Annual Cost of Water ($ per 1,000 gallons), based on PF=2	$10.14
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=2	$5.15

JMP *10/5/2019*

REGION D
EVALUATIONS OF ALTERNATIVE WATER MANAGEMENT STRATEGIES
FOR MEETING PROJECTED WATER SUPPLY NEEDS
TO YEAR 2070

RED RIVER COUNTY

WUGs:

The City of Clarksville
Red River County Irrigation

EVALUATION OF WATER MANAGEMENT STRATEGIES FOR MEETING THE PROJECTED WATER SUPPLY NEEDS OF CITY OF CLARKSVILLE

Description of Water User Group:

The City of Clarksville is located in Red River County. The system is projected to serve 3,315 people through the planning period. The current sources of supply are wells into the Blossom Aquifer. Groundwater had previously been mixed with surface water from Langford Lake, however sedimentation has hindered its use as a water supply. Water quality issues with the groundwater (TDS) and surface water (turbidity) necessitate mixing of the supplies to meet Texas drinking water standards. The groundwater has over 1,000 ppm of dissolved solids including high levels of sodium, sulfate, and chloride. The City provides water to its own customers in the Sulphur basin and is projected to have a water supply deficit of 237 ac-ft/yr in 2020, due to sedimentation issues in Langford Lake. As the surface water supply for the City diminishes, the capability to mix the surface supply with the groundwater supply commensurately diminishes as well. Thus as surface supply diminishes, so too does the capability to utilize the City's existing groundwater supply. As noted in a 4 October, 2013 memorandum from the City's consultant, Murray, Thomas & Griffin, Inc. (MTG):

> "Clarksville has no available surface water when a water level of 417.0 (2006 low water level) and a sediment level at 415.0 (2013 lake bottom) are considered. Each of these conditions has occurred during the past ten years. The surface water is necessary to address total volume needs as well as for blending with the ground water."

For the current regional plan the City's water supply is solely from groundwater, thus the estimated deficit is reflective of the current groundwater production and treatment capacity without mixing of surface water. The system does have a water conservation and drought management plan in place.

Water Supply and Demand Analysis:

	2020	2030	2040	2050	2060	2070
Population	3,315	3,315	3,315	3,315	3,315	3,315
Projected Water Demand	620	602	593	592	590	590
Water Demand from other entities	0	0	0	0	0	0
Current Water Supply	383	371	371	371	371	371
Projected Supply Surplus (+) / Deficit (-)	**-237**	**-231**	**-222**	**-221**	**-219**	**-219**

Evaluation of Potentially Feasible Water Management Strategies:

The various feasible strategies considered to meet Clarksville's water supply shortages are listed in the table below. Advanced conservation was not selected because Clarksville's supply would not be projected to meet TCEQ regulatory minimums. Furthermore, reduction in demand would not alleviate the aforementioned water quality issues with the City's projected supplies. There are no significant current water needs in Clarksville that could be met by water reuse. Additional groundwater pumping from the Blossom Aquifer in the Sulphur River Basin and Reverse Osmosis treatment of all of the City's existing groundwater supplies has also been considered. The City's existing surface water supply has been made unavailable due to sedimentation issues in Langford Lake, the City's sole existing surface water supply. The City has requested the consideration of multiple potential surface water strategies to meet Clarksville's water supply needs. Potentially feasible strategies evaluated include:

- Treated Water Pipeline to DeKalb - purchasing water from the City of Texarkana's available supply from Wright Patman Reservoir;
- Dredging of sediment from Langford Lake;
- Construction of a new surface water reservoir, Dimple Reservoir;
- Construction of a raw water pipeline tying into to Region C's proposed Marvin Nichols Reservoir.
- Treated Water Pipeline to Detroit - purchasing water from the City of Paris (via Lamar County WSD) from Paris available supply.

The projected amount of firm supply necessary to meet the above projected demands differ due to the City's current methodology of mixing their surface and groundwater supplies at a ratio of 51%.

Strategy	Firm Yield (ac-ft)	Total Capital Cost	Total Annual Cost	Unit Cost (During Debt Service)	Unit Cost (After Debt Service	Env. Impact
Drill Additional Wells and RO Treatment	**388**	**$10,537,000**	**$1,673,000**	**$4,312**	**$2,402**	**1**
Contract with Lamar County WSD	**303**	**$12,255,000**	**$1,518,000**	**$5,010**	**$2,165**	**2**
Contract with Riverbend WRD and Treated Water Pipeline to DeKalb (ac-ft/yr)	**303**	**$11,702,000**	**$1,171,000**	**$3,865**	**$1,149**	**2**
Dredge Langford Lake (ac-ft/yr)	**303**	**$36,200,000**	**$2,807,000**	**$5,398**	**$0**	**5**
Dimple Reservoir (ac-ft/yr)	**303**	**$38,489,000**	**$2,415,000**	**$7,970**	**$1,099**	**5**

Description of evaluated projects

Raw Water Pipeline to Marvin Nichols Reservoir – The City of Clarksville has requested that their top priority for consideration as a water management strategy be a pipeline tying into Region C's water management strategy for the construction of Marvin Nichols Reservoir (as it is reported in the Sulphur River Basin Feasibility Study, SRBA 2014, that 20% of the water potentially available from Marvin Nichols Reservoir would be available for local use in Region D). Preliminary communications with Region C have indicated that this strategy is currently under consideration as a Proposed or Alternative Water Management Strategy for implementation by the year 2060 in the 2021 Region C Water Plan. As Region D has identified that the City of Clarksville has needs as early as 2020, Marvin Nichols as currently envisioned by Region C would not be available to meet the City's identified needs. Furthermore, the North East Texas Regional Water Planning Group opposes the construction of any reservoir in the Sulphur River Basin, and does not recommend this as a Recommended or Alternative Water Management Strategy. However, the City of Clarksville has noted that should this source be available during the planning period, it has reserved the right to work with the Sulphur River Basin Authority and to utilize this source once available.

New Groundwater Wells and Treatment Facility – A planning level analysis was performed to evaluate a strategy including the addition of new wells into the Blossom or Nacatoch Aquifer, Sulphur River Basin, in Red River County, and additional treatment of all of the City's groundwater supplies to address the aforementioned water quality issues. The available yield from the project was determined to be 237 ac-ft/yr. This was the amount calculated to be necessary to meet the projected future demands for the City, once added to Clarksville's existing groundwater supplies. It is thus critical to note that consideration of this strategy is for the entire 620 ac-ft/yr of supply necessary to meet the City's projected demands. The planning process strictly considers the amount of supply necessary to meet the projected shortage, i.e., 237 ac-ft/yr, and uses this amount as the basis for cost estimation purposes. Nevertheless, the strategy would be for the development of sufficient groundwater sources to meet the full 620 ac-ft/yr of projected City demands. It has been assumed for this strategy that existing groundwater wells of the City's are maintained.

Additional assumptions for this analysis included assuming Total Dissolved Solids (TDS) of 1,275 mg/L, and that two Reverse Osmosis (RO), Level 4 treatment plants would be located at the end of a 5-mile, 8-inch transmission line sized sufficiently to carry the full flow of pre-treated water, since when brackish water is treated, approximately 20% of the supply is lost as concentrate. An average of nearby depth (650 ft.) and head (250 ft.) of wells was utilized to calculate the potential number of wells needed (six new wells). For an assumed distance between wells of 1,500 ft., a total length of 7,500 ft. of 6-in. diameter well field piping was estimated. For the pipeline, 30 psi was assumed for the residual head at the end of the pipe, with a maximum pipeline pressure of 150 psi. Difference in elevation was assumed to be 50 ft. The treatment facilities would be of sufficient size (0.7 mgd) to treat the entirety of Clarksville's groundwater supply, both existing and proposed wells.

The TWDB's Unified Costing Model (UCM) was used to develop costs for this strategy. The total capital cost of the project is calculated to be approximately $10,537,000, with an annual cost of $1,598,000, for a unit cost during debt service of $2,577 per ac-ft ($7.91 per 1,000 gallons). After debt service, the unit cost would be approximately $1,382 per ac-ft.

Contract with Lamar County WSD and Treated Water Pipeline to Detroit - A strategy requested by the City of Clarksville is the construction of a 16" diameter pipeline from Clarksville to Detroit, and the purchase of up to 2 MGD of treated water from the Lamar County WSD. This strategy would be contingent upon the Lamar County WSD purchase of equivalent supply from the City of Paris. Cost estimates are based upon the TWDB's Unified Costing Model (UCM). The project is estimated to provide 303 ac-ft/yr by constructing a pipeline to Detroit, whereby the City of Clarksville would enter into a contract with the Lamar County WSD (contingent upon the District contracting for available supply from the City of Paris). This amount provides the surface water supply necessary for mixing with the City's existing groundwater supply, for a total project cost of $12.3 million, an annual cost of $1.5 million, and a unit cost for the additional supply of $5,010 per ac-ft. during debt service and $2,165 per ac-ft after debt service. Identifying uses for the additional production capability of the pipeline (up to 2 MGD) would likely lower the unit cost for this strategy.

Contract with Texarkana and Treated Water Pipeline to De Kalb – Another strategy previously requested by the City of Clarksville is the construction of a 16" diameter pipeline from Clarksville to De Kalb, and the purchase of up to 2 MGD of treated water from Texarkana. This project is based on a cost estimate developed by Riverbend Water Resources District, along with a similar project cost estimate from MTG Engineers. The total cost, annual cost, and unit cost of water from the project has been estimated based upon the results of these studies, as entered into the TWDB's Unified Costing Model (UCM). The project is estimated to have a total yield of 2,240 ac-ft/yr of supply by constructing a pipeline to De Kalb, whereby the City of Clarksville would enter into a contract with the City of Texarkana (or alternatively Riverbend Water Resources District) for up to 593 ac-ft/yr (0.53 MGD). The amount necessary to meet Clarksville's projected needs is 303 ac-ft/yr (0.27 MGD). This amount provides the surface water supply necessary for mixing with the City's existing groundwater supply, for a total project cost of $11.7 million, an annual cost of $1.2 million, and a unit cost for the additional supply of $3,865 per ac-ft. during debt service and $1,149 per ac-ft after debt service. Identifying uses for the additional production capability of the pipeline (up to 2 MGD) would likely lower the unit cost for this strategy.

Concerns about this strategy are with regard to present issues entailing the supply of Wright Patman Reservoir to Texarkana and the remaining Member Cities of Riverbend Water Resources District. Concerns regarding the priority of a new contract for Clarksville for treated water supply from Texarkana/Riverbend are somewhat ameliorated due to the fact that in times of drought, Texarkana's 2012 Water Conservation & Drought Contingency Plan specifies that curtailment of water deliveries to wholesale customers will be done by a pro-rata method as provided in Texas Water Code, §11.039. Furthermore, the amounts of supply considered within the 2021 North East Texas Regional Water Plan are based upon firm yields developed employing the TCEQ Water Availability Model, and reflect legal and infrastructure constraints to identify the amount of available supply. It is expected that costs associated with this strategy would be negotiated between the City of Clarksville and Texarkana/Riverbend WRD, as the City of Clarksville has expressed a potential interest in entering into a water supply relationship as a partner with these entities. This strategy, if implemented, would be contingent upon water management strategies identified for Riverbend WRD and its Member Entities.

Dredge Langford Lake – The firm yield of Langford Lake decreases over time due to sedimentation in the reservoir reducing the total volume of conservation capacity. This strategy would entail the dredging of sediment from Langford Lake to restore storage capacity within the reservoir which has been lost due to this sedimentation. This project utilizes a 24" dredge to remove an estimated 3,000 ac-ft of sediment over a one-year calendar period. The unit cost of reservoir dredging, in units of dollars per ac-ft of sediment removed, has been calculated based upon a formula from the World Bank, as presented in the TWDB Report *Dredging vs. New Reservoirs* (2004). The resultant calculated cost was entered into the UCM to determine the debt service cost. The project is estimated to yield 520 ac-ft of firm supply by dredging an estimated total of 3,000 ac-ft of sediment from Langford Lake over one year, for a total project cost of $36.2 million, an annual cost of $2.8 million, and a unit cost of $5,398 per ac-ft. during debt service and $0 per ac-ft after debt service.

Concerns with this strategy include the location and impacts from disposition of dredged material, the efficiency of removal of the dredged material, and the potential need to repeat the effort in the future since dredging does not remove the source of sedimentation issues in the contributing watershed. As noted in TWDB (2005), issues with regard to dredging fall into four general categories: removal of the sediment, transportation, disposal, and re-use.

For the removal of sediment, dredging reservoirs, particularly at the shallow headwaters and reservoir margins can destroy habitats and affect wetland birds, etc. If the water sustains flora or fauna of particular value, or if fish issues are important, then issues exist regarding lowering the water level. Dredging may also result in a temporary loss of reservoir water quality, through removal of organic material, although there may be long-term improvements in the reservoir water quality through removal of such organic material. Downstream water quality may also be temporarily impacted due to dredging. There may also be a loss of land for containment areas to drain/treat the sediment.

Regarding transportation, reservoirs are often in remote areas. The impact of additional transportation during dredging can place pressure on local communities (e.g., noise/air pollution and physical damage to roads), although these impacts may be reduced if the sediment can be effectively dewatered at or near the reservoir site using, for example, a hydrocyclone and/or a filter bed press. The viability of disposal to land depends on the level of contaminants, whereby there may be risks to groundwater supplies from contamination by leaching.

Opportunities for the re-use of dredged material include sand/gravel/bricks for the construction industry, fertilizer, usage for filling abandoned quarry areas or mines, and usage for capping landfill sites.

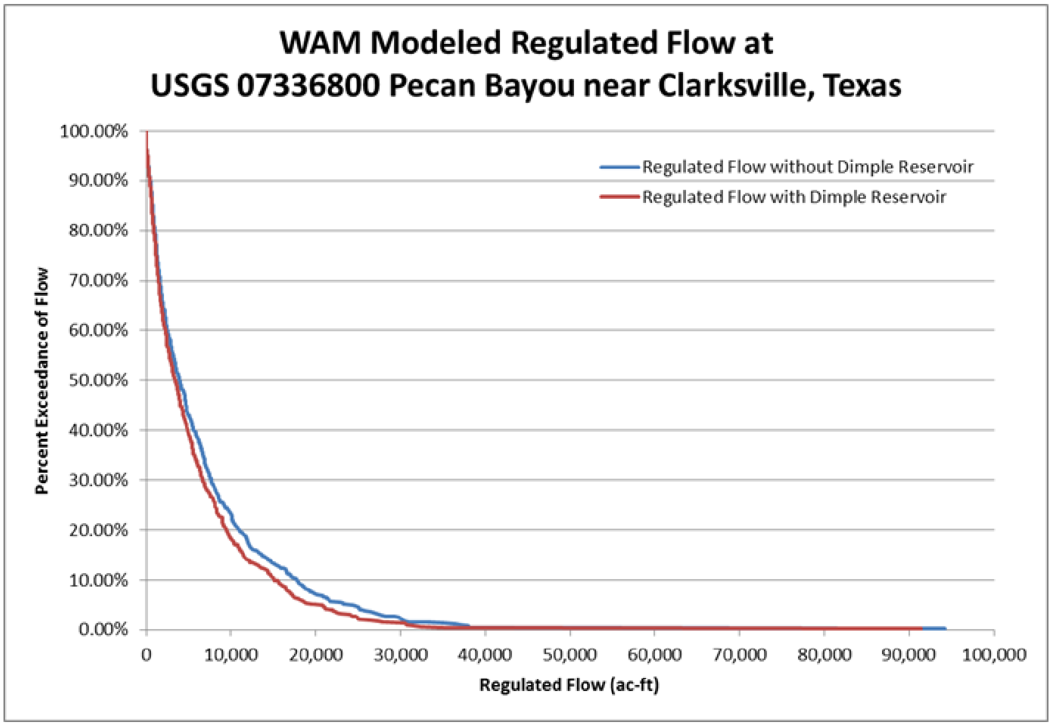
Dimple Reservoir – The City has also identified a feasible strategy to meet future water supply needs as being the construction of a new 28,541 ac-ft reservoir with a projected surface are of 2,230 acres on White Oak Bayou, a tributary of Pecan Bayou, to be utilized as an interbasin transfer from the Red River Basin to the Sulphur River Basin. This reservoir project was originally described in a 1986 report from HDR to the Red River Authority and project participants, entitled *Preliminary Engineering Report for Proposed Dimple Reservoir Project on White Oak Bayou*. The 1986 report identified a potential project site, reservoir area capacity, drainage area, and estimated construction costs for the reservoir and intake structure without equipment. Intake structure equipment and water pipelines from the reservoir were not included in the report, nor was a cost estimate. This site is described in Section 8.9.5 of the 2021 Region D Plan, although it has not been recommended as a unique reservoir site by the NETRWPG for the present round of regional planning.

The reservoir construction costs from the 1986 report have been adjusted to September 2018 costs using the ENR Construction Cost Index (CCI) and entered into the UCM. Intake equipment and a raw water pipeline from the reservoir to the City of Clarksville's water treatment plant have also been preliminarily identified and included in the UCM. The raw water pipeline in the UCM is modeled to deliver the estimated firm yield with a peaking factor of 2. The project pipeline is 8" diameter, and approximately 8 miles long, following existing roadways with an elevation increase of 40 feet. The pipeline costing utilizes the UCM's assumption of 15 psi for the residual head at End of Pipe for raw water and assumes a maximum pipeline pressure of 250 psi. UCM calculations for pump and power requirements provide the cost estimate for the intake equipment. For the 2021 planning process, the reservoir has been modeled in the Red River WAM (Run 3), subject to consensus environmental criteria at a junior priority date, and modeled considering the full demand of existing water rights in the Red River Basin. The results of this WAM analysis indicate the project has a firm yield of 10,200 ac-ft per year, although Clarksville needs only 303 ac-ft/yr to have adequate supply to mix with the City's groundwater supplies to meet its projected needs beyond 2020. However, the City intends to use up to 593 ac-ft/yr to meet its full projected demands. This strategy includes constructing a new 28,541 ac-ft reservoir and 8" pipeline to Clarksville's WTP, for a total project cost of $38.5 million with an annual cost of $2.4 million and a unit cost for the needed supply of $7,970 per ac-ft. with debt service and $1,099 per ac-ft without debt service. It should be noted, however, that Dimple Reservoir, as envisioned herein, is based on existing studies (from 1986) and characterizations of the impoundment. Studies investigating alternative configurations, perhaps using a smaller footprint, are encouraged. Furthermore, needs from additional entities, if identified as willing participants to such an effort, could improve the unit costs calculated for Clarksville herein.

Concerns with this strategy include the potential need for obtaining a surface water permit for an interbasin transfer from the Red River Basin to the Sulphur River Basin. However, there is the potential that this could be waived given the project is located within the same county as the proposed use. The Texas Water Code §11.085 identifies factors to be considered in the applicable regional water plans to address the following:

(A) the availability of feasible and practicable alternative supplies in the receiving basin to the water proposed for transfer;
(B) the amount and purposes of use in the receiving basin for which water is needed;
(C) proposed methods and efforts by the receiving basin to avoid waste and implement water conservation and drought contingency measures;
(D) proposed methods and efforts by the receiving basin to put the water proposed for transfer to beneficial use;
(E) the projected economic impact that is reasonably expected to occur in each basin as a result of the transfer; and
(F) the projected impacts of the proposed transfer that are reasonably expected to occur on existing water rights, instream uses, water quality, aquatic and riparian habitat, and bays and estuaries that must be assessed under Sections 11.147, 11.150, and 11.152 of this code in each basin. If the water sought to be transferred is currently authorized to be used under an existing permit, certified filing, or certificate of adjudication, such impacts shall only be considered in relation to that portion of the permit, certified filing, or certificate of adjudication proposed for transfer and shall be based on historical uses of the permit, certified filing, or certificate of adjudication for which amendment is sought;

The other alternatives considered herein present available alternatives in the receiving basin to the water proposed for transfer. The water would be used for municipal purposes. The City maintains its Water Conservation and Drought Contingency Plan, implementing measures identified therein to avoid waste and conserve water during times of drought. Minimal economic impact is expected in the Red River Basin, whereas positive economic benefits may occur by maintaining the City's municipal supply. As noted above, minimal impacts are expected on existing water rights, as the WAM has been utilized to maintain priorities of these water rights. There exists significant concern with regard to potential environmental impacts of the proposed reservoir considering that the reservoir's contributing watershed represents approximately 25% of the watershed contributing to Pecan Bayou, a stream segment conditionally recognized in the 2021 Region D Plan and by the Texas Parks and Wildlife Department as being an ecologically unique stream segment in the North East Texas Region. Presented below is a monthly flow frequency chart depicting the variation in flows in Pecan Bayou for with- and without project conditions. Significant impacts to agricultural and natural resources would also be expected within the footprint of the reservoir as well. Furthermore, mitigation and compensation may be necessary to the basin of origin.



Flow Frequency Distribution of Regulated Flows at USGS Gage #07336800, Pecan Bayou near Clarksville, Texas, with- and without Dimple Reservoir.

Alternatives:

	2020	2030	2040	2050	2060	2070
Dimple Reservoir (ac-ft/yr)	303	303	303	303	303	303
Contract with Riverbend WRD and Treated Water Pipeline to DeKalb (ac-ft/yr)	303	303	303	303	303	303
Detroit Pipeline (ac-ft/yr)	303	303	303	303	303	303

At present, considerable uncertainty exists in each of the identified feasible water management strategies for the City of Clarksville. The NETRWPG supports any efforts by the City of Clarksville to further study all potential strategies to identify the best approach for the City to meeting all of its future water supply needs, and such a study should be considered consistent with the 2021 North East Texas Regional Water Plan.

Should development of additional groundwater wells to provide up to 237 ac-ft (ac-ft/yr) to meet supply shortages be determined to not be cost feasible, the City will need alternative strategies. To meet the City's projected deficit in 2020, identified alternative strategies for water supply include the study and development one of the following options*:

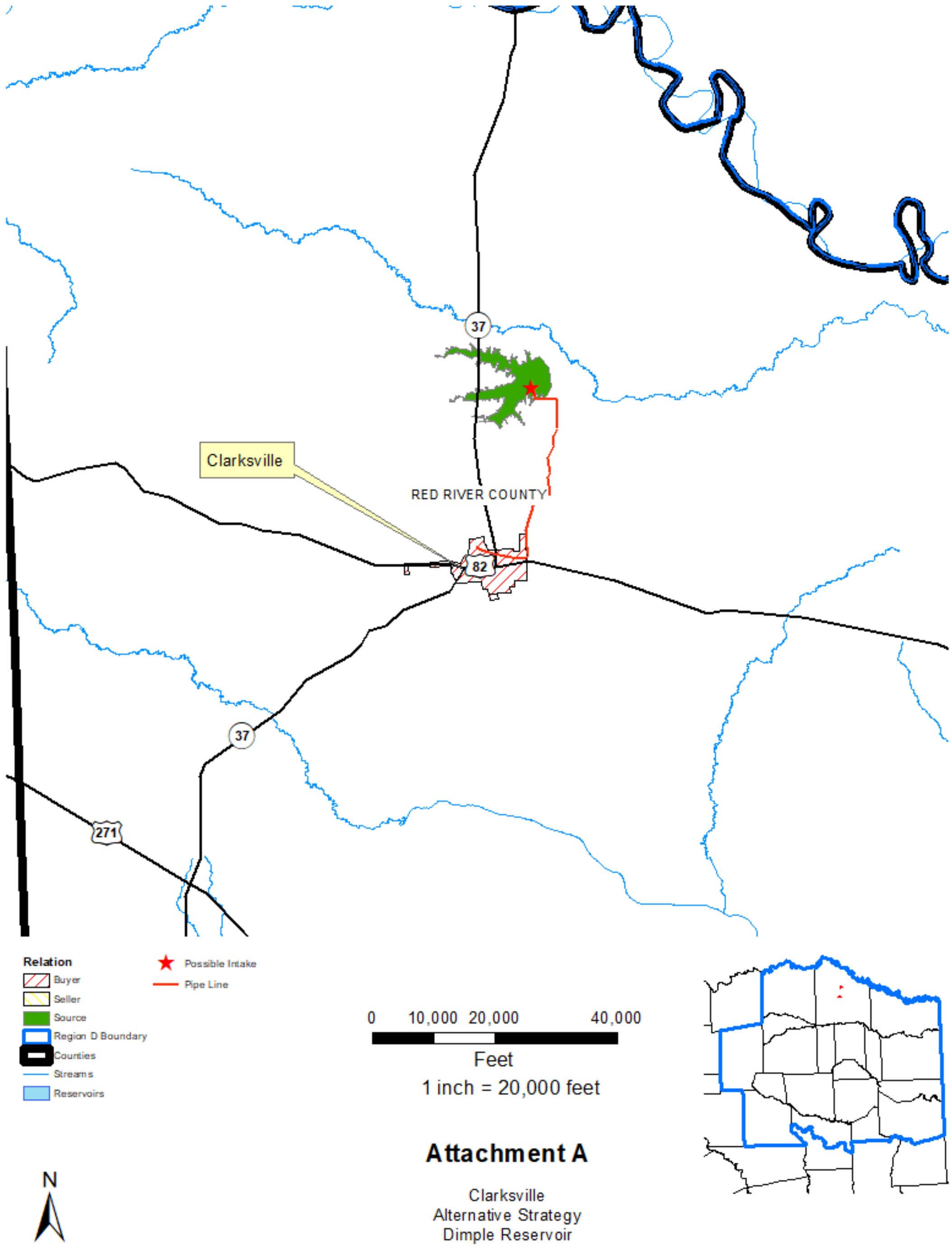
- Construct and develop Dimple Reservoir to provide a maximum 10,200 ac-ft/yr. To meet the City's projected deficit in 2020 an identified alternative strategy is for the City of Clarksville to pursue the development of Dimple Reservoir to meet the City's projected deficit in 2020. This project has the capability to meet the City's identified needs, as well as developing a supply to be potentially utilized by other demands in the area.
- Contract with the Riverbend WRD for supply from Riverbend WRD, which includes the development of a Treated Water Pipeline tying into Riverbend WRD 's system in DeKalb, Texas, to provide 303 ac-ft/yr for the projected needs of the City of Clarksville, although the City of Clarksville has indicated their intent, if this strategy is implemented, to contract additional supply as necessary to meet their full projected demands. This strategy provides a reliable supply without

construction of a new reservoir, thus minimizing potential impacts to the agricultural and natural resources within the Region. Further, this amount allows for the continued use of the City's existing groundwater supplies via mixing. Thus, this recommended strategy is contingent upon the City's use of its existing groundwater supplies, as well as contingent upon recommended strategies for the Riverbend Water Resources District.

- Contract with the Lamar County WSD for supply from the City of Paris, which includes the development of a Treated Water Pipeline tying into Lamar County WSD's system in Detroit, Texas, to provide 303 ac-ft/yr for the projected needs of the City of Clarksville, although the City of Clarksville has indicated their intent, if this strategy is implemented, to contract additional supply as necessary to meet their full projected demands. This strategy allows for the resumption of the City's utilization of existing groundwater supplies via mixing. This strategy is contingent upon the Lamar County WSD contracting for the necessary additional supply from the City of Paris.

*Assuming that water from the Sulphur River is not available from an upper region reservoir.

Given Clarksville's geographic location, it will be necessary that Clarksville establish working relationships with the City of Texarkana, Riverbend Water Resources District, the Sulphur River Basin Authority and/or the Red River Basin Authority to develop any new reservoir and/or water supply strategy.



Attachment A

Clarksville
Alternative Strategy
Dimple Reservoir

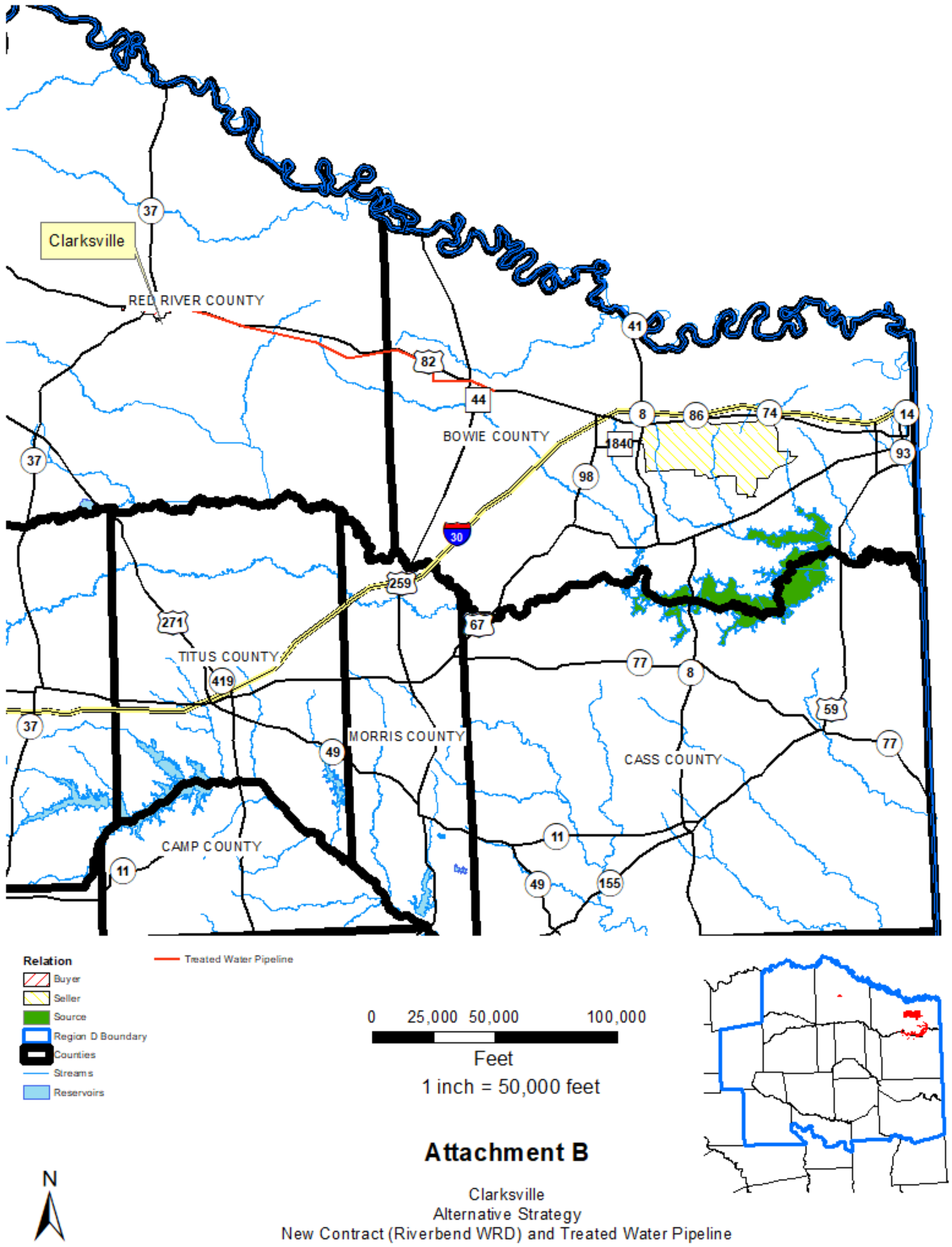
Cost Estimate Summary
Water Supply Project Option
September 2018 Prices
Clarksville - Dimple Reservoir

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 201.9 for September 2018

Item	***Estimated Costs for Facilities***
Dam and Reservoir (Conservation Pool 28541 acft, 2130 acres)	$12,915,000
Primary Pump Station (0.54 MGD)	$3,212,000
Transmission Pipeline (8 in dia., 8 miles)	$1,941,000
Integration, Relocations, & Other	$3,558,000
TOTAL COST OF FACILITIES	**$21,626,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$5,681,000
Environmental & Archaeology Studies and Mitigation	$5,151,000
Land Acquisition and Surveying (2154 acres)	$4,999,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$1,032,000
TOTAL COST OF PROJECT	**$38,489,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$836,000
Reservoir Debt Service (3.5 percent, 40 years)	$1,246,000
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$55,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$80,000
Dam and Reservoir (1.5% of Cost of Facilities)	$194,000
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (50990 kW-hr @ 0.08 $/kW-hr)	$4,000
Purchase of Water (acft/yr @ $/acft)	$0
TOTAL ANNUAL COST	**$2,415,000**
Available Project Yield (acft/yr)	303
Annual Cost of Water ($ per acft), based on PF=2	$7,970
Annual Cost of Water After Debt Service ($ per acft), based on PF=2	$1,099
Annual Cost of Water ($ per 1,000 gallons), based on PF=2	$24.46
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=2	$3.37

Note: One or more cost element has been calculated externally

JMP *10/5/2019*



Attachment B

Clarksville
Alternative Strategy
New Contract (Riverbend WRD) and Treated Water Pipeline

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices

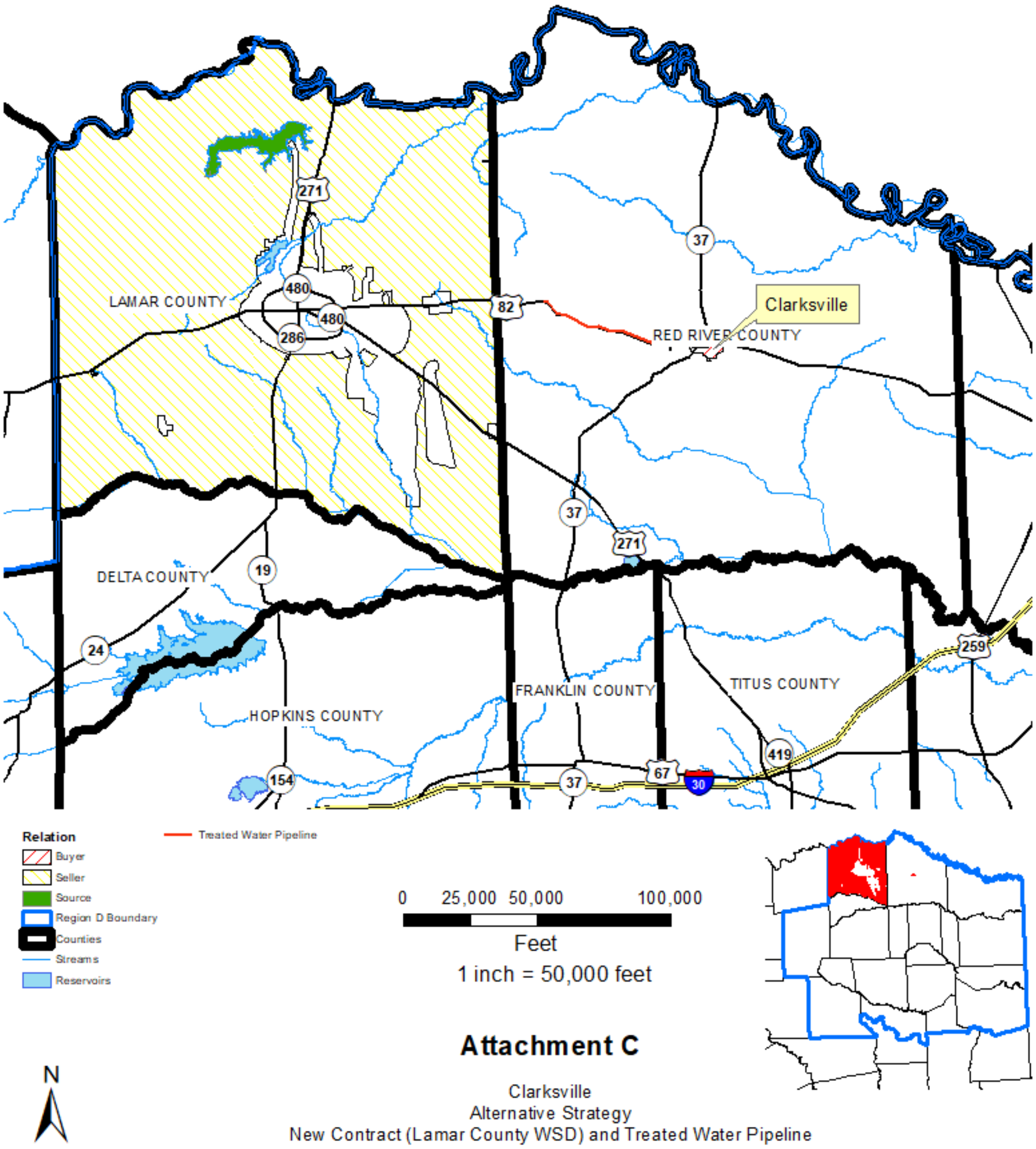
Clarksville - New Contract with Riverbend and pipeline to De Kalb

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 201.9 for September 2018

Item	Estimated Costs for Facilities
Primary Pump Station (2.1 MGD)	$1,565,000
Transmission Pipeline (16 in dia., 27 miles)	$7,945,000
TOTAL COST OF FACILITIES	**$9,510,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$1,650,000
Environmental & Archaeology Studies and Mitigation	$15,000
Land Acquisition and Surveying (70 acres)	$213,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$314,000
TOTAL COST OF PROJECT	**$11,702,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$823,000
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$79,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$39,000
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (1049911 kW-hr @ 0.08 $/kW-hr)	$84,000
Purchase of Water (303 acft/yr @ 482.23 $/acft)	$146,000
TOTAL ANNUAL COST	**$1,171,000**
Available Project Yield (acft/yr)	303
Annual Cost of Water ($ per acft), based on PF=1	$3,865
Annual Cost of Water After Debt Service ($ per acft), based on PF=1	$1,149
Annual Cost of Water ($ per 1,000 gallons), based on PF=1	$11.86
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1	$3.52

Note: One or more cost element has been calculated externally

JMP *10/5/2019*



Attachment C

Clarksville
Alternative Strategy
New Contract (Lamar County WSD) and Treated Water Pipeline

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices

Clarksville - New Contract with Lamar County WSD and pipeline to Detroit

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 201.9 for September 2018

Item	*Estimated Costs for Facilities*
Primary Pump Station (2.1 MGD)	$1,088,000
Transmission Pipeline (16 in dia., 13 miles)	$7,693,000
TOTAL COST OF FACILITIES	**$8,781,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$2,689,000
Environmental & Archaeology Studies and Mitigation	$340,000
Land Acquisition and Surveying (37 acres)	$117,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$328,000
TOTAL COST OF PROJECT	**$12,255,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$862,000
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$77,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$27,000
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (727701 kW-hr @ 0.08 $/kW-hr)	$58,000
Purchase of Water (303 acft/yr @ 1629.14 $/acft)	$494,000
TOTAL ANNUAL COST	**$1,518,000**
Available Project Yield (acft/yr)	303
Annual Cost of Water ($ per acft), based on PF=1	$5,010
Annual Cost of Water After Debt Service ($ per acft), based on PF=1	$2,165
Annual Cost of Water ($ per 1,000 gallons), based on PF=1	$15.37
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1	$6.64

JMP *10/5/2019*

EVALUATION OF WATER MANAGEMENT STRATEGIES FOR MEETING THE PROJECTED WATER SUPPLY NEEDS OF IRRIGATION IN RED RIVER COUNTY

Description of Water User Group:

The Irrigation WUG in Red River County has a demand that is projected to decrease from 5,156 ac-ft/yr in 2020 to 4,895 ac-ft/yr in 2070. Irrigation in Red River County is projected to be supplied by existing surface water from run-of-river diversions from the Red and Sulphur Rivers. A deficit of 4,376 ac-ft/yr is projected to occur in 2020 and decrease to 4,125 ac-ft/yr by 2070.

Water Supply and Demand Analysis:

	2020	2030	2040	2050	2060	2070
Projected Water Demand	3,867	3,867	3,867	3,867	3,867	3,867
Current Water Supply	2,523	2,523	2,523	2,523	2,523	2,523
Projected Supply Surplus (+)/Deficit(-)	**-1,344**	**-1,344**	**-1,344**	**-1,344**	**-1,344**	**-1,344**

Projected Supply Surplus (+)/Deficit(-) by Basin	**2020**	**2030**	**2040**	**2050**	**2060**	**2070**
Sulphur	-2,154	-2,154	-2,154	-2,154	-2,154	-2,154
Red	810	810	810	810	810	810
Total	**-1,344**	**-1,344**	**-1,344**	**-1,344**	**-1,344**	**-1,344**

Evaluation of Potentially Feasible Water Management Strategies:

Multiple alternative strategies were considered to meet the Red River County Irrigation WUG's water supply shortages. Advanced water conservation for irrigation practices were not considered in this planning effort, as amounts potentially saved would not provide sufficient savings to meet the projected needs over the planning period. The use of reuse water from nearby municipalities is not considered feasible as it would not be effective to deliver reuse water to farm irrigation systems.

Groundwater was identified as a potential source of water for irrigation in Red River County. A local hydrogeologic assessment was performed by Region D to assess source groundwater availability, as there is no GCD located within the Region. Based on a relatively low average annual water level decline and the potential for high-productivity wells in the portion of the Nacatoch Aquifer located in the Sulphur River Basin in Red River County, it has been determined that the future projected needs can likely be met with additional irrigation wells. For the portion of the Trinity Aquifer located in the Sulphur River Basin in Red River County, the local hydrogeologic assessment did not identify sufficient available data to determine potential productivity; however, since there is little to no current production from this portion of the Trinity Aquifer, it has been determined that sufficient source availability is likely to meet the projected needs identified for the Irrigation WUG in Red River County.

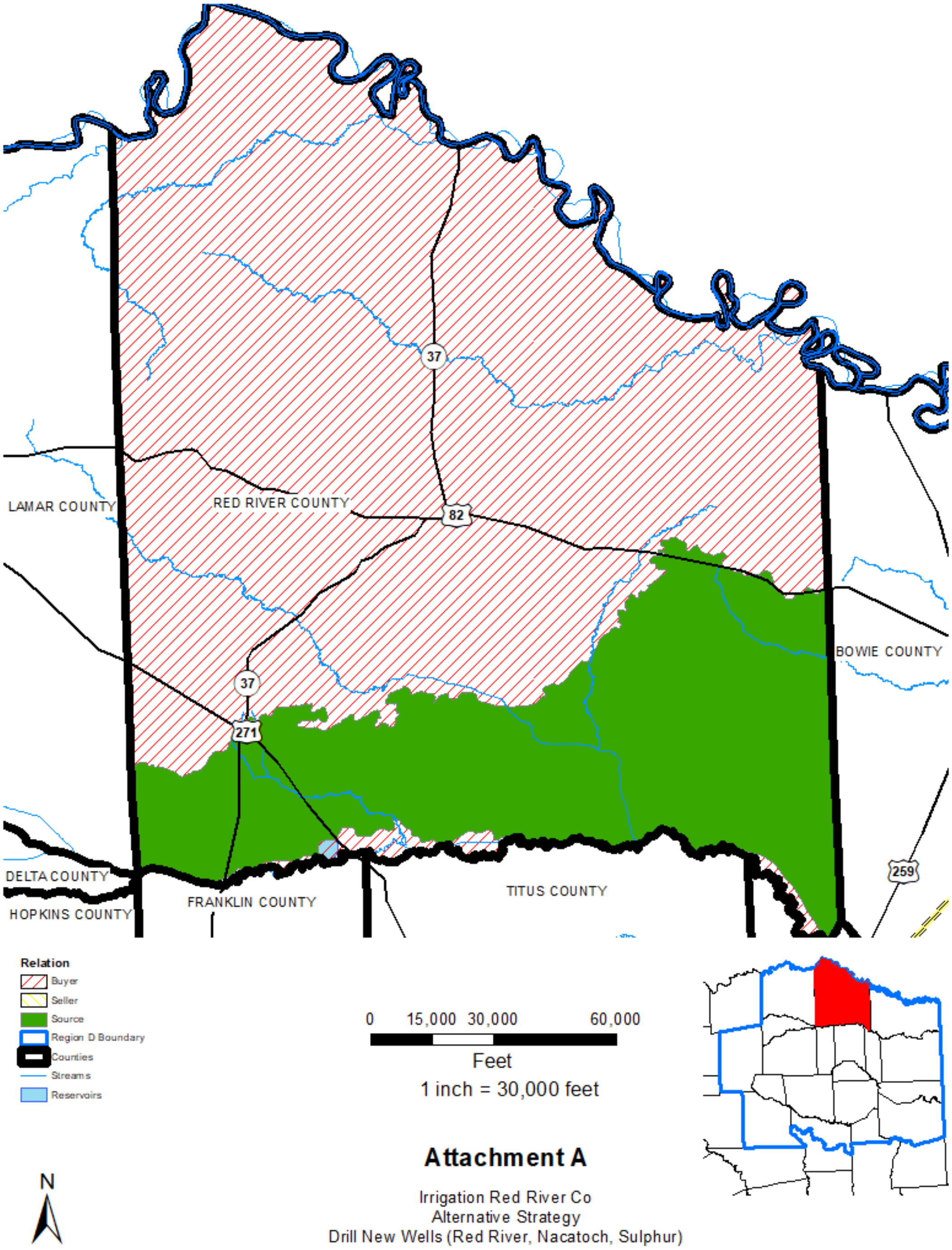
Treated surface water purchased from Lamar County WSD was considered as a viable supplement to the additional groundwater in order to meet projected demands. Purchasing sufficient treated surface water from Lamar County WSD to meet the entirety of the need was also considered as possible strategy. Purchasing raw water from the City of Paris has also been considered as a possible strategy, with a higher capital cost but an anticipated lower annual cost. The City's surface water permit for Pat Mayse Reservoir, as amended, allows for the interbasin transfer and use of water in both the Red and Sulphur River basins. However, the use of water via this permit would require a minor amendment to add irrigation as a permitted use.

Strategy	Firm Yield (AF)	Total Capital Cost	Total Annualized Cost	Unit Cost	Env. Impact
Drill New Wells, (Nacatoch Aquifer, Sulphur Basin)	**2,057**	**$6,551,000**	**$1,709,000**	**$831**	**1**
Drill New Wells (Trinity Aquifer, Sulphur Basin)	**97**	**$425,000**	**$88,000**	**$907**	**1**
Pat Mayse Treated Water Pipeline from Lamar County WSD	**2,154**	**$23,769,000**	**$5,619,000**	**$2,609**	**2**
Pat Mayse Raw Water Pipeline from Paris	**2,154**	**$45,682,000**	**$4,535,000**	**$2,105**	**2**

Identified Alternative WMS and WMSP:

	2020	2030	2040	2050	2060	2070
Drill New Well (Trinity Aquifer, Sulphur Basin)	97	97	97	97	97	97

The identified alternative water management strategy for the Red River County Irrigation WUG to meet projected demands during the planning period is in addition to the recommended strategy, to drill one new well in the Trinity Aquifer, Sulphur Basin, Red River County, to meet the remaining unmet need of 97 ac-ft/yr due to MAG limitations. The Region D analysis indicates that the 97 ac-ft/yr of need remaining after implementation of recommended strategies can be obtained from existing sources exceeding the MAG from the Trinity Aquifer, Sulphur Basin with one additional well rated at 75 gpm. This alternative strategy represents the more likely scenario for the WUG given the lack of a Groundwater Conservation District within the NETRWPA.



Attachment A

Irrigation Red River Co
Alternative Strategy
Drill New Wells (Red River, Nacatoch, Sulphur)

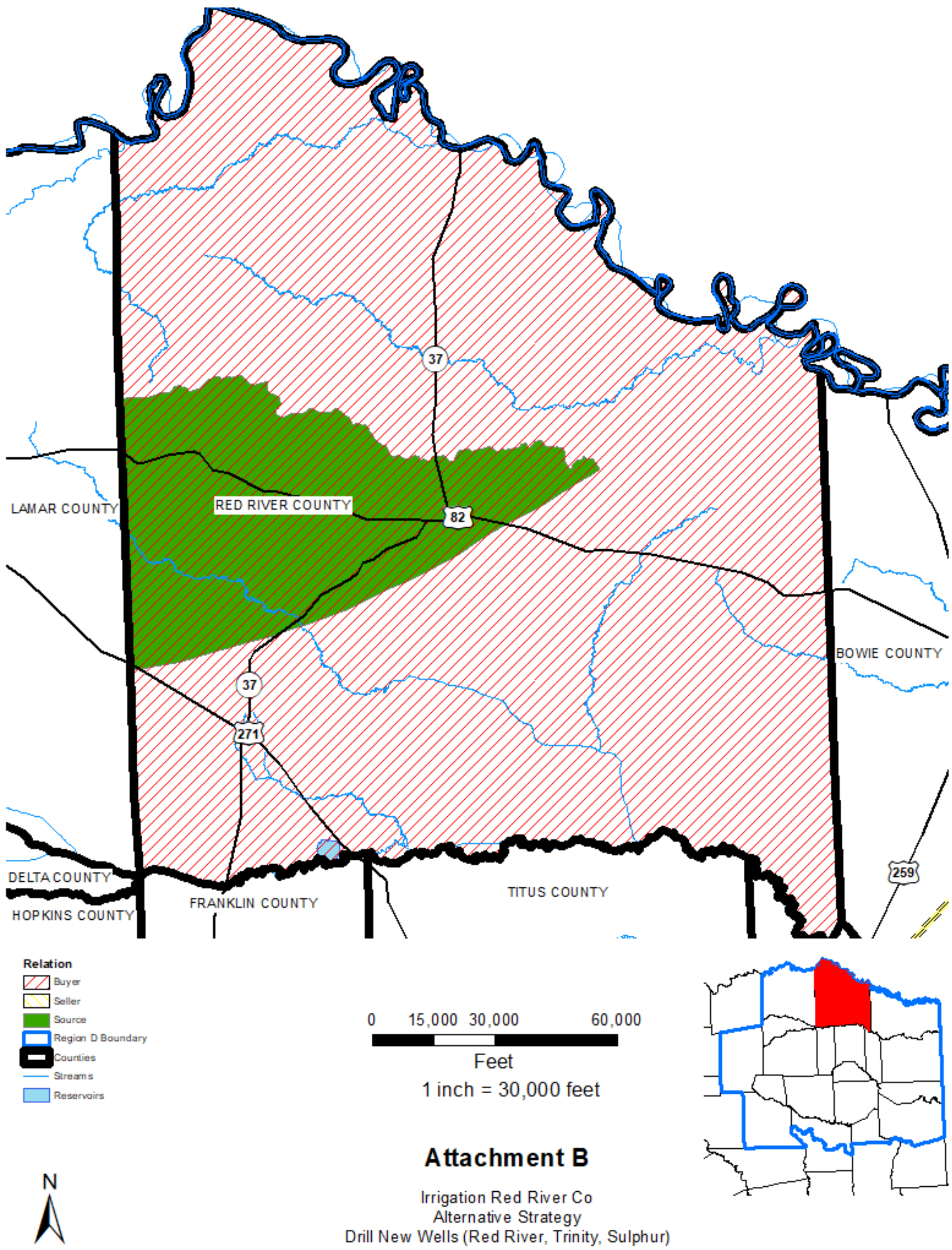
Cost Estimate Summary
Water Supply Project Option
September 2018 Prices

Irrigation Red River - Drill New Wells (Red River, Nacatoch Aquifer, Sulphur Basin)

Cost based on ENR CCI 11170.28 for September 2018 and
a PPI of 201.9 for September 2018

Item	*Estimated Costs for Facilities*
CAPITAL COST	
Well Fields (Wells, Pumps, and Piping)	$4,580,000
TOTAL COST OF FACILITIES	**$4,580,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$1,603,000
Environmental & Archaeology Studies and Mitigation	$131,000
Land Acquisition and Surveying (12 acres)	$61,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$176,000
TOTAL COST OF PROJECT	**$6,551,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$461,000
Reservoir Debt Service (3.5 percent, 40 years)	$0
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$46,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (2158148 kW-hr @ 0.08 $/kW-hr)	$173,000
Purchase of Water (2057 acft/yr @ 500 $/acft)	$1,029,000
TOTAL ANNUAL COST	**$1,709,000**
Available Project Yield (acft/yr)	2,057
Annual Cost of Water ($ per acft), based on PF=1	$831
Annual Cost of Water After Debt Service ($ per acft), based on PF=1	$607
Annual Cost of Water ($ per 1,000 gallons), based on PF=1	$2.55
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1	$1.86

JMP *10/5/2019*



Attachment B

Irrigation Red River Co
Alternative Strategy
Drill New Wells (Red River, Trinity, Sulphur)

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices

Irrigation Red River - Drill New Wells (Red River, Trinity Aquifer, Sulphur Basin)

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 201.9 for September 2018

Item	*Estimated Costs for Facilities*
Well Fields (Wells, Pumps, and Piping)	$298,000
TOTAL COST OF FACILITIES	**$298,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$104,000
Environmental & Archaeology Studies and Mitigation	$8,000
Land Acquisition and Surveying (1 acres)	$3,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$12,000
TOTAL COST OF PROJECT	**$425,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$30,000
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$3,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (77268 kW-hr @ 0.08 $/kW-hr)	$6,000
Purchase of Water (97 acft/yr @ 500 $/acft)	$49,000
TOTAL ANNUAL COST	**$88,000**
Available Project Yield (acft/yr)	97
Annual Cost of Water ($ per acft), based on PF=1	$907
Annual Cost of Water After Debt Service ($ per acft), based on PF=1	$598
Annual Cost of Water ($ per 1,000 gallons), based on PF=1	$2.78
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1	$1.83

JMP *10/5/2019*

REGION D
EVALUATIONS OF ALTERNATIVE WATER MANAGEMENT STRATEGIES
FOR MEETING PROJECTED WATER SUPPLY NEEDS
TO YEAR 2070

VAN ZANDT COUNTY

WUGs:

The City of Canton
Van Zandt County Manufacturing

EVALUATION OF WATER MANAGEMENT STRATEGIES FOR MEETING THE PROJECTED WATER SUPPLY NEEDS OF CITY OF CANTON

Description of Water User Group:

The City of Canton provides water service in Van Zandt County. The city's population is projected to be 3,981 by 2020 and increasing to 5,352 by 2070. The City of Canton utilizes groundwater from the Carrizo-Wilcox aquifer, and surface water from Mill Creek Reservoir and a run of river water right for water supplies. The City of Canton is not projected to have a shortage during the planning period.

Water Supply and Demand Analysis:

	2020	2030	2040	2050	2060	2070
Population	3,981	4,352	4,636	4,919	5,153	5,352
Projected Water Demand	965	1,036	1,089	1,148	1,201	1,247
Water Demand from other entities	0	0	0	0	0	0
Current Water Supply	1,611	1,611	1,611	1,611	1,568	1,568
Projected Supply Surplus (+) / Deficit (-)	**646**	**575**	**522**	**463**	**367**	**321**

Projected Supply Surplus (+) / Deficit (-) by Basin	2020	2030	2040	2050	2060	2070
Sabine	645	574	522	463	367	321
Trinity	1	1	0	0	0	0
Total	**646**	**575**	**522**	**463**	**367**	**321**

Evaluation of Potentially Feasible Water Management Strategies:

In 2008, the Canton City council authorized the appropriation of $70,000 to prepare a long-term water plan. The project evaluated four (4) reservoir sites in Van Zandt County. Two of the four proved to be feasible from a technical standpoint. The City spent an additional $30,000 in 2009 and 2010 to address questions and provide additional information requested by the committee members. In addition to these two long-term strategies, two additional water wells were included to satisfy short-term needs. These two additional wells have been completed. Additional groundwater supply is a potentially feasible strategy. Water reuse is a potentially feasible water supply strategy, as the City currently has a water rights application pending at the Texas Commission on Environmental Quality for the authorization of indirect reuse. At the request of the City of Canton, the construction of an additional water well by 2020 was identified as a feasible strategy because the City of Canton is planning on developing additional groundwater supply to supplement existing supplies. Also at the request of the City, a potential new reservoir on Grand Saline Creek was also considered as a feasible strategy for the City.

Strategy	Firm Yield (ac-ft)	Total Capital Cost	Total Annualized Cost	Unit Cost	Environmental Impact
Indirect/Direct Reuse	**323**	**$8,381,000**	**$1,063,000**	**$3,291**	**2**
Drill New Well (Carrizo-Wilcox, Sabine Basin)	**100**	**$716,000**	**$142,000**	**$1,420**	**1**
New Reservoir on Grand Saline Creek	**1,810**	**$62,966,000**	**$3,896,000**	**$2,152**	**5**

New Reservoir on Grand Saline Creek – The City has identified a feasible strategy to meet future water supply needs as being the construction of a new 1,845 acre (24,980 ac-ft) reservoir on Grand Saline Creek, a tributary of Sabine River. This reservoir project was originally described in a 2008 report from Gary Burton Engineering, Inc. to the City of Canton, entitled *Long-Term Water Study Surface Water Supply.* The 2008 report identified the project site, reservoir surface area, drainage area, and estimated construction costs for the reservoir, intake structure, transmission pipeline and water treatment plant expansion.

The construction costs associated with the new reservoir, raw water transmission line, and water treatment plant expansion are based on calculations from the UCM. For the 2016 planning process, the reservoir has been modeled in the Sabine River WAM (Run 3), subject to SB 3 environmental flow criteria at a junior priority date, and modeled considering the full demand of existing water rights in the Sabine River Basin. The results of this WAM analysis indicate the project has a firm yield of 1,810 ac-ft per year. The project is estimated to yield 1,810 ac-ft/yr of supply by constructing a new 24,980 ac-ft reservoir and 14" pipeline to Canton's WTP and expanding the WTP, for a total project cost of $63 million with an annual cost of $3.9 million and a unit cost for the additional supply of $2,152 per ac-ft. with debt service and $265 per ac-ft without debt service.

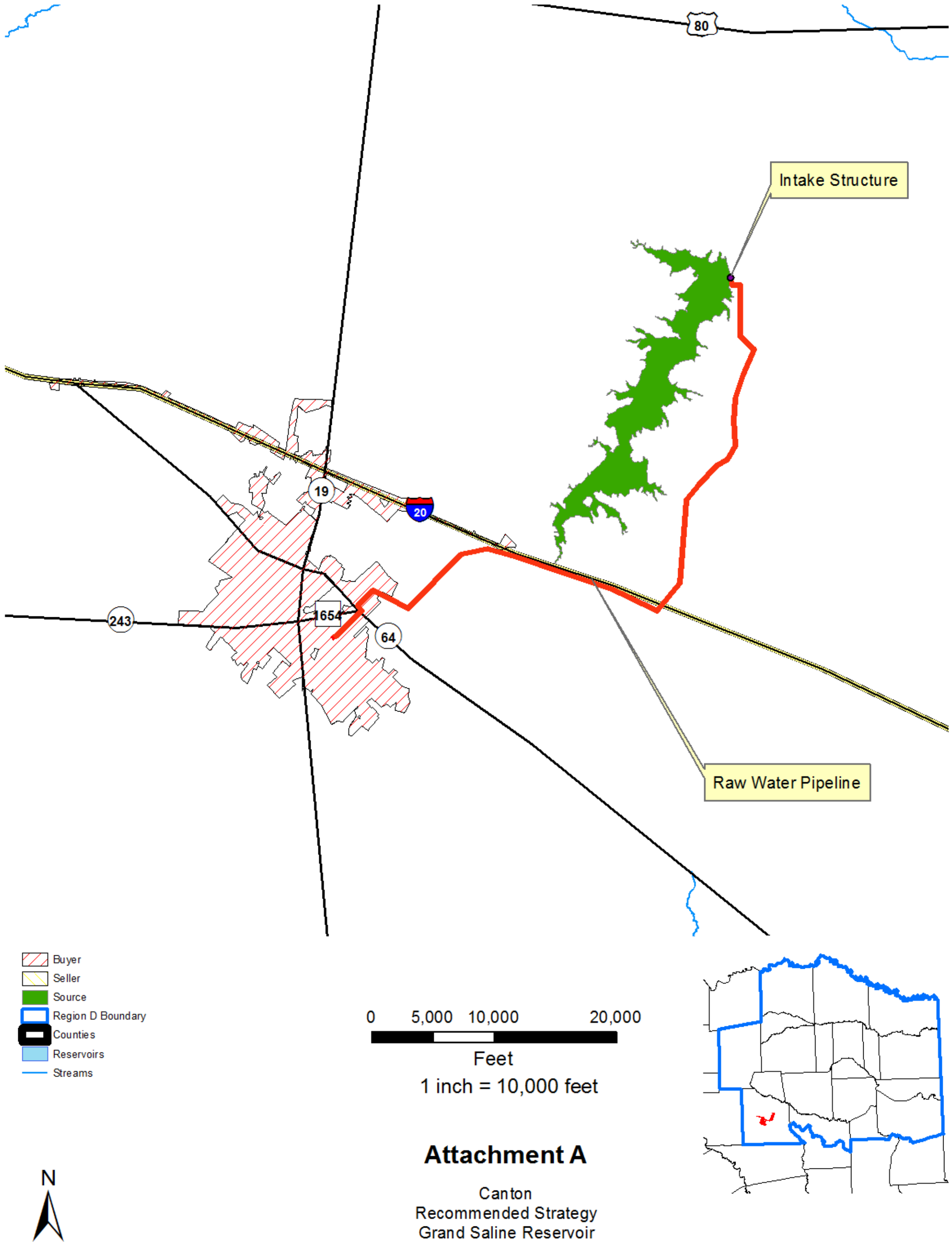
Identified Alternative WMS and WMSP:

	2020	2030	2040	2050	2060	2070
New Reservoir on Grand Saline Creek (ac-ft/yr)	1,810	1,810	1,810	1,810	1,810	1,810

Because of substantial disagreement over future population and water demands, the City has requested the following alternate strategy:

> The strategy to meet future needs "is with surface water from a proposed reservoir on Grand Saline Creek. The City of Canton has provided to NETRWPG resolutions from three other cities in Van Zandt County supporting the reservoir project. This show of support indicates that a regional surface water reservoir could possibly replace the groundwater strategies for other Van Zandt County public water supplies with projected deficits. However, due to the time typically required to obtain the necessary permits to impound surface water, the City plans to construct one or two additional wells, or implement a reuse option in the interim to meet increasing demands due to population growth and the First Monday influence." This alternative wording should be considered consistent with this plan in the event that population growth in the potential service area significantly exceeds current NETRWPG projections.

This alternative strategy for the City of Canton is to construct by 2020 a new 1,845 acre (24,980 ac-ft) reservoir on Grand Saline Creek, a tributary of Sabine River, construct a 14" pipeline from the new reservoir's intake to Canton's WTP and expanding the WTP. The project is estimated to yield 1,810 ac-ft/yr of supply.


80
Intake Structure
19
20
243
1654
64
Raw Water Pipeline
Buyer
Seller
Source
Region D Boundary
Counties
Reservoirs
Streams
0 5,000 10,000 20,000
Feet
1 inch = 10,000 feet
Attachment A
Canton
Recommended Strategy
Grand Saline Reservoir
N

Cost Estimate Summary ***Water Supply Project Option*** ***September 2018 Prices*** ***Canton - New Reservoir on Grand Saline Creek***	
Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 201.9 for September 2018	
Item	***Estimated Costs for Facilities***
CAPITAL COST	
Dam and Reservoir (Conservation Pool 24980 acft, 1845 acres)	$10,713,000
Transmission Pipeline (14 in dia., 11.9 miles)	$5,174,000
Intake Pump Stations (3.2 MGD)	$6,440,000
Transmission Pump Station(s) & Storage Tank(s)	$2,493,000
TOTAL COST OF FACILITIES	**$24,820,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$8,428,000
Environmental & Archaeology Studies and Mitigation	$18,601,000
Land Acquisition and Surveying (1884 acres)	$9,431,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$1,686,000
TOTAL COST OF PROJECT	**$62,966,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$1,398,000
Reservoir Debt Service (3.5 percent, 40 years)	$2,018,000
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$62,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$198,000
Dam and Reservoir (1.5% of Cost of Facilities)	$161,000
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (733645 kW-hr @ 0.08 $/kW-hr)	$59,000
Purchase of Water (acft/yr @ $/acft)	$0
TOTAL ANNUAL COST	**$3,896,000**
Available Project Yield (acft/yr)	1,810
Annual Cost of Water ($ per acft), based on PF=2	$2,152
Annual Cost of Water After Debt Service ($ per acft), based on PF=2	$265
Annual Cost of Water ($ per 1,000 gallons), based on PF=2	$6.60
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=2	$0.81
JMP	*10/17/2019*

EVALUATION OF WATER MANAGEMENT STRATEGIES FOR MEETING THE PROJECTED WATER SUPPLY NEEDS OF MANUFACTURING IN VAN ZANDT COUNTY

Description of Water User Group:

The Manufacturing WUG in Van Zandt County has a demand that is projected to increase from 506 ac-ft/yr in 2020 to 757 ac-ft/yr by 2030, remaining constant through 2070. Manufacturing in Van Zandt County is supplied by groundwater from the Carrizo-Wilcox Aquifer, purchased groundwater from Golden WSC and Grand Saline, and surface water from run-of-river permits on the Sabine River, a permit for diversion from Lake Tawakoni. A deficit of 208 ac-ft/yr is projected to occur in 2030, decreasing to 116 ac-ft/yr by 2070.

Water Supply and Demand Analysis:

	2020	2030	2040	2050	2060	2070
Projected Water Demand	506	757	757	757	757	757
Current Water Supply	264	264	264	264	253	253
Projected Supply Surplus (+)/Deficit(-)	**-242**	**-493**	**-493**	**-493**	**-504**	**-504**

Projected Supply Surplus (+)/Deficit(-) by Basin	2020	2030	2040	2050	2060	2070
Sabine	-242	-492	-492	-492	-503	-503
Trinity	0	-1	-1	-1	-1	-1
Total	**-242**	**-493**	**-493**	**-493**	**-504**	**-504**

Evaluation of Potentially Feasible Water Management Strategies:

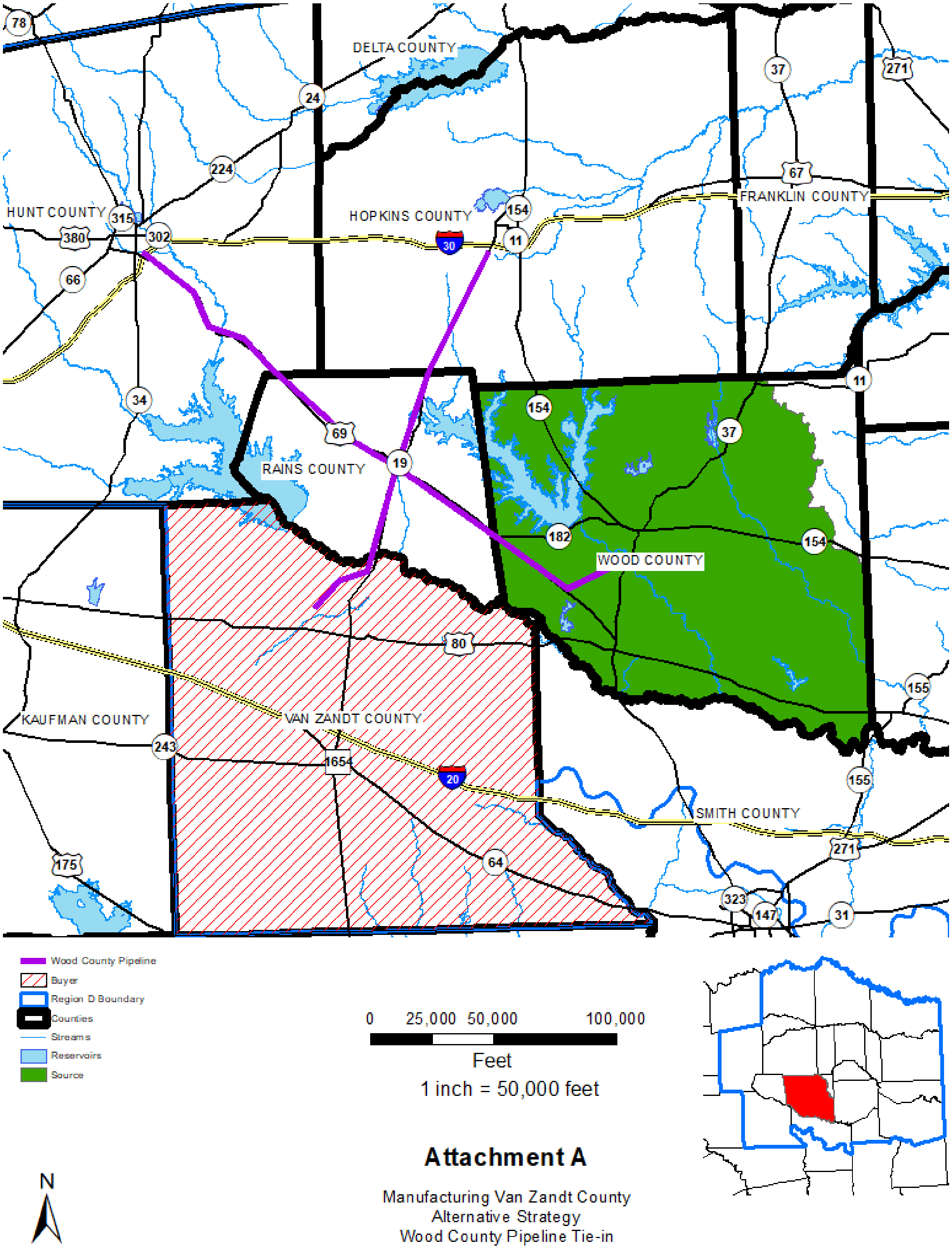
Eight alternative strategies were considered to meet the Van Zandt County Manufacturing WUG's water supply shortages. Advanced water conservation for manufacturing was considered in this planning effort to reduce overall demands; however, it does not resolve all identified needs. The use of reuse water from nearby municipalities was not considered to be feasible at present. Surface water was not considered as a viable alternative to meet projected demands because no supplies are readily available in the proximity of the identified needs. Groundwater has been identified as a potential source of water for manufacturing in Van Zandt County. In addition, groundwater supplies can be contracted from the City of Grand Saline and Golden WSC. Another potentially feasible strategy is the Wood County Pipeline which could supply groundwater from Wood County.

Strategy	Firm Yield (AF)	Total Capital Cost	Total Annualized Cost	Unit Cost	Environmental Impact
Advanced Water Conservation	**75**	**$0**	**$0**	**$0**	**1**
Drill New Wells (Carrizo-Wilcox Aquifer; Trinity Basin)	**504**	**$2,852,000**	**$506,000**	**$1,004**	**1**
Drill New Wells (Carrizo-Wilcox Aquifer; Sabine Basin)	**1**	**$292,000**	**$24,000**	**$24,000**	**1**
Increase Existing Contract for Carrizo-Wilcox from Grand Saline	**72**	**$0**	**$202,000**	**$2,806**	**1**
Increase Existing Contract for Carrizo-Wilcox from Golden WSC	**214**	**$0**	**$279,000**	**$1,304**	**1**
Wood County Pipeline Tie-in	**429**	**$0**	**$619,000**	**$1,442**	**2**

Identified Alternative WMS and WMSP:

	2020	2030	2040	2050	2060	2070
Advanced Water Conservation	0	75	75	75	75	75
Wood County Pipeline Tie-in	242	418	418	418	429	429

The identified Alternative Water Management Strategy for the Manufacturing WUG in Van Zandt County is the Wood County Pipeline Strategy, of which an Alternative Water Management Strategy Project is the acquisition of raw water from the Van Zandt County Branch of the Wood County Pipeline Strategy. For the purposes of the 2021 Plan, costs associated with the Van Zandt County Branch are included in the overall costs of the WMS. That portion of the capital and annual costs associated to the Van Zandt County Branch are included in the annual purchase cost for this WMSP. No additional costs were assumed for distribution of the raw water beyond the assumed end of the Van Zandt County Branch. This alternative strategy is contingent upon the regionalized development of a groundwater well field in Wood County and a conveyance pipeline from Wood County to Van Zandt County.



Attachment A

Manufacturing Van Zandt County
Alternative Strategy
Wood County Pipeline Tie-in

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices

Manufacturing Van Zandt - Wood County Pipeline Tie-in

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 201.9 for September 2018

Item	***Estimated Costs for Facilities***
ANNUAL COST	
Operation and Maintenance	
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (0 kW-hr @ 0.08 $/kW-hr)	$0
Purchase of Water (429 acft/yr @ 1442 $/acft)	$619,000
TOTAL ANNUAL COST	**$619,000**
Available Project Yield (acft/yr)	429
Annual Cost of Water ($ per acft), based on PF=1	$1,443
Annual Cost of Water After Debt Service ($ per acft), based on PF=1	$1,443
Annual Cost of Water ($ per 1,000 gallons), based on PF=1	$4.43
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1	$4.43

JMP *10/6/2019*

REGION D
EVALUATIONS OF ALTERNATIVE WATER MANAGEMENT STRATEGIES
FOR MEETING PROJECTED WATER SUPPLY NEEDS
TO YEAR 2070

WOOD COUNTY

WUGs:

Wood County Livestock
Wood County Manufacturing
Wood County Pipeline Regionalization Strategy

EVALUATION OF WATER MANAGEMENT STRATEGIES FOR MEETING THE PROJECTED WATER SUPPLY NEEDS LIVESTOCK IN WOOD COUNTY

Description of Water User Group:

The Livestock WUG in Wood County is a split entity and has a demand that is projected to be a constant 483 ac-ft/yr from 2020 to 2070. Livestock in Wood County, Cypress has a current water supply consisting of water wells from the Carrizo-Wilcox Aquifer and Local Supplies. The total rated available supply from these sources is 449 ac-ft/yr in 2020 thru 2070. Livestock in Wood County, Cypress is projected to have a water supply deficit of 34 ac-ft/yr in 2020 thru 2070.

The Livestock WUG in Wood County Sabine is a split entity and has a demand that is projected to be a constant 2,741 ac-ft/yr from 2020 to 2070. Livestock in Wood County Sabine has a current water supply consisting of water wells from the Carrizo-Wilcox Aquifer and Local Supplies. The total rated available supply from these sources is 1,643 ac-ft/yr in 2020 thru 2070. Livestock in Wood County, Sabine is projected to have a water supply deficit of 1,098 ac-ft/yr in 2020 thru 2070.

Water Supply and Demand Analysis:

Livestock Wood Cypress	2020	2030	2040	2050	2060	2070
Projected Water Demand	483	483	483	483	483	483
Current Water Supply	555	555	555	555	555	555
Projected Supply Surplus (+)/Deficit(-)	72	72	72	72	72	72

Livestock Wood Sabine	2020	2030	2040	2050	2060	2070
Projected Water Demand	2,741	2,741	2,741	2,741	2,741	2,741
Current Water Supply	1,643	1,643	1,643	1,643	1,643	1,643
Projected Supply Surplus (+)/Deficit(-)	-1,098	-1,098	-1,098	-1,098	-1,098	-1,098

Evaluation of Potentially Feasible Water Management Strategies:

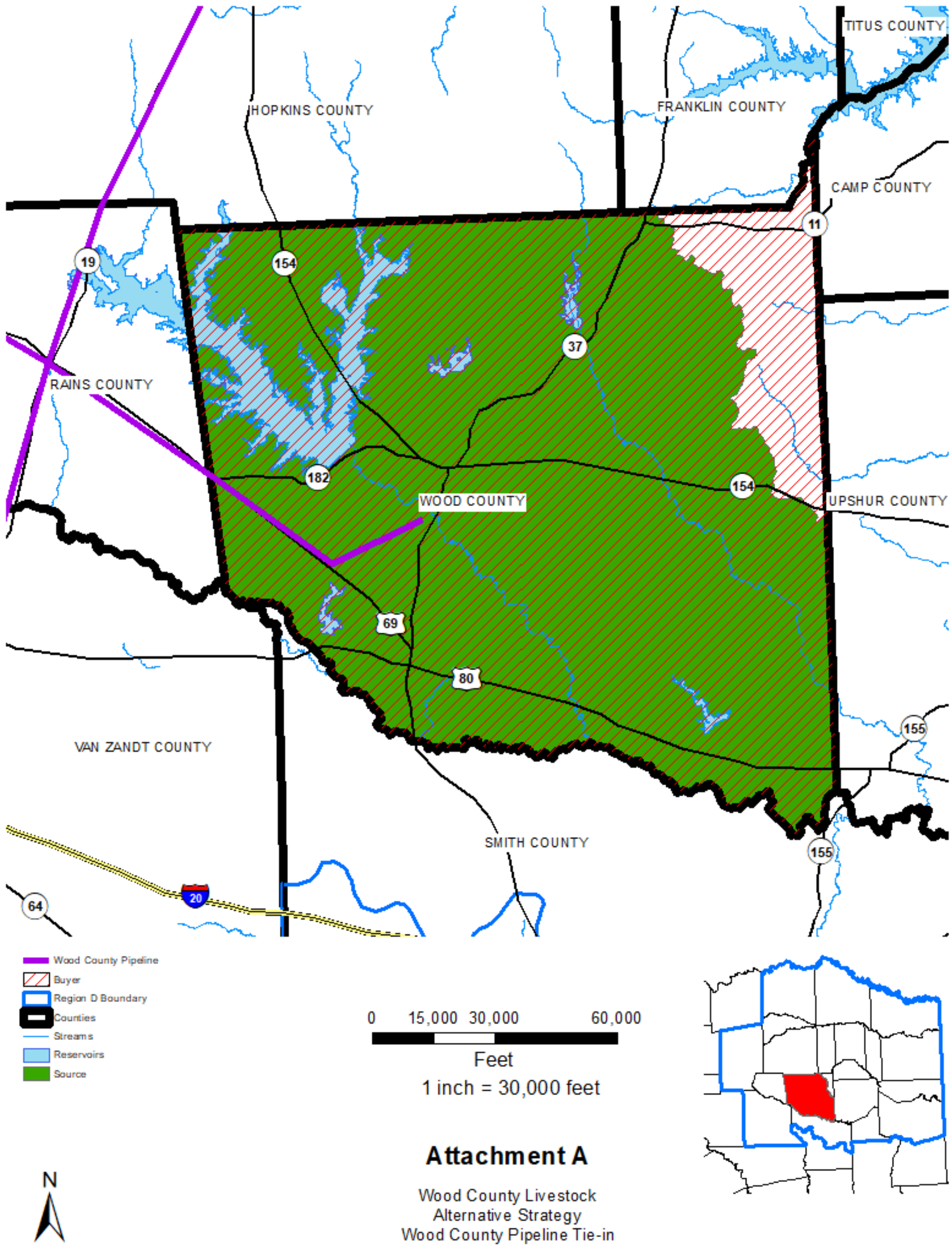
Six alternative strategies were considered to meet the Wood County, Livestock, Sabine water supply shortages as summarized in the following table. Advanced conservation, water reuse, and surface water alternatives were not considered because the livestock demands are very rural in nature. Groundwater from the Queen City Aquifer (Sabine River Basin) was identified as a potentially feasible strategy for the WUG. Groundwater from the Wood County Pipeline has also been identified as a potentially feasible strategy.

Strategy	Firm Yield (AF)	Total Capital Cost	Total Annualized Cost	Unit Cost	Environmental Impact
Groundwater (Sabine)	**1,129**	**$ 1,210,000**	**$ 125,000**	**$ 111**	**1**
Wood County Pipeline Tie-in	**1,132**	**$2,479,000**	**$787,000**	**$695**	**2**

Identified Alternative WMS and WMSP:

	2020	2030	2040	2050	2060	2070
Wood County Pipeline Tie-in	1,132	1,132	1,132	1,132	1,132	1,132

The identified Alternative Water Management Strategy for the Livestock WUG in Wood County to meet their projected deficit of 1,098 ac-ft/yr in 2020 thru 2070 is the Wood County Pipeline Strategy, of which an Alternative Water Management Strategy Project is to construct a tie-in pipeline into the Wood County Wellfield and transmission pipeline. This alternative WMSP assumes a 2 mile long 12" diameter pipeline with a reduced unit cost of water given the proximity of the demand to the source. This alternative strategy is contingent upon the regionalized development of a groundwater well field in Wood County.



Attachment A

Wood County Livestock
Alternative Strategy
Wood County Pipeline Tie-in

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices
Wood County Livestock - Wood County Pipeline Tie-in

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 201.9 for September 2018

Item	***Estimated Costs for Facilities***
Primary Pump Station (2.02 MGD)	$999,000
Transmission Pipeline (12 in dia., 2 miles)	$719,000
TOTAL COST OF FACILITIES	**$1,718,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$565,000
Environmental & Archaeology Studies and Mitigation	$75,000
Land Acquisition and Surveying (10 acres)	$54,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$67,000
TOTAL COST OF PROJECT	**$2,479,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$174,000
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$7,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$25,000
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (182738 kW-hr @ 0.08 $/kW-hr)	$15,000
Purchase of Water (1132 acft/yr @ 500 $/acft)	$566,000
TOTAL ANNUAL COST	**$787,000**
Available Project Yield (acft/yr)	1,132
Annual Cost of Water ($ per acft), based on PF=2	$695
Annual Cost of Water After Debt Service ($ per acft), based on PF=2	$542
Annual Cost of Water ($ per 1,000 gallons), based on PF=2	$2.13
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=2	$1.66

JMP *10/6/2019*

EVALUATION OF WATER MANAGEMENT STRATEGIES FOR MEETING THE PROJECTED WATER SUPPLY NEEDS MANUFACTURING IN WOOD COUNTY

Description of Water User Group:

The Manufacturing WUG in Wood County has a demand that is projected to be increasing from 2,532 ac-ft/yr in 2020 to 3,085 ac-ft/yr in 2070. Manufacturing in Wood County has a current water supply from Carrizo-Wilcox Aquifer. The total rated available supply from this source is 1,502 ac-ft/yr. Manufacturing in Wood County is projected to have a water supply deficit of 1,030 ac-ft/yr in 2020 increasing to a deficit of 1,583 ac-ft/yr in 2070.

Water Supply and Demand Analysis:

	2020	2030	2040	2050	2060	2070
Projected Water Demand	2532	2085	3085	3085	3085	3085
Current Water Supply	1502	1502	1502	1502	1502	1502
Projected Supply Surplus (+)/Deficit(-)	**-1,030**	**-1,583**	**-1,583**	**-1,583**	**-1,583**	**-1,583**

Evaluation of Potentially Feasible Water Management Strategies:

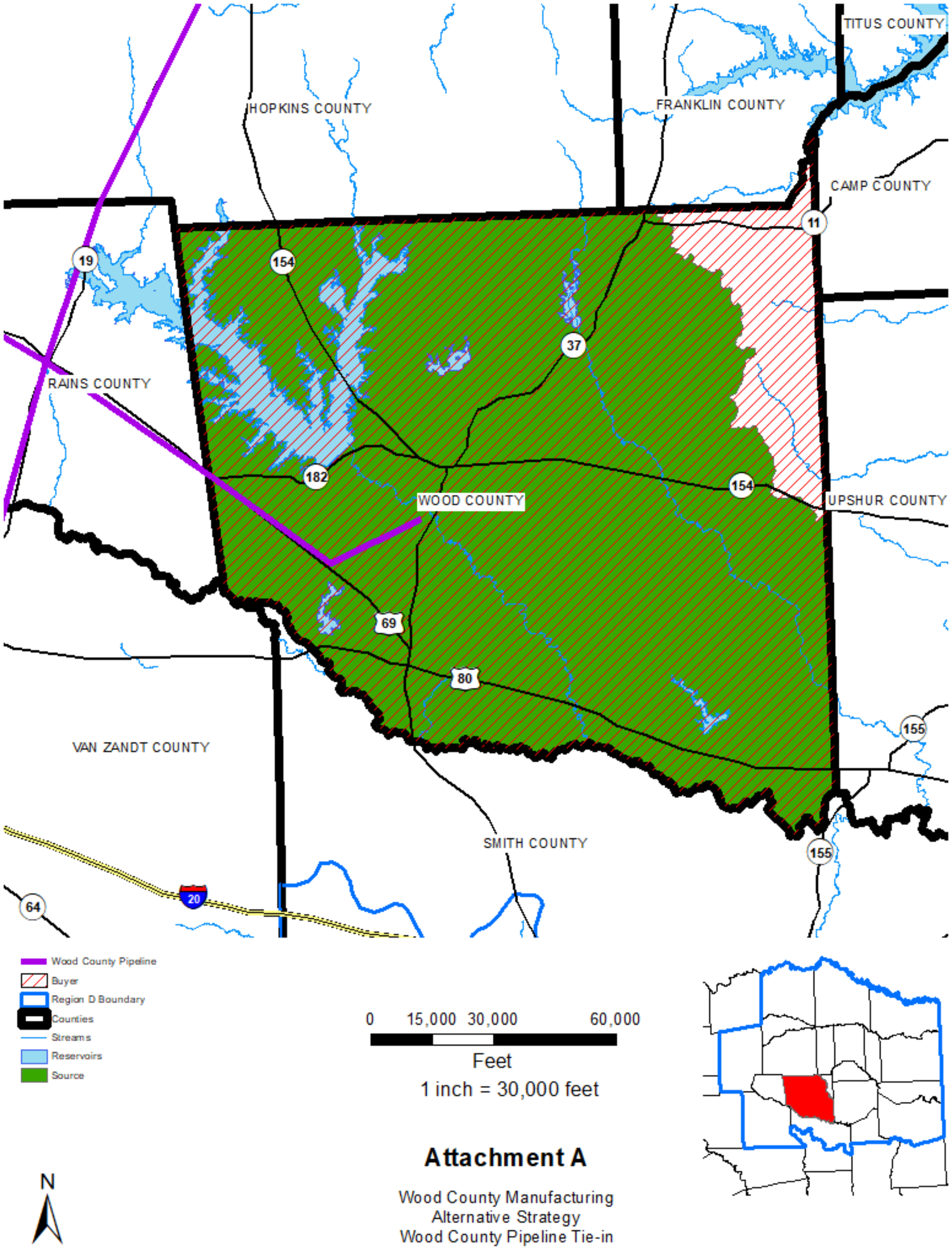
Five alternative strategies were considered to meet the Wood County Manufacturing water supply shortages as summarized in the following table. Advanced conservation and water reuse was not considered because operational procedures for the existing mines is not available. Surface water alternatives were omitted since there is not a supply source within close proximity to the county with available supply. Groundwater wells in the Queen City Aquifer (Sabine River Basin) were identified as a potentially feasible strategy for the WUG. Groundwater from the Wood County Pipeline has also been identified as a potentially feasible strategy.

Strategy	Firm Yield (AF)	Total Capital Cost	Total Annualized Cost	Unit Cost	Environmental Impact
Groundwater (Queen City Aquifer, Sabine Basin)	**1,610**	**$ 1,210,000**	**$ 125,000**	**$ 78**	**1**
Wood County Pipeline Tie-in	**1,583**	**$2,722,000**	**$1,038,000**	**$656**	**2**

Identified Alternative WMS and WMSP:

	2020	2030	2040	2050	2060	2070
Wood County Pipeline Tie-in	1,030	1,583	1,583	1,583	1,583	1,583

The identified Alternative Water Management Strategy for the Manufacturing WUG in Wood County to meet their projected deficit of 1,583 ac-ft/yr is the Wood County Pipeline Strategy, of which an Alternative Water Management Strategy Project is to construct a tie-in pipeline into the Wood County Wellfield and transmission pipeline. This alternative WMSP assumes a 2 mile long 14” diameter pipeline with a reduced unit cost of water given the proximity of the demand to the source. This alternative strategy is contingent upon the regionalized development of a groundwater well field in Wood County.



Attachment A

Wood County Manufacturing
Alternative Strategy
Wood County Pipeline Tie-in

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices

Wood County Manufacturing - Wood County Pipeline Tie-in

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 201.9 for September 2018

Item	***Estimated Costs for Facilities***
Primary Pump Station (2.83 MGD)	$1,029,000
Transmission Pipeline (14 in dia., 2 miles)	$870,000
TOTAL COST OF FACILITIES	**$1,899,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$621,000
Environmental & Archaeology Studies and Mitigation	$75,000
Land Acquisition and Surveying (10 acres)	$54,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$73,000
TOTAL COST OF PROJECT	**$2,722,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$191,000
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$9,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$26,000
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (251006 kW-hr @ 0.08 $/kW-hr)	$20,000
Purchase of Water (1583 acft/yr @ 500 $/acft)	$792,000
TOTAL ANNUAL COST	**$1,038,000**
Available Project Yield (acft/yr)	1,583
Annual Cost of Water ($ per acft), based on PF=2	$656
Annual Cost of Water After Debt Service ($ per acft), based on PF=2	$535
Annual Cost of Water ($ per 1,000 gallons), based on PF=2	$2.01
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=2	$1.64

JMP *10/6/2019*

EVALUATION OF REGIONALIZATION STRATEGY WOOD COUNTY PIPELINE

Description of Regional Strategy:

An identified potentially feasible water management strategy representing a regionalization approach is the development and construction of a well field in Wood County and transmission pipelines from the well field to Greenville in Hunt County and tie-in pipelines to Hopkins and Van Zandt Counties, utilizing potentially available supply from the Carrizo-Wilcox Aquifer, Sabine River Basin. Preliminary analyses suggest approximately 35,000 ac-ft/yr of supply could be produced and used as a potential supply. The NETRWPG has identified a number of entities with projected needs over the 2020-2070 planning period that could feasibly utilize this supply

WUG Water Need Analysis:

WUG	2020	2030	2040	2050	2060	2070
Brinker WSC	0	0	0	12	47	83
Cumby	13	29	44	58	77	88
Irrigation Hopkins County	4,627	4,627	4,627	4,627	4,627	4,627
Livestock Hopkins County	1,068	1,090	1,140	1,143	1,196	1,219
Martin Springs WSC	0	0	0	0	0	29
Miller Grove WSC	8	16	23	29	40	52
Mining Hopkins County	227	283	360	444	533	639
B H P WSC	2	72	125	209	333	505
Caddo Basin SUD	7	220	406	722	1,202	1,866
Caddo Mills (Via Greenville)	0	1	36	68	108	254
Cash SUD	330	394	1,009	1,346	1,346	1,346
Celeste	29	52	86	136	209	316
Hunt County-Other (Via Greenville)	0	0	166	703	1,817	3,834
Hickory Creek SUD (Via Greenville)	96	273	519	866	1,366	2,095
Mining Hunt County	73	64	35	19	7	0
North Hunt SUD	89	165	266	405	603	888
Poetry WSC	0	66	115	200	330	510
Wolfe City (Via Greenville)	0	0	0	54	157	308
Manufacturing Van Zandt County	242	418	418	418	429	429
Livestock Wood County	1,132	1,132	1,132	1,132	1,132	1,132
Manufacturing Wood County	1,030	1,583	1,583	1,583	1,583	1,583
Volume Passed Through Greenville	96	274	721	1,691	3,448	6,491
Total Projected Need	**8,973**	**10,485**	**12,090**	**14,174**	**17,142**	**21,803**

Projected Need by County	2020	2030	2040	2050	2060	2070
Hopkins	5,943	6,045	6,194	6,313	6,520	6,737
Hunt	956	1,307	2,763	4,728	7,478	11,922
Van Zandt	242	418	418	418	429	429
Wood	2,162	2,715	2,715	2,715	2,715	2,715
Total	**8,973**	**10,485**	**12,090**	**14,174**	**17,142**	**21,803**

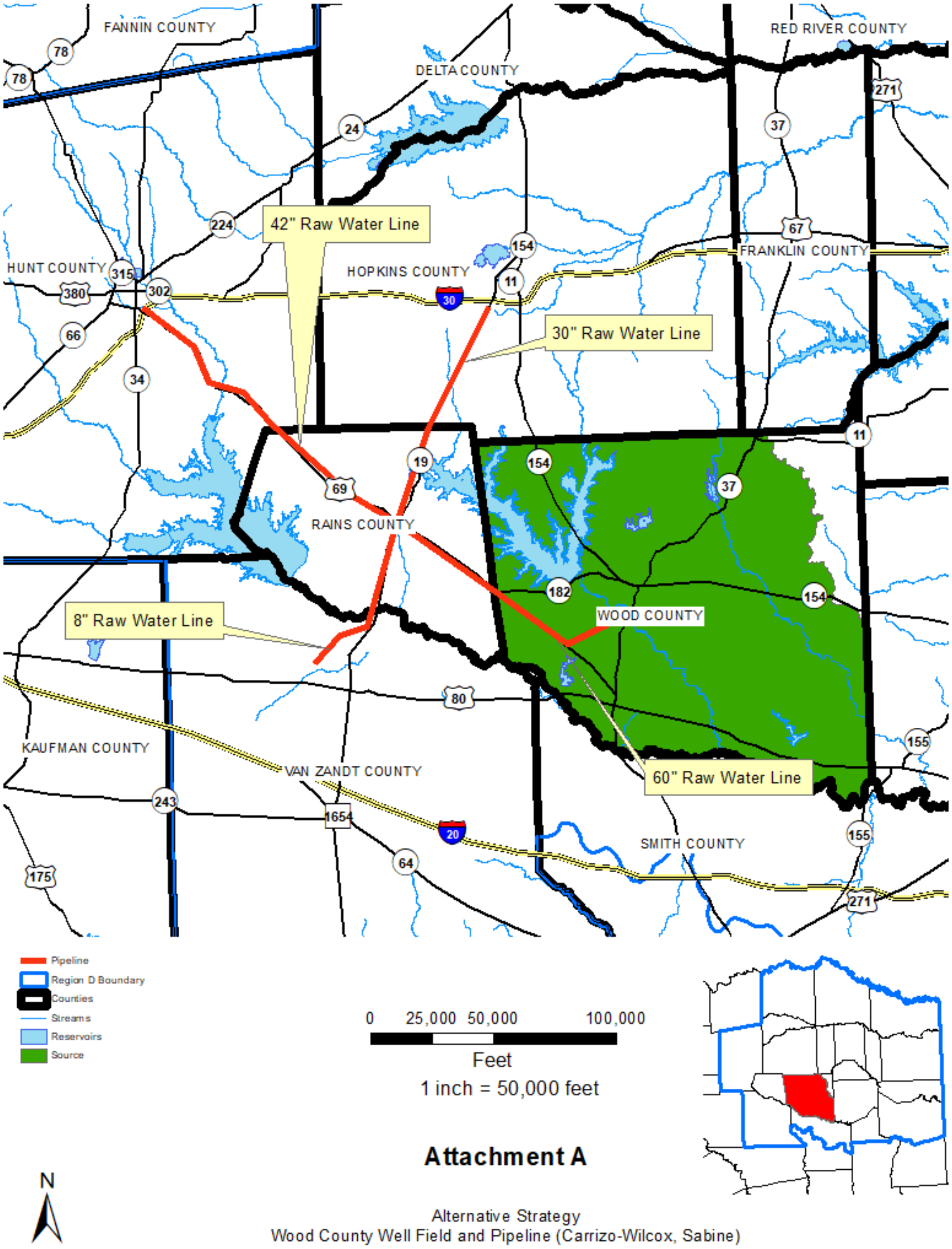
Identified Alternative WMS:

The Wood County Well Field could provide up to 21,803 ac-ft of water per year from the Carrizo-Wilcox Aquifer by an estimated total of 22 wells with peak production capacity of 1,800 gpm. A single well with a peak capacity of 1,800 gpm could provide up to 990 ac-ft per year of water per well, with four (4) contingency wells for a total of 26 wells. The Carrizo-Wilcox Aquifer in Wood County, in the Sabine River Basin, is projected to have sufficient supply availability to meet the needs of the identified WUGs for the planning period. Water from the well field would be pumped to a 610,000 gallon ground storage tank before being pumped to Greenville in Hunt County via a 60” diameter pipeline to Emory and a 42” diameter line to Greenville. At Emory, a 30” diameter tie-in delivers water to Hopkins County and an 8” tie-in delivers water to Van Zandt County. Individual customer WUGs then have Alternative WMS projects which are contingent upon this strategy to develop tie-in pipelines to the Wood County Well Field’s transmission pipeline.

Costs for the WMS have been developed at the planning level utilizing the TWDB's UCM. The project is estimated to yield 21,803 ac-ft/yr of supply to meet the current projected demands for the identified WUGs in Region D. The estimated total capital cost for the well field, collection lines, and major transmission lines to Hunt, Hopkins and Van Zandt Counties is approximately $232.7 million. The estimated annual cost is approximately $31 million, with a unit cost for the additional supply of $1,422 per ac-ft ($4.36/1,000 gal) with debt service, and $671 per ac-ft ($2.06/1,000 gal) without debt service.

Strategy	**Firm Yield (AF)**	**Total Capital Cost**	**Total Annualized Cost**	**Unit Cost**	**Env. Impact**
Drill New Wells and Raw Water Pipeline (Carrizo-Wilcox, Sabine)	21,803	$232,728,000	$31,010,000	$1,422	2

Given significant present uncertainty regarding the extent of participation in this regional strategy and lack of details regarding the specific infrastructure necessary to meet actual participant water demands, it should be recognized that the strategy as represented herein is a planning-level characterization. Variations as to the specific users of this project, as well as variations in the characteristics of the project's infrastructure, should be considered consistent with this alternative water management strategy for the purposes of the 2021 Region D Plan. The NETRWPG supports additional study of this regionalization water management strategy, and such studies or technical evaluations should also be considered consistent for the purposes of the 2021 Region D Plan. Participation in this strategy would be on a voluntary basis.



Attachment A

Alternative Strategy
Wood County Well Field and Pipeline (Carrizo-Wilcox, Sabine)

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices

Wood Co. Wellfield WMS - Wood Co. Wellfield

Cost based on ENR CCI 11170.28 for September 2018 and
a PPI of 201.9 for September 2018

Item	*Estimated Costs for Facilities*
CAPITAL COST	
Transmission Pipeline (60 in dia., 47.2 miles)	$84,308,000
Primary Pump Stations (38.9 MGD)	$27,146,000
Transmission Pipeline (30 in dia., 31.7 miles)	$21,697,000
Well Fields (Wells, Pumps, and Piping)	$32,650,000
Storage Tanks (Other Than at Booster Pump Stations)	$3,537,000
TOTAL COST OF FACILITIES	**$169,338,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$53,968,000
Environmental & Archaeology Studies and Mitigation	$2,389,000
Land Acquisition and Surveying (156 acres)	$804,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$6,229,000
TOTAL COST OF PROJECT	**$232,728,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$16,375,000
Reservoir Debt Service (3.5 percent, 40 years)	$0
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$1,422,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$679,000
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treamtent Facility	$0
Pumping Energy Costs (20400583 kW-hr @ 0.08 $/kW-hr)	$1,632,000
Purchase of Water (21803 acft/yr @ 500 $/acft)	$10,902,000
TOTAL ANNUAL COST	**$31,010,000**
Available Project Yield (acft/yr)	21,803
Annual Cost of Water ($ per acft), based on PF=2	$1,422
Annual Cost of Water After Debt Service ($ per acft), based on PF=2	$671
Annual Cost of Water ($ per 1,000 gallons), based on PF=2	$4.36
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=2	$2.06

HK and JMP *10/6/2019*

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Region D 2021 - North Easat Texas Regional Water Planning Group
Recommended Water Management Strategies by Source

Supply Source		County	Entity	Projected Deficit (-) / Recommendation (ac-ft/yr) by Decade						Strategy	Contingency	Seller	County	Basin	Reliability of Source
Groundwater	Surface Water			2020	2030	2040	2050	2060	2070			(if applicable)			
BLOSSOM AQUIFER		RED RIVER	CLARKSVILLE	388	388	388	388	388	388	DRILL NEW WELLS AND RO TREATMENT			RED RIVER	SULPHUR	HIGH
BLOSSOM AQUIFER		RED RIVER	LIVESTOCK RED RIVER	10	11	10	11	10	11	DRILL NEW WELLS			RED RIVER	RED	HIGH
CARRIZO-WILCOX AQUIFER		BOWIE	IRRIGATION BOWIE	4,134	4,134	4,134	4,134	4,134	4,134	DRILL NEW WELLS			BOWIE	SULPHUR	HIGH
CARRIZO-WILCOX AQUIFER		BOWIE	LIVESTOCK BOWIE	417	417	378	325	278	260	DRILL NEW WELLS			BOWIE	SULPHUR	HIGH
CARRIZO-WILCOX AQUIFER		CASS	COUNTY-OTHER, CASS	323	323	323	323	323	323	DRILL NEW WELLS			CASS	CYPRESS	HIGH
CARRIZO-WILCOX AQUIFER		CASS	COUNTY-OTHER, CASS	216	216	216	216	216	216	DRILL NEW WELLS			CASS	SULPHUR	HIGH
CARRIZO-WILCOX AQUIFER		FRANKLIN	LIVESTOCK FRANKLIN	805	805	805	805	805	805	DRILL NEW WELLS			FRANKLIN	CYPRESS	HIGH
CARRIZO-WILCOX AQUIFER		FRANKLIN	LIVESTOCK FRANKLIN	1,129	1,129	1,129	1,129	1,129	1,129	DRILL NEW WELLS			FRANKLIN	SULPHUR	HIGH
CARRIZO-WILCOX AQUIFER		GREGG	MINING GREGG	27	27	27	27	27	27	DRILL NEW WELLS			GREGG	SABINE	HIGH
CARRIZO-WILCOX AQUIFER		HOPKINS	IRRIGATION HOPKINS	0	0	111	387	575	931	DRILL NEW WELLS			HOPKINS	SABINE	HIGH
CARRIZO-WILCOX AQUIFER		HOPKINS	IRRIGATION HOPKINS	4,627	4,627	4,516	4,240	4,052	3,696	DRILL NEW WELLS			HOPKINS	SULPHUR	HIGH
CARRIZO-WILCOX AQUIFER		HOPKINS	LIVESTOCK HOPKINS	1,068	1,090	1,140	1,143	1,196	1,219	DRILL NEW WELLS			HOPKINS	SULPHUR	HIGH
CARRIZO-WILCOX AQUIFER		HOPKINS	MILLER GROVE WSC	8	16	23	29	40	52	DRILL NEW WELLS			HOPKINS	SULPHUR	HIGH
CARRIZO-WILCOX AQUIFER		HOPKINS	MINING HOPKINS	227	283	360	444	533	639	DRILL NEW WELLS			HOPKINS	SULPHUR	HIGH
CARRIZO-WILCOX AQUIFER		SMITH	CRYSTAL SYSTEMS TEXAS	0	0	135	135	269	538	DRILL NEW WELLS			SMITH	SABINE	HIGH
CARRIZO-WILCOX AQUIFER		SMITH	CRYSTAL SYSTEMS TEXAS	0	0	134	134	269	538	DRILL NEW WELLS			SMITH	NECHES	HIGH
CARRIZO-WILCOX AQUIFER		SMITH	LINDALE	322	644	966	1,288	1,610	1,932	DRILL NEW WELLS			SMITH	SABINE	HIGH
CARRIZO-WILCOX AQUIFER		SMITH	STARRVILLE-FRIENDSHIP WSC	0	0	0	0	108	108	DRILL NEW WELLS			SMITH	SABINE	HIGH
CARRIZO-WILCOX AQUIFER		SMITH	WINONA	0	0	0	108	108	108	DRILL NEW WELLS			SMITH	SABINE	HIGH
CARRIZO-WILCOX AQUIFER		TITUS	LIVESTOCK TITUS	275	334	379	425	517	560	DRILL NEW WELLS			TITUS	CYPRESS	HIGH
CARRIZO-WILCOX AQUIFER		TITUS	LIVESTOCK TITUS	1,664	1,605	1,560	1,514	1,467	1,445	DRILL NEW WELLS			TITUS	SULPHUR	HIGH
CARRIZO-WILCOX AQUIFER		UPSHUR	GILMER	0	0	216	216	216	216	DRILL NEW WELLS			UPSHUR	CYPRESS	HIGH
CARRIZO-WILCOX AQUIFER		UPSHUR	MANUFACTURING UPSHUR	161	161	161	161	161	161	DRILL NEW WELLS			UPSHUR	CYPRESS	HIGH
CARRIZO-WILCOX AQUIFER		VAN ZANDT	CANTON	100	100	100	100	100	100	DRILL NEW WELLS			VAN ZANDT	SABINE	HIGH
CARRIZO-WILCOX AQUIFER		VAN ZANDT	EDOM WSC	13	21	27	37	49	64	DRILL NEW WELLS			VAN ZANDT	NECHES	HIGH
CARRIZO-WILCOX AQUIFER		VAN ZANDT	LITTLE HOPE MOORE WSC	0	0	0	3	11	17	DRILL NEW WELLS			VAN ZANDT	NECHES	HIGH

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Supply Source		County	Entity	Projected Deficit (-) / Recommendation (ac-ft/yr) by Decade						Strategy	Contingency	Seller (if applicable)	County	Basin	Reliability of Source
Groundwater	Surface Water			2020	2030	2040	2050	2060	2070						
CARRIZO-WILCOX AQUIFER		VAN ZANDT	MANUFACTURING VAN ZANDT	242	504	504	356	238	143	DRILL NEW WELLS			VAN ZANDT	TRINITY	HIGH
CARRIZO-WILCOX AQUIFER		VAN ZANDT	R P M WSC	0	34	79	131	175	217	DRILL NEW WELLS			VAN ZANDT	NECHES	HIGH
NACATOCH AQUIFER		BOWIE	LIVESTOCK BOWIE	252	252	229	196	168	156	DRILL NEW WELLS			BOWIE	RED	HIGH
NACATOCH AQUIFER		DELTA	LIVESTOCK DELTA	262	250	250	250	250	250	DRILL NEW WELLS			DELTA	SULPHUR	HIGH
NACATOCH AQUIFER		HOPKINS	CUMBY	13	29	44	58	77	88	DRILL NEW WELLS			HOPKINS	SABINE	HIGH
NACATOCH AQUIFER		HUNT	IRRIGATION HUNT	230	230	230	230	230	230	DRILL NEW WELLS			HUNT	SABINE	HIGH
NACATOCH AQUIFER		HUNT	NORTH HUNT SUD	89	165	266	405	603	888	DRILL NEW WELLS			HUNT	SABINE	HIGH
NACATOCH AQUIFER		RED RIVER	IRRIGATION RED RIVER	2,057	2,057	2,057	2,057	2,057	2,057	DRILL NEW WELLS			RED RIVER	SULPHUR	HIGH
QUEEN CITY AQUIFER		CAMP	LIVESTOCK CAMP	3,962	3,962	3,962	3,962	3,962	3,962	DRILL NEW WELLS			CAMP	CYPRESS	HIGH
QUEEN CITY AQUIFER		CASS	LIVESTOCK CASS	968	968	968	968	968	968	DRILL NEW WELLS			CASS	CYPRESS	HIGH
QUEEN CITY AQUIFER		CASS	LIVESTOCK CASS	966	966	966	966	966	966	DRILL NEW WELLS			CASS	SULPHUR	HIGH
QUEEN CITY AQUIFER		HARRISON	IRRIGATION HARRISON	484	484	484	484	484	484	DRILL NEW WELLS			HARRISON	CYPRESS	HIGH
QUEEN CITY AQUIFER		HARRISON	IRRIGATION HARRISON	161	161	161	161	161	161	DRILL NEW WELLS			HARRISON	SABINE	HIGH
QUEEN CITY AQUIFER		HARRISON	LEIGH WSC	0	0	54	108	108	162	DRILL NEW WELLS			HARRISON	CYPRESS	HIGH
QUEEN CITY AQUIFER		HARRISON	MINING HARRISON	332	332	332	332	332	332	DRILL NEW WELLS			HARRISON	CYPRESS	HIGH
QUEEN CITY AQUIFER		HARRISON	MINING HARRISON	1,452	1,452	1,452	1,452	1,452	1,452	DRILL NEW WELLS			HARRISON	SABINE	HIGH
QUEEN CITY AQUIFER		HARRISON	NORTH HARRISON WSC	0	0	0	0	54	54	DRILL NEW WELLS			HARRISON	CYPRESS	HIGH
QUEEN CITY AQUIFER		HARRISON	PANOLA-BETHANY WSC	0	54	108	216	270	324	DRILL NEW WELLS			HARRISON	SABINE	HIGH
QUEEN CITY AQUIFER		HARRISON	SCOTTSVILLE	54	54	108	108	162	162	DRILL NEW WELLS			HARRISON	CYPRESS	HIGH
QUEEN CITY AQUIFER		HARRISON	WASKOM	108	162	162	216	270	324	DRILL NEW WELLS			HARRISON	CYPRESS	HIGH
QUEEN CITY AQUIFER		MARION	MINING MARION	432	645	654	654	654	654	DRILL NEW WELLS			MARION	CYPRESS	HIGH
QUEEN CITY AQUIFER		MORRIS	LIVESTOCK MORRIS	483	483	483	483	483	483	DRILL NEW WELLS			MORRIS	SULPHUR	HIGH
QUEEN CITY AQUIFER		MORRIS	LIVESTOCK MORRIS	644	644	644	644	644	644	DRILL NEW WELLS			MORRIS	CYPRESS	HIGH
QUEEN CITY AQUIFER		SMITH	SMITH COUNTY MUD 1	0	0	108	216	432	648	DRILL NEW WELLS			SMITH	SABINE	HIGH
QUEEN CITY AQUIFER		SMITH	STAR MOUNTAIN WSC	108	108	108	108	216	216	DRILL NEW WELLS			SMITH	SABINE	HIGH
QUEEN CITY AQUIFER		UPSHUR	LIVESTOCK UPSHUR	161	161	161	161	161	161	DRILL NEW WELLS			UPSHUR	CYPRESS	HIGH

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Supply Source		County	Entity	Projected Deficit (-) / Recommendation (ac-ft/yr) by Decade						Strategy	Contingency	Seller (if applicable)	County	Basin	Reliability of Source
Groundwater	Surface Water			2020	2030	2040	2050	2060	2070						
QUEEN CITY AQUIFER		UPSHUR	LIVESTOCK UPSHUR	161	161	161	161	161	161	DRILL NEW WELLS			UPSHUR	SABINE	HIGH
QUEEN CITY AQUIFER		VAN ZANDT	IRRIGATION VAN ZANDT	43	61	63	64	66	68	DRILL NEW WELLS			VAN ZANDT	NECHES	HIGH
QUEEN CITY AQUIFER		WOOD	LIVESTOCK WOOD	1,129	1,129	1,129	1,129	1,129	1,129	DRILL NEW WELLS			WOOD	SABINE	HIGH
QUEEN CITY AQUIFER		WOOD	MANUFACTURING WOOD	1,129	1,610	1,610	1,610	1,610	1,610	DRILL NEW WELLS			WOOD	SABINE	HIGH
TRINITY AQUIFER		HUNT	LIVESTOCK HUNT	2	2	2	2	2	2	DRILL NEW WELLS			HUNT	SABINE	HIGH
TRINITY AQUIFER		HUNT	MINING HUNT	73	64	35	19	7	0	DRILL NEW WELLS			HUNT	SABINE	HIGH
TRINITY AQUIFER		RED RIVER	LIVESTOCK RED RIVER	174	173	174	173	174	173	DRILL NEW WELLS			RED RIVER	SULPHUR	HIGH
WOODBINE AQUIFER		HUNT	CELESTE	29	52	86	136	209	229	DRILL NEW WELLS			HUNT	TRINITY	HIGH
	BOB SANDLIN LAKE /RESERVOIR	TITUS	MANUFACTURING TITUS	0	1,003	880	890	1,149	1,279	RENEW AND INCREASE CONTRACT		MOUNT PLEASANT	RESERVOIR	CYPRESS	HIGH
	BOB SANDLIN LAKE /RESERVOIR	TITUS	STEAM-ELECTRIC POWER GENERATION TITUS	5,451	6,119	5,860	5,816	4,968	4,272	INCREASE CONTRACT		NETMWD	RESERVOIR	CYPRESS	HIGH
	CHAPMAN /COOPER LAKE / RESERVOIR NON-SYSTEM PORTION	HOPKINS	MARTIN SPRINGS WSC	0	0	0	0	0	29	INCREASE CONTRACT		SULPHUR SPRINGS	RESERVOIR	SULPHUR	HIGH
	LAKE O' THE PINES /RESERVOIR	CASS	HOLLY SPRINGS WSC	80	80	80	80	80	80	INCREASE CONTRACT		NETMWD	RESERVOIR	CYPRESS	HIGH
	LAKE O' THE PINES /RESERVOIR	HARRISON, MARION	HARLETON WSC	62	74	91	127	173	230	INCREASE CONTRACT		NETMWD	RESERVOIR	CYPRESS	HIGH
	LAKE O' THE PINES /RESERVOIR	TITUS	STEAM-ELECTRIC POWER GENERATION TITUS	24,615	24,747	25,906	26,750	27,846	28,811	INCREASE CONTRACT		NETMWD	RESERVOIR	CYPRESS	HIGH
	LOCAL SUPPLY	MORRIS	LIVESTOCK MORRIS	60	60	60	60	60	60	LIVESTOCK LOCAL SUPPLY			MORRIS	SULPHUR	HIGH
	LOCAL SUPPLY	WOOD	LIVESTOCK WOOD	34	34	34	34	34	34	LIVESTOCK LOCAL SUPPLY			WOOD	SABINE	HIGH
	NTMWD SYSTEM	HUNT	B H P WSC	2	71	124	208	331	502	INCREASE CONTRACT	REGION C NTMWD WMS	ROYSE CITY	RESERVOIR	TRINITY	HIGH
	NTMWD SYSTEM	HUNT	CADDO BASIN SUD	5	216	402	715	1,190	1,848	INCREASE CONTRACT	REGION C NTMWD WMS	NTMWD	RESERVOIR	TRINITY	HIGH
	NTMWD SYSTEM	HUNT	CASH SUD	332	688	1,025	1,353	1,352	1,343	INCREASE CONTRACT	REGION C NTMWD WMS	NTMWD	RESERVOIR	TRINITY	HIGH
	NTMWD SYSTEM	HUNT	POETRY WSC	0	64	114	197	326	503	INCREASE CONTRACT	REGION C TERRELL INCREASE CONTRACT & REGION C NTMWD WMS	TERRELL	RESERVOIR	TRINITY	HIGH
	PAT MAYSE LAKE /RESERVOIR	LAMAR	COUNTY-OTHER, LAMAR	204	204	212	224	234	244	INCREASE CONTRACT		LAMAR COUNTY WSD	RESERVOIR	RED	HIGH
	PAT MAYSE LAKE /RESERVOIR	LAMAR	IRRIGATION LAMAR	1,468	1,468	1,468	1,468	1,468	1,468	PAT MAYSE RAW WATER PIPELINE		PARIS	RESERVOIR	RED	HIGH
	PAT MAYSE LAKE /RESERVOIR	LAMAR	LIVESTOCK LAMAR	617	617	617	617	617	617	LIVESTOCK WATER PIPELINE		LAMAR COUNTY WSD	LAMAR	RED	HIGH
	SULPHUR SPRINGS LAKE /RESERVOIR	HOPKINS	BRINKER WSC	0	0	0	12	47	83	INCREASE CONTRACT		SULPHUR SPRINGS	RESERVOIR	SULPHUR	HIGH

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Supply Source		County	Entity	Projected Deficit (-) / Recommendation (ac-ft/yr) by Decade						Strategy	Contingency	Seller (if applicable)	County	Basin	Reliability of Source
Groundwater	Surface Water			2020	2030	2040	2050	2060	2070						
	TAWAKONI LAKE / RESERVOIR	HUNT	CADDO MILLS	0	1	36	68	108	254	INCREASE CONTRACT	GREENVILLE WMSPS	GREENVILLE	RESERVOIR	SULPHUR, SABINE	HIGH
	TAWAKONI LAKE / RESERVOIR	HUNT	CELESTE	0	0	0	0	0	87	TREATED PIPELINE AND NEW CONTRACT	GREENVILLE WMSPS	GREENVILLE	RESERVOIR	SABINE, SULPHUR	HIGH
	TAWAKONI LAKE / RESERVOIR	HUNT	COUNTY-OTHER, HUNT	0	0	166	703	1,817	3,834	INCREASE CONTRACT	GREENVILLE WMSPS	GREENVILLE	RESERVOIR	SABINE, SULPHUR	HIGH
	TAWAKONI LAKE /RESERVOIR	HUNT	GREENVILLE	0	0	0	0	0	455	VOLUNTARY REALLOCATION (HUNT MANUFACTURING)			RESERVOIR	SABINE	HIGH
	TAWAKONI LAKE / RESERVOIR	HUNT	GREENVILLE	0	9,335	9,335	9,335	9,335	9,335	WTP EXPANSION (15 MGD)	ADVANCED CONSERVATION		RESERVOIR	SABINE	HIGH
	TAWAKONI LAKE / RESERVOIR	HUNT	GREENVILLE	0	0	0	0	0	9,335	NEW WTP (15 MGD)	ADVANCED CONSERVATION		RESERVOIR	SABINE, SULPHUR	HIGH
	TAWAKONI LAKE / RESERVOIR	HUNT	WOLFE CITY	0	0	0	54	157	308	GREENVILLE TIE-IN PIPELINE	GREENVILLE WMSPS	GREENVILLE	HUNT	SABINE, SULPHUR	HIGH
	WRIGHT PATMAN LAKE /RESERVOIR	BOWIE	RIVERBEND WATER RESOURCES DISTRICT	13,810	73,099	80,081	88,793	97,520	115,820	RIVERBEND WMS			RESERVOIR	SULPHUR	HIGH
	WRIGHT PATMAN LAKE /RESERVOIR	BOWIE	RIVERBEND WATER RESOURCES DISTRICT	0	1,370	1,423	1,496	1,493	1,493	NEW 2.5 MGD PACKAGE WTP AND TRANSMISSION LINE	RIVERBEND WMS		RESERVOIR	SULPHUR	HIGH
	WRIGHT PATMAN LAKE /RESERVOIR	BOWIE	BURNS REDBANK WSC	201	199	196	194	193	193	RENEW EXISTING CONTRACT	RIVERBEND WMS	CITY OF HOOKS	RESERVOIR	SULPHUR	HIGH
	WRIGHT PATMAN LAKE /RESERVOIR	BOWIE	CENTRAL BOWIE COUNTY WSC	619	639	708	784	869	962	RENEW EXISTING CONTRACT	RIVERBEND WMS	RIVERBEND WATER RESOURCES DISTRICT	RESERVOIR	SULPHUR	HIGH
	WRIGHT PATMAN LAKE /RESERVOIR	BOWIE	DE KALB	295	292	289	291	294	298	RENEW EXISTING CONTRACT	RIVERBEND WMS	RIVERBEND WATER RESOURCES DISTRICT	RESERVOIR	SULPHUR	HIGH
	WRIGHT PATMAN LAKE /RESERVOIR	BOWIE	HOOKS	281	278	276	271	269	269	RENEW EXISTING CONTRACT	RIVERBEND WMS	RIVERBEND WATER RESOURCES DISTRICT	RESERVOIR	SULPHUR	HIGH
	WRIGHT PATMAN LAKE /RESERVOIR	BOWIE	MACEDONIA EYLAU MUD 1	588	598	601	601	601	601	RENEW EXISTING CONTRACT	RIVERBEND WMS	RIVERBEND WATER RESOURCES DISTRICT	RESERVOIR	SULPHUR	HIGH
	WRIGHT PATMAN LAKE /RESERVOIR	BOWIE	MANUFACTURING BOWIE	789	59,724	66,305	74,531	82,757	100,609	RENEW EXISTING CONTRACT	RIVERBEND WMS	RIVERBEND WATER RESOURCES DISTRICT	RESERVOIR	SULPHUR	HIGH
	WRIGHT PATMAN LAKE /RESERVOIR	BOWIE	MAUD	211	226	241	238	237	237	RENEW EXISTING CONTRACT	RIVERBEND WMS	RIVERBEND WATER RESOURCES DISTRICT	RESERVOIR	SULPHUR	HIGH
	WRIGHT PATMAN LAKE /RESERVOIR	BOWIE	NASH	392	458	523	589	589	589	RENEW EXISTING CONTRACT	RIVERBEND WMS	RIVERBEND WATER RESOURCES DISTRICT	RESERVOIR	SULPHUR	HIGH
	WRIGHT PATMAN LAKE /RESERVOIR	BOWIE	NEW BOSTON	1,390	1,399	1,385	1,381	1,379	1,379	RENEW EXISTING CONTRACT	RIVERBEND WMS	RIVERBEND WATER RESOURCES DISTRICT	RESERVOIR	SULPHUR	HIGH
	WRIGHT PATMAN LAKE /RESERVOIR	BOWIE	REDWATER	440	487	535	588	616	616	RENEW EXISTING CONTRACT	RIVERBEND WMS	RIVERBEND WATER RESOURCES DISTRICT	RESERVOIR	SULPHUR	HIGH
	WRIGHT PATMAN LAKE /RESERVOIR	BOWIE	TEXARKANA	7,145	7,282	7,459	7,706	8,028	8,380	RENEW EXISTING CONTRACT	RIVERBEND WMS	RIVERBEND WATER RESOURCES DISTRICT	RESERVOIR	SULPHUR	HIGH
	WRIGHT PATMAN LAKE /RESERVOIR	BOWIE	WAKE VILLAGE	699	750	802	861	932	931	RENEW EXISTING CONTRACT	RIVERBEND WMS	RIVERBEND WATER RESOURCES DISTRICT	RESERVOIR	SULPHUR	HIGH
	WRIGHT PATMAN LAKE /RESERVOIR	CASS	MANUFACTURING CASS	0	1,075	1,135	1,209	1,206	1,206	VOLUNTARY REALLOCATION (ATLANTA)	NEW 2.5 MGD PACKAGE WTP AND TRANSMISSION LINE, RIVERBEND WMS	RIVERBEND WATER RESOURCES DISTRICT	RESERVOIR	SULPHUR	HIGH
	WRIGHT PATMAN LAKE /RESERVOIR	CASS	ATLANTA	0	1,075	1,135	1,209	1,206	1,206	RENEW EXISTING CONTRACT	NEW 2.5 MGD PACKAGE WTP AND TRANSMISSION LINE, RIVERBEND WMS, AND VOLUNTARY REALLOCATION (CASS MANUFACTURING)	RIVERBEND WATER RESOURCES DISTRICT	RESERVOIR	SULPHUR	HIGH

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Supply Source		County	Entity	Projected Deficit (-) / Recommendation (ac-ft/yr) by Decade						Strategy	Contingency	Seller	County	Basin	Reliability of Source
Groundwater	Surface Water			2020	2030	2040	2050	2060	2070			(if applicable)			
	WRIGHT PATMAN LAKE /RESERVOIR	CASS	MANUFACTURING CASS	0	44	44	44	44	44	VOLUNTARY REALLOCATION (COUNTY-OTHER, CASS)	RIVERBEND WMS	RIVERBEND WATER RESOURCES DISTRICT	RESERVOIR	SULPHUR	HIGH
	WRIGHT PATMAN LAKE /RESERVOIR	CASS	COUNTY-OTHER, CASS	0	44	44	44	44	44	RENEW EXISTING CONTRACT	NEW 2.5 MGD PACKAGE WTP AND TRANSMISSION LINE, RIVERBEND WMS, AND VOLUNTARY REALLOCATION (CASS MANUFACTURING)	RIVERBEND WATER RESOURCES DISTRICT	RESERVOIR	SULPHUR	HIGH
	INDIRECT REUSE	VAN ZANDT	CANTON	323	323	323	323	323	323	INDIRECT REUSE			VAN ZANDT	SABINE	HIGH
		BOWIE	MANUFACTURING BOWIE	161	204	204	204	204	204	ADVANCED WATER CONSERVATION					HIGH
		HUNT	B H P WSC	0	1	1	1	2	3	ADVANCED WATER CONSERVATION					HIGH
		HUNT	CADDO BASIN SUD	2	4	4	7	12	18	ADVANCED WATER CONSERVATION					HIGH
		HUNT	CASH SUD	5	7	9	11	14	18	ADVANCED WATER CONSERVATION					HIGH
		HUNT	GREENVILLE	4,051	4,486	5,140	6,124	7,593	9,741	ADVANCED WATER CONSERVATION					HIGH
		HUNT	POETRY WSC	1	2	1	3	4	7	ADVANCED WATER CONSERVATION					HIGH
		TITUS	MANUFACTURING TITUS	0	415	415	415	415	415	ADVANCED WATER CONSERVATION					HIGH
		VAN ZANDT	MANUFACTURING VAN ZANDT	0	75	75	75	75	75	ADVANCED WATER CONSERVATION					HIGH
		VAN ZANDT	MANUFACTURING VAN ZANDT	0	0	0	0	0	72	INCREASE CONTRACT					HIGH
		VAN ZANDT	MANUFACTURING VAN ZANDT	0	0	0	62	191	214	INCREASE CONTRACT					HIGH

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Region D Water User Group (WUG) Management Supply Factor

WUG supplies and projected demands are entered for each of a WUG's region-county-basin divisions. To calculate the Management Supply Factor for each WUG as a whole, not split by region-county-basin, the combined total of existing and future supply is divided by the total projected demand. If a WUG is split by more than one planning region, the whole WUG's management supply factor will show up in each of its planning region's management supply factor reports.

	WUG MANAGEMENT SUPPLY FACTOR					
WUG NAME	2020	2030	2040	2050	2060	2070
410 WSC	1.0	1.0	1.0	1.0	1.0	1.0
ABLES SPRINGS WSC*	1.0	1.0	1.0	1.0	1.0	1.0
ALGONQUIN WATER RESOURCES OF TEXAS*	3.5	3.1	2.8	2.6	2.3	2.1
ATLANTA	1.0	1.0	1.0	1.0	1.0	1.0
B H P WSC*	1.0	1.0	1.0	1.0	1.0	1.0
BEN WHEELER WSC*	1.9	1.9	1.8	1.7	1.7	1.6
BETHEL ASH WSC*	1.9	1.7	1.5	1.4	1.3	1.2
BI COUNTY WSC	1.6	1.4	1.3	1.2	1.1	1.0
BIG SANDY	1.3	1.3	1.2	1.2	1.1	1.1
BLACKLAND WSC*	1.0	1.0	1.0	1.0	1.0	1.0
BLOCKER CROSSROADS WSC	1.6	1.6	1.5	1.4	1.3	1.2
BLOSSOM	1.6	1.7	1.9	1.9	1.8	1.8
BOGATA	4.1	4.4	4.5	4.6	4.6	4.6
BRASHEAR WSC	1.0	1.0	1.0	1.0	1.0	1.0
BRIGHT STAR SALEM SUD	2.9	4.1	4.3	4.2	4.2	4.1
BRINKER WSC	1.3	1.2	1.1	1.0	1.0	1.0
BURNS REDBANK WSC	1.0	1.0	1.0	1.0	1.0	1.0
CADDO BASIN SUD*	1.0	1.0	1.0	1.0	1.0	1.0
CADDO MILLS	1.2	1.0	1.0	1.0	1.0	1.0
CANTON	2.1	2.0	1.9	1.8	1.7	1.6
CARROLL WSC*	1.0	1.0	1.0	1.0	1.0	1.0
CASH SUD*	1.2	1.1	1.0	1.0	1.0	1.1
CELESTE	1.0	1.0	1.0	1.0	1.0	1.0
CENTRAL BOWIE COUNTY WSC	1.0	1.0	1.0	1.0	1.0	1.0
CLARKSVILLE	1.2	1.3	1.3	1.3	1.3	1.3
CLARKSVILLE CITY	2.5	2.3	2.2	2.0	1.8	1.7
COMBINED CONSUMERS SUD	1.0	1.0	1.0	1.0	1.0	1.0
COMMERCE	1.2	3.1	2.8	2.2	1.2	1.1
COOPER	2.2	2.2	2.3	2.3	2.3	2.3
CORNERSVILLE WSC	2.0	1.9	1.8	1.7	1.6	1.5
COUNTY-OTHER, BOWIE	2.2	2.8	4.5	4.4	4.4	4.4
COUNTY-OTHER, CAMP	2.5	2.8	3.0	3.3	3.6	4.0
COUNTY-OTHER, CASS	1.1	1.2	1.3	1.4	1.4	1.4
COUNTY-OTHER, DELTA	2.4	2.2	2.2	2.3	2.3	2.4
COUNTY-OTHER, FRANKLIN	2.0	2.0	2.1	2.0	2.0	2.0
COUNTY-OTHER, GREGG	2.2	3.1	3.1	3.1	3.1	2.8
COUNTY-OTHER, HARRISON	2.6	2.6	2.6	2.6	2.5	2.3
COUNTY-OTHER, HOPKINS	7.6	9.3	10.9	9.5	10.5	10.0
COUNTY-OTHER, HUNT	2.1	1.3	1.0	1.0	1.0	1.0
COUNTY-OTHER, LAMAR	1.0	1.0	1.0	1.0	1.0	1.0
COUNTY-OTHER, MARION	17.7	18.7	20.0	22.0	24.7	28.8
COUNTY-OTHER, MORRIS	1.5	1.6	1.6	1.5	1.5	1.5
COUNTY-OTHER, RAINS	5.3	5.5	5.9	6.0	6.4	6.7
COUNTY-OTHER, RED RIVER	1.0	1.5	2.5	3.3	4.1	20.1

*A single asterisk next to a WUG's name denotes that the WUG is split by more than one planning region.

Region D Water User Group (WUG) Management Supply Factor

	WUG MANAGEMENT SUPPLY FACTOR					
WUG NAME	2020	2030	2040	2050	2060	2070
COUNTY-OTHER, SMITH*	1.4	1.3	1.3	1.3	1.3	1.3
COUNTY-OTHER, TITUS	3.3	1.8	1.7	1.6	1.4	1.3
COUNTY-OTHER, UPSHUR	2.6	2.6	2.6	2.5	2.4	2.3
COUNTY-OTHER, VAN ZANDT	2.5	2.5	2.4	2.3	2.4	2.3
COUNTY-OTHER, WOOD	15.3	15.7	16.5	17.2	18.4	20.1
CROSS ROADS SUD*	2.5	2.5	2.4	2.3	2.2	2.1
CRYSTAL SYSTEMS TEXAS*	1.4	1.3	1.4	1.3	1.3	1.4
CUMBY	1.0	1.0	1.0	1.0	1.0	1.0
CYPRESS SPRINGS SUD	5.5	5.3	5.1	4.9	4.6	4.3
DAINGERFIELD	3.4	3.4	3.4	3.4	3.3	3.2
DE KALB	1.0	1.0	1.0	1.0	1.0	1.0
DELTA COUNTY MUD*	1.0	1.0	1.0	1.0	1.0	1.0
DIANA SUD	2.6	2.5	2.5	2.4	2.3	2.2
E M C WSC	1.4	1.4	1.4	1.4	1.4	1.4
EAST MOUNTAIN WATER SYSTEM	1.5	1.4	1.4	1.3	1.3	1.2
EAST TAWAKONI	1.0	1.0	1.0	1.0	1.0	1.0
EASTERN CASS WSC	3.8	3.9	4.0	4.1	4.2	4.2
EDGEWOOD	1.6	1.6	1.5	1.5	1.5	1.5
EDOM WSC*	1.0	1.0	1.0	1.0	1.0	1.0
ELDERVILLE WSC*	2.1	1.9	1.8	1.6	1.4	1.3
EMORY	1.0	1.0	1.0	1.0	1.0	1.0
FOUKE WSC	1.3	1.3	1.3	1.3	1.3	1.3
FROGNOT WSC*	2.1	1.9	1.6	1.3	1.1	1.0
FRUITVALE WSC	1.6	1.5	1.5	1.4	1.4	1.3
GAFFORD CHAPEL WSC	1.5	1.5	1.5	1.5	1.4	1.4
GILL WSC*	1.7	1.7	1.6	1.6	1.5	1.4
GILMER	1.1	1.0	1.2	1.1	1.1	1.0
GLADEWATER	1.3	1.3	1.2	1.1	1.0	1.0
GLENWOOD WSC	1.2	1.2	1.2	1.1	1.1	1.0
GOLDEN WSC	1.8	1.8	1.9	1.6	1.1	1.0
GRAND SALINE	1.7	1.7	1.7	1.6	1.5	1.3
GREENVILLE	1.1	1.0	1.0	1.0	1.0	1.0
GUM SPRINGS WSC	4.4	4.3	4.1	3.9	3.6	3.2
HALLSVILLE	1.5	1.4	1.4	1.3	1.2	1.1
HARLETON WSC	1.0	1.0	1.0	1.0	1.0	1.0
HAWKINS	3.0	2.9	2.9	2.9	2.8	2.8
HICKORY CREEK SUD*	0.8	0.6	0.4	0.3	0.2	0.1
HOLLY SPRINGS WSC	1.0	1.1	1.1	1.1	1.1	1.1
HOOKS	1.0	1.0	1.0	1.0	1.0	1.0
HUGHES SPRINGS	2.0	2.1	2.2	2.2	2.2	2.2
IRRIGATION, BOWIE	1.1	1.1	1.1	1.1	1.1	1.1
IRRIGATION, DELTA	3.8	3.8	3.8	3.8	3.8	3.8
IRRIGATION, FRANKLIN	3.0	3.0	3.0	3.0	3.0	3.0
IRRIGATION, GREGG	4.8	4.8	4.8	4.8	4.8	4.8
IRRIGATION, HARRISON	1.2	1.2	1.2	1.2	1.2	1.2
IRRIGATION, HOPKINS	1.0	1.0	1.0	1.0	1.0	1.0
IRRIGATION, HUNT	1.0	1.0	1.0	1.0	1.0	1.0
IRRIGATION, LAMAR	1.0	1.0	1.0	1.0	1.0	1.0

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Region D Water User Group (WUG) Management Supply Factor

	WUG MANAGEMENT SUPPLY FACTOR					
WUG NAME	2020	2030	2040	2050	2060	2070
IRRIGATION, MARION	26.8	26.8	26.8	26.8	26.8	26.8
IRRIGATION, MORRIS	6.4	6.4	6.4	6.4	6.4	6.4
IRRIGATION, RAINS	3.2	3.2	3.2	3.2	3.2	3.2
IRRIGATION, RED RIVER	1.2	1.2	1.2	1.2	1.2	1.2
IRRIGATION, SMITH*	1.6	1.6	1.6	1.6	1.6	1.6
IRRIGATION, TITUS	1.4	1.4	1.4	1.4	1.4	1.4
IRRIGATION, UPSHUR	4.2	4.2	4.2	4.2	4.2	4.2
IRRIGATION, VAN ZANDT	1.4	1.3	1.3	1.3	1.3	1.3
IRRIGATION, WOOD	2.8	2.8	2.8	2.8	2.8	2.8
JACKSON WSC*	1.0	2.9	2.8	2.6	2.5	1.3
JEFFERSON	3.9	4.0	4.1	4.1	4.1	4.1
JONES WSC	2.1	2.1	2.1	2.1	2.1	2.1
JOSEPHINE*	1.0	1.0	1.0	1.0	1.0	1.0
KELLYVILLE-BEREA WSC	1.4	1.5	1.5	1.6	1.6	1.6
KILGORE*	1.1	2.0	1.8	1.6	1.5	1.4
LAKE FORK WSC	3.0	3.0	3.1	3.1	3.0	3.0
LAMAR COUNTY WSD	3.6	3.6	3.5	3.4	3.3	3.3
LEIGH WSC	1.1	1.0	1.1	1.1	1.0	1.0
LIBERTY CITY WSC	1.8	1.7	1.6	1.5	1.3	1.2
LINDALE RURAL WSC*	2.2	2.1	1.9	1.8	1.6	1.4
LINDALE*	1.2	1.3	1.3	1.4	1.4	1.3
LINDEN	1.5	1.5	1.6	1.6	1.6	1.6
LITTLE HOPE MOORE WSC	1.1	1.1	1.0	1.0	1.0	1.0
LIVESTOCK, BOWIE	1.0	1.0	1.0	1.0	1.0	1.0
LIVESTOCK, CAMP	1.0	1.0	1.0	1.0	1.0	1.0
LIVESTOCK, CASS	1.0	1.0	1.0	1.0	1.0	1.0
LIVESTOCK, DELTA	1.0	1.0	1.0	1.0	1.0	1.0
LIVESTOCK, FRANKLIN	1.0	1.0	1.0	1.0	1.0	1.0
LIVESTOCK, GREGG	1.0	1.0	1.0	1.0	1.0	1.0
LIVESTOCK, HARRISON	1.5	1.6	1.6	1.6	1.6	1.6
LIVESTOCK, HOPKINS	1.1	1.1	1.1	1.1	1.1	1.1
LIVESTOCK, HUNT	1.0	1.0	1.0	1.0	1.0	1.0
LIVESTOCK, LAMAR	1.5	1.5	1.5	1.5	1.5	1.5
LIVESTOCK, MARION	2.2	2.2	2.2	2.2	2.2	2.2
LIVESTOCK, MORRIS	1.1	1.1	1.1	1.1	1.1	1.1
LIVESTOCK, RAINS	1.2	1.2	1.2	1.2	1.2	1.2
LIVESTOCK, RED RIVER	1.1	1.1	1.1	1.1	1.1	1.1
LIVESTOCK, SMITH*	1.5	1.5	1.5	1.5	1.5	1.5
LIVESTOCK, TITUS	1.0	1.0	1.0	1.0	1.0	1.0
LIVESTOCK, UPSHUR	1.1	1.1	1.1	1.1	1.1	1.1
LIVESTOCK, VAN ZANDT	1.6	1.6	1.6	1.6	1.5	1.5
LIVESTOCK, WOOD	1.0	1.0	1.0	1.0	1.0	1.0
LONE STAR	4.0	4.1	4.1	4.1	4.0	3.9
LONGVIEW	1.8	2.0	1.8	1.7	1.5	1.4
MABANK*	1.0	1.0	1.0	1.0	1.0	1.0
MACBEE SUD*	1.2	1.1	1.1	1.1	1.1	1.1
MACEDONIA EYLAU MUD 1	1.0	1.0	1.0	1.0	1.0	1.0
MANUFACTURING, BOWIE	0.6	29.3	32.5	36.5	40.5	49.3

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Region D Water User Group (WUG) Management Supply Factor

WUG NAME	WUG MANAGEMENT SUPPLY FACTOR					
	2020	2030	2040	2050	2060	2070
MANUFACTURING, CAMP	2.9	2.0	2.0	2.0	2.0	2.0
MANUFACTURING, CASS	1.0	1.0	1.0	1.0	1.0	1.0
MANUFACTURING, FRANKLIN	1.4	1.0	1.0	1.0	1.0	1.0
MANUFACTURING, GREGG	1.3	1.0	1.0	1.0	1.0	1.0
MANUFACTURING, HARRISON	4.4	3.9	3.9	3.9	3.9	3.9
MANUFACTURING, HOPKINS	1.8	1.9	2.0	2.1	2.2	2.4
MANUFACTURING, HUNT	2.0	1.9	2.2	2.4	2.6	2.2
MANUFACTURING, LAMAR	1.2	1.2	1.3	1.3	1.4	1.5
MANUFACTURING, MORRIS	4.7	4.5	4.3	4.4	4.7	4.5
MANUFACTURING, RAINS	1.0	1.0	1.0	1.0	1.0	1.0
MANUFACTURING, RED RIVER	2,842.3	2,842.3	2,840.0	2,840.0	2,840.0	2,840.0
MANUFACTURING, SMITH*	1.0	1.0	1.0	1.0	1.0	1.0
MANUFACTURING, TITUS	1.3	1.0	1.0	1.0	1.0	1.0
MANUFACTURING, UPSHUR	2.4	2.2	2.2	2.2	2.2	2.2
MANUFACTURING, VAN ZANDT	1.1	1.1	1.1	1.0	1.0	1.0
MANUFACTURING, WOOD	1.0	1.0	1.0	1.0	1.0	1.0
MARSHALL	2.8	2.6	2.5	2.3	2.1	1.9
MARTIN SPRINGS WSC	1.6	1.4	1.3	1.2	1.0	1.0
MAUD	1.0	1.0	1.0	1.0	1.0	1.0
MILLER GROVE WSC	1.0	1.0	1.0	1.0	1.0	1.0
MIMS WSC	7.0	7.0	7.0	7.0	7.0	7.0
MINEOLA	1.6	1.6	1.6	1.6	1.6	1.5
MINING, CAMP	1.9	2.1	2.3	2.6	2.9	3.3
MINING, CASS	21.5	14.9	14.7	20.1	30.9	47.6
MINING, FRANKLIN	208.0	203.2	248.5	243.5	318.0	477.0
MINING, GREGG	1.1	1.0	1.0	1.0	1.1	1.1
MINING, HARRISON	1.0	1.2	1.5	1.9	2.4	3.1
MINING, HOPKINS	1.0	1.0	1.0	1.0	1.0	1.0
MINING, HUNT	1.0	1.0	1.0	1.0	1.0	1.1
MINING, MARION	1.1	1.0	1.1	1.3	1.6	2.0
MINING, RED RIVER	1.0	1.0	1.0	1.0	1.0	1.0
MINING, SMITH*	1.4	1.6	1.6	1.5	1.5	1.5
MINING, TITUS	2.8	2.7	2.6	2.6	2.3	2.0
MINING, UPSHUR	1.3	1.1	1.1	1.2	1.2	1.3
MINING, VAN ZANDT	11.1	10.9	10.3	9.7	9.2	8.8
MINING, WOOD	12.4	12.5	13.8	15.3	16.2	17.3
MOUNT PLEASANT	4.6	3.8	3.4	3.0	2.6	2.3
MOUNT VERNON	5.3	5.0	4.8	4.5	4.3	4.0
MYRTLE SPRINGS WSC	1.7	1.6	1.6	1.5	1.4	1.3
NAPLES	1.5	1.5	1.5	1.5	1.5	1.4
NASH	1.0	1.0	1.0	1.0	1.0	1.0
NEW BOSTON	1.0	1.0	1.0	1.0	1.0	1.0
NEW HOPE SUD	1.1	1.1	1.1	1.1	1.1	1.1
NORTH HARRISON WSC	1.1	1.1	1.1	1.0	1.2	1.1
NORTH HOPKINS WSC	1.9	1.9	1.8	1.7	1.5	1.4
NORTH HUNT SUD*	1.0	1.0	1.0	1.0	1.0	1.0
OMAHA	1.4	1.4	1.4	1.4	1.3	1.3
ORE CITY	11.1	10.7	10.3	9.9	9.4	9.0

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Region D Water User Group (WUG) Management Supply Factor

	WUG MANAGEMENT SUPPLY FACTOR					
WUG NAME	2020	2030	2040	2050	2060	2070
OVERTON*	0.9	1.0	1.0	1.0	1.0	1.0
PANOLA-BETHANY WSC*	1.0	1.1	1.0	1.0	1.0	1.0
PARIS	8.6	8.6	8.6	8.4	8.2	8.0
PINE RIDGE WSC	1.8	1.7	1.6	1.4	1.3	1.2
PITTSBURG	2.0	2.0	1.9	1.9	1.8	1.8
POETRY WSC*	1.0	1.0	1.0	1.0	1.0	1.0
POINT	1.0	1.0	1.0	1.0	1.0	1.0
PRITCHETT WSC	1.5	1.5	1.4	1.4	1.3	1.3
PRUITT SANDFLAT WSC	2.1	2.0	1.9	1.8	1.8	1.7
QUEEN CITY	1.0	1.1	1.1	1.1	1.1	1.1
QUINLAN	1.0	1.0	1.0	1.0	1.0	1.0
QUITMAN	1.0	3.2	3.2	3.1	3.0	3.0
R P M WSC*	1.1	1.0	1.0	1.0	1.0	1.0
RAMEY WSC	2.3	2.3	2.4	2.4	2.4	2.3
RED RIVER COUNTY WSC	1.4	1.4	1.4	1.4	1.4	1.3
REDWATER	1.0	1.0	1.0	1.0	1.0	1.0
RENO (Lamar)	1.1	1.3	1.3	1.4	1.5	1.6
RIVERBEND WATER RESOURCES DISTRICT	1.0	1.0	1.0	1.0	1.0	1.0
ROYSE CITY*	1.0	1.0	1.0	1.0	1.0	1.0
SAND FLAT WSC	2.2	2.1	1.9	1.8	1.6	1.5
SCOTTSVILLE	1.1	1.0	1.2	1.1	1.2	1.1
SHADY GROVE NO 2 WSC	1.0	1.0	1.0	1.0	1.0	1.0
SHADY GROVE WSC	1.0	1.0	1.0	1.0	1.0	1.0
SHARON WSC	2.2	2.2	2.3	2.2	2.1	2.1
SHIRLEY WSC	1.5	1.5	1.4	1.4	1.3	1.3
SMITH COUNTY MUD 1	1.3	1.1	1.1	1.0	1.0	1.0
SOUTH RAINS SUD	1.5	1.5	1.5	1.5	1.5	1.5
SOUTH TAWAKONI WSC	1.0	1.0	1.0	1.0	1.0	1.0
SOUTHERN UTILITIES*	1.1	1.1	1.1	1.1	1.1	1.1
STAR MOUNTAIN WSC	1.4	1.3	1.2	1.1	1.3	1.2
STARRVILLE-FRIENDSHIP WSC	1.4	1.3	1.2	1.1	1.3	1.2
STEAM ELECTRIC POWER, GREGG	2.4	2.4	2.4	2.4	2.4	2.4
STEAM ELECTRIC POWER, HARRISON	1.3	1.3	1.3	1.3	1.3	1.3
STEAM ELECTRIC POWER, HUNT	1.0	1.0	1.0	1.0	1.0	1.0
STEAM ELECTRIC POWER, LAMAR	1.6	1.6	1.6	1.6	1.6	1.6
STEAM ELECTRIC POWER, MARION	1.0	1.0	1.1	1.2	1.4	1.5
STEAM ELECTRIC POWER, MORRIS	16.4	16.4	16.4	16.4	16.4	16.4
STEAM ELECTRIC POWER, TITUS	1.0	1.0	1.0	1.0	1.0	1.0
SULPHUR SPRINGS	1.6	1.6	1.5	1.5	1.4	1.4
TALLEY WSC	2.0	2.0	2.0	1.8	1.7	1.5
TEXARKANA	1.0	1.0	1.0	1.0	1.0	1.0
TEXAS A&M UNIVERSITY COMMERCE	1.0	1.0	1.0	1.0	1.1	1.1
TRI SUD	1.0	1.0	1.0	1.0	1.0	1.0
TRYON ROAD SUD	2.5	2.4	2.2	2.1	1.9	1.7
TYLER*	1.0	1.1	1.1	1.1	1.1	1.1
UNION GROVE WSC	2.4	2.3	2.2	2.1	2.0	1.9
VAN	2.7	2.5	2.4	2.2	2.1	2.0
WAKE VILLAGE	1.0	1.0	1.0	1.0	1.0	1.0

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Region D Water User Group (WUG) Management Supply Factor

	WUG MANAGEMENT SUPPLY FACTOR					
WUG NAME	2020	2030	2040	2050	2060	2070
WASKOM	1.0	1.1	1.1	1.1	1.1	1.1
WEST GREGG SUD*	1.7	1.6	1.5	1.4	1.2	1.1
WEST HARRISON WSC	2.8	2.7	2.6	2.5	2.3	2.1
WEST LEONARD WSC*	1.9	1.8	1.8	1.6	1.3	1.0
WEST TAWAKONI	1.0	2.6	2.2	1.7	1.4	1.1
WESTERN CASS WSC	5.0	5.2	5.4	5.4	5.5	5.5
WHITE OAK	1.9	1.8	1.7	1.5	1.4	1.3
WILLS POINT	1.2	2.3	2.3	1.9	1.6	1.6
WINNSBORO	2.8	2.6	2.5	2.4	2.2	2.1
WINONA	1.3	1.1	1.0	1.5	1.3	1.1
WOLFE CITY*	1.5	1.3	1.1	1.0	1.0	1.0

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	MANAGEMENT SUPPLY FACTOR					
MWP NAME	**2020**	**2030**	**2040**	**2050**	**2060**	**2070**
CASH SUD	1	0.9	0.8	0.9	0.9	0.9
CHEROKEE WATER COMPANY	1	1	1	1	1	1
COMMERCE	0.9	2.2	2	1.7	1	0.9
EMORY	0.7	0.7	0.7	0.7	0.7	0.7
FRANKLIN COUNTY WD	1	0.9	0.9	0.8	0.8	0.8
GREENVILLE	1.1	1	1	1	1.1	1.2
LAMAR COUNTY WSD	2.3	2.2	2.2	2.2	2.1	2.1
LONGVIEW	1.2	1.4	1.3	1.3	1.2	1.1
MARSHALL	2.2	2.1	2	1.9	1.8	1.7
MOUNT PLEASANT	2.4	2.3	2.1	2	1.8	1.7
NORTHEAST TEXAS MWD	1	1	1	1	1	1
PARIS	1.8	1.7	1.7	1.7	1.7	1.7
RIVERBEND WATER RESOURCES DISTRICT	0.8	1	1	1	1	1
SABINE RIVER AUTHORITY	1	0.9	0.9	1.8	1.8	1.8
SULPHUR RIVER MWD	1	1	1	1	1	1
SULPHUR SPRINGS	1.2	1.2	1.2	1.2	1.2	1.1
TEXARKANA	0.7	0.7	0.7	0.7	0.7	0.7
TITUS COUNTY FWD #1	0.7	0.7	0.7	0.7	0.7	0.7

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Region D Recommended Water Management Strategy (WMS) Supply Associated with a New or Amended Inter-Basin Transfer (IBT) Permit

Region D has no recommended WMS supplies that are associated with an IBT Permit.

Region D Recommended Water Management Strategy (WMS) Supply Associated with a New or Amended Inter-Basin Transfer (IBT) Permit

IBT WMS supply is the portion of the total WMS benefitting WUGs that will require a new or amended IBT permit that is not considered exempt under the Texas Water Code § 11.085.

			IBT WMS SUPPLY (ACRE-FEET PER YEAR)					
WMS NAME	SOURCE BASIN	RECIPIENT WUG BASIN	2020	2030	2040	2050	2060	2070

Region D Water User Groups (WUGs)
Recommended Water Management Strategy (WMS) Supply Associated with a
New or Amended Inter-Basin Transfer (IBT) Permit and Total Recommended Conservation WMS Supply

IBT WMS supply is the portion of the total WMS benefitting the WUG basin split listed that will require a new or amended IBT permit that is not considered exempt under the Texas Water Code§ 11.085. Total conservation supply represents all conservation WMS volumes recommended within the WUG's region-basin geographic split.

BENEFITTING WUG NAME | BASIN	WMS SOURCE ORIGIN BASIN | WMS NAME	WMS SUPPLY (ACRE-FEET PER YEAR)					
		2020	2030	2040	2050	2060	2070
ABLES SPRINGS WSC | SABINE BASIN	SULPHUR BASIN | MARVIN NICHOLS (328) STRATEGY FOR NTMWD, TRWD, AND UTRWD	0	0	0	21	35	44
	SULPHUR BASIN | WRIGHT PATMAN REALLOCATION FOR NTMWD, TRWD, AND UTRWD	0	0	0	0	0	15
	TOTAL RECOMMENDED IBT WMS SUPPLY	**0**	**0**	**0**	**21**	**35**	**59**
	TOTAL RECOMMENDED CONSERVATION	**1**	**2**	**1**	**3**	**7**	**10**
B H P WSC | SABINE BASIN	SULPHUR BASIN | MARVIN NICHOLS (328) STRATEGY FOR NTMWD, TRWD, AND UTRWD	0	0	0	68	107	125
	SULPHUR BASIN | WRIGHT PATMAN REALLOCATION FOR NTMWD, TRWD, AND UTRWD	0	0	0	0	0	42
	TOTAL RECOMMENDED IBT WMS SUPPLY	**0**	**0**	**0**	**68**	**107**	**167**
	TOTAL RECOMMENDED CONSERVATION	**0**	**0**	**0**	**0**	**0**	**0**
BLACKLAND WSC | SABINE BASIN	SULPHUR BASIN | MARVIN NICHOLS (328) STRATEGY FOR NTMWD, TRWD, AND UTRWD	0	0	0	1	1	1
	SULPHUR BASIN | WRIGHT PATMAN REALLOCATION FOR NTMWD, TRWD, AND UTRWD	0	0	0	0	0	0
	TOTAL RECOMMENDED IBT WMS SUPPLY	**0**	**0**	**0**	**1**	**1**	**1**
	TOTAL RECOMMENDED CONSERVATION	**0**	**1**	**1**	**1**	**0**	**1**
CADDO BASIN SUD | SABINE BASIN	SULPHUR BASIN | MARVIN NICHOLS (328) STRATEGY FOR NTMWD, TRWD, AND UTRWD	0	0	0	217	349	421
	SULPHUR BASIN | WRIGHT PATMAN REALLOCATION FOR NTMWD, TRWD, AND UTRWD	0	0	0	0	0	142
	TOTAL RECOMMENDED IBT WMS SUPPLY	**0**	**0**	**0**	**217**	**349**	**563**
	TOTAL RECOMMENDED CONSERVATION	**1**	**2**	**3**	**5**	**9**	**15**
CASH SUD | SABINE BASIN	SULPHUR BASIN | MARVIN NICHOLS (328) STRATEGY FOR NTMWD, TRWD, AND UTRWD	0	0	0	255	303	262
	SULPHUR BASIN | WRIGHT PATMAN REALLOCATION FOR NTMWD, TRWD, AND UTRWD	0	0	0	0	0	89
	TOTAL RECOMMENDED IBT WMS SUPPLY	**0**	**0**	**0**	**255**	**303**	**351**
	TOTAL RECOMMENDED CONSERVATION	**0**	**1**	**1**	**0**	**0**	**0**
JOSEPHINE | SABINE BASIN	SULPHUR BASIN | MARVIN NICHOLS (328) STRATEGY FOR NTMWD, TRWD, AND UTRWD	0	0	0	16	20	17
	SULPHUR BASIN | WRIGHT PATMAN REALLOCATION FOR NTMWD, TRWD, AND UTRWD	0	0	0	0	0	6
	TOTAL RECOMMENDED IBT WMS SUPPLY	**0**	**0**	**0**	**16**	**20**	**23**
	TOTAL RECOMMENDED CONSERVATION	**1**	**3**	**5**	**7**	**7**	**7**
MABANK | TRINITY BASIN	SULPHUR BASIN | MARVIN NICHOLS (328) STRATEGY FOR NTMWD, TRWD, AND UTRWD	0	0	0	16	27	36
	SULPHUR BASIN | WRIGHT PATMAN REALLOCATION FOR NTMWD, TRWD, AND UTRWD	0	0	0	0	0	12
	TOTAL RECOMMENDED IBT WMS SUPPLY	**0**	**0**	**0**	**16**	**27**	**48**
	TOTAL RECOMMENDED CONSERVATION	**3**	**4**	**5**	**7**	**8**	**10**
POETRY WSC | SABINE BASIN	SULPHUR BASIN | MARVIN NICHOLS (328) STRATEGY FOR NTMWD, TRWD, AND UTRWD	0	0	0	55	87	102
	SULPHUR BASIN | WRIGHT PATMAN REALLOCATION FOR NTMWD, TRWD, AND UTRWD	0	0	0	0	0	34
	TOTAL RECOMMENDED IBT WMS SUPPLY	**0**	**0**	**0**	**55**	**87**	**136**
	TOTAL RECOMMENDED CONSERVATION	**1**	**2**	**1**	**3**	**4**	**7**
ROYSE CITY | SABINE BASIN	SULPHUR BASIN | MARVIN NICHOLS (328) STRATEGY FOR NTMWD, TRWD, AND UTRWD	0	0	0	9	14	17

Region D Water User Groups (WUGs)
Recommended Water Management Strategy (WMS) Supply Associated with a
New or Amended Inter-Basin Transfer (IBT) Permit and Total Recommended Conservation WMS Supply

ROYSE CITY | SABINE BASIN	SULPHUR BASIN | WRIGHT PATMAN REALLOCATION FOR NTMWD, TRWD, AND UTRWD	0	0	0	0	0	6
	TOTAL RECOMMENDED IBT WMS SUPPLY	**0**	**0**	**0**	**9**	**14**	**23**
	TOTAL RECOMMENDED CONSERVATION	**1**	**1**	**1**	**0**	**3**	**2**

Region D Sponsored Recommended Water Management Strategy (WMS) Supplies Unallocated to Water User Groups (WUG)

Region D has no recommended WMS supplies that are unallocated to a WUG.

Region D Sponsored Recommended Water Management Strategy (WMS) Supplies Unallocated* to Water User Groups (WUG)

WMS NAME	WMS SPONSOR	SOURCE NAME	UNALLOCATED STRATEGY SUPPLY (ACRE-FEET PER YEAR)					
			2020	2030	2040	2050	2060	2070
TOTAL UNALLOCATED STRATEGY SUPPLIES								

* Strategy supplies created through the WMS that have not been assigned to a WUG will be allocated to the entity responsible for the water through an ‘unassigned water volumes’ entity. Only strategy supplies associated with an 'unassigned water volume' entity are shown in this report, and may not represent all strategy supplies associated with the listed WMS.

Region D Water User Group (WUG) Strategy Supplies by Water Management Strategy (WMS) Type

WMS TYPE *	STRATEGY SUPPLY (ACRE-FEET PER YEAR)					
	2020	2030	2040	2050	2060	2070
AQUIFER STORAGE & RECOVERY	0	0	1	0	1	1
GROUNDWATER WELLS & OTHER	32,207	33,671	34,723	35,476	36,930	38,279
INDIRECT REUSE	323	376	434	480	665	816
MUNICIPAL CONSERVATION	4,059	4,502	5,158	6,150	7,631	9,793
NEW MAJOR RESERVOIR	4	195	267	871	1,282	1,436
OTHER CONSERVATION	211	694	694	694	694	694
OTHER SURFACE WATER	46,416	109,372	119,295	131,550	144,667	169,929
SEAWATER DESALINATION	0	0	0	0	0	0
CONJUNCTIVE USE	0	0	0	0	0	0
DIRECT POTABLE REUSE	0	0	0	0	0	0
OTHER STRATEGIES	0	0	0	0	0	0
GROUNDWATER DESALINATION	0	0	0	0	0	0
OTHER DIRECT REUSE	0	0	0	0	0	0
IRRIGATION CONSERVATION	0	0	0	0	0	0
DROUGHT MANAGEMENT	0	0	0	0	0	0
TOTAL STRATEGY SUPPLIES	**83,220**	**148,810**	**160,572**	**175,221**	**191,870**	**220,948**

* WMS type descriptions can be found on the interactive state water plan website at http://texasstatewaterplan.org/ using the 'View data for' drop-down menus to navigate to a specific WMS Type page. The data used to create each WMS type value is available in Appendix 3 of the Guidelines for Regional Water Planning Data Deliverable (Exhibit D) document at http://www.twdb.texas.gov/waterplanning/rwp/planningdocu/2021/doc/current_docs/contract_docs/ExhibitD.pdf

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Region D Water User Group (WUG)
Recommended Water Management Strategy (WMS) Supplies by Source Type

SOURCE SUBTYPE*	STRATEGY SUPPLY (ACRE-FEET PER YEAR)					
	2020	2030	2040	2050	2060	2070
AQUIFER STORAGE & RECOVERY	0	0	1	0	1	1
GROUNDWATER	32,207	33,671	34,723	35,476	36,930	38,279
GROUNDWATER TOTAL STRATEGY SUPPLIES	**32,207**	**33,671**	**34,724**	**35,476**	**36,931**	**38,280**
DIRECT NON-POTABLE REUSE	0	0	0	0	0	0
DIRECT POTABLE REUSE	0	0	0	0	0	0
INDIRECT NON-POTABLE REUSE	0	0	0	0	0	0
INDIRECT POTABLE REUSE	323	376	434	480	665	816
REUSE TOTAL STRATEGY SUPPLIES	**323**	**376**	**434**	**480**	**665**	**816**
ATMOSPHERE	0	0	0	0	0	0
GULF OF MEXICO	0	0	0	0	0	0
LIVESTOCK LOCAL SUPPLY	0	0	0	0	0	0
OTHER LOCAL SUPPLY	0	0	0	0	0	0
RAINWATER HARVESTING	0	0	0	0	0	0
RESERVOIR	46,074	108,822	118,363	131,107	144,566	169,696
RESERVOIR SYSTEM	346	745	1,199	1,314	1,383	1,372
RUN-OF-RIVER	0	0	0	0	0	297
SURFACE WATER TOTAL STRATEGY SUPPLIES	**46,420**	**109,567**	**119,562**	**132,421**	**145,949**	**171,365**
REGION D TOTAL STRATEGY SUPPLIES	**78,950**	**143,614**	**154,720**	**168,377**	**183,545**	**210,461**

* A full list of source subtype definitions can be found in section 3 of the Guidelines for Regional Water Planning Data Deliverable (Exhibit D) document at http://www.twdb.texas.gov/waterplanning/rwp/planningdocu/2021/doc/current_docs/contract_docs/ExhibitD.pdf.

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Region D Major Water Provider (MWP) Existing Sales and Transfers

Major Water Providers are entities of particular significance to a region's water supply as defined by the Regional Water Planning Group (RWPG), and may be a Water User Group (WUG) entity, Wholesale Water Provider (WWP) entity , or both (WUG/WWP).

Retail denotes WUG projected demands and existing water supplies used by the WUG. Wholesale denotes a WWP or WUG/WWP selling water to another entity.

CASH SUD - WUG/WWP	**WATER VOLUMES (ACRE-FEET PER YEAR)**					
DATA DESCRIPTION	**2020**	**2030**	**2040**	**2050**	**2060**	**2070**
PROJECTED RETAIL WUG DEMANDS	2,353	2,736	3,215	3,808	4,537	5,411
PROJECTED WHOLESALE CONTRACT DEMANDS	926	1,155	1,491	1,765	2,367	3,351
TOTAL PROJECTED WHOLESALE CONTRACT AND RETAIL DEMANDS	**3,279**	**3,891**	**4,706**	**5,573**	**6,904**	**8,762**
REUSE SALES TO RETAIL CUSTOMERS	524	641	729	772	697	642
SURFACE WATER SALES TO RETAIL CUSTOMERS	1,918	1,734	1,477	1,690	2,494	4,074
SURFACE WATER SALES TO WHOLESALE CUSTOMERS	357	507	738	930	1,354	2,082
TOTAL WHOLESALE AND RETAIL SALES TO CUSTOMERS	**2,799**	**2,882**	**2,944**	**3,392**	**4,545**	**6,798**

CHEROKEE WATER COMPANY - WWP	**WATER VOLUMES (ACRE-FEET PER YEAR)**					
DATA DESCRIPTION	**2020**	**2030**	**2040**	**2050**	**2060**	**2070**
PROJECTED WHOLESALE CONTRACT DEMANDS	18,000	18,000	18,000	18,000	18,000	18,094
TOTAL PROJECTED WHOLESALE CONTRACT AND RETAIL DEMANDS	**18,000**	**18,000**	**18,000**	**18,000**	**18,000**	**18,094**
SURFACE WATER SALES TO WHOLESALE CUSTOMERS	18,000	18,000	18,000	18,000	18,000	18,094
TOTAL WHOLESALE AND RETAIL SALES TO CUSTOMERS	**18,000**	**18,000**	**18,000**	**18,000**	**18,000**	**18,094**

COMMERCE - WUG/WWP	**WATER VOLUMES (ACRE-FEET PER YEAR)**					
DATA DESCRIPTION	**2020**	**2030**	**2040**	**2050**	**2060**	**2070**
PROJECTED RETAIL WUG DEMANDS	1,427	1,555	1,749	2,039	2,473	3,108
PROJECTED WHOLESALE CONTRACT DEMANDS	796	808	808	808	808	808
TOTAL PROJECTED WHOLESALE CONTRACT AND RETAIL DEMANDS	**2,223**	**2,363**	**2,557**	**2,847**	**3,281**	**3,916**
GROUNDWATER SALES TO RETAIL CUSTOMERS	244	244	244	244	244	244
SURFACE WATER SALES TO RETAIL CUSTOMERS	1,427	4,586	4,609	4,249	2,694	3,078
GROUNDWATER SALES TO WHOLESALE CUSTOMERS	78	78	78	78	78	78
SURFACE WATER SALES TO WHOLESALE CUSTOMERS	202	214	214	214	214	214
TOTAL WHOLESALE AND RETAIL SALES TO CUSTOMERS	**1,951**	**5,122**	**5,145**	**4,785**	**3,230**	**3,614**

EMORY - WUG/WWP	**WATER VOLUMES (ACRE-FEET PER YEAR)**					
DATA DESCRIPTION	**2020**	**2030**	**2040**	**2050**	**2060**	**2070**
PROJECTED RETAIL WUG DEMANDS	791	829	837	842	845	847
PROJECTED WHOLESALE CONTRACT DEMANDS	963	965	961	960	960	961
TOTAL PROJECTED WHOLESALE CONTRACT AND RETAIL DEMANDS	**1,754**	**1,794**	**1,798**	**1,802**	**1,805**	**1,808**
SURFACE WATER SALES TO RETAIL CUSTOMERS	791	829	837	842	845	847
SURFACE WATER SALES TO WHOLESALE CUSTOMERS	427	438	435	434	435	436
TOTAL WHOLESALE AND RETAIL SALES TO CUSTOMERS	**1,218**	**1,267**	**1,272**	**1,276**	**1,280**	**1,283**

FRANKLIN COUNTY WD - WWP	**WATER VOLUMES (ACRE-FEET PER YEAR)**					
DATA DESCRIPTION	**2020**	**2030**	**2040**	**2050**	**2060**	**2070**
PROJECTED WHOLESALE CONTRACT DEMANDS	9,500	9,500	9,500	9,500	9,500	9,500
TOTAL PROJECTED WHOLESALE CONTRACT AND RETAIL DEMANDS	**9,500**	**9,500**	**9,500**	**9,500**	**9,500**	**9,500**
SURFACE WATER SALES TO WHOLESALE CUSTOMERS	9,031	8,649	8,265	7,960	7,577	7,271
TOTAL WHOLESALE AND RETAIL SALES TO CUSTOMERS	**9,031**	**8,649**	**8,265**	**7,960**	**7,577**	**7,271**

GREENVILLE - WUG/WWP	**WATER VOLUMES (ACRE-FEET PER YEAR)**

Region D Major Water Provider (MWP) Existing Sales and Transfers

DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
PROJECTED RETAIL WUG DEMANDS	9,271	10,481	12,187	14,624	18,163	23,319
PROJECTED WHOLESALE CONTRACT DEMANDS	2,431	2,608	2,807	3,022	3,213	3,410
TOTAL PROJECTED WHOLESALE CONTRACT AND RETAIL DEMANDS	**11,702**	**13,089**	**14,994**	**17,646**	**21,376**	**26,729**
SURFACE WATER SALES TO RETAIL CUSTOMERS	6,032	5,855	5,656	5,441	5,250	5,053
SURFACE WATER SALES TO WHOLESALE CUSTOMERS	2,431	2,608	2,807	3,022	3,213	3,410
TOTAL WHOLESALE AND RETAIL SALES TO CUSTOMERS	**8,463**	**8,463**	**8,463**	**8,463**	**8,463**	**8,463**

LAMAR COUNTY WSD - WUG/WWP	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
PROJECTED RETAIL WUG DEMANDS	2,216	2,238	2,252	2,280	2,316	2,349
PROJECTED WHOLESALE CONTRACT DEMANDS	2,776	2,900	3,008	3,100	3,222	3,317
TOTAL PROJECTED WHOLESALE CONTRACT AND RETAIL DEMANDS	**4,992**	**5,138**	**5,260**	**5,380**	**5,538**	**5,666**
SURFACE WATER SALES TO RETAIL CUSTOMERS	8,891	8,796	8,715	8,655	8,597	8,512
SURFACE WATER SALES TO WHOLESALE CUSTOMERS	2,637	2,761	2,869	2,961	3,083	3,178
TOTAL WHOLESALE AND RETAIL SALES TO CUSTOMERS	**11,528**	**11,557**	**11,584**	**11,616**	**11,680**	**11,690**

LONGVIEW - WUG/WWP	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
PROJECTED RETAIL WUG DEMANDS	24,268	26,122	28,353	31,051	34,232	37,865
PROJECTED WHOLESALE CONTRACT DEMANDS	26,765	26,767	26,767	26,767	26,767	26,767
TOTAL PROJECTED WHOLESALE CONTRACT AND RETAIL DEMANDS	**51,033**	**52,889**	**55,120**	**57,818**	**60,999**	**64,632**
SURFACE WATER SALES TO RETAIL CUSTOMERS	43,410	52,251	52,284	52,316	52,351	52,386
REUSE SALES TO WHOLESALE CUSTOMERS	6,161	6,161	6,161	6,161	6,161	6,161
SURFACE WATER SALES TO WHOLESALE CUSTOMERS	14,144	14,146	14,146	14,146	14,146	14,146
TOTAL WHOLESALE AND RETAIL SALES TO CUSTOMERS	**63,715**	**72,558**	**72,591**	**72,623**	**72,658**	**72,693**

MARSHALL - WUG/WWP	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
PROJECTED RETAIL WUG DEMANDS	4,994	5,232	5,499	5,959	6,500	7,148
PROJECTED WHOLESALE CONTRACT DEMANDS	2,423	2,423	2,423	2,423	2,423	2,423
TOTAL PROJECTED WHOLESALE CONTRACT AND RETAIL DEMANDS	**7,417**	**7,655**	**7,922**	**8,382**	**8,923**	**9,571**
SURFACE WATER SALES TO RETAIL CUSTOMERS	13,748	13,748	13,748	13,748	13,748	13,748
SURFACE WATER SALES TO WHOLESALE CUSTOMERS	2,423	2,423	2,423	2,423	2,423	2,423
TOTAL WHOLESALE AND RETAIL SALES TO CUSTOMERS	**16,171**	**16,171**	**16,171**	**16,171**	**16,171**	**16,171**

MOUNT PLEASANT - WUG/WWP	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
PROJECTED RETAIL WUG DEMANDS	3,890	4,302	4,745	5,260	5,828	6,433
PROJECTED WHOLESALE CONTRACT DEMANDS	5,773	6,027	6,276	6,510	6,899	7,208
TOTAL PROJECTED WHOLESALE CONTRACT AND RETAIL DEMANDS	**9,663**	**10,329**	**11,021**	**11,770**	**12,727**	**13,641**
SURFACE WATER SALES TO RETAIL CUSTOMERS	17,800	17,428	17,062	16,734	16,228	15,825
SURFACE WATER SALES TO WHOLESALE CUSTOMERS	5,773	6,027	6,276	6,510	6,899	7,208
TOTAL WHOLESALE AND RETAIL SALES TO CUSTOMERS	**23,573**	**23,455**	**23,338**	**23,244**	**23,127**	**23,033**

NORTHEAST TEXAS MWD - WWP	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
PROJECTED WHOLESALE CONTRACT DEMANDS	164,561	163,892	163,126	162,472	161,810	161,747
TOTAL PROJECTED WHOLESALE CONTRACT AND RETAIL DEMANDS	**164,561**	**163,892**	**163,126**	**162,472**	**161,810**	**161,747**

Region D Major Water Provider (MWP) Existing Sales and Transfers

SURFACE WATER SALES TO WHOLESALE CUSTOMERS	133,659	132,689	131,746	130,988	130,233	129,427
TOTAL WHOLESALE AND RETAIL SALES TO CUSTOMERS	**133,659**	**132,689**	**131,746**	**130,988**	**130,233**	**129,427**

PARIS - WUG/WWP	**WATER VOLUMES (ACRE-FEET PER YEAR)**					
DATA DESCRIPTION	**2020**	**2030**	**2040**	**2050**	**2060**	**2070**
PROJECTED RETAIL WUG DEMANDS	3,059	3,042	3,017	3,033	3,079	3,123
PROJECTED WHOLESALE CONTRACT DEMANDS	27,494	27,743	27,983	28,190	28,586	28,789
TOTAL PROJECTED WHOLESALE CONTRACT AND RETAIL DEMANDS	**30,553**	**30,785**	**31,000**	**31,223**	**31,665**	**31,912**
SURFACE WATER SALES TO RETAIL CUSTOMERS	27,896	27,601	27,314	27,074	26,614	26,372
SURFACE WATER SALES TO WHOLESALE CUSTOMERS	25,608	25,905	26,191	26,431	26,892	27,105
TOTAL WHOLESALE AND RETAIL SALES TO CUSTOMERS	**53,504**	**53,506**	**53,505**	**53,505**	**53,506**	**53,477**

RIVERBEND WATER RESOURCES DISTRICT - WUG/WWP	**WATER VOLUMES (ACRE-FEET PER YEAR)**					
DATA DESCRIPTION	**2020**	**2030**	**2040**	**2050**	**2060**	**2070**
PROJECTED RETAIL WUG DEMANDS	523	536	539	537	537	537
PROJECTED WHOLESALE CONTRACT DEMANDS	168,443	194,985	201,822	210,348	218,967	237,176
TOTAL PROJECTED WHOLESALE CONTRACT AND RETAIL DEMANDS	**168,966**	**195,521**	**202,361**	**210,885**	**219,504**	**237,713**
SURFACE WATER SALES TO RETAIL CUSTOMERS	0	0	0	0	0	0
SURFACE WATER SALES TO WHOLESALE CUSTOMERS	122,630	122,623	122,616	122,615	122,615	122,615
TOTAL WHOLESALE AND RETAIL SALES TO CUSTOMERS	**122,630**	**122,623**	**122,616**	**122,615**	**122,615**	**122,615**

SABINE RIVER AUTHORITY - WWP	**WATER VOLUMES (ACRE-FEET PER YEAR)**					
DATA DESCRIPTION	**2020**	**2030**	**2040**	**2050**	**2060**	**2070**
PROJECTED WHOLESALE CONTRACT DEMANDS	512,482	512,482	512,482	512,482	512,482	512,482
TOTAL PROJECTED WHOLESALE CONTRACT AND RETAIL DEMANDS	**512,482**	**512,482**	**512,482**	**512,482**	**512,482**	**512,482**
SURFACE WATER SALES TO WHOLESALE CUSTOMERS	499,343	472,640	469,585	466,299	462,823	462,734
TOTAL WHOLESALE AND RETAIL SALES TO CUSTOMERS	**499,343**	**472,640**	**469,585**	**466,299**	**462,823**	**462,734**

SULPHUR RIVER MWD - WWP	**WATER VOLUMES (ACRE-FEET PER YEAR)**					
DATA DESCRIPTION	**2020**	**2030**	**2040**	**2050**	**2060**	**2070**
PROJECTED WHOLESALE CONTRACT DEMANDS	13,548	13,470	13,393	13,317	13,240	13,163
TOTAL PROJECTED WHOLESALE CONTRACT AND RETAIL DEMANDS	**13,548**	**13,470**	**13,393**	**13,317**	**13,240**	**13,163**
SURFACE WATER SALES TO WHOLESALE CUSTOMERS	13,548	13,470	13,393	13,317	13,240	13,163
TOTAL WHOLESALE AND RETAIL SALES TO CUSTOMERS	**13,548**	**13,470**	**13,393**	**13,317**	**13,240**	**13,163**

SULPHUR SPRINGS - WUG/WWP	**WATER VOLUMES (ACRE-FEET PER YEAR)**					
DATA DESCRIPTION	**2020**	**2030**	**2040**	**2050**	**2060**	**2070**
PROJECTED RETAIL WUG DEMANDS	3,118	3,199	3,278	3,403	3,547	3,697
PROJECTED WHOLESALE CONTRACT DEMANDS	5,206	5,413	5,701	5,767	6,116	6,397
TOTAL PROJECTED WHOLESALE CONTRACT AND RETAIL DEMANDS	**8,324**	**8,612**	**8,979**	**9,170**	**9,663**	**10,094**
SURFACE WATER SALES TO RETAIL CUSTOMERS	5,002	5,002	5,002	5,002	5,002	5,002
SURFACE WATER SALES TO WHOLESALE CUSTOMERS	5,206	5,413	5,701	5,767	6,116	6,397
TOTAL WHOLESALE AND RETAIL SALES TO CUSTOMERS	**10,208**	**10,415**	**10,703**	**10,769**	**11,118**	**11,399**

TEXARKANA - WUG/WWP	**WATER VOLUMES (ACRE-FEET PER YEAR)**					
DATA DESCRIPTION	**2020**	**2030**	**2040**	**2050**	**2060**	**2070**
PROJECTED RETAIL WUG DEMANDS	7,145	7,282	7,459	7,706	8,028	8,380
PROJECTED WHOLESALE CONTRACT DEMANDS	180,000	180,000	180,000	180,000	180,000	180,000
TOTAL PROJECTED WHOLESALE CONTRACT AND RETAIL DEMANDS	**187,145**	**187,282**	**187,459**	**187,706**	**188,028**	**188,380**

Region D Major Water Provider (MWP) Existing Sales and Transfers

SURFACE WATER SALES TO RETAIL CUSTOMERS	0	0	0	0	0	0
SURFACE WATER SALES TO WHOLESALE CUSTOMERS	122,630	122,623	122,616	122,615	122,615	122,615
TOTAL WHOLESALE AND RETAIL SALES TO CUSTOMERS	**122,630**	**122,623**	**122,616**	**122,615**	**122,615**	**122,615**

TITUS COUNTY FWD #1 - WWP	**WATER VOLUMES (ACRE-FEET PER YEAR)**					
DATA DESCRIPTION	**2020**	**2030**	**2040**	**2050**	**2060**	**2070**
PROJECTED WHOLESALE CONTRACT DEMANDS	40,000	40,000	40,000	40,000	40,000	40,000
TOTAL PROJECTED WHOLESALE CONTRACT AND RETAIL DEMANDS	**40,000**	**40,000**	**40,000**	**40,000**	**40,000**	**40,000**
SURFACE WATER SALES TO WHOLESALE CUSTOMERS	28,900	28,900	28,900	28,900	28,900	28,900
TOTAL WHOLESALE AND RETAIL SALES TO CUSTOMERS	**28,900**	**28,900**	**28,900**	**28,900**	**28,900**	**28,900**

Region D Major Water Provider (MWP) Water Management Strategy (WMS) Summary

MWPs are entities of significance to a region's water supply as defined by the Regional Water Planning Group (RWPG) and may be a Water User Group (WUG) entity, Wholesale Water Provider (WWP) entity, or both (WUG/WWP).'MWP Retail Customers' denotes recommended WMS supply used by the WUG. 'Transfers Related to Wholesale Customers' denotes a WWP or WUG/WWP selling or transferring recommended WMS supply to another entity. Supply associated with the MWP's wholesale transfers will only display if it is listed as the main seller in the State Water Planning database, even if multiple sellers are involved with the sale o water to WUGs. Unallocated water volumes represent MWP recommended WMS supply not currently allocated to a customer of the MWP.'Total MWP Related WMS Supply' will display if the MWP's WMS is related to more than one WMS supply type (retail, wholesale, and/or unallocated). Associated WMS Projects are listed when the MWP is one of the project's sponsors. Report contains draft data and is subject to change.

CASH SUD | ADVANCED WATER CONSERVATION (CASH SUD)

DATA DESCRIPTION	WATER VOLUMES (ACRE-FEET PER YEAR)					
	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	0	1	1	0	0	0

CASH SUD | CONSERVATION - CASH SUD

DATA DESCRIPTION	WATER VOLUMES (ACRE-FEET PER YEAR)					
	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	0	1	2	3	5	7

CASH SUD | CONSERVATION, IRRIGATION RESTRICTIONS– CASH SUD

DATA DESCRIPTION	WATER VOLUMES (ACRE-FEET PER YEAR)					
	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	4	5	7	8	9	11

CASH SUD | CONSERVATION, WATER LOSS CONTROL - CASH SUD

DATA DESCRIPTION	WATER VOLUMES (ACRE-FEET PER YEAR)					
	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	1	1	0	0	0	0

WMS RELATED MWP SPONSORED PROJECTS	PROJECT DESCRIPTION
CONSERVATION, WATER LOSS CONTROL - CASH SUD	WATER LOSS CONTROL

CASH SUD | INCREASE EXISTING CONTRACT (CASH SUD)

DATA DESCRIPTION	WATER VOLUMES (ACRE-FEET PER YEAR)					
	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	332	416	568	642	471	337

WMS RELATED MWP SPONSORED PROJECTS	PROJECT DESCRIPTION
CASH WSC - ADDITIONAL DELIVERY INFRASTRUCTURE FROM NTMWD	CONVEYANCE/TRANSMISSION PIPELINE; PUMP STATION

CASH SUD | MARVIN NICHOLS (328) STRATEGY FOR NTMWD, TRWD, AND UTRWD

DATA DESCRIPTION	WATER VOLUMES (ACRE-FEET PER YEAR)					
	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	0	0	0	277	329	285

CASH SUD | NTMWD - ADDITIONAL LAVON WATERSHED REUSE

DATA DESCRIPTION	WATER VOLUMES (ACRE-FEET PER YEAR)					
	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	0	0	0	20	51	66

CASH SUD | NTMWD - ADDITIONAL MEASURES TO ACCESS FULL LAVON YIELD

DATA DESCRIPTION	WATER VOLUMES (ACRE-FEET PER YEAR)					
	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	0	255	318	216	253	216

Region D Major Water Provider (MWP) Water Management Strategy (WMS) Summary

WMS RELATED MWP SPONSORED PROJECTS	PROJECT DESCRIPTION
CASH WSC - ADDITIONAL DELIVERY INFRASTRUCTURE FROM NTMWD	CONVEYANCE/TRANSMISSION PIPELINE; PUMP STATION

CASH SUD | NTMWD - EXPANDED WETLAND REUSE

DATA DESCRIPTION	WATER VOLUMES (ACRE-FEET PER YEAR)					
	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	0	17	44	40	61	64

CASH SUD | NTMWD - OKLAHOMA

DATA DESCRIPTION	WATER VOLUMES (ACRE-FEET PER YEAR)					
	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	0	0	0	0	0	85

CASH SUD | NTMWD - TEXOMA BLENDING

DATA DESCRIPTION	WATER VOLUMES (ACRE-FEET PER YEAR)					
	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	0	0	95	158	187	194

CASH SUD | WRIGHT PATMAN REALLOCATION FOR NTMWD, TRWD, AND UTRWD

DATA DESCRIPTION	WATER VOLUMES (ACRE-FEET PER YEAR)					
	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	0	0	0	0	0	96

CHEROKEE WATER COMPANY | NO RECOMMENDED WMS SUPPLY RELATED TO MWP

COMMERCE | NO RECOMMENDED WMS SUPPLY RELATED TO MWP

EMORY | NO RECOMMENDED WMS SUPPLY RELATED TO MWP

FRANKLIN COUNTY WD | NO RECOMMENDED WMS SUPPLY RELATED TO MWP

GREENVILLE | GREENVILLE CONSERVATION AND WTP

DATA DESCRIPTION	WATER VOLUMES (ACRE-FEET PER YEAR)					
	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	0	140	1,391	3,059	5,320	3,212
TRANSFERS RELATED TO WHOLESALE CUSTOMERS	0	1	202	771	1,925	4,088
TOTAL MWP RELATED WMS SUPPLY	4,051	4,627	6,733	9,954	14,838	17,041

WMS RELATED MWP SPONSORED PROJECTS	PROJECT DESCRIPTION
WTP EXPANSION 2030 (GREENVILLE, SABINE)	WATER TREATMENT PLANT EXPANSION

GREENVILLE | NEW CONTRACT WITH GREENVILLE AND PIPELINE TO CELESTE

DATA DESCRIPTION	WATER VOLUMES (ACRE-FEET PER YEAR)					
	2020	2030	2040	2050	2060	2070
TRANSFERS RELATED TO WHOLESALE CUSTOMERS	0	0	0	0	0	87

WMS RELATED MWP SPONSORED PROJECTS	PROJECT DESCRIPTION
WTP EXPANSION 2030 (GREENVILLE, SABINE)	WATER TREATMENT PLANT EXPANSION

GREENVILLE | NEW CONTRACT WITH GREENVILLE AND PIPELINE TO WOLFE CITY

DATA DESCRIPTION	WATER VOLUMES (ACRE-FEET PER YEAR)					
	2020	2030	2040	2050	2060	2070
TRANSFERS RELATED TO WHOLESALE CUSTOMERS	0	0	0	54	157	308

Region D Major Water Provider (MWP) Water Management Strategy (WMS) Summary

WMS RELATED MWP SPONSORED PROJECTS	PROJECT DESCRIPTION
WTP EXPANSION 2030 (GREENVILLE, SABINE)	WATER TREATMENT PLANT EXPANSION

GREENVILLE | NEW WTP GREENVILLE

DATA DESCRIPTION	WATER VOLUMES (ACRE-FEET PER YEAR)					
	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	0	0	0	0	0	5,313

WMS RELATED MWP SPONSORED PROJECTS	PROJECT DESCRIPTION
NEW WTP GREENVILLE	NEW WATER TREATMENT PLANT

LAMAR COUNTY WSD | INCREASE EXISTING CONTRACT (COUNTY-OTHER LAMAR)

DATA DESCRIPTION	WATER VOLUMES (ACRE-FEET PER YEAR)					
	2020	2030	2040	2050	2060	2070
TRANSFERS RELATED TO WHOLESALE CUSTOMERS	204	204	212	224	234	244

LAMAR COUNTY WSD | LAMAR LIVESTOCK PIPELINE AND CONTRACT WITH LAMAR CO WSD

DATA DESCRIPTION	WATER VOLUMES (ACRE-FEET PER YEAR)					
	2020	2030	2040	2050	2060	2070
TRANSFERS RELATED TO WHOLESALE CUSTOMERS	617	617	617	617	617	617

LONGVIEW | NO RECOMMENDED WMS SUPPLY RELATED TO MWP

MARSHALL | NO RECOMMENDED WMS SUPPLY RELATED TO MWP

MOUNT PLEASANT | INCREASE EXISTING CONTRACT (MANUFACTURING TITUS FROM MT PLEASANT SURPLUS)

DATA DESCRIPTION	WATER VOLUMES (ACRE-FEET PER YEAR)					
	2020	2030	2040	2050	2060	2070
TRANSFERS RELATED TO WHOLESALE CUSTOMERS	0	1,003	880	890	1,149	1,279

NORTHEAST TEXAS MWD | INCREASE EXISTING CONTRACT (HARLETON, CYPRESS)

DATA DESCRIPTION	WATER VOLUMES (ACRE-FEET PER YEAR)					
	2020	2030	2040	2050	2060	2070
TRANSFERS RELATED TO WHOLESALE CUSTOMERS	62	74	91	127	173	230

NORTHEAST TEXAS MWD | INCREASE EXISTING CONTRACT (STEAM ELECTRIC POWER TITUS)

DATA DESCRIPTION	WATER VOLUMES (ACRE-FEET PER YEAR)					
	2020	2030	2040	2050	2060	2070
TRANSFERS RELATED TO WHOLESALE CUSTOMERS	30,066	30,866	31,766	32,566	32,814	33,083

PARIS | PAT MAYSE RAW WATER PIPELINE (IRRIGATION LAMAR)

DATA DESCRIPTION	WATER VOLUMES (ACRE-FEET PER YEAR)					
	2020	2030	2040	2050	2060	2070
TRANSFERS RELATED TO WHOLESALE CUSTOMERS	1,468	1,468	1,468	1,468	1,468	1,468

RIVERBEND WATER RESOURCES DISTRICT | RIVERBEND STRATEGY

DATA DESCRIPTION	WATER VOLUMES (ACRE-FEET PER YEAR)					
	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	523	536	539	537	537	537
TRANSFERS RELATED TO WHOLESALE CUSTOMERS	12,849	72,133	79,124	87,841	96,571	114,871
TOTAL MWP RELATED WMS SUPPLY	13,372	72,669	79,663	88,378	97,108	115,408

Region D Major Water Provider (MWP) Water Management Strategy (WMS) Summary

WMS RELATED MWP SPONSORED PROJECTS	PROJECT DESCRIPTION
RIVERBEND WMS INTERIM TO ULTIMATE STORAGE CONVERSION	CONTRACT AMENDMENT; RAISE CONSERVATION POOL
RIVERBEND WMS WATER RIGHT AMENDMENT	NEW WATER RIGHT/PERMIT AMENDMENT NON-EXEMPT IBT
RIVERBEND WMS NEW RAW WATER INTAKE 120 MGD 2030	NEW SURFACE WATER INTAKE
RIVERBEND WMS RAW WATER PUMP STATION 66 MGD 2030	PUMP STATION
RIVERBEND WMS RAW WATER PIPELINE 72 MGD 2030	CONVEYANCE/TRANSMISSION PIPELINE
RIVERBEND WMS NEW WTP 25 MGD 2030	NEW WATER TREATMENT PLANT
RIVERBEND WMS WTP EXPANSION 5 MGD 2040	WATER TREATMENT PLANT EXPANSION
RIVERBEND WMS PUMP STATION EXPANSION 6 MGD 2040	PUMP STATION
RIVERBEND WMS WTP EXPANSION 10 MGD 2050	WATER TREATMENT PLANT EXPANSION
RIVERBEND WMS PUMP STATION EXPANSION 18 MGD 2050	PUMP STATION
RIVERBEND WMS NEW RAW WATER PIPELINE 32 MGD 2050	CONVEYANCE/TRANSMISSION PIPELINE
RIVERBEND WMS PUMP STATION EXPANSION 30 MGD 2060	PUMP STATION

RIVERBEND WATER RESOURCES DISTRICT | RIVERBEND STRATEGY CASS COUNTY						
	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
TRANSFERS RELATED TO WHOLESALE CUSTOMERS	0	1,119	1,179	1,253	1,250	1,250
WMS RELATED MWP SPONSORED PROJECTS	PROJECT DESCRIPTION					
RIVERBEND STRATEGY CASS NEW WTP AND TRANSMISSION LINE	CONVEYANCE/TRANSMISSION PIPELINE; NEW WATER TREATMENT PLANT					

SABINE RIVER AUTHORITY | CENT-TOL-PIPELINE FROM TOLEDO BEND TO LAKE CENTER						
	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
TRANSFERS RELATED TO WHOLESALE CUSTOMERS	0	0	2,242	2,242	2,242	2,242

SABINE RIVER AUTHORITY | EAST TEXAS TRANSFER						
	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
TRANSFERS RELATED TO WHOLESALE CUSTOMERS	0	0	0	250,000	250,000	250,000
WMS RELATED MWP SPONSORED PROJECTS	PROJECT DESCRIPTION					
EAST TEXAS TRANSFER	CONVEYANCE/TRANSMISSION PIPELINE; PUMP STATION					

SABINE RIVER AUTHORITY | LNVA-SRA-PURCHASE FROM SABINE RIVER AUTHORITY (TOLEDO BEND)						
	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
TRANSFERS RELATED TO WHOLESALE CUSTOMERS	0	0	0	200,000	200,000	200,000

SABINE RIVER AUTHORITY | NEWTON MINING - TRANSFER FROM SRA						
	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
TRANSFERS RELATED TO WHOLESALE CUSTOMERS	115	59	0	0	0	0

SABINE RIVER AUTHORITY | ORAN-IRR-PURCHASE FROM SABINE RIVER AUTHORITY (SABINE RIVER)						
	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
TRANSFERS RELATED TO WHOLESALE CUSTOMERS	0	526	526	526	526	526

SABINE RIVER AUTHORITY | RUSK-SEP-PURCHASE FROM SABINE RIVER AUTHORITY (TOLEDO BEND)	
	WATER VOLUMES (ACRE-FEET PER YEAR)

Region D Major Water Provider (MWP) Water Management Strategy (WMS) Summary

DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
TRANSFERS RELATED TO WHOLESALE CUSTOMERS	0	1,103	1,103	1,103	1,103	1,103

SABINE RIVER AUTHORITY | SAUG-LTK-PURCHASE FROM SRA (TOLEDO BEND)

	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
TRANSFERS RELATED TO WHOLESALE CUSTOMERS	0	1,539	1,774	2,048	2,349	2,349

SABINE RIVER AUTHORITY | SHEL-LTK-PURCHASE FROM SABINE RIVER AUTHORITY (TOLEDO BEND)

	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
TRANSFERS RELATED TO WHOLESALE CUSTOMERS	6,491	8,761	11,524	14,896	19,006	19,006

SABINE RIVER AUTHORITY | SHEL-SHW-PURCHASE FROM CENTER

	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
TRANSFERS RELATED TO WHOLESALE CUSTOMERS	61	68	77	87	97	105

SULPHUR RIVER MWD | NO RECOMMENDED WMS SUPPLY RELATED TO MWP

SULPHUR SPRINGS | INCREASE EXISTING CONTRACT (BRINKER WSC, SULPHUR)

	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
TRANSFERS RELATED TO WHOLESALE CUSTOMERS	0	0	0	12	47	83

SULPHUR SPRINGS | INCREASE EXISTING CONTRACT (MARTIN SPRINGS)

	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
TRANSFERS RELATED TO WHOLESALE CUSTOMERS	0	0	0	0	0	29

TEXARKANA | RIVERBEND STRATEGY

	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	7,145	7,282	7,459	7,706	8,028	8,380

TITUS COUNTY FWD #1 | NO RECOMMENDED WMS SUPPLY RELATED TO MWP

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Region D Water User Group (WUG) Unmet Needs

WUG supplies and projected demands are entered for each of a WUG's region-county-basin divisions. The unmet needs shown in the WUG Unmet Needs report are calculated by first deducting the WUG split's projected demand from the sum of its total existing water supply volume and all associated recommended water management strategy water volumes. If the WUG split has a greater future supply volume than projected demand in any given decade, this amount is considered a surplus volume. In order to display only unmet needs associated with the WUG split, these surplus volumes are updated to a zero and the unmet needs water volumes are shown as absolute values.

	WUG UNMET NEEDS (ACRE-FEET PER YEAR)					
	2020	**2030**	**2040**	**2050**	**2060**	**2070**
BOWIE COUNTY - SULPHUR BASIN						
MANUFACTURING	629	0	0	0	0	0
HUNT COUNTY - SABINE BASIN						
HICKORY CREEK SUD*	32	114	228	393	629	977
HUNT COUNTY - SULPHUR BASIN						
HICKORY CREEK SUD*	36	91	172	285	451	692
HUNT COUNTY - TRINITY BASIN						
HICKORY CREEK SUD*	17	45	85	142	223	341
RED RIVER COUNTY - SULPHUR BASIN						
IRRIGATION	97	97	97	97	97	97

*A single asterisk next to a WUG's name denotes that the WUG is split by two or more planning regions.

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Region D Water User Group (WUG) Unmet Needs Summary

WUG supplies and projected demands are entered for each of a WUG's region-county-basin divisions. The unmet needs shown in the WUG Unmet Needs Summary report are calculated by first deducting the WUG split's projected demand from the sum of its total existing water supply volume and all associated recommended water management strategy water volumes. If the WUG split has a greater future supply volume than projected demand in any given decade, this amount is considered a surplus volume. Before aggregating the difference between supplies and demands to the WUG category level, calculated surpluses are updated to zerc so that only the WUGs with unmet needs in the decade are included with the Needs totals. Unmet needs water volumes are shown as absolute values.

WUG CATEGORY	NEEDS (ACRE-FEET PER YEAR)					
	2020	2030	2040	2050	2060	2070
MUNICIPAL	85	250	485	820	1,303	2,010
COUNTY-OTHER	0	0	0	0	0	0
MANUFACTURING	629	0	0	0	0	0
MINING	0	0	0	0	0	0
STEAM ELECTRIC POWER	0	0	0	0	0	0
LIVESTOCK	0	0	0	0	0	0
IRRIGATION	97	97	97	97	97	97

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WUG Name	Reported Water Conservation Plan		Decadal Goals					
	Total Five Year Goal	Total Ten Year Goal	2020	2030	2040	2050	2060	2070
410 WSC			143	138	135	134	134	134
ALGONQUIN WATER RESOURCES OF TEXAS			60	60	60	60	60	60
ATLANTA			154	150	147	145	145	145
B H P WSC			67	63	61	61	61	61
BEN WHEELER WSC			75	72	69	68	67	67
BI COUNTY WSC			92	89	87	86	86	86
BIG SANDY			136	132	129	127	127	127
BLOCKER CROSSROADS WSC			82	78	75	73	73	73
BLOSSOM			78	74	71	69	69	69
BOGATA			93	88	85	85	85	85
BRASHEAR WSC			168	164	161	160	160	160
BRIGHT STAR SALEM SUD	62	61	72	67	64	63	63	63
BRINKER WSC			96	92	89	88	88	88
BURNS REDBANK WSC			114	110	107	106	105	105
CADDO BASIN SUD			100	95	93	92	92	92
CADDO MILLS			79	75	73	72	72	72
CANTON			216	212	210	208	208	208
CASH SUD	78	68	103	99	97	97	96	96
CELESTE			109	105	102	101	100	100
CENTRAL BOWIE COUNTY WSC	74	69	73	71	71	71	71	71
CLARKSVILLE			167	162	160	159	159	159
CLARKSVILLE CITY			94	90	88	86	86	86
COMBINED CONSUMERS SUD			74	70	67	66	66	66
COMMERCE	133	133	143	139	136	135	135	134
COOPER	118	113	196	192	188	188	187	187
CORNERSVILLE WSC			118	114	111	110	110	110
CRYSTAL SYSTEMS TEXAS			279	276	275	275	275	274
CUMBY			114	110	107	106	106	106

WUG Name	Total Five Year Goal	Total Ten Year Goal	2020	2030	2040	2050	2060	2070
CYPRESS SPRINGS SUD	78	72	81	77	75	73	73	73
DAINGERFIELD			159	155	152	150	150	150
DE KALB			154	149	146	146	145	145
DELTA COUNTY MUD			63	60	60	60	60	60
DIANA SUD			77	74	71	70	70	70
E M C WSC			60	60	60	60	60	60
EAST MOUNTAIN WATER SYSTEM			107	103	100	99	99	99
EAST TAWAKONI			183	179	176	175	175	175
EASTERN CASS WSC			70	68	65	64	64	64
EDGEWOOD	115	110	155	151	148	147	147	147
EDOM WSC			97	94	91	90	89	89
ELDERVILLE WSC			60	60	60	60	60	60
EMORY	100	100	329	325	323	321	321	321
FOUKE WSC			98	94	92	91	91	91
FRUITVALE WSC			80	77	74	73	72	72
GAFFORD CHAPEL WSC			80	76	73	72	72	72
GILL WSC			103	98	95	94	94	94
GILMER			176	172	169	167	167	167
GLADEWATER	155	144	149	145	142	140	140	140
GLENWOOD WSC			89	85	82	81	80	80
GOLDEN WSC			72	68	65	63	63	63
GRAND SALINE			102	98	95	93	93	93
GREENVILLE	149	147	277	273	270	268	268	268
GUM SPRINGS WSC			83	79	76	75	74	74
HALLSVILLE			122	118	116	114	114	114
HARLETON WSC			91	87	84	82	82	82
HAWKINS			228	224	220	219	219	219
HICKORY CREEK SUD			89	85	84	83	83	83
HOLLY SPRINGS WSC			82	78	75	74	73	73

WUG Name	Total Five Year Goal	Total Ten Year Goal	2020	2030	2040	2050	2060	2070
HOOKS			82	78	75	73	73	73
HUGHES SPRINGS			100	96	92	91	91	91
JEFFERSON			164	160	156	154	154	154
JONES WSC			80	76	73	71	71	71
KELLYVILLE-BEREA WSC			74	70	66	65	65	65
KILGORE			193	189	186	184	184	184
LAKE FORK WSC			89	84	81	80	80	80
LAMAR COUNTY WSD			117	113	111	110	109	109
LEIGH WSC			199	195	192	190	190	190
LIBERTY CITY WSC			90	86	83	82	82	81
LINDALE			202	199	198	197	197	197
LINDALE RURAL WSC	90	92	70	66	64	63	62	62
LINDEN			127	122	119	119	119	119
LITTLE HOPE MOORE WSC			89	86	83	82	81	81
LONE STAR			101	97	94	92	92	92
LONGVIEW	239	234	245	241	238	237	237	237
MACBEE SUD			60	60	60	60	60	60
MACEDONIA EYLAU MUD 1			60	60	60	60	60	60
MARSHALL	220	215	180	176	172	171	170	170
MARTIN SPRINGS WSC			108	104	102	101	100	100
MAUD			139	134	131	129	129	129
MILLER GROVE WSC			123	119	116	115	115	115
MIMS WSC			60	60	60	60	60	60
MINEOLA			141	137	134	132	132	132
MOUNT PLEASANT	134	132	198	194	192	190	190	190
MOUNT VERNON	149	141	175	171	168	167	167	167
MYRTLE SPRINGS WSC			65	62	60	60	60	60
NAPLES			103	99	95	94	94	94
NASH			86	86	86	86	86	86

WUG Name	Total Five Year Goal	Total Ten Year Goal	2020	2030	2040	2050	2060	2070
NEW BOSTON			208	204	200	199	199	199
NEW HOPE SUD			116	112	110	108	108	108
NORTH HARRISON WSC			92	88	85	83	83	83
NORTH HOPKINS WSC			70	65	62	61	61	61
NORTH HUNT SUD			60	60	60	60	60	60
OMAHA			157	153	150	148	147	147
ORE CITY			106	102	99	98	97	97
PANOLA-BETHANY WSC			177	173	170	169	168	168
PARIS	443	432	100	96	93	91	91	91
PINE RIDGE WSC			105	101	99	97	97	97
PITTSBURG			158	154	150	149	148	148
POETRY WSC			98	94	93	92	92	91
POINT			219	215	212	211	210	210
PRITCHETT WSC			79	75	72	70	70	70
PRUITT SANDFLAT WSC			98	95	92	91	90	90
QUEEN CITY			135	131	127	127	126	126
QUINLAN			79	74	71	69	69	69
QUITMAN			138	134	130	129	129	129
R P M WSC			97	94	92	91	91	91
RAMEY WSC			67	63	61	60	60	60
RED RIVER COUNTY WSC			67	63	60	60	60	60
REDWATER			120	117	114	112	112	112
RENO (Lamar)			148	144	142	140	140	140
RIVERBEND WATER RESOURCES DISTRICT	150	128	861	857	854	852	852	852
SAND FLAT WSC			64	60	60	60	60	60

WUG Name	Total Five Year Goal	Total Ten Year Goal	2020	2030	2040	2050	2060	2070
SCOTTSVILLE			194	190	187	185	185	185
SHADY GROVE NO 2 WSC			169	165	162	161	161	161
SHADY GROVE WSC			84	80	78	77	77	77
SHARON WSC			71	67	63	63	62	62
SHIRLEY WSC			120	116	113	112	112	112
SMITH COUNTY MUD 1			400	396	395	394	393	393
SOUTH RAINS SUD			80	76	74	73	72	72
SOUTH TAWAKONI WSC			84	79	77	75	75	75
STAR MOUNTAIN WSC			150	146	144	142	142	142
STARRVILLE-FRIENDSHIP WSC			105	101	99	97	97	97
SULPHUR SPRINGS	200	195	176	172	168	167	166	166
TALLEY WSC			67	63	60	60	60	60
TEXARKANA			168	164	161	159	159	159
TEXAS A&M UNIVERSITY COMMERCE			150	146	144	143	143	143
TRI SUD	90	89	89	85	83	82	82	82
TRYON ROAD SUD			130	126	123	121	121	121
UNION GROVE WSC			63	60	60	60	60	60
VAN			111	107	104	103	103	103
WAKE VILLAGE			101	98	95	93	93	93
WASKOM			133	129	126	124	124	124
WEST GREGG SUD			77	74	71	70	70	69
WEST HARRISON WSC			88	84	81	79	79	79
WEST TAWAKONI			92	88	86	85	84	84
WESTERN CASS WSC			84	80	77	76	75	75
WHITE OAK			173	169	166	164	164	164
WILLS POINT			155	151	148	146	146	146
WINNSBORO			166	162	159	158	157	157
WINONA			185	180	177	176	175	175
WOLFE CITY	100	97	88	83	80	80	79	79

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Appendix C6 – Chapter 6:

IMPACTS OF THE REGIONAL WATER PLAN

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APPENDIX C6

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County	Entity	Strategy	Quantity (Ac-Ft/Yr)	Start Decade	Reliability	Cost ($/Ac-Ft)	Impacts of Strategy on: Environmental Factors	Env. Factors	Agricultural Resources/ Rural Areas	Agricultural Resources/ Rural Areas	Other Natural Resources	Key Water Quality Parameters	Political Feasibility
			#		*(1-5)	$	(Acres)	**(1-5)	(Acres)	**(1-5)	**(1-5)	**(1-5)	**(1-5)
BOWIE	BURNS REDBANK WSC	Renew Existing Contract (Hooks)	201	2020	1	$483	N/A	1	N/A	1	1	1	1
BOWIE	CENTRAL BOWIE COUNTY WSC	Renew Existing Contract (Riverbend WRD)	962	2020	1	$482	N/A	1	N/A	1	1	1	1
BOWIE	DE KALB	Renew Existing Contract (Riverbend WRD)	298	2020	1	$242	N/A	1	N/A	1	1	1	1
BOWIE	HOOKS	Renew Existing Contract (Riverbend WRD)	281	2020	1	$242	N/A	1	N/A	1	1	1	1
BOWIE	IRRIGATION	Drill New Wells (Carrizo-Wilcox, Sulphur)	4,134	2020	1	$778	17	1	17	2	1	1	2
BOWIE	LIVESTOCK	Drill New Wells (Carrizo-Wilcox, Sulphur)	417	2020	1	$1,017	6	1	2	1	1	1	1
BOWIE	LIVESTOCK	Drill New Wells (Nacatoch, Red)	252	2020	1	$1,063	7	1	2	1	1	1	1
BOWIE	MACEDONIA-EYLAU MUD #1	Renew Existing Contract (Riverbend WRD)	601	2020	1	$483	N/A	1	N/A	1	1	1	1
BOWIE	MANUFACTURING BOWIE	Advanced Water Conservation	204	2020	1	$0	N/A	1	N/A	1	1	1	1
BOWIE	MANUFACTURING BOWIE	Renew Existing Contract (Riverbend WRD)	100,609	2020	1	$482	N/A	1	N/A	1	1	1	1
BOWIE	MAUD	Renew Existing Contract (Riverbend WRD)	238	2020	1	$241	N/A	1	N/A	1	1	1	1
BOWIE	NASH	Renew Existing Contract (Riverbend WRD)	589	2020	1	$243	N/A	1	N/A	1	1	1	1
BOWIE	NEW BOSTON	Renew Existing Contract (Riverbend WRD)	1,399	2020	1	$243	N/A	1	N/A	1	1	1	1
BOWIE	REDWATER	Renew Existing Contract (Riverbend WRD)	616	2020	1	$242	N/A	1	N/A	1	1	1	1
BOWIE	TEXARKANA	Renew Existing Contract (Riverbend WRD)	8,380	2020	1	$243	N/A	1	N/A	1	1	1	1
BOWIE	RIVERBEND WRD	Riverbend WMS	115,820	2020	1	$592	46	1	0	1	1	1	1
BOWIE	WAKE VILLAGE	Renew Existing Contract (Riverbend WRD)	932	2020	1	$242	N/A	1	N/A	1	1	1	1
CAMP	LIVESTOCK	Drill New Wells (Queen City, Cypress)	4,025	2020	1	$123	1	1	1	1	1	1	1
CASS	ATLANTA	Renew Existing Contract (Riverbend WRD)	1,206	2030	1	$242	N/A	1	N/A	1	1	1	1
CASS	COUNTY-OTHER	Drill New Wells (Carrizo-Wilcox, Cypress)	323	2020	1	$514	1	1	0	1	1	1	1
CASS	COUNTY-OTHER	Drill New Wells (Carrizo-Wilcox, Sulphur)	216	2020	1	$528	1	1	0	1	1	1	1
CASS	COUNTY-OTHER	Renew Existing Contract (Riverbend WRD)	44	2030	1	$483	N/A	1	N/A	1	1	1	1
CASS	HOLLY SPRINGS WSC	Increase Existing Contract (NETMWD)	80	2020	1	$1,629	N/A	1	N/A	1	1	1	1
CASS	LIVESTOCK	Drill New Wells (Queen City, Cypress)	968	2020	1	$111	1	1	1	1	1	1	1
CASS	LIVESTOCK	Drill New Wells (Queen City, Sulphur)	968	2020	1	$111	1	1	1	1	1	1	1
CASS	MANUFACTURING	Voluntary Reallocation Supply for Atlanta	1,206	2030	1	$0	N/A	1	N/A	1	1	1	1
CASS	MANUFACTURING	Voluntary Reallocation Supply for Cass County-Oth	44	2030	1	$0	N/A	1	N/A	1	1	1	1
CASS	RIVERBEND WRD	New 2.5 MGD Package WTP and Transmission Line	1,493	2030	1	$1,812	18	1	1	1	1	1	1
DELTA	LIVESTOCK	Drill New Wells (Nacatoch, Sulphur))	262	2020	1	$1,134	1	1	1	1	1	1	1
FRANKLIN	LIVESTOCK	Drill New Wells (Carrizo-Wilcox, Cypress)	805	2020	1	$111	1	1	1	1	1	1	1
FRANKLIN	LIVESTOCK	Drill New Wells (Carrizo-Wilcox, Sulphur)	1,129	2020	1	$111	1	1	1	1	1	1	1
GREGG	MINING	Drill New Wells (Carrizo-Wilcox, Sabine)	27	2020	1	$370	1	1	0	1	1	1	1
HARRISON	HARLETON WSC	Increase Existing Contract (NETMWD)	230	2020	1	$652	N/A	1	N/A	1	1	1	1
HARRISON	IRRIGATION	Drill New Wells (Queen City, Cypress)	484	2020	1	$120	1	1	1	1	1	1	1
HARRISON	IRRIGATION	Drill New Wells (Queen City, Sabine)	161	2020	1	$118	1	1	1	1	1	1	1
HARRISON	LEIGH WSC	Drill New Wells (Queen City, Cypress)	162	2040	1	$981	1	1	0	1	1	1	1

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County	Entity	Strategy	Quantity (Ac-Ft/Yr)	Start Decade	Reliability	Cost ($/Ac-Ft)	Impacts of Strategy on:					Key Water Quality Parameters	Political Feasibility
							Environmental Factors	Env. Factors	Agricultural Resources/ Rural Areas	Agricultural Resources/ Rural Areas	Other Natural Resources		
			#		*(1-5)	$	(Acres)	**(1-5)	(Acres)	**(1-5)	**(1-5)	**(1-5)	**(1-5)
HARRISON	MINING	Drill New Wells (Queen City, Cypress)	332	2020	1	$117	1	1	0	1	1	1	1
HARRISON	MINING	Drill New Wells (Queen City, Sabine)	1,452	2020	1	$126	1	1	0	1	1	1	1
HARRISON	NORTH HARRISON WSC	Drill New Wells (Queen City, Cypress)	54	2060	1	$926	1	1	0	1	1	1	1
HARRISON	PANOLA-BETHANY WSC	Drill New Wells (Queen City, Sabine)	324	2030	1	$602	1	1	0	1	1	1	1
HARRISON	SCOTTSVILLE	Drill New Wells (Queen City, Cypress)	162	2020	1	$716	1	1	0	1	1	1	1
HARRISON	WASKOM	Drill New Wells (Queen City, Cypress)	324	2020	1	$602	1	1	0	1	1	1	1
HOPKINS	BRINKER WSC	Increase Existing Contract (Sulphur Springs)	83	2050	1	$1,145	N/A	1	N/A	1	1	1	1
HOPKINS	CUMBY	Drill New Wells (Nacatoch, Sabine)	88	2020	1	$1,614	2	1	0	1	1	1	1
HOPKINS	IRRIGATION	Drill New Wells (Carrizo-Wilcox, Sabine)	931	2040	1	$803	5	1	5	1	1	1	1
HOPKINS	IRRIGATION	Drill New Wells (Carrizo-Wilcox, Sulphur)	4,627	2020	1	$759	15	1	12	2	1	1	1
HOPKINS	LIVESTOCK	Drill New Wells (Carrizo-Wilcox, Sulphur)	1,219	2020	1	$979	18	1	6	1	1	1	1
HOPKINS	MARTIN SPRINGS WSC	Increase Existing Contract (Sulphur Springs)	29	2070	1	$1,172	N/A	1	N/A	1	1	1	1
HOPKINS	MILLER GROVE WSC	Drill New Wells (Carrizo-Wilcox, Sulphur)	52	2020	1	$2,173	2	1	0	1	1	1	1
HOPKINS	MINING	Drill New Wells (Carrizo-Wilcox, Sulphur)	639	2020	1	$983	10	1	0	1	1	1	1
HUNT	B H P WSC	Advanced Water Conservation	3	2030	1	$770	N/A	1	N/A	1	1	1	1
HUNT	B H P WSC	Increase Existing Contract (Royse City)	502	2020	1	$500	N/A	1	N/A	1	1	1	1
HUNT	CADDO BASIN SUD	Advanced Water Conservation	18	2020	1	$770	N/A	1	N/A	1	1	1	1
HUNT	CADDO BASIN SUD	Increase Existing Contract (NTMWD)	1,848	2020	1	$228	N/A	1	N/A	1	1	1	1
HUNT	CADDO MILLS	Increase Existing Contract (Greenville)	254	2030	1	$882	N/A	1	N/A	1	1	1	1
HUNT	CASH SUD	Advanced Water Conservation	18	2020	1	$770	N/A	1	N/A	1	1	1	1
HUNT	CASH SUD	Increase Existing Contract (NTMWD)	1,353	2020	1		N/A	1	N/A	1	1	1	1
HUNT	CELESTE	Drill New Wells (Woodbine, Trinity)	229	2020	1	$1,275	4	1	0	1	1	1	1
HUNT	CELESTE	Treated Water Pipeline and New Contract (Greenv	87	2070	1	$3,920	34	1	1	1	1	1	1
HUNT	COUNTY-OTHER	Increase Existing Contract (Greenville)	3,834	2060	1	$883	N/A	1	N/A	1	1	1	1
HUNT	GREENVILLE	Voluntary Reallocation (Hunt Manuf)	455	2070	1	$0	N/A	1	N/A	1	1	1	1
HUNT	GREENVILLE	Advanced Water Conservation	9,741	2020	1	$681	N/A	1	N/A	1	1	1	1
HUNT	GREENVILLE	WTP Expansion	9,335	2020	1	$569	8	1	1	1	1	1	1
HUNT	GREENVILLE	New WTP	9,335	2070	1	$529	8	1	1	1	1	1	1
HUNT	HICKORY CREEK SUD	Greenville Tie-in Pipeline	2,095	2020	1	$1,239	22	1	0	1	1	1	1
HUNT	IRRIGATION	Drill New Wells (Nacatoch Aquifer, Sabine)	230	2020	1	$983	5	1	5	1	1	1	1
HUNT	LIVESTOCK	Drill New Wells (Trinity Aquifer, Sabine)	2	2020	1	$16,500	1	1	1	1	1	1	1
HUNT	MINING	Drill New Wells (Trinity Aquifer, Sabine)	73	2020	1	$1,384	2	1	0	1	1	1	1
HUNT	NORTH HUNT SUD	Drill New Wells (Nacatoch Aquifer, Sabine)	888	2020	1	$1,642	28	1	14	2	1	1	2
HUNT	POETRY WSC	Advanced Water Conservation	7	2020	1	$770	N/A	1	N/A	1	1	1	1
HUNT	POETRY WSC	Increase Existing Contract (NTMWD)	503	2030	1		N/A	1	N/A	1	1	1	1
HUNT	WOLFE CITY	Greenville Tie-in Pipeline	308	2050	1	$2,747	44	1	3	1	1	1	1
LAMAR	COUNTY-OTHER	Increase Existing Contract (Lamar County WSD)	244	2020	1	$1,631	N/A	1	N/A	1	1	1	1
LAMAR	IRRIGATION	Pat Mayse Raw Water Pipeline (Paris)	1,468	2020	1	$897	50	1	8	1	1	1	1
LAMAR	LIVESTOCK	Water Pipeline (Lamar County WSD)	617	2020	1	$3,626	50	1	6	1	1	1	1

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County	Entity	Strategy	Quantity (Ac-Ft/Yr)	Start Decade	Reliability	Cost ($/Ac-Ft)	Impacts of Strategy on:					Key Water Quality Parameters	Political Feasibility
							Environmental Factors	Env. Factors	Agricultural Resources/ Rural Areas	Agricultural Resources/ Rural Areas	Other Natural Resources		
			#		*(1-5)	$	(Acres)	**(1-5)	(Acres)	**(1-5)	**(1-5)	**(1-5)	**(1-5)
MARION	MINING	Drill New Wells (Queen City, Cypress)	645	121	1	$121	1	1	1	1	1	1	1
MORRIS	LIVESTOCK	Local Supply	60	2020	1	$0	N/A	1	N/A	1	1	1	1
MORRIS	LIVESTOCK	Drill New Wells (Queen City, Sulphur)	483	2020	1	$97	1	1	1	1	1	1	1
MORRIS	LIVESTOCK	Drill New Wells (Queen City, Cypress)	644	2020	1	$121	1	1	1	1	1	1	1
RAINS	MANUFACTURING	Advanced Water Conservation	1	2020	1	$0	N/A	1	N/A	1	1	1	1
RED RIVER	CLARKSVILLE	Drill New Wells (Blossom, Sulphur)	388	2020	1	$4,312	25	2	1	1	1	3	3
RED RIVER	IRRIGATION	Drill New Wells (Nacatoch, Sulphur)	2,057	2020	1	$790	1	1	1	1	1	1	1
RED RIVER	LIVESTOCK	Drill New Wells (Blossom, Red)	11	2020	1	$3,636	1	1	1	1	1	1	1
RED RIVER	LIVESTOCK	Drill New Wells (Trinity Aquifer, Sulphur)	174	2020	1	$1,207	5	1	1	1	1	1	1
SMITH	CRYSTAL SYSTEMS INC	Drill New Wells (Carrizo-Wilcox, Sabine)	538	2040	1	$429	1	1	0	1	1	1	1
SMITH	CRYSTAL SYSTEMS INC	Drill New Wells (Carrizo-Wilcox, Neches)	538	2040	1	$429	1	1	0	1	1	1	1
SMITH	LINDALE	Drill New Wells (Carrizo-Wilcox, Sabine)	1,932	2020	1	$370	18	1	6	1	1	1	1
SMITH	SMITH COUNTY MUD 1	Drill New Wells (Queen City, Sabine)	648	2040	1	$537	1	1	0	1	1	1	1
SMITH	STAR MOUNTAIN WSC	Drill New Wells (Queen City, Sabine)	216	2020	1	$611	1	1	0	1	1	1	1
SMITH	STARRVILLE-FRIENDSHIP WSC	Drill New Wells (Carrizo-Wilcox, Sabine)	108	2060	1	$574	1	1	0	1	1	1	1
SMITH	WINONA	Drill New Wells (Carrizo-Wilcox, Sabine)	108	2050	1	$611	1	1	0	1	1	1	1
TITUS	LIVESTOCK	Drill New Wells (Carrizo-Wilcox, Cypress)	560	2020	1	$886	1	1	0	1	1	1	1
TITUS	LIVESTOCK	Drill New Wells (Carrizo-Wilcox, Sulphur)	1,664	2020	1	$819	1	1	0	1	1	1	1
TITUS	MANUFACTURING	Advanced Water Conservation	415	2030	1	$0	N/A	1	N/A	1	1	1	1
TITUS	MANUFACTURING	Increase Existing Contract (Mount Pleasant)	1,279	2030	1	$782	N/A	1	N/A	1	1	1	1
TITUS	STEAM ELECTRIC POWER	Increase Existing Contract (NETMWD, Lake O' The I	28,811	2020	1	$100	N/A	1	N/A	1	1	1	1
TITUS	STEAM ELECTRIC POWER	Increase Existing Contract (NETMWD; Bob Sandlin)	6,119	2020	1	$100	N/A	1	N/A	1	1	1	1
UPSHUR	GILMER	Drill New Wells (Carrizo-Wilcox, Cypress)	216	2030	1	$319	1	1	0	1	1	1	1
UPSHUR	LIVESTOCK	Drill New Wells (Carrizo-Wilcox, Cypress)	161	2020	1	$106	1	1	0	1	1	1	1
UPSHUR	LIVESTOCK	Drill New Wells (Carrizo-Wilcox, Sabine)	161	2020	1	$106	1	1	0	1	1	1	1
UPSHUR	MANUFACTURING	Drill New Wells (Carrizo-Wilcox, Cypress)	161	2020	1	$106	1	1	0	1	1	1	1
VAN ZANDT	CANTON	Drill New Wells (Carrizo-Wilcox, Sabine)	100	2020	1	$1,420	1	1	0	1	1	1	1
VAN ZANDT	CANTON	Indirect Reuse	323	2020	1	$3,291	81	2	46	3	1	1	2
VAN ZANDT	EDOM WSC	Drill New Wells (Carrizo-Wilcox, Neches)	64	2020	1	$2,125	3	1	1	1	1	1	1
VAN ZANDT	IRRIGATION	Drill New Wells (Queen City, Neches)	227	2020	1	$1,137	6	1	6	1	1	1	1
VAN ZANDT	LITTLE HOPE MOORE WSC	Drill New Wells (Carrizo-Wilcox, Neches)	17	2050	1	$2,588	1	1	0	1	1	1	1
VAN ZANDT	MANUFACTURING	Advanced Water Conservation	75	2030	1	$0	N/A	1	N/A	1	1	1	1
VAN ZANDT	MANUFACTURING	Drill New Wells (Carrizo-Wilcox, Trinity)	207	2030	1	$1,106	1	1	0	1	1	1	1
VAN ZANDT	MANUFACTURING	Increase Existing Contract (Grand Saline)	72	2070	1	$2,806	N/A	1	N/A	1	1	1	1

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County	Entity	Strategy	Quantity (Ac-Ft/Yr)	Start Decade	Reliability	Cost ($/Ac-Ft)	Impacts of Strategy on: Environmental Factors	Env. Factors	Agricultural Resources/ Rural Areas	Agricultural Resources/ Rural Areas	Other Natural Resources	Key Water Quality Parameters	Political Feasibility
			#		*(1-5)	$	(Acres)	**(1-5)	(Acres)	**(1-5)	**(1-5)	**(1-5)	**(1-5)
VAN ZANDT	MANUFACTURING	Increase Existing Contract (Golden WSC)	62	2050	1	$1,304	N/A	1	N/A	1	1	1	1
VAN ZANDT	R P M WSC	Drill New Wells (Carrizo-Wilcox, Neches)	217	2030	1	$1,945	12	1	4	1	1	1	1
WOOD	LIVESTOCK	Local Supply	34	2020	1	$0	N/A	1	N/A	1	1	1	1
WOOD	LIVESTOCK	Drill New Wells (Queen City, Sabine)	1,129	2020	1	$111	1	1	1	1	1	1	1
WOOD	MANUFACTURING	Drill New Wells (Queen City, Sabine)	1,610	2020	1	$78	1	1	0	1	1	1	1

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County	Entity	Strategy		Environmental Factors									
			Total Acres Impacted	Total Acres Impacted	Wetland Acres	Wetland Acres	Envir Water Needs	Habitat	Threat and Endangered Species	Cultural Resources	Bays & Estuaries	Envir Water Quality	Overall Environmental Impacts
			(Acres)	(1-5)	(Acres)	(1-5)	(1-5)	(1-5)	#	(1-5)	(1-5)	(1-5)	(1-5)
BOWIE	BURNS REDBANK WSC	Renew Existing Contract (Hooks)	N/A	1	N/A	1	1	1	14	1	N/A	1	1
BOWIE	CENTRAL BOWIE COUNTY WSC	Renew Existing Contract (Riverbend WRD)	N/A	1	N/A	1	1	1	14	1	N/A	1	1
BOWIE	DE KALB	Renew Existing Contract (Riverbend WRD)	N/A	1	N/A	1	1	1	14	1	N/A	1	1
BOWIE	HOOKS	Renew Existing Contract (Riverbend WRD)	N/A	1	N/A	1	1	1	14	1	N/A	1	1
BOWIE	IRRIGATION	Drill New Wells (Carrizo-Wilcox, Sulphur)	17	2	0	1	1	1	14	1	N/A	1	1
BOWIE	LIVESTOCK	Drill New Wells (Carrizo-Wilcox, Sulphur)	6	1	0	1	1	1	14	1	N/A	1	1
BOWIE	LIVESTOCK	Drill New Wells (Nacatoch, Red)	7	1	0	1	1	1	14	1	N/A	1	1
BOWIE	MACEDONIA-EYLAU MUD #1	Renew Existing Contract (Riverbend WRD)	N/A	1	N/A	1	1	1	14	1	N/A	1	1
BOWIE	MANUFACTURING BOWIE	Advanced Water Conservation	N/A	1	N/A	1	1	1	14	1	N/A	1	1
BOWIE	MANUFACTURING BOWIE	Renew Existing Contract (Riverbend WRD)	N/A	1	N/A	1	1	1	14	1	N/A	1	1
BOWIE	MAUD	Renew Existing Contract (Riverbend WRD)	N/A	1	N/A	1	1	1	14	1	N/A	1	1
BOWIE	NASH	Renew Existing Contract (Riverbend WRD)	N/A	1	N/A	1	1	1	14	1	N/A	1	1
BOWIE	NEW BOSTON	Renew Existing Contract (Riverbend WRD)	N/A	1	N/A	1	1	1	14	1	N/A	1	1
BOWIE	REDWATER	Renew Existing Contract (Riverbend WRD)	N/A	1	N/A	1	1	1	14	1	N/A	1	1
BOWIE	TEXARKANA	Renew Existing Contract (Riverbend WRD)	N/A	1	N/A	1	1	1	14	1	N/A	1	1
BOWIE	RIVERBEND WRD	Riverbend WMS	46	3	2	1	1	2	14	2	N/A	1	1
BOWIE	WAKE VILLAGE	Renew Existing Contract (Riverbend WRD)	N/A	1	N/A	1	1	1	14	1	N/A	1	1
CAMP	LIVESTOCK	Drill New Wells (Queen City, Cypress)	1	1	0	1	1	1	11	1	N/A	1	1
CASS	ATLANTA	Renew Existing Contract (Riverbend WRD)	N/A	1	N/A	1	1	1	14	1	N/A	1	1
CASS	COUNTY-OTHER	Drill New Wells (Carrizo-Wilcox, Cypress)	1	1	0	1	1	1	14	1	N/A	1	1
CASS	COUNTY-OTHER	Drill New Wells (Carrizo-Wilcox, Sulphur)	1	1	0	1	1	1	14	1	N/A	1	1
CASS	COUNTY-OTHER	Renew Existing Contract (Riverbend WRD)	N/A	1	N/A	1	1	1	14	1	N/A	1	1
CASS	HOLLY SPRINGS WSC	Increase Existing Contract (NETMWD)	N/A	1	N/A	1	1	1	14	1	N/A	1	1
CASS	LIVESTOCK	Drill New Wells (Queen City, Cypress)	1	1	0	1	1	1	14	1	N/A	1	1
CASS	LIVESTOCK	Drill New Wells (Queen City, Sulphur)	1	1	0	1	1	1	14	1	N/A	1	1
CASS	MANUFACTURING	Voluntary Reallocation Supply for Atlanta	N/A	1	N/A	1	1	1	14	1	N/A	1	1
CASS	MANUFACTURING	Voluntary Reallocation Supply for Cass County-Oth	N/A	1	N/A	1	1	1	14	1	N/A	1	1
CASS	RIVERBEND WRD	New 2.5 MGD Package WTP and Transmission Line	18	2	2	1	1	2	14	2	N/A	1	1
DELTA	LIVESTOCK	Drill New Wells (Nacatoch, Sulphur))	1	1	0	1	1	1	9	1	N/A	1	1
FRANKLIN	LIVESTOCK	Drill New Wells (Carrizo-Wilcox, Cypress)	1	1	0	1	1	1	13	1	N/A	1	1
FRANKLIN	LIVESTOCK	Drill New Wells (Carrizo-Wilcox, Sulphur)	1	1	0	1	1	1	13	1	N/A	1	1
GREGG	MINING	Drill New Wells (Carrizo-Wilcox, Sabine)	1	1	0	1	1	1	18	1	N/A	1	1
HARRISON	HARLETON WSC	Increase Existing Contract (NETMWD)	N/A	1	N/A	1	1	1	23	1	N/A	1	1
HARRISON	IRRIGATION	Drill New Wells (Queen City, Cypress)	1	1	0	1	1	1	23	1	N/A	1	1
HARRISON	IRRIGATION	Drill New Wells (Queen City, Sabine)	1	1	0	1	1	1	23	1	N/A	1	1
HARRISON	LEIGH WSC	Drill New Wells (Queen City, Cypress)	1	1	0	1	1	1	23	1	N/A	1	1
HARRISON	MINING	Drill New Wells (Queen City, Cypress)	1	1	0	1	1	1	23	1	N/A	1	1
HARRISON	MINING	Drill New Wells (Queen City, Sabine)	1	1	0	1	1	1	23	1	N/A	1	1
HARRISON	NORTH HARRISON WSC	Drill New Wells (Queen City, Cypress)	1	1	0	1	1	1	23	1	N/A	1	1

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County	Entity	Strategy		Environmental Factors									
			Total Acres Impacted	Total Acres Impacted	Wetland Acres	Wetland Acres	Envir Water Needs	Habitat	Threat and Endangered Species	Cultural Resources	Bays & Estuaries	Envir Water Quality	Overall Environmental Impacts
			(Acres)	(1-5)	(Acres)	(1-5)	(1-5)	(1-5)	#	(1-5)	(1-5)	(1-5)	(1-5)
HARRISON	PANOLA-BETHANY WSC	Drill New Wells (Queen City, Sabine)	1	1	0	1	1	1	23	1	N/A	1	1
HARRISON	SCOTTSVILLE	Drill New Wells (Queen City, Cypress)	1	1	0	1	1	1	23	1	N/A	1	1
HARRISON	WASKOM	Drill New Wells (Queen City, Cypress)	1	1	0	1	1	1	23	1	N/A	1	1
HOPKINS	BRINKER WSC	Increase Existing Contract (Sulphur Springs)	N/A	1	N/A	1	1	1	11	1	N/A	1	1
HOPKINS	CUMBY	Drill New Wells (Nacatoch, Sabine)	2	1	0	1	1	1	11	1	N/A	1	1
HOPKINS	IRRIGATION	Drill New Wells (Carrizo-Wilcox, Sabine)	5	1	0	1	1	1	11	1	N/A	1	1
HOPKINS	IRRIGATION	Drill New Wells (Carrizo-Wilcox, Sulphur)	15	2	0	1	1	1	11	1	N/A	1	1
HOPKINS	LIVESTOCK	Drill New Wells (Carrizo-Wilcox, Sulphur)	18	2	0	1	1	1	11	1	N/A	1	1
HOPKINS	MARTIN SPRINGS WSC	Increase Existing Contract (Sulphur Springs)	N/A	1	N/A	1	1	1	11	1	N/A	1	1
HOPKINS	MILLER GROVE WSC	Drill New Wells (Carrizo-Wilcox, Sulphur)	2	1	0	1	1	1	11	1	N/A	1	1
HOPKINS	MINING	Drill New Wells (Carrizo-Wilcox, Sulphur)	10	1	0	1	1	1	11	1	N/A	1	1
HUNT	B H P WSC	Advanced Water Conservation	N/A	1	N/A	1	1	1	14	1	N/A	1	1
HUNT	B H P WSC	Increase Existing Contract (Royse City)	N/A	1	N/A	1	1	1	14	1	N/A	1	1
HUNT	CADDO BASIN SUD	Advanced Water Conservation	N/A	1	N/A	1	1	1	14	1	N/A	1	1
HUNT	CADDO BASIN SUD	Increase Existing Contract (NTMWD)	N/A	1	N/A	1	1	1	14	1	N/A	1	1
HUNT	CADDO MILLS	Increase Existing Contract (Greenville)	N/A	1	N/A	1	1	1	14	1	N/A	1	1
HUNT	CASH SUD	Advanced Water Conservation	N/A	1	N/A	1	1	1	14	1	N/A	1	1
HUNT	CASH SUD	Increase Existing Contract (NTMWD)	N/A	1	N/A	1	1	1	14	1	N/A	1	1
HUNT	CELESTE	Drill New Wells (Woodbine, Trinity)	4	1	0	1	1	1	14	1	N/A	1	1
HUNT	CELESTE	Treated Water Pipeline and New Contract (Greenvi	34	3	0	1	1	1	14	1	N/A	1	1
HUNT	COUNTY-OTHER	Increase Existing Contract (Greenville)	N/A	1	N/A	1	1	1	14	1	N/A	1	1
HUNT	GREENVILLE	Voluntary Reallocation (Hunt Manuf)	N/A	1	N/A	1	1	1	14	1	N/A	1	1
HUNT	GREENVILLE	Advanced Water Conservation	N/A	1	N/A	1	1	1	14	1	N/A	1	1
HUNT	GREENVILLE	WTP Expansion	8	1	0	1	1	2	14	2	N/A	1	1
HUNT	GREENVILLE	New WTP	8	1	0	1	1	2	14	2	N/A	1	1
HUNT	HICKORY CREEK SUD	Greenville Tie-in Pipeline	22	3	0	1	1	1	14	1	N/A	1	1
HUNT	IRRIGATION	Drill New Wells (Nacatoch Aquifer, Sabine)	5	1	0	1	1	1	14	1	N/A	1	1
HUNT	LIVESTOCK	Drill New Wells (Trinity Aquifer, Sabine)	1	1	N/A	1	1	1	14	1	N/A	1	1
HUNT	MINING	Drill New Wells (Trinity Aquifer, Sabine)	2	1	0	1	1	1	14	1	N/A	1	1
HUNT	NORTH HUNT SUD	Drill New Wells (Nacatoch Aquifer, Sabine)	28	3	0	1	1	2	14	2	N/A	1	1
HUNT	POETRY WSC	Advanced Water Conservation	N/A	1	N/A	1	1	1	14	1	N/A	1	1
HUNT	POETRY WSC	Increase Existing Contract (NTMWD)	N/A	1	N/A	1	1	1	14	1	N/A	1	1
HUNT	WOLFE CITY	Greenville Tie-in Pipeline	44	3	0	1	1	1	14	1	N/A	1	1
LAMAR	COUNTY-OTHER	Increase Existing Contract (Lamar County WSD)	N/A	1	N/A	1	1	1	14	1	N/A	1	1
LAMAR	IRRIGATION	Pat Mayse Raw Water Pipeline (Paris)	50	3	0	1	1	2	14	2	N/A	1	1
LAMAR	LIVESTOCK	Water Pipeline (Lamar County WSD)	50	3	0	1	1	2	14	2	N/A	1	1
MARION	MINING	Drill New Wells (Queen City, Cypress)	1	1	0	1	1	1	15	1	N/A	1	1
MORRIS	LIVESTOCK	Local Supply	N/A	1	N/A	1	1	1	12	1	N/A	1	1
MORRIS	LIVESTOCK	Drill New Wells (Queen City, Sulphur)	1	1	0	1	1	1	12	1	N/A	1	1
MORRIS	LIVESTOCK	Drill New Wells (Queen City, Cypress)	1	1	0	1	1	1	12	1	N/A	1	1

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County	Entity	Strategy	Total Acres Impacted	Total Acres Impacted	Wetland Acres	Wetland Acres	Envir Water Needs	Habitat	Threat and Endangered Species	Cultural Resources	Bays & Estuaries	Envir Water Quality	Overall Environmental Impacts
				Environmental Factors									
			(Acres)	(1-5)	(Acres)	(1-5)	(1-5)	(1-5)	#	(1-5)	(1-5)	(1-5)	(1-5)
RAINS	MANUFACTURING	Advanced Water Conservation	N/A	1	N/A	1	1	1	14	1	N/A	1	1
RED RIVER	CLARKSVILLE	Drill New Wells (Blossom, Sulphur)	25	3	1	1	1	1	14	1	N/A	1	2
RED RIVER	IRRIGATION	Drill New Wells (Nacatoch, Sulphur)	1	1	0	1	1	1	14	1	N/A	1	1
RED RIVER	LIVESTOCK	Drill New Wells (Blossom, Red)	1	1	0	1	1	1	14	1	N/A	1	1
RED RIVER	LIVESTOCK	Drill New Wells (Trinity Aquifer, Sulphur)	5	1	0	1	1	1	14	1	N/A	1	1
SMITH	CRYSTAL SYSTEMS INC	Drill New Wells (Carrizo-Wilcox, Sabine)	1	1	0	1	1	1	16	1	N/A	1	1
SMITH	CRYSTAL SYSTEMS INC	Drill New Wells (Carrizo-Wilcox, Neches)	1	1	0	1	1	1	16	1	N/A	1	1
SMITH	LINDALE	Drill New Wells (Carrizo-Wilcox, Sabine)	18	2	0	1	1	1	16	1	N/A	1	1
SMITH	SMITH COUNTY MUD 1	Drill New Wells (Queen City, Sabine)	1	1	0	1	1	1	16	1	N/A	1	1
SMITH	STAR MOUNTAIN WSC	Drill New Wells (Queen City, Sabine)	1	1	0	1	1	1	16	1	N/A	1	1
SMITH	STARRVILLE-FRIENDSHIP WSC	Drill New Wells (Carrizo-Wilcox, Sabine)	1	1	0	1	1	1	16	1	N/A	1	1
SMITH	WINONA	Drill New Wells (Carrizo-Wilcox, Sabine)	1	1	0	1	1	1	16	1	N/A	1	1
TITUS	LIVESTOCK	Drill New Wells (Carrizo-Wilcox, Cypress)	1	1	0	1	1	1	12	1	N/A	1	1
TITUS	LIVESTOCK	Drill New Wells (Carrizo-Wilcox, Sulphur)	1	1	0	1	1	1	12	1	N/A	1	1
TITUS	MANUFACTURING	Advanced Water Conservation	N/A	1	N/A	1	1	1	12	1	N/A	1	1
TITUS	MANUFACTURING	Increase Existing Contract (Mount Pleasant)	N/A	1	N/A	1	1	1	12	1	N/A	1	1
TITUS	STEAM ELECTRIC POWER	Increase Existing Contract (NETMWD, Lake O' The F	N/A	1	N/A	1	1	1	12	1	N/A	1	1
TITUS	STEAM ELECTRIC POWER	Increase Existing Contract (NETMWD; Bob Sandlin)	N/A	1	N/A	1	1	1	12	1	N/A	1	1
UPSHUR	GILMER	Drill New Wells (Carrizo-Wilcox, Cypress)	1	1	0	1	1	1	16	1	N/A	1	1
UPSHUR	LIVESTOCK	Drill New Wells (Carrizo-Wilcox, Cypress)	1	1	0	1	1	1	16	1	N/A	1	1
UPSHUR	LIVESTOCK	Drill New Wells (Carrizo-Wilcox, Sabine)	1	1	0	1	1	1	16	1	N/A	1	1
UPSHUR	MANUFACTURING	Drill New Wells (Carrizo-Wilcox, Cypress)	1	1	0	1	1	1	16	1	N/A	1	1
VAN ZANDT	CANTON	Drill New Wells (Carrizo-Wilcox, Sabine)	1	1	0	1	1	1	17	1	N/A	1	1
VAN ZANDT	CANTON	Indirect Reuse	81	4	2	1	1	1	17	1	N/A	1	2
VAN ZANDT	EDOM WSC	Drill New Wells (Carrizo-Wilcox, Neches)	3	1	0	1	1	1	17	1	N/A	1	1
VAN ZANDT	IRRIGATION	Drill New Wells (Queen City, Neches)	6	1	0	1	1	1	17	1	N/A	1	1
VAN ZANDT	LITTLE HOPE MOORE WSC	Drill New Wells (Carrizo-Wilcox, Neches)	1	1	0	1	1	1	17	1	N/A	1	1
VAN ZANDT	MANUFACTURING	Advanced Water Conservation	N/A	1	N/A	1	1	1	17	1	N/A	1	1
VAN ZANDT	MANUFACTURING	Drill New Wells (Carrizo-Wilcox, Trinity)	1	1	0	1	1	1	17	1	N/A	1	1
VAN ZANDT	MANUFACTURING	Increase Existing Contract (Grand Saline)	N/A	1	N/A	1	1	1	17	1	N/A	1	1
VAN ZANDT	MANUFACTURING	Increase Existing Contract (Golden WSC)	N/A	1	N/A	1	1	1	17	1	N/A	1	1
VAN ZANDT	R P M WSC	Drill New Wells (Carrizo-Wilcox, Neches)	12	2	0	1	1	1	17	1	N/A	1	1
WOOD	LIVESTOCK	Local Supply	N/A	1	N/A	1	1	1	18	1	N/A	1	1
WOOD	LIVESTOCK	Drill New Wells (Queen City, Sabine)	1	1	0	1	1	1	18	1	N/A	1	1
WOOD	MANUFACTURING	Drill New Wells (Queen City, Sabine)	1	1	0	1	1	1	18	1	N/A	1	1

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County	Entity	Strategy	Quantity (Ac-Ft/Yr)	Start Decade	Reliability	Cost ($/Ac-Ft)	Impacts of Strategy on: Environmental Factors	Environmental Factors	Agricultural Resources/ Rural Areas	Agricultural Resources/ Rural Areas	Other Natural Resources	Key Water Quality Parameters	Political Feasibility
			#		*(1-5)	$	(acres)	**(1-5)	(acres)	**(1-5)	**(1-5)	**(1-5)	**(1-5)
CASS	MANUFACTURING CASS	VOLUNTARY REALLOCATION (QUEEN CITY)	251	2030	1	$0	0	1	0	1	1	1	1
CASS	QUEEN CITY	NEW CONTRACT	251	2030	1	$482	0	1	0	1	1	1	1
HOPKINS	BRINKER WSC	Drill New Wells (Carrizo-Wilcox, Sulphur)	83	2050	1	$2,108	4	1	1	1	1	1	1
HOPKINS	BRINKER WSC	Wood County Pipeline	83	2050	1	$4,983	35	2	15	2	1	1	3
HOPKINS	CUMBY	Wood County Pipeline	88	2020	1	$5,865	35	2	16	2	1	1	3
HOPKINS	IRRIGATION	Wood County Pipeline	4,627	2020	1	$1,501	35	2	15	2	1	1	3
HOPKINS	LIVESTOCK	Wood County Pipeline	1,219	2020	1	$1,501	35	2	15	2	1	1	3
HOPKINS	MARTIN SPRINGS WSC	Wood County Pipeline	29	2070	1	$5,777	35	2	15	2	1	1	3
HOPKINS	MILLER GROVE WSC	Wood County Pipeline	52	2020	1	$3,905	35	2	16	2	1	1	3
HOPKINS	MINING HOPKINS	Wood County Pipeline	639	2020	1	$1,501	35	2	15	2	1	1	3
HUNT	B H P WSC	Wood County Pipeline	505	2020	1	$1,493	35	2	17	2	1	1	3
HUNT	CADDO BASIN SUD	Wood County Pipeline	1,866	2020	1	$1,493	35	2	17	2	1	1	3
HUNT	CADDO MILLS	Wood County Pipeline	254	2030	1	$1,493	35	2	17	2	1	1	3
HUNT	CASH SUD	Wood County Pipeline	895	2040	1	$1,286	35	2	19	2	1	1	3
HUNT	CELESTE	Wood County Pipeline	316	2020	1	$1,718	35	2	16	2	1	1	3
HUNT	COUNTY-OTHER, HUNT	Wood County Pipeline	3,834	2050	1	$1,286	35	2	19	2	1	1	3
HUNT	GREENVILLE	Wood County Pipeline	6,491	2020	1	$1,286	35	2	19	2	1	1	3
HUNT	HICKORY CREEK SUD	Wood County Pipeline	2,095	2020	1	$1,718	35	2	16	2	1	1	3
HUNT	MINING HUNT	Wood County Pipeline	73	2020	1	$1,286	35	2	19	2	1	1	3
HUNT	NORTH HUNT SUD	Wood County Pipeline	888	2020	1	$1,922	35	2	17	2	1	1	3
HUNT	POETRY WSC	Wood County Pipeline	510	2030	1	$1,286	35	2	19	2	1	1	3
HUNT	WOLFE CITY	Wood County Pipeline	308	2050	1	$4,033	35	2	16	2	1	1	3
RED RIVER	CLARKSVILLE	Pat Mayse Pipeline Treated Water (Contract w/ Lamar WSD)	303	2020	1	$5,010	93	2	29	3	1	1	3
RED RIVER	CLARKSVILLE	Dimple Reservoir	303	2020	1	$7,970	1,891	5	1,734	5	1	1	5
RED RIVER	CLARKSVILLE	Wright Patman Pipeline (Riverbend WRD)	388	2020	1	$3,865	70	1	0	1	1	1	3
VAN ZANDT	CANTON	Grand Saline Reservoir	1,810	2020	1	$3,087	1,935	5	1,748	5	1	1	3
VAN ZANDT	MANUFACTURING VAN ZANDT	Wood County Pipeline	429	2030	1	$2,995	35	2	18	2	1	1	3
WOOD	LIVESTOCK WOOD	Wood County Pipeline	1,132	2020	1	$739	35	2	19	2	1	1	3
WOOD	MANUFACTURING WOOD	Wood County Pipeline	1,583	2020	1	$739	35	2	19	2	1	1	3

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County	Entity	Strategy	Environmental Factors										
			Total Acres Impacted	Total Acres Impacted	Wetland Acres	Wetland Acres	Envir Water Needs	Habitat	Threatened and Endangered Species	Cultural Resources	Bays & Estuaries	Envir Water Quality	Overall Environmental Impacts
			(Acres)	(1-5)	(Acres)	(1-5)	(1-5)	(1-5)	#	(1-5)	(1-5)	(1-5)	(1-5)
CASS	MANUFACTURING CASS	VOLUNTARY REALLOCATION (QUEEN CITY)	N/A	1	N/A	1	1	1	14	1	N/A	1	1
CASS	QUEEN CITY	NEW CONTRACT	N/A	1	N/A	1	1	1	14	1	N/A	1	1
HOPKINS	BRINKER WSC	Drill New Wells (Carrizo-Wilcox, Sulphur)	4	1	N/A	1	1	1	11	1	N/A	1	1
HOPKINS	BRINKER WSC	Wood County Pipeline	35	3	7	1	1	1	11	1	N/A	1	2
HOPKINS	CUMBY	Wood County Pipeline	35	3	7	1	1	1	11	1	N/A	1	2
HOPKINS	IRRIGATION	Wood County Pipeline	35	3	6	1	1	1	11	1	N/A	1	2
HOPKINS	LIVESTOCK	Wood County Pipeline	35	3	6	1	1	1	11	1	N/A	1	2
HOPKINS	MARTIN SPRINGS WSC	Wood County Pipeline	35	3	6	1	1	1	11	1	N/A	1	2
HOPKINS	MILLER GROVE WSC	Wood County Pipeline	35	3	7	1	1	1	11	1	N/A	1	2
HOPKINS	MINING HOPKINS	Wood County Pipeline	35	3	6	1	1	1	11	1	N/A	1	2
HUNT	B H P WSC	Wood County Pipeline	35	3	7	1	1	1	14	1	N/A	1	2
HUNT	CADDO BASIN SUD	Wood County Pipeline	35	3	7	1	1	1	14	1	N/A	1	2
HUNT	CADDO MILLS	Wood County Pipeline	35	3	7	1	1	1	14	1	N/A	1	2
HUNT	CASH SUD	Wood County Pipeline	35	3	7	1	1	1	14	1	N/A	1	2
HUNT	CELESTE	Wood County Pipeline	35	3	10	1	1	1	14	1	N/A	1	2
HUNT	COUNTY-OTHER, HUNT	Wood County Pipeline	35	3	7	1	1	1	14	1	N/A	1	2
HUNT	GREENVILLE	Wood County Pipeline	35	3	7	1	1	1	14	1	N/A	1	2
HUNT	HICKORY CREEK SUD	Wood County Pipeline	35	3	10	1	1	1	14	1	N/A	1	2
HUNT	MINING HUNT	Wood County Pipeline	35	3	7	1	1	1	14	1	N/A	1	2
HUNT	NORTH HUNT SUD	Wood County Pipeline	35	3	8	1	1	1	14	1	N/A	1	2
HUNT	POETRY WSC	Wood County Pipeline	35	3	7	1	1	1	14	1	N/A	1	2
HUNT	WOLFE CITY	Wood County Pipeline	35	3	9	1	1	1	14	1	N/A	1	2
RED RIVER	CLARKSVILLE	Pat Mayse Pipeline Treated Water (Contract w/ Lamar WSD)	93	4	3	1	1	1	14	1	N/A	1	2
RED RIVER	CLARKSVILLE	Dimple Reservoir	1,891	5	381	5	1	1	14	1	N/A	1	5
RED RIVER	CLARKSVILLE	Wright Patman Pipeline (Riverbend WRD)	70	4	1	1	1	2	14	2	N/A	1	2
VAN ZANDT	CANTON	Grand Saline Reservoir	1,935	5	303	5	1	1	17	1	N/A	1	5
VAN ZANDT	MANUFACTURING VAN ZANDT	Wood County Pipeline	35	3	8	1	1	1	17	1	N/A	1	2
WOOD	LIVESTOCK WOOD	Wood County Pipeline	35	3	1	1	1	1	18	1	N/A	1	2
WOOD	MANUFACTURING WOOD	Wood County Pipeline	35	3	1	1	1	1	18	1	N/A	1	2

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Socioeconomic Impacts of Projected Water Shortages

for the North East Texas (Region D) Regional Water Planning Area

Prepared in Support of the 2021 Region D Regional Water Plan

Texas Water Development Board

Dr. John R. Ellis
Water Use, Projections, & Planning Division
Texas Water Development Board

November 2019

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Executive Summary

Evaluating the social and economic impacts of not meeting identified water needs is a required analysis in the regional water planning process. The Texas Water Development Board (TWDB) estimates these impacts for regional water planning groups (RWPGs) and summarizes the impacts in the state water plan. The analysis presented is for the North East Texas Regional Water Planning Group (Region D).

Based on projected water demands and existing water supplies, Region D identified water needs (potential shortages) that could occur within its region under a repeat of the drought of record for six water use categories (irrigation, livestock, manufacturing, mining, municipal and steam-electric power). The TWDB then estimated the annual socioeconomic impacts of those needs—if they are not met—for each water use category and as an aggregate for the region.

This analysis was performed using an economic impact modeling software package, IMPLAN (Impact for Planning Analysis), as well as other economic analysis techniques, and represents a snapshot of socioeconomic impacts that may occur during a single year repeat of the drought of record with the further caveat that no mitigation strategies are implemented. Decade specific impact estimates assume that growth occurs, and future shocks are imposed on an economy at 10-year intervals. The estimates presented are not cumulative (i.e., summing up expected impacts from today up to the decade noted), but are simply snapshots of the estimated annual socioeconomic impacts should a drought of record occur in each particular decade based on anticipated water supplies and demands for that same decade.

For regional economic impacts, income losses and job losses are estimated within each planning decade (2020 through 2070). The income losses represent an approximation of gross domestic product (GDP) that would be foregone if water needs are not met.

The analysis also provides estimates of financial transfer impacts, which include tax losses (state, local, and utility tax collections); water trucking costs; and utility revenue losses. In addition, social impacts are estimated, encompassing lost consumer surplus (a welfare economics measure of consumer wellbeing); as well as population and school enrollment losses.

IMPLAN data reported that Region D generated more than $30 billion in GDP (2018 dollars) and supported more than 393,000 jobs in 2016. The Region D estimated total population was approximately 783,000 in 2016.

It is estimated that not meeting the identified water needs in Region D would result in an annually combined lost income impact of approximately $5.9 billion in 2020, increasing to $6.1 billion in 2070 (Table ES-1). In 2020, the region would lose approximately 46,000 jobs, and by 2070 job losses would increase to approximately 60,000 if anticipated needs are not mitigated.

All impact estimates are in year 2018 dollars and were calculated using a variety of data sources and tools including the use of a region-specific IMPLAN model, data from TWDB annual water use estimates, the U.S. Census Bureau, Texas Agricultural Statistics Service, and the Texas Municipal League.

Table ES-1 Region D socioeconomic impact summary

Regional Economic Impacts	2020	2030	2040	2050	2060	2070
Income losses ($ millions)*	$5,868	$7,000	$6,602	$6,211	$6,068	$6,148
Job losses	46,069	57,405	55,266	54,160	56,434	59,710
Financial Transfer Impacts	**2020**	**2030**	**2040**	**2050**	**2060**	**2070**
Tax losses on production and imports ($ millions)*	$445	$548	$500	$454	$440	$450
Water trucking costs ($ millions)*	$92	$94	$97	$101	$105	$114
Utility revenue losses ($ millions)*	$44	$46	$52	$69	$96	$139
Utility tax revenue losses ($ millions)*	$1	$1	$1	$1	$1	$2
Social Impacts	**2020**	**2030**	**2040**	**2050**	**2060**	**2070**
Consumer surplus losses ($ millions)*	$141	$146	$155	$173	$220	$300
Population losses	8,458	10,540	10,147	9,944	10,361	10,963
School enrollment losses	1,618	2,016	1,941	1,902	1,982	2,097

* Year 2018 dollars, rounded. Entries denoted by a dash (-) indicate no estimated economic impact. Entries denoted by a zero ($0) indicate estimated income losses less than $500,000.

1 Introduction

Water shortages during a repeat of the drought of record would likely curtail or eliminate certain economic activity in businesses and industries that rely heavily on water. Insufficient water supplies could not only have an immediate and real impact on the regional economy in the short term, but they could also adversely and chronically affect economic development in Texas. From a social perspective, water supply reliability is critical as well. Shortages could disrupt activity in homes, schools and government, and could adversely affect public health and safety. For these reasons, it is important to evaluate and understand how water supply shortages during drought could impact communities throughout the state.

As part of the regional water planning process, RWPGs must evaluate the social and economic impacts of not meeting water needs (31 Texas Administrative Code §357.33 (c)). Due to the complexity of the analysis and limited resources of the planning groups, the TWDB has historically performed this analysis for the RWPGs upon their request. Staff of the TWDB's Water Use, Projections, & Planning Division designed and conducted this analysis in support of Region D, and those efforts for this region as well as the other 15 regions allow consistency and a degree of comparability in the approach.

This document summarizes the results of the analysis and discusses the methodology used to generate the results. Section 1 provides a snapshot of the region's economy and summarizes the identified water needs in each water use category, which were calculated based on the RWPG's water supply and demand established during the regional water planning process. Section 2 defines each of ten impact assessment measures used in this analysis. Section 3 describes the methodology for the impact assessment and the approaches and assumptions specific to each water use category (i.e., irrigation, livestock, manufacturing, mining, municipal, and steam-electric power). Section 4 presents the impact estimates for each water use category with results summarized for the region as a whole. Appendix A presents a further breakdown of the socioeconomic impacts by county.

1.1 Regional Economic Summary

The Region D Regional Water Planning Area generated more than $30 billion in gross domestic product (2018 dollars) and supported more than 393,000 jobs in 2016, according to the IMPLAN dataset utilized in this socioeconomic analysis. This activity accounted for nearly 2 percent of the state's total gross domestic product of 1.73 trillion dollars for the year based on IMPLAN. Table 1-1 lists all economic sectors ranked by the total value-added to the economy in Region D. The manufacturing sector (including agribusiness and timber production) generated 18 percent of the region's total value-added and was also a significant source of tax revenue. The top employers in the region were in the public administration, health care, retail trade, and manufacturing sectors. Region D's estimated total population was approximately 783,000 in 2016, close to 3 percent of the state's total.

This represents a snapshot of the regional economy as a whole, and it is important to note that not all economic sectors were included in the TWDB socioeconomic impact analysis. Data considerations prompted use of only the more water-intensive sectors within the economy because damage estimates could only be calculated for those economic sectors which had both reliable income and water use estimates.

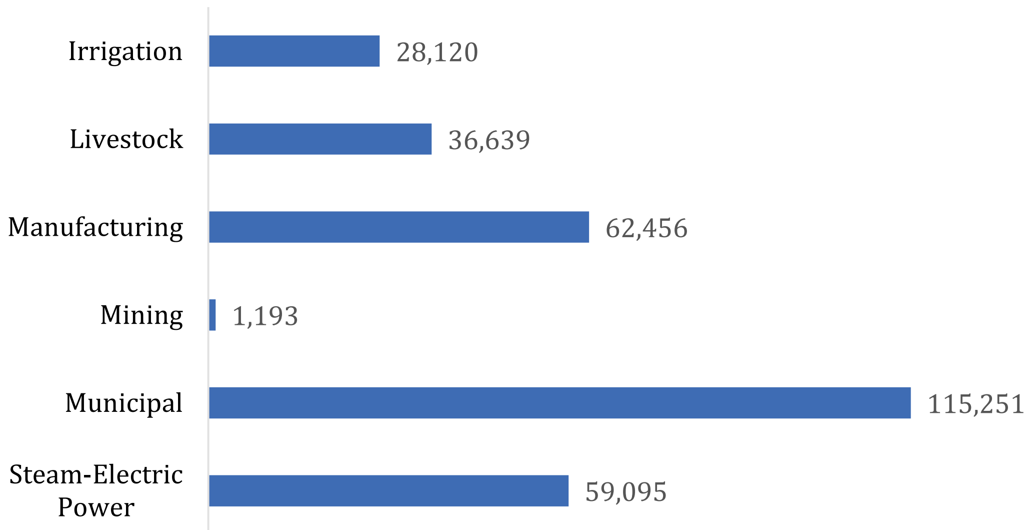
Table 1-1 Region D regional economy by economic sector*

Economic sector	Value-added ($ millions)	Tax ($ millions)	Jobs
Manufacturing	$5,446.6	$240.3	38,589
Public Administration	$3,360.9	$(14.8)	46,555
Real Estate and Rental and Leasing	$2,676.3	$465.8	11,460
Health Care and Social Assistance	$2,136.7	$39.1	42,208
Retail Trade	$2,120.1	$562.8	39,363
Wholesale Trade	$2,105.1	$405.9	13,804
Construction	$1,974.9	$32.3	29,218
Mining, Quarrying, and Oil and Gas Extraction	$1,940.3	$519.4	15,703
Utilities	$1,424.3	$265.9	2,452
Professional, Scientific, and Technical Services	$1,102.8	$38.6	17,643
Accommodation and Food Services	$974.6	$171.6	27,595
Other Services (except Public Administration)	$964.3	$106.9	23,534
Transportation and Warehousing	$922.6	$47.8	13,758
Finance and Insurance	$910.1	$66.8	15,397
Administrative and Support and Waste Management and Remediation Services	$664.1	$28.6	17,688
Agriculture, Forestry, Fishing and Hunting	$539.9	$23.6	24,728
Information	$500.2	$162.6	3,105
Management of Companies and Enterprises	$126.6	$7.2	2,555
Educational Services	$93.7	$6.8	3,988
Arts, Entertainment, and Recreation	$83.7	$25.6	3,793
Grand Total	$30,067.9	$3,202.7	393,138

*Source: 2016 IMPLAN for 536 sectors aggregated by 2-digit NAICS (North American Industry Classification System)

While the manufacturing sector led the region in economic output, the municipal category used the most water in 2016 (38 percent of the region's total). Notably, nearly 13 percent of the state's water use for steam-electric power generation occurred in Region D. Figure 1-1 illustrates Region D's breakdown of the 2016 water use estimates by TWDB water use category.

Figure 1-1 Region D 2016 water use estimates by water use category (in acre-feet)



Source: TWDB Annual Water Use Estimates (all values in acre-feet)

1.2 Identified Regional Water Needs (Potential Shortages)

As part of the regional water planning process, the TWDB adopted water demand projections for water user groups (WUG) in Region D with input from the planning group. WUG-level demand projections were established for utilities that provide more than 100 acre-feet of annual water supply, combined rural areas (designated as county-other), and county-wide water demand projections for five non-municipal categories (irrigation, livestock, manufacturing, mining and steam-electric power). The RWPG then compared demands to the existing water supplies of each WUG to determine potential shortages, or needs, by decade.

Table 1-2 summarizes the region's identified water needs in the event of a repeat of the drought of record. Demand management, such as conservation, or the development of new infrastructure to increase supplies, are water management strategies that may be recommended by the planning group to address those needs. This analysis assumes that no strategies are implemented, and that the identified needs correspond to future water shortages. Note that projected water needs generally increase over time, primarily due to anticipated population growth, economic growth, or declining supplies. To provide a general sense of proportion, total projected needs as an overall percentage of total demand by water use category are also presented in aggregate in Table 1-2. Projected needs for individual water user groups within the aggregate can vary greatly and may reach 100% for a given WUG and water use category. A detailed summary of water needs by WUG and county appears in Chapter 4 of the 2021 Region D Regional Water Plan.

Table 1-2 Regional water needs summary by water use category

Water Use Category		2020	2030	2040	2050	2060	2070
Irrigation	water needs (acre-feet per year)	13,696	13,696	13,696	13,696	13,696	13,696
	% of the category's total water demand	39%	39%	39%	39%	39%	39%
Livestock	water needs (acre-feet per year)	15,005	15,015	15,003	14,918	14,940	14,954
	% of the category's total water demand	42%	42%	42%	42%	42%	43%
Manufacturing	water needs (acre-feet per year)	2,683	5,308	5,159	5,148	5,380	5,489
	% of the category's total water demand	3%	5%	5%	5%	5%	5%
Mining	water needs (acre-feet per year)	2,250	2,138	1,776	1,423	1,113	928
	% of the category's total water demand	32%	28%	23%	20%	16%	14%
Municipal*	water needs (acre-feet per year)	15,034	15,716	17,594	23,230	31,981	45,627
	% of the category's total water demand	12%	11%	12%	14%	18%	22%
Steam-electric power	water needs (acre-feet per year)	30,066	30,866	31,766	32,566	32,814	33,083
	% of the category's total water demand	32%	33%	34%	35%	35%	35%
Total water needs (acre-feet per year)		**78,734**	**82,739**	**84,994**	**90,981**	**99,924**	**113,777**

* Municipal category consists of residential and non-residential (commercial and institutional) subcategories.

2 Impact Assessment Measures

A required component of the regional and state water plans is to estimate the potential economic and social impacts of potential water shortages during a repeat of the drought of record. Consistent with previous water plans, ten impact measures were estimated and are described in Table 2-1.

Table 2-1 Socioeconomic impact analysis measures

Regional economic impacts	Description
Income losses - value-added	The value of output less the value of intermediate consumption; it is a measure of the contribution to gross domestic product (GDP) made by an individual producer, industry, sector, or group of sectors within a year. Value-added measures used in this report have been adjusted to include the direct, indirect, and induced monetary impacts on the region.
Income losses - electrical power purchase costs	Proxy for income loss in the form of additional costs of power as a result of impacts of water shortages.
Job losses	Number of part-time and full-time jobs lost due to the shortage. These values have been adjusted to include the direct, indirect, and induced employment impacts on the region.
Financial transfer impacts	**Description**
Tax losses on production and imports	Sales and excise taxes not collected due to the shortage, in addition to customs duties, property taxes, motor vehicle licenses, severance taxes, other taxes, and special assessments less subsidies. These values have been adjusted to include the direct, indirect and induced tax impacts on the region.
Water trucking costs	Estimated cost of shipping potable water.
Utility revenue losses	Foregone utility income due to not selling as much water.
Utility tax revenue losses	Foregone miscellaneous gross receipts tax collections.
Social impacts	**Description**
Consumer surplus losses	A welfare measure of the lost value to consumers accompanying restricted water use.
Population losses	Population losses accompanying job losses.
School enrollment losses	School enrollment losses (K-12) accompanying job losses.

2.1 Regional Economic Impacts

The two key measures used to assess regional economic impacts are income losses and job losses. The income losses presented consist of the sum of value-added losses and the additional purchase costs of electrical power.

Income Losses - Value-added Losses

Value-added is the value of total output less the value of the intermediate inputs also used in the production of the final product. Value-added is similar to GDP, a familiar measure of the productivity of an economy. The loss of value-added due to water shortages is estimated by input-output analysis using the IMPLAN software package, and includes the direct, indirect, and induced monetary impacts on the region. The indirect and induced effects are measures of reduced income as well as reduced employee spending for those input sectors which provide resources to the water shortage impacted production sectors.

Income Losses - Electric Power Purchase Costs

The electrical power grid and market within the state is a complex interconnected system. The industry response to water shortages, and the resulting impact on the region, are not easily modeled using traditional input/output impact analysis and the IMPLAN model. Adverse impacts on the region will occur and are represented in this analysis by estimated additional costs associated with power purchases from other generating plants within the region or state. Consequently, the analysis employs additional power purchase costs as a proxy for the value-added impacts for the steam-electric power water use category, and these are included as a portion of the overall income impact for completeness.

For the purpose of this analysis, it is assumed that power companies with insufficient water will be forced to purchase power on the electrical market at a projected higher rate of 5.60 cents per kilowatt hour. This rate is based upon the average day-ahead market purchase price of electricity in Texas that occurred during the recent drought period in 2011. This price is assumed to be comparable to those prices which would prevail in the event of another drought of record.

Job Losses

The number of jobs lost due to the economic impact is estimated using IMPLAN output associated with each TWDB water use category. Because of the difficulty in predicting outcomes and a lack of relevant data, job loss estimates are not calculated for the steam-electric power category.

2.2 Financial Transfer Impacts

Several impact measures evaluated in this analysis are presented to provide additional detail concerning potential impacts on a portion of the economy or government. These financial transfer impact measures include lost tax collections (on production and imports), trucking costs for imported water, declines in utility revenues, and declines in utility tax revenue collected by the state. These measures are not solely adverse, with some having both positive and negative impacts. For example, cities and residents would suffer if forced to pay large costs for trucking in potable water. Trucking firms, conversely, would benefit from the transaction. Additional detail for each of these measures follows.

Tax Losses on Production and Imports

Reduced production of goods and services accompanying water shortages adversely impacts the collection of taxes by state and local government. The regional IMPLAN model is used to estimate reduced tax collections associated with the reduced output in the economy. Impact estimates for this measure include the direct, indirect, and induced impacts for the affected sectors.

Water Trucking Costs

In instances where water shortages for a municipal water user group are estimated by RWPGs to exceed 80 percent of water demands, it is assumed that water would need to be trucked in to support basic consumption and sanitation needs. For water shortages of 80 percent or greater, a fixed, maximum of $35,000[1] per acre-foot of water applied as an economic cost. This water trucking cost was utilized for both the residential and non-residential portions of municipal water needs.

Utility Revenue Losses

Lost utility income is calculated as the price of water service multiplied by the quantity of water not sold during a drought shortage. Such estimates are obtained from utility-specific pricing data provided by the Texas Municipal League, where available, for both water and wastewater. These water rates are applied to the potential water shortage to estimate forgone utility revenue as water providers sold less water during the drought due to restricted supplies.

Utility Tax Losses

Foregone utility tax losses include estimates of forgone miscellaneous gross receipts taxes. Reduced water sales reduce the amount of utility tax that would be collected by the State of Texas for water and wastewater service sales.

2.3 Social Impacts

Consumer Surplus Losses for Municipal Water Users

Consumer surplus loss is a measure of impact to the wellbeing of municipal water users when their water use is restricted. Consumer surplus is the difference between how much a consumer is

[1] Based on staff survey of water hauling firms and historical data concerning transport costs for potable water in the recent drought in California for this estimate. There are many factors and variables that would determine actual water trucking costs including distance to, cost of water, and length of that drought.

willing and able to pay for a commodity (i.e., water) and how much they actually have to pay. The difference is a benefit to the consumer's wellbeing since they do not have to pay as much for the commodity as they would be willing to pay. Consumer surplus may also be viewed as an estimate of how much consumers would be willing to pay to keep the original quantity of water which they used prior to the drought. Lost consumer surplus estimates within this analysis only apply to the residential portion of municipal demand, with estimates being made for reduced outdoor and indoor residential use. Lost consumer surplus estimates varied widely by location and degree of water shortage.

Population and School Enrollment Losses

Population loss due to water shortages, as well as the associated decline in school enrollment, are based upon the job loss estimates discussed in Section 2.1. A simplified ratio of job and net population losses are calculated for the state as a whole based on a recent study of how job layoffs impact the labor market population.[2] For every 100 jobs lost, 18 people were assumed to move out of the area. School enrollment losses are estimated as a proportion of the population lost based upon public school enrollment data from the Texas Education Agency concerning the age K-12 population within the state (approximately 19%).

[2] Foote, Andrew, Grosz, Michel, Stevens, Ann. "Locate Your Nearest Exit: Mass Layoffs and Local Labor Market Response." University of California, Davis. April 2015, http://paa2015.princeton.edu/papers/150194. The study utilized Bureau of Labor Statistics data regarding layoffs between 1996 and 2013, as well as Internal Revenue Service data regarding migration, to model the change in the population as the result of a job layoff event. The study found that layoffs impact both out-migration and in-migration into a region, and that a majority of those who did move following a layoff moved to another labor market rather than an adjacent county.

3 Socioeconomic Impact Assessment Methodology

This portion of the report provides a summary of the methodology used to estimate the potential economic impacts of future water shortages. The general approach employed in the analysis was to obtain estimates for income and job losses on the smallest geographic level that the available data would support, tie those values to their accompanying historic water use estimate, and thereby determine a maximum impact per acre-foot of shortage for each of the socioeconomic measures. The calculations of economic impacts are based on the overall composition of the economy divided into many underlying economic sectors. Sectors in this analysis refer to one or more of the 536 specific production sectors of the economy designated within IMPLAN, the economic impact modeling software used for this assessment. Economic impacts within this report are estimated for approximately 330 of these sectors, with the focus on the more water-intensive production sectors. The economic impacts for a single water use category consist of an aggregation of impacts to multiple, related IMPLAN economic sectors.

3.1 Analysis Context

The context of this socioeconomic impact analysis involves situations where there are physical shortages of groundwater or surface water due to a recurrence of drought of record conditions. Anticipated shortages for specific water users may be nonexistent in earlier decades of the planning horizon, yet population growth or greater industrial, agricultural or other sector demands in later decades may result in greater overall demand, exceeding the existing supplies. Estimated socioeconomic impacts measure what would happen if water user groups experience water shortages for a period of one year. Actual socioeconomic impacts would likely become larger as drought of record conditions persist for periods greater than a single year.

3.2 IMPLAN Model and Data

Input-Output analysis using the IMPLAN software package was the primary means of estimating the value-added, jobs, and tax related impact measures. This analysis employed regional level models to determine key economic impacts. IMPLAN is an economic impact model, originally developed by the U.S. Forestry Service in the 1970's to model economic activity at varying geographic levels. The model is currently maintained by the Minnesota IMPLAN Group (MIG Inc.) which collects and sells county and state specific data and software. The year 2016 version of IMPLAN, employing data for all 254 Texas counties, was used to provide estimates of value-added, jobs, and taxes on production for the economic sectors associated with the water user groups examined in the study. IMPLAN uses 536 sector-specific Industry Codes, and those that rely on water as a primary input were assigned to their appropriate planning water user categories (irrigation, livestock, manufacturing, mining, and municipal). Estimates of value-added for a water use category were obtained by summing value-added estimates across the relevant IMPLAN sectors associated with that water use category. These calculations were also performed for job losses as well as tax losses on production and imports.

The adjusted value-added estimates used as an income measure in this analysis, as well as the job and tax estimates from IMPLAN, include three components:

- ***Direct effects*** representing the initial change in the industry analyzed;
- ***Indirect effects*** that are changes in inter-industry transactions as supplying industries respond to reduced demands from the directly affected industries; and,
- ***Induced effects*** that reflect changes in local spending that result from reduced household income among employees in the directly and indirectly affected industry sectors.

Input-output models such as IMPLAN only capture backward linkages and do not include forward linkages in the economy.

3.3 Elasticity of Economic Impacts

The economic impact of a water need is based on the size of the water need relative to the total water demand for each water user group. Smaller water shortages, for example, less than 5 percent, are generally anticipated to result in no initial negative economic impact because water users are assumed to have a certain amount of flexibility in dealing with small shortages. As a water shortage intensifies, however, such flexibility lessens and results in actual and increasing economic losses, eventually reaching a representative maximum impact estimate per unit volume of water. To account for these characteristics, an elasticity adjustment function is used to estimate impacts for the income, tax and job loss measures. Figure 3-1 illustrates this general relationship for the adjustment functions. Negative impacts are assumed to begin accruing when the shortage reaches the lower bound 'b1' (5 percent in Figure 3-1), with impacts then increasing linearly up to the 100 percent impact level (per unit volume) once the upper bound reaches the 'b2' level shortage (40 percent in Figure 3-1).

To illustrate this, if the total annual value-added for manufacturing in the region was $2 million and the reported annual volume of water used in that industry is 10,000 acre-feet, the estimated economic measure of the water shortage would be $200 per acre-foot. The economic impact of the shortage would then be estimated using this value-added amount as the maximum impact estimate ($200 per acre-foot) applied to the anticipated shortage volume and then adjusted by the elasticity function. Using the sample elasticity function shown in Figure 3-1, an approximately 22 percent shortage in the livestock category would indicate an economic impact estimate of 50% of the original $200 per acre-foot impact value (i.e., $100 per acre-foot).

Such adjustments are not required in estimating consumer surplus, utility revenue losses, or utility tax losses. Estimates of lost consumer surplus rely on utility-specific demand curves with the lost consumer surplus estimate calculated based on the relative percentage of the utility's water shortage. Estimated changes in population and school enrollment are indirectly related to the elasticity of job losses.

Assumed values for the lower and upper bounds 'b1' and 'b2' vary by water use category and are presented in Table 3-1.

Figure 3-1 Example economic impact elasticity function (as applied to a single water user's shortage)

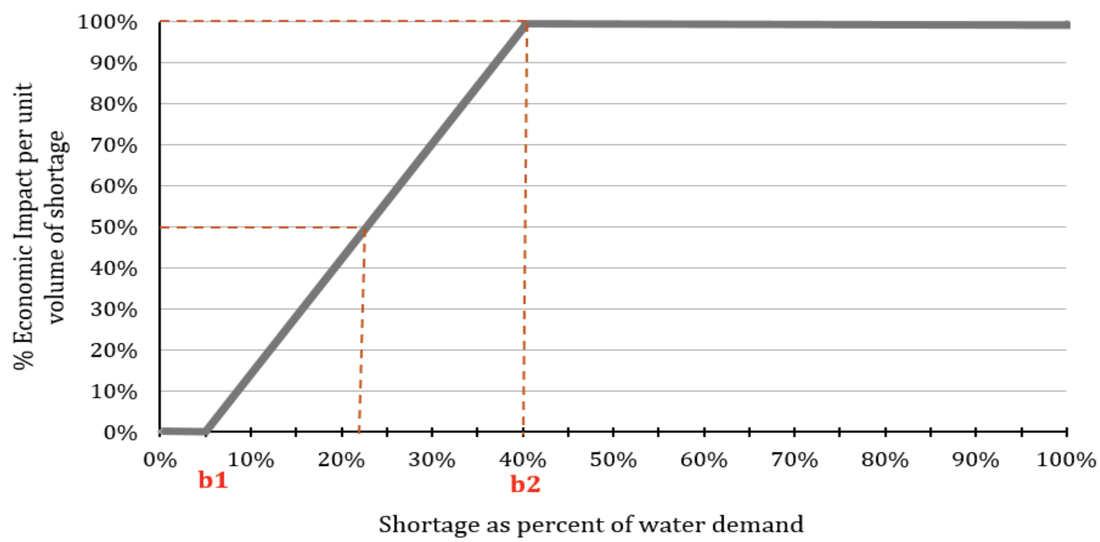


Table 3-1 Economic impact elasticity function lower and upper bounds

Water use category	Lower bound (b1)	Upper bound (b2)
Irrigation	5%	40%
Livestock	5%	10%
Manufacturing	5%	40%
Mining	5%	40%
Municipal (non-residential water intensive subcategory)	5%	40%
Steam-electric power	N/A	N/A

3.4 Analysis Assumptions and Limitations

The modeling of complex systems requires making many assumptions and acknowledging the model's uncertainty and limitations. This is particularly true when attempting to estimate a wide range of socioeconomic impacts over a large geographic area and into future decades. Some of the key assumptions and limitations of this methodology include:

1. The foundation for estimating the socioeconomic impacts of water shortages resulting from a drought are the water needs (potential shortages) that were identified by RWPGs as part of the

regional water planning process. These needs have some uncertainty associated with them but serve as a reasonable basis for evaluating the potential impacts of a drought of record event.

2. All estimated socioeconomic impacts are snapshots for years in which water needs were identified (i.e., 2020, 2030, 2040, 2050, 2060, and 2070). The estimates are independent and distinct "what if" scenarios for each particular year, and water shortages are assumed to be temporary events resulting from a single year recurrence of drought of record conditions. The evaluation assumed that no recommended water management strategies are implemented. In other words, growth occurs and future shocks are imposed on an economy at 10-year intervals, and the resulting impacts are estimated. Note that the estimates presented are not cumulative (i.e., summing up expected impacts from today up to the decade noted), but are simply snapshots of the estimated annual socioeconomic impacts should a drought of record occur in each particular decade based on anticipated water supplies and demands for that same decade.

3. Input-output models such as IMPLAN rely on a static profile of the structure of the economy as it appears today. This presumes that the relative contributions of all sectors of the economy would remain the same, regardless of changes in technology, availability of limited resources, and other structural changes to the economy that may occur in the future. Changes in water use efficiency will undoubtedly take place in the future as supplies become more stressed. Use of the static IMPLAN structure was a significant assumption and simplification considering the 50-year time period examined in this analysis. To presume an alternative future economic makeup, however, would entail positing many other major assumptions that would very likely generate as much or more error.

4. This is not a form of cost-benefit analysis. That approach to evaluating the economic feasibility of a specific policy or project employs discounting future benefits and costs to their present value dollars using some assumed discount rate. The methodology employed in this effort to estimate the economic impacts of future water shortages did not use any discounting methods to weigh future costs differently through time.

5. All monetary values originally based upon year 2016 IMPLAN and other sources are reported in constant year 2018 dollars to be consistent with the water management strategy requirements in the State Water Plan.

6. IMPLAN based loss estimates (income-value-added, jobs, and taxes on production and imports) are calculated only for those IMPLAN sectors for which the TWDB's Water Use Survey (WUS) data was available and deemed reliable. Every effort is made in the annual WUS effort to capture all relevant firms who are significant water users. Lack of response to the WUS, or omission of relevant firms, impacts the loss estimates.

7. Impacts are annual estimates. The socioeconomic analysis does not reflect the full extent of impacts that might occur as a result of persistent water shortages occurring over an extended duration. The drought of record in most regions of Texas lasted several years.

8. Value-added estimates are the primary estimate of the economic impacts within this report. One may be tempted to add consumer surplus impacts to obtain an estimate of total adverse economic impacts to the region, but the consumer surplus measure represents the change to the wellbeing of households (and other water users), not an actual change in the flow of dollars through the economy. The two measures (value-added and consumer surplus) are both valid impacts but ideally should not be summed.

9. The value-added, jobs, and taxes on production and import impacts include the direct, indirect and induced effects to capture backward linkages in the economy described in Section 2.1. Population and school enrollment losses also indirectly include such effects as they are based on the associated losses in employment. The remaining measures (consumer surplus, utility revenue, utility taxes, additional electrical power purchase costs, and potable water trucking costs), however, do not include any induced or indirect effects.

10. The majority of impacts estimated in this analysis may be more conservative (i.e., smaller) than those that might actually occur under drought of record conditions due to not including impacts in the forward linkages in the economy. Input-output models such as IMPLAN only capture backward linkages on suppliers (including households that supply labor to directly affected industries). While this is a common limitation in this type of economic modeling effort, it is important to note that forward linkages on the industries that use the outputs of the directly affected industries can also be very important. A good example is impacts on livestock operators. Livestock producers tend to suffer substantially during droughts, not because there is not enough water for their stock, but because reductions in available pasture and higher prices for purchased hay have significant economic effects on their operations. Food processors could be in a similar situation if they cannot get the grains or other inputs that they need. These effects are not captured in IMPLAN, resulting in conservative impact estimates.

11. The model does not reflect dynamic economic responses to water shortages as they might occur, nor does the model reflect economic impacts associated with a recovery from a drought of record including:
    a. The likely significant economic rebound to some industries immediately following a drought, such as landscaping;
    b. The cost and time to rebuild liquidated livestock herds (a major capital investment in that industry);
    c. Direct impacts on recreational sectors (i.e., stranded docks and reduced tourism); or,
    d. Impacts of negative publicity on Texas' ability to attract population and business in the event that it was not able to provide adequate water supplies for the existing economy.

12. Estimates for job losses and the associated population and school enrollment changes may exceed what would actually occur. In practice, firms may be hesitant to lay off employees, even in difficult economic times. Estimates of population and school enrollment changes are based on regional evaluations and therefore do not necessarily reflect what might occur on a statewide basis.

13. **The results must be interpreted carefully. It is the general and relative magnitudes of impacts as well as the changes of these impacts over time that should be the focus rather than the absolute numbers.** Analyses of this type are much better at predicting relative percent differences brought about by a shock to a complex system (i.e., a water shortage) than the precise size of an impact. To illustrate, assuming that the estimated economic impacts of a drought of record on the manufacturing and mining water user categories are $2 and $1 million, respectively, one should be more confident that the economic impacts on manufacturing are twice as large as those on mining and that these impacts will likely be in the millions of dollars. But one should have less confidence that the actual total economic impact experienced would be $3 million.

14. The methodology does not capture "spillover" effects between regions – or the secondary impacts that occur outside of the region where the water shortage is projected to occur.

15. The methodology that the TWDB has developed for estimating the economic impacts of unmet water needs, and the assumptions and models used in the analysis, are specifically designed to estimate potential economic effects at the regional and county levels. Although it may be tempting to add the regional impacts together in an effort to produce a statewide result, the TWDB cautions against that approach for a number of reasons. The IMPLAN modeling (and corresponding economic multipliers) are all derived from regional models – a statewide model of Texas would produce somewhat different multipliers. As noted in point 14 within this section, the regional modeling used by TWDB does not capture spillover losses that could result in other regions from unmet needs in the region analyzed, or potential spillover gains if decreased production in one region leads to increases in production elsewhere. The assumed drought of record may also not occur in every region of Texas at the same time, or to the same degree.

4 Analysis Results

This section presents estimates of potential economic impacts that could reasonably be expected in the event of water shortages associated with a drought of record and if no recommended water management strategies were implemented. Projected economic impacts for the six water use categories (irrigation, livestock, manufacturing, mining, municipal, and steam-electric power) are reported by decade.

4.1 Impacts for Irrigation Water Shortages

Eight of the 19 counties in the region are projected to experience water shortages in the irrigated agriculture water use category for one or more decades within the planning horizon. Estimated impacts to this water use category appear in Table 4-1. Note that tax collection impacts were not estimated for this water use category. IMPLAN data indicates a negative tax impact (i.e., increased tax collections) for the associated production sectors, primarily due to past subsidies from the federal government. However, it was not considered realistic to report increasing tax revenues during a drought of record.

Table 4-1 Impacts of water shortages on irrigation in Region D

Impact measure	2020	2030	2040	2050	2060	2070
Income losses ($ millions)*	$3	$3	$3	$3	$3	$3
Job losses	94	94	94	94	94	94

* Year 2018 dollars, rounded. Entries denoted by a dash (-) indicate no estimated economic impact. Entries denoted by a zero ($0) indicate estimated income losses less than $500,000.

4.2 Impacts for Livestock Water Shortages

Fourteen of the 19 counties in the region are projected to experience water shortages in the livestock water use category for one or more decades within the planning horizon. Estimated impacts to this water use category appear in Table 4-2.

Table 4-2 Impacts of water shortages on livestock in Region D

Impact measure	2020	2030	2040	2050	2060	2070
Income losses ($ millions)*	$523	$523	$524	$522	$524	$525
Jobs losses	13,614	13,618	13,596	13,514	13,523	13,530
Tax losses on production and imports ($ millions)*	$31	$31	$31	$31	$31	$31

* Year 2018 dollars, rounded. Entries denoted by a dash (-) indicate no estimated economic impact. Entries denoted by a zero ($0) indicate estimated income losses less than $500,000.

4.3 Impacts of Manufacturing Water Shortages

Manufacturing water shortages in the region are projected to occur in eight of the 19 counties in the region for at least one decade of the planning horizon. Estimated impacts to this water use category appear in Table 4-3.

Table 4-3 Impacts of water shortages on manufacturing in Region D

Impacts measure	2020	2030	2040	2050	2060	2070
Income losses ($ millions)*	$2,627	$3,843	$3,769	$3,754	$3,841	$3,881
Job losses	21,846	33,544	32,571	32,428	33,771	34,407
Tax losses on production and Imports ($ millions)*	$189	$303	$295	$294	$308	$315

* Year 2018 dollars, rounded. Entries denoted by a dash (-) indicate no estimated economic impact. Entries denoted by a zero ($0) indicate estimated income losses less than $500,000.

4.4 Impacts of Mining Water Shortages

Mining water shortages in the region are projected to occur in five of the 19 counties in the region for one or more decades within the planning horizon. Estimated impacts to this water use type appear in Table 4-4.

Table 4-4 Impacts of water shortages on mining in Region D

Impacts measure	2020	2030	2040	2050	2060	2070
Income losses ($ millions)*	$1,791	$1,682	$1,327	$900	$561	$453
Job losses	6,779	6,300	4,983	3,411	2,171	1,814
Tax losses on production and Imports ($ millions)*	$206	$195	$154	$105	$66	$54

* Year 2018 dollars, rounded. Entries denoted by a dash (-) indicate no estimated economic impact. Entries denoted by a zero ($0) indicate estimated income losses less than $500,000.

4.5 Impacts for Municipal Water Shortages

Sixteen of the 19 counties in the region are projected to experience water shortages in the municipal water use category for one or more decades within the planning horizon.

Impact estimates were made for two sub-categories within municipal water use: residential and non-residential. Non-residential municipal water use includes commercial and institutional users, which are further divided into non-water-intensive and water-intensive subsectors including car wash, laundry, hospitality, health care, recreation, and education. Lost consumer surplus estimates were made only for needs in the residential portion of municipal water use. Available IMPLAN and TWDB Water Use Survey data for the non-residential, water-intensive portion of municipal demand allowed these sectors to be included in income, jobs, and tax loss impact estimate.

Trucking cost estimates, calculated for shortages exceeding 80 percent, assumed a fixed, maximum cost of $35,000 per acre-foot to transport water for municipal use. The estimated impacts to this water use category appear in Table 4-5.

Table 4-5 Impacts of water shortages on municipal water users in Region D

Impacts measure	2020	2030	2040	2050	2060	2070
Income losses[1] ($ millions)*	$176	$181	$189	$222	$324	$464
Job losses[1]	3,736	3,849	4,022	4,712	6,876	9,866
Tax losses on production and imports[1] ($ millions)*	$19	$20	$20	$24	$35	$50
Trucking costs ($ millions)*	$92	$94	$97	$101	$105	$114
Utility revenue losses ($ millions)*	$44	$46	$52	$69	$96	$139
Utility tax revenue losses ($ millions)*	$1	$1	$1	$1	$1	$2

[1] Estimates apply to the water-intensive portion of non-residential municipal water use.
* Year 2018 dollars, rounded. Entries denoted by a dash (-) indicate no estimated economic impact. Entries denoted by a zero ($0) indicate estimated income losses less than $500,000.

4.6 Impacts of Steam-Electric Water Shortages

Steam-electric water shortages in the region are projected to occur in one of the 19 counties in the region for one or more decades within the planning horizon. Estimated impacts to this water use category appear in Table 4-6.

Note that estimated economic impacts to steam-electric water users:

- Are reflected as an income loss proxy in the form of estimated additional purchasing costs for power from the electrical grid to replace power that could not be generated due to a shortage;
- Do not include estimates of impacts on jobs. Because of the unique conditions of power generators during drought conditions and lack of relevant data, it was assumed that the industry would retain, perhaps relocating or repurposing, their existing staff in order to manage their ongoing operations through a severe drought.
- Do not presume a decline in tax collections. Associated tax collections, in fact, would likely increase under drought conditions since, historically, the demand for electricity increases during times of drought, thereby increasing taxes collected on the additional sales of power.

Table 4-6 Impacts of water shortages on steam-electric power in Region D

Impacts measure	2020	2030	2040	2050	2060	2070
Income Losses ($ millions)*	$748	$768	$790	$810	$816	$823

* Year 2018 dollars, rounded. Entries denoted by a dash (-) indicate no estimated economic impact. Entries denoted by a zero ($0) indicate estimated income losses less than $500,000.

4.7 Regional Social Impacts

Projected changes in population, based upon several factors (household size, population, and job loss estimates), as well as the accompanying change in school enrollment, were also estimated and are summarized in Table 4-7.

Table 4-7 Region-wide social impacts of water shortages in Region D

Impacts measure	2020	2030	2040	2050	2060	2070
Consumer surplus losses ($ millions)*	$141	$146	$155	$173	$220	$300
Population losses	8,458	10,540	10,147	9,944	10,361	10,963
School enrollment losses	1,618	2,016	1,941	1,902	1,982	2,097

* Year 2018 dollars, rounded. Entries denoted by a dash (-) indicate no estimated economic impact. Entries denoted by a zero ($0) indicate estimated income losses less than $500,000.

Appendix A - County Level Summary of Estimated Economic Impacts for Region D

County level summary of estimated economic impacts of not meeting identified water needs by water use category and decade (in 2018 dollars, rounded). Values are presented only for counties with projected economic impacts for at least one decade.
(* Entries denoted by a dash (-) indicate no estimated economic impact)

		Income losses (Million $)*						Job losses					
County	Water Use Category	2020	2030	2040	2050	2060	2070	2020	2030	2040	2050	2060	2070
BOWIE	IRRIGATION	$0.82	$0.82	$0.82	$0.82	$0.82	$0.82	23	23	23	23	23	23
BOWIE	LIVESTOCK	$15.18	$15.18	$13.77	$11.82	$10.12	$9.44	646	646	586	503	431	402
BOWIE	MANUFACTURING	$1,779.61	$2,269.87	$2,269.87	$2,269.87	$2,269.87	$2,269.87	15,731	20,065	20,065	20,065	20,065	20,065
BOWIE	MUNICIPAL	$169.95	$173.24	$176.26	$180.55	$185.61	$190.83	3,616	3,685	3,750	3,841	3,949	4,060
BOWIE Total		**$1,965.55**	**$2,459.10**	**$2,460.72**	**$2,463.06**	**$2,466.42**	**$2,470.96**	**20,016**	**24,420**	**24,424**	**24,433**	**24,468**	**24,550**
CAMP	LIVESTOCK	$147.01	$147.01	$147.01	$147.01	$147.01	$147.01	3,628	3,628	3,628	3,628	3,628	3,628
CAMP	MANUFACTURING	-	$0.31	-	-	-	-	-	3	-	-	-	-
CAMP Total		**$147.01**	**$147.32**	**$147.01**	**$147.01**	**$147.01**	**$147.01**	**3,628**	**3,630**	**3,628**	**3,628**	**3,628**	**3,628**
CASS	LIVESTOCK	$62.51	$62.51	$62.51	$62.44	$62.44	$62.44	1,728	1,728	1,728	1,727	1,727	1,727
CASS	MUNICIPAL	$0.58	$0.41	$0.26	$0.17	$0.17	$0.17	12	9	5	4	4	4
CASS Total		**$63.09**	**$62.92**	**$62.77**	**$62.61**	**$62.61**	**$62.61**	**1,741**	**1,737**	**1,734**	**1,730**	**1,730**	**1,730**
DELTA	LIVESTOCK	$4.90	$4.67	$4.67	$4.67	$4.67	$4.67	276	264	264	264	264	264
DELTA	MUNICIPAL	$0.00	$0.00	$0.00	$0.00	$0.01	$0.01	0	0	0	0	0	0
DELTA Total		**$4.90**	**$4.68**	**$4.68**	**$4.68**	**$4.68**	**$4.68**	**276**	**264**	**264**	**264**	**264**	**264**
FRANKLIN	LIVESTOCK	$70.65	$70.65	$70.65	$70.65	$70.65	$70.65	1,492	1,492	1,492	1,492	1,492	1,492
FRANKLIN Total		**$70.65**	**$70.65**	**$70.65**	**$70.65**	**$70.65**	**$70.65**	**1,492**	**1,492**	**1,492**	**1,492**	**1,492**	**1,492**
GREGG	MUNICIPAL	-	-	-	-	-	$0.01	-	-	-	-	-	0
GREGG Total		**-**	**-**	**-**	**-**	**-**	**$0.01**	**-**	**-**	**-**	**-**	**-**	**0**
HARRISON	IRRIGATION	$0.11	$0.11	$0.11	$0.11	$0.11	$0.11	6	6	6	6	6	6
HARRISON	MINING	$1,331.43	$958.19	$656.36	$330.47	$73.77	-	5,122	3,686	2,525	1,271	284	-
HARRISON	MUNICIPAL	$0.57	$0.88	$1.64	$3.55	$5.48	$7.57	12	19	35	75	117	161
HARRISON Total		**$1,332.12**	**$959.19**	**$658.12**	**$334.13**	**$79.37**	**$7.68**	**5,140**	**3,710**	**2,565**	**1,352**	**406**	**167**
HOPKINS	IRRIGATION	$1.13	$1.13	$1.13	$1.13	$1.13	$1.13	30	30	30	30	30	30
HOPKINS	LIVESTOCK	$33.47	$34.16	$35.73	$35.82	$37.48	$38.21	818	835	873	875	916	933
HOPKINS	MINING	$35.15	$51.97	$80.13	$114.79	$154.54	$203.53	160	237	365	523	704	927
HOPKINS	MUNICIPAL	$0.01	$0.07	$0.17	$0.29	$0.58	$0.96	0	2	4	6	12	20
HOPKINS Total		**$69.77**	**$87.33**	**$117.17**	**$152.03**	**$193.74**	**$243.83**	**1,008**	**1,102**	**1,271**	**1,434**	**1,662**	**1,910**
HUNT	IRRIGATION	$0.06	$0.06	$0.06	$0.06	$0.06	$0.06	3	3	3	3	3	3

		Income losses (Million $)*						Job losses					
County	**Water Use Category**	**2020**	**2030**	**2040**	**2050**	**2060**	**2070**	**2020**	**2030**	**2040**	**2050**	**2060**	**2070**
HUNT	MINING	$74.10	$64.96	$35.29	$11.99	$1.44	-	249	218	119	40	5	-
HUNT	MUNICIPAL	$1.28	$2.73	$5.59	$29.22	$117.52	$240.13	27	58	118	619	2,495	5,100
HUNT Total		**$75.43**	**$67.75**	**$40.94**	**$41.27**	**$119.01**	**$240.19**	**279**	**279**	**239**	**662**	**2,502**	**5,103**
LAMAR	IRRIGATION	$0.09	$0.09	$0.09	$0.09	$0.09	$0.09	3	3	3	3	3	3
LAMAR	LIVESTOCK	$12.86	$12.86	$12.86	$12.86	$12.86	$12.86	598	598	598	598	598	598
LAMAR	MUNICIPAL	$1.52	$1.52	$1.58	$1.66	$1.74	$1.81	32	32	34	35	37	39
LAMAR Total		**$14.46**	**$14.46**	**$14.52**	**$14.61**	**$14.69**	**$14.76**	**634**	**634**	**635**	**637**	**638**	**640**
MARION	MINING	$350.77	$606.56	$554.84	$442.93	$331.02	$249.21	1,249	2,159	1,975	1,577	1,178	887
MARION	MUNICIPAL	$0.03	$0.04	$0.06	$0.13	$0.23	$0.38	1	1	1	3	5	8
MARION Total		**$350.80**	**$606.61**	**$554.91**	**$443.06**	**$331.25**	**$249.59**	**1,249**	**2,160**	**1,976**	**1,579**	**1,183**	**895**
MORRIS	LIVESTOCK	$34.19	$34.19	$34.19	$34.19	$34.19	$34.19	931	931	931	931	931	931
MORRIS	MUNICIPAL	$0.02	$0.02	$0.01	$0.01	$0.01	$0.01	0	0	0	0	0	0
MORRIS Total		**$34.21**	**$34.21**	**$34.21**	**$34.21**	**$34.21**	**$34.21**	**931**	**931**	**931**	**931**	**931**	**931**
RAINS	MANUFACTURING	$13.09	$13.09	$13.09	$13.09	$13.09	$13.09	139	139	139	139	139	139
RAINS	MUNICIPAL	$1.06	$0.73	$0.78	$0.84	$0.92	$1.04	22	16	17	18	20	22
RAINS Total		**$14.15**	**$13.82**	**$13.88**	**$13.93**	**$14.01**	**$14.14**	**161**	**154**	**156**	**157**	**158**	**161**
RED RIVER	IRRIGATION	$0.41	$0.41	$0.41	$0.41	$0.41	$0.41	16	16	16	16	16	16
RED RIVER	LIVESTOCK	$4.09	$4.09	$4.09	$4.09	$4.09	$4.09	190	190	190	190	190	190
RED RIVER	MUNICIPAL	$0.49	$0.48	$0.45	$0.44	$0.44	$0.44	10	10	9	9	9	9
RED RIVER Total		**$4.98**	**$4.97**	**$4.94**	**$4.94**	**$4.93**	**$4.93**	**217**	**217**	**216**	**216**	**216**	**216**
SMITH	IRRIGATION	$0.33	$0.33	$0.33	$0.33	$0.33	$0.33	12	12	12	12	12	12
SMITH	LIVESTOCK	$11.52	$11.52	$11.52	$11.52	$11.52	$11.52	473	473	473	473	473	473
SMITH	MUNICIPAL	$0.02	$0.67	$2.12	$4.43	$9.83	$18.91	0	14	45	94	209	402
SMITH Total		**$11.86**	**$12.52**	**$13.96**	**$16.27**	**$21.67**	**$30.75**	**485**	**499**	**530**	**579**	**694**	**887**
TITUS	LIVESTOCK	$84.02	$84.02	$84.02	$84.02	$85.97	$86.88	1,752	1,752	1,752	1,752	1,793	1,812
TITUS	MANUFACTURING	-	$268.59	$220.36	$224.10	$331.98	$385.55	-	3,904	3,203	3,258	4,826	5,605
TITUS	STEAM ELECTRIC POWER	$748.02	$767.93	$790.32	$810.22	$816.39	$823.08	-	-	-	-	-	-
TITUS Total		**$832.05**	**$1,120.53**	**$1,094.70**	**$1,118.35**	**$1,234.34**	**$1,295.52**	**1,752**	**5,657**	**4,956**	**5,010**	**6,619**	**7,417**
UPSHUR	LIVESTOCK	$2.42	$2.42	$2.42	$2.42	$2.42	$2.42	89	89	89	89	89	89
UPSHUR	MANUFACTURING	$227.70	$253.00	$253.00	$253.00	$253.00	$253.00	2,052	2,280	2,280	2,280	2,280	2,280
UPSHUR	MUNICIPAL	$0.00	$0.00	$0.00	$0.03	$0.42	$1.05	0	0	0	1	9	22
UPSHUR Total		**$230.12**	**$255.42**	**$255.42**	**$255.45**	**$255.84**	**$256.47**	**2,141**	**2,369**	**2,369**	**2,370**	**2,378**	**2,391**
VAN ZANDT	IRRIGATION	$0.02	$0.02	$0.02	$0.02	$0.02	$0.02	2	2	2	2	2	2
VAN ZANDT	MANUFACTURING	-	$106.62	$81.01	$62.33	$40.92	$27.31	-	1,123	853	656	431	288
VAN ZANDT	MUNICIPAL	$0.14	$0.20	$0.25	$0.43	$0.72	$1.14	2	3	4	6	11	17
VAN ZANDT Total		**$0.17**	**$106.85**	**$81.29**	**$62.78**	**$41.67**	**$28.48**	**4**	**1,127**	**858**	**664**	**443**	**307**

County	Water Use Category	Income losses (Million $)* 2020	2030	2040	2050	2060	2070	Job losses 2020	2030	2040	2050	2060	2070
WOOD	LIVESTOCK	$40.14	$40.14	$40.14	$40.14	$40.14	$40.14	991	991	991	991	991	991
WOOD	MANUFACTURING	$606.23	$931.71	$931.71	$931.71	$931.71	$931.71	3,924	6,031	6,031	6,031	6,031	6,031
WOOD	MUNICIPAL	$0.00	-	-	-	-	-	0	-	-	-	-	-
WOOD Total		**$646.37**	**$971.85**	**$971.85**	**$971.85**	**$971.85**	**$971.85**	**4,915**	**7,022**	**7,022**	**7,022**	**7,022**	**7,022**
REGION D Total		**$5,867.69**	**$7,000.18**	**$6,601.72**	**$6,210.89**	**$6,067.93**	**$6,148.30**	**46,069**	**57,405**	**55,266**	**54,160**	**56,434**	**59,710**

Appendix C7 – Chapter 7:

DROUGHT RESPONSE INFORMATION, ACTIVITIES, AND RECOMMENDATIONS

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APPENDIX C7

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Region D 2021 - North East Texas Regional Water Plan
TCEQ Listed Drought-Affected Entities as of July 2019

PWS ID	PWS Name	County	Priority	TCEQ Stage	Population	Connections	Date Notified
190021	RIVERBEND WATER RESOURCES DISTRICT	BOWIE	W	V	5180	3363	10/5/2017
600001	CITY OF COOPER	DELTA	W	2	2146	1060	8/19/2013
920028	SUN ACRES MOBILE HOME PARK	GREGG	W	2	183	61	9/4/2013
920006	CITY OF WHITE OAK	GREGG	W	2	7119	2991	8/26/2013
1020004	CITY OF HALLSVILLE	HARRISON	W	V	3577	1400	10/17/2018
1020078	WEST HARRISON WSC	HARRISON	W	V	1437	479	7/6/2015
1120011	BRINKER WSC	HOPKINS	W	V	2508	836	9/13/2013
1120018	PICKTON WSC	HOPKINS	W	V	654	218	9/13/2013
1120013	CORNERSVILLE WSC	HOPKINS	W	V	1089	363	8/13/2013
1120015	MARTIN SPRINGS WSC	HOPKINS	W	V	3549	1183	7/19/2013
1120001	CITY OF CUMBY	HOPKINS	W	1	777	451	7/18/2013
1160018	CASH SUD	HUNT	W	V	16542	5908	9/14/2015
1160012	CITY OF WEST TAWAKONI	HUNT	W	V	3600	1250	5/5/2015
1160004	CITY OF GREENVILLE	HUNT	W	V	25557	9506	10/29/2013
1160006	CITY OF LONE OAK	HUNT	W	V	598	286	8/26/2013
1160031	JACOBIA WSC	HUNT	W	2	972	324	8/21/2013
1160029	CADDO BASIN SUD	HUNT	W	1	10419	3473	8/19/2013
1160042	SHADY GROVE SUD	HUNT	W	1	1374	458	7/16/2013
1160007	CITY OF QUINLAN	HUNT	W	1	2448	816	7/15/2013
1160005	CITY OF WOLFE CITY	HUNT	W	1	1412	620	7/25/2012
1160028	HOLIDAY ESTATES WATER	HUNT	W	V	216	72	4/23/2012
1160017	CAMPBELL WSC	HUNT	W	V	1482	494	3/19/2012
1390012	PETTY WSC	LAMAR	W	V	132	44	11/20/2011
1390001	CITY OF DEPORT	LAMAR	W	1	927	309	9/30/2011
1900011	CITY OF EAST TAWAKONI	RAINS	W	1	1959	945	5/1/2014
1900009	SOUTH RAINS SUD	RAINS	W	2	2847	949	3/31/2014
1940002	CITY OF CLARKSVILLE	RED RIVER	W	V	3237	1610	9/9/2013
2120005	EAST TEXAS MUD OF SMITH COUNTY	SMITH	W	1	2343	781	9/30/2011
2300002	CITY OF GILMER	UPSHUR	W	1	5243	2844	9/12/2011
2300008	UNION GROVE WSC	UPSHUR	W	V	2793	931	8/26/2011
2340009	EDOM WSC	VAN ZANDT	W	V	1443	481	5/2/2013
2340007	CALLENDER LAKE	VAN ZANDT	W	1	1842	614	3/26/2012
2500007	JONES WSC	WOOD	W	V	5352	1784	8/25/2013
2500015	BRIGHT STAR-SALEM SUD	WOOD	W	1	5871	1957	8/10/2011

Priority of Water Use

Priority	Description
O - Outage	Water service interrupted.
E - Emergency	Could be out of water in 45 days or less.
P - Priority	Could be out of water in 90 days or less.
C - Concern	Could be out of water in 180 days or less.
W - Watch	Has greater than a 180-day supply of water remaining.
R - Resolved	No longer experiencing water capacity problems.

TCEQ Drought Response Stages

TCEQ Stage	Description
V - Voluntary	Customers requested to voluntarily limit water use.
1 - Mild restrictions	Use of water for non-essential uses is restricted (i.e. outdoor watering limited to no more than twice or once a week)
2 - Moderate restrictions	All outdoor water usage is prohibited except by hand-held hoses with manual on/off nozzles. Water usage for livestock is exempt from this restriction.
3 - Severe restrictions	All outdoor water usage is prohibited; livestock watering may be exempted by the utility. All consumption may also be limited to each customer in specific ways.
Date Notified	The "date notified" is the most recent date that the Public Water System notified TCEQ of changes to their drought response stage.

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7.2MODEL DROUGHT CONTINGENCY PLAN – WHOLESALE WATER PROVIDERS

General Information

Introduction

Drought is a very real natural disaster that occurs in Texas, even in the verdant bottomlands, green pastures, and piney woods of northeast Texas. As recently as 2008, drought strained water systems in the northeast Texas region. In addition to natural drought, there are also water supply emergencies that occur from time to time in which water supply becomes contaminated. A good example of this is the MTBE spill into Lake Tawakoni in May 2000, which contaminated supply for several Hunt County water systems for multiple days.

In an effort to better respond to drought conditions than we've been able to in the past, the North East Texas Regional Water Planning Group (NETRWPG) has prepared this document, with the idea that if water providers study their water supply system before a drought or emergency occurs, then they will be better prepared to respond. In preparing this document, several references were used, including Chapters 288 and 363 of the Texas Administrative Code, the Texas Commission on Environmental Quality's (TCEQ) 'Handbook for Drought Contingency Planning for Retail Public Water Suppliers,' Texas Water Code § 11.1272, and the TCEQ and TWDB websites. All of these resources are available to you if you need further information or clarification. You may also contact the TCEQ at 512-239-4691 with questions or for information. Example wording for your plan will be found throughout in bold italics.

According to the requirements set forth in the amended Chapter 288, Subchapter C of the Texas Administrative Code, retail public water suppliers providing water service to 3,300 or more connections must submit revisions to existing drought contingency plans to the executive director not later than May 1, 2009, and every five years after that date to coincide with the regional water planning group. Any new or revised plans must be submitted to the executive director within 90 days of adoption by the community water system. Any new retail public water suppliers providing water service to 3,300 or more connections shall prepare and adopt a drought contingency plan within 180 days of commencement of operation, and submit the plan to the executive director within 90 days of adoption. If you are a retail supplier, but serve less than 3,300 connections, you are still required to develop and implement a plan, but you do not need to submit the plan unless specifically requested by TCEQ. If you provide retail supply in addition to wholesale supply, you will also need to develop a retail drought contingency plan. Please see the Northeast Texas Region's guidance for retail drought contingency plans.

The ___________________(water provider) understands that water conservation is a viable strategy for protecting water resources both now and in the future, and that adequate planning for times of drought or emergency is a necessary part of conservation. The purpose of this plan is to prepare for the possibility of a drought or emergency situation where water is in short supply. This plan will help to ensure that ________________________(water supplier) and its wholesale customers use water wisely and efficiently during periods of drought.

Though not specifically required by rule, it is helpful to the reader if you summarize your water supply and distribution systems in the introduction. This will familiarize users of the Plan with your system, and help them to make sense of the actions that you intend to take. In addition, discussing your water system here will assist those who update the plan in five years, because they will know exactly what the system looked like when the plan was created.

The ______________(water supplier) utilizes groundwater /surface water from _______________(source). Supply is secured by a (water right, water supply contract, etc.) through the year _____. Our customers include ___________________________, and their current contracted amounts are ______. Our storage and distribution systems consist of ____.

Coordination with the North East Texas Regional Water Planning Group

The drought contingency plan must document coordination with the regional water planning groups for the service area of the wholesale public water supplier to ensure consistency with the appropriate approved regional water plans. – 30 TAC Chapter 288

A copy of this adopted plan will be submitted to the NETRWPG via its administrator, Mr. Walt Sears, Northeast Texas Municipal Water District, P. O. Box 955, Hughes Springs, Texas 75656. Proof of submittal is attached hereto as Figure ___.

Informing the Public/Requesting Input

According to 30 TAC Chapter 288, Subchapter B.a.1, "Preparation of the plan shall include provisions to actively inform the public and to affirmatively provide opportunity for user input in the preparation of the plan and for informing wholesale customers about the plan. Such acts may include, but are not limited to, having a public meeting at a time and location convenient to the public and providing written notice to the public concerning the proposed plan and meeting."

The ___________________________________(water supplier) gave the public and its wholesale customers an opportunity to provide input into this plan by ____________________________(public notice, public hearing, letter requesting comments, etc.). Public comments included _________________.

Efforts to inform wholesale customers and the public about each stage of the plan, and when stages are implemented or rescinded, will be through ____________________________ (certified letter, newspaper articles, radio announcements, website announcements, etc.).

Authorization/Applicability

The _________________ (mayor, president, city administrator, etc.) is hereby authorized to monitor weather conditions as well as water supply and demand conditions and to implement the Drought Contingency Plan as appropriate.

The _______________________(City Council, Board of Directors, etc.) authorizes the Plan by a _______________(resolution, ordinance), which has been included in this Plan.

Coordination with the Texas Commission on Environmental Quality

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According to 30 TAC Chapter 288, Subchapter C, "Wholesale public water suppliers shall submit a drought contingency plan meeting the requirements of Subchapter B of this chapter to the executive director not later than May 1, 2005, after adoption of the drought contingency plan by the governing body of the water supplier. Thereafter, the wholesale public water suppliers shall submit the next revision of the plan not later than May 1, 2009, and every five years after that date to coincide with the regional water planning group. Any new or revised plans must be submitted to the executive director within 90 days of adoption by the governing body of the wholesale public water supplier."

This plan was submitted to the executive director of the Texas Commission of Environmental Quality on _______________________(date).

Send your plan to the following address: TCEQ, Resource Protection Team, Mail Code 160, P.O. Box 13087, Austin, TX 78711-3087 for regular and certified mail, or 12100 Park 35 Circle, Austin, TX 78753 for express carrier deliveries (U.S. Post Office Express Mail, FedEx, UPS, etc.).

For questions to the TCEQ, see the website at www.tceq.state.tx.us, or call: 512/239-4691.

Coordination with Wholesale Water Supplier

This section only applies if you purchase supply from a wholesale provider. If you have a contract or agreement with a water provider, then complete this section. If you have your own water rights or otherwise own your supply, this section does not apply.

This plan has been created with our water provider, ________________'s drought contingency plan in mind. We have included __________________'s (water provider) requirements within our plan and have created this plan to compliment _____________'s (water provider) plan. ______________(water provider) has been provided a copy of this plan.

Plan Definitions

For the purposes of this Plan**,** the following definitions, taken from TCEQ guidance, shall apply:

Aesthetic water use: water use for ornamental or decorative purposes such as fountains, reflecting pools, and water gardens.

Commercial and institutional water use: water use which is integral to the operations of commercial and non-profit establishments and governmental entities such as retail establishments, hotels and motels, restaurants, and office buildings.

Conservation: those practices, techniques, and technologies that reduce the consumption of water, reduce the loss or waste of water, improve the efficiency in the use of water or increase the recycling and reuse of water so that a supply is conserved and made available for future or alternative uses.

Customer: any person, company, or organization using water supplied by __________________ (name of water supplier).

Domestic water use: water use for personal needs or for household or sanitary purposes such as drinking, bathing, heating, cooking, sanitation, or for cleaning a residence, business, industry, or institution.

Even number address: street addresses, box numbers, or rural postal route numbers ending in 0, 2, 4, 6, or 8 and locations without addresses.

Industrial water use: the use of water in processes designed to convert materials of lower value into forms having greater usability and value.

Landscape irrigation use: water used for the irrigation and maintenance of landscaped areas, whether publicly or privately owned, including residential and commercial lawns, gardens, golf courses, parks, rights-of-way and medians.

Non-essential water use: water uses that are not essential nor required for the protection of public, health, safety, and welfare, including:

(a) irrigation of landscape areas, including parks, athletic fields, and golf courses, except otherwise provided under this Plan;
(b) use of water to wash any motor vehicle, motorbike, boat, trailer, airplane or other vehicle;
(c) use of water to wash down any sidewalks, walkways, driveways, parking lots, tennis courts, or other hard-surfaced areas;
(d) use of water to wash down buildings or structures for purposes other than immediate fire protection;
(e) flushing gutters or permitting water to run or accumulate in any gutter or street;

(f) use of water to fill, refill, or add to any indoor or outdoor swimming pools or jacuzzi-type pools;
(g) use of water in a fountain or pond for aesthetic or scenic purposes except where necessary to support aquatic life;
(h) failure to repair a controllable leak(s) within a reasonable period after having been given notice directing the repair of such leak(s); and
(i) use of water from hydrants for construction purposes or any other purposes other than fire fighting.

Odd numbered address: street addresses, box numbers, or rural postal route numbers ending in 1, 3, 5, 7, or 9.

RESPONSE TO A DROUGHT EVENT

In this portion of the plan, it will need to be determined whether a water constraint will more likely be caused by a shortage in water supply or by constraints in the storage and distribution system. Associated goals and water management measures should correspond to the type of constraint expected. For example, if insufficient storage is determined to be the most likely cause of water shortage during a drought, then an emergency back-up supply source would not solve the problem; reduced use during peak hours (banning lawn watering, etc.) would more likely solve the problem by giving storage tanks a better opportunity to refill.

The drought contingency plan should be designed for a drought condition at least as severe as the drought of record according to TCEQ rules. Since the drought of record in Texas occurred in the 1950's, few systems will have water use records still available to plan by. Therefore, the NETRWPG suggests using the most recent drought for the State, which occurred in 1996. If your system does not have records for 1996, use the time period in your records when your system was the most strained by dry weather conditions.

The drought contingency plan must include a minimum of three drought or emergency response stages providing for the implementation of measures in response to water supply conditions during a repeat of the drought-of-record. – 30 TAC Chapter 288

The drought contingency plan must include specific, quantified targets for water use reductions to be achieved during periods of water shortage and drought. The entity preparing the plan shall establish the targets. The goals established by the entity under this paragraph are not enforceable. – 30 TAC Chapter 288

A minimum of three drought stages is required in this plan. During each stage, it will need to be determined what will trigger initiation, what the water use reduction target goal is, what water management strategies will be put into place, and, finally, what will terminate the stage. Keep in mind that a supplier who is also a customer of its wholesale provider must comply with its provider's Drought Contingency Plan. Do not develop stages or management strategies that are in conflict with your water provider's DCP. Also note that the NETRWPG has developed water management strategies for all providers who are projected to have a water shortage within the planning period (50 years). You should review the latest version of the Regional Water Plan to determine if you have had strategies prepared for you.

Include an opening paragraph in this section that describes what information should be monitored in order to initiate the stages, and a rationale of why you chose the triggering criteria that you chose.

The drought contingency plan must include a provision in every wholesale water contract entered into or renewed after adoption of the plan, including contract extensions, that in case of a shortage of water resulting from drought, the water to be distributed shall be divided in accordance with Texas Water Code, §11.039. – 30 TAC Chapter 288

Texas Water Code, §11.039 states, "DISTRIBUTION OF WATER DURING SHORTAGE. (a) If a shortage of water in a water supply not covered by a water conservation plan prepared in compliance with Texas Natural Resource Conservation Commission or Texas Water Development Board rules results from drought, accident, or other cause, the water to be distributed shall be divided among all customers pro rata, according to the amount each may be entitled to, so that preference is given to no one and everyone suffers alike. (b) If a shortage of water in a water supply covered by a water conservation plan prepared in compliance with Texas Natural Resource Conservation Commission or Texas Water Development Board rules results from drought, accident, or other cause, the person, association of persons, or corporation owning or controlling the water shall divide the water to be distributed among all customers pro rata, according to: (1) the amount of water to which each customer may be entitled; or (2) the amount of water to which each customer may be entitled, less the amount of water the customer would have saved if the customer had operated its water system in compliance with the water conservation plan.(c) Nothing in Subsection (a) or (b) precludes the person, association of persons, or corporation owning or controlling the water from supplying water to a person who has a prior vested right to the water under the laws of this state.

Stage 1 – Mild Water Shortage

Initiation: The _______________________(name of water supplier) will consider that a mild water shortage exists when___________________________________ (i.e. water levels in the reservoir reach_____; average daily water use reaches ___% of capacity for three consecutive days; water level in elevated storage tank is at or below ____ for more than 12 hours, etc.)***, or when requested by __________*** (entity's water provider) if applicable**.**

Target Goal: When a mild water shortage exists, the ____________________(water supplier) will implement water management strategies in an attempt to reduce daily water use to __________________________ (i.e. 2 MGD; ___% of average daily water use, etc.) Please note that this goal must be quantifiable. Goals established in this section are not enforceable.

Termination: Stage 1 shall be rescinded when ___________________________ (i.e. water levels in the reservoir rise above ___ for 7 consecutive days; average daily water use falls below ___% of capacity for three consecutive days; storage facilities return to normal levels for 24 consecutive hours, etc.)***, or when Stage I is rescinded by ___________________________*** (entity's water provider) if applicable**.**

Water Management Strategies: During Stage 1, we will take the following steps to reduce water use:_______________.

The following are examples of strategies that are commonly used during this stage. These are not mandatory, only suggestive. When determining strategies, remember the type of constraint you expect on your system and plan accordingly.

The drought contingency plan must include the specific water supply or water demand management measures to be implemented during each stage of the plan including, but not limited to, the following: (A) pro rata curtailment of water deliveries to or diversions by wholesale water customers as provided in Texas Water Code, §11.039; and (B) utilization of alternative water sources with the prior approval of the executive director as appropriate, e.g. interconnection with another water system, temporary use of a non-municipal water supply, use of reclaimed water for non-potable purposes, etc.). – 30 TAC Chapter 288

- Request voluntary water conservation from all customers
- Recommend that customers initiate Stage 1 of their Drought Contingency Plans
- Reduce operating procedures that use water (i.e. flushing of mains) as appropriate

Stage 2 – Moderate Water Shortage

Initiation: The _______________________(water supplier) will consider that a moderate water shortage exists when__________________________________(i.e. water levels in the reservoir reach_____; average daily water use reaches ___% of capacity for three consecutive days; water level in elevated storage tank is at or below ____ for more than 12 hours, etc.)***, or when requested by __________ (entity's water provider)*** if applicable.

Target Goal: When a moderate water shortage exists, the ____________________(water supplier) will implement water management strategies in an attempt to reduce daily water use to ___________________________ (i.e. 2 MGD; ___% of average daily water use, etc.) Please note that this goal must be quantifiable. Goals established in this section are not enforceable.

Termination: Stage 2 shall be rescinded when ____________________________ (i.e. water levels in the reservoir rise above ___ for 7 consecutive days; average daily water use falls below ___% of capacity for three consecutive days; storage facilities return to normal levels for 24 consecutive hours, etc.)***, or when Stage 2 is rescinded by***

__________________________ (entity's water provider) if applicable. ***Upon termination of Stage 2, Stage 1 becomes operative.***

Water Management Strategies: During Stage 2, we will take the following steps to reduce water use:_______________.

The following are examples of strategies that are commonly used during this stage. These are not mandatory, only suggestive. When determining strategies, remember the type of constraint you expect on your system and plan accordingly.

The drought contingency plan must include the specific water supply or water demand management measures to be implemented during each stage of the plan including, but not limited to, the following: (A) pro rata curtailment of water deliveries to or diversions by wholesale water customers as provided in Texas Water Code, §11.039; and (B) utilization of alternative water sources with the prior approval of the executive director as appropriate, e.g. interconnection with another water system, temporary use of a non-municipal water supply, use of reclaimed water for non-potable purposes, etc.). – 30 TAC Chapter 288

- Recommend that customers initiate Stage 2 of their Drought Contingency Plans, which should, at a minimum, contain lawn watering restrictions
- Modify reservoir operations if applicable
- Initiate strong public awareness campaign in service area to warn of impending shortages

Stage 3 – Severe Water Shortage

Initiation: The ______________________(water supplier) will consider that a severe water shortage exists when _________________________________(i.e. water levels in the reservoir reach_____; average daily water use reaches ___% of capacity for three consecutive days; water level in elevated storage tank is at or below ____ for more than 12 hours, etc.)***, or when requested by*** __________ (entity's water provider) if applicable**.**

Target Goal: When a severe water shortage exists, the ____________________(water supplier) will implement water management strategies in an attempt to reduce daily water use to __________________________ (i.e. 2 MGD; ___% of average daily water use, etc.) Please note that this goal must be quantifiable. Goals established in this section are not enforceable.

Termination: Stage 3 shall be rescinded when ___________________________ (i.e. water levels in the reservoir rise above ___ for 7 consecutive days; average daily water use falls below ___% of capacity for three consecutive days; storage facilities return to normal levels for 24 consecutive hours, etc.)***, or when Stage 3 is rescinded by*** __________________________ (entity's water provider) if applicable***. Upon termination of Stage 3, Stage 2 becomes operative.***

Water Management Strategies: During Stage 3, we will take the following steps to reduce water use:______________.

The following are examples of strategies that are commonly used during this stage. These are not mandatory, only suggestive. When determining strategies, remember the type of constraint you expect on your system and plan accordingly.

The drought contingency plan must include the specific water supply or water demand management measures to be implemented during each stage of the plan including, but not limited to, the following: (A) pro rata curtailment of water deliveries to or diversions by wholesale water customers as provided in Texas Water Code, §11.039; and (B) utilization of alternative water sources with the prior approval of the executive director as appropriate, e.g. interconnection with another water system, temporary use of a non-municipal water supply, use of reclaimed water for non-potable purposes, etc.). – 30 TAC Chapter 288

- Recommend that customers initiate Stage 3 of their Drought Contingency Plans, which, at a minimum, must include a ban on lawn watering
- Begin pro rata water allocation (Pro rata curtailment of water deliveries to or diversions by wholesale water customers must be considered in a wholesale DCP according to 30 TAC Chapter 288, Subchapter B. Rules for pro rata curtailment are provided in Texas Water Code, §11.039.)
- Implement water rate surcharges (i.e. a set charge for any use above average monthly use)
- Implement price adjustments (i.e. increase the price per 1,000 gallons of water used above the average monthly use)
- Utilize alternate or emergency water sources

Stage 4 – Emergency Water Shortage

This Stage could apply in the instance of a major water line break, a contamination of the water supply source, or other urgent water system conditions. Most likely, this stage would be initiated by decision of the authorized plan implementer (Mayor, President, Manager, etc.)

Initiation: The ______________________(water supplier) will consider that an emergency water shortage exists when_________________________________ (i.e. the water main at the water treatment plant bursts or is otherwise significantly damaged; the reservoir is contaminated by oil spill; etc.,)***, or when requested by __________*** (entity's water provider) if applicable.

Target Goal: When an emergency water shortage exists, the ____________________(water supplier) will implement water management strategies in an attempt to reduce daily water use to __________________________ (i.e. 2 MGD; ___% of average daily water use, etc.) Please note that this goal must be quantifiable. Goals established in this section are not enforceable.

Termination: Stage 4 shall be rescinded when ___________________________ (i.e. the main at the water treatment plant is restored and storage tanks have been allowed to refill; analysis of the source water indicates that supply is safe to use; etc.), ***or when Stage 4 is rescinded by ___________________________***(entity's water provider) if applicable.

Water Management Strategies: During Stage 4, we will take the following steps to reduce water use:_______________.

The following are examples of strategies that are commonly used during this stage. These are not mandatory, only suggestive. When determining strategies, remember the type of constraint you expect on your system and plan accordingly.

The drought contingency plan must include the specific water supply or water demand management measures to be implemented during each stage of the plan including, but not limited to, the following: (A) pro rata curtailment of water deliveries to or diversions by wholesale water customers as provided in Texas Water Code, §11.039; and (B) utilization of alternative water sources with the prior approval of the executive director as appropriate, e.g. interconnection with another water system, temporary use of a non-municipal water supply, use of reclaimed water for non-potable purposes, etc.). – 30 TAC Chapter 288

- Utilize alternative or emergency water supplies (i.e. tying into a neighboring water system, etc. This may require approval by the TCEQ Executive Director)
- Modify reservoir operations
- Strategies listed in Stage 3

PLAN EXECUTION

Public Involvement

This section should discuss the ways in which the supplier will inform its wholesale customers about the initiation and termination of drought stages, as well as management strategies that customers are expected to follow. Public involvement can be in the form of special public hearings, articles and notices in the local newspaper, radio announcements, announcements on local television stations, notices in billing statements, etc.

The ______________________ (water provider) will keep its customers apprised of initiation of the drought contingency plan, and changes in stages, by means of ___________________________.

Enforcement

The ______________ (Mayor, City Manager, President, etc.), or his/her designee, is responsible for monitoring weather conditions and water supplies, and determining when to initiate and terminate stages of the DCP.

The drought contingency plan must include procedures for the enforcement of any mandatory water use restrictions including specification of penalties (e.g., liquidated damages, water rate surcharges, discontinuation of service) for violations of such restrictions. – 30 TAC Chapter 288, Subchapter B.a.10.

The _______________ (governing body) has adopted this plan through ___________ (ordinance, resolution), and has made it an official _________ (city, Corporation, etc.) policy. The _______________ (ordinance, resolution, etc.) is attached hereto as Figure ___.

Provision for responding to wholesale provider restrictions

Any water supplier that receives all or a portion of its water supply from another water supplier shall consult with that supplier and shall include in the drought contingency plan appropriate provisions for responding to reductions in that water supply. – 30 TAC Chapter 288

If you have a wholesale provider, then add this section. If you own your own supply, please skip this section.

As stated in each water shortage stage, we intend to comply with all requirements of our wholesale provider's drought contingency plan. This plan is as stringent as our provider's plan, and in some cases may be more so.

Notification of TCEQ on mandatory provisions

A wholesale or retail water supplier shall notify the executive director within five business days of the implementation of any mandatory provisions of the drought contingency plan. – 30 TAC Chapter 288

The Executive Director at TCEQ shall be notified with 5 business days if any mandatory provisions of this plan are implemented. The Executive Director can be reached at 512-239-3900.

Variance procedures

The drought contingency plan must include procedures for granting variances to the plan. – 30 TAC Chapter 288

The _____________ (authorized representative) may, in writing, grant temporary variance for existing water uses otherwise prohibited under this Plan if it is determined that failure to grant such variance would cause an emergency condition adversely affecting the health, sanitation, or fire protection for the public or the customer requesting such variance and if one or more of the following conditions are met:

(a) Compliance with this Plan cannot be technically accomplished during the duration of the water supply shortage or other condition for which the Plan is in effect.

(b) Alternative methods can be implemented which will achieve the same level of reduction in water use.

Customers requesting an exemption from the provisions of this Plan shall file a petition for variance with the _____________ (water supplier) within 5 days after the Plan or a particular drought response stage has been invoked. All petitions for variances shall be reviewed by the _________ (authorized representative), and shall include the following:

(a) Name and address of the petitioner(s).
(b) Purpose of water use.
(c) Specific provision(s) of the Plan from which the petitioner is requesting relief.
(d) Detailed statement as to how the specific provision of the Plan adversely affects the petitioner or what damage or harm will occur to the petitioner or others if petitioner complies with this Ordinance.
(e) Description of the relief requested.
(f) Period of time for which the variance is sought.
(g) Alternative water use restrictions or other measures the petitioner is taking or proposes to take to meet the intent of this Plan and the compliance date.
(h) Other pertinent information.

Variances granted by the _______________ (water supplier) shall be subject to the following conditions, unless waived or modified:

(a) Variances granted shall include a timetable for compliance.
(b) Variances granted shall expire when the Plan is no longer in effect, unless the petitioner has failed to meet specified requirements.

No variance shall be retroactive or otherwise justify any violation of this Plan occurring prior to the issuance of the variance.

5-year updates

The retail public water supplier shall review and update, as appropriate, the drought contingency plan, at least every five years, based on new or updated information, such as the adoption or revision of the regional water plan. – 30 TAC Chapter 288

This plan shall be re-evaluated and updated every five years based on updated information; especially the latest adopted NETRWPG Regional Water Plan.

7.2 MODEL DROUGHT CONTINGENCY PLAN –GROUNDWATER USER

Plan Definitions

For the purposes of this Plan, the following definitions, taken from TCEQ guidance, are provided for reference:

Aesthetic water use: water use for ornamental or decorative purposes such as fountains, reflecting pools, and water gardens.

Conservation: those practices, techniques, and technologies that reduce the consumption of water, reduce the loss or waste of water, improve the efficiency in the use of water or increase the recycling and reuse of water so that a supply is conserved and made available for future or alternative uses.

Domestic water use: water use for personal needs or for household or sanitary purposes such as drinking, bathing, heating, cooking, sanitation, or for cleaning a residence, business, industry, or institution.

Landscape irrigation use: water used for the irrigation and maintenance of landscaped areas, whether publicly or privately owned, including residential and commercial lawns, gardens, golf courses, parks, rights-of-way and medians.

Non-essential water use: water uses that are not essential nor required for the protection of public, health, safety, and welfare, including:

(j) irrigation of landscape areas, including parks, athletic fields, and golf courses, except otherwise provided under this Plan;
(k) use of water to wash any motor vehicle, motorbike, boat, trailer, airplane or other vehicle;
(l) use of water to wash down any sidewalks, walkways, driveways, parking lots, tennis courts, or other hard-surfaced areas;
(m) use of water to wash down buildings or structures for purposes other than immediate fire protection;
(n) flushing gutters or permitting water to run or accumulate in any gutter or street;
(o) use of water to fill, refill, or add to any indoor or outdoor swimming pools or jacuzzi-type pools;
(p) use of water in a fountain or pond for aesthetic or scenic purposes except where necessary to support aquatic life;
(q) failure to repair a controllable leak(s) within a reasonable period after having been given notice directing the repair of such leak(s); and
(r) use of water from hydrants for construction purposes or any other purposes other than fire fighting.

RESPONSE TO A DROUGHT EVENT

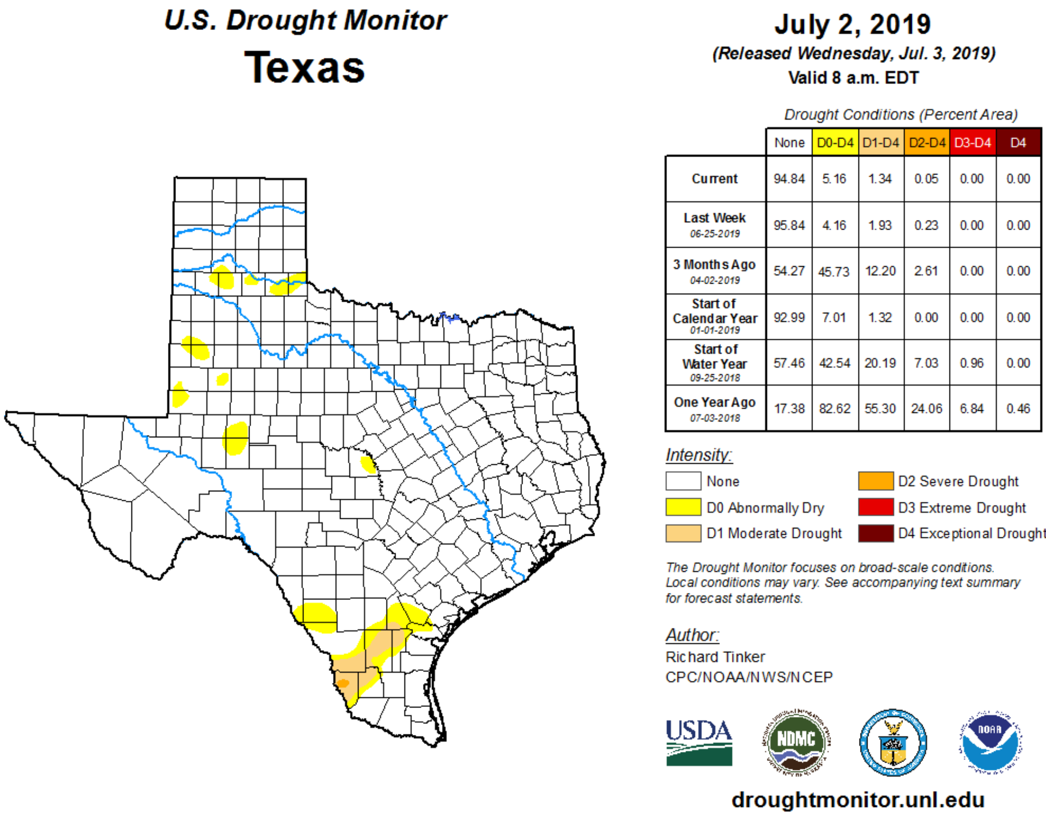
The drought contingency plan must include a minimum of three drought or emergency response stages providing for the implementation of measures in response to water supply conditions during a repeat of the drought-of-record. – 30 TAC Chapter 288

The drought contingency plan must include specific, quantified targets for water use reductions to be achieved during periods of water shortage and drought. The entity preparing the plan shall establish the targets. The goals established by the entity under this paragraph are not enforceable. – 30 TAC Chapter 288

This model DCP is intended to follow the regional recommendations for groundwater users. This recommendation is to monitor drought intensity using the U.S. Drought Monitor website. Drought intensity is updated weekly with a map of Texas shaded with the applicable drought condition.

Category	Description	Possible Impacts	Palmer Drought Index	USGS Weekly Streamflow (Percentiles)
D0	Abnormally Dry	Going into drought: short-term dryness slowing planting, growth of crops or pastures. Coming out of drought: some lingering water deficits; pastures or crops not fully recovered	-1.0 to -1.9	21-30
D1	Moderate Drought	Some damage to crops, pastures; streams, reservoirs, or wells low, some water shortages developing or imminent; voluntary water-use restrictions requested	-2.0 to -2.9	11-20
D2	Severe Drought	Crop or pasture losses likely; water shortages common; water restrictions imposed	-3.0 to -3.9	6-10
D3	Extreme Drought	Major crop/pasture losses; widespread water shortages or restrictions	-4.0 to -4.9	3-5
D4	Exceptional Drought	Exceptional and widespread crop/pasture losses; shortages of water in reservoirs, streams, and wells creating water emergencies	-5.0 or less	0-2

Go to https://droughtmonitor.unl.edu/Maps/MapArchive.aspx
Select “current” “state” and “Texas” from the drop-down menus.



	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	94.84	5.16	1.34	0.05	0.00	0.00
Last Week 06-25-2019	95.84	4.16	1.93	0.23	0.00	0.00
3 Months Ago 04-02-2019	54.27	45.73	12.20	2.61	0.00	0.00
Start of Calendar Year 01-01-2019	92.99	7.01	1.32	0.00	0.00	0.00
Start of Water Year 09-25-2018	57.46	42.54	20.19	7.03	0.96	0.00
One Year Ago 07-03-2018	17.38	82.62	55.30	24.06	6.84	0.46

Once the specific drought intensity is determined using the map, the groundwater user is encouraged to voluntarily follow the drought responses recommended by the nearest public water supplier(s) to the groundwater user.

Stage 1 – Mild Water Shortage

The following are examples of strategies that are commonly used during this stage. These are not mandatory, only suggestive.

- Request voluntary water conservation from all customers

Stage 2 – Moderate Water Shortage

Initiation: The groundwater user will consider that a moderate water shortage exists when the local drought stage shown on the weekly Texas map is category D1 - moderate drought.

Termination: Stage 2 shall be rescinded when the local weekly drought category is D0 - abnormally dry.

Water Management Strategies: During Stage 2, we will follow the drought restrictions of local public water supplier(s).

The following are examples of strategies that are commonly used during this stage.

- Lawn watering restrictions

Stage 3 – Severe Water Shortage

Initiation: The groundwater user will consider that a moderate water shortage exists when the local drought stage shown on the weekly Texas map is category D2 - severe drought.

Termination: Stage 3 shall be rescinded when the local weekly drought category is D1 – moderate drought.

Water Management Strategies: During Stage 3, we will follow the drought restrictions of local public water supplier(s).

The following are examples of strategies that are commonly used during this stage. These are not mandatory, only suggestive. When determining strategies, remember the type of constraint you expect on your system and plan accordingly.

- A ban on lawn watering and all other non-essential water use
- Utilize alternate or emergency water sources

Stage 4 – Emergency Water Shortage

Initiation: The groundwater user will consider that a moderate water shortage exists when the local drought stage shown on the weekly Texas map is category D3 - extreme drought.

Termination: Stage 4 shall be rescinded when the local weekly drought category is D2 – severe drought.

Water Management Strategies: During Stage 4, we will follow the drought restrictions of local public water supplier(s).

The following are examples of strategies that are commonly used during this stage. These are not mandatory, only suggestive.

- Utilize alternative or emergency water supplies (i.e. tying into a neighboring water system, etc.
- Strategies listed in Stage 3

1.1 MODEL DROUGHT CONTINGENCY PLAN – MUNICPAL USER

General Information

Introduction

Drought is a very real natural disaster that occurs in Texas, even in the verdant bottomlands, green pastures, and piney woods of northeast Texas. As recently as 2011, drought strained water systems in the northeast Texas region. In addition to natural drought, there are also water supply emergencies that occur from time to time in which water supply becomes contaminated. A good example of this is the MTBE spill into Lake Tawakoni in May 2000, which contaminated supply for several Hunt County water systems for multiple days.

In an effort to better respond to drought conditions than we've been able to in the past, the North East Texas Regional Water Planning Group (NETRWPG) has prepared this document, with the idea that if water providers study their water supply system before a drought or emergency occurs, then they will be better prepared to respond. In preparing this document, several references were used, including Chapters 288 and 363 of the Texas Administrative Code, the Texas Commission on Environmental Quality's (TCEQ) 'Handbook for Drought Contingency Planning for Retail Public Water Suppliers,' Texas Water Code § 11.1272, and the TCEQ and TWDB websites. All of these resources are available to you if you need further information or clarification. You may also contact the TCEQ at 512-239-4691 with questions or for information. Example wording for your plan will be found throughout in bold italics.

According to the requirements set forth in the amended Chapter 288, Subchapter C of the Texas Administrative Code, retail public water suppliers providing water service to 3,300 or more connections must submit revisions to existing drought contingency plans to the executive director not later than May 1, 2009, and every five years after that date to coincide with the regional water planning group. Any new or revised plans must be submitted to the executive director within 90 days of adoption by the community water system. Any new retail public water suppliers providing water service to 3,300 or more connections shall prepare and adopt a drought contingency plan within 180 days of commencement of operation, and submit the plan to the executive director within 90 days of adoption. If you are a retail supplier, but serve less than 3,300 connections, you are still required to develop and implement a plan, but you do not need to submit the plan unless specifically requested by TCEQ. If you provide retail supply in addition to wholesale supply, you will also need to develop a retail drought contingency plan. Please see the Northeast Texas Region's guidance for retail drought contingency plans.

The ___________________(water provider) understands that water conservation is a viable strategy for protecting water resources both now and in the future, and that adequate planning for times of drought or emergency is a necessary part of conservation. The purpose of this plan is to prepare for the possibility of a drought or emergency situation where water is in short supply. This plan will help to ensure that ________________________(water supplier) and its wholesale customers use water wisely and efficiently during periods of drought.

Though not specifically required by rule, it is helpful to the reader if you summarize your water supply and distribution systems in the introduction. This will familiarize users of the Plan with your system, and help them to make sense of the actions that you intend to take. In addition, discussing your water system here will assist those who update the plan in five years, because they will know exactly what the system looked like when the plan was created.

The ______________(water supplier) utilizes groundwater /surface water from _______________(source). Supply is secured by a (water right, water supply contract, etc.) through the year _____. Our customers include ___________________________, and their current contracted amounts are ______. Our storage and distribution systems consist of ____.

Coordination with the North East Texas Regional Water Planning Group

The drought contingency plan must document coordination with the regional water planning groups for the service area of the wholesale public water supplier to ensure consistency with the appropriate approved regional water plans. – 30 TAC Chapter 288

A copy of this adopted plan will be submitted to the NETRWPG via its administrator, Mr. Walt Sears, Northeast Texas Municipal Water District, P. O. Box 955, Hughes Springs, Texas 75656. Proof of submittal is attached hereto as Figure ___.

Informing the Public/Requesting Input

According to 30 TAC Chapter 288, Subchapter B.a.1, "Preparation of the plan shall include provisions to actively inform the public and to affirmatively provide opportunity for user input in the preparation of the plan and for informing wholesale customers about the plan. Such acts may include, but are not limited to, having a public meeting at a time and location convenient to the public and providing written notice to the public concerning the proposed plan and meeting."

The ___________________________________(water supplier) gave the public and its wholesale customers an opportunity to provide input into this plan by ____________________________(public notice, public hearing, letter requesting comments, etc.). Public comments included _________________.

Efforts to inform wholesale customers and the public about each stage of the plan, and when stages are implemented or rescinded, will be through ____________________________ (certified letter, newspaper articles, radio announcements, website announcements, etc.).

Authorization/Applicability

The _________________ (mayor, president, city administrator, etc.) is hereby authorized to monitor weather conditions as well as water supply and demand conditions and to implement the Drought Contingency Plan as appropriate.

The _______________________(City Council, Board of Directors, etc.) authorizes the Plan by a _______________(resolution, ordinance), which has been included in this Plan.

Coordination with the Texas Commission on Environmental Quality

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According to 30 TAC Chapter 288, Subchapter C, "Wholesale public water suppliers shall submit a drought contingency plan meeting the requirements of Subchapter B of this chapter to the executive director not later than May 1, 2005, after adoption of the drought contingency plan by the governing body of the water supplier. Thereafter, the wholesale public water suppliers shall submit the next revision of the plan not later than May 1, 2009, and every five years after that date to coincide with the regional water planning group. Any new or revised plans must be submitted to the executive director within 90 days of adoption by the governing body of the wholesale public water supplier."

This plan was submitted to the executive director of the Texas Commission of Environmental Quality on _______________________(date).

Send your plan to the following address: TCEQ, Resource Protection Team, Mail Code 160, P.O. Box 13087, Austin, TX 78711-3087 for regular and certified mail, or 12100 Park 35 Circle, Austin, TX 78753 for express carrier deliveries (U.S. Post Office Express Mail, FedEx, UPS, etc.).

For questions to the TCEQ, see the website at www.tceq.state.tx.us, or call: 512/239-4691.

Coordination with Wholesale Water Supplier

This section only applies if you purchase supply from a wholesale provider. If you have a contract or agreement with a water provider, then complete this section. If you have your own water rights or otherwise own your supply, this section does not apply.

This plan has been created with our water provider, ________________'s drought contingency plan in mind. We have included __________________'s (water provider) requirements within our plan and have created this plan to compliment _____________'s (water provider) plan. ______________(water provider) has been provided a copy of this plan.

Plan Definitions

For the purposes of this Plan**,** the following definitions, taken from TCEQ guidance, shall apply:

Aesthetic water use: water use for ornamental or decorative purposes such as fountains, reflecting pools, and water gardens.

Commercial and institutional water use: water use which is integral to the operations of commercial and non-profit establishments and governmental entities such as retail establishments, hotels and motels, restaurants, and office buildings.

Conservation: those practices, techniques, and technologies that reduce the consumption of water, reduce the loss or waste of water, improve the efficiency in the use of water or increase the recycling and reuse of water so that a supply is conserved and made available for future or alternative uses.

Customer: any person, company, or organization using water supplied by __________________ (name of water supplier).

Domestic water use: water use for personal needs or for household or sanitary purposes such as drinking, bathing, heating, cooking, sanitation, or for cleaning a residence, business, industry, or institution.

Even number address: street addresses, box numbers, or rural postal route numbers ending in 0, 2, 4, 6, or 8 and locations without addresses.

Industrial water use: the use of water in processes designed to convert materials of lower value into forms having greater usability and value.

Landscape irrigation use: water used for the irrigation and maintenance of landscaped areas, whether publicly or privately owned, including residential and commercial lawns, gardens, golf courses, parks, rights-of-way and medians.

Non-essential water use: water uses that are not essential nor required for the protection of public, health, safety, and welfare, including:

(a) irrigation of landscape areas, including parks, athletic fields, and golf courses, except otherwise provided under this Plan;
(b) use of water to wash any motor vehicle, motorbike, boat, trailer, airplane or other vehicle;
(c) use of water to wash down any sidewalks, walkways, driveways, parking lots, tennis courts, or other hard-surfaced areas;
(d) use of water to wash down buildings or structures for purposes other than immediate fire protection;
(e) flushing gutters or permitting water to run or accumulate in any gutter or street;

(f) use of water to fill, refill, or add to any indoor or outdoor swimming pools or jacuzzi-type pools;
(g) use of water in a fountain or pond for aesthetic or scenic purposes except where necessary to support aquatic life;
(h) failure to repair a controllable leak(s) within a reasonable period after having been given notice directing the repair of such leak(s); and
(i) use of water from hydrants for construction purposes or any other purposes other than fire fighting.

Odd numbered address: street addresses, box numbers, or rural postal route numbers ending in 1, 3, 5, 7, or 9.

RESPONSE TO A DROUGHT EVENT

In this portion of the plan, it will need to be determined whether a water constraint will more likely be caused by a shortage in water supply or by constraints in the storage and distribution system. Associated goals and water management measures should correspond to the type of constraint expected. For example, if insufficient storage is determined to be the most likely cause of water shortage during a drought, then an emergency back-up supply source would not solve the problem; reduced use during peak hours (banning lawn watering, etc.) would more likely solve the problem by giving storage tanks a better opportunity to refill.

The drought contingency plan should be designed for a drought condition at least as severe as the drought of record according to TCEQ rules. Since the drought of record in Texas occurred in the 1950's, few systems will have water use records still available to plan by. Therefore, the NETRWPG suggests using the most recent drought for the State, which occurred in 2011. If your system does not have records for 2011, use the time period in your records when your system was the most strained by dry weather conditions.

The drought contingency plan must include a minimum of three drought or emergency response stages providing for the implementation of measures in response to water supply conditions during a repeat of the drought-of-record. – 30 TAC Chapter 288

The drought contingency plan must include specific, quantified targets for water use reductions to be achieved during periods of water shortage and drought. The entity preparing the plan shall establish the targets. The goals established by the entity under this paragraph are not enforceable. – 30 TAC Chapter 288

A minimum of three drought stages is required in this plan. During each stage, it will need to be determined what will trigger initiation, what the water use reduction target goal is, what water management strategies will be put into place, and, finally, what will terminate the stage. Keep in mind that a supplier who is also a customer of its wholesale provider must comply with its provider's Drought Contingency Plan. Do not develop stages or management strategies that are in conflict with your water provider's DCP. Also note that the NETRWPG has developed water management strategies for all providers who are projected to have a water shortage within the planning period (50 years). You should review the latest version of the Regional Water Plan to determine if you have had strategies prepared for you.

Include an opening paragraph in this section that describes what information should be monitored in order to initiate the stages, and a rationale of why you chose the triggering criteria that you chose.

The drought contingency plan must include a provision in every wholesale water contract entered into or renewed after adoption of the plan, including contract extensions, that in case of a shortage of water resulting from drought, the water to be distributed shall be divided in accordance with Texas Water Code, §11.039. – 30 TAC Chapter 288

> Texas Water Code, §11.039 states, "DISTRIBUTION OF WATER DURING SHORTAGE. (a) If a shortage of water in a water supply not covered by a water conservation plan prepared in compliance with Texas Natural Resource Conservation Commission or Texas Water Development Board rules results from drought, accident, or other cause, the water to be distributed shall be divided among all customers pro rata, according to the amount each may be entitled to, so that preference is given to no one and everyone suffers alike. (b) If a shortage of water in a water supply covered by a water conservation plan prepared in compliance with Texas Natural Resource Conservation Commission or Texas Water Development Board rules results from drought, accident, or other cause, the person, association of persons, or corporation owning or controlling the water shall divide the water to be distributed among all customers pro rata, according to: (1) the amount of water to which each customer may be entitled; or (2) the amount of water to which each customer may be entitled, less the amount of water the customer would have saved if the customer had operated its water system in compliance with the water conservation plan.(c) Nothing in Subsection (a) or (b) precludes the person, association of persons, or corporation owning or controlling the water from supplying water to a person who has a prior vested right to the water under the laws of this state.

Stage 1 – Mild Water Shortage

Initiation: The _______________________(name of water supplier) will consider that a mild water shortage exists when___________________________________ (i.e. water levels in the reservoir reach_____; average daily water use reaches ___% of capacity for three consecutive days; water level in elevated storage tank is at or below ____ for more than 12 hours, etc.)***, or when requested by __________*** (entity's water provider) if applicable***.***

Target Goal: When a mild water shortage exists, the ____________________(water supplier) will implement water management strategies in an attempt to reduce daily water use to ___________________________ (i.e. 2 MGD; ___% of average daily water use, etc.) Please note that this goal must be quantifiable. Goals established in this section are not enforceable.

Termination: Stage 1 shall be rescinded when **___________________________** (i.e. water levels in the reservoir rise above **___** for 7 consecutive days; average daily water use falls below ___% of capacity for three consecutive days; storage facilities return to normal levels for 24 consecutive hours, etc.)***, or when Stage I is rescinded by*** **__________________________** (entity's water provider) if applicable**.**

Water Management Strategies: During Stage 1, we will take the following steps to reduce water use:_______________.

The following are examples of strategies that are commonly used during this stage. These are not mandatory, only suggestive. When determining strategies, remember the type of constraint you expect on your system and plan accordingly.

The drought contingency plan must include the specific water supply or water demand management measures to be implemented during each stage of the plan including, but not limited to, the following: (A) pro rata curtailment of water deliveries to or diversions by wholesale water customers as provided in Texas Water Code, §11.039; and (B) utilization of alternative water sources with the prior approval of the executive director as appropriate, e.g. interconnection with another water system, temporary use of a non-municipal water supply, use of reclaimed water for non-potable purposes, etc.). – 30 TAC Chapter 288

- Request voluntary water conservation from all customers
- Recommend that customers initiate Stage 1 of their Drought Contingency Plans
- Reduce operating procedures that use water (i.e. flushing of mains) as appropriate

<u>Stage 2 – Moderate Water Shortage</u>

Initiation: The _______________________(water supplier) will consider that a moderate water shortage exists when_________________________________(i.e. water levels in the reservoir reach_____; average daily water use reaches ___% of capacity for three consecutive days; water level in elevated storage tank is at or below ____ for more than 12 hours, etc.)***, or when requested by __________ (entity's water provider)*** if applicable.

Target Goal: When a moderate water shortage exists, the ____________________(water supplier) will implement water management strategies in an attempt to reduce daily water use to **___________________________** (i.e. 2 MGD; ___% of average daily water use, etc.) Please note that this goal must be quantifiable. Goals established in this section are not enforceable.

Termination: Stage 2 shall be rescinded when **___________________________** (i.e. water levels in the reservoir rise above **___** for 7 consecutive days; average daily water use falls below ___% of capacity for three consecutive days; storage facilities return to normal levels for 24 consecutive hours, etc.)***, or when Stage 2 is rescinded by***

_________________________ (entity's water provider) if applicable. ***Upon termination of Stage 2, Stage 1 becomes operative.***

Water Management Strategies: During Stage 2, we will take the following steps to reduce water use:_______________.

The following are examples of strategies that are commonly used during this stage. These are not mandatory, only suggestive. When determining strategies, remember the type of constraint you expect on your system and plan accordingly.

The drought contingency plan must include the specific water supply or water demand management measures to be implemented during each stage of the plan including, but not limited to, the following: (A) pro rata curtailment of water deliveries to or diversions by wholesale water customers as provided in Texas Water Code, §11.039; and (B) utilization of alternative water sources with the prior approval of the executive director as appropriate, e.g. interconnection with another water system, temporary use of a non-municipal water supply, use of reclaimed water for non-potable purposes, etc.). – 30 TAC Chapter 288

- Recommend that customers initiate Stage 2 of their Drought Contingency Plans, which should, at a minimum, contain lawn watering restrictions
- Modify reservoir operations if applicable
- Initiate strong public awareness campaign in service area to warn of impending shortages

Stage 3 – Severe Water Shortage

Initiation: The _______________________(water supplier) will consider that a severe water shortage exists when___________________________________(i.e. water levels in the reservoir reach_____; average daily water use reaches ___% of capacity for three consecutive days; water level in elevated storage tank is at or below ____ for more than 12 hours, etc.)***, or when requested by __________*** (entity's water provider) if applicable**.**

Target Goal: When a severe water shortage exists, the _____________________(water supplier) will implement water management strategies in an attempt to reduce daily water use to ___________________________ (i.e. 2 MGD; ___% of average daily water use, etc.) Please note that this goal must be quantifiable. Goals established in this section are not enforceable.

Termination: Stage 3 shall be rescinded when ____________________________ (i.e. water levels in the reservoir rise above ___ for 7 consecutive days; average daily water use falls below ___% of capacity for three consecutive days; storage facilities return to normal levels for 24 consecutive hours, etc.)***, or when Stage 3 is rescinded by ___________________________*** (entity's water provider) if applicable***. Upon termination of Stage 3, Stage 2 becomes operative.***

Water Management Strategies: During Stage 3, we will take the following steps to reduce water use:_______________.

The following are examples of strategies that are commonly used during this stage. These are not mandatory, only suggestive. When determining strategies, remember the type of constraint you expect on your system and plan accordingly.

The drought contingency plan must include the specific water supply or water demand management measures to be implemented during each stage of the plan including, but not limited to, the following: (A) pro rata curtailment of water deliveries to or diversions by wholesale water customers as provided in Texas Water Code, §11.039; and (B) utilization of alternative water sources with the prior approval of the executive director as appropriate, e.g. interconnection with another water system, temporary use of a non-municipal water supply, use of reclaimed water for non-potable purposes, etc.). – 30 TAC Chapter 288

- Recommend that customers initiate Stage 3 of their Drought Contingency Plans, which, at a minimum, must include a ban on lawn watering
- Begin pro rata water allocation (Pro rata curtailment of water deliveries to or diversions by wholesale water customers must be considered in a wholesale DCP according to 30 TAC Chapter 288, Subchapter B. Rules for pro rata curtailment are provided in Texas Water Code, §11.039.)
- Implement water rate surcharges (i.e. a set charge for any use above average monthly use)
- Implement price adjustments (i.e. increase the price per 1,000 gallons of water used above the average monthly use)
- Utilize alternate or emergency water sources

<u>Stage 4 – Emergency Water Shortage</u>

This Stage could apply in the instance of a major water line break, a contamination of the water supply source, or other urgent water system conditions. Most likely, this stage would be initiated by decision of the authorized plan implementer (Mayor, President, Manager, etc.)

Initiation: The ______________________(water supplier) will consider that an emergency water shortage exists when__________________________________ (i.e. the water main at the water treatment plant bursts or is otherwise significantly damaged; the reservoir is contaminated by oil spill; etc.,)***, or when requested by __________*** (entity's water provider) if applicable.

Target Goal: When an emergency water shortage exists, the ____________________(water supplier) will implement water management strategies in an attempt to reduce daily water use to ___________________________ (i.e. 2 MGD; ___% of average daily water use, etc.) Please note that this goal must be quantifiable. Goals established in this section are not enforceable.

Termination: Stage 4 shall be rescinded when ___________________________ (i.e. the main at the water treatment plant is restored and storage tanks have been allowed to refill; analysis of the source water indicates that supply is safe to use; etc.), ***or when Stage 4 is rescinded by ___________________________***(entity's water provider) if applicable.

Water Management Strategies: During Stage 4, we will take the following steps to reduce water use:_______________.

The following are examples of strategies that are commonly used during this stage. These are not mandatory, only suggestive. When determining strategies, remember the type of constraint you expect on your system and plan accordingly.

The drought contingency plan must include the specific water supply or water demand management measures to be implemented during each stage of the plan including, but not limited to, the following: (A) pro rata curtailment of water deliveries to or diversions by wholesale water customers as provided in Texas Water Code, §11.039; and (B) utilization of alternative water sources with the prior approval of the executive director as appropriate, e.g. interconnection with another water system, temporary use of a non-municipal water supply, use of reclaimed water for non-potable purposes, etc.). – 30 TAC Chapter 288

- Utilize alternative or emergency water supplies (i.e. tying into a neighboring water system, etc. This may require approval by the TCEQ Executive Director)
- Modify reservoir operations
- Strategies listed in Stage 3

PLAN EXECUTION

Public Involvement

This section should discuss the ways in which the supplier will inform its wholesale customers about the initiation and termination of drought stages, as well as management strategies that customers are expected to follow. Public involvement can be in the form of special public hearings, articles and notices in the local newspaper, radio announcements, announcements on local television stations, notices in billing statements, etc.

The ______________________ (water provider) will keep its customers apprised of initiation of the drought contingency plan, and changes in stages, by means of ___________________________.

Enforcement

The ______________ (Mayor, City Manager, President, etc.), or his/her designee, is responsible for monitoring weather conditions and water supplies, and determining when to initiate and terminate stages of the DCP.

The drought contingency plan must include procedures for the enforcement of any mandatory water use restrictions including specification of penalties (e.g., liquidated damages, water rate surcharges, discontinuation of service) for violations of such restrictions. – 30 TAC Chapter 288, Subchapter B.a.10.

The _______________ (governing body) has adopted this plan through ___________ (ordinance, resolution), and has made it an official _________ (city, Corporation, etc.) policy. The _______________ (ordinance, resolution, etc.) is attached hereto as Figure ___.

Provision for responding to wholesale provider restrictions

Any water supplier that receives all or a portion of its water supply from another water supplier shall consult with that supplier and shall include in the drought contingency plan appropriate provisions for responding to reductions in that water supply. – 30 TAC Chapter 288

If you have a wholesale provider, then add this section. If you own your own supply, please skip this section.

As stated in each water shortage stage, we intend to comply with all requirements of our wholesale provider's drought contingency plan. This plan is as stringent as our provider's plan, and in some cases may be more so.

Notification of TCEQ on mandatory provisions

A wholesale or retail water supplier shall notify the executive director within five business days of the implementation of any mandatory provisions of the drought contingency plan. – 30 TAC Chapter 288

The Executive Director at TCEQ shall be notified with 5 business days if any mandatory provisions of this plan are implemented. The Executive Director can be reached at 512-239-3900.

Variance procedures

The drought contingency plan must include procedures for granting variances to the plan. – 30 TAC Chapter 288

The _____________ (authorized representative) may, in writing, grant temporary variance for existing water uses otherwise prohibited under this Plan if it is determined that failure to grant such variance would cause an emergency condition adversely affecting the health, sanitation, or fire protection for the public or the customer requesting such variance and if one or more of the following conditions are met:

(a) Compliance with this Plan cannot be technically accomplished during the duration of the water supply shortage or other condition for which the Plan is in effect.

(b) Alternative methods can be implemented which will achieve the same level of reduction in water use.

Customers requesting an exemption from the provisions of this Plan shall file a petition for variance with the ______________ (water supplier) within 5 days after the Plan or a particular drought response stage has been invoked. All petitions for variances shall be reviewed by the _________ (authorized representative), and shall include the following:

(a) Name and address of the petitioner(s).
(b) Purpose of water use.
(c) Specific provision(s) of the Plan from which the petitioner is requesting relief.
(d) Detailed statement as to how the specific provision of the Plan adversely affects the petitioner or what damage or harm will occur to the petitioner or others if petitioner complies with this Ordinance.
(e) Description of the relief requested.
(f) Period of time for which the variance is sought.
(g) Alternative water use restrictions or other measures the petitioner is taking or proposes to take to meet the intent of this Plan and the compliance date.
(h) Other pertinent information.

Variances granted by the _______________ (water supplier) shall be subject to the following conditions, unless waived or modified:

(a) Variances granted shall include a timetable for compliance.
(b) Variances granted shall expire when the Plan is no longer in effect, unless the petitioner has failed to meet specified requirements.

No variance shall be retroactive or otherwise justify any violation of this Plan occurring prior to the issuance of the variance.

5-year updates

The retail public water supplier shall review and update, as appropriate, the drought contingency plan, at least every five years, based on new or updated information, such as the adoption or revision of the regional water plan. – 30 TAC Chapter 288

This plan shall be re-evaluated and updated every five years based on updated information; especially the latest adopted NETRWPG Regional Water Plan.

1.2 MODEL DROUGHT CONTINGENCY PLAN – INDUSTRIAL USER (MANUFACTURING AND STEAM ELECTRIC POWER)

RESPONSE TO A DROUGHT EVENT

The drought contingency plan must include a minimum of three drought or emergency response stages providing for the implementation of measures in response to water supply conditions during a repeat of the drought-of-record. – 30 TAC Chapter 288

The drought contingency plan must include specific, quantified targets for water use reductions to be achieved during periods of water shortage and drought. The entity preparing the plan shall establish the targets. The goals established by the entity under this paragraph are not enforceable. – 30 TAC Chapter 288

This model DCP is intended to follow the regional recommendations for industrial users, which includes manufacturing and steam electric power. This recommendation is to monitor drought intensity using the U.S. Drought Monitor website. Drought intensity is updated weekly with a map of Texas shaded with the applicable drought condition.

Category	Description	Possible Impacts	Palmer Drought Index	USGS Weekly Streamflow (Percentiles)
D0	Abnormally Dry	Going into drought: short-term dryness slowing planting, growth of crops or pastures. Coming out of drought: some lingering water deficits; pastures or crops not fully recovered	-1.0 to -1.9	21-30
D1	Moderate Drought	Some damage to crops, pastures; streams, reservoirs, or wells low, some water shortages developing or imminent; voluntary water-use restrictions requested	-2.0 to -2.9	11-20
D2	Severe Drought	Crop or pasture losses likely; water shortages common; water restrictions imposed	-3.0 to -3.9	6-10
D3	Extreme Drought	Major crop/pasture losses; widespread water shortages or restrictions	-4.0 to -4.9	3-5
D4	Exceptional Drought	Exceptional and widespread crop/pasture losses; shortages of water in reservoirs, streams, and wells creating water emergencies	-5.0 or less	0-2

Go to https://droughtmonitor.unl.edu/Maps/MapArchive.aspx
Select "current" "state" and "Texas" from the drop-down menus.

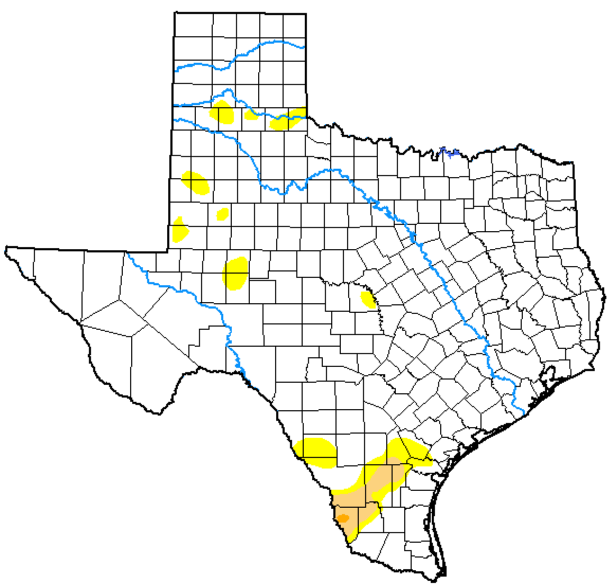
U.S. Drought Monitor

Texas

July 2, 2019

(Released Wednesday, Jul. 3, 2019)

Valid 8 a.m. EDT



Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	94.84	5.16	1.34	0.05	0.00	0.00
Last Week *06-25-2019*	95.84	4.16	1.93	0.23	0.00	0.00
3 Months Ago *04-02-2019*	54.27	45.73	12.20	2.61	0.00	0.00
Start of Calendar Year *01-01-2019*	92.99	7.01	1.32	0.00	0.00	0.00
Start of Water Year *09-25-2018*	57.46	42.54	20.19	7.03	0.96	0.00
One Year Ago *07-03-2018*	17.38	82.62	55.30	24.06	6.84	0.46

Intensity:

- None
- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

Author:
Richard Tinker
CPC/NOAA/NWS/NCEP

droughtmonitor.unl.edu

Once the specific drought intensity is determined using the map, the industrial user is encouraged to voluntarily follow the drought responses recommended by the nearest public water supplier(s) or this plan.

Stage 1 – Mild Water Shortage

The following are examples of strategies that are commonly used during this stage. These are not mandatory, only suggestive.

- Request voluntary water conservation from all customers

Stage 2 – Moderate Water Shortage

Initiation: The groundwater user will consider that a moderate water shortage exists when the local drought stage shown on the weekly Texas map is category D1 - moderate drought.

Termination: Stage 2 shall be rescinded when the local weekly drought category is D0 - abnormally dry.

Water Management Strategies: During Stage 2, we will follow the drought restrictions of local public water supplier(s).

The following are examples of strategies that are commonly used during this stage.

- Request ten percent water conservation

Stage 3 – Severe Water Shortage

Initiation: The groundwater user will consider that a moderate water shortage exists when the local drought stage shown on the weekly Texas map is category D2 - severe drought.

Termination: Stage 3 shall be rescinded when the local weekly drought category is D1 – moderate drought.

Water Management Strategies: During Stage 3, we will follow the drought restrictions of local public water supplier(s).

The following are examples of strategies that are commonly used during this stage. These are not mandatory, only suggestive. When determining strategies, remember the type of constraint you expect on your system and plan accordingly.

- Request twenty percent water conservation
- Utilize alternate or emergency water sources

Stage 4 – Emergency Water Shortage

Initiation: The groundwater user will consider that a moderate water shortage exists when the local drought stage shown on the weekly Texas map is category D3 - extreme drought.

Termination: Stage 4 shall be rescinded when the local weekly drought category is D2 – severe drought.

Water Management Strategies: During Stage 4, we will follow the drought restrictions of local public water supplier(s).

The following are examples of strategies that are commonly used during this stage. These are not mandatory, only suggestive.

- Request thirty percent water conservation
- Utilize alternative or emergency water supplies (i.e. tying into a neighboring water system, etc.

The following worksheet content is from TCEQ industrial conservation plan guidance, and is included For guidance.

WATER USE AND CONSERVATION PRACTICES

Water Use in Industrial Processes

Production Use	*% Groundwater*	*% Surface Water*	*% Saline Water*	*% Treated Water*	*Water Use (in acre-ft)*
Cooling, condensing, & refrigeration	______	______	______	______	______
Processing, washing, transport	______	______	______	______	______
Boiler feed	______	______	______	______	______
Incorporated into product	______	______	______	______	______
Other	______	______	______	______	______

Facility Use	*% Groundwater*	*% Surface Water*	*% Saline Water*	*% Treated Water*	*Water Use (in acre-ft)*
Cooling tower(s)	______	______	______	______	______
Pond(s)	______	______	______	______	______
Once through	______	______	______	______	______
Sanitary & drinking water	______	______	______	______	______
Irrigation & dust control	______	______	______	______	______

1. Was fresh water recirculated at this facility? ☐ Yes ☐ No

2. Provide a detailed description of how the water will be utilized in the industrial process.

3. Estimate the quantity of water consumed in production processes and is therefore unavailable for reuse, discharge, or other means of disposal.

4. Monthly water consumption for previous year (in acre-feet).

Month	*Diversion Amount*	*% of Water Returned (If Any)*	*Monthly Consumption*
January			
February			
March			
April			
May			
June			
July			
August			
September			
October			
November			
December			
Totals			

5. Projected monthly water consumption for next year (in acre-feet).

Month	*Diversion Amount*	*% of Water Returned (If Any)*	*Monthly Consumption*
January			
February			
March			
April			
May			
June			

July			
August			
September			
October			
November			
December			
Totals			

Specific and Quantified Conservation Goal

Water conservation goals for the industrial sector are generally established either for (1) the amount of water recycled, (2) the amount of water reused, or (3) the amount of water not lost or consumed, and therefore is available for return flow.

6. Water conservation goal (water use efficiency measure)

   Type of goal(s):

   % reused water

   % of water not consumed and therefore returned

   Other (specify)

7. Provide specific, quantified 5-year and 10-year targets for water savings and the basis for development of such goals for this water use/facility.

   Quantified 5-year and 10-year targets for water savings:

   a. 5-year goal:

   b. 10-year goal:

8. Describe the device(s) and/or method(s) used to measure and account for the amount of water diverted from the supply source, and verify the accuracy is within plus or minus 5%.

9. Provide a description of the leak-detection and repair, and water-loss accounting measures used.

10. Describe the application of state-of-the-art equipment and/or process modifications used to improve water use efficiency.

11. Describe any other water conservation practice, method, or technique which the user shows to be appropriate for achieving the stated goal or goals of the water conservation plan:

1.2 MODEL DROUGHT CONTINGENCY PLAN – INDUSTRIAL USER (MANUFACTURING AND STEAM ELECTRIC POWER)

RESPONSE TO A DROUGHT EVENT

The drought contingency plan must include a minimum of three drought or emergency response stages providing for the implementation of measures in response to water supply conditions during a repeat of the drought-of-record. – 30 TAC Chapter 288

The drought contingency plan must include specific, quantified targets for water use reductions to be achieved during periods of water shortage and drought. The entity preparing the plan shall establish the targets. The goals established by the entity under this paragraph are not enforceable. – 30 TAC Chapter 288

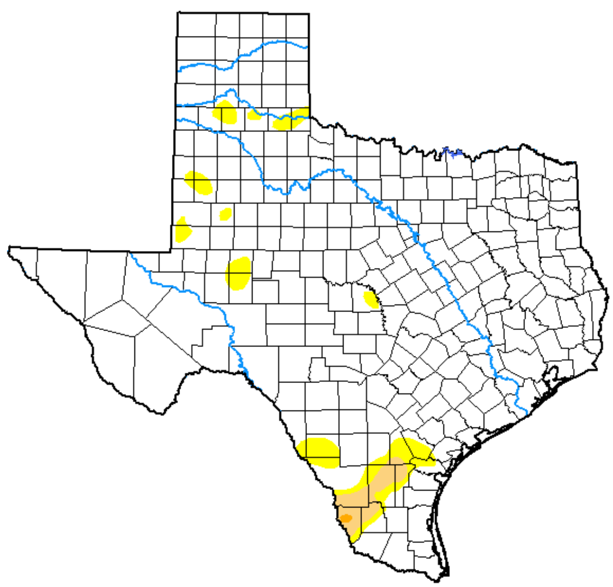
This model DCP is intended to follow the regional recommendations for industrial users, which includes manufacturing and steam electric power. This recommendation is to monitor drought intensity using the U.S. Drought Monitor website. Drought intensity is updated weekly with a map of Texas shaded with the applicable drought condition.

Category	Description	Possible Impacts	Palmer Drought Index	USGS Weekly Streamflow (Percentiles)
D0	Abnormally Dry	Going into drought: short-term dryness slowing planting, growth of crops or pastures. Coming out of drought: some lingering water deficits; pastures or crops not fully recovered	-1.0 to -1.9	21-30
D1	Moderate Drought	Some damage to crops, pastures; streams, reservoirs, or wells low, some water shortages developing or imminent; voluntary water-use restrictions requested	-2.0 to -2.9	11-20
D2	Severe Drought	Crop or pasture losses likely; water shortages common; water restrictions imposed	-3.0 to -3.9	6-10
D3	Extreme Drought	Major crop/pasture losses; widespread water shortages or restrictions	-4.0 to -4.9	3-5
D4	Exceptional Drought	Exceptional and widespread crop/pasture losses; shortages of water in reservoirs, streams, and wells creating water emergencies	-5.0 or less	0-2

Go to https://droughtmonitor.unl.edu/Maps/MapArchive.aspx
Select "current" "state" and "Texas" from the drop-down menus.

U.S. Drought Monitor
Texas

July 2, 2019
(Released Wednesday, Jul. 3, 2019)
Valid 8 a.m. EDT



Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	94.84	5.16	1.34	0.05	0.00	0.00
Last Week 06-25-2019	95.84	4.16	1.93	0.23	0.00	0.00
3 Months Ago 04-02-2019	54.27	45.73	12.20	2.61	0.00	0.00
Start of Calendar Year 01-01-2019	92.99	7.01	1.32	0.00	0.00	0.00
Start of Water Year 09-25-2018	57.46	42.54	20.19	7.03	0.96	0.00
One Year Ago 07-03-2018	17.38	82.62	55.30	24.06	6.84	0.46

Intensity:
None
D0 Abnormally Dry
D1 Moderate Drought
D2 Severe Drought
D3 Extreme Drought
D4 Exceptional Drought

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

Author:
Richard Tinker
CPC/NOAA/NWS/NCEP

USDA NDMC NOAA

droughtmonitor.unl.edu

Once the specific drought intensity is determined using the map, the industrial user is encouraged to voluntarily follow the drought responses recommended by the nearest public water supplier(s) or this plan.

<u>Stage 1 – Mild Water Shortage</u>
The following are examples of strategies that are commonly used during this stage. These are not mandatory, only suggestive.

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Termination: Stage 2 shall be rescinded when the local weekly drought category is D0 - abnormally dry.

Water Management Strategies: During Stage 2, we will follow the drought restrictions of local public water supplier(s).

The following are examples of strategies that are commonly used during this stage.

- Request ten percent water conservation

Stage 3 – Severe Water Shortage

Initiation: The groundwater user will consider that a moderate water shortage exists when the local drought stage shown on the weekly Texas map is category D2 - severe drought.

Termination: Stage 3 shall be rescinded when the local weekly drought category is D1 – moderate drought.

Water Management Strategies: During Stage 3, we will follow the drought restrictions of local public water supplier(s).

The following are examples of strategies that are commonly used during this stage. These are not mandatory, only suggestive. When determining strategies, remember the type of constraint you expect on your system and plan accordingly.

- Request twenty percent water conservation
- Utilize alternate or emergency water sources

Stage 4 – Emergency Water Shortage

Initiation: The groundwater user will consider that a moderate water shortage exists when the local drought stage shown on the weekly Texas map is category D3 - extreme drought.

Termination: Stage 4 shall be rescinded when the local weekly drought category is D2 – severe drought.

Water Management Strategies: During Stage 4, we will follow the drought restrictions of local public water supplier(s).

The following are examples of strategies that are commonly used during this stage. These are not mandatory, only suggestive.

- Request thirty percent water conservation
- Utilize alternative or emergency water supplies (i.e. tying into a neighboring water system, etc.

The following worksheet content is from TCEQ industrial conservation plan guidance, and is included For guidance.

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Boiler feed					
Incorporated into product					
Other					

Facility Use	*% Groundwater*	*% Surface Water*	*% Saline Water*	*% Treated Water*	*Water Use (in acre-ft)*
Cooling tower(s)					
Pond(s)					
Once through					
Sanitary & drinking water					
Irrigation & dust control					

1. Was fresh water recirculated at this facility? ☐ Yes ☐ No

2. Provide a detailed description of how the water will be utilized in the industrial process.

3. Estimate the quantity of water consumed in production processes and is therefore unavailable for reuse, discharge, or other means of disposal.

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Month	*Diversion Amount*	*% of Water Returned (If Any)*	*Monthly Consumption*
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February			
March			
April			
May			
June			
July			
August			
September			
October			
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Totals			

5. Projected monthly water consumption for next year (in acre-feet).

Month	*Diversion Amount*	*% of Water Returned (If Any)*	*Monthly Consumption*
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   Type of goal(s):

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7. Provide specific, quantified 5-year and 10-year targets for water savings and the basis for development of such goals for this water use/facility.

   Quantified 5-year and 10-year targets for water savings:

   a. 5-year goal:

   b. 10-year goal:

8. Describe the device(s) and/or method(s) used to measure and account for the amount of water diverted from the supply source, and verify the accuracy is within plus or minus 5%.

9. Provide a description of the leak-detection and repair, and water-loss accounting measures used.

10. Describe the application of state-of-the-art equipment and/or process modifications used to improve water use efficiency.

11. Describe any other water conservation practice, method, or technique which the user shows to be appropriate for achieving the stated goal or goals of the water conservation plan:

Appendix C8 – Chapter 8:

UNIQUE STREAM SEGMENTS, RESERVOIR SITES, AND LEGISLATIVE RECOMMENDATIONS

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APPENDIX C8

The 2011 Regional Water Plan reports of Ecologically Unique Stream Segments are included herein for use in the 2021 Regional Water Plan.

TABLE OF CONTENTS

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Description for Designation of Pecan Bayou as an Ecologically Unique Stream Segment

Pecan Bayou originates two miles south of Woodland in northwestern Red River County, flows generally east forty miles to join the Red River approximately one mile west of the Bowie County line (Texas Historical Association, 2009). The site, including bottomland forest, encompasses approximately 613,462 acres (fig.1). It represents one of the largest undammed watersheds in northeast Texas; and supports multiple large examples of mature bottomland hardwood forest, and rare and endangered species (Zwartjes, et al, 2000).

1) **Biological function**: Extensive bottomland hardwood forest supporting multiple occurrences of rare plant life, including:
    - Arkansas meadowrue (*Thalictrum arkansanum* G2QS1) (Sanders, 1994)
    - Southern lady's slipper orchid (*Cypripedium kentuckiense* G3S1) (Sanders, 1994)
    - Old growth Shortleaf Pine-Oak forest (*Pinus echinata-Quercus sp*. G4S4) (Sanders, 1994)
    - Water oak-Willow oak association (*Quercus nigra-Q. phellos* G4S3) (Sanders, 1994)

2) **Hydrologic function**: Represents one of the largest undammed watersheds in northeast Texas, natural hydrologic regime is assumed intact. Flood attenuation, flow stabilization and impacts on groundwater recharge have not been quantified.
3) **Riparian conservation areas:** No public conservation areas however significant private conservation area[1].
4) **High water quality/exceptional aquatic life**: Insufficient data
5) **Threatened and endangered species**:
    - American Burying Beetle (*Nicrophorus americanus* G2 Federally listed Endangered) (Godwin, 2005)
    - Black Bear (*Ursus americanus* G5 State Threatened, ssp. *luteolus* Federally listed Threatened) (Garner, personal communication, 2007)
    - Timber Rattlesnake (*Crotalus horridus* G4 State Threatened*)*

[1]The Nature Conservancy, Texas Chapter, owns 1334 acres within a 6,960-acre site protecting examples of the preceding conservation elements although they are extensive within the watershed. The preserve, Lennox Woods, is located approximately 1.5 miles south of the community of Negley. The land protects an approximate 2.6 mile segment of Pecan Bayou.

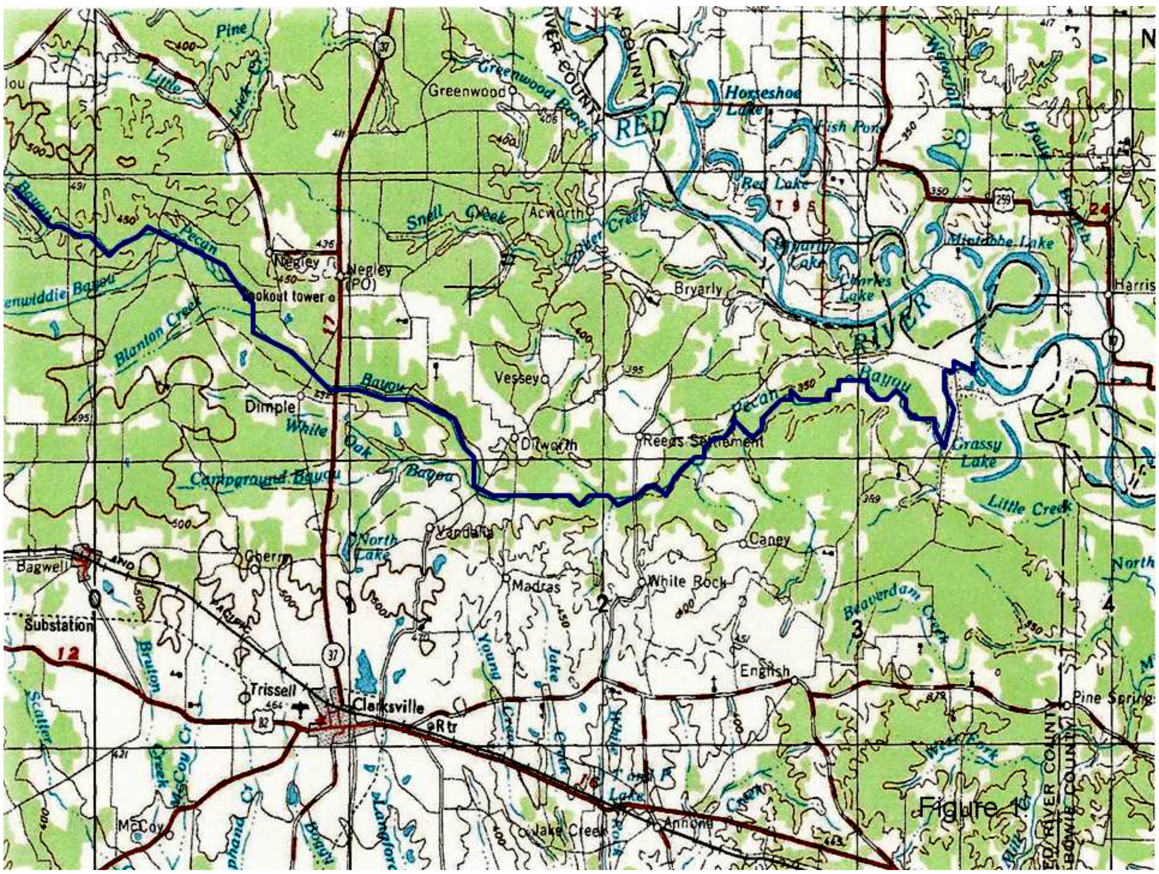
Garner, Nathan. 2007. Personal communication regarding black bear presence within the Pecan Bayou area.

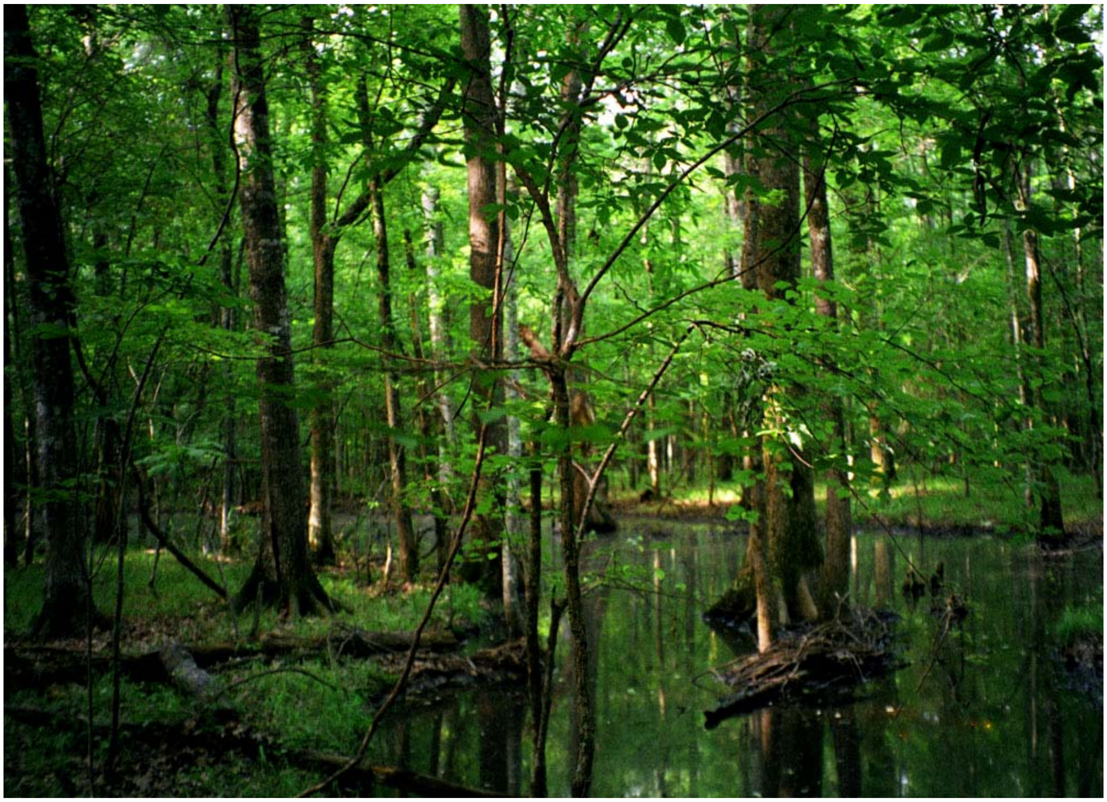
Godwin, Will 2005. Internal report to The Nature Conservancy

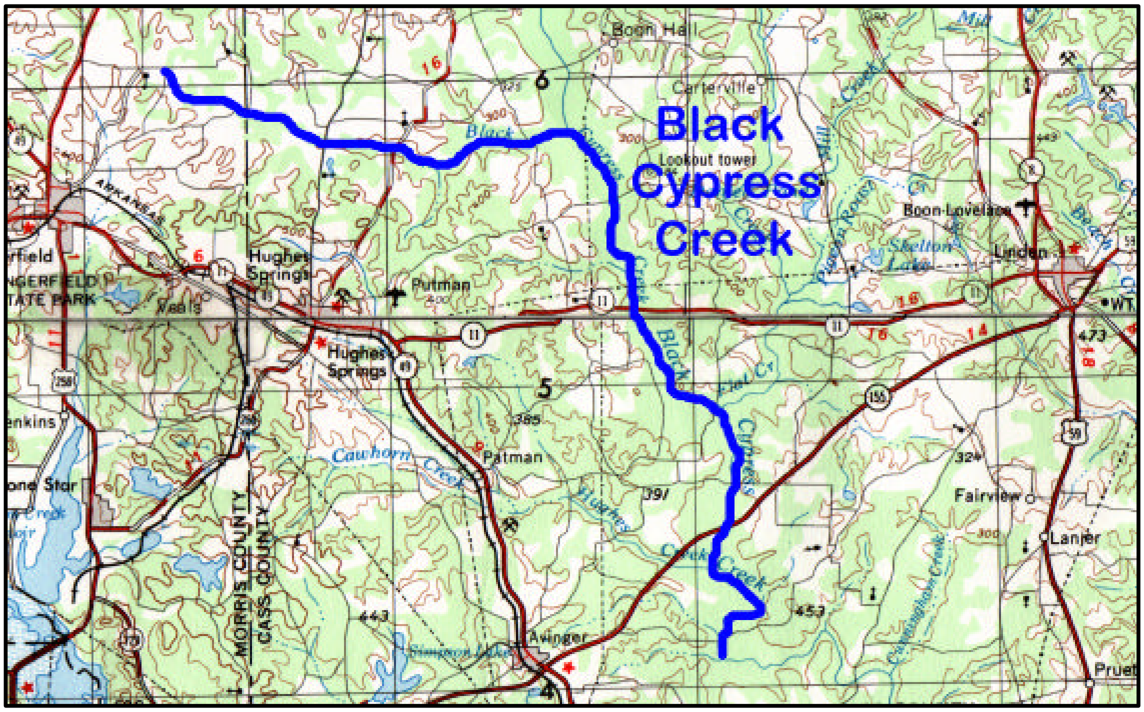
Handbook of Texas Online, s.v. ",” http://www.tshaonline.org/handbook/online/articles/PP/rhp4.html

Sanders. R.W. 1994. Vegetational Survey: Lennox Woods Preserve, Red River County, Texas. Unpublished report prepared for The Nature Conservancy of Texas. Botanical Research Institute of Texas. Ft. Worth, Texas

Zwartjes, Michelle, Eidson, James and Kristen Terpening, 2000. Conservation Plan for the Pecan Bayou Megasite. Report to The Nature Conservancy, Texas Chapter.







Adapted from USGS Tyler, Texas. Original Scale 1: 250,000.

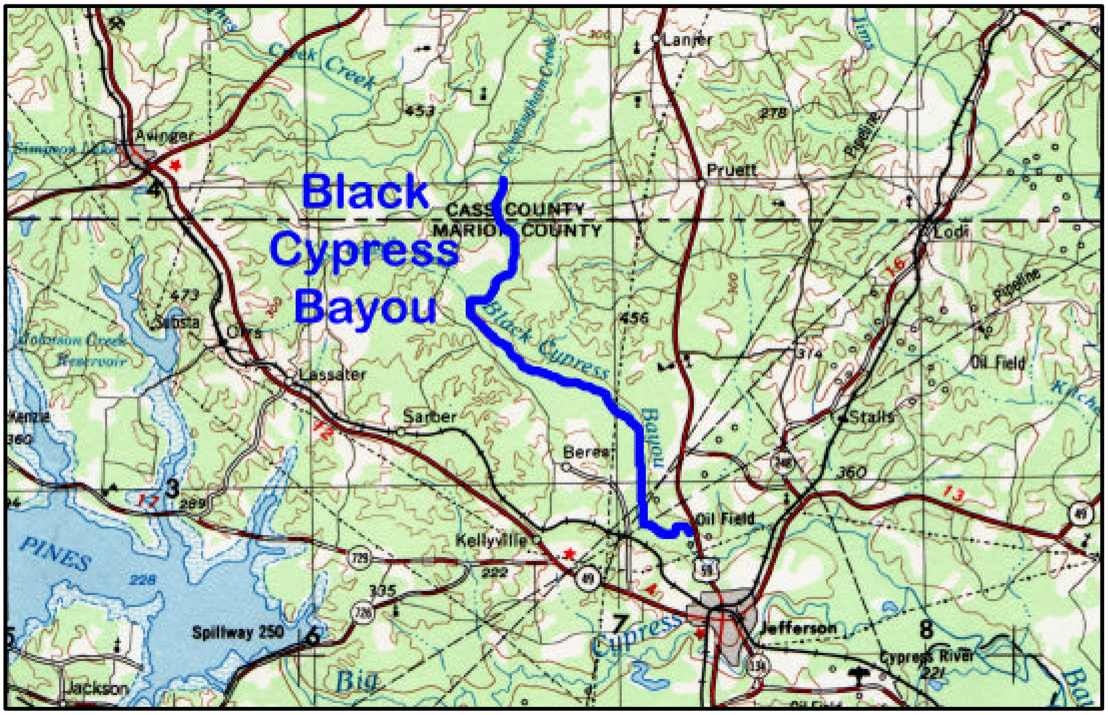
Figure 6. Map Location of Black Cypress Creek

Figure 7. Black Cypress Creek east of CR 1617

Black Cypress Creek

Black Cypress Creek begins northeast of Daingerfield in eastern Morris County and flows southeasterly about 20 miles where it becomes Black Cypress Bayou east of Avinger in southern Cass County. It has a very favorable hydrologic regime, as there are no reservoirs upstream, thus the creek floods frequently and has numerous tributaries and sloughs. The stream channel meanders extensively over a substrate that is comprised predominately of clay and decaying organic matter (Bayer et al., 1992). The lower portion of the creek is within a 12,800-acre area identified by the USFWS as containing priority bottomland hardwood. This area is very diverse with a mix of high quality water oak, willow oak, overcup oak, and red oak mixed with sweetgum, black gum, river birch, ironwood, and mayhaw, as well as several significant cypress stands (USFWS, 1985). This habitat has high species value to white-tail deer, American alligators, furbearers, squirrels, waterfowl, turkeys, raptors, colonial waterbirds, and other migratory birds (USFWS, 1985). Abundant vegetation also provides instream cover in the form of woody debris and overhanging vegetation that helps the creek support a diverse assemblage of fish and benthic macroinvertebrates. Fish species collected from Black Cypress Creek in August of 1989 include several shiner species, pugnose minnow, bullhead minnow, tadpole madtom, pirate perch, western mosquitofish, flier, largemouth bass, several darter species (slough, cypress, redfin, dusky), and several sunfish species (Bayer et al., 1992). The candidate segment is from the confluence with Black Cypress Bayou east of Avinger in South Cass County upstream to its headwaters located four miles northeast of Daingerfield in eastern Morris County.

(1) Biological Function- priority bottomland hardwood habitat displays significant overall habitat value (USFWS, 1985).
(2) Hydrologic Function- bottomland hardwood forest and associated wetlands perform valuable hydrologic function relating to water quality.
(3) Riparian Conservation Area- none identified.
(4) High Water Quality/Exceptional Aquatic Life/High Aesthetic Value- designated as a South Central Plains Ecoregion Stream by the TPWD River Studies Program due to diversity of benthic macroinvertebrates and fish (Bayer et al., 1992; Linam et al., in review).
(5) Threatened or Endangered Species/Unique Communities- none identified.



Adapted from USGS Tyler, Texas. Original Scale 1: 250,000.

Figure 8. Map Location of Black Cypress Bayou

Figure 9. Black Cypress Bayou south of CC Bridge Road

Black Cypress Bayou

Black Cypress Bayou begins at the confluence with Black Cypress Creek east of Avinger in southern Cass County and flows southeasterly about 20 miles where it empties into Big Cypress Bayou in Marion County. The upper reach of the bayou is within the same 12,800-acre area of priority bottomland hardwoods as Black Cypress Creek, thus it supports the same diverse mix of oak, sweetgum, black gum, river birch, ironwood, mayhaw, and cypress. Also like Black Cypress Creek, the bayou has high species value to white-tail deer, waterfowl, furbearers, American alligators, squirrels, turkeys, raptors, colonial waterbirds, and other migratory birds (USFWS, 1985). This section of the bayou, like much of the Big Cypress Bayou Basin, is within the target recovery area set by the TPWD for the state threatened paddlefish (Pitman, 1992). The candidate segment is from the confluence with Big Cypress Bayou in south central Marion County upstream to the confluence with Black Cypress Creek east of Avinger in south Cass County.

(1) Biological Function- priority bottomland hardwood forest displays significant overall habitat value (USFWS, 1985).
(2) Hydrologic Function- bottomland forest and associated wetlands provide valuable hydrologic function relating to water quality.
(3) Riparian Conservation Area- none identified.
(4) High Water Quality/Exceptional Aquatic Life/High Aesthetic Value- insufficient data to evaluate criteria.
(5) Threatened or Endangered Species/Unique Communities- significant due to presence of state threatened paddlefish (TPWD, 1998b).

ANDREWS KURTH LLP ATTORNEYS

1717 Main Street, Suite 3700
Dallas, Texas 75201
214.659.4400 Phone
214.659.4401 Fax
andrewskurth.com

Austin
Beijing
Dallas
Houston
London
New York
The Woodlands
Washington, DC

Memorandum

To: Jim Eidson

From: John Dugdale

Date: December 28, 2009

Subject: Legal Aspects of Recommendations by Regional Water Planning Groups to Designate Texas Stream Segment Designations as Having Unique Ecological Values and of Potentially-Associated Impacts of Such Designation

You have posed several questions regarding the impact of a Regional Water Planning Group's recommendation, ultimately to the Texas Water Development Board, to designate, in an adopted regional water plan, river and stream segments as having unique ecological values.

Background:

The statutory authority for the Texas Legislature to designate a river or stream segment of unique ecological value is Texas Water Code, Sections 16.051(e) and (f)[1] (emphasis added - full

[1] Sec. 16.051. STATE WATER PLAN: DROUGHT, CONSERVATION, DEVELOPMENT, AND MANAGEMENT; EFFECT OF PLAN. (a) Not later than January 5, 2002, and before the end of each successive five-year period after that date, the board shall prepare, develop, formulate, and adopt a comprehensive state water plan that incorporates the regional water plans approved under Section 16.053. The state water plan shall provide for the orderly development, management, and conservation of water resources and preparation for and response to drought conditions, in order that sufficient water will be available at a reasonable cost to ensure public health, safety, and welfare; further economic development; and protect the agricultural and natural resources of the entire state.
(b) The state water plan, as formally adopted by the board, shall be a guide to state water policy. The commission shall take the plan into consideration in matters coming before it.
(c) The board by rule shall define and designate river basins and watersheds.
(d) The board, in coordination with the commission, the Department of Agriculture, and the Parks and Wildlife Department, shall adopt by rule guidance principles for the state water plan which reflect the public interest of the entire state. When adopting guidance principles, due consideration shall be given to the construction and improvement of surface water resources and the application of principles that result in voluntary redistribution of water resources. The board shall review and update the guidance principles, with input from the commission, the Department of Agriculture, and the Parks and Wildlife Department, as necessary but at least every five years to coincide with the five-year cycle for adoption of a new water plan as described in Subsection (a).
(e) On adoption the board shall deliver the state water plan to the governor, the lieutenant governor, and the speaker of the house of representatives and present the plan for review to the appropriate legislative committees. The plan shall include legislative recommendations that the board believes are needed and desirable to facilitate more voluntary water transfers. The plan shall identify river and stream segments of unique ecological value and sites of unique value for the construction of reservoirs that the board recommends for protection under this section.
(f) The legislature may designate a river or stream segment of unique ecological value. This designation solely means that a state agency or political subdivision of the state may not finance the actual construction of a reservoir in a specific river or stream segment designated by the legislature under this subsection.

text of Section 16.051 included in Footnote 1 for context). The Legislature has delegated the authority for the designation of such stream segments to Regional Water Planning Groups; the regulations that define how a Regional Water Planning Group is to make such a recommendation to the Texas Water Development Board are found at 31 TAC § 357.8, Ecologically Unique River and Stream Segments[2] (emphasis added).

(g) The legislature may designate a site of unique value for the construction of a reservoir. A state agency or political subdivision of the state may not obtain a fee title or an easement that would significantly prevent the construction of a reservoir on a site designated by the legislature under this subsection.
(g-1) Notwithstanding any other provisions of law, a site is considered to be a designated site of unique value for the construction of a reservoir if the site is recommended for designation in the 2007 state water plan adopted by the board and in effect on May 1, 2007. The designation of a unique reservoir site under this subsection terminates on September 1, 2015, unless there is an affirmative vote by a proposed project sponsor to make expenditures necessary in order to construct or file applications for permits required in connection with the construction of the reservoir under federal or state law.
(h) The board, the commission, or the Parks and Wildlife Department or a political subdivision affected by an action taken in violation of Subsection (f) or (g) may bring a cause of action to remedy or prevent the violation. A cause of action brought under this subsection must be filed in a district court in Travis County or in the county in which the action is proposed or occurring.
(i) For purposes of this section, the acquisition of fee title or an easement by a political subdivision for the purpose of providing retail public utility service to property in the reservoir site or allowing an owner of property in the reservoir site to improve or develop the property may not be considered a significant impairment that prevents the construction of a reservoir site under Subsection (g). A fee title or easement acquired under this subsection may not be considered the basis for preventing the future acquisition of land needed to construct a reservoir on a designated site.

[2] 31 TAC § 357.8(a): Regional Water Planning Groups may include in adopted regional water plans recommendations for all or parts of river and stream segments of unique ecological value located within the regional water planning area by preparing a recommendation package consisting of a physical description giving the location of the stream segment, maps, and photographs of the stream segment and a site characterization of the stream segment documented by supporting literature and data. The recommendation package shall address each of the criteria for designation of river and stream segments of ecological value found in subsection (b) of this section. <u>The regional water planning group shall forward the recommendation package to the Texas Parks and Wildlife Department and allow the Texas Parks and Wildlife Department 30 days for its written evaluation of the recommendation</u>. The adopted regional water plan shall include, if available, Texas Parks and Wildlife Department's written evaluation of each river and stream segment recommended as a river or stream segment of unique ecological value.
(b) A regional water planning group may recommend a river or stream segment as being of unique ecological value based upon the following criteria:
(1) biological function--stream segments which display significant overall habitat value including both quantity and quality considering the degree of biodiversity, age, and uniqueness observed and including terrestrial, wetland, aquatic, or estuarine habitats;
(2) hydrologic function--stream segments which are fringed by habitats that perform valuable hydrologic functions relating to water quality, flood attenuation, flow stabilization, or groundwater recharge and discharge;
(3) riparian conservation areas--stream segments which are fringed by significant areas in public ownership including state and federal refuges, wildlife management areas, preserves, parks, mitigation areas, or other areas held by governmental organizations for conservation purposes, or stream segments which are fringed by other areas managed for conservation purposes under a governmentally approved conservation plan;
(4) high water quality/exceptional aquatic life/high aesthetic value--stream segments and spring resources that are significant due to unique or critical habitats and exceptional aquatic life uses dependent on or associated with high water quality; or

The three questions your posed are:

1. What impact may the mere designation as an ecologically unique stream segment pursuant to TX Water Code § 16.051(f) have on the riparian rights of a landowner whose property is adjacent to a stream segment designated as such by the Legislature?

2. Could subsequent legislation that, unlike the current scheme, imposes restrictions on the development and usage rights of such a landowner, retroactively impact a pre-existing ecologically unique stream segment designation?

3. Is there a link between the designation of a stream segment an ecologically unique stream segment and value and the potential designation of that stream segment as a Wild and Scenic River pursuant to the Wild and Scenic Rivers Act (the "Act"), 16 U.S.C. § 1271 *et seq*.

Responses:

1. No impact - please note that this response presupposes only that the State Water Board has adopted the designation in the State Water Plan. *See* TX Water Code § 16.051(b):

   TX Water Code § 16.051(f) unambiguously states:

   > The legislature may designate a river or stream segment of unique ecological value. This designation solely means that a state agency or political subdivision of the state may not finance the actual construction of a reservoir in a specific river or stream segment designated by the legislature under this subsection.

   Notwithstanding the response stated *supra*, the legislative history for the companion provision of TX Water Code § 16.051(g), which relates to the designation of a site having unique attributes to the construction of a reservoir, The Bill Analysis of SB 3 indicates that the Legislature considered for the interference with private landowners' property rights in violation of Section 17 of the Texas Constitution:

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(5) threatened or endangered species/unique communities--sites along streams where water development projects would have significant detrimental effects on state or federally listed threatened and endangered species, and sites along streams significant due to the presence of unique, exemplary, or unusually extensive natural communities.
(c) For every river and stream segment that has been designated as a unique river or stream segment by the legislature, during a session that ends not less than one year before the required date of submittal of an adopted regional water plan to the board, or recommended as a unique river or stream segment in the regional water plan, the regional water planning group shall assess the impact of the regional water plan on these segments. The assessment shall be a quantitative analysis of the impact of the plan on the flows important to the river or stream segment, as determined by the regional water planning group, comparing current conditions to conditions with implementation of all recommended water management strategies. The assessment shall also describe the impact of the plan on the unique features cited in the region's recommendation of that segment.

A cause of action could be bought under certain circumstances. Before bringing a cause of action against a state agency or other political subdivision that had taken an action preventing the construction of a reservoir on a designated reservoir site, a political subdivision would have to file a letter of intent to construct a reservoir on the site affected by the action and offer to pay each owner of real property in the reservoir site an encumbrance. An owner of real property could reject the encumbrance The payment would have to be paid annually until the property was either acquired for the reservoir or no longer in the reservoir site. The amount would have to be at least 2.5 times the total ad valorem taxes imposed in the preceding year…

Reservoir designation. CSSB 3 needlessly would cloud the title of landowners within a designated reservoir site, because the threat of a future reservoir negatively would affect their property value. Supporters of reservoir designation point out that many of these reservoirs may never be built. However, the cloud would remain on the title to property in a designated site from the moment the bill [for the reservoir designation] was enacted. It would be unfair to make this designation without providing immediate funds to offset the loss in value that landowners would see. Without such compensation, the state in effect would be taking private property rights without compensation.

2. No:

Pursuant to Article 1, Section 16, of the Texas Constitution, the Texas Legislature may not enact an *ex post facto* or retroactive law.

In addition, pursuant to Article 1, Section 17, of the Texas Constitution, "no person's property shall be taken, damaged, or destroyed for or applied to public use without adequate compensation being made, unless by the consent of such person…"

However, there is no constitutional prohibition against a change in law that could void an existing riparian landuse scheme and impose new restrictions (which new restrictions, of course, could be subject to challenge).

3. Possibly.

Pursuant to Section 2(a)(ii) of the Act, 16 U.S.C. § 1272(a)(ii), a condition precedent for the Secretary of the Interior to designate, through a notice and comment rulemaking, a river or stream as a Wild and Scenic River, the Secretary must receive such a request from the governor of the state or states where the river or stream is located.[3]

[3] In pertinent part, Section 2(a)(ii) of the Act states: [The national and scenic rivers system shall comprise rivers]… that are designated as wild, scenic or recreational rivers by or pursuant to an act of the legislature

Among the determinations the Department of Interior ("DOI") must make in that process is whether there are sufficient local, state, and federal mechanisms already in place to protect the river or stream in question, and whether the state in question has the ability to implement those mechanisms.

Thus, the designation by the Texas Legislature, pursuant to TX Water Code TX Water Code § 16.051(e), of a river or stream as an ecologically unique stream segment would be a condition precedent for such a river or stream's candidacy for designation as a Wild and Scenic River. That segment's designation by the Texas Legislation would necessarily follow the recommendation of a regional water planning group in a regional water plan to nominate that segment as a unique river or stream segment. *See* 31 TAC § 357.8.

Finally, we had also discussed potential concerns of individual liability exposure of members of regional planning groups for acts conducted in their capacity as a member of such a group.

TX Water Code § 16.053(m) - (o) provide the following:

(m) A cause of action does not accrue against a regional water planning group, a representative who serves on the regional water planning group, or an employee of a political subdivision that contracts with the regional water planning group under Subsection (l) for an act or omission in the course and scope of the person's work relating to the regional water planning group.

(n) A regional water planning group, a representative who serves on the regional water planning group, or an employee of a political subdivision that contracts with the regional water planning group under Subsection (l) is not liable for damages that may arise from an act or omission in the course and scope of the person's work relating to the regional water planning group.

(o) The attorney general, on request, shall represent a regional water planning group, a representative who serves on the regional water planning group, or an employee of a political subdivision that contracts with the regional water planning group under Subsection (l) in a suit arising from an act or omission relating to the regional water planning group.

Please do not hesitate to call me to discuss this memorandum.

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of the State or States through which they flow, that are to be permanently administered as weld, scenic, or recreational rivers by an agency or political subdivision of the State or States concerned, that are found by the Secretary of the Interior, upon application of the Governor of the State or the Governors of the States concerned, or a person or persons thereunto duly appointed by him or them, to meet the criteria established in this Act and such critical supplementary thereto as he may prescribe, and that are approved by him for inclusion in the system.

cc: David Bezanson, TNC

Appendix C9 – Chapter 9:
INFRASTRUCTURE FINANCING

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APPENDIX C9

Completed documentation from the Infrastructure Financing survey are included herein.

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Infrastructure Financing Survey Report

Project Sponsor Name:	B H P WSC
Primary Planning Region:	D

Contact Information:

Name:	Shelly Webb
Phone Number:	972-636-2154
Email:	
Comments:	Interview by Phone

As part of the state water planning process, regional water planning groups recommend water supply projects for each of their respective regions. The Texas Water Development Board (TWDB) has several funding programs for water projects that support the planning, design, and construction of water supply projects with several financing options including low-interest loans and deferral of principal and interest. Texas Water Code Section 16.053 (q) requires the regional water planning groups to examine the financing needed to implement the water management strategies and projects recommended in their regional plan.

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Water Management Strategy-Project Name:	B H P WSC - DIRECT CONNECTION TO NTWMD	**Project Total Capital Cost:**	$ 3,108,000
1) Planning, Design, Permitting & Acquisition Funding	Amount: $	Year Needed:	
2) Construction Funding	Amount: $	Year Needed:	
Total Anticipated State Funding Assistance:	$ *sum above*		
3) Percent State Participation in Owning Excess Capacity		State Ownership:	%

Implemented new contract directly with NTMWD, obtaining funding from USDA. Does not intend to secure TWDB funding.

Project Sponsor Name:	CADDO BASIN SUD
Primary Planning Region:	D

Contact Information:

Name:	Kevin Wendland
Phone Number:	903-527-3504
Email:	
Comments:	No response

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Water Management Strategy-Project Name:	CONSERVATION, WATER LOSS CONTROL - CADDO BASIN SUD	**Project Total Capital Cost:**	$ 5,095
1) Planning, Design, Permitting & Acquisition Funding	Amount: $	Year Needed:	
2) Construction Funding	Amount: $	Year Needed:	
Total Anticipated State Funding Assistance:	$ *sum above*		
3) Percent State Participation in Owning Excess Capacity		State Ownership:	%

Project Sponsor Name:	CANTON
Primary Planning Region:	D

Contact Information:

Name:	Lonny Cluck
Phone Number:	903-567-2826
Email:	lcluck@cantontex.com
Comments:	Written response received.

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Water Management Strategy-Project Name:	CANTON INDIRECT REUSE	**Project Total Capital Cost:**	~~$ 8,381,000~~ $2,500,000
1) Planning, Design, Permitting & Acquisition Funding	Amount: $ $500,000	Year Needed:	2021
2) Construction Funding	Amount: $ $2.0 Million	Year Needed:	2022
Total Anticipated State Funding Assistance:	$ $2.5 Million *sum above*		
3) Percent State Participation in Owning Excess Capacity		State Ownership:	0 %

Water Management Strategy-Project Name:	DRILL NEW WELLS (CANTON, CARRIZO-WILCOX, SABINE)	**Project Total Capital Cost:**	$ 716,000
1) Planning, Design, Permitting & Acquisition Funding	Amount: $ 0	Year Needed:	
2) Construction Funding	Amount: $ 0	Year Needed:	
Total Anticipated State Funding Assistance:	$ 0 *sum above*		
3) Percent State Participation in Owning Excess Capacity		State Ownership:	%

Project Total Capital Cost $47,676,000

Alternative WMS: Canton Grand Saline Reservoir

1) Planning, Design, Permitting & Acquisition Funding $15.5 Million Year Needed: 2025

2) Construction Funding $32.2 Million Year Needed: 2035

Total Anticipated State Funding Assistance $47.2 Million

3) Percent State Participation in Owning Excess Capacity State Ownership: 90%

Project Sponsor Name:	CASH SUD
Primary Planning Region:	D

Contact Information:

Name:	Clay Hodges
Phone Number:	903-883-2695
Email:	chodges@cashwater.org
Comments:	Written response and Phone interview, not seeking funding.

As part of the state water planning process, regional water planning groups recommend water supply projects for each of their respective regions. The Texas Water Development Board (TWDB) has several funding programs for water projects that support the planning, design, and construction of water supply projects with several financing options including low-interest loans and deferral of principal and interest. Texas Water Code Section 16.053 (q) requires the regional water planning groups to examine the financing needed to implement the water management strategies and projects recommended in their regional plan.

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Water Management Strategy-Project Name:	CASH WSC - ADDITIONAL DELIVERY INFRASTRUCTURE FROM NTMWD	**Project Total Capital Cost:**	$ 7,888,000
1) Planning, Design, Permitting & Acquisition Funding	Amount: $	Year Needed:	
2) Construction Funding	Amount: $	Year Needed:	
Total Anticipated State Funding Assistance:	$ *sum above*		
3) Percent State Participation in Owning Excess Capacity		State Ownership:	%

Water Management Strategy-Project Name:	CONSERVATION, WATER LOSS CONTROL - CASH SUD	**Project Total Capital Cost:**	$ 2,304
1) Planning, Design, Permitting & Acquisition Funding	Amount: $	Year Needed:	
2) Construction Funding	Amount: $	Year Needed:	
Total Anticipated State Funding Assistance:	$ *sum above*		
3) Percent State Participation in Owning Excess Capacity		State Ownership:	%

Project Sponsor Name:	CELESTE
Primary Planning Region:	D

Contact Information:

Name:	Jenoa Lipsey
Phone Number:	903-568-4512
Email:	cityofceleste@yahoo.com
Comments:	Written & Phone interview

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Water Management Strategy-Project Name:	DRILL NEW WELLS (CELESTE, WOODBINE, TRINITY, 2020)	**Project Total Capital Cost:**	$ 694,000
1) Planning, Design, Permitting & Acquisition Funding	Amount: $ 140,000	Year Needed:	
2) Construction Funding	Amount: $ 554,000	Year Needed:	
Total Anticipated State Funding Assistance:	$ 694,000 *sum above*		
3) Percent State Participation in Owning Excess Capacity		State Ownership:	%

Water Management Strategy-Project Name:	DRILL NEW WELLS (CELESTE, WOODBINE, TRINITY, 2040)	**Project Total Capital Cost:**	$ 509,000
1) Planning, Design, Permitting & Acquisition Funding	Amount: $ 102,000	Year Needed:	
2) Construction Funding	Amount: $ 407,000	Year Needed:	
Total Anticipated State Funding Assistance:	$ 509,000 *sum above*		
3) Percent State Participation in Owning Excess Capacity		State Ownership:	%

Water Management Strategy-Project Name:	DRILL NEW WELLS (CELESTE, WOODBINE, TRINITY, 2060)	**Project Total Capital Cost:**	$ 509,000
1) Planning, Design, Permitting & Acquisition Funding	Amount: $ 102,000	Year Needed:	
2) Construction Funding	Amount: $ 407,000	Year Needed:	
Total Anticipated State Funding Assistance:	$ 509,000 *sum above*		
3) Percent State Participation in Owning Excess Capacity		State Ownership:	%

Water Management Strategy-Project Name:	NEW CONTRACT WITH GREENVILLE AND PIPELINE TO CELESTE	**Project Total Capital Cost:**	$ 3,314,000
1) Planning, Design, Permitting & Acquisition Funding	Amount: $ 650,000	Year Needed:	
2) Construction Funding	Amount: $ 2,692,000	Year Needed:	
Total Anticipated State Funding Assistance:	$ 3,314,000 *sum above*		
3) Percent State Participation in Owning Excess Capacity		State Ownership:	%

Project Sponsor Name:	CLARKSVILLE
Primary Planning Region:	D

Contact Information:

Name:	Julie Arrington
Phone Number:	903-427-3834
Email:	citymanager@suddenlinkmail.com
Comments:	Phone interview, getting a new well, secured USDA grant, refurbing tower and distribution system, does not intend to seek funding from TWDB.

As part of the state water planning process, regional water planning groups recommend water supply projects for each of their respective regions. The Texas Water Development Board (TWDB) has several funding programs for water projects that support the planning, design, and construction of water supply projects with several financing options including low-interest loans and deferral of principal and interest. Texas Water Code Section 16.053 (q) requires the regional water planning groups to examine the financing needed to implement the water management strategies and projects recommended in their regional plan.

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Water Management Strategy-Project Name:	CONTRACT WITH TEXARKANA AND TREATED WATER PIPELINE TO DEKALB (CLARKSVILLE, SULPHUR)	**Project Total Capital Cost:**	$ 11,702,000
1) Planning, Design, Permitting & Acquisition Funding	Amount: $	Year Needed:	
2) Construction Funding	Amount: $	Year Needed:	
Total Anticipated State Funding Assistance:	$ *sum above*		
3) Percent State Participation in Owning Excess Capacity		State Ownership:	%

Project Sponsor Name:	COUNTY-OTHER, CASS
Primary Planning Region:	D

Contact Information:

Name:	
Phone Number:	
Email:	
Comments:	

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Water Management Strategy-Project Name:	DRILL NEW WELLS (COUNTY OTHER, CASS, CARRIZO, CYPRESS)	**Project Total Capital Cost:**	$ 1,973,000
1) Planning, Design, Permitting & Acquisition Funding	Amount: $	Year Needed:	
2) Construction Funding	Amount: $	Year Needed:	
Total Anticipated State Funding Assistance:	$ *sum above*		
3) Percent State Participation in Owning Excess Capacity		State Ownership:	%

Water Management Strategy-Project Name:	DRILL NEW WELLS (COUNTY OTHER, CASS, CARRIZO, SULPHUR)	**Project Total Capital Cost:**	$ 1,324,000
1) Planning, Design, Permitting & Acquisition Funding	Amount: $	Year Needed:	
2) Construction Funding	Amount: $	Year Needed:	
Total Anticipated State Funding Assistance:	$ *sum above*		
3) Percent State Participation in Owning Excess Capacity		State Ownership:	%

Project Sponsor Name:	CRYSTAL SYSTEMS TEXAS
Primary Planning Region:	D

Contact Information:

Name:	
Phone Number:	
Email:	
Comments:	

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Projects you are designated as sponsoring in the Regional Water Plan

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Data descriptions:
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Water Management Strategy-Project Name:	CRYSTAL SYSTEMS CONSERVATION	**Project Total Capital Cost:**	$ 954,000
1) Planning, Design, Permitting & Acquisition Funding	Amount: $	Year Needed:	
2) Construction Funding	Amount: $	Year Needed:	
Total Anticipated State Funding Assistance:	$ *sum above*		
3) Percent State Participation in Owning Excess Capacity		State Ownership:	%

Water Management Strategy-Project Name:	DRILL NEW WELLS (CRYSTAL SYSTEMS INC, CARRIZO, NECHES)	**Project Total Capital Cost:**	$ 2,531,000
1) Planning, Design, Permitting & Acquisition Funding	Amount: $	Year Needed:	
2) Construction Funding	Amount: $	Year Needed:	
Total Anticipated State Funding Assistance:	$ *sum above*		
3) Percent State Participation in Owning Excess Capacity		State Ownership:	%

Water Management Strategy-Project Name:	DRILL NEW WELLS (CRYSTAL SYSTEMS INC, CARRIZO, SABINE)	**Project Total Capital Cost:**	$ 2,531,000
1) Planning, Design, Permitting & Acquisition Funding	Amount: $	Year Needed:	
2) Construction Funding	Amount: $	Year Needed:	
Total Anticipated State Funding Assistance:	$ *sum above*		
3) Percent State Participation in Owning Excess Capacity		State Ownership:	%

Water Management Strategy-Project Name:	SMTH-CYS - INFRASTRUCTURE	**Project Total Capital Cost:**	$ 2,021,000
1) Planning, Design, Permitting & Acquisition Funding	Amount: $	Year Needed:	
2) Construction Funding	Amount: $	Year Needed:	
Total Anticipated State Funding Assistance:	$ *sum above*		
3) Percent State Participation in Owning Excess Capacity		State Ownership:	%

Project Sponsor Name:	CUMBY
Primary Planning Region:	D

Contact Information:

Name:	Aron Reynolds
Phone Number:	903-994-2272
Email:	cityofcumby@cumbytel.com
Comments:	No response

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Water Management Strategy-Project Name:	DRILL NEW WELLS (CUMBY, HOPKINS, NACATOCH, SABINE, 2020)	**Project Total Capital Cost:**	$ 480,000
1) Planning, Design, Permitting & Acquisition Funding	Amount: $	Year Needed:	
2) Construction Funding	Amount: $	Year Needed:	
Total Anticipated State Funding Assistance:	$ *sum above*		
3) Percent State Participation in Owning Excess Capacity		State Ownership:	%

Water Management Strategy-Project Name:	DRILL NEW WELLS (CUMBY, HOPKINS, NACATOCH, SABINE, 2070)	**Project Total Capital Cost:**	$ 480,000
1) Planning, Design, Permitting & Acquisition Funding	Amount: $	Year Needed:	
2) Construction Funding	Amount: $	Year Needed:	
Total Anticipated State Funding Assistance:	$ *sum above*		
3) Percent State Participation in Owning Excess Capacity		State Ownership:	%

Project Sponsor Name:	EDOM WSC
Primary Planning Region:	D

Contact Information:

Name:	Lindsey Moore
Phone Number:	903-852-5055
Email:	lmoore@edomwsc.com
Comments:	Phone interview, has recently secured EDAP funding, but was unsuccessful in identifying productive location of well site, intends to secure loan from local bank.

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Data descriptions:

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Water Management Strategy-Project Name:	DRILL NEW WELL (EDOM WSC, VAN ZANDT, CARRIZO, NECHES, 2020)	**Project Total Capital Cost:**	$ 403,000
1) Planning, Design, Permitting & Acquisition Funding	Amount: $	Year Needed:	
2) Construction Funding	Amount: $	Year Needed:	
Total Anticipated State Funding Assistance:	$ *sum above*		
3) Percent State Participation in Owning Excess Capacity		State Ownership:	%

Water Management Strategy-Project Name:	DRILL NEW WELL (EDOM WSC, VAN ZANDT, CARRIZO, NECHES, 2050)	**Project Total Capital Cost:**	$ 358,000
1) Planning, Design, Permitting & Acquisition Funding	Amount: $	Year Needed:	
2) Construction Funding	Amount: $	Year Needed:	
Total Anticipated State Funding Assistance:	$ *sum above*		
3) Percent State Participation in Owning Excess Capacity		State Ownership:	%

Water Management Strategy-Project Name:	DRILL NEW WELL (EDOM WSC, VAN ZANDT, CARRIZO, NECHES, 2070)	**Project Total Capital Cost:**	$ 344,000
1) Planning, Design, Permitting & Acquisition Funding	Amount: $	Year Needed:	
2) Construction Funding	Amount: $	Year Needed:	
Total Anticipated State Funding Assistance:	$ *sum above*		
3) Percent State Participation in Owning Excess Capacity		State Ownership:	%

Project Sponsor Name:	GILMER
Primary Planning Region:	D

Contact Information:

Name:	
Phone Number:	
Email:	
Comments:	

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Water Management Strategy-Project Name:	DRILL NEW WELLS (GILMER, CARRIZO, CYPRESS)	**Project Total Capital Cost:**	$ 801,000
1) Planning, Design, Permitting & Acquisition Funding	Amount: $	Year Needed:	
2) Construction Funding	Amount: $	Year Needed:	
Total Anticipated State Funding Assistance:	$ *sum above*		
3) Percent State Participation in Owning Excess Capacity		State Ownership:	%

Project Sponsor Name:	GREENVILLE
Primary Planning Region:	D

Contact Information:

Name:	James Belcher
Phone Number:	903-457-3190
Email:	jbelcher@ci.greenville.tx.us
Comments:	No response.

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Water Management Strategy-Project Name:	NEW WTP GREENVILLE	**Project Total Capital Cost:**	$ 81,786,000
1) Planning, Design, Permitting & Acquisition Funding	Amount: $	Year Needed:	
2) Construction Funding	Amount: $	Year Needed:	
Total Anticipated State Funding Assistance:	$ *sum above*		
3) Percent State Participation in Owning Excess Capacity		State Ownership:	%

Water Management Strategy-Project Name:	WTP EXPANSION 2030 (GREENVILLE, SABINE)	**Project Total Capital Cost:**	$ 43,955,000
1) Planning, Design, Permitting & Acquisition Funding	Amount: $	Year Needed:	
2) Construction Funding	Amount: $	Year Needed:	
Total Anticipated State Funding Assistance:	$ *sum above*		
3) Percent State Participation in Owning Excess Capacity		State Ownership:	%

Project Sponsor Name:	HARLETON WSC
Primary Planning Region:	D

Contact Information:

Name:	
Phone Number:	
Email:	
Comments:	

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Water Management Strategy-Project Name:	INCREASE EXISTING CONTRACT (HARLETON, CYPRESS)	**Project Total Capital Cost:**	$ 4,928
1) Planning, Design, Permitting & Acquisition Funding	Amount: $	Year Needed:	
2) Construction Funding	Amount: $	Year Needed:	
Total Anticipated State Funding Assistance:	$ *sum above*		
3) Percent State Participation in Owning Excess Capacity		State Ownership:	%

Project Sponsor Name:	HICKORY CREEK SUD
Primary Planning Region:	D

Contact Information:

Name:	Mike Wemhoener
Phone Number:	903-568-4760
Email:	hickorycreeksud@yahoo.com
Comments:	Phone interview, intends to develop additional groundwater supply.

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Water Management Strategy- Project Name:	NEW CONTRACT WITH GREENVILLE AND PIPELINE TO HICKORY CREEK SUD	**Project Total Capital Cost:**	$ 8,553,000
1) Planning, Design, Permitting & Acquisition Funding	Amount: $	Year Needed:	
2) Construction Funding	Amount: $	Year Needed:	
Total Anticipated State Funding Assistance:	$ *sum above*		
3) Percent State Participation in Owning Excess Capacity		State Ownership:	%

Project Sponsor Name:	HOLLY SPRINGS WSC
Primary Planning Region:	D

Contact Information:

Name:	
Phone Number:	
Email:	
Comments:	

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2) Construction Funding: Enter portion of total costs into the 'Construction' category for which you anticipate applying for state funding to construct your project using a low interest loan from TWDB.

3) Percent State Participation in Excess Capacity of the Project: Enter the percent share of the total project capacity that will not be needed within the first 10 years of the project life. For some larger projects that qualify, the state may acquire a temporary ownership interest in some percentage portion of the project which allows entities to optimally size a regional project with excess capacity that won't be needed until the future. The entity buys back the state's portion of the facility over time. Principal and interest are deferred on the state-owned portion of project.

Water Management Strategy-Project Name:	INCREASE EXISTING CONTRACT (HOLLY SPRINGS, CYPRESS)	**Project Total Capital Cost:**	$ 130,000
1) Planning, Design, Permitting & Acquisition Funding	Amount: $	Year Needed:	
2) Construction Funding	Amount: $	Year Needed:	
Total Anticipated State Funding Assistance:	$ *sum above*		
3) Percent State Participation in Owning Excess Capacity		State Ownership:	%

Project Sponsor Name:	IRRIGATION, BOWIE
Primary Planning Region:	D

Contact Information:

Name:	
Phone Number:	
Email:	
Comments:	

As part of the state water planning process, regional water planning groups recommend water supply projects for each of their respective regions. The Texas Water Development Board (TWDB) has several funding programs for water projects that support the planning, design, and construction of water supply projects with several financing options including low-interest loans and deferral of principal and interest. Texas Water Code Section 16.053 (q) requires the regional water planning groups to examine the financing needed to implement the water management strategies and projects recommended in their regional plan.

This Infrastructure Financing Survey is a tool to gather information regarding how you, as a project sponsor, anticipate financing the water supply projects recommended to meet your needs in the 2021 regional water plan, including whether you, as a sponsor, intend to use financial assistance programs offered by the State of Texas and administered by the TWDB.

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http://www.twdb.texas.gov/financial/index.asp

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Please enter only the share of total project costs that you wish to receive through a TWDB program in the "Share of Costs" fields and do not enter a specific portion of a project cost more than once.

Projects you are designated as sponsoring in the Regional Water Plan

For each of the project(s) listed below **for which you are designated as sponsor**, please enter only the funding amounts you anticipate requesting from TWDB categories in the '**Amount**' field; enter the earliest '**Year Needed**' date that you anticipate requiring these amounts; and, enter in the '**State Ownership**' field the percent share of the overall project capacity that you anticipate the state taking initial ownership of. Note that the total amount entered into the separate funding categories may not exceed the **Project Total Capital Cost**. **Only enter the amount of funding that you expect to request from state funding programs.**

Data descriptions:
1) Planning, Design, Permitting, and Acquisition Funding: Enter portion of total costs into the 'Planning and Acquisition' category for which you anticipate applying for a low interest loan from TWDB for development efforts leading up to construction. This option includes providing funding for all pre-construction stages of the project.

2) Construction Funding: Enter portion of total costs into the 'Construction' category for which you anticipate applying for state funding to construct your project using a low interest loan from TWDB.

3) Percent State Participation in Excess Capacity of the Project: Enter the percent share of the total project capacity that will not be needed within the first 10 years of the project life. For some larger projects that qualify, the state may acquire a temporary ownership interest in some percentage portion of the project which allows entities to optimally size a regional project with excess capacity that won't be needed until the future. The entity buys back the state's portion of the facility over time. Principal and interest are deferred on the state-owned portion of project.

Water Management Strategy-Project Name:	DRILL NEW WELLS (BOWIE IRRIGATION, CARRIZO-WILCOX, SULPHUR)	**Project Total Capital Cost:**	$ 10,597,000
1) Planning, Design, Permitting & Acquisition Funding	Amount: $	Year Needed:	
2) Construction Funding	Amount: $	Year Needed:	
Total Anticipated State Funding Assistance:	$ *sum above*		
3) Percent State Participation in Owning Excess Capacity		State Ownership:	%

Project Sponsor Name:	IRRIGATION, HARRISON
Primary Planning Region:	D

Contact Information:

Name:	
Phone Number:	
Email:	
Comments:	

As part of the state water planning process, regional water planning groups recommend water supply projects for each of their respective regions. The Texas Water Development Board (TWDB) has several funding programs for water projects that support the planning, design, and construction of water supply projects with several financing options including low-interest loans and deferral of principal and interest. Texas Water Code Section 16.053 (q) requires the regional water planning groups to examine the financing needed to implement the water management strategies and projects recommended in their regional plan.

This Infrastructure Financing Survey is a tool to gather information regarding how you, as a project sponsor, anticipate financing the water supply projects recommended to meet your needs in the 2021 regional water plan, including whether you, as a sponsor, intend to use financial assistance programs offered by the State of Texas and administered by the TWDB.

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http://www.twdb.texas.gov/financial/index.asp

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Projects you are designated as sponsoring in the Regional Water Plan

For each of the project(s) listed below **for which you are designated as sponsor**, please enter only the funding amounts you anticipate requesting from TWDB categories in the '**Amount**' field; enter the earliest '**Year Needed**' date that you anticipate requiring these amounts; and, enter in the '**State Ownership**' field the percent share of the overall project capacity that you anticipate the state taking initial ownership of. Note that the total amount entered into the separate funding categories may not exceed the **Project Total Capital Cost**. **Only enter the amount of funding that you expect to request from state funding programs.**

Data descriptions:
1) Planning, Design, Permitting, and Acquisition Funding: Enter portion of total costs into the 'Planning and Acquisition' category for which you anticipate applying for a low interest loan from TWDB for development efforts leading up to construction. This option includes providing funding for all pre-construction stages of the project.

2) Construction Funding: Enter portion of total costs into the 'Construction' category for which you anticipate applying for state funding to construct your project using a low interest loan from TWDB.

3) Percent State Participation in Excess Capacity of the Project: Enter the percent share of the total project capacity that will not be needed within the first 10 years of the project life. For some larger projects that qualify, the state may acquire a temporary ownership interest in some percentage portion of the project which allows entities to optimally size a regional project with excess capacity that won't be needed until the future. The entity buys back the state's portion of the facility over time. Principal and interest are deferred on the state-owned portion of project.

Water Management Strategy-Project Name:	DRILL NEW WELLS (IRRIGATION HARRISON, QUEEN CITY, CYPRESS)	**Project Total Capital Cost:**	$ 577,000
1) Planning, Design, Permitting & Acquisition Funding	Amount: $	Year Needed:	
2) Construction Funding	Amount: $	Year Needed:	
Total Anticipated State Funding Assistance:	$ *sum above*		
3) Percent State Participation in Owning Excess Capacity		State Ownership:	%

Water Management Strategy-Project Name:	DRILL NEW WELLS (IRRIGATION HARRISON, QUEEN CITY, SABINE)	**Project Total Capital Cost:**	$ 193,000
1) Planning, Design, Permitting & Acquisition Funding	Amount: $	Year Needed:	
2) Construction Funding	Amount: $	Year Needed:	
Total Anticipated State Funding Assistance:	$ *sum above*		
3) Percent State Participation in Owning Excess Capacity		State Ownership:	%

Project Sponsor Name:	IRRIGATION, HOPKINS
Primary Planning Region:	D

Contact Information:

Name:	
Phone Number:	
Email:	
Comments:	

As part of the state water planning process, regional water planning groups recommend water supply projects for each of their respective regions. The Texas Water Development Board (TWDB) has several funding programs for water projects that support the planning, design, and construction of water supply projects with several financing options including low-interest loans and deferral of principal and interest. Texas Water Code Section 16.053 (q) requires the regional water planning groups to examine the financing needed to implement the water management strategies and projects recommended in their regional plan.

This Infrastructure Financing Survey is a tool to gather information regarding how you, as a project sponsor, anticipate financing the water supply projects recommended to meet your needs in the 2021 regional water plan, including whether you, as a sponsor, intend to use financial assistance programs offered by the State of Texas and administered by the TWDB.

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http://www.twdb.texas.gov/financial/index.asp

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Projects you are designated as sponsoring in the Regional Water Plan

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Data descriptions:

1) Planning, Design, Permitting, and Acquisition Funding: Enter portion of total costs into the 'Planning and Acquisition' category for which you anticipate applying for a low interest loan from TWDB for development efforts leading up to construction. This option includes providing funding for all pre-construction stages of the project.

2) Construction Funding: Enter portion of total costs into the 'Construction' category for which you anticipate applying for state funding to construct your project using a low interest loan from TWDB.

3) Percent State Participation in Excess Capacity of the Project: Enter the percent share of the total project capacity that will not be needed within the first 10 years of the project life. For some larger projects that qualify, the state may acquire a temporary ownership interest in some percentage portion of the project which allows entities to optimally size a regional project with excess capacity that won't be needed until the future. The entity buys back the state's portion of the facility over time. Principal and interest are deferred on the state-owned portion of project.

Water Management Strategy-Project Name:	DRILL NEW WELLS (IRRIGATION HOPKINS, CARRIZO-WILCOX, SABINE, 2040)	**Project Total Capital Cost:**	$ 1,030,000
1) Planning, Design, Permitting & Acquisition Funding	Amount: $	Year Needed:	
2) Construction Funding	Amount: $	Year Needed:	
Total Anticipated State Funding Assistance:	$ *sum above*		
3) Percent State Participation in Owning Excess Capacity		State Ownership:	%

Water Management Strategy-Project Name:	DRILL NEW WELLS (IRRIGATION HOPKINS, CARRIZO-WILCOX, SABINE, 2060)	**Project Total Capital Cost:**	$ 1,802,000
1) Planning, Design, Permitting & Acquisition Funding	Amount: $	Year Needed:	
2) Construction Funding	Amount: $	Year Needed:	
Total Anticipated State Funding Assistance:	$ *sum above*		
3) Percent State Participation in Owning Excess Capacity		State Ownership:	%

Water Management Strategy-Project Name:	DRILL NEW WELLS (IRRIGATION HOPKINS, CARRIZO-WILCOX, SULPHUR)	**Project Total Capital Cost:**	$ 10,927,000
1) Planning, Design, Permitting & Acquisition Funding	Amount: $	Year Needed:	
2) Construction Funding	Amount: $	Year Needed:	
Total Anticipated State Funding Assistance:	$ *sum above*		
3) Percent State Participation in Owning Excess Capacity		State Ownership:	%

Project Sponsor Name:	IRRIGATION, HUNT
Primary Planning Region:	D

Contact Information:

Name:	
Phone Number:	
Email:	
Comments:	

As part of the state water planning process, regional water planning groups recommend water supply projects for each of their respective regions. The Texas Water Development Board (TWDB) has several funding programs for water projects that support the planning, design, and construction of water supply projects with several financing options including low-interest loans and deferral of principal and interest. Texas Water Code Section 16.053 (q) requires the regional water planning groups to examine the financing needed to implement the water management strategies and projects recommended in their regional plan.

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Projects you are designated as sponsoring in the Regional Water Plan

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Data descriptions:

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2) Construction Funding: Enter portion of total costs into the 'Construction' category for which you anticipate applying for state funding to construct your project using a low interest loan from TWDB.

3) Percent State Participation in Excess Capacity of the Project: Enter the percent share of the total project capacity that will not be needed within the first 10 years of the project life. For some larger projects that qualify, the state may acquire a temporary ownership interest in some percentage portion of the project which allows entities to optimally size a regional project with excess capacity that won't be needed until the future. The entity buys back the state's portion of the facility over time. Principal and interest are deferred on the state-owned portion of project.

Water Management Strategy-Project Name:	DRILL NEW WELLS (IRRIGATION HUNT, NACATOCH, SABINE)	**Project Total Capital Cost:**	$ 1,249,000
1) Planning, Design, Permitting & Acquisition Funding	Amount: $	Year Needed:	
2) Construction Funding	Amount: $	Year Needed:	
Total Anticipated State Funding Assistance:	$ *sum above*		
3) Percent State Participation in Owning Excess Capacity		State Ownership:	%

Project Sponsor Name:	IRRIGATION, LAMAR
Primary Planning Region:	D

Contact Information:

Name:	
Phone Number:	
Email:	
Comments:	

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This Infrastructure Financing Survey is a tool to gather information regarding how you, as a project sponsor, anticipate financing the water supply projects recommended to meet your needs in the 2021 regional water plan, including whether you, as a sponsor, intend to use financial assistance programs offered by the State of Texas and administered by the TWDB.

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http://www.twdb.texas.gov/financial/index.asp

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Projects you are designated as sponsoring in the Regional Water Plan

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Data descriptions:

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2) Construction Funding: Enter portion of total costs into the 'Construction' category for which you anticipate applying for state funding to construct your project using a low interest loan from TWDB.

3) Percent State Participation in Excess Capacity of the Project: Enter the percent share of the total project capacity that will not be needed within the first 10 years of the project life. For some larger projects that qualify, the state may acquire a temporary ownership interest in some percentage portion of the project which allows entities to optimally size a regional project with excess capacity that won't be needed until the future. The entity buys back the state's portion of the facility over time. Principal and interest are deferred on the state-owned portion of project.

Water Management Strategy-Project Name:	PAT MAYSE RAW WATER PIPELINE (IRRIGATION LAMAR, RED)	**Project Total Capital Cost:**	$ 12,021,000
1) Planning, Design, Permitting & Acquisition Funding	Amount: $	Year Needed:	
2) Construction Funding	Amount: $	Year Needed:	
Total Anticipated State Funding Assistance:	$ *sum above*		
3) Percent State Participation in Owning Excess Capacity		State Ownership:	%

Project Sponsor Name:	IRRIGATION, RED RIVER
Primary Planning Region:	D

Contact Information:

Name:	
Phone Number:	
Email:	
Comments:	

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Projects you are designated as sponsoring in the Regional Water Plan

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Data descriptions:

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2) Construction Funding: Enter portion of total costs into the 'Construction' category for which you anticipate applying for state funding to construct your project using a low interest loan from TWDB.

3) Percent State Participation in Excess Capacity of the Project: Enter the percent share of the total project capacity that will not be needed within the first 10 years of the project life. For some larger projects that qualify, the state may acquire a temporary ownership interest in some percentage portion of the project which allows entities to optimally size a regional project with excess capacity that won't be needed until the future. The entity buys back the state's portion of the facility over time. Principal and interest are deferred on the state-owned portion of project.

Water Management Strategy- Project Name:	DRILL NEW WELLS (IRRIGATION, RED RIVER, NACATOCH, SULPHUR)	**Project Total Capital Cost:**	$ 6,551,000
1) Planning, Design, Permitting & Acquisition Funding	Amount: $	Year Needed:	
2) Construction Funding	Amount: $	Year Needed:	
Total Anticipated State Funding Assistance:	$ *sum above*		
3) Percent State Participation in Owning Excess Capacity		State Ownership:	%

Project Sponsor Name:	IRRIGATION, VAN ZANDT
Primary Planning Region:	D

Contact Information:

Name:	
Phone Number:	
Email:	
Comments:	

As part of the state water planning process, regional water planning groups recommend water supply projects for each of their respective regions. The Texas Water Development Board (TWDB) has several funding programs for water projects that support the planning, design, and construction of water supply projects with several financing options including low-interest loans and deferral of principal and interest. Texas Water Code Section 16.053 (q) requires the regional water planning groups to examine the financing needed to implement the water management strategies and projects recommended in their regional plan.

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http://www.twdb.texas.gov/financial/index.asp

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Projects you are designated as sponsoring in the Regional Water Plan

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Data descriptions:
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2) Construction Funding: Enter portion of total costs into the ‘Construction’ category for which you anticipate applying for state funding to construct your project using a low interest loan from TWDB.

3) Percent State Participation in Excess Capacity of the Project: Enter the percent share of the total project capacity that will not be needed within the first 10 years of the project life. For some larger projects that qualify, the state may acquire a temporary ownership interest in some percentage portion of the project which allows entities to optimally size a regional project with excess capacity that won't be needed until the future. The entity buys back the state’s portion of the facility over time. Principal and interest are deferred on the state-owned portion of project.

Water Management Strategy- Project Name:	DRILL NEW WELLS (IRRIGATION VAN ZANDT, QUEEN, NECHES)	**Project Total Capital Cost:**	$ 1,683,000
1) Planning, Design, Permitting & Acquisition Funding	Amount: $	Year Needed:	
2) Construction Funding	Amount: $	Year Needed:	
Total Anticipated State Funding Assistance:	$ *sum above*		
3) Percent State Participation in Owning Excess Capacity		State Ownership:	%

Project Sponsor Name:	LEIGH WSC
Primary Planning Region:	D

Contact Information:

Name:	
Phone Number:	
Email:	
Comments:	

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This Infrastructure Financing Survey is a tool to gather information regarding how you, as a project sponsor, anticipate financing the water supply projects recommended to meet your needs in the 2021 regional water plan, including whether you, as a sponsor, intend to use financial assistance programs offered by the State of Texas and administered by the TWDB.

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http://www.twdb.texas.gov/financial/index.asp

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Projects you are designated as sponsoring in the Regional Water Plan

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Data descriptions:

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2) Construction Funding: Enter portion of total costs into the 'Construction' category for which you anticipate applying for state funding to construct your project using a low interest loan from TWDB.

3) Percent State Participation in Excess Capacity of the Project: Enter the percent share of the total project capacity that will not be needed within the first 10 years of the project life. For some larger projects that qualify, the state may acquire a temporary ownership interest in some percentage portion of the project which allows entities to optimally size a regional project with excess capacity that won't be needed until the future. The entity buys back the state's portion of the facility over time. Principal and interest are deferred on the state-owned portion of project.

Water Management Strategy-Project Name:	DRILL NEW WELLS (LEIGH, QUEEN CITY, CYPRESS)	**Project Total Capital Cost:**	$ 1,973,000
1) Planning, Design, Permitting & Acquisition Funding	Amount: $	Year Needed:	
2) Construction Funding	Amount: $	Year Needed:	
Total Anticipated State Funding Assistance:	$ *sum above*		
3) Percent State Participation in Owning Excess Capacity		State Ownership:	%

Project Sponsor Name:	LINDALE
Primary Planning Region:	D

Contact Information:

Name:	
Phone Number:	
Email:	
Comments:	

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This Infrastructure Financing Survey is a tool to gather information regarding how you, as a project sponsor, anticipate financing the water supply projects recommended to meet your needs in the 2021 regional water plan, including whether you, as a sponsor, intend to use financial assistance programs offered by the State of Texas and administered by the TWDB.

More information on these financial assistance programs can be found at the TWDB website at:
http://www.twdb.texas.gov/financial/index.asp

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Projects you are designated as sponsoring in the Regional Water Plan

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Data descriptions:
1) Planning, Design, Permitting, and Acquisition Funding: Enter portion of total costs into the 'Planning and Acquisition' category for which you anticipate applying for a low interest loan from TWDB for development efforts leading up to construction. This option includes providing funding for all pre-construction stages of the project.

2) Construction Funding: Enter portion of total costs into the ‘Construction’ category for which you anticipate applying for state funding to construct your project using a low interest loan from TWDB.

3) Percent State Participation in Excess Capacity of the Project: Enter the percent share of the total project capacity that will not be needed within the first 10 years of the project life. For some larger projects that qualify, the state may acquire a temporary ownership interest in some percentage portion of the project which allows entities to optimally size a regional project with excess capacity that won't be needed until the future. The entity buys back the state’s portion of the facility over time. Principal and interest are deferred on the state-owned portion of project.

Water Management Strategy-Project Name:	DRILL NEW WELLS (LINDALE, CARRIZO, NECHES)	**Project Total Capital Cost:**	$ 7,592,000
1) Planning, Design, Permitting & Acquisition Funding	Amount: $	Year Needed:	
2) Construction Funding	Amount: $	Year Needed:	
Total Anticipated State Funding Assistance:	$ *sum above*		
3) Percent State Participation in Owning Excess Capacity		State Ownership:	%

Water Management Strategy-Project Name:	SMTH-LDL-INFRASTRUCTURE	**Project Total Capital Cost:**	$ 5,803,000
1) Planning, Design, Permitting & Acquisition Funding	Amount: $	Year Needed:	
2) Construction Funding	Amount: $	Year Needed:	
Total Anticipated State Funding Assistance:	$ *sum above*		
3) Percent State Participation in Owning Excess Capacity		State Ownership:	%

Project Sponsor Name:	LITTLE HOPE MOORE WSC
Primary Planning Region:	D

Contact Information:

Name:	Kevin Wayne Perkins
Phone Number:	903-253-5565
Email:	lhmwsc@gmail.com
Comments:	Phone interview, does not intend to seek TWDB funding, intends to utilize local bank.

As part of the state water planning process, regional water planning groups recommend water supply projects for each of their respective regions. The Texas Water Development Board (TWDB) has several funding programs for water projects that support the planning, design, and construction of water supply projects with several financing options including low-interest loans and deferral of principal and interest. Texas Water Code Section 16.053 (q) requires the regional water planning groups to examine the financing needed to implement the water management strategies and projects recommended in their regional plan.

This Infrastructure Financing Survey is a tool to gather information regarding how you, as a project sponsor, anticipate financing the water supply projects recommended to meet your needs in the 2021 regional water plan, including whether you, as a sponsor, intend to use financial assistance programs offered by the State of Texas and administered by the TWDB.

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http://www.twdb.texas.gov/financial/index.asp

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Please enter only the share of total project costs that you wish to receive through a TWDB program in the "Share of Costs" fields and do not enter a specific portion of a project cost more than once.

Projects you are designated as sponsoring in the Regional Water Plan

For each of the project(s) listed below **for which you are designated as sponsor**, please enter only the funding amounts you anticipate requesting from TWDB categories in the '**Amount**' field; enter the earliest '**Year Needed**' date that you anticipate requiring these amounts; and, enter in the '**State Ownership**' field the percent share of the overall project capacity that you anticipate the state taking initial ownership of. Note that the total amount entered into the separate funding categories may not exceed the **Project Total Capital Cost**. **Only enter the amount of funding that you expect to request from state funding programs.**

Data descriptions:

1) Planning, Design, Permitting, and Acquisition Funding: Enter portion of total costs into the 'Planning and Acquisition' category for which you anticipate applying for a low interest loan from TWDB for development efforts leading up to construction. This option includes providing funding for all pre-construction stages of the project.

2) Construction Funding: Enter portion of total costs into the 'Construction' category for which you anticipate applying for state funding to construct your project using a low interest loan from TWDB.

3) Percent State Participation in Excess Capacity of the Project: Enter the percent share of the total project capacity that will not be needed within the first 10 years of the project life. For some larger projects that qualify, the state may acquire a temporary ownership interest in some percentage portion of the project which allows entities to optimally size a regional project with excess capacity that won't be needed until the future. The entity buys back the state's portion of the facility over time. Principal and interest are deferred on the state-owned portion of project.

Water Management Strategy-Project Name:	DRILL NEW WELL (LITTLE HOPE MOORE WSC, VAN ZANDT, CARRIZO, NECHES	**Project Total Capital Cost:**	$ 371,000
1) Planning, Design, Permitting & Acquisition Funding	Amount: $	Year Needed:	
2) Construction Funding	Amount: $	Year Needed:	
Total Anticipated State Funding Assistance:	$ *sum above*		
3) Percent State Participation in Owning Excess Capacity		State Ownership:	%

Project Sponsor Name:	LIVESTOCK, BOWIE
Primary Planning Region:	D

Contact Information:

Name:	
Phone Number:	
Email:	
Comments:	

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Projects you are designated as sponsoring in the Regional Water Plan

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Data descriptions:
1) Planning, Design, Permitting, and Acquisition Funding: Enter portion of total costs into the 'Planning and Acquisition' category for which you anticipate applying for a low interest loan from TWDB for development efforts leading up to construction. This option includes providing funding for all pre-construction stages of the project.

2) Construction Funding: Enter portion of total costs into the 'Construction' category for which you anticipate applying for state funding to construct your project using a low interest loan from TWDB.

3) Percent State Participation in Excess Capacity of the Project: Enter the percent share of the total project capacity that will not be needed within the first 10 years of the project life. For some larger projects that qualify, the state may acquire a temporary ownership interest in some percentage portion of the project which allows entities to optimally size a regional project with excess capacity that won't be needed until the future. The entity buys back the state's portion of the facility over time. Principal and interest are deferred on the state-owned portion of project.

Water Management Strategy-Project Name:	DRILL NEW WELLS (LIVESTOCK BOWIE , NACATOCH, RED)	**Project Total Capital Cost:**	$ 1,630,000
1) Planning, Design, Permitting & Acquisition Funding	Amount: $	Year Needed:	
2) Construction Funding	Amount: $	Year Needed:	
Total Anticipated State Funding Assistance:	$ *sum above*		
3) Percent State Participation in Owning Excess Capacity		State Ownership:	%

Water Management Strategy-Project Name:	DRILL NEW WELLS (LIVESTOCK, BOWIE, CARRIZO-WILCOX, SULPHUR)	**Project Total Capital Cost:**	$ 2,423,000
1) Planning, Design, Permitting & Acquisition Funding	Amount: $	Year Needed:	
2) Construction Funding	Amount: $	Year Needed:	
Total Anticipated State Funding Assistance:	$ *sum above*		
3) Percent State Participation in Owning Excess Capacity		State Ownership:	%

Project Sponsor Name:	LIVESTOCK, CAMP
Primary Planning Region:	D

Contact Information:

Name:	
Phone Number:	
Email:	
Comments:	

As part of the state water planning process, regional water planning groups recommend water supply projects for each of their respective regions. The Texas Water Development Board (TWDB) has several funding programs for water projects that support the planning, design, and construction of water supply projects with several financing options including low-interest loans and deferral of principal and interest. Texas Water Code Section 16.053 (q) requires the regional water planning groups to examine the financing needed to implement the water management strategies and projects recommended in their regional plan.

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Projects you are designated as sponsoring in the Regional Water Plan

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Data descriptions:
1) Planning, Design, Permitting, and Acquisition Funding: Enter portion of total costs into the 'Planning and Acquisition' category for which you anticipate applying for a low interest loan from TWDB for development efforts leading up to construction. This option includes providing funding for all pre-construction stages of the project.

2) Construction Funding: Enter portion of total costs into the 'Construction' category for which you anticipate applying for state funding to construct your project using a low interest loan from TWDB.

3) Percent State Participation in Excess Capacity of the Project: Enter the percent share of the total project capacity that will not be needed within the first 10 years of the project life. For some larger projects that qualify, the state may acquire a temporary ownership interest in some percentage portion of the project which allows entities to optimally size a regional project with excess capacity that won't be needed until the future. The entity buys back the state's portion of the facility over time. Principal and interest are deferred on the state-owned portion of project.

Water Management Strategy- Project Name:	DRILL NEW WELLS (LIVESTOCK, CAMP, QUEEN, CYPRESS)	**Project Total Capital Cost:**	$ 4,401,500
1) Planning, Design, Permitting & Acquisition Funding	Amount: $	Year Needed:	
2) Construction Funding	Amount: $	Year Needed:	
Total Anticipated State Funding Assistance:	$ *sum above*		
3) Percent State Participation in Owning Excess Capacity		State Ownership:	%

Project Sponsor Name:	LIVESTOCK, CASS
Primary Planning Region:	D

Contact Information:

Name:	
Phone Number:	
Email:	
Comments:	

As part of the state water planning process, regional water planning groups recommend water supply projects for each of their respective regions. The Texas Water Development Board (TWDB) has several funding programs for water projects that support the planning, design, and construction of water supply projects with several financing options including low-interest loans and deferral of principal and interest. Texas Water Code Section 16.053 (q) requires the regional water planning groups to examine the financing needed to implement the water management strategies and projects recommended in their regional plan.

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http://www.twdb.texas.gov/financial/index.asp

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Water Management Strategy-Project Name:	DRILL NEW WELLS (LIVESTOCK, CASS, QUEEN CITY, CYPRESS)	**Project Total Capital Cost:**	$ 1,037,000
1) Planning, Design, Permitting & Acquisition Funding	Amount: $	Year Needed:	
2) Construction Funding	Amount: $	Year Needed:	
Total Anticipated State Funding Assistance:	$ *sum above*		
3) Percent State Participation in Owning Excess Capacity		State Ownership:	%

Water Management Strategy-Project Name:	DRILL NEW WELLS (LIVESTOCK, CASS, QUEEN CITY, SULPHUR)	**Project Total Capital Cost:**	$ 1,037,000
1) Planning, Design, Permitting & Acquisition Funding	Amount: $	Year Needed:	
2) Construction Funding	Amount: $	Year Needed:	
Total Anticipated State Funding Assistance:	$ *sum above*		
3) Percent State Participation in Owning Excess Capacity		State Ownership:	%

Project Sponsor Name:	LIVESTOCK, DELTA
Primary Planning Region:	D

Contact Information:

Name:	
Phone Number:	
Email:	
Comments:	

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Projects you are designated as sponsoring in the Regional Water Plan

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Data descriptions:
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Water Management Strategy-Project Name:	DRILL NEW WELLS (LIVESTOCK, DELTA, NACATOCH, SULPHUR)	**Project Total Capital Cost:**	$ 1,929,000
1) Planning, Design, Permitting & Acquisition Funding	Amount: $	Year Needed:	
2) Construction Funding	Amount: $	Year Needed:	
Total Anticipated State Funding Assistance:	$ *sum above*		
3) Percent State Participation in Owning Excess Capacity		State Ownership:	%

Project Sponsor Name:	LIVESTOCK, FRANKLIN
Primary Planning Region:	D

Contact Information:

Name:	
Phone Number:	
Email:	
Comments:	

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Water Management Strategy-Project Name:	DRILL NEW WELLS (LIVESTOCK, FRANKLIN, CARRIZO, CYPRESS)	**Project Total Capital Cost:**	$ 865,000
1) Planning, Design, Permitting & Acquisition Funding	Amount: $	Year Needed:	
2) Construction Funding	Amount: $	Year Needed:	
Total Anticipated State Funding Assistance:	$ *sum above*		
3) Percent State Participation in Owning Excess Capacity		State Ownership:	%

Water Management Strategy-Project Name:	DRILL NEW WELLS (LIVESTOCK, FRANKLIN, CARRIZO, SULPHUR)	**Project Total Capital Cost:**	$ 1,211,000
1) Planning, Design, Permitting & Acquisition Funding	Amount: $	Year Needed:	
2) Construction Funding	Amount: $	Year Needed:	
Total Anticipated State Funding Assistance:	$ *sum above*		
3) Percent State Participation in Owning Excess Capacity		State Ownership:	%

Project Sponsor Name:	LIVESTOCK, HOPKINS
Primary Planning Region:	D

Contact Information:

Name:	
Phone Number:	
Email:	
Comments:	

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Projects you are designated as sponsoring in the Regional Water Plan

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Data descriptions:

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Water Management Strategy-Project Name:	DRILL NEW WELLS (LIVESTOCK HOPKINS, HOPKINS, CARRIZO, SULPHUR, 2020)	**Project Total Capital Cost:**	$ 4,961,000
1) Planning, Design, Permitting & Acquisition Funding	Amount: $	Year Needed:	
2) Construction Funding	Amount: $	Year Needed:	
Total Anticipated State Funding Assistance:	$ *sum above*		
3) Percent State Participation in Owning Excess Capacity		State Ownership:	%

Water Management Strategy-Project Name:	DRILL NEW WELLS (LIVESTOCK HOPKINS, HOPKINS, CARRIZO, SULPHUR, 2060)	**Project Total Capital Cost:**	$ 924,000
1) Planning, Design, Permitting & Acquisition Funding	Amount: $	Year Needed:	
2) Construction Funding	Amount: $	Year Needed:	
Total Anticipated State Funding Assistance:	$ *sum above*		
3) Percent State Participation in Owning Excess Capacity		State Ownership:	%

Project Sponsor Name:	LIVESTOCK, HUNT
Primary Planning Region:	D

Contact Information:

Name:	
Phone Number:	
Email:	
Comments:	

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Projects you are designated as sponsoring in the Regional Water Plan

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Data descriptions:

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Water Management Strategy-Project Name:	DRILL NEW WELL (LIVESTOCK HUNT, TRINITY, SABINE)	**Project Total Capital Cost:**	$ 407,000
1) Planning, Design, Permitting & Acquisition Funding	Amount: $	Year Needed:	
2) Construction Funding	Amount: $	Year Needed:	
Total Anticipated State Funding Assistance:	$ *sum above*		
3) Percent State Participation in Owning Excess Capacity		State Ownership:	%

Project Sponsor Name:	LIVESTOCK, LAMAR
Primary Planning Region:	D

Contact Information:

Name:	
Phone Number:	
Email:	
Comments:	

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Projects you are designated as sponsoring in the Regional Water Plan

For each of the project(s) listed below **for which you are designated as sponsor**, please enter only the funding amounts you anticipate requesting from TWDB categories in the '**Amount**' field; enter the earliest '**Year Needed**' date that you anticipate requiring these amounts; and, enter in the '**State Ownership**' field the percent share of the overall project capacity that you anticipate the state taking initial ownership of. Note that the total amount entered into the separate funding categories may not exceed the **Project Total Capital Cost**. **Only enter the amount of funding that you expect to request from state funding programs.**

Data descriptions:
1) Planning, Design, Permitting, and Acquisition Funding: Enter portion of total costs into the 'Planning and Acquisition' category for which you anticipate applying for a low interest loan from TWDB for development efforts leading up to construction. This option includes providing funding for all pre-construction stages of the project.

2) Construction Funding: Enter portion of total costs into the 'Construction' category for which you anticipate applying for state funding to construct your project using a low interest loan from TWDB.

3) Percent State Participation in Excess Capacity of the Project: Enter the percent share of the total project capacity that will not be needed within the first 10 years of the project life. For some larger projects that qualify, the state may acquire a temporary ownership interest in some percentage portion of the project which allows entities to optimally size a regional project with excess capacity that won't be needed until the future. The entity buys back the state's portion of the facility over time. Principal and interest are deferred on the state-owned portion of project.

Water Management Strategy-Project Name:	NEW CONTRACT AND PIPELINE TO LAMAR CO WSD FOR LAMAR LIVESTOCK	**Project Total Capital Cost:**	$ 14,574,000
1) Planning, Design, Permitting & Acquisition Funding	Amount: $	Year Needed:	
2) Construction Funding	Amount: $	Year Needed:	
Total Anticipated State Funding Assistance:	$ *sum above*		
3) Percent State Participation in Owning Excess Capacity		State Ownership:	%

Project Sponsor Name: LIVESTOCK, MORRIS

Primary Planning Region: D

Contact Information:

Name:	
Phone Number:	
Email:	
Comments:	

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Data descriptions:

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3) Percent State Participation in Excess Capacity of the Project: Enter the percent share of the total project capacity that will not be needed within the first 10 years of the project life. For some larger projects that qualify, the state may acquire a temporary ownership interest in some percentage portion of the project which allows entities to optimally size a regional project with excess capacity that won't be needed until the future. The entity buys back the state's portion of the facility over time. Principal and interest are deferred on the state-owned portion of project.

Water Management Strategy-Project Name:	DRILL NEW WELLS (LIVESTOCK, MORRIS, QUEEN CITY, CYPRESS)	**Project Total Capital Cost:**	$ 767,000
1) Planning, Design, Permitting & Acquisition Funding	Amount: $	Year Needed:	
2) Construction Funding	Amount: $	Year Needed:	
Total Anticipated State Funding Assistance:	$ *sum above*		
3) Percent State Participation in Owning Excess Capacity		State Ownership:	%

Water Management Strategy-Project Name:	DRILL NEW WELLS (LIVESTOCK, MORRIS, QUEEN CITY, SULPHUR)	**Project Total Capital Cost:**	$ 539,000
1) Planning, Design, Permitting & Acquisition Funding	Amount: $	Year Needed:	
2) Construction Funding	Amount: $	Year Needed:	
Total Anticipated State Funding Assistance:	$ *sum above*		
3) Percent State Participation in Owning Excess Capacity		State Ownership:	%

Project Sponsor Name:	LIVESTOCK, RED RIVER
Primary Planning Region:	D

Contact Information:

Name:	
Phone Number:	
Email:	
Comments:	

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Data descriptions:

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3) Percent State Participation in Excess Capacity of the Project: Enter the percent share of the total project capacity that will not be needed within the first 10 years of the project life. For some larger projects that qualify, the state may acquire a temporary ownership interest in some percentage portion of the project which allows entities to optimally size a regional project with excess capacity that won't be needed until the future. The entity buys back the state's portion of the facility over time. Principal and interest are deferred on the state-owned portion of project.

Water Management Strategy-Project Name:	DRILL NEW WELLS (LIVESTOCK RED RIVER, BLOSSOM, RED)	**Project Total Capital Cost:**	$ 425,000
1) Planning, Design, Permitting & Acquisition Funding	Amount: $	Year Needed:	
2) Construction Funding	Amount: $	Year Needed:	
Total Anticipated State Funding Assistance:	$ *sum above*		
3) Percent State Participation in Owning Excess Capacity		State Ownership:	%

Water Management Strategy-Project Name:	DRILL NEW WELLS (LIVESTOCK RED RIVER, TRINITY AQUIFER, SULPHUR)	**Project Total Capital Cost:**	$ 1,436,000
1) Planning, Design, Permitting & Acquisition Funding	Amount: $	Year Needed:	
2) Construction Funding	Amount: $	Year Needed:	
Total Anticipated State Funding Assistance:	$ *sum above*		
3) Percent State Participation in Owning Excess Capacity		State Ownership:	%

Project Sponsor Name:	LIVESTOCK, TITUS
Primary Planning Region:	D

Contact Information:

Name:	
Phone Number:	
Email:	
Comments:	

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Water Management Strategy-Project Name:	DRILL NEW WELLS (LIVESTOCK TITUS, CARRIZO, CYPRESS, 2020)	**Project Total Capital Cost:**	$ 767,000
1) Planning, Design, Permitting & Acquisition Funding	Amount: $	Year Needed:	
2) Construction Funding	Amount: $	Year Needed:	
Total Anticipated State Funding Assistance:	$ *sum above*		
3) Percent State Participation in Owning Excess Capacity		State Ownership:	%

Water Management Strategy-Project Name:	DRILL NEW WELLS (LIVESTOCK TITUS, CARRIZO, CYPRESS, 2030)	**Project Total Capital Cost:**	$ 684,000
1) Planning, Design, Permitting & Acquisition Funding	Amount: $	Year Needed:	
2) Construction Funding	Amount: $	Year Needed:	
Total Anticipated State Funding Assistance:	$ *sum above*		
3) Percent State Participation in Owning Excess Capacity		State Ownership:	%

Water Management Strategy-Project Name:	DRILL NEW WELLS (LIVESTOCK TITUS, CARRIZO, SULPHUR)	**Project Total Capital Cost:**	$ 5,215,000
1) Planning, Design, Permitting & Acquisition Funding	Amount: $	Year Needed:	
2) Construction Funding	Amount: $	Year Needed:	
Total Anticipated State Funding Assistance:	$ *sum above*		
3) Percent State Participation in Owning Excess Capacity		State Ownership:	%

Project Sponsor Name:	LIVESTOCK, UPSHUR
Primary Planning Region:	D

Contact Information:

Name:	
Phone Number:	
Email:	
Comments:	

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Water Management Strategy-Project Name:	DRILL NEW WELLS (LIVESTOCK, UPSHUR, QUEEN CITY, CYPRESS)	**Project Total Capital Cost:**	$ 172,000
1) Planning, Design, Permitting & Acquisition Funding	Amount: $	Year Needed:	
2) Construction Funding	Amount: $	Year Needed:	
Total Anticipated State Funding Assistance:	$ *sum above*		
3) Percent State Participation in Owning Excess Capacity		State Ownership:	%

Water Management Strategy-Project Name:	DRILL NEW WELLS (LIVESTOCK, UPSHUR, QUEEN CITY, SABINE)	**Project Total Capital Cost:**	$ 172,000
1) Planning, Design, Permitting & Acquisition Funding	Amount: $	Year Needed:	
2) Construction Funding	Amount: $	Year Needed:	
Total Anticipated State Funding Assistance:	$ *sum above*		
3) Percent State Participation in Owning Excess Capacity		State Ownership:	%

Project Sponsor Name:	LIVESTOCK, WOOD
Primary Planning Region:	D

Contact Information:

Name:	
Phone Number:	
Email:	
Comments:	

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Water Management Strategy-Project Name:	DRILL NEW WELL (LIVESTOCK, WOOD, QUEEN CITY, SABINE)	**Project Total Capital Cost:**	$ 1,210,000
1) Planning, Design, Permitting & Acquisition Funding	Amount: $	Year Needed:	
2) Construction Funding	Amount: $	Year Needed:	
Total Anticipated State Funding Assistance:	$ *sum above*		
3) Percent State Participation in Owning Excess Capacity		State Ownership:	%

Project Sponsor Name:	MANUFACTURING, UPSHUR
Primary Planning Region:	D

Contact Information:

Name:	
Phone Number:	
Email:	
Comments:	

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Water Management Strategy-Project Name:	DRILL NEW WELLS (MANUFACTURING UPSHUR, QUEEN CITY, CYPRESS)	**Project Total Capital Cost:**	$ 172,000
1) Planning, Design, Permitting & Acquisition Funding	Amount: $	Year Needed:	
2) Construction Funding	Amount: $	Year Needed:	
Total Anticipated State Funding Assistance:	$ *sum above*		
3) Percent State Participation in Owning Excess Capacity		State Ownership:	%

Project Sponsor Name:	MANUFACTURING, VAN ZANDT
Primary Planning Region:	D

Contact Information:

Name:	
Phone Number:	
Email:	
Comments:	

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Water Management Strategy-Project Name:	DRILL NEW WELLS (MANUFACTURING VAN ZANDT, CARRIZO-WILCOX, TRINITY, 2020)	**Project Total Capital Cost:**	$ 1,043,000
1) Planning, Design, Permitting & Acquisition Funding	Amount: $	Year Needed:	
2) Construction Funding	Amount: $	Year Needed:	
Total Anticipated State Funding Assistance:	$ *sum above*		
3) Percent State Participation in Owning Excess Capacity		State Ownership:	%

Water Management Strategy-Project Name:	DRILL NEW WELLS (MANUFACTURING VAN ZANDT, CARRIZO-WILCOX, TRINITY, 2030)	**Project Total Capital Cost:**	$ 1,355,000
1) Planning, Design, Permitting & Acquisition Funding	Amount: $	Year Needed:	
2) Construction Funding	Amount: $	Year Needed:	
Total Anticipated State Funding Assistance:	$ *sum above*		
3) Percent State Participation in Owning Excess Capacity		State Ownership:	%

Project Sponsor Name:	MANUFACTURING, WOOD
Primary Planning Region:	D

Contact Information:

Name:	
Phone Number:	
Email:	
Comments:	

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2) Construction Funding: Enter portion of total costs into the 'Construction' category for which you anticipate applying for state funding to construct your project using a low interest loan from TWDB.

3) Percent State Participation in Excess Capacity of the Project: Enter the percent share of the total project capacity that will not be needed within the first 10 years of the project life. For some larger projects that qualify, the state may acquire a temporary ownership interest in some percentage portion of the project which allows entities to optimally size a regional project with excess capacity that won't be needed until the future. The entity buys back the state's portion of the facility over time. Principal and interest are deferred on the state-owned portion of project.

Water Management Strategy-Project Name:	DRILL NEW WELLS (MANUFACTURING, WOOD, QUEEN CITY, SABINE)	**Project Total Capital Cost:**	$ 1,210,000
1) Planning, Design, Permitting & Acquisition Funding	Amount: $	Year Needed:	
2) Construction Funding	Amount: $	Year Needed:	
Total Anticipated State Funding Assistance:	$ *sum above*		
3) Percent State Participation in Owning Excess Capacity		State Ownership:	%

Project Sponsor Name:	MILLER GROVE WSC
Primary Planning Region:	D

Contact Information:

Name:	Sandra Garrett
Phone Number:	903-459-3383
Email:	mgwater@cumbytel.com
Comments:	No response

As part of the state water planning process, regional water planning groups recommend water supply projects for each of their respective regions. The Texas Water Development Board (TWDB) has several funding programs for water projects that support the planning, design, and construction of water supply projects with several financing options including low-interest loans and deferral of principal and interest. Texas Water Code Section 16.053 (q) requires the regional water planning groups to examine the financing needed to implement the water management strategies and projects recommended in their regional plan.

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Projects you are designated as sponsoring in the Regional Water Plan

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Data descriptions:

1) Planning, Design, Permitting, and Acquisition Funding: Enter portion of total costs into the 'Planning and Acquisition' category for which you anticipate applying for a low interest loan from TWDB for development efforts leading up to construction. This option includes providing funding for all pre-construction stages of the project.

2) Construction Funding: Enter portion of total costs into the 'Construction' category for which you anticipate applying for state funding to construct your project using a low interest loan from TWDB.

3) Percent State Participation in Excess Capacity of the Project: Enter the percent share of the total project capacity that will not be needed within the first 10 years of the project life. For some larger projects that qualify, the state may acquire a temporary ownership interest in some percentage portion of the project which allows entities to optimally size a regional project with excess capacity that won't be needed until the future. The entity buys back the state's portion of the facility over time. Principal and interest are deferred on the state-owned portion of project.

Water Management Strategy-Project Name:	DRILL NEW WELLS (MILLER GROVE WSC, HOPKINS, CARRIZO-WILCOX, SULPHUR, 2020)	**Project Total Capital Cost:**	$ 459,000
1) Planning, Design, Permitting & Acquisition Funding	Amount: $	Year Needed:	
2) Construction Funding	Amount: $	Year Needed:	
Total Anticipated State Funding Assistance:	$ *sum above*		
3) Percent State Participation in Owning Excess Capacity		State Ownership:	%

Water Management Strategy-Project Name:	DRILL NEW WELLS (MILLER GROVE WSC, HOPKINS, CARRIZO-WILCOX, SULPHUR, 2070)	**Project Total Capital Cost:**	$ 459,000
1) Planning, Design, Permitting & Acquisition Funding	Amount: $	Year Needed:	
2) Construction Funding	Amount: $	Year Needed:	
Total Anticipated State Funding Assistance:	$ *sum above*		
3) Percent State Participation in Owning Excess Capacity		State Ownership:	%

Project Sponsor Name:	MINING, GREGG
Primary Planning Region:	D

Contact Information:

Name:	
Phone Number:	
Email:	
Comments:	

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Projects you are designated as sponsoring in the Regional Water Plan

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Data descriptions:
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2) Construction Funding: Enter portion of total costs into the 'Construction' category for which you anticipate applying for state funding to construct your project using a low interest loan from TWDB.

3) Percent State Participation in Excess Capacity of the Project: Enter the percent share of the total project capacity that will not be needed within the first 10 years of the project life. For some larger projects that qualify, the state may acquire a temporary ownership interest in some percentage portion of the project which allows entities to optimally size a regional project with excess capacity that won't be needed until the future. The entity buys back the state's portion of the facility over time. Principal and interest are deferred on the state-owned portion of project.

Water Management Strategy-Project Name:	DRILL NEW WELLS (MINING GREGG, CARRIZO-WILCOX, SABINE)	**Project Total Capital Cost:**	$ 117,000
1) Planning, Design, Permitting & Acquisition Funding	Amount: $	Year Needed:	
2) Construction Funding	Amount: $	Year Needed:	
Total Anticipated State Funding Assistance:	$ *sum above*		
3) Percent State Participation in Owning Excess Capacity		State Ownership:	%

Project Sponsor Name:	MINING, HARRISON
Primary Planning Region:	D

Contact Information:

Name:	
Phone Number:	
Email:	
Comments:	

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Projects you are designated as sponsoring in the Regional Water Plan

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Data descriptions:
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2) Construction Funding: Enter portion of total costs into the ‘Construction’ category for which you anticipate applying for state funding to construct your project using a low interest loan from TWDB.

3) Percent State Participation in Excess Capacity of the Project: Enter the percent share of the total project capacity that will not be needed within the first 10 years of the project life. For some larger projects that qualify, the state may acquire a temporary ownership interest in some percentage portion of the project which allows entities to optimally size a regional project with excess capacity that won't be needed until the future. The entity buys back the state’s portion of the facility over time. Principal and interest are deferred on the state-owned portion of project.

Water Management Strategy-Project Name:	DRILL NEW WELLS (MINING HARRISON, QUEEN CITY, CYPRESS)	**Project Total Capital Cost:**	$ 384,000
1) Planning, Design, Permitting & Acquisition Funding	Amount: $	Year Needed:	
2) Construction Funding	Amount: $	Year Needed:	
Total Anticipated State Funding Assistance:	$ *sum above*		
3) Percent State Participation in Owning Excess Capacity		State Ownership:	%

Water Management Strategy-Project Name:	DRILL NEW WELLS (MINING HARRISON, QUEEN CITY, SABINE)	**Project Total Capital Cost:**	$ 1,555,000
1) Planning, Design, Permitting & Acquisition Funding	Amount: $	Year Needed:	
2) Construction Funding	Amount: $	Year Needed:	
Total Anticipated State Funding Assistance:	$ *sum above*		
3) Percent State Participation in Owning Excess Capacity		State Ownership:	%

Project Sponsor Name:	MINING, HOPKINS
Primary Planning Region:	D

Contact Information:

Name:	
Phone Number:	
Email:	
Comments:	

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Projects you are designated as sponsoring in the Regional Water Plan

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Data descriptions:

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2) Construction Funding: Enter portion of total costs into the 'Construction' category for which you anticipate applying for state funding to construct your project using a low interest loan from TWDB.

3) Percent State Participation in Excess Capacity of the Project: Enter the percent share of the total project capacity that will not be needed within the first 10 years of the project life. For some larger projects that qualify, the state may acquire a temporary ownership interest in some percentage portion of the project which allows entities to optimally size a regional project with excess capacity that won't be needed until the future. The entity buys back the state's portion of the facility over time. Principal and interest are deferred on the state-owned portion of project.

Water Management Strategy-Project Name:	DRILL NEW WELLS (MINING HOPKINS, HOPKINS, CARRIZO, SULPHUR, 2020)	**Project Total Capital Cost:**	$ 1,528,000
1) Planning, Design, Permitting & Acquisition Funding	Amount: $	Year Needed:	
2) Construction Funding	Amount: $	Year Needed:	
Total Anticipated State Funding Assistance:	$ *sum above*		
3) Percent State Participation in Owning Excess Capacity		State Ownership:	%

Water Management Strategy-Project Name:	DRILL NEW WELLS (MINING HOPKINS, HOPKINS, CARRIZO, SULPHUR, 2050)	**Project Total Capital Cost:**	$ 428,000
1) Planning, Design, Permitting & Acquisition Funding	Amount: $	Year Needed:	
2) Construction Funding	Amount: $	Year Needed:	
Total Anticipated State Funding Assistance:	$ *sum above*		
3) Percent State Participation in Owning Excess Capacity		State Ownership:	%

Water Management Strategy-Project Name:	DRILL NEW WELLS (MINING HOPKINS, HOPKINS, CARRIZO, SULPHUR, 2060)	**Project Total Capital Cost:**	$ 924,000
1) Planning, Design, Permitting & Acquisition Funding	Amount: $	Year Needed:	
2) Construction Funding	Amount: $	Year Needed:	
Total Anticipated State Funding Assistance:	$ *sum above*		
3) Percent State Participation in Owning Excess Capacity		State Ownership:	%

Project Sponsor Name:	MINING, HUNT
Primary Planning Region:	D

Contact Information:

Name:	
Phone Number:	
Email:	
Comments:	

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Water Management Strategy- Project Name:	DRILL NEW WELLS (MINING HUNT, TRINITY, SABINE)	**Project Total Capital Cost:**	$ 766,000
1) Planning, Design, Permitting & Acquisition Funding	Amount: $	Year Needed:	
2) Construction Funding	Amount: $	Year Needed:	
Total Anticipated State Funding Assistance:	$ *sum above*		
3) Percent State Participation in Owning Excess Capacity		State Ownership:	%

Project Sponsor Name:	MINING, MARION
Primary Planning Region:	D

Contact Information:

Name:	
Phone Number:	
Email:	
Comments:	

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Projects you are designated as sponsoring in the Regional Water Plan

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Data descriptions:

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Water Management Strategy- Project Name:	DRILL NEW WELLS (MINING MARION, QUEEN CITY, CYPRESS)	**Project Total Capital Cost:**	$ 767,000
1) Planning, Design, Permitting & Acquisition Funding	Amount: $	Year Needed:	
2) Construction Funding	Amount: $	Year Needed:	
Total Anticipated State Funding Assistance:	$ *sum above*		
3) Percent State Participation in Owning Excess Capacity		State Ownership:	%

Project Sponsor Name:	MINING, SMITH
Primary Planning Region:	D

Contact Information:

Name:	
Phone Number:	
Email:	
Comments:	

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Data descriptions:

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Water Management Strategy-Project Name:	SMTH-MIN-INFRASTRUCTURE	**Project Total Capital Cost:**	$ 3,103,000
1) Planning, Design, Permitting & Acquisition Funding	Amount: $	Year Needed:	
2) Construction Funding	Amount: $	Year Needed:	
Total Anticipated State Funding Assistance:	$ *sum above*		
3) Percent State Participation in Owning Excess Capacity		State Ownership:	%

Project Sponsor Name:	NORTH HARRISON WSC
Primary Planning Region:	D

Contact Information:

Name:	
Phone Number:	
Email:	
Comments:	

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Projects you are designated as sponsoring in the Regional Water Plan

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Data descriptions:

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Water Management Strategy-Project Name:	DRILL NEW WELLS (NORTH HARRISON, QUEEN CITY, CYPRESS)	**Project Total Capital Cost:**	$ 612,000
1) Planning, Design, Permitting & Acquisition Funding	Amount: $	Year Needed:	
2) Construction Funding	Amount: $	Year Needed:	
Total Anticipated State Funding Assistance:	$ *sum above*		
3) Percent State Participation in Owning Excess Capacity		State Ownership:	%

Project Sponsor Name:	NORTH HUNT SUD
Primary Planning Region:	D

Contact Information:

Name:	Stacey Nicholson
Phone Number:	903-456-0269
Email:	snicholson253@hotmail.com
Comments:	Phone interview

As part of the state water planning process, regional water planning groups recommend water supply projects for each of their respective regions. The Texas Water Development Board (TWDB) has several funding programs for water projects that support the planning, design, and construction of water supply projects with several financing options including low-interest loans and deferral of principal and interest. Texas Water Code Section 16.053 (q) requires the regional water planning groups to examine the financing needed to implement the water management strategies and projects recommended in their regional plan.

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Projects you are designated as sponsoring in the Regional Water Plan

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Data descriptions:

1) Planning, Design, Permitting, and Acquisition Funding: Enter portion of total costs into the 'Planning and Acquisition' category for which you anticipate applying for a low interest loan from TWDB for development efforts leading up to construction. This option includes providing funding for all pre-construction stages of the project.

2) Construction Funding: Enter portion of total costs into the 'Construction' category for which you anticipate applying for state funding to construct your project using a low interest loan from TWDB.

3) Percent State Participation in Excess Capacity of the Project: Enter the percent share of the total project capacity that will not be needed within the first 10 years of the project life. For some larger projects that qualify, the state may acquire a temporary ownership interest in some percentage portion of the project which allows entities to optimally size a regional project with excess capacity that won't be needed until the future. The entity buys back the state's portion of the facility over time. Principal and interest are deferred on the state-owned portion of project.

Water Management Strategy-Project Name:	DRILL NEW WELLS (NORTH HUNT SUD, HUNT, NACATOCH, SABINE, 2020)	**Project Total Capital Cost:**	$ 1,493,000
1) Planning, Design, Permitting & Acquisition Funding	Amount: $ 300,000	Year Needed:	2021
2) Construction Funding	Amount: $ $1,193,000	Year Needed:	2021
Total Anticipated State Funding Assistance:	$ 1,493,000 *sum above*		
3) Percent State Participation in Owning Excess Capacity		State Ownership:	%

Water Management Strategy-Project Name:	DRILL NEW WELLS (NORTH HUNT SUD, HUNT, NACATOCH, SABINE, 2030)	**Project Total Capital Cost:**	$ 1,054,000
1) Planning, Design, Permitting & Acquisition Funding	Amount: $ 210,000	Year Needed:	
2) Construction Funding	Amount: $ 844,000	Year Needed:	
Total Anticipated State Funding Assistance:	$ 1,054,000 *sum above*		
3) Percent State Participation in Owning Excess Capacity		State Ownership:	%

Water Management Strategy-Project Name:	DRILL NEW WELLS (NORTH HUNT SUD, HUNT, NACATOCH, SABINE, 2040)	**Project Total Capital Cost:**	$ 1,054,000
1) Planning, Design, Permitting & Acquisition Funding	Amount: $ 210,000	Year Needed:	
2) Construction Funding	Amount: $ 844,000	Year Needed:	
Total Anticipated State Funding Assistance:	$ 1,054,000 *sum above*		
3) Percent State Participation in Owning Excess Capacity		State Ownership:	%

Water Management Strategy-Project Name:	DRILL NEW WELLS (NORTH HUNT SUD, HUNT, NACATOCH, SABINE, 2050)	**Project Total Capital Cost:**	$ 1,998,000
1) Planning, Design, Permitting & Acquisition Funding	Amount: $ 400,000	Year Needed:	
2) Construction Funding	Amount: $ 1,598,000	Year Needed:	
Total Anticipated State Funding Assistance:	$ 1,998,000 *sum above*		
3) Percent State Participation in Owning Excess Capacity		State Ownership:	%

Water Management Strategy-Project Name:	DRILL NEW WELLS (NORTH HUNT SUD, HUNT, NACATOCH, SABINE, 2060)	**Project Total Capital Cost:**	$ 2,932,000
1) Planning, Design, Permitting & Acquisition Funding	Amount: $ 585,000	Year Needed:	
2) Construction Funding	Amount: $ 2,347,000	Year Needed:	
Total Anticipated State Funding Assistance:	$ 2,932,000 *sum above*		
3) Percent State Participation in Owning Excess Capacity		State Ownership:	%

Water Management Strategy-Project Name:	DRILL NEW WELLS (NORTH HUNT SUD, HUNT, NACATOCH, SABINE, 2070)	**Project Total Capital Cost:**	$ 2,902,000
1) Planning, Design, Permitting & Acquisition Funding	Amount: $ 580,000	Year Needed:	
2) Construction Funding	Amount: $ 2,322,000	Year Needed:	
Total Anticipated State Funding Assistance:	$ 2,902,000 *sum above*		
3) Percent State Participation in Owning Excess Capacity		State Ownership:	%

Project Sponsor Name:	PANOLA-BETHANY WSC
Primary Planning Region:	D

Contact Information:

Name:	
Phone Number:	
Email:	
Comments:	

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Water Management Strategy-Project Name:	DRILL NEW WELLS (PANOLA BETHANY, QUEEN CITY, SABINE)	**Project Total Capital Cost:**	$ 2,399,000
1) Planning, Design, Permitting & Acquisition Funding	Amount: $	Year Needed:	
2) Construction Funding	Amount: $	Year Needed:	
Total Anticipated State Funding Assistance:	$ *sum above*		
3) Percent State Participation in Owning Excess Capacity		State Ownership:	%

Project Sponsor Name:	POETRY WSC
Primary Planning Region:	D

Contact Information:

Name:	Phillip Keys
Phone Number:	972-563-7471
Email:	
Comments:	No response

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Water Management Strategy-Project Name:	CONSERVATION, WATER LOSS CONTROL - POETRY WSC	**Project Total Capital Cost:**	$ 3,186
1) Planning, Design, Permitting & Acquisition Funding	Amount: $	Year Needed:	
2) Construction Funding	Amount: $	Year Needed:	
Total Anticipated State Funding Assistance:	$ *sum above*		
3) Percent State Participation in Owning Excess Capacity		State Ownership:	%

Project Sponsor Name:	R P M WSC
Primary Planning Region:	D

Contact Information:

Name:	Robert Young
Phone Number:	903-852-3115
Email:	rpmwsc@yahoo.com
Comments:	No response

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Water Management Strategy- Project Name:	DRILL NEW WELLS (R-P-M WSC, CARRIZO-WILCOX, NECHES, 2030)	**Project Total Capital Cost:**	$ 895,000
1) Planning, Design, Permitting & Acquisition Funding	Amount: $	Year Needed:	
2) Construction Funding	Amount: $	Year Needed:	
Total Anticipated State Funding Assistance:	$ *sum above*		
3) Percent State Participation in Owning Excess Capacity		State Ownership:	%

Water Management Strategy- Project Name:	DRILL NEW WELLS (R-P-M WSC, CARRIZO-WILCOX, NECHES, 2040)	**Project Total Capital Cost:**	$ 370,000
1) Planning, Design, Permitting & Acquisition Funding	Amount: $	Year Needed:	
2) Construction Funding	Amount: $	Year Needed:	
Total Anticipated State Funding Assistance:	$ *sum above*		
3) Percent State Participation in Owning Excess Capacity		State Ownership:	%

Water Management Strategy- Project Name:	DRILL NEW WELLS (R-P-M WSC, CARRIZO-WILCOX, NECHES, 2050)	**Project Total Capital Cost:**	$ 753,000
1) Planning, Design, Permitting & Acquisition Funding	Amount: $	Year Needed:	
2) Construction Funding	Amount: $	Year Needed:	
Total Anticipated State Funding Assistance:	$ *sum above*		
3) Percent State Participation in Owning Excess Capacity		State Ownership:	%

Water Management Strategy-Project Name:	DRILL NEW WELLS (R-P-M WSC, CARRIZO-WILCOX, NECHES, 2060)	**Project Total Capital Cost:**	$ 784,000
1) Planning, Design, Permitting & Acquisition Funding	Amount: $	Year Needed:	
2) Construction Funding	Amount: $	Year Needed:	
Total Anticipated State Funding Assistance:	$ *sum above*		
3) Percent State Participation in Owning Excess Capacity		State Ownership:	%

Water Management Strategy-Project Name:	DRILL NEW WELLS (R-P-M WSC, CARRIZO-WILCOX, NECHES, 2070)	**Project Total Capital Cost:**	$ 774,000
1) Planning, Design, Permitting & Acquisition Funding	Amount: $	Year Needed:	
2) Construction Funding	Amount: $	Year Needed:	
Total Anticipated State Funding Assistance:	$ *sum above*		
3) Percent State Participation in Owning Excess Capacity		State Ownership:	%

Project Sponsor Name:	RIVERBEND WATER RESOURCES DISTRICT
Primary Planning Region:	D

Contact Information:

Name:	Kyle Dooley
Phone Number:	903-831-0091
Email:	kyledooley@rwrd.org
Comments:	Written response. See note below.

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Water Management Strategy-Project Name:	RIVERBEND STRATEGY CASS NEW WTP AND TRANSMISSION LINE	**Project Total Capital Cost:**	$ 22,807,000
1) Planning, Design, Permitting & Acquisition Funding	Amount: $	Year Needed:	
2) Construction Funding	Amount: $	Year Needed:	
Total Anticipated State Funding Assistance:	$ *sum above*		
3) Percent State Participation in Owning Excess Capacity		State Ownership:	%

Water Management Strategy-Project Name:	RIVERBEND WMS INTERIM TO ULTIMATE STORAGE CONVERSION	**Project Total Capital Cost:**	$ 20,550,000
1) Planning, Design, Permitting & Acquisition Funding	Amount: $	Year Needed:	
2) Construction Funding	Amount: $	Year Needed:	
Total Anticipated State Funding Assistance:	$ *sum above*		
3) Percent State Participation in Owning Excess Capacity		State Ownership:	%

Water Management Strategy-Project Name:	RIVERBEND WMS NEW RAW WATER INTAKE 120 MGD 2030	**Project Total Capital Cost:**	$ 13,282,000
1) Planning, Design, Permitting & Acquisition Funding	Amount: $	Year Needed:	
2) Construction Funding	Amount: $	Year Needed:	
Total Anticipated State Funding Assistance:	$ *sum above*		
3) Percent State Participation in Owning Excess Capacity		State Ownership:	%

Water Management Strategy-Project Name:	RIVERBEND WMS NEW RAW WATER PIPELINE 32 MGD 2050	**Project Total Capital Cost:**	$ 61,647,000
1) Planning, Design, Permitting & Acquisition Funding	Amount: $	Year Needed:	
2) Construction Funding	Amount: $	Year Needed:	
Total Anticipated State Funding Assistance:	$ *sum above*		
3) Percent State Participation in Owning Excess Capacity		State Ownership:	%

Water Management Strategy-Project Name:	RIVERBEND WMS NEW WTP 25 MGD 2030	**Project Total Capital Cost:**	$ 127,811,000
1) Planning, Design, Permitting & Acquisition Funding	Amount: $	Year Needed:	
2) Construction Funding	Amount: $	Year Needed:	
Total Anticipated State Funding Assistance:	$ *sum above*		
3) Percent State Participation in Owning Excess Capacity		State Ownership:	%

Water Management Strategy-Project Name:	RIVERBEND WMS PUMP STATION EXPANSION 18 MGD 2050	**Project Total Capital Cost:**	$ 11,603,000
1) Planning, Design, Permitting & Acquisition Funding	Amount: $	Year Needed:	
2) Construction Funding	Amount: $	Year Needed:	
Total Anticipated State Funding Assistance:	$ *sum above*		
3) Percent State Participation in Owning Excess Capacity		State Ownership:	%

Water Management Strategy-Project Name:	RIVERBEND WMS PUMP STATION EXPANSION 30 MGD 2060	**Project Total Capital Cost:**	$ 22,130,000
1) Planning, Design, Permitting & Acquisition Funding	Amount: $	Year Needed:	
2) Construction Funding	Amount: $	Year Needed:	
Total Anticipated State Funding Assistance:	$ *sum above*		
3) Percent State Participation in Owning Excess Capacity		State Ownership:	%

Water Management Strategy-Project Name:	RIVERBEND WMS PUMP STATION EXPANSION 6 MGD 2040	**Project Total Capital Cost:**	$ 4,326,000
1) Planning, Design, Permitting & Acquisition Funding	Amount: $	Year Needed:	
2) Construction Funding	Amount: $	Year Needed:	
Total Anticipated State Funding Assistance:	$ *sum above*		
3) Percent State Participation in Owning Excess Capacity		State Ownership:	%

Water Management Strategy-Project Name:	RIVERBEND WMS RAW WATER PIPELINE 72 MGD 2030	**Project Total Capital Cost:**	$ 36,061,000
1) Planning, Design, Permitting & Acquisition Funding	Amount: $	Year Needed:	
2) Construction Funding	Amount: $	Year Needed:	
Total Anticipated State Funding Assistance:	$ *sum above*		
3) Percent State Participation in Owning Excess Capacity		State Ownership:	%

Water Management Strategy-Project Name:	RIVERBEND WMS RAW WATER PUMP STATION 66 MGD 2030	**Project Total Capital Cost:**	$ 45,041,000
1) Planning, Design, Permitting & Acquisition Funding	Amount: $	Year Needed:	
2) Construction Funding	Amount: $	Year Needed:	
Total Anticipated State Funding Assistance:	$ *sum above*		
3) Percent State Participation in Owning Excess Capacity		State Ownership:	%

Water Management Strategy-Project Name:	RIVERBEND WMS WATER RIGHT AMENDMENT	**Project Total Capital Cost:**	$ 103,000
1) Planning, Design, Permitting & Acquisition Funding	Amount: $	Year Needed:	
2) Construction Funding	Amount: $	Year Needed:	
Total Anticipated State Funding Assistance:	$ *sum above*		
3) Percent State Participation in Owning Excess Capacity		State Ownership:	%

Water Management Strategy-Project Name:	RIVERBEND WMS WTP EXPANSION 10 MGD 2050	**Project Total Capital Cost:**	$ 33,348,000
1) Planning, Design, Permitting & Acquisition Funding	Amount: $	Year Needed:	
2) Construction Funding	Amount: $	Year Needed:	
Total Anticipated State Funding Assistance:	$ *sum above*		
3) Percent State Participation in Owning Excess Capacity		State Ownership:	%

Water Management Strategy-Project Name:	RIVERBEND WMS WTP EXPANSION 5 MGD 2040	**Project Total Capital Cost:**	$ 19,745,000
1) Planning, Design, Permitting & Acquisition Funding	Amount: $	Year Needed:	
2) Construction Funding	Amount: $	Year Needed:	
Total Anticipated State Funding Assistance:	$ *sum above*		
3) Percent State Participation in Owning Excess Capacity		State Ownership:	%

For the Riverbend WMS (2020) and the New 2.5 MGD Package WTP and Transmission Line (2030) information, please refer to the RWRD Regional Water Master Plan Study (2018) and any associated additional documents. Currently, the Riverbend WMS (2020) is planned to start later this year. The package WTP is still considered for implementation around 2030. It is planned that all estimated project costs for both strategies would require application for state funding.

Project Sponsor Name:	SCOTTSVILLE
Primary Planning Region:	D

Contact Information:

Name:	
Phone Number:	
Email:	
Comments:	

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Water Management Strategy-Project Name:	DRILL NEW WELLS (SCOTTSVILLE, QUEEN CITY, CYPRESS)	**Project Total Capital Cost:**	$ 1,429,000
1) Planning, Design, Permitting & Acquisition Funding	Amount: $	Year Needed:	
2) Construction Funding	Amount: $	Year Needed:	
Total Anticipated State Funding Assistance:	$ *sum above*		
3) Percent State Participation in Owning Excess Capacity		State Ownership:	%

Project Sponsor Name:	SMITH COUNTY MUD 1
Primary Planning Region:	D

Contact Information:

Name:	
Phone Number:	
Email:	
Comments:	

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For each of the project(s) listed below **for which you are designated as sponsor**, please enter only the funding amounts you anticipate requesting from TWDB categories in the ‘**Amount**’ field; enter the earliest '**Year Needed**' date that you anticipate requiring these amounts; and, enter in the '**State Ownership**' field the percent share of the overall project capacity that you anticipate the state taking initial ownership of. Note that the total amount entered into the separate funding categories may not exceed the **Project Total Capital Cost**. **Only enter the amount of funding that you expect to request from state funding programs.**

Data descriptions:
1) Planning, Design, Permitting, and Acquisition Funding: Enter portion of total costs into the 'Planning and Acquisition' category for which you anticipate applying for a low interest loan from TWDB for development efforts leading up to construction. This option includes providing funding for all pre-construction stages of the project.

2) Construction Funding: Enter portion of total costs into the ‘Construction’ category for which you anticipate applying for state funding to construct your project using a low interest loan from TWDB.

3) Percent State Participation in Excess Capacity of the Project: Enter the percent share of the total project capacity that will not be needed within the first 10 years of the project life. For some larger projects that qualify, the state may acquire a temporary ownership interest in some percentage portion of the project which allows entities to optimally size a regional project with excess capacity that won't be needed until the future. The entity buys back the state’s portion of the facility over time. Principal and interest are deferred on the state-owned portion of project.

Water Management Strategy-Project Name:	DRILL NEW WELLS (SMITH COUNTY MUD 1, QUEEN CITY, SABINE)	**Project Total Capital Cost:**	$ 3,948,000
1) Planning, Design, Permitting & Acquisition Funding	Amount: $	Year Needed:	
2) Construction Funding	Amount: $	Year Needed:	
Total Anticipated State Funding Assistance:	$ *sum above*		
3) Percent State Participation in Owning Excess Capacity		State Ownership:	%

Project Sponsor Name:	STAR MOUNTAIN WSC
Primary Planning Region:	D

Contact Information:

Name:	
Phone Number:	
Email:	
Comments:	

As part of the state water planning process, regional water planning groups recommend water supply projects for each of their respective regions. The Texas Water Development Board (TWDB) has several funding programs for water projects that support the planning, design, and construction of water supply projects with several financing options including low-interest loans and deferral of principal and interest. Texas Water Code Section 16.053 (q) requires the regional water planning groups to examine the financing needed to implement the water management strategies and projects recommended in their regional plan.

This Infrastructure Financing Survey is a tool to gather information regarding how you, as a project sponsor, anticipate financing the water supply projects recommended to meet your needs in the 2021 regional water plan, including whether you, as a sponsor, intend to use financial assistance programs offered by the State of Texas and administered by the TWDB.

More information on these financial assistance programs can be found at the TWDB website at:
http://www.twdb.texas.gov/financial/index.asp

Your cooperation and responses to these questions are crucial to assisting the state in providing ongoing funding opportunities to ensure that our communities and our citizens have adequate water supplies. Note that a response to this survey is required for any entity seeking SWIFT funding for state water plan projects.

Please enter only the share of total project costs that you wish to receive through a TWDB program in the "Share of Costs" fields and do not enter a specific portion of a project cost more than once.

Projects you are designated as sponsoring in the Regional Water Plan

For each of the project(s) listed below **for which you are designated as sponsor**, please enter only the funding amounts you anticipate requesting from TWDB categories in the ‘**Amount**’ field; enter the earliest '**Year Needed**' date that you anticipate requiring these amounts; and, enter in the '**State Ownership**' field the percent share of the overall project capacity that you anticipate the state taking initial ownership of. Note that the total amount entered into the separate funding categories may not exceed the **Project Total Capital Cost**. **Only enter the amount of funding that you expect to request from state funding programs.**

Data descriptions:
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Water Management Strategy-Project Name:	DRILL NEW WELLS (STAR MOUNTAIN, QUEEN CITY, SABINE)	**Project Total Capital Cost:**	$ 1,521,000
1) Planning, Design, Permitting & Acquisition Funding	Amount: $	Year Needed:	
2) Construction Funding	Amount: $	Year Needed:	
Total Anticipated State Funding Assistance:	$ *sum above*		
3) Percent State Participation in Owning Excess Capacity		State Ownership:	%

Project Sponsor Name:	STARRVILLE-FRIENDSHIP WSC
Primary Planning Region:	D

Contact Information:

Name:	
Phone Number:	
Email:	
Comments:	

As part of the state water planning process, regional water planning groups recommend water supply projects for each of their respective regions. The Texas Water Development Board (TWDB) has several funding programs for water projects that support the planning, design, and construction of water supply projects with several financing options including low-interest loans and deferral of principal and interest. Texas Water Code Section 16.053 (q) requires the regional water planning groups to examine the financing needed to implement the water management strategies and projects recommended in their regional plan.

This Infrastructure Financing Survey is a tool to gather information regarding how you, as a project sponsor, anticipate financing the water supply projects recommended to meet your needs in the 2021 regional water plan, including whether you, as a sponsor, intend to use financial assistance programs offered by the State of Texas and administered by the TWDB.

More information on these financial assistance programs can be found at the TWDB website at:
http://www.twdb.texas.gov/financial/index.asp

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Projects you are designated as sponsoring in the Regional Water Plan

For each of the project(s) listed below **for which you are designated as sponsor**, please enter only the funding amounts you anticipate requesting from TWDB categories in the '**Amount**' field; enter the earliest '**Year Needed**' date that you anticipate requiring these amounts; and, enter in the '**State Ownership**' field the percent share of the overall project capacity that you anticipate the state taking initial ownership of. Note that the total amount entered into the separate funding categories may not exceed the **Project Total Capital Cost**. **Only enter the amount of funding that you expect to request from state funding programs.**

Data descriptions:

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Water Management Strategy-Project Name:	DRILL NEW WELLS (STARRVILLE FRIENDSHIP, CARRIZO, SABINE)	**Project Total Capital Cost:**	$ 761,000
1) Planning, Design, Permitting & Acquisition Funding	Amount: $	Year Needed:	
2) Construction Funding	Amount: $	Year Needed:	
Total Anticipated State Funding Assistance:	$ *sum above*		
3) Percent State Participation in Owning Excess Capacity		State Ownership:	%

Project Sponsor Name:	WASKOM
Primary Planning Region:	D

Contact Information:

Name:	
Phone Number:	
Email:	
Comments:	

As part of the state water planning process, regional water planning groups recommend water supply projects for each of their respective regions. The Texas Water Development Board (TWDB) has several funding programs for water projects that support the planning, design, and construction of water supply projects with several financing options including low-interest loans and deferral of principal and interest. Texas Water Code Section 16.053 (q) requires the regional water planning groups to examine the financing needed to implement the water management strategies and projects recommended in their regional plan.

This Infrastructure Financing Survey is a tool to gather information regarding how you, as a project sponsor, anticipate financing the water supply projects recommended to meet your needs in the 2021 regional water plan, including whether you, as a sponsor, intend to use financial assistance programs offered by the State of Texas and administered by the TWDB.

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Water Management Strategy-Project Name:	DRILL NEW WELLS (WASKOM, QUEEN CITY, CYPRESS)	**Project Total Capital Cost:**	$ 2,399,000
1) Planning, Design, Permitting & Acquisition Funding	Amount: $	Year Needed:	
2) Construction Funding	Amount: $	Year Needed:	
Total Anticipated State Funding Assistance:	$ *sum above*		
3) Percent State Participation in Owning Excess Capacity		State Ownership:	%

Project Sponsor Name:	WINONA
Primary Planning Region:	D

Contact Information:

Name:	
Phone Number:	
Email:	
Comments:	

As part of the state water planning process, regional water planning groups recommend water supply projects for each of their respective regions. The Texas Water Development Board (TWDB) has several funding programs for water projects that support the planning, design, and construction of water supply projects with several financing options including low-interest loans and deferral of principal and interest. Texas Water Code Section 16.053 (q) requires the regional water planning groups to examine the financing needed to implement the water management strategies and projects recommended in their regional plan.

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Water Management Strategy-Project Name:	DRILL NEW WELLS (WINONA, CARRIZO-WILCOX, SABINE)	**Project Total Capital Cost:**	$ 761,000
1) Planning, Design, Permitting & Acquisition Funding	Amount: $	Year Needed:	
2) Construction Funding	Amount: $	Year Needed:	
Total Anticipated State Funding Assistance:	$ *sum above*		
3) Percent State Participation in Owning Excess Capacity		State Ownership:	%

Project Sponsor Name:	WOLFE CITY
Primary Planning Region:	D

Contact Information:

Name:	Kris Burns
Phone Number:	903-496-2251
Email:	info@wolfecitytx.org
Comments:	No response

As part of the state water planning process, regional water planning groups recommend water supply projects for each of their respective regions. The Texas Water Development Board (TWDB) has several funding programs for water projects that support the planning, design, and construction of water supply projects with several financing options including low-interest loans and deferral of principal and interest. Texas Water Code Section 16.053 (q) requires the regional water planning groups to examine the financing needed to implement the water management strategies and projects recommended in their regional plan.

This Infrastructure Financing Survey is a tool to gather information regarding how you, as a project sponsor, anticipate financing the water supply projects recommended to meet your needs in the 2021 regional water plan, including whether you, as a sponsor, intend to use financial assistance programs offered by the State of Texas and administered by the TWDB.

More information on these financial assistance programs can be found at the TWDB website at:
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Water Management Strategy-Project Name:	NEW CONTRACT WITH GREENVILLE AND PIPELINE TO WOLFE CITY	**Project Total Capital Cost:**	$ 7,124,000
1) Planning, Design, Permitting & Acquisition Funding	Amount: $	Year Needed:	
2) Construction Funding	Amount: $	Year Needed:	
Total Anticipated State Funding Assistance:	$ *sum above*		
3) Percent State Participation in Owning Excess Capacity		State Ownership:	%

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Appendix C10 – Chapter 10:

ADOPTION OF PLAN AND PUBLIC PARTICIPATION

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APPENDIX C10

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Texas Water Development Board

P.O. Box 13231, 1700 N. Congress Ave.
Austin, TX 78711-3231, www.twdb.texas.gov
Phone (512) 463-7847, Fax (512) 475-2053

Mr. Jim Thompson, Chair
c/o Ward Timber
1101 US 59
Linden, Texas 75563

Mr. Walt Sears
Northeast Texas Municipal Water District
P.O. Box 955
Hughes Springs, Texas 75656

Re: Texas Water Development Board Comments for the North East Texas (Region D) Regional Water Planning Group Initially Prepared Plan, Contract No. 1548301832

Dear Mr. Thompson and Mr. Sears:

Texas Water Development Board (TWDB) staff have completed their review of the Initially Prepared Plan (IPP) submitted by March 3, 2020 on behalf of the North East Texas Regional Water Planning Group (RWPG). The attached comments follow this format:

- **Level 1:** Comments, questions, and data revisions that must be satisfactorily addressed in order to meet statutory, agency rule, and/or contract requirements; and,

- **Level 2:** Comments and suggestions for consideration that may improve the readability and overall understanding of the regional water plan.

Please note that rule references are based on recent revisions to 31 Texas Administrative Code (TAC) Chapter 357, adopted by the TWDB Board on June 4, 2020. 31 TAC § 357.50(f) requires the RWPG to consider timely agency and public comment. Section 357.50(g) requires the final adopted plan include summaries of all timely written and oral comments received, along with a response explaining any resulting revisions or why changes are not warranted. Copies of TWDB's Level 1 and 2 written comments and the region's responses must be included in the final, adopted regional water plan (*Contract Exhibit C, Section 13.1.2)*.

Standard to all planning groups is the need to include certain content in the final regional water plans that was not yet available at the time that IPPs were prepared and submitted. In your final regional water plan, please be sure to also incorporate the following:

a) Completed results from the RWPG's infrastructure financing survey for sponsors of recommended projects with capital costs, including an electronic version of the survey spreadsheet *[31 TAC § 357.44]*;

b) Completed results from the implementation survey, including an electronic version of the survey spreadsheet *[31 TAC § 357.45(a)]*;
c) Documentation that comments received on the IPP were considered in the development of the final plan *[31 TAC § 357.50(f)]*; and
d) Evidence, such as a certification in the form of a cover letter, that the final, adopted regional water plan is complete and adopted by the RWPG *[31 TAC § 357.50(h)(1)]*.

Please ensure that the final plan includes updated State Water Planning Database (DB22) reports, and that the numerical values presented in the tables throughout the final, adopted regional water plan are consistent with the data provided in DB22. For the purpose of development of the 2022 State Water Plan, water management strategy and other data entered by the RWPG in DB22 shall take precedence over any conflicting data presented in the final regional water plan *[Contract Exhibit C, Sections 13.1.3 and 13.2.2]*.

Additionally, subsequent review of DB22 data is being performed. If issues arise during our ongoing data review, they will be communicated promptly to the planning group to resolve. Please anticipate the need to respond to additional comments regarding data integrity, including any source overallocations, prior to the adoption of the final regional water plans.

The provision of certain content in an electronic-only form is permissible as follows: Internet links are permissible as a method for including model conservation and drought contingency plans within the final regional water plan; hydrologic modeling files may be submitted as electronic appendices, however all other regional water plan appendices should also be incorporated in hard copy format within each plan *[31 TAC § 357.50(g)(2)(C), Contract Exhibit C, Section 13.1.2 and 13.2.1]*.

The following items must accompany, the submission of the final, adopted regional water plan:

1. The prioritized list of all recommended projects in the regional water plan, including an electronic version of the prioritization spreadsheet *[31 TAC § 357.46];* and,
2. All hydrologic modeling files and GIS files, including any remaining files that may not have been provided at the time of the submission of the IPP but that were used in developing the final plan *[31 TAC § 357.50(g)(2)(C), Contract Exhibit C, Section 13.1.2, and 13.2.1].*

The following general requirements that apply to recommended water management strategies must be adhered to in all final regional water plans including:

1. Regional water plans must not include any recommended strategies or project costs that are associated with simply maintaining existing water supplies or replacing existing infrastructure. Plans may include only infrastructure costs that are associated with volumetric increases of treated water supplies delivered to water user groups or that result in more efficient use of existing supplies *[31 TAC § 357.10(39), § 357.34(e)(3)(A), Contract Exhibit C, Sections 5.5.2 and 5.5.3]*; and,

2. Regional water plans must not include the costs of any retail distribution lines or other infrastructure costs that are not directly associated with the development of additional supply volumes (e.g., via treatment) other than those line replacement costs related to projects that are for the primary purpose of achieving conservation savings via water loss reduction *[§ 357.34(e)(3)(A), Contract Exhibit C, Section 5.5.3]*.

Please be advised that, within the attached document, your region has received a comment specifically requesting that the RWPG provide the basis for how the RWPG considers it feasible that certain water management strategies will actually be implemented by January 5, 2023 (see Level 1, Comment 1), especially for projects with long lead times. This comment is aimed at making sure RWPGs do not present projects in their plans to provide water during the 2020 decade that cannot reasonably be expected to be online, *and provide water supply*, by January 5, 2023. For project types whose drought yields rely on *previously stored water*, the 2020 supply volume should take into consideration reasonably expected accumulated storage that would already be available in the event of drought. The RWPG must adequately address this Level 1 comment in the final, adopted regional water plan, which might require making changes to your regional plan.

It is preferable that RWPGs adopt a realistic plan that acknowledges the likelihood of unmet needs in a near-term drought, rather than to present a plan that overlooks reasonably foreseeable, near-term shortages due to the inclusion of unrealistic project timelines. If a '2020' decade project cannot reasonably be expected to come online by January 2023, for example if a reservoir has not started the permitting process, it should be moved to the 2030 decade. Any potential supply gaps (unmet needs) created by moving out projects to the 2030 decade may be shown as simply 'unmet' in the 2020 decade or be shown as met by a 'demand management' strategy. Doing so will appropriately reflect the fact that some entities would likely face an actual shortage if a drought of record were to occur in the very near future despite projects (that may be included in the plan but associated with a later decade) that will eventually address those same potential shortages in future years.

It is imperative that you provide the TWDB with information on how you intend to address this comment and all other comments well in advance of your adoption the regional water plan to ensure that the response is adequate for the Executive Administrator to recommend the plan to the TWDB Board for consideration in a timely and efficient manner. Your TWDB project manager will review and provide feedback to ensure all IPP comments and associated plan revisions have been addressed adequately. Failure to adequately address this comment (or any Level 1 comment) may result in the delay of the TWDB Board approval of your final regional water plan.

As a reminder, the deadline to submit the final, adopted regional water plan and associated material to the TWDB is **October 14, 2020**. Any remaining data revisions to DB22 must be communicated to Sabrina Anderson at Sabrina.Anderson@twdb.texas.gov by **September 14, 2020.**

If you have any questions regarding these comments or would like to discuss your approach to addressing any of these comments, please do not hesitate to contact Ron Ellis at (512) 463-4146 or Ron.Ellis@twdb.texas.gov. TWDB staff will be available to assist you in any way possible to ensure successful completion of your final regional water plan.

Sincerely,

Jessica Pena Zuba Digitally signed by Jessica Pena Zuba
Date: 2020.06.18 11:06:38 -05'00'

Jessica Zuba
Deputy Executive Administrator
Water Supply and Infrastructure

Date: 6/18/2020

Attachment

c w/att.: Mr. Tony Smith, Carollo Engineers

Team Response to Texas Water Development Board Comments for the North East Texas (Region D) Regional Water Planning Group Initially Prepared Plan

Level 1: Comments, questions, and data revisions that must be satisfactorily addressed in order to meet statutory, agency rule, and/or contract requirements.

1. Chapter 5 and the State Water Planning Database (DB22). The plan includes the following recommended water management strategies (WMS) by WMS type, providing supply in 2020 (not including demand management): 48 groundwater wells & other, one indirect reuse, and eight other surface water. Strategy supply with an online decade of 2020 must be constructed and delivering water by January 5, 2023.

a) Please confirm that all strategies shown as providing supply in 2020 are expected to be providing water supply by January 5, 2023. [31 § TAC 357.10(21); Contract Exhibit C, Section 5.2]

Response: The NETRWPG's consultants have performed outreach efforts throughout the regional water planning process to engage the Region's Water User Groups (WUGs) and Major Water Providers (MWPs) to ensure the accuracy of demand, supply, needs, and strategy information in the 2021 Regional Water Plan. As part of these efforts, information developed by the WUGs and the NETRWPG were exchanged as much as practicable. To the extent that WUGs and MWPs engaged this planning process to share information with the NETRWPG, the NETRWPG confirms that information regarding the identified near-term need and accordant recommended strategies have been shared with all entities for which needs have been identified and strategies recommended. The extent of the NETRWPG's awareness of these entities' plans and actions taken to date are reflected in this Plan's reporting of the infrastructure financing and implementation survey results as reported in Chapters 9 and 11 of the Plan, respectively.

b) Please provide the specific basis on which the planning group anticipates that it is feasible that the eight other surface water WMSs will all actually be online and providing water supply by January 5, 2023. For example, provide information on actions taken by sponsors and anticipated future project milestones that demonstrate sufficient progress toward implementation. [31 § TAC 357.10(21); Contract Exhibit C, Section 5.2]

Response:

1. **Riverbend Water Resources District and its' member entities have each taken actions to pursue implementation of the Riverbend WMS and its' accordant WMSPs, for both the Riverbend WMS, the New 2.5 MGD Water Treatment Plant, and all other recommended WMSPs associated with the Riverbend WRD for the purposes of the 2021 Plan. The District has secured funding with TWDB, and is currently pursuing permitting and contracting actions at both the state and federal levels. Details of their intended path forward are reflected in the Riverbend Regional Water Master Plan and supporting documentation.**
2. **Holly Springs WSC – This WUG has hired an engineering firm to prepare plans and specifications for expanding their storage facilities and a notice to proceed has been issued to**

start construction, consistent with the recommended WMSP to increase their water supply contract with the Northeast Texas Municipal Water District.

3. **Harleton WSC – This WUG has an existing water purchase contract with the Northeast Texas Municipal Water District stating the WUG will increase their contract for future water needs and will not construct additional wells, consistent with the recommended WMSP to increase their contract with the Northeast Texas Municipal Water District.**
4. **Hickory Creek SUD – This WUG has indicated plans for the development of groundwater supplies. As the rules applicable for the regional water planning process currently limit the NETRWPG's ability to recommend groundwater supplies greater than the modeled amounts identified by the TWDB, this WUG's need has been left remaining as an unmet need for the purposes of the planning process. The surface water strategy identified in the IPP (Greenville Tie-In Pipeline; 2020) has been removed for the purposes of the Final Plan.**
5. **Irrigation, Lamar County – Regarding the recommended WMSP for the Pat Mayse Raw Water Pipeline, this WUG is not represented by a single political subdivision. The NETRWPG is aware of the development of surface water supplies by Daisy Farms in Lamar County, and anticipates similar development for irrigation needs in this county that cannot be met by private groundwater supply development.**
6. **Livestock, Lamar County - Regarding the recommended WMSP for the Livestock Raw Water Pipeline, this WUG is not represented by a single political subdivision. The NETRWPG is aware of the development of surface water supplies by Daisy Farms in Lamar County, and anticipates similar development for livestock needs in this county that cannot be met by private groundwater supply development.**
7. **City of Clarksville – The City has indicated to the NETRWPG its' plans to continue development of additional groundwater supplies to meet its' needs. Thus, the WMS identified in the IPP (Contract with Riverbend WRD and Treated Water Pipeline to DeKalb) has been replaced with a recommend groundwater WMSP.**
8. **City of Canton – The City has communicated to the NETRWPG plans and actions taken for the near-term development of additional supplies relating to reuse and groundwater. The City has submitted an application for reuse and is prioritizing that effort. These efforts are consistent with the recommended WMSPs for the City of Canton (Canton Indirect Reuse and Drill New Wells) for the purposes of the Final 2021 Region D Plan.**

c) In the event that the resulting adjustment of the timing of WMSs in the plan results in an increase in near-term unmet water needs, please update the related portions of the plan and DB22 accordingly, and also indicate whether 'demand management' will be the WMS used in the event of drought to address such water supply shortfalls or if the plan will show these as simply 'unmet'. If municipal shortages are left 'unmet' and without a 'demand management' strategy to meet the shortage, please also ensure that adequate justification is included in accordance with 31 TAC § 357.50(j). [TWC § 16.051(a); 31 § TAC 357.50(j); [31 TAC § 357.34(i)(2); Contract Exhibit C, Section 5.2]

Response: The recommended WMS for Hickory Creek SUD identified in the Region D IPP has been removed for the purposes of the Final 2021 Region D Plan, and the resultant need for this WUG left as an unmet municipal need. Section 6.3.1 on unmet needs has been revised to include an explanation to adequately address 31 TAC § 357.50(j). [TWC § 16.051(a); 31 § TAC 357.50(j); and [31 TAC § 357.34(i)(2). The additional text is as follows:

> **Communications with Hickory Creek SUD have indicated that this WUG intends to meet projected water needs through the construction of additional well(s) as needed. This WUG is not currently in the regulatory area of a Groundwater Conservation District, and thus has the legal capability to pursue such a strategy.**
>
> **In its' evaluation of potentially feasible strategies, the NETRWPG determined that the amounts needed would exceed the amounts identified by MAG amounts for aquifer sources proximate to the WUG. A subsequent process was then performed whereby the NETRWPG exercised its' authority to determine groundwater availability within the RWPA as established by Senate Bill 1101 (passed by the 84th Texas Legislature in 2015). Broadly, this law allows a RWPG to define all groundwater availability as long as there are no GCDs within the RWPA. As noted previously, this applies only to Region D.**
>
> **Through this process, the TWDB's review identified modeled estimates of compatible groundwater availability for desired future conditions for relevant aquifers which in some instances limited the determined availability. These instances were identified by TWDB's modeling to potentially result in an impact to an adjacent area outside the RWPA that does have established DFCs.**
>
> **While technically this has been identified as an unmet municipal need for the purposes of the 2021 Region D Plan, it is recognized by the NETRWPG that this WUG intends to meet its' regulatory requirements through a legally implementable WMS. This groundwater strategy is not recommended for the purposes of this 2021 Region D Plan due to the aforementioned limitations in the planning process.**
>
> **To meet all applicable planning requirements, the NETRWPG considered all potentially feasible strategies including drought management and conservation, which are not recommended as they each would be insufficient to meet the projected needs while meeting TCEQ regulatory minimums. In the event of a repeat of the drought of record, the NETRWPG recognizes that the groundwater approach identified by the WUG is within their legal capability to meet projected needs in a manner that ensures public health, safety, and welfare over the planning horizon. It is further recognized that as the Joint Planning Process continues, future adjustments to availability may allow the opportunity to amend this Plan if deemed necessary in the future to address all or a portion of this unmet need.**
>
> **Two recommendations are proffered based on the aforementioned process. These recommendations have also been included in the Recommendations portion of Chapter 8 of this 2021 Plan:**
>
> 1. **That the Joint Planning Process representing the coordination between GMA 8 and the NETRWPG incorporate the above information as appropriate to make adjustments to better**

address the identified limitations in the MAG amounts relating to actual and planned legal pumping activities; and

2. **The TWDB consider revising its analytic approach to identifying allowable groundwater availabilities to more adequately address the legal capabilities of WUGs currently using or planning to use groundwater as a WMS within Region D, to better align with the intent of the aforementioned SB 1101.**

As noted in Chapter 3, the NETRWPG believes that local entities that operate wells and wellfields in the region have insight and information that may be helpful in refining the groundwater availability estimates.

The two recommendations above have also been incorporated into the recommendations portion of Chapter 8 (Section 8.14.13) and the summary of recommendations presented in the Executive Summary. All other references to the previously identified WMS identified for this WUG as recommended in the IPP have been removed from the Final 2021 Region D Plan.

Text in the Executive Summary pertaining to Unmet Needs has also been revised as follows:

> **Three needs have been identified as remaining unmet in the North East Texas Region for the purposes of the 2021 Plan, for manufacturing in Bowie County, irrigation in Red River County, and a municipal unmet need for Hickory Creek SUD in Hunt County. A summary of these unmet needs, by category, is presented in Section 5.5.5, Section 6.3.1, and tabulated in Appendix ES-6.**

d) Please be advised that, in accordance with Senate Bill 1511, 85th Texas Legislature, the planning group will be expected to rely on its next planning cycle budget to amend its 2021 Regional Water Plan during development of the 2026 Regional Water Plan, if recommended WMSs or projects become infeasible, for example, due to timing of projects coming online. Infeasible WMSs include those WMSs where proposed sponsors have not taken an affirmative vote or other action to make expenditures necessary to construct or file applications for permits required in connection with implementation of the WMS on a schedule in order for the WMS to be completed by the time the WMS is needed to address drought in the plan. [Texas Water Code § 16.053(h)(10); 31 TAC § 357.12(b)]

Response: Acknowledged.

2. Executive Summary and Appendices. DB22 reports are not presented together in a single appendix in the plan. Please include all DB22 reports together in one appendix and include a reference to that appendix in the Executive Summary, in the final, adopted regional water plan. Additionally, the plan includes some DB22 reports that appear blank due to the region not having relevant data for these reports. Please provide a cover page to the DB22 report appendix indicating the reason for these report contents being blank. *[Contract Exhibit C, Section 13.1.2]*

Response: Appendix ES has been revised to aggregate all required DB22 reports, and a reference added to Executive Summary. Cover pages have been added in Appendix ES for Reports 18, 19, and 20 indicating reasons why these specific DB22 reports are blank for Region D.

3. Section 2.3.5, page 2-18, Table 2.19. Please revise the section and table headers referring to "Wholesale Water Provider" to "Major Water Provider" in the final, adopted regional water plan. *[31 TAC § 357.31(b); 31 TAC § 357.31(f)]*

Response: Section 2.3.5, Tables 2.19 and 2.20 revised from "Wholesale Water Provider" (WWP) to "Major Water Provider" (MWP).

4. Appendix 5C, page 521. The plan appears to present population and water demand projections for the City of Canton that are inconsistent with TWDB Board adopted projections. Population and water demands presented on page 521 appear to represent only the projections for the Sabine River Basin. Population projections on page 521 is presented as 3,963 in 2020; 4,333 in 2030; 4,616 in 2040; 4,897 in 2050; 5,130 in 2060; and 5,329 in 2070. TWDB Board-adopted population projections for Canton are 3,981 in 2020, 4,352 in 2030; 4,636 in 2040; 4,919 in 2050; 5,153 in 2060; and 5,352 in 2070. Please revise the City of Canton projections and water demands to match Board-adopted projections in the final, adopted regional water plan. *[31 TAC § 357.31(a)]*

Response: Population and demand projections for the City of Canton as described in Appendix 5C revised to match Board adopted projections.

5. Section 3.1.2, pages 3-14 to 3-18. The plan does not appear to document the methodology used to estimate local annual water availability volumes for surface water withdrawals that do not require permits. Please clarify the methodology used to estimate local supply availability (irrigation and livestock) in the final, adopted regional water plan. *[Contract Exhibit C, Section 3.2]*

Response: Section 3.1, 5th paragraph, revised to state:

> **Where permits have been identified for irrigation and/or livestock uses, water availability for local supply sources was determined utilizing the applicable official WAM. Supplies not requiring a permit for domestic irrigation and/or livestock uses, such as private supplies from individual water wells on private property, have been based on a comparative analysis of USDA reported 2017 county census amounts of livestock along with estimated median water use coefficients developed and reported by the USGS (Lovelace, 2009) for various livestock categories. These estimates were then compared to reported historical agricultural water use estimates along with the supplies reported and adopted for previous Region D Water Plans to ensure estimated firm water supplies for the non-permitted domestic irrigation and/or livestock uses are conservative and consistent with reported county amounts.**

6. Section 3.2.1, page 3-21, 2nd paragraph. The plan describes the hydrologic variance request process for MAG reallocations, however the TWDB's approval of Region D's groundwater availability adjustments are approved through a separate process outlined in 31 TAC § 357.32(d)(2). Please remove the information on the MAG reallocation process and consider

including a more detailed discussion of the process for approving Region D's groundwater availability. Please consider including a copy of the 1/16/2020 TWDB Board item approving the availability and copies of the RWPG documentation requesting the availabilities in an appendix in the final, adopted regional water plan. *[31 TAC § 357.32(d)(2)]*

Response: Section 3.2.1 text revised to remove discussion of MAG reallocation and provide a more detailed discussion of the process for approving the groundwater availabilities used by the NETRWPG for the purposes of the 2021 Region D Plan. An additional appendix (Appendix C3-3) has been added which includes all formal communications between the NETRWPG and TWDB regarding the approval process, including minutes from the January 16, 2020, meeting of the TWDB Board.

7. Section 3.3.8, Table 3.25, pages 3-50 through 3-51. The plan does not appear to include the evaluation results of existing supplies for major water providers (MWP). Results for wholesale water providers (WWP) are reported in Section 3.3.8 and the plan previously states that Region D's WWPs and MWPs are the same entities. Please revise the name of Section 3.3.8 and Table 3.25 header and column header from 'Wholesale Water Provider' to 'Major Water Providers' in the final, adopted regional water plan. *[31 TAC § 357.32(g)]*

Response: Section 3.3.8, tables and associated appendices revised to identification of MWP.

8. Chapter 3. Please include a summary with information on the Water Availability Model (WAM) version, WAM simulation date, and WRAP version used for simulations in the final, adopted regional water plan. *[Contract Exhibit C, Section 3.2.1]*

Response: A summary Table 3.3 has been added to Chapter 3 providing information on the Water Availability Model (WAM) version, WAM simulation date, and WRAP version used for simulations in the final, adopted regional water plan.

9. Appendix C5. The plan, in several instances, appears to include existing supply volumes for WUGs that are inconsistent with the total existing supplies reported for the entities in DB22. For example, Canton (page 521), Cash SUD (page 387), and Greenville (page 401) appear to report inconsistent data between the plan and DB22. Please reconcile this information as necessary in the final, adopted regional water plan. *[31 TAC § 357.32(g)]*

Response: Existing supply volumes in the adopted plan have been reconciled with amounts in DB22 for the City of Canton and Cash SUD. Values shown in Appendix C5 for the City of Greenville supplies agree with DB22 data for total raw supply when compared to the Total Volume In identified in the TWDB's water balance. Existing supplies reported in DB22 have been added as rows to the City's reported existing supply amounts in Appendix C5-7. The WMS summary provided in Appendix C5 for the City of Greenville now shows total water demand as a single value representing treated and raw water demand as well as a second representation presenting just the treated water demand.

10. Appendix C5. The plan, in several instances, appears to include surplus/needs for WUGs that are inconsistent with the needs/surplus reported for the entities in DB22. For example, Canton (page 521) and Greenville (page 401) appear to report inconsistent data between the plan and DB22. Please reconcile this information as necessary in the final, adopted regional water plan. *[31 TAC § 357.33(a)]*

Response: Reported surplus and need amounts in the final, adopted plan have been reconciled with amounts in DB22.

11. Section 4.3, Table 4.30, pages 4-16 to 4-18. The plan does not appear to include the evaluation results of water needs for MWPs. Results for WWPs are reported in Section 4.3. Please revise the name of Section 4.3 and Table 4.30 header from 'Wholesale Water Provider' to 'Major Water Providers' in the final, adopted regional water plan. *[31 TAC § 357.33(b)]*

Response: Section 4.3 and Table 4.30 revised to identify entities as Major Water Providers.

12. Chapter 4. The plan does not appear to include a secondary needs analysis for MWPs. Please present the results of the secondary needs analysis by decade for MWPs in the final, adopted regional water plan. *[31 TAC § 357.33(e)]*

Response: A new Section 4.4 and Table 4.58 has been added to document results of a secondary needs analysis by decade for Major Water Providers in the North East Texas Region.

13. Page 5-12 and Appendix C5, page 404. The demand reduction volumes (over 40 percent of total demands) for Greenville appear high especially considering that there are no specific practices identified to achieve those volumes. Please consider identifying specific best management practices or adding discussion to support the magnitude of the demand reduction volume for Greenville in the final, adopted regional water plan. *[31 TAC § 357.34(i)(2)(B)]*

Response: Additional text added to Section 5.2.5.1 (Pg. 5-12) stating:

> **The identification of an advanced water conservation strategy for the City of Greenville is based on the baseline per capita usage of 156 gpcd reported by TWDB to the NETRWPG for the City of Greenville in comparison to the base reported per-capita amounts of approximately 277 gpcd from 2011 employed for developing the demand projections. Five- and Ten- Year goals for the City are 149 gpcd and 147 gpcd, respectively.**

14. Section 5.3.4.1, page 5-47. It is not clear from the plan if or how environmental flow criteria were taken into account in the calculation of additional firm yield of Wright Patman Lake associated with the amendment of Certificate of Adjudication 03-4836, which is required for the implementation of the Riverbend Strategy. Please clarify how environmental flow criteria were considered for this strategy evaluation and document this information in the final, adopted regional water plan. *[31 TAC § 357.34(e)(3)(B); 31 TAC § 358.3(22); 31 TAC § 358.3(23)]*

Response: Additional text added to Section 5.3.4.1 to clarify as follows:

> **The official TCEQ WAM for the Sulphur River Basin was applied to reflect this new diversion, backed by the permitted storage of Lake Wright Patman. Refilling of the reservoir due to the junior diversion was modeled subject to environmental flow constraints. As there is no Senate Bill 3 environmental flow standard adopted for the Sulphur River Basin, consensus planning criteria were employed in this modeling. It was determined that sufficient supply exists in the**

originally permitted full storage at the original priority date for Lake Wright Patman to meet the increased diversion amount.

Associated WAM files have been included in the digital deliverable for the Final Plan.

15. Chapter 5. The plan states that irrigation conservation was not considered for several of the identified irrigation water needs [pp. 5-50, 5-64, 5-71, 5-80, 5-85, 5-90, 5-104, 5-112, 5-120]. In some cases, the plan identifies best management practices implemented or generalized reasons that conservation is not feasible for irrigation in the region. In these cases, it appears that the planning group may have considered conservation as a strategy but did not recommend irrigation conservation strategies them. Please ensure that the *consideration* of conservation practices for all identified water needs is documented in the final, adopted regional water plan. *[31 TAC § 357.34(i)]*

Response: A new Section 5.2.5.4 has been added stating:

Water conservation strategies for other users (irrigation, livestock and mining) for all water needs were considered by the NETRWPG but ultimately not recommended for the purposes of the 2021 Region D Plan. Irrigation demand is projected to decline from 9 percent to 7 percent of the demand over the planning period. Livestock and mining comprise a total of 11 percent to 9 percent of the demand. The cost of water in these industries comprises a small percentage of the overall business cost and it is not expected these industries will see a significant economic benefit to water conservation.

Text throughout Chapter 5 has also been revised to clarify the consideration of strategies and the subsequent determination of their feasibility.

16. Chapter 5. The plan does not appear to present management supply factors for MWPs. Please present management supply factors for MWPs by entity and decade in the final, adopted regional water plan. *[31 TAC § 357.35(g)(2)]*

Response: Section 5.3 revised to reflect the inclusion of management supply factors for both WUGs and MWPs in Appendix C5-13.

17. DB22 Report 'WUG Recommended Conservation WMS Associated with Recommended IBT WMS' appears to include water user groups (WUG) in which Region D is the primary region such as Hickory Creek SUD that receive WMS supply from a proposed interbasin transfer WMS yet do not have any recommended conservation WMS supply. Please include a water conservation WMS for each WUG or WWP that is to obtain water from a proposed interbasin transfer to which TWC § 11.085 applies, in the final, adopted regional water plan. *[31 TAC § 357.34(i)(2)(C)]*

Response: This WMSP for Hickory Creek SUD identified as a recommended strategy in the Region D IPP (i.e., Greenville Tie-In Pipeline; 2020) has been removed for the purposes of the Final 2021 Region D Plan, and the need identified as an unmet need. See response to Comment 1(c).

18. Appendix C5. The plan, in several instances, appears to include WMS supply volumes that are inconsistent with the WMS supplies reported in DB22. For example, the City of Canton Indirect/Direct Reuse WMS (page 522), Cash SUD's Increase Contract (NTMWD) WMS (page

388), Greenville's WTP Expansion (15 MGD) WMS (page 404), and Van Zandt County – Manufacturing Advanced Conservation WMS (page 537) appear to report inconsistent WMS supply volumes between the plan and DB22. Please reconcile this information as necessary in the final, adopted regional water plan. *[31 TAC § 357.35(g)(1)]*

Response: Reported WMS supply volumes in the final, adopted plan have been reconciled with amounts in DB22.

19. Appendix C5 and DB22. The Greenville WTP Expansion (2030) WMS has an online decade of 2030 however, the related WMS project (on which the strategy would rely) in DB22, New WTP Greenville, has an online decade of 2070. Please confirm the online decade for this WMS and WMSP and ensure that projects necessary to implement strategies are online prior to or in concurrence with the WMS supply online decade in the final, adopted regional water plan. *[Contract Exhibit C, Section 5.2]*

Response: In coordination with TWDB staff, DB22 has been modified to be consistent with the amounts and language provided in the Final Plan. It is confirmed that the first recommended WMSP for the City of Greenville (WTP Expansion 2030) has an online decade of 2030, and the second recommended WMSP (New WTP Greenville) has an online decade of 2070.

20. Appendix C5, page 476. The evaluation for Crystal Systems Drill New Wells WMS does not appear to break out capital cost estimates for each project component. Please submit the costing tool's standardized cost output report or present capital cost estimates for each project component for each WMS evaluated in the final, adopted regional water plan. *[Contract Exhibit C, Section 5.5.1]*

Response: Capital cost estimates for the Crystal Systems Drill New Wells WMS have been revised to break out capital cost estimates for each project component.

21. Appendix 5C, pages 521-522. The evaluation for the Canton alternative New Reservoir on Grand Saline Creek WMS does not appear to present the reservoir-associated land costs separately. Please include separated reservoir-associated land costs as applicable to this strategy in the final, adopted regional water plan. *[Contract Exhibit C, Section 5.5]*

Response: The cost evaluation for the City of Canton's alternative WMS (i.e., New Reservoir on Grand Saline Creek) tabulated in the Final 2021 Region D Water Plan is based on application of the Unified Costing Model (UCM) provided by the TWDB. The table presenting the cost estimates is generated by the UCM.

A unit land cost of $4,947/acre was utilized from the Texas A&M University Real Estate Center data, and applied in the UCM to represent a reservoir area of 1,845 acres for a resultant estimated cost of approximately $9,127,215. Estimated costs for facilities represent 28.8 acres of pipeline ($142,670), 5 acres for intake and pump station facilities ($24,735), and 5 acres for booster stations ($24,735). The total estimated acreage is approximately 1,884 acres. Surveying costs estimated utilizing the UCM were approximately $111,000. The costing table in the Final Report for this WMS generated by the UCM, presents a line item "Land Acquisition and Surveying" that aggregates the total of the acreages described above (1,884 acres) and reports the sum of the aforementioned land and surveying costs, which amounts to $9.431 Million.

A second line item included in the costing table for this WMS is entitled "Environmental & Archaelogy Studies and Mitigation." This line item represents the sum of three elements: reservoir, pipeline, and other (for environmental, archaeological, and/or mitigation costs estimates for facilities other than the reservoir and pipelines). For the reservoir component, the UCM utilizes a default assumption of 200 percent of the land costs to calculate costs for environmental & archaeologic studies and mitigation. As mentioned above, land costs of the reservoir with an area of 1,845 acres are $9,127,215; thus, the estimated environmental, archaeological, and mitigation costs related to the reservoir that are generated using the default application of the UCM is $18,254,430. Costs associated with pipelines utilize the UCM's default $25,000/mile and an estimated 12 miles of pipelines, for an estimated cost of approximately $300,000 for environmental, archaeological, and mitigation. Costs associated with the remaining facilities utilize the default UCM assumption of 100% of the land costs, resulting in an estimated cost of $49,470 for environmental, archaeological, and mitigation for these acreages. The resultant aggregated estimated cost represented in the cost table generated by the UCM and included in the Final 2021 Region D Plan for this alternative WMS is the sum of these three elements, which equates to $18,601,000.

22. Appendix 5C, page 522. The plan states that direct and indirect reuse are conservation WMS options for the City of Canton. For planning purposes, *reuse* is considered a unique strategy type separate from *conservation*. Please revise this statement in the final, adopted regional water plan. *[Contract Exhibit C, Section 5.10]*

Response: Appendix 5C language pertaining to the recommended reuse strategy for the City of Canton has been revised to remove the term *conservation* from the description.

23. Appendix 5C-7. The plan does not appear to include MGD, pipe diameters, or pipe length information in strategy evaluations costing reports that include pipelines. For example, the values are presented as zero in the costing reports for the Riverbend, Wolfe City, Lamar County Irrigation, Cash SUD, Lamar County Livestock, Clarksville, and Canton. Please provide this information, if known, or remove the zeros from the costing outputs in the final, adopted regional water plan. *[Contract Exhibit C, Section 5.6]*

Response: Default reports generated by the TWDB UCM presented in Appendix 5C-7 have each been modified to correct reporting of individual line items.

24. Chapter 6 and Appendix C6. The tables presenting impact of WMSs do not appear to include descriptions of all of the criteria used for the quantitative rankings. Impacted acreages appear to be used for agricultural and natural resources; however, it is not clear how the impacted acreages or other methodology is used to assess impacts on environmental water needs, cultural resources, and effect of upstream development on bays, estuaries, and arms of the Gulf of Mexico. Please include a description of the quantitative criteria presented in the final, adopted regional water plan. *[31 TAC § 357.34(e)(3)(B)]*

Response: A new paragraph has been added to Chapter 6.7, stating:

> **For the purposes of this plan, it has been assumed in Table 6.17 that strategies not necessitating the implementation of significant long-term infrastructure and thus relatively small associated impacted acreages (e.g., conservation, contractual, or groundwater wells), would have minimal impacts on environmental needs and cultural resources, and are thus ranked 1. Calculated estimates of acreages for strategies contemplating the implementation**

of infrastructure were evaluated using Table 6.14 and determined to have a slightly larger impact (2), but remaining minimal due to the fact that the implementation of each WMS project would include permitting activities that would require minimal impacts to environmental and cultural resources. As there are no bays or estuaries within Region D, the characterization of potential impacts from Region D recommended strategies to bays and estuaries have been assumed to not be applicable (N/A).

25. Chapter 6. The plan does not appear to include a description of the impacts of the regional water plan on navigation. Please describe any effects of the plan on navigation in the final, adopted regional water plan. *[31 TAC § 357.40(b)(6)]*

Response: A new Section 6.7.2 has been added to the final, adopted plan presenting a description of the impacts of the regional water plan on navigation, stating:

> **As noted in Chapter 1, while the lack of perennial streams limits the viability of navigation projects in northeast Texas, there are several notable navigation projects either in the region or affected by streamflows from the region. None of the recommended water management strategies proffered herein are expected to exhibit impacts on navigation within the region. Conservation, groundwater wells, reuse, and contractual strategies will not impact navigation of surface waters, and the recommended surface water strategies considering development of infrastructure utilize existing surface water supplies and not affect navigation of streams in the region.**

Additional information on the Cypress Valley Navigation District (CVND) along with a description of the importance of navigation within Region D has been additionally added to Chapter 1, Section 1.5.4, stating:

> **The Cypress Valley Navigation District (CVND) is a unit of government in the state of Texas that was formed as a Navigation, Conservation and Reclamation District in the 1960's. The district is composed of all the territory in the watershed of the Cypress Bayou and its tributaries in Harrison and Marion Counties. CVND is funded by yearly contributions from both Harrison and Marion Counties and by an MOU with the TPWD. CVND has all the powers and rights generally granted to other navigation districts including the ability to own land, issue bonds, operate marinas, ports and other aids to navigation. The district also possesses the right to use eminent domain and to serve as the local sponsor for federal navigation projects on the Cypress Bayou and its tributaries. One such project was the now defunct Daingerfield Reach Project. This project was investigated as a possible way to enable goods to be shipped from Northeast Texas downstream to Shreveport and, using the Locks and Dams on the Red River, to other ports of commerce along the Mississippi River. This project was found not to be feasible and was never fully authorized. The possible development of new navigation projects upstream of Shreveport on the Red River are now being investigated. The location of the area under consideration begins just north of Shreveport and extends to Lake Texoma.**
>
> **The main activities that CVND engages in are to maintain navigation in and around Caddo Lake and upstream to Jefferson Texas. This maintenance has historically included dredging, log and tree removal, navigational marker repair, replacement and updating. With the discovery of the invasive aquatic plant, Giant Salvinia, in 2006 on Caddo Lake, the CVND role was increased to include efforts to suppress the spread of this plant. CVND has taken an active role in combatting this problem, participating in the Rapid Response Budget Committee which raised funds to combat Giant Salvinia and authorized CVND to construct a 2-mile barrier across Caddo Lake to**

slow the spread of the plant, along with public information campaigns and development of funding for a herbicide application program on Caddo Lake.

The work of CVND also helps to address concerns about logjams and siltation problems arising from previous alterations of the streams. The beneficial impacts of CVND's work include water quality improvements for water removed by the intake of the city of Marshall and uses involving the shoreline of the river and lake. These changes in the natural condition of Big Cypress and its tributaries below Jefferson were made in an attempt at facilitating steamboat traffic in the 19th Century. VND has been working to limit the impacts of the 19th Century modifications for more than five decades.

CVND is an example of a specially created water district that has adjusted its mission to address emerging issues of concern. It is an example of a unit of government that is largely dependent on other taxing entities to provide financial support for it. Further, it is an example of an organization that is successfully working with federal, state, and local governments to achieve improvements involving water resources. The enjoyment of Caddo Lake is enabled by CVND and the individuals who provide time and energy to assure the health of Caddo Lake.

and,

A recent report from the USACE regarding the J. Bennett Johnston Waterway (JBJWW) offers insight as to the ongoing benefits of that navigation project. Located in the central and northwestern part of Louisiana, this project receives water from Cypress, Sulphur, and Red River Basins located within Region D. Opened on December 31, 1994, the project consists of a 9-foot deep by 200-foot wide navigation channel that extends 236 miles from the junction of the Old River and Red River to the Shreveport-Bossier City area, with five navigation locks. This navigation project has been found to be economically justified both on a total project basis and a remaining project basis, offering numerous benefits such as avoided and reduced waterway shutdowns, limiting costs for dredging, and decreased navigation delays.

26. Chapter 7. The plan does not appear to include a discussion of whether drought contingency measures have been recently implemented (for example, since adoption of the last regional water plan) in response to drought conditions. Please include this information in the final, adopted regional water plan. *[Contract Scope of Work, Task 7, subtask 3]*

Response: New text and a new Table 7.9 have been added to Section 7.7.2 presenting a list of wholesale water providers and/or retail entities within Region D that have reported to the TCEQ their implementation of drought contingency measures since 2015.

27. Section 8.6 and Appendix C8. Please include a status of the unique stream segment recommendation package submitted to the Texas Parks and Wildlife Department (TPWD) and TPWD's response to the request if available, in the final, adopted regional water plan. *[31 TAC § 357.43(b)]*

Response: As noted in the IPP and Final Plan, the NETRWPG does not recommend that any stream segment be unconditionally designated as Ecologically Unique in this region. The NETRWPG did, however, elect to conditionally recommend the Pecan Bayou stream segment in the Red River Basin and the Black Cypress Bayou and Black Cypress Creek in the Cypress Creek Basin be identified as Ecologically Unique Stream Segments. Additional text has been added to Section 8.6 stating:

> **The conditional recommendations herein are those as presented in the previously adopted 2011 and 2016 Region D Water Plans. The information required in 31 TAC §357.43(b) is presented herein as part of the conditional recommendations proffered in this Plan. The TPWD has had the opportunity to review this information as part of their review of the Region D IPP. Comments from TPWD on the 2021 Region D IPP stated "TPWD staff applauds the planning group for making this recommendation." A separate, standalone package reflecting these recommendations was submitted to the TPWD by the NETRWPG on September 4, 2020.**

28. Chapter 8. The plan does not appear to include a quantitative analysis of the impact of the plan on the unique stream segments recommended for designation. Please include an assessment on the flows important to the river or stream segment, as determined by the planning group, comparing current conditions to conditions with implementation of all recommended WMSs, in the final, adopted regional water plan. *[31 TAC § 357.43(b)(2)]*

Response: The IPP and the Final 2021 Region D Water Plan include conditional recommendations for three unique stream segments: the Pecan Bayou stream segment in the Red River Basin and the Black Cypress Bayou and Black Cypress Creek in the Cypress Creek Basin. A statement has been added to Section 8.6 stating:

> **There are no recommended strategies in the 2021 Region D Water Plan that impact the conditionally recommended ecologically unique stream segments.**

29. Chapter 11. Please provide a brief summary of how the 2016 Plan differs from the 2021 Plan with regards to recommended and alternative WMS *projects* in the final, adopted regional water plan. *[31 TAC § 357.45(c)(4)]*

Response: A new Section 11.2.7 has been added to Chapter 11 providing a comparison of recommended and alternative WMSPs between the 2016 and 2021 Region D Plans. Two tables presenting the comparisons of the recommended and alternative WMSPs have also been added to this new section.

30. The GIS files submitted did not appear to include the locations of every recommended and alternative WMS project. Please include the locations of every recommended and alternative WMS project listed in the final, adopted regional water plan with the final GIS data submitted. *[Contract Exhibit C, Section 13.1.2]*

Response: GIS files have now been compiled into the required three feature classes, with a feature assigned for each individual WMS Project, and will be included in the final digital data deliverable.

31. The WMS Project vector data was submitted across more than one shapefile/feature class for the same feature type. The vector data must be divided into point, line, and polygon feature types across a maximum of three shapefiles in a single folder or three feature classes in a single file geodatabase (one for each feature type). Please combine the following files into a single shapefile or feature class for each feature type: *CantonGrandSalineReservoir.mdb, DimpleReservoirWMS.mdb, RegionD2022RWP_WMSProjects.gdb, RegionD_WMS_Polygons.shp, RegionD_WMS_Polylines.shp, TemplateWUG_WMS.shp, WoodCountyPipelineAltWMS.shp*

and *WUG_WMS_DataDrivenIndex.shp*, in the final GIS data submitted. *[Contract Exhibit D, Section 2.4.5]*

Response: GIS files have now been compiled into the required three feature classes, with a feature assigned for each individual WMS Project, and will be included in the final digital data deliverable.

32. Please remove use of the TWDB logo from the final, adopted regional water plan. In accordance with TWDB's Logo and Seal Policy, use of the TWDB logo requires an approved licensing agreement.

Response: The TWDB logo has been removed from the final plan.

Level 2: Comments and suggestions for consideration that may improve the readability and overall understanding of the regional water plan.

1. Section ES.5.3, page ES-9 states that 140 GPCD is the TWDB recommended goal for municipal users. This is a recommendation by the Texas Water Conservation Implementation Task Force, not a TWDB recommendation. Please correct this in the final plan.

Response: Text in Section ES.5.3 revised to state:

> **The 140 gpcd target was selected to coincide with prior recommendations of the Texas Water Conservation Implementation Task Force**

2. Page 2-18 references Appendices C3-2 and C3-3 for contractual and WUG demands. Appendices C3-2 and C3-3 do not appear to present WUG demands. Please consider revising this reference as appropriate in the final plan.

Response: Erroneous reference to Appendices C3-2 and C3-3 removed from final plan.

3. Section 3.1. As reuse is considered a separate water source, please consider presenting reuse in a separate section within Chapter 3.

Response: A new Section 3.3 on reuse in the NETRWPA has been added.

4. Table 3.4, pages 3-14 and 3-15. There is no footnote accompanying the asterisk for Brandy Branch Lake. Please include the footnote in the final plan.

Response: Asterisk was a simple typographical error, has been removed for Final Plan.

5. Section 3.2.2. For the Blossom and Nacatoch aquifers, please consider adding references to previous modeled available groundwater reports and aquifer assessments that were used when determining groundwater availability.

Response: References added to Section 3.2.2 for the Blossom and Nacatoch aquifers.

6. Section 4.3, pages 4-17 and 4-18 (Table 4.30) are set to print in portrait orientation within the electronic version of the plan, which results in cut off data. Please consider revising the page orientation for this table.

Response: Table 4.30 reformatted for Final Plan.

7. Page 5-11 includes rainwater harvesting in the list of advance water conservation measures. While the TWDB acknowledges that the municipal conservation best practices guide includes rainwater harvesting, for regional water planning purposes rainwater harvesting is considered as surface water source and should not be classified as conservation. Please consider clarifying this information within Section 5.2.5.1 in the final plan. *[Contract Exhibit C, Section 5.6]*

Response: An asterisk has been added to the listed rainwater harvesting items with a subsequent note stating: "*Note: While the municipal conservation best practices guide includes rainwater harvesting, it is acknowledged that for regional water planning purposes rainwater harvesting is considered as a surface water source and is not classified as conservation for the purposes of this Plan."

8. Section 5.2.5.1, page 5-11. Please consider providing additional explanation for why water conservation was not considered as a water management strategy for entities with greater than 140 GPCD and for which the plan states "supply was not projected to meet the TCEQ regulatory minimum of 0.6 gpm/connection". Please consider clarifying the consideration of the relationship between an identified water need and flow rate, with the understanding that the infrastructure to address system pressurization requirements is not appropriate for inclusion in the final plan.

Response: Section 5.2.5.1 revised to state:

The NETRWPG recommends that a minimum consumption of 115 gallons per capita daily (gpcd) should be established for all municipal WUGs, and that a reasonable upper municipal level – a goal but not a requirement – be established at 140 gallons/person/day. The 140 gpcd target was selected to coincide with prior recommendations of the Texas Water Conservation Implementation Task Force. The use of this minimum per capita consumption amount acknowledges the potential for smaller, rural water systems to grow in per capita usage as their systems evolve. Advanced water conservation practices were considered and quantitatively evaluated for all WUGs to which TWC §11.1271 and §13.146 apply. Advanced conservation strategies were considered, but not recommended, in those instances where advanced conservation would not alone support an entity in meeting the TCEQ regulatory minimum of 0.6 gpm/connection, as conservation would not improve this number and a supply strategy would still be necessary to meet TCEQ regulatory requirements. This process has been utilized in previous planning cycles, and was formally adopted by the NETRWPG for the purposes of this Plan.

9. Appendix C5-5 presents the Wood County Pipeline Tie-in as an alternative WMS project. The Wood County Pipeline Tie-in project is categorized in DB22 as a recommended WMS project. Please reconcile this information as necessary in the final plan.

Response: This error was revised in the data checks process completed since the IPP publication. The Wood County Pipeline Tie-in project is characterized as an alternative WMS for the purposes of the final 2021 Plan within the report and within DB22.

10. Appendix C5. In the County summary sections for WMSs, the plan includes blank cells in some of the tables. It appears that the blank cells are associated with potentially feasible WMSs that were not evaluated, for example on page 224 (Burns Redbank WSC). Please consider removing the rows associated with WMSs that were not evaluated, or add a footnote to the tables, to clarify the blank information.

Response: Blank rows have been removed from these summary tables in the Final Plan.

11. Appendix C5, page 263. The costing tool output for the Riverbend WMS identifies two water treatment plants, 25 MGD and 15 MGD, but the narrative description of the Riverbend WMS only discusses the 25 MGD WTP. Please update the narrative description of the Riverbend WMS to describe all elements of the WMS in the final plan.

Response: The narrative description of the Riverbend WMS has been revised to include the 5 MGD WTP expansion in 2040 and a final 10 MGD WTP expansion in 2050, consistent with the associated costing and DB22 information.

12. Section 7.7.1, page 7-43. The plan references the August 1, 2019 letter from the Drought Preparedness Council; however, the plan describes one of the Council's recommendations for the 2016 plan. Please consider updating this information in the final plan.

Response: Section 7.7.1 has been modified to remove the reference to the 2016 recommendation and updated to reflect the content of the 2020 recommendation as follows:

"Per the recommendations of the Texas Drought Preparedness Council provided to the NETRWPG in a August 1, 2019 letter, portions of this chapter have been formulated consistent with the outline template for Chapter 7 provided by the TWDB. Additionally, water supplies developed for the 2021 Region D Plan have been based upon firm yield/100% reliability of existing supply, thus accounting for significant drought conditions experienced historically by North East Texas. Availability determinations have been based upon full utilization of existing, permitted water rights, while demand projections have been based upon per capita usage amounts from the year 2011, a period of significant drought in the region. Each of these factors allow a margin of safety when considering risks associated with droughts more significant than the DOR, in an effort to address and plan for responses to extreme drought conditions."

13. The GIS files submitted for WMS projects do not include the minimum required metadata. Please include at a minimum, metadata about the data's projection, with the final GIS data submitted. *[Contract Exhibit D, Section 2.4.1]*

Response: GIS files have been updated to include metadata identifying the data's geospatial projection.

14. The GIS files submitted for WMS projects do not adhere to the contractually required naming convention. Please rename the GIS files following the naming convention outlined in Exhibit D, Section 2.4.5 in the final GIS data submitted. *[Contract Exhibit D, Section 2.4.5]*

Response: GIS files have been revised to conform to the required naming convention.

COMMENTS MADE AT THE PUBLIC HEARING
FOR USE BY REGION D REGIONAL WATER PLANNING GROUP
IN COORDINATION WITH THE
TEXAS WATER DEVELOPMENT BOARD

The public hearing was held on June 11, 2020, at the Civic Center in Mount Pleasant and hosted by the Northeast Texas Municipal Water District. Notice of public hearing was provided in newspapers, direct mailings, websites, the Texas Register, and additional locations to all interested parties. Comments were sought to improve the plan being developed and to be completed in 2020.

PUBLIC COMMENTS IN CHRONOLOGICAL ORDER:

P U B L I C   C O M M E N T S

RICHARD LETOURNEAU: Hello, my name is Richard LeTourneau, and I've been associated with this fine Region D group for quite some time.

In 2015, there was a -- it was a culmination of many years of not accomplishing

anything between Region C and Region D as it addressed the conflict that was defined, in the last instance, by an appellate court, and there were representatives from Region C and Region D that agreed to the agreement, and their signatures were on the agreement. So, actually, the agreement that they signed resolved, at the time, the conflict. When we were asked in late 2019 to negotiate with Region C, Region C came to the first meeting and had changed the timeline that was on the agreement and wanted to act as if that was just a given; but it was not part of the agreement.

So I would assume that we don't have to rehear the case on whether or not there was a conflict. There was a conflict between Region C and Region D. That conflict was resolved. But at the time that Region C arbitrarily wants to change the content of the agreement, I think we're back to the point where we have a conflict between Region C and Region D again; and I don't believe that there's any reasonable answer that would conclude that Region C can arbitrarily change the timing of Marvin Nichols from what we have agreed to in 2015.

So I appreciate it. I just wanted to clarify that.

GARY CHEATWOOD: I'm Gary Cheatwood, of course from Red River County, from Cuthand, and that's in the heart of the proposed Marvin Nichols Reservoir.

And here we go again. We've been fighting this thing for 30 years or so, like Richard's talking about there, and we hadn't gotten any further along. Region C keeps pushing this thing on us, and that's the most detrimental thing that could ever happen to our county or the Sulphur River Basin. Even the virus hasn't affected us like that lake's going to do.

And I want this thing to go through the water plan, Region D's water plan, with no Marvin Nichols on it; and I wish, some way or another, to get Region C to back off, because this ain't right, what they're doing. We're a free and independent people, and we should have the right to live where we want to live and do what we want to do and work there without any interference from somebody else. They're trying to boot us off our land, is exactly what they're trying to do, so they can make a dollar off of it.

Thank you.

EDDIE BELCHER: My name is Eddie

Belcher, and I'm from Red River County, also, born and raised; lived in Cuthand all my life, 59 years. My mother and dad, they were born and raised there. Dad's gone. Mama's 83.

Our family's farm, ranch, whatever you want to call it, almost 800 acres, is in the heart of this lake, right on the bank of the Sulphur River. This land has been in my family almost ten generations, and I don't stand to see it be taken away from my kids, my grandkids, and their grandkids and so on.

Region C has no right to come into our territory and take what they think is rightfully their privilege. They waste water every day, running down the sidewalks. I guarantee you go up there now and it's pouring down the curbs.

But I'm just totally -- you know, you wake up every day wondering if you're going to have a place to live. I worked four-and-a-half years building my home I've been wanting to build for 30 years, and moved into it about a year ago now, and it -- I'd have to put pontoons on it now. But I don't stand to see it gone.

And every day you wake up with the stress. And you age; you age twice as fast, wondering if this is going to happen, if tomorrow am I going to have to pack up and leave my home and go -- where are we going to go? Where are we going to go if they take our property, our land? There's no place left. I'm not going to -- I'll go somewhere up north, where there is room; but I'm not going to live here, not like this.

DAVID STEWART: Hello. My name is David Stewart. I'm also from Cuthand, Texas; lived there all of my life. My family owns land there. I don't own as much land as a lot of people and don't stand to lose as much property as a lot of people, but I stand with my neighbors because I know I have a lot of neighbors that's going to lose a lot of property that's been in their family for generations. They took care of it; spent a lifetime taking care of it.

But another thing that, personally, I feel is that putting the lake in would practically annihilate the Sulphur River, and I, for one, deeply love Sulphur River. I've fished in it all my life, hauled catfish out of it, and I just love the river itself. And I would whole lot rather have the Sulphur River than a big lake.

And that's all I've got to say, and

thank you.

LINDY GUEST: My name is Lindy Guest. I'm from Red River County and in the Cuthand area, also.

According to the map that we've seen over the last few years, our land will be on the west end of -- our family land will be on the west end of the lake; and there's a pretty good chance, probably about a 99.999, that we're going to lose our land. Now, it's not a lot of land, but my mom and dad worked real hard about 30 years ago to buy the place and put it together and pass it down through our family and our kids. We plan on passing it down through our family to our kids, also, like they passed it down to us.

But I guess what I want to say here today is, we're not looking to try to sell our land. We don't want to sell our land. We're like a lot of other folks around there that has land. And where my home is located, I could possibly lose it, too. Although it doesn't look like it now--it depends on how the mitigation goes--but I could possibly lose my house place there, too.

And I guess what I'm trying to say is, most of the folks that's pushing for this lake

don't really have a stake or don't really have land involved in it. A lot of the folks -- I know the people in Region C don't. And a lot of folks around in our part of the country that is pushing for the lake, they don't have anything to lose as far as, like, the ones that actually have the land there. And I would just like for them for one minute to look around and just trade places with us for a minute. How would they like somebody to drive up to their home or their place, or whatever, and say, "We want your land," or "We want your home," or "We want your property," "We want your business," and you say -- they say, "I don't want to sell it. I'm perfectly happy where I'm at." You say, "Well, we want it because we're going to build this" or "we're going to build that." So that's kind of the way we feel about it. We feel like we're being taken advantage of.

Also, a question that I have, if the questions will be posted, is, if this ever happened, who would decide on what the land prices would be? Would it be somebody that Region C would appoint to come down to our part of the country and decide what our land was supposedly worth, or would we get the metroplex prices, you know? I say this: if we were

getting paid by the square foot, it might be a little different than what I figure it's going to be, if the past history of what's happened to the other places that's lost land to this lake. They hadn't gotten the full value of what they thought their land was worth, and I feel like we'd be in the same boat as they are in. So that's just some questions I have.

Also, we was wondering about what's going to happen to our taxes. Some of the guys has told me that they're -- come in there and develop that land, and we've been told it would be mitigated and wouldn't be any development around it. So who knows what's going to happen. And if the land is going to be developed, then why would they have mitigation and take our land and turn right around and develop it? That doesn't seem like the right thing to do for the people that's involved in it. It just seems like it's a big boondoggle.

And here's what I don't understand. If this is really about the water, then why, when they're offered reasonable alternatives to that lake, where they can get all the water that they could use from another source and not have to do that, why don't they consider that? They always say, "We know that that source is there"; every meeting I've been to, say, "We know the source is there. We know that you got" this or that. "We know that the source is there to get the water, but we're not interested in that source. We're interested in building this lake right here," taking a big footprint out of our part of the country.

And I can speak for a lot of my neighbors and friends that live in our area that they are against it, too. They're not able to be here today, but they feel the same way as I do about it.

That's all I've got to say. Thank you.

JOE COATS: All right. My name is Joe Coats. I'm from Queen City, Texas. That's in Cass County.

This is the first meeting like this that I've been. I started hearing about water when I was a lot younger. I left out of there in high school, traveled the world, did a lot of things, and now I'm back with my family and been back a few years. And really glad to be here tonight, just to hear everybody talk and everything.

Been following it a little bit here

and there over time. I don't really know anybody here. As far as what is my stake in this, I'm just a family man there in Cass County, and I care about the resources that we have. And I care about the state of Texas; I care about the United States of America; and I believe that anytime we have the opportunity to make sure that these development plans are -- they're sound, they're sustainable, they've got a good mission, and there aren't people behind the curtain filling their pockets and destroying our resources -- because this ain't just about us, folks; it's about our grandkids and generations to come. So everything that we do, we've got to be strong about it and stick together.

I notice that in a statement that was made--and it was published--it said, quote, "Per the terms of agreement set forth from the October 5, 2015 mediation between Regions C and D and ratified by the NETRWPG at its October 21, 2015 meeting, the NETRWPG does not challenge Marvin Nichols Reservoir as a unique reservoir site for the purposes of this Plan. At the time of publication of this Initially Prepared Plan, no agreement has been made between Regions C and D for the purposes of the 2021 Region D Plan," which is -- you know, this 2021 plan

is what this is about, but I can tell there's a lot of -- I'm just getting to the part here where I can tell we've been talking about Marvin Nichols, and there's a lot of fire in the room.

They say in there now that we want this thing put together by October, and there's no telling what they're going to try to slip in there, what kind of conversations that are going to be made over the phone, meetings that are going to be made in person, things that are going to be done behind our back, just like what happens in Washington, D.C.: you thought you were getting this, but you were getting a lot more that you didn't ask for.

So the thing about Dallas, Texas, and all them folks up there, I care about them people; and I'm sure a lot of you here, you got family that live up there, kids, friends, all kinds of different things, and we care about those people. The problem is, is that they need to be responsible for their resources they have in their area. Okay? And what a bad precedent would we set if we just said, "Yeah, you know what, you people need water. We're going to give it to you" and put all these other people short. We do it that time, they're going to do it all over the state. And then other states, you

know, they'll look to us as an example and they'll do it in their state, and that's BS.

And I do see a lot of old folks in the room, and I do encourage you, you know, when we leave this thing, and to come, you'll be getting your grandkids, your kids, fired up about this, because evil always seems to do a good job of carrying the torch and passing it along, but the good people sometimes forget to pass the torch, and we got to fight that stuff.

This thing just isn't about Marvin Nichols, as well. There's also a lot of good things, I think -- and I haven't read the whole plan--it's a big plan--about water management strategy and whatnot and -- you know, I hope to hear some of those things and read some good things, but there is -- one of the other things that we need to make sure of is that we are being conservative with our water practices and upkeep our liberties and freedoms at the same time. That can be hard to do, but we don't need Nestle and Ozarka Water, like in Hawkins, Texas, bottling all that spring water, you know. So we ought to be asking the question: why is our municipal water supply, why isn't that good to drink? Why is everybody drinking bottled water at their house? Come on, that's ridiculous. That's absolutely nuts. We don't even drink tap water out of own sink; we buy bottled water.

Is anyone from Region C here tonight in the audience? Raise your hand. You are? Okay.

Anyways, folks, I say we keep fighting no matter what. That's all I've got.

AARON ROLEN: Hello, I'm Aaron Rolen. I know most of you, or quite a few of you, at least. I stand today to support a Region D water plan that does not include Marvin Nichols.

I live in Cuthand with my wife and two kids. I actually grew up in Cuthand, until I was about ten. Then we left and traveled everywhere, traveled around the world a little bit, before I was married. I lived in three different states with my wife, multiple cities. And it was actually her decision, after visiting Cuthand several times, to move back there; and so, of course, she's the boss, so that's exactly what we did.

I love Cuthand. I love the people there. I love everything about it. It personifies a sense of community that I feel has been lost in a lot of modern society. It is the place that we want

to be. And when we made the decision to move there -- I remember as a kid hearing about the lake coming in and all these different things. Of course, I was a kid; I didn't care. And then I had asked a little bit, and they said, "Well, hey, we recently got an agreement. We don't have to worry about this lake, really, for probably another 40 or 50 years, and then they're going to, maybe, reassess and see if it's necessary at that time," which sounded reasonable. So we went all-in. Moved to Cuthand, built our home, only to realize about a year later, "Hey, they're wanting to change the game here. They're wanting to throw this agreement out the window." And so then I started thinking, well, man, this is a little bit crazy; we better go to some of these meetings to figure out what's going on.

And I'll tell you what Region C did. Mr. LeTourneau touched on it a little bit. There was an agreement that, by all appearances, had been hashed out after a lot of weeping and wailing and gnashing of teeth. There was a lot of litigation going on; and it was all, essentially, the Texas Water Development Board refused to see that there was a disagreement, a conflict, between two plans

that one of which called for a plan of water, a massive lake, 66,000 acres in our area, and then, of course, ours said, "Well, we don't want that," and they refused to see that there was even a conflict. And so that's what all that went on about. And that seems absurd, for a normal person to look at that. But I'll tell you, I haven't said earlier, but I am a lawyer, and you would think that lawyers would be smart folks; and sometimes I think they're too smart for their own good and they look at things like that and they don't see a conflict, which is silly.

So, anyways, we showed up to some of these meetings. I got in it late in the game--I haven't been fighting it for 30 years--but I saw a Region C board member stand up and, essentially, what he said was, "Hey, we entered this agreement. Great. We redid some of our numbers based on some new projections, new drought boards, things like that, and now we don't really like it, so we're going to toss it." And then everybody, of course, was angry about it. And he, essentially, said -- I'm going to paraphrase him, but he, essentially, said, "Well, we like the legal process better than trying to go along with the plan we had." So that's, essentially, making an agreement with

someone, a business arrangement, and then turning around and telling them, a little bit later, "Hey, I know we had this agreement. Go jump in the lake and sue me. I've got a better deal now," you know, "and I think I'll do better in court," which is just not how respectable people conduct themselves and not how they should.

So the way they did this is they handed out some pamphlets, and the pamphlets kind of go through the process. And what it boils down to is the Texas Water Development Board will ultimately make the decision on what to do with these two conflicting water plans. And if you think that the Water Development Board, the same board that refused to see there was a conflict in the first place, is going to give anyone here a fair shake, you'd better think again. It's not going to happen. All right? It is not going to happen. So -- I mean, unless there's some new members or something on the board; I don't know anything about that.

Region C talked a lot about their water needs. They got up and everybody, like the gentleman that spoke before me said -- they have some serious water needs. And that's understandable. No one wants anybody going thirsty.

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Everybody understands that people need water to survive. But if you'll look at their plan, which I read through--it was exhilarating--they did this economic study and they look at the environment and things like that. And if you look at the projections they do, the projections are, essentially, based off perpetual growth. They look and they say, "Hey, Dallas and D/FW has this population now. It's grown by this much in the prior 30 years, and it'll continue to do so." In fact, after, like, 50 years, I think they expect it to jump even more, which is crazy. If you want to ask about perpetual growth, ask someone in Chicago 60 years ago whether they thought they would have negative growth. It doesn't make sense. None of the numbers they have put forth make sense. They're just projections that are pulled out of the air. And I get it. There's some expert somewhere who has said, you know, this is what it's going to be, they've put their numbers together, but ask anybody who's been alive in 2020 what projections mean and whether you know what's going to happen tomorrow. Right?

So I stand today to stand against Marvin Nichols and against what it will do. It is a

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permanent solution that is completely unnecessary. There are other ways to do it other than destroying people's lives.

Thank you.

MAX SHUMAKE: Hello, kinfolks. I'm Max Shumake from De Kalb, Texas, right close to the Sulphur River. We've been fighting this fight now since I was a young, black-headed guy. I've now changed color of hair, as many of y'all have. Many of us aren't here anymore. Look around.

I stand here today to tell you that Region C does not need Marvin Nichols, is the main reason we need to oppose it. We have got found water all over the world. As recently as a couple of months ago, some folks from Arkansas called me and said, "How can I get in front of Bowie County to present four-million-acre feet a year we want to sell to Dallas, or to y'all?" It was deep water. It was an aquifer they have up around Mena, Arkansas, that never runs out. It replenishes. Every time it comes a big flood in Oklahoma and along the Arkansas River, this aquifer refills. I said, "Man, yeah, this sounds like what they're looking for, cheap water."

And on top of all that, that same

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engineering firm that was telling me about this had a pipeline they worked for, too. You know, it's strange that they tell us down here "Our pipelines cost a billion dollars a mile," and they build them up there for a million dollars a mile. That's a tremendous amount of difference in cost. Of course, that billion dollars a mile on pipelines is when we're trying to get them to go from Cooper Lake down to Lake Wright Patman. That's that billion dollars a mile they were talking about. So they do not shoot straight with us. They have not shot straight with us. They continue to lie to us.

We've got to continue to fight them the best we can. We need to continue with our political process, getting people elected that will do damage to them. We need to continue getting our old-timers, that think like we think, on the Region D board. We need to keep our good folks, even our new ones, like Fred; we need to keep all of our folks. We need to get rid of these backstabbing suckers that's been right here with us the whole time. And that don't sound good, but that's the truth. We stood up here and talked and gave reasonable explanations of why we see things the way we have, and they've laughed at us behind our back.

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The best thing I found about this lake fight is I've met nearly all of my kinfolks at Cuthand, Texas. My grandparents moved from Cuthand, Texas, in 1872 and moved to Dalby Springs, down the river about 30 miles. But y'all are my folks, too.

No one needs this water.

Now, someone brought up Dallas changing their criteria a while ago. The first meeting I ever attended, they were talking about Dallas had to have 330 gallons per person, per person per day, in Dallas. Well, we got to laughing and making fun of them--San Antonio was already using about 200 gallons per person per day--and, lo and behold, they decided, "Well, we don't need that. We need about 200 gallons per person per day. But, oh, by the way, instead of 7 million people, we're going to gain 25 million people; we still need Marvin Nichols." Nothing we do solves the Marvin Nichols problem. Now, there's something we can do. I don't know what it is, but we're going to go to working on it.

The negative impacts on the people in Northeast Texas is just -- we can't even imagine it: our timber companies, our stock farms, our farms, people that's made a living off this land all of their lives. They don't think nothing of that. They don't think we are good for anything, I guess. But we've got the biggest timber, hardwood timber, production in the country, is in the Sulphur bottoms right now. Any Marvin Nichols lake that's built, and, as far as that goes, any other lake that's built on the Sulphur River is going to knock out that hardwood timber. The lake they build is going to require the rest of the Sulphur River to mitigate it, and there went our timber, our wildlife. I guess that some people get to fish in a lake, which we prefer to fish in a river, ourselves. By the way, my nephew caught a 52-pound blue today under Sulphur River bridge.

That's what we're looking at. We don't need Marvin Nichols. Don't let up one bit. Don't change nothing. Don't change a word in our plan.

Thank you.

HEATH HOLT: My name is Heath Holt. I live in the Cuthand area. I'm a fourth-generation on the land that my grandfather put together, him and my grandma. We've raised cattle. And I run a dump truck business; we haul rock for a living. And I have a little boy who's about to turn three years

old next month. And I just wanted to stand up here and say thank y'all for not putting Marvin Nichols in the Region D plan, and I support y'all a hundred percent.

Thank you.

MARTHA DALBY: Howdy. This is my first one of these meetings to go to. I'm Martha Dalby. I currently live in Gregg County, north of Longview, but I have very deep roots in Bowie County, right along the Sulphur River. I'm a Dalby from Dalby Springs. Think I'm about the fifth generation.

Our home place, the Dalbys have been living there since 1839 and farming that land, all the way down to my brother, until he passed away three-and-a-half years ago. My sister-in-law, my 13-year-old nephew, live there and raise cattle and hay, and so on, on that family land. We also have several hundred acres a little way away from our home place, that are right on the Sulphur River. Floods when the river floods.

I guess the reason I'm here today, I don't -- I'm not so well-versed on all the issues with everything from the plans for Region C and D. I guess I'm just here to represent the long-time

landowner. I'm a co-owner of that land, and I'd like to see it -- it wouldn't be under the lake, but it would definitely be in the mitigation land; and I'd just like to see it remain in control of our family for my nephew, that sixth generation, and maybe the ones after that, to be able to farm and use and hunt and fish on, just like our family always has.

So that's why I'm here today, and I'm going to start learning more. So thank you.

D.D. VIGNALI: Jim and I don't have a large plot of land, by any means. We moved out of the metroplex, out to the country, to enjoy the rest of our lives. At the meeting that we had where you had C and D together, when we were -- we are allowed our minutes, then they discuss among themselves, and then they tell you what they have decided. And they don't really regard what you have to say or what we have to say, at all. And Jim was going to ask a question, of course, and you can't ask a question. At the end of the meeting, two of the Region D guys -- or C guys, the ones for the metroplex, were talking to each other--everybody was leaving--and one of the gentlemen said, "Well, the rain belongs to Texas." Well, God made the rain. The rain ends

up on your land. It doesn't belong to the State. We'll allow it to flow that way because that's the natural course of things, but it's not natural for them to come in and take your land to make a manmade lake for their purposes. They're making the money. We are all going to get screwed. Excuse the expression.

And the other gentleman said, "Well, do you realize how many people are on assistance in this county?" because Red River is supposed to be the poorest county in the state. I don't care how many people are on assistance. I don't care if you need to have extra food and, you know, extra money for rent. I would put any amount of assistance that Red River gives against the amount of assistance the metroplex gives to their population, in whole, and it's a drop in the bucket. It's insulting to us.

They don't view us as valuable. We're not allowed to ask a question when someone says something. We're not combative; we just want to expand on the information. That's what an open meeting is all about. So I would -- when you're done with the meeting, I think that, from now on, it ought to be set up backwards. These two need to discuss at their table, we need to hear what they've

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discussed, and then we need to be allowed to ask the questions, because we come up and we say we love our property and we want to stay where we are, we enjoy it, we enjoy our neighbors, it's quiet, we like our wildlife; they don't really care. Garland is expanding. Sherman is expanding. All they're doing is counting their bits of silver, and we will go at their expense.

And it bothers me that the state of Texas -- and I did not grow up in the state of Texas, but we learned Texas history in the school that I went to, and it was kind of like, oh, wow, this is really cool; these people have so much respect for each other. They don't. Your large cities don't give two hoots about any of us, and it shows every day. And I have family that live down there, and I know for a fact they don't give two hoots. As long as they get what they want, go shopping, and make sure that they get to go out and eat every night, they're happy as clams.

So I hope we can all be neighbors until the end of time for us, whatever time that may be; and if there's anything you guys ever need, we live on County Road 1410. It's got a sign that says "The Dirt Farm," and you're always welcome.

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J.B. WATSON: My name is J.B. Watson. I live in Red River County.

So one of the issues I have been seeing with this is, there's been two revisions. There was Version 1 and Version 2, of the IPP. The second revision has 254 more pages than Version 1, but, also, it does not include the entire section dedicated to Marvin Nichols, but it does not specifically declare that they are against Marvin Nichols. There's only 29 references to Marvin Nichols in the new Initially Prepared Plan. That is through -- I think through the appendices.

So another thing is, Mr. Shumake discussed that there was a company out of Arkansas that bought up an aquifer. Well, they actually sent a representative to the Bowie County Commissioners Court back in March, and he actually presented a presentation that actually says that they would be able to take care of most, if not all, of the new needs of Dallas and Region C. If constructed, it would provide a better quality of water, that is untreated, versus treated out of the new sources such as the Marvin Nichols, and even expanding on the others. It's actually better water than Lake Wright Patman. And that is untreated versus

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treated.

Also, it would cost less, capital-wise, to build the pipeline. The pipeline would be an estimated 194 miles from Dallas to the spot they could access the aquifer from. So I think it is around Mena, Arkansas, where the point of access would be for the water, and I would like to see Region D mention it in an Initially Prepared Plan, I mean, even in the final plan, and also take -- instead of a soft stance against Marvin Nichols, take a hard stance and actually declare it in the final plan to the state board. This way, they would not be able to say there was no conflict, because this will declare a conflict and it would be taken to the courts.

Thank you.

(End of public comments.)

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STATE OF TEXAS)
COUNTY OF TITUS)

I, AMANDA J. LEIGH, Certified Shorthand Reporter in and or the State of Texas, certify that the foregoing is a true and correct transcription of public comments held at the above-referenced time and place.

I further certify that I am neither counsel for, related to, nor an employee of any interested party to any matter, and further, that I am not financially or otherwise interested in the outcome.

Certified to by me on this 25th day of June, 2020.

/S/ Amanda J. Leigh

AMANDA J. LEIGH, TEXAS CSR 3791
My Commission Expires 1/31/2021
LEIGH & ASSOCIATES COURT
REPORTING AND VIDEO
Firm Registration No. 684
Office: (903) 295-2955

APPENDIX C10-4
Submitted Written Comments on the 2021 Region D Initially Prepared Plan

From: Greg Carter [mailto:wgcarter@aep.com]
Sent: Monday, March 2, 2020 5:12 PM
To: Tony Smith <tlsmith@carollo.com>
Cc: Walt Sears (NETMWD@aol.com) <NETMWD@aol.com>
Subject: Region D IPP

Tony – the references to the combined cycle power plant in Hunt County should probably be scrubbed. We had 12,400 af to 28,500 af in the 2016 plan to address this plant. The PUCT has a list of power project and the Hunt County Cobisa project was on the PUCT cancelled list in a 2017 update.

Note that I am not referring to the 373 acft Hunt County steam electric which is the City of Greenville's plant.

The pages in Volume 1 are on pdf pages 372 and 373 and in Volume 2 on pdf pages 408 and 628.

Hopefully I am providing enough direction but feel free to call if I need to clarify.

SOUTHWESTERN ELECTRIC POWER COMPANY
An AEP Company

GREG CARTER | ENGINEER PRIN
WGCARTER@AEP.COM | D:903.927.5896 | C:903.746.4585
2400 FM 3251, HALLSVILLE, TX 75650-9448

---------- Forwarded message ---------
From: **Jim Vignali** <jvignali@gmail.com>
Date: Fri, Jun 12, 2020, 8:02 AM
Subject: Red River County Resident
To: < regiond@netmwd
Cc: Jim Vignali < jvignali@gmail.com>, D D Vignali < dvignali@sbcglobal.net>, Gary Cheatwood < gwcheatwood@gmail.com>, < bret.mccoy@edwardjones.com>, < wally_kraft@yahoo.com>, <' Reeves'@gmail.com>

Goodmorning,

I would like to voice my objection / concern regarding Region C invasion of our property.

The reservoir is not needed due to numerous other opportunities to address and resolve projected needs.

1. Pass a requirement that all building and Construction companies MUST adhere to. This being that any requirements for fill dirt in any construction projects MUST come from dredging of any / all current reservoirs in use within Region C area. A 2 foot dredging of all current reservoirs and a 2 foot raising of all current resivoirs would more than address projected worst case scenarios.

2. Utilize available aquifers with in the regions as well as the aquifer available from the State of Arkansas.

3. Require all city building plans to build a water runoff catch system that would supplement current water needs. Currently nothing is being built which would capture and utilize the spring runoff that is now flowing directly to the ocean. Some, very little is being captured by the natural flow into existing reservoirs.

4. Create multiple 20 to 50 acre runoff ponds thru out Region C to capture water as well as create small natural wildlife refuge area that could be enjoyed by residents of Region C as well as tourists.

The projected population estimates for Region C show an ever increasing increase in numbers. This is unsustainable because at some point, sooner than projections show there will be a negative decrease in population. Look at all the major metro areas concerning growth in 25 years.

Thank you

-----Original Message-----
From: Adam Morin [mailto:idrum1977@gmail.com]
Sent: Thursday, June 25, 2020 9:48 AM
To: regiond@netmwd.com
Subject: Region D Plan

To whom it may concern:

We like the plan as currently written WITHOUT Marvin Nichols on it. Thank you for your consideration.

Sincerely,

Adam Morin
Bogata

Sent from my iPhone

-----Original Message-----
From: Kelly Kennedy [mailto:kkennedy@rivercrestisd.net]
Sent: Friday, June 19, 2020 6:52 PM
To: regiond@netmwd.com
Subject: OPPOSITION to the Marvin Nichols Reservoir

I am writing this letter to express my strong opposition to the Marvin Nichols Reservoir being included in the Region D water plan. I like the plan the way it is now, WITHOUT Marvin Nichols.

There are more cost-effective, safer, and better for the envronment ways to get water to the DFW metroplex without taking cherished land that has been in families for hundreds of years. We're talking about land that would be lost forever. Land that they aren't making any more of….

The taking of this land will cause ruin for the many local, family owned farms, therefore causing ruin for the many families who depend on the land for their livelihood. Many of which, farming is the only thing they know to do to make a living and be prosperous. That, in it self, has to weigh heavily on the minds of people who live and work in the area. I would also like to mention the negative impact it would have on the many people who don't live or work here yet depend on this area for livestock, farming, and timber products, which would be lost if the MN Reservoir were to become a reality.

I would like to see the other options be considered and implemented, like reduction in water usage per person, using the available water that is being offered by the Toledo Bend Reservoir, raising the dam at Wright Patman Lake, etc, before including the Marvin Nichols Reservoir in the Region D water plan.

I like the plan the way it is now, WITHOUT Marvin Nichols Reservoir!

Respectfully submitted,
Kelly Kennedy

From: Aaron Whitley [mailto:aaron.r.whitley@gmail.com]
Sent: Friday, June 19, 2020 11:09 AM
To: regiond@netmwd.com
Subject: Region D Water Plan & Marvin Nichols Reservoir

I am NOT in support of Marvin Nichols Reservoir. I do support the current water plan for Region D that does not include the reservoir being built.

Respectfully,

Aaron and Wendi Whitley
Cuthand, TX
Red River County Residents

-----Original Message-----
From: Stephanie Wright [mailto:wright106@suddenlink.net]
Sent: Friday, June 19, 2020 7:17 PM
To: regiond@netmwd.com
Subject: Marvin Nichols Reservoir

The plan to take land that belongs to good citizens and flood it with the Marvin Nichols Reservoir is absolutely absurd! My family and friends that live in the area that will be affected have worked hard to take care of their land. Many of them have lived there for many, many years, and much of the land has been handed down for generations. If you were to "buy them out" to put in this reservoir, they would not be able to afford to rebuild anything similar to what they have now.
Rivercrest has a phenomanol school district made up of students from Talco and Bogata. Several years ago, the 2 towns passed a bond to build a wonderful facility for PK-12th grade students. If this reservoir were to take place, it would devastate the school district.

Shame on you for pushing such a plan that would ruin the livelihood for so many people!! I am no genius, but I know there are other ideas that should be considered instead. Creating this reservoir is a terrible plan, and it makes me and others believe that people involved in the planning must be profiting from this crazy plan. I urge you to choose another plan to get water to the Dallas area— you know there are better ways to handle this.

Stephanie Wright
Mt. Vernon, TX

From: Kasey Crawford [mailto:crawford.kasey@yahoo.com]
Sent: Friday, June 19, 2020 4:45 PM
To: regiond@netmwd.com
Subject: Region D Water Plan

I support a Region D water plan WITHOUT Marvin Nichols.

Marvin Nichols will destroy the community that I live in and all other areas located around the lake. I feel that many people just don't realize or care that many have homes and land that the lake will cover. Many more will lose their homes and land to mitigation. A large portion of land owners in our community make a living off of their property. I don't believe that those of us displaced would ever be able to find another property of the same size and scope elsewhere without having to pay much more per acre than what will be given. This lake covers so much acreage I feel it would also be impossible to relocate anywhere near to home. Marvin Nichols would not just destroy communities but also a way of life that has been passed from generation to generation. So many families have deep roots here. The Sulphur River basin is also home to a diverse variety of wildlife that will be displaced and large amounts of mature timber will also be gone forever. There has to be a better solution than the Marvin Nichols Reservoir. Thank you.

Sent from Yahoo Mail on Android

-----Original Message-----
From: Marla Ballard [mailto:marlaballard76@gmail.com]
Sent: Thursday, June 18, 2020 9:23 PM
To: regiond@netmwd.com
Subject: Marvin Nichols Reservoir

I am writing in regards to the proposed Marvin Nichols Reservoir and would like to see the proposal REMOVED from any plans moving forward. There are many more cost-effective, safer, better-for-the-environment, and overall better resources that don't require land to be lost forever. The agricultural impact alone is enormous; so many people in Northeast Texas depend on land for their livelihood through forestry, livestock, farming, etc. Please consider these people and the contributions they make to our economy in this great state as well as our country before moving forward with a plan to take/ destroy this land.

Thank you for your time!

Marla Ballard

From: Laura M. Rex [mailto:cityofbigsandy@yahoo.com]
Sent: Monday, May 18, 2020 11:33 AM
To: regiond@netmwd.com
Subject:

Can you please send us a copy of the adopted Initially Prepared Plan?

Thank you,

Laura M. Rex
City Administrator
PO Box 986 | Big Sandy TX 75755
p 903.636.4343 | f 903.636.4413
cityofbigsandy@yahoo.com

From: Laura Ashley Overdyke [mailto:lao@caddolake.us]
Sent: Monday, April 6, 2020 6:56 PM
To: regiond@netmwd.com
Subject: Comments 2021 Region D Water Plan

The Caddo Lake Institute and partners have been studying the chemistry, hydrology, wildlife and vegetation in the Cypress basin since 1993. Our mission includes not just the conservation of the ecological value of the region, but also the economic and cultural values. Our experience indicates that the needs of municipalities, people, industry, can be balanced with the needs of the environment (which ultimately serve all of the above as well.) From that context, we submit 6 comments.

1. We are in support of the emphasis on environmental flows and the balancing of needs.
2. We are grateful for celebrating the success of the Paddlefish project (restoring an extirpated, once native species.)
3. We support Region D standing firm in opposition to Marvin Nichols or any of new lakes/reservoirs, especially since the demand for water does not seem to be exist, and conservation measures have not been fully implemented.
4. Demand – Mining - we would hope to see demand (for water for mining) revised DOWNWARDS after the closing of multiple Coal Fired Power Plants in the region.
5. RESERVOIRS –We would like to see a stronger stance against Little Cypress Reservoir as it would negatively impact Texas's only Wetland of International Importance, Caddo Lake.
6. We support designating Black Cypress as an Ecologically Unique Stream Segment.

Laura-Ashley Overdyke
Executive Director, Caddo Lake Institute
www.caddolakeinstitute.org
email address – lao@caddolakeinstitute.org
physical address – Caddo Lake National Wildlife Refuge, Zeugner Drive, Karnack, Tx
mailing address during covid shutdown – 7804 Mary Eve Rd, Shreveport, LA 71106
phone - 318-541-6923

From: Walt Sears [mailto:netmwd@aol.com]
Sent: Monday, March 30, 2020 8:17 AM
To: regiond@netmwd.com
Cc: ron.ellis@twdb.texas.gov; Tony Smith <tlsmith@carollo.com>; rgoodson@netmwd.com
Subject: Roster of all voting members & key folk, a lot of helping hands

To all current voting members of Region D,

Regional water planning began with the passage of SB 1 in 1997. There have been 101 different voting members of Region D so far. Further selections of voting members will be made in 2020 so that number is going to keep growing. The service provided by each of these members is appreciated. The Plan for Region D in 2020 relies upon all of these contributions of service.

Attached to this email is a file that reveals the identity of all of the voting members from the beginning together with additional persons who have helped this process along. Some members serve more than one rotation but the list does not have a repeat in the names. Please note that there have been six different Chairs of Region D. Two (Richard & Jim) have served more than once. There have been numerous contributions by alternates of voting members but the identities of the alternates for the last 22 years are not provided in the attached file. The contributions of the alternates are also appreciated.

Please note that there have been 5 people from the TWDB assigned to help assure that Region D completes all of the assigned tasks.

Please note that there have been several engineers hired to assist in the completion of the tasks. Stan Hayes and James Beach have helped Region D in every round of planning. Tony Smith lead the engineers during the completion of the last two plans.

There has been only one Administrator, NETMWD. On behalf of NETMWD, please allow me to mention two things: 1) the process is governed by special laws that have been changed several times in the last 20+ years, and 2) future planning will benefit from a smooth transition to a new Administrator.

Concerning the first point, applicable laws, administrative provisions, and previous plans are further identified below. The laws in the Texas Water Code involving regional water planning include: Section 16.053, Section 16.051, and Section 16.052.

Most of the content in Section 16.053 is attributable to the special law passed in 1997 known as SB 1. Other signature water laws include SB 2 in 2001 and SB 3 in 2007. Section 16.053 has been amended at least 22 times since 1997. The law as set out in 16.053 is implemented according the content found in Texas Administrative Code Title 31, Part 10, Chapter 357. Texas Water Code 16.053 and TAC Chapter 357 specifically involve regional planning. Section 16.053 includes the portion of the law involving representation from diverse interest groups in planning.

Section 16.051 of the Texas Water Code involves the State Water Plan. Title 31, Part 10, Chapter 358 of the Texas Administrative Code provide insight about how the State Water Plan is to be completed. Since 1997, the State Water Plan uses regional water plans from each region to develop the State Water Plan.

Section 16.052 of the Texas Water Code was added in 2019. This new law creates the Interregional Planning Council. This Council has three purposes: 1) improve coordination among regional water planning groups, 2) facilitate dialogue regarding strategies that could affect multiple regional water planning areas, and, 3) share best practices regarding the planning process. It should be noted that the new law asserts that the primary purposes of this Council is coordination, dialogue, and sharing. Those three purposes are not consistent with encouraging fighting.

Although there are 16 regional water planning groups, there is only 1 State Water Plan in effect. Texas produced a State Water Plan in the following years: 1961, 1968, 1984, 1990, 1997, 2002, 2007, 2012, and 2017. That is a total of 9 plans. Using regional water plans has been a significant part of the last 4 State Water Plans.

All nine plans are accessible at: http://www.twdb.texas.gov/waterplanning/index.asp.

The Texas Water Code is accessible at: https://statutes.capitol.texas.gov/.

The applicable portions of the Texas Administrative Code for regional planning are accessible at: https://texreg.sos.state.tx.us/public/readtac$ext.ViewTAC?tac_view=3&ti=31&pt=10.

Concerning the second point, the new Administrator will have the benefit of a very experienced TWDB to help. A lot of written guidance has been developed during the last 5 cycles that will be a significant help to the new Administrator. Much of this guidance is available online at the TWDB website. TWDB is there to help.

The new Administrator will have the benefit of several experienced voting members who are continuing their role as voting members. Thank you, in advance, for your help in that regard.

The new Administrator should also have access to a team of engineers with experience.

The new Administrator will have the benefit of being able to call on NETMWD for any assistance or insight sought by the new Administrator. NETMWD hopes that the new Administrator will be familiar with the TWDB and water providers since these relationships significantly helped NETMWD to fulfill its role during the first 5 cycles of regional water planning. NETMWD intends to remain active in regional water planning, just not as the Administrator of Region D.

NETMWD performed valuable services for Region D. NETMWD began helping when there were no experienced voting members, no engineers with direct knowledge of a completed comprehensive regional water plan built to SB 1 specifications, and no lessons learned from the completion of prior plans. By the way, the first cycle was successfully completed with a time frame of less than 5 years despite a lack of prior experience.

On a personal note, I had been the NETMWD General Manager for less than 90 days when NETMWD was selected to be the Region D Administrator. Region D selected the NETMWD as Administrator on April 20, 1998. I was hired by NETMWD with a start date of February 1, 1998. I think that I have been present at more than 220 formal meetings involving Region D. I know that I was helped by listening to more than a thousand folk sharing insight about regional water planning. I am grateful for the opportunity to have been involved in the first five cycles of regional water planning.

NETMWD hopes that Round 6 will continue to have a properly developed comprehensive plan. To achieve that development, Region D will need good voting members, a competent engineering team, a helpful TWDB Project Manager, and an Administrator who will work within this dynamic framework. Everyone should be optimistic about Round 6.

Sincerely,

Walt Sears, Jr.

NETMWD General Manager

INSERT VOTING MEMBER LIST HERE

From: Walt Sears [mailto:netmwd@aol.com]
Sent: Friday, March 20, 2020 9:25 AM
To: regiond@netmwd.com
Subject: Sharing is Rewarding

To all voting members of Region D,

This comment is to reinforce that sharing surplus water with those who have need for it is worth pursuing.

The Region D IPP describes on page 4-24 Northeast Texas Municipal Water District (NETMWD) as having a surplus. This is the fifth cycle of regional water planning and the condition of surplus is not a surprise. A surplus was reported in previous planning cycles. This recent information is an encouragement for NETMWD to continue to share. NETMWD intends to do just that.

NETMWD was formed in 1953 and was financially supported by property taxes from seven communities: Avinger, Daingerfield, Hughes Springs, Jefferson, Ore City, and Pittsburg. Their sacrifices make an abundant water supply out of Lake O' the Pines possible.

Some of the surplus identified in earlier planning cycles is being shared with Diana SUD, Tryon Road SUD, Harleton WSC, and the city of Marshall. These communities are improved as a result of sharing water resources with them. As these communities receive water, they pay for that water.

All of the revenue from these four communities (100%) attributable to the raw water in Lake O' the Pines is delivered to the communities of Avinger, Daingerfield, Hughes Springs, Jefferson, Ore City, and Pittsburg. These seven communities share in the proportion that each paid property taxes. Each of these seven towns receive a check each month. The revenue to these seven towns during the last two cycles of regional water planning is larger than the entire amount of taxes paid to NETMWD. This means that these seven towns are now receiving revenue in amounts beyond the investment originally made. If this were a business, the proper word for that revenue at this point is profit.

Four communities are receiving the water that each needs and seven more are receiving financial benefits from sharing a portion of the surplus. That is 11 communities that are directly helped when planning information turns into implemented projects.

The good news is that the current Region D IPP identifies further amounts of surplus that can be shared. That is good for both the communities that get the water and for the communities benefited by the revenue.

The citizens who live in the 11 communities are receiving benefits from this cooperative approach. The citizens who live in the member cities receive additional benefits beyond the revenue delivered monthly to their City Hall.

It is rewarding to see that the sacrifices of citizens made decades earlier (1950-1979) are producing significant benefits. Those citizens did not choose to fight, they chose wisely to share. The citizens living today in our member cities are hugely better off due to the leadership in action that began before I was born. NETMWD will continue to find ways to honor that legacy.

Please encourage the sharing of resources. Sharing is a better option than fighting.

Sincerely,

Walt Sears, Jr.
NETMWD General Manager

From: Walt Sears [mailto:netmwd@aol.com]
Sent: Wednesday, March 18, 2020 8:18 AM
To: regiond@netmwd.com
Subject: Conservation is Important

To all voting members of Region D,

Conservation is important. Region C is making significant strides in reducing the amount of water used on a per person basis. The gap between the usage in Region D and Region C narrowed considerably during the last decade.

On page 5B 13 of the Region C IPP, in Section 5B.3.1., information about the composition of water use across Texas is provided. Please note that the largest use of water in Region C is, by far, for municipal purposes. That municipal use is more than 85% of all of the water used in Region C according to the Region C IPP. That makes the strides in conservation by Region C all the more important in the municipal sector.

On page 1-42 of the Region D IPP, Figure 1.20 shows that Region D's municipal category is about 38% (less than ½ of the total). The municipal category is significant in Region D but other uses are also fairly large shares as well. For example, manufacturing and power generation are. Figure 1.21 in the Region D IPP projects that municipal use in Region D will remain less than ½ of the total for the next 50 years.

Table 5B.1 on page 5B 16 of the Region C IPP describes the progress that has occurred since 2008 in Region C. This table shows the impact of sustained attention to reducing the amount that is used by Region C on a per person basis. This is real progress.

Please note that the amount used in Region C overall is less than 150 gallons per person in 2017. Please note that the 2017 average for the last five years is slightly below 155 gallons per person.

Please note that the amount used in Region C in 2008 was slightly less than 180 gallons per person. This means that the progress is about 30 gallons per person during that time period using single year analysis. Those are statistics that reveal double digit decreases in usage per person.

Please note the five-year average in 2008 was slightly above 180 gallons per person. Using the five-year average, the amount per person has fallen by about 30 gallons per person per day. Using the five-year methodology confirms a double digit decrease in usage per person within Region C.

Please be aware that the Region C IPP also provides insight about Region D. In Region D, the five-year average was about 150 gallons per person in 2011 and about 135 gallons per person in 2017. This means while Region D is slightly lower in 2011 and 2017, the gap was closing between 2011 and 2017.

The statewide average was 142 gallons per person in 2017. This means that Region D's 2017 number is modestly lower than the state average and Region C's number is modestly above the average number. Both were less than 10 gallons from the statewide average in 2017. This means that the usage in both Region C and D were less than 5% different from the state average either way.

The Region D IPP suggests that the goals for municipal usage should be at least 115 gallons per person as a minimum usage. The Region D IPP on ES-9 asserts a top number goal as 140 gallons per person per day. The Region C number in 2017 is less than 6% from the general municipal goal stated in the Region D IPP.

Using the number of 140 gallons per person per day in comparison to the usage reported in the Region C IPP, the reported use in Region C was about 26% more than 140 in 2008. By 2017, the reported use was about 5.7% above the volume of 140 gallons per day. That is a lot of change from 2008 to 2017 and is good news.

It is inaccurate to describe the recent overall usage in Region C & D as grossly different based on this information. It is certain that the voluminous available information can be used to justify virtually any position sought to be advanced. As with any "statistic", comparisons can be made that distort or that provide clarity.

Hopefully, the information that regional water planning relies upon is as accurate as possible. Based on the information contained within the IPPs of both regions, it is fair to assert that Region C has made significant advances in conservation since the onset of regional water planning in 1997. It is also fair to assert that Region D likely has slightly below average per person usage due to abundant rainfall, attention to conservation, and additional factors.

Sincerely,

Walt Sears, Jr.

General Manager of Northeast Texas MWD

From: Walt Sears [mailto:netmwd@aol.com]
Sent: Tuesday, March 24, 2020 7:58 AM
To: regiond@netmwd.com
Cc: Tony Smith <tlsmith@carollo.com>; ron.ellis@twdb.texas.gov; rgoodson@netmwd.com
Subject: CVND PROVIDES VITAL HELP TO CADDO LAKE

To the voting members of Region D,

The Cypress Valley Navigation District (CVND) is a unit of government in the state of Texas that was formed as a Navigation, Conservation and Reclamation District in the 1960's. The district is composed of all the territory in the watershed of the Cypress Bayou and its tributaries in Harrison and Marion Counties. The members of the Board of Directors are selected to serve by the Commissioners Courts of the respective counties. The Board is comprised of 10 individuals with 5 being appointed by Marion County and 5 by Harrison County to serve staggered 2-year terms.

CVND has all the powers and rights generally granted to other navigation districts including the ability to own land, issue bonds, operate marinas, ports and other aids to navigation. The district also possesses the right to use eminent domain and to serve as the local sponsor for federal navigation projects on the Cypress Bayou and its tributaries. One such project was the now defunct Daingerfield Reach Project. This project was investigated s a possible way to enable goods to be shipped from Northeast Texas downstream to Shreveport and, using the Locks and Dams on the Red River, to other ports of commerce along the Mississippi River. This project was found not to be feasible and was never fully authorized. The possible development of new navigation projects upstream of Shreveport on the Red River are now being investigated. The location of the area under consideration begins just north of Shreveport and extends to Lake Texoma.

CVND is funded by yearly contributions from both Harrison and Marion Counties and by an MOU with Texas Parks and Wildlife. This funding is around $50,000.00 per year from all sources combined.

The main activities that CVND engages in are to maintain navigation in and around Caddo Lake and upstream to Jefferson Texas. This maintenance has historically included dredging, log and tree removal, navigational marker repair, replacement and updating. With the discovery of the invasive aquatic plant, Giant Salvinia, in 2006 on Caddo Lake, the CVND role was increased to include efforts to suppress the spread of this plant.

Giant Salvinia is one of the worst invasive plants in the world. Giant Salvinia grows rapidly and causes a lot of impacts. CVND recognized this concern immediately upon its discovery in Caddo Lake and reached out to both County Judges and others to strategize on ways to combat this problem.

In 2007, the Rapid Response Budget Committee was formed made up of: the city of Marshall, the Northeast Texas Municipal Water District, Harrison County, Caddo Lake Institute, CVND, U. S. Fish and Wildlife Service and AEP/SWEPCO.

This committee raised $65,000 dollars to combat Giant Salvinia and authorized CVND to build a 2 mile barrier across Caddo Lake to slow the spread of the plant. They also approved floating signs to be built and deployed as well as developing and publishing a public information handbook about how to identify invasive plants and to prevent the spread of Giant Salvinia.

CVND was also able to get funding from TPWD through the Texas Legislature in 2007, 2009, and 2011 to fund an herbicide application program on Caddo. This program was active from 2008-2012. CVND received over $750,000.00 during this time from TPWD and used those funds to apply herbicides on Caddo Lake to control Giant Salvinia. As additional lakes became infested, TPWD hired statewide contractors that had the ability to go to any lake and spray as needed. As a result of this expanded effort, CVND discontinued their spray program in 2013 but continues with its directive to maintain navigation in the Cypress Basin.

CVND is an example of a specially created water district that has adjusted its mission to address emerging issues of concern. It is an example of a unit of government that is largely dependent on other taxing entities to provide financial support for it. It is an example of an organization that is successfully working with federal, state, and local governments to achieve improvements involving water resources. The enjoyment of Caddo Lake is enabled by CVND and the individuals who provide time and energy to assure the health of Caddo Lake.

It is suggested that content about navigation on page 1-46 in Section 1.54 in the Region D IPP be adjusted to include more information about navigation and the CVND. The language could include an acknowledgment that CVND provides beneficial services in maintaining unrestricted flows of water in Big Cypress and its tributaries. This content could be added either in the last paragraph or by adding a new paragraph.

The work of CVND helps to address concerns about logjams and siltation problems arising from previous alterations of the streams. The beneficial impacts of CVND's work include water quality improvements for water removed by the intake of the city of Marshall and uses involving the shoreline of the river and lake. These changes in the natural condition of Big Cypress and its tributaries below Jefferson were made in an attempt at facilitating steamboat traffic in the 19th Century. CVND has been working to limit the impacts of the 19th Century modifications for more than five decades.

Sincerely,

Walt Sears, Jr.
General Manager of NETMWD

From: Walt Sears [mailto:netmwd@aol.com]
Sent: Friday, March 20, 2020 8:14 AM
To: regiond@netmwd.com
Cc: ron.ellis@twdb.texas.gov; Tony Smith <tlsmith@carollo.com>; rgoodson@netmwd.com
Subject: Interregional Coordination

To all voting members of Region D,

Region C has sent a letter about three recommended strategies involving Region D that directly involve both Region C and Region D. Attached to this message is a copy of that letter from the Chair of Region C.

The three strategies are: 1) groundwater, 2) Wright Patman, and 3) Marvin Nichols Reservoir.

The intent of regional water planning is to assure sufficient coordination among the regions developing plans with interregional consequences. For example, please consider water providers that have responsibilities in multiple planning regions.

North Texas MWD is headquartered in Wylie, Texas and has a service responsibility in both Region C and D. Page 4-6 of the Region D IPP describes some of this ongoing responsibility in Region D. There are customers in Region D dependent on North Texas MWD who reside in the Region D County predicted to have the fastest growth, Hunt County. The Sabine River Authority (SRA) is another example of a water provider with customers in multiple planning regions. The SRA is headquartered in Region I but has significant water resources in both Region I and Region D.

The groundwater strategy is intended to provide about 30,000 acre feet per year. The Wright Patman strategy is intended to provide about 122,200 acre feet per year. The Marvin Nichols strategy is intended to provide about 451,300 acre feet per year with about 361,000 for use in Region C and 90,300 for use in Region D. The volumes described in this paragraph are described in more detail in the Region C IPP. That IPP is available at http://www.regioncwater.org/Documents/index.cfm?Category=2021+REGION+C+IPP.

The Region D IPP has content about each of these three possible strategies. The content about the groundwater topic begins on page 5-122 of the Region D IPP. The strategy of Wright Patman is mentioned on pages 6-41 and ES-14 of the Region D IPP. The topic of Marvin Nichols Reservoir is mentioned in several pages in the Executive Summary, Chapter 6, and Chapter 8 of the Region D IPP. The Region D plan is available at http://netmwd.com/regiond.html.

These projects have interregional consequences when the locations of use are considered. Presently, citizens in Region D rely on two of the three sources mentioned in the Region C letter, groundwater and Wright Patman. The entities in Region D that would benefit from an additional supply involving the third source include rural retail water systems and small towns near the source of water as well as citizens in Hunt County.

At this time, the IPP of both regions have fairly consistent language on the first two topics. The one strategy with significantly contrasting language is Marvin Nichols Reservoir. The intent is for the forwarded letter to be further reviewed and considered at the next Region D meeting. The date of that meeting is not yet set. It is suggested that the language in the Region D IPP be considered as a beginning point on this third topic and not as the finished product.

Sincerely,

Walt Sears, Jr.

General Manager of NETMWD

INSERT REGION C 2021 IPP LETTER HERE

From: Walt Sears [mailto:netmwd@aol.com]
Sent: Friday, March 13, 2020 9:02 AM
To: regiond@netmwd.com
Cc: ron.ellis@twdb.texas.gov; Tony Smith <tlsmith@carollo.com>; rgoodson@netmwd.com
Subject: Negotiating provides more benefits than stubbornly resisting

To All Region D Voting Members,

This comment is to provide an example of a lake where negotiating produced better results than opposing the lake.

The Region D IPP states that Lake Bob Sandlin sits in multiple counties and was constructed in 1975. It was built with property taxes from only one county because only one county was willing to support it.

Although some of the water in Lake Bob Sandlin is stored on land in Camp County, Camp County did not get a vote in how it was developed and gets no vote in how the lake is managed. Camp County has no say in who or how the water is used. The governing body for Lake Bob Sandlin only comes from Titus County.

These are permanent consequences caused by the lack of support for Lake Bob Sandlin in Camp County more than 40 years ago. Some choices about lakes have permanent consequences.

Some Camp County residents do receive good benefits from Lake Bob Sandlin as a result of NETMWD choosing to negotiate. Some citizens in Cass, Morris, Marion, and Upshur Counties receive financial benefits due to NETMWD choosing a path of negotiation.

In the 1970's as Lake Bob Sandlin was being proposed to be built, NETMWD had the choice to oppose the lake or to negotiate. NETMWD chose to negotiate. As a result, NETMWD has the right to store more than 3.8 billion gallons of water in the lake for free for as long as there is a Lake Bob Sandlin. This means that water sold by NETMWD does not have the same costs as water that must be bought from the city of Mt. Pleasant since Mt. Pleasant must pay for water from Lake Bob Sandlin.

Some of the 3.8 billion gallons that NETMWD gets to store for free is sold each year to industry and the proceeds of those sales are used to provide financial benefits to the communities of Daingerfield, Hughes Springs, Avinger, Lone Star, Jefferson, Ore City, and Pittsburg. These benefits are in the hundreds of thousand of dollars annually.

The production cost of the water from Lake Bob Sandlin used in homes in Pittsburg has been lower for decades and is presently about 1/2 of what is charged to homes in northern Titus & Morris County using that same source of water but those homes are not served by NETMWD. Pittsburg is a member city of NETMWD and only pays $1.48 per thousand gallons for treated water.

This is an example of how negotiating, instead of fighting, provides real long-term financial benefits for local citizens living in the member cities of NETMWD. Citizens in five different counties benefit daily from the choices made because seeking genuine cooperation in water resource development and management.

Region D is encouraged to seek cooperation, not confrontation, in developing ideas about how to supply future Texans with the water that is needed. Encouraging those with contrasting ideas to fight during the planning phase is not likely to produce better planning.

The second paragraph on page 6-41 of the Region D IPP highlights that the arrangement involving Marvin Nichols Reservoir put in place in October of 2015 for planning purposes between Region C & D has not yet been replaced by another arrangement. This language will need revision based on how the next few months play out. Either negotiation or fighting will become the dominant theme. Based on future developments, this initial language will need to be revised.

In 2015, the Region D group by unanimous action allowed the inclusion of Marvin Nichols Reservoir as a recommended strategy in the appropriate plans. In 2020, the breakdown in negotiation occurred over the decade that the strategy should be assigned to be built in. Hopefully, this impasse can be resolved without resort to formal procedures, but only time will tell.

NETMWD is encouraging a path forward of negotiation, not confrontation. NETMWD is encouraging this path based on past experience that genuine negotiation produces better results.

Sincerely,

Walt Sears, Jr.
General Manager of NETMWD

RECEIVED
JUL 09 2020

July 6, 2020,

NETMWD /NETRWPG
PO Box 955
4180 Hwy 250
Hughes Springs, TX 75656

To Proponents, Opponents, and the undecided of Marvin Nichols Reservoir.

First, let me congradulate Region "D" for their dedication in preparing the 2021 IPP.

My name is John Denison and I live in Rosalie, Texas, just outside of Bogata.

I've spent all of my life, except two years in Region D. To me it's the center of the universe as I'm sure it is to my neighbors.

As of this writing there is an estimated 28,995,881 people in Texas. Ever heard that addage "I'm not from Texas, but I got here as fast as I could"?

Texas is filling up. That means more of every thing; more law inforcement, more medical facilities, more residences, more bars, more food stores, more schools, more multi million dollar stadiums, more roads, more churches, more, more , and yes, MORE WATER.

I symothise with my Region C neighbors for wanting MORE water. However, if you look at any computer map application, and you visit the metroplex, you see residential swimming pools, wading parks, municipal swimming facilities, fountains, hotel/motel pools, car washes, all kinds of amenities to draw people. If you drive around, you see nice manicured lawns in residential and commercial areas with metered sprinkler systems running no matter what the weather (rain, snow, sleet, or sun shine) and the access is running down the street into the gutter. That's the Metroplex lifestyle.

Region C and Region D are two different jungles, one a concrete and the other land, wild life, farms, ranches, and forrest.

Also, many Region "C" residents own properties, cabins, and homes in the proposed MNR footprint and many more will be in the mitigation plan. In visiting with these folks, they don't know about the reservoir.

Let's look at some real statistics.

The ADVOCATE MAGAGINE (April 02, 2015) had this to say. "The expenses for the City of Dallas Water Department are heavily weighted towards repairing and maintaining infrastructure. Unlike other City functions, only one –sixth of tour budget is people. We have $5billion worth of infrastructure, serving 400 square miles with 9,000 miles of pipe, 22 pump stations, three water treatment plants and two wastewater treatment plants. We are a 24/7 department keeping this infastructure operating smoothely."

"On top of those infrastructure costs, she explains that there are significant expenses being incurred to insure the future availability of water. In addition to pricing that encourages conservation and maintains infrastructure, "We are paying $800 million dollars as our share of a 20 year, $2 billion project with Tarrant Regional Water District to construct 150 miles of pipeline from Lake Palestiner as part of our plan to insure adequate water suply through 2070."

Okay, so Marvin Nichols is estimated to cost $4.3 BILLION. We know with cost overuns, it's going to cost more than that.
So, according to my grade school math, $4.3 Billlion is 5000 times more to get water from MLR than it is to get water from Plalestine. DID I MISS SOMETHING?????

Let's examine water rates In Region C and Region D.
The population of Dallas alone is 1.38 million. Cost of residential water in Region C for 2700 gallons is $5.02 with a base rate of $5.33. That's a total of $10.35/ per month. I can certainly see how Dalllas customers want to conserve their water!
If I was a Region C water customer, it wouldn't mind a bit paying to fill my swimming pool.

Cost for residential water in Region D for 2700 gallons is $38.50. Region D pays 3.72 times more per month for water. WHAT'S WRONG WITH THIS PICTURE?

This proposed reservoir is about water but it is also about politicts, money, power, and whether any entity has the rights to take another man's land. THEY DON'T!

There are other alternatives besides MNR.
Toledo Bend will sell water to the metroplex. Each Metroplex meter might be required to pay more but that is the price to pay for luxary.
Deer Island , just off the coast of Boston, Massachusetts is a premier waste water treatment plant in which the water is reintroduced to the potable water system. Has the Metroplex studied this possibility? What about daming up the Trinity?

Arkansas has proposet to sell water from a fast recovery underground aquifer which supply up to one million acre feet of water per year.

In closing, several school districts, Rivercrest, Mount Pleasant, Clarksville, Paul Pewitt, Mount Vernon, and Harts Bluff will all be affected by loss of local revenue and state funding.

I could expound for pages but I think you get the point.

NO MARVIN NICHOLS, REGION "D" IS NOT FOR SALE!!!!!

You do have an opinion. Make it known by writing that opinion to the address at the beginning of this letter. Indifference is not an option.

I leave you with this quote.

"No power on earth has a right to take our property from us without our consent."

John Jay , First Chief Justice of the United States Supreme Court

Article 1, Section 17, the Texas Constitution:

No person's property shall be taken, damaged or destroyed for or applied to public use without adequate compensation being made.

Sincerely Submitted,

John Denison
12843 F.M. 909
Bogata, TX 75417

John Denison
12843 F M 909
Bogata, TX 75417

NORTH TEXAS TX P&DC
DALLAS TX 750
07 JUL 2020 PM 4 L

NETMWD/NETRWPG
P.O. Box 955
4180 HWY 250
HUGHS SPRINGS, TX 75650

75656-481180

From: Jan Mccoy <mamc50@aol.com>
To: "RegionD@NETMWD.com" <RegionD@NETMWD.com>
Date: August 10, 2020 9:12 PM
Subject: Public Comment on Marvin Nichols Reservoir

When Cooper Lake was built our family lost land for mitigation of that lake. We were offered $315 per acre for our land. They may have considered that 'fair market value' at that time but we thought it was a very low offer. The timber value alone should have been worth more than that. We got them up to a final offer of $515 per acre. If we didn't take that offer we would have to hire a lawyer and go to court. Not knowing what the legal fees could be, my family decided to take the $515 offer. Several years later, timber prices were high and we decided to sell the timber on some other land that we own which was similar to the place we lost to mitigation. The timber we sold brought almost $2000 per acre. We replanted pine seedlings and have thinned them once and they are ready to thin again and we still own the land. Some land in Region D is now selling for $3000 to $5000 per acre.

There are very few places in this state left to build a large lake and none are this close to Region C. I believe there are many good options left to get more water to Region C and avoid building this lake.

However, if Marvin Nichols be built and the mitigation land be taken in the same drainage basin, the land covered by the lake and the property taken for mitigation should be some of the most valuable land in the state of Texas.

Mike McCoy
1602 TX Hwy 11 West
Daingerfield, Tx 75638
mamc50@aol.com
903 918 5360

TEXAS STATE SOIL AND WATER CONSERVATION BOARD

Protecting and Enhancing Natural Resources for Tomorrow

June 18, 2020

Mr. Walt Sears
Region D Administrator

Dear Mr. Sears;

For the past 2 years the Texas State Soil and Water Conservation Board (TSSWCB) has been participating in the Texas Water Development Board's (TWDB) Regional Water Planning meetings as directed by Senate Bill 1511, passed in the 2017 legislative session. We appreciate being included in the process and offer these constructive comments to the regional water plans and ultimately the State water plan. Attached you will find some specific comments to the Region D water plan as they pertain to the TSSWCB.

As you may know 82% of Texas' land area is privately-owned and are working lands, involved in agricultural, timber, and wildlife operations. These lands are important as they provide substantial economic, environmental, and recreational resources that benefit both the landowners and public. They also provide ecosystem services that we all rely on for everyday necessities, such as air and water quality, carbon sequestration, and wildlife habitat.

With that said, these working lands are where the vast majority of our rain falls and ultimately supply the water for all of our needs, such as municipal, industrial, wildlife, and agricultural to name a few. Texas' private working lands are a valuable resource for all Texans.

Over the years, the private landowners of these working lands have been good stewards of their property. In an indirect way they have been assisting the 16 TWDB's Regional Water Planning Groups in achieving their goals through voluntary incentive-based land conservation practices.

It has been proven over time if a raindrop is controlled where it hits the ground there can be a benefit to both water quality and water quantity. Private landowners have been providing benefits to our water resources by implementing Best Management Practices (BMP) that slow water runoff and provide for soil stabilization, which also slows the sedimentation of our reservoirs and allows for more water infiltration into our aquifers.

1497 Country View Lane • Temple, TX 76504-8806
Phone: 254-773-2250 • Fax: 254-773-3311
http://www.tsswcb.texas.gov

Some common BMPs include brush management, prescribed grazing, fencing, grade stabilization, irrigation land leveling, terrace, contour farming, cover crop, residue and tillage management, and riparian herbaceous cover.

The TSSWCB has been active with agricultural producers since 1939 as the lead agency for planning, implementing, and managing coordinated natural resource conservation programs for preventing and abating agricultural and sivicultural nonpoint sources of water pollution.

The TSSWCB also works to ensure that the State's network of over 2,000 flood control dams are protecting lives and property by providing operation, maintenance, and structural repair grants to local government sponsors.

The TSSWCB successfully delivers technical and financial assistance to private landowners of Texas through Texas' 216 local Soil and Water Conservation Districts (SWCD) which are led by 1,080 locally elected district directors who are active in agriculture. Through the TSSWCB Water Quality Management Plan Program (WQMP), farmers, ranchers, and silviculturalists receive technical and financial assistance to voluntarily conserve and protect our natural resources. Participants receive assistance with conservation practices, BMPs, that address water quality, water quantity, and soil erosion while promoting the productivity of agricultural lands. This efficient locally led conservation delivery system ensures that those most affected by conservation programs can make decisions on how and what programs will be implemented voluntarily on their private lands.

Over time, lands change ownership and many larger tracts are broken up into smaller parcels. Most new landowners did not grow up on working lands and therefore may not have a knowledge of land management techniques. The TSSWCB is writing new WQMPs for these new landowners who are implementing BMPs on their land. Education and implementation of proper land management and BMPs continues to be essential. Voluntary incentive-based programs are essential to continue to address soil and water conservation in Texas.

These BMPs implemented for soil and water conservation provide benefits not only to the landowner but ultimately to all Texans and our water supply.

Respectfully,

Barry Mahler

Barry Mahler
Chairman

Rex Isom
Executive Director

Attachment

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Phone: 254-773-2250 • Fax: 254-773-3311
http://www.tsswcb.texas.gov

Region D (Northeast Texas)

- Page 1-50
  "*3. Encouragement of reservoir owners/operators to participate in watershed protection programs such as the TWDB Source Water Assessment Program, part of the Clean Water State Revolving Fund; and the Section 319 Program offered by ~~the Natural Resources Conservation Service in Conjunction with~~ the Texas State Soil and Water Conservation Board*."

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http://www.tsswcb.texas.gov

TEXAS PARKS & WILDLIFE

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August 18, 2020

Mr. Walt Sears, Jr.
NETRWPG – Region D Administrative Office
C/O Northeast Texas Municipal Water District
P.O. Box 955
Hughes Springs, TX 75656

Re: Review of Region D North East Texas Region Initially Prepared Water Plan

Dear Mr. Sears:

Thank you for seeking review and comment from the Texas Parks and Wildlife Department (TPWD) on the 2021 Initially Prepared Regional Water Plan (IPP) for Region D North East Texas. Thank you for the Region's responsiveness to TPWD's comments in previous planning cycles. Water impacts every aspect of TPWD's mission to manage and conserve the natural and cultural resources of Texas. Although TPWD has limited regulatory authority over the use of state waters, we are the agency charged with primary responsibility for protecting the state's fish and wildlife resources. To that end, TPWD offers these comments intended to help avoid or minimize impacts to state fish and wildlife resources.

TPWD understands that regional water planning groups are guided by 31 TAC §357 when preparing regional water plans. These water planning rules spell out requirements related to natural resource and environmental protection. Accordingly, TPWD staff reviewed the IPP with a focus on the following questions:

- Does the IPP include a quantitative reporting of environmental factors including the effects on environmental water needs and habitat?
- Does the IPP include a description of natural resources and threats to natural resources due to water quantity or quality problems?
- Does the IPP discuss how these threats will be addressed?
- Does the IPP describe how it is consistent with long-term protection of natural resources?
- Does the IPP include water conservation as a water management strategy?
- Does the IPP include Drought Contingency Plans?
- Does the IPP recommend any stream segments be nominated as ecologically unique?
- Does the IPP address concerns raised by TPWD in connection with the 2016 Water Plan.

4200 SMITH SCHOOL ROAD
AUSTIN, TEXAS 78744-3291
512.389.4800
www.tpwd.texas.gov

The population of the 19 county Region D North East Texas Water Planning Region is expected to grow approximately 65 percent from 831,469 in 2020 to over 1.3 million in 2070. However, total annual water demands are expected to increase only 19 percent from about 401,409 acre-feet per year in 2020 to 479,321 acre-feet per year by 2070. This increase in regional water demand is due to increases in municipal water needs. The IPP also acknowledges water in the region is used for recreational and environmental demands and discusses efforts related to the identification and voluntary protection of instream flow regimes.

Recommended Water Management Strategies (WMS) for meeting future water needs include advanced water conservation, voluntary reallocation of existing supply sources, increasing contractual supplies from existing surface water sources, entering into new contracts, drilling additional groundwater wells, and importation of water by pipeline from Toledo Bend Reservoir and other water bodies within the North East Texas Region.

Chapter 1 of the IPP provides a detailed description of natural resources in the region and describes threats to the natural resources. Springs are briefly mentioned in Section 1.4.1. Giant salvinia, water hyacinth, hydrilla, zebra mussels and other exotic species are discussed as a serious threat to the region's water sources. To prevent the transmission of invasive species TPWD recommends avoiding transport of water from basins where these species are known to occur. If this is unavoidable these transfers of water should be directly to water treatment plants. Threatened and endangered species are listed in Table 1.12. Please note there have been recent updates (March 30, 2020) to the list of federal and state listed species and Species of Greatest Conservation need. We recommend that you update Table 1.12 with the latest information that is available at:
https://tpwd.texas.gov/huntwild/wild/wildlife_diversity/nongame/listed-species/.

The 2021 Region D IPP includes a quantitative reporting of environmental factors. A summary of the evaluations of potential impacts from the recommended WMS is presented in Table 6.15. Table 6.16 presents an index associated the acreage impacted for a given WMS to a ranked score of 1-5 with 5 representing the greatest impact. The acreage of each WMS and the respective resultant index ranking for each WMS are incorporated into Table 6.15. Overall environmental impacts are then calculated based on the scoring from each of the environmental factors focusing upon the quantified total and wetlands acreage impacted. Potential impacts to spring flows and spring ecosystems should also be addressed where additional groundwater development was identified as a water management strategy. TWDB planning rules require that groundwater supplies not exceed the Modeled Available Groundwater (MAG) values that were determined to meet the desired future conditions (DFCs) of the groundwater source. However, adopted DFCs for aquifers in Region D do not address protection of springs or groundwater surface water interaction. Ultimately TPWD would like to see DFCs adopted to protect these features.

Region D supports water conservation as a management strategy for entities with daily per capita consumption above the Texas Water Conservation Task Force goal of 140 gallons per person per day. Advanced water conservation is recommended as a water management strategy for the City of Greenville. The IPP does not include drought management measures as a water management strategy but drought contingency plans are included for municipalities.

Marvin Nichols Reservoir is not a recommended water management strategy for Region D; however the 2021 Region C IPP includes a larger configuration of Marvin Nichols Reservoir. Since the project would be located within Region D, the Region D IPP summarizes impacts on water resources, agricultural resources and natural resources that could be expected to occur if Marvin Nichols Reservoir were to be built. TPWD agrees the natural resource impacts related to the construction of Marvin Nichols Reservoir would be substantial. Region D does acknowledge that reallocation of Wright Patman Reservoir provides a viable potential water management strategy to assist in meeting the needs for Region C. Although less impacting than new reservoir construction, TPWD's concerns remain regarding the elevation of Lake Wright Patman. TPWD looks forward to continued cooperation with project sponsors to address those concerns.

TPWD agrees with many of the policy recommendations included in the IPP. The recommendations consistently recognize the importance of environmental flows, habitat mitigation, and Giant salvinia control measures. Of particular note is Region D's support of voluntary instream flow goals developed in the Cypress Creek Basin and now being explored in the Sulphur Basin. As in previous plans, Region D elected not to unconditionally recommend any stream segments but did once again elect to conditionally recommend the following segments for consideration as ecologically unique stream segments: Pecan Bayou in the Red River Basin and Black Cypress Bayou and Black Cypress Creek in the Cypress Creek Basin. TPWD staff applauds the planning group for making this recommendation.

Thank you for your consideration of these comments. TPWD looks forward to continuing to work with the planning group to develop water supply strategies that not only meet the future water supply needs of the region but also preserve the ecological health of the region's aquatic resources. Please contact me at (512) 389-8715 or Cindy.Loeffler@TPWD.Texas.gov if you have any questions or comments.

Sincerely,

Cindy Loeffler

Cindy Loeffler, Chief
Water Resources Branch

APPENDIX C10-6
Response to Comments to the Initially Prepared Plan for Region D

The North East Texas Regional Water Planning Group (NETRWPG, Region D) received a total of forty (40) comments from thirty-two (32) individuals on the Initially Prepared Plan (IPP). All comments, both verbal and written, must be addressed specifically, and have been considered in the development of the final 2021 Region D Plan. This instrument is intended to provide the necessary documentation to reflect how the comments have been considered and addressed by the NETRWPG. The consultant team has categorized the comments into two distinct groups as follows:

Group 1 – Comments, thirty-four (34), which reflect the opinion of the commenter but do not specifically request any changes in the IPP. These comments are typically considered as being more generic in nature.

Group 2 – Comments, six (6), which represent facts which are incorrectly stated or need additional information or clarity to improve the quality of the IPP. These comments may necessitate changes in the document but are consistent with the intent of the IPP. Three comments from two agencies of the State of Texas that provided review comments of the Region D IPP are included in this group as well.

Group 1 – Comments which reflect the opinion of the commenter.

No.	Date	Name	Entity	Form of Comment	Location in Final 2021 Plan	Subject	Response
1-1	06/12/20	Jim Vignali	Self	Written	Appendix C10-4	Against Marvin Nichols, proposes alternative strategies	The IPP and Final 2021 Region D Water Plan include statements in Section ES.6.8, Section 6.9, and Section 6.10, indicating the NETRWPG's continued position that Marvin Nichols Reservoir should not be included as a water management strategy in any regional water plan or the State Water Plan. A list of alternative strategies suggested by commenters to the Region D IPP has been aggregated and presented herein.
1-2	06/25/20	Adam Morin	Self	Written	Appendix C10-4	Against Marvin Nichols	The IPP and Final 2021 Region D Water Plan include statements in Section ES.6.8, Section 6.9, and Section 6.10, indicating the NETRWPG's continued position that Marvin Nichols Reservoir should not be included as a water management strategy in any regional water plan or the State Water Plan.
1-3	06/19/20	Kelly Kennedy	Self	Written	Appendix C10-4	Against Marvin Nichols, proposes alternative strategies	The IPP and Final 2021 Region D Water Plan include statements in Section ES.6.8, Section 6.9, and Section 6.10, indicating the NETRWPG's continued position that Marvin Nichols Reservoir should not be included as a water management strategy in any regional water plan or the State Water Plan. A list of alternative strategies suggested by commenters to the Region D IPP has been aggregated and presented herein.

No.	Date	Name	Entity	Form of Comment	Location in Final 2021 Plan	Subject	Response
1-4	06/19/20	Aaron and Wendi Whitley	Self	Written	Appendix C10-4	Against Marvin Nichols	The IPP and Final 2021 Region D Water Plan include statements in Section ES.6.8, Section 6.9, and Section 6.10, indicating the NETRWPG's continued position that Marvin Nichols Reservoir should not be included as a water management strategy in any regional water plan or the State Water Plan.
1-5	06/19/20	Stephanie Wright	Self	Written	Appendix C10-4	Against Marvin Nichols	The IPP and Final 2021 Region D Water Plan include statements in Section ES.6.8, Section 6.9, and Section 6.10, indicating the NETRWPG's continued position that Marvin Nichols Reservoir should not be included as a water management strategy in any regional water plan or the State Water Plan.
1-6	06/19/20	Kasey Crawford	Self	Written	Appendix C10-4	Against Marvin Nichols	The IPP and Final 2021 Region D Water Plan include statements in Section ES.6.8, Section 6.9, and Section 6.10, indicating the NETRWPG's continued position that Marvin Nichols Reservoir should not be included as a water management strategy in any regional water plan or the State Water Plan.
1-7	06/18/20	Marla Ballard	Self	Written	Appendix C10-4	Against Marvin Nichols	The IPP and Final 2021 Region D Water Plan include statements in Section ES.6.8, Section 6.9, and Section 6.10, indicating the NETRWPG's continued position that Marvin Nichols Reservoir should not be included as a water management strategy in any regional water plan or the State Water Plan.
1-8	04/06/19	Laura Ashley Overdyke	Caddo Lake Institute	Written	Appendix C10-4	Supports emphasis on environmental flows and balancing of needs	No change required.

No.	Date	Name	Entity	Form of Comment	Location in Final 2021 Plan	Subject	Response
1-9	04/06/19	Laura Ashley Overdyke	Caddo Lake Institute	Written	Appendix C10-4	Grateful for celebrating success of Paddlefish restoration	No change required.
1-10	04/06/19	Laura Ashley Overdyke	Caddo Lake Institute	Written	Appendix C10-4	Against Marvin Nichols	The IPP and Final 2021 Region D Water Plan include statements in Section ES.6.8, Section 6.9, and Section 6.10, indicating the NETRWPG's continued position that Marvin Nichols Reservoir should not be included as a water management strategy in any regional water plan or the State Water Plan.
1-11	04/06/19	Laura Ashley Overdyke	Caddo Lake Institute	Written	Appendix C10-4	Expresses hope to see mining demand revised downwards after closing of multiple Coal Fired Power Plants in region	Demands for WUGs in the NETRWPA were formally adopted by the TWDB during the early portion of the planning process. Changes in specific non-municipal demand projections, such as for mining, will manifest through the development of revised projections for the purposes of the next planning cycle, and will incorporate more recent reported water use.
1-12	04/06/19	Laura Ashley Overdyke	Caddo Lake Institute	Written	Appendix C10-4	Preference for stronger stance against Little Cypress Reservoir as it would negatively impact Caddo Lake	The NETRWPG has not taken a position encouraging development of Little Cypress Reservoir, as the Little Cypress Reservoir is not identified as a recommended water management strategy for the purposes of the 2021 Regional Water Plan.
1-13	04/06/19	Laura Ashley Overdyke	Caddo Lake Institute	Written	Appendix C10-4	Support for designation of Black Cypress as an ecologically unique stream segment	No change required.
1-14	03/30/20	Walt Sears, Jr.	Northeast Texas Municipal Water District	Written	Appendix C10-4	Historical information on regional planning process and historical voting members	No change required.

No.	Date	Name	Entity	Form of Comment	Location in Final 2021 Plan	Subject	Response
1-15	03/20/20	Walt Sears, Jr.	Northeast Texas Municipal Water District	Written	Appendix C10-4	Sharing of surplus water with those who have need for it is worth pursuing	No change required.
1-16	03/18/20	Walt Sears, Jr.	Northeast Texas Municipal Water District	Written	Appendix C10-4	Conservation is important, presenting and comparing information on conservation from the Region C and Region D IPPs	No change required.
1-17	03/20/20	Walt Sears, Jr.	Northeast Texas Municipal Water District	Written	Appendix C10-4	Discusses interregional coordination, provides communication from Region C, and suggests language in the IPP be considered as a beginning point on the topic of Marvin Nichols Reservoir	No change required.
1-18	03/13/20	Walt Sears, Jr.	Northeast Texas Municipal Water District	Written	Appendix C10-4	Presents historical information on negotiations relating to Lake Bob Sandlin, and encourages a path forward for negotiation, not confrontation, relating to Marvin Nichols Reservoir	No change required.
1-19	06/11/20	Richard LeTourneau	Self	Oral	Appendix C10-3	Against Marvin Nichols, timing of Marvin Nichols has changed from the 2015 agreement, and asserts his position that a conflict exists between Region C and Region D again	The IPP and Final 2021 Region D Water Plan include statements in Section ES.6.8, Section 6.9, and Section 6.10, indicating the NETRWPG's continued position that Marvin Nichols Reservoir should not be included as a water management strategy in any regional water plan or the State Water Plan.

No.	Date	Name	Entity	Form of Comment	Location in Final 2021 Plan	Subject	Response
1-20	06/11/20	Gary Cheatwood	Self	Oral	Appendix C10-3	Against Marvin Nichols	The IPP and Final 2021 Region D Water Plan include statements in Section ES.6.8, Section 6.9, and Section 6.10, indicating the NETRWPG's continued position that Marvin Nichols Reservoir should not be included as a water management strategy in any regional water plan or the State Water Plan.
1-21	06/11/20	Eddie Belcher	Self	Oral	Appendix C10-3	Against Marvin Nichols	The IPP and Final 2021 Region D Water Plan include statements in Section ES.6.8, Section 6.9, and Section 6.10, indicating the NETRWPG's continued position that Marvin Nichols Reservoir should not be included as a water management strategy in any regional water plan or the State Water Plan.
1-22	06/11/20	David Stewart	Self	Oral	Appendix C10-3	Against Marvin Nichols	The IPP and Final 2021 Region D Water Plan include statements in Section ES.6.8, Section 6.9, and Section 6.10, indicating the NETRWPG's continued position that Marvin Nichols Reservoir should not be included as a water management strategy in any regional water plan or the State Water Plan.

No.	Date	Name	Entity	Form of Comment	Location in Final 2021 Plan	Subject	Response
1-23	06/11/20	Lindy Guest	Self	Oral	Appendix C10-3	Against Marvin Nichols. Poses multiple questions. 1. If Marvin Nichols ever happened, who would decide what the land prices would be? 2. What will happen to our taxes? 3. If the land is going to be developed, then why would they have mitigation and take our land and turn right around and develop it? 4. Why don't they consider other reasonable alternatives?	The IPP and Final 2021 Region D Water Plan include statements in Section ES.6.8, Section 6.9, and Section 6.10, indicating the NETRWPG's continued position that Marvin Nichols Reservoir should not be included as a water management strategy in any regional water plan or the State Water Plan. Regarding the questions asked in this comment: 1. Acquisition costs are principally the responsibility of the Project Sponsor, which would include some form of negotiation. 2. Tax rates are established by local taxing entities. The tax base of those entities is affected by numerous factors, including how a property is used. The most recent information on the Marvin Nichols Reservoir is that the tax base of the taxing entities in Franklin, Red River, and Titus County would increase. (Sulphur River Basin Feasibility Study). 3. Mitigation is the primary responsibility of the project sponsor, which is required to be consistent with USACE requirements. 4. The project sponsor will be required to vet reasonable alternatives as part of the USACE permitting process. The Planning Rules require analysis of reasonable feasible alternatives.

No.	Date	Name	Entity	Form of Comment	Location in Final 2021 Plan	Subject	Response
1-24	06/11/20	Joe Coats	Self	Oral	Appendix C10-3	Against Marvin Nichols. Supports conservative water practices. Against Nestle and Ozarka bottling East Texas water, supports use of municipal water.	The IPP and Final 2021 Region D Water Plan include statements in Section ES.6.8, Section 6.9, and Section 6.10, indicating the NETRWPG's continued position that Marvin Nichols Reservoir should not be included as a water management strategy in any regional water plan or the State Water Plan.
1-25	06/11/20	Aaron Rolen	Self	Oral	Appendix C10-3	Against Marvin Nichols	The IPP and Final 2021 Region D Water Plan include statements in Section ES.6.8, Section 6.9, and Section 6.10, indicating the NETRWPG's continued position that Marvin Nichols Reservoir should not be included as a water management strategy in any regional water plan or the State Water Plan.
1-26	06/11/20	Max Shumake	Self	Oral	Appendix C10-3	Against Marvin Nichols	The IPP and Final 2021 Region D Water Plan include statements in Section ES.6.8, Section 6.9, and Section 6.10, indicating the NETRWPG's continued position that Marvin Nichols Reservoir should not be included as a water management strategy in any regional water plan or the State Water Plan.
1-27	06/11/20	Heath Holt	Self	Oral	Appendix C10-3	Against Marvin Nichols	The IPP and Final 2021 Region D Water Plan include statements in Section ES.6.8, Section 6.9, and Section 6.10, indicating the NETRWPG's continued position that Marvin Nichols Reservoir should not be included as a water management strategy in any regional water plan or the State Water Plan.

No.	Date	Name	Entity	Form of Comment	Location in Final 2021 Plan	Subject	Response
1-28	06/11/20	Martha Dalby	Self	Oral	Appendix C10-3	Against Marvin Nichols	The IPP and Final 2021 Region D Water Plan include statements in Section ES.6.8, Section 6.9, and Section 6.10, indicating the NETRWPG's continued position that Marvin Nichols Reservoir should not be included as a water management strategy in any regional water plan or the State Water Plan.
1-29	06/11/20	D.D. Vignali	Self	Oral	Appendix C10-3	Against Marvin Nichols. Requests interregional coordination meetings be set up with opportunities for public comment at the end of the meetings.	The IPP and Final 2021 Region D Water Plan include statements in Section ES.6.8, Section 6.9, and Section 6.10, indicating the NETRWPG's continued position that Marvin Nichols Reservoir should not be included as a water management strategy in any regional water plan or the State Water Plan.
1-30	06/11/20	J.B. Watson	Self	Oral	Appendix C10-3	Against Marvin Nichols. Indicates two revisions to the Region D IPP.	Drafts of individual chapters of the 2021 Region D IPP were developed over the course of the 5-year development process. These were finalized into a single, two volume document. A single formal Region D IPP was adopted and hardcopies distributed to libraries and the County Clerk offices in each of the 19 counties within the region, and was made available for download at www.netmwd.com.
1-31	06/11/20	J.B. Watson	Self	Oral	Appendix C10-3	Indicates Region D IPP lacks declaration of opposition to Marvin Nichols Reservoir. Requests declaration of conflict within the Final Plan.	The IPP and Final 2021 Region D Water Plan include statements in Section ES.6.8, Section 6.9, and Section 6.10, indicating the NETRWPG's continued position that Marvin Nichols Reservoir should not be included as a water management strategy in any regional water plan or the State Water Plan.

No.	Date	Name	Entity	Form of Comment	Location in Final 2021 Plan	Subject	Response
1-32	06/11/20	J.B. Watson	Self	Oral	Appendix C10-3	Identifies alternative groundwater source in Arkansas. Requests identification of potential groundwater supply from Arkansas within the Region D Plan.	A list of alternative strategies suggested by commenters to the Region D IPP has been aggregated and presented herein.
1-33	07/06/20	John Denison	Self	Written	Appendix C10-4	Against Marvin Nichols, proposes alternative strategies.	The IPP and Final 2021 Region D Water Plan include statements in Section ES.6.8, Section 6.9, and Section 6.10, indicating the NETRWPG's continued position that Marvin Nichols Reservoir should not be included as a water management strategy in any regional water plan or the State Water Plan. A list of alternative strategies suggested by commenters to the Region D IPP has been aggregated and presented herein.
1-34	08/10/20	Mike McCoy	Self	Written	Appendix C10-4	Against Marvin Nichols, supportive of other strategies and fair land pricing	The IPP and Final 2021 Region D Water Plan include statements in Section ES.6.8, Section 6.9, and Section 6.10, indicating the NETRWPG's continued position that Marvin Nichols Reservoir should not be included as a water management strategy in any regional water plan or the State Water Plan.

Several of the commenters (No. 1, 3, 23, 32, and 33) offered suggestions as to water strategies that could potentially serve as alternatives to Marvin Nichols Reservoir. These suggestions provided by the commenters are aggregated below for reference, in no priority order, as follows:

- Pass a requirement that all building and Construction companies must adhere to. This being that any requirements for fill dirt in any construction projects must come from dredging of any / all current reservoirs in use within Region C area. A 2 foot dredging of all current reservoirs and a 2 foot raising of all current reservoirs would more than address projected worst case scenarios.
- Utilize available aquifers with in the regions as well as the aquifer available from the State of Arkansas.
- Require all city building plans to build a water runoff catch system that would supplement current water needs. Currently nothing is being built which would capture and utilize the spring runoff that is now flowing directly to the ocean. Some, very little is being captured by the natural flow into existing reservoirs.
- Create multiple 20 to 50 acre runoff ponds throughout Region C to capture water as well as create small natural wildlife refuge area that could be enjoyed by residents of Region C as well as tourists.
- Reduction in water usage per person.
- Using available water that is being offered by the Toledo Bend Reservoir.
- Raising the dam at Wright Patman Lake.
- Groundwater from an aquifer located near Mena, Arkansas (4 Million ac-ft/yr).
- Direct reuse.
- Additional impoundments on the Trinity.

In response to comments expressing opposition to the Marvin Nichols Reservoir strategy identified in the Region C IPP, it is noted that the Region D IPP and Final 2021 Region D Water Plan include the following statements regarding Marvin Nichols Reservoir:

> **Section ES.6.8:**
> It has been, and continues to be the position of the NETRWPG that due to the significant negative impacts upon environmental factors, agricultural resources/rural areas, other natural resources, and third parties, Marvin Nichols I Reservoir should not be included as a water management strategy in any regional water plan or the State Water Plan. In referencing Marvin Nichols I, the North East Texas Regional Water Plan incorporates Marvin Nichols I, Marvin Nichols IA, and any major dam sites on the main stem of the Sulphur River.
>
> **Section 6.9, 2nd Paragraph:**
> Based on the reasons set forth below, it has been and continues to be the position of the NETRWPG that Marvin Nichols I Reservoir should not be included in any regional plans as a water management strategy and not be included in the State Water Plan as a water management strategy. The NETRWPG continues to oppose any Marvin Nichols type reservoir.
>
> **Section 6.10, 1st and 2nd Paragraphs:**
> It has been and continues to be the position of the NETRWPG that due to the significant negative impacts upon environmental factors, agricultural resources/rural areas, other natural resources, and third parties, Marvin Nichols I Reservoir should not be included as a water

management strategy in any regional water plan or the State Water Plan. In referencing Marvin Nichols I, the NETRWP incorporates Marvin Nichols I, Marvin Nichols IA, and any major dam sites on the main steam of the Sulphur River.

Per the terms of agreement set forth from the October mediation between Regions C and D and ratified by the NETRWPG at its October, meeting, the NETRWPG does not challenge Marvin Nichols Reservoir as a unique reservoir site for the purposes of this Plan. At the time of publication of this Regional Water Plan, no agreement has been made between Regions C and D for the purposes of the Region D Plan.

Group 2 – Comments which represent facts or clarifications.

No.	Date	Name	Entity	Form of Comment	Location in Final 2021 Plan	Subject
2-1	03/02/20	Greg Carter	AE Power	Written	Appendix C10-4	Requests removal of references to combined cycle power plant in Hunt County
2-2	05/18/20	Laura M. Rex	City of Big Sandy	Written	Appendix C10-4	Requests copy of Initially Prepared Plan
2-3	03/24/20	Walt Sears, Jr.	Northeast Texas Municipal Water District	Written	Appendix C10-4	Suggests that content about navigation in Section 1.5.4 in the IPP be adjusted to include more information about navigation and the Cypress Valley Navigation District
2-4	06/18/20	Barry Mahler Rex Isom	Texas State Soil and Water Conservation Board	Written	Appendix C10-5	Requests Page 1-50 be revised to more accurately reflect the offering of programs specifically from the Texas State Soil and Water Conservation Board
2-5	8/18/20	Cindy Loeffler	Texas Parks and Wildlife Department	Written	Appendix C10-5	Update list of Threatened and Endangered Species.
2-6	8/18/20	Cindy Loeffler	Texas Parks and Wildlife Department	Written	Appendix C10-5	Potential impacts to spring flows and spring ecosystems should also be addressed.

Group 2 comments are addressed by topic, as shown below.

Comment 2-1: Mr. Greg Carter, Engineering Principal at AE Power, requests that references to the combined cycle power plant in Hunt County should be removed, as the PUCT has included the Hunt County Cobisa project as cancelled in a 2017 update. References to this plant have been removed from the descriptions of power generation in Hunt County relating to recommended and alternative strategies for the City of Greenville in Appendix C5-7 and Appendix C5-11, respectively.

Comment 2-2: Ms. Laura M. Rex, City Administrator for the City of Big Sandy, requested a copy of the Region D IPP. A hardcopy of the 2021 Region D Initially Prepared Plan was sent to the City of Big Sandy.

Comment 2-3: Mr. Walt Sears, Jr., General Manager of the Northeast Texas Municipal Water District, suggested that content about navigation in Section 1.5.4 be adjusted to include more information about navigation and the Cypress Valley Navigation District. Section 1.5.4 has been revised to include additional information on the Cypress Valley Navigation District, its' activities, and relevant navigation projects reported by USACE.

Comment 2-4: Mr. Barry Mahler, Chairman, and Mr. Rex Isom, Executive Director, of the Texas State Soil and Water Conservation Board (TSSWCB), requested Page 1-50 of the Region D IPP to be revised to more accurately reflect the offering of programs specifically from the TSSWCB. Language in the Final Region D Water Plan (Chapter 1, pg. 1-52) has been revised to more accurately reflect offerings of the Section 319 program from the Texas State Soil and Water Conservation Board. Additional information presented as part of the submitted comments regarding activities of the TSSWCB has been incorporated into Section 1.6.1 in the Final Report.

Comment 2-5: Texas Parks and Wildlife Department comments that threatened and endangered species are listed in Table 1.12. Please note there have been recent updates (March 30, 2020) to the list of federal and state listed species and Species of Greatest Conservation need. We recommend that you update Table 1.12 with the latest information that is available at: https://tpwd.texas.gov/huntwild/wild/wildlife_diversity/nongame/listed-species/. Table 1.14 (formerly Table 1.12) and associated text have been updated to reflect the latest available information, along with tables in Chapter 6.

Comment 2-6: Texas Parks and Wildlife Department Comments that potential impacts to spring flows and spring ecosystems should also be addressed where additional groundwater development was identified as a water management strategy. TWDB planning rules require that groundwater supplies not exceed the Modeled Available Groundwater (MAG) values that were determined to meet the desired future conditions (DFCs) of the groundwater source. However, adopted DFCs for aquifers in Region D do not address protection of springs or groundwater surface water interaction. Ultimately TPWD would like to see DFCs adopted to protect these features. Section 8.14.13, Item 6, has been revised to include the following statement:

> Such coordination could further consider the protection of springs and groundwater surface water interaction.

ACTION: September 2 2020, accepted Items 1-1 – 1-34 Items 2-1 – 2-6.

Appendix C11 – Chapter 11:

IMPLEMENTATION AND COMPARISON TO PREVIOUS REGIONAL WATER PLAN

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APPENDIX C11

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Planning Region	WMS or WMS Project Name	Database Online Decade	Related Sponsor Entity and/or Benefitting WUGs	Implementation Survey Record Type	Database ID	Has Sponsor taken affirmative vote or actions?* (TWC 16.053(h)(10))	If yes, in what year did this occur?	If yes, by what date is the action on schedule for implementation?	At what level of implementation is the project currently?*	If not implemented, why?* (When "If other, please describe" is selected, please add the descriptive text to that field)	What impediments presented to implementation? * (When "If other, please describe" is selected, please add the descriptive text to that field)	Current water supply project yield (ac-ft/yr)	Funds expended to date ($)	Project Cost ($)	Year the project is online?*	Is this a phased project?*	(Phased) Ultimate volume (ac-ft/yr)	(Phased) Ultimate project cost ($)	Year project reaches maximum capacity?*	What is the project funding source(s)?*	Funding Mechanism if Other?	Included in 2021 plan?*	Does the project or WMS involve reallocation of flood control?*	Does the project or WMS provide any measurable flood risk reduction?*	Optional Comments
D	DRILL NEW WELLS (BI COUNTY WSC, QUEEN, CYPRESS, CAMP, 2060)	2060	PROJECT SPONSOR(S): BI COUNTY WSC	RECOMMENDED WMS PROJECT	1987									$ 1,320,000.00		Yes	269	$ 1,320,000.00	2070			No	No	No	
D	DRILL NEW WELLS (BI COUNTY WSC, QUEEN, CYPRESS, UPSHUR, 2060)	2060	PROJECT SPONSOR(S): BI COUNTY WSC	RECOMMENDED WMS PROJECT	2452									$ 510,000.00		No		$ 510,000.00	2070			No	No	No	
D	DRILL NEW WELLS (BI COUNTY WSC, QUEEN, CYPRESS, CAMP, 2070)	2070	PROJECT SPONSOR(S): BI COUNTY WSC	RECOMMENDED WMS PROJECT	1989									$ 912,000.00		Yes	269	$ 912,000.00	2070			No	No	No	
D	INCREASE EXISTING CONTRACT (BRINKER WSC, SULPHUR)	2060	PROJECT SPONSOR(S): BRINKER WSC	RECOMMENDED WMS PROJECT	1606	Yes	2018	2020	All phases fully implemented					$ -		No						Yes	No	No	No plans to request assistance and/or financing.
D	NEW CONTRACT (CADDO BASIN SUD, SABINE)	2020	PROJECT SPONSOR(S): CADDO BASIN SUD	RECOMMENDED WMS PROJECT	1614									$ -		No			2060			No	No	No	
D	NEW CONTRACT (CADDO BASIN SUD, SULPHUR)	2050	PROJECT SPONSOR(S): CADDO BASIN SUD	RECOMMENDED WMS PROJECT	1616									$ -		No			2070			No	No	No	
D	INCREASE EXISTING CONTRACT (CADDO MILLS, SABINE)	2030	PROJECT SPONSOR(S): CADDO MILLS	RECOMMENDED WMS PROJECT	1617									$ -		No			2070			Yes	No	No	
D	CANTON INDIRECT REUSE	2020	PROJECT SPONSOR(S): CANTON	RECOMMENDED WMS PROJECT	2671	Yes	2010	2021	Permit application submitted/pending	Too soon	Access to funding	865	$ 130,000.00	$ 2,500,000.00	2022	No				TWDB - SWIFT	DWSRF	Yes	No	No	The initial amendment application was issued in 2017. We were concerned about efficacy due to e-flow limitations. We discovered another route by adding a secondary outfall location for the WWTP effluent. The TPDES amendment application is administratively complete, and initial notices have been sent. A second Certificate of Adjudication amendment application will be submitted soon.
D	DRILL NEW WELLS (CANTON, CARRIZO-WILCOX, SABINE)	2020	PROJECT SPONSOR(S): CANTON	RECOMMENDED WMS PROJECT	1663	Yes	2018		Not implemented	Too soon	Access to funding	200	$ -			No			2070	Market		Yes	No	No	Not implemented due to being too soon, financing, and funds reallocated to reuse water management strategy.
D	DRILL NEW WELLS (CELESTE, WOODBINE, SABINE, 2050)	2050	PROJECT SPONSOR(S): CELESTE	RECOMMENDED WMS PROJECT	1618	No			Not implemented	Too soon	Not applicable	0	$ -	$ 1,275,000.00		Yes	204	$ 2,550,000.00	2070	TWDB - SWIFT		Yes	No	No	
D	DRILL NEW WELLS (CELESTE, WOODBINE, SABINE, 2070)	2070	PROJECT SPONSOR(S): CELESTE	RECOMMENDED WMS PROJECT	1687	No			Not implemented	Too soon	Not applicable	0	$ -	$ 1,275,000.00		Yes	204	$ 2,550,000.00	2070	TWDB - SWIFT		Yes	No	No	
D	CONTRACT WITH TEXARKANA AND TREATED WATER PIPELINE TO DEKALB (CLARKSVILLE, SULPHUR)	2040	PROJECT SPONSOR(S): CLARKSVILLE	RECOMMENDED WMS PROJECT	1643	No			Not implemented	Too soon	Not applicable		$ -	$ 10,053,000.00		No			2070			Yes	No	No	
D	DRILL NEW WELLS (COUNTY-OTHER HUNT, NACATOCH, SABINE, 2030)	2030	PROJECT SPONSOR(S): COUNTY-OTHER (HUNT)	RECOMMENDED WMS PROJECT	1621									$ 2,396,000.00		Yes	2387	$ 9,584,000.00	2040			No	No	No	
D	DRILL NEW WELLS (COUNTY-OTHER HUNT, NACATOCH, SABINE, 2040)	2040	PROJECT SPONSOR(S): COUNTY-OTHER (HUNT)	RECOMMENDED WMS PROJECT	1688									$ 2,396,000.00		Yes	2387	$ 9,584,000.00	2040			No	No	No	
D	INCREASE EXISTING CONTRACT WITH POETRY WSC (TAWAKONI)	2040	PROJECT SPONSOR(S): COUNTY-OTHER (HUNT)	RECOMMENDED WMS PROJECT	1622									$ -		No			2060			No	No	No	
D	DRILL NEW WELLS (COUNTY-OTHER HUNT, NACATOCH, SABINE, 2050)	2050	PROJECT SPONSOR(S): COUNTY-OTHER (HUNT)	RECOMMENDED WMS PROJECT	1689									$ 2,396,000.00		Yes	2387	$ 9,584,000.00	2060			No	No	No	
D	DRILL NEW WELLS (COUNTY-OTHER HUNT, NACATOCH, SABINE, 2060)	2060	PROJECT SPONSOR(S): COUNTY-OTHER (HUNT)	RECOMMENDED WMS PROJECT	1690									$ 2,396,000.00		Yes	2387	$ 9,584,000.00	2060			No	No	No	
D	INCREASE EXISTING CONTRACT WITH POETRY WSC (FORK)	2060	PROJECT SPONSOR(S): COUNTY-OTHER (HUNT)	RECOMMENDED WMS PROJECT	1623									$ -		No			2060			No	No	No	
D	GREENVILLE TIE-IN PIPELINE (COUNTY-OTHER HUNT, SABINE)	2070	PROJECT SPONSOR(S): COUNTY-OTHER (HUNT)	RECOMMENDED WMS PROJECT	1624									$ 25,670,000.00		No			2070			No	No	No	
D	INCREASE EXISTING CONTRACT (COUNTY-OTHER LAMAR, RED)	2020	PROJECT SPONSOR(S): COUNTY-OTHER (LAMAR)	RECOMMENDED WMS PROJECT	1635									$ -		No			2070			Yes	No	No	
D	RENEW EXISTING CONTRACT (RED RIVER COUNTY-OTHER, SULPHUR)	2020	PROJECT SPONSOR(S): COUNTY-OTHER (RED RIVER)	RECOMMENDED WMS PROJECT	1644									$ -		No			2070			No	No	No	
D	DRILL NEW WELLS (CRYSTAL SYSTEMS INC, QUEEN, SABINE, 2020)	2020	PROJECT SPONSOR(S): CRYSTAL SYSTEMS INC	RECOMMENDED WMS PROJECT	1646	Yes	2016	2016	Currently operating			644	$ 500,000.00	$ 2,330,000.00	2016	Yes	2053	$ 7,084,000.00	2070	Commercial/Bank loan		No	No	No	
D	DRILL NEW WELLS (CRYSTAL SYSTEMS INC, QUEEN, SABINE, 2040)	2040	PROJECT SPONSOR(S): CRYSTAL SYSTEMS INC	RECOMMENDED WMS PROJECT	2261	No			Not implemented	Too soon	Not applicable	0	$ -	$ 1,212,000.00		Yes	2053	$ 7,084,000.00	2070			Yes	No	No	
D	DRILL NEW WELLS (CRYSTAL SYSTEMS INC, QUEEN, SABINE, 2050)	2050	PROJECT SPONSOR(S): CRYSTAL SYSTEMS INC	RECOMMENDED WMS PROJECT	2263	No			Not implemented	Too soon	Not applicable	0	$ -	$ 2,330,000.00		Yes	2053	$ 7,084,000.00	2070			Yes	No	No	
D	DRILL NEW WELLS (CRYSTAL SYSTEMS INC, QUEEN, SABINE, 2070)	2070	PROJECT SPONSOR(S): CRYSTAL SYSTEMS INC	RECOMMENDED WMS PROJECT	2264	No			Not implemented	Too soon	Not applicable	0	$ -	$ 1,212,000.00		Yes	2053	$ 7,084,000.00	2070			Yes	No	No	
D	DRILL NEW WELLS (CUMBY, NACATOCH)	2030	PROJECT SPONSOR(S): CUMBY	RECOMMENDED WMS PROJECT	1607									$ 772,000.00		No			2070			Yes	No	No	
D	RENEW EXISTING CONTRACT (DEKALB)	2020	PROJECT SPONSOR(S): DE KALB	RECOMMENDED WMS PROJECT	1186	Yes	2019	2020	Sponsor has taken official action to initiate project			See RWRD Regional Master Plan Study (2018)	$ -		2021	No			See RWRD Regional Master Plan & Assoc. documents.			Yes	No	No	Project related to Riverbend WRD WMS. Currently, RWRD has submitted an application for funding through the Drinking Water State Revolving Fund.
D	DRILL NEW WELLS (GILMER, QUEEN, CYPRESS)	2030	PROJECT SPONSOR(S): GILMER	RECOMMENDED WMS PROJECT	1660	Yes	2018	2018	Currently operating			108	$ 350,000.00	$ 1,051,000.00	2018	Yes	216	$ 801,000.00	2040	Commercial/Bank loan		Yes	No	No	
D	WTP EXPANSION (GREENVILLE, SABINE)	2020	PROJECT SPONSOR(S): GREENVILLE	RECOMMENDED WMS PROJECT	1625									$ 36,074,000.00		No			2040			Yes	No	No	
D	CHAPMAN RAW WATER PIPELINE AND NEW WTP (GREENVILLE, SULPHUR)	2050	PROJECT SPONSOR(S): GREENVILLE	RECOMMENDED WMS PROJECT	1626									$ 193,438,000.00		No			2070			No	No	No	
D	TOLEDO BEND TIE-IN PIPELINE (GREENVILLE, SABINE)	2070	PROJECT SPONSOR(S): GREENVILLE	RECOMMENDED WMS PROJECT	1627									$ 42,470,000.00		No			2070			No	No	No	
D	DRILL NEW WELLS (HICKORY CREEK SUD, WOODBINE, SABINE, 2040)	2040	PROJECT SPONSOR(S): HICKORY CREEK SUD	RECOMMENDED WMS PROJECT	1629	No			Not implemented	Too soon	Not applicable	0	$ -	$ 1,705,000.00		Yes	1138	$ 6,820,000.00	2070	Market		No	No	No	
D	DRILL NEW WELLS (HICKORY CREEK SUD, TRINITY, TRINITY, 2050)	2050	PROJECT SPONSOR(S): HICKORY CREEK SUD	RECOMMENDED WMS PROJECT	1628	No			Not implemented	Too soon	Not applicable	0	$ -	$ 1,607,000.00		Yes	463	$ 4,821,000.00	2070	Market		No	No	No	
D	DRILL NEW WELLS (HICKORY CREEK SUD, WOODBINE, SABINE, 2050)	2050	PROJECT SPONSOR(S): HICKORY CREEK SUD	RECOMMENDED WMS PROJECT	1691	No			Not implemented	Too soon	Not applicable	0	$ -	$ 1,705,000.00		Yes	1138	$ 6,820,000.00	2070	Market		No	No	No	
D	DRILL NEW WELLS (HICKORY CREEK SUD, TRINITY, TRINITY, 2060)	2060	PROJECT SPONSOR(S): HICKORY CREEK SUD	RECOMMENDED WMS PROJECT	1694	No			Not implemented	Too soon	Not applicable	0	$ -	$ 1,607,000.00		Yes	463	$ 4,821,000.00	2070	Market		No	No	No	
D	DRILL NEW WELLS (HICKORY CREEK SUD, WOODBINE, SABINE, 2060)	2060	PROJECT SPONSOR(S): HICKORY CREEK SUD	RECOMMENDED WMS PROJECT	1692	No			Not implemented	Too soon	Not applicable	0	$ -	$ 1,705,000.00		Yes	1138	$ 6,820,000.00	2070	Market		No	No	No	
D	DRILL NEW WELLS (HICKORY CREEK SUD, TRINITY, TRINITY, 2070)	2070	PROJECT SPONSOR(S): HICKORY CREEK SUD	RECOMMENDED WMS PROJECT	1695	No			Not implemented	Too soon	Not applicable	0	$ -	$ 1,607,000.00		Yes	463	$ 4,821,000.00	2070	Market		No	No	No	
D	DRILL NEW WELLS (HICKORY CREEK SUD, WOODBINE, SABINE, 2070)	2070	PROJECT SPONSOR(S): HICKORY CREEK SUD	RECOMMENDED WMS PROJECT	1693	No			Not implemented	Too soon	Not applicable	0	$ -	$ 1,705,000.00		Yes	1138	$ 6,820,000.00	2070	Market		No	No	No	
D	INCREASE EXISTING CONTRACT (HIDEAWAY, QUEEN, SABINE)	2070	PROJECT SPONSOR(S): HIDEAWAY	RECOMMENDED WMS PROJECT	1647	Yes	2016	2016	Currently operating		Not applicable	0	$ -	$ -	2016	No			2070			No	No	No	Hideaway Lake is a retail customer of Crystal Systems
D	RENEW EXISTING CONTRACT (HOOKS)	2020	PROJECT SPONSOR(S): HOOKS	RECOMMENDED WMS PROJECT	1189	Yes	2019	2020	Sponsor has taken official action to initiate project			See RWRD Regional Master Plan Study (2018)	$ -		2021	No			See RWRD Regional Master Plan & Assoc. documents.			Yes	No	No	Project related to Riverbend WRD WMS. Currently, RWRD has submitted an application for funding through the Drinking Water State Revolving Fund.
D	DRILL NEW WELLS (BOWIE IRRIGATION, CARRIZO-WILCOX, SULPHUR)	2020	PROJECT SPONSOR(S): IRRIGATION (BOWIE)	RECOMMENDED WMS PROJECT	1197									$ 2,021,000.00		No			2020			Yes	No	No	
D	DRILL NEW WELLS (BOWIE IRRIGATION, NACATOCH, RED)	2020	PROJECT SPONSOR(S): IRRIGATION (BOWIE)	RECOMMENDED WMS PROJECT	1200									$ 1,466,000.00		No			2020			No	No	No	
D	DRILL NEW WELLS (IRRIGATION HARRISON, CARRIZO-WILCOX, CYPRESS)	2020	PROJECT SPONSOR(S): IRRIGATION (HARRISON)	RECOMMENDED WMS PROJECT	1596	No			Not implemented	Too soon	Not applicable	0	$ -	$ 1,092,000.00		No			2070			No	No	No	
D	DRILL NEW WELLS (IRRIGATION HARRISON, CARRIZO-WILCOX, SABINE)	2020	PROJECT SPONSOR(S): IRRIGATION (HARRISON)	RECOMMENDED WMS PROJECT	1597	No			Not implemented	Too soon	Not applicable	0	$ -	$ 377,000.00		No			2070			No	No	No	
D	DRILL NEW WELLS (IRRIGATION HOPKINS, CARRIZO-WILCOX, CYPRESS)	2020	PROJECT SPONSOR(S): IRRIGATION (HOPKINS)	RECOMMENDED WMS PROJECT	1609									$ 33,000.00		No			2070			Yes	No	No	
D	DRILL NEW WELLS (IRRIGATION HOPKINS, CARRIZO-WILCOX, SABINE)	2020	PROJECT SPONSOR(S): IRRIGATION (HOPKINS)	RECOMMENDED WMS PROJECT	1610									$ 681,000.00		No			2070			Yes	No	No	
D	SULPHUR SPRINGS RAW WATER PIPELINE (IRRIGATION HOPKINS, SULPHUR)	2020	PROJECT SPONSOR(S): IRRIGATION (HOPKINS)	RECOMMENDED WMS PROJECT	1612									$ 4,758,000.00		No			2070			No	No	No	
D	DRILL NEW WELLS (IRRIGATION HUNT, NACATOCH, SABINE)	2020	PROJECT SPONSOR(S): IRRIGATION (HUNT)	RECOMMENDED WMS PROJECT	1630									$ 282,000.00		No			2020			Yes	No	No	
D	PAT MAYSE RAW WATER PIPELINE (IRRIGATION LAMAR, RED)	2020	PROJECT SPONSOR(S): IRRIGATION (LAMAR)	RECOMMENDED WMS PROJECT	1636									$ 3,717,000.00		No			2020			Yes	No	No	
D	DRILL NEW WELLS (IRRIGATION VAN ZANDT, QUEEN, NECHES)	2020	PROJECT SPONSOR(S): IRRIGATION (VAN ZANDT)	RECOMMENDED WMS PROJECT	1664									$ 227,000.00		No			2070			Yes	No	No	
D	DRILL NEW WELLS (LINDALE, QUEEN, SABINE, 2020)	2020	PROJECT SPONSOR(S): LINDALE	RECOMMENDED WMS PROJECT	1648	Yes	2018	2018	Currently operating		Not applicable	429	$ 1,337,300.00	$ 3,470,000.00	2018	Yes	2898	$ 10,977,000.00	2070	Commercial/Bank loan		No	No	No	
D	DRILL NEW WELLS (LINDALE, QUEEN, SABINE, 2030)	2030	PROJECT SPONSOR(S): LINDALE	RECOMMENDED WMS PROJECT	2265	No			Not implemented	Too soon	Not applicable	0	$ -	$ 1,278,000.00		Yes	2898	$ 10,977,000.00	2070			Yes	No	No	
D	DRILL NEW WELLS (LINDALE, QUEEN, SABINE, 2040)	2040	PROJECT SPONSOR(S): LINDALE	RECOMMENDED WMS PROJECT	2266	No			Not implemented	Too soon	Not applicable	0	$ -	$ 1,278,000.00		Yes	2898	$ 10,977,000.00	2070			Yes	No	No	
D	DRILL NEW WELLS (LINDALE, QUEEN, SABINE, 2050)	2050	PROJECT SPONSOR(S): LINDALE	RECOMMENDED WMS PROJECT	2267	No			Not implemented	Too soon	Not applicable	0	$ -	$ 1,278,000.00		Yes	2898	$ 10,977,000.00	2070			Yes	No	No	
D	DRILL NEW WELLS (LINDALE, QUEEN, SABINE, 2060)	2060	PROJECT SPONSOR(S): LINDALE	RECOMMENDED WMS PROJECT	2268	No			Not implemented	Too soon	Not applicable	0	$ -	$ 2,395,000.00		Yes	2898	$ 10,977,000.00	2070			Yes	No	No	
D	DRILL NEW WELLS (LINDALE, QUEEN, SABINE, 2070)	2070	PROJECT SPONSOR(S): LINDALE	RECOMMENDED WMS PROJECT	2270	No			Not implemented	Too soon	Not applicable	0	$ -	$ 1,278,000.00		Yes	2898	$ 10,977,000.00	2070			Yes	No	No	
D	INCREASE EXISTING CONTRACT (LONE OAK)	2070	PROJECT SPONSOR(S): LONE OAK	RECOMMENDED WMS PROJECT	1997									$ -		No			2070			No	No	No	
D	RENEW EXISTING CONTRACT (MACEDONIA)	2020	PROJECT SPONSOR(S): MACEDONIA-EYLAU MUD #1	RECOMMENDED WMS PROJECT	1190	Yes	2020	2020	Sponsor has taken official action to initiate project			See RWRD Regional Master Plan Study (2018)	$ -		2021	No			See RWRD Regional Master Plan & Assoc. documents.			Yes	No	No	Project related to Riverbend WRD WMS. Currently, RWRD has submitted an application for funding through the Drinking Water State Revolving Fund.
D	ADVANCED WATER CONSERVATION (MANUFACTURING CASS)	2020	PROJECT SPONSOR(S): MANUFACTURING (CASS)	RECOMMENDED WMS PROJECT	1593				Not implemented	Too soon	Not applicable	0	$ -	$ -		No			2070			No	No	No	
D	DRILL NEW WELLS (MANUFACTURING CASS, CARRIZO-WILCOX , CYPRESS)	2020	PROJECT SPONSOR(S): MANUFACTURING (CASS)	RECOMMENDED WMS PROJECT	1592				Not implemented	Too soon	Not applicable	0	$ -	$ 894,000.00		No			2070			No	No	No	
D	INCREASE EXISTING CONTRACT (MANUFACTURING CASS, SULPHUR)	2060	PROJECT SPONSOR(S): MANUFACTURING (CASS)	RECOMMENDED WMS PROJECT	1591				Not implemented	Too soon	Not applicable	0	$ -	$ -		No			2070			No	No	No	
D	ADVANCED WATER CONSERVATION (MANUFACTURING HARRISON, SABINE)	2020	PROJECT SPONSOR(S): MANUFACTURING (HARRISON)	RECOMMENDED WMS PROJECT	1598				Not implemented	Too soon	Not applicable	0	$ -	$ -		No			2070			No	No	No	
D	TOLEDO BEND INTAKE AND RAW WATER PIPELINE (MANUFACTURING HARRISON, SABINE)	2020	PROJECT SPONSOR(S): MANUFACTURING (HARRISON)	RECOMMENDED WMS PROJECT	1599				Not implemented	Too soon	Not applicable	0	$ -	$ 498,773,000.00		No			2060			No	No	No	
D	ADVANCED WATER CONSERVATION (MANUFACTURING LAMAR, RED)	2020	PROJECT SPONSOR(S): MANUFACTURING (LAMAR)	RECOMMENDED WMS PROJECT	1637									$ -		No			2070			No	No	No	
D	DRILL NEW WELLS (MANUFACTURING LAMAR, BLOSSOM, RED)	2070	PROJECT SPONSOR(S): MANUFACTURING (LAMAR)	RECOMMENDED WMS PROJECT	1638									$ 76,000.00		No			2070			No	No	No	
D	ADVANCED WATER CONSERVATION (MANUFACTURING MORRIS, CYPRESS)	2020	PROJECT SPONSOR(S): MANUFACTURING (MORRIS)	RECOMMENDED WMS PROJECT	1641				Not implemented	Too soon	Not applicable	0	$ -	$ -		No			2070			No	No	No	
D	DRILL NEW WELLS (MANUFACTURING RED RIVER, TRINITY, SULPHUR)	2040	PROJECT SPONSOR(S): MANUFACTURING (RED RIVER)	RECOMMENDED WMS PROJECT	1645									$ 136,000.00		No			2070			No	No	No	
D	ADVANCED WATER CONSERVATION (MANUFACTURING TITUS, CYPRESS)	2020	PROJECT SPONSOR(S): MANUFACTURING (TITUS)	RECOMMENDED WMS PROJECT	1652									$ -		No			2070			Yes	No	No	
D	DRILL NEW WELLS (MANUFACTURING TITUS, QUEEN, CYPRESS)	2020	PROJECT SPONSOR(S): MANUFACTURING (TITUS)	RECOMMENDED WMS PROJECT	1653									$ 113,000.00		No			2070			No	No	No	
D	INCREASE EXISTING CONTRACT (MANUFACTURING TITUS, CYPRESS)	2020	PROJECT SPONSOR(S): MANUFACTURING (TITUS)	RECOMMENDED WMS PROJECT	1654									$ -		No			2070			Yes	No	No	
D	DRILL NEW WELLS (MANUFACTURING UPSHUR, QUEEN, CYPRESS, 2020)	2020	PROJECT SPONSOR(S): MANUFACTURING (UPSHUR)	RECOMMENDED WMS PROJECT	1661				Not implemented	Too soon	Not applicable	0	$ -	$ 2,151,000.00		Yes	430	$ 2,854,000.00	2060			No	No	No	
D	DRILL NEW WELLS (MANUFACTURING UPSHUR, QUEEN, CYPRESS, 2060)	2060	PROJECT SPONSOR(S): MANUFACTURING (UPSHUR)	RECOMMENDED WMS PROJECT	2030				Not implemented	Too soon	Not applicable	0	$ -	$ 703,000.00		Yes	430	$ 2,854,000.00	2060			No	No	No	
D	DRILL NEW WELLS (MANUFACTURING VAN ZANDT, CARRIZO-WILCOX, NECHES, 2020)	2020	PROJECT SPONSOR(S): MANUFACTURING (VAN ZANDT)	RECOMMENDED WMS PROJECT	1665									$ 489,000.00		Yes	285	$ 734,000.00	2050			Yes	No	No	
D	DRILL NEW WELLS (MANUFACTURING VAN ZANDT, CARRIZO-WILCOX, NECHES, 2050)	2050	PROJECT SPONSOR(S): MANUFACTURING (VAN ZANDT)	RECOMMENDED WMS PROJECT	2032									$ 245,000.00		Yes	285	$ 734,000.00	2050			Yes	No	No	
D	INCREASE EXISTING CONTRACT (MARSHALL, CYPRESS)	2060	PROJECT SPONSOR(S): MARSHALL	RECOMMENDED WMS PROJECT	1600	No			Not implemented	Too soon	Not applicable			$ 4,738,000.00		No			2070			No	No	No	
D	DRILL NEW WELLS (MARTIN SPRINGS WSC, CARRIZO-WILCOX, SABINE, 2060)	2060	PROJECT SPONSOR(S): MARTIN SPRINGS WSC	RECOMMENDED WMS PROJECT	1613									$ 922,000.00		Yes	101	$ 1,844,000.00	2070			No	No	No	
D	DRILL NEW WELLS (MARTIN SPRINGS WSC, CARRIZO-WILCOX, SABINE, 2070)	2070	PROJECT SPONSOR(S): MARTIN SPRINGS WSC	RECOMMENDED WMS PROJECT	1686									$ 922,000.00		Yes	101	$ 1,844,000.00	2070			No	No	No	

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Planning Region	WMS or WMS Project Name	Database Online Decade	Related Sponsor Entity and/or Benefitting WUGs	Implementation Survey Record Type	Database ID	Has Sponsor taken affirmative vote or actions?* (TWC 16.053(h)(10))	If yes, in what year did this occur?	If yes, by what date is the action on schedule for implementation?	At what level of implementation is the project currently?*	If not implemented, why?* (When "If other, please describe" is selected, please add the descriptive text to that field)	What impediments presented to implementation? * (When "If other, please describe" is selected, please add the descriptive text to that field)	Current water supply project yield (ac-ft/yr)	Funds expended to date ($)	Project Cost ($)	Year the project is online?*	Is this a phased project?*	(Phased) Ultimate volume (ac-ft/yr)	(Phased) Ultimate project cost ($)	Year project reaches maximum capacity?*	What is the project funding source(s)?*	Funding Mechanism if Other?	Included in 2021 plan?*	Does the project or WMS involve reallocation of flood control?*	Does the project or WMS provide any measurable flood risk reduction?*	Optional Comments
D	RENEW EXISTING CONTRACT (MAUD)	2020	PROJECT SPONSOR(S): MAUD	RECOMMENDED WMS PROJECT	1191	Yes	2019	2020	Sponsor has taken official action to initiate project			See RWRD Regional Master Plan Study (2018)	$ -		2021	No			See RWRD Regional Master Plan & Assoc. documents.			Yes	No	No	Project related to Riverbend WRD WMS. Currently, RWRD has submitted an application for funding through the Drinking Water State Revolving Fund.
D	DRILL NEW WELLS (MINING GREGG, CARRIZO-WILCOX, CYPRESS)	2020	PROJECT SPONSOR(S): MINING (GREGG)	RECOMMENDED WMS PROJECT	1594				Not implemented	Too soon	Not applicable	0	$ -	$ 377,000.00		No			2070			Yes	No	No	
D	DRILL NEW WELLS (MINING GREGG, CARRIZO-WILCOX, SABINE, 2020)	2020	PROJECT SPONSOR(S): MINING (GREGG)	RECOMMENDED WMS PROJECT	1595				Not implemented	Too soon	Not applicable	0	$ -	$ 1,045,000.00		Yes	339	$ 1,569,000.00	2030			Yes	No	No	
D	DRILL NEW WELLS (MINING GREGG, CARRIZO-WILCOX, SABINE, 2030)	2030	PROJECT SPONSOR(S): MINING (GREGG)	RECOMMENDED WMS PROJECT	1990				Not implemented	Too soon	Not applicable	0	$ -	$ 524,000.00		Yes	339	$ 1,569,000.00	2030			Yes	No	No	
D	DRILL NEW WELLS (MINING HARRISON, CARRIZO-WILCOX, CYPRESS, 2020)	2020	PROJECT SPONSOR(S): MINING (HARRISON)	RECOMMENDED WMS PROJECT	1602				Not implemented	Too soon	Not applicable	0	$ -	$ 526,000.00		Yes	324	$ 1,578,000.00	2040			No	No	No	
D	DRILL NEW WELLS (MINING HARRISON, CARRIZO-WILCOX, SABINE)	2020	PROJECT SPONSOR(S): MINING (HARRISON)	RECOMMENDED WMS PROJECT	1603				Not implemented	Too soon	Not applicable	0	$ -	$ 5,994,000.00		No			2070			No	No	No	
D	DRILL NEW WELLS (MINING HARRISON, CARRIZO-WILCOX, CYPRESS, 2030)	2030	PROJECT SPONSOR(S): MINING (HARRISON)	RECOMMENDED WMS PROJECT	1991				Not implemented	Too soon	Not applicable	0	$ -	$ 526,000.00		Yes	324	$ 1,578,000.00	2040			No	No	No	
D	DRILL NEW WELLS (MINING HARRISON, CARRIZO-WILCOX, CYPRESS, 2040)	2040	PROJECT SPONSOR(S): MINING (HARRISON)	RECOMMENDED WMS PROJECT	1992				Not implemented	Too soon	Not applicable	0	$ -	$ 526,000.00		Yes	324	$ 1,578,000.00	2040			No	No	No	
D	DRILL NEW WELLS (MINING HUNT, NACATOCH , SABINE)	2020	PROJECT SPONSOR(S): MINING (HUNT)	RECOMMENDED WMS PROJECT	1998									$ 254,000.00		No			2050			No	No	No	
D	DRILL NEW WELLS (MINING MARION, QUEEN CITY, CYPRESS, 2020)	2020	PROJECT SPONSOR(S): MINING (MARION)	RECOMMENDED WMS PROJECT	1640				Not implemented	Too soon	Not applicable	0	$ -	$ 1,043,000.00		Yes	648	$ 1,569,000.00	2030			Yes	No	No	
D	DRILL NEW WELLS (MINING MARION, QUEEN CITY, CYPRESS, 2030)	2030	PROJECT SPONSOR(S): MINING (MARION)	RECOMMENDED WMS PROJECT	2256				Not implemented	Too soon	Not applicable	0	$ -	$ 526,000.00		Yes	648	$ 1,569,000.00	2030			Yes	No	No	
D	DRILL NEW WELLS (MINING SMITH, QUEEN, SABINE)	2060	PROJECT SPONSOR(S): MINING (SMITH)	RECOMMENDED WMS PROJECT	1649				Not implemented	Too soon	Not applicable	0	$ -	$ 607,000.00		No			2070			No	No	No	
D	DRILL NEW WELLS (MINING UPSHUR, QUEEN , CYPRESS/SABINE, 2020)	2020	PROJECT SPONSOR(S): MINING (UPSHUR)	RECOMMENDED WMS PROJECT	1662				Not implemented	Too soon	Not applicable	0	$ -	$ 2,785,000.00		Yes	860	$ 5,570,000.00	2030			No	No	No	
D	DRILL NEW WELLS (MINING UPSHUR, QUEEN , CYPRESS/SABINE, 2030)	2030	PROJECT SPONSOR(S): MINING (UPSHUR)	RECOMMENDED WMS PROJECT	2031				Not implemented	Too soon	Not applicable	0	$ -	$ 2,785,000.00		Yes	860	$ 5,570,000.00	2030			No	No	No	
D	RENEW EXISTING CONTRACT (NASH)	2020	PROJECT SPONSOR(S): NASH	RECOMMENDED WMS PROJECT	1192	Yes	2019	2020	Sponsor has taken official action to initiate project			See RWRD Regional Master Plan Study (2018)	$ -		2021	No			See RWRD Regional Master Plan & Assoc. documents.			Yes	No	No	Project related to Riverbend WRD WMS. Currently, RWRD has submitted an application for funding through the Drinking Water State Revolving Fund.
D	RENEW EXISTING CONTRACT (NEW BOSTON)	2020	PROJECT SPONSOR(S): NEW BOSTON	RECOMMENDED WMS PROJECT	1193	Yes	2019	2020	Sponsor has taken official action to initiate project			See RWRD Regional Master Plan Study (2018)	$ -		2021	No			See RWRD Regional Master Plan & Assoc. documents.			Yes	No	No	Project related to Riverbend WRD WMS. Currently, RWRD has submitted an application for funding through the Drinking Water State Revolving Fund.
D	INCREASE EXISTING CONTRACT (NORTH HUNT SUD, SULPHUR)	2030	PROJECT SPONSOR(S): NORTH HUNT SUD	RECOMMENDED WMS PROJECT	1631	No			Not implemented	Lacks treatment capability for surface water strategy, implementing groundwater strategies as more cost effective.	Not applicable			$ -								No	No	No	
D	DELTA COUNTY PIPELINE (NORTH HUNT SUD, SULPHUR)	2060	PROJECT SPONSOR(S): NORTH HUNT SUD	RECOMMENDED WMS PROJECT	1632	No			Not implemented	Lacks treatment capability for surface water strategy, implementing groundwater strategies as more cost effective.	Not applicable			$ -								No	No	No	
D	RENEW EXISTING CONTRACT (REDWATER)	2020	PROJECT SPONSOR(S): REDWATER	RECOMMENDED WMS PROJECT	1194	Yes	2019	2020	Sponsor has taken official action to initiate project			See RWRD Regional Master Plan Study (2018)	$ -		2021	No			See RWRD Regional Master Plan & Assoc. documents.			Yes	No	No	Project related to Riverbend WRD WMS. Currently, RWRD has submitted an application for funding through the Drinking Water State Revolving Fund.
D	DRILL NEW WELLS (R-P-M WSC, CARRIZO-WILCOX, NECHES, 2020)	2020	PROJECT SPONSOR(S): R-P-M WSC	RECOMMENDED WMS PROJECT	1666									$ 959,000.00		Yes	285	$ 3,836,000.00	2060			Yes	No	No	
D	DRILL NEW WELLS (R-P-M WSC, CARRIZO-WILCOX, NECHES, 2030)	2030	PROJECT SPONSOR(S): R-P-M WSC	RECOMMENDED WMS PROJECT	2033									$ 959,000.00		Yes	285	$ 3,836,000.00	2060			Yes	No	No	
D	DRILL NEW WELLS (R-P-M WSC, CARRIZO-WILCOX, NECHES, 2050)	2050	PROJECT SPONSOR(S): R-P-M WSC	RECOMMENDED WMS PROJECT	2034									$ 959,000.00		Yes	285	$ 3,836,000.00	2060			Yes	No	No	
D	DRILL NEW WELLS (R-P-M WSC, CARRIZO-WILCOX, NECHES, 2060)	2060	PROJECT SPONSOR(S): R-P-M WSC	RECOMMENDED WMS PROJECT	2035									$ 959,000.00		Yes	285	$ 3,836,000.00	2060			Yes	No	No	
D	ADVANCED WATER CONSERVATION (STEAM ELECTRIC POWER HUNT, SABINE)	2020	PROJECT SPONSOR(S): STEAM ELECTRIC POWER (HUNT)	RECOMMENDED WMS PROJECT	1633									$ -		No			2070			No	No	No	
D	INCREASE EXISTING CONTRACT (STEAM ELECTRIC LAMAR, RED)	2030	PROJECT SPONSOR(S): STEAM ELECTRIC POWER (LAMAR)	RECOMMENDED WMS PROJECT	1639									$ -		No			2070			No	No	No	
D	INCREASE EXISTING CONTRACT (STEAM ELECTRIC POWER TITUS, CYPRESS, TITUS COUNTY FWD)	2020	PROJECT SPONSOR(S): STEAM ELECTRIC POWER (TITUS)	RECOMMENDED WMS PROJECT	1655									$ -		No			2070			No	No	No	
D	INCREASE EXISTING CONTRACT (STEAM ELECTRIC POWER TITUS, CYPRESS, NETMWD, BOB SANDLIN)	2030	PROJECT SPONSOR(S): STEAM ELECTRIC POWER (TITUS)	RECOMMENDED WMS PROJECT	1656									$ -		No			2070			Yes	No	No	
D	INCREASE EXISTING CONTRACT (STEAM ELECTRIC POWER TITUS, CYPRESS, NETMWD, LOTP)	2040	PROJECT SPONSOR(S): STEAM ELECTRIC POWER (TITUS)	RECOMMENDED WMS PROJECT	1657									$ -		No			2070			Yes	No	No	
D	INCREASE EXISTING CONTRACT (STEAM ELECTRIC POWER TITUS, CYPRESS, NETMWD REALLOCATE HARRISON)	2070	PROJECT SPONSOR(S): STEAM ELECTRIC POWER (TITUS)	RECOMMENDED WMS PROJECT	1658									$ -		No			2070			Yes	No	No	
D	INCREASE EXISTING CONTRACT (STEAM ELECTRIC POWER TITUS, CYPRESS, NETMWD REALLOCATE MARION)	2070	PROJECT SPONSOR(S): STEAM ELECTRIC POWER (TITUS)	RECOMMENDED WMS PROJECT	1659									$ -		No			2070			Yes	No	No	
D	RENEW EXISTING CONTRACT (TEXAMERICAS CENTER)	2020	PROJECT SPONSOR(S): TEXAMERICAS CENTER	RECOMMENDED WMS PROJECT	1195	Yes	2019	2020	Sponsor has taken official action to initiate project			See RWRD Regional Master Plan Study (2018)	$ -		2021	No			See RWRD Regional Master Plan & Assoc. documents.			Yes	No	No	Project related to Riverbend WRD WMS. Currently, RWRD has submitted an application for funding through the Drinking Water State Revolving Fund.
D	RIVERBEND STRATEGY (TEXARKANA)	2020	PROJECT SPONSOR(S): TEXARKANA	RECOMMENDED WMS PROJECT	1169	Yes	2019	2020	Sponsor has taken official action to initiate project	RWRD has secured funding through the Drinking Water State Revolving Fund.	Access to funding	See RWRD Regional Master Plan Study (2018)	$ -	$ 200,000,000.00	2022	Yes	See RWRD Regional Master Plan & Assoc. documents.	See RWRD Regional Master Plan & Assoc. documents.	2070	TWDB - Other	TWDB-DWSRF	Yes	No	No	For detailed information see Riverbend WRD Regional Water Master Plan.
D	DREDGE WRIGHT PATMAN (TEXARKANA)	2050	PROJECT SPONSOR(S): TEXARKANA	RECOMMENDED WMS PROJECT	1168	No			Not implemented	Too soon												No	No	No	
D	RENEW AND INCREASE EXISTING CONTRACT (TRI SUD, CYPRESS)	2020	PROJECT SPONSOR(S): TRI SUD	RECOMMENDED WMS PROJECT	1642	Yes	2018	2018	All phases fully implemented					$ -	2018	No						No	No	No	
D	RENEW EXISTING CONTRACT (WAKE VILLAGE)	2020	PROJECT SPONSOR(S): WAKE VILLAGE	RECOMMENDED WMS PROJECT	1196	Yes	2019	2020	Sponsor has taken official action to initiate project			See RWRD Regional Master Plan Study (2018)	$ -		2021	No			See RWRD Regional Master Plan & Assoc. documents.			Yes	No	No	Project related to Riverbend WRD WMS. Currently, RWRD has submitted an application for funding through the Drinking Water State Revolving Fund.
D	DRILL NEW WELLS (WASKOM, CARRIZO-WILCOX, CYPRESS, 2020)	2020	PROJECT SPONSOR(S): WASKOM	RECOMMENDED WMS PROJECT	1605	No			Not implemented	Too soon	Access to funding	46	$ -	$ 445,000.00		Yes	184	$ 1,780,000.00	2070	Commercial/Bank loan		Yes	No	No	
D	DRILL NEW WELLS (WASKOM, CARRIZO-WILCOX, CYPRESS, 2050)	2050	PROJECT SPONSOR(S): WASKOM	RECOMMENDED WMS PROJECT	1993	No			Not implemented	Too soon	Access to funding		$ -	$ 445,000.00		Yes	184	$ 1,780,000.00	2070			Yes	No	No	
D	DRILL NEW WELLS (WASKOM, CARRIZO-WILCOX, CYPRESS, 2060)	2060	PROJECT SPONSOR(S): WASKOM	RECOMMENDED WMS PROJECT	1994	No			Not implemented	Too soon	Access to funding		$ -	$ 445,000.00		Yes	184	$ 1,780,000.00	2070			Yes	No	No	
D	DRILL NEW WELLS (WASKOM, CARRIZO-WILCOX, CYPRESS, 2070)	2070	PROJECT SPONSOR(S): WASKOM	RECOMMENDED WMS PROJECT	1995	No			Not implemented	Too soon	Access to funding		$ -	$ 445,000.00		Yes	184	$ 1,780,000.00	2070			Yes	No	No	
D	DRILL NEW WELLS (WINONA, QUEEN, SABINE)	2050	PROJECT SPONSOR(S): WINONA	RECOMMENDED WMS PROJECT	1651									$ 695,000.00		No			2070			No	No	No	
D	DRILL NEW WELLS (WOLFE CITY, WOODBINE, SULPHUR, 2050)	2050	PROJECT SPONSOR(S): WOLFE CITY	RECOMMENDED WMS PROJECT	1634									$ 1,155,000.00		Yes	192	$ 4,376,000.00	2070			No	No	No	
D	DRILL NEW WELLS (WOLFE CITY, WOODBINE, SULPHUR, 2060)	2060	PROJECT SPONSOR(S): WOLFE CITY	RECOMMENDED WMS PROJECT	1698									$ 2,066,000.00		Yes	192	$ 4,376,000.00	2070			No	No	No	
D	DRILL NEW WELLS (WOLFE CITY, TRINITY, TRINITY, 2070)	2070	PROJECT SPONSOR(S): WOLFE CITY	RECOMMENDED WMS PROJECT	1699									$ 1,155,000.00		Yes	81	$ 4,376,000.00	2070			No	No	No	
D	INCREASE EXISTING CONTRACT (STEAM ELECTRIC LAMAR, WUG REALLOCATION)	2070	WMS SELLER: PARIS; WMS SUPPLY RECIPIENT: STEAM ELECTRIC POWER, LAMAR	RECOMMENDED WMS SUPPLY WITHOUT WMS PROJECT	10656									#N/A		No			2070			No	No	No	
D	VOLUNTARY REALLOCATION OF HUNT MANUFACTURING SURPLUS (GREENVILLE, TAWAKONI)	2020	WMS SUPPLY RECIPIENT: GREENVILLE	RECOMMENDED WMS SUPPLY WITHOUT WMS PROJECT	10087									#N/A		No			2070			No	No	No	
D	CONSERVATION - CADDO BASIN SUD	2020	WUG REDUCING DEMAND: CADDO BASIN SUD	RECOMMENDED DEMAND REDUCTION STRATEGY WITHOUT WMS PROJECT	4041									#N/A		No			2070			Yes	No	No	
D	CONSERVATION - CASH SUD	2030	WUG REDUCING DEMAND: CASH SUD	RECOMMENDED DEMAND REDUCTION STRATEGY WITHOUT WMS PROJECT	4057	Yes	2016	2016	Currently operating				$ -	#N/A		No			2070			Yes	No	No	Water My Yard infrastructure for monitoring conservation and irrigation program
D	CRYS ENHANCED PUBLIC AND SCHOOL EDUCATION	2020	WUG REDUCING DEMAND: CRYSTAL SYSTEMS INC	RECOMMENDED DEMAND REDUCTION STRATEGY WITHOUT WMS PROJECT	11291	No			Not implemented	Too soon			$ -	#N/A		No		$ -	2070			No	No	No	
D	CRYS WATER CONSERVATION PRICING	2020	WUG REDUCING DEMAND: CRYSTAL SYSTEMS INC	RECOMMENDED DEMAND REDUCTION STRATEGY WITHOUT WMS PROJECT	11297	No			Not implemented	Too soon			$ -	#N/A		No		$ -	2070			No	No	No	
D	CONSERVATION - HICKORY CREEK SUD	2020	WUG REDUCING DEMAND: HICKORY CREEK SUD	RECOMMENDED DEMAND REDUCTION STRATEGY WITHOUT WMS PROJECT	4469	No			Not implemented	If other, please describe.	Not applicable		$ -	#N/A		No			2070			No	No	No	WUG intends to develop groundwater supplies.
D	LIND ENHANCED PUBLIC AND SCHOOL EDUCATION	2020	WUG REDUCING DEMAND: LINDALE	RECOMMENDED DEMAND REDUCTION STRATEGY WITHOUT WMS PROJECT	11303	No			Not implemented	Too soon			$ -	#N/A		No		$ -	2070			No	No	No	

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Planning Region	WMS or WMS Project Name	Database Online Decade	Related Sponsor Entity and/or Benefitting WUGs	Implementation Survey Record Type	Database ID	Has Sponsor taken affirmative vote or actions?* (TWC 16.053(h)(10))	If yes, in what year did this occur?	If yes, by what date is the action on schedule for implementation?	At what level of implementation is the project currently?*	If not implemented, why?* (When "If other, please describe" is selected, please add the descriptive text to that field)	What impediments presented to implementation? * (When "If other, please describe" is selected, please add the descriptive text to that field)	Current water supply project yield (ac-ft/yr)	Funds expended to date ($)	Project Cost ($)	Year the project is online?*	Is this a phased project?*	(Phased) Ultimate volume (ac-ft/yr)	(Phased) Ultimate project cost ($)	Year project reaches maximum capacity?*	What is the project funding source(s)?*	Funding Mechanism if Other?	Included in 2021 plan?*	Does the project or WMS involve reallocation of flood control?*	Does the project or WMS provide any measurable flood risk reduction?*	Optional Comments
D	LIND WATER CONSERVATION PRICING	2020	WUG REDUCING DEMAND: LINDALE	RECOMMENDED DEMAND REDUCTION STRATEGY WITHOUT WMS PROJECT	11309	No			Not implemented	Too soon			$ -	#N/A		No		$ -	2070			No	No	No	
D	CONSERVATION - MACBEE SUD	2060	WUG REDUCING DEMAND: MACBEE SUD	RECOMMENDED DEMAND REDUCTION STRATEGY WITHOUT WMS PROJECT	5563	Yes	2018	2018	Currently operating				$ -	#N/A		No						No	No	No	
D	CONSERVATION - NORTH HUNT SUD	2050	WUG REDUCING DEMAND: NORTH HUNT SUD	RECOMMENDED DEMAND REDUCTION STRATEGY WITHOUT WMS PROJECT	5729									#N/A		No						No	No	No	
D	RPMW-ENHANCED PUBLIC AND SCHOOL EDUCATION	2020	WUG REDUCING DEMAND: R-P-M WSC	RECOMMENDED DEMAND REDUCTION STRATEGY WITHOUT WMS PROJECT	19853									#N/A		No						No	No	No	
D	ADVANCED WATER CONSERVATION (TEXARKANA)	2020	WUG REDUCING DEMAND: TEXARKANA	RECOMMENDED DEMAND REDUCTION STRATEGY WITHOUT WMS PROJECT	6508	Yes	Annual	2019	Currently operating		Not applicable		$ -	#N/A		Yes						No	No	No	

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Region D Water User Group (WUG) Data Comparison to 2016 Regional Water Plan (RWP)

	2020 PLANNING DECADE			2070 PLANNING DECADE		
	2016 RWP	2021 RWP	DIFFERENCE (%)	2016 RWP	2021 RWP	DIFFERENCE (%)
BOWIE COUNTY | COUNTY-OTHER WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	3,501	3,501	0.0%	3,535	3,535	0.0%
PROJECTED DEMAND TOTAL (acre-feet per year)	2,379	1,584	-33.4%	2,304	800	-65.3%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	0	0	0.0%	0	0	0.0%
BOWIE COUNTY | IRRIGATION WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	981	7,161	630.0%	981	7,161	630.0%
PROJECTED DEMAND TOTAL (acre-feet per year)	6,221	10,373	66.7%	5,121	10,373	102.6%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	5,240	4,134	-21.1%	4,140	4,134	-0.1%
BOWIE COUNTY | LIVESTOCK WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	1,156	1,156	0.0%	720	720	0.0%
PROJECTED DEMAND TOTAL (acre-feet per year)	1,156	1,825	57.9%	720	1,136	57.8%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	0	669	100.0%	0	416	100.0%
BOWIE COUNTY | MANUFACTURING WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	35	35	0.0%	35	35	0.0%
PROJECTED DEMAND TOTAL (acre-feet per year)	1,579	1,611	2.0%	2,286	2,047	-10.5%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	1,544	1,579	2.3%	2,251	2,014	-10.5%
BOWIE COUNTY | MUNICIPAL WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	187	66	-64.7%	187	66	-64.7%
PROJECTED DEMAND TOTAL (acre-feet per year)	17,374	12,850	-26.0%	17,399	15,058	-13.5%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	17,187	12,784	-25.6%	17,216	14,992	-12.9%
CAMP COUNTY | COUNTY-OTHER WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	432	432	0.0%	478	478	0.0%
PROJECTED DEMAND TOTAL (acre-feet per year)	136	173	27.2%	48	120	150.0%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	0	0	0.0%	0	0	0.0%
CAMP COUNTY | LIVESTOCK WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	952	952	0.0%	952	952	0.0%
PROJECTED DEMAND TOTAL (acre-feet per year)	952	4,914	416.2%	952	4,914	416.2%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	0	3,962	100.0%	0	3,962	100.0%
CAMP COUNTY | MANUFACTURING WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	47	102	117.0%	58	102	75.9%
PROJECTED DEMAND TOTAL (acre-feet per year)	46	35	-23.9%	58	52	-10.3%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	0	0	0.0%	0	0	0.0%
CAMP COUNTY | MINING WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	23	23	0.0%	23	23	0.0%
PROJECTED DEMAND TOTAL (acre-feet per year)	12	12	0.0%	7	7	0.0%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	0	0	0.0%	0	0	0.0%
CAMP COUNTY | MUNICIPAL WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	2,762	2,814	1.9%	2,792	2,814	0.8%
PROJECTED DEMAND TOTAL (acre-feet per year)	1,539	1,480	-3.8%	2,194	2,091	-4.7%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	0	0	0.0%	226	0	-100.0%
CASS COUNTY | COUNTY-OTHER WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	2,766	638	-76.9%	3,073	638	-79.2%
PROJECTED DEMAND TOTAL (acre-feet per year)	1,589	1,087	-31.6%	1,410	846	-40.0%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	0	449	100.0%	0	208	100.0%

*WUG supplies and projected demands are entered for each of a WUG's region-county-basin divisions. The needs shown in the WUG Data Comparison to 2016 RWP report are calculated by first deducting the WUG split's projected demand from its total existing water supply volume. If the WUG split has a greater existing supply volume than projected demand in any given decade, this amount is considered a surplus volume. Before aggregating the difference between supplies and demands to the WUG county and category level, calculated surpluses are updated to zero so that only the WUGs with needs in the decade are included with the Needs totals.

Region D Water User Group (WUG) Data Comparison to 2016 Regional Water Plan (RWP)

	2020 PLANNING DECADE			2070 PLANNING DECADE		
	2016 RWP	2021 RWP	DIFFERENCE (%)	2016 RWP	2021 RWP	DIFFERENCE (%)
CASS COUNTY | LIVESTOCK WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	839	839	0.0%	841	841	0.0%
PROJECTED DEMAND TOTAL (acre-feet per year)	715	2,657	271.6%	715	2,657	271.6%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	0	1,818	100.0%	0	1,816	100.0%
CASS COUNTY | MANUFACTURING WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	120,051	32,774	-72.7%	88,056	32,845	-62.7%
PROJECTED DEMAND TOTAL (acre-feet per year)	115,199	32,723	-71.6%	150,883	32,799	-78.3%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	115	0	-100.0%	62,827	0	-100.0%
CASS COUNTY | MINING WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	839	839	0.0%	952	952	0.0%
PROJECTED DEMAND TOTAL (acre-feet per year)	39	39	0.0%	20	20	0.0%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	0	0	0.0%	0	0	0.0%
CASS COUNTY | MUNICIPAL WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	2,974	4,250	42.9%	2,920	4,438	52.0%
PROJECTED DEMAND TOTAL (acre-feet per year)	1,882	2,415	28.3%	1,766	2,502	41.7%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	0	47	100.0%	0	38	100.0%
DELTA COUNTY | COUNTY-OTHER WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	1,148	194	-83.1%	1,022	175	-82.9%
PROJECTED DEMAND TOTAL (acre-feet per year)	207	82	-60.4%	210	73	-65.2%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	0	0	0.0%	0	0	0.0%
DELTA COUNTY | IRRIGATION WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	4,601	9,163	99.2%	4,530	9,203	103.2%
PROJECTED DEMAND TOTAL (acre-feet per year)	2,775	2,396	-13.7%	2,626	2,396	-8.8%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	0	0	0.0%	0	0	0.0%
DELTA COUNTY | LIVESTOCK WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	373	279	-25.2%	373	291	-22.0%
PROJECTED DEMAND TOTAL (acre-feet per year)	373	541	45.0%	373	541	45.0%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	0	262	100.0%	0	250	100.0%
DELTA COUNTY | MUNICIPAL WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	1,807	1,119	-38.1%	1,668	1,116	-33.1%
PROJECTED DEMAND TOTAL (acre-feet per year)	457	591	29.3%	442	580	31.2%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	0	6	100.0%	0	15	100.0%
FRANKLIN COUNTY | COUNTY-OTHER WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	197	197	0.0%	232	215	-7.3%
PROJECTED DEMAND TOTAL (acre-feet per year)	153	98	-35.9%	170	109	-35.9%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	0	0	0.0%	0	0	0.0%
FRANKLIN COUNTY | IRRIGATION WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	300	314	4.7%	300	314	4.7%
PROJECTED DEMAND TOTAL (acre-feet per year)	26	103	296.2%	26	103	296.2%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	0	0	0.0%	0	0	0.0%
FRANKLIN COUNTY | LIVESTOCK WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	1,046	1,046	0.0%	1,046	1,046	0.0%
PROJECTED DEMAND TOTAL (acre-feet per year)	1,036	2,850	175.1%	1,036	2,850	175.1%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	0	1,804	100.0%	0	1,804	100.0%

*WUG supplies and projected demands are entered for each of a WUG's region-county-basin divisions. The needs shown in the WUG Data Comparison to 2016 RWP report are calculated by first deducting the WUG split's projected demand from its total existing water supply volume. If the WUG split has a greater existing supply volume than projected demand in any given decade, this amount is considered a surplus volume. Before aggregating the difference between supplies and demands to the WUG county and category level, calculated surpluses are updated to zero so that only the WUGs with needs in the decade are included with the Needs totals.

Region D Water User Group (WUG) Data Comparison to 2016 Regional Water Plan (RWP)

	2020 PLANNING DECADE			2070 PLANNING DECADE		
	2016 RWP	2021 RWP	DIFFERENCE (%)	2016 RWP	2021 RWP	DIFFERENCE (%)
FRANKLIN COUNTY | MANUFACTURING WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	0	7	100.0%	0	7	100.0%
PROJECTED DEMAND TOTAL (acre-feet per year)	0	5	100.0%	0	7	100.0%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	0	0	0.0%	0	0	0.0%
FRANKLIN COUNTY | MINING WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	1,040	1,040	0.0%	954	954	0.0%
PROJECTED DEMAND TOTAL (acre-feet per year)	5	5	0.0%	2	2	0.0%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	0	0	0.0%	0	0	0.0%
FRANKLIN COUNTY | MUNICIPAL WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	4,981	6,871	37.9%	4,605	5,575	21.1%
PROJECTED DEMAND TOTAL (acre-feet per year)	1,298	1,333	2.7%	1,367	1,404	2.7%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	0	0	0.0%	0	0	0.0%
GREGG COUNTY | COUNTY-OTHER WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	1,288	1,320	2.5%	1,682	2,503	48.8%
PROJECTED DEMAND TOTAL (acre-feet per year)	718	595	-17.1%	1,075	900	-16.3%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	0	0	0.0%	0	0	0.0%
GREGG COUNTY | IRRIGATION WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	182	192	5.5%	182	192	5.5%
PROJECTED DEMAND TOTAL (acre-feet per year)	24	40	66.7%	24	40	66.7%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	0	0	0.0%	0	0	0.0%
GREGG COUNTY | LIVESTOCK WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	215	215	0.0%	215	215	0.0%
PROJECTED DEMAND TOTAL (acre-feet per year)	215	210	-2.3%	215	210	-2.3%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	0	0	0.0%	0	0	0.0%
GREGG COUNTY | MANUFACTURING WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	6,846	1,572	-77.0%	6,848	1,574	-77.0%
PROJECTED DEMAND TOTAL (acre-feet per year)	4,251	1,233	-71.0%	6,542	1,517	-76.8%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	0	0	0.0%	0	0	0.0%
GREGG COUNTY | MINING WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	70	263	275.7%	116	174	50.0%
PROJECTED DEMAND TOTAL (acre-feet per year)	274	274	0.0%	180	180	0.0%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	204	11	-94.6%	64	6	-90.6%
GREGG COUNTY | MUNICIPAL WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	42,961	52,959	23.3%	49,154	64,679	31.6%
PROJECTED DEMAND TOTAL (acre-feet per year)	30,079	30,191	0.4%	46,786	46,965	0.4%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	0	0	0.0%	0	11	100.0%
GREGG COUNTY | STEAM ELECTRIC POWER WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	2,242	2,242	0.0%	2,242	2,242	0.0%
PROJECTED DEMAND TOTAL (acre-feet per year)	978	940	-3.9%	2,094	940	-55.1%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	0	0	0.0%	0	0	0.0%
HARRISON COUNTY | COUNTY-OTHER WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	4,200	3,750	-10.7%	4,845	4,395	-9.3%
PROJECTED DEMAND TOTAL (acre-feet per year)	3,176	1,438	-54.7%	4,397	1,878	-57.3%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	0	0	0.0%	0	0	0.0%

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Region D Water User Group (WUG) Data Comparison to 2016 Regional Water Plan (RWP)

	2020 PLANNING DECADE			2070 PLANNING DECADE		
	2016 RWP	2021 RWP	DIFFERENCE (%)	2016 RWP	2021 RWP	DIFFERENCE (%)
HARRISON COUNTY | IRRIGATION WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	212	169	-20.3%	212	169	-20.3%
PROJECTED DEMAND TOTAL (acre-feet per year)	445	701	57.5%	445	701	57.5%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	233	532	128.3%	233	532	128.3%
HARRISON COUNTY | LIVESTOCK WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	964	964	0.0%	1,313	1,313	0.0%
PROJECTED DEMAND TOTAL (acre-feet per year)	856	636	-25.7%	1,097	815	-25.7%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	0	0	0.0%	0	0	0.0%
HARRISON COUNTY | MANUFACTURING WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	40,956	108,372	164.6%	40,956	107,894	163.4%
PROJECTED DEMAND TOTAL (acre-feet per year)	95,100	24,736	-74.0%	140,534	27,940	-80.1%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	55,006	0	-100.0%	100,394	0	-100.0%
HARRISON COUNTY | MINING WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	865	792	-8.4%	953	880	-7.7%
PROJECTED DEMAND TOTAL (acre-feet per year)	2,498	2,498	0.0%	855	855	0.0%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	1,633	1,706	4.5%	18	129	616.7%
HARRISON COUNTY | MUNICIPAL WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	15,424	22,164	43.7%	10,450	22,127	111.7%
PROJECTED DEMAND TOTAL (acre-feet per year)	7,493	9,425	25.8%	10,658	13,564	27.3%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	6	174	2800.0%	849	1,113	31.1%
HARRISON COUNTY | STEAM ELECTRIC POWER WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	24,161	26,508	9.7%	24,161	26,508	9.7%
PROJECTED DEMAND TOTAL (acre-feet per year)	19,838	21,112	6.4%	46,625	21,112	-54.7%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	0	0	0.0%	22,464	0	-100.0%
HOPKINS COUNTY | COUNTY-OTHER WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	1,705	1,342	-21.3%	1,585	1,230	-22.4%
PROJECTED DEMAND TOTAL (acre-feet per year)	824	177	-78.5%	844	123	-85.4%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	0	0	0.0%	0	0	0.0%
HOPKINS COUNTY | IRRIGATION WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	143	144	0.7%	143	144	0.7%
PROJECTED DEMAND TOTAL (acre-feet per year)	2,269	4,769	110.2%	2,269	4,769	110.2%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	2,126	4,627	117.6%	2,126	4,627	117.6%
HOPKINS COUNTY | LIVESTOCK WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	4,854	4,854	0.0%	4,856	4,856	0.0%
PROJECTED DEMAND TOTAL (acre-feet per year)	4,236	5,498	29.8%	4,236	5,498	29.8%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	0	1,068	100.0%	0	1,219	100.0%
HOPKINS COUNTY | MANUFACTURING WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	1,741	1,741	0.0%	2,275	2,275	0.0%
PROJECTED DEMAND TOTAL (acre-feet per year)	1,741	944	-45.8%	2,275	968	-57.5%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	0	0	0.0%	0	0	0.0%
HOPKINS COUNTY | MINING WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	804	804	0.0%	938	938	0.0%
PROJECTED DEMAND TOTAL (acre-feet per year)	1,031	1,031	0.0%	1,577	1,577	0.0%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	227	227	0.0%	639	639	0.0%

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	2020 PLANNING DECADE			2070 PLANNING DECADE		
	2016 RWP	2021 RWP	DIFFERENCE (%)	2016 RWP	2021 RWP	DIFFERENCE (%)
HOPKINS COUNTY | MUNICIPAL WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	21,309	8,753	-58.9%	19,611	8,719	-55.5%
PROJECTED DEMAND TOTAL (acre-feet per year)	4,670	5,389	15.4%	6,022	6,855	13.8%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	0	20	100.0%	255	254	-0.4%
HUNT COUNTY | COUNTY-OTHER WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	2,517	1,652	-34.4%	5,340	3,012	-43.6%
PROJECTED DEMAND TOTAL (acre-feet per year)	2,282	790	-65.4%	12,893	6,846	-46.9%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	0	0	0.0%	7,554	3,834	-49.2%
HUNT COUNTY | IRRIGATION WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	108	125	15.7%	108	125	15.7%
PROJECTED DEMAND TOTAL (acre-feet per year)	254	355	39.8%	254	355	39.8%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	146	230	57.5%	146	230	57.5%
HUNT COUNTY | LIVESTOCK WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	1,150	1,146	-0.3%	1,150	1,147	-0.3%
PROJECTED DEMAND TOTAL (acre-feet per year)	1,141	1,095	-4.0%	1,141	1,095	-4.0%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	0	2	100.0%	0	1	100.0%
HUNT COUNTY | MANUFACTURING WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	1,386	1,102	-20.5%	2,525	1,941	-23.1%
PROJECTED DEMAND TOTAL (acre-feet per year)	705	555	-21.3%	1,312	672	-48.8%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	0	0	0.0%	0	0	0.0%
HUNT COUNTY | MINING WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	55	55	0.0%	50	50	0.0%
PROJECTED DEMAND TOTAL (acre-feet per year)	128	128	0.0%	47	47	0.0%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	73	73	0.0%	0	0	0.0%
HUNT COUNTY | MUNICIPAL WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	14,704	13,754	-6.5%	24,455	20,894	-14.6%
PROJECTED DEMAND TOTAL (acre-feet per year)	15,288	16,768	9.7%	41,507	45,799	10.3%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	3,362	3,431	2.1%	18,892	25,190	33.3%
HUNT COUNTY | STEAM ELECTRIC POWER WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	351	373	6.3%	351	373	6.3%
PROJECTED DEMAND TOTAL (acre-feet per year)	12,436	373	-97.0%	28,564	373	-98.7%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	12,085	0	-100.0%	28,213	0	-100.0%
LAMAR COUNTY | COUNTY-OTHER WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	351	275	-21.7%	342	280	-18.1%
PROJECTED DEMAND TOTAL (acre-feet per year)	418	479	14.6%	458	524	14.4%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	67	204	204.5%	116	244	110.3%
LAMAR COUNTY | IRRIGATION WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	2,633	8,658	228.8%	2,320	8,658	273.2%
PROJECTED DEMAND TOTAL (acre-feet per year)	20,945	10,126	-51.7%	20,622	10,126	-50.9%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	18,312	1,468	-92.0%	18,302	1,468	-92.0%
LAMAR COUNTY | LIVESTOCK WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	3,258	1,624	-50.2%	3,253	1,624	-50.1%
PROJECTED DEMAND TOTAL (acre-feet per year)	2,800	1,469	-47.5%	2,800	1,469	-47.5%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	0	617	100.0%	0	617	100.0%

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	2020 PLANNING DECADE			2070 PLANNING DECADE		
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LAMAR COUNTY | MANUFACTURING WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	5,961	5,961	0.0%	7,475	7,475	0.0%
PROJECTED DEMAND TOTAL (acre-feet per year)	6,427	5,026	-21.8%	8,338	5,137	-38.4%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	565	0	-100.0%	951	0	-100.0%
LAMAR COUNTY | MUNICIPAL WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	37,835	37,631	-0.5%	36,295	36,064	-0.6%
PROJECTED DEMAND TOTAL (acre-feet per year)	5,976	5,959	-0.3%	6,208	6,195	-0.2%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	0	0	0.0%	0	0	0.0%
LAMAR COUNTY | STEAM ELECTRIC POWER WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	8,961	8,961	0.0%	8,961	8,961	0.0%
PROJECTED DEMAND TOTAL (acre-feet per year)	8,503	5,511	-35.2%	19,529	5,511	-71.8%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	0	0	0.0%	10,568	0	-100.0%
MARION COUNTY | COUNTY-OTHER WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	1,766	1,757	-0.5%	1,766	1,757	-0.5%
PROJECTED DEMAND TOTAL (acre-feet per year)	545	99	-81.8%	545	61	-88.8%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	0	0	0.0%	0	0	0.0%
MARION COUNTY | IRRIGATION WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	0	321	100.0%	0	321	100.0%
PROJECTED DEMAND TOTAL (acre-feet per year)	0	12	100.0%	0	12	100.0%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	0	0	0.0%	0	0	0.0%
MARION COUNTY | LIVESTOCK WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	411	411	0.0%	411	411	0.0%
PROJECTED DEMAND TOTAL (acre-feet per year)	411	188	-54.3%	411	188	-54.3%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	0	0	0.0%	0	0	0.0%
MARION COUNTY | MANUFACTURING WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	72	0	-100.0%	95	0	-100.0%
PROJECTED DEMAND TOTAL (acre-feet per year)	72	0	-100.0%	95	0	-100.0%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	0	0	0.0%	0	0	0.0%
MARION COUNTY | MINING WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	116	116	0.0%	128	128	0.0%
PROJECTED DEMAND TOTAL (acre-feet per year)	489	489	0.0%	393	393	0.0%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	373	373	0.0%	265	265	0.0%
MARION COUNTY | MUNICIPAL WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	1,708	2,960	73.3%	1,708	2,960	73.3%
PROJECTED DEMAND TOTAL (acre-feet per year)	423	950	124.6%	395	949	140.3%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	0	15	100.0%	0	56	100.0%
MARION COUNTY | STEAM ELECTRIC POWER WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	1,852	4,257	129.9%	3,967	6,247	57.5%
PROJECTED DEMAND TOTAL (acre-feet per year)	1,852	4,257	129.9%	3,967	4,257	7.3%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	0	0	0.0%	0	0	0.0%
MORRIS COUNTY | COUNTY-OTHER WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	540	540	0.0%	540	540	0.0%
PROJECTED DEMAND TOTAL (acre-feet per year)	445	352	-20.9%	458	371	-19.0%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	0	0	0.0%	0	0	0.0%

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MORRIS COUNTY | IRRIGATION WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	0	70	100.0%	0	70	100.0%
PROJECTED DEMAND TOTAL (acre-feet per year)	0	11	100.0%	0	11	100.0%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	0	0	0.0%	0	0	0.0%
MORRIS COUNTY | LIVESTOCK WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	626	626	0.0%	626	626	0.0%
PROJECTED DEMAND TOTAL (acre-feet per year)	618	1,605	159.7%	618	1,605	159.7%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	0	979	100.0%	0	979	100.0%
MORRIS COUNTY | MANUFACTURING WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	134,943	121,906	-9.7%	128,105	115,068	-10.2%
PROJECTED DEMAND TOTAL (acre-feet per year)	95,931	25,738	-73.2%	130,868	25,743	-80.3%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	0	0	0.0%	2,763	0	-100.0%
MORRIS COUNTY | MUNICIPAL WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	3,025	3,191	5.5%	2,995	3,197	6.7%
PROJECTED DEMAND TOTAL (acre-feet per year)	1,307	1,383	5.8%	1,356	1,426	5.2%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	164	26	-84.1%	170	20	-88.2%
MORRIS COUNTY | STEAM ELECTRIC POWER WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	820	820	0.0%	820	820	0.0%
PROJECTED DEMAND TOTAL (acre-feet per year)	43	50	16.3%	91	50	-45.1%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	0	0	0.0%	0	0	0.0%
RAINS COUNTY | COUNTY-OTHER WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	711	393	-44.7%	727	409	-43.7%
PROJECTED DEMAND TOTAL (acre-feet per year)	587	74	-87.4%	608	61	-90.0%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	0	0	0.0%	0	0	0.0%
RAINS COUNTY | IRRIGATION WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	55	211	283.6%	55	211	283.6%
PROJECTED DEMAND TOTAL (acre-feet per year)	38	65	71.1%	38	65	71.1%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	0	0	0.0%	0	0	0.0%
RAINS COUNTY | LIVESTOCK WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	506	506	0.0%	506	506	0.0%
PROJECTED DEMAND TOTAL (acre-feet per year)	506	428	-15.4%	506	428	-15.4%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	0	0	0.0%	0	0	0.0%
RAINS COUNTY | MANUFACTURING WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	5	12	140.0%	5	12	140.0%
PROJECTED DEMAND TOTAL (acre-feet per year)	3	12	300.0%	3	12	300.0%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	0	0	0.0%	0	0	0.0%
RAINS COUNTY | MUNICIPAL WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	2,022	2,656	31.4%	3,178	3,041	-4.3%
PROJECTED DEMAND TOTAL (acre-feet per year)	1,170	2,000	70.9%	1,221	2,103	72.2%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	0	1	100.0%	0	65	100.0%
RED RIVER COUNTY | COUNTY-OTHER WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	332	159	-52.1%	324	161	-50.3%
PROJECTED DEMAND TOTAL (acre-feet per year)	238	159	-33.2%	6	8	33.3%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	0	0	0.0%	0	0	0.0%

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RED RIVER COUNTY | IRRIGATION WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	780	2,523	223.5%	770	2,523	227.7%
PROJECTED DEMAND TOTAL (acre-feet per year)	5,156	3,867	-25.0%	4,895	3,867	-21.0%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	4,376	2,154	-50.8%	4,125	2,154	-47.8%
RED RIVER COUNTY | LIVESTOCK WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	1,687	1,527	-9.5%	1,687	1,527	-9.5%
PROJECTED DEMAND TOTAL (acre-feet per year)	1,484	1,532	3.2%	1,484	1,532	3.2%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	0	184	100.0%	0	184	100.0%
RED RIVER COUNTY | MANUFACTURING WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	9	8,527	94644.4%	2	8,520	425900.0%
PROJECTED DEMAND TOTAL (acre-feet per year)	9	3	-66.7%	11	3	-72.7%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	0	0	0.0%	9	0	-100.0%
RED RIVER COUNTY | MINING WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	4	4	0.0%	3	3	0.0%
PROJECTED DEMAND TOTAL (acre-feet per year)	4	4	0.0%	3	3	0.0%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	0	0	0.0%	0	0	0.0%
RED RIVER COUNTY | MUNICIPAL WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	1,905	1,730	-9.2%	1,001	1,717	71.5%
PROJECTED DEMAND TOTAL (acre-feet per year)	1,237	1,407	13.7%	1,271	1,384	8.9%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	0	237	100.0%	591	219	-62.9%
RED RIVER COUNTY | STEAM ELECTRIC POWER WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	8,510	0	-100.0%	9,290	0	-100.0%
PROJECTED DEMAND TOTAL (acre-feet per year)	489	0	-100.0%	1,048	0	-100.0%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	0	0	0.0%	0	0	0.0%
SMITH COUNTY | COUNTY-OTHER WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	2,912	567	-80.5%	4,500	1,239	-72.5%
PROJECTED DEMAND TOTAL (acre-feet per year)	1,371	544	-60.3%	2,300	1,216	-47.1%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	0	0	0.0%	0	0	0.0%
SMITH COUNTY | IRRIGATION WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	370	324	-12.4%	475	324	-31.8%
PROJECTED DEMAND TOTAL (acre-feet per year)	370	324	-12.4%	475	324	-31.8%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	0	0	0.0%	0	0	0.0%
SMITH COUNTY | LIVESTOCK WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	468	514	9.8%	468	514	9.8%
PROJECTED DEMAND TOTAL (acre-feet per year)	468	514	9.8%	468	514	9.8%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	0	0	0.0%	0	0	0.0%
SMITH COUNTY | MANUFACTURING WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	0	4	100.0%	0	5	100.0%
PROJECTED DEMAND TOTAL (acre-feet per year)	300	4	-98.7%	442	5	-98.9%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	300	0	-100.0%	442	0	-100.0%
SMITH COUNTY | MINING WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	320	448	40.0%	452	697	54.2%
PROJECTED DEMAND TOTAL (acre-feet per year)	287	287	0.0%	497	497	0.0%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	0	0	0.0%	45	0	-100.0%

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Region D Water User Group (WUG) Data Comparison to 2016 Regional Water Plan (RWP)

	2020 PLANNING DECADE			2070 PLANNING DECADE		
	2016 RWP	2021 RWP	DIFFERENCE (%)	2016 RWP	2021 RWP	DIFFERENCE (%)
SMITH COUNTY | MUNICIPAL WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	7,376	8,304	12.6%	9,508	10,274	8.1%
PROJECTED DEMAND TOTAL (acre-feet per year)	6,106	6,657	9.0%	11,947	12,448	4.2%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	146	65	-55.5%	2,802	2,526	-9.9%
SMITH COUNTY | STEAM ELECTRIC POWER WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	12	0	-100.0%	27	0	-100.0%
PROJECTED DEMAND TOTAL (acre-feet per year)	12	0	-100.0%	27	0	-100.0%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	0	0	0.0%	0	0	0.0%
TITUS COUNTY | COUNTY-OTHER WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	1,573	1,573	0.0%	1,882	992	-47.3%
PROJECTED DEMAND TOTAL (acre-feet per year)	497	474	-4.6%	829	790	-4.7%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	0	0	0.0%	0	0	0.0%
TITUS COUNTY | IRRIGATION WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	1,077	1,468	36.3%	1,077	1,468	36.3%
PROJECTED DEMAND TOTAL (acre-feet per year)	1,000	1,053	5.3%	1,000	1,053	5.3%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	0	0	0.0%	0	0	0.0%
TITUS COUNTY | LIVESTOCK WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	1,008	1,008	0.0%	942	942	0.0%
PROJECTED DEMAND TOTAL (acre-feet per year)	930	2,947	216.9%	930	2,947	216.9%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	0	1,939	100.0%	0	2,005	100.0%
TITUS COUNTY | MANUFACTURING WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	5,392	5,392	0.0%	5,816	2,461	-57.7%
PROJECTED DEMAND TOTAL (acre-feet per year)	8,995	4,063	-54.8%	11,256	4,155	-63.1%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	3,603	0	-100.0%	5,440	1,694	-68.9%
TITUS COUNTY | MINING WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	4,553	4,560	0.2%	4,659	4,666	0.2%
PROJECTED DEMAND TOTAL (acre-feet per year)	1,644	1,644	0.0%	2,392	2,392	0.0%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	0	0	0.0%	0	0	0.0%
TITUS COUNTY | MUNICIPAL WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	6,966	19,550	180.6%	7,185	18,528	157.9%
PROJECTED DEMAND TOTAL (acre-feet per year)	5,508	5,488	-0.4%	9,017	8,985	-0.4%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	1,396	0	-100.0%	2,229	0	-100.0%
TITUS COUNTY | STEAM ELECTRIC POWER WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	31,865	31,865	0.0%	29,148	28,848	-1.0%
PROJECTED DEMAND TOTAL (acre-feet per year)	52,423	61,931	18.1%	120,703	61,931	-48.7%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	20,558	30,066	46.2%	91,555	33,083	-63.9%
UPSHUR COUNTY | COUNTY-OTHER WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	1,919	1,908	-0.6%	2,050	2,135	4.1%
PROJECTED DEMAND TOTAL (acre-feet per year)	1,498	735	-50.9%	1,855	911	-50.9%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	0	0	0.0%	0	0	0.0%
UPSHUR COUNTY | IRRIGATION WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	272	713	162.1%	272	713	162.1%
PROJECTED DEMAND TOTAL (acre-feet per year)	185	170	-8.1%	185	170	-8.1%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	0	0	0.0%	0	0	0.0%

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Region D Water User Group (WUG) Data Comparison to 2016 Regional Water Plan (RWP)

	2020 PLANNING DECADE			2070 PLANNING DECADE		
	2016 RWP	2021 RWP	DIFFERENCE (%)	2016 RWP	2021 RWP	DIFFERENCE (%)
UPSHUR COUNTY | LIVESTOCK WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	1,511	1,511	0.0%	1,511	1,511	0.0%
PROJECTED DEMAND TOTAL (acre-feet per year)	1,358	1,651	21.6%	1,358	1,651	21.6%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	0	140	100.0%	0	140	100.0%
UPSHUR COUNTY | MANUFACTURING WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	6	6	0.0%	6	6	0.0%
PROJECTED DEMAND TOTAL (acre-feet per year)	272	69	-74.6%	382	76	-80.1%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	266	63	-76.3%	376	70	-81.4%
UPSHUR COUNTY | MINING WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	1	484	48300.0%	1	438	43700.0%
PROJECTED DEMAND TOTAL (acre-feet per year)	379	379	0.0%	333	333	0.0%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	378	0	-100.0%	332	0	-100.0%
UPSHUR COUNTY | MUNICIPAL WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	7,002	7,919	13.1%	7,003	7,890	12.7%
PROJECTED DEMAND TOTAL (acre-feet per year)	3,598	4,253	18.2%	4,467	5,278	18.2%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	0	0	0.0%	291	206	-29.2%
VAN ZANDT COUNTY | COUNTY-OTHER WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	4,458	3,530	-20.8%	5,144	3,911	-24.0%
PROJECTED DEMAND TOTAL (acre-feet per year)	2,780	1,421	-48.9%	3,422	1,698	-50.4%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	0	0	0.0%	0	0	0.0%
VAN ZANDT COUNTY | IRRIGATION WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	107	457	327.1%	107	432	303.7%
PROJECTED DEMAND TOTAL (acre-feet per year)	437	500	14.4%	437	500	14.4%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	330	43	-87.0%	330	68	-79.4%
VAN ZANDT COUNTY | LIVESTOCK WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	2,928	2,928	0.0%	2,923	2,923	0.0%
PROJECTED DEMAND TOTAL (acre-feet per year)	2,172	1,889	-13.0%	2,172	1,889	-13.0%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	0	0	0.0%	0	0	0.0%
VAN ZANDT COUNTY | MANUFACTURING WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	523	264	-49.5%	641	253	-60.5%
PROJECTED DEMAND TOTAL (acre-feet per year)	681	506	-25.7%	928	757	-18.4%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	158	242	53.2%	287	504	75.6%
VAN ZANDT COUNTY | MINING WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	2,146	3,316	54.5%	2,984	4,154	39.2%
PROJECTED DEMAND TOTAL (acre-feet per year)	300	300	0.0%	470	470	0.0%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	0	0	0.0%	0	0	0.0%
VAN ZANDT COUNTY | MUNICIPAL WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	7,241	7,933	9.6%	9,853	8,584	-12.9%
PROJECTED DEMAND TOTAL (acre-feet per year)	3,958	5,249	32.6%	5,033	6,682	32.8%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	13	29	123.1%	199	340	70.9%
WOOD COUNTY | COUNTY-OTHER WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	4,413	4,413	0.0%	4,461	4,461	0.0%
PROJECTED DEMAND TOTAL (acre-feet per year)	477	288	-39.6%	515	222	-56.9%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	0	0	0.0%	0	0	0.0%

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Region D Water User Group (WUG) Data Comparison to 2016 Regional Water Plan (RWP)

	2020 PLANNING DECADE			2070 PLANNING DECADE		
	2016 RWP	2021 RWP	DIFFERENCE (%)	2016 RWP	2021 RWP	DIFFERENCE (%)
WOOD COUNTY | IRRIGATION WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	940	1,374	46.2%	940	1,374	46.2%
PROJECTED DEMAND TOTAL (acre-feet per year)	721	489	-32.2%	721	489	-32.2%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	0	0	0.0%	0	0	0.0%
WOOD COUNTY | LIVESTOCK WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	2,092	2,198	5.1%	2,092	2,198	5.1%
PROJECTED DEMAND TOTAL (acre-feet per year)	1,810	3,224	78.1%	1,810	3,224	78.1%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	0	1,098	100.0%	0	1,098	100.0%
WOOD COUNTY | MANUFACTURING WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	1,502	1,502	0.0%	1,502	1,502	0.0%
PROJECTED DEMAND TOTAL (acre-feet per year)	759	2,532	233.6%	1,004	3,085	207.3%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	0	1,030	100.0%	0	1,583	100.0%
WOOD COUNTY | MINING WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	309	309	0.0%	328	328	0.0%
PROJECTED DEMAND TOTAL (acre-feet per year)	25	25	0.0%	19	19	0.0%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	0	0	0.0%	0	0	0.0%
WOOD COUNTY | MUNICIPAL WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	7,850	9,710	23.7%	8,493	9,974	17.4%
PROJECTED DEMAND TOTAL (acre-feet per year)	4,627	4,871	5.3%	4,729	5,035	6.5%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	0	0	0.0%	0	0	0.0%
REGION D						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	674,967	677,524	0.4%	660,854	692,647	4.8%
PROJECTED DEMAND TOTAL (acre-feet per year)	634,172	401,419	-36.7%	956,972	479,321	-49.9%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	150,192	80,588	-46.3%	410,695	117,022	-71.5%

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Region D Source Data Comparison to 2016 Regional Water Plan (RWP)

	2020 PLANNING DECADE			2070 PLANNING DECADE		
	2016 RWP	2021 RWP	DIFFERENCE (%)	2016 RWP	2021 RWP	DIFFERENCE (%)
BOWIE COUNTY						
GROUNDWATER AVAILABILITY TOTAL (acre-feet per year)	13,430	15,086	12.3%	12,297	14,213	15.6%
SURFACE WATER AVAILABILITY TOTAL (acre-feet per year)	3,591	10,066	180.3%	3,345	9,820	193.6%
CAMP COUNTY						
GROUNDWATER AVAILABILITY TOTAL (acre-feet per year)	7,583	8,356	10.2%	7,583	8,200	8.1%
SURFACE WATER AVAILABILITY TOTAL (acre-feet per year)	535	535	0.0%	725	725	0.0%
CASS COUNTY						
GROUNDWATER AVAILABILITY TOTAL (acre-feet per year)	42,726	56,532	32.3%	42,726	56,135	31.4%
SURFACE WATER AVAILABILITY TOTAL (acre-feet per year)	846	854	0.9%	847	855	0.9%
DELTA COUNTY						
GROUNDWATER AVAILABILITY TOTAL (acre-feet per year)	937	631	-32.7%	937	631	-32.7%
SURFACE WATER AVAILABILITY TOTAL (acre-feet per year)	4,801	9,444	96.7%	4,762	9,445	98.3%
FRANKLIN COUNTY						
GROUNDWATER AVAILABILITY TOTAL (acre-feet per year)	9,514	9,816	3.2%	9,514	9,816	3.2%
SURFACE WATER AVAILABILITY TOTAL (acre-feet per year)	1,155	1,159	0.3%	1,145	1,159	1.2%
GREGG COUNTY						
GROUNDWATER AVAILABILITY TOTAL (acre-feet per year)	15,222	15,025	-1.3%	15,222	15,025	-1.3%
REUSE AVAILABILITY TOTAL (acre-feet per year)	6,161	6,161	0.0%	6,161	6,161	0.0%
SURFACE WATER AVAILABILITY TOTAL (acre-feet per year)	3,774	15,333	306.3%	3,776	15,333	306.1%
HARRISON COUNTY						
GROUNDWATER AVAILABILITY TOTAL (acre-feet per year)	19,210	21,106	9.9%	19,012	20,899	9.9%
SURFACE WATER AVAILABILITY TOTAL (acre-feet per year)	28,478	105,031	268.8%	28,623	105,176	267.5%
HOPKINS COUNTY						
GROUNDWATER AVAILABILITY TOTAL (acre-feet per year)	4,598	11,481	149.7%	4,598	11,157	142.6%
SURFACE WATER AVAILABILITY TOTAL (acre-feet per year)	3,110	3,089	-0.7%	2,589	2,568	-0.8%
HUNT COUNTY						
GROUNDWATER AVAILABILITY TOTAL (acre-feet per year)	7,185	4,774	-33.6%	7,185	6,333	-11.9%
SURFACE WATER AVAILABILITY TOTAL (acre-feet per year)	1,148	1,165	1.5%	1,149	1,166	1.5%
LAMAR COUNTY						
GROUNDWATER AVAILABILITY TOTAL (acre-feet per year)	5,470	583	-89.3%	5,470	583	-89.3%
REUSE AVAILABILITY TOTAL (acre-feet per year)	12	12	0.0%	12	12	0.0%
SURFACE WATER AVAILABILITY TOTAL (acre-feet per year)	1,633	10,232	526.6%	1,633	10,232	526.6%
MARION COUNTY						
GROUNDWATER AVAILABILITY TOTAL (acre-feet per year)	17,626	18,133	2.9%	17,626	17,997	2.1%
SURFACE WATER AVAILABILITY TOTAL (acre-feet per year)	148	1,072	624.3%	148	1,072	624.3%
MORRIS COUNTY						
GROUNDWATER AVAILABILITY TOTAL (acre-feet per year)	12,268	12,037	-1.9%	12,095	11,930	-1.4%
REUSE AVAILABILITY TOTAL (acre-feet per year)	72,086	72,086	0.0%	65,248	65,248	0.0%
SURFACE WATER AVAILABILITY TOTAL (acre-feet per year)	492	481	-2.2%	497	486	-2.2%
RAINS COUNTY						
GROUNDWATER AVAILABILITY TOTAL (acre-feet per year)	1,704	1,840	8.0%	1,584	1,746	10.2%
SURFACE WATER AVAILABILITY TOTAL (acre-feet per year)	730	886	21.4%	730	886	21.4%
RED RIVER COUNTY						
GROUNDWATER AVAILABILITY TOTAL (acre-feet per year)	3,479	4,949	42.3%	3,479	4,946	42.2%
SURFACE WATER AVAILABILITY TOTAL (acre-feet per year)	10,675	12,427	16.4%	11,445	12,427	8.6%
RESERVOIR* COUNTY						
SURFACE WATER AVAILABILITY TOTAL (acre-feet per year)	1,211,304	1,220,004	0.7%	1,006,609	1,117,950	11.1%

* Since reservoir sources can exist across multiple counties, the county field value, ‘reservoir’ is applied to all reservoir sources.

Region D Source Data Comparison to 2016 Regional Water Plan (RWP)

	2020 PLANNING DECADE			2070 PLANNING DECADE		
	2016 RWP	2021 RWP	DIFFERENCE (%)	2016 RWP	2021 RWP	DIFFERENCE (%)
SMITH COUNTY						
GROUNDWATER AVAILABILITY TOTAL (acre-feet per year)	38,239	41,589	8.8%	38,215	41,083	7.5%
SURFACE WATER AVAILABILITY TOTAL (acre-feet per year)	994	994	0.0%	994	994	0.0%
TITUS COUNTY						
GROUNDWATER AVAILABILITY TOTAL (acre-feet per year)	10,459	10,197	-2.5%	9,776	10,176	4.1%
REUSE AVAILABILITY TOTAL (acre-feet per year)	160	160	0.0%	160	160	0.0%
SURFACE WATER AVAILABILITY TOTAL (acre-feet per year)	1,644	2,029	23.4%	1,644	2,029	23.4%
UPSHUR COUNTY						
GROUNDWATER AVAILABILITY TOTAL (acre-feet per year)	32,685	34,522	5.6%	32,504	34,276	5.5%
SURFACE WATER AVAILABILITY TOTAL (acre-feet per year)	1,359	1,556	14.5%	1,359	1,556	14.5%
VAN ZANDT COUNTY						
GROUNDWATER AVAILABILITY TOTAL (acre-feet per year)	14,097	15,259	8.2%	13,865	14,862	7.2%
SURFACE WATER AVAILABILITY TOTAL (acre-feet per year)	4,183	4,498	7.5%	4,591	4,906	6.9%
WOOD COUNTY						
GROUNDWATER AVAILABILITY TOTAL (acre-feet per year)	31,651	31,503	-0.5%	31,423	31,283	-0.4%
SURFACE WATER AVAILABILITY TOTAL (acre-feet per year)	2,765	3,199	15.7%	2,765	3,199	15.7%
REGION D						
GROUNDWATER AVAILABILITY TOTAL (acre-feet per year)	288,083	313,419	8.8%	285,111	311,291	9.2%
REUSE AVAILABILITY TOTAL (acre-feet per year)	78,419	78,419	0.0%	71,581	71,581	0.0%
SURFACE WATER AVAILABILITY TOTAL (acre-feet per year)	1,283,365	1,404,054	9.4%	1,079,376	1,301,984	20.6%

* Since reservoir sources can exist across multiple counties, the county field value, ‘reservoir’ is applied to all reservoir sources.

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HAYES ENGINEERING, INC

TEXAS REGISTERED ENGINEERING FIRM F-1465

Prepared for

The North East Texas Regional Water Planning Group

2021 REGION D WATER PLAN VOLUME II: APPENDICES

FINAL

October 14, 2020

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