# 11 IMPLEMENTATION AND COMPARISON TO THE PREVIOUS REGIONAL WATER PLAN

The Regional and State Water Planning process administered by the Texas Water Development Board (TWDB) operates on a five-year cycle. Inherently, this cycle enables continual refinements and changes to major components of the planning process, such as water demands, supplies, and recommended strategies. This chapter assesses the changes between cycles of Regional Water Plans (RWPs), in accordance with TWDB requirements for the development of the 2021 RWP. Specifically, this chapter contains a discussion of the implementation of previously recommended water management strategies (WMS) (Section 11.1), as well as a summary of how various components of the current 2021 RWP compare to the previously adopted 2016 RWP (Section 11.2). In addition, this chapter addresses the progress of the Region F Water Planning Group in encouraging the cooperation between entities for the purpose of achieving economies of scales and otherwise incentivizing strategies that benefit the region as a whole (Section 11.3).

## 11.1 Implementation of Previously Recommended Water Management Strategies

The following sections discuss those WMSs that were recommended in the 2016 Regional Water Plan and have been partially or completely implemented since that plan was published. These WMSs are included in the 2021 plan as currently available supply. Information was collected on the implementation status of projects in the 2021 plan via an implementation survey.

### 11.1.1 Mining Conservation – Well Field Recycling/Reuse

In at least 11 counties across Region F, the Texas Water Development Board water use survey showed that mining operators were already employing the 2016 plan mining conservation strategy to reuse, and recycling water used for fracking operations.

### 11.1.2 City of Eden – Direct Non-Potable Reuse

Eden had a recommended strategy in the 2016 Plan to supply a golf course with direct non-potable reuse supplies from their wastewater treatment plant (WWTP). This strategy has been implemented and is currently in use.

### 11.1.3 Mining WUGs – City of Midland Reuse Supply

One proposed water management strategy for some mining users in the previous Region F Water Plan involved purchasing wastewater effluent from the City of Midland. This strategy included improvements to the City's wastewater treatment plant (WWTP) and the construction of a transmission pipeline to move water to surrounding counties. The City of Midland has since negotiated a contract to sell their treated effluent to Pioneer Resources for mining use. For planning purposes, it is an existing supply in the 2021 plan to mining users in Midland, Martin, Reagan, and Upton Counties. The contract is for up to 15 MGD but current flows are limited to 10 MGD. The City is currently completing improvements to the WWTP to treat the full 15 MGD. These improvements are expected to be completed by 2020.

## 11.2 Differences Between Previous and Current Regional Water Plan

The following sections provide a discussion of changes from the 2016 plan to the current 2021 plan. Specifically, these sections address differences in:

- Water demand projections
- Drought of record and hydrologic modeling and assumptions
- Source water availabilities
- Existing water supplies for water users
- Identified water needs for WUGs and WWPs
- Recommended and alternative water management strategies

### 11.2.1 Water Demand Projections

The total projected water demand in Region F is about 9 to 13 percent lower for the 2021 plan than in the 2016 plan. This equates to a decrease of about 73,000 to 109,000 acre-feet per year decrease in total demands over the planning horizon. This is displayed in Figure 11-1. Table 11-1 shows the differences in demand by use type. These differences and their causes are explored more fully in the following sections.

**Figure 11-1**
**Comparison of Region F Water Demand in 2016 and 2021 Plans**

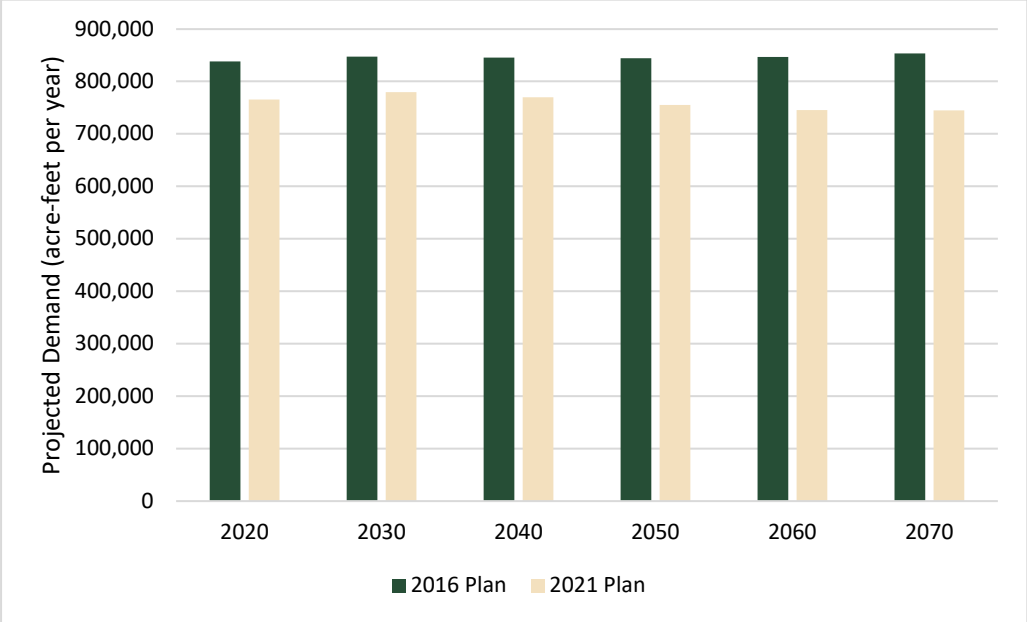



**Table 11-1**
**Changes in Projected Demands from the 2016 Plan to the 2021 Plan by Use Type**

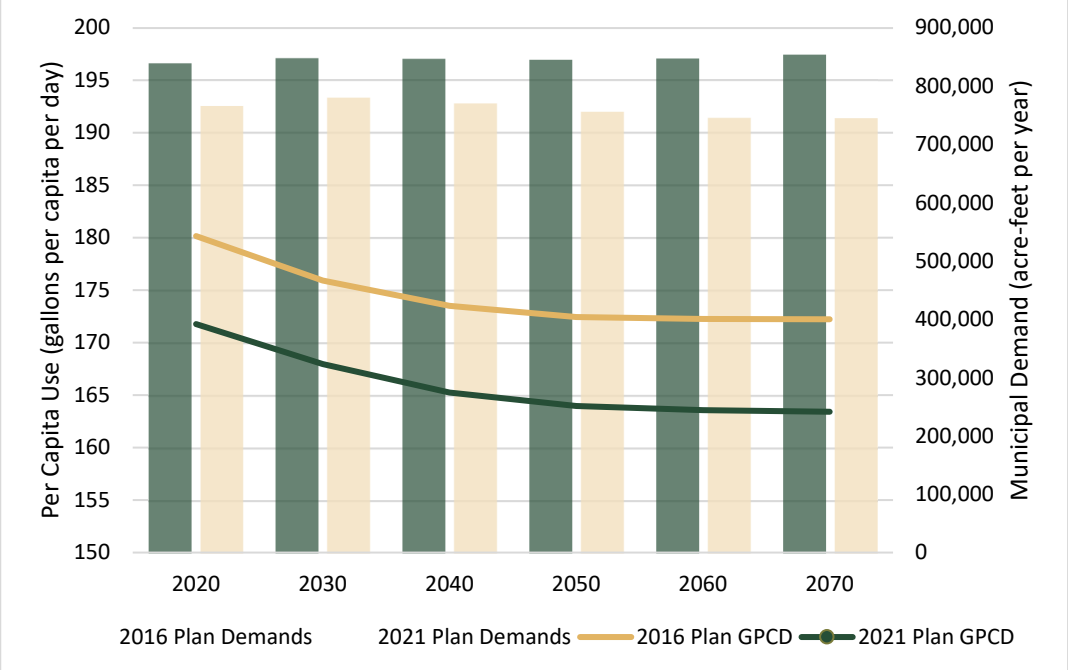
| Use Type | Percent Change in Projected Water Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2020 | 2030 | 2040 | 2050 | 2060 | 2070 |
| Irrigation | -19.7% | -19.1% | -18.5% | -17.9% | -17.4% | -16.8% |
| Livestock | -29.4% | -29.4% | -29.4% | -29.4% | -29.4% | -29.4% |
| Manufacturing | 3.8% | 6.1% | 0.4% | -4.0% | -9.5% | -14.7% |
| Mining | 95.6% | 94.9% | 97.0% | 94.3% | 89.4% | 83.9% |
| Municipal | -2.6% | -0.7% | -0.9% | -1.3% | -1.6% | -1.7% |
| Steam Electric Power | -5.2% | -15.1% | -24.8% | -34.1% | -42.8% | -49.9% |
| **Region F Total** | **-8.7%** | **-8.0%** | **-9.0%** | **-10.5%** | **-12.0%** | **-12.8%** |

### *Municipal Demands*

One of the major changes for this round of planning is the use of water utility boundaries rather than city limits for municipal water user groups (WUGs). This resulted in changes of individual WUG populations as customers outside the city limits were included in the WUG population. Also, the criteria for defining a municipal WUG was changed from a population basis to a water demand basis. This resulted in the addition of seven new municipal WUGs in the 2021 Region F Plan and no removed WUGs. While this change in definition of municipal WUGs changed how the demands were delineated, it made little difference in the overall municipal demand projections.

The methodology for development of the municipal demands in both plans were similar. A dry year per capita demand was estimated for each entity. Then, the per capita demand was multiplied by the projected population of each entity to determine the total demand in acre-feet per year. For some users, the 2021 plan population projections were updated to reflect population growth caused by increased oil and gas activities that were not captured in the 2010 Census or the 2016 plan. The per capita water use for both plans was based on the year 2011 (with a few exceptions). One notable exception for the 2021 plan, was Midland's request to use a lower gpcd value based on more recent historic use. Due to Midland's significant population, this change contributed to a slightly lower municipal demand for the region as a whole. As shown in Figure 11-2, the per capita use and the total municipal demand for the region is less in the 2021 plan than it was in the 2016 plan.

**Figure 11-2**
**Comparison of the 2016 and 2021 Plan Projected Per Capita Use and Municipal Demand**




### *Non-Municipal Demands*

There were significant differences in the methodologies used to develop the non-municipal demands for the 2016 and 2021 plans. As a result, non-municipal demands decreased for the region by about 10 to 15 percent.

A decrease in irrigation demands is the largest contribution to the overall decrease in demands for the region in the 2021 plan. Irrigation demands in the 2021 plan were based on a five-year average (2010 to 2014) of historical TWDB irrigation water use estimates, while irrigation demands in the 2016 plan were based on a five-

year maximum (2005 to 2009) of water use. The difference in the data used as the baseline for calculations (average versus maximum) between the plans is the primary cause for the decrease in the projected irrigation demands.

Steam electric power demands decreased between the 2021 and 2016 plan due to the removal of more speculative future steam electric demands. Future water demands for steam electric power are no longer considered in the regional plans unless there is a specific facility planned in that location. Demands associated with steam electric power plants in Region F that are no longer in operation were also removed. This results in a lower, more realistic steam electric power demand in Region F. However, the methodology may underestimate the need for water for future power generation on a state-wide basis.

Similarly, when comparing the 2021 plan to the 2016 plan, livestock demands are nearly 30 percent lower throughout the planning horizon. This is also due to a differing methodology of using the 5-year average (2010-2014) historical use for the baseline instead of a five-year maximum (2005-2009) historical use.

Manufacturing demands increased in the first two decades for the 2021 plan but decreased after 2030. This is due to the methodology used in the demand development for the 2021 plan where manufacturing demands were increased between 2020 and 2030 based on growth in the county. After 2030, the manufacturing demands were held constant. This may underestimate demands, especially in high growth areas, after 2030.

In contrast, mining demands nearly doubled in the 2021 plan compared to the 2016 plan. This is largely due to the renewed interest in oil and gas development in the Permian Basin that is anticipated to be sustained for several decades.

### 11.2.2 Drought of Record and Hydrologic Modeling Assumptions

In general, the drought of record is defined as the worst drought to occur in a region during the period of available meteorological records. For most of Texas, the drought of record began around 1950 and continued through early 1957. In Region F, most surface water sources were in drought-of-record conditions as of the publication of the 2011 and 2016 plans. The extreme drought conditions have lessened since the 2016 plan, but many reservoirs have never filled and the availability of surface water supplies in the region may still be impacted in future plans. The impacts of the drought on surface water availability under WAM Run 3 (strict priority analysis) does not show the full impact of the drought since many of the reservoirs already had little to no yield. The impacts are more fully shown in the subordination strategy. However, the full impact of ongoing drought conditions cannot be fully evaluated until the current drought is officially over (which is defined by the refilling of the reservoir).

#### *WAM Run 3 (Strict Priority Analysis)*

In 2013, the TCEQ recognized the new drought of record in Region F and updated the full Colorado WAM to include naturalized flows from 1940 through the end of 2013. However, the finalized version was not available in time for use in the 2016 Plan. Instead a draft of the updated version of the Colorado WAM was used for the 2016 plan analysis. For the 2021 plan, the final version of the TCEQ Colorado WAM was available and used. This change resulted in several relatively small changes in surface water availability under WAM Run 3.

#### *Subordination*

The subordination strategy changes key assumptions in the WAM such that downstream water rights do not constantly make priority calls on the upstream rights in Region F. This is consistent with the historical operation of the basin.

For the 2016 plan, Region F adopted the premise of the Region K cutoff model for the subordination strategy. The cutoff model modifies priority dates for all water rights above Lakes Ivie and Brownwood. The draft Colorado WAM with hydrology through 2013 was used for the subordination strategy in the 2016 plan. For the 2021 plan, Region F used the same cutoff model concept from Region K but with

updated hydrology through 2016. The model used for the 2021 plan was developed by Region K and adopted by Region F with some minor modifications. The Region F Plan cutoff model differs slightly from the Region K model by including Junction's run-of-river right, Brady Creek Reservoir, and including priority operation only under certain conditions for the Pecan Bayou watershed. The Region F adjustments to the Region K cutoff model were the same for the 2016 and 2021 plans. More information on the subordination strategy is included in Chapter 5C.

### 11.2.3 Source Water Availability

The total source water availability (not considering infrastructure or permit constraints) in Region F is greater in the 2021 plan than in the previous 2016 plan. Major differences in groundwater availability stem from changes to the Groundwater Availability Models, and in some cases, small changes in Desired Future Conditions for aquifers. Slight differences in surface water availability were caused by using an updated, final version of the WAM Run 3 for the 2021 Plan. The increase in reuse supplies in the 2021 plan are largely attributed to an increase in reuse water supplied to mining entities in the region. Overall, there was about a 4 to 7 percent increase in water availability throughout the region between the 2016 and 2021 plans.

#### *Groundwater*

In accordance with TWDB rules, the groundwater availability in the 2021 and 2016 plans are determined by the Modeled Available Groundwater (MAG) estimate. These plans were both required to use groundwater estimates developed through the state-sponsored groundwater joint planning process, which is discussed in further detail in Chapter 3, Section 3.1.1. Most of the increased groundwater availability came from volumes estimated from new Groundwater Availability Models (GAMs). Specifically, the updated Ogallala aquifer model, known as the High Plains Aquifer System GAM and the Llano Uplift Aquifers GAM. The new HPAS GAM significantly increased the available volume from the southern portion of the Ogallala and in Region F Counties. In the 2016 Plan, the Llano Uplift Aquifer GAM was not available to estimate MAGs. The availability from the Llano Uplift Aquifers generally increased with the use of the Llano Uplift Aquifers GAM in conjunction with some changes in DFCs for the aquifers in Region F counties.

**Figure 11-3**
**Comparison of Groundwater Availability in the 2016 and 2021 Plans**

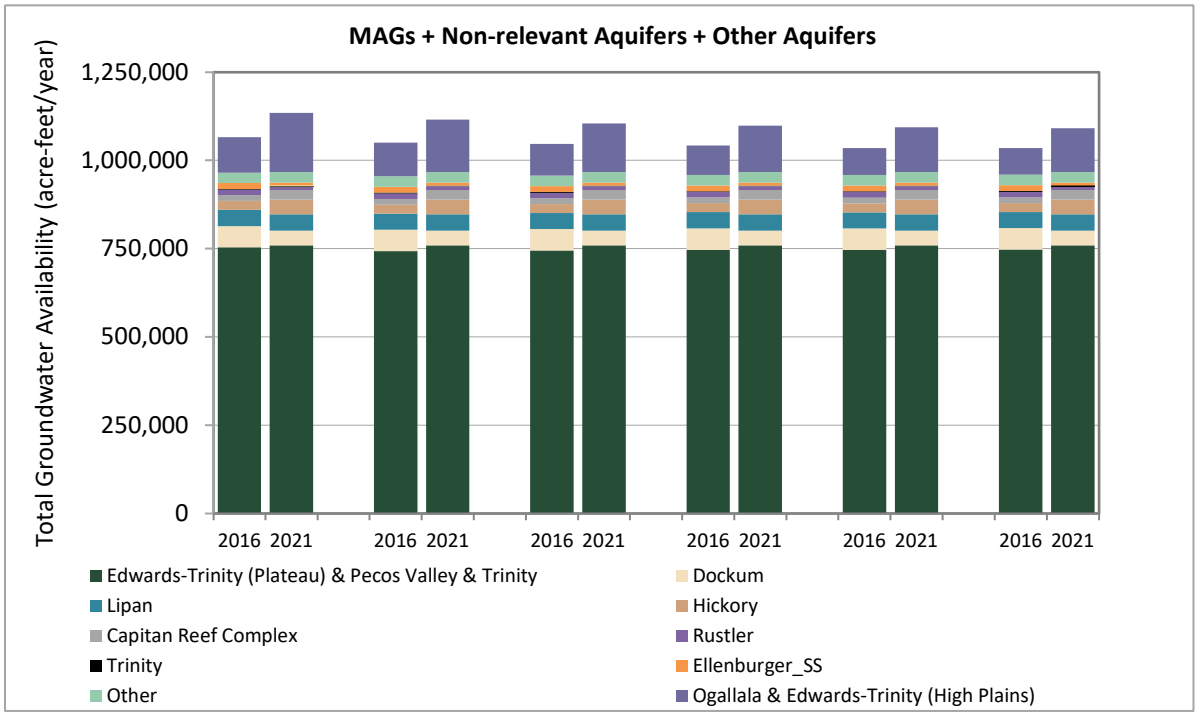
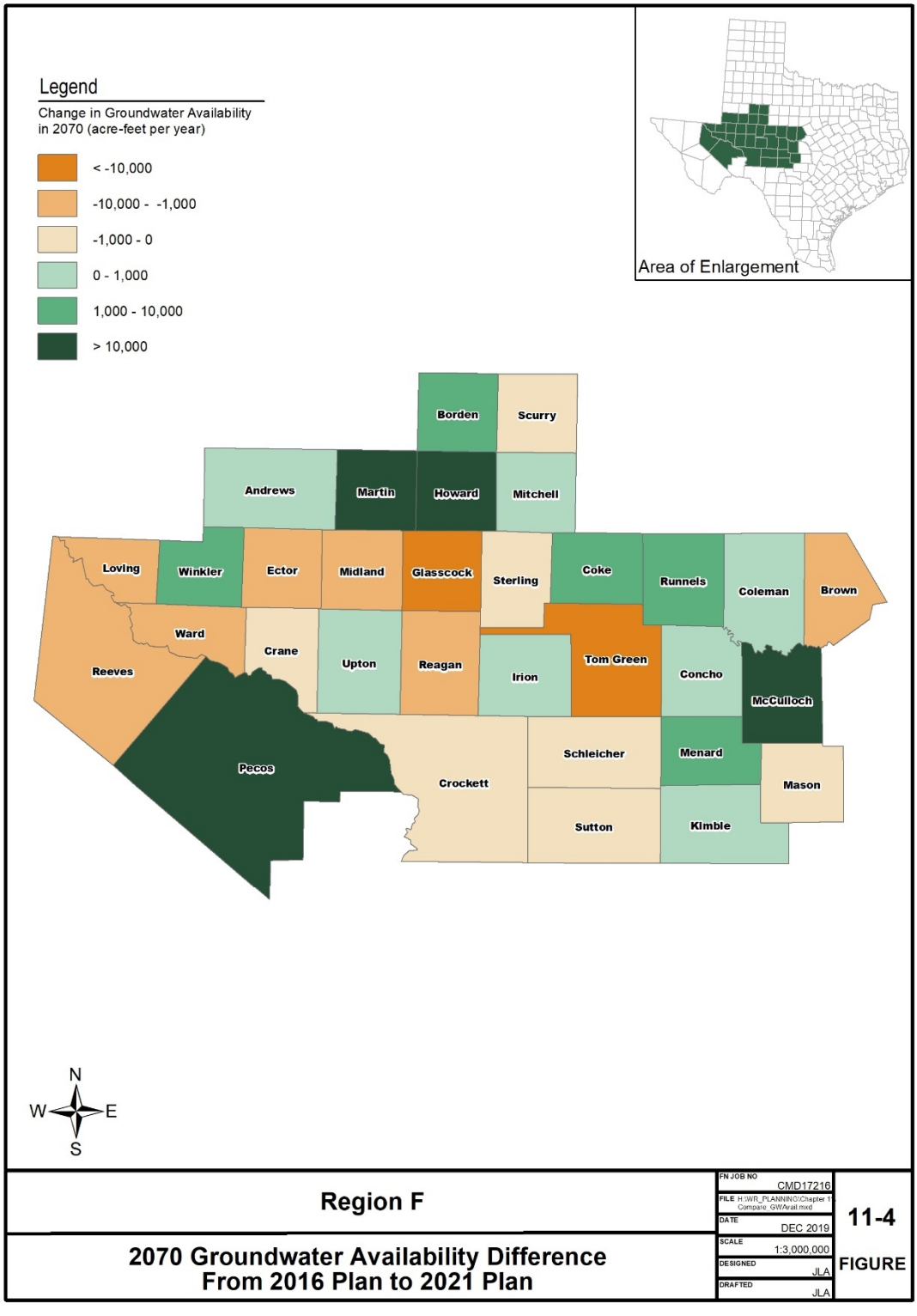


**Figure 11-4**
**Groundwater Availability Difference**



### *Surface Water*

In the 2016 plan, a draft version of the WAM Run 3 (strict priority analysis) was used to model surface water availability. For the 2021 plan, the final version of this WAM run was used. Consequently, the volume of surface water supply shown from major reservoirs in the 2021 plan is around five percent lower than amount of reservoir supplies shown in the 2016 plan (see Figure 11-5). The decline in major reservoir supplies between the 2016 plan and 2021 are further illustrated through the subordination strategy, where the reservoir supplies also declined around 10 percent. This is shown in Figure 11-6.

**Figure 11-5**
**Comparison of Existing Surface Water Availability (WAM Run 3) in the 2016 and 2021 Plans**

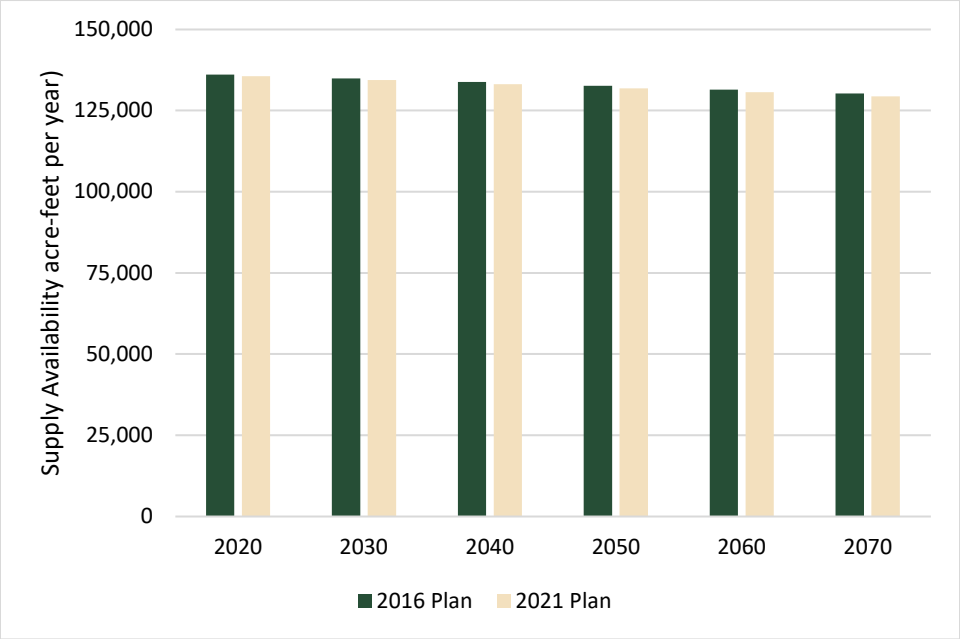
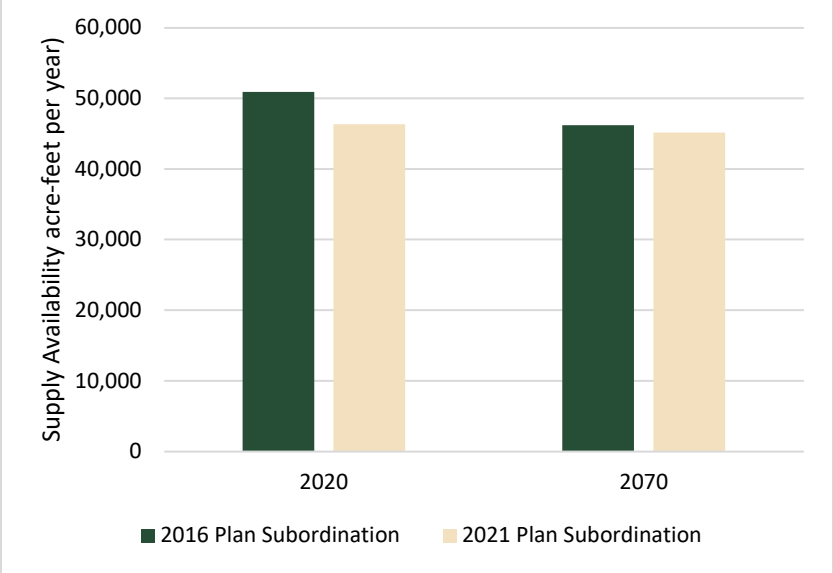


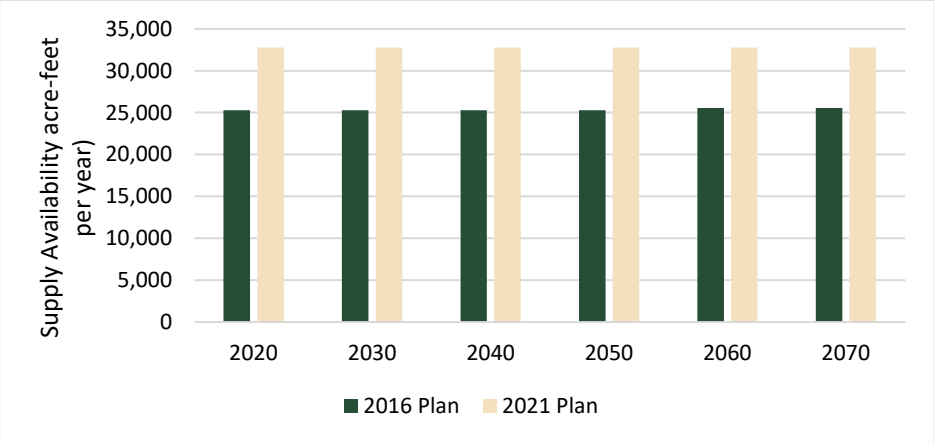

**Figure 11-6**
**Comparison of Subordination Supplies in the 2016 and 2021 Plans**



### *Reuse*

Existing reuse source availability went up from the 2016 plan to the 2021 plan, as shown in Figure 11-7. This is largely attributed to the increase in oil and gas well field recycling and reuse that was observed in several counties.

**Figure 11-7**
**Comparison of Reuse Water Availability in the 2016 and 2021 Plans**




## 11.2.4 Existing Water Supplies of Water Users

### *New Sources of Existing Supply for Water Users*

Drought conditions in Region F not only reduced the yield from each source, but also greatly impact the quality of the supplies from those sources. In many cases, water quality has become too poor to use the remaining dwindling supply. In addition, further development of oil and gas operations within the region has caused increased demands for these supplies. As a result, communities are seeking more drought tolerant sources of water including reuse and groundwater.

Table 11-2 shows users in Region F that have new sources of supply in the 2021 plan that were not included in the 2016 plan. Some of these new supplies were recommended strategies in the 2016 plan that have since been implemented and are discussed in Section 11.3. This changes the status of these supplies from "new supplies" to "existing supplies". Other supplies not considered in the 2016 plan were developed in response to drought and are now new sources of existing supply.

**Table 11-2**
**Entities with New Sources of Existing Supply in the 2021 Plan**

| Entity | New Existing Supply |
|---|---|
| Concho Rural Water; Mining, Tom Green | Purchase from UCRA |
| Eden | Direct Reuse |
| County-Other, Mitchell; Manufacturing, Mitchell | Purchase from Colorado City |
| Grandfalls | Purchase from CRMWD |
| Mining (Andrews, Martin, Reagan, Upton) | Purchase from Odessa |
| Mining (Martin, Midland, Reeves, Upton) | Purchase from Midland |
| Mining (Reeves, Pecos) | Purchase from Fort Stockton |
| Mining (Ector, Glasscock, Howard, Irion, Martin, Midland, Reagan, Upton, Ward) | Well Field Recycling |
| Steam Electric Power, Howard | Purchase from Big Spring |

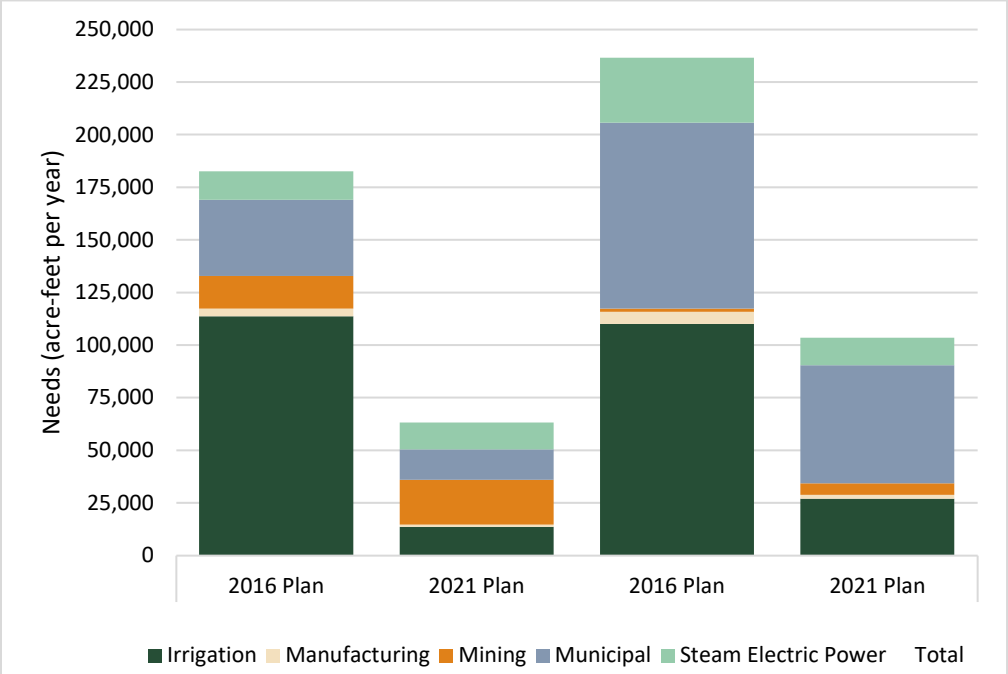
Most of the new existing supplies included in the 2021 plan are purchased water from wholesale water providers or nearby cities. In particular, mining users in Region F are purchasing wastewater effluent or

recycling water from their well fields to meet the water needs of their expanded oil and gas operations. Various water user groups also show groundwater supplies from sources named differently in the 2021 plan. However, these name changes are not substantive changes to the users water supply source. Rather the differences are attributed to differences in naming convention and groupings of aquifers for the MAG runs for the 2021 plan. These non-substantive changes are not considered new "existing supplies".

### 11.2.5 Identified Water Needs

Due to decreased demands and increases in modeled groundwater availability, needs across Region F decreased approximately 55 to 65 percent from the 2016 plan to the 2021 plan. The composition of these needs also changed significantly. Figure 11-8 highlights the differences in need by use type between the two plans in the years 2020 and 2070.

**Figure 11-8**
**Need by Use Type in the 2016 2021 Plan**




Needs for irrigated agriculture reduced significantly in the 2021 plan. Existing supplies changed minimally between the two plans, so this change this is mainly due to a significant decrease in irrigation demands throughout the planning horizon.

In contrast, mining needs increased from the 2016 plan to the 2021 plan, especially during the early decades. The changes in mining needs were primarily fueled by increased demands associated with interests in oil and gas exploration in the region.

In the 2016 plan, livestock showed a small shortage (less than 500 acre-feet total). This was mainly due to counties in which all users were shorted due to limited groundwater availability under the MAG. The 2021 plan shows an even smaller shortage (less than 50 acre-feet total). This is also due to limited groundwater availability under the MAG, but only in Andrews County.

Manufacturing needs decreased by around 70 percent from the 2016 plan to the 2021 plan. This difference is attributed to two factors: 1) lower manufacturing demands, especially in the later decades of the 2021 plan and 2) an increase in manufacturing supplies, particularly in Howard and Midland Counties where there

were severe MAG limitations in the 2016 plan that do not exist in the 2021 plan.

Steam electric power needs in the 2021 plan are lower than in the 2016 plan, particularly in the later decades. In the 2016 plan, the TWDB included the speculative future demands and demands associated with shuttered facilities in their demand projections. In many cases, these demands were not realistic and resulted in higher needs for steam electric power in the 2016 plan. In the 2021 plan, the demands only included known potential future facilities and demands associated with the shuttered steam electric power facilities were removed. This resulted in a more realistic demand and lower needs throughout the planning horizon.

Municipal needs decreased by about 60 percent in 2020 and about 35 percent in 2070 from the 2021 plan to the 2016 plan. The decrease in municipal needs between these plans is largely due to increased groundwater availability from the MAG.

### 11.2.6 Recommended and Alternative Water Management Strategies

#### *New Water Management Strategies*

New strategies were developed to meet new shortages or better represent entities' current plans that have changed since the previous round of planning. There are 17 new infrastructure strategies in the 2021 plan that were not included in the 2016 plan. This does not include the new conservation strategies for municipal, irrigation, or mining use for new municipal WUGs or non-municipal WUGs with needs. The new recommended strategies are outlined in Table 11-3. New alternative strategies are included in Table 11-4.

**Table 11-3**
**New Recommended Water Management Strategies in the 2021 Plan**

| Water User Group or Wholesale Provider | New Recommended Water Management Strategy |
|---|---|
| Balmorhea | Develop Edwards-Trinity Plateau Aquifer Supplies |
| Bronte | Develop Other Aquifer Supplies in Southwest Coke County |
| Colorado River MWD | Ward County Well Field Replacement |
| Concho Rural WSC | Purchase from Provider (UCRA) |
| Grandfalls | Develop Pecos Valley Aquifer Supplies |
| Greater Gardendale WSC | Purchase from City of Odessa - Treated Water |
| Manufacturing, Scurry | Develop Other Aquifer Supplies |
| Midland | Advanced RO Treatment, Expanded Use of Paul Davis Well Field |
| Mining, Brown | Develop Cross Timbers Aquifer Supplies |
| Mining, Reeves | Develop Pecos Valley Aquifer Supplies |
| Pecos | Partner with Madera Valley WSC and Expand Pecos Valley Aquifer Supplies |
| Pecos | Advanced Water Treatment Plant |
| Pecos | Direct Potable Reuse |
| Pecos | Direct Non-Potable Reuse |
| Pecos County WCID #1 | Replace Transmission Pipeline |
| Sonora | Develop Additional Edwards-Trinity Aquifer Supplies |
| Steam Electric Power, Mitchell | Direct Non-Potable Reuse Sales from Colorado City |

**Table 11-4**
**New Alternative Water Management Strategies**

| Water User Group or Wholesale Provider | New Alternative Water Management Strategy |
|---|---|
| Bronte | Develop Other Aquifer Supplies in Runnels County |
| Brown County WCID | Develop New Groundwater (previously recommended) |
| Grandfalls | Purchase from Provider (CRMWD) |
| Great Plains | Develop Ogallala Aquifer Supplies |
| Greater Gardendale WSC | Purchase from Midland County FWSD No. 1 - Winkler County Water |
| Manufacturing, Andrews | Develop Additional Groundwater[a] |
| Multiple Municipal Users | Advanced Metering Infrastructure |
| Pecos | Indirect Potable Reuse with ASR |

a. Listed as an alternative strategy due to constraints of MAG availability in the county.

### *Altered Water Management Strategies*

Several strategies in the current plan were also in the previous plan but have been altered in some way. This section focuses on strategies that were significantly changed from the last plan either due to major conceptual changes, better available data, or considerable changes in assumptions used to calculate the water available from the strategy. The changes to these strategies are outlined below. This section is meant to highlight the differences, not give a full description of the strategy. More information on these strategies can be found in Chapter 5 and Appendix C. Strategies with only minor adjustments that did not change the spirit of the strategy are considered to be the same and are not discussed in this section.

Municipal Conservation

The municipal conservation strategy was fundamentally similar in both the 2021 and 2016 plans, e.g., municipal conservation was considered as a strategy for all named municipal WUGs, regardless of if they had a need, and all conservation best management practices (BMPs) considered were the same.. However, there were some slight changes in the strategy assumptions in the 2021 plan that changed the entities that receive municipal conservation and the conservation volumes shown. For instance, in the 2016 plan, municipal conservation was considered for County-Other entities if their per-capita usage was over the state goal of 140 gallons per capita per day (GPCD), while in the 2021 plan, municipal conservation was only considered for County-Other entities that had a need. Furthermore, the WUG adoption rate assumed for certain BMPs, such as education and outreach and water waste ordinance, was decreased from the 2016 plan to the 2021 plan to reflect that some entities have already adopted these BMPs. More information of the municipal conservation strategy can be found in Subchapter 5B.

Weather Modification

In the previous plan, data from the WTWMA's 2013 growing season estimated a 9.6 average percent increase in rainfall across counties in Region F. This was the basis for the water savings calculations in the 2016 plan. More updated information from the 2016 growing season for the WTWMA and TPWMA estimated average increases in rainfall of 9.3 and 4.7 percent, respectively, with percent increases varying by county. This more recent data was used for the water savings calculations associated with this strategy in the 2021 plan.

Big Spring Water Treatment Plant

In the previous plan, there was a strategy for the City of Big Spring to implement a 5.5 MGD expansion to their current water treatment facility. However, after further consideration, the City has decided to construct an entirely new water treatment facility with a capacity of 18 to 20 MGD. The details and estimated costs for this project were updated to reflect this change in the 2021 plan.

San Angelo Indirect Reuse (Concho River Water Project)

The City of San Angelo recently initiated an engineering feasibility study to investigate various water supply alternatives, including strategies to re-purpose their treated effluent. The results from this study were not available during the publication of the 2016 plan, therefore, a general reuse strategy was included in that plan. Since then, this study has been completed and the City has identified an indirect potable reuse project (commonly referred to as the "Concho River Water Project") as the recommended water supply strategy for the City. The 2021 plan includes the specific logistics for this strategy, including project details, volumes, estimated costs, and timelines. For more information, refer to Appendix C.

### *Removed Water Management Strategies*

In addition to new and altered strategies, some strategies included in the 2016 plan are no longer being considered for the entity for various reasons. These are outlined in Table 11-5.

**Table 11-5**
**Strategies No Longer Considered in the 2021 Plan**

| Water User Group or Wholesale Provider | Strategies from the 2016 Plan No Longer in the 2021 Plan |
|---|---|
| Ballinger | Purchase Water Rights from Clyde (Fort Phantom Hill Reservoir) |
| Bronte | New Groundwater at Oak Creek Reservoir |
| Bronte | New Groundwater Southeast of Bronte |
| Bronte; Robert Lee | Purchase Water From UCRA |
| Colorado River MWD | ASR of Existing Surface Water Supplies in Ward County Well Field |
| Colorado River MWD | ASR of Brackish Groundwater |
| Colorado River MWD | Desalination of Brackish Groundwater |
| Colorado River MWD | Desalination of Brackish Surface Water (CRMWD Diverted Water System) |
| Concho Rural Water Corporation | Develop Additional Lipan Aquifer Supplies |
| Concho Rural Water Corporation | Desalination of Other Aquifer Supplies in Tom Green County |
| County-Other, Coke | Voluntary Transfer (Purchase) |
| County-Other, Howard | Voluntary Transfer (Purchase) |
| County-Other, Martin | Develop Additional Dockum Aquifer Supplies |
| County-Other, McCulloch | Voluntary Transfer (Purchase) |
| County-Other, Midland | Develop Pecos Valley Aquifer Supplies |
| County-Other, Winkler | Develop Pecos Valley Aquifer Supplies |
| Livestock, Andrews | Develop Pecos Valley Aquifer Supplies |
| Livestock, Howard | Develop Additional Dockum Aquifer Supplies |
| Livestock, Martin | Develop Additional Dockum Aquifer Supplies |
| Livestock, McCulloch | Develop Additional Edwards-Trinity Plateau Aquifer Supplies |
| Livestock, Scurry | New Groundwater from Local Alluvium Aquifer |
| Manufacturing, Martin | Voluntary Transfer (Purchase) |
| Manufacturing, McCulloch | Voluntary Transfer (Purchase) |

| Water User Group or Wholesale Provider | Strategies from the 2016 Plan No Longer in the 2021 Plan |
|---|---|
| Midland | Development of Groundwater in Midland County (Previously Used For Mining) |
| Midland | Additional T-Bar Groundwater with Treatment |
| Mining, Coke | Develop Additional Edwards-Trinity Plateau Aquifer Supplies |
| Mining, Coleman | Develop Additional Hickory Aquifer Supplies |
| Mining, Concho | Develop Additional Hickory Aquifer Supplies |
| Mining, Howard | Develop Additional Dockum Aquifer Supplies |
| Mining, Howard | Develop Additional Ogallala Aquifer Supplies |
| Mining, Irion | Develop Additional Dockum Aquifer Supplies |
| Mining, Irion | Develop Additional Edwards-Trinity Plateau Aquifer Supplies |
| Mining, Martin | Develop Additional Dockum Aquifer Supplies |
| Mining, Martin | Develop Additional Edwards-Trinity Plateau Aquifer Supplies |
| Mining, Runnels | Develop Other Aquifer Supplies |
| Mining, Scurry | Develop Local Alluvium Aquifer Supplies |
| San Angelo | Desalination of Other Aquifer Supplies in Tom Green County |
| San Angelo | Development of Capitan Reef Complex Aquifer Supplies in Pecos County |
| San Angelo | Red Arroyo OCR |
| San Angelo | West Texas Water Partnership |
| Sonora | Direct Non-Potable Reuse for Irrigation of Industrial and Municipal Parks (Type I) |
| Steam Electric Power, Coke | Steam Electric Power Conservation |
| Steam Electric Power, Ector | Steam Electric Power Conservation |
| Steam Electric Power, Mitchell | Steam Electric Power Conservation |
| Steam Electric Power, Ward | Develop Pecos Valley Aquifer Supplies |
| Steam Electric Power, Ward | Conservation - Alternative Cooling Technology |
| Upper Colorado River Authority | Voluntary Transfer (Purchase) |

## 11.3 Assessment of Regionalization Across Region F

As a part of the regional planning process, regional water planning groups (RWPGs) are required to prepare long-term plans that consider ongoing local and regional planning efforts and are consistent with other regional plans across the state. In addition, regional water plans are required to meet the projected needs of water user groups (WUGs) with strategies that, among other requirements, are cost-effective. Regional water management strategies, or strategies that meet needs of multiple WUGs, can be more cost-effective than localized strategies due to economies of scale and potential reductions in the unit cost of planning, design, and construction of one, regionalized infrastructure project in densely populated areas. However, in more sparsely populated areas, the cost of long transmission lines can outweigh the potential benefits and cost savings from the economies of scale of a regional project.

In Region F, regional strategies that meet the needs of multiple WUGs and achieve economies of scale are implemented in areas where it is cost-effective and technically feasible. For example, the Colorado River Municipal Water District (CRMWD) sells and distributes water to multiple water users in Region F, including other major water providers (Midland, Odessa,

and San Angelo) that distribute water to their own customers. Strategies implemented by CRMWD are inherently regional as they provide for the needs of their customers and any potential future customers. In addition, the cities of Midland, San Angelo, and Abilene (Region G) are collaborating and considering the development of a regional water supply strategy (referred to as the "West Texas Water Partnership") that could provide for the growing needs of their customers. Growing communities outside Midland (Midland County Utility District and Midland County FWD) and San Angelo (UCRA) are considering regional solutions to meet their needs. Another potential regional strategy in Region F includes the development of a regional system between the cities of Bronte, Ballinger, Winters, and Robert Lee that would produce water from either Lake Brownwood or Lake Fort Phantom Hill. However, regional strategies for Bronte, Ballinger, Winters, and Robert Lee have not been found to be cost effective due to the long distances of transmission pipeline that is needed for relatively small amounts of water.

Regional strategies can achieve economies of scales and be cost-effective, particularly for centralized areas that have a large water need. However, in comparison to other regions across Texas, Region F has demographic and geographic characteristics that limit the advantages of regional strategies. With the exception of a few metropolitan areas, the majority of Region F is rural, and demands are primarily met with local water supplies, such as groundwater or local reservoirs. Furthermore, Region F is geographically expansive, as it encompasses 32 counties and spans across nearly half the state of Texas. Consequently, the need for large-scale projects are limited since many communities already have local supplies available. Also, unless water user groups are relatively nearby, regional projects can be cost-prohibitive due to long transmission distances.

## 11.4 Conclusion

Overall, the 2021 Region F Water Plan has changed in various ways from the 2016 Region F Water Plan. Surface water supplies are slightly lower due to changes to the finalized Water Availability Model for existing supplies and extended hydrology for the subordination strategy. Groundwater supplies increased significantly due to the Joint Planning Efforts with the GMAs, resulting in higher MAG values and less artificial shortages. These increases in groundwater availability coupled with lower overall demands in the region resulted in the reduction or removal of needs for water users across the region. The region removed 48 strategies and added 17 strategies, resulting in a net decrease of 30 strategies in the 2021 plan.