

REGION H

Water Planning Group



2021 REGIONAL WATER PLAN

VOLUME 1

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Prepared for:
Texas Water Development Board

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ES – Executive Summary

ES.1 INTRODUCTION

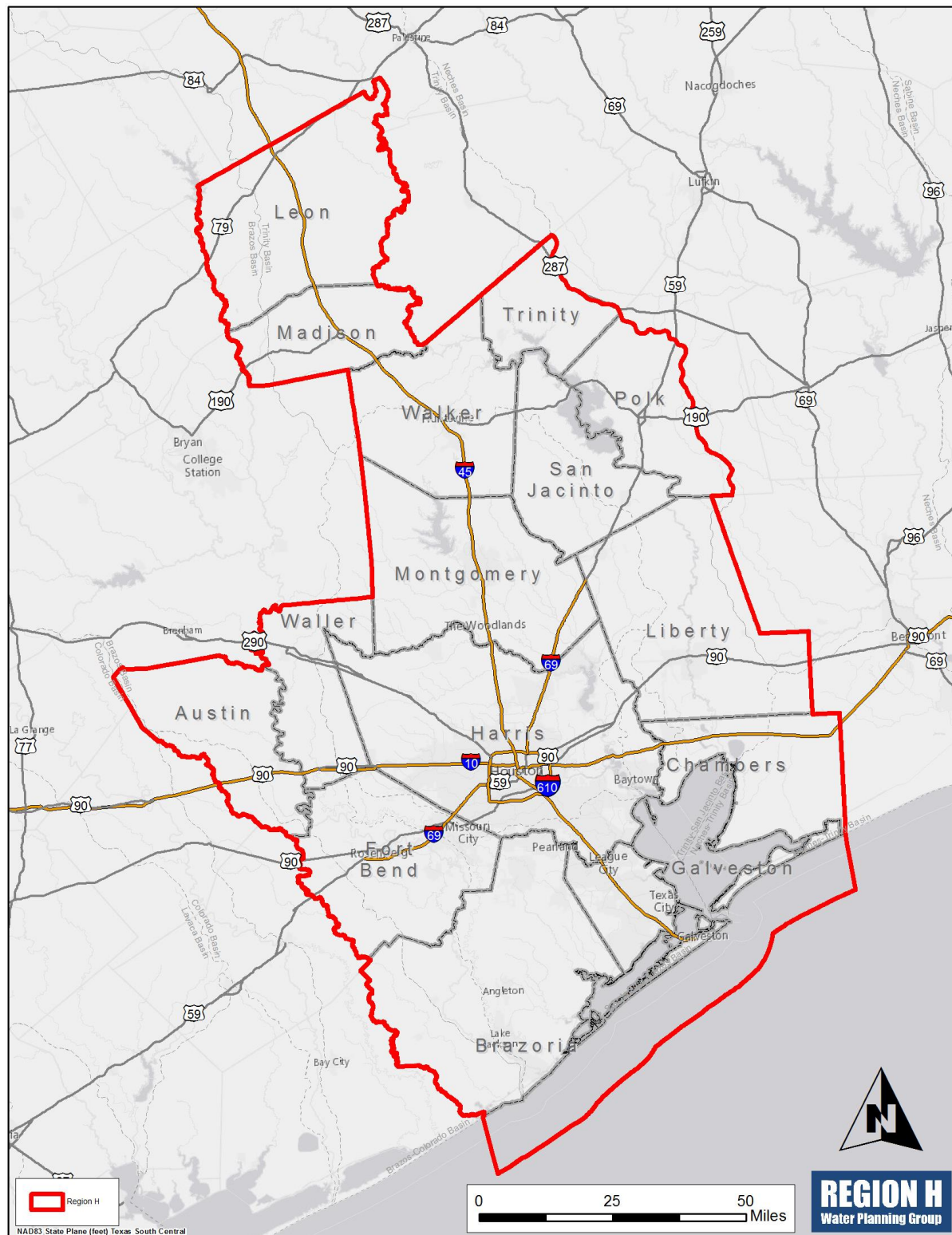
In 1997 the State Legislature, through Senate Bill 1, determined that a Texas State Water Plan for the 2000 to 2050 timeframe would be developed through a regional water planning approach. To accomplish this task, the Texas Water Development Board (TWDB) divided the state into 16 regional water planning areas and appointed representational Regional Water Planning Groups (RWPGs) that have guided the development of each region's plan. In 2001, a new set of rules and guidelines from TWDB were enacted through Senate Bill 2. The 2002 State Water Plan received enormous public involvement compared to previous plans. The planning process is cyclic, with updated Regional Water Plans (RWPs) and State Water Plans (SWPs) being produced every five years. The 2016 Region H Water Plan and the 2017 State Water Plan were created during the fourth planning cycle and are now being updated as part of the fifth round of regional planning.

Region H encompasses all or part of fifteen counties in southeast Texas and includes the majority of the San Jacinto River Basin and the lower reaches of the Brazos and Trinity River Basins. A location map showing the regional boundaries is included in *Figure ES-1*. The Region H Water Planning Group (RHWPG) consists of 26 voting and 10 non-voting members that represent a diverse range of backgrounds and interests. Additional information about Region H and the RHWPG can be found in **Chapter 1** of the 2021 RWP and on the Region H Water website, <http://www.regionhwater.org>. Regional water planning is conducted under the oversight of TWDB. Information on regional water planning and the State Water Plan can be found at the TWDB website, <http://www.twdb.texas.gov>.

Region H is an economic powerhouse crucial to the Texas and national economies. Adequate water supplies are essential to continued economic health and to the region's future growth. Two thirds of all U.S. petrochemical production and almost a third of the nation's petroleum industries are located in Region H. The area provides some of the state's most popular vacation spots that generate hundreds of millions of dollars in annual tourism revenues. The Port of Houston is the second busiest port in the nation. Region H is generally characterized by urbanizing land uses and broad-based economic development. In areas outside of the urban core, agriculture is a major contributor to economic activities.

Any large-scale water supply or conveyance projects will require the close cooperation of political entities in the affected areas. While municipal and county governments are most visible in Region H, there are numerous other governmental and regulatory agencies with jurisdiction over aspects of water supply development in the region. These include fifteen river and water authorities, seven groundwater-regulating entities, three councils of governments, eleven soil and water conservation districts, and hundreds of utility districts and water supply corporations that outnumber any other region in the state.

Figure ES-1 – Region H Location Map



ES.2 PROJECTED POPULATION AND WATER DEMANDS

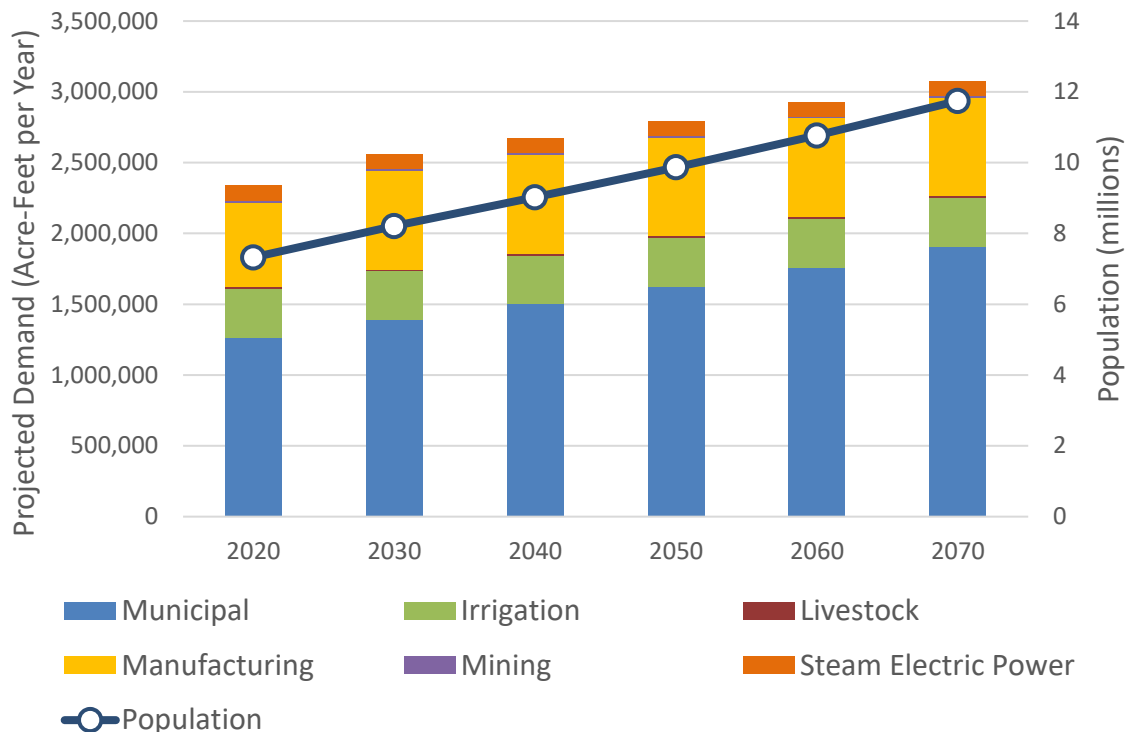
Population in Region H is projected to grow from approximately 6.8 million in 2015 to approximately 11.7 million in 2070. The almost doubling of population over the fifty-year planning period represents an annual growth rate of slightly less than one percent.

Population data are projected for each of the fifteen counties in the region and at a more refined scale for accounting units known as Water User Groups (WUGs). Defined municipal WUGs are entities serving more than 100 acre-feet per year (ac-ft/yr) for municipal use. All smaller service providers and rural/unincorporated areas of municipal and domestic water use, aggregated at the county level, are considered part of an additional WUG and are referred to as “County-Other” for each county. Within Region H, there are numerous municipal WUGs as well as fifteen County-Other WUGs, each of which are further divided by basin and county.

Population projections for Brazoria, Fort Bend, Galveston, Harris, and Montgomery Counties were developed for the 2016 RWP through an outside study to examine population growth based on the 2010 United States Census and projected on the basis of an economically driven growth model. This five-county area accounts for almost 95 percent of the region’s population. These projections were subsequently adapted by TWDB for the 2021 RWP. Population projections for other areas were developed based on a standard cohort-component methodology applied by TWDB. Population-based demands were developed from these population projections based on recorded water use information compiled by TWDB and adjusted for future adoption of passive water conservation measures. It was observed that prior to adjustment for passive conservation, the mean and median per-capita water use by municipal WUGs in the 2021 RWP are 153 and 129 gallons per-capita daily (gpcd). These values are similar to those in the 2016 RWP, for which mean and median per-capita use were 154 and 127 gpcd. This change in gpcd is more heavily influenced by the way WUGs are defined in this 2021 round of planning rather than trends in per-capita use, since both plans rely heavily upon dry-year usage trends observed in 2011.

Water use in other sectors also represents significant demands within Region H. This is most notably true for the Irrigation and Manufacturing sectors. Projections from the 2016 RWP for these demands, along with Livestock, Mining, and Steam Electric Power segments, were reviewed and amended by TWDB to generate the 2021 RWP projections based on observed historical trends in water use. Manufacturing and Steam Electric Power demand projects in the 2021 RWP are significantly lower than previous projections due to revisions to TWDB’s methodology for developing projections. During a review of the updated projections, the RHWPG noted that the required assumptions of constant Manufacturing water demand after 2030 and constant water demand for steam electric power after 2020 do not reflect the ongoing growth in these sectors in Region H. The RHWPG recommends that these trends should be revisited in the next round of planning.

Region H population and water demand projections by WUG category are shown in *Figure ES-2*. Additional information regarding the projection of population and demand can be found in **Chapter 2** of the 2021 RWP.

Figure ES-2 – Population and Water Demand Projections by WUG Category

ES.3 ANALYSIS OF CURRENT WATER SUPPLIES

The total water supply currently available to Region H from existing water sources within the region is approximately 3.35 million ac-ft/yr in 2020. Of that amount, about two-thirds is surface water. By the year 2070, the available supply will be approximately 3.13 million ac-ft/yr. The reduction in supply between 2020 and 2070 reflects restrictions on the use of the Gulf Coast Aquifer, instituted to combat subsidence in a large part of the region. Reduced reservoir yields due to sedimentation also contribute to the reduction in supply over time. The predominant sources of surface water supply are three reservoirs: Lakes Conroe and Houston within the San Jacinto River Basin and Lake Livingston within the lower Trinity River Basin.

Surface water supply for each river basin and coastal basin was determined using the Texas Commission on Environmental Quality (TCEQ) Water Availability Models (WAMs), which analyze permitted diversions against the historic rainfall record, including the drought of record period in the 1950s. In the Trinity and Brazos River Basins, limited wastewater return flows were included in the models based on expectations that full reuse would not occur during the planning period. For all other basins, the yields are based upon the no-return-flow scenario used for water rights permitting.

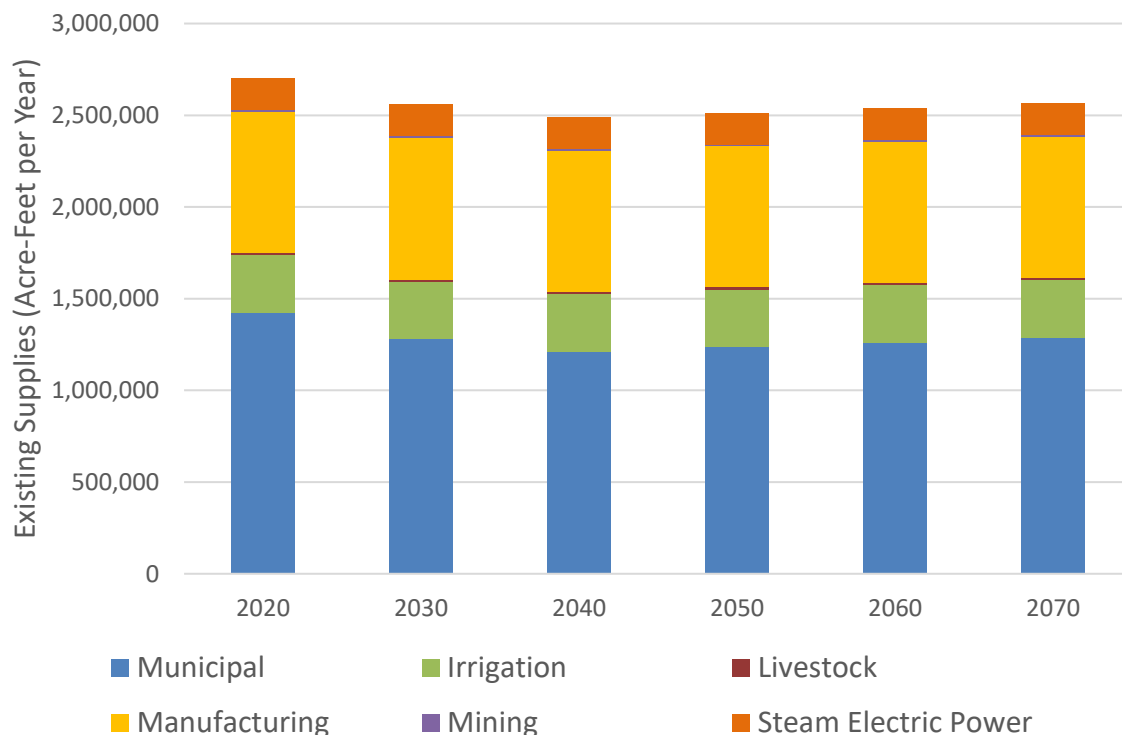
Groundwater supply projections were largely derived from estimates of Modeled Available Groundwater (MAG) that are developed as a result of the Groundwater Management Area (GMA) joint planning process. Regional planning groups are required to use these availabilities when planning for all applicable aquifer formations, but additional guidance implemented by TWDB during the 2021 planning cycle allows RWPGs to apply a peaking factor to these volumes to reconcile the differences in the GMA and regional water planning processes and better reflect management by

groundwater districts. During the development of the 2021 RWP, the RHWPG coordinated with groundwater-regulating entities in Region H and developed MAG peak factors for some of the formations in Region H.

Direct and indirect reuse of wastewater return flows accounts for a small portion of the existing supplies in Region H. These supplies were estimated based on existing levels of reuse as reported by TWDB and by individual WUGs.

A detailed analysis of the entire water supply is found in **Chapter 3** of the 2021 RWP. A summary of available water supply allocated by WUG category is provided in *Figure ES-3*.

Figure ES-3 – Existing Water Supplies by WUG Category and Decade



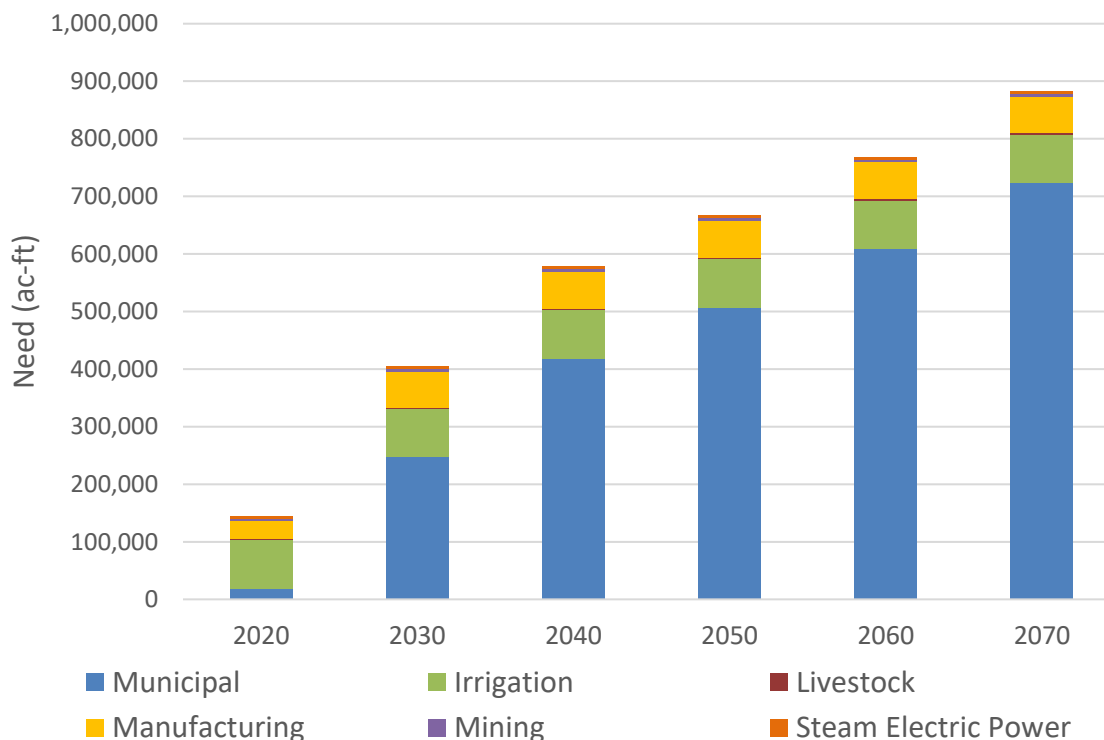
ES.4 ANALYSIS OF NEEDS

Water supplies were compared to projected water demands to determine if any areas in the region are expected to experience water shortages during the planning period. Despite substantial overall water supplies on a regional level through the year 2070, the RHWPG has identified communities and non-municipal water users that will experience water shortages during the planning period under conditions similar to the drought of record unless they take action to increase their supplies. Some of these WUGs will be able to meet their demands simply by extending or increasing existing water supply contracts.

The projected shortages identified in the year 2020 for WUGs wholly or partly within Region H totaled 145,122 acre-feet per year, increasing to as much as 883,136 acre-feet per year in the year 2070. Needs across Region H are shown by water use category in *Figure ES-4*. The projections estimate

lower needs compared to the 2016 RWP, largely due to the reduction in projected Manufacturing and Steam Electric Power demands. Needs identified in the 2021 RWP are discussed in further detail in **Chapter 4**.

Figure ES-4 – Identified Water Needs by WUG Category by Decade



ES.5 WATER MANAGEMENT STRATEGIES

State legislation and TWDB rules specify that RWPGs shall identify potentially feasible Water Management Strategies (WMS) for all WUGs and Wholesale Water Providers (WWPs) with future water supply needs. As a growing region with expanding populations and increasing economic development, Region H projects substantial needs over the 2020–2070 planning horizon. In order to address these needs, consideration was given to a wide range of data when developing recommendations for WMS and associated projects (specific infrastructure or measures used to increase or manage water supplies). Potentially feasible WMS were identified in three ways. First, strategies recommended in the 2016 Region H Water Plan for either implementation or additional study were considered. Next, new strategies were solicited during the scope development period for the 2021 RWP. Finally, entities that conducted independent strategy studies for WMS or projects that they intend to sponsor were able to bring their reports to the planning group and request that they be considered in the plan. The list of potentially feasible WMS and projects considered by the RHWP are listed in *Table ES-1*.

Table ES-1 – Region H Potentially Feasible WMS and Projects

Conservation
Advanced Municipal Conservation and Water Loss Reduction
Irrigation Conservation
Conveyance
BWA Transmission Expansion
CHCRWA Transmission and Internal Distribution
City of Houston GRP Transmission
COH, NHCRWA, and CHCRWA Shared Transmission
CWA Transmission Expansion
East Texas Transfer
GCWA Industrial Raw Water Line
Lake Livingston to SJRA Transfer
LNVA Neches-Trinity Basin Interconnect
NFBWA Phase 2 Distribution Segments
NHCRWA Distribution Expansion
NHCRWA Transmission Lines
Southeast Transmission Line Improvements
Surfside Beach Supply Infrastructure
WHCRWA Distribution Expansion
WHCRWA/NFBWA Transmission Line
Groundwater Development
Aquifer Storage and Recovery
Brackish Groundwater Development and Groundwater Blending
BWA Brackish Groundwater Development
City of Houston Area 2 Groundwater Infrastructure
Expanded Use of Groundwater
Forestar Houston County Project
Forestar Liberty County Project
GCWA Backup Well Development
Groveton Groundwater Expansion
SJRA Catahoula Aquifer Supplies
Groundwater Reduction Plans
CHCRWA GRP
City of Houston GRP
City of Missouri City GRP
City of Richmond GRP
City of Rosenberg GRP
City of Sugar Land IWRP
Fort Bend County MUD 25 GRP
Fort Bend County WC&ID No. 2 GRP
Montgomery County MUDs 8 and 9 GRP

NFBWA GRP
NHCRWA GRP
Porter SUD Joint GRP
River Plantation and East Plantation Joint GRP
SJRA GRP
WHCRWA GRP

Reuse

City of Houston Reuse
City of Pearland Reuse
Galveston County Industrial Reuse
NFBWA Member District Reuse
NHCRWA Member District Reuse
San Jacinto Basin Regional Return Flows
Wastewater Reclamation for Industry
Wastewater Reclamation for Municipal Irrigation
Westwood Shores MUD Reuse

Surface Water Development

Allens Creek Reservoir
BRA System Operation Permit
Dow Reservoir and Pump Station Expansion
Freeport Seawater Desalination
Lake Somerville Augmentation
Lone Star Lake
Manvel Supply Expansion
NRG Cedar Bayou Desalination

Treatment

BWA Conventional Treatment Expansion
City of Houston Treatment Expansion
City of Houston West Water Purification Plant
GCWA Western Galveston County Treatment Expansion
Northeast Water Purification Plant Expansion
Pearland Surface Water Treatment Plant
SEWPP Additional Module

Other

Brazos Saltwater Barrier
GCWA Shannon Pump Station Expansion
Municipal Drought Management
New and Expanded Contracts

Depending on the information available, Region H may adapt data directly from detailed studies developed by project sponsors or develop a high-level analysis of a concept for inclusion in the RWP. In other cases, Region H has performed more in-depth planning studies to evaluate the potential of projects that may yield great regional benefits to water supply. The evaluation of each potentially

feasible WMS included assessments of supply quantity and reliability, cost, and impacts to cultural and environmental resources. WMS evaluation and selection for recommendation also incorporated a dual-phased selection process, with one phase focused on the applicability of a WMS or project to the needs of individual WUGs and the other phase focused on evaluating a set of criteria applied to the overall WMS or associated projects.

Due to the extensive geographic area within Region H and the diverse nature of demands, a variety of WMS were recommended to meet needs including but not limited to the following approaches:

- water conservation,
- development of conveyance infrastructure and contracts to more fully utilize existing supplies,
- development of groundwater resources within areas with sufficient groundwater availability,
- reuse,
- development of new surface water supplies,
- development of treatment infrastructure.

Needs remaining after the application of conservation and direct reuse WMS are known as second tier needs. These needs are shown in *Figure ES-5*. A summary of source allocations and remaining unallocated volumes is shown in *Table ES-2*. *Table ES-3* summarizes the key projects selected as part of recommended WMS along with their total potential yield, capital cost, and decade of implementation. The evaluation and recommendation of WMS and projects in the 2021 RWP are discussed in further detail in **Chapter 5**.

Figure ES-5 – Second Tier Needs After Application of Conservation and Direct Reuse WMS

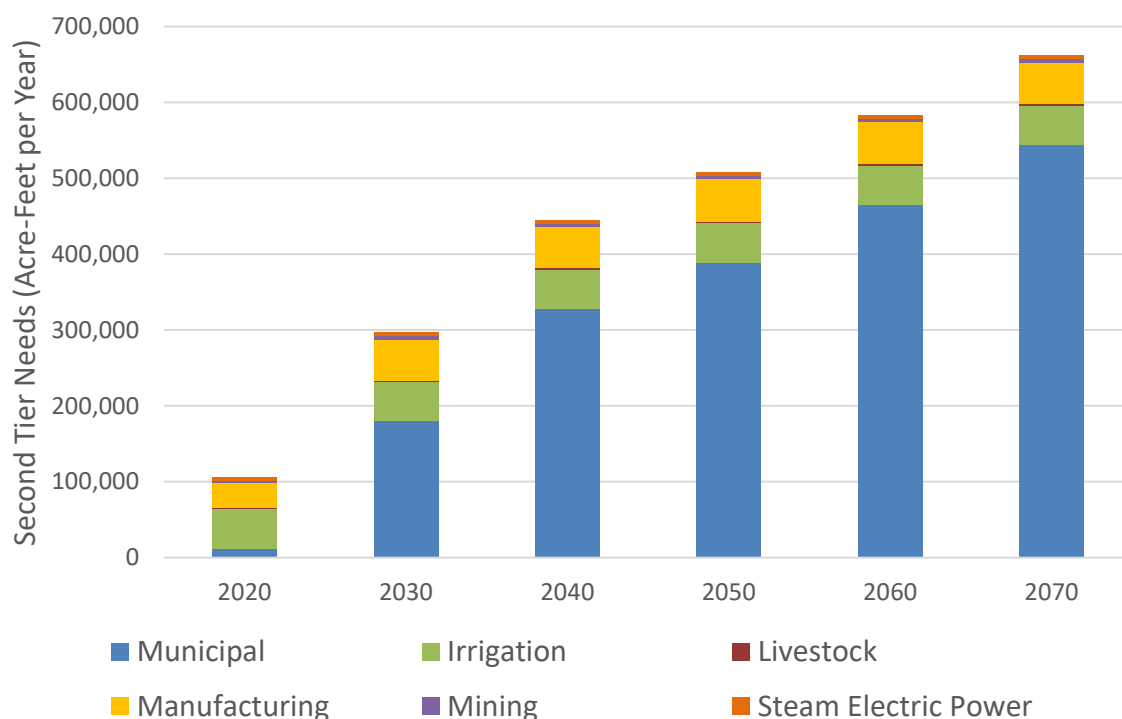


Table ES-2 – Source Water Balance Summary

Source Type	2070 Existing and Future Allocations (ac ft)	2070 Unallocated Source Balance (ac ft)
Reservoirs		
Allens Creek Reservoir	99,650	0
Dow Harris Reservoir Expansion	80,000	0
Lake Conroe	75,600	0
Lake Houston	156,400	0
Lake Livingston-Wallisville Saltwater Barrier System	1,275,900	0
Manvel Mustang Bayou Reservoir	902	0
Other Surface Water		
Gulf of Mexico Saline	11,200	0
Brazos Run-Of-River	461,130	0
Brazos-Colorado Run-Of-River	11,729	0
Neches Run-Of-River	0	176
Neches-Trinity Run-Of-River	37,474	7
San Jacinto Run-Of-River	12,618	9
San Jacinto-Brazos Run-Of-River	38,827	0
Trinity Run-Of-River	137,250	1
Trinity-San Jacinto Run-Of-River	5,537	0
Trinity-San Jacinto Run-Of-River (Saline)	22,400	0
Groundwater		
Gulf Coast Aquifer ASR	9,426	0
Brazos River Alluvium Aquifer	0	19,971
Carrizo-Wilcox Aquifer	9,261	10,505
Gulf Coast Aquifer System	732,732	102,248
Queen City Aquifer	677	526
San Bernard River Alluvium Aquifer	0	520
San Jacinto River Alluvium Aquifer	0	1,450
Sparta Aquifer	3,491	2,810
Trinity River Alluvium Aquifer	0	3,913
Yegua-Jackson Aquifer	2,874	4,301
Reuse		
Direct Reuse	75,622	0
San Jacinto Regional Return Flows	119,673	0
San Jacinto COH Reuse	242,554	0
Indirect Reuse, Houston	5,147	0
Indirect Reuse, Huntsville	2,240	0
Indirect Reuse, Montgomery County MUDs 8 And 9	697	0
Indirect Reuse, SJRA	11,939	0
Indirect Reuse, SJRA And Conroe	8,834	0

Source Type	2070 Existing and Future Allocations (ac ft)	2070 Unallocated Source Balance (ac ft)
Indirect Reuse, The Woodlands	438	0
Conservation		
Irrigation Conservation	93,562	0
Municipal Conservation	124,573	0
Water Loss Reduction	62,601	0

Table ES-3 – Key Project Overview

Project	Potential Volume ¹ (ac ft)	Capital Cost (\$)	Unit Cost (\$/ac ft)		Start Decade
			Start Decade	2070	
Conservation ²					
Irrigation Conservation	93,562	\$1,489,156	\$133	\$131	2020
Municipal Conservation (Advanced Conservation)	123,251	\$2,211,236,519	\$754	\$591	2020
Municipal Conservation (Water Loss Reduction)	62,601	\$891,822,048	\$625	\$578	2020
Conveyance					
BWA Transmission Expansion	26,211	\$77,755,692	\$248	\$39	2030
CHCRWA Transmission and Internal Distribution	5,466	\$17,202,167	\$238	\$16	2030
City of Houston GRP Transmission	27,216	\$31,986,905	\$91	\$8	2030
COH, NHRWA, and CHCRWA Shared Transmission	154,575	\$545,329,786	\$282	\$24	2030
CWA Transmission Expansion	349,785	\$119,336,981	\$43	\$19	2040
East Texas Transfer	250,000	\$458,840,377	\$146	\$17	2050
GCWA Industrial Raw Water Line	33,600	\$45,110,104	\$104	\$9	2020
Lake Livingston to SJRA Transfer	50,000	\$245,492,975	\$437	\$92	2050
LNVA Neches-Trinity Basin Interconnect	67,000	\$103,316,000	\$135	\$27	2040
NFBWA Phase 2 Distribution Segments	62,496	\$83,859,522	\$104	\$9	2030
NHRWA Distribution Expansion	143,360	\$919,703,916	\$489	\$44	2030
NHRWA Transmission Lines	143,360	\$327,910,960	\$185	\$24	2030
Southeast Transmission Line Improvements	39,928	\$119,413,067	\$229	\$19	2030
Surfside Beach Supply Infrastructure	323	\$1,900,440	\$450	\$36	2020
WHCRWA Distribution Expansion	92,288	\$276,977,822	\$237	\$26	2030
WHCRWA/NFBWA Transmission Line	169,030	\$1,310,701,901	\$613	\$67	2030
Groundwater Development					
Aquifer Storage and Recovery	9,426	\$222,907,186	\$2,551	\$2,551	2070
Brackish Groundwater Development ³	Varies	Varies by project	Varies by WUG	Varies by WUG	2020
BWA Brackish Groundwater Development	3,136	\$33,246,167	\$579	\$370	2030
City of Houston Area 2 Groundwater Infrastructure	50,400	\$122,751,076	\$403	\$222	2030
Expanded Use of Groundwater ³	31,000+	Varies by WUG	Varies by WUG	Varies by WUG	2020

Project	Potential Volume ¹ (ac ft)	Capital Cost (\$)	Unit Cost (\$/ac ft)		Start Decade
			Start Decade	2070	
GCWA Backup Well Development	1,120	\$1,346,492	\$169	\$84	2040
Groveton Groundwater Expansion	242	\$2,211,952	\$699	\$56	2020
SJRA Catahoula Aquifer Supplies	10,500	\$18,200,411	\$479	\$358	2040
Groundwater Reduction Plans					
CHCRWA GRP ⁴	5,466	\$0	\$0	\$0	2030
City of Houston GRP ⁴	124,914	\$0	\$0	\$0	2020
City of Missouri City GRP	25,760	\$87,837,323	\$405	\$165	2030
City of Richmond GRP	7,178	\$70,936,844	\$1,108	\$285	2020
City of Rosenberg GRP	3,920	\$12,963,110	\$261	\$29	2030
City of Sugar Land IWRP	15,492	\$133,134,039	\$1,210	\$390	2030
Fort Bend County MUD 25 GRP	1,120	\$26,718,250	\$2,541	\$862	2030
Fort Bend County WC&ID No. 2 GRP	6,720	\$63,535,966	\$1,106	\$440	2030
Montgomery County MUDs #8 and #9 GRP	2,240	\$30,510,375	\$1,875	\$917	2020
NFBWA GRP ⁴	62,496	\$0	\$0	\$0	2030
NHCRWA GRP ⁴	143,360	\$0	\$0	\$0	2030
Porter SUD Joint GRP	2,240	\$26,862,532	\$1,542	\$699	2020
River Plantation and East Plantation Joint GRP ⁵	51	\$0	\$0	\$0	2030
SJRA GRP	100,000	\$998,910,850	\$697	\$340	2030
WHCRWA GRP ⁴	92,288	\$0	\$0	\$0	2030
Reuse					
City of Houston Reuse	242,554	\$555,093,731	\$373	\$139	2040
City of Pearland Reuse	1,154	\$12,648,000	\$913	\$142	2030
Galveston County Industrial Reuse	22,400	\$90,746,960	\$564	\$279	2030
NFBWA Member District Reuse	3,816	\$46,640,088	\$1,695	\$835	2020
NHCRWA Member District Reuse	300	\$4,295,775	\$1,913	\$905	2020
San Jacinto Basin Regional Return Flows ⁴	119,673	\$0	\$0	\$0	2020
Wastewater Reclamation for Municipal Irrigation	19,776	\$181,028,437	\$1,308	\$896	2030
Westwood Shores MUD Reuse	150	\$2,031,251	\$1,921	\$968	2020
Surface Water Development					
Allens Creek Reservoir	99,650	\$365,446,301	\$211	\$39	2040
BRA System Operation Permit ⁴	78,276	\$0	\$0	\$0	2020
Dow Reservoir and Pump Station Expansion	80,000	350,000,000	\$373	\$66	2030
Freeport Seawater Desalination	11,200	155,877,822	\$2,273	\$1,293	2040
Manvel Supply Expansion	15,680	\$269,052,608	\$1,488	\$309	2030
NRG Cedar Bayou Desalination	22,400	\$342,840,391	\$2,637	\$1,560	2030
Treatment					
BWA Conventional Treatment Expansion	8,400	\$19,085,165	\$351	\$191	2030
City of Houston Treatment Expansion ⁴	89,396	\$0	\$0	\$0	2040
City of Houston West Water Purification Plant	103,385	\$959,257,534	\$1,418	\$407	2040
GCWA Western Galveston County Treatment Expansion	22,400	\$167,919,105	\$894	\$367	2030

Project	Potential Volume ¹ (ac ft)	Capital Cost (\$)	Unit Cost (\$/ac ft)		Start Decade
			Start Decade	2070	
Northeast Water Purification Plant Expansion	448,000	\$2,179,413,588	\$615	\$272	2030
Pearland Surface Water Treatment Plant	22,400	\$232,787,093	\$973	\$242	2030
SEWPP Additional Module	22,400	\$97,597,266	\$497	\$191	2030
Other Infrastructure					
Brazos Saltwater Barrier	10,000	\$67,552,043	\$517	\$42	2040
GCWA Shannon Pump Station Expansion	162,400	\$65,801,381	\$35	\$7	2030

1. Volumes listed in this table represent the maximum anticipated volume associated with the projects rather than new increments of yield. Volumes shown in this table may overlap and are not necessarily additive.
2. It should be noted costs for municipal water conservation programs represent a total cost for offsetting a unit volume of water at the point of delivery. A number of strategies require multiple projects or project components (source generation, treatment, transmission, etc.) working in conjunction to meet needs at points of use. Therefore, the additive nature of these costs must be considered when they are compared with and contrasted against conservation programs.
3. Includes brackish groundwater projects implemented under Expanded Use of Groundwater. Costs vary by WUG.
4. Costs, including construction costs, engineering, legal, and permitting fees, land acquisition, and other capital costs, are included under associated infrastructure projects.
5. Supply generated through expanded use of existing infrastructure. Cost estimated to be minimal.

Following the application of WMS and key projects, some identified needs were found to remain. Under drought of record conditions, it was determined that needs would persist in the Irrigation and Livestock demand sectors within some areas of Region H without the availability of an interruptible water supply to provide a low-cost option for meeting demands. These sectors are particularly sensitive to the cost of water and are also unable to easily develop long-term contracts for water on the firm yield basis that is required for development of water supply projects in the RWP. Each of these sectors will continue to rely on low-cost, interruptible supplies of water as well as local supplies and a balance of groundwater and surface water resources when they are available. However, according to the guidelines for RWP development, these supplies are not permissible for planning purposes and may not be shown in the RWP. For this reason, the needs identified in *Table ES-4* are shown as unmet although, in reality, cost-effective solutions exist that may provide water to these demands. The development of firm yield projects within the RWP may also provide additional interruptible supplies to meet these demands in most, if not all, years.

Table ES-4 – Remaining Unmet Needs

WUG Name	County	Basin	Unmet Needs (ac ft)					
			2020	2030	2040	2050	2060	2070
Irrigation	Brazoria	SJ-B	38,229	38,229	38,229	38,229	38,229	38,229
	Chambers	T	4,695	4,695	4,695	4,695	4,695	4,695
		T-SJ	1,616	1,616	1,616	1,616	1,616	1,616
	Galveston	SJ-B	2,765	2,765	2,765	2,765	2,765	2,765
Livestock	Brazoria	B-C	0	0	0	0	0	8
	Galveston	N-T	53	53	53	53	53	53
		SJ-B	184	184	184	184	184	184
	Harris	SJ	383	766	1,022	1,022	1,022	1,022
		T-SJ	101	101	101	101	101	101

N-T = Neches-Trinity, T = Trinity, T-SJ = Trinity-San Jacinto, SJ = San Jacinto, SJ-B = San Jacinto-Brazos, B-C = Brazos-Colorado

ES.5.1 Conservation Recommendations

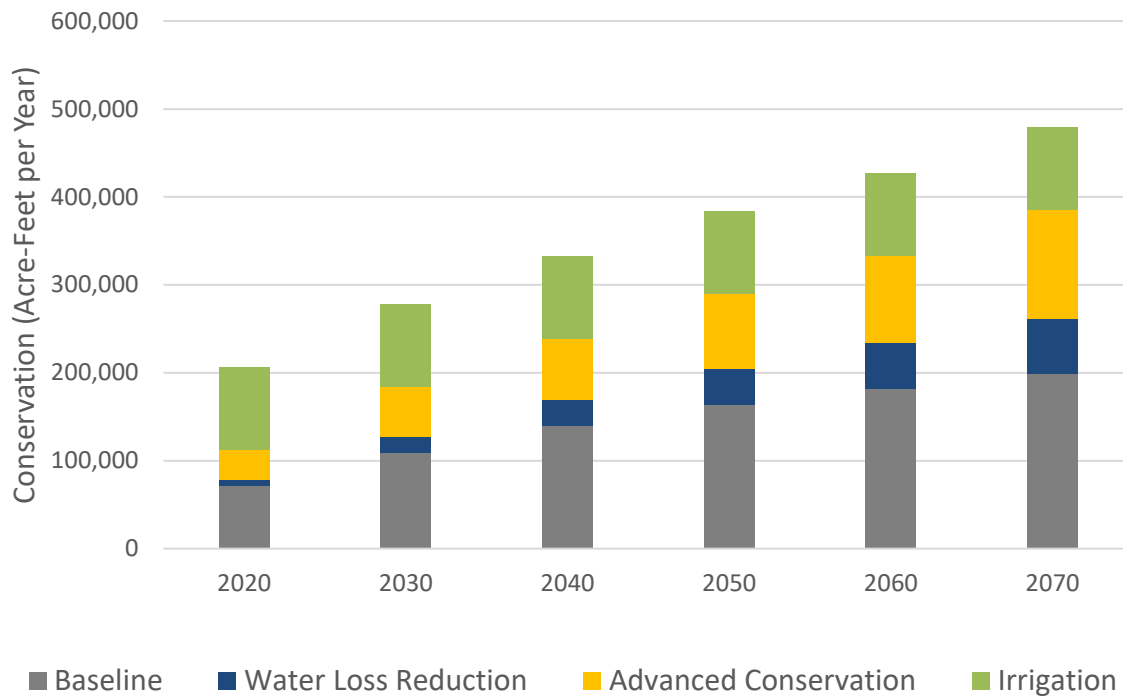
Water conservation plays an important role in meeting future water needs across the State of Texas. Because of this, TWDB guidance requires that RWPs dedicate a subchapter of **Chapter 5** to conservation recommendations for each region. This section contains information related, not only to the importance of water conservation implementation, but also to its challenges within Region H and the state as a whole.

Current conservation efforts were evaluated for the region based on the conservation plans developed by individual water utilities. This analysis demonstrated that Region H focuses much of its conservation resources toward outreach, conservation-oriented rate structures, water system audits, and leak detection and repair.

Water conservation recommendations in the 2021 RWP are based on conservation measures and associated estimated water savings included in the TWDB Municipal Water Conservation Planning Tool (MWCPT). The RHWPG has recommended varying levels of outdoor residential conservation and other measures for nearly all municipal WUGs based on the demand profiles of individual WUGs. Long-term projections for savings attributed to municipal conservation programs were combined with estimates of potential savings related to water loss reduction to provide a comprehensive water conservation program for WUGs in Region H.

Conservation was also applied to Irrigation demands. Region H recommends both on-farm and off-farm measures based on an evaluation of the extent of existing conservation measures in order to prevent overestimation of potential savings. Irrigation conservation practices provide significant potential water savings due to the magnitude of these demands in Region H.

The comprehensive water conservation applied in the 2021 RWP is summarized in *Figure ES-6*. Additional information related to conservation can be found in **Chapter 5** and **Chapter 5B**.

Figure ES-6 – Total Region H 2021 RWP Conservation

ES.6 IMPACTS OF THE REGIONAL WATER PLAN

Both surface water and groundwater in Region H are generally of good quality and can be used with conventional treatment only. Advanced treatment measures are recommended to develop direct wastewater reuse projects and the utilization of non-traditional water supplies such as brackish groundwater. The management strategies recommended in the plan are not anticipated to directly affect water quality in most basins, although the reduction of instream flows due to full use of water rights may indirectly increase the concentration of some contaminants (by reducing the overall volume of water). However, plan development was guided by the principle that the designated water quality and related water uses as shown in the state water quality management plan shall be improved or maintained. The Brazos Saltwater Barrier is specifically recommended to improve water quality in the lower Brazos Basin by preventing seawater from migrating upstream during periods of low flows. The transfer of water to the San Jacinto River Authority (SJRA) from Trinity River supplies will introduce Trinity River water into the San Jacinto River Basin. It should be noted that Trinity River water is currently transferred into Harris County via other conveyances. Similarly, the East Texas Transfer will also introduce water from basins as far east as the Sabine River into western basins on a path toward the Houston area. The reuse of wastewater and other treatment projects will produce a brine concentrate, which must be judiciously discharged to prevent adverse environmental impacts.

Agricultural areas in Region H are generally served by a combination of groundwater and surface water supplies depending primarily on the location of use and the application. Groundwater use is not projected to change during the planning period. Surface water used for irrigation is typically contracted on a year-to-year basis and often originates from supplies that are not firm during the drought of record. The RHWPG recognizes the sensitivity of agriculture to the availability of less

expensive water supplies that are not available on a regular basis during drought-of-record conditions. Although these supplies cannot be used in the RWP per planning guidance, these interruptible supplies will continue to be an important resource in meeting the needs of irrigation users in Region H.

The management strategies recommended in this plan will fully utilize, to the extent applicable to projected needs, the currently available water rights in all basins. Many projects in the plan will require some environmental mitigation due to habitat impacts. However, the plan strives to identify the most feasible projects from standpoints of economics and sustainability. The recommended reuse of wastewater will further reduce instream flows, particularly during drought conditions. Some of this reduction will be mitigated by an overall increase in wastewater discharges beyond the current level and the reduction in need for developing new raw water supplies.

Groundwater use in the region is projected to increase within the sustainable yield of the aquifers or the regulated withdrawal cap, as applicable. The export of groundwater from its county of origin is not recommended in this plan.

Additional information related to impacts of the plan can be found in **Chapter 6** of the RWP.

ES.7 DROUGHT RESPONSE

Drought is the primary driver behind water planning in Texas, and the historical drought of record serves as the fundamental basis for evaluating the supplies and needs in the development of each RWP. As specified in TWDB guidance for RWP development, the 2021 RWP includes material related to preparation for and response to drought conditions.

The drought of record in Region H has consistently been the drought of the 1950s. Although recent dry years have eclipsed the severity of the 1950s drought for short periods of time, the long-term severity of the 1950s drought has, so far, not been exceeded. Current drought contingency plans for surface water supplies in Region H have used the 1950s drought as a basis for assigning triggers and responses to drought conditions. The RHWPG recommends adoption of the triggers and responses prescribed by project owners and sponsors for management of surface water supplies such as reservoirs. For groundwater supplies, identification of drought conditions generally requires evaluation of other factors in order to recognize and respond to drought. For these supplies, Region H recommends that water providers regularly review the Palmer Drought Severity Index (PDSI) as a basis for recognizing drought conditions and taking appropriate measures to respond.

Some drought conditions are of such a severity that they pose risks to life, safety, and the economy. This is particularly true for small water systems that have limited sources of water currently connected, as well as for rural communities that are distant from alternative supplies that may serve to meet needs during emergency conditions. As part of the evaluation of drought responses, Region H proposed a number of emergency measures for these utilities to consider, should drought conditions deem emergency response necessary. These measures include, where viable, the use of additional surface water supplies, development of additional local groundwater or brackish groundwater, or utilization of existing or potential interconnections with neighboring systems. It should be noted that these approaches may become necessary during either hydrologic drought periods or emergency conditions brought about by failure of water source or infrastructure.

Additional information related to drought response can be found in **Chapter 7** of the RWP.

ES.8 UNIQUE STREAM SEGMENTS, RESERVOIR SITES, AND OTHER RECOMMENDATIONS

The Texas Water Code guides the RWPGs to adopt recommendations on Unique Stream Segments, Unique Reservoir Sites, and legislative policy. **Chapter 8** of the 2021 RWP describes these recommendations in depth, and a summary is provided below.

ES.8.1 Unique Stream Segments

The Texas Water Code offers the opportunity for RWPGs to identify river and stream segments of unique ecological value. Stream segments designated by the Legislature as having unique ecological value cannot be developed as reservoir sites by the State or any political subdivision of the State. Based on the information provided in past RWPs, the RHWPG elected to retain the unique designations for the eight segments designated by the Texas Legislature based on prior consideration and review. These segments are listed in *Table ES-5*. No additional segments were nominated for designation in the 2021 RWP. Additional information is contained in **Chapter 8**.

Table ES-5 – Recommended Unique Stream Segments

Stream Segment	County
Armand Bayou	Harris
Austin Bayou	Brazoria
Bastrop Bayou	Brazoria
Big Creek	Fort Bend
Big Creek	San Jacinto
Cedar Creek Lake	Brazoria
Menard Creek	Liberty and Polk
Oyster Bayou	Chambers

ES.8.2 Unique Reservoir Sites

The Texas Water Code also offers an opportunity for RWPGs to designate sites of unique value for use as surface water supply reservoirs. Designation by the Legislature as a unique reservoir site prevents the State from constructing major infrastructure (such as major highways) within the project limits. Through use of a decision-based water management strategy analysis and selection process, the RHWPG selected two major reservoir projects for meeting needs in the 2021 RWP: Allens Creek Reservoir and the Dow Expansion to Harris Reservoir. Region H chose to select Allens Creek Reservoir as a recommendation for any future reaffirmation of Unique Reservoir Sites. This site is described below in *Table ES-6*. Additional information is contained in **Chapter 8**.

Table ES-6 – Recommended Unique Reservoir Sites

Name	County	General Location
Allens Creek	Austin	1 mile north of the City of Wallis

ES.8.3 Regulatory, Administrative, and Legislative Recommendations

Guidance for regional water planning specifies that RWPGs may develop and include in the RWP regulatory, administrative, and legislative recommendations. These recommendations are addressed to each governmental agency that has the appropriate jurisdiction over each subject. It is generally assumed that regulatory recommendations are directed toward TCEQ, that administrative recommendations are directed toward TWDB, and that legislative recommendations are directed toward the State of Texas Legislature.

The RHWPG has adopted the following regulatory, administrative, and legislative recommendations:

Regulatory and Administrative Recommendations

- The Region H Water Planning Group recommends that the TWDB determines, in conjunction with the TCEQ and TPWD, which specific environmental studies and analysis are required for each category of management strategy (i.e., new water right, new reservoir, etc.). Furthermore, the guidance should be added to the Planning Guidelines, so that Regional Water Planning Groups can reflect the cost of those requirements in their budgets and scopes of work. Adding environmental guidelines will also make water plans consistent across the state.
- The Region H Water Planning Group recommends that the TPWD, in cooperation with TWDB and the Regional Water Planning Groups, develop an updated analysis of ecologically significant river and stream segments, including identification of river and stream segments of unique ecological value.
- The Region H Water Planning Group recommends that TCEQ continue routine updates to Water Availability Models across the state based on a prioritized methodology based on observed climate conditions and the overall limitation on water resources in each basin. This may be prescribed in future rulemaking. Furthermore, these rules should require that the most recent model for each basin be made available through the TCEQ website for use by both the RWPGs and the public.
- Provide for additional opportunities for Groundwater Management Areas and Regional Water Planning Groups to align their planning through rules that recognize the inherent differences of these processes and account for the timing of the methodologies so that changes in groundwater management can be reflected in the Regional Water Plans.
- Work with water utilities and planners to identify the limitations of current planning approaches regarding OneWater management and how these programs may best be reflected in regional plans. This will have the added benefit of promoting these options for comprehensive water management.

Legislative Recommendations

- The Region H Water Planning Group recommends that the Legislature remove the unnecessary and counterproductive barriers to interbasin transfers that exist in current law.
- The Region H Water Planning Group recommends establishment of additional and dedicated funding to pursue necessary future efforts of the state's bay and estuary programs.
- The Region H Water Planning Group supports continued usage of the Rule of Capture as the basis of groundwater law throughout the State of Texas except as modified through creation of certified groundwater conservation districts.

- The Region H Water Planning Group supports creation of groundwater conservation districts, as necessary, by local subarea water interests. These districts provide a unique opportunity for balancing local management with regional planning through the joint planning exercises of Groundwater Management Areas.
- The Region H Water Planning Group wishes to recognize the Legislature's efforts in implementing the SWIFT program and also supports ongoing and expanded support for financing methods by the State of Texas for development of water supply projects recommended within adopted Regional Water Plans.
- The Region H Water Planning Group supports continued funding for the Groundwater Availability Modeling effort and recommends comprehensive analysis of all groundwater resources within the state.
- The Region H Water Planning Group supports funding of research and development studies associated with the efficient usage of irrigation technologies and practices.
- The Region H Water Planning Group supports water conservation and recommends that the Legislature continue to address and improve water conservation activities in the state. In addition, the RHWPG recommends the State consider improvements to statewide efforts and messaging regarding the importance of water conservation.
- The Region H Water Planning Group recommends that the State fund research into advanced conservation technologies.
- The Region H Water Planning Group recommends that the State consider legislation clarifying the liability exposure of reservoir operators for passing storm flows through water supply reservoirs.
- The Region H Water Planning Group recommends that the State direct the State Demographer's office to explore the potential changes in population distribution made possible by rapid advancements in information technology.
- The Region H Water Planning Group recommends that the TWDB request additional and adequate funding and the adoption of the appropriate administrative procedures from the Legislature to facilitate ongoing activities of the RWPGs. Funding should be made available throughout the entirety of the planning cycle without funding gaps that make it difficult for planning groups to accomplish their ongoing efforts.

Infrastructure Financing Recommendations

- The Region H Water Planning Group recommends increasing the funding of the State Revolving Funds Program in future decades and expand the program to include coverage for system capacity increases to meet projected growth for communities.
- Provide a mechanism to leverage federal grant programs for agriculture by providing the local matching share. Increase funding of associated loan programs and consider adding a one-time grant or subsidy component to stimulate early adoption of conservation practices by individual irrigators. Provide opportunities for joint cooperation between growers and landowners to facilitate the use of funding programs for property under long-term lease agreements.
- The Region H Water Planning Group recommends continued state and federal support of the Texas Community Development Program and increase the allocation of funds for the Small Town Environment Program.

- The Region H Water Planning Group recommends continued support and increased funding of Water and Waste Disposal Loans and Grants from USDA Rural Utilities Service at the federal level.
- Provide technical assistance grants for the advancement of desalination water supplies and implementation of new desalination technologies available to wholesale and retail water suppliers. Provide resources for identification and feasibility assessment of opportunities for aquifer storage and recovery projects. Continue to fund appropriate demonstration facilities to develop a customer base and pursue federal funding for desalination programs.
- Region H supports the forming of regional partnerships and encourages the State to allow them the greatest possible latitude for financing in their governing regulations. Additionally, funding opportunities should be made available to these public/private partnerships and to private nonprofit water supply corporations.

Additional information is contained in **Chapter 8**.

ES.9 REPORTING OF FINANCING MECHANISMS FOR WATER MANAGEMENT STRATEGIES

Approximately \$20.1 billion in capital costs were identified for meeting needs throughout the planning period. These capital costs primarily represent infrastructure (wells, pump stations, treatment facilities, transmission mains, etc.) required to implement water management strategies at the WWP and WUG levels. This total capital cost does not include the annual costs such as debt service associated with the new projects. Additionally, these costs do not represent improvements that will be required within individual WUGs' water supply systems for providing adequate water supply.

With the assistance of the RHWPG, TWDB conducted a survey of water utilities related to the anticipated cost of infrastructure and approaches to fund these projects. Anticipated costs developed as part of the RWP were submitted to WUGs in order to determine their interest in pursuing one or more of the financial assistance programs offered by TWDB. Survey responses were returned by 22 sponsors (approximately 5.9 percent) of the 375 who received the survey. The surveys captured 77 projects and approximately \$7.3 billion in identified capital projects. Results demonstrated a need for approximately \$819 million in State funding for project planning, design, permitting and acquisition costs and \$4.7 billion for construction of projects. The total anticipated need for State funding totaled \$5.5 billion, per the surveys. Additional information is contained in **Chapter 9**.

ES.10 ADOPTION OF PLAN AND PUBLIC PARTICIPATION

During the course of developing the 2021 RWP, the RHWPG conducted numerous public meetings corresponding with various phases of plan development. Details of these meetings and comments from the public and interested agencies are provided in **Chapter 10** of the RWP.

After the submittal of the Initially Prepared Plan (IPP) to TWDB, the RHWPG held a public hearing on April 23, 2020 to provide an overview of the IPP and take public comment. While no comments were received at the hearing, the RHWPG subsequently received three written comments covering a range of topics. Details of the hearing and public comments received after the submittal of the IPP are discussed in **Chapter 10**.

ES.11 IMPLEMENTATION AND COMPARISON TO THE PREVIOUS REGIONAL WATER PLAN

Guidance for the development of regional water plans requires that each RWP, beginning with the 2016 plan, include a comparison to the previous plan. As part of this comparison, RWPs should discuss the implementation of WMS and projects recommended in the previous plan, as well as the development of water demands, supplies, and strategies associated with each RWP. A detailed comparison of the 2016 and 2021 RWPs is provided in **Chapter 11**.

A number of projects in the 2016 RWP were identified as implemented, partially implemented, or in progress at the time of development of the 2021 RWP. Many of the projects currently in development are related to groundwater reduction plans (GRPs) and provide additional alternative water supplies to meet 2025 conversion requirements by subsidence districts. Numerous projects, including GRP projects and others, have received funding from TWDB to facilitate their completion.

Overall, the two plans differ slightly in relation to water demands. Municipal demands in Region H have remained relatively similar between the two RWPs with only minor differences, which are primarily attributable to the new method of delineating WUGs in the 2021 RWP. While some categories of non-population demands remained very similar to projections in the 2016 RWP, projected demands in the Manufacturing and Steam Electric Power sectors were reduced dramatically due to the new projection methodology applied by TWDB.

The estimated availability of surface water in Region H, including both reservoir and run-of-the-river supplies, has remained similar between the 2016 and 2021 RWPs. Small differences may be attributed to updated modeling assumptions in the WAMs, as well as the approval of the Brazos River Authority System Operations Permit by TCEQ, some of the yield of which is utilized within Region H. Estimates of the MAG for each aquifer and county are required for use in development of 2021 RWPs. During the previous planning cycle, Region H identified issues related to the use of these numbers related to the differences in planning approaches between regional water plans and the GMA joint planning process. This issue was addressed in the current planning cycle through the application of MAG peak factors, as well as the acknowledgment by TWDB that aquifers in Fort Bend, Harris, and Galveston Counties are not governed by the GMA process and are instead subject to subsidence district regulations. As a result of these changes, groundwater supplies in the 2021 RWP more closely align with regional planning assumptions and groundwater regulations than those in the 2016 RWP.

The identified WUG needs in the 2021 RWP are lower than those identified in the 2016 RWP, primarily due to the revised methodologies that have projected lower demands in the Manufacturing and Steam Electric Power sectors. However, needs for all non-population demand categories have been reduced, with the exception of a small increase in Steam Electric Power needs in 2020 and 2030 and retention of Mining demand projections from the 2016 RWP. Municipal needs have decreased in 2020, primarily due to the implementation of strategies recommended in the 2016 RWP. However, municipal needs have increased in all decades after 2020, which is mostly due to the changes in WUG delineation which more accurately assigns demands and available supplies to water users. The total water need in Region H in 2070 in the 2021 RWP was found to be less than the identified 2070 needs in the 2016 RWP.

In total, the RHWPG has recommended 60 WMSs and 818 projects in the 2021 RWP. This compares to 58 WMSs and 656 capital projects identified in the 2016 RWP. Allocations of WMS supplies in the

2021 RWP differ from those in the 2016 RWP for a number of reasons, including differences in projected WUG demands, establishment of new existing contracts between water providers and WUG customers, implementation of 2016 WMS as existing supplies, changes in recommended WMS, and changes to associated project schedules. A comparison of allocated WMS volume and active project count for the two plans is presented in *Figure ES-7* below.

Figure ES-7 – WMS Supply and Active Projects by Decade

