
Exhibit C

**First Amended General Guidelines for Fifth Cycle of
Regional Water Plan Development**

April 2017

This document is subject to future revision based upon any future Legislative actions.

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Background

The fifth cycle of regional and state water planning as defined by Senate Bill 1 of the 75th Texas Legislature commenced in 2015 and will extend through 2021. Regional Water Planning Groups (RWPGs) must prepare the 2021 regional water plans (RWPs) that, once approved, shall become the basis for the 2022 State Water Plan. The RWP guidance and format requirements have been updated and are intended to incorporate new statutory and rule requirements that clarify required content, make it easier for Texas Water Development Board (TWDB) to review the RWPs, and to make it easier for the public to find and understand the information contained in all 16 RWPs.

Regional water planning is based on the Texas Water Code (TWC). The principles guiding regional water planning are further detailed in provisions of Title 31 of the Texas Administrative Code (TAC), Chapters 355, 357, and 358, which apply broadly to all activities addressed in this guidance document. See the TWDB reference pamphlet: “**Statute and Administrative Rules Governing Regional Water Planning in Texas**” (effective date December 8, 2016) for all statutory and TAC references relevant to regional water planning.

Other referenced sources throughout this document provide additional guidance and clarification including the TWDB documents entitled “**Guidelines for Regional Water Planning Data Deliverables**” (Contract Exhibit D), which contains important supplementary information regarding estimating and reporting water supply availability and other data; and the TWDB “**Regional Water Planning Public Notice Quick-Reference**” (effective date December 8, 2016). Both of these references will be available at the TWDB’s website. Any future revisions to 31 TAC 355, 357, and/or 358 adopted by the TWDB may result in changes to these planning guidelines.

Purpose

These guidelines provide additional information on the required methods, content, and format of information to be contained in each RWP. The Initially Prepared Plans (IPPs) and the final adopted RWPs will be reviewed by TWDB based on statute, regional water planning rules, as well as requirements in this and all other contract documents including the Scope of Work (SOW).

The following document summarizes guidelines for developing RWPs for the current planning cycle. These guidelines include specific **shall** requirements that must be complied with by RWPGs as they prepare the RWP. This guidance includes some **may** or **consider** language that leaves certain considerations to the discretion of the RWPGs.

Included in this document are sections specifically addressing the following tasks as specified in statute and agency rules:

1. Description of the Regional Water Planning Area [**31 TAC §357.30**]
2. Projected Population and Water Demands [**31 TAC §357.31**]
3. Water Supply Analysis [**31 TAC §357.32**]
4. Needs Analysis: Comparison of Water Supplies and Demands [**31 TAC §357.33**]

5. Identification and Evaluation of Potentially Feasible Water Management Strategies and Water Management Strategy Projects [31 TAC §357.34]; Recommended Water Management Strategies and Alternative Water Management Strategy Projects [31 TAC §357.35]
6. Impacts of Regional Water Plan [31 TAC §357.40]; Consistency with Long-term Protection of Water Resources, Agricultural Resources, and Natural Resources [31 TAC §357.41]
7. Drought Response Information, Activities, and Recommendations [31 TAC §357.42]
8. Regulatory, Administrative, or Legislative Recommendations [31 TAC §357.43]
9. Infrastructure Financing Analysis [31 TAC §357.44]
10. Adoption, Submittal, and Approval of Regional Water Plans [31 TAC §357.50 and §357.21]
11. Implementation and Comparison to the Previous Regional Water Plan [31 TAC §357.45]
12. Prioritization of Projects by RWPGs [31 TAC §357.46]

This document augments existing statute and rules that govern regional water planning. **Provisions of Title 31 of TAC Chapters 355, 357, and 358 serve as the foundation for information in this document and are not superseded or abridged by anything contained within or excluded from this document.**

Definition of Terms and Acronyms¹

The terms and acronyms used in this guidance document as defined in 31 TAC §357.10 have the following meanings:

1. Agricultural Water Conservation – Defined in 31 Texas Administrative Code (TAC) §363.1302 (relating to Definition of Terms) as “those practices, techniques or technologies used in agriculture, as defined in Texas Agriculture Code, which will improve the efficiency of the use of water and further water conservation in the state, including but not limited to those programs or projects defined in Texas Water Code §§17.871 - 17.912.”
2. Alternative Water Management Strategy – A fully evaluated water management strategy that may be substituted into a regional water plan in the event that a recommended water management strategy is no longer recommended.
3. Availability – The maximum amount of raw water that could be produced by a source during a repeat of the drought of record, regardless of whether the supply is physically connected to or legally accessible by water user groups.
4. Board (or TWDB) – The Texas Water Development Board.
5. Collective Reporting Unit (CRU) – A grouping of utilities located in a regional water planning area. Utilities within a Collective Reporting Unit must have a logical relationship, such as being served by common wholesale water providers, having common sources, or other appropriate associations.
6. Commission (or TCEQ) – The Texas Commission on Environmental Quality.
7. County-Other – An aggregation of utilities that provide less than an average of 100 acre-feet per year, as well as rural areas not served by a water utility in a given county.
8. Drought Contingency Plan (DCP) – A plan required from wholesale and retail public water suppliers and irrigation districts pursuant to Texas Water Code §11.1272 (relating to Drought Contingency Plans for Certain Applicants and Water Right Holders). The plan may consist of one or more strategies for temporary supply and demand management and demand management responses to temporary and potentially recurring water supply shortages and other water supply emergencies as required by the Commission.
9. Drought Management Measures – Demand management activities to be implemented during drought that may be evaluated and included as water management strategies.
10. Drought Management Water Management Strategy – A drought management measure or measures evaluated and/or recommended in a state or regional water plan that quantifies temporary reductions in demand during drought conditions.
11. Drought of Record– The period of time when historical records indicate that natural hydrological conditions would have provided the least amount of water supply.
12. Executive Administrator (EA) – The executive administrator of the Texas Water Development Board or a designated representative.
13. Existing Water Supply – The maximum amount of water that is physically and legally accessible from existing sources for immediate use by a water user group under a repeat of drought of record conditions.
14. Firm Yield (reservoir availability) – The maximum water volume a reservoir can provide each year under a repeat of the drought of record using anticipated sedimentation rates and assuming that all senior water rights will be totally utilized and all applicable permit conditions met.

¹ Regional water planning rules: 31 TAC §357.10 (effective December 8, 2016).

15. Initially Prepared Plan (IPP) – The draft regional water plan that is presented at a public hearing in accordance with 31 TAC §357.21(d) (relating to Notice and Public Participation) and submitted for Board review and comment.
16. Interbasin Transfer of Surface Water – Defined and governed in the Texas Water Code §11.085 (relating to Interbasin Transfers) as the diverting of any state water from a river basin and transfer of that water to any other river basin.
17. Interregional Conflict – An interregional conflict exists when:
 - a. more than one regional water plan includes the same source of water supply for identified and quantified recommended water management strategies and there is insufficient water available to implement such water management strategies; or
 - b. in the instance of a recommended water management strategy proposed to be supplied from a different regional water planning area, the regional water planning group with the location of the strategy has studied the impacts of the recommended water management strategy on its economic, agricultural, and natural resources, and demonstrates to the Board that there is a potential for a substantial adverse effect on the region as a result of those impacts.
18. Intraregional Conflict – A conflict between two or more identified, quantified, and recommended water management strategies in the same initially prepared plan that rely upon the same water source, so that there is not sufficient water available to fully implement all water management strategies and thereby creating an over-allocation of that source.
19. Major Water Provider (MWP) – A water user group or a wholesale water provider of particular significance to the region's water supply as determined by the regional water planning group. This may include public or private entities that provide water for any water use category.
20. Modeled Available Groundwater (MAG) Peak Factor – A percentage (e.g. greater than 100 percent) that is applied to a modeled available groundwater value reflecting the annual groundwater availability that, for planning purposes, shall be considered temporarily available for pumping consistent with desired future conditions. The approval of a MAG Peak Factor is not intended as a limit to permits or as guaranteed approval or pre-approval of any future permit application.
21. Planning Decades – Temporal snapshots of conditions anticipated to occur and presented at even intervals over the planning horizon used to present simultaneous demands, supplies, needs, and strategy volume data. A water management strategy that is shown as initially providing a supply in the 2040 decade, for example, is assumed to come online in the year 2040.
22. Political Subdivision - City, county, district, or authority created under the Texas Constitution, Article III, §52, or Article XVI, §59, any other political subdivision of the state, any interstate compact commission to which the state is a party, and any nonprofit water supply corporation created and operating under the Texas Water Code Chapter 67 (relating to Nonprofit Water Supply or Sewer Service Corporations).
23. Regional Water Plan (RWP) – The plan adopted or amended by a regional water planning group pursuant to the Texas Water Code §16.053 (relating to Regional Water Plans) and 31 TAC Chapter 357.
24. Regional Water Planning Area (RWPA) – The area designated pursuant to the Texas Water Code §16.053.
25. Regional Water Planning Group (RWPG) – A group designated pursuant to the Texas Water Code §16.053.
26. RWPG-Estimated Groundwater Availability – The groundwater availability used for planning purposes as determined by RWPGs to which 31 TAC §357.32(d)(2) (relating to

Water Supply Analysis) is applicable or where no desired future condition has been adopted.

27. Retail Public Utility – Defined in the Texas Water Code §13.002 (relating to Water Rates and Services) as "any person, corporation, public utility, water supply or sewer service corporation, municipality, political subdivision or agency operating, maintaining, or controlling in this state facilities for providing potable water service or sewer service, or both, for compensation."
28. Reuse – Defined in 31 TAC §363.1302 (relating to Definition of Terms) as "the beneficial use of groundwater or surface water that has already been beneficially used". For purposes of this document:
 - a. Indirect reuse is process water that reenters a river or stream system and is diverted and used again downstream.
 - b. Direct reuse is process water recirculated within a given system.
29. State Drought Preparedness Plan – A plan, separate from the state water plan, that is developed by the Drought Preparedness Council for the purpose of mitigating the effects of drought pursuant to the Texas Water Code §16.0551 (relating to State Drought Preparedness Plan).
30. State Drought Response Plan – A plan prepared and directed by the chief of the Texas Division of Emergency Management for the purpose of managing and coordinating the drought response component of the State Water Plan and the State Drought Preparedness Plan pursuant to the Texas Water Code §16.055 (relating to Drought Response Plan).
31. State Water Plan – The most recent state water plan adopted by the Board under the Texas Water Code §16.051 (relating to State Water Plan).
32. State Water Planning Database – The database maintained by TWDB that stores data related to population and Water Demand projections, water availability, existing water supplies, water management strategy supplies, and water management strategy projects. It is used to collect, analyze, and disseminate regional and statewide water planning data.
33. Unmet Water Need – The portion of an identified water need that is not met by recommended water management strategies.
34. Water Conservation Measures – Practices, techniques, programs, and technologies that will protect water resources, reduce the consumption of water, reduce the loss or waste of water, or improve the efficiency in the use of water that may be presented as water management strategies, so that a water supply is made available for future or alternative uses. For planning purposes, water conservation measures do not include reservoirs, aquifer storage and recovery, or other types of projects that develop new water supplies.
35. Water Conservation Plan – The most current plan required by the Texas Water Code §11.1271 (relating to Water Conservation Plans) from an applicant for a new or amended water rights permit and from any holder of a permit, certificate, etc. who is authorized to appropriate 1,000 acre-feet per year or more for municipal, industrial, and other non-irrigation uses and for those who are authorized to appropriate 10,000 acre-feet per year or more for irrigation; the most current plan required by the Texas Water Code §13.146 from a retail public utility that provides potable water service to 3,300 or more connections; and the most current plan required by the Texas Administrative Code §363.15 from an applicant for financial assistance. These plans must include specific, quantified 5-year and 10-year targets for water savings.
36. Water Conservation Strategy – A water management strategy with quantified volumes of water associated with water conservation measures.
37. Water Demand – The volume of water required to carry out the anticipated domestic, public, and/or economic activities of a water user group during drought conditions.

38. Water Management Strategy (WMS) – A plan to meet a need for additional water by a discrete water user group, which can mean increasing the total water supply or maximizing an existing supply, including through reducing demands. A WMS may or may not require an associated water management strategy project(s) to be implemented.
39. Water Management Strategy Project (WMSP) – A water project that has a non-zero capital cost and that when implemented, would develop, deliver, and/or treat additional water supply volumes, or conserve water for water user groups or wholesale water providers. One WMSP may be associated with multiple WMSs.
40. Water Need – A potential water supply shortage based on the difference between projected water demands and existing water supplies.
41. Water User Group (WUG) – Identified user or group of users for which water demands and existing water supplies have been identified and analyzed and plans developed to meet water needs. These include:
 - a. privately-owned utilities that provide an average of more than 100 acre-feet per year for municipal use for all owned water systems,
 - b. water systems serving institutions or facilities owned by the state or federal government that provide more than 100 acre-feet per year for municipal use;
 - c. all other retail public utilities not covered in paragraphs (a) and (b) that provide more than 100 acre-feet per year for municipal use;
 - d. collective reporting units, or groups of retail public utilities that have a common association and are requested for inclusion by the regional water planning group;
 - e. municipal and domestic water use, referred to as county-other, not included in subparagraphs (a) – (d) of this subsection; and,
 - f. non-municipal water use including manufacturing, irrigation, steam electric power generation, mining, and livestock watering for each county or portion of a county in a regional water planning area.
42. Wholesale Water Provider (WWP) – Any person or entity, including river authorities and irrigation districts, that delivers or sells water wholesale (treated or raw) to WUGs or other WWPs or that the RWPG expects or recommends to deliver or sell water wholesale to WUGs or other WWPs during the period covered by the plan. The RWPGs shall identify the WWPs within each region to be evaluated for plan development.

Other definitions pertinent to regional water planning:

43. Aquifer – Geologic formation that contains sufficient saturated permeable material to yield significant quantities of water to wells and springs. The formation could be sand, gravel, limestone, sandstone, or fractured igneous rocks.
44. Aquifer Recharge – Water that infiltrates to the water table of an aquifer.
45. Aquifer Storage and Recover – The practice of injecting water, when available, into an aquifer where it is stored for later use.
46. Brackish Water – Water containing total dissolved solids between 1,000 and 10,000 milligrams per liter.
47. Capital Cost – Portion of the estimated cost of a water management strategy that includes both the direct costs of constructing facilities, such as materials, labor, and equipment, and the indirect costs associated with construction activities, such as engineering studies, legal counsel, land acquisition, contingencies, environmental mitigation, interest during construction, and permitting.
48. Conjunctive Use - Combined use of surface water, groundwater and/or reuse sources that optimizes the beneficial characteristics of each source.

49. Desalination – Process of removing salt and other dissolved solids from seawater or brackish water.
50. Desired Future Condition (DFC) – the desired, quantified condition of groundwater resources (such as water levels, spring flows, or volumes) within a management area at one or more specified future times as defined by participating groundwater conservation districts within a groundwater management area as part of the joint planning process.
51. Drought – Generally applied to periods of less than average precipitation over a certain period of time. Associated definitions include meteorological drought (abnormally dry weather), agricultural drought (adverse impact on crop or range production), and hydrologic drought (below-average water content in aquifers and/or reservoirs).
52. Environmental flows – An environmental flow is an amount of water that should remain in a stream or river for the benefit of the environment of the river, bay, and estuary, while balancing human needs.
53. Estuary – A bay or inlet, often at the mouth of a river and may be bounded by barrier islands, where freshwater and seawater mix together providing for economically and ecologically important habitats and species and which also yield essential ecosystem services.
54. Firm Diversion (run of river availability) – evaluated for municipal sole-source water use (i.e. not firmed up with other sources) is defined as the minimum monthly diversion amount that is available 100 percent of the time during a repeat of the drought of record. Evaluated for all other water users, the ‘firm diversion’ is defined as the minimum annual diversion, which is the lowest annual summation of the monthly diversions reported by the WAM over the simulation period (lowest annual summation being the calendar year within the simulation that represents the lowest diversion available).
55. Groundwater Availability Model (GAM) – a regional groundwater flow model approved by the Executive Administrator.
56. Groundwater Management Area (GMA) – Geographical region of Texas designated and delineated by the TWDB as an area suitable for management of groundwater resources.
57. Infrastructure – Physical means for meeting water and wastewater needs, such as dams, wells, conveyance systems, and water treatment plants.
58. Instream Flow – Water flow and water quality regime adequate to maintain an ecologically sound environment in streams and rivers.
59. Local Groundwater Supplies – are those found in local groundwater areas usually not associated with a major, minor, or other aquifer (e.g., a small local alluvial aquifer) that may still be used as a non-municipal water supply source (e.g., for livestock use), but that the GMA determined to be small enough to not go through the DFC process.
60. Local Surface Water Supplies – limited, unnamed individual surface water supplies that, separately, are available only to particular non-municipal WUGs, such as livestock.
61. Major Aquifer – an aquifer that produces large amounts of water over a large area.
62. Minor Aquifer – an aquifer that produces minor amounts of water over a large area or large amounts of water over small area.
63. Modeled Available Groundwater (MAG) – the amount of water that the executive administrator determines may be produced on an average annual basis to achieve a desired future condition.
64. Non-relevant Aquifer – an Aquifer/Region/County/Basin geographic unit or a sub-portion of such a geographic aquifer unit where the GMA did not assign a DFC. This results in this geographic unit (or sub-portion) not having an associated availability MAG volume. In addition, this means that the associated Aquifer/Region/County/Basin geographic unit may or may not have a non-MAG groundwater availability volume (as determined by the RWPG) associated with it.

65. Other Aquifer – an aquifer that has not been designated as major or minor.
66. Rainwater Harvesting – An ancient practice involving the capture, diversion, and storage of rainwater for landscape irrigation, drinking and domestic use, aquifer recharge, and in modern times, stormwater abatement.
67. Relevant Aquifer – Aquifers or parts of aquifers for which groundwater conservation districts have defined desired future conditions.
68. Seawater – Water typically containing total dissolved solids of 35,000 milligrams per liter or greater. The volume of total dissolved solids may be lower than 35,000 milligrams per liter.
69. Sedimentation – Action or process of depositing sediment in a reservoir, usually silts, sands, or gravel.
70. Storage – Natural or artificial impoundment and accumulation of water in surface or underground reservoirs, usually for later withdrawal or release.
71. System Gain – the amount of permitted water a system creates that would otherwise be unavailable if the reservoirs were operated independently and this volume must be reported separately. For multi-reservoir systems, the minimum system gain during drought of record conditions may be considered additional water available, if permitted.
72. Water Availability Model (WAM) – Numerical computer program used to determine the availability of surface water within each river basin for permitting in the state.

Cross Reference for Fifth Cycle Contract and Regional Water Plan Documents

For convenience, Table 1 below illustrates how contract tasks, guidance, Administrative Rules, and RWP chapters generally relate.² The chapter breakdown for each RWP is specifically required under 31 TAC §357.22(b). Plans that are not organized in this manner shall be considered administratively incomplete and shall not be reviewed.

² Some rules (e.g., TAC §358; §357.22) apply more broadly to all regional water planning activities.

Table 1 – General Document Cross-Reference

Regional Water Planning Contract Document References			2021 Regional Water Plan Chapter, Associated TAC Sections, and Content		
TWDB Contract Reimbursement Accounting Number ('CAS')	Exhibit A - Contract SOW Task	Exhibit C - General Guidelines for Regional Water Plan Development	Regional Water Plan Chapter Number	Primary TAC Section	General Content
4	1	1	1	§357.30	Description of the Regional Water Planning Area
1	2A	2	2	§357.31	Projected Non-Municipal Water Demands
2	2B			§357.31	Projected Population and Municipal Water Demands
5	3	3	3	§357.32	Water Supply Analysis
6	4A	4	4	§357.33	Identification of Water Needs
7	4C			contract	Technical Memorandum
8	4B	5	5	§357.34	Identification of Potentially Feasible Water Management Strategies (WMSs)
9	5A			§357.34; §357.35	Evaluations of Potentially Feasible WMSs, Recommended WMSs/WMSPs, and Alternative WMSs/WMSPs
10	5B			§357.34	Conservation Recommendations <i>[as an individual subchapter]</i>
11	6	6	6	§357.40	Impacts of Regional Water Plan
				§357.41	Consistency with Protection of Water Resources, Agricultural Resources, and Natural Resources
12	7	7	7	§357.42	Drought Response Information, Activities, and Recommendations
13	8	8	8	§357.43	Policy Recommendations & Unique Sites
14	9	9	9	§357.44	Infrastructure Financing Analysis
3	10	10	10	§357.21; §357.50	Public Participation and Plan Adoption
15	11	11	11	§357.45	Implementation and Comparison to the Previous Regional Water Plan
16	12	12	N/A	§357.46	RWPG Prioritization of Recommended Water Management Strategy Projects (WMSP)

1.0 Planning Area Description³

Chapter 1 is a summary of the regional water planning area (RWPA) that addresses items described in 31 TAC §357.30, including the new ‘utility-based’ water user groups (WUGs) and the new category *major water providers* (MWP), as well as any other significant aspects of the RWPA that are considered relevant to the RWP. The MWPs for the RWPA are a subset of WUGs and/or wholesale water providers (WWPs) as identified by the RWPG. Data analysis and evaluations described throughout this document are relevant to the WUGs and WWPs of the RWPA. This WUG and WWP data will support compiling results to describe the MWPs of the RWPA.

RWPGs shall describe their RWPA including the following:

1. social and economic aspects of a region such as information on current population, economic activity and economic sectors heavily dependent on water resources;
2. current water use and major water demand centers;
3. current groundwater, surface water, and reuse supplies including major springs that are important for water supply or protection of natural resources;
4. major water providers;
5. agricultural and natural resources;
6. identified water quality problems;
7. identified threats to agricultural and natural resources due to water quantity problems or water quality problems related to water supply;
8. summary of existing local and regional water plans;
9. the identified historic drought(s) of record within the RWPA;
10. current preparations for drought within the RWPA;
11. information provided by the Board from water loss audits performed by Retail Public Utilities pursuant to 31 TAC §358.6 (relating to water loss audits); and,
12. an identification of each threat to agricultural and natural resources and a discussion of how that threat will be addressed or affected by the water management strategies (WMSs) evaluated in the plan.

Information provided by the TWDB from water loss audits may be presented, for example, as a summary in tabular form along with a description of the information and how the RWPG considered the information in developing the RWP.

When presenting historic drought(s) of record, the RWPG may identify other relevant (e.g., basin-level) droughts of record that impact RWPA water supplies in addition to identifying the overall historic drought of record in the RWPA.

2.0 Population and Water Demand Projections

TWDB will prepare draft population and municipal water demand projections for 2020-2070 for all population-related WUGs using data based on the population projections in the 2017 State Water Plan as reassembled by utility service areas. Because there will not be new decennial census data available in time to be used in the 2021 regional water plans, the emphasis of this work will be on the transition of the 2017 State Water Plan population projections and the associated water demand projections from political boundaries to utility service area boundaries and to making

³ Primarily related to 31 TAC §357.30

limited modifications based on relevant changed conditions that have occurred since the development of the projections used in the 2017 State Water Plan.

Non-population related draft water demand projections consisting of manufacturing, irrigation and steam-electric power generation will be developed using newly adopted methodologies and made available for review by the RWPGs. For mining and livestock categories, the same projections with minor adjustments from the 2017 State Water Plan will be proposed as draft projections for the 2021 regional water plans.

The definition of WUGs to be used in the 2021 regional water plans and the 2022 State Water Plan can be found in 31 TAC Chapter 357.10(41).

2.1 Criteria and Required Data for Requested Changes to Draft Projections and Revisions of Approved Projections

The initial list of WUGs will be established with the input of each RWPG. The TWDB then will prepare draft population and water demand projections for each region. The RWPGs shall then review the draft projections and may provide input to the TWDB or request specific changes to the draft projections from the TWDB. All requests to adjust draft projections shall be submitted along with associated quantified data in an electronic format determined by the TWDB (e.g., **fixed format spreadsheets**). If adequate justification is provided by the RWPGs to the TWDB, population and/or water demand projections may be adjusted by the TWDB in consultation with Texas Department of Agriculture (TDA), Texas Commission on Environmental Quality (TCEQ), and Texas Parks and Wildlife Department (TPWD). TWDB will then incorporate approved adjustments to the projections prior to the Board's consideration of adoption of the population and water demand projections.

The RWPGs must use the Board-adopted projections when preparing their regional water plans. The TWDB will directly populate DB22 with all Board-adopted WUG-level projections and make any changes to DB22 if subsequent revisions are approved by the Board.

Prior to the release of the draft projections, TWDB analyzed the most recent population estimates from the Texas Demographic Center⁴ (TDC) in comparison to the 2017 State Water Plan projections to determine the maximum region-wide population changes that may be considered by the RWPGs. The maximum region-wide population data will be provided for the RWPG.

2.1.1 Population Projections

2.1.1.1 County-Level Population Projections

Any adjustments to a county-total population projection due to adjustments to WUG-level projections within the county must be justified and will require a justifiable redistribution of projected county populations within the region so that the summed regional total remains the same.

Criteria for Adjustment: One or more of the following criteria must be verified by the RWPG and the Executive Administrator (EA) for consideration of revising the county population projections:

1. The most recent county population **estimate** by the TDC is significantly different than a corresponding interpolation of the draft county's population projections. The RWPGs

⁴ Formerly known as the Texas State Data Center/Office of State Demographer, <http://osd.texas.gov>

should compare the 2015 TDC county estimate to the trend line between the 2010 and 2020 decades in the draft projections.

2. The most recent county population **projection** by the TDC (half-migration scenario) is significantly different than the TWDB's draft county population.

Data Requirements: The RWPG must provide the following data associated with the identified criteria to the EA for justifying any adjustments to the county-level population projections:

1. County population estimates and/or projections from the TDC.
2. Projected in-migration and out-migration of a county, indicating that the net migration of a county over the most recent years (2011-2015) is significantly different than the net migration rate used for the draft projections.
3. Other data that the RWPG believes is important to justify any changes to the county-level population projections.

2.1.1.2 Water User Group Population Projections

Any adjustments to a WUG population projection must involve a justifiable redistribution of projected populations within the relevant county so that the county total remains the same unless an adjustment to the county total is also justified and approved.

Criteria for Adjustment: One or more of the following criteria must be verified by the RWPG and the EA for consideration in adjusting the WUG population projections:

1. The 2010 permanent population-served estimate by a WUG (utilities, public water systems, or rural area of a county) is significantly different than the 2010 baseline population estimate used in the draft projections.
2. The population growth rate for a WUG (utilities, public water systems, or rural area of a county) over the most recent five years (2011-2015) is substantially different than the growth rate between 2010 and 2020 in the draft projections.
3. Identification of growth limitations or potential build-out conditions for a WUG that would result in an expected maximum population that is different than the draft projection.
4. Updated information regarding the utility or public water system service area, or anticipated near-term changes in service area.

Data Requirements: The RWPG must provide the following data associated with the identified criteria to the EA for justifying any adjustment to the WUG-level population projections as compared to the trend line between the 2010 and 2020 projections in the 2017 State Water Plan.

1. The verified number of residential connections or permanent population of utilities or public water systems that are associated with a WUG.
2. Population estimates for cities developed and published by the TDC or by a regional council of governments will be considered for utilities serving these respective cities.
3. Documentation from an official of a city or utility that describes the conditions expected to limit population growth and estimates the maximum expected population for a utility.
4. Documentation or maps that verify and display changes in the utility service area.
5. Other data that the RWPG believes is important to justify any changes to the WUG-level population projections.

2.1.2 Water Demand Projections

2.1.2.1 Municipal Water Demand Projections

Dry Year Designation

Municipal water demand projections will be based upon dry-year demand conditions. The default base year that will be used to develop the draft water demand projections for the utility gallons per capita per day (GPCD) in the 2022 State Water Plan will be 2011. If a different dry-year, or a combination of dry years, was approved for use in the 2017 State Water Plan, that value will be carried forward as the default GPCD for the fifth cycle unless otherwise specifically requested. Additionally, regions may make a request to use a GPCD value from a more recent dry-year (e.g., 2012-2015) as the basis for the demand projections of certain water providers. The TWDB will consider an alternative base year only if the RWPG provides sufficient evidence that the alternative year is more representative of demands expected under dry-year conditions.

Municipal Water Use

Municipal water use includes both residential and non-residential water use. Residential use includes single and multi-family residential household water use. Non-residential use includes water used by commercial establishments, public offices, and institutions, and light industrial facilities, but does not include significant industrial water users, such as large manufacturing or power generation facilities. Residential and non-residential water uses are categorized together because they are similar types of use; both use water primarily for drinking, cleaning, sanitation, cooling, and landscape watering. Reported municipal water use data through the TWDB Water Use Survey for the designated dry year will be used to calculate the base per capita water use rate for each utility. The reported data included in the municipal draft projections includes fresh surface water and groundwater sources, but does not include brackish groundwater and reuse sources (see criteria for adjustment).

The municipal water demand projections shall incorporate anticipated future water savings due to the transition to more water-efficient plumbing fixtures and appliances, as detailed in relevant legislation and provided to the RWPGs by the TWDB. Any additional anticipated future water savings due to conservation programs undertaken by utilities or county-other WUGs should be considered as water management strategies by the RWPG. *It should be noted that municipal is the only category of water use in which a level of assumed conservation savings are embedded in the demand projections.*

Any adjustment to the population projections for a WUG will require adjustments to the municipal water demand projections.

Criteria for Adjustment: One or more of the following criteria must be verified by the RWPG and the EA for consideration of revising the municipal water demand projections:

1. Evidence that per capita water use from a different year between 2012-2015 would be more appropriate because that year was more representative of dry-year conditions.
2. Evidence of errors identified in the historical water use for a utility or public water system, including evidence that volumes of reuse (treated effluent) water or brackish groundwater used for municipal purposes should be included in the draft projections.
3. Evidence that the dry year water use was abnormal due to temporary infrastructure constraints.

4. Trends indicating that per capita water use for a utility or rural area of a county have changed substantially since 2011 and evidence that these trends will continue to rise in the short-term future.
5. Evidence that the number of installations of water-efficient fixtures and appliances between 2010 and 2015 is substantially different than the TWDB estimate.

Data Requirements: The RWPG must provide the following data associated with the identified criteria to the EA for justifying any adjustments to the municipal water demand projections:

1. Annual municipal water production (total surface water diversions and/or groundwater pumpage and water purchased from other entities) for a utility measured in acre-feet, between 2012 - 2015.
2. The volume of water sales by a utility to other water users (utilities, industries, public water systems, etc.) measured in acre-feet.
3. Net annual municipal water use, defined as total water production less sales to other water users (utilities, industries, public water systems, etc.) measured in acre-feet.
4. Documentation of temporary infrastructure or other water supply constraints that were in place.
5. Drought index or growing season rainfall data to document a year different than the designated dry year as a more appropriate base year for projections.
6. Documentation of the number of water-efficient fixtures replaced between 2010 and 2015.
7. To verify increasing per capita water use trends for a utility or rural area of a county and therefore revising projections of per capita water use to reflect this increasing trend, the following data should be provided with the request from the RWPG:
 - a. Historical per capita water use estimates based on net annual municipal water use for a utility or rural area of a county, beginning in 2010. A trend analysis which takes into account the variation in annual rainfall.
 - b. Revised projections of per capita water use for a utility or rural area of a county, that demonstrate an increasing trend of per capita water use.
 - c. Growth data in the residential, commercial and/or public sectors that would justify an increase in per capita water use.
 - d. Documentation of planned future growth.
8. Other data that the RWPG considers adequate to justify an adjustment to the municipal water demand projections.

2.1.2.2 Manufacturing Water Demand Projections

Manufacturing water use is defined as water used for the production of manufactured goods. Manufacturing facilities report their water use to the TWDB annually through the Water Use Survey. Different manufacturing sectors are denoted by North American Industrial Classification System (NAICS) codes.

Criteria for Adjustment: One or more of the following criteria must be verified by the RWPG and the EA for consideration of revising the manufacturing water demand projections:

1. A new or existing facility that has not been included in the TWDB water use survey.
2. An industrial facility has recently closed its operation in a county.
3. Plans for new construction or expansion of an existing industrial facility in a county at some future date.
4. Evidence of a long-term projected water demand of a facility or industry within a county that is substantially different than the draft projections.

5. Evidence of errors identified in historical water use, including volumes of reuse (treated effluent) or brackish groundwater that were not included in the draft projections.

Data Requirements: The RWPG must provide the following data associated with the identified criteria to the EA for justifying any adjustments to the manufacturing water demand projections.

1. Historical water use data and the 6-digit NAICS code of a manufacturing facility.
2. Documentation and analysis that justify that the new manufacturing facility not included in the Water Use Survey database will increase the future manufacturing water demand for the county above the draft projections.
3. The 6-digit NAICS code of the industrial facility that has recently located in a county and annual water use volume.
4. Documentation of plans for a manufacturing facility to locate in a county at some future date will include the following data:
 - a. The quantity of water required by the planned facility on an annual basis.
 - b. The proposed construction schedule for the facility including the date the facility will become operational.
 - c. The 6-digit NAICS code for the planned facility.
5. Other data that the RWPG considers adequate to justify an adjustment to the manufacturing water demand projections.

2.1.2.3 Steam-Electric Power Generation Water Demand Projections

Water use for steam-electric power generation is consumptive use reported to the TWDB through the annual Water Use Survey. Steam-electric power water demand projections do not include water used in cogeneration facilities (included in manufacturing projections), facilities which do not require water for production (wind, solar, dry-cooled generation), or hydro-electric generation facilities.

Criteria for Adjustment: One or more of the following criteria must be verified by the RWPG and the EA for consideration of revising the power generation water demand projections:

1. Documentation that the TWDB draft projections have not included a facility that warrants inclusion.
2. Any local information related to new facilities or facility closures that may not have been included in Electrical Reliability Council of Texas's Capacity, Demand, and Reserves report.
3. Evidence of a long-term projected water demand of a facility or in a county that is substantially different than the draft projections.
4. Evidence of errors identified in historical water use, including volumes of reuse (treated effluent) water or brackish groundwater that were not included in the draft projections.
5. Evidence that a currently-operating power generation facility has experienced a higher dry-year water use beyond the most recent five years, within the most recent 10 years.

Data Requirements: The RWPG must provide the following data associated with the identified criteria to the EA for justifying any adjustments to the steam-electric water demand projections.

1. Historical (2010 – 2014) water use data and description of a surveyed or future facility, including the fuel type, cooling process, capacity, average percent of time operating, and any other information necessary to estimate water use.
2. Reports describing alternative trends or anticipated water use for steam-electric power generation.

3. Specific information of an anticipated facility not listed in state or federal reports necessary to estimate the volume of water reasonably expected to be *consumed*. Such information would include generation method, cooling method, generation capacity and any additional information necessary to estimate the future water use.
4. Other data that the RWPG considers adequate to justify an adjustment to the steam electric power water demand projections.

2.1.2.4 Mining Water Demand Projections

Mining water demand includes water used for oil and gas development, as well as extraction of coal and lignite, sand aggregate, and other resources. Projections do not include water use required for the transportation or refining of materials. The TWDB's annual mining water use estimates are comprised of data from both surveyed and non-surveyed entities.

Criteria for Adjustment: One or more of the following criteria must be verified by the RWPG and the EA for consideration of revising the mining water demand projections:

1. Evidence that mining water use in a county is substantially different than the draft projections. This could include trends in water use data from the FracFocus national online registry⁵, the Texas Railroad Commission, or other sources.
2. Evidence of new facilities coming online, or reported closures in surveyed facilities that may impact county projections
3. Evidence of errors identified in historical water use, including volumes of reuse (treated effluent) water or brackish groundwater that were not included in the draft projections.

Data Requirements: The RWPG must provide the following data associated with the identified criteria to the EA for justifying any adjustments to the mining water demand projections.

1. Historical (2010 – 2014) water use data and description of a surveyed or future facility, and any other information necessary to estimate water use.
2. Reports describing alternative trends or anticipated water use for mining.
3. Other data that the RWPG considers adequate to justify an adjustment to the mining water demand projections.

2.1.2.5 Irrigation Water Demand Projections

Irrigation water demand projections include the water necessary for irrigation activities, primarily field crops, but also include orchards, pasture, turf grass, vineyards, self-supplied golf courses, and limited aquaculture operations. Note that for the purposes of regional water planning, irrigation demands account for the amount of water pumped for irrigation, not the water needed or used by the crop or associated with dry-land farming.

Criteria: One or more of the following criteria must be verified by the RWPG and the EA for consideration of revising the irrigation water demand projections:

1. Evidence that irrigation water use estimates for a county from another information source or more recent modeled available groundwater volumes are more accurate than those used in the draft projections.
2. Evidence that recent (10 years or less) irrigation trends are more indicative of future trends than the draft groundwater resource-constrained water demand projections.
3. Evidence that the baseline projection is more likely as a future demand than the draft groundwater resource-constrained water demand projections.

⁵ <https://fracfocus.org/>

4. Region or county-specific studies that have developed water demand projections or trends for the planning period, or part of the planning period, and are deemed more accurate than the draft projections.
5. Evidence of errors identified in historical water use, including volumes of reuse (treated effluent) or brackish groundwater that were not included in the draft projections.

Data Requirements: The RWPG must provide the following data associated with the identified criteria to the EA for justifying any adjustments to the irrigation water demand projections:

1. Historical water use, diversion, or pumpage volumes for irrigation by county.
2. Acreage and water use data for irrigated crops grown in a region as published by the Texas Agricultural Statistics Service, the Texas Agricultural Extension Service, the Farm Service Agency or other sources.
3. Available economic, technical, and/or water supply-related evidence that may provide a basis for adjustments in the default baseline projection and/or the future rate of change in irrigation water demand.
4. Alternative projected water availability volumes that may constrain water demand projections.
5. Other data that the RWPG considers adequate to justify an adjustment to the irrigation water demand projections.

2.1.2.6 Livestock Water Demand Projections

Livestock water use is defined as water used in the production of livestock, both for consumption and for cleaning and environmental purposes. TWDB produces annual water use estimates for livestock, based on daily water demand per head assumptions for cattle (beef and dairy), hogs, poultry, horses, sheep, and goats.

Criteria for Adjustment: One or more of the following criteria must be verified by the RWPG and the EA for consideration of revising the livestock water demand projections:

1. Evidence that livestock water use estimates for a county from another source are more accurate than those used in the draft projections.
2. Plans for the construction of a confined livestock feeding operation in a county at some future date.
3. Documentation of an existing confined livestock feeding operation not captured in the draft projections.
4. Other evidence of change in livestock inventory or water requirements that would justify an adjustment in the projected future rate of change in livestock water demand.
5. Evidence of errors identified in historical water use, including volumes of reuse (treated effluent) or brackish groundwater that were not included in the draft projections.

Data Requirements: The RWPG must provide the following data associated with the identified criteria to the EA for justifying any adjustments to the livestock water demand projections:

1. Documentation of plans for the construction of a confined livestock feeding facility in a county at some future date will include the following:
 - a. Confirmation of land purchase or lease arrangements for the facility.
 - b. The construction schedule including the date the livestock feeding facility will become operational.
 - c. The daily water requirements of the planned livestock feeding facility.
2. Other evidence that would document an expected increase or decrease in the livestock inventory in the county.

3. Other data that the RWPG considers adequate to justify an adjustment to the livestock water demand projections.

2.2 The Sub-WUG Planning Option*

At the discretion of each RWPG, certain WUGs may be subdivided into 'sub-WUG' level units for purposes of doing more detailed analysis and accounting. If a RWPG chooses to do this more refined analysis, **please discuss with TWDB early on** to ensure compatibility with DB22 and guidance. DB22 can incorporate sub-WUG data with some limited parameters (e.g., the sum of all WUG splits including sub-WUGs should equal the original whole WUG projections provided). Although it may require additional effort, this flexibility to include higher resolution in water needs analyses may allow some RWPGs to better account for and present water supplies and needs within, for example, certain county-other WUGs of interest. To accommodate the time necessary to create identified sub-WUGs in DB22, the anticipated deadline for identifying sub-WUGs for data reporting purposes is **September 1, 2017**. This request should be accompanied by the name of the associated whole WUG (for example, County-Other, Harris County), and the geographic designation (Region/County/Basin) of the sub-WUGs. Subsequently, the sub-WUGs share of population and water demand projections developed by the RWPG and adjustments to the associated WUG splits will be required to be submitted with all other projection revision requests by **November 2017**.

*Note bolded deadlines associated with this option.

Criteria for Adjustment: A proposed sub-WUG must meet the following criteria to be included in the 2022 State Water Plan:

1. The sub-WUG(s) must be approved by the RWPG and submitted to the TWDB by September 1, 2017.
2. The sub-WUG must be an existing utility, public water system, or geographic area, within the existing WUG.
3. The RWPGs requesting the sub-WUG will develop the projections, existing supply, needs, and water management strategy(s) volumes, all of which must be less than the total volumes for the WUG. The sum of all WUG splits, including sub-WUGs, should equal the total volumes for the WUG as a whole.
4. For municipal sub-WUGs, the sub-WUG GPCD may differ from the whole County-Other WUG GPCD. However, the sum of the population and demand totals of all WUG splits including sub-WUGs should match the County-Other WUG totals. Population, demand and GPCD values in the other WUG splits may need to be adjusted to offset the sub-WUG population and demand projections submitted by the RWPG.

Data Requirements: The RWPG must provide the following data associated with the identified criteria to the EA to be included in the 2022 State Water Plan:

1. Sub-WUG(s) with the geographic designation along with a list of the utilities, public water systems, or area included in the sub-WUG(s) and the name of the associated whole WUG (by September 1, 2017).
2. Population projections and GPCDs (for municipal sub-WUGs), and water demand projections (for all sub-WUGs) for 2020-2070 presented by region, county, and basin splits where applicable.
3. The adjusted remaining values including population, GPCD and demand for the other WUG splits after identifying the sub-WUG must be submitted for consideration with the sub-WUG projections.

3.0 Water Availability and Existing Water Supplies⁶

3.1 Introduction

Estimating how much water there is to meet water demands is a two-step process that examines both water availability and existing water supply. Those two terms have very specific, and not necessarily intuitive, meanings in the water planning process.

Water *availability* refers to the maximum volume of raw water that could be withdrawn annually from each source (such as a reservoir or aquifer) during a repeat of the drought of record. Availability does not account for whether the supply is connected to or legally authorized for use by a specific WUG. Water availability is analyzed from the perspective of the source and answers the question: “How much water from this source could be delivered to water users as either an existing water supply or, in the future, as part of a water management strategy?” Determining water availability is the first step in assessing potential water supply volumes for a planning group.

Second, planning groups evaluate the subset of the water availability volume that is already connected to WUGs. This subset is defined as *existing water supply* and is based on legal access to the water as well as the infrastructure (such as pipelines and treatment plant capacity) already in place to treat and deliver the water to the “doorstep” of WUGs. Existing water supply is analyzed from the perspective of water users and answers the question: “How much water supply could each WUG already rely on should there be a repeat of the drought of record?” **It is the responsibility of the RWPG** to ensure that the resulting estimates of alternative water availability are reasonable for drought planning purposes and will reflect conditions expected in the event of near-term, actual drought conditions.

RWPGs shall evaluate water source availability and existing water supplies during drought conditions for entities including WUGs and wholesale water providers (WWPs) (and the resulting subset of MWPs) as defined in this guidance document’s Definitions and Acronyms section and the TWDB administrative rules [31 TAC §357.10].⁷

RWPGs shall identify all water sources and their associated annual availability volumes within the RWPA even if such sources are not currently connected or being used but are potentially available for existing use or in the future.

The determination of water source availability is a source-based analysis. Water availability may be increased (or decreased) through a future project or action, for example, by building a new reservoir or by modifying a desired future condition (DFC) that changes an annual modeled available groundwater (MAG) volume.

All surface water availability shall be based on water availability model (WAM) runs. For groundwater non-MAG RWPG-estimated availabilities, the RWPGs shall include a table summarizing the basis of these RWPG-estimated availabilities. Reuse availability may be based on a population-dependent infrastructure concept, for example, relying on wastewater from a growing population that is anticipated to already be initially treated and available for additional treatment for reuse purposes.

⁶ Primarily related to 31 TAC §357.32

⁷ In addition to material regarding water supplies in this guidance document, RWPGs should refer to the TWDB’s Contract Exhibit D “*Guidelines for Regional Water Planning Data Deliverables*” for additional information for estimating water source availability and existing water supplies.

The water availability at each source and the associated existing water supply information for each WUG and WWP shall be entered into the state water planning database (DB22). RWPGs shall report both: a) water availability data; and b) existing water supply data in the Technical Memorandum, IPP, and final adopted RWP for WUGs and MWPs. Note that data for WWPs that the RWPG determines are necessary for purposes of developing their plan will need to be entered into DB22 for purposes of data analysis.⁸ Due to recent rule changes, only MWPs rather than WWPs are to be presented in the RWP.

3.2 Evaluation of Surface Water Availability

Regional water planning surface water availability shall be evaluated using the TCEQ's WAMs; specifically, the unmodified **RUN#3** version, which includes all water rights at full authorization; all applicable permit conditions, such as flow requirements, are met; and, no return flows. All TCEQ unmodified **WAM RUN#3** models also use the original reservoir capacity, i.e., do not include reservoir sedimentation. However, for regional water planning purposes, inclusion of anticipated sedimentation⁹ into the **WAM RUN#3** models for major reservoirs, defined as greater than 5,000 acre-feet, is a necessary modification¹⁰ to be performed by the RWPGs independent of the hydrovariance request process. **Any further reference to use of an unmodified WAM RUN #3 in this document is assumed to include the use of anticipated modification.**

Reservoir availability or firm yield is defined as the maximum water volume a reservoir can provide each year under a repeat of the drought of record using anticipated sedimentation rates and assuming that: all senior water rights will be totally utilized, no return flows are included, and, all applicable permit conditions are met and is determined utilizing these **WAM RUN#3** characteristics. This definition of firm yield does not prevent accounting for run of river firm diversions or firm supplies that rely on multiple surface water or conjunctive supplies in the planning process.

"Firm" means that the use-appropriate monthly percentage of the annual firm diversion amount must be satisfied in each and every month of the estimation period (or a shorter period if it is used in the estimation) for all surface water diversions. Unless otherwise approved by the EA, available surface water shall be described by the permitted portion of firm yields for reservoirs and the permitted portion of firm diversions for run of river supplies.

Updating anticipated sedimentation using reservoir volumetric survey data would be a WAM firm yield modification to include new existing area-capacity conditions in the model as provided from an updated scientific volumetric survey performed on a reservoir since the last update to **WAM RUN#3** or other relevant information as deemed appropriate by the RWPG in order to more accurately reflect existing firm yield.

Run of river availability or firm diversion evaluated for **municipal sole-source** water use (i.e. not firmed up with other sources), is defined as the minimum monthly diversion amount that is available 100 percent of the time during a repeat of the drought of record. Evaluated for **all other**

⁸ The TWDB will migrate a limited amount of DB17 data to DB22 and confirm lists of WWPs with RWPGs at that time. RWPGs will continue to use WWP information and water transfer points in their data analysis of their plan.

⁹ *Anticipated sedimentation* is the anticipated decreases in a reservoir's *area-capacity condition* resulting in projected firm yield decreases each decade; the necessary modification to all WAM RUN#3 models for inclusion of the anticipated sedimentation for all reservoirs will **not** require a hydrologic variance.

¹⁰ 31 TAC §357.10(14)

water users, the firm diversion is defined as the minimum annual diversion, which is the lowest annual summation of the monthly diversions reported by the WAM over the simulation period (lowest annual summation being the calendar year within the simulation that produces the lowest run of river diversion volume). Such run of river availabilities may be determined without the inclusion of reservoir sedimentation modifications if deemed appropriate by the RWPG since sedimentation modification requirements of **WAM RUN #3** apply to stored water.

For municipal WUGs whose only source of water is from a run of river diversion, it is important that RWPGs do not over-estimate reliable run of river water availability during drought of record conditions, for example, by overlooking the need for additional intra-year storage and/or alternative sources of water supply necessary to bridge potential seasonal water shortages. If an intra-year shortage is identified in **WAM RUN#3**, based on the reasonable monthly diversion distribution pattern, then the annual firm diversion volume to be reported is that for which the monthly diversion amounts are met in each and every month, unless the municipal WUG has supplies from multiple run of river sources or a combination of reservoir and run of river supply that serve to firm up the monthly supply.

In general for surface waters bordering neighboring states or countries, RWPGs shall analyze and report currently available water supplies taking into account existing legal agreements. For interstate and international reservoirs, RWPGs shall report annual water volumes that are available to Texas according to existing legal agreements. Future availability may be based on strategies.

For surface water withdrawals that do not require permits, such as for domestic and livestock uses, RWPGs will estimate these local annual water availability volumes under drought of record conditions based on the most current accessible information. RWPGs shall document the methodologies utilized for these RWPG-estimated availabilities in the IPP and final adopted RWP.

RWPGs should consider requesting model modification for any issue that varies from the base requirements or that is expected to have significant effects on existing supply estimates.

If the use of a potential hydrologic variance for an alternative surface water availability evaluation is approved by the EA, then both the unmodified **WAM RUN#3** firm yield/firm diversion and the alternative annual availability volume shall be reported for each reservoir/river source in the hydrologic variance technical documentation. For modifications to reservoir firm yield, the original unmodified firm yield shall be a reported total value in the plan documents while the alternative availability is utilized as the basis for planning in the IPP, final adopted RWP, and DB22. See Table 2 for reporting requirements of availability conditions and Section 3.6 of these guidelines for more information on the hydrologic variance process.

Table 2 – Example Scenarios for Reporting Unmodified and Alternative Surface Water Availability for Individual and “System” Reservoirs

	<i>No Hydrologic Variance Assumptions</i>		<i>If Hydrologic Variance Assumptions</i>		
	Always report this value in plan; and	Potentially use one of these three conditions for plan development			
Reservoir	Firm Yield (individual reservoir)	Firm Yield System (multi-reservoir)	Individual Reservoir		System
X	X	X, Y, Z	X	or	X, Y, Z
Y	Y	X, Y, Z	Y	or	X, Y, Z
Z	Z	X, Y, Z	Z	or	X, Y, Z

3.2.1 Standard Criteria and Assumptions for TCEQ WAM RUN#3

When estimating surface water availability associated with *firm yields* or *firm diversions* with the TCEQ’s unmodified **WAM RUN#3**, the following criteria must be met if applicable:

1. available inflows to reservoirs are the remainder of naturalized stream flows after upstream (and downstream) senior water rights are met unless the use of lower diversion rates for an upstream right is approved by the EA;
2. downstream senior water rights must be met; however, this does not require releases of legally stored water unless specifically stated in existing water rights;
3. all special conditions of water rights must be considered, including, but not limited to:
 - a. bay, estuary, and instream flow requirements;
 - b. TCEQ environmental flow standards and associated TCEQ rules (e.g. instream flow set-asides); or
 - c. other relevant limitations.
4. minimum allowable reservoir levels are the top of dead pool unless the use of a lower level is approved by the EA (this dead pool limitation applies only to situations where the dead pool is specified in the water right permit or other binding agreement);
5. maximum allowable reservoir levels are the top of conservation pool unless the use of a higher level is approved by the EA;
6. evaporative losses are based on evaporation rate data that best coincide with the location of the reservoir and the period of record and time steps for inflows;
7. annual water supply demands are constant for all years; the distribution of annual demands within a given year are constant in all years and shall reflect the patterns of different types of water use expected; and,
8. model run time steps shall not be longer than one month.

3.3 System Availability and Related WMSs

Future water supply sources may be aggregated in a WMS and categorized as systems if they meet one or more of the following criteria:

1. aggregated sources that come from two or more of the following categories: groundwater, surface water, and reuse;
2. several reservoirs are to operate together under permit, so that supplies from a specific reservoir cannot be tracked directly to an end user; and/or,
3. two or more reservoirs are to operate, under permit, as a system resulting in a system gain in firm yield.

System operations must produce a measurable system yield greater than the sum of the individual reservoir yields. System operations that mask individual reservoir yields or that group reservoirs together without a permitted relationship shall not be allowed in the RWPs. Such a permitted

relationship could include reservoirs owned and operated by the same entity, so long as the operations comply with the existing permit conditions.

System gain is the amount of permitted water a system creates that would otherwise be unavailable if the reservoirs were operated independently; and for existing systems, this volume shall be reported separately in the RWPs in addition to the individual reservoir *firm yields*. For multi-reservoir systems, the minimum system gain during drought conditions may be considered additional water available, if it has already been permitted. Total existing water from a system shall not exceed the sum of the system gain plus the *firm yields* of individual reservoirs in that system.

As described above, potential future operation of multiple reservoirs as a new system, or changes to current operational procedures for existing reservoir systems, in order to provide additional yield may be evaluated as a potential WMS. Such a WMS analysis shall adequately describe methods used to calculate these future system gains (to be permitted) and shall include discussion regarding any associated permit changes that would be required.

3.4 Reuse Availability and Related WMSs

For regional water planning purposes, reuse is considered a stand-alone water source type and RWPGs will evaluate reuse availability and supplies separately from conservation, which is classified as a demand reduction associated with a WUG.

Availability cannot exceed the capacity of the existing infrastructure to deliver produced treated water¹¹ to customers or existing permits. However, it should be clarified that to avoid overestimating reuse availability, the reuse availability will also be dependent upon the associated decade population/demand projections that would determine the amount of wastewater flowing into a wastewater treatment plant (WWTP) on an annual basis. This population-dependent availability would be less than a WWTP's maximum permit capacity and would increase each future decade (as population/demand increases) up to the annual volume restricted by existing infrastructure and/or permit (i.e., WWTP inflow projections could be a more stringent restriction for reuse availability in early planning decades). This same population-dependent concept would hold true for determining future WMS decadal reuse availabilities.

Direct reuse is process water recirculated within a given system and should be classified as potable or non-potable. The standardized naming convention for a direct reuse source will include the Producer's Name plus the Recipient's Name.¹² For direct reuse, RWPGs shall base their drought of record existing direct reuse analyses on: currently installed wastewater reclamation infrastructure; and the amount of wastewater anticipated to be treated at the WWTP, based on associated decade populations/demands. These amounts shall not exceed the amounts of water available to utilities generating the wastewater. RWPGs shall evaluate potential future sources of direct reuse that will require new permits and additional reclamation infrastructure as WMSs, and shall provide adequate justification to explain methods for estimating the amount of future direct reuse water available from such sources, including consideration of the population/demand projections for each decade associated with the WMS.

¹¹ May require additional level of treatment prior to reuse to be included as a WMS.

¹² See Contract Exhibit D for more details on naming direct reuse sources within DB22 and presented in the RWP.

3.5 Evaluation of Groundwater Availability

Groundwater is generally governed by the rule of capture, which may be modified where groundwater conservation and groundwater subsidence districts exist. Districts may issue permits that regulate pumping of groundwater and spacing of wells within their jurisdictions.

With the passage of House Bill 1763 in 2005, groundwater conservation districts (GCDs) within groundwater management areas were required to work together to establish the DFCs of relevant aquifers within that area.

Desired future conditions are the desired, quantified conditions of groundwater resources (such as water levels, water quality, spring flows, or storage volumes) at a specified time in the future or in perpetuity. The TWDB uses DFCs to determine a MAG value for an aquifer or part of an aquifer in the groundwater management area. A MAG value is the volume of groundwater production, on an average annual basis, that will achieve the DFC. These values are independent of existing pumping permits and may, depending on the aquifer characteristics and how the DFCs are defined, include a variety of water quality types, including brackish groundwater. Depending on the aquifer and location, the inclusion of brackish groundwater in MAG values might be subject to local and regional supply evaluations.

Groundwater availability models (GAMs) are the most common tool used to estimate MAGs. The GAMs are designed to simulate groundwater behavior in aquifers but they are not based on water quality and they generally do not distinguish between fresh and brackish groundwater. Each GAM report includes a section on water quality so that users of the GAM can evaluate the water quality conditions in the coverage area of the model. Please see the TWDB website for links to the web pages associated with each model where these reports can be downloaded and reviewed.

Unlike the regional and state water planning process, the DFC process does not have the requirements to development management policies under drought of record conditions. Groundwater districts in a groundwater management area may, but are not required to, consider the drought of record in developing the DFC. By extension, the MAG values derived from DFC statements across the state may or may not incorporate the drought of record.

It should be noted that not all groundwater availability falls within MAG values.

3.5.1 Availability for Relevant Aquifers

For RWPA with at least one GCD, MAGs shall be the basis for groundwater availability in all locations that have a DFC. Every available MAG must be used for all geographic areas in the RWPA regardless of whether there is a GCD in a particular location.

The MAG(s) for each relevant aquifer will be provided by the TWDB through the DB22 interface, split into *discrete geographic-aquifer units* by: Aquifer/Region/County/ Basin.

The groundwater availability (and the associated existing and future groundwater supplies based on the availability) for any given discrete geographic-aquifer unit in the RWPs shall not exceed the annual MAG volume as provided in DB22 unless authorized by the EA approval prior to the IPP through the hydrologic variance request process to apply a MAG peak factor. Any reallocation of annual MAG volumes between discrete geographic-aquifer units must be consistent with the relevant aquifer's MAG. See Section 3.6 for more information on the hydrologic variance process.

3.5.2 Availability for Non-relevant Aquifers and Local Groundwater Supply Areas

As described above, most areas with groundwater availability volumes occur within a recognized major, minor, or other aquifer that have associated DFCs, and will therefore have an associated annual MAG volume. In limited locations, however, there will be some annual groundwater availability volumes that are not associated with DFCs as follows:

1. all or portions of a major or minor aquifer that were classified as non-relevant by GCD(s) in a GMA, and therefore do not have associated DFCs or MAGs;
2. any other aquifers or portions of aquifers that were not considered in the DFC process, but for which there are identified existing groundwater supplies; or
3. a local groundwater supply area usually not associated with a major, minor, or other aquifer (e.g., a small local alluvial aquifer) that may still be used as a non-municipal water supply source, but that the GMA determined to be not relevant to the DFC process.

For these groundwater sources where no DFC exists, RWPGs shall determine the groundwater availability, for planning purposes. These RWPG-estimated groundwater availabilities may be determined by using what is presented in the local GCD management plan. If no GCD exists, the RWPG may use the TWDB GAMs, if available, or other means to develop estimates of groundwater availability (e.g., based on previous RWP estimates). RWPGs shall document and justify the method(s) used.

To assist RWPGs, all of the associated MAGs that only cover a portion of a discrete geographic-aquifer unit will be flagged in DB22. This means that the associated discrete geographic-aquifer unit may or may not have an additional RWPG-estimated groundwater availability associated with it.

3.5.3 Availability for an RWPG with no GCDs within its RWPA

In accordance with 31 TAC §357.32(d)(2), an RWPG with no GCDs within its RWPA shall determine the *availability* of relevant aquifers for regional planning purposes. The TWDB shall review and consider approving this *RWPG-estimated groundwater availability* prior to inclusion in the IPP¹³, including determining if the estimate is physically compatible with the DFCs for relevant aquifers in GCDs in the co-located GMA(s). The EA shall use the TWDB's GAMs as appropriate to conduct the compatibility review.¹⁴

3.5.4 Groundwater Availability and Related WMSs

For planning purposes, future groundwater availability cannot be increased by implementing water management strategies other than aquifer recharge-type projects. Groundwater availability may increase or decrease in the future, typically through changes in groundwater management policy (revised desired future conditions) or improvements in technical evaluation approaches (new or updated groundwater availability models). Groundwater availability may also increase with the identification of brackish groundwater production zones not previously accounted for in a MAG.

When evaluating WMSs associated with groundwater to meet identified water needs, a future groundwater WMS would utilize that portion of an aquifer's groundwater availability that would require **new or additional infrastructure and/or new permits** in order to withdraw that water.

RWPGs shall consider opportunities for, and the benefits of, developing WMSs for large-scale brackish groundwater desalination facilities that could utilize local or regional brackish

¹³ These are to be sent for preview as soon as they have been estimated.

¹⁴ Related to 84(R) SB 1101 requirements. As of October 2016 these requirements only apply to the North East Texas (Region D) RWPG, as it is the only region currently in the state with no GCDs in its RWPA.

groundwater production zones, where brackish groundwater is defined for regional water planning purposes as a total dissolved solid (TDS) concentration typically between 1,000 and 10,000 milligrams per liter (mg/L).¹⁵

Below are examples of scenarios that would not be eligible to use as future groundwater management strategies:

1. Overalllocation:¹⁶ TWDB will review IPPs and final adopted RWPs to ensure that annual groundwater availability is not exceeded or “overdrafted” during any decade or for any discrete geographic-aquifer unit by existing supplies and/or future WMS supplies. WMSs that would require temporarily pumping groundwater in excess of a MAG **shall not be included in an RWP, unless** a written hydrologic variance request for a MAG Peak Factor that would accommodate temporary increases in existing annual availability for planning purposes is approved in writing by the EA. See Section 3.6 for more information on the hydrologic variance process.
2. Permitting Uncertainty: In instances where more than a single WUG and/or WWP seek to include recommended groundwater-based WMSs that, when combined, would exceed the annual groundwater availability and therefore could not all be permitted by a GCD, the affected RWPG(s) may not include these recommended WMSs simultaneously in the RWP(s).¹⁷ See Section 3.6 for more information on the hydrologic variance process.

The TWDB received funding through House Bill (HB) 30 to delineate brackish groundwater production zones of four aquifers (Gulf Coast, Blaine, Rustler, and Carrizo-Wilcox), and studies were completed by the summer of 2016. Additional aquifers will be added in subsequent years.¹⁸ These other resources may be available to the RWPGs to assist in their consideration of developing brackish supplies.

The Technical Memorandum, IPP, and final adopted RWP shall include a written summary of all WAM and GAM models on which the surface and groundwater *availabilities* in the RWP are based (except for *availability* associated with MAGs) as well as WAM and GAM model(s) input/output or other model files necessary to support replication of the results used in developing the surface water and non-MAG groundwater availabilities. This summary must include:

1. the named/labeled version (including date) of each model used;
2. a summary of any modifications to each model and the date these modifications were approved by the EA;
3. the name of the entity/firm that performed each model run; and,
4. the date of each model run.¹⁹

¹⁵ Related to 84(R), HB 30 requirements.

¹⁶ The term *over allocation*, as used in the regional water planning process, is a planning term not a hydrologic term. It simply indicates that a project would rely on more groundwater than was designated as *available* for use by the RWPGs in the RWPs; in this case, more than the annual MAG volumes. Availability is subject to change.

¹⁷ Applies both intra-regionally and inter-regionally. Competing projects may be prorated, for example.

¹⁸ More information on HB 30 or other research projects, including those in support of groundwater models, can be found at <http://www.twdb.texas.gov/innovativewater/bracs/HB30.asp> and <http://www.twdb.texas.gov/groundwater/models/research/index.asp>

¹⁹ All input files of WAM and GAM models used to develop the RWP shall be included as an electronic appendix per Section 13.2.1 of this guidance document.

3.6 Hydrologic Variance Requests for Water Availability Determination

As previously stated for water availability evaluations, as a default RWPGs shall use the unmodified TCEQ **WAM RUN#3** (plus anticipated sedimentation) to estimate reservoir firm yields and run of river firm diversions or MAGs for groundwater availabilities, in order to determine existing water supplies. If an RWPG would like to use an alternative methodology to evaluate water availability, the **RWPG may submit a written request to the EA for a hydrologic variance** to modify the default hydrologic assumptions. If the EA finds the hydrologic variance to be necessary and/or appropriate to more accurately reflect existing water supplies, the EA will then provide written approval.

In general, an RWPG hydrologic variance request must be submitted in writing to the EA and include:²⁰

1. a description of the alternative availability assumptions being requested;
2. documentation justifying the basis for the request;
3. how the modification will affect²¹ the associated annual availability volume(s) in the RWP; and,
4. the date the RWPG approved submittal of the request to the TWDB EA.

If approved by the EA in writing, the RWPG shall still present the unmodified firm yield and/or annual availability volume(s) in the hydrologic variance technical documentation in the technical memorandum, IPP, the final adopted RWP, and DB22 as well the approved alternative availabilities (see Table 2).

While an EA authorization can be granted to use an alternative hydrologic modeling assumption(s) in order to evaluate availability for existing water supplies for development of an RWPG's 2021 RWP, **it is the responsibility of that RWPG to ensure** that the resulting estimates of alternative water availability are reasonable for drought planning purposes and will reflect conditions expected in the event of near-term, actual drought conditions; and in all other regards will be evaluated in accordance with the contract guidance documents.

Below are types of potential alternative hydrologic assumptions for groundwater and surface water availability evaluations that would require written approval prior to the IPP from the EA through the hydrologic variance request process.

3.6.1 Potential Groundwater Hydrologic Variance Assumptions

MAG Reallocation: A hydrologic variance request to shift portions of annual MAG volumes between discrete geographic-aquifer units shall be in writing from the RWPG and must be consistent with the relevant aquifer's MAG. This proposed hydrologic variance request must include a table with the proposed changes for each discrete geographic-aquifer unit, for each decade, along with an explanation of:

1. the basis for the reallocation request;
2. how DFCs at that location as well as the DFCs in any surrounding areas shall be achieved under the reallocation;²²

²⁰ These steps are just a general outline - different types of hydrologic variance requests may require additional information, such as for a MAG Peak Factor, which is described in more detail in Section 3.6.1 of this guidance document.

²¹ This may be a qualitative assessment if no quantified information is available at the time of the variance request.

3. how the reallocation is consistent with the relevant MAG and GCD management plan(s); and,
4. the long-term impact that pumping based on the reallocation would have on the DFC at that location.

If approved by the EA, the reallocation of annual MAG volumes between discrete geographic-aquifer units shall be performed by TWDB only within DB22. Note that the unmodified, discrete geographic-aquifer annual MAG volume(s) shall also be reported in the hydrologic variance technical documentation.

MAG Peak Factor (31 TAC §357.32(d)(3)): With approval of the relevant GCD (where applicable) and GMA, a RWPG may submit a written request for the use of a MAG peak factor to accommodate temporary increases in annual availability volumes, for planning purposes, above the MAG. The MAG peak factor is a percentage (e.g., greater than 100 percent) that is applied to an annual MAG volume reflecting groundwater availability that, for planning purposes, shall be considered temporarily available for pumping consistent with a DFC(s). This is a regional water planning accommodation to reflect anticipated pumping fluctuations between wet and dry years or may account for other shifts in the timing of pumping while remaining consistent with DFCs and maintaining the integrity of the planning process. This proposed MAG peak factor request must:

1. include written approval from **both** the relevant GCD, if one exists within the particular aquifer-region-county-basin split, and representatives of the GMA;
2. include the technical basis for the request in sufficient detail to support GCD, GMA, and the EA evaluation; and,
3. document how the MAG peak factor will not prevent the associated GCD(s) from managing groundwater resources to achieve the DFC(s).

The TWDB will review documentation provided by the RWPG submitted in support of the proposal to implement a MAG peak factor. This review may, depending on the area to be affected by the MAG peak factor, involve evaluation of the relevant hydrostratigraphic and geologic features, groundwater levels and groundwater flow, groundwater pumping, spring flow, interaquifer flow, and discharge to surface waters. RWPGs may need to provide adjusted model well files, detailed georeferenced maps of pumping assumptions (pumping location, pumping amounts, and model layer) or unallocated supply assumptions to support the TWDB's evaluation. The effect of the MAG peak factor on the adjacent or hydrologically connected groundwater resources outside of the applicable GCD will be evaluated to understand the possible effect of the MAG peak factor on the ability of neighboring GCDs to achieve their relevant DFCs. This evaluation may include reviewing existing GAM runs and/or performing additional modeling runs, as required.

If approved by the EA, the MAG peak factor would be applied by TWDB only to the associated annual MAG volume within DB22 to calculate the modified groundwater availability volume that would be used by an RWPG in order to determine existing supplies and future water management strategies. Note that the unmodified, discrete geographic-aquifer annual MAG volume(s) shall also be reported in the MAG peak factor request technical documentation.

3.6.2 Potential Surface Water Hydrologic Variance Assumptions

For surface water availability and supply analyses, RWPGs shall use the most current WAMs from TCEQ. RWPGs may use better, more representative water availability modeling assumptions or

²² This may be a qualitative assessment if no quantified information is available at the time of the variance request.

better site-specific information with written approval from the EA. RWPGs should always consider requesting a hydrologic variance for a hydrologic assumption modification for any issue that is expected to have a significant effect on determining an existing supply.

The reasonableness of any individual requested model modification and any combination of modifications must be established prior to EA approval. Any such modification must be used consistently across the planning process, for example, if the reliability of firm yield is adjusted downward based on an analysis using reshuffled annual historical hydrology, assessments of impacts to water quality, natural resources, agricultural resources, and water resources must be assessed using consistent assumptions about hydrology. The nature of and basis for each such modification shall be fully explained in the RWP.

Model modification assumptions and unmodified firm diversion and/or firm yields shall be submitted in the hydrovariance request documentation, included in the appropriate methodological sections of the IPP and final adopted RWP, and all model files shall be included as pdf documents in the IPP and final adopted RWP documentation submitted.

Under **NO** circumstances will a hydrologic variance be allowed that assumes unreliable supplies would be available under drought of record conditions, including those that assume:

1. the reliable supply from a run of river diversion (firm diversion) could use the 75/75 rule, i.e., 75% of the water available in 75% of the time for irrigation water rights; and
2. a sole-source municipal reliable supply from a run of river diversion (firm diversion) is equal to the minimal annual diversion.

Examples from past plans of potentially appropriate surface water modeling assumptions for RWP development are included below.

1. **Addition of Return Flows:** This is a WAM modification to include a certain level of return flows that are reasonably expected to be available under drought of record conditions from specific entities/locations in the model in order to evaluate existing supplies (current WAM RUN#3 models contain no return flows). Planning groups should give consideration to the RWPA's projection "dry year" (i.e., reflecting return flows from the same year as that of the demand projection dry year).
2. **Reservoir Operational Yield:** This is a WAM modification to decrease the effective drought of record firm yield of the reservoir due to, for example, the actual location of a user's intake; the smaller firm yield would allow that user to maintain its inflow diversion. A past example is an approximate 50% decrease in firm yield to maintain the flow from a small lake through the adjacent fish hatchery.
3. **Extended Hydrology for Revised Reservoir Inflows (and Potential Recognition of New Drought of Record):** This is a WAM firm yield modification to include extended hydrology, with or without full scale naturalized flow development, in order to account for recent conditions that may be more severe than the current drought of record. A past example is the inclusion of recent hydrologic data available since the completion of WAM RUN#3 in order to produce a more conservative supply estimate during conditions that are worse than the drought of record.
4. **Reservoir Safe Yield:** This is a WAM modification to decrease the firm yield of the reservoir so that an identified annual volume is held in reserve in order to account for

droughts worse than the drought of record. The volume of this annual reserve is determined by the RWPG and can vary by source. Past examples include: minimum 1 year supply held in reserve; 3-9 month supply held in reserve; 2 year supply held in reserve; and, 7% reservoir system storage during the critical month of the drought of record, which would be equivalent to roughly a 6-month supply held in reserve.

5. **Incorporation of Subordination Agreements:** This is a WAM modification to reflect subordination agreements that currently exist, but are not explicit in individual water rights; and would be a more realistic reflection of current operations. Past examples include a downstream reservoir's subordination to an upstream reservoir in a common river basin through an agreement between a river authority and a city.
6. **Alternative Reservoir Level:** This is a WAM firm yield modification to decrease the minimum reservoir level below the top of the *dead pool*; or increase the maximum reservoir level above the top of the *conservation pool* (i.e., use of the flood pool).
7. **Reservoir Conditional Reliability:** This is a WAM firm yield modification for determination of a reliable reservoir firm yield supply utilizing a conditional reliability assessment, which is defined here as an assessment that starts with current conditions and analyzes all sequences of available historical hydrology; and based on the statistical output, a level of risk for each possible outcome is assigned, revealing probable firm yields based on these historical hydrology sequences. This approach should not be used for estimating yields over the full planning horizon but rather to address near-decade conditions, when appropriate. A past example is a conditional reliability assessment used to compensate for the uncertainty of a **new** current/ongoing drought of record that is occurring in a region.
8. **Reliability of Firm Yield of Reservoirs:** RWPs may take into account the reliability of firm yield of reservoirs. For example, to account for the impact of hydrologic variability and drought persistence on reservoir firm yield, firm yield may be compared to alternate estimates of firm yield derived from a reshuffled annual historic hydrology. This approach, or type of Monte Carlo reliability analysis, will provide higher confidence in firm yield calculations and may serve as guidance for lowering existing water yield estimates of reservoirs. **Any such analysis must be pre-approved by the EA through a hydrologic variance request, including proposed methodology.**
9. **Addition of Actual Diversion Locations:** This is a WAM modification that will include additional actual diversion locations outside of a reservoir(s) resulting in improved accuracy of the simulation of actual diversion operations along the river and any associated releases from associated reservoirs.
10. **Simplification of Diversion Locations:** This is a WAM modification to include simplified groupings of actual diversion locations outside of a reservoir(s), while maintaining a reasonably accurate reflection of water rights and operations in the model simulation. A past example is a WAM with a significant number of individual water rights diversion locations and allowing the creation of several single diversion points, each for a group of closely located water rights diversions. This simplified model was approved by the TCEQ prior to the TWDB hydrologic variance approval.

11. **Reservoir System Operations:** This is a WAM firm yield modification to include system operations of a single reservoir; and/or operation of multiple reservoirs as a single system to affect an overall system gain and increase the effective firm yield.
12. **Hydropower Generation Diversions:** This is a WAM firm yield modification to include simulation of hydropower generation water use in a reservoir that may not currently be considered in WAM RUN#3.
13. **Updated Water Rights:** This is a WAM modification to include updated water rights data since the last time the WAM RUN#3 was officially updated.
14. **Special Operational Procedures:** A WAM modification to reflect operational agreements with entities such as the U.S. Army Corps of Engineers, International Boundary and Water Commission, or Water Master Operations.
15. **Use of Daily Time-Steps:** This is a WAM firm yield modification to change from monthly time-steps to daily time-steps in order to better simulate diversions and releases from reservoir storage. A past example was for an individual city's diversions and releases from a reservoir.
16. **Drought Management Plan Firm Diversion:** This is a WAM modification allowing less than a full firm diversion during drought of record conditions if this occurs in an approved operation plan (e.g., exists in an entity's Drought Management Plan).
17. **Conjunctive Use of Surface Water and/or Groundwater:** To reflect interdependencies that result in net firm supplies.

Any other assumptions or modifications are approved as appropriate by the EA.

3.7 Determination of Existing Water Supplies for WUGs and WWPs

In order to be considered an existing water supply, the supply must not only be legally accessible but must also be physically connected to the WUG, meaning that it currently has infrastructure for conveying the water to the WUG or it is anticipated that the WUG will have access by the conclusion of the current planning cycle (i.e., by 2021). All WUG existing water supplies shall be directly associated with one or more water sources. The water rights, which are the basis for surface water availability volumes, shall be presented in the IPP and final adopted RWP.²³

The determination of existing water supply is an entity-based analysis, the results of which are limited by:

1. the portion of each water source that could be immediately accessed for supply by a WUG or WWP in the event of drought;
2. legal or policy constraints regarding access to the water (e.g., by contract or water right); and,
3. physical constraints such as transmission or treatment facility capacities that would limit the volume of delivery of treated supplies to WUGs or WWPs.

²³ Although all surface water existing supplies must be based on permitted diversions and storage, RWPGs may aggregate these volumes as appropriate for entering water rights into DB22 and presenting in the RWPs.

By definition, the sum of the WUG or WWP existing water supplies associated with a particular source shall not exceed the total availability for that same source. Annual water availability volumes associated with a water source shall not be counted more than once as the basis for an existing water supply. **Over-allocation of any surface water source availability in an RWP is strictly prohibited under this guidance.**

Regardless of whether the EA authorizes hydrologic variance modifications to WAM or GAM models to evaluate water source availability and/or existing water supplies for development of an RWP, it is the **responsibility of the RWPG to ensure** that the resulting estimates of both water source availability and existing water supplies are reasonable for drought planning purposes, shall reflect conditions expected to occur in the event of actual drought conditions, and in all other regards, shall be evaluated in accordance with this guidance document.

Calculation of existing water supplies shall consider and be based on the following criteria:

1. The *availability* of water at the source as determined under Sections 3.2 – 3.5 of this guidance document. Existing water supplies must be based on water that is available in every year throughout a drought of record (e.g., interruptible permit volumes based on TCEQ's 75%/75% criteria would not automatically qualify as a supply that is available during a drought of record except for that portion of the water volume that is anticipated to be present throughout the specified drought conditions. Therefore, interruptible supplies that are not anticipated to be available during drought of record conditions shall not be included in an RWP as the basis for an existing supply).
2. Sources of existing water supplies that may include surface waters such as reservoirs and rivers, groundwater, water reuse, and/or a combination of several different sources used conjunctively including desalinated sources.
3. The greatest annual volume of surface water obtainable from the source without violating the most restrictive physical and/or regulatory conditions, including infrastructure, under drought of record conditions.
4. The greatest annual volume of groundwater that can be withdrawn from an aquifer without violating the most restrictive physical and/or regulatory conditions, including infrastructure, and limiting these withdrawals appropriately under drought conditions. Regulatory conditions refer to limits on water withdrawals imposed by GCDs. A RWPG shall not set existing groundwater supplies equal to demands just for convenience. If a RWPG determines groundwater supplies values are appropriate to equal demands values, they must provide justification within the RWP. If an existing groundwater supply (and the underlying associated availability) is sufficient to meet a growing demand through 2070, then the 2020 existing groundwater supply shall reflect the full 2070 existing supply if the infrastructure and rights to the water already exist in 2020 that will meet 2070 demands. The allocation of available groundwater to be used as WUG existing supplies, however, may be adjusted to adhere to MAG limits or other limits as necessary.
5. Evaluation of existing run of river surface water available for municipal WUGs during drought of record conditions shall be based on the minimum monthly diversion amounts that are available 100 percent of the time, if those run of river supplies are the **only supply for the municipal WUG**. Run of river firm diversion means that the use-appropriate monthly percentage of the annual firm diversion must be satisfied in each and every month

of the simulation period for all surface water diversions. This is not a "minimum annual diversion" in which one or more months might have no authorized diversions at all.

6. If appropriate, evaluation of existing run of river supply during drought of record conditions may be based on the minimum annual diversion or minimum annual supply for **municipal WUGs with multiple supply sources and all other non-municipal WUGs**. This minimum annual diversion is defined as the lowest annual summation of the monthly diversions reported by the WAM over the simulation period. Lowest annual summation is the calendar year within the simulation that represents the lowest diversion available.
7. Existing supplies from run of river diversions based on the county-basin location of the diversion point and associated use. List the diversion volume(s) based on a) the county-basin location of the diversion point; and, b) the WUG use category.²⁴ Run of river diversions may be aggregated into a single run of river diversion source type based on a) the county-basin; and b) the WUG use category, regardless of the size or number of the associated water rights. Do not list water right volumes individually unless required to track source water for specific WUGs.
8. Evaluation of existing stored surface water accessible during drought of record conditions shall be based on firm yield. The analysis may be based on justified operational procedures other than firm yield with EA written approval through the hydrologic variance process.
9. Existing water rights, permits, surface water storage rights, contracts and option agreements, and/or other planning and water supply studies.
10. RWPGs shall classify existing water supplies from reuse as either direct or indirect and does not require a WMS to use. Indirect reuse is process water that reenters a river or stream system and is diverted and used again downstream (less the channel loss) and should be classified as potable or non-potable. The standard naming convention for an indirect reuse source will include the Producer's Name plus the receiving Water Body's Name from which the reuse supply will be diverted.²⁵ RWPGs shall base their drought of record existing indirect reuse analyses on: currently permitted reuse projects that have the associated infrastructure in place that is required to divert and use this water in accordance with permits issued by the TCEQ; and on the amount of wastewater anticipated to be treated at the WWTP, based on associated population/demands. Potential sources for future indirect reuse that will require new permits and additional infrastructure shall be evaluated as WMSs in the RWPs. RWPGs shall sufficiently explain the methods used to estimate the future indirect reuse availability and supply generated, including consideration of the population/demand projections for each decade associated with the WMS.
11. Contracted agreements and associated terms of contracts, which shall be assumed to renew upon a contract's termination date if contract holders contemplate renewals or extension or if the contract provides for renewal or extensions.

²⁴ Although all surface water existing supplies must be based on permitted diversions and storage, RWPGs may aggregate these volumes as appropriate for entering water rights into DB22 and presenting in the RWPs.

²⁵ See Contract Exhibit D for more details on naming indirect reuse sources within DB22 and presented in the RWP.

12. For contracts already in existence, if infrastructure also exists to deliver the water, then the full volume must be shown as existing supply in the earliest planning decade. Existing water supplies should not be underrepresented in early decades and increased over time simply based on expected demand increases if the full amount would be accessible in earlier decades.
13. Net water volume delivered to the WUG after transmission losses.
14. Net water that a WUG will have in order to meet its own WUG demands (i.e., gross volume of water minus water the WUG must provide to other entities).
15. The assumption that all existing water supply, transmission, and treatment infrastructure will be adequately maintained, rehabilitated, or replaced as a part of regular operation and maintenance into the future to maintain existing water supplies.²⁶ An identified water need shall not be based on the assumption or expectation that existing infrastructure will not continue in service or that associated water supplies will no longer be available in the future as a result of neglect or lack of maintenance of infrastructure.²⁷
16. The assumption for existing supplies in future decades – that current infrastructure for existing water supplies does not change through time (but is adequately maintained).²⁸
17. The current infrastructure capacity, excluding internal water distribution systems. This capacity shall be considered in order to determine how much water may be transported, treated, and delivered to the intake of the WUG's distribution system. This may include physical limitations associated with the horizontal location and/or elevation of a provider's intake facility within a reservoir, for example, or the depth of an existing well.
18. The ability to make minor operational changes that are not strictly precluded by a physical or legal constraint such as, the supply associated with a decision to turn on a groundwater pump, for example, shall be considered as part of an existing supply, not a WMS, if the pump is already installed in the existing groundwater well and is accessible to the user.
19. Functional, existing infrastructure and associated water supply **regardless of whether it is currently being used**. Note that an identified water need shall not be based on an assumption or expectation that a current existing water supply, either at the WWP or WUG level, is simply not used even though it could be used in the event of drought.
20. Consideration of the current and future water quality of the source.

²⁶ An exception would be that it should not necessarily be assumed that reservoirs would be dredged to remove silt as a regular operation and maintenance item. If anticipated, future dredging of a reservoir should be shown as a WMS.

²⁷ Planned decommissioning of WTPs that will be replaced, for example, should not be considered the basis for an 'identified water need'; however, an additional new or expanded WTP that will increase the amount of water supply available to meet a WUG(s) need would be a WMS.

²⁸ An exception would be the large-scale project in response to a significant water-loss-audit-identified infrastructure system water loss, such as large scale distribution pipeline replacements and/or largescale advanced meter replacements; this type of project would increase the current volume of an existing supply by capturing water that is currently being lost from the system and may be a recommended WMS in the RWP.

21. Consideration of information from the previous RWPs.
22. Local surface water supplies shall be firm supplies and local groundwater supplies shall be based on RWPG-estimated groundwater availabilities during drought conditions and may be included with a description of the source; these shall **not** be associated with municipal users, including county-other. The RWPs shall include a single table that lists each local surface water supply with: a) an explanation for the basis of the supply itself; and b) the basis for the volume of supply. For unpermitted supplies, list the source as the sum of unpermitted surface water by county-basin split. Any unpermitted local surface water supplies shall be listed individually as well with explanation and may be aggregated at the county-basin level when appropriate.

RWPGs shall report existing water supply evaluation results by WUG in accordance with 31 TAC §357.31(a) (relating to Projected Population and Water Demands) and by MWP in accordance with 31 TAC §357.31(b).

4.0 Identification of Water Needs²⁹

RWPs shall include identified water needs for WUGs and MWPs. RWPGs shall compare projected water demands³⁰ with existing water supplies accessible to WUGs and WUG customers of WWP in an RWPA,³¹ in order to determine whether entities will experience water surpluses or needs for additional supplies. Results shall be reported for WUGs by categories of use including municipal, manufacturing, irrigation, steam electric, mining, and livestock for each county or portion of a county in an RWPA for each decade. Results shall be reported for MWPs by categories of use including municipal, manufacturing, irrigation, steam electric, mining, and livestock for the RWPA each decade.

The RWPs are based on planning decades³² which represent temporal ‘snapshots’ (e.g. 2020, 2030) representing conditions for that year and the subsequent years prior to the next decade (e.g. 2030 needs shall be assumed to carry through 2039). This also means that if a municipal water need is identified for the 2030 decade, a recommended WMS would have to be developed and operating by the year 2030 if it is to meet that water need. Therefore, a WMS that is shown as providing a supply in the 2030 decade is assumed to come online in or prior to the year 2030.

4.1 Water User Group Needs

Water needs of individual WUGs may result from availability limits, infrastructure limitations, or legal limits. Identified, decadal water needs may arise within any planning decade for a variety of reasons including, but not limited to:

1. water demands that exceed existing water supplies in the first planning decade;
2. increases in water demands that eventually exceed existing water supplies in a later planning decade(s);
3. a foreseeable decline in existing water supply volumes over time for example, due to:
 - a. the anticipated loss of the use of water wells due to lowered water quality in that geographic area,

²⁹ Primarily related to 31 TAC §357.33

³⁰ developed in accordance with 31 TAC §357.31

³¹ developed in accordance with 31 TAC §357.32. WUG analysis is to be performed by the TWDB through DB22.

³² 31 TAC §357.10(21)

- b. anticipated sedimentation in a reservoir, or,
 - c. the inability to reach available groundwater supplies using existing wells due to a declining water table.
4. unreliable existing water supplies for example, due to:
 - a. an intra-year monthly run of river water shortage that occurs, for example, only during summer months; or
 - b. the inability to reach available surface water during drought due to an existing intake elevation or location in a reservoir.
 5. the inability to convey available water to an entity; or,
 6. a lack of capacity to treat the available water at the entity.

The TWDB will perform **numerical calculations of water needs** based on data entered by the RWPG into DB22 for each WUG by comparing projected demands and existing water supplies without implementation of any WMSs. The resulting DB22 report presenting surpluses or needs shall be included, without modification, in the Technical Memorandum, IPP, and final adopted RWP. The TWDB will also produce data reports from DB22 in support of the RWPG analysis of identifying MWP needs.

4.2 County-Other, or Sub-WUG Planning

In select past RWPs, presenting needs and recommended strategies associated with the county-other WUGs has proven challenging for the RWPG. These are the largely rural communities and water systems that fall below the municipal WUG thresholds (utilities less than 100 acre-feet/year annual retail sales or rural areas not served by a utility) represented in the plans as an aggregate for each county. Because of the effects of aggregation, the water needs (and associated WMSs) of entities that fall within this category, the excess supply of one entity within county-other (i.e., “sub-WUG”) may hide a need of another entity and thereby make it difficult to identify the need for water management strategies.

If there are anticipated county-other needs, it is important to make sure that the existing water supply of the county-other WUG is not inadvertently overstated, for example, by assuming that the *existing water supply* of county-other WUGs is equivalent to the entire groundwater *availability* in that county. Water availability is defined as the maximum amount of water available from a source during the drought of record, regardless of whether the supply is physically or legally available to WUGs. Existing supply, however, is defined as the amount of water that is legally and physically accessible by WUGs. Existing water supplies are a subset of the total availability and, in many cases, due to limited infrastructure (e.g., well capacity), will be significantly less than availability.

Some approaches to assist in addressing these challenges are presented below:

1. Needs: Even though existing water supplies are presented as aggregate volumes for all the sub-WUGs within county-other, there may be more specific knowledge of a particular sub-WUG’s supplies and needs. If the aggregate volume of the county-other WUG obscures the known existing supply shortages of a sub-WUG, that shortage may still be acknowledged in the text of the plan (although it must be included in the online state water planning database for that county-other WUG need volume to be reported and counted in the regional and state water plans; see Exhibit D for more information).
2. WMS: If there is no specific information available as discussed above to reflect needs for sub-WUGs and/or there is knowledge that additional wells, for example will be required, despite an inability to show an explicit water need, the RWPG may still evaluate and recommend WMSs for either specific sub-WUGs and/or county-other. A water need does

not have to be identified in order for a county-other WMS to be evaluated and recommended.

If the RWPG determines that sub-WUG planning through data entry and analysis in DB22 is appropriate during the development of their plan, sub-WUGs must be identified for the TWDB by **September 1, 2017**. This set date is necessary to allow for data structuring to occur in DB22 in advance of data entry (for more information see Exhibit D of this contract.)

4.3 Second-Tier Needs Analysis

Once conservation and direct reuse WMSs are identified and recommended by the RWPG, they are to notify TWDB, which will then provide a *second-tier water needs analysis* to the RWPG based on DB22 data in order to determine any water needs that would remain for each entity if all recommended conservation and direct reuse strategies were fully implemented. This second-tier needs analysis is simply a calculation by TWDB that will provide additional information that RWPGs may consider when subsequently identifying and recommending additional infrastructure water supply projects. These second-tier needs estimates may be considered when performing technical evaluations of WMSs including anticipated unit costs of water.

The resulting DB22 reports for the second-tier needs analysis shall present secondary water needs volumes by WUG and decade and shall be included in the IPP and the final adopted RWP. The TWDB will also produce data reports from DB22 in support of the RWPG analysis of identifying MWP needs.

5.0 Water Management Strategies and Water Management Strategy Projects ³³

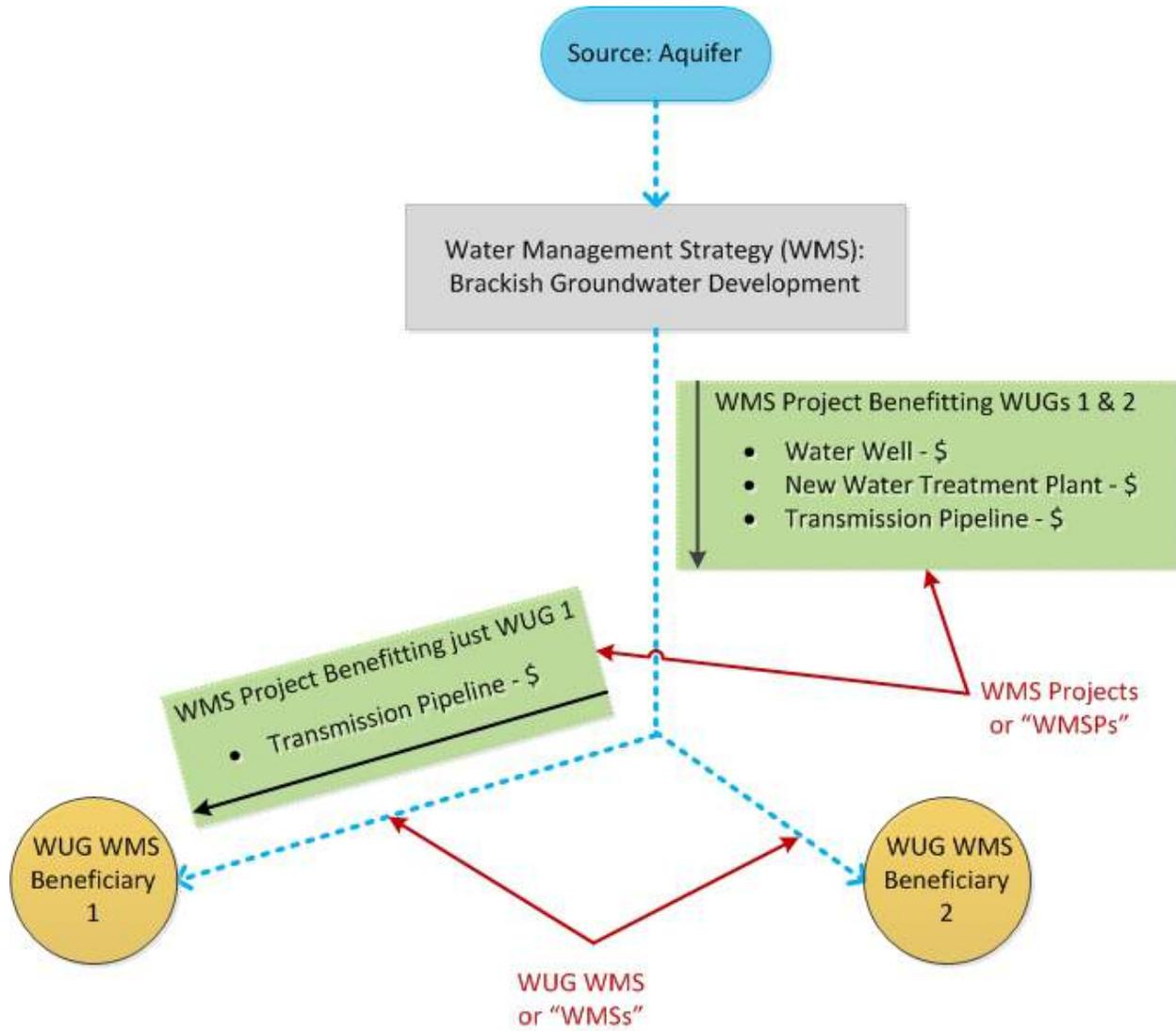
A WMS is a plan to meet an identified need for additional water by an entity, which can mean increasing the total water supply or maximizing an existing supply, including through reducing demands. A water management strategy project (WMSP) is a water project that has a non-zero capital cost and that when implemented would develop, deliver, and/or treat additional water supply volumes, or conserve water for an entity(s). A WMS may or may not require the development of an associated WMSP(s) for implementation and one WMSP may be associated with multiple WMSs. See Figure 5.1 for an example of the structure of WMSs and WMSPs.

RWPGs shall identify and evaluate potentially feasible WMSs and the associated WMSPs required to implement those strategies for each WUG and WWP where future water supply needs exist [as required by statute and administrative rules 31 TAC §357.34 and §357.35]. A need for water is identified when existing water supplies are less than projected water demands for that same WUG or WWP within any planning decade. Note that retail distribution connection pressurization is a regulatory distribution system requirement not applicable to regional water supply planning, including the identification of water supply needs. Similarly, distribution system daily peaking capacity is not a condition relevant to state water supply planning. The regional and state water plans are based on annual historical dry year use, not short-term system capacity.

If no potentially feasible WMSs are identified or recommended the RWP shall document the reason.

³³ Primarily related to 31 TAC §357.34 & §357.35

Figure 5.1 – 2017 WMS Project Data Structure



5.1 Potentially Feasible Water Management Strategies

As required by TWC §16.053(e)(3), and 31 TAC §357.34(c) the RWP shall consider, **but not be limited to considering**, the following types of water management strategies for all identified water needs:

1. conservation
2. drought management
3. reuse
4. management of existing water supplies
5. conjunctive use
6. acquisition of available existing water supplies
7. development of new water supplies
8. developing regional water supply facilities or providing regional management of water supply facilities
9. developing large-scale desalination facilities for seawater or brackish groundwater that serve local or regional brackish groundwater production zones identified and designated under TWC §16.060(b)(5)³⁴
10. developing large-scale desalination facilities for marine seawater that serve local or regional entities
11. voluntary transfer of water within the region using, but not limited to, contracts, water marketing, regional water banks, sales, leases, options, subordination agreements, and financing agreements
12. emergency transfer of water under TWC §11.139
13. interbasin transfers of surface water
14. system optimization
15. reallocation of reservoir storage to new uses
16. enhancements of yields
17. improvements to water quality
18. new surface water supply
19. new groundwater supply
20. brush control³⁵
21. precipitation enhancement
22. aquifer storage and recovery
23. cancellation of water rights
24. rainwater harvesting

The Technical Memorandum, IPP, and final adopted RWP shall include:

1. the documented process used by the RWPG to identify potentially feasible WMS; and,
2. the list of all identified WMSs that were considered potentially feasible for meeting a need in the region per 31 TAC §357.12(b). Potentially feasible WMSs shall include those listed

³⁴ Note that local or regional brackish groundwater production zones are only relevant to brackish groundwater sources, not seawater.

³⁵ See Section 5.2.2 for further guidance when evaluating brush control strategies.

above. An example template for documenting WMSs considered to meet needs is provided in Appendix 1.0 of this guidance document as Table E.

5.2 Water Management Strategy Evaluations

All potentially feasible WMSs and WMSPs shall be evaluated in accordance with 31 TAC §357.34.

This information shall be included in Chapter 5 of the IPP and final adopted RWP along with additional narrative description and other relevant materials and documentation associated with the RWPG's identification of potentially feasible WMSs considered for the region.

As necessary, RWPGs shall update or redevelop any previous WMS or WMSP evaluations (e.g., developed for other RWPs) to meet current rule and guidance requirements, reflect changed physical or socioeconomic conditions that have since occurred, reflect changes in water project configurations or conditions, consider newly identified WUGs or WWPs, reflect more recent or updated costs, reflect more recent information related to potential impacts to natural or agricultural resources, or, to accommodate changes in identified water needs.

Existing water rights, water contracts, and option agreements shall be protected, although amendments to these may be recommended realizing that consent of owners would be needed for implementation.

WMS and WMSP data shall be structured in a way that is compatible with DB22 as outlined in the TWDB Regional Water Planning Contract's Exhibit D – *Guidelines for Regional Water Planning Data Deliverables*.

All recommended WMSs and WMSPs that are entered into DB22 and prioritized by RWPGs shall be designed to reduce the consumption of water; reduce the loss or waste of water; improve the efficiency in the use of water; or develop, deliver, or treat additional water supply volumes to WUGs or WWPs when implemented in at least one planning decade such that additional water is available during drought of record conditions. Any other RWPG recommendations regarding permit modifications, operational changes, and/or other infrastructure that do not meet these requirements shall be indicated as such and presented separately in the RWP; and shall not be eligible for funding from the State Water Implementation Fund for Texas (SWIFT).³⁶

Regional water plans are not simply updates to previous water plans. They are stand-alone plans and require consideration of all potentially feasible strategies. Any previously recommended strategy that will be recommended in a new plan must have been updated, evaluated, and recommended anew.

RWPGs shall evaluate WMSs and associated WMSPs based on criteria specified in 31 TAC §357.34 and §357.35 including strategy/project water quantities generated, reliability, financial costs, and environmental impacts. For all WMSs and WMSPs previously identified in the 2016 RWPs, RWPGs shall develop and/or update financial costs using the most current version of the WMSP costing tool provided by the TWDB. For remaining evaluation criteria, each RWPG shall determine the degree to which conditions have changed or new information has become available and update the WMS and

³⁶ 31 TAC §357.34(d)

WMSP evaluations accordingly. All evaluation criteria shall also be met for newly identified WMSs and WMSPs.

Water conservation strategies, drought management strategies, and WMS related to reducing water losses shall be considered along with all other categories of WMSs. *Active* water conservation strategies are those that conserve water over and beyond what would happen anyway as result of *passive* water conservation measures that stem from federal and state legislation requiring more efficient plumbing fixtures in new building construction. When evaluating and recommending WMSs and WMSPs, each RWPG shall:

1. consider *active* water conservation as potentially feasible WMSs for WUGs for which the water conservation requirements contained in TWC §11.1271 apply;
2. consider *active* water conservation strategies for WUGs and WWP WUG customers with identified needs;
3. document the reasons, if an RWPG does not recommend specific potentially feasible *active* conservation WMSs to meet needs for a specific WUG or WWP WUG customer;
4. if TWC §11.085(l) applies to a proposed IBT, include water conservation measures at the *highest practicable level* of water conservation and efficiency achievable (includes existing conservation as well as that proposed within a WMS) for each WUG or WWP WUG customer that is recommended to rely on a WMS involving the IBT;³⁷ and,
5. present recommended conservation WMSs associated with an IBT WMS analysis by WUG and WWP WUG customers. Recommended conservation WMS information will be tabulated in a DB22 generated standardized report for each WUG with an associated recommended WMS that requires an IBT. This report shall be included in the IPP and final adopted RWP.

A separate subchapter (in accordance with 31 TAC §357.34(h)) shall consolidate and present all conservation recommendations for the RWPA.

RWPGs shall consider WMSs to address any issues identified in the information provided by the TWDB from the water loss audits performed by retail public utilities pursuant to 31 TAC §357.34(g)(2)(D).

RWPGs shall also consider drought management WMSs for each identified water need, and shall include drought management measures for each WUG to which TWC §11.1272 applies that are consistent with any applicable TCEQ guidance. Drought management strategies associated with Drought Management Plans also decrease water demand requirements similar to conservation WMSs, although there are some basic differences. For example, water conservation and drought management strategies differ in their longevity –conservation WMSs are generally implemented on a permanent basis, whereas drought management strategies are implemented on a temporary basis during times of severe drought or other emergencies that can limit water supplies. If, after considering drought management measures for each WUG with a need to which TWC §11.1272 does not apply, a RWPG does not select drought management as a WMS for an individual WUG with a need, they shall document the reason.

Water quantities produced by recommended WMSs and WMSPs shall be based on water availability in accordance with Section 3. **Additionally, WMSs shown as providing a supply in a planning decade, must come online in or prior to that decade.** For example, if a WMS is shown as providing supply in the 2040 decade, it is assumed to come online in or prior to the year 2040.

³⁷WMSs that require an IBT under TWC §11.085 should indicate this.

5.2.1 Surface Water Quantity and Reliability for Water Management Strategies

When evaluating WMSs to determine future water availability associated with surface water to meet identified water needs:

1. Analyses shall be based on firm yield and firm diversion.
2. RWPGs shall analyze every WMS using an unmodified TCEQ **WAM RUN#3** to determine surface water availability(s) and WMS firm yield(s)/firm diversion(s). This analysis reflects conditions under which an associated permit application will be evaluated.
3. Analyses shall be in accordance with 31 TAC §357.34, §357.35, and Section 5 of this guidance document.
4. Analyses shall be in accordance with Senate Bill 3 environmental flow standards adopted in TCEQ's 30 TAC Chapter 298 rules (e.g., flow set-asides) or, if there are no TCEQ environmental flow standards, other relevant limitations (e.g., pass-throughs required by the 1997 Consensus Criteria for Environmental Flow Needs) (see Appendix 2.0 of this guidance document).
5. Exceptions to using an unmodified TCEQ **WAM RUN#3** shall be when the WMS being evaluated (as well as the anticipated permitting process associated with the WMS) are based on: a future, new water right (including for a new reservoir); an amendment of an existing water right; a proposed subordination agreement; and/or, a proposed new use of return flows. In these instances, the TCEQ **WAM RUN#3** may be modified only to the degree required to allow the simulation of such a WMS. The resulting, modified WAM, however, shall not then be used as the basis for evaluating other additional WMSs unless, for example, they are anticipated to be implemented in combination.
6. RWPGs shall clearly indicate in the RWPs which, if any, WMSs are assumed to rely on or to mutually exclude another WMS and explain how the interaction may impact both the estimated future water availability and the future water supply associated with each WMS.
7. Consideration that water needs based on non-firm run of river supplies resulting from intra-year shortages might be met in some cases, for example, by a recommended WMS that adds an amount of off-channel storage sufficient to increase the firm diversion amount (i.e., to "firm up" the associated water supply in all months and in all years).
8. Conjunctive WMSs (i.e., using a combination of surface water, groundwater, and/or reuse) must have an overall firm supply as a WMS project but may be associated with less than firm surface water volumes during certain periods as long as the groundwater availability (or reuse availability) offsets the surface water availability sufficiently to ensure a firm WMS project yield.
9. That portion of a reservoir's firm yield that is unpermitted, if any, may not be shown as a currently accessible existing water supply from that source. However, RWPGs may evaluate and include a WMS that relies on the unpermitted portion of a reservoir's firm yield if the WMS is based on an associated increase to the accessible water supply brought about through a permit amendment, for example.

10. If there are factors that could potentially limit the firm yield/firm diversion of a WMS that are not reflected in the applicable TCEQ **WAM RUN#3** and that the RWPG considers significant to a recommended WMS, RWPGs may consider validating the WMS firm yield through the underlying WAM(s) that was used to evaluate existing surface water availability as referenced above. This does not include applying the same assumptions to the WMS being validated (e.g., safe yield procedures used to evaluate existing availability would not have to be applied to a WMS's new reservoir(s)). This analysis may be performed to confirm that a WMS being recommended could be reasonably expected to provide the estimated supply under the same drought conditions on which existing water supplies were evaluated. If considered appropriate by the RWPG, this validation could be the basis for reducing an estimated WMS firm yield but shall not be used as the basis for increasing a WMS firm yield above that determined using an unmodified TCEQ **WAM RUN#3**. This validation, if applied, is intended to provide a conservative measure to ensure that future WMS supplies are not over-estimated for drought planning purposes.

5.2.2 Other Water Management Strategies Quantity and Reliability

Groundwater desalination project supply volumes shall be within the availability of the associated groundwater volumes available in the project location. Reuse project supply volumes shall be sufficiently justified including the methods used to estimate the source amounts and giving consideration to the projected population and demand projections for each decade associated with the WMS as outlined in Section 3.4 of this guidance document.

WMS yields must be firm under drought conditions and shall take into account:

1. environmental flow standards in TCEQ 30 TAC Chapter 298 rules (e.g., flow set-asides) or, if there are no TCEQ environmental flow standards, other relevant limitations (e.g., pass-throughs required by the 1997 *Consensus Criteria for Environmental Flow Needs*); and
2. other recommended WMSs³⁸ (e.g., two recommended WMSs shall not rely on the same water availability volume thereby becoming mutually exclusive with regard to their source water).

RWPGs shall present in the plan separate from recommended WMS or WMSPs any recommendations regarding permit modifications, operational changes, and/or other infrastructure **that are not designed** to reduce the consumption of water, reduce the loss or waste of water, improve the efficiency in the use of water, or develop, deliver or treat additional water supply volumes to WUGs or WWPs in at least one planning decade such that additional water is available during drought of record conditions. This section should be clearly labeled as such.³⁹

5.2.3 Water Management Strategy Losses

Estimated water losses associated with each WMS shall be presented in the IPP and final adopted RWP. Technical evaluations may present for example:

1. total intake volumes at the supply source;
2. total net volume delivered to the end water user(s) (e.g., WUG(s));
3. with the difference between (1) & (2) being total water loss (e.g., due to conveyance losses); or,
4. the associated calculated percent water losses for strategies.

³⁸ Does not necessarily apply to *alternative* WMSs since these would replace certain *recommended* WMSs.

³⁹ 31 TAC 357.34(d)

Examples of information presented in past plans include calculated percent water loss included in each strategy evaluation summary or a tabulated range of estimated losses by strategy type.

5.3 Environmental Impacts and Limitations on Water Management Strategies

RWPGs shall evaluate and provide a quantitative reporting of how WMSs could affect environmental and cultural resources including impacts to environmental water needs, wildlife habitats, cultural resources, and the effects of upstream development on the bays, estuaries, and arms of the Gulf of Mexico. This evaluation may be in a variety of forms, including a cumulative analysis of all recommended WMSs in the plan. RWPGs shall develop and document an overall methodology for evaluating impacts; however, for environmental flows, and incorporating appropriate limitations on WMS yields, RWPGs must, in the following order:

1. follow environmental flows standards in TCEQ30 TAC Chapter 298 rules⁴⁰; or, in the absence of these flow standards;
2. use site specific studies when available; or, in the absence of these studies; or,
3. apply the 1997 “*Consensus Criteria for Environmental Flow Needs.*”⁴¹

This will be done in order to evaluate WMSs involving surface water development requiring permits from the TCEQ, including limitations to firm yield associated with releases or pass-throughs based on these criteria.

The 1997 consensus criteria were developed through extensive collaboration among scientists and engineers from the state’s natural resource agencies including the TWDB, TCEQ, and the TPWD, as well as academic professionals, engineering consultants, and informed members of the public. More specifically, the criteria are multi-stage rules for environmentally safe operation of impoundments and diversions during above normal flow conditions, below normal flow conditions, and during drought of record conditions. Documentation describing the methodology and its application is available in Appendix 2.0.

5.4 Recommended Water Management Strategies Requiring Interbasin Transfers

RWPGs recommending water management strategies involving an interbasin transfer must include documentation of consideration of the highest practicable level of water conservation and efficiency achievable, including water conservation strategies for each WUG or WWP that is to obtain water from a proposed interbasin transfer to which TWC §11.085 applies (31 TAC §357.34(e)(6)).

Recommended conservation WMS information will be tabulated in a DB22 generated standardized report for each WUG with an associated recommended WMS that requires an IBT. These reports are to be included as an appendix physically located immediately following the executive summary, but may include these reports elsewhere in the plan as deemed appropriate by the RWPG.

5.5 Financial Costs

Cost evaluations for new WMSPs being evaluated shall include capital costs, debt service, and annual operating and maintenance expenses over the planning horizon. The TWDB provides a WMSP costing tool that shall be used by RWPGs (see Section 5.5.1)⁴². Reported costs shall only include expenses associated with infrastructure needed to convey water from sources and treat water for end user requirements; however, reported costs shall not include expenses associated with internal distribution networks (e.g., infrastructure beyond treatment plants and major

⁴⁰ [http://texreg.sos.state.tx.us/public/readtac\\$ext.ViewTAC?tac_view=5&ti=30&pt=1&ch=298&sch=A&rl=Y](http://texreg.sos.state.tx.us/public/readtac$ext.ViewTAC?tac_view=5&ti=30&pt=1&ch=298&sch=A&rl=Y)

⁴¹ These consensus criteria can be found in Appendix 2.0 of this guidelines document.

⁴² The Executive Administrator anticipates that this tool will either be updated fully with updated assumptions and complete construction cost data or will be adjusted using the ENR cost index.

transmission/conveyance facilities). RWPGs shall report capital costs and average annual operation and maintenance costs as separate items in the Regional Water Planning Data Web Interface (see the TWDB's Contract Exhibit D *Guidelines for Regional Water Planning Data Deliverables* for further information).

Costs of WMSPs shall be prepared and presented separately and discretely for each separate WMSP and shall not be aggregated and presented as a single capital cost representing multiple WMSPs that would actually be located in multiple locations and funded by separate sponsors or implemented separately. Each project with a capital cost should have an associated volume of water or annual capacity presented in the plan. RWPGs shall not, in general, aggregate multiple facilities into a single cost estimate and then allocate shares of the resulting total cost, for example, pro rata across several entities or locations.

Capital Costs

Capital costs consist of construction funds and other capital outlays including, but not limited to, costs for engineering, contingencies, financial, legal, administration, environmental permitting and mitigation, land, and interest during construction.

1. Construction costs, if applicable, shall be based on September 2018 price indices for commodities such as cement and steel as reported in the *Engineering News Record (ENR) Construction Cost Index*⁴³ and shall include expected construction bid prices for the following types of infrastructure:
 - a. pump stations
 - b. pipelines
 - c. water intakes
 - d. water treatment and storage facilities
 - e. well fields
 - f. relocation of existing infrastructure such as roads and utilities
 - g. any other significant construction costs identified by each RWPG
2. Note that if construction cost estimates are available for some WMSPs based on prior cost estimates that are more detailed than those provided by the WMSP costing tool provided by the TWDB, these more detailed cost estimates may be updated by adjusting them based on the September 2018 price indices for commodities such as cement and steel as reported in the *Engineering News Record (ENR) Construction Cost Index*.

Interest during construction is based on total project costs drawn down at a constant rate per month during a construction period. Interest is the total interest accrued at the end of a construction period using a 3.0 percent annual interest rate less a 0.5 percent rate of return on investment of unspent funds.

If applicable, other capital costs shall include:⁴⁴

1. engineering and feasibility studies, legal assistance, financing, bond counsel, and contingencies (engineering, contingencies, financial, and legal services may be lumped together and estimated as 30 percent of total construction costs for pipeline projects and 35

⁴³ ENR quarterly cost reports can be found at <http://www.enr.com>

⁴⁴ These development costs may vary by project category based on the TWDB WMSP costing tool.

percent for other facilities unless more detailed project and/or site specific information is available);

2. permitting and mitigation activities including, but not limited to, those associated with
 - a. archeological/historic resources;
 - b. environmental analyses and biological assessments;
 - c. mitigation activities including: evaluation, land acquisition, implementation, monitoring, financial assurances, and adaptive management; or
 - d. other permitting and mitigation costs.
3. land purchase costs not associated with mitigation;
4. easements costs (easement costs for pipelines shall include a permanent easement plus a temporary construction easement as well as rights to enter easements for maintenance); and,
5. purchases of water rights.

Note that costs and land areas associated with development of reservoirs, in particular, shall be broken out within the aforementioned costing items to show separate lines items for:

1. the land area of the reservoir footprint (conservation pool only) alongside the estimated land purchase cost;
2. mitigation land area and associated estimate of purchase cost; and,
3. construction costs of embankment/dam facilities (separate from transmission facilities).

Debt Service

For WMSs other than reservoirs the length of debt service is 20 years unless otherwise justified. For reservoirs, the period is 40 years. Level debt service applies to all projects, and the annual interest rate for project financing is 3.5 percent. Terms of debt service shall be reported in the TWDB's Regional Water Planning Data Interface.

Annual Operating and Maintenance Costs

Operations and maintenance unit costs shall be based on the associated quantity of water supplied. Unless more accurate, project-specific data are accessible, RWPGs shall calculate annual operating and maintenance costs as 1.0 percent of total estimated construction cost for pipelines, 2.5 percent of estimated construction costs for pump stations, and 1.5 percent of estimated construction costs for dams. Costs shall include labor and materials required to maintain projects such as regular repair and/or replacement of equipment. Power costs shall be calculated on an annual basis using calculated horsepower input and a power purchase cost of \$0.08 per kilowatt hour; however, each RWPG may adjust this figure based on local and regional conditions if they specify and document their reasons. RWPGs shall include costs of water if WMSs involve purchases of raw or treated water on an annual basis (e.g. leases of water rights).

At a minimum, annual costs should be presented by debt service, operation and maintenance cost as a percentage of total construction cost, power costs, and cost of purchasing water (if applicable). If precise information on the cost of purchasing water is not available, the plan should include a best estimate (e.g., as a percent markup) of the raw or treated water cost and the water management strategy evaluation can state the cost is an estimate.

Unit Costs of Water

The RWP shall present the unit costs of the net volume of water anticipated to be delivered to water users (*after water losses*) in dollars per acre-foot. Unit costs of WMSs must be evaluated, compared, and presented in an ‘apples-to-apples’ manner. For example, RWPGs should not compare firm yield unit water costs of one reservoir to the safe yield unit water costs of another reservoir within the same river basin.

5.5.1 WMSP Costing Tool for Regional Water Planning

The TWDB spreadsheet-based WMSP costing tool will be updated and made available for use by RWPGs and located, along with a user guide, on the TWDB website. This spreadsheet-based costing tool provides a broad set of historical costs linked to costing curves that will be utilized to develop costs for typical elements of water projects (e.g., pump stations, pipelines, and treatment plants). This tool reflects the requirements of these regional water planning guidelines and presents output cost data accordingly. The tool has the flexibility to incorporate a certain amount of local knowledge and project specific data. **In the absence of more accurate and detailed, project-specific cost estimates, RWPGs shall utilize this WMSP costing tool for every cost estimate presented in the RWPs**, including updating project cost estimates previously developed in the 2016 RWPs. **RWPGs should present the costing tool’s standardized, automated cost output report for each WMSP evaluated** in the IPP and final adopted RWP. If a different format is utilized, the RWPG shall apply the data and procedures used in the costing tool, and present the resulting output as analogous to the costing tool, for example breaking out capital cost estimates for each project component.

5.5.2 Infrastructure/Costs That Shall be Included in Regional Water Plans

The WMSP components that are included in RWPs shall be limited to the infrastructure and costs that are required to develop and convey *increased* water supplies from water supply sources and/or to treat the water for the end-user entity. This may include treatment facilities at the end-user entity’s delivery point or treatment facilities at a point prior to transmission to the WUG (e.g., at a WWP location). Costs shall also include conservation WMSs that have associated infrastructure or other costs (e.g., to address water loss; plumbing retrofits); or WMSs needed to address infrastructure bottlenecks in an existing water supply conveyance system – the removal of which would allow an increase to the water supply volume delivered to an end-user entity.

The types of facilities and associated capital or other costs that **shall** be included in a RWP⁴⁵ are directly associated with development of new supplies from new water sources or additional supplies from more efficient use of existing supplies (i.e., conservation), or volumetric increases to existing water supplies delivered to entities. Such strategies include but are not limited to

1. facilities associated with a new water supply (e.g., new reservoir, new well field, intakes, pump stations);
2. water supply storage facilities associated with increasing water supply source yields (e.g., reservoirs, some aquifer storage and recovery facilities);
3. facilities that are required to increase water supply from an existing water supply source (e.g., a new water transmission pipeline from an existing reservoir);
4. expansion of existing facilities that are required to accommodate increased supply capacity to treat increased water supply for entities (e.g. water treatment plant capacity expansion);

⁴⁵ RWPGs must report capital and annual costs through DB22 (see the TWDB’s Contract Exhibit D *Guidelines for Regional Water Planning Data Deliverables* for further information).

5. facilities associated with increasing overall water supply yields, for example, by blending new sources of water with existing water sources (e.g., conjunctive use);
6. expanded infrastructure required to fully utilize existing water rights/supplies (e.g. expansion of an undersized raw water intake or expansion of a water treatment plant);
7. new facilities required to obtain water from an existing water source that may be changing (e.g., replacement of a groundwater well in order to obtain water from an existing groundwater supply in an aquifer that is being drawn down below the level of the existing well);
8. infrastructure associated with water (raw or treated) supply transmission lines from WWP to WUGs;
9. costs associated with conservation WMSs that have identified capital or other costs for the associated decrease in system water use or water losses, including active plumbing retrofit programs; replacement of portions of an existing leaking water transmission or distribution network that results in an immediate, quantifiable increase in water supply; or, meter replacement/SCADA installation that also results in an immediate, quantifiable increase in water savings;
10. costs associated with the increased wastewater treatment requirements needed to provide new or additional reuse water supplies;
11. cost of major transmission lines conveying direct reuse supplies; and,
12. costs of temporary *drought management* strategies.⁴⁶

Water plans may include only infrastructure costs that are:

1. associated with volumetric increases of treated water supplies delivered to water user groups (e.g., up to a water utility's intake or service area), or
2. that would immediately result in more efficient use of existing supplies or in an immediate reduction in water losses.

In accordance with 31 TAC §357.34(e)(3)(A), regional and state water plans are not to include the cost of distribution of water within a water user group service area⁴⁷. The only exception regarding the inclusion of costs associated with water distribution systems are for conservation strategy projects that are in accordance with the following:

1. costs are associated with plumbing retrofits, metering, or other best management practices that will result in immediate reduction in the use of or loss of water; or
2. costs are associated with replacement of only those portions of water lines in an existing retail water distribution system service area that for the primary purpose of addressing significant, measurable, water loss, and:
 - a. the proposed replacement water line(s) is not more than two, standard pipe diameters larger than the existing line proposed to be replaced. For example, replacement of an existing 6-inch water line with a 12-inch line may not be

⁴⁶ Estimated costs of probable economic impacts due to temporary *drought management* strategy implementation may be presented for WMS evaluation and comparison purposes within technical analyses but shall not be included in water plans as a capital cost of the RWP. The TWDB WMSP costing tool includes a temporary *drought management* strategy component that may be used to estimate economic impacts associated with demand reductions for the purpose of comparing to costs of WMSs.

⁴⁷ The reference of distribution system in the section is not equivalent to large-scale transmission projects within the boundaries of collective reporting units.

included in the water plan since it is more than 2 diameters larger (i.e., larger than both 8-inch and 10-inch);⁴⁸

- b. the proposed water line replacement will provide an immediate, quantifiable increase in water supplies; and,
- c. the primary purpose of the project is to achieve water conservation savings.⁴⁹

If the distribution line replacement for the water conservation strategy is subject to adopted utility standard minimum size requirements that exceed two standard pipe diameters, the water management strategy evaluation shall note the specific utility standard and include:

1. a map of the proposed line replacement; and,
2. detailed water loss calculations before and after the proposed line replacement.

5.5.3 Infrastructure/Costs That Shall Not be Included in Regional Water Plans

If an infrastructure component is not required to increase the treated water supply volume delivered to an entity either as new supply or through demand reduction, then the component and its costs shall not be included in the RWP. Types of items and associated cost that shall **not** be incorporated into a RWP include, but are not limited to:

1. new facilities associated with internal distribution networks. (e.g., retail distribution within a WUG's system) and that do not convey additional water supply volumes to a WUG;
2. internal distribution facilities including those associated with direct reuse water (per 31 TAC §357.34(e)(3)(A));
3. wastewater collection systems associated with a direct reuse project;
4. water system improvements to address compliance issues related to water quality or water distribution pressure;
5. new wells that are required simply to replace aging wells (i.e., maintenance);
6. maintenance of, or upgrades to, existing equipment or facilities that do not directly increase volumetric water supply (e.g., for improving water treatment processes at existing water treatment plants; replacement of electrical systems; replacement of pumps; or installation of cathodic protection on existing facilities);
7. preventative measures to protect or maintain infrastructure against future water loss or degradation; and,
8. water storage facilities directly associated with retail water distribution networks (e.g., elevated storage tank).

Regional water plans must not include any strategies or costs that are associated with:

1. simply maintaining existing water supplies; or
2. replacing existing infrastructure for maintenance or compliance; or

⁴⁸ For the purposes of state water planning, water line upsizings over two diameters are considered an indication that the primary purpose of the line replacement is to increase the volume of water being delivered rather than reduction of water loss.

⁴⁹ Conservation strategies should not be based on potential water savings that are only ancillary benefits of a non-conservation project. For example, replacing existing small diameter water lines with much larger lines to increase delivery of water in a distribution system may often entail a small side-benefit of reducing at least some water losses but is not a sufficient basis for inclusion of the project as a conservation capital cost in a regional water plan. The impracticality of labelling such a project as a conservation strategy may also be indicated by a noticeably higher unit cost of conserved water.

3. expanding water distribution system capacity or the distribution network, for example, to address compliance issues related to water quality or water pressure, or to reach new retail development areas; or
4. delivering greater volumes of water within the distribution system for the purpose of addressing increased system growth of new retail developments; or
5. delivering greater volumes of water within the distribution system for the purpose of existing or future fire protection.

5.6 Reporting of Strategy Evaluation Information

Water management strategy technical evaluations and cost estimate summaries should identify the major facilities or projects related to the strategy, their approximate locations, and their associated capital costs. Cost estimate summaries shall be provided for each WMS evaluation using the format of the output of the unified (WMSP) costing tool. Project phases, if applicable, should be described and associated volumes and costs presented for each phase.

Required quantified impacts must be quantitatively reported in the IPP and final adopted RWP. Illustrative examples of quantification from previous planning cycles have included:

1. project-specific acreages impacted;
2. quantified ranges of acreage correlating to qualitative impact descriptions (e.g. low, medium, high);
3. flow frequency curve comparisons;
4. well hydrographs of anticipated pumping;
5. percent attainment of freshwater inflow targets (annual and monthly) under different scenarios; and,
6. monthly median freshwater inflows comparisons.

5.7 Recommended and Alternative Water Management Strategies and Water Management Strategy Projects

RWPGs shall recommend WMSs separately from WMSPs although they are often interrelated.

RWPGs shall include in the Appendix immediately following their RWP Executive Summary the *TWDB DB22 Recommended WUG Water Management Strategy*⁵⁰ report and the *TWDB DB22 Recommended Projects Associated with WMS* report, which shall, respectively, list all of the recommended WMSs and WMSPs that are included in the IPP and final adopted RWP.

RWPGs shall also include in the Appendix following their RWP Executive Summary the *TWDB DB22 Alternative WUG Water Management Strategy* report and the *TWDB DB22 Projects Associated with Alternative WMS* report, which shall, respectively, list all alternative WMSs and WMSPs that are included in the IPP and final adopted RWP. All alternative WMSs shall be fully evaluated based on criteria specified in 31 TAC §357.34 & §357.35. Technical evaluations of each alternative WMS must have a generally defined delivery point for the water.

After RWP adoption, a RWPG may **substitute** a fully-evaluated *alternative* WMS for a previously recommended WMS, if the previously recommended strategy is no longer feasible if a substitution request to the EA is approved (per 31 TAC §357.51(e)).

⁵⁰ All 'TWDB DB22...' reports are based on data entered by RWPGs into DB22. These reports will be provided by the TWDB and must be included as part of every Technical Memorandum, IPP and final adopted RWP as indicated by this guidance document.

5.8 Allocating Water Management Strategy Supplies

A WMS’s source will have an *availability* that will reflect the full drought of record firm yield/firm diversion. The availability associated with a WMS/WMSP shall be allocated to WUGs/WWPs as future *supplies* as appropriate, in accordance with the following:

- a) may be fully allocated to the WUGs and/or WWP WUG customers; or
- b) may be partially allocated to WUGs and/or WWP WUG customers and the remainder allocated to entities representing the unassigned water volumes; or
- c) may remain unallocated, by associating the water volumes with an ‘unassigned water volume entity’ that represents the entity that sponsored the development of the water.

Just as for *existing* reuse, *future* reuse availability shall not exceed the capacity of the future infrastructure to provide effluent for potential reuse. To avoid overestimating availability, the future reuse volume will also be dependent upon the WMSP online decade population/demand projections that would determine the amount of anticipated wastewater flowing into a WWTP on an annual basis. This population-dependent availability would be less than a future WWTP’s maximum permit capacity and would increase each future decade (as population/demand projections increase) up to the annual volume restricted by infrastructure and/or permit (i.e., WWTP inflow projections would be a more stringent restriction for reuse availability in early planning decades).

5.9 Management Supply Factor

The IPP and final adopted RWP shall include, for informational purposes only, a TWDB-provided table that presents the calculated *management supply factors* for each decade and for each WUG, that considers all recommended WMSs. The TWDB will provide supporting data from DB22 to assist in the analysis and presentation of management supply factors for major water providers. The management supply factor for a WUG or MWP shall be calculated as follows and is for reporting purposes only:

$$MSF = \frac{Ve + Vr}{D}$$

Where:

MSF = management supply factor

Ve = total volume of all decadal existing water supplies associated with a WUG (adjusted if necessary for strategies)

Vr = total volume of all decadal recommended WMS supplies associated with a WUG

D = total identified decadal water demand volume for a WUG to be met by (*Ve* + *Vr*)

For example, the management supply factor for a WUG with a projected decadal demand of 10,000 acre-feet/year, a total of 5,600 acre-feet/year existing supplies, and a total of 5,400 acre-feet/year supply from all recommended WMSs would be:

$$MSF = \frac{5,600\ AFY + 5,400\ AFY}{10,000\ AFY} = 1.1$$

WUGs with **unmet** needs, for example associated with some irrigation demands, will result in management supply factors less than 1.0.

For example:

$$MSF = \frac{5,000 \text{ AFY} + 1,000 \text{ AFY}}{10,000 \text{ AFY}} = 0.6$$

A management supply factor shall also be presented individually for **each** MWP, by decade.

WUGs may be grouped by category **and** similar management supply factors in a summary format when appropriate. If the management supply factor was predetermined by the RWPG prior to recommending strategies⁵¹, the underlying basis for the magnitude of the management supply factor shall be explained in the RWP and may be summarized within the Management Supply Factor Table.

To address uncertainty in the planning and project implementation process over the current planning horizon and/or to address potential water needs beyond the planning horizon, RWPGs may choose to identify and incorporate a predetermined management supply factor (e.g., beyond just meeting identified water needs) for WUGs and MWPs when developing the RWP.

Management supply factors may be used to take into account uncertainties associated with:

1. projections of populations,
2. projections of water demands,
3. climate variability,
4. potential droughts more severe than the drought of record,
5. yield of recommended WMSs,
6. permitting or other uncertainties impacting implementation of WMSPs, and/or,
7. other uncertainties.

The RWPG may choose to predetermine appropriate management supply factors as the basis for recommending WMSs that, together, provide water volumes in excess of the identified water needs. RWPGs shall provide an explanation for any predetermined management supply factors and may present these factors based, for example, on sizes of water users, types of water uses, water availability conditions, types of WMSs, or any other factors the RWPG considers relevant at the project or water user level.

If a RWPG chooses not to predetermine or standardize management supply factors, the management supply factors will simply be reported in the RWP based on the recommended WMSs.

5.10 Water Conservation Recommendations

A separate subchapter (in accordance with 31 TAC §357.34(g)(2) & (h)) shall consolidate and present conservation recommendations that may include considerations of applicable Best Management Practices appropriate for the region. The RWPG must consider potentially applicable Best Management Practices when developing water conservation strategies involving an interbasin transfer to which Water Code section 11.085(l) applies. Best Management Practices identified by the state's Water Conservation Advisory Council and other information for consideration, including conservation quantification studies, may be found on the TWDB website. It should be noted that water reuse is a unique strategy type separate from conservation. Model water conservation plans, (consistent with TWC §11.1271), may be referenced, instead of included in hard copy, in this subchapter by providing internet links.

⁵¹ Not required

Note that the definition of *water conservation measure* has been clarified in rule 31 TAC §357.10(34) to be more consistent with the State Water Implementation Fund for Texas (SWIFT) rules. For planning purposes, **water conservation measures do not include projects that develop new supplies**, such as new reservoirs or aquifer storage and recovery projects. Please refer to the definitions section of this document for more information.

Note that water-efficiency savings (plumbing code savings) are incorporated into the underlying municipal demand projections and include the estimated or anticipated savings due to fixture and appliance design specifications in state or federal legislation. Additionally, the base GPCD for the projections would include the effects of any conservation best management practices that the utility had already achieved by the time projections were developed. **In the development of municipal conservation WMSs, ensure that the strategies do not double-count the plumbing code savings that are already embedded in the projections.**⁵² The TWDB will provide a plumbing code savings worksheet to the planning groups of the difference between the base per-person water use for municipal WUGs and the projected GPCD which will include expected savings due to plumbing codes and water-efficient appliances. The savings are will be presented by region, county, and municipal WUG, but it will be up to each RWPG as to how the savings are included in the RWPs.

If applicable, this subchapter must summarize the reason(s) that a conservation WMS(s) was not recommended for each WUG having an identified water need.

5.11 Developing the Scope of Work for Task 5A

This section describes, in general, the process by which RWPGs shall develop and submit Scopes of Work (SOW) in order to obtain EA 'notice-to-proceed' authorization to expend funds associated with Task 5A – Evaluation and Recommendation of WMSs and WMSPs. Each of the 16 regional water planning contracts includes a 'notice-to-proceed' requirement for Task 5A that will include a funding allocation but no associated written SOW. This is because RWPGs should complete their work to scope potential strategy evaluation work after identifying needs.

Before RWPGs may proceed on Task 5A work they shall first provide a proposed SOW for the budget that has been allocated to the RWPG under the Contract.

The process to obtain a 'notice-to-proceed' is as follows:

1. RWPGs shall develop and approve its proposed 5A SOW in the format shown in Appendix 1.0, Table D. The SOW will include a description of how the associated Task 5A funds would specifically be spent, based on a work description.⁵³
2. **As part of the SOW submittal, the RWPG shall report the date on which the RWPG provided its overall method for identifying potentially feasible WMSs to the public for comment and the date on which the RWPG approved the method.**
3. The proposed SOW and an associated budget breakdown shall be presented in logical increments that allow the TWDB to evaluate the SOW and associated work effort.
4. The TWDB will then review the SOW and associated budget breakdown. TWDB may request that the SOW subtasks and associated budgets be further broken down and/or clarified.

⁵² Water efficiency savings are not incorporated into the demand projections for any other category of water use.

⁵³ Work effort associated with preparing and submitting a proposed Task 5A scope of work in order to obtain a written 'notice-to-proceed' from the TWDB is not reimbursable under the Contract.

5. Once sufficient information is provided to TWDB on the proposed SOW, the final SOW and budget will be negotiated, as appropriate.
6. If approved by the EA, the TWDB will issue a written 'notice-to-proceed' for the final SOW and associated share of the 5A funds and amend the approved final SOW into the existing Contract. Unless adequate justification is provided above, some 5A funds may not receive a 'notice-to-proceed'.

RWPGs may submit proposed SOWs and budget breakdowns for Task 5A in multiple stages, which would require more than one TWDB review and more than one Contract amendment and notice-to-proceed.

There are no guarantees that all funds allocated to a RWPG for Task 5A shall be expended. All budgets and expenditures under Task 5A must be eligible and justified in an approved SOW in order to receive an EA-approved notice-to-proceed and expenses must be documented adequately in order to receive reimbursement.

6.0 Impacts of the Regional Water Plan⁵⁴

RWPGs shall describe anticipated various impacts of the RWP including potential impacts on navigation and the socioeconomic impacts of not meeting identified water needs.

6.1 Impacts of Water Management Strategies on Key Water Quality Parameters in the State and Impacts of Moving Water from Agricultural and Rural Areas

Each RWPG shall describe how implementing recommended and alternative WMSs could affect key parameters of water quality in Texas. RWPGs should base water quality impacts on parameters important to water uses in each region.

RWPGs shall also discuss how WMSs could have long-term effects on: 1) third party social and economic impacts resulting from voluntary redistributions of water including analysis of third party impacts of moving water from rural and agricultural areas; 2) water resources of the state including groundwater and surface water inter-relationships; and, 3) other factors deemed relevant by RWPGs such as recreational impacts.

For river and stream segments that have been designated as unique by the legislature⁵⁵, the RWPGs shall include a quantitative assessment of the impact of the plan on flows important to river and stream segment. The analysis should compare current conditions to conditions with all recommended WMS implemented and describe the impact of the plan on the unique features cited in the RWPG's recommendation of the unique segment.

Furthermore, RWPGs should consider statutory provisions regarding interbasin transfers of surface water [TWC §11.085]. At a minimum, considerations should include a summation of water needs in basins of origin and receiving basins based on water needs in the final approved RWP.

6.2 Descriptions of how Regional Water Plans are Consistent with the Long-term Protection of the State's Water, Agricultural, and Natural Resources

The RWPGs shall describe how the RWPs are consistent with the long-term protection of Texas' water, agricultural, and natural resources including the requirement that planning analyses and

⁵⁴ Primarily related to 31 TAC §357.40 and §357.33(c)

⁵⁵ 31 TAC §357.43(b)(2)

recommendations honor all existing water rights and contracts. Although much of the analyses pertaining to this requirement shall be developed for other tasks, including tasks associated with estimating the environmental and water quality impacts of WMSs during WMS evaluation. RWPGs are encouraged to identify the specific resources important to their RWPAs and describe how these resources are specifically protected through the regional water planning process.

6.3 Descriptions of Unmet Municipal Needs⁵⁶

The RWPGs shall provide adequate justification of any unmet municipal needs that are included in the final adopted RWP. For each municipal WUG with unmet needs, the RWPG shall include:

1. documentation that all potentially feasible WMS were considered to meet the need, including drought management WMS;
2. explanations as to why additional conservation and/or drought management WMS were not recommended to address the need;
3. descriptions of how, in the event of a repeat of the drought of record, the WUG associated with the unmet need shall ensure the public health, safety, and welfare in each planning decade with an unmet need; and,
4. explanation as to whether there may be occasion, prior to the development of the next IPP, to amend the RWP to address all or a portion of the unmet municipal need.

6.4 Descriptions of the Socioeconomic Impacts of Not Meeting Identified Needs

In general, RWPGs request that the TWDB provide the analysis of the socioeconomic impacts of not meeting a region's identified water needs; however, the RWPGs have the option to perform this task themselves. If the TWDB is requested to perform this analysis for the RWPG, the water needs of the RWPA will need to be identified by a date to be provided which will allow for the time necessary to conduct and provide the analysis. Due to the ongoing nature of plan development, the water supply needs utilized for the analysis may differ slightly from the identified water supply needs in the final adopted RWP.

7.0 Drought Response Information, Activities, and Recommendations⁵⁷

This chapter of the RWP shall consolidate existing and/or new information on droughts of record and drought preparations in the region and present a variety of recommendations developed by the RWPG.

It has been recommended, by the state's Drought Protection Council⁵⁸, that the RWP follow the TWDB working outline template for the Drought Chapter, which will be posted on the TWDB website⁵⁹.

7.1 Drought(s) of Record

The RWP shall present and summarize information regarding the current drought(s) of record for the region and any other relevant sub-regional or basin-specific drought of record periods that impact the existing RWPA water supplies. This summary may include relevant sub-regional, basin-based, and/or sub-basin droughts of record.

⁵⁶ 31 TAC §357.50(j)

⁵⁷ Primarily related to 31 TAC §357.42

⁵⁸ November 2014 letter from Drought Protection Council to RWPGs

⁵⁹ http://www.twdb.texas.gov/waterplanning/rwp/planningdocu/2021/current_docs.asp

The RWP may present information supporting recognition of potential new droughts of record for the region or a sub-region and/or for individual river basins or groundwater resources that impact the RWPA water supplies.

7.2 Descriptions of Current Preparations for Drought in the Region

The RWP shall consolidate and present:

1. an overall assessment of current drought preparations and planned responses to drought conditions in the region (this may include information from local drought contingency plans);
2. summary of the current triggers used for initiating drought responses in the region; and,
3. description of how water suppliers in the region both a) identify and b) respond to the onset of drought including the role of drought contingency plans.

7.3 Existing and Potential Emergency Interconnects⁶⁰

RWPGs shall collect and summarize information on existing and potential major water infrastructure facilities that may be used for emergency interconnects and provide this information to the EA confidentially and separately from the final adopted RWP. The information may be collected by a subgroup of RWPG members in a closed meeting.

Emergency interconnection data information may be submitted as a hard-copy under separate cover from the final adopted plan. The information may also be submitted electronically, but should be done in a manner that preserves its confidential nature, such as a password-protected pdf. The information deemed confidential should be marked as such on each page of the document submitted.⁶¹

This information may be collected in a tabular format that shows the potential user(s) of the interconnect, the potential supplier(s), the estimated potential volume of supply that could be provided via the interconnect (including the source name), and a general description of the facility/infrastructure and its location.

At a minimum, the RWP shall include a general description of the methodology used to collect the emergency interconnect information and present the number of existing and potential emergency interconnects within the RWPA. This includes basic information on the currently existing interconnections, such as who is connected to whom. If there are currently existing infrastructure facilities where a future potential interconnect could be developed in the event of an emergency shortage of water, this should be identified at least in very general terms. Any information regarding the location or description of facilities should be excluded from the plan.

RWPs shall also provide a general description of local drought contingency plans that involve making emergency connections.

7.4 Emergency Responses to Local Drought Conditions or Loss of Municipal Supply

The RWPGs shall evaluate potential emergency responses to local drought conditions or loss of existing water supplies. These shall include temporary responses that may or may not require additional temporary and/or permanent infrastructure (e.g., surface-laid pipes; wells). For the

⁶⁰ Per 31 TAC §357.42(d); and TWC §16.053(r)

⁶¹ 31 TAC 357.42(d)

purpose of this analysis, it shall be assumed that the entities being evaluated have approximately 180 days or less of water supply remaining.

The analysis shall be a limited, high-level review to serve as a general indicator of the universe of potential options, or lack thereof, for each municipal entity evaluated. The results are to provide basic guidepost ‘arrows’ indicating potential solutions that might be considered in the event of local emergency. The information may reveal municipal water users that are most vulnerable in the event of a loss of supply. These screening-level evaluations do not require technical analyses or evaluations in accordance with 31 TAC §357.34 and §357.35 (WMS and WMSP evaluation and recommendation criteria).

RWPGs shall evaluate, at a minimum, all municipal WUGs in the region that

1. have 2010 populations less than 7,500 and rely on a sole source⁶² for its existing water supply regardless of whether that water is provided by a WWP, and
2. all county-other WUGs, regardless of population or number of sources.

See Appendix 1.0, Table B for an example format.

7.5 RWPG Recommendations Regarding Triggers & Actions to be Taken In Drought

RWPGs shall develop and present drought response recommendations for existing surface water and groundwater sources on which the region relies. This includes the RWPG developing recommendations for both drought triggers and responses for each water source on which the region relies. The RWPG shall identify and recommend actions to be taken as part of the drought response by:

1. the manager of each water source (such as water providers, reservoir operators, groundwater conservation districts); and,
2. the entities relying on each source (self-supplying entities, customers).

If the RWPG is uncertain of the source manager or if there is none, the plan should indicate “NA”. The RWPG should report, by source, the triggers that are available. If there are no triggers, the RWPG should report that information as “none”.

The RWPG shall make recommendations regarding the number of drought stages and degrees of water use reduction that should be considered by users and providers. RWPGs may consider existing triggers and actions from existing drought contingency plans when developing recommendations.

In general, RWPGs should consider multiple drought response stages but, at a minimum, RWPGs shall develop and recommend two distinct sets of triggers and drought stages for a) *severe* and b) *critical/emergency* conditions. See Appendix 1.0, Table A for an example format.⁶³

The RWPG should consider making drought trigger recommendations as they consider appropriate. Note that drought triggers and responses for multiple minor water supplies (e.g., small run of river water rights) may be aggregated in the table based on their association with a common water source and/or use (e.g., irrigation), if appropriate.

⁶² Sole source for an entity is a source-based analysis rather than an analysis of discrete infrastructure (e.g. a well field of 5 wells in a common aquifer is a single source).

⁶³ May be incorporated into DB22 if sufficient TWDB resources are available.

7.6 Development of Region-Specific Model Drought Contingency Plans

The RWPGs shall develop region-specific model drought contingency plans that shall be presented in the RWP. Model plans shall be consistent with the minimum requirements in 30 TAC Chapter 288, which provides requirements on drought contingency plans for public water suppliers, irrigation use, and WWPs. The TCEQ requires the following types of water users to prepare and implement drought contingency plans: new water right applicants or water right amendments, retail public water suppliers, WWPs, irrigation districts, and investor-owned or privately-owned water utilities.⁶⁴

At a minimum, two model plans shall be developed and address triggers for and responses to *severe* and *critical/emergency* drought conditions. Model plans may be based, for example, on different water use categories, user sizes, and/or types of water source. It is at the discretion of the RWPG on the type of models plans developed, but is recommended that RWPGs develop plans that would be of use to the types of water users within the RWPA.

These model plans may be included as an internet hyperlink in the RWP, however the link provided must be an operational link to the document on the RWPG's or designated political subdivision's website.

7.7 RWPG Drought Management Water Management Strategies

For regional water planning purposes, drought management strategies are temporary demand management measures that reduce water use during times of drought by restricting normal economic and domestic activities. Examples of drought management strategies include demand reductions based on drought contingency plan triggers, economic impacts, and/or other factors determined by the planning groups; and pumping restrictions based on drought management plan triggers.

The RWP shall present all drought management WMSs that were:

1. considered and/or evaluated as potentially feasible (including those not recommended);
2. recommended in the RWP (including the associated triggers for implementing each recommended WMS); and,
3. included in the RWP as alternative WMSs (including the associated triggers for implementing each alternative WMS).

7.8 Other Drought-Related Considerations and Recommendations

The RWPG shall consider any relevant recommendations from the Drought Preparedness Council.

The RWPGs shall include, as appropriate, additional recommendations regarding:

1. any other drought management measures that were recommended by the RWPG (including the associated triggers, if applicable);
2. recommendations developed by the RWPG regarding the State's Drought Preparedness Council and the State Drought Preparedness Plan;
3. recommendations developed by the RWPG regarding development of, content of, and implementation of drought contingency plans in the region;
4. recommendations developed by the RWPG regarding current drought management preparation in the RWPA, including drought triggers and actions; and,
5. any other general recommendations regarding drought management in the region or state.

⁶⁴ 31 TAC §357.42(j); https://www.tceq.texas.gov/permitting/water_rights/wr_technical-resources/contingency.html

8.0 Unique Stream Segments and Reservoir Sites and Other Recommendations ⁶⁵

Planning groups may make recommendations for designating river and stream segments of unique ecological value and unique sites for reservoir construction; however, the Texas Legislature is responsible for making the official designations of these sites. Planning group recommendations should be clear as to which Unique Stream Segments or Unique Reservoir Sites have been previously designated by the Legislature and which Unique Stream Segments or Unique Reservoir Sites are being recommended for designation by the RWPG, including whether the RWPG recommends that the legislature re-designate a previously designated reservoir site, or not .

8.1 Unique Stream Segments

RWPGs may recommend all or parts of river and stream segments in their respective regions as having “unique ecological values.” To recommend this designation, RWPGs must justify it based on the following criteria:

1. biological function measured as stream segments displaying significant habitat value including both quantity and quality considering degrees of biodiversity, age, and uniqueness including terrestrial, wetland, aquatic, or estuarine habitats;
2. hydrologic function measured as stream segments 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 measured as stream segments 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 fringed by other areas managed for conservation purposes under governmentally approved conservation plans;
4. high water quality, exceptional aquatic life, high aesthetic value 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
5. threatened or endangered species and unique communities defined as 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.

RWPGs seeking a designation shall forward a recommendation package to the TPWD, who will in turn provide a written evaluation of the proposal within 30 days. If the RWPG is recommending stream segments that were recommended in a previous plan but not designated by the legislature, the recommendation package must be submitted to TPWD for their written evaluation⁶⁶.

Recommendation packages shall contain a physical description giving the location of the stream segment, along with maps, photographs, and documentation with supporting literature and data that characterizes a site’s unique ecological value addressing criteria in 31 TAC §357.43(b).

⁶⁵ Primarily related to 31 TAC 357.43

⁶⁶ 31 TAC §357.43(b)

Final adopted RWPs shall include the Texas Parks and Wildlife Department's written evaluation. If the Texas Legislature designates a stream or river segment as unique; or if a RWPG recommends that a stream or river segment be classified as unique, each RWPG must quantitatively assess how recommended WMSs in a RWP would affect flows deemed important (by RWPGs) to the stream or river segment in question. Furthermore, assessments shall describe how a RWP would affect the unique features and criteria cited by a RWPG as the impetus for a legislative designation.

8.2 Unique Reservoir Sites

RWPGs may recommend sites for reservoir construction that have “unique value” by including a description of the site, reasons for⁶⁷ the unique designation and expected beneficiaries of water supplies developed at a given site. The following criteria shall be used to determine if a site is unique:

1. site specific reservoir development is recommended as a specific WMS or as a unique reservoir site in a final adopted RWP; or
2. factors such as location, hydrologic, geologic, topographic, water availability, water quality, environmental, cultural, and current development characteristics make a site uniquely suited for either reservoir development to provide water supply for the current planning period; or where it might reasonably be needed to meet water needs beyond the 50-year planning period.

8.3 Other Legislative Recommendations

RWPGs may develop and include in the RWP regulatory, administrative, or legislative recommendations that will facilitate the orderly development, management, and conservation of water resources in Texas, and will facilitate more voluntary water transfers and help the state prepare for and respond to droughts. In addition, they may develop information regarding the potential impacts of recommendations enacted into law once proposed changes are in effect.

9.0 Reporting of Financing Mechanisms for Water Management Strategies

RWPGs shall assess how local governments, regional authorities, and other political subdivisions in the region would finance the implementation of WMSs and associated WMSPs. RWPGs shall also propose what role the state will have in financing projects identified in the plan, giving particular attention to proposed increases in the level of state participation in funding for regional projects to meet needs beyond the reasonable financing capability of local governments, regional authorities, and other political subdivisions involved in building water infrastructure⁶⁸.

The RWPG will provide information via an online survey administered by the TWDB and performed by each RWPG. The TWDB will develop a survey instrument and methodology. Each RWPG shall conduct a survey and report findings to the TWDB. The approach will be similar to how the infrastructure financing survey was conducted during the 2011-2016 Regional Water Planning cycle. The TWDB will provide additional instructions and documentation describing the survey methodology and formats for reporting resulting data.

⁶⁷ The regional water plan should make explicitly clear whether a recommendation is for a new, additional designation by the legislature, or re-designation of a previously designated reservoir site.

⁶⁸ Texas Water Code §16.053(q)(2)

10.0 Adoption of Plan and Public Participation

As required by 31 TAC §357.21, the RWPGs shall conduct all business in meetings posted and held in accordance with the Texas Open Meetings Act, Texas Government Code Chapter 551, with a copy of all materials presented or discussed available for public inspection prior to and following public meetings. Additional notice requirements referenced in 31 TAC §357.21 shall also be followed when applicable.

The RWPGs shall adopt RWPs and allow for public participation in the RWP adoption process in accordance with administrative rules, the Contract, statute and the RWPG bylaws. Please see the latest TWDB *“Regional Water Planning Public Notice Quick-Reference”* document for a summary of public notification requirements.

This task includes all work and eligible expenses required to hold meetings and include public input and participation in development of the RWP, including but not limited to:

1. holding regular RWPG meetings;
2. posting public notices;
3. holding public input meetings and hearings;
4. holding special meetings;
5. collect and disseminate public input;
6. costs of technical and other consultants, as needed, to prepare for and participate in RWPG meetings, workshops, hearings, and any other special meetings during the development of the 2021 RWP;
7. costs of performing any surveys of water suppliers or WUGs;
8. coordination with and collection of information from groundwater conservation districts, water users, WWPs, and any other entity involved with water planning in the region;
9. revise relevant portions of the 2016 RWP for inclusion in the 2021 IPP and final adopted final 2021 RWP;
10. incorporation of DB22 reports and an executive summary in the IPP and final RWP;
11. assembling, producing, and submitting the Technical Memorandum, IPP and final RWP; and,
12. interregional cooperation and interregional conflict resolution efforts.

11.0 Implementation and Comparison to the Previous Regional Water Plan

11.1 Implementation of Previous Regional Water Plan⁶⁹

The RWPGs shall report the level of implementation of previously recommended WMSs and WMSPs that have affected progress in meeting water needs. The content of this section in the plans shall be largely supported by data summaries based on information provided by RWPGs through DB17 during the previous planning cycle.

RWPG members are strongly encouraged to directly participate in eliciting and gathering responses regarding implementation of projects that are associated with the category of entities that they represent on the RWPG.

11.1.1 Implementation Survey Process

Information needed to report on implementation of the previous RWP shall be collected through a survey tool provided by the TWDB. The survey shall be conducted through an online survey instrument administered by the TWDB, similar to the survey instrument to be provided under

⁶⁹ 31 TAC §357.45(a)

Section 9.0 of this guidance document. The implementation survey instrument shall be provided to the regional water planning consultants prior to the IPP submission. As in the process of reporting on Financing under Section 9.0 of this guidance document, the TWDB will provide a survey instrument and the RWPGs and their technical consultants shall be ultimately responsible for contacting the project sponsors to ensure completion of the implementation data.

Reports may be created from that data and shall be used by the RWPGs in preparing that section of their IPP and final adopted RWP.

Regional water planning groups should verify if recommended WMSs and WMSPs were formerly included in the 2016 RWPs.

Additional methods that RWPGs may consider using to identify projects that may potentially have been implemented may include:

1. tracking changes since the last plan including:
 - a. changes in existing WUG or WWP supplies (e.g., water provider reporting a previously recommended WMS as an existing supply in the 2021 RWP); or
 - b. identifying WMSs that are not recommended in latest plan, possibly due to implementation;
2. using TWDB funding records to identify projects (SWIFT, WIF, State Participation, DWSRF, EDAP etc.); and,
3. using conservation implementation reports submitted to the TWDB (i.e., conservation volumes are higher from previous report).

11.1.2 Survey Content and Data Format

Appendix 1.0, Table C includes the data categories that will be included in the survey. The table headers represent questions that would be asked. The pre-defined answer options to each of the questions are listed below each header. For those questions without pre-defined answer options, the table is blank. The TWDB will also pre-populate some of the fields in the survey using data from DB17. Those fields of Table C are in grey.

Because of the large number of WMSs and WMSPs that have been recommended in the plans, and the reasonable expectation that the majority of them will not have been implemented, default answers for each of the survey questions will be set so that no edits will be required for the majority of the strategies and projects. Those default options listed in Table C are underlined. For example, under the question ‘What level of implementation has the strategy or project achieved?’ the answer ‘*not implemented*’ will be set as a default to minimize the effort required.

11.2 Comparison to Previous Regional Water Plan⁷⁰

The RWP shall include a brief summary that shows how the 2021 adopted RWP differs from the previous 2016 RWP. Comparisons shall include summary tables and other graphics, as appropriate, that concisely convey the changes between plans. The 2021 RWP shall provide comparisons to the 2016 RWP regarding:

1. water demand projections,
2. drought(s) of record and the hydrologic and modeling assumption(s) on which the 2021 plan is based,

⁷⁰ 31 TAC §357.45(b)

3. source water availabilities,
4. existing water supplies of WUGs and WWP, s,
5. WUG and WWP needs,
6. recommended and alternative WMSs and WMSPs, and,
7. any other aspects of the 2021 plan that the RWPG chooses to compare.

The comparison shall include a brief explanation of the underlying reasons for the changes that occurred regarding each of the above categories.

12.0 Prioritization of Recommended WMSPs by RWPGs

All recommended WMSPs in the final adopted RWP are to be prioritized in accordance with the uniform standards developed by the stakeholders committee per 31 TAC §357.46. These uniform standards are available on the TWDB website. The TWDB will provide prioritization templates populated with recommended WMSPs and supporting data similar to the process conducted during the 2016 regional water planning cycle.

This template will be based upon the recommended WMSPs in the 2021 RWP, as provided by the RWPG to the TWDB through DB22. The RWPG shall:

1. apply all of the uniform standards to each project and filling in the prioritization template to be produced from DB22;
2. obtain RWPG approval for submittal to the TWDB of the final prioritization templates at a regular regional water planning group meeting; and,
3. submit to the TWDB the completed final prioritization template **in the original format provided** and that displays each uniform standard score, for each project. This final prioritization shall be submitted separately, but along with the final adopted RWP.

13.0 Deliverables

13.1 Written Reports

RWPGs must prepare and submit a Technical Memorandum, an Initially Prepared Plan (IPP), and a final adopted RWP.

13.1.1 Technical Memorandum

To be considered administratively complete, the **Technical Memorandum** shall include:⁷¹

1. the *TWDB DB22 Population Projection and Water Demand* reports (presenting population and water demand projections by WUG, county, and river basin);
2. the *TWDB DB22 Source Water Availability* report (presenting water availability by source);
3. the *TWDB DB22 Existing Water Supplies* report (presenting existing water supplies by WUG, county, and river basin);
4. the *TWDB DB22 Identified Water Needs/Surpluses* report (presenting identified water needs by WUG, county, and river basin);
5. the *TWDB DB22 WUG Category Summary* report (presenting population, demands, supplies, and needs by WUG category);
6. the *TWDB DB22 Source Water Balance* report **with the condition that the total has to be zero or greater than zero** (except for those sources that are thereby revealed in IPPs as potentially overallocated and create potential interregional conflicts);

⁷¹ Draft examples of some of these tables are shown in Appendix 1.0.

7. the documented process used by the RWPG to identify potentially feasible WMSs;
8. a single tabular list of all potentially feasible WMSs identified by the RWPG to date; and,
9. information regarding the versions and dates of all WAM models and runs used in determining surface water availability and the electronic model input/output, or other model files used to date.

In addition to submitting the sufficient electronic model input/output or other model files necessary to support replication of results, the Technical Memorandum, IPP, and final adopted RWP shall include a written summary of all WAM and GAM models on which the surface and groundwater *availabilities* in the RWP are based (except for *availability* associated with MAGs). This summary must include:

1. the named/labeled version (including date) of each model used;
2. a summary of any modifications to each model and the date these modifications were approved by the EA;
3. the name of the entity/firm that performed each model run; and,
4. the date of each model run.⁷²

Following receipt of the Technical Memorandum, TWDB will issue a letter acknowledging receipt and will provide information to the planning groups for their consideration in the development of their RWPs.

13.1.2 Contents of Regional Water Plan Documents

The chapters and subchapters of the RWP shall be organized in accordance with 31 TAC §357.22(b). Table 1 of this guidance document provides the outline with chapter numbers that shall be followed by each RWP. RWPGs shall update, rewrite, replace, reorganize and/or augment, as appropriate, any content from the 2016 RWPs that is also used in developing the 2021 RWP to include new information and analyses conducted as part of the current planning cycle and in response to changed conditions and in accordance with new planning rules, Contract scope of work, updated guidance documents and new RWPG decisions. Any materials developed in previous plans and incorporated by reference into the 2021 RWP, shall include precise reference to the material and a summary of the information presented in the prior plan. Examples from past plans have included supporting unique stream segment designation materials. Information relevant to or in support of a WMS evaluations shall be included directly in the plan document; it may not be incorporated by reference.

Reporting requirements new to the 5th cycle of planning include the RWPG designation of MWPs of significance to the water supply of the regional water planning area. MWPs may be public or private entities, WUGs or WWPs, that provide water to any defined water use category and are not limited by a volumetric threshold. Reports from DB22 will be developed to aggregate associated WUG and WWP data to reflect MWP customer base.

INITIALLY PREPARED PLAN AND FINAL ADOPTED REGIONAL WATER PLAN

To be considered administratively complete, both the **Initially Prepared Plans** (IPPs) and **final adopted RWPs** shall include:

1. an executive summary documenting key findings and recommendations that does not exceed 30 pages and includes as an adjacent executive summary appendix containing all TWDB DB22 data reports as listed in Table 2, without modification. Supplemental county

⁷² All input files of WAM models used to develop the RWP shall be included as an electronic appendix per Section 13.2.1 of this guidance document.

specific summaries, for example, may also be included as a supplemental executive summary appendix;

2. a technical report containing all of the plan chapters in accordance with 31TAC §357.22(b) presenting the work and results of each planning task summarized in this document and according to the planning rules;
3. a statement as to whether or not the planning group met all requirements under the Texas Open Meetings Act in accordance with 31 TAC §357.21 and §357.50(f);
4. a single tabular list of all potentially feasible WMSs identified by the RWPG; and,
5. a set of ArcGIS-compatible data constituting a SINGLE geodatabase of shp files marking the locations of every recommended WMS/WMSP that has a capital cost (e.g., with representative map latitude/longitude coordinates for the locations of both intake and delivery points of proposed pipelines). Shapefiles may include points, lines, and polygons, as appropriate. This may include approximate locations and simplified representations as necessary and should be delivered on digital media as a self-contained package with metadata (e.g., as an ESRI Map Package).

Table 3 – Required Regional Water Planning Application (DB22) Reports

Number	DB22 Report Name ^A	Summary of Report Content	31 TAC rule met by report	Technical Memo	Minimum Location in IPP and RWP ^B	Entities Included	
						WUGs	WWPs
1	WUG Population Projections	Decadal population projections by WUG, county, and river basin.	357.31(a)	x	x	x	
2	WUG Water Demands	Decadal water demand projections by WUG, county, and river basin.	357.31(a)	x	x	x	
3	WUG Category - Summary	Decadal population and water demand projections, supplies, and needs by WUG category.		x	x	x	
4	Source Water Availability	Water availability by source, location, and decade.	357.32(a)(1);(g)	x	x		
5	WUG Existing Water Supplies	Existing water supplies by WUG, source, county, river basin, and decade.	357.32(a)(1);(g)	x	x	x	
6	WUG Identified Water Needs/Surpluses	Identified water needs and/or surpluses by WUG, county, river basin, and decade.	357.33(b);(d)	x	x	x	
7	WUG Second-Tier Identified Water Need	Decadal identified water needs by: WUG, county, and river basin after implementation of conservation and direct reuse strategies.	357.33(e)		x	x	
8	WUG Second-Tier Identified Water Need - Summary	Decadal identified water needs by WUG category after implementation of conservation and direct reuse strategies.			x	x	

9	Source Water Balance	Source availability compared to total water use. Must show no over allocation of source availability (except for those sources that are thereby revealed in IPPs as potentially overallocated and thereby creating potential interregional conflicts).		x			
10	WUG Unmet Needs	All unmet needs by WUG, county, river basin, and decade.	357.40(c)		x	x	
11	WUG Unmet Needs-Summary	All unmet needs by category and decade.			x	x	
12	WUG Recommended Water Management Strategies	All recommended WMSs for each WUG; including the strategy names, source name, total yield of the WMS for all decades, and unit costs in 2020 and 2070.	357.35(g)(1)		x	x	
13	Recommended Projects Associated with Water Management Strategies	All recommended projects including associated project sponsor, whether sponsor is a WWP, project name, project description, capital cost, and decade online.			x	x	x
14	WUG Alternative Water Management Strategies	All alternative WMSs for each WUG; including the strategy names, source name, total yield of the WMS for all decades, and unit costs in 2020 and 2070.	357.35(g)(3)		x	x	
15	Alternative Projects Associated with Water Management Strategies	All alternative projects including associated project sponsor, whether sponsor is a WWP, project name, project description, capital cost, and decade online.			x	x	x
16	WUG Management Supply Factor	Calculated management supply factor for each WUG by decade as described in Section 5.9 of this document.	357.35(g)(2)		x	x	
17	Recommended Water Management Strategies Requiring an IBT Permit	All recommended WMS involving an IBT to which TWC 11.085 applies.			x	x	x

18	WUG Recommended Conservation WMS Associated with Recommended IBT WMS	All recommended conservation WMS for each WUG that relies on a WMS involving an IBT to which TWC 11.085 applies.			X	X	
19	Recommended WMS Supplies Unallocated to WUGs	All recommended WMS volumes not allocated to WUGs, including WMS name, source name, sponsor name, and planning decade.			X	X	X
20	Summary of WMS Users by WMS Type	Aggregation of recommended WMS supply by WMS type.			X	X	
21	Summary of WMS Users by Source	Summary of recommended WMS supply by source type.			X	X	
22	MWP Existing Sales and Transfers	MWP projected WUG and sales contract demands, population served, and wholesale/retail sales by water use category and source type.	357.31(b)		X		
23	MWP Recommended WMS and Projects	Recommended WMS and WMSPs, by MWP, water use category, and population served; including unallocated WMS supplies			X		

Note A: Availability subject to agency resources.

Note B: Reports shall be included in the plan accordingly but may be additionally included elsewhere in the plan documents if desired.

Additional documentation in the RWP shall include, but not be limited to:

1. web links to model water conservation plans pursuant to [TWC §11.1271];
2. region-specific model drought contingency plans developed by RWPG per TAC §357.42(j) and in accordance with [TWC §11.1272];
3. water loss audit summary;
4. table of drought triggers and responses developed by the RWPG per Section 7.5;⁷³
5. WUG emergency water supply screening Table per Section 7.4;⁷⁴
6. electronic appendices with WAM and GAM input files per Section 13.2.1, including inputs for approved hydrologic variance availability models (e.g., non-system firm yields, system yields, and safe yields).
7. summaries of written and oral comments on the IPP from the public along with responses provided by the RWPG explaining how plans were revised or why changes were not warranted;⁷⁵
8. copies of written TWDB EA comments on the IPP along with responses provided by the RWPG explaining how RWP was revised or why changes were no warranted;⁷⁶
9. any other appendices deemed appropriate by RWPGs; and,
10. if sufficient agency resources are available during this cycle, the TWDB may provide a schematic map of each region's recommended WMSs/WMSPs for illustrative purposes. The map will be developed based on the data provided by the RWPG through DB22. If provided by the TWDB, RWPGs will be required to review and confirm the map contents and include a fold-out, 11x17 color version of this map as part of the final adopted RWPs. If the TWDB is unable to provide such a map, the RWPG shall provide their own 11x17 color map containing their significant recommended WMSs/WMSPs.

A RWP that is missing any one of the required elements shall be considered administratively incomplete and shall not be reviewed until missing content is provided to the TWDB.

Amendments to final adopted RWPs that have been approved by the Board shall contain these same elements to the extent that they apply to the scope of the RWP amendment.

13.1.3 Rounding of Numbers in the Regional Water Plan

Only whole numbers shall be presented in the RWPs and DB22.

Cumulative rounding errors shall not exceed 1.0 in any single number presented or in any total presented in the plan, for example, when multiple values, each with an underlying error, are presented within a table.

Individual and cumulative data values in reports produced from DB22 shall supersede all other data presented in RWPs for purposes of state water plan development.

13.2 Regional Water Planning Data Provision and Data Reporting

See Contract Exhibit D (*Guidelines for Regional Water Planning Data Deliverables*) for more information.

⁷³ May be incorporated into DB22 if sufficient TWDB resources are available.

⁷⁴ May be incorporated into DB22 if sufficient TWDB resources are available.

⁷⁵ Included in adopted RWP only

⁷⁶ Included in adopted RWP only

13.2.1 Electronic Appendices

Each IPP and final adopted RWP shall include the following clearly labeled electronic **appendices** that will only be included on the submitted electronic media (e.g., CD, DVD, thumb drive) along with MS Word and PDF versions of the RWP (hard copies of the plans will not mention these electronic appendices and will not include copies of these electronic appendices):

1. Appendix containing the sufficient WAM model(s) input/output or other model files necessary to support replication of the results used in developing the surface water availabilities used in the development of the RWP. A PDF document will include a cover page with the date of each model run; and,
2. Appendix containing the full GAM model(s) input/output or other model files necessary to support replication of the results used in developing any non-MAG groundwater availabilities used in the RWP. A PDF document will include a cover page with the date(s) of each model run.

13.2.2 State Water Planning Database (DB22)

The TWDB State Water Planning Database (DB22) will synthesize regions' data and provide summary reports that shall be incorporated into each Technical Memorandum, IPP, and final adopted RWP.

RWPGs shall complete and submit, via the DB22 interface, all data generated or updated during the current cycle of planning to the TWDB in accordance with TWDB specifications *prior to* submitting Technical Memorandums and IPPs. **Deadlines for the entry of categories of data (e.g. existing water supplies) by RWPGs are to be determined by the TWDB as part of the contract documentation. These deadlines are necessary to allow sufficient time for the TWDB to vet data and to then generate the TWDB DB22 reports that shall be included in the RWPG-deliverable reports.** Data shall be entered through the TWDB's internet State Water Planning Database Interface (DB22), whose link can be found at:

<http://www.twdb.texas.gov/waterplanning/data/rwp-database/index.asp>

Specifications regarding data requirements, format, calculation, and composition are available on the TWDB's website.⁷⁷

Data entered by RWPGs into DB22 and RWPs shall be rounded to the nearest whole number to avoid cumulative data errors. In any and all instances where numbers in the final adopted RWP text and tables do not match DB22, **the data in DB22 shall take precedence** for the purpose of summarizing RWPs and preparation of the state water plan.

In compliance with 1 TAC Chapters 206 and 213 (related to Accessibility and Usability of State Web Sites), the **digital copy** of the final adopted RWP report shall comply with the requirements and standards specified in statute.

13.2.3 Prioritization of Recommended Water Management Strategy Projects

Referring to Guidance Section 12.0, the RWPG will provide their list of prioritized recommended WMSPs utilizing the format provided to the RWPGs by the TWDB. The final version of this prioritization list will be provided electronically as a document separate from, but submitted along with, the final adopted RWP.

⁷⁷ See *Guidelines for Regional Water Planning Data Deliverables*

APPENDIX 1.0

Templates for Data Presentation

Table A - Template for Drought Trigger and Response Action Recommendations

SOURCE NAME	TYPE (sw/gw)	Factor to be considered	SPECIFIC TRIGGERS						SPECIFIC ACTIONS					
			SOURCE MANAGER			USERS (e.g. WUGs)			SOURCE MANAGER			USERS (e.g. WUGs)		
			tbd	'severe'	'critical/emergency'	tbd	'severe'	'critical/emergency'	tbd	'severe'	'critical/emergency'	tbd	'severe'	'critical/emergency'

Table C - Data Categories and Potential Responses Collected by Implementation Survey

Region*	County*	Entity(ies)*	DB17 WMS Name*	Source(s)*	Project Type (DB17)*	Project Description	Project Type	Infrastructure Type
A	ANDERSON				Aquifer Storage and Recovery		Conjunctive Water Use	Pipeline
B	ANDREWS				Brush Control		Conservation - Municipal	Canal
C	ANGELINA				Conservation		Conservation - Irrigation	Water Treatment Plant
D	ARANSAS				Drought Management		Conservation - Other	Impoundment
E	ARCHER				Existing Sources/Expanded Use		Desalination - Seawater	Wells
H	ARMSTRONG				New Surface or Groundwater		Desalination - Brackish GW	Other
I	ATASCOSA				Reuse		Other - Aquifer Storage and Recovery	No Infrastructure
J	AUSTIN				Weather Modification		Other - Brush Control	
K	BAILEY						Other - Drought Management	
L	BANDERA						Other - Precipitation/Rainfall Harvesting	
M	BASTROP						Other - Weather Modification	
N	BAYLOR						Reuse - Direct	
O	BEE						Reuse - Indirect	
P	BELL						SW/GW - Diversions or Conveyance from Existing Surface Water Supply	
	BEXAR						SW/GW - New Contracts or Water Rights	
	BLANCO						SW/GW - New Reservoir	
	BORDEN						SW/GW - New Wells	
	BOSQUE						SW/GW - Other Groundwater	
	BOWIE						SW/GW - Other Surface Water	
	BRAZORIA						Conjunctive Use	
	BRAZOS							
	BREWSTER							

*Fields pre-populated by the TWDB from DB17

Table C - Data Categories and Potential Responses Collected by Implementation Survey (cont.)

At what level of Implementation is the project?	If not, why?	Initial Volume of water provided (acft/yr)	Funds Expended to Date (\$)	Project Cost** (\$)	Year the Project is Online?	Is this a phased project?	(Phased) Ultimate Volume (acft/yr)	(Phased)Ultimate Project Cost (\$)	Year project reaches maximum capacity?	What is the project funding source(s)?	Included in 2021 Plan
Not Implemented	Too soon				2011	Yes			2011	Self (Cash)	Yes
	Financing				2012	No			2012	Local	No
Sponsor has Taken Official Action to Initiate Project	Permit constraints				2013				2013	County	
Feasibility Study Ongoing	Environ. obstacles				2014				2014	TWDB	
Permit Application Submitted/Pending	Other				2015				2015		
Acquisition and Design Phase					2016				2016	State - Other	
									2017		
									2018	Federal - EPA	
Under Construction								2019			
Currently Operating									2020	Federal - USDA	
									2025		
All Phases Fully Implemented									2030	Federal - Other	
									2035	Other	
									2040		
									2050		
									2060		
									2070		

** Should include development and construction costs

Table D – Template for Task 5A Contract Scope of Work Submission Content*

Region	Overall TWDB Task Number	SubTask # / WMS evaluation number	SubTask / WMS(s) Name	SubTask Scope of Work Write-up	Deliverable	SubTask Budget	WUG(s) &/OR WWP Entities Potentially Served by WMS(s)	Addressing a changed condition from previous cycle?	When was this WMS identified by RWPG as a potentially feasible WMS?	Was WMS evaluated in any previous Regional Water Planning Cycles?	Is evaluation a limited update to previous technical evaluation information?
X	5A	1				\$ -					
X	5A	2				\$ -					
X	5A	3				\$ -					
X	5A	4				\$ -					
X	5A	5				\$ -					
X	5A	6				\$ -					
X	5A	ETC.				\$ -					
TOTAL BUDGET						\$ -					

* May not be submitted until after public process for identifying potentially feasible WMS is conducted.

Table E – Template for Presenting Water Management Strategies Considered and Evaluated

Every WUG Entity with an Identified Need		WMSs NAMED TO BE CONSIDERED BY STATUTE ¹											Additional WMSs named to be considered by Rule									
Water User Group Name	maximum need 2020-2070 (af/yr)_	conservation	drought management	reuse	management of existing supplies	development of large-scale marine seawater or brackish groundwater	conjunctive use	acquisition of available existing supplies	development of new supplies	development of regional water supply or regional management of water supply facilities	voluntary transfer of water (including regional water banks, sales, leases, options, subordination agreements, and financing agreements)	emergency transfer of water under Section 11.139	system optimization, reallocation of reservoir storage to new uses, contracts, water marketing, enhancement of yield, improvement of water quality	new surface water supply	new groundwater supply	brush control; precipitation enhancement	interbasin transfers of surface water	aquifer storage and recovery	cancellation of water rights	rainwater harvesting	other	other
City A	20,000	PF	nPF	PF	PF	PF	PF	PF	PF	PF	PF	PF	PF	PF	nPF	nPF	nPF	nPF	nPF	nPF		
City B	5,500	PF	PF	PF	nPF	PF	nPF	PF	PF	nPF	PF	nPF	PF	nPF	PF	nPF	nPF	PF	nPF	nPF		

¹ Texas Water Code §16.053(e)(3)

nPF = considered but determined 'not potentially feasible' (may include WMSs that were initially identified as potentially feasible)

PF = considered 'potentially feasible' and therefore evaluated

(all pertinent information for WMS evaluations shall be presented in the regional water plan, including for WMSs considered potentially feasible but not recommended)

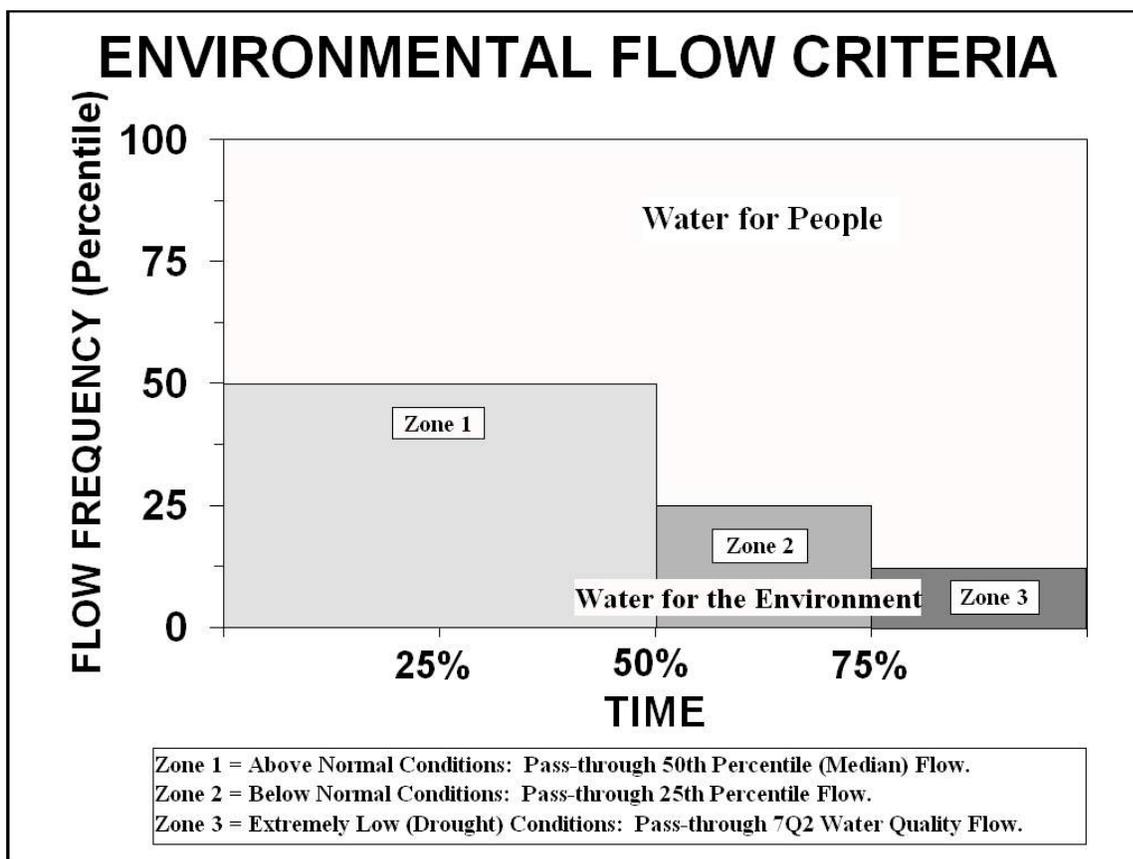
APPENDIX 2.0

Consensus Criteria for Environmental Flow Needs

Consensus Criteria for Environmental Flow Needs

State and regional water planning guidelines require use of TCEQ environmental flow standards or site-specific studies where available. If such studies are not available, then water planners should use the 1997 Consensus Criteria for Environmental Flow Needs (CCEFN) on all new surface water development WMSs requiring permit authorization. It applies to both instream flow and freshwater inflow needs. The criteria were developed through extensive collaboration among scientists and engineers from the State’s natural resource agencies (i.e., TWDB, TPWD, and TCEQ), as well as academics, engineering consultants, and informed members of the public. Specifically, the criteria are composed of multi-stage rules for environmentally safe operation of impoundments and diversions during above normal conditions, below normal conditions, and the emergency conditions we call “drought” (Figure 1).

Figure 1. Environmental Flow Criteria



The primary goal of the CCEFN is to provide an indication during the planning process of the amount of water that may be available through the permitting process. They also provide balance by sharing the adverse impacts of drought so that neither human nor environmental needs unacceptably prevail over the other at all times. However, it should be recognized that the state and federal permitting processes may require different environmental flow constraints based on the results of intensive field studies or other permitting considerations.

The CCEFN is commonly referred to as a “desktop” technique because it is based on a statistical analysis of hydrological records for a potential water development site. No fieldwork is required, but the results may not be as precise or reliable as those derived from field studies. It should be

noted that intensive field study and modeling assessment of the actual flow needs for environmental maintenance are generally required during the State and Federal permitting process. However, the CCEF N is considered adequate and appropriate for planning purposes. All new water resource developments are required to consider the ecological flow needs of riverine and estuarine fisheries, wildlife habitats, and water quality requirements.

Criteria for the Planning Process

Application of the CCEF N, as described below for different types of water development projects, provides for a priority to human needs during dry and drought conditions, while sharing of the adverse impacts of drought with the environment. The environmental flows specified below are representative of what may be required in the regulatory process. For planning purposes, the environmental pass-through requirements for all zones will be added to those for downstream water rights. The protection of downstream water rights will be accomplished by using the full recorded amount of the existing water rights in the WAM.

New Project On-Channel Reservoirs

As illustrated in Figure 2, the conservation storage of a new on-channel water supply reservoir would be divided into three zones for water management purposes as follows:

Zone 1

In Zone 1 of the reservoir, when the reservoir water level is greater than 80 percent of storage capacity, inflows will be passed up to the monthly medians that are calculated with naturalized daily streamflow estimates.⁷⁸

Zone 2

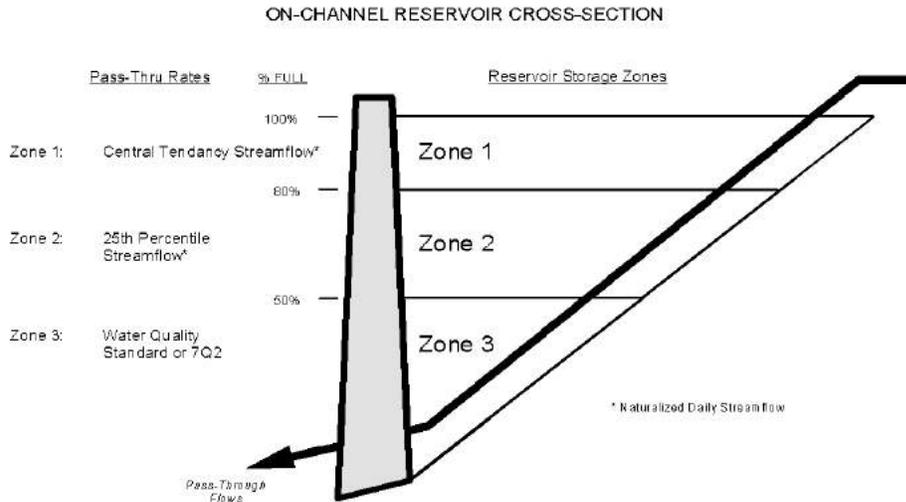
As dry conditions develop and the reservoir water level declines into Zone 2 between 50 and 80 percent storage capacity, inflows passed would be reduced to an amount up to the monthly 25th percentile flow values that are calculated with naturalized daily streamflow estimates.

Zone 3

As more severe drought conditions develop and the reservoir level declines into Zone 3 below 50 percent storage capacity, environmental pass-throughs would be further reduced to an amount up to the established water quality standard for the downstream segment. In lieu of any established water quality standard, the 7Q2 low flow value, as published in the TCEQ's Water Quality Standards, would be used as the default criterion for Zone 3 pass-throughs. If in Zones 1 and 2, the value necessary to maintain downstream water quality is higher than the medians or 25th percentiles, then the value necessary to maintain downstream water quality will be used instead of the other target flow values.

⁷⁸ Naturalized streamflow is the estimated amount of water that would have been present in a watercourse with no direct manmade impacts in the watershed. It is calculated by taking values of historically measured streamflow, adding amounts of estimated man-made losses from the upstream watershed caused by diversion and lake evaporation, then subtracting amounts of transfers.

Figure 2. On-Channel Reservoir Cross-Section



In all zones, it is the State’s intent that flows passed for instream purposes would also reflect the needs of the associated bay and estuary system. Therefore, instream flows are not to be considered available for impoundment before they reach the receiving bay and estuary. In addition to passage of environmental flows, adequate flows will be passed through for protection of downstream water rights. In all zones, water that can be captured by reservoirs in excess of the environmental provisions is available for water supply storage, and no water will be released from storage to meet environmental targets when inflows are below these limits.

New Project Direct Diversions

As illustrated in Figure 3, the CCEF_N for direct diversions from a river or stream that are recommended in the Regional Water Plan would be based on streamflow conditions just upstream of the diversion point, and would also be divided into three zones as follows:

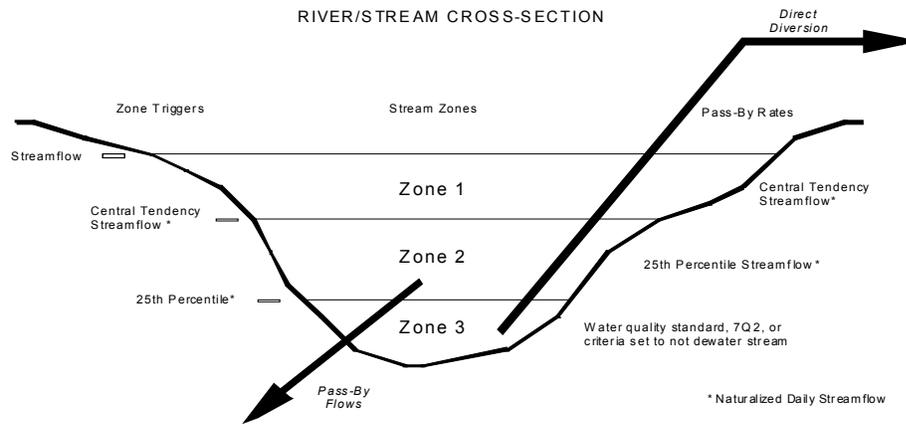
Zone 1

Zone 1 occurs when actual streamflow is greater than monthly medians calculated with naturalized daily streamflow estimates. When streamflow is within Zone 1, minimum flows passed will be the monthly medians that are calculated with naturalized daily streamflow estimates.

Zone 2

Zone 2 occurs when actual streamflow is less than or equal to medians, but greater than monthly 25th percentile values. When streamflow is within Zone 2, minimum flows passed will be the monthly 25th percentile values that are calculated with naturalized daily streamflow estimates.

Figure 3. River/Stream Cross-Section



Zone 3

Zone 3 occurs when actual streamflow is less than or equal to monthly 25th percentile values. When streamflow is within Zone 3, minimum flows passed will be the larger of: (1) the value necessary to maintain downstream water quality or (2) a continuous flow threshold to be determined by the water agencies (e.g., 10th percentile flow) that will not allow the diversion, by itself, to dry up the stream.

For perennial river/stream segments where a water quality standard has been established for a stream segment, that value will be used as the pass-by target. Where such a standard has not yet been established, the default planning criterion is the 7Q2 value as published in the TCEQ's Water Quality Standards. For Zones 1 and 2, if the value necessary to maintain downstream water quality is higher than the medians or 25th percentiles, this value necessary to maintain downstream water quality will be used instead of the other values.

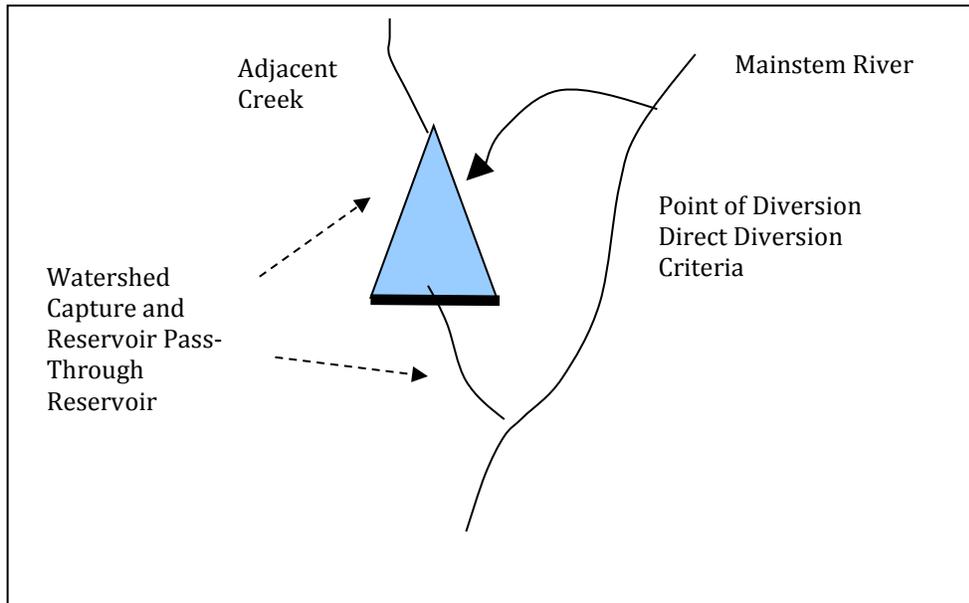
All Zones

The trigger values above are calculated with naturalized daily streamflow estimates. In addition to passage of environmental flows, adequate flows will be passed through for protection of downstream water rights. The above stepping procedure does not have smooth transition between zones, leaving brief periods when the instantaneous diversion rate is zero.

New Direct Diversions into Large Off-Channel Storage

In those cases where a large water supply project would divert its water from a river or stream into off-channel storage, a combination of the direct diversion and reservoir criteria would apply (Figure 4). The direct diversion criteria will govern the ability to divert water into the off-channel project. The reservoir criteria will address the ability of the reservoir to capture water from its own watershed, as well as define the reservoir's multi-stage operations that pass-through environmental flows, and flows for protection of downstream water rights.

Figure 4. Direct Diversions into Large Off-Channel Storage



Bay and Estuary Conditions

As a planning place-holder value, the Zone 1 reservoir pass-throughs or direct diversion pass-bys described previously will also provide freshwater inflow to the bays and estuaries. However, where inflow values adequate to meet the beneficial inflow needs as described in Texas Water Code §11.147 have been determined, those recommended inflow volumes will be used for projects within 200 river miles of the coast, commencing from the mouth of the river, as the basis for calculating the relative contributions of fresh water from the associated rivers and coastal basins during times of Zone 1 conditions. No other special provisions would be made for estuarine maintenance under Zone 2 or 3 conditions for either new reservoirs or large direct diversions except that the instream flows are not to be considered available for impoundment or diversion before they reach the receiving bay and estuary. Freshwater inflow needs analyzed by the water agencies may be determined by TPWD until that agency and the TCEQ jointly make a determination in accordance with Texas Water Code §11.1491.

The target flows in Zone 1 of the reservoir operating procedure should be established to provide the beneficial flows as defined in §11.147(a) of the Texas Water Code (i.e., the "salinity, nutrient, and sediment loading regime adequate to maintain an ecologically sound environment in the receiving bay and estuary system that is necessary for the maintenance of productivity of economically important and ecologically characteristic sport or commercial fish and shellfish species and estuarine life upon which such fish and shellfish are dependent").

In practical terms, that means it is not necessarily MinQ or MaxQ produced by the optimization model, but a point along that curve between these values that provides some margin of safety (comfort) in providing sufficient flows in Zone 1 to maintain average historic productivity on the fisheries. The state recommended freshwater inflow target is one that has been validated by

comparing the seasonal distribution of estuarine salinity regimes with the patterns of abundance and distribution of selected estuarine-dependent plants and animals.

Bay and estuary pass-through requirements for a new water development project will be based on a pro-rata share of that location's contribution of flow to the estuary in question. Once the target amount of water reaches an estuary during a month, no additional flows need to be provided for purposes of estuarine maintenance during that month. For the remainder of the month, environmental flows revert to the instream criteria.

Results of Inflow and Instream Studies – Use of State Determinations

When the results of freshwater inflow or instream flow studies are available, those criteria will be used in the planning process rather than any generic rule such as the CCEF. When established criteria are available and agreed to by TPWD and TCEQ, bay and estuary inflow requirements would be apportioned to each new project identified in the Regional Water Plan according to its proportional share (based on contribution hydrology), and as provided for by TCEQ. Where possible, this process seeks to restore seasonal flow patterns and minimize cumulative impacts from water development projects.

APPENDIX 3.0

TWDB Data Sources for Regional Water Plan Development

1. Historical Water Use Estimates

<http://www.twdb.texas.gov/waterplanning/waterusesurvey/estimates/index.asp>

- a. Water use summaries (by region, county, basin, cities, utilities)
- b. Annual reports by industry type (NAICS Code)
- c. Water reuse reports by reuse type and planning region
- d. Municipal and industrial water intake reports by planning region
- e. County-Other WUG detail reports – these report parameters will be updated at the end of our ongoing rule revision but the link is here:

http://www2.twdb.texas.gov/ReportServerExt/Pages/ReportViewer.aspx?%2fWU%2fSumFinal_CountyOther_WUG_Detail&rs:Command=Render

2. Historical Groundwater Pumpage Estimates

<http://www.twdb.texas.gov/waterplanning/waterusesurvey/historical-pumpage.asp>

3. Water Data for Texas – Historic and current reservoir data, drought status and resources, groundwater well level, and coastal hydrology data.

<http://www.waterdatafortexas.org/reservoirs/statewide>

4. TWDB Groundwater Availability Models

<http://www.twdb.texas.gov/groundwater/models/gam/index.asp>

5. TWDB Research Projects in Support of Groundwater Models

<http://www.twdb.texas.gov/groundwater/models/research/index.asp>

6. TWDB Groundwater Database Reports - The purpose of the TWDB's data collection efforts over the years has been to gain representative information about aquifers in the state in order to support water planning from the local to a more regional perspective.

<http://www.twdb.texas.gov/groundwater/data/gwdbbrpt.asp>

7. TWDB Groundwater Data Viewer – GIS datasets relating to groundwater resources, including brackish groundwater data.

<http://www2.twdb.texas.gov/apps/waterdatainteractive/groundwaterdataviewer>

8. Brackish Resources Aquifer Characterization (BRACS)

<http://www.twdb.texas.gov/innovativewater/bracs/index.asp>

a. House Bill 30 Projects

<http://www.twdb.texas.gov/innovativewater/bracs/HB30.asp>

9. Texas Instream Flows Program (SB2) and Related Documents

<http://www.twdb.texas.gov/surfacewater/flows/instream/index.asp>

10. Texas Environmental Flows (SB3) and Related Documents

<http://www.twdb.texas.gov/surfacewater/flows/environmental/index.asp>

11. Freshwater Inflow Needs and Related Documents

<http://www.twdb.texas.gov/surfacewater/flows/freshwater/index.asp>

12. Water Reuse and Aquifer Storage and Recovery

<http://www.twdb.texas.gov/innovativewater/index.asp>

- a. Direct Potable Reuse Resource Document
- b. ASR in Texas: 2015

13. Water Conservation

<http://www.twdb.texas.gov/conservation/index.asp>

- a. Water Conservation Advisory Council and BMPs
- b. Water Loss Audit information
- c. Water conservation plans

14. Other water planning data resources

<http://www.twdb.texas.gov/waterplanning/data/resources/index.asp>

- a. Population data links
- b. Socio-economic data links
- c. TCEQ water utility database link

15. TWDB-funded research relevant to regional water planning

<http://www.twdb.texas.gov/waterplanning/rwp/research/index.asp>