Chapter 6: Impacts and Contribution of Regional Flood Plan

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6. Impacts and Contribution of Regional Flood Plan

This chapter summarizes the overall impacts of the Regional Flood Plan (RFP), considering the potential for both positive and negative outcomes related to flood risk and multiple other considerations. Other resources which are not directly related to flood planning, but which can be strongly influenced by flood-related actions include water supply, the environment, agriculture, recreation, water quality, and navigation. It is important to consider all aspects of flood solutions that were evaluated and are recommended as part of the RFP. That way, any potential negative outcomes can be addressed early in the planning phase, and the opportunities for synergy with multiple other potential benefits can be explored and optimized.

6.1 Impacts of Regional Flood Plan

This section includes an overview of potential impacts associated with recommended Flood Management Evaluations (FMEs), Flood Management Strategies (FMSs), and Flood Mitigation Projects (FMPs). The Regional Flood Planning Group (RFPG) evaluated each recommended flood solution to identify direct and indirect potential outcomes to each flood solution that are both positive and negative.

This section includes:

- A statement that the plan, when implemented, will not negatively affect neighboring areas located within or outside of the Flood Planning Region (FPR).
- A general description of the types of potential positive and negative socioeconomic or recreational impacts of the recommended FMPs and FMSs within the FPR.
- A general description of the overall impacts of the recommended FMPs and FMSs in the Regional Flood Plan on the environment, agriculture, recreational resources, water quality, erosion, sedimentation, and navigation.
- A region-wide summary of the relative reduction in flood risk that implementation of the Regional Flood Plan would achieve within the region, including with regard to life, injuries, and property.

6.1.1 FME Impacts

The RFPG identified and recommends a broad range of FMEs to lay the foundation for increased flood awareness and management of both flood-related and environmental issues. While the specific benefits associated with each FME cannot be quantifed until certain studies have been completed, the FME evaluation table presented in **Appendix 4A** of *Chapter 4* does quantify the existing risk in the general areas affected by each FME. A summary of the total count for each evaluated flood risk exposure indicator, which would be benefitted by completing all of the FMEs, is provided in **Table 6-1**. These reported quantities are not based on sum totals from the

full evaluation table in **Appendix 4A.** Instead, significantly overlapping areas were removed from the totals to avoid double-counting in certain areas.

Table 6-1. Summary of Potential 1% Annual Chance Event Exposure within FME Areas

Exposure Type	Quantity for Existing Conditions*
Structures (count)	89014
Habitable Structures (count)	69624
Population (count)	297554
Critical Facilities (count)	624
Low Water Crossings (count)	497
Road Length (miles)	2513
Agricultural Land (acres)	190411

*Quantities are approximate and may contain overlapping between some FMEs.

The general types of FMEs recommended include the following:

- Project planning;
- Storm water master plans (SWMPs);
- Dam Safety and Emergency Needs;
- Preparedness and riverine risk related to sediment or levees; and
- Irrigation and stormwater interaction.

Most of the recommended FMEs actually fall into more than one of the categories above. The specific FMEs associated with each of the general types above are listed in Section 4.3 of *Chapter 4*. The potential positive and negative impacts of each of these general FME types are provided in this section.

Project Planning FME Impacts

The primary benefit associated with FMEs that identify and evaluate flood infrastructure projects is that conceptual projects can be refined and modeled to quantify potential flood benefits, costs, and negative impacts. In addition, after these project planning FMEs are completed (up to the 30% design level), each project will have a greater chance of being funded through a future grant or funding opportunity. Potential negative impacts to project planning include the possibility that a project may be categorized infeasible as a result of the study, for a variety of reasons. In which, case Project sponsors would have paid for a study that ultimately resulted in no action being taken. However, this is still an important and necessary step in all flood mitigation planning.

SWMP FME Impacts

The recommendation of SWMP FMEs was based upon communities with the greatest number of structures at risk of 1% annual chance flooding, using best available risk mapping. In most cases, the cursory Fathom floodplain mapping was the most reliable source available to assess existing flood risk, which indicates a need for updated detailed flood mapping throughout the region. El Paso is an exception; since it has recent Preliminary Federal Emergency Management Agency (FEMA) mapping and recently updated City and County SWMPs. SWMPs are highly beneficial for each community where they are recommended because they not only identify potential flood mitigation projects, but they also establish detailed floodplain mapping and identify/quantify areas of high flood risk.

Potential negative effects of SWMPs are that they may identify significant areas of flood risk, which could effect the market value of certain properties. Since mapping developed from SWMPs are not regulatory, there is not an over-arching entity (such as FEMA) standardizing the quality and methods used for identifying and mitigating flood risk. This means the quality standards can vary significantly, depending on the firm completing the study and the amount of funding available for the study. If approximate flood risk mapping identifies specific areas at risk, and the study becomes publicly available information, there is the potential for the real estate market to react in a negative way toward areas thought to be at risk of flooding.

All SWMPs involve stakeholder coordination to identify flood-related projects and needs most important to each community. For example, FME IDs: 141000002 and 141000023 specify the consideration of nature based solutions and stream restoration for the cities of Presidio and Alpine, respectively. The RFPG identified issues related to incised channels and diminished storage capacity in Alpine and Moss Creeks upstream of the City of Alpine and in Cibolo Creek upstream of the City of Presidio. “Channel and floodplain restoration can enhance the ability of a channelized or incized reach to temporarily store the flow and dissipate the energy of passing flood waves”[1]. In addition, nature-based enhancements in area streams that slow flood waters and increase recharge would provide benefits for the environment (habitat), sedimentation/erosion issues (geomorphology), as well as water supply (aquifer recharge).

Dam Safety and Emergency Needs Impacts

Dams upstream of populated areas which are identified by the Texas Commission on Environmental Quality (TCEQ) as being hydraulically inadequate were considered an emergency need in the RFP. Studies to rehabilitate such dams are recommended in six different FMEs. These FMEs are beneficial because they address the need to rehabilitate flood control infrastructure that may have reached its design life. Potential negative aspects of dam rehabilitiation or decommissioning projects is that they can take a relatively long time to complete due to several federal and state regulations and requirements, and they can be expensive if state or federal funding is not acquired.

[1] Sholts, Joel. Hydraulic analysis of stream restoration on flood wave propagation. University of North Carolina at Chapel Hill. 2009, pp. 43.

Impacts of FMEs for Preparedness and Riverine Risk Related to Sediment or Levees

FMEs related to riverine flooding or levees are important and beneficial in areas where significant populations are at risk of flooding on the landward side of a levee, such as in the El Paso region. In these cases, the build-up of sediment or vegetation in the channel floodway due to lack of maintenance can significantly increase flood risk to populated areas. Establishing minimum flood conveyance capacities and methods for consistently measuring/monitoring flood capacity would help alert the responsible parties when maintenance is needed for flood safety purposes. It also benefits the agricultural community, since the ability of the irrigation system to drain into the Rio Grande can be significantly affected by sediment build-up in the river.

A potential negative impact associated with these types of studies is that they may identify areas which are important to maintain from a flood safety perspective, but which may be restricted from typical vegetation clearing methods due to the presence of a protected species or habitat. In these stream reaches, it can be a much more expensive process, and can take much longer to establish the desired flood capacity.

Impacts of Irrigation and Stormwater Interaction

Particularly in El Paso County, an extensive irrigation system woven through both urban and rural areas can play a critical role in stormwater conveyance; and thus, requires coordination between multiple entities such as El Paso County Water Improvement District No. 1 (EPCWID1), El Paso Water, El Paso County, and the U.S. Section of the International Boundary and Water Commission (USIBWC). It is important to facilitate stormwater planning coordination between these different entities, as they all may benefit or be negatively impacted by potential issues that can arise related to maintenance, communication, or emergency response activities.

For example, El Paso has the potential to convey stormwater through segments of the irrigation system, if necessary, during extreme flood events. While it would be a benefit to the areas relieved of flooding, there is potential risk to downstream agricultural property when diverting stormwater through the system, as it was not designed for that specific purpose. This is why it is recommended to perform modeling and design increased capacities for culvert crossings in the Lower Mesa Drain (FME ID: 141000004). This study and design would provide the information needed to allow El Paso Water and EPCWID1 to decide how much stormwater can be diverted through the system during pre-project and post-project conditions without causing downstream negative impacts.

Potential negative impacts of performing studies related to the irrigation and stormwater system interactions is that there are many stakeholders involved with highly sensitive and political issues. This can complicate the decision on which entity will fund associated studies or implementation resulting from studies. For these reasons, most FMEs involving complex coordination between multiple entities on politically charged subjects are recommended as strategies, as they can involve multiple studies or steps before implementation can actually occur. However, FME ID: 141000001 was recommended as an FME and not an FMS, because an initial study has already been performed (Study ID 4), which identifies and quantifies both flood

risk and maintenance issues, paving the way for recommended actions to be implemented. The recommended FME would leverage knowledge gained from Study ID 4, as well as from updated hydrologic and hydraulic modeling that is expected to be available in 2022 from an ongoing USIBWC study within the same river reach of the Rio Grande.

6.1.2 FMP Impacts

FMPs were analyzed using best available hydrologic and hydraulic modeling, which was refined as part of the RFP in some instances, to quantify positive and potential negative impacts. The potentially feasible FMP evaluation table included in **Appendix 4C** documents these impacts based on pre-project and post-project flood risk indicators. **Table 6-2** summarizes the results of the analyses performed, and quantifies the overall impact of all recommended FMPs in the RFP.

Table 6-2. Summary of Impacts from FMPs in 1% Annual Chance Event

Exposure Type	Pre-Project Conditions	Post-Project Conditions	Difference (Exposure Reduction from FMPs)
Structures (count)	3,905	2,438	1,467
Habitable Structures (count)	2,016	916	1,100
Population (count)	13,386	5,989	7,291
Critical Facilities (count)	19	14	5
Low Water Crossings (count)	153	144	9
Road Length (miles)	463	408	55
Agricultural Land (acres)	1,784	1591	193

In addition to the 1% annual chance flood benefits noted above, the recommended FMPs are estimated to remove a total of 2002 structures from the 0.2% annual chance flood risk inundation boundary.

No Negative Impact Statement

The TWDB has a statutory requirement to "…not negatively affect a neighboring area," particularly as a result of structural flood mitigation projects. This requirement is base on Texas Water Code 16.062(h) and (i). Additionally, the TWDB rules include a definition of "Negative Effect" to mean, "An increase in flood-related risks to life and property, either upstream or downstream of the proposed project." 31 TAC 361.10.

For the purposes of the RFP, each recommended FME, FMP, and FMS was reviewed to investigate potential negative impacts to surrounding properties. Since all of the FMEs and FMSs include non-structural recommendations (studies, program development, coordination, early warning systems, etc.), there is not a potential for direct negative flooding impacts. However, for FMPs involving proposed flood control infrastructure, analyses were performed using project-specific models and mapping, considering proposed project intentions, infrastructure components, and model results. *Chapter 5* documents the project-specific

methodologies and results of these "no negative impact" assessments for each FMP in **Appendix 5B**. In addition, **Appendix Table 5D** ("Flood Mitigation Projects Recommended by RFPG") includes a column entitled, "How No Negative Impact was Determined," which specifies the method and/or models used to assess pre-project vs. post-project conditions to confirm that no negative flood impacts are anticipated on neighboring areas to FMPs.

The overall result of the reviews and analyses performed is that when implemented, the recommended FMPs are estimated not to negatively affect neighboring areas located within or outside of Region 14. Project sponsors will ultimately be responsible for ensuring the final project designs of each project will have no negative impact prior to construction.

Impacts Related to Proposed Project Scoring

To develop a single ranked list for the State Flood Plan, the TWDB must collect data by which to rank projects across the state. The intent of the project ranking is to reflect the State Flood Plan primary objective of protecting against loss of life and property while also accommodating a sufficiently wide range of project types and project geographies. To aid in the ranking process, quantitative and qualitative data were used by the RFPG to score each recommended FMP in 15 categories specified in TWDB's Technical Guidelines for Regional Flood Planning (2021). These categories include assessment and scoring related to potential impacts and benefits from the FMP to flood risk, life and safety, the environment, agriculture, recreational resources, navigation, water quality, erosion, sedimentation, and implementation/permitting. This information is presented in **Appendix 5F** of *Chapter 5,* "Data Entry Table for TWDB Scoring of Flood Mitigation Projects".

Detailed methods were specified in the RFP Technical Guidelines for assigning scores to each category; however, the method weighting each score to calculate a combined total score has not been specified at this time. As part of the scoring process, desktop analyses were performed to identify potential environmental and cultural resources impacts for each FMP. Any environmental benefits or potential permitting/implementation impacts associated with protected species/habitat or cultural resources in the area were identified Scoring Notes 12, 13, and 14 of the table in **Appendix 5F**.

Cultural Resources Background Reviews

Projects in Texas can come under the purview of the National Historic Preservation Act (NHPA) and the Antiquities Code of Texas (ACT). Both are administered by the Texas Historical Commission (THC), the State Historic Preservation Office in Austin, Texas. If an undertaking is federally permitted, licensed, or partially funded, the project must comply with Section 106 of the NHPA. The ACT requires projects on land owned or operated by a political subdivision of the State of Texas to assess whether the project will impact cultural resources that meet the requirements for listing as a State Antiquities Landmark (SAL). Projects under control of political subdivisions of the State of Texas, such as water agencies, counties, and city-owned entities, must comply with the ACT.

As part of the RFP impacts assessment for each recommended FMP, a cultural resources records review was performed to determine if any cultural resources were recorded within or immediately adjacent to the proposed project areas. To conduct this review, an archaeologist reviewed the relevant U.S. Geological Survey (USGS) 7.5-minute quadrangle maps on the Texas Archeological Sites Atlas (Atlas), the THC's archaeological database. This source provided information on the nature and location of previously recorded archaeological sites, locations of National Register of Historic Places (NRHP) districts and properties, sites designated as SAL, Official Texas Historical Markers, Recorded Texas Historic Landmarks, linear historic features, and cemeteries.

The results of the cultural resources background review are reflected in Scoring Note 14 of **Appendix 5F** as well as in the narratives for each FMP included in **Appendix 4D**. These cultural resources background reviews were based on preliminary project boundaries. Any future changes to project area boundaries, project impact footprints, and more detailed project designs may require additional background review that could result in changes to regulatory requirements.

Post Project and Future Risks Associated with FMPs

Flood recovery activities most often include debris removal from culvert entrances and bridges by cities, counties, and the Texas Department of Transportation (TxDOT), who maintain employees to perform assessment of damages and debris removal. The recommended FMPs for proposed detention/retention sediment basins will reduce this maintenance burden in downstream areas in addition to reducing or eliminating significant expenses associated with floodwater depositing sediment on agricultural land.

Six recommended FMPs, listed at the beginning of **Appendix 5B** of *Chapter 5*, include detention/retention storage basins with earthen embankments. Sediment storage capacity is included as a design criteria for structures expecting high sediment loads. The design of sediment storage capacity is a requirement for Natural Resources and Conservation Service (NRCS) dams, but it is not a Texas Commission on Environmental Quality (TCEQ) design requirment for dams.

Regular maintenance and inspections are required to maintain the intended minimum storage capacity and to identify potential risks associated with erosion, integrity, or performance of the structure. An annual maintenance cost of $10,000 was considered in the Benefit Cost Analysis (BCA) performed for each of these structures.

An Operation and Maintenance Manual and an Emergency Action Plan (EAP) with breach inundation hydraulic modeling and mapping will be required for any proposed structure classified as a dam per TCEQ regulations. These requirements will define the risk of potential catastrophic failure due to a dam breach and the potential for future increases to these risks due to lack of maintenance.

6.1.3 FMS Impacts

Each recommended FMS was reviewed to identify the potential for both positive and negative impacts. While the specific benefits associated with most FMSs cannot be quantifed until certain studies or designs have been completed, the FMS evaluation table presented in **Appendix 4E** of *Chapter 4* does quantify the existing risk in the general areas affected by each FMS, as well as flood risk benefits estimated for three of the FMSs which had relevant project-specific models or mapping available. The project-specific analyses performed for each of these three FMSs (including assessment of no negative impacts) is documented in **Appendix 5A** of *Chapter 5*. **Appendix 5A** also includes discussions on the remaining FMSs, explaining why they were not analyzed for project-specific benefits and why they are also estimated to have no negative impact to neighboring areas.

Based on results from the FMS evaluations documented in Appendix 4E, a summary of the overall flood risk indicators for existing conditions are provided in Table 6-3. These results summarize just the FMSs which were not analyzed for project-specific flood benefits and may contain overlapping areas. However, significantly overlapping areas and region wide FMEs were not included in the totals to avoid double counting certain areas, where possible.

Table 6-3. 1% Annual Chance Exposure for FMSs not Analyzed with Models or Mapping

Exposure Type	Quantity for Existing Conditions*
Structures (count)	34,830
Habitable Structures (count)	23,927
Population (count)	107,451
Critical Facilities (count)	71
Low Water Crossings (count)	822
Road Length (miles)	2207
Agricultural Land (acres)	77829

*Quantities are approximate and may contain overlapping between some FMSs

Results from the three project-specific FMS analyses documented in **Appendix 5A** have significant flood benefits, for the 1% annual chance event. These FMSs include two levee certification FMSs (one on the Rio Grande in El Paso County and one on Cibolo Creek in the City of Presidio). The third FMS analyzed includes complex coordination between EPWater and The U.S. Army to construct two flood control structures and maintain two existing dams on Fort Bliss Military base property. Combined results from these three FMSs are reported in **Table 6-4**.

Table 6-4. 1% Annual Chance Impacts for Analyzed FMSs (142000001, 142000004, 142000008)

Exposure Type	Pre-Project Conditions for Only Project-Specific FMSs	Post-Project Conditions for Only Project-Specific FMSs	Difference (Exposure Reduction from Only Project-Specific FMSs)
Structures (count)	12,082	1,121	10,961
Habitable Structures (count)	10,488	862	9,626
Population (count)	32,365	2,801	29,564
Critical Facilities (count)	38	8	30
Low Water Crossings (count)	39	7	32
Road Length (miles)	240	58	183
Agricultural Land (acres)	23,486	5,622	17,864

In general, FMSs do not typically fit into the FME or FMP categories for a variety of reasons. Below is a list of criteria that led to the decision to list a flood reduction action as an FMS rather than an FME or FMP:

- Studies, projects, and/or program development involving complex coordination between multiple entities (local, state, federal, or international);
- Associated with other FMEs, FMSs, or FMPs requiring a specified sequence of actions as part of a larger plan;
- Involve multiple projects with varying statuses of design/construction; and
- Include recurring costs.

Positive and negative impacts associated with these aspects of FMSs are discussed in this section.

Impacts of FMSs for Complex Coordination Between Entities

Potential negative impacts associated with complex coordination between multiple entities is the overalll strategies can be expensive and take a long time to implement. This could be related to the time needed to gain permits and approvals from multiple entities, or due to politically sensitive issues affecting international, federal, state, or local agreements.

Benefits to facilitating this type of coordination between entities are associated with a more holistic approach to flood planning. If all the necessary stakeholders are involved early on in making planning decisions that affect not only flood risk, but sometimes environmental and water supply issues, the overall plan is more likely to be successful and leverage the necessary resources to optimize benefits in multiple scoring categories that are documented in **Appendix 5F** of *Chapter 5,* "Data Entry Table for TWDB Scoring of Flood Mitigation Projects".

For these reasons, FMSs typically include a significant amount of budget for stakeholder coordination. In addition, scopes of work specified in the FMS narratives included in

Appendix 4F include analyses of a strategy from differet stakeholder perspectives. For example, Presidio County Emergency Management identified drainage issues related to vegetation and sediment for communities located adjacent to the Rio Grande and FM 170, between the City of Presidio and Candelaria. This strategy involves coordination with TXDOT (FM170 drainage), local stakeholders (communities draining to the Rio Grande), and USIBWC (who has jurisdiction over projects affecting the Rio Grande).

Positive benefits of this strategy include improved roadway and local drainage for communities as well as reduced riverine flood risk for communities if sedimentation issues are identified and resolved. However, the RFPG has noted that this area is a protected habitat for birds, and a tourist attraction, which must be considered when evaluating alternatives for vegetative clearing. In addition, there are numerous wells in the floodplain between Candelaria and Presidio. These are anticipated to be shallow wells in unconfined riparian aquifers. Any effort to increase conveyance velocities could potentially negatively impact some of these wells. These potential issues are identified in the scope of the FMS to ensure these potential risks are identified in the data collection phase.

Impacts of FMSs with Multiple Phases and Associated FMEs, FMPs, or FMSs

If not carefully planned and monitored, potential negative impacts can result from FMSs that require associated studies, strategies, or projects to be completed prior to implementation, or which have different phases of design and construction on multiple project components of a larger plan. Either of these circumstances introduce complexities to the planning process, which is why it is important to clearly identify which phases should be constructed or studied sequentially. This can have cost saving benefits by avoiding re-work or investigation of solutions to a problem that has already been studied. For these reasons, associated FMEs, FMS, or FMPs are included in all evaluation tables, and are discussed within the applicable narratives. If not carefully planned and tracked, there could be the potential for negative impacts associated with increased costs or increased flood risk to neighboring areas. An example would be implementing a solution in one area before flood mitigation measures could be implemented that would prevent negative impacts to neighboring areas.

Impacts of FMSs with Recurring Costs

Most of the FMSs which include recurring costs are associated with flood early warning systems. These FMSs are also identified as emergency needs by the RFPG. While early warning has clear safety benefits associated with emergency response, significant recurring costs can be a financial burden too great for some of the small communities that need these services the most. For these reasons, multiple FMSs and FMPs are recommended for early warning systems or devices, which include a variety of options.

For example, FMP ID: 143000007 and FMS ID: 142000025 both address early warning in Marfa, where a death from a vehicle swept away at a low water crossing occurred in 2021. One option proposed for early warning includes a fixed cost (the FMP), and another includes a more robust system with recurring service fees (the FMS). Alternatively, FMS ID: 142000014 is recommended to apply a region-wide planning approach to select the optimum locations for

new flood gages throughout Region 14. While recurring costs would still be necessary, if multiple entities are involved and benefit from the system, there are opportunities for cost sharing amongst larger groups or over-arching entities, making the strategy more affordable for all involved.

6.1.4 Summary of RFP Impacts

The methods applied to estimate potential increases in future conditions flood risk are documented in *Chapter 2 ("Flood Risk Analyses")*. The anticipated increased flood risk was modeled and mapped in the RFP based on the following:

- Best available flood risk modeling and mapping data;
- Future precipitation projections based on recent studies (for El Paso County watersheds only);
- Future land use planning documents (for El Paso County watersheds only); and
- Population projections throughout the region.

Based on these methods, a future 1% annual chance and 0.2% annual chance floodplain was developed for Region 14 and compared to the existing conditions inundation areas for corresponding flood frequency boundaries. The extent of increased 1% annual chance risk inundation area from existing to future conditions is **242** square miles (sq. mi.). The extent of increased 0.2% annual chance risk inundation area from existing to future conditions (separate from the 1% annual chance risk inundation area) is **181** sq. mi. These anticipated increases in flood risk are estimated to be reduced if the FMEs, FMSs, and FMPs recommended in the RFP are performed.

As noted in *Chapter 4*, there are 20 out of the 23 counties within Region 14 that are in need of flood risk identification or in need of updated flood risk mapping. The exceptions are El Paso, Ector, and Val Verde Counties, which have recent flood risk mapping. Out of these 20 counties which need current floodplain mapping, there are 39 cities or Census Designated Places (CDPs) within Region 14, which have a combined jurisdictional area of 175 sq. mi. To address this need, there are 9 FMEs recommended for cities with outdated or no floodplain mapping. These 9 cities have a combined total jurisdictional area of **110 sq. mi**. These cities were selected for SWMP FMEs based on an assessment of cities within the region with the greatest number of structures at risk of 1% annual chance flooding.

As noted in *Chapter 2*, there are approximately 40,121 structures at risk of 1% annual chance flooding in the region with a total population of 115,530. There are an additional 14,290 structures within the 0.2% annual chance flood risk inundation area (separate from the 1% annual chance risk inundation area) with a population of 47,985. The recommended FMPs and project-specific FMSs analyzed for flood risk benefits are estimated to remove **12,908** structures from the 1% annual chance flood risk boundary with a combined population of approximately **36,855**. The recommended FMPs are estimated to remove **2002** structures from the 0.2% annual chance flood risk boundary with an approximate population of **2,400**. Furthermore, the

recommended FMPs and FMS are estimated to remove **50** low water crossings from the 1% annual chance flood risk boundary.

6.2 Contributions to and Impacts on Water Supply Development and the State Water Plan

Flood management and water supply management are fundamentally interrelated. Strategies and projects which reduce flood risk may also augment or diminish water availability. To address this, the RFP included an evaluation of potential impacts from the recommended FMSs and FMPs on water supply development or the State Water Plan (SWP).

This effort included:

- A region-wide summary and description of the contribution that the RFP would have to water supply development including a list of the specific FMSs and FMPs that would contribute to water supply; and
- A description of any anticipated impacts that the RFP FMSs and FMPs may have on water supply, water availability, or projects in the SWP.

6.2.1 Contributions to Water Supply Development

There are no recommended FMPs that would measurably contribute to water supply. However, there is one recommended FMS which is estimated to contribute to water supply (FMS ID: 142000002). In the RFP, this FMS is named, "Irrigation and Recharge Application of Captured Rainwater Runoff at Alpine." It is also recommended in the adopted State Water Plan (TWDB, 2022) as well as in the current Far West Texas Water Plan (TWDB, 2021) for Region E, where it is identified as Strategy E-2, "Irrigation and Recharge Application of Captured Rainwater Runoff."

This nature-based solution in the City of Alpine involves three rainwater catchment basins centered around Kokernot Park to accomplish a shared goal of reducing stormwater in roadways while improving water quality, groundwater infiltration, and saving water supply costs associated with landscaping irrigation systems. The stormwater is proposed to be diverted from roadways to a natural swale that runs parallel to the road at a lower elevation using curb cuts. A series of basins with designed native plantings and excavated 16 inches (in.) to 24 in. deep are proposed to capture and infiltrate runoff.

While no hydrologic or hydraulic models or proposed drawings are currently available, runoff calculations and estimates of impervious cover were used to estimate total volume of water drained to each collection point in average and drought years. These estimates were based upon the following assumptions:

- 33% of the watershed area is impervious;
- 66% of the watershed area is permeable;
- < 0.2 in. rainfall event will not produce runoff;

- By design the system for high frequency (low intensity) events, the average annual effective rainfall is 7.2";
- 80% of the water falling on impervious surfaces will run off;
- 30% of the water falling on permeable surfaces will run off;
- A drought year is defined as 75% of average annual rainfall;
- A square foot of surface will shed 0.6 gallons per inch of rain; and
- Catchment areas were delineated for the three project locations based on Interferometric Synthetic Aperture Radar (IFSAR), with the following areas associated with each project location (project locations are provided in a figure included with the FMS narrative in **Appendix 4F**):
  - Location 1: 25 acres (ac.).
  - Location 2: 8.75 ac.
  - Location 3: 312.5 ac.

Based on the assumptions above, **Table 6-5** shows the expected volume of water that will drain to each of the 3 proposed catchment locations.

Table 6-5. Estimated Runoff Volume Drained to Each Basin in Average and Drought Years

Basin Location	Gallons (Average Year)	Gallons (Drought Year)	Acre-ft (Average Year)	Acre-ft (Drought Year)
1	2,187,583	1,640,687	6.7	5.0
2	765,654	574,241	2.3	1.8
3	27,344,790	20,508,593	83.9	62.9

The Water User Group identified for this strategy in the Region E Water Plan is the City of Alpine. State Water Plan identified the City of Alpine as the Sponsor of the recommended strategy. Based on the information provided by the project planners and the Far West Texas Water Plan (TWDB, 2021) for Region E, this strategy is expected to directly increases water supply volume available during droughts of record for the City of Alpine.

6.2.2 Impacts on the State Water Plan

The RFPG is required to list recommended FMSs or FMPs that, if implemented, would negatively impact and/or measurably reduce:

- Water availability volumes that are the basis for the most recently adopted SWP; and
- Water supply volumes if implemented.

For example, an FMS or FMP that involves reallocating a portion of reservoir storage that is currently designated for water supply purposes to be used, instead, for flood storage, would

measurably reduce the water availability at that water source in the most recently adopted state water plan.

Sections 16.051 and 16.055 of the Texas Water Code direct the Executive Administrator of the TWDB to prepare and maintain a comprehensive State Water Plan. The overall goal of the State Water Plan is to address water supply needs at the local level with the consideration of balancing affordable water supply availability and conserving the State's natural resources. The State Water Plan serves as a flexible guide for the development and management of all water resources in Texas.

In February 1998, the TWDB adopted rules establishing 16 regional water planning areas. Similar to the regional flood planning process, each planning area is responsible for preparing a consensus-based Regional Water Plan (RWP) that will provide for the water needs of its region for the next 50 years. The TWDB incorporates the results of each RWP into the State Water Plan, which is updated in 5-year cycles. The most recent State Water Plan was published in 2022, incorporating results from the 2021 Regional Water Plans.

Of the 16 Regional Water Planning Regions in Texas, three regions – Regions E, F, and J – are within the bounds of the Upper Rio Grande Flood Planning Region, as shown in **Figure 6.1**.

Water Planning Region E

Region E ("Far West Texas") consists of seven counties from the Upper Rio Grande Flood Planning Region (URGFPR), including the Counties of Brewster, Culberson, El Paso, Hudspeth, Jeff Davis, Presidio, and Terrell. Within the URGFPR, Region E overlaps three major aquifers (most notably the Hueco-Mesilla Bolson aquifer along the Rio Grande in El Paso and Hudspeth Counties) and six minor aquifers (including the Igneous aquifer in Jeff Davis, Brewster, and Presidio Counties). Due to the limited availability of surface water, a majority of the region relies on groundwater sources for water, while only a small portion of the water supply is sourced from controlled flows in the Rio Grande and direct reuse water. None of the recommended FMSs or FMPs are anticipated to negatively impact or measurably reduce the yield or operation of these existing aquifers or direct use sources in Region E.

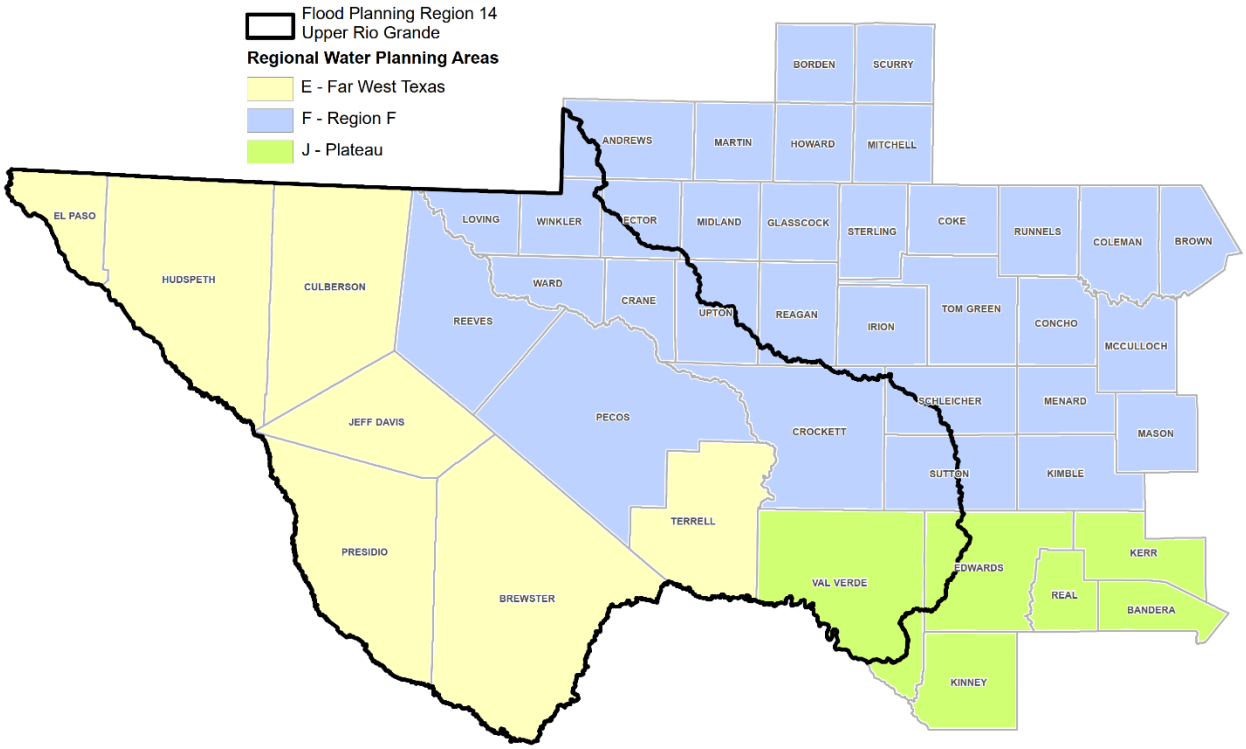

Figure 6.1 Region 14 Overlap with Water Planning Regions

Water Planning Region F

Region F consists of 14 counties from the URGFPR, including the Counties of Andrews, Crane, Crockett, Ector, Loving, Midland, Pecos, Reagan, Reeves, Schleicher, Sutton, Upton, Ward, and Winkler. Within the URGFPR, Region F overlaps two major aquifers – the Pecos Valley and Edwards-Trinity aquifers – as well as four other minor aquifers. The region also includes the 279,000 acre-foot Red Bluff Reservoir along the Pecos River in Loving and Reeves Counties and Lake Balmorhea along Toyah Creek in Reeves County. Based on historical water use data from the 2021 Regional Water Plan, approximately 75% of the region's water is supplied by groundwater, while approximately 15% of the water supply is sourced from surface water reservoirs and less than 10% comes from direct water reuse. None of the recommended FMSs or FMPs are anticipated to negatively impact or measurably reduce the yield or operation of these existing aquifers, reservoirs, or direct use sources in Region F.

Water Planning Region J

Region J ("Plateau") consists of two counties from the URGFPR, including the Counties of Edwards and Val Verde. Within the URGFPR, Region J overlaps with parts of the Edwards-Trinity aquifer. The region also includes the 3.4 million acre-foot Amistad Reservoir along the Rio Grande, which is managed jointly by the United States and Mexico in accordance with international treaties through the International Boundary and Water Commission (IBWC). Flows of the mainstream Rio Grande and Pecos and Devils Rivers provide only limited amounts of

water for irrigation, livestock, and wildlife. None of the recommended FMSs or FMPs are anticipated to negatively impact or measurably reduce the yield or operation of the Amistad Reservoir or Region J aquifers.

Ecologically Unique River and Stream Segments

In addition, as part of the water planning process, each water planning group has the option to include recommendations for the designation of Ecologically Unique River and Stream Segments in their adopted regional water plan (31 TAC 357.43). Based on these recommendations, the Texas Legislature may then designate a river or stream segment to be of unique ecological value, restricting state financing for the construction of a reservoir along the segment. In the 2021 Region E RWP, ten stream segments within the boundaries of state-managed properties were recommended for the ecologically unique designation, eight of which have received designation by the Texas Legislature.[2]

In particular, two of the recommended ecologically unique stream segments overlap with one FME and one FMS in the Regional Flood Plan, including the Alamito Creek segment (FME ID: 141000008) and the Rio Grande Wild and Scenic River segment (FMS ID: 142000006). The segment of Alamito Creek that is protected is within the boundaries of Big Bend Ranch State Park, and the Rio Grande Wild and Scenic River segment is within Big Bend National Park. Since both of these flood solutions are associated with initial studies and not the implementation of projects, neither is estimated to be affected by the ecologically unique designation, which restricts financing for the construction of reservoirs along protected segments.

While the Alamito Creek study will investigate potential locations for sediment basins, the protected stream segment will be eliminated from consideration due to this restriction. The recommended FMS involving the study of binational streamflow recommendations for the Big Bend Reach of Rio Grande/Rio Bravo will not consider any alternatives associated with constructing a reservoir on the Rio Grande.

Overall Impact on the State Water Plan

Based on the evaluations of recommended FMSs and FMPs previously discussed in *Chapter 5*, no measurable negative impacts are anticipated on water supply, water availability, or projects in the State Water Plan.

[2] In the 2021 Regional Water Plans, both Region F and Region J decided to not recommend any river or stream segments as ecologically unique.