

### Appendix 4B. Narratives for Flood Management Evaluations

#### **4B-1. Flood Management Evaluation ID: 141000001**

**Name:** Develop a plan for a Sediment and Vegetation Control Program in the Rio Grande at El Paso.

**Description:** Assess Rio Grande capacity in El Paso County considering updated hydrology, sediment, and vegetation conditions. Establish maintenance program with minimum risk-based channel capacity. Address maintenance agreements between the U.S. and Mexico. Assess risks in El Paso and Hudspeth Counties associated with varying levels of Rio Grande channel maintenance.

**Affected Jurisdiction:** City of El Paso, El Paso County, Hudspeth County, Doña Ana County

**Discussion on Flood Risk:** The Rio Grande through El Paso County has an alluvial bed subject to progressive deposition of sediments on river banks and within the channel (eventually forming islands). High vegetation grows on these deposits, limiting channel capacity during floods. A 2019 study by the Joint Committee on Rio Grande Project Flood Risk (JCRGPFR) [Elephant Butte Irrigation District (EBID), El Paso Water, and El Paso County Water Improvement District No. 1 (EPCWID1)] developed a hydraulic model (HEC-RAS) of the Rio Grande from Anthony to American Dam. This model simulation, based upon detailed survey of sediment and vegetation conditions in 2018, included these conclusions:

“1) The HEC-RAS simulations showed that there are multiple locations within the study area where flow rates which are significantly less than the reported 100 year flood flow will result in water overflowing from the Rio Grande and potentially flooding large areas of the Mesilla Valley. Once water escapes the Rio Grande the water cannot return until after it has flowed through neighborhoods, schools, and business areas and reaches the outlet of the Montoya drainage channel which returns the water to the Rio Grande 2 miles upstream of the American Dam.

2) The obstruction of the main channel by vegetated sandbars increases the flow depth in both normal and flood conditions. The rate of growth of the surface area of the vegetated sandbars in the main channels was 45% from 2016 to 2018. The growth in the median size (acres) of vegetated island was 125%.

3) The increased sediment in the main channel of the Rio Grande results in increased sediment load in the water diverted from the Rio Grande and the American Canal and delivered to the irrigated lands and water treatment facilities in the El Paso Valley. The cost to EPCWID1 and the City of El Paso for the annual removal of sediment from the Franklin and Riverside canals and from the settling ponds of the Jonathan Rogers Water Treatment Plant has increased significantly in the last 20 years and has resulted in an increase in annual maintenance and construction cost of over \$2 million per year.”

Since this study, significant effort has been made by the U.S. International Boundary and Water Commission (USIBWC) to remove sediment and vegetation and restore river hydraulic capacity. The purpose of this Flood Management Evaluation (FME) is to establish a plan by which the Texas stakeholders (El Paso Water, EPCWID1, and El Paso County) can provide proactive action to identify and promote the addressing of any future loss of design hydraulic capacity of the river through El Paso County.

#### **Flood Management Evaluation Scope of Work:**

The sponsors for this FME will be the public stakeholders in El Paso County that manage flood-related infrastructure affected by Rio Grande capacity: El Paso Water, EPCWID1, and El Paso County.

The scope of work (SOW) for the FME will include these tasks.

*Task 1 - Data Collection.* Data will be collected that is relevant to the estimation of current and future hydraulic capacity of the Rio Grande through El Paso County. This will include assembly and processing of the most recent survey, LiDAR and satellite image data. In addition, an updated hydrologic and hydraulic (H&H) model for the Rio Grande is expected to be issued by the USIBWC during the period following the issuance of the draft Upper Rio Grande Regional Flood Plan (URGRFP). This model is expected to show substantive differences in riverine hydrology (i.e., river design flood flowrates) versus the hydrology used in the 2019 JCRGPFRR flood study cited above. New conditions expected to lead to the change are recent changes in estimated statistical rainfall and reductions in access of riverine floods into the riverine terrace beyond the levees. This model and its report will be reviewed and its changes incorporated into the FME planning.

*Task 2 - Engineering Analysis of Existing Conditions.* **Exhibit Map 19.01** of *Chapter 5* depicts the FME area (based upon Rio Grande Natural Valley flood extents) and the local watersheds associated with the two-dimensional hydraulic model domains used in the El Paso County Interior Drainage Analysis (AECOM, 2021). The new USIBWC model will be reviewed, adjusted as needed to reflect current data, and prepared for use in FME planning. In addition:

- The historic data presented in the 2019 report will be analyzed to estimate the historic range of annual increases in sediment deposition within the Rio Grande through El Paso County, with explanation for years with extreme high and low rates of deposition.
- The current capacity of the river versus federal levee design requirements will be noted.
- The excess flood capacity over design capacity in the river reach through El Paso, if any, will be noted and quantified in terms of excess flood conveyance volume in the subject reach.
- This volume will be compared to the range of historic annual sediment depositions
- Assumptions in the new USIBWC model will be reviewed to identify any revised assumptions that the FME sponsors want to consider in developing riverine flood capacity targets.

*Task 3 - Alternatives Development.* Alternatives will be developed for target minimum river cross-sections to be maintained that protect the reach of the river within El Paso County from flood damages. Alternatives will vary by:

- Target minimum flow capacity criteria (e.g., federal levee design standards, 500-year flood, 100-year flood, amount of freeboard over design flood level, overtopping flow);
- How to consider likelihood periods when Rio Grande releases from upstream USBR dams are raised to lower reservoir levels;
- Level of instrumentation to be installed on/adjacent to the river;
- Estimated rate of future sediment deposition for use in planning; and
- How to apply any revised model assumptions that the plan sponsors wish to consider.

*Task 4 - Alternatives Selection.* Alternatives will be developed for a proposed strategy for: 1) ongoing monitoring of river flow capacity, 2) future recommendations to USIBWC as to flow capacity status, and 3) a future communications plan with USIBWC on this issue. A workshop will be held with plan stakeholders to develop criteria for alternative selection and to select an alternative based on those criteria.

*Task 5 - Report.* A report will present the plan for future sponsor interaction with USIBWC over Rio Grande capacity through El Paso County. The report will document the data and process for plan development. A Flood Mitigation Project (FMP) will be developed for installation of added riverine instrumentation. The FMP will be developed consistent with Texas Water Development Board (TWDB) criteria for FMPs. Full Regional Flood Plan (RFP)-required data for the FMP will be developed.

*Task 6 - Stakeholder Coordination.* It is assumed that bi-weekly meetings will take place with affected stakeholders such as the City of El Paso, El Paso County, EBID, EPCWID1, and USIBWC, since the selected alternative will potentially affect flooding issues, maintenance, and/or operating procedures managed by these different entities.

**Estimated Cost for FME:**

<b>Labor Cost</b>	
<b>Task 1 – Data Collection</b>	\$ 16,820
<b>Task 2 – Existing Condition Engineering Analyses</b>	\$ 15,140
<b>Task 3 – Alternatives Development</b>	\$ 36,850
<b>Task 4 - Alternatives Selection</b>	\$ 11,860
<b>Task 5 – Report</b>	\$ 17,210
<b>Task 6 – Stakeholder Coordination</b>	\$ 9,520
<b>Total Project Labor</b>	<b>\$ 107,400</b>
<b>Travel</b>	<b>\$ -</b>
<b>Total FME cost</b>	<b>\$ 107,000</b>

#### 4B-2. Flood Management Evaluation ID: 141000002

**Name:** Develop H&H Models for Cibolo Creek and arroyos through the City of Presidio, and develop an FMP for flood reduction of buildings and emergency access roadways.

**Description:** Develop H&H models for Cibolo Creek and the City of Presidio arroyos to evaluate flood risk. Develop FMPs, an interior drainage analysis for east Cibolo Creek levee, and a coincident storm analysis for Cibolo Creek, the Rio Conchos, and the Rio Grande.

**Affected Jurisdictions:** City of Presidio, Presidio County

**Discussion on Flood Risk:** The City of Presidio is an incorporated area in Presidio County. Approximate modeling performed as a task for the RFP identified over 650 structures at risk in the 1% Annual Chance (AC) flood within the City of Presidio, assuming the Cibolo Creek levees (which are not certified) are absent. Extent of 1% AC flood risk is depicted in **Exhibit Map 15 (Map 1 of 31)**. The City of Presidio Comprehensive Plan 2020-2030 (Kleinman, 2020) provides a concept for future drainage infrastructure to address flooding associated with the smaller arroyos east of Cibolo Creek. Fifteen new stormwater detention ponds are proposed in the Plan.

#### Flood Management Evaluation Scope of Work:

The Flood Management Evaluation (FME) for City of Presidio will develop and select FMP alternatives (both structural and non-structural) for the mitigation of the identified flood risk. Flood Management Strategy (FMS) ID: 142000008 (which includes developing a levee certification package) will follow this FME, as a requirement for levee certification by the Federal Emergency Management Agency (FEMA) is an interior drainage study which will be conducted as part of this FME. The SOW for the FME will include these tasks.

*Task 1 - Data Collection.* Cibolo Creek - Engineering reports on Cibolo Creek by the United State Army Corps of Engineers (USACE) or other sources will be reviewed, to include review of previous assumptions concerning coincidence of Rio Conchos/Rio Grande/Cibolo Creek flooding. The 63.6 square mile watershed of Cibolo Creek is shown in **Exhibit Map 19.02 of Chapter 5**. Historic data will be collected from previous reports available through public data sources to identify and characterize historic extreme events. Spatial rainfall data will be collected to facilitate model replication of selected extreme event(s). Data will be collected from local residents or entities with drainage oversight to: 1) identify the primary critical route(s) that have been inundated, 2) collect locations of physical HWMs or anecdotal flood depths at known locations, and 3) solicit ideas for potential solutions. Field survey data will be collected at HWMs and at selected locations (e.g., culverts/ bridges) needed to refine hydraulic modeling. Existing topographic data will be refined and processed as needed. Local property and infrastructure valuations and vulnerability data will be collected.

Arroyos east of Cibolo Creek - The City of Presidio 2020 Comprehensive Plan includes updated proposed flood improvements based upon 2008 H&H modeling of existing conditions with existing and future land use, developed as part of the "Final Hydraulic Report/Drainage Study

for the City of Presidio, Texas” (S&B Infrastructure, LTD). The available hydraulic modeling in the 2008 analysis consists of HY-8 culvert analyses only, and does not include hydraulic models of floodplains through the study area. Basic hydrologic information (watershed topography, rainfall statistics, current land use) will be developed per the most recent data sources.

*Task 2 - Engineering Analysis of Existing Conditions.* Cibolo Creek - A coincident flood analysis will be performed for flooding on the Rio Conchos, Rio Grande, and Cibolo Creek. A hydrologic model will be developed for the Cibolo Creek watershed. A hydraulic model for Cibolo Creek will be developed for the reach including City of Presidio, the existing levee, and critical local routes. It is expected that the levee will contain the 1% AC flood per the National Levee Database.

Arroyos east of Cibolo Creek (see Figure below) - The City of Presidio 2020 Comprehensive Plan modeling will be reviewed and updated to reflect existing conditions and current rainfall statistics. Hydraulic models will be developed for floodplains flowing through the City of Presidio, and floodplains will be mapped assuming the Cibolo Creek levees are in place and the Rio Grande levees are not in place. As a requirement for levee certification of the Cibolo Creek levees in FMS ID: 142000008, which includes levee certification of the left (east) Cibolo Creek levee, an interior drainage analysis will be required per §65.10 in Title 44 of the Code of Federal Regulations (CFR). That interior drainage analysis will be performed as part of the floodplain modeling and mapping associated with this FME.

*Task 3 - Alternatives Development.* Alternatives in the Comprehensive Plan will be reviewed and edited as needed to provide improved performance of local critical route(s) during floods, reduction of risk to occupied structures, and addressing of other identified flood-related community concerns (e.g., planning for improved communication, improved emergency response, nature-based solutions, etc.). Plan concept design(s) and cost estimate(s) will be reviewed and revised as needed for structural alternatives (e.g., detention basins). Costs will also be developed for additional non-structural alternatives. Revised flood damages and locally defined evaluation criteria will be estimated for each alternative. Alternatives for Cibolo Creek in the City of Presidio area are not expected to be required, although upland restoration would benefit incised segments of the creek with diminished storage capacity.

*Task 4 - Alternatives Selection.* Structural and non-structural FMPs will be selected for inclusion in a future RFP using criteria developed in a workshop with local stakeholders. These criteria will be consistent with TWDB criteria for FMPs. Full RFP-required data for the selected FMPs will be developed.

*Task 5 - Report.* A report will be generated for presentation to the sponsors providing documentation of the proposed FMP.

*Task 6 - Stakeholder Coordination.* It is assumed that up to four virtual coordination meetings will take place with affected stakeholders such as the City of Presidio, Presidio County, USACE, and USIBWC since the selected alternative will potentially affect flood infrastructure owned, designed, maintained, and/or operated by different entities.

**Estimated Cost for FME:**

<b>Labor Cost</b>	
<b>Task 1 – Data Collection</b>	\$ 20,540
<b>Task 2– Existing Condition Engineering Analyses</b>	\$ 66,465
<b>Task 3 – Alternatives Development</b>	\$ 32,240
<b>Task 4 - Alternatives Selection</b>	\$ 27,010
<b>Task 5 – Report</b>	\$ 19,890
<b>Task 6 – Stakeholder Coordination</b>	\$ 13,560
<b>Total Project Labor</b>	<b>\$ 179,705</b>
<b>Travel</b>	<b>\$ 2,816</b>
<b>Total FME cost</b>	<b>\$ 183,000</b>

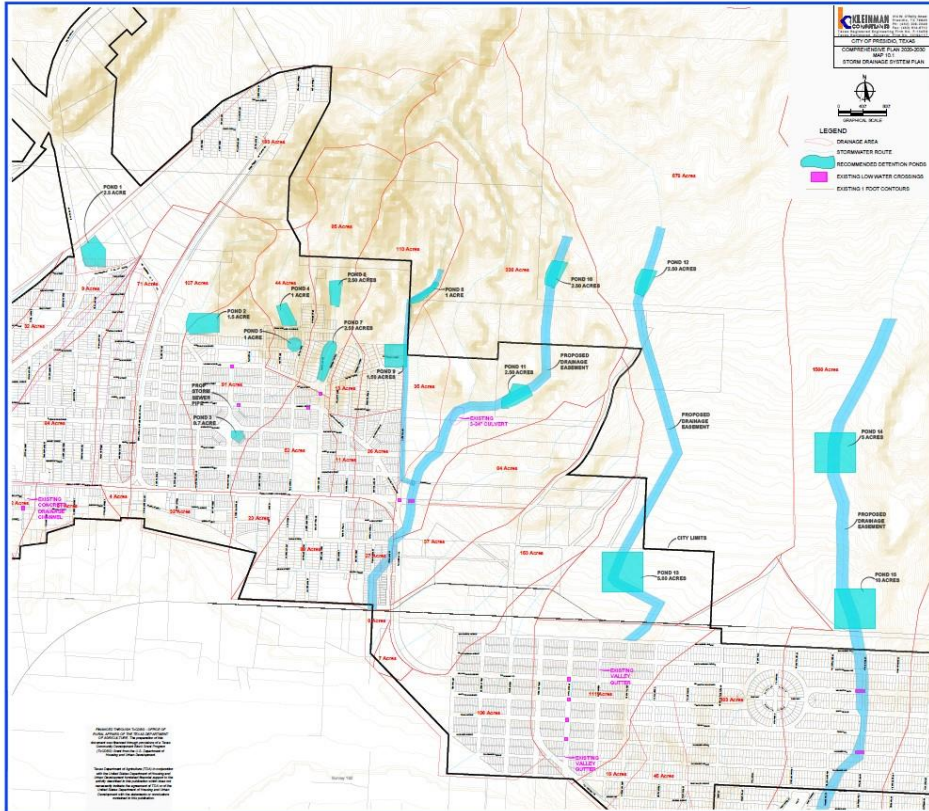


Figure 4B-2. Proposed Project Locations Figure from City of Presidio Comprehensive Plan 2020-2030 (Kleinman, 2020)

### 4B-3. Flood Management Evaluation ID: 141000003

**Name:** Arroyo Siphon at State Highway (SH) 20 near Tornillo.

**Description:** Coordinate with Texas Department of Transportation (TXDOT) to install siphon at SH20 to prevent road from overtopping and stormwater from entering EPCWID1 canal system.

**Affected Jurisdictions:** El Paso County

**Discussion on Flood Risk:** Floods from an unnamed arroyo in El Paso County located approximately 4.5 miles southeast of the Census Designated Place, Tornillo, with a watershed area of 6.7 square miles routinely causes interruptions of traffic along SH20 and conveys sediment into the Tornillo Canal and pecan orchards located south of SH20. This watershed is shown in **Exhibit Map 19.03** of *Chapter 5*.

#### Flood Management Evaluation Scope of Work:

The FME for the unnamed arroyo near Tornillo crossing of SH20 will develop and select FMP alternatives (both structural and non-structural) for the mitigation of the identified flood risk. The SOW for the FME will include these tasks.

*Task 1 - Data Collection.* Field survey data will be collected at the crossing and in the area downstream of the crossing to the Tornillo Canal. Existing topographic data will be refined and processed as needed. Local property and infrastructure valuations and vulnerability data will be collected.

*Task 2 - Existing Condition Engineering Analysis.* A hydrologic model will be developed for the 6.7 square mile Bianca Draw watershed. A hydraulic model will be developed for the flows overtopping SH20, entering the Tornillo Canal, and exceeding the capacity of the Tornillo Canal, which runs parallel to SH20, immediately downstream (southwest) of the roadway.

*Task 3 - Alternatives Development.* Alternatives will be developed for improved performance of SH20 and the Tornillo Canal during floods, and reduction of risk to downstream agricultural land. Concept design(s) and cost estimate(s) will be developed for structural alternatives, which will likely include a debris basin with limited flood pool, and a siphon under SH20 and the Tornillo Canal. Costs will also be developed for additional non-structural alternatives. Revised flood damages and locally defined evaluation criteria will be estimated for each alternative. Alternatives will involve measures outside of the TXDOT right-of-way.

*Task 4 - Alternatives Selection.* An FMP for inclusion in a future RFP will be selected using criteria developed in a workshop with local stakeholders. These criteria will be consistent with TWDB criteria for FMPs. Full RFP-required data for the selected FMP will be developed.

*Task 5 - Report.* A report will be generated for presentation to the Regional Flood Planning Group (RFPG) and TWDB providing documentation of the proposed FMP.



*Task 6 - Stakeholder Coordination.* It is assumed that two virtual coordination meetings will need to take place with EPCWID1 and TXDOT since the selected alternative will improve sediment and flooding issues on the TXDOT-owned roadway (SH20) and the EPCWID1-owned Tornillo Canal.

**Estimated Cost for FME:**

<b>Labor Cost</b>	
<b>Task 1 – Data Collection</b>	\$ 3,200
<b>Task 2– Existing Condition Engineering Analyses</b>	\$ 8,635
<b>Task 3 – Alternatives Development</b>	\$ 10,220
<b>Task 4 - Alternatives Selection</b>	\$ 6,070
<b>Task 5 – Report</b>	\$ 6,225
<b>Task 6 - Stakeholder Coordination</b>	\$ 3,460
<b>Total Project Labor</b>	<b>\$ 37,810</b>
<b>Travel</b>	<b>\$ -</b>
<b>Total FME cost</b>	<b>\$ 38,000</b>

#### 4B-4. Flood Management Evaluation ID: 141000004

**Name:** Lower Mesa Drain Improvements at El Paso.

**Description:** Assess capacity of upstream reservoirs; develop detailed hydraulic model of Lower Mesa Drain to design 30+ culvert improvements; assess capacity of Mesa Drain to accept runoff without impacting downstream agricultural property.

**Affected Jurisdictions:** The City of El Paso, City of Socorro, and El Paso County.

**Discussion on Flood Risk:** The study will evaluate existing conditions and proposed improvements to infrastructure in the Mesa Spur Drain, Mesa Drain, and Fabens Waste Channel. These drains are currently designed primarily for the groundwater drainage of surrounding agricultural fields, but are currently used as flood mitigation infrastructure during storm events in the El Paso County Lower Valley. The drainage watershed includes urban, suburban, agricultural, and desert range land. Approximately 40 ephemeral drainage paths (arroyos) discharge water and sediment into the Mesa Drain/Fabens Channel system. Increased industrial development within the portions of the watershed adjacent to Interstate Highway (IH) 10 have increased the volume of runoff and reduced the time-of-concentration of flows. Stormwater intake during major storm events exceeds design capacity, leading to overflow, breaking, and flooding of surrounding streets, homes, businesses, and agricultural fields.

#### Flood Management Evaluation Scope of Work:

The purpose of this FME is to develop a FMP for increasing the capacity of Mesa Drain through measures to improve conveyance capacity of road crossings and channel expansion. The SOW for the FME will include these tasks.

*Task 1 - Data Collection.* This task includes:

- Land surveying of approximately 31.4 miles of drain with right of way varying from 80 feet to 120 feet. Tasks include LiDAR and aerial images collection, field observations, measurements, and a review of historical records of the drain system necessary for the development of preliminary engineering designs and H&H studies.
- Structure surveying and hydraulic assessment includes reviewing existing road crossings, including approximately 45 culverts, 10 flumes, 7 free-span bridges, utilities, O&M roads, and other appurtenances.

*Task 2 - Existing Condition Engineering Analyses.* H&H modeling will be performed to estimate Drain hydraulic capacity throughout Mesa Drain, Mesa Spur Drain, and Fabens Waste Channel.

**Exhibit Map 19.04** of *Chapter 5* depicts the local watershed.

*Task 3 - Flood Mitigation Project Development.* H&H modeling will be performed to estimate system changes to establish a uniform 1% AC hydraulic capacity. Preliminary engineering design work will include developing concept-level plans for the proposed drain lengths and for any upgrades needed on culverts, drain gates, floodway headings, and intake and waste

structures. This task includes preliminary environmental and compliance work necessary for developing documents that adhere to Federal, state, and local laws, regulations, and codes, as applicable. The task also includes defining the FMP per TWDB guidance to facilitate inclusion in the URGRFP.

*Task 4 - Report.* A report will be generated that provides technical backup for the proposed FMP in accordance with TWDB guidance.

*Task 5 - Stakeholder Coordination.* It is assumed that monthly virtual coordination meetings will take place with EPCWID1 and with other affected stakeholders as needed (e.g., El Paso Water, City of Socorro, etc.) since the selected alternative will improve sediment and flooding issues for multiple entities.

**Estimated Cost for FME:**

<b>Labor Cost</b>	
<b>Task 1 – Data Collection</b>	\$ 256,409
<b>Task 2 – Existing Condition Engineering Analyses</b>	\$ 78,720
<b>Task 3 – Flood Mitigation Project Development</b>	\$ 252,665
<b>Task 4 – Report</b>	\$ 60,800
<b>Task 5 – Stakeholder Coordination</b>	\$ 40,200
<b>Total Project Labor</b>	<b>\$ 688,794</b>
<b>Travel</b>	<b>\$ -</b>
<b>Total FME cost</b>	<b>\$ 689,000</b>

#### 4B-5. Flood Management Evaluation ID: 141000005

**Name:** Develop stormwater master plan (SWMP) for City of San Elizario.

**Description:** The SWMP includes data collection, refinement of existing flood maps, refinement of flood risk, and development and selection of alternatives to address that risk.

**Affected Jurisdiction:** City of San Elizario, El Paso County

**Description of Flood Risk.** The City of San Elizario is an incorporated area in El Paso County. Per recent modeling of flood risk within El Paso County, there are over 500 structures at risk within San Elizario from the 1% AC flood, with an additional 800 structures at risk for the same flood within populated areas adjacent to San Elizario. See **Exhibit Map 15 (Map 12 of 31)** for a depiction of the flood risk.

#### Flood Management Evaluation Scope of Work:

The FME for the City of San Elizario and adjacent populated areas will develop and select FMP alternatives (both structural and non-structural) for the mitigation of the identified flood risk. The SOW for the FME will include these tasks.

*Task 1 - Data Collection.* Data will be collected from local residents to: 1) identify the primary critical route(s) that have been inundated, 2) collect locations of physical HWMs or anecdotal flood depths at known locations, and 3) solicit ideas for potential solutions. Field survey data will be collected at HWMs and at selected locations (e.g., culverts/ bridges) needed to refine hydraulic modeling. Spatial rainfall data will be collected to facilitate model replication of the August, 2022 event. Existing topographic data will be refined and processed as needed. Local property and infrastructure valuations and vulnerability data will be collected.

*Task 2 - Engineering Analysis of Existing Conditions.* A hydrologic model will be developed for the area watershed. A 2-D hydraulic model for San Elizario will be developed for the incorporated area and adjacent populated areas. Existing flood damages will be assessed per TWDB guidance. **Exhibit Map 19.05** of *Chapter 5* depicts the relevant watershed.

*Task 3 - Alternatives Development.* Alternatives will be developed for improved performance of local critical route(s) during floods, reduction of risk to occupied structures, and addressing of other identified flood-related community concerns (e.g., planning for improved communication, improved emergency response, etc.). Concept design(s) and cost estimate(s) will be developed for structural alternatives. Costs will also be developed for additional non-structural alternatives. Revised flood damages and locally defined evaluation criteria will be estimated for each alternative.

*Task 4 - Alternatives Selection.* An FMP for inclusion in a future RFP will be selected using criteria developed in a workshop with local stakeholders. These criteria will be consistent with TWDB criteria for FMPs. Full RFP-required data for the selected FMP will be developed.

*Task 5 - Report.* A report will be generated for presentation to the RFPG and TWDB providing documentation of the proposed FMP.

*Task 6 – Stakeholder Coordination*

**Estimated Cost for FME:**

<b>Labor Cost</b>	
<b>Task 1 – Data Collection</b>	\$ 9,900
<b>Task 2– Existing Condition Engineering Analyses</b>	\$ 12,075
<b>Task 3 – Alternatives Development</b>	\$ 22,340
<b>Task 4 - Alternatives Selection</b>	\$ 11,250
<b>Task 5 – Report</b>	\$ 10,770
<b>Task 6 – Stakeholder Coordination</b>	\$ 6,760
<b>Total Project Labor</b>	<b>\$ 73,095</b>
<b>Travel</b>	<b>\$ -</b>
<b>Total FME cost</b>	<b>\$ 73,000</b>

#### 4B-6. Flood Management Evaluation ID: 141000006

**Name:** Increase Storage Capacity of Fort Bliss Sump

**Description:** Excavate Fort Bliss Sump while avoiding newly delineated wetland to increase storage capacity of sump. Requires continued coordination with U.S. Army due to project location on Fort Bliss.

**Affected Jurisdiction:** City of El Paso, Fort Bliss

**Description of Flood Risk.** The City of El Paso is an incorporated area in El Paso County, and Fort Bliss is a United States Army post in northeast El Paso, extending into New Mexico. Fort Bliss Sump is located on Fort Bliss property; however, El Paso Water is able to access the sump for maintenance purposes. Per recent modeling of flood risk within El Paso County, there are over 2,300 structures at risk from the 1% AC flood within the Fort Bliss Sump Drainage System, which is a drainage system originally delineated as part of the City of El Paso Stormwater Master Plan (URS, MCI, 2009). See **Exhibit Map 19.06** for a depiction of the contributing drainage system and flood risk.

#### Flood Management Evaluation Scope of Work:

The FME for Fort Bliss Sump will develop and select an FMP alternative for the extent and volume of excavation needed for mitigation of the identified flood risk. The SOW for the FME will include these tasks.

*Task 1 - Data Collection.* This project was originally identified by El Paso Water in the 2015 time frame. A high level drainage assessment was performed by MCI for El Paso Water in 2015; however, the evaluation was never documented in the form of a memorandum or report, and further study was put on hold pending a wetland delineation by the U.S. Army. The U.S. Army has recently provided to El Paso Water a recent wetland delineation report (Study ID: 93), dated July 2021. A hydrologic model of this drainage system was developed for the City of El Paso Stormwater Master Plan (URS, MCI, 2009), but the effective FEMA model is based upon a more recent Letter of Map Change (LOMC) approved by the Federal Emergency Management Agency (FEMA), Case No. 18-06-0885P. This "Northeast LOMC" was developed using a HEC-HMS hydrologic model and a FLO-2D hydraulic model with point discharge hydrographs from the HEC-HMS results applied to the 2D hydraulic model as inputs. In addition, hydrologic and hydraulic models are currently being developed by El Paso Water for Tobin Drain and Diana Ditch, which both contribute to Fort Bliss Sump. If these models are available at the time this study begins, they would likely be the best available models to assess existing conditions; however, these models, along with the 2009 hydrologic model and the Northeast LOMC hydrologic and hydraulic models will be reviewed and compared as part of the data collection phase to select the most appropriate an accurate models to use as the starting point for assessing existing flood conditions affected by the capacity of Fort Bliss Sump.

*Task 2 - Existing Condition Engineering Analyses.* A hydrologic model will be developed for the area watershed. One dimensional and/or two dimensional hydraulic models will be developed

for the contributing area to Fort Bliss Sump, depending on which of the previously developed models are deemed most appropriate to use as base models. Existing flood damages will be assessed per TWDB guidance.

*Task 3 - Alternatives Development.* Alternatives will be developed for the extent and volume of excavation needed in Fort Bliss Sump for the mitigation of the identified flood risk. As part of the high level assessment performed by MCI in 2015, a concept-level cost estimate for \$19.5 million was developed by MCI in September 2015. Concept design(s) and cost estimate(s) will be developed/refined for structural alternatives as part of this FME. Revised flood damages and locally defined evaluation criteria will be estimated for each alternative.

*Task 4 - Report.* A report will be generated for presentation to the RFPG and TWDB providing documentation of the proposed FMP.

**Estimated Cost for FME:**

<b>Labor Cost</b>	
<b>Task 1 – Data Collection</b>	\$ 3,960
<b>Task 2 – Existing Condition Engineering Analyses</b>	\$ 12,075
<b>Task 3 – Alternatives Development</b>	\$ 4,740
<b>Task 4 – Report</b>	\$ 6,550
<b>Task 5 – Stakeholder Coordination</b>	\$ 2,560
<b>Total Project Labor</b>	<b>\$ 29,885</b>
<b>Travel</b>	<b>\$ -</b>
<b>Total FME cost</b>	<b>\$ 30,000</b>

#### 4B-7. Flood Management Evaluation ID: 141000008

**Name:** Sediment Control at Alamito and Ternereros Creek

**Description:** Design sediment control structures on Alamito Creek and Ternereros Creek upstream of confluence with the Rio Grande to reduce sediment in the Rio Grande and reduce USIBWC maintenance burden.

**Affected Jurisdiction:** City of Presidio, Presidio County

**Description of Flood Risk.** Alamito Creek and Ternereros Creek drain watersheds of 1500 square miles and 230 square miles within Presidio, Jeff Davis, and Brewster Counties. The watershed is shown in Map 16.08. These natural arroyos convey large volumes of sediment into the Rio Grande, raising the river bed in the vicinity of the City of Presidio, exacerbating flooding in that city. This FE develops solutions to address this issue. See **Exhibit Map 19.08** for a depiction of the contributing drainage areas and flood risk.

#### Flood Management Evaluation Scope of Work:

This FMS has the goal of developing structural and non-structural solutions for control of sediment inflow into the Rio Grande from Alamito Creek and Ternereros Creek. This FME is necessarily preceded by FME 141000015 (which provides a method for estimation of annual sediment loadings for regional arroyos) and FMS 142000016 (which provides a set of erosion control solutions reviewed and recommended by the RFPG). FMS ID: 142000006 will follow this FME as it considers updated sediment loads into the Rio Grande from Alamito and Ternereros Creeks for recommended environmental flows through the Rio Conchos and the Rio Grande.

The Scope of Work (SOW) for this FME includes five tasks.

*Task 1 - Estimation of existing condition sediment loadings.* This task includes:

- Review of past studies of Alamito Creek and Ternereros Creek
- Assembly of GIS data, to include historic LiDAR data for the two arroyos.
- Estimation of annual and event-based sediment loadings per literature review and method developed in FME 141000015
- Use of historic LiDAR data (and maintenance data) to estimate changes in bed elevations and sediment volume between dates of LiDAR.

*Task 2. Alternatives Development.* Alternatives will be developed for control of sediment within each of the two watersheds, per RFPG-approved guidelines presented in FMS 142000016. Alternatives will be developed which present a range of sediment volume controlled versus construction costs and benefits/ costs to the environment. Maintenance costs for sustaining the benefits will be presented.



*Task 3 - Workshop to review initial alternatives.* The workshop with RFPG-defined stakeholders will review and discuss the conceptual designs developed as part of Task 2. The goals of the workshop will be to select alternative(s) for development into FMPs.

*Task 4 - Define FMPs and FMSs to improve sediment controls on the two creeks.* The concept designs selected for each creek will be refined and aggregated as two FMPs (one for Alamito Creek, one Ternereros Creek). FMPs will conform to TWDB guidance. The SOWs for non-structural solutions will be combined into a single FMS.

*Task 5 - Develop report.* The report will include documentation of Tasks 1-4.

*Task 6 - Stakeholder Coordination.*

**Estimated Cost for FME:**

<b>Labor Cost</b>	
<b>Task 1 – Estimation of Existing Condition Sediment Loadings</b>	\$ 20,220
<b>Task 2 – Alternatives Development</b>	\$ 19,780
<b>Task 3– Workshop to review initial alternatives</b>	\$ 11,140
<b>Task 4 – Define FMPs and FMSs to improve sediment controls on 2 creeks</b>	\$ 41,440
<b>Task 5 – Report</b>	\$ 10,580
<b>Task 6 – Stakeholder Coordination</b>	\$ 7,900
<b>Total Project Labor</b>	<b>\$ 111,060</b>
<b>Travel</b>	<b>\$ -</b>
<b>Total FME cost</b>	<b>\$ 111,000</b>

#### 4B-8. Flood Management Evaluation ID: 141000010

**Name:** Develop city-wide drainage study and stormwater master plan for Pecos.

**Description:** Develop city-wide drainage study and stormwater master plan for City of Pecos and adjacent Lindsay Census Designated Place. Develop detailed H&H models and floodplain maps. Evaluate FMP alternatives.

**Affected Jurisdictions:** City of Pecos, Lindsay Census Designated Place (CDP), Reeves County

**Discussion on Flood Risk:** The City of Pecos incorporated area is located adjacent and to the north of Lindsay CDP in Reeves County. For the 1% AC flood, per mapping performed for the RFP, the floodplain potentially causes damage to over 1,900 structures and restricts travel. Extent of 1% AC flood risk is depicted in **Exhibit Map 15 (Map 3 of 31)**. As part of the public outreach effort, a public roadshow meeting was held in the City of Pecos on February 9, 2022. Approximate flood inundation maps were presented to local flood-related entities, who confirmed that flooding throughout large areas can be a problem due to the extremely flat topography and raised embankments of roadways and railroads, which sometimes re-direct runoff. A playa lake known as Mosquito Lake was also confirmed to be present southeast of the City of Pecos. As part of a recent RFPG effort to aid the City in the development of an FMP, data have been collected and analyzed from local rainfall gages. A meeting with the City has captured experience with recent flood events and identified areas of priority flood risk concern. In addition, a watershed hydrologic model has been developed, and a 2D hydraulic model has been developed. Insight from these studies has shown that estimation of flood risk associated with Cottonwood Creek requires detailed hydrologic model calibration. This model calibration is included in the scope of work of FMP 141000119.

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#### Flood Management Evaluation Scope of Work:

The FME for the City of Pecos will develop and select FMP alternatives (both structural and non-structural) for the mitigation of the identified flood risk. FMS ID: 142000007 will follow this FME, as it addresses flood-related saltcedar issues in the City of Pecos which may benefit from knowing the locations of existing flood hazards relative to saltcedar growth. The SOW for the FME will include the following tasks.

*Task 1 - Data Collection.* Flood waters in the City of Pecos primarily arise from two sources: 1) the Pecos River watershed below Red Bluff Dam (approximately 2,500 square miles) and tributaries to the Pecos River from the west, e.g., Cottonwood Creek (watershed exceeding 674 square miles). This latter 674 square mile watershed is shown in **Exhibit Map 19.10** of *Chapter 5*. Flood risk in the City of Pecos is strongly influenced by the potential coincidence of major floods from these two watersheds. Data collection will include:

- Stage and flow data will be collected from the USGS gages on the Pecos River upstream and downstream of the City of Pecos.
- Data will be collected from local residents and/or entities with drainage oversight to: 1) identify the primary critical route(s) that have been inundated; 2) collect locations of

physical HWMs or anecdotal flood depths at known locations; and 3) solicit ideas for potential solutions.

- Field survey data will be collected at HWMs and at selected locations (e.g., culverts/bridges) needed to refine hydraulic modeling.
- Historic spatial rainfall data will be collected to replicate a selected recent event on Pecos River Lateral No. 1.
- Existing topographic data will be refined and processed as needed. Local property and infrastructure valuations and vulnerability data will be collected.

*Task 2 - Existing Condition Engineering Analysis.* A hydrologic model will be developed for the Pecos River Lateral No. 1 watershed. Potential coincident flood hydrographs on the Pecos River will be developed based upon Pecos River USGS gage data. Existing flood damages for coincident flood scenarios will be assessed per TWDB guidance.

*Task 3 - Alternatives Development.* Alternatives will be developed for improved performance of local critical route(s) during floods, reduction of risk to occupied structures, and addressing of other identified flood-related community concerns (e.g., planning for improved communication, improved emergency response, etc.). Concept design(s) and cost estimate(s) will be developed for structural alternatives. Costs will also be developed for additional non-structural alternatives. Revised flood damages and locally defined evaluation criteria will be estimated for each alternative.

*Task 4 - Alternatives Selection.* FMPs for inclusion in a future RFP will be selected using criteria developed in a workshop with local stakeholders. Alternatives for diverting flood sources from the west toward the playa located southeast of the City of Pecos (Mosquito Lake) will be considered and evaluated for no negative impact. These criteria will be consistent with TWDB criteria for FMPs. Full RFP-required data for the selected FMPs will be developed.

*Task 5 - Report.* A report will be generated for presentation to the RFPG and TWDB providing documentation of the proposed FMPs.

*Task 6 - Stakeholder Coordination.* It is assumed that up to four virtual coordination meetings will take place with affected stakeholders such as the City of Pecos, Lindsay CDP, Reeves County, and TXDOT, since the selected alternative will potentially affect flood infrastructure owned, designed, maintained, and/or operated by different entities.

**Estimated Cost for FME:**

<b>Labor Cost</b>	
<b>Task 1 – Data Collection</b>	\$ 14,030
<b>Task 2– Existing Condition Engineering Analyses</b>	\$ 22,070
<b>Task 3 – Alternatives Development</b>	\$ 23,660
<b>Task 4 - Alternatives Selection</b>	\$ 12,500
<b>Task 5 – Report</b>	\$ 9,970
<b>Task 6 – Stakeholder Coordination</b>	\$ 8,440
<b>Total Project Labor</b>	<b>\$ 91,000</b>
<b>Travel</b>	<b>\$ 1,440</b>
<b>Total FME cost</b>	<b>\$ 92,000</b>

#### 4B-9. Flood Management Evaluation ID: 141000012

**Name:** Dam Improvements at Comanche Creek Reservoir at Fort Stockton.

**Description:** Inspect and evaluate rehabilitation improvements for Comanche Creek Reservoir to protect Fort Stockton from similar flooding to that which occurred on April 4, 2004.

**Affected Jurisdictions:** City of Fort Stockton, Pecos County

**Discussion on Flood Risk:** The City of Fort Stockton is an incorporated area in Pecos County, and Comanche Creek Dam is located immediately upstream of the city, to the southeast. On April 4, 2004, a rare early morning severe weather event hit Fort Stockton area, and Comanche Creek, which is downstream of the Comanche Creek Dam, was one of the worst flooding areas in Fort Stockton. Comanche Creek runs through James Rooney Memorial Park, which had multiple feet of flooding. Best available floodplain mapping in the area identified over 160 structures at risk in the 1% AC flood within Fort Stockton. Extent of 1% AC flood risk is depicted in **Exhibit Map 15 (Map 26 of 31)**. In addition, Comanche Creek Dam has been identified by the Texas Commission on Environmental Quality (TCEQ) as being in poor condition and hydraulically inadequate.

#### Flood Management Evaluation Scope of Work:

The FME for City of Fort Stockton will develop and select FMP alternatives (both structural and non-structural) for the mitigation of the identified flood risk. The SOW for the FME will include these tasks.

*Task 1 - Data Collection.* Historic data will be collected from previous reports available through public data sources to identify and characterize historic extreme events. Spatial rainfall data will be collected to facilitate model replication of selected extreme event(s). Data will be collected from local residents and/or entities with drainage oversight to: 1) identify the primary critical route(s) that have been inundated; 2) collect locations of physical HWMs or anecdotal flood depths at known locations; and 3) solicit ideas for potential solutions. Field survey data will be collected at HWMs and at selected locations (e.g., culverts/ bridges) needed to refine hydraulic modeling. Existing topographic data will be refined and processed as needed. Local property and infrastructure valuations and vulnerability data will be collected.

*Task 2 - Engineering Analysis of Existing Conditions.* A hydrologic model will be developed for the Comanche Creek watershed, to include development of a hydraulic model to route flood flows through Comanche Creek Dam. The 64 square mile watershed of Comanche Creek above Comanche Creek Dam is shown in **Exhibit Map 19.12 of Chapter 5**. A hydraulic model for Comanche Creek will be developed for the reach, including City of Fort Stockton and critical local routes. Existing flood damages will be assessed per TWDB guidance. Design floods for the dam will be developed in accordance with TCEQ dam safety guidance. A dam breach inundation model will be developed for Comanche Creek Dam.

*Task 3 - Alternatives Development.* Alternatives will be developed for rehabilitation of Comanche Creek Dam to meet TCEQ dam safety guidance. In addition, alternatives will include

improved performance of local critical route(s) during floods, reduction of risk to occupied structures, and addressing of other identified flood-related community concerns (e.g., planning for improved communication, improved emergency response, etc.). Concept design(s) and cost estimate(s) will be developed for structural alternatives. Costs will also be developed for additional non-structural alternatives. Revised flood damages and locally defined evaluation criteria will be estimated for each alternative.

*Task 4 - Alternatives Selection.* An FMP for inclusion in a future RFP will be selected using criteria developed in a workshop with local stakeholders. These criteria will be consistent with TWDB criteria for FMPs. Full RFP-required data for the selected FMP will be developed.

*Task 5 - Report.* A report will be generated for presentation to the RFPG and TWDB providing documentation of the proposed FMP.

*Task 6 - Stakeholder Coordination.* It is assumed that up to three virtual coordination meetings will take place with affected stakeholders such as the City of Fort Stockton, Pecos County, and TCEQ since the selected alternative will potentially affect flood infrastructure owned, designed, maintained, and/or operated by different entities.

**Estimated Cost for FME:**

<b>Labor Cost</b>	
<b>Task 1 – Data Collection</b>	\$ 6,450
<b>Task 2– Existing Condition Engineering Analyses</b>	\$ 15,205
<b>Task 3 – Alternatives Development</b>	\$ 24,120
<b>Task 4 - Alternatives Selection</b>	\$ 5,880
<b>Task 5 – Report</b>	\$ 8,120
<b>Task 6 – Stakeholder Coordination</b>	\$ 5,920
<b>Total Project Labor</b>	<b>\$ 65,695</b>
<b>Travel</b>	<b>\$ 2,208</b>
<b>Total FME cost</b>	<b>\$ 68,000</b>

#### 4B-10. Flood Management Evaluation ID: 141000014

**Name:** Develop a Colonia-wide Drainage System at Fort Hancock.

**Description:** Conduct surveys and a drainage study to define flood areas, size 5<sup>th</sup> St. crossing structures, develop H&H models, and propose FMPs. Address flooding at Hwy 20, Mustang Rd., and complete Supplemental Watershed Plans for Camp Rice Dam 1 and Alamo Dam 3.

**Affected Jurisdictions:** Fort Hancock CDP, Acala CDP, Hudspeth County

**Discussion on Flood Risk:** Fort Hancock CDP and Acala CDP are unincorporated areas in Hudspeth County, which is experiencing rapid development. Eight flood control dams were designed and constructed in Hudspeth County by the federal Soil Conservation Service, now the Natural Resources Conservation Service (NRCS), during the 1960s, and three additional dams in the 1980s. Six of the older dams have been identified as hydraulically inadequate by TCEQ Dam Safety. Two of these latter dams (Camp Rice Arroyo Dam 1 and Alamo Arroyo Dam 3) provide flood protection to Fort Hancock and Acala. These CDPs, dams and the relevant watershed areas are shown in **Exhibit Map 19.14** of *Chapter 5*.

#### Flood Management Evaluation Scope of Work:

The FME for Fort Hancock and Acala will develop and select FMP alternatives (both structural and non-structural) for the mitigation of the identified flood risk. The SOW for this FME is divided into three tasks: 1) Perform a Comprehensive Engineering Study with appropriate surveys and H&H modeling to fully define specific area flood risks and propose detailed remedial methods to mitigate the identified risks; and 2) develop a Supplemental Watershed Plan and Environmental Assessment (EA) for Camp Rice Arroyo Dam 1 and Alamo Arroyo Dam 3, which provide current flood protection to Fort Hancock and Acala. FMS ID: 142000003 will follow this FME as it develops a County program for long-term maintenance to sustain the FME-recommended improvements.

*Task 1 – Comprehensive Engineering Study.* Goal 4.1 of the “Colonia Area Study and Plan 2019 - 2029” (Grantworks, 2019) defines this task to perform a Comprehensive Engineering Study with appropriate surveys and H&H modeling to fully define specific area flood risks and propose detailed remedial methods to mitigate the identified risks. This task includes sizing cross drainage structures for 5<sup>th</sup> Street and addressing drainage issues at Highway 20 and Mustang Road. The study will also include investigating benefits of expanding roadside ditches/culverts and regrading ditches throughout the study area. Cost estimates for proposed FMPs will also be developed as part of the plan.

*Task 2 – Supplemental Watershed Plan and EA.* The SOW for planning the needed upgrades for Camp Rice Arroyo Dam 1 and Alamo Arroyo Dam 3 (originally built by the federal government as part of the USDA Small Watershed Program) is expected to be executed as part of the development of a Supplemental Watershed Plan and EA, as defined by NRCS. A Supplemental Watershed Plan is funded 100% by the federal government (NRCS) and includes concept designs and cost estimates to upgrade watershed dams to meet federal dam safety requirements. The

State of Texas (TCEQ) recognizes these standards as appropriate and generally waives full compliance with State dam safety requirements when federal requirements are met. The inclusion of RFGP approval for performance of a Supplemental Watershed Plan for this watershed will strengthen the request to the federal government for leadership and funding of the needed planning. The tasks in the table below derive directly from the required SOW for a Supplemental Watershed Plan in the NRCS *National Watershed Manual*. The estimated cost provided below is based upon recent pricing of Supplemental Watershed Plans within the State of Texas for plans involving upgrade of multiple dams, assuming a watershed evaluation would identify two dams for upgrade.

**Estimated Cost for FME:**

*Total FME Cost.* The total estimated cost for this FME is \$791,000, per the table below. Detailed costs for the subtasks of Tasks 1 and 2 are also provided following the summary cost table below.

<b>FME ID 141000014 Total Cost</b>	
<b>Task 1 – Comprehensive Engineering Study</b>	\$ 99,000
<b>Task 2 – Supplemental Watershed Plan and EA</b>	\$ 696,000
<b>Total FME Cost</b>	<b>\$ 795,000</b>

*Task 1 Cost.* Estimated cost for Task 1 is \$99,000, per the table below.

<b>Task 1 Labor Cost</b>	
<b>Task 1.1 – Data Collection</b>	\$ 12,700
<b>Task 1.2– Existing Condition Engineering Analyses</b>	\$ 17,075
<b>Task 1.3 – Alternatives Development</b>	\$ 29,220
<b>Task 1.4 - Alternatives Selection</b>	\$ 12,690
<b>Task 1.5 – Report</b>	\$ 18,810
<b>Task 1.6 – Stakeholder Coordination</b>	\$ 7,600
<b>Total Task 1 Labor</b>	<b>\$ 98,095</b>
<b>Task 1 Travel</b>	<b>\$ 1,112</b>
<b>Total Task 1 cost</b>	<b>\$ 99,000</b>



Task 2 Cost. Estimated Cost for Task 2 is \$696,000, per the table below.

Task 2 Labor Cost			
<b>Task 2.1 – Data Collection</b>			\$ 31,571
<b>Task 2.2 - Identify Problems, Opportunities &amp; Concerns</b>			\$ 24,769
<b>Task 2.3 - Meetings / Determine Objectives</b>			\$ 37,954
<b>Task 2.4 - Inventory Resources (Conduct Planning Studies)</b>			
A.	Analyze Existing Data		\$ 1,080
B.	Environmental Assessment		\$ 8,820
C.	Analyze Existing Resource Data		\$ 1,380
D.	Economics and Social Effects		\$ 5,025
E.	Archeological and Historic Resources		\$ 61,155
F.	Engineering		\$ 10,898
G.	Geology (see Geology Tab)		\$ 14,910
<b>Task 2.5 - Analyze Resource Data</b>			
A.	Support Maps		\$ 3,503
B.	Hydrology		\$ 8,633
C.	Hydraulics		\$ 30,150
D.	Economics (all alternatives)		\$ 16,358
E.	QA/QC		\$ 4,680
<b>Task 2.6 - Formulate And Evaluate Alternatives</b>			
A.	Formulate Alternatives		\$ 10,463
B.	Evaluate Alternatives (SITES)		\$ 60,585
C.	Evaluate Economic Impacts		\$ 5,828
D.	Evaluate Environmental Impacts		\$ 7,166
E.	Evaluate Social Impacts		\$ 7,166
F.	Alternative Trade-off Analysis (Economic, Environmental, Social)		\$ 5,996
G.	Review Alternatives w/Sponsors & Steering Committee		\$ 623
H.	Identify Preferred Alternative		\$ 1,193
I.	QA/QC		\$ 5,700
<b>Task 2.7 - Prepare Supplemental Watershed Plan/Environmental Assessment</b>			
A.	Prepare Draft Document		\$ 59,366
B.	Draft Document Technical Reviews		\$ 27,563
C.	Prepare Final Plan/EA		\$ 3,443
<b>Task 2.8 - Prepare Finding of No Significant Impact</b>			\$ -
<b>Task 2.10 - Subcontracts</b>			
A.	Sediment Survey		\$ 20,000
B.	Topographic Survey		\$ 50,000
C.	Geologic Investigation		\$ 120,000
D.	Geologic Investigation (Lab)		\$ 40,000
		<b>Total Task 2 Labor</b>	<b>\$ 685,978</b>
		<b>Task 2 Travel</b>	<b>\$ 10,000</b>
		<b>Total Task 2 Cost</b>	<b>\$ 696,000</b>

#### 4B-11. Flood Management Evaluation ID: 141000015

**Name:** Prioritize arroyos on their likelihood producing sediment/debris flows.

**Description:** Prioritize arroyos in the City of El Paso, El Paso County, and Hudspeth County on their likelihood of producing sediment/debris flows

**Affected Jurisdictions:** City of El Paso, El Paso County

**Discussion on Flood Risk:** Numerous arroyos in El Paso County have alluvial fans that extend through developed areas and irrigated areas. Many of these arroyos lack sediment/debris control structures to prevent sediment deposition in flood water conveyance structures (flood control channels, culverts, irrigation drains that periodically convey stormwater). This deposition reduces or blocks flood conveyance capacity, leading to increased risk of flood-induced damages, high post-flood maintenance costs, and the potential for loss of life.

#### Flood Management Evaluation Scope of Work:

This FME will provide research and engineering evaluations of arroyos that have historically created flood damages and high maintenance costs. FMS ID: 142000016 will follow this FME as the FMS focuses on 1) developing structural and non-structural solutions to reduce sediment loadings from arroyos (using an arroyo identified in FME 141000015 as an example), and 2) generalizing the strategies and technical methods suggested for the example arroyo for application throughout the region. The SOW for this FME will include:

*Task 1 - Data Collection.* This task includes:

- Regional studies and local maintenance records will be reviewed to assemble data that can be used to estimate future sediment loadings for a variety of typical local watershed conditions.
- Interviews with stakeholder engineering and maintenance staff to identify priority uncontrolled arroyos and characterize historic sedimentation associated with those arroyos.
- Collection of watershed data from identified arroyos: terrain slopes, vegetation, soil type, changes per readily accessible historic aerial photography.

*Task 2 - Existing Condition Engineering Analysis.* The data collected will be analyzed and a refined method developed to estimate relative production of sediment for each identified uncontrolled arroyo. Available floodplain models will be reviewed to estimate, for each identified uncontrolled arroyo, the added flood risk associated with drainage conveyance blockage. **Exhibit Map 19.15** of *Chapter 5* depicts major watersheds in the County.

*Task 3 - Report.* A report will be generated that estimates annual and event-based sediment transport volume associated with each of the identified uncontrolled arroyos. These estimates are expected to be used in refining stakeholder requirements for sediment storage in future

detention basins and in refinement of design and prioritization of construction for future regional detention projects.

*Task 4 - Stakeholder Coordination.* It is assumed that up to four virtual coordination meetings will take place with affected stakeholders such as the City of El Paso, El Paso County, Hudspeth County, EBID, and EPCWID1, since the selected alternative will potentially affect flooding issues, maintenance, and/or operating procedures managed by these different entities.

**Estimated Cost for FME:**

<b>Labor Cost</b>	
<b>Task 1 – Data Collection</b>	\$ 20,800
<b>Task 2– Existing Condition Engineering Analyses</b>	\$ 25,340
<b>Task 3 – Report</b>	\$ 14,840
<b>Task 4 – Stakeholder Coordination</b>	\$ 9,400
<b>Total Project Labor</b>	<b>\$ 70,380</b>
<b>Travel</b>	<b>\$ -</b>
<b>Total FME cost</b>	<b>\$ 70,000</b>

#### 4B-12. Flood Management Evaluation ID: 141000018

**Name:** Conduct flood risk assessment at El Paso locations where drainage is controlled by river stage, and there are significant flood risks on the non-river side of the levee.

**Description:** Identify the Rio Grande outfalls that are most susceptible to blockage and most likely to allow flood damage during periods of high river stage.

**Affected Jurisdictions:** City of El Paso, El Paso County

**Discussion on Flood Risk:** The City and County of El Paso have 79 outfalls of stormwater into the Rio Grande, identified and tabulated in the Interior Drainage Study performed as part of the Rio Grande levee certification process. Ten of these outfalls are associated with pump stations; the remainder drain via gravity into the river. Because of the extreme flat slopes of the river terrace adjacent to the river, when these outfalls fail to properly function (due to blockage or partial blockage by river sedimentation), there can be extensive localized flooding occurring until the flows can be conveyed into the river (by opening the planned outlet or conveyance to the next outlet). In circumstances when the river is at flood stage and the gravity outlet is submerged, there is heightened risk of further interior flooding. Outfall locations are shown in the figure below.

#### Flood Management Evaluation Scope of Work

The purpose of this FME is to identify the river outfalls that are: 1) most susceptible to blockage, and 2) most likely to allow flood damage during periods of high river stage. The FME will create a prioritized listing of outfalls requiring designs for upgrades to address these issues. Flood Management Strategy (FMS) ID: 142000017 will follow this FME, as it will utilize the results of this study to develop structural and non-structural solutions for improvement of conveyance of stormwater into the Rio Grande in El Paso County. The SOW for this FME includes:

*Task 1 - Data Collection.* This task includes:

- Review of existing data concerning river gravity outfalls, to include confirmation of outfall location, structure type and size, outfall invert elevation and condition (blocked, partially blocked, free), tributary watershed area, size of detention pond upstream of the outfall (if any), and description of backflow controls (if any).
- Interviews with stakeholder engineering and maintenance staff to identify outfalls per stakeholder criteria.

*Task 2 - Engineering Analysis of Existing Conditions.* **Exhibit Map 19.18** of Chapter 5 depicts the major watersheds contributing to the Rio Grande. A qualitative comparison will be made between outfalls with a significant size of watershed (TBD with sponsors) via approximate analysis methods, for example:

- For each significant outfall, an elevation-volume curve will be developed for the area above the outfall inlet.

- For each significant outfall, rating curves (flowrate versus ponded area elevation) will be developed for three river scenarios (normal operation plus two more TBD per sponsors).
- 1% AC runoff volume for each tributary watershed will be estimated based upon hydrologic characteristics (% impervious, curve number).
- 1% AC flood elevation assuming outfall is blocked; or open for each of the river scenarios (four elevations).
- Estimates of numbers of impacted structures for each of the four flood elevations upstream of the outfall will be estimated.

*Task 3 - Report.* A report will be generated that identifies and prioritizes outfalls for consideration for new construction or improvement to reduce flood risk from interior floods during periods of high river stage.

*Task 4 – Stakeholder Coordination.*

**Estimated Cost for FME:**

<b>Labor Cost</b>	
<b>Task 1 – Data Collection</b>	\$ 20,850
<b>Task 2– Existing Condition Engineering Analyses</b>	\$ 31,500
<b>Task 3 – Report</b>	\$ 12,280
<b>Task 4 – Stakeholder Coordination</b>	\$ 5,420
<b>Total Project Labor</b>	<b>\$ 70,050</b>
<b>Travel</b>	<b>\$ -</b>
<b>Total FME cost</b>	<b>\$ 70,000</b>

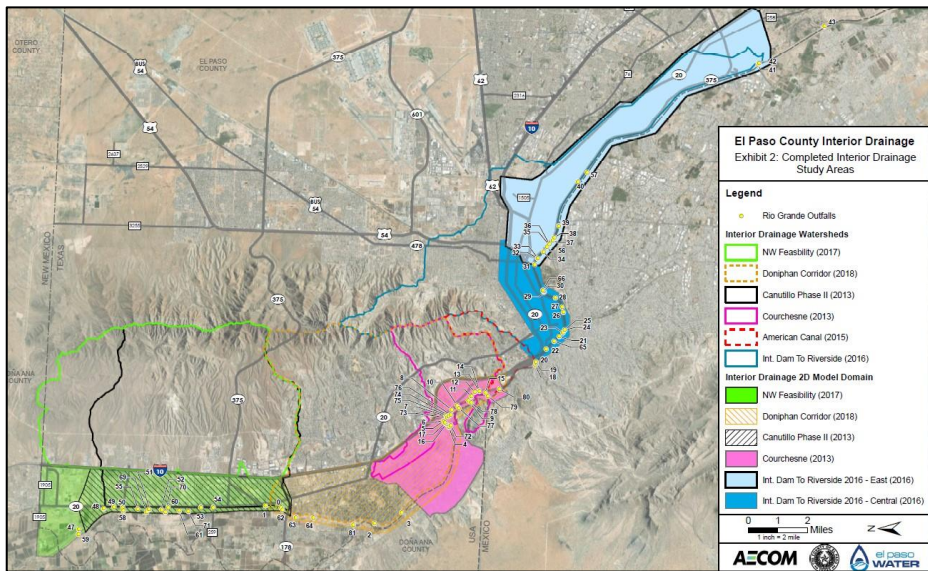


Figure 4B-12. Location of Rio Grande Outfalls in El Paso County from Exhibit 2 of El Paso County Interior Drainage Study (AECOM, 2021)

#### 4B-13. Flood Management Evaluation ID: 141000019

**Name:** Plan for mitigation of drainage controls where ground water reduces stormwater conveyance capacity in the Montoya Drain.

**Description:** Perform H&H modeling to develop a FMP for increasing the capacity of Montoya Drain through measures to control groundwater intrusion into the drain.

**Affected Jurisdictions:** City of El Paso, City of Sunland Park, New Mexico, El Paso County, Doña Ana County

**Discussion on Flood Risk:** The Montoya Drain is a primary conveyor of stormwater for neighborhoods in the Mesilla Valley (west) portion of the City of El Paso. The original purpose of the drain was to control the elevation of groundwater under agricultural land and provide limited conveyance of surface water runoff from agricultural fields. The Montoya Drain also conveys drain flows from the West Drain (New Mexico) and the Nemexas Drain (New Mexico and Texas) and numerous arroyos and stormwater discharges. The capacity of this drain is significantly reduced by high ground water in the lower reaches of the Drain, upstream of the point of discharge into the Rio Grande, and backwater from flow in the Rio Grande. The immediate watershed to the drain is shown in **Exhibit Map 19.19** of *Chapter 5*.

#### Flood Management Evaluation Scope of Work:

The purpose of this FME is to develop a FMP for increasing the capacity of Montoya Drain through improvement of the discharge structure at the outlet of the drain and providing a pumping plant to lower the water elevation in the drain during periods of high groundwater or flooding in the Rio Grande. This SOW will include:

*Task 1 - Data Collection.* This task includes:

- Review of existing data concerning: 1) transmissivity of the surficial soils in the vicinity of lower Montoya Drain, 2) range of water surface elevations in lower Montoya Drain through the seasons and through larger storm events, and 3) current topographic data.
- Collection of updated survey data in the vicinity of the drain outfall into the Rio Grande.

*Task 2 - Existing Condition Engineering Analyses.* H&H modeling will be performed to estimate Drain hydraulic capacity (in cfs) without groundwater controls.

*Task 3 - Alternatives Development.* H&H modeling will be performed to estimate Montoya Drain's hydraulic capacity (in cfs) with groundwater controls of varying capacity and location. Three alternative concept designs for groundwater controls will be developed with costs and benefits. Lead times for lowering the drain water surface elevation will be estimated for each alternative.

*Task 4 - Alternatives Selection.* A stakeholder workshop will be conducted for the selection of a preferred alternative configuration. Cost/benefit data for the preferred alternative will be developed per TWDB guidance to allow for the inclusion of the alternative as an FMP in the RFP.

*Task 4 - Report.* A report will be generated that provides technical backup for the proposed FMP in accordance with TWDB guidance.

**Estimated Cost for FME:**

<b>Labor Cost</b>	
<b>Task 1 – Data Collection</b>	\$ 11,120
<b>Task 2 – Existing Condition Engineering Analyses</b>	\$ 5,200
<b>Task 3 – Alternatives Development</b>	\$ 47,800
<b>Task 4 – Alternatives Selection</b>	\$ 26,300
<b>Task 5 – Report</b>	\$ 39,200
<b>Total Project Labor</b>	<b>\$ 129,620</b>
<b>Travel</b>	
<b>Total FME cost</b>	<b>\$ 130,000</b>



#### 4B-14. Flood Management Evaluation ID: 141000021

**Name:** Develop stormwater master plan (SWMP) for City of Kermit.

**Description:** The SWMP includes data collection, refinement of existing flood maps, refinement of flood risk, and development and selection of alternatives to address that risk.

**Affected Jurisdictions.** City of Kermit, Winkler County

**Discussion of Flood Risk.** The City of Kermit is an incorporated area in Winkler County. The terrain in the vicinity of the City of Kermit is exceptionally flat, such that no continuous streamlines carrying concentrated flow have been mapped in the region. Nuisance flooding occurs within local discontinuous depressions. For the 1% AC flood (per mapping performed for the RFP), there is ponding to depths of 2-5 feet within the city potentially causing damage to over 1,100 structures and restricting travel. As part of the public outreach effort, a meeting was held between RFPG and City staff that confirmed that this flood issue was present. **Exhibit Map 15 (Map 6 of 31)** depicts the area of flood risk.

#### Flood Management Evaluation Scope of Work

The FME for the City of Kermit and adjacent populated areas will develop and select FMP alternatives (both structural and non-structural) for the mitigation of the identified flood risk. The SOW for the FME will include these tasks.

*Task 1 - Data Collection.* Data will be collected from local residents to: 1) identify the primary critical route(s) that have been inundated, 2) collect locations of physical HWMs or anecdotal flood depths at known locations, and 3) solicit ideas for potential solutions. Field survey data will be collected at HWMs and at selected locations (e.g., culverts/ bridges) needed to refine hydraulic modeling. Historic spatial rainfall data will be collected to replicate a selected recent event. Existing topographic data will be refined and processed as needed. Local property and infrastructure valuations and vulnerability data will be collected.

*Task 2 - Engineering Analysis of Existing Conditions.* A hydrologic model will be developed for the area watershed. The watershed is depicted in **Exhibit Map 19.21** of *Chapter 5*. A 2-D hydraulic model for the City of Kermit will be developed for the incorporated area and adjacent populated areas. Existing flood damages will be assessed per TWDB guidance.

*Task 3 - Alternatives Development.* Alternatives will be developed for improved performance of local critical route(s) during floods, reduction of risk to occupied structures, and addressing of other identified flood-related community concerns (e.g., planning for improved communication, improved emergency response, etc.). Concept design(s) and cost estimate(s) will be developed for structural alternatives. Costs will also be developed for additional non-structural alternatives. Revised flood damages and locally defined evaluation criteria will be estimated for each alternative.

*Task 4 - Alternatives Selection.* An FMP for inclusion in a future RFP will be selected using criteria developed in a workshop with local stakeholders. These criteria will be consistent with TWDB criteria for FMPs. Full RFP-required data for the selected FMP will be developed.

*Task 5 - Report.* A report will be generated for presentation to the RFPG and TWDB providing documentation of the proposed FMP.

*Task 6 – Stakeholder Coordination.*

**Estimated Cost for FME:**

<b>Labor Cost</b>	
<b>Task 1 – Data Collection</b>	\$ 9,900
<b>Task 2– Existing Condition Engineering Analyses</b>	\$ 12,075
<b>Task 3 – Alternatives Development</b>	\$ 22,340
<b>Task 4 - Alternatives Selection</b>	\$ 11,250
<b>Task 5 – Report</b>	\$ 10,770
<b>Task 6 – Stakeholder Coordination</b>	\$ 6,760
<b>Total Project Labor</b>	<b>\$ 73,095</b>
<b>Travel</b>	<b>\$ 1,632</b>
<b>Total FME cost</b>	<b>\$ 75,000</b>

#### 4B-15. Flood Management Evaluation ID: 141000022

**Name:** Develop stormwater master plan (SWMP) for Sierra Blanca.

**Description:** The SWMP includes data collection, refinement of existing flood maps, refinement of flood risk, and development and selection of alternatives to address that risk.

**Affected Jurisdictions.** Sierra Blanca CDP, Hudspeth County

**Description of Flood Risk.** Sierra Blanca is a CDP in Hudspeth County. The County Floodplain Administrator provided a written description and pictorial evidence of flooding that occurred August 12-15, 2022. For 5 days, the flooding inundated long stretches of roads that provide sole access to the residences of local ranchers and portions of a local subdivision (Sunset Ranch). Garrett Road was washed out. The risk analysis that was performed as part of Task 2 of this RFP shows Blanca Draw collects runoff from an uncontrolled 20.7 square mile watershed and passes through Sierra Blanca. The 1% AC flood in Blanca Draw is estimated to inundate 38 structures and to overtop several roadways that provide sole access to Interstate 10 and regional services.

#### Flood Management Evaluation Scope of Work:

The FME for Sierra Blanca will develop and select FMP alternatives (both structural and non-structural) for the mitigation of the identified flood risk. The SOW for the FME will include these tasks.

*Task 1 - Data Collection.* Data will be collected from local residents to: 1) identify the primary critical route(s) that have been inundated, 2) collect locations of physical HWMs or anecdotal flood depths at known locations, and 3) solicit ideas for potential solutions. Field survey data will be collected at HWMs and at selected locations (e.g., culverts/ bridges) needed to refine hydraulic modeling. Spatial rainfall data will be collected to facilitate model replication of the August, 2022 event. Existing topographic data will be refined and processed as needed. Local property and infrastructure valuations and vulnerability data will be collected.

*Task 2 - Engineering Analysis of Existing Conditions.* A hydrologic model will be developed for the Bianca Draw watershed. A hydraulic model for Bianca Draw will be developed for the reach, including Sierra Blanca and critical local routes. Existing flood damages will be assessed per TWDB guidance. **Exhibit Map 19.22** of *Chapter 5* depicts the watershed.

*Task 3 - Alternatives Development.* Alternatives will be developed for improved performance of local critical route(s) during floods, reduction of risk to occupied structures, and addressing of other identified flood-related community concerns (e.g., planning for improved communication, improved emergency response, etc.). Concept design(s) and cost estimate(s) will be developed for structural alternatives. Costs will also be developed for additional non-structural alternatives. Revised flood damages and locally defined evaluation criteria will be estimated for each alternative.

*Task 4 - Alternatives Selection.* An FMP for inclusion in a future RFP will be selected using criteria developed in a workshop with local stakeholders. These criteria will be consistent with TWDB criteria for FMPs. Full RFP-required data for the selected FMP will be developed.

*Task 5 - Report.* A report will be generated for presentation to the RFPG and TWDB providing documentation of the proposed FMP.

*Task 6 – Stakeholder Coordination*

**Estimated Cost for FME:**

<b>Labor Cost</b>	
<b>Task 1 – Data Collection</b>	\$ 12,160
<b>Task 2– Existing Condition Engineering Analyses</b>	\$ 12,075
<b>Task 3 – Alternatives Development</b>	\$ 22,340
<b>Task 4 - Alternatives Selection</b>	\$ 11,250
<b>Task 5 – Report</b>	\$ 10,770
<b>Task 6 – Stakeholder Coordination</b>	\$ 6,760
<b>Total Project Labor</b>	<b>\$ 75,355</b>
<b>Travel</b>	<b>\$ 1,112</b>
<b>Total FME cost</b>	<b>\$ 76,000</b>

#### 4B-16. Flood Management Evaluation ID: 141000023

**Name:** Develop stormwater master plan (SWMP) for City of Alpine.

**Description:** The SWMP includes data collection, refinement of existing flood maps, refinement of flood risk, and development and selection of alternatives to address that risk.

**Affected Jurisdictions:** City of Alpine, Brewster County

**Description of Flood Risk:** The City of Alpine is an incorporated area in Brewster County. Three named creeks traverse the City of Alpine: Paisano Creek and Alpine Creek (combined watershed of 56.2 sq mi) and Moss Creek (watershed of 29.5 sq mi). Per modeling performed as part of Task 2 of the RFP, over 1,600 structures within the city are estimated to be potentially impacted during the 1% AC (100-year) flood. Exhibit **Map 15 (Map 4 of 31)** depicts this risk. Recent study performed under this plan has shown this map to present an overestimation of flood risk within the City and FME 14000036 is proposed to develop a more accurate estimate of flood risk.

#### Flood Management Evaluation Scope of Work:

The FME for the City of Alpine will develop and select FMP alternatives (both structural and non-structural) for the mitigation of the identified flood risk. The SOW for the FME will include these tasks.

*Task 1 - Data Collection.* Per study performed under the preparation of this Plan, further data need to be collected to calibrate loss rates and lag times for the watersheds of each of the three creeks that traverse the City of Alpine. New instrumentation (stage and rainfall gages) is required to collect these data. FME 14000036 is proposed to address this need.

*Task 2 - Engineering Analysis of Existing Conditions.* Under work performed for this Plan, new detailed hydrologic models have been developed for the Paisano Creek, Alpine Creek and Moss Creek watersheds. Similarly new a 2-D hydraulic model for each of the three creeks through the City of Alpine has been developed for the incorporated area and adjacent populated areas. Once sufficient event data has been collected per Task 1, these models will be calibrated. Refined estimates for existing flood damages for each creek will be assessed per TWDB guidance, using these calibrated models. Exhibit Map 19.23 of Chapter 5 depicts the watersheds from these creeks.

*Task 3 - Alternatives Development.* Alternatives will be developed for improved performance of local critical route(s) during floods, reduction of risk to occupied structures, and addressing of other identified flood-related community concerns (e.g., planning for improved communication, improved emergency response, nature-based solutions, etc.). Concept design(s) and cost estimate(s) will be developed for structural alternatives. Costs will also be developed for additional non-structural and natural alternatives. Moss and Alpine Creeks will be considered for upland restoration to address diminished storage capacity associated with incised channels. Revised flood damages and locally defined evaluation criteria will be estimated for each alternative. Separate alternatives will be derived for each of the three creeks.

**Deleted:** Data will be collected from local residents to: 1) identify the primary critical route(s) that have been inundated, 2) collect locations of physical HWMs or anecdotal flood depths at known locations, and 3) solicit ideas for potential solutions. Field survey data will be collected at HWMs and at selected locations (e.g., culverts/bridges) needed to refine hydraulic modeling. Historic spatial rainfall data will be collected to replicate a selected recent event. Existing topographic data will be refined and processed as needed. Local property and infrastructure valuations and vulnerability data will be collected.

**Deleted:** A hydrologic model will be developed for the Paisano Creek, Alpine Creek and Moss Creek watersheds. A hydraulic model for each of the three creeks through the City of Alpine will be developed for the incorporated area and adjacent populated areas. Existing flood damages for each creek will be assessed per TWDB guidance

*Task 4 - Alternatives Selection.* FMP(s) for each of the three creeks for inclusion in a future RFP will be selected using criteria developed in a workshop with local stakeholders. These criteria will be consistent with TWDB criteria for FMPs. Full RFP-required data for the selected FMP will be developed.

*Task 5 - Report.* A report will be generated for presentation to the RFPG and TWDB providing documentation of the proposed FMP.

*Task 6 – Stakeholder Coordination.*

**Estimated Cost for FME:**

The initial cost estimate of \$105,000 was increased to \$250,000 per request by the City of Alpine. The request was provided through a financing survey sent to City of Alpine. The following question was asked in the survey:

“Does the estimated cost for the specified FME/FMS/FMP from the link provided in Question No. 4 seem accurate? If not, please provide revised costs or additional information you would like to be considered in the cost estimate. Our Technical Consultant, AECOM, developed the cost estimates with the available information, and they can set up a phone call to explain the details of the scope and cost estimate if you request it in your response.”

City of Alpine’s response was that an additional \$145,000 was needed “(due to increased costs and inflation)”.

Deleted: :

The cost estimate is documented in the table below.

Labor Cost	
Task 1 – Data Collection	\$ -
Task 2 – Existing Condition Engineering Analyses	\$ 14,140
Task 3 – Alternatives Development	\$ 32,620
Task 4 - Alternatives Selection	\$ 16,820
Task 5 – Report	\$ 13,490
Task 6 – Stakeholder Coordination	\$ 9,400
<b>Total Project Labor</b>	<b>\$ 86,470</b>
Travel	\$ 1,536
<b>Total FME Cost Estimated by AECOM</b>	<b>\$ 88,000</b>
<b>Additional Labor Cost Requested by City of Alpine (due to increased costs and inflation):</b>	<b>\$ 145,000</b>
<b>Total FME Cost</b>	<b>\$ 233,000</b>

**Deleted: ¶**  
 “Increase to \$250,000 (due to increase costs and inflation)” ¶  
 The initial and revised cost estimates are documented in the table below. ¶

Labor Cost	
Task 1 – Data Collection	
Task 2 – Existing Condition Engineering Anal	
Task 3 – Alternatives Development	
Task 4 - Alternatives Selection	
Task 5 – Report	
Task 6 – Stakeholder Coordination	
<b>Total</b>	
<b>Initial Total FME Cost Estimate</b>	
<b>Additional Labor Cost Requested by City of Al</b>	
<b>increased costs &amp;</b>	
<b>Tc</b>	

#### 4B-17. Flood Management Evaluation ID: 141000024

**Name:** Develop Supplemental Watershed Plans (SWP) for the flood control dams that protect the city.

**Description:** The SWP is a federally funded plan that will identify scopes of work and costs for addressing hydraulically inadequate dams that protect the City of Sonora.

**Affected Jurisdictions.** City of Sonora, Sutton County

**Description of Flood Risk.** The City of Sonora is an incorporated area in Sutton County. In 1959, the city council commissioned plans for a series of flood-control dams; 13 were constructed on the Devil's River Draw and Lowrey Draw by March 1961. Eight of these dams have been identified as hydrologically inadequate by TCEQ Dam Safety. Per approximate H&H modeling performed as part of the RFP effort, over 650 structures in Sonora are potentially impacted by the 1% AC flood. **Exhibit Map 15 (Map 9 of 31)** depicts the area of flood risk. **Exhibit Map 19.24** of *Chapter 5* depicts the relevant watershed and the locations of the relevant dams.

#### Flood Management Evaluation Scope of Work:

The FME for City of Sonora will develop and select FMP alternatives (both structural and non-structural) for the mitigation of the identified flood risk. The SOW for the FME is expected to be executed as part of the development of a Supplemental Watershed Plan and EA for the Dry Devil Draw and Lowrey Draw Watershed, as defined by the NRCS. A Supplemental Watershed Plan is funded 100% by the federal government and includes concept designs and cost estimates to upgrade watershed dams to meet federal dam safety requirements. The State of Texas (TCEQ) recognizes these standards as appropriate and generally waives full compliance with State dam safety requirements when federal requirements are met. Federal standards for upgrade of the high hazard dam(s) upstream of Sonora include increasing flood pool storage of each dam to fully control the 1% AC flood. Therefore, the federal planning for dam upgrades will include planning for an increase in flood protection for the City of Sonora. The inclusion of RFPG approval for performance of a Supplemental Watershed Plan for this watershed will strengthen the request to the federal government for leadership and funding of the needed planning. The tasks in the table below derive directly from the required SOW for a Supplemental Watershed Plan in the NRCS *National Watershed Manual*. The estimated cost provided below is based upon recent pricing of Supplemental Watershed Plans within the State of Texas for plans involving upgrade of multiple dams, assuming a watershed evaluation would identify four dams for upgrade.

**Estimated Cost for FME:**

I	DATA COLLECTION		\$	84,190
II	IDENTIFY PROBLEMS, OPPORTUNITIES & CONCERNS		\$	66,050
III	MEETINGS / DETERMINE OBJECTIVES		\$	101,210
IV	INVENTORY RESOURCES (CONDUCT PLANNING STUDIES)			
	A.	Analyze Existing Data	\$	2,880
	B.	Environmental Assessment	\$	23,520
	C.	Analyze Existing Resource Data	\$	3,680
	D.	Economics and Social Effects	\$	13,400
	E.	Archeological and Historic Resources	\$	163,080
	F.	Engineering	\$	29,060
	G.	Geology (see Geology Tab)	\$	39,760
V	ANALYZE RESOURCE DATA			
	A.	Support Maps	\$	9,340
	B.	Hydrology	\$	23,020
	C.	Hydraulics	\$	80,400
	D.	Economics (all alternatives)	\$	43,620
	E.	QA/QC	\$	12,480
VI	FORMULATE AND EVALUATE ALTERNATIVES			
	A.	Formulate Alternatives	\$	27,900
	B.	Evaluate Alternatives (SITES)	\$	161,560
	C.	Evaluate Economic Impacts	\$	15,540
	D.	Evaluate Environmental Impacts	\$	19,110
	E.	Evaluate Social Impacts	\$	19,110
	F.	Alternative Trade-off Analysis (Economic, Environmental, S	\$	15,990
	G.	Review Alternatives w/Sponsors & Steering Committee	\$	1,660
	H.	Identify Preferred Alternative	\$	3,180
	I.	QA/QC	\$	15,200
VII	PREPARE SUPPLEMENTAL WATERSHED PLAN/EA			
	A.	Prepare Draft Document	\$	158,310
	B.	Draft Document Technical Reviews	\$	73,500
	C.	Prepare Final Plan/EA	\$	9,180
VIII	PREPARE FINDING OF NO SIGNIFICANT IMPACT		\$	-
IX	OTHER DIRECT COSTS			
	A.	Travel	\$	10,000
X	SUBCONTRACTS			
	A.	Sediment Survey	\$	20,000
	B.	Topographic Survey	\$	50,000
	C.	Geologic Investigation	\$	120,000
	D.	Geologic Investigation (Lab)	\$	40,000
			\$	<b>1,456,000</b>



#### 4B-18. Flood Management Evaluation ID: 141000025

**Name:** Develop Supplemental Watershed Plans (SWP) for the flood control dams that protect the City of Ozona.

**Description:** The SWP is a federally funded plan that will identify SOWs and costs for addressing hydraulically inadequate dams that protect the City of Ozona.

**Affected Jurisdictions.** City of Ozona, Crockett County

**Description of Flood Risk.** Ozona is an unincorporated area in Crockett County. Seven dams were designed and constructed by the Soil Conservation Service, now NRCS, during the 1950s. Five of these dams have been identified as hydrologically inadequate by TCEQ Dam Safety due to their change in hazard class from Low/ Significant Hazard to High Hazard. Approximate modeling performed as a task for the RFP identified over 900 structures at risk in the 1% AC flood within Ozona. **Exhibit Map 15 (Map 7 of 31)** depicts the area of flood risk. **Exhibit Map 19.25** of *Chapter 5* depicts the relevant watershed and the locations of the relevant dams.

#### Flood Management Evaluation Scope of Work:

The FME for Ozona will develop and select FMP alternatives (both structural and non-structural) for the mitigation of the identified flood risk. The SOW for the FME is expected to be executed as part of the development of a Supplemental Watershed Plan and EA for the Johnson's Draw Watershed, as defined by the NRCS. A Supplemental Watershed Plan is funded 100% by the federal government and includes concept designs and cost estimates to upgrade watershed dams to meet federal dam safety requirements. The State of Texas (TCEQ) recognizes these standards as appropriate and generally waives full compliance with State dam safety requirements when federal requirements are met. Federal standards for upgrade of the high hazard dam(s) upstream of Ozona include increasing flood pool storage of each dam to fully control the 1% AC flood. Therefore, the federal planning for dam upgrades will include planning for an increase in flood protection for Ozona. The inclusion of RFPG approval for performance of a Supplemental Watershed Plan for this watershed will strengthen the request to the federal government for leadership and funding of the needed planning. The tasks in the table below derive directly from the required SOW for a Supplemental Watershed Plan in the NRCS National Watershed Manual. The estimated cost provided below is based upon recent pricing of Supplemental Watershed Plans within the State of Texas for plans involving upgrade of multiple dams, assuming a watershed evaluation would identify four dams for upgrade.

**Estimated Cost for FME:**

I	DATA COLLECTION		\$	84,190
II	IDENTIFY PROBLEMS, OPPORTUNITIES & CONCERNS		\$	66,050
III	MEETINGS / DETERMINE OBJECTIVES		\$	101,210
IV	INVENTORY RESOURCES (CONDUCT PLANNING STUDIES)			
	A.	Analyze Existing Data	\$	2,880
	B.	Environmental Assessment	\$	23,520
	C.	Analyze Existing Resource Data	\$	3,680
	D.	Economics and Social Effects	\$	13,400
	E.	Archeological and Historic Resources	\$	163,080
	F.	Engineering	\$	29,060
	G.	Geology (see Geology Tab)	\$	39,760
V	ANALYZE RESOURCE DATA			
	A.	Support Maps	\$	9,340
	B.	Hydrology	\$	23,020
	C.	Hydraulics	\$	80,400
	D.	Economics (all alternatives)	\$	43,620
	E.	QA/QC	\$	12,480
VI	FORMULATE AND EVALUATE ALTERNATIVES			
	A.	Formulate Alternatives	\$	27,900
	B.	Evaluate Alternatives (SITES)	\$	161,560
	C.	Evaluate Economic Impacts	\$	15,540
	D.	Evaluate Environmental Impacts	\$	19,110
	E.	Evaluate Social Impacts	\$	19,110
	F.	Alternative Trade-off Analysis (Economic, Environmental, S	\$	15,990
	G.	Review Alternatives w/Sponsors & Steering Committee	\$	1,660
	H.	Identify Preferred Alternative	\$	3,180
	I.	QA/QC	\$	15,200
VII	PREPARE SUPPLEMENTAL WATERSHED PLAN/EA			
	A.	Prepare Draft Document	\$	158,310
	B.	Draft Document Technical Reviews	\$	73,500
	C.	Prepare Final Plan/EA	\$	9,180
VIII	PREPARE FINDING OF NO SIGNIFICANT IMPACT		\$	-
IX	OTHER DIRECT COSTS			
	A.	Travel	\$	10,000
X	SUBCONTRACTS			
	A.	Sediment Survey	\$	20,000
	B.	Topographic Survey	\$	50,000
	C.	Geologic Investigation	\$	120,000
	D.	Geologic Investigation (Lab)	\$	40,000
			\$	<b>1,456,000</b>

#### 4B-19. Flood Management Evaluation ID: 141000026

**Name:** Develop stormwater master plan (SWMP) for City of Monahan and Southwest Sandhill CDP.

**Description:** The SWMP includes data collection, refinement of existing flood maps, refinement of flood risk, and development and selection of alternatives to address that risk.

**Affected Jurisdictions:** City of Monahans, Ward County

**Description of Flood Risk.** The City of Monahans is located in Ward County. Southwest Sandhill is an adjacent census designated place. Approximate modeling performed as a task for the RFP identified over 790 structures at risk in West Sandhill and over 450 structures at risk in Monahans for the 1% AC flood. **Exhibit Map 15 (Maps 8 and 13 of 31)** depict the areas of flood risk.

#### Flood Management Evaluation Scope of Work:

The FME for Southwest Sandhill and the City of Monahans will develop and select FMP alternatives (both structural and non-structural) for the mitigation of the identified flood risk for both entities. The SOW for the FME will include these tasks.

*Task 1 - Data Collection.* Data will be collected from local residents to: 1) identify the primary critical route(s) that have been inundated, 2) collect locations of physical HWMs or anecdotal flood depths at known locations, and 3) solicit ideas for potential solutions. Field survey data will be collected at HWMs and at selected locations (e.g., culverts/ bridges) needed to refine hydraulic modeling. Spatial rainfall data will be collected to facilitate model replication of the August, 2022 event. Existing topographic data will be refined and processed as needed. Local property and infrastructure valuations and vulnerability data will be collected.

*Task 2 - Engineering Analysis of Existing Conditions.* A hydrologic model will be developed for the tributary watershed that drains to both communities. A hydraulic model for each community and critical local routes. Existing flood damages in each community will be assessed per TWDB guidance. **Exhibit Map 19.26 of Chapter 5** depicts the relevant watersheds.

*Task 3 - Alternatives Development.* Alternatives will be developed for improved performance of local critical route(s) during floods, reduction of risk to occupied structures, and addressing of other identified flood-related community concerns (e.g., planning for improved communication, improved emergency response, etc.). Concept design(s) and cost estimate(s) will be developed for structural alternatives. Costs will also be developed for additional non-structural alternatives. Revised flood damages and locally defined evaluation criteria will be estimated for each alternative. Benefits to each of the two communities (Monahans and Southwest Sandhill) will be estimated separately for each alternative.

*Task 4 - Alternatives Selection.* FMP(s) for inclusion in a future RFP will be selected using criteria developed in a workshop with local stakeholders. These criteria will be consistent with TWDB criteria for FMPs. Full RFP-required data for the selected FMP(s) will be developed.

*Task 5 - Report.* A report will be generated for presentation to the RFPG and TWDB providing documentation of the proposed FMP.

*Task 6 – Stakeholder Coordination.*

**Estimated Cost for FME:**

<b>Labor Cost</b>	
<b>Task 1 – Data Collection</b>	\$ 11,700
<b>Task 2– Existing Condition Engineering Analyses</b>	\$ 19,490
<b>Task 3 – Alternatives Development</b>	\$ 32,620
<b>Task 4 - Alternatives Selection</b>	\$ 16,820
<b>Task 5 – Report</b>	\$ 13,490
<b>Task 6 – Stakeholder Coordination</b>	\$ 8,440
<b>Total Project Labor</b>	<b>\$ 102,560</b>
<b>Travel</b>	<b>\$ 1,596</b>
<b>Total FME cost</b>	<b>\$ 104,000</b>

#### 4B-20. Flood Management Evaluation ID: 141000033

**Name:** Develop a flood mitigation for specific areas of known flood risk in the City of Socorro.

**Description:** The SOW includes data collection, refinement of existing flood maps, refinement of flood risk, and development and selection of alternatives to address these specific areas of identified risk.

**Affected Jurisdictions:** City of Socorro, El Paso County

**Description of Flood Risk.** The City of Socorro is an incorporated area in El Paso County. Per current available floodplain modeling, there are over 2,500 structures in the city potentially impacted by a 1% AC flood. In addition, city drainage infrastructure is at risk of being plugged by sediment conveyed by arroyos upstream of the City. **Exhibit Map 15 (Map 2 of 31)** depicts this risk.

#### Flood Management Evaluation Scope of Work:

The FME for the City of Socorro and adjacent populated areas will develop and select FMP alternatives (both structural and non-structural) for the mitigation of the identified flood risk. The SOW for the FME will include these tasks.

*Task 1 - Data Collection.* Data will be collected from local residents to: 1) identify the primary critical route(s) that have been inundated, 2) collect locations of physical HWMs or anecdotal flood depths at known locations, and 3) solicit ideas for potential solutions. Field survey data will be collected at HWMs and at selected locations (e.g., culverts/ bridges) needed to refine hydraulic modeling. Spatial rainfall data will be collected to facilitate model replication of the August, 2022 event. Existing topographic data will be refined and processed as needed. Local property and infrastructure valuations and vulnerability data will be collected.

*Task 2 - Engineering Analysis of Existing Conditions.* A hydrologic model will be developed for the area watershed. A 2-D hydraulic model for Socorro will be developed for the incorporated area and adjacent populated areas. Existing flood damages will be assessed per TWDB guidance. **Exhibit Map 19.33** of *Chapter 5* depicts the relevant watershed for study.

*Task 3 - Alternatives Development.* Alternatives will be developed for improved performance of local critical route(s) during floods, reduction of risk to occupied structures, and addressing of other identified flood-related community concerns (e.g., planning for improved communication, improved emergency response, etc.). Concept design(s) and cost estimate(s) will be developed for structural alternatives. Costs will also be developed for additional non-structural alternatives. Revised flood damages and locally defined evaluation criteria will be estimated for each alternative.

*Task 4 - Alternatives Selection.* An FMP for inclusion in a future RFP will be selected using criteria developed in a workshop with local stakeholders. These criteria will be consistent with TWDB criteria for FMPs. Full RFP-required data for the selected FMP will be developed.

*Task 5 - Report.* A report will be generated for presentation to the RFGP and TWDB providing documentation of the proposed FMP.

*Task 6 – Stakeholder Coordination.*

**Estimated Cost for FME:**

<b>Labor Cost</b>	
<b>Task 1 – Data Collection</b>	\$ 9,900
<b>Task 2– Existing Condition Engineering Analyses</b>	\$ 12,075
<b>Task 3 – Alternatives Development</b>	\$ 22,340
<b>Task 4 - Alternatives Selection</b>	\$ 11,250
<b>Task 5 – Report</b>	\$ 10,770
<b>Task 6 – Stakeholder Coordination</b>	\$ 6,760
<b>Total Project Labor</b>	<b>\$ 73,095</b>
<b>Travel</b>	<b>\$ -</b>
<b>Total FME cost</b>	<b>\$ 73,000</b>

#### 4B-21. Flood Management Evaluation ID: 141000034

**Name:** Develop Flood Mitigation Projects (FMPs) for additional projects in City of El Paso/El Paso Water Stormwater Master Plan

**Description:** Develop all required datasets and models for 52 projects from the City of El Paso/El Paso Water Stormwater Master Plan to be recommended as FMPs in the RFP.

**Affected Jurisdictions:** City of El Paso

**Description of Flood Risk.** The “El Paso Water and City of El Paso El Paso Stormwater Master Plan Update” (AECOM, 2021) includes 96 recommended stormwater infrastructure projects to mitigate flooding within the City of El Paso jurisdiction. The City Stormwater Master Plan (SMP) is an update to the 2009 SMP, resulting in the elimination of some projects that were constructed, modifications to projects which have revised designs since 2009, and new projects that were not in the original SMP. The 2021 City SMP describes the existing flood risk addressed by the plan as the following:

“... the 2009 SMP considered all parts of the City for evaluation, but then focused its attention on areas where flood risk was particularly high. This process allowed the evaluation and planning efforts to focus on major threats and produced a more cost-effective and useful plan than a broader and more costly effort might have produced.”

#### Flood Management Evaluation Scope of Work:

**Exhibit Map 19.34** of *Chapter 5* depicts the major drainage systems in the City of El Paso. Six of the projects from the 96 recommended projects in the City SMP were evaluated and recommended as FMPs in this RFP. Through coordination with El Paso Water, 52 additional projects from the County SMP were selected for inclusion in this FME. The SOW for each project in this FME includes developing or refining all required H&H models to meet the RFP data and modeling requirements for recommended FMPs. The process for selecting projects for this FME and estimating labor fees for the evaluation of each project was based upon a series of meetings with El Paso Water in which the status of each project was discussed, and the following general questions were asked about each project:

- Have there been potential design or development changes since the concept designs and cost estimates were defined in the SMP?
- Is the Project likely to have a low Benefit Cost Ratio (BCR)?
- Does the Project already have committed funding?
- Is the Project already under final design?
- Is the Project already under construction?
- Has the Project already been conceptually studied or designed by others outside of the SMP?
- Is the Project too small for El Paso Water to consider for inclusion in a state or federal grant application?

Based on the information provided by El Paso Water, the 52 projects listed in the cost estimate for this FME were selected, and labor fees needed to convert each project to an FMP in the RFP were estimated. In addition to the factors listed in the questions above, the labor cost estimates for each project in this FME were developed considering the following additional factors:

- What is the project type (basin, channel, storm drain, pump station, etc.)?
- Will the evaluation potentially involve evaluation of multiple alternatives?
- Are previously developed H&H models available for the Project? If so, which software was used?
- Are previously developed BCRs available for the project?
- Do previously developed feasibility studies confirm no negative impact for a project?

A labor estimate for each project in this FME is provided below as a unique task number, along with the reported Total Project Cost from the SMP, for reference. Note, in some cases (i.e., Task Numbers 7, 9, 12, and 37), multiple related SMP projects were combined into a single task for the purpose of estimating labor fees. In these cases, the reported Total SMP Project costs, which include construction, were also combined in the right column of the cost estimate table provided below.



**Estimated Cost for FME:**

Labor Cost		Estimated SMP Project Cost	
Task - 1 - Develop FMP Data Requirements for CE Dam 6	\$ 10,000		\$ 600,000
Task - 2 - Develop FMP Data Requirements for CE Dam 7	\$ 10,000		\$ 600,000
Task - 3 - Develop FMP Data Requirements for CE Dam 8	\$ 10,000		\$ 600,000
Task - 4 - Develop FMP Data Requirements for CE3	\$ 50,000		\$ 2,500,000
Task - 5 - Develop FMP Data Requirements for CE4A	\$ 20,000		\$ 7,200,000
Task - 6 - Develop FMP Data Requirements for CE4B	\$ 35,000		\$ 1,700,000
Task - 7 - Develop FMP Data Requirements for CE5A, CE5B, and CE 5C Combined	\$ 60,000		\$ 18,200,000
Task - 8 - Develop FMP Data Requirements for EA11	\$ 30,000		\$ 550,060
Task - 9 - Develop FMP Data Requirements for EA1A and EA1B Combined	\$ 45,000		\$ 10,150,000
Task - 10 - Develop FMP Data Requirements for EA2	\$ 30,000		\$ 900,000
Task - 11 - Develop FMP Data Requirements for EA2 Alternate	\$ 40,000		\$ 5,000,000
Task - 12 - Develop FMP Data Requirements for EA4A and EA4B Combined	\$ 50,000		\$ 11,000,000
Task - 13 - Develop FMP Data Requirements for EA5	\$ 30,000		\$ 2,500,000
Task - 14 - Develop FMP Data Requirements for EA6B	\$ 40,000		\$ 3,922,000
Task - 15 - Develop FMP Data Requirements for EA6C	\$ 40,000		\$ 5,600,000
Task - 16 - Develop FMP Data Requirements for EA7 Ph2	\$ 35,000		\$ 8,400,000
Task - 17 - Develop FMP Data Requirements for EA8A	\$ 30,000		\$ 2,500,000
Task - 18 - Develop FMP Data Requirements for EA8B	\$ 30,000		\$ 3,000,000
Task - 19 - Develop FMP Data Requirements for EA8C	\$ 30,000		\$ 3,000,000
Task - 20 - Develop FMP Data Requirements for EA8D	\$ 30,000		\$ 4,000,000
Task - 21 - Develop FMP Data Requirements for EA8E	\$ 30,000		\$ 4,000,000
Task - 22 - Develop FMP Data Requirements for EA9B	\$ 5,000		\$ 2,700,000
Task - 23 - Develop FMP Data Requirements for MidV10	\$ 15,000		\$ 585,004
Task - 24 - Develop FMP Data Requirements for MidV5	\$ 15,000		\$ 5,000,000
Task - 25 - Develop FMP Data Requirements for MidV6	\$ 40,000		\$ 3,000,000
Task - 26 - Develop FMP Data Requirements for MidV8	\$ 15,000		\$ 4,304,300
Task - 27 - Develop FMP Data Requirements for MV1	\$ 25,000		\$ 24,804,000
Task - 28 - Develop FMP Data Requirements for MV2B	\$ 40,000		\$ 13,536,900
Task - 29 - Develop FMP Data Requirements for MV2C	\$ 25,000		\$ 7,829,900
Task - 30 - Develop FMP Data Requirements for MV3	\$ 35,000		\$ 1,000,000
Task - 31 - Develop FMP Data Requirements for MV4	\$ 50,000		\$ 21,000,000
Task - 32 - Develop FMP Data Requirements for MV8	\$ 40,000		\$ 13,962,000
Task - 33 - Develop FMP Data Requirements for NE1	\$ 40,000		\$ 1,200,000
Task - 34 - Develop FMP Data Requirements for NE2	\$ 18,000		\$ 6,500,000
Task - 35 - Develop FMP Data Requirements for NE5	\$ 12,000		\$ 2,197,000
Task - 36 - Develop FMP Data Requirements for NE6	\$ 30,000		\$ 800,000
Task - 37 - Develop FMP Data Requirements for NW11A, NW11B, NW11C, and NW11D Combined	\$ 30,000		\$ 4,277,100
Task - 38 - Develop FMP Data Requirements for NW2	\$ 40,000		\$ 6,500,000
Task - 39 - Develop FMP Data Requirements for NW6	\$ 12,000		\$ 4,600,000
Task - 40 - Develop FMP Data Requirements for NW7	\$ 12,000		\$ 4,000,000
Task - 41 - Develop FMP Data Requirements for WC1	\$ 12,000		\$ 1,000,000
Task - 42 - Develop FMP Data Requirements for WC3	\$ 25,000		\$ 3,800,000
Task - 43 - Develop FMP Data Requirements for WC4	\$ 12,000		\$ 3,000,000
Task - 44 - Develop FMP Data Requirements for WC6C	\$ 35,000		\$ 1,796,600
Task - 45 - Develop FMP Data Requirements for WC8	\$ 20,000		\$ 897,000
<b>Total Project Labor</b>	<b>\$ 1,288,000</b>	<b>Total SMP Project Cost:</b>	<b>\$ 234,211,864</b>
<b>Total FME cost</b>	<b>\$ 1,288,000</b>		

#### 4B-22. Flood Management Evaluation ID: 141000035

**Name:** Develop Flood Mitigation Projects (FMPs) for additional projects from the El Paso County Stormwater Master Plan

**Description:** Develop all required datasets and models for 21 projects from the El Paso County Stormwater Master Plan to be considered as FMPs in the RFP.

**Affected Jurisdictions:** El Paso County

**Description of Flood Risk.** The “El Paso County Stormwater Master Plan Update” (AECOM, 2021) includes 66 recommended stormwater infrastructure projects to mitigate flooding within the El Paso County jurisdiction, outside of the City of El Paso limits.

#### Flood Management Evaluation Scope of Work:

**Exhibit Map 19.35** of *Chapter 5* depicts the major watersheds for El Paso County. Four of the projects from the 66 recommended projects in the City SMP were evaluated and recommended as FMPs in this RFP, and six of the crossing improvement projects on Mesa Drain (HAC9, HAC10, HAC11, HAC12, HAC13, and HAC14) are included in Flood Management FME (FME) FME ID: 141000004. Through coordination with El Paso County, 21 additional projects from the County SMP were selected for inclusion in this FME. The SOW for each Project in this FME includes developing or refining all required H&H models to meet the RFP data and modeling requirements for recommended FMPs. The process for selecting projects for this FME and estimating labor fees for the evaluation of each project was based upon coordination with El Paso County, during which the status of each project was provided by the County, and the following general questions were asked about each project:

- Was the project already evaluated as an FME or FMP in the RFP?
- Have there been potential design or development changes since the concept designs and cost estimates were defined in the SMP?
- Is the Project likely to have a low Benefit Cost Ratio (BCR)?
- Does the Project already have committed funding?
- Is the Project already under final design?
- Is the Project already under construction?
- Has the Project already been conceptually studied or designed by others outside of the SMP?
- Is the Project too small for El Paso County to consider applying for inclusion in a state or federal grant application?

Based on the information provided by El Paso County and the Tier specified for each project in the SMP, the 21 projects listed in the cost estimate for this FME were selected, and labor fees needed to convert each project to an FMP in the RFP were estimated. In addition to the factors listed in the questions above, the labor cost estimates for each project in this FME were developed considering the following additional factors:

- What is the project type (basin, channel, crossing, etc.)?
- Will the evaluation potentially involve evaluation of multiple alternatives?
- Are previously developed H&H models available for the Project? If so, which software was used?
- Are previously developed BCRs available for the project?
- Do previously developed feasibility studies confirm no negative impact for a project?

A labor estimate for each task of this FME is provided below, along with the reported total Project cost from the SMP, for reference.

**Estimated Cost for FME:**

Labor Cost		Estimated SMP Project Cost	
Task 1 - Develop FMP Data Requirements for CAN1	\$ 20,000	\$	1,960,000
Task 2 - Develop FMP Data Requirements for CAN2	\$ 12,000	\$	6,030,000
Task 3 - Develop FMP Data Requirements for CAN3	\$ 12,000	\$	200,000
Task 4 - Develop FMP Data Requirements for FAB3	\$ 12,000	\$	1,750,000
Task 5 - Develop FMP Data Requirements for HAC1	\$ 12,000	\$	1,080,000
Task 6 - Develop FMP Data Requirements for HAC2	\$ 12,000	\$	37,810,000
Task 7 - Develop FMP Data Requirements for HAC4	\$ 12,000	\$	1,890,000
Task 8 - Develop FMP Data Requirements for HAC5	\$ 12,000	\$	2,920,000
Task 9 - Develop FMP Data Requirements for HAC6	\$ 12,000	\$	4,470,000
Task 10 - Develop FMP Data Requirements for MON1	\$ 12,000	\$	15,780,000
Task 11 - Develop FMP Data Requirements for MON15	\$ 12,000	\$	1,470,000
Task 12 - Develop FMP Data Requirements for MON2	\$ 12,000	\$	8,030,000
Task 13 - Develop FMP Data Requirements for SOC3	\$ 12,000	\$	1,100,000
Task 14 - Develop FMP Data Requirements for SSA3	\$ 12,000	\$	1,510,000
Task 15 - Develop FMP Data Requirements for SSA5	\$ 20,000	\$	12,300,000
Task 16 - Develop FMP Data Requirements for SSA6	\$ 12,000	\$	2,700,000
Task 17 - Develop FMP Data Requirements for TOR1	\$ 12,000	\$	3,120,000
Task 18 - Develop FMP Data Requirements for TOR3	\$ 12,000	\$	60,000
Task 19 - Develop FMP Data Requirements for TOR4	\$ 12,000	\$	1,750,000
Task 20 - Develop FMP Data Requirements for VIN1	\$ 12,000	\$	29,500,000
Task 21 - Develop FMP Data Requirements for VIN3	\$ 20,000	\$	160,000
<b>Total Project Labor:</b>	<b>\$ 276,000</b>	<b>Total SMP Project Cost:</b>	<b>\$ 135,590,000</b>
<b>Total FME cost:</b>	<b>\$ 276,000</b>		

**4B-23. Flood Management Evaluation ID: 141000036**

**Name:** Install Instrumentation to Enhance Estimate of Flood Risk for City of Alpine.

**Description:** This evaluation includes the procurement and installation of 5 stage gages and 6 precipitation gages in and upstream of the City of Alpine, Texas. The purpose of the gages is to record instantaneous (i.e. fifteen minute time step or less) rainfall data and associated runoff stage data within the watersheds of Paisano Creek, Moss Creek, and Alpine Creek per the figures below. The gages will be isolated from public power and will record data for later download. The expected service time for the gages is 5 to ten years. The City will provide periodic gage maintenance and collect data post-storm events. Costs will include training of City staff on gage maintenance and data download.

**Affected Jurisdictions:** City of Alpine, Brewster County

**Description of Flood Risk:** The City of Alpine is an incorporated area in Brewster County. Three named creeks traverse the City of Alpine: Paisano Creek and Alpine Creek (combined watershed of 56.2 sq mi) and Moss Creek (watershed of 29.5 sq mi). Per modeling performed as part of Task 2 of the RFP, over 1,600 structures within the city are estimated to be potentially impacted during the 1% AC (100-year) flood. Exhibit **Map 15 (Map 4 of 31)** depicts this risk. Recent study performed under this plan has shown this map to present an overestimation of flood risk within the City and this FME is proposed as an essential step in the development of a more accurate estimate of flood risk.

**Flood Management Evaluation Scope of Work:**

Task 1: Procure and install precipitation gages.

Task 2: Procure and install stage gages.

Task 3: Training of City Staff on Gage Operation and Data Collection.

Task 4: Labor support by City Staff through first 5 years of gage operation.

The cost estimate is documented in the table below.

Scope Item	Unit	Unit Cost	Quantity	Cost
<i>(1) Precipitation Gages</i>				
Equipment	Site	\$ 1,500	6	\$ 9,000
Installation (including travel)	Site	\$ 4,600	6	\$ 27,600
<i>(2) Stage gages</i>				
Equipment	Site	\$ 1,000	5	\$ 5,000
Installation (including travel)	Site	\$ 4,600	5	\$ 23,000
<i>(3) Training of City Staff on maintenance/data download</i>				
	hr	\$ 150	32	\$ 4,800
<i>(4) City Staff Support Costs for 5 years</i>				
	Per year	\$ 5,000	5	\$ 25,000
<b>TOTAL COST</b>				<b>\$ 94,400</b>
<b>Notes</b>				
1. Assumes City of Alpine will be responsible for labor and equipment costs associated with gage maintenance and data-retrieval after 5 years.				
2. Does not include security or land acquisition.				
3. Assumes site access.				
4. For comparison purposes, USGS-provided labor for precipitation gages is up to \$3,500/year per gage, including remote data-logging capabilities. These gages will not have remote data-logging capability				