

Appendix 4A

Evaluation Summary Table of Potential Flood Management Evaluations

Table 4A. Potential Flood Management Evaluations Identified by RFPG

FME ID	FME Name	Description	Associated Goals	Associated FME, FMS, or FMP	Associated FME, FMS, or FMP Description	Counties	HUC8s
141000001	Develop a plan for a Sediment and Vegetation Control Program in the Rio Grande at El Paso	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 U.S. and Mexico.	14007003, 14004001	N/A	N/A	El Paso	13030102, 13040100
141000002	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.	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.	14007003, 14014002, 14009002, 14009004	FMS ID: 142000008	FMS ID: 142000008 will follow, as interior drainage is needed for levee certification.	Presidio	13040201
141000003	Arroyo Siphon at SH20 near Tornillo	Coordinate with TXDOT to install siphon at SH20 to prevent road from overtopping and stormwater from entering EPCWID1 canal system.	14010001, 14010002	N/A	N/A	El Paso	13040100
141000004	Lower Mesa Drain Improvements at El Paso	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.	14007003, 14009001, 14009003	N/A	N/A	El Paso	13040100
141000005	Develop solution for flooding of San Elizario historic district, and localized flooding in San Elizario and adjacent communities	Develop Stormwater Master Plan for San Elizario, including drainage swales to convey runoff into the River Drain and relieve localized ponding, as well as plantings along flowpaths for butterfly habitat.	14009001, 14009003	N/A	N/A	El Paso	13040100
141000006	Increase Storage Capacity of Fort Bliss Sump	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.	14009001, 14009003	N/A	N/A	El Paso	13040100
141000008	Sediment Control at Alamito and Ternereros Creek	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 USBWC maintenance burden.	14004002, 14011001	FME ID: 141000015; FMS ID: 142000006; FMS ID: 142000016	FME 141000015 & FMS 142000016 precede as they provide method for estimating sediment loads & develop erosion solutions for region. FMS ID 142000006 follows as it considers updated sediment loads into the Rio Grande for recommended environmental flows.	Presidio	13040201, 13040202, 13040203, 13040204, 13070005, 13070006, 13050004
141000010	Develop city-wide drainage study and stormwater master plan for Pecos	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.	14014001, 14009002, 14009004, 14010001, 14010002	FMS ID: 142000007	FMS ID: 142000007 will follow as it addresses flood-related saltcedar issue	Reeves	13070003, 13070001
141000012	Dam Improvements at Comanche Creek Reservoir at Fort Stockton	Inspect and evaluate rehabilitation improvements for Comanche Creek Reservoir to protect Fort Stockton from similar flooding to that which occurred on April 4, 2004.	14014001, 14009002, 14009004, 14010001, 14010002	N/A	N/A	Pecos	13070007
141000014	Develop a Colonia-wide Drainage System at Fort Hancock	Conduct surveys and drainage study to define flood areas, size 5th 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, Alamo Dam 3.	14014001, 14009002, 14009004, 14010001, 14010002	FMS ID: 142000003	FMS ID: 142000003 will follow as it develops a maintenance program for the improvements.	Hudspeth	13040100
141000015	Prioritize arroyos on their likelihood of producing sediment/ debris flows	Investigate uncontrolled arroyos that have created flood damages and high maintenance costs. Develop method to estimate relative production of sediment for uncontrolled arroyos and estimate added flood risk associated with drainage conveyance blockage.	14009001, 14009003, 14010001, 14010002	FME ID: 141000008; FMS ID: 142000016	FMS ID: 142000016 will follow as it develops solutions to reduce sediment in an arroyo identified in this FME. FME ID: 141000008 will follow as it utilizes the method for estimating sediment loads developed in this FME.	El Paso	13030102, 13040100, 13050003

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FME ID	FME Name	Description	Associated Goals	Associated FME, FMS, or FMP	Associated FME, FMS, or FMP Description	Counties	HUC8s
141000018	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.	Identify the Rio Grande outfalls that are most susceptible to blockage, and most likely to allow flood damage during periods of high river stage.	14009001, 14009003, 14004001	FMS ID: 142000017	FMS ID: 142000017 will follow as it uses results from this FME to develop solutions for conveyance of stormwater into the Rio Grande in El Paso County	El Paso	13030102, 13040100
141000019	Plan for mitigation of drainage controls where ground water reduces storm water conveyance capacity in the Montoya Drain	Perform H&H modeling to develop a FMP for increasing the capacity of Montoya Drain through measures to control groundwater intrusion into the drain.	14007003	N/A	N/A	El Paso	13030102
141000021	Develop city-wide drainage study and stormwater master plan for the City of Kermit.	Develop city-wide drainage study and stormwater master plan for Kermit. Develop detailed H&H models and floodplain maps. Evaluate FMP alternatives.	14014001, 14009002, 14009004, 14010001, 14010002	N/A	N/A	Winkler	13070007
141000022	Develop solutions for flooding near Sierra Blanca	Develop drainage study and stormwater master plan for Sierra Blanca and surrounding ranches with access issues during floods. Develop detailed H&H models and floodplain maps. Evaluate FMP alternatives.	14014001, 14009002, 14009004, 14010001, 14010002	N/A	N/A	Hudspeth	13040201
141000023	Develop city-wide drainage study and stormwater master plan for Alpine	Develop city-wide drainage study and stormwater master plan for Alpine. Develop detailed H&H models and floodplain maps. Evaluate FMP alternatives.	14014001, 14009002, 14009004, 14010001, 14010002	N/A	N/A	Brewster	13070006
141000024	Develop Supplemental Watershed Plans for flood control dams protecting Sonora	Assess & evaluate rehabilitation improvements for 7 NRCS dams identified by TCEQ as "Hydraulically Inadequate". Define upgrades of dams in Supplemental Watershed Plans for Dry Devils & Lowry Dams 3, 4, 5, 7, 8, 10, & 12.	14014001, 14009002, 14009004, 14010001, 14010002	N/A	N/A	Sutton	13040301
141000025	Develop Supplemental Watershed Plans for flood control dams protecting Ozona	Assess & evaluate rehabilitation improvements for NRCS dam identified by TCEQ as "Hydraulically Inadequate". Define upgrades of dam in Supplemental Watershed Plans for Johnsons Draw SCS Site 7 Dam.	14014001, 14009002, 14009004, 14010001, 14010002	N/A	N/A	Crockett	13040301
141000026	Develop city-wide drainage study and stormwater master plan for Monahans/ Southwest Sandhill	Develop drainage study and stormwater master plan for City of Monahans and Southwest Sandhill Census Designated Place. Develop detailed H&H models and floodplain maps. Evaluate FMP alternatives.	14014001, 14009002, 14009004, 14010001, 14010002	N/A	N/A	Ward, Winkler	13070007
141000033	Develop city-wide drainage study and stormwater master plan for City of Socorro	Develop city-wide drainage study and stormwater master plan for Socorro. Develop detailed H&H models and floodplain maps. Evaluate FMP alternatives.	14014001, 14009001, 14009003, 14010001, 14010002	N/A	N/A	El Paso	13040100
141000034	Develop FMPs for additional projects in City of El Paso/El Paso Water Stormwater Master Plan	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 Regional Flood Plan.	14009001, 14009003, 14010001, 14010002	N/A	N/A	El Paso	13030102, 13040100, 13050003
141000035	Develop FMPs for additional projects from the El Paso County Stormwater Master Plan	Develop all required datasets and models for 21 projects from the El Paso County Stormwater Master Plan to be considered as FMPs in the Regional Flood Plan.	14009001, 14009003, 14010001, 14010002	N/A	N/A	El Paso	13030102, 13040100, 13050003

Table 4A. Potential Flood Management Evaluations Identified by RFPG

FME ID	FME Name	Study Type	FME Area (sqmi)	Flood Risk Type	Sponsor	Entities with Oversight	Emergency Need	Estimated Study Cost
141000001	Develop a plan for a Sediment and Vegetation Control Program in the Rio Grande at El Paso	Preparedness	110.7	Riverine	El Paso Water, El Paso County, EPCWID1	USIBWC, El Paso Water, El Paso County, Doña Ana County, Hudspeth County, EPCWID1	No	\$ 107,000
141000002	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.	Project Planning	10.2	Riverine	Presidio city, Presidio County	Presidio city, Presidio County, USIBWC, USACE	No	\$ 183,000
141000003	Arroyo Siphon at SH20 near Tornillo	Project Planning	0.1	Riverine	El Paso County, EPCWID1, TXDOT	El Paso County, EPCWID1, TXDOT	No	\$ 38,000
141000004	Lower Mesa Drain Improvements at El Paso	Project Planning	5.6	Urban/Local	El Paso Water, El Paso County, EPCWID1	El Paso Water, El Paso County, EPCWID1	No	\$ 689,000
141000005	Develop solution for flooding of San Elizario historic district, and localized flooding in San Elizario and adjacent communities	Project Planning	7.3	Urban/Local	San Elizario city, El Paso County	San Elizario city, El Paso County	No	\$ 73,000
141000006	Increase Storage Capacity of Fort Bliss Sump	Project Planning	0.7	Urban/Local	El Paso Water	U.S. Army, El Paso Water	No	\$ 30,000
141000008	Sediment Control at Alamito and Ternereros Creek	Project Planning	1621.9	Riverine	Presidio County	USIBWC, Presidio County	No	\$ 111,000
141000010	Develop city-wide drainage study and stormwater master plan for Pecos	Project Planning	23.1	Urban/Local, Playa, Riverine	Pecos city, Lindsay CDP, Reeves County, TXDOT	Pecos city, Lindsay CDP, Reeves County, TXDOT	No	\$ 92,000
141000012	Dam Improvements at Comanche Creek Reservoir at Fort Stockton	Project Planning	6.1	Urban,/Local, Riverine	Fort Stockton city, Pecos County	Fort Stockton city, Pecos County	Yes	\$ 68,000
141000014	Develop a Colonia-wide Drainage System at Fort Hancock	Project Planning	22.0	Urban/Local, Riverine	Hudspeth County	Fort Hancock CDP, Acala CDP, Hudspeth County	Yes	\$ 795,000
141000015	Prioritize arroyos on their likelihood of producing sediment/ debris flows	Preparedness	1011.0	Riverine	El Paso Water, El Paso County, EPCWID1	El Paso Water, El Paso County, EPCWID1	No	\$ 70,000

Table 4A. Potential Flood Management Evaluations Identified by RFPG

FME ID	FME Name	Study Type	FME Area (sqmi)	Flood Risk Type	Sponsor	Entities with Oversight	Emergency Need	Estimated Study Cost
141000018	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.	Preparedness	110.7	Urban/Local, Riverine	El Paso Water, El Paso County	El Paso Water, El Paso County	No	\$ 70,000
141000019	Plan for mitigation of drainage controls where ground water reduces storm water conveyance capacity in the Montoya Drain	Project Planning	0.3	Urban/Local	El Paso Water, EPCWID1	El Paso Water, EPCWID1, Doña Ana County, EBID	No	\$ 130,000
141000021	Develop city-wide drainage study and stormwater master plan for the City of Kermit.	Project Planning	2.5	Urban/Local, Playa	Kermit city, Winkler County	Kermit city, Winkler County	No	\$ 75,000
141000022	Develop solutions for flooding near Sierra Blanca	Project Planning	4.8	Riverine	Hudspeth County	Hudspeth County	No	\$ 76,000
141000023	Develop city-wide drainage study and stormwater master plan for Alpine	Project Planning	4.8	Urban/Local, Riverine	Alpine city, Brewster County	Alpine city, Brewster County	No	\$ 250,000
141000024	Develop Supplemental Watershed Plans for flood control dams protecting Sonora	Project Planning	2.2	Riverine	Sonora city, Sutton County	Sonora city, Sutton County	Yes	\$ 1,456,000
141000025	Develop Supplemental Watershed Plans for flood control dams protecting Ozona	Project Planning	4.6	Riverine	Ozona CDP, Crockett County	Ozona CDP, Crockett County	Yes	\$ 1,456,000
141000026	Develop city-wide drainage study and stormwater master plan for Monahans/ Southwest Sandhill	Project Planning	36.1	Urban/Local, Playa	Monahans city, Southwest Sandhill CDP, Ward County	Monahans city, Southwest Sandhill CDP, Ward County	No	\$ 104,000
141000033	Develop city-wide drainage study and stormwater master plan for City of Socorro	Project Planning	21.9	Urban/Local, Riverine	Socorro city, El Paso County	Socorro city, El Paso County	No	\$ 73,000
141000034	Develop FMPs for additional projects in City of El Paso/El Paso Water Stormwater Master Plan	Project Planning	298.8	Urban/Local, Riverine	El Paso Water	El Paso Water	No	\$ 1,288,000
141000035	Develop FMPs for additional projects from the El Paso County Stormwater Master Plan	Project Planning	711.1	Urban/Local, Riverine	El Paso County	El Paso County	No	\$ 276,000

Table 4A. Potential Flood Management Evaluations Identified by RFPG

FME ID	FME Name	Potential Funding Sources and Amount	Estimated number of structures at flood risk	Habitable structures at flood risk	Estimated Population at flood risk	Critical facilities at flood risk (#)	Number of low water crossings at flood risk (#)	Estimated number of road closures (#)	Estimated length of roads at flood risk (miles)	Estimated active farm & ranch land at flood risk (acres)	Existing or Anticipated Models (year)	Existing or Anticipated Maps (year)
141000001	Develop a plan for a Sediment and Vegetation Control Program in the Rio Grande at El Paso	Taxes, Water Use Fees, 50%	12341	10696	34727	16	2	20	228.13	26706.88	2222	2019
141000002	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.	General Revenue, 20%	760	479	1624	0	0	0	16.27	412.21	2008	1985
141000003	Arroyo Siphon at SH20 near Tornillo	Taxes, Water Use Fees, 50%	0	0	0	0	0	0	0.25	10.93	2019	2019
141000004	Lower Mesa Drain Improvements at El Paso	Taxes, Water Use Fees, 50%	375	216	1004	0	0	0	12.46	1474.78	2009	2019
141000005	Develop solution for flooding of San Elizario historic district, and localized flooding in San Elizario and adjacent communities	General Revenue / General Funds or Bonds or Tax notes, 25%	641	598	1524	1	0	0	10.39	1201.38	2019	2019
141000006	Increase Storage Capacity of Fort Bliss Sump	Revenue bonds, Cash Revenues, Credit, 0%	3766	2331	24444	45	2	82	150.70	666.10	2019	2018
141000008	Sediment Control at Alamito and Ternereros Creek	Unknown	444	173	890	0	24	132	46.96	28207.58	None	1985
141000010	Develop city-wide drainage study and stormwater master plan for Pecos	Unknown	2120	1240	7359	3	18	295	89.92	536.60	None	1985
141000012	Dam Improvements at Comanche Creek Reservoir at Fort Stockton	Unknown	169	111	900	2	4	27	22.15	14.47	None	1985
141000014	Develop a Colonia-wide Drainage System at Fort Hancock	General Revenue, 0%	57	0	115	0	9	9	5.02	2482.87	None	1985
141000015	Prioritize arroyos on their likelihood of producing sediment/ debris flows	Taxes, Water Use Fees, 50%	21373	16856	70212	37	132	841	607.25	48550.99	2019	2019

Table 4A. Potential Flood Management Evaluations Identified by RFPG

FME ID	FME Name	Potential Funding Sources and Amount	Estimated number of structures at flood risk	Habitable structures at flood risk	Estimated Population at flood risk	Critical facilities at flood risk (#)	Number of low water crossings at flood risk (#)	Estimated number of road closures (#)	Estimated length of roads at flood risk (miles)	Estimated active farm & ranch land at flood risk (acres)	Existing or Anticipated Models (year)	Existing or Anticipated Maps (year)
141000018	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.	Revenue bonds, Cash Revenues, Credit, 0%	12341	10696	34727	16	2	20	228.13	26706.88	2021	2021
141000019	Plan for mitigation of drainage controls where ground water reduces storm water conveyance capacity in the Montoya Drain	Taxes, Water Use Fees, 50%	63	58	187	0	0	0	1.80	10.88	None	2019
141000021	Develop city-wide drainage study and stormwater master plan for the City of Kermit.	Unknown	1119	916	2126	1	0	5	31.63	2.67	None	1976
141000022	Develop solutions for flooding near Sierra Blanca	General Revenue, 0%	36	13	75	0	4	28	7.81	5.53	None	1985
141000023	Develop city-wide drainage study and stormwater master plan for Alpine	Unknown	1640	1181	4364	6	18	199	38.03	49.91	None	1985
141000024	Develop Supplemental Watershed Plans for flood control dams protecting Sonora	Unknown	682	419	1103	2	20	97	14.98	0.36	None	1989
141000025	Develop Supplemental Watershed Plans for flood control dams protecting Ozona	Unknown	944	661	1599	4	29	144	19.76	1.86	None	1973
141000026	Develop city-wide drainage study and stormwater master plan for Monahans/ Southwest Sandhill	Dedicated Revenue, 10%	1222	92	2536	1	0	38	51.27	57.44	None	1988
141000033	Develop city-wide drainage study and stormwater master plan for City of Socorro	General Funds or Bonds or Tax notes, 55%	2578	2267	7825	0	0	0	43.73	3083.54	2019	2019
141000034	Develop FMPs for additional projects in City of El Paso/El Paso Water Stormwater Master Plan	Revenue bonds, Cash Revenues, Credit, 0%	13881	10736	55754	26	51	614	374.95	6056.93	2019	2019
141000035	Develop FMPs for additional projects from the El Paso County Stormwater Master Plan	General Funds or Bonds or Tax notes, 5%	7480	6117	20411	10	81	224	228.22	42408.64	2021	2021

Appendix 4B

Narratives of Potential Flood Management Evaluations

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:

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

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:

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

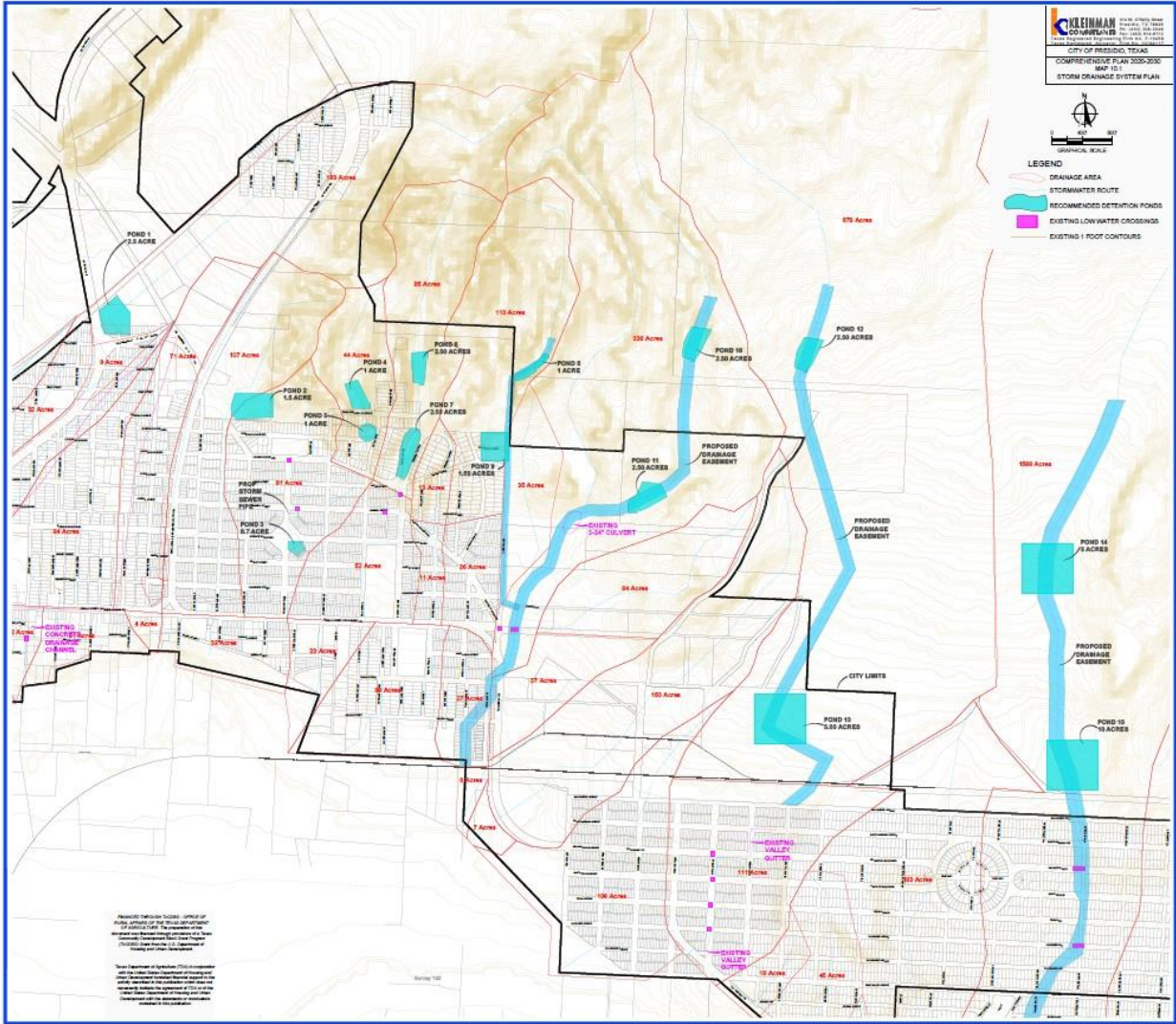


Figure 4B-2. Proposed Project Locations Figure from City of Presidio Comprehensive Plan 2020-2030 (Kleinman, 2020)

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:

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

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:

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

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 RFGP and TWDB providing documentation of the proposed FMP.

Task 6 – Stakeholder Coordination

Estimated Cost for FME:

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

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 and 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:

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

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 RFGP-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 Terneros 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:

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

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.

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:

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

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:

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

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 5th 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 5th 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.

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

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

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

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

Task 2 Labor Cost			
Task 2.1 – Data Collection			\$ 31,571
Task 2.2 - Identify Problems, Opportunities & Concerns			\$ 24,769
Task 2.3 - Meetings / Determine Objectives			\$ 37,954
Task 2.4 - Inventory Resources (Conduct Planning Studies)			
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
Task 2.5 - Analyze Resource Data			
A.	Support Maps		\$ 3,503
B.	Hydrology		\$ 8,633
C.	Hydraulics		\$ 30,150
D.	Economics (all alternatives)		\$ 16,358
E.	QA/QC		\$ 4,680
Task 2.6 - Formulate And Evaluate Alternatives			
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
Task 2.7 - Prepare Supplemental Watershed Plan/Environmental Assessment			
A.	Prepare Draft Document		\$ 59,366
B.	Draft Document Technical Reviews		\$ 27,563
C.	Prepare Final Plan/EA		\$ 3,443
Task 2.8 - Prepare Finding of No Significant Impact			\$ -
Task 2.10 - Subcontracts			
A.	Sediment Survey		\$ 20,000
B.	Topographic Survey		\$ 50,000
C.	Geologic Investigation		\$ 120,000
D.	Geologic Investigation (Lab)		\$ 40,000
Total Task 2 Labor			\$ 685,978
Task 2 Travel			\$ 10,000
Total Task 2 Cost			\$ 696,000

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:

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

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:

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

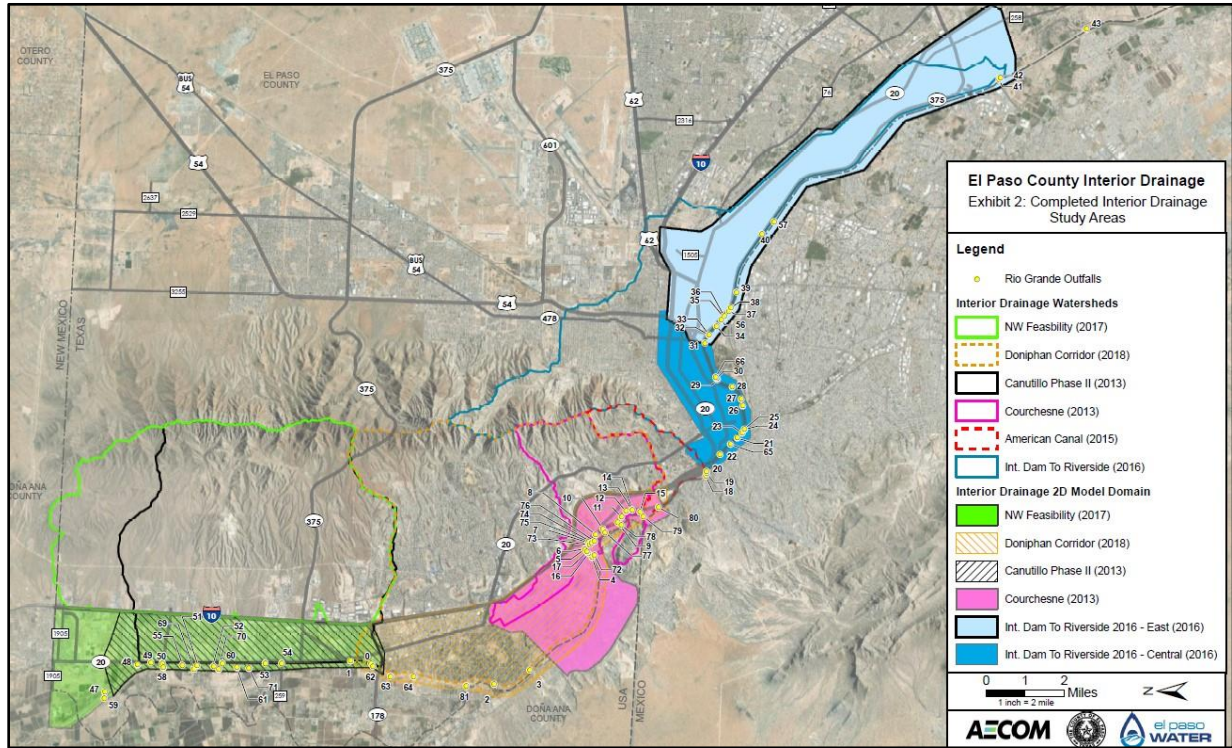


Figure 4B-12. Location of Rio Grande Outfalls in El Paso County from Exhibit 2 of El Paso County Interior Drainage Study (AECOM, 2021)

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:

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

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:

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

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:

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

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.

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. 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 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. **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.

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 RFGP 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:

“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	\$ 11,700
Task 2 – Existing Condition Engineering Analyses	\$ 19,490
Task 3 – Alternatives Development	\$ 32,620
Task 4 - Alternatives Selection	\$ 16,820
Task 5 – Report	\$ 13,490
Task 6 – Stakeholder Coordination	\$ 9,400
Total Project Labor	\$ 103,520
Travel	\$ 1,536
Initial Total FME Cost Estimated by AECOM	\$ 105,000
Additional Labor Cost Requested by City of Alpine (due to increased costs and inflation):	\$ 145,000
Total FME Cost	\$ 250,000

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
				\$	1,456,000

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
			\$	1,456,000

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:

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

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:

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

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 CEDam 6	\$ 10,000	\$	600,000
Task - 2 - Develop FMP Data Requirements for CEDam 7	\$ 10,000	\$	600,000
Task - 3 - Develop FMP Data Requirements for CEDam 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 CE5C 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
Total Project Labor	\$ 1,288,000	Total SMP Project Cost:	\$ 234,211,864
Total FME cost	\$ 1,288,000		

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
Total Project Labor:	\$ 276,000	Total SMP Project Cost:	\$ 135,590,000
Total FME cost:	\$ 276,000		

Appendix 4C

Evaluation Summary Table of Potentially Feasible Flood Mitigation Projects

Table 4C. Potentially Feasible Flood Mitigation Projects Identified by RFPG

FMP ID	FMP Name	Description	Associated Goals (ID)	Associated FME, FMS, or FMP	Associated FME, FMS, or FMP Description	Counties	HUC12s	Project Type	Project Area (sqmi)	Flood Risk Type (Riverine, Coastal, Urban, Playa, Other)	Sponsor	Entities with Oversight	Emergency Need (Y/N)	Estimated Project Cost (\$)	Potential Funding Sources and Amount
143000003	Small pond at San Elizario	Construct a new 0.34 ac-ft pond to relieve roadway flooding. Described as Alternative 3 from City of San Elizario "Drainage Feasibility Study" (2018).	14009001, 14009003	N/A	N/A	El Paso	130401000307	Detention Pond	0.001	Urban/Local	San Elizario city	San Elizario city	No	\$224,000	General Revenue
143000005	SH20 Drainage Improvements from Doniphan Drive to Texas Avenue	Improvements to inlet and culvert capacities at 8 crossings, with cost estimates and prioritizations available.	14010001, 14010002	N/A	N/A	El Paso	130401000107	Storm Drain	0.1	Urban/Local	TXDOT, El Paso Water	TXDOT, El Paso Water	No	\$3,745,000	Revenue bonds, Cash Revenues, Credit
143000007	Install Flood Gates in Marfa and Monitoring Gage on North Alamito Creek and Highway 17	Add flood gates to roadways at 4 LWCS on Alamito Creek, and a monitoring gage/early detection on North Alamito Creek at Hwy 17 Bridge upstream of Marfa. This provides early warning for Emergency Management to deploy before imminent road flooding.	14005001, 14006001	FMS ID: 142000025	FMS ID: 142000025 also improves early warning in Marfa, but is not required before or after this FMS.	Presidio County	130402020105	Preparedness	0.02	Riverine	Marfa city	Marfa city, Presidio County	Yes	\$358,000	General Funds
143000009	Develop and Implement Floodplain Ordinance to Regulate Development at Hudspeth County	Coordinate with Hudspeth County Commissioners, Road & Bridge Departments, Safety & Inspection Departments, & County Attorney to draft a floodplain ordinance (or modify existing subdivision ordinance) to regulate development standards in Hudspeth County.	14001001, 14002001	N/A	N/A	Hudspeth County		Other	4552.1	Riverine, Playa, Urban/Local	Hudspeth County	Hudspeth County	No	\$50,000	General Revenue
143000011	SSA4	Detention Basin SSA4	14009003, 14009001, 14011001	N/A	N/A	El Paso	130401000204	Detention Pond	0.1	Riverine	El Paso County	El Paso County	No	\$14,744,000	General Funds, Bonds, Tax Notes
143000021	SOC4	Sediment/Detention Basin at "Mankato Arroyo"	14009003, 14009001, 14011001	N/A	N/A	El Paso	130401000307	Detention Pond	0.04	Riverine	El Paso County, EPCWID1	El Paso County, EPCWID1, Socorro city	No	\$2,383,000	Taxes, water use fees
143000024	MON3	Sediment/Retention Basin	14009003, 14009001, 14011001	N/A	N/A	El Paso	130401000203	Detention Pond	1.3	Playa	El Paso County	El Paso County	No	\$27,033,000	General Funds, Bonds, Tax Notes
143000025	HAC3	Sediment/Retention Basin	14009003, 14009001, 14011001	N/A	N/A	El Paso	130401000307	Detention Pond	0.1	Riverine	El Paso County	El Paso County	No	\$4,619,000	General Funds, Bonds, Tax Notes
143000097	NW16	Expand channel from Village Ct to Doniphan Dr	14009003, 14009001	N/A	N/A	El Paso	130301020906	Channel	0.0	Urban/Local	El Paso Water	El Paso Water	No	\$1,570,000	Revenue bonds, Cash Revenues, Credit
143000100	NE3B	Alcan Pond: new catch basin to capture FP15 upstream	14009003, 14009001, 14011001	N/A	N/A	El Paso	130401000103	Detention Pond	0.1	Urban/Local	El Paso Water	El Paso Water	No	\$21,234,000	Revenue bonds, Cash Revenues, Credit
143000105	EA10A	Build sediment/detention basin upstream of Paseo del Este Drive	14009003, 14009001, 1401101	N/A	N/A	El Paso	130401000204	Detention Pond	0.02	Riverine	El Paso Water	El Paso Water, El Paso County	No	\$9,647,000	Revenue bonds, Cash Revenues, Credit
143000111	NW3	Construction of new larger capacity Doniphan Pump Station to replace PS1, with new force main directly to the Rio Grande. Install new catch basin with mechanical bar screen upstream of PS2.	14009003, 14009001	N/A	N/A	El Paso	130401000107	Detention Pond	0.3	Urban/Local	El Paso Water	El Paso Water	No	\$16,132,000	Revenue bonds, Cash Revenues, Credit
143000113	NW26	Acquire land, construct a permanent wetland, install a storm drain system to Doniphan Drive, construct pipeline to Doniphan Pump Station and build new pump station to control flood levels.	14009003, 14009001	N/A	N/A	El Paso	130401000107	Detention Pond	0.2	Urban/Local	El Paso Water	El Paso Water	No	\$35,568,000	Revenue bonds, Cash Revenues, Credit
143000116	EA9A	Build sediment/detention basin upstream of Paseo del Este Drive	14009003, 14009001, 14011001	N/A	N/A	El Paso	130401000204	Detention Pond	0.04	Riverine	El Paso Water	El Paso Water	No	\$11,897,000	Revenue bonds, Cash Revenues, Credit

Table 4C. Potentially Feasible Flood Mitigation Projects Identified by RFPG

FMP ID	FMP Name	Flood Risk										Reduction in Flood Risk										
		Area in 100yr (1% annual chance) Floodplain in square miles	Area in 500yr (0.2% annual chance) Floodplain in square miles	Estimated number of structures at 100yr flood risk	Residential structures at 100-year flood risk	Estimated Population at 100-year flood risk	Critical facilities at 100-year flood risk (#)	Number of low water crossings at flood risk (#)	Estimated number of road closures (#)	Estimated length of roads at 100-year flood risk (Miles)	Estimated farm & ranch land at 100-year flood risk (acres)	Number of structures with reduced 100yr (1% annual chance) flood risk	Number of structures removed from 100yr (1% annual chance) flood risk	Number of structures removed from 500yr (0.2% annual chance) flood risk	Residential structures removed from 100yr (1% annual chance) flood risk	Estimated Population removed from 100yr (1% annual chance) flood risk	Critical facilities removed from 100yr (1% annual chance) flood risk (#)	Number of low water crossings removed from 100yr (1% annual chance) flood risk (#)	Estimated reduction in road closure occurrences	Estimated length of roads removed from 100yr flood risk (Miles)	Estimated farm & ranch land removed from 100yr flood risk (acres)	Estimated reduction in fatalities (if available)
143000003	Small pond at San Elizario	0.0	0	0	0	0	0	0	2	0.2	0	0	0	0	0	0	0	0	2	0.2	0	
143000005	SH20 Drainage Improvements from Doniphan Drive to Texas Avenue	0.005	0.004	2	0	30	0	8	16	0.21	0	0	0	0	0	0	0	8	0	0	0	
143000007	Install Flood Gates in Marfa and Monitoring Gage on North Alamito Creek and Highway 17	0.022	0	0	0	0	0	4	4	0.32	0.001	0	0	0	0	0	0	0	0	0	0	1
143000009	Develop and Implement Floodplain Ordinance to Regulate Development at Hudspeth County	937	1155	823	44	1629	2	70	489	288	246	0	0	0	0	0	0	0	0	0	0	
143000011	SSA4	0.77	2.8	185	139	564	1	0	32	3.7	314.6	185	99	184	74	299	0	0	0	0.02	4.0	
143000021	SOC4	0.21	0.6	10	2	26	0	0	4	0.3	99.9	10	10	65	2	26	0	0	4	0.3	19.2	
143000024	MON3	8.69	13.4	756	557	1977	2	23	267	64.1	0.0	660	327	609	248	820	0	0	11	14.9	0	
143000025	HAC3	0.42	0.7	10	6	23	0	0	1	0.2	96.7	10	10	11	6	23	0	0	1	0.1	43.2	
143000097	NW16	0.01	0.02	3	0	12	0	0	0	0.01	0.0	3	3	0	0	12	0	0	0	0.01	0	
143000100	NE3B	0.11	0.3	136	107	615	1	0	34	3.9	0.0	98	54	0	104	167	0	0	8	1.1	0	
143000105	EA10A	0.79	1.7	17	6	287	0	10	23	4.3	331.5	8	1	30	1	3	0	0	0	0.1	29.2	
143000111	NW3	0.03	0.3	6	1	37	1	0	7	0.7	0.0	6	6	0	1	37	1	0	7	0.7	0	
143000113	NW26	0.03	0.3	6	1	37	1	0	7	0.7	0.0	6	0	0	0	0	0	0	1	0.1	0	
143000116	EA9A	0.79	1.7	17	6	287	0	10	23	4.3	331.5	17	13	37	2	282	0	1	9	1.4	89.2	

Table 4C. Potentially Feasible Flood Mitigation Projects Identified by RFPG

FMP ID	FMP Name	Pre-Project Level-of-Service	Post-Project Level-of-Service	Cost/ Structure removed	Percent Nature-based Solution (by cost)	Negative Impact (Y/N)	Negative Impact Mitigation (Y/N)	Social Vulnerability Index (SVI)	Water Supply Benefit (Y/N)	Benefit-Cost Ratio
143000003	Small pond at San Elizario	Unknown	10% annual chance	N/A	0	No	No	0	No	0
143000005	SH20 Drainage Improvements from Doniphan Drive to Texas Avenue	<20% annual chance	10% annual chance	N/A	0	No	No	0.29	No	0
143000007	Install Flood Gates in Marfa and Monitoring Gage on North Alamito Creek and Highway 17	<20% annual chance	<20% annual chance	N/A	0	No	No	0.00	No	0
143000009	Develop and Implement Floodplain Ordinance to Regulate Development at Hudspeth County	Unknown	Unknown	N/A	0	No	No	0.56	No	0
143000011	SSA4	<1% annual chance	1% annual chance	\$148,929	0	No	No	0.90	No	0.1
143000021	SOC4	<1% annual chance	1% annual chance	\$238,300	0	No	No	0.94	No	0.1
143000024	MON3	<1% annual chance	1% annual chance	\$82,670	0	No	No	0.74	No	0.2
143000025	HAC3	<1% annual chance	1% annual chance	\$461,900	0	No	No	0.99	No	0
143000097	NW16	<1% annual chance	1% annual chance	\$523,333	0	No	No	0.89	No	0
143000100	NE3B	<1% annual chance	1% annual chance	\$393,222	0	No	No	0.78	No	0.1
143000105	EA10A	<1% annual chance	0.2% annual chance	\$9,647,000	0	No	No	0.64	No	0
143000111	NW3	<1% annual chance	1% annual chance	\$2,688,667	0	No	No	0.79	No	0
143000113	NW26	<1% annual chance	1% annual chance	N/A	1	No	No	0.00	No	0
143000116	EA9A	<1% annual chance	0.2% annual chance	\$915,154	0	No	No	0.64	No	0

Appendix 4D

Narratives of Potentially Feasible Flood Mitigation Projects

Appendix 4D. Narratives for Flood Mitigation Projects

4D-1. Flood Mitigation Project ID: 143000003

Name: Small pond at San Elizario

Description: Construct a new 0.34 ac-ft pond to relieve roadway flooding. Described as Alternative 3 from City of San Elizario “Drainage Feasibility Study” (2018).

Affected Jurisdictions: City of San Elizario

Discussion on Cultural Resources Background: Two National Register Districts and five archaeological sites are located within and /or adjacent to the proposed project area. As the project area is located within one National Register Districts, Section 106 of the NHPA will take effect and a cultural resources survey of the entire project area will be required to evaluate any unrecorded, potential cultural resources that can contribute to this district, and determine if any adverse effects will happen on historic properties.

Table 4D. Cultural Resources Within and/or Adjacent to FMP ID: 143000003

Resource Name	Resource Type	Prehistoric/ Historic	NRHP Eligibility	Location
Archaeological Site	Historic Structure	Historic	Ineligible	Adjacent
Archaeological Site	Historic Structure	Historic	Ineligible	Adjacent
Archaeological Site	Historic Structure	Historic	Ineligible	Adjacent
Archaeological Site	Historic Homestead	Historic	Ineligible	Adjacent
Archaeological Site	Historic Homestead	Historic	Ineligible	Adjacent
EPCWID	National Register District	Historic	Listed	Intersects
San Elizario Historic District	National Register District	Historic	Listed	Adjacent

Discussion on Flood Risk: The Drainage Feasibility Study (Brock & Bustillos, Inc., 2018) describes the existing flood risk for the project as the following:

“The City of San Elizario, Texas has continuously experienced flooding of the intersections of Socorro Rd. and San Antonio St., and Socorro Rd. and Main St. as shown in Figure 1. The flooding occurs on practically any storm event and causes disruption to traffic, area residents, and business owners. It also creates unsanitary conditions as trash and debris accumulates in the area as these are transported by the storm water. The City of San Elizario contracted the services of Brock & Bustillos Inc. (B&B) to develop a feasibility study to determine up to three (3) potential alternatives to mitigate flooding and ponding problems at these intersections. This study identifies existing drainage infrastructure, determines the contributing watershed area, determines expected storm water flows, identifies potential regional ponding areas, presents flood mitigating alternatives, determines

estimated probable construction costs, and provides a recommendation for flooding mitigation.”

Project Description: The Drainage Feasibility Study (Brock & Bustillos, Inc., 2018) describes the project as the following:

“This alternative was identified by City of San Elizario officials due to its practical and proximity location to the flooding intersections. It consists of the creation of a new pond located in a portion of 1408 San Antonio St. identified by EPCAD Property ID 394930. The proposed layout is shown on Exhibit D. Unfortunately, the vacant portion where a pond can be located is only about 0.128-Ac and has approximate capacity of 0.34-Ac-ft or only 3% of the required 10.4-Ac-ft expected runoff from a 100-year storm event.”

Estimated Cost for FMP:

Total FMP Cost	
Subtotal 1 – Drainage Feasibility Study Construction Cost (Brock & Bustillos, Dec. 2018)	\$ 81,183
Subtotal 2 – RFP Construction Cost (September 2020, using CCI)	\$ 83,455
Subtotal 3 – RFP Construction Contingency (35%)	\$ 29,209
Total Construction Cost	\$ 112,664
Subtotal 4 – Drainage Feasibility Study Land Acquisition Cost (Brock & Bustillos, Dec. 2018)	\$ 50,000
Subtotal 5 – RFP Land Acquisition Cost (September 2020, using CPI)	\$ 51,801
Subtotal 6 – RFP Final Design Cost (20%)	\$ 22,533
Subtotal 7 – RFP Permitting Cost (10%)	\$ 11,266
Subtotal 8 – RFP Construction Oversight Cost (8%)	\$ 9,013
Subtotal 9 – RFP Geotech Cost (15%)	\$ 16,900
Total Non-Construction Cost	\$ 111,512
Total FMP Cost	\$ 224,000

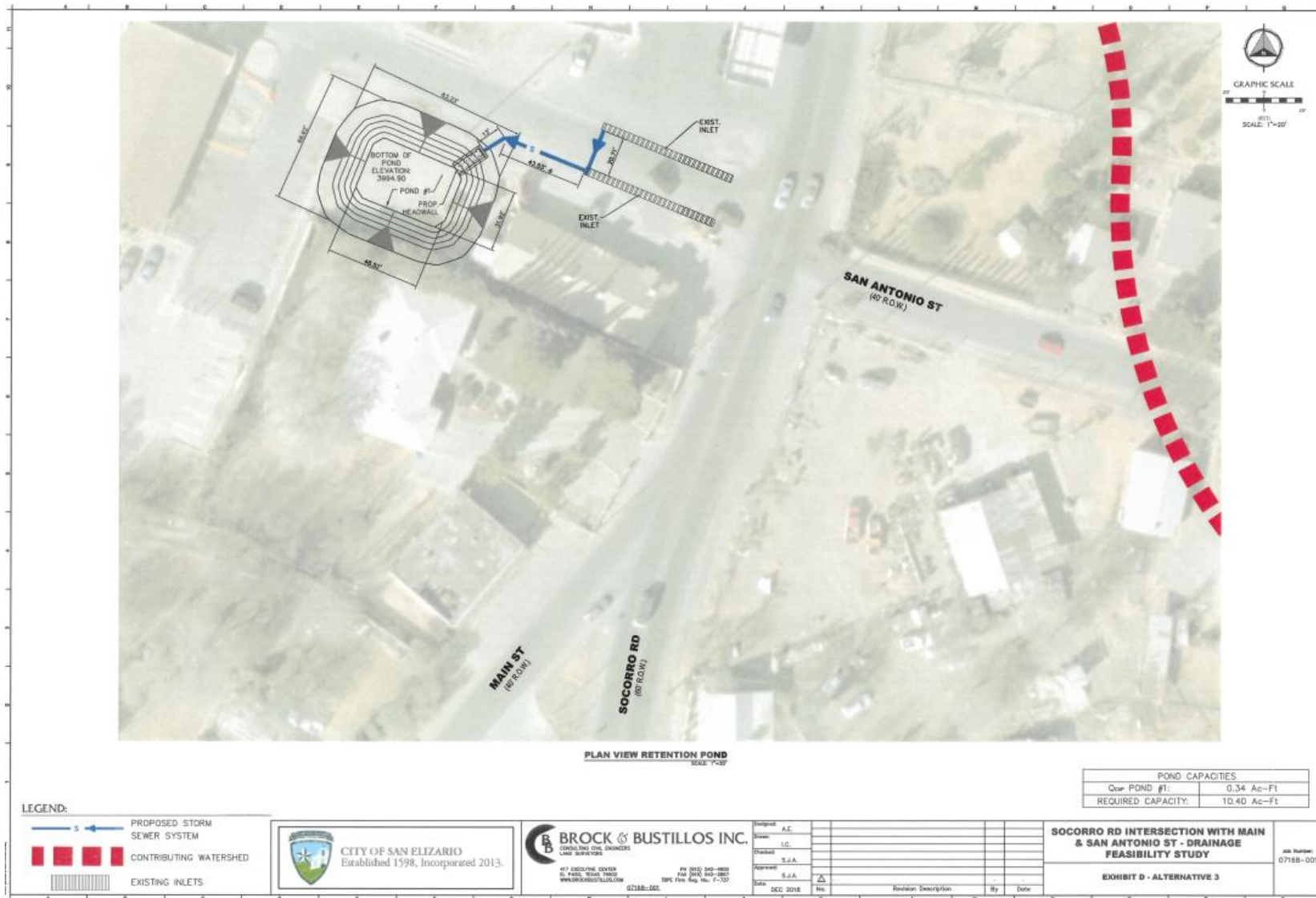


Figure 4D-1: Exhibit D, Alternative 3 from Drainage Feasibility Study Socorro Rd. Intersections with San Antonio St. & Main St. (Brock & Bustillos, 2018)

4D-2. Flood Mitigation Project ID: 143000005

Name: SH20 Drainage Improvements from Doniphan Drive to Texas Avenue

Description: Improvements to inlet and culvert capacities at eight crossings, with cost estimates and prioritizations available.

Affected Jurisdictions: City of El Paso

Discussion on Cultural Resources Background: No cultural resources are located within or immediately adjacent to the project area. Given the proposed design includes facility improvements, SWCA recommends no cultural resources survey of the project area based on current design plans.

Discussion on Flood Risk: The “Drainage Study for SH20 (Mesa Street), from Doniphan Drive to Texas Avenue” (AECOM, 2019) describes the existing flood risk for the project as the following:

“Most of the existing drainage crossings have adequate capacity to convey the 100-year flows without overtopping the roadway. The primary issue is the inability of the runoff from offsite areas and at some locations runoff from within the SH 20 ROW to efficiently drain to the crossings.”

Project Description: The “Drainage Study for SH20 (Mesa Street), from Doniphan Drive to Texas Avenue” (AECOM, 2019) describes the project as the following:

“Potential drainage improvements were developed at a conceptual level for locations with a LOS less than a 10-yr event. The drainage improvements recommended in this report are conceptual and require further study before detailed design. Each drainage improvement will improve the LOS around each crossing or identified flooding location and reduce the frequency of flooding. It should be expected that roadway flooding will occur post improvements for storm events in excess of a 5-year 24-hour storm event.”

Each of the recommended and prioritized drainage improvements is described below in order of priority, from the “Drainage Study for SH20 (Mesa Street), from Doniphan Drive to Texas Avenue” (AECOM, 2019):

“10-1 - Increase the length of the weir along Mesa Hills drive to increase the capacity by 75 cfs.

10-2 - Add inlets along Festival Drive connected to crossings 7D. Estimated necessary capacity 75 cfs.

10-3 - Increase the capacity of the inlets and crossing at 9A & 9B by 30 cfs.

10-4 - Add an inlet upstream of the inlet along E Castellano Drive. Also increase the size of the inlet at the sag at the intersection of E Castellano Drive and SH 20. Connect both inlets to crossing 11. Estimated necessary capacity of each inlet 75 cfs.

10-5 - Add inlets along SH 20 connecting to crossings 12A. Estimated necessary capacity: Approximately 250 cfs.

10-6 - Add inlets at the sag at the Brentwood intersection. Connect the inlets to the downstream side of crossing 14B. Estimated necessary capacity: Approximately 90 cfs.

10-7 - Add inlets at the sag near crossing 18. Connect the inlets to crossing 18. Estimated capacity: Approximately 50 cfs.

10-8 - Add inlets at the Sag within the Kerbey intersection and the sag near crossing 19. Connect the inlets to crossing 19. Estimated necessary capacity for each inlet: Approximately 60 cfs.”

Estimated Cost for FMP:

Total FMP Cost	
Subtotal 1 – Drainage Study for SH20 Construction Cost (AECOM, Jan. 2019)	\$ 1,774,823
Subtotal 2 – RFP Construction Cost (September 2020, using CCI)	\$ 1,813,170
Subtotal 3 – RFP Construction Contingency (35%)	\$ 634,610
Total Construction Cost	\$ 2,447,780
Subtotal 4 – Drainage Study SH-20 2019 Land Acquisition Cost (Jan. 2019)	\$ -
Subtotal 5 – RFP Land Acquisition Cost (September 2020, using CPI)	\$ -
Subtotal 6 – RFP Final Design Cost (20%)	\$ 489,556
Subtotal 7 – RFP Permitting Cost (10%)	\$ 244,778
Subtotal 8 – RFP Construction Oversight Cost (8%)	\$ 195,822
Subtotal 9 – RFP Geotech Cost (15%)	\$ 367,167
Total Non-Construction Cost	\$ 1,297,323
Total FMP Cost	\$ 3,745,000

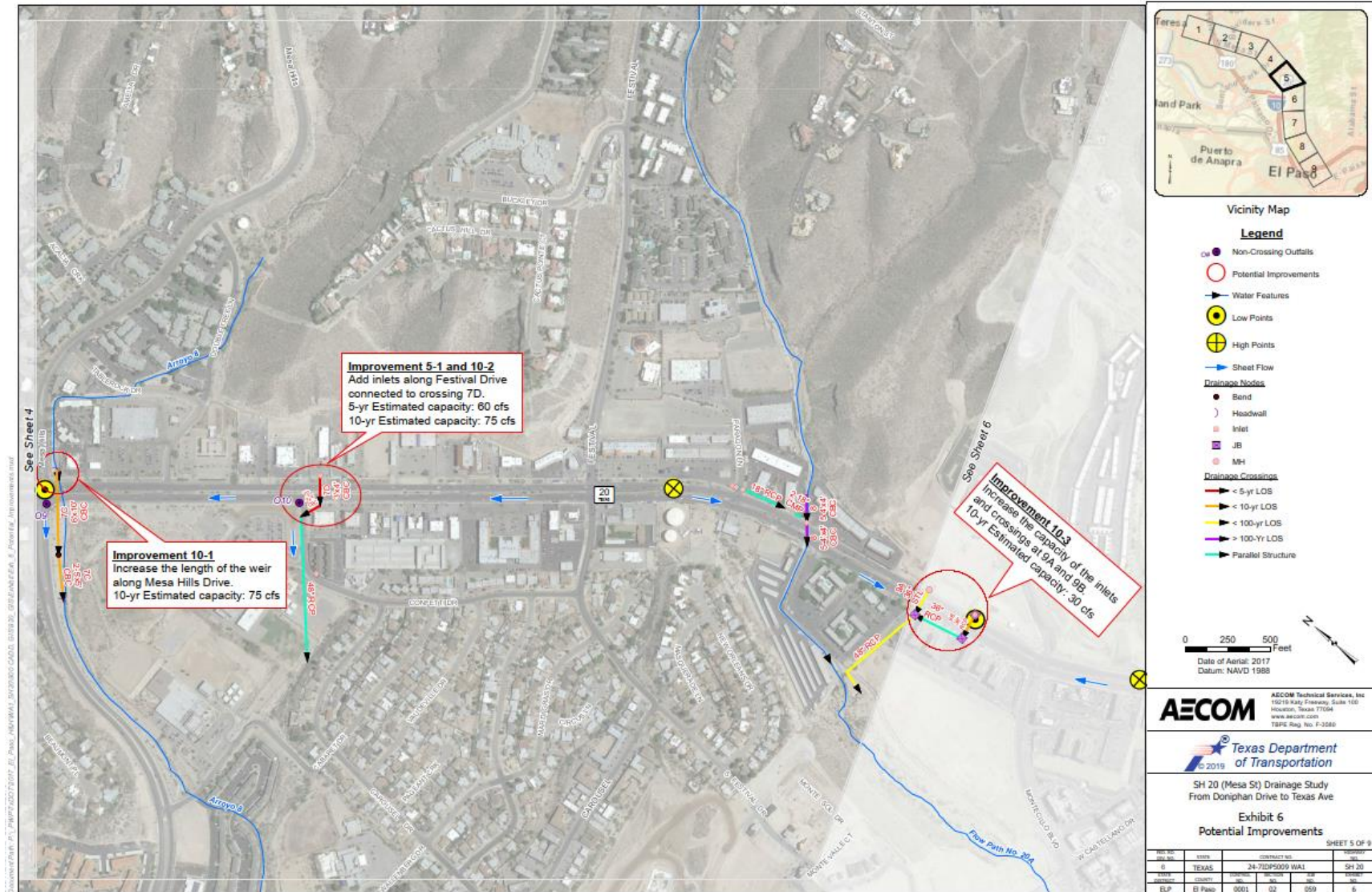


Figure 4D-2.1: Exhibit 6, Sheet 5 from Drainage Study for SH20 (Mesa Street) from Doniphan Drive to Texas Avenue (AECOM, 2019)

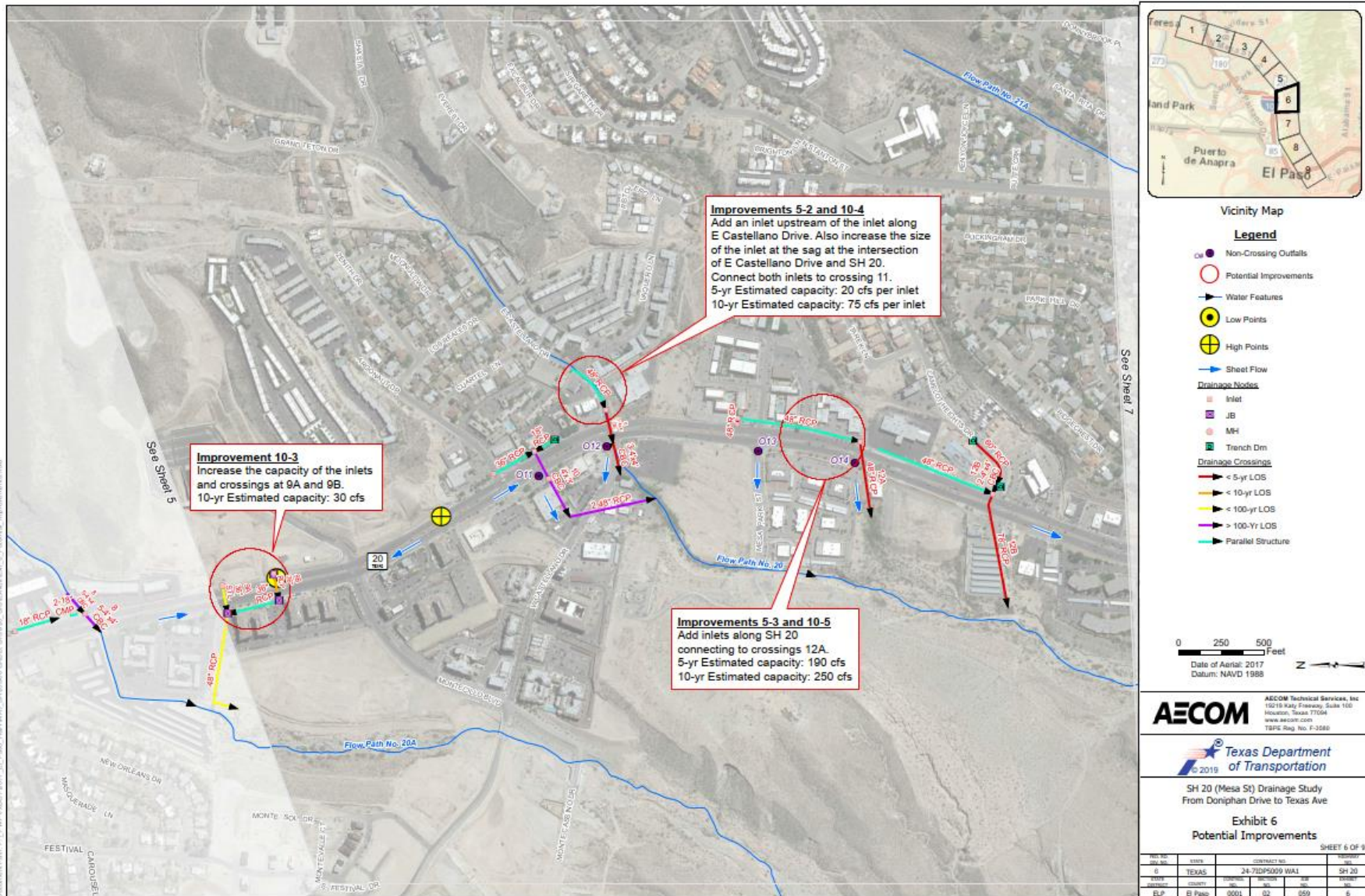


Figure 4D-2.2: Exhibit 6, Sheet 6 from Drainage Study for SH20 (Mesa Street) from Doniphan Drive to Texas Avenue (AECOM, 2019)

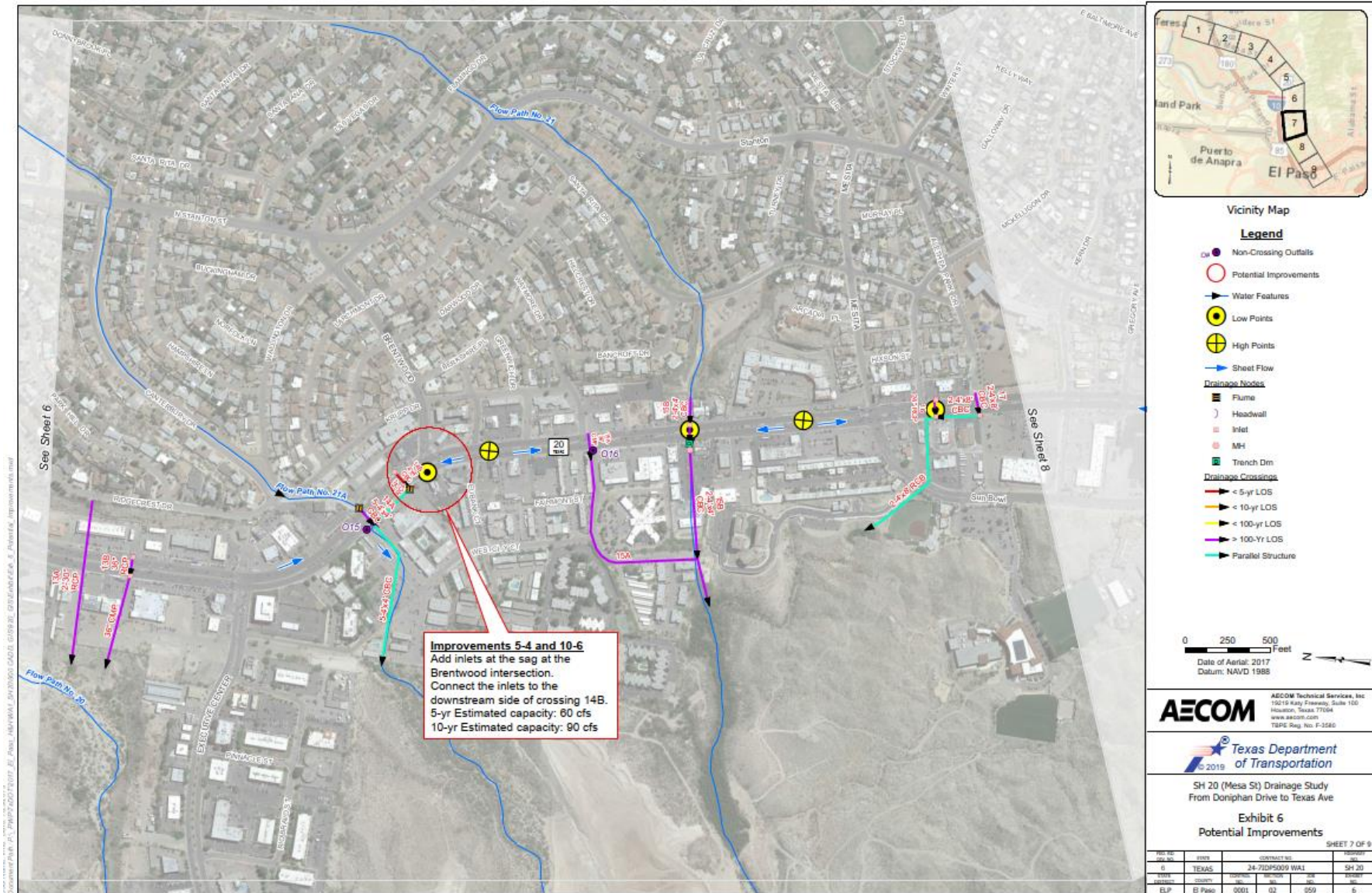


Figure 4D-2.3: Exhibit 6, Sheet 7 from Drainage Study for SH20 (Mesa Street) from Doniphan Drive to Texas Avenue (AECOM, 2019)

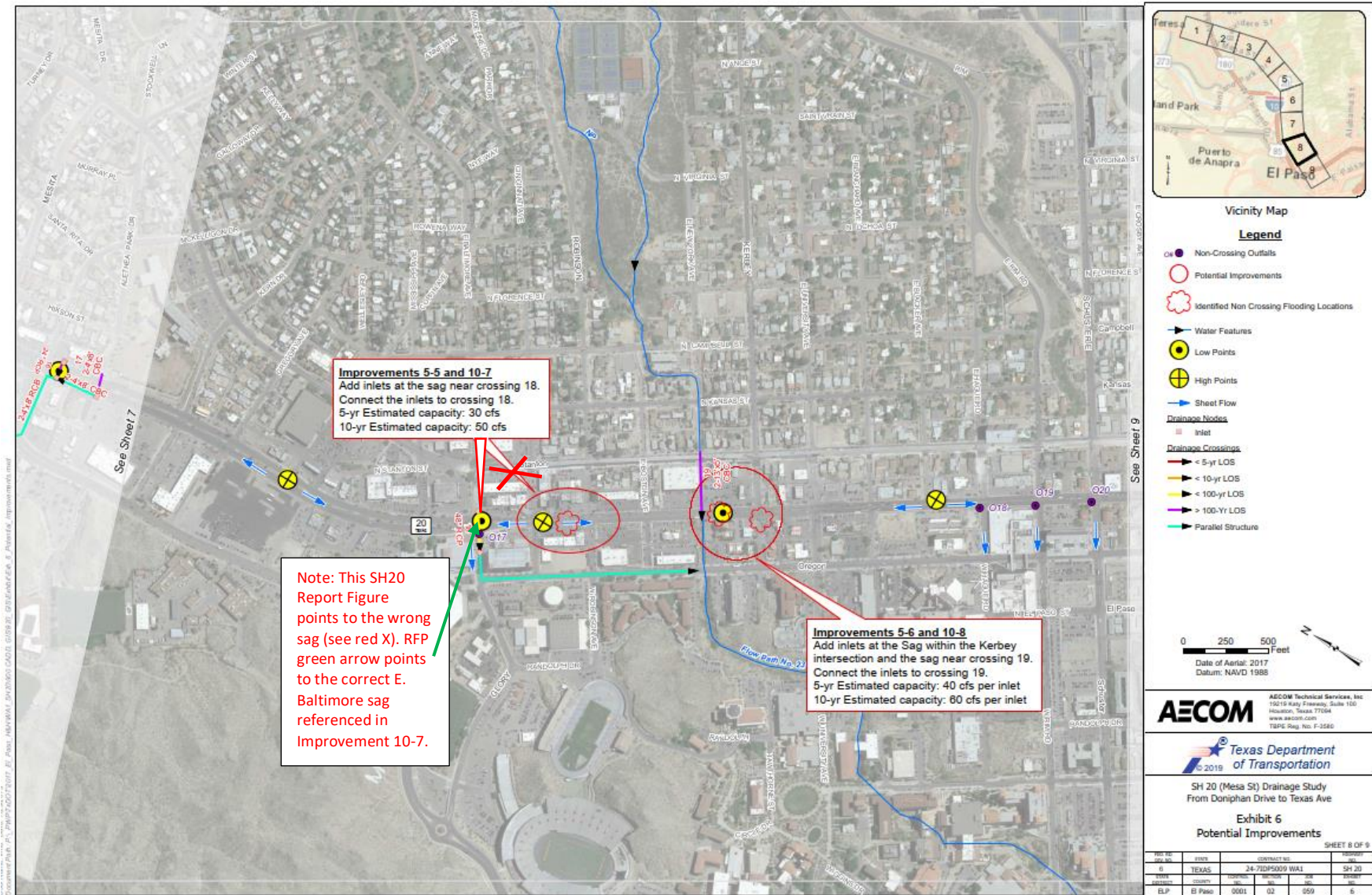


Figure 4D-2.4: Exhibit 6, Sheet 8 from Drainage Study for SH20 (Mesa Street) from Doniphan Drive to Texas Avenue (AECOM, 2019)

4D-3. Flood Mitigation Project ID: 143000007

Name: Install Flood Gates in Marfa and Monitoring Gage on North Alamito Creek and Highway 17

Description: Add flood gates to roadways at 4 LWCs on Alamito Creek, and a monitoring gage/early detection on North Alamito Creek at Hwy 17 Bridge upstream of Marfa. This provides early warning for Emergency Management to deploy before imminent road flooding.

Affected Jurisdictions: City of Marfa, Presidio County

Discussion on Cultural Resources Background: No cultural resources are located within or immediately adjacent to the project area. Assuming that the project design just includes facility updates and no ground disturbing activities are planned, SWCA recommends no cultural resources survey is necessary.

Project Description: A total of four flood gates will be added to the low water crossings shown in **Exhibit Map 20.7** of *Chapter 5*, and a new flood gage will be installed at North Alamito Creek under Hwy 17 Bridge to aid in providing early warning. While the FMS ID: 142000025 also affects early warning in the City of Marfa, the FMS depends on the implementation of a gage system which requires recurring costs, unlike this FMP. While the FMS would improve early warning times associated with this FMP, it is not required to be implemented before or after this FMP is constructed. A bid is included in **Appendix 4G**, provided by High Sierra Electronics, Inc. to City of Marfa on January 26, 2022 for the equipment and services associated with this FMP.

Estimated Cost for FMP:

Total FMP Cost	
Subtotal 1 – High Sierra Electronics Construction/Equipment Cost (Jan. 2022)	\$ 253,425
Subtotal 2 – RFP Construction/Equipment Cost (September 2020, using CCI)	\$ 232,099
RFP Total Construction/Equipment Cost (Sept. 2020)	\$ 232,099
Subtotal 3 – High Sierra Electronics Services/Installation Cost (Jan. 2022)	\$ 132,189
Subtotal 4 – High Sierra Electronics Maintenance/Operation Training Cost (Jan. 2022)	\$ 3,566
High Sierra Total Non Construction Cost (Jan 2022)	\$ 135,755
RFP Total Non-Construction Cost (September 2020, using CPI)	\$ 125,679
Total FMP Cost	\$ 358,000

4D-4. Flood Mitigation Project ID: 14300009

Name: Develop and Implement Floodplain Ordinance to Regulate Development at Hudspeth County

Description: Coordinate with Hudspeth County Commissioners, Road & Bridge Departments, Safety & Inspection Departments, and County Attorney to draft a floodplain ordinance (or modify an existing subdivision ordinance) to regulate development standards in Hudspeth County.

Affected Jurisdictions: Hudspeth County

Discussion on Cultural Resources Background: One NHRP District, 172 archaeological sites, and two cemeteries are located within Hudspeth County. The Butterfield Overland Mail Route National Register District is located within the northeastern corner of Hudspeth County, near Guadalupe Mountains National Park. The district includes multiple nineteenth century to mid-twentieth century road segments associated with the broad national pattern of western expansion and settlement. As the most significant cultural resource within the county, and the association of many archaeological sites within and outside of the district limits, cultural resources survey will be required within the district boundaries through Section 106; SWCA recommends cultural resource survey anywhere within 0.6-mile (1.0 kilometer) of the district boundary.

Project Description: A request submitted by Hudspeth County to receive an earmark for Federal funding from FEMA in April 2022 stated the following:

“Task 1. Develop and implement floodplain management regulations within Hudspeth County. In recent years, paid residential development has occurred in Hudspeth County in the region covered by this project. The County lacks an administrative and legal structure to require review and approval of drainage impacts of these developments. This task was recommended in the 2019 Colonia Area Plan, and endorsed as a potential non-structural Floodplain Mitigation Project (FMP) by the URGFP. Cost is estimated at \$50,000.”

Estimated Cost for FMP:

The funding earmark request submitted by Hudspeth County included an estimated cost of **\$50,000** based on coordination with the Regional Flood Planning Group (RFP) and El Paso County. A coordination call was held with Hudspeth County, El Paso County, and the RFP on April 7, 2022 to discuss the needs of Hudspeth County concerning regulation of new development and to seek input from El Paso County based on their current system. El Paso County described their challenges and successes related to new development. The discussion aided in the decision on an appropriate cost estimate for a consultant to evaluate Hudspeth County’s development process and make recommendations for improvements.

4D-5. Flood Mitigation Project ID: 143000011

Name: SSA4

Description: Detention Basin SSA4.

Affected Jurisdictions: City of Socorro, Sparks CDP, El Paso County

Discussion on Cultural Resources Background: The entire project area has been previously surveyed in 2010 by Geo-Marine Inc. on behalf of United States Army Corps of Engineers for a proposed detention basin, resulting in no newly documented cultural resources within the project area. SWCA, therefore, recommends no cultural resource survey necessary based on current design plans.

Discussion on Flood Risk: The El Paso County Stormwater Master Plan (AECOM, 2021) describes the existing flood risk for the project as the following:

“Uncontrolled flows originating in the upper end of the watershed pose a flood risk to the WWTP at the upstream end of the Sparks Arroyo and to residences located adjacent to the arroyo. Runoff from the development in Horizon City and other undeveloped areas on the mesa enters the upper tributaries of the watershed that converge to form the Sparks Arroyo. According to the USACE feasibility study, flows from these tributaries pose a flood risk to the WWTP at the upstream end of the Sparks Arroyo. The tributaries converge approximately 300 feet downstream of the WWTP. At this location, flows from the tributaries exceed the capacity of the Sparks Arroyo and pose a flood risk to residences downstream.”

Project Description: The El Paso County Stormwater Master Plan (AECOM, 2021) describes the project as the following:

“This project involves constructing a detention basin at the upper end of the Sparks Arroyo, just upstream of the WWTP. The proposed basin requires approximately 550 acre-feet of excavation for flood and sediment pool storage. The outlet structure for this basin consists of a 4-foot RCP. The basin has two primary purposes:

- Capture sediment being transported down the arroyos and reduce deposition in the downstream channels and floodplains; and
- Detain the flood flows coming down the arroyos and release them slowly from the detention basin at a rate that will reduce flooding downstream.”

Estimated Cost for FMP:

Total FMP Cost	
Subtotal 1 – El Paso County 2021 SWMP Construction Cost (February 2020)	\$ 6,768,982
Subtotal 2 – RFP Construction Cost (September 2020, using CCI)	\$ 6,830,162
Subtotal 3 – RFP Construction Contingency (35%)	\$ 2,390,557
Total Construction Cost	\$ 9,220,718
Subtotal 4 – El Paso County 2021 SWMP Land Acquisition Cost (February 2020)	\$ 632,000
Subtotal 5 – RFP Land Acquisition Cost (September 2020, using CPI)	\$ 635,914
Subtotal 6 – RFP Final Design Cost (20%)	\$ 1,844,144
Subtotal 7 – RFP Permitting Cost (10%)	\$ 922,072
Subtotal 8 – RFP Construction Oversight Cost (8%)	\$ 737,657
Subtotal 9 – RFP Geotech Cost (15%)	\$ 1,383,108
Total Non-Construction Cost	\$ 5,522,895
Total FMP Cost	\$ 14,744,000

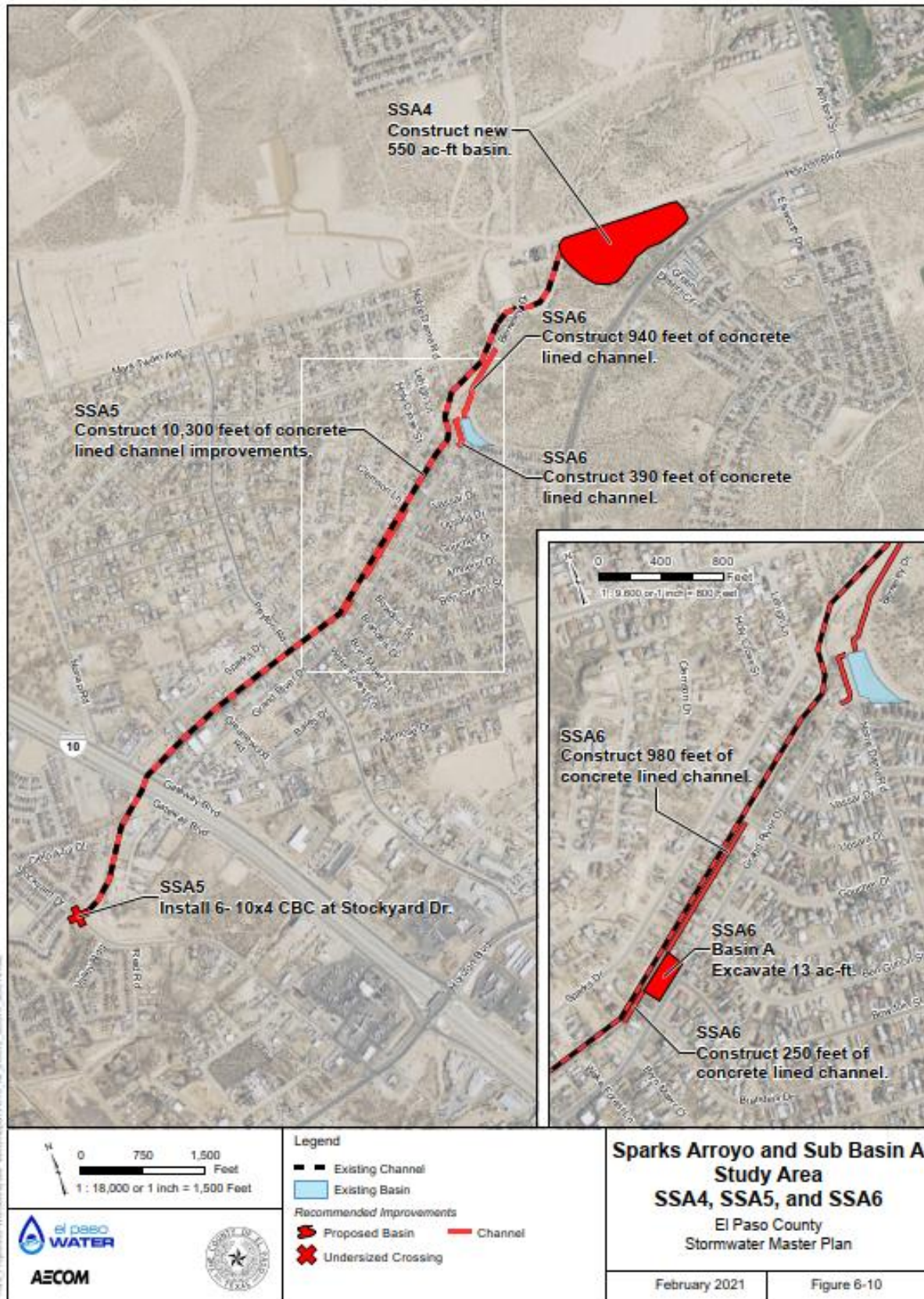


Figure 4D-5: Figure 6-10 from the El Paso County Stormwater Master Plan (AECOM, 2021)

4D-6. Flood Mitigation Project ID: 143000021

Name: SOC4

Description: Sediment/Detention Basin at “Mankato Arroyo”.

Affected Jurisdictions: El Paso County, City of Socorro, Athena West Colonia

Discussion on Cultural Resources Background: The project area is located within the EPCWID National Register District. As such, Section 106 of the NHPA will take effect and a cultural resources survey of the entire project area will be required to evaluate any unrecorded, potential cultural resources that can contribute to this district, and determine if any adverse effects will happen on historic properties.

Discussion on Flood Risk: The El Paso County Stormwater Master Plan (AECOM, 2021) describes the existing flood risk for the project as the following:

“Uncontrolled flows originating in the upper end of the watershed pose a flood risk to residences upstream of the intersection of Stream 5.5 and the Mesa Spur Drain. Runoff from undeveloped areas along the mesa is conveyed through the watershed via Stream 5.5. Additional runoff and sediment are accumulated as flows travel through the steepest part of the watershed. Several feet of sediment have been observed on Gateway E. Drive after major storm events. Approximately 1,000 feet upstream of the intersection of Stream 5.5 and Mankato Road, development and agricultural lands are present on both sides of the arroyo. The arroyo passes over a low water crossing at Mankato Road, depositing sediment before converging with the Mesa Spur Drain. The flows in the arroyo are uncontrolled and pose a flood risk to residences and agricultural lands adjacent to Stream 5.5.”

Project Description: The El Paso County Stormwater Master Plan (AECOM, 2021) describes the project as the following:

“This project involves constructing a detention basin at the lower end of Stream 5.5. The proposed embankment is approximately 29 feet tall and requires approximately 11 acre-feet of excavation for flood and sediment pool storage. The outlet structure for this basin consists of a 2-foot by 2-foot CBC. The basin has two primary purposes:

- Capture sediment being transported down the arroyos and reduce deposition in the downstream channels and floodplains.
- Detain the flood flows coming down the arroyos and release them slowly from the detention basin at a rate that will reduce flooding downstream.”

Estimated Cost for FMP:

Total FMP Cost	
Subtotal 1 – El Paso County 2010 SWMP Construction Cost (February 2010)	\$ 739,907
Subtotal 2 – RFP Construction Cost (September 2020, Using CCI)	\$ 980,000
Subtotal 3 – El Paso County 2021 SWMP Additional Construction Cost due to Atlas 14	\$ 70,000
Subtotal 4 – RFP Construction Contingency (35%)	\$ 367,500
Total Construction Cost	\$ 1,417,500
Subtotal 5 – El Paso County 2010 Land Acquisition Cost (February 2010)	\$ 178,626
Subtotal 6 – RFP Land Acquisition Cost (September 2020, Using CPI)	\$ 214,508
Subtotal 7 – RFP Final Design Cost (20%)	\$ 283,500
Subtotal 8 – RFP Permitting Cost (10%)	\$ 141,750
Subtotal 9 – RFP Construction Oversight Cost (8%)	\$ 113,400
Subtotal 10 – RFP Geotech Cost (15%)	\$ 212,625
Total Non-Construction Cost	\$ 965,783
Total FMP Cost	\$ 2,383,000



Figure 4D-6: Figure 6-15 from the El Paso County Stormwater Master Plan (AECOM, 2021)

4D-7. Flood Mitigation Project ID: 143000024

Name: MON3

Description: Sediment/Retention Basin.

Affected Jurisdictions: Homestead Meadows North CDP, Homestead Meadows South CDP, Butterfield CDP, El Paso County

Discussion on Cultural Resources Background: One prehistoric archaeological site is located within the proposed project area with undetermined NRHP eligibility. Given the proposed project includes significant ground disturbance and potential for cultural resources, SWCA recommends a structured cultural resources survey of the project area for due diligence.

Discussion on Flood Risk: The El Paso County Stormwater Master Plan (AECOM, 2021) describes the existing flood risk for the project as the following:

“Uncontrolled flows originating in the slopes above Flowpaths M-2, M-3, and M-5 spread out over a vast area, merging and diverging from each other at various points. The majority of the flows concentrate at a narrow opening between hills located approximately 2,000 feet south of the intersection of Stagecoach Drive and Old Butterfield Trail. From here, these flows continue westward down Flowpath M-3 contributing to flooding of numerous residences and conveying debris that overwhelms a series of culvert crossings. These flows ultimately terminate at several large natural depressions. Several residences are located within this natural depression and are impacted by major storm events.”

Project Description:

The El Paso County Stormwater Master Plan (AECOM, 2021) describes the project as the following:

“This project involves constructing a detention basin on Flowpath M-3. The proposed basin controls flows from the upper end of the watershed and contains two embankments. The proposed embankments for the basin are approximately 25 feet tall and 27 feet tall and require approximately 4 acre-feet of excavation for flood and sediment pool storage. The outlet structure for the basin consists of two 4-foot by 4-foot CBCs. The basin has two primary purposes:

- Capture sediment being transported down the arroyos and reduce deposition in the downstream channels and floodplains.
- Detain the flood flows coming down the arroyos and release them slowly from the detention basin at a rate that will reduce flooding downstream.”

Estimated Cost for FMP:

Total FMP Cost	
Subtotal 1 – El Paso County 2021 SWMP Construction Cost (February 2020)	\$ 12,970,769
Subtotal 2 – RFP Construction Cost (September 2020, using CCI)	\$ 13,088,002
Subtotal 3 – RFP Construction Contingency (35%)	\$ 4,580,801
Total Construction Cost	\$ 17,668,803
Subtotal 4 – El Paso County 2021 SWMP Land Acquisition Cost (February 2010)	\$ -
Subtotal 5 – RFP Land Acquisition Cost (September 2020, using CPI)	\$ -
Subtotal 6 – RFP Final Design Cost (20%)	\$ 3,533,761
Subtotal 7 – RFP Permitting Cost (10%)	\$ 1,766,880
Subtotal 8 – RFP Construction Oversight Cost (8%)	\$ 1,413,504
Subtotal 9 – RFP Geotech Cost (15%)	\$ 2,650,320
Total Non-Construction Cost	\$ 9,364,465
Total FMP Cost	\$ 27,033,000

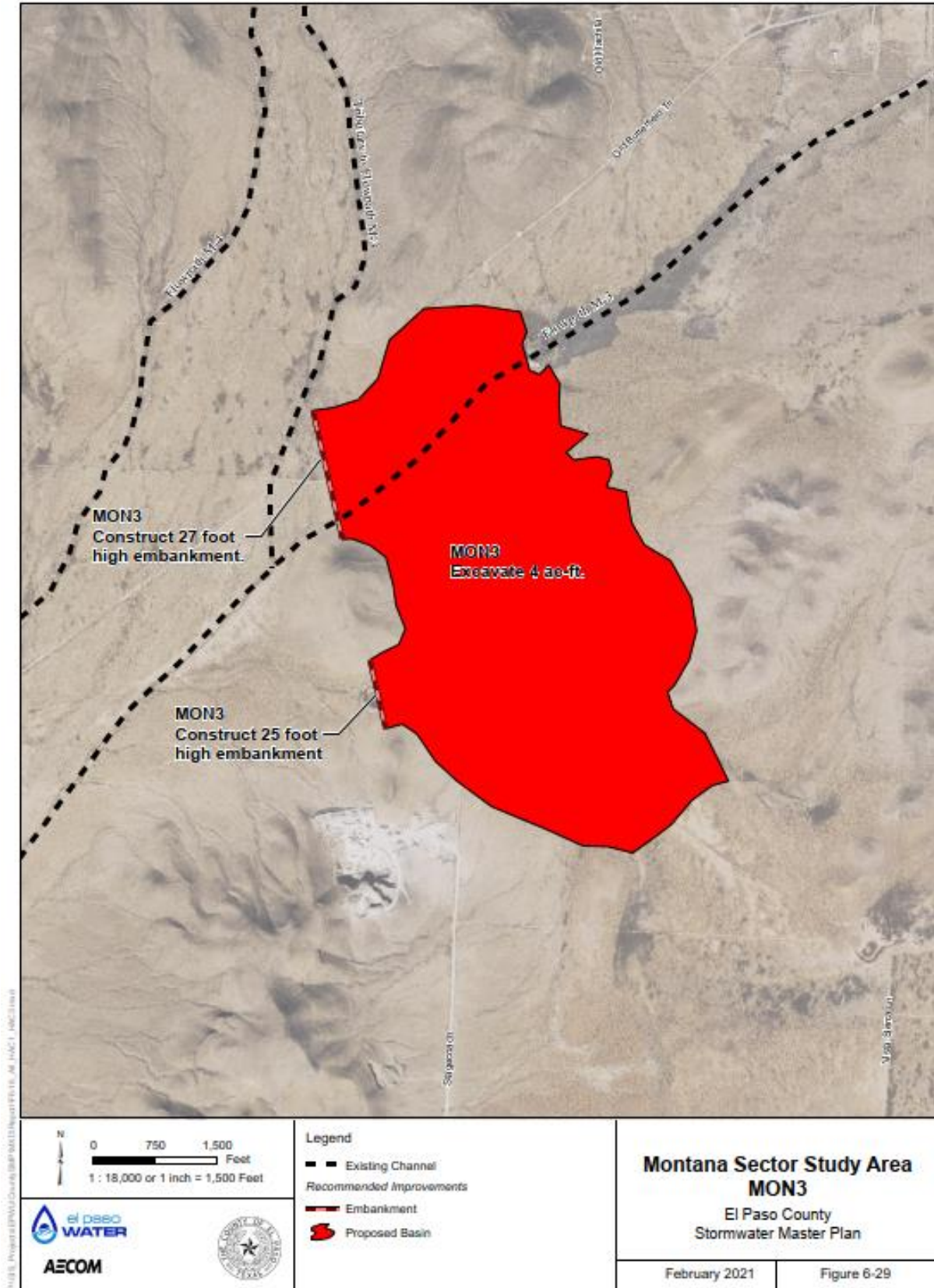


Figure 4D-7: Figure 6-29 from the El Paso County Stormwater Master Plan (AECOM, 2021)

4D-8. Flood Mitigation Project ID: 143000025

Name: HAC3

Description: Sediment/Retention Basin.

Affected Jurisdictions: El Paso County

Discussion on Cultural Resources Background: El Paso County Water Improvement District No. 1 (EPCWID) National Register District is located 770 feet (234 meters) to the west of the proposed project area. The EPCWID National Register District is an operational, historic-age irrigation system designed by the Bureau of Reclamation in the early twentieth century. The historic irrigation system is located within the El Paso Valley of the Rio Grande River, serving over 56,000 acres of farmland through the major Franklin and Riverside canals. The system helped to transform local and statewide irrigation agriculture as El Paso Valley shifted exclusively to the production of cash crops. Only publicly owned properties are included within this district; this does not include privately owned features, such as ditches and fields, served by the publicly owned portions of the system, or the thousands of properties lying between the ditches defining the system (National Park Service 1997). As the project area is located within a National Register District, Section 106 of the NHPA will take effect and a cultural resources survey of the entire project area will be required to evaluate any unrecorded, potential cultural resources that can contribute to this district, and determine if any adverse effects will happen on historic properties.

Discussion on Flood Risk: The El Paso County Stormwater Master Plan (AECOM, 2021) describes the existing flood risk for the project as the following:

“Uncontrolled flows originating in the upper end of the watershed are causing flooding at the mouth of Stream 8, upstream of Northloop Drive. Runoff from undeveloped areas along the mesa is conveyed through the watershed via Stream 8. Additional runoff and sediment are accumulated as flows travel through the steepest part of the watershed. Approximately 1,500 feet east of the intersection of Virrey Road and Reina Road, the arroyo becomes undefined, with no clear outfall to the Mesa Drain. At this location, flows spread out flooding a number of residences and depositing sediment.”

Project Description: The El Paso County Stormwater Master Plan (AECOM, 2021) describes the project as the following:

“This project involves constructing a retention basin at the lower end of Stream 8. The proposed embankment is approximately 6 feet tall and requires approximately 68 acre-feet of excavation for flood and sediment pool storage. The outlet structure for the basin consists of a 2-foot by 2-foot CBC. The basin has two primary purposes:

- Capture sediment being transported down the arroyos and reduce deposition in the downstream channels and floodplains; and
- Retain the flood flows coming down the arroyos and allow minimal releases.”

Estimated Cost for FMP:

Total FMP Cost	
Subtotal 1 – El Paso County 2010 SWMP Construction Cost (February 2010)	\$ 1,582,638
Subtotal 2 – RFP Construction Cost (September 2020, Using CCI)	\$ 2,100,000
Subtotal 3 – El Paso County 2021 SWMP Additional Construction Cost due to Atlas 14	\$ 120,000
Subtotal 4 – RFP Construction Contingency (35%)	\$ 777,000
Total Construction Cost	\$ 2,997,000
Subtotal 5 – El Paso County 2010 Land Acquisition Cost (February 2010)	\$ 27,833
Subtotal 6 – RFP Land Acquisition Cost (September 2020, Using CPI)	\$ 33,424
Subtotal 7 – RFP Final Design Cost (20%)	\$ 599,400
Subtotal 8 – RFP Permitting Cost (10%)	\$ 299,700
Subtotal 9 – RFP Construction Oversight Cost (8%)	\$ 239,760
Subtotal 10 – RFP Geotech Cost (15%)	\$ 449,550
Total Non-Construction Cost	\$ 1,621,834
Total FMP Cost	\$ 4,619,000

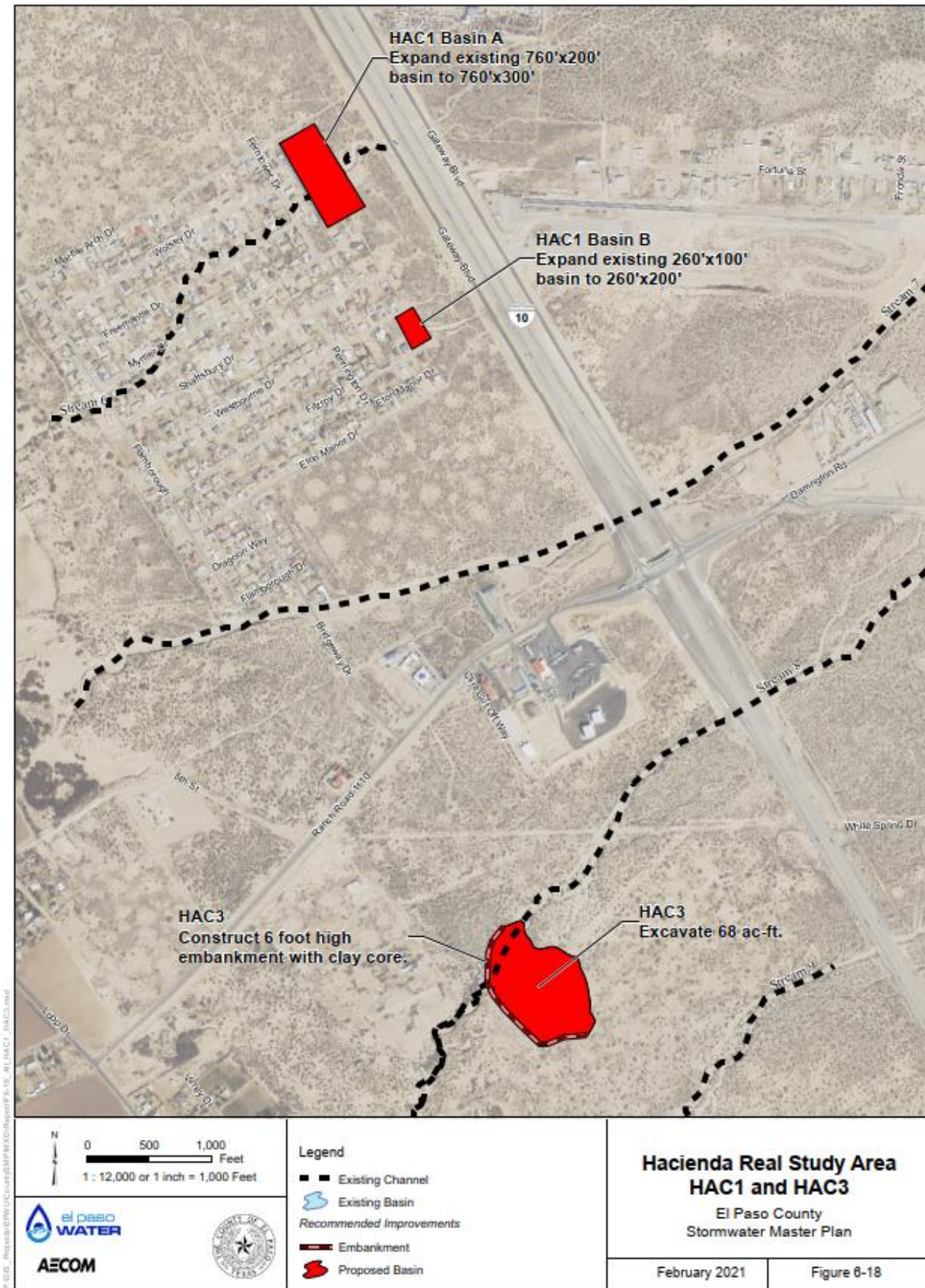


Figure 4D-8: Figure 6-18 from the El Paso County Stormwater Master Plan (AECOM, 2021)

4D-9. Flood Mitigation Project ID: 143000097

Name: NW16

Description: Expand channel from Village Ct to Doniphan Dr.

Affected Jurisdictions: City of El Paso

Discussion on Cultural Resources Background: The proposed project area is located within the Elephant Butte Irrigation National Register District. The Elephant Butte Irrigation National Register District is an operational, historic-age irrigation system designed by the Bureau of Reclamation in the early twentieth century. The historic irrigation system is located within the Rincon and Mesilla Valley of the Rio Grande River, serving over 100,000 acres of farmland between New Mexico and Texas. The system was developed in 1906 by the Bureau of Reclamation, impacting local and statewide irrigation agriculture as El Paso Valley shifted exclusively to the production of cash crops. Only publicly owned properties are included within this district; this does not include privately owned features, such as ditches and fields, served by the publicly owned portions of the system (National Park Service 1997). As the project area is located within a National Register District, Section 106 of the NHPA will take effect and a cultural resources survey of the entire project area will be required to evaluate any unrecorded, potential cultural resources that can contribute to this district, and determine if any adverse effects will happen on historic properties.

Discussion on Flood Risk: The El Paso Water Utilities and City of El Paso Stormwater Master Plan (AECOM, 2009) describes the existing flood risk for the project (White Spur Drain – Upstream) as the following:

“East extent of White Spur Drain is undersized.”

Project Description:

The El Paso Water Utilities and City of El Paso Stormwater Master Plan (AECOM, 2009) describes the project as the following:

“The hydraulic analysis indicates the channel in the upper section of the White Spur Drain is undersized. The existing concrete-lined channel has a depth of 3 feet, with side slopes of 1.25H:1V, and a bottom width of 6 feet. The proposed channel should be 4.5 feet deep, with side slopes of 1.25H:1V and a bottom width of 6 feet.”

Estimated Cost for FMP:

Total FMP Cost	
Subtotal 1 – EPW 2009 SWMP Construction Cost (March 2009)	\$ 561,481
Subtotal 2 – RFP Construction Cost (September 2020, using CCI)	\$ 760,000
Subtotal 3 – RFP Construction Contingency (35%)	\$ 266,000
Total Construction Cost	\$ 1,026,000
Subtotal 4 – EPW 2009 SWMP Land Acquisition Cost (March 2009)	\$ -
Subtotal 5 – RFP Land Acquisition Cost (September 2020, using CPI)	\$ -
Subtotal 6 – RFP Final Design Cost (20%)	\$ 205,200
Subtotal 7 – RFP Permitting Cost (10%)	\$ 102,600
Subtotal 8 – RFP Construction Oversight Cost (8%)	\$ 82,080
Subtotal 9 – RFP Geotech Cost (15%)	\$ 153,900
Total Non-Construction Cost	\$ 543,780
Total FMP Cost	\$ 1,570,000



Figure 4D-9: Figure 8-5-12 from EPWater & COEP Stormwater Master Plan (AECOM, 2021)

4D-10. Flood Mitigation Project ID: 143000100

Name: NE3B

Description: Alcan Pond: new catch basin to capture FP15 upstream.

Affected Jurisdictions: City of El Paso

Discussion on Cultural Resources Background: No cultural resources are located within or immediately adjacent to the project area, and the area has not been previously surveyed for cultural resources. Given that the proposed design includes facility improvements, SWCA recommends no cultural resources survey of the project area are necessary based on current design plans.

Discussion on Flood Risk: The City of El Paso Stormwater Master Plan (AECOM, 2021) describes the existing flood risk for the project as the following:

“Undersized crossings, unfinished earthen channels, and sediment transfer clogging culverts.”

Project Description: The City of El Paso Stormwater Master Plan (AECOM, 2021) describes the existing flood risk for the project as the following:

“Construct Alcan Pond: new catch basin to capture Flow Path 15 upstream.”

Estimated Cost for FMP:

Total FMP Cost	
Subtotal 1 – EPW 2021 SWMP Construction Cost (December 2018)	\$ 10,000,000
Subtotal 2 – RFP Construction Cost (September 2020, using CCI)	\$ 10,280,000
Subtotal 3 – RFP Construction Contingency (35%)	\$ 3,598,000
Total Construction Cost	\$ 13,878,000
Subtotal 4 – EPW 2021 SWMP Land Acquisition Cost (December 2018)	\$ -
Subtotal 5 – RFP Land Acquisition Cost (September 2020, using CPI)	\$ -
Subtotal 6 – RFP Final Design Cost (20%)	\$ 2,775,600
Subtotal 7 – RFP Permitting Cost (10%)	\$ 1,387,800
Subtotal 8 – RFP Construction Oversight Cost (8%)	\$ 1,110,240
Subtotal 9 – RFP Geotech Cost (15%)	\$ 2,081,700
Total Non-Construction Cost	\$ 7,355,340
Total FMP Cost	\$ 21,234,000



Figure 4D-10: Figure 8-4-3 from EPWater & COEP Stormwater Master Plan (AECOM, 2021)

4D-11. Flood Mitigation Project ID: 143000105

Name: EA10A

Description: Build sediment/detention basin upstream of Paseo del Este Drive.

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

Discussion on Cultural Resources Background: No cultural resources are within or immediately adjacent to the project area. Given the lack of cultural resources, and overall, shallowly buried, weakly developed soils within the area, SWCA recommends no cultural resources survey of the project area, based on current design plans.

Discussion on Flood Risk: The City of El Paso Stormwater Master Plan (AECOM, 2021) describes the existing flood risk for the project as the following:

“Undersized crossings, unfinished earthen channels, and sediment transfer clogging culverts.”

Project Description: The City of El Paso Stormwater Master Plan (AECOM, 2021) describes the existing flood risk for the project as the following:

“The proposed improvements at Mercantile Channel consist of two phases, as shown on Figure. Phase 1 consists of a 140 acre-foot desilting/detention basin. The desilting/detention basin would be located upstream of the Mercantile Channel crossing at Mercantile Avenue. Phase 2 consists of one new concrete-lined channel section. The concrete-lined channel section would consist of a trapezoidal section with approximate dimensions consisting of a 20-foot bottom, 1H:1V side slopes and 5-foot normal depth.”

Estimated Cost for FMP:

Total FMP Cost	
Subtotal 1 – EPW 2009 SWMP Construction Cost (March 2009)	\$ 3,438,519
Subtotal 2 – RFP Construction Cost (September 2020, using CCI)	\$ 4,630,000
Subtotal 3 – RFP Construction Contingency (35%)	\$ 1,620,500
Total Construction Cost	\$ 6,250,500
Subtotal 4 – EPW 2009 SWMP Land Acquisition Cost (March 2009)	\$ 67,766
Subtotal 5 – RFP Land Acquisition Cost (September 2020, using CPI)	\$ 83,536
Subtotal 6 – RFP Final Design Cost (20%)	\$ 1,250,100
Subtotal 7 – RFP Permitting Cost (10%)	\$ 625,050
Subtotal 8 – RFP Construction Oversight Cost (8%)	\$ 500,040
Subtotal 9 – RFP Geotech Cost (15%)	\$ 937,575
Total Non-Construction Cost	\$ 3,396,301
Total FMP Cost	\$ 9,647,000

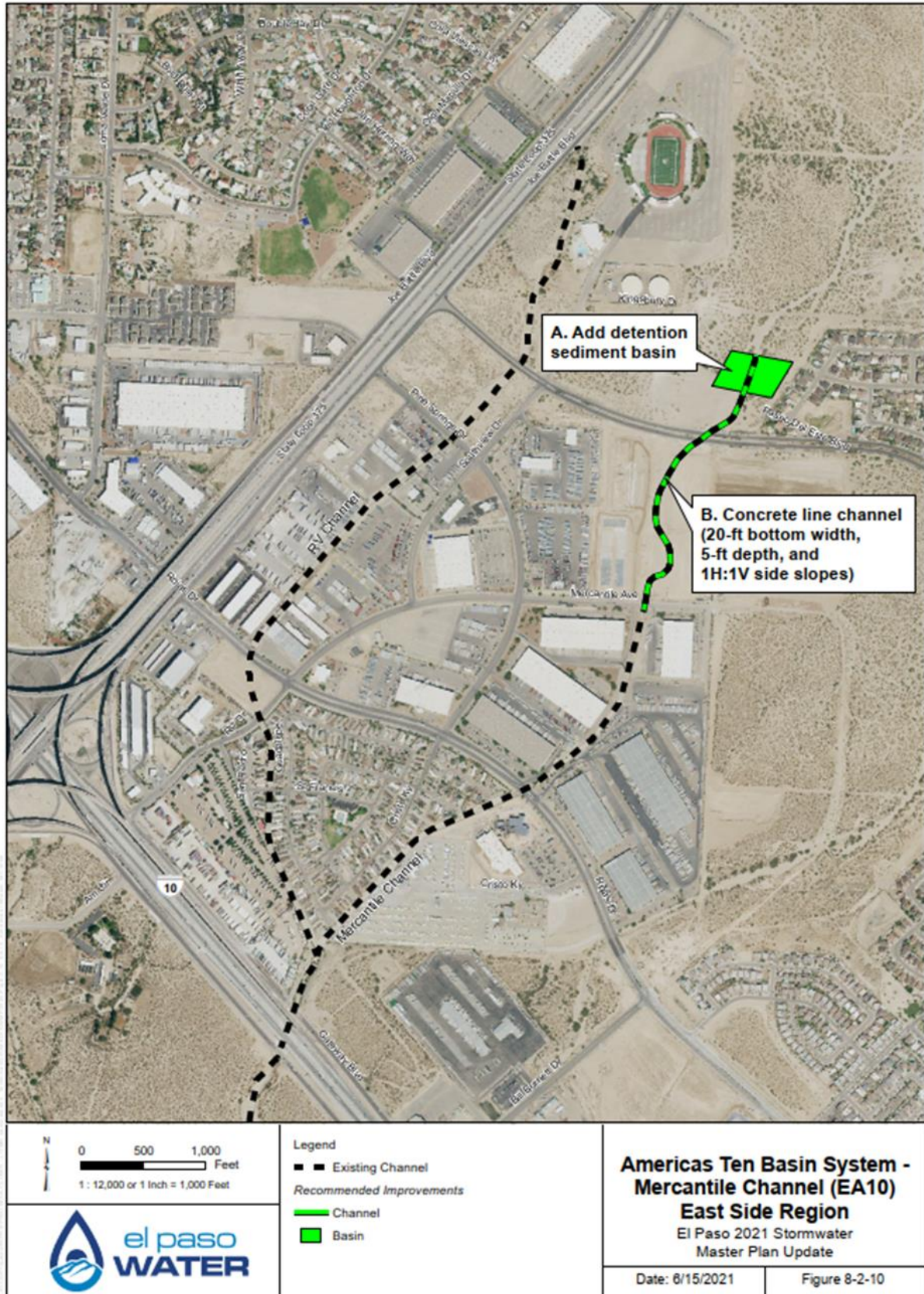


Figure 4D-11: Figure 8-2-10 from EPWater & COEP Stormwater Master Plan (AECOM, 2021)

4D-12. Flood Management Evaluation ID: 143000111

Name: NW3

Description: Construction of new larger capacity Doniphan Pump Station to replace PS1, with new force main directly to the Rio Grande. Install new catch basin with mechanical bar screen upstream of PS2.

Affected Jurisdictions: City of El Paso

Discussion on Cultural Resources Background: The proposed project area is located within the Elephant Butte Irrigation National Register District. As the project area is located within a National Register District, Section 106 of the NHPA is triggered, however, as the project consists of facility upgrades and is located along a developed, concrete roadway, SWCA proposes no cultural resources survey and instead a consultation with THC for concurrence of no survey.

Discussion on Flood Risk: The City of El Paso Stormwater Master Plan (AECOM, 2021) describes the existing flood risk for the project as the following:

“PSs in Doniphan system are undersized.”

The El Paso Water Utilities and City of El Paso Stormwater Master Plan (URS, MCI, 2009) describes the existing flood risk for the project as the following:

“The two pump stations (PS13 and PS14) located along Doniphan Drive currently take flow from the roadway and discharge it into the Keystone Dam Outlet Conduit. This is not a preferred condition as it can adversely affect the functionality of the Keystone Dam Outlet Conduit and the pump stations. The proposed solution is to have the pump stations discharge directly into Doniphan Ditch via a 36-inch pipe for PS14 and a 42-inch pipe for PS13, as shown on Figure 8-36. As PS13 is within the State of New Mexico, coordination with relevant stakeholders will be required. This project will only be possible after projects NW1 and NW2 are complete.”

Project Description: The City of El Paso Stormwater Master Plan (AECOM, 2021) describes the existing flood risk for the project as the following:

“Acquire land, construct a permanent wetland, install a storm drain system to Doniphan Drive, construct pipeline to Doniphan Pump Station and build new pump station to control flood levels.”

Estimated Cost for FME:

Total FMP Cost	
Subtotal 1 – Feasibility Study Construction Cost (URS, July 2014)	\$ 6,680,900
Subtotal 2 – RFP Construction Cost (September 2020, using CCI)	\$ 7,810,000
Subtotal 3 – RFP Construction Contingency (35%)	\$ 2,733,500
Total Construction Cost	\$ 10,543,500
Subtotal 4 – EPW 2021 SWMP Land Acquisition Cost (December 2018)	\$ -
Subtotal 5 – RFP Land Acquisition Cost (September 2020, using CPI)	\$ -
Subtotal 6 – RFP Final Design Cost (20%)	\$ 2,108,700
Subtotal 7 – RFP Permitting Cost (10%)	\$ 1,054,350
Subtotal 8 – RFP Construction Oversight Cost (8%)	\$ 843,480
Subtotal 9 – RFP Geotech Cost (15%)	\$ 1,581,525
Total Non-Construction Cost	\$ 5,588,055
Total FMP Cost	\$ 16,132,000

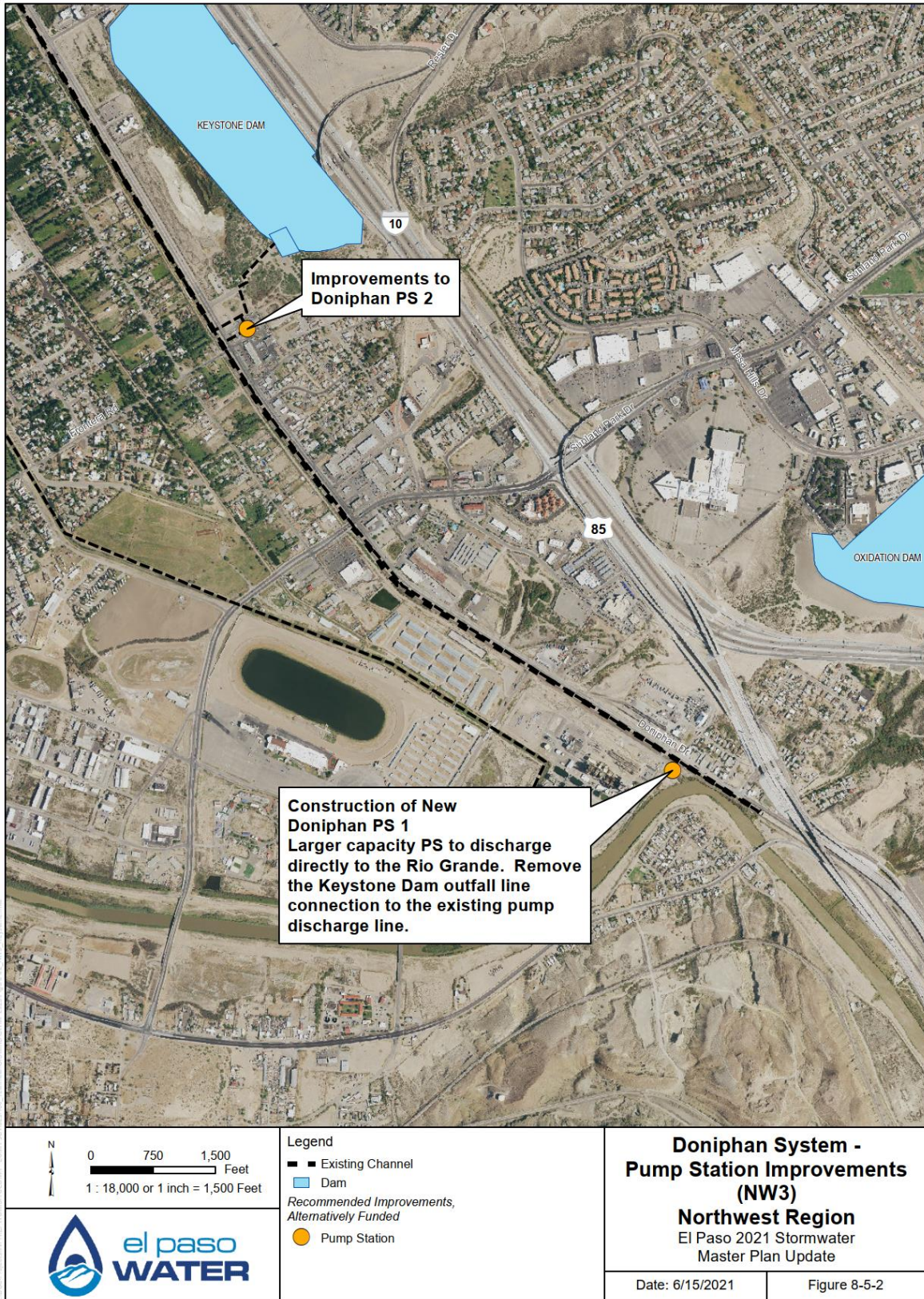


Figure 4D-12: Figure 8-5-2 from EPWater & COEP Stormwater Master Plan (AECOM, 2021)

4D-13. Flood Mitigation Project ID: 143000113

Name: NW26

Description: Acquire land, construct a permanent wetland, install a storm drain system to Doniphan Drive, construct pipeline to Doniphan Pump Station, and build new pump station to control flood levels.

Affected Jurisdictions: City of El Paso, City of Sunland Park (New Mexico)

Discussion on Cultural Resources Background: No cultural resources are located within or immediately adjacent to the project area. The Elephant Butte Irrigation National Register District is located 0.2 miles (0.3 kilometers) to the northeast of the proposed project area. As such, SWCA recommends that a structured cultural resources survey of the final design plan, for due diligence, be performed to accurately assess the presence and significance of unrecorded cultural resources within its boundaries, especially in relation to the Elephant Butte Irrigation National Register District.

Discussion on Flood Risk: The City of El Paso Stormwater Master Plan (AECOM, 2021) describes the existing flood risk for the project as the following:

“Reduce flooding of Doniphan Drive and create control of the Montoya Drain System & Keystone Outfall with new pump station”

Project Description: The City of El Paso Stormwater Master Plan (AECOM, 2021) describes the existing flood risk for the project as the following:

“Acquire land, construct a permanent wetland, install a storm drain system to Doniphan Drive, construct pipeline to Doniphan Pump Station and build new pump station to control flood levels.”

Estimated Cost for FMP:

Total FMP Cost	
Subtotal 1 – EPW 2021 SWMP Construction Cost (December 2018)	\$ 16,582,175
Subtotal 2 – RFP Construction Cost (September 2020, using CCI)	\$ 17,058,829
Subtotal 3 – Planning, Design & Const. of Nature-based Solution (Wetland) (Jan 2015)	\$ 101,175
Subtotal 4 – RFP Nature-Based Solution Cost (Wetland) (September 2020, using CCI)	\$ 116,668
Subtotal 3 – RFP Construction Contingency (35%)	\$ 5,970,590
Total Construction Cost	\$ 23,247,000
Subtotal 4 – EPW 2021 SWMP Land Acquisition Cost (December 2018)	\$ -
Subtotal 5 – RFP Land Acquisition Cost (September 2020, using CPI)	\$ -
Subtotal 6 – RFP Final Design Cost (20%)	\$ 4,649,400
Subtotal 7 – RFP Permitting Cost (10%)	\$ 2,324,700
Subtotal 8 – RFP Construction Oversight Cost (8%)	\$ 1,859,760
Subtotal 9 – RFP Geotech Cost (15%)	\$ 3,487,050
Total Non-Construction Cost	\$ 12,320,910
Total FMP Cost	\$ 35,568,000



Figure 4D-13: Figure 8-5-14 from EPWater & COEP Stormwater Master Plan (AECOM, 2021)

4D-14. Flood Mitigation Project ID: 143000116

Name: EA9A

Description: Build sediment/detention basin upstream of Paseo del Este Drive.

Affected Jurisdictions: City of El Paso, City of Socorro

Discussion on Cultural Resources Background: No cultural resources are within or immediately adjacent to the project area. Given the lack of cultural resources, and overall, shallowly buried, weakly developed soils within the area, SWCA recommends no cultural resources survey of the project area, based on current design plans.

Discussion on Flood Risk: The City of El Paso Stormwater Master Plan (AECOM, 2021) describes the existing flood risk for the project as the following:

“Undersized crossings, unfinished earthen channels, and sediment transfer clogging culverts.”

Project Description: The City of El Paso Stormwater Master Plan (AECOM, 2021) describes the existing flood risk for the project as the following:

“The proposed improvements at RV Channel consist of two phases, as shown on Figure 8-14. Phase 1 consists of an 80 acre-feet desilting/detention basin. The desilting/detention basin would be located upstream of the RV Channel crossing at Paseo del Este Boulevard. Phase 2 consists of three concrete-lined channel sections. The first concrete-lined channel section would consist of a trapezoidal section with approximate dimensions consisting of a 20-foot bottom, 1H:1V side slopes and 4-foot normal depth. The second concrete-lined channel section would consist of a trapezoidal section with approximate dimensions consisting of a 30-foot bottom, 1H:1V side slopes and 4-foot normal depth. The third concrete-lined channel section would consist of a trapezoidal section with approximate dimensions consisting of a 40-foot bottom, 1H:1V side slopes and 2-foot normal depth, located downstream of the junction point with the Mercantile Channel heading towards IH-10.”

Estimated Cost for FMP:

Total FMP Cost	
Subtotal 1 – EPW 2009 SWMP Construction Cost (March 2009)	\$ 4,273,333
Subtotal 2 – RFP Construction Cost (September 2020, using CCI)	\$ 5,760,000
Subtotal 3 – RFP Construction Contingency (35%)	\$ 2,016,000
Total Construction Cost	\$ 7,776,000
Subtotal 4 – EPW/COEP 2009 SWMP Land Acquisition Cost (March 2009)	\$ 3,155,850
Subtotal 5 – RFP Land Acquisition Cost (Land is Acquired per EPWater Coordination)	\$ -
Subtotal 6 – RFP Final Design Cost (20%)	\$ 1,555,200
Subtotal 7 – RFP Permitting Cost (10%)	\$ 777,600
Subtotal 8 – RFP Construction Oversight Cost (8%)	\$ 622,080
Subtotal 9 – RFP Geotech Cost (15%)	\$ 1,166,400
Total Non-Construction Cost	\$ 4,121,280
Total FMP Cost	\$ 11,897,000

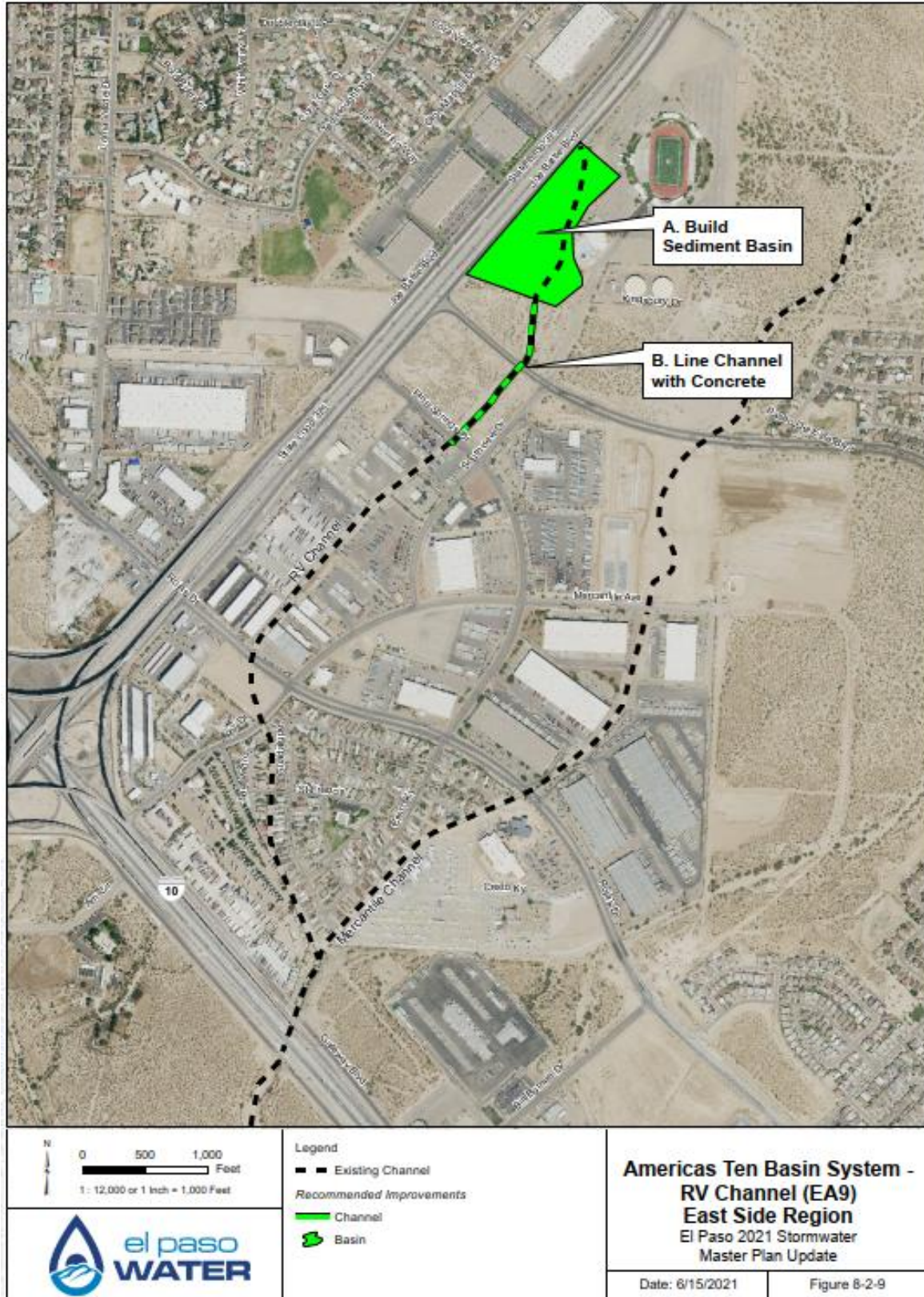


Figure 4D-14: Figure 8-2-9 from EPWater & COEP Stormwater Master Plan (AECOM, 2021)

Appendix 4E

Evaluation Summary Table of Potentially Feasible Flood Management Strategies

Table 4E. Potentially Feasible Flood Management Strategies Identified by RFPG

FMS ID	FMS Name	Description	Associated Goals (ID)	Associated FME, FMS, or FMP	Associated FME, FMS, or FMP Description	Counties	HUCs	Strategy Type	Strategy Project Area (sqmi)	Flood Risk Type (Riverine, Coastal, Urban, Playa, Other)	Sponsor
14200001	FEMA Levee Accreditation for All Rio Grande Levees at El Paso	Coordination needed between USIBWC, FEMA, El Paso Water, El Paso County, Doña Ana County, and Hudspeth County to certify and accredit all remaining levee segments through El Paso County. Interior drainage studies are needed in Hudspeth and Doña Ana.	14004001	N/A	N/A	El Paso	13030102, 13040100	Regulatory and Guidance	91.19	Riverine	USIBWC, El Paso Water, El Paso County, Doña Ana County, Hudspeth County
14200002	Irrigation and Recharge Application of Captured Rainwater Runoff at Alpine	Construct rainwater basins at 3 locations around Kokernot Park to drain neighboring streets, impound runoff volume, promote infiltration and aquifer recharge, reduce landscaping water costs, and remediate pollutants.	14012001, 14013001	N/A	N/A	Brewster	13070006	Infrastructure Projects	0.06	Urban/Local	City of Alpine, Brewster County
14200003	Implement Colonia-wide Drainage System and Maintenance and Outreach Program for Roadside Swales and Driveway Culverts at Fort Hancock	Construct drainage improvements as detailed in FME ID: 141000014; maintain existing roadside ditches/swales to ensure positive drainage; and develop an outreach program to encourage residents to maintain and repair driveway culverts.	14007001, 14007002, 14014001, 14009002, 14009004, 14010001, 14010002	FME ID: 141000014	FME ID: 141000014 will be done prior to identify flood mitigation improvements in Fort Hancock and Acala.	Hudspeth	13040100	Education and Outreach, Other	1.12	Urban/Local	Fort Hancock CDP, Hudspeth County
14200004	Coordination with Ft. Bliss for FMP Permitting and Maintenance Access	El Paso Water designed NE7 on Ft. Bliss near unexploded ordinances (UXOs), and has an easement to maintain Fusselman and Northgate Dams, but can't access them due to UXOs. El Paso County designed MON1 on Ft. Bliss near a training ground and potential UXOs.	14007003, 14011001, 14009001, 14009003, 14010001, 14010002	N/A	N/A	El Paso	13040100	Infrastructure Projects	0.67	Urban/Local	El Paso Water, El Paso County, U.S. Army
14200005	Maintenance Program to control Salt Cedar vegetation along Rio Grande upstream of Presidio	Study to develop alternatives to clear vegetation along the Rio Grande between Candelaria and City of Presidio to allow for proper drainage for communities located along FM 170. Coordination needed between RGCOG, Presidio County, TXDOT, USACE and USIBWC.	14007003, 14012001	FMS ID: 142000007	FMS ID: 142000007 will follow as it utilizes this FME's saltcedar research.	Presidio	13040201	Education and Outreach, Other	28.86	Urban/Local	RGCOG, Presidio County, TXDOT, USIBWC, USACE
14200006	Study Binational Streamflow Recommendations for Big Bend Reach of Rio Grande/Rio Bravo	Conduct study with recommendations for binationally beneficial stream flows for Big Bend reach of the Rio Grande/Rio Bravo. Study will identify stream flows to support the river's ecological environment in state and federal parks in the U.S. and Mexico.	14007003, 14012001	FME ID: 141000008; FME ID: 141000015; FMS ID: 142000016	FME 141000008 precedes to assess how proposed sediment control on Alamito & Terneros Creeks affect recommended pulse flows. FME 141000015 & FMS 142000016 precede as they provide method for estimating sediment loads & develop erosion solutions for region.	Presidio, Brewster	13040203, 13040204, 13040205, 13040202, 13040201	Other	212.79	Riverine	Presidio County, USIBWC, RG/B Basin Flows Collaboration, Rio Grande Joint Venture
14200007	Study to plan the management of saltcedar growth and debris in channels in/adjacent to City of Pecos	Study to identify and characterize alternatives to manage vegetation in natural drainages in and adjacent to the City of Pecos to increase conveyance and reduce flooding within the City of Pecos.	14012001	FME ID: 141000010; FMS ID: 142000005	FME ID: 141000010 will be done prior as it studies flooding in City of Pecos; FMS ID: 142000005 will be done prior as it involves saltcedar research that will be utilized.	Reeves	13060007, 13060011, 13040212, 13070002, 13070003, 13070006, 13070008, 13070009, 13070010, 13070011, 13070012, 13070001, 13070007	Other	124.33	Riverine	City of Pecos, Reeves County
14200008	Develop Certification Package for Cibolo Creek Channel and Levee	Perform planning and design required by FEMA for levee accreditation, then complete certification package for Cibolo Creek levee in vicinity of City of Presidio. Package includes O&M Plan.	14015001, 14007000, 14004002	FME ID: 141000002	FME ID: 141000002 will be done prior as the interior drainage study is needed for levee certification	Presidio	13040201	Regulatory and Guidance	2.75	Riverine	USACE, Presidio County, City of Presidio
14200009	Regulatory Review of Off-Road Traffic on State Lands	Coordination should take place between EPCWID1, El Paso County, and State land owners to discuss enforcement of restrictions associated with off-road motor vehicles on undeveloped land.	14002001, 14007003	N/A	N/A	El Paso	13040100, 13050003	Regulatory and Guidance	620.49	Other	EPCWID1, El Paso County, Texas GLO
14200010	Regulatory Review of Impervious Cover on New Development in El Paso County	Coordination should take place between EPCWID1, El Paso County, and Texas GLO land owners to discuss revisions to development regulations associated with detention and impervious cover.	14001001, 14007003	N/A	N/A	El Paso	13040100, 13050003	Regulatory and Guidance	619.88	Urban/Local	EPCWID1, El Paso County, Texas GLO

Table 4E. Potentially Feasible Flood Management Strategies Identified by RFPG

FMS ID	FMS Name	Description	Associated Goals (ID)	Associated FME, FMS, or FMP	Associated FME, FMS, or FMP Description	Counties	HUC8s	Strategy Type	Strategy Project Area (sqmi)	Flood Risk Type (Riverine, Coastal, Urban, Playa, Other)	Sponsor
14200013	Staff augmentation support or funding for at risk communities to join and/or enforce the NFIP	Prioritize and provide staff augmentation support or funding for at risk communities not currently participating in the NFIP or communities with limited resources to enforce the NFIP. Aid communities in implementing recommended minimum standards.	14001001, 14001002	N/A	N/A	Presidio, Hudspeth, Reeves, Andrews, Edwards, Pecos, Winkler		Regulatory and Guidance	16144.52	Urban/Local, Riverine	RGCOG
14200014	Develop new flood gages throughout the region	Prioritize, fund, and develop new flood gages (rainfall and/or stream gages) throughout the region to support flood warning system improvements and improve ability to validate or calibrate existing and new flood models	14005001, 14006001, 1400602	N/A	N/A	All of Region 14		Flood Measurement and Warning	43031.15	Riverine	RGCOG
14200015	Develop and design standard options for addressing identified development-related flooding in El Paso	Evaluate COEP and El Paso County drainage design standards for inlets, curb cuts, requirements for on-site storage in new developments, addressing as-built elevations, protecting remaining on-site storage and recovering original storage for existing developments.	14002001, 14003001	N/A	N/A	El Paso	13030102, 13040100, 13050003	Regulatory and Guidance	1011.05	Urban/Local	El Paso Water, El Paso County
14200016	Develop regional solutions to address erosion issues in natural channels affecting stormwater conveyance	Develop consensus region-specific erosion-resistant designs to prevent removal of material from drainage conveyances, with functional comparisons to aid selection of best practices.	14007003, 14002001, 14003001, 14007001, 14007002	FME ID: 141000008; FME ID: 141000015	FME ID: 141000008 will follow as it utilizes the erosion control solutions developed in this FME. FME ID: 141000015 will be done prior as it estimates sediment in arroyos and develops method to estimate sediment in arroyos throughout region.	All of Region 14	13030102, 13040100, 13050003	Other	1011.05	Urban/Local, Riverine	RGCOG
14200017	Develop solutions to address city/county stormwater conveyance into the Rio Grande (El Paso County)	Refine agency action coordination in conveyance of interior flooding to the Rio Grande. Develop FMP designs and costs for improvements of conveyance from river terrace storm water infrastructure, considering high ground water.	14006001, 14004001, 14004002, 14007003	FME ID: 14000018	FME ID: 14000018 will be done prior as it identifies new outfalls and prioritizes existing outfalls improvements	El Paso	13030102, 13040100, 13040201, 13040202, 13040203, 13040204, 13040205, 13040206, 13040207, 13040208, 13040209, 13040210, 13040211, 13040212, 13070006, 13070008, 13070010, 13070012, 13050003, 13050004, 13070007	Infrastructure Projects, Other	17923.72	Urban/Local, Riverine	El Paso Water, El Paso County
14200019	Initiate program to develop integrated solutions to improve irrigation system/stormwater conveyance system interaction in El Paso area	Initiate program to develop integrated solutions to improve irrigation system/stormwater conveyance system interaction in El Paso area	14014001, 14007000	N/A	N/A	El Paso	13030102, 13040100, 13050003	Other	1011.05	Urban/Local, Riverine	El Paso Water, El Paso County, EPCWID1
14200020	Develop and Improve Early Warning System for El Paso City/ County interior drainage	Conduct study to evaluate and proposed improvements to Early Warning Systems (EWSs) for interior drainage in El Paso City and El Paso County. Includes assessment of existing flood EWS.	14006001, 1400602	N/A	N/A	El Paso	13030102, 13040100, 13050003	Flood Measurement and Warning	1010.83	Urban/Local, Riverine	El Paso Water, COEP, El Paso County, EPCWID1
14200021	Develop and Improve Early Warning System for City of Pecos	Conduct study to evaluate and propose improvements to Early Warning Systems (EWSs) for City of Pecos and adjacent Lindsay Census Designated Place. Includes assessment of existing flood EWS.	14006001, 1400602	N/A	N/A	Reeves	13070003, 13070001	Flood Measurement and Warning	23.03	Urban/Local, Riverine	City of Pecos, Reeves County
14200022	Develop and Improve Early Warning System for City of Alpine	Conduct study to evaluate and propose improvements to Early Warning Systems (EWSs) for City of Alpine. Includes assessment of existing flood EWS.	14006001, 1400602	N/A	N/A	Brewster	13070006	Flood Measurement and Warning	4.79	Urban/Local, Riverine	City of Alpine, Brewster County
14200023	Develop and Improve Early Warning System for City of Presidio, Presidio County	Identify and design access routes and bridges/culverts to provide emergency access during extreme flood events in the City of Presidio.	14006001, 1400602	N/A	N/A	Presidio	13040201	Flood Measurement and Warning	2.57	Urban/Local, Riverine	City of Presidio, Presidio County
14100024	Develop and Improve Early Warning System for City of Fort Stockton	Conduct study to evaluate and propose improvements to Early Warning Systems (EWSs) for City of Fort Stockton. Includes assessment of existing flood EWS.	14006001, 1400602	N/A	N/A	Pecos	13070007	Flood Measurement and Warning	5.53	Urban/Local, Riverine	City of Fort Stockton, Pecos County
14200025	Develop and Improve Early Warning System for City of Marfa, Presidio County	Identify and design access routes and bridges/culverts to provide emergency access during extreme flood events in Marfa. Southeast Marfa and dirt portion of FM2810 were identified as problem areas by Presidio County Office of Emergency Management.	14006001, 1400602	FMP ID: 143000007	FMP ID: 143000007 also improves early warning in Marfa, but is not required before or after this FMS.	Presidio	13040202	Flood Measurement and Warning	1.62	Urban/Local, Riverine	City of Marfa, Presidio County

Table 4E. Potentially Feasible Flood Management Strategies Identified by RFPG

FMS ID	FMS Name	Entities with Oversight	Emergency Need (Y/N)	Estimated Project Cost (\$)	Potential Funding Sources and Amount	Flood Risk									
						Area in 100yr (1% annual chance) Floodplain	Area in 500yr (0.2% annual chance) Floodplain	Estimated number of structures at 100yr flood risk	Residential structures at flood risk	Estimated population at flood risk	Critical facilities at flood risk (#)	Number of low water crossings at flood risk (#)	Estimated number of road closures (#)	Estimated length of roads at flood risk (miles)	Estimated active farm & ranch land at flood risk (acres)
142000001	FEMA Levee Accreditation for All Rio Grande Levees at El Paso	USIBWC, El Paso Water, El Paso County, Doña Ana County, Hudspeth County	No	\$ 482,000	Federal, State, Local	54.3	65.7	11251	9905	30450	35	34	334	196	23451
142000002	Irrigation and Recharge Application of Captured Rainwater Runoff at Alpine	City of Alpine, Brewster County	No	\$ 1,282,000	State, Local	0.06	0.1	13	5	42	0	0	5	0.45	0.0
142000003	Implement Colonia-wide Drainage System and Maintenance and Outreach Program for Roadside Swales and Driveway Culverts at Fort Hancock	Fort Hancock CDP, Acala CDP, Hudspeth County	No	\$ 404,000	State, Local	0.3	0.4	12	0	16	0	6	0	2	61
142000004	Coordination with Ft. Bliss for FMP Permitting and Maintenance Access	El Paso Water, El Paso County, U.S. Army	No	\$ 49,000	Federal, State, Local	1.0	1.1	119	104	443	3	5	87	30.1	0
142000005	Maintenance Program to control Salt Cedar vegetation along Rio Grande upstream of Presidio	Presidio County, TXDOT, USIBWC, USACE	No	\$ 97,000	Federal, State, Local	21.6	22.5	18	0	49	0	2	2	1	109
142000006	Study Binational Streamflow Recommendations for Big Bend Reach of Rio Grande/Rio Bravo	City of Presidio, Presidio County, Brewster County, Big Bend National Park, Rio Grande Wild and Scenic River, Big Bend Ranch State Park, Black Gap Wildlife Management Area, Santa Elena Canyon Wildlife and Plant Protection Area, Maderas del Carmen Wildlife and Plant Protection Area, Ocampo Wildlife and Plant Protection Area, and the Rio Bravo Monument	No	\$ 63,000	Federal, State	64.9	70.9	136	46	361	0	107	113	182.1	282
142000007	Study to plan the management of saltcedar growth and debris in channels in/adjacent to City of Pecos	City of Pecos, Reeves County	No	\$ 73,000	Federal, State, Local	12.8	12.9	2120	1240	7359	3	18	295	89.9	532
142000008	Develop Certification Package for Cibolo Creek Channel and Levee	USACE, Presidio County	No	\$ 79,000	Federal, State, Local	1.6	1.7	712	479	1472	0	0	22	14.1	34
142000009	Regulatory Review of Off-Road Traffic on State Lands	EPCWID1, El Paso County, Texas GLO	No	\$ 99,000	State, Local	118.0	168.7	2603	2056	7134	1	51	104	97	35063
142000010	Regulatory Review of Impervious Cover on New Development in El Paso County	EPCWID1, El Paso County, Texas GLO	No	\$ 64,000	State, Local	117.9	168.5	2603	2056	7134	1	51	103	97	35026

Table 4E. Potentially Feasible Flood Management Strategies Identified by RFPG

FMS ID	FMS Name	Entities with Oversight	Emergency Need (Y/N)	Estimated Project Cost (\$)	Potential Funding Sources and Amount	Flood Risk									
						Area in 100yr (1% annual chance) Floodplain	Area in 500yr (0.2% annual chance) Floodplain	Estimated number of structures at 100yr flood risk	Residential structures at flood risk	Estimated population at flood risk	Critical facilities at flood risk (#)	Number of low water crossings at flood risk (#)	Estimated number of road closures (#)	Estimated length of roads at flood risk (miles)	Estimated active farm & ranch land at flood risk (acres)
142000013	Staff augmentation support or funding for at risk communities to join and/or enforce the NFIP	Presidio County, Hudspeth County, Reeves County, Andrews County, Edwards County, Pecos County, Winkler County, City of Alpine, City of Sonora, City of Barstow, City of Kermit, City of Rankin, City of Thorntonville, Town of Valentine, City of Wickett, City of Wink	No	\$ 44,000	Federal, State, Local	3900.0	4843.0	8498	3843	22565	22	523	1188	1243.2	28217
142000014	Develop new flood gages throughout the region		Yes	\$ 240,000	Federal, State, Local	9286.0	11041.0	40121	24931	115519	94	1778	5871	3792	479713
142000015	Develop and design standard options for addressing identified development-related flooding in El Paso	El Paso Water, El Paso County	No	\$ 35,000	State, Local	179	245	21373	16856	70212	37	132	841	607	48551
142000016	Develop regional solutions to address erosion issues in natural channels affecting stormwater conveyance		No	\$ 57,000	State, Local	9286.0	11041.0	40121	24931	115519	94	1778	5871	3792	479713
142000017	Develop solutions to address city/county stormwater conveyance into the Rio Grande (El Paso County)	El Paso Water, El Paso County	No	\$ 99,000	Federal, State, Local	179	245	21373	16856	70212	37	132	841	607	48551
142000019	Initiate program to develop integrated solutions to improve irrigation system/stormwater conveyance system interaction in El Paso area	El Paso Water, El Paso County, EPCWID1	No	\$ 21,000	State, Local	179	245	21373	16856	70212	37	132	841	607	48551
142000020	Develop and Improve Early Warning System for El Paso City/ County interior drainage	El Paso Water, COEP, El Paso County, EPCWID1	Yes	\$ 140,000	State, Local	179	245	21373	16856	70212	37	132	841	607.00	48551
142000021	Develop and Improve Early Warning System for City of Pecos	City of Pecos, Reeves County	Yes	\$ 50,000	State, Local	12.8	12.9	2120	1240	7359	3	18	295	89.92	532
142000022	Develop and Improve Early Warning System for City of Alpine	City of Alpine, Brewster County	Yes	\$ 50,000	State, Local	2.0	2.3	1640	1181	4364	6	18	199	38.03	50
142000023	Develop and Improve Early Warning System for City of Presidio, Presidio County	City of Presidio, Presidio County	Yes	\$ 50,000	State, Local	0.8	0.9	655	513	1292	0	0	56	15.71	14
141000024	Develop and Improve Early Warning System for City of Fort Stockton	City of Fort Stockton, Pecos County	Yes	\$ 50,000	State, Local	0.8	1.1	166	108	899	2	4	26	21.61	14
142000025	Develop and Improve Early Warning System for City of Marfa, Presidio County	City of Marfa, Presidio County	Yes	\$ 50,000	State, Local	0.3	0.4	212	140	334	1	12	55	6.46	0

Table 4E. Potentially Feasible Flood Management Strategies Identified by RFPG

FMS ID	FMS Name	Reduction in Flood Risk												Cost/ Structure removed	Consideration of nature- based solution (Y/N)	Negative Impact (Y/N)	Negative Impact Mitigation (Y/N)	Water Supply Benefit (Y/N)
		Number of structures with reduced 100yr (1% annual chance) flood risk	Number of structures removed from 100yr (1% annual chance) flood risk	Number of structures removed from 500yr (0.2% annual chance) flood risk	Residential structures removed from 100yr (1% annual chance) flood risk	Estimated Population removed from 100yr (1% annual chance) flood risk	Critical facilities removed from 100yr (1% annual chance) flood risk (#)	Number of low water crossings removed from 100yr (1% annual chance) flood risk (#)	Estimated reduction in road closure occurrences	Estimated length of roads removed from 100yr flood risk (miles)	Estimated active farm & ranch land removed from 100yr flood risk (acres)	Estimated reduction in fatalities (if available)	Estimated reduction in injuries (if available)					
142000001	FEMA Levee Accreditation for All Rio Grande Levees at El Paso	11036	10275	0	9160	28148	30	32	188	168	17834	0	0	\$ 44	No	No	No	No
142000002	Irrigation and Recharge Application of Captured Rainwater Runoff at Alpine	0	0	0	0	0	0	0	0	0	0	0	0	N/A	Yes	No	No	Yes
142000003	Implement Colonia-wide Drainage System and Maintenance and Outreach Program for Roadside Swales and Driveway Culverts at Fort Hancock	0	0	0	0	0	0	0	0	0	0	0	0	N/A	No	No	No	No
142000004	Coordination with Ft. Bliss for FMP Permitting and Maintenance Access	118	5	0	4	15	0	0	0	0.8	0	0	0	\$ 415	No	No	No	No
142000005	Maintenance Program to control Salt Cedar vegetation along Rio Grande upstream of Presidio	0	0	0	0	0	0	0	0	0	0	0	0	N/A	Yes	No	No	No
142000006	Study Binational Streamflow Recommendations for Big Bend Reach of Rio Grande/Rio Bravo	0	0	0	0	0	0	0	0	0	0	0	0	N/A	Yes	No	No	No
142000007	Study to plan the management of saltcedar growth and debris in channels in/adjacent to City of Pecos	0	0	0	0	0	0	0	0	0	0	0	0	N/A	Yes	No	No	No
142000008	Develop Certification Package for Cibolo Creek Channel and Levee	681	681	0	462	1401	0	0	11	13.4	30	0	0	\$ 116	No	No	No	No
142000009	Regulatory Review of Off-Road Traffic on State Lands	0	0	0	0	0	0	0	0	0	0	0	0	N/A	No	No	No	No
142000010	Regulatory Review of Impervious Cover on New Development in El Paso County	0	0	0	0	0	0	0	0	0	0	0	0	N/A	No	No	No	No

Table 4E. Potentially Feasible Flood Management Strategies Identified by RFPG

FMS ID	FMS Name	Reduction in Flood Risk												Cost/ Structure removed	Consideration of nature- based solution (Y/N)	Negative Impact (Y/N)	Negative Impact Mitigation (Y/N)	Water Supply Benefit (Y/N)
		Number of structures with reduced 100yr (1% annual chance) flood risk	Number of structures removed from 100yr (1% annual chance) flood risk	Number of structures removed from 500yr (0.2% annual chance) flood risk	Residential structures removed from 100yr (1% annual chance) flood risk	Estimated Population removed from 100yr (1% annual chance) flood risk	Critical facilities removed from 100yr (1% annual chance) flood risk (#)	Number of low water crossings removed from 100yr (1% annual chance) flood risk (#)	Estimated reduction in road closure occurrences	Estimated length of roads removed from 100yr flood risk (miles)	Estimated active farm & ranch land removed from 100yr flood risk (acres)	Estimated reduction in fatalities (if available)	Estimated reduction in injuries (if available)					
142000013	Staff augmentation support or funding for at risk communities to join and/or enforce the NFIP	0	0	0	0	0	0	0	0	0	0	0	0	N/A	No	No	No	No
142000014	Develop new flood gages throughout the region	0	0	0	0	0	0	0	0	0	0	0	0	N/A	No	No	No	No
142000015	Develop and design standard options for addressing identified development-related flooding in El Paso	0	0	0	0	0	0	0	0	0	0	0	0	N/A	No	No	No	No
142000016	Develop regional solutions to address erosion issues in natural channels affecting stormwater conveyance	0	0	0	0	0	0	0	0	0	0	0	0	N/A	No	No	No	No
142000017	Develop solutions to address city/county stormwater conveyance into the Rio Grande (El Paso County)	0	0	0	0	0	0	0	0	0	0	0	0	N/A	No	No	No	No
142000019	Initiate program to develop integrated solutions to improve irrigation system/ stormwater conveyance system interaction in El Paso area	0	0	0	0	0	0	0	0	0	0	0	0	N/A	No	No	No	No
142000020	Develop and Improve Early Warning System for El Paso City/ County interior drainage	0	0	0	0	0	0	0	0	0	0	0	0	N/A	No	No	No	No
142000021	Develop and Improve Early Warning System for City of Pecos	0	0	0	0	0	0	0	0	0	0	0	0	N/A	No	No	No	No
142000022	Develop and Improve Early Warning System for City of Alpine	0	0	0	0	0	0	0	0	0	0	0	0	N/A	No	No	No	No
142000023	Develop and Improve Early Warning System for City of Presidio, Presidio County	0	0	0	0	0	0	0	0	0	0	0	0	N/A	No	No	No	No
141000024	Develop and Improve Early Warning System for City of Fort Stockton	0	0	0	0	0	0	0	0	0	0	0	0	N/A	No	No	No	No
142000025	Develop and Improve Early Warning System for City of Marfa, Presidio County	0	0	0	0	0	0	0	0	0	0	1	0	N/A	No	No	No	No

Appendix 4F

Narratives of Potentially Feasible Flood Management Strategies

Appendix 4F. Narratives for Flood Management Strategies

4F-1. Flood Management Strategy ID: 142000001

Name: FEMA Levee Accreditation for All Rio Grande Levees at El Paso.

Description: Coordination needed between the United States International Boundary and Water Commission (USIBWC), the Federal Emergency Management Agency (FEMA), El Paso Water (EPWater), El Paso County, Doña Ana County, and Hudspeth County to certify and accredit all remaining levee segments through El Paso County. Interior drainage studies are needed in Hudspeth and Doña Ana counties.

Affected Jurisdictions: City of El Paso, El Paso County, Hudspeth County, Doña Ana County

Discussion on Flood Risk: Areas adjacent to the Rio Grande River protected by FEMA-accredited levees are not only protected from riverine flooding, but residents will also be eligible for reduced flood insurance premiums.

Flood Management Strategy Scope of Work:

There are multiple unaccredited levee segments along the Rio Grande River through El Paso County that currently provide flood protection to adjacent areas. These levees are designed and operated by the USIBWC. A certified levee indicates that the levee segment is formally recognized by FEMA as providing flood risk reduction for the 1% annual chance (AC) flood on the applicable Flood Insurance Rate Map(s) (FIRMs). To achieve this recognition, the levee systems must meet and continue to meet the minimum design, operation, and maintenance standards per Title 44, Chapter 1, Section 65.10 of the *Code of Federal Regulations* (44 CFR Section 65.10). This regulation specifies select items that need to be submitted and reviewed by FEMA to obtain levee accreditation, including the following:

- Documentation that the levee meets design criteria (freeboard, stability, settlement, etc.);
- Certified as-built levee plans showing tie-ins;
- Officially adopted operation and maintenance (O&M);
- Emergency Preparedness Plan (including documentation of flood warning systems, emergency notification flowchart); and
- Interior drainage evaluation.

This Flood Management Strategy (FMS) will prepare an individual certification package and summary report, including all associated attachments, by levee segment for FEMA submission. The package will include all elements required by 44 CFR Section 65.10 and described in FEMA guidance, *Meeting the Criteria for Accrediting Levee Systems on Flood Insurance Rate Maps* (FEMA Fact Sheet May 2021). The text of the report will reference other studies/data as necessary to show compliance with 44 CFR Section 65.10. Preparation of each package does not include performing the detailed studies required for certification, but rather aggregation,

review, and summary/presentation of the certification material. Sections and/or items to be included in the package and report include the following:

Purpose of Certification package and background;
Certification Statement (to be signed by levee owner/sponsor);
Regulation Compliance;
As-Built Plans and Freeboard Check;
Natural Valley Analysis;
Levee System Check (roadway crossings, structure crossings, upstream and downstream tie-in locations);
Interior Drainage Analysis;
Geotechnical Report of the levee assessing embankment and foundation stability, seepage, and settlement;
Embankment Protection, including vegetation and cover assessment and analysis of shear stress ;
Closure Structure Data;
O&M Plan;
Emergency Preparedness Plan;
Inspection reports, and
Statement of compliance with all local, state, and federal laws.

There are eight USIBWC levee segments along the Rio Grande within the County of El Paso that require certification, three of which extend outside of the County limits, requiring an interior drainage study and/or a hydraulic independence analysis to be performed to certify portions of the levee segments within El Paso County:

Canutillo/Mesilla – East 1 (extends into New Mexico):

- Requires interior drainage study in Doña Ana County and/or hydraulic independence analysis to certify levee segments in El Paso County.

Canutillo/Mesilla – East 2 (includes Canutillo Phase 2 Floodwall and Sunland Park East).

- A construction contract for levee repair of the Sunland Park East levee from the Borderland Road Bridge to the El Paso Electric Rio Grande Power Plant (8.42 miles) was awarded on September 20, 2022 and is expected to be completed by March 2025.

Canutillo/Mesilla – West (extends into New Mexico, includes Nemexas and Sunland Park West):

- Requires interior drainage study in Doña Ana County and/or hydraulic independence analysis to certify levee segments in El Paso County.
- Levee repair construction of the Sunland Park West levee from the Borderland Road Bridge to Country Club Road Bridge reached substantial completion on June 11, 2021.
- A construction contract for levee repair of Sunland Park West levee from Country Club Road Bridge to the Nemexas Siphon (0.59 miles) was awarded on September 20, 2022.

Courchesne – West.

El Paso 1 / Paisano (American Dam to International Dam).

El Paso 2B (South Zaragoza Road to Riverside Weir).

El Paso 3 (Riverside Weir to Wingo Reserve Road/upstream of Shaffer Road, Tornillo, TX, includes Ysleta to Fabens and Fabens).

El Paso 4 (Wingo Reserve Road/upstream of Shaffer Road, Tornillo, TX to extends into Hudspeth County):

- Requires interior drainage study in Doña Ana County and/or hydraulic independence analysis to certify portions of levee segments in El Paso County.

The project is divided into the major tasks below.

Task 1 – Stakeholder Coordination;

Task 2 – Meetings;

Task 3 – Data Collection;

Task 4 – Interior Drainage Studies; and

Task 5 – Levee Certification Package by Segment.

Estimated Cost for FMS:

Labor Cost	
Task 1 – Stakeholder Coordination	\$ 40,000
Task 2– Meetings	\$ 49,200
Task 3 – Data Collection	\$ 40,380
Task 5 – Levee Certification Package Preparation	\$ 350,620
Total Project Labor	\$ 480,200
Travel	\$ 2,091
Total FME cost	\$ 482,000

4F-2. Flood Management Strategy ID: 142000002

Name: Irrigation and Recharge Application of Captured Rainwater Runoff at Alpine.

Description: Construct rainwater basins at three locations around Kokernot Park to drain neighboring streets, impound runoff volume, promote infiltration and aquifer recharge, reduce landscaping water costs, and remediate pollutants.

Affected Jurisdictions: City of Alpine, Brewster County

Discussion on Flood Risk: This strategy was recommended in the Regional Water Plan for Region E (January 2021, FNI and WSP). A description of the flood risk in Alpine from Section E-2 of the Regional Water Plan for Region E (January 2021, FNI and WSP) is provided below for reference:

“In a good year, the City of Alpine receives approximately 17 inches of rain, much of which is lost to runoff. High-intensity thunderstorms contribute to greater runoff into nearby Alpine Creek, causing higher peak flooding. This prevents the creek from functioning properly as evidenced by the scoured, cut and straightened channel that exists today which must be armored with engineered banks. Additionally, runoff transports pollutants into the creek, which eventually flows into the Rio Grande. As with many towns in West Texas, the streets act as a storm water drainage system. These water catchments take that liability and turn it into an asset.”

Flood Management Strategy Scope of Work:

A description of the strategy from Section E-2 of the Regional Water Plan for Region E (January 2021, FNI and WSP) is provided below for reference:

“This strategy proposes constructing rainwater catchment basins at three locations around Kokernot Park, which will drain neighboring streets. Impounding a large volume of water from the roads will allow the captured water time to infiltrate the soil, recharge the underlying aquifer, and remediate pollutants. These basins will also be landscaped with water-efficient plants without tapping into the city’s aquifer water for irrigation. These catchments will also demonstrate how residents can reduce water use and cost by capturing rainwater and landscaping with water-efficient native plants. This project will also help reduce down-stream flooding.”

A figure of the three proposed project locations where runoff will be diverted from roadways toward Kokernot Park is provided below.

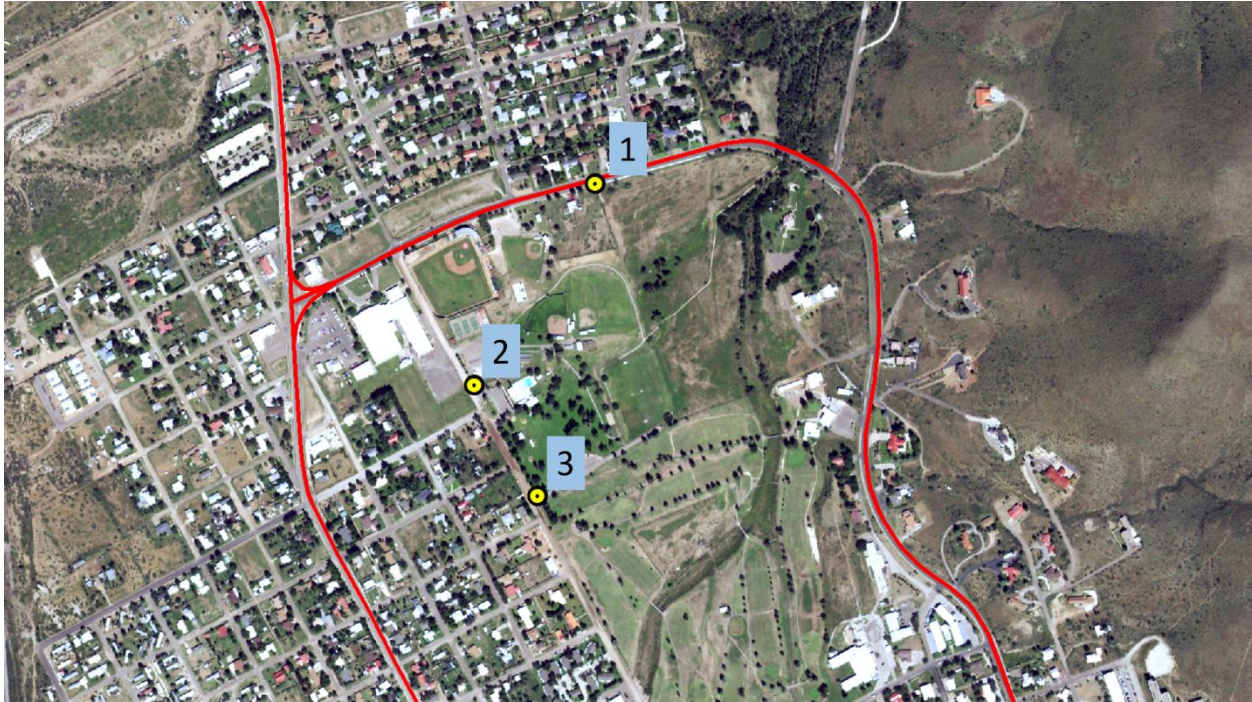


Figure 4D-2. Project locations for diverting runoff to Kokernot Park

Estimated Cost for FMS:

The total estimated Cost for this strategy is \$1,282,000. The strategy cost from the Region E water plan (\$1,296,000) was adjusted from January 2021 dollars to September 2020 dollars (\$1,282,000) using the Construction Cost Index to be consistent with other costs documented in the Regional Flood Plan. A description of the cost associated with this strategy from Section E-2 of the Regional Water Plan for Region E (January 2021, FNI and WSP) is provided below for reference:

“The three catchment basins (approximately 70 acres in combined size) are calculated to capture approximately 70 acre-feet during an average drought (12 inches or 75% of average annual rainfall) year. The project is planned for construction within the 2030 decade and come online prior to 2030. The estimated capital cost to construct the three catchment basins and retention dams is \$1,296,000.”

4F-3. Flood Management Strategy ID: 142000003

Name: Implement Colonia-wide Drainage System and Maintenance and Outreach Program for Roadside Swales and Driveway Culverts at Fort Hancock.

Description: Construct drainage improvements as detailed in FME ID: 141000014; maintain existing roadside ditches/swales to ensure positive drainage; and develop an outreach program to encourage residents to maintain and repair driveway culverts.

Affected Jurisdictions: Fort Hancock (CDP), Acala (CDP)

Discussion on Flood Risk: Fort Hancock and Acala are unincorporated areas in Hudspeth County located within the Rio Grande terrace, just downstream from El Paso County. The area has been recently developed without strict drainage controls, and as a result, is subject to frequent shallow flooding which interrupts routine road traffic. The County is responsible for the road maintenance which provides the primary drainage in the area. The County lacks the resources to plan for system improvements and has limited staff and means for system maintenance. The Regional Flood Planning Group (RFPG) has proposed a Flood Management Evaluation (FME ID: 141000014) for Fort Hancock and Acala that will develop and select Flood Mitigation Project (FMP) alternatives (both structural and non-structural) for the mitigation of the identified flood risk. This strategy follows this FME and develops a County program to sustain the FME-recommended improvements.

Flood Management Strategy Scope of Work:

This FMS has the goal of establishing a program for long-term maintenance that includes a plan for future county staff, county equipment, and county infrastructure needed to sustain the flood improvements recommended under FME ID: 14000014. The FMS will include a recommended funding strategy and public education program to develop support for that strategy.

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

Task 1. Assessment of existing county drainage maintenance program needs. The existing county program will be reviewed, and interviews/data collected from the County to assess current needs in terms of staffing, equipment, and infrastructure.

Task 2. Assessment of future county drainage maintenance program needs. The study associated with FME 14000014 will be reviewed to estimate County needs (staffing, equipment, and infrastructure and associated annual costs) following planned execution of recommended FMPs.

Task 3. Develop a plan to fund the estimated annual costs. The funding of similar regional county maintenance programs will be reviewed. A plan will be developed to address: 1) existing funding needs and 2) future funding needs.

Task 4. Public Education Program. A public education program will be developed that explains drainage system maintenance needs and solicits public ideas and support for addressing the funding of those needs.

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

Task 6. Stakeholder Coordination.

Estimated Cost for FMS:

In addition to the labor costs associated with the tasks noted above, this strategy includes a recurring cost associated with the public education program and a lump sum assumed for construction and implementation of this strategy, including recommendations from FME 14000014. The lump sum construction cost is based upon the cost requested in a 2022 earmark funding request by Hudspeth County and the planning document entitled, “Villa Allegre, Fort Hancock East Unit 1, & Fort Hancock East Unit 2 Colonia Area Study and Plan 2019-2029” (Grantworks, 2019).

Labor Cost	
Task 1 – Assessment of existing county drainage maintenance program needs	\$ 12,820
Task 2– Assessment of future county drainage maintenance program needs	\$ 5,760
Task 3 – Develop plan to fund estimated annual costs	\$ 8,060
Task 4 - Public Education Program	\$ 12,140
Task 5 – Report	\$ 11,860
Task 6 – Stakeholder Coordination	\$ 5,360
Total Project Labor	\$ 56,000
Travel	\$ 1,500
Total Fixed Non-Construction Costs	\$ 57,500
Implementation Estimate	
Subtotal 1 - Recurring Cost Associated with Public Education and Outreach Program	\$ 3,500
Subtotal 2 - Assumed Construction Cost From 2019-2029 Colonia Plan (Dec. 2019)	\$ 251,000
Subtotal 3 – RFP Construction Cost (September 2020, using CCI)	\$ 254,000
Subtotal 4 – RFP Construction Contingency (35%)	\$ 88,900
Total Construction Cost	\$ 342,900
Total Fixed FME cost	\$ 400,000
Total Recurring FME cost	\$ 3,500

4F-4. Flood Management Strategy ID: 142000004

Name: Coordination with Ft. Bliss for FMP Permitting and Maintenance Access.

Description: EPWater designed NE7 on Ft. Bliss near unexploded ordinances (UXOs) and has an easement to maintain Fusselman and Northgate Dams, but can't access them due to UXOs. El Paso County designed MON1 on Ft. Bliss near a training ground and potential UXOs.

Affected Jurisdictions: Fort Bliss (CDP), City of El Paso, El Paso County

Discussion on Flood Risk: The U.S. Army Ft. Bliss has an area of about 1,700 square miles, including a large tract within the Franklin Mountains north, west, and adjacent to the City of El Paso, and a large portion of the northeast portion of El Paso County. Training ranges within Fort Bliss have historically been used for live fire exercises, and in these areas, there is some risk of UXOs being present in surficial soils. The potential presence of UXOs impacts the permitting, construction, and maintenance of needed flood mitigation infrastructure in both the City of El Paso and El Paso County. In the City of El Paso and El Paso County, needed new sediment/debris flow basins identified as part of extensive public stormwater master planning are impeded from construction due to UXO issues. These basins are designated as project NE7 within the City of El Paso Stormwater Master Plan (AECOM 2021) and as project MON1 within the El Paso County Stormwater Master Plan (AECOM, 2021). The easements to maintain existing stormwater detention infrastructure (Fusselman Dam and Northgate Dam) cannot be accessed due to UXO issues.

Flood Management Strategy Scope of Work:

This FMS has the goal of developing a plan for the resolution of UXO-related impediments to implementation and maintenance of stormwater infrastructure within the City of El Paso and El Paso County.

The SOW for this FMS includes the following tasks.

Task 1. Identification and characterization of UXO-related impediments to implementation and maintenance of stormwater infrastructure within the City of El Paso and El Paso County. This task will involve two meetings with the U.S. Army staff at Fort Bliss and review of existing relevant studies. The deliverable from this task will be a memorandum summarizing the issues and providing available details useful in planning solutions.

Task 2. Stakeholder meetings. A series of three meetings will be held with City of El Paso, EPWater, El Paso County, and the U.S. Army to develop short- and long-term plans with solutions that address issues defined in the Task 1 memorandum. This SOW includes:

Meeting 1 will be a workshop including City of El Paso, EPWater, and El Paso County where alternatives are developed for addressing issues defined in the Task 1 memorandum. These suggested alternatives will be summarized in a written communication to the U.S. Army.

Meeting 2 will be a workshop including the City of El Paso, EPWater, El Paso County, and the U.S. Army and will include discussions centered on the suggestions from Meeting 1. Remaining/edited /new alternatives and ideas on how to proceed with implementing those ideas will be summarized in a written communication to the U.S. Army.

Task 3. Plan to address City/County actions. A plan will be developed including concept designs and costs sufficient to define a FME, FMS, or FMP per the RFP, for actions that will have City/County sponsorship.

Task 4. Stakeholder coordination.

Estimated Cost for FMS:

Labor Cost	
Task 1 – ID and Characterization of UXO Issues	\$ 10,210
Task 2– Stakeholder Meetings	\$ 20,500
Task 3 – Plan to address City/ County actions	\$ 14,700
Task 4 – Stakeholder coordination	\$ 3,570
Total Project Labor	\$ 48,980
Travel	\$ -
Public meeting materials cost	\$ -
Total FME cost	\$ 49,000

4F-5. Flood Management Strategy ID: 142000005

Name: Maintenance Program to control Salt Cedar vegetation along Rio Grande upstream of Presidio.

Description: Study to develop alternatives to clear vegetation along the Rio Grande between Candelaria and the City of Presidio to allow for proper drainage for communities located along FM 170. Coordination needed between the Rio Grande Council of Governments (RGCOG), Presidio County, Texas Department of Transportation (TXDOT), U.S. Army Corps of Engineers (USACE), and USIBWC.

Affected Jurisdictions: Presidio County, Candelaria Colonia

Discussion on Flood Risk: In Rio Grande reach between Candelaria and the City of Presidio, the growth of saltcedar between FM 170 and the Rio Grande, and within the flood conveyance area of the river has a number of ancillary negative impacts on flooding and drainage: the cedar growth promotes sedimentation that reduces flow area, the height of the vegetation impinges on flood flows and increases resistance to flow (roughness). This increases riverine flood risk and causes issues for communities adjacent to FM 170 with local runoff draining toward the Rio Grande. The sediment accumulation in the river blocks gravity outfalls of stormwater into the river, increasing interior flooding adjacent to the river. The saltcedar growth has also been studied for other impacts (USACE, *Forgotten Reach of the Rio Grande, Fort Quitman To Presidio, Texas*, Section 729, January 2008). Identified impacts of cedar growth include:

“The consequences of this noxious shrub invasion is increased salinization of soils and water, substantial loss of habitat quality for many faunal species, displacement of native flora, increased surface and groundwater loss due to evapotranspiration losses by saltcedar, and loss of agricultural productivity. Seventeen faunal or fish species are federally or state listed in the study area (Rio Grande reach upstream of Presidio) and the entire reach is declared an impaired stream by TCEQ for total dissolved solids, bacteria, and chloride salts (USACE, 2007).”

This strategy will be focused on providing basic planning information necessary for later definition of projects/strategies that meet the multiple goals associated with saltcedar removal. This strategy will:

- Estimate current flood capacity within the reach;
- Set goals for minimum flood capacity at selected population centers;
- Estimate flood benefits associated achieving those capacities;
- Estimate annual sediment loadings into the reach;
- Develop alternatives for communities along FM 170 which have drainage issues with runoff directed toward the river; and
- Include a qualitative evaluation of alternatives for cedar control in this reach for criteria to be determined by the public sponsors of the FMS.

The 2008 report proposes a number of alternatives for addressing saltcedar growth in the Rio Grande reach upstream of Presidio. These alternatives include:

Vegetation Management: large-scale land treatment;
Saltcedar Controls: biological control using natural predators, active re-vegetation;
Sediment management: in-channel enhancements to increase sediment transport capacity, and arroyo detention structures;
Channel improvement via river training measures;
Wetland construction;
Water Management and Improved Stream Flows; and
Research.

Current information on these alternatives will be assembled and applied to this reach to perform this FMS qualitative assessment.

Flood Management Strategy Scope of Work:

This FMS includes the development of alternatives to address saltcedar impacts in the Rio Grande, and includes two tasks (literature review, qualitative comparison of salt cedar controls) that will have overlap with FMS ID: 142000007. Costs for FMS ID: 142000007 are reduced assuming FMS ID: 142000005 will be executed prior to it.

The SOW for this FMS includes five tasks:

Task 1. Literature Review. The science that underlies identifying potential solutions to saltcedar growth is rapidly expanding. The USACE 2007 report reviewed for this FMS provides recommendations for important research on the issue that are likely to have been initiated and partially completed prior to issuance of this RFP. This task will include coordination between RGCOG, Presidio County, TXDOT, USACE, USIBWC, and other public stakeholders to identify the most current relevant research. This research will be reviewed and a meeting held with coordination partners to develop: 1) a list of priority data gaps and identify alternatives for cedar control to be evaluated in Task 4, and 2) a list of the evaluation criteria to be quantitatively applied for each method.

Task 2. Data Collection. Data collection will include:

Assembly of the full range of available recent (2000-current) LiDAR for the subject reach.

Assembly of the best available hydraulic and hydrologic models for the reach.

Assembly of historic (2000-current) imagery suitable for estimating vegetation change by species.

Review of existing well locations relative to the Rio Grande floodplain, using Fathom risk boundaries and the TWDB groundwater data viewer. There are expected to be shallow wells in unconfined riparian aquifers, which could be negatively impacted by increased conveyance velocities.

Task 3. Engineering Analyses. This task includes these subtasks:

Risk Analyses for Riverine Floods. Available hydrologic and hydraulic models will be revised as needed to map flood risk for three flood risk levels deemed appropriate by the sponsors of the FMS, for existing conditions:

The goal for riverine flood capacity in terms of statistical flood (e.g., 4% AC) within the limits of the study area will be procured from the USIBWC.

The existing condition hydraulic model will be altered (by removal of vegetation and sediment) such that the goal flood risk criterion is met within the reach within the boundaries of defined populated areas (cities, census designated place, colonia).

Estimation of Sedimentation/Vegetation Removal to Meet Goals. The volume of sediment removal and area of vegetation removal needed to achieve the riverine flood capacity goal will be estimated using the above model results.

Estimation of Historic Annual Changes in Vegetation and Sedimentation. Historic LiDAR and aerial imagery in the reach will be analyzed to quantify changes in channel conveyance volume and areas of major vegetation types within the data record. These changes will be summarized in terms of average and extreme annual changes within the reach within the areas affecting flood stage in the populated areas.

A desktop analysis of Candelaria drainage patterns will be performed with best available topographic data. Coordination will take place with Presidio County and/or local stakeholders to investigate historical drainage issues for the community related to excessive sediment and/or vegetation in outfalls draining to the Rio Grande. Solutions identified for outfalls will be considered for application at other communities along FM 170 with similar drainage issues. Alternatives will be reviewed with coordination partners to discuss maintenance responsibilities.

Task 4. Qualitative Comparison of Salt Cedar Controls. The alternatives for saltcedar control identified in Task 1 will be qualitatively evaluated versus the evaluation criteria set in Task 1. Reasoning underlying selection of qualitative rankings for each criterion will be documented. Data gaps impeding evaluation will be noted, and details provided as to data/research required for evaluation.

Task 5. Report: Future Planning Information. A summary report will be prepared that summarizes Tasks 1-4.

Estimated Cost for FMS:

Labor Cost	
Task 1 – Literature Review	\$ 11,340
Task 2– Data Collection	\$ 23,340
Task 3 – Engineering Analysis	\$ 31,240
Task 4 - Qualitative Comparison of Salt Cedar Controls	\$ 14,100
Task 5 – Report	\$ 9,780
Task 6 – Stakeholder Coordination	\$ 7,600
Total Project Labor	\$ 97,400
Travel	\$ -
Total FME cost	\$ 97,000

4F-6. Flood Management Strategy ID: 142000006

Name: Study Binational Streamflow Recommendations for Big Bend Reach of Rio Grande/Rio Bravo.

Description: Conduct study with recommendations for binationally beneficial stream flows for Big Bend reach of the Rio Grande/Rio Bravo. Study will identify stream flows to support the river's ecological environment in state and federal parks in the U.S. and Mexico.

Affected Jurisdictions: City of Presidio, Presidio County, Brewster County, Big Bend National Park, Rio Grande Wild and Scenic River, Big Bend Ranch State Park, Black Gap Wildlife Management Area, Santa Elena Canyon Wildlife and Plant Protection Area, Maderas del Carmen Wildlife and Plant Protection Area, Ocampo Wildlife and Plant Protection Area, and the Rio Bravo Monument

Discussion on Flood Risk:

The reach of the Rio Grande adjacent to the City of Presidio and including a series of downstream state and federal parks in the U.S. and Mexico (listed under "Affected Jurisdictions" above) is subject to loss of hydraulic capacity due to sediment inflows from the Rio Conchos (upstream of the city), and from Alamito and Ternereros Creeks (downstream of the city). Prior fluvial geomorphic and environmental study of this reach (downstream through Big Bend National Park) includes this report:

"Environmental Flows Recommendations Report, Final Submission to the Environmental Flows Advisory Group, Rio Grande Basin and Bay Area Stakeholders Committee, and Texas Commission on Environmental Quality", Upper Rio Grande Basin and Bay Expert Science Team, July 2012.

This report includes this recommendation for high pulse flows that "mobilize and reorganize coarse gravel and cobble deposits on the [Rio Grande] channel bed, and must be of sufficient duration to export fine sediment that has accumulated within the river channel." Specifically, the report recommends:

"To achieve these geomorphic goals, we recommend that annual channel filling flows of 10,500 ft³/s with a minimum of a 5-day duration be excluded from permit consideration. Ideally, high-flow pulses for channel maintenance purposes would happen during, near the end of, or soon after monsoon season for the purposes of exporting the sediment inputs that occur during the monsoon. Alternatively, if an annual high flow pulse is not available during the monsoon season; geomorphic goals could be met with a high pulse flow during the Spring season and would have the benefit of providing biological cues to species such as the Rio Grande Silvery Minnow. Therefore, The URG BBEST recommends that the first high flow pulse of the above stated magnitude and duration following the monsoon season be excluded from permit consideration."

This recommendation has numerous benefits to the environment (cited in the report), in addition to flood benefits to the City of Presidio and downstream communities adjacent to the Rio Grande. The flood benefits are primarily associated with maintaining Rio Grande flood conveyance capacity.

Flood Management Strategy Scope of Work:

This FMS has the goal of facilitating use of high pulse flows to maintain both flood capacity and riverine environmental function in the reach of the Rio Grande downstream of the Rio Conchos. The releases for these high pulse flows will necessarily originate from reservoir storage in Mexico. FME F141000008 within this plan has the goal of developing sediment controls on Alamito Creek and Ternereros Creek, which would have the potential for lessening the high pulse flows needed from the Rio Conchos watershed per the 2012 study cited above. This FMS would follow FME F141000008 and would assemble a portion of the 2012 technical team to assess whether potential sediment control improvements to Alamito Creek and Ternereros Creek would affect recommended pulse flows from the 2012 study.

The SOW for this FMS includes five tasks:

Task 1. Given revised sediment inflow estimates to the Rio Grande from Alamito Creek and Ternereros Creek (per improvements defined in FME F141000008), confirm or adjust the 2012 recommendations for magnitude and frequency of high pulse flows from the Rio Conchos, and given the specific goal of maintaining Rio Grande channel capacity in the vicinity of the City of Presidio. It is expected that the modeling performed for the 2012 study would serve as a starting point for the revised estimates.

Task 2. Estimate flood benefits to City of Presidio of maintaining Rio Grande capacity via management of high pulse flows. This task will include: estimation of Rio Grande bed and banks configuration in the reach affects flooding in the City of Presidio that: 1) meets the regional goal for riverine flood protection in this area and 2) serves environmental goals in the 2012 study. Hydraulic modeling will be performed to compare flood risk in the City of Presidio with and without high pulse flows. Assumptions for the “without high pulse flows” condition will be developed in consultation with strategy stakeholders.

Task 3. Estimate multiple benefits (to habitat, stream function) associated with the revised recommended high pulse flows for the full reach of the Rio Grande from the junction with the Rio Conchos downstream through Big Bend National Park to Amistad Dam.

Task 4. Develop report. The report will provide recommendations from the RFPG to TWDB detailing benefits to reduction of flood risk associated with providing high pulse flows from the Rio Conchos.

Task 5. Stakeholder coordination.

Estimated Cost for FMS:

Labor Cost	
Task 1 – Revise High Pulse Flow Recommendations for Rio Conchos	\$ 4,660
Task 2 – Estimate Flood Risk Benefits of Task 1 Recommendations	\$ 26,300
Task 3 – Estimate Multiple Benefits of Task 1 Recommendations	\$ 15,740
Task 4 – Define FMPs and FMSs to improve sediment controls on 2 creeks	\$ -
Task 4 – Report	\$ 10,420
Task 5 – Stakeholder Coordination	\$ 5,420
Total Project Labor	\$ 63,000
Travel	\$ -
Total FME cost	\$ 63,000

4F-7. Flood Management Strategy ID: 142000007

Name: Study to plan the management of saltcedar growth and debris in channels in/adjacent to City of Pecos

Description: Study to identify and characterize alternatives to manage vegetation in natural drainages in and adjacent to the City of Pecos to increase conveyance and reduce flooding within the City of Pecos.

Affected Jurisdictions: City of Pecos, Reeves County

Discussion on Flood Risk: The growth of saltcedar within the Pecos River has a number of ancillary negative impacts on floodwater conveyance: the saltcedar growth promotes sedimentation that reduces flow area, and the height of the vegetation impinges on flood flows and increases resistance to flow (roughness). This increases riverine flood risk. The sediment accumulation in the river blocks gravity outfalls of stormwater into the river, increasing interior flooding adjacent to the river. The saltcedar growth has also been studied for other impacts, which have been identified in a study of the Rio Grande (US Army Corp of Engineers [USACE], Forgotten Reach of the Rio Grande, Fort Quitman To Presidio, Texas, Section 729, January 2008). Identified impacts of cedar growth include:

“The consequences of this noxious shrub invasion is increased salinization of soils and water, substantial loss of habitat quality for many faunal species, displacement of native flora, increased surface and groundwater loss due to evapotranspiration losses by saltcedar, and loss of agricultural productivity.”

FMS ID: 142000005 includes the development of alternatives to address saltcedar impacts in the Rio Grande, and includes two tasks (literature review, qualitative comparison of salt cedar controls) that will have overlap to this strategy. Costs for this strategy are reduced assuming FMS ID: 142000005 will be executed prior to this strategy. In addition, FME ID: 141000010 (which models and maps flood hazards in City of Pecos) will be performed prior to FMS ID: 142000007, as this FMS would potentially benefit from knowing the locations of existing flood hazards relative to locations of saltcedar growth.

This strategy will also include a qualitative evaluation of alternatives for cedar control in the vicinity of the City of Pecos, which is the primary population center potentially affected by riverine flooding in the Pecos River basin. The 2007 report proposes a number of alternatives for addressing salt cedar growth in the Rio Grande reach upstream of Presidio. These alternatives (which might be considered for the City of Pecos area) include:

Vegetation Management: large scale land treatment;
Saltcedar Controls: biological control using natural predators, active re-vegetation;
Sediment management: in-channel enhancements to increase sediment transport capacity, and arroyo detention structures;
Channel improvement via river training measures;
Wetland construction;

Water Management and Improved Stream Flows; and Research.

Current information on these alternatives will be assembled and applied to the relevant waterways for the City of Pecos.

Flood Management Strategy Scope of Work:

Task 1. Literature Review. The science that underlies identifying potential solutions to salt cedar growth is rapidly expanding. The USACE 2007 report reviewed for this FMS provides recommendations for important research on the issue that is likely to have been initiated and partially completed prior to issuance of this RFP. Recent relevant studies on the Pecos River and relevant tributaries from the west (e.g., Cottonwood Creek) will also be reviewed. This task will include coordination between RGCOG, City of Pecos, Reeves County, TXDOT, USACE, and other public stakeholders to identify the most current relevant research. This research will be reviewed and a meeting held with coordination partners to develop 1) a list of priority data gaps to identify alternatives for saltcedar control to be evaluated in Task 4, and 2) a list of the evaluation criteria to be quantitatively applied for each method.

Task 2. Data Collection. Data collection will include:

Assembly of full range of available recent (2000-current) LiDAR for reaches of the Pecos River and tributaries to the Pecos River from the west.

Assembly of best available hydraulic and hydrologic models for relevant reaches (note FME 141000010 will develop updated models for these reaches).

Assembly of historic (2000 – current) imagery suitable for estimating vegetation change by species.

Task 3. Engineering Analyses. This task includes these subtasks:

Risk Analyses for Riverine Floods. The existing condition hydraulic models for the Pecos River and tributaries from the west will be altered (by removal of vegetation and sediment) such that the goal flood risk criterion is met within boundaries of defined populated areas (cities, census designated place, colonia).

Estimation of Sedimentation/ Vegetation Removal to Meet Goals. The volume of sediment removal and area of vegetation removal needed to achieve the riverine flood capacity goal will be estimated using the above model results.

Estimation of Historic Annual Changes in Vegetation and Sedimentation. Historic LiDAR and aerial imagery in the reaches will be analyzed to quantify changes in channel conveyance volume and areas of major vegetation types within the data record. These changes will be summarized in terms of average and extreme annual changes within the reach within the areas affecting flood stage in the populated areas.

Task 4. Qualitative Comparison of Saltcedar Controls. The alternatives for saltcedar and sediment control identified in Task 1 will be qualitatively evaluated, including the consideration of nature-based solutions for upland restoration of tributaries to the west, utilizing structures such as loose rock dams or gabion baskets. Reasoning underlying selection of qualitative rankings for each criterion will be documented. Data gaps impeding evaluation will be noted, and details will be provided as to data/ research required for evaluation.

Task 5. Report: Future Planning Information. A summary report will be prepared that summarizes Tasks 1-4.

Estimated Cost for FMS:

These costs assume that this strategy will be preceded by FMS 14200005 (development of alternatives to address salt cedar impacts in the Rio Grande) and FME 141000010 (storm water planning for City of Pecos). These two studies will perform tasks relevant to this FMS, reducing the costs for Tasks 1 and 3.

Labor Cost	
Task 1 – Literature Review	\$ 11,340
Task 2– Data Collection	\$ 11,520
Task 3 – Engineering Analysis	\$ 23,440
Task 4 - Qualitative Comparison of Salt Cedar Controls	\$ 11,780
Task 5 – Report	\$ 9,780
Task 6 – Project Management	\$ 5,120
Total Project Labor	\$ 72,980
Travel	\$ -
Total FME cost	\$ 73,000

4F-8. Flood Management Strategy ID: 142000008

Name: Develop Certification Package for Cibolo Creek Channel and Levee

Description: Perform planning and design required by FEMA for levee accreditation, then complete certification package for Cibolo Creek levee in vicinity of City of Presidio. Package includes O&M Plan.

Affected Jurisdictions: City of Presidio

Description of Flood Risk:

The City of Presidio is protected by a levee owned by the City. The levee was constructed by the U.S. Army Corps of Engineers to meet federal levee standards, but the levee has not been certified under the federal NFIP. Per recent approximate hydraulic modeling performed as part of Regional Flood Plan risk analysis, over 600 structures in the City would be at risk without the levee. This strategy is to develop a FEMA-compliant levee maintenance program for the city that sustains the infrastructure and allows for levee certification. FME ID: 141000002 will precede this FMS, as the FME includes an interior drainage analysis, which is a requirement for levee certification.

Flood Management Strategy Scope of Work:

The reach of levee along Cibolo Creek adjacent to the City of Presidio is not certified the requirements of the NFIP. A certified levee indicates that the levee segment is formally recognized by FEMA as providing flood risk reduction for the 1% annual chance (AC) flood on the applicable FIRMs. To achieve this recognition, the levee systems must meet and continue to meet the minimum design, operation, and maintenance standards per Title 44, Chapter 1, Section 65.10 of the Code of Federal Regulations (44 CFR Section 65.10). This regulation specifies select items that need to be submitted and reviewed by FEMA to obtain levee accreditation, including the following:

- Documentation that the levee meets design criteria (freeboard, stability, settlement, etc.);
- Certified as-built levee plans showing tie-ins;
- Officially adopted operation and maintenance (O&M);
- Emergency Preparedness Plan (including documentation of flood warning systems, emergency notification flowchart); and
- Interior drainage evaluation.

It is assumed that an Emergency Preparedness Plan is currently available for the levee, and that modeling for an interior drainage evaluation will not be needed.

Task 1. Stakeholder Coordination

It is assumed that coordination web/phone meetings will need to occur with stakeholders and sponsoring entities involved.

Task 2. Data Collection

Collect, review, and organize applicable studies and plans necessary for submittal to FEMA for levee certification.

Task 3. Develop an Operations and Maintenance Plan for the Levee.

An Operations and Maintenance (O&M) Plan for the levee will be developed in accordance with USACE and FEMA requirements. This will include:

Meeting with City staff to ascertain and document the existing maintenance program, and to document any known city needs identified as part of the current program;
Assessment of the existing program versus federal requirements;
Meeting with the City to strategize means to meet federal maintenance requirements, if needed; and
Writing the O&M Plan.

Task 4. Prepare Levee Certification Package.

This FMS will prepare an individual certification package and summary report, including all associated attachments, for the Cibol Creek levee segment adjacent to the City of Presidio for FEMA submission. The package will include all elements required by 44 CFR Section 65.10 and described in FEMA guidance, *Meeting the Criteria for Accrediting Levee Systems on Flood Insurance Rate Maps* (FEMA Fact Sheet May 2021). The text of the report will reference other studies/data as necessary to show compliance with 44 CFR Section 65.10. Preparation of each package does not include performing the detailed studies required for certification, but rather aggregation, review, and summary/presentation of the certification material. Sections and/or items to be included in the package and report include the following:

Purpose of Certification package and background;
Certification Statement (to be signed by levee owner/sponsor);
Regulation Compliance;
As-Built Plans and Freeboard Check;
Natural Valley Analysis;
Levee System Check (Roadway crossings, structure crossings, upstream and downstream tie-in locations);
Interior Drainage Analysis (to be performed as part of FME ID: 141000002);
Geotechnical report of the levee assessing embankment and foundation stability, seepage, and settlement;
Embankment Protection, including vegetation and cover assessment and analysis of shear stress;

Closure Structure Data;
 O&M Plan;
 Emergency Preparedness Plan;
 Inspection reports; and
 Statement of compliance with all local, state, and federal laws.

The project is divided into the major tasks below.

Task 1 – Stakeholder Coordination;
 Task 2 – Meetings;
 Task 3 – Data Collection; and
 Task 4 – Levee Certification Package. Estimated costs for this task derive from recent experience in El Paso County with development of a certification package for a segment of the Rio Grande levee.

Estimated Cost for FMS:

Labor Cost	
Task 1 – Stakeholder Coordination	\$ 6,700
Task 2 – Data Collection	\$ 10,220
Task 3– Develop O&M Plan	\$ 7,020
Task 4 – Levee Certification Package Preparation	\$ 55,260
Total Project Labor	\$ 79,200
Travel	\$ -
Total FME cost	\$ 79,000

4F-9. Flood Management Strategy ID: 142000009

Name: Regulatory Review of Off-Road Traffic on State Lands.

Description: Coordination should take place between EPCWID No. 1, El Paso County, and State land owners to discuss enforcement of restrictions associated with off-road motor vehicles on undeveloped land.

Affected Jurisdictions: El Paso County

Description of Strategy

State Lands in El Paso County (EPC) have annual damages to their arid watersheds due to trespassing off-road motor vehicles. These all-terrain vehicles (ATVs) cause extensive damage to the fragile surficial ecosystem, notably through destruction of native vegetation and creation of surficial trails with exposed alluvial soils. These destruction compounds during flood events, when gulying leads to large volumes of sediment deposition at roads and drainage structures, exacerbating flood-related infrastructure damages.

Flood Management Strategy Scope of Work:

This FMS has the goal of developing data and alternative courses of action for assessing and reducing illegal ATV-induced damage to State Lands within EPC.

The SOW for this FMS is includes five tasks.

Task 1. Assessment of existing damages. This assessment will include:

Review of relevant records of stewards of State Lands within EPC and statewide.

Interviews with relevant staff within oversight agencies.

Identification via the above of priority areas to address.

GIS analysis following data collection and interviews to quantify rate of watershed damages within the priority areas. Historic high resolution images will be compared using images spanning over a decade to estimate rate of area disturbance. High density historic LIDAR data will be analyzed to estimate gully expansion within portions of priority areas, where data availability permits.

Task 2. Stakeholder meetings. Two meetings will be held with EPC public stakeholders impacted by increased sediment loads from Task 1 priority watersheds.

Meeting 1: Presentation of Task 1 results, definition of issue and workshop to develop potential alternatives and evaluation factors for alternative selection.

Meeting 2: Discussion of results of alternatives analyses and alternative(s) selection.

Task 3. Alternatives analyses. Qualitative estimates of alternative impacts on illegal ATV use per evaluation factors developed in Meeting 1.

Task 4. Public Education Program. A public education program will be developed that presents information developed in Tasks 1-3. Two public meetings will be held.

Task 5. Develop report. The report will include documentation of Tasks 1-4. Alternatives will be presented with actions defined per TWDB guidance as FMEs, FMSs, or as legislative/administrative changes per Task 8 of the RFP.

Task 6. Stakeholder Coordination.

Estimated Cost for FMS:

Labor Cost	
Task 1 – Assessment of existing damages	\$ 25,980
Task 2– Stakeholder Meetings	\$ 18,340
Task 3 – Alternatives Analyses	\$ 15,800
Task 4 - Public Education Program	\$ 12,500
Task 5 – Report	\$ 12,540
Task 6 – Stakeholder Coordination	\$ 8,400
Total Project Labor	\$ 93,560
Travel	\$ 500
Public meeting materials cost	\$ 5,000
Total FME cost	\$ 99,000

4F-10. Flood Management Strategy ID: 142000010

Name: Regulatory Review of Impervious Cover on New Development in El Paso County.

Description: Coordination should take place between EPCWID No. 1, El Paso County, and Texas GLO land owners to discuss revisions to development regulations associated with detention and impervious cover.

Affected Jurisdictions: El Paso County

Discussion on Flood Risk: There has been significant population, public infrastructure, and private infrastructure growth in El Paso County over the past two decades. There have been two historically extreme major floods (August 2006 and August 2021) during that period, each with extensive transportation disruptions and property damage. This experience demonstrates a need for review of existing local (city, county, water district) regulatory restrictions and design guidance associated with addition of impervious cover and associated design of detention/retention basins.

Flood Management Strategy Scope of Work:

This FMS has the goal of facilitating the developing of revisions to existing regulatory restrictions and design guidance associated with addition of impervious cover and associated design of detention/retention basins.

The SOW for this FMS is includes five tasks.

Task 1. Data collection. Recent construction costs will be reviewed and tabulated to provide a current basis for FMS alternatives cost estimates.

Task 2. Workshop to review existing regulatory restrictions and design guidance. The workshop will review and discuss current restrictions and guidance cited by City of El Paso (COEP), El Paso County (EPC), and El Paso County WID1 (EPCWID1). Attendees will include both public agencies (COEP, EPC, and EPCWID1) and representatives of the development community. Alternatives for the current restrictions and guidance will be discussed and selected for further evaluation. Costs per Task 1 will be reviewed. Potential impacts of each alternative to land development feasibility, developer infrastructure costs, and city/county maintenance costs will be tabulated. Impacts that can be quantified in terms of maintenance cost reduction, flood damage reduction, critical route access, and associated developer cost will be identified for study in Task 2.

Task 3. Alternatives analyses. Study on alternatives impacts will be performed per workshop consensus.

Task 4. Public Meeting. A public meeting will be held, using info derived from Tasks 1-2

Task 5. Develop report. The report will include documentation of Tasks 1-4. Alternatives will be presented with actions defined per TWDB guidance as FMEs, FMSs, or as legislative/administrative changes per Task 8 of the RFP. Impacts per Task 3 for each alternative will be presented. No selection of alternatives will be performed within the report.

Task 6. Stakeholder Coordination.

Estimated Cost for FMS:

Labor Cost	
Task 1 – Data collection	\$ 9,820
Task 2– Workshop to review existing regulatory restrictions and design guidance	\$ 18,340
Task 3 – Alternatives Analyses	\$ 11,660
Task 4 - Public Meeting	\$ 8,260
Task 5 – Report	\$ 8,740
Task 6 – Stakeholder Coordination	\$ 5,420
Total Project Labor	\$ 62,240
Travel	\$ 500
Public meeting materials cost	\$ 1,500
Total FME cost	\$ 64,000

4F-11. Flood Management Strategy ID: 142000013

Name: Staff augmentation support or funding for at risk communities to join and/or enforce the NFIP

Description: Prioritize and provide staff augmentation support or funding for at risk communities not currently participating in the NFIP or communities with limited resources to enforce the NFIP. Aid communities in implementing recommended minimum standards.

Affected Jurisdictions: Presidio County, Hudspeth County, Reeves County, Andrews County, Edwards County, Pecos County, Winkler County, City of Alpine, City of Sonora, City of Barstow, City of Kermit, City of Rankin, City of Thorntonville, Town of Valentine, City of Wickett, City of Wink

Discussion on Flood Risk: During several meetings of the RFPG, and during the June 16, 2022 RFPG Subcommittee 4 meeting (with Presidio County, Hudspeth County, Reeves County, City of Alpine and City of Sonora in attendance), jurisdictions within the large sparsely populated Flood Planning Area outside of El Paso County expressed a common major issue: lack of resources. This lack of ability to hire and fund qualified staff is a primary reason for the lack of focus on local floodplain management, flood mitigation planning, and implementation of flood mitigation measures. Specific shortfalls in these areas include:

For floodplain management: lack of qualified staff/ training for administration of the National Flood Insurance Program (NFIP), lack of funding for badly needed new floodplain maps, lack of training of staff in development and technical oversight of local drainage design criteria for new development, lack of resource for education of local populace in importance of floodplain management.

For flood mitigation planning: lack of funding for strategic growth plan essential for planning future drainage infrastructure, lack of training of staff in FEMA disaster programs (e.g., post-disaster Public Assistance), lack of funding for storm water master planning, lack of resources for education of local populace in importance of storm water master planning.

For flood mitigation implementation: lack of training in USACE Section 404 permitting of channel maintenance, lack of training in selection of grant opportunities across the full spectrum of available grants, lack of technical support for the associated grant application data requirements and processes, lack of resources for education of local populace in importance of implementation of priority flood mitigation actions.

One consensus partial solution to the above issues is to establish a Flood Planning Region-wide staff resource that the small population jurisdictions can access as needed. This strategy develops such a solution.

Flood Management Strategy Scope of Work:

This FMS has the goal of establishing a Flood Planning Region-wide staff resource that the small population jurisdictions can access as needed to address wide-ranging needs associated with

flood mitigation. The RFGP will request that this part time position be funded out of the TWDB regional allocation for state-sponsored flood mitigation planning.

The SOW for this FMS includes two tasks.

Task 1. Definition of a part-time position at the Rio Grande Council of Governments to support small population jurisdictions as needed to improve floodplain management, flood mitigation planning, and flood mitigation implementation within the full Upper Rio Grande Flood Planning Region. This position definition will include:

Requirements for education and experience. This position is not expected to have an engineering education, but will be expected to have GIS skills.
 Required training to be undertaken once hired, to include training costs (estimated for this FMS as \$30,000)

A list of support activities (derived from the strategy definition above) to be provided
 An estimate of hours per year and cost per year required for providing support.

Task 2. Preparation of Regional Interactive GIS Maps. This task will include loading selected GIS layers from the Regional Flood Plan into ArcGIS Online to be available for use as needed by regional jurisdictions. The part time staff that is the focus of Task 1 will be available to aid local jurisdictions with use of these GIS layers.

- Existing Flood Hazard
- Existing Flood Hazard Gaps
- Existing Flood Exposure/Vulnerability
- Future Flood Hazard
- Future Flood Hazard Gaps
- Future Flood Exposure/Vulnerability
- Availability of H&H Models

Task 3. Stakeholder Coordination

Estimated Cost for FMS:

Labor Cost	
Task 1 – Definition of new partial position at RGCOG	\$ 32,000
Task 2– Uploading of Regional GIS Maps to Online Service	\$ 8,000
Task 3– Stakeholder Coordination	\$ 2,000
Total Project	\$ 42,000
Fees to upload data (one time cost)	\$ 2,000
Total FMS cost	\$ 44,000
Recurring Costs (per year)	
Cost of partial staff position at COG	TBD
Fees to ArcGIS Online (Subscription plus hosting)	\$ 700

4F-12. Flood Management Strategy ID: 142000014

Name: Develop new flood gages throughout the region.

Description: Prioritize, fund, and develop new flood gages (rainfall and/or stream gages) throughout the region to support flood warning system improvements and improve ability to validate or calibrate existing and new flood models

Affected Jurisdictions: All of Region 14

Discussion on Flood Risk: Across Flood Planning Region 14 there is a growing need for flood gages that can improve real-time flood alert systems or enhance existing or future flood forecast models. This strategy proposes installing 12 flood gages by using a prioritization process for identifying optimal gage locations, and the development of a simple flood alert system for notifying key emergency personnel. This SOW provides a tailored approach for the Upper Rio Grande Basin, with key aspects that have been used previously for enhancing flood forecast capabilities by the Texas Water Development Board (TWDB) and TxDOT.

Flood Management Strategy Scope of Work:

The preliminary SOW for this project is summarized in five general tasks described below.

Task 1 – Stakeholder Engagement. One in person and up to three virtual meetings with key project stakeholders, such as the flood planning group, will be held throughout the project process to describe the proposed site location prioritization process, solicit feedback on preliminary gage locations, and flood alert or forecasting needs. Stakeholder understanding and contribution will ensure the project's goals are being fully represented and achieved.

Meetings will also be used to better understand long-term objectives for these gage data, such as integrated real-time flood forecasting capabilities or more simplified and easier to maintain flood alert systems. Stakeholder meetings will present opportunities to review and refine the preliminary scope, which will allow the project team to integrate stakeholder knowledge and input across the entire life of the project.

Task 2 – Data Collection and Prioritization. With 10-12 new streamgages being proposed for installation, a framework is necessary to identify and prioritize locations across the flood planning region that will best enhance existing flood warning systems or at locations that have the greatest overall need for flood alerts or forecasting. A site selection process such as the analytic hierarchy process (AHP) is proposed herein, and will provide an objective and defensible process for ranking and recommending streamgage locations. Since its introduction in the 1980s by Saaty, AHP has been applied in a wide variety of settings to model complex decisions and excels at quantitatively ranking decision alternatives, including geospatially.

In 2016 AHP was used in a Texas Water Development Board (TWDB) study, which identified communities with the most pressing need for streamgages for improved flood forecasting services. The TWDB study worked closely with the NWS and USGS in identifying new

streamgage locations and increasing the forecasting accuracy of the NWS Advanced Hydrologic Prediction Service (AHPS). As part of an ongoing TxDOT Project, AHP was utilized to rank 60 new streamgage locations based on vulnerable bridges susceptible to overtopping and sustaining flood and economic damages.

Applicable datasets will be identified and integrated in the AHP for ranking streamgage locations. Each dataset would have a weight, or ranking, compared to other utilized datasets, allowing the project team to decide which data are the most important factors. While dataset are anticipated to be reviewed and selected during the project and through careful consultation with stakeholders, some example datasets that could be utilized are as follows:

Flood fatalities: regions with increased fatalities due to flooding, such as vehicle related

Bridge/Roadway flooding: bridges that have been closed due to flooding or flood damage.

National Flood Insurance Program claim payment data: regions with high levels of flood claim payments, such as high repetitive losses or frequency of flooding.

Recent Fathom Floodplain mapping data: these recently completed data products provide a detailed floodplain map and water level depths in areas previously unrepresented in traditional FEMA maps.

Terrain Slope: regions with higher slope have the potential for increased flash flood risk.

EPA's Environmental Justice Map Data: identify regions with populations more vulnerable to flooding risks and flood impacts.

Task 3 – Site Investigation and Gage Equipment Review. Once a final ranking of gage locations are provided, a further site review to assess the feasibility of a streamgage installation and operation will be conducted. Virtual visits using aerial photography, or even street view photos, will be used to conduct a preliminary site review and reduce the need for physical visits. Many streamgage locations initially ranked through the prioritization process may not be practically feasible due to a number of reasons, including inaccessible location, or other installation or operation and maintenance limitations.

With a large number of gage locations anticipated to be identified at low water crossings or even culverts, a variety of water level monitoring technology will need to be considered. Beyond the traditional streamgage, which uses a pressure transducer to measure water levels, other approaches that will be considered include radar or doppler technology.

Another important component of a gage is its ability to transmit collected data for integration into a flood alert system or forecast model. Data transmission should occur in real-time and can utilize cell, VHF radio, or satellite technology. A variety of options and considerations, such as ongoing operational and maintenance needs, can be discussed during the stakeholder engagement process of this project.

Task 4 – Streamgage Equipment and Installation. Once feasible gage sites and a streamgage type have been identified, gage installation can occur. In addition to necessary equipment, installation will require permitting and approval from the appropriate governing authorities.

Task 5 – Flood Alert System. Flood gages transmitting data will require data storage and management, and to use these data to implement an alert system to notify key emergency personnel when flooding is occurring or water levels have reached a critical level. These systems can range from relatively simple emails, website notifications and visual interfaces, to more complicated system-wide forecasting approaches. Some equipment suppliers offer integrated alert systems and software with associated annual usage fees. For this proposal a simple flood alert system is budgeted, which aims to reduce annual software fees.

Task 6 – Stakeholder Coordination and Reporting. A project manager will oversee the project. A report will also be written, summarizing the project’s methodology, site prioritization process, installed and implemented streamgages, the data management system, and any implemented alert system. A staff training on system operations and maintenance, along with an operations manual, will ensure project continuity and long-term success.

Estimated Cost for FMS:

The total estimated fixed project cost for this FMS is \$240,000, with a task and equipment cost breakdown provided below. Annual operation and maintenance costs are estimated at \$7,000. Alternative flood alert system proprietary software costs can also be explored but will likely cost more than estimated in the second cost stable shown below.

Estimate of Fixed Strategy Costs					
Task	Labor Cost	Travel Costs	Equipment Cost	Estimate of Total Cost	Notes
Task 1 - Stakeholder Engagement	\$ 5,165	\$ 690		\$ 5,855	Three stakeholder meetings, 1 in-person in El Paso, 2 virtual
Task 2 - Data Collection and Prioritization	\$ 8,100			\$ 8,100	
Task 3 - Site Investigation and Gage Equipment Review	\$ 11,200	\$1,997		\$ 13,197	
Task 4 - Streamgage Equipment and Installation	\$ 24,640	\$5,434	\$ 168,000	\$ 198,074	Equipment estimated at \$14,000 per gage site
Task 5 - Real-time Monitoring and Alert System	\$ 10,125			\$ 10,125	Simple flood alert notification system developed by Aqua Strategies
Task 6 - Stakeholder Coordination and Reporting	\$ 4,600			\$ 4,600	
Total	\$ 63,830	\$8,121	\$ 168,000	\$ 240,000	

Estimate of Recurring Annual Strategy Costs			
Annual O&M Costs	Labor Cost	Travel Costs	Annual O&M Total Cost Estimate
Annual site/maintenance visit for 1 staff	\$ 3,240	\$ 2,477	\$ 5,717
Simple Flood Alert Notification/System Maintenance	\$ 980		\$ 980
Total Recurring Costs (Annually)	\$ 4,220	\$ 2,477	\$ 7,000

4F-13. Flood Management Strategy ID: 142000015

Name: Develop and design standard options for addressing identified development-related flooding in El Paso.

Description: Evaluate COEP and EPC drainage design standards for inlets, curb cuts, requirements for on-site storage in new developments, addressing as-built elevations, protecting remaining on-site storage and recovering original storage for existing developments.

Affected Jurisdictions: El Paso County

Discussion on Flood Risk: There has been significant population, public infrastructure, and private infrastructure growth in El Paso County over the past two decades. There have been two historically extreme major floods (August 2006 and August 2021) during that period, each with extensive transportation disruptions and property damage. Local agency experience in two events were discussed in an URGFPG meeting in November, 2021. This expressed experience identified a need for review of existing local (city, county, water district) design requirements for specific types of drainage structures. These structures include 1) storm drain system inlets across the El Paso County environment. Issues include a) inlet capacity on steep slopes, b) addressing risk of sediment blockage, and c) addressing discharge into irrigation drains. Other structures for technical design requirement review include 2) curb cuts into off-channel detention and 3) on-site detention for individual residential structures.

Flood Management Strategy Scope of Work:

This FMS involves coordination between El Paso Water, El Paso County, and EPCWID1 with the goal of facilitating the developing of revisions to existing design guidance for storm drain inlets, curb cuts, and on-site detention.

The SOW for this FMS is includes five tasks.

Task 1. Reference review. Current design guidance will be reviewed versus current technical studies associated with inlets on steep slopes, protection of inlets from sediment blockage, discharge from developments into existing flood channels, rating curves (flow versus depth) of curb cuts, and effectiveness of on-site detention. Interviews will also be held with City of El Paso, El Paso County, and El Paso County Water Improvement District No 1 to document agency history with current design standards addressing these issues.

Task 2. Workshop to review existing design guidance. The workshop will review and discuss current design guidance issued by City of El Paso (COEP), El Paso County (EPC), and El Paso County WID1 (EPCWID1) for the above issues. Attendees will include both public agencies (COEP, EPC, and EPCWID1) and representatives of the development community. Technical recommendations will be presented for improvement of the existing design guidance, with associated technical justification. Issues to address via further technical study will be identified.

Task 3: Issues analyses. Study of outstanding issues will be performed per workshop consensus.

Task 4. Develop report. The report will include documentation of Tasks 1-3. Technical recommendations for revised design standards will be provided for each of the issues associated with this FMS.

Task 5. Stakeholder Coordination.

Estimated Cost for FMS:

Labor Cost	
Task 1 – Reference Review	\$ 14,060
Task 2– Workshop to review existing design guidance	\$ 6,900
Task 3 – Issues Analyses	\$ 5,300
Task 4 – Report	\$ 5,380
Task 5 – Stakeholder Coordination	\$ 3,040
Total Project Labor	\$ 34,680
Travel	\$ -
Total FME cost	\$ 35,000

4F-14. Flood Management Strategy ID: 142000016

Name: Develop regional solutions to address erosion issues in natural channels affecting stormwater conveyance.

Description: Develop consensus region-specific erosion-resistant designs to prevent removal of material from drainage conveyances, with functional comparisons to aid selection of best practices.

Affected Jurisdictions: All of Region 14

Discussion on Flood Risk: In the arid URGFPR, unlined, broad natural channels (e.g., arroyos) convey a significant portion of the flood waters that impact structures (buildings, roads) in the region. Arroyos potentially also convey a high volume of sediment/ debris during floods which can greatly add to the damage of these structures. The sediment deposition leads to high post-flood maintenance/ clean-up costs that can be a significant financial burden on regional cities and counties. This Regional Flood Plan has a Flood Management Evaluation (FME ID: 141000015) that estimates sediment loadings from floods in selected arroyos in El Paso County, and presents a refined method to estimate relative production of sediment in arroyos throughout the region. This FMS follows that FME and is focused 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 this arroyo for application throughout the region. This strategy is focused on arroyos in general within the region. FME 141000015 is focused more specifically on arroyo-related issues in the El Paso area.

The solutions to be developed as part of this FMS are expected to incorporate the recent experience of the Rio Grande Joint Venture (RGJV). At Alamito Creek Preserve, Rio Grande Joint Venture has installed a dozen loose rock structures and road aprons along with high density large woody debris structures. In Cienega Creek, brush-weir structures at Las Cienegas were installed. The RGJV plans to install Beaver Dam Analogs adjacent to the other structures and scale up these types of streamflow harvesting and groundwater recharge techniques.

Flood Management Strategy Scope of Work:

This FMS has the goal of developing regional solutions to address erosion issues in natural channels affecting stormwater conveyance. These solutions will be designed to meet state-wide and RFPG stated goals to serve multiple purposes: reduce erosion, preserve/ enhance the natural environment, promote water conservation, etc.

The SOW for this FMS includes five tasks.

Task 1. Reference review. Current publicly available design guidance issued/ in use by regional (Texas and New Mexico) natural resource management agencies for erosion mitigation will be collected and reviewed. Each potential erosion mitigation action (and its associated design) will be classified as to relevance for application to the conditions present in the URGRFPA.

Where feasible, watersheds where relevant practices have been employed will be investigated to ascertain relative success in serving the defined RFGP multiple goals.

Task 2. Workshop to review relevant potential erosion mitigation actions. The workshop will review and discuss potential erosion mitigation actions deemed relevant for consideration in the URGRFPA. Invitees to the workshop will be determined by the RFGP. Alternative actions presented will include qualitative technical evaluations as to 1) limitation on applicability within the region, 2) relative benefits in meeting each of the multiple goals, 3) costs of implementation, and 4) costs of maintaining benefits. Issues to address via further technical study for each potential action will be identified. A regional arroyo will be chosen for development of example designs.

Task 3: Issues analyses and sample designs. Study of outstanding issues will be performed per workshop consensus. Develop example designs for a selected regional arroyo.

Task 4. Develop report. The report will include documentation of Tasks 1-3. Technical recommendations for design standards will be provided for each of the potential mitigation actions identified with this FMS. Individual action design guidance will generally consist of 1) appropriate site conditions for action application, 2) a reference to existing design guidance (available for download from a public source), 3) a list of the issues identified in Task 2 and their resolution via Task 3, and 4) a qualitative relative cost.

Task 5. Stakeholder Coordination.

Estimated Cost for FMS:

Labor Cost	
Task 1 – Reference Review	\$ 14,060
Task 2– Workshop to review relevant potential erosion mitigation actions	\$ 8,740
Task 3 – Issues Analyses and Sample Designs	\$ 21,400
Task 4 – Report	\$ 7,540
Task 5 – Stakeholder Coordination	\$ 5,120
Total Project Labor	\$ 56,860
Travel	\$ -
Total FME cost	\$ 57,000

4F-15. Flood Management Strategy ID: 142000017

Name: Develop solutions to address city/county stormwater conveyance into the Rio Grande (El Paso County).

Description: Refine agency action coordination in conveyance of interior flooding to the Rio Grande. Develop FMP designs and costs for improvements of conveyance from river terrace storm water infrastructure, considering high ground water.

Affected Jurisdictions: City of El Paso, El Paso County

Discussion on Flood Risk: The City and County of El Paso have 79 outfalls of storm water 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). A study recommended by the RFPG, FME ID: 14000018 identifies site for new outfalls and prioritizes existing outfalls for consideration for improvement. This FMS provides concept level designs and costs to install new outfall(s) and improve the existing priority outfalls. In addition, non-structural measures (e.g., improved interagency coordination, early warning planning) will be developed to improve stormwater conveyance into the Rio Grande as part of this FMS.

Flood Management Strategy Scope of Work:

This FMS has the goal of developing structural and non-structural solutions for improvement of conveyance of stormwater into the Rio Grande in El Paso County. This FMS is necessarily preceded by an evaluation of the existing system per the SOW presented in FME 14000018.

The SOW for this FMS includes five tasks.

Task 1. Alternatives Development. For each priority outfall (assumed 5), an alternative will be developed to prevent localized flood damage due to the 1% AC flood, for each of these scenarios

Rio Grande at normal operational stage;

Rio Grande at intermediate flood stage (to be determined by the RFPG); and

Rio Grande at 2% AC flood stage (or alternate level to be determined by the RFPG).

Solutions may include conduit upsizing, addition of a new pump/ expanded pump capacity, addition of detention. Rough order of magnitude costs will be developed for each outfall and scenario.

Non-structural solutions to be developed will include potential actions to improve system operation/ interagency coordination; and actions to improve early warning, if needed.

Task 2. Workshop to review initial alternatives. The workshop will review and discuss the conceptual designs developed as part of Task 1. The goals of the workshop will be to:

For each outfall addressed:

- Select a scenario to use as a design criteria
- Identify potential improvements for the design for the selected scenario
- Identify issues to address in conversion to a FMP

Review scopes of work (SOWs) for non-structural improvements and:

- Edit per workshop consensus

Task 3: Define a FMP and FMS to improve outfall performance. The concept designs selected for each priority outfall will be refined and aggregated as two FMPs (one for the aggregate City outfalls, one for the aggregate county outfalls). FMPs will conform to TWDB guidance. The SOWs for non-structural solutions will be combined into a single FMS. Agencies expected to be involved in the proposed development of interagency flood and emergency planning concerning Rio Grande discharges will review this FMS. A meeting will be held to achieve consensus on the SOW among planning participants.

Task 4. Develop report. The report will include documentation of Tasks 1-3.

Task 5. Stakeholder Coordination.

Estimated Cost for FMS:

Labor Cost	
Task 1 – Alternatives Development	\$ 30,300
Task 2– Workshop to review initial alternatives	\$ 11,140
Task 3 – Define a FMP and FMS to improve outfall performance	\$ 38,000
Task 4 – Report	\$ 10,580
Task 5 – Stakeholder Coordination	\$ 9,040
Total Project Labor	\$ 99,060
Travel	\$ -
Total FME cost	\$ 99,000

4F-16. Flood Management Strategy ID: 142000019

Name: Initiate program to develop integrated solutions to improve irrigation system/ stormwater conveyance system interaction in El Paso area.

Description: Initiate program to develop integrated solutions to improve irrigation system/ stormwater conveyance system interaction in El Paso area.

Affected Jurisdictions: El Paso County

Discussion on Flood Risk: Historically, river water has been conveyed from the Rio Grande (via diversion at American Dam) via canals into the riverine terrace adjacent to the Rio Grande. These canals are necessarily at an elevation above the agricultural fields. Farmers divert water via gravity flow from the canals into their fields. The flow from the fields is collected in drains (e.g., Mesa Drain), conveyed to wasteways where the water is eventually discharged back into the Rio Grande. These linear structures (canals, drains, wasteways) are operated and maintained by EPCWID1. The Playa Drain, maintained by COEP is an exception. These structures necessarily interact with stormwater and divert and concentrate stormwater into the same wasteways. The historic agricultural operations have been progressively replaced within El Paso County by urban area, and in some areas of the city and county the agricultural drain system is the primary conveyor of urban stormwater. The purpose of this strategy is to enhance the existing active cooperation between EPCWID1, El Paso Water, and El Paso County by developing a storm water-focused report for the canal/ drain/ wasteway system developed jointly by the three entities (and other Regional Flood Plan-defined stakeholders). The report will provide recommendations addressing identified needs for multi-agency administrative and regulatory action for improved storm water conveyance. Identifications of FMPs for system improvements are addressed by FME 141000004 (Mesa Drain improvements) and FME 141000019 (Montoya Drain Improvements) and are not addressed by this FMS.

Flood Management Strategy Scope of Work:

This FMS will identify relevant issues involving administrative (e.g., development permitting) and regulatory actions associated with stormwater conveyance into the Rio Grande via the drains and wasteways operated and maintained by EPCWID1 and COEP. Recommendations will be developed to address those issues.

The SOW for this FMS is includes five tasks.

Task 1. Data Collection. A map will be developed using existing models and agency datasets displaying: 1) city and county jurisdictional boundaries, 2) system elements: canals, drains, wasteways, 3) watershed areas tributary to historic agricultural drains, 4) locations of permitted storm water connections into drains, 5) system gates/ controls, and 6) crossings/ siphons under canals. This map will be prepared in such a way that stakeholders can annotate the map with issues as appropriate. The map will be provided to the sponsors prior to the kickoff meeting.

Task 2. Project scoping and Kickoff Meeting. The sponsors (EPCWID1, EPW, and EPC) will invite other stakeholders representing multipurpose issues (environment, water supply) as appropriate. This kickoff meeting will be a workshop where issues associated with the use of the irrigation system for stormwater conveyance are identified and physically located (if appropriate) on the map developed in Task 1. The deliverable from the meeting will be a list of action items for meeting participants (sponsors, stakeholders, technical consultants). These action items are to be addressed prior to Task 4.

Task 3: Issues analyses. Action items to be performed by the project technical consultant will be performed.

Task 4. Workshop to Define/Address Future Action. A second workshop will be held where sponsors, stakeholders and the technical consultant present their resolution of the action items raised in Task 2. Issues associated with action items will be defined as resolved or deferred for future action. The final deliverable for the FMS will be a summary of the issues, action items, and resolution from this workshop.

Task 5. Stakeholder Coordination.

Estimated Cost for FMS:

Labor Cost	
Task 1 – Data Collection	\$ 4,860
Task 2– Kickoff meeting	\$ 2,850
Task 3 – Issues Analyses	\$ 6,460
Task 4 –Workshop to Address Future Action	\$ 4,530
Task 5 – Stakeholder Coordination	\$ 1,890
Total Project Labor	\$ 20,590
Travel	\$ -
Total FME cost	\$ 21,000

4F-17. Flood Management Strategy IDs: 142000020

Name: Develop and Improve Early Warning System (EWS) for El Paso City/ County interior drainage

Description: Conduct study to evaluate and proposed improvements to Early Warning Systems (EWSs) for interior drainage in El Paso City and El Paso County. Includes assessment of existing flood EWS.

Affected Jurisdictions: City of El Paso, El Paso County

Discussion on Flood Risk: While the City of El Paso has an existing flood warning system in place for both the Rio Grande and interior flooding, there are varying warning times that can be provided from meteorologists associated with providing those warnings. This strategy aims to improve the existing Early Warning System in the City of El Paso County and El Paso County.

Flood Management Strategy Scope of Work:

A proposal prepared by aem and Vieux & Associates (July 2022) for the purposes of the Regional Flood Plan is attached, which describes the SOW and costs associated with this strategy.

Estimated Cost for FMS:

The attached bid estimate prepared by aem and Vieux & Associates (July 2022) includes two options (specified as Level 1 and Level 2 in the proposal) with varying fixed and recurring costs. The equipment/construction costs were adjusted from July 2022 dollars to September 2020 dollars using the Construction Cost Index, while the non-construction costs associated with services, installation, and training were converted to September 2020 dollars using the Consumer Price Index. The fixed and recurring costs for each option are provided in the following two cost tables.

Total FMS Cost - Level 1 Option	
Subtotal 1.1 – Vieux/aem Construction/Equipment Cost (July. 2022)	\$ 17,389
Subtotal 1.2 – RFP Construction/Equipment Cost (September 2020, using CCI)	\$ 15,000
RFP Total Construction/Equipment Cost (Sept. 2020)	\$ 15,000
Subtotal 1.3 – Vieux/aem Services/Installation Cost (July 2022)	\$ 107,420
Subtotal 1.4 - RFP Services/Installation Cost (September 2020, using CPI)	\$ 94,906
RFP Total Non-Construction Cost (September 2020, using CPI)	\$ 95,000
Total Fixed FMS Cost	\$ 110,000
Total Recurring FMS Cost (Annually)	\$ 30,000

Total FMS Cost - Level 2 Option	
Subtotal 2.1 – View/aem Construction/Equipment Cost (July. 2022)	\$ 5,000
Subtotal 2.2 – RFP Construction/Equipment Cost (September 2020, using CCI)	\$ 4,000
RFP Total Construction/Equipment Cost (Sept. 2020)	\$ 4,000
Subtotal 2.3 – View/aem Services/Installation Cost (July 2022)	\$ -
Subtotal 2.4 - RFP Services/Installation Cost (September 2020, using CPI)	\$ -
RFP Total Non-Construction Cost (September 2020, using CPI)	\$ -
Total Fixed FMS Cost	\$ 4,000
Total Recurring FMS Cost (Annually)	\$ 108,000

4F-18. Flood Management Strategy IDs: 142000021

Name: Develop and Improve Early Warning System for City of Pecos

Description: Conduct study to evaluate and propose improvements to Early Warning Systems (EWSs) for City of Pecos and adjacent Lindsay Census Designated Place (CDP). Includes assessment of existing flood EWS.

Affected Jurisdictions: City of Pecos, Lindsay 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 Regional Flood Plan, the floodplain potentially causes damage to over 1,900 structures and restricts travel. Extent of 1% AC flood risk is depicted in Map 15, Map 3 of 31. This strategy aims to develop an Early Warning System for the City of Pecos and improve Reeves County Emergency Management warning times for road closures and evacuations.

Flood Management Strategy Scope of Work:

A proposal prepared by aem and Vieux & Associates (July 2022) for the purposes of the Regional Flood Plan is attached, which describes the SOW and costs associated with this strategy.

Estimated Cost for FMS:

The attached bid estimate prepared by aem and Vieux & Associates (July 2022) includes both fixed and recurring costs. The equipment/construction costs were adjusted from July 2022 dollars to September 2020 dollars using the Construction Cost Index, while the non-construction costs associated with services and installation were converted to September 2020 dollars using the Consumer Price Index. The fixed and recurring costs for each option are provided in the following cost table.

Total FMS Cost	
Subtotal 1.1 – Vieux/aem Construction/Equipment Cost (July. 2022)	\$ 1,060
Subtotal 1.2 – RFP Construction/Equipment Cost (September 2020, using CCI)	\$ 926
RFP Total Construction/Equipment Cost (Sept. 2020)	\$ 1,000
Subtotal 1.3 – Vieux/aem Services/Installation Cost (July 2022)	\$ 41,580
Subtotal 1.4 - RFP Services/Installation Cost (September 2020, using CPI)	\$ 36,736
RFP Total Non-Construction Cost (September 2020, using CPI)	\$ 37,000
Total Fixed FMS Cost	\$ 38,000
Total Recurring FMS Cost (Annually)	\$ 12,000

4F-19. Flood Management Strategy IDs: 142000022

Name: Develop and Improve Early Warning System for City of Alpine

Description: Conduct study to evaluate and propose improvements to Early Warning Systems (EWSs) for City of Alpine. Includes assessment of existing flood EWS.

Affected Jurisdictions: City of Alpine, Brewster County

Discussion on 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 Regional Flood Plan, over 1,600 structures within the city are estimated to be potentially impacted during the 1% Annual Chance (100-year) flood. Map 15, Map 4 of 31 depicts this risk. This strategy aims to develop an Early Warning System for the City of Alpine and improve Brewster County Emergency Management warning times for road closures and evacuations.

Flood Management Strategy Scope of Work:

A proposal prepared by aem and Vieux & Associates (July 2022) for the purposes of the Regional Flood Plan is attached, which describes the SOW and costs associated with this strategy.

Estimated Cost for FMS:

The attached bid estimate prepared by aem and Vieux & Associates (July 2022) includes both fixed and recurring costs. The equipment/construction costs were adjusted from July 2022 dollars to September 2020 dollars using the Construction Cost Index, while the non-construction costs associated with services and installation were converted to September 2020 dollars using the Consumer Price Index. The fixed and recurring costs for each option are provided in the following cost table.

Total FMS Cost	
Subtotal 1.1 – Vieux/aem Construction/Equipment Cost (July, 2022)	\$ 1,060
Subtotal 1.2 – RFP Construction/Equipment Cost (September 2020, using CCI)	\$ 926
RFP Total Construction/Equipment Cost (Sept. 2020)	\$ 1,000
Subtotal 1.3 – Vieux/aem Services/Installation Cost (July 2022)	\$ 41,580
Subtotal 1.4 - RFP Services/Installation Cost (September 2020, using CPI)	\$ 36,736
RFP Total Non-Construction Cost (September 2020, using CPI)	\$ 37,000
Total Fixed FMS Cost	\$ 38,000
Total Recurring FMS Cost (Annually)	\$ 12,000

4F-20. Flood Management Strategy IDs: 142000023

Name: Develop and Improve Early Warning System for City of Presidio, Presidio County

Description: Identify and design access routes and bridges/culverts to provide emergency access during extreme flood events in the City of Presidio.

Affected Jurisdictions: City of Presidio, Presidio County

Discussion on Flood Risk: The City of Presidio is an incorporated area in Presidio County, and is subject to flooding from the confluences of several large creeks with the Rio Grande (Cibolo Creek, Alamito Creek, Terneros Creek), as well as potential flooding from the Rio Conchos confluence with the Rio Grande. Approximate modeling performed as a task for the Regional Flood Plan identified over 650 structures at risk in the 1% AC flood within City of Presidio, assuming the Cibolo Creek and Rio Grande levees (which are not accredited by FEMA) are absent. Extent of 1% AC flood risk is depicted in Map 15, Map 1 of 31.

Presidio does not have a meteorologist dedicated to early flood warnings for the county, and they share information with Jeff Davis (upstream watershed) based off National Weather Service flood warnings. Per Presidio County Emergency Management, the County can check online gage monitors and notify the public through a reverse 911 system. The County also coordinates with the USIBWC on flood warning related to the Rio Grande. This strategy aims to develop an Early Warning System for the City of Presidio and improve Presidio County Emergency Management warning times for road closures and evacuations.

Flood Management Strategy Scope of Work:

A proposal prepared by aem and Vieux & Associates (July 2022) for the purposes of the Regional Flood Plan is attached, which describes the SOW and costs associated with this strategy.

Estimated Cost for FMS:

The attached bid estimate prepared by aem and Vieux & Associates (July 2022) includes both fixed and recurring costs. The equipment/construction costs were adjusted from July 2022 dollars to September 2020 dollars using the Construction Cost Index, while the non-construction costs associated with services and installation were converted to September 2020 dollars using the Consumer Price Index. The fixed and recurring costs for each option are provided in the following cost table.

Total FMS Cost	
Subtotal 1.1 – View/aem Construction/Equipment Cost (July. 2022)	\$ 1,060
Subtotal 1.2 – RFP Construction/Equipment Cost (September 2020, using CCI)	\$ 926
RFP Total Construction/Equipment Cost (Sept. 2020)	\$ 1,000
Subtotal 1.3 – View/aem Services/Installation Cost (July 2022)	\$ 41,580
Subtotal 1.4 - RFP Services/Installation Cost (September 2020, using CPI)	\$ 36,736
RFP Total Non-Construction Cost (September 2020, using CPI)	\$ 37,000
Total Fixed FMS Cost	\$ 38,000
Total Recurring FMS Cost (Annually)	\$ 12,000

4F-21. Flood Management Strategy IDs: 142000024

Name: Develop and Improve Early Warning System for City of Fort Stockton

Description: Conduct study to evaluate and propose improvements to Early Warning Systems (EWSs) for City of Fort Stockton. Includes assessment of existing flood EWS.

Affected Jurisdictions: City of Fort Stockton, Pecos County

Discussion on Flood Risk: The City of Fort Stockton is an incorporated area in Pecos County. 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 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. This strategy aims to develop an Early Warning System for the City of Fort Stockton and improve Pecos County Emergency Management warning times for road closures and evacuations.

Flood Management Strategy Scope of Work:

A proposal prepared by aem and Vieux & Associates (July 2022) for the purposes of the Regional Flood Plan is attached, which describes the SOW and costs associated with this strategy.

Estimated Cost for FMS:

The attached bid estimate prepared by aem and Vieux & Associates (July 2022) includes both fixed and recurring costs. The equipment/construction costs were adjusted from July 2022 dollars to September 2020 dollars using the Construction Cost Index, while the non-construction costs associated with services and installation were converted to September 2020 dollars using the Consumer Price Index. The fixed and recurring costs for each option are provided in the following cost table.

Total FMS Cost	
Subtotal 1.1 – Vieux/aem Construction/Equipment Cost (July. 2022)	\$ 1,060
Subtotal 1.2 – RFP Construction/Equipment Cost (September 2020, using CCI)	\$ 926
RFP Total Construction/Equipment Cost (Sept. 2020)	\$ 1,000
Subtotal 1.3 – Vieux/aem Services/Installation Cost (July 2022)	\$ 41,580
Subtotal 1.4 - RFP Services/Installation Cost (September 2020, using CPI)	\$ 36,736
RFP Total Non-Construction Cost (September 2020, using CPI)	\$ 37,000
Total Fixed FMS Cost	\$ 38,000
Total Recurring FMS Cost (Annually)	\$ 12,000

4F-22. Flood Management Strategy IDs: 142000025

Name: Develop and Improve Early Warning System for City of Marfa, Presidio County.

Description: Identify and design access routes and bridges/culverts to provide emergency access during extreme flood events in Marfa. Southeast Marfa and dirt portion of FM 2810 were identified as problem areas by Presidio County Office of Emergency Management.

Affected Jurisdictions: City of Marfa, Presidio County

Discussion on Flood Risk: The City of Marfa is an incorporated area in Presidio County. On June 28, 2021, a car was swept away while attempting to pass the Alamito Creek low water crossing (LWC) at Neville Street in Marfa, Texas, resulting in the death of the driver. A non-structural FMP is proposed (FMP ID: 143000007) in the Regional Flood Plan to add flood gates to four low water crossings in Marfa and install an upstream flood gage at the Highway 17 crossing of North Alamito Creek. While the FMP would prevent drivers from crossing LWCs during floods, and the upstream gage would provide additional warning time for Emergency Management to deploy, a more robust Early Warning System could provide even more warning time and aid in preparing for evacuations, if needed. This strategy aims to develop an Early Warning System for the City of Marfa and improve Presidio County Emergency Management warning times for road closures and evacuations.

Flood Management Strategy Scope of Work:

A proposal prepared by aem and Vieux & Associates (July 2022) for the purposes of the Regional Flood Plan is attached, which describes the SOW and costs associated with this strategy. While the FMP ID: 143000007 also affects early warning in the City of Marfa, the FMP does not require recurring costs, and this FMS includes a system that does have recurring costs. While this FMS would supplement early warning times associated with the FMP, it is not required to be implemented before or after this FMP is constructed.

Estimated Cost for FMS:

The attached bid estimate prepared by aem and Vieux & Associates (July 2022) includes both fixed and recurring costs. The equipment/construction costs were adjusted from July 2022 dollars to September 2020 dollars using the Construction Cost Index, while the non-construction costs associated with services and installation were converted to September 2020 dollars using the Consumer Price Index. The fixed and recurring costs for each option are provided in the following cost table.

Total FMS Cost	
Subtotal 1.1 – View/aem Construction/Equipment Cost (July. 2022)	\$ 1,060
Subtotal 1.2 – RFP Construction/Equipment Cost (September 2020, using CCI)	\$ 926
RFP Total Construction/Equipment Cost (Sept. 2020)	\$ 1,000
Subtotal 1.3 – View/aem Services/Installation Cost (July 2022)	\$ 41,580
Subtotal 1.4 - RFP Services/Installation Cost (September 2020, using CPI)	\$ 36,736
RFP Total Non-Construction Cost (September 2020, using CPI)	\$ 37,000
Total Fixed FMS Cost	\$ 38,000
Total Recurring FMS Cost (Annually)	\$ 12,000