Texas Water Development Board

Supporting Information for stakeholders reviewing the proposed methods for ranking recommended flood projects in the state flood plan

Content

Purpose

In 2019, the Texas Legislature passed Senate Bill 8 directing the creation of the first-ever state flood plan for Texas. Statute requires that all recommended flood mitigation projects be ranked in the state flood plan. The 15 Regional Flood Planning Groups (RFPG), designated by the TWDB in 2020, will submit their amended regional flood plans to TWDB by July 10, 2023. The TWDB will combine the approved regional flood plans into a single state flood plan to be delivered to the Legislature by September 1, 2024.

The TWDB is soliciting stakeholder feedback on the proposed methods for ranking Flood Management Evaluations (FME), Flood Mitigation Projects (FMP), and Flood Management Strategies (FMS) in the 2024 State Flood Plan. This supporting document and its attachments are intended to be used in conjunction with the three Excel Ranking Workbooks available for download on the TWDB website: https://www.twdb.texas.gov/flood/planning/sfp/index.asp . All feedback will be collected via online survey tool: https://forms.office.com/r/0K3bLSADuq

TWDB will consider this stakeholder feedback when developing the project rankings that will be included in the *draft* state flood plan that will also become available for public comment in 2024. For maximum transparency, the actual spreadsheets with ranking criteria, weightings, project data, and the resulting example rankings are being provided to stakeholders as part of this feedback solicitation process.

Background

The overarching goal of the regional and state flood plans is to protect against the loss of life and property by (1) identifying and reducing the risk and impact to life and property that already exists, and (2) avoid increasing or creating new flood risks by addressing future development within areas known to have existing or future flood risks. In each of their regional flood plans, Regional Flood Planning Groups (RFPGs) recommended FMEs, FMPs, and FMSs.

To better help you review and evaluate the attached proposed ranking methods, it is important to first understand the intent of ranking:

Ranking is generally intended:
- to identify areas with the worst existing risk of flooding in the 1% annual chance floodplain
- to identify flood risk mitigation solutions that may result in greater overall reduction in flood risk
- to primarily focus on projects with the greater potential to mitigate the risk to life and property

Ranking is NOT intended:
- as a method for allocating state funding. Future funding decisions will occur through a separate TWDB process if and when funds are appropriated by the Texas Legislature. How the state flood plan project ranking may be considered in future flood project funding *prioritization* and allocation processes remains to be determined although it is anticipated that the state flood plan *ranking* will be at least one of the considerations.

Overall approach

The intent of the TWDB ranking method for the state flood plan is to provide a consistent and even-handed approach to be used across all Texas regions to systematically address, in general, the flood hazard with most population, properties and critical facilities at risk first in the state during a 1% annual chance flood. The proposed process aims to result in a ranking with a focus on (a) severity of flood risk and (b) reduction of flood risk and impact to life and property as required by 86th Texas Legislature Senate Bill 8.

The basic approach to developing the proposed ranking methodology was to first to ensure, back at the beginning of this first regional flood planning cycle that by the end of the regional flood planning cycle, TWDB would collect enough comparable data from all 15 regions to provide an adequate basis for developing a meaningful ranking method that could be applied in a consistent manner to all recommended flood solutions.

In keeping with the bottom-up approach of the regional flood planning program, the proposed ranking methods utilize only data provided by each RFPG in their regional flood plans for ranking flood solutions in the state flood plan. Note that there is one ranking factor under consideration that was calculated by TWDB using RFPG-reported data, and it is clearly marked as such in the list of proposed ranking criteria. **Attachment 1** details the respective ranking criteria under consideration for FMEs, FMPs and FMSs.

The ranking criteria generally focus on flood risk and flood risk reduction to people, structures, critical facilities, low water crossings, farm and ranch land and several other relevant and/or statutory factors including water supply benefits, nature-based solutions, mobility, and environmental benefits amongst others.

During review, TWDB noted some data inconsistencies in the RFPG-reported dataset. Therefore, reported data originally considered for ranking but to found to have significant inconsistencies across several regions were ultimately not included in ranking during this planning cycle. Several of these factors are detailed in **Attachment 2**.

Ranking Methods

For the sections below, please refer to the **Attachment 1**: Ranking methods for recommended FMEs, FMPs, and FMSs of this document or the Ranking_Criteria tab in any of the **three Excel Ranking Workbooks.** TWDB only considered data submitted by RFPGs in this proposed ranking methodology with the goal of ranking projects based on technical merit. Note that this methodology includes consideration of feedback received from the TWDB Flood Technical Advisory Group. While some potential criteria considered for ranking were ultimately not recommended (e.g., those shown with a 0.0% weight), they were still included in the Excel Workbook(s) and are adjustable for the purpose of soliciting stakeholder feedback.

Each of the individual criteria scores is normalized on a range of 0-100 based on the highest raw value represented for that criterion. For example, the highest raw value for "Estimated Population removed from 100yr (1% annual chance) Floodplain" is 346,773. FMPs with a raw value of 346,773 will receive a normalized score of 100 while a raw value of 0 will receive a normalized score of 0. All other FMPs will receive a normalized score proportional to their raw value between 0 and 346,773. To show how scores were normalized and weighted, please see the FME Ranking Workbook. This score breakdown was not provided in the FMP or FMS Ranking Workbook for brevity. Once normalized, scores are then multiplied by the weighting value, shown as a percent. All the weighted scores are then summed and used for the final sequential ranking.

There are three sets of prioritizations by flood solution type:

Flood Management Evaluation (FME): A proposed study to identify flood risk or flood risk reduction solution (e.g., FMPs).

Ranking criteria for FMEs are limited to the identification of flood risk in the 1% floodplain (See **Attachment 1**: blue cells). These criteria are grouped into three major themes: life, safety and property; mobility; and agriculture. The associated proposed weights for these criteria show an emphasis on areas of greatest risk to life and property, including areas with low water crossings and structures.

Flood Mitigation Projects (FMP): A proposed project, both structural and nonstructural, that has a non-zero capital costs or other non-recurring cost and that when implemented will reduce flood risk, mitigate flood hazards to life or property.

The ranking criteria for FMPs are split into two major categories, Reported Data and Project Details:

1. **Reported Data:** Raw data included for each of the recommended FMPs. Criteria obtained from Reported Data comprises 70% of the total weight for FMPs. Only one of these criteria, "Percent of structures removed from 100yr (1% annual chance) floodplain" was calculated by TWDB using Reported Data. The intent of this criterion is to provide a means of giving additional weight to projects with a bigger impact to smaller communities.
2. **Project Details:** More complex project scores computed by RFPGs using raw data. While Reported Data was required for all recommended FMPs, not all RFPGs submitted Project Details information for recommended FMPs. Criteria obtained

from Project Details comprises 30% of the total weight for FMPs. The [Project Details Template](#) is an excel worksheet intended to acquire detailed project data for each recommended FMP in the regional flood plan.

FMP ranking criteria primarily focus on flood risk reduction (See **Attachment 1**: orange cells) in the 1% annual chance floodplain in addition to several 'Other' benefit indicators. FMP flood risk reduction criteria in the top "Reported Data" table are grouped into three major themes: life, safety and property; mobility; and agriculture.

For details on how the Project Details scores were calculated, please refer to Section 3.9 of the TWDB [Exhibit C: Technical Guidelines for Regional Flood Planning](#) and the Project Details Workbook available on our [website](#).

Flood Management Strategies (FMS): Long term flood risk reduction solution ideas that still need to be formulated, for example, regulatory enhancements. All solutions and strategies that do not belong in FME or FMP belong to FMS.

FMS ranking criteria focus on both risk identification in the 1% annual chance floodplain and flood risk reduction. While there is potential or FMSs to share the same flood risk reduction criteria as FMPs, TWDB found a general lack of data provided to that effect as many recommended FMSs are nonstructural strategies.

Using the Ranking Workbooks

TWDB has provided, for download and use, the three Ranking Workbooks for FMEs, FMPs, and FMSs, respectively. These Ranking Workbooks use actual data submitted by the 15 RFPGs in their final regional flood plans due to the TWDB January 10, 2023. Note that the data is currently in review, may change prior to TWDB Board approval of the regional flood plans, and is therefore considered at this point only as working data intended for testing purposes only.

In the Ranking_Criteria tab of each Ranking Workbook you may easily modify the ranking percent weight for each of the criteria to see how scoring and ranking change (see images below). Once weights are modified on the Ranking_Criteria tab, (**check to make sure you don't exceed 100% in the total weighting**) scroll all the way to the right of the FME/FMP/FME_Ranking tabs to see the updated scores and relative ranking for each recommended flood project.

Note: All three Ranking Workbooks contain the same Ranking_Criteria tab which includes all three sets of weightings. Therefore, remember to only modify the weights of the associated flood solution type (FME, FMP, FMS) while using the corresponding Ranking Workbook. For example, if you modify the FME Ranking Weights in Ranking_Criteria tab of the FMP Ranking Workbook, it will have no effect on the resulting FMP rankings since those FME weightings are not tied to the FMPs.

Ranking_Criteria tab of the Ranking Workbooks. "Ranking Percent Weight" columns are adjustable. Note that "Total" for each weighting column must add up to 100 percent.

FMP_Ranking tab of the FMP Ranking Workbook. Adjusted weights from the "FMP Ranking Percent Weight" column in the Ranking_Criteria tab will automatically update here.

Attachment 1
Ranking criteria for recommended FMEs, FMPs, and FMSs

Texas Water Development Board
Flood Planning Division

DRAFT

Proposed 2024 State Flood Plan Flood Management Evaluation (FME), Flood Mitigation Project (FMP) and Flood Management Strategy (FMS) Ranking Criteria and Weight

Texas Water Code Sec. 16.061, "(b) The state flood plan must include: … (2) a statewide, ranked list of ongoing and proposed flood control and mitigation projects and strategies necessary to protect against the loss of life and property from flooding…"

TWDB rules state that the state flood plan shall incorporate "a statewide, ranked list of recommended FMEs, FMSs, and FMPs that have associated one-time capital costs derived from the Board-approved RFPs (31 TAC §362.4 (c)(5)).

* All flood risk and risk reduction information are for 1% annual chance storm.

	Criteria Name	Criteria Type	Criteria Grouping	FME Ranking Criteria	FME Ranking Weight	FME Grouping Weight	FMP Ranking Criteria	FMP Ranking Percent Weight	FMP Grouping Weight	FMS Ranking Criteria	FMS Ranking Percent Weight	FMS Grouping Weight
1	Emergency Need (Y/N)	Other		No	0.0%		No	0.0%		No	0.0%	
2	Estimated number of structures at 100yr flood risk	Flood Risk	Life, Safety and Structures	Yes	15.0%	80.0%	No	0.0%	0.0%	Yes	10.0%	45.0%
3	Residential structures at 100-year flood risk	Flood Risk		Yes	10.0%		No	0.0%		Yes	5.0%	
4	Estimated Population at 100-year flood risk	Flood Risk		Yes	15.0%		No	0.0%		Yes	10.0%	
5	Critical facilities at 100-year flood risk (#)	Flood Risk		Yes	20.0%		No	0.0%		Yes	10.0%	
6	Number of low water crossings at flood risk (#)	Flood Risk		Yes	20.0%		No	0.0%		Yes	10.0%	
7	Estimated number of road closures (#)	Flood Risk	Mobility	Yes	5.0%	15.0%	No	0.0%	0.0%	Yes	5.0%	15.0%
8	Estimated length of roads at 100-year flood risk (Miles)	Flood Risk		Yes	10.0%		No	0.0%		Yes	10.0%	
9	Estimated farm & ranch land at 100-year flood risk (acres)	Flood Risk	Agriculture	Yes	5.0%	5.0%	No	0.0%	0.0%	Yes	5.0%	5.0%
10	Number of structures with reduced 100yr (1% annual chance) Floodplain	Flood Risk Reduction	Life, Safety and Structures				Yes	5.0%	50.0%	No	0.0%	20.0%
11	Number of structures removed from 100yr (1% annual chance) Floodplain	Flood Risk Reduction					Yes	5.0%		Yes	10.0%	
12	Percent of structures removed from 100yr (1% annual chance) Floodplain (**Calculated** by TWDB from reported data)	Flood Risk Reduction					Yes	10.0%				
13	Residential structures removed from 100yr (1% annual chance) Floodplain	Flood Risk Reduction					No	0.0%		No	0.0%	
14	Estimated Population removed from 100yr (1% annual chance) Floodplain	Flood Risk Reduction					Yes	10.0%		Yes	10.0%	
15	Critical facilities removed from 100yr (1% annual chance) Floodplain (#)	Flood Risk Reduction					Yes	10.0%		No	0.0%	
16	Number of low water crossings removed from 100yr (1% annual chance) Floodplain (#)	Flood Risk Reduction					Yes	10.0%		No	0.0%	
17	Estimated reduction in road closure occurrences	Flood Risk Reduction	Mobility				No	0.0%	5.0%	No	0.0%	0.0%
18	Estimated length of roads removed from 100yr floodplain (Miles)	Flood Risk Reduction					Yes	5.0%		No	0.0%	
19	Estimated farm & ranch land removed from 100yr floodplain (acres)	Flood Risk Reduction	Agriculture				Yes	5.0%	5.0%	No	0.0%	0.0%
20	Cost per structure removed from 100-year floodplain	Other					No	0.0%		No	0.0%	
21	Percent Nature-based Solution (by cost)	Other					Yes	2.5%		Yes	5.0%	
22	Benefit-Cost Ratio	Other					Yes	2.5%				
23	Water Supply Benefit (Y/N)	Other					Yes	5.0%		Yes	10.0%	
	Subtotal				**100.0%**			**70.0%**			**100.0%**	
24	Score 1: Severity - Pre-Project Average Depth of Flooding (100-year)	Flood Risk					Yes	5.0%				
25	Score 2: Severity - Community Need (% Population)	Flood Risk					No	0.0%				
26	Score 3: Flood Risk Reduction	Flood Risk Reduction					See above	0.0%				
27	Score 4: Flood Damage Reduction	Flood Risk Reduction					Yes	2.5%				
28	Score 5: Critical Facilities Damage Reduction	Flood Risk Reduction					No	0.0%				
29	Score 6: Life and Safety	Flood Risk Reduction					Yes	5.0%				
30	Score 7: Water Supply	Other Benefits					Yes	5.0%				
31	Score 8: Social Vulnerability	Other					Yes	2.5%				
32	Score 9: Nature-Based Solution	Other Benefits					See above	0.0%				
33	Score 10: Multiple Benefits	Other Benefits					Yes	2.5%				
34	Score 11: O&M	Other					Yes	2.5%				
35	Score 12: Admin, Regulatory Obstacles	Other					No	0.0%				
36	Score 13: Environmental Benefit	Other Benefits					Yes	2.5%				
37	Score 14: Environmental Impact	Other Benefits					No	0.0%				
38	Score 15: Mobility	Other Benefits					Yes	2.5%				
39	Score 16: Regional (Geographic Distribution)	Other Benefits					No	0.0%				
	Subtotal				**0.0%**			**30.0%**			**0.0%**	
	Total				**100.0%**			**100.0%**			**100.0%**	

Left side labels: REPORTED DATA FROM FME, FMP and FMS FEATURE CLASSES (rows 1-23); FMP PROJECT DETAILS SCORING (COMPUTED BY RFPG, SOME DUPLICATION MAY EXIST) (rows 24-39)

Please refer to RFP Exhibit C (pages 114 - 135) for definition of Project Details Scoring:

Exhibit C: Technical Guidelines for Regional Flood Planning

1 Severity Ranking - Pre-Project Average Depth of Flooding (100-year): Ranking of severity based on the baseline/pre-project average 100-year flood depth.

2 Severity Ranking - Community Need (% Population): Ranking of severity based on a community's need by percentage of project community affected by population.

3 Flood Risk Reduction: Ranking of reduced flood risk by percentage of structures removed from the 100-year floodplain in post- project condition.

4 Flood Damage Reduction: Ranking of flood risk reduction (property protection) by a percentage of 100-year damage reduction calculation.

5 Critical Facilities Damage Reduction: indication of reduced flood risk by percentage of critical facilities removed from the 100-year floodplain in post-project condition.

6 Life and Safety Ranking (Injury/Loss of life): Ranking project based on life/injury risk percentage using estimates of area hazard rating, area vulnerability rating, and historical loss of life injury data for project.

7 Water Supply Ranking: Ranking project based on a project's water supply benefits to direct or indirect water availability and/or supply.

8 Social Vulnerability Ranking: A ranking based on the Center for Disease Control SVI data for Texas, by calculating an average project SVI by census tract and classifying the vulnerability level.

9 Green/Nature-Based Solution Ranking: Ranking by the percentage of project cost that qualifies as green/nature based as reported by RFPG.

10 Multiple Benefit Ranking: Ranking a project based on the reporting of significant, measurable, expected benefits to: recreation, transportation, social and quality of life, local economic impacts, meeting sustainability goals, and/or project resilience goals.

11 Operations and Maintenance Ranking: Project ranking by expected level of O&M needs and annual costs provided.

12 Administrative, Regulatory, and other implementation obstacles/difficulty ranking: Ranking based on anticipated project limitations and/or requirements in terms of administrative, regulatory, and other implementation obstacles.

13 Environmental Benefit Ranking: Ranking of expected level of environmental benefits to be delivered by project to water quality, cultural heritage, habitat, air quality, natural resources, agricultural resources, and soils/erosion and sedimentation.

14 Environmental Impact Ranking: Ranking of expected level of adverse environmental impacts due to project affecting water quality, cultural heritage, habitat, air quality, natural resource protection, agricultural resources, and erosion and sedimentation.

15 Technical Complexity Ranking: Ranking of estimated project design, modeling, and construction requirements.

16 Mobility Ranking: Ranking project improvement and protection of mobility during flood events, with particular emphasis on emergency service access and major access routes.

Attachment 2
Data considered but not used as ranking criteria

Data considered but not used as ranking criteria: The table below include some data that was considered but ultimately not used as ranking criteria for recommended flood solutions in the state flood plan. Note that this list is not exhaustive of all criteria originally considered.

	Reported Data Name	**Data Source**	**Flood Solution Type**	**Details**
1	Emergency Need (Y/N)	Reported Data	FME; FMP; FMS	Inconsistency in interpretation of the definition of 'Emergency need' by various RFPGs during this planning cycle
2	Potential Funding (Y/N)	Reported Data	FME; FMP; FMS	Not relevant to efficacy of studies or flood risk mitigation projects
4	Estimated number of structures at 500yr flood risk	Reported Data	FME; FMP; FMS	Issues with data integrity and greater uncertainty around occurrence of this event
5	Number of structures removed from 500yr (0.2% annual chance) Floodplain	Reported Data	FMP; FMS	Issues with data integrity and greater uncertainty around occurrence of this event
6	Estimated reduction in road closure occurrences	Reported Data	FMP; FMS	Minimal data reported during this planning cycle
7	Cost per structure removed from 100-year floodplain	Reported Data	FMP	Data inconsistency and redundant with BCA
8	Social Vulnerability Index (SVI)	Reported Data	FMP	Using Project Details SVI elsewhere in ranking