

drainage plan





Introduction

Drainage is a serious concern throughout the City of Brownsville. The combination of Brownsville's geographic location, rainfall patterns, and runoff characteristics cause repeated flooding events throughout the City. While the City has taken measures to address some of its drainage issues, there are still key issues that affect the City's ability to provide adequate drainage services to the entire community. In recent years, the Brownsville Irrigation District, in cooperation with the City and other local entities, has been more effective during pre-storm preparation by lowering water levels in resacas to provide additional flood storage volume. Despite these advances in drainage management, there are still several key factors that inhibit effective and efficient drainage. The major key issues, along with drainage objectives, are presented below.

This section relates most directly to the "Functioning" vision theme identified by the community and also has a direct impact on both the "Efficient" and "Safe" themes. One of the most important recommendations

highlighted in this Plan, is the need for the City to develop a funding mechanism to generate revenue for much needed drainage improvement projects. This mechanism would improve the overall operational efficiency of the City and provide a better level of service and safety for its residents. Other vision themes that this section indirectly impacts are highlighted in Figure 1.

	DIRECT	INDIRECT
PROSPEROUS		•
EFFICIENT	•	
FUNCTIONING	•	
SAFE	•	
TALENTED		
HEALTHY		•
LIVABLE		•
VIBRANT		•
ENGAGED		•
COLLABORATIVE		•
EQUITABLE		•
SUSTAINABLE		•

Figure 1. Vision Themes Related to the Drainage Element

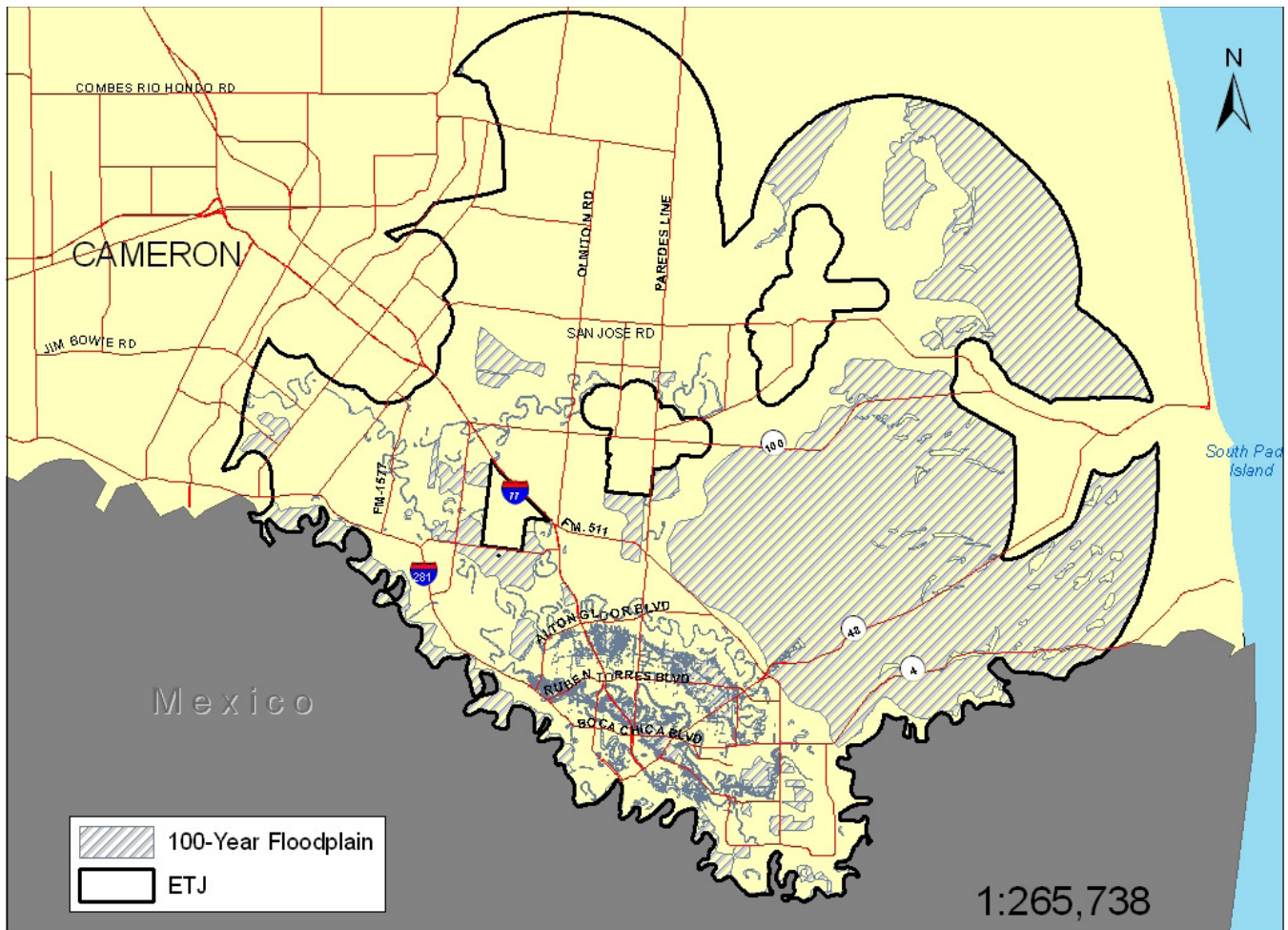


Figure 2. 100-year Floodplain

Objectives

Want a financially sustainable operation with efficient and competitive life cycle costs that maximizes external funding sources, has competitive, affordable user fees/tax rates dedicated to drainage, and distributes life cycle costs among private and public sectors in an equitable manner.

Want a comprehensive drainage management system that encourages collaborative and consistent approaches among different service providers and promotes and supports the community's overall quality of life and economic development.

Want drainage management approaches that incorporate structural and non-structural measures that produce multiple benefits (e.g. drainage, environmental, aesthetic, and recreational).

Want a sufficient, reliable, and well-maintained drainage capacity that reduces the net present value of current and future flood risk/damages to maximize net benefits.

Gaps / Key Issues

1. A large portion of Brownsville is located within both 100-year floodplains and tidally impacted areas, making the City susceptible to large-scale flooding.

The proximity of the City of Brownsville to the Gulf Coast and the Rio Grande River, combined with low elevations, flat slopes, and poorly draining soils, makes large-scale regional flooding from extreme rainfall and/or hurricane events a serious concern throughout the majority of the City. It is estimated that approximately 41% of both the ETJ and City Limits are within the 100-year floodplain. Furthermore, approximately 9% of the ETJ and nearly 18% of the City Limits is currently developed, including the airport, primary roadways, and several residential subdivisions. The presence of large floodplains throughout the City implies that there is inadequate drainage capacity in the City's primary and secondary drainage system.

2. Currently, drainage is managed by multiple entities across the City, with no consistent set of guidelines and policies and sometimes unclear jurisdictional boundaries.

There are seven entities that influence and have jurisdictional authority with regards to drainage regulations/issues within the Brownsville ETJ: Cameron County Drainage District No. 1, City of Brownsville, Brownsville Irrigation District, Cameron County, Brownsville Public Utilities Board, Cameron County Drainage District No. 3, and Cameron County Drainage District No. 4/ Cameron County Irrigation District 2. This makes understanding, implementing, and enforcing drainage policy throughout the ETJ difficult and confusing. Furthermore, there is not one consistent set of policies between regulatory entities, even in situations where different entities have jurisdiction within the same watershed.

3. The City currently has no designated budget for drainage capital improvement projects and an insufficient budget for necessary maintenance of the existing system.

There is no portion of the City budget currently dedicated to capital improvement projects for drainage. Additionally, the amount that is dedicated for drainage (used for maintenance of the existing drainage system) is low relative to the budget of peer cities like McAllen. In 2008, the City of Brownsville budgeted \$66,631 for drainage, less than 0.1% of the overall City budget, while McAllen budgeted \$1,668,624, approximately 2% of their budget. While there are several entities that deal with drainage throughout the City, the Cameron County Drainage District No. 1 (CCDD1) is the regulatory authority for a major portion of the developed part of the ETJ. CCDD1 uses a drainage tax rate of \$0.04/\$100 versus that of Cameron County Drainage Districts No. 3 and 5, which use a rate of \$0.14 and \$0.15 / \$100 respectively. This relatively low taxing rate makes it difficult to generate the necessary funds for drainage improvement projects.





Another issue with regards to drainage project funding is the difficulty now associated with obtaining Flood Mitigation Assistance (FMA) grants from FEMA. Since the time that the City formally adopted a Flood Protection Plan, a requirement for eligibility of receiving federal funding through the FMA program, FEMA added an additional requirement. This states that at least 50% of the homes and/or businesses in the area that will be helped by the proposed project must have flood insurance. This creates an additional burden on the City to provide documentation of flood insurance. Furthermore, the low per capita income of Brownsville residents means that many are not able to afford flood insurance.

4. In addition to having confusing jurisdictional boundaries for drainage entities, there is minimal sharing of financial burdens for drainage improvement projects.

There is currently minimal coordinated effort between entities to address drainage needs across districts. Given that the boundaries of the regulatory entities do not follow watershed boundaries, the policies of one entity directly affect regions outside of their jurisdiction and vice versa. Furthermore, any drainage improvement/project within one jurisdictional region could provide a benefit to adjacent districts. With the high costs associated with drainage improvement projects, it would be mutually beneficial (from both efficiency and effectiveness standpoints) for entities to work together in providing drainage improvements to the community as a whole, as opposed to remotely within a given district.

5. The drainage ditches that flow through the center of Brownsville do not provide sufficient drainage capacity. There is limited space for the expansion of these facilities and the creation of additional detention pond sites.

The lack of dedicated funds for drainage improvement projects is further complicated in the highly developed portions of the City where ROW is limited for ditch expansions or detention pond construction. Specifically, the watershed draining to the North Main Drain is highly developed, often right up to the edge of the ditch. Water levels in this ditch rise rapidly during storm events and it would be beneficial to expand this ditch to provide additional capacity. However, the lack of public ROW along the ditch makes this infeasible. Furthermore, the majority of the watershed area that is located close enough to the ditch to be viable as a detention pond site is already developed or consists of very small undeveloped lots that are not adequate in size to make detention pond construction cost-effective.

Capital Improvement Projects/ Strategies

Strategy 1: Create a single, accountable drainage entity charged with the responsibility and authority to develop an effective stormwater management program.

To address drainage issues in a consistent, effective, and efficient manner, a single entity should be created. This entity needs to have the authority to implement and enforce drainage regulations and it should have a mechanism in which to procure funds for drainage projects and maintenance. Specific issues that the entity needs to address include:

- Enforcing prescriptive easements on drain ditches and resacas for maintenance issues
- Limiting development within the floodplain and addressing properties that are currently within the floodplain that have been subject to repeated flooding in the past 5-10 years

- Increasing the drainage capacity of existing ditches throughout the ETJ
- Enforce grading plans in new subdivisions
- Create a standard for inlet frequency in new developments
- Generate local funds and pursue external funds for drainage projects
- Development of a watershed approach to drainage that focuses on detention storage and appropriate land uses in the upstream areas and increased hydraulic efficiency in drainage ditches downstream to move stormwater out of the City quickly

The presence of such an entity would also solve the problem within the ETJ of it being unclear which entity has jurisdiction of a given area.

Strategy 2. Designate a budget and funding mechanism for drainage capital improvement projects

The City should investigate a drainage utility rate structure or similar alternative to generate revenue that could be used to provide drainage improvements. There are currently many cities throughout Texas that use such a system including Austin, Mesquite, El Paso, Laredo and Plano, among others. The average fee for drainage utilities throughout Texas is \$3.74/month for a single-family home, although charges vary significantly and are often weighted proportionately to the amount of impervious cover on a given lot. Throughout Texas, this system generates anywhere from \$100,000 to over \$50,000,000 annually, depending on the rate and the population of the community. A reasonable rate for Brownsville to investigate is a flat \$3.00 - \$3.50 per month fee for single-family homes that could be collected with water/wastewater utility fees. This could include an increased rate structure for multi-family and commercial/industrial users that is contingent on the level of impervious cover on the site. It is estimated that this would generate between \$3 - \$6 million per year that could be strictly dedicated to much needed drainage improvements and maintenance. This strategy could be implemented by the City immediately. Upon implementation of Strategy 1, the single drainage entity could adopt the structure and become responsible for collecting

and managing those funds. The majority of the funds should be used for capital improvement projects like the ones described in Strategy 3, in addition to others, and approximately 10-15% should be allocated towards maintenance.

Additionally, to address the problem of many residents living in floodplains without flood insurance, the City should consider assisting families in flood-prone areas to purchase flood insurance. This would make the City eligible to apply for federal funding from the FEMA Flood Mitigation Assistance (FMA) Program, thus lessening the financial burden of the proposed capital improvement projects. This would require creating an inventory of those homes within FEMA floodplain boundaries without flood insurance and performing a cost-benefit analysis to determine the benefit this action would provide.

Strategy 3. Use designated budget to develop and construct specific flood mitigation improvements in critical and frequently inundated areas throughout the City.

Upon creation/designation of a drainage budget, the following flood mitigation projects should be investigated and given priority:

- a. City Detention Pond Near Airport and Airport Levee

The area at and surrounding the airport has been repeatedly subject to flooding over the past several years. In addition to the damages that these flooding events inflict, they also result in temporary closure of the airport. This could have significant impact on potential flood and/or hurricane recovery efforts during a storm event, as addressed in the Emergency Management Element of this report, and should be addressed immediately. The proposed detention pond would be approximately 300 acres and provide nearly 3800 acre-feet (ac-ft) of storage capacity. Design of the detention pond should investigate the use of multi-benefit/use strategies as described in Strategy 4. The pond should serve as a storage reservoir for stormwater diverted directly from



the North Main Drain Ditch to be most effective. In conjunction with the construction of the detention pond, it is recommended that a levee be constructed around the southern portion of the airport to prevent flooding due to spillover from the drainage ditch during storm events. The estimated cost of the detention pond is approximately \$6 million dollars with an additional \$750,000 required to construct the levee.

b. Construct City Detention Pond Near Owens Road and Brownsville Botanical Gardens

The City currently owns property near Owens Road and the new Botanical Gardens, and adjacent to the Ruiz Street detention pond, where a 20 acre, 162 ac-ft capacity detention pond is proposed. The pond should serve as a storage reservoir for stormwater directly diverted from the North Main Drain Ditch and should incorporate multi-use strategies, including the possibility of incorporating portions of the storage reservoir as part of the Botanical Gardens. The estimated cost of constructing the pond is approximately \$3 million.

c. Reclaiming ROW adjacent to North Main Drain and Expanding the Ditch to Leverage Entire 100-foot ROW

This project would be divided into two phases. During the first phase, the ROW on either side of the North Main Drain Ditch shall be reclaimed and all structures within the ROW removed. This stage requires immediate attention and could cost up to \$250,000 in surveying and legal fees to acquire the necessary ROW over the length of the Ditch.

The second phase of the project involves expanding the ditch to utilize the entire 100-foot ROW. The trapezoidal ditch should be constructed to have 20 foot bottom width, 3:1 side slopes, and an 80 foot top width to allow for 10 foot maintenance access on either side. The estimated cost of completing the project ranges from \$20-25 million but could be completed in phases, beginning at the downstream sections and working upstream.

d. Constructing the Second Phase of the Towne North Detention Pond

In 2007, Phase I of the Towne North detention pond was constructed, providing much needed flooding relief to the local Towne North residents. Phase I involved the construction of a 70 acre-foot capacity pond. Phase II would include constructing an additional 40 acre-foot of storage capacity and would collect stormwater diverted directly from Cameron County Drainage District No. 1 Ditch No. 1 (CCDD1). Estimated cost of constructing the Phase II detention pond is approximately \$0.5 million.

e. Land Purchase of Various Sites for Future Cameron County Drainage District No. 1 Ditch No. 1 Detention Ponds

While the need for additional stormwater detention capacity is imminent, the high capital costs associated with the design and construction of such ponds require their construction and funding to be spread over time. However, as the City continues to rapidly develop, suitable land for ditch expansions and detention ponds becomes limited, necessitating the acquisition of land immediately. Areas that should be considered for purchase include vacant lands near Dana Road and CCDD1, FM 802 and CCDD1, Robindale and CCDD1, and near Minnesota and Austin Roads. While the cost of land purchase is variable, it is estimated that the acquisition of suitable land areas would cost between \$5-\$7 million dollars for 350-400 acres of land.

f. Impala Pump Station Upgrade and Lining of Ditch from South Wastewater Treatment Plant to Impala Pump Station

This project involves increasing the pumping capacity of the Impala Pump Station and enlarging the sump area to improve pumping efficiency. The estimated cost of implementing this strategy is approximately \$1.2 million. The second part of this strategy involves lining the ditch from the South Wastewater Treatment Plant to the Impala Pump Station. Estimated cost of this phase is approximately \$3 million.

Strategy 4. Develop and construct green detention/retention ponds that are multi-use and provide an aesthetic amenity to the City

The need for additional stormwater runoff capacity throughout the City is imminent. One of the most effective methods for creating effective, additional storage capacity is through the construction of off-ditch detention/retention ponds. However, detention ponds also take up valuable City property and are only used during rainfall events when the extra stormwater capacity is needed. As such, a desirable method to deal with expensive, unattractive detention ponds that are not utilized the entire year is to develop multi-use features. These would function as detention/retention ponds during storm events and as parks, trails, or habitat areas that provide an additional amenity to the City and its residents when not in use as a detention facility. In addition to off-ditch detention ponds, this technique could also be implemented for ditch expansions. The City of Houston has a stepped ditch feature that includes a hike/bike trail during non peak flow conditions but provides additional storage capacity during storm events. Additionally, because such features could help provide park and public space, the costs can be more efficiently distributed between City department budgets. The placement of hike and bike trails along resacas should also be investigated and encouraged.

Drainage Indicators

To evaluate Brownsville’s current status in meeting the stated drainage objectives and to track future progress as strategies are initiated, the following set of indicators (Figure 3) should be monitored and evaluated. The indicator table includes recommended “Target” values at 5 years after initiation of the Plan based on standards of comparison and an evaluation of what seems reasonable over the short-run.



Indicator	Current	Standard of Comparison	5-yr Target
% Developed area in City Limits in 100-yr floodplain	~18%	Varies	18%
% Developed area in ETJ in 100-yr floodplain	~9%	Varies	9%
Designated Drainage Budget	\$66,631	\$1,668,624 (McAllen)	\$4 million
City Budget per Capita spent on Drainage	\$0.36/capita	\$12.87/capita (McAllen)	\$15.00/capita
% Drainage Budget Dedicated to Maintenance and Landscaping	100%	Varies	15%
% Drainage Improvements that are multi-use	0%	N/A	50%
% Drainage Ditches and/or Resacas with Trails	<5%	No Standard	15%

Figure 3. Drainage Indicators



Implementation

In implementing the strategies described in this plan, the most important first step is to develop a designated funding mechanism for much needed capital improvement projects and maintenance of the existing primary and secondary drainage systems. Specific capital improvement projects will be reviewed by the drainage technical group in conjunction with the City Engineering department. The drainage technical group should coordinate with the City Parks director to identify the potential for multi-use facilities that would provide a shared use for valuable space throughout the City and a possible sharing of costs and regular maintenance.

Funding

While many of the recommended drainage strategies will require direct funding from the City, the development of a funding mechanism as described in Strategy 2 will ease the burden on the City to finance capital improvement projects. Partnerships with the Parks Department could provide further cost efficiency for the implementation of drainage improvement projects through the development of multi-use facilities as described in Strategy 4. In addition, tracking the number and location of households that possess flood insurance would allow the City to identify flood mitigation projects that would qualify for FMA funding.

