CITY OF PEARLAND

Repetitive Loss Area Analysis

July 2023

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Cover photo: "Painted Pears" at Independence Park at the corner of John Lizer Rd. and Liberty Dr.

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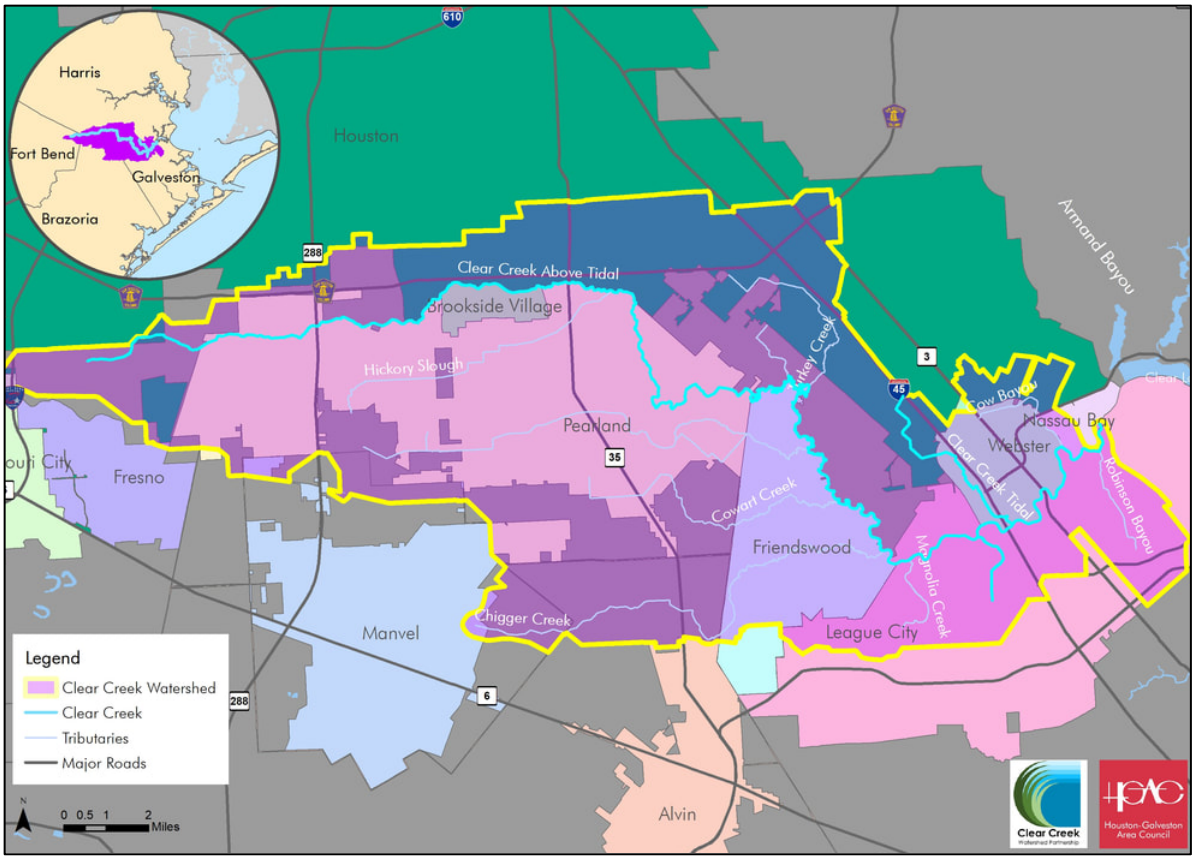
1.0 INTRODUCTION

The city of Pearland is approximately halfway between Houston and Galveston, and spans three counties in the southeastern part of Texas: Brazoria, Fort Bend, and Harris. As of the 2020 census, the population in Pearland was 125,828 and the city was recently named one of the fastest-growing in the state. The climate in Pearland is hot and humid summers with mild winters. Numerous channels and tributaries, plus its proximity to Galveston Bay and the Gulf Coast, makes the city of Pearland vulnerable to tropical storms as well as riverine flooding.

1.1 The Flood Hazard

FEMA issued Pearland's Flood Hazard Boundary Map in January of 1975. The first FEMA Flood Insurance Rate Map (FIRM) is dated July 5, 1984. The most current effective FEMA FIRM for Brazoria county was issued on December 30, 2020, January 6, 2017 for Fort Bend County, and January 29, 2021, for Harris County. Pearland is contained entirely within the Clear Creek Watershed which spreads across 16 cities and flows from west to east and into Galveston Bay. Within the watershed are two primary streams: Clear Creek and Turkey Creek. Clear Creek watershed includes 154 miles of open streams (primary streams and tributary channel) and spans 197 square miles. The graphic below shows Clear Creek watershed (yellow outline) which includes Pearland and several other cities. There are numerous tributaries that run through Pearland that feed into Clear Creek, namely Hickory Slough, Cowart Creek, and Mary's Creek, which serve to drain more than 90% of the city.



Floods have been and continue to be the most frequent, destructive, and costly natural hazard facing the state of Texas. Ninety percent (90%) of the State's damage reported for major disasters is associated with floods. Historical records indicate that the streams draining Pearland have flooded throughout the City's history. The flat terrain, clay soils, and impervious surfaces found in this area contribute to the flooding problem. Since 1990, Pearland has been impacted by six significant flood events including 1994, 1998, 2001, 2005, 2008, 2017, and 2020. Implementation of higher drainage design standards for new construction and improving existing drainage conveyance systems based on new standards has been a primary focus of the city to reduce flooding problems in Pearland.

1.2 Flood Insurance Coverage

City staff actively educates the public on the importance of flood insurance, including helping residents understand that flood damage is not covered by regular homeowners' insurance. Given the numerous tributaries running through the city, as well as the city's proximity to Galveston Bay and the Gulf, the purchase and maintenance of a flood insurance policy are strongly encouraged for every resident and business owner in Pearland. The table below is a breakdown of flood insurance data in Pearland based on the effective FIRM flood zones *(data current as of May 29, 2023)*.

	# of Policies	Premium	Insurance-in-Force
All A Zone	877	$651,201	$269,235,000
X/Shaded X Zone	9,735	$5,726,032	$3,269,438,000
TOTAL	**10,612**	**$5,927,233**	**$3,538,673,000**

The City is committed to making flood insurance more affordable for its residents. The recent rollout of FEMA's Risk Rating 2.0 initiative put a spotlight on the importance of flood insurance since each policy is based on the structure's actuarial risk as opposed to the location relative to the floodplain. Since structures outside the FEMA-mapped floodplain may now be eligible for the discount available through the NFIP's Community Rating System (CRS), the City has prioritized CRS class improvements to make flood insurance premiums more affordable to residents, thereby increasing the number of policies and flood insurance coverage.

2.0 IDENTIFY REPETITIVE LOSS AREAS

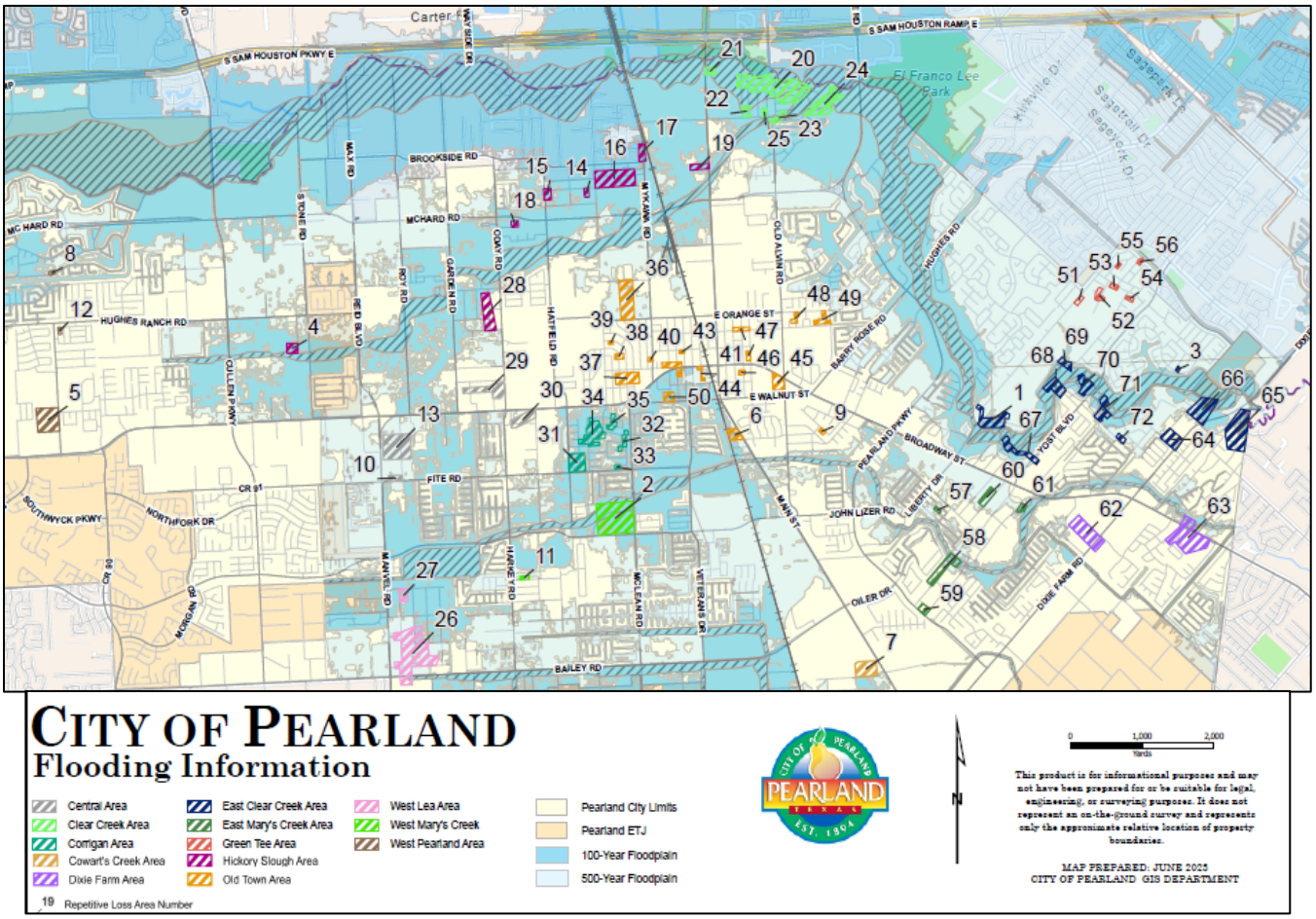
The City's goal to ease the financial burden of flood insurance for its residents is a strong motivator towards improving their class rating in the CRS program. In 2022, the City and its CRS consultant, Cahoon Consulting, began preparing for the City's CRS five-year cycle visit that would not only verify existing activities but also include other activities that may qualify for a class improvement. Part of the City's plan to improve the CRS rating involved the development of this Repetitive Loss Area Analysis (RLAA), a process that actually started in 2021. An RLAA is a report that identifies repetitive loss areas (RLAs) and recommends alternatives to mitigate the effects of future flooding. A property is classified as a repetitive loss if it has had two or more claims of more than $1,000 that have been paid by the National Flood Insurance Program (NFIP) within any 10-year period since 1978. Repetitive loss properties have been an ongoing financial strain on the NFIP,

representing a quarter of all NFIP payments since 1978, FEMA maintains a list of repetitive loss properties, making it available to any CRS community by request. The list includes property specifics, loss dates, and claims information. (Due to the sensitivity of the data, it is protected by the Privacy Act of 1974 and cannot be shared with the general public.)

Repetitive loss properties remain on FEMA's list for the life of the structure and are classified as either mitigated or unmitigated. A mitigated property means the structure has been protected against future flood damage through elevation, acquisition, demolition, structural control project, or another form of resolution. In preparation for the CRS visit, and for the purpose of developing this RLAA, the City tasked the Engineering Department with assistance from the consultant, (hereafter known as the "Team"), to investigate the problem of unmitigated repetitive loss properties and to consider mitigation alternatives that may alleviate the flood hazard. The Team submitted a Data Sharing Agreement to FEMA Region VI and obtained the latest repetitive loss list in 2021 when the RLAA process began.

The first step in the RLAA process was to identify properties that were not under the Pearland jurisdiction and should be removed from the City's list. The Team prepared an NFIP Flood Loss Update Worksheet with accompanying documentation and forwarded it to NFIP Underwriting to remove 17 addresses from Pearland's list. The City's GIS specialist then plotted the remaining unmitigated properties on a map revealing that the repetitive loss properties were scattered throughout the city limits. The Team designated 72 RLAs, with each RLA containing at least 2 properties and 13 sub-sections named and based on geographic cluster location for a total of 862 properties. These 862 include FEMA's repetitive loss properties plus adjacent or nearby properties that may be susceptible to the same cause of flooding. While many of the nearby structures have no history of flooding, it is a safe assumption that they are at a higher risk based on their proximity to channels, drainage system features, age and/or foundation of the structure, or other factors.

Other reasons to include some properties in the RLAs that are not on FEMA's list is that they may have flooded in the past but the homeowners did not have flood insurance or did not file for disaster assistance. These properties may be one loss away from ending up on FEMA's repetitive loss list. FEMA's data of losses and claims history, as well as flood insurance policy statistics, were also examined. All of the above factors were deemed reasonable enough to group particular properties into the 72 RLAs. The following sections explain the process of developing the RLAA per the requirements set forth in the 2017 CRS Coordinator's Manual and supplemental guidance. All of the RLAs are discussed in more detail in Section 6. The map on the following page features all 72 RLAs, shaded by their general, geographical area.



3.0 CONTACT PROPERTY OWNERS

On April 25, 2022, the City mailed letters to the property owners whose addresses were identified in the 72 RLAs. The letter explained the purpose of the RLAA and what kinds of information would be used in the report including permit records, appraisal district records, field data, and photographs. The letter also notified property owners that the draft report would be posted on the City's website for comments (see Appendix E) and included a link and a QR code to an online, 10-question Flood Protection Survey regarding individual flood damage history and property protection options.

Responses and comments from the RLA citizens were factored in to the decisions regarding recommended mitigation alternatives as outlined in this RLAA. Based on the review of responses received from residents living in the RLAs, the review of existing drainage guidelines, and current/future drainage projects, the key takeaways from the survey are summarized below.

- Approximately 35% of the residents are not aware of the FEMA floodplain and floodway. It is essential to continue and improve outreach efforts.

- Approximately 77% of the residents carry a flood insurance policy which is good, but there is room to make the residents aware of flooding potential and motivate rest of the residents to carry flood insurance.
- Approximately 65% of the properties experienced flooding in their homes and a majority of the residents identify the overbank flooding, storm sewer backup, or drainage from neighboring properties as the main cause of flooding. The existing drainage CIP agrees with the source identified by the residents. The existing drainage CIP developed based on the City's Master Drainage Plan recommendation, Hurricane Harvey Assessment and drainage concerns brought to the City's attention agree with the source identified by the residents. The city needs to continue to develop drainage plans to address flooding issues.
- Approximately 96% of the residents own homes and more than 55% of the residents have been living in the same home for more than 10 years. Drainage improvements in the older neighborhoods should be prioritized based on the age of the infrastructure which is also one of the metrics used in developing and prioritizing drainage bond projects. The concept shall be used in future CIP drainage plans.

A copy of the letter is included in Appendix A. Questions from the Flood Protection Survey and a summary of the responses are included in Appendix B.

4.0 COLLECT BUILDING DATA

An essential part of the RLAA process involved assessing the flood risk each building faced based, in part, on the specific characteristics of that structure. Each structure was researched using the applicable county's appraisal district, as well as the Team's knowledge of the areas and observations noted in the field.

4.1 Appraisal Districts

The Team procured the majority of building data from the online appraisal districts of Brazoria County, Fort Bend County, and Harris County. The information available in the public versions of the appraisal districts' database included year of construction and foundation type. The data from the appraisal district was combined with the data available on FEMA's repetitive loss list, as well as the Team's knowledge of the areas, to form a comprehensive view of each structure at risk in the RLAs. The building data helped determine the level of risk for each structure such as identifying how a common source of flooding might affect a house built in 1940 vs one built in 1990. Older homes, such as pre-FIRM structures, were not required to meet the higher standards the City currently enforces such as freeboard above the base flood elevation. This extra level of protection has helped diminish the flooding risk to newer structures or structures that have been substantially damaged or improved. A substantially damaged building is one where the cost of repairing the structure to its pre-flood condition is greater than 50% of the market value of the structure. When a structure has been declared substantially damaged, it is required that the structure be brought into the current code and regulations per the City's Flood Damage Prevention Ordinance. Most often, coming into compliance means elevating the structure to the City's freeboard level for added protection from the base flood.

4.2 Field Data

In addition to data from the appraisal districts, the Team observed properties in the field. City staff canvassed the RLAs and captured ground elevation differences, drainage patterns, and nearby drainage features such as inlets, culverts, or storm drains. This data helped in understanding where and how each property drained, and whether or not water collecting in the lot or drainage from nearby structures may have contributed to previous flooding. The Team also conducted observations of the natural channels and drainage systems to see how vegetation or other obstructions may affect the channel's ability to function optimally.

5.0 CONTACT OTHER AGENCIES

Prior to identifying the best mitigation option for the RLA properties, the Team gathered information on ongoing or future studies and projects conducted by other entities and organizations in the area. The Team contacted three entities via email to request this information. (A copy of the email from the City is included in Appendix C.)

5.1 Brazoria Drainage District No. 4

The City did not receive a direct response to their request for information from Brazoria Drainage District No. 4 (BDD4); however, the City is already aware of the various projects conducted with and by this entity. For instance, the City and BDD4 have worked together to construct several joint venture regional detention projects, and both entities are in active collaboration with four regional detention floodplain reduction projects: Clear Creek, Hickory Slough, Mary's Creek, and Cowart Creek. Applicable BDD4 projects are identified and described for the appropriate RLAs in Section 6.

5.2 Texas Department of Transportation

The City did not receive a response to their request for information from the Texas Department of Transportation (TxDOT). Based on existing TxDOT projects in the Pearland jurisdiction, the City believes the projects will not have an impact (positive or negative) on the flood risk in the repetitive loss areas.

5.3 Harris County Flood Control District

The City did not receive a response to their request for information from the Harris County Flood Control District (HCFCD), however, the City is already aware of the various projects conducted by this entity such as the Clear Creek Federal Project. The City and HCFCD are both members of the Clear Creek Watershed Steering Committee (CCWSC) and participate in bimonthly meetings. In addition, the City, HCFCD, and BDD4 hold a quarterly project update status meeting specifically on Clear Creek Federal Flood Risk Management project. These projects are identified and described in Section 6.

6.0 REPETITIVE LOSS AREAS

Given the scattered nature of the RLAs throughout the city, it made sense to group them into general, geographical areas that faced the same cause of flooding. Section 6 of this report

discusses the 72 RLAs in each of the 13 general locations. Note that RLAs in any given area are not necessarily in sequential order. For instance, the West Pearland Area includes RLAs 5, 6, and 12. Below is a table of the general locations and the RLA numbers included in each of them.

General Location	Repetitive Loss Areas
Central Area	10, 13, 29, 30
Clear Creek Area	20, 21, 22, 23, 24, 25
Corrigan Area	31, 32, 33, 34, 35
Cowart's Creek Area	7
Dixie Farm Area	62, 63
East Clear Creek Area	1, 3, 64, 65, 66, 67, 68, 69, 70, 71, 72
East Mary's Creek Area	57, 58, 59, 60, 61
Green Tea Area	51, 52, 53, 54, 55, 56
Hickory Slough Area	4, 14, 15, 16, 17, 18, 19, 28
Old Town Area	6, 9, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50
West Lea Area	26, 27
West Mary's Creek Area	2, 11
West Pearland Area	5, 8, 12

Each sub-section in Section 6 is named for the general location of the city (in alphabetical order) that contains the RLA(s), describes the cause of flooding and/or flood risk for the RLAs, features the RLAs on a GIS map, explores the six (6) FEMA mitigation categories (listed below), and recommends the appropriate mitigation alternative(s). At the end of Section 6, there is a summary table of recommended mitigation alternatives per sub-section.

Mitigation Categories	
Preventative	Property Protection
Natural Resource Protection	Emergency Services
Structural Projects	Public Information

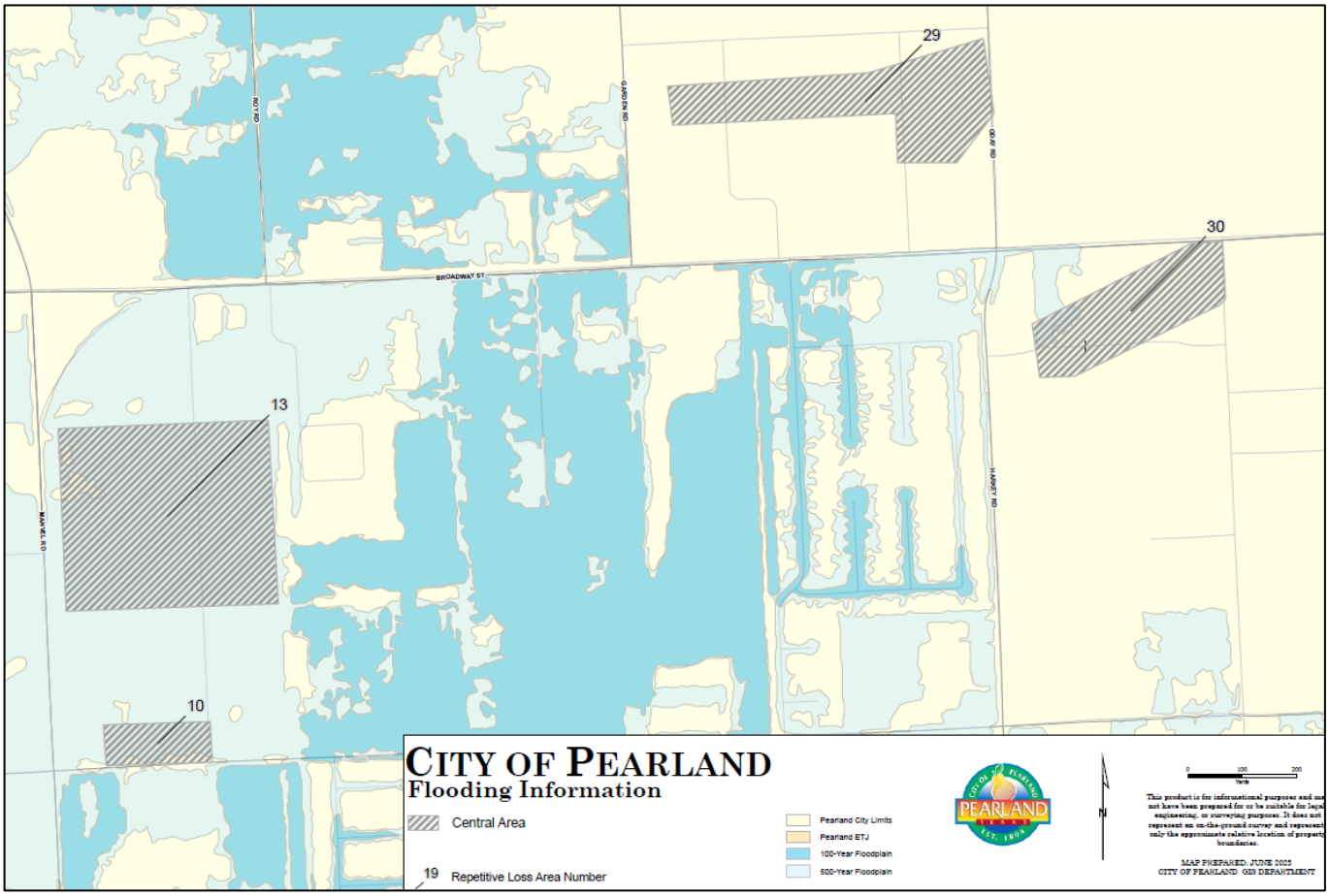
6.1 Central Area

6.1.1 Cause of Flooding

The Central Area is comprised of RLAs 10, 13, 29, and 30. The table below breaks down the RLAs to demonstrate the number of FEMA repetitive loss properties within them. Homes in RLAs 10, 29, and 30 were built in the mid-1960s, and are located outside of 100-year and 500-year floodplains on the current FIRM. These properties are in older neighborhoods, and do not meet current engineering drainage design guidelines such as detention requirements, minimum finish floor elevation requirements, no impact to downstream mitigation requirements, and adequate conveyance capacity. The drainage system within the subdivision, as well as the conveyance

channel that removes the stormwater from the subdivision, is undersized and is in need of drainage improvements.

General Area	RLA #	Total # of Properties	Total # of FEMA RLs within RLA
Central Area	10	3	1
	13	6	2
	29	10	3
	30	15	3
	TOTAL	**34**	**9**



6.1.2 Mitigation Alternatives

The Team evaluated several mitigation options to determine what would have the greatest impact on the four RLAs located in the Central Area. Considerations were given to the location of the nearest channel, flood zone, age and condition of the homes, cost effectiveness, feasibility, and potential to reduce future flood risk. Below is a summary of mitigation alternatives considered and recommended for RLAs 10, 13, 29, and 30.

Preventative

The City has adopted and implemented higher standards for residential and commercial development through its Unified Development Code (UDC), Engineering Design Criteria Manual (EDCM), and Flood Damage Prevention Ordinance (Ordinance 532-8). One such requirement is for all new and substantially damaged/improved construction in the 100-year floodplain to have its lowest floor and utilities elevated to one foot above the base flood elevation. The freeboard extends to the shaded X/500-year floodplain as well. The City has also adopted Atlas 14 rainfall for H&H analysis and design, as well as the floodplain fill mitigation requirement up to the 500-year storm event. This requirement for compensatory storage helps to balance out the amount of development occurring in Pearland. However, since the properties in RLAs 10, 13, 29, and 30 are located outside of the 100- and 500-year floodplain, the preventative mitigation alternative would not have a positive impact on these RLAs.

Property Protection

The City promotes the purchase and maintenance of flood insurance via an annual targeted outreach project to all the RLA properties as well as an extensive outreach campaign to all residents (explained further in *Public Information*). Through the City's outreach, residents are encouraged to contact City staff for advice or to request a one-on-one site visit to explore property protection options such as elevation grants via mitigation funding. One of the repetitive flood loss homes in RLA 10 has qualified for home elevation through the 2019 Flood Mitigation Assistance (FMA) grant, but has yet to be elevated. Similarly, one of the repetitive flood loss homes will be elevated through the FMA 2020 home elevation grant.

Natural Resource Protection

Mitigation alternatives under natural resource protection were considered by the Team, but deemed not feasible for the RLAs in this area.

Emergency Services

The City of Pearland's flood warning program relies largely upon flood threat recognition provided by the National Weather Service (NWS) and climatological projections (i.e., quarterly NWS probabilistic hydrologic outlooks) which forecast the probability that specific drainage canals will exceed their banks based on a 90-day precipitation forecast. Advance flood warning is provided by a series of approximately 18 stream gauges located within the City of Pearland's most prominent drainage streams (i.e., Clear Creek, Mary's Creek, Hickory Slough, etc.), and additional gauges located in a close proximity to the city. These gauges, part of a regional flood warning system, maintained by the HCFCD and BDD4, measure and report rainfall in real-time on an hourly basis, as well as water elevation relative to the top of the stream bank. A link to the regional flood warning system is provided in several areas on the City's website. In addition, both residents and public safety officials can register to receive alerts when specific stream gauges exceed a specified water elevation. Residents are also encouraged to register for the Everbridge emergency notification system and the Connect2Pearland app that relay flood warnings and flood safety tips to users. Post-storm activities include posting door hangers on homes of suspected flood damage with response and recovery information and posts on social media.

Structural Projects

The City is in the process of several structural projects that should help alleviate the flooding problem in these RLAs. For instance, the City completed a street and drainage improvement project (Wagon Trail, Cantu St, and Ochoa St) in 2018 to address repetitive flood loss in RLA 30 and completed a drainage improvement project along Piper Road (RLA 10) in 2021. The City has also developed a drainage improvement plan for RLA 29 which is included in the drainage bond

referendum that passed in May 2023. The projects are identified as the Garden Acre subdivision/Hickory Creek subdivision drainage improvement in RLA 29. In addition, Harkey Road Street and Drainage Project funded through a drainage bond is expected to improve the drainage from FM 518 to Mary's Creek in RLA 30.

Public Information

Part of the City's extensive public outreach involves a targeted, annual mailing in June/July to the owners of all 862 properties in the RLAs. The RLA mailing is in both English and Spanish, and includes basic floodplain management-related messages as well as information on property protection and sources of financial assistance such as mitigation grants. Other methods of public outreach include the City's Engineering Department's mailing of a "What You Need to Know" flood hazard brochure and a storm sewer brochure are distributed on an annual basis in the utility bills, and the City's Office of Emergency Management's insert in the Community Impact newspaper delivered to every home, flood safety messages scrolling on treadmill screens in the recreation center, and social media posts. The City also maintains a comprehensive Flood Protection Information page on its website with information and links on various topics such as flood insurance, flood warning system, property protection, natural and beneficial functions, and flood safety measures.

SUMMARY TABLE

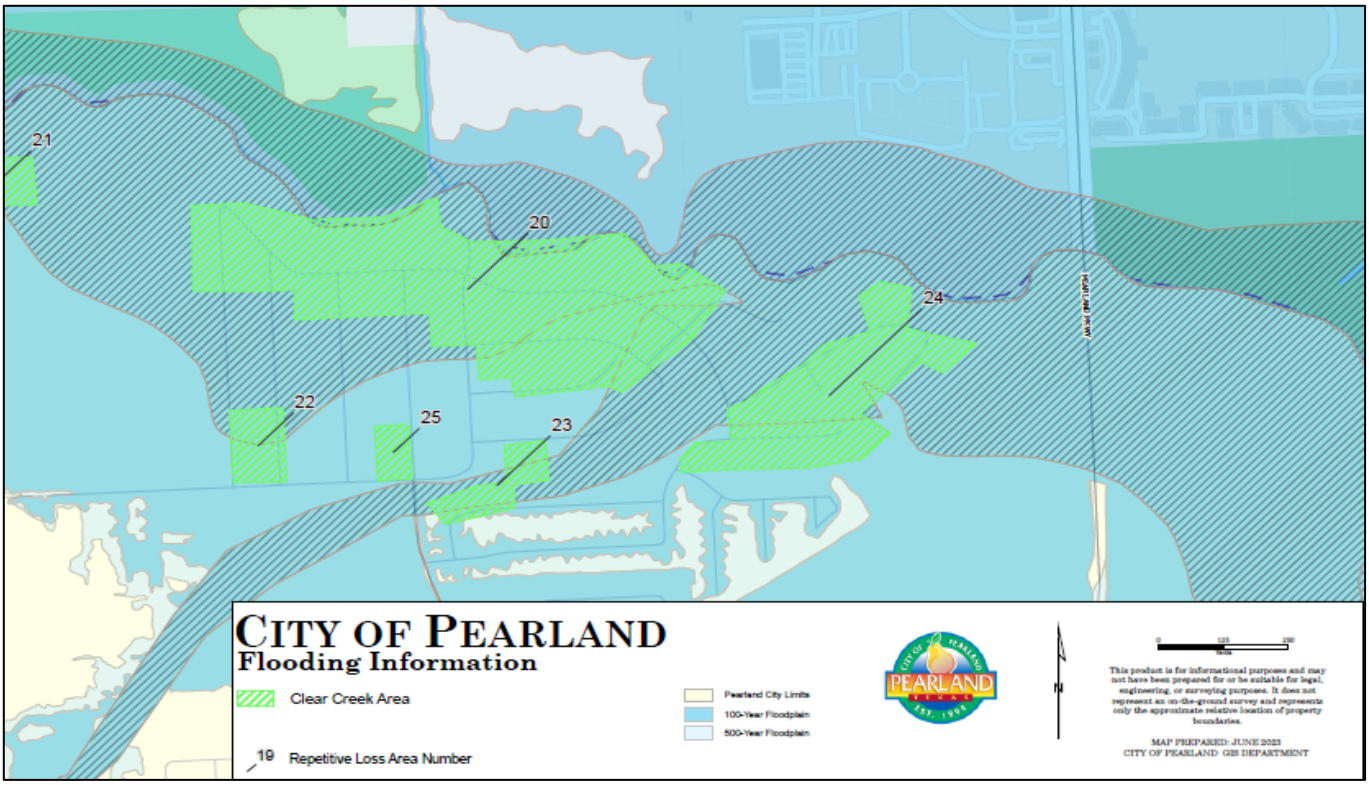
RLAs - Recommended Mitigation Alternative	Responsibility	Funding	Timeline
Structural Projects	City of Pearland	Bond	Ongoing
Public Information	City of Pearland	Operating budget	Ongoing

6.2 Clear Creek Area

6.2.1 Cause of Flooding

The Clear Creek area is comprised of six (6) RLAs: RLAs 20, 21, 22, 23, 24, and 25. These areas are located between Clear Creek and Hickory Slough, and are mostly located in the floodway and 100-year floodplain. The 1960 plat date of these subdivisions indicates that the homes were built prior to the adoption of engineering design guidelines such as detention requirement, minimum finish floor elevation requirement, no impact to downstream, and conveyance capacity. Analysis of the natural ground elevation (40' approximately) compared to the 100-year flood elevation (43' approximately) as depicted on the FEMA FIRM reveals that the area has greater potential to be flooded due to the water surface elevation of Clear Creek and Hickory Slough during an extreme storm event. Most homes in this area have a finished floor elevation below the 100-year flood elevation, and it would be challenging to significantly lower the flood elevation of Clear Creek to prevent existing homes from flooding.

General Area	RLA #	Total # of Properties	Total # of FEMA RLs within RLA
Clear Creek Area	20	96	35
	21	3	1
	22	9	2
	23	8	4
	24	38	12
	25	4	1
	TOTAL	**158**	**55**



6.2.2 Mitigation Alternatives

The Team evaluated several mitigation options to determine what would have the greatest impact on these RLAs including condition of the homes, cost effectiveness, feasibility, and potential to reduce future flood risk. Below is a summary of mitigation alternatives considered and recommended.

Preventative

The City has adopted and implemented higher standards for residential and commercial development through its UDC, EDCM, and Flood Damage Prevention Ordinance (Ordinance 532-8). One such requirement is for all new and substantially damaged/improved construction in the

100-year floodplain to have its lowest floor and utilities elevated to one foot above the base flood elevation, and to be built on pier and beam to avoid filling in the floodplain in this area. The freeboard requirement extends to the shaded X/500-year floodplain as well. The City has also adopted Atlas 14 rainfall for H&H analysis and design, as well as the floodplain fill mitigation requirement up to the 500-year storm event. This requirement for compensatory storage helps to balance out the amount of development occurring in Pearland.

Property Protection

Several properties in this area took advantage of the buyout program through FEMA grants after Tropical Storm Allison in 2001. In addition, the City and BDD4 bought several properties after Hurricane Harvey in 2017. There is potential for the City to pursue future mitigation grants for acquisitions if there is enough interest and the structures qualify.

Natural Resource Protection

Upstream from RLA 8 is the Shadow Creek Ranch Nature Trail which is managed by the City's Parks and Recreation Department as a natural area park focusing on preserving habitat and providing nature experiences for the community. The park is approximately 36 acres bordering Clear Creek and includes 12.5 acres of emergent wetlands. This is also the site where the City is restoring 10 acres of historic coastal tallgrass prairie. The prairie restoration project included removing a monoculture Chinese Tallow Triadica sebifera stand and the re-introduction of locally native prairie plants through seeding and plantings. Currently, 239 species of birds have been documented in the park including several species listed on Texas Parks and Wildlife Department's Species of Greatest Conservation Need, such as LeConte's Sparrow. The park features a paved walking path with interpretive signage providing information on native wildlife and plants found in the park. Along the trail is an elevated viewing platform near the wetlands. This site provides many ecological services to the area, such as, storing stormwater, reducing runoff, improving water and air quality, and serving as a valuable sanctuary for native flora and fauna while also allowing for abundant outdoor nature experiences.

Emergency Services

The City's flood warning program relies largely upon flood threat recognition provided by the NWS and climatological projections (i.e., quarterly NWS probabilistic hydrologic outlooks) which forecast the probability that specific drainage canals will exceed their banks based on a 90-day precipitation forecast. Advance flood warning is provided by a series of approximately 18 stream gauges located within the City of Pearland's most prominent drainage streams (i.e., Clear Creek, Mary's Creek, Hickory Slough, etc.), and additional gauges located in a close proximity to the city. These gauges, part of a regional flood warning system, maintained by the HCFCD and BDD4, measure and report rainfall in real-time on an hourly basis, as well as water elevation relative to the top of the stream bank. A link to the regional flood warning system is provided in several areas on the City's website. In addition, both residents and public safety officials can register to receive alerts when specific stream gauges exceed a specified water elevation. Residents are also encouraged to register for the Everbridge emergency notification system and the Connect2Pearland app that relay flood warnings and flood safety tips to users. Post-storm activities include posting door hangers on homes of suspected flood damage with response and recovery information and posts on social media.

Structural Projects

The Clear Creek Federal Flood Risk Management Project is a joint venture effort between the City, US Army Corps of Engineers, HCFCD, Galveston County, BDD4, and is expected to widen Clear Creek to improve the drainage along Clear Creek. The construction of the project is anticipated to be completed by 2032 based on the information received from HCFCD. This area

is identified for future regional detention site but not identified in the City's five-year CIP yet as the project size and scope will be dependent on the Clear Creek project. The current project limit does not go beyond the city limit of Pearland, but Clear Creek needs to be improved all the way to Clear Lake in order to see the full drainage benefit in all areas near and around the creek.

Public Information

Part of the City's extensive public outreach involves a targeted, annual mailing in June/July to the owners of all 862 properties in the RLAs. The RLA mailing is in both English and Spanish, and includes basic floodplain management-related messages, as well as information on property protection and sources of financial assistance such as mitigation grants. Other methods of public outreach include the City's Engineering Department's mailing of a "What You Need to Know" flood hazard brochure and a storm sewer brochure are distributed on an annual basis in the utility bills, and the City's Office of Emergency Management's insert in the Community Impact newspaper delivered to every home, flood safety messages scrolling on treadmill screens in the recreation center, and social media posts. The City also maintains a comprehensive Flood Protection Information page on its website with information and links on various topics such as flood insurance, flood warning system, property protection, natural and beneficial functions, and flood safety measures.

SUMMARY TABLE

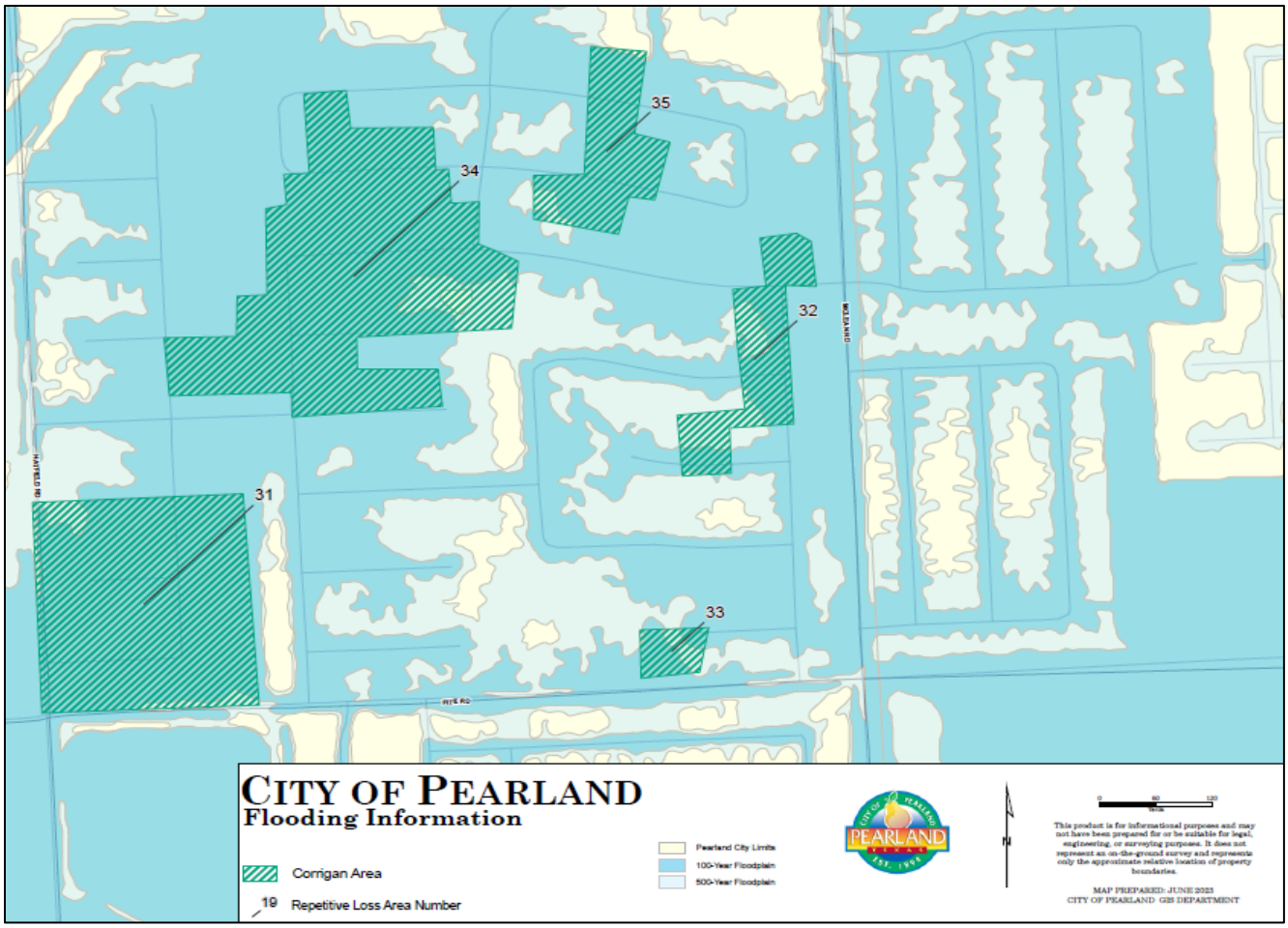
RLAs - Recommended Mitigation Alternative	Responsibility	Funding	Timeline
Natural Resource Protection	City of Pearland	Operating budget	Completed
Structural Projects	Joint venture	Bond	Ongoing
Property Protection	City of Pearland	Mitigation grant	Dependent on funding

6.3 Corrigan Area

6.3.1 Cause of Flooding

The Corrigan Area is comprised of five (5) RLAs: RLA 31, 32, 33, 34, and 35. This area is in an older neighborhood that was platted sometime in 1967 and is mostly located in the FEMA 100-year and 500-year floodplain. The homes in the subdivision were built prior to the adoption of engineering design guidelines and FEMA FIRM by the City. Analysis of the street elevation (lowest 44' approx.) compared to the 100-year flood elevation (49' approx.) as depicted on FEMA FIRM reveals that the area has greater potential to be flooded due to the water surface elevation of Mary's Creek. Most homes in this area have a finished floor elevation below the 100-year flood elevation, and it would be challenging to significantly lower the flood elevation of Mary's Creek to prevent existing homes from flooding.

General Area	RLA #	Total # of Properties	Total # of FEMA RLs within RLA
Corrigan Area	31	35	10
	32	10	4
	33	2	1
	34	56	27
	35	11	7
	TOTAL	**114**	**49**



6.3.2 Mitigation Alternatives

The Team evaluated several mitigation options to determine what would have the greatest impact on these RLAs including condition of the homes, cost effectiveness, feasibility, and potential to reduce future flood risk. Below is a summary of mitigation alternatives considered and recommended.

Preventative

The City has adopted and implemented higher standards for residential and commercial development through its UDC, EDCM, and Flood Damage Prevention Ordinance (Ordinance 532-8). One such requirement is for all new and substantially damaged/improved construction in the 100-year floodplain to have its lowest floor and utilities elevated to one foot above the base flood elevation, and to be built on pier and beam to avoid filling in the floodplain in this area. The freeboard requirement extends to the shaded X/500-year floodplain as well. The City has also adopted Atlas 14 rainfall for H&H analysis and design, as well as the floodplain fill mitigation requirement up to the 500-year storm event. This requirement for compensatory storage helps to balance out the amount of development occurring in Pearland.

Property Protection

Several properties in this area have taken advantage of the buyout program through FEMA grants after Tropical Storm Allison in 2001,and are currently maintained by the City as open space. There is potential for the City to pursue future mitigation grants for acquisitions if there is enough interest and the structures qualify.

Natural Resource Protection

Northwest of RLAs 31, 32, 33, 34, and 35 is Centennial Park which is a mixed-use site that features softball fields, tennis courts, playground, splashpad, walking trails, open greenspace, and a protected natural wetland area. The natural wetland area within the park is 15 acres in size that is made up of a chain of wetland depressions adjacent to Mary's Creek. This site has been identified by the City as an important environmental area to be preserved. These natural wetlands help mitigate local flooding issues, filter stormwater before entering Mary's Creek, and provide wildlife habitat along with other environmental services. Interpretive signage is located along the trail bordering the wetland site to educate visitors on functions, plants, and animals associated with the area.

Emergency Services

The City's flood warning program relies largely upon flood threat recognition provided by the NWS and climatological projections (i.e., quarterly NWS probabilistic hydrologic outlooks) which forecast the probability that specific drainage canals will exceed their banks based on a 90-day precipitation forecast. Advance flood warning is provided by a series of approximately 18 stream gauges located within the City of Pearland's most prominent drainage streams (i.e., Clear Creek, Mary's Creek, Hickory Slough, etc.), and additional gauges located in a close proximity to the city. These gauges, part of a regional flood warning system, maintained by the HCFCD and BDD4, measure and report rainfall in real-time on an hourly basis, as well as water elevation relative to the top of the stream bank. A link to the regional flood warning system is provided in several areas on the City's website. In addition, both residents and public safety officials can register to receive alerts when specific stream gauges exceed a specified water elevation. Residents are also encouraged to register for the Everbridge emergency notification system and the Connect2Pearland app that relay flood warnings and flood safety tips to users. Post-storm activities include posting door hangers on homes of suspected flood damage with response and recovery information and posts on social media.

Structural Projects

The City constructed a Corrigan bypass channel in 2005 to divert the flow going through the neighborhood which improved the conveyance and provided linear detention volume to reduce the flood risk. The Corrigan bypass channel, Corrigan Detention pond, and Veteran's Regional Detention ponds were constructed to reduce flooding problems in this neighborhood. Similarly, the drainage of the subdivision was improved by upgrading the storm sewer system in the

neighborhood through funding from mobility and drainage bonds in 2007. The drainage improvement has helped to mitigate localized flooding problems, but flooding during extreme events such as Hurricane Harvey will be difficult to prevent due to Mary's Creek's elevation.

Public Information

Part of the City's extensive public outreach involves a targeted, annual mailing in June/July to the owners of all 862 properties in the RLAs. The RLA mailing is in both English and Spanish, and includes basic floodplain management-related messages, as well as information on property protection and sources of financial assistance such as mitigation grants. Other methods of public outreach include the City's Engineering Department's mailing of a "What You Need to Know" flood hazard brochure in the summer utility bills and a storm sewer brochure in the fall, and the City's Office of Emergency Management's insert in the Community Impact newspaper delivered to every home, flood safety messages scrolling on treadmill screens in the recreation center, and social media posts. The City also maintains a comprehensive Flood Protection Information page on its website with information and links on various topics such as flood insurance, flood warning system, property protection, natural and beneficial functions, and flood safety measures.

SUMMARY TABLE

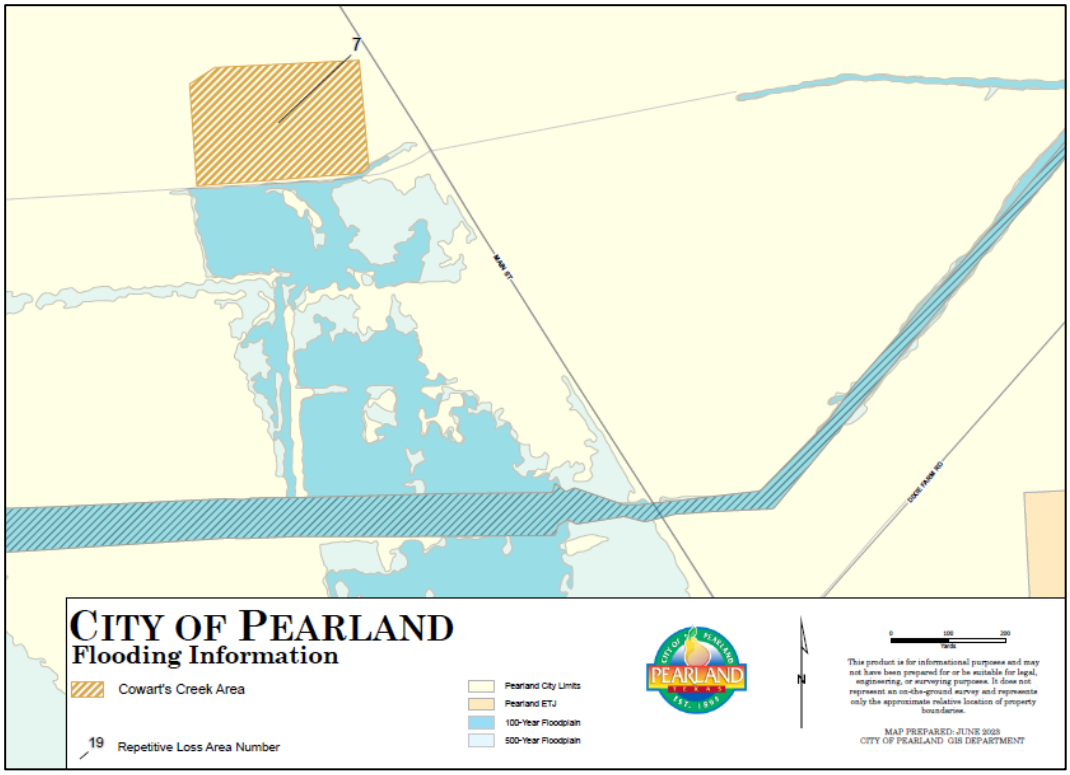
RLAs - Recommended Mitigation Alternative	Responsibility	Funding	Timeline
Preventative	City of Pearland	Operating budget	Ongoing
Property Protection	City of Pearland	Mitigation grant	Dependent on funding
Natural Resource Protection	City of Pearland	Operating budget	Completed
Structural Projects	City of Pearland	CIP	Completed

6.4 Cowart's Creek Area

6.4.1 Cause of Flooding

RLA 1 lies outside of the 100-year and 500-year FEMA floodplain, but experiences localized flooding. The properties in RLA 7 were platted in 1978. It is possible that the street drainage system was not properly designed to carry the flow during extreme storm events. In addition, the cross culvert across SH35 that is owned and maintained by TxDOT is restricting the flow from the west side, resulting in flooding of the commercial properties during an extreme storm event.

General Area	RLA #	Total # of Properties	Total # of FEMA RLs within RLA
Cowart's Creek Area	7	7	2



6.4.2 Mitigation Alternatives

The Team evaluated several mitigation options to determine what would have the greatest impact on this RLA including condition of the homes, cost effectiveness, feasibility, and potential to reduce future flood risk. Below is a summary of mitigation alternatives considered and recommended.

Preventative

The City has adopted and implemented higher standards for residential and commercial development through its UDC, EDCM, and Flood Damage Prevention Ordinance (Ordinance 532-8); however, since the properties in RLA 7 are located outside of the 100- and 500-year floodplain, these regulations would have little to no effect to alleviate the repetitive flooding in this RLA.

Property Protection

It is recommended that the commercial business owner implement floodproofing of the buildings to protect the property from flooding and to carry flood insurance. The City promotes the purchase and maintenance of flood insurance via an annual targeted outreach project as well as an extensive outreach campaign to everyone in the city.

Natural Resource Protection

Mitigation alternatives under natural resource protection were considered by the Team, but deemed not feasible for the RLA in this area.

Emergency Services

The City's flood warning program relies largely upon flood threat recognition provided by the NWS and climatological projections (i.e., quarterly NWS probabilistic hydrologic outlooks) which forecast the probability that specific drainage canals will exceed their banks based on a 90-day precipitation forecast. Advance flood warning is provided by a series of approximately 18 stream gauges located within the City of Pearland's most prominent drainage streams (i.e., Clear Creek, Mary's Creek, Hickory Slough, etc.), and additional gauges located in a close proximity to the city. These gauges, part of a regional flood warning system, maintained by the HCFCD and BDD4, measure and report rainfall in real-time on an hourly basis, as well as water elevation relative to the top of the stream bank. A link to the regional flood warning system is provided in several areas on the City's website. In addition, both residents and public safety officials can register to receive alerts when specific stream gauges exceed a specified water elevation. Residents are also encouraged to register for the Everbridge emergency notification system and the Connect2Pearland app that relay flood warnings and flood safety tips to users. Post-storm activities include posting door hangers on homes of suspected flood damage with response and recovery information and posts on social media.

Structural Projects

The City realigned the Industrial Drive at State Highway 35 in 2017 which has helped to reduce the flooding problem in this area as the project included realignment of roadside ditch and ditch regrading. In addition, reconstruction of the Industrial Drive has been identified as a five-year infrastructure recapitalization project by Pearland Economic Development Corporation (PEDC) which will include a concrete curb and gutter roadway, storm sewer system, and a detention pond to reduce the flooding of this area. PEDC is a non-profit Type B Corporation under the Texas Development Corporation Act and provides funding for several city infrastructure projects.

Public Information

Part of the City's extensive public outreach involves a targeted, annual mailing in June/July to the owners of all 862 properties in the RLAs. The RLA mailing is in both English and Spanish, and includes basic floodplain management-related messages, as well as information on property protection and sources of financial assistance such as mitigation grants. Other methods of public outreach include the City's Engineering Department's mailing of a "What You Need to Know" flood hazard brochure and a storm sewer brochure are distributed on an annual basis in the utility bills, and the City's Office of Emergency Management's insert in the Community Impact newspaper delivered to every home, flood safety messages scrolling on treadmill screens in the recreation center, and social media posts. The City also maintains a comprehensive Flood Protection Information page on its website with information and links on various topics such as flood insurance, flood warning system, property protection, natural and beneficial functions, and flood safety measures.

SUMMARY TABLE

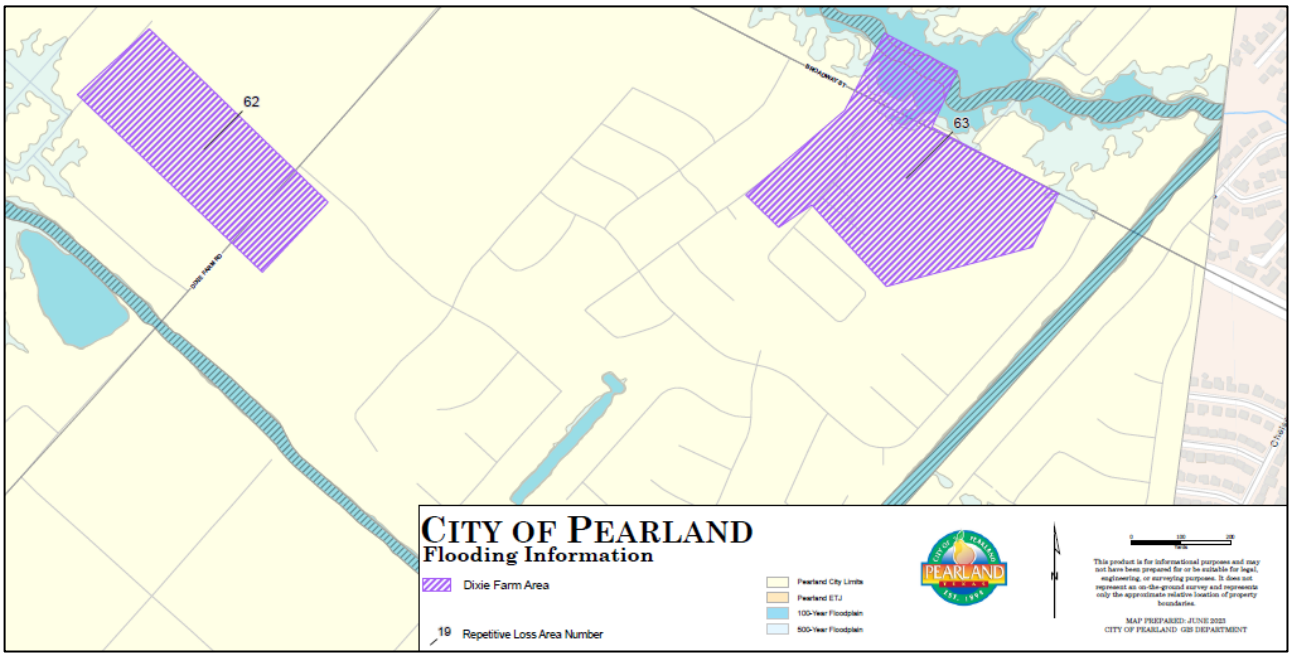
RLAs - Recommended Mitigation Alternative	Responsibility	Funding	Timeline
Property Protection	Business owners	Private	Dependent on funding
Structural Projects	PEDC	PEDC	Ongoing
Public Information	City of Pearland	Operating budget	Ongoing

6.5 Dixie Farm Area

6.5.1 Cause of Flooding

The Dixie Farm area is made up of RLAs 62 and 63. RLA 62 is outside of the FEMA floodplain. The homes may have been built in 1970 based on the Brazoria County appraisal district information and the latest flood loss claim was in 2006. RLA 63 consists of two different neighborhoods. The subdivision located south side of FM 518 is outside of the FEMA floodplain but experiences repetitive flood loss due to localized drainage problems. It has an inefficient drainage system restricting the stormwater to reach Mary's Creek bypass channel.

General Area	RLA #	Total # of Properties	Total # of FEMA RLs within RLA
Dixie Farm Area	62	13	1
	63	65	4
	TOTAL	**78**	**5**



6.5.2 Mitigation Alternatives

The Team evaluated several mitigation options to determine what would have the greatest impact on these RLAs including condition of the homes, cost effectiveness, feasibility, and potential to reduce future flood risk. Below is a summary of mitigation alternatives considered and recommended.

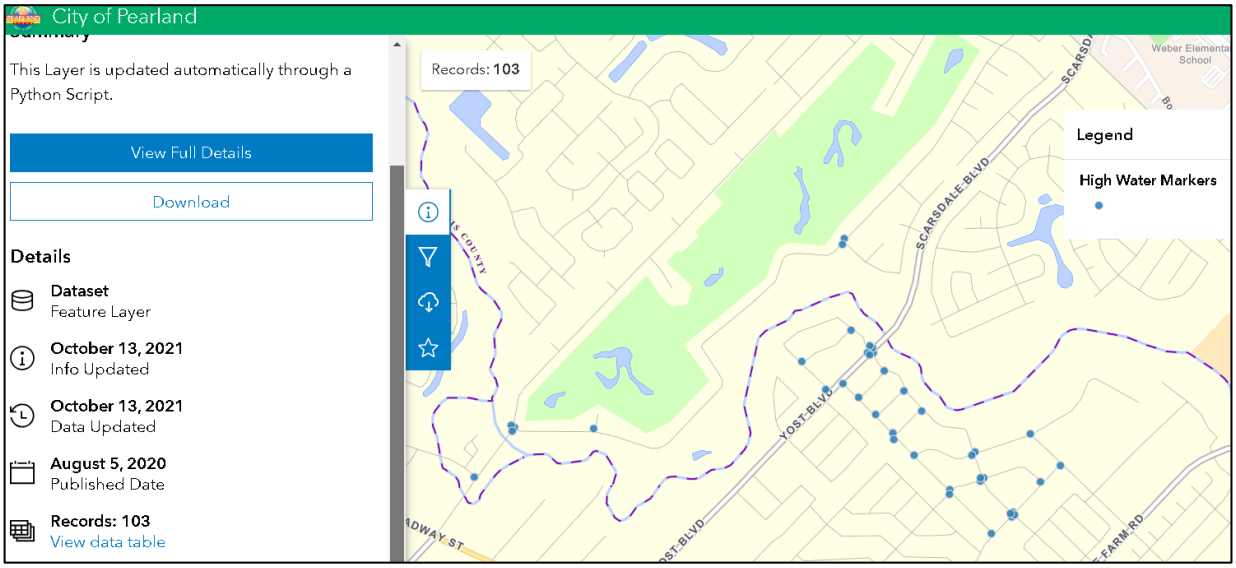
Preventative
The City has adopted and implemented higher standards for residential and commercial development through its UDC, EDCM, and Flood Damage Prevention Ordinance (Ordinance 532-8). One such requirement is for all new and substantially damaged/improved construction in the 100-year floodplain to have its lowest floor and utilities elevated to one foot above the base flood elevation, and to be built on pier and beam to avoid filling in the floodplain in this area. The freeboard requirement also extends to the shaded X/500-year floodplain as well.

Property Protection
The City promotes the purchase and maintenance of flood insurance via an annual targeted outreach project as well as an extensive outreach campaign to everyone in the city. Through the City's outreach, residents are encouraged to contact City staff for advice or to request a one-on-one site visit to explore property protection options such as elevation grants via mitigation funding. In fact, several repetitively flooded homes in RLA 63 have been removed and reconstructed.

Natural Resource Protection
Mitigation alternatives under natural resource protection were considered by the Team, but deemed not feasible for the RLAs in this area.

Emergency Services
The City's flood warning program relies largely upon flood threat recognition provided by the NWS and climatological projections (i.e., quarterly NWS probabilistic hydrologic outlooks) which forecast the probability that specific drainage canals will exceed their banks based on a 90-day precipitation forecast. Advance flood warning is provided by a series of approximately 18 stream gauges located within the City of Pearland's most prominent drainage streams (i.e., Clear Creek, Mary's Creek, Hickory Slough, etc.), and additional gauges located in a close proximity to the city. These gauges, part of a regional flood warning system, maintained by the HCFCD and BDD4, measure and report rainfall in real-time on an hourly basis, as well as water elevation relative to the top of the stream bank. A link to the regional flood warning system is provided in several areas on the City's website. In addition, both residents and public safety officials can register to receive alerts when specific stream gauges exceed a specified water elevation. Residents are also encouraged to register for the Everbridge emergency notification system and the Connect2Pearland app that relay flood warnings and flood safety tips to users. Post-storm activities include posting door hangers on homes of suspected flood damage with response and recovery information and posts on social media.

In addition, the City's public GIS includes a layer showing locations of highwater markers (map on the following page) that are predominantly located within RLA 63. These high-water markers are indicative of past flooding problems, and are a reminder to residents that the threat of flooding is still present in the area.



Structural Projects

Reconstruction of Dixie Farm Road in 2011 with a properly designed drainage system may have helped to alleviate localized drainage issues in RLA 62. In addition, the City has developed a drainage improvement plan which will include conveyance improvement and detention for RLA 63 which was included in the drainage bond referendum in May 2023. The residential property located north side of FM 518 has been demolished and reconstructed as a commercial property.

Public Information

Part of the City's extensive public outreach involves a targeted, annual mailing in June/July to the owners of all 862 properties in the RLAs. The RLA mailing is in both English and Spanish, and includes basic floodplain management-related messages, as well as information on property protection and sources of financial assistance such as mitigation grants. Other methods of public outreach include the City's Engineering Department's mailing of a "What You Need to Know" flood hazard brochure and a storm sewer brochure are distributed on an annual basis in the utility bills, and the City's Office of Emergency Management's insert in the Community Impact newspaper delivered to every home, flood safety messages scrolling on treadmill screens in the recreation center, and social media posts. The City also maintains a comprehensive Flood Protection Information page on its website with information and links on various topics such as flood insurance, flood warning system, property protection, natural and beneficial functions, and flood safety measures.

SUMMARY TABLE

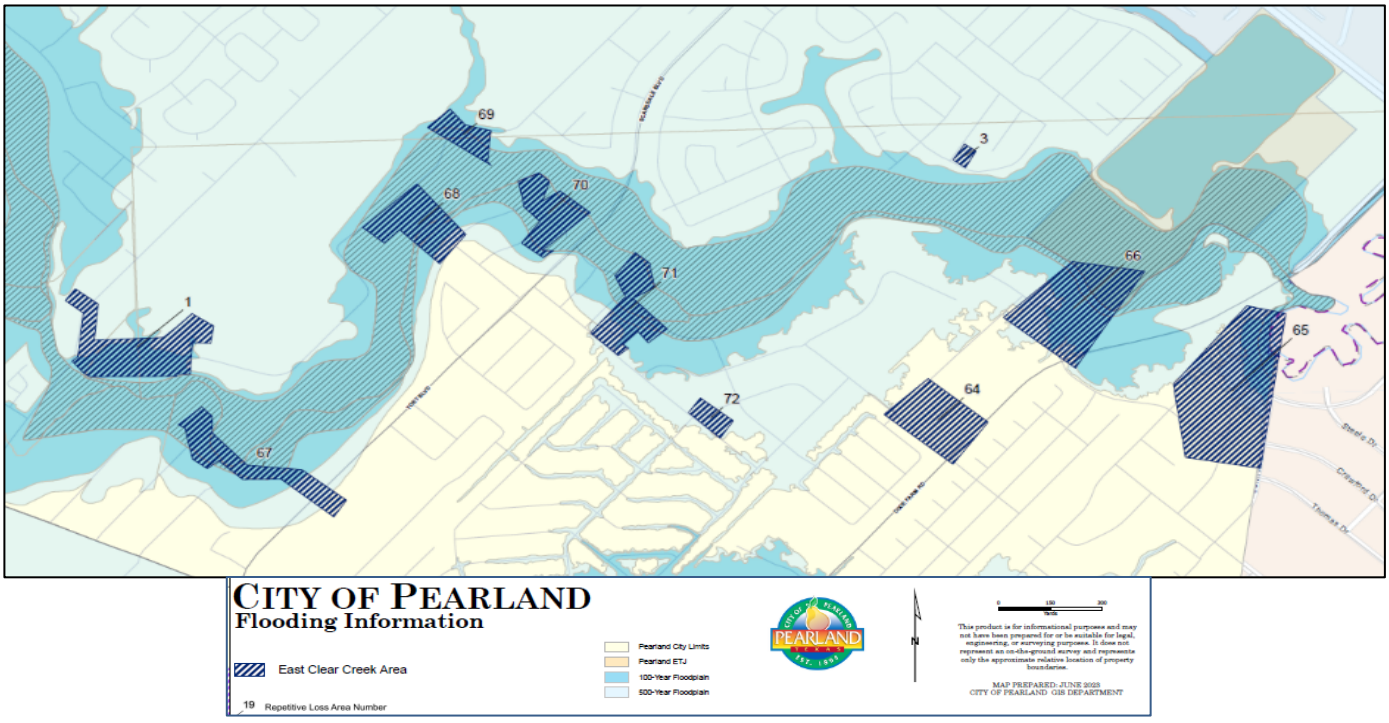
RLAs - Recommended Mitigation Alternative	Responsibility	Funding	Timeline
Emergency Services	City of Pearland	Operating budget	Completed
Property Protection	City of Pearland	Operating budget	Completed
Public Information	City of Pearland	Operating budget	Ongoing

6.6 East Clear Creek Area

6.6.1 Cause of Flooding

The East Clear Creek Area consists of 11 RLAs: RLAs 1, 3, 64, 65, 66, 67, 68, 69, 70, 71 and 72. The main source of flooding of the residential and commercial development in these RLAs is Clear Creek flood water. Most of the residential and commercial structures built along Clear Creek predate the engineering design requirement adopted by the City. The structures are constructed below FEMA 100-year floodplain and without the provision of stormwater and floodplain fill mitigation requirements.

General Area	RLA #	Total # of Properties	Total # of FEMA RLs within RLA
East Clear Creek Area	1	31	30
	3	3	2
	64	4	1
	65	29	3
	66	9	1
	67	5	3
	68	11	10
	69	4	4
	70	6	5
	71	11	5
	72	4	1
	TOTAL	**117**	**65**



6.6.2 Mitigation Alternatives

The Team evaluated several mitigation options to determine what would have the greatest impact on these RLAs including condition of the homes, cost effectiveness, feasibility, and potential to reduce future flood risk. Below is a summary of mitigation alternatives considered and recommended.

Preventative

The City has adopted and implemented higher standards for residential and commercial development through its UDC, EDCM, and Flood Damage Prevention Ordinance (Ordinance 532-8). One such requirement is for all new and substantially damaged/improved construction in the 100-year floodplain to have its lowest floor and utilities elevated to one foot above the base flood elevation, and to be built on pier and beam to avoid filling in the floodplain in this area. The freeboard requirement also extends to the shaded X/500-year floodplain as well. The City has also adopted Atlas 14 rainfall for H&H analysis and design, as well as the floodplain fill mitigation requirement up to the 500-year storm event. This requirement for compensatory storage helps to balance out the amount of development occurring in Pearland.

Property Protection

The City promotes the purchase and maintenance of flood insurance via an annual targeted outreach project as well as an extensive outreach campaign to all residents. Through the City's outreach, residents are encouraged to contact City staff for advice or to request a one-on-one site visit to explore property protection options such as elevation grants via mitigation funding. Several properties in these areas took advantage of the buyout program through FEMA mitigation grants after Tropical Storm Allison in 2001. Most of the repetitive loss homes in these RLAs are candidates for elevation or buyout due to their location with respect to Clear Creek floodway and floodplain.

Natural Resource Protection

Mitigation alternatives under natural resource protection were considered by the Team, but deemed not feasible for the RLAs in this area.

Emergency Services

The City's flood warning program relies largely upon flood threat recognition provided by the NWS and climatological projections (i.e., quarterly NWS probabilistic hydrologic outlooks) which forecast the probability that specific drainage canals will exceed their banks based on a 90-day precipitation forecast. Advance flood warning is provided by a series of approximately 18 stream gauges located within the City of Pearland's most prominent drainage streams (i.e., Clear Creek, Mary's Creek, Hickory Slough, etc.), and additional gauges located in a close proximity to the city. These gauges, part of a regional flood warning system, maintained by the HCFCD and BDD4, measure and report rainfall in real-time on an hourly basis, as well as water elevation relative to the top of the stream bank. A link to the regional flood warning system is provided in several areas on the City's website. In addition, both residents and public safety officials can register to receive alerts when specific stream gauges exceed a specified water elevation. Residents are also encouraged to register for the Everbridge emergency notification system and the Connect2Pearland app that relay flood warnings and flood safety tips to users. Post-storm activities include posting door hangers on homes of suspected flood damage with response and recovery information and posts on social media.

Structural Projects

The Clear Creek Federal Flood Risk Management Project is expected to widen Clear Creek to improve the drainage along Clear Creek. The construction of the project is anticipated to be completed by 2032 based on the information received from HCFCD. The project is a joint venture effort between the City, US Army Corps of Engineers, HCFCD, Galveston County, and BDD4. In 2022, the City completed a street and drainage improvement project in RLAs 69 and 70. The proposed future plan includes the construction of a regional detention pond in the City-owned property adjacent to RLA 65. It is expected to be a joint venture project and Galveston County Consolidated District will be the main lead for the project.

Public Information

Part of the City's extensive public outreach involves a targeted, annual mailing in June/July to the owners of all 862 properties in the RLAs. The RLA mailing is in both English and Spanish, and includes basic floodplain management-related messages, as well as information on property protection and sources of financial assistance such as mitigation grants. Other methods of public outreach include the City's Engineering Department's mailing of a "What You Need to Know" flood hazard brochure and a storm sewer brochure are distributed on an annual basis in the utility bills, and the City's Office of Emergency Management's insert in the Community Impact newspaper delivered to every home, flood safety messages scrolling on treadmill screens in the recreation center, and social media posts. The City also maintains a comprehensive Flood Protection Information page on its website with information and links on various topics such as flood insurance, flood warning system, property protection, natural and beneficial functions, and flood safety measures.

SUMMARY TABLE

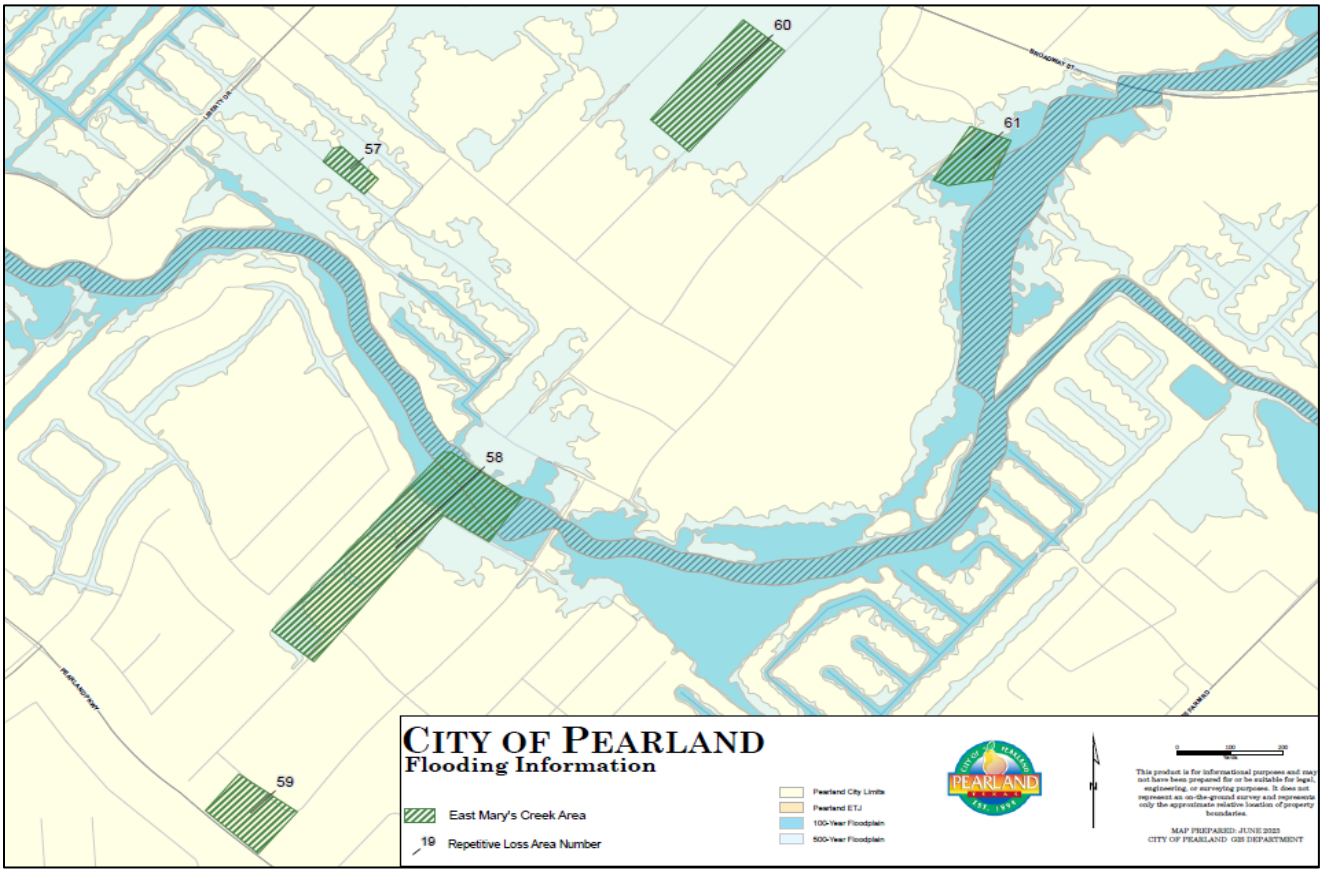
RLAs - Recommended Mitigation Alternative	Responsibility	Funding	Timeline
Property Protection	City of Pearland	Mitigation grant	Dependent on funding
Structural Projects	Joint venture	Bond	Ongoing

6.7 East Mary's Creek Area

6.7.1 Cause of Flooding

The East Mary's Creek Area consists of five (5) RLAs: RLAs 57, 58, 59, 60, and 61. All the properties in these five RLAs are located in an older neighborhood with inadequate drainage conveyance system that predates the adoption of engineering guidelines such as the detention requirement, minimum finished floor elevation requirement, no impact to downstream, and conveyance capacity. The repetitive flooding of RLAs 57, 59, and 60 can be attributed to inefficient drainage systems causing localized flooding. Similarly, RLAs 58 and 61 may have localized flooding, as well as the impact of riverine flooding.

General Area	RLA #	Total # of Properties	Total # of FEMA RLs within RLA
East Mary's Creek Area	57	4	1
	58	12	3
	59	3	1
	60	6	3
	61	3	1
	TOTAL	**28**	**9**



6.7.2 Mitigation Alternatives

The Team evaluated several mitigation options to determine what would have the greatest impact on these RLAs including condition of the homes, cost effectiveness, feasibility, and potential to reduce future flood risk. Below is a summary of mitigation alternatives considered and recommended.

Preventative
The City has adopted and implemented higher standards for residential and commercial development through its UDC, EDCM, and Flood Damage Prevention Ordinance (Ordinance 532-8). One such requirement is for all new and substantially damaged/improved construction in the 100-year floodplain to have its lowest floor and utilities elevated to one foot above the base flood elevation, and to be built on pier and beam to avoid filling in the floodplain in this area. The freeboard requirement also extends to the shaded X/500-year floodplain as well.

Property Protection
The City promotes the purchase and maintenance of flood insurance via an annual targeted outreach project as well as an extensive outreach campaign to everyone in the city. Through the City's outreach, residents are encouraged to contact City staff for advice or to request a one-on-one site visit to explore property protection options such as elevation grants via mitigation funding.

Natural Resource Protection
Mitigation alternatives under natural resource protection were considered by the Team, but deemed not feasible for the RLAs in this area.

Emergency Services
The City of Pearland's flood warning program relies largely upon flood threat recognition provided by the NWS and climatological projections (i.e., quarterly NWS probabilistic hydrologic outlooks) which forecast the probability that specific drainage canals will exceed their banks based on a 90-day precipitation forecast. Advance flood warning is provided by a series of approximately 18 stream gauges located within the City of Pearland's most prominent drainage streams (i.e., Clear Creek, Mary's Creek, Hickory Slough, etc.), and additional gauges located in a close proximity to the city. These gauges, part of a regional flood warning system, maintained by the HCFCD and BDD4, measure and report rainfall in real-time on an hourly basis, as well as water elevation relative to the top of the stream bank. A link to the regional flood warning system is provided in several areas on the City's website. In addition, both residents and public safety officials can register to receive alerts when specific stream gauges exceed a specified water elevation. Residents are also encouraged to register for the Everbridge emergency notification system and the Connect2Pearland app that relay flood warnings and flood safety tips to users. Post-storm activities include posting door hangers on homes of suspected flood damage with response and recovery information and posts on social media.

Structural Projects
In 2012, the City constructed a 204 ac-ft East Mary's Creek regional detention pond to reduce the flooding of the area. In addition, BDD4 constructed Mary's Creek Bypass Channel to improve the drainage of the area. The City has developed a drainage improvement plan to address drainage issues in RLA 60 and 61 which was included in the drainage bond referendum in May 2023. The construction of Pearland Pkwy between Oiler Drive and Dixie Farm included storm sewer system and Shadycrest ditch improvement which has helped alleviate the drainage problem in RLA 59. RLA 58 will be considered for future drainage improvement.

Public Information
Part of the City's extensive public outreach involves a targeted, annual mailing in June/July to the owners of all 862 properties in the RLAs. The RLA mailing is in both English and Spanish, and includes basic floodplain management-related messages, as well as information on property protection and sources of financial assistance such as mitigation grants. Other methods of public outreach include the City's Engineering Department's mailing of a "What You Need to Know" flood hazard brochure and a storm sewer brochure are distributed on an annual basis in the utility bills,

and the City's Office of Emergency Management's insert in the Community Impact newspaper delivered to every home, flood safety messages scrolling on treadmill screens in the recreation center, and social media posts. The City also maintains a comprehensive Flood Protection Information page on its website with information and links on various topics such as flood insurance, flood warning system, property protection, natural and beneficial functions, and flood safety measures.

SUMMARY TABLE

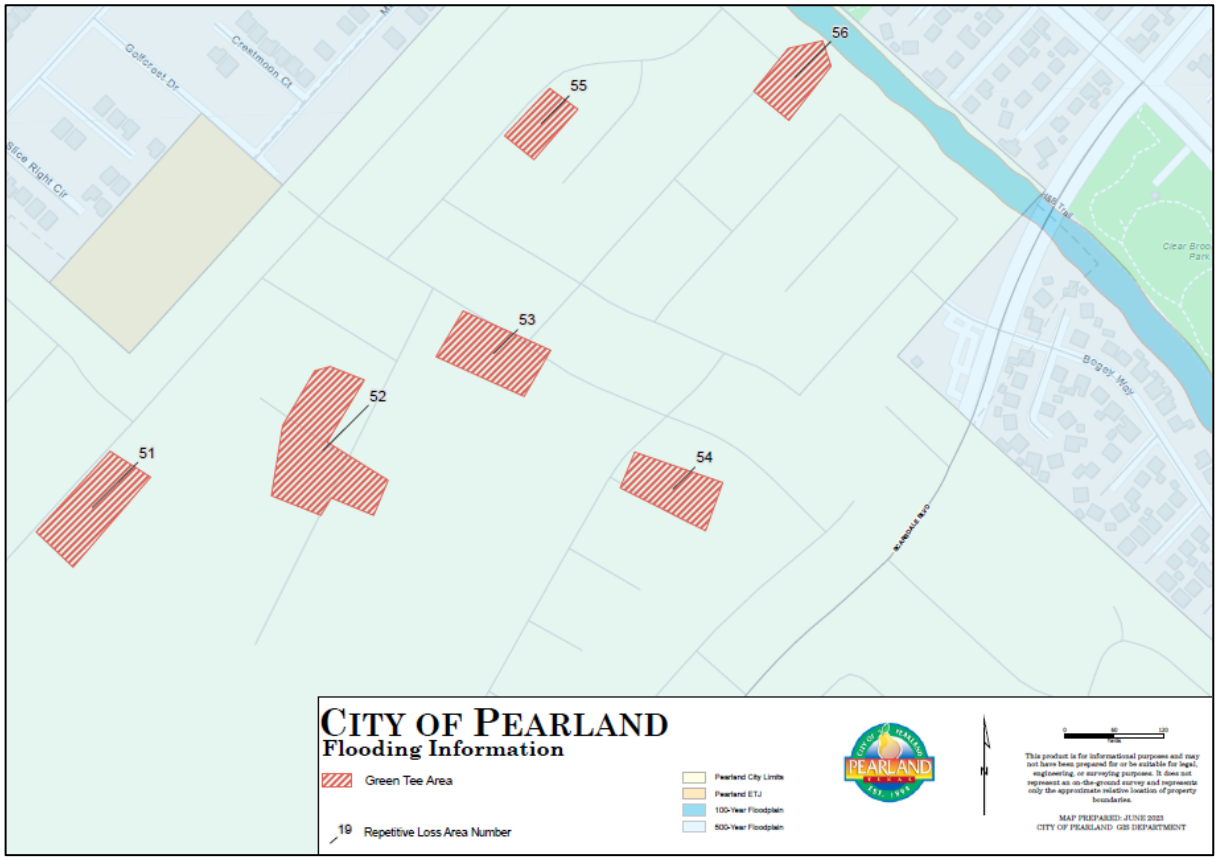
RLAs - Recommended Mitigation Alternative	Responsibility	Funding	Timeline
Preventative	City of Pearland	Operating budget	Ongoing
Structural Projects	City of Pearland	Bond	Ongoing

6.8 Green Tee Area

6.8.1 Cause of Flooding

There are six (6) RLAs located in the Green Tea Area: RLAs 51, 52, 53, 54, 55, and 56. All the properties in these RLAs are in the FEMA 500-year floodplain and are in older neighborhoods with inadequate drainage conveyance systems. The construction of a curb and gutter roadway with storm sewer system indicates the use of engineering design criteria adopted in 1980. The design criteria during this time did not require detention mitigation and minimum finish floor elevation. Based on the analysis of flood history, most of the residential homes have flooded due to inefficient storm sewer systems.

General Area	RLA #	Total # of Properties	Total # of FEMA RLs within RLA
Green Tee Area	51	4	4
	52	6	8
	53	4	2
	54	4	2
	55	3	2
	56	3	2
	TOTAL	**24**	**20**



6.8.2 Mitigation Alternatives

The Team evaluated several mitigation options to determine what would have the greatest impact on these RLAs including condition of the homes, cost effectiveness, feasibility, and potential to reduce future flood risk. Below is a summary of mitigation alternatives considered and recommended.

Preventative

The City has adopted and implemented higher standards for residential and commercial development through its UDC, EDCM, and Flood Damage Prevention Ordinance (Ordinance 532-8). One such requirement is for all new and substantially damaged/improved construction in the 100-year floodplain to have its lowest floor and utilities elevated to one foot above the base flood elevation, and to be built on pier and beam to avoid filling in the floodplain in this area. The freeboard requirement also extends to the shaded X/500-year floodplain as well.

Property Protection

The City promotes the purchase and maintenance of flood insurance via an annual targeted outreach project as well as an extensive outreach campaign to everyone in the city. Through the City's outreach, residents are encouraged to contact City staff for advice or to request a one-on-one site visit to explore property protection options such as elevation grants via mitigation funding.

Natural Resource Protection

Mitigation alternatives under natural resource protection were considered by the Team, but deemed not feasible for the RLAs in this area.

Emergency Services

The City's flood warning program relies largely upon flood threat recognition provided by the NWS and climatological projections (i.e., quarterly NWS probabilistic hydrologic outlooks) which forecast the probability that specific drainage canals will exceed their banks based on a 90-day precipitation forecast. Advance flood warning is provided by a series of approximately 18 stream gauges located within the City of Pearland's most prominent drainage streams (i.e., Clear Creek, Mary's Creek, Hickory Slough, etc.), and additional gauges located in a close proximity to the city. These gauges, part of a regional flood warning system, maintained by the HCFCD and BDD4, measure and report rainfall in real-time on an hourly basis, as well as water elevation relative to the top of the stream bank. A link to the regional flood warning system is provided in several areas on the City's website. In addition, both residents and public safety officials can register to receive alerts when specific stream gauges exceed a specified water elevation. Residents are also encouraged to register for the Everbridge emergency notification system and the Connect2Pearland app that relay flood warnings and flood safety tips to users. Post-storm activities include posting door hangers on homes of suspected flood damage with response and recovery information and posts on social media.

Structural Projects

Reconstruction of the street and drainage system would alleviate localized flooding but will not be economically feasible as the flood loss homes are spread over several sections of the subdivision.

Public Information

Part of the City's extensive public outreach involves a targeted, annual mailing in June/July to the owners of all 862 properties in the RLAs. The RLA mailing is in both English and Spanish, and includes basic floodplain management-related messages, as well as information on property protection and sources of financial assistance such as mitigation grants. Other methods of public outreach include the City's Engineering Department's mailing of a "What You Need to Know" flood hazard brochure and a storm sewer brochure are distributed on an annual basis in the utility bills, and the City's Office of Emergency Management's insert in the Community Impact newspaper delivered to every home, flood safety messages scrolling on treadmill screens in the recreation center, and social media posts. The City also maintains a comprehensive Flood Protection Information page on its website with information and links on various topics such as flood insurance, flood warning system, property protection, natural and beneficial functions, and flood safety measures.

SUMMARY TABLE

RLAs - Recommended Mitigation Alternative	Responsibility	Funding	Timeline
Public Information	City of Pearland	Operating budget	Ongoing

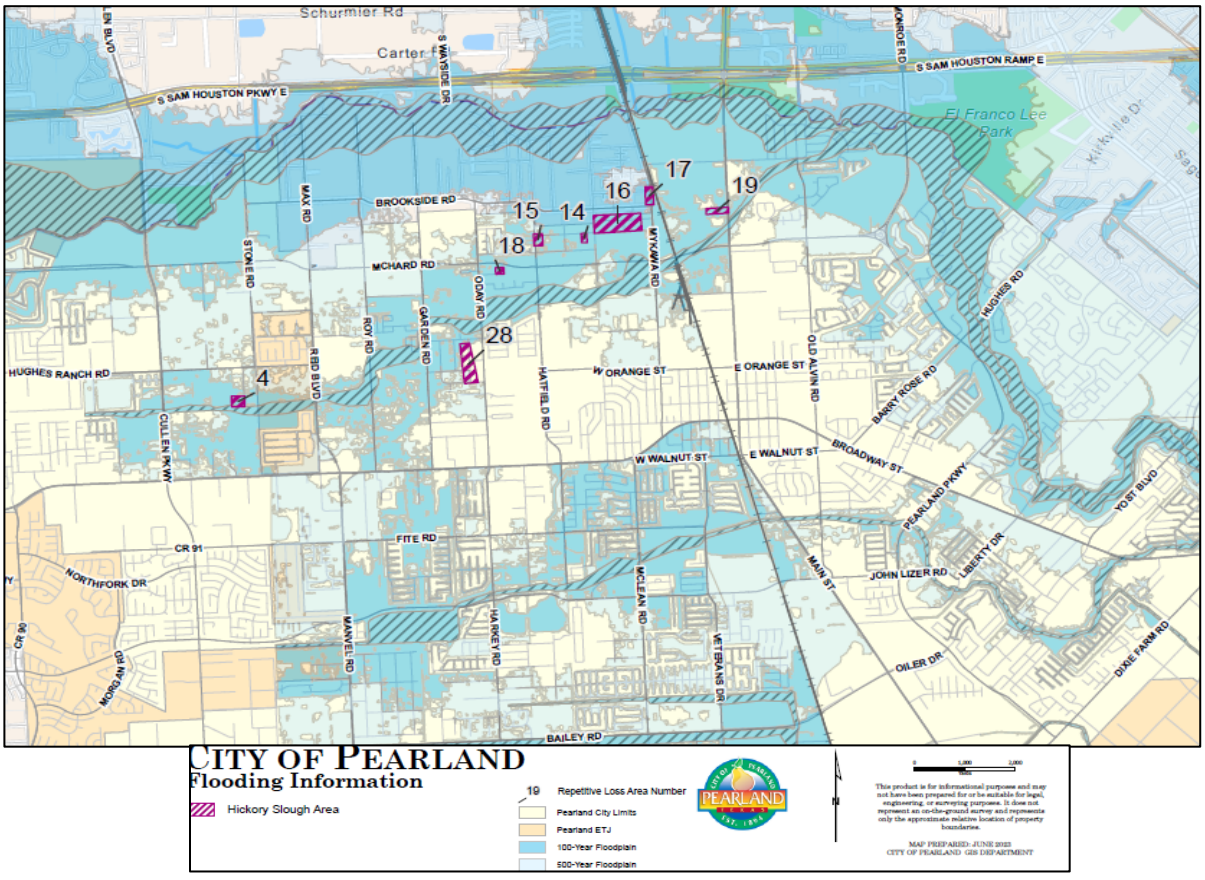
6.9 Hickory Slough Area

6.9.1 Cause of Flooding

There are eight (8) RLAs in the Hickory Slough Area: RLAs 4, 14, 15, 16, 17, 18, 19, and 28. All of the properties identified in the picture are located in an older neighborhood with inadequate drainage conveyance system and predates the adoption of engineering guidelines such as the

detention requirement, minimum finish floor elevation requirement, no impact to downstream, and conveyance capacity regulations. All residential homes in these RLAs are located on the north side of Hickory Slough and are in FEMA 100-year floodplain. The lowest street elevation in RLAs 14, 15, and 16 is about 2.5 feet below the 100-year FEMA floodplain elevation (47.5 feet approximately). Repetitive flooding of the area along the north side of Hickory Slough can be attributed to both localized flooding and riverine flooding.

General Area	RLA #	Total # of Properties	Total # of FEMA RLs within RLA
Hickory Slough Area	4	2	1
	14	3	1
	15	3	1
	16	47	8
	17	2	1
	18	2	1
	19	8	1
	28	13	2
	TOTAL	**80**	**16**



6.9.2 Mitigation Alternatives

The Team evaluated several mitigation options to determine what would have the greatest impact on these RLAs including condition of the homes, cost effectiveness, feasibility, and potential to reduce future flood risk. Below is a summary of mitigation alternatives considered and recommended.

Preventative

The City has adopted and implemented higher standards for residential and commercial development through its UDC, EDCM, and Flood Damage Prevention Ordinance (Ordinance 532-8). One such requirement is for all new and substantially damaged/improved construction in the 100-year floodplain to have its lowest floor and utilities elevated to one foot above the base flood elevation, and to be built on a pier and beam to avoid filling in the floodplain in this area. The freeboard requirement also extends to the shaded X/500-year floodplain as well.

Property Protection

The City promotes the purchase and maintenance of flood insurance via an annual targeted outreach project as well as an extensive outreach campaign to everyone in the city. Through the City's outreach, residents are encouraged to contact City staff for advice or to request a one-on-one site visit to explore property protection options such as elevation grants via mitigation funding. Several properties in this area took advantage of the buyout program through FEMA grants after Tropical Storm Allison in 2001. In addition, the City and BDD4 bought several properties after Hurricane Harvey in 2017. There is potential for the City to pursue future mitigation grants for acquisitions if there is enough interest and the structures qualify.

Natural Resource Protection

Mitigation alternatives under natural resource protection were considered by the Team, but deemed not feasible for the RLAs in this area.

Emergency Services

The City of Pearland's flood warning program relies largely upon flood threat recognition provided by the NWS and climatological projections (i.e., quarterly NWS probabilistic hydrologic outlooks) which forecast the probability that specific drainage canals will exceed their banks based on a 90-day precipitation forecast. Advance flood warning is provided by a series of approximately 18 stream gauges located within the City of Pearland's most prominent drainage streams (i.e., Clear Creek, Mary's Creek, Hickory Slough, etc.), and additional gauges located in a close proximity to the city. These gauges, part of a regional flood warning system, maintained by the HCFCD and BDD4, measure and report rainfall in real-time on an hourly basis, as well as water elevation relative to the top of the stream bank. A link to the regional flood warning system is provided in several areas on the City's website. In addition, both residents and public safety officials can register to receive alerts when specific stream gauges exceed a specified water elevation. Residents are also encouraged to register for the Everbridge emergency notification system and the Connect2Pearland app that relay flood warnings and flood safety tips to users. Post-storm activities include posting door hangers on homes of suspected flood damage with response and recovery information and posts on social media.

Structural Projects

The City has developed a drainage improvement plan to address drainage issues in RLAs 13, 14, 15, and 16. Funding from the General Land Office (GLO) has already been secured to improve drainage system in these areas. The City and BDD4 have a joint venture regional detention (230 ac-ft) project to help reduce flooding of this area which is expected to be complete in 2024.

Similarly, the City developed a drainage plan to address localized flooding in RLA 28 which was included in the drainage bond referendum in May 2023.

Public Information

Part of the City's extensive public outreach involves a targeted, annual mailing in June/July to the owners of all 862 properties in the RLAs. The RLA mailing is in both English and Spanish, and includes basic floodplain management-related messages, as well as information on property protection and sources of financial assistance such as mitigation grants. Other methods of public outreach include the City's Engineering Department's mailing of a "What You Need to Know" flood hazard brochure and a storm sewer brochure are distributed on an annual basis in the utility bills, and the City's Office of Emergency Management's insert in the Community Impact newspaper delivered to every home, flood safety messages scrolling on treadmill screens in the recreation center, and social media posts. The City also maintains a comprehensive Flood Protection Information page on its website with information and links on various topics such as flood insurance, flood warning system, property protection, natural and beneficial functions, and flood safety measures.

SUMMARY TABLE

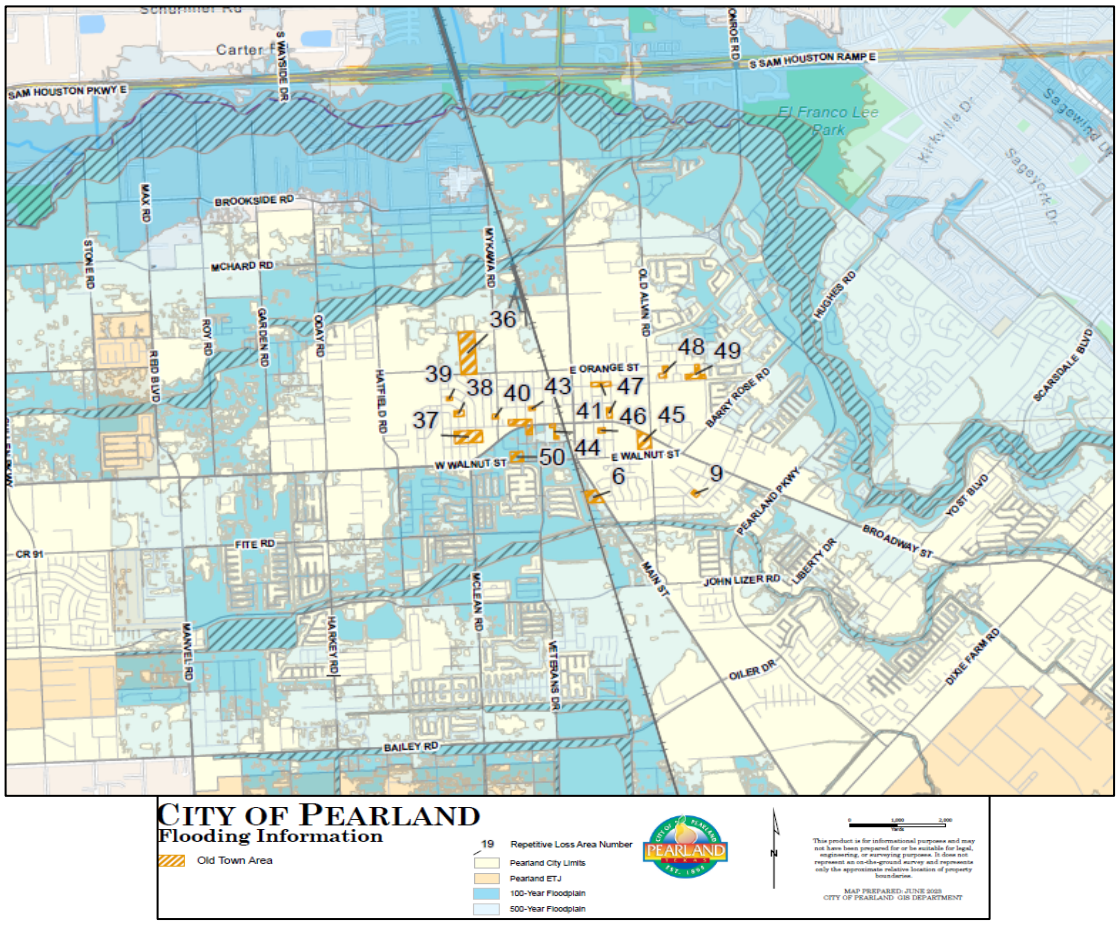
RLAs - Recommended Mitigation Alternative	Responsibility	Funding	Timeline
Preventative	City of Pearland	Operating budget	Ongoing
Structural Projects	Joint venture	GLO	Ongoing

6.10 Old Town Area

6.10.1 Cause of Flooding

Old Town Area includes 17 RLAs: RLAs 6, 9, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, and 50. Most of the RLAs in the Old Town Area are the oldest parts of Pearland which were platted in 1894 and are collectively known as Old Town Site. The RLAs consist of a mix of commercial and residential development and experiences repetitive flood loss due to an inefficient drainage system with inadequate drainage conveyance that predates the adoption of engineering guidelines such as the detention requirement, minimum finish floor elevation requirement, no impact to downstream, and conveyance capacity regulations. Localized flooding due to inefficient systems is the main cause of flooding.

General Area	RLA #	Total # of Properties	Total # of FEMA RLs within RLA
Old Town Area	6	15	1
	9	3	1
	36	2	2
	37	18	10
	38	6	3
	39	3	1
	40	3	1
	41	4	2
	42	27	4
	43	5	1
	44	2	2
	45	14	1
	46	2	1
	47	2	1
	48	5	2
	49	13	3
	50	11	5
	TOTAL	**135**	**41**



CITY OF PEARLAND
Flooding Information

Old Town Area

19 Repetitive Loss Area Number
Pearland City Limits
Pearland ETJ
100-Year Floodplain
500-Year Floodplain

MAP PREPARED: JUNE 2023
CITY OF PEARLAND GIS DEPARTMENT

6.10.2 Mitigation Alternatives

The Team evaluated several mitigation options to determine what would have the greatest impact on these RLAs including condition of the homes, cost effectiveness, feasibility, and potential to reduce future flood risk. Below is a summary of mitigation alternatives considered and recommended.

Preventative

The City has adopted and implemented higher standards for residential and commercial development through its UDC, EDCM, and Flood Damage Prevention Ordinance (Ordinance 532-8). One such requirement is for all new and substantially damaged/improved construction in the 100-year floodplain to have its lowest floor and utilities elevated to one foot above the base flood elevation, and to be built on a pier and beam to avoid filling in the floodplain in this area. The freeboard requirement also extends to the shaded X/500-year floodplain as well.

Property Protection

The City promotes the purchase and maintenance of flood insurance via an annual targeted outreach project as well as an extensive outreach campaign to everyone in the city. Through the City's outreach, residents are encouraged to contact City staff for advice or to request a one-on-one site visit to explore property protection options such as elevation grants via mitigation funding.

Natural Resource Protection

Mitigation alternatives under natural resource protection were considered by the Team, but deemed not feasible for the RLAs in this area.

Emergency Services

The City of Pearland's flood warning program relies largely upon flood threat recognition provided by the NWS and climatological projections (i.e., quarterly NWS probabilistic hydrologic outlooks) which forecast the probability that specific drainage canals will exceed their banks based on a 90-day precipitation forecast. Advance flood warning is provided by a series of approximately 18 stream gauges located within the City of Pearland's most prominent drainage streams (i.e., Clear Creek, Mary's Creek, Hickory Slough, etc.), and additional gauges located in a close proximity to the city. These gauges, part of a regional flood warning system, maintained by the HCFCD and BDD4, measure and report rainfall in real-time on an hourly basis, as well as water elevation relative to the top of the stream bank. A link to the regional flood warning system is provided in several areas on the City's website. In addition, both residents and public safety officials can register to receive alerts when specific stream gauges exceed a specified water elevation. Residents are also encouraged to register for the Everbridge emergency notification system and the Connect2Pearland app that relay flood warnings and flood safety tips to users. Post-storm activities include posting door hangers on homes of suspected flood damage with response and recovery information and posts on social media.

Structural Projects

The City completed a drainage improvement project in 2021 to address the drainage issue in RLA 37. Reconstruction of the street and drainage in RLAs 37, 38, and 39 is currently under construction and expected to be completed by 2023. The City has developed a drainage improvement plan to address drainage issues in RLAs 42, 44,48, 49, and 50 which were included in the drainage bond referendum in May 2023. Walnut Street drainage improvement project with a detention system was completed to address the drainage issue in RLAs 44 and 45. Similarly, the drainage system within the same area is under construction and expected to complete by the

end of 2023. The southwest quadrant of Old Town site and Old Alvin Road drainage improvements will address the flooding issues in RLA 50.

Public Information

Part of the City's extensive public outreach involves a targeted, annual mailing in June/July to the owners of all 862 properties in the RLAs. The RLA mailing is in both English and Spanish, and includes basic floodplain management-related messages, as well as information on property protection and sources of financial assistance such as mitigation grants. Other methods of public outreach include the City's Engineering Department's mailing of a "What You Need to Know" flood hazard brochure and a storm sewer brochure are distributed on an annual basis in the utility bills, and the City's Office of Emergency Management's insert in the Community Impact newspaper delivered to every home, flood safety messages scrolling on treadmill screens in the recreation center, and social media posts. The City also maintains a comprehensive Flood Protection Information page on its website with information and links on various topics such as flood insurance, flood warning system, property protection, natural and beneficial functions, and flood safety measures.

SUMMARY TABLE

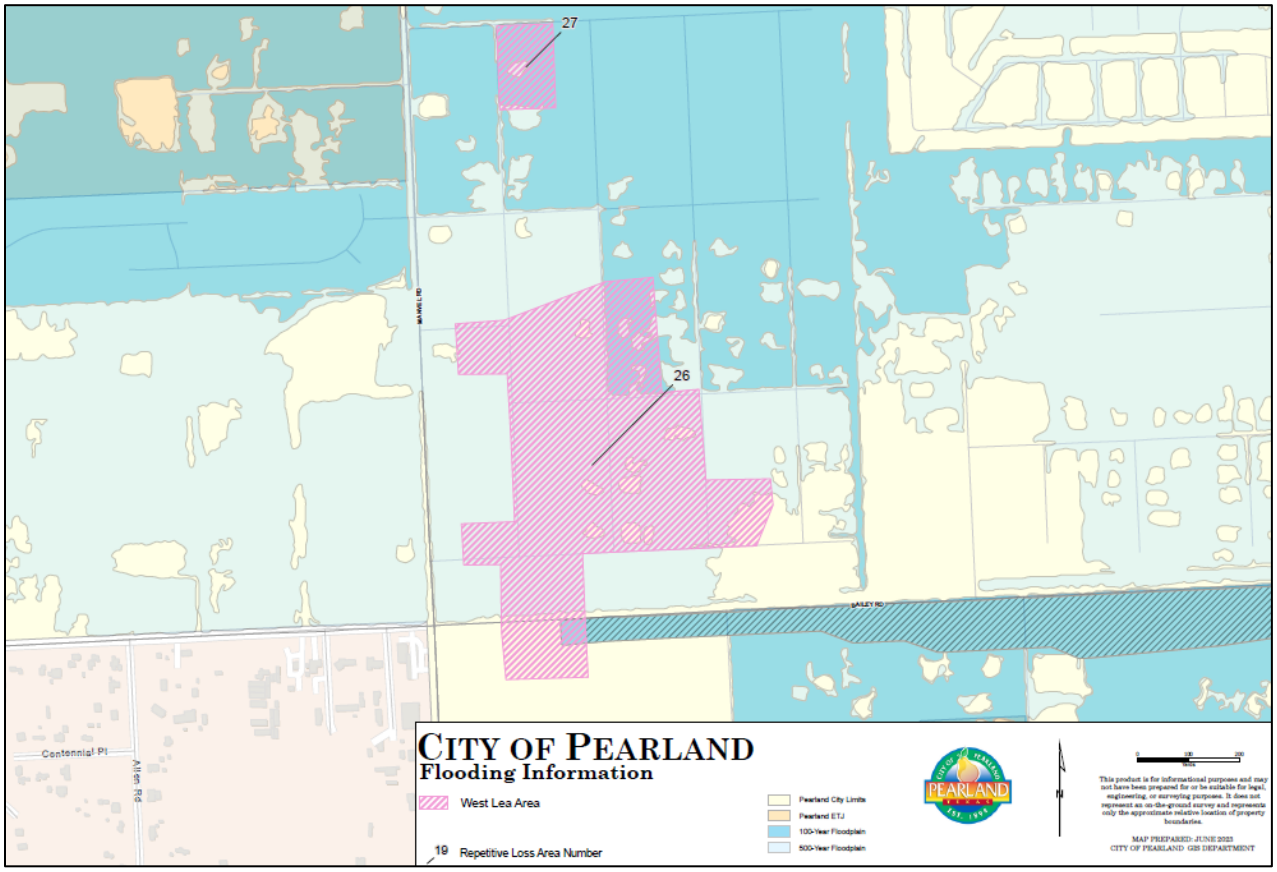
RLAs - Recommended Mitigation Alternative	Responsibility	Funding	Timeline
Preventative	City of Pearland	Operating budget	Ongoing
Structural Projects	City of Pearland	Bond	Ongoing
Public Information	City of Pearland	Operating budget	Ongoing

6.11 West Lea Area

6.11.1 Cause of Flooding

There are two (2) RLAs in the West Lea Area – RLAs 26 and 27 – and both are located between Mary's Creek and Cowart's Creek and are mostly in the FEMA 100-year floodplain. The plat date of 1964 for these subdivisions indicates that the homes were built prior to the adoption of engineering design guidelines and FEMA FIRM by the City. Analysis of the lowest street elevation (50 ft approximately) compared to the 100-year flood elevation (52 ft approximately) as depicted on the FEMA FIRM reveals that the areas have greater potential to be flooded due to the water surface elevation of Mary's Creek. Most homes in these areas have a finished floor elevation below the current 100-year flood elevation, and it would be challenging to significantly lower the flood elevation of Mary's Creek to prevent existing homes from flooding.

General Area	RLA #	Total # of Properties	Total # of FEMA RLs within RLA
West Lea Area	26	47	6
	27	3	1
	TOTAL	**50**	**7**



6.11.2 Mitigation Alternatives

The Team evaluated several mitigation options to determine what would have the greatest impact on these RLAs including condition of the homes, cost effectiveness, feasibility, and potential to reduce future flood risk. Below is a summary of mitigation alternatives considered and recommended.

Preventative

The City has adopted and implemented higher standards for residential and commercial development through its UDC, EDCM, and Flood Damage Prevention Ordinance (Ordinance 532-8). One such requirement is for all new and substantially damaged/improved construction in the 100-year floodplain to have its lowest floor and utilities elevated to one foot above the base flood elevation, and to be built on a pier and beam to avoid filling in the floodplain in this area. The freeboard requirement also extends to the shaded X/500-year floodplain as well.

Property Protection

The City promotes the purchase and maintenance of flood insurance via an annual targeted outreach project as well as an extensive outreach campaign to everyone in the city. Through the City's outreach, residents are encouraged to contact City staff for advice or to request a one-on-one site visit to explore property protection options such as elevation grants via mitigation funding. Several properties in this area took advantage of the buyout program through FEMA grants after Tropical Storm Allison in 2001. In addition, the City and BDD4 bought several properties after

Hurricane Harvey in 2017. There is potential for the City to pursue future mitigation grants for acquisitions if there is enough interest and the structures qualify. There is a current CIP that is addressing the flood protection.

Natural Resource Protection

The Magnolia Parkway Ponds are 63 acres of created wetlands within two stormwater retention basins. These ponds act as functioning wetlands and serve RLAs 26 and 27 for stormwater retention requirements. These basins have been designed to support wetland vegetation by holding very shallow water and consisting of more gradual slopes. The associated wetland vegetation helps to filter stormwater before entering Mary's Creek improving water quality for the area. The establishment of wetland vegetation is important for providing wildlife habitat and this site has become a popular birding spot due to the high concentration of waterbirds present.

Emergency Services

The City of Pearland's flood warning program relies largely upon flood threat recognition provided by the NWS and climatological projections (i.e., quarterly NWS probabilistic hydrologic outlooks) which forecast the probability that specific drainage canals will exceed their banks based on a 90-day precipitation forecast. Advance flood warning is provided by a series of approximately 18 stream gauges located within the City of Pearland's most prominent drainage streams (i.e., Clear Creek, Mary's Creek, Hickory Slough, etc.), and additional gauges located in a close proximity to the city. These gauges, part of a regional flood warning system, maintained by the HCFCD and BDD4, measure and report rainfall in real-time on an hourly basis, as well as water elevation relative to the top of the stream bank. A link to the regional flood warning system is provided in several areas on the City's website. In addition, both residents and public safety officials can register to receive alerts when specific stream gauges exceed a specified water elevation. Residents are also encouraged to register for the Everbridge emergency notification system and the Connect2Pearland app that relay flood warnings and flood safety tips to users. Post-storm activities include posting door hangers on homes of suspected flood damage with response and recovery information and posts on social media.

Structural Projects

Reconstruction of the street drainage system, along with a linear detention pond, is currently under construction and expected to be completed by 2023. This drainage reconstruction project is expected to help mitigate localized flooding problems in these RLAs, but will not be able to prevent flooding of homes from extreme event storms such as Hurricane Harvey in 2017 as the finish floor elevation of most of the older homes are below 100-year water surface elevation of Mary's Creek. A portion of RLA 26 drains into the Bailey Road drainage system. The construction of Bailey Road drainage system has helped to improve the drainage of the area adjacent to Bailey Road.

Public Information

Part of the City's extensive public outreach involves a targeted, annual mailing in June/July to the owners of all 862 properties in the RLAs. The RLA mailing is in both English and Spanish, and includes basic floodplain management-related messages, as well as information on property protection and sources of financial assistance such as mitigation grants. Other methods of public outreach include the City's Engineering Department's mailing of a "What You Need to Know" flood hazard brochure and a storm sewer brochure are distributed on an annual basis in the utility bills, and the City's Office of Emergency Management's insert in the Community Impact newspaper delivered to every home, flood safety messages scrolling on treadmill screens in the recreation center, and social media posts. The City also maintains a comprehensive Flood Protection Information page on its website with information and links on various topics such as flood

insurance, flood warning system, property protection, natural and beneficial functions, and flood safety measures.

SUMMARY TABLE

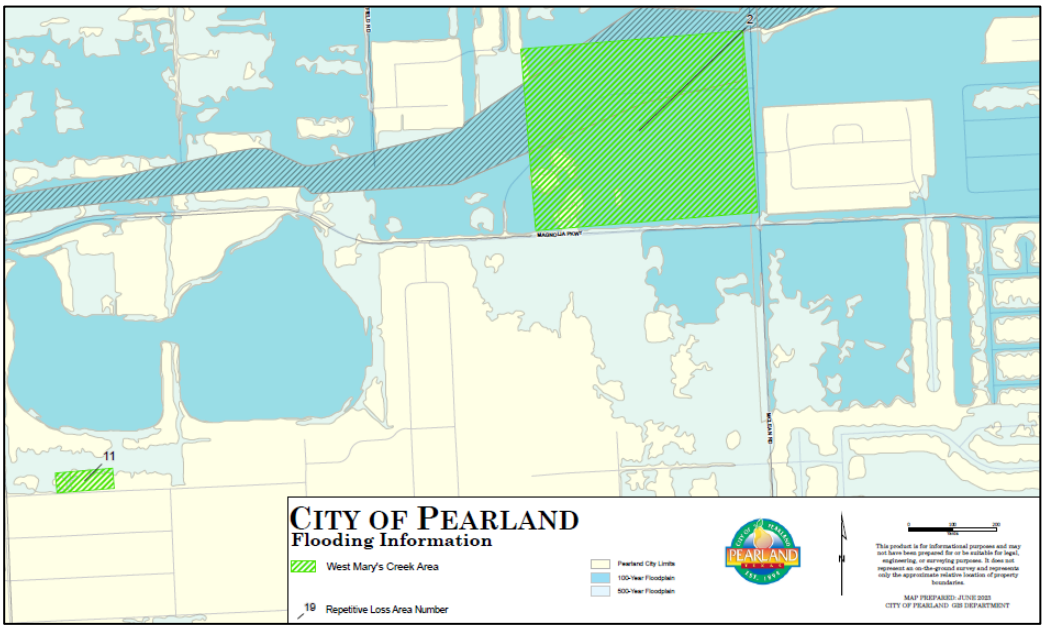
RLAs - Recommended Mitigation Alternative	Responsibility	Funding	Timeline
Preventative	City of Pearland	Operating budget	Ongoing
Property Protection	City of Pearland	Mitigation grant	Dependent on funding
Natural Resource Protection	City of Pearland	Operating budget	Completed
Structural Projects	City of Pearland	CIP	Ongoing

6.12 West Mary's Creek Area

6.12.1 Cause of Flooding

There are two (2) properties in the West Mary's Creek Area: RLAs 2 and 11. The properties in these RLAs are located in an older neighborhood with an inadequate drainage conveyance system and predate the adoption of engineering guidelines such as the detention requirement, minimum finish floor elevation requirement, no impact to downstream, and conveyance capacity regulations. The cause of flooding for RLA 2 can be attributed to an inefficient drainage system; whereas, the cause for RLA 11 may be the result of both the localized flooding and riverine flooding due to its nexus to Mary's Creek.

General Area	RLA #	Total # of Properties	Total # of FEMA RLs within RLA
West Mary's Creek Area	2	21	3
	11	3	1
	TOTAL	**24**	**4**



6.12.2 Mitigation Alternatives

The Team evaluated several mitigation options to determine what would have the greatest impact on these RLAs including the condition of the homes, cost-effectiveness, feasibility, and potential to reduce future flood risk. Below is a summary of mitigation alternatives considered and recommended.

Preventative

The City has adopted and implemented higher standards for residential and commercial development through its UDC, EDCM, and Flood Damage Prevention Ordinance (Ordinance 532-8). One such requirement is for all new and substantially damaged/improved construction in the 100-year floodplain to have its lowest floor and utilities elevated to one foot above the base flood elevation, and to be built on a pier and beam to avoid filling in the floodplain in this area. The freeboard requirement also extends to the shaded X/500-year floodplain as well.

Property Protection

Several properties in RLA 11 have taken advantage of the buyout program through FEMA grants after Tropical Storm Allison in 2001 to eliminate repetitive flood loss. There is potential for the City to pursue more acquisitions through future mitigation grants.

Natural Resource Protection

Centennial Park is southwest of RLA2 and is a mixed-use site that features softball fields, tennis courts, playground, splashpad, walking trails, open greenspace, and a protected natural wetland area. The natural wetland area is 15 acres in size that is made up of a chain of wetland depressions adjacent to Mary's Creek. This site has been identified by the City as an important environmental area to be preserved. These natural wetlands help mitigate local flooding issues, filter stormwater before entering Mary's Creek, and provide wildlife habitat along with other environmental services. Interpretive signage is located along the trail bordering the wetland site to educate visitors on functions, plants, and animals associated with the area.

The John Hargrove Environmental Complex (JHEC) is a site that focuses on stormwater retention and environmental preservation and education that also affects RLA 11. JHEC is approximately 77 acres that consists of two large retention ponds (50 acres total) that serve as area/neighborhood stormwater retention. This is also the site of the first municipal floating wetlands in Texas. Floating wetlands are large, artificial floating mats designed to support wetland vegetation. The roots grow through the mat and suspend in the water column to help filter contaminates before entering Mary's Creek and provide habitat for fish and other aquatic life. Looping around the ponds is almost two miles of trails for exercising and wildlife viewing. This site also has multiple no mow zones and over 1,000 native trees that have been planted as a forest creation project to provide natural habitat and help filter pollutants from incoming stormwater. JHEC also hosts a nesting colony of waterbirds making this a very important wildlife site protected by the City as well as federal law. A survey in 2023 counted 907 nesting pairs of egrets, herons, cormorants, ibis, and spoonbill. The City of Pearland recently constructed and opened the Delores Fenwick Nature Center (DFNC) on this site. The DFNC is open to the public at no cost and features a variety of nature-based educational exhibits, daily programming, and trained staff to interact with the community.

Emergency Services

The City of Pearland's flood warning program relies largely upon flood threat recognition provided by the NWS and climatological projections (i.e., quarterly NWS probabilistic hydrologic outlooks) which forecast the probability that specific drainage canals will exceed their banks based on a 90-

day precipitation forecast. Advance flood warning is provided by a series of approximately 18 stream gauges located within the City of Pearland's most prominent drainage streams (i.e., Clear Creek, Mary's Creek, Hickory Slough, etc.), and additional gauges located in a close proximity to the city. These gauges, part of a regional flood warning system, maintained by the HCFCD and BDD4, measure and report rainfall in real-time on an hourly basis, as well as water elevation relative to the top of the stream bank. A link to the regional flood warning system is provided in several areas on the City's website. In addition, both residents and public safety officials can register to receive alerts when specific stream gauges exceed a specified water elevation. Residents are also encouraged to register for the Everbridge emergency notification system and the Connect2Pearland app that relay flood warnings and flood safety tips to users. Post-storm activities include posting door hangers on homes of suspected flood damage with response and recovery information and posts on social media.

Structural Projects

The City constructed a 433 ac-ft (John Hargrove Environmental Center) regional detention pond in 2006 to alleviate the flooding of RLA 11. In addition, a large regional detention pond (127 ac-ft) was constructed downstream of RLA 2 to help reduce the flooding problem.

Public Information

Part of the City's extensive public outreach involves a targeted, annual mailing in June/July to the owners of all 862 properties in the RLAs. The RLA mailing is in both English and Spanish, and includes basic floodplain management-related messages, as well as information on property protection and sources of financial assistance such as mitigation grants. Other methods of public outreach include the City's Engineering Department's mailing of a "What You Need to Know" flood hazard brochure and a storm sewer brochure are distributed on an annual basis in the utility bills, and the City's Office of Emergency Management's insert in the Community Impact newspaper delivered to every home, flood safety messages scrolling on treadmill screens in the recreation center, and social media posts. The City also maintains a comprehensive Flood Protection Information page on its website with information and links on various topics such as flood insurance, flood warning system, property protection, natural and beneficial functions, and flood safety measures.

SUMMARY TABLE

RLAs - Recommended Mitigation Alternative	Responsibility	Funding	Timeline
Property Protection	City of Pearland	Mitigation grant	Dependent on funding
Natural Resource Protection	City of Pearland	Operating budget	Completed
Structural Projects	City of Pearland	CIP	Ongoing

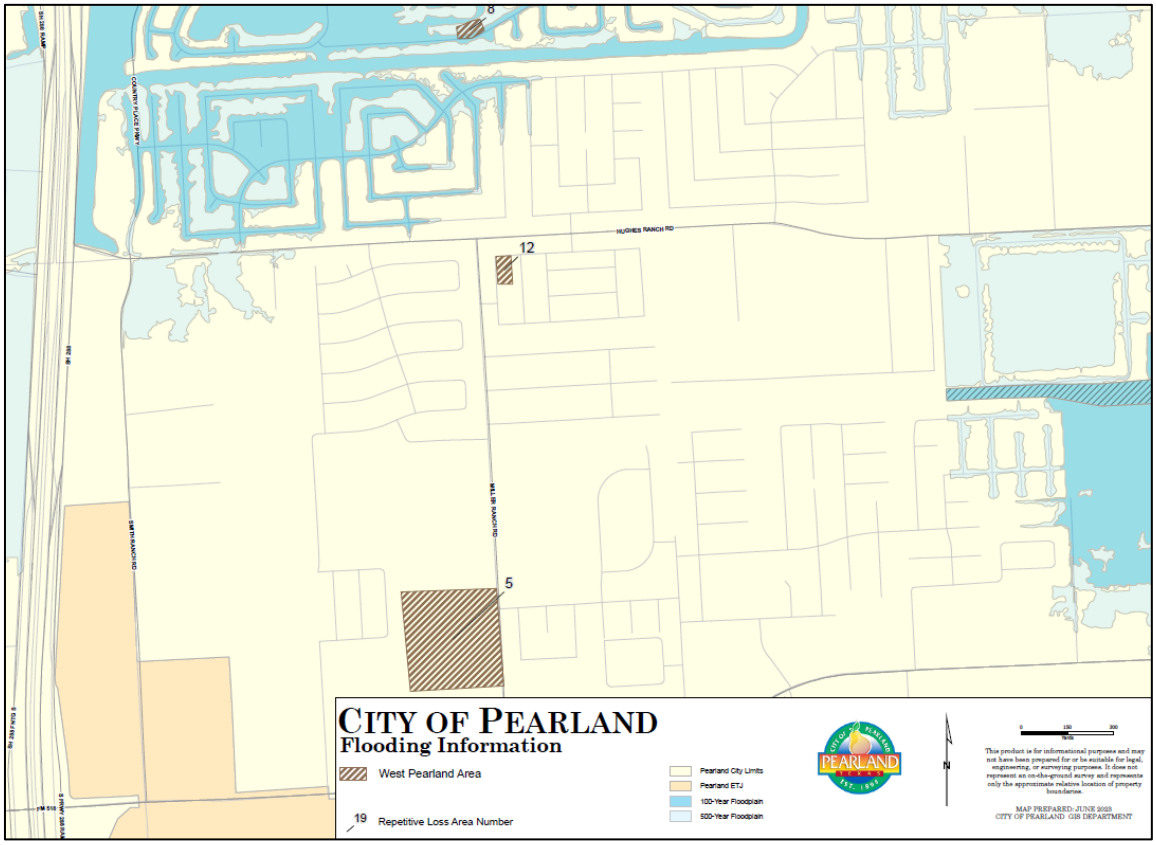
6.13 West Pearland Area

6.13.1 Cause of Flooding

There are three (3) RLAs in the West Pearland Area: RLAs 5, 8, and 12. RLA 5 is located in the FEMA 100-year floodplain. The subdivision consists of a curb and gutter street with an underground storm sewer system. The main source of flooding for these properties appears to be localized flooding. RLAs 8 and 12 were constructed around the year 2000 and followed the engineering design guidelines at that time which were not as stringent as current requirements.

The structures may have been built below the 100-year elevation, as those project areas are located outside of the limit of FEMA study. Tail water condition of Hickory Slough in the upstream section may have caused the slow movement of water causing inundation of the properties.

General Area	RLA #	Total # of Properties	Total # of FEMA RLs within RLA
West Pearland Area	5	2	1
	8	4	1
	12	4	1
	TOTAL	**10**	**3**



6.13.2 Mitigation Alternatives

The Team evaluated several mitigation options to determine what would have the greatest impact on these RLAs including condition of the homes, cost effectiveness, feasibility, and potential to reduce future flood risk. Below is a summary of mitigation alternatives considered and recommended.

Preventative
The City has adopted and implemented higher standards for residential and commercial development through its UDC, EDCM, and Flood Damage Prevention Ordinance (Ordinance 532-8). One such requirement is for all new and substantially damaged/improved construction in the 100-year floodplain to have its lowest floor and utilities elevated to one foot above the base flood elevation, and to be built on a pier and beam to avoid filling in the floodplain in this area. The freeboard requirement also extends to the shaded X/500-year floodplain as well.

Property Protection
The City promotes the purchase and maintenance of flood insurance via an annual targeted outreach project as well as an extensive outreach campaign to everyone in the city. Through the City's outreach, residents are encouraged to contact City staff for advice or to request a one-on-one site visit to explore property protection options such as elevation grants via mitigation funding.

Natural Resource Protection
Downstream of RLA 8 is the Shadow Creek Ranch Natural Trail that is managed by the City's Parks and Recreation Department as a natural area park focusing on preserving habitat and providing nature experiences for the community. The park is approximately 36 acres bordering Clear Creek and includes 12.5 acres of emergent wetlands. This is also the site where the City is restoring 10 acres of historic coastal tallgrass prairie. The prairie restoration project included removing a monoculture Chinese Tallow Triadica sebifera stand and the reintroduction of locally native prairie plants through seeding and plantings. Currently, 239 species of birds have been documented in the park including several species listed on Texas Parks and Wildlife Department's Species of Greatest Conservation Need, such as LeConte's Sparrow. The park features a paved walking path with interpretive signage providing information on native wildlife and plants found in the park. Along the trail is an elevated viewing platform near the wetlands. This site provides many ecological services to the area, such as, storing stormwater, reducing runoff, improving water and air quality, and serving as a valuable sanctuary for native flora and fauna while also allowing for abundant outdoor nature experiences.

Emergency Services
The City of Pearland's flood warning program relies largely upon flood threat recognition provided by the NWS and climatological projections (i.e., quarterly NWS probabilistic hydrologic outlooks) which forecast the probability that specific drainage canals will exceed their banks based on a 90-day precipitation forecast. Advance flood warning is provided by a series of approximately 18 stream gauges located within the City of Pearland's most prominent drainage streams (i.e., Clear Creek, Mary's Creek, Hickory Slough, etc.), and additional gauges located in a close proximity to the city. These gauges, part of a regional flood warning system, maintained by the HCFCD and BDD4, measure and report rainfall in real-time on an hourly basis, as well as water elevation relative to the top of the stream bank. A link to the regional flood warning system is provided in several areas on the City's website. In addition, both residents and public safety officials can register to receive alerts when specific stream gauges exceed a specified water elevation. Residents are also encouraged to register for the Everbridge emergency notification system and the Connect2Pearland app that relay flood warnings and flood safety tips to users. Post-storm activities include posting door hangers on homes of suspected flood damage with response and recovery information and posts on social media.

Structural Projects
Improving the conveyance capacity of Hickory Slough along with the provision of a regional detention pond will help to reduce the repetitive flood loss. A large drainage improvement project

will not be economically feasible as the repetitive loss homes are spread over several sections of the subdivision.

Public Information

Part of the City's extensive public outreach involves a targeted, annual mailing in June/July to the owners of all 862 properties in the RLAs. The RLA mailing is in both English and Spanish, and includes basic floodplain management-related messages, as well as information on property protection and sources of financial assistance such as mitigation grants. Other methods of public outreach include the City's Engineering Department's mailing of a "What You Need to Know" flood hazard brochure and a storm sewer brochure are distributed on an annual basis in the utility bills, and the City's Office of Emergency Management's insert in the Community Impact newspaper delivered to every home, flood safety messages scrolling on treadmill screens in the recreation center, and social media posts. The City also maintains a comprehensive Flood Protection Information page on its website with information and links on various topics such as flood insurance, flood warning system, property protection, natural and beneficial functions, and flood safety measures.

SUMMARY TABLE

RLAs - Recommended Mitigation Alternative	Responsibility	Funding	Timeline
Preventative	Engineering	Operating budget	Ongoing
Property Protection	City of Pearland	Mitigation grant	Dependent on funding
Natural Resource Protection	City of Pearland	Operating budget	Completed

7.0 CONCLUSION

The city of Pearland has faced its share of storm events such that drainage improvements and other structural projects remain a priority when it comes to CIP projects, bonds, and mitigation funding. As an ongoing measure, the City strives to alleviate the flooding hazard through drainage maintenance, implementation of higher standards in ordinances and criteria manuals, comprehensive outreach campaigns, natural floodplain functions, emergency services, and programs that focus on protecting the city's waterways. The City is also proactive in heading off potential events through its strict policies on developing the floodplain in both current and future conditions. As a result, more residents are doing their part to protect themselves and their properties such as purchasing and maintaining flood insurance, keeping storm drains clear of debris, and other forms of property protection. The City will continue its drainage improvement program to reduce flooding hazards through drainage maintenance, the use of higher design standards in ordinances and criteria manuals, comprehensive outreach campaigns, and programs that focus on protecting the city's waterways. In addition, grant applications for drainage projects, and drainage partnership projects with key stakeholders such as PEDC, HCFCD, BDD4, etc. shall be continued. Through ongoing outreach and aggressive mitigation measures, the City remains confident it can reduce future flood damage for the benefit of its residents.

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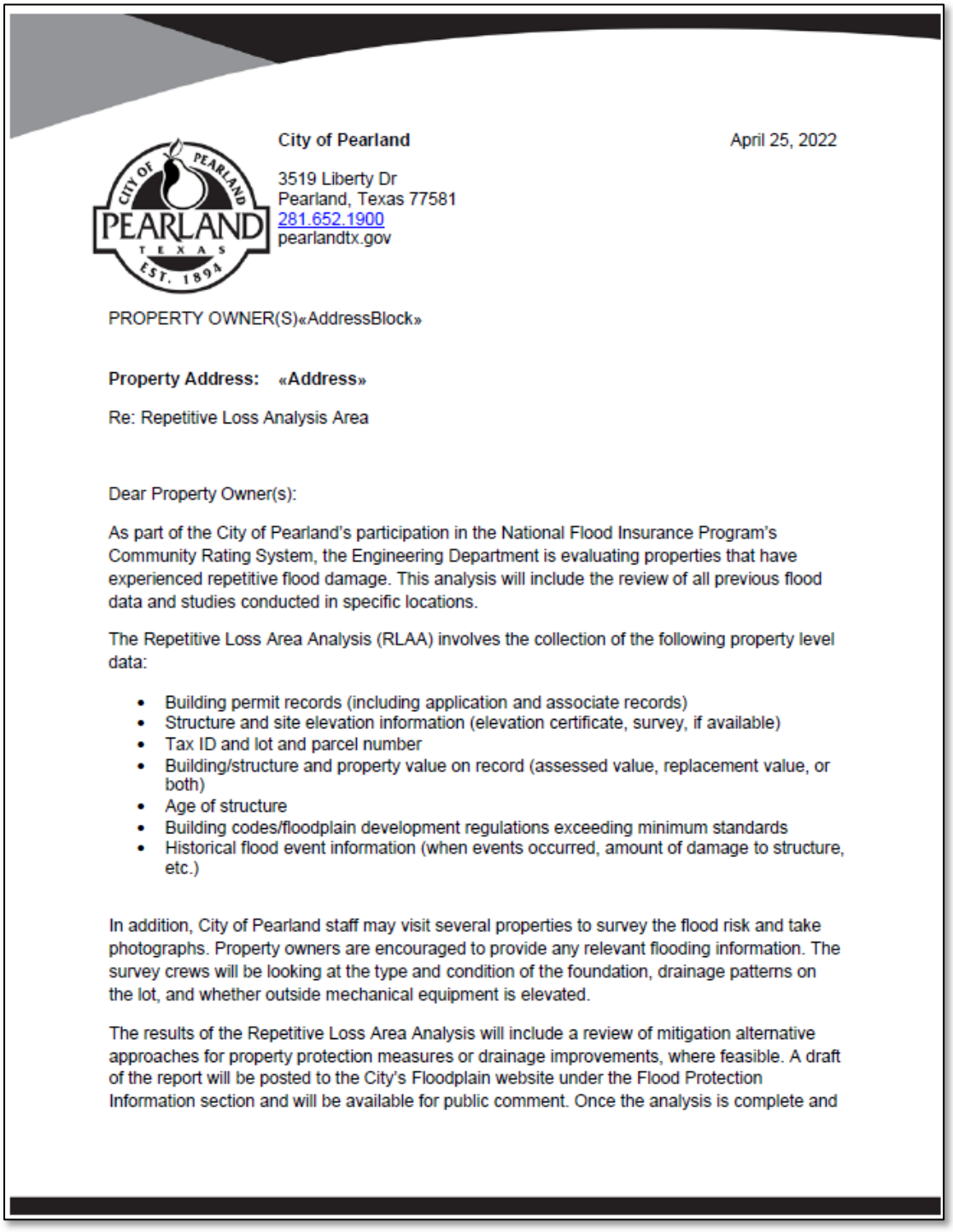
APPENDIX A

Below is a screenshot of the letter the City of Pearland mailed to 862 property owners on April 25, 2022.



City of Pearland

April 25, 2022

3519 Liberty Dr
Pearland, Texas 77581
281.652.1900
pearlandtx.gov

PROPERTY OWNER(S)«AddressBlock»

Property Address: «Address»

Re: Repetitive Loss Analysis Area

Dear Property Owner(s):

As part of the City of Pearland's participation in the National Flood Insurance Program's Community Rating System, the Engineering Department is evaluating properties that have experienced repetitive flood damage. This analysis will include the review of all previous flood data and studies conducted in specific locations.

The Repetitive Loss Area Analysis (RLAA) involves the collection of the following property level data:

- Building permit records (including application and associate records)
- Structure and site elevation information (elevation certificate, survey, if available)
- Tax ID and lot and parcel number
- Building/structure and property value on record (assessed value, replacement value, or both)
- Age of structure
- Building codes/floodplain development regulations exceeding minimum standards
- Historical flood event information (when events occurred, amount of damage to structure, etc.)

In addition, City of Pearland staff may visit several properties to survey the flood risk and take photographs. Property owners are encouraged to provide any relevant flooding information. The survey crews will be looking at the type and condition of the foundation, drainage patterns on the lot, and whether outside mechanical equipment is elevated.

The results of the Repetitive Loss Area Analysis will include a review of mitigation alternative approaches for property protection measures or drainage improvements, where feasible. A draft of the report will be posted to the City's Floodplain website under the Flood Protection Information section and will be available for public comment. Once the analysis is complete and

has been adopted by City Council, a copy of the report can be obtained from the City Secretary's Department or by calling 281-652-1900.

You can help the City of Pearland perform this analysis by completing a **Flood Protection Survey** by **May 31, 2022.** The questionnaire can be accessed at https://polco.us/s3qc5z or by the QR Code below. If you have any questions, please email sbuchheit@pearlandtx.gov.

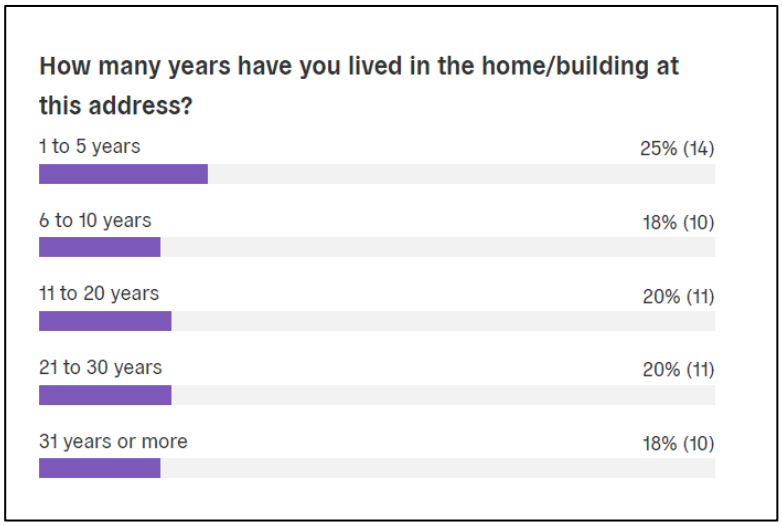
Sincerely,

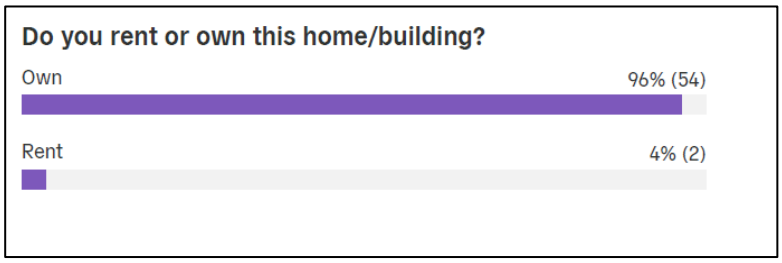
Sasha Buchheit, CFM

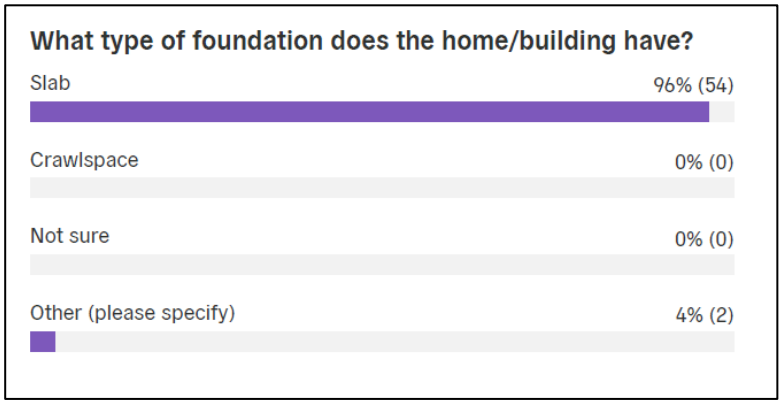
Stormwater Coordinator

APPENDIX B

Within the letter to the property owners (Appendix A), the City included a link and a QR code to an online Flood Protection Survey. Below are the questions and summary responses from the survey that received 54 responses.







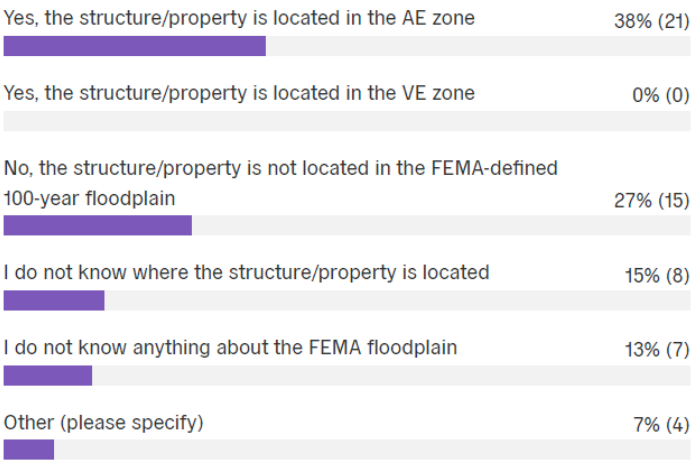
If you answered 'other' on Question 4, please elaborate here.

N/A

Deep slab to meet FEMA regulations in 2008 new home construction after a localized flood incident in 2006. The original house was substantially damaged and not repairable.

Pier and Beam with steel pony walls

Do you know if your home/building or property is within the FEMA-defined 100-year floodplain?



If you answered 'other' on Question 6, please elaborate here.

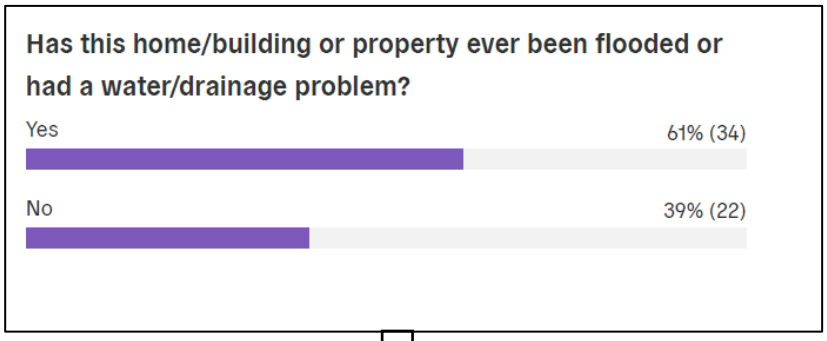
Our house was certified as not in a floodplain in 2012, however after Harvey we discovered it was only 1 of 2 houses on the street and surrounding streets to be determined not in a floodplain.

N/A

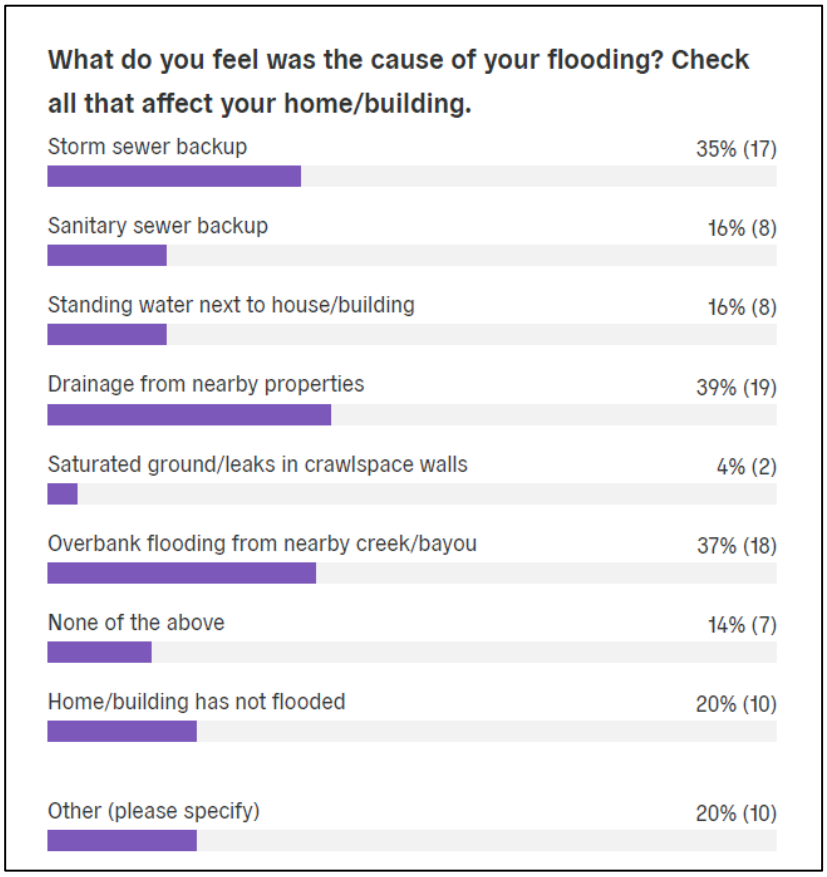
Not sure but if we get more than 4" of rain per hour then we flood and flooded with TS Alison, hurricane Ike and Harvey

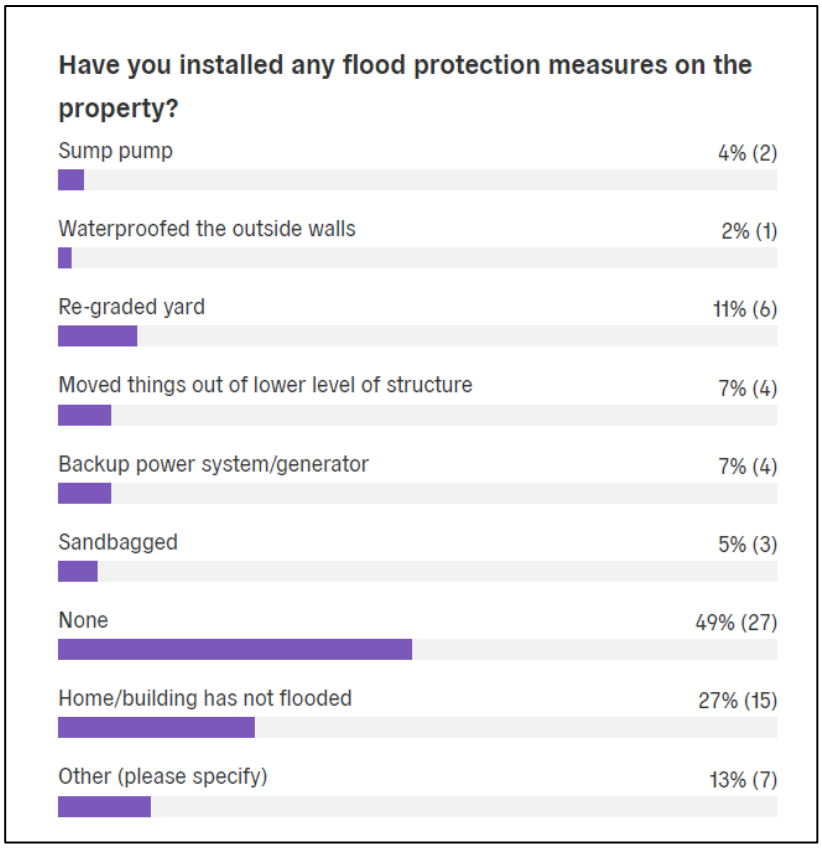
I think it's in the 100 year . We were required to have flood insurance and pay $3k a year for it sooooooo....

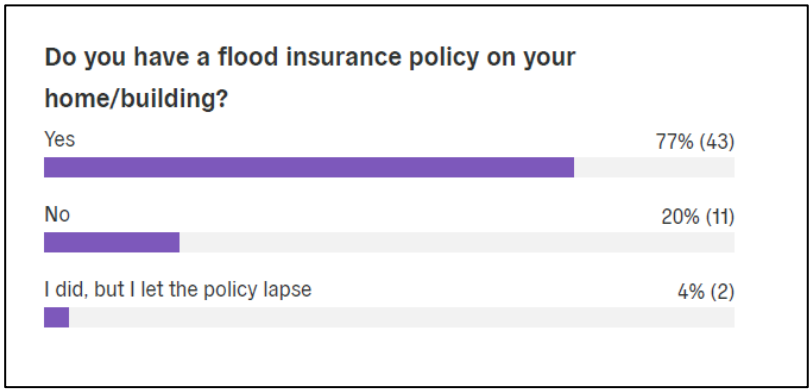
The flood dwelling ins. policy we have says : Regular CRS class : 6 Flood Risk/Rated Zone: X Current Flood Zone: X Elevation Difference: Grandfathered: N



- Approximately half of the respondents reported damage from Hurricane Harvey in 2017.
- Respondents also referred to flooding caused by Tropical Storm Allison in 2001.
- Most common complaint was with regards to inadequate drainage.




Have you installed any flood protection measures on the property?
Sump pump
4% (2)
Waterproofed the outside walls
2% (1)
Re-graded yard
11% (6)
Moved things out of lower level of structure
7% (4)
Backup power system/generator
7% (4)
Sandbagged
5% (3)
None
49% (27)
Home/building has not flooded
27% (15)
Other (please specify)
13% (7)


Do you have a flood insurance policy on your home/building?
Yes
77% (43)
No
20% (11)
I did, but I let the policy lapse
4% (2)

APPENDIX C

The City reached out via email to three entities – BDD4, TxDOT, and HCFCD – for feedback on any planned or current projects that might affect the RLAs. Their responses are included in Section 5 of this RLAA. Below is the content of each email sent by the City.

Good Afternoon,

The City of Pearland is in the process of developing a Repetitive Loss Area Analysis to examine the causes of repetitive flooding and consider appropriate mitigation efforts. As such, the City is looking for any planned or current projects or drainage studies administered by neighboring communities or entities that may have an impact on the flooding problem in Pearland.

Please advise if you are aware of any such projects and, if so, please provide the following information:

- Project name
- Goal of the project
- Funding source
- Timeline and current status
- A link of the project (if available)

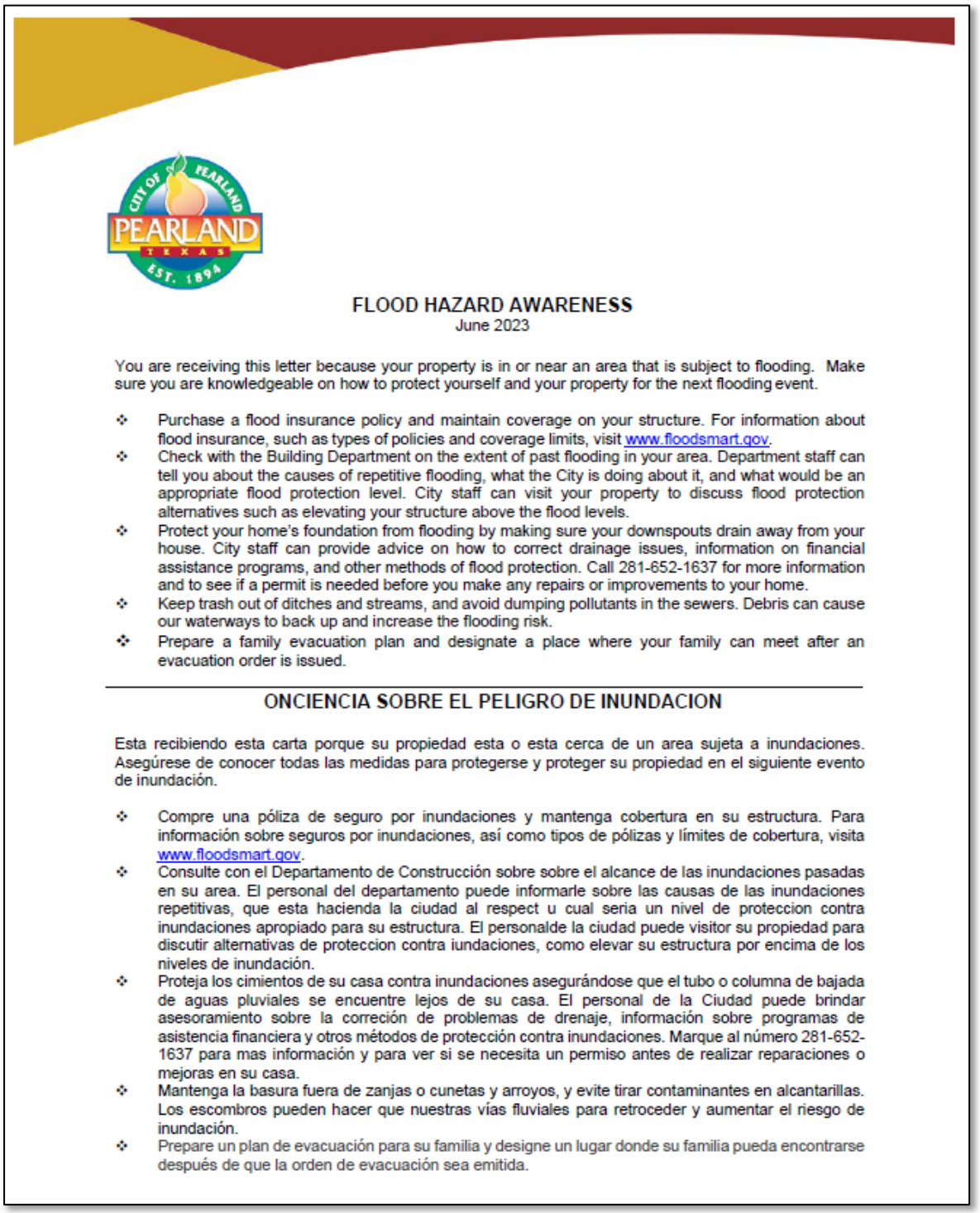
Thank you for your time and consideration. If you have any questions, please do not hesitate to contact me.

Sincerely,

Sasha Buchheit, CFM
Stormwater Coordinator | Engineering & Public Works
2016 Old Alvin Rd | Pearland, TX 77581
P: 281.652.1648

APPENDIX D

The City mails a repetitive loss area outreach project to the owners of all 862 properties. The letter includes both English and Spanish, and is mailed in June or July on an annual basis.



FLOOD HAZARD AWARENESS
June 2023

You are receiving this letter because your property is in or near an area that is subject to flooding. Make sure you are knowledgeable on how to protect yourself and your property for the next flooding event.

- Purchase a flood insurance policy and maintain coverage on your structure. For information about flood insurance, such as types of policies and coverage limits, visit www.floodsmart.gov.
- Check with the Building Department on the extent of past flooding in your area. Department staff can tell you about the causes of repetitive flooding, what the City is doing about it, and what would be an appropriate flood protection level. City staff can visit your property to discuss flood protection alternatives such as elevating your structure above the flood levels.
- Protect your home's foundation from flooding by making sure your downspouts drain away from your house. City staff can provide advice on how to correct drainage issues, information on financial assistance programs, and other methods of flood protection. Call 281-652-1637 for more information and to see if a permit is needed before you make any repairs or improvements to your home.
- Keep trash out of ditches and streams, and avoid dumping pollutants in the sewers. Debris can cause our waterways to back up and increase the flooding risk.
- Prepare a family evacuation plan and designate a place where your family can meet after an evacuation order is issued.

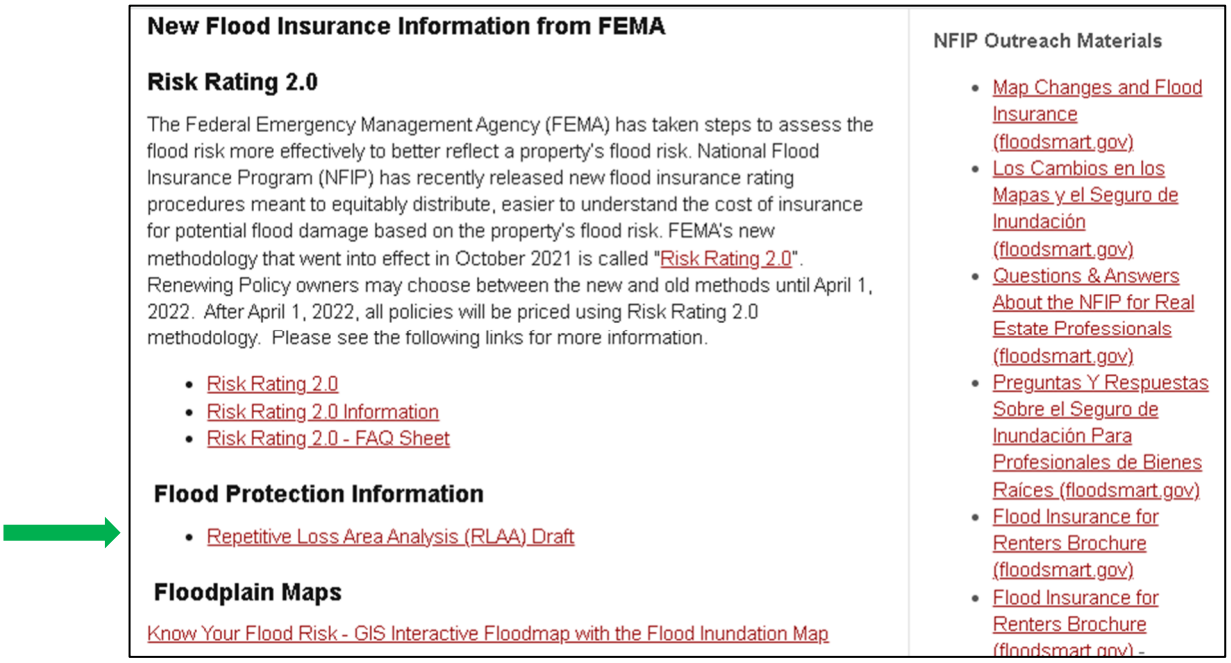
ONCIENCIA SOBRE EL PELIGRO DE INUNDACION

Esta recibiendo esta carta porque su propiedad esta o esta cerca de un area sujeta a inundaciones. Asegúrese de conocer todas las medidas para protegerse y proteger su propiedad en el siguiente evento de inundación.

- Compre una póliza de seguro por inundaciones y mantenga cobertura en su estructura. Para información sobre seguros por inundaciones, así como tipos de pólizas y límites de cobertura, visita www.floodsmart.gov.
- Consulte con el Departamento de Construcción sobre sobre el alcance de las inundaciones pasadas en su area. El personal del departamento puede informarle sobre las causas de las inundaciones repetitivas, que esta hacienda la ciudad al respect u cual seria un nivel de proteccion contra inundaciones apropiado para su estructura. El personalde la ciudad puede visitor su propiedad para discutir alternativas de proteccion contra iundaciones, como elevar su estructura por encima de los niveles de inundación.
- Proteja los cimientos de su casa contra inundaciones asegurándose que el tubo o columna de bajada de aguas pluviales se encuentre lejos de su casa. El personal de la Ciudad puede brindar asesoramiento sobre la correción de problemas de drenaje, información sobre programas de asistencia financiera y otros métodos de protección contra inundaciones. Marque al número 281-652-1637 para mas información y para ver si se necesita un permiso antes de realizar reparaciones o mejoras en su casa.
- Mantenga la basura fuera de zanjas o cunetas y arroyos, y evite tirar contaminantes en alcantarillas. Los escombros pueden hacer que nuestras vías fluviales para retroceder y aumentar el riesgo de inundación.
- Prepare un plan de evacuación para su familia y designe un lugar donde su familia pueda encontrarse después de que la orden de evacuación sea emitida.

APPENDIX E

The draft Repetitive Loss Area Analysis was posted on the Floodplain Management page on the City's website: https://www.pearlandtx.gov/departments/engineering-and-capital-projects/engineering-division/floodplain-management.



New Flood Insurance Information from FEMA

Risk Rating 2.0

The Federal Emergency Management Agency (FEMA) has taken steps to assess the flood risk more effectively to better reflect a property's flood risk. National Flood Insurance Program (NFIP) has recently released new flood insurance rating procedures meant to equitably distribute, easier to understand the cost of insurance for potential flood damage based on the property's flood risk. FEMA's new methodology that went into effect in October 2021 is called "Risk Rating 2.0". Renewing Policy owners may choose between the new and old methods until April 1, 2022. After April 1, 2022, all policies will be priced using Risk Rating 2.0 methodology. Please see the following links for more information.

- Risk Rating 2.0
- Risk Rating 2.0 Information
- Risk Rating 2.0 - FAQ Sheet

Flood Protection Information

- Repetitive Loss Area Analysis (RLAA) Draft

Floodplain Maps

Know Your Flood Risk - GIS Interactive Floodmap with the Flood Inundation Map

NFIP Outreach Materials

- Map Changes and Flood Insurance (floodsmart.gov)
- Los Cambios en los Mapas y el Seguro de Inundación (floodsmart.gov)
- Questions & Answers About the NFIP for Real Estate Professionals (floodsmart.gov)
- Preguntas Y Respuestas Sobre el Seguro de Inundación Para Profesionales de Bienes Raíces (floodsmart.gov)
- Flood Insurance for Renters Brochure (floodsmart.gov)
- Flood Insurance for Renters Brochure (floodsmart.gov) -

APPENDIX F

In accordance with the Privacy Act of 1974, Appendix F containing sensitive and site-specific data will not be shared with the public.