



MASTER DRAINAGE PLAN



CITY OF SUGAR LAND

2014

ORDINANCE NO. 1977

AN ORDINANCE OF THE CITY COUNCIL OF THE CITY OF SUGAR LAND, TEXAS, ADOPTING THE SUGAR LAND MASTER DRAINAGE PLAN AS AMENDED AS PART OF THE COMPREHENSIVE PLAN OF THE CITY OF SUGAR LAND.

WHEREAS, chapter 213 of the Local Government Code authorizes the City to adopt a comprehensive plan for the long-range development of the City; and

WHEREAS, the plan may:

- (1) include provisions on land use, transportation, and public facilities;
- (2) consist of a single plan or a coordinated set of plans organized by subject matter and geographic area; and
- (3) be used to coordinate and guide the establishment of development regulations; and

WHEREAS, the 2007 Master Drainage Plan is an official City master plan and a coordinated element of the Comprehensive Plan; and

WHEREAS, the City wishes to revise the Master Drainage Plan by adopting the 2014 Master Drainage Plan to:

- (1) build on the work of the 2007 Master Drainage Plan by reviewing and confirming asset ownership, the criteria for evaluation of acceptable street ponding, the scoring and ranking of drainage problems, and updates to field work evaluation score sheets;
- (2) identify the City's new tool for evaluating stormwater management drainage;
- (3) identify potential projects for consideration in the City's capital improvements program;
- (4) summarize funding sources for drainage projects
- (5) identify policy direction for the city's role in the maintenance of detention facilities;
- (6) identify strategies for how the City can implement drainage-related goals found in the Comprehensive Plan; and
- (7) provide a roadmap for the City's future drainage-related activities; and

WHEREAS, the 2014 Master Drainage Plan incorporates input from drainage entities and community input from online activities, a public meeting, and public hearings.

WHEREAS, the Planning & Zoning Commission held public hearings at which the public was given an opportunity to give testimony and present written evidence as required by law; NOW, THEREFORE;

**BE IT ORDAINED BY THE CITY COUNCIL
OF THE CITY OF SUGAR LAND, TEXAS:**

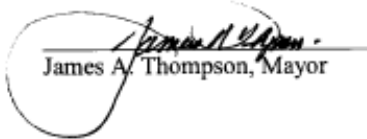
Section 1. That the City of Sugar Land 2014 Master Drainage Plan, shown on Exhibit A, attached to and made a part of this ordinance, revises the 2007 Master Drainage Plan and is adopted as part of the Comprehensive Plan.

APPROVED on first consideration on October 21, 2014.

ADOPTED upon second consideration on November 14, 2014.

ATTEST:


Glenda Gundermann, City Secretary


James A. Thompson, Mayor

APPROVED AS TO FORM:



Exhibit A: City of Sugar Land 2014 Master Drainage Plan

Sugar Land City Council

Mayor
James A. Thompson

Himesh Gandhi
At Large 1

Joe R. Zimmerman
At Large 2

Steve Porter
District 1

Bridget Yeung
District 2

Amy Mitchell
District 3

Harish Jajoo
District 4

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EXECUTIVE SUMMARY

The City of Sugar Land Master Drainage Plan (MDP) describes the City's physical and institutional planning environment, establishes roles and responsibilities for drainage and flood control, provides a basis for formulating and prioritizing the City's drainage capital improvement projects, and identifies future studies to assist in drainage planning and flood control.

Drainage management within Sugar Land is complex. There are many drainage entities operating within the City that have roles and responsibilities over drainage. Therefore, drainage management within the City is carried out within a multi-jurisdictional environment in consultation with other drainage entities, such as levee improvement districts, municipal utility districts, and other special purpose districts. Identifying and clarifying drainage roles and responsibilities is key to effective drainage planning, infrastructure development, and management of drainage facilities.

In 2007, the City adopted its first Master Drainage Plan (MDP), which was created in consultation with drainage entities operating within the City. The fundamental goals of the Plan were to define, identify, and delineate roles and responsibilities for drainage facilities within the City and its extra-territorial jurisdiction (ETJ). The 2007 MDP also established criteria for evaluating, scoring and ranking drainage problems. Using these criteria, a field work evaluation score sheet was created for field assessments of drainage problems.

This 2014 MDP was developed in a similar multijurisdictional environment (Chapter 1). Chapter 2 identifies the planning process followed to create the MDP. The development of this MDP included participation and involvement from key stakeholders and the public. The City solicited input from drainage entities and provided opportunities for the public to participate in the plan through online activities, a public meeting, and public hearings.

The 2014 MDP builds upon the work of the 2007 MDP by reviewing and confirming asset ownership, the criteria for evaluation of acceptable street ponding, the scoring and ranking of drainage problems and updates to field work evaluation score sheets (Chapters 3, 4, 5). The update identifies the City's new tool for evaluating drainage, the Integrated Storm Water Management Model (ISWMM), a stormwater management planning tool (Chapter 5). Using ISWMM and the criteria for the evaluation, scoring and ranking of drainage problems, the plan identifies potential projects for consideration in the City's capital improvements program (CIP) (Chapter 6). Funding sources for drainage projects are summarized in Chapter 7. The plan identifies policy direction for the City's role in the maintenance of detention facilities in Chapter 8. The City adopted an update to the Comprehensive Plan in 2012 and with it new drainage-related goals. The MDP identifies strategies for how the City can implement drainage-related goals found in the Comprehensive Plan (Chapter 8).

The 2014 MDP provides a road map for the City's future drainage-related activities. A summary of plan recommendations, including future capital and policy projects is located in Chapter 9. This plan identifies a future work plan of projects for implementation. The work plan lists

numbered projects, which are referenced throughout the plan document. Projects are prioritized by high priority (1-2 years), medium priority (3-5 years), and low priority (6-10 years).

CHAPTER 1: MASTER DRAINAGE PLANNING

The City of Sugar Land (City), located in Fort Bend County (County), engages in a continuous drainage planning process for the benefit of its citizens. Drainage planning and consequent infrastructure development in the City and County are complex; roles and responsibilities of various jurisdictional entities for developing, operating, and maintaining drainage infrastructure are often overlapping, have numerous gaps, and are sometimes ambiguous. The planning process seeks to provide for efficient, appropriate, and orderly drainage infrastructure development, operation, and maintenance by:

- Addressing current drainage needs and concerns;
- Identifying future drainage issues and concerns;
- Clarifying roles and responsibilities for meeting current and future drainage needs; and
- Identifying programs and projects to deal with current and anticipated drainage issues and needs.

The City utilizes the Master Drainage Plan (MDP) as a tool to guide and implement this process. The MDP was last updated and adopted in 2007. While drawing upon previous engineering studies and the 2007 MDP, the 2014 Plan is not a set of engineering analyses. This updated MDP is a planning document that describes the City's physical and institutional planning environment, establishes roles and responsibilities for drainage and flood control within this environment, provides a basis for formulating and prioritizing the City's drainage capital improvements projects, and identifies future activities to assist in drainage planning and flood control.

DRAINAGE BROADLY DEFINED

In the context of master drainage planning for the current MDP Update, drainage is broadly defined, encompassing water collection and storage resulting from rainfall; conveyance, storage, and control of storm waters from upstream to downstream points; delivery of surface waters to points of withdrawal or discharge; control and direction of runoff waters to prevent ponding, overflow, or flooding; control, evaluation, and management of flowing waters in ditches, channels, bayous, creeks, tributaries, streams, rivers, and similar watercourses; evaluation, control, and prevention of flood conditions; and management of the activities that contribute to or impact inundation of floodplains. From the perspective of citizen and community impact and the perspective taken in this report, storm water runoff and conveyance, storage of waters, flow in rivers, and overflow of rivers leading to flooding are all issues of drainage.

MULTI-JURISDICTIONAL ENVIRONMENT

Contained within or crossing the City boundaries and nearby areas within the City's extraterritorial jurisdiction (ETJ) are a variety of jurisdictions with particular drainage related responsibilities, including the Fort Bend County Drainage District (FBCDD), levee

improvement districts (LIDs), municipal utility districts (MUDs), and other special entities such as the Gulf Coast Water Authority (GCWA). As illustrated in [Exhibits 8 and 9](#), there are ten different Levee Improvement Districts (LIDs) and nineteen different Municipal Utility Districts (MUDs) lying all or in part within the City limits or its ETJ.

These different jurisdictional entities have different constituencies, different purposes, and different responsibilities, all of which contribute to a complex drainage planning, development, and management environment. No one entity has responsibility for control of all drainage planning, development, and management. Recognizing this complexity, the City, in consultation with the County, devised a planning process for updating its MDP in 2007. This process in 2007 incorporated consultation with key drainage entities in the region in updating the MDP. The current 2014 MDP update builds upon the work accomplished in 2007 and includes additional consultation with key drainage entities.

CHAPTER 2: PLANNING PROCESS

The City of Sugar Land has participated in local drainage activities in the past, but it was not until 2007 when the City formally began documenting local drainage activities in a master plan. The City adopted its first Master Drainage Plan (MDP) in 2007 as part of a two-phased planning approach. In 2013, the City identified a number of changes, necessitating an update to the MDP. In addition to documenting drainage activities, the 2014 MDP identifies a list of future activities to achieve the drainage-related goals and objectives identified in the City's Comprehensive Plan. This Chapter recounts the process for creating and updating the Master Drainage Plan.

2007 MASTER DRAINAGE PLAN

The City developed a two-phased process to update the MDP. Figure 1 provides an overview of the process. The primary objective of Phase 1 was the identification of the City's roles and

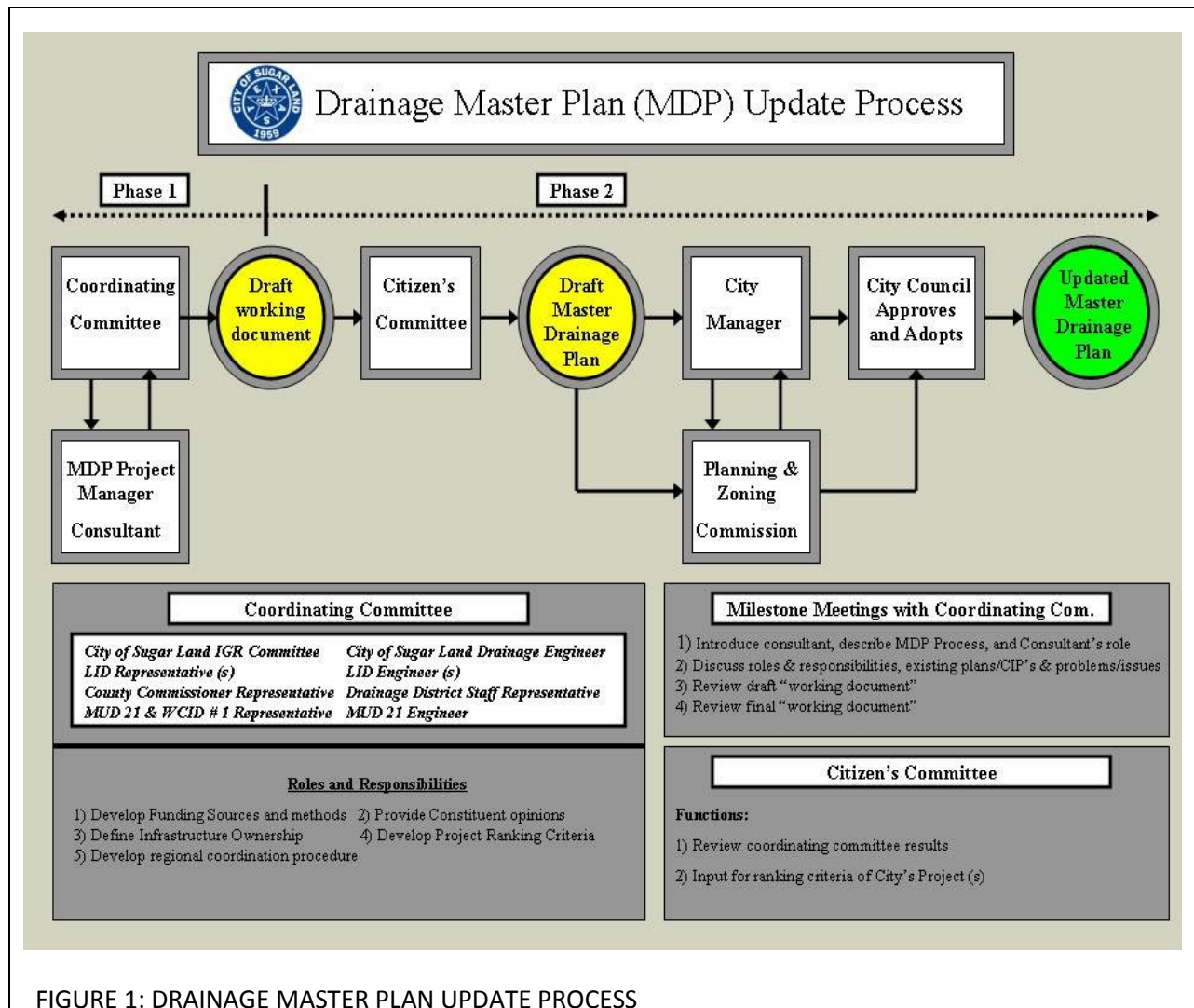


FIGURE 1: DRAINAGE MASTER PLAN UPDATE PROCESS

responsibilities in drainage planning, development, management and the roles and responsibilities of other jurisdictional entities within City boundaries. Phase 1 involved a Citizen's Committee working cooperatively with the City to address multi-jurisdictional drainage issues. These multi-jurisdictional issues are reflected in the roles and responsibilities for drainage for all drainage-related jurisdictional entities in the City. Phase 2 addressed non-multi-jurisdictional drainage issues internal to the City's jurisdiction and decision-making groups, such as the Planning & Zoning Commission and City Council.

Phase 2 focused on issues critical to the City's decision-making about Capital Improvements Program (CIP) to address drainage needs and critical questions such as the following:

1. How can we identify drainage problems which likely warrant remedy?
2. Where are drainage problems, and what are their severities?
3. How can we distinguish between which drainage needs are more deserving of remedy?
4. How can we, in view of limited resources, prioritize potential projects for construction?
5. Where can funds be obtained to construct prioritized projects?

The Phase 1 and Phase 2 reports were developed with an emphasis on defining procedures and techniques that can be used in future planning efforts.

Public input was considered in the development of the 2007 MDP. In 2005, the City established a Coordinating Committee to define, identify, and delineate each entity's roles and responsibilities for drainage. The Coordinating Committee was composed and represented by the following:

- City of Sugar Land Intergovernmental Relations Committee, represented by Sugar Land Council Member Daniel Wong
- Fort Bend County, represented by Commissioner James Patterson
- Fort Bend County Drainage District, represented by Mark Vogler, P.E.
- FBC LID 2 Representative, Andre McDonald
- FBC LID 2 Engineer, Greg Frank, P.E.
- Former FBC MUD 21 Representative, Dale O'Reilly
- Former FBC MUD 21 Engineer, Chad Hablinski, P.E.
- Former WCID 1 Representative, Leon Anhaizer

Staff support to the Committee was provided by the City's Engineering Department, supported by its consultant, Klotz Associates, Inc.

Input from the public was also sought as part of the 2007 Master Drainage Plan update process. A Citizens Committee was formed with members selected by the City Manager representing various parts of the City. The Citizens Committee role was to review the results of the Coordinating Committee and provide their input on multi-jurisdictional drainage issues. Their input was also sought in developing ranking criteria for identifying and ranking drainage capital improvement projects. Public hearings held at City Council and Planning and Zoning Commission

meetings provided additional opportunities to hear public comments on the 2007 MDP.

2014 UPDATE

Several changes led to the need for an update to the MDP since the adoption of the 2007 plan including the following:

- Asset ownership and responsibilities of agencies changed;
- A number of critical drainage projects were completed or underway;
- The City increasingly recognized the need for policy guidance on the issue of detention pond maintenance to ensure functional and aesthetic elements of detention ponds are properly designed and constructed and adequately maintained;
- The City developed the Integrated Stormwater Management (“ISWWM”) drainage model and needed to document how to utilize the model to the City’s greatest benefit; and
- In 2012, the City adopted new drainage-related goals through the adoption of the Comprehensive Plan. A review of drainage-related goals was needed to identify additional projects.

The 2014 Master Drainage Plan update was completed in-house by City Staff from the Engineering, Planning, Public Works, Parks & Recreation, Building Permits & Inspections, and Information Technology (GIS) departments. The update is based on the 2007 MDP. Staff revised information, updated tables, and added new information to reflect the current conditions and plan for future drainage projects. The 2014 MDP adds a new feature which is the inclusion of a work plan or list of future activities in Chapter 9. Future activities include policy projects and organizational projects which are prioritized and identify actions for achieving the City’s drainage-related goals.

The City solicited feedback from the public to inform the 2014 update. Staff contacted local drainage entities including Levee Improvement Districts (LIDs), Municipal Utility Districts (MUDs), Fort Bend County Drainage District, and other drainage entities to receive feedback on the plan update.

There were several online opportunities to provide public feedback on drainage-related issues in the City and comment on the draft plan, including the following:

- A project webpage (www.sugarlandtx.gov/drainage) was set up to provide information on the project and promote citizen involvement in the plan update.
- Approximately 100 people signed up to receive email updates about the plan.
- The project webpage linked to an Online Town Hall question, “What do you think the City’s drainage priorities should be?” Online Town Hall allows participants to post a comment and support other comments.
- An online mapping activity, shown in Figure 2, collected information from citizens on where they have observed drainage issues, including flooding above the curb, blocked drains,

MASTER DRAINAGE PLAN

maintenance issues, and other concerns. Feedback from the mapping activity is summarized in [Appendix 1: Online Mapping Activity - Map and Table](#).

A public meeting provided an additional opportunity for the public to review the draft recommendations and provide feedback. Information received from the public meeting is summarized in [Appendix 2](#) and [Appendix 3](#). Prior to bringing the plan before Planning & Zoning Commission and City Council for feedback and approval, the draft plan was posted online for public review and comment. Feedback received was considered in finalizing the plan. [Appendix 4](#) summarizes public feedback received on the draft plan. Public hearings held at City Council and Planning and Zoning Commission meetings provided additional opportunities to hear public comments on the 2014 MDP.

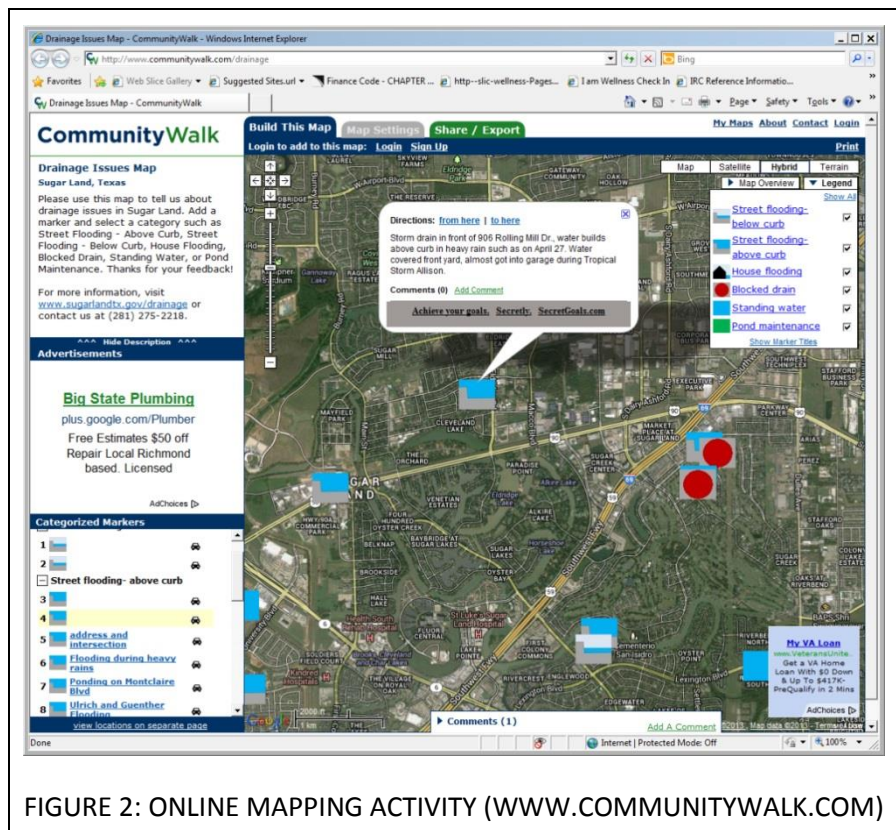


FIGURE 2: ONLINE MAPPING ACTIVITY (WWW.COMMUNITYWALK.COM)

CHAPTER 3: ROLES AND RESPONSIBILITIES

DRAINAGE ENTITIES

The various jurisdictions within the City and its ETJ with policy, statutory, or administrative level responsibilities include the City of Sugar Land, Fort Bend County Drainage District, Levee Improvement Districts (LIDs), Municipal Utility Districts (MUDs), and the Gulf Coast Water Authority (GCWA). The following section identifies the roles and responsibilities of these drainage entities.

City of Sugar Land

The City, by adoption of its charter, assumes a paramount role for the protection, safety and wellbeing of its citizens. The City maintains 826 miles of streets, 338 miles of storm sewers and open ditches, and mows more than 130 acres of drainage rights-of-way/easements. Drainage is critical to the safety and wellbeing of the citizens of the City. Through a combination of planning, infrastructure funding and development, minimization of flood losses, and drainage system management and operation, the City has a duty to provide for the following:

- Assure the proper functioning of drainage collection systems;
- Provide for the safe and effective conveyance of storm waters to points of discharge;
- Control runoff waters to prevent or limit damages and adverse impacts from flooding;
- Review of plats and drainage plans of new development to assure that new development does not adversely impact drainage and that mitigation is provided to minimize flooding impacts that a new development may generate;
- Provide for the utilization of surface water-dependent facilities and systems in a manner consistent with federal and state law and regulation;
- Regulate utilization of land and facilities to assure adequate drainage system capacities, minimize adverse impacts on drainage systems, and reduce flood losses.

The City currently engages in all these functions in various ways. In particular, the roles and responsibilities are distinguished by whether the drainage in question deals or is associated with collection systems or conveyance systems. In general, the City oversees the function of drainage collection systems within the City.

Collection systems are smaller scale drainage systems, commonly consisting of curb and gutters, street inlets, pipes, junction boxes, manholes, culverts, roadside ditches, energy dissipators, and sewer outfalls, and are intended for the collection and initial transport of runoff waters from individual residential subdivisions; commercial or industrial developments; parks and recreational areas; roads, streets and parking lots; commercial strips or developments; or subareas within such areas to either a receiving watercourse, such as a drainage ditch, or a receiving impoundment, such as a detention pond.

Conveyance systems are larger scale drainage systems which receive water from collection systems and either store or convey the collected water to a larger watercourse, which may receive storm water from many collection systems, for discharge to even larger watercourses or more downstream points. Primary elements in conveyance systems can include ditches (exclusive of roadside ditches collecting primarily roadway runoff), canals, channels, creeks, sloughs, bayous, streams, and rivers; impoundments such as ponds, lakes, and reservoirs; conveyance structures such as culverts, siphons, flumes, and chutes; and dams, weirs, gates, diversion structures, and similar hydraulic control structures.

The City operates and maintains drainage collection systems throughout the City, irrespective of the jurisdiction in which such collection systems lie. The various drainage authorities and powers described below for various water districts (LIDs, MUDS, etc.) do not deal with drainage collection systems; their authorities and powers are concentrated in what has been defined here as conveyance systems. Drainage collection systems, once constructed and dedicated to the City by the original constructor as part of land development activities, become the responsibility of the City.

Fort Bend County Drainage District (FBCDD)

Fort Bend County addresses drainage issues through the Fort Bend County Drainage District (FBCDD), which encompasses all of Fort Bend County. The purpose of the FBCDD is to maintain drainage channels in their existing flow conditions. The FBCDD maintains approximately 1,800 miles of drainage ditches, applies herbicides and mows ditches, performs structural repairs and channel rehabilitation, and assists landowners in the design of water gates, bridges, and erosion control devices. A secondary role of the FBCDD is to review plats and drainage plans for new development to assure that new development does not adversely impact drainage and that developers mitigate whatever increases in flooding a new development may generate.

The FBCDD has the following responsibilities:

- Conveyance of storm water runoff draining from saturated lands to downstream points via ditches, channels, canals, creeks, bayous and streams;
- Operation and maintenance of ditches, channels, canals, creeks, bayous and streams for conveying storm waters;
- Regulation of watercourses and adjacent lands and their uses and modifications for the purpose of flood prevention or limitation;
- Control of drainage from or across overflow areas;
- Planning, design, financing, and construction of facilities for drainage, and flood prevention or limitation; and
- FBCDD roles and responsibilities do not include local sewer collection systems.

Because the FBCDD deals with conveyance systems which provide and carry flow, including floodwaters, across the County and into and across the City, the FBCDD has a duty to regulate and manage flood waters and land use and development in such manner as to not aggravate,

promote, or otherwise increase flooding impacts within the City by allowing increases of flood flows conveyed to the City from upstream areas in the County.

Levee Improvement Districts

Nine different LIDs lie within the City limits or the ETJ of the City. Fort Bend County LIDs 2, 7, 10, 14, 15, 17 and 19 and First Colony LID and First Colony LID 2 lie all or in part within the City limits (see [Exhibit 8](#)). The purposes of a LID include (TWC § 57.091):

- Construction and maintenance of levees and other improvements on, along, and contiguous to rivers, creeks, and streams;
- Reclamation of land from overflow from such streams;
- Control and distribution of the waters of rivers and streams by straightening and otherwise improving them; and
- To provide for the proper drainage of reclaimed land.

A LID reclaims land originally subject to flooding by constructing and maintaining a levee and associated drainage facilities within the interior of the levee. The leveed area is generally protected from a design 100-year storm event (1% chance of occurring in any given year). All exercise of powers by a LID is intended to be in support of this basic purpose.

Unique among the drainage purposes of a LID is the drainage management for coincident storm events. Drainage waters collected within a levee-protected area must be detained and stored in impoundments and the ditches, channels, and other conveyances within the levee-protected area until such time as the receiving waters have receded sufficiently to allow discharge from the conveyances to the receiving water.

A LID has as its primary duty the construction, operation and maintenance of the drainage conveyance system within a levee-protected area for the purpose of storing storm runoff waters and preventing flooding, including that which might occur during coincident storm events. Levees exist for the reclamation of lands interior to the levee, which imposes an additional duty upon the LID to manage storm water runoff from within the levee-protected area by detaining such runoff within the conveyances interior to the levee-protected area during periods of coincident storm runoff conditions. Fulfillment of this additional duty can and typically does require expenditure of financial resources by the LID.

Municipal Utility Districts

Various MUDs lie within City limits or the ETJ of the City (see [Exhibit 9](#)). The purposes of a MUD (TWC § 54.012) include the following within the boundaries of the MUD:

- Control, storage, preservation, and distribution of storm waters and floodwaters and waters of rivers and streams for irrigation, power, and all other useful purposes;
- Reclamation and irrigation of arid, semiarid, and other land needing irrigation;
- Reclamation and drainage of overflowed land and other land needing drainage;

- Conservation and development of forests, water, and hydroelectric power;
- Control, abatement, and change of any shortage or harmful excess of water; and
- Protection, preservation, and restoration of the purity and sanitary condition of water within the state.

As a consequence of these powers, MUDs can but are not required to operate impoundments for retention or detention; construct and manage drainage to reclaim land or prevent lands from inundation by floods; develop water for water supply purposes, including development of groundwater, and operate wastewater treatment systems. Thus, as a practical matter, MUDs within the City limits commonly provide water supply and wastewater treatment, provide detention facilities to limit flooding, and construct and operate storm water conveyance systems or components of such systems. As of August 2014, there are nineteen (19) active MUDs within the City of Sugar Land limits and its ETJ as shown in [Exhibit 9](#).

Gulf Coast Water Authority (GCWA)

The Gulf Coast Water Authority (GCWA) was originally created in 1965 by the Texas Legislature as the Galveston County Water Authority with a charge to provide an adequate water supply for municipal, domestic, manufacturing, irrigation, and other useful purposes for the inhabitants and water users of Galveston County. Later reorganization of the Authority resulted in its name change to the Gulf Coast Water Authority. GCWA draws raw water from a variety of sources, including Oyster Creek, and conveys it via various canals to local governments, other jurisdictional entities (such as MUDs), and industrial customers in Galveston County.

ROLES AND RESPONSIBILITIES

Based upon ownership of facilities and input received from other drainage entities as part of the 2014 MDP update, current roles and responsibilities have been identified for operation, maintenance, and floodplain management.

General Principles for Exercising Roles and Responsibilities

In exercising various roles and responsibilities, there are common principles that should be employed by any jurisdictional entity. The principles proposed here are considered basic to drainage related activities performed by the various jurisdictions within and across the City:

- *Due Notice:* Decisions or proposed actions by a particular jurisdiction which have reasonable possibility of significantly affecting 1) drainage conditions beyond the limits of the jurisdictional or 2) the management of drainage by another entity within the boundaries of the jurisdiction should provide due notice to affected entities, such due notice being provided in such time and detail that affected entities can reasonably assess the impacts of the decision or action and register their concerns with the jurisdiction if such concerns exist. In

the case that the City or the County is making the decision or proposing an action, the City or the County, as the case may be, has an obligation to notify all those drainage entities within their jurisdiction that may be significantly affected by the decisions or proposed actions.

- *Review and Comment:* An entity which provides review and potential permit of a drainage impacting facility or development, including development plats and construction drawings, has an obligation to provide opportunity for other jurisdictional entities with drainage conditions potentially affected to offer review and comment on such proposed facility of development, such opportunity being provided in a manner and detail as to allow reasonable assessment by reviewing entities. The approving entity has a duty to receive and carefully consider any comments, and as may be appropriate, recognize those comments in its potential approval of the facility or development.
- *Consistency:* Entities should seek to provide consistency in standards and criteria between various overlapping jurisdictions, and avoid use of standards and criteria which over the long term may result in inadequate drainage conditions for any overlapping jurisdiction.
- *Response to Noncompliance:* When a non-compliance to approved plans or specifications is identified by any jurisdictional entity, the report of such non-compliance by the jurisdictional entity to the approving entity should be received and carefully considered by the approving entity, and acted upon.
- *Enforcement When Noncompliance Occurs:* If a facility or development is found to be non-compliant with approved plans or specifications, the approving entity has a duty to initiate actions to remove the non-compliance, within its powers.

Water District Responsibilities

Water district responsibilities are defined in the Texas Water Code (TWC), Title IV, General Law Districts, Chapters 49-67. Chapter 54 covers MUDs and Chapter 57 covers LIDs. These districts are empowered to exercise certain responsibilities; the responsibilities of each type of district are not mutually exclusive. A district may be formed to manage drainage and storm water; construct and maintain levees; control and improve water resources; or manage all the utility needs of a new municipality, including drainage. MUDs and LIDs are all given authority to manage storm water drainage. The exercise of a district's legislatively defined authority in regard to drainage is largely discretionary.

Categories of roles and responsibilities

The purposes of various jurisdictional entities are manifested in particular activities or undertakings that define the roles and responsibilities for drainage entities. These roles and responsibilities fall into several broad categories as given below. Proposals for exercising these roles and responsibilities within these categories are also presented.

Administration and Regulation

These roles and responsibilities deal with specification and control of drainage facility design, development, construction, modification, and use. These roles and responsibilities are manifested in drainage ordinances, criteria, codes, and standards which define the regulatory

environment for drainage development and management. Administrative functions provide for the implementation of the regulatory framework, and include the following particularly important functions:

- Development and promulgation of drainage criteria, codes, and standards;
- Adoption of drainage related ordinances;
- Review, approval, and permit of plans for drainage and land development;
- Issuance of permits for construction of land development and drainage facilities;
- Inspection of facilities under construction for conformance to approved plans and specifications; and
- Enforcement of conformance to approved plans and specifications.

Objectives in exercising these roles and responsibilities include 1) enhancing growth consistent with jurisdictional goals and sound drainage management, 2) facilitating sound growth with the use of consistent and technically sound criteria and standards, and 3) providing full opportunity for input from potentially affected parties and jurisdictions. **The City and the County should take the lead in establishing, developing, promulgating, and adopting criteria, codes, standards, and ordinances.** The City and County should coordinate their efforts to the extent possible to maximize consistency and efficiency in the application of such criteria, codes, standards, and ordinances.

PROJECT
2,3,4,5

Regulatory authority (exclusive of floodplain management) resides in the powers of the City and County. Consequently, it is proposed that within the City, the City exercise final authority for approval of plans for drainage and land development, issuance of permits for construction and land development, and exercise of inspection and enforcement activities. In the County outside the City limits, the County should exercise similar responsibilities. In the exercise of these responsibilities, the City and the County should regularly and frequently coordinate and provide review opportunities to each other when particular facilities or land developments may impact the other party are reviewed.

The County has a particular responsibility to limit or control facilities and development which may, because of downstream impacts, adversely impact the City. The City and the County should establish a review process whereby when such situations which might cause such adverse impacts to arise the City can be provided appropriate opportunities for review.

MUDs and LIDs should have ample opportunity to review and comment on proposals for proposed drainage facilities and land development within their jurisdictional boundaries or proposed drainage facilities and land development which because of upstream or downstream impacts may affect drainage within their jurisdictional boundaries.

In addition, a LID has an obligation to review plans and plats for proposed development within the boundaries of the LID for conformance to the LID's Reclamation Plan (i.e. master development plan) and to inform the City (or County as appropriate) as to whether or not the proposed development is in conformance with the Reclamation Plan.

Capital Improvements

Capital improvements can be undertaken by different entities and typically include design and construction of new, upgraded, or retrofitted infrastructure. Drainage infrastructure improvements commonly include drainage ditch or canal construction, realignment, or capacity enhancement; construction of conveyance-scale culverts or pipelines; construction or rehabilitation of control structures, gates, dams, diversion works, outfalls, and intakes; construction of levees and associated appurtenances; and construction of impoundments. Critical steps in capital improvement activities include the following:

- Identifying needed capital improvements for drainage;
- Prioritizing proposed capital improvements;
- Designing capital improvements;
- Providing or securing funds for capital improvements;
- Complying with safety and environmental regulations; and
- Construction of capital improvements in conformance with plans and specifications.

Capital improvements can be undertaken by different jurisdictions, but jurisdictions should recognize the potential impacts of such improvements on the operation of other drainage systems. Particular capital improvements should be integrated with other existing or planned improvements to enhance overall drainage conditions. Coordination between various jurisdictions should occur when capital improvements are proposed so that adverse impacts or inefficiencies do not result from a particular drainage improvement, and opportunities for mutual benefits are not overlooked. Execution of capital improvements by the entity most affected by the improvements and most responsible for operation and maintenance of the improvements once constructed can facilitate effective drainage development.

The following responsibilities for implementation of capital improvements by any jurisdiction are proposed:

- Any capital improvement should conform to geographically applicable criteria, codes, standards, and ordinances, irrespective of whether the entity undertaking the improvement is legally required to recognize such criteria, codes, standards, or ordinances.
- Adverse impacts both interior to and exterior to the boundaries of the jurisdictional entity undertaking the improvement should be fully identified and communicated to any affected party.
- Jurisdictions whose drainage will be affected in any significant manner by a contemplated capital improvement should be provided due notice sufficient to assess potential effects and communicate in a timely fashion their concerns and questions to the jurisdiction proposing to undertake the improvement. The proposing jurisdiction has a responsibility to carefully consider such concerns and questions.
- No capital improvement should be undertaken without identifying and confirming through expressed approval of the entity responsible for operations and maintenance once constructed.

- No capital improvement should be undertaken under the assumption (whether implied or explicitly made) that the operation or maintenance responsibilities would be assumed by a jurisdiction which is not proposing the improvement.
- Construction of the improvement should occur only with adequate protection against adverse construction-related impacts.
- Construction should be in full conformance with plans and specifications, and deviations which could cause significant impacts upon drainage in other jurisdictions should not be allowed without due notice to the affected jurisdiction.
- The jurisdiction constructing an improvement has a responsibility to maintain in perpetuity full as-built construction records for the improvement and make such records available (with payment of reasonable fee) to other entities should such records be requested.

Floodplain Management

While floodplain management clearly has administrative and regulatory features, it is sufficiently unique in its application that it is considered a distinct and separate role and responsibility for a jurisdictional entity. Floodplain management is focused upon the regulation of activities and land uses which can cause or contribute to flooding and inundation of floodplains. Particular activities include study and delineation in concert with the Federal Emergency Management Agency (FEMA) of flood-prone lands; review and approval of proposed alterations of flood-prone lands; review and approval of proposed development of lands in or near flood-prone lands; and review and approval of drainage and flood control works that can alter flooding conditions, particularly in areas which lie within the regulatory floodplain as defined by FEMA (see [Appendix 8](#)).

Development of floodplains and adjacent lands can impact both local and upstream and downstream areas; and regulatory review and approvals should recognize upstream and downstream consequences. Review and comment opportunities for development both inside and outside the City limits can help in assuring adequate recognition of adverse consequences. Consistency in the criteria and procedures applied in review and approval of floodplain developments can facilitate growth without adverse impact on flooding conditions. Consistency is achieved by concentration of authority along with review and comment to insure recognition of impacts and concerns on a holistic (watershed) basis.

Current responsibility for floodplain management within the City limits is accomplished almost entirely by the City. This responsibility is exercised through the City acting as a formal floodplain manager/administrator. In the City's jurisdiction, proposed development (by fill, excavation or similar alteration) of floodplains requires the approval of the City. Fort Bend County (FBC) LID 2 currently retains floodplain management responsibilities for lands within the FBC LID 2's jurisdiction (see [Exhibit 8](#)). The Fort Bend County Engineering Department acts as the floodplain administrator for County lands outside the limits of the City's and other municipal entities in unincorporated areas within the County. Currently, LIDs within the City and Fort Bend County that retain floodplain management responsibilities are considering relinquishing their responsibilities to the City and County, respectively to avoid overlapping roles and

responsibilities. **This MDP identifies a project to clarify the City's roles and responsibilities for floodplain management within the ETJ and within the City where multiple entities have jurisdiction over floodplain management.**

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The limitations of current floodplain management arise because of three primary factors:

1. Exercise of the ultimate authority for approval of floodplain development for lands which lie within City boundaries without appropriate recognition of concerns of other affected jurisdictions;
2. Exercise of authority for approval of floodplain development without adequate recognition of the downstream impacts of such development on lands within the City; and
3. Inconsistency in applying the criteria among different drainage authorities.

Operation and Maintenance

Operation and maintenance is likely the most complex category for defining roles and responsibilities because of the diversity of specific operation and maintenance activities and the limited funds often available for such activities. Operation and maintenance responsibilities are also considerably complicated by the geographic overlap of responsibilities and authorities and the multiple sources of funds for operation and maintenance. Operation and maintenance can be diverse, with varying frequency, differing causes for occurrence, and different levels of effort. Operation and maintenance may lead to or require construction or be limited to operation or maintenance of simple equipment.

Current roles and responsibilities for certain maintenance activities have been identified; these are listed in [Exhibits 2 and 3](#) along with the entity that has responsibility for performing the activity. The listed operation and maintenance responsibilities are clearly dominated by what are termed continuing regular maintenance and upkeep activities. Comparison of the listed activities clearly indicates a scarceness of specifically identified current operation and maintenance responsibilities. This scarceness is a reflection of the limited understanding and knowledge of current roles and responsibilities for drainage across the various jurisdictions in the City. [Exhibits 2 and 3](#) provide a jurisdictional- and facility-based overview of current roles and responsibilities for regular continuing maintenance and upkeep.

Emergency Management

The City's Office of Emergency Management (OEM) is responsible for coordinating a response from various departments within the City in the event of an emergency associated with flooding. Flooding risks that exist within the City and associated hazard mitigation measures are identified in the Fort Bend County Hazard Mitigation Plan prepared by the OEM. This Hazard Mitigation Plan has also been approved by the Federal Emergency Management Agency (FEMA).

The City's Emergency Management Department has also developed an Emergency

Operation Plan (EOP) to provide a framework for the coordination of resources to help ensure the safety of life and property in the event of a flooding-related emergency within the City of Sugar Land, including emergencies associated with Levee Improvement Districts. The EOP outlines responsibilities and procedures, and is available in Emergency Management Department office by request.

FUNDING

The following section identifies how various drainage entities typically fund drainage improvement projects.

City

The City issues General Obligation Bonds to cover capital improvements. The City has no general obligation legal debt limit other than a ceiling on the tax rate specified by the State of Texas but may issue general obligation debt in an amount no greater than that which can be covered by a debt service tax rate and rate of tax collection.

The City's Debt Service Fund is established by ordinance and accounts for the issuance of debt and provides for the payment of debt principal and interest as it becomes due. A property tax rate and tax levy is required to be computed and levied, and it should be sufficient to produce the money to satisfy annual debt service requirements. This fund also includes revenues from property taxes, interest income, and additional transfers from the Tourism Fund and Utility Fund. This fund covers repayment of the Certificates of Obligation (CO) issued for the City and 80% of assumed water and wastewater debt from annexed and dissolved MUDs.

The City of Sugar Land established Financial Management Policy Statements that emphasize fiscal responsibility and accountability. The City also has a policy to rebate a portion of the property taxes collected from in-City MUDs back to the districts. The Debt Service Fund expenditures include the debt service component of these agreements.

Drainage projects make up the third largest component of the 2014 capital improvement programs, with approximately \$7 Million dedicated for drainage which represents 7.1% of the total funding for 2014. Major projects include improvements in the Covington Woods area, improvements to drainage in the Sugar Creek area, rehabilitation of the AMIL gates acquired from LID 2, and other localized drainage improvements.

The City's adopted 5-year CIP program for the period of 2014-2018, identifies 7 drainage projects for a total of \$19,015,000. The source of funds for this CIP program includes general revenue (\$1,740,000) and certificates of obligation (\$17,725,000).

County

The Fort Bend County Commissioner's Court regulates the fiscal operations of the County. The Commissioners enforce a debt policy that regulates the use of debt instruments to fund capital

improvements in the County. Debt instruments permitted under this policy include the following:

- General obligation tax bonds
- Revenue bonds
- Subordinate-lien Bonds
- Commercial paper
- Variable rate demand notes
- Variable rate auction notes
- Bond anticipation notes
- Revenue anticipation notes
- Tax anticipation notes
- Capitalized leases

Debt instruments can be used only for the following:

- Funding of a lease
- Purchase or construction of capital assets
- Infrastructure improvements
- Funding or decrease existing debt
- Funding capitalized interest
- Funding costs of issuance
- Making deposits to reserve funds
- Other funding required or provided for in debt instruments

County debt instruments may not be used for operating expenses (except in extreme circumstances). The County also has a policy that projects to be funded with debt must have a longer useful life than the associated debt.

Generally, capital improvement projects will be paid from current revenues. Bonds or other forms of debt are used for capital projects when the use of bonds or other debt instruments is appropriate, and when the capital asset created will have a useful life equal to or longer than the debt repayment period. Each annual operating fund maintained by the County is budgeted.

The Fort Bend County Drainage District's (FBCDD) 2013/2014 operation and maintenance budget is \$8,582,304, and requires a tax rate of 1.5 cents per \$100 property value. The District's maintenance and operation program includes mowing, spraying herbicide, general maintenance and periodic de-silting of channels within its drainage system. The District also works through interlocal agreements with the City of Sugar Land and various Municipal Utility Districts and Levee Improvement Districts to repair or upgrade drainage channels and ditches under their respective jurisdictions. At the direction of County Judge Robert Hebert, the District has begun an inspection program of all FEMA certified levees within the County. These inspections are based on the standards established in the Corps of Engineers Rehabilitation and Inspection Program. The only current funded on-going Capital Improvement type drainage project by

FBCDD is the Stafford Run Creek project, which also drains a portion of Sugar Land.

Municipal Utility Districts (MUDs)

A MUD may issue bonds to pay for any services the district requires to fulfill its purpose. Options in repaying these bonds are the following: 1) land tax, if at least 1500 acres, 2) pledging designated revenues, or 3) pledging district revenues. In addition, the MUD can designate certain areas or property of the district to pay for improvements that may benefit them, but not necessarily benefit the whole district. As result, the tax would only apply to the designated area benefiting from the improvement.

A MUD may issue bonds for any purpose authorized in Texas Water Code, Title IV, Chapters 49 and 54 or other applicable laws. These bonds must be repaid in any one of the following ways:

- The levy and collection of property taxes
- Pledging all or any part of the designated revenues to result from the ownership or operation of the district's works, improvements, facilities, plants equipment and appliances or under specific contracts for the period of time the board determines
- Pledging all or part of any funds or revenues available to the district

Bonds payable solely from revenues may be issued by resolution or order of the MUD board without an election, but no bonds, except refunding bonds, can be issued until authorized by a majority vote. At the time bonds are issued the board levies property taxes for each year the bonds are outstanding and determines the rate based on what is needed to cover the interest coupons.

Levee Improvement Districts (LIDs)

A LID may issue bonds called "Levee Improvement Bonds" and levy taxes to pay for the bonds. These districts may finance improvements without issuing bonds by arranging for contributions (including taxes) from landowners or other sources. The district may also choose to create an indebtedness not funded by bonds. However, if the district chooses the latter, the cost of construction of a project must not exceed 1) the engineer's estimated cost, 2) the cost of maintaining the improvements for two years, and 3) an additional amount equal to 10 percent to meet unexpected costs. If additional improvements are needed to reclaim all the land in the district or extensive repairs are necessary, the LID Board may provide additional funds for the district using approved fundraising methods.

CHAPTER 4: WATERSHEDS, DRAINAGE FACILITIES & OWNERSHIP

To facilitate the definition of drainage roles and responsibilities, watersheds and drainage conveyances and associated facilities in these watersheds have been determined as part of this MDP update process.

WATERSHEDS

A watershed is the area of land where all of the water that is under it or drains off of it travels to the same area, typically to a body of water such as Oyster Creek. Watersheds are identified within the City based upon physical water divides and jurisdictional boundaries of various entities. LID and MUD boundaries are shown in [Exhibits 8 and 9](#). Watersheds for master drainage planning are collectively shown in [Exhibit 2](#); these watersheds are generally assigned names indicative of the jurisdictional entity or land development project that dominates the watershed area.

DRAINAGE FACILITIES & OWNERSHIP

Ownership of drainage facilities is a key determinate for identifying drainage roles and responsibilities. Initial delineation of ownership was accomplished by a map-based review of land parcel ownership as obtained from the Fort Bend County Appraisal District records. This preliminary ownership evaluation was subsequently refined by information and review provided by the City and feedback received from other drainage entities in the region. The resulting watersheds and responsibilities are presented in [Exhibits 2 and 3](#). Ownership and maintenance responsibilities of detention facilities are presented in [Exhibits 4 and 5](#).

Each facility is given a unique identifying number. The facilities are predominately impoundments (lakes or ponds) or conveyances, including channels, ditches, major culverts, creeks, bayous; control structures such as dams and gates; levees, pumping systems and pump system fore- and after-bays; detention ponds and lakes; and other conveyance elements such as outfalls. Other miscellaneous facilities are included if considered particularly important to the operation or management of conveyances in the City.

Facility ownership falls in one of several possible categories: the City; the Fort Bend County Drainage District (FBCDD); a MUD, LID, or a private entity (including development corporations, private companies, or home owner associations) is the owner. When ownership is unknown or ambiguous, the listing is shown as “unclear”. For example, in some instances it is unclear which entity is solely responsible for maintenance.

CHAPTER 5: DRAINAGE SYSTEM EVALUATION

INTEGRATED STORMWATER MANAGEMENT (ISWMM)

The City uses the Integrated Stormwater Management Model (ISWMM) to evaluate drainage systems within the City. ISWMM is a stormwater management planning tool that was used to integrate the City's hydraulic and hydrologic models into a common platform. The tool uses existing model data and LiDAR (Light Image Detection and Ranging) survey imagery and applies it within GIS (Geographic Information System) for ease of use and comparison of various possible flooding scenarios. It can be used to predict city-wide drainage system performance and also serves as a valuable tool in preparing for emergency response, such as hurricane preparedness. Such a tool provides City staff with a system-wide analysis indicating how all components operate under potential flooding scenarios.

ISWMM is a city-wide macro level model that can be used for analysis of drainage systems in various watersheds, comparison of past rainfall events, analyzing "what if" scenarios and predicting system performance. ISWMM can assist in identifying problem areas that will need further investigation and analysis. The development of ISWMM took place in two phases, Phase I and Phase II.

Phase I primarily involved the integration of existing hydrologic and hydraulic models in various watersheds in a GIS environment. Some of the key tasks completed under Phase I included:

- Integration of hydrologic and hydraulic models from previous studies within GIS;
- Development of a city-wide ponding map that identified potential ponding depths during extreme rain events; and
- Delineation of floodplain limits to identify flood hazard areas.

Phase II built upon the framework already developed as part of the first phase. Key tasks completed under Phase II included:

- Integration of hydrologic and hydraulic models from previous studies within GIS, which includes data compiled from other agencies such as Fort Bend County Levee Improvement District No. 2 (FBC LID 2);
- Update ponding map to include various design storm frequencies (5, 10, 25, 50 and 100-year). These storms statistically have the probability of occurring in any given year by 20%, 10%, 4%, 2% and 1%, respectively. A design storm is commonly equated to a particular amount of rainfall falling within a specified duration. As such, for a 100-year design storm there could be several possible scenarios. For example, one possible scenario in Sugar Land for a 100-year design storm is 12.5 inches of rainfall

- occurring over a period of 24-hours;
- Analyze “what-if” scenarios such as during the occurrence of a coincidental rainfall event (e.g. local rainfall when Brazos is at a high stage);
- A pilot study to simulate levee breach and operation of levee outlets to facilitate emergency preparedness and response during such events; and
- Detailed two-dimensional (2D) modeling of Covington Woods watershed.

With the development of ISWMM, the tool has enabled City staff to view potential impacts from an impending rainfall event, by comparing it with ponding maps developed for various design frequencies (5, 10, 25, 50 and 100 year). These ponding maps have further assisted in identifying problem areas leading to more detailed analysis and inclusion of drainage projects within the City’s Capital Improvement Program (CIP) to mitigate flooding. Using this tool, drainage improvement projects in areas such as Ragus Lakes, Sugar Creek and Covington Woods are currently being planned. Also, this tool has been used to evaluate street ponding concerns along the intersections of Settlers Way at Austin Parkway and William’s Trace at Lexington Ave., as part of the street re-construction CIP projects. A snap-shot of the ponding map in the Town Center area is shown below in Figure 3: Ponding Map in Town Center Area (ISWMM).

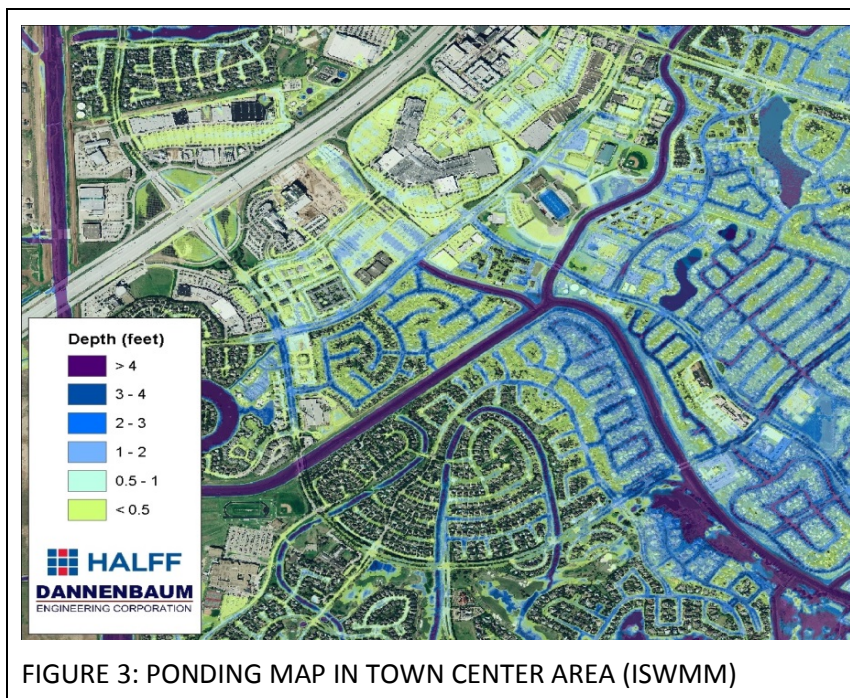


FIGURE 3: PONDING MAP IN TOWN CENTER AREA (ISWMM)

ISWMM was also used in the development of an Emergency Action Plan (EAP) for potential high water events on the Brazos River and Oyster Creek, working in conjunction with Levee Improvement Districts (LIDs). This tool was used to simulate pilot levee breaches and how the breaches would impact a particular area. This information was used to better identify staff needs and to educate first responders and provide them with information that would assist them in better

identifying these types of failures. This tool has allowed the City staff to conduct training and planning scenarios with various LIDs. These include simulating “coincidental rainfall event” within all levee districts which shows the impact within the City during a certain rainfall events when the levee outfall structures are closed due to high water conditions in the Brazos River.

ISWMM is a tool that is currently being used to screen potential problem areas at a macro level

city-wide. As and when new developments are annexed into the City, ISWMM coverage may be extended for these areas. **Updates to ISWMM will be evaluated and identified as part of each MDP update process.**

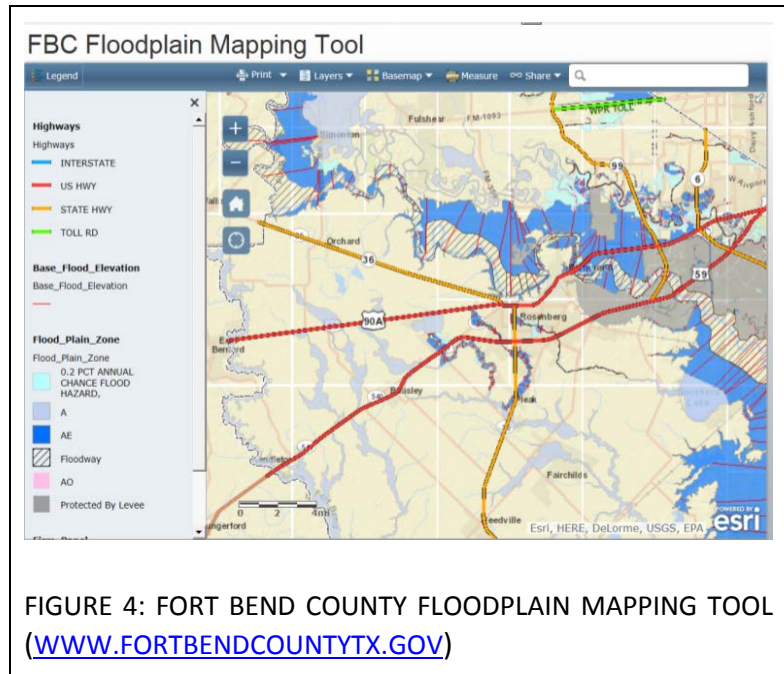
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FEMA FLOOD MAPPING

The Federal Emergency Management Agency (FEMA) started a nationwide Flood Map Modernization Program in 2004. The main objective of this program was to provide better quality and updated Flood Insurance Rate Maps (FIRM) that would identify the flooding risks within a community. This map enables insurance agents to issue accurate flood insurance policies to homeowners in communities participating in the National Flood Insurance Program.

The Fort Bend County map update initiative began in 2005. Both Fort Bend County and the City of Sugar Land, under an agreement with FEMA, contributed the local government share of funding to facilitate this program.

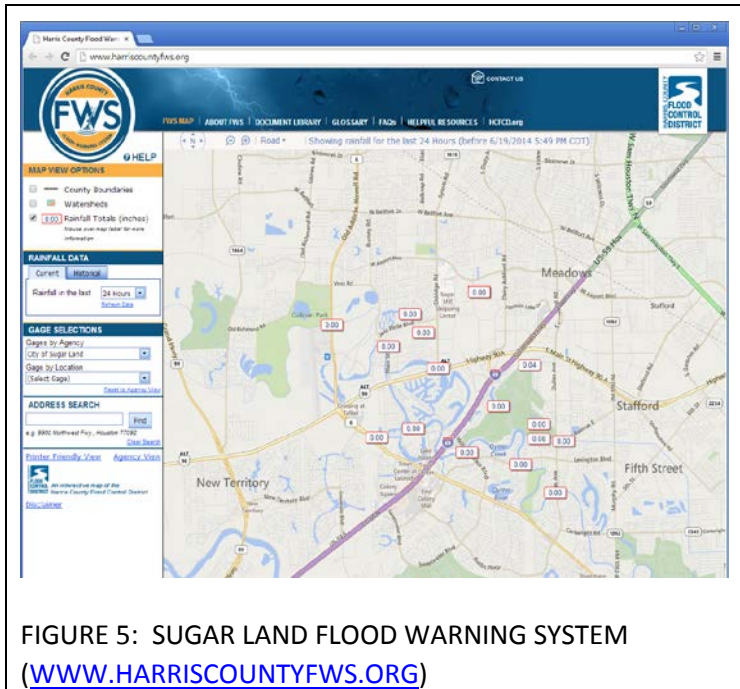
The City adopted new FEMA digital on April 2, 2014. These new maps can be obtained online from Fort Bend County's website, see Figure 4: Fort Bend County Floodplain Mapping Tool (www.fortbendcountytx.gov).



FLOW MONITORING

The City of Sugar Land currently owns and maintains a network of flood gauge stations located throughout the City.

The 17 gauge stations are located in channels, bayous and detention basins and provide the public and staff with measured rainfall amounts and water levels. The measured rainfall and water levels is transmitted to the Harris County Flood Control District and displayed as part of the Harris County Flood Warning System. In addition to the Sugar Land data, the Harris County Flood Warning System includes data from partner agencies such as Fort Bend County, Harris County Toll Road Authority, City of Houston, METRO, City of Pearland, TxDOT, the Trinity River Authority and the San Jacinto River Authority. The public can also access this information online at www.harriscountyfws.org, see Figure 5.

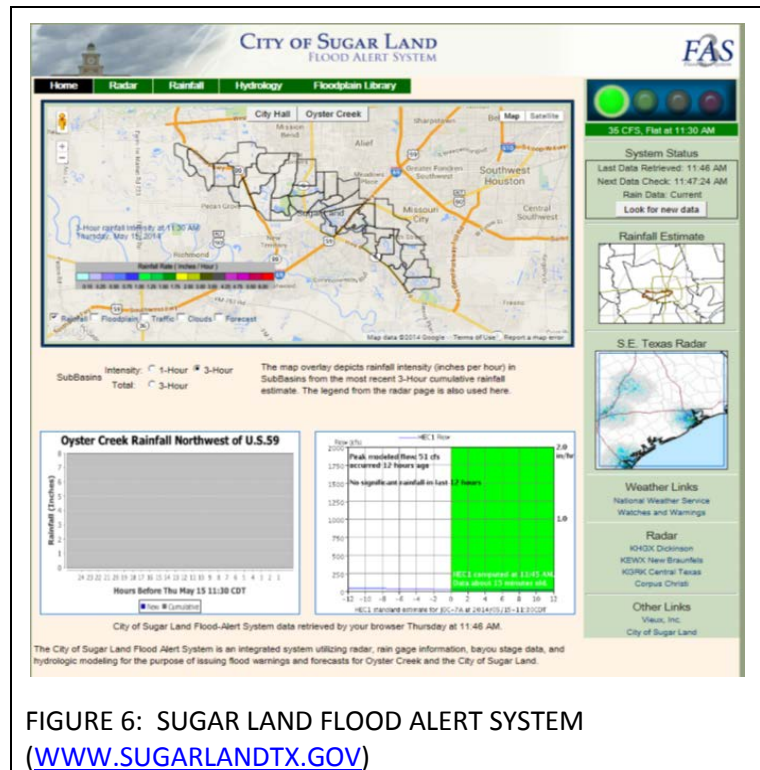


RADAR BASED FLOOD ALERT SYSTEM (RBFAS)

The City of Sugar Land's Flood Alert System is an integrated system utilizing radar, rain gauge information, bayou stage data, and hydrologic modeling for the purpose of issuing flood warnings and forecasts for Oyster Creek and the City of Sugar Land. The Radar Based Flood Alert System (RBFAS) provides early warnings on an imminent flooding situation so the City has lead time to plan for an emergency response. This alert system was developed for the Oyster Creek Watershed as a pilot project, and is currently being used. Upon further testing during future rain events, this system can be expanded to include other watersheds within the City.

Some of the key aspects of the RBFAS include:

- Hydrologic model development (update) for Oyster Creek;
- The existing rainfall/runoff hydrologic model for Oyster Creek was updated and is a key component of the RBFAS. With input from radar based rainfall estimates, the hydrologic model can estimate peak flows at critical locations along Oyster Creek ahead of a rainfall event;
- Floodplain Map Library (FPML) to delineate floodplain for various rainfall intensities;
- A map library of floodplain inundation along Oyster Creek for various rainfall intensities was developed. In anticipation of a rain event with expected rainfall amounts, an inundation map can be retrieved from the map library that would provide an estimate of inundation in the Oyster Creek watershed for the expected rain event;
- Centralized flood monitoring by incorporating real-time rain and stream gauges and cameras; and
- The RBFAS will enable advanced planning and preparedness in anticipation of a rain event. The radar estimates of rainfall will be used for forecasting peak flows and stages along Oyster Creek before the actual rain event. This can be field verified during or after the occurrence of the rainfall by field installed stream gauges and/or cameras. All this information can be viewed from a centralized location, such as, at the Emergency Operations Center.



RBFAS data is available online on the City's website, see Figure 6: Sugar Land Flood Alert System (www.sugarlandtx.gov).

CHAPTER 6: CAPITAL IMPROVEMENT PROGRAM (CIP) DEVELOPMENT

METHODOLOGY

A Capital Improvement Program (CIP) for drainage projects consists of a collection of projects proposed for implementation to address drainage and flood control problems. Examples of such problems could include overflow of stormwater from streets into the yards of several residences during a severe rainstorm; overflow of the banks of a creek with consequent entry of overflowing water into habitable structures located along the banks of the creek; inundation of a section of a well-traveled thoroughfare by rainfall runoff waters; ponding of rainfall waters in low lying, poorly drained areas with consequent creation of conditions conducive to growth of mosquito larvae; or flooding of a river with resulting inundation of large amounts of acreage with commercial structures. These examples are drainage problems or drainage needs for which remedy is to be sought by implementation of a CIP project. Some projects may be focused on local drainage areas while others may address flooding along rivers or channels.

CIP drainage projects may be construction projects, design projects intended to lead to constructed projects, projects to maintain, improve, or expand drainage projects constructed previously, and projects which are used to assist in management of drainage and flood control activities. The projects to address drainage needs may be such things as construction of sewer systems in newly developing areas, maintenance and repair of existing drainage systems, construction of flood control works, and development of engineering systems in support of drainage systems or flood control works or programs.

RANKING AND PRIORITIZATION

Introduction – Process for CIP Project Implementation

There are four conceptual steps in developing a CIP to address drainage needs:

1. *Screening of Drainage Problems:* Determining whether a drainage problem meets certain criteria to be considered for remedy, for the purpose of applying available City resources to those problems in most need of remedy.
2. *Ranking Severity:* Assessing, describing or characterizing the severity of a drainage need or problem, with the intent of objectively distinguishing the relative severity of one need from another as a guide to determining which drainage problems are in more or less need of remedy
3. *Prioritizing Projects:* Identifying particular projects to address particular drainage needs, estimating their individual implementation costs, and prioritizing the projects in a preferred order for implementation

4. *Funding Projects for the CIP:* Determining possible sources and allocation of funds for implementing the prioritized projects. The collection of prioritized projects selected for actual funding and implementation defines the CIP.

This Chapter addresses the first two of the aforementioned steps: screening of problems to see if certain criteria are satisfied, and ranking the severity of drainage problems which meet or exceed the screening criteria, focusing upon practical procedures to distinguish between the relative need to remedy a current or anticipated future drainage problem.

There are a number of factors and parameters that might be considered for describing drainage problem severity and the priority of a project for addressing the need. From a practical perspective, factors and parameters to be considered should be limited and reasonably ascertainable, particularly if the current level of detailed information on drainage problems is limited and the time and resources for obtaining more information are likewise limited. An overly complicated prioritization process can also significantly limit its usefulness and application. The processes developed and described in the following pages are considered practical and reasonable for application in today's drainage management environment.

SCREENING USING THRESHOLD CRITERIA

Drainage Infrastructure Design Criteria

The Fort Bend County Design Criteria Manual (FBCDCM) was adopted in 1987 and serves as a basis for the City of Sugar Land's drainage infrastructure design criteria. In general, subdivisions built in Fort Bend County after 1987 have used the FBCDCM criteria in the design of drainage infrastructure. One of the key requirements of the FBCDCM is the design and layout of streets to facilitate conveyance of storm water runoff during extreme rainfall events. This design concept recognizes that streets are an integral part of the drainage system, especially during extreme events. However, this design criterion was not applicable prior to 1987, and it is very likely that subdivisions built prior to 1987 were not designed to these standards. Storm sewers and roadside ditch design is a balance of capacity and economics. Under the FBCDCM criteria, storm sewers are typically designed to handle rainfall runoff from less intense, more frequent rainfall events with the intent of allowing for traffic movement during these events. Such systems are commonly constructed to handle up to a 2-year design storm event (50% statistical probability of occurring in any given year).

When rainfall exceeds the capacity of the storm sewer system, the additional runoff is intended to be stored or conveyed over land (via streets) in a manner that reduces the threat of structural flooding. This excess runoff that is conveyed through the streets is commonly referred to as sheet flow. The overall purpose of the combined sewer, surface drainage, and street system (storm sewers, roadside ditches, open channels, streets, etc.) is prevention of structural flooding during the occurrence of a design 100-year event (1% statistical probability of occurring in any given year).

Under current FBCDCM criteria, streets are required to accommodate an acceptable level of ponding. Building slabs are also required to be designed and built at levels higher than the highest level of ponding anticipated during this extreme event. According to FBCDCM, the maximum allowable ponding level in a street is the lowest of the following:

- One foot above natural ground
- One foot over top of curb
- One foot below the lowest slab elevation

The City has subsequently updated this minimum criterion to reflect higher standards than the FBCDCM for street ponding. This would essentially entail lower level of street ponding during extreme rain events, in order to facilitate passage of emergency response vehicles through residential neighborhoods. Under the City's current standards, the maximum allowable ponding level in a street is the lowest of the following:

- One foot above natural ground
- Nine inches over top of curb
- One foot below the lowest slab elevation

Because of the historical changes in criteria (or lack thereof), some older subdivisions in the City were designed to standards different than the current standards. It is not uncommon that the majority of drainage and flooding complaints reported during a major rain event are located in these older subdivisions. Many municipalities, including the City of Sugar Land, are faced with the dilemma as to when street ponding and flooding in these subdivisions becomes sufficiently excessive to warrant expensive retrofits to existing drainage systems to remedy such problems. In addition, the question arises as to whether the City should evaluate the performance of such an older drainage system based on current standards when it was probably not initially designed or built to the current standards. Requiring retrofits which comply with current standards could result in unwise expenditures of City resources in light of other drainage needs.

Threshold Screening

A threshold can be used as a benchmark to identify when drainage problems warrant attention for possible remedy. When threshold conditions are exceeded, the City may consider the problem (or a complaint about a problem) to be sufficiently severe to warrant detailed assessment and possibly proposal of a CIP project for the problem remedy. The process allows the City to objectively evaluate concerns based on established criteria rather than purely by the number of complaints received. Once the threshold criteria are exceeded, a detailed study may be performed and a potential project may be identified that would either remedy the problem or lessen its severity. All such projects identified in the City can be prioritized using the ranking criteria developed as part of this MDP Update (see discussion below). Such an objective, methodical approach would allow the City to focus its resources on more critical areas and problems, such as when public health and safety are compromised, and address problems more effectively and be fiscally responsible.

The thresholds proposed here are based on three key factors: rainfall depth, duration, and frequency. Structural flooding is given the highest priority and is evaluated using major storm events. Major events are classified here as storm events which have magnitudes corresponding to 25-year or larger recurrence intervals, such as the 25-year, 50-year and 100-year design storm events, with a probability of occurrence of 4%, 2%, and 1%, respectively, in any given year. For practical purposes, the largest maximum event considered is the 100-year event.

On the other hand, street flooding is evaluated using the minor events. Minor events are classified here as storm events which have magnitudes corresponding to less than a 25-year recurrence intervals, such as the 2-year, 5-year and 10-year design storm events, which have a probability of occurrence of 50%, 20%, and 10%, respectively, in any given year.

The depth-duration relationships for these major and minor events are given in the City's criteria. The criteria require a drainage system to accommodate a 100-year design storm without causing structural flooding. Similarly, the current criteria require that storm sewers be sized to handle a 2-year design storm without causing street ponding. For screening purposes, recognizing the practical limit of available City resources of assessing and remedying drainage problems, the thresholds that are proposed to screen a drainage problem or need and determine whether the problem or need should be considered for evaluation and development of possible remedy by the City staff are the following:

1. *Structural Flooding*: The threshold for structural flooding is met if a major rainfall event (25-year or larger event up to a 100-year event) results in structural flooding. It is not common to see structural flooding during minor rain events. However, if structural flooding were to occur during a minor event, the threshold would also be considered to have been exceeded, and the complaint about such occurrence would be considered for further evaluation. Only structural flooding arising from water backup from a street, storm sewer, ditch, or any other public right-of-way would be considered. Structural flooding arising due to property owner-related issues, such as poor back lot drainage, would not be considered.
2. *Street Flooding*: Street ponding or flooding would be evaluated using minor rain events (events of less than or equal in severity to a 10-year event); larger events causing street flooding or ponding would not be considered because street ponding is expected during major events. During the occurrence of such a minor event (10-year or less severity) the threshold would not be exceeded as long as the ponding were confined to a level at or below the top of the curb as measured from the front of the lot (or within the confines of a ditch system). If during these minor events, the ponding depth exceeds the top of curb, then the ponding is considered severe and to have exceeded the threshold. In addition, if the duration of the ponding lasts for more than 4-hours after the time of peak rainfall, the threshold is also considered to have been exceeded.

The thresholds described above are to be used primarily to evaluate drainage infrastructure

performance during rain events. Events and associated drainage problems which pass a threshold criterion are to be considered sufficiently severe for evaluation using ranking procedures discussed below. Ranked problems may then be considered for possible remedy by a drainage project which might be included in a CIP. The threshold criteria would be evaluated as part of future MDP updates and can be revised if necessary. To facilitate the application of the threshold criteria, drainage complaint reporting, monitoring, and documenting processes should be streamlined and well prescribed.

Identification of Problem Areas

A drainage problem exists when undesirable conditions from stormwater occur such as flooding of streets and structures, impediment to the movement of vehicle traffic, or creation of hazardous conditions for some or all of the citizens of the community. CIP drainage projects, typically drainage improvement projects, commonly seek to either prevent a potential (future) drainage problem or alleviate an existing drainage problem. Projects are also implemented to provide new or improve existing drainage services, even when a specific drainage problem is not identified. CIP drainage projects are intended to both remedy (i.e., “fix”) existing or anticipated future drainage problems and needs and, as well, provide drainage services to promote the wellbeing and growth of the community. CIP drainage projects seek both remedy of problems and promotion of community growth; if growth begins to develop without adequate recognition of consequent drainage needs, the needs become problems to remedy. Thus, in broad terms, CIP drainage projects address in one fashion or another “drainage needs or problems.

SEVERITY RANKING OF DRAINAGE PROBLEMS

Ranking includes identifying drainage needs and problems, characterizing the severity of a need or problem, and comparing the severity of drainage problems and needs.

Identifying drainage problems for remedy is the first step in problem ranking. Drainage projects that would be expected to eventually become part of a CIP should, in the interest of wise use of public resources, be selected on a rational basis. The basis on which projects are selected should be that a project seeks to remedy, all or in part, directly or indirectly, one or more drainage needs. Those drainage needs may be immediate or anticipated to develop in the future. Thus, drainage problems must be identified before their remedy can be sought.

In the municipal setting drainage problems and needs are quite common after a major rainfall event and the public is often vocal about them. A drainage problem or need may actually exist, be reported to exist, be found or discovered to exist, be believed but without definitive proof to exist, perceived to exist, or expected in light of possible conditions to develop in the future. A drainage problem may be large or small, isolated or part of a much larger problem, a one-time occurrence or a recurring phenomenon, with large or small adverse impacts, and well or only poorly documented. This identification process is typically not well structured. It is the collective result of citizen observation with notice to the City or complaint to the City; City staff observation and report made as a consequence of staff duties; external person or agency

observation, comment or action, such as Federal Emergency Management Agency review comments on city floodplain management; formal or informal comments made by other jurisdictional entities such as levee improvement districts; changes in property values because of worsening drainage conditions; or technical judgments about adverse consequences and needed remedy arising from future growth.

The screening process using threshold criteria as discussed above provides a rational, structured basis upon which to distinguish between different apparent drainage problems and identify which problems warrant more immediate attention. Once a potential drainage problem passes the screening review by meeting one or more threshold criteria described above, it can receive more detailed attention. Experience in the City suggests that three types of drainage impacts are of particular concern in the City and consequently would warrant detailed attention if such impacts are sufficient to meet screening thresholds:

1. *Structural Flooding Impacts:* Accumulation of waters during or shortly after a rainstorm or flooding event which results in some type of inundation of a physical structure, such as a house or a business. Depending upon the situation, the structure which floods may or may not be a habitable structure.
2. *Street Flooding Impacts:* Accumulation of waters during or shortly after a rainstorm or flooding event which results in some type of inundation of a highway, road, or street and which becomes sufficient to impede to some significant degree the movement of vehicles.
3. *Quality of Life Impacts:* Accumulation of waters during or shortly after a rainstorm or flooding event which could result in minor inconveniences to common daily activities (e.g., partial road blockage by water in one lane of a four lane highway) or danger to the health and safety of citizens (e.g., ponded water aiding to mosquito breeding).

Because City funds for CIP projects are limited, care must be taken in not only identifying problems and needs but also determining from a factual perspective what the severities of the drainage problems and needs are, particularly in terms of the factors judged by the City as of prime concern, i.e., structural flooding, street flooding, and quality of life. That is, because City funds available for remedy of drainage problems and dealing with drainage needs are limited, a rational basis for allocating the available funds should recognize the relative severity of various drainage problems and needs that may be identified. All other factors being equal, funds should be applied in a way that recognizes the relative severity of the drainage problems and needs.

The following factors are considered in a drainage problem ranking. A maximum score is identified for each factor listing from which staff assigns a score based on the score sheet in [Exhibit 6](#).

Severity Factors for Structural Flooding focus on drainage problems which result in flooding of structures and property.

1. *Type of structure (5)*: This factor recognizes that the inundation of a habitable structure (e.g., a residence) is more significant than that of an uninhabited structure (e.g., a garage) or merely the land near a structure.
2. *Maximum flooding depth in structure (5)*: This factor recognizes increased severity of flooding impacts as not only the depth of flooding in a structure increases but also as the duration of that maximum or near maximum depth occurs.
3. *Source of flooding (3)*: This factor recognizes that flooding from overflow of a watercourse is more significant than backup of storm sewer or poor drainage of a yard, the latter being attributed to poor residential construction as opposed to inadequate capacity of a drainage facility.
4. *Spatial extent of flooding (4)*: This factor recognizes that the severity of flooding impacts increases as the area of flooding increases.
5. *Value of structure (2)*: This factor recognizes that the severity of flooding impacts increases as the monetary value of the structure increases.
6. *Codes and standards (2)*: This factor accounts for whether or not the structure was built according to codes and standards at the time the structure was constructed; the flooding is considered more severe if a structure built in the past conformed to the codes and standards existent at the time of construction than the flooding of a structure not built in conformance to codes and standards at the time of construction. Flooding of a structure built to current codes and standards is considered the most severe because it suggests a deficiency in the current codes and standards.
7. *Floodplain impact (3)*: The factor recognizes that flooding of a structure in a floodplain can be more reasonably expected than flooding of a structure not in a floodplain.
8. *Frequency of flooding (4)*: This factor accounts for how often flooding occurs; as the frequency of flooding occurs, the severity of the drainage problem increases.

Severity Factors for Street Flooding deal with impacts to movement of vehicles on streets, roads, and highways.

9. *Access and use of roadway (5)*: This mitigating factor recognizes the extent to which flooding impedes traffic, with a high impact associated with impediment to emergency vehicles.
10. *Location of flooding (4)*: This factor recognizes that the greater the level of traffic (during non-flood periods) along a roadway, the greater is the impact of roadway flooding.
11. *Duration of flooding (3)*: This factor recognizes that long term flooding of roadways has a greater impact than short term flooding (e.g., more traffic is affected, or it is more likely that emergency vehicles will be impeded).
12. *Frequency of flooding (4)*: This factor recognizes that the more often a roadway is flooded, the more severe is the flooding problem.

Severity Factors for Quality of Life seek to address factors which impact the wellbeing of the City's citizens.

13. *Health and safety (5)*: This factor recognizes that flooding and poor drainage can directly or indirectly affect the health and safety of people in the community. Poor drainage impacts can range from such simple impacts as aesthetic impacts from floatables to such dangerous consequences as the release of sewage from flooded waste treatment works.
14. *Economic impacts (beyond structure damage) (3)*: This factor recognizes that in addition to damage of a structure, flooding can affect the well-being of City citizens by impacting the operation of business and commerce.
15. *Nuisance factor (2)*: This factor accounts for such things as flooding promoting undesirable growth of aquatic life or disruption to daily activities such as long term impediment to traffic and closure to business and traffic.

Ranking methodology

The City of Sugar Land Severity Ranking Method is intended to describe the severity of a drainage problem or need in terms of a relative rating. The identified drainage problem or need that is rated is given a score using the Ranking Method. Because this method leads to a numerical score for each drainage problem or need, application of the method allows identified drainage problems and needs to be objectively ranked with regard to their severity.

Depending upon the particular problem, the frequency at which it may occur, and how City staff become aware of the problem or need, the rating method could be applied each time a problem occurs (e.g., each time a citizen complaint is made), or it may be applied (conceptually done one time) by City staff using the collected body of information accumulated over time by the City about the problem. In the case of the latter one-time application, the one-time rating becomes the final drainage problem or need ranking.

The Ranking Method also recognizes the technical factors in describing the severity of a drainage problem or need by introducing metrics that from a technical standpoint, based upon hydrologic, hydraulic, traffic flow, safety, and environmental protection, are potentially significant to the Policymaker in assessing the impact of a drainage problem. The individual weighting of these metrics is suggested because of technical considerations and professional experience, but can certainly, in the final analysis, be selected in light of policymaking considerations.

Policy-Determined Factors

The Ranking Method recognizes preferences by incorporating what are called “policy-determined” factors. The policy-determined factors express the relative importance of features of a drainage problem by assigning weighting factors to various features describing the problem. The policy-determined factors are as follows:

Type of Impact: The Policymaker assigns a relative importance (on an arbitrary scale) of the three types of impacts: structural flooding, street flooding, and quality of life. A recommended relative weighting for these three impacts is:

Structural flooding: street flooding: quality of life - 3:2:1

The example Ranking Table (see [Exhibit 6](#)), implements this relative weighting by assigning numerical factors of 60, 40, and 20 to structural flooding, street flooding, and quality of life impacts, respectively; the absolute numerical values are of no importance, it is their relative value that is important.

Severity Mitigating Factors:

Each type of impact, as shown in the example Ranking Table (see [Exhibit 6](#)), is characterized by a set of factors which act to mitigate the severity of the type of factor, either increasing or decreasing its impact on the overall severity rating. The mitigating factors are as follows:

Mitigating Factors for Structural Flooding Impacts: Type of structure

1. Maximum flooding depth in structure
2. Source of flooding
3. Spatial extent of flooding
4. Value of structure
5. Codes and standards
6. Floodplain impact
7. Frequency of flooding

Mitigating Factors for Street Flooding Impacts:

8. Access and use of roadway
9. Location of flooding
10. Duration of flooding
11. Frequency of flooding

Mitigating Factors for Quality of Life Impacts:

12. Health and safety
13. Economic impacts (beyond structure damage)
14. Nuisance factor

Each of the mitigating factors, for each individual type of problem, is assigned a relative weighting (referred to as the “Mitigating Factor Rating”). The absolute numerical value of the mitigating factor rating is unimportant; it is the relative weighting that is important. As the weight assigned to a mitigating factor increases, the relative importance of that mitigating factor increases in assessing the magnitude of each impact. Thus, the type of structure (Mitigating Factor 1 for Structure Flooding) has a weight of 5 while the type of use (Mitigating Factor 6 for Structural Flooding) has a weight of 2. Thus for the Policymaker who has established these weights, the type of structure is $5/2 = 2.5$ times as important as the use of the structure in determining the structural flooding impact on drainage need or problem severity.

Example Application of Rating Method

The Severity Ranking Method was established as part of the 2007 MDP Update and applied to the City's proposed CIP projects in four major watersheds. Four major watershed-wide CIP drainage projects were examined in terms of the drainage problems they are intended to remedy in the above areas. The problems were ranked using the Ranking Method by staff in the City's Engineering Department using staff reports on flooding occurrences over a period of six years. The four major drainage projects considered are listed in Table 1 below.

There are two methods by which an Evaluator can rate a particular flooding problem or need. Method 1 is relatively a subjective and simplistic method, while Method 2 is moderately an objective method based on detailed data gathered during or after a flooding event. Both methods yield a score between 0 and 100. Instructions for using ranking forms are detailed in [Exhibit 6](#).

In Method 1, the Evaluator assigns a rating for each type of flooding impacts: structural flooding, street flooding, and quality of life. This rating is based upon experience and judgment alone, and must lie, for each flooding type, between a minimum of zero and a maximum equal to the weighting assigned to flooding type by the Policymaker. The spreadsheet in which the scorings are placed automatically computes a final ranking for the flooding problem scaled to a value between 0 and 100.

In Method 2, the Evaluator assigns to a particular flooding problem a rating for each severity mitigating factor listed in Ranking Table 2 of the ranking spreadsheet. However, there are a total of sixteen (16) severity mitigating factors, which capture more details of the flooding impact, such as the type of structure, type of roadway, duration of flooding, etc.

The results of the ranking process are as follows:

TABLE 1: RANKING MAJOR DRAINAGE PROJECTS		
Project (see Appendix 6 for description of projects)	Method 1 Ranking	Method 2 Ranking
Sugar Creek Improvements	66.7 out of 100	53.0 out of 100
Sugar Mill Improvements	70.8 out of 100	62.0 out of 100
Covington Woods Improvements	70.8 out of 100	60.2 out of 100
Belknap/Brookside Improvements	75.0 out of 100	71.4 out of 100

The ranking results were reasonable and consistent with staff field observations. However, it is noted that Method 2 consistently gives a somewhat lower ranking than Method 1, suggesting Method 2 causes a more detailed consideration of factors affecting the severity of a drainage problem.

5-YEAR CAPITAL IMPROVEMENTS PROGRAM (CIP)

The City of Sugar Land's Drainage Capital Improvement Program (CIP) has been developed in order to further the City's commitment to the citizens of Sugar Land. This program works to meet today's drainage infrastructure needs as well as those of the future. The five-year CIP addresses the drainage needs of the City through responsible City government and a comprehensive approach that ensures efficient use of public funds. The CIP is a long range plan that identifies capital projects, provides a planning schedule, and identifies options for financing the plan. The program provides a link between the City's Comprehensive Plan, various master plans, the annual budget, and the five-year financial forecast. The development of a drainage CIP is a continual process and, consequently, should be viewed as a work in progress. Therefore, while this document covers a five- year planning perspective, the CIP is revised every year in order to accommodate new projects, reflect changes in ongoing projects, and extend the program an additional year. The first year of the CIP is incorporated into the annual budget as required by the City's charter, and funds are appropriated through the budget adoption. Improvements identified in subsequent years are approved only on a planning basis and do not receive any appropriation. Cost estimates for years two through five are presented for planning purposes only, and are used in conjunction with the City's long-range financial plan.

The CIP development process utilizes a "project-ready" approach whereby the scope and budget for a proposed improvement are clearly defined prior to the appropriation of funds for construction. The City seeks involvement of various stakeholders during the CIP development process because the City recognizes the invested interest in maintaining Sugar Land as a "great place to live and work." The City considers input from citizens, the Planning and Zoning Commission, City Council and City staff members in the drainage CIP preparation.

A project list is compiled by the Engineering Department, prioritized based on the MDP criteria, and cost estimates assigned. City Council is able to weigh citizen's input with staff recommendations to ensure that both are equally considered. The Budget & Research Department also looks at the overall impact of projects, including the need to issue debt, potential impact on the tax rate, and operations and maintenance impact to the City. The City Council, through budget workshops, reviews the proposed CIP list and any recommended changes are incorporated into the final document. A final five- year CIP is then presented with the annual budget for Council consideration and approval. Upon Council adoption, the five-year drainage CIP project list is finalized for implementation. The adopted (2015 to 2019) drainage CIP program list of projects is presented below. A detailed description of each of these proposed projects is presented in ([Appendix 6](#)). Also included here is a map showing the location of proposed drainage CIP projects as well as major drainage CIP projects already completed during the past 5 years.

MASTER DRAINAGE PLAN

TABLE 2: 5-YEAR (FY 15 TO FY 19) DRAINAGE CAPITAL IMPROVEMENT PROGRAM			
CIP Project #	CIP Project Name	Type	Allocated Funding
DR1001	Sugar Creek Drainage Improvements - Phase II	Design/Construction (Carryover)	
DR1501	Ditch H Model Update	Study	\$240,000
DR1502	Localized Drainage Improvements	Design/Construction	\$300,000
DR1503	Business Park Pump Station	Study	\$100,000
DR1504	Sugar Creek Drainage Improvements - Longview Dr. & Golf Course	Design/Construction	\$5,850,000
DR1505	Covington Woods Drainage Improvements, Offline Pond, BP Ditch and JP Bridge	Design/Construction	\$2,040,000
DR1506	Covington Woods Drainage ImprovementsA-22 Bournewood Trunk	Design/Construction	\$5,830,000
DR1601	Covington Woods Drainage Improvements - Ivymount	Design/Construction	\$710,000
DR1602	Sugar Creek Drainage Improvements - Montclair Dr.	Design/Construction	\$5,735,000
DR1603	Localized Drainage Improvements	Design/Construction	\$1,200,000
DR 1701	Covington Woods Drainage Improvements - Jess Pirtle Side Streets & Greywood	Design/Construction	\$1,260,000
DR1801	Sugar Creek Drainage Improvements - Brunswick Dr. & Fairway Dr.	Design/Construction	\$3,430,000
DR1802	Sugar Creek Drainage Improvements - East Ditch	Design/Construction	\$1,675,000
DR1803	Sugar Creek Drainage Improvements - Chevy Chase Dr.	Design/Construction	\$1,885,000
DR1901	Covington Woods Drainage Improvements - Sugar Land MS	Design/Construction	\$110,000
DR1902	Covington Woods Drainage Improvements - Covington West & Imperial Woods	Design/Construction	\$180,000
		Total 5-Year CIP	\$30,545,000

CHAPTER 7: CIP PROJECT FUNDING

As discussed in Chapter 6, there are four conceptual steps in developing a Capital Improvement Program (CIP) to address drainage needs. The first three are *Screening of Drainage Problems*, *Ranking Severity*, and *Prioritizing Projects*. *Funding Projects for CIP* is the fourth conceptual step in developing a CIP to address drainage problems. Screening determines which drainage problems are in sufficient need of remedy to consider a project for remedy. Ranking the severity of drainage problems determines which drainage problems are in more need of remedy than other drainage problems. Prioritization of needed projects establishes which projects yield the greatest benefit for the costs incurred to implement the project, thereby defining a preferred order for project implementation. To construct the needed projects, different potential sources of funds can be accessed. This Chapter discusses potential funding sources and some of the possible consequences of using such sources.

CURRENT SOURCES OF FUNDING

The City of Sugar Land uses a variety of sources for generating funds for public purposes throughout the City. Funding of CIP projects are a primary component of the City's total annual budget; in FY 2014 (the City's fiscal year begins on October 1 of each year), the City adopted a budget of approximately \$267 million, an increase of 3.6% above the prior fiscal year budget. Of this total \$267 million, approximately \$38 million was for capital improvement projects. The drainage component of the capital improvement projects was approximately 7.1%. The City is currently funding or considering funding more than 20 projects (including different phases of an overall single project) over the five year planning period of 2014 to 2018; these projects total nearly \$19 million. For the CIP drainage program over the period of 2015 to 2019, the City proposes to fund \$30 million of CIP drainage projects (see [Appendix 7](#)).

OTHER POTENTIAL SOURCES OF FUNDING

Funds for CIP projects come from a variety of sources, including pay-as-you go funds and debt incurred through the use of various financial instruments (e.g., general obligation bonds), which the City commits to repay. The source of the monies for repayment of debt comes from revenue the City receives from various charges (e.g., taxes and fees) it institutes in one form or another upon the community, its citizens, developers, and service providers.

The revenue received by the City goes to meet a variety of funding needs; only a portion of the revenues received are allocated to capital improvement projects, including drainage projects. These revenue sources include the following:

1. General sales tax;
2. Property tax. The 2014 total property tax rate is 30.895 cents per \$100 of assessed valuation;

3. Connection fees, a fee paid when service by City utilities, e.g., water and sewer, to a residence or business is initiated by the City;
4. Franchise fees for a right to provide services and for right-of-way permits and similar access for non-city service provider (e.g., electricity);
5. Contributions, which represent funds from private or other public sources (e.g., local private developers, state and federal agencies) participating in City-sponsored projects.
6. General license and permit fees, e.g., building permit fees;
7. Fine and forfeitures;
8. Interest income, which is earned interest on funds invested or on deposit by the City;
9. Hotel occupancy tax, a tax that supports the City Tourism and Utility Fund;
10. Intergovernmental Transfers, e.g., fund transfers for services provided by the City to another city or governmental entity;
11. Tax Incremental Redevelopment Zone (TIRZ) funds;
12. Community Development Block Grants; and
13. Developer impact fees. A fee charged for new development but whose maximum value is established by law (Local Government Code Chapter 395.015) and is computed by the following equation:
$$\frac{\text{Cost of capital improvements} - \text{property and utility tax credits}}{\text{Total number of new service units}}$$

Related revenue sources include water, wastewater, and solid waste service fees, but these revenues cannot by law be used for drainage purposes.

The City does not currently have a dedicated source of funding such as a drainage impact fee to fund all identified drainage improvement projects.

**PROJECT
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Identified projects are further ranked and prioritized for inclusion in the City's CIP program based on available funding through other traditional sources such as the general fund and certificate of obligations.

CHAPTER 8: DRAINAGE POLICY

COMPREHENSIVE PLAN VISION AND GOALS

The Sugar Land Comprehensive Plan (2012) describes a vision for the City and guides policy decisions affecting the City's physical development. Master Plans identify how to achieve the subject specific goals identified in the Comprehensive Plan. The Master Drainage Plan (MDP) is one of the City's eight official master plans and is a component of the Comprehensive Plan. The MDP provides policy guidance on how to accomplish drainage-related goals in the Comprehensive Plan, including:

- Safe Community;
- City prepared for all hazards, disaster and post disaster recovery including coordination with local, regional, and state resources;
- Clean, well-maintained, attractive lakes and waterways, both public and private; and
- Effective stormwater management and drainage system enhancing quality of surface water and protecting neighborhoods.

Many of the drainage-related goals found in the Comprehensive Plan are addressed by the City's current activities. As a component of this master plan update, staff reviewed each drainage related goal, identified current activities addressing that goal, and identified gaps or challenges. An evaluation of how the City addresses each goal and objective is detailed in a chart located in [Appendix 5: Comprehensive Plan Goals Chart](#). The chart identifies proposed projects to fully address each drainage-related goal and objective through the MDP. The following resulting proposed projects are divided into two categories: projects to be addressed in the MDP and projects for future implementation.

Projects to Address in the MDP

The following projects were identified for completion as a part of this MDP update:

1. Promote online links to seek drainage need related information. Solicit feedback from residents on drainage issues through plan participation. Education on drainage operations (e.g. street ponding).
2. Updates to ISWMM model as warranted by changes in development or infrastructure (not all improvements will justify an update to ISWMM). Update the City's drainage hydrologic and hydraulic model(s) in conjunction with updates to the Master Drainage Plan.
3. Develop an approach to detention pond maintenance, including identification of code amendments to strengthen enforcement opportunities for maintenance issues.

4. When an MDP update is initiated, review the Comprehensive Plan goals and objectives to identify future drainage-related projects to include.
5. Continue to update ownership and assets with each update to the Master Drainage Plan.

Projects for future implementation

The following projects were identified for completion after adoption of the MDP:

1. Engage regional partners in developing a flood warning system.
2. Engage the public to assist the City in identifying locations of problem areas (via communications tools).
3. Review and enhance/update Storm Water Management Plan address stormwater pollution prevention and improve stormwater quality.
4. Amend Design Standards with national standards and best practices for storm water pollution prevention.
5. Consider funding mechanism for drainage facilities and detention pond maintenance (e.g. drainage impact fee, Public Improvement District).
6. Consider regional detention pond opportunities.
7. Policy project to weigh the pros and cons of a regional drainage entity taking more of a leadership role in stormwater management.
8. Amend Development Code to make flood damage reduction criteria to be more consistent with other agencies in our region.
9. Amend Development Code and Design Standards to incorporate standards for detention facilities to also be used as recreational amenities (parks/trails).
10. Identify partnership opportunities with other drainage entities in the region for the construction of drainage infrastructure projects.
11. As part of future updates to the Master Drainage Plan, review Comprehensive Plan goals and objectives to identify future drainage projects and update detention facility ownership and assets.

PROJECT
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PROJECT
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PROJECT
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PROJECT
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PROJECT
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PROJECT
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PROJECT
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PROJECT
14

PROJECT
15

Plan as shown in the Master Drainage Plan Project List (see Chapter 9).

DETENTION FACILITIES

The City has increasingly recognized the need to re-evaluate detention facility maintenance to ensure that both functional and aesthetic elements of detention facilities are properly designed, constructed and adequately maintained. Guidance is set forth in the City of Sugar Land - Development Code, Drainage Design Standards, and the Fort Bend County Drainage Criteria Manual (FBCDCM).

Detention Basins

A detention basin (also known as a detention pond) is the most common method to satisfy both stormwater detention and stormwater quality requirements. It is applicable to small and large developments, can be easily designed and constructed, and is long-lasting and durable while reducing peak flows (with adequate inspection and maintenance). Stormwater detention ponds are open basins built by typically excavating below existing ground. The detention pond temporarily stores stormwater runoff during rain events and slowly releases it through an outlet (control structure).

Detention ponds are typically designed to completely drain within 24 hours after a storm event. Components that are typically associated with a detention pond include the following: control structure/flow restrictor, debris barrier (e.g. trash rack), energy dissipaters, maintenance berm (access road), and fence.



FIGURE 7: DRY DETENTION POND



FIGURE 8: WET DETENTION POND



FIGURE 9: SLOUGHING

Dry Detention

A dry detention basin (see Figure 7 on page 45) is intended to drain dry between storm events, but sometimes may not have a chance to drain completely between closely occurring storm events. The detention basin begins to fill as stormwater runoff enters the facility. The first flush volume is captured in order to ensure water quality. One or more outlet structures then release the stormwater runoff slowly to reduce peak discharge rates and to provide time for sediments to settle.

Wet Detention

A wet pond (see Figure 8 on page 45) is an open basin that retains a permanent pool of water (wet pool) typically year around. The volume of the wet pool allows sediments and other pollutants to settle out of the runoff. Wetland vegetation is typically planted within the wet pond to provide additional treatment through nutrient (i.e. nitrogen) removal. Stormwater detention volume storage can be provided with additional temporary storage volume above the permanent pool elevation.

Maintenance Issues

Effective and safe operation of a detention basin depends on continuous maintenance of all system components. **Detention basin easements and access should be provided during the planning stage in order to allow for proper inspection and maintenance.**

PROJECT
4



FIGURE 10: SLOUGHING



FIGURE 11: BULKHEAD REPAIR



FIGURE 12: WATER PONDING

Maintenance and operations responsibilities may include:

- Inspecting dry detention basin every 12 months and/or particularly after a heavy rainfall event. Record all observations with pictures and document any measurements taken. Perform any maintenance and repair erosion promptly. Remove debris and trash after storm events. Check outlet structures regularly for clogging. If upstream erosion is not properly controlled, dry detention basins can be maintenance-intensive with respect to sediment removal, nuisance odors, insects, mosquitoes, etc. Figure 12 on page 46 shows water ponding in a dry detention pond.
- Maintain a thick and healthy growth of vegetation (usually grass). Mow or trim at regular intervals to encourage a healthy growth. Remove leaves, grass clippings, or sticks from detention basin regularly to prevent stormwater pollution.
- Remove trees or nuisance vegetation as necessary to ensure structural integrity of the basin. This is especially true in embankments. Signs should be posted at detention ponds to discourage local homeowners from depositing yard trimmings, waste, and fill materials inside the basin. Appropriate signs and barriers such as fences should also be considered at detention basins where children have easy access to the site.
- A detention basin may not have sufficient vegetation on the slopes and bottom to prevent erosion (see Figure 13). Vegetation must be maintained and cut at adequate intervals. Mow at regular intervals so that grass does not exceed approximately 6-8 inches in height.
- Remove sediment when accumulation becomes noticeable (Above 2-inches over a wide area) or if re-suspension is observed or probable. Sediment may be permitted to accumulate if the detention basin volume has been overdesigned with adequate controls to prevent further sediment movement.



FIGURE 13: EROSION



FIGURE 14: BULKHEAD FAILURE

City-Owned Detention Facilities

The City owns fourteen (14) detention ponds including dry and wet ponds. **The City performs an annual evaluation of City-owned detention facilities, and a report is available in Appendix 7.**

**PROJECT
1**

As part of the 2014 MDP update, an assessment of all City-owned detention ponds was performed in January, 2014. Based on this assessment, all the City-owned ponds were satisfactorily maintained to serve their design functionalities.

POLICY FOR DETENTION FACILITIES

Background

It is clear that without proper inspection and maintenance, detention ponds will not be able to fully accomplish their design objectives and may also become an eye sore. In most cases, the ownership and maintenance responsibility rests with the owner, typically a Home Owner Association (HOA). HOAs collect annual assessments from home owners to cover costs associated with routine maintenance in common areas (including detention ponds), which includes mowing, landscaping and water quality management. However, these assessments typically are not intended or sufficient to address failures of a detention pond, such as the erosion of slopes or a failing bulkhead (see Figures 13 and 14 on page 47).

A typical example is the Grants Lake wet facility located in the First Colony area of the City. This pond is owned and maintained by the Colony Grant HOA. A failing wooden bulkhead protecting the pond seems to be causing the soil around it to cave-in (see Figure 11 on page 46). This may ultimately become a safety issue and could adversely impact homes adjacent to the pond and also impact the functionality of the pond. The HOA does not have the resources to address this issue and looks to the City for further assistance. In a situation like this, it becomes necessary for the City to have a “Detention Pond Maintenance Policy (DPMP)” that can be used to fairly and consistently administer City policies when situations such as the Grant Lakes arise.

The fundamental question seems to be: is it the responsibility of the City or the owner (HOA) to operate and maintain a detention pond? If the owner fails to operate and maintain a detention pond as originally intended, what role should the City take and when should the City intervene? These broad based policy decisions present monetary, legal and enforcement challenges. With this mind and based on feedback provided by the City Council, the City identified a policy for non-City-owned detention ponds.

Key Terms

The following key terms used in the City’s Detention Pond Maintenance Policy are defined below:

Functional elements of a detention facility – Those elements of a detention facility that are essential to mitigate flooding impacts and impact public safety (e.g. a clogged orifice or outlet pipe and slope failure leading to a compromise in structural stability within the detention facility).

Non-functional or architectural elements of a detention facility – Those elements that are not essential to mitigating flooding impacts and do not impact public safety from a flooding perspective (e.g. trash build-up, high grass and weeds, bulkhead failures, and water ponding that leads to mosquito breeding.).

Privately-owned facility – A detention facility that is owned by a non-taxing entity, such as an HOA or an individual property owner.

Publicly-owned facility – A detention facility that is owned by a political subdivision of the state, including LIDS, MUDs, Fort Bend County Drainage District, and other political subdivisions of the state.

The City's Role

The City has a unique role to play in detention pond maintenance, as defined by the following:

- The City will maintain City-owned detention facilities.
- The City will oversee the functional elements of all detention facilities and respond to concerns and issues in order to protect life and property.
- The City will take all lawful actions necessary in order to protect life and property.
- The City will accept ownership of new privately-owned detention facilities as outlined in the Detention Facility Acceptance Policy (detailed in this chapter).
- The City will adopt code amendments to address architectural (non-functional) and functional elements of detention facilities and property protection concerns with respect to privately owned facilities and publicly-owned facilities.

The City will comply with the federally-mandated *Stormwater Protection Program*.

The City will address the “functional” elements of all detention facilities (city-owned and non-City-owned) so that the detention facility is adequately served (design, construction and maintenance). The City will annually assess the condition of City-owned or maintained detention facilities and identify maintenance needs. Using codes and ordinances, the City will address non-functional elements of detention facility maintenance. The City's design standards address the architectural design of detention facilities.

The City has a role to play in the enforcement of privately and publicly owned facilities. A distinction is made between the City's role in functional issues and in architectural or non-functional issues.

- If a detention facility serves a drainage function and a maintenance issue is brought to the City's attention, the City will evaluate this issue further. The City will notify the owner or responsible entity to address functional issues. If the owner or responsible entity fails to address a functional issue, City will only intervene pursuant to law when public safety is involved. **The City may front the cost to address functional deficiencies when the responsible entity fails to take timely action (when public safety is involved) but will need to identify a mechanism to recoup costs incurred.**
- The majority of the issues related to maintenance of privately-owned facilities are architectural or non-functional elements. These are generally attributed to sub-standard property maintenance. The City should not expend its resources to repair non-functional

PROJECT
2

elements of a detention facility but will address such issues through code enforcement. The City's current codes are not set-up to specifically address detention facility maintenance issues. **The following codes will need to be amended:**

1. **International Property Maintenance Code (IPMC)** addresses general maintenance issues along the exterior of a detention facility.
2. **City of Sugar Land Code of Ordinances** – address weeds and offensive conditions in and around a detention facility and other maintenance issues.
3. **City of Sugar Land Development Code** – address functional issues related to a detention facility.

PROJECT
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PROJECT
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ACCEPTANCE POLICY FOR NEW PRIVATELY-OWNED DETENTION FACILITY

The City has developed a policy to identify when the City will accept ownership of newly constructed (based on future developmental projects) privately-owned detention facilities and under what conditions. The purpose of this policy is to establish criteria for the acceptance of ownership and/or the maintenance responsibility of a privately-owned detention facility.

Background

Designation of a responsible entity(ies) is important to ensure proper inspection and maintenance of detention facilities. Property owners or a home owners association (HOA) and their agents are at all times responsible for the maintenance and repair of detention facilities located on their property unless such responsibility has been explicitly transferred to and accepted by the City of Sugar Land (City). The City shall not maintain any detention facility created for on-site detention unless responsibility for such maintenance has been accepted by the City through the appropriate process.

Acceptance of ownership and/or maintenance responsibility by the City of a newly constructed detention facility will only be considered when the following criteria are met:

1. The detention facility must serve more than a single property owner or development and is a critical component of the public drainage system for the attenuation of flood events.
2. The facility shall be built and maintained in accordance with City's current standards.
3. The facility must be included within a dedicated public easement or tract for which the City has been identified as the agent responsible for maintenance or the property should be deeded to the City.
4. The detention facility must have a storage volume in excess of twelve (12) acre feet.
5. The City Council has ultimate authority in determining if the City will accept ownership of a privately owned facility based on public need and benefit.

a privately owned facility based on public need and benefit.

Detention facility maintenance agreements and easements must be approved in conjunction with the City's acceptance of maintenance responsibilities. Such documents shall clearly define the responsibilities of both the City and private entities related to long-term maintenance. Such documents shall also provide that in the event that property owners fail to fulfill their maintenance obligations, the City may perform the required work and then seek to recover its costs.

The City may assume maintenance responsibility of a facility owned by a Municipal Utility District (MUD) if it serves a common public purpose and is also designed to detain a portion of the public roadway drainage (i.e. a roadway section).

City may assume detention facility maintenance responsibility upon the dissolution of a MUD as part of the dissolution agreement, in which the District's funds are made available for maintenance (Ex: Detention facilities located in the now dissolved Eldridge Road MUD).

CHAPTER 9: RECOMMENDATIONS

The City of Sugar Land (City), located in Fort Bend County, Texas, has updated its Master Drainage Plan (MDP). This MDP is a conceptual planning document that describes the City's physical and institutional planning environment, establishes roles and responsibilities for drainage and flood control, provides a basis for formulating and prioritizing the City's drainage capital improvement projects, and identifies future studies to assist in drainage planning and flood control.

This Plan builds upon the work that was accomplished in 2007, especially when it relates to identifying, updating, and clarifying drainage roles and responsibilities for various drainage entities in the region. As part of this update, particular emphasis was placed on identifying roles and responsibilities on drainage/detention facilities located in the City and its ETJ. Issues and gaps related to the maintenance of detention facilities were identified, and potential future policy projects to address this issue were identified. In this update, the City's current policy on the evaluation of problem drainage areas and identifying and ranking drainage capital improvement projects was further evaluated. This MDP update documents the proposed 5-year drainage Capital Improvement Program (FY 2015 to FY 2019) developed based on the methodology identified in this MDP.

PROJECT LIST

The Master Drainage Plan identifies a work plan to achieve drainage-related goals and objectives identified in the Comprehensive Plan. The following chart (on page 54) identifies the prioritized list of projects for future implementation. Projects are prioritized by annual, high priority (1-2 years), medium priority (3-5 years), and low priority (6-10 years). Leaders of implementation of each project are identified. References to the triggers for creating the project are provided and include page references for additional details about the project found throughout this plan document.

MASTER DRAINAGE PLAN

MASTER DRAINAGE PLAN PROJECT LIST					
#	Priority	Project	Description	Leader	Reference
ANNUAL					
1	High	City-Owned/ Maintained Detention Facilities	Annually inspect City-owned or maintained detention facilities	City Staff	Detention Facilities (Chapter 8)
HIGH PRIORITY (1-2 YEARS)					
2	High	Update Development Code	Update regulatory standards for flood damage reduction	City Staff	Comprehensive Plan Goals (Chapter 8),
			Identify standards for utilizing detention pond facilities as recreational amenities (non-City-owned)		
			Codify City's role in inspection and maintenance of privately-owned detention facilities	City Staff	Detention Facilities (Chapter 8)
3	High	Update International Property Maintenance Code	Address provisions for water ponding within stormwater detention facilities.	City Staff	Detention Facilities (Chapter 8)
4	High	Update Code of Ordinance	Address weeds and offensive conditions around stormwater facilities	City Staff	Detention Facilities (Chapter 8)
			Address weeds and offensive conditions around stormwater facilities		

MASTER DRAINAGE PLAN

5	High	Update Design Standards	Identify storm water pollution prevention elements (national standards and best practices)	Consultant	Comprehensive Plan Goals (Chapter 8), Detention Facilities (Chapter 8)
			Evaluate easement and access related issues for adequate maintenance.		
			Identify design standards (including landscape regulations) for dry ponds, wet ponds, and wetlands (city-owned ponds)		
			Identify standards for utilizing detention pond facilities as recreational amenities (city-owned ponds)		
6	High	Public participation to identify drainage issues	Engage the public to assist the City in identifying locations of drainage problems.	City Staff	Comprehensive Plan Goals (Chapter 8)
MEDIUM PRIORITY (3-5 YEARS)					
7	Medium	Funding drainage projects, operations, and maintenance	Consider funding mechanisms for drainage projects, operations, and maintenance	City Staff	CIP Project Funding (Chapter 7)
8	Medium	Floodplain Management Responsibilities	Establish a City policy for floodplain management responsibilities for all areas within the City's jurisdiction, within the City and the ETJ.	City Staff	Floodplain Management (Chapter 3)
			Consult with the LIDs in establishing minimum floor elevation and other development related issues within LID boundaries		
9	Medium	Update Storm Water Management Plan	Review and enhance/update Storm Water Management Plan to address stormwater pollution prevention and improve stormwater quality	Consultant	Comprehensive Plan Goals (Chapter 8)
10	Medium	Regional flood warning system	Engage regional partners in developing a flood warning system	City Staff	Comprehensive Plan Goals (Chapter 8)

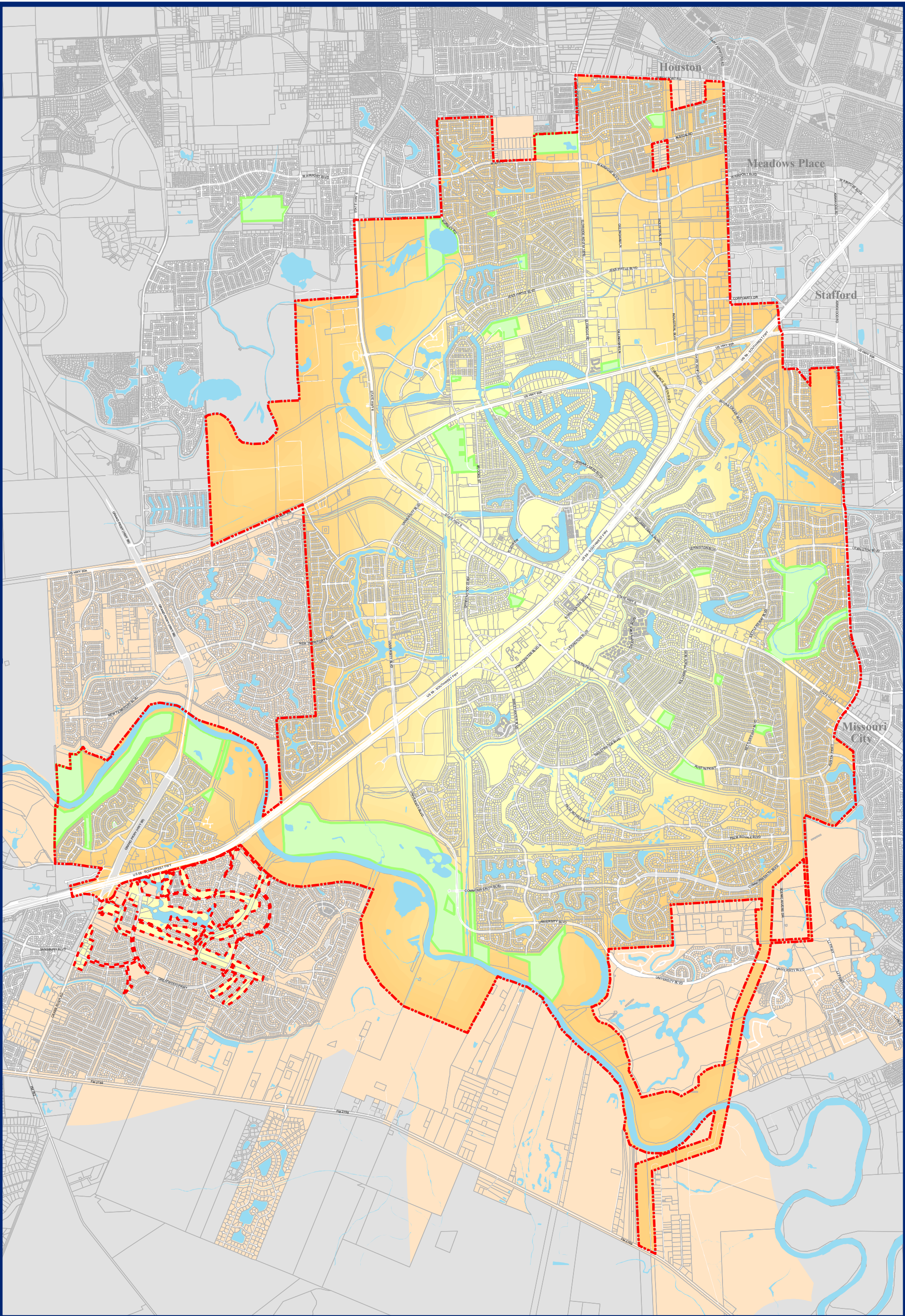
LOW PRIORITY (6-10 YEARS)					
11	Low	Regional detention ponds	Consider regional detention pond opportunities	City Staff	Comprehensive Plan Goals (Chapter 8)
12	Low	Evaluate Ranking Threshold Criteria	Identify criteria used to evaluate drainage problems, and ranking projects for inclusion in the City's Capital Improvement Program. Evaluate in coordination with updates to the MDP.	City Staff	Comprehensive Plan Goals (Chapter 8)
13	Low	Regional drainage entities	Policy project to understand the benefits of establishing a single regional drainage entity to manage all aspects of drainage within the City. Project to result in a recommendation to the City	City Staff	Comprehensive Plan Goals (Chapter 8)
14	Low	Partnerships to construct infrastructure	Identify partnership opportunities with other drainage entities in the region to construction drainage infrastructure projects	City Staff	Comprehensive Plan Goals (Chapter 8)
15	Low	Master Drainage Plan Updates	As part of each Master Drainage Plan (MDP) update: 1. Evaluate the need to update the Integrated Stormwater Management Model (ISWMM). 2. Review Comprehensive Plan goals and objectives to identify future drainage projects. 3. Update detention facility ownership and assets.	City Staff	Drainage System Evaluation (Chapter 5) Comprehensive Plan Goals (Chapter 8)

References

1. Phase I Working Document: Basis for consensus for the roles and responsibilities for drainage in the City of Sugar Land; July, 2007 - Klotz Associates, Inc.
2. Master Drainage Plan Update Phase 2: CIP planning and implementation for drainage and flood control in the City of Sugar Land. October, 2007 - Klotz Associates, Inc.
3. Best Management Practice for Maintenance of Private Storm Water Facilities; City of Cedar Rapids, IOWA Public Works Department – March, 2008.
4. Aesthetically Enhanced Detention and Water Quality Ponds; City of Denver – September, 2010.

Exhibits

Exhibit 1: Vicinity Map of Sugar Land



**CITY OF SUGAR LAND
MASTER DRAINAGE PLAN
EXHIBIT 1: VICINITY MAP**

- LAKES, STREAMS, & CREEKS
- CITY PARK
- CITY OF SUGAR LAND - CITY LIMITS
- CITY OF SUGAR LAND - LPA
- CITY OF SUGAR LAND - ETJ



APRIL, 2014

0 1,250 2,500 5,000 7,500 10,000 Feet

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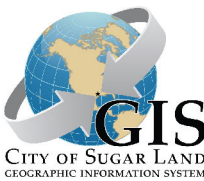
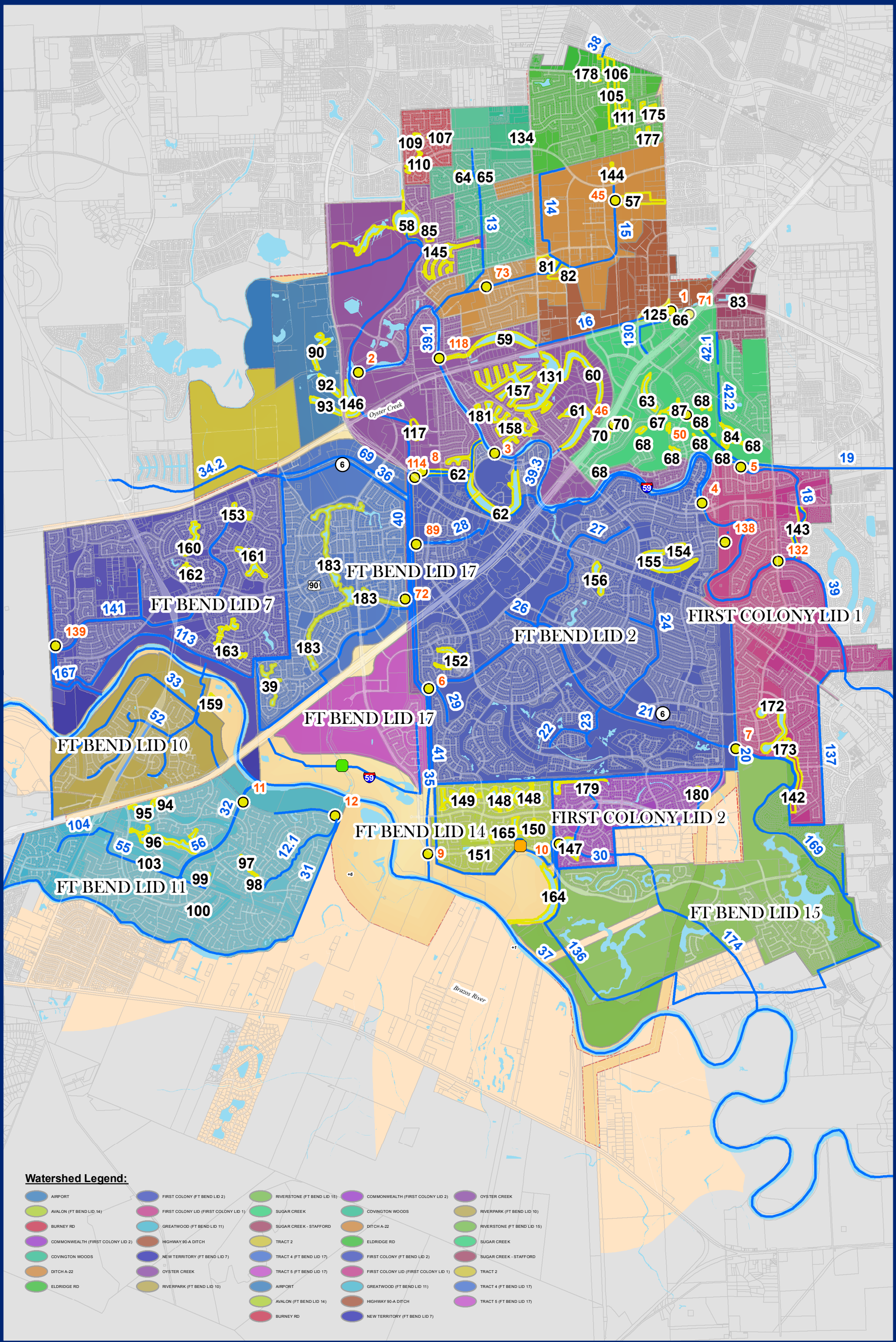


Exhibit 2: Watersheds and Drainage Facilities (Map)

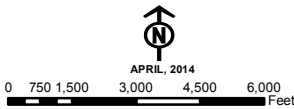


Watershed Legend:

- | | | | | |
|-----------------------------------|---------------------------------------|-----------------------------|---------------------------------------|-----------------------------|
| AIRPORT | FIRST COLONY (FT BEND LID 2) | RIVERSTONE (FT BEND LID 15) | COMMONWEALTH (FIRST COLONY LID 2) | OYSTER CREEK |
| AVALON (FT BEND LID 14) | FIRST COLONY LID (FIRST COLONY LID 1) | SUGAR CREEK | COVINGTON WOODS | RIVERPARK (FT BEND LID 10) |
| BURNEY RD | GREATWOOD (FT BEND LID 11) | SUGAR CREEK - STAFFORD | DITCH A-22 | RIVERSTONE (FT BEND LID 15) |
| COMMONWEALTH (FIRST COLONY LID 2) | HIGHWAY 90-A DITCH | TRACT 2 | ELDRIDGE RD | SUGAR CREEK |
| COVINGTON WOODS | NEW TERRITORY (FT BEND LID 7) | TRACT 4 (FT BEND LID 17) | FIRST COLONY (FT BEND LID 2) | SUGAR CREEK - STAFFORD |
| DITCH A-22 | OYSTER CREEK | TRACT 5 (FT BEND LID 17) | FIRST COLONY LID (FIRST COLONY LID 1) | TRACT 2 |
| ELDRIDGE RD | RIVERPARK (FT BEND LID 10) | AIRPORT | GREATWOOD (FT BEND LID 11) | TRACT 4 (FT BEND LID 17) |
| | | AVALON (FT BEND LID 14) | HIGHWAY 90-A DITCH | TRACT 5 (FT BEND LID 17) |
| | | BURNEY RD | NEW TERRITORY (FT BEND LID 7) | |

- | | |
|------------------------------------|---|
| 11 FORT BEND LID 14 PUMP STATION 1 | 70 INFRASTRUCTURE I REFERENCE NUMBER |
| 16 FORT BEND LID 17 PUMP STATION 2 | 95 INFRASTRUCTURE II REFERENCE NUMBER |
| INFRASTRUCTURE I | 101 INFRASTRUCTURE III REFERENCE NUMBER |
| INFRASTRUCTURE II | |
| INFRASTRUCTURE III | |
| | 70 INFRASTRUCTURE I REFERENCE NUMBER |
| | 95 INFRASTRUCTURE II REFERENCE NUMBER |
| | 101 INFRASTRUCTURE III REFERENCE NUMBER |

- | |
|---|
| LAKE, STREAMS, & CREEKS |
| CITY OF SUGAR LAND - CITY LIMITS |
| CITY OF SUGAR LAND - LIMITED PURPOSE ANNEXATION |
| CITY OF SUGAR LAND - ETJ |



APRIL, 2014
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CITY OF SUGAR LAND
MASTER DRAINAGE PLAN
EXHIBIT 2: WATERSHED & DRAINAGE

Exhibit 3: Drainage Inventory and Ownership (Table)

CITY OF SUGAR LAND
Master Drainage Plan
Exhibit 3 : Watershed & Drainage
Drainage Structure Inventory & Ownership

Facility ID No.	Facility Name	Owner (Based upon 2012 FBCAD Parcel Information, supplemented with miscellaneous data sources)	Infrst. Type	Location: City, ETJ, or FBC
AIRPORT WATERSHED				
39.2	Oyster Creek Channel (Upstream of Dam 1)	Unknown	II	City, ETJ
90	Sugar Land Airport Detention Ponds	City of Sugar Land	III	City
92	Sugar Land Airport Detention Pond Central	City of Sugar Land	III	City
93	Airport Detention Pond South	Texas Department of Criminal Justice, State of Texas	III	City
AVALON WATERSHED				
112	Avalon Watershed Levee	Fort Bend LID 14	II	City
148	Avalon Lake North	Fort Bend LID 14	III	City
149	Avalon Lake West	Fort Bend LID 14	III	City
150	Avalon Lake Central	Fort Bend LID 14	III	City
151	Avalon Lake South	Fort Bend LID 14	III	City
165	Gardens of Avalon Lake	Fort Bend LID 14	III	City
+1	Fort Bend LID 14 Pump Station 1	Fort Bend LID 14	II	City
BURNEY ROAD WATERSHED				
107	Glen Laurels Detention Pond - 1	Burney Road MUD	III	City
108	Glen Laurels Detention Pond - 2	Burney Road MUD	III	City
109	Glen Laurels Detention Pond - 3	Burney Road MUD	III	City
110	Glen Laurels Detention Pond - 4	Burney Road MUD	III	City
COMMONWEALTH WATERSHED				
10	Commonwealth Watershed Outfall	First Colony LID 2	I	City
30	Commonwealth Watershed Levee	First Colony LID 2	II	City
43	Commonwealth Outfall Ditch	First Colony LID 2	II	City
147	Alcorn Lake	First Colony LID 2	III	City
179	Commonwealth West Detention System	First Colony LID 2	III	City
180	Commonwealth East Detention System	First Colony LID 2	III	City
COVINGTON WOODS WATERSHED				
13	Covington Woods Channel	City of Sugar Land	II	City
64	Covington Woods Detention Ponds (West Pond)	Burney Road MUD	III	City
65	Covington Woods Detention Ponds (East Pond)	Burney Road MUD	III	City
134	West Airport Road Detention Pond	City of Sugar Land	III	City
DITCH A-22 WATERSHED				

14	Ditch B	City of Sugar Land	II	City
45	Ditch A-22 Pump Station	City of Sugar Land	I	City
57	Northeast Detention Pond	City of Sugar Land	III	City
73	Ditch A-22 Restrictor	City of Sugar Land	I	City
81	West Detention Ponds	City of Sugar Land	III	City
82	East Detention Ponds	City of Sugar Land	III	City
144	Ditch A-22 Headwater Pond	Sugar Land Industrial Park Maintenance Fund Inc		City
15	Ditch A-22 Channel	City of Sugar Land	II	-
ELDRIDGE ROAD WATERSHED				
38	Eldridge Road MUD Outfall	Unknown	II	FBC
91	Eldridge Road Watershed Detention Ponds	Ashford Lakes Community Improvement Association Inc	III	City
105	Eldridge Road Watershed & 271 Acre Feet Detention Pond	City of Sugar Land	III	In/Out ETJ
106	Eldridge Road Watershed Pond Expansion	Unknown	III	In/Out ETJ
111	Eldridge Road MUD Watershed Detention Ponds	Ashford Lakes HOA	III	City
175	Ashford Lakes Pond North	Ashford Lakes Community Improvement Association Inc	III	City
176	Ashford Lakes Pond West	Ashford Lakes Community Improvement Association Inc	III	City
177	Ashford Lakes Pond South	Ashford Lakes Community Improvement Association Inc	III	City
178	Barrington Place Detention Pond	Burney Road MUD	III	City
FIRST COLONY WATERSHED				
6	First Colony Ditch A Pump Station	Fort Bend LID 2	I	City
7	East Levee Gate Structure	Fort Bend LID 2	I	City
9	Ditch H Outfall Drop Structure	Fort Bend LID 2	I	City
20	First Colony Watershed Levee	Fort Bend LID 2	II	City
21	LID 2 Ditch A (alternate name: First Colony Ditch A)	Fort Bend LID 2	II	City
22	LID 2 Ditch B1 (alternate name: First Colony Ditch B1)	Fort Bend LID 2	II	City
23	LID 2 Ditch B (alternate name: First Colony Ditch B)	Fort Bend LID 2	II	City
24	LID 2 Ditch C (alternate name: First Colony Ditch C)	Fort Bend LID 2	II	City
25	LID 2 Ditch C1 (alternate name: First Colony Ditch C1)	Fort Bend LID 2	II	City
26	LID 2 Ditch D (alternate name: First Colony Ditch D)	Fort Bend LID 2	II	City
27	LID 2 Ditch E (alternate name: First Colony Ditch E)	Fort Bend LID 2	II	City
28	LID 2 Ditch F (alternate name: First Colony Ditch F)	Fort Bend LID 2	II	City
29	LID 2 Ditch G (alternate name: First Colony Ditch G)	Fort Bend LID 2	II	City
41	Ditch H (First Colony Watershed to Brazos River)	Fort Bend LID 2	II	City

62	Brooks Lake	First Colony Community Services Association Inc.	III	City
89	First Colony Ditch F Pump Station	Fort Bend LID 2	I	City
115	Brooks Lake Recirculation Pipe	Unknown	II	City
152	Crescent Lake	First Colony Community Services Association Inc	III	City
154	Edgewater Lake - East	First Colony Community Services Association Inc		City
155	Edgewater Lake - West	First Colony Community Services Association Inc	III	City
156	Grants Lake	Colony Grant HOA	III	City
FIRST COLONY LID WATERSHED				
5	Siphon Crossing of GCWA Canal	First Colony LID 1	I	City
39.3	Osyter Creek Channel (Downstream of Dam 3)	Unknown	II	City, ETJ
132	Dulles Street Crossing of Oyster Creek	Fort Bend County (Within ROW - City of Sugar Land)	I	City
137	First Colony LID Levee	First Colony LID 1	II	City, ETJ, County
138	City Parks	City of Sugar Land	II/I	City
142	Detention Pond South	First Colony LID 1	III	FBC
143	Detention Pond North	First Colony LID 1	III	FBC
172	First Colony LID Lake North	First Colony Community Services Assoc.	III	City
173	First Colony LID Lake South	First Colony Community Services Assoc., First Colony LID I	III	FBC
39	Oyster Creek Thru Fort Bend LID 1	First Colony LID 1	II	-
4	Dam 3 Across Oyster Creek	City of Sugar Land	I	-
169	Steepbank Creek	First Colony LID 1	II	-
GREATWOOD WATERSHED				
11	Greatwood Watershed Pump Station 1	Fort Bend LID 11	I	ETJ
12	Greatwood Watershed Pump Station 2	Fort Bend LID 11	I	ETJ
31	Greatwood Levee - Exterior	Fort Bend LID 11	II	ETJ
32	Drainage Channel	Fort Bend LID 11	II	ETJ
54	Greatwood Watershed Diversion Channels	Fort Bend LID 11	II	ETJ
55	Greatwood Watershed Diversion Channels	Fort Bend LID 11	II	ETJ
56	Greatwood Watershed Diversion Channels	Fort Bend LID 11	II	ETJ
94	Greatwood Watershed Detention Pond - 4	Greatwood Community Association Inc.	III	ETJ
95	Greatwood Watershed Detention Pond - 5	Fort Bend LID 11	III	ETJ
96	Greatwood Watershed Detention Pond - 6	Fort Bend LID 11	III	ETJ
97	Greatwood Watershed Detention Pond - 7	Greatwood Community Association Inc.	III	ETJ
98	Greatwood Watershed Detention Pond - 8	Greatwood Community Association Inc.	III	ETJ
99	Greatwood Watershed Detention Pond - 9	Texas Par Golf Academy Inc.	III	ETJ
100	Greatwood Watershed Detention Pond - 10	Texas Par Golf Academy Inc.	III	ETJ

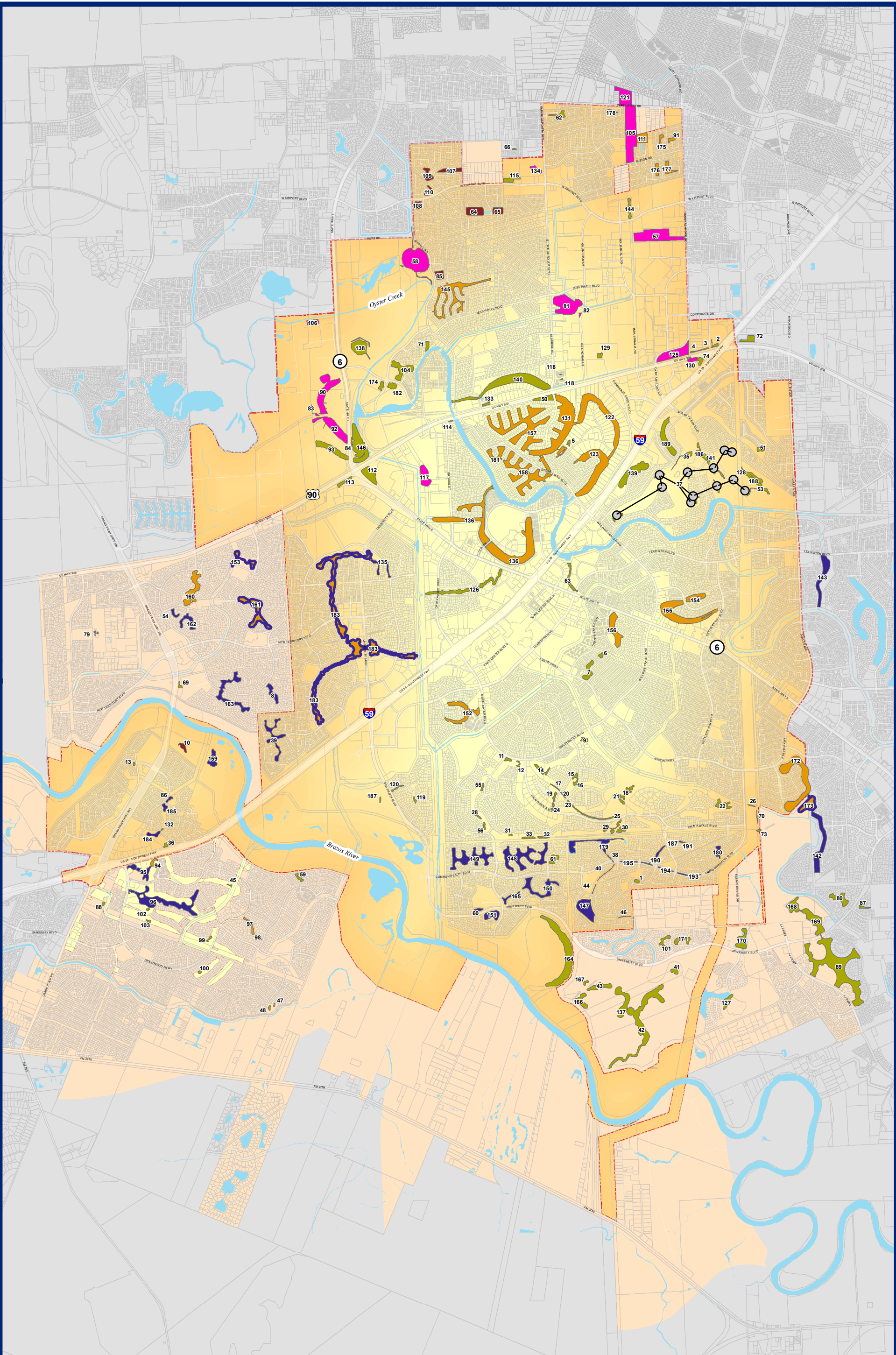
102	Greatwood Watershed Detention Pond - 11	Texas Par Golf Academy Inc.	III	ETJ
103	Greatwood Watershed Detention Pond - 12	Texas Par Golf Academy Inc.	III	ETJ
104	Greatwood Watershed Detention Pond - 13	Fort Bend County MUD 116	II	In/Out ETJ
171	Greatwood Outfall Channel	Fort Bend LID 11	II	City/ETJ
HWY 90-A DITCH WATERSHED				
1	Corporate Business Park Pump Station (Serving Industrial Park)	Morris William	I	City
16	Ditch Hwy 90-A From Cleveland Land To Dentention Pond	Fort Bend County	II	City
125	Regional Detention Pond	City of Sugar Land	III	City
NEW TERRITORY WATERSHED				
113	New Territory Watershed Levee	Fort Bend LID 7	II	ETJ
139	New Territory Pump Station	Fort Bend LID 7	I	ETJ
140	New Territory Ditch O	Fort Bend LID 7	II	ETJ
141	New Territory Ditch M	Fort Bend LID 7	II	ETJ
153	New Territory P1 & P2 Ponds	Fort Bend LID 7, New Territory Residential Community Association Inc.	III	ETJ
160	New Territory Pond North	New Territory Residential Community Association Inc.	III	ETJ
161	New Territory Pond East	New Territory Residential Community Association Inc., Fort Bend LID 7	III	ETJ
162	New Territory Pond West	Fort Bend LID 7	III	ETJ
163	New Territory Pond South	Fort Bend LID 7	III	ETJ
167	Ellis Creek Outfall	Fort Bend LID 7	II	ETJ
170	New Territory Ditch M Outfall Channel	Fort Bend LID 7	II	ETJ
OYSTER CREEK WATERSHED				
2	Oyster Creek Dam 1	City of Sugar Land	I	City
3	Oyster Creek Dam 2	City of Sugar Land	I	City
4	Oyster Creek Dam 3	City of Sugar Land	I	City
8	3 Amil D-800 Gates	City of Sugar Land	I	City
17	Brooks Lake Diversion Outlet (diversion ditch downstream of Amil Gates; see Facility 8)	Fort Bend LID 2, City of Sugar Land, State of Texas	II	City
39.1	Osyter Creek Channel (Downstream of Dam 1 to Dam 3)	Multiple Owners / Unknown	II	City/ ETJ
40	Ditch H (In Oyster Creek Watershed)	Fort Bend LID 2 & Fort Bend County Drainage District (FBCDD Maintains)	II	City/ ETJ
58	Gannoway Lake	City of Sugar Land	III	City
59	Cleveland Lake	Multiple Owners/Private	III	City
60	Alkire Lake	Alkire Lake Section II HOA, Gulf Coast Water Authority (GCWA)	III	City
61	Horseshoe Lake	Suagr Lakes Homeowners Assoc.	III	City
85	Gannoway Lakes Estates Detention Pond	Burney Road MUD	III	City
114	TX DOT Flapgates	State of Texas	I	City
117	Upper Ditch H Regional Detention	City of Sugar Land	III	City
118	Cleveland Lake Outfall @ Oyster Creek	Unknown (City Maintains Water Hyacinth Spraying)	I	City

123	Brooks Lake Diversion Channel (Diversion channel upstream of Amil Gates)	Fort Bend LID 2	II	City
126	Ditch H Extension Structure	Fort Bend County Drainage District	II	City
127	Horseshoe Lake Outfall To Oyster Creek	First Colony Community Services Assoc., City of Sugar Land and/or other unknown entity (s)	II	City
131	Eldridge Lake	Sugar Lakes Homeowners Assoc. and/or other unknown entities	III	City
145	Misty Lake	Sugar Mill Community Assoc., City of Sugar Land	III	City
146	Sugar Land Airport Pond East	Fort Bend Country Drainage District / State of Texas	III	City
157	Venetian Lake North	Lake Venetian Property Owners Assoc.	III	City
158	Venetian Lake South/ Sugar Lake	Sugar Lakes Homeowners Assoc.	III	City
166	Gannoway Lake Outfall	City of Sugar Land	II	City
181	Venetian Estates Lake West (Imperial Lake)	Sugar Lakes Homeowners Assoc.	III	City
RIVERPARK WATERSHED				
33	Riverpark Watershed Levee	Fort Bend LID 10	II	Citry
48	Detention Phase 2	Fort Bend LID 10	II	City
49	Grand Parkway Ditch	State of Texas	II	City
51	Detention Phase 3-5	Fort Bend LID 10, Fort Bend County Drainage District	II	City
52	Outfall Channel	Fort Bend LID 10	II	City
53	Detention Phas 1	Fort Bend LID 10	II	City
159	Riverpark Lake	Unknown	III	City
168	Outfall Channel	Fort Bend LID 10	II	City
RIVERSTONE WATERSHED				
136	LID 15 Riverstone Levee	Fort Bend LID No. 15	II	City/ETJ/County
164	Old River Oxbow Lake	Unknown	III	ETJ
169	Steepbank Creek	Fort Bend County Drainge District	II	ETJ/FBC
174	Alcorn Bayou	Fort Bend LID 15 / Unknown	II	City/ETJ/FBC
SUGAR CREEK WATERSHED				
18	Sugar Creek Channel	Riverbend Country Club & First Colony LID	II	City
19	GCWA Canal	Gulf Coast Water Authority (GCWA)	II	City
42.1	East Sugar Creek Channel	City of Sugar Land	II	City
42.2	CMP Arch Pipe (19'x12')	City of Sugar Land	II	City
46	Sugar Creek Golf Course Sluice Gate	City of Sugar Land	I	City
50	Sugar Creek Blvd Sluice Gate	City of Sugar Land	I	City
63	Jane Long Lake	Fort Bend County (No One Maintains)	III	City
66	Triangle Detention Pond	City of Sugar Land, State of Texas	III	City
67	Sugar Creek Country Club Lakes West	Sugar Creek Country Club (City Maintains)	III	City
70	Hwy 59 Ponds - Sugar Creek Country Club - South Pond	Fort Bend County	III	City
71	Tx Dot Detention Pond Pump Station	State of Texas	I	City
74	Tx Dot Detention Pond (with Pump Station - see Facility #71)	State of Texas	III	City
84	Sugar Creek Country Club Lakes West	Riverbend Country Club	III	City
87	North & South Pecan Lakes - North	Fort Bend Co Drainage District	III	City

88	North & South Pecan Lakes - South	Fort Bend Co Drainage District	III	City
130	Proposed RCP - Triangle Detention Pond To Jane Long Lake (underground)	City of Sugar Land	III	City
68	Sugar Creek Country Club Lakes	Riverbend Country Club & Sugar Creeek Country Club	III	City
SUGAR CREEK - STAFFORD				
83	East Sugar Creek (City of Stafford) Detention Pond	LIT Industrial Texas Limited Partnership	III	FBCDD
TRACT 2 WATERSHED				
34.2	Bullhead Slough (In ETJ, Outside City Limits)	Fort Bend County Drainage District	II	ETJ
TRACT 4 & 5 WATERSHED				
35	Levee - Tract 5	Fort Bend 17	II	City
36	Levee - Tract 4	Fort Bend County LID 17	II	City
37	Brazos River	Unknown	II	N/A
69	Realigned Bullhead Slough Realignment	Fort Bend County LID #17, City of Sugar Land, HEB Grocery Compant LP, Cathi LP	II	City
72	Telfair Watershed Pump Station No. 1	Fort Bend LID 17	I	City
75	Telfair Watershed Lake South (LV2 Storage Reservoir)	Fort Bend LID 17	III	City
78	Telfair Watershed Lake East (Main Storage)	Fort Bend LID 17 & Telfair HOA	III	City
"2"	Channel "A"	Fort Bend LID 17	III	City
"3"	Channel "B"	Fort Bend LID 17	III	City
"5"	MV-1 Channel / Perimeter Drainage Channel	Fort Bend LID 17	III	City
+6	Fort Bend LID 17 Pump Station 2	Fort Bend LID 17	II	City
"7"	US90A Bypass Storm Sewer Diversion	Fort Bend LID 17	III	City

This data has been produced from various sources. Every effort has been made to ensure the accuracy of this data. However, the City of Sugar Land assumes no liability or damages due to errors, or omissions.

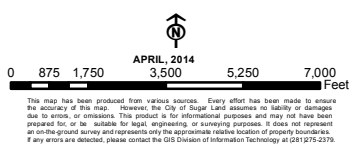
Exhibit 4: Detention Ponds (Map)



**CITY OF SUGAR LAND
MASTER DRAINAGE PLAN
EXHIBIT 4: DETENTION
PONDS/LAKES**

- CITY OWNERSHIP
- HOA OWNERSHIP
- HOA & LID OWNERSHIP
- LID OWNERSHIP
- MUD OWNERSHIP
- MULTIPLE / OTHER / PRIVATE OWNERSHIP

- 101** DETENTION PONDS LABELS
- LAKES, STREAMS, & CREEKS
 - CITY OF SUGAR LAND - ETJ
 - CITY OF SUGAR LAND - CITY LIMITS
 - CITY OF SUGAR LAND - LIMITED PURPOSE ANNEXATION



**Exhibit 5: Detention Ponds Inventory and Ownership
(Table)**

CITY OF SUGAR LAND
Master Drainage Plan
Exhibit 5 : Detention Ponds/Lakes
Drainage Structure Inventory & Ownership

Facility ID No.	Facility Name	Owner (Based upon 2013 FBCAD Parcel Information, supplemented with miscellaneous data sources)	Infrst. Type	Location: City, ETJ, or FBC	Deed Page No.	File Record #
AIRPORT WATERSHED						
83	Sugar Land Airport Detention Ponds	City of Sugar Land	III	City		
90	Sugar Land Airport Detention Ponds	City of Sugar Land	III	City	2001083251	R263242
92	Sugar Land Airport Detention Pond Central	City of Sugar Land	III	City	20010803251	R127532
93	Airport Detention Pond South	Texas Department of Criminal Justice, State of Texas	III	City	N/A	R156477
106	Sugar Land Airport Detention Ponds	City of Sugar Land	III	City		
AVALON WATERSHED						
60		Fort Bend LID 14	III	City		
61		Navarro Gabriel	III	City		
148	Avalon Lake North	Fort Bend LID 14	III	City		R222203
149	Avalon Lake West	Fort Bend LID 14	III	City		R255686
150	Avalon Lake Central	Fort Bend LID 14	III	City		R230503
151	Avalon Lake South	Fort Bend LID 14	III	City		R235451
165	Gardens of Avalon Lake	Fort Bend LID 14	III	City		R226226
BURNEY ROAD WATERSHED						
107	Glen Laurels Detention Pond - 1	Burney Road MUD	III	City	2004083958	R264997
108	Glen Laurels Detention Pond - 2	Burney Road MUD	III	City	99080406	R22234
109	Glen Laurels Detention Pond - 3	Burney Road MUD	III	City	2000051480	R238178
110	Glen Laurels Detention Pond - 4	Burney Road MUD	III	City	99080406	R222354
COMMONWEALTH WATERSHED						
1		Commonwealth Civic Association	III	City		
38		First Colony LID 2	III	City		
40		Fort Bend County	III	City		
44		Fort Bend County	III	City		
46		First Colony LID 2	III	City		
147	Alcorn Lake	First Colony LID 2	III	City		R142966
179	Commonwealth West Detention System	First Colony LID 2	III	City		R150239
180	Commonwealth East Detention System	First Colony LID 2	III	City		R140069
189		Commonwealth Civic Association	III	City		
190		First Colony LID 2	III	City		
191		First Colony LID 2	III	City		
192		First Colony LID 2	III	City		

193		First Colony LID 2	III	City		
194		First Colony LID 2	III	City		
195		First Colony LID 2	III	City		
196		First Colony LID 2	III	City		
COVINGTON WOODS WATERSHED						
64	Covington Woods Detention Ponds (West Pond)	Burney Road MUD	III	City	2006090060	R314485
65	Covington Woods Detention Ponds (East Pond)	Burney Road MUD	III	City	2006090060	R314489
66		Rode Enterprises	III	FBC		
115		West Airport Property Owners Association Inc	III	City		
134	West Airport Road Detention Pond	City of Sugar Land	III	City	2003148328	R311127
DITCH A-22 WATERSHED						
57	Northeast Detention Pond	City of Sugar Land	III	City	2007062163	R222129
81	West Detention Ponds	City of Sugar Land	III	City	2007062166	R137666
82	Gillingham Detention Pond	City of Sugar Land	III	City		
129		Schlumberger Tech Corp.	III	City		
144	Ditch A-22 Headwater Pond	Sugar Land Industrial Park Maintence Fund Inc	III	City		
ELDRIDGE ROAD WATERSHED						
62		Eldridge Lake community Association Inc.	III	City		
91	Eldridge Road Watershed Detention Ponds	Ashford Lakes Community Improvement Association Inc	III	City		
105	Eldridge Road Watershed & 271 Acre Feet Detention Pond	City of Sugar Land	III	City		R138826
111	Eldridge Road MUD Watershed Detention Ponds	Ashford Lakes HOA	III	City		
121	Eldridge Road Watershed Pond Expansion	City of Sugar Land	III	ETJ		R123646
175	Ashford Lakes Pond North	Ashford Lakes Community Improvement Association Inc	III	City		
176	Ashford Lakes Pond West	Ashford Lakes Community Improvement Association Inc	III	City	2011008466	R263859
177	Ashford Lakes Pond South	Ashford Lakes Community Improvement Association Inc	III	City	2011008466	R279396
178	Barrington Place Detention Pond	Burney Road MUD	III	City	2006095120	R306280
FIRST COLONY WATERSHED						
11		WSG Sweetwater IV LP	III	City		
12		WSG Sweetwater IV LP	III	City		
14		WSG Sweetwater IV LP	III	City		
15		WSG Sweetwater IV LP	III	City		
16		WSG Sweetwater IV LP	III	City		
17		WSG Sweetwater IV LP	III	City		
18		WSG Sweetwater IV LP	III	City		
19		WSG Sweetwater IV LP	III	City		
20		WSG Sweetwater IV LP	III	City		
21		WSG Sweetwater IV LP	III	City		
22		WSG Sweetwater IV LP	III	City		
23		First Colony Community Services Association Inc.	III	City		
24		WSG Sweetwater IV LP	III	City		
25		First Colony Community Services Association Inc.	III	City		

26		Centerpoint Energy Houston Electric LLC	III	City		
27		WSG Sweetwater IV LP	III	City		
28		WSG Sweetwater IV LP	III	City		
29		WSG Sweetwater IV LP	III	City		
30		WSG Sweetwater IV LP	III	City		
31		WSG Sweetwater IV LP	III	City		
32		WSG Sweetwater IV LP	III	City		
33		WSG Sweetwater IV LP	III	City		
34		First Colony MUD 10	III	City		
55		WSG Sweetwater IV LP	III	City		
56		WSG Sweetwater IV LP	III	City		
70		Fort Bend LID 2	III	City		R163358
136	Brooks Lake	First Colony Community Services Association Inc.	III	City	2001060757	R260584
152	Crescent Lake	First Colony Community Services Association Inc	III	City		R163358
154	Edgewater Lake - East	First Colony Community Services Association Inc	III	City		R129201
155	Edgewater Lake - West	First Colony Community Services Association Inc	III	City		R30051
156	Grants Lake	Colony Grant HOA	III	City		R20890
FIRST COLONY LID WATERSHED						
73		Centerpoint Energy Houston Electric LLC	III	City		
142	Detention Pond South	First Colony LID 1	III	FBC	9542960	R195444
143	Detention Pond North	First Colony LID 1	III	FBC	9668335	R162509
172	First Colony LID Lake North	First Colony Community Services Assoc.	III	City		R39608
173	First Colony LID Lake South	First Colony Community Services Assoc.	III	FBC		R39607
		First Colony LID 1	III	City		
GREATWOOD WATERSHED						
45		Texas Par Golf Academy Inc.	III	ETJ		
47		Greatwood Community Association Inc.	III	ETJ		
48		Greatwood Community Association Inc.	III	ETJ		
59		Greatwood Community Association Inc.	III	ETJ		
88		Sugar Land At Greatwood LP	III	ETJ		
94	Greatwood Watershed Detention Pond - 4	Greatwood Community Association Inc.	III	ETJ	9880652	R225778
95	Greatwood Watershed Detention Pond - 5	Fort Bend LID 11	III	ETJ	9880652	R225777
96	Greatwood Watershed Detention Pond - 6	Fort Bend LID 11	III	ETJ	2408	R142785
97	Greatwood Watershed Detention Pond - 7	Greatwood Community Association Inc.	III	ETJ	2002078538	R226366
98	Greatwood Watershed Detention Pond - 8	Greatwood Community Association Inc.	III	ETJ	2000091509	R243264
99	Greatwood Watershed Detention Pond - 9	Texas Par Golf Academy Inc.	III	ETJ	2005132861	R184573
100	Greatwood Watershed Detention Pond - 10	Texas Par Golf Academy Inc.	III	ETJ	2005132861	R181308
102	Greatwood Watershed Detention Pond - 11	Texas Par Golf Academy Inc.	III	ETJ	2005132861	R163937

103	Greatwood Watershed Detention Pond - 12	Texas Par Golf Academy Inc.	III	ETJ	2005132861	R142777
HWY 90-A DITCH WATERSHED						
3		GSL Fund 21 & Sub D LLC	III	City		
4		Morris William	III	City		
118		Eldridge Pointe Office Condos	III	City		
125	Regional Detention Pond	City of Sugar Land	III	City	2011082696	R159272
NEW TERRITORY WATERSHED						
8		Fort Bend LID 7	III	FBC		
10		Fort Bend MUD 1	III	City		
13		Riverpark on the Brazos Property Association Inc.	III	City		
54		Fort Bend LID 7	III	FBC		
69		New Territory Residential Community Association Inc.	III	FBC		
77		Parker David A & Margaret C	III	FBC		
78		Parker David A & Margaret C	III	FBC		
79		Parker David A & Margaret C	III	FBC		
86		Fort Bend LID 10	III	City		
153	New Territory P1 & P2 Ponds	New Territory Residential Community Association Inc.	III	FBC		
		Fort Bend LID 7	III	City		
160	New Territory Pond North	New Territory Residential Community Association Inc.	III	FBC		R154124
161	New Territory Pond East	New Territory Residential Community Association Inc.	III	FBC		R212126
		Fort Bend LID 7		City		
162	New Territory Pond West	Fort Bend LID 7	III	FBC		R163711
163	New Territory Pond South	Fort Bend LID 7	III	FBC	9744075	R214844
OYSTER CREEK WATERSHED						
5		Young Billy E & Sharon S	III	City		
6		Sinha Ashish	III	City		
7		Reedy James S Jr & Donna H	III	City		
9		WSG Sweetwater IV LP	III	City		
50		Westbrook Eileen	III	City		
58	Gannoway Lake	City of Sugar Land	III	City		R40882-R408829
63		First Colony Community Services Assoc	III	City		
71		Oyster Creek Property Owners Association Inc	III	City		
84		State of Texas	III	City		
85	Gannoway Lakes Estates Detention Pond	Burney Road MUD	III	City	2006090058	R268231
104	Imperial Development Lake SL1	Imperial Redevelopment District	III	City		
112		State of Texas	III	City		
114		Texas Department of Transportation	III	City		
117	Upper Ditch H Regional Detention	City of Sugar Land	III	City	2008123431	R275252
122	Alkire Lake	Alkire Lake Section II HOA, Gulf Coast Water Authority (GCWA)	III	City		R31427-R314279
123	Horseshoe Lake	Suagr Lakes Homeowners Assoc.; Gulf Coast Water Authority (GCWA)	III	City		R31418-R314189
126		Fort Bend LID 2	III	City		
131	Eldridge Lake	Sugar Lakes Homeowners Association	III	City		R31423

133		Orchard-Sugar Land Property Owners Association Inc	III	City		
135		Fort Bend LID 17	III	City		
138	Imperial Development Lake NL1	Imperial Redevelopment District	III	City		
140	Cleveland Lake	Cherokee Sugar Land LP/ Permanent School Fund & Others	III	City		R40657-R406579
145	Misty Lake	Sugar Mill Community Assoc.	III	City	133	R126018
146	Sugar Land Airport Pond East	Fort Bend Country Drainage District / State of Texas	III	City		
157	Venetian Lake North	Venetian Estates Property Owners Assoc.	III	City		R405720-R405729
158	Venetian Lake South	Sugar Lakes Homeowners Assoc.	III	City	99109146	R195690
174	Imperial Development Lake SL3	Imperial Redevelopment District	III	City		
181	Venetian Estates Lake West	Sugar Lakes Homeowners Assoc.	III	City	99109146	R195628
182	Imperial Development Lake SL2	Imperial Redevelopment District	III	City		
RIVERPARK WATERSHED						
36		State of Texas	III	City		
132		Fort Bend County	III	City		
159	Riverpark Lake	Fort Bend LID 10	III	City		
184		Fort Bend LID 10	III	City		
185		Fort Bend LID 10	III	City		
RIVERSTONE WATERSHED						
41		Sugarland Ranch Dvmt LLC	III	FBC		
42		Sugarland Ranch Dvmt LLC	III	FBC		
43		Sugarland Ranch Dvmt LLC	III	FBC		
80		Multiple Owners	III	FBC		
87		Frost Ranch Development LLC	III	FBC		
89		Sugar Land Ranch Dvmt II Corp	III	FBC		
101		Taylor Morrison of Texas Inc	III	FBC		
127		Hillsboro Estates LLC	III	FBC		
137		Sugarland Ranch Dvmt LLC	III	FBC		
164	Old River Oxbow Lake	Sugar Land Ranch Development LLC	III	City		R143996
166		Sugarland Ranch Dvmt LLC	III	FBC		
167		Sugarland Ranch Dvmt LLC	III	FBC		
168		Fort Bend LID 15	III	FBC		
169		Fort Bend LID 15	III	FBC		
170		Sugarland Ranch Dvmt LLC	III	FBC		
171		Taylor Morrison of Texas Inc	III	FBC		
SUGAR CREEK WATERSHED						
2		State of Texas	III	City		
35	Sugar Creek Country Club Lakes West	Sugar Creek Country Club (City Maintains)	III	City		R31386-R313869
37 [37.1 - 37.16]	Sugar Creek Country Club Lakes	Riverbend Country Club & Sugar Creeek Country Club	III	City		R31386-313869
51		Moore Olga	III	City		
52		Sugar Creek Country Club	III	City		
53		Riverbend Country Club	III	City		
72		Kirkwood Southwest Assoc. LTD	III	FBC		

74	Tx Dot Detention Pond (with Pump Station - see Facility #71)	State of Texas	III	City		
128		Centerpoint Energy Houston Electric LLC	III	City		
130	Triangle Detention Pond	City of Sugar Land, State of Texas	III	City		R129250
139	Hwy 59 Ponds - Sugar Creek Country Club - South Pond	Fort Bend County	III	City	181	R147132
141	North & South Pecan Lakes - South	Fort Bend Co Drainage District	III	City		
186	North & South Pecan Lakes - North	Fort Bend Co Drainage District	III	City	181	R151604
188	Sugar Creek Country Club Lakes West	Riverbend Country Club	III	City		
189	Jane Long Lake	Fort Bend County (No One Maintains)	III	City	181	R147433
TRACT 4 & 5 WATERSHED						
39	Telfair Watershed Lake South (LV2 Storage Reservoir)	Fort Bend LID 17	III	City		R398741
119		Taylor Morrison of Texas Inc	III	City		
120		Taylor Morrison of Texas Inc	III	City		
183	Telfair Watershed Lake East (Main Storage)	Fort Bend LID 17	III	City		
		Telfair HOA	III	City		
187		University of Houston System	III	City		
OUTSIDE OF ALL WATERSHEDS						
113		State of Texas	III	City		

This data has been produced from various sources. Every effort has been made to ensure the accuracy of this data. However, the City of Sugar Land assumes no liability or damages due to errors, or omissions.

Exhibit 6: Ranking and Prioritizing CIP Projects

INSTRUCTIONS FOR USING RANKING FORMS

Introduction

The Severity Ranking Method uses two ranking tables; copies of the two severity ranking tables are at the end of this set of instructions. Both tables are Excel spreadsheets which provide places for entry of data and perform particular calculations using the entered data. The ranking process can be applied not only to a drainage problem but also to a project which is intended to deal with the problem, the project ranking then reflecting the severity of the drainage problem the project is intended to remedy.

Two types of people are assumed to be involved in using the ranking tables for rating the severity or seriousness of a drainage or flooding problem, event, or occurrence, which collected are referred to as a "drainage problem."

- **Policymaker:** A Policymaker (also called a decision-maker) has the ability to establish the relative importance of factors which characterize the severity of a drainage problem. The factors selected by the Policymaker, once selected, should remain unchanged over time as different drainage problems are evaluated. The relative importance of the factors, once selected, should, likewise, remain unchanged over time.
- **Evaluator (also sometimes referred to as an Inspector):** A person, typically a City employee, who rates the severity of a drainage problem using the factors established by Policymaker.

The Evaluator has the option to use one or both of two methods: Method 1 and/or Method 2. It is Policymaker's decision as to which method or methods are to be used by the Evaluator.

- **Method 1:** A simplified, experienced-based method to rate the severity of a flooding event. Method 1 is implemented using "Primary Ranking Factor Table 1" spreadsheet (see attached table).
- **Method 2:** A method which examines and scores individual factors which are used to characterize the severity of a drainage problem. Method 2 using both the "Primary Ranking Factor Table 1" and "Mitigating Factors Table 2" spreadsheet (see attached tables).

The spreadsheets are linked, so that if Method 2 is to be used, both the Table1 and Table 2 spreadsheets must be active and in the same Excel notebook. Data entered in one place is automatically transferred to other places in the spreadsheets where it is needed. A particular piece of information is entered only once (at the proper location); it is not and should not be copied by the Policymaker or the Evaluator to another location in the spreadsheet.

Method 1 is rather subjective; Method 2 is considerably less subjective than Method 1, but is not fully objective. Application of either method results in a drainage problem rating in the range of zero to 100, irrespective of how weighting factors are assigned by the Policymaker.

If one method is not used (as indicated by assigning no ratings for the method), the rating sheet will indicate the method was not used.

Implementing either of the two methods has two basic steps:

- **Step 1:** The Policymaker assigns rating weights to reflect policy preferences as to the relative importance of factors affecting the severity of a flooding event. Once this step is complete, the assigned ratings should be not changed; the weightings should be consistently utilized. Places where data should be entered by the Policymaker are indicated in light blue shading in Tables 1 and 2. Suggested Policymaker values are already assigned in the sample table provided, but the policy maker can change these values if desired.
- **Step 2:** Once the Policymaker selects values for the policy-determined factors, the Evaluator can use the tables to assign values to particular and various parameters and factors to reflect the Evaluator's estimate of the severity of various conditions describing the flooding event and its consequences.

Step 1: Using Policy to Select Weighting Factors

On Table 1, the Policymaker should set numerical values giving relative weights to describe the relative importance of three impact factors that are used to describe a drainage problem:

- **Structural Flooding**, which addresses the severity of drainage impacts on structures
- **Street Flooding**, which addresses the severity of drainage behavior on vehicle movement
- **Quality of Life**, which address the impact of drainage conditions on general activities of the citizens at large

In Table 1, these factors are listed and assigned (by the Policymaker) numerical values which define the relative importance of these three impact factors. Any numerical values (greater than zero) can be assigned; it is their relative size that is important. Suggested values are 60, 40, and 20 for structural flooding, street flooding and quality of life, respectively. If Method 1, only, is to be used, no additional information must be entered by the Policymaker. If the Policy maker wishes to make one of these three impact factors zero (i.e., excluded from the evaluation of problem severity), a very small value (e.g., 0.0001) should be assigned to the value to make it become virtually zero in importance.

If Method 2 is to be used, then in addition, the Policymaker must assign weighting values for mitigating factors in Table 1 (these weighting values are automatically transferred to Table 2 for use by the Evaluator). In Table 1, specific "mitigating factors" are identified under the headings of Structural Flood (factors 1 to 9), Street Flooding (factors 10 to 13), and Quality of Life (factors 14 to 16). Relative weights, reflecting the policymaker preferences, should be assigned to the factors within each grouping. That is, the relative weights assigned to the 9 factors for Structural Flooding should be based upon their relative importance to Structural Flooding only, not Street Flooding or Quality of Life. The relative importance of the Structural Flooding mitigating factors is material only to Structural Flooding. The mitigating

factors for Street Flooding and Quality of Life are likewise independently selected. Suggested values are given in the light blue cells in Table 1.

In Table 2 (when using Method 2), the mitigation factors are detailed with potential ratings that might be assigned to each mitigating factor. The maximum value of each mitigating factor rating is defined at the head of the example ratings; one maximum is assigned to all mitigating factors. The Evaluator can select a convenient maximum rating (its absolute value is not important; the value is automatically scaled to reflect Policymaker preferences); a value of 5 is suggested. Potential rating values are then assigned by the Evaluator to each mitigating factor, each assigned value to be less than or equal to the maximum value, with the order of values such that they increase from small to the large.

Step 2: Rating Procedure by the Evaluator

The Evaluator uses Table 1, only, if using Method 1 is used; Tables 1 and 2 are used if Method 2 is used. In either method, when evaluating a particular flooding event, complete the information at the top of Table 1 identifying and describing the general character of the problem and where it was located irrespective of whether Method 1 or Method 2 is used. The places in where Table 1 where this general information is to be provided is shaded in light yellow. Method 1 and 2 are implemented as follows:

Method 1. The Evaluator merely provides his subjective rating for each of the three impact factors based upon the maximum possible value assigned by the Policymaker. For example, if structural flooding is assigned a maximum rating of 60 and the Evaluator, based upon his experience and judgment, believes the flooding event, in so far as structural impacts are concerned, is about $\frac{1}{2}$ as bad as the worse case of structural flooding that might have occurred, the Evaluator might give a rating of 30 to the structural impact factor.

Method 2. The Evaluator works directly with Table 2, assigning a value in the range of zero to the maximum value for each factor. If a factor does not apply, assign a value of zero. Assigning values to all mitigating factors automatically results in a computed score between 0 and 100.

TABLE 1 OF RANKING METHOD

FLOODING EVENT RANKING SYSTEM-PRIMARY SCORING-TABLE 1		TRACKING NO.	
DRAINAGE/FLOODING PROBLEM DESCRIPTION		Report data	
City Inspector		Flooding date	
Person reporting problem & contact information:		Rating for Method 1 (max of 100) = 66.7	
		Rating for Method 2 (max of 100) = 66.9	
Description of problem (include location):			
NOTE: The evaluator ratings for Method 1 are assumed example values			
NOTE: The evaluator ratings for Method 2 listed in Table 2 are assumed example values			
POLICY-BASED WEIGHTING FACTORS ARE USED TO EMPHASIS RELATIVE IMPORTANCE OF DIFFERENT IMPACTS: Policy-based weighting factor are used to give the relative importance of various impacts (structural flooding, street flooding, quality of life); this policy based factor can adjust to reflect to relative importance of impact to city. Values selected for weighing can be any positive value; their relative magnitude is what is important. It is suggested that factors be selected on a scale of 1 to 100, corresponding to very low relative importance to very high relative importance.			
Weighting Factor (>0) for STRUCTURAL FLOODING :		60	
Weighting Factor (>0) for STREET FLOODING :		40	
Weighting Factor (>0) for QUALITY OF LIFE :		20	

METHOD 1 OF RANKING (no mitigating factors used)		Maximum Possible Rating	Inspector rating (leave all blank if not using this method)
STRUCTURAL FLOODING with maximum score =		60.00	30.00
STREET FLOODING with maximum score =		40.00	35.00
QUALITY OF LIFE with maximum score =		20.00	15.00

METHOD 2 OF RANKING: Uses mitigating factors to determine impacts of different specific effects, as listed below			
Use second sheet (mitigating rating sheet) to rate individual mitigating factors; relative importance of factors can be changed by changing the values listed under the column to the right entitled "Policy-based Maximum Mitigating Factor Rating" (values shaded in light blue). Values determined using this second sheet automatically transfer to this summary sheet in the column on the right entitled "Mitigating Factor Rating (from mitigation rating sheet)".		Policy-base Maximum Mitigating Factor Rating	Scaled Mitigating Factor Rating (from mitigation rating sheet-Table 2; Evaluator not to fill this column in on this sheet; use Table 2)
STRUCTURAL FLOODING			
Mitigating Factor 1:	Type of Structure	5	4.00
Mitigating Factor 2:	Maximum Flooding Depth in Structure	5	4.00
Mitigating Factor 3:	Source of Flooding	3	3.00
Mitigating Factor 4:	Spatial Extent of Structural Flooding	4	1.60
Mitigating Factor 5:	Value of Structure	3	1.80
Mitigating Factor 6:	Type of Structure Use	2	1.60
Mitigating Factor 7:	Codes and Standards	2	2.00
Mitigating Factor 8:	Floodplain impact	3	1.20
Mitigating Factor 9:	Frequency of Flooding	4	0.80
sum		31.0	20.00
STREET FLOODING			
Mitigating Factor 10:	Access and Use of Roadway	5	4.00
Mitigating Factor 11:	Location of flooding	4	1.60
Mitigating Factor 12:	Duration of flooding	3	2.40
Mitigating Factor 13:	Frequency of Flooding	4	3.20
sum		16.0	11.20
QUALITY OF LIFE			
Mitigating Factor 14:	Health & Safety	5	3.00
Mitigating Factor 15:	Economic Impacts (beyond structure damage)	3	1.80
Mitigating Factor 16:	Nuisance Factor	2	2.00
sum		10.0	6.80

Score Using No-Mitigation Methodology (0 to 100)	66.67
Score Using Mitigation Methodology (0 to 100)	66.92

Note 1: The numbers in light blue shaded areas are policy based values and can be changed to reflect city policy

Note 2: The yellow areas are informational data to be completed by Inspector

Note 3: Dark gray shaded areas are to be filled in by Inspector for rating of flood severity

TABLE 2 OF RANKING METHOD

FLOODING OR DRAINAGE PROBLEM RANKING SYSTEM: MITIGATING FACTOR ADJUSTMENTS					Continuation Sheet	
USE THIS SHEET ONLY IF MITIGATION METHOD IS TO BE USED						
CATEGORY OF FLOODING OR DRAINAGE PROBLEM			TRACKING NO.		0	
Mitigation Factor			Report date		1/0/1900	
Mitigation Level description			Flooding date		1/0/1900	
Factor ID No.	Note: The mitigation level descriptions are only indicative of the severity of the flooding problem and are intended only as a guide; inspector should use experience and judgment in applying rating to each mitigation factor. If the factor does not apply, set rating to zero. If factor does apply, set rating to any value between zero and maximum of 5. Level of severity in mitigation levels should go from lowest to highest in listing as one goes down in list.	Policy-based Mitigation Weighting Factor (for reference)	Policy-based Mitigation Level Ratings: Set to range of zero to 5	Inspection-based mitigation level rating in range of 0 to maximum of 5	Computed Mitigation Score (relative to policy-based maximum)	
STRUCTURAL FLOODING						
1	Type of Structure	5			4.00	
	Property only (structure not affected)		0.5	Put rating in range of 0 to 5 in shadowed area		
	Non Habital Structure (e.g., garage, tool shed; swimming pool)		2.0			
	Habital Structure (e.g., residence, office building, library, church)		5.0	4		
2	Maximum Flooding Depth In Structure	5			4.00	
	Water in structure but less than 6 inches less than 1 hour duration		1.0	Put rating in range of 0 to 5 in shadowed area		
	Water in structure but less than 6 inches more than 1 hour duration		3.0			
	Water in structure and more than 6 inches		5.0	4		
3	Source of Flooding	3			3.00	
	Water in structure due to poor yard or land drainage		1.0	Put rating in range of 0 to 5 in shadowed area		
	Water in structure due to street or gutter overflow or storm sewer backup		3.0			
	Water in structure due to overflow from river, creek, drainage ditch		5.0	5		
4	Spatial Extent of Structural Flooding	4			1.60	
	One structure (e.g., residence) flooded		1.0	Put rating in range of 0 to 5 in shadowed area		
	Several adjacent structures flooded (but less than full block of flooding)		3.0			
	About one block of structures flooded		4.0	2		
	Several or more blocks of structures flooded		5.0			
5	Value of Structure	3			1.80	
	Low value structures (less than \$50,000)		1.0	Put rating in range of 0 to 5 in shadowed area		
	Med-value structures (\$50,000 to \$250,000)		3.0			
	High value structures (more than \$250,000)		5.0	3		
6	Type of Structure Use	2			1.60	
	Commercial building (not providing essential community services)		1.0	Put rating in range of 0 to 5 in shadowed area		
	Residence		3.0			
	Important community services building (e.g., school, city hall, electric power station)		4.0	4		
	Critical public service building (e.g., hospital, fire station)		5.0			
7	Codes and Standards	2			2.00	
	Structure not built to current code but current code in force at time of construction		1.0	Put rating in range of 0 to 5 in shadowed area		
	Structure likely not built to prior code at time of construction		2.0			
	Structure built to prior code at time of construction		4.0	5		
	Structure built to current code		5.0			
8	Floodplain Impact	3			1.20	
	Structure in 100-year floodplain		1.0	Put rating in range of 0 to 5 in shadowed area		
	Structure in 500-year floodplain and beyond 100-year floodplain		2.0			
	Structure not in floodplain		3.0	2		
	Flooding occurs within levee protected area due to levee or pump system malfunction		5.0			
9	Frequency of Flooding	4			0.80	
	Rarely floods or never flooded before		1.0	Put rating in range of 0 to 5 in shadowed area		
	Infrequent flooding, occurs about once every 5 years		3.0			
	Frequent flooding, commonly occurs 2 or more times per year		5.0	1		
STREET FLOODING						
10	Access and Use of Roadway	5			4.00	
	Only slows vehicles; general vehicle movement only slowed		1.0	Put rating in range of 0 to 5 in shadowed area		
	Stops most vehicles but not emergency vehicles		3.0			
	Emergency response vehicles cannot get through		5.0	4		
11	Location of flooding	4			1.60	
	Side street, dead end street, culdesac, similar		1.0	Put rating in range of 0 to 5 in shadowed area		
	Primary city street (boulevard, parkway, avenue, main subdivision street)		2.0			
	Minor arterial or collector, county road		3.0	2		
	Federal or state highway		4.0			
	Emergency response access route		5.0			
12	Duration of flooding	3			2.40	
	Less than 3 hours		1.0	Put rating in range of 0 to 5 in shadowed area		
	3 hours to 12 hours		3.0			
	More than 12 hours		5.0	4		
13	Frequency of Flooding	4			3.20	
	Rarely floods, or never flooded before		1.0	Put rating in range of 0 to 5 in shadowed area		
	Infrequent flooding, occurs about once every 5 years		3.0			
	Frequent flooding, commonly occurs 2 or more times per year		5.0	4		
QUALITY OF LIFE						
14	Health & Safety	5			3.00	
	Flood waters contain excessive or obvious floatables (e.g., paper cups)		1.0	Put rating in range of 0 to 5 in shadowed area		
	Flooding likely to produce long term standing water and promote mosquitoes		3.0			
	Flood waters likely contain sewage or other dangerous materials		5.0	3		
15	Economic Impacts (beyond structure damage)	3			1.80	
	Loss of customers or business revenue for extended period		1.0	Put rating in range of 0 to 5 in shadowed area		
	Long term loss of property or building use		3.0			
	Forced sale of property or loss of property ownership		5.0	3		
16	Nuisance Factor	2			2.00	
	Long term standing water promotes aquatic vegetation or undesirable visual impacts		1.0	Put rating in range of 0 to 5 in shadowed area		
	Excessive standing water promotes car splash or vehicle hydroplaning		2.0			
	Slow drainage impedes traffic for extended period		3.0	5		
	Ineffective drainage prevents access to homes or businesses for extended period		5.0			

Note 1: The numbers in light blue shaded areas are policy based values and can be changed to reflect city policy

Note 2: Dark gray shaded areas are to be filled in for rating of mitigating flood factors

Exhibit 7: Flooding/Drainage Problem Field Checklist

FLOODING/DRAINAGE PROBLEM FIELD CHECKLIST

Tracking NO.
Staff:
Event Date

CATEGORY OF FLOODING/DRAINAGE PROBLEM

STRUCTURAL FLOODING

1	Type of Structure Property Only (Structure not affected) Habitual Structure (e.g. residence, office building, library, church) Non Habital Structure (e.g. garage, tool shed, swimming pool)	☐ ☐ ☐
2	Maximum Flooding Depth in Structure Water in structure but less than 6 inches less than 1 hour duration Water in structure but less than 6 inches more than 1 hour duration Water in structure more and 6 inches	☐ ☐ ☐
3	Source of Flooding Water in structure due to poor yard or land drainage Water in structure due to street or gutter overflow or storm sewer backup Water in structure due to overflow from river, creek, drainage ditch	☐ ☐ ☐
4	Spatial Extent of Structural Flooding One Structure (e.g. residence) flooded Several adjacent structures flooded (but less than full block of flooding) About one block of structures flooded Several or more blocks of structures flooded	☐ ☐ ☐ ☐
5	Type of Structure Use Commercial Building (not providing essential community services) Residence Important community services building (e.g. school, city hall, electric power station) Critical Public Service Building (e.g. hospital, fire station)	☐ ☐ ☐ ☐
6	Floodplain Impact Structure in 100-year floodplain Structure in 500-year floodplain Structure not in floodplain Flooding occurs within levee protected area due to levee or pump system malfunction	☐ ☐ ☐ ☐
7	Frequency of Flooding Rarely floods or never flooded before Infrequent flooding, occurs about once every 5 years Frequent flooding, commonly occurs 2 or more times a year	☐ ☐ ☐

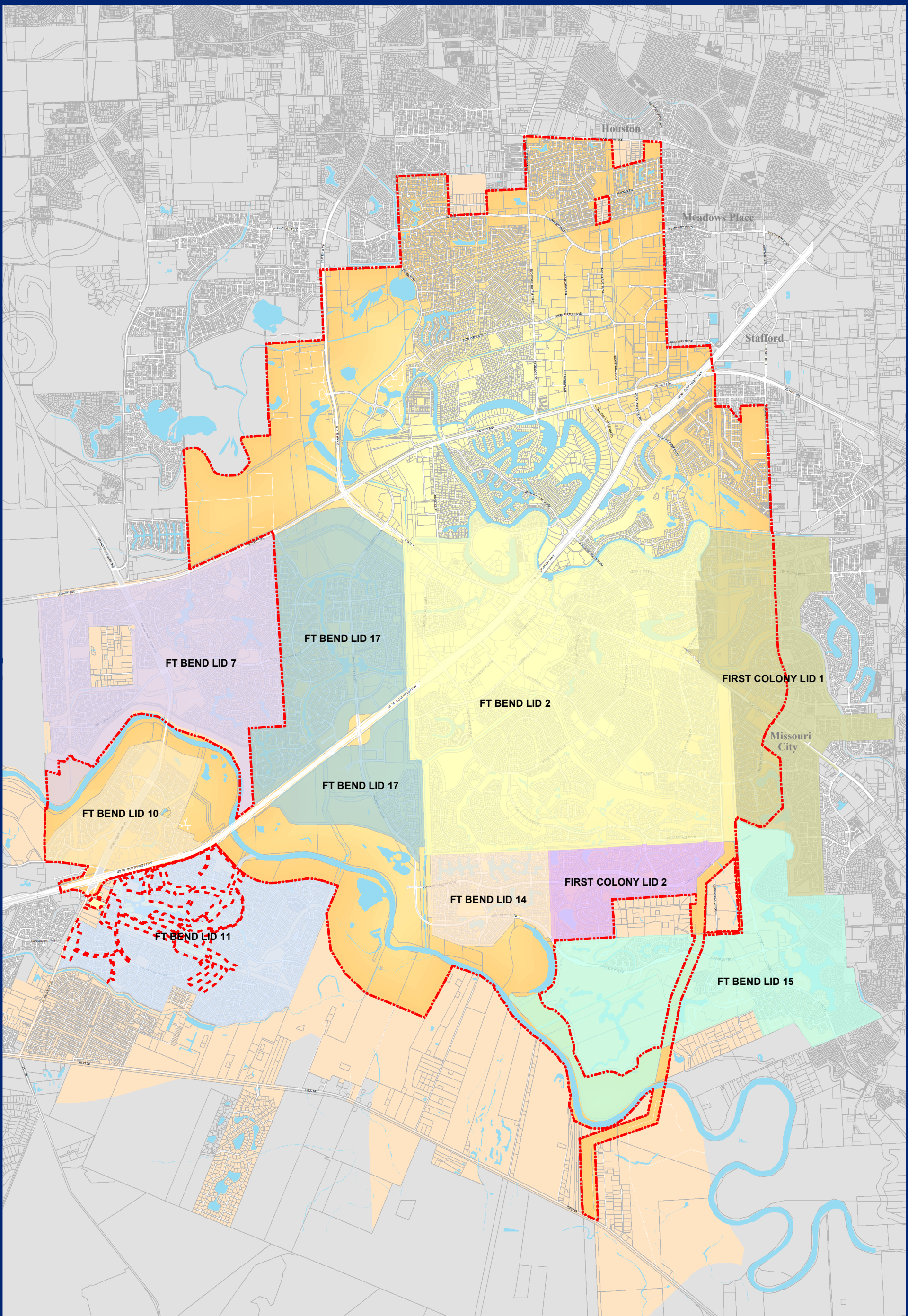
Street Flooding

8	Access and Use of Roadway Only slows vehicles; general vehicle movement only slowed Stops most vehicles but not emergency vehicles Emergency response cannot get through	☐ ☐ ☐
9	Location of Flooding Side Street, dead end street, culdesac, similar Primary city street, (boulevard, parkway, avenue, main subdivision street) Minor Arterial or collector, county road Federal or State Highway Emergency response access route	☐ ☐ ☐ ☐ ☐
10	Duration of Flooding Less than 3 Hours 3 hours to 12 hours More than 12 hours	☐ ☐ ☐
11	Frequency of Flooding Rarely floods or never flooded before Infrequent flooding, occurs about once every 5 years Frequent flooding, commonly occurs 2 or more times a year	☐ ☐ ☐ ☐

Quality of Life

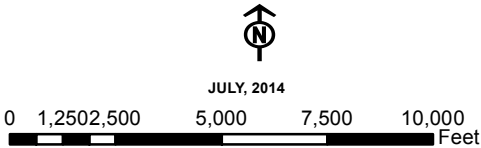
12	Health and Safety Flood waters contain excessive or obvious floatables (e.g. paper cups) Flooding likely to produce long term standing water and promote mosquitos Flood waters likely to contain sewage or other dangerous materials	☐ ☐ ☐
13	Economic Impacts (beyond structure damage) Loss of customers or business revenue for extended period Long term loss of property or building use Forced sale of property or loss of property ownership	☐ ☐ ☐
14	Nuisance Factor Long term standing water promotes aquatic vegetation or undesirable visual impacts Excessive standing water promotes car splace or vehicle hydroplaning Slow drainage impedes traffic for extended period Ineffective drainage prevents access to homes or businesses for extended period	☐ ☐ ☐ ☐

Exhibit 8: Levee Improvement Districts (LIDs)



**CITY OF SUGAR LAND
MASTER DRAINAGE PLAN
EXHIBIT 8: LEVEE
IMPROVEMENT DISTRICTS**

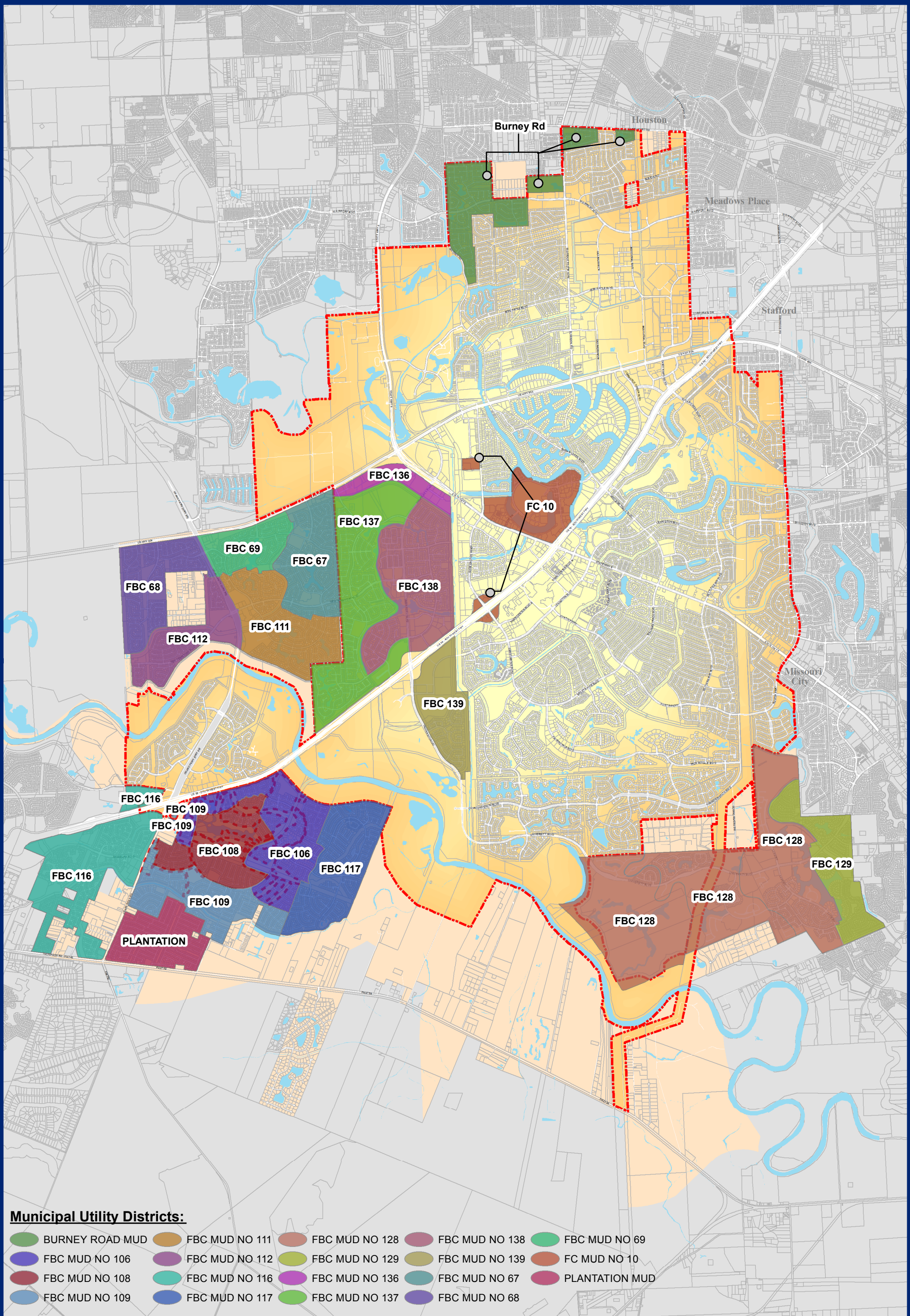
- LAKES, STREAMS, & CREEKS
- CITY OF SUGAR LAND - CITY LIMITS
- CITY OF SUGAR LAND - LPA
- CITY OF SUGAR LAND - ETJ



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Exhibit 9: Municipal Utility Districts (MUDs)



Municipal Utility Districts:

- | | | | | |
|-----------------|----------------|----------------|----------------|----------------|
| BURNEY ROAD MUD | FBC MUD NO 111 | FBC MUD NO 128 | FBC MUD NO 138 | FBC MUD NO 69 |
| FBC MUD NO 106 | FBC MUD NO 112 | FBC MUD NO 129 | FBC MUD NO 139 | FC MUD NO 10 |
| FBC MUD NO 108 | FBC MUD NO 116 | FBC MUD NO 136 | FBC MUD NO 67 | PLANTATION MUD |
| FBC MUD NO 109 | FBC MUD NO 117 | FBC MUD NO 137 | FBC MUD NO 68 | |



**CITY OF SUGAR LAND
MASTER DRAINAGE PLAN
EXHIBIT 9: MUNICIPAL
UTILITY DISTRICTS**

- LAKES, STREAMS, & CREEKS
- CITY OF SUGAR LAND - CITY LIMITS
- CITY OF SUGAR LAND - LPA
- CITY OF SUGAR LAND - ETJ

JULY, 2014

0 1,375 2,750 5,500 8,250 11,000 Feet

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Appendix

Appendix 1: Online Mapping Activity – (Map and Table)



MASTER DRAINAGE PLAN

MASTER DRAINAGE PLAN

Mapping Activity at www.communitywalk.com/drainage

April –July 2013

201 Views

16 Locations

	ICON	COMMENT	RECOMMENDATION
1	Street flooding -below curb	<i>Approximate location: 1743 Carriage Way</i> Saturday, April 27	<i>None, acceptable condition</i>
2	Street flooding – above curb	Storm drain in front of 906 Rolling Mill Dr., water builds above curb in heavy rain such as on April 27. Water covered front yard, almost got into garage during Tropical Storm Allison	<i>Notify Public Works, maintenance needed</i>
3	Street flooding – above curb	1111 Barrowgate Street flooded ~ 4 in. above the curb during recent storm (June 2013)	
4	Street flooding – above curb	The flooding occurs on both Barrowgate Dr. and Bournewood with the mass of the water at my corner residence.	
5	Street flooding – above curb	Flooding during heavy rains Flooding occurs every time during a heavy rainfall. The water level rises covering the entire street from sidewalk to across the street sidewalk. (7411 Frampton Lane)	
6	Street flooding – above curb	Ponding on Montclair Blvd Regular ponding and flooding on Montclair Blvd in Sugar Creek subdivision	
7	Street flooding – above curb	Ulrich and Guenther Flooding This area floods below curb in a normal rain and above curb in an extreme rain event. Guenther street is affected down to Matlage but it is worse at the intersection.	
8	Street flooding - above curb	2722 Fieldstone During heavy rains the cul de sac on Fieldstone floods above curb and over the sidewalk into the yards, and floods any vehicles that happen to be parked on the street. This also occurs at the entrance to the neighborhood at Sugar Wood Dr. and Williams Trace. Some street flooding above curb also happens on Creekside Drive as it curves around, which is the street nearest Oyster creek. I have witnessed this happening 2 times in the last year and a half. Thanks!	
9	Street flooding – above curb	Flooding during heavy rains – 17510 Marigold Drive, Sugar Lane, TX , USA, 218-565-2581 The storm sewers at the intersection of Marigold	

MASTER DRAINAGE PLAN

		and Caladium will flood during heavy rains. The water will rise above the curb. Usually when this happens, after a while it seems like a pump is turned on or a plug is opened, and the water will suddenly quickly drain -- but not before the level has been advancing upwards across the front lawn toward our house, causing quite a bit of concern.	
10	Street flooding – above curb	651 Chevy Chase Circle Storm Drain Box at driveway/street at intersection of Chevy Chase Circle and Plantation does not drain during medium rain showers. Reported to public works several months ago. Issue still not investigated or resolved.	
11	Blocked drain	<i>Near 702 Chevy Chase Cir</i> <i>No comment</i>	<i>Notify Public Works, maintenance needed</i>
12	Blocked drain	Regularly Blocked Drain on Wellington Lane Drain that regularly gets blocked during heavy rain events on Wellington Lane at Wellington Drive in Sugar Creek subdivision.	<i>Notify Public Works, maintenance needed</i>
13	Standing water	1511 S. Gabriel River Circle Floods every time it rains. The water does not drain down the street. Every time I run the sprinklers or it rains I have to sweep the water from our drive around the corner and down the street enough so the sun will dry the remaining water or it stays stagnant and starts to smell.	
14	Standing water	Ellicott Way standing water - consistent standing water in a couple areas; getting worse - B Atkinson	
15	Standing Water	North of new WhatABurger on new streets At the intersection of the newest streets just north of the new WhatABurger on 6 that is just south of 90A. After the big rain Saturday, there was a large pond still there Sunday morning covering the entire street at the stop sign.	
16	Comment	re: 823 Sandpiper Dr. Drainage problem as this is corner lot and Horseshoe has heavy traffic also a bus stop on this corner. House is in my wife's name. Draining hundreds of yards from Sandpiper to corner as well as on Horseshoe. Sandpiper bigger problem as grade prevents flow. Karen Daly asked me to identify and prefer not to bother with phone tag and to and fro. Please repair--even if temporary again--been done before. - William Maxey	

Appendix 2: Public Meeting Report

Master Drainage Plan Update

MEETING REPORT

Meeting: Public Meeting
Date/Time: November 6, 2013; 6-7:30 pm
Location: Cane Room, City Hall, 2700 Town Center Blvd N, Sugar Land TX 77479

Attendance: 18 Attendees (see Exhibit A)
Staff attendees: Christopher Steubing, Shashi Kumar, Tim Jahn, Idahosa Igbinoba, Andrew Yee, Stacie Henderson, Lisa Kocich-Meyer

Agenda:

- Welcome, sign in, view watershed and drainage facilities maps, participate in mapping activity, comment cards
- Presentation by Cathy Halka and Shashi Kumar
- Question and Answer
- Staff available to receive additional feedback and answer questions

Q&A Session:

1. Q: Who gives permits for drainage facilities?
A: Lots of entities including the County and the City.
2. C: Sugar Lakes owned by HOAs. There are bulkhead issues. HOAs take care of them. Alkire residents don't maintain bulkheads, which are 30 years old.
3. C: Look at Development Code for potential remedies. There's a \$2,000 fine for water quality issues and maybe detention pond maintenance issues could be wrapped into that.
4. Q: I've heard of "nuisance flooding" in the past. How does the City define nuisance flooding?
A: we have a criteria that includes Structural flooding, Street Flooding and Quality of Life Flooding.
5. C: 100-year storm events, how often are we having them
A: we are seeing them more frequently than every 100-years
6. C: Ashwood @ Bournwood there were drainage improvements completed and just after that the flooding in my area (Barrowgate) worsened. I think all the drainage now goes to into Covington neighborhood next to it. (38 year resident, former Planning Commissioner).
7. Q: What do the people here think about what is too high for flooding level and what is too long for being stuck in your homes during a storm event? Is being stuck in your home for 2 hours acceptable? I think at a basic level we need emergency vehicle access. (CM Porter)

A: I think that 8" of moving water on the street is not acceptable, it's dangerous (Debbie Coffman)

8. C: it's all like major surgery – it's an issue if it's happening to you but not if it's happening to someone else
9. C: While this is a drainage plan, I think the City needs to be thinking about not only what happens when we have too much rain, but what happens when we don't have enough. We need to start thinking ahead for drought conditions and thinking about how to handle it. Is there a more efficient way to handle water? Can we use Oyster Creek water to irrigate medians?

A: The topic of reusing water and being more efficient with water resources is being addressed as part of the Water Master Plan update.

Additional comments received:

- Comments from Al Abramaczyk: See Exhibit B
- Mapping Activity feedback: See Exhibit C

Report Date: 11/12/13

Report By: Cathy Halka

Exhibit A: Sign In Sheets

MASTER DRAINAGE PLAN UPDATE

PLEASE SIGN IN

PUBLIC MEETING

NOVEMBER 6, 2013

FIRST NAME

LAST NAME

EMAIL ADDRESS (PLEASE PRINT CLEARLY)

Andrei	McDONALD	
Bonnie	Marshall	
Scott	Saeng-	
Zach	Haverkamp	
JESSE	DE LA ROSA	
Hui-Fong	Chang	
AL	ABRAMOWICZ	
Matthew	Zere	
Sylvester Schneider	Schrieder	
Greg	Frank	
DAVID	GORNET	
STEVE	PORTER	
HALISA	JASON	

PLEASE SIGN IN

NOVEMBER 6, 2013

EMAIL ADDRESS (PLEASE PRINT CLEARLY)

[illegible]

Exhibit B: Comments from Al Abramaczyk

Sugar Land Drainage Plan- Detention Pond Maintenance Policy Public Meeting 11/6/13- Comments from Sugar Lakes HOA

Key purpose of Drainage Plan update: "The City needs policy guidance on the issue of detention pond maintenance to ensure functional and aesthetic elements of detention ponds are properly designed and constructed and adequately maintained."

Sugar Lakes HOA proposals:

A- City to coordinate efforts to determine and, if possible, help resolve issues regarding rights & responsibilities of the Gulf Coast Water Authority (GCWA), the City of Sugar Land, MUD', HOA', residents and others for:

- All waterways within the City including;
- Oyster Creek (residents own the land to midpoint of the Creek) and the
- Tri Lakes (Horseshoe, Eldridge & Alkire) with multiple rights & no obligations)

B-Specific areas of concern:

- 1- Maintenance of bulkheads (malfunctioning bulkheads results in soil dumped on waterways). Update the Development Code section on Stormwater Quality to include bulkheads, and to provide for periodic inspections, notices & fines.
- 2 – Need, regardless of the size of the waterway, for a "no impact statement" from a certified drainage engineer required by the City's permitting process for replacing bulkheads with a new one parallel to the old one (Ordinance No. 1661)
- 3- Update, if necessary, recreational use provisions in City's ordinances prohibiting (a) gasoline powered boats/model boats (Section 3-174) & (b) swimming, boating etc. on City owned property.(Section 3-175)
- 4- Update, if necessary, City's Development Code prohibiting dumping of debris (Stormwater Quality Section 11-22). Note-Also prohibited by agreements signed by predecessors of the City, GCWA & Sugar Lakes HOA.
- 5- Use of lake water for irrigation purposes (residents of Venetian Estates permitted to do so in the GRP agreement)
- 6- Control of undesirable vegetation (Note-GCWA & the City treat Oyster Creek)
- 7- Insuring compliance with City ordinances by City's enforcement staff
- 8- Public's education of water issues/ Communication with residents.

Exhibit C: Promotional Flyer

PLEASE JOIN US FOR A

PUBLIC MEETING

TO RECEIVE CITIZEN FEEDBACK ON THE

MASTER DRAINAGE PLAN UPDATE



WEDNESDAY, NOVEMBER 6
6–7:30 PM
CANE ROOM, CITY HALL
2700 TOWN CENTER BLVD. NORTH
SUGAR LAND, TEXAS 77479

WWW.SUGARLANDTX.GOV/DRAINAGE | CITYENGINEER@SUGARLANDTX.GOV | 281-275-2780

Please join us to
provide your feedback
on draft recommendations
of the Master Drainage Plan

TOPICS INCLUDE:

Drainage facility ownership
Did you know that there are over 180 drainage facilities and more than 30 ownership entities in Sugar Land?

Integrated Storm Water Management Model
This new tool allows the City to better identify potential flooding or problem areas.

Detention Pond Maintenance
What are your community's responsibilities for maintaining wet and dry ponds?

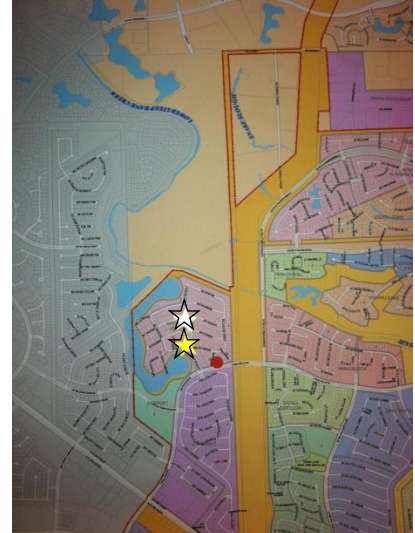
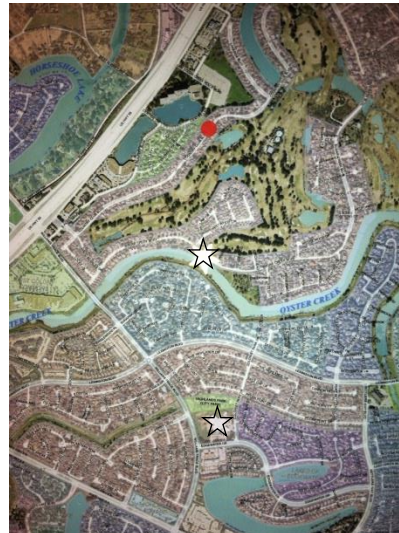
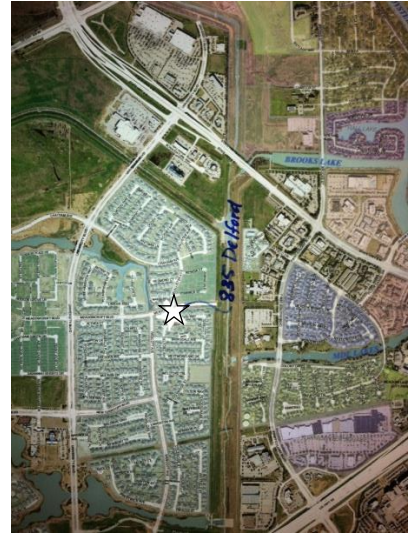
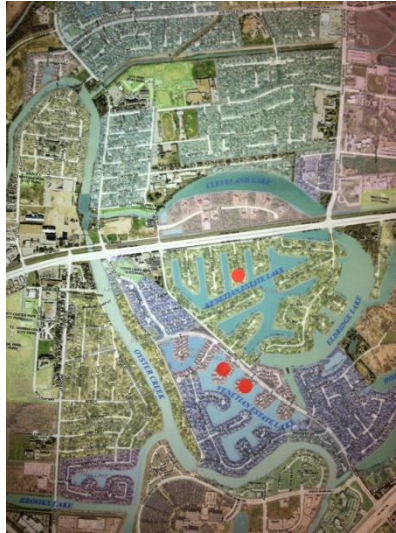
Comprehensive Plan
The City's drainage efforts are aligned with the goals and vision of the Comprehensive Plan.

Defining drainage problems
Did you know that our streets are designed to hold and move stormwater during major rain events?



CITY OF SUGAR LAND

Exhibit D: Mapping Activity



MAPPING ACTIVITY

WHERE DO YOU LIVE?

Place a dot on the map.

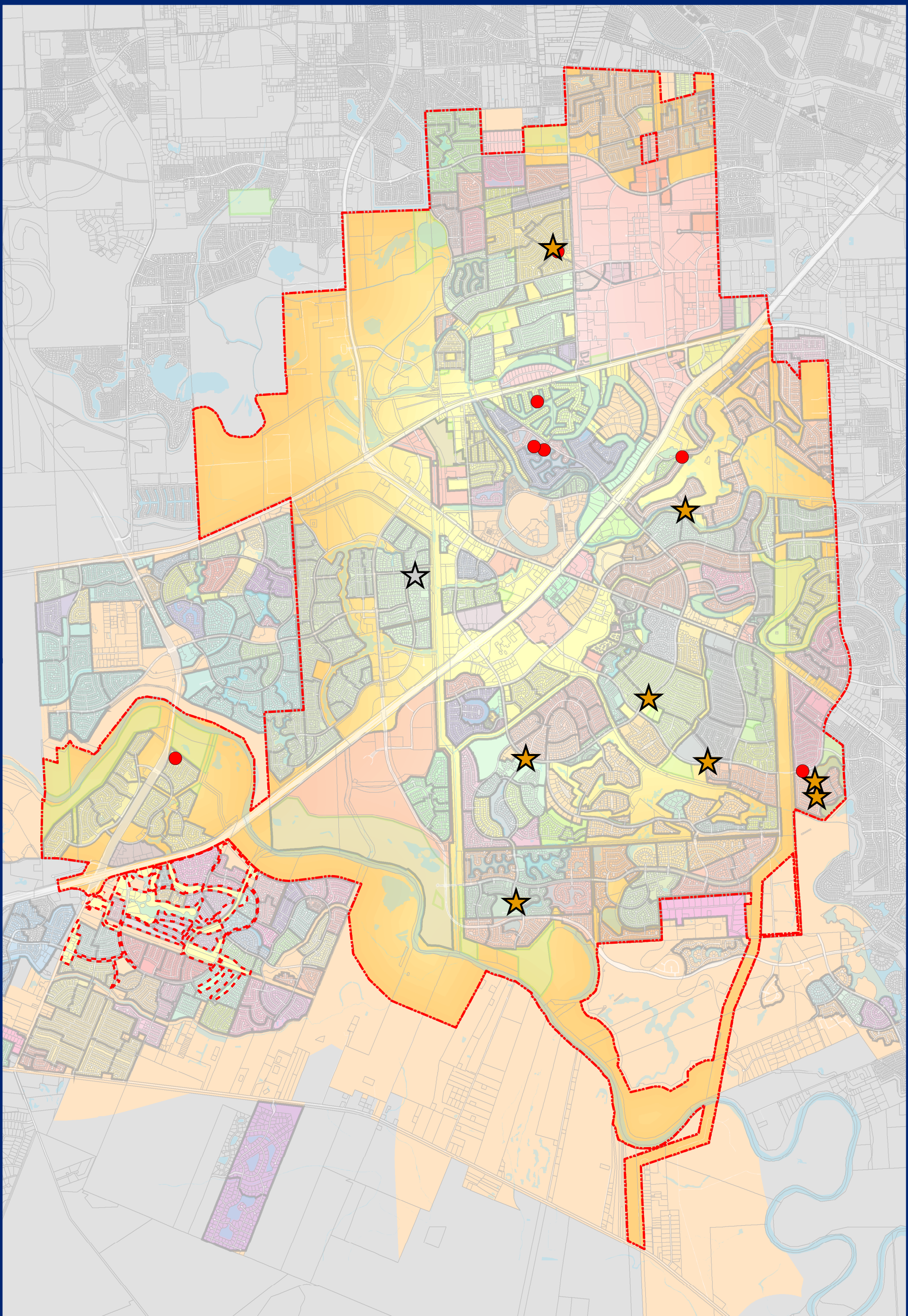
WHERE HAVE YOU SEEN DRAINAGE ISSUES IN THE RECENT PAST?

Place a star on the map.

Star Color	Issue Type
Green	House Flooding
Gold	Street Flooding
Blue	Standing Water
Silver	Blocked Drain
Red	Detention Pond Issue

www.sugarlandtx.gov/drainage

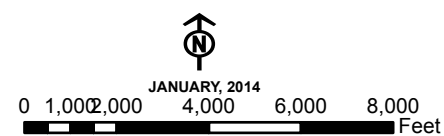
Appendix 3: Public Meeting Mapping Activity



**CITY OF SUGAR LAND
MASTER DRAINAGE PLAN
PUBLIC MEETING DATA
NOVEMBER 6, 2013**

Mapping Activity

-  Street Flooding
-  Blocked Drain
-  Where you live



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Appendix 4: Public Feedback on Draft Plan

Public Comments on Draft Plan

Email from Sugar Land Resident

Sirs:

I have read the Master Drainage Plan draft for Sugar Land and have the following comment and recommendation:

- I cannot help but notice that there are a copious number of government regulatory agencies involved in the approval process. I recommend that the City start, if they have not already started too, to lobby the State law makers to consolidate them in to one State agency with limited powers. Do we really need so many agencies to tell us what to do?
- I also noticed that the MDP is very detailed and lengthy. I suggest that it be streamlined to not be so detailed (i.e. let the HOA's handle local issue and not get the City involved in them - example: Bulkhead; neighborhood beautification watering and private property drainage area regulations and issues).
- I do agree that street flooding is a city wide issue but, not individual or local community private property issue.
- Free-up the HOA's and/or neighbors to solve their own local issues. After all, powerful HOA's have served Houston very well over the past hundred fifty plus years.

In my opinion, the less the City government is involved in neighborhood issues, the more they can address their issue better and the less work for City, After all, you have enough work to do just keeping up with the State regulations rules.

All this said, I still think we live in the greatest City in the Texas. Thank you for all your hard work and to allow me to express my opinion (What a GREAT Country).

Email from Sugar Lakes HOA

This E mail is to formally express the support of the Sugar Lakes HOA Board for the passage by City Council of the Master Drainage Plan recently approved by the P & Z Commission, and specially for the strategies and work program contained in its Pond Maintenance sections. We believe that the City needs to lead in setting standards in private waterways and in coordinating the enforcement of these standards. This is of special importance in lakes and other waterways that have multiple owners.

Following are several comments regarding the Plan's details:

(a) attached are suggested changes to Exhibit 3 (Watershed & Drainage) and Exhibit 5 (Detention Ponds/Lakes) to correct errors in the listing of owners , names etc. *and*

(b) we also suggest using existing easements that the City has on various waterways as an additional tool for maintaining the waterways. An example of the latter includes the easements on Eldridge & Horseshoe lakes, acquired with the purchase of WCD# 1, by which the City has the right, but not the obligation, to maintain bulkheads and other improvements.

We look forward to the next steps in the City's approval process including the public hearing scheduled for October 21 and culminating in the City Council vote scheduled for November 4.

Phone Call from Sugar Land Resident

1. I see a lot of drainage projects proposed in other sub-divisions, but why not in Venetian Estates?
2. I'm a tax payer too and my neighborhood floods during rain events. Why are my tax dollars not being used in my neighborhood?
3. My subdivision does not have a curb/gutter system as is required per current standards. Can that be installed to improve drainage?
4. Upon expansion of 90A and installation of sound wall, there is more trash coming to our lakes that serve the subdivision drainage. Can City do something about it?

Appendix 5: Comprehensive Plan Goals Chart

Comprehensive Plan Goals - Worksheet for Master Drainage Plan

This chart identifies drainage related goals and objectives found in the Comprehensive Plan. To ensure that the Master Drainage Plan addresses each goal and objective, the chart documents current activities, identifies challenges and opportunities, and proposed activities or future projects to include in the Master Drainage Plan. The end result being that the Master Drainage Plan addresses what's needed to implement drainage-related goals and objectives of the Comprehensive Plan.

Highlighted fields = new MDP projects

Item #	Comprehensive Plan Goal/Objectives (Drainage-Related)	Current Activities (some examples)	Challenges/Gaps accomplishing these goals	Opportunities for accomplishing these goals	Proposed Activities (action statement to include in MDP)	Notes
	Goal A: Safe Community					
1	1.Safest city in the United States	Community Rated System (CRS), Member of National Flood Insurance Program	Financial/staffing	Better CRS rating	N/A - completed by Emergency Management. Submit a CRS application and pursue a better rating.	2010 CRS 7 Rating provided a 15% reduction on flood insurance premiums. Office of Emergency Management should submit a CRS application and pursue a better rating.
		Emergency response of Levee Improvement Districts	Emergency management services by non-City entities	Coordination with drainage entities on emergency management	N/A - completed by Emergency Management Department. City outreach/coordination on emergency management with non-City entities	City should continue to be a member of the National Flood Insurance Program and regularly communicate and coordinate with Levee Improvement Districts and other independent organizations involved in drainage management.
		Emergency Operations Plan (includes emergency plan for drainage which is reviewed annually)	Updating partners and keeping people prepared	Rolling updates, coordination with City departments and non-City organizations to review plan	N/A - completed by Emergency Management Department. Document training and exercise plan and program for City and non-City agencies for events, periodic review of EOP with City depts. and non-City partners	
		State reporting for Emergency Management Performance Grant (EMPG) funding - helps cities fund emergency management related activities (including drainage activities related to emergency management)	Funding for emergency operations and planning	Secure state funding sources	N/A - completed by Emergency Management Department. Apply for EMPG funding (underway)	
		No flooding forecasting system is currently in place	Forecasting flooding of the Brazos River	Encourage County to lead a project to prepare for potential future issues	Engage regional partners in developing a flood warning system.	
2	3. Informed citizens participating in and taking responsibility for community safety and emergency preparedness	Attend HOA meeting, Hold Quarterly HOA meeting, Reverse 911 alerts, newsletters, website (sugarlandtx.gov and sugarlandresponds.com)	Misunderstandings about drainage facilities (e.g. street ponding is part of normal drainage operations)	Link residents to web tools, ask residents where drainage problems exist	Promote online links to drainage information. Solicit feedback from residents on drainage issues through plan participation. Education on drainage operations (e.g. street ponding).	
		Website sugarlandresponds.com includes information on Potential Hazards, City Preparedness and Community Response Teams	N/A	N/A	N/A	

Item #	Comprehensive Plan Goal/Objectives (Drainage-Related)	Current Activities (some examples)	Challenges/Gaps accomplishing these goals	Opportunities for accomplishing these goals	Proposed Activities (action statement to include in MDP)	Notes
		AM Radio Station 1650AM - emergency information (coordinated capabilities with adjacent jurisdictions)	N/A	N/A	N/A	
3	4. Rapid, professional and coordinated response to an emergency call for service	Public works responds to service calls, 311 service requests	N/A	Improve Citizen Survey rating for service requests	N/A - to be addressed by other City Departments	Citizen Survey 87% approval
		Calls/emails for service	Social media (responding quickly to real time information - twitter feeds)	Technology to gather intelligence for emergency response from social media	N/A - Technology improvements to be addressed by Emergency Management	
4	5. City prepared for all hazards, disaster and post disaster recovery including coordination with local, regional and state resources	ISWMM model	N/A	Use ISWMM to identify potential problem areas through modeling events.	Updates to ISWMM model as warranted by significant changes to drainage infrastructure. Changes to drainage infrastructure may occur as new areas are annexed into the City or with the construction of new developments.	Keep detailed records of storm events and share data to understand frequency of events and track rainfall quantities. Use the ISWMM model to identify areas of the City that may be vulnerable to flooding and/or erosion including modeling to account for potential intensification of storm events. Based on storm event data, evaluate the definitions of 5, 10, 50 and 100 year storm events.
		FEMA Flood Map Modernization Program	N/A	N/A	N/A	
		Emergency Action Plan	Other drainage entities need to have coordinated efforts (with the City)	Coordinate emergency plan / disaster and post disaster recovery with other drainage entities	N/A - to be addressed by Emergency Management Department. Create a coordinated action plan (City and other jurisdictions)	
		All Hazards Incident Management Training (for all City Depts. - NIMS), Incident Action Plan put together for each City Event (coordinated by Parks and Rec)	Keeping staff trained and updated	N/A	N/A	
5	6. Health and building codes promoting highest reasonable standards for safety	Code Enforcement and Public Works monitoring of drainage issues (health issues related to mosquito breeding grounds)	Difficult to identify locations with standing water	Better outreach to public - to help identify areas with standing water, public awareness of the importance of addressing standing water	Engage the public to assist the City in identifying locations of drainage problems (communications tools - email, phone, Facebook)	
		Building Code Requirements (building elevation), compliance with drainage design standards	N/A	Modifications to the flood damage reduction (dev.) code	Amend (dev.) code to update flood damage reduction standards	
	Goal B: Beautiful Community					

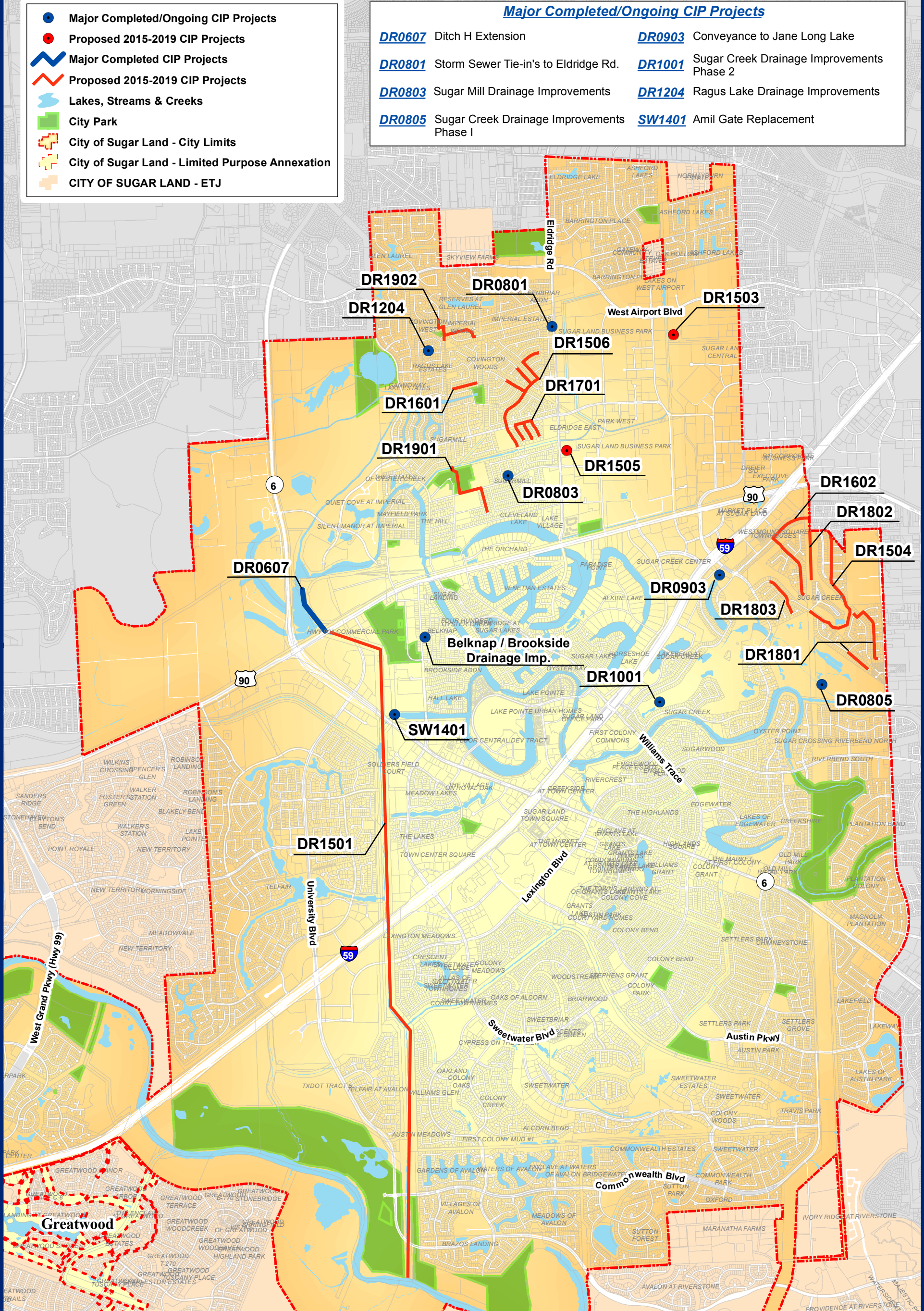
Item #	Comprehensive Plan Goal/Objectives (Drainage-Related)	Current Activities (some examples)	Challenges/Gaps accomplishing these goals	Opportunities for accomplishing these goals	Proposed Activities (action statement to include in MDP)	Notes
6	4. Clean, well-maintained, attractive lakes and waterways, both public and private	City and County performs maintenance of facilities	Funding for Public Works Dept. to maintain detention ponds	MDP – will identify policy for detention pond maintenance	Identify a City policy for detention pond maintenance, including identification of code amendments to strengthen enforcement opportunities for issues with mowing, sloughing, erosion, etc.	
		Coordination with drainage entities	Roles and responsibilities for maintenance (jurisdictional and City dept. - Parks/PW)	N/A	N/A - MDP update will clarify roles and responsibilities	
		Code enforcement of detention pond maintenance	Enforcement of maintenance	identify a standard by which non-City owned facilities must be maintained and identify the steps the City will take to enforce those standards	Identify a City policy for detention pond maintenance, including identification of code amendments to strengthen enforcement opportunities and Identification of funding sources for detention pond maintenance	
		City design standards for construction of detention ponds,	Standards for multipurpose detention pond facilities	Set standards for multipurpose detention facilities used not only to hold water during storm events but to serve as recreation amenities during dry periods	Amend Development Code and Design Standards to incorporate standards for detention facilities to also be used as recreational amenities (parks/trails).	
	Goal C: Inclusive Community					
7	5. Residents informed, actively involved and participating in community and civic affairs	See item 2, Public participating in MDP update, Public may participate in CIP update	N/A	N/A	N/A	
	Goal D: Environmentally Responsible Community					
8	1. City as a leader – model for standards, processes and operations	Storm Water Management Plan-completed by Public Works, Adopted LID Standards	Evolving legislation for more stringent storm water pollution prevention plan requirements	Enhancement to improve storm water quality	Review and enhance/update Storm Water Management Plan for improved storm water quality	As the City transitions from ground water to surface water, storm water quality and treatment is more important.
		Development Review Process includes water quality issues (during construction- EPA Standards), Design standards for drainage, Public works review practices every 2 years.	N/A	Identify any update to the Design Standards that could prevent storm water pollution	Amend Design Standards with national standards and best practices for storm water prevention	
		ISWMM modeling	N/A	Utilize the ISWMM tool to our best advantage	See Item 4	

Item #	Comprehensive Plan Goal/Objectives (Drainage-Related)	Current Activities (some examples)	Challenges/Gaps accomplishing these goals	Opportunities for accomplishing these goals	Proposed Activities (action statement to include in MDP)	Notes
		Brazos River Park designed to preserve floodway areas and minimize flood risk.	N/A	N/A	N/A	
9	2. Open green spaces throughout the city	Designate flood hazard areas and prevent encroachment into floodways	As City builds out - development opportunities limited and pressure on green areas increased, Balancing multi use facilities (recreation/drainage) with water quality/safety	Coordinating green spaces with drainage facilities (multi-use facilities)	Identify drainage facilities that can serve recreational purposes as well (see item 6)	
10	3. Effective stormwater management and drainage system enhancing quality of surface water and protecting neighborhoods	Inspections of drainage facilities	Enforcement of maintenance of non-City owned facilities	Adopt a detention pond maintenance policy, Amend code of ordinances as needed to allow for enforcement	See Items 6 and 8	Storm Water Quality - during general permit adoption process, Council adopted plan which sets how far we go- how much we require of developers.
12	8. Developments, redevelopments and buildings incorporating the concepts of environmental sustainability	Adopted optional Low Impact Development Standards	N/A	Consider amending dev. code for PDs to requires certain sustainability features, consider amending code to encourage pervious sidewalks	N/A	
13	10. Reasonable approach and balance with a "return on investments" – economic and/or community benefit	Low Impact Development standards are optional (balanced approach for development)	N/A	N/A	N/A	
		City has conventional requirements for surface water quality	N/A	Store rain water in Tract 2 (retention pond) and use the water to provide volume for surface water treatment	N/A	
	Goal E: Destination Activity Centers					
15	5. Public open space and parks for people to gather and enjoy; neighborhood to use; and to conduct community events	Canoe launch locations for Oyster Creek and Brazos River (planned)	N/A	Using retention ponds for recreation - trails around amenity lakes	See Item 6	
		Single-use detention ponds	N/A	Consider requiring for PDs that retention ponds have trails around them. Consider requiring in PDs that a trail gets built before homes go it	See Item 6	
	Goal F: Great Neighborhoods					
16	4. Well-maintained, replaced and up to date neighborhood infrastructure: streets, utilities, sidewalks, street lights and drainage	Street and drainage maintenance activities (by City)	N/A	N/A	N/A	
		Non-City-owned detention ponds are maintained by owner (not City)	Detention pond mowing and maintenance by non-City (per ordinance)	More stringent enforcement of City ordinances	See item 6	

Item #	Comprehensive Plan Goal/Objectives (Drainage-Related)	Current Activities (some examples)	Challenges/Gaps accomplishing these goals	Opportunities for accomplishing these goals	Proposed Activities (action statement to include in MDP)	Notes
		Funding drainage improvements through pay as you go capital projects out of the general fund	Not adequate funding to address all drainage infrastructure needs	Establish an impact fee or user fee to fund drainage infrastructure	Consider funding mechanisms for drainage facilities and detention pond maintenance (e.g. drainage impact fee, Public Improvement District, etc.)	
17	8. Top quality community and neighborhood parks with active and passive areas	see item 16	N/A	N/A	N/A	
	Goal J: Balanced Development and Redevelopment					
18	2. Well-designed, well-maintained city infrastructure and facilities throughout the city	Design Standards (reviewed as needed and minor amendments e.g. roundabouts, permeable pavers, etc.)	N/A	Consider complete review of Design Standards (every 5 years) in comparison to national best practices and standards	N/A	
		Neighborhood drainage infrastructure is upgraded at the time areas are rebuilt (e.g. street reconstruction)	Not all subdivisions are built to the City's current standards	Retrofit existing communities	See item 16	
19	3. Innovative designs meeting city's development standards and adding value to the surrounding neighborhoods	addressed in item 8	N/A	N/A	N/A	
20	4. New developments and redevelopments consistent with city vision, comprehensive plan, policies and standards	Requiring redevelopments comply with current standards	When redeveloping, there is a challenge to bring subdivisions to current City standards	Bring new developments into compliance with current standards	N/A	
		Include a review of the Comprehensive Plan goals and objectives at the time that the Master Drainage Plan is updated and identify additional projects to address those goals and objectives	N/A	Ensure future updates to the MDP address drainage-related goals and objectives found in the Comprehensive Plan	When an MDP update is initiated, review the Comprehensive Plan goals and objectives to identify future drainage-related projects to include.	
	Goal K: Community Pride in Sugar Land					
21	1. City working in partnership with residents, community organizations, businesses and other government entities	City of Sugar Land does not have regional detention ponds	Detention pond requirements are addressed individually with each development	Harris County has regional detention ponds.	Consider regional detention pond opportunities	
		Working with public and private drainage entities to implement drainage infrastructure projects in Sugar Land	Coordinating all groups	Consider option of a regional drainage entity like Fort Bend County or the City taking more of a leadership role in drainage	Policy project to weigh the pros and cons of a regional drainage entity taking more of a leadership role. Policy project would result in a recommendation to the City. (strategic project)	

Item #	Comprehensive Plan Goal/Objectives (Drainage-Related)	Current Activities (some examples)	Challenges/Gaps accomplishing these goals	Opportunities for accomplishing these goals	Proposed Activities (action statement to include in MDP)	Notes
		City staff attends LID and MUD meetings to maintain open communication and positive relationships.	N/A	N/A	N/A	
		Master Drainage Plan identifies drainage entities and verifies ownership	Multiple drainage entities having jurisdiction within the city makes coordination difficult	MDP updates provide an opportunity to confirm ownership and assets	Continue to update ownership and assets with each update to the Master Drainage Plan	
22	5. Residents engaged in civic and community affairs	Public participation process included for all master plans	N/A	N/A	N/A	
23	9. City demonstrating sound financial management practices and policies including cost-effective service delivery	See item 16 - Funding drainage improvements through pay as you go capital projects out of the general fund	N/A	N/A	N/A	
		Develop partnerships with other drainage entities to build infrastructure projects and divide costs equitably	N/A	N/A	Identify partnership opportunities with other drainage entities in the region to construct drainage infrastructure projects.	
24	10. Comprehensive Plan and associated master plans guide City decision making	Master Drainage Plan update identifies projects and strategies for achieving the City's drainage goals (as identified in the Comprehensive Plan)	N/A	N/A	N/A	

Appendix 6: FY15-FY19 Capital Improvements Program (CIP)

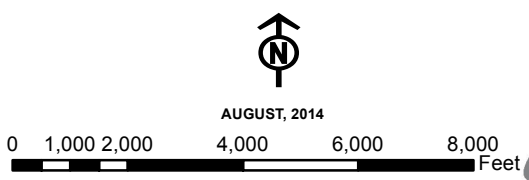


- Major Completed/Ongoing CIP Projects
- Proposed 2015-2019 CIP Projects
- Major Completed CIP Projects
- Proposed 2015-2019 CIP Projects
- Lakes, Streams & Creeks
- City Park
- City of Sugar Land - City Limits
- City of Sugar Land - Limited Purpose Annexation
- CITY OF SUGAR LAND - ETJ

- Major Completed/Ongoing CIP Projects**
- | | | | |
|------------------------|---|------------------------|---|
| DR0607 | Ditch H Extension | DR0903 | Conveyance to Jane Long Lake |
| DR0801 | Storm Sewer Tie-in's to Eldridge Rd. | DR1001 | Sugar Creek Drainage Improvements Phase 2 |
| DR0803 | Sugar Mill Drainage Improvements | DR1204 | Ragus Lake Drainage Improvements |
| DR0805 | Sugar Creek Drainage Improvements Phase I | SW1401 | Amil Gate Replacement |



CITY OF SUGAR LAND LOCATION MAP OF DRAINAGE CAPITAL IMPROVEMENT PROJECTS (CIP)



This map has been produced from various sources. Every effort has been made to ensure the accuracy of this map. However, the City of Sugar Land assumes no liability or damages due to errors or omissions. This product is for informational purposes and may not have been prepared for, or be suitable for, legal, engineering, or surveying purposes. It does not represent an on-the-ground survey and represents only the approximate relative location of property boundaries. If any errors are detected, please contact the GIS Division of Information Technology at (281) 275-2375.



**CITY OF SUGAR LAND
2015 - 2019 CAPITAL IMPROVEMENT PROGRAM
DRAINAGE**

PROJECT NO.	PROJECT NAME	PRIOR FUNDING	2015 BUDGET	2016 ESTIMATE	2017 ESTIMATE	2018 ESTIMATE	2019 ESTIMATE	2015-2019 TOTAL
DR1001	Sugar Creek Drainage Improvements - Phase II	\$ 4,403,000	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
DR1501	Ditch H Model Update	-	240,000	-	-	-	-	240,000
DR1502	Localized Drainage Improvements	-	300,000	-	-	-	-	300,000
DR1503	Business Park Pump Station	-	100,000	-	-	-	-	100,000
DR1504	Sugar Creek Drainage Improvements - Longview Dr. & Golf Course	-	550,000	5,300,000	-	-	-	5,850,000
DR1505	Covington Woods Drainage Improvements - Offline Pond, BP Ditch, JP Bridge	-	220,000	1,820,000	-	-	-	2,040,000
DR1506	Covington Woods Drainage Improvements - A22 Bournewood Trunk Line	-	530,000	5,300,000	-	-	-	5,830,000
DR1601	Covington Woods Drainage Improvements - Ivymount Dr.	-	-	110,000	600,000	-	-	710,000
DR1602	Sugar Creek Drainage Improvements - Montclair Dr.	-	-	535,000	5,200,000	-	-	5,735,000
DR1603	Localized Drainage Improvements	-	-	300,000	300,000	300,000	300,000	1,200,000
DR1701	Covington Woods Drainage Improvements - Jess Pirtle Side Streets & Greywood	-	-	-	130,000	1,130,000	-	1,260,000
DR1801	Sugar Creek Drainage Improvements - Brunswick Dr. & Fairway Dr.	-	-	-	-	330,000	3,100,000	3,430,000
DR1802	Sugar Creek Drainage Improvements - East Ditch	-	-	-	-	175,000	1,500,000	1,675,000
DR1803	Sugar Creek Drainage Improvements - Chevy Chase Dr.	-	-	-	-	185,000	1,700,000	1,885,000
DR1901	Covington Woods Drainage Improvements - Sugar Land MS / Sugar Mill Relief Line	-	-	-	-	-	110,000	110,000
DR1902	Covington Woods Drainage Improvements - Covington West & Imperial Woods	-	-	-	-	-	180,000	180,000
	TOTAL FUNDING	\$ 4,403,000	\$ 1,940,000	\$ 13,365,000	\$ 6,230,000	\$ 2,120,000	\$ 6,890,000	\$ 30,545,000

SOURCE OF FUNDS	PRIOR FUNDING	2015 BUDGET	2016 ESTIMATE	2017 ESTIMATE	2018 ESTIMATE	2019 ESTIMATE	2015-2019 TOTAL
General Revenue	\$ -	\$ 300,000	\$ 410,000	\$ 430,000	\$ 300,000	\$ 590,000	\$ 2,030,000
CO's	4,403,000	1,500,000	12,955,000	5,800,000	1,820,000	6,300,000	28,375,000
SLDC	-	-	-	-	-	-	-
SL4B	-	-	-	-	-	-	-
Airport Revenues	-	-	-	-	-	-	-
Revenue Bonds	-	40,000	-	-	-	-	40,000
Connection Fees	-	-	-	-	-	-	-
Unfunded	-	-	-	-	-	-	-
Other Funding Sources	-	100,000	-	-	-	-	100,000
TOTAL	\$ 4,403,000	\$ 1,940,000	\$ 13,365,000	\$ 6,230,000	\$ 2,120,000	\$ 6,890,000	\$ 30,545,000

CITY OF SUGAR LAND
2015 - 2019 CAPITAL IMPROVEMENT PROGRAM
SUMMARY BY FUNDING SOURCES - DRAINAGE

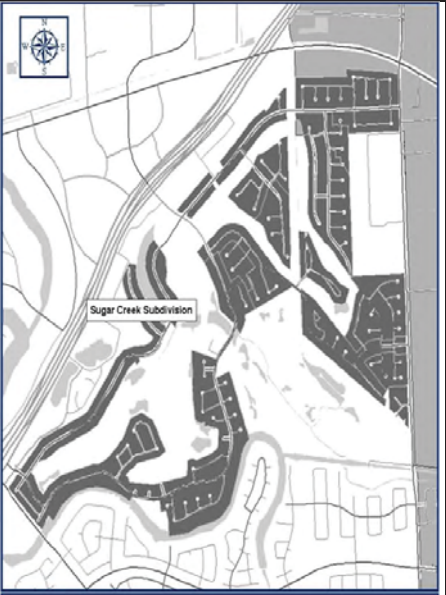
PROJECT NAME	2015	2016	2017	2018	2019	TOTAL
Localized Drainage Improvements	\$ 300,000	\$ -	\$ -	\$ -	\$ -	\$ 300,000
Covington Woods Drainage Improvements - Ivymount Dr.	-	110,000	-	-	-	110,000
Localized Drainage Improvements	-	300,000	300,000	300,000	300,000	1,200,000
Covington Woods Drainage Improvements - Jess Pirtle Side Streets & Greywood	-	-	130,000	-	-	130,000
Covington Woods Drainage Improvements - Sugar Land MS / Sugar Mill Relief Line	-	-	-	-	110,000	110,000
Covington Woods Drainage Improvements - Covington West & Imperial Woods	-	-	-	-	180,000	180,000
TOTAL -GENERAL REVENUES	\$ 300,000	\$ 410,000	\$ 430,000	\$ 300,000	\$ 590,000	\$ 2,030,000

PROJECT NAME	2015	2016	2017	2018	2019	TOTAL
Ditch H Model Update	\$ 240,000	\$ -	\$ -	\$ -	\$ -	\$ 240,000
Sugar Creek Drainage Improvements - Longview Dr. & Golf Course	510,000	5,300,000	-	-	-	5,810,000
Covington Woods Drainage Improvements - Offline Pond, BP Ditch, JP Bridge	220,000	1,820,000	-	-	-	2,040,000
Covington Woods Drainage Improvements - A22 Bournewood Trunk Line	530,000	5,300,000	-	-	-	5,830,000
Covington Woods Drainage Improvements - Ivymount Dr.	-	-	600,000	-	-	600,000
Sugar Creek Drainage Improvements - Montclair Dr.	-	535,000	5,200,000	-	-	5,735,000
Covington Woods Drainage Improvements - Jess Pirtle Side Streets & Greywood	-	-	-	1,130,000	-	1,130,000
Sugar Creek Drainage Improvements - Brunswick Dr. & Fairway Dr.	-	-	-	330,000	3,100,000	3,430,000
Sugar Creek Drainage Improvements - East Ditch	-	-	-	175,000	1,500,000	1,675,000
Sugar Creek Drainage Improvements - Chevy Chase Dr.	-	-	-	185,000	1,700,000	1,885,000
TOTAL -CO'S	\$ 1,500,000	\$ 12,955,000	\$ 5,800,000	\$ 1,820,000	\$ 6,300,000	\$ 28,375,000

PROJECT NAME	2015	2016	2017	2018	2019	TOTAL
Sugar Creek Drainage Improvements - Longview Dr. & Golf Course	\$ 40,000	\$ -	\$ -	\$ -	\$ -	\$ 40,000
TOTAL - REVENUE BONDS	\$ 40,000	\$ -	\$ -	\$ -	\$ -	\$ 40,000

PROJECT NAME	Source	2015	2016	2017	2018	2019	TOTAL
Business Park Pump Station	MUD21	\$ 100,000	\$ -	\$ -	\$ -	\$ -	\$ 100,000
TOTAL - Other Sources		\$ 100,000	\$ -	\$ -	\$ -	\$ -	\$ 100,000

CITY OF SUGAR LAND 2015-2019 CAPITAL IMPROVEMENT PROGRAM DRAINAGE								D-2 Ranking
PROJECT NO. DR1001	PROJECT TITLE Sugar Creek Drainage Improvements - Phase II							
DESCRIPTION Construction of drainage improvement as recommended in the 2005 Sugar Creek Drainage Analysis. These improvements include upgrading storm sewer outfalls at various locations within the watershed to convey flow during extreme rain events.		IMPACT ON OPERATING BUDGET						
		Expenditures	2015	2016	2017	2018	2019	
		Personnel Services	\$ -	\$ -	\$ -	\$ -	\$ -	
		Operations & Maintenance	-	-	-	-	-	
		Capital	-	-	-	-	-	
JUSTIFICATION Excessive street ponding was observed in Sugar Creek during major rain events. This was attributed to lack of "sheet flow" capacity within the drainage system. The proposed improvements would mitigate ponding in the subdivision during major rain events. Detention projects have been constructed downstream to accommodate these improvements.		TOTAL						
		\$ -	\$ -	\$ -	\$ -	\$ -		
PROJECT COSTS	Project Budget To Date	FISCAL YEAR PLAN					Project Total	
		BUDGET	ESTIMATED					
		2015	2016	2017	2018	2019		
PER	317,447						317,447	
Land/Right of Way	500,000						500,000	
Design/Surveying	385,553						385,553	
Construction	3,000,000						3,000,000	
Equipment and Furniture							-	
Contingency	200,000						200,000	
TOTAL COSTS	\$ 4,403,000	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 4,403,000	
SOURCE OF FUNDS		FISCAL YEAR PLAN					Project Total	
		BUDGET	ESTIMATED					
		2015	2016	2017	2018	2019		
General Revenue							-	
CO's	4,403,000						4,403,000	
SLDC							-	
SL4B							-	
Airport Revenues							-	
Revenue Bonds							-	
Connection Fees							-	
Unfunded							-	
Other Funding Sources							-	
TOTAL SOURCE	\$ 4,403,000	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 4,403,000	
PROJECT SCHEDULE	START (MTH, YEAR)	FINISH (MTH, YEAR)		OTHER:				
Engineering								
Land/Right of Way								
Design/Surveying								
Construction	Oct-14	Oct-15						
Equipment and Furniture								
Contingency								
TOTAL PROJECT								





DR1001
Sugar Creek Drainage
Improvements Phase II



City Goal:	Safest City in the Area
Reference:	Sugar Creek Drainage Analysis (2005)
Project Manager:	Shashi Kumar
Estimator:	Engineering

CITY OF SUGAR LAND 2015-2019 CAPITAL IMPROVEMENT PROGRAM DRAINAGE								I-2 Ranking
PROJECT NO. DR1501	PROJECT TITLE Ditch H Model Update							
DESCRIPTION Update the Ditch H hydraulic and hydrologic model to reflect current conditions and incorporate as-built projects. Provide final analysis on remaining capacity and clarify usage by entities.		IMPACT ON OPERATING BUDGET						
		Expenditures	2015	2016	2017	2018	2019	
		Personnel Services	\$ -	\$ -	\$ -	\$ -	\$ -	
		Operations & Maintenance	-	-	-	-	-	
		Capital	-	-	-	-	-	
JUSTIFICATION Capacity has been allocated within Ditch H to serve areas within the City and to accommodate future drainage improvement projects. An update to the Ditch H Model is necessary to ensure regulatory levels are maintained, reflect current conditions and to incorporate as-built projects.		TOTAL						
		\$ -	\$ -	\$ -	\$ -	\$ -		
PROJECT COSTS	Project Budget To Date	FISCAL YEAR PLAN					Project Total	
		BUDGET	ESTIMATED					
		2015	2016	2017	2018	2019		
Engineering		220,000					220,000	
Land/Right of Way							-	
Design/Surveying							-	
Construction							-	
Equipment and Furniture							-	
Contingency		20,000					20,000	
TOTAL COSTS	\$ -	\$ 240,000	\$ -	\$ -	\$ -	\$ -	\$ 240,000	
SOURCE OF FUNDS	Project Budget To Date	FISCAL YEAR PLAN					Project Total	
		BUDGET	ESTIMATED					
		2015	2016	2017	2018	2019		
General Revenue							-	
CO's		240,000					240,000	
SLDC							-	
SL4B							-	
Airport Revenues							-	
Revenue Bonds							-	
Connection Fees							-	
Unfunded							-	
Other Funding Sources							-	
TOTAL SOURCE	\$ -	\$ 240,000	\$ -	\$ -	\$ -	\$ -	\$ 240,000	
PROJECT SCHEDULE	START (MTH, YEAR)		FINISH (MTH, YEAR)		OTHER:			
Engineering	Jan-15		Oct-15					
Land/Right of Way								
Design/Surveying								
Construction								
Equipment and Furniture								
Contingency								
TOTAL PROJECT								





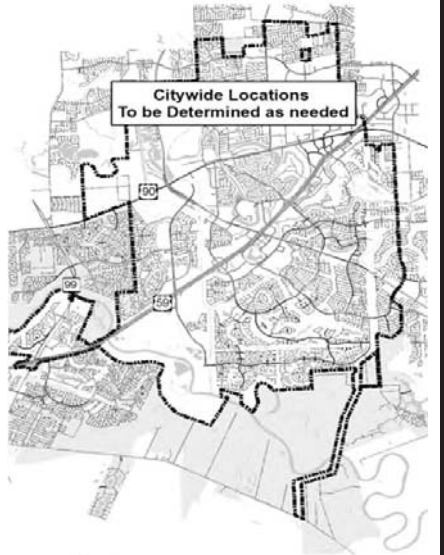
Ditch H Model Update

CITY OF SUGAR LAND
Capital Improvement Program



City Goal:	Responsible City Government
Reference:	Dodson 2011 Study
Project Manager:	Engineering
Estimator:	Engineering

CITY OF SUGAR LAND 2015-2019 CAPITAL IMPROVEMENT PROGRAM DRAINAGE								D-2 Ranking
PROJECT NO. DR1502	PROJECT TITLE Localized Drainage Improvements							
DESCRIPTION Annual funding to address drainage improvements or repairs to existing drainage infrastructure on an as needed basis as identified through inspections or as identified through customer complaints. These include drainage outfalls to facilities owned by other entities, such as the Levee Improvement Districts.		IMPACT ON OPERATING BUDGET						
		Expenditures	2015	2016	2017	2018	2019	
		Personnel Services	\$ -	\$ -	\$ -	\$ -	\$ -	
		Operations & Maintenance	-	-	-	-	-	
		Capital	-	-	-	-	-	
		TOTAL	\$ -	\$ -	\$ -	\$ -	\$ -	
JUSTIFICATION Provides funding to rectify unanticipated failures, such as a collapsed inlet, which could occur anywhere in the City. This funding will facilitate timely correction of localized drainage problems and minimize flooding risks.								
PROJECT COSTS	Project Budget To Date	FISCAL YEAR PLAN					Project Total	
		BUDGET	ESTIMATED					
		2015	2016	2017	2018	2019		
Engineering							-	
Land/Right of Way							-	
Design/Surveying							-	
Construction		300,000					300,000	
Equipment and Furniture							-	
Contingency							-	
TOTAL COSTS	\$ -	\$ 300,000	\$ -	\$ -	\$ -	\$ -	\$ 300,000	
SOURCE OF FUNDS	Project Budget To Date	FISCAL YEAR PLAN					Project Total	
		BUDGET	ESTIMATED					
		2015	2016	2017	2018	2019		
General Revenue		300,000					300,000	
CO's							-	
SLDC							-	
SL4B							-	
Airport Revenues							-	
Revenue Bonds							-	
Connection Fees							-	
Unfunded							-	
Other Funding Sources							-	
TOTAL SOURCE	\$ -	\$ 300,000	\$ -	\$ -	\$ -	\$ -	\$ 300,000	
PROJECT SCHEDULE	START (MTH, YEAR)	FINISH (MTH, YEAR)		OTHER:				
Engineering								
Land/Right of Way								
Design/Surveying								
Construction	Oct-14	Sep-15						
Equipment and Furniture								
Contingency								
TOTAL PROJECT								



Citywide Locations To be Determined as needed



Localized Drainage Improvements



City Goal:	Responsible City Government
Reference:	KSA Outfall Study 2008
Project Manager:	Public Works
Estimator:	Public Works

CITY OF SUGAR LAND 2015-2019 CAPITAL IMPROVEMENT PROGRAM DRAINAGE										D-2 Ranking
PROJECT NO. DR1503		PROJECT TITLE Business Park Pump Station								
DESCRIPTION Conduct a study to evaluate the existing storm water pump station located in the Business Park and identify any improvement needs.					IMPACT ON OPERATING BUDGET					
					Expenditures	2015	2016	2017	2018	2019
					Personnel Services	\$ -	\$ -	\$ -	\$ -	\$ -
					Operations & Maintenance	-	-	-	-	-
					Capital	-	-	-	-	-
JUSTIFICATION The existing Business Park pump station previously owned by MUD 21 was constructed in 2003. Upon dissolution of the MUD 21, City staff conducted site visits and field investigation and it appears the pumps and motors need rehabilitation due to age, wear and tear. An engineering study will need to be performed to estimate rehabilitation costs.					TOTAL					
					\$ -	\$ -	\$ -	\$ -	\$ -	
PROJECT COSTS		Project Budget To Date	FISCAL YEAR PLAN					Project Total		
			BUDGET	ESTIMATED						
			2015	2016	2017	2018	2019			
Engineering			90,000					90,000		
Land/Right of Way								-		
Design/Surveying								-		
Construction								-		
Equipment and Furniture								-		
Contingency			10,000					10,000		
TOTAL COSTS		\$ -	\$ 100,000	\$ -	\$ -	\$ -	\$ -	\$ 100,000		
SOURCE OF FUNDS		Project Budget To Date	FISCAL YEAR PLAN					Project Total		
			BUDGET	ESTIMATED						
			2015	2016	2017	2018	2019			
General Revenue								-		
CO's								-		
SLDC								-		
SL4B								-		
Airport Revenues								-		
Revenue Bonds								-		
Connection Fees								-		
Unfunded								-		
Other Funding Sources MUD21			100,000					100,000		
TOTAL SOURCE		\$ -	\$ 100,000	\$ -	\$ -	\$ -	\$ -	\$ 100,000		
PROJECT SCHEDULE		START (MTH, YEAR)		FINISH (MTH, YEAR)		OTHER:				
Engineering		Dec-14		May-15						
Land/Right of Way										
Design/Surveying										
Construction										
Equipment and Furniture										
Contingency										
TOTAL PROJECT										





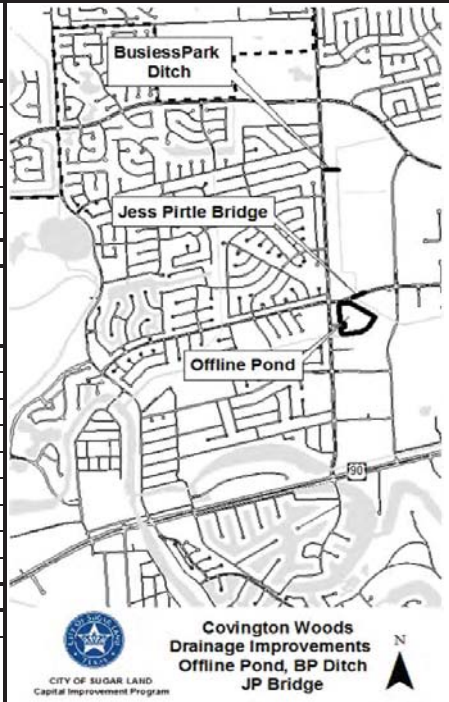
Business Park Pump Station

CITY OF SUGAR LAND
Capital Improvement Program

City Goal: Responsible City Government
Reference: MUD 21 Dissolution
Project Manager: Engineering
Estimator: Engineering

CITY OF SUGAR LAND 2015-2019 CAPITAL IMPROVEMENT PROGRAM DRAINAGE										D-3 Ranking	
PROJECT NO. DR1504		PROJECT TITLE Sugar Creek Drainage Improvements - Longview Dr. & Golf Course									
DESCRIPTION Design and construction of new reinforced concrete boxes south on Longview Dr. to divert flow to East Sugar Creek and new storm inlets along Longview Dr. to reduce backwater surcharging. This project includes street reconstruction.					IMPACT ON OPERATING BUDGET						
					Expenditures		2015	2016	2017	2018	2019
					Personnel Services		\$ -	\$ -	\$ -	\$ -	\$ -
					Operations & Maintenance		-	-	-	-	-
					Capital		-	-	-	-	-
JUSTIFICATION Sugar Creek experiences significant flooding during medium to intense flood events due to undersized inlets and storm drains. Results of the Preliminary Engineering Report (PER) indicates a large portion of the development does not meet current City design criteria. Improvements will need to be made to reduce flooding and meet City design standards.					TOTAL		\$ -	\$ -	\$ -	\$ -	\$ -
PROJECT COSTS		Project Budget To Date	FISCAL YEAR PLAN					Project Total			
			BUDGET		ESTIMATED						
		2015	2016	2017	2018	2019					
Engineering							-				
Land/Right of Way							-				
Design/Surveying		500,000					500,000				
Construction			4,800,000				4,800,000				
Equipment and Furniture							-				
Contingency		50,000	500,000				550,000				
TOTAL COSTS		\$ -	\$ 550,000	\$ 5,300,000	\$ -	\$ -	\$ -	\$ 5,850,000			
SOURCE OF FUNDS		Project Budget To Date	FISCAL YEAR PLAN					Project Total			
			BUDGET		ESTIMATED						
		2015	2016	2017	2018	2019					
General Revenue							-				
CO's		510,000	5,300,000				5,810,000				
SLDC							-				
SL4B							-				
Airport Revenues							-				
Revenue Bonds		40,000					40,000				
Connection Fees							-				
Unfunded							-				
Other Funding Sources							-				
TOTAL SOURCE		\$ -	\$ 550,000	\$ 5,300,000	\$ -	\$ -	\$ -	\$ 5,850,000			
PROJECT SCHEDULE		START (MTH, YEAR)		FINISH (MTH, YEAR)		OTHER:					
Engineering											
Land/Right of Way											
Design/Surveying		Nov-14		Oct-15							
Construction		2016		2016							
Equipment and Furniture											
Contingency											
TOTAL PROJECT											
 Sugar Creek Drainage Improvements Longview Dr. Golf Course											
City Goal: Responsible City Government											
Reference: Half Associates 2014 PER											
Project Manager: Engineering											
Estimator: Engineering											

CITY OF SUGAR LAND 2015-2019 CAPITAL IMPROVEMENT PROGRAM DRAINAGE										D-3 Ranking
PROJECT NO. DR1505		PROJECT TITLE Covington Woods Drainage Improvements - Offline Pond, BP Ditch, JP Bridge								
DESCRIPTION Design and construction of the western portion of the existing detention basin to an "offline" pond to reduce storm event peak and mitigate downstream impacts. The Business Park Ditch will include a secondary outfall to the Eldridge Road storm sewer to help reduce water elevations. The Jess Pirtle Bridge will include a new storm water conveyance pipe to reduce backwater flooding.		IMPACT ON OPERATING BUDGET								
		Expenditures	2015	2016	2017	2018	2019			
		Personnel Services	\$ -	\$ -	\$ -	\$ -	\$ -			
		Operations & Maintenance	-	-	-	-	-			
		Capital	-	-	-	-	-			
JUSTIFICATION Covington Woods is subject to wide spread roadway inundation during medium to extreme rain events. Many of the roadways are impassible during these storm events and subject to excessively long times to drain leading to decreased mobility. Portions of the area do not meet current City design standards. Improvements are needed to address flood and design issues.		TOTAL								
		\$ -	\$ -	\$ -	\$ -	\$ -				
PROJECT COSTS	Project Budget To Date	FISCAL YEAR PLAN					Project Total			
		BUDGET								
		2015	2016	2017	2018	2019				
Engineering							-			
Land/Right of Way							-			
Design/Surveying		200,000					200,000			
Construction			1,630,000				1,630,000			
Equipment and Furniture							-			
Contingency		20,000	190,000				210,000			
TOTAL COSTS	\$ -	\$ 220,000	\$ 1,820,000	\$ -	\$ -	\$ -	\$ 2,040,000			
SOURCE OF FUNDS	Project Budget To Date	FISCAL YEAR PLAN					Project Total			
		BUDGET	ESTIMATED							
		2015	2016	2017	2018	2019				
General Revenue							-			
CO's		220,000	1,820,000				2,040,000			
SLDC							-			
SL4B							-			
Airport Revenues							-			
Revenue Bonds							-			
Connection Fees							-			
Unfunded							-			
Other Funding Sources							-			
TOTAL SOURCE	\$ -	\$ 220,000	\$ 1,820,000	\$ -	\$ -	\$ -	\$ 2,040,000			
PROJECT SCHEDULE	START (MTH, YEAR)		FINISH (MTH, YEAR)		OTHER:					
Engineering										
Land/Right of Way										
Design/Surveying	Nov-14		Aug-15							
Construction	2016		2016							
Equipment and Furniture										
Contingency										
TOTAL PROJECT										



City Goal: Responsible City Government

Reference: LAN 2014 PER

Project Manager: Engineering

Estimator: Engineering

CITY OF SUGAR LAND 2015-2019 CAPITAL IMPROVEMENT PROGRAM DRAINAGE										D-3 Ranking
PROJECT NO. DR1506		PROJECT TITLE Covington Woods Drainage Improvements - A22 Bournewood Trunk Line								
DESCRIPTION Design and construction of a new efficient stormwater outfall and new trunk line to extend north from Ditch A-22 along Bournewood Dr. to Bramblebury Dr. to mitigate subdivision and street flooding impacts. This project includes street reconstruction.		IMPACT ON OPERATING BUDGET								
		Expenditures	2015	2016	2017	2018	2019			
		Personnel Services	\$ -	\$ -	\$ -	\$ -	\$ -			
		Operations & Maintenance	-	-	-	-	-			
		Capital	-	-	-	-	-			
JUSTIFICATION Covington Woods is subject to wide spread roadway inundation during medium to extreme rain events. Many of the roadways are impassible during these storm events and subject to excessively long times to drain leading to decreased mobility. Portions of the area do not meet current City design standards. Improvements are needed to address flood and design issues.		TOTAL								
		\$ -	\$ -	\$ -	\$ -	\$ -	\$ -			
PROJECT COSTS	Project Budget To Date	FISCAL YEAR PLAN					Project Total			
		BUDGET								
		2015	2016	2017	2018	2019				
		Engineering								
		Land/Right of Way								
		Design/Surveying	480,000							
		Construction		4,770,000						
Equipment and Furniture										
Contingency		50,000	530,000							
TOTAL COSTS	\$ -	\$ 530,000	\$ 5,300,000	\$ -	\$ -	\$ -	\$ 5,830,000			
SOURCE OF FUNDS	Project Budget To Date	FISCAL YEAR PLAN					Project Total			
		BUDGET	ESTIMATED							
		2015	2016	2017	2018	2019				
		General Revenue								
		CO's	530,000	5,300,000						
		SLDC								
		SL4B								
Airport Revenues										
Revenue Bonds										
Connection Fees										
Unfunded										
Other Funding Sources										
TOTAL SOURCE	\$ -	\$ 530,000	\$ 5,300,000	\$ -	\$ -	\$ -	\$ 5,830,000			
PROJECT SCHEDULE	START (MTH, YEAR)	FINISH (MTH, YEAR)	OTHER:							
Engineering										
Land/Right of Way										
Design/Surveying	Nov-14	Sep-15								
Construction	2016	2016								
Equipment and Furniture										
Contingency										
TOTAL PROJECT										



A22 Bournewood Trunk Line

Covington Woods Drainage Improvements A22 Bournewood Trunk Line

 CITY OF SUGAR LAND
Capital Improvement Program

City Goal: Responsible City Government
Reference: LAN 2014 PER
Project Manager: Engineering
Estimator: Engineering

CITY OF SUGAR LAND 2015-2019 CAPITAL IMPROVEMENT PROGRAM DRAINAGE								D-3 Ranking
PROJECT NO. DR1601	PROJECT TITLE Covington Woods Drainage Improvements - Ivymount Dr.							
DESCRIPTION Addition of inlets and upsized storm sewer to alleviate backwater conditions causing street flooding.		IMPACT ON OPERATING BUDGET						
		Expenditures	2015	2016	2017	2018	2019	
		Personnel Services	\$ -	\$ -	\$ -	\$ -	\$ -	
		Operations & Maintenance	-	-	-	-	-	
		Capital	-	-	-	-	-	
JUSTIFICATION Covington Woods is subject to wide spread roadway inundation during medium to extreme rain events. Many of the roadways are impassible during these storm events and subject to excessively long times to drain leading to decreased mobility. Portions of the area do not meet current City design standards. Improvements are needed to address flood and design issues.		TOTAL	\$ -	\$ -	\$ -	\$ -	\$ -	
PROJECT COSTS	Project Budget To Date	FISCAL YEAR PLAN					Project Total	
		BUDGET 2015	2016	2017	2018	2019		
Engineering							-	
Land/Right of Way							-	
Design/Surveying			100,000	540,000			640,000	
Construction							-	
Equipment and Furniture							-	
Contingency			10,000	60,000			70,000	
TOTAL COSTS	\$ -	\$ -	\$ 110,000	\$ 600,000	\$ -	\$ -	\$ 710,000	
SOURCE OF FUNDS	Project Budget To Date	FISCAL YEAR PLAN					Project Total	
		BUDGET 2015	2016	2017	2018	2019		
General Revenue			110,000				110,000	
CO's				600,000			600,000	
SLDC							-	
SL4B							-	
Airport Revenues							-	
Revenue Bonds							-	
Connection Fees							-	
Unfunded							-	
Other Funding Sources							-	
TOTAL SOURCE	\$ -	\$ -	\$ 110,000	\$ 600,000	\$ -	\$ -	\$ 710,000	
PROJECT SCHEDULE	START (MTH, YEAR)	FINISH (MTH, YEAR)		OTHER:				
Engineering								
Land/Right of Way								
Design/Surveying	2016	2016						
Construction	2017	2017						
Equipment and Furniture								
Contingency								
TOTAL PROJECT								



**Covington Woods
Drainage Improvements
Ivymount Dr.**

CITY OF SUGAR LAND
Capital Improvement Program

City Goal:	Responsible City Government
Reference:	LAN 2014 PER
Project Manager:	Engineering
Estimator:	Engineering

CITY OF SUGAR LAND 2015-2019 CAPITAL IMPROVEMENT PROGRAM DRAINAGE								D-3 Ranking
PROJECT NO. DR1602	PROJECT TITLE Sugar Creek Drainage Improvements - Montclair Dr.							
DESCRIPTION Design and construction of new reinforced concrete boxes along Montclair Dr. to divert flow to East Sugar Creek ditch and new, larger inlets along Montclair Dr. to reduce backwater surcharging and alleviate street flooding. This project includes street reconstruction.		IMPACT ON OPERATING BUDGET						
		Expenditures	2015	2016	2017	2018	2019	
		Personnel Services	\$ -	\$ -	\$ -	\$ -	\$ -	
		Operations & Maintenance	-	-	-	-	-	
		Capital	-	-	-	-	-	
JUSTIFICATION Sugar Creek experiences significant flooding during medium to intense flood events due to undersized inlets and storm drains. Results of the Preliminary Engineering Report (PER) indicate a large portion of the development does not meet current City design criteria. Improvements will need to be made to reduce flooding and meet City design standards.		TOTAL						
		\$ -	\$ -	\$ -	\$ -	\$ -		
PROJECT COSTS	Project Budget To Date	FISCAL YEAR PLAN					Project Total	
		BUDGET						
		2015	2016	2017	2018	2019		
Engineering							-	
Land/Right of Way							-	
Design/Surveying			485,000				485,000	
Construction				4,680,000			4,680,000	
Equipment and Furniture							-	
Contingency			50,000	520,000			570,000	
TOTAL COSTS	\$ -	\$ -	\$ 535,000	\$ 5,200,000	\$ -	\$ -	\$ 5,735,000	
SOURCE OF FUNDS	Project Budget To Date	FISCAL YEAR PLAN					Project Total	
		BUDGET	ESTIMATED					
		2015	2016	2017	2018	2019		
General Revenue							-	
CO's			535,000	5,200,000			5,735,000	
SLDC							-	
SL4B							-	
Airport Revenues							-	
Revenue Bonds							-	
Connection Fees							-	
Unfunded							-	
Other Funding Sources							-	
TOTAL SOURCE	\$ -	\$ -	\$ 535,000	\$ 5,200,000	\$ -	\$ -	\$ 5,735,000	
PROJECT SCHEDULE	START (MTH, YEAR)	FINISH (MTH, YEAR)		OTHER:				
Engineering								
Land/Right of Way								
Design/Surveying	2016	2016						
Construction	2017	2018						
Equipment and Furniture								
Contingency								
TOTAL PROJECT								



Sugar Creek Drainage Improvements Montclair Dr.

CITY OF SUGAR LAND
Capital Improvement Program

City Goal: Responsible City Government
Reference: Halff Associates 2014 PER
Project Manager: Engineering
Estimator: Engineering

CITY OF SUGAR LAND 2015-2019 CAPITAL IMPROVEMENT PROGRAM DRAINAGE								D-2 Ranking
PROJECT NO. DR1603	PROJECT TITLE Localized Drainage Improvements							
DESCRIPTION Annual funding to address drainage improvements or repairs to existing drainage infrastructure on an as needed basis as identified through inspections or as identified through customer complaints. These include drainage outfalls to facilities owned by other entities, such as the Levee Improvement Districts.		IMPACT ON OPERATING BUDGET						
		Expenditures	2015	2016	2017	2018	2019	
		Personnel Services	\$ -	\$ -	\$ -	\$ -	\$ -	
		Operations & Maintenance	-	-	-	-	-	
		Capital	-	-	-	-	-	
JUSTIFICATION Provides funding to rectify unanticipated failures, such as a collapsed inlet, which could occur anywhere in the City. This funding will facilitate timely correction of localized drainage problems and minimize flooding risks.		TOTAL						
		\$ -	\$ -	\$ -	\$ -	\$ -		
PROJECT COSTS	Project Budget To Date	FISCAL YEAR PLAN					Project Total	
		BUDGET	ESTIMATED					
		2015	2016	2017	2018	2019		
Engineering							-	
Land/Right of Way							-	
Design/Surveying							-	
Construction			300,000	300,000	300,000	300,000	1,200,000	
Equipment and Furniture							-	
Contingency							-	
TOTAL COSTS	\$ -	\$ -	\$ 300,000	\$ 300,000	\$ 300,000	\$ 300,000	\$ 1,200,000	
SOURCE OF FUNDS	Project Budget To Date	FISCAL YEAR PLAN					Project Total	
		BUDGET	ESTIMATED					
		2015	2016	2017	2018	2019		
General Revenue			300,000	300,000	300,000	300,000	1,200,000	
CO's							-	
SLDC							-	
SL4B							-	
Airport Revenues							-	
Revenue Bonds							-	
Connection Fees							-	
Unfunded							-	
Other Funding Sources							-	
TOTAL SOURCE	\$ -	\$ -	\$ 300,000	\$ 300,000	\$ 300,000	\$ 300,000	\$ 1,200,000	
PROJECT SCHEDULE	START (MTH, YEAR)	FINISH (MTH, YEAR)		OTHER:				
Engineering								
Land/Right of Way								
Design/Surveying								
Construction	2016	2016						
Equipment and Furniture								
Contingency								
TOTAL PROJECT								



**Citywide Locations
To be Determined as needed**



**Localized
Drainage
Improvements**



City Goal: _____

Reference: _____

Project Manager: _____

Estimator: _____

Responsible City Government

KSA Outfall Study 2008

Public Works

Public Works

CITY OF SUGAR LAND 2015-2019 CAPITAL IMPROVEMENT PROGRAM DRAINAGE										D-3 Ranking
PROJECT NO. DR1701		PROJECT TITLE Covington Woods Drainage Improvements - Jess Pirtle Side Streets & Greywood								
DESCRIPTION Design and construction of new reinforced concrete pipe along Sugarfield, Sugardale, and Sugar Mountain Courts to reduce stormwater ponding. Greywood Dr. include storm sewer improvements parallel to the existing storm system to provide additional conveyance.		IMPACT ON OPERATING BUDGET								
		Expenditures	2015	2016	2017	2018	2019			
		Personnel Services	\$ -	\$ -	\$ -	\$ -	\$ -			
		Operations & Maintenance	-	-	-	-	-			
		Capital	-	-	-	-	-			
JUSTIFICATION Covington Woods is subject to wide spread roadway inundation during medium to extreme rain events. Many of the roadways are impassible during these storm events and subject to excessively long times to drain leading to decreased mobility. Portions of the area do not meet current City design standards. Improvements are needed to address flood and design issues.		TOTAL								
		\$ -	\$ -	\$ -	\$ -	\$ -				
PROJECT COSTS	Project Budget To Date	FISCAL YEAR PLAN					Project Total			
		BUDGET								
		2015	2016	2017	2018	2019				
Engineering							-			
Land/Right of Way							-			
Design/Surveying				115,000			115,000			
Construction					1,010,000		1,010,000			
Equipment and Furniture							-			
Contingency				15,000	120,000		135,000			
TOTAL COSTS	\$ -	\$ -	\$ -	\$ 130,000	\$ 1,130,000	\$ -	\$ 1,260,000			
SOURCE OF FUNDS	Project Budget To Date	FISCAL YEAR PLAN					Project Total			
		BUDGET	ESTIMATED							
		2015	2016	2017	2018	2019				
General Revenue				130,000			130,000			
CO's					1,130,000		1,130,000			
SLDC							-			
SL4B							-			
Airport Revenues							-			
Revenue Bonds							-			
Connection Fees							-			
Unfunded							-			
Other Funding Sources							-			
TOTAL SOURCE	\$ -	\$ -	\$ -	\$ 130,000	\$ 1,130,000	\$ -	\$ 1,260,000			
PROJECT SCHEDULE	START (MTH, YEAR)	FINISH (MTH, YEAR)		OTHER:						
Engineering										
Land/Right of Way										
Design/Surveying	2017	2017								
Construction	2018	2019								
Equipment and Furniture										
Contingency										
TOTAL PROJECT										



Jess Pirtle Side Streets



**Covington Woods Drainage Improvements
Jess Pirtle Side Streets**

CITY OF SUGAR LAND
Capital Improvement Program

City Goal:	Responsible City Government
Reference:	LAN 2014 PER
Project Manager:	Engineering
Estimator:	Engineering

CITY OF SUGAR LAND 2015-2019 CAPITAL IMPROVEMENT PROGRAM DRAINAGE										D-3 Ranking
PROJECT NO. DR1801		PROJECT TITLE Sugar Creek Drainage Improvements - Brunswick Dr. & Fairway Dr.								
DESCRIPTION Design and construction of new reinforced concrete boxes along Brunswick Dr. and Fairway Dr. and diversion of flow to Longview Dr. to reduce flooding. Inlets and laterals are replaced along Brunswick Dr. and Fairway Dr. with new, larger sizes to reduce backwater surcharging. This project includes street reconstruction.		IMPACT ON OPERATING BUDGET								
		Expenditures	2015	2016	2017	2018	2019			
		Personnel Services	\$ -	\$ -	\$ -	\$ -	\$ -			
		Operations & Maintenance	-	-	-	-	-			
		Capital	-	-	-	-	-			
		TOTAL	\$ -	\$ -	\$ -	\$ -	\$ -			
JUSTIFICATION Sugar Creek experiences significant flooding during medium to intense flood events due to undersized inlets and storm drains. Results of the Preliminary Engineering Report (PER) indicate a large portion of the development does not meet current City design criteria. Improvements will need to be made to reduce flooding and meet City design standards.										
PROJECT COSTS	Project Budget To Date	FISCAL YEAR PLAN					Project Total			
		BUDGET								
		2015	2016	2017	2018	2019				
Engineering							-			
Land/Right of Way							-			
Design/Surveying					300,000		300,000			
Construction						2,800,000	2,800,000			
Equipment and Furniture							-			
Contingency					30,000	300,000	330,000			
TOTAL COSTS	\$ -	\$ -	\$ -	\$ -	\$ 330,000	\$ 3,100,000	\$ 3,430,000			
SOURCE OF FUNDS	Project Budget To Date	FISCAL YEAR PLAN					Project Total			
		BUDGET								
		2015	2016	2017	2018	2019				
General Revenue							-			
CO's					330,000	3,100,000	3,430,000			
SLDC							-			
SL4B							-			
Airport Revenues							-			
Revenue Bonds							-			
Connection Fees							-			
Unfunded							-			
Other Funding Sources							-			
TOTAL SOURCE	\$ -	\$ -	\$ -	\$ -	\$ 330,000	\$ 3,100,000	\$ 3,430,000			
PROJECT SCHEDULE	START (MTH, YEAR)	FINISH (MTH, YEAR)		OTHER:						
Engineering										
Land/Right of Way										
Design/Surveying	2018	2018								
Construction	2019	2020								
Equipment and Furniture										
Contingency										
TOTAL PROJECT										

Sugar Creek Drainage Improvements
Brunswick Dr.
Fairway Dr.

City Goal: Responsible City Government

Reference: Half Associates 2014 PER

Project Manager: Engineering

Estimator: Engineering

CITY OF SUGAR LAND 2015-2019 CAPITAL IMPROVEMENT PROGRAM DRAINAGE										D-3 Ranking
PROJECT NO. DR1802		PROJECT TITLE Sugar Creek Drainage Improvements - East Ditch								
DESCRIPTION Design and construction of new storm inlets along East Ditch to increase capacity. Inlets and laterals are replaced with larger sizes to increase capacity and reduce street flooding.				IMPACT ON OPERATING BUDGET						
				Expenditures	2015	2016	2017	2018	2019	
				Personnel Services	\$ -	\$ -	\$ -	\$ -	\$ -	
				Operations & Maintenance	-	-	-	-	-	
JUSTIFICATION Sugar Creek experiences significant flooding during medium to intense flood events due to undersized inlets and storm drains. Results of the Preliminary Engineering Report (PER) indicate a large portion of the development does not meet current City design criteria. Improvements will need to be made to reduce flooding and meet City design standards.				Capital	-	-	-	-	-	
				TOTAL	\$ -	\$ -	\$ -	\$ -	\$ -	
PROJECT COSTS		Project Budget To Date	FISCAL YEAR PLAN					Project Total		
			BUDGET							
			2015	2016	2017	2018	2019			
Engineering								-		
Land/Right of Way								-		
Design/Surveying					150,000			150,000		
Construction						1,350,000		1,350,000		
Equipment and Furniture								-		
Contingency					25,000	150,000		175,000		
TOTAL COSTS		\$ -	\$ -	\$ -	\$ -	\$ 175,000	\$ 1,500,000	\$ 1,675,000		
SOURCE OF FUNDS		Project Budget To Date	FISCAL YEAR PLAN					Project Total		
			BUDGET	ESTIMATED						
			2015	2016	2017	2018	2019			
General Revenue								-		
CO's						175,000	1,500,000	1,675,000		
SLDC								-		
SL4B								-		
Airport Revenues								-		
Revenue Bonds								-		
Connection Fees								-		
Unfunded								-		
Other Funding Sources								-		
TOTAL SOURCE		\$ -	\$ -	\$ -	\$ -	\$ 175,000	\$ 1,500,000	\$ 1,675,000		
PROJECT SCHEDULE		START (MTH, YEAR)		FINISH (MTH, YEAR)		OTHER:				
Engineering										
Land/Right of Way										
Design/Surveying		2018		2018						
Construction		2019		2020						
Equipment and Furniture										
Contingency										
TOTAL PROJECT										

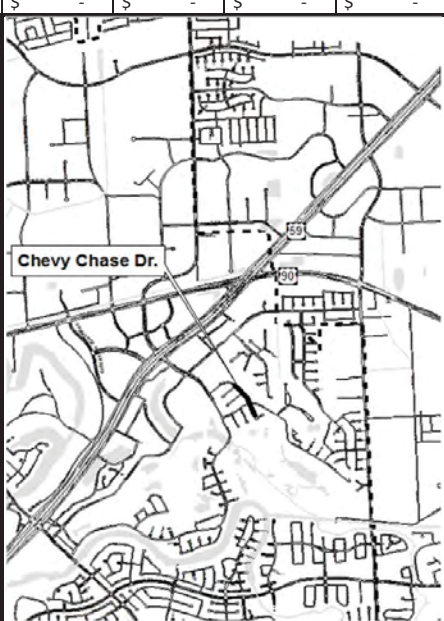


East Ditch

CITY OF SUGAR LAND
Capital Improvement Program

**Sugar Creek
Drainage Improvements
East Ditch**

City Goal: Responsible City Government
Reference: Halff Associates 2014 PER
Project Manager: Engineering
Estimator: Engineering

CITY OF SUGAR LAND 2015-2019 CAPITAL IMPROVEMENT PROGRAM DRAINAGE										D-3 Ranking
PROJECT NO. DR1803	PROJECT TITLE Sugar Creek Drainage Improvements - Chevy Chase Dr.									
DESCRIPTION Design and construction of new reinforced concrete boxes and new storm inlets along Chevy Chase Dr. to increase capacity. Inlets and laterals are replaced with larger sizes to increase capacity and reduce street flooding. This project includes street reconstruction.					IMPACT ON OPERATING BUDGET					
					Expenditures	2015	2016	2017	2018	2019
					Personnel Services	\$ -	\$ -	\$ -	\$ -	\$ -
					Operations & Maintenance	-	-	-	-	-
					Capital	-	-	-	-	-
JUSTIFICATION Sugar Creek experiences significant flooding during medium to intense flood events due to undersized inlets and storm drains. Results of the Preliminary Engineering Report (PER) indicate a large portion of the development does not meet current City design criteria. Improvements will need to be made to reduce flooding and meet City design standards.					TOTAL \$ - \$ - \$ - \$ - \$ -					
PROJECT COSTS	Project Budget To Date	FISCAL YEAR PLAN					Project Total			
		BUDGET								
		2015	2016	2017	2018	2019				
Engineering							-			
Land/Right of Way							-			
Design/Surveying					165,000		165,000			
Construction						1,530,000	1,530,000			
Equipment and Furniture							-			
Contingency					20,000	170,000	190,000			
TOTAL COSTS	\$ -	\$ -	\$ -	\$ -	\$ 185,000	\$ 1,700,000	\$ 1,885,000			
SOURCE OF FUNDS	Project Budget To Date	FISCAL YEAR PLAN					Project Total			
		BUDGET	ESTIMATED							
		2015	2016	2017	2018	2019				
General Revenue							-			
CO's					185,000	1,700,000	1,885,000			
SLDC							-			
SL4B							-			
Airport Revenues							-			
Revenue Bonds							-			
Connection Fees							-			
Unfunded							-			
Other Funding Sources							-			
TOTAL SOURCE	\$0	\$0	\$0	\$0	\$185,000	\$1,700,000	\$1,885,000			
PROJECT SCHEDULE	START (MTH, YEAR)	FINISH (MTH, YEAR)		OTHER:						
Engineering										
Land/Right of Way										
Design/Surveying	2018	2018								
Construction	2019	2020								
Equipment and Furniture										
Contingency										
TOTAL PROJECT										

Sugar Creek Drainage Improvements Chevy Chase Dr.

CITY OF SUGAR LAND
Capital Improvement Program

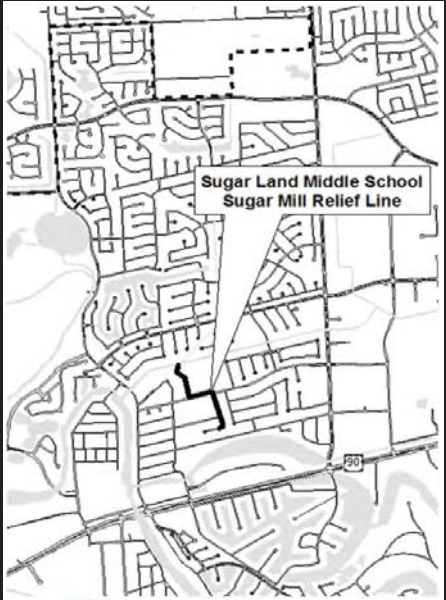
City Goal: Responsible City Government

Reference: Half Associates 2014 PER

Project Manager: Engineering

Estimator: Engineering

CITY OF SUGAR LAND 2015-2019 CAPITAL IMPROVEMENT PROGRAM DRAINAGE										D-3 Ranking
PROJECT NO. DR1901		PROJECT TITLE Covington Woods Drainage Improvements - Sugar Land MS / Sugar Mill Relief Line								
DESCRIPTION Design and construction of new reinforced concrete pipe along Sugarfield, Sugardale, and Sugar Mountain Courts to reduce stormwater ponding. Greywood Dr. include storm sewer improvements parallel to the existing storm system to provide additional conveyance.		IMPACT ON OPERATING BUDGET								
		Expenditures	2015	2016	2017	2018	2019			
		Personnel Services	\$ -	\$ -	\$ -	\$ -	\$ -			
		Operations & Maintenance	-	-	-	-	-			
		Capital	-	-	-	-	-			
JUSTIFICATION Covington Woods is subject to wide spread roadway inundation during medium to extreme rain events. Many of the roadways are impassible during these storm events and subject to excessively long times to drain leading to decreased mobility. Portions of the area do not meet current City design standards. Improvements are needed to address flood and design issues.		TOTAL								
PROJECT COSTS		Project Budget To Date	FISCAL YEAR PLAN					Project Total		
			BUDGET							
			2015	2016	2017	2018	2019			
Engineering								-		
Land/Right of Way								-		
Design/Surveying						100,000		100,000		
Construction								-		
Equipment and Furniture								-		
Contingency						10,000		10,000		
TOTAL COSTS		\$ -	\$ -	\$ -	\$ -	\$ -	\$ 110,000	\$ 110,000		
SOURCE OF FUNDS		Project Budget To Date	FISCAL YEAR PLAN					Project Total		
			BUDGET	ESTIMATED						
			2015	2016	2017	2018	2019			
General Revenue							110,000	110,000		
CO's								-		
SLDC								-		
SL4B								-		
Airport Revenues								-		
Revenue Bonds								-		
Connection Fees								-		
Unfunded								-		
Other Funding Sources								-		
TOTAL SOURCE		\$ -	\$ -	\$ -	\$ -	\$ -	\$ 110,000	\$ 110,000		
PROJECT SCHEDULE		START (MTH, YEAR)	FINISH (MTH, YEAR)		OTHER:					
Engineering										
Land/Right of Way										
Design/Surveying		2019	2019							
Construction		2020	2021							
Equipment and Furniture										
Contingency										
TOTAL PROJECT										



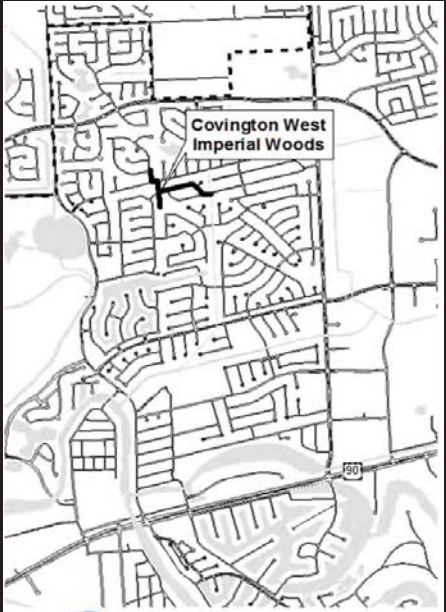
**Sugar Land Middle School
Sugar Mill Relief Line**



**Covington Woods
Drainage Improvements
Sugar Land Middle School
Sugar Mill Relief Line**

City Goal:	Responsible City Government
Reference:	LAN 2014 PER
Project Manager:	Engineering
Estimator:	Engineering

CITY OF SUGAR LAND 2015-2019 CAPITAL IMPROVEMENT PROGRAM DRAINAGE										D-3 Ranking
PROJECT NO. DR1902		PROJECT TITLE Covington Woods Drainage Improvements - Covington West & Imperial Woods								
DESCRIPTION Design and construction of new reinforced concrete pipe within Covington West and Imperial Woods to increase stormwater conveyance and decrease ponding in these areas.		IMPACT ON OPERATING BUDGET								
		Expenditures	2015	2016	2017	2018	2019			
		Personnel Services	\$ -	\$ -	\$ -	\$ -	\$ -			
		Operations & Maintenance	-	-	-	-	-			
		Capital	-	-	-	-	-			
JUSTIFICATION Covington Woods is subject to wide spread roadway inundation during medium to extreme rain events. Many of the roadways are impassible during these storm events and subject to excessively long times to drain leading to decreased mobility. Portions of the area do not meet current City design standards and improvements are needed to address flood and design issues.		TOTAL								
		\$ -	\$ -	\$ -	\$ -	\$ -	\$ -			
PROJECT COSTS	Project Budget To Date	FISCAL YEAR PLAN					Project Total			
		BUDGET								
		2015	2016	2017	2018	2019				
		Engineering								
		Land/Right of Way								
		Design/Surveying				160,000		160,000		
		Construction								
Equipment and Furniture										
Contingency					20,000	20,000				
TOTAL COSTS	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 180,000	\$ 180,000			
SOURCE OF FUNDS	Project Budget To Date	FISCAL YEAR PLAN					Project Total			
		BUDGET								
		2015	2016	2017	2018	2019				
		General Revenue						180,000	180,000	
		CO's							-	
		SLDC							-	
		SL4B							-	
Airport Revenues						-				
Revenue Bonds						-				
Connection Fees						-				
Unfunded						-				
Other Funding Sources						-				
TOTAL SOURCE	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 180,000	\$ 180,000			
PROJECT SCHEDULE	START (MTH, YEAR)	FINISH (MTH, YEAR)		OTHER:						
Engineering										
Land/Right of Way										
Design/Surveying	2019	2019								
Construction	2020	2021								
Equipment and Furniture										
Contingency										
TOTAL PROJECT										



**Covington Woods
Drainage Improvements
Covington West
Imperial Woods**

 CITY OF SUGAR LAND
Capital Improvement Program

City Goal: Responsible City Government

Reference: LAN 2014 PER

Project Manager: Engineering

Estimator: Engineering

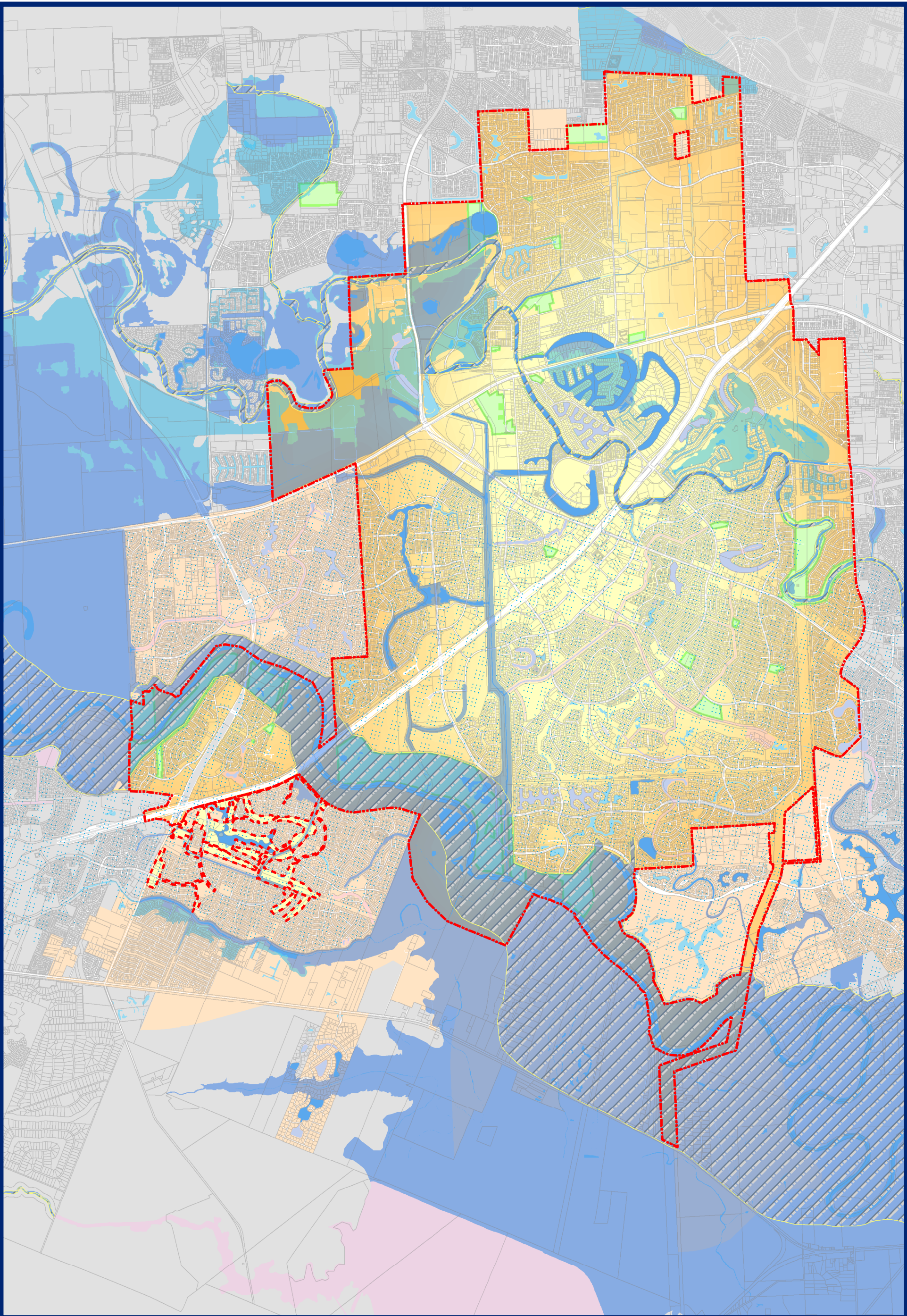
Appendix 7: Assessment of City-Owned Detention Facilities

CITY OF SUGAR LAND
Summary of Assessment of
City Owned/Maintained Stormwater Detention Facilities

Facility ID No.	Facility Name	Owner (Based upon 2013 FBCAD Parcel Information, supplemented with miscellaneous data sources)	Pond Type	Date of Assessment	Comments
AIRPORT WATERSHED					
83	Sugar Land Airport Detention Ponds	City of Sugar Land	Wet	1/7/2014	In good condition.
90	Sugar Land Airport Detention Ponds	City of Sugar Land	Wet	1/7/2014	In good condition.
92	Sugar Land Airport Detention Pond Central	City of Sugar Land	Wet	1/9/2014	In good condition.
106	Sugar Land Airport Detention Ponds	City of Sugar Land	Dry	1/7/2014	Outfalls Directly to Oyster Creek. In excellent condition.
COVINGTON WOODS WATERSHED					
134	Eldridge Park Detention Pond	City of Sugar Land	Wet	1/7/2014	Mainly serves City's Park property. In good condition.
DITCH A-22 WATERSHED					
57	Northeast Detention Pond	City of Sugar Land	Dry	1/7/2014	In good condition.
81	West Detention Ponds	City of Sugar Land	Dry	1/7/2014	In good condition.
82	Gillingham Detention Pond	City of Sugar Land	Dry	1/7/2014	In good condition.
ELDRIDGE ROAD WATERSHED					
105	Eldridge Road Watershed & 271 Acre Feet Detention Pond	City of Sugar Land	Dry	1/7/2014	In good Condition
121	Eldridge Road Watershed Pond Expansion	City of Sugar Land	Dry	1/7/2014	In good Condition
HWY 90-A DITCH WATERSHED					
125	Ditch 90 A - Regional Detention Pond	City of Sugar Land	Dry	1/7/2014	In good Condition
OYSTER CREEK WATERSHED					
58	Gannoway Lake	City of Sugar Land	Wet	1/7/2014	Functions as a "pass thru" drainage facility. Water Hyacinth and sedimentation is a major concern here.
117	Upper Ditch H Regional Detention	City of Sugar Land	Dry	1/7/2014	In fair condition. Grass seeding and erosion protection measures needed as some locations.
SUGAR CREEK WATERSHED					
130	Triangle Detention Pond	City of Sugar Land, State of Texas	Wet	1/7/2014	Regional Detention Basin. In good condition.

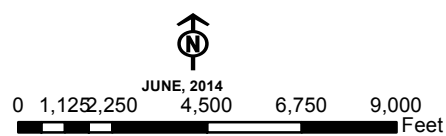
Note: Please refer to Appendix 8 of the Master Drainage Plan (MDP) Report for additional details. Facility ID is referenced in Exhibit 4 of the MDP.

Appendix 8: FEMA Identified Flood Hazard Areas



**CITY OF SUGAR LAND
APPENDIX 8 FEMA IDENTIFIED
FLOOD HAZARD AREAS
DFIRM EFFECTIVE
APRIL 2, 2014**

- FLOODWAY
- ZONE X PROTECTED BY LEVEE
- ZONE A0
- ZONE AE (100 YR)
- ZONE A
- 500 YR (0.2% ACFH)
- LAKES, STREAMS, & CREEKS
- CITY PARK
- CITY OF SUGAR LAND - CITY LIMITS
- CITY OF SUGAR LAND - LIMITED PURPOSE ANNEXATION
- CITY OF SUGAR LAND - ETJ



This map has been produced from various sources. Every effort has been made to ensure the accuracy of this map. However, the City of Sugar Land assumes no liability or damages due to errors, or omissions. This product is for informational purposes and may not have been prepared for, or be suitable for legal, engineering, or surveying purposes. It does not represent an on-the-ground survey and represents only the approximate relative location of property boundaries. If any errors are detected, please contact the GIS Division of Information Technology at (281)275-2379.



CITY OF SUGAR LAND