

SECTION I – INTRODUCTION

This section provides an overview of the project, and discusses the overall flooding concerns within the City of Harlingen. In addition, the purpose and objectives of the project are presented.

BACKGROUND

The City of Harlingen has experienced frequent flooding of varying degrees throughout its history. Adequate drainage of storm water runoff has long been a challenge for the City of Harlingen area in light of the flat topography, periodic intense rainfalls, and limited capacities of existing drainage systems. Localized flooding that hinders traffic mobility and threatens residences and business has occurred frequently.

The City of Harlingen, as a community in the Lower Rio Grande Valley, has experienced significant population increase in recent years. According to the Census 2003, it had a total population of 68,550 with a five percent increase from 2000. It is projected that the city's population will be more than doubled by 2060. As land use changes with development, more impervious cover increases the amount of rainfall runoff and peak discharges. The fast population growth has contributed to the frequency, severity and extent of drainage and flooding problems in many areas of the city in recent years.

Future growth and development of the city will be greatly influenced by how well the existing and future drainage systems are maintained and managed. Many of the existing drainage systems are in need of replacement or do not adequately convey runoff from frequent rainfall events. The City recognizes the need to develop a master drainage plan that contains sufficient drainage information in order to properly manage its drainage systems in an efficient and effective manner. A drainage plan is required to identify the location and extent of drainage inadequacies, needed drainage system improvements, the cost to implement the improvements, a plan to finance and prioritize the improvements. In October 2007, the City of Harlingen entered an agreement with Civil Systems Engineering Inc. to provide professional engineering services to develop a Master Drainage Plan for the City.

This report summarizes the procedures and findings of the various engineering efforts in developing the Master Drainage Plan, including data collection of existing drainage systems, field surveying, GIS applications and GIS data layers development, LiDAR digital elevation model (DEM) dataset development, HEC-HMS watershed hydrologic modeling, HEC-RAS drainage ditch hydraulic modeling, EPA-SWMM storm sewer system modeling, and the Capital Improvement Plan (CIP) development.

STUDY AREA

The study area addressed in this study covers all the area within the City of Harlingen corporate limits (City limits) and its 3 ½ mile extraterritorial jurisdiction (ETJ), and other additional area surrounding the city. Detailed studies were performed for only the areas within the city limits and its 3 ½ mile ETJ, as shown in **Figure 1**.

The City of Harlingen is located at the intersection of U.S. highway 77 and 83 in northwestern Cameron County in the heart of the Rio Grade Valley of south Texas. The City covers a total area of 37.137 square miles and is located within the watershed of the Arroyo Colorado. Arroyo Colorado is the only natural waterway flowing northeasterly across the City. The topography of the study area is typical of areas located in the Gulf Coastal Plan. It is generally flat, sloping gently toward the coast at an average grade of about 1 foot per mile. The flat topography imposes problems on the design of practical drainage systems because the hydraulic grades for drainage ditches are limited.

The urbanized portion of the City is primarily served by underground storm sewer systems. The storm sewers vary in dimension from 12 to 60 inches in diameter. Open drainage ditches also exist in many parts of the urbanized area, as shown in **Figure 2**. Nearly all of the developed area drains into the Arroyo Colorado, which flows northeast into the Laguna Madre. The northern part of the city drains into Cameron County Drainage District #5 (CCDD5) North Main Drain which in turn drains into the Arroyo Colorado.

The primary soil present in the study area is classified as Hydrologic Soil Group D. The Soil Group D is represented with high runoff potential and very low infiltration rates when thoroughly wet. Soils in the northern and western parts of the city are slow permeable, loamy soils. In the central and southern parts of the area, soils are slow permeable clayey soils with poor drainage.

The study area has a subtropical and semi-arid climate with dry winters and hot, humid summers. The average annual rainfall is approximately 26 inches. Most precipitation occurs in summer thundershowers and intense rainfall associated with tropical depressions and hurricanes that characterize the Gulf Coast from June to October. The heavy storm between May 25 and 26, 2007 produced a 24-hour rainfall total of 9 to 12 inches. Most recently, Hurricane Dolly on July 23, 2008 dumped 12 to 18 inches of rainfall in the City of Harlingen Area.

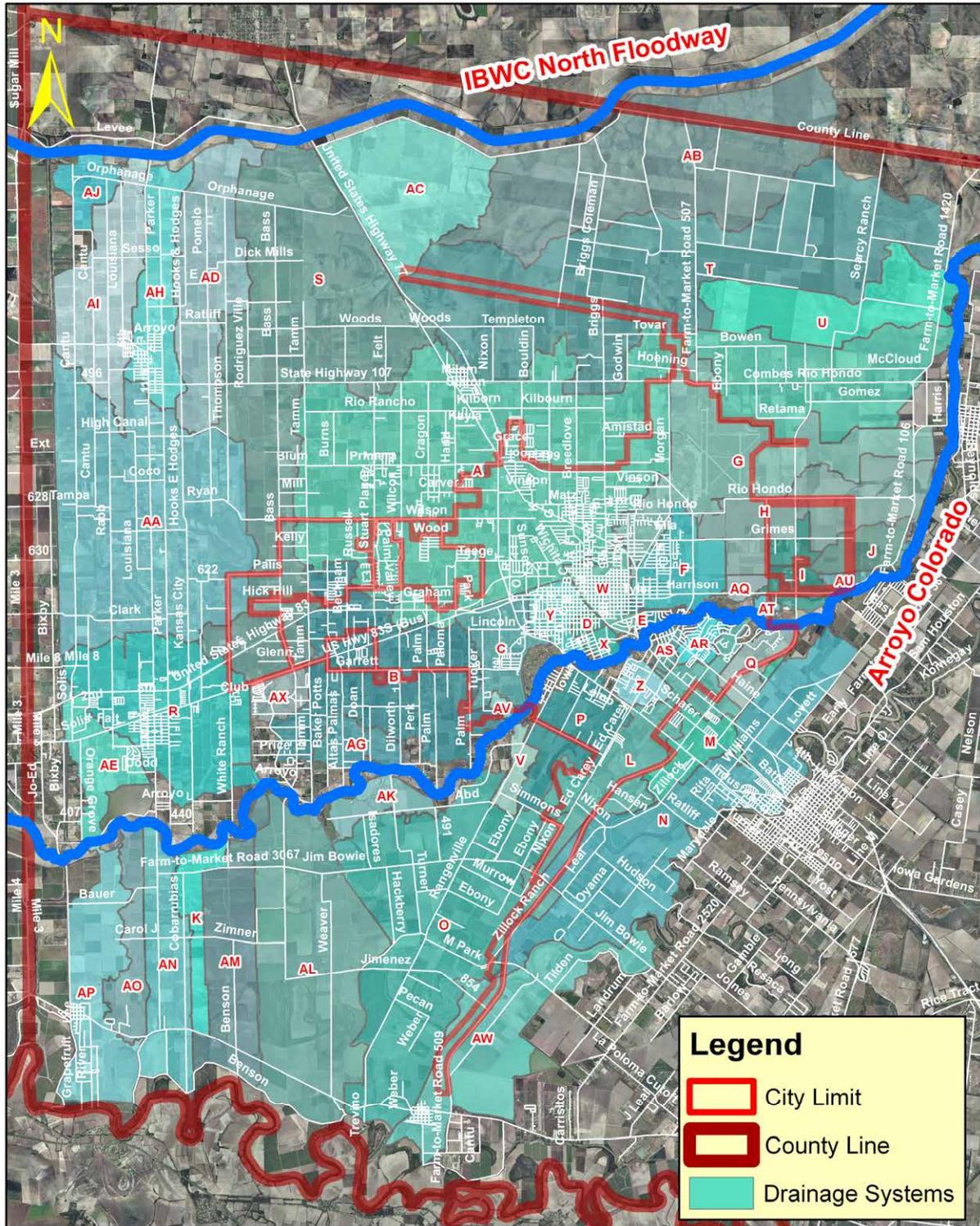


FIGURE 1. STUDY AREA

PURPOSE AND OBJECTIVES

The purpose of this project was to develop a Master Drainage Plan to assist the City staff, City Council, and citizens in making decisions toward a more comprehensive and integrated drainage system approach that meets the needs of the community. The Master Drainage Plan was developed to provide sufficient information on its drainage systems including existing drainage systems conditions, drainage and flooding problem areas, locations of inadequate drainage systems, drainage improvement requirements. A Capital Improvement Plan (CIP) was developed, which allows the City in planning its future capital expenditures to address the needs of drainage systems.

Specific objectives of this project include:

- Identify locations and extent of flooding problems areas.
- Evaluate and optimize drainage improvement requirements (plans) to eliminate or reduce existing flooding problems.
- Estimate probable costs associated with proposed drainage system improvements.
- Prioritize proposed drainage improvement plans.
- Develop a Geographic Information System (GIS) database for the city's drainage systems (open ditches and underground storm sewers)

AUTHORIZATION

Authorization for the City of Harlingen Master Drainage Plan is covered in the terms of an Agreement between the City of Harlingen and Civil Systems Engineering, Inc. (CSE), dated October 31, 2007.