



**MASTER PLAN PROJECT**

# Update

No. 1 • March 2002

# CITY OF CORPUS CHRISTI STORM WATER

## Master Plan will establish consistent policies and drainage system design standards

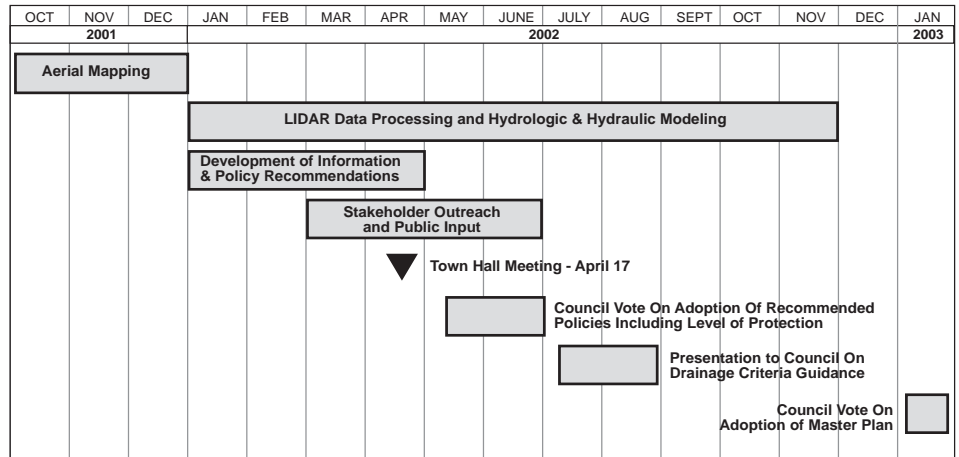
The City of Corpus Christi has launched a year-long storm water planning process aimed at setting consistent standards and replacing a patchwork of outdated drainage plans covering portions of the city.

The objective of this project is to create a comprehensive master plan for application in design of drainage improvements and land use development with well-defined policies and design requirements.

The effort will replace existing storm water master plans adopted in 1961, 1970 and 1982, each covering limited areas of the city and including differing design criteria. Another plan was prepared in 1988 but never adopted. Some areas of the city are not covered by these plans and there is no city-wide drainage criteria manual to guide City engineers or private developers.

Additionally, there have been substantial changes in state and federal environmental regulations during the past two decades. Measures must be taken to minimize the water quality impact of runoff on receiving streams and bays.

The ongoing planning process encompasses all the geographic area within the



city limits and portions of the City's five-mile extraterritorial jurisdiction. The result will be proposed policies, drainage criteria, level of protection and a Storm Water Master Plan to be considered for adoption by the City Council.

The City's planning process will provide opportunities for interested groups and individuals to help develop recommended policies and standards that are realistic for the community and acceptable to most stakeholders.

The project will evaluate the City's existing criteria and level of protection

standard. Policies developed and adopted during the planning process will result in publication of a City Storm Water Criteria and Design Manual. This manual will serve as a guide to engineers in planning public and private projects.

The planning effort will include evaluation of available drainage criteria for applicability within the city, policy development for storm water quality management, storm water pollution prevention and development issues.

Topographic data of the city has been gathered and is being processed into digital maps. Modeling techniques will utilize the data for hydrologic and hydraulic analysis. This will help establish storm water drainage system capacity and define existing and proposed drainage basin characteristics for designated areas.

The process will provide the City with tools that can be used to set priorities and decide where to spend limited public funds to improve public drainage infrastructure. For example, investigation and analysis of 25 critical stream miles will enable the City to address existing deficiencies, required rehabilitation and

*(continued p.2)*

### Rainfall Data Analysis

An analysis of hourly rainfall data collected by the Weather Bureau at the Corpus Christi airport since 1948 shows that most rain events that are intense enough to cause flooding occur in August, September and October. These events are frequently associated with tropical weather. A total of 14 inches of rain fell over seven days (Sept. 19-26) in the wake of Hurricane Beulah in 1967 with 6.38 inches coming on a single day.

In storm water management, the intensity and duration of a rain event are the two critical factors. The data is generally shown as maximum rainfall in a single hour and as total hours for a single rainfall event. Here are some of the highest recorded events at the airport:

**One Hour Maximums**

Sept. 19, 1979.....	3.21"
June 2, 1978.....	3.01"
Oct. 29, 1995.....	2.82"
Oct. 16, 1960.....	2.73"

**Maximum Duration Events**

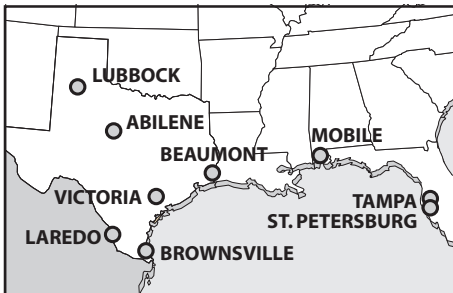
Sept. 6-7, 1955	8.47"	38 Hrs
Aug. 9-10, 1980	10.76"	35 Hrs
(Hurricane Allen)		
Jan. 4-5, 1958	6.54"	29 Hrs
Aug. 22-23, 1999	5.93"	27 Hrs
(Hurricane Bret)		

future drainage system needs.

Design criteria established as part of the plan will apply both to City capital improvement projects and to private land developments.

Policies to be developed will address level of protection, storm water quantity and quality, joint use of open drainage channels, storm water detention, and natural drainage corridors.

A consultant team of Goldston Engineering, Inc., Dodson and Associates, Inc., Bass and Welsh Engineering Company, The Rodman Company and TerraPoint, LLC is assisting the City in this effort.



## Storm Water Services Being Compared to Nine Other Cities

To better assess how well Corpus Christi is doing in storm water management, information from nine cities in Texas, Alabama and Florida is being collected for comparison.

Brownsville, Victoria, Beaumont, Mobile, Tampa and St. Petersburg were selected because they are coastal cities with geographic conditions comparable to Corpus Christi. Lubbock, Abilene and Laredo were put on the list to provide a cross-section of Texas cities with similar annual rainfall rates.

Information being collected on the cities includes population, land area, annual rainfall data, what city department is responsible for system maintenance, storm water budgets, how the activity is funded, how many employees are assigned, what services are provided and level of protection standards.

	Population	Sq. Miles	Annual Rainfall
Victoria	61,699	32.8	37.4"
Beaumont	109,697	78.7	55.7"
Abilene	115,930	111	24.4"
Brownsville	147,701	107	26.6"
Laredo	183,160	79.4	21.5"
Lubbock	190,002	115	18.7"
Mobile	198,915	128	64"
St. Petersburg	248,232	58	48.8"
Corpus Christi	281,791	150	30.1"
Tampa	303,447	106	43.9"

# Setting a Level of Protection

The first decision point in the process of developing a storm water master plan will be for the City Council to consider recommendations and adopt a "level of protection" value for the city.

What is level of protection? It is the level of flooding that a community decides is acceptable given a storm event of a certain frequency and intensity, balancing costs against property protection and convenience benefits.

The level of protection (LOP) decision has significant cost implications. It will determine, to a great extent, the design standards that must be achieved in designing and upgrading specific components of the storm water management system. This standard will affect City street projects, Texas Department of Transportation (TxDOT) projects and developments undertaken by private property owners who must discharge their storm water into the area's drainage system.

The project team has evaluated the existing level of protection in the city. This has been compared to levels of protection set by other cities.

Having a good characterization of rainfall patterns is essential in setting an LOP. This is generally expressed in terms such as a 5-year rain event, a 10-year rain event or a 25-year rain event. The analysis of hourly rainfall data available indicates that the airport has experienced two 50-year rain events during the 54 years records are available (Hurricanes Beulah-'67 and Allen-'80).

The Corpus Christi airport is the only location in the region where hourly rainfall data is recorded. The City is considering installation of additional automated gauging stations at other locations so that more accurate data will be available in the future.

In setting the level of protection it may be necessary to consider having one level for areas of the city that are already substantially developed and a second higher standard for new facilities being built beyond the edge of existing development.

There are really two issues involved in setting an LOP - protecting life and property and enhancing convenience, particularly in moving traffic.



**Streets serve as part of city's storm water management system**

A level of protection that is set to keep water out of homes, schools and businesses during a significant storm event in Corpus Christi will still stop traffic and result in damage to vehicles parked on the street.

### Role of Streets

In fact, streets play a major beneficial role in the city's existing storm water management system. Because most of the city is very flat, streets are used to convey water to underground storm drains and to store water during a major storm event until the conveyance system is able to carry it away.

Keeping water off streets during a major rain event would be extremely expensive and therefore is impractical. However, special consideration must be given to the movement of emergency vehicles, to evacuation routes and to access to critical facilities such as hospitals.

Current TxDOT design standards call for freeways to be passable in a 50-year storm event and principal arterials for a 10-year event. Frontage roads have a minimum 5-year event design standard.

Two alternate level of protection recommendations will be presented based on research, data evaluation and public input. The ultimate objective is to choose a level of protection that strikes the appropriate balance for this community.

# LIDAR data is important planning resource

An essential element in developing a new storm water master plan is having accurate topographic elevation data.

This data will be used in mapping, delineation of drainage basins and in computerized hydrologic modeling of watersheds.

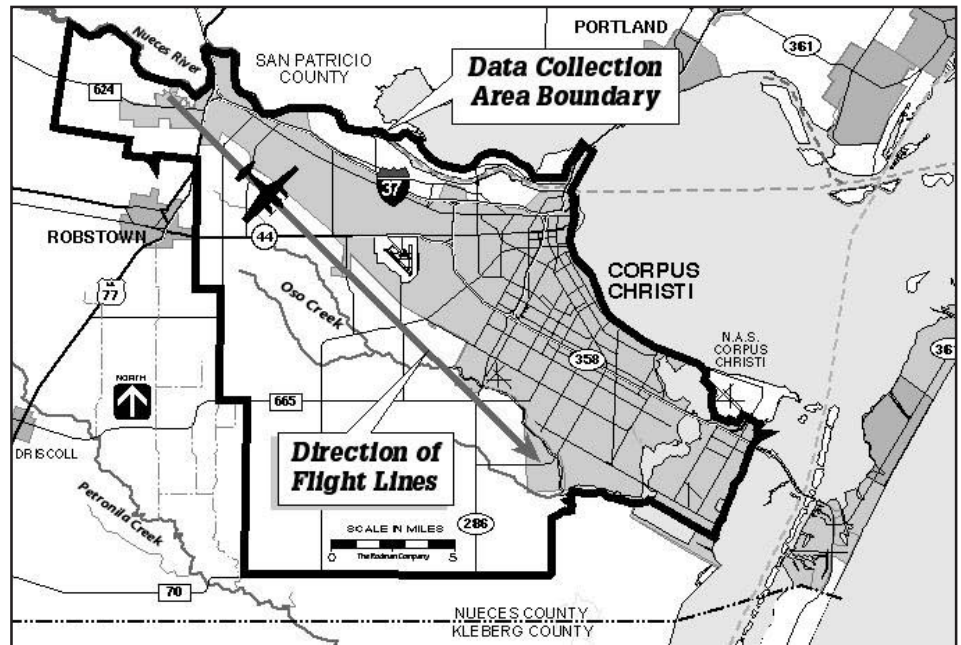
Developing accurate topographic data has historically been a long, expensive labor-intensive process combining aerial photography, photo interpretation and field surveys.

The City decided to utilize a faster, relatively less expensive, highly automated technology to collect the data needed for the drainage study.

During November and December an aircraft flew over the city using a laser mapping technique called LIDAR (light detection and ranging). TerraPoint technicians aboard the aircraft collected topographic elevation data using global positioning technology and a state-of-the-art computerized laser system to scan the ground surface.

The plane flew at an elevation of 3,200 to 3,500 feet during good weather to cover mainland portions of the city and some of the City's five-mile extraterritorial jurisdiction.

Data collected along 125 straight flight line strips is now being pieced together by computer into a complete digital elevation map.



The airborne LIDAR system results in up to 1.4 million data point per square mile - approximately 3,000 points on an area the size of a football field. LIDAR records all land features including buildings and vegetation.

The approximate elevation of the land surface, streets, curbs, sidewalks and drainage ditches can be determined using LIDAR data. The data is being confirmed and calibrated using traditional on-the-ground survey techniques.

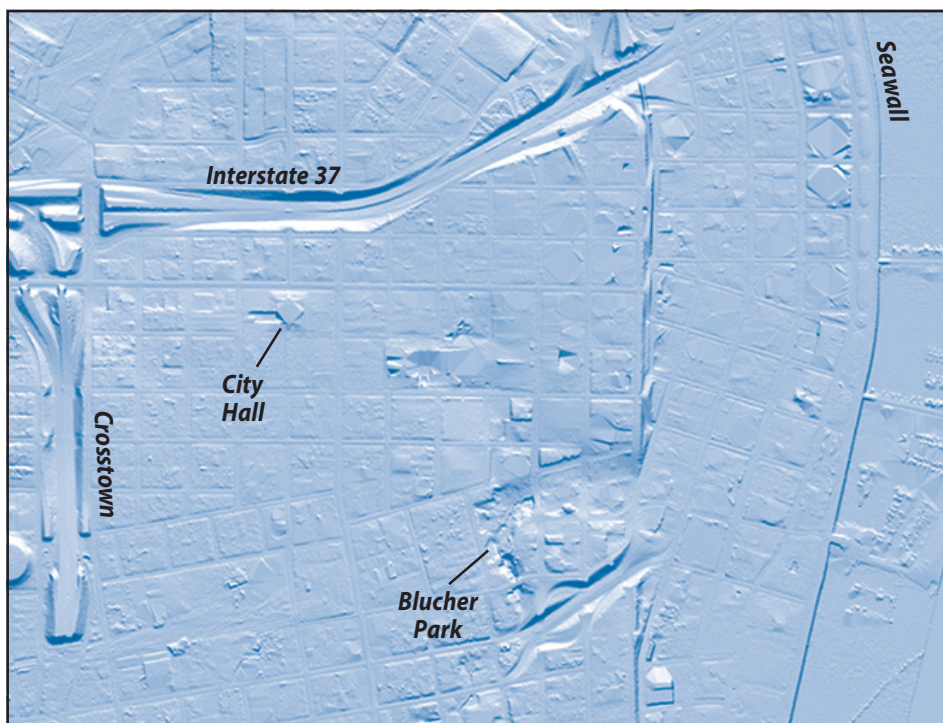
Computers must be used to turn the raw data collected by the aerial laser scanner into useful information. This includes a process which removes most structures including bridges.

Once processed and verified, the data will be used in this project to produce 2-foot contour maps of most of the Corpus Christi study area. That compares to the 5-foot contour on standard USGS topographic maps and requires a much greater number of data points.

Data was collected for some outlying areas adjacent to the city but will not be processed until some point in the future when it is needed.

Portions of the city on Padre and Mustang Islands were not included in the LIDAR data collection because the City already has adequate topographic information on their relatively uniform barrier island geography.

The aerial mapping data collected for the Storm Water Master Plan will be of significant ongoing benefit to the City as a tool in future planning decisions. It will be integrated into the City's existing computerized Geographic Information System (GIS). It can be used to support a broad range of needs.



*This "bare earth" image represents a portion of the LIDAR data collected for the bayfront and Central Business District with buildings digitally removed*

## Website will be part of planning process

Increasingly the City of Corpus Christi is making information available to the public on the City's internet website.

A portion of that website dedicated to Storm Water Department programs and information will be utilized in the public involvement component of the master plan development process.

Additionally, data and reports developed during the project will be posted on the website so that interested individuals can have full access to it at their convenience. The web address is:

[www.ci.corpus-christi.tx.us/services/stormwater](http://www.ci.corpus-christi.tx.us/services/stormwater)

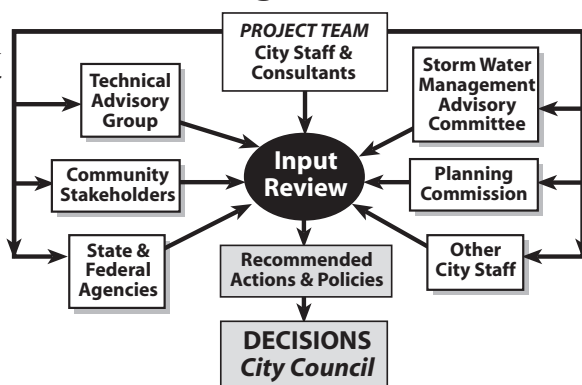
The stakeholder involvement process for the master plan project began with identification of groups, agencies and individuals who are likely to have an interest.

Presentations about the planning process and information developed during the initial phase of the project have been made to the Storm Water Management Advisory Committee and the new Development Services Advisory Group. Similar

presentations will be made to interested groups upon request.

The City has also formed a Technical Advisory Group (TAG) of individuals experienced in dealing with various storm water management issues. Participants represent various sectors of the community including developers and builders, consulting engineers, and environmental and conservation interests. The Planning Commission and the Storm Water Management Advisory Committee will also participate.

## Involving Stakeholders



## Notice of Town Hall Meeting on Storm Water Master Plan

6 p.m. • April 17, 2002  
Corpus Christi City Hall  
Council Chambers

Technical Advisory Group participants have practical knowledge and can help assist the project team which has the job of crafting new storm water management policies and design criteria that are well balanced and workable.

The public is invited to participate in an April 17 town hall meeting at which storm water policy recommendations will be discussed.

Questions or comments about the storm water master plan development process should be directed to:

*William J. "Bill" Green, P.E., (361) 888-8100 ext. 152, fax (361) 888-8600; email: [bgreen@goldston-engineering.com](mailto:bgreen@goldston-engineering.com)*



This newsletter is published by the City of Corpus Christi as part of a comprehensive Storm Water Master Plan project. Findings and recommendations resulting from the planning process will be reviewed by the Planning Commission and considered for adoption by the City Council. Interested individuals are encouraged to participate in the planning process.

### CITY OF CORPUS CHRISTI STORM WATER DEPARTMENT

c/o Goldston Engineering Inc.  
P.O. Box 2886  
Corpus Christi, Texas 78403-2886