

Early Warning System Report

Cameron County Drainage District No. 1

Ditch No. 1 Watershed Monitoring

March 3, 2020

Submitted by:



Cameron County Drainage District No. 1

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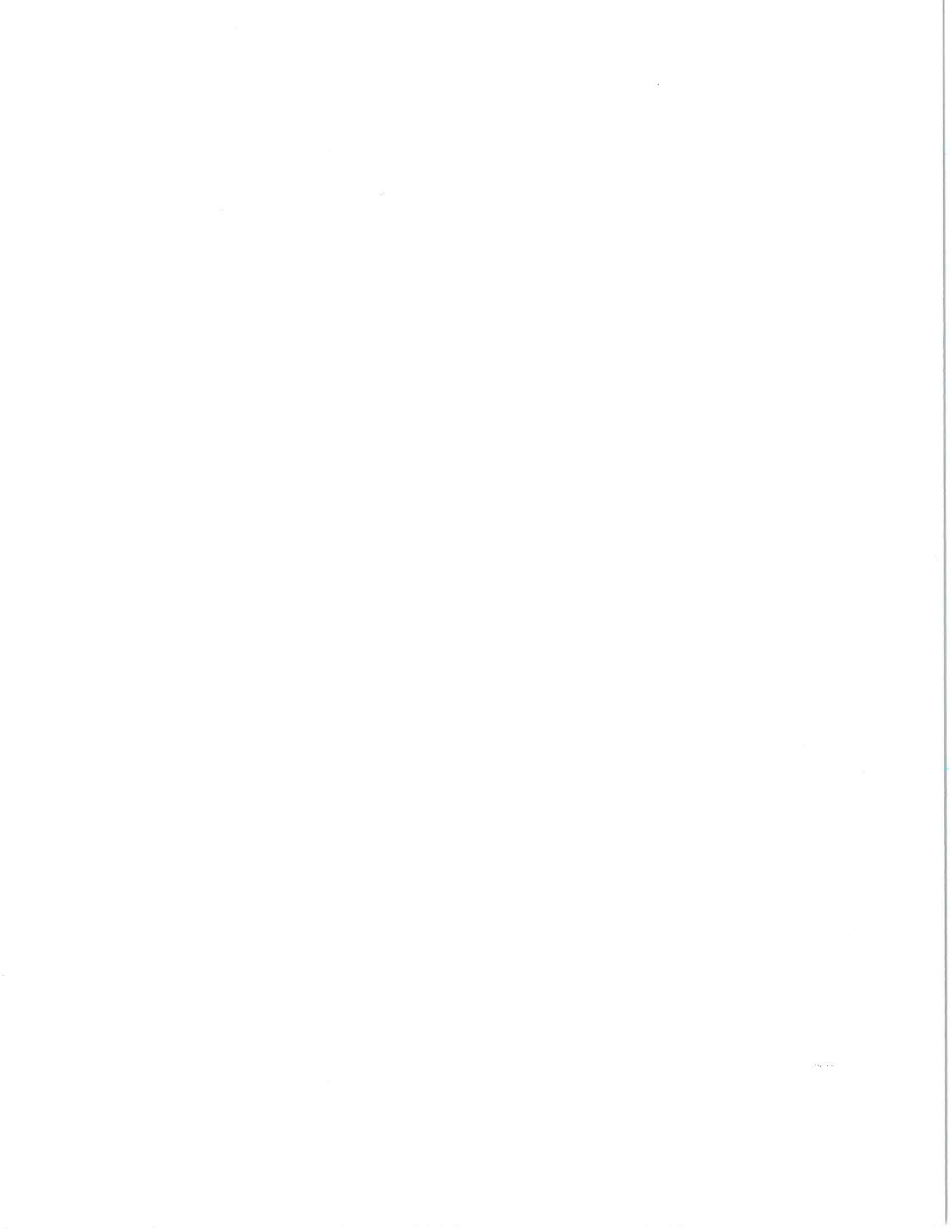
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Executive Summary

Cameron County Drainage District No. 1 was founded in 1910 to serve southeastern Cameron County for agricultural purposes. Over the last century, the greater Brownsville area, which includes the City of Los Fresnos, the Town of Bayview, and the Town of Rancho Viejo, has developed into an urbanized area and caused the District to become the primary conveyance of urban stormwater runoff toward the Brownsville Ship Channel. The District’s main drains and their associated laterals, which once served to drain agricultural fields, are now overburdened with runoff from impervious urban hardscape. Due to this change, these drains now frequently flood, even during minor rainfall events.

Introduction

The Ditch No. 1 Watershed serves the northern portion of the City of Brownsville (See Figure 1). In 2016, it was estimated that approximately 5,000 structures were located in the portion of this watershed that falls within the 100-year floodplain (See Figures 2 and 3). Recently, the Federal Emergency Management Agency released proposed “work maps” for the purposes of gaining public comment prior to finalizing a new set of National Flood Insurance Rate Maps for Cameron County. These “work maps” seem to indicate that the 100-year floodplain in the Ditch No. 1 Watershed will increase substantially, to include even more structures.

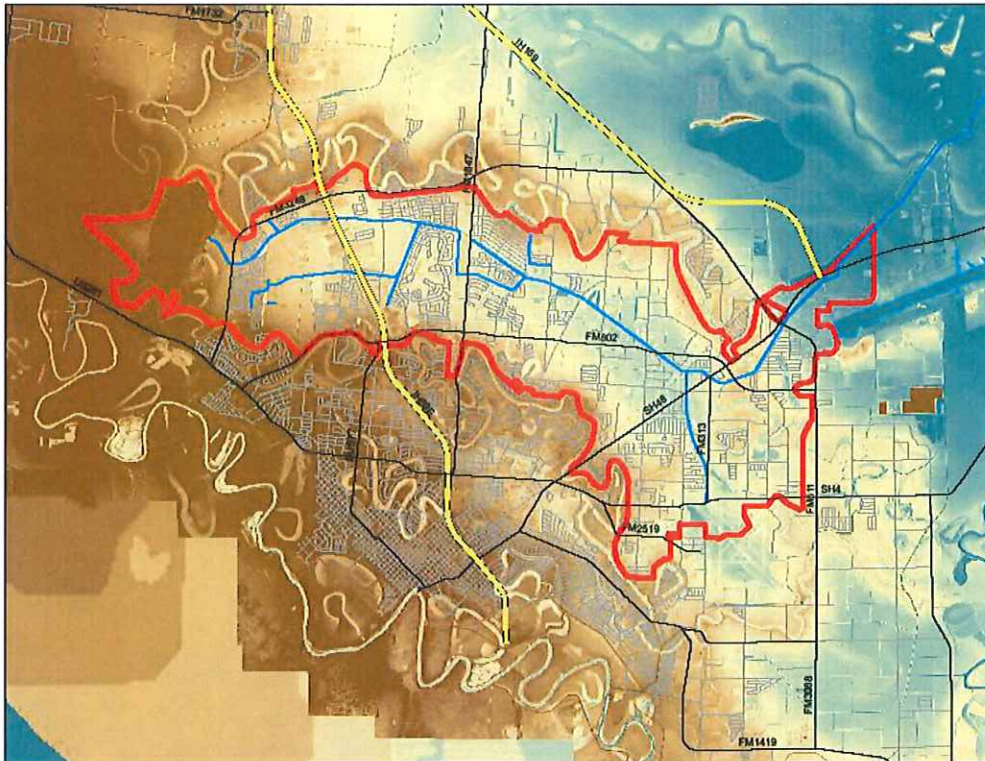


Figure 1. Ditch One Watershed Depicted on a Digital Elevation Model.

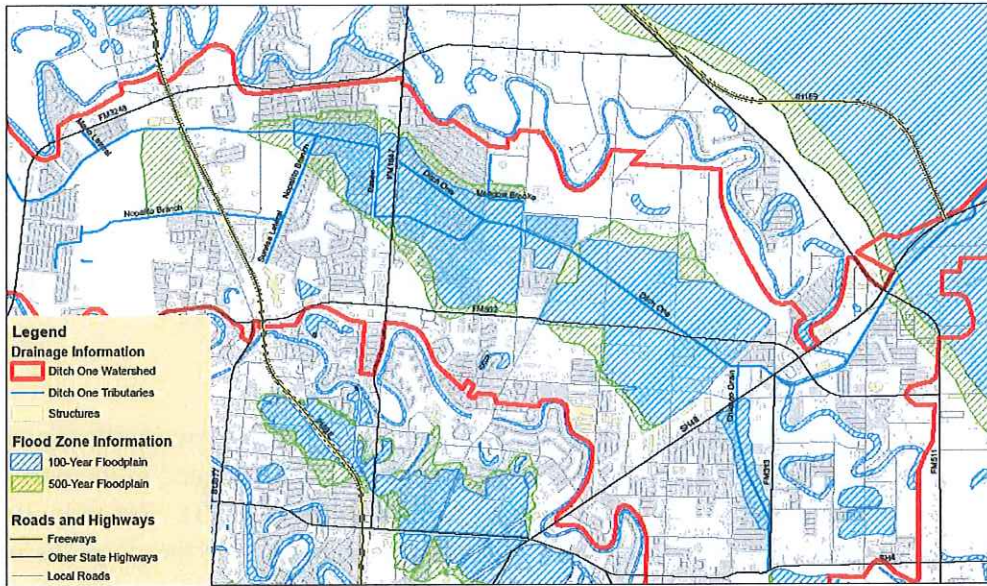


Figure 2. Flood Zones in the Ditch No. 1 Watershed

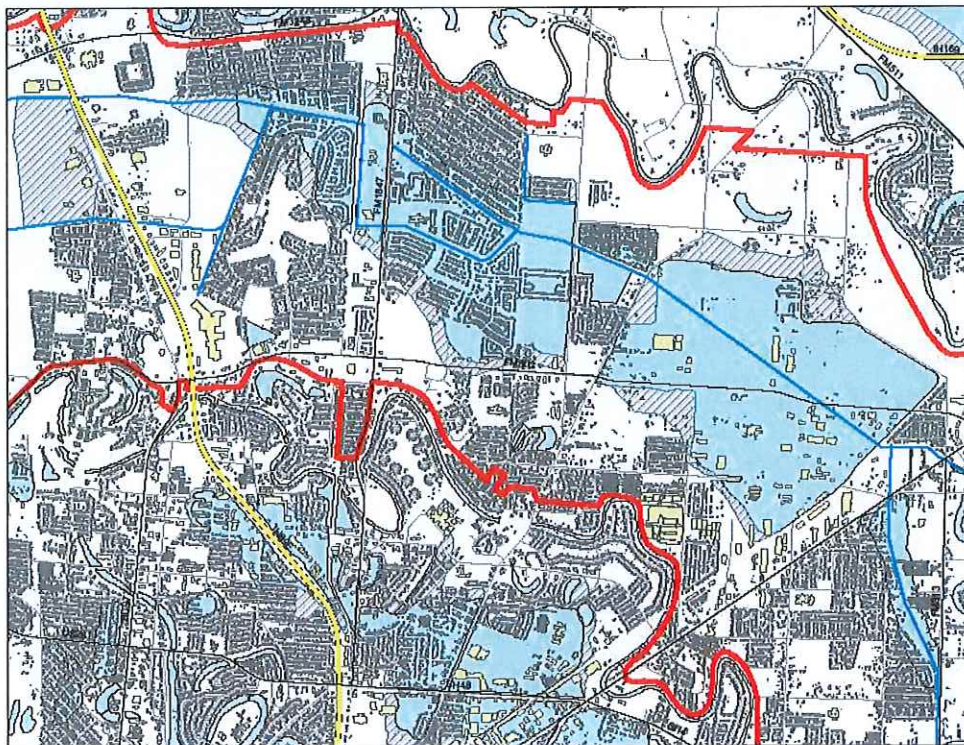


Figure 3. Structures Within the 100 Year Floodplain

The primary objective of this project is to empower local public agencies and the community at large, which are threatened by flooding, to act in a timely and appropriate manner to reduce the possibility of loss of life and property.

Three Public Meetings have been held to introduce this project to other local entities and the public at large. The City of Brownsville, which recently had a management change, is excited about working with the District to implement these emergency response efforts.

Methodology

In 2010, the National Oceanic and Atmospheric Administration funded the publication of the Flash Flood Early Warning System Reference Guide. This project was based on those guidelines as follows:

1. Detecting and forecasting hazards and developing hazard warning messages.

This project involves the enhancement of the District's existing Supervisory Control and Data Acquisition (SCADA) system. The District's current SCADA system allows for the remote monitoring of the water level in a regional detention pond known as the Paseo de la Resaca-Resaca Calmada. Utilizing the existing SCADA system, District personnel can remotely open a flood gate to lower the water level in the Resaca Calmada during or prior to a major rainfall event. This project seeks to greatly enhance the existing SCADA system through the installation of sixteen ultrasonic water level sensors which have been installed along the main tributaries of the Ditch No. 1 Watershed, which is one of Brownsville's most populated and flood prone watersheds (See Figure 4). These sensors will transmit real-time water level information back to the District via a SCADA network. Once the level transmitters are installed, the SCADA system will be upgraded with high level alarms that will notify District personnel and allow them to react appropriately by opening flood gates and notifying other local agencies of the situation. In addition, this project includes the installation of a second SCADA controlled actuator on another existing manual flood gate that serves the Resaca Calmada. This will allow personnel to lower water level in the Resaca Calmada twice as fast in order to provide floodwater storage.

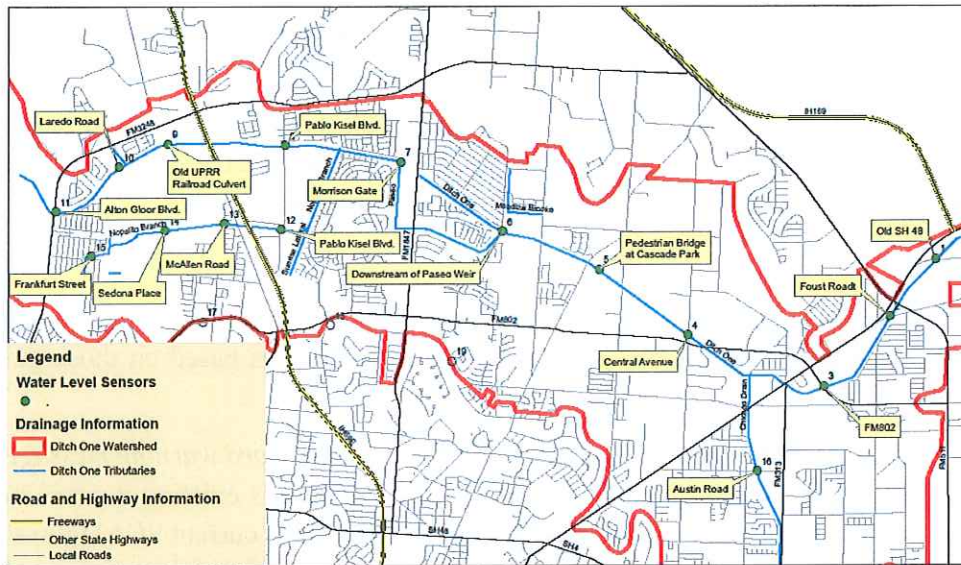


Figure 4. SCADA Level Sensors

2. *Assessing potential risks and integrating risk information into warning messages.*

Utilizing existing LiDAR information, District personnel can correlate the water level in the tributaries of the watershed to flood prone streets and neighborhoods which will be affected as the level rises on a foot by foot basis (See Figures 5-7 for examples in which dark blue areas are inundated at different flood elevations). This information will be verified once the SCADA level sensors are utilized during an actual heavy rain event. Based on the various elevations of the rising water levels, warning messages will be developed and disseminated to local law enforcement to close streets or evacuate flood prone areas. The closure of streets is important since much of the flood damage caused locally is from vehicle wakes entering homes as they traverse the inundated streets.

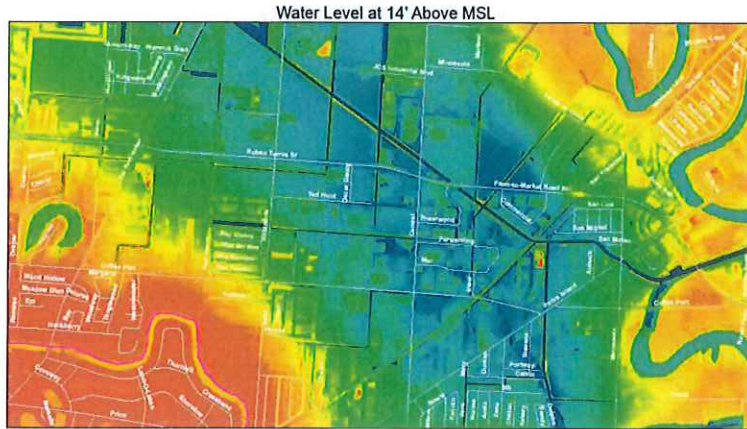


Figure 5. Inundation (dark blue shade) when Flood Level Reaches 14' above M.S.L.

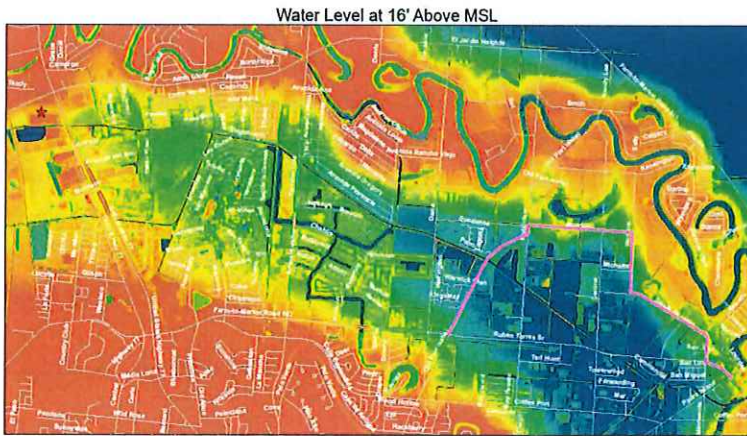


Figure 6. Inundation (dark blue shade) when Flood Level Reaches 16' above M.S.L.

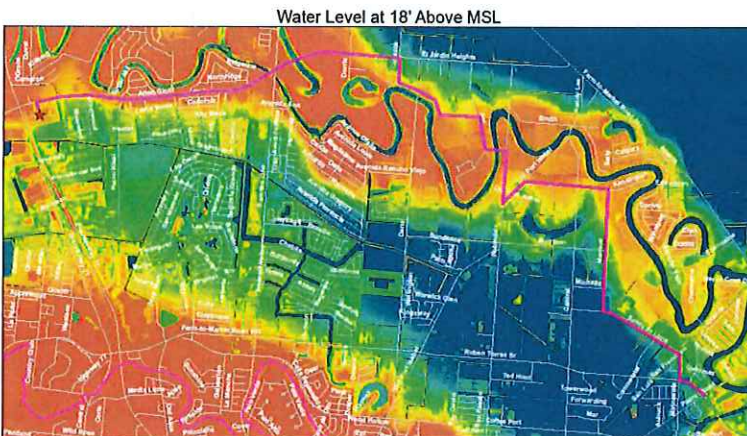


Figure 7. Inundation (dark blue shade) when Flood Level Reaches 18' above M.S.L.

3. *Disseminating timely, reliable, and understandable warning messages to authorities and at-risk public.*

The information that was discussed in the previous bullet can be used to predict areas which will flood based on the elevation of floodwater. An effective protocol for issuing warnings will then be developed. Those warnings will then be provided to local authorities and the general public, so that flooded areas can be avoided by the general public or so that evacuations can take place in advance of the flood event. Emergency vehicles such as ambulances will also be re-routed, when necessary, to avoid flooded thoroughfares, which will enable them to respond to emergencies more efficiently.

4. *Community based emergency planning, preparedness and training focused on eliciting an effective response to warnings to reduce potential impact on lives and livelihoods.*

The SCADA system will maintain a record of the high water levels, and the duration of the flooding. This type of data is very important for post disaster recovery efforts. This recorded data will also enhance local disaster planning efforts regarding future flood events because local entities will eventually be able to use this recorded data to correlate rainfall intensity and other details, such as pre-event soil moisture, to the effects on the drainage system. Local entities such as the City of Brownsville will also be able to evaluate and control future land use, to minimize the effects on the floodplain. Preparedness will also be enhanced because the numerous monitoring stations will allow the local entities to see the effects of culverts or bridges on the flow or levels of the water in the tributaries, which will provide them with knowledge of how potential capital improvements, such as bridge replacements, can improve the flow of water.

Coordination and training efforts can be developed for local public entities to better react to flood events.

As mentioned above, this project involves the installation of a remote controlled actuator on an existing flood gate and sixteen ultrasonic water level sensors. The locations for these sensors were selected along the three main tributaries of the Ditch No. 1 Watershed. Locations for the sensors were selected based on proximity to flood prone neighborhoods, and to culverts and bridges which may be impeding the flow of water in the tributaries.

The sensors are powered by batteries which are connected to solar panels for continuous recharge. This will allow the District to collect data even during times of power outages. Radio communication was selected as a communication method because it is not reliant on internet or cellular networks, which could go down during storm events.

The District had each site surveyed so that the mounted sensors over the water will relay flood elevations in relation to mean sea level. District personnel have also installed the mounting hardware and communication racks at each site, and an IT contractor has installed and programmed the SCADA panels, the level sensors, and the new gate actuator. This IT contractor has also developed individual computer screens for each location, as

well as an overall watershed screen which will display the real-time water levels in the tributary.

Simultaneously, District personnel have been working to correlate foot by foot water level increases and their impacts vulnerable neighborhoods and thoroughfares. They will then work with local emergency responders to develop warning messages and protocols for their usage. They will also work with local officials to introduce them to the project for planning or post-disaster response opportunities.

Conclusion

Now that the level sensors and actuators have been installed and tested, District staff will be responsible for their maintenance. It is anticipated that each site will have to be maintained once per year. Monitoring of the sites can be accomplished through the SCADA computer at the District Headquarters, or through the use of a VNC program, the sites can be monitored from any smart device. The sensors are equipped with high level alarms that will notify District personnel of a flood event at any time of the day or night. Another feature of this system is tamper/intrusion alarms. If a panel is opened, District personnel will be automatically notified, and local law enforcement will be notified. Datasets of flood events will be made available on the District's website as events occur. Entities such as the University of Texas-Rio Grande Valley Civil Engineering Department, the local branch of the National Weather Service, and the City of Brownsville will be notified of the availability of this data so that they may use it to compare to any flood models that they may be performing.

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Appendix

Executive Administrator's Comments on Draft Final Report

Texas Water Development Board

P.O. Box 13231, 1700 N. Congress Ave.
Austin, TX 78711-3231, www.twdb.texas.gov
Phone (512) 463-7847, Fax (512) 475-2053

Mr. Albert Barreda
Cameron County Drainage District No. 1
3510 Old Port Isabel Road
Brownsville, TX 78526

RE: Flood Protection Grant Contract with Cameron County Drainage District No. 1, Contract No. 1600012038, Draft Report Entitled "Early Warning System Report"

Dear Mr. Barreda:

Staff members of the Texas Water Development Board (TWDB) have completed a review of the draft report prepared under the above-referenced contract. ATTACHMENT 1 provides the comments resulting from this review. As stated in the TWDB contract, the Central Texas Council of Governments will consider revising the final report in response to comments from the Executive Administrator and other reviewers. In addition, the Central Texas Council of Governments will include a copy of the Executive Administrator's draft report comments in the Final Report.

Please note: The TWDB logo should not be used in the Final Report.

The TWDB's Contract Administration staff looks forward to receiving one (1) electronic copy of the entire Final Report in Portable Document Format (PDF) and five (5) bound double-sided copies. **Please further note, that in compliance with Texas Administrative Code Chapters 206 and 213 (related to Accessibility and Usability of State Web Sites), the digital copy of the final report must comply with the requirements and standards specified in statute. For more information, visit <http://www.sos.state.tx.us/tac/index.shtml>.** If you have any questions on accessibility, please contact David Carter with the Contract Administration Division at (512) 936-6079 or david.carter@twdb.texas.gov.

Cameron County Drainage District No. 1 shall also submit one (1) electronic copy of any computer programs or models, and, if applicable, an operations manual developed under the terms of this Contract.

If you have any questions or need any further information, please feel free to contact Mr. Ivan Ortiz of TWDB's Flood Mitigation Planning staff at 512-463-8184 or ivan.ortiz@twdb.texas.gov.

Sincerely,



John T. Dupnik, P.G.
Deputy Executive Administrator
Water Science and Conservation

Attachment

c w/o att.: Ivan Ortiz, Flood Mitigation Planning

Our Mission	:	Board Members
To provide leadership, information, education, and support for planning, financial assistance, and outreach for the conservation and responsible development of water for Texas	:	Peter M. Lake, Chairman Kathleen Jackson, Board Member Brooke T. Paup, Board Member
	:	Jeff Walker, Executive Administrator

ATTACHMENT 1
Early Warning System Report
Cameron County Drainage District No. 1
Contract No. 1600012038
Texas Water Development Board Comments to Draft Report

REQUIRED CHANGES

General Draft Report Comments:

In general, the study follows standard methodologies and practice. Mitigation alternatives identified by the study may be eligible for funding under the Texas Water Development Board's financial assistance programs. Application requirements and eligibility criteria are identified by Texas Water Development Board rules specified in Section 363 of the Texas Administrative Code (TAC). The report would be appropriate for use in support of an application to the Board for financing the proposed improvements. All additional information required by Board rules, 31 TAC 363.401-404, as well as necessary information to make legal findings as required by Texas Water Code Chapter 17.771-776, would be required at the time of loan application.

Please conduct a final edit of the document for grammar, spelling, typographical errors, and inconsistent usage of acronyms, and abbreviations. Please spell out all acronyms, with the acronym in parentheses, the first time they are used. Please include a list of acronyms used in the report after the Table of Contents.

Specific Draft Report Comments:

- 1) Table of Contents, List of Figures, includes titles for various figures throughout the document which do not match titles of figures found within the document. Please update List of Figures or figure titles as applicable.
- 2) Introduction, page three, discusses public meetings held for the flood early warning system project. Please, include the third public meeting in this discussion.