
*CTC Agreement between the LCRA and
FEMA Region VI*

Task Agreement TA-01
The DFIRM Pilot Project

Submitted to
Federal Emergency Management Agency

Region VI

Federal Regional Center
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BY



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The DIRM Pilot Project

Task Agreement No. TA-01

On May 7, 1999, the Lower Colorado River Authority (LCRA) signed an agreement with the Federal Emergency Management Agency (FEMA) to act as a Cooperating Technical Community (CTC) partner. The CTC program is an initiative by FEMA to increase local involvement and ownership of the flood mapping process.

The LCRA is a conservation and reclamation district established by the Texas legislature in 1934. The district consists of ten counties comprising the watershed of the lower Colorado River, Texas. The ten counties are: Blanco, Burnet, Colorado, Llano, Travis, Bastrop, Wharton, San Saba, and Matagorda. LCRA's mission is to prevent or aid within the boundaries of the district in the prevention of damage to person or property from the waters of the Colorado River and its tributaries.

In accordance with the CTC Memorandum of Agreement, LCRA and FEMA Task Agreement TA-01 is as follows:

1. Objective and Scope:

The objective of this Task Agreement, TA-01, is the conversion of effective Flood Insurance Rate Maps (FIRMs) and Flood Boundary Floodway Maps (FBFMs) to a digital format that conforms with the FEMA's Digital Flood Insurance Rate Map (DFIRM) Specifications.

Because this is new program for both parties, an incremental approach is planned for the DFIRM conversion project. The objective of this pilot test is to perfect the DFIRM process and, to establish the production procedures and processes. The lessons learned from this pilot effort would then be applied, under a separate agreement, to the larger area encompassing the Lower Colorado river basin corridor.

The scope of this agreement includes the production of a set of DFIRM map panels for Lago Vista, Texas a community in Travis County around the Highland lakes. The panels to be produced include:

48453C0350E	48453C0315E
48453C0355E	48453C0320E
48453C0360E	48453C0325E

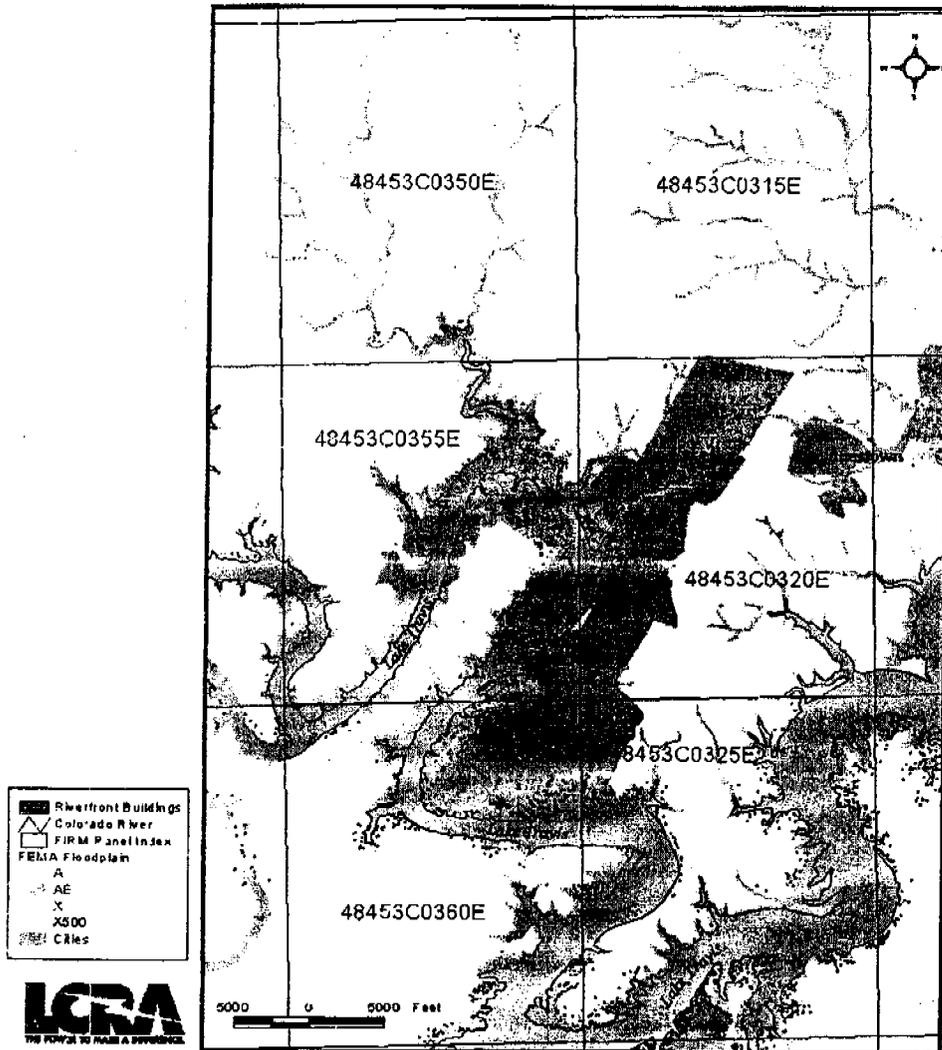
Figure 1 shows the location of the proposed DFIRM panels.

The Lago Vista community was selected because:

- Updated digital topographic data are now available from the LCRA Phase 1 Contour mapping project.
- Base flood elevations are established. Note: No hydrologic or hydraulic engineering analysis are planned under this task agreement

- The area represents a combination of urban and rural populations.
- The area has experienced a significant increase in growth since the maps were last updated.
- The pilot project can be readily expanded to include all of Travis County. The LCRA and CAPCO have recently completed projects to produce FEMA quality, digital base maps.

Figure 1
DFIRM Panel Location and Id



The pilot DFIRM project has been broken into a series of activities, which are described below.

Activity 1: Prepare Work Plan.

Develop a revised work plan, QA/QC plan and production schedule. Present this to FEMA during the kick-off meeting for the project. Prepare a Project Work Plan Memorandum which includes the QA/QC plan and updated schedule.

Activity 2: Assimilate Existing LOMR and Flood Studies

Examine the previous engineering flood studies prepared for the Lago Vista area. Confer with the local flood plain administrator to help identify specific local needs and concerns. Obtain Letters of Map Revisions (LOMR) submitted for the Highland Lakes region along the Colorado River, both as to map products and water surface profile computations. Prepare a summary memorandum and data file of the relevant water surface elevations, cross-section information to allow importation into the GIS terrain model.

Activity 3: Review DFIRM Standards.

Conduct a review of the relevant literature and FEMA DFIRM specifications and guidelines. Develop the required templates and protocols for production of DFIRM maps to FEMA standards. Confer with FEMA 's DFIRM Mapping Coordinator Contractor (MCC) to acquire relevant standards and protocols. Prepare DFIRM standards book and distribute to project team.

Activity 4 Develop Base Map and Panel Layout.

Create a GIS Base Map of the Pilot Area in accordance with FEMA DFIRM standards. Prepare a layout of a DFIRM panel showing outline and scale. Prepare draft of Milestone 1 package for QA/QC review. Incorporate recommendations/change from QA/QC review. Prepare Milestone 1 submittal package.

Activity 5: QA/QC: Milestone 1

Perform quality control per FEMA requirements and approved QA/QC plan for the draft Milestone 1 package. Prepare QA/QC report and present to project manager for implementation.

Activity 6: Develop Design Flood Elevations.

Using the relevant flood data collected in the previous tasks, create a GIS version of the design floodwater surface profiles. If updated water surface profiles have not changed within the

selected panel, a digitized version (FEMA Q3 data) of the Flood Hazard Area Designation will be utilized. No new hydrologic or hydraulic analyses will be performed.

Activity 7: Prepare Inundation Map.

Intersect the design flood elevations and base map to determine a flood inundation map for the Pilot Area. Compare this map with the ones previously created to identify differences between new and old maps and the reasons for them. Prepare assessment memorandum and assess the need for additional LOMR's.

Activity 8: Prepare DFIRM Panel.

Create polygon coverage or coverages showing the extent of inundation under the various hydraulic conditions involved in flood plain mapping. Overlay this polygon coverage on its digital orthophoto base map data. Populate panel database and construct DFIRM metadata files. Prepare a draft DFIRM panel and associated data CD-ROM for QA/QC review. Incorporate recommendations/changes from QA/QC review. Prepare Milestone 2 submittal package.

Activity 9: QA/QC: Milestone 2

Perform quality control of the draft DFIRM panel package. Identify and document errors in the mapped region generated in the intersection process or caused by artifacts in the digital terrain model. Prepare QA/QC report and present to project manager for implementation.

Activity 10: Prepare Final DFIRM Deliverables.

Incorporate comments from FEMA review of DFIRM panel submittal. Prepare final DFIRM package for remaining DFIRM panels. Populate data files and prepare DFIRM metadata files. Prepare a draft DFIRM package including data files, hard copy of maps and CD-ROM for QA/QC review. Incorporate comments from QA/QC review. Prepare Milestone 3 final deliverable package.

Activity 11: QA/QC-Milestone 3

Perform quality control on the digitally created flood inundation map to identify and deal with errors in the mapped region generated in the intersection process or caused by artifacts in the digital terrain model. Prepare QA/QC report and present to project manager for implementation.

Activity 12: Project Meetings

A series of formal project review meetings are planned between the LCRA, Lago Vista and FEMA. Other meetings will be conducted on an as needed basis. Planned meetings include:

- **Project kickoff meeting.** In this meeting we will present the project work plan and introduce the project team to FEMA.
- **Milestone Delivery meeting(s)** (3 planned). When a milestone in the project has been reached, a formal review meeting will be held to present and discuss the delivered information.

A summary of each meeting will be prepared and distributed.

Activity 13: Project Management.

Organize and monitor project performance and production. Conduct regular review meetings with the project team, community and with FEMA. Prepare Quarterly Status reports and meeting summaries. Monitors schedules and budget progress take corrective action as required to maintain baseline budget and schedule.

2. Period of Performance:

This Task Agreement will begin on October 1, 1999 and end no later than September 30, 2000. This task Agreement may be terminated at the option FEMA or LCRA in accordance with the provisos of the CTC Memorandum of Agreement dated May 7, 1999.

3. Funding/Cost Sharing:

Table 1 presents a summary of the estimated project costs. Total project cost is estimated to . It includes the cost of the University of Texas and LCRA personnel. Based upon a contribution from FEMA, the Federal percentage is 18%.

4. Standards:

The DFIRM's will be created using the version, in effect during the period of this agreement, of the following standards and documents:

- *Guidelines and Specifications for Study Contractors (FEMA 37)*
- *Guidelines and Specifications for Flood Map Production Coordination Contractors (Draft February 17, 1999)*
- *Base Map Standards for DFIRMs (FEMA)*. This document provides minimum, base map standards for DFIRMs. These include the following requirements for DFIRM base map data:
 - ✓ Cover the community(s)
 - ✓ Be distributed by FEMA to the public;
 - ✓ Meet the minimum accuracy requirements outlined in the document; and
 - ✓ Include all required features.
- *Digital Flood Insurance Rate Map (DFIRM) Specifications*. (FEMA is in the process of developing specifications for its new DFIRM product. Once those specifications are complete, they will apply to this Task Agreement). This document will provide information about graphic specifications for hardcopy DFIRM products as well as minimum standards for the DFIRM database that accompanies the mapping files, file formats, transfer media, etc. The "Basic DFIRM" tables and items in the DFIRM database apply; optional tables and items are not required.
- *Standards for Digital Orthophotos (U.S. Geological Survey, National Mapping Program, December 1996)*
- *Content Standards for Digital Geospatial Metadata (Federal Geographic Data Committee, 1998)*

5. Deliverables:

The LCRA shall deliver the following deliverables to FEMA:

- **Quarterly Status Report**. The report will include the percent complete of the work under this Task Agreement, major accomplishments made during the quarter, and major problems encountered, and the resolution of any major problems encountered.
- **DFIRM mapping files**. Mapping files will conform to format specified in FEMA specification: *Digital Insurance Rate Map*. All files will be delivered on CD-ROM.

- **DFIRM database files.** Database files will conform to form specified in FEMA specification: *Digital Flood Insurance Rate Map (DFIRM) Specifications*. Data files will be delivered on CD-ROM.
- **Metadata Files.** Metadata files describing the DFIRM data will be provided. The files will include the required information and follow examples shown in FEMA's *Digital Flood Insurance Rate Map (DFIRM) Specifications*.
- **DFIRM Panel Plots.** A complete set of panel plots of the DFIRM maps will be provided showing all detail at the scales approved under the first milestone meeting. Acceptable DFIRM scales are 1" = 500', 1" = 1000', and 1" = 2000'.
- **QA/QC Report.** A report documenting the procedures and results of all automated and manual quality assurance steps taken during the production of the DFIRM will be provided. A draft of the QA/QC procedures and format will be presented as part of Milestone 1.

6. Schedule and Milestones:

Overall, we estimate to complete the project within 12 months of our Contract start date. Assuming an October 1, 1999 contract start date we expect to complete the project on or before September 30, 2000.

In order to monitor project progress a series of Milestones are planned:

- Milestone 1: DFIRM Base Map and Panel Layout
- Milestone 2: DFIRM Prototype Panel.
- Milestone 3: DFIRM Final Production

Table 2 summarizes the tasks to be accomplished within each milestone event.

Table 2
Summary of Milestone Deliverables and Activities

Activity Name	Milestone No.		
	1	2	3
1. Prepare work plan.	●		
2. Assimilate Existing LOMR and Flood Studies	●		
3. Review DFIRM Standards	●		
4. Develop Base Map & DFIRM Panel Layout	●		
5. QA/QC-Milestone 1	●		
6. Develop Design Flood Elevations		●	
7. Prepare Inundation Map.		●	
8. Prepare DFIRM Panel		●	
9. QA/QC-Milestone 2		●	
10. Prepare Final DFIRM Deliverables			●
11. QA/QC-Milestone 3			●
12. Project Meetings	●	●	●
13. Project Management.	●	●	●

A description of each milestone deliverable is presented below.

Milestone 1: DFIRM Base Map & Panel Selection

The deliverables for the first milestone include:

- A description of the proposed DFIRM base map panels including digital base map information checklist (available in FEMA 37);
- A diagram showing the proposed DFIRM panel layout for the new panels that includes the community and/or county boundary(s) and scale of all panels.
- A copy of the current FIRM index.
- QA/QC report.

Deliverables for Milestone 1 will be submitted to the FEMA Project Officer no later than 3-months after Contract start date.

Milestone 2: DFIRM Prototype Production

The deliverables for the second milestone will include the following:

- A set of digital files containing DFIRM data for one FIRM panel. The digital files will include the base map data as well as all FIRM information converted to DFIRM format.
- Mapping files will be accompanied by the appropriate DFIRM database tables described in FEMA's *Digital Flood Insurance Rate Map (DFIRM) Specifications*.
- Metadata files describing the DFIRM data.
- A plot of the DFIRM panel showing all detail at the scale approved under the first milestone.
- QA/QC report.

Deliverables for Milestone 2 will be submitted to the FEMA Project Officer no later than 7-months after the Contract start date.

Milestone 3: DFIRM Final Production

The final deliverables for this Task Agreement include the following:

- A set of digital files containing all DFIRM data for the entire community(s) and/or county(s) defined in Section 1 of this Agreement. The digital files must include the base map data as well as all FIRM information converted to DFIRM format.
- The mapping files must be accompanied by the appropriate DFIRM database tables described in FEMA's *Digital Flood Insurance Map (DFIRM) Specifications*.
- Metadata files describing the DFIRM data must be provided.

- A complete set of plots of the DFIRM panels showing all detail at the scale(s) approved under the first milestones must also be provided.
- QA/QC report.

Final deliverables will be submitted to the FEMA Project Officer no later than 12-months from the Contract start date.

7. Certification:

The DFIRM metadata files must include a description of the horizontal and vertical accuracy of the DFIRM base map and floodplain information.

8. Technical Assistance and Resources:

FEMA will provide the LCRA copies of FEMA-issued Letters of Map Change (LOMC), archived engineering backup data, and data collected as part of the Five- Year Mapping Needs Assessment from FEMA's Mapping Coordination Contractor (MCC). The MCC may be contacted at 1-877-FEMA-MAP.

General technical and programmatic information can be downloaded from FEMA's Flood Hazard Mapping web site (www.fema.gov/mit/tsd/). Specific technical and programmatic support may be provided through FEMA's MCC; such assistance should be requested through the FEMA Project Officer specified in Section 12 of this agreement and may include:

- preparation of a DFIRM panel layout and panel grid in electronic format;
- example DFIRM mapping and database files;
- technical assistance in the form of training and technical guidance; and
- DFIRM production tools, software, cell libraries, automated QA/QC tools, etc., that FEMA has developed for its own use.

9. Subcontractors:

LCRA will subcontract portions of the work to the University of Texas Center for Research in Water Resources (CRWR). The CRWR has been active for some years in the development of tools to link the flood hydrology and hydraulic models of the Hydrologic Engineering Center (HEC) of the US Army Corps of Engineers to the GIS software provided by the Environmental Systems Research Institute (ESRI). The HEC and ESRI products are the standards that LCRA uses for its flood analysis and digital mapping tasks, respectively. The University of Texas complies with the requirements of 44 CFR 13.36.

The CRWR principal investigator (Dr Maidment) is presently engaged on a panel of the US National Research Council which, at the request of the Congress, is studying the procedures for Risk-Based Analyses for Flood-Damage Reduction Studies of the US Army Corps of Engineers (National Research Council, 1999). Service on this committee involves interaction with personnel from FEMA and the Association of State Flood Plain Managers because those organizations are impacted by changes in procedure undertaken by the Corps. Insight and personal contacts gained from service this committee will be useful in ensuring that the flood plain mapping procedures adopted in this project are conformal with FEMA requirements and reflective of the best available technology.

10. QA/QC Procedures:

DFIRM data prepared under this Task Agreement must be independently reviewed to ensure that the following QA/QC requirements are met. This independent review will be conducted by the LCRA Survey and Mapping Department to perform QA/QC review. The procedures used may include a mixture of manual and automated QA/QC procedures:

- Complete data capture of all required DFIRM features must be assured.
- Data capture without distortion (other than that resulting from the addition of horizontal control and/ or edgematching) must be assured.
- Topological fidelity of the DFIRM files must be assured. This includes assurance that the files contain no overshoots or dangles, gaps, node errors, or pseudo nodes and assurance that all area features are closed.
- FEMA's horizontal and vertical accuracy requirements for DFIRM must be met.
- All internal edgematching between panels must be resolved. If this Task Agreement covers more than one community, edgematching between contiguous communities must also be resolved. This includes both "graphical" mismatches as well as mismatches in engineering data portrayed on the DFIRM (e.g., floodplain width, base flood elevations, etc.)
- Complete data capture of all required DFIRM database features must be assured. In addition, logical data encoding checks should be performed to assure consistency within the DFIRM database. For example, feature attributes must fall within the specified range and domain for that feature type.
- Hardcopy DFIRM must be legible and plotted at the scale(s) agreed upon after the first milestone of this Task Agreement.

11. Reporting:

Reporting requirements are described in the Deliverable section of this agreement.

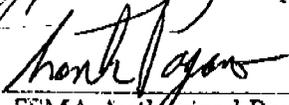
12. Points of Contact:

The FEMA Project Manager is Jack Quarles, P.E. and the LCRA's Project Manager is Wes Birdwell, P.E., or subsequent personnel of comparable experience who are appointed to fulfill these responsibilities.

Each part has caused this Task Agreement to be executed by its duly authorized representatives.



LCRA Authorized Representative



FEMA Authorized Representative

29 June 99
date

8/26/99
date