

**Kansas Citys, Missouri and Kansas
Flood Damage Reduction Feasibility Study
(Section 216 – Review of Completed Civil Works Projects)
Engineering Appendix to the Interim Feasibility Report**

Chapter A-3

SURVEYING, MAPPING, AND OTHER GEOSPATIAL DATA REQUIREMENTS

CHAPTER A-3 SURVEYING, MAPPING, AND OTHER GEOSPATIAL DATA REQUIREMENTS

A-3.1 INFORMATION TO SUPPORT PREPARATION OF FEASIBILITY REPORT

A-3.1.1 Surveys

The O&M Manuals and Record Drawings were reviewed and were followed by field visits with sponsor representatives to compare available survey information with actual field conditions.

A centerline survey of the top of levee was conducted in April of 2001 for all seven units in the Kansas Citys protection system. The survey was conducted for verification of the O&M Manual elevations and used as a baseline for the hydrologic and hydraulic analyses.

A review of the centerline survey indicated that some areas along the levee were lower than shown in the O&M Manual. Based on this, a resurvey of portions of the centerline was conducted in late 2003. The results of the resurvey confirmed that, in comparison with the original design elevations, several areas were lower. The following are the sections of levee units that were resurveyed:

CID-MO Unit – Station 73+00 to Station 89+37

CID-KS Unit – Station 0+00 to Station 3+00

Fairfax-Jersey Creek Unit – Station 27+00 to Station 30+00

Fairfax-Jersey Creek Unit – Station 303+00 to Station 295+00

North Kansas City Unit – Station 90+00 to Station 110+00

North Kansas City Unit – Station 265+00 to Station 285+00

Armourdale Unit – Station 93+00 to Station 102+00

Armourdale Unit – Station 246+00 to Station 252+00

In addition, the area between the CID-MO and East Bottoms Units was resurveyed to verify the intended line of protection (existing “high ground”). Contour mapping suggested that this area does not provide the same level of protection as the CID-MO or East Bottoms Units.

Two-dimensional survey data (see Geospatial data below) of the Argentine Unit was purchased from the Wyandotte County (Kansas) Unified Government in 2003 for use in development of earthwork quantities. Survey information included areas outside the centerline of the levee (Argentine Unit) and was converted to three-dimensional data (using Microstation) by moving each contour to its specific elevation. A Digital Terrain Model (DTM) was developed using Inroads and combined with the centerline survey of the levee. Inroads was used to station the centerline of the Argentine Unit and then modify the stationing to coincide with the O&M Manual. The existing surface (baseline) was used in an iterative process to develop earthwork quantities for the various raise alternatives under consideration for the Argentine Unit.

A-3.1.2 Geospatial Data

Around the beginning of the feasibility phase, the GIS members of the team were tasked with acquiring geospatial data from GIS vendors, local municipalities, etc. As this study area covers two different state plane zones, it was decided that all project geospatial data be in UTM zone 15, which covers the whole study area.

Geospatial data used for this project includes the following:

- Acquired Data (see Exhibit A-3.1 for graphical summary)
 - The Unified Government of Wyandotte County provided detailed mapping of the Kansas River. This topographic and planimetric AutoCAD mapping (103 files) has a projection of Kansas State Plane, North (feet), NAD 83. The 2D contours have a 2-foot interval. Concerning utility data, sanitary sewer, water, and electric, AutoCAD data was acquired from three different points of contact within the Unified Government of Wyandotte County. Again, all of the utility data had a projection of Kansas State Plane, North (feet), NAD 83.
 - The governments of Cass County, Missouri, the City of Kansas City, Missouri, and Wyandotte County, Kansas each provided relatively current land parcel spatial data and accompanying tabular data detailing appraised value, assessed value, land use, and ownership information.
 - The project team purchased 3D data (ASCII point and break line data) that the contractor used to produce the Wyandotte County 2D contours. This 3D data was used to help identify the projected toe of levee for the various proposed raise alternatives.
- Existing In-House (Corporate) Data
 - For this phase of the study, the project team decided that the existing Missouri River Microstation mapping would be adequate to meet the team's geospatial needs. The Missouri River mapping was created in 1998 and 1995 and has a projection of UTM Zone 15 (feet), NAD 83. The topographic data, or 3D contours, have a 4-foot interval and a vertical datum of NGVD 29 feet. The planimetric data was adequate for the team's needs, but the utility data was sparse and needed to be supplemented with much more detailed data.
 - ESRI, GDT, and Navtech data sets were used as references. These USACE licensed, commercially derived, data sets are essentially census spatial data with more attribution and accuracy. These data sets were in a variety of projections and needed to be manipulated for use within the project.
 - USGS's Digitally Ortho-rectified Quarter Quadrangles (DOQQ) black and white imagery was used throughout this project as import background and navigation information. The DOQQs have a 1-meter resolution. The dates of these DOQQs range from 1991 to 1997. The DOQQs are a part of the GIS team members' corporate data holdings, which were acquired through regional geospatial data clearinghouses.
 - The USACE-KCD purchased commercially made digital ortho-rectified color imagery of the Kansas City metropolitan area. This

imagery has a 2-foot resolution. The date of this imagery is June 2001.

- Projects
 - Data Acquisition – October 2000 through March 2001
Much of this time was used to data mine for Kansas River spatial data and arrange for acquisition of this data.
 - Data Processing – March 2001 through May 2001
All of the Wyandotte County AutoCAD data was converted to Microstation format and then projected from Kansas State Plane, North (feet), NAD 83 to UTM Zone 15 (feet), NAD 83.
 - Public Hearing Support – May 2001 through June 2001
The GIS members of the project team were tasked with mapping support for the June public meeting. The maps mainly showed each levee unit's zone with aerial photography behind it.
 - HEC-FDA Model Inputs (Economic and H&H support) – October 2001 through March 2003
The GIS members of the project team were tasked with mapping support for the economics field inventory efforts. After acquiring the land parcel spatial and tabular data from the sources listed above, this land parcel data and their parcel numbers were displayed over the top of contour, building, and road name spatial data with the DOQQ's as a background. These maps helped the USACE economists acquire information about possible damage assessment associated with levee failure. The USACE economists used these maps to complete field studies to gather new, accurate data about building wealth in the Kansas City metro area.
The GIS members of the project team were also tasked with mapping support for the H&H efforts. H&H team members requested a set of comparison maps showing the relationship between river miles and existing levee structures where they cross the top of levee centerline. This data later aided in comparing the top of levee elevation to the water surface elevation of a 0.2% chance of exceedance (500-yr) flood event.
 - Levee Raise Layouts (existing & new top of levee) – February 2003 through June 2004
The GIS members of the project team were tasked with creating a map set showing the location of existing levee structures where they cross the top of levee centerline. Color-coded station number text was included to coincide with the Levee/Floodwall Features Inventory spreadsheet information and to help categorize each feature's point. The project team needed this mapping for eventual use in this engineering appendix document.
The GIS members of the project team were also tasked with creating a map set showing the location of specific zones of inundation near selected pump stations. Again, the project team needed this mapping for eventual inclusion in this engineering appendix.

Lastly, the GIS members of the project team were tasked with creating a map set showing the footprints of potentially affected areas, borrow areas, and utility line (UL) uplift concern areas. Also needed was the location of existing levee structures where they cross the top of levee centerline. The project team needed this mapping to analyze areas of concern.

➤ Feature Inventory Delineation Maps – September 2003 through December 2003

The GIS members of the project team were tasked with adding onto the information created with the existing condition maps by adding top-of-levee elevation and description text to the existing levee station text. By adding this information to the map, map users are able to gather most of the aforementioned spreadsheet information without referring to the spreadsheets.

➤ Utility Site Maps – November 2003 through June 2004

For the Argentine Unit, the GIS members of the project team were tasked with creating a map set that shows specific zones of uplift concern for utilities data. This map set also shows utilities data with text.

Also for the Argentine Unit, the GIS Section created a map set showing where utilities cross the levee. At these crossings, there are specific text boxes giving data about the crossings.

➤ Real Estate Support – December 2001 through June 2004

The GIS members of the project team were tasked with creating map plates similar to those created for the economic field survey discussed above, but without the contour information. Real estate personnel on the project team needed this information for their analysis.

For the Argentine Unit, the real estate team members needed a group of maps showing the three alternatives being considered: raising the levee to a 500 year level of protection, raising it to 500-year plus 3 feet, and raising it to 500-year plus 5 feet. Each of these alternatives has a different set of files that include stability berms, proposed levee raise, proposed I-walls, proposed floodwalls, temporary right of ways, and outside COE property areas that the COE may have to purchase.

This map set was generated for a sponsor meeting on 28 January 2004.

A-3.2 SURVEY INFORMATION NEEDED FOR DESIGN, PLANS, AND SPECIFICATIONS

Survey information used during feasibility was from a combination of sources of varying degrees of age and accuracy. While this data is acceptable for feasibility, it is inadequate for design and construction. A completely new survey will be conducted prior to developing plans and specifications for construction. The development of plans and specifications requires a higher degree of accuracy and detail in regards to existing elevations, structures, utilities, and other items.

A-3.3 SUPPLEMENTAL EXHIBITS

EXHIBIT A-3.1

Kansas City, Missouri and Kansas, Flood Damage Reduction Report Feasibility Study Currency of Acquired Data

