

Section 2

Data Collection and Development

2.1 Watershed Inventory

The watershed inventory consisted of reviewing existing information, developing digital datasets specific to the Master Plan development, and a drainage structure survey to fill data gaps. Known existing information was identified based on previous master plan studies and data collected by the City. The existing information collected during the study included:

- Existing land use and street network
- Existing floodway and flood fringe boundaries
- Existing hydrologic and hydraulic models
- Land ownership information
- Stream gage and precipitation data
- As-built plans for ponds and drainage structures/bridges
- City water quality data
- City of Lincoln Flood Insurance Study
- Historical photographs
- Color aerial photography
- U. S. Geological Survey LiDAR data (non-bare earth points)
- Corps of Engineers Section 22 Feasibility Study
- Corps of Engineers Hydrology/Hydraulics/Geomorphology Study for East Campus
- East Campus Geomorphology Study by Schemmer/Intuition & Logic
- Taylor and Herbert Park Geomorphology Study by Intuition & Logic
- City Drainage Manual
- Past public involvement correspondence
- Lancaster County soil map

Numerous new datasets were developed using GIS technology to organize the technical evaluations during the study and are included in Appendix A under GIS datasets. A description of each GIS dataset created during the study is provided below.

- **Bridge and Culverts/Detention Facilities** - This dataset includes shapefiles with the identification number, type, size, length, flow capacity, top of road profile, and invert elevation as well as the survey information gathered during the project. Also included in this folder are the scanned hardcopies of the design drawing data used in the hydraulic model analysis.
- **Known Problem Areas** - These datasets identify the location of CIPs and other areas evaluated that address issues for street and building flooding, existing erosion problems, and promoting water quality. The information was obtained by the project team during the CIP analysis.
- **Geomorphology Information** - These datasets summarize field information gathered by the project team to analyze the geomorphic processes within the natural stream reaches. Datasets include channel bar type and condition, bed and bank material, type and bed consolidation, channel profile and cross section information, erosion and mass wasting,

vegetative bank protection and condition of riparian corridor, outfalls, infrastructure crossings, location of stream reach photographs, shear values, location of knickpoints, debris jams, and fluvial process layers depicting meander adjustment, incising, widening, and stable channel.

- **Hydrologic Evaluation** - These datasets include the HEC-HMS model input files used during the hydrologic evaluation process. The files include time of concentration flow paths, subbasins, detention ponds, merged land-use and soils curve number files, and location of divergence nodes.
- **Hydraulic and Floodplain Information** - These datasets relate to the hydraulic model output and include the stream centerlines, the 100-year floodplain and floodway merged shapefile, floodplain shapefile for the 500-year floodplain, and the cross sections from the hydraulic models.
- **Benefit-Cost Analysis** - These datasets were used to develop the benefit-cost analysis described in Section 9. Shapefiles include structures impacted by the existing conditions floodplain as well as those impacted by the recommended CIP (Section 8). Also included are the depth grids used in the estimation of damages.
- **Water Quality Evaluation** - These datasets include the study's wet-weather evaluation sites as well as the City's NPDES program dry monitoring sites in shapefile format.
- **Fieldwork Photographs** - This dataset includes location of photographs taken throughout the watershed with a reference to the photo identification number.

Electronic Files

The electronic files associated with the study have been organized according to the following folder structure:

- Study Report and Appendix Information
- Public Participation, Field Work, and Survey Photographs
- GIS Datasets (as described above; can be accessed using ArcGIS)
- Hydrologic and Hydraulic Models

2.2 Drainage Structure Field Survey

A drainage structure field survey was conducted to obtain the necessary hydraulic data along the study reaches. The information was collected using global positioning system (GPS) to obtain the required elevations for each drainage structure. The drainage structures were categorized based on three types: bridges, culverts, and detention facilities.



52nd and Francis Street Bridge Crossing

- **Bridges** - The types of information collected for each bridge included a stream cross section to define the upstream face of the bridge opening, centerline profile of the bridge decking, low chord elevation of the bridge, physical characteristics of the support system, and photographs of the upstream face, downstream face, looking downstream, looking upstream, and piers.



Culvert extending beneath MoPac Trail just north of "O" Street

- **Culverts** - The types of information collected included a stream cross section immediately upstream of the culvert, centerline profile of the roadway crossing, upstream and downstream invert locations, opening dimensions, material type, wing-wall configuration, and photographs of the upstream face, downstream face, looking downstream, and looking upstream.



Carriage Hill Detention Facility near "A" Street and 84th Street

- **Detention Facilities** - Information was collected for detention facilities located within the watershed that provided watershed storage. The types of information collected included the location and dimensions of the inlet and outlet structures, dimensions of the emergency spillway, centerline profile of the detention embankment, a cross section of the emergency spillway at the embankment toe and crest, and representative photographs.

Table 2-1 summarizes each drainage structure surveyed, as well as those that contained useable design drawing information. Appendix A contains a CD-ROM that includes the electronically recorded survey data and photographs for each drainage structure.

2.3 Base Mapping

Two sources of topography data were used for the base mapping for this project. The City's 1997 2-foot contour information was used during the hydrologic evaluation. To use the contour information, it was converted to a digital elevation model (DEM) using ArcInfo technology. The base map used for the hydraulic model and floodplain mapping was created using ArcInfo technology by converting the City's 2003 bare earth LiDAR data into a triangular irregular network (TIN). The DEM and TIN are three-dimensional

**Table 2-1
Drainage Structure Survey Data**

Reach	Location	River Station	Structure Type	Topography Source
Main Channel	Cornhusker Highway	2709.360	Bridge	Design Drawing
Main Channel	Burlington Northern Railroad	4126.170	Bridge	Survey
Main Channel	Abandoned Railroad	4197.290	Bridge	Survey
Main Channel	33 rd and Baldwin	4952.940	Culvert	Survey
Main Channel	Huntington Avenue	5589.235	Bridge	Survey
Main Channel	38 th Street at UNL East	7270.680	Bridge	Survey
Main Channel	48 th Street	10837.900	Bridge	Survey
Main Channel	University Place Park Pedestrian Crossing	11265.400	Bridge	Survey
Main Channel	52 nd and Francis	12558.700	Bridge	Survey
Main Channel	56 th and Holdrege	14241.100	Culvert	Design Drawing
Main Channel	Chateau Footbridge	16640.700	Bridge	Survey
Main Channel	Chateau Bridge	17220.000	Bridge	Survey
Main Channel	North Cotner	17987.720	Bridge	Design Drawing
Main Channel	Vine Street	18233.060	Bridge	Design Drawing
Main Channel	MoPac Bridge	18350.800	Bridge	Survey
Main Channel	66 th Street	20033.400	Bridge	Design Drawing
Main Channel	70 th Street	21766.300	Culvert	Survey
Main Channel	MoPac Bridge/NDOR Culvert	23300.600	Culvert	Survey
Main Channel	O Street	24232.900	Culvert	Survey
Main Channel	Corporate Drive	24530.000	Culvert	Survey
Main Channel	Bike Trail downstream of Wedgewood Lake	25322.800	Bridge	Survey
Main Channel	Englewood Drive	27591.500	Culvert	Survey
Main Channel	Bike Trail upstream of Englewood Drive	27815.300	Culvert	Survey
Main Channel	Bike Trail extended off Hickory Lane	28733.400	Culvert	Survey
Main Channel	Bike Trail downstream of Vine Street	18139.000	Bridge	Survey
Tributary	DMR West Trib Culvert into DMR Main Channel	100.548	Culvert	Survey
Tributary	Cargill RR Spur	1812.705	Bridge	Survey
Tributary	Burlington Northern Railroad	1953.561	Bridge	Survey
Tributary	OLB Railroad	2022.994	Bridge	Survey
Tributary	Lincoln Elevator and Feed Old Road owned by JAVA	2613.568	Culvert	Survey

representations of the ground topography. The 2003 LiDAR data are the more recent information and were assumed to represent existing conditions more accurately than the 1997 data. Because of the size of the watershed, the LiDAR data were not used in the hydrologic evaluation. The 1997 data were assumed to provide the required accuracy for the hydrologic evaluation. The creation of the hydrologic and hydraulic models is discussed in greater detail in Sections 3 and 4, respectively.

The quality control results, which evaluated the accuracy of the LiDAR TIN, were presented to the City and NRD under separate cover. In summary, the quality control analysis indicated that the data met the National Mapping Accuracy Standards criteria for vertical accuracy as a function of horizontal accuracy, as required in *Appendix A of the FEMA Guidelines and Specifications for Flood Hazard Mapping Partners*. Therefore, the LiDAR data were used for the Deadmans Run hydraulics evaluation and mapping process.

2.4 Water Quality Evaluation

The water quality evaluation consisted of reviewing previous water quality studies in the watershed and performing a limited water quality assessment on the main channel. The purpose of the review process was to become familiar with existing data, with the goal of building on past efforts. Two previous water quality documents were available, including the University of Nebraska's *Dry Weather Stormwater Monitoring* study published in September 2005 and a Masters of Science thesis, *The Storm Water Quality Evaluation of Livestock Runoff From East Campus Site*. Both studies are summarized in Section 6.4.

The purpose of the Master Plan's water quality assessment was to gather additional wet weather data along the main channel of Deadmans Run. Samples were collected in two locations, the 33rd Street crossing at Baldwin Street and the 70th Street crossing of Deadmans Run, as shown on Figure 2-1. Wet weather sampling was conducted during two separate storm events, the first on July 13, 2006, and the second on September 21, 2006. Grab samples were collected to quantify runoff pollutant concentrations. The results were used to evaluate various structural and nonstructural BMPs to address pollutants at their source and to provide treatment at regional locations.

2.5 Geomorphic Investigation

The geomorphic evaluation included a background analysis, field investigation, and geomorphic analysis for the stream reaches identified on Figure 2-1. The background analysis was performed using existing datasets, while the field investigation was used to gather the geomorphic information datasets summarized in Section 2.1. The purpose of the background analysis and field investigation was to characterize the natural stream segments with the goal of using the data to evaluate potential stream improvements to address erosive or excess sediment conditions.

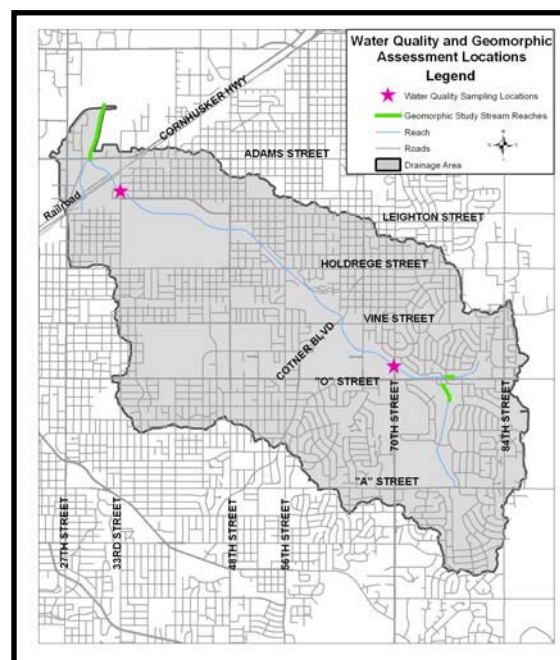


Figure 2-1
Water Quality and Geomorphic Assessment Locations