2 Data Collection Program and Equipment

Data Collection Program

The field effort, as stated previously, included continuous monitoring of the water-level changes due to vessel waves, current speed and directions, wind speed and direction, and suspended-sediment fluctuations at various locations within the proposed study areas. Concurrent with these measurements, intensive data collection efforts were performed during navigation traffic passage events to obtain current speeds, directions, and suspended-sediment samples. The data were to be obtained during approximate high-, mean-, and low-flow stages of the river at each of the proposed monitoring sites. However, all the monitored flows for Pools 26 and La Grange are below the 50-percent duration flow. The data obtained during these efforts were collected at regular intervals over 3 consecutive days at each site for each data collection period. Navigation traffic passages through the study areas were sampled more frequently by the data collection boats onsite to determine changes in suspended-sediment concentrations. This plan utilized a minimum of three boats for monitoring three to four data collection ranges at each study area. A typical arrangement of data collection ranges are shown in Plates 1-7.

Data were collected in the UMR-IWW Sedimentation Study during the months of October/November 1995, July 1996, and September 1996. The actual dates of the data collection period are listed below:

Pool 8	2-3 Nov. 1995	-	13-14 Sept. 1996
Pool 26	8-9 Nov. 1995	11-12 July 1996	5-6 Sept. 1996
La Grange (Illinois R.)	-	15-16 July 1996	9-10 Sept. 1996

The data collection efforts are described in further detail in subsequent sections of this report.

Water-Level Fluctuation Measurements

Instruments were deployed for monitoring of water-level fluctuations from boat waves and drawdown effects. These instrument deployment locations are identified in Plates 1-7 and in Table 1. Water-level fluctuations were monitored using microwave water-level recorders, as described in Appendix A. A typical installation of the wave/water-level sensors is shown in Figure 1. The sensor is secured inside a weighted aluminum tripod mounting unit and lowered to the bottom of the river in the nearshore area in water depth of 1.2 to 1.5 m. A retrieval line is secured to the tripod and the opposite end, then attached to a secure object (tree, piling, etc.) on the shore.

Fixed-Depth Velocity and Direction

Fixed-depth velocity and direction measurements within areas of the main river and in off-channel locations were recorded using ENDECO model 174 SSM current meters similar to that described in the section on recording velocity meters of Appendix A. A typical installation of the velocity meter is shown in Figure 2. At each location, a single meter was deployed and positioned at a fixed point from the bottom equivalent to 0.4 of the total water depth at the deployment location. A surface float was attached to the meter suspension line to mark the location and provide flotation support for the velocity meter. Listings of the instrument locations and their positions are presented in Table 1. The sampling interval of these recording current meters was set at 10 sec.

Suspended-Sediment Measurements

The suspended-sediment measurements for determination of background and navigation effect changes in concentration levels were obtained with optical backscatterance (OBS) sensors and portable water-sampling equipment, as described in the suspended-sediment concentrations measurements section of Appendix A. These instruments were deployed in areas relatively close to the navigation channel and in water depths ranging from 1 to 5.5 m. A data collection platform was designed for use in a riverflow environment. A typical installation of the OBS data collection platform is shown in Plate 8. The sensors were positioned at various intervals below the water surface depending on the overall water depth at the deployment location. Generally, three sensors were used when water depths were less than 3.6 m, and five sensors were used when depths were greater than 3.6 m. The locations designated by ranges are indicated in Table 1 and in the location maps shown in Plates 1-7. For safety and security of the instruments, the data collection platforms were outfitted with reflective signs and flashing lights to warn approaching vessels of their proximity to the navigation channel. The sampling interval for these suspended-sediment concentration sensors was 240 readings per minute.

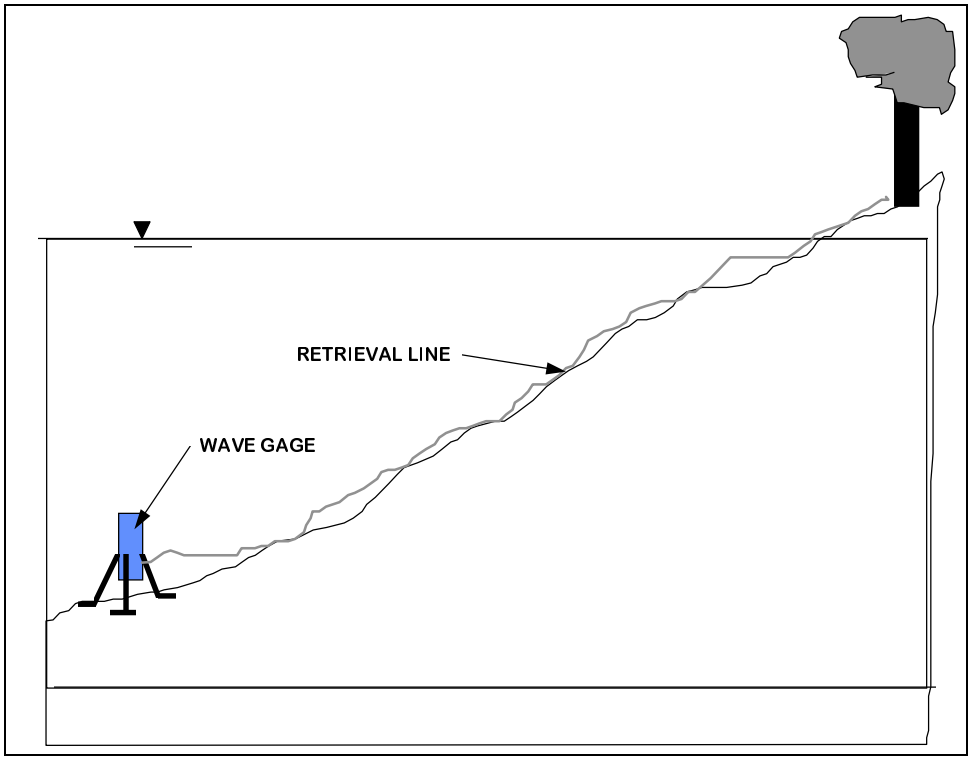

Figure 1. Typical wave gauge deployment

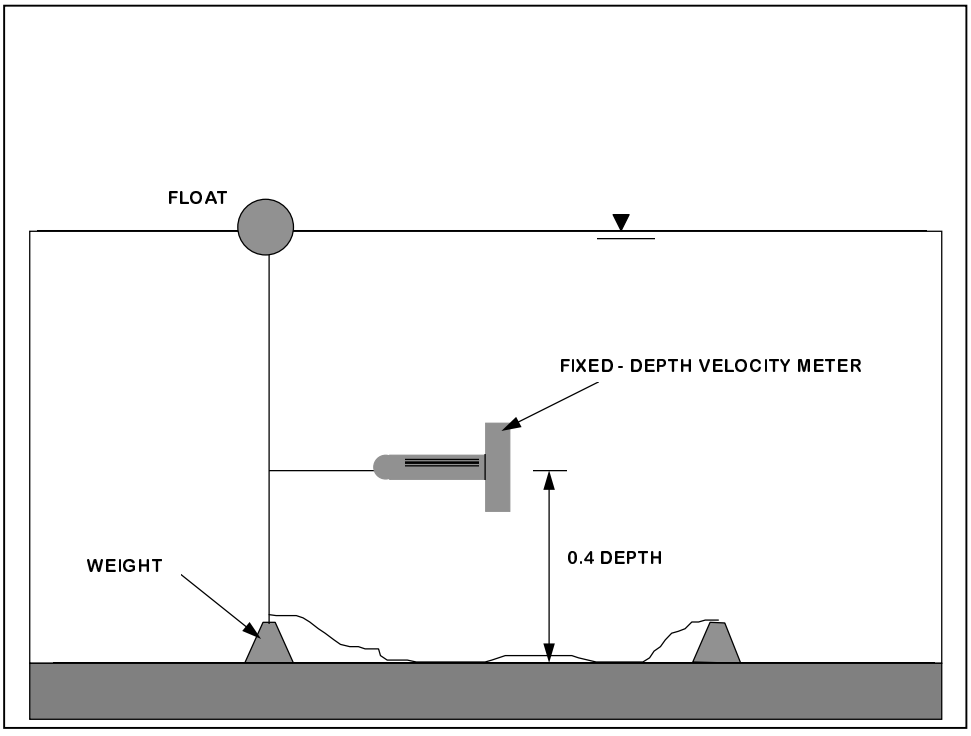

Figure 2. Typical deployment of the fixed-depth velocity meter

Water samples were collected during several of the data collection transects along each range at a minimum of three depths: near bottom, middepth, and surface. The near-bottom sample was obtained approximately 0.6 m above the actual bottom. The middepth sample was obtained at the actual middepth measurement. The surface sample was obtained at approximately 1.0 m below the water surface. The samples were obtained by pumping the water from the desired depth to a collection point at the surface. The pumping system used is described in the suspended-sediment sample section of Appendix A. Laboratory analysis of these water samples provided a means of quantifying the suspended-sediment concentrations.

Velocity and Direction Profile Measurements

During the intensive data collection efforts, boat-mounted Acoustic Doppler Current Profilers (ADCP), as described in Appendix A, were used to collect profiles of velocity and direction. A total of three boats were used in each study area, and ADCP instruments were employed to monitor data collection ranges within the main river and in a few of the entrances of off-channel areas (side channels, backwater channels, etc.). The data collection ranges were selected to yield the information most applicable for the numerical model studies. The general location of these ranges are shown in Plates 1-7 and listed in Table 1 for the various study areas. Water samples were obtained at various depths at each data collection range throughout the data collection period for determination of sediment-concentration profiles, as described in the previous section. These samples were obtained to determine background sediment levels during the periods of no navigation traffic and to determine changes in sediment levels following a vessel passage.

Laboratory Analysis of Water Samples for Suspended-Sediment Concentrations

The individual water samples collected during the intensive field effort were analyzed for sediment content in the laboratory at the U.S. Army Engineer Waterways Experiment Station (WES). The analysis techniques used are described in the Laboratory Equipment and Sample Analysis section of Appendix A.

Boat Procedures

Global position system (GPS) equipment on each data collection boat were used to monitor the data collection boat position at the start and end of each transect and the water sample collection points. At each of the data collection ranges, the assigned boat moved into position using the same GPS starting point

for the respective transect, initialized the ADCP, and slowly traversed the transect. The data at each transect were obtained hourly whenever possible. Along each transect, the boat position, current speed, direction, and depth data were recorded electronically via computer. After traversing the data collection transect, the boat returned to predetermined locations along each transect where the water samples were obtained for later analysis of suspended-sediment concentrations.

River-Bottom Sediment Sampling

Sediments from the river bottom were obtained at each of the OBS sensor data collection platform deployments both for calibration of the OBS sensors and for riverbed sediment material characterization. Samples were obtained by using a push core sampler as described in Appendix A.

Laboratory Analysis of Bottom-Sediment Samples for Sediment Characterization

The individual bottom material samples collected during the data collection periods were analyzed for sediment characterization in the laboratory at WES. The analysis techniques used are described in the Laboratory Equipment and Sample Analysis section of Appendix A.