

In cooperation with the Michigan Department of Environmental Quality

Sediment Characteristics and Configuration within the Otsego City Dam Impoundment on the Kalamazoo River, Michigan, 2001-02



Water-Resources Investigations Report 03-4218

U.S. Department of the Interior
U.S. Geological Survey

Cover photograph. Otsego City Dam on the Kalamazoo River at Otsego, Mich. Photograph by D.L. Hubbell, June 2002.

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By S.J. Rheaume, D.L. Hubbell, C.M. Rachol, A. Simard, and L.M. Fuller

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**U.S. Department of the Interior
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Conversion Factors, Datums, and Abbreviations

Multiply	By	To obtain
Length		
inch (in.)	25.4	millimeter (mm)
foot (ft)	0.3048	meter (m)
mile (mi)	1.609	kilometer (km)
Area		
square foot (ft ²)	0.09290	square meter (m ²)
square mile (mi ²)	2.590	square kilometer (km ²)
Volume		
cubic yard (yd ³)	0.7646	cubic meter (m ³)
Flow rate		
cubic foot per second (ft ³ /s)	0.02832	cubic meter per second (m ³ /s)
Mass/Weight		
milligram (mg)	0.00003527	ounce, avoirdupois (oz)
kilogram (kg)	2.205	pound, avoirdupois (lb)

Vertical coordinate information is referenced to the North American Vertical Datum of 1988 (NAVD 88). Horizontal coordinate information is referenced to the North American Datum of 1983 (NAD 83).

Abbreviated water-quality units used in this report: Chemical concentrations for bed sediment are given in milligrams per kilogram (mg/kg), a unit expressing the concentration of chemical constituents in bed sediment (dry weight) for synthetic organic compounds and trace elements. Numerical values expressed as milligrams per kilogram are the same as concentrations in parts per million (ppm).

ABBREVIATIONS

USEPA	U.S. Environmental Protection Agency
PCBs	Polychlorinated biphenyls
MDNR	Michigan Department of Natural Resources
CDM	Camp, Dresser & McKee
USGS	U.S. Geological Survey
MDEQ	Michigan Department of Environmental Quality
ERD	Environmental Response Division
GPS	Global Positioning System
SC	Sediment Core
RP	Reference Point
TL	Transect Location

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By S.J. Rheume, D.L. Hubbell, C.M. Rachol, A. Simard, and L.M. Fuller

Abstract

The removal of the Otsego City Dam on the Kalamazoo River at Otsego, Mich., is under consideration by the Michigan Department of Environmental Quality and the city of Otsego. The historical discharge of papermill waste containing polychlorinated biphenyls from sources upstream from the dam has led the U.S. Environmental Protection Agency to designate the Kalamazoo River from Morrow Dam near Comstock to its mouth near Saugatuck as a Federal Superfund site. The papermill waste is concentrated in organic sediment and kaolinite clay, with the sediment containing as much as 94 milligrams per kilogram polychlorinated biphenyls. This contaminated sediment could move if the dam is removed; therefore, it is necessary to estimate the characteristics and configuration of the sediment before removal plans begin.

Data from augered sections and sediment cores show that the current Otsego City impoundment sediments were deposited in two distinctly different sedimentary environments: (1) lacustrine sediments consisting of organic-rich silt and clay, fine to medium sand, and some gravel deposited in a repetitive, cyclic fashion related to former stream velocities when the Otsego City impoundment water levels were 2-4 feet higher (1880s-1960s), and from downstream movement of lacustrine sediments during the removal of the upstream Plainwell Dam superstructure in the 1980s; and (2) more recent (1980s-2002) coarse-grained alluvium deposited on top of the lacustrine sediments. The volume of instream sediment contained within the Otsego City impoundment is estimated to be about 457,270 cubic yards. This estimate is based on the composite thicknesses of the lacustrine deposits and overlying alluvium, which were determined to contain PCBs, and does not include bank or flood-plain deposits.

Introduction

From the mid-1800s to the early 1900s, four dams were constructed on the Kalamazoo River between the cities of Plainwell and Allegan, Mich. (fig. 1). The Otsego City Dam

was built in the 1840s in an effort to create a freight business on the Kalamazoo River (Dalrymple, 1972). The original dam was 5 ft high and contained a lock for the passage of barges, canoes, or rafts. In the 1880s, a papermill was built at the dam site and remains in operation to date (2002). Over the years, the dam has been rebuilt and repaired, providing a continuous industrial water supply for the mill.

Beginning in the 1950s, the storage capacities of the four impoundments were reduced by an influx of papermill waste rich in polychlorinated biphenyls (PCBs) from upstream industrial sources (Malcolm Pirnie Engineers, 1958). The primary industrial activity associated with PCB releases to the Kalamazoo River was the recycling of carbonless copy paper containing PCBs as an ink solvent (Camp Dresser & McKee, 1999). Kalamazoo-area papermills that de-inked or re-pulped paper from 1957 to 1971 incorporated the PCB-laden ink solvent in their waste discharge. These paper wastes also included kaolinite clays, which were found in the impoundment sediments to contain concentrations of PCBs as high as 94 mg per kg (Blasland, Bouck, & Lee, 1994). During the 1960s, water levels within three of the four impoundments were lowered, exposing previously inundated contaminated sediments. In response to the lowering of water levels, the river began to erode the sediments and transport them downstream, but much of this waste clay remains impounded behind the Otsego City Dam. If the dam is removed, transport and deposition of the impounded materials could alter the downstream characteristics of the stream channel and increase the PCB exposure potential to stream biota.

The presence of PCBs in the Kalamazoo River has prompted the U.S. Environmental Protection Agency (USEPA) to designate the reach from the city of Kalamazoo to its outlet into Lake Michigan as a Federal Superfund site. The Michigan Department of Environmental Quality-Environmental Response Division (MDEQ-ERD) and the city of Otsego are considering the removal of the Otsego City Dam (Dennis Eagle, MDEQ-ERD, oral commun., 2000). Removal of the structure will return this part of the Kalamazoo River to run-of-the-river flow and improve aquatic habitat in the reach. Removal of the dam can also result in problems such as movement of sediment downstream and migration of invasive species from the Great Lakes to headwater areas. Because

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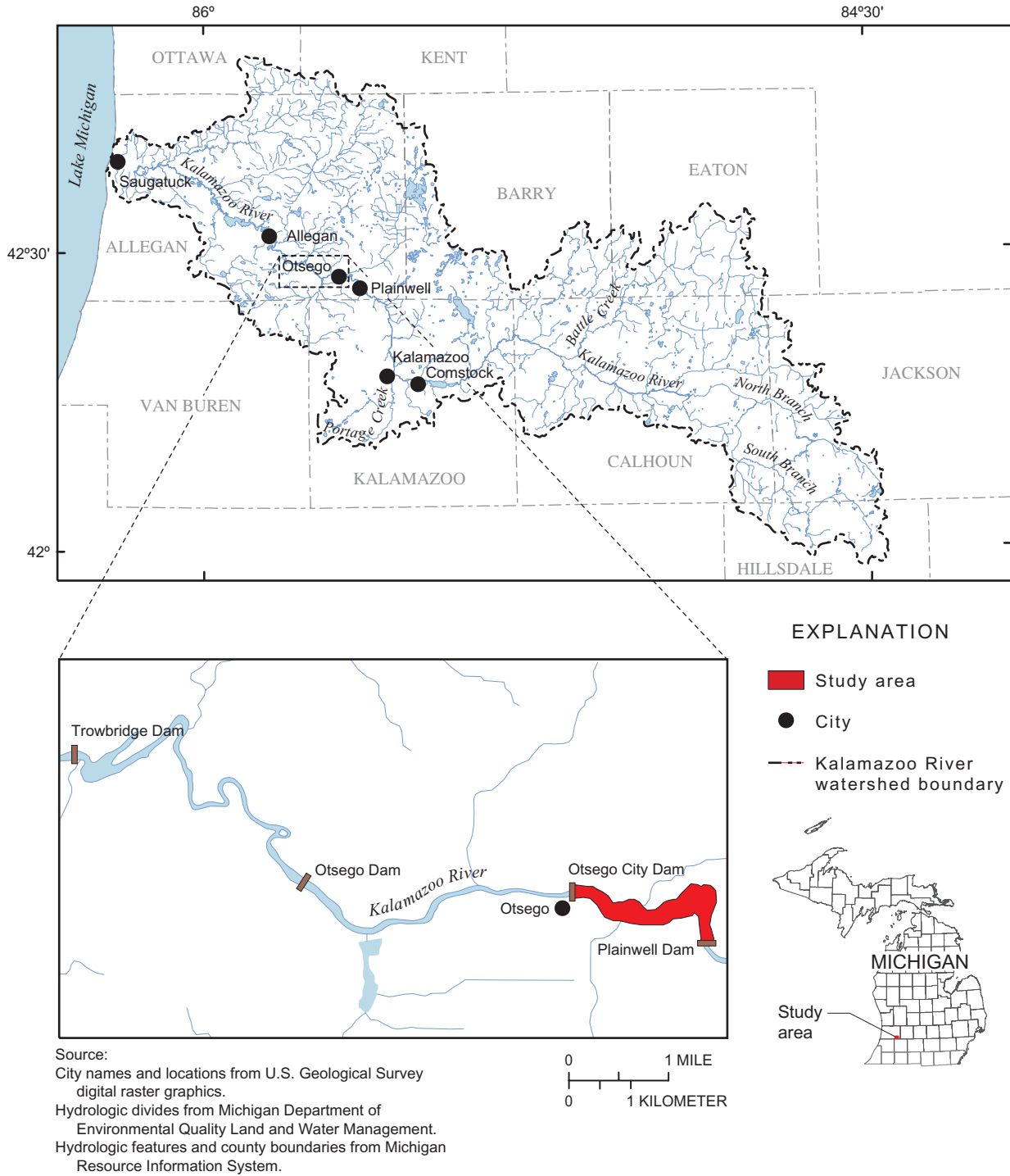


Figure 1. Location of Kalamazoo River watershed and study area in Michigan.

additional impoundments downstream from the project area will remain in place, migration of invasive species should not be a problem; however, movement of contaminated sediments is a concern. The release of these sediments may result in the spread of additional contaminants into the downstream environment (Doyle and others, 2003).

In the summers of 2001-2002, the U.S. Geological Survey (USGS), in cooperation with MDEQ-ERD and USEPA, conducted channel surveys of instream sediments in the Otsego City impoundment on the Kalamazoo River. Rheame and others, 2002, reported on the volume, character, and size distribution of the instream sediments in the surrounding Plainwell, Otsego, and Trowbridge impoundments.

Purpose and Scope

This report (1) describes the results of the USGS and MDEQ-ERD data-collection effort in the Otsego City impoundment, (2) relates this information to the depositional history of sediments behind the dam, and (3) provides an estimate of the volume of instream sediment in the Otsego City impoundment. Maps of sediment distribution and thickness, as well as tables of lithologic descriptions and particle-size analysis results, are provided.

Hydrologic Setting

The city of Otsego lies in the Kalamazoo River Valley in the southwestern part of Michigan (fig. 1). This river valley was a large, glacial meltwater channel, formed in the interlobate zone between the Michigan and Saginaw glacial-ice lobes during the late Pleistocene Epoch (Leverett and Taylor, 1915). As the Michigan Ice Lobe retreated to the west, broken upland ridges consisting of poorly bedded cobble, sand, and gravel, developed (Monaghan and Larson, 1984). These ridges mark the drainageways or channels of a much larger river than present that flowed during this glacial epoch (Deutsch and others, 1960). As ice blocks melted and outlets lowered, the Kalamazoo River was rejuvenated and developed its modern-day size and course (Martin, 1958).

Currently (2002), the main stem of the Kalamazoo River originates in Calhoun County at the confluence of the North and South Branches and flows northwestward for 123 mi to Lake Michigan near the city of Saugatuck. The river has meandering channels and point bars, and flows through a broad, well-defined flood plain. The Kalamazoo River has a drainage area of more than 2,000 mi² with more than 400 mi of tributaries, including Portage Creek, a known source of PCBs (Stratus Consulting, Inc., 2000). A USGS streamflow-gaging station has been operating on the Kalamazoo River at Comstock, Mich., from 1931 to present (2002). The drainage area at Comstock is approximately 1,010 mi². The mean annual flow for the 70-year period of record is 896 ft³/s. A maximum daily mean flow of 6,830 ft³/s was recorded on April 8, 1947, and a minimum daily mean flow of 185 ft³/s was recorded on

August 7, 1934 (Blumer and others, 2001). The Kalamazoo River from Kalamazoo to Plainwell has an average slope of 2.6 ft/mi, whereas the average slope from Plainwell to Allegan is 4.9 ft/mi (Malcolm Pirnie Engineers, 1958). Historically, the river has been impounded for hydroelectrical and other industrial purposes where the gradients are higher (Blasland, Bouck & Lee, Inc., 1994).

Methods of Investigation

This study was conducted to determine the volume, character, and size distribution of sediments in the Otsego City impoundment. The sediment volume estimate is for the instream reach from the Otsego City Dam to the foot of the Plainwell Dam (approximately 1.8 mi upstream) and does not include bank or flood-plain deposits.

Description of Transects

Eighty-five transects were established in the impoundment (fig. 2a). Transect spacing on the main stem of the Kalamazoo River was based on the river width at the Otsego City dam (fig. 2a). Transect G1 was positioned as close to the dam as safety would allow. Transects G2, G3, and G4 were spaced upstream at intervals of one river width apart. Transects G5, G6, and G7 were spaced at intervals of two river widths apart. Transects G8, G9, and G10 were spaced at four river widths apart, providing data into the end of the backwater for the current (2002) impoundment. The distance from the dam to transect G10 is approximately 1.2 mi. The end of this backwater was indicated by increased river velocities, riffles, and debris islands. Transects in all other channels of the Otsego City impoundment (A, B, C, D, E, F, H, I, and J) generally were placed at the beginning, ending, or splitting of channels (fig. 2).

Reference points were established at each transect by driving a steel fence post into the right or left bank, close to the edge of the water. Altitudes of the top of the reference points were surveyed to 0.1 ft using Real Time Kinematic Global Positioning System (RTK GPS) equipment. Altitudes of bank height and water surface were measured from reference points as transects were completed.

A 3/16-in. steel cable tagline, painted at 5-ft intervals, was stretched across the river perpendicular to the channel at each transect. As the transect data were collected, latitude-longitude coordinates were taken at both ends of the tagline and at the left and right banks by use of a hand-held GPS unit. For locations along the main stem of the Kalamazoo River within the impoundment (G1-G10), the transect width between the banks was divided into 15 equal sections for measurements of water depth, water velocity, and sediment thickness (appendix 1). In all other river channels (A, B, C, D, E, F, H, I, and J), spacing of data points across transect lines generally was set at 10-ft intervals. The coordinates for individual data points were interpolated from the bank coordinates.

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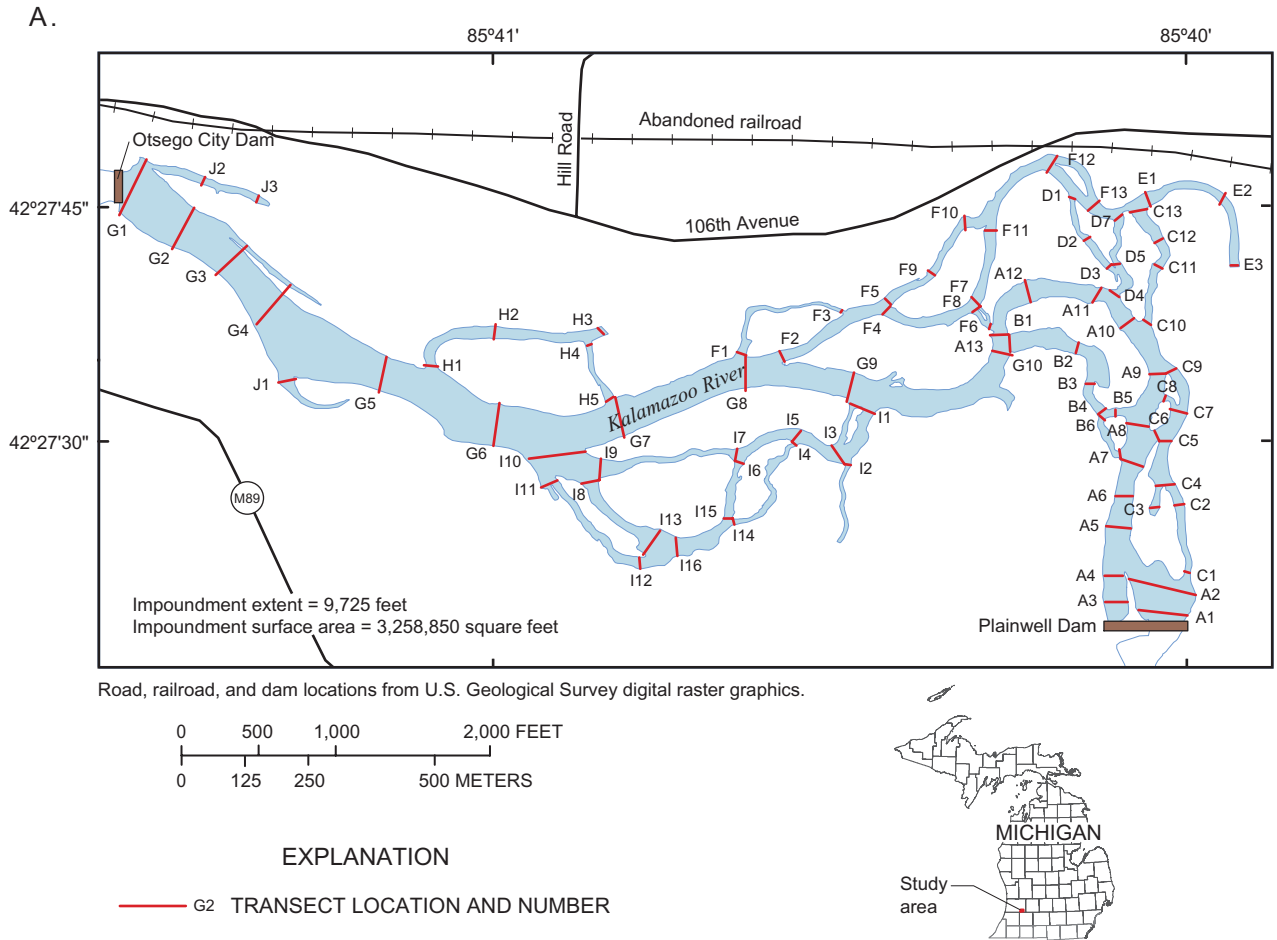


Figure 2a. Location of transects in the Otsego City impoundment on the Kalamazoo River, Mich.

Collection of Data Points and Sediment Cores

Data points (water depth, water velocity, and sediment thickness) were collected across each transect in the impoundment. Water depths and water velocities were measured by standard USGS methods (Rantz and others, 1982) using a boat-cable measuring device equipped with an A-reel, a 15- or 30-lb weight, and a Price AA standard current meter.

Hand augering along transect lines was performed in order to determine sediment thickness. Thickness of the impoundment sediment was obtained by boring with a 1-ft-long by 1½-in.-diameter auger bit with 4-ft extension pipes. The depth of the impoundment sediment that overlay the pre-dam alluvium (altitude prior to dam construction) was indicated when the auger could no longer be advanced. This contact between the pre-dam outwash and the post-dam sediments was distinct, and could be determined easily by a grinding that could be heard and felt when the auger bit contacted the underlying coarser material of cobbles and stones.

Core samples were collected at one point along selected transects, generally where impoundment sediments were thickest (fig. 2b). Cores were collected at depths where lithology changed by use of a stainless steel 2-in.-diameter sediment bore. Changes in sediment texture and color were observed in the field. A total of 164 samples from 76 core locations were collected and sieved at the Michigan State University Department of Geography Geomorphology Laboratory by use of U.S. Standard Sieves.

Estimation of Sediment Volume

In order to estimate the volume of the instream sediments, a series of grids was generated by use of a geographic information system (GIS). Grid surfaces for water depth and post-dam sediment were interpolated on the basis of auger-point data by use of TOPOGRID in Arc/Info 8.2. Contours were generated from the interpolated grid surfaces. The contours were modified, redrawn manually on the basis of

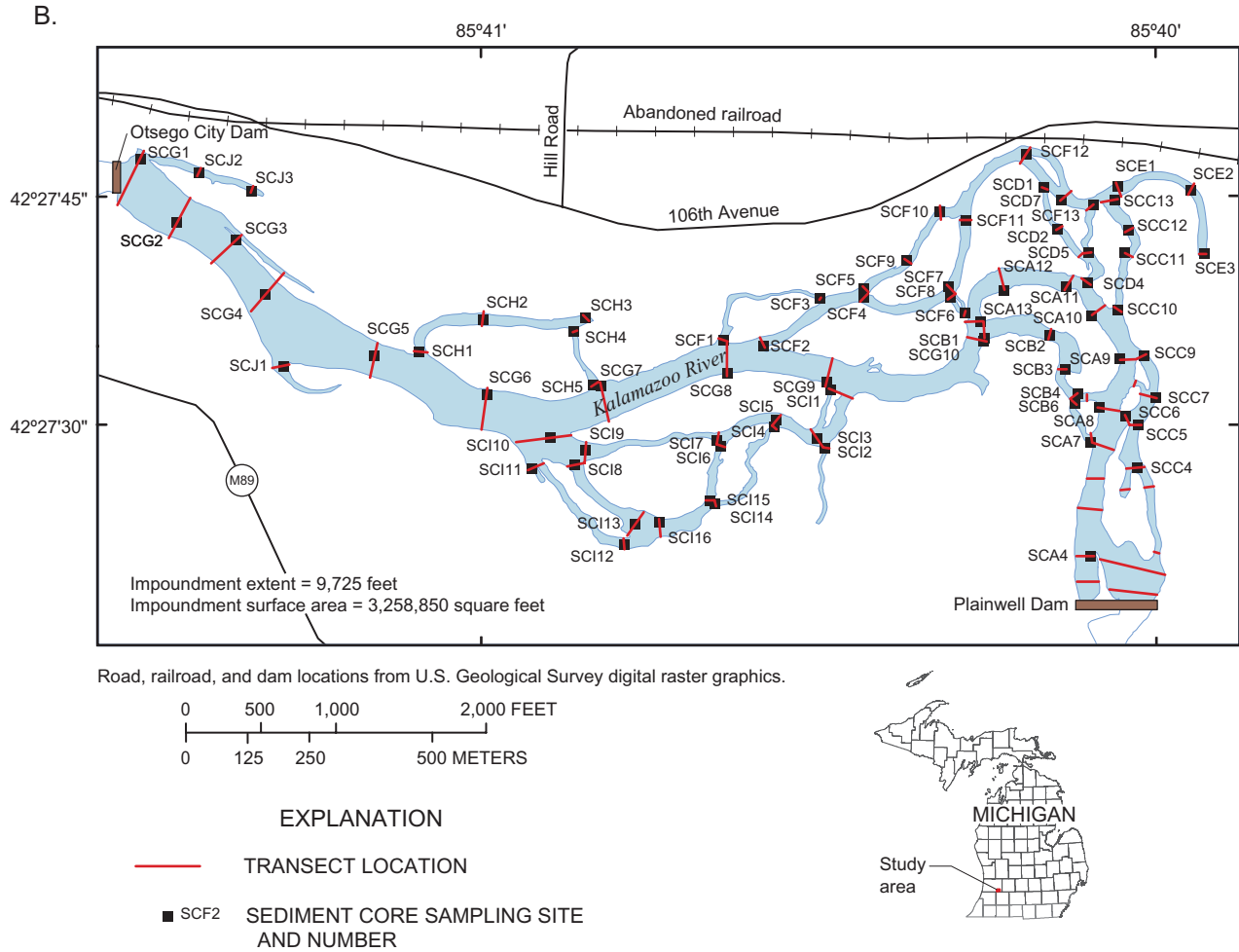


Figure 2b. Location of sediment core sample sites in the Otsego City impoundment on the Kalamazoo River, Mich.

field observations, and used to create the final grid surfaces for water depth and post-dam sediment. The water-depth and post-dam-sediment grids were used to generate a thickness grid. The thickness of post-dam sediment was computed by means of the equation

$$T = D_s - D_w, \quad (1)$$

where

T is the thickness (in feet),
 D_s is the interpolated depth of post-dam sediment (in feet),

and

D_w is the interpolated depth of water (in feet).

The total estimated volume (V_{total}) of the instream impoundment sediment (in cubic yards) was computed by means of the equation

$$V_{total} = \frac{[\Sigma(A \cdot T)]}{27}, \quad (2)$$

where

A is the area of the grid cell (in square feet).

Areas between transects were digitized, and the number of square feet within each area was computed. These measured areas were used in conjunction with average sediment thickness per digitized area to compute volume of sediments between transects.

The accuracy of the grids was determined by comparing the computed value for each grid to the value at each auger-

point. This comparison allowed for a root mean squared error (RMSE) by

$$RMSE = \sqrt{\frac{\sum(x_{auger} - x_{grid})^2}{n}}, \quad (3)$$

where

x_{auger} is the value of the auger-point,

and

x_{grid} is the value of the grid interpolation.

The RMSE provides an error estimate for the grid cells corresponding to the auger-points, which were used as the control, and is a measurement of how well the interpolated surface fits the observed auger-point data. In the absence of additional data, these points are believed to be representative of the grid as a whole. As outlined in the “National Standard for Spatial Data Accuracy,” the RMSE can be used to determine the accuracy using the equation for data with normally distributed error (Federal Geographic Data Committee, 1998).

$$Accuracy = 1.96 \times RMSE. \quad (4)$$

A summary of the maximum residuals, RMSE, and accuracy are listed in table 1.

Table 1. Summary of errors for grids used in sediment-volume estimate based on 2001-02 survey, Otsego City impoundment, Otsego, Mich.

Grid	Maximum residual	Root Mean Squared Error	Accuracy
Bathymetry	2.4	0.82	1.61
Sediment depth	4.3	.76	1.49
Sediment thickness	7.2	1.09	2.14

Sediment Characteristics within the Otsego City Impoundment

Stratigraphic relations among the sediments within and flanking the channel vary as a function of distance upstream from the dam. The area inundated by the impoundment during the different time periods is reflected by the sediment stratigraphy and can be divided into an upper zone and a lower zone.

The upper zone contains the reach flooded by the dam when it was fully operational at design-pool levels (2-4 ft higher than present). Backwater from the impoundment

extended 1.6 mi upstream from the Otsego City Dam or 0.2 mi below the Plainwell Dam (fig. 2). As water levels behind the Otsego City Dam were lowered (late 1960s), previously inundated backwater sediment was exposed. In the upstream reach of the historical impoundment, lacustrine deposits remain in the floodplain but have been eroded completely in the present-day river channel. At these locations, increased slopes and river velocities have exposed very coarse pre-dam alluvium, which in some places has been overlain by recent (1980s-2002) sand and gravel.

The lower zone is the 1.2-mi extent of backwater created by the present-day dam (approximately from the dam to transect G10; fig. 2). Three stratigraphic units can be identified in the lower zone. These units are (1) outwash and alluvial cobble, gravel, and sand deposited before dam construction, (2) interbedded lacustrine clay, silt, and sand deposited and redeposited when water levels were 2-4 ft higher in the impoundment, and (3) sand and gravel deposited after water levels in the impoundment were lowered.

Lithologic descriptions of the cores are given in appendix 2. Particle-size distributions for the samples are presented in appendix 3. A summary of the sediment thicknesses at core locations through the main stem of the river within the study reach is given in table 2.

Pre-dam Outwash and Alluvium

As glacial ice retreated from the study area 10,000 to 15,000 years ago, meltwaters flowed westward through continually lowering outlets (Martin, 1958). The glacial Kalamazoo River was much larger than the present river, eroding large volumes of sediment as it cut through outwash and lake plains to form the Kalamazoo River Valley. After the end of the Pleistocene epoch, the volume of water discharged through the Kalamazoo River diminished greatly, leaving the river to occupy only a small part of its outwash and alluvium-filled ancestral river valley (Deutsch and others, 1960). For thousands of years, the Kalamazoo River meandered across the Kalamazoo River Valley, reworking the pre-dam outwash and alluvium. This pre-dam material is identified easily and consists of cobbles, coarse gravel, and lesser amounts of medium to coarse sand.

Lacustrine Deposits

For approximately 80 years, the Otsego City Dam impounded water at levels 2-4 ft higher than present impoundment levels (fig. 3a). Lacustrine material deposited in the impoundment consisted of interbedded, organic-rich silt and clay, fine to medium sand, and some gravel deposited cyclically in response to changes in river velocities during high and low flows. Previous work has shown that elevated PCB concentrations are contained in the lacustrine deposits (Weston, Inc., 2002).

Table 2. Bed-thickness and altitude measurements of core samples from the main stem of the Kalamazoo River in the Otsego City impoundment, Mich., based on 2001-02 survey

[Altitude in feet above NAVD88; ft, feet; transect locations shown in figure 2]

Sediment core No.	Altitude of stream bottom (ft)	Altitude of base of post-dam sediment (ft)	Thickness of recent, post-drawdown alluvium (ft)	Thickness of the dam lacustrine sediments (ft)	Total thickness of impoundment sediment (ft)
Otsego City impoundment					
SC-G1	694.3	686.8	0.5	7.0	7.5
SC-G2	692.3	684.8	.5	7.0	7.5
SC-G3	693.8	687.8	1.0	5.0	6.0
SC-G4	692.8	687.8	.5	4.5	5.0
SC-G5	693.0	687.0	1.0	5.0	6.0
SC-G6	694.7	691.2	1.0	2.5	3.5
SC-G7	694.7	691.2	1.0	2.5	3.5
SC-G8	696.7	688.7	2.5	5.5	8.0
SC-G9	694.8	686.8	1.0	7.0	8.0
SC-G10	697.1	689.6	.0	7.5	7.5
SC-A13	696.4	689.4	3.0	4.0	7.0
SC-A12	696.5	690.1	.0	6.4	6.4
SC-A11	695.0	691.0	1.0	3.0	4.0
SC-A10	697.4	695.4	.0	2.0	2.0
SC-A9	696.0	695.5	.0	.5	.5
SC-A8	696.8	696.2	.6	.0	.6
SC-A7	697.3	694.8	.0	2.5	2.5
SC-A6	694.6	694.6	.0	.0	.0
SC-A5	695.4	695.4	.0	.0	.0
SC-A2	698.0	698.0	.0	.0	.0
SC-A1	695.0	695.0	.0	.0	.0

Judging from streambank elevations, the thickness of the lacustrine material was as much as 10.5 ft thick in the Otsego City impoundment by the mid-1960s. In the late 1960s, water levels were lowered in the Otsego City impoundment (fig. 3b), causing some of the previously deposited lacustrine sediments to be eroded and transported downstream. Demolition of the upstream Plainwell dam superstructure (Camp Dresser & McKee, 1999) in the mid-1980s resulted in appreciable channel erosion of lacustrine sediments in the Plainwell impoundment (Rheume and others, 2002). The mobilized sediments subsequently were redeposited in channels of the Otsego City impoundment. This aggradation resulted in the river becoming more braided as the main channels were filled and new channels that were lower in elevation were cut (fig. 3c).

Auger-point data and sediment cores collected in 2001-02 showed that the thickness of the lacustrine deposits in the main stem of the present Kalamazoo River (fig. 3d) ranges from 0 to 7.5 ft in the Otsego City impoundment (table 2); however, thicknesses as great as 11.2 ft were observed in the side channels of the impoundment (appendix 1).

Post-drawdown Alluvium

From an examination of sediment cores, the most likely period of channel stabilization was the 1980s. After the channels stabilized, sand and gravel began to aggrade within the impoundment from upstream sources. These recent coarse-grained alluvial deposits lie directly over the lacustrine deposits and, for the most part, consist of sands and gravel with lower PCB concentrations than those in the lacustrine sediments. Sediment samples of these deposits collected by the USEPA in 2001 contained PCB concentrations less than 30 ppm (Weston, Inc., 2002). These post-drawdown alluvium deposits are not PCB free because PCBs continued to be released into the channel from erosion of flood-plain deposits, slumping streambanks, and upstream channel-bed scour (Camp Dresser & McKee, 1999). Auger-point data and sediment cores collected in 2001-2002 showed that the thickness of the post-drawdown alluvium ranges from 0 to 3.0 ft in the main channel of the Otsego City impoundment (table 2).

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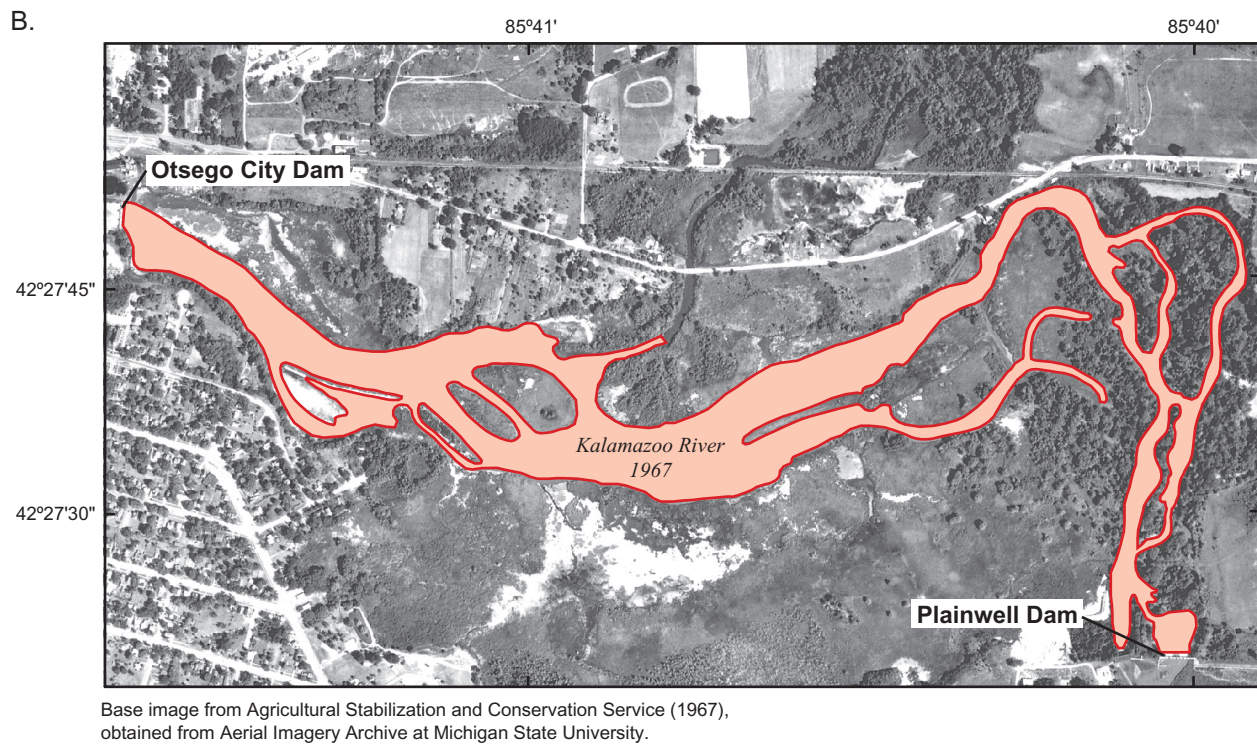
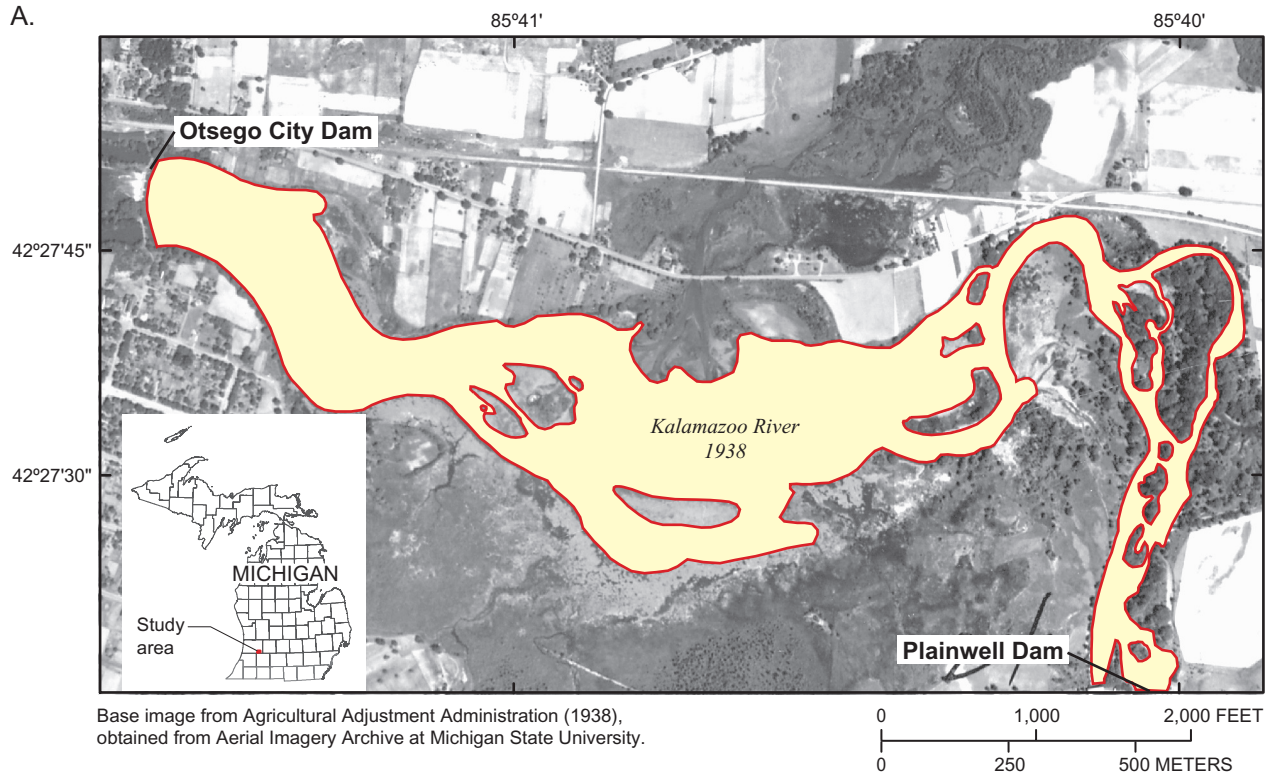


Figure 3. Area inundated (color shading) by the Otsego City Dam in (A) 1938, and (B) 1967 on the Kalamazoo River, Mich.

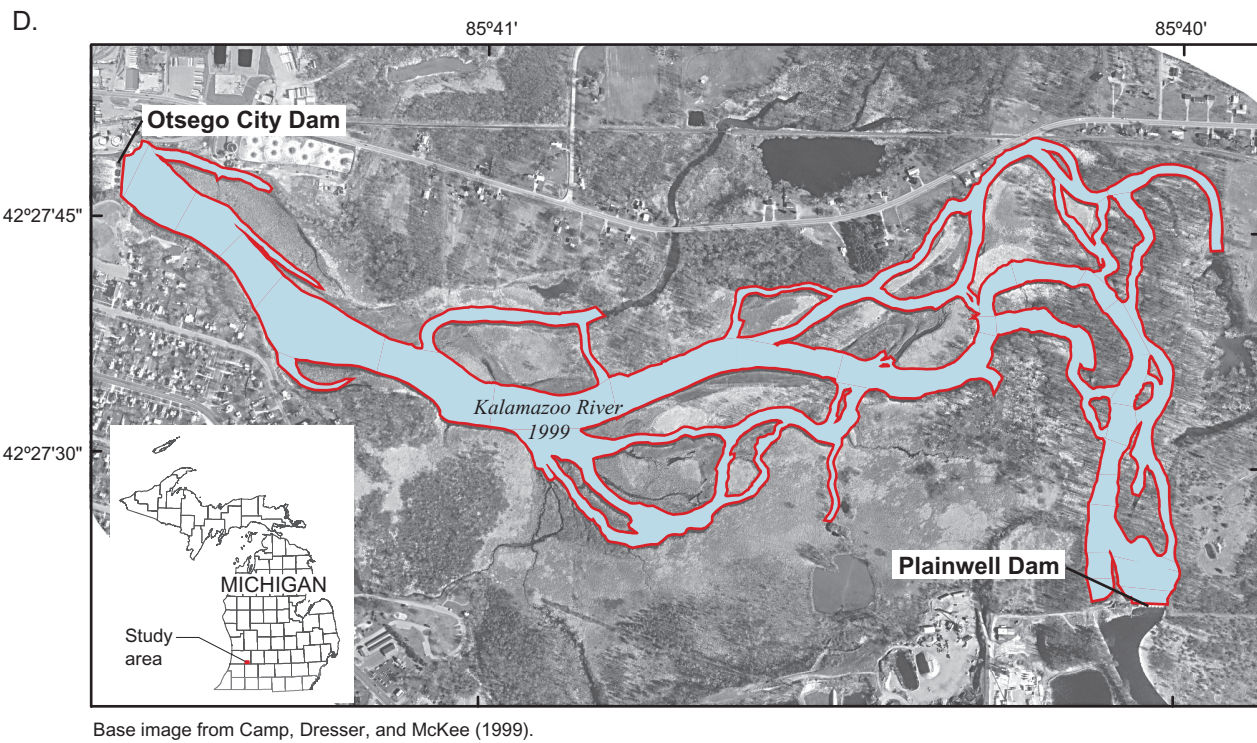
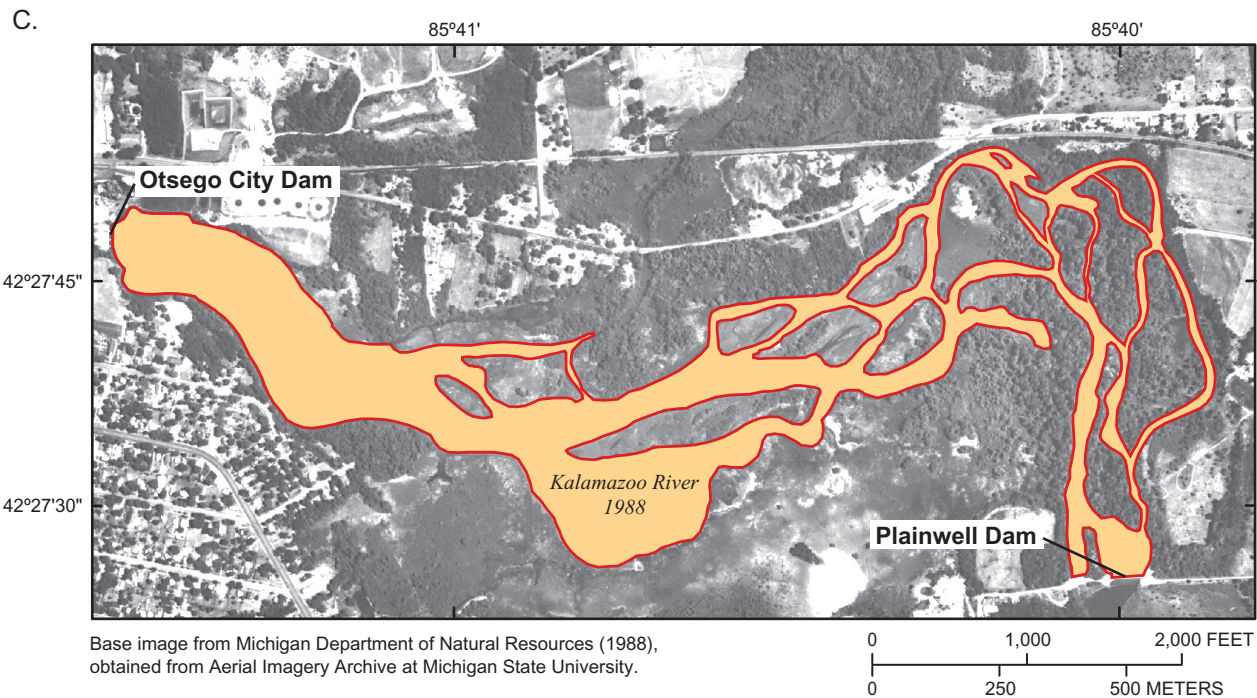


Figure 3. Area inundated (color shading) by the Otsego City Dam in (C) 1988, and (D) 1999 on the Kalamazoo River, Mich.

Sediment Configuration within the Otsego City Impoundment

Impoundment Bathymetry

Altitude of the water surface, present-day streambed, and base of the impoundment sediment was determined at each data point along transect lines. Altitudes for each layer were established by level and rod survey (appendix 1). Water depths in the impoundment during low flows ranged from 0 to 10 ft, with average depths being less than 7.5 ft (fig. 4).

Sediment Thickness and Volume in the Impoundment

As inferred from sediment-thickness data gathered near the dam, the streambed bottom of the pre-dam river was at altitudes 7-10 ft lower than the bottom of the present-day impoundment (fig. 5). Particle-size analysis of core samples collected in the impoundment indicate that the pre-dam river consisted of a cobble-gravel bottom and stable cobble-lined banks.

When water levels were lowered in the Otsego City impoundment during the mid-1960s, dam lacustrine sediments were eroded, transported, and redeposited. Subsequent

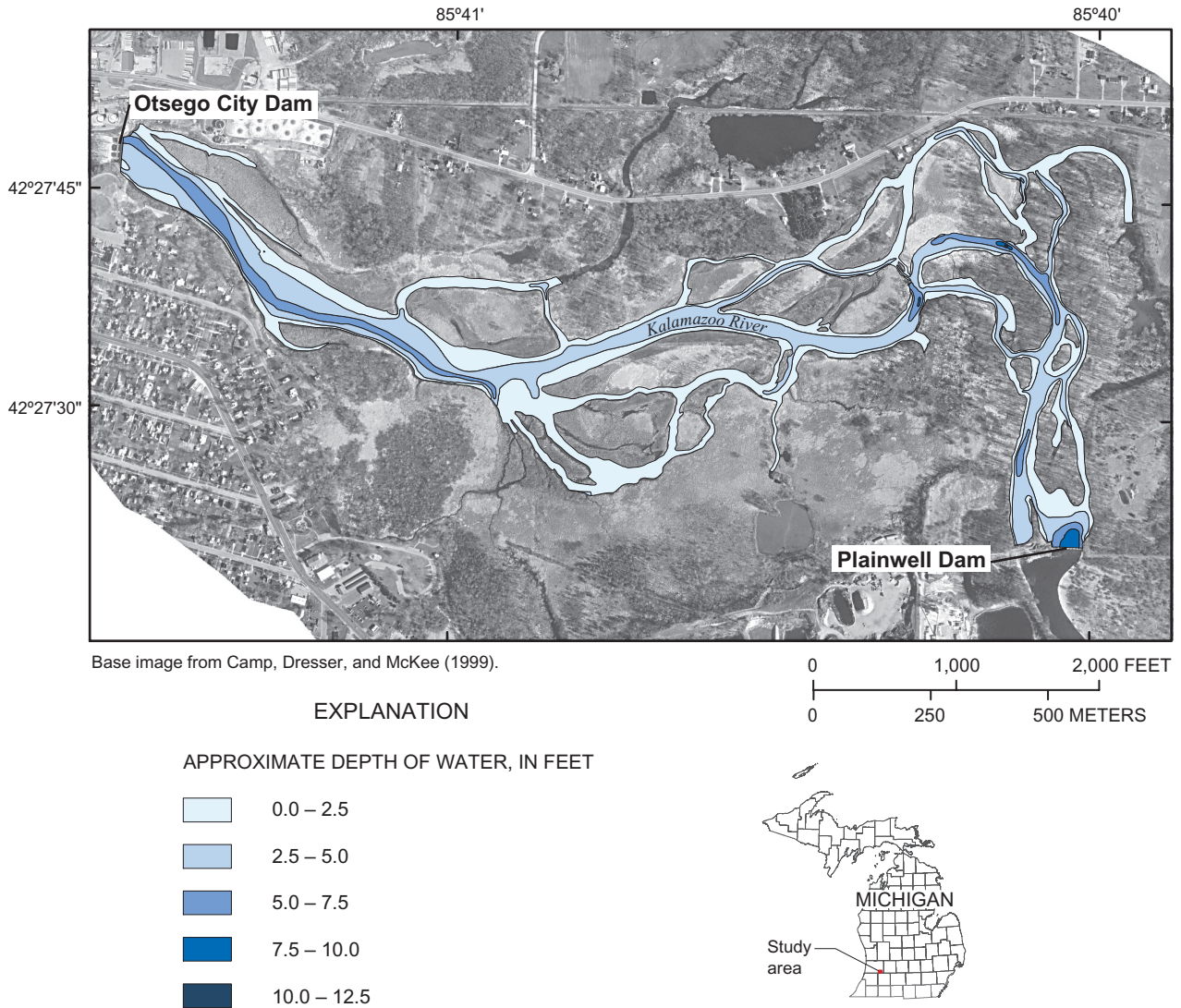


Figure 4. Bathymetry of the Otsego City impoundment on the Kalamazoo River, Mich.

demolition of the upstream Plainwell Dam in the mid-1980s resulted in the movement of lacustrine sediments in the Plainwell impoundment. As these sediments moved downstream, they filled in channels in the Otsego City impoundment. New channels were formed, and increased river velocities began to transport and deposit coarser grained sands and gravel from upstream.

Westjohn (1997) showed that both the coarse-grained alluvium and fine-grained lacustrine deposits in a river channel are capable of being transported downstream if a dam is removed. For this reason, the post-drawdown alluvium and dam lacustrine deposits are considered as one unit in the Otsego City

impoundment and are reported together in the volume estimate as total cubic yards of instream sediment (fig. 6, table 3).

The estimated total volume of instream sediment in the Otsego City impoundment is 457,270 yd³. Sediment thickness ranges from 0 to 11.2 ft, and the average thickness is 3.7 ft over the 3,291,470-ft² impoundment (appendix 1). Approximately 56 percent (258,000 yd³) of the total 457,270 yd³ of sediment in the impoundment is in the main-stem channel between the Otsego City Dam and Plainwell Dam (transects G1-G10, A13-A5, A2-A1); and 44 percent is in the side channels (B, C, D, E, F, H, J, & I). Of the 258,000 yd³ in the main channel, 93 percent is located in the lower half of the main channel between the dam and transect G10 (figs. 2A and 6).

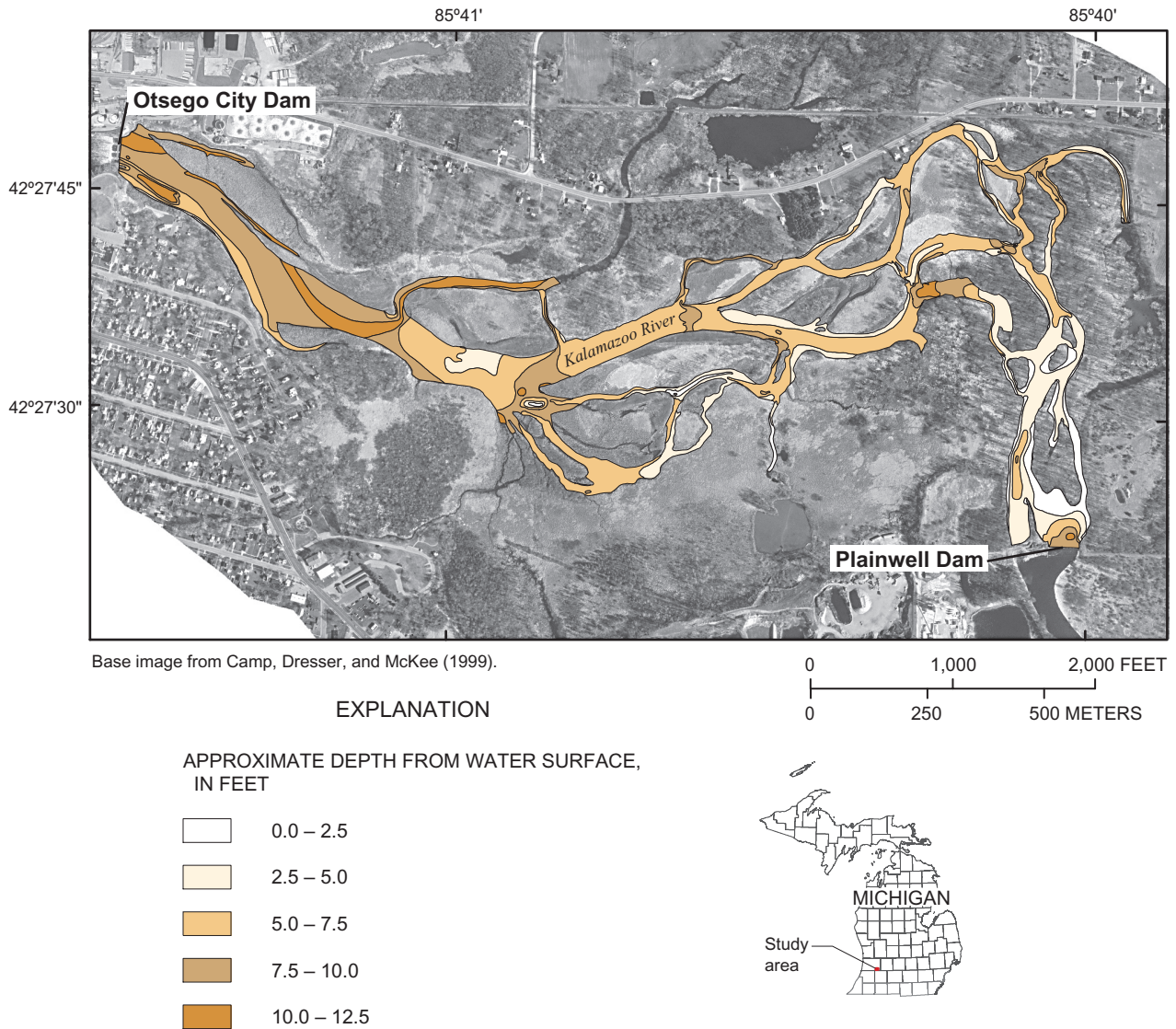


Figure 5. Depth to pre-dam alluvium in the Otsego City impoundment on the Kalamazoo River, Mich.

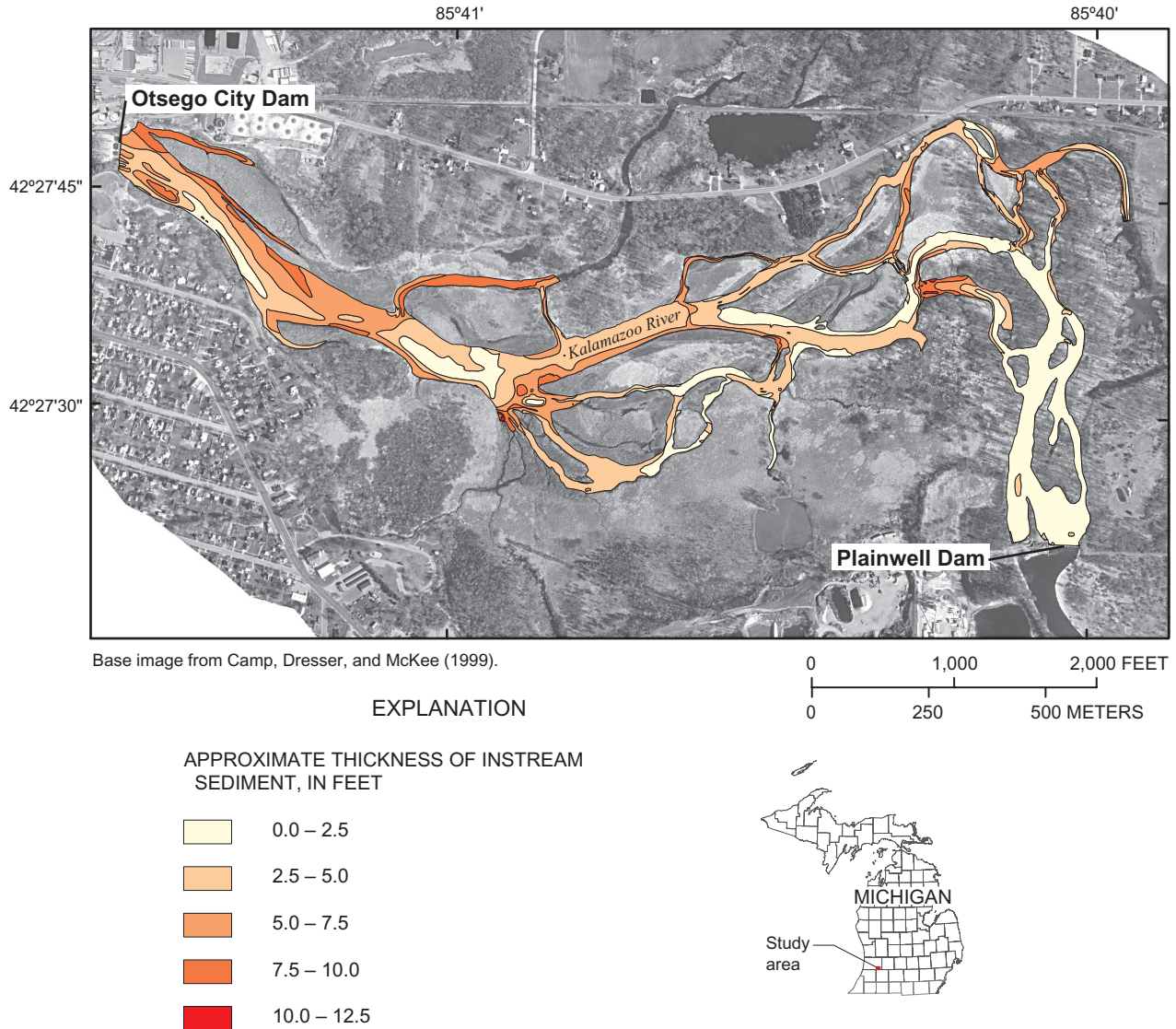


Figure 6. Combined thickness of post-dam lacustrine deposits in the Otsego City impoundment on the Kalamazoo River, Mich.

Summary

The Michigan Department of Environmental Quality (MDEQ) and the city of Otsego, Mich. are considering the removal of the Otsego City Dam. Removal of the structure will return part of the Kalamazoo River to run-of-river flow and improve aquatic habitat in affected river sections. However, because of PCB contamination in the sediment, the U.S. Environmental Protection Agency (USEPA) has designated the Kalamazoo River from the city of Kalamazoo to its outlet into Lake Michigan as a Federal Superfund site. Removal of the dam may result in a mobilization of contaminated sediment with adverse consequences on the downstream environment.

The U.S. Geological Survey (USGS), in cooperation with MDEQ and USEPA, studied the volume, character,

and size distribution of instream sediments in the Otsego City impoundment on the Kalamazoo River in 2001-2002. Water depth and sediment thicknesses were measured along 85 transects. Sediment cores were collected at 76 sites in the impoundment. Sediment-depth profiles and particle-size analysis of core samples formed the principal basis for an interpretation of the depositional history and lithology in the Otsego City impoundment. The following are major findings and conclusions of the study:

- The pre-dam streambed has been well defined upstream from the Otsego City Dam. The pre-dam streambed easily is identifiable and is composed of very coarse outwash and alluvium material: cobbles, coarse gravel, and lesser amounts of medium to coarse sand. All of the sediment-depth measurements for this study terminated in this coarse pre-dam outwash and alluvium.

Table 3. Volume of sediment in the Otsego City impoundment at Otsego, Mich.[ft, foot; ft², square feet; yd³, cubic yards; transect locations shown in figure 2]

Location of area	Surficial area (ft ²)	Average thickness of sediment in digitized area (ft)	Volume of sediment in digitized area (yd ³)
Otsego City Dam to transect G1	20,400	5.7	4,270
Transect G1 to transect G2	132,710	5.5	26,790
Transect G2 to transect G3	99,730	4.6	17,010
Transect G3 to transect G4	96,350	4.6	16,390
Transect G4 to transect G5	278,290	5.7	58,340
Transect G5 to transect G6	207,020	4.2	32,040
Transect G6 to transect G7	188,070	3.8	26,480
Transect G7 to transect G8	168,690	4.1	25,680
Transect G8 to transect G9	106,720	3.3	13,040
Transect G9 to transect G10	182,350	2.7	18,250
Transect G10 to transect A13	12,610	4.0	1,850
Transect A13 to transect A12	37,960	2.8	3,950
Transect A12 to transect A11	47,430	2.0	3,560
Transect A11 to transect A10	25,960	1.2	1,200
Transect A10 to transect A9	36,220	.4	590
Transect A9 to transect A8	43,250	.3	530
Transect A8 to transect A7	39,190	.2	220
Transect A7 to transect A6	24,980	.3	310
Transect A6 to transect A5	27,390	.9	860
Transect A5 to transect A2	97,690	1.0	3,590
Transect A4 to Plainwell Dam	41,050	.8	1,260
Transect A2 to transect A1	60,300	.8	1,740
Transect A1 to Plainwell Dam	21,740	1.6	1,310
Transect B1 to B7	118,570	4.0	17,690
Transect C1 to C13	176,510	1.8	11,680
Transect D1 to D7	50,610	4.1	7,740
Transect E1 to E3	61,510	4.1	9,370
Transect F1 to F13	301,180	4.3	47,650
Transect H1 to H5	96,640	7.5	26,680
Transect I1 to I10	435,650	3.9	62,990
Transect J1 to J3	54,700	7.0	14,210
Otsego City impoundment (total)	3,291,470		457,270

- Two types of deposits are present: (1) lacustrine deposits that accumulated after the dam was constructed and (2) recent (1980s to present) alluvial deposits that accumulated on the lacustrine deposits after the impoundment levels were lowered.

- Lacustrine deposits consist of interbedded, organic-rich silt and clay, fine to medium sand, and some gravel. Auger-point data and sediment cores within the main channel show that the thickness of the current (2002)

lacustrine deposits ranges from 0 to 7.5 ft in the Otsego City impoundment.

- Post-drawdown alluvium deposits are medium to coarse sand and gravel with traces of silt and clay. This coarse-grained surface is related to increases in gradient and velocity, which took place after water levels were lowered at the Otsego City Dam in the 1980s. These alluvium deposits lie directly on remaining instream lacustrine deposits. Thickness of the post-

drawdown alluvium ranges from 0 to 3.0 ft in the main channel of the Otsego City impoundment.

- The combined volumes of post-dam lacustrine deposits and post-drawdown alluvium are estimated to be 457,270 yd³. Total sediment thickness ranges from 0 to 11.2 ft, and average thickness is 3.7 ft over an area of 3,291,470 ft². Approximately 56 percent (258,000 yd³) of the total 457,270 yd³ of sediments in the impoundment is within the main-stem channel between the Otsego City Dam and Plainwell Dam; 44 percent is within the side channels. Of the 258,000 yd³ in the main channel, 93 percent of that is located in the lower half of the main channel.

Acknowledgments

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Appendix 1

Date, location, water velocity, altitude of surfaces, and total thickness of sediment at transect data points in the Otsego City impoundment on the Kalamazoo River at Otsego, Mich.

16 Sediment Characteristics and Configuration within Otsego City Dam on Kalamazoo River, Michigan, 2001-02

Appendix 1. Date, location, water velocity, altitude of surfaces, and total thickness of sediment at transect data points in the Otsego City impoundment on the Kalamazoo River at Otsego, Mich.

[Vertical data referenced to the North American Vertical Datum of 1988 (NAVD 88). Water surface normalized to a stage of 2.0 ft. Abbreviations: °, degrees; ', minutes; ", seconds; ft, feet; mi, miles; ft/s, feet per second; --, no data. Sediment cores denoted in bold.]

Transect No. (fig. 2a)	Date	Latitude	Longitude	Distance from right edge of water (ft)	River miles from mouth (mi)	Mean velocity (ft/s)	Altitude of water surface (ft)	Altitude of stream-bed (ft)	Altitude of base sediment (ft)	Total thickness of sediment (ft)
A1	06-13-01	42° 27' 21.94"	085° 40' 00.94"	0	54.84	--	700.9	698.4	698.4	0.0
A1	06-13-01	42° 27' 21.97"	085° 40' 01.29"	26	54.84	--	700.9	695.0	695.0	.0
A1	06-13-01	42° 27' 21.99"	085° 40' 01.59"	50	54.84	--	700.9	691.0	690.0	1.0
A1	06-13-01	42° 27' 22.01"	085° 40' 01.86"	70	54.84	--	700.9	691.5	690.5	1.0
A1	06-13-01	42° 27' 22.03"	085° 40' 02.17"	93	54.84	--	700.9	691.5	690.5	1.0
A1	06-13-01	42° 27' 22.04"	085° 40' 02.50"	118	54.84	--	700.9	692.5	691.5	1.0
A1	06-13-01	42° 27' 22.07"	085° 40' 02.80"	140	54.84	--	700.9	693.5	692.5	1.0
A1	06-13-01	42° 27' 22.09"	085° 40' 03.14"	166	54.84	--	700.9	695.0	694.0	1.0
A1	06-13-01	42° 27' 22.12"	085° 40' 03.48"	191	54.84	--	700.9	695.0	694.0	1.0
A1	06-13-01	42° 27' 22.13"	085° 40' 03.80"	216	54.84	--	700.9	696.0	694.0	2.0
A1	06-13-01	42° 27' 22.15"	085° 40' 04.15"	242	54.84	--	700.9	698.0	696.0	2.0
A1	06-13-01	42° 27' 22.18"	085° 40' 04.39"	260	54.84	--	700.9	699.0	696.0	3.0
A1	06-13-01	42° 27' 22.19"	085° 40' 04.61"	277	54.84	--	700.9	699.5	698.5	1.0
A1	06-13-01	42° 27' 22.20"	085° 40' 04.85"	295	54.84	--	700.9	700.0	698.5	1.5
A2	06-13-01	42° 27' 23.22"	085° 40' 00.22"	0	54.80	--	700.9	700.2	700.2	.0
A2	06-13-01	42° 27' 23.29"	085° 40' 00.65"	33	54.80	--	700.9	698.0	698.0	.0
A2	06-13-01	42° 27' 23.36"	085° 40' 01.02"	62	54.80	--	700.9	697.5	697.5	.0
A2	06-13-01	42° 27' 23.41"	085° 40' 01.37"	89	54.80	--	700.9	698.0	697.0	1.0
A2	06-13-01	42° 27' 23.48"	085° 40' 01.80"	122	54.80	--	700.9	698.0	698.0	.0
A2	06-13-01	42° 27' 23.55"	085° 40' 02.17"	151	54.80	--	700.9	699.0	698.5	.5
A2	06-13-01	42° 27' 23.61"	085° 40' 02.55"	180	54.80	--	700.9	700.0	699.5	.5
A2	06-13-01	42° 27' 23.68"	085° 40' 02.99"	214	54.80	--	700.9	699.5	699.2	.3
A2	06-13-01	42° 27' 23.75"	085° 40' 03.40"	246	54.80	--	700.9	700.0	700.0	.0
A2	06-13-01	42° 27' 23.81"	085° 40' 03.81"	276	54.80	--	700.9	700.2	700.2	.0
A2	06-13-01	42° 27' 23.94"	085° 40' 04.54"	333	54.80	--	700.9	700.0	699.7	.3
A2	06-13-01	42° 27' 24.00"	085° 40' 04.88"	359	54.80	--	700.9	699.0	699.0	.0
A2	06-13-01	42° 27' 24.08"	085° 40' 05.28"	390	54.80	--	700.9	699.5	699.5	.0
A2	06-13-01	42° 27' 24.12"	085° 40' 05.65"	419	54.80	--	700.9	697.5	697.5	.0
A3	05-22-01	42° 27' 22.70"	085° 40' 05.88"	0	54.83	0.00	700.9	699.4	698.1	1.3
A3	05-22-01	42° 27' 22.69"	085° 40' 06.08"	15	54.83	.00	700.9	698.4	697.5	.9
A3	05-22-01	42° 27' 22.69"	085° 40' 06.29"	30	54.83	.00	700.9	697.9	697.7	.2
A3	05-22-01	42° 27' 22.69"	085° 40' 06.48"	45	54.83	.00	700.9	698.0	697.7	.3
A3	05-22-01	42° 27' 22.69"	085° 40' 06.68"	60	54.83	.00	700.9	697.7	697.6	.1
A3	05-22-01	42° 27' 22.68"	085° 40' 06.88"	75	54.83	.00	700.9	697.4	697.4	.0

Appendix 1. Date, location, water velocity, altitude of surfaces, and total thickness of sediment at transect data points in the Otsego City impoundment on the Kalamazoo River at Otsego, Mich.--Continued

[Vertical data referenced to the North American Vertical Datum of 1988 (NAVD 88). Water surface normalized to a stage of 2.0 ft. Abbreviations: °, degrees; ', minutes; ", seconds; ft, feet; mi, miles; ft/s, feet per second; --, no data. Sediment cores denoted in bold.]

Transect No. (fig. 2a)	Date	Latitude	Longitude	Distance from right edge of water (ft)	River miles from mouth (mi)	Mean velocity (ft/s)	Altitude of water surface (ft)	Altitude of stream-bed (ft)	Altitude of base sediment (ft)	Total thickness of sediment (ft)
A3	05-22-01	42° 27' 22.68"	085° 40' 07.09"	90	54.83	0.00	700.9	696.6	696.5	0.1
A3	05-22-01	42° 27' 22.68"	085° 40' 07.29"	105	54.83	.00	700.9	696.8	696.6	.2
A3	05-22-01	42° 27' 22.67"	085° 40' 07.49"	120	54.83	.00	700.9	697.3	696.7	.6
A3	05-22-01	42° 27' 22.67"	085° 40' 07.75"	140	54.83	.00	700.9	699.1	698.6	.5
A4	05-22-01	42° 27' 24.32"	085° 40' 06.23"	0	54.78	.00	700.9	698.9	698.9	.0
A4	05-22-01	42° 27' 24.32"	085° 40' 06.31"	10	54.78	.00	700.9	698.7	698.3	.4
A4	05-22-01	42° 27' 24.32"	085° 40' 06.45"	20	54.78	.00	700.9	698.4	697.5	.9
A4	05-22-01	42° 27' 24.32"	085° 40' 06.58"	30	54.78	.00	700.9	698.1	697.2	.9
A4	05-22-01	42° 27' 24.32"	085° 40' 06.71"	40	54.78	.00	700.9	698.0	697.1	.9
A4	05-22-01	42° 27' 24.32"	085° 40' 06.85"	50	54.78	.00	700.9	698.0	697.1	.9
A4	05-22-01	42° 27' 24.32"	085° 40' 06.98"	60	54.78	.00	700.9	697.9	696.7	1.2
A4	05-22-01	42° 27' 24.31"	085° 40' 07.11"	70	54.78	.00	700.9	697.7	696.4	1.3
A4	05-22-01	42° 27' 24.31"	085° 40' 07.25"	80	54.78	.00	700.9	696.9	696.4	.5
A4	05-22-01	42° 27' 24.31"	085° 40' 07.38"	90	54.78	.00	700.9	696.9	696.1	.8
A4	05-22-01	42° 27' 24.31"	085° 40' 07.51"	100	54.78	.00	700.9	696.4	696.4	.0
A4	05-22-01	42° 27' 24.31"	085° 40' 07.65"	110	54.78	.00	700.9	697.8	697.4	.4
A4	05-22-01	42° 27' 24.31"	085° 40' 07.78"	120	54.78	.00	700.9	699.7	699.1	.6
A5	06-11-01	42° 27' 27.29"	085° 40' 05.61"	0	54.73	.00	698.9	698.1	696.1	2.0
A5	06-11-01	42° 27' 27.30"	085° 40' 05.72"	10	54.73	2.45	698.9	698.1	698.1	.0
A5	06-11-01	42° 27' 27.31"	085° 40' 05.85"	20	54.73	3.74	698.9	698.3	698.3	.0
A5	06-11-01	42° 27' 27.31"	085° 40' 05.97"	30	54.73	3.28	698.9	698.1	698.1	.0
A5	06-11-01	42° 27' 27.32"	085° 40' 06.11"	40	54.73	3.32	698.9	697.5	697.5	.0
A5	06-11-01	42° 27' 27.33"	085° 40' 06.23"	50	54.73	3.89	698.9	697.9	697.9	.0
A5	06-11-01	42° 27' 27.34"	085° 40' 06.36"	60	54.73	3.12	698.9	697.2	697.2	.0
A5	06-11-01	42° 27' 27.35"	085° 40' 06.50"	70	54.73	3.95	698.9	696.4	696.4	.0
A5	06-11-01	42° 27' 27.35"	085° 40' 06.64"	80	54.73	4.04	698.9	695.4	695.4	.0
A5	06-11-01	42° 27' 27.36"	085° 40' 06.76"	90	54.73	3.82	698.9	693.6	693.6	.0
A5	06-11-01	42° 27' 27.37"	085° 40' 06.90"	100	54.73	3.50	698.9	691.9	691.9	.0
A5	06-11-01	42° 27' 27.38"	085° 40' 07.03"	110	54.73	2.28	698.9	691.1	691.1	.0
A5	06-11-01	42° 27' 27.38"	085° 40' 07.16"	120	54.73	2.25	698.9	691.6	691.6	.0
A5	06-11-01	42° 27' 27.39"	085° 40' 07.30"	130	54.73	3.36	698.9	693.4	693.4	.0
A5	06-11-01	42° 27' 27.40"	085° 40' 07.43"	140	54.73	1.73	698.9	694.8	694.8	.0
A5	06-11-01	42° 27' 27.41"	085° 40' 07.56"	150	54.73	.81	698.9	696.1	696.1	.0
A5	06-11-01	42° 27' 27.42"	085° 40' 07.67"	160	54.73	.00	698.9	698.6	698.6	.0

18 Sediment Characteristics and Configuration within Otsego City Dam on Kalamazoo River, Michigan, 2001-02

Appendix 1. Date, location, water velocity, altitude of surfaces, and total thickness of sediment at transect data points in the Otsego City impoundment on the Kalamazoo River at Otsego, Mich.--Continued

[Vertical data referenced to the North American Vertical Datum of 1988 (NAVD 88). Water surface normalized to a stage of 2.0 ft. Abbreviations: °, degrees; ', minutes; ", seconds; ft, feet; mi, miles; ft/s, feet per second; --, no data. Sediment cores denoted in bold.]

Transect No. (fig. 2a)	Date	Latitude	Longitude	Distance from right edge of water (ft)	River miles from mouth (mi)	Mean velocity (ft/s)	Altitude of water surface (ft)	Altitude of stream-bed (ft)	Altitude of base sediment (ft)	Total thickness of sediment (ft)
A6	05-15-01	42° 27' 29.31"	085° 40' 05.52"	0	54.68	0.66	698.5	697.8	697.8	0.0
A6	05-15-01	42° 27' 29.31"	085° 40' 05.64"	10	54.68	2.16	698.5	696.6	696.6	.0
A6	05-15-01	42° 27' 29.30"	085° 40' 05.80"	20	54.68	2.44	698.5	696.6	696.6	.0
A6	05-15-01	42° 27' 29.30"	085° 40' 05.92"	30	54.68	3.79	698.5	695.6	695.6	.0
A6	05-15-01	42° 27' 29.30"	085° 40' 06.04"	40	54.68	5.12	698.5	694.6	694.6	.0
A6	05-15-01	42° 27' 29.30"	085° 40' 06.19"	50	54.68	5.58	698.5	693.6	693.6	.0
A6	05-15-01	42° 27' 29.30"	085° 40' 06.31"	60	54.68	6.13	698.5	693.6	693.6	.0
A6	05-15-01	42° 27' 29.30"	085° 40' 06.46"	70	54.68	6.45	698.5	694.1	694.1	.0
A6	05-15-01	42° 27' 29.30"	085° 40' 06.71"	90	54.68	3.76	698.5	695.6	695.6	.0
A6	05-15-01	42° 27' 29.30"	085° 40' 06.92"	105	54.68	.00	698.5	698.5	698.5	.0
A7	05-15-01	42° 27' 31.16"	085° 40' 04.64"	0	54.65	.00	698.2	697.5	694.5	3.0
A7	05-15-01	42° 27' 31.19"	085° 40' 04.76"	10	54.65	.45	698.2	696.3	694.8	1.5
A7	05-15-01	42° 27' 31.22"	085° 40' 04.90"	20	54.65	.90	698.2	695.5	695.0	.5
A7	05-15-01	42° 27' 31.25"	085° 40' 05.03"	30	54.65	2.73	698.2	695.3	695.3	.0
A7	05-15-01	42° 27' 31.28"	085° 40' 05.14"	40	54.65	3.82	698.2	695.3	695.3	.0
A7	05-15-01	42° 27' 31.31"	085° 40' 05.27"	50	54.65	5.10	698.2	695.3	695.3	.0
A7	05-15-01	42° 27' 31.34"	085° 40' 05.39"	60	54.65	5.27	698.2	695.3	695.3	.0
A7	05-15-01	42° 27' 31.38"	085° 40' 05.51"	70	54.65	6.08	698.2	695.3	695.3	.0
A7	05-15-01	42° 27' 31.41"	085° 40' 05.66"	80	54.65	5.89	698.2	695.3	695.3	.0
A7	05-15-01	42° 27' 31.45"	085° 40' 05.83"	95	54.65	5.23	698.2	695.3	695.3	.0
A7	05-15-01	42° 27' 31.50"	085° 40' 06.02"	110	54.65	4.64	698.2	695.3	695.3	.0
A7	05-15-01	42° 27' 31.55"	085° 40' 06.21"	125	54.65	3.57	698.2	695.8	695.8	.0
A7	05-15-01	42° 27' 31.58"	085° 40' 06.33"	135	54.65	1.76	698.2	695.8	695.8	.0
A7	05-15-01	42° 27' 31.60"	085° 40' 06.41"	140	54.65	1.16	698.2	696.3	696.0	.3
A7	05-15-01	42° 27' 31.65"	085° 40' 06.65"	160	54.65	.00	698.2	697.3	694.8	2.5
A8	05-15-01	42° 27' 33.66"	085° 40' 04.23"	0	54.61	3.30	697.8	695.5	695.5	.0
A8	05-15-01	42° 27' 33.68"	085° 40' 04.36"	10	54.61	4.04	697.8	695.5	695.5	.0
A8	05-15-01	42° 27' 33.70"	085° 40' 04.49"	20	54.61	3.70	697.8	695.5	695.5	.0
A8	05-15-01	42° 27' 33.71"	085° 40' 04.60"	30	54.61	4.00	697.8	695.5	695.5	.0
A8	05-15-01	42° 27' 33.72"	085° 40' 04.76"	40	54.61	3.90	697.8	695.5	695.5	.0
A8	05-15-01	42° 27' 33.74"	085° 40' 04.89"	50	54.61	3.80	697.8	695.5	695.5	.0
A8	05-15-01	42° 27' 33.75"	085° 40' 05.01"	60	54.61	3.88	697.8	695.0	695.0	.0
A8	05-15-01	42° 27' 33.76"	085° 40' 05.15"	70	54.61	4.31	697.8	695.0	695.0	.0
A8	05-15-01	42° 27' 33.78"	085° 40' 05.28"	80	54.61	3.76	697.8	694.5	694.5	.0
A8	05-15-01	42° 27' 33.79"	085° 40' 05.42"	90	54.61	4.00	697.8	695.0	695.0	.0

Appendix 1. Date, location, water velocity, altitude of surfaces, and total thickness of sediment at transect data points in the Otsego City impoundment on the Kalamazoo River at Otsego, Mich.--Continued

[Vertical data referenced to the North American Vertical Datum of 1988 (NAVD 88). Water surface normalized to a stage of 2.0 ft. Abbreviations: °, degrees; ', minutes; ", seconds; ft, feet; mi, miles; ft/s, feet per second; --, no data. Sediment cores denoted in bold.]

Transect No. (fig. 2a)	Date	Latitude	Longitude	Distance from right edge of water (ft)	River miles from mouth (mi)	Mean velocity (ft/s)	Altitude of water surface (ft)	Altitude of stream-bed (ft)	Altitude of base sediment (ft)	Total thickness of sediment (ft)
A8	05-15-01	42° 27' 33.80"	085° 40' 05.55"	100	54.61	3.69	697.8	696.0	696.0	0.0
A8	05-15-01	42° 27' 33.82"	085° 40' 05.68"	110	54.61	3.30	697.8	695.3	695.3	.0
A8	05-15-01	42° 27' 33.83"	085° 40' 05.83"	120	54.61	2.37	697.8	696.9	696.9	.0
A8	05-15-01	42° 27' 33.86"	085° 40' 05.95"	130	54.61	.64	697.8	696.8	696.2	.6
A8	05-15-01	42° 27' 33.86"	085° 40' 06.10"	140	54.61	.00	697.8	697.5	696.5	1.0
A9	05-15-01	42° 27' 37.03"	085° 40' 02.83"	0	54.54	.00	697.8	696.5	696.0	.5
A9	05-15-01	42° 27' 37.03"	085° 40' 02.96"	10	54.54	.00	697.8	695.0	694.0	1.0
A9	05-15-01	42° 27' 37.02"	085° 40' 03.08"	20	54.54	.50	697.8	694.0	693.5	.5
A9	05-15-01	42° 27' 37.02"	085° 40' 03.21"	30	54.54	1.64	697.8	694.0	693.5	.5
A9	05-15-01	42° 27' 37.02"	085° 40' 03.36"	40	54.54	2.15	697.8	694.0	692.0	2.0
A9	05-15-01	42° 27' 37.02"	085° 40' 03.50"	50	54.54	1.81	697.8	693.0	692.0	1.0
A9	05-15-01	42° 27' 37.02"	085° 40' 03.63"	60	54.54	2.70	697.8	692.0	692.0	.0
A9	05-15-01	42° 27' 37.01"	085° 40' 03.75"	70	54.54	3.50	697.8	692.5	692.5	.0
A9	05-15-01	42° 27' 37.01"	085° 40' 03.88"	80	54.54	3.91	697.8	692.5	692.5	.0
A9	05-15-01	42° 27' 37.01"	085° 40' 04.00"	90	54.54	3.87	697.8	693.0	693.0	.0
A9	05-15-01	42° 27' 37.01"	085° 40' 04.16"	100	54.54	2.44	697.8	694.0	694.0	.0
A9	05-15-01	42° 27' 37.03"	085° 40' 04.22"	105	54.54	1.22	697.8	696.0	695.5	.5
A10	05-15-01	42° 27' 40.41"	085° 40' 05.66"	0	54.46	.24	697.7	693.4	693.4	.0
A10	05-15-01	42° 27' 40.35"	085° 40' 05.77"	10	54.46	3.00	697.7	691.9	691.9	.0
A10	05-15-01	42° 27' 40.29"	085° 40' 05.87"	20	54.46	4.03	697.7	691.9	691.9	.0
A10	05-15-01	42° 27' 40.24"	085° 40' 05.96"	30	54.46	3.50	697.7	691.9	691.9	.0
A10	05-15-01	42° 27' 40.16"	085° 40' 06.08"	40	54.46	3.85	697.7	691.9	691.9	.0
A10	05-15-01	42° 27' 40.11"	085° 40' 06.19"	50	54.46	3.77	697.7	692.4	692.4	.0
A10	05-15-01	42° 27' 40.05"	085° 40' 06.28"	60	54.46	3.52	697.7	692.9	692.9	.0
A10	05-15-01	42° 27' 39.99"	085° 40' 06.39"	70	54.46	3.62	697.7	693.4	693.4	.0
A10	05-15-01	42° 27' 39.92"	085° 40' 06.49"	80	54.46	2.70	697.7	694.9	694.9	.0
A10	05-15-01	42° 27' 39.87"	085° 40' 06.60"	90	54.46	1.61	697.7	694.9	694.4	.5
A10	05-15-01	42° 27' 39.81"	085° 40' 06.70"	100	54.46	.80	697.7	695.9	695.4	.5
A10	05-15-01	42° 27' 39.74"	085° 40' 06.81"	110	54.46	.00	697.7	697.4	695.4	2.0
A11	05-14-01	42° 27' 42.29"	085° 40' 08.41"	0	54.41	.00	697.7	693.5	693.5	.0
A11	05-14-01	42° 27' 42.24"	085° 40' 08.45"	7	54.41	.00	697.7	693.5	693.5	.0
A11	05-14-01	42° 27' 42.18"	085° 40' 08.50"	14	54.41	.00	697.7	692.0	692.0	.0
A11	05-14-01	42° 27' 42.12"	085° 40' 08.55"	21	54.41	.32	697.7	690.5	690.5	.0
A11	05-14-01	42° 27' 42.05"	085° 40' 08.60"	28	54.41	.96	697.7	689.0	689.0	.0

20 Sediment Characteristics and Configuration within Otsego City Dam on Kalamazoo River, Michigan, 2001-02

Appendix 1. Date, location, water velocity, altitude of surfaces, and total thickness of sediment at transect data points in the Otsego City impoundment on the Kalamazoo River at Otsego, Mich.--Continued

[Vertical data referenced to the North American Vertical Datum of 1988 (NAVD 88). Water surface normalized to a stage of 2.0 ft. Abbreviations: °, degrees; ', minutes; ", seconds; ft, feet; mi, miles; ft/s, feet per second; --, no data. Sediment cores denoted in bold.]

Transect No. (fig. 2a)	Date	Latitude	Longitude	Distance from right edge of water (ft)	River miles from mouth (mi)	Mean velocity (ft/s)	Altitude of water surface (ft)	Altitude of stream-bed (ft)	Altitude of base sediment (ft)	Total thickness of sediment (ft)
A11	05-14-01	42° 27' 41.99"	085° 40' 08.66"	35	54.41	1.87	697.7	687.5	687.5	0.0
A11	05-14-01	42° 27' 41.94"	085° 40' 08.69"	42	54.41	2.66	697.7	689.5	689.5	.0
A11	05-14-01	42° 27' 41.88"	085° 40' 08.75"	49	54.41	3.35	697.7	691.0	691.0	.0
A11	05-14-01	42° 27' 41.82"	085° 40' 08.80"	56	54.41	3.05	697.7	691.5	691.5	.0
A11	05-14-01	42° 27' 41.76"	085° 40' 08.85"	63	54.41	2.72	697.7	692.2	692.2	.0
A11	05-14-01	42° 27' 41.70"	085° 40' 08.89"	70	54.41	2.53	697.7	693.0	693.0	.0
A11	05-14-01	42° 27' 41.64"	085° 40' 08.94"	77	54.41	2.41	697.7	693.5	693.5	.0
A11	05-14-01	42° 27' 41.58"	085° 40' 08.99"	84	54.41	1.06	697.7	695.0	691.0	4.0
A11	05-14-01	42° 27' 41.52"	085° 40' 09.03"	91	54.41	.36	697.7	695.0	693.0	2.0
A11	05-14-01	42° 27' 41.44"	085° 40' 09.11"	100	54.41	.00	697.7	697.0	694.2	2.8
A12	05-14-01	42° 27' 42.64"	085° 40' 14.85"	0	54.33	.00	697.4	693.7	690.7	3.0
A12	05-14-01	42° 27' 42.56"	085° 40' 14.82"	10	54.33	.39	697.4	692.2	690.7	1.5
A12	05-14-01	42° 27' 42.49"	085° 40' 14.79"	20	54.33	.48	697.4	691.2	690.7	.5
A12	05-14-01	42° 27' 42.40"	085° 40' 14.75"	30	54.33	.68	697.4	691.7	691.0	.8
A12	05-14-01	42° 27' 42.30"	085° 40' 14.72"	40	54.33	1.71	697.4	691.7	691.2	.5
A12	05-14-01	42° 27' 42.21"	085° 40' 14.68"	50	54.33	2.19	697.4	691.7	691.7	.0
A12	05-14-01	42° 27' 42.10"	085° 40' 14.65"	60	54.33	2.39	697.4	692.2	692.2	.0
A12	05-14-01	42° 27' 41.99"	085° 40' 14.61"	70	54.33	2.69	697.4	693.7	693.7	.0
A12	05-14-01	42° 27' 41.89"	085° 40' 14.57"	80	54.33	2.54	697.4	694.7	694.7	.0
A12	05-14-01	42° 27' 41.80"	085° 40' 14.54"	90	54.33	1.98	697.4	695.2	690.2	5.0
A12	05-14-01	42° 27' 41.71"	085° 40' 14.49"	100	54.33	1.49	697.4	694.1	690.2	3.9
A12	05-14-01	42° 27' 41.62"	085° 40' 14.47"	110	54.33	1.99	697.4	695.1	690.2	4.9
A12	05-14-01	42° 27' 41.52"	085° 40' 14.42"	120	54.33	1.63	697.4	694.8	690.2	4.6
A12	05-14-01	42° 27' 41.42"	085° 40' 14.40"	130	54.33	1.36	697.4	694.2	689.2	5.0
A12	05-14-01	42° 27' 41.33"	085° 40' 14.35"	140	54.33	.00	697.4	696.5	690.1	6.4
A13	05-14-01	42° 27' 39.23"	085° 40' 17.71"	0	54.26	1.92	697.1	694.4	690.6	3.8
A13	05-14-01	42° 27' 39.23"	085° 40' 17.60"	7	54.26	1.06	697.1	691.4	690.4	1.0
A13	05-14-01	42° 27' 39.23"	085° 40' 17.51"	14	54.26	3.00	697.1	690.4	690.4	.0
A13	05-14-01	42° 27' 39.23"	085° 40' 17.42"	21	54.26	2.86	697.1	690.9	690.9	.0
A13	05-14-01	42° 27' 39.23"	085° 40' 17.32"	28	54.26	2.74	697.1	691.4	691.4	.0
A13	05-14-01	42° 27' 39.24"	085° 40' 17.23"	35	54.26	2.66	697.1	692.4	692.4	.0
A13	05-14-01	42° 27' 39.24"	085° 40' 17.14"	42	54.26	2.54	697.1	692.9	692.9	.0
A13	05-14-01	42° 27' 39.24"	085° 40' 17.04"	49	54.26	2.60	697.1	693.8	693.8	.0
A13	05-14-01	42° 27' 39.24"	085° 40' 16.95"	56	54.26	2.21	697.1	694.9	693.9	1.0
A13	05-14-01	42° 27' 39.24"	085° 40' 16.86"	63	54.26	2.29	697.1	694.5	693.9	.6

Appendix 1. Date, location, water velocity, altitude of surfaces, and total thickness of sediment at transect data points in the Otsego City impoundment on the Kalamazoo River at Otsego, Mich.--Continued

[Vertical data referenced to the North American Vertical Datum of 1988 (NAVD 88). Water surface normalized to a stage of 2.0 ft. Abbreviations: °, degrees; ', minutes; ", seconds; ft, feet; mi, miles; ft/s, feet per second; --, no data. Sediment cores denoted in bold.]

Transect No. (fig. 2a)	Date	Latitude	Longitude	Distance from right edge of water (ft)	River miles from mouth (mi)	Mean velocity (ft/s)	Altitude of water surface (ft)	Altitude of stream-bed (ft)	Altitude of base sediment (ft)	Total thickness of sediment (ft)
A13	05-14-01	42° 27' 39.24"	085° 40' 16.78"	70	54.26	2.14	697.1	694.5	689.4	5.1
A13	05-14-01	42° 27' 39.25"	085° 40' 16.68"	77	54.26	1.25	697.1	694.6	689.2	5.4
A13	05-14-01	42° 27' 39.25"	085° 40' 16.58"	84	54.26	.88	697.1	695.6	689.4	6.2
A13	05-14-01	42° 27' 39.25"	085° 40' 16.48"	91	54.26	.00	697.1	696.4	689.2	7.2
A13	05-14-01	42° 27' 39.25"	085° 40' 16.39"	98	54.26	.00	697.1	696.4	689.4	7.0
A13	05-14-01	42° 27' 39.25"	085° 40' 16.26"	110	54.26	.00	697.1	696.4	688.6	7.8
B1	05-16-01	42° 27' 39.22"	085° 40' 16.11"	0	54.25	.00	697.1	697.1	686.9	10.2
B1	05-16-01	42° 27' 39.12"	085° 40' 16.11"	10	54.25	.00	697.1	696.4	687.4	9.0
B1	05-16-01	42° 27' 39.03"	085° 40' 16.09"	20	54.25	.83	697.1	693.9	686.9	7.0
B1	05-16-01	42° 27' 38.93"	085° 40' 16.08"	30	54.25	1.77	697.1	693.1	686.8	6.3
B1	05-16-01	42° 27' 38.83"	085° 40' 16.08"	40	54.25	1.96	697.1	693.9	686.8	7.1
B1	05-16-01	42° 27' 38.73"	085° 40' 16.06"	50	54.25	1.95	697.1	694.4	686.4	8.0
B1	05-16-01	42° 27' 38.63"	085° 40' 16.04"	60	54.25	2.00	697.1	694.9	685.7	9.2
B1	05-16-01	42° 27' 38.53"	085° 40' 16.04"	70	54.25	1.84	697.1	695.6	684.4	11.2
B1	05-16-01	42° 27' 38.43"	085° 40' 16.03"	80	54.25	1.78	697.1	695.9	686.4	9.5
B1	05-16-01	42° 27' 38.33"	085° 40' 16.01"	90	54.25	1.45	697.1	696.3	687.7	8.6
B1	05-16-01	42° 27' 38.23"	085° 40' 16.01"	100	54.25	.00	697.1	696.9	687.4	9.5
B2	05-16-01	42° 27' 38.82"	085° 40' 10.27"	0	54.45	.00	697.3	697.3	692.5	4.8
B2	05-16-01	42° 27' 38.68"	085° 40' 10.32"	15	54.45	3.41	697.3	695.2	692.7	2.5
B2	05-16-01	42° 27' 38.58"	085° 40' 10.36"	25	54.45	2.27	697.3	694.2	692.7	1.5
B2	05-16-01	42° 27' 38.48"	085° 40' 10.40"	35	54.45	2.94	697.3	694.2	692.9	1.3
B2	05-16-01	42° 27' 38.38"	085° 40' 10.44"	45	54.45	1.74	697.3	695.7	693.2	2.5
B2	05-16-01	42° 27' 38.29"	085° 40' 10.46"	55	54.45	1.10	697.3	696.7	691.7	5.0
B2	05-16-01	42° 27' 38.14"	085° 40' 10.51"	70	54.45	.00	697.3	697.2	692.2	5.0
B3	05-17-01	42° 27' 36.29"	085° 40' 08.95"	0	54.56	.67	697.5	695.9	693.9	2.0
B3	05-17-01	42° 27' 36.29"	085° 40' 09.07"	10	54.56	2.71	697.5	693.9	693.9	.0
B3	05-17-01	42° 27' 36.29"	085° 40' 09.20"	20	54.56	2.45	697.5	693.9	693.9	.0
B3	05-17-01	42° 27' 36.28"	085° 40' 09.35"	30	54.56	2.66	697.5	694.1	694.1	.0
B3	05-17-01	42° 27' 36.28"	085° 40' 09.48"	40	54.56	1.43	697.5	694.3	693.3	1.0
B3	05-17-01	42° 27' 36.28"	085° 40' 09.62"	50	54.56	.00	697.5	697.5	692.5	5.0
B4	05-17-01	42° 27' 34.74"	085° 40' 07.86"	0	54.60	.00	697.6	697.6	693.1	4.5
B4	05-17-01	42° 27' 34.68"	085° 40' 07.98"	10	54.60	.18	697.6	695.7	694.0	1.7
B4	05-17-01	42° 27' 34.63"	085° 40' 08.08"	20	54.60	1.76	697.6	694.8	694.2	.6

22 Sediment Characteristics and Configuration within Otsego City Dam on Kalamazoo River, Michigan, 2001-02

Appendix 1. Date, location, water velocity, altitude of surfaces, and total thickness of sediment at transect data points in the Otsego City impoundment on the Kalamazoo River at Otsego, Mich.--Continued

[Vertical data referenced to the North American Vertical Datum of 1988 (NAVD 88). Water surface normalized to a stage of 2.0 ft. Abbreviations: °, degrees; ', minutes; ", seconds; ft, feet; mi, miles; ft/s, feet per second; --, no data. Sediment cores denoted in bold.]

Transect No. (fig. 2a)	Date	Latitude	Longitude	Distance from right edge of water (ft)	River miles from mouth (mi)	Mean velocity (ft/s)	Altitude of water surface (ft)	Altitude of stream-bed (ft)	Altitude of base sediment (ft)	Total thickness of sediment (ft)
B4	05-17-01	42° 27' 34.57"	085° 40' 08.21"	30	54.60	2.69	697.6	694.2	694.2	0.0
B4	05-17-01	42° 27' 34.52"	085° 40' 08.31"	40	54.60	3.01	697.6	694.0	693.0	1.0
B4	05-17-01	42° 27' 34.46"	085° 40' 08.42"	50	54.60	1.58	697.6	694.2	692.5	1.7
B4	05-17-01	42° 27' 34.41"	085° 40' 08.52"	60	54.60	.75	697.6	697.6	695.6	2.0
B5	05-17-01	42° 27' 34.77"	085° 40' 07.05"	0	54.60	1.17	697.7	694.5	693.3	1.2
B5	05-17-01	42° 27' 34.67"	085° 40' 07.06"	10	54.60	2.34	697.7	695.3	693.8	1.5
B5	05-17-01	42° 27' 34.56"	085° 40' 07.06"	20	54.60	1.81	697.7	695.3	694.8	.5
B5	05-17-01	42° 27' 34.44"	085° 40' 07.06"	30	54.60	1.01	697.7	694.8	694.8	.0
B5	05-17-01	42° 27' 34.36"	085° 40' 07.06"	40	54.60	1.53	697.7	694.3	694.1	.2
B5	05-17-01	42° 27' 34.27"	085° 40' 07.05"	50	54.60	.78	697.7	694.8	694.1	.7
B6	05-17-01	42° 27' 34.03"	085° 40' 07.98"	0	54.61	.00	697.6	697.6	697.1	.5
B6	05-17-01	42° 27' 34.10"	085° 40' 08.08"	10	54.61	.72	697.6	696.6	694.4	2.2
B6	05-17-01	42° 27' 34.16"	085° 40' 08.17"	20	54.61	.88	697.6	695.3	694.6	.7
B6	05-17-01	42° 27' 34.22"	085° 40' 08.28"	30	54.61	.58	697.6	695.7	695.7	.0
B6	05-17-01	42° 27' 34.29"	085° 40' 08.39"	40	54.61	.00	697.6	696.2	695.2	1.0
B7	05-17-01	42° 27' 32.12"	085° 40' 06.65"	0	54.65	.00	698.0	698.0	698.0	.0
B7	05-17-01	42° 27' 32.03"	085° 40' 06.63"	8	54.65	.30	698.0	695.5	695.3	.2
B7	05-17-01	42° 27' 31.91"	085° 40' 06.60"	18	54.65	.82	698.0	695.6	695.6	.0
B7	05-17-01	42° 27' 31.81"	085° 40' 06.59"	28	54.65	.98	698.0	695.6	694.6	1.0
B7	05-17-01	42° 27' 31.71"	085° 40' 06.57"	38	54.65	.00	698.0	697.4	694.8	2.6
C1	06-11-01	42° 27' 24.59"	085° 40' 00.62"	0	54.83	1.68	700.6	699.8	699.8	.0
C1	06-11-01	42° 27' 24.60"	085° 40' 00.69"	5	54.83	3.53	700.6	699.8	699.8	.0
C1	06-11-01	42° 27' 24.61"	085° 40' 00.75"	10	54.83	3.31	700.6	699.7	699.7	.0
C1	06-11-01	42° 27' 24.62"	085° 40' 00.82"	15	54.83	3.90	700.6	699.4	699.4	.0
C1	06-11-01	42° 27' 24.64"	085° 40' 00.89"	20	54.83	3.79	700.6	699.6	699.6	.0
C1	06-11-01	42° 27' 24.65"	085° 40' 00.94"	25	54.83	3.72	700.6	700.0	700.0	.0
C1	06-11-01	42° 27' 24.66"	085° 40' 01.00"	30	54.83	1.86	700.6	700.1	700.1	.0
C2	05-16-01	42° 27' 28.84"	085° 40' 01.23"	0	54.69	.00	698.7	698.7	698.7	.0
C2	05-16-01	42° 27' 28.84"	085° 40' 01.38"	10	54.69	1.43	698.7	696.3	696.3	.0
C2	05-16-01	42° 27' 28.82"	085° 40' 01.51"	20	54.69	.73	698.7	696.9	696.5	.4
C2	05-16-01	42° 27' 28.81"	085° 40' 01.66"	30	54.69	1.09	698.7	696.9	696.8	.1
C2	05-16-01	42° 27' 28.80"	085° 40' 01.79"	40	54.69	2.02	698.7	696.8	696.8	.0
C2	05-16-01	42° 27' 28.78"	085° 40' 01.96"	55	54.69	1.79	698.7	697.2	697.2	.0

Appendix 1. Date, location, water velocity, altitude of surfaces, and total thickness of sediment at transect data points in the Otsego City impoundment on the Kalamazoo River at Otsego, Mich.--Continued

[Vertical data referenced to the North American Vertical Datum of 1988 (NAVD 88). Water surface normalized to a stage of 2.0 ft. Abbreviations: °, degrees; ', minutes; ", seconds; ft, feet; mi, miles; ft/s, feet per second; --, no data. Sediment cores denoted in bold.]

Transect No. (fig. 2a)	Date	Latitude	Longitude	Distance from right edge of water (ft)	River miles from mouth (mi)	Mean velocity (ft/s)	Altitude of water surface (ft)	Altitude of stream-bed (ft)	Altitude of base sediment (ft)	Total thickness of sediment (ft)
C3	05-16-01	42° 27' 28.66"	085° 40' 03.24"	0	54.69	0.00	698.6	698.4	696.7	1.7
C3	05-16-01	42° 27' 28.63"	085° 40' 03.53"	20	54.69	.00	698.6	696.7	696.0	.7
C3	05-16-01	42° 27' 28.61"	085° 40' 03.80"	40	54.69	.00	698.6	697.4	697.0	.4
C3	05-16-01	42° 27' 28.59"	085° 40' 04.00"	55	54.69	.00	698.6	698.6	696.9	1.7
C4	05-16-01	42° 27' 30.09"	085° 40' 02.00"	0	54.67	.00	698.6	698.6	698.6	.0
C4	05-16-01	42° 27' 30.09"	085° 40' 02.06"	5	54.67	.36	698.6	698.0	697.1	.9
C4	05-16-01	42° 27' 30.08"	085° 40' 02.19"	15	54.67	1.41	698.6	696.9	696.9	.0
C4	05-16-01	42° 27' 30.06"	085° 40' 02.39"	30	54.67	1.43	698.6	696.7	696.7	.0
C4	05-16-01	42° 27' 30.05"	085° 40' 02.59"	45	54.67	.88	698.6	695.7	694.2	1.5
C4	05-16-01	42° 27' 30.03"	085° 40' 02.87"	65	54.67	.00	698.6	697.2	697.2	.0
C4	05-16-01	42° 27' 30.02"	085° 40' 03.07"	80	54.67	.00	698.6	696.7	695.4	1.3
C4	05-16-01	42° 27' 30.00"	085° 40' 03.27"	95	54.67	.00	698.6	697.2	695.8	1.4
C4	05-16-01	42° 27' 29.99"	085° 40' 03.47"	110	54.67	.00	698.6	697.7	695.4	2.3
C4	05-16-01	42° 27' 29.98"	085° 40' 03.52"	115	54.67	.00	698.6	698.6	698.6	.0
C5	05-16-01	42° 27' 32.79"	085° 40' 02.37"	0	54.62	.00	697.9	697.9	697.9	.0
C5	05-16-01	42° 27' 32.79"	085° 40' 02.41"	3	54.62	.00	697.9	697.9	694.4	3.5
C5	05-16-01	42° 27' 32.78"	085° 40' 02.61"	18	54.62	1.34	697.9	695.6	694.5	1.1
C5	05-16-01	42° 27' 32.78"	085° 40' 02.79"	33	54.62	1.36	697.9	695.3	694.0	1.3
C5	05-16-01	42° 27' 32.78"	085° 40' 02.99"	48	54.62	.78	697.9	694.9	694.7	.2
C5	05-16-01	42° 27' 32.78"	085° 40' 03.19"	63	54.62	.29	697.9	695.7	694.7	1.0
C5	05-16-01	42° 27' 32.78"	085° 40' 03.31"	71	54.62	.00	697.9	696.5	695.5	1.0
C6	05-15-01	42° 27' 33.41"	085° 40' 03.75"	0	54.62	.00	697.9	697.6	697.1	.5
C6	05-15-01	42° 27' 33.31"	085° 40' 03.68"	7	54.62	.65	697.9	696.8	695.3	1.5
C6	05-15-01	42° 27' 33.22"	085° 40' 03.63"	17	54.62	1.29	697.9	696.1	695.1	1.0
C6	05-15-01	42° 27' 33.13"	085° 40' 03.57"	27	54.62	1.86	697.9	695.5	694.9	.6
C6	05-15-01	42° 27' 33.05"	085° 40' 03.52"	37	54.62	2.31	697.9	695.3	695.3	.0
C6	05-15-01	42° 27' 32.96"	085° 40' 03.46"	47	54.62	1.94	697.9	695.1	695.1	.0
C6	05-15-01	42° 27' 32.87"	085° 40' 03.40"	57	54.62	1.89	697.9	695.3	695.3	.0
C6	05-15-01	42° 27' 32.78"	085° 40' 03.34"	67	54.62	.00	697.9	696.1	696.1	.0
C7	05-15-01	42° 27' 34.53"	085° 40' 01.09"	0	54.57	1.74	697.9	696.6	695.6	1.0
C7	05-15-01	42° 27' 34.56"	085° 40' 01.23"	10	54.57	1.52	697.9	695.9	695.3	.6
C7	05-15-01	42° 27' 34.60"	085° 40' 01.43"	25	54.57	3.24	697.9	695.4	695.1	.3
C7	05-15-01	42° 27' 34.63"	085° 40' 01.62"	40	54.57	3.12	697.9	695.4	695.1	.3
C7	05-15-01	42° 27' 34.66"	085° 40' 01.79"	55	54.57	2.50	697.9	697.6	696.6	1.0

Appendix 1. Date, location, water velocity, altitude of surfaces, and total thickness of sediment at transect data points in the Otsego City impoundment on the Kalamazoo River at Otsego, Mich.--Continued

[Vertical data referenced to the North American Vertical Datum of 1988 (NAVD 88). Water surface normalized to a stage of 2.0 ft. Abbreviations: °, degrees; ', minutes; ", seconds; ft, feet; mi, miles; ft/s, feet per second; --, no data. Sediment cores denoted in bold.]

Transect No. (fig. 2a)	Date	Latitude	Longitude	Distance from right edge of water (ft)	River miles from mouth (mi)	Mean velocity (ft/s)	Altitude of water surface (ft)	Altitude of stream-bed (ft)	Altitude of base sediment (ft)	Total thickness of sediment (ft)
C7	05-15-01	42° 27' 34.68"	085° 40' 01.86"	59	54.57	0.00	697.9	697.9	696.4	1.5
C7	05-15-01	42° 27' 34.72"	085° 40' 02.07"	76	54.57	.00	697.9	697.9	696.9	1.0
C7	05-15-01	42° 27' 34.74"	085° 40' 02.19"	85	54.57	1.20	697.9	697.5	697.1	.4
C7	05-15-01	42° 27' 34.78"	085° 40' 02.38"	100	54.57	1.18	697.9	697.6	697.1	.5
C8	05-15-01	42° 27' 35.62"	085° 40' 02.85"	0	54.57	.00	697.8	697.8	693.8	4.0
C8	05-15-01	42° 27' 35.48"	085° 40' 02.90"	14	54.57	.00	697.8	697.8	694.0	3.8
C8	05-15-01	42° 27' 35.40"	085° 40' 02.94"	24	54.57	.91	697.8	697.3	693.7	3.6
C8	05-15-01	42° 27' 35.30"	085° 40' 02.98"	34	54.57	.00	697.8	697.8	692.8	5.0
C9	05-15-01	42° 27' 37.31"	085° 40' 02.05"	0	54.54	.00	697.8	696.0	693.7	2.3
C9	05-15-01	42° 27' 37.27"	085° 40' 02.17"	10	54.54	1.68	697.8	693.5	692.0	1.5
C9	05-15-01	42° 27' 37.23"	085° 40' 02.29"	20	54.54	2.35	697.8	693.5	692.2	1.3
C9	05-15-01	42° 27' 37.18"	085° 40' 02.40"	30	54.54	2.24	697.8	695.5	692.7	2.8
C9	05-15-01	42° 27' 37.14"	085° 40' 02.52"	40	54.54	2.56	697.8	695.5	695.2	.3
C9	05-15-01	42° 27' 37.10"	085° 40' 02.63"	50	54.54	1.92	697.8	696.0	695.5	.5
C9	05-15-01	42° 27' 37.05"	085° 40' 02.78"	60	54.54	.00	697.8	697.8	695.8	2.0
C10	05-22-01	42° 27' 40.05"	085° 40' 04.23"	0	54.48	.89	697.8	696.4	693.9	2.5
C10	05-22-01	42° 27' 40.10"	085° 40' 04.35"	10	54.48	1.03	697.8	696.2	694.2	2.0
C10	05-22-01	42° 27' 40.16"	085° 40' 04.45"	20	54.48	1.62	697.8	694.9	693.4	1.5
C10	05-22-01	42° 27' 40.21"	085° 40' 04.56"	30	54.48	1.48	697.8	693.9	693.4	.5
C10	05-22-01	42° 27' 40.26"	085° 40' 04.67"	40	54.48	1.86	697.8	693.6	693.6	.0
C10	05-22-01	42° 27' 40.29"	085° 40' 04.75"	45	54.48	.00	697.8	693.8	693.2	.6
C11	05-22-01	42° 27' 43.62"	085° 40' 03.45"	0	54.44	1.67	697.8	697.2	690.9	6.3
C11	05-22-01	42° 27' 43.66"	085° 40' 03.58"	10	54.44	2.75	697.8	694.9	690.9	4.0
C11	05-22-01	42° 27' 43.71"	085° 40' 03.69"	20	54.44	1.81	697.8	694.9	691.7	3.2
C11	05-22-01	42° 27' 43.75"	085° 40' 03.81"	30	54.44	1.94	697.8	694.6	692.4	2.2
C11	05-22-01	42° 27' 43.80"	085° 40' 03.93"	40	54.44	1.22	697.8	696.2	693.2	3.0
C11	05-22-01	42° 27' 43.82"	085° 40' 04.00"	45	54.44	.00	697.8	697.4	693.3	4.1
C12	05-22-01	42° 27' 45.41"	085° 40' 03.32"	0	54.43	1.61	697.7	695.2	690.1	5.1
C12	05-22-01	42° 27' 45.37"	085° 40' 03.43"	10	54.43	1.86	697.7	694.1	690.7	3.4
C12	05-22-01	42° 27' 45.32"	085° 40' 03.55"	20	54.43	1.80	697.7	694.8	690.1	4.7
C12	05-22-01	42° 27' 45.27"	085° 40' 03.67"	30	54.43	2.23	697.7	694.8	690.5	4.3
C12	05-22-01	42° 27' 45.22"	085° 40' 03.77"	40	54.43	1.33	697.7	695.5	689.9	5.6
C12	05-22-01	42° 27' 45.17"	085° 40' 03.89"	50	54.43	.00	697.7	697.1	690.3	6.8

Appendix 1. Date, location, water velocity, altitude of surfaces, and total thickness of sediment at transect data points in the Otsego City impoundment on the Kalamazoo River at Otsego, Mich.--Continued

[Vertical data referenced to the North American Vertical Datum of 1988 (NAVD 88). Water surface normalized to a stage of 2.0 ft. Abbreviations: °, degrees; ', minutes; ", seconds; ft, feet; mi, miles; ft/s, feet per second; --, no data. Sediment cores denoted in bold.]

Transect No. (fig. 2a)	Date	Latitude	Longitude	Distance from right edge of water (ft)	River miles from mouth (mi)	Mean velocity (ft/s)	Altitude of water surface (ft)	Altitude of stream-bed (ft)	Altitude of base sediment (ft)	Total thickness of sediment (ft)
C13	05-22-01	42° 27' 47.03"	085° 40' 06.08"	0	54.42	0.00	697.7	695.8	690.7	5.1
C13	05-22-01	42° 27' 47.07"	085° 40' 05.87"	15	54.42	.21	697.7	695.5	691.1	4.4
C13	05-22-01	42° 27' 47.10"	085° 40' 05.67"	30	54.42	.67	697.7	696.1	691.8	4.3
C13	05-22-01	42° 27' 47.13"	085° 40' 05.47"	45	54.42	1.17	697.7	696.1	686.8	9.3
C13	05-22-01	42° 27' 47.16"	085° 40' 05.28"	60	54.42	1.96	697.7	696.5	691.7	4.8
C13	05-22-01	42° 27' 47.19"	085° 40' 05.09"	75	54.42	2.09	697.7	695.8	690.1	5.7
C13	05-22-01	42° 27' 47.21"	085° 40' 04.90"	90	54.42	2.07	697.7	694.7	689.8	4.9
C13	05-22-01	42° 27' 47.24"	085° 40' 04.70"	105	54.42	.89	697.7	695.4	688.2	7.2
D1	05-21-01	42° 27' 47.81"	085° 40' 10.78"	0	54.38	.00	697.6	696.7	690.6	6.1
D1	05-21-01	42° 27' 47.84"	085° 40' 10.89"	8	54.38	2.28	697.6	696.0	694.4	1.6
D1	05-21-01	42° 27' 47.86"	085° 40' 10.98"	15	54.38	2.38	697.6	696.2	690.6	5.6
D1	05-21-01	42° 27' 47.88"	085° 40' 11.06"	22	54.38	2.34	697.6	696.4	691.2	5.2
D1	05-21-01	42° 27' 47.90"	085° 40' 11.15"	29	54.38	1.15	697.6	696.8	691.5	5.3
D1	05-21-01	42° 27' 47.92"	085° 40' 11.24"	35	54.38	.00	697.6	697.2	691.6	5.6
D2	05-21-01	42° 27' 45.43"	085° 40' 09.49"	0	54.39	1.15	697.6	697.0	693.5	3.5
D2	05-21-01	42° 27' 45.38"	085° 40' 09.59"	10	54.39	2.25	697.6	696.4	693.5	2.9
D2	05-21-01	42° 27' 45.33"	085° 40' 09.71"	20	54.39	1.87	697.6	696.2	693.2	3.0
D2	05-21-01	42° 27' 45.27"	085° 40' 09.83"	30	54.39	.62	697.6	696.9	692.3	4.6
D2	05-21-01	42° 27' 45.22"	085° 40' 09.94"	40	54.39	.00	697.6	697.3	688.4	8.9
D3	05-22-01	42° 27' 43.74"	085° 40' 07.64"	0	54.41	.00	697.7	696.8	691.2	5.6
D3	05-22-01	42° 27' 43.70"	085° 40' 07.69"	4	54.41	2.18	697.7	696.5	691.5	5.0
D3	05-22-01	42° 27' 43.63"	085° 40' 07.80"	14	54.41	1.90	697.7	696.4	692.3	4.1
D3	05-22-01	42° 27' 43.56"	085° 40' 07.87"	24	54.41	1.33	697.7	696.6	693.6	3.0
D3	05-22-01	42° 27' 43.50"	085° 40' 07.94"	32	54.41	.00	697.7	697.5	694.3	3.2
D4	05-22-01	42° 27' 41.74"	085° 40' 06.93"	0	54.43	.00	697.7	697.4	691.4	6.0
D4	05-22-01	42° 27' 41.80"	085° 40' 07.02"	9	54.43	.49	697.7	696.7	691.7	5.0
D4	05-22-01	42° 27' 41.85"	085° 40' 07.13"	19	54.43	1.57	697.7	696.2	691.4	4.8
D4	05-22-01	42° 27' 41.91"	085° 40' 07.25"	29	54.43	1.63	697.7	695.6	692.1	3.5
D4	05-22-01	42° 27' 41.96"	085° 40' 07.36"	39	54.43	1.10	697.7	696.8	692.0	4.8
D4	05-22-01	42° 27' 42.03"	085° 40' 07.48"	49	54.43	1.62	697.7	697.3	696.2	1.1
D4	05-22-01	42° 27' 42.08"	085° 40' 07.59"	59	54.43	1.62	697.7	696.5	695.4	1.1
D4	05-22-01	42° 27' 42.14"	085° 40' 07.70"	69	54.43	1.15	697.7	695.9	692.0	3.9

Appendix 1. Date, location, water velocity, altitude of surfaces, and total thickness of sediment at transect data points in the Otsego City impoundment on the Kalamazoo River at Otsego, Mich.--Continued

[Vertical data referenced to the North American Vertical Datum of 1988 (NAVD 88). Water surface normalized to a stage of 2.0 ft. Abbreviations: °, degrees; ', minutes; ", seconds; ft, feet; mi, miles; ft/s, feet per second; --, no data. Sediment cores denoted in bold.]

Transect No. (fig. 2a)	Date	Latitude	Longitude	Distance from right edge of water (ft)	River miles from mouth (mi)	Mean velocity (ft/s)	Altitude of water surface (ft)	Altitude of stream-bed (ft)	Altitude of base sediment (ft)	Total thickness of sediment (ft)
D5	05-22-01	42° 27' 43.80"	085° 40' 06.88"	0	54.42	0.00	697.7	697.3	692.4	4.9
D5	05-22-01	42° 27' 43.79"	085° 40' 07.01"	10	54.42	.81	697.7	696.2	692.0	4.2
D5	05-22-01	42° 27' 43.79"	085° 40' 07.15"	20	54.42	1.69	697.7	696.1	691.9	4.2
D5	05-22-01	42° 27' 43.78"	085° 40' 07.28"	30	54.42	1.51	697.7	696.7	691.3	5.4
D5	05-22-01	42° 27' 43.77"	085° 40' 07.36"	36	54.42	.00	697.7	697.7	690.3	7.4
D7	05-21-01	42° 27' 46.86"	085° 40' 06.77"	0	54.41	.00	697.7	696.0	692.4	3.6
D7	05-21-01	42° 27' 46.80"	085° 40' 06.87"	10	54.41	.27	697.7	695.7	690.0	5.7
D7	05-21-01	42° 27' 46.74"	085° 40' 06.98"	20	54.41	.41	697.7	694.3	689.0	5.3
D7	05-21-01	42° 27' 46.68"	085° 40' 07.09"	30	54.41	.37	697.7	694.3	689.1	5.2
D7	05-21-01	42° 27' 46.61"	085° 40' 07.19"	40	54.41	.79	697.7	692.3	688.9	3.4
D7	05-21-01	42° 27' 46.56"	085° 40' 07.28"	50	54.41	1.67	697.7	692.3	688.6	3.7
D7	05-21-01	42° 27' 46.50"	085° 40' 07.40"	60	54.41	.54	697.7	695.5	688.9	6.6
E1	05-13-02	42° 27' 48.26"	085° 40' 04.80"	0	54.42	.00	697.7	697.7	690.5	7.2
E1	05-13-02	42° 27' 48.17"	085° 40' 04.76"	10	54.42	.00	697.7	696.7	690.7	6.0
E1	05-13-02	42° 27' 48.09"	085° 40' 04.71"	20	54.42	.00	697.7	696.2	689.9	6.3
E1	05-13-02	42° 27' 48.01"	085° 40' 04.67"	30	54.42	.00	697.7	696.2	691.2	5.0
E1	05-13-02	42° 27' 47.92"	085° 40' 04.62"	40	54.42	.00	697.7	696.2	690.2	6.0
E1	05-13-02	42° 27' 47.82"	085° 40' 04.56"	50	54.42	.00	697.7	696.2	690.7	5.5
E1	05-13-02	42° 27' 47.72"	085° 40' 04.52"	60	54.42	.00	697.7	695.7	690.7	5.0
E1	05-13-02	42° 27' 47.61"	085° 40' 04.46"	70	54.42	.00	697.7	696.7	690.4	6.3
E1	05-13-02	42° 27' 47.48"	085° 40' 04.39"	85	54.42	.00	697.7	697.7	689.9	7.8
E2	05-13-02	42° 27' 48.16"	085° 39' 58.18"	0	54.47	.00	697.7	697.7	696.7	1.0
E2	05-13-02	42° 27' 48.07"	085° 39' 58.23"	10	54.47	.00	697.7	697.0	695.5	1.5
E2	05-13-02	42° 27' 47.98"	085° 39' 58.29"	20	54.47	.00	697.7	697.0	694.2	2.8
E2	05-13-02	42° 27' 47.90"	085° 39' 58.36"	30	54.47	.00	697.7	697.3	693.8	3.5
E2	05-13-02	42° 27' 47.80"	085° 39' 58.42"	40	54.47	.00	697.7	697.7	692.9	4.8
E3	05-13-02	42° 27' 43.82"	085° 39' 56.95"	0	54.50	.00	697.8	697.8	695.5	2.3
E3	05-13-02	42° 27' 43.82"	085° 39' 57.09"	10	54.50	.00	697.8	697.4	692.9	4.5
E3	05-13-02	42° 27' 43.82"	085° 39' 57.23"	20	54.50	.06	697.8	696.4	692.4	4.0
E3	05-13-02	42° 27' 43.81"	085° 39' 57.37"	30	54.50	.03	697.8	697.4	694.2	3.2
E3	05-13-02	42° 27' 43.82"	085° 39' 57.53"	42	54.50	.00	697.8	697.8	695.8	2.0
F1	04-24-02	42° 27' 37.92"	085° 40' 39.06"	0	53.89	.00	696.5	696.5	688.7	7.8
F1	04-24-02	42° 27' 37.88"	085° 40' 38.91"	10	53.89	.00	696.5	695.5	689.5	6.0

Appendix 1. Date, location, water velocity, altitude of surfaces, and total thickness of sediment at transect data points in the Otsego City impoundment on the Kalamazoo River at Otsego, Mich.--Continued

[Vertical data referenced to the North American Vertical Datum of 1988 (NAVD 88). Water surface normalized to a stage of 2.0 ft. Abbreviations: °, degrees; ', minutes; ", seconds; ft, feet; mi, miles; ft/s, feet per second; --, no data. Sediment cores denoted in bold.]

Transect No. (fig. 2a)	Date	Latitude	Longitude	Distance from right edge of water (ft)	River miles from mouth (mi)	Mean velocity (ft/s)	Altitude of water surface (ft)	Altitude of stream-bed (ft)	Altitude of base sediment (ft)	Total thickness of sediment (ft)
F1	04-24-02	42° 27' 37.85"	085° 40' 38.79"	20	53.89	0.00	696.5	695.3	689.5	5.8
F1	04-24-02	42° 27' 37.82"	085° 40' 38.66"	30	53.89	.00	696.5	695.3	688.2	7.1
F1	04-24-02	42° 27' 37.78"	085° 40' 38.53"	40	53.89	.00	696.5	695.5	689.3	6.2
F1	04-24-02	42° 27' 37.74"	085° 40' 38.36"	55	53.89	.00	696.5	696.5	689.1	7.4
F2	03-18-02	42° 27' 38.01"	085° 40' 35.47"	0	53.94	.00	696.8	696.8	691.3	5.5
F2	03-18-02	42° 27' 37.93"	085° 40' 35.41"	10	53.94	1.17	696.8	694.9	692.0	2.9
F2	03-18-02	42° 27' 37.85"	085° 40' 35.36"	20	53.94	1.82	696.8	694.5	691.8	2.7
F2	03-18-02	42° 27' 37.76"	085° 40' 35.30"	30	53.94	2.28	696.8	694.2	691.7	2.5
F2	03-18-02	42° 27' 37.66"	085° 40' 35.25"	40	53.94	2.19	696.8	694.0	691.7	2.3
F2	03-18-02	42° 27' 37.58"	085° 40' 35.19"	50	53.94	2.24	696.8	692.4	691.5	.9
F2	03-18-02	42° 27' 37.48"	085° 40' 35.12"	60	53.94	1.82	696.8	692.4	689.0	3.4
F2	03-18-02	42° 27' 37.40"	085° 40' 35.07"	70	53.94	.00	696.8	696.8	689	7.8
F3	04-24-02	42° 27' 40.65"	085° 40' 30.24"	0	53.99	.00	696.7	696.7	687.7	9.0
F3	04-24-02	42° 27' 40.57"	085° 40' 30.32"	10	53.99	.25	696.7	695.6	687.7	7.9
F3	04-24-02	42° 27' 40.51"	085° 40' 30.37"	17	53.99	.00	696.7	696.7	688.7	8.0
F4	03-18-02	42° 27' 40.42"	085° 40' 26.85"	0	54.05	.00	696.9	696.9	689.9	7.0
F4	03-18-02	42° 27' 40.49"	085° 40' 26.74"	12	54.05	.96	696.9	696.0	690.1	5.9
F4	03-18-02	42° 27' 40.56"	085° 40' 26.67"	22	54.05	1.43	696.9	695.7	690.1	5.6
F4	03-18-02	42° 27' 40.63"	085° 40' 26.57"	32	54.05	1.60	696.9	695.6	690.1	5.5
F4	03-18-02	42° 27' 40.70"	085° 40' 26.48"	42	54.05	2.07	696.9	695.3	691.6	3.7
F4	03-18-02	42° 27' 40.78"	085° 40' 26.40"	52	54.05	2.02	696.9	693.7	690.1	3.6
F4	03-18-02	42° 27' 40.85"	085° 40' 26.30"	62	54.05	2.02	696.9	692.6	691.0	1.6
F4	03-18-02	42° 27' 40.93"	085° 40' 26.21"	72	54.05	.00	696.9	696.9	691.1	5.8
F5	04-24-02	42° 27' 41.42"	085° 40' 26.69"	0	54.04	.00	696.8	696.8	692.8	4.0
F5	04-24-02	42° 27' 41.35"	085° 40' 26.59"	10	54.04	.40	696.8	695.5	690.5	5.0
F5	04-24-02	42° 27' 41.29"	085° 40' 26.50"	20	54.04	.85	696.8	695.7	690.3	5.4
F5	04-24-02	42° 27' 41.22"	085° 40' 26.41"	30	54.04	1.59	696.8	695.4	690.3	5.1
F5	04-24-02	42° 27' 41.16"	085° 40' 26.31"	40	54.04	1.46	696.8	695.2	690.3	4.9
F5	04-24-02	42° 27' 41.09"	085° 40' 26.21"	50	54.04	.98	696.8	694.8	690.3	4.5
F5	04-24-02	42° 27' 41.02"	085° 40' 26.11"	60	54.04	.00	696.8	696.8	691.3	5.5
F6	04-24-02	42° 27' 40.99"	085° 40' 18.65"	0	54.28	.00	696.9	696.9	691.5	5.4
F6	04-24-02	42° 27' 40.94"	085° 40' 18.75"	10	54.28	.71	696.9	695.1	691.5	3.6
F6	04-24-02	42° 27' 40.88"	085° 40' 18.86"	20	54.28	.88	696.9	694.5	691.4	3.1

Appendix 1. Date, location, water velocity, altitude of surfaces, and total thickness of sediment at transect data points in the Otsego City impoundment on the Kalamazoo River at Otsego, Mich.--Continued

[Vertical data referenced to the North American Vertical Datum of 1988 (NAVD 88). Water surface normalized to a stage of 2.0 ft. Abbreviations: °, degrees; ', minutes; ", seconds; ft, feet; mi, miles; ft/s, feet per second; --, no data. Sediment cores denoted in bold.]

Transect No. (fig. 2a)	Date	Latitude	Longitude	Distance from right edge of water (ft)	River miles from mouth (mi)	Mean velocity (ft/s)	Altitude of water surface (ft)	Altitude of stream-bed (ft)	Altitude of base sediment (ft)	Total thickness of sediment (ft)
F6	04-24-02	42° 27' 40.82"	085° 40' 18.96"	30	54.28	0.00	696.9	695.4	692.0	3.4
F6	04-24-02	42° 27' 40.77"	085° 40' 19.06"	40	54.28	.30	696.9	695.4	691.7	3.7
F6	04-24-02	42° 27' 40.71"	085° 40' 19.17"	50	54.28	2.07	696.9	694.9	692.0	2.9
F6	04-24-02	42° 27' 40.66"	085° 40' 19.26"	60	54.28	1.79	696.9	695.0	692.1	2.9
F6	04-24-02	42° 27' 40.61"	085° 40' 19.35"	65	54.28	.00	696.9	696.9	692.0	4.9
F7	03-18-02	42° 27' 41.56"	085° 40' 19.33"	0	54.28	.00	697	697.0	689.5	7.5
F7	03-18-02	42° 27' 41.51"	085° 40' 19.27"	7	54.28	1.43	697	695.9	689.9	6.0
F7	03-18-02	42° 27' 41.45"	085° 40' 19.18"	17	54.28	1.83	697	695.6	689.6	6.0
F7	03-18-02	42° 27' 41.38"	085° 40' 19.09"	27	54.28	1.95	697	695.6	691.4	4.2
F7	03-18-02	42° 27' 41.30"	085° 40' 18.98"	37	54.28	1.63	697	695.6	691.4	4.2
F7	03-18-02	42° 27' 41.24"	085° 40' 18.90"	47	54.28	1.20	697	695.4	691.4	4.0
F7	03-18-02	42° 27' 41.16"	085° 40' 18.79"	57	54.28	1.05	697	695.7	691.7	4.0
F7	03-18-02	42° 27' 41.09"	085° 40' 18.70"	67	54.28	.43	697	695.4	691.9	3.5
F7	03-18-02	42° 27' 41.02"	085° 40' 18.61"	77	54.28	.00	697	697.0	690.8	6.2
F8	04-24-02	42° 27' 39.92"	085° 40' 17.71"	0	54.28	.00	697.2	697.2	691.2	6.0
F8	04-24-02	42° 27' 39.83"	085° 40' 17.75"	10	54.28	1.50	697.2	694.8	691.1	3.7
F8	04-24-02	42° 27' 39.73"	085° 40' 17.79"	20	54.28	2.11	697.2	694.2	692.7	1.5
F8	04-24-02	42° 27' 39.62"	085° 40' 17.83"	30	54.28	.00	697.2	697.2	691.5	5.7
F9	04-24-02	42° 27' 43.16"	085° 40' 23.00"	0	54.29	.00	697	697.0	692.7	4.3
F9	04-24-02	42° 27' 43.11"	085° 40' 22.89"	10	54.29	.99	697	696.1	692.0	4.1
F9	04-24-02	42° 27' 43.05"	085° 40' 22.77"	20	54.29	1.60	697	695.5	692.3	3.2
F9	04-24-02	42° 27' 43.00"	085° 40' 22.66"	30	54.29	1.63	697	695.4	692.0	3.4
F9	04-24-02	42° 27' 42.95"	085° 40' 22.56"	40	54.29	1.21	697	695.3	691.5	3.8
F9	04-24-02	42° 27' 42.92"	085° 40' 22.49"	46	54.29	.00	697	697.0	691.5	5.5
F10	04-24-02	42° 27' 46.60"	085° 40' 20.04"	0	54.30	.00	696.9	696.9	692.1	4.8
F10	04-24-02	42° 27' 46.51"	085° 40' 20.03"	10	54.30	.00	696.9	696.9	692.1	4.8
F10	04-24-02	42° 27' 46.41"	085° 40' 20.02"	20	54.30	.30	696.9	696.4	692.6	3.8
F10	04-24-02	42° 27' 46.30"	085° 40' 20.01"	30	54.30	.85	696.9	695.1	692.1	3.0
F10	04-24-02	42° 27' 46.21"	085° 40' 20.00"	40	54.30	1.15	696.9	694.8	692.2	2.6
F10	04-24-02	42° 27' 46.10"	085° 40' 19.99"	50	54.30	.84	696.9	694.8	692.6	2.2
F10	04-24-02	42° 27' 46.00"	085° 40' 19.98"	60	54.30	.64	696.9	695.1	692.4	2.7
F10	04-24-02	42° 27' 45.90"	085° 40' 19.96"	70	54.30	.00	696.9	696.9	693.0	3.9

Appendix 1. Date, location, water velocity, altitude of surfaces, and total thickness of sediment at transect data points in the Otsego City impoundment on the Kalamazoo River at Otsego, Mich.--Continued

[Vertical data referenced to the North American Vertical Datum of 1988 (NAVD 88). Water surface normalized to a stage of 2.0 ft. Abbreviations: °, degrees; ', minutes; ", seconds; ft, feet; mi, miles; ft/s, feet per second; --, no data. Sediment cores denoted in bold.]

Transect No. (fig. 2a)	Date	Latitude	Longitude	Distance from right edge of water (ft)	River miles from mouth (mi)	Mean velocity (ft/s)	Altitude of water surface (ft)	Altitude of stream-bed (ft)	Altitude of base sediment (ft)	Total thickness of sediment (ft)
F11	03-18-02	42° 27' 45.75"	085° 40' 18.32"	0	54.32	0.00	697.2	697.2	689.2	8.0
F11	03-18-02	42° 27' 45.76"	085° 40' 18.18"	10	54.32	1.17	697.2	695.6	690.6	5.0
F11	03-18-02	42° 27' 45.76"	085° 40' 18.05"	20	54.32	1.69	697.2	696.2	688.8	7.4
F11	03-18-02	42° 27' 45.76"	085° 40' 17.92"	30	54.32	2.16	697.2	696.2	689.1	7.1
F11	03-18-02	42° 27' 45.76"	085° 40' 17.78"	40	54.32	1.97	697.2	695.8	689.4	6.4
F11	03-18-02	42° 27' 45.77"	085° 40' 17.66"	50	54.32	1.50	697.2	696.0	689.6	6.4
F11	03-18-02	42° 27' 45.77"	085° 40' 17.52"	60	54.32	1.10	697.2	695.6	691.1	4.5
F11	03-18-02	42° 27' 45.77"	085° 40' 17.40"	68	54.32	.00	697.2	697.2	690.7	6.5
F12	03-19-02	42° 27' 50.48"	085° 40' 12.32"	0	54.35	.00	697.4	697.4	693.4	4.0
F12	03-19-02	42° 27' 50.39"	085° 40' 12.40"	10	54.35	.03	697.4	695.7	693.7	2.0
F12	03-19-02	42° 27' 50.30"	085° 40' 12.48"	20	54.35	.09	697.4	695.7	693.7	2.0
F12	03-19-02	42° 27' 50.20"	085° 40' 12.55"	30	54.35	.18	697.4	695.9	691.7	4.2
F12	03-19-02	42° 27' 50.13"	085° 40' 12.61"	40	54.35	.63	697.4	696.2	690.9	5.3
F12	03-19-02	42° 27' 50.05"	085° 40' 12.68"	50	54.35	.65	697.4	694.7	690.9	3.8
F12	03-19-02	42° 27' 49.98"	085° 40' 12.73"	60	54.35	1.42	697.4	693.7	690.9	2.8
F12	03-19-02	42° 27' 49.89"	085° 40' 12.80"	70	54.35	1.80	697.4	694.5	691.2	3.3
F12	03-19-02	42° 27' 49.80"	085° 40' 12.87"	80	54.35	1.97	697.4	695.2	691.5	3.7
F12	03-19-02	42° 27' 49.70"	085° 40' 12.95"	90	54.35	1.62	697.4	695.9	691.7	4.2
F12	03-19-02	42° 27' 49.61"	085° 40' 13.02"	100	54.35	1.20	697.4	696.4	691.6	4.8
F12	03-19-02	42° 27' 49.51"	085° 40' 13.11"	114	54.35	.00	697.4	697.4	691.3	6.1
F13	03-19-02	42° 27' 47.69"	085° 40' 08.76"	0	54.40	.00	697.4	697.4	690.4	7.0
F13	03-19-02	42° 27' 47.61"	085° 40' 08.88"	10	54.40	1.01	697.4	696.7	690.7	6.0
F13	03-19-02	42° 27' 47.55"	085° 40' 08.97"	20	54.40	1.03	697.4	697.2	690.2	7.0
F13	03-19-02	42° 27' 47.49"	085° 40' 09.06"	30	54.40	.56	697.4	696.7	690.7	6.0
F13	03-19-02	42° 27' 47.43"	085° 40' 09.16"	40	54.40	.94	697.4	696.3	690.0	6.3
F13	03-19-02	42° 27' 47.36"	085° 40' 09.26"	50	54.40	1.16	697.4	696.2	689.2	7.0
F13	03-19-02	42° 27' 47.29"	085° 40' 09.37"	60	54.40	1.87	697.4	695.7	688.7	7.0
F13	03-19-02	42° 27' 47.24"	085° 40' 09.45"	70	54.40	2.08	697.4	694.7	688.8	5.9
F13	03-19-02	42° 27' 47.16"	085° 40' 09.55"	80	54.40	1.88	697.4	694.5	688.7	5.8
F13	03-19-02	42° 27' 47.11"	085° 40' 09.64"	88	54.40	.00	697.4	697.4	688.6	8.8
G1	10-11-01	42° 27' 49.30"	085° 41' 29.15"	0	53.05	.00	695.8	695.8	686.8	9.0
G1	10-11-01	42° 27' 49.07"	085° 41' 29.31"	25	53.05	.00	695.8	694.3	687.3	7.0
G1	10-11-01	42° 27' 48.85"	085° 41' 29.44"	50	53.05	.00	695.8	694.3	686.8	7.5
G1	10-11-01	42° 27' 48.63"	085° 41' 29.59"	74	53.05	.00	695.8	693.8	685.3	8.5

Appendix 1. Date, location, water velocity, altitude of surfaces, and total thickness of sediment at transect data points in the Otsego City impoundment on the Kalamazoo River at Otsego, Mich.--Continued

[Vertical data referenced to the North American Vertical Datum of 1988 (NAVD 88). Water surface normalized to a stage of 2.0 ft. Abbreviations: °, degrees; ', minutes; ", seconds; ft, feet; mi, miles; ft/s, feet per second; --, no data. Sediment cores denoted in bold.]

Transect No. (fig. 2a)	Date	Latitude	Longitude	Distance from right edge of water (ft)	River miles from mouth (mi)	Mean velocity (ft/s)	Altitude of water surface (ft)	Altitude of stream-bed (ft)	Altitude of base sediment (ft)	Total thickness of sediment (ft)
G1	10-11-01	42° 27' 48.42"	085° 41' 29.72"	98	53.05	0.54	695.8	690.3	684.8	5.5
G1	10-11-01	42° 27' 48.21"	085° 41' 29.85"	122	53.05	1.30	695.8	689.8	684.3	5.5
G1	10-11-01	42° 27' 48.00"	085° 41' 29.99"	146	53.05	1.48	695.8	690.3	684.3	6.0
G1	10-11-01	42° 27' 47.76"	085° 41' 30.13"	170	53.05	1.49	695.8	691.3	685.3	6.0
G1	10-11-01	42° 27' 47.56"	085° 41' 30.26"	194	53.05	1.58	695.8	691.8	687.3	4.5
G1	10-11-01	42° 27' 47.31"	085° 41' 30.42"	218	53.05	1.74	695.8	692.3	686.8	5.5
G1	10-11-01	42° 27' 47.13"	085° 41' 30.53"	242	53.05	1.84	695.8	692.3	684.8	7.5
G1	10-11-01	42° 27' 46.92"	085° 41' 30.68"	266	53.05	1.86	695.8	692.8	689.3	3.5
G1	10-11-01	42° 27' 46.71"	085° 41' 30.81"	290	53.05	1.47	695.8	693.3	687.3	6.0
G1	10-11-01	42° 27' 46.48"	085° 41' 30.95"	314	53.05	1.09	695.8	693.8	690.8	3.0
G1	10-11-01	42° 27' 46.26"	085° 41' 31.09"	338	53.05	.96	695.8	692.8	687.3	5.5
G1	10-11-01	42° 27' 46.03"	085° 41' 31.23"	365	53.05	.00	695.8	693.8	689.8	4.0
G2	10-10-01	42° 27' 46.31"	085° 41' 25.10"	0	53.13	.00	695.8	695.8	686.3	9.5
G2	10-10-01	42° 27' 46.16"	085° 41' 25.22"	17	53.13	1.08	695.8	691.3	685.8	5.5
G2	10-10-01	42° 27' 46.01"	085° 41' 25.31"	34	53.13	1.18	695.8	691.6	686.3	5.3
G2	10-10-01	42° 27' 45.85"	085° 41' 25.42"	51	53.13	1.30	695.8	690.3	687.3	3.0
G2	10-10-01	42° 27' 45.71"	085° 41' 25.51"	68	53.13	1.52	695.8	690.5	687.8	2.7
G2	10-10-01	42° 27' 45.57"	085° 41' 25.62"	85	53.13	1.66	695.8	690.3	687.8	2.5
G2	10-10-01	42° 27' 45.41"	085° 41' 25.72"	102	53.13	1.81	695.8	690.6	687.8	2.8
G2	10-10-01	42° 27' 45.27"	085° 41' 25.82"	119	53.13	1.88	695.8	690.8	687.8	3.0
G2	10-10-01	42° 27' 45.11"	085° 41' 25.93"	136	53.13	1.80	695.8	691.5	687.8	3.7
G2	10-10-01	42° 27' 44.97"	085° 41' 26.03"	153	53.13	1.78	695.8	691.8	689.3	2.5
G2	10-10-01	42° 27' 44.82"	085° 41' 26.13"	170	53.13	1.68	695.8	692.3	684.8	7.5
G2	10-10-01	42° 27' 44.67"	085° 41' 26.24"	187	53.13	1.56	695.8	692.8	685.8	7.0
G2	10-10-01	42° 27' 44.53"	085° 41' 26.33"	204	53.13	1.09	695.8	693.3	684.8	8.5
G2	10-10-01	42° 27' 44.37"	085° 41' 26.45"	221	53.13	.51	695.8	693.8	685.3	8.5
G2	10-10-01	42° 27' 44.22"	085° 41' 26.55"	238	53.13	.42	695.8	693.8	685.3	8.5
G2	10-10-01	42° 27' 44.08"	085° 41' 26.64"	255	53.13	.32	695.8	693.8	687.3	6.5
G2	10-10-01	42° 27' 43.94"	085° 41' 26.74"	270	53.13	.00	695.8	693.8	691.8	2.0
G3	10-10-01	42° 27' 44.12"	085° 41' 20.50"	0	53.19	.00	695.8	695.8	685.8	10.0
G3	10-10-01	42° 27' 43.98"	085° 41' 20.67"	17	53.19	.00	695.8	694.8	687.8	7.0
G3	10-10-01	42° 27' 43.87"	085° 41' 20.84"	34	53.19	.00	695.8	695.8	687.8	8.0
G3	10-10-01	42° 27' 43.76"	085° 41' 20.97"	51	53.19	.95	695.8	693.8	687.8	6.0
G3	10-10-01	42° 27' 43.63"	085° 41' 21.15"	68	53.19	1.05	695.8	693.3	688.3	5.0
G3	10-10-01	42° 27' 43.53"	085° 41' 21.29"	85	53.19	1.05	695.8	693.3	690.8	2.5

Appendix 1. Date, location, water velocity, altitude of surfaces, and total thickness of sediment at transect data points in the Otsego City impoundment on the Kalamazoo River at Otsego, Mich.--Continued

[Vertical data referenced to the North American Vertical Datum of 1988 (NAVD 88). Water surface normalized to a stage of 2.0 ft. Abbreviations: °, degrees; ', minutes; ", seconds; ft, feet; mi, miles; ft/s, feet per second; --, no data. Sediment cores denoted in bold.]

Transect No. (fig. 2a)	Date	Latitude	Longitude	Distance from right edge of water (ft)	River miles from mouth (mi)	Mean velocity (ft/s)	Altitude of water surface (ft)	Altitude of stream-bed (ft)	Altitude of base sediment (ft)	Total thickness of sediment (ft)
G3	10-10-01	42° 27' 43.41"	085° 41' 21.46"	102	53.19	1.09	695.8	691.3	688.8	2.5
G3	10-10-01	42° 27' 43.29"	085° 41' 21.62"	119	53.19	1.28	695.8	690.8	687.8	3.0
G3	10-10-01	42° 27' 43.17"	085° 41' 21.80"	136	53.19	1.70	695.8	690.3	687.8	2.5
G3	10-10-01	42° 27' 43.04"	085° 41' 21.97"	153	53.19	1.85	695.8	689.8	687.3	2.5
G3	10-10-01	42° 27' 42.92"	085° 41' 22.14"	170	53.19	2.09	695.8	689.8	687.8	2.0
G3	10-10-01	42° 27' 42.81"	085° 41' 22.29"	187	53.19	2.11	695.8	689.3	687.8	1.5
G3	10-10-01	42° 27' 42.71"	085° 41' 22.43"	204	53.19	1.90	695.8	689.8	687.8	2.0
G3	10-10-01	42° 27' 42.60"	085° 41' 22.59"	221	53.19	.76	695.8	689.8	688.8	1.0
G3	10-10-01	42° 27' 42.49"	085° 41' 22.75"	238	53.19	.19	695.8	693.3	689.8	3.5
G3	10-10-01	42° 27' 42.36"	085° 41' 22.91"	255	53.19	.00	695.8	694.8	694.8	.0
G4	10-11-01	42° 27' 41.74"	085° 41' 16.73"	0	53.27	.00	695.8	694.8	685.8	9.0
G4	10-11-01	42° 27' 41.57"	085° 41' 16.93"	30	53.27	.00	695.8	694.8	685.3	9.5
G4	10-11-01	42° 27' 41.08"	085° 41' 17.49"	92	53.27	.00	695.8	694.8	687.8	7.0
G4	10-11-01	42° 27' 40.91"	085° 41' 17.67"	113	53.27	1.40	695.8	693.6	687.8	5.8
G4	10-11-01	42° 27' 40.76"	085° 41' 17.84"	134	53.27	1.22	695.8	693.3	688.3	5.0
G4	10-11-01	42° 27' 40.62"	085° 41' 18.00"	155	53.27	1.31	695.8	693.8	686.6	7.2
G4	10-11-01	42° 27' 40.44"	085° 41' 18.20"	176	53.27	1.24	695.8	693.3	687.1	6.2
G4	10-11-01	42° 27' 40.28"	085° 41' 18.41"	197	53.27	1.59	695.8	692.8	687.8	5.0
G4	10-11-01	42° 27' 40.13"	085° 41' 18.56"	218	53.27	1.72	695.8	692.8	687.3	5.5
G4	10-11-01	42° 27' 39.96"	085° 41' 18.75"	239	53.27	1.86	695.8	692.3	687.3	5.0
G4	10-11-01	42° 27' 39.80"	085° 41' 18.93"	260	53.27	1.82	695.8	691.8	687.8	4.0
G4	10-11-01	42° 27' 39.63"	085° 41' 19.13"	281	53.27	1.68	695.8	690.1	688.3	1.8
G4	10-11-01	42° 27' 39.49"	085° 41' 19.28"	302	53.27	1.94	695.8	688.8	688.3	.5
G4	10-11-01	42° 27' 39.31"	085° 41' 19.49"	323	53.27	1.47	695.8	689.3	689.3	.0
G4	10-11-01	42° 27' 39.07"	085° 41' 19.77"	354	53.27	1.18	695.8	693.3	690.8	2.5
G5	10-11-01	42° 27' 37.26"	085° 41' 08.63"	0	53.43	.00	696	695.0	686.5	8.5
G5	10-11-01	42° 27' 37.12"	085° 41' 08.66"	16	53.43	1.30	696	693.5	687.0	6.5
G5	10-11-01	42° 27' 36.95"	085° 41' 08.71"	32	53.43	1.60	696	695.0	688.0	7.0
G5	10-11-01	42° 27' 36.80"	085° 41' 08.75"	48	53.43	1.79	696	694.0	687.5	6.5
G5	10-11-01	42° 27' 36.63"	085° 41' 08.79"	64	53.43	1.92	696	693.7	688.0	5.7
G5	10-11-01	42° 27' 36.48"	085° 41' 08.85"	80	53.43	2.06	696	693.0	687.0	6.0
G5	10-11-01	42° 27' 36.33"	085° 41' 08.88"	96	53.43	2.08	696	692.3	687.0	5.3
G5	10-11-01	42° 27' 36.18"	085° 41' 08.93"	112	53.43	1.82	696	690.7	686.0	4.7
G5	10-11-01	42° 27' 36.01"	085° 41' 08.98"	128	53.43	2.04	696	690.0	686.0	4.0
G5	10-11-01	42° 27' 35.87"	085° 41' 09.01"	144	53.43	2.36	696	690.0	688.0	2.0

Appendix 1. Date, location, water velocity, altitude of surfaces, and total thickness of sediment at transect data points in the Otsego City impoundment on the Kalamazoo River at Otsego, Mich.--Continued

[Vertical data referenced to the North American Vertical Datum of 1988 (NAVD 88). Water surface normalized to a stage of 2.0 ft. Abbreviations: °, degrees; ', minutes; ", seconds; ft, feet; mi, miles; ft/s, feet per second; --, no data. Sediment cores denoted in bold.]

Transect No. (fig. 2a)	Date	Latitude	Longitude	Distance from right edge of water (ft)	River miles from mouth (mi)	Mean velocity (ft/s)	Altitude of water surface (ft)	Altitude of stream-bed (ft)	Altitude of base sediment (ft)	Total thickness of sediment (ft)
G5	10-11-01	42° 27' 35.70"	085° 41' 09.05"	160	53.43	1.70	696	691.0	686.0	5.0
G5	10-11-01	42° 27' 35.56"	085° 41' 09.10"	176	53.43	2.42	696	692.0	686.0	6.0
G5	10-11-01	42° 27' 35.39"	085° 41' 09.14"	192	53.43	1.30	696	692.3	685.5	6.8
G5	10-11-01	42° 27' 35.19"	085° 41' 09.20"	215	53.43	.32	696	694.1	685.0	9.1
G6	10-12-01	42° 27' 34.44"	085° 40' 59.04"	0	53.58	.00	696.4	695.7	691.7	4.0
G6	10-12-01	42° 27' 34.26"	085° 40' 59.06"	19	53.58	1.13	696.4	694.7	690.7	4.0
G6	10-12-01	42° 27' 34.07"	085° 40' 59.11"	38	53.58	1.71	696.4	694.7	691.2	3.5
G6	10-12-01	42° 27' 33.88"	085° 40' 59.15"	57	53.58	2.21	696.4	695.2	691.7	3.5
G6	10-12-01	42° 27' 33.71"	085° 40' 59.17"	76	53.58	2.13	696.4	694.9	691.7	3.2
G6	10-12-01	42° 27' 33.50"	085° 40' 59.21"	95	53.58	2.01	696.4	694.9	691.2	3.7
G6	10-12-01	42° 27' 33.32"	085° 40' 59.24"	114	53.58	1.67	696.4	694.9	691.7	3.2
G6	10-12-01	42° 27' 33.13"	085° 40' 59.27"	133	53.58	1.49	696.4	694.5	691.7	2.8
G6	10-12-01	42° 27' 32.96"	085° 40' 59.30"	152	53.58	1.73	696.4	694.2	691.5	2.7
G6	10-12-01	42° 27' 32.76"	085° 40' 59.33"	171	53.58	1.42	696.4	693.7	691.7	2.0
G6	10-12-01	42° 27' 32.57"	085° 40' 59.36"	190	53.58	1.90	696.4	692.2	691.0	1.2
G6	10-12-01	42° 27' 32.38"	085° 40' 59.38"	209	53.58	2.38	696.4	690.7	690.7	.0
G6	10-12-01	42° 27' 32.21"	085° 40' 59.42"	228	53.58	2.69	696.4	692.2	690.7	1.5
G6	10-12-01	42° 27' 32.02"	085° 40' 59.44"	247	53.58	2.15	696.4	693.4	691.0	2.4
G6	10-12-01	42° 27' 31.84"	085° 40' 59.48"	265	53.58	.00	696.4	695.2	689.7	5.5
G7	10-12-01	42° 27' 34.92"	085° 40' 49.26"	0	53.73	.67	696.4	695.9	691.2	4.7
G7	10-12-01	42° 27' 34.74"	085° 40' 49.20"	17	53.73	1.28	696.4	694.7	691.2	3.5
G7	10-12-01	42° 27' 34.57"	085° 40' 49.14"	34	53.73	1.89	696.4	693.7	689.7	4.0
G7	10-12-01	42° 27' 34.41"	085° 40' 49.09"	51	53.73	2.13	696.4	692.7	690.7	2.0
G7	10-12-01	42° 27' 34.26"	085° 40' 49.04"	68	53.73	2.62	696.4	692.5	689.5	3.0
G7	10-12-01	42° 27' 34.10"	085° 40' 48.99"	85	53.73	2.72	696.4	692.7	689.7	3.0
G7	10-12-01	42° 27' 33.94"	085° 40' 48.93"	102	53.73	2.64	696.4	692.7	689.5	3.2
G7	10-12-01	42° 27' 33.77"	085° 40' 48.87"	119	53.73	2.18	696.4	692.4	691.0	1.4
G7	10-12-01	42° 27' 33.61"	085° 40' 48.82"	136	53.73	1.13	696.4	693.7	691.2	2.5
G7	10-12-01	42° 27' 33.44"	085° 40' 48.77"	153	53.73	1.76	696.4	694.2	691.5	2.7
G7	10-12-01	42° 27' 33.27"	085° 40' 48.72"	170	53.73	1.91	696.4	695.0	689.7	5.3
G7	10-12-01	42° 27' 33.12"	085° 40' 48.66"	187	53.73	1.67	696.4	695.2	690.2	5.0
G7	10-12-01	42° 27' 32.97"	085° 40' 48.62"	204	53.73	1.68	696.4	695.2	690.2	5.0
G7	10-12-01	42° 27' 32.78"	085° 40' 48.55"	221	53.73	1.79	696.4	695.2	689.2	6.0
G7	10-12-01	42° 27' 32.57"	085° 40' 48.49"	245	53.73	.20	696.4	694.7	689.2	5.5

Appendix 1. Date, location, water velocity, altitude of surfaces, and total thickness of sediment at transect data points in the Otsego City impoundment on the Kalamazoo River at Otsego, Mich.--Continued

[Vertical data referenced to the North American Vertical Datum of 1988 (NAVD 88). Water surface normalized to a stage of 2.0 ft. Abbreviations: °, degrees; ', minutes; ", seconds; ft, feet; mi, miles; ft/s, feet per second; --, no data. Sediment cores denoted in bold.]

Transect No. (fig. 2a)	Date	Latitude	Longitude	Distance from right edge of water (ft)	River miles from mouth (mi)	Mean velocity (ft/s)	Altitude of water surface (ft)	Altitude of stream-bed (ft)	Altitude of base sediment (ft)	Total thickness of sediment (ft)
G8	11-05-01	42° 27' 37.60"	085° 40' 38.33"	0	53.89	0.00	696.7	696.7	689.7	7.0
G8	11-05-01	42° 27' 37.49"	085° 40' 38.33"	14	53.89	1.91	696.7	693.9	688.6	5.3
G8	11-05-01	42° 27' 37.34"	085° 40' 38.33"	28	53.89	1.86	696.7	693.6	689.1	4.5
G8	11-05-01	42° 27' 37.22"	085° 40' 38.32"	42	53.89	2.34	696.7	693.9	690.1	3.8
G8	11-05-01	42° 27' 37.09"	085° 40' 38.32"	56	53.89	1.99	696.7	693.5	689.1	4.4
G8	11-05-01	42° 27' 36.95"	085° 40' 38.32"	70	53.89	2.29	696.7	693.5	688.6	4.9
G8	11-05-01	42° 27' 36.80"	085° 40' 38.32"	84	53.89	2.46	696.7	693.6	688.6	5.0
G8	11-05-01	42° 27' 36.67"	085° 40' 38.31"	98	53.89	2.34	696.7	693.4	687.6	5.8
G8	11-05-01	42° 27' 36.52"	085° 40' 38.31"	112	53.89	2.54	696.7	693.1	687.6	5.5
G8	11-05-01	42° 27' 36.38"	085° 40' 38.31"	126	53.89	2.86	696.7	693.3	690.1	3.2
G8	11-05-01	42° 27' 36.24"	085° 40' 38.30"	140	53.89	2.97	696.7	692.6	688.1	4.5
G8	11-05-01	42° 27' 36.11"	085° 40' 38.30"	154	53.89	3.28	696.7	693.5	690.6	2.9
G8	11-05-01	42° 27' 35.96"	085° 40' 38.30"	168	53.89	2.48	696.7	694.3	691.1	3.2
G8	11-05-01	42° 27' 35.83"	085° 40' 38.30"	182	53.89	.50	696.7	695.1	692.1	3.0
G8	11-05-01	42° 27' 35.70"	085° 40' 38.29"	195	53.89	.00	696.7	696.7	688.7	8.0
G9	11-06-01	42° 27' 36.72"	085° 40' 29.17"	0	54.02	.00	696.9	696.9	692.9	4.0
G9	11-06-01	42° 27' 36.61"	085° 40' 29.21"	13	54.02	1.08	696.9	694.7	693.3	1.4
G9	11-06-01	42° 27' 36.48"	085° 40' 29.26"	26	54.02	1.20	696.9	695.0	693.3	1.7
G9	11-06-01	42° 27' 36.35"	085° 40' 29.30"	39	54.02	1.38	696.9	695.1	693.3	1.8
G9	11-06-01	42° 27' 36.24"	085° 40' 29.34"	52	54.02	2.02	696.9	694.2	692.3	1.9
G9	11-06-01	42° 27' 36.11"	085° 40' 29.38"	65	54.02	2.59	696.9	693.6	689.3	4.3
G9	11-06-01	42° 27' 35.99"	085° 40' 29.41"	78	54.02	2.66	696.9	693.8	690.3	3.5
G9	11-06-01	42° 27' 35.87"	085° 40' 29.45"	91	54.02	2.64	696.9	694.0	689.3	4.7
G9	11-06-01	42° 27' 35.73"	085° 40' 29.50"	104	54.02	2.72	696.9	694.3	688.8	5.5
G9	11-06-01	42° 27' 35.60"	085° 40' 29.54"	117	54.02	2.71	696.9	694.6	690.8	3.8
G9	11-06-01	42° 27' 35.47"	085° 40' 29.58"	130	54.02	2.57	696.9	694.3	690.8	3.5
G9	11-06-01	42° 27' 35.35"	085° 40' 29.61"	143	54.02	2.62	696.9	694.5	688.3	6.2
G9	11-06-01	42° 27' 35.23"	085° 40' 29.65"	156	54.02	2.90	696.9	694.8	686.8	8.0
G9	11-06-01	42° 27' 35.10"	085° 40' 29.69"	169	54.02	2.66	696.9	695.3	686.3	9.0
G9	11-06-01	42° 27' 34.97"	085° 40' 29.74"	185	54.02	.00	696.9	696.9	687.4	9.5
G10	11-06-01	42° 27' 38.22"	085° 40' 17.41"	0	54.23	.00	697.1	697.1	693.6	3.5
G10	11-06-01	42° 27' 38.21"	085° 40' 17.28"	10	54.23	.38	697.1	694.0	691.5	2.5
G10	11-06-01	42° 27' 38.19"	085° 40' 17.14"	20	54.23	3.04	697.1	691.3	690.5	.8
G10	11-06-01	42° 27' 38.17"	085° 40' 17.04"	30	54.23	4.15	697.1	689.9	689.9	.0
G10	11-06-01	42° 27' 38.14"	085° 40' 16.88"	40	54.23	3.77	697.1	689.8	688.8	1.0

Appendix 1. Date, location, water velocity, altitude of surfaces, and total thickness of sediment at transect data points in the Otsego City impoundment on the Kalamazoo River at Otsego, Mich.--Continued

[Vertical data referenced to the North American Vertical Datum of 1988 (NAVD 88). Water surface normalized to a stage of 2.0 ft. Abbreviations: °, degrees; ', minutes; ", seconds; ft, feet; mi, miles; ft/s, feet per second; --, no data. Sediment cores denoted in bold.]

Transect No. (fig. 2a)	Date	Latitude	Longitude	Distance from right edge of water (ft)	River miles from mouth (mi)	Mean velocity (ft/s)	Altitude of water surface (ft)	Altitude of stream-bed (ft)	Altitude of base sediment (ft)	Total thickness of sediment (ft)
G10	11-06-01	42° 27' 38.13"	085° 40' 16.77"	50	54.23	3.06	697.1	690.0	687.5	2.5
G10	11-06-01	42° 27' 38.11"	085° 40' 16.65"	60	54.23	2.46	697.1	688.5	687.5	1.0
G10	11-06-01	42° 27' 38.09"	085° 40' 16.51"	70	54.23	1.46	697.1	690.3	688.5	1.8
G10	11-06-01	42° 27' 38.07"	085° 40' 16.38"	80	54.23	1.40	697.1	691.5	688.5	3.0
G10	11-06-01	42° 27' 38.05"	085° 40' 16.25"	90	54.23	.46	697.1	694.0	689.0	5.0
G10	11-06-01	42° 27' 38.02"	085° 40' 16.07"	103	54.23	.00	697.1	697.1	689.6	7.5
H1	05-14-02	42° 27' 36.78"	085° 41' 05.24"	0	53.48	.00	696.2	696.2	691.2	5.0
H1	05-14-02	42° 27' 36.78"	085° 41' 05.11"	10	53.48	1.90	696.2	691.5	686.7	4.8
H1	05-14-02	42° 27' 36.77"	085° 41' 04.97"	20	53.48	2.43	696.2	692.1	686.4	5.7
H1	05-14-02	42° 27' 36.76"	085° 41' 04.81"	30	53.48	1.25	696.2	692.5	685.9	6.6
H1	05-14-02	42° 27' 36.75"	085° 41' 04.68"	40	53.48	.45	696.2	695.4	686.7	8.7
H1	05-14-02	42° 27' 36.74"	085° 41' 04.53"	50	53.48	.34	696.2	695.5	687.4	8.1
H1	05-14-02	42° 27' 36.74"	085° 41' 04.37"	65	53.48	.00	696.2	695.7	687.7	8.0
H2	05-14-02	42° 27' 39.28"	085° 40' 59.46"	0	53.52	.00	696.3	696.3	685.1	11.2
H2	05-14-02	42° 27' 39.18"	085° 40' 59.49"	10	53.52	1.09	696.3	694.3	685.5	8.8
H2	05-14-02	42° 27' 39.08"	085° 40' 59.50"	20	53.52	1.70	696.3	694.4	685.8	8.6
H2	05-14-02	42° 27' 38.99"	085° 40' 59.51"	30	53.52	2.04	696.3	694.4	685.8	8.6
H2	05-14-02	42° 27' 38.88"	085° 40' 59.54"	40	53.52	1.88	696.3	694.4	685.5	8.9
H2	05-14-02	42° 27' 38.78"	085° 40' 59.56"	50	53.52	1.68	696.3	694.5	685.9	8.6
H2	05-14-02	42° 27' 38.68"	085° 40' 59.56"	60	53.52	1.42	696.3	694.6	686.2	8.4
H2	05-14-02	42° 27' 38.53"	085° 40' 59.58"	75	53.52	.00	696.3	696.3	686.5	9.8
H3	05-14-02	42° 27' 39.29"	085° 40' 50.83"	0	53.75	.00	696.4	696.4	688.9	7.5
H3	05-14-02	42° 27' 39.22"	085° 40' 50.75"	10	53.75	.50	696.4	695.6	687.7	7.9
H3	05-14-02	42° 27' 39.14"	085° 40' 50.64"	20	53.75	1.98	696.4	694.7	687.5	7.2
H3	05-14-02	42° 27' 39.07"	085° 40' 50.55"	30	53.75	2.20	696.4	694.5	687.7	6.8
H3	05-14-02	42° 27' 39.01"	085° 40' 50.45"	40	53.75	2.38	696.4	694.5	687.7	6.8
H3	05-14-02	42° 27' 38.93"	085° 40' 50.36"	50	53.75	2.32	696.4	694.7	688.0	6.7
H3	05-14-02	42° 27' 38.87"	085° 40' 50.25"	60	53.75	.00	696.4	696.4	687.9	8.5
H4	05-14-02	42° 27' 38.28"	085° 40' 51.34"	0	53.73	.00	696.4	696.4	689.0	7.4
H4	05-14-02	42° 27' 38.25"	085° 40' 51.46"	10	53.73	.14	696.4	693.5	689.5	4.0
H4	05-14-02	42° 27' 38.21"	085° 40' 51.60"	20	53.73	.19	696.4	692.9	689.1	3.8
H4	05-14-02	42° 27' 38.18"	085° 40' 51.71"	30	53.73	.19	696.4	695.0	689.0	6.0
H4	05-14-02	42° 27' 38.15"	085° 40' 51.82"	38	53.73	.06	696.4	694.0	689.5	4.5

Appendix 1. Date, location, water velocity, altitude of surfaces, and total thickness of sediment at transect data points in the Otsego City impoundment on the Kalamazoo River at Otsego, Mich.--Continued

[Vertical data referenced to the North American Vertical Datum of 1988 (NAVD 88). Water surface normalized to a stage of 2.0 ft. Abbreviations: °, degrees; ', minutes; ", seconds; ft, feet; mi, miles; ft/s, feet per second; --, no data. Sediment cores denoted in bold.]

Transect No. (fig. 2a)	Date	Latitude	Longitude	Distance from right edge of water (ft)	River miles from mouth (mi)	Mean velocity (ft/s)	Altitude of water surface (ft)	Altitude of stream-bed (ft)	Altitude of base sediment (ft)	Total thickness of sediment (ft)
H5	05-14-02	42° 27' 35.01"	085° 40' 49.42"	0	53.73	0.00	696.4	696.4	690.4	6.0
H5	05-14-02	42° 27' 34.95"	085° 40' 49.54"	10	53.73	.18	696.4	695.0	690.5	4.5
H5	05-14-02	42° 27' 34.90"	085° 40' 49.64"	20	53.73	.21	696.4	694.4	691.5	2.9
H5	05-14-02	42° 27' 34.85"	085° 40' 49.75"	30	53.73	.23	696.4	694.0	690.6	3.4
H5	05-14-02	42° 27' 34.79"	085° 40' 49.87"	40	53.73	.22	696.4	694.3	689.5	4.8
H5	05-14-02	42° 27' 34.73"	085° 40' 49.97"	50	53.73	.37	696.4	694.0	689.3	4.7
H5	05-14-02	42° 27' 34.69"	085° 40' 50.04"	57	53.73	.00	696.4	696.4	688.6	7.8
I1	11-07-01	42° 27' 34.81"	085° 40' 29.42"	0	54.04	.00	696.9	696.9	687.9	9.0
I1	11-07-01	42° 27' 34.74"	085° 40' 29.24"	11	54.04	.97	696.9	694.8	687.3	7.5
I1	11-07-01	42° 27' 34.70"	085° 40' 29.06"	22	54.04	1.87	696.9	695.5	688.3	7.2
I1	11-07-01	42° 27' 34.67"	085° 40' 28.96"	33	54.04	1.85	696.9	695.8	688.3	7.5
I1	11-07-01	42° 27' 34.63"	085° 40' 28.81"	44	54.04	1.08	696.9	696.3	689.3	7.0
I1	11-07-01	42° 27' 34.49"	085° 40' 28.38"	88	54.04	.00	696.9	692.3	690.8	1.5
I1	11-07-01	42° 27' 34.45"	085° 40' 28.24"	99	54.04	1.73	696.9	694.3	690.3	4.0
I1	11-07-01	42° 27' 34.42"	085° 40' 28.09"	110	54.04	2.36	696.9	695.8	693.3	2.5
I1	11-07-01	42° 27' 34.38"	085° 40' 27.95"	121	54.04	2.29	696.9	695.3	693.3	2.0
I1	11-07-01	42° 27' 34.34"	085° 40' 27.80"	132	54.04	2.18	696.9	695.1	693.3	1.8
I1	11-07-01	42° 27' 34.31"	085° 40' 27.66"	143	54.04	1.50	696.9	695.3	692.8	2.5
I1	11-07-01	42° 27' 34.24"	085° 40' 27.44"	161	54.04	.00	696.9	696.9	693.4	3.5
I2	05-21-02	42° 27' 31.00"	085° 40' 29.28"	0	54.04	.00	696.9	696.9	689.8	7.1
I2	05-21-02	42° 27' 31.00"	085° 40' 29.46"	10	54.04	.03	696.9	696.2	690.8	5.4
I2	05-21-02	42° 27' 31.00"	085° 40' 29.57"	20	54.04	.08	696.9	695.8	692.3	3.5
I2	05-21-02	42° 27' 31.00"	085° 40' 29.71"	30	54.04	.02	696.9	695.9	690.2	5.7
I2	05-21-02	42° 27' 31.03"	085° 40' 29.86"	40	54.04	.00	696.9	696.9	690.0	6.9
I3	05-20-02	42° 27' 32.18"	085° 40' 30.94"	0	54.03	.00	696.9	696.9	690.4	6.5
I3	05-20-02	42° 27' 32.11"	085° 40' 30.86"	10	54.03	.36	696.9	695.5	691.0	4.5
I3	05-20-02	42° 27' 32.00"	085° 40' 30.79"	20	54.03	.49	696.9	694.7	690.0	4.7
I3	05-20-02	42° 27' 31.93"	085° 40' 30.72"	30	54.03	1.23	696.9	694.6	690.5	4.1
I3	05-20-02	42° 27' 31.86"	085° 40' 30.65"	40	54.03	.71	696.9	694.5	689.9	4.6
I3	05-20-02	42° 27' 31.75"	085° 40' 30.58"	50	54.03	1.00	696.9	695.1	689.8	5.3
I3	05-20-02	42° 27' 31.72"	085° 40' 30.50"	60	54.03	1.14	696.9	694.2	689.6	4.6
I3	05-20-02	42° 27' 31.61"	085° 40' 30.43"	70	54.03	1.20	696.9	693.6	688.9	4.7
I3	05-20-02	42° 27' 31.54"	085° 40' 30.32"	80	54.03	1.31	696.9	694.5	691.0	3.5
I3	05-20-02	42° 27' 31.46"	085° 40' 30.25"	90	54.03	.91	696.9	695.2	691.9	3.3

Appendix 1. Date, location, water velocity, altitude of surfaces, and total thickness of sediment at transect data points in the Otsego City impoundment on the Kalamazoo River at Otsego, Mich.--Continued

[Vertical data referenced to the North American Vertical Datum of 1988 (NAVD 88). Water surface normalized to a stage of 2.0 ft. Abbreviations: °, degrees; ', minutes; ", seconds; ft, feet; mi, miles; ft/s, feet per second; --, no data. Sediment cores denoted in bold.]

Transect No. (fig. 2a)	Date	Latitude	Longitude	Distance from right edge of water (ft)	River miles from mouth (mi)	Mean velocity (ft/s)	Altitude of water surface (ft)	Altitude of stream-bed (ft)	Altitude of base sediment (ft)	Total thickness of sediment (ft)
I3	05-20-02	42° 27' 31.36"	085° 40' 30.18"	100	54.03	0.95	696.9	694.5	692.3	2.2
I3	05-20-02	42° 27' 31.28"	085° 40' 30.11"	110	54.03	1.07	696.9	695.0	692.0	3.0
I3	05-20-02	42° 27' 31.21"	085° 40' 30.00"	120	54.03	.63	696.9	695.2	692.0	3.2
I3	05-20-02	42° 27' 31.10"	085° 40' 29.93"	130	54.03	.25	696.9	695.7	692.3	3.4
I3	05-20-02	42° 27' 31.07"	085° 40' 29.86"	140	54.03	.00	696.9	696.9	690.5	6.4
I4	05-21-02	42° 27' 32.36"	085° 40' 34.28"	0	53.96	.00	696.8	696.8	692.3	4.5
I4	05-21-02	42° 27' 32.29"	085° 40' 34.18"	10	53.96	1.24	696.8	695.0	692.2	2.8
I4	05-21-02	42° 27' 32.22"	085° 40' 34.07"	20	53.96	.43	696.8	696.3	693.3	3.0
I4	05-21-02	42° 27' 32.15"	085° 40' 33.92"	35	53.96	.00	696.8	696.8	693.2	3.6
I5	05-20-02	42° 27' 33.12"	085° 40' 33.53"	0	53.97	.00	696.8	696.8	692.7	4.1
I5	05-20-02	42° 27' 33.05"	085° 40' 33.60"	10	53.97	.44	696.8	696.2	693.4	2.8
I5	05-20-02	42° 27' 32.98"	085° 40' 33.71"	20	53.97	1.08	696.8	695.4	693.7	1.7
I5	05-20-02	42° 27' 32.90"	085° 40' 33.78"	30	53.97	1.47	696.8	694.8	694.5	.3
I5	05-20-02	42° 27' 32.80"	085° 40' 33.85"	40	53.97	1.69	696.8	694.7	692.9	1.8
I5	05-20-02	42° 27' 32.76"	085° 40' 33.92"	50	53.97	1.79	696.8	695.2	692.1	3.1
I5	05-20-02	42° 27' 32.65"	085° 40' 34.03"	60	53.97	1.96	696.8	695.1	692.8	2.3
I5	05-20-02	42° 27' 32.58"	085° 40' 34.10"	70	53.97	1.97	696.8	695.7	691.3	4.4
I5	05-20-02	42° 27' 32.51"	085° 40' 34.18"	80	53.97	1.38	696.8	696.1	693.3	2.8
I5	05-20-02	42° 27' 32.40"	085° 40' 34.28"	95	53.97	.00	696.8	696.8	692.6	4.2
I6	05-21-02	42° 27' 31.14"	085° 40' 39.14"	0	53.87	.00	696.7	696.7	690.7	6.0
I6	05-21-02	42° 27' 31.10"	085° 40' 39.00"	10	53.87	.14	696.7	695.6	692.0	3.6
I6	05-21-02	42° 27' 31.07"	085° 40' 38.86"	20	53.87	1.97	696.7	694.3	691.7	2.6
I6	05-21-02	42° 27' 31.07"	085° 40' 38.75"	30	53.87	1.63	696.7	695.2	691.6	3.6
I6	05-21-02	42° 27' 31.00"	085° 40' 38.60"	40	53.87	1.81	696.7	695.8	692.0	3.8
I6	05-21-02	42° 27' 31.00"	085° 40' 38.50"	50	53.87	1.38	696.7	696.1	692.1	4.0
I6	05-21-02	42° 27' 30.96"	085° 40' 38.35"	60	53.87	.00	696.7	696.7	690.7	6.0
I7	05-20-02	42° 27' 31.86"	085° 40' 38.89"	0	53.86	.00	696.7	696.7	691.5	5.2
I7	05-20-02	42° 27' 31.75"	085° 40' 38.93"	10	53.86	.91	696.7	695.1	694.1	1.0
I7	05-20-02	42° 27' 31.64"	085° 40' 38.96"	20	53.86	1.57	696.7	695.1	693.8	1.3
I7	05-20-02	42° 27' 31.57"	085° 40' 39.00"	30	53.86	1.82	696.7	695.4	694.8	.6
I7	05-20-02	42° 27' 31.46"	085° 40' 39.04"	40	53.86	1.63	696.7	695.8	694.8	1.0
I7	05-20-02	42° 27' 31.39"	085° 40' 39.04"	50	53.86	.90	696.7	695.7	692.3	3.4
I7	05-20-02	42° 27' 31.28"	085° 40' 39.04"	60	53.86	.00	696.7	696.5	696.3	.2
I7	05-20-02	42° 27' 31.18"	085° 40' 39.07"	70	53.86	.00	696.7	696.7	690.5	6.2

Appendix 1. Date, location, water velocity, altitude of surfaces, and total thickness of sediment at transect data points in the Otsego City impoundment on the Kalamazoo River at Otsego, Mich.--Continued

[Vertical data referenced to the North American Vertical Datum of 1988 (NAVD 88). Water surface normalized to a stage of 2.0 ft. Abbreviations: °, degrees; ', minutes; ", seconds; ft, feet; mi, miles; ft/s, feet per second; --, no data. Sediment cores denoted in bold.]

Transect No. (fig. 2a)	Date	Latitude	Longitude	Distance from right edge of water (ft)	River miles from mouth (mi)	Mean velocity (ft/s)	Altitude of water surface (ft)	Altitude of stream-bed (ft)	Altitude of base sediment (ft)	Total thickness of sediment (ft)
18	05-21-02	42° 27' 29.77"	085° 40' 50.66"	0	53.69	0.00	696.5	696.4	688.4	8.0
18	05-21-02	42° 27' 29.74"	085° 40' 50.81"	10	53.69	.07	696.5	695.5	688.1	7.4
18	05-21-02	42° 27' 29.74"	085° 40' 50.92"	20	53.69	.20	696.5	695.3	688.2	7.1
18	05-21-02	42° 27' 29.70"	085° 40' 51.06"	30	53.69	.75	696.5	694.7	689.1	5.6
18	05-21-02	42° 27' 29.70"	085° 40' 51.20"	40	53.69	.76	696.5	694.8	688.9	5.9
18	05-21-02	42° 27' 29.66"	085° 40' 51.31"	50	53.69	.89	696.5	694.5	688.2	6.3
18	05-21-02	42° 27' 29.66"	085° 40' 51.46"	60	53.69	.86	696.5	694.4	688.9	5.5
18	05-21-02	42° 27' 29.63"	085° 40' 51.56"	70	53.69	.79	696.5	694.5	689.0	5.5
18	05-21-02	42° 27' 29.63"	085° 40' 51.71"	80	53.69	.65	696.5	694.1	689.3	4.8
18	05-21-02	42° 27' 29.59"	085° 40' 51.85"	90	53.69	.10	696.5	695.1	690.4	4.7
18	05-21-02	42° 27' 29.56"	085° 40' 52.00"	103	53.69	.00	696.5	696.5	691.5	5.0
19	05-20-02	42° 27' 31.10"	085° 40' 50.41"	0	53.69	.00	696.5	696.1	687.5	8.6
19	05-20-02	42° 27' 31.00"	085° 40' 50.41"	10	53.69	.16	696.5	695.6	688.6	7.0
19	05-20-02	42° 27' 30.89"	085° 40' 50.41"	20	53.69	.43	696.5	696.0	687.0	9.0
19	05-20-02	42° 27' 30.82"	085° 40' 50.41"	30	53.69	1.11	696.5	695.9	689.1	6.8
19	05-20-02	42° 27' 30.71"	085° 40' 50.45"	40	53.69	1.36	696.5	695.6	688.5	7.1
19	05-20-02	42° 27' 30.64"	085° 40' 50.45"	50	53.69	1.36	696.5	695.5	688.1	7.4
19	05-20-02	42° 27' 30.53"	085° 40' 50.48"	60	53.69	1.35	696.5	695.4	689.2	6.2
19	05-20-02	42° 27' 30.42"	085° 40' 50.45"	70	53.69	1.17	696.5	695.2	688.9	6.3
19	05-20-02	42° 27' 30.35"	085° 40' 50.48"	80	53.69	.72	696.5	695.0	688.4	6.6
19	05-20-02	42° 27' 30.24"	085° 40' 50.48"	90	53.69	.19	696.5	695.0	688.1	6.9
19	05-20-02	42° 27' 30.13"	085° 40' 50.48"	100	53.69	.08	696.5	695.2	688.1	7.1
19	05-20-02	42° 27' 29.95"	085° 40' 50.48"	115	53.69	.00	696.5	696.1	687.1	9.0
I10	11-07-01	42° 27' 31.57"	085° 40' 51.78"	0	53.66	--	696.4	696.4	686.4	10.0
I10	11-07-01	42° 27' 31.54"	085° 40' 52.07"	26	53.66	--	696.4	693.8	687.3	6.5
I10	11-07-01	42° 27' 31.50"	085° 40' 52.43"	52	53.66	--	696.4	693.8	687.3	6.5
I10	11-07-01	42° 27' 31.46"	085° 40' 52.79"	78	53.66	--	696.4	693.8	686.8	7.0
I10	11-07-01	42° 27' 31.43"	085° 40' 53.08"	104	53.66	--	696.4	694.3	686.3	8.0
I10	11-07-01	42° 27' 31.39"	085° 40' 53.44"	130	53.66	--	696.4	694.3	685.8	8.5
I10	11-07-01	42° 27' 31.36"	085° 40' 53.76"	156	53.66	--	696.4	694.8	686.3	8.5
I10	11-07-01	42° 27' 31.32"	085° 40' 54.08"	182	53.66	--	696.4	694.3	690.3	4.0
I10	11-07-01	42° 27' 31.28"	085° 40' 54.44"	208	53.66	--	696.4	694.3	691.3	3.0
I10	11-07-01	42° 27' 31.25"	085° 40' 54.77"	234	53.66	--	696.4	694.3	691.3	3.0
I10	11-07-01	42° 27' 31.21"	085° 40' 55.13"	260	53.66	--	696.4	694.3	690.8	3.5
I10	11-07-01	42° 27' 31.18"	085° 40' 55.49"	286	53.66	--	696.4	694.3	689.3	5.0

Appendix 1. Date, location, water velocity, altitude of surfaces, and total thickness of sediment at transect data points in the Otsego City impoundment on the Kalamazoo River at Otsego, Mich.--Continued

[Vertical data referenced to the North American Vertical Datum of 1988 (NAVD 88). Water surface normalized to a stage of 2.0 ft. Abbreviations: °, degrees; ', minutes; ", seconds; ft, feet; mi, miles; ft/s, feet per second; --, no data. Sediment cores denoted in bold.]

Transect No. (fig. 2a)	Date	Latitude	Longitude	Distance from right edge of water (ft)	River miles from mouth (mi)	Mean velocity (ft/s)	Altitude of water surface (ft)	Altitude of stream-bed (ft)	Altitude of base sediment (ft)	Total thickness of sediment (ft)
I10	11-07-01	42° 27' 31.14"	085° 40' 55.81"	312	53.66	--	696.4	693.8	689.3	4.5
I10	11-07-01	42° 27' 31.10"	085° 40' 56.17"	338	53.66	--	696.4	690.8	689.3	1.5
I10	11-07-01	42° 27' 31.03"	085° 40' 56.75"	370	53.66	--	696.4	696.4	688.9	7.5
I11	05-21-02	42° 27' 29.74"	085° 40' 54.08"	0	53.65	0.00	696.5	696.5	688.7	7.8
I11	05-21-02	42° 27' 29.66"	085° 40' 54.19"	10	53.65	.28	696.5	695.7	690.1	5.6
I11	05-21-02	42° 27' 29.66"	085° 40' 54.30"	20	53.65	.53	696.5	694.6	689.1	5.5
I11	05-21-02	42° 27' 29.63"	085° 40' 54.44"	30	53.65	.74	696.5	695.0	688.6	6.4
I11	05-21-02	42° 27' 29.56"	085° 40' 54.55"	40	53.65	.64	696.5	694.6	689.4	5.2
I11	05-21-02	42° 27' 29.52"	085° 40' 54.66"	50	53.65	.00	696.5	695.9	687.9	8.0
I11	05-21-02	42° 27' 29.48"	085° 40' 54.77"	60	53.65	.00	696.5	695.5	688.4	7.1
I11	05-21-02	42° 27' 29.45"	085° 40' 54.91"	70	53.65	.14	696.5	695.4	686.4	9.0
I11	05-21-02	42° 27' 29.41"	085° 40' 55.02"	80	53.65	.29	696.5	695.2	684.2	11.0
I11	05-21-02	42° 27' 29.38"	085° 40' 55.16"	90	53.65	.11	696.5	695.5	684.3	11.2
I11	05-21-02	42° 27' 29.34"	085° 40' 55.27"	100	53.65	.00	696.5	695.9	684.8	11.1
I11	05-21-02	42° 27' 29.30"	085° 40' 55.38"	110	53.65	.00	696.5	696.4	685.4	11.0
I12	05-21-02	42° 27' 24.98"	085° 40' 47.03"	0	53.69	.00	696.6	696.5	691.6	4.9
I12	05-21-02	42° 27' 24.88"	085° 40' 47.03"	10	53.69	.09	696.6	695.6	691.0	4.6
I12	05-21-02	42° 27' 24.80"	085° 40' 47.03"	20	53.69	.50	696.6	695.2	690.7	4.5
I12	05-21-02	42° 27' 24.70"	085° 40' 46.99"	30	53.69	.60	696.6	695.0	690.3	4.7
I12	05-21-02	42° 27' 24.59"	085° 40' 46.99"	40	53.69	.45	696.6	695.2	688.2	7.0
I12	05-21-02	42° 27' 24.52"	085° 40' 46.96"	50	53.69	.31	696.6	695.6	688.8	6.8
I12	05-21-02	42° 27' 24.41"	085° 40' 46.96"	60	53.69	.26	696.6	695.6	689.9	5.7
I12	05-21-02	42° 27' 24.30"	085° 40' 46.92"	70	53.69	.00	696.6	696.5	690.0	6.5
I13	05-21-02	42° 27' 26.78"	085° 40' 45.26"	0	53.71	.00	696.6	696.5	690.5	6.0
I13	05-21-02	42° 27' 26.68"	085° 40' 45.34"	12	53.71	.00	696.6	696.0	690.0	6.0
I13	05-21-02	42° 27' 26.53"	085° 40' 45.44"	25	53.71	.00	696.6	695.9	690.5	5.4
I13	05-21-02	42° 27' 26.46"	085° 40' 45.55"	37	53.71	.20	696.6	695.9	690.2	5.7
I13	05-21-02	42° 27' 26.35"	085° 40' 45.62"	50	53.71	.36	696.6	696.0	690.0	6.0
I13	05-21-02	42° 27' 26.24"	085° 40' 45.73"	62	53.71	.56	696.6	696.0	691.2	4.8
I13	05-21-02	42° 27' 26.14"	085° 40' 45.80"	75	53.71	.67	696.6	695.9	690.4	5.5
I13	05-21-02	42° 27' 26.06"	085° 40' 45.91"	87	53.71	.50	696.6	695.7	690.3	5.4
I13	05-21-02	42° 27' 25.96"	085° 40' 46.02"	100	53.71	.63	696.6	695.5	690.0	5.5
I13	05-21-02	42° 27' 25.85"	085° 40' 46.09"	112	53.71	.67	696.6	695.1	690.3	4.8
I13	05-21-02	42° 27' 25.74"	085° 40' 46.20"	125	53.71	.79	696.6	694.9	691.7	3.2

Appendix 1. Date, location, water velocity, altitude of surfaces, and total thickness of sediment at transect data points in the Otsego City impoundment on the Kalamazoo River at Otsego, Mich.--Continued

[Vertical data referenced to the North American Vertical Datum of 1988 (NAVD 88). Water surface normalized to a stage of 2.0 ft. Abbreviations: °, degrees; ', minutes; ", seconds; ft, feet; mi, miles; ft/s, feet per second; --, no data. Sediment cores denoted in bold.]

Transect No. (fig. 2a)	Date	Latitude	Longitude	Distance from right edge of water (ft)	River miles from mouth (mi)	Mean velocity (ft/s)	Altitude of water surface (ft)	Altitude of stream-bed (ft)	Altitude of base sediment (ft)	Total thickness of sediment (ft)
I13	05-21-02	42° 27' 25.63"	085° 40' 46.31"	137	53.71	0.61	696.6	695.1	691.3	3.8
I13	05-21-02	42° 27' 25.52"	085° 40' 46.38"	150	53.71	.41	696.6	695.6	691.1	4.5
I13	05-21-02	42° 27' 25.45"	085° 40' 46.49"	162	53.71	.31	696.6	695.5	690.7	4.8
I13	05-21-02	42° 27' 25.27"	085° 40' 46.63"	180	53.71	.00	696.6	696.5	690.8	5.7
I14	05-22-02	42° 27' 27.54"	085° 40' 39.22"	0	53.80	.00	696.6	696.6	692.1	4.5
I14	05-22-02	42° 27' 27.40"	085° 40' 39.14"	10	53.80	.46	696.6	695.2	693.0	2.2
I14	05-22-02	42° 27' 27.32"	085° 40' 39.14"	20	53.80	.98	696.6	695.1	692.0	3.1
I14	05-22-02	42° 27' 27.25"	085° 40' 39.11"	30	53.80	.22	696.6	695.2	691.9	3.3
I14	05-22-02	42° 27' 27.14"	085° 40' 39.04"	40	53.80	.00	696.6	696.6	691.7	4.9
I15	05-22-02	42° 27' 27.54"	085° 40' 39.97"	0	53.80	.00	696.6	696.6	692.2	4.4
I15	05-22-02	42° 27' 27.54"	085° 40' 39.83"	10	53.80	1.79	696.6	695.0	692.8	2.2
I15	05-22-02	42° 27' 27.54"	085° 40' 39.72"	20	53.80	1.73	696.6	695.2	692.6	2.6
I15	05-22-02	42° 27' 27.54"	085° 40' 39.61"	30	53.80	1.42	696.6	695.5	692.7	2.8
I15	05-22-02	42° 27' 27.54"	085° 40' 39.47"	40	53.80	1.02	696.6	695.3	692.7	2.6
I15	05-22-02	42° 27' 27.54"	085° 40' 39.32"	50	53.80	.35	696.6	695.3	693.3	2.0
I15	05-22-02	42° 27' 27.54"	085° 40' 39.22"	60	53.80	.00	696.6	696.6	693.0	3.6
I16	05-22-02	42° 27' 26.28"	085° 40' 44.00"	0	53.74	.00	696.6	696.5	690.5	6.0
I16	05-22-02	42° 27' 26.17"	085° 40' 43.97"	10	53.74	.68	696.6	696	690.0	6.0
I16	05-22-02	42° 27' 26.06"	085° 40' 43.93"	20	53.74	.76	696.6	696.4	689.3	7.1
I16	05-22-02	42° 27' 25.99"	085° 40' 43.93"	30	53.74	1.02	696.6	696.2	690.2	6.0
I16	05-22-02	42° 27' 25.88"	085° 40' 43.90"	40	53.74	1.20	696.6	695.8	690.6	5.2
I16	05-22-02	42° 27' 25.78"	085° 40' 43.90"	50	53.74	.92	696.6	695.1	691.2	3.9
I16	05-22-02	42° 27' 25.67"	085° 40' 43.90"	60	53.74	1.16	696.6	694.3	689.8	4.5
I16	05-22-02	42° 27' 25.60"	085° 40' 43.90"	70	53.74	.81	696.6	694.6	689.8	4.8
I16	05-22-02	42° 27' 25.49"	085° 40' 43.90"	80	53.74	.71	696.6	694.6	690.2	4.4
I16	05-22-02	42° 27' 25.38"	085° 40' 43.86"	90	53.74	.44	696.6	694.7	690.6	4.1
I16	05-22-02	42° 27' 25.31"	085° 40' 43.82"	100	53.74	.27	696.6	695.6	690.5	5.1
I16	05-22-02	42° 27' 25.16"	085° 40' 43.82"	115	53.74	.00	696.6	696.6	690.7	5.9
J1	05-15-02	42° 27' 35.79"	085° 41' 16.34"	0	53.33	.00	695.9	695.5	687.7	7.8
J1	05-15-02	42° 27' 35.77"	085° 41' 16.47"	10	53.33	.00	695.9	695.0	687.0	8.0
J1	05-15-02	42° 27' 35.75"	085° 41' 16.60"	20	53.33	.00	695.9	695.0	688.4	6.6
J1	05-15-02	42° 27' 35.72"	085° 41' 16.73"	30	53.33	.00	695.9	694.7	687.2	7.5
J1	05-15-02	42° 27' 35.70"	085° 41' 16.87"	40	53.33	.00	695.9	695.0	688.3	6.7

Appendix 1. Date, location, water velocity, altitude of surfaces, and total thickness of sediment at transect data points in the Otsego City impoundment on the Kalamazoo River at Otsego, Mich.--Continued

[Vertical data referenced to the North American Vertical Datum of 1988 (NAVD 88). Water surface normalized to a stage of 2.0 ft. Abbreviations: °, degrees; ', minutes; ", seconds; ft, feet; mi, miles; ft/s, feet per second; --, no data. Sediment cores denoted in bold.]

Transect No. (fig. 2a)	Date	Latitude	Longitude	Distance from right edge of water (ft)	River miles from mouth (mi)	Mean velocity (ft/s)	Altitude of water surface (ft)	Altitude of stream-bed (ft)	Altitude of base sediment (ft)	Total thickness of sediment (ft)
J1	05-15-02	42° 27' 35.68"	085° 41' 16.99"	50	53.33	0.00	695.9	694.7	687.7	7.0
J1	05-15-02	42° 27' 35.66"	085° 41' 17.12"	60	53.33	.00	695.9	694.7	688.4	6.3
J1	05-15-02	42° 27' 35.64"	085° 41' 17.24"	70	53.33	.00	695.9	695.0	688.0	7.0
J1	05-15-02	42° 27' 35.61"	085° 41' 17.37"	80	53.33	.00	695.9	694.8	689.0	5.8
J1	05-15-02	42° 27' 35.58"	085° 41' 17.57"	95	53.33	.00	695.9	695.4	689.0	6.4
J2	05-15-02	42° 27' 48.33"	085° 41' 24.17"	0	53.11	.00	695.8	695.4	686.9	8.5
J2	05-15-02	42° 27' 48.24"	085° 41' 24.23"	10	53.11	.00	695.8	695.2	686.8	8.4
J2	05-15-02	42° 27' 48.15"	085° 41' 24.28"	20	53.11	.00	695.8	695.2	687.3	7.9
J2	05-15-02	42° 27' 48.08"	085° 41' 24.32"	30	53.11	.00	695.8	695.2	685.9	9.3
J2	05-15-02	42° 27' 47.99"	085° 41' 24.37"	40	53.11	.00	695.8	695.2	685.6	9.6
J2	05-15-02	42° 27' 47.89"	085° 41' 24.41"	50	53.11	.00	695.8	695.3	685.2	10.1
J3	05-15-02	42° 27' 47.21"	085° 41' 19.61"	0	53.17	.00	695.8	695.8	687.2	8.6
J3	05-15-02	42° 27' 47.10"	085° 41' 19.66"	10	53.17	.00	695.8	695.4	686.7	8.7
J3	05-15-02	42° 27' 47.01"	085° 41' 19.70"	20	53.17	.00	695.8	694.9	685.6	9.3
J3	05-15-02	42° 27' 46.92"	085° 41' 19.75"	30	53.17	.00	695.8	694.4	686.9	7.5
J3	05-15-02	42° 27' 46.80"	085° 41' 19.80"	45	53.17	.00	695.8	695.4	687.9	7.5

Appendix 2

Lithologic descriptions of sediment cores collected at selected sites in the Otsego City impoundment on the Kalamazoo River at Otsego, Mich.

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Appendix 2. Lithologic descriptions of sediment cores collected at selected sites in the Otsego City impoundment on the Kalamazoo River at Otsego, Mich.

Site and lithology	Thickness (feet)	Site and lithology	Thickness (feet)
Site SC-A4 Silt/clay, black; sand, fine	0.9	Site SC-C4 Silt/clay, black; sand, fine	1.5
Site SC-A7 Sand, fine-medium; some silt/clay, gray	2.5	Site SC-C5 Sand, medium-fine; silt/clay, black	1.1
Site SC-A8 Sand, fine-coarse, black; gravel	.6	Site SC-C6 Sand, fine-medium; silt/clay, black	1.5
Site SC-A9 Sand, medium-fine; silt/clay, black	.5	Site SC-C7 Silt/clay, black; sand, fine-medium	1.0
Site SC-A10 Sand, fine-medium; silt/clay, black Sand, medium-fine	1.5 .5	Site SC-C9 Sand, coarse-fine; silt/clay, black; gravel Sand, medium-fine; silt/clay, black	1.0 .5
Site SC-A11 Sand, medium-fine, brown Sand, fine-coarse, black; some gravel Sand, medium-coarse, black	1.0 1.0 2.0	Site SC-C10 Gravel; sand, medium Silt/clay, black; some fine sand	.5 1.0
Site SC-A12 Silt/clay, gray; sand, fine-medium Sand, medium-fine	4.8 1.6	Site SC-C11 Silt/clay, gray Sand, coarse-fine, gray; gravel	2.0 2.1
Site SC-A13 Sand, medium-coarse, black Silt/clay, black Sand, medium-fine, black	3.0 1.5 2.5	Site SC-C12 Sand, fine-medium; silt/clay, black	4.3
Site SC-B1 Sand, coarse-medium, black; gravel Sand, coarse-fine; gravel, silt/clay, black	3.0 6.5	Site SC-C13 Sand, fine-medium; silt/clay, black Sand, fine-coarse, black	1.6 2.8
Site SC-B2 Gravel; sand, medium-fine; some silt/clay Sand, medium-fine; silt/clay, black	.7 .6	Site SC-D2 Sand, fine-medium; gravel Sand, medium-fine, gray	.5 4.1
Site SC-B3 Sand, fine-medium; silt/clay, black Sand, medium-fine	1.4 .6	Site SC-D4 Gravel; sand, medium-coarse Sand, medium-coarse, black; gravel	.9 3.9
Site SC-B4 Sand, medium-fine; silt/clay, black; some gravel	4.5	Site SC-D5 Sand, coarse-fine; gravel Sand, coarse-medium; silt/clay, black	.1 4.1
Site SC-B6 Sand, fine-medium; silt/clay, black	2.2	Site SC-D7 Sand, fine-medium; silt/clay, black	3.6

Appendix 2. Lithologic descriptions of sediment cores collected at selected sites in the Otsego City impoundment on the Kalamazoo River at Otsego, Mich. -- Continued

Site and lithology	Thickness (feet)	Site and lithology	Thickness (feet)
Site SC-E1		Site SC-F9	
Silt/clay, black; sand, fine-coarse	3.5	Gravel; sand, coarse	3.0
Sand, coarse-medium, gray	2.8	Sand, fine-coarse; silt/clay, black; gravel	1.1
Site SC-E2		Site SC-F10	
Sand, medium-fine, gray	3.5	Silt/clay, black; sand, fine	1.9
		Sand, fine-coarse, brown; silt/clay; gravel	1.1
Site SC-E3		Site SC-F11	
Silt/clay, black; sand, fine-coarse	4.5	Sand, coarse-medium; gravel	2.1
		Sand, medium-coarse	2.5
Site SC-F1		Sand, coarse-fine; silt/clay	2.5
Silt/clay, black; sand, coarse	3.6		
Sand, fine-medium; silt/clay	3.5	Site SC-F12	
		Sand, coarse; gravel	1.0
Site SC-F2		Silt/clay, black; sand, coarse; gravel	2.8
Silt/clay, black; sand, medium-fine	1.7		
Sand, coarse-medium	1.7	Site SC-F13	
		Sand, coarse-medium; gravel	1.0
Site SC-F3		Sand, coarse; silt/clay, black; some gravel	4.8
Sand, fine-medium; silt/clay, black	4.9		
Sand, fine, brown; silt/clay	3.0	Site SC-G1	
		Sand, medium-coarse, black; some gravel	.5
Site SC-F4		Silt/clay, black; sand, medium-fine	7.0
Sand, coarse-medium	2.8		
Sand, fine-medium; silt/clay, black	1.0	Site SC-G2	
Sand, fine-coarse; silt/clay	1.7	Sand, coarse-medium; gravel	.5
		Sand, coarse-medium, black	5.0
Site SC-F5		Sand, fine-medium; silt/clay, gray	2.0
Sand, coarse-medium, gravel	.9		
Sand, coarse-fine; silt/clay; some gravel	4.5	Site SC-G3	
		Sand, medium-fine, black	1.0
Site SC-F6		Silt/clay, black; sand, fine	3.0
Sand, coarse-fine	.5	Sand, medium-fine; some silt/clay	2.0
Silt/clay, black; sand, fine-medium	2.4		
Sand, coarse-fine; gravel; some silt/clay	.8	Site SC-G4	
		Sand, coarse-medium; gravel	.5
Site SC-F7		Sand, coarse-medium, black	3.5
Silt/clay; sand, coarse-medium; gravel	1.2	Silt/clay; sand, coarse-medium	1.0
Silt/clay, black; sand, fine; gravel	3.2		
Sand, coarse-medium; silt/clay; gravel	1.6	Site SC-G5	
		Sand, coarse-medium; gravel	1.0
Site SC-F8		Sand, medium-coarse; some gravel	3.0
Sand, fine-coarse; silt/clay	.5	Silt/clay; sand, coarse-medium	2.0
Sand, fine-medium; silt/clay, gray; gravel	1.8		
Sand, fine-coarse; silt/clay; some gravel	1.4	Site SC-G6	
		Sand, coarse-medium; gravel	1.0
		Sand, fine-medium; silt/clay	1.5
		Sand, fine; silt/clay	1.0

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Appendix 2. Lithologic descriptions of sediment cores collected at selected sites in the Otsego City impoundment on the Kalamazoo River at Otsego, Mich. -- Continued

Site and lithology	Thickness (feet)	Site and lithology	Thickness (feet)
Site SC-G7		Site SC-I2	
Sand, coarse-medium; gravel	1.0	Silt/clay; sand, fine; wood fiber	2.7
Sand, fine-medium; silt/clay, black	1.5	Sand, fine; silt/clay; wood fiber	3.0
Sand, fine-medium; silt/clay	1.0		
Site SC-G8		Site SC-I3	
Sand, fine-coarse; gravel	2.5	Sand, medium-fine; silt/clay; wood fiber	2.2
Sand, fine-medium; silt/clay, black; some gravel	4.5	Sand, coarse-medium; silt/clay, gray	2.5
Sand, fine-coarse; silt/clay, black	1.0		
Site SC-G9		Site SC-I4	
Gravel; pebbles; sand, fine	1.0	Sand, fine-medium; silt/clay	1.5
Silt/clay; sand, fine	6.0	Sand, coarse-fine; silt/clay	1.3
Sand, fine-medium; silt/clay, gray	1.0		
Site SC-G10		Site SC-I5	
Sand, fine-coarse; some silt/clay	4.0	Gravel; sand, coarse	.9
Sand, medium-fine; silt/clay	3.5	Sand, fine-medium; silt/clay, gray	.8
		Sand, fine-coarse; gravel; silt/clay, black	1.4
Site SC-H1		Site SC-I6	
Sand, medium-fine, black	5.6	Gravel; sand, coarse-medium	.2
Silt/clay; sand, fine; some gravel	1.0	Silt/clay; sand, fine-medium	2.1
		Sand, medium-fine; silt/clay	1.3
Site SC-H2		Site SC-I7	
Sand, medium-coarse; silt/clay	.6	Gravel; silt/clay, black; some sand	.2
Silt/clay, black	7.0	Sand, fine-medium, green; silt/clay	3.2
Sand, medium-coarse; silt/clay	1.3		
Site SC-H3		Site SC-I8	
Sand, medium, brown	1.0	Sand, fine-medium; silt/clay, black	5.1
Sand, coarse-medium, gray	1.7	Sand, fine-coarse; silt/clay; some gravel	1.2
Sand, medium-fine; silt/clay, black	4.5		
Site SC-H4		Site SC-I9	
Sand, medium-fine, brown	.5	Sand, coarse-medium; gravel	.5
Sand, medium-coarse, gray	3.1	Silt/clay, black; sand, coarse-fine	3.9
Sand, medium-fine; silt/clay, black	.2	Sand, coarse-medium; gray	3.0
Site SC-H5		Site SC-I10	
Sand, coarse-fine, brown	.5	Sand, coarse-fine; gravel	2.5
Sand, coarse-fine; some gravel	3.6	Silt/clay; sand, fine	5.0
Sand, fine-coarse, brown; silt/clay; gravel	.7	Silt/clay; sand, fine-medium, brown	1.0
Site SC-I1		Site SC-I11	
Gravel; pebbles; sand, coarse	.1	Muck; wood fiber	8.3
Silt/clay, black; some gravel	6.4	Sand, fine-coarse; silt/clay, black	2.7
Sand, fine-coarse; some gravel	1.0		

Appendix 2. Lithologic descriptions of sediment cores collected at selected sites in the Otsego City impoundment on the Kalamazoo River at Otsego, Mich. -- Continued

Site and lithology	Thickness (feet)	Site and lithology	Thickness (feet)
Site SC-I12		Site SC-I16	
Muck; wood fiber	5.9	Sand, fine-coarse, brown	1.0
Silt/clay; sand, fine-coarse; some gravel	1.1	Sand, fine-medium, green; silt/clay, black	3.0
		Sand, fine-medium; silt/clay, gray	3.1
Site SC-I13		Site SC-J1	
Sand, fine-medium; silt/clay	4.4	Silt/clay, black; some sand, fine	3.2
Sand, coarse-fine; some silt/clay	1.1	Sand, fine-medium, brown; silt/clay	4.3
Site SC-I14		Site SC-J2	
Sand, fine, green; silt/clay, black	1.3	Silt/clay, black; some sand, fine	8.5
Sand, fine-medium, brown; silt/clay	1.8	Gravel; silt/clay; sand, coarse-medium	.8
Site SC-I15		Site SC-J3	
Sand, coarse-fine, brown; gravel	1.0	Silt/clay, black; some sand, fine	6.0
Sand, fine, green; silt/clay	.9	Sand, coarse-medium; gravel; silt/clay	1.5
Sand, fine, brown; silt/clay	.9		

Appendix 3

Particle size of selected sediment samples from cores collected in the Otsego City impoundment on the Kalamazoo River at Otsego, Mich.

Appendix 3. Particle size of selected sediment samples from cores collected in the Otsego City impoundment on the Kalamazoo River at Otsego, Mich.

[Particle sizes are tallied by using Wentworth size classes, in which the size doubles with each class (0.063, 0.125, 0.25, 0.5, 1, 2, 4, 16 mm); >, greater than; ≤ less than or equal to; mm, millimeters; --, no data.]

Sedi- ment core number (fig. 2b)	Depth of sample interval below streambed (feet)	Percentage of sample within sieve size fraction, in mm								
		>16 (pebble)	≤16 and >4 (medium to coarse gravel)	≤4 and >2 (fine gravel)	≤2 and >1 (very coarse sand)	≤1 and >0.5 (coarse sand)	≤0.5 and >0.25 (medium sand)	≤0.25 and >0.125 (fine sand)	≤0.125 and >0.063 (very fine sand)	≤0.063 (silt/ clay)
SC-A4-1	0-0.9	0.00	6.52	0.00	3.34	2.47	4.28	13.54	25.44	44.41
SC-A7-1	0-2.5	.00	.00	4.99	5.23	7.63	19.44	35.64	11.92	15.15
SC-A8-1	0-0.6	21.44	8.25	10.57	9.09	6.78	11.67	25.06	5.83	1.31
SC-A9-1	0-0.5	.00	1.61	.22	1.16	4.66	31.00	24.87	4.93	31.54
SC-A10-1	0-1.5	.00	2.44	.42	2.65	4.54	22.61	38.10	12.84	16.40
SC-A10-2	1.5-2.0	--	--	--	--	--	--	--	--	--
SC-A11-1	0-1.0	.00	.00	.00	.09	3.58	67.50	27.90	.80	.13
SC-A11-2	1.0-2.0	.00	11.59	5.44	8.31	17.45	34.80	18.47	3.34	.60
SC-A11-3	2.0-4.0	.00	2.86	12.02	16.18	22.13	36.91	8.98	.59	.33
SC-A12-1	0-4.8	.00	.00	.79	2.75	5.10	8.15	21.10	17.03	45.09
SC-A12-2	4.8-6.4	--	--	--	--	--	--	--	--	--
SC-A13-1	0-3.0	.00	.35	4.33	16.06	38.49	34.53	6.01	.20	.03
SC-A13-2	3.0-4.5	.00	.00	3.44	2.65	3.09	4.32	2.65	2.56	81.29
SC-A13-3	4.5-7.0	.00	.02	.20	1.04	9.15	71.54	17.00	.70	.34
SC-B1-1	0-3.0	1.47	14.25	29.81	18.85	12.69	14.30	7.27	1.20	.15
SC-B1-2	3.0-9.5	.00	.00	31.16	12.50	11.18	15.54	12.65	2.58	14.38
SC-B2-1	0-0.7	.00	32.17	10.94	7.74	7.36	12.65	12.65	5.73	10.77
SC-B2-2	0.7-1.3	.00	.00	2.62	3.16	9.20	29.23	25.56	6.99	23.23
SC-B3-1	0-1.4	.00	.00	.41	2.27	3.98	17.81	27.22	14.69	33.63
SC-B3-2	1.4-2.0	--	--	--	--	--	--	--	--	--
SC-B4-1	0-4.5	.00	11.57	5.25	4.14	6.99	17.16	11.68	6.43	36.78
SC-B6-1	0-2.2	.00	.00	.60	2.17	2.68	13.44	25.95	13.27	41.90
SC-C4-1	0-1.5	.00	.00	.43	1.00	1.92	4.63	13.96	10.97	67.09
SC-C5-1	0-1.1	.00	3.13	3.07	4.81	9.84	21.13	18.65	7.76	31.62

Appendix 3. Particle size of selected sediment samples from cores collected in the Otsego City impoundment on the Kalamazoo River at Otsego, Mich.--Continued

[Particle sizes are tallied by using Wentworth size classes, in which the size doubles with each class (0.063, 0.125, 0.25, 0.5, 1, 2, 4, 16 mm); >, greater than; ≤ less than or equal to; mm, millimeters; --, no data.]

Sedi- ment core number (fig. 2b)	Depth of sample interval below streambed (feet)	Percentage of sample within sieve size fraction, in mm								
		>16 (pebble)	≤16 and >4 (medium to coarse gravel)	≤4 and >2 (fine gravel)	≤2 and >1 (very coarse sand)	≤1 and >0.5 (coarse sand)	≤0.5 and >0.25 (medium sand)	≤0.25 and >0.125 (fine sand)	≤0.125 and >0.063 (very fine sand)	≤0.063 (silt/ clay)
SC-C6-1	0-1.5	0.00	0.00	5.55	3.66	5.84	15.92	17.39	5.88	45.76
SC-C7-1	0-1.0	.00	.00	.44	.95	1.69	9.18	14.83	11.38	61.53
SC-C9-1	0-1.0	.00	7.85	5.70	13.40	18.30	21.94	15.66	4.52	12.63
SC-C9-2	1.0-1.5	.00	.00	6.58	11.01	13.64	25.23	15.93	3.60	24.01
SC-C10-1	0-0.5	5.92	40.64	14.47	5.51	4.69	21.01	7.04	.45	.28
SC-C10-2	0.5-1.5	.00	.00	1.31	.51	.56	1.16	2.12	5.26	89.09
SC-C11-1	0-2.0	.00	.00	.66	.73	1.12	1.52	2.11	3.63	90.22
SC-C11-2	2.0-4.1	.00	19.56	12.37	13.00	14.48	20.23	16.03	2.43	1.90
SC-C12-1	0-4.3	.00	2.90	2.57	1.74	3.31	29.25	37.37	6.84	16.03
SC-C13-1	0-1.6	.00	1.43	4.41	6.33	8.24	24.02	46.66	5.87	3.04
SC-C13-2	1.6-4.4	.00	5.12	5.59	4.78	3.48	20.23	54.04	5.57	1.19
SC-D2-1	0-0.5	.00	9.75	16.06	9.98	7.38	15.26	31.57	8.72	1.28
SC-D2-2	0.5-4.6	--	--	--	--	--	--	--	--	--
SC-D4-1	0-0.9	.00	41.13	25.62	6.78	4.21	15.17	6.15	.64	.30
SC-D4-2	0.9-4.8	.00	12.11	12.16	7.90	13.15	44.06	9.60	.62	.41
SC-D5-1	0-0.1	1.02	8.76	15.77	23.36	14.92	20.26	14.47	1.36	.06
SC-D5-2	0.1-4.2	.00	.00	6.94	28.02	13.65	6.07	7.89	4.17	33.26
SC-D7-1	0-3.6	.00	.93	.71	1.42	3.39	25.05	33.73	7.08	27.69
SC-E1-1	0-3.5	.00	1.10	3.10	2.27	9.30	19.24	15.76	5.63	43.61
SC-E1-2	3.5-6.3	.00	2.26	8.17	13.62	26.33	38.11	8.60	1.61	1.31
SC-E2-1	0-3.5	.00	.51	2.17	3.09	11.10	44.23	32.87	4.52	1.50
SC-E3-1	0-4.5	.00	.00	.00	4.98	5.90	13.11	8.78	7.99	59.24
SC-F1-1	0-3.6	.00	.00	7.00	15.31	11.59	4.84	1.86	4.13	55.26
SC-F1-2	3.6-7.1	.00	.00	3.39	4.30	3.14	8.24	50.99	8.35	21.60

Appendix 3. Particle size of selected sediment samples from cores collected in the Otsego City impoundment on the Kalamazoo River at Otsego, Mich.--Continued

[Particle sizes are tallied by using Wentworth size classes, in which the size doubles with each class (0.063, 0.125, 0.25, 0.5, 1, 2, 4, 16 mm); >, greater than; ≤ less than or equal to; mm, millimeters; --, no data.]

Sedi- ment core number (fig. 2b)	Depth of sample interval below streambed (feet)	Percentage of sample within sieve size fraction, in mm								
		>16 (pebble)	≤16 and >4 (medium to coarse gravel)	≤4 and >2 (fine gravel)	≤2 and >1 (very coarse sand)	≤1 and >0.5 (coarse sand)	≤0.5 and >0.25 (medium sand)	≤0.25 and >0.125 (fine sand)	≤0.125 and >0.063 (very fine sand)	≤0.063 (silt/ clay)
SC-F2-1	0-1.7	0.00	0.00	3.03	3.03	3.74	9.03	7.76	3.63	69.77
SC-F2-2	1.7-3.4	.00	1.18	4.87	11.97	31.70	41.95	7.30	.55	.48
SC-F3-1	0-4.9	.00	.00	2.17	3.26	6.68	23.89	32.14	6.19	25.68
SC-F3-2	4.9-7.9	.00	.00	6.00	7.06	5.41	7.06	19.42	16.01	39.02
SC-F4-1	0-2.8	.00	.38	5.24	20.23	28.20	36.41	9.25	.21	.08
SC-F4-2	2.8-3.8	.00	.00	1.93	6.00	8.84	19.77	35.21	6.16	22.08
SC-F4-3	3.8-5.5	.00	.00	1.56	6.23	11.19	24.22	29.04	4.91	22.85
SC-F5-1	0-0.9	.00	7.00	33.24	34.16	15.51	7.72	1.70	.50	.17
SC-F5-2	0.9-5.4	.00	.49	13.41	23.66	11.22	12.73	12.29	3.61	22.59
SC-F6-1	0-0.5	.00	1.71	5.59	9.33	19.94	40.95	20.40	1.59	.50
SC-F6-2	0.5-2.9	.00	.00	.86	3.85	7.20	11.41	21.68	14.62	40.37
SC-F6-3	2.9-3.7	.00	.00	31.44	9.67	8.19	20.62	14.09	3.86	12.13
SC-F7-1	0-1.2	.00	11.41	14.89	12.35	6.42	9.08	6.34	.82	38.69
SC-F7-2	1.2-4.4	.00	.00	14.96	7.46	4.99	5.11	10.02	12.37	45.09
SC-F7-3	4.4-6.0	.00	.00	19.77	12.55	14.55	24.23	6.67	2.56	19.67
SC-F8-1	0-0.5	.00	.00	3.61	3.57	9.84	17.70	31.78	11.56	21.94
SC-F8-2	0.5-2.3	.00	.00	13.59	5.15	4.44	7.59	30.26	12.96	26.00
SC-F8-3	2.3-3.7	.00	.00	8.85	8.33	13.04	28.50	21.41	4.23	15.64
SC-F9-1	0-3.0	.00	17.55	45.73	23.58	6.06	3.87	2.38	.57	.26
SC-F9-2	3.0-4.1	.00	.00	23.00	12.57	5.71	4.71	18.93	11.36	23.71
SC-F10-1	0-1.9	.00	.00	2.34	2.91	1.85	5.18	20.10	7.95	59.66
SC-F10-2	1.9-3.0	.00	.00	14.34	11.00	5.50	9.06	26.68	6.15	27.28
SC-F11-1	0-2.1	.00	14.46	29.92	25.83	14.72	11.73	3.11	.15	.08
SC-F11-2	2.1-4.6	.00	.05	1.57	8.08	33.49	49.44	7.00	.24	.12

Appendix 3. Particle size of selected sediment samples from cores collected in the Otsego City impoundment on the Kalamazoo River at Otsego, Mich.--Continued

[Particle sizes are tallied by using Wentworth size classes, in which the size doubles with each class (0.063, 0.125, 0.25, 0.5, 1, 2, 4, 16 mm); >, greater than; ≤ less than or equal to; mm, millimeters; --, no data.]

Sedi- ment core number (fig. 2b)	Depth of sample interval below streambed (feet)	Percentage of sample within sieve size fraction, in mm								
		>16 (pebble)	≤16 and >4 (medium to coarse gravel)	≤4 and >2 (fine gravel)	≤2 and >1 (very coarse sand)	≤1 and >0.5 (coarse sand)	≤0.5 and >0.25 (medium sand)	≤0.25 and >0.125 (fine sand)	≤0.125 and >0.063 (very fine sand)	≤0.063 (silt/ clay)
SC-F11-3	4.6-7.1	0.00	2.16	3.54	3.67	18.37	37.92	12.17	1.33	20.84
SC-F12-1	0-1.0	.00	4.88	35.41	36.12	14.63	6.17	1.95	.74	.10
SC-F12-2	1.0-3.8	.00	.00	28.88	26.93	4.44	4.34	4.93	.63	29.85
SC-F13-1	0-1.0	.00	4.58	19.42	38.63	26.25	9.91	.92	.17	.12
SC-F13-2	1.0-5.8	.00	.00	12.04	24.19	22.44	6.56	.62	.23	33.92
SC-G1-1	0-0.5	.00	2.36	9.16	10.93	17.25	46.19	12.00	1.45	.65
SC-G1-2	0.5-7.5	.00	.39	3.10	3.25	5.65	18.13	9.30	1.47	58.71
SC-G2-1	0-0.5	.00	11.03	30.88	25.31	16.16	14.12	2.35	.09	.04
SC-G2-2	0.5-5.5	.00	.56	2.07	13.60	38.72	36.37	7.85	.62	.22
SC-G2-3	5.5-7.5	.00	.00	2.31	3.03	4.09	14.90	34.01	8.11	33.55
SC-G3-1	0-1.0	.00	.28	1.44	2.96	7.06	46.15	38.71	2.79	.63
SC-G3-2	1.0-4.0	.00	.43	5.10	4.01	3.64	8.20	12.08	9.11	57.44
SC-G3-3	4.0-6.0	.00	.00	.59	1.55	6.98	46.83	28.77	2.40	12.89
SC-G4-1	0-0.5	.55	6.16	17.50	22.06	19.47	21.93	11.81	.43	.08
SC-G4-2	0.5-4.0	.00	.48	4.55	27.18	39.19	24.45	2.46	1.35	.34
SC-G4-3	4.0-5.0	.00	2.14	2.55	9.31	9.56	7.83	3.54	4.70	60.38
SC-G5-1	0-1.0	.00	6.22	22.80	21.71	21.55	24.63	2.69	.23	.17
SC-G5-2	1.0-4.0	.81	3.43	11.95	10.87	18.26	48.46	6.01	.12	.10
SC-G5-3	4.0-6.0	.00	.74	6.86	8.53	9.09	9.93	1.86	1.21	61.78
SC-G6-1	0-1.0	.00	15.34	20.66	27.42	12.91	16.82	6.17	.45	.23
SC-G6-2	1.0-2.5	.00	.00	.00	2.10	3.41	15.86	43.83	8.41	26.38
SC-G6-3	2.5-3.5	.00	4.78	5.49	4.07	2.75	9.74	31.18	7.17	34.81
SC-G7-1	0-1.0	.00	4.59	14.79	20.41	24.63	24.63	9.06	1.46	.43
SC-G7-2	1.0-2.5	.00	.00	3.73	5.62	9.47	14.59	26.95	11.14	28.51

Appendix 3. Particle size of selected sediment samples from cores collected in the Otsego City impoundment on the Kalamazoo River at Otsego, Mich.--Continued

[Particle sizes are tallied by using Wentworth size classes, in which the size doubles with each class (0.063, 0.125, 0.25, 0.5, 1, 2, 4, 16 mm); >, greater than; ≤ less than or equal to; mm, millimeters; --, no data.]

Sedi- ment core number (fig. 2b)	Depth of sample interval below streambed (feet)	Percentage of sample within sieve size fraction, in mm								
		>16 (pebble)	≤16 and >4 (medium to coarse gravel)	≤4 and >2 (fine gravel)	≤2 and >1 (very coarse sand)	≤1 and >0.5 (coarse sand)	≤0.5 and >0.25 (medium sand)	≤0.25 and >0.125 (fine sand)	≤0.125 and >0.063 (very fine sand)	≤0.063 (silt/ clay)
SC-G7-3	2.5-3.5	0.00	0.00	9.74	4.02	5.04	14.44	28.34	6.20	32.22
SC-G8-1	0-2.5	.00	17.89	25.16	15.41	7.68	8.41	19.78	4.95	.72
SC-G8-2	2.5-7.0	.00	2.32	12.01	8.08	5.58	15.89	32.86	6.83	16.43
SC-G8-3	7.0-8.0	.00	.64	8.52	11.03	7.02	19.87	30.69	6.53	15.69
SC-G9-1	0-1.0	19.83	40.64	12.74	4.22	1.89	3.23	12.46	3.49	1.50
SC-G9-2	1.0-7.0	.00	.00	.16	1.38	1.06	3.53	18.55	16.61	58.71
SC-G9-3	7.0-8.0	.00	.00	3.14	2.43	6.74	27.22	25.02	8.36	27.09
SC-G10-1	0-4.0	.00	.00	.92	10.16	2.31	10.03	52.20	13.13	11.25
SC-G10-2	4.0-7.5	.00	.00	1.59	1.88	4.27	30.21	29.36	4.41	28.28
SC-H1-1	0-5.6	.00	.00	.07	1.10	5.38	58.86	29.30	2.72	2.57
SC-H1-2	5.6-6.6	.00	.00	10.67	4.47	4.52	6.99	10.40	9.72	53.23
SC-H2-1	0-0.6	.00	.28	.51	2.52	23.38	59.39	13.48	.40	.04
SC-H2-2	0.6-7.6	.00	.00	.53	1.27	1.17	1.48	1.80	3.87	89.88
SC-H2-3	7.6-8.9	.00	1.86	2.46	8.26	23.96	38.02	7.01	1.39	17.04
SC-H3-1	0-1.0	.00	.31	.79	4.00	17.13	65.98	11.58	.17	.03
SC-H3-2	1.0-2.7	.00	2.19	7.26	18.53	36.78	30.18	4.91	.10	.05
SC-H3-3	2.7-7.2	.00	.17	2.93	7.65	16.02	24.85	17.29	6.63	24.47
SC-H4-1	0-0.5	.00	.57	1.38	2.85	10.98	65.30	17.20	1.32	.39
SC-H4-2	0.5-3.6	.00	5.21	6.28	7.43	15.49	49.51	13.94	1.54	.59
SC-H4-3	3.6-3.8	.00	.00	1.32	2.84	13.86	45.23	19.38	2.48	14.90
SC-H5-1	0-0.5	.00	3.05	9.86	10.78	11.51	35.51	27.51	1.49	.29
SC-H5-2	0.5-4.1	.00	1.86	14.75	12.76	16.98	25.53	16.36	7.56	4.21
SC-H5-3	4.1-4.8	.00	6.47	7.08	5.35	9.72	30.05	23.09	1.85	16.38
SC-I1-1	0-0.1	24.84	46.20	16.20	6.54	2.86	2.19	.97	.12	.08

Appendix 3. Particle size of selected sediment samples from cores collected in the Otsego City impoundment on the Kalamazoo River at Otsego, Mich.--Continued

[Particle sizes are tallied by using Wentworth size classes, in which the size doubles with each class (0.063, 0.125, 0.25, 0.5, 1, 2, 4, 16 mm); >, greater than; ≤ less than or equal to; mm, millimeters; --, no data.]

Sedi- ment core number (fig. 2b)	Depth of sample interval below streambed (feet)	Percentage of sample within sieve size fraction, in mm								
		>16 (pebble)	≤16 and >4 (medium to coarse gravel)	≤4 and >2 (fine gravel)	≤2 and >1 (very coarse sand)	≤1 and >0.5 (coarse sand)	≤0.5 and >0.25 (medium sand)	≤0.25 and >0.125 (fine sand)	≤0.125 and >0.063 (very fine sand)	≤0.063 (silt/ clay)
SC-I1-2	0.1-6.5	0.00	12.27	9.57	3.69	1.70	1.28	2.62	4.54	64.33
SC-I1-3	6.5-7.5	.00	4.71	11.35	7.38	5.45	6.30	17.48	12.88	34.45
SC-I2-1	0-2.7	.00	.00	.00	1.45	2.68	7.52	29.65	11.42	47.29
SC-I2-2	2.7-5.7	.00	.00	4.75	1.39	1.39	7.76	44.15	9.56	31.00
SC-I3-1	0-2.2	.00	.00	.00	4.56	.77	25.70	23.62	8.88	36.47
SC-I3-2	2.2-4.7	.00	.35	5.96	22.08	26.59	19.35	6.66	5.96	13.04
SC-I4-1	0-1.5	.00	.00	3.59	2.27	4.15	12.37	36.83	8.22	32.58
SC-I4-2	1.5-2.8	.00	1.96	2.74	6.12	20.42	33.73	15.56	3.63	15.84
SC-I5-1	0-0.9	.00	20.86	39.57	16.46	8.98	8.28	4.95	.63	.29
SC-I5-2	0.9-1.7	.00	3.66	6.95	5.47	5.74	17.09	23.07	9.87	28.16
SC-I5-3	1.7-3.1	.00	11.64	11.05	8.17	8.17	20.75	15.78	4.58	19.88
SC-I6-1	0-0.2	.00	19.58	33.83	15.07	10.51	13.14	6.41	.97	.49
SC-I6-2	0.2-2.3	.00	.00	2.60	2.03	3.56	9.79	14.11	9.41	58.51
SC-I6-3	2.3-3.6	.00	.00	3.43	2.52	6.66	32.38	24.73	4.26	26.01
SC-I7-1	0-0.2	.00	34.90	23.14	7.39	3.51	2.50	5.34	4.89	18.33
SC-I7-2	0.2-3.4	.00	3.40	4.98	2.69	4.14	9.87	23.64	10.44	40.82
SC-I8-1	0-5.1	.00	.00	3.32	3.32	4.14	9.96	21.24	27.19	30.83
SC-I8-2	5.1-6.3	.00	5.49	8.14	7.28	7.57	9.46	18.40	16.27	27.39
SC-I9-1	0-0.5	.00	1.20	13.38	26.06	26.61	19.87	11.24	1.23	.41
SC-I9-2	0.5-4.4	.00	.00	3.69	9.54	11.48	10.83	9.43	4.45	50.59
SC-I9-3	4.4-7.4	.00	.23	4.35	14.79	29.86	39.45	9.23	1.05	1.04
SC-I10-1	0-2.5	.00	6.03	16.12	18.87	16.89	21.19	18.20	2.19	.50
SC-I10-2	2.5-7.5	.00	1.06	6.14	7.00	3.73	3.22	18.63	17.62	42.60
SC-I10-3	7.5-8.5	.00	.00	2.35	4.55	4.15	5.64	16.38	14.97	51.96

Appendix 3. Particle size of selected sediment samples from cores collected in the Otsego City impoundment on the Kalamazoo River at Otsego, Mich.--Continued

[Particle sizes are tallied by using Wentworth size classes, in which the size doubles with each class (0.063, 0.125, 0.25, 0.5, 1, 2, 4, 16 mm); >, greater than; ≤ less than or equal to; mm, millimeters; --, no data.]

Sedi- ment core number (fig. 2b)	Depth of sample interval below streambed (feet)	Percentage of sample within sieve size fraction, in mm								
		>16 (pebble)	≤16 and >4 (medium to coarse gravel)	≤4 and >2 (fine gravel)	≤2 and >1 (very coarse sand)	≤1 and >0.5 (coarse sand)	≤0.5 and >0.25 (medium sand)	≤0.25 and >0.125 (fine sand)	≤0.125 and >0.063 (very fine sand)	≤0.063 (silt/ clay)
SC-I11-1	0-8.3	--	--	--	--	--	--	--	--	--
SC-I11-2	8.3-11.0	0.00	0.00	6.56	6.73	9.25	13.46	11.94	7.15	44.91
SC-I12-1	0-5.9	--	--	--	--	--	--	--	--	--
SC-I12-2	5.9-7.0	.00	1.09	10.66	6.74	7.32	7.14	9.97	6.57	50.52
SC-I13-1	0-4.4	.00	1.29	4.79	2.93	2.62	4.79	38.42	22.94	22.23
SC-I13-2	4.4-5.5	.00	1.39	5.00	10.85	18.39	43.95	12.71	1.57	6.14
SC-I14-1	0-1.3	.00	.00	.40	.57	1.08	13.28	55.05	9.36	20.26
SC-I14-2	1.3-3.1	.00	.00	1.43	1.28	2.26	13.61	41.73	7.97	31.73
SC-I15-1	0-1.0	.00	5.96	27.68	19.22	14.06	15.43	14.83	2.09	.73
SC-I15-2	1.0-1.9	.00	.00	2.64	2.00	1.82	8.56	51.43	7.42	26.13
SC-I15-3	1.9-2.8	.00	.00	1.15	.92	.92	7.66	49.90	10.64	28.81
SC-I16-1	0-1.0	.00	.97	4.48	11.12	19.31	31.40	28.81	3.13	.77
SC-I16-2	1.0-4.0	.00	.00	.20	.84	1.88	12.86	36.46	13.42	34.33
SC-I16-3	4.0-7.1	.00	.00	2.78	3.19	4.28	12.48	42.12	6.15	29.01
SC-J1-1	0-3.2	.00	.00	.00	2.67	1.98	1.98	3.01	4.99	85.37
SC-J1-2	3.2-7.5	.00	.00	4.54	1.42	1.38	19.03	38.59	7.69	27.35
SC-J2-1	0-8.5	.00	.69	1.63	1.75	1.19	2.00	4.19	5.26	83.29
SC-J2-2	8.5-9.3	.00	20.82	19.07	16.85	9.78	7.30	6.74	1.52	17.91
SC-J3-1	0-6.0	.00	.00	1.16	2.39	1.89	.94	1.52	3.55	88.54
SC-J3-2	6.0-7.5	.00	16.21	22.54	18.58	17.84	11.34	1.00	.39	12.10



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