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Model Evaluation Workgroup

Technical Memorandum 2e

Estimation of Lower Fox River Sediment Bed Properties

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Wisconsin Department of Natural Resources

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1.0 SUMMARY

This technical memorandum is provided in partial fulfillment of the Memorandum of Agreement ("Agreement") between the State of Wisconsin and seven paper companies ("Companies"), dated January 31, 1997.

Model evaluations will be undertaken according to the procedures discussed in the "Workplan to Evaluate the Fate and Transport Models for the Fox River and Green Bay"("Workplan"). This workplan was developed by Limno-Tech, Inc. ("LTI") on behalf of the Companies and the Wisconsin Department of Natural Resources ("WDNR") and was conditionally approved by WDNR on September 26, 1997. This technical memorandum is an extension of the Task 2 series of model evaluation work products, entitled "Estimation of Lower Fox River Sediment Bed Properties."

Numerous investigations of Lower Fox River sediments completed since the 1989 Green Bay Mass Balance Study provide information about sediment bed properties at discrete points in space (and time). However, no investigation can provide information about sediment properties through the entire areal and volumetric extent of the sediment bed without additional analysis. The results of these studies must be interpolated in a consistent and technically sound manner to provide a continuous representation of sediment bed properties. The objective of this technical memorandum is to present a methodology to estimate sediment bed properties from the results of field investigations and its application to the Lower Fox River to estimate the physicochemical properties of the sediment bed. One specific intent of this work effort is to provide a single, consistent set of interpolated sediment bed properties for use in model evaluation and State of Wisconsin-led Natural Resources Damage Assessment (NRDA) and Superfund (CERCLA) Remedial Investigation/Feasibility Study (RI/FS) and Risk Assessment (RA) efforts.

The selected interpolation approach was: ArcView 3.0 GIS software with the Spatial Analyst 1.0 extension, regular networks (grids), and Inverse Distance Weighting (IDW). The selected grid cell size was 10 meters by 10 meters. The selected IDW weighting exponent n was 5. The selected radius of influence r was 100 meters for sediment thickness interpolations and 1000 meters for all other properties.

The estimated total sediment volume in the Lower Fox River from Lake Winnebago to Green Bay was 11.3 million m^3. The estimated contaminated sediment volume ranged from 5.2 million m^3 to 8.8 million m^3. The estimated sediment polychlorinated biphenyl (PCB) inventory ranged from 39,400 kg to 47,300 kg. Other sediment bed properties estimated are dry bulk density, particle grain size (sand, silt, and clay), total organic carbon (TOC), and mercury (Hg). These interpolations infer sediment bed properties for 74% of the surface area of the river bed. Null ("no data") values were assigned to the remaining 26% of the river bed area. Null values indicate that no sediment bed properties were inferred at a location.

2.0 INTRODUCTION

2.1 PURPOSE OF THIS DOCUMENT

To complete the model evaluation process as described in the Agreement, the physicochemical properties of the Lower Fox River and Green Bay sediment beds must be estimated. These estimated properties are necessary to define model initial conditions as well as spatial conditions of the Lower Fox River/Green Bay system for the temporal (point-in-time) analysis of model performance. The purpose of this document is to present:

1. development of a general methodology to estimate sediment bed properties; and
2. application of this methodology to the Lower Fox River and estimated sediment bed properties.

Sediment bed properties for Green Bay are not estimated or presented in this document.

2.2 OVERVIEW

Numerous investigations of Lower Fox River sediments have been completed since the 1989 Green Bay Mass Balance Study (GBMBS). The study area location is presented in Figure 1. Each of these investigations provides information about sediment bed properties at discrete points in space (and time). However, no investigation can provide information about sediment properties through the entire areal and volumetric extent of the sediment bed without additional analysis; the results of each study must be interpolated in a consistent and technically sound manner to provide a continuous representation of sediment bed properties. The objective of this technical memorandum is to present a methodology to estimate sediment bed properties from the results of field investigations and its application to the Lower Fox River to estimate the physicochemical properties of the sediment bed. One specific intent of completing this work effort is to provide a single, consistent set of interpolated sediment bed properties for use in model evaluation and State of Wisconsin-led Natural Resources Damage Assessment (NRDA) and Superfund (CERCLA) Remedial Investigation/Feasibility Study (RI/FS) and Risk Assessment (RA) efforts.

The methodology to interpolate sediment bed properties was developed in consideration of a wide array of interpolation tools, frameworks, and techniques. To assess the performance of each possible interpolation approach in an objective manner, a series of evaluation criteria were developed. These criteria and selected interpolation approach are discussed in Section 3.0. The selected interpolation approach is described as the sediment bed model.

The site-specific application of the sediment bed model to the Lower Fox River was developed in consideration of areal and vertical distribution of observations for the river. To select sediment bed model parameter values specific to the Lower Fox River, a series of evaluation criteria were developed. These criteria and the selected sediment bed model parameter values are presented in Section 4.0. A general description of Lower Fox River sediment bed data sources is also presented in Section 4.0.

The estimated sediment bed properties of the Lower Fox River are presented in Section 5.0. The data handling operations needed to prepared input data for interpolation are also presented in Section 5.0. Example data handling operations include converting the various measurements reported in each data source to consistent units of measure and the converting the various methods of reporting locational information to a single coordinate system using a consistent datum. The estimated sediment bed properties presented in this technical memorandum are:

1. Sediment Thickness;
2. Depth of Contamination;
3. Dry Bulk Density;
4. Particle Grain Size Classification: Sand, Silt, Clay;
5. Total Organic Carbon (TOC);
6. Polychlorinated Biphenyls (PCBs); and
7. Mercury (Hg).

3.0 DEVELOPMENT OF THE SEDIMENT BED MODEL

Development of a generalized sediment bed model is the first step in interpolating sediment bed properties from field observations for any site of interest. To develop a sediment bed model of broad applicability, three characteristics must be explored. These characteristics are:

1. the interpolation tool;
2. the interpolation framework; and
3. the interpolation technique.

Description of these characteristics and selection of a general approach to interpolating sediment bed properties are presented in the sections that follow. The application of this sediment bed model to the Lower Fox River is presented in Section 4.0.

3.1 SELECTION OF THE INTERPOLATION TOOL AND PLATFORM

A wide range of tools and platforms are available to display and interpolate spatial information. Representative tools include vector and raster-based geographic information systems (GIS), computer-aided drawing/drafting (CAD) software, and surface and volumetric contouring software, as well as manual methods. Example software products include ArcView GIS, Arc/Info GIS, AutoCad, and Surfer.

Interpolations can be constructed using any of these approaches so it was necessary to develop evaluation criteria to assess the ability of these tools and platforms to create interpolations. The evaluation criteria for this assessment were that the selected interpolation tool and platform should:

1. be capable of performing interpolation operations and displaying the results;
2. preserve and maintain locational information associated with field observations and interpolated properties; and
3. be available to, and usable by, a wide audience (in the case of computer software packages, be available commercially or in the public domain).

The manual interpolation approach (hand contouring) provides a widely available method to perform interpolations. Until the advent of more automated contouring methods, the manual approach was commonly used to perform interpolation operations. Display of manual interpolations is typically performed through use of CAD, or similar, display tools. Although widely used and available, manual methods can be difficult to apply in practice because this approach is heavily dependent on individual operator skill and judgment. Locational fidelity can also be limited by operator skill and judgment. As a consequence, it is difficult for one operator to always accurately reproduce interpolations generated by different operators. Based on these considerations, the manual interpolation approach was excluded from further review.

The CAD and surface/volumetric contouring approaches were considered in tandem. CAD packages, such as AutoCAD provide a widely available method to display graphical data such as the results of interpolation. However, most CAD packages lack surface generation tools to perform interpolation operations directly. This limitation can be overcome by performing interpolations using surface/volumetric modeling software or manual methods. A variety of surface/volumetric contouring tools, such as Surfer, are available to perform interpolations. The results of these external interpolations can then be digitized for subsequent display with in a CAD package. Unfortunately, the CAD/external interpolation approach suffers from a further, significant limitation. Although able to accurately represent relative spatial differences, CAD packages are not well-suited for this application since they are not designed to maintain absolute spatial references to known datums. This limits the ultimate utility of this approach since loss of locational fidelity can introduce additional uncertainty in interpolation results. Based on these considerations, the CAD/external interpolation approach was excluded from further review.

The GIS approach also provides a widely available method to perform interpolations. GIS packages, such as ArcView and Arc/Info, are specifically designed to perform a wide array of data interpolation and display operations. Interpolations can be completed internally or through use of external companion modules such as Spatial Analyst. GIS packages are also specifically designed to preserve and maintain locational information associated with field observations and interpolated properties. ArcView and Arc/Info are two examples of available GIS tools. Given the specific intent that this task is to provide a single, consistent set of interpolated sediment bed properties for model evaluation, NRDA, and Superfund (CERCLA) RI/FS and RA efforts, it is worth noting that ArcView and Spatial Analyst are readily available to all groups participating in these efforts. Based on these considerations, ArcView GIS Version 3.0 (ESRI, 1996a) with the Spatial Analyst 1.0 extension (ESRI, 1996b) were selected to as the best overall tool to perform interpolation operations.

3.2 SELECTION OF THE INTERPOLATION FRAMEWORK

There are two general categories of interpolation frameworks: irregular and regular networks. In ArcView, these categories are triangular irregular networks (TINs) and Grids. Using TINs, the surface to be interpolated is represented as a collection of adjoining triangles. Each field observation location (a point at which a sample was collected in the field) form a vertex of each triangle in the network. Using Grids, the surface to be interpolated is represented as a series of regular, square cells in rows and columns. Each field observation location is assigned to one of the square cells in the network.

Interpolations can be constructed using either of these approaches so it was necessary to develop an evaluation criterion to assess to ability of these frameworks to create interpolations. The evaluation criterion was: contour lines should never intersect. Intersecting contour lines are considered inappropriate because at locations where contours intersect, more than one value is assigned to a single location for a single sediment bed property (e.g. two PCB concentrations for one location). Both TINs and Grids were assessed using Lower Fox River sediment thickness as test case for interpolation by an arbitrary technique with default parameter values as supplied by ArcView. To test the TIN approach, the ArcView 3D Analyst extension is required; the TIN generation function in 3D Analyst uses linear interpolation. To test the Grid approach, it was also necessary to select a grid cell size. The choice of grid cell size is arbitrary; a 10 meter by 10 meter grid size was selected. Larger grid cell sizes resulted in a more block-like representation of the system boundaries; smaller grid cell sizes dramatically increase the computational time needed to complete an interpolation. In this test case, the arbitrary interpolation technique was inverse distance weighting using the default parameter value weighting power of 2 and radius of influence of 100 meters.

Although simple, this criterion is quantitative and was sufficient to clearly select an interpolation framework. TINs can be sensitive to abrupt changes in data density and distribution. As a consequence of differences in data density and distribution, TIN-generated contours sometimes intersected. In contrast, Grid-generated contours never intersected. On this basis, the grids were selected as the most reliable interpolation framework. Sample output for TIN and Grid-generated sediment thickness contours are presented in Figures 2-3.

3.3 SELECTION OF THE INTERPOLATION TECHNIQUE

There are three general categories of interpolation techniques: 1) Moving Averages; 2) Spline and Bezier Curves; and 3) Kriging (a stochastic method). In ArcView (with Spatial Analyst), interpolation techniques within each of these categories are available. A general discussion of these interpolation techniques is presented by P. A. Burrough (1986).

Interpolations can be constructed using any of these techniques so it was necessary to develop evaluation criteria to assess the ability of these approaches to create interpolations that closely correspond to field observations. The evaluation criteria were:

1. interpolated values can never be less than zero; and

2. the underlying mathematics of the interpolation technique should be readily understood and communicable to a wide audience; and

3. the computational effort needed to complete an interpolation should not exceed more than 10 hours of processing time (if possible).

These three categories of interpolation techniques were assessed using Lower Fox River sediment thickness as a test case for interpolation. Test cases were conducted using ArcView with Spatial Analyst as the selected tool and grids as the selected framework. Each general category of interpolation techniques was tested using a representative technique with default parameter values as supplied by ArcView/Spatial Analyst.

Moving average methods assign the interpolated value of a grid cell as a function of radial distance from surrounding observations. The Inverse Distance Weight (IDW) technique was selected as a representative technique within this general category. The mathematics of this technique are easily understood and communicated by the following expression:

$$C_i = \sum_{j=1}^{m} w_j \, f(x_j, y_j)$$

$$w_j = \frac{d_j^{-n}}{\sum_{k=1}^{m} d_k^{-n}}$$

where: C_i = interpolated value at grid cell i (at location x_i, y_i)

w_j	=	weight expressing the influence of an observed value on grid cell *i*
$f(x_j,y_j)$	=	observed value (at location x_j,y_j)
$d_{j,k}$	=	distance between the locations of observation *j* (or *k*) and grid cell *i*
n	=	weighting exponent to control the influence of observed values on adjacent grid cells
m	=	number of observed values within radius *r* of grid cell *i*
r	=	radius of influence around grid cell *i*

The IDW technique does not force interpolated values to equal observed values at grid cells where observations are available. The performance of this technique is controlled through selection of the exponent *n* and radius *r*. As *n* increases, the influence distant points have on the interpolated value at a grid cell decreases. For very large *n* values, the IDW technique approximates the results of the Thiessen polygon technique. As the radius r increases, the number of observations that influence the interpolated value at a grid cell increases; larger radius values reduce the potential area for which interpolated values cannot be computed. The default parameter values used for the sediment thickness interpolation test case were: n = 2 and r = 100 meters. River shorelines and dams were treated as barriers. The effect of barriers is to limit the spatial extent of interpolation. In the absence of barriers, interpolation proceeds in a two-dimensional infinite field bounded only by the radius of influence. No value is assigned to a barrier. The grid cell size was 10 meters by 10 meters. For this test case, interpolated sediment thickness values were never less than zero and ranged from 0 to 6.03 meters. Observed sediment thickness values ranged from 0 to 6.03 meters. Processing time for a whole river interpolation was approximately 6 hours.

Spline methods, which include Bezier curves, assign the interpolated value at a grid cell as piecewise polynomial functions of surrounding observed values. The mathematics of this technique are readily understood and communicated by the following expressions:

$$C_i = T(x,y) + \sum_{j=1}^{N} \mathbf{l}_j R(r_j)$$

$$T(x,y) = a_1 + a_2\, x + a_3\, y$$

$$R(r) = \frac{1}{2\mathbf{p}}\left\{\frac{r^2}{4}\left[\ln\left(\frac{r}{2\mathbf{t}}\right) + c - 1\right] + \mathbf{t}^2\left[K_O\left(\frac{r}{\mathbf{t}}\right) + c + \ln\left(\frac{r}{2\mathbf{p}}\right)\right]\right\}$$

where:	C_i	=	interpolated value at a grid cell *i*
	N	=	number observations in the spline function
		=	coefficients determined by solution of a system of linear equations
	r	=	distance from the grid cell being interpolated to an observation
	$a_{1,2,3}$	=	coefficients determined by solution of a system of linear equations
	K_0	=	modified Bessel function
		=	weight attached to third derivative terms during minimization.
	c	=	a constant equal to 0.577215

The spline technique forces interpolated values to equal observed values at grid cells where observations are available, enforcing the condition that the cumulative sum of the squares of the second derivative terms of the equations are minimized. The performance of this technique is controlled through selection of the number of observations *N* in the piecewise function domain. As *N* increases, interpolated contours become more smooth. However, as *N* increases the number of inflection points in the interpolated contours also increases. Each inflection point can cause abrupt changes in interpolated values over very short distances. The default parameter value used for the sediment thickness interpolation test case was: n = 12. The grid cell size was 10 meters by 10 meters. For this test case, interpolated sediment thickness values were often less than zero and ranged from -50 to 50 meters from grid cell to grid cell within the bounds of the river. Observed sediment thickness values ranged from 0 to 6.03 meters. Processing time for a whole river interpolation was approximately 8 hours.

Kriging methods assign the interpolated value at a grid cell as a function of changes in local variance relative to the global variance of the observations. The kriging technique is a stochastic approach based on regionalized variable theory. The major assumption of this theory is that the spatial variation of any variable can be expressed as the sum of three components: 1) a Astructural≅ component associated with a constant mean value or tend, 2) a random, spatially correlated component, and 3) a random noise or residual component. The mathematics of this technique, although not straightforward to understand or express in simple terms, can be communicated by the following expression:

$$C_i = m(d) + \boldsymbol{e}'(d) + \boldsymbol{e}''$$

where: C_i = interpolated value at a grid cell i

$m(d)$ = deterministic function of distance d describing the structural component of observed values C_o that can change abruptly at a boundary or vary with a constant trend

$'(d)$ = stochastic function of locally varying, dependent residuals of $m(d)$ that are spatially correlated with $m(d)$

$''$ = spatially independent Gaussian noise term with zero mean and variance ^{2} that is uncorrelated with $m(d)$

The kriging technique does not force interpolated values to equal observed values at grid cells where observations are available. The performance of this technique is controlled through consideration of the underlying semivariogram to select optimal interpolation weights (Burroughs, 1986). The default parameter value used for the sediment thickness interpolation test case was: Universal Kriging. The grid cell size was 10 meters by 10 meters. For this test case, although interpolated sediment thickness values usually fell within the range of field observations, interpolated values were sometimes less than zero with a minimum value of -11 meters within the bounds of a computation for the Little Lake Butte des Morts (LLBdM) region of the river. Observed sediment thickness values ranged from 0 to 6.03 meters (for the whole river). The occurrence of interpolated values less than zero was likely caused by differences between nature of the field observations and the assumptions of the underlying semivariogram (Universal Kriging). As a result of its complexity, the computational requirements of the kriging technique are very large. Processing time for the LLBdM test case was more than 30 hours. Processing time for a whole river interpolation is unknown; the whole river kriging interpolation was aborted after the interpolation failed to reach the 1% completion threshold after more than 135 hours of computation.

On the basis of the sediment thickness test case results, IDW was selected as the best available interpolation technique.

4.0 APPLICATION TO THE LOWER FOX RIVER

As described in Section 3.0, a sediment bed model for interpolating sediment properties was developed. ArcView GIS 3.0 with the Spatial Analyst 1.0 extension was selected as the tool. The Grid method was selected as the framework. The Inverse Distance Weight (IDW) method was selected as the interpolation technique. To apply this sediment bed model to the Lower Fox River and conduct interpolations, IDW parameter values must be selected in consideration of the density and distribution of field observations. Interpolated Lower Fox River sediment bed properties are presented in Section 5.0.

4.1 SELECTION OF INTERPOLATION TECHNIQUE PARAMETER VALUES

The selected technique for interpolation was IDW. To perform interpolations with the IDW, values for two parameters must be chosen: 1) the weighting exponent *n*, and 2) the radius of influence *r*. The exponent value affects the weight that an observation has on a grid cell for which an interpolated value is computed. As the exponent value increases, the effect an observation has on an interpolated value at a given distance decreases. The radius of influence is the maximum distance an observed value can be away from a grid cell and influence the interpolation. As the radius value increases, the number of observations that can influence the interpolated value at a grid cell increases (assuming more observations occur within the increased radius). As radius increases, the areal extent of zones for which interpolated sediment bed properties cannot be computed decreases. However, the computational effort needed to complete an interpolation also increases as radius increases.

To select the IDW exponent *n*, a series of interpolations were conducted using sediment thickness as a test case. The selection criterion for the exponent value was: minimize (or eliminate) the residual error of interpolation. The residual error of interpolation was computed as the root mean square (RMS) error of interpolated and observed values for a series of 30 randomly selected grid cells (for which observations were available). In this series of interpolations, the IDW exponent value was successively increased from a low of one to a high of seven. The default radius of 100 meters was used for each case. Abridged results of this test case are presented in Table 1. These results show that the residual error of interpolation decreases as the IDW exponent value increases. Based on this analysis, an IDW exponent *n* value of five was selected.

To select the IDW radius of influence *r*, a series of interpolations were conducted using sediment thickness and PCB concentrations as test cases. The selection criteria for the radius value were: 1) minimize differences between interpolations with different radius values, 2) minimize the occurrence of zones for which interpolations cannot be completed, and 3) minimize computational effort to complete interpolations. Three radius values were examined: 100 meters, 500 meters, and 1000 meters. Interpolated values depend on the distribution and density of observations. As the radius of influence increases, a larger number of observed values factor into an interpolation (assuming more observations occur within the increased radius). Each included observation contributes to the interpolated value at other locations and can cause differences between interpolated values computed for different radius values. Interpolated sediment properties cannot be computed for grid cells located more than one radius from at least one observation. Grid cells for which interpolations cannot be completed are categorized as “no data” zones. However, as the radius is increased to reduce the extent of “no data” zones, the computational effort needed to complete an interpolation significantly increases.

For Lower Fox River data sets, sediment thickness observations are tightly spaced and very dense relative to other observations of physicochemical sediment properties. Increasing the IDW radius from 100 meters to 1000 meters yielded differences of less than 5% for the sediment thickness test case. The sediment thickness test case using a 100 meter radius required 6 hours of computation and resulted in "no data" zones for approximately 25% percent of the river surface area. The sediment thickness test case using a 1000 meter radius required more than 140 hours of computation and resulted in "no data" zones for approximately 9% percent of the river surface area. However, given the relatively large distances between observations for other sediment property data sets such as PCBs, radius values less than 1000 meters resulted in "no data" zones for approximately 60% of the river surface area. Therefore, as a result of differences in data distribution and density, it was necessary to choose different radius values for sediment thickness and all other interpolations to best meet the radius selection criteria. Based on this analysis, an IDW radius *r* value of 100 meters was selected for sediment thickness interpolations and a radius value of 1000 meters for all other interpolations.

4.2 LOWER FOX RIVER SEDIMENT BED PROPERTY DATA SOURCES

Physical and chemical data from nine sources were used to characterize the Lower Fox River sediment bed from Lake Winnebago to Green Bay. These data sources are presented in Table 2. Data from each source were managed as described in Section 4.3 and used to estimate the specific sediment bed properties defined in Section 4.4. The data reported in these sources were collected from 1989 through 1997. In total, physicochemical samples from over 500 core locations were included in this analysis. Sediment thickness measurements from over 3,900 locations were also included. Data collected during 1998 are not included in this analysis.

4.3 DATA HANDLING OPERATIONS

Prior to spatial analysis, it was necessary to standardize the sediment bed data. Consistency in measurement units is critical to successful interpolation. All data were reviewed to determine the original units of measure used for data reporting. The data were then transformed to consistent units of measure. All sediment core lengths were converted from their original units of measure (inches, feet, centimeters, etc.) to meters; the datum for all observations was the sediment-water interface. Sediment bed property measurements were also converted from their original units of measure (e.g. ppb, % moisture by weight, etc.) to consistent units (e.g. mg/kg, % solids by weight, etc.).

It was also necessary to standardize sample locational data. Consistency in coordinate systems and reference datums is also critical to successful interpolation. All locational information were reviewed to determine the original coordinate system and reference datum used for reporting. Locational data accuracy was verified by comparing electronic information to field logs and then examining the visual display of sample locations to confirm that all observations fell within river boundaries. All coordinates were then transformed to the Wisconsin Transverse Mercator (WTM) projection. The WTM projection is the standard for WDNR surveying and GIS efforts. During the period of Lower Fox River sampling efforts, two reference datums were in use: 1) the North American Datum of 1927 (NAD 27); and 2) the North American Datum of 1983 (NAD 83). After reviewing the locational data, the NAD 27 was selected as the reference datum to minimize the number of data handling operations and for the greatest consistency with existing Lower Fox River GIS coverages. The NAD 27 datum is convertible to the NAD 83 datum through the application of National Datum Transformation Standards (1990).

4.4 DEFINITION OF SEDIMENT BED PROPERTIES

The estimated sediment bed properties presented in this technical memorandum are:

1. Sediment Thickness (meters);
2. Depth of Contamination (meters or %);
3. Dry Bulk Density (g/cm^3);
4. Particle Grain Size Classification: Sand, Silt, Clay (%);
5. Total Organic Carbon (TOC) (%);
6. Polychlorinated Biphenyls (PCBs) (mg/kg); and
7. Mercury (Hg) (mg/kg).

Sediment Thickness is the measure of the unconsolidated sediment overlying consolidated basal material or bedrock. Sediment thickness was measured by physical probing methods, and consisted of pushing a graduated 2.5 inch diameter aluminum sounding pole from the water/sediment interface (i.e., a bathymetry measure) through the soft sediment until refusal.

Depth of Contamination is the extent of sediment thickness measured from the water/sediment interface that contains levels of contaminant greater than the laboratory limit of detection for a chemical. For this analysis, the depth of contamination was based on the occurrence of detectable PCB contamination in the sediment column. The method detection limit (MDL) for PCBs in the sediments ranged from 0.02 mg/kg (ppm) to 0.05 mg/kg.

The depth of contamination for any core location is influenced by the recovery of sediments at that site. The mechanics associated with sediment coring equipment and sampling techniques generally cause differences in the depth of sediment penetrated during coring and the total length of core retrieved. These differences are attributable to a variety of mechanisms (rodding, disturbance of surficial layers, compression due to friction of core tube walls, etc.). The ratio of total length of core retrieved to the depth of sediment penetrated is defined as the recovery ratio. When the recovery ratio is less than one (less than 100% recovery), misalignment of core slices recovered from the sampling device and the actual stratigraphic layer penetrated can occur. Any misalignments between core slices and in-situ sediment layers can result in misrepresentation of contaminated sediment volumes and masses. To account for any possible misrepresentations, three depth of contamination measures were defined: 1) Minimum (Min); 2) Midpoint (Mid); and 3) Maximum (Max). Each of these measures is defined below:

- The minimum depth of contamination assumes there is no misalignment between core slices retrieved and in-situ sediment layers penetrated. In this case, the depth of contamination is defined by the deepest core slice where the contaminant (PCB) concentration is greater than the MDL. Even if concentrations in the last core slice analyzed exceed the MDL, contamination is assumed to be zero in all sediment deeper than the depth of last core slice. This approach provides a lower bound for estimated sediment bed properties (for uncertainty attributable to the vertical location of observations).

- The midpoint depth of contamination accounts for potential misalignment between core slices and in-situ sediment layers by adjusting the core slice limits by the sample recovery ratio. For example, if 0.50 meters of sediment were recovered from a core that penetrated 1.0 meters of the sediment column, the recovery ratio would be 0.5; the core slice from 0.10 to 0.30 meters would be adjusted (divided) by the recovery ratio and assumed to represent the in-situ layer from 0.20 to 0.60 meters. In this case, the depth of contamination is defined by the deepest core slice where the contaminant concentration is greater than the MDL. Even if concentrations in the last core slice analyzed exceed the MDL, contamination is assumed to be zero in all sediment deeper than the depth of last (recovery ratio adjusted) core slice. This approach provides an intermediate bound for estimated sediment bed properties (for uncertainty attributable to the vertical location of observations).

- The maximum depth of contamination also accounts for potential misalignment between core slices retrieved and in-situ sediment layers penetrated by adjusting the core slice limits by the sample recovery ratio. In this case, the depth of contamination again defined by the deepest core slice analyzed where the contaminant (PCB) concentration is greater than the MDL. If concentrations in the last core slice analyzed exceed the MDL, all sediment deeper than the depth of last (recovery ratio adjusted) core slice are assumed to be contaminated at the concentration of deepest core slice. At locations where this occurs, the depth of contamination is equal to the total sediment thickness at that site. This approach provides an upper bound for estimated sediment bed properties (for uncertainty attributable to the vertical location of observations).

Dry Bulk Density is the mass of dry sediment particles per unit volume at the in-situ porosity of the sediments. Dry bulk density is computed from water content (% moisture) and particle density (specific gravity). For the purposes of this analysis, data sources that reported alternate measures of water content (% moisture, % natural moisture, etc.) were expressed as equivalent % solids values.

Sand, Silt, Clay is the fraction (expressed as a percentage) of the total particle concentration that falls into each of these three grain size classifications. Particle grain size was reported using U.S. Department of Agriculture (USDA) definitions. Sands are materials greater than 0.062 mm in diameter. For the purposes of this analysis, the sand classification was also assigned to the very small percentage of material larger than the upper limits sand classification (2 mm) in the few instances where this condition occurred. Silts are materials 0.002 mm to 0.062 mm in diameter. Clay are materials less than 0.002 mm in diameter.

Total Organic Carbon (TOC) is defined as the organic carbon content of dry sediment particles. For the purposes of this analysis, only those data sources following the TOC analytical protocol were considered. Data sources that reported Loss on Ignition (LOI) were not considered. LOI values typically exceed TOC values for the same sample because the LOI analytical protocol can also oxidize inorganic carbon forms.

PCB is defined as the total PCB concentration associated with particles on a dry weight basis. Most data sources reported total PCB concentration values quantified as Aroclor 1242. In some instances, PCB values were quantified as individual congeners and reported as the sum of congeners to represent the total PCB concentration. As previously noted, the MDL for total PCBs in sediments ranged from 0.02 mg/kg to 0.05 mg/kg.

Mercury is defined as the total elemental mercury (Hg) concentration associated with particles on a dry weight basis. The MDL for Mercury in sediments was 0.08 mg/kg.

5.0 ESTIMATED LOWER FOX RIVER SEDIMENT BED PROPERTIES

The specific results of interpolation for each property are presented in the sections that follow. The PCB interpolations presented are for the Mid depth of contamination case. Interpolation results for the Min and Max cases are presented in Appendix A. Summaries of results by sediment deposit, interdeposit (the area between named sediment deposits) and sediment management units (SMUs) is presented in Appendix B.

5.1 SEDIMENT THICKNESS

Sediment thickness is the measure of the unconsolidated sediment overlying consolidated basal material or bedrock. All locational information was reviewed for accuracy and transformed to Wisconsin Transverse Mercator coordinates using the North American Datum of 1927 (WTM NAD 27). Sediment thickness data collected during the 1989 sediment survey from Lake Winnebago to DePere (WDNR, 1995) required additional processing. These data were available only as contour lines (metadata) on survey maps rather than in electronic form. Prior to interpolation, these contour lines were digitized. Each contour line on the original survey map was then represented in closed line form (as polygons). The contour line polygons were then converted to grids and assigned the sediment thickness attribute from its corresponding contour interval. The sediment thickness data collected during the 1993-1994 sediment survey of four sites in the first 32 miles of the river (GAS, 1996) replaced the contour line metadata at those four locations: Deposits POG, D/E, N and EE/GG/HH. As described in Section 4.1, the IDW radius of influence was 100 meters for this interpolation. Over 3,900 direct sediment thickness observations and more than 62,000 additional metadata values (based on digitization of the 1989 sediment thickness contours) were included in this analysis.

Sediment thickness interpolation results are presented in Figure 4. Estimated sediment thickness ranged from 0 to 6.03 meters. Observed sediment thickness ranged from 0 to 6.03 meters. Sediment volume is estimated as the product of sediment thickness and the surface of each 10 meter by 10 meter grid cell (100 m^2). Total sediment volume in the Lower Fox River from Lake Winnebago to Green Bay was estimated at 11.3 million m^3.

5.2 DEPTH OF CONTAMINATION

Depth of contamination is the extent of sediment thickness measured from the water/sediment interface that contains levels of contaminant greater than the laboratory limit of detection for a chemical. For this analysis, the depth of contamination was based on the occurrence of detectable PCB contamination in the sediment column. As described in Section 4.4, three cases were considered: Min, Mid, and Max. Sample recovery ratio was available for most core locations in electronic form or field logs. For the few locations where this information was not available, the recovery ratio was estimated as the average recovery ratio for all samples collected during that specific field sampling event.

Depth of contamination interpolation results for the Min, Mid, and Max cases are presented in Figures 5-7. Contaminated sediment volume is estimated as the product of sediment thickness, the depth of contamination (expressed as a percentage), and the surface of each grid cell. Total contaminated sediment volume in the Lower Fox River from Lake Winnebago to Green Bay was estimated at:

1. Min: 5.2 million m^3;
2. Mid: 7.7 million m^3; and
3. Max: 8.8 million m^3.

5.3 DRY BULK DENSITY

Dry bulk density is the mass of dry sediment particles per unit volume at the in-situ porosity of the sediments (g/cm^3). Dry bulk density was computed from various expressions of water content and particle density (specific gravity). As a consequence of many physical factors, dry bulk density can vary with depth at a site as well as from site to site. Prior to interpolation, the sediment moisture contents and particle density data were examined to determine whether vertical differences in these properties were more pronounced that horizontal differences. On a whole river basis, the variability in water content and particle density with depth in the sediment column at a location was less than the site to site variability for any given sediment depth interval. The average bulk density across all locations was approximately 0.49 g/cm^3 with a standard deviation of ∀ 0.20 g/cm^3. Through the vertical, the average bulk density was approximately 0.52 g/cm^3 with a standard deviation of ∀ 0.20 g/cm^3. Based on this analysis, the sediment dry bulk density was interpolated as a constant with depth at a site.[1]

Water content was available for nearly all core locations and was expressed in one of three manners: % moisture, % solids, % natural moisture. Each of these measures of water content was converted to % solids (by weight) prior to analysis. Particle density was reported for only 16 locations (40 total analyses). In the dry bulk density analysis, the average (arithmetic mean) of all particle density values was used to represent particle density at all sites. The average particle density value used in this analysis was 2.45 g/cm^3.

It is important to note that the particle density data reported by GAS (1996) were excluded from this analysis. The particle density values reported by GAS were very different than values reported by other sources and significantly lower (50% less) than density values expected for soil/sediment materials. The quality of these values could not be confirmed from the quality assurance (QA) information for the GAS effort and were therefore excluded from the analysis.

Dry bulk density was then calculated for each location where water content was available using the formula:

$$\boldsymbol{r}_b = \frac{1}{\frac{1}{\boldsymbol{r}_p} + \frac{1}{f_m} - 1}$$

where: $_b$ = dry bulk density (g/cm^3)

[1] It is also worth noting that the very spatially dispersed and sparse distribution of bulk density measures in the vertical direction largely prevents interpolation as a three dimensional sediment bed property. In most locations, bulk density measures are only available at a single depth interval. It would therefore be necessary to create an assumed vertical distribution of bulk density prior to interpolation. To assume a vertical distribution of a property would defeat the purpose of constructing a three dimensional interpolation.

$_p$ = particle density (g/cm^3)

f_m = fraction of particles by weight = % solids) 100

At those locations where water content was reported for more than one core slice, the dry bulk density was estimated as the thickness-weighted average of the core slice values prior to interpolation.

Dry bulk density interpolation results are presented in Figure 8. Estimated dry bulk density ranged from 0.21 to 1.80 g/cm^3. Observed dry bulk density (as computed at each core location from % solids and particle density) ranged from 0.20 to 1.80 g.cm^3.

5.4 Particle Grain Size Classification: Sand, Silt, Clay

Sand, Silt, Clay is the fraction of the total particle concentration that falls into each of these grain size classifications. For the purposes of this analysis, the sand classification was also assigned to very small percentage of material larger than the upper limits of the sand classification in the few instances where this occurred.

The sand, silt, and clay fractions of each core slice for which data were reported sum to unity (i.e. 100%). Small errors attributable to round-off can cause slight (less than one percent) deviations from this condition. Each grain size classification was interpolated separately since it represents a unique sediment bed property. However, separate interpolation can introduce errors that might cause the sum of the interpolated sand, silt, and clay values at each grid cell to differ from unity. To prevent the introduction of interpolation errors arising from separate interpolation, the sand, silt, and clay fractions were interpolated as concentrations rather than fractions (percentages).

At core locations were the grain size fractions were reported for more than one core slice, the individual sand, silt, and clay fractions were each computed as a thickness-weighted average for each quantity, sand, silt, and clay. Individual sand, silt, and clay concentrations were computed as the product of the thickness-weighted average of each grain size and dry bulk density values. Since dry bulk density expresses the total particle concentrations, the product of the grain size fraction and the bulk density expresses the concentration of that individual grain size. Each grain size class was then interpolated individually as a concentration. The interpolated grain size fractions (percentages) were then computed by dividing each individual interpolated grain size concentration by the sum of the three interpolated concentrations.

Sand, silt, and clay interpolation results are presented in Figures 9-11. Estimated sand fractions range from 1% to 99%. Observed sand fractions ranged from 1% to 99%. Estimated silt fractions range from 0 % to 86 %. Observed silt fractions ranged from 0% to 86%. Estimated clay fractions range from 0 % to 61 %. Observed clay fractions ranged from 0% to 61%.

5.5 Total Organic Carbon (TOC)

Total Organic Carbon is the organic carbon content of dry sediment particles. For the purposes of this analysis, only those data sources following the TOC analytical protocol were considered. Data sources that reported Loss on Ignition (LOI) were not considered because the LOI analytical protocol can also oxidize inorganic carbon forms. As a consequence of many physical factors, TOC can vary with depth at a site as well as from site to site. Prior to interpolation, the sediment TOC data were examined to determine whether vertical differences in these properties were more pronounced that horizontal differences. On a whole river basis, the variability in water content and particle density with depth in the sediment column at a location was similar to the site to site variability for any given sediment depth interval. The average TOC for all locations and all depths was 5.85% with a standard deviation of ∀2.99%. At those locations where TOC was measured at more than one depth interval, the average TOC was 5.48%. At locations where TOC was measured only at one depth interval (almost always the surface sediment slice), the TOC was 6.90%. These values are within 20% of the average of all TOC values and well within the standard deviation of the average of all TOC measurements. Based on this analysis, the TOC was interpolated as a constant with depth at a site. At those locations where TOC was reported for more than one core slice, the TOC was estimated as the thickness-weighted average of the core slice values prior to interpolation.

TOC interpolation results are presented in Figures 12. Estimated TOC contents (expressed as a percentage) ranged from 0.3 % to 34 %. Observed TOC contents ranged from 0.2% to 34%.

5.6 PCBs

PCBs is the total PCB concentration associated with particles. Prior to interpolation, the sediment PCB data were examined to determine whether vertical differences in concentration were more pronounced that horizontal differences. On a whole river basis, the variability in PCB concentration with depth in the sediment column at a location was greater than the site to site variability for any given sediment depth interval. This assessment was based on simple statistics (computed means, standard deviations, etc.) and professional judgment. Based on this analysis, the sediment PCB concentration was interpolated in a manner to describe variation with depth at a site.

To permit variation of PCB concentrations with depth, nine depth intervals (sediment layers) for interpolation were defined:

1. 0 - 0.1 meters (0 was defined as the sediment-water interface);
2. 0.1 - 0.3 meters;
3. 0.3 - 0.5 meters;
4. 0.5 - 1.0 meters;
5. 1.0 - 1.5 meters;
6. 1.5 - 2.0 meters;
7. 2.0 - 2.5 meters;
8. 2.5 - 3.0 meters; and
9. > 3.0 meters.

PCB concentrations for each defined layer for each core location were then computed as a function of the depth of contamination. This accounts for any potential misrepresentations between the core slices and the in-situ sediment layers penetrated during sampling. The core slice limits (0-10 cm, 1-3 ft, etc.)

were adjusted by the recovery ratio for the Mid, Min, and Max depth of contamination cases and used to compute a thickness-weighted average PCB concentration for each sediment layer at each core location. This process resulted in 27 PCB interpolations: one for each of the nine sediment layers for each of three depth of contamination cases.

PCB interpolation results for the Mid depth of contamination case are presented in Figures 13-21. Estimated Mid PCB concentrations range from < 0.05 to 650 mg/kg (ppm). Observed PCB concentrations ranged from < 0.05 mg/kg to 710 mg/kg. Interpolation results for the Min and Max cases are presented in Appendix A. Tabular results for the Mid case are presented in Appendix B. The Mid representation is believed to best reflect the sediment PCB inventory of the Lower Fox River.

PCB mass is estimated as the product of sediment thickness, the surface of each grid cell, dry bulk density, depth of contamination (expressed as a percent of sediment thickness), and PCB concentration. Total PCB mass in the Lower Fox River from Lake Winnebago to Green Bay for the Mid depth of contamination case was estimated at 45,200 kg. Total PCB mass estimates ranged from 39,400 kg (Min) to 47,300 kg (Max).

5.7 MERCURY (HG)

Mercury is the total elemental mercury (Hg) concentration associated with particles. Prior to interpolation, efforts were made to examine the sediment Hg data to determine whether vertical differences in concentration were more pronounced that horizontal differences. The variability in Hg concentration with depth in the sediment column at a location was greater than the site to site variability for any given sediment depth interval. This assessment was based on simple statistics (computed means, standard deviations, etc.) and professional judgment. Based on this analysis, the sediment Hg concentration was interpolated in a manner to describe variation with depth at a site. To permit variation of Hg concentrations with depth, the nine depth intervals (sediment layers) for interpolation previously defined for PCB interpolations were used.

Although concentrations for each layer for each core location can be computed as a function of the depth of contamination (defined for Hg rather than PCBs) to account for potential misrepresentations between the core slices and in-situ sediment layers, Hg data were reported for relatively few core locations. As a consequence of this relatively low data density (which causes large Ano data≅ zones), interpolations were performed only for the Min depth of contamination case. While interpolations can be performed for the Mid and Max depth of contamination cases, the effort needed to define depths of contamination specific to Hg exceeded the potential utility of these interpolations given the large areas of river surface in “no data” zones. This decision was based on professional judgment.

Hg interpolation results for the Min depth of contamination case are presented in Figures 22-30. Estimated Min Hg concentrations range from < 0.08 to 14 mg/kg (ppm). Observed Hg values range from < 0.08 to 14 mg/kg.

6.0 UNCERTAINTY

Sediment bed property interpolations are affected by uncertainty attributable to sample collection and analysis and uncertainty introduced by the interpolation technique. Uncertainty attributable to sample collection and analysis affects the interpretation of spatial and temporal trends in field observations and cannot be minimized through optimization of the interpolation technique. Examples of this type of uncertainty include the accuracy of sample location information (in two and three dimensions) and the accuracy of sample concentration information. The greater the level of spatial heterogeneity and temporal variability in the system sampled, the more influence uncertainty attributable to sample collection and analysis has on interpolated sediment bed property results. Uncertainty introduced by the interpolation technique affects interpolated results and can be minimized through the optimization of parameter values for the technique used to interpolate sediment bed properties. For the IDW technique, these parameters are the weighting exponent and the radius of influence. A discussion of factors that contribute to uncertainty is presented below.

6.1 SPATIAL HETEROGENEITY OF FIELD OBSERVATIONS

Observed sediment bed properties differ from location to location as a reflection of the spatial heterogeneity of the system. The spatial heterogeneity of field observations can be segregated into two components: horizontal (x, y) and vertical (z). In the Lower Fox River, the spatial heterogeneity of PCB concentrations is more pronounced in the vertical than the horizontal direction. In the horizontal, observed PCB concentrations change over a scale of meters at a minimum to tens of meters or more. However, in the vertical, concentrations change over a scale of centimeters. For this reason it was assumed that, at least for PCBs, inaccuracies in representing the vertical location of observations were more significant than inaccuracies in the horizontal location. As described in Sections 4.4 and 5.6, the Min, Mid, and Max representations of sediment PCB concentrations express sample location uncertainty in the vertical direction.

The Min depth of contamination is a lower bound for interpolated sediment PCB concentrations. This representation assumed that there was no misalignment between the core slices retrieved and in-situ sediment layers penetrated. Since sample recovery ratios was always less than 100%, the Min representation will always represent the lowest possible bound for PCB extent in the vertical since contaminants are assumed to be present in the least depth of sediments. This representation assumes that the reason sample recovery ratios were less than 100% was that after initial penetration the coring device plugged and rodded through the remaining depth of sediments penetrated without permitting additional material to enter the core tube. As previously described, the Min representation of the sediment PCB inventory was 39,400 kg.

The Mid depth of contamination is an intermediate bound for interpolated sediment PCB concentrations. This representation assumed there was misalignment between core slices and penetrated layers. Observations of sediment coring equipment indicate that the sampling device always penetrated more material than was retrieved (i.e. less than 100% recovery). In this representation, it is assumed that the reason sample recovery ratios were less than 100% was that resistance to sediment entering the core tube caused penetrated materials to compress but that material present in the core tube represented all sediment layers penetrated. As previously described, the Mid representation of the sediment PCB inventory was 45,300 kg. The Mid representation is believed to best reflect the sediment bed PCB inventory of the Lower Fox River.

The Max depth of contamination is an upper bound for interpolated sediment PCB concentrations. Observations PCB concentrations in the last core slice analyzed were sometimes greater than the analytical limit of detection. This representation assumed that, in addition to misalignment between core slices and in-situ sediment layers, the PCB concentration present in the deepest core slice analyzed extended from that point through the remaining depth of the sediment column at locations where the PCB concentration in the deepest core slice was greater than the limit of detection. As previously described, the Max representation of the sediment PCB inventory was 47,300 kg.

6.2 TEMPORAL VARIABILITY OF FIELD OBSERVATIONS

Observed sediment bed properties may differ over time at any given location as a reflection of the temporal variability of the system. The spatial variability of sediment bed properties are best determined when similar numbers of observations are collected in an area at approximately the same locations over time. However, if observations are not collected at the same horizontal and vertical locations over time, the spatial heterogeneity of the system may confound assessments of temporal variability.

Field observations of the Lower Fox River sediment bed have been collected over a 10 year time frame (1988-1998). In development of the sediment property bed map, it was assumed that spatial heterogeneity was more pronounced than potential temporal variability. This assumption permits data to be aggregated across all sampling events to produce interpretations of bed properties that provide the greatest possible coverage the sediment surface area. If this assumption is not applicable, it would be necessary to segregate data by time (temporally stratify) prior to interpolation.[2]

However, to at least account for any potential temporal variation in sediment bed properties, field observation were segregated by time prior to interpolation. Where possible, field observations used to generate the sediment bed property interpolations were limited to data collected in 1994 and 1995. Most sediment thickness data were collected in 1994. PCB observations for the area downstream of the DePere Dam were collected in 1995. PCB observations for Deposits POG, D/E, N, and EE/GG/HH were collected in 1994. Additional PCB samples to characterize Deposit N and Hotspot 56/57 were collected in 1997. Upstream of the DePere dam, for areas where no more recent observations existed, data from 1989-1990 were used. It is important to note that those upstream areas were nearly always regions of low PCB concentration and low PCB mass. With the possible exception of Deposit A, these areas typically do not influence the cumulative PCB inventory of the river by more than a few percent at most. As a result of this temporal stratification of data, the interpolated sediment bed properties presented in this report are considered representative of sediment conditions that establish model final conditions for hindcast simulations and initial conditions for forecast simulations (assuming a 1995 hindcast end year and a 1996 forecast start year).

[2] It is interesting to note that at other project sites, researchers nearly always aggregated sediment data across wide time horizons prior to interpretation. These same aggregated sediment interpretations were then often used to advance the position that sediment contaminant concentrations change rapidly even though this conclusion is a direct violation of the assumption that allowed the initial aggregation of the data.

6.3 IDW WEIGHTING EXPONENT

The value selected for the IDW weighting exponent has a pronounced effect on sediment bed property interpolations. As described in Section 4.1, the IDW exponent was selected to minimize (or eliminate) the residual error of interpolation. The residual error of interpolation was defined as the root mean square error of interpolated and observed values for a series of 30 randomly selected grid cells for which observations were available. The exponent value was selected by performing using a series of interpolations with different exponent values and computing the residual error. Results of this test case were presented in Table 1. Based on this analysis, the exponent value of five selected was optimal. As an optimal value, uncertainty attributable to this parameter is considered minimized.

6.4 IDW RADIUS OF INFLUENCE

The value selected for the IDW radius of influence also has a pronounced effect on sediment bed property interpolations. It is important to recall that physicochemical properties of Lower Fox River sediments have been characterized at approximately 500 discrete locations. In a strict sense, bed properties are only known at these discrete, small (the size of a sediment coring tube) points. This is obviously very, very small relative to the full surface area of the river sediments. At all other locations, estimated sediment bed properties are inferred through the IDW procedure from the bed properties at these known locations. The number and spatial distribution of sediment samples varies tremendously from location to location over short distances. The value of observed sediment bed properties (such as PCB concentrations) can also vary widely. In regions where this occurs, a small radius of influence is preferable to minimize the impact distance points have locally.

Except for sediment thickness, the estimated sediment bed properties presented in this report used a 1000 meter radius of influence for interpolations. This large radius of influence value allowed interpolations to be developed for a much larger portion of the sediment bed than did any smaller radius values (74% coverage at 1000 meters versus 40% coverage at 100 meters). However, in regions where sample locations were tightly clustered and sharp gradients existed (e.g. concentration gradients), the 1000 meter radius can potentially exaggerate the influence of the properties of tightly clustered observations.

This situation occurred in the regions of Deposits A and B in Little Lake Butte des Mort and Deposits N and O in Kimberly. Deposit A is extensively characterized (tightly clustered observations) and includes sediments with high PCB concentrations relative to nearby Deposit B (a concentration gradient). Similarly, Deposit N is even more extensively characterized and includes sediments with very high PCB concentrations relative to nearby Deposit O. Using a 1000 meter radius of influence for interpolations, much of the area of Deposit B in within the influence of Deposit A and all of Deposit O is within the influence of Deposit N. As a consequence, interpolated PCB concentrations for Deposits B and O are similar to their more extensively characterized, more contaminated neighbors. Interpolated PCB concentrations in these situations are greater than have been observed for these locations. While it is possible that sediments with high PCB concentrations exist in Deposits B and O, none have been observed to date. For this reason, interpolated sediment bed properties for Deposit B and Deposit O are more uncertain than are interpolated properties at other locations.

To address these occasional situations, it may be preferable to isolate those areas of the river and perform interpolations using a 100 meter radius of influence. All other aspects of the interpolation procedure would remain unchanged. The 100 meter interpolations would replace the 1000 meter interpolations in the specific areas of the river. However, for consistency, all sediment bed properties other than sediment thickness were interpolated using a 1000 meter radius of influence.

6.5 LOCATION OF THE SEDIMENT-WATER INTERFACE

The vertical location of each sample (core slice) used in this analysis was measured relative to the sediment-water interface. The absolute elevation of the sediment-water interface was not measured at the time of sample collection. Given that the data used in this analysis were collected over a number of years, and that the location (the absolute elevation) of the sediment-water interface can change over time, differences in the sediment bed elevation between sampling events introduces an element of uncertainty into the analysis. Without knowledge of the absolute locations of samples in the vertical, changes in sediment bed elevation may confound efforts to distinguish between spatial heterogeneity and temporal variability of sediment bed properties. For example, if sediment bed elevations decreased by 10 cm at a sampling location over time, then a 0-10 cm core slice may best be described by a 10-20 cm core slice at a sampling location where the sediment bed elevation did not change. Since the absolute elevation of the sediment-water interface was not measured at the time of sample collection, it is difficult to assess even qualitatively what affect sediment bed elevation changes may have on sediment bed property estimates. The estimated sediment bed properties presented in this technical memorandum do not account for the effect of possible changes in sediment bed elevation over time.

7.0 REFERENCES

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Table 1. Abridged results of IDW exponent selection: observed and predicted sediment thickness.

Observed Sediment Thickness (m)	*Predicted Sediment Thickness (m) for IDW Exponent Values*						
	1	*2*	*3*	*4*	*5*	*6*	*7*
2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60
3.70	3.70	3.70	3.70	3.70	3.70	3.70	3.70
1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80
1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50
0.94	1.04	0.95	0.94	0.94	0.94	0.94	0.94
0.15	0.40	0.17	0.15	0.15	0.15	0.15	0.15
0	0.38	0.04	0	0	0	0	0
0.91	0.73	0.89	0.91	0.91	0.91	0.91	0.91
0.37	0.49	0.42	0.39	0.38	0.37	0.37	0.37
0.15	0.32	0.18	0.15	0.15	0.15	0.15	0.15
0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15
0.30	0.57	0.34	0.30	0.30	0.30	0.30	0.30
0.58	0.57	0.58	0.58	0.58	0.58	0.58	0.58
0.18	0.57	0.24	0.19	0.18	0.18	0.18	0.18
1.4	1.03	1.32	1.40	1.40	1.40	1.40	1.40
1.77	1.66	1.76	1.77	1.77	1.77	1.77	1.77
1.95	1.93	1.95	1.95	1.95	1.95	1.95	1.95
1.65	1.60	1.64	1.65	1.65	1.65	1.65	1.65
1.50	1.20	1.45	1.50	1.50	1.50	1.50	1.50
0.20	0.15	0.18	0.19	0.20	0.20	0.20	0.20
1.80	1.59	1.73	1.79	1.80	1.80	1.80	1.80
1.40	1.45	1.43	1.41	1.40	1.40	1.40	1.40
0.10	0.45	0.15	0.11	0.10	0.10	0.10	0.10
2.80	2.64	2.76	2.79	2.80	2.80	2.80	2.80
1.20	1.01	1.16	1.19	1.20	1.20	1.20	1.20
1.20	1.37	1.21	1.20	1.20	1.20	1.20	1.20
Root Mean Square (RMS) Error (m)	0.227	0.039	0.009	0.002	0	0	0

Table 2. Data sources included in estimation of Lower Fox River Sediment Bed Properties

Data Source	Year Collected	Areas Sampled	Number of Core Locations	Parameters Measured					
				Sediment Thickness	Water Content/ Particle Density	Particle Size	TOC	PCBs	Hg
WDNR, 1989 (Velleux and Endicott, 1994)	1989-1990	Depere Dam to Green Bay	33		Y (WC)[1]	Y	Y	Y	
WDNR, 1995	1989-1990	Lake Winnebago to Depere Dam	246	Y	Y (WC)	Y	Y	Y	
Graef, Anhalt, Schloemer, and Associates (GAS), 1996	1993-1994	4 Deposits: POG, D/E, N, EE/GG/HH	122	Y	Y (WC) Y (PD)[2]	Y	Y	Y	Y
Woodward-Clyde/EWI, 1996	1991-1992	Deposit A	14	Y	Y (WC) Y (PD)	Y	Y	Y	
WDNR, 1998a	1993-94 1995	Depere Dam to Green Bay	107	Y	Y (WC)	Y	Y	Y	Y
WDNR, 1998b	1997	Deposit N, SMU 56/57	12			Y	Y	Y	
Foth and Van Dyke, 1998	1997	Deposit N	6	Y	Y (WC) Y (PD)	Y	Y	Y	
Montgomery Watson, 1998	1997	SMU 56/57		Y	Y (WC) Y (PD)	Y	Y	Y	Y

1 WC = water content, PD = particle density.

2 Particle density data reported by GAS (1996) did not meet quality assurance review and were excluded.

Figure 1: Study Area, Lower Fox River
Lake Winnebago to Green Bay

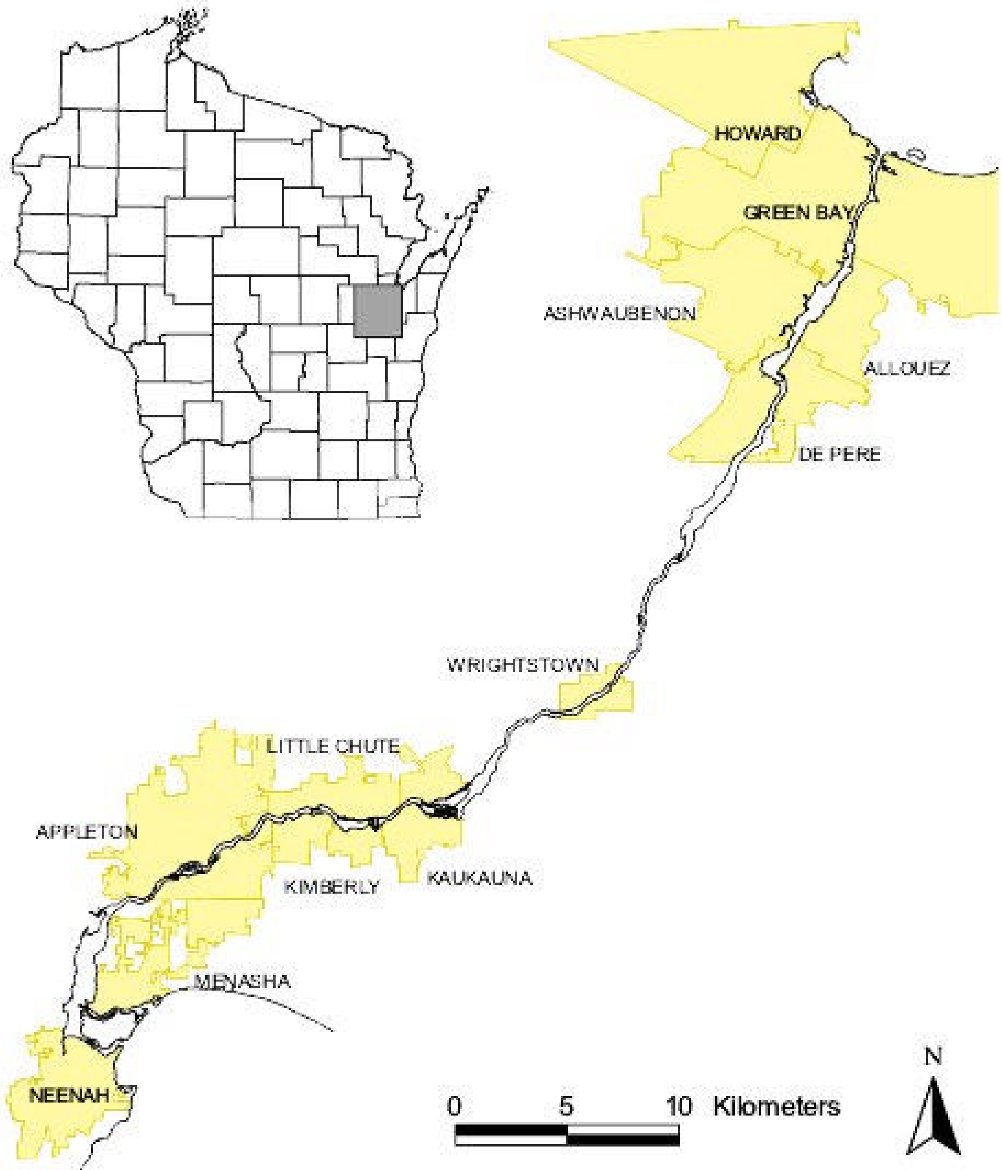


Figure 2: TIN Contours(1ft)

Figure 3: Grid Countours(1ft)

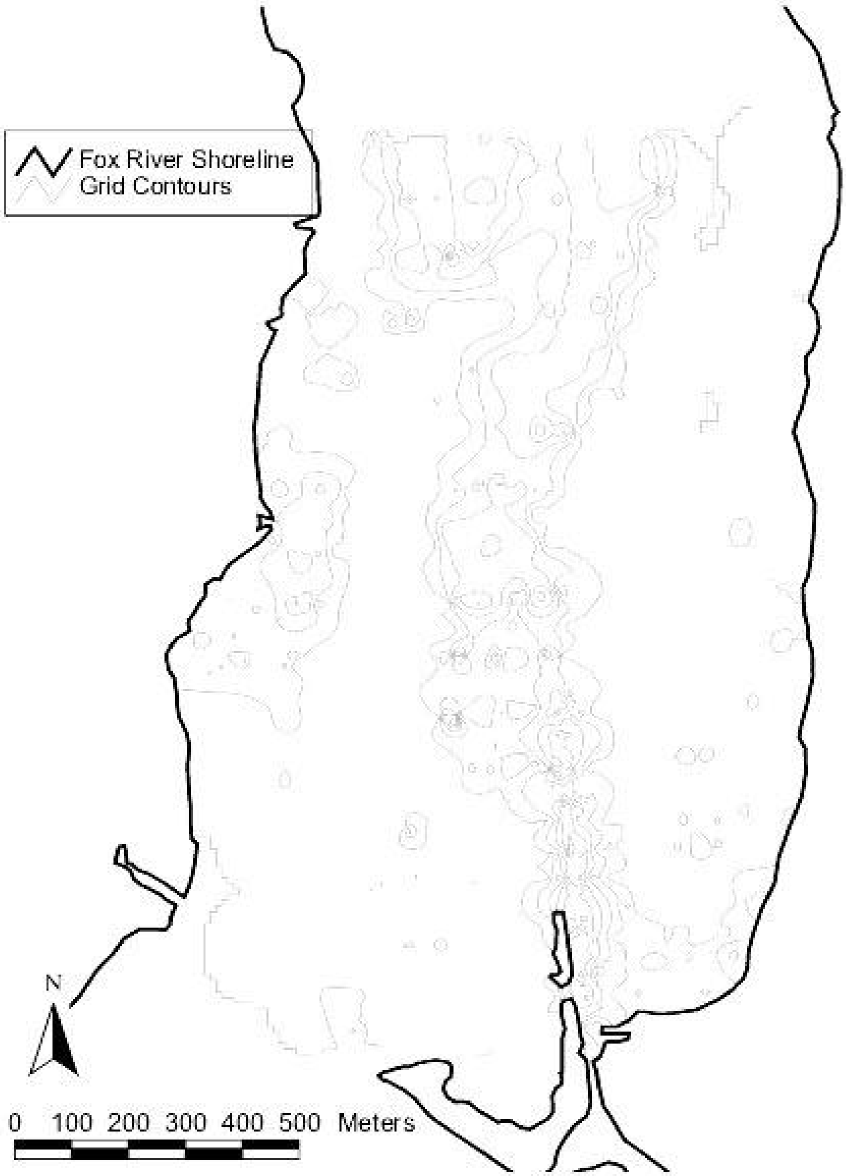


Figure 4: Sediment Thickness
Little Lake Butte des Morts

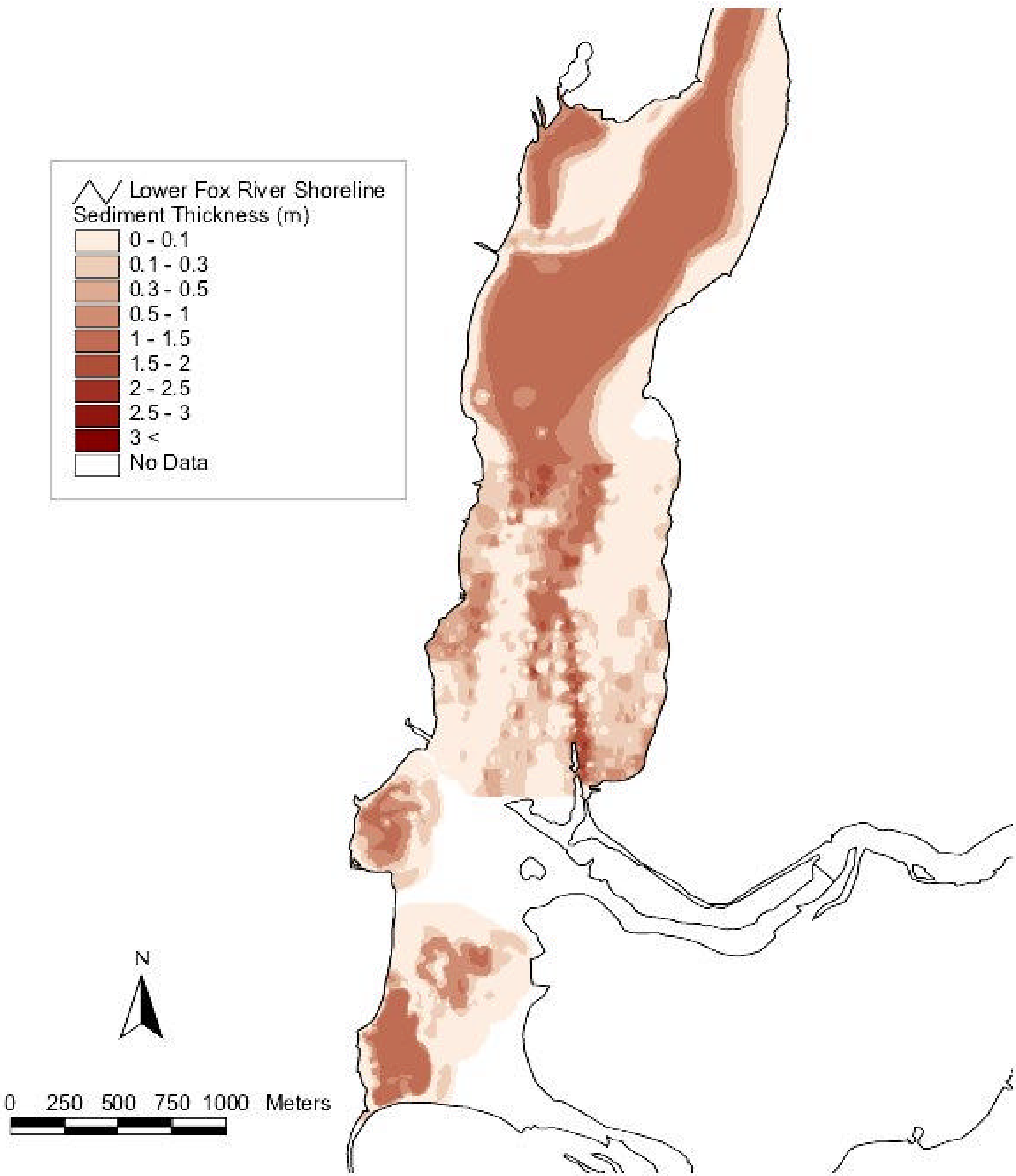


Figure 5: Minimum Depth of Contamination
Little Lake Butte des Morts

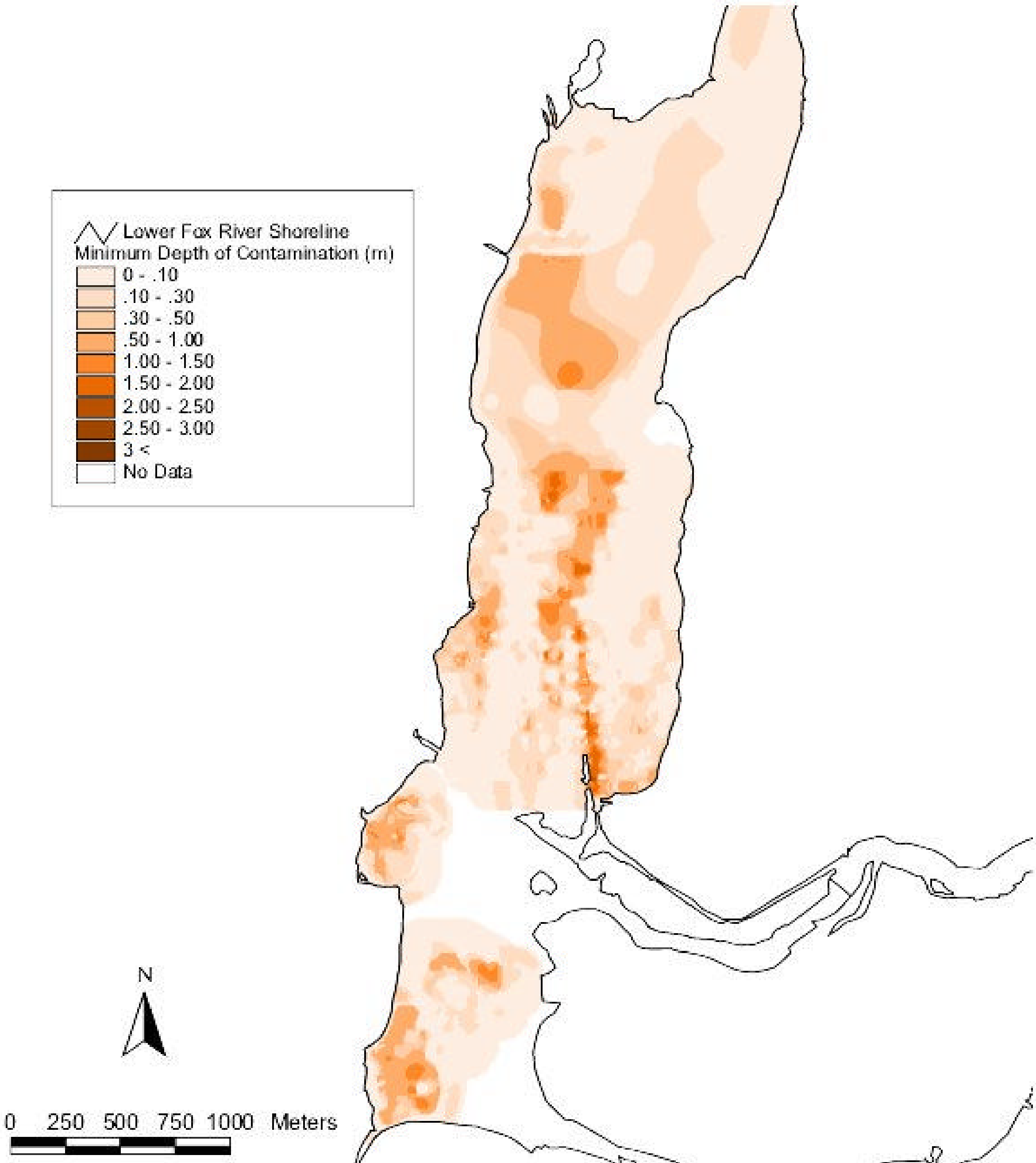


Figure 6: Mid Depth of Contamination
Little Lake Butte des Morts

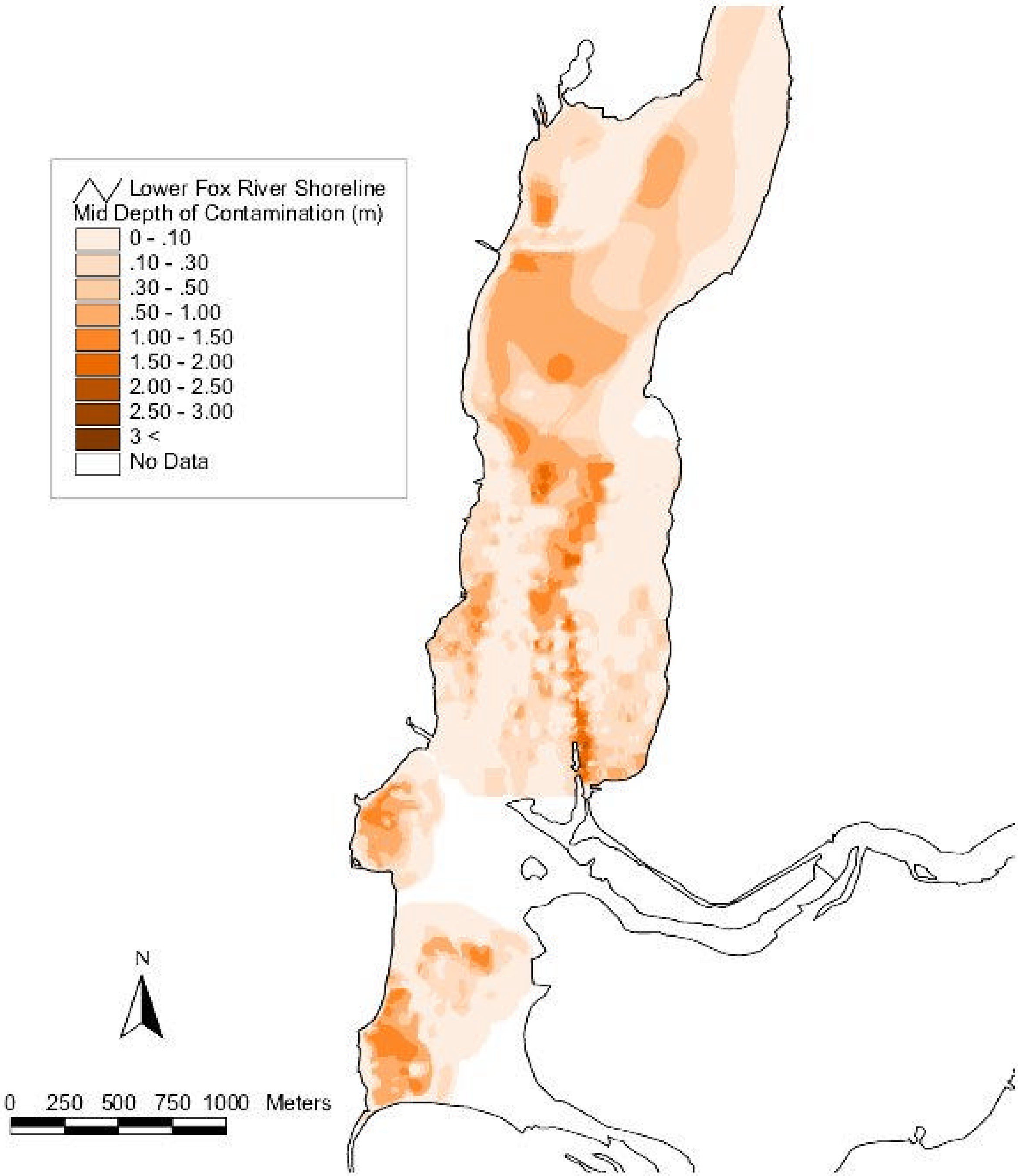


Figure 7: Maximum Depth of Contamination
Little Lake Butte des Morts

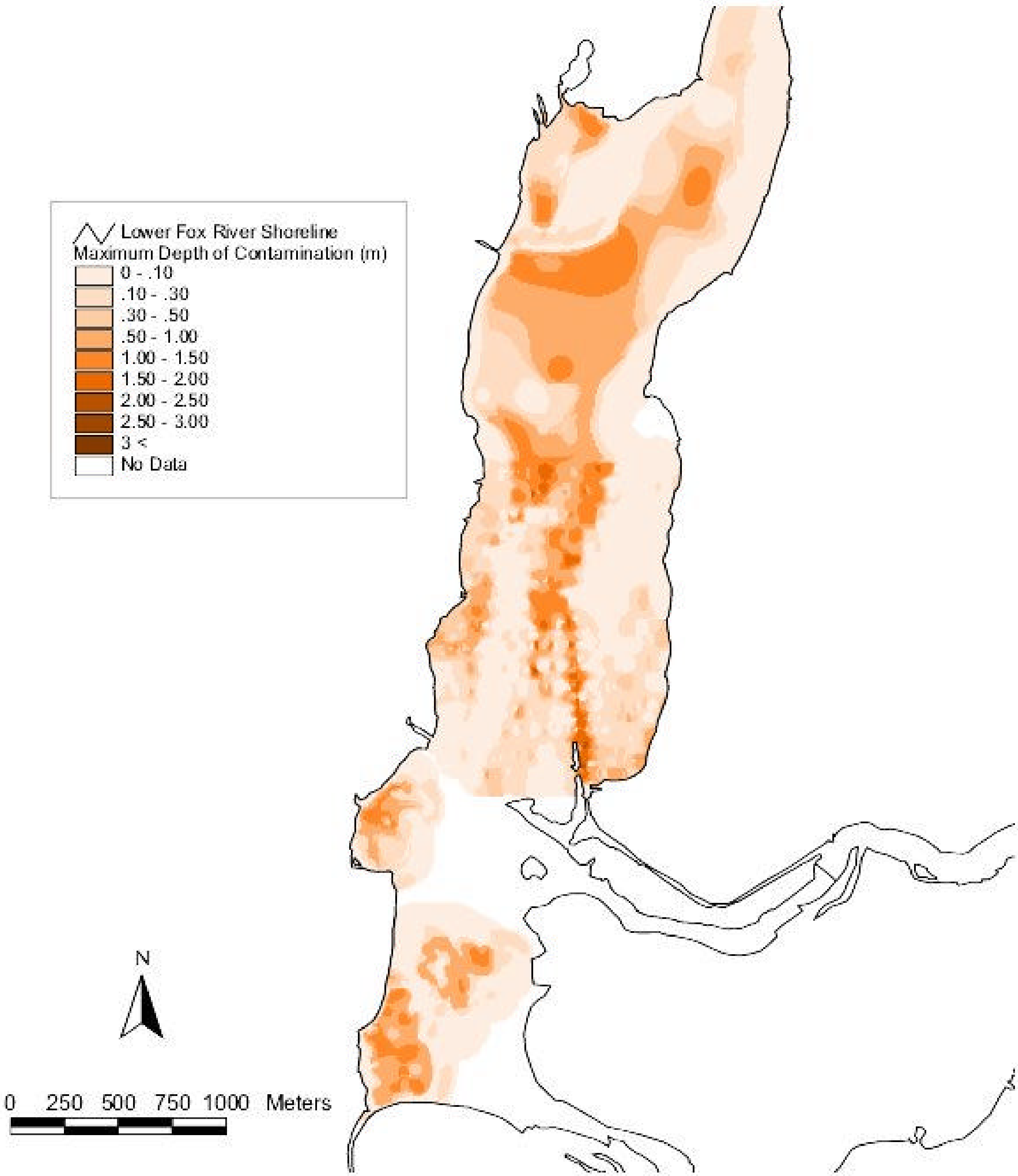


Figure 8: Dry Bulk Density
Little Lake Butte des Morts

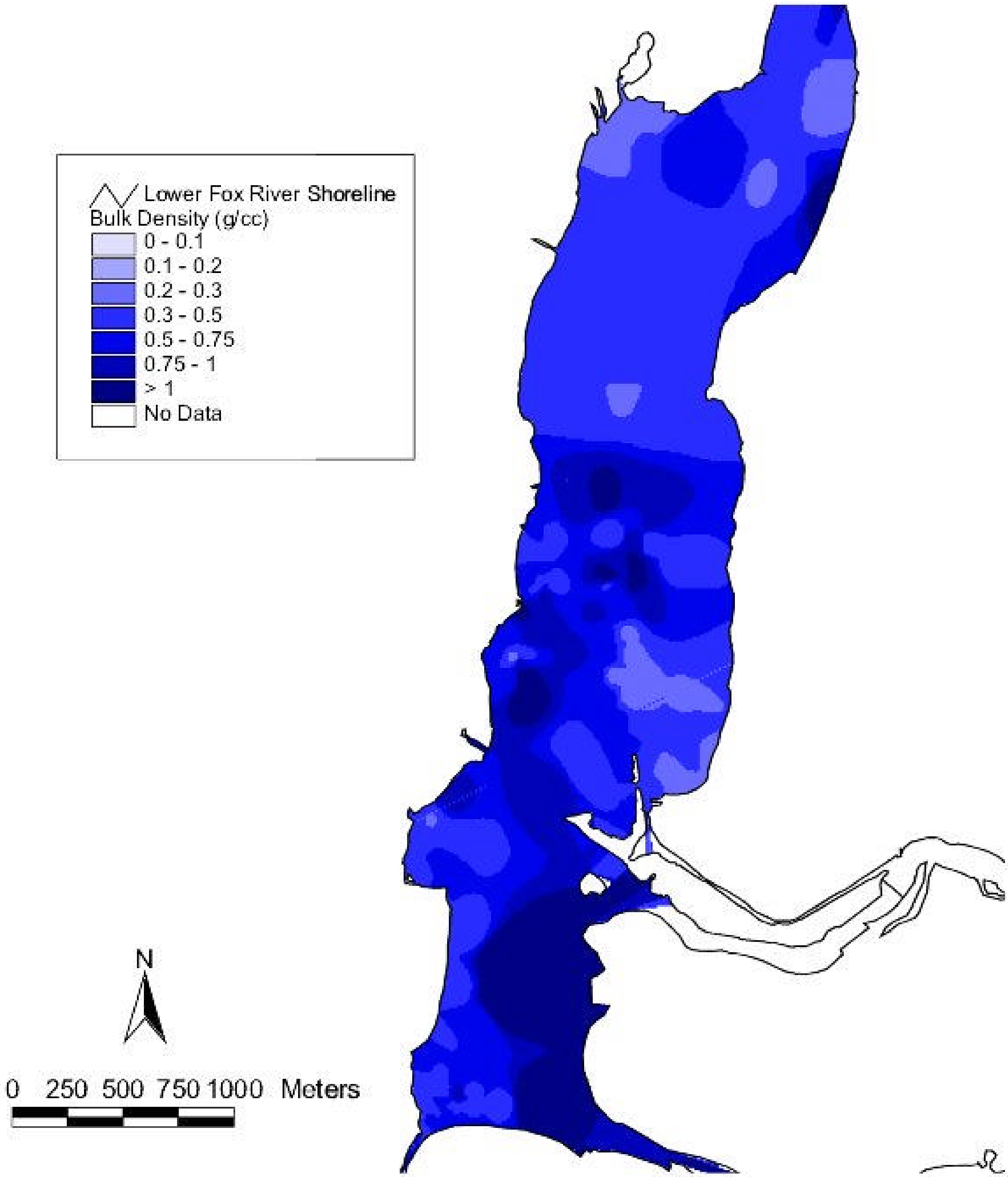


Figure 9: Percent Sand Content
Little Lake Butte des Morts

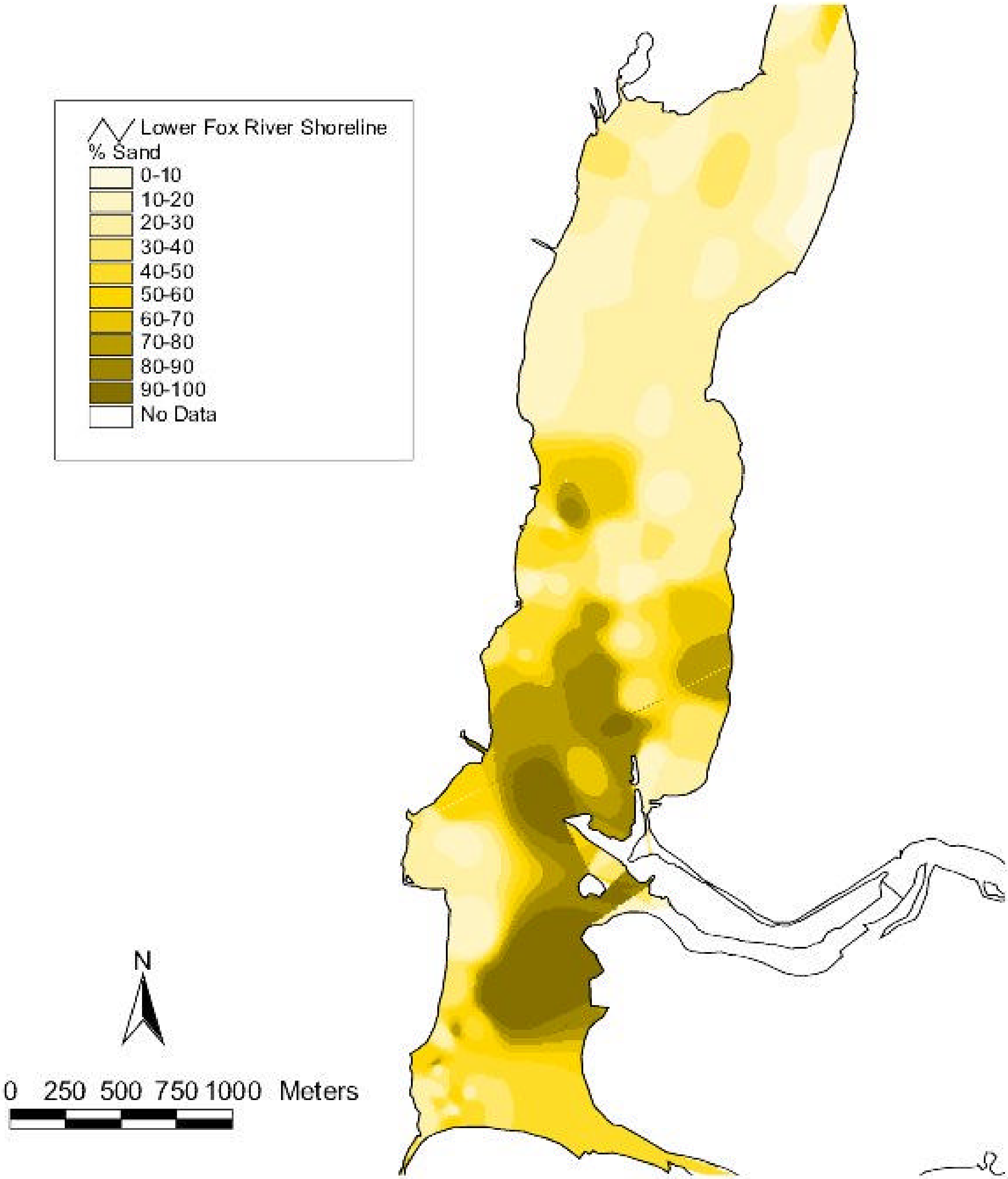


Figure 10: Percent Silt Content
Little Lake Butte des Morts

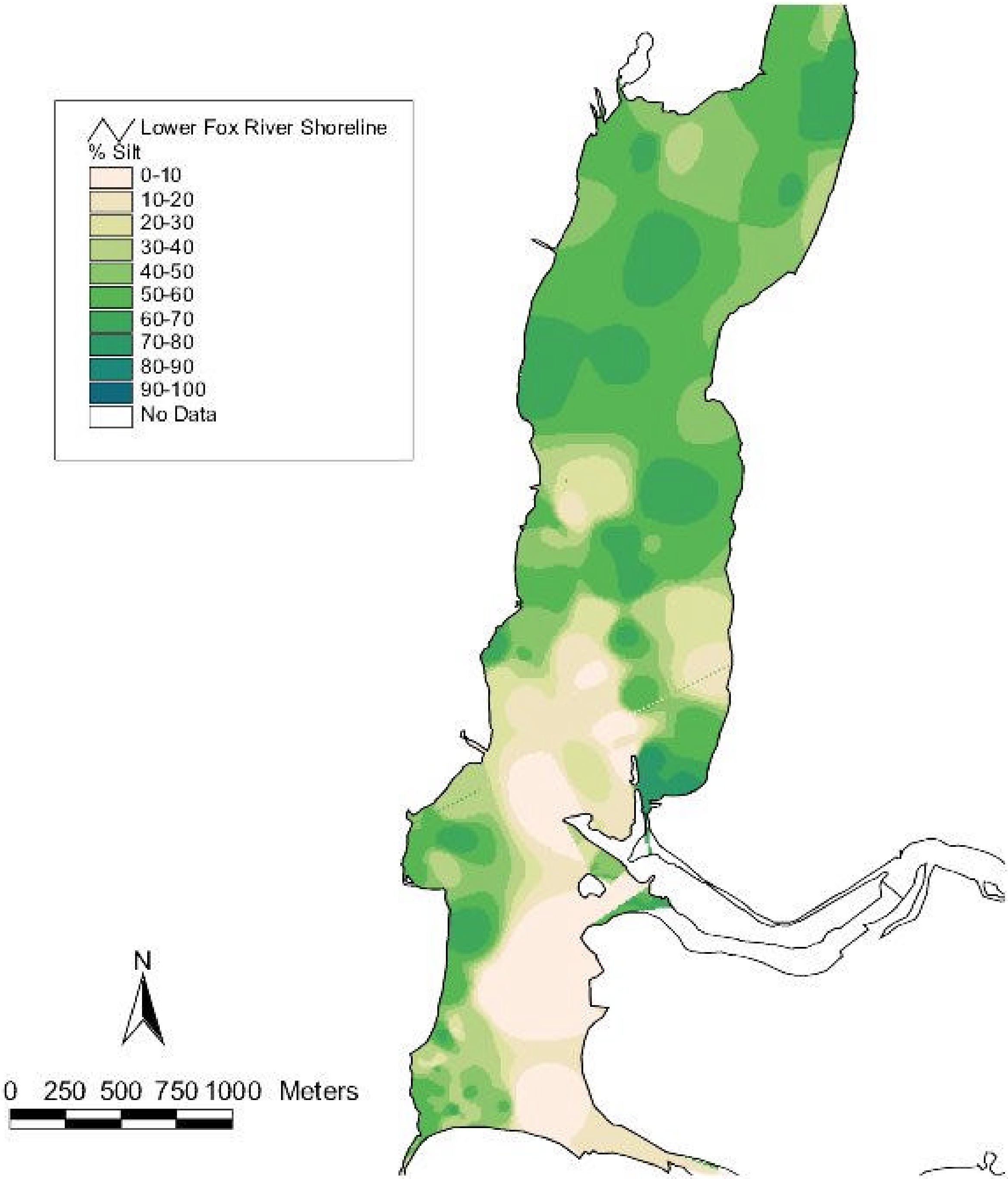


Figure 11: Percent Clay Content
Little Lake Butte des Morts

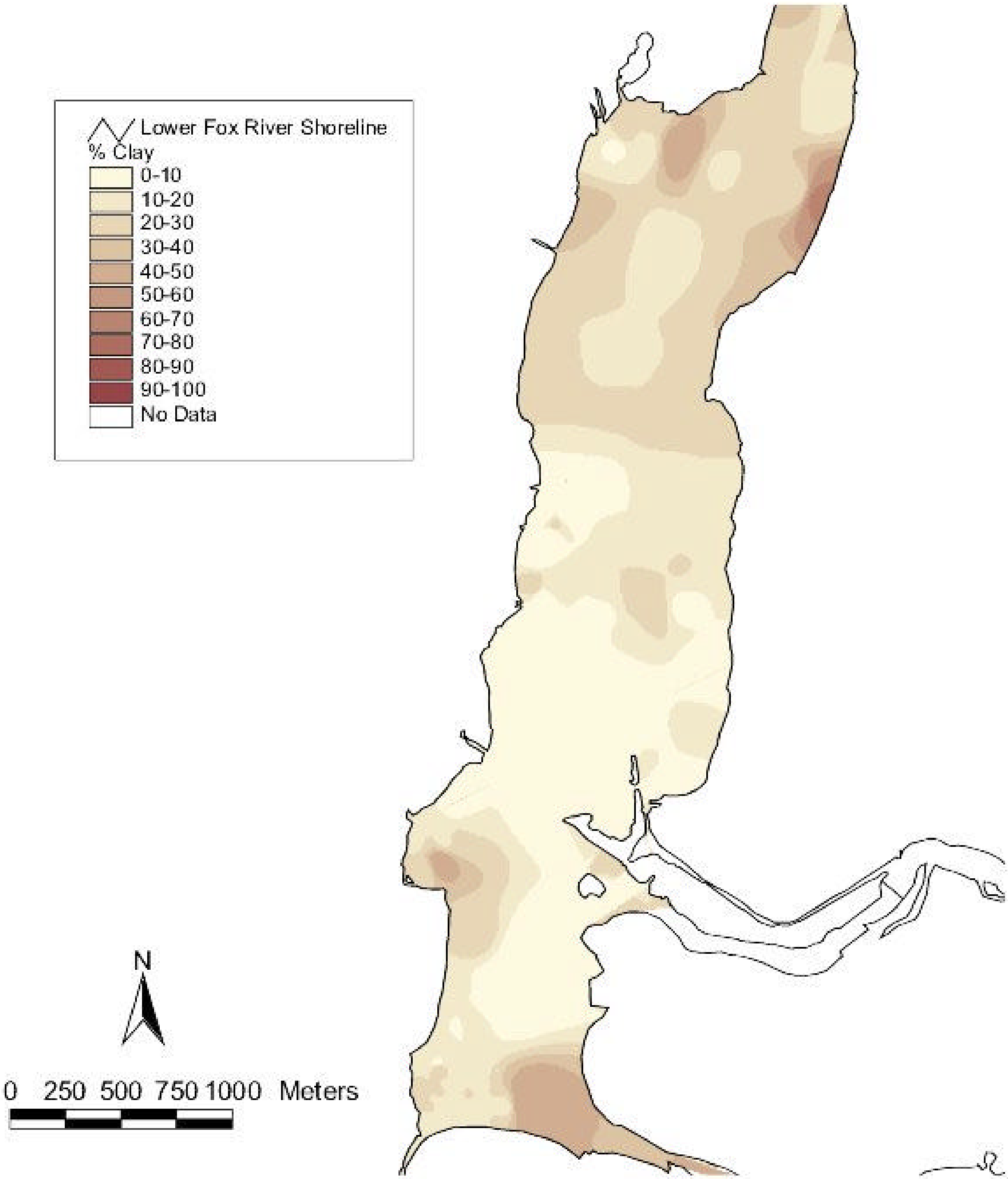


Figure 12: Percent Total Organic Carbon
Little Lake Butte des Morts

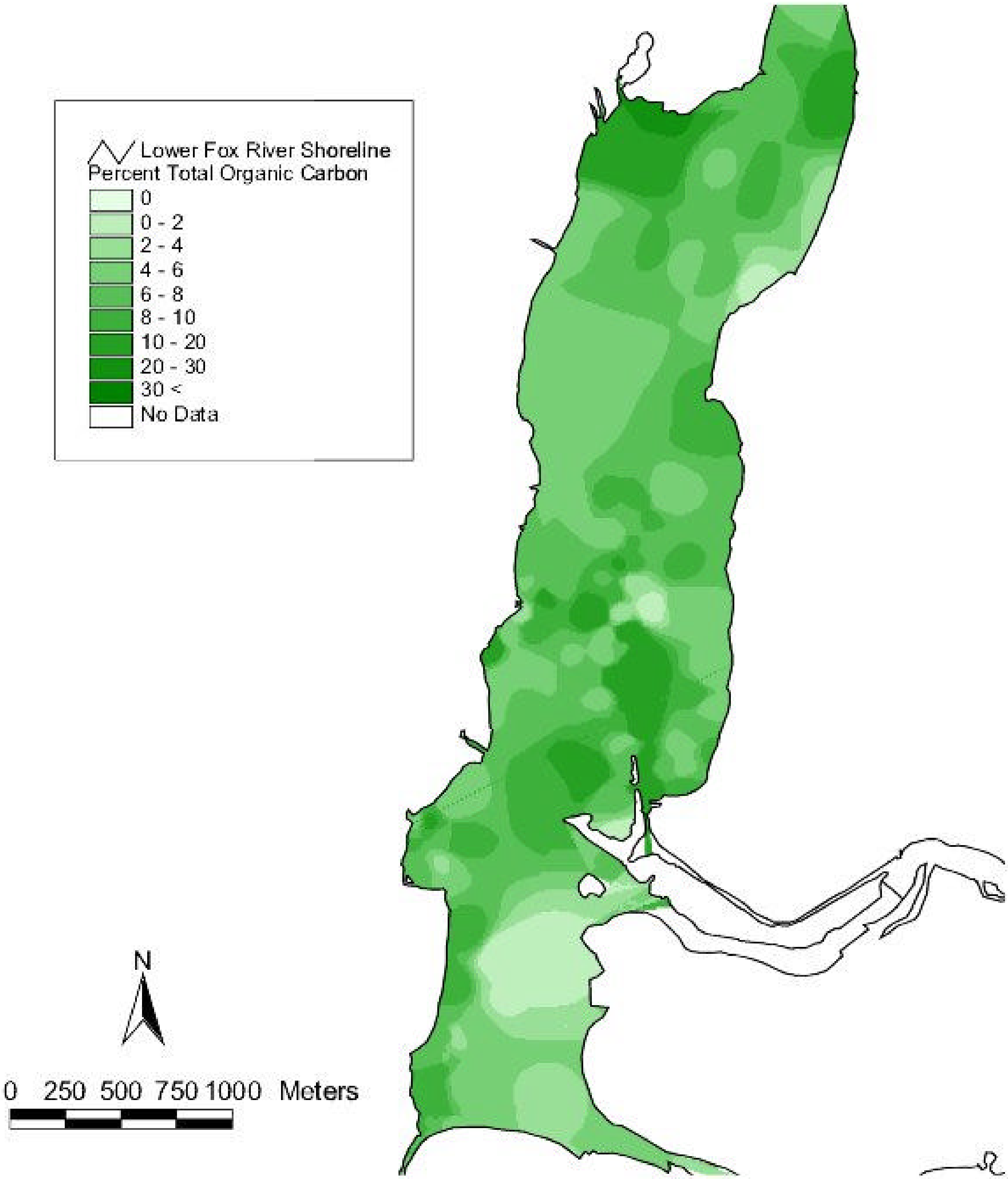


Figure 13: PCB Concentration Layer 1 (0-0.1m)
Little Lake Butte des Morts

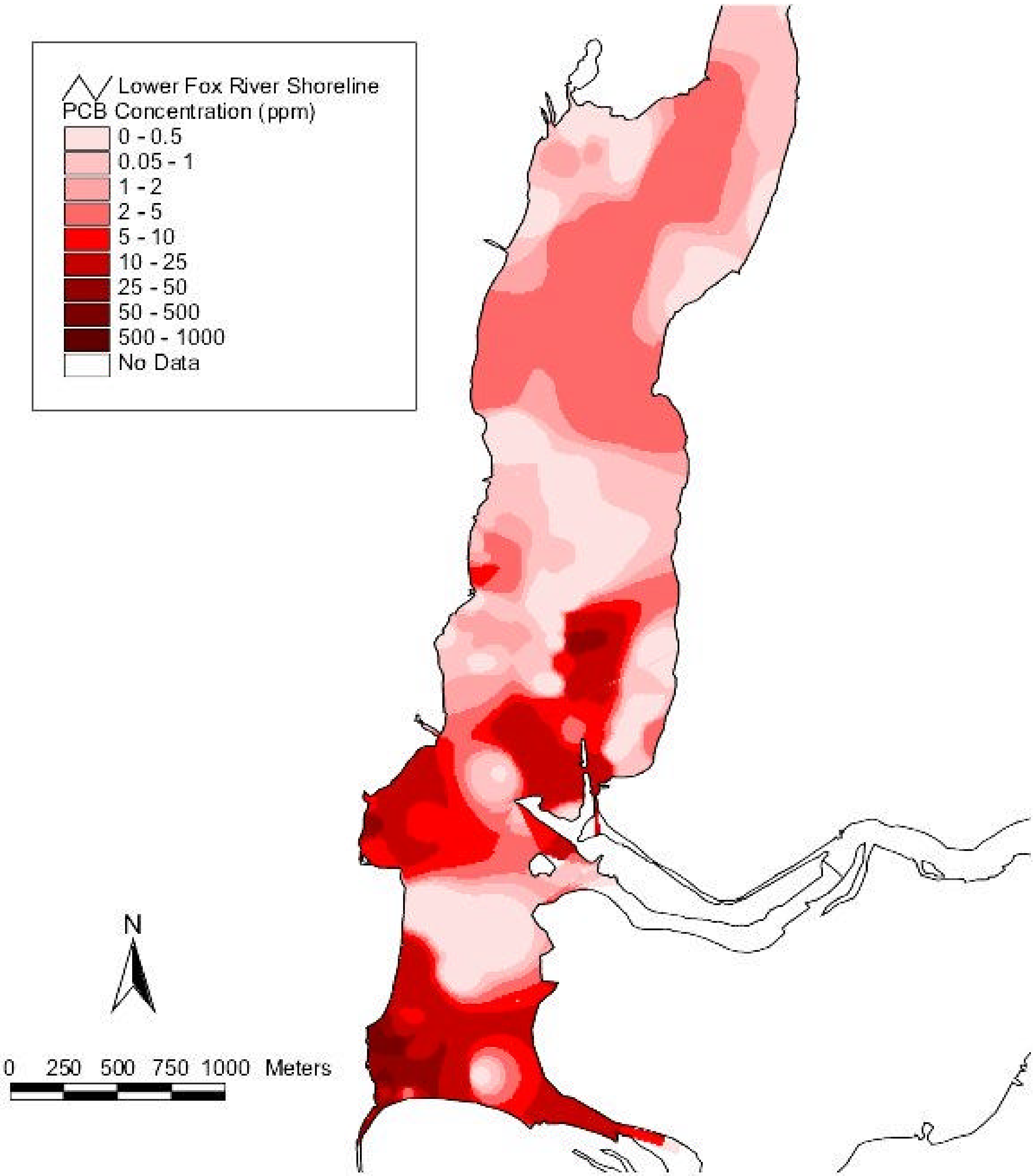


Figure 14: PCB Concentration Layer 2 (0.1-0.3m)
Little Lake Butte des Morts

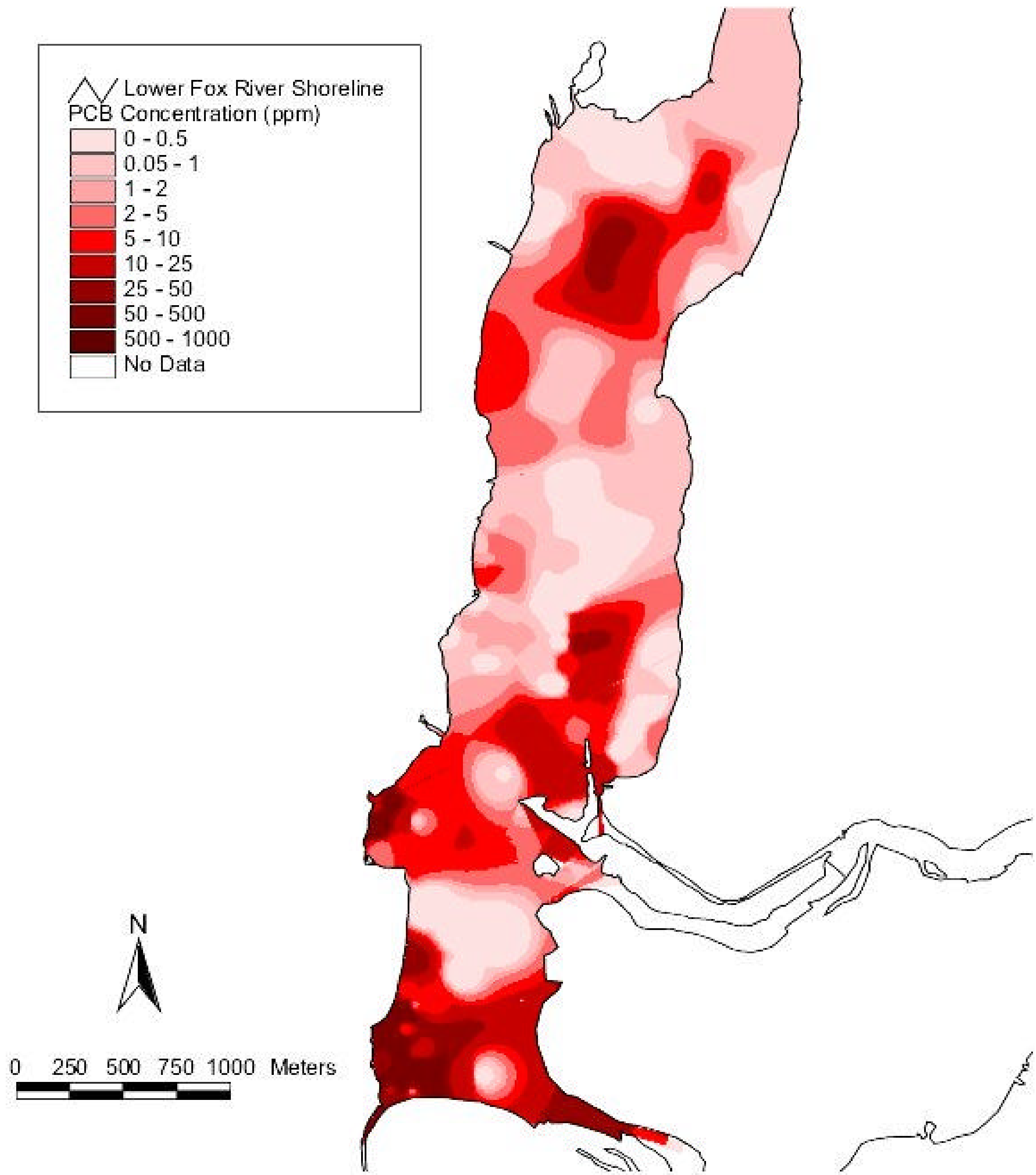


Figure 15: PCB Concentration Layer 3 (0.3-0.5m)
Little Lake Butte des Morts

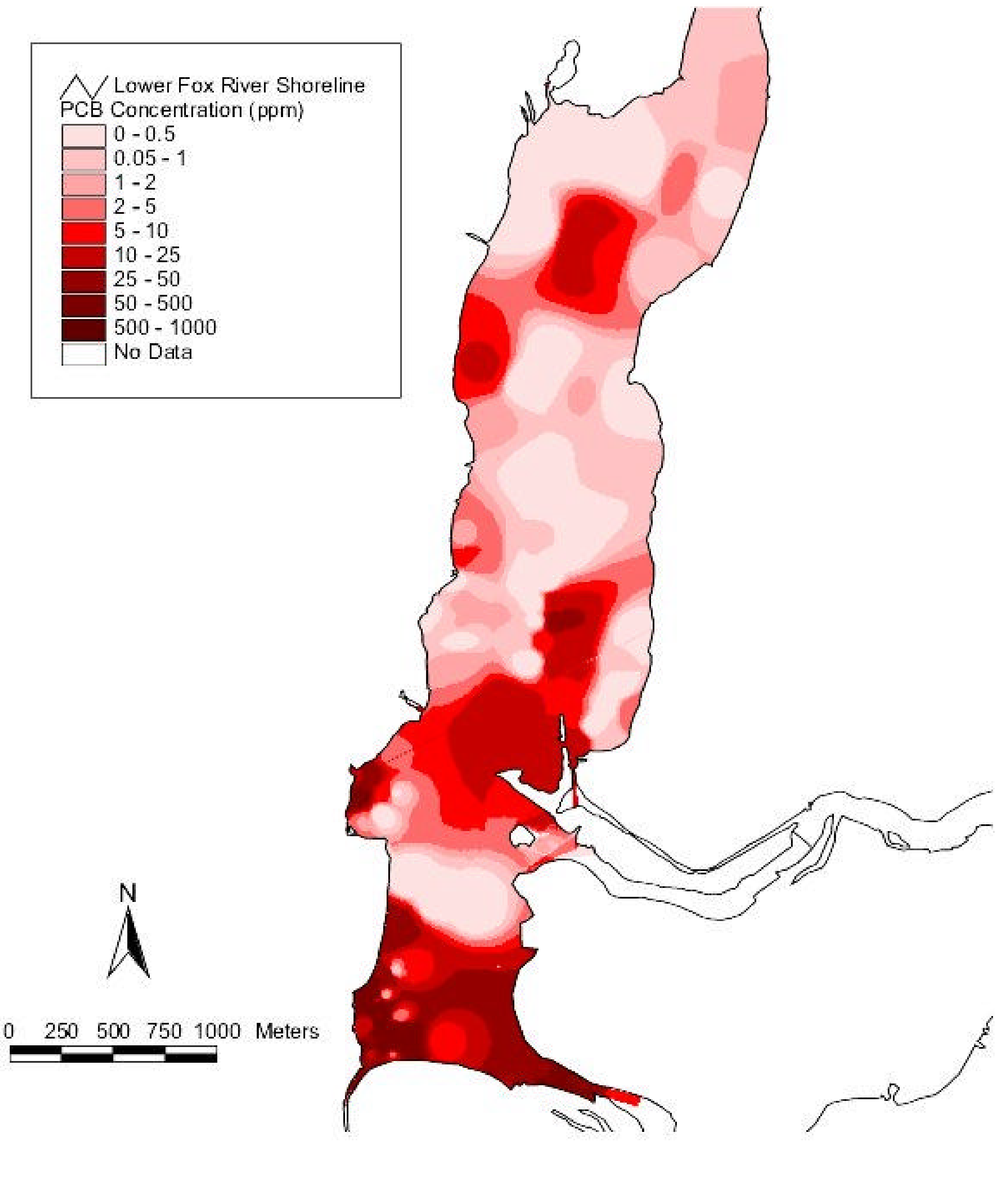


Figure 16: PCB Concentration Layer 4 (0.5-1.0m)
Little Lake Butte des Morts

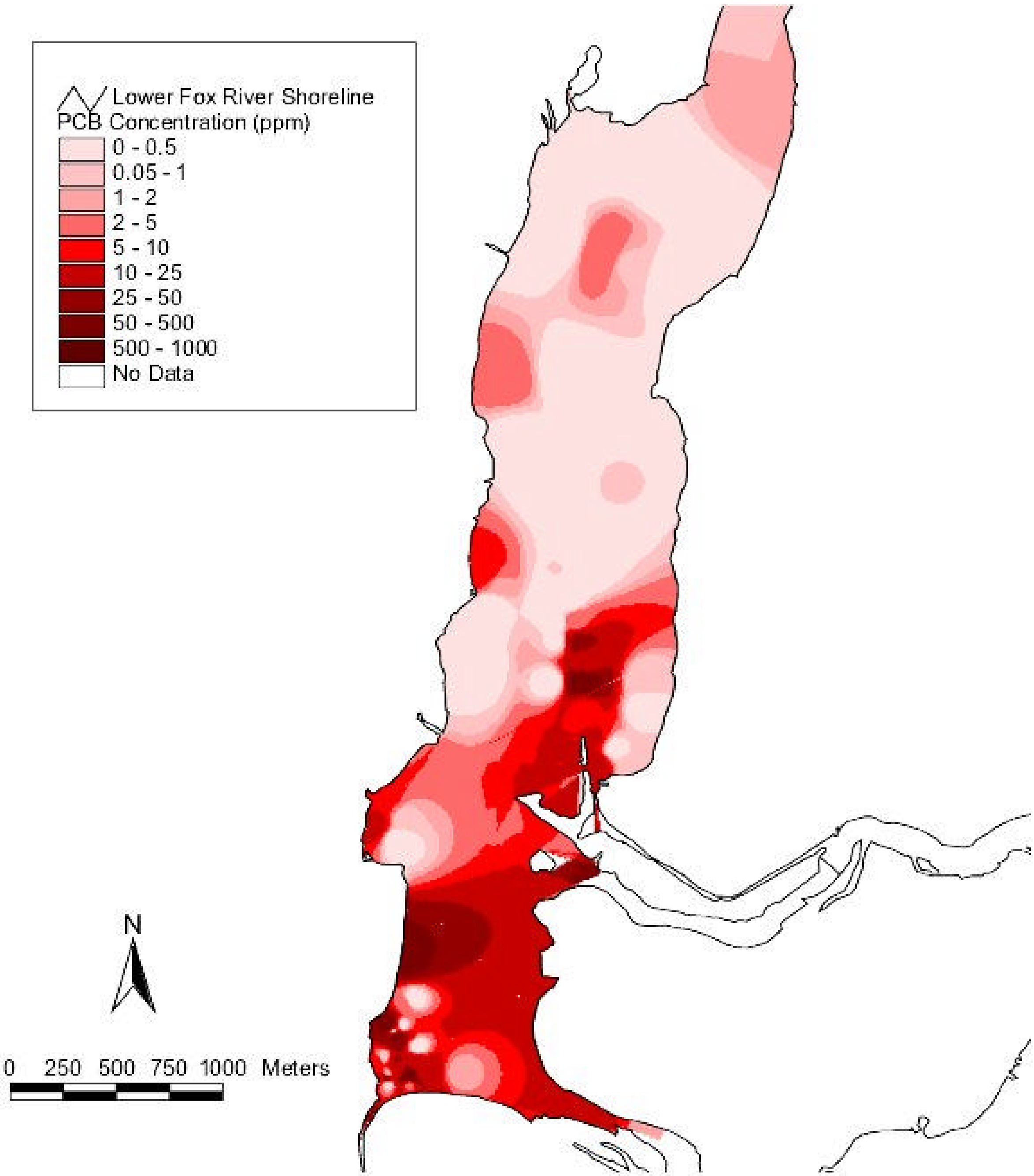


Figure 17: PCB Concentration Layer 5 (1.0-1.5m)
Little Lake Butte des Morts

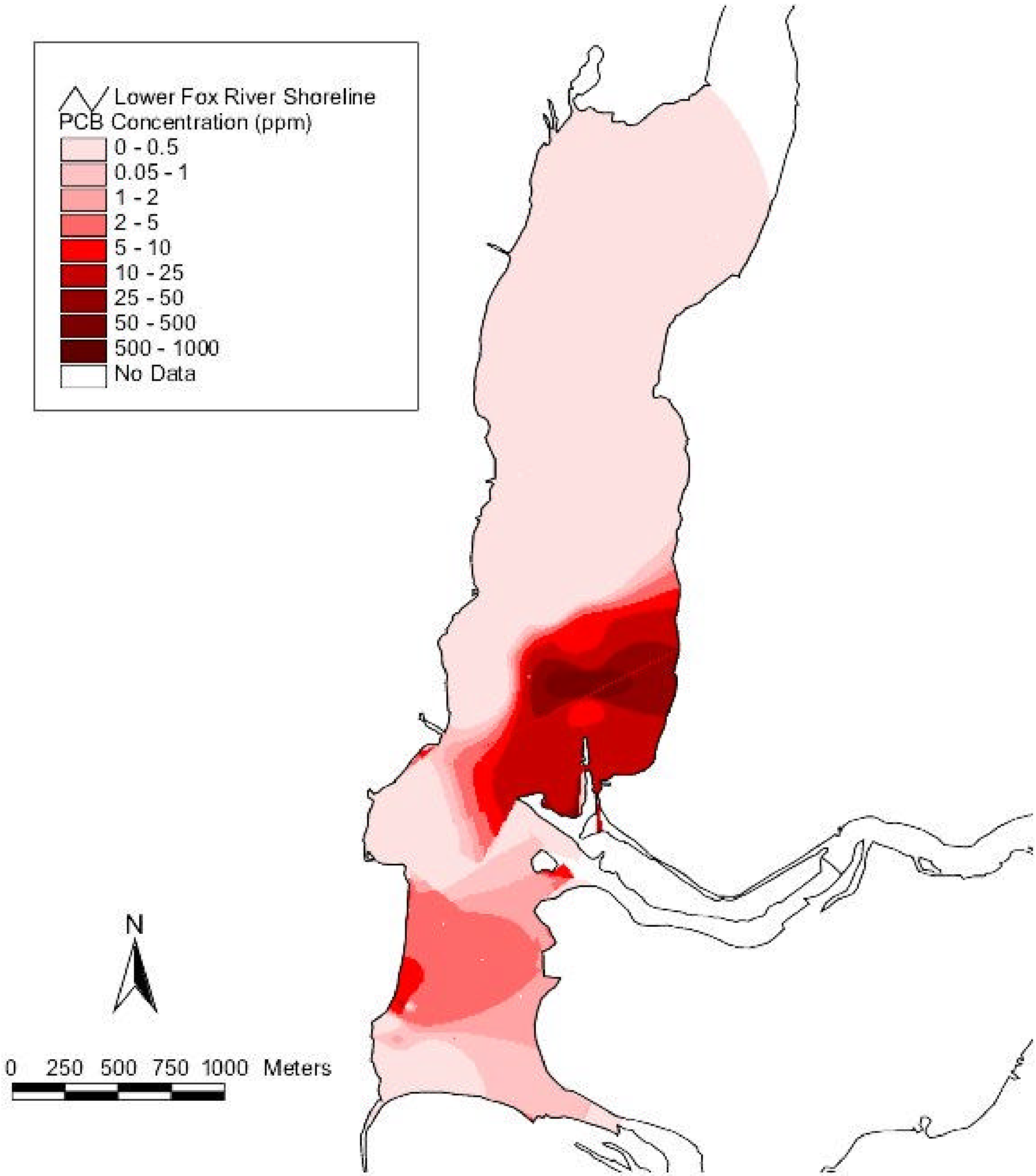


Figure 18: PCB Concentration Layer 6 (1.5-2.0m)
Little Lake Butte des Morts

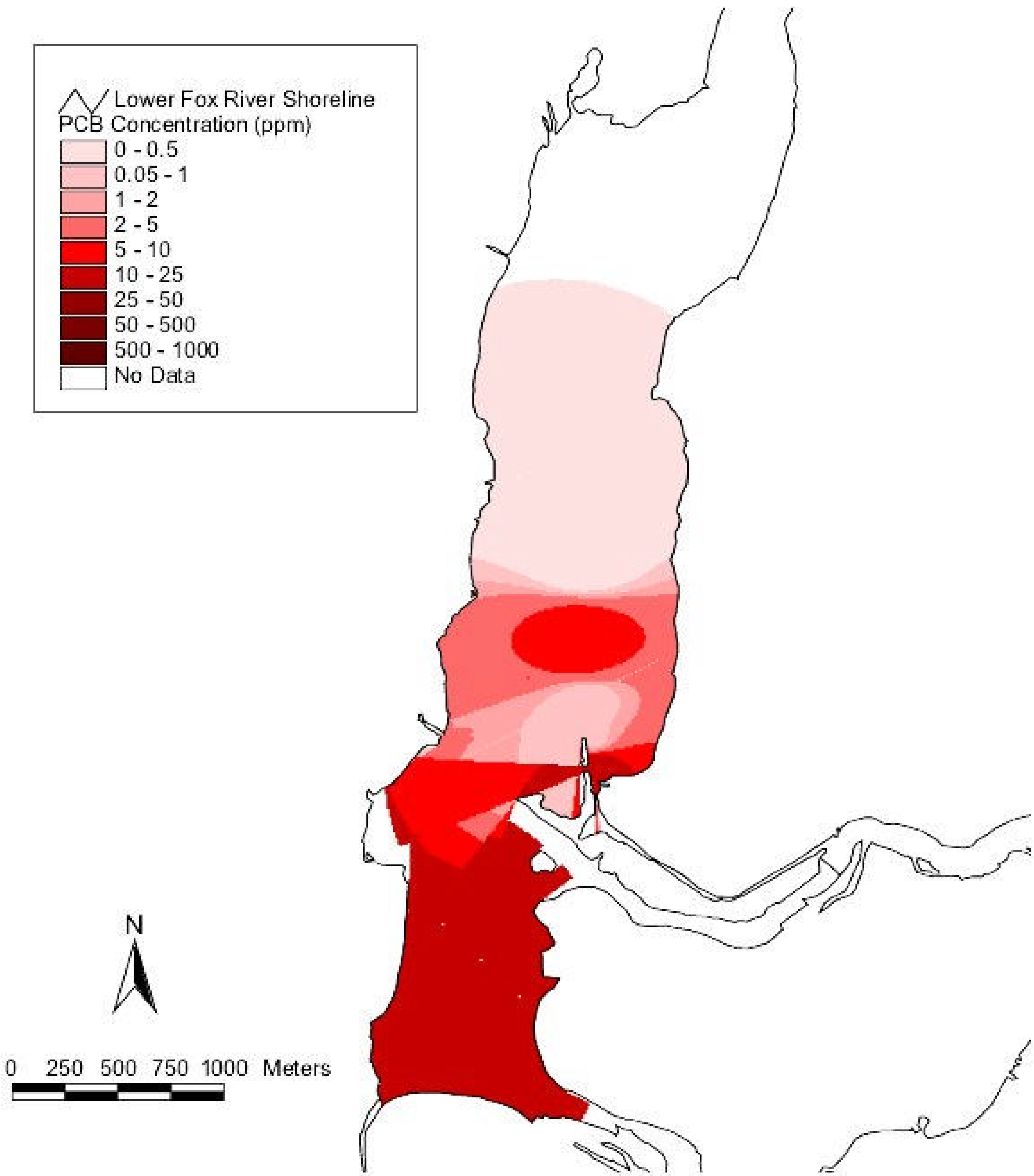


Figure 19: PCB Concentration Layer 7 (2.0-2.5m)
Little Lake Butte des Morts

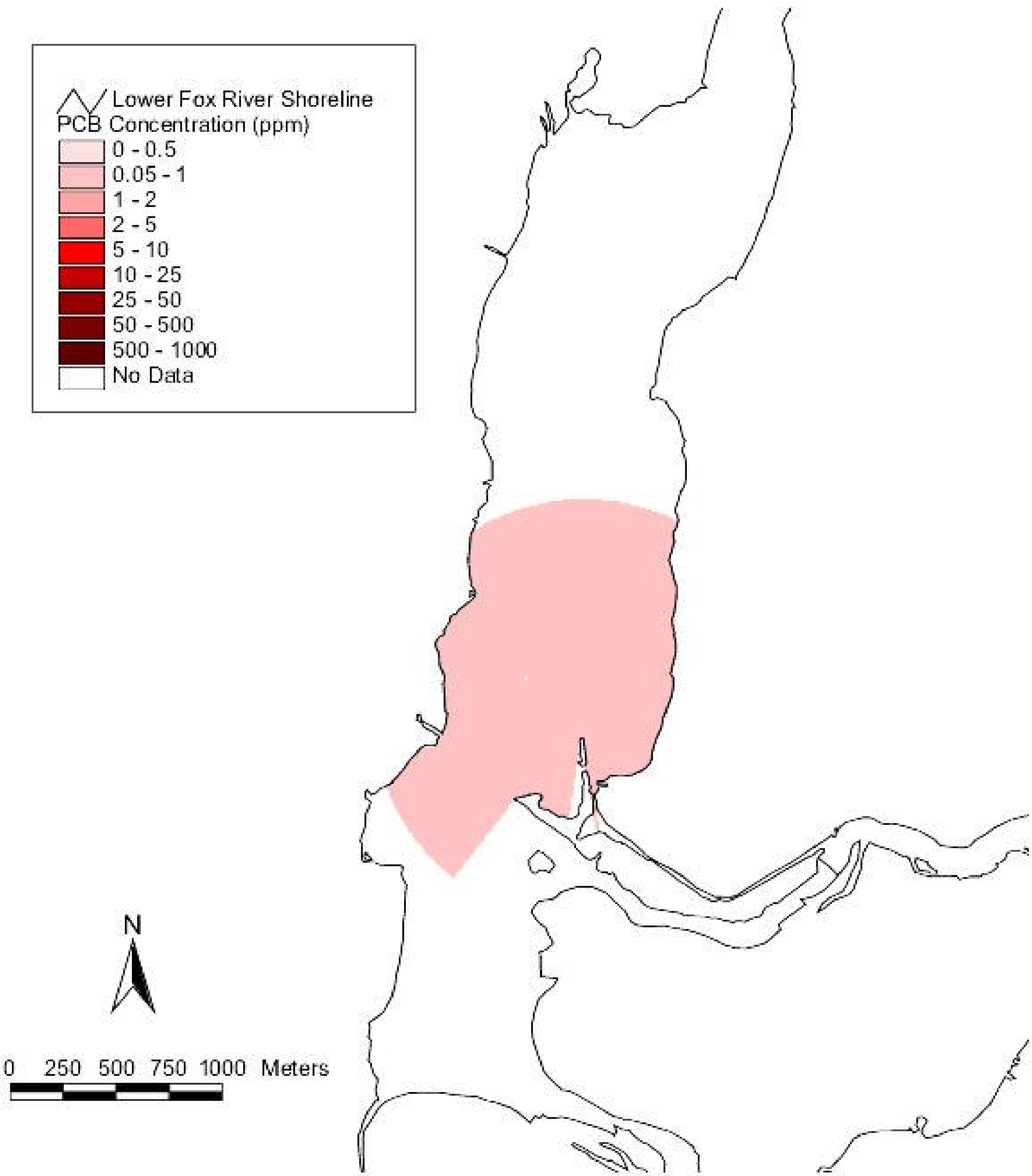


Figure 20: PCB Concentration Layer 8 (2.5-3.0m)
Little Lake Butte des Morts

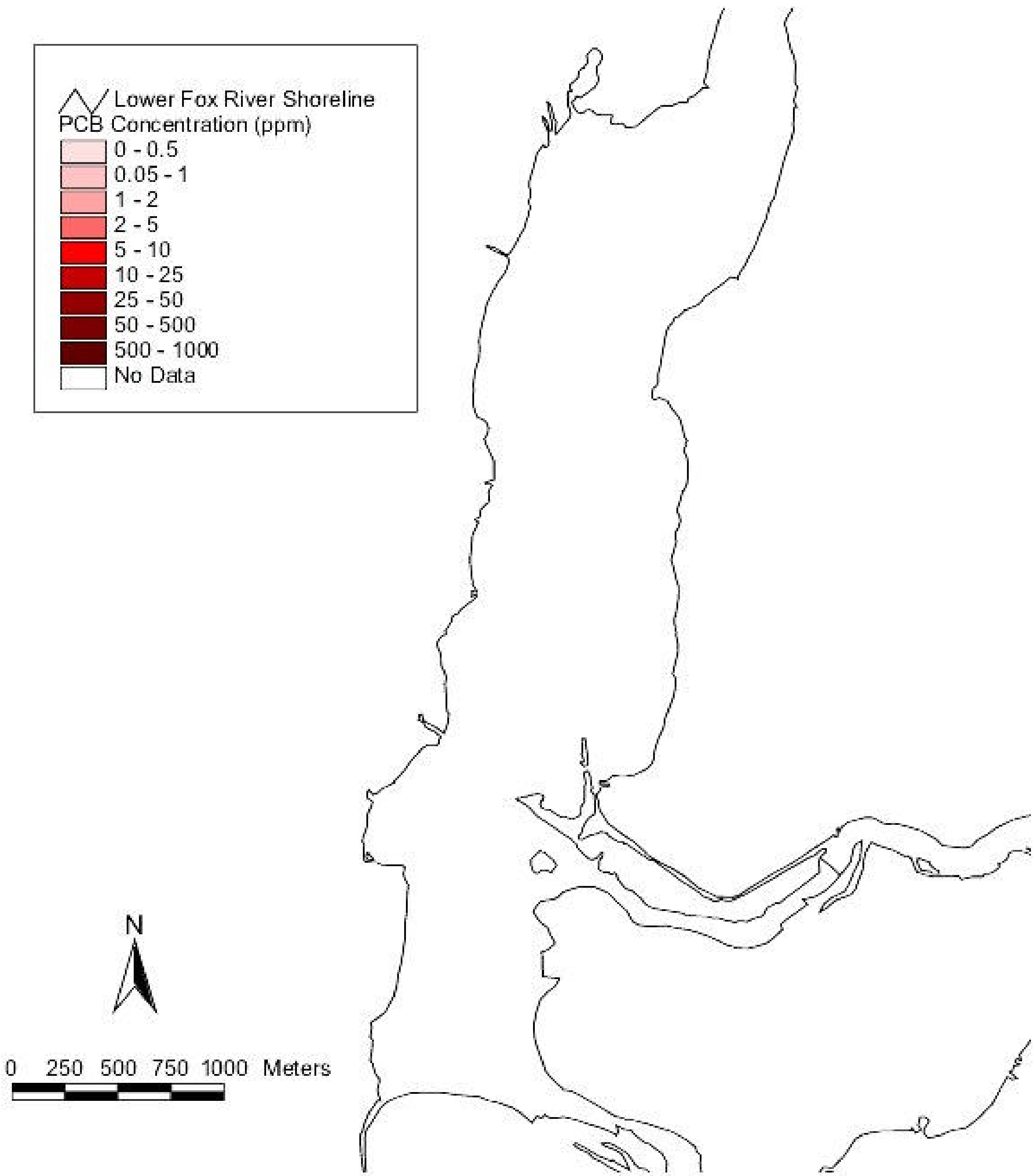


Figure 21: PCB Concentration Layer 9 (3.0m <)
Little Lake Butte des Morts

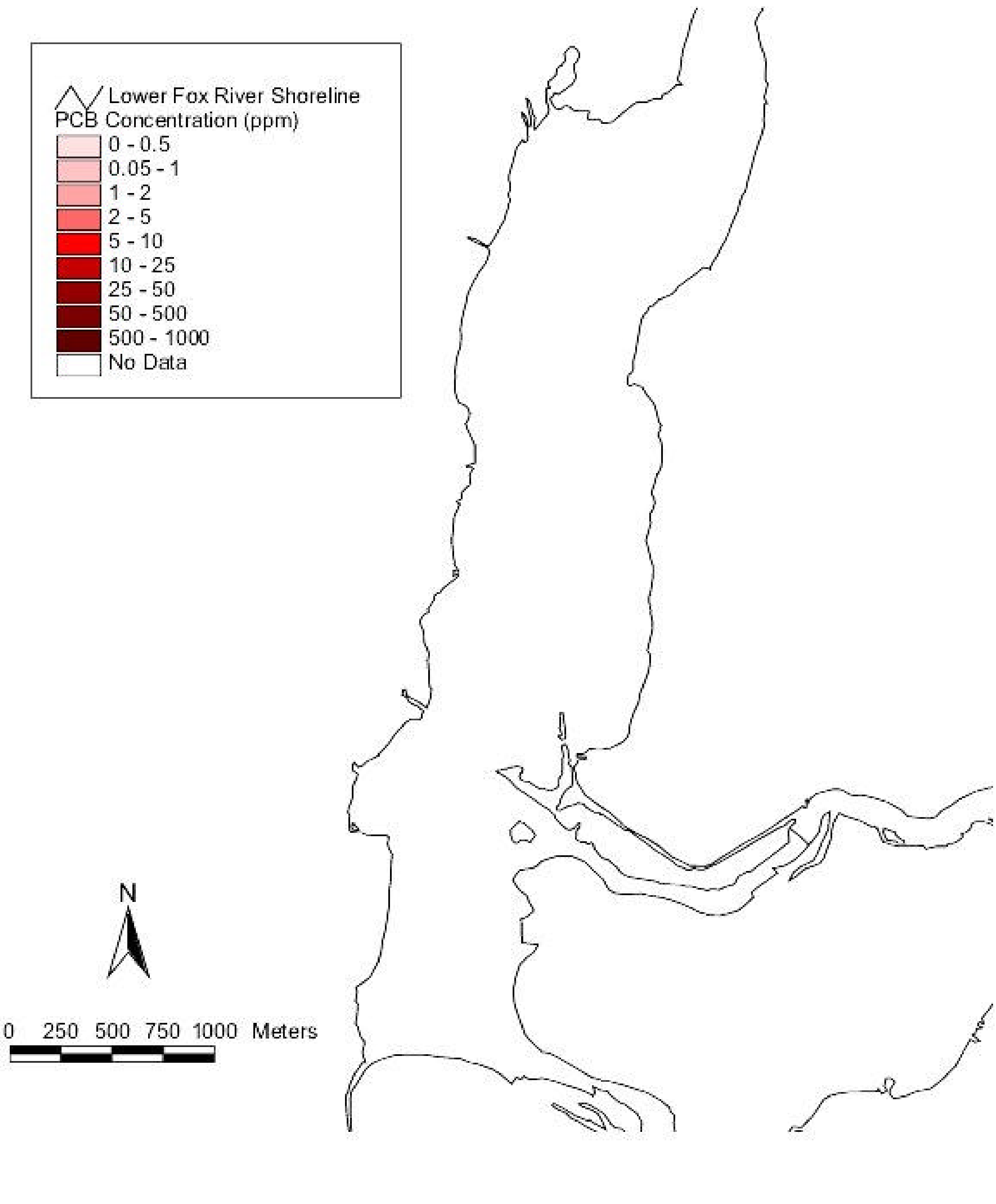


Figure 22: Mercury Concentrations Layer 1 (0-0.1m)
Little Lake Butte des Morts

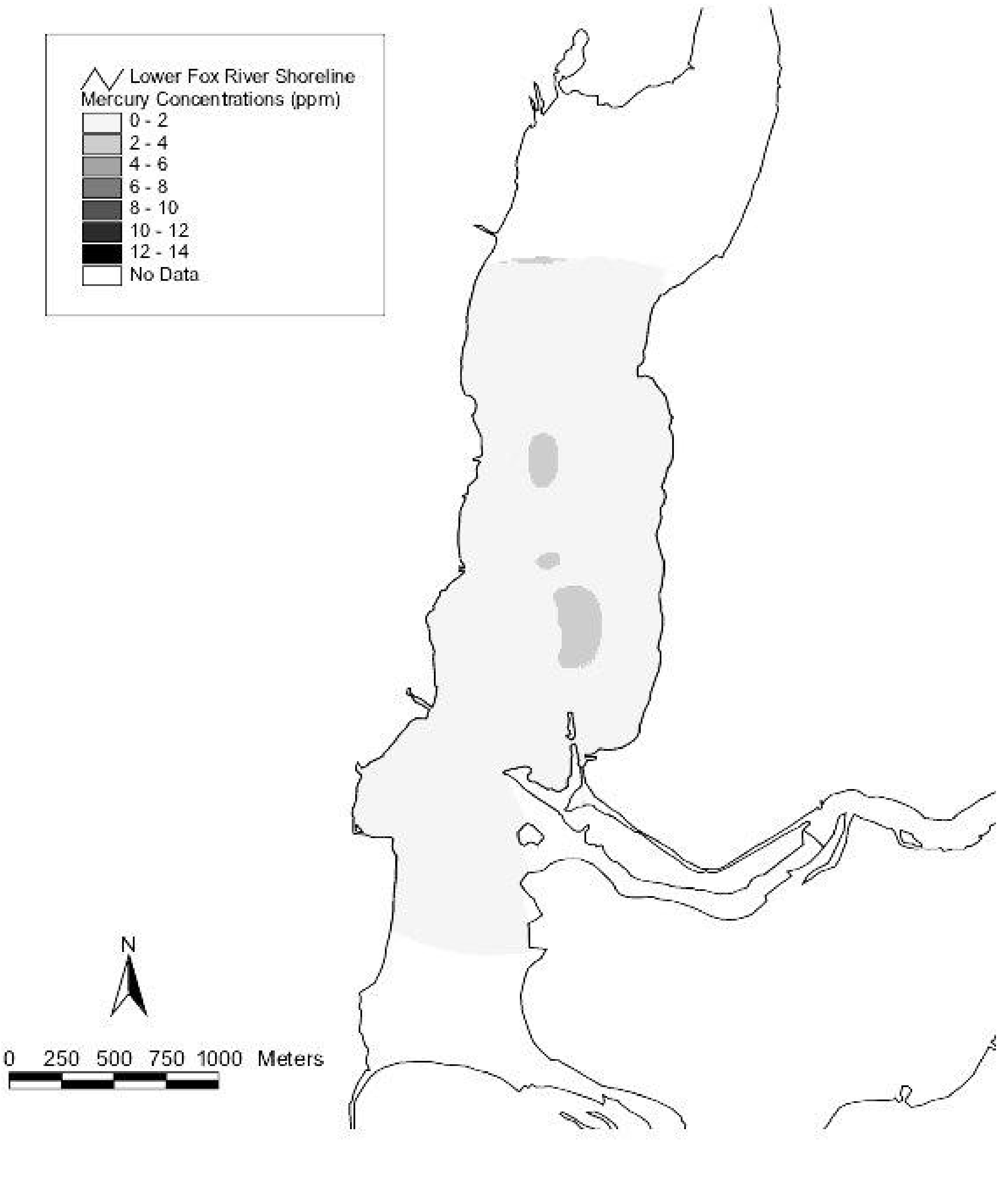


Figure 23: Mercury Concentrations Layer 2 (0.1-0.3m)
Little Lake Butte des Morts

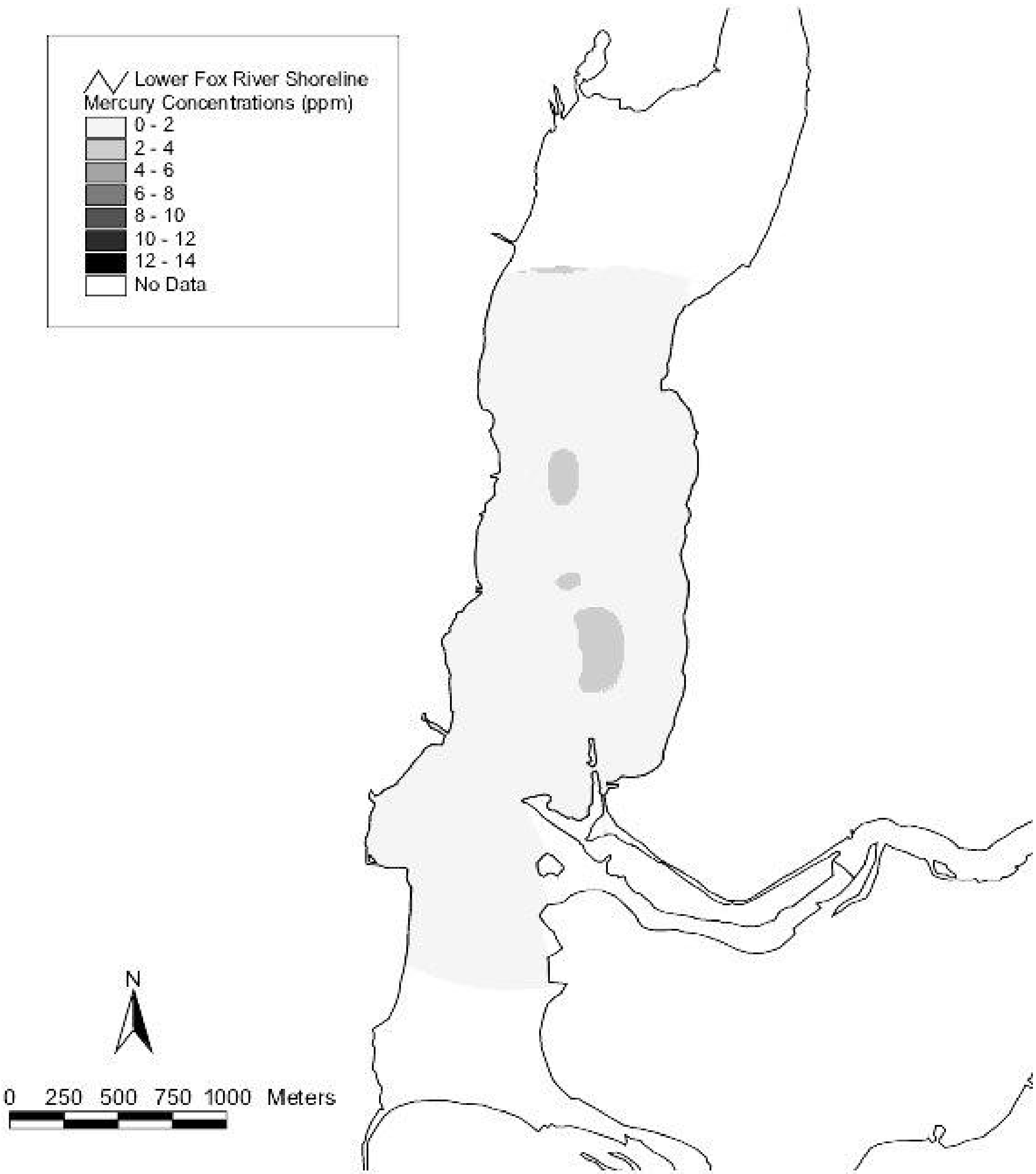


Figure 24: Mercury Concentrations Layer 3 (0.3-0.5m)
Little Lake Butte des Morts

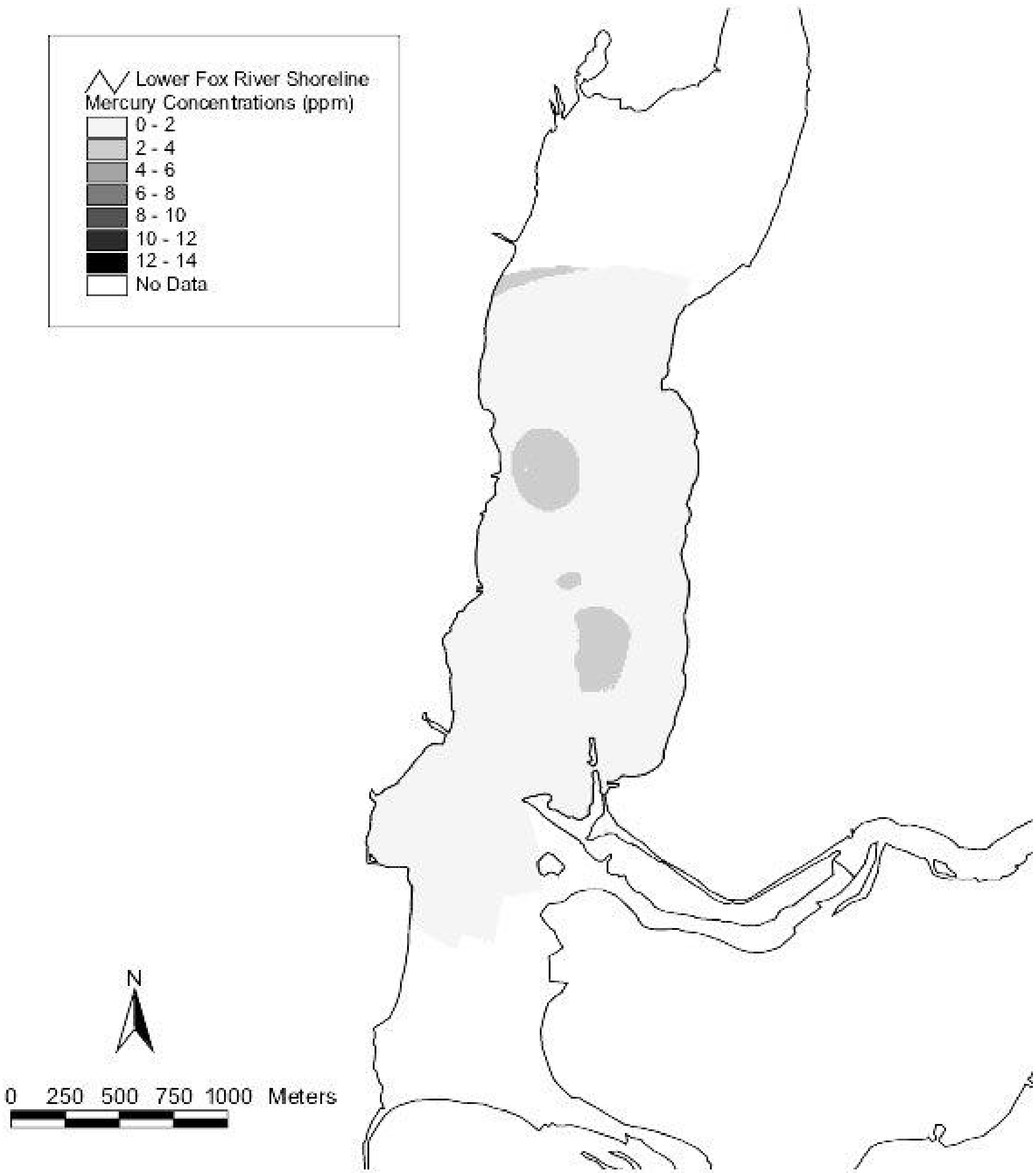


Figure 25: Mercury Concentrations Layer 4(0.5-1.0m) Little Lake Butte des Morts

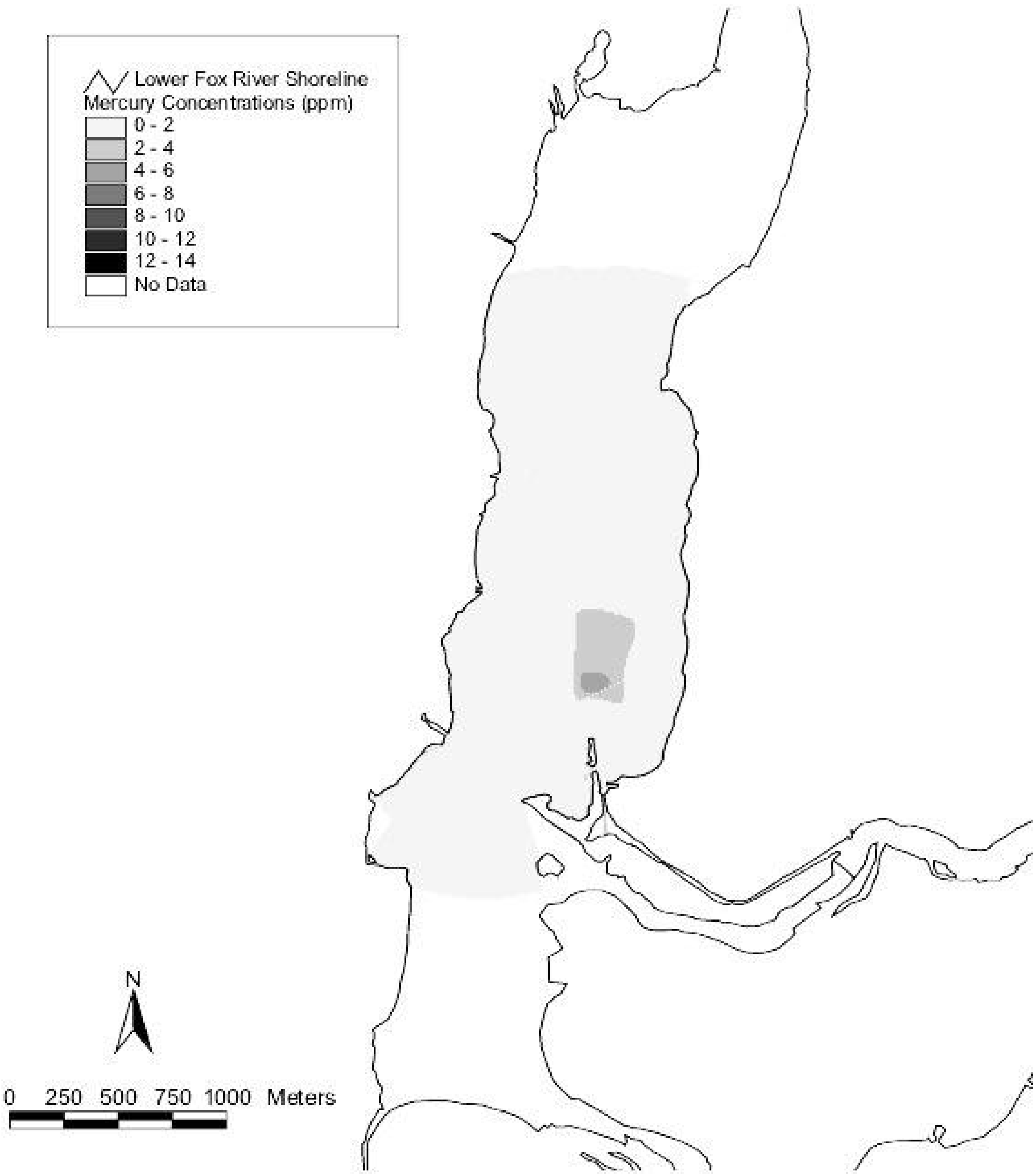


Figure 26: Mercury Concentrations Layer 5(1.0-1.5m)
Little Lake Butte des Morts

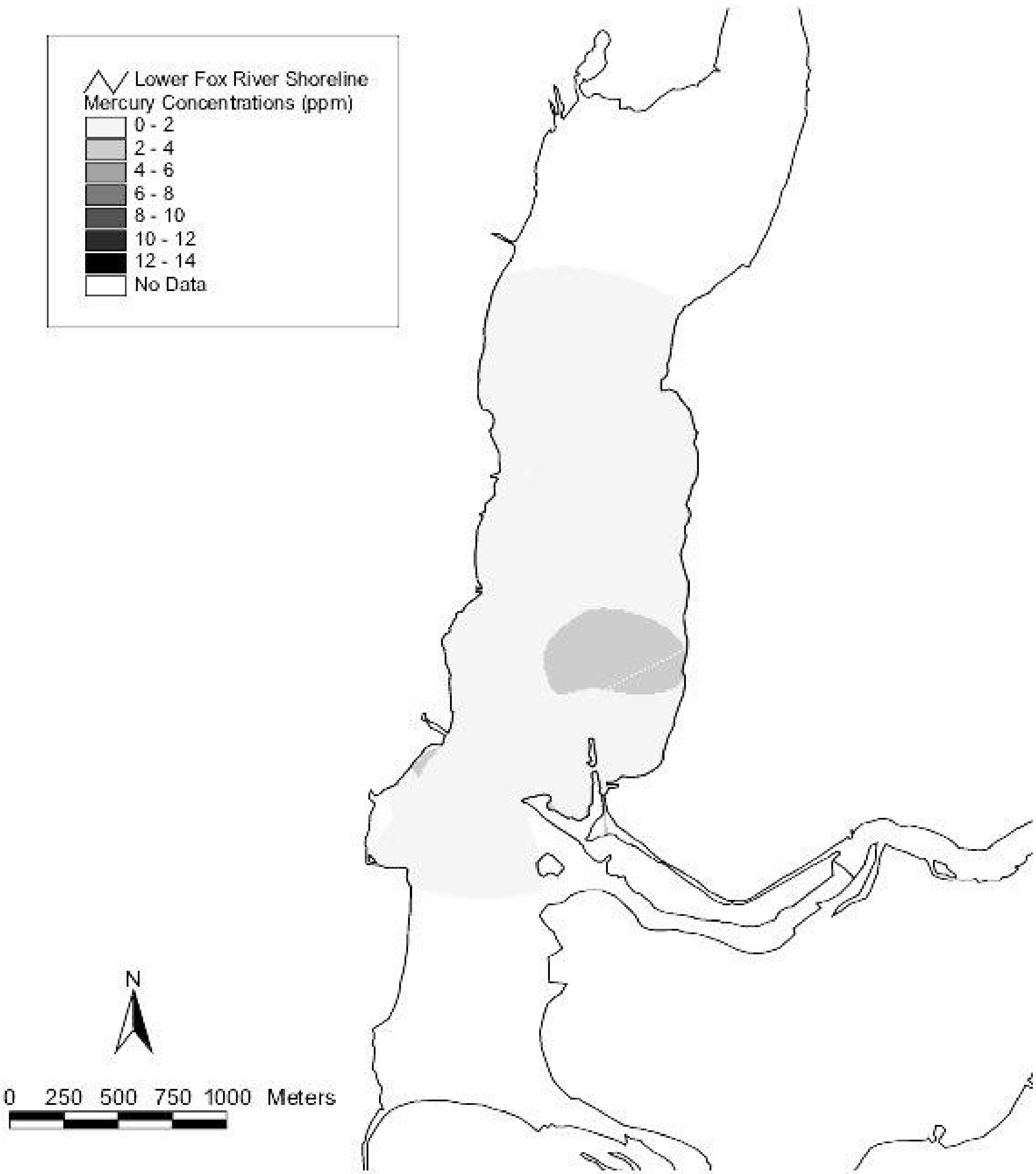


Figure 27: Mercury Concentrations Layer 6(1.5-2.0m) Little Lake Butte des Morts

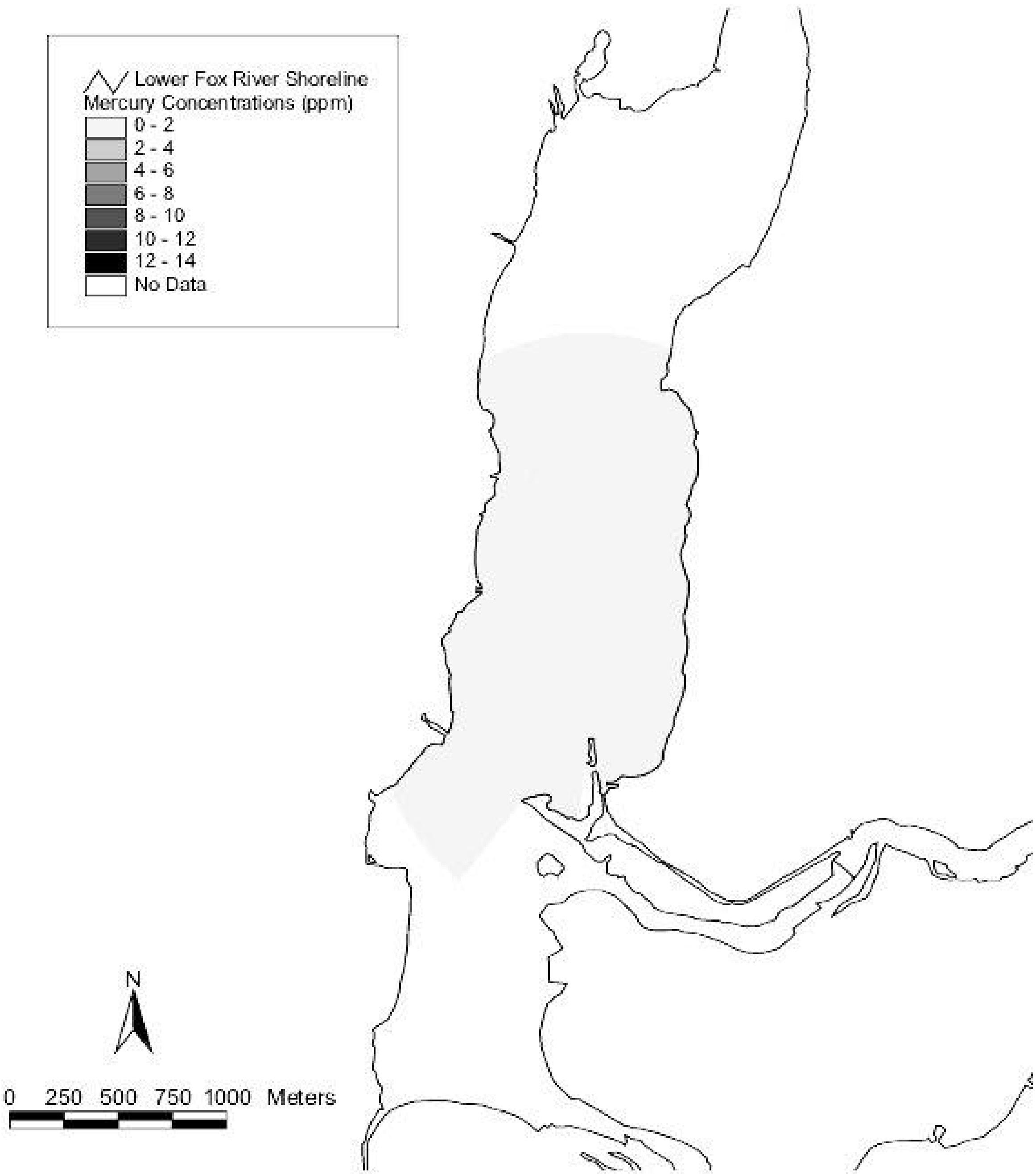


Figure 28: Mercury Concentrations Layer 7(2.0-2.5m)
Little Lake Butte des Morts

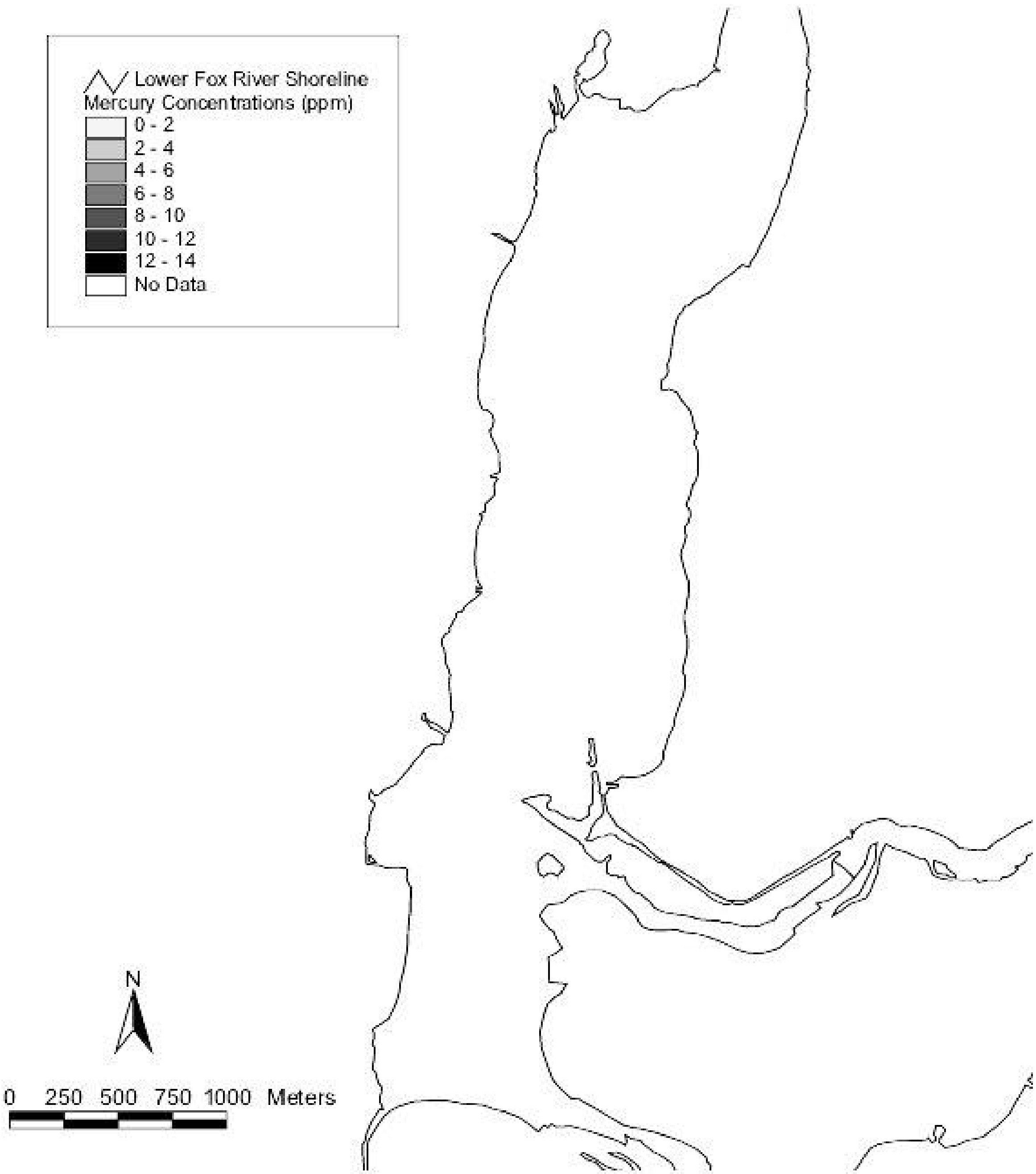


Figure 29: Mercury Concentrations Layer 8(2.5-3.0m) Little Lake Butte des Morts

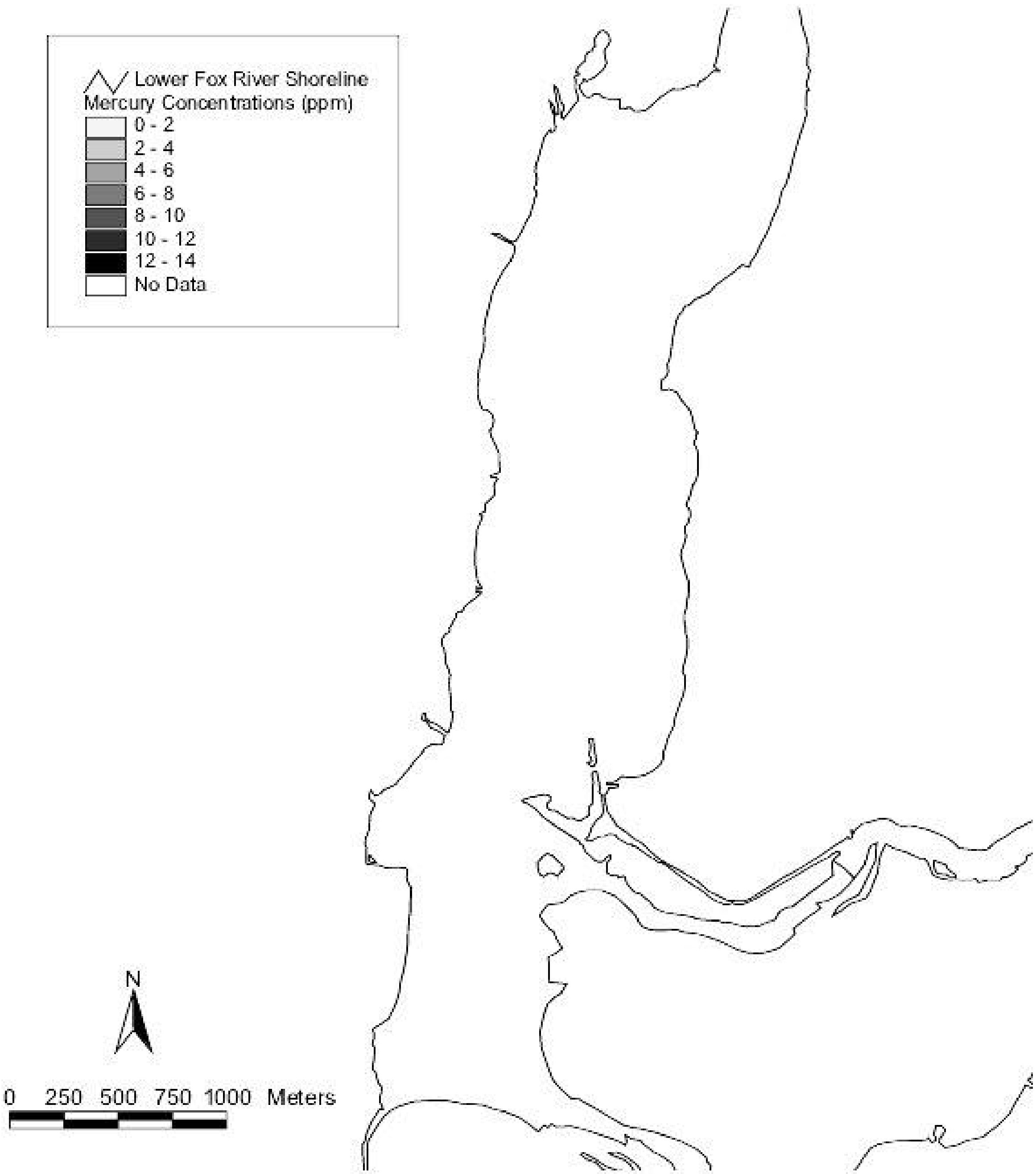
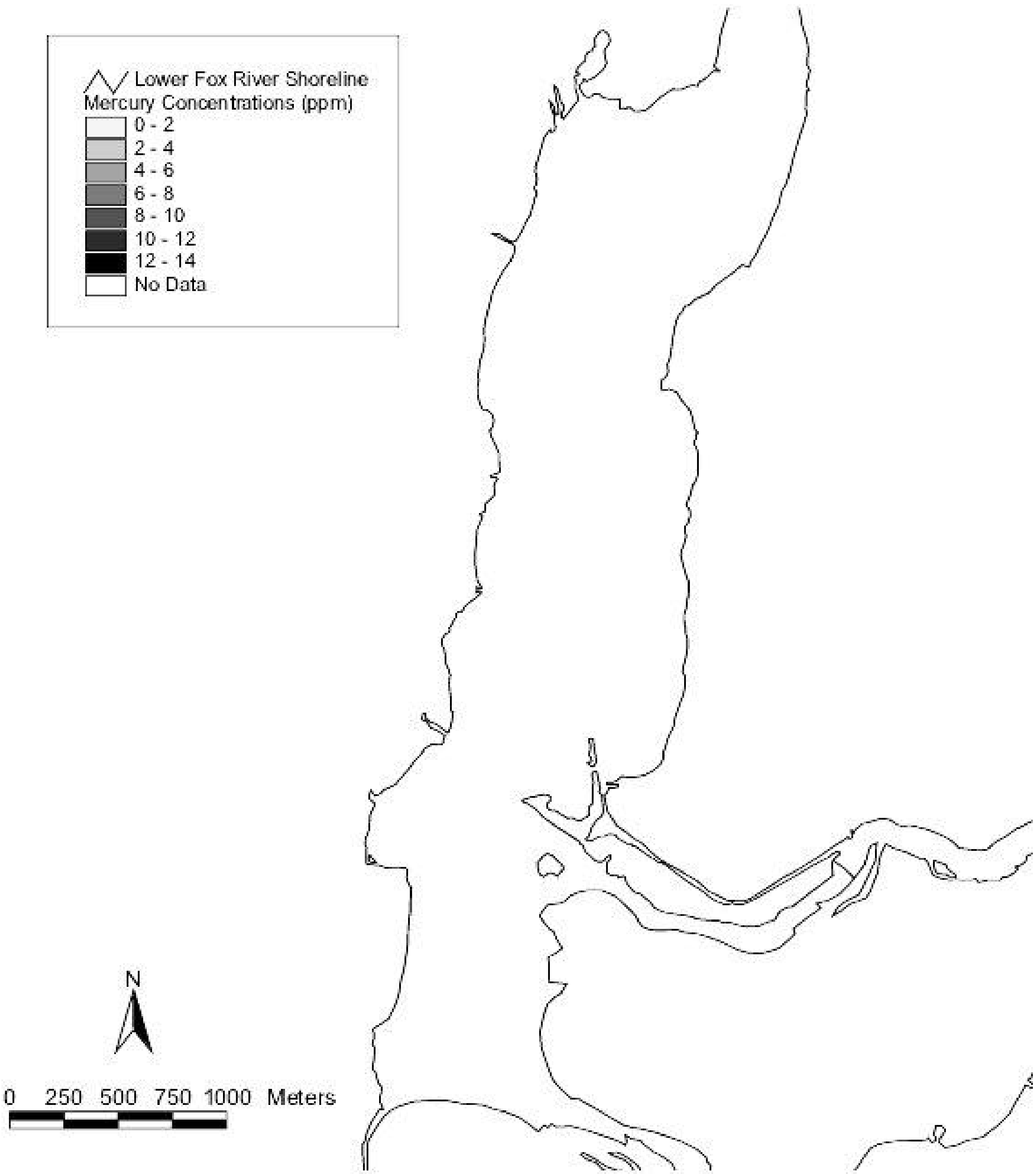


Figure 30: Mercury Concentrations Layer 9(3m<)
Little Lake Butte des Morts



APPENDIX A

Figure 1A: Min PCB Concentration Layer 1 (0-0.1m)
Little Lake Butte des Morts

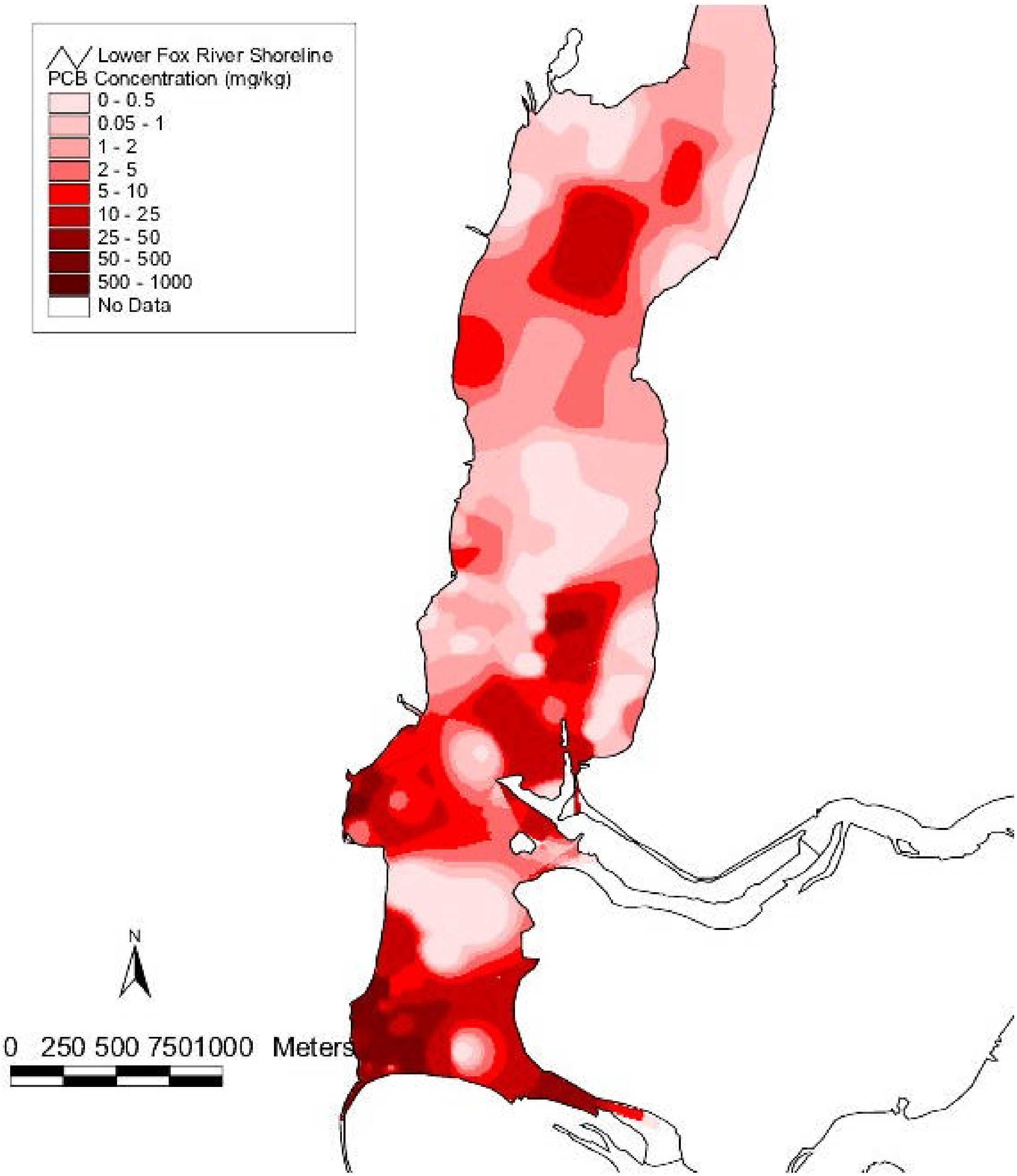


Figure 2A: Min PCB Concentration Layer 2(0.1-0.3m)
Little Lake Butte des Morts

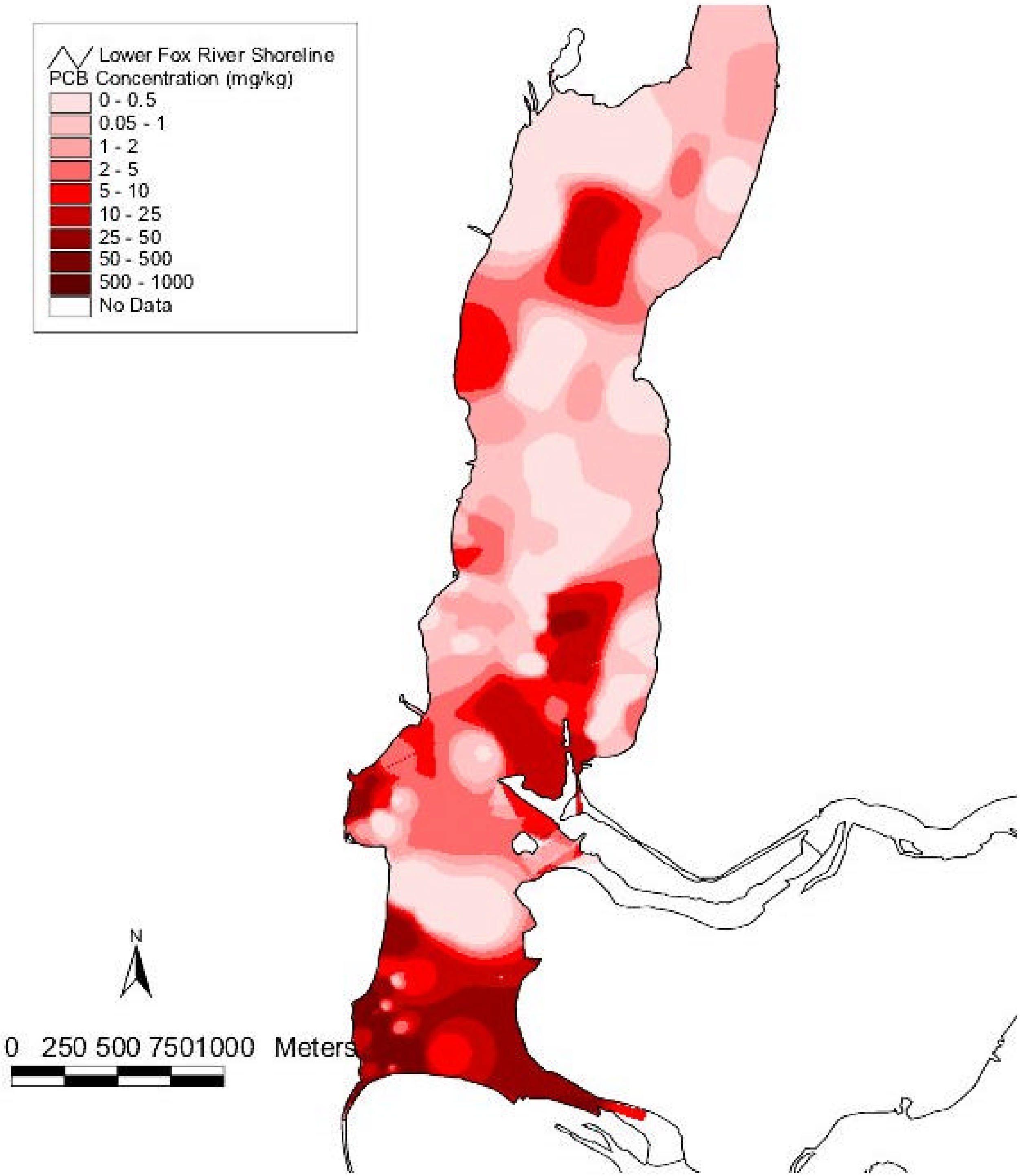


Figure 3A: Min PCB Concentration Layer 3 (0.3-0.5m)
Little Lake Butte des Morts

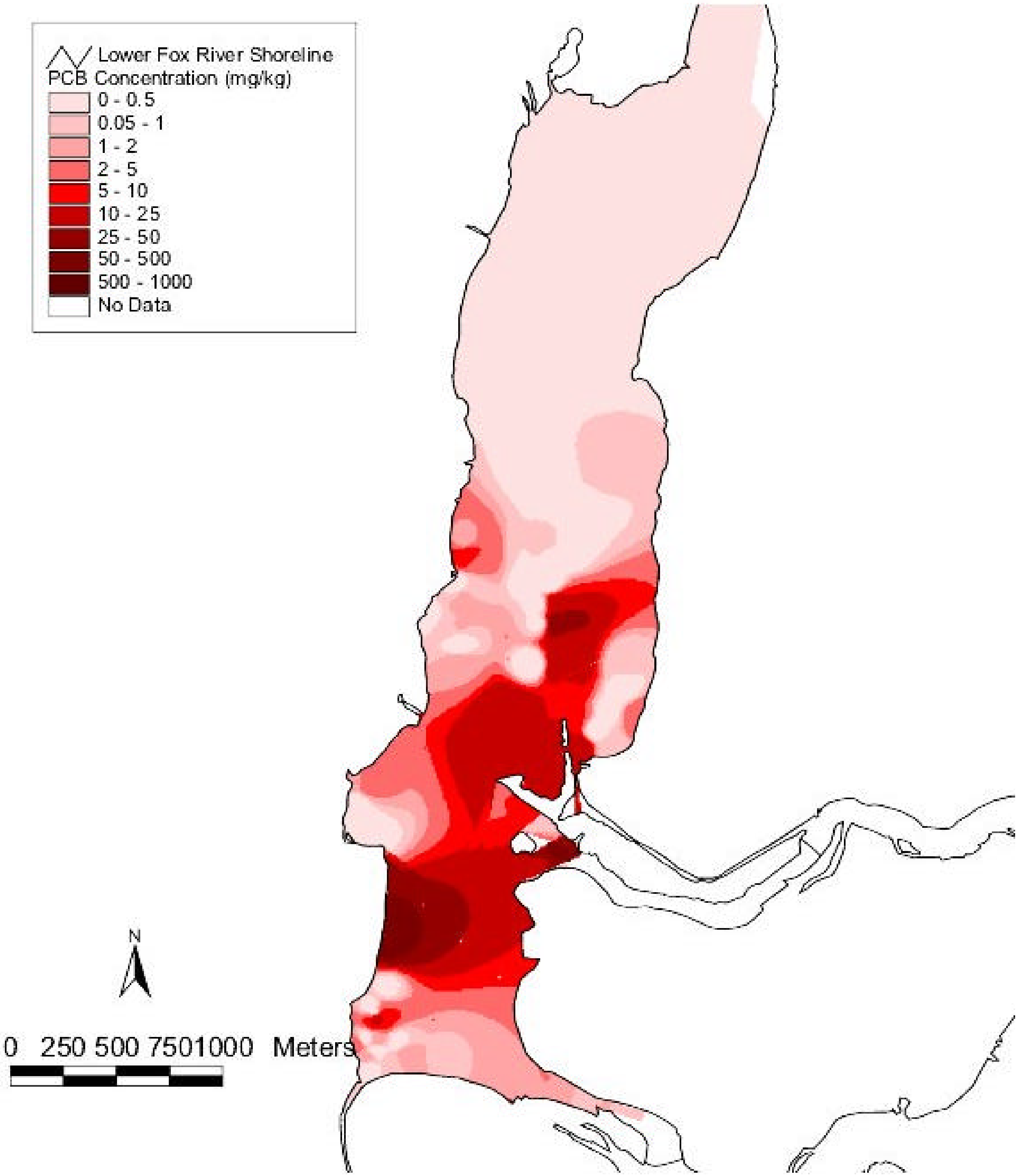


Figure 4A: Min PCB Concentration Layer 4 (0.5-1.0m)
Little Lake Butte des Morts

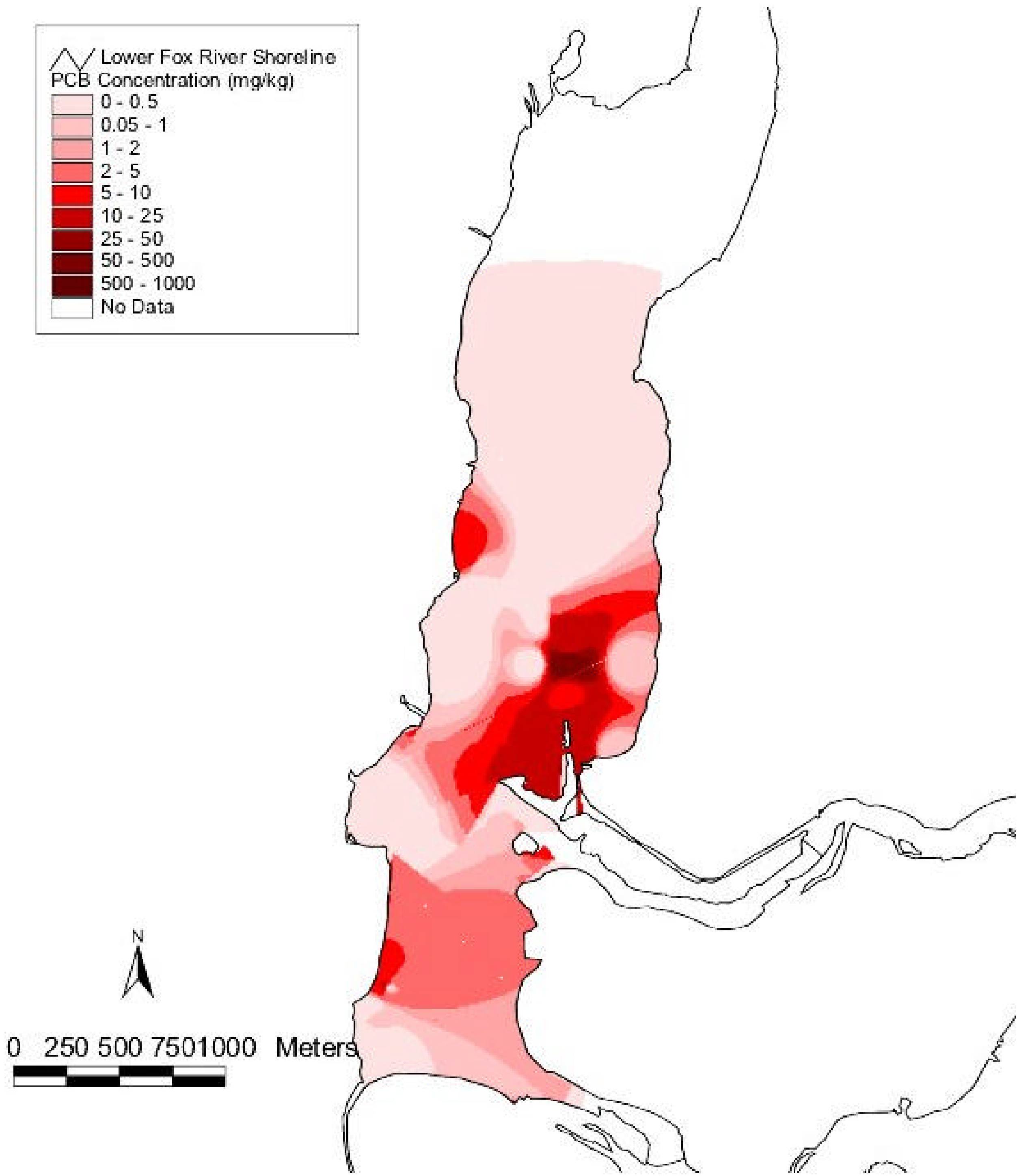


Figure 5A: Min PCB Concentration Layer 5 (1.0-1.5m)
Little Lake Butte des Morts

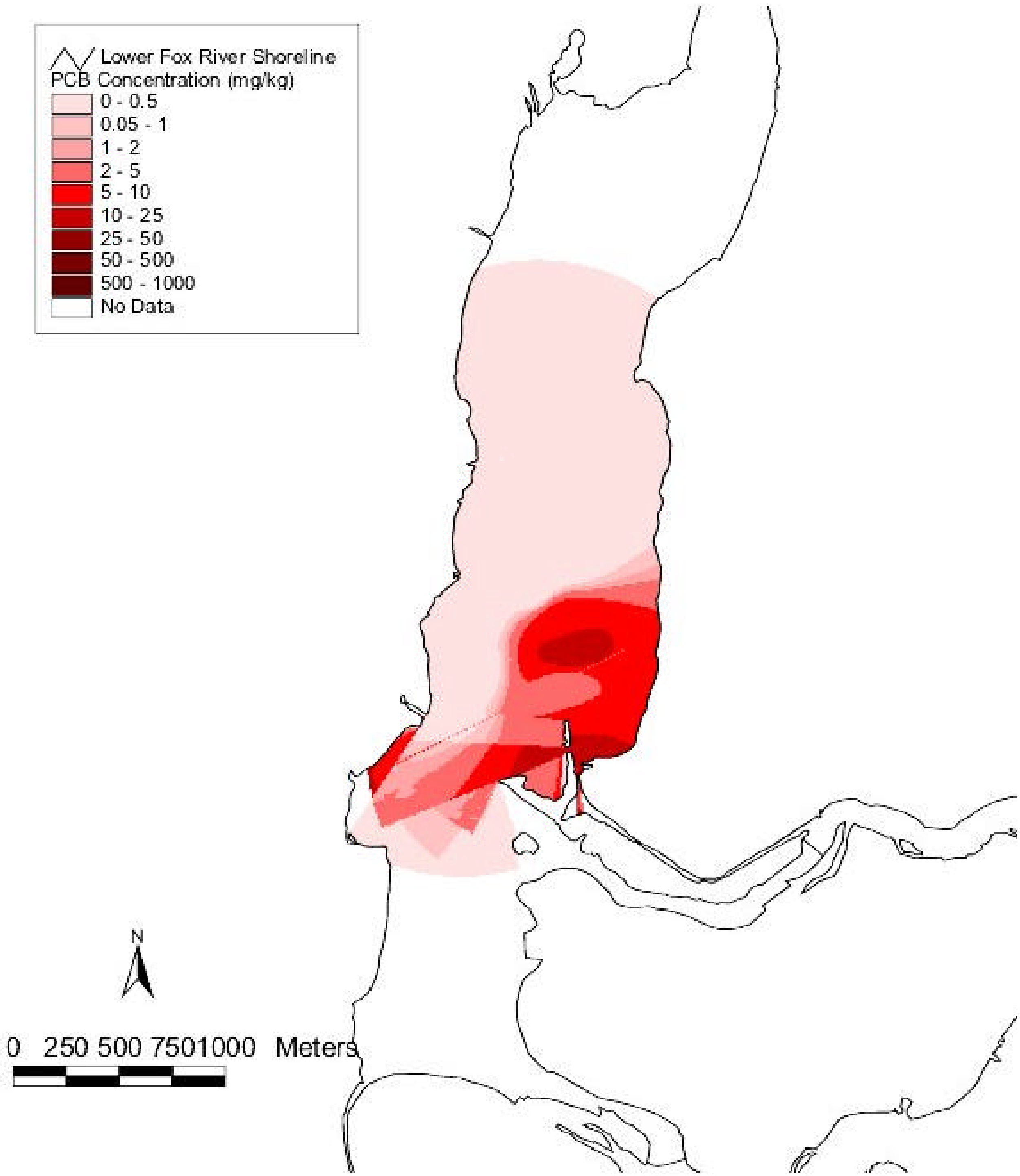


Figure 6A: Min PCB Concentration Layer 6 (1.5-2.0m)
Little Lake Butte des Morts

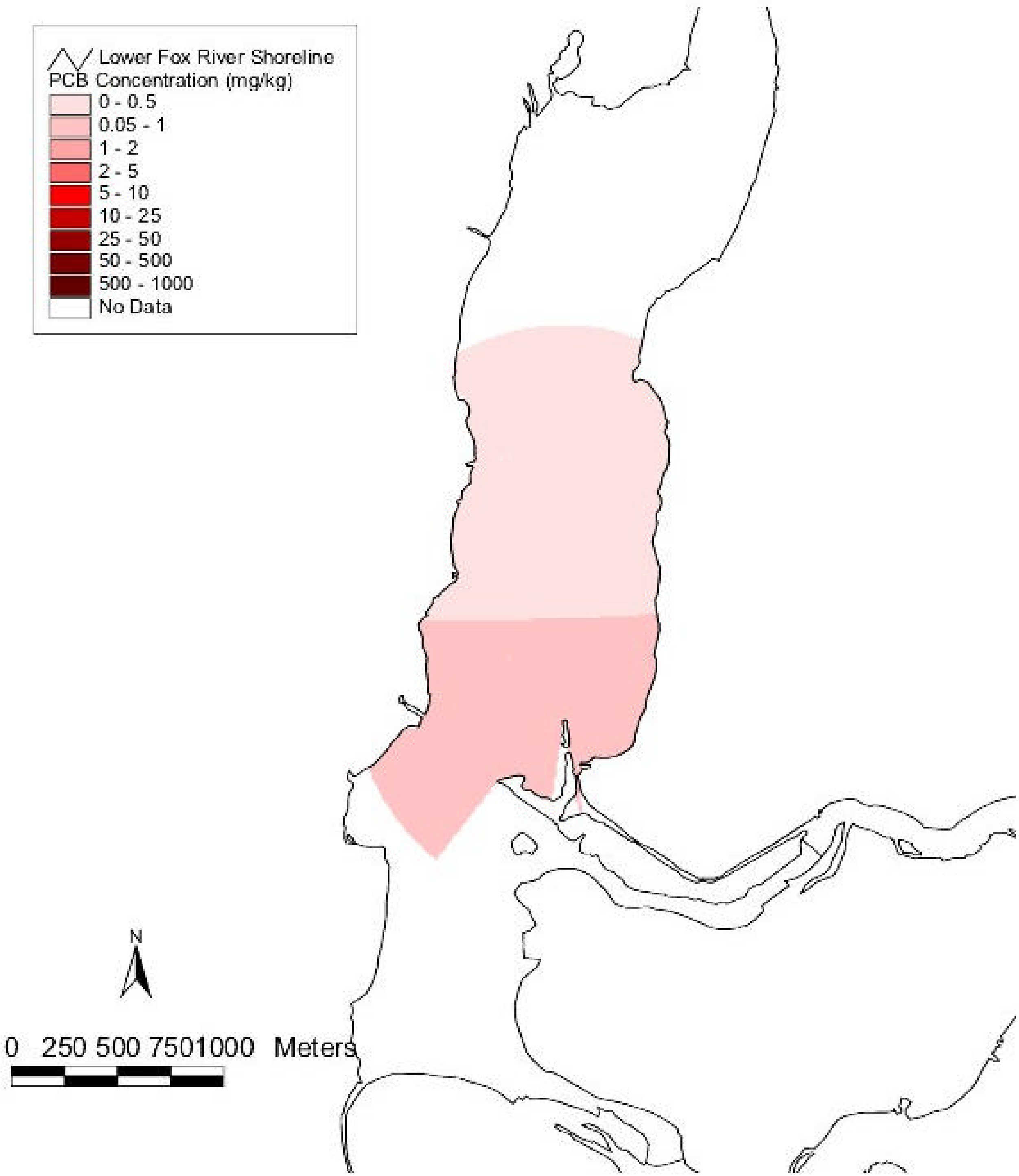


Figure 7A: Min PCB Concentration Layer 7 (2.0-2.5m) Little Lake Butte des Morts

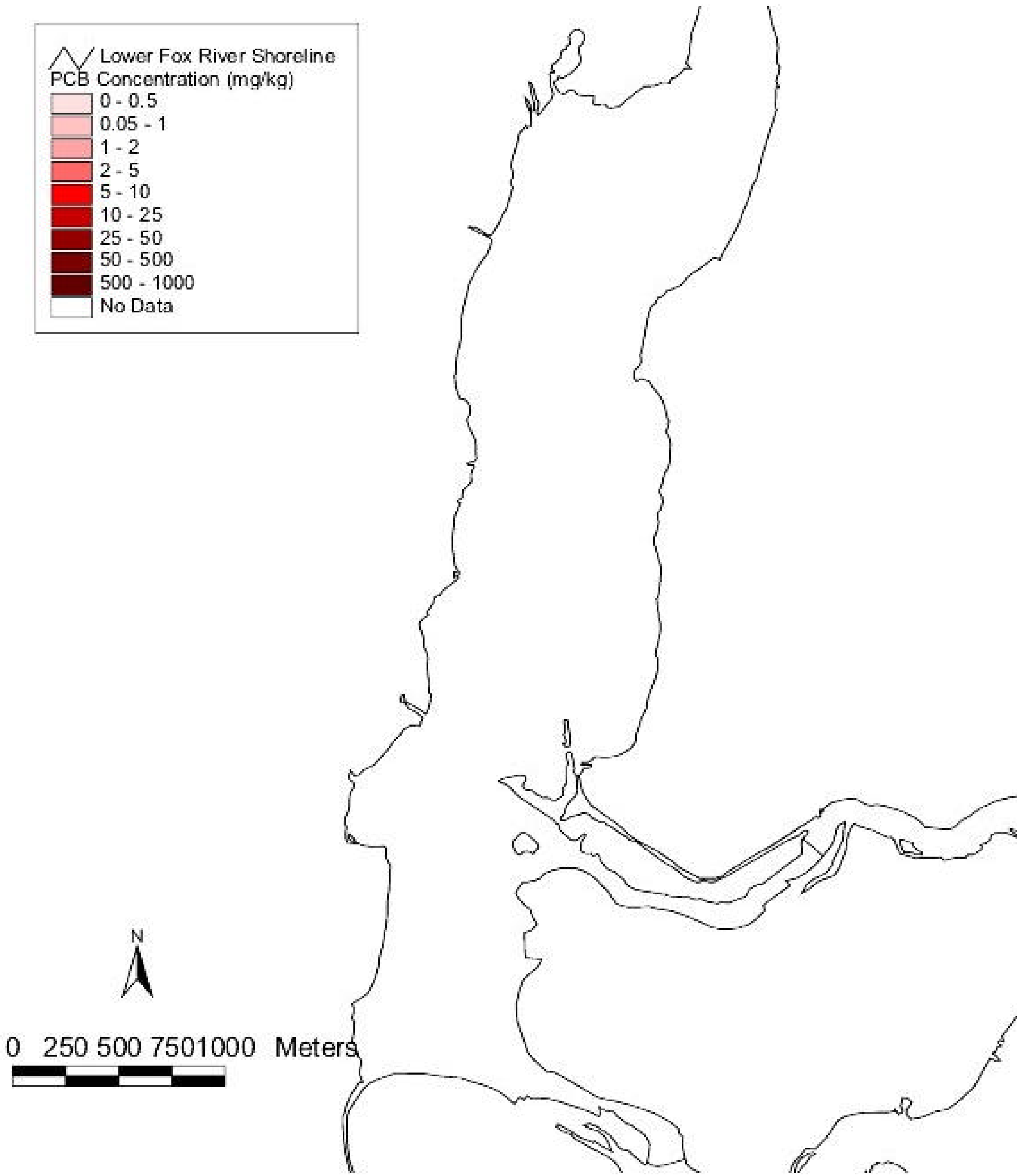


Figure 8A: Min PCB Concentration Layer 8 (2.5-3.0m) Little Lake Butte des Morts

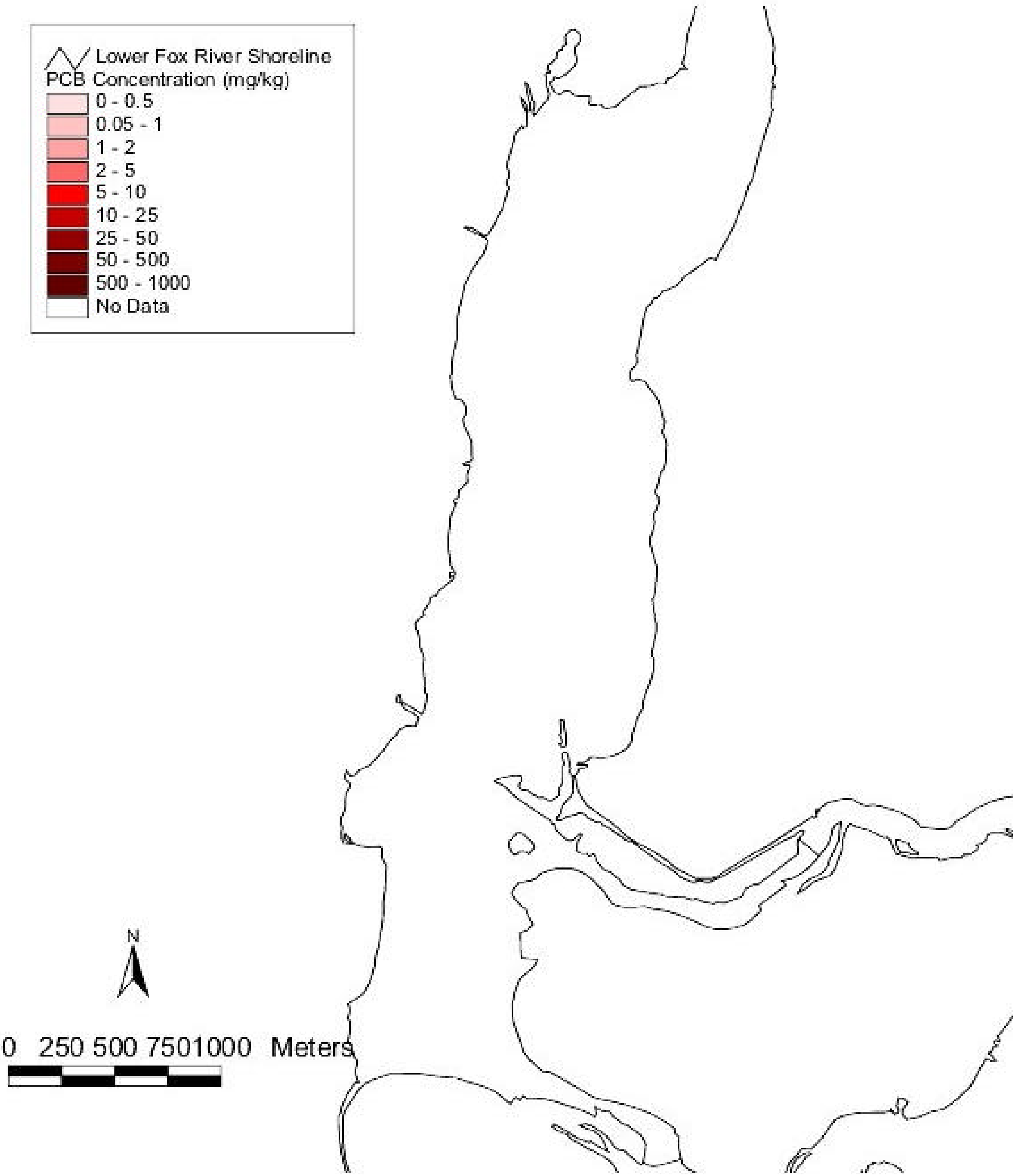


Figure 9A: Min PCB Concentration Layer 9 (3m<)
Little Lake Butte des Morts

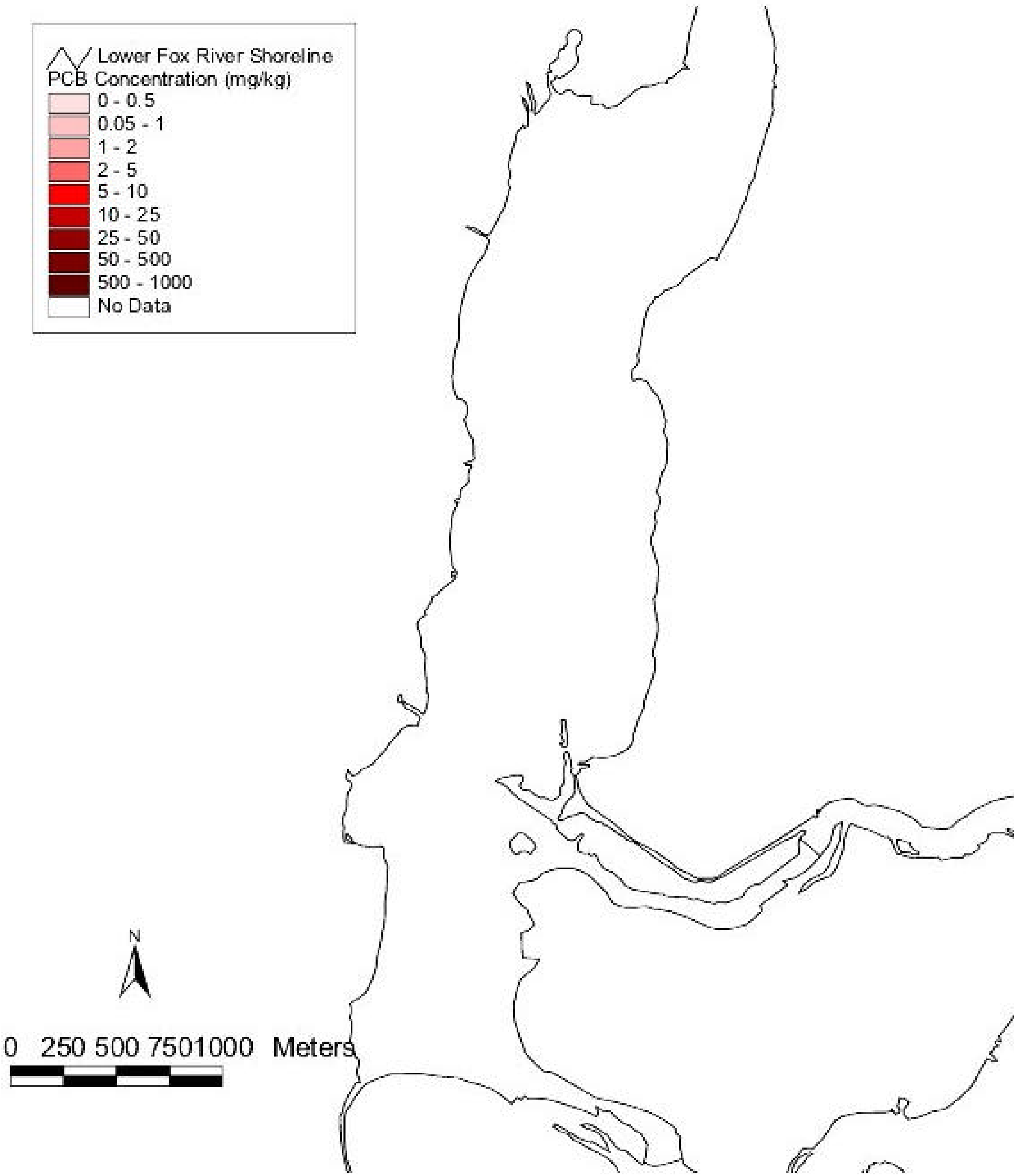


Figure 10A: Max PCB Concentration Layer 1 (0-0.1m)
Little Lake Butte des Morts

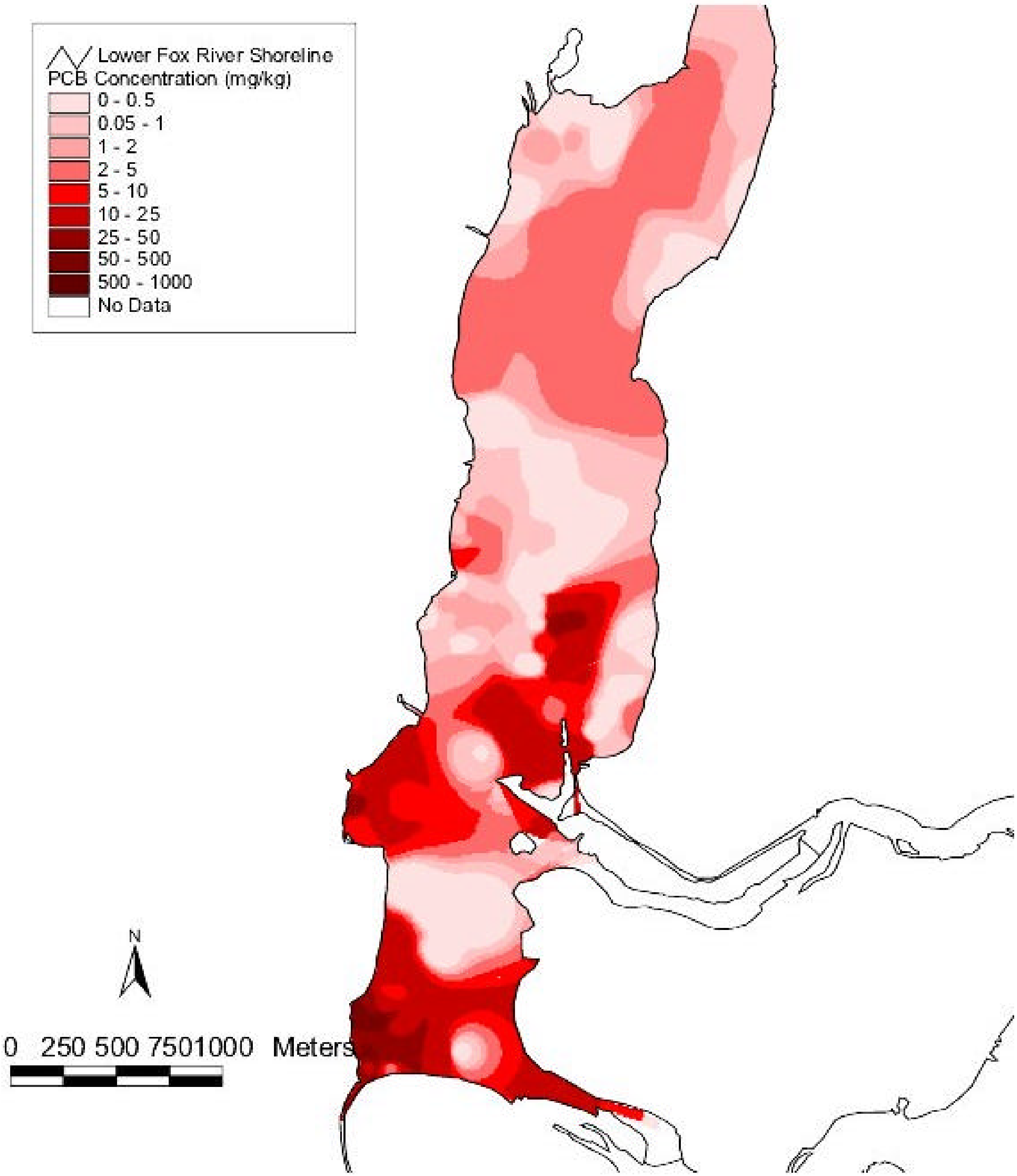


Figure 11A: Max PCB Concentration Layer 2 (0.1-0.3m)
Little Lake Butte des Morts

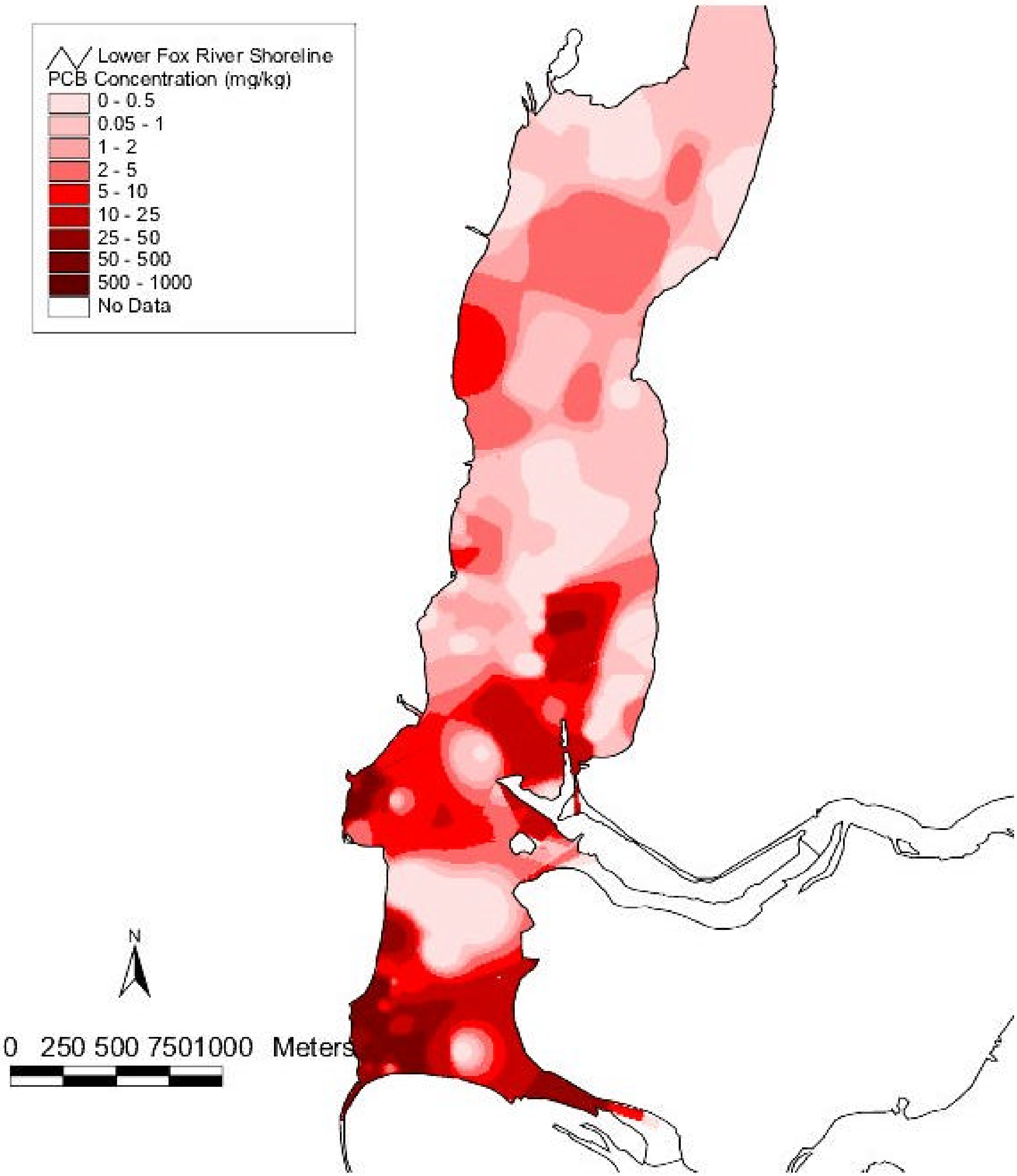


Figure 12A: Max PCB Concentration Layer 3 (0.3-0.5m)
Little Lake Butte des Morts

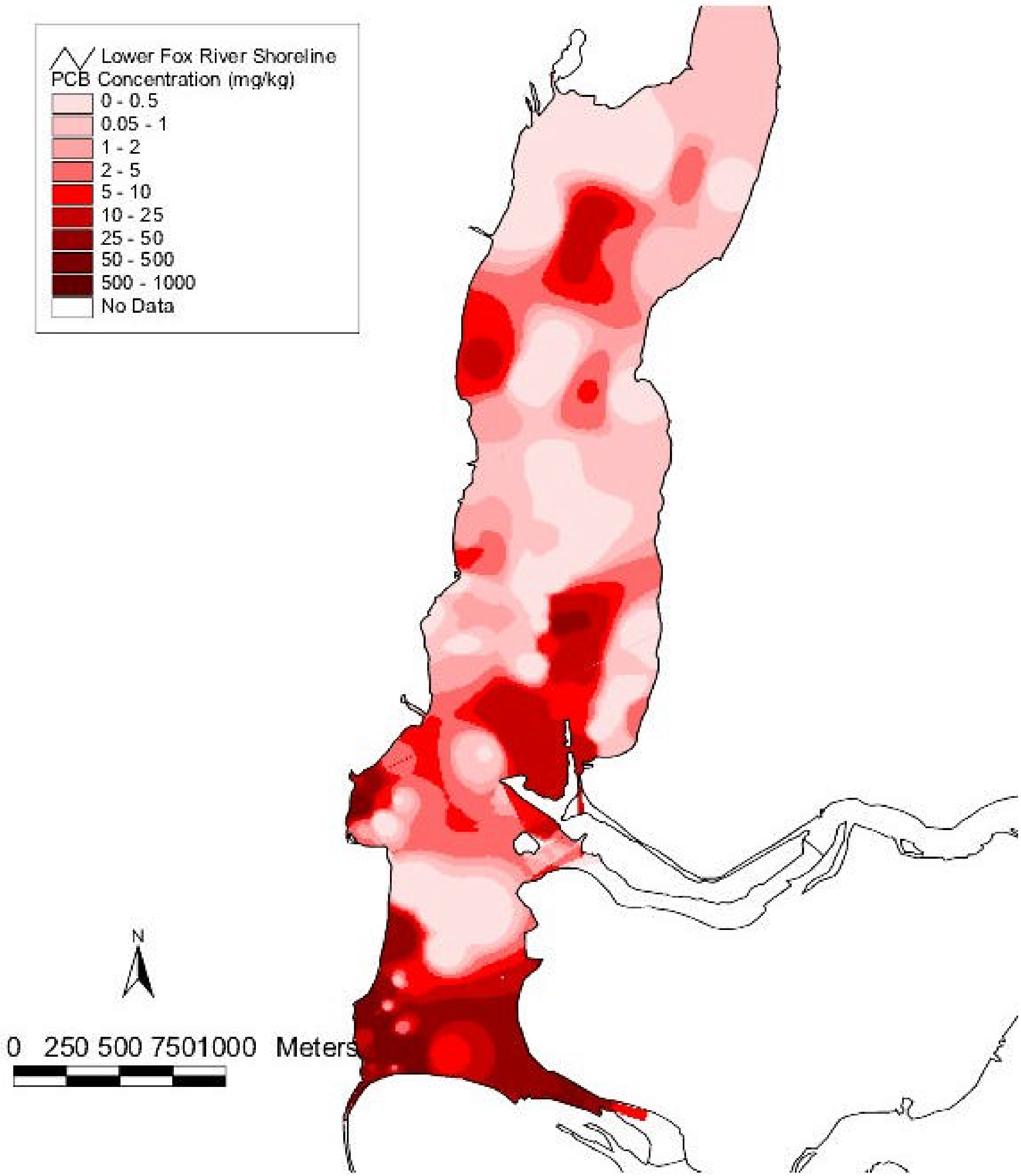


Figure 13A: Max PCB Concentration Layer 4 (0.5-1.0m)
Little Lake Butte des Morts

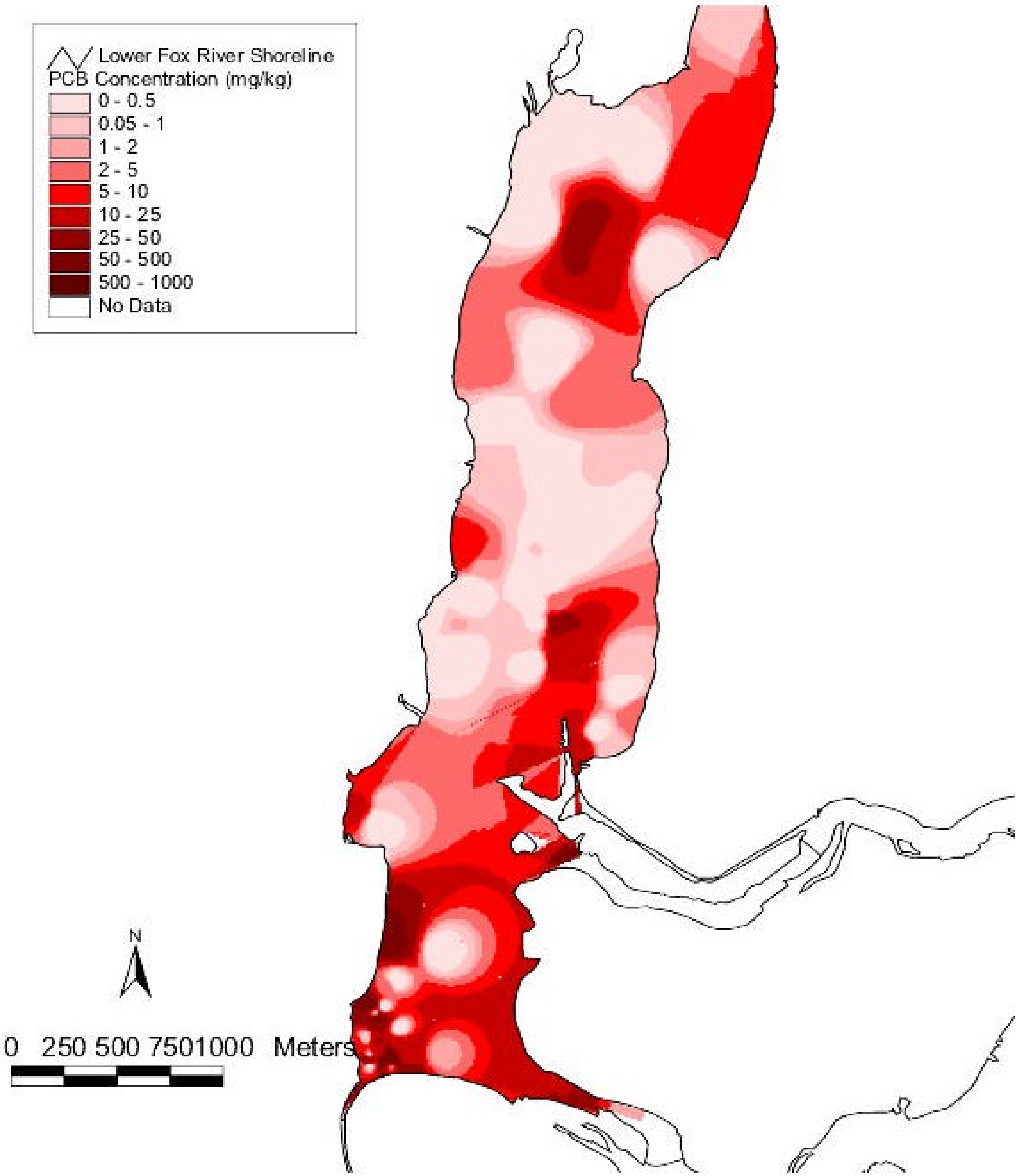


Figure 14A: Max PCB Concentration Layer 5 (1.0-1.5m)
Little Lake Butte des Morts

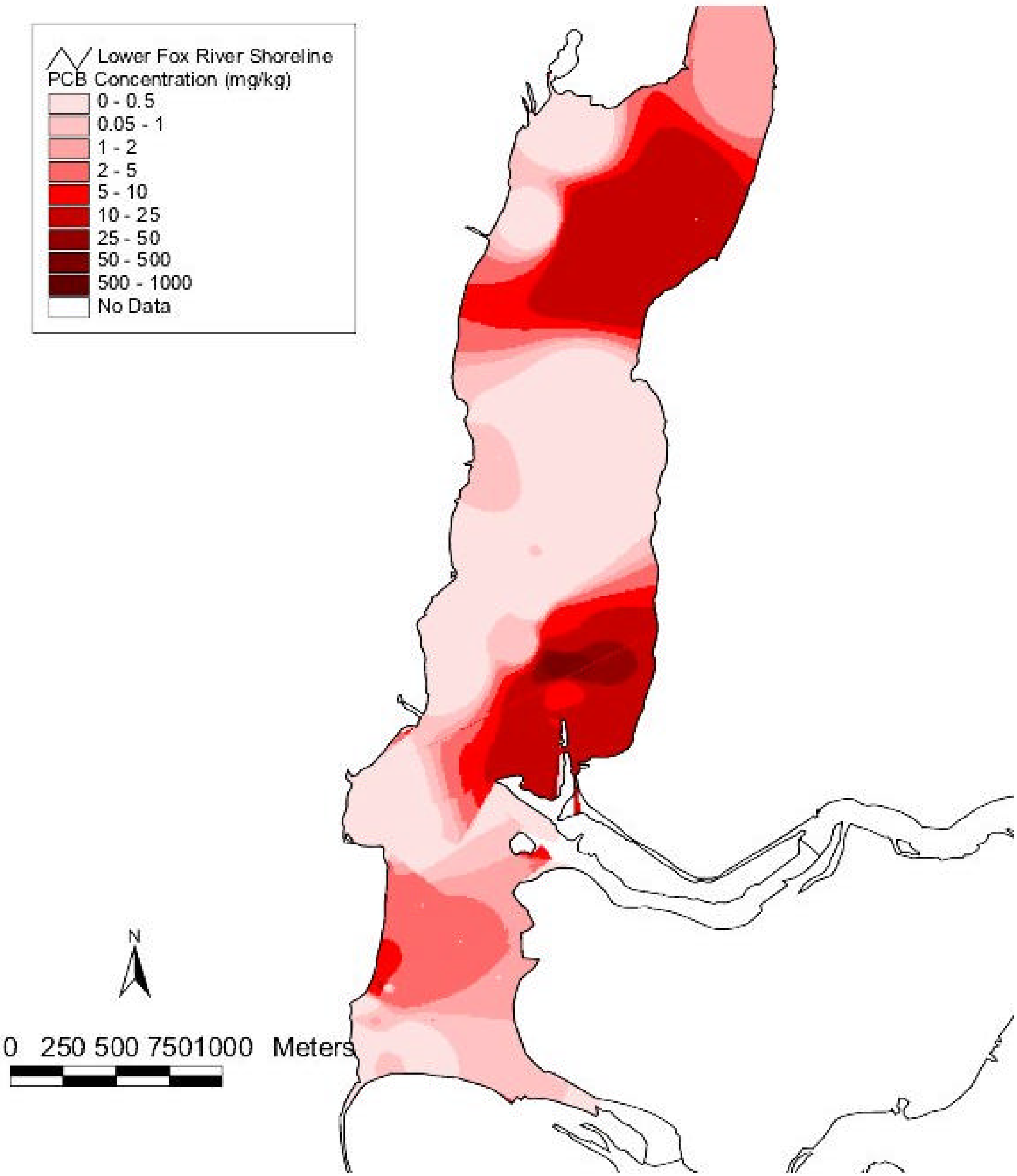


Figure 15A: Max PCB Concentration Layer 6 (1.5-2.0m)
Little Lake Butte des Morts

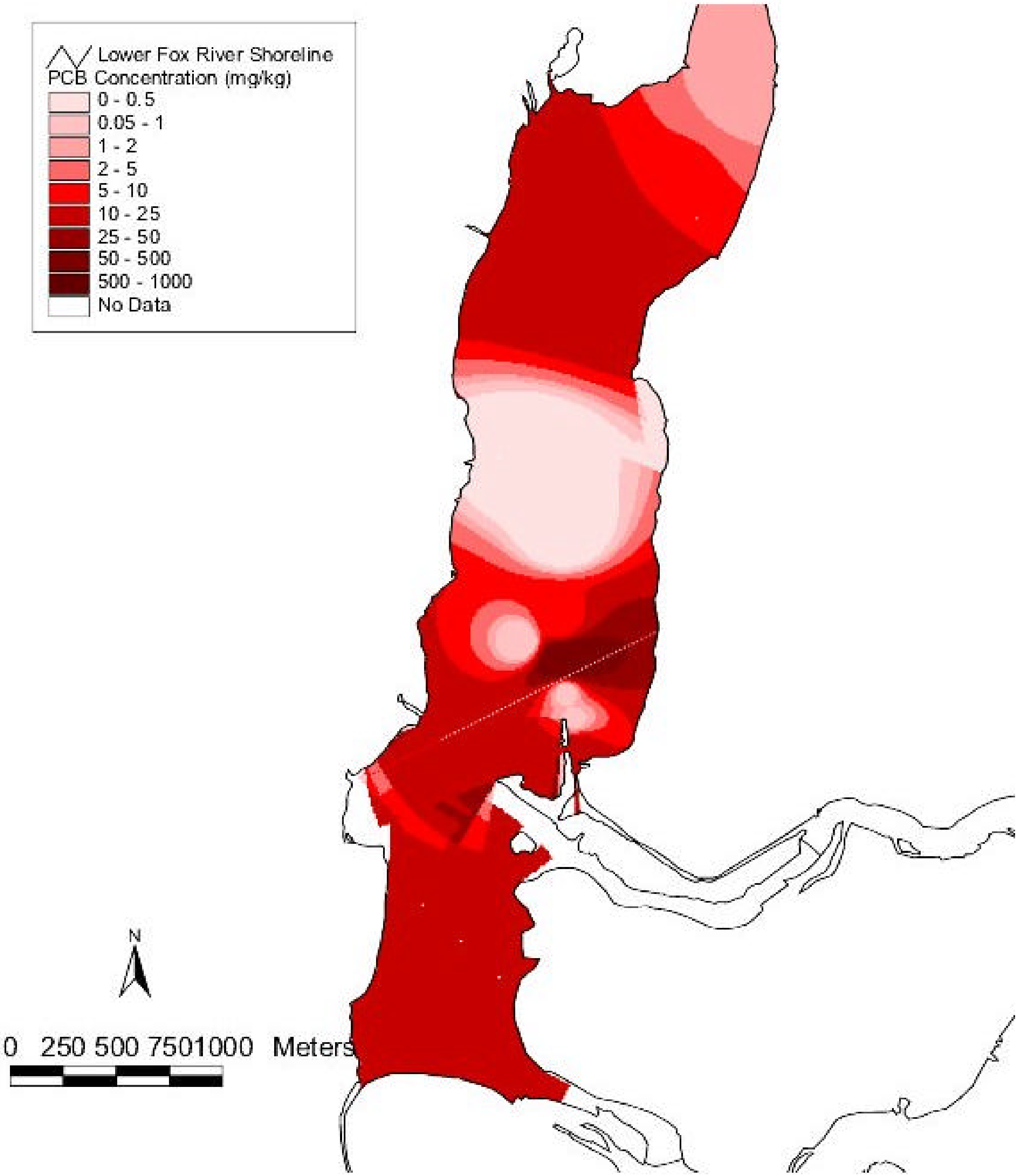


Figure 16A: Max PCB Concentration Layer 7 (2.0-2.5m)
Little Lake Butte des Morts

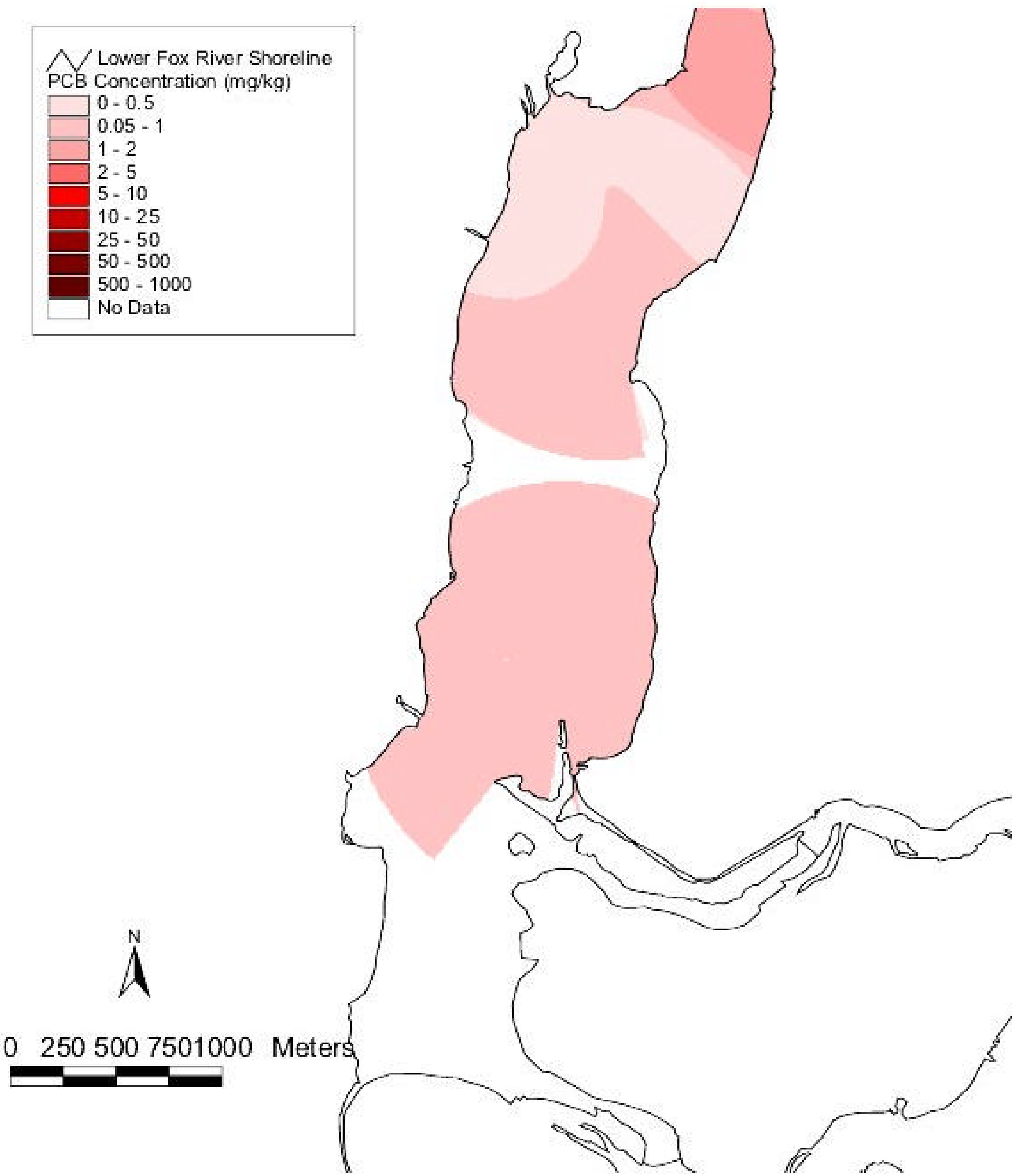


Figure 17A: Max PCB Concentraion Layer 8 (2.5-3.0m)
Little Lake Butte des Morts

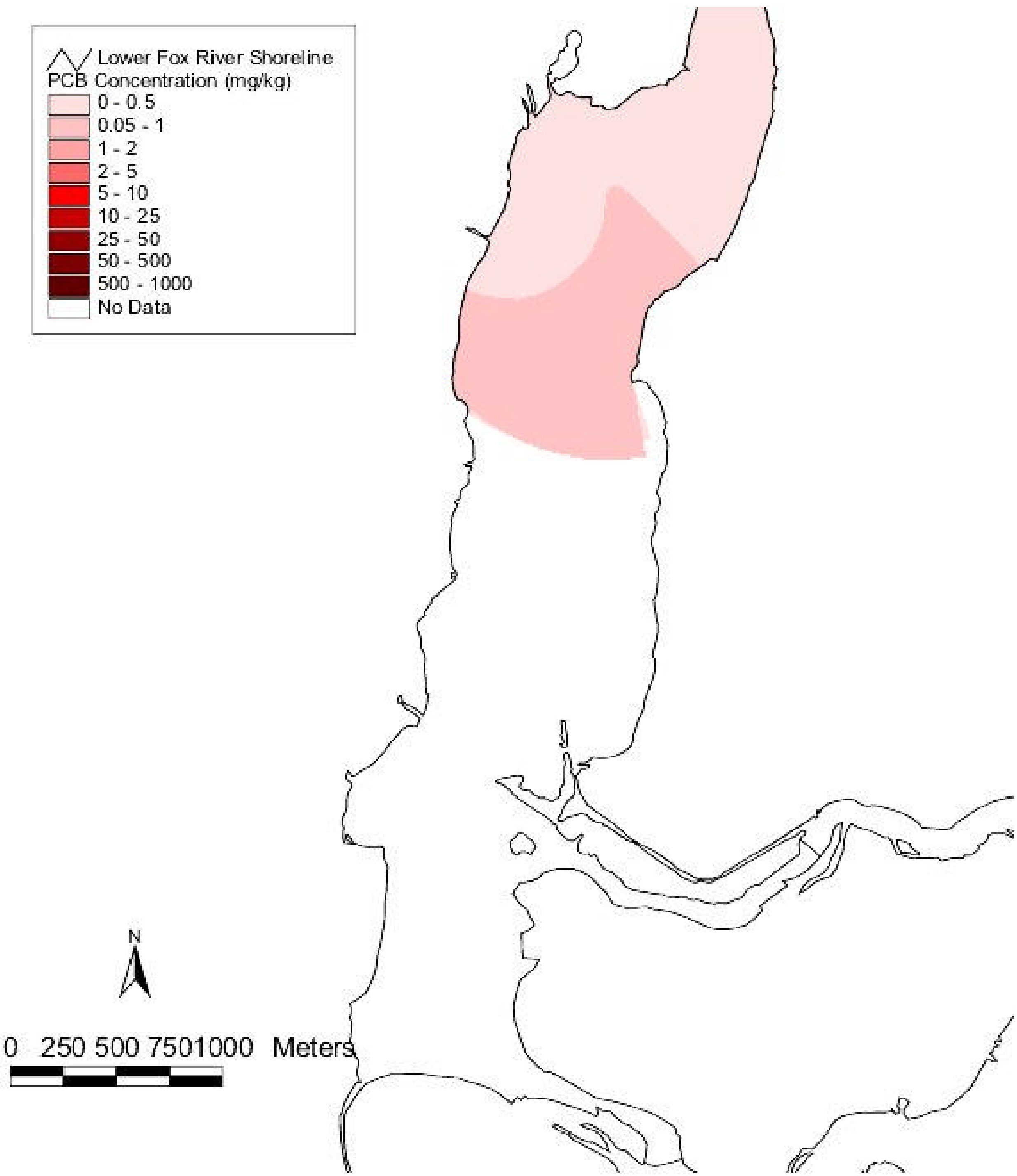
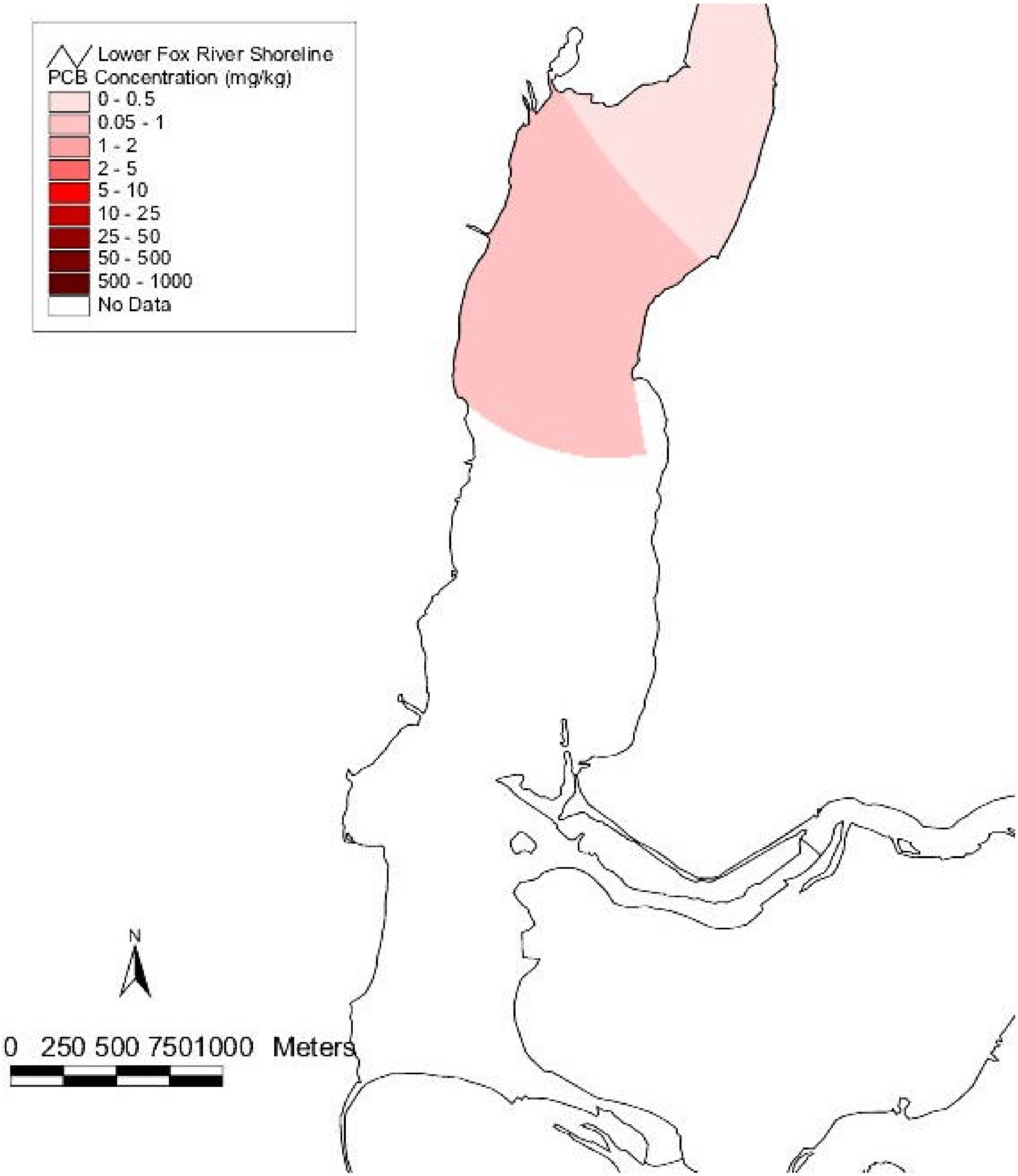


Figure 18A: Max PCB Concentration Layer 9 (3m<)
Little Lake Butte des Morts



APPENDIX B

NOTES ON TABLES IN APPENDIX B

Summaries of sediment bed property interpolations are presented in this appendix. Physical and chemical sediment properties are presented in successive table for each sediment deposit, interdeposit (the area between named deposits), and sediment management units (SMUs). Sediment properties (volume, area, and thickness) are presented for each of the nine depth intervals for which interpolations were performed. It should be noted that the thickness value presented for any sediment deposit, interdeposit, or SMU is computed as an "apparent thickness" value. Because not all grid cells in a sediment area necessary contain sediment throughout the entirety of the sediment column (i.e. the depth of individual grid cells may be less than the depth interval queried), the apparent thickness of a layer may be less that the nominal thickness of the layer (e.g. 0.1 m, 0.2 m, or 0.5 m). In some situations, the apparent thickness of a layer may exceed the nominal layer thickness (usually by a very small amount); these situations are believed to be a function of the manner in which the Map Calculator function in ArcView computes and tabulates the results of Boolean queries of interpolation results. In one instance (for SMU-105), the computed apparent thickness exceeds that nominal thickness by a notable amount (30% for Layers 1-2). This difference could be explained by 20 grid cells that factored into queries to compute volume for a layer but did not factor into queries of sediment area for the layer.

Table B1. Physical properties of the Lower Fox River sediment bed.

Deposit, Interdeposit, SMU	*Average Thickness (m)*	*Maximum Thickness (m)*	*Sand (%)*	*Silt (%)*	*Clay (%)*	*Bulk Density (g/cm3)*	*TOC (%)*
Dep A	0.76	1.07	0.41	0.43	0.16	0.53	6.50
Dep B	0.36	1.07	0.83	0.11	0.06	1.24	2.49
Dep C	0.57	1.07	0.30	0.48	0.22	0.51	6.65
Dep D	0.28	1.35	0.51	0.41	0.08	0.68	6.64
Dep POG2	0.53	2.26	0.43	0.49	0.08	0.35	9.35
Dep POG1 (Seg 05)	0.13	1.28	0.78	0.17	0.05	0.50	9.19
Dep E	0.69	2.14	0.25	0.53	0.22	0.48	6.74
Dep F	0.61	1.07	0.25	0.52	0.23	0.34	14.01
Dep G	0.46	1.07	0.54	0.32	0.14	0.63	3.75
Dep H	0.07	0.30	0.63	0.24	0.13	0.89	3.04
Dep I	0.21	1.07	0.14	0.61	0.25	0.53	5.66
Dep J	0.15	0.61	0.23	0.58	0.20	0.63	3.69
Dep K	0.09	0.30	0.67	0.19	0.14	0.81	2.92
Dep L	0.07	0.30	0.30	0.44	0.26	0.71	3.40
Dep M	0.15	0.61	0.09	0.62	0.29	0.45	5.59
Dep N	0.25	1.24	0.51	0.37	0.11	0.60	8.32
Dep O	0.49	1.07	0.64	0.26	0.10	0.67	6.71
Dep P	0.67	1.07	0.46	0.40	0.14	0.97	2.37
Dep Q	0.05	0.30	0.45	0.42	0.13	0.47	8.62
Dep R	0.24	0.61	0.35	0.43	0.21	0.95	8.53
Dep S	0.48	0.91				0.60	8.13
Dep T	0.55	1.07	0.91	0.04	0.05	0.53	8.22
Dep U	0.26	1.07	0.35	0.48	0.16	0.47	6.56
Dep V	0.48	1.07	0.53	0.36	0.11	0.52	4.42
Dep W	0.63	1.07	0.52	0.33	0.15	0.61	3.98
Dep X	0.26	1.07	0.34	0.52	0.14	0.49	4.97
Dep Y	0.11	0.61	0.48	0.38	0.15	0.66	2.54
Dep Z	0.38	1.07	0.29	0.49	0.23	0.70	0.00
Dep AA	0.05	0.30	0.56	0.20	0.24	1.14	1.87
Dep BB	0.09	0.30	0.46	0.34	0.20	0.86	1.87
Dep CC	0.62	1.07	0.30	0.21	0.49	0.78	1.89
Dep DD	0.64	1.07	0.32	0.43	0.25	0.64	4.38
Dep EE	0.85	2.77	0.33	0.47	0.20	0.54	5.77
Dep FF	0.32	0.61	0.03	0.62	0.34	0.36	5.91
Dep GG	0.78	2.07	0.24	0.56	0.20	0.39	6.48
Dep HH	0.69	2.41	0.23	0.55	0.22	0.59	6.01
Seg 02-ID	0.08	0.53	0.44	0.28	0.28	0.79	5.21
Seg 03-ID	0.04	0.31	0.69	0.09	0.23	1.13	3.21
Seg 04-ID	0.10	1.64	0.65	0.25	0.10	0.75	6.58
Seg 06-ID	0.18	1.89	0.59	0.32	0.09	0.56	7.08
Seg 07-ID	0.06	1.22	0.32	0.48	0.20	0.53	6.92
Seg 08-ID	0.07	0.91	0.17	0.50	0.33	0.52	9.08
Seg 09-ID	0.25	1.07	0.27	0.48	0.24	0.46	6.99
Seg 10-ID	0.03	0.35	0.50	0.32	0.18	0.65	4.44
Seg 11-ID	0.00	0.22	0.58	0.28	0.14	1.02	2.90
Seg 12-ID	0.05	0.62	0.44	0.39	0.17	0.65	7.76
Seg 13-ID	0.03	0.94	0.41	0.40	0.19	0.70	6.58

Table B1 (continued). Physical properties of the Lower Fox River sediment bed.

Deposit, Interdeposit, SMU	*Average Thickness (m)*	*Maximum Thickness (m)*	*Sand (%)*	*Silt (%)*	*Clay (%)*	*Bulk Density (g/cm3)*	*TOC (%)*
Seg 14-ID	0.01	0.61	0.39	0.43	0.18	0.61	7.93
Seg 15-ID	0.02	0.38	0.77	0.16	0.08	0.91	5.55
Seg 16-ID	0.04	1.07	0.76	0.16	0.08	1.02	4.13
Seg 17-ID	0.06	0.91	0.37	0.45	0.17	0.63	3.17
Seg 18-ID	0.07	0.53	0.48	0.26	0.26	0.88	1.62
Seg 19-ID	0.08	1.07	0.86	0.04	0.09	1.38	0.81
Seg 20-ID	0.01	0.15	0.87	0.04	0.09	1.39	4.56
Seg 21-ID	0.09	0.53	0.52	0.30	0.18	0.74	0.00
Seg 22-ID	0.02	0.30	0.65	0.24	0.11	0.96	3.16
Seg 23-ID	0.06	0.16	0.46	0.38	0.16	0.66	4.38
Seg 24-ID	0.01	0.27	0.37	0.44	0.20	0.53	5.62
Seg 25-ID	0.17	0.59	0.40	0.40	0.20	0.63	5.02
Seg 26-ID	0.15	1.33	0.20	0.52	0.27	0.49	6.12
Seg 27-ID	0.60	2.53	0.27	0.53	0.20	0.58	6.79
SMU-020	1.15	5.27	0.37	0.44	0.18	0.54	5.53
SMU-021	1.15	2.70	0.29	0.54	0.17	0.78	3.97
SMU-022	1.55	5.80	0.27	0.48	0.24	0.68	5.81
SMU-023	0.71	2.95	0.22	0.57	0.21	0.95	2.78
SMU-024	1.22	3.85	0.33	0.47	0.21	0.62	5.56
SMU-025	0.85	3.00	0.28	0.51	0.21	1.02	2.73
SMU-026	0.57	1.62	0.19	0.61	0.20	0.80	2.82
SMU-027	0.34	0.93	0.25	0.53	0.22	0.76	3.50
SMU-028	0.59	2.70	0.22	0.61	0.17	0.73	3.31
SMU-029	1.26	2.70	0.32	0.47	0.21	0.77	3.48
SMU-030	0.26	1.10	0.25	0.58	0.17	0.70	3.73
SMU-031	0.20	1.17	0.29	0.46	0.25	1.05	1.35
SMU-032	0.57	1.60	0.32	0.50	0.17	0.86	4.31
SMU-033	0.25	0.86	0.40	0.41	0.18	0.64	5.14
SMU-034	1.36	3.39	0.37	0.46	0.17	0.85	4.02
SMU-035	1.36	3.40	0.38	0.41	0.20	0.63	4.98
SMU-036	0.15	0.35	0.38	0.39	0.23	0.94	2.54
SMU-037	0.49	1.80	0.26	0.48	0.26	0.78	3.45
SMU-038	0.70	3.37	0.51	0.38	0.11	0.73	3.37
SMU-039	0.56	1.99	0.14	0.63	0.23	0.80	3.23
SMU-040	1.26	3.70	0.45	0.38	0.17	0.64	5.13
SMU-041	1.16	2.90	0.30	0.52	0.18	0.74	3.92
SMU-042	0.26	1.52	0.46	0.38	0.16	0.81	3.74
SMU-043	0.60	1.58	0.36	0.47	0.16	0.94	2.09
SMU-044	0.78	2.87	0.34	0.48	0.17	0.59	4.24
SMU-045	1.12	2.74	0.23	0.58	0.19	0.51	5.24
SMU-046	1.20	3.70	0.29	0.54	0.17	0.64	4.44
SMU-047	1.83	3.69	0.32	0.50	0.19	0.48	6.78
SMU-048	1.23	3.50	0.48	0.38	0.14	0.72	3.78
SMU-049	1.46	3.16	0.44	0.41	0.15	0.52	4.62
SMU-050	0.96	1.70	0.21	0.59	0.20	0.92	2.90
SMU-051	1.31	3.26	0.49	0.39	0.12	0.88	2.95
SMU-052	1.73	3.39	0.24	0.59	0.17	0.61	5.63

Table B1 (continued). Physical properties of the Lower Fox River sediment bed.

Deposit, Interdeposit, SMU	*Average Thickness (m)*	*Maximum Thickness (m)*	*Sand (%)*	*Silt (%)*	*Clay (%)*	*Bulk Density (g/cm3)*	*TOC (%)*
SMU-053	1.35	3.10	0.21	0.62	0.18	0.58	4.64
SMU-054	0.61	2.10	0.37	0.49	0.14	0.56	4.76
SMU-055	0.18	0.84	0.17	0.65	0.18	0.49	5.09
SMU-056	2.33	6.04	0.29	0.53	0.17	0.48	6.48
SMU-057	2.22	4.29	0.28	0.51	0.21	0.52	6.71
SMU-058	2.11	4.40	0.33	0.50	0.17	0.48	6.02
SMU-059	1.31	2.37	0.32	0.42	0.26	0.70	4.31
SMU-060	0.35	2.13	0.30	0.53	0.18	0.53	5.62
SMU-061	1.03	2.59	0.37	0.43	0.20	0.75	3.07
SMU-062	1.69	4.30	0.23	0.58	0.19	0.49	7.05
SMU-063	2.60	2.60	0.37	0.48	0.15	0.80	4.07
SMU-064	0.29	1.61	0.29	0.53	0.19	0.57	6.13
SMU-065	2.40	2.60	0.35	0.50	0.15	0.77	4.50
SMU-066			0.28	0.52	0.20	0.59	6.02
SMU-067	1.95	2.60	0.24	0.59	0.17	0.59	5.91
SMU-068	2.83	4.60	0.23	0.58	0.19	0.52	5.87
SMU-069	2.93	4.60	0.31	0.51	0.18	0.54	5.90
SMU-070	2.86	4.60	0.27	0.55	0.18	0.49	6.31
SMU-071	2.80	4.60	0.35	0.49	0.16	0.57	5.64
SMU-072	1.90	1.90	0.32	0.52	0.17	0.58	5.89
SMU-073	2.60	2.60	0.40	0.45	0.15	0.72	5.11
SMU-074	2.10	2.10	0.49	0.38	0.13	0.63	4.92
SMU-075	1.20	1.20	0.23	0.52	0.25	1.04	2.61
SMU-076	2.97	3.70	0.50	0.38	0.12	0.61	5.02
SMU-077	1.31	3.70	0.40	0.47	0.13	0.87	3.48
SMU-078	3.70	3.70	0.51	0.38	0.11	0.60	5.07
SMU-079	1.31	3.70	0.38	0.51	0.11	0.80	3.40
SMU-080	2.17	2.70	0.51	0.35	0.14	0.79	4.14
SMU-081	3.08	3.40	0.41	0.45	0.14	0.70	5.30
SMU-082	1.86	2.70	0.44	0.42	0.14	0.76	3.99
SMU-083	2.92	3.40	0.41	0.44	0.15	0.76	5.10
SMU-084	1.40	1.50	0.36	0.50	0.15	0.74	3.88
SMU-085	3.00	3.00	0.40	0.44	0.16	0.81	5.07
SMU-086	2.61	3.40	0.33	0.53	0.14	0.75	5.08
SMU-087	1.80	1.80	0.22	0.54	0.24	0.94	4.16
SMU-088	2.06	3.40	0.36	0.50	0.13	0.85	3.86
SMU-089	1.57	1.80	0.14	0.57	0.29	0.90	5.00
SMU-090	0.50	0.50	0.36	0.50	0.14	1.02	2.64
SMU-091	0.92	1.40	0.27	0.50	0.23	0.81	4.99
SMU-092	1.10	1.10	0.26	0.55	0.20	0.48	4.54
SMU-093	1.10	1.10	0.52	0.31	0.17	0.92	3.20
SMU-094	1.21	1.80	0.27	0.52	0.21	0.50	5.32
SMU-095	1.15	1.20	0.59	0.27	0.14	1.13	2.33
SMU-096	1.58	1.80	0.29	0.56	0.15	0.40	5.74
SMU-097	1.20	1.20	0.53	0.31	0.16	1.02	2.63
SMU-098	1.20	1.20	0.41	0.38	0.21	0.94	2.64
SMU-099	1.50	1.50	0.64	0.25	0.11	1.19	1.52

Table B1 (continued). Physical properties of the Lower Fox River sediment bed.

Deposit, Interdeposit, SMU	*Average Thickness (m)*	*Maximum Thickness (m)*	*Sand (%)*	*Silt (%)*	*Clay (%)*	*Bulk Density (g/cm3)*	*TOC (%)*
SMU-100	1.20	1.20	0.49	0.32	0.18	1.10	2.19
SMU-101	1.50	1.50	0.56	0.31	0.13	1.14	1.68
SMU-102	1.20	1.20	0.62	0.25	0.13	1.38	1.46
SMU-103	1.50	1.50	0.41	0.45	0.14	0.96	2.03
SMU-104	0.30	0.30	0.54	0.29	0.18	0.77	1.43
SMU-105	1.38	1.40	0.43	0.34	0.22	0.86	2.72
SMU-106	0.63	1.50	0.48	0.35	0.17	0.82	1.58
SMU-107	0.77	1.40	0.45	0.33	0.22	0.77	3.19
SMU-108	1.13	1.50	0.42	0.47	0.11	0.81	1.92
SMU-109	0.85	0.90	0.42	0.44	0.14	0.77	2.87
SMU-110	1.42	1.52	0.33	0.49	0.18	0.81	3.93
SMU-111	2.50	2.60	0.37	0.50	0.13	0.54	6.04
SMU-112	1.65	2.62	0.22	0.60	0.17	0.63	4.60
SMU-113	2.09	3.05	0.32	0.54	0.13	0.56	5.91
SMU-114	1.35	1.90	0.28	0.52	0.20	0.75	3.82
SMU-115	0.71	2.35	0.31	0.53	0.16	0.69	5.75

Table B2. PCB concentrations of the Lower Fox River sediment bed.

Deposit, Interdeposit, SMU	*Maximum Thickness* (m)	*Average PCB Concentration by Layer (mg/kg)* *Layer 1* 0 - 0.1 m	*Layer 2* 0.1 - 0.3 m	*Layer 3* 0.3 - 0.5 m	*Layer 4* 0.5 - 1.0 m	*Layer 5* 1.0 - 1.5 m	*Layer 6* 1.5 - 2.0 m	*Layer 7* 2.0 - 2.5 m	*Layer 8* 2.5 - 3.0 m	*Layer 9* > 3.0 m
Dep A	1.07	31.60	62.97	53.91	16.67	1.87				
Dep B	1.07	2.81	4.34	9.34	29.36	4.14				
Dep C	1.07	14.60	21.48	12.94	4.71	0.15				
Dep D	1.35	2.34	2.34	2.30	2.18	0.34				
Dep POG2	2.26	8.33	8.33	8.40	10.61	25.36	5.10	1.61		
Dep POG1 (Seg 05)	1.28	15.48	13.06	14.78	13.56	24.67				
Dep E	2.14	2.35	4.39	2.89	1.07	0.14	0.23			
Dep F	1.07	1.26	1.06	0.48	0.20	0.05				
Dep G	1.07	0.18	0.18	0.23						
Dep H	0.30	2.10	1.94							
Dep I	1.07	0.76	0.76	0.76						
Dep J	0.61	0.12	0.11	0.10						
Dep K	0.30	0.26	0.23							
Dep L	0.30	0.29	0.29							
Dep M	0.61	0.70	0.70	0.70						
Dep N	1.24	38.15	38.15	39.45	56.81	69.91				
Dep O	1.07	13.62	13.08	13.96	47.03	63.86				
Dep P	1.07	1.50	1.79	0.99	3.13	2.47				
Dep Q	0.30	1.80	1.62							
Dep R	0.61	1.85	1.68	2.57	4.99					
Dep S	0.91	0.72	0.20	0.15						
Dep T	1.07	5.99	5.65	5.00	3.74					
Dep U	1.07	1.00	1.00							
Dep V	1.07	1.67	1.70	1.70	0.72	0.04				
Dep W	1.07	1.02	1.10	1.77	2.24	0.04				
Dep X	1.07	1.38	2.94	2.73	1.95	0.04				
Dep Y	0.61	0.37	0.37	0.37	5.80					
Dep Z	1.07	0.31	0.31	0.37						
Dep AA	0.30	0.25	0.25							
Dep BB	0.30	0.13	0.13							
Dep CC	1.07	1.46	0.39	0.28						
Dep DD	1.07	0.92	0.88	2.65	2.45	0.14				
Dep EE	2.77	2.57	4.90	4.71	2.50	0.29	0.05	0.03	0.03	

Table B2 (continued). PCB concentrations of the Lower Fox River sediment bed.

Deposit, Interdeposit, SMU	*Maximum Thickness* (m)	*Average PCB Concentration by Layer (mg/kg)*								
		Layer 1 0 - 0.1 m	*Layer 2* 0.1 - 0.3 m	*Layer 3* 0.3 - 0.5 m	*Layer 4* 0.5 - 1.0 m	*Layer 5* 1.0 - 1.5 m	*Layer 6* 1.5 - 2.0 m	*Layer 7* 2.0 - 2.5 m	*Layer 8* 2.5 - 3.0 m	*Layer 9* > 3.0 m
Dep FF	0.61	15.22	17.98	24.38	1.62					
Dep GG	2.07	11.51	11.30	14.45	10.29	1.58	0.32	0.13		
Dep HH	2.41	3.63	3.64	3.68	2.58	0.18	0.14	0.09		
Seg 02-ID	0.53	13.21	19.53	24.00	14.23					
Seg 03-ID	0.31	7.02	12.42	23.12						
Seg 04-ID	1.64	6.03	6.38	7.68	9.64	5.32	8.43			
Seg 06-ID	1.89	3.93	3.93	3.86	4.02	12.02	3.65			
Seg 07-ID	1.22	2.47	1.60	1.16	0.59	0.21				
Seg 08-ID	0.91	1.96	5.54	3.53	0.97					
Seg 09-ID	1.07	1.09	1.24	1.68	0.19					
Seg 10-ID	0.35	0.75	0.75	1.00						
Seg 11-ID	0.22	0.66	0.65							
Seg 12-ID	0.62	9.56	9.48	12.81	32.55					
Seg 13-ID	0.94	6.11	6.09	8.55	29.25					
Seg 14-ID	0.61	0.59	0.23	0.32						
Seg 15-ID	0.38	2.14	1.99	4.69						
Seg 16-ID	1.07	0.60	0.85	0.75	0.88	0.04				
Seg 17-ID	0.91	0.74	1.05	1.32	5.59					
Seg 18-ID	0.53	0.61	0.25	0.18						
Seg 19-ID	1.07	0.18	0.18							
Seg 20-ID	0.15	0.18								
Seg 21-ID	0.53	0.90	0.79	2.08	2.20					
Seg 22-ID	0.30	0.67	0.69							
Seg 23-ID	0.16	1.26	3.92							
Seg 24-ID	0.27	2.66	4.69							
Seg 25-ID	0.59	1.77	2.83	1.76	1.55					
Seg 26-ID	1.33	4.84	6.90	5.75	1.77	0.37				
Seg 27-ID	2.53	6.98	8.00	7.12	5.83	2.71	0.64	0.10		
SMU-020	5.27	3.63	12.16	17.07	12.15	9.17	4.96	8.06	15.23	
SMU-021	2.70	3.22	15.00	19.54	5.12	4.86	0.28	0.52	2.87	8.82
SMU-022	5.80	3.25	13.19	30.60	29.58	29.23	26.95	30.15	38.48	
SMU-023	2.95	0.98	1.24	2.17	1.76	3.15	0.37	0.61	0.66	5.82
SMU-024	3.85	2.09	10.66	19.90	23.29	22.65	19.89	16.72	20.26	

Table B2 (continued). PCB concentrations of the Lower Fox River sediment bed.

Deposit, Interdeposit, SMU	*Maximum Thickness* (m)	*Average PCB Concentration by Layer (mg/kg)* *Layer 1* 0 - 0.1 m	*Layer 2* 0.1 - 0.3 m	*Layer 3* 0.3 - 0.5 m	*Layer 4* 0.5 - 1.0 m	*Layer 5* 1.0 - 1.5 m	*Layer 6* 1.5 - 2.0 m	*Layer 7* 2.0 - 2.5 m	*Layer 8* 2.5 - 3.0 m	*Layer 9* > 3.0 m
SMU-025	3.00	1.20	7.00	8.77	7.37	4.50	0.41	0.32	0.36	6.73
SMU-026	1.62	1.68	3.63	6.26	4.43	3.81	0.81			
SMU-027	0.93	3.16	11.84	6.24	2.44					
SMU-028	2.70	1.04	7.86	16.85	14.03	12.10	0.74	0.57	0.09	
SMU-029	2.70	3.22	15.41	13.85	7.13	5.34	1.39	0.27	0.17	
SMU-030	1.10	1.00	10.87	21.30	17.67	15.24				
SMU-031	1.17	1.30	5.32	6.48	10.71	9.00				
SMU-032	1.60	4.02	12.66	11.55	10.08	5.11	3.42			
SMU-033	0.86	2.86	5.82	7.29	5.77					
SMU-034	3.39	3.99	13.39	11.40	9.81	3.70	0.53	0.18	0.11	
SMU-035	3.40	2.32	4.91	6.67	6.47	13.00	22.99	8.99	3.06	6.05
SMU-036	0.35	3.02	9.99	9.57						4.72
SMU-037	1.80	0.41	0.99	1.53	1.54	1.50	1.45			
SMU-038	3.37	2.78	10.76	17.94	7.12	4.75	8.29	2.25	0.71	
SMU-039	1.99	1.12	9.79	11.73	11.57	7.44	2.52			0.79
SMU-040	3.70	2.93	10.50	16.45	15.62	15.38	13.02	4.92	1.07	
SMU-041	2.90	2.51	10.94	16.24	22.92	16.02	1.52	1.35	0.59	0.96
SMU-042	1.52	1.98	8.99	13.36	22.06	19.06	7.22			
SMU-043	1.58	1.05	0.98	0.97	5.95	5.08	1.98			
SMU-044	2.87	2.16	2.92	2.54	2.10	2.47	1.79	1.56	5.52	
SMU-045	2.74	2.20	4.40	10.79	15.32	7.27	2.90	1.24	1.24	
SMU-046	3.70	2.35	4.02	3.03	1.84	3.61	3.77	5.68	4.64	
SMU-047	3.69	2.22	7.63	10.04	14.30	12.81	5.33	5.69	3.02	1.11
SMU-048	3.50	3.96	10.49	11.06	5.99	3.02	0.46	3.01	1.12	0.60
SMU-049	3.16	1.39	8.30	10.99	12.00	14.70	4.25	2.24	1.28	1.39
SMU-050	1.70	1.62	0.51	0.39	0.90	1.09	16.80			13.34
SMU-051	3.26	4.89	9.81	12.95	10.74	7.39	17.38	20.45	28.74	
SMU-052	3.39	2.90	2.50	2.46	9.62	13.21	17.22	9.22	13.90	13.83
SMU-053	3.10	3.74	5.08	5.93	2.80	2.47	5.32	6.72	13.26	21.49
SMU-054	2.10	1.64	1.89	2.16	5.64	7.32	15.86	8.39		13.00
SMU-055	0.84	2.80	4.33	5.69	4.90					
SMU-056	6.04	5.27	20.22	35.63	43.75	39.35	29.69	27.15	30.63	
SMU-057	4.29	2.39	5.25	18.97	41.75	33.09	29.66	36.20	16.86	10.34

Table B2 (continued). PCB concentrations of the Lower Fox River sediment bed.

Deposit, Interdeposit, SMU	*Maximum Thickness* (m)	*Average PCB Concentration by Layer (mg/kg)*								
		Layer 1 0 - 0.1 m	*Layer 2* 0.1 - 0.3 m	*Layer 3* 0.3 - 0.5 m	*Layer 4* 0.5 - 1.0 m	*Layer 5* 1.0 - 1.5 m	*Layer 6* 1.5 - 2.0 m	*Layer 7* 2.0 - 2.5 m	*Layer 8* 2.5 - 3.0 m	*Layer 9* > 3.0 m
SMU-058	4.40	3.35	9.63	15.20	18.81	19.67	17.55	17.62	16.50	22.84
SMU-059	2.37	2.28	3.44	7.25	13.69	11.13	8.03	21.53		14.87
SMU-060	2.13	2.39	7.65	14.87	21.24	20.88	17.19	22.60		
SMU-061	2.59	2.12	3.16	6.93	13.14	10.62	7.36	33.15	16.58	
SMU-062	4.30	1.88	2.88	5.84	15.08	30.02	35.67	14.20	3.47	
SMU-063	2.60	2.20	3.72	4.02	3.26	2.82	1.15	1.97	1.09	14.42
SMU-064	1.61	2.21	2.93	5.21	15.68	20.25	19.42			
SMU-065	2.60	2.35	8.70	10.19	7.59	6.20	0.87	2.12	1.26	
SMU-066										
SMU-067	2.60	2.87	19.09	22.86	16.92	13.05	0.96	8.10	4.92	
SMU-068	4.60	2.61	3.94	4.24	6.65	6.26	12.98	34.36	18.26	
SMU-069	4.60	2.86	8.56	11.25	14.44	15.02	24.95	23.33	17.66	18.28
SMU-070	4.60	3.74	9.23	11.20	14.27	13.84	19.02	31.10	17.51	21.25
SMU-071	4.60	2.84	12.92	16.26	16.12	13.92	12.94	11.60	9.36	15.80
SMU-072	1.90	4.61	16.98	20.68	20.24	17.85	11.97			20.64
SMU-073	2.60	2.98	18.18	22.15	20.90	15.27	5.33	4.46	2.79	
SMU-074	2.10	3.14	7.47	9.50	6.39	6.70	2.21	1.40		
SMU-075	1.20	5.60	9.24	11.27	2.86	0.98				
SMU-076	3.70	2.84	5.88	7.29	5.82	6.34	2.96	1.85	2.94	
SMU-077	3.70	5.25	9.67	12.22	1.98	0.98	2.32	1.46	2.79	2.79
SMU-078	3.70	2.56	4.11	4.83	4.98	5.71	3.95	2.45	2.89	2.90
SMU-079	3.70	6.25	9.91	11.93	3.25	1.01	1.99	1.25	5.41	4.93
SMU-080	2.70	3.26	2.32	2.21	2.23	1.59	0.35	0.18	0.54	0.54
SMU-081	3.40	3.42	7.80	11.76	15.81	14.26	3.22	1.58	0.12	
SMU-082	2.70	4.77	3.56	3.23	3.25	1.50	0.83	0.38	0.54	0.55
SMU-083	3.40	2.96	4.84	8.87	15.27	12.78	4.68	2.08	0.13	
SMU-084	1.50	6.34	4.39	3.81	3.87	1.07				0.65
SMU-085	3.00	2.57	3.34	7.90	16.24	12.99	5.43	2.34	0.14	
SMU-086	3.40	2.62	8.41	17.34	18.44	18.11	0.95	0.82	0.11	
SMU-087	1.80	0.98	2.86	10.85	11.58	11.46	1.96			0.11
SMU-088	3.40	2.10	6.59	17.46	18.58	18.27	0.89	0.79	0.11	
SMU-089	1.80	1.19	4.02	9.34	9.85	9.90	2.41			0.11
SMU-090	0.50	0.87	2.27	16.83						

Table B2 (continued). PCB concentrations of the Lower Fox River sediment bed.

Deposit, Interdeposit, SMU	*Maximum Thickness* (m)	*Average PCB Concentration by Layer (mg/kg)*								
		Layer 1 0 - 0.1 m	*Layer 2* 0.1 - 0.3 m	*Layer 3* 0.3 - 0.5 m	*Layer 4* 0.5 - 1.0 m	*Layer 5* 1.0 - 1.5 m	*Layer 6* 1.5 - 2.0 m	*Layer 7* 2.0 - 2.5 m	*Layer 8* 2.5 - 3.0 m	*Layer 9* > 3.0 m
SMU-091	1.40	1.42	3.37	8.11	8.58	8.71				
SMU-092	1.10	1.69	3.18	4.26	4.38	5.00				
SMU-093	1.10	0.71	0.69	1.13	1.22	1.68				
SMU-094	1.80	1.75	2.82	3.82	3.92	3.90	2.90			
SMU-095	1.20	0.55	0.56	1.28	1.32	2.24				
SMU-096	1.80	1.86	2.29	3.06	3.14	3.14	2.90			
SMU-097	1.20	0.75	0.84	1.57	1.53	1.85				
SMU-098	1.20	0.59	0.50	0.28	0.13	1.36				
SMU-099	1.50	0.14	0.19	0.21	0.18	0.18				
SMU-100	1.20	0.79	0.72	0.57	0.09	0.90				
SMU-101	1.50	0.22	0.29	0.42	0.42	0.51				
SMU-102	1.20	1.03	1.01	0.99	0.08	0.61				
SMU-103	1.50	0.22	0.34	0.69	0.92	1.17				
SMU-104	0.30	1.00	1.00							
SMU-105	1.40	1.50	1.31	0.70	0.59	1.44				
SMU-106	1.50	0.78	0.79	0.47	0.56	1.09				
SMU-107	1.40	1.76	1.57	0.87	0.72	1.45				
SMU-108	1.50	0.30	0.31	0.36	0.47	1.25				
SMU-109	0.90	1.11	0.92	0.42	0.38					
SMU-110	1.52	1.50	2.02	2.09	1.41	1.41	7.00			
SMU-111	2.60	1.69	1.59	1.51	0.74	0.68	8.33	11.00	11.00	
SMU-112	2.62	1.67	1.89	1.77	1.29	1.30	7.30	11.00	11.00	
SMU-113	3.05	1.65	1.61	1.51	0.90	0.84	8.32	11.00	11.00	
SMU-114	1.90	1.61	1.92	1.79	1.26	1.40	5.29			
SMU-115	2.35	0.81	1.08	1.45	0.80	0.52	8.33	11.00		

Table B3. PCB Mass Inventory of the Lower Fox River sediment bed.

Deposit, Interdeposit, SMU	*Maximum Thickness* (m)	*PCB Mass by Layer (kg)* *Layer 1* 0 - 0.1 m	*Layer 2* 0.1 - 0.3 m	*Layer 3* 0.3 - 0.5 m	*Layer 4* 0.5 - 1.0 m	*Layer 5* 1.0 - 1.5 m	*Layer 6* 1.5 - 2.0 m	*Layer 7* 2.0 - 2.5 m	*Layer 8* 2.5 - 3.0 m	*Layer 9* > 3.0 m
Dep A	1.07	198.42	814.80	655.36	432.73	6.76				
Dep B	1.07	17.43	48.71	117.64	392.94	2.56				
Dep C	1.07	69.35	169.52	70.88	34.93	0.07				
Dep D	1.35	27.85	34.29	17.63	12.17	0.01				
Dep POG2	2.26	52.86	77.31	59.61	116.52	102.99	6.64	0.11		
Dep POG1 (Seg 05)	1.28	48.15	28.41	4.16	5.69	1.03				
Dep E	2.14	162.18	596.61	344.98	235.50	4.34	0.34			
Dep F	1.07	4.84	7.82	2.78	2.16	0.06				
Dep G	1.07	0.32	0.64	0.56						
Dep H	0.30	0.43	0.79							
Dep I	1.07	0.46	0.92	0.55						
Dep J	0.61	0.08	0.16	0.02						
Dep K	0.30	0.03	0.06							
Dep L	0.30	0.05	0.10							
Dep M	0.61	0.17	0.34	0.08						
Dep N	1.24	19.93	21.98	17.34	25.44	1.68				
Dep O	1.07	9.59	17.60	13.95	125.86	14.95				
Dep P	1.07	2.39	6.38	3.53	29.81	1.99				
Dep Q	0.30	0.06	0.11							
Dep R	0.61	0.75	1.35	0.89	0.95					
Dep S	0.91	5.72	3.19	1.95						
Dep T	1.07	5.33	9.81	6.27	8.33					
Dep U	1.07	0.44	0.87							
Dep V	1.07	0.98	1.99	1.49	1.75	0.00				
Dep W	1.07	32.43	60.57	100.26	220.34	0.20				
Dep X	1.07	11.52	53.11	35.29	43.24	0.07				
Dep Y	0.61	0.26	0.53	0.06	0.55					
Dep Z	1.07	0.35	0.71	0.09						
Dep AA	0.30	0.04	0.07							
Dep BB	0.30	0.06	0.11							
Dep CC	1.07	8.46	4.53	2.18						
Dep DD	1.07	7.49	14.22	38.55	61.89	0.16				
Dep EE	2.77	321.65	1174.54	1056.52	1341.49	19.03	1.42	0.19	0.01	

Table B3 (continued). PCB Mass Inventory of the Lower Fox River sediment bed.

Deposit, Interdeposit, SMU	*Maximum Thickness* (m)	*PCB Mass by Layer (kg)*								
		Layer 1 0 - 0.1 m	*Layer 2* 0.1 - 0.3 m	*Layer 3* 0.3 - 0.5 m	*Layer 4* 0.5 - 1.0 m	*Layer 5* 1.0 - 1.5 m	*Layer 6* 1.5 - 2.0 m	*Layer 7* 2.0 - 2.5 m	*Layer 8* 2.5 - 3.0 m	*Layer 9* > 3.0 m
Dep FF	0.61	1.90	4.39	3.03	0.11					
Dep GG	2.07	10.13	18.49	18.10	22.33	1.97	0.12	0.00		
Dep HH	2.41	6.54	11.14	10.69	15.01	0.34	0.11	0.02		
Seg 02-ID	0.53	39.02	27.50	9.19	0.38					
Seg 03-ID	0.31	10.83	3.84	0.01						
Seg 04-ID	1.64	70.06	45.46	22.81	5.55	1.82	0.03			
Seg 06-ID	1.89	52.05	30.47	9.67	6.81	7.98	0.66			
Seg 07-ID	1.22	4.49	3.31	0.60	0.43	0.01				
Seg 08-ID	0.91	5.86	9.84	0.47	0.09					
Seg 09-ID	1.07	2.19	2.40	0.43	0.04					
Seg 10-ID	0.35	0.48	0.30	0.01						
Seg 11-ID	0.22	0.33	0.01							
Seg 12-ID	0.62	53.15	46.80	6.41	0.66					
Seg 13-ID	0.94	9.29	8.07	3.55	1.98					
Seg 14-ID	0.61	0.58	0.05	0.00						
Seg 15-ID	0.38	10.69	2.97	0.10						
Seg 16-ID	1.07	3.25	2.49	1.22	0.51	0.00				
Seg 17-ID	0.91	2.17	0.90	1.45	3.21					
Seg 18-ID	0.53	5.29	1.94	0.48						
Seg 19-ID	1.07	1.14	0.49							
Seg 20-ID	0.15	0.01								
Seg 21-ID	0.53	2.41	1.11	0.27	0.00					
Seg 22-ID	0.30	1.33	1.13							
Seg 23-ID	0.16	1.59	0.53							
Seg 24-ID	0.27	0.11	0.03							
Seg 25-ID	0.59	8.02	12.81	2.08	0.02					
Seg 26-ID	1.33	15.74	13.57	3.52	0.29	0.02				
Seg 27-ID	2.53	51.07	81.14	62.22	72.76	9.71	0.99	0.04		
SMU-020	5.27	71.23	439.18	571.11	775.38	441.75	87.24	134.19	64.06	42.76
SMU-021	2.70	32.96	270.53	336.20	197.39	140.66	3.99	1.84	2.89	
SMU-022	5.80	10.67	91.24	334.10	509.35	325.02	240.68	210.46	191.13	443.05
SMU-023	2.95	11.36	26.17	33.68	30.70	36.30	2.67	1.09	0.16	
SMU-024	3.85	12.26	130.17	211.33	418.61	268.54	149.45	84.54	45.96	9.70

Table B3 (continued). PCB Mass Inventory of the Lower Fox River sediment bed.

Deposit, Interdeposit, SMU	*Maximum Thickness (m)*	*PCB Mass by Layer (kg)*								
		Layer 1 0 - 0.1 m	*Layer 2* 0.1 - 0.3 m	*Layer 3* 0.3 - 0.5 m	*Layer 4* 0.5 - 1.0 m	*Layer 5* 1.0 - 1.5 m	*Layer 6* 1.5 - 2.0 m	*Layer 7* 2.0 - 2.5 m	*Layer 8* 2.5 - 3.0 m	*Layer 9* > 3.0 m
SMU-025	3.00	13.14	141.38	157.48	254.95	123.29	5.57	1.16	0.08	
SMU-026	1.62	2.03	7.07	10.10	13.40	3.77	0.01			
SMU-027	0.93	4.34	21.23	5.40	0.80					
SMU-028	2.70	4.94	63.28	90.79	99.49	31.02	0.41	0.09	0.00	
SMU-029	2.70	19.41	184.28	157.53	174.63	79.31	9.46	0.31	0.01	
SMU-030	1.10	0.77	9.33	9.64	7.19	0.11				
SMU-031	1.17	1.44	2.74	2.09	4.96	0.14				
SMU-032	1.60	15.82	78.97	48.40	61.24	12.76	0.34			
SMU-033	0.86	9.28	27.53	4.22	0.09					
SMU-034	3.39	20.62	138.36	109.51	203.07	56.44	2.48	0.21	0.08	1.47
SMU-035	3.40	10.52	45.86	57.25	120.52	121.40	105.46	22.57	4.47	1.69
SMU-036	0.35	3.58	10.42	0.16						
SMU-037	1.80	0.60	1.86	1.68	2.02	0.19	0.02			
SMU-038	3.37	9.79	59.41	67.21	40.21	7.97	5.65	0.15	0.01	0.00
SMU-039	1.99	2.28	30.82	26.63	47.77	19.09	0.35			
SMU-040	3.70	17.48	126.03	183.51	334.13	207.86	58.85	12.39	0.50	0.40
SMU-041	2.90	24.05	188.67	247.79	740.63	297.53	10.55	2.72	0.26	
SMU-042	1.52	6.85	33.82	28.45	36.78	3.76	0.03			
SMU-043	1.58	8.63	11.46	5.06	63.16	25.48	0.02			
SMU-044	2.87	14.45	32.60	21.09	30.64	21.71	6.20	0.30	0.90	
SMU-045	2.74	20.44	74.93	170.51	497.31	149.93	22.04	0.59	0.17	
SMU-046	3.70	25.71	78.34	55.10	69.01	94.95	70.31	51.47	6.62	0.10
SMU-047	3.69	16.03	113.48	146.65	502.57	404.11	86.96	30.04	4.12	0.08
SMU-048	3.50	46.06	228.11	243.60	276.09	92.09	7.07	7.73	0.73	0.46
SMU-049	3.16	17.39	199.99	259.75	679.60	605.15	104.64	11.33	0.11	0.01
SMU-050	1.70	3.66	2.18	1.61	5.35	2.08	4.57			
SMU-051	3.26	10.26	33.83	44.59	88.58	38.73	21.72	2.78	0.78	0.32
SMU-052	3.39	17.48	26.58	25.08	255.00	341.31	345.16	89.98	23.38	1.08
SMU-053	3.10	21.09	48.47	53.89	55.74	31.76	31.75	7.47	6.67	0.34
SMU-054	2.10	4.33	5.76	4.11	38.58	34.27	29.51	0.75		
SMU-055	0.84	1.52	2.99	1.76	1.05					
SMU-056	6.04	15.15	126.81	218.03	658.69	545.42	362.83	229.38	118.26	113.89
SMU-057	4.29	10.38	50.50	192.84	1047.52	783.72	602.13	456.24	82.05	9.43

Table B3 (continued). PCB Mass Inventory of the Lower Fox River sediment bed.

Deposit, Interdeposit, SMU	*Maximum Thickness* (m)	*PCB Mass by Layer (kg)*								
		Layer 1 0 - 0.1 m	*Layer 2* 0.1 - 0.3 m	*Layer 3* 0.3 - 0.5 m	*Layer 4* 0.5 - 1.0 m	*Layer 5* 1.0 - 1.5 m	*Layer 6* 1.5 - 2.0 m	*Layer 7* 2.0 - 2.5 m	*Layer 8* 2.5 - 3.0 m	*Layer 9* > 3.0 m
SMU-058	4.40	4.91	27.20	42.31	125.48	123.65	100.07	65.45	15.43	4.95
SMU-059	2.37	4.25	12.89	27.81	126.08	63.04	13.06	0.82		
SMU-060	2.13	3.53	11.63	10.42	25.08	8.67	2.00	0.19		
SMU-061	2.59	6.85	19.23	38.49	152.69	60.96	3.40	7.14	0.11	
SMU-062	4.30	4.97	9.74	17.29	89.19	178.31	204.54	44.01	7.47	3.96
SMU-063	2.60	0.82	2.00	2.10	3.86	3.88	0.82	0.30	0.04	
SMU-064	1.61	2.20	1.43	1.38	13.15	3.82	0.09			
SMU-065	2.60	6.19	36.10	41.72	76.77	64.73	8.20	1.56	0.20	
SMU-066										
SMU-067	2.60	1.36	19.44	23.28	42.75	32.49	1.25	0.05	0.01	
SMU-068	4.60	0.63	1.57	1.67	8.33	8.35	19.99	17.17	8.62	23.00
SMU-069	4.60	0.05	0.29	0.39	0.89	0.98	1.21	1.11	0.55	1.49
SMU-070	4.60	15.34	78.47	94.95	293.80	281.81	373.92	378.56	164.84	264.14
SMU-071	4.60	6.28	64.20	80.08	192.90	158.08	119.57	104.13	44.10	119.61
SMU-072	1.90	0.37	5.51	6.62	12.24	9.31	0.49			
SMU-073	2.60	0.65	12.04	14.53	33.83	22.47	4.05	2.25	0.16	
SMU-074	2.10	0.11	0.66	0.87	1.30	1.30	0.03	0.01		
SMU-075	1.20	0.11	0.43	0.56	0.08	0.01				
SMU-076	3.70	6.37	27.65	34.53	67.21	72.65	30.01	17.75	17.12	23.35
SMU-077	3.70	14.01	53.50	68.26	19.49	3.94	0.36	0.23	0.70	0.24
SMU-078	3.70	0.37	0.80	0.82	3.31	4.04	3.90	2.42	2.31	3.24
SMU-079	3.70	1.15	3.81	4.66	2.52	0.32	0.15	0.09	0.09	0.12
SMU-080	2.70	1.31	1.86	1.77	4.48	3.23	0.07	0.07	0.35	
SMU-081	3.40	0.30	1.62	2.14	5.69	5.58	0.25	0.23	0.03	0.03
SMU-082	2.70	12.68	18.66	16.91	42.46	18.14	0.33	0.25	1.08	
SMU-083	3.40	6.36	18.47	37.06	174.06	142.36	49.83	21.88	1.34	0.18
SMU-084	1.50	2.31	3.10	2.67	6.79	1.11				
SMU-085	3.00	0.70	1.31	4.16	25.32	19.49	9.14	3.85	0.21	
SMU-086	3.40	1.37	8.61	22.17	59.33	58.14	2.52	0.95	0.14	0.11
SMU-087	1.80	0.26	1.20	10.74	28.96	28.38	1.72			
SMU-088	3.40	4.16	25.12	95.41	154.77	138.27	4.91	3.22	0.47	0.38
SMU-089	1.80	0.89	5.75	24.05	60.49	55.95	2.79			
SMU-090	0.50	0.16	0.37	18.59						

Table B3 (continued). PCB Mass Inventory of the Lower Fox River sediment bed.

Deposit, Interdeposit, SMU	*Maximum Thickness* (m)	*PCB Mass by Layer (kg)*								
		Layer 1 0 - 0.1 m	*Layer 2* 0.1 - 0.3 m	*Layer 3* 0.3 - 0.5 m	*Layer 4* 0.5 - 1.0 m	*Layer 5* 1.0 - 1.5 m	*Layer 6* 1.5 - 2.0 m	*Layer 7* 2.0 - 2.5 m	*Layer 8* 2.5 - 3.0 m	*Layer 9* > 3.0 m
SMU-091	1.40	0.11	0.72	2.99	2.18	1.74				
SMU-092	1.10	0.02	0.04	0.06	0.16	0.03				
SMU-093	1.10	0.23	0.45	0.67	1.84	0.37				
SMU-094	1.80	4.48	15.69	20.96	50.20	31.59	5.81			
SMU-095	1.20	1.36	2.76	7.55	18.99	15.70				
SMU-096	1.80	1.19	3.29	4.10	10.39	9.25	3.76			
SMU-097	1.20	0.11	0.22	0.98	1.82	2.80				
SMU-098	1.20	0.12	0.17	0.03	0.06	0.79				
SMU-099	1.50	0.12	0.35	0.43	0.92	0.88				
SMU-100	1.20	2.67	4.90	3.95	0.89	5.53				
SMU-101	1.50	0.43	1.33	2.22	6.46	7.59				
SMU-102	1.20	0.63	1.25	1.25	0.19	0.55				
SMU-103	1.50	0.08	0.25	0.52	1.76	2.23				
SMU-104	0.30	0.89	1.77							
SMU-105	1.40	0.61	1.60	1.34	2.18	1.80				
SMU-106	1.50	1.93	3.93	0.85	2.82	3.47				
SMU-107	1.40	4.48	8.19	4.84	5.52	2.88				
SMU-108	1.50	0.27	0.56	0.68	2.21	2.63				
SMU-109	0.90	0.41	0.64	0.22	0.27					
SMU-110	1.52	0.90	2.58	2.76	4.55	3.71	0.10			
SMU-111	2.60	0.42	0.78	0.74	0.90	0.83	9.58	12.13	2.43	
SMU-112	2.62	4.00	9.51	9.17	16.29	14.81	24.39	4.05	0.21	
SMU-113	3.05	3.66	7.18	6.78	9.95	9.24	75.95	43.21	6.28	
SMU-114	1.90	0.41	0.82	0.71	1.11	0.92	1.82			
SMU-115	2.35	0.70	1.29	1.24	1.60	0.82	9.62	2.52		

Table B4. Volume by layer of the Lower Fox River sediment bed (excluding null area).

Deposit, Interdeposit, SMU	*Sediment Volume in Depth Interval (m3)*								
	Layer 1 0 - 0.1 m	*Layer 2* 0.1 - 0.3 m	*Layer 3* 0.3 - 0.5 m	*Layer 4* 0.5 - 1.0 m	*Layer 5* 1.0 - 1.5 m	*Layer 6* 1.5 - 2.0 m	*Layer 7* 2.0 - 2.5 m	*Layer 8* 2.5 - 3.0 m	*Layer 9* > 3.0 m
Dep A	12,104	24,153	21,940	49,777	6,230	0	0	0	0
Dep B	9,690	19,378	11,740	11,012	497	0	0	0	0
Dep C	9,711	19,149	13,738	21,961	1,589	0	0	0	0
Dep D	19,376	25,205	12,804	11,112	489	0	0	0	0
Dep POG2	20,779	29,986	18,682	26,438	13,882	4,081	163	0	0
Dep POG1 (Seg 05)	7,250	5,002	906	448	45	0	0	0	0
Dep E	157,687	308,144	277,115	593,458	84,362	1,553	27	0	0
Dep F	12,730	25,460	20,525	39,711	3,955	0	0	0	0
Dep G	2,801	5,586	3,860	6,263	420	0	0	0	0
Dep H	230	460	0	0	0	0	0	0	0
Dep I	1,150	2,300	1,380	1,395	28	0	0	0	0
Dep J	1,060	2,120	320	176	0	0	0	0	0
Dep K	161	320	0	0	0	0	0	0	0
Dep L	240	480	0	0	0	0	0	0	0
Dep M	540	1,080	240	132	0	0	0	0	0
Dep N	1,629	1,891	1,029	891	63	0	0	0	0
Dep O	1,218	2,420	1,900	3,188	266	0	0	0	0
Dep P	2,570	5,140	4,296	8,123	777	0	0	0	0
Dep Q	70	140	0	0	0	0	0	0	0
Dep R	422	840	360	198	0	0	0	0	0
Dep S	12,883	25,760	20,880	20,454	0	0	0	0	0
Dep T	1,616	3,220	2,360	3,926	364	0	0	0	0
Dep U	920	1,840	760	1,003	35	0	0	0	0
Dep V	1,710	3,420	1,963	3,976	406	0	0	0	0
Dep W	48,230	96,420	74,140	125,026	10,717	0	0	0	0
Dep X	19,616	39,132	29,284	55,659	5,285	0	0	0	0
Dep Y	1,081	2,160	260	143	0	0	0	0	0
Dep Z	1,641	3,280	1,739	2,428	126	0	0	0	0
Dep AA	130	260	0	0	0	0	0	0	0
Dep BB	500	1,000	0	0	0	0	0	0	0
Dep CC	7,405	14,761	10,418	17,882	1,456	0	0	0	0
Dep DD	12,816	25,523	20,080	34,867	1,869	0	0	0	0
Dep EE	233,562	465,581	423,047	924,407	153,244	33,603	9,174	705	0

Table B4 (continued). Volume by layer of the Lower Fox River sediment bed (excluding null areas).

Deposit, Interdeposit, SMU	*Sediment Volume in Depth Interval (m3)*								
	Layer 1 0 - 0.1 m	*Layer 2* 0.1 - 0.3 m	*Layer 3* 0.3 - 0.5 m	*Layer 4* 0.5 - 1.0 m	*Layer 5* 1.0 - 1.5 m	*Layer 6* 1.5 - 2.0 m	*Layer 7* 2.0 - 2.5 m	*Layer 8* 2.5 - 3.0 m	*Layer 9* > 3.0 m
Dep FF	346	676	340	187	0	0	0	0	0
Dep GG	2,207	3,743	3,110	5,605	3,065	947	14	0	0
Dep HH	3,615	5,456	4,738	8,260	5,124	2,677	727	0	0
Seg 02-ID	4,381	2,483	519	19	0	0	0	0	0
Seg 03-ID	3,130	1,223	1	0	0	0	0	0	0
Seg 04-ID	14,450	10,839	2,233	1,356	337	24	0	0	0
Seg 06-ID	29,228	23,513	9,615	11,123	2,632	154	0	0	0
Seg 07-ID	3,809	2,227	851	1,597	359	0	0	0	0
Seg 08-ID	5,685	3,865	743	651	0	0	0	0	0
Seg 09-ID	5,072	5,098	2,328	5,026	574	0	0	0	0
Seg 10-ID	3,415	2,377	90	0	0	0	0	0	0
Seg 11-ID	1,624	78	0	0	0	0	0	0	0
Seg 12-ID	9,307	6,447	1,343	133	0	0	0	0	0
Seg 13-ID	1,607	1,248	383	203	0	0	0	0	0
Seg 14-ID	948	336	45	11	0	0	0	0	0
Seg 15-ID	5,697	1,702	43	0	0	0	0	0	0
Seg 16-ID	5,310	4,010	2,158	1,610	32	0	0	0	0
Seg 17-ID	5,783	3,091	1,008	918	0	0	0	0	0
Seg 18-ID	7,565	8,625	2,939	35	0	0	0	0	0
Seg 19-ID	7,963	5,746	3,220	8,050	1,127	0	0	0	0
Seg 20-ID	1,049	249	0	0	0	0	0	0	0
Seg 21-ID	6,118	6,151	1,879	15	0	0	0	0	0
Seg 22-ID	3,718	1,968	0	0	0	0	0	0	0
Seg 23-ID	2,059	231	0	0	0	0	0	0	0
Seg 24-ID	75	23	0	0	0	0	0	0	0
Seg 25-ID	8,620	8,134	2,344	67	0	0	0	0	0
Seg 26-ID	7,662	6,677	1,782	633	206	0	0	0	0
Seg 27-ID	11,312	16,177	12,931	24,534	15,724	7,787	1,202	3	0
SMU-020	37,610	68,810	62,697	132,168	88,352	34,769	15,749	5,407	2,620
SMU-021	14,296	26,230	24,177	49,932	32,449	17,498	7,656	721	0
SMU-022	9,818	18,523	17,620	29,088	18,484	12,827	9,413	8,350	29,276
SMU-023	13,706	24,244	18,137	25,395	9,378	5,637	2,696	865	0
SMU-024	10,556	18,539	16,249	28,798	21,911	15,107	10,172	6,746	3,654

Table B4 (continued). Volume by layer of the Lower Fox River sediment bed (excluding null areas).

Deposit, Interdeposit, SMU	*Sediment Volume in Depth Interval (m3)*								
	Layer 1 0 - 0.1 m	*Layer 2* 0.1 - 0.3 m	*Layer 3* 0.3 - 0.5 m	*Layer 4* 0.5 - 1.0 m	*Layer 5* 1.0 - 1.5 m	*Layer 6* 1.5 - 2.0 m	*Layer 7* 2.0 - 2.5 m	*Layer 8* 2.5 - 3.0 m	*Layer 9* > 3.0 m
SMU-025	12,432	19,856	15,786	28,685	19,697	12,252	4,539	1,076	0
SMU-026	1,472	2,370	1,677	2,759	801	12	0	0	0
SMU-027	1,823	2,647	1,304	697	0	0	0	0	0
SMU-028	6,405	10,964	7,786	11,073	4,361	919	276	29	0
SMU-029	7,993	15,713	15,162	33,146	19,340	7,992	1,906	98	0
SMU-030	1,073	1,151	637	561	10	0	0	0	0
SMU-031	1,557	1,271	507	437	17	0	0	0	0
SMU-032	4,543	7,557	4,773	6,745	2,392	89	0	0	0
SMU-033	4,872	6,816	1,322	86	0	0	0	0	0
SMU-034	6,123	12,107	11,267	24,531	17,967	7,352	2,465	1,146	387
SMU-035	7,450	14,837	14,049	29,454	18,241	9,828	4,724	1,633	484
SMU-036	1,173	1,011	14	0	0	0	0	0	0
SMU-037	1,978	2,659	1,511	2,337	986	221	0	0	0
SMU-038	4,803	7,522	5,154	9,296	5,180	1,978	477	203	76
SMU-039	2,737	3,866	2,851	4,505	1,961	137	0	0	0
SMU-040	9,569	18,126	16,878	33,945	23,170	11,140	5,546	1,484	1,125
SMU-041	13,361	25,663	23,764	50,434	27,220	11,151	2,902	776	0
SMU-042	4,376	4,002	2,383	2,962	373	4	0	0	0
SMU-043	8,688	13,893	12,185	21,774	6,555	15	0	0	0
SMU-044	11,311	19,596	14,478	23,702	14,461	5,666	1,417	482	0
SMU-045	18,254	33,665	30,668	64,233	42,663	15,793	2,988	224	0
SMU-046	17,477	33,445	30,667	60,216	36,822	21,059	9,646	1,508	316
SMU-047	15,229	30,430	30,283	73,095	60,676	40,693	22,602	4,673	467
SMU-048	18,092	34,398	32,572	72,101	48,222	18,015	4,771	1,932	660
SMU-049	24,546	47,255	43,969	96,330	80,250	50,321	21,663	1,988	66
SMU-050	2,450	4,775	4,577	8,274	3,800	396	0	0	0
SMU-051	2,502	4,923	4,881	11,641	6,871	1,615	219	50	26
SMU-052	10,109	19,776	19,327	45,148	39,103	28,811	14,385	3,368	158
SMU-053	9,630	18,139	17,291	37,940	26,803	16,439	4,616	918	40
SMU-054	5,306	6,875	4,812	9,874	6,481	2,414	106	0	0
SMU-055	1,191	1,476	696	382	0	0	0	0	0
SMU-056	6,677	13,337	13,186	31,915	29,721	25,487	16,312	8,507	10,106
SMU-057	8,428	16,733	16,565	40,975	39,451	33,829	18,129	9,009	3,797

Table B4 (continued). Volume by layer of the Lower Fox River sediment bed (excluding null areas).

Deposit, Interdeposit, SMU	*Sediment Volume in Depth Interval (m3)*								
	Layer 1 0 - 0.1 m	*Layer 2* 0.1 - 0.3 m	*Layer 3* 0.3 - 0.5 m	*Layer 4* 0.5 - 1.0 m	*Layer 5* 1.0 - 1.5 m	*Layer 6* 1.5 - 2.0 m	*Layer 7* 2.0 - 2.5 m	*Layer 8* 2.5 - 3.0 m	*Layer 9* > 3.0 m
SMU-058	3,170	6,310	6,206	14,669	13,407	11,526	8,044	1,929	442
SMU-059	2,672	5,233	5,164	12,228	8,178	2,037	54	0	0
SMU-060	2,836	3,104	1,516	2,364	963	182	13	0	0
SMU-061	4,292	8,083	7,330	13,642	8,273	2,393	296	9	0
SMU-062	4,980	7,133	6,387	13,890	11,263	9,397	8,305	7,482	15,498
SMU-063	460	920	920	2,300	2,300	2,300	2,300	460	0
SMU-064	1,850	1,014	796	1,407	370	11	0	0	0
SMU-065	3,560	7,120	7,120	17,800	17,800	16,800	12,800	2,560	0
SMU-066	0	0	0	0	0	0	0	0	0
SMU-067	850	1,700	1,700	4,250	4,250	3,460	300	60	0
SMU-068	500	1,000	1,000	2,500	2,500	2,500	800	800	2,560
SMU-069	30	60	60	150	150	150	70	50	160
SMU-070	8,500	17,000	17,000	42,500	42,500	41,120	25,000	18,390	28,497
SMU-071	3,910	7,820	7,820	19,550	19,550	19,550	14,550	5,640	11,254
SMU-072	230	460	460	1,150	1,150	920	0	0	0
SMU-073	420	840	840	2,100	2,100	2,100	2,100	420	0
SMU-074	50	100	100	250	250	250	50	0	0
SMU-075	20	40	40	100	40	0	0	0	0
SMU-076	3,640	7,280	7,280	18,200	18,200	18,200	11,680	9,957	13,586
SMU-077	2,800	5,600	5,600	14,000	6,347	1,049	765	340	140
SMU-078	270	540	540	1,350	1,350	1,350	1,350	1,350	1,890
SMU-079	220	440	440	1,100	470	50	50	50	70
SMU-080	520	1,040	1,040	2,600	2,600	1,450	1,450	580	0
SMU-081	120	240	240	600	600	500	500	500	400
SMU-082	3,610	7,220	7,220	18,050	16,902	6,999	5,441	1,605	0
SMU-083	2,930	5,860	5,860	14,650	14,650	12,950	12,950	12,950	2,720
SMU-084	510	1,020	1,020	2,550	2,024	0	0	0	0
SMU-085	360	720	720	1,800	1,800	1,800	1,800	1,800	0
SMU-086	850	1,700	1,700	4,250	4,250	3,410	2,150	2,150	1,720
SMU-087	400	800	800	2,000	2,000	1,200	0	0	0
SMU-088	3,190	6,380	6,380	10,992	10,246	8,609	7,100	7,100	5,680
SMU-089	1,100	2,200	2,200	5,250	4,738	1,770	0	0	0
SMU-090	500	1,000	1,000	0	0	0	0	0	0

Table B4 (continued). Volume by layer of the Lower Fox River sediment bed (excluding null areas).

Deposit, Interdeposit, SMU	*Sediment Volume in Depth Interval (m3)*								
	Layer 1 0 - 0.1 m	*Layer 2* 0.1 - 0.3 m	*Layer 3* 0.3 - 0.5 m	*Layer 4* 0.5 - 1.0 m	*Layer 5* 1.0 - 1.5 m	*Layer 6* 1.5 - 2.0 m	*Layer 7* 2.0 - 2.5 m	*Layer 8* 2.5 - 3.0 m	*Layer 9* > 3.0 m
SMU-091	130	260	260	300	240	0	0	0	0
SMU-092	30	60	60	150	30	0	0	0	0
SMU-093	340	680	680	1,700	340	0	0	0	0
SMU-094	5,070	10,140	10,140	22,470	9,841	3,890	0	0	0
SMU-095	3,040	6,080	6,080	15,080	4,500	0	0	0	0
SMU-096	1,150	2,300	2,300	5,510	4,492	2,429	0	0	0
SMU-097	470	940	940	2,350	940	0	0	0	0
SMU-098	280	560	560	1,400	560	0	0	0	0
SMU-099	910	1,820	1,820	4,550	4,550	0	0	0	0
SMU-100	2,880	5,760	5,760	14,400	5,760	0	0	0	0
SMU-101	2,790	5,580	5,580	13,950	13,950	0	0	0	0
SMU-102	360	720	720	1,800	720	0	0	0	0
SMU-103	380	760	760	1,900	1,900	0	0	0	0
SMU-104	1,050	2,100	0	0	0	0	0	0	0
SMU-105	430	860	660	1,610	1,280	0	0	0	0
SMU-106	2,840	5,680	1,880	4,370	3,050	0	0	0	0
SMU-107	3,560	7,120	7,120	7,501	2,091	0	0	0	0
SMU-108	1,160	2,320	2,320	5,090	2,250	0	0	0	0
SMU-109	840	1,680	1,680	2,899	0	0	0	0	0
SMU-110	720	1,440	1,440	3,600	3,000	24	0	0	0
SMU-111	460	920	920	2,300	2,300	2,143	2,050	410	0
SMU-112	3,990	7,980	7,980	19,950	18,798	6,273	782	40	0
SMU-113	4,040	8,080	8,080	20,200	20,200	16,215	6,613	925	5
SMU-114	470	940	940	1,902	1,579	498	0	0	0
SMU-115	1,211	1,691	1,342	2,967	2,289	1,798	355	0	0

Table B5. Surface Area by layer of the Lower Fox River sediment bed (excluding null areas).

Deposit, Interdeposit, SMU	*Sediment Surface Area at the Upper limit of the Depth Interval (m2)*								
	Layer 1 0 - 0.1 m	*Layer 2* 0.1 - 0.3 m	*Layer 3* 0.3 - 0.5 m	*Layer 4* 0.5 - 1.0 m	*Layer 5* 1.0 - 1.5 m	*Layer 6* 1.5 - 2.0 m	*Layer 7* 2.0 - 2.5 m	*Layer 8* 2.5 - 3.0 m	*Layer 9* > 3.0 m
Dep A	150,800	120,600	117,700	109,700	89,000	0	0	0	0
Dep B	146,200	96,900	85,200	58,700	7,100	0	0	0	0
Dep C	115,900	95,100	87,300	68,600	22,800	0	0	0	0
Dep D	248,900	165,400	91,400	44,900	5,200	0	0	0	0
Dep POG2	210,900	187,600	110,800	74,200	36,000	17,800	1,400	0	0
Dep POG1 (Seg 05)	101,300	50,700	8,000	2,900	200	0	0	0	0
Dep E	2,021,700	1,532,500	1,469,500	1,354,100	989,000	11,400	200	0	0
Dep F	168,000	127,300	120,400	102,600	56,500	0	0	0	0
Dep G	41,100	28,000	24,500	19,300	6,000	0	0	0	0
Dep H	10,600	2,300	0	0	0	0	0	0	0
Dep I	29,800	11,500	9,200	6,900	400	0	0	0	0
Dep J	24,900	10,600	5,700	1,600	0	0	0	0	0
Dep K	5,200	1,600	100	0	0	0	0	0	0
Dep L	10,600	2,400	500	0	0	0	0	0	0
Dep M	13,300	5,400	2,800	1,200	0	0	0	0	0
Dep N	22,200	12,600	7,200	3,500	700	0	0	0	0
Dep O	18,500	12,100	11,400	9,500	3,800	0	0	0	0
Dep P	31,300	25,700	24,900	21,400	11,100	0	0	0	0
Dep Q	4,200	700	0	0	0	0	0	0	0
Dep R	7,700	4,200	2,700	1,800	0	0	0	0	0
Dep S	166,400	128,800	120,900	104,400	0	0	0	0	0
Dep T	20,800	16,100	14,300	11,800	5,200	0	0	0	0
Dep U	17,400	9,200	6,600	3,800	500	0	0	0	0
Dep V	23,700	17,100	12,600	9,800	5,800	0	0	0	0
Dep W	561,500	480,700	457,200	369,300	152,800	0	0	0	0
Dep X	254,700	195,000	176,700	146,000	75,500	0	0	0	0
Dep Y	31,900	10,800	6,500	1,300	0	0	0	0	0
Dep Z	24,300	16,400	13,600	8,600	1,800	0	0	0	0
Dep AA	8,100	1,300	0	0	0	0	0	0	0
Dep BB	15,800	5,000	1,600	0	0	0	0	0	0
Dep CC	83,600	73,800	71,100	52,000	20,800	0	0	0	0
Dep DD	147,200	127,500	118,000	100,400	26,700	0	0	0	0
Dep EE	2,580,200	2,289,600	2,206,300	2,066,400	1,494,400	89,500	37,600	4,600	0

Table B5 (continued). Surface Area by layer of the Lower Fox River sediment bed (excluding null areas).

Deposit, Interdeposit, SMU	*Sediment Surface Area at the Upper limit of the Depth Interval (m2)*								
	Layer 1 0 - 0.1 m	*Layer 2* 0.1 - 0.3 m	*Layer 3* 0.3 - 0.5 m	*Layer 4* 0.5 - 1.0 m	*Layer 5* 1.0 - 1.5 m	*Layer 6* 1.5 - 2.0 m	*Layer 7* 2.0 - 2.5 m	*Layer 8* 2.5 - 3.0 m	*Layer 9* > 3.0 m
Dep FF	4,800	3,400	2,700	1,700	0	0	0	0	0
Dep GG	24,000	21,000	17,000	14,100	7,900	4,300	500	0	0
Dep HH	44,600	32,200	24,900	21,900	12,300	7,800	3,700	0	0
Seg 02-ID	90,800	28,500	4,300	1,100	0	0	0	0	0
Seg 03-ID	97,600	15,300	200	0	0	0	0	0	0
Seg 04-ID	281,800	105,000	21,500	5,700	1,400	200	0	0	0
Seg 06-ID	409,800	199,800	71,200	32,500	12,800	1,000	0	0	0
Seg 07-ID	134,100	20,000	4,100	3,400	2,400	0	0	0	0
Seg 08-ID	160,900	37,300	5,800	3,500	0	0	0	0	0
Seg 09-ID	72,800	40,100	16,300	10,400	8,200	0	0	0	0
Seg 10-ID	219,500	23,300	3,200	0	0	0	0	0	0
Seg 11-ID	454,300	3,600	0	0	0	0	0	0	0
Seg 12-ID	369,600	59,000	16,300	2,200	0	0	0	0	0
Seg 13-ID	99,700	10,200	3,800	1,100	0	0	0	0	0
Seg 14-ID	251,800	2,700	800	0	0	0	0	0	0
Seg 15-ID	367,800	33,500	700	0	0	0	0	0	0
Seg 16-ID	302,900	24,700	15,000	7,300	500	0	0	0	0
Seg 17-ID	195,300	25,500	9,600	2,600	0	0	0	0	0
Seg 18-ID	260,900	59,400	28,100	2,700	0	0	0	0	0
Seg 19-ID	314,200	71,500	16,100	16,100	16,100	0	0	0	0
Seg 20-ID	216,500	7,100	0	0	0	0	0	0	0
Seg 21-ID	151,000	48,500	17,000	800	0	0	0	0	0
Seg 22-ID	279,400	26,800	500	0	0	0	0	0	0
Seg 23-ID	38,500	9,300	0	0	0	0	0	0	0
Seg 24-ID	6,700	200	0	0	0	0	0	0	0
Seg 25-ID	111,400	66,100	21,700	3,400	0	0	0	0	0
Seg 26-ID	111,400	54,400	19,400	1,900	800	0	0	0	0
Seg 27-ID	147,000	93,400	68,600	58,500	39,000	24,900	6,200	100	0
SMU-020	388,700	369,700	326,600	302,000	228,200	113,800	44,100	21,700	6,600
SMU-021	149,300	137,100	124,200	114,100	81,700	47,100	24,700	6,500	0
SMU-022	98,900	98,100	91,000	82,600	46,900	29,400	21,000	17,600	15,900
SMU-023	140,300	132,300	108,000	78,300	26,400	14,200	8,400	3,500	0
SMU-024	106,700	103,100	86,900	73,200	48,800	38,400	23,600	17,600	9,500

Table B5 (continued). Surface Area by layer of the Lower Fox River sediment bed (excluding null areas).

Deposit, Interdeposit, SMU	*Sediment Surface Area at the Upper limit of the Depth Interval (m2)*								
	Layer 1 0 - 0.1 m	*Layer 2* 0.1 - 0.3 m	*Layer 3* 0.3 - 0.5 m	*Layer 4* 0.5 - 1.0 m	*Layer 5* 1.0 - 1.5 m	*Layer 6* 1.5 - 2.0 m	*Layer 7* 2.0 - 2.5 m	*Layer 8* 2.5 - 3.0 m	*Layer 9* > 3.0 m
SMU-025	134,800	115,800	86,000	72,300	45,100	33,800	14,500	5,200	0
SMU-026	16,000	14,400	9,700	7,400	2,900	100	0	0	0
SMU-027	19,200	17,700	9,100	3,800	0	0	0	0	0
SMU-028	70,400	58,500	46,900	31,600	14,700	3,200	1,200	200	0
SMU-029	80,300	79,800	77,400	74,700	53,300	25,000	7,600	800	0
SMU-030	13,200	9,400	3,900	2,700	200	0	0	0	0
SMU-031	18,500	13,400	4,200	1,900	100	0	0	0	0
SMU-032	46,000	45,200	29,600	19,400	9,700	1,300	0	0	0
SMU-033	52,100	46,800	15,700	1,200	0	0	0	0	0
SMU-034	61,400	61,100	59,500	54,100	43,400	25,200	7,000	3,300	1,800
SMU-035	73,800	73,800	73,300	66,500	47,700	28,000	12,600	6,000	1,800
SMU-036	14,600	10,700	300	0	0	0	0	0	0
SMU-037	19,900	19,500	8,900	6,200	3,200	1,200	0	0	0
SMU-038	49,600	46,000	29,000	22,900	14,000	7,600	2,300	500	300
SMU-039	27,000	24,200	15,200	12,100	5,100	1,200	0	0	0
SMU-040	96,300	94,200	88,100	81,300	56,000	35,100	15,600	5,200	2,100
SMU-041	131,800	131,100	122,000	114,900	78,600	34,000	12,100	2,800	0
SMU-042	54,600	33,200	14,000	10,500	1,800	200	0	0	0
SMU-043	104,100	78,000	63,700	58,200	25,300	400	0	0	0
SMU-044	115,200	108,700	80,300	61,600	35,800	21,000	4,300	1,700	0
SMU-045	185,100	176,200	160,000	145,800	108,000	55,900	12,500	1,700	0
SMU-046	174,800	172,900	160,500	143,700	95,000	54,000	30,400	8,800	600
SMU-047	151,100	151,000	150,900	150,000	134,900	102,000	65,100	24,800	1,800
SMU-048	186,900	178,300	168,200	157,600	128,800	61,100	16,700	6,700	2,100
SMU-049	250,900	241,000	231,300	210,800	177,800	138,000	69,800	13,400	800
SMU-050	25,300	24,100	23,700	21,700	10,900	3,000	0	0	0
SMU-051	24,300	24,100	23,600	23,500	20,800	6,100	1,200	100	100
SMU-052	103,100	99,300	97,000	94,600	85,100	65,500	47,400	14,200	900
SMU-053	97,000	95,400	88,400	84,200	64,200	43,500	19,400	3,900	600
SMU-054	58,900	49,000	26,300	22,200	16,500	9,200	1,700	0	0
SMU-055	20,400	9,400	4,800	2,500	0	0	0	0	0
SMU-056	66,000	65,700	65,500	64,700	61,200	57,200	41,100	22,600	13,100
SMU-057	84,300	84,200	83,500	82,400	81,300	76,200	54,200	25,000	11,300

Table B5 (continued). Surface Area by layer of the Lower Fox River sediment bed (excluding null areas).

Deposit,	*Sediment Surface Area at the Upper limit of the Depth Interval (m2)*								
Interdeposit, SMU	*Layer 1* 0 - 0.1 m	*Layer 2* 0.1 - 0.3 m	*Layer 3* 0.3 - 0.5 m	*Layer 4* 0.5 - 1.0 m	*Layer 5* 1.0 - 1.5 m	*Layer 6* 1.5 - 2.0 m	*Layer 7* 2.0 - 2.5 m	*Layer 8* 2.5 - 3.0 m	*Layer 9* > 3.0 m
SMU-058	30,900	30,900	30,600	29,700	28,300	25,000	20,300	10,500	500
SMU-059	27,100	26,600	26,000	25,700	23,000	9,200	300	0	0
SMU-060	31,400	25,800	9,000	6,200	3,400	900	100	0	0
SMU-061	42,800	42,700	38,100	34,700	24,000	9,400	1,800	100	0
SMU-062	49,800	49,800	33,200	30,500	25,100	20,600	17,600	15,900	14,300
SMU-063	4,600	4,600	4,600	4,600	4,600	4,600	4,600	4,600	0
SMU-064	18,500	18,500	4,400	3,600	1,900	100	0	0	0
SMU-065	35,600	35,600	35,600	35,600	35,600	35,600	25,600	25,600	0
SMU-066	0	0	0	0	0	0	0	0	0
SMU-067	8,500	8,500	8,500	8,500	8,500	8,500	600	600	0
SMU-068	5,000	5,000	5,000	5,000	5,000	5,000	1,600	1,600	1,600
SMU-069	300	300	300	300	300	300	300	100	100
SMU-070	82,200	82,200	82,200	82,200	82,200	82,200	51,200	48,400	20,700
SMU-071	39,100	39,100	39,100	39,100	39,100	39,100	39,100	26,600	7,100
SMU-072	2,300	2,300	2,300	2,300	2,300	2,300	0	0	0
SMU-073	4,200	4,200	4,200	4,200	4,200	4,200	4,200	4,200	0
SMU-074	500	500	500	500	500	500	500	0	0
SMU-075	200	200	200	200	200	0	0	0	0
SMU-076	36,400	36,400	36,400	36,400	36,400	36,400	36,400	20,100	19,600
SMU-077	28,000	28,000	28,000	28,000	28,000	2,400	1,800	1,400	200
SMU-078	2,700	2,700	2,700	2,700	2,700	2,700	2,700	2,700	2,700
SMU-079	2,200	2,200	2,200	2,200	2,200	100	100	100	100
SMU-080	5,200	5,200	5,200	5,200	5,200	2,900	2,900	2,900	0
SMU-081	1,200	1,200	1,200	1,200	1,200	1,000	1,000	1,000	1,000
SMU-082	36,100	36,100	36,100	36,100	36,100	15,600	12,300	9,400	0
SMU-083	29,300	29,300	29,300	29,300	29,300	25,900	25,900	25,900	6,800
SMU-084	5,100	5,100	5,100	5,100	5,100	0	0	0	0
SMU-085	3,600	3,600	3,600	3,600	3,600	3,600	3,600	3,600	0
SMU-086	8,500	8,500	8,500	8,500	8,500	8,500	4,300	4,300	4,300
SMU-087	4,000	4,000	4,000	4,000	4,000	4,000	0	0	0
SMU-088	31,900	31,900	31,900	22,700	21,200	19,700	14,200	14,200	14,200
SMU-089	11,000	11,000	11,000	10,500	10,500	5,900	0	0	0
SMU-090	5,000	5,000	5,000	0	0	0	0	0	0

Table B5 (continued). Surface Area by layer of the Lower Fox River sediment bed (excluding null areas).

Deposit, Interdeposit, SMU	*Sediment Surface Area at the Upper limit of the Depth Interval (m2)*								
	Layer 1 0 - 0.1 m	*Layer 2* 0.1 - 0.3 m	*Layer 3* 0.3 - 0.5 m	*Layer 4* 0.5 - 1.0 m	*Layer 5* 1.0 - 1.5 m	*Layer 6* 1.5 - 2.0 m	*Layer 7* 2.0 - 2.5 m	*Layer 8* 2.5 - 3.0 m	*Layer 9* > 3.0 m
SMU-091	1,300	1,300	1,300	600	600	0	0	0	0
SMU-092	300	300	300	300	300	0	0	0	0
SMU-093	3,400	3,400	3,400	3,400	3,400	0	0	0	0
SMU-094	50,400	50,400	50,400	50,400	21,600	14,200	0	0	0
SMU-095	29,300	29,300	29,300	29,300	29,200	0	0	0	0
SMU-096	11,500	11,500	11,500	11,500	9,100	8,400	0	0	0
SMU-097	4,700	4,700	4,700	4,700	4,700	0	0	0	0
SMU-098	2,800	2,800	2,800	2,800	2,800	0	0	0	0
SMU-099	9,100	9,100	9,100	9,100	9,100	0	0	0	0
SMU-100	28,800	28,800	28,800	28,800	28,800	0	0	0	0
SMU-101	27,900	27,900	27,900	27,900	27,900	0	0	0	0
SMU-102	3,600	3,600	3,600	3,600	3,600	0	0	0	0
SMU-103	3,800	3,800	3,800	3,800	3,800	0	0	0	0
SMU-104	10,500	10,500	10,500	0	0	0	0	0	0
SMU-105	3,300	3,300	3,300	3,300	3,200	0	0	0	0
SMU-106	28,400	28,400	28,400	9,400	6,100	0	0	0	0
SMU-107	35,600	35,600	35,600	35,600	6,300	0	0	0	0
SMU-108	11,600	11,600	11,600	11,600	4,500	0	0	0	0
SMU-109	8,400	8,400	8,400	8,400	0	0	0	0	0
SMU-110	7,200	7,200	7,200	7,200	7,200	1,200	0	0	0
SMU-111	4,600	4,600	4,600	4,600	4,600	4,600	4,100	4,100	0
SMU-112	39,900	39,900	39,900	39,900	39,900	28,200	2,500	500	0
SMU-113	40,400	40,400	40,400	40,400	40,400	40,400	20,900	6,300	200
SMU-114	4,700	4,700	4,700	4,700	3,300	2,800	0	0	0
SMU-115	16,400	10,000	7,300	6,400	5,100	4,300	2,900	0	0

Table B6. Apparent thickness by layer of the Lower Fox River sediment bed.

Deposit,	*Average Sediment Thickness through Depth Interval: Apparent Thickness (m)*								
Interdeposit, SMU	*Layer 1* 0 - 0.1 m	*Layer 2* 0.1 - 0.3 m	*Layer 3* 0.3 - 0.5 m	*Layer 4* 0.5 - 1.0 m	*Layer 5* 1.0 - 1.5 m	*Layer 6* 1.5 - 2.0 m	*Layer 7* 2.0 - 2.5 m	*Layer 8* 2.5 - 3.0 m	*Layer 9* > 3.0 m
Dep A	0.0803	0.2003	0.1864	0.4538	0.0700	0.0000	0.0000	0.0000	0.0000
Dep B	0.0663	0.2000	0.1378	0.1876	0.0700	0.0000	0.0000	0.0000	0.0000
Dep C	0.0838	0.2014	0.1574	0.3201	0.0697	0.0000	0.0000	0.0000	0.0000
Dep D	0.0778	0.1524	0.1401	0.2475	0.0940	0.0000	0.0000	0.0000	0.0000
Dep POG2	0.0985	0.1598	0.1686	0.3563	0.3856	0.2293	0.1161	0.0000	0.0000
Dep POG1 (Seg 05)	0.0716	0.0987	0.1133	0.1546	0.2227	0.0000	0.0000	0.0000	0.0000
Dep E	0.0780	0.2011	0.1886	0.4383	0.0853	0.1362	0.1341	0.0000	0.0000
Dep F	0.0758	0.2000	0.1705	0.3870	0.0700	0.0000	0.0000	0.0000	0.0000
Dep G	0.0682	0.1995	0.1576	0.3245	0.0700	0.0000	0.0000	0.0000	0.0000
Dep H	0.0217	0.2000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Dep I	0.0386	0.2000	0.1500	0.2022	0.0700	0.0000	0.0000	0.0000	0.0000
Dep J	0.0426	0.2000	0.0561	0.1100	0.0000	0.0000	0.0000	0.0000	0.0000
Dep K	0.0309	0.2000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Dep L	0.0226	0.2000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Dep M	0.0406	0.2000	0.0857	0.1100	0.0000	0.0000	0.0000	0.0000	0.0000
Dep N	0.0734	0.1501	0.1430	0.2545	0.0894	0.0000	0.0000	0.0000	0.0000
Dep O	0.0658	0.2000	0.1667	0.3355	0.0700	0.0000	0.0000	0.0000	0.0000
Dep P	0.0821	0.2000	0.1725	0.3796	0.0700	0.0000	0.0000	0.0000	0.0000
Dep Q	0.0167	0.2000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Dep R	0.0549	0.2000	0.1333	0.1100	0.0000	0.0000	0.0000	0.0000	0.0000
Dep S	0.0774	0.2000	0.1727	0.1959	0.0000	0.0000	0.0000	0.0000	0.0000
Dep T	0.0777	0.2000	0.1650	0.3327	0.0700	0.0000	0.0000	0.0000	0.0000
Dep U	0.0529	0.2000	0.1152	0.2639	0.0700	0.0000	0.0000	0.0000	0.0000
Dep V	0.0722	0.2000	0.1558	0.4057	0.0700	0.0000	0.0000	0.0000	0.0000
Dep W	0.0859	0.2006	0.1622	0.3385	0.0701	0.0000	0.0000	0.0000	0.0000
Dep X	0.0770	0.2007	0.1657	0.3812	0.0700	0.0000	0.0000	0.0000	0.0000
Dep Y	0.0339	0.2000	0.0400	0.1100	0.0000	0.0000	0.0000	0.0000	0.0000
Dep Z	0.0675	0.2000	0.1279	0.2823	0.0700	0.0000	0.0000	0.0000	0.0000
Dep AA	0.0160	0.2000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Dep BB	0.0316	0.2000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Dep CC	0.0886	0.2000	0.1465	0.3439	0.0700	0.0000	0.0000	0.0000	0.0000
Dep DD	0.0871	0.2002	0.1702	0.3473	0.0700	0.0000	0.0000	0.0000	0.0000
Dep EE	0.0905	0.2033	0.1917	0.4474	0.1025	0.3755	0.2440	0.1532	0.0000

Table B6 (continued). Apparent thickness by layer of the Lower Fox River sediment bed.

Deposit,	*Average Sediment Thickness through Depth Interval: Apparent Thickness (m)*								
Interdeposit, SMU	*Layer 1* 0 - 0.1 m	*Layer 2* 0.1 - 0.3 m	*Layer 3* 0.3 - 0.5 m	*Layer 4* 0.5 - 1.0 m	*Layer 5* 1.0 - 1.5 m	*Layer 6* 1.5 - 2.0 m	*Layer 7* 2.0 - 2.5 m	*Layer 8* 2.5 - 3.0 m	*Layer 9* > 3.0 m
Dep FF	0.0720	0.1987	0.1259	0.1100	0.0000	0.0000	0.0000	0.0000	0.0000
Dep GG	0.0920	0.1782	0.1830	0.3975	0.3880	0.2202	0.0288	0.0000	0.0000
Dep HH	0.0811	0.1694	0.1903	0.3772	0.4165	0.3432	0.1964	0.0000	0.0000
Seg 02-ID	0.0482	0.0871	0.1208	0.0168	0.0000	0.0000	0.0000	0.0000	0.0000
Seg 03-ID	0.0321	0.0799	0.0034	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Seg 04-ID	0.0513	0.1032	0.1039	0.2379	0.2405	0.1197	0.0000	0.0000	0.0000
Seg 06-ID	0.0713	0.1177	0.1350	0.3422	0.2056	0.1536	0.0000	0.0000	0.0000
Seg 07-ID	0.0284	0.1114	0.2075	0.4698	0.1497	0.0000	0.0000	0.0000	0.0000
Seg 08-ID	0.0353	0.1036	0.1281	0.1860	0.0000	0.0000	0.0000	0.0000	0.0000
Seg 09-ID	0.0697	0.1271	0.1428	0.4832	0.0700	0.0000	0.0000	0.0000	0.0000
Seg 10-ID	0.0156	0.1020	0.0283	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Seg 11-ID	0.0036	0.0215	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Seg 12-ID	0.0252	0.1093	0.0824	0.0606	0.0000	0.0000	0.0000	0.0000	0.0000
Seg 13-ID	0.0161	0.1224	0.1007	0.1850	0.0000	0.0000	0.0000	0.0000	0.0000
Seg 14-ID	0.0038	0.1244	0.0563	#DIV/0!	0.0000	0.0000	0.0000	0.0000	0.0000
Seg 15-ID	0.0155	0.0508	0.0620	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Seg 16-ID	0.0175	0.1624	0.1439	0.2205	0.0643	0.0000	0.0000	0.0000	0.0000
Seg 17-ID	0.0296	0.1212	0.1050	0.3530	0.0000	0.0000	0.0000	0.0000	0.0000
Seg 18-ID	0.0290	0.1452	0.1046	0.0129	0.0000	0.0000	0.0000	0.0000	0.0000
Seg 19-ID	0.0253	0.0804	0.2000	0.5000	0.0700	0.0000	0.0000	0.0000	0.0000
Seg 20-ID	0.0048	0.0350	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Seg 21-ID	0.0405	0.1268	0.1105	0.0184	0.0000	0.0000	0.0000	0.0000	0.0000
Seg 22-ID	0.0133	0.0734	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Seg 23-ID	0.0535	0.0248	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Seg 24-ID	0.0111	0.1137	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Seg 25-ID	0.0774	0.1230	0.1080	0.0196	0.0000	0.0000	0.0000	0.0000	0.0000
Seg 26-ID	0.0688	0.1227	0.0919	0.3334	0.2572	0.0000	0.0000	0.0000	0.0000
Seg 27-ID	0.0769	0.1732	0.1885	0.4194	0.4032	0.3127	0.1938	0.0256	0.0000
SMU-020	0.0968	0.1861	0.1920	0.4376	0.3872	0.3055	0.3571	0.2492	0.3970
SMU-021	0.0958	0.1913	0.1947	0.4376	0.3972	0.3715	0.3100	0.1109	0.0000
SMU-022	0.0993	0.1888	0.1936	0.3522	0.3941	0.4363	0.4482	0.4744	1.8413
SMU-023	0.0977	0.1832	0.1679	0.3243	0.3552	0.3970	0.3209	0.2472	0.0000
SMU-024	0.0989	0.1798	0.1870	0.3934	0.4490	0.3934	0.4310	0.3833	0.3846

Table B6 (continued). Apparent thickness by layer of the Lower Fox River sediment bed.

Deposit,	*Average Sediment Thickness through Depth Interval: Apparent Thickness (m)*								
Interdeposit, SMU	*Layer 1* 0 - 0.1 m	*Layer 2* 0.1 - 0.3 m	*Layer 3* 0.3 - 0.5 m	*Layer 4* 0.5 - 1.0 m	*Layer 5* 1.0 - 1.5 m	*Layer 6* 1.5 - 2.0 m	*Layer 7* 2.0 - 2.5 m	*Layer 8* 2.5 - 3.0 m	*Layer 9* > 3.0 m
SMU-025	0.0922	0.1715	0.1836	0.3967	0.4367	0.3625	0.3131	0.2069	0.0000
SMU-026	0.0920	0.1646	0.1729	0.3729	0.2764	0.1199	0.0000	0.0000	0.0000
SMU-027	0.0949	0.1496	0.1433	0.1835	0.0000	0.0000	0.0000	0.0000	0.0000
SMU-028	0.0910	0.1874	0.1660	0.3504	0.2967	0.2873	0.2300	0.1470	0.0000
SMU-029	0.0995	0.1969	0.1959	0.4437	0.3629	0.3197	0.2508	0.1230	0.0000
SMU-030	0.0813	0.1225	0.1632	0.2078	0.0517	0.0000	0.0000	0.0000	0.0000
SMU-031	0.0842	0.0949	0.1207	0.2298	0.1721	0.0000	0.0000	0.0000	0.0000
SMU-032	0.0988	0.1672	0.1612	0.3477	0.2466	0.0684	0.0000	0.0000	0.0000
SMU-033	0.0935	0.1456	0.0842	0.0720	0.0000	0.0000	0.0000	0.0000	0.0000
SMU-034	0.0997	0.1981	0.1894	0.4534	0.4140	0.2917	0.3521	0.3472	0.2149
SMU-035	0.1009	0.2010	0.1917	0.4429	0.3824	0.3510	0.3749	0.2722	0.2689
SMU-036	0.0804	0.0945	0.0453	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
SMU-037	0.0994	0.1363	0.1698	0.3769	0.3083	0.1844	0.0000	0.0000	0.0000
SMU-038	0.0968	0.1635	0.1777	0.4059	0.3700	0.2603	0.2072	0.4060	0.2520
SMU-039	0.1014	0.1597	0.1875	0.3723	0.3845	0.1142	0.0000	0.0000	0.0000
SMU-040	0.0994	0.1924	0.1916	0.4175	0.4137	0.3174	0.3555	0.2854	0.5359
SMU-041	0.1014	0.1958	0.1948	0.4389	0.3463	0.3280	0.2398	0.2770	0.0000
SMU-042	0.0801	0.1205	0.1702	0.2821	0.2074	0.0185	0.0000	0.0000	0.0000
SMU-043	0.0835	0.1781	0.1913	0.3741	0.2591	0.0367	0.0000	0.0000	0.0000
SMU-044	0.0982	0.1803	0.1803	0.3848	0.4039	0.2698	0.3295	0.2837	0.0000
SMU-045	0.0986	0.1911	0.1917	0.4406	0.3950	0.2825	0.2390	0.1319	0.0000
SMU-046	0.1000	0.1934	0.1911	0.4190	0.3876	0.3900	0.3173	0.1714	0.5263
SMU-047	0.1008	0.2015	0.2007	0.4873	0.4498	0.3990	0.3472	0.1884	0.2592
SMU-048	0.0968	0.1929	0.1936	0.4575	0.3744	0.2948	0.2857	0.2884	0.3144
SMU-049	0.0978	0.1961	0.1901	0.4570	0.4513	0.3646	0.3104	0.1484	0.0831
SMU-050	0.0968	0.1981	0.1931	0.3813	0.3487	0.1320	0.0000	0.0000	0.0000
SMU-051	0.1030	0.2043	0.2068	0.4954	0.3304	0.2647	0.1824	0.5000	0.2635
SMU-052	0.0980	0.1992	0.1992	0.4772	0.4595	0.4399	0.3035	0.2372	0.1761
SMU-053	0.0993	0.1901	0.1956	0.4506	0.4175	0.3779	0.2380	0.2354	0.0672
SMU-054	0.0901	0.1403	0.1830	0.4448	0.3928	0.2624	0.0622	0.0000	0.0000
SMU-055	0.0584	0.1570	0.1451	0.1529	0.0000	0.0000	0.0000	0.0000	0.0000
SMU-056	0.1012	0.2030	0.2013	0.4933	0.4856	0.4456	0.3969	0.3764	0.7714
SMU-057	0.1000	0.1987	0.1984	0.4973	0.4853	0.4440	0.3345	0.3604	0.3361

Table B6 (continued). Apparent thickness by layer of the Lower Fox River sediment bed.

Deposit, Interdeposit, SMU	*Average Sediment Thickness through Depth Interval: Apparent Thickness (m)*								
	Layer 1 0 - 0.1 m	*Layer 2* 0.1 - 0.3 m	*Layer 3* 0.3 - 0.5 m	*Layer 4* 0.5 - 1.0 m	*Layer 5* 1.0 - 1.5 m	*Layer 6* 1.5 - 2.0 m	*Layer 7* 2.0 - 2.5 m	*Layer 8* 2.5 - 3.0 m	*Layer 9* > 3.0 m
SMU-058	0.1026	0.2042	0.2028	0.4939	0.4738	0.4611	0.3962	0.1837	0.8850
SMU-059	0.0986	0.1967	0.1986	0.4758	0.3556	0.2214	0.1790	0.0000	0.0000
SMU-060	0.0903	0.1203	0.1684	0.3813	0.2833	0.2017	0.1323	0.0000	0.0000
SMU-061	0.1003	0.1893	0.1924	0.3932	0.3447	0.2546	0.1643	0.0917	0.0000
SMU-062	0.1000	0.1432	0.1924	0.4554	0.4487	0.4561	0.4719	0.4706	1.0837
SMU-063	0.1000	0.2000	0.2000	0.5000	0.5000	0.5000	0.5000	0.1000	0.0000
SMU-064	0.1000	0.0548	0.1810	0.3909	0.1945	0.1088	0.0000	0.0000	0.0000
SMU-065	0.1000	0.2000	0.2000	0.5000	0.5000	0.4719	0.5000	0.1000	0.0000
SMU-066	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
SMU-067	0.1000	0.2000	0.2000	0.5000	0.5000	0.4071	0.5000	0.1000	0.0000
SMU-068	0.1000	0.2000	0.2000	0.5000	0.5000	0.5000	0.5000	0.5000	1.6000
SMU-069	0.1000	0.2000	0.2000	0.5000	0.5000	0.5000	0.2333	0.5000	1.6000
SMU-070	0.1034	0.2068	0.2068	0.5170	0.5170	0.5002	0.4883	0.3800	1.3766
SMU-071	0.1000	0.2000	0.2000	0.5000	0.5000	0.5000	0.3721	0.2120	1.5851
SMU-072	0.1000	0.2000	0.2000	0.5000	0.5000	0.4000	0.0000	0.0000	0.0000
SMU-073	0.1000	0.2000	0.2000	0.5000	0.5000	0.5000	0.5000	0.1000	0.0000
SMU-074	0.1000	0.2000	0.2000	0.5000	0.5000	0.5000	0.1000	0.0000	0.0000
SMU-075	0.1000	0.2000	0.2000	0.5000	0.2000	0.0000	0.0000	0.0000	0.0000
SMU-076	0.1000	0.2000	0.2000	0.5000	0.5000	0.5000	0.3209	0.4954	0.6932
SMU-077	0.1000	0.2000	0.2000	0.5000	0.2267	0.4370	0.4252	0.2429	0.7000
SMU-078	0.1000	0.2000	0.2000	0.5000	0.5000	0.5000	0.5000	0.5000	0.7000
SMU-079	0.1000	0.2000	0.2000	0.5000	0.2136	0.5000	0.5000	0.5000	0.7000
SMU-080	0.1000	0.2000	0.2000	0.5000	0.5000	0.5000	0.5000	0.2000	0.0000
SMU-081	0.1000	0.2000	0.2000	0.5000	0.5000	0.5000	0.5000	0.5000	0.4000
SMU-082	0.1000	0.2000	0.2000	0.5000	0.4682	0.4487	0.4424	0.1708	0.0000
SMU-083	0.1000	0.2000	0.2000	0.5000	0.5000	0.5000	0.5000	0.5000	0.4000
SMU-084	0.1000	0.2000	0.2000	0.5000	0.3969	0.0000	0.0000	0.0000	0.0000
SMU-085	0.1000	0.2000	0.2000	0.5000	0.5000	0.5000	0.5000	0.5000	0.0000
SMU-086	0.1000	0.2000	0.2000	0.5000	0.5000	0.4012	0.5000	0.5000	0.4000
SMU-087	0.1000	0.2000	0.2000	0.5000	0.5000	0.3000	0.0000	0.0000	0.0000
SMU-088	0.1000	0.2000	0.2000	0.4842	0.4833	0.4370	0.5000	0.5000	0.4000
SMU-089	0.1000	0.2000	0.2000	0.5000	0.4512	0.3000	0.0000	0.0000	0.0000
SMU-090	0.1000	0.2000	0.2000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Table B6 (continued). Apparent thickness by layer of the Lower Fox River sediment bed.

Deposit, Interdeposit, SMU	*Average Sediment Thickness through Depth Interval: Apparent Thickness (m)*								
	Layer 1 0 - 0.1 m	*Layer 2* 0.1 - 0.3 m	*Layer 3* 0.3 - 0.5 m	*Layer 4* 0.5 - 1.0 m	*Layer 5* 1.0 - 1.5 m	*Layer 6* 1.5 - 2.0 m	*Layer 7* 2.0 - 2.5 m	*Layer 8* 2.5 - 3.0 m	*Layer 9* > 3.0 m
SMU-091	0.1000	0.2000	0.2000	0.5000	0.4000	0.0000	0.0000	0.0000	0.0000
SMU-092	0.1000	0.2000	0.2000	0.5000	0.1000	0.0000	0.0000	0.0000	0.0000
SMU-093	0.1000	0.2000	0.2000	0.5000	0.1000	0.0000	0.0000	0.0000	0.0000
SMU-094	0.1006	0.2012	0.2012	0.4458	0.4556	0.2739	0.0000	0.0000	0.0000
SMU-095	0.1038	0.2075	0.2075	0.5147	0.1541	0.0000	0.0000	0.0000	0.0000
SMU-096	0.1000	0.2000	0.2000	0.4791	0.4936	0.2892	0.0000	0.0000	0.0000
SMU-097	0.1000	0.2000	0.2000	0.5000	0.2000	0.0000	0.0000	0.0000	0.0000
SMU-098	0.1000	0.2000	0.2000	0.5000	0.2000	0.0000	0.0000	0.0000	0.0000
SMU-099	0.1000	0.2000	0.2000	0.5000	0.5000	0.0000	0.0000	0.0000	0.0000
SMU-100	0.1000	0.2000	0.2000	0.5000	0.2000	0.0000	0.0000	0.0000	0.0000
SMU-101	0.1000	0.2000	0.2000	0.5000	0.5000	0.0000	0.0000	0.0000	0.0000
SMU-102	0.1000	0.2000	0.2000	0.5000	0.2000	0.0000	0.0000	0.0000	0.0000
SMU-103	0.1000	0.2000	0.2000	0.5000	0.5000	0.0000	0.0000	0.0000	0.0000
SMU-104	0.1000	0.2000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
SMU-105	0.1303	0.2606	0.2000	0.4879	0.4000	0.0000	0.0000	0.0000	0.0000
SMU-106	0.1000	0.2000	0.0662	0.4649	0.5000	0.0000	0.0000	0.0000	0.0000
SMU-107	0.1000	0.2000	0.2000	0.2107	0.3319	0.0000	0.0000	0.0000	0.0000
SMU-108	0.1000	0.2000	0.2000	0.4388	0.5000	0.0000	0.0000	0.0000	0.0000
SMU-109	0.1000	0.2000	0.2000	0.3451	0.0000	0.0000	0.0000	0.0000	0.0000
SMU-110	0.1000	0.2000	0.2000	0.5000	0.4167	0.0200	0.0000	0.0000	0.0000
SMU-111	0.1000	0.2000	0.2000	0.5000	0.5000	0.4658	0.5000	0.1000	0.0000
SMU-112	0.1000	0.2000	0.2000	0.5000	0.4711	0.2225	0.3129	0.0809	0.0000
SMU-113	0.1000	0.2000	0.2000	0.5000	0.5000	0.4014	0.3164	0.1469	0.0265
SMU-114	0.1000	0.2000	0.2000	0.4048	0.4786	0.1778	0.0000	0.0000	0.0000
SMU-115	0.0738	0.1691	0.1838	0.4636	0.4488	0.4182	0.1225	0.0000	0.0000

Table B7. Total surface area, interpolated surface area, and null surface area.

Deposit, Interdeposit, SMU	*Surface Area* Total m2	*Interpolated* m2	*Null* m2	*Interpolated* %	*Null* %
Dep A	150800	150800	0	100%	0%
Dep B	146200	146200	0	100%	0%
Dep C	115900	115900	0	100%	0%
Dep D	249000	248900	100	100%	0%
Dep POG2	103800	101300	2500	98%	2%
Dep POG1 (Seg 05)	210900	210900	0	100%	0%
Dep E	2021700	2021700	0	100%	0%
Dep F	168000	168000	0	100%	0%
Dep G	41100	41100	0	100%	0%
Dep H	10600	10600	0	100%	0%
Dep I	29800	29800	0	100%	0%
Dep J	24900	24900	0	100%	0%
Dep K	5200	5200	0	100%	0%
Dep L	10600	10600	0	100%	0%
Dep M	13300	13300	0	100%	0%
Dep N	22200	22200	0	100%	0%
Dep O	18500	18500	0	100%	0%
Dep P	31300	31300	0	100%	0%
Dep Q	4200	4200	0	100%	0%
Dep R	7700	7700	0	100%	0%
Dep S	166400	166400	0	100%	0%
Dep T	20800	20800	0	100%	0%
Dep U	17400	17400	0	100%	0%
Dep V	23700	23700	0	100%	0%
Dep W	561500	561500	0	100%	0%
Dep X	254700	254700	0	100%	0%
Dep Y	31900	31900	0	100%	0%
Dep Z	24300	24300	0	100%	0%
Dep AA	8100	8100	0	100%	0%
Dep BB	15800	15800	0	100%	0%
Dep CC	83600	83600	0	100%	0%
Dep DD	147200	147200	0	100%	0%
Dep EE	2580200	2580200	0	100%	0%
Dep FF	4800	4800	0	100%	0%
Dep GG	24000	24000	0	100%	0%
Dep HH	44600	44600	0	100%	0%
Seg 02-ID	155500	90800	64700	58%	42%
Seg 03-ID	219200	97600	121600	45%	55%
Seg 04-ID	654000	281800	372200	43%	57%
Seg 06-ID	410400	409800	600	100%	0%
Seg 07-ID	162000	134100	27900	83%	17%
Seg 08-ID	180600	160900	19700	89%	11%
Seg 09-ID	149200	72800	76400	49%	51%
Seg 10-ID	824400	219500	604900	27%	73%
Seg 11-ID	692000	454300	237700	66%	34%
Seg 12-ID	485200	369600	115600	76%	24%
Seg 13-ID	130700	99700	31000	76%	24%

Table B7 (continued). Total surface area, interpolated surface area, and null surface area.

Deposit, *Interdeposit,* SMU	*Surface Area* *Total* m2	*Interpolated* m2	*Null* m2	*Interpolated* %	*Null* %
Seg 14-ID	414600	251800	162800	61%	39%
Seg 15-ID	1038900	367800	671100	35%	65%
Seg 16-ID	411500	302900	108600	74%	26%
Seg 17-ID	243200	195300	47900	80%	20%
Seg 18-ID	353400	260900	92500	74%	26%
Seg 19-ID	791200	314200	477000	40%	60%
Seg 20-ID	504900	216500	288400	43%	57%
Seg 21-ID	393700	151000	242700	38%	62%
Seg 22-ID	627500	279400	348100	45%	55%
Seg 23-ID	38500	38500	0	100%	0%
Seg 24-ID	6700	6700	0	100%	0%
Seg 25-ID	112400	111400	1000	99%	1%
Seg 26-ID	111600	111400	200	100%	0%
Seg 27-ID	174600	147000	27600	84%	16%
SMU-020	406300	388700	17600	96%	4%
SMU-021	149300	149300	0	100%	0%
SMU-022	179800	98900	80900	55%	45%
SMU-023	140300	140300	0	100%	0%
SMU-024	121200	106700	14500	88%	12%
SMU-025	134800	134800	0	100%	0%
SMU-026	16000	16000	0	100%	0%
SMU-027	19200	19200	0	100%	0%
SMU-028	70400	70400	0	100%	0%
SMU-029	80300	80300	0	100%	0%
SMU-030	13200	13200	0	100%	0%
SMU-031	18500	18500	0	100%	0%
SMU-032	46000	46000	0	100%	0%
SMU-033	52100	52100	0	100%	0%
SMU-034	61400	61400	0	100%	0%
SMU-035	73800	73800	0	100%	0%
SMU-036	14600	14600	0	100%	0%
SMU-037	19900	19900	0	100%	0%
SMU-038	49600	49600	0	100%	0%
SMU-039	27000	27000	0	100%	0%
SMU-040	96300	96300	0	100%	0%
SMU-041	131800	131800	0	100%	0%
SMU-042	54600	54600	0	100%	0%
SMU-043	104200	104100	100	100%	0%
SMU-044	121400	115200	6200	95%	5%
SMU-045	185100	185100	0	100%	0%
SMU-046	174800	174800	0	100%	0%
SMU-047	151100	151100	0	100%	0%
SMU-048	186900	186900	0	100%	0%
SMU-049	250900	250900	0	100%	0%
SMU-050	25300	25300	0	100%	0%
SMU-051	24300	24300	0	100%	0%
SMU-052	103100	103100	0	100%	0%

Table B7 (continued). Total surface area, interpolated surface area, and null surface area.

Deposit,	*Surface Area*				
Interdeposit, SMU	*Total* m2	*Interpolated* m2	*Null* m2	*Interpolated* %	*Null* %
SMU-053	97000	97000	0	100%	0%
SMU-054	59000	58900	100	100%	0%
SMU-055	20400	20400	0	100%	0%
SMU-056	66000	66000	0	100%	0%
SMU-057	95000	84300	10700	89%	11%
SMU-058	30900	30900	0	100%	0%
SMU-059	28200	27100	1100	96%	4%
SMU-060	31400	31400	0	100%	0%
SMU-061	43800	42800	1000	98%	2%
SMU-062	55600	49800	5800	90%	10%
SMU-063	13900	4600	9300	33%	67%
SMU-064	43900	18500	25400	42%	58%
SMU-065	48900	35600	13300	73%	27%
SMU-066	6200	0	6200	0%	100%
SMU-067	13700	8500	5200	62%	38%
SMU-068	18900	5000	13900	26%	74%
SMU-069	6100	300	5800	5%	95%
SMU-070	90900	82200	8700	90%	10%
SMU-071	69900	39100	30800	56%	44%
SMU-072	14900	2300	12600	15%	85%
SMU-073	9400	4200	5200	45%	55%
SMU-074	1800	500	1300	28%	72%
SMU-075	10600	200	10400	2%	98%
SMU-076	48100	36400	11700	76%	24%
SMU-077	45300	28000	17300	62%	38%
SMU-078	4500	2700	1800	60%	40%
SMU-079	3500	2200	1300	63%	37%
SMU-080	5700	5200	500	91%	9%
SMU-081	5800	1200	4600	21%	79%
SMU-082	36100	36100	0	100%	0%
SMU-083	47700	29300	18400	61%	39%
SMU-084	5100	5100	0	100%	0%
SMU-085	5800	3600	2200	62%	38%
SMU-086	11600	8500	3100	73%	27%
SMU-087	7600	4000	3600	53%	47%
SMU-088	41800	31900	9900	76%	24%
SMU-089	36700	11000	25700	30%	70%
SMU-090	7300	5000	2300	68%	32%
SMU-091	6700	1300	5400	19%	81%
SMU-092	7000	300	6700	4%	96%
SMU-093	7100	3400	3700	48%	52%
SMU-094	69200	50400	18800	73%	27%
SMU-095	57100	29300	27800	51%	49%
SMU-096	42600	11500	31100	27%	73%
SMU-097	12500	4700	7800	38%	62%
SMU-098	5100	2800	2300	55%	45%
SMU-099	16900	9100	7800	54%	46%

Table B7 (continued). Total surface area, interpolated surface area, and null surface area.

Deposit, Interdeposit, SMU	*Surface Area*				
	Total m2	*Interpolated* m2	*Null* m2	*Interpolated* %	*Null* %
SMU-100	52400	28800	23600	55%	45%
SMU-101	52400	27900	24500	53%	47%
SMU-102	5300	3600	1700	68%	32%
SMU-103	5600	3800	1800	68%	32%
SMU-104	22600	10500	12100	46%	54%
SMU-105	34100	3300	30800	10%	90%
SMU-106	42300	28400	13900	67%	33%
SMU-107	38800	35600	3200	92%	8%
SMU-108	16700	11600	5100	69%	31%
SMU-109	14100	8400	5700	60%	40%
SMU-110	29300	7200	22100	25%	75%
SMU-111	24200	4600	19600	19%	81%
SMU-112	44400	39900	4500	90%	10%
SMU-113	40400	40400	0	100%	0%
SMU-114	23800	4700	19100	20%	80%
SMU-115	16400	16400	0	100%	0%