Appendix: Velocity-Profile Plots for OU–3 and OU–4
Notes on construction of the velocity-profile plots

This section describes the specific techniques and data used to construct the velocity-profile plots included in this appendix. The plots were created using custom scripts written for the R statistical package (R Development Core Team, 2006).

Figure A1. Example velocity plot.

Main velocity plot. Regression includes velocity points between 10 percent and 20 percent of the total water depth from the sediment-water interface. Secondary regression (not shown) is calculated for data between the effective depth and 10 percent of total depth.

“Effective depth” is the closest depth to the sediment-water interface that can be resolved by the ADCP.

Shear-stress plot. This plot shows the calculated shear stress within the water column as estimated with the turbulent-kinetic-energy (TKE) method.

Calculated shear-stress parameters. This text box summarizes the key shear-stress parameters as estimated by the various methods described in the report.

Shear velocity and bottom roughness were calculated from the regression coefficients associated with the 10–20 percent of depth velocity points.

Wind rose. The wind-rose plot shows the distribution of wind direction and speed over the day when the ADCP was deployed. The data were recorded roughly hourly, at the Austin Straubel International Airport. The gray bars on the plot correspond to 5 miles per hour wind-speed increments. The direction represents the direction that the wind was coming from.

ADCP deployment details. This text box lists details about the ADCP deployment that may be useful in interpreting the associated plots.

Velocity plot. This plot shows the instantaneous water-velocity time series for the day of ADCP deployment (6-hour increments, from midnight to midnight). The dotted vertical line shows the approximate time period for the deployment.

Data sources:

1) OU-3. Velocity record is 15-minute data obtained from a side-looking Doppler current meter. The location is shown on map 2 as “PT-2”.

2) OU-4. Velocity record is splined 60-minute data obtained from the side-looking Doppler current meter at the Oil Tank Depot (USGS ID 040851385).
October 2004 Velocity Profiles (OU–3)
Estimates of Shear Stress and Measurements of Water Levels in the Lower Fox River near Green Bay, Wisconsin

3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment
2) Average wind conditions calculated for conditions within an hour (+/−) of sampling time
1) Wind−rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions

Shear velocity (cm/s): 0.73
Boundary Reynolds number: 220.21 Test: PASS
Shear stress (TKE) (dyn/cm²): 1.37
Shear stress (LP) (dyn cm²): 0.53
Bottom roughness, Ks (cm): 3.01
Shear stress (LP, 6−10% depth) (dyn/cm²): 0.02
Latitude: 44
Actual offset (cm): 21.3
Blanking dist. (cm): 25
Water−cell size (cm): 1
Field recorded depthfinder depth (ft): 4.5
File recorded ADCP depth (ft): 5.4
Field recorded offset (cm): 21.3
Longitude: 88° 6′ 55″ W
Avg. water depth (ft): 5.42
Water mode: 11
Water-cell size (cm): 1
Field recorded depthfinder depth (ft): 4.5
Total number of recorded ensembles: 303
Heading: 95.91 ± 2.08
Pitch: 3.48 ± 0.66
Roll: 1.59 ± 0.29
Filename: Vert20041026105821r.csv

VERTICALLY AVERAGED WATER FLOW: 0.37 ft/s, to direction 34.7°
AVERAGE WIND CONDITIONS: 8.97 mi/h, from direction 34.1°

CALCULATED SHEAR STRESS PARAMETERS
Shear stress (LP) (dyn/cm²): 0.53 [0.46 ≤ τ ≤ 0.62]
Shear stress (LP, 6−10% depth) (dyn/cm²): 0.02 [−1.5 ≤ τ ≤ 2.26]
Shear stress (TKE) (dyn/cm²): 1.37
Shear velocity (cm/s): 0.73 [0.67 ≤ u ≤ 0.79]
Bottom roughness, Ks (cm): 3.01
Boundary Reynolds number: 220.21 Test: PASS

ADCP DEPLOYMENT DETAILS

NOTES
1) Wind−rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (+/−) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment
Vertically averaged water flow: 0.8 ft/s, to direction 36.5°
Average wind conditions: 8.1 mi/h, from direction 30°

CALCULATED SHEAR STRESS PARAMETERS

Shear stress (LP) (dyn/cm²): 1.81 [1.63 ≤ τ ≤ 2]
Shear stress (LP, 6–10% depth) (dyn/cm²): 1.46 [1.26 ≤ τ ≤ 1.69]
Shear stress (TKE) (dyn/cm²): 4.74
Shear velocity (cm/s): 1.35 [1.27 ≤ u ≤ 1.42]
Bottom roughness, K₇ (cm): 1.7
Boundary Reynolds number: 229.31 Test: PASS

ADCP DEPLOYMENT DETAILS

Avg. water depth (ft): 11.87
Water mode: 11
Water-cell size (cm): 1
Blanking dist. (cm): 25
Field recorded offset (cm): 107
Actual offset (cm): 107
Latitude: 44° 23' 27.7" N
Longitude: 88° 6' 50.4" W
Field recorded ADCP depth (ft): 13.4
Field recorded depthfinder depth (ft): 11.2
Total number of recorded ensembles: 187
Heading: 75.53 ± 7.09
Pitch: 4.46 ± 0.97
Roll: −0.67 ± 1.13
Filename: Vert20041026111548r.csv

NOTES

1) Wind–rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (+/-) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment

DAILY WIND ROSE

VELOCITY AT DE PERE
Estimates of Shear Stress and Measurements of Water Levels in the Lower Fox River near Green Bay, Wisconsin

**Velocity Profile – Lower Fox River – OU3–1B2**


**CALCULATED SHEAR STRESS PARAMETERS**

- Shear stress (LP) (dyn/cm²): 2.66 [2.45 ≤ τ ≤ 2.88]
- Shear stress (LP, 6–10% depth) (dyn/cm²): 2 [1.72 ≤ τ ≤ 2.29]
- Shear stress (TKE) (dyn/cm²): 5.73
- Shear velocity (cm/s): 1.63 [1.57 ≤ u ≤ 1.7]
- Bottom roughness, Ks (cm): 7.6
- Boundary Reynolds number: 1239.84 Test: PASS

**ADCP DEPLOYMENT DETAILS**

- Avg. water depth (ft): 12.06
- Water mode: 11
- Water-cell size (cm): 1
- Blanking dist. (cm): 25
- Field recorded offset (cm): 107
- Actual offset (cm): 107
- Latitude: 44° 23' 27.7" N
- Longitude: 88° 6' 50.4" W
- Field recorded ADCP depth (ft): 13.4
- Field recorded depthfinder depth (ft): 11.2
- Total number of recorded ensembles: 301
- Heading: 80.27 ± 12.45
- Pitch: 2.72 ± 1.64
- Roll: 2.24 ± 2.26
- Filename: Vert20041026112219r.csv

**NOTES**

1) Wind−rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (+−) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment
**Velocity Profile – Lower Fox River – OU3–1C**

10/26/2004 11:40:58

Vertically averaged water flow: 0.35 ft/s, to direction 58.8°

Average wind conditions: 8.1 mi/h, from direction 30°

**CALCULATED SHEAR STRESS PARAMETERS**

- Shear stress (LP) (dyn/cm²): 1.03 [0.83 ≤ τ ≤ 1.24]
- Shear stress (LP, 6–10% depth) (dyn/cm²): 0.21 [NaN ≤ τ ≤ NaN]
- Shear stress (TKE) (dyn/cm²): 1.79
- Shear velocity (cm/s): 1.01 [0.91 ≤ u ≤ 1.11]
- Bottom roughness, Kn (cm): 19.79
- Boundary Reynolds number: 2004.11 Test: PASS

**ADCP DEPLOYMENT DETAILS**

- Avg. water depth (ft): 5.15
- Water mode: 11
- Water-cell size (cm): 1
- Blanking dist. (cm): 25
- Field recorded offset (cm): 21.3
- Actual offset (cm): 21.3
- Latitude: 44° 23′ 23.6″ N
- Longitude: 88° 6′ 47″ W
- Field recorded ADCP depth (ft): 5
- Field recorded depthfinder depth (ft): 4.4
- Total number of recorded ensembles: 300
- Heading: 68.64 ± 3.62
- Pitch: 3.52 ± 0.35
- Roll: −1.56 ± 0.77
- Filename: Vert20041026114058r.csv

**NOTES**

1. Wind–rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2. Average wind conditions calculated for conditions within an hour (±0.5) of sampling time
3. Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment
Estimates of Shear Stress and Measurements of Water Levels in the Lower Fox River near Green Bay, Wisconsin

Vertically averaged water flow: 0.41 ft/s, to direction 36.3°
Average wind conditions: 8.97 mi/h, from direction 34.1°

CALCULATED SHEAR STRESS PARAMETERS
Shear stress (LP) (dyn/cm²): 0.89 [0.78 ≤ τ ≤ 1]
Shear stress (LP, 6–10% depth) (dyn/cm²): 0.89 [0.67 ≤ τ ≤ 1.14]
Shear stress (TKE) (dyn/cm²): 1.15
Shear velocity (cm/s): 0.94 [0.89 ≤ u ≤ 1]
Bottom roughness, Ks (cm): 5.88
Boundary Reynolds number: 554.66 Test: PASS

ADCP DEPLOYMENT DETAILS
Avg. water depth (ft): 7.17
Water mode: 11
Water-cell size (cm): 1
Blanking dist. (cm): 25
Field recorded offset (cm): 21.3
Actual offset (cm): 21.3
Latitude: 44° 23' 35.63" N
Longitude: 88° 6' 58.18" W
Field recorded ADCP depth (ft): 7.3
Field recorded depthfinder depth (ft): 6.5
Total number of recorded ensembles: 301
Heading: 134.47° ± 3.78
Pitch: 2.83° ± 0.59
Roll: -1.29° ± 1.75
Filename: Vert20041026103343r.csv

NOTES
1) Wind–rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (±1) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment
Velocity Profile – Lower Fox River – OU3–1L2
10/26/2004 10:44:16

Vertically averaged water flow: 0.4 ft/s, to direction 37.3°
Average wind conditions: 8.97 mi/h, from direction 34.1°

Shear stress (LP) (dyn/cm²): 1.7 [1.5 ≤ τ ≤ 1.92]
Shear stress (LP, 6–10% depth) (dyn/cm²): 2.57 [−0.41 ≤ τ ≤ 14.77]
Shear stress (TKE) (dyn/cm²): 2.23
Shear velocity (cm/s): 1.31 [1.22 ≤ u ≤ 1.39]
Bottom roughness, Ks (cm): 27.47
Boundary Reynolds number: 3585.78 Test: PASS

ADCP DEPLOYMENT DETAILS
Avg. water depth (ft): 7.31
Water mode: 11
Water–cell size (cm): 1
Blanking dist. (cm): 25
Field recorded offset (cm): 21.3
Actual offset (cm): 21.3
Latitude: 44° 23' 35.63" N
Longitude: 88° 6' 58.18" W
Field recorded ADCP depth (ft): 7.3
Field recorded depthfinder depth (ft): 6.5
Total number of recorded ensembles: 312
Heading: 115.96 ± 13.48
Pitch: 3.67 ± 1.01
Roll: −2.27 ± 6.91
Filename: Vert20041026104416r.csv

NOTES
1) Wind–rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (+−) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment.
Velocity Profile – Lower Fox River – OU3–2A1
10/26/2004 12:45:59

Vertically averaged water flow: 0.65 ft/s, to direction 49°
Average wind conditions: 8.07 mi/h, from direction 33.3°

CALCULATED SHEAR STRESS PARAMETERS
Shear stress (LP) (dyn/cm²): 1.68 [1.37 ≤ τ ≤ 2.02]
Shear stress (LP, 6–10% depth) (dyn/cm²): 1.48 [1.12 ≤ τ ≤ 1.9]
Shear stress (TKE) (dyn/cm²): 7.61
Shear velocity (cm/s): 1.3 [1.17 ≤ u* ≤ 1.42]
Bottom roughness, Ks (cm): 4.74
Boundary Reynolds number: 615.23 Test: PASS

ADCP DEPLOYMENT DETAILS
Avg. water depth (ft): 10.78
Water mode: 11
Water-cell size (cm): 1
Blanking dist. (cm): 25
Field recorded offset (cm): 107
Actual offset (cm): 107
Latitude: 44° 24' 0.9" N
Longitude: 88° 6' 13.9" W
Field recorded ADCP depth (ft): 10.8
Field recorded depthfinder depth (ft): ---
Total number of recorded ensembles: 110
Heading: 85 ± 7.05
Pitch: 2.56 ± 1.53
Roll: −0.82 ± 0.68
Filename: Vert20041026124559r.csv

NOTES
1) Wind−rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (+/−) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment

Estimated shear stress and measurements of water levels in the Lower Fox River near Green Bay, Wisconsin.

DISTANCE ABOVE RIVER BOTTOM, IN FEET
(NATURAL LOG SCALE)

VELOCITY, IN FEET PER SECOND

SHEAR STRESS, IN DYNES PER CENTIMETER SQUARED

DAILY WIND ROSE

VELOCITY AT DE PERE

Longitude: 88° 6' 13.9" W
Latitude: 44° 24' 0.9" N
Actual offset (cm): 107
Blanking dist. (cm): 25
Water-cell size (cm): 1
Water mode: 11
Avg. water depth (ft): 10.78
Field recorded ADCP depth (ft): 10.8
Field recorded depthfinder depth (ft): ---
Total number of recorded ensembles: 110
Heading: 85 ± 7.05
Pitch: 2.56 ± 1.53
Roll: −0.82 ± 0.68
Filename: Vert20041026124559r.csv

NOTES
1) Wind−rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (+/−) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment
Velocity Profile – Lower Fox River – OU–3A2
10/26/2004 12:50:09

Vertically averaged water flow: 0.71 ft/s, to direction 52.9°
Average wind conditions: 8.07 mi/h, from direction 33.3°

CALCULATED SHEAR STRESS PARAMETERS
Shear stress (LP) (dyn/cm²): 2.87 [2.7 ≤ τ ≤ 3.06]
Shear stress (LP, 6–10% depth) (dyn/cm²): 1.88 [1.01 ≤ τ ≤ 3.02]
Shear stress (TKE) (dyn/cm²): 6.64
Shear velocity (cm/s): 1.7 [1.64 ≤ u ≤ 1.75]
Bottom roughness, Ks (cm): 13.81
Boundary Reynolds number: 2341.51 Test: PASS

ADCP DEPLOYMENT DETAILS
Avg. water depth (ft): 10.9
Water mode: 11
Water–cell size (cm): 1
Blanking dist. (cm): 25
Field recorded offset (cm): 107
Actual offset (cm): 107
Latitude: 44° 24' 0.9" N
Longitude: 88° 6' 13.9" W
Field recorded ADCP depth (ft): 10.8
Field recorded depthfinder depth (ft): 10.8
Total number of recorded ensembles: 300
Heading: 81.84 ± 7.8
Pitch: 2.61 ± 1.42
Roll: −0.95 ± 0.99
Filename: Vert20041026125009r.csv

NOTES
1) Wind–rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (+–) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment
Velocity Profile – Lower Fox River – OU3−2B
10/26/2004 12:26:44

Vertically averaged water flow: 0.58 ft/s, to direction 49°
Average wind conditions: 8.07 mi/h, from direction 33.3°

CALCULATED SHEAR STRESS PARAMETERS
Shear stress (LP) (dyn/cm²): 1.38 [1.23 ≤ τ ≤ 1.54]
Shear stress (LP, 6−10% depth) (dyn/cm²): 0.96 [0.68 ≤ τ ≤ 1.28]
Shear stress (TKE) (dyn/cm²): 2.1
Shear velocity (cm/s): 1.18 [1.11 ≤ u ≤ 1.14]
Bottom roughness, $K_s$ (cm): 5.53
Boundary Reynolds number: 649.29 Test: PASS

ADCP DEPLOYMENT DETAILS
Avg. water depth (ft): 7.79
Water mode: 11
Water-cell size (cm): 1
Blanking dist. (cm): 25
Field recorded offset (cm): 21.3
Actual offset (cm): 21.3
Latitude: 44° 23' 56.7" N
Longitude: 88° 6' 11" W
Field recorded ADCP depth (ft): 7.8
Field recorded depthfinder depth (ft): 7.3
Total number of recorded ensembles: 301
Heading: 97.17 ± 5.54
Pitch: 3.15 ± 0.32
Roll: -1.43 ± 0.32
Filename: Vert20041026122644r.csv

NOTES
1) Wind−rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (+/−) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment
Velocity Profile – Lower Fox River – OU3–3A
10/26/2004 13:52:52

Vertically averaged water flow: 0.7 ft/s, to direction 24.8°
Average wind conditions: 8.38 mi/h, from direction 40.4°

CALCULATED SHEAR STRESS PARAMETERS
Shear stress (LP) (dyn/cm²): 1.38 [1.19 ≤ τ ≤ 1.58]
Shear stress (LP, 6–10% depth) (dyn/cm²): 1.36 [1.17 ≤ τ ≤ 1.56]
Shear stress (TKE) (dyn/cm²): 4.23
Shear velocity (cm/s): 1.17 [1.09 ≤ u ≤ 1.26]
Bottom roughness, Kₘ (cm): 1.88
Boundary Reynolds number: 220.79 Test: PASS

ADCP DEPLOYMENT DETAILS
Avg. water depth (ft): 11.95
Water mode: 11
Water-cell size (cm): 1
Blanking dist. (cm): 25
Field recorded offset (cm): 107
Actual offset (cm): 107
Latitude: 44° 24' 45" N
Longitude: 88° 5' 34.3" W
Field recorded ADCP depth (ft): 12
Field recorded depthfinder depth (ft): 11.2
Total number of recorded ensembles: 303
Heading: 4.42 ± 4.86
Pitch: 3.31 ± 0.9
Roll: −0.48 ± 0.81
Filename: Vert20041026135252r.csv

NOTES
1) Wind–rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (+−) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment
50 Estimates of Shear Stress and Measurements of Water Levels in the Lower Fox River near Green Bay, Wisconsin

Velocity Profile – Lower Fox River – OU3–3B
10/26/2004 14:07:02

Vertically averaged water flow: 0.64 ft/s, to direction 12.2°
Average wind conditions: 12.3 mi/h, from direction 57.5°

CALCULATED SHEAR STRESS PARAMETERS
Shear stress (LP) (dyn/cm²): 1.48 [1.33 ≤ τ ≤ 1.63]
Shear stress (LP, 6–10% depth) (dyn/cm²): 1.87 [1.72 ≤ τ ≤ 2.03]
Shear stress (TKE) (dyn/cm²): 2.62
Shear velocity (cm/s): 1.22 [1.15 ≤ u ≤ 1.28]
Bottom roughness, Ks (cm): 4.18
Boundary Reynolds number: 507.79 Test: PASS

ADCP DEPLOYMENT DETAILS
Avg. water depth (ft): 12.16
Water mode: 11
Water-cell size (cm): 1
Blanking dist. (cm): 25
Field recorded offset (cm): 107
Actual offset (cm): 107
Latitude: 44° 24' 43.3" N
Longitude: 88° 5' 28" W
Field recorded ADCP depth (ft): 12
Field recorded depthfinder depth (ft): 11.5
Total number of recorded ensembles: 299
Heading: 6.17 ± 3.71
Pitch: 2.95 ± 0.81
Roll: 1.94 ± 0.42
Filename: Vert20041026140702r.csv

NOTES
1) Wind–rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (+/-) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment
Velocity Profile – Lower Fox River – OU3–3R
10/26/2004 14:21:43

**Vertically averaged water flow:** 0.72 ft/s, to direction 11.5°
**Average wind conditions:** 12.3 mi/h, from direction 57.5°

**CALCULATED SHEAR STRESS PARAMETERS**
- Shear stress (LP) (dyn/cm²): 1.36 \[1.17 \leq \tau \leq 1.56\]
- Shear stress (LP, 6–10% depth) (dyn/cm²): 4.71 \[3.48 \leq \tau \leq 6.13\]
- Shear stress (TKE) (dyn/cm²): 1.03
- Shear velocity (cm/s): 1.17 \[1.08 \leq u \leq 1.25\]
- Bottom roughness, \(K_s\) (cm): 1.22
- Boundary Reynolds number: 142.35  Test: PASS

**ADCP DEPLOYMENT DETAILS**
- Avg. water depth (ft): 8.39
- Water mode: 11
- Water-cell size (cm): 1
- Blanking dist. (cm): 25
- Field recorded offset (cm): 21.3
- Actual offset (cm): 21.3
- Latitude: 44° 24' 24.2" N
- Longitude: 88° 5' 25.4" W
- Field recorded ADCP depth (ft): 8.2
- Field recorded depthfinder depth (ft): 6.9
- Total number of recorded ensembles: 300
- Heading: 198.23 ± 2.54
- Pitch: 3.79 ± 0.42
- Roll: 0.27 ± 0.28
- Filename: Vert20041026142143r.csv

**NOTES**
1) Wind–rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (+/−) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment
Velocity Profile – Lower Fox River – OU3–4A
10/27/2004 12:59:10

Vertically averaged water flow: 0.62 ft/s, to direction 32.1°
Average wind conditions: 14.1 mi/h, from direction 50°

CALCULATED SHEAR STRESS PARAMETERS
Shear stress (LP) (dyn/cm²): 1.3 [1.12 ≤ τ ≤ 1.49]
Shear stress (LP, 6–10% depth) (dyn/cm²): 0.93 [0.74 ≤ τ ≤ 1.15]
Shear stress (TKE) (dyn/cm²): 0.63
Shear velocity (cm/s): 1.14 [1.06 ≤ u ≤ 1.22]
Bottom roughness, Kₚ (cm): 3.6
Boundary Reynolds number: 410.83 Test: PASS

ADCP DEPLOYMENT DETAILS
Avg. water depth (ft): 8.19
Water mode: 11
Water-cell size (cm): 1
Blanking dist. (cm): 25
Field recorded offset (cm): 21.3
Actual offset (cm): 21.3
Latitude: 44° 25' 42.1" N
Longitude: 88° 4' 34.9" W
Field recorded ADCP depth (ft): 8.2
Field recorded depthfinder depth (ft): 8.3
Total number of recorded ensembles: 301
Heading: 202.08 ± 1.37
Pitch: 2.74 ± 0.3
Roll: -1.14 ± 0.38
Filename: Vert20041027125910r.csv

NOTES
1) Wind–rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (+/-) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment
Velocity Profile – Lower Fox River – OU3–4B

10/27/2004 12:45:51

Vertically averaged water flow: 0.8 ft/s, to direction 25.9°
Average wind conditions: 14.1 mi/h, from direction 50°

CALCULATED SHEAR STRESS PARAMETERS

Shear stress (LP) (dyn/cm²): 1.5 [1.28 ≤ τ ≤ 1.74]
Shear stress (LP, 6–10% depth) (dyn/cm²): 1.39 [1.14 ≤ τ ≤ 1.67]
Shear stress (TKE) (dyn/cm²): 0.96
Shear velocity (cm/s): 1.23 [1.13 ≤ u ≤ 1.32]
Bottom roughness, Ks (cm): 1
Boundary Reynolds number: 122.4 Test: PASS

ADCP DEPLOYMENT DETAILS

Avg. water depth (ft): 8.49
Water mode: 11
Water-cell size (cm): 1
Blanking dist. (cm): 25
Field recorded offset (cm): 320
Actual offset (cm): 0
Latitude: 44° 25' 40" N
Longitude: 88° 4' 30.3" W
Field recorded ADCP depth (ft): 19
Field recorded depthfinder depth (ft): 19.5
Total number of recorded ensembles: 303
Heading: 209.26 ± 4.66
Pitch: 0.24 ± 0.48
Roll: −3.01 ± 0.79
Filename: Vert20041027124551r.csv

NOTES

1) Wind–rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (+/-) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment
Estimates of Shear Stress and Measurements of Water Levels in the Lower Fox River near Green Bay, Wisconsin

Velocity Profile – Lower Fox River – OU3–4C

Vertically averaged water flow: 0.82 ft/s, to direction 26.4°
Average wind conditions: 14.1 mi/h, from direction 50°

CALCULATED SHEAR STRESS PARAMETERS
Shear stress (LP) (dyn/cm²): 2.45 [2.27 ≤ τ ≤ 2.64]
Shear stress (LP, 6–10% depth) (dyn/cm²): 2.96 [2.37 ≤ τ ≤ 3.61]
Shear stress (TKE) (dyn/cm²): 1.15
Shear velocity (cm/s): 1.57 [1.51 ≤ u ≤ 1.62]
Bottom roughness, Ks (cm): 4.57
Boundary Reynolds number: 715.13 Test: PASS

ADCP DEPLOYMENT DETAILS
Avg. water depth (ft): 10.48
Water mode: 11
Water-cell size (cm): 1
Blanking dist. (cm): 25
Field recorded offset (cm): 76.2
Actual offset (cm): 76.2
Lat/Lon: 44° 25' 39.2" N
Longitude: 88° 4' 28.6" W
Field recorded ADCP depth (ft): 10.5
Field recorded depthfinder depth (ft): 9.2
Total number of recorded ensembles: 305
Heading: 226.32 ± 1.96
Pitch: 1.68 ± 0.16
Roll: −0.46 ± 0.58
Filename: Vert20041027123112r.csv

NOTES
1) Wind–rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (+/−) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment
DISTANCE ABOVE RIVER BOTTOM, IN FEET

3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment
2) Average wind conditions calculated for conditions within an hour (+−) of sampling time
1) Wind−rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions

Shear velocity (cm/s): 0.77
Shear stress (LP, 6−10% depth) (dyn/cm²): 1.87
Boundary Reynolds number: 260.62 Test: PASS
Shear stress (TKE) (dyn/cm²): 1.06
Shear stress (LP) (dyn cm²): 0.59
Bottom roughness, Ks (cm): 3.38
Latitude: 44°
Actual offset (cm): 30.5
Field recorded depthfinder depth (ft): 7.9
Field recorded depthfinder depth (ft): 8.6
Total number of recorded ensembles: 81
Heading: 21.62 ± 10.62
Pitch: 2.62 ± 2.09
Roll: −1.94 ± 4.56
Filename: Vert20041027114620r.csv

Vertically averaged water flow: 0.44 ft/s, to direction 37.5°
Average wind conditions: 15 mi/h, from direction 50°

CALCULATED SHEAR STRESS PARAMETERS
Shear stress (LP) (dyn/cm²): 0.59 [0.47 ≤ τ ≤ 0.73]
Shear stress (LP, 6−10% depth) (dyn/cm²): 1.87 [0.81 ≤ τ ≤ 3.35]
Shear stress (TKE) (dyn/cm²): 1.06
Shear velocity (cm/s): 0.77 [0.69 ≤ u ≤ 0.86]
Bottom roughness, Ks (cm): 3.38
Boundary Reynolds number: 260.62 Test: PASS

ADCP DEPLOYMENT DETAILS
Avg. water depth (ft): 9.2
Water mode: 11
Water−cell size (cm): 1
Blanking dist. (cm): 25
Field recorded offset (cm): 30.5
Actual offset (cm): 30.5
Latitude: 44° 25' 56.17" N
Longitude: 88° 4' 23" W

NOTES
1) Wind−rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (+−) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment

Velocity Profile – Lower Fox River – OU3−5A1

VELOCITY, IN FEET PER SECOND

VELOCITY AT DE PERE

DAILY WIND ROSE
Estimates of Shear Stress and Measurements of Water Levels in the Lower Fox River near Green Bay, Wisconsin

**Velocity Profile – Lower Fox River – OU3–5A2**


**CALCULATED SHEAR STRESS PARAMETERS**

- Shear stress (LP) (dyn/cm²): 0.58 [0.51 ≤ τ ≤ 0.67]
- Shear stress (LP, 6–10% depth) (dyn/cm²): 10.43 [7.01 ≤ τ ≤ 14.52]
- Shear stress (TKE) (dyn/cm²): 0.56
- Shear velocity (cm/s): 0.76 [0.71 ≤ u ≤ 0.82]
- Bottom roughness, $K_s$ (cm): 6.54
- Boundary Reynolds number: 499.97 Test: PASS

**ADCP DEPLOYMENT DETAILS**

- Avg. water depth (ft): 9.06
- Water mode: 11
- Water-cell size (cm): 1
- Blanking dist. (cm): 25
- Field recorded offset (cm): 30.5
- Actual offset (cm): 30.5
- Latitude: 44° 25' 56.11" N
- Longitude: 88° 4' 23" W
- Field recorded ADCP depth (ft): 8.6
- Field recorded depthfinder depth (ft): 7.9
- Total number of recorded ensembles: 302
- Heading: 29.14 ± 6.43
- Pitch: 2.74 ± 0.24
- Roll: -1.68 ± 0.4
- Filename: Vert20041027114823r.csv

**NOTES**

1) Wind–rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (±) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment
Velocity Profile – Lower Fox River – OU3–5B1
10/27/2004 10:45:22

Vertical averaged water flow: 0.62 ft/s, to direction 35.9°
Average wind conditions: 15.51 mi/h, from direction 52.4°

CALCULATED SHEAR STRESS PARAMETERS
Shear stress (LP) (dyn/cm²): 1.08 [0.99 ≤ τ ≤ 1.18]
Shear stress (LP, 6–10% depth) (dyn/cm²): 3.53 [3.03 ≤ τ ≤ 4.07]
Shear stress (TKE) (dyn/cm²): 1.09
Shear velocity (cm/s): 1.04 [1 ≤ u ≤ 1.09]
Bottom roughness, Kₜ (cm): 0.94
Boundary Reynolds number: 97.5 Test: PASS

ADCP DEPLOYMENT DETAILS
Avg. water depth (ft): 16.11
Water mode: 11
Water–cell size (cm): 1
Blanking dist. (cm): 25
Field recorded offset (cm): 320
Actual offset (cm): 320
Latitude: 44° 25' 52.8" N
Longitude: 88° 4' 17.5" W
Field recorded ADCP depth (ft): 16.1
Field recorded depthfinder depth (ft): 16.1
Total number of recorded ensembles: 302
Heading: 302.98 ± 4.98
Pitch: 1.3 ± 1.01
Roll: −0.35 ± 0.61
Filename: Vert20041027104522r.csv

NOTES
1) Wind–rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (+/−) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment
Velocity Profile – Lower Fox River – OU3–5B2

Vertically averaged water flow: 0.64 ft/s, to direction 38.4°
Average wind conditions: 15.51 mi/h, from direction 52.4°

CALCULATED SHEAR STRESS PARAMETERS
Shear stress (LP) (dyn/cm²): 1.39 [1.27 ≤ τ ≤ 1.51]
Shear stress (LP, 6–10% depth) (dyn/cm²): 4.47 [3.82 ≤ τ ≤ 5.17]
Shear stress (TKE) (dyn/cm²): 0.8
Shear velocity (cm/s): 1.18 [1.13 ≤ u ≤ 1.23]
Bottom roughness, Ks (cm): 3.59
Boundary Reynolds number: 423.08 Test: PASS

ADCP DEPLOYMENT DETAILS
Avg. water depth (ft): 16.28
Water mode: 11
Water-cell size (cm): 1
Blanking dist. (cm): 25
Field recorded offset (cm): 229
Actual offset (cm): 229
Latitude: 44° 25.52.8’ N
Longitude: 88° 4’ 17.5” W
Field recorded ADCP depth (ft): 16.1
Field recorded depthfinder depth (ft): 16.1
Total number of recorded ensembles: 311
Heading: 1.29 ± 8.04
Pitch: -0.12 ± 1.66
Roll: 2.09 ± 0.97
Filename:Vert20041027105509r.csv

NOTES
1) Wind−rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (+/−) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment
**Velocity Profile – Lower Fox River – OU3–5C**

10/27/2004 11:17:36

![Graph showing velocity profile](image)

**Vertically averaged water flow:** 0.3 ft/s, to direction 69.2°

**Average wind conditions:** 15 mi/h, from direction 50°

**Calculated Shear Stress Parameters**

- **Shear stress (LP) (dyn/cm²):** 0.24 \(0.18 \leq \tau \leq 0.3\)
- **Shear stress (LP, 6–10% depth) (dyn/cm²):** 0.25 \([0.11 \leq \tau \leq 0.44]\)
- **Shear stress (TKE) (dyn/cm²):** 0.41
- **Shear velocity (cm/s):** 0.49 \([0.43 \leq u \leq 0.55]\)
- **Bottom roughness, \(k_s\) (cm):** 1.32
- **Boundary Reynolds number:** 64.59 Test: MAYBE

**ADCP Deployment Details**

- Avg. water depth (ft): 6.65
- Water mode: 11
- Water-cell size (cm): 1
- Blanking dist. (cm): 25
- Field recorded offset (cm): 21.3
- Actual offset (cm): 21.3
- Latitude: 44° 25' 51.7" N
- Longitude: 88° 4' 16.6" W
- Field recorded ADCP depth (ft): 6.6
- Field recorded depthfinder depth (ft): 6.4
- Total number of recorded ensembles: 312
- Heading: 195.63 ± 2.99
- Pitch: 2.58 ± 0.34
- Roll: −1.78 ± 0.27
- Filename: Vert20041027111736r.csv

**Notes**

1) **Wind–rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions**
2) **Average wind conditions calculated for conditions within an hour (+−) of sampling time**
3) **Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment**
Velocity Profile – Lower Fox River – OU3–6A1
10/27/2004 10:08:15

Vertically averaged water flow: 0.33 ft/s, to direction 29.4°
Average wind conditions: 15.51 mi/h, from direction 52.4°

CALCULATED SHEAR STRESS PARAMETERS
Shear stress (LP) (dyn/cm²): 0.62 [0.38 ≤ τ ≤ 0.92]
Shear stress (LP, 6–10% depth) (dyn/cm²): 0.55 [0.12 ≤ τ ≤ 1.29]
Shear stress (TKE) (dyn/cm²): 0.47
Shear velocity (cm/s): 0.79 [0.62 ≤ u ≤ 0.96]
Bottom roughness, Ks (cm): 9.3
Boundary Reynolds number: 734.48 Test: PASS

ADCP DEPLOYMENT DETAILS
Avg. water depth (ft): 5.98
Water mode: 11
Water-cell size (cm): 1
Blanking dist. (cm): 25
Field recorded offset (cm): 21.3
Actual offset (cm): 21.3
Latitude: 44° 26' 15.3" N
Longitude: 88° 4' 12.7" W
Field recorded ADCP depth (ft): 5.9
Field recorded depthfinder depth (ft): 5.9
Total number of recorded ensembles: 181
Heading: 23.17 ± 1.58
Pitch: 3.21 ± 0.1
Roll: -0.72 ± 0.18
Filename: Vert20041027100815r.csv

NOTES
1) Wind–rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (+/−) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment
Velocity Profile – Lower Fox River – OU3–6A2


Vertically averaged water flow: 0.33 ft/s, to direction 29.6°
Average wind conditions: 15.51 mi/h, from direction 52.4°

CALCULATED SHEAR STRESS PARAMETERS
Shear stress (LP) (dyn/cm²): 0.47 [0.38 ≤ τ ≤ 0.58]
Shear stress (LP, 6–10% depth) (dyn/cm²): 1.68 [−0.02 ≤ τ ≤ 7.51]
Shear stress (TKE) (dyn/cm²): 0.38
Shear velocity (cm/s): 0.69 [0.61 ≤ u ≤ 0.76]
Bottom roughness, Ks (cm): 6.47
Boundary Reynolds number: 443.9 Test: PASS

ADCP DEPLOYMENT DETAILS
Avg. water depth (ft): 5.96
Water mode: 11
Water-cell size (cm): 1
Blanking dist. (cm): 25
Field recorded offset (cm): 21.3
Actual offset (cm): 21.3
Latitude: 44° 26' 15.3" N
Longitude: 88° 4' 12.7" W
Field recorded ADCP depth (ft): 5.9
Field recorded depthfinder depth (ft): 5.9
Total number of recorded ensembles: 302
Heading: 24.45 ± 1.34
Pitch: 3.21 ± 0.09
Roll: −0.66 ± 0.16
Filename: Vert20041027101321r.csv

NOTES
1) Wind–rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (+/−) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment
**Velocity Profile – Lower Fox River – OU3–6B1**


- **10–20% depth:** \( y = 7.85x - 4.78 \)
- **6–10% depth:** \( y = 10.8x - 7.07 \)
- \( r^2 = 0.97 \) for 10–20% depth
- \( r^2 = 0.98 \) for 6–10% depth

**CALCULATED SHEAR STRESS PARAMETERS**

- Shear stress (LP) (dyn/cm\(^2\)): \( 2.54 \) [\( 2.31 \leq \tau \leq 2.77 \)]
- Shear stress (LP, 6–10% depth) (dyn/cm\(^2\)): \( 1.35 \) [\( NaN \leq \tau \leq NaN \)]
- Shear stress (TKE) (dyn/cm\(^2\)): \( 0 \)
- Shear velocity (cm/s): \( 1.59 \) [\( 1.52 \leq u^* \leq 1.67 \)]
- Bottom roughness, \( K_s \) (cm): \( 7.7 \)
- Boundary Reynolds number: 1226.28 Test: PASS

**ADCP DEPLOYMENT DETAILS**

- Avg. water depth (ft): 22.34
- Water mode: 11
- Water–cell size (cm): 1
- Blanking dist. (cm): 25
- Field recorded offset (cm): 320
- Actual offset (cm): 320
- Latitude: 44° 26' 14.7" N
- Longitude: 88° 4' 7.3" W
- Field recorded ADCP depth (ft): 22.3
- Field recorded depthfinder depth (ft): 22.4
- Total number of recorded ensembles: 300
- Heading: 207.84 ± 3.04
- Pitch: -0.35 ± 0.45
- Roll: -2.65 ± 0.7
- Filename: Vert20041027094255r.csv

**VELOCITY AT DE PERE**

**NOTES**

1) Wind–rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (+/-) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment

Vertically averaged water flow: 0.86 ft/s, to direction 20.3°
Average wind conditions: 15.51 mi/h, from direction 52.4°
Velocity Profile – Lower Fox River – OU3–6B2

Vertically averaged water flow: 0.87 ft/s, to direction 22.8°
Average wind conditions: 15.51 mi/h, from direction 52.4°

CALCULATED SHEAR STRESS PARAMETERS
Shear stress (LP) (dyn/cm²): 2.36 [2.2 ≤ τ ≤ 2.53]
Shear stress (LP, 6–10% depth) (dyn/cm²): 1.59 [1.46 ≤ τ ≤ 1.72]
Shear stress (TKE) (dyn/cm²): 1.45
Shear velocity (cm/s): 1.54 [1.48 ≤ u ≤ 1.59]
Bottom roughness, Kₛ (cm): 4
Boundary Reynolds number: 615.41 Test: PASS

ADCP DEPLOYMENT DETAILS
Avg. water depth (ft): 22.29
Water mode: 11
Water-cell size (cm): 2
Blanking dist. (cm): 25
Field recorded offset (cm): 320
Actual offset (cm): 320
Latitude: 44° 26' 14.7" N
Longitude: 88° 4' 7.3" W
Field recorded ADCP depth (ft): 22.3
Field recorded depthfinder depth (ft): 22.4
Total number of recorded ensembles: 300
Heading: 206.02 ± 3.41
Pitch: 0.02 ± 0.63
Roll: –2.55 ± 0.64
Filename: Vert20041027095123r.csv

NOTES
1) Wind–rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (+/−) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment
Velocity Profile – Lower Fox River – OU3–6C

10/27/2004 9:28:40

Vertically averaged water flow: 0.74 ft/s, to direction 19.2°
Average wind conditions: 15.51 mi/h, from direction 52.4°

**CALCULATED SHEAR STRESS PARAMETERS**

- Shear stress (LP) (dyn/cm²): 0.81 [0.73 ≤ τ ≤ 0.9]
- Shear stress (LP, 6–10% depth) (dyn/cm²): 1.35 [1.16 ≤ τ ≤ 1.54]
- Shear stress (TKE) (dyn/cm²): 0.67
- Shear velocity (cm/s): 0.9 [0.86 ≤ u ≤ 0.95]
- Bottom roughness, Kₚ (cm): 0.1
- Boundary Reynolds number: 9.1 Test: MAYBE

**ADCP DEPLOYMENT DETAILS**

- Avg. water depth (ft): 11.88
- Water mode: 11
- Water-cell size (cm): 1
- Blanking dist. (cm): 25
- Field recorded offset (cm): NA
- Actual offset (cm): 107
- Latitude: 44° 26' 13.1'' N
- Longitude: 88° 4' 4.7'' W
- Field recorded ADCP depth (ft): 11.9
- Field recorded depthfinder depth (ft): 11.8
- Total number of recorded ensembles: 304
- Heading: 199.1° ± 1.64
- Pitch: 2.58° ± 0.14
- Roll: -1.29° ± 0.54
- Filename: Vert20041027092840r.csv

**NOTES**

1) Wind-rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (+/-) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment
Velocity Profile – Lower Fox River – OU3–7A
10/27/2004 8:44:24

Vertically averaged water flow: 0.59 ft/s, to direction 39.3°
Average wind conditions: 15.73 mi/h, from direction 50°

CALCULATED SHEAR STRESS PARAMETERS
Shear stress (LP) (dyn/cm²): 1.81 [1.65 ≤ τ ≤ 1.99]
Shear stress (LP, 6–10% depth) (dyn/cm²): 1.13 [1.07 ≤ τ ≤ 1.2]
Shear stress (TKE) (dyn/cm²): 0.54
Shear velocity (cm/s): 1.35 [1.28 ≤ u ≤ 1.41]
Bottom roughness, Ks (cm): 13.5
Boundary Reynolds number: 1816.6 Test: PASS

ADCP DEPLOYMENT DETAILS
Avg. water depth (ft): 18.91
Water mode: 11
Water–cell size (cm): 1
Blanking dist. (cm): 25
Field recorded offset (cm): 320
Actual offset (cm): 320
Latitude: 44° 26' 28.4" N
Longitude: 88° 3' 59.2" W
Field recorded ADCP depth (ft): 18.9
Field recorded depthfinder depth (ft): 18.9
Total number of recorded ensembles: 303
Heading: 42 ± 3.2°
Pitch: 3.19 ± 1
Roll: 1.45 ± 1.18
Filename:Vert20041027084424r.csv

NOTES
1) Wind–rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (+/-) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment
Velocity Profile – Lower Fox River – OU3–7B
10/27/2004 8:59:11

Vertically averaged water flow: 0.41 ft/s, to direction 24°
Average wind conditions: 15.73 mi/h, from direction 50°

CALCULATED SHEAR STRESS PARAMETERS
Shear stress (LP) (dyn/cm²): 1 [0.89 ≤ τ ≤ 1.1]
Shear stress (LP, 6–10% depth) (dyn/cm²): 0.49 [0.42 ≤ τ ≤ 0.57]
Shear stress (TKE) (dyn/cm²): 0.27
Shear velocity (cm/s): 1 [0.94 ≤ u ≤ 1.05]
Bottom roughness, Ks (cm): 13.28
Boundary Reynolds number: 1325.26 Test: PASS

ADCP DEPLOYMENT DETAILS
Avg. water depth (ft): 10
Water mode: 11
Water-cell size (cm): 1
Blanking dist. (cm): 25
Field recorded offset (cm): 107
Actual offset (cm): 107
Latitude: 44° 26’ 25.8” N
Longitude: 88° 3’ 54.4” W
Field recorded ADCP depth (ft): 10
Field recorded depthfinder depth (ft): 9.8
Total number of recorded ensembles: 302
Heading: 3.92 ± 0.97
Pitch: 1.68 ± 0.13
Roll: -1.03 ± 0.19
Filename: Vert20041027085911r.csv

NOTES
1) Wind–rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (+/-) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment
CALCULATED SHEAR STRESS PARAMETERS

Shear stress (LP) (dyn/cm²): 0.35 \([0.29 \leq \tau \leq 0.41]\)
Shear stress (LP, 6–10% depth) (dyn/cm²): 0.32 \([0.26 \leq \tau \leq 0.38]\)
Shear stress (TKE) (dyn/cm²): 0.37
Shear velocity (cm/s): 0.59 \([0.54 \leq u \leq 0.64]\)
Bottom roughness, \(K_s\) (cm): 0.14
Boundary Reynolds number: 7.95 Test: MAYBE

ADCP DEPLOYMENT DETAILS

Avg. water depth (ft): 11.15
Water mode: 11
Water-cell size (cm): 1
Blanking dist. (cm): 25
Field recorded offset (cm): 107
Actual offset (cm): 107
Latitude: 44° 26' 29" N
Longitude: 88° 4' 0.8" W
Field recorded ADCP depth (ft): 11.3
Field recorded depthfinder depth (ft): 10.4
Total number of recorded ensembles: 307
Heading: 44.84 ± 5.52
Pitch: 2.99 ± 0.10
Roll: −2.69 ± 0.23
Filename: Vert20041027082951r.csv

NOTES

1) Wind–rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (±) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment

Vertically averaged water flow: 0.48 ft/s, to direction 41.2°
Average wind conditions: 15.73 mi/h, from direction 50°

Effective depth limit
10 percent of depth above bottom
20 percent of depth above bottom
Velocity point USED in regression
Shear–stress estimate
Velocity point NOT USED in regression
20 percent of depth above bottom
10 percent of depth above bottom
Effective depth limit

DAILY WIND ROSE

VELOCITY AT DE PERE
Estimates of Shear Stress and Measurements of Water Levels in the Lower Fox River near Green Bay, Wisconsin

Velocity Profile – Lower Fox River – OU3–8A
10/26/2004 16:58:51

Vertically averaged water flow: 0.73 ft/s, to direction 29.2°
Average wind conditions: 13.76 mi/h, from direction 70°

CALCULATED SHEAR STRESS PARAMETERS
Shear stress (LP) (dyn/cm²): 1.89 [1.75 ≤ τ ≤ 2.03]
Shear stress (LP, 6–10% depth) (dyn/cm²): 1.09 [0.94 ≤ τ ≤ 1.25]
Shear stress (TKE) (dyn/cm²): 0.66
Shear velocity (cm/s): 1.37 [1.32 ≤ u ≤ 1.42]
Bottom roughness, Ks (cm): 3.83
Boundary Reynolds number: 525.49 Test: PASS

ADCP DEPLOYMENT DETAILS
Avg. water depth (ft): 18.37
Water mode: 11
Water-cell size (cm): 1
Blanking dist. (cm): 25
Field recorded offset (cm): 320
Actual offset (cm): 320
Latitude: 44° 26’ 35.8” N
Longitude: 88° 3’ 52.3” W
Field recorded ADCP depth (ft): 18.4
Field recorded depthfinder depth (ft): 18.2
Total number of recorded ensembles: 301
Heading: 343.62 ± 6.76
Pitch: 3.8 ± 0.49
Roll: -3.68 ± 1.68
Filename: Vert20041026165851r.csv

NOTES
1) Wind−rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (+/−) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment
Velocity Profile – Lower Fox River – OU3−8B
10/26/2004 16:43:36

Vertically averaged water flow: 0.8 ft/s, to direction 27.8°
Average wind conditions: 13.76 mi/h, from direction 70°

CALCULATED SHEAR STRESS PARAMETERS
Shear stress (LP) (dyn/cm²): 1.45 [1.33 ≤ τ ≤ 1.57]
Shear stress (LP, 6–10% depth) (dyn/cm²): 2.78 [2.65 ≤ τ ≤ 2.92]
Shear stress (TKE) (dyn/cm²): 1.23
Shear velocity (cm/s): 1.2 [1.15 ≤ u ≤ 1.25]
Bottom roughness, Ks (cm): 0.63
Boundary Reynolds number: 76.09 Test: PASS

ADCP DEPLOYMENT DETAILS
Avg. water depth (ft): 18.2
Water mode: 11
Water−cell size (cm): 1
Blanking dist. (cm): 25
Field recorded offset (cm): 320
Actual offset (cm): 320
Latitude: 44° 26’ 34.7” N
Longitude: 88° 3’ 50.4” W
Field recorded ADCP depth (ft): 18.2
Field recorded depthfinder depth (ft): 18
Total number of recorded ensembles: 301
Heading: 0.68 ± 3.65
Pitch: 2.3 ± 0.62
Roll: −1.13 ± 1.12
Filename: Vert20041026164336r.csv

NOTES
1) Wind−rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (+/−) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment

DAILY WIND ROSE

VELOCITY AT DE PERE
Velocity Profile – Lower Fox River – OU3–8R
10/26/2004 16:28:52

Vertically averaged water flow: 0.3 ft/s, to direction 16.4°
Average wind conditions: 13.76 mi/h, from direction 70°

CALCULATED SHEAR STRESS PARAMETERS
Shear stress (LP) (dyn/cm²): 0.2 [0.02 ≤ τ ≤ 0.6]
Shear stress (LP, 6–10% depth) (dyn/cm²): 0.36 [0.3 ≤ τ ≤ 0.43]
Shear stress (TKE) (dyn/cm²): 0.3
Shear velocity (cm/s): −0.45 [−0.13 ≤ u ≤ −0.78]
Bottom roughness, K_s (cm): 17207398
Boundary Reynolds number: −778210958.19 Test: FAIL

ADCP DEPLOYMENT DETAILS
Avg. water depth (ft): 11.25
Water mode: 11
Water-cell size (cm): 1
Blanking dist. (cm): 25
Field recorded offset (cm): 107
Actual offset (cm): 107
Latitude: 44° 26’ 23.3” N
Longitude: 88° 3’ 47” W
Field recorded ADCP depth (ft): 11.3
Field recorded depthfinder depth (ft): 11.4
Total number of recorded ensembles: 300
Heading: 36.76 ± 3.35
Pitch: 1.66 ± 0.3
Roll: −1.42 ± 0.62
Filename: Vert20041026162852r.csv

NOTES
1) Wind-rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (+/-) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment
Vertically averaged water flow: 0.52 ft/s, to direction 42.9°
Average wind conditions: 13.82 mi/h, from direction 67.2°

CALCULATED SHEAR STRESS PARAMETERS
Shear stress (LP) (dyn/cm²): 1.53 [1.13 ≤ τ ≤ 2]
Shear stress (LP, 6–10% depth) (dyn/cm²): 1.79 [1.17 ≤ τ ≤ 2.54]
Shear stress (TKE) (dyn/cm²): 1.14
Shear velocity (cm/s): 1.24 [1.06 ≤ u ≤ 1.41]
Bottom roughness, Kn (cm): 10.58
Boundary Reynolds number: 1308.58 Test: PASS

ADCP DEPLOYMENT DETAILS
Avg. water depth (ft): 6.93
Water mode: 11
Water-cell size (cm): 1
Blanking dist. (cm): 25
Field recorded offset (cm): 21.3
Actual offset (cm): 21.3
Latitude: 44° 24’ 24.0” N
Longitude: 88° 5’ 48.2” W
Field recorded ADCP depth (ft): 6.9
Field recorded depthfinder depth (ft): 6.5
Total number of recorded ensembles: 97
Heading: 186.89 ± 2.34
Pitch: 2.97 ± 0.35
Roll: −1.9 ± 0.22
Filename: Vert20041027142247r.csv

NOTES
1) Wind–rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (+−) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment.
Velocity Profile – Lower Fox River – OU3–SUPP2
10/27/2004 14:25:42

Vertically averaged water flow: 0.54 ft/s, to direction 41.3°
Average wind conditions: 13.82 mi/h, from direction 67.2°

CALCULATED SHEAR STRESS PARAMETERS
Shear stress (LP) (dyn/cm²): 0.89 [0.7 ≤ τ ≤ 1.11]
Shear stress (LP, 6–10% depth) (dyn/cm²): 2.93 [1.48 ≤ τ ≤ 4.86]
Shear stress (TKE) (dyn/cm²): 0.85
Shear velocity (cm/s): 0.94 [0.84 ≤ u ≤ 1.05]
Bottom roughness, Ks (cm): 2.18
Boundary Reynolds number: 205.37 Test: PASS

ADCP DEPLOYMENT DETAILS
Avg. water depth (ft): 6.98
Water mode: 11
Water–cell size (cm): 1
Blanking dist. (cm): 25
Field recorded offset (cm): 21.3
Actual offset (cm): 21.3
Latitude: 44° 24’ 20.7” N
Longitude: 88° 5’ 48.2” W
Field recorded ADCP depth (ft): 6.9
Field recorded depthfinder depth (ft): 6.5
Total number of recorded ensembles: 62
Heading: 185.47 ± 3.27
Pitch: 3.41 ± 0.49
Roll: -1.61 ± 0.41
Filename: Vert20041027142542r.csv

NOTES
1) Wind–rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (+/-) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment
June 2003 Velocity Profiles (OU–4)

Results from the June, 2003, shakedown cruise were often given only a transect label without being assigned a site ID letter (A, B, C, etc.) In cases where the site ID is missing or unclear, the recorded coordinate data should be used to verify the actual position of the ADCP deployment.
**Velocity Profile – Lower Fox River – OU4–2**


Vertically averaged water flow: 0.09 ft/s, to direction 38.4°
Average wind conditions: 7.62 mi/h, from direction 200°

**CALCULATED SHEAR STRESS PARAMETERS**

- Shear stress (LP) (dyn/cm²): 7.64 [NaN ≤ τ ≤ NaN]
- Shear stress (LP, 6–10% depth) (dyn/cm²): 0.23 [NaN ≤ τ ≤ NaN]
- Shear stress (TKE) (dyn/cm²): 0
- Shear velocity (cm/s): −2.76 [NaN ≤ u* ≤ NaN]
- Bottom roughness, Kₚ (cm): 5607.83
- Boundary Reynolds number: −1549996.27 Test: FAIL

**ADCP DEPLOYMENT DETAILS**

- Avg. water depth (ft): 20.32
- Water mode: 1
- Water-cell size (cm): 25
- Blanking dist. (cm): 25
- Field recorded offset (cm): NA
- Actual offset (cm): 21.3
- Longitude: 88° 3' 24.9" W
- Field recorded ADCP depth (ft): ---
- Field recorded depthfinder depth (ft): ---
- Total number of recorded ensembles: 1021
- Heading: 124.25 ± 1.45
- Pitch: 6.87 ± 0.75
- Roll: 0.83 ± 0.31
- File name: FoxHydro20030623182347r.csv

**NOTES**

1) Wind-rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (+/-) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment
Velocity Profile – Lower Fox River – OU4-2
6/24/2003 17:42:23

10–20% depth: \( y = 16.7x - 2.41 \), \( r^2 = 0.95 \)
6–10% depth: \( y = 19.6x - 3 \), \( r^2 = 0.97 \)

Vertically averaged water flow: 0.16 ft/s, to direction 4.3°
Average wind conditions: 15.15 mi/h, from direction 203°

CALCULATED SHEAR STRESS PARAMETERS
Shear stress (LP) (dyn/cm²): 0.56 [0.31 ≤ τ ≤ 0.88]
Shear stress (LP, 6–10% depth) (dyn/cm²): 0.41 [0.08 ≤ τ ≤ 0.98]
Shear stress (TKE) (dyn/cm²): 0.31
Shear velocity (cm/s): 0.75 [0.56 ≤ u* ≤ 0.94]
Bottom roughness, \( K_s \) (cm): 82.5
Boundary Reynolds number: 6166.04 Test: PASS

ADCP DEPLOYMENT DETAILS
Avg. water depth (ft): 12.67
Water mode: 5
Water-cell size (cm): 5
Blanking dist. (cm): 25
Field recorded offset (cm): NA
Actual offset (cm): 18.3
Latitude: 44° 27' 41.7" N
Longitude: 88° 3' 26.2" W
Field recorded ADCP depth (ft): —
Field recorded depthfinder depth (ft): —
Total number of recorded ensembles: 79
Heading: 214.18 ± 4.51
Pitch: –1.82 ± 0.61
Roll: –1.87 ± 0.48
Filename: FoxHydro20030624174223r.csv

NOTES
1) Wind–rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (+/-) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment
Veritcaly averaged water flow: 0.01 ft/s, to direction 269.8°
Average wind conditions:  8.8 mi/h, from direction 196.1°

CALCULATED SHEAR STRESS PARAMETERS
Shear stress (LP) (dyn/cm²): 2.28 [1.6 ≤ τ ≤ 3.07]
Shear stress (LP, 6−10% depth) (dyn/cm²): 0.23 [−0.63 ≤ τ ≤ 3.09]
Shear stress (TKE) (dyn/cm²): 0.12
Shear velocity (cm/s): −1.51 [−1.26 ≤ u∗ ≤ −1.75]
Bottom roughness, Ks (cm): 6627.97
Boundary Reynolds number: −10003.04  Test:  FAIL

ADCP DEPLOYMENT DETAILS
Avg. water depth (ft): 16.63
Water mode: 5
Water−cell size (cm): 5
Blanking dist. (cm): 25
Field recorded offset (cm): 213
Actual offset (cm): 213
Latitude: 44° 28' 16.9" N
Longitude: 88° 3' 2.1" W
Field recorded ADCP depth (ft): 16.6
Field recorded depthinder depth (ft): 16.4
Total number of recorded ensembles: 595
Heading: 207.06 ± 5.43
Pitch: -6.29 ± 6.12
Roll: -1.35 ± 1.22
Filename: Transect3200030625135049r.csv

NOTES
1) Wind−rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (+−) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment
Velocity Profile – Lower Fox River – OU4-4
6/24/2003 17:45:21

Vertically averaged water flow: 0.09 ft/s, to direction 237.2°
Average wind conditions: 15.15 mi/h, from direction 203°

CALCULATED SHEAR STRESS PARAMETERS
Shear stress (LP) (dyn/cm²): 0.09 [0.05 ≤ τ ≤ 0.15]
Shear stress (LP, 6–10% depth) (dyn/cm²): 0.04 [−0.02 ≤ τ ≤ 0.27]
Shear stress (TKE) (dyn/cm²): 0.38
Shear velocity (cm/s): 0.3 [0.22 ≤ u ≤ 0.39]
Bottom roughness, K_s (cm): 50.9
Boundary Reynolds number: 1546.38 Test: PASS

ADCP DEPLOYMENT DETAILS
Avg. water depth (ft): 12.85
Water mode: 5
Water-cell size (cm): 25
Blanking dist. (cm): 25
Field recorded offset (cm): NA
Actual offset (cm): 18.3
Latitude: 44° 27′ 41.7″ N
Longitude: 88° 3′ 26.2″ W
Field recorded ADCP depth (ft): --
Field recorded depthfinder depth (ft): --
Total number of recorded ensembles: 563
Heading: 211.46 ± 5.31
Pitch: −0.01 ± 1.36
Roll: −2.74 ± 0.96
Filename:FoxHydro20030624174521r.csv

NOTES
1) Wind–rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (±1) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment.
Velocity Profile – Lower Fox River – OU4–4
6/27/2003 11:16:10

Vertically averaged water flow: 0.5 ft/s, to direction 32.5°
Average wind conditions: 8.72 mi/h, from direction 243.9°

CALCULATED SHEAR STRESS PARAMETERS
Shear stress (LP) (dyn/cm²): 0.61 [0.44 ≤ τ ≤ 0.8]
Shear stress (LP, 6–10% depth) (dyn/cm²): 0.97 [0.36 ≤ τ ≤ 1.87]
Shear stress (TKE) (dyn/cm²): 0.09
Shear velocity (cm/s): 0.78 [0.66 ≤ u* ≤ 0.89]
Bottom roughness, Kₜ (cm): 1.5
Boundary Reynolds number: 116.95 Test: PASS

ADCP DEPLOYMENT DETAILS
Avg. water depth (ft): 8.26
Water mode: 5
Water-cell size (cm): 5
Blanking dist. (cm): 25
Field recorded offset (cm): NA
Actual offset (cm): 24.4
Latitude: 44° 28' 40.8" N
Longitude: 88° 2' 39" W
Field recorded ADCP depth (ft): 8.35
Field recorded depthfinder depth (ft): ---
Total number of recorded ensembles: 551
Heading: 244.29 ± 3.93
Pitch: 1.53 ± 0.49
Roll: 0.06 ± 0.76
Filename: Transect420030627111610r.csv

NOTES
1) Wind-rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (+/-) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment
Velocity Profile – Lower Fox River – OU4–4R
6/27/2003 11:37:05

Vertically averaged water flow: 0.44 ft/s, to direction 28.2°
Average wind conditions: 8.72 mi/h, from direction 243.9°

CALCULATED SHEAR STRESS PARAMETERS
Shear stress (LP) (dyn/cm²): 0.41 [0 ≤ τ ≤ 1.72]
Shear stress (LP, 6–10% depth) (dyn/cm²): NA [NA ≤ τ ≤ NA]
Shear stress (TKE) (dyn/cm²): 0.14
Shear velocity (cm/s): 0.64 [−0.04 ≤ u* ≤ 1.31]
Bottom roughness, Ks (cm): 0.52
Boundary Reynolds number: 33.43 Test: MAYBE

ADCP DEPLOYMENT DETAILS
Avg. water depth (ft): 4.79
Water mode: 11
Water-cell size (cm): 5
Blanking dist. (cm): 1
Field recorded offset (cm): NA
Actual offset (cm): 24.4
Latitude: 0° 0’ 0” N
Longitude: 0° 0’ 0” W
Field recorded ADCP depth (ft): --
Field recorded depthfinder depth (ft): --
Total number of recorded ensembles: 541
Heading: 245.27 ± 1.8
Pitch: 0.94 ± 0.6
Roll: 0.61 ± 1.04
Filename: Transect420030627113705r.csv

DAILY WIND ROSE

NOTES
1) Wind–rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (±1) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment
Vertically averaged water flow: 0.08 ft/s, to direction 214.9°

Average wind conditions: 10.73 mi/h, from direction 254.3°

CALCULATED SHEAR STRESS PARAMETERS
Shear stress (LP) (dyn/cm²): 0.03 [−0.07 ≤ τ ≤ 0.35]
Shear stress (LP, 6–10% depth) (dyn/cm²): 0.28 [−4.58 ≤ τ ≤ 10.18]
Shear stress (TKE) (dyn/cm²): 0.45
Shear velocity (cm/s): −0.17 [0.26 ≤ u* ≤ −0.59]
Bottom roughness, Ks (cm): 3035465
Boundary Reynolds number: −50364250.59 Test: FAIL

ADCP DEPLOYMENT DETAILS
Avg. water depth (ft): 8.16
Water mode: 5
Water-cell size (cm): 5
Blanking dist. (cm): 25
Field recorded offset (cm): NA
Actual offset (cm): 24.4
Latitude: 0° 0’ 0” N
Longitude: 0° 0’ 0” W

Field recorded ADCP depth (ft): ---
Field recorded depthfinder depth (ft): 8
Total number of recorded ensembles: 585
Heading: 231.47 ± 3.02
Pitch: 1.67 ± 0.48
Roll: 0.05 ± 1.6
Filename: Transect520030627134605r.csv

NOTES
1) Wind-rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (+/-) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment
Vertically averaged water flow: 0.05 ft/s, to direction 222.7°
Average wind conditions: 15.55 mi/h, from direction 260°

CALCULATED SHEAR STRESS PARAMETERS
Shear stress (LP) (dyn/cm²): 0.01 [0 ≤ τ ≤ 0.03]
Shear stress (LP, 6–10% depth) (dyn/cm²): NA [NA ≤ τ ≤ NA]
Shear stress (TKE) (dyn/cm²): 0.02
Shear velocity (cm/s): −0.09 [−0.01 ≤ u* ≤ −0.17]
Bottom roughness, K_s (cm): 756712.9
Boundary Reynolds number: −6696194.51 Test: FAIL

ADCP DEPLOYMENT DETAILS
Avg. water depth (ft): 4.27
Water mode: 5
Water-cell size (cm): 5
Blanking dist. (cm): 25
Field recorded offset (cm): NA
Actual offset (cm): 24.4
Latitude: 0° 0’ 0” N
Longitude: 0° 0’ 0” W
Field recorded ADCP depth (ft): ---
Field recorded depthfinder depth (ft): 4.2
Total number of recorded ensembles: 936
Heading: 261.04 ± 3.21
Pitch: 2.01 ± 0.5
Roll: −1.67 ± 1.08
Filename: Transect520030627140945r.csv

NOTES
1) Wind–rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (+/−) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment
Velocity Profile – Lower Fox River – OU4–6
6/26/2003 9:40:30

Vertically averaged water flow: 0.11 ft/s, to direction 228°
Average wind conditions: 12.51 mi/h, from direction 232.7°

CALCULATED SHEAR STRESS PARAMETERS
Shear stress (LP) (dyn/cm²): 0.25 [0.19 ≤ τ ≤ 0.31]
Shear stress (LP, 6–10% depth) (dyn/cm²): 0.05 [-0.01 ≤ τ ≤ 0.27]
Shear stress (TKE) (dyn/cm²): 0.28
Shear velocity (cm/s): −0.5 [−0.44 ≤ u* ≤ −0.56]
Bottom roughness, Ks (cm): 226437.7
Boundary Reynolds number: −11288385.12 Test: FAIL

ADCP DEPLOYMENT DETAILS
Avg. water depth (ft): 13
Water mode: 5
Water-cell size (cm): 5
Blanking dist. (cm): 25
Field recorded offset (cm): NA
Actual offset (cm): 24.4
Latitude: 44° 30′ 19.6″ N
Longitude: 88° 1′ 50.4″ W
Field recorded ADCP depth (ft): ---
Field recorded depthfinder depth (ft): ---
Total number of recorded ensembles: 494
Heading: 240.62 ± 4.9
Pitch: 1.35 ± 0.54
Roll: 0.97 ± 0.53
Filename: Transect620030626094030r.csv

NOTES
1) Wind–rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (±1) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment
Velocity Profile – Lower Fox River – OU4–7


Vertically averaged water flow: 0.32 ft/s, to direction 10.9°
Average wind conditions: 15.68 mi/h, from direction 263.2°

CALCULATED SHEAR STRESS PARAMETERS
Shear stress (LP) (dyn/cm²): 1 [0.8 ≤ τ ≤ 1.23]
Shear stress (LP, 6–10% depth) (dyn/cm²): 0.42 [0.26 ≤ τ ≤ 0.61]
Shear stress (TKE) (dyn/cm²): 0.25
Shear velocity (cm/s): 1 [0.89 ≤ u* ≤ 1.11]
Bottom roughness, K_s (cm): 64.06
Boundary Reynolds number: 6417.22 Test: PASS

ADCP DEPLOYMENT DETAILS
Avg. water depth (ft): 15.86
Water mode: 5
Water-cell size (cm): 5
Blanking dist. (cm): 25
Field recorded offset (cm): 152
Actual offset (cm): 152
Latitude: 44° 30’ 59.76” N
Longitude: 88° 0’ 57.13” W
Field recorded ADCP depth (ft): ---
Field recorded depthfinder depth (ft): --- Total number of recorded ensembles: 532
Heading: 182.35 ± 3.17 Pitch: 0.2 ± 0.91 Roll: 0.54 ± 1.71 Filename: Transect720030626131423r.csv

NOTES
1) Wind–rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (+/-) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment
November 2003 Velocity Profiles (OU–4)
Velocity Profile – Lower Fox River – OU4–1A
11/5/2003 11:01:02

10–20% depth: \( y = 9.01x - 6.25 \), \( r^2 = 0.91 \)
6–10% depth: \( y = 1.87x - 2.99 \), \( r^2 = 0.97 \)

Vertically averaged water flow: 0.7 ft/s, to direction 31.7°
Average wind conditions: 9.17 mi/h, from direction 283.1°

CALCULATED SHEAR STRESS PARAMETERS
Shear stress (LP) (dyn/cm²): 1.92 \([1.16 \leq \tau \leq 2.88]\)
Shear stress (LP, 6–10% depth) (dyn/cm²): 44.47 \([29.3 \leq \tau \leq 62.8]\)
Shear stress (TKE) (dyn/cm²): 2.3
Shear velocity (cm/s): 1.39 \([1.08 \leq u^* \leq 1.7]\)
Bottom roughness, \( K_s \) (cm): 1.77
Boundary Reynolds number: 244.86 Test: PASS

ADCP DEPLOYMENT DETAILS
Avg. water depth (ft): 4.13
Water mode: 11
Water-cell size (cm): 1
Blanking dist. (cm): 25
Field recorded offset (cm): 21.3
Actual offset (cm): 21.3
Latitude: 44° 27’ 21.8” N
Longitude: 88° 4’ 4.3” W
Field recorded ADCP depth (ft): ---
Field recorded depthfinder depth (ft): 4.1
Total number of recorded ensembles: 293
Heading: 253.73 ± 1.7
Pitch: 2.69 ± 0.6
Roll: -1.45 ± 0.57
Filename: Vert20031105110102r.csv

NOTES
1) Wind–rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (+/−) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment
Vertically averaged water flow: 1.06 ft/s, to direction 38.9°
Average wind conditions: 9.17 mi/h, from direction 283.1°
Velocity Profile – Lower Fox River – OU4–1B2
11/5/2003 11:16:42

Vertically averaged water flow: 1.07 ft/s, to direction 36.3°
Average wind conditions: 9.17 mi/h, from direction 283.1°

CALCULATED SHEAR STRESS PARAMETERS
Shear stress (LP) (dyn/cm²): 2.65 [1.97 ≤ τ ≤ 3.43]
Shear stress (LP, 6–10% depth) (dyn/cm²): NA [NA ≤ τ ≤ NA]
Shear stress (TKE) (dyn/cm²): 2.59
Shear velocity (cm/s): 1.63 [1.41 ≤ u_τ ≤ 1.85]
Bottom roughness, K_s (cm): 0.31
Boundary Reynolds number: 51.25 Test: MAYBE

ADCP DEPLOYMENT DETAILS
Avg. water depth (ft): 4.34
Water mode: 11
Water-cell size (cm): 1
Blanking dist. (cm): 25
Field recorded offset (cm): 21.3
Actual offset (cm): 21.3
Latitude: 44° 27’ 18.2” N
Longitude: 88° 4’ 1.2” W
Field recorded ADCP depth (ft): ---
Field recorded depthfinder depth (ft): 4.4
Total number of recorded ensembles: 274
Heading: 233.09 ± 1.95
Pitch: 2.43 ± 0.4
Roll: –1.21 ± 0.89
Filename:Vert20031105111642r.csv

NOTES
1) Wind–rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (+/-) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment
**Velocity Profile – Lower Fox River – OU4–1C1**

**11/5/2003 11:33:20**

**Vertically averaged water flow:** 1.07 ft/s, to direction 45.9°

**Average wind conditions:** 9.17 mi/h, from direction 283.1°

**CALCULATED SHEAR STRESS PARAMETERS**

- Shear stress (LP) (dyn/cm²): 4.26 \([3.75 \leq \tau \leq 4.79]\)
- Shear stress (LP, 6–10% depth) (dyn/cm²): 2.64 \([1.4 \leq \tau \leq 2.06]\)
- Shear stress (TKE) (dyn/cm²): 2.12
- Shear velocity (cm/s): 2.06 \([1.94 \leq u^* \leq 2.19]\)
- Bottom roughness, \(K_s\) (cm): 4.01
- Boundary Reynolds number: 827.93 Test: PASS

**ADCP DEPLOYMENT DETAILS**

- Avg. water depth (ft): 14.59
- Water mode: 11
- Water-cell size (cm): 1
- Blanking dist. (cm): 25
- Field recorded offset (cm): 213
- Actual offset (cm): 213
- Latitude: 44° 27’ 15.5” N
- Longitude: 88° 3’ 59” W
- Field recorded ADCP depth (ft): ---
- Field recorded depthfinder depth (ft): 14.6
- Total number of recorded ensembles: 143
- Heading: 243.63 ± 8.3
- Pitch: -3.09 ± 2.4
- Roll: -3.71 ± 2.73
- Filename: Vert20031105113320r.csv

**NOTES**

1) Wind–rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (+/-) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment
Velocity Profile – Lower Fox River – OU-4C2
11/5/2003 11:37:49

Vertically averaged water flow: 1.14 ft/s, to direction 43.1°
Average wind conditions: 9.17 mi/h, from direction 283.1°

CALCULATED SHEAR STRESS PARAMETERS
Shear stress (LP) (dyn/cm²): 2.61 [2.35 ≤ τ ≤ 2.89]
Shear stress (LP, 6–10% depth) (dyn/cm²): 1.86 [1.59 ≤ τ ≤ 2.15]
Shear stress (TKE) (dyn/cm²): 2.54
Shear velocity (cm/s): 1.62 [1.53 ≤ u* ≤ 1.7]
Bottom roughness, K₇ (cm): 0.37
Boundary Reynolds number: 60.39 Test: MAYBE

ADCP DEPLOYMENT DETAILS
Avg. water depth (ft): 14.45
Water mode: 11
Water-cell size (cm): 1
Blanking dist. (cm): 25
Field recorded offset (cm): 213
Actual offset (cm): 213
Latitude: 44° 27' 15.5" N
Longitude: 88° 3' 59.9" W

Field recorded ADCP depth (ft): --
Field recorded depthfinder depth (ft): 14.6
Total number of recorded ensembles: 236
Heading: 256.26 ± 6.22
Pitch: -2.12 ± 1.51
Roll: -4.77 ± 1.97
Filename: Vert20031105113749r.csv

NOTES
1) Wind-rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (+/-) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment.
Vertically averaged water flow: 0.08 ft/s, to direction 175.2°
Average wind conditions: 9.17 mi/h, from direction 283.1°

CALCULATED SHEAR STRESS PARAMETERS
Shear stress (LP) (dyn/cm²): 4.02 [−42.33 ≤ τ ≤ 110.58]
Shear stress (LP, 6–10% depth) (dyn/cm²): 0.03 [0.01 ≤ τ ≤ 0.06]
Shear stress (TKE) (dyn/cm²): 0.27
Shear velocity (cm/s): −2 [6.51 ≤ u* ≤ −10.52]
Bottom roughness, Ks (cm): 2523.59
Boundary Reynolds number: −505875.8 Test: FAIL

ADCP DEPLOYMENT DETAILS
Avg. water depth (ft): 11.55
Water mode: 11
Water-cell size (cm): 1
Blanking dist. (cm): 25
Field recorded offset (cm): 152
Actual offset (cm): 152
Latitude: 44° 27′ 10.8″ N
Longitude: 88° 3′ 54.6″ W
Field recorded ADCP depth (ft): --
Field recorded depthfinder depth (ft): 11.8
Total number of recorded ensembles: 262
Heading: 276.49 ± 2.78
Pitch: 1.49 ± 0.69
Roll: −0.18 ± 3.59
Filename: Vert20031105115552r.csv

NOTES
1) Wind-rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (+/-) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment.
Velocity Profile – Lower Fox River – OU4–1L
11/5/2003 10:48:03

Vertically averaged water flow: 0.35 ft/s, to direction 45°
Average wind conditions: 11.02 mi/h, from direction 291.1°

CALCULATED SHEAR STRESS PARAMETERS
Shear stress (LP) (dyn/cm²): 1.55 [0.16 ≤ τ ≤ 4.35]
Shear stress (LP, 6–10% depth) (dyn/cm²): 3.04 [1.96 ≤ τ ≤ 4.35]
Shear stress (TKE) (dyn/cm²): 3.83
Shear velocity (cm/s): 1.25 [0.41 ≤ u* ≤ 2.09]
Bottom roughness, Ks (cm): 11.99
Boundary Reynolds number: 1493.97 Test: PASS

ADCP DEPLOYMENT DETAILS
Avg. water depth (ft): 2.52
Water mode: 11
Water-cell size (cm): 1
Blanking dist. (cm): 25
Field recorded offset (cm): 21.3
Actual offset (cm): 21.3
Latitude: 0° 0' 0" N
Longitude: 0° 0' 0" W
Field recorded ADCP depth (ft): ---
Field recorded depthfinder depth (ft): 2.4
Total number of recorded ensembles: 187
Heading: 273.2 ± 3.99
Pitch: 2.1 ± 0.18
Roll: 1.54 ± 0.53
Filename: Vert20031105104803r.csv

NOTES
1) Wind–rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (+/-) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment
**Velocity Profile – Lower Fox River – OU4–2A**


Vertically averaged water flow: 0.4 ft/s, to direction 37.6°
Average wind conditions: 9.49 mi/h, from direction 288°

**CALCULATED SHEAR STRESS PARAMETERS**

- Shear stress (LP) (dyn/cm²): 0.84 \([0.42 \leq \tau \leq 1.39]\)
- Shear stress (LP, 6–10% depth) (dyn/cm²): 0.48 \([0.14 \leq \tau \leq 1.02]\)
- Shear stress (TKE) (dyn/cm²): 1.23
- Shear velocity (cm/s): 0.91 \([0.65 \leq u_\ast \leq 1.18]\)
- Bottom roughness, \(K_s\) (cm): 3.54
- Boundary Reynolds number: 323.63 Test: PASS

**ADCP DEPLOYMENT DETAILS**

- Avg. water depth (ft): 3.63
- Water mode: 11
- Water-cell size (cm): 1
- Blanking dist. (cm): 25
- Field recorded offset (cm): 18.3
- Actual offset (cm): 18.3
- Latitude: 44° 27′ 43.4″ N
- Longitude: 88° 3′ 32.5″ W
- Field recorded ADCP depth (ft): 3.2
- Field recorded depthfinder depth (ft): 3.2
- Total number of recorded ensembles: 257
- Heading: 212.51 ± 1.78
- Pitch: 0.71 ± 0.71
- Roll: −0.25 ± 4.59
- Filename: Vert20031105134743r.csv

**NOTES**

1) Wind–rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (+/−) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment
Velocity Profile – Lower Fox River – OU4–2B

11/5/2003 13:36:17

Vertically averaged water flow: 0.61 ft/s, to direction 41.4°
Average wind conditions: 9.49 mi/h, from direction 288°

CALCULATED SHEAR STRESS PARAMETERS

Shear stress (LP) (dyn/cm²): 1.47 [1.31 ≤ τ ≤ 1.65]
Shear stress (LP, 6–10% depth) (dyn/cm²): 1.04 [0.87 ≤ τ ≤ 1.23]
Shear stress (TKE) (dyn/cm²): 1.03
Shear velocity (cm/s): 1.21 [1.14 ≤ u* ≤ 1.28]
Bottom roughness, Kₙ (cm): 5.33
Boundary Reynolds number: 647.01 Test: PASS

ADCP DEPLOYMENT DETAILS

Avg. water depth (ft): 9.63
Water mode: 11
Water-cell size (cm): 1
Blanking dist. (cm): 25
Field recorded offset (cm): 54.9
Actual offset (cm): 54.9
Latitude: 44° 27' 40" N
Longitude: 88° 3' 31.4" W
Field recorded ADCP depth (ft): ---
Field recorded depthfinder depth (ft): 9.5
Total number of recorded ensembles: 260
Heading: 228.41 ± 1.48
Pitch: 0.93 ± 0.19
Roll: −1.84 ± 1.96
Filename:Vert20031105133617r.csv

NOTES

1) Wind-rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (+/-) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment
Velocity Profile – Lower Fox River – OU4–2C

Profile Not Valid

Vertically averaged water flow: 1.24 ft/s, to direction 35.1°
Average wind conditions: 9.49 mi/h, from direction 288°

CALCULATED SHEAR STRESS PARAMETERS
Shear stress (LP) (dyn/cm²): 2.37 [1.47 ≤ τ ≤ 3.47]
Shear stress (LP, 6–10% depth) (dyn/cm²): 1.84 [1.26 ≤ τ ≤ 2.53]
Shear stress (TKE) (dyn/cm²): 8.98
Shear velocity (cm/s): 1.54 [1.21 ≤ u* ≤ 1.86]
Bottom roughness, Ks (cm): 0.25
Boundary Reynolds number: 38.22 Test: MAYBE

ADCP DEPLOYMENT DETAILS
Avg. water depth (ft): 20.57
Water mode: 11
Water-cell size (cm): 2
Blanking dist. (cm): 25
Field recorded offset (cm): 244
Actual offset (cm): 244
Latitude: 44° 27′ 43.3″ N
Longitude: 88° 3′ 27.8″ W
Field recorded ADCP depth (ft): ---
Field recorded depthfinder depth (ft): 20.5
Total number of recorded ensembles: 255
Heading: 230.47 ± 2.44
Pitch: -2.12 ± 0.65
Roll: -3.1 ± 3.16
Filename: Vert20031105131727r.csv

NOTES
1) Wind-rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (+/-) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment
Velocity Profile – Lower Fox River – OU4–2D1

11/5/2003 12:47:00

Vertically averaged water flow: 0.89 ft/s, to direction 26.5°
Average wind conditions: 8.47 mi/h, from direction 280°

CALCULATED SHEAR STRESS PARAMETERS
Shear stress (LP) (dyn/cm²): 1.76 [0.8 ≤ τ ≤ 3.08]
Shear stress (LP, 6–10% depth) (dyn/cm²): 5.46 [2.69 ≤ τ ≤ 9.2]
Shear stress (TKE) (dyn/cm²): 1.94
Shear velocity (cm/s): 1.33 [0.9 ≤ u* ≤ 1.76]
Bottom roughness, Ks (cm): 0.35
Boundary Reynolds number: 46.43 Test: MAYBE

ADCP DEPLOYMENT DETAILS
Avg. water depth (ft): 11.53
Water mode: 11
Water-cell size (cm): 1
Blanking dist. (cm): 25
Field recorded offset (cm): 91.4
Actual offset (cm): 91.4
Latitude: 44° 27’ 41.6” N
Longitude: 88° 3’ 26.2” W
Field recorded ADCP depth (ft): ---
Field recorded depthfinder depth (ft): 10.6
Total number of recorded ensembles: 15
Heading: 234.68 ± 13.49
Pitch: 1.1 ± 0.28
Roll: −4.15 ± 0.91
Filename: Vert20031105124700r.csv

NOTES
1) Wind–rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (±1) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment
Velocity Profile – Lower Fox River – OU4–2D2


Vertically averaged water flow: 0.85 ft/s, to direction 23.3°
Average wind conditions: 8.47 mi/h, from direction 280°

CALCULATED SHEAR STRESS PARAMETERS
Shear stress (LP) (dyn/cm²): 4.96 [4.13 ≤ τ ≤ 5.86]
Shear stress (LP, 6–10% depth) (dyn/cm²): 3.62 [0.94 ≤ τ ≤ 8.03]
Shear stress (TKE) (dyn/cm²): 1.03
Shear velocity (cm/s): 2.23 [2.03 ≤ u* ≤ 2.42]
Bottom roughness, Ks (cm): 17.51
Boundary Reynolds number: 3899.49 Test: PASS

ADCP DEPLOYMENT DETAILS
Avg. water depth (ft): 11.51
Water mode: 11
Water-cell size (cm): 1
Blanking dist. (cm): 25
Field recorded offset (cm): 91.4
Actual offset (cm): 91.4
Latitude: 44° 27′ 41.6″ N
Longitude: 88° 3′ 26.2″ W
Field recorded ADCP depth (ft): ---
Field recorded depthfinder depth (ft): 10.6
Total number of recorded ensembles: 32
Heading: 233.82° ± 6.77
Pitch: 0.99° ± 0.14
Roll: -4.1° ± 0.31
Filename: Vert20031105124855r.csv

NOTES
1) Wind-rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (+/-) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment
Appendix: Velocity-Profile Plots for OU−3 and OU−4

Velocity Profile – Lower Fox River – OU4−2D3
11/5/2003 12:53:08

Vegetation profile:

- 10–20% depth: $y = 12.8x - 9.62$, $r^2 = 0.95$
- 6–10% depth: $y = 8.77x - 6.56$, $r^2 = 0.95$

Effective depth limit, 10 percent of depth above bottom

Shear-stress estimate:

- 0.70 0.75 0.80 0.85
- $-0.6$ $-0.4$ $-0.2$ $0.0$ $0.2$ $0.4$ $0.6$ $0.8$ $1.0$ $1.2$ $1.4$ $1.6$ $1.8$ $2.0$

Vertically averaged water flow: 0.84 ft/s, to direction 24.8°
Average wind conditions: 8.47 mi/h, from direction 280°

CALCULATED SHEAR STRESS PARAMETERS

Shear stress (LP) (dyn/cm²): 0.96 [0.81 ≤ $τ$ ≤ 1.11]
Shear stress (LP, 6–10% depth) (dyn/cm²): 2.03 [1.59 ≤ $τ$ ≤ 2.53]
Shear stress (TKE) (dyn/cm²): 0.37
Shear velocity (cm/s): 0.98 [0.9 ≤ $u$ ≤ 1.05]
Bottom roughness, $K_\text{s}$ (cm): 0.06
Boundary Reynolds number: 5.93 Test: MAYBE

ADCP DEPLOYMENT DETAILS

Avg. water depth (ft): 11.48
Water mode: 11
Water-cell size (cm): 1
Blanking dist. (cm): 25
Field recorded offset (cm): 91.4
Actual offset (cm): 91.4
Latitude: 44° 27′ 41.6″ N
Longitude: 88° 3′ 26.2″ W

Field recorded ADCP depth (ft): --
Field recorded depthfinder depth (ft): 10.6
Total number of recorded ensembles: 230
Heading: 228.86 ± 3.15
Pitch: 0.78 ± 0.18
Roll: −2.99 ± 1.3
Filename: Vert20031105125308r.csv

NOTES

1) Wind–rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (+/-) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment
Estimates of Shear Stress and Measurements of Water Levels in the Lower Fox River near Green Bay, Wisconsin

Velocity Profile – Lower Fox River – OU4–3A
11/5/2003 14:45:13

Vertically averaged water flow: 0.23 ft/s, to direction 18.1°
Average wind conditions: 10.95 mi/h, from direction 300°

CALCULATED SHEAR STRESS PARAMETERS
Shear stress (LP) (dyn/cm²): 1.01 [0.3 ≤ τ ≤ 2.13]
Shear stress (LP, 6–10% depth) (dyn/cm²): 2.49 [1.53 ≤ τ ≤ 3.68]
Shear stress (TKE) (dyn/cm²): 3.69
Shear velocity (cm/s): 1 [0.55 ≤ u* ≤ 1.46]
Bottom roughness, Kₘ (cm): 14.49
Boundary Reynolds number: 1452.67 Test: PASS

ADCP DEPLOYMENT DETAILS
Avg. water depth (ft): 2.1
Water mode: 11
Water–cell size (cm): 1
Blanking dist. (cm): 25
Field recorded offset (cm): 18.3
Actual offset (cm): 18.3
Latitude: 44° 28' 18.7" N
Longitude: 88° 3' 10.1" W
Field recorded ADCP depth (ft): ---
Field recorded depthfnder depth (ft): ---
Total number of recorded ensembles: 303
Heading: 244.96 ± 1.83
Pitch: 1.69 ± 0.67
Roll: -0.7 ± 3.93
Filename: Vert20031105144513r.csv

NOTES
1) Wind–rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (+/-) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment
Appendix: Velocity-Profile Plots for OU−3 and OU−4

Velocity Profile − Lower Fox River − OU−3B
11/5/2003 14:57:48

VELOCITY, IN FEET PER SECOND
DISTANCE ABOVE RIVER BOTTOM, IN FEET
(NATURAL LOG SCALE)

10−20% depth:  y = 9.1x−4.93  r² = 0.96
6−10% depth:  y = 10.0x−5.5  r² = 0.83

Effective depth limit
10 percent of depth above bottom
20 percent of depth above bottom
Velocity point USED in regression
Velocity point NOT USED in regression
Shear–stress estimate

Vertically averaged water flow: 0.6 ft/s, to direction 27.4°
Average wind conditions: 10.95 mi/h, from direction 300°

CALCULATED SHEAR STRESS PARAMETERS
Shear stress (LP) (dyn/cm²): 1.89 [1.47 ≤ τ ≤ 2.36]
Shear stress (LP, 6−10% depth) (dyn/cm²): 1.56 [0.21 ≤ τ ≤ 4.14]
Shear stress (TKE) (dyn/cm²): 0.57
Shear velocity (cm/s): 1.37 [1.21 ≤ u* ≤ 1.53]
Bottom roughness, Kₚ (cm): 6.58
Boundary Reynolds number: 904.97  Test: PASS

ADCP DEPLOYMENT DETAILS
Avg. water depth (ft): 4.93
Water mode: 11
Water–cell size (cm): 1
Blanking dist. (cm): 25
Field recorded offset (cm): 18.3
Actual offset (cm): 18.3
Latitude: 44° 28’ 17.4” N
Longitude: 88° 3’ 5.6” W
Field recorded ADCP depth (ft): 4.5
Field recorded depthfinder depth (ft): 4.5
Total number of recorded ensembles: 267
Heading: 237.84 ± 1.44
Pitch: 1.5 ± 0.41
Roll: −0.72 ± 4.56
Filename: Vert20031105145748r.csv

NOTES
1) Wind–rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (+/−) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment
Vertically averaged water flow: 1.15 ft/s, to direction 27.9°
Average wind conditions: 13.55 mi/h, from direction 287.5°

CALCULATED SHEAR STRESS PARAMETERS
Shear stress (LP) (dyn/cm²): 3.9 [3.57 ≤ τ ≤ 4.25]
Shear stress (LP, 6–10% depth) (dyn/cm²): 3.4 [3.15 ≤ τ ≤ 3.66]
Shear stress (TKE) (dyn/cm²): 3.1
Shear velocity (cm/s): 1.97 [1.89 ≤ u* ≤ 2.06]
Bottom roughness, K_s (cm): 2.02
Boundary Reynolds number: 399.12 Test: PASS

ADCP DEPLOYMENT DETAILS
Avg. water depth (ft): 16.45
Water mode: 11
Water-cell size (cm): 1
Blanking dist. (cm): 25
Field recorded offset (cm): 244
Actual offset (cm): 244
Latitude: 44°28'17.2'' N
Longitude: 88°3'2.5'' W
Field recorded ADCP depth (ft): ---
Field recorded depthfinder depth (ft): 15.9
Total number of recorded ensembles: 240
Heading: 214.98 ± 3.35
Pitch: -1.99 ± 0.73
Roll: -3.43 ± 1.59
Filename: Vert20031105151247r.csv

NOTES
1) Wind−rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (+/−) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment
Appendix: Velocity-Profile Plots for OU–3 and OU–4

Velocity Profile – Lower Fox River – OU4–3D

Vertically averaged water flow: 0.48 ft/s, to direction 15.4°
Average wind conditions: 13.55 mi/h, from direction 287.5°

CALCULATED SHEAR STRESS PARAMETERS
Shear stress (LP) (dyn/cm²): 0.75 [0.31 ≤ τ ≤ 1.36]
Shear stress (LP, 6–10% depth) (dyn/cm²): 0.68 [0.4 ≤ τ ≤ 1.02]
Shear stress (TKE) (dyn/cm²): 2.31
Shear velocity (cm/s): 0.86 [0.56 ≤ u* ≤ 1.17]
Bottom roughness, Ks (cm): 0.88
Boundary Reynolds number: 76.02 Test: PASS

ADCP DEPLOYMENT DETAILS
Avg. water depth (ft): 3.78
Water mode: 11
Water-cell size (cm): 1
Blanking dist. (cm): 25
Field recorded offset (cm): NA
Actual offset (cm): 21.3
Lat: 44° 28’ 15.4” N
Long: 88° 2’ 57.6” W
Field recorded ADCP depth (ft): --
Field recorded depthfinder depth (ft): --
Total number of recorded ensembles: 334
Heading: 204.95 ± 1.24
Pitch: 1.94 ± 0.22
Roll: −1.49 ± 0.37
Filename:Vert20031105152841r.csv

NOTES
1) Wind–rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (±1/2) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment
Velocity Profile – Lower Fox River – OU4–4A
11/6/2003 9:00:24

Vertically averaged water flow: 0.31 ft/s, to direction 24.3°
Average wind conditions: 8.6 mi/h, from direction 270°

CALCULATED SHEAR STRESS PARAMETERS
Shear stress (LP) (dyn/cm²): 0.46 \([0.09 \leq \tau \leq 1.11]\)
Shear stress (LP, 6–10% depth) (dyn/cm²): 1.3 \([NaN \leq \tau \leq NaN]\)
Shear stress (TKE) (dyn/cm²): 0
Shear velocity (cm/s): 0.68 \([0.31 \leq u \leq 1.05]\)
Bottom roughness, \(K_s\) (cm): 3.5
Boundary Reynolds number: 238.16 Test: PASS

ADCP DEPLOYMENT DETAILS
Avg. water depth (ft): 4.08
Water mode: 11
Water-cell size (cm): 1
Blanking dist. (cm): 25
Field recorded offset (cm): 21.3
Actual offset (cm): 21.3
Latitude: 44° 28' 42.1" N
Longitude: 88° 2' 45.9" W
Field recorded ADCP depth (ft): ---
Field recorded depthfinder depth (ft): 3.4
Total number of recorded ensembles: 298
Heading: 241.62 ± 1.22
Pitch: 2.29 ± 0.18
Roll: 2.12 ± 0.27
Filename: Vert20031106090024r.csv

NOTES
1) Wind–rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (+/-) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment
Velocity Profile – Lower Fox River – OU4–4A1

PROFILE NOT VALID

Vertically averaged water flow: 0.37 ft/s, to direction 27.5°
Average wind conditions: 16.65 mi/h, from direction 280°

CALCULATED SHEAR STRESS PARAMETERS
Shear stress (LP) (dyn/cm²): 2.45 \([0.16 \leq \tau \leq 7.48]\)
Shear stress (LP, 6–10% depth) (dyn/cm²): 7.03 \([-107.33 \leq \tau \leq 245.34]\)
Shear stress (TKE) (dyn/cm²): 0.57
Shear velocity (cm/s): 1.57 \([0.4 \leq u^* \leq 2.73]\)
Bottom roughness, \(K_s\) (cm): 34.03
Boundary Reynolds number: 5325.74 Test: PASS

ADCP DEPLOYMENT DETAILS
Avg. water depth (ft): 3.36
Water mode: 11
Water-cell size (cm): 1
Blanking dist. (cm): 25
Field recorded offset (cm): 21.3
Actual offset (cm): 21.3
Latitude: 44° 28' 42.1" N
Longitude: 88° 2' 45.8" W
Field recorded ADCP depth (ft): --
Field recorded depthfinder depth (ft): 3.8
Total number of recorded ensembles: 84
Heading: 225.44 ± 2.32
Pitch: 1.83 ± 0.19
Roll: −0.65 ± 0.46
Filename: Vert20031105164232r.csv

NOTES
1) Wind–rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (+/-) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment.
Velocity Profile – Lower Fox River – OU4-4A2

11/5/2003 16:45:28

Vertically averaged water flow: 0.35 ft/s, to direction 26.9°
Average wind conditions: 16.65 mi/h, from direction 280°

CALCULATED SHEAR STRESS PARAMETERS
Shear stress (LP) (dyn/cm²): 0.6 [0.04 ≤ τ ≤ 1.81]
Shear stress (LP, 6–10% depth) (dyn/cm²): 1.41 [−293.68 ≤ τ ≤ 380.79]
Shear stress (TKE) (dyn/cm²): 0.39
Shear velocity (cm/s): 0.77 [0.2 ≤ u* ≤ 1.35]
Bottom roughness, Ks (cm): 2.74
Boundary Reynolds number: 211.54 Test: PASS

ADCP DEPLOYMENT DETAILS
Avg. water depth (ft): 3.39
Water mode: 11
Water-cell size (cm): 1
Blanking dist. (cm): 25
Field recorded offset (cm): 21.3
Actual offset (cm): 21.3
Latitude: 44° 28′ 42.1″ N
Longitude: 88° 2′ 45.8″ W

Field recorded ADCP depth (ft): ---
Field recorded depthfinder depth (ft): 3.8
Total number of recorded ensembles: 142
Heading: 227.27° ± 1.38
Pitch: 1.8 ± 0.23
Roll: -0.72 ± 0.52
Filename: Vert20031105164528r.csv

NOTES
1) Wind-rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (±1) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment
**Velocity Profile – Lower Fox River – OU–4A3**

11/5/2003 16:50:01

**CALCULATED SHEAR STRESS PARAMETERS**

- Shear stress (LP) (dyn/cm²): 0.78 \([0.23 \leq \tau \leq 1.67]\)
- Shear stress (LP, 6–10% depth) (dyn/cm²): 3.42 \([0.7 \leq \tau \leq 8.2]\)
- Shear stress (TKE) (dyn/cm²): 0.32
- Shear velocity (cm/s): 0.88 \([0.48 \leq u^* \leq 1.29]\)
- Bottom roughness, \(K_s\) (cm): 6.75
- Boundary Reynolds number: 597.04 Test: PASS

**ADCP DEPLOYMENT DETAILS**

- Avg. water depth (ft): 3.46
- Water mode: 11
- Water-cell size (cm): 1
- Blanking dist. (cm): 25
- Field recorded offset (cm): 21.3
- Actual offset (cm): 21.3
- Latitude: 44° 28' 42.11" N
- Longitude: 88° 2' 45.8" W
- Field recorded ADCP depth (ft): ---
- Field recorded depthfinder depth (ft): 3.8
- Total number of recorded ensembles: 209
- Heading: 227.64 ± 1.17
- Pitch: 2.32 ± 0.36
- Roll: 0.04 ± 0.28
- Filename: Vert20031105165001r.csv

**NOTES**

1) Wind–rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (+/-) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment
Vertically averaged water flow: 1.12 ft/s, to direction 37.2°
Average wind conditions: 16.65 mi/h, from direction 280°

CALCULATED SHEAR STRESS PARAMETERS
Shear stress (LP) (dyn/cm²): 3.01 [2.69 ≤ τ ≤ 3.36]
Shear stress (LP, 6−10% depth) (dyn/cm²): 1.64 [1.16 ≤ τ ≤ 2.21]
Shear stress (TKE) (dyn/cm²): 1.59
Shear velocity (cm/s): 1.74 [1.64 ≤ u∗ ≤ 1.83]
Bottom roughness, Ks (cm): 0.73
Boundary Reynolds number: 126.26 Test: PASS

ADCP DEPLOYMENT DETAILS
Avg. water depth (ft): 7.99
Water mode: 11
Water-cell size (cm): 1
Blanking dist. (cm): 25
Field recorded offset (cm): 21.3
Actual offset (cm): 21.3
Latitude: 44° 28' 40.9" N
Longitude: 88° 2' 38.8" W

Field recorded ADCP depth (ft): ---
Field recorded depthfinder depth (ft): 7.6
Total number of recorded ensembles: 222
Heading: 223.51 ± 1.96
Pitch: 1.71 ± 0.22
Roll: −0.65 ± 0.94
Filename: Vert20031105163048r.csv

NOTES
1) Wind-rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (±1) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment
Velocity Profile – Lower Fox River – OU4–4B

11/6/2003 8:46:00

Vertically averaged water flow: 0.81 ft/s, to direction 35.8°
Average wind conditions: 9.75 mi/h, from direction 270°

CALCULATED SHEAR STRESS PARAMETERS
Shear stress (LP) (dyn/cm²): 1.53 [1.28 ≤ τ ≤ 1.8]
Shear stress (LP, 6–10% depth) (dyn/cm²): 1.3 [0.89 ≤ τ ≤ 1.8]
Shear stress (TKE) (dyn/cm²): 0.67
Shear velocity (cm/s): 1.24 [1.13 ≤ u* ≤ 1.34]
Bottom roughness, Ks (cm): 0.93
Boundary Reynolds number: 115.13 Test: PASS

ADCP DEPLOYMENT DETAILS
Avg. water depth (ft): 8.46
Water mode: 11
Water-cell size (cm): 1
Blanking dist. (cm): 25
Field recorded offset (cm): 21.3
Actual offset (cm): 21.3
Latitude: 44° 28′ 41″ N
Longitude: 88° 2′ 39.1″ W
Field recorded ADCP depth (ft): ---
Field recorded depthfinder depth (ft): 8.1
Total number of recorded ensembles: 241
Heading: 234.54 ± 1.51
Pitch: 1.95 ± 0.32
Roll: 1.26 ± 0.43
Filename: Vert20031106084600r.csv

NOTES
1) Wind-rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (+/−) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment.
Estimates of Shear Stress and Measurements of Water Levels in the Lower Fox River near Green Bay, Wisconsin

**Velocity Profile – Lower Fox River – OU4–4C**

11/5/2003 16:15:16

**VELOCITY, IN FEET PER SECOND**

**DISTANCE ABOVE RIVER BOTTOM, IN FEET**

(NATURAL LOG SCALE)

**CALCULATED SHEAR STRESS PARAMETERS**

- Shear stress (LP) (dyn/cm²): 1.75 \([0.94 \leq \tau \leq 2.82]\)
- Shear stress (LP, 6–10% depth) (dyn/cm²): 1.32 \([0.31 \leq \tau \leq 3.05]\)
- Shear stress (TKE) (dyn/cm²): 0.72
- Shear velocity (cm/s): 1.32 \([0.97 \leq \text{u}^* \leq 1.68]\)
- Bottom roughness, \(K_s\): 2.32
- Boundary Reynolds number: 307.84
- Test: PASS

**ADCP DEPLOYMENT DETAILS**

- Avg. water depth (ft): 3.36
- Water mode: 11
- Water-cell size (cm): 1
- Blanking dist. (cm): 25
- Field recorded offset (cm): 21.3
- Actual offset (cm): 21.3
- Latitude: 44° 28' 37.3" N
- Longitude: 88° 2' 22.9" W
- Total number of recorded ensembles: 293
- Heading: 232.46 ± 1.51
- Pitch: 2.55 ± 0.48
- Roll: 0.14 ± 0.83
- Filename: Vert20031105161516r.csv

**DAILY WIND ROSE**

1) Wind-rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (+/-) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment

Vertically averaged water flow: 0.61 ft/s, to direction 26.7°
Average wind conditions: 16.65 mi/h, from direction 280°
Velocity Profile – Lower Fox River – OU4–4C
11/6/2003 8:27:48

Vertically averaged water flow: 0.43 ft/s, to direction 28.5°
Average wind conditions: 9.75 mi/h, from direction 270°

CALCULATED SHEAR STRESS PARAMETERS
Shear stress (LP) (dyn/cm²): 1.15 [0.73 ≤ τ ≤ 1.67]
Shear stress (LP, 6–10% depth) (dyn/cm²): 2.76 [0.59 ≤ τ ≤ 6.52]
Shear stress (TKE) (dyn/cm²): 4.62
Shear velocity (cm/s): 1.07 [0.86 ≤ u* ≤ 1.29]
Bottom roughness, Ks (cm): 6.42
Boundary Reynolds number: 689.35 Test: PASS

ADCP DEPLOYMENT DETAILS
Avg. water depth (ft): 4.01
Water mode: 11
Water-cell size (cm): 1
Blanking dist. (cm): 25
Field recorded offset (cm): 21.3
Actual offset (cm): 21.3
Latitude: 44° 28’ 37.4” N
Longitude: 88° 2’ 22.8” W
Field recorded ADCP depth (ft): —
Field recorded depthfinder depth (ft): 3.1
Total number of recorded ensembles: 287
Heading: 212.28 ± 2.01
Pitch: 2.5 ± 0.3
Roll: 1.02 ± 2.5
Filename: Vert20031106082748r.csv

NOTES
1) Wind–rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (+/-) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment
Velocity Profile – Lower Fox River – OU4–5A
11/6/2003 10:26:15

Vertically averaged water flow: 0.46 ft/s, to direction 67.3°
Average wind conditions: 8.02 mi/h, from direction 275.7°

CALCULATED SHEAR STRESS PARAMETERS
Shear stress (LP) (dyn/cm²): 0.55 [0.23 ≤ τ ≤ 1.01]
Shear stress (LP, 6–10% depth) (dyn/cm²): 0.63 [NaN ≤ τ ≤ NaN]
Shear stress (TKE) (dyn/cm²): 0
Shear velocity (cm/s): 0.74 [0.48 ≤ u* ≤ 1]
Bottom roughness, Ks (cm): 0.56
Boundary Reynolds number: 41.35 Test: MAYBE

ADCP DEPLOYMENT DETAILS
Avg. water depth (ft): 3.77
Water mode: 11
Water–cell size (cm): 1
Blanking dist. (cm): 25
Field recorded offset (cm): 21.3
Actual offset (cm): 21.3
Latitude: 44° 29′ 8″ N
Longitude: 88° 2′ 24.1″ W
Field recorded ADCP depth (ft): ---
Field recorded depthfinder depth (ft): 3.2
Total number of recorded ensembles: 297
Heading: 268.86 ± 1.62
Pitch: 2.61 ± 0.34
Roll: 2.73 ± 0.57
Filename: Vert20031106102615r.csv

NOTES
1) Wind–rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (+/−) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment
Velocity Profile – Lower Fox River – OU4–5B
11/6/2003 10:11:24

Vertically averaged water flow: 0.9 ft/s, to direction 54.8°
Average wind conditions: 8.02 mi/h, from direction 275.7°

CALCULATED SHEAR STRESS PARAMETERS
Shear stress (LP) (dyn/cm²): 1.48 \([1.33 \leq \tau \leq 1.64]\)
Shear stress (LP, 6–10% depth) (dyn/cm²): 0.63 \([0.47 \leq \tau \leq 0.82]\)
Shear stress (TKE) (dyn/cm²): 1.54
Shear velocity (cm/s): 1.22 \([1.15 \leq u^* \leq 1.28]\)
Bottom roughness, \(K_s\) (cm): 0.38
Boundary Reynolds number: 45.89 Test: MAYBE

ADCP DEPLOYMENT DETAILS
Avg. water depth (ft): 8.36
Water mode: 11
Water–cell size (cm): 1
Blanking dist. (cm): 25
Field recorded offset (cm): 21.3
Actual offset (cm): 21.3
Latitude: 44° 29' 4.2'' N
Longitude: 88° 2' 16.2'' W
Field recorded ADCP depth (ft): ---
Field recorded depthfinder depth (ft): 8
Total number of recorded ensembles: 245
Heading: 287.93 ± 2.33
Pitch: 2.5 ± 0.27
Roll: 2.22 ± 0.53
Filename: Vert20031106101124r.csv

NOTES
1) Wind–rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (+/-) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment
Velocity Profile – Lower Fox River – OU4–5C

11/6/2003 9:54:55

Vertically averaged water flow: 0.6 ft/s, to direction 29°
Average wind conditions: 8.6 mi/h, from direction 270°

CALCULATED SHEAR STRESS PARAMETERS
Shear stress (LP) (dyn/cm²): 0.94 [0.76 ≤ τ ≤ 1.12]
Shear stress (LP, 6–10% depth) (dyn/cm²): 0.8 [0.58 ≤ τ ≤ 1.05]
Shear stress (TKE) (dyn/cm²): 0.79
Shear velocity (cm/s): 0.97 [0.87 ≤ u * ≤ 1.06]
Bottom roughness, Ks (cm): 1.14
Boundary Reynolds number: 110.05 Test: PASS

ADCP DEPLOYMENT DETAILS
Avg. water depth (ft): 7.12
Water mode: 11
Water–cell size (cm): 1
Blanking dist. (cm): 25
Field recorded offset (cm): 21.3
Actual offset (cm): 21.3
Latitude: 44° 28' 57.5" N
Longitude: 88° 2' 2.3" W

Field recorded ADCP depth (ft): ---
Field recorded depthfinder depth (ft): 6.2
Total number of recorded ensembles: 262
Heading: 256.08 ± 2.18
Pitch: 2.3 ± 0.4
Roll: 1.26 ± 0.55
Filename: Vert20031106095455r.csv

NOTES
1) Wind–rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (+/-) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment
Velocity Profile – Lower Fox River – OU4-6A
11/6/2003 11:51:00

Vertically averaged water flow: 0.72 ft/s, to direction 45.7°
Average wind conditions: 9.9 mi/h, from direction 286.9°

CALCULATED SHEAR STRESS PARAMETERS
Shear stress (LP) (dyn/cm²): 3.15 [2.6 ≤ τ ≤ 3.75]
Shear stress (LP, 6–10% depth) (dyn/cm²): 33.85 [14.02 ≤ τ ≤ 62.27]
Shear stress (TKE) (dyn/cm²): 1.57
Shear velocity (cm/s): 1.77 [1.61 ≤ u* ≤ 1.94]
Bottom roughness, Ks (cm): 7.37
Boundary Reynolds number: 1307.44 Test: PASS

ADCP DEPLOYMENT DETAILS
Average water depth (ft): 4.9
Water mode: 11
Water-cell size (cm): 1
Blanking dist. (cm): 25
Field recorded offset (cm): 18.3
Actual offset (cm): 18.3
Latitude: 44° 29' 22.5" N
Longitude: 88° 1' 55.8" W

Field recorded ADCP depth (ft): —
Field recorded depthfinder depth (ft): 4.3
Total number of recorded ensembles: 266
Heading: 215.31 ± 1.25
Pitch: 2.64 ± 0.15
Roll: −0.44 ± 0.31
Filename: Vert20031106115100r.csv

NOTES
1) Wind–rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (+/-) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment
Vertically averaged water flow: 1.13 ft/s, to direction 47°
Average wind conditions: 9.9 mi/h, from direction 286.9°

CALCULATED SHEAR STRESS PARAMETERS
Shear stress (LP) (dyn/cm²): 5.76 [5.27 ≤ τ ≤ 6.28]
Shear stress (LP, 6−10% depth) (dyn/cm²): 3.07 [2.69 ≤ τ ≤ 3.47]
Shear stress (TKE) (dyn/cm²): 2.22
Shear velocity (cm/s): 2.4 [2.3 ≤ u* ≤ 2.51]
Bottom roughness, Kₚ (cm): 7.87
Boundary Reynolds number: 1887.97 Test: PASS

ADCP DEPLOYMENT DETAILS
Avg. water depth (ft): 12.65
Water mode: 11
Water-cell size (cm): 1
Blanking dist. (cm): 25
Field recorded offset (cm): 146
Actual offset (cm): 146
Latitude: 44° 29' 20.1" N
Longitude: 88° 1' 50.1" W
Field recorded ADCP depth (ft): ---
Field recorded depthfinder depth (ft): 12.6
Total number of recorded ensembles: 245
Heading: 254.46 ± 2.24
Pitch: 1.07 ± 0.61
Roll: -1.72 ± 0.44
Filename: Vert20031106113205r.csv

NOTES
1) Wind−rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (+−) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment
Velocity Profile – Lower Fox River – OU4–6C
11/6/2003 11:16:17

Vertically averaged water flow: 1.03 ft/s, to direction 49.7°
Average wind conditions: 9.9 mi/h, from direction 286.9°

CALCULATED SHEAR STRESS PARAMETERS
Shear stress (LP) (dyn/cm²): 3.49 [3.23 ≤ τ ≤ 3.75]
Shear stress (LP, 6–10% depth) (dyn/cm²): 2.18 [1.98 ≤ τ ≤ 2.38]
Shear stress (TKE) (dyn/cm²): 2.22
Shear velocity (cm/s): 1.87 [1.8 ≤ u ≤ 1.94]
Bottom roughness, Ks (cm): 3.02
Boundary Reynolds number: 563.41 Test: PASS

ADCP DEPLOYMENT DETAILS
Avg. water depth (ft): 15.26
Water mode: 11
Water-cell size (cm): 1
Blanking dist. (cm): 25
Field recorded offset (cm): 207
Actual offset (cm): 207
Latitude: 44° 29' 18.6" N
Longitude: 88° 1' 46.6" W
Field recorded ADCP depth (ft): ---
Field recorded depthfinder depth (ft): 15
Total number of recorded ensembles: 238
Heading: 226.64 ± 3.35
Pitch: 0.76 ± 0.45
Roll: −2.52 ± 0.52
Filename: Vert20031106111617r.csv

NOTES
1) Wind–rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (+/-) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment
Vertical averaged water flow: 0.42 ft/s, to direction 36.5°
Average wind conditions: 11.1 mi/h, from direction 283.1°

CALCULATED SHEAR STRESS PARAMETERS
Shear stress (LP) (dyn/cm²): 0.56 [0.47 ≤ τ ≤ 0.66]
Shear stress (LP, 6−10% depth) (dyn/cm²): 0.28 [0 ≤ τ ≤ 1.07]
Shear stress (TKE) (dyn/cm²): 1.17
Shear velocity (cm/s): −0.75 [−0.69 ≤ u ≤ −0.81]
Bottom roughness, K_s (cm): 2079398
Boundary Reynolds number: −156134147.36 Test: FAIL

ADCP DEPLOYMENT DETAILS
Avg. water depth (ft): 19.88
Water mode: 11
Water-cell size (cm): 2
Blanking dist. (cm): 25
Field recorded offset (cm): 320
Actual offset (cm): 320
Latitude: 44° 31′ 2.2″ N
Longitude: 88° 1′ 3.5″ W
Field recorded ADCP depth (ft): ---
Field recorded depthfinder depth (ft): 18.8
Total number of recorded ensembles: 250
Heading: 217.98 ± 3.43
Pitch: 1.44 ± 0.35
Roll: −2.24 ± 0.53
Filename: Vert20031106133509r.csv

NOTES
1) Wind−rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (+/-) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment
Velocity Profile – Lower Fox River – OU4–7B


Vertically averaged water flow: 0.73 ft/s, to direction 30.3°
Average wind conditions: 11.1 mi/h, from direction 283.1°

CALCULATED SHEAR STRESS PARAMETERS
Shear stress (LP) (dyn/cm²): 9.19 [0.72 ≤ τ ≤ 27.2]
Shear stress (LP, 6–10% depth) (dyn/cm²): 1.01 [0.32 ≤ τ ≤ 2.1]
Shear stress (TKE) (dyn/cm²): 19.16
Shear velocity (cm/s): 3.03 [0.85 ≤ u* ≤ 5.22]
Bottom roughness, Ks (cm): 192.14
Boundary Reynolds number: 58244.68 Test: PASS

ADCP DEPLOYMENT DETAILS
Avg. water depth (ft): 26.15
Water mode: 11
Water-cell size (cm): 2
Blanking dist. (cm): 25
Field recorded offset (cm): 320
Actual offset (cm): 320
Latitude: 44° 31’ 17” N
Longitude: 88° 0’ 59” W
Field recorded ADCP depth (ft): --
Field recorded depthfinder depth (ft): 26.5
Total number of recorded ensembles: 270
Heading: 199.34 ± 2.2
Pitch: 0.32 ± 0.42
Roll: −2.09 ± 0.97
Filename: Vert20031106131732r.csv

NOTES
1) Wind–rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (±) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment
Vertically averaged water flow: 0.47 ft/s, to direction 20.6°
Average wind conditions: 10.27 mi/h, from direction 286.7°

Calculated Shear Stress Parameters
Shear stress (LP) (dyn/cm²): 0.78 [0.65 ≤ τ ≤ 0.92]
Shear stress (LP, 6–10% depth) (dyn/cm²): 1.06 [0.92 ≤ τ ≤ 1.22]
Shear stress (TKE) (dyn/cm²): 0.77
Shear velocity (cm/s): 0.88 [0.8 ≤ u* ≤ 0.96]
Bottom roughness, K_s (cm): 5.16
Boundary Reynolds number: 455.48 Test: PASS

Adcp Deployment Details
Avg. water depth (ft): 15.21
Water mode: 11
Water-cell size (cm): 1
Blanking dist. (cm): 25
Field recorded offset (cm): 213
Actual offset (cm): 213
Latitude: 44° 31' 0.3" N
Longitude: 88° 0' 56.9" W
Field recorded ADCP depth (ft): ---
Field recorded depthfinder depth (ft): 13.8
Total number of recorded ensembles: 242
Heading: 178.54° ± 2.81
Pitch: 1.83° ± 0.37
Roll: −0.04° ± 0.74
Filename: Vert20031106125700r.csv

Notes
1) Wind-rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (+/-) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment
March 2004 Velocity Profiles (OU–4)
Velocity Profile – Lower Fox River – OU4–1A
3/7/2004 10:32:20

Vertically averaged water flow: 1.04 ft/s, to direction 30.6°
Average wind conditions: 17.11 mi/h, from direction 253.8°

CALCULATED SHEAR STRESS PARAMETERS
Shear stress (LP) (dyn/cm²): 6 [2.85 ≤ τ ≤ 10.3]
Shear stress (LP, 6–10% depth) (dyn/cm²): 117.39 [22.23 ≤ τ ≤ 287.45]
Shear stress (TKE) (dyn/cm²): 3.6
Shear velocity (cm/s): 2.45 [1.69 ≤ u* ≤ 3.21]
Bottom roughness, Ks (cm): 7.4
Boundary Reynolds number: 1811.8 Test: PASS

ADCP DEPLOYMENT DETAILS
Avg. water depth (ft): 4.96
Water mode: 11
Water-cell size (cm): 1
Blanking dist. (cm): 25
Field recorded offset (cm): 18.3
Actual offset (cm): 18.3
Latitude: 44° 27′ 22″ N
Longitude: 88° 4′ 4.1″ W
Field recorded ADCP depth (ft): ---
Field recorded depthfinder depth (ft): 4
Total number of recorded ensembles: 235
Heading: 281.85 ± 1.77
Pitch: 2.64 ± 0.38
Roll: −2.16 ± 0.44
Filename: Vert20040307103220r.csv

NOTES
1) Wind-rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (+/-) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment
Velocity Profile – Lower Fox River – OU4–1B
3/7/2004 10:15:30

Vertically averaged water flow: 1.02 ft/s, to direction 32°
Average wind conditions: 17.11 mi/h, from direction 253.8°

CALCULATED SHEAR STRESS PARAMETERS
Shear stress (LP) (dyn/cm²): 1.71 [0.88 ≤ τ ≤ 2.81]
Shear stress (LP, 6–10% depth) (dyn/cm²): 252.83 [120.25 ≤ τ ≤ 434.12]
Shear stress (TKE) (dyn/cm²): 5.26
Shear velocity (cm/s): 1.31 [0.94 ≤ u* ≤ 1.68]
Bottom roughness, Ks (cm): 0.08
Boundary Reynolds number: 9.82 Test: MAYBE

ADCP DEPLOYMENT DETAILS
Avg. water depth (ft): 5.1
Water mode: 11
Water-cell size (cm): 1
Blanking dist. (cm): 25
Field recorded offset (cm): 21.3
Actual offset (cm): 21.3
Latitude: 44° 27’ 18.2” N
Longitude: 88° 4’ 1.5” W
Field recorded ADCP depth (ft): 4.1
Field recorded depthfinder depth (ft): 4.1
Total number of recorded ensembles: 264
Heading: 259.6 ± 3.85
Pitch: 3.31 ± 0.23
Roll: −1.24 ± 1.5
Filename: Vert20040307101530r.csv

NOTES
1) Wind–rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (±1/2) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment.
Velocity Profile – Lower Fox River – OU4–1C

3/7/2004 9:57:09

Vertically averaged water flow: 1.22 ft/s, to direction 36.9°
Average wind conditions: 16.86 mi/h, from direction 253.4°

CALCULATED SHEAR STRESS PARAMETERS
Shear stress (LP) (dyn/cm²): 1.44 [1.23 ≤ τ ≤ 1.66]
Shear stress (LP, 6–10% depth) (dyn/cm²): 1.09 [0.58 ≤ τ ≤ 1.76]
Shear stress (TKE) (dyn/cm²): 2.21
Shear velocity (cm/s): 1.2 [1.11 ≤ u* ≤ 1.29]
Bottom roughness, Ks (cm): 0.02
Boundary Reynolds number: 1.86 Test: FAIL

ADCP DEPLOYMENT DETAILS
Avg. water depth (ft): 14.34
Water mode: 11
Water-cell size (cm): 2
Blanking dist. (cm): 25
Field recorded offset (cm): –3018
Actual offset (cm): 134
Latitude: 44° 27’ 15.6” N
Longitude: 88° 3’ 58.9” W
Field recorded ADCP depth (ft): ---
Field recorded depthfinder depth (ft): ---
Total number of recorded ensembles: 252
Heading: 262.72 ± 8.29
Pitch: 2.23 ± 1.77
Roll: –3.78 ± 1.79
Filename: Vert20040307095709r.csv

NOTES
1) Wind–rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (+/−) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment
Appendix: Velocity-Profile Plots for OU−3 and OU−4

Velocity Profile – Lower Fox River – OU4−1D
3/7/2004 9:04:50

CALCULATED SHEAR STRESS PARAMETERS
Shear stress (LP) (dyn/cm²): 0.4 [0.17 ≤ τ ≤ 0.74]
Shear stress (LP, 6–10% depth) (dyn/cm²): 0.54 [−0.72 ≤ τ ≤ 5.36]
Shear stress (TKE) (dyn/cm²): 2.17
Shear velocity (cm/s): −0.63 [−0.41 ≤ u* ≤ −0.86]
Bottom roughness, Ks (cm): 4670367
Boundary Reynolds number: −295839713.87 Test: FAIL

ADCP DEPLOYMENT DETAILS
Avg. water depth (ft): 13.27
Water mode: 11
Water-cell size (cm): 2
Blanking dist. (cm): 25
Field recorded offset (cm): 21.3
Actual offset (cm): 21.3
Latitude: 44° 27’ 10.7” N
Longitude: 88° 3’ 54.5” W
Field recorded ADCP depth (ft): 13.2
Field recorded depthfinder depth (ft): 13.9
Total number of recorded ensembles: 253
Heading: 274.13 ± 8.12
Pitch: 2.96 ± 1.23
Roll: −2.41 ± 0.66
Filename: Vert20040307090450r.csv

NOTES
1) Wind−rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (+/−) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment
Velocity Profile – Lower Fox River – OU4–2A

3/7/2004 12:40:19

Vertically averaged water flow: 0.83 ft/s, to direction 35.7°
Average wind conditions: 15.73 mi/h, from direction 243.1°

CALCULATED SHEAR STRESS PARAMETERS
Shear stress (LP) (dyn/cm²): 1.46 [1.05 ≤ τ ≤ 1.94]
Shear stress (LP, 6–10% depth) (dyn/cm²): 120.41 [NaN ≤ τ ≤ NaN]
Shear stress (TKE) (dyn/cm²): 0
Shear velocity (cm/s): 1.21 [1.02 ≤ u* ≤ 1.39]
Bottom roughness, Ks (cm): 0.17
Boundary Reynolds number: 20.66 Test: MAYBE

ADCP DEPLOYMENT DETAILS
Avg. water depth (ft): 3.39
Water mode: 11
Water-cell size (cm): 1
Blanking dist. (cm): 25
Field recorded offset (cm): 18.3
Actual offset (cm): 18.3
Latitude: 44° 27' 43.6" N
Longitude: 88° 3' 32.5" W
Field recorded ADCP depth (ft): ---
Field recorded depthfinder depth (ft): 2.6
Total number of recorded ensembles: 260
Heading: 223.99 ± 2.46
Pitch: 2.7 ± 0.49
Roll: -1.49 ± 3.5
Filename: Vert20040307124019r.csv

NOTES
1) Wind−rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (+/−) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment
Velocity Profile – Lower Fox River – OU4–2B

3/7/2004 12:27:33

Vertically averaged water flow: 1.28 ft/s, to direction 40.5°
Average wind conditions: 15.73 mi/h, from direction 243.1°

CALCULATED SHEAR STRESS PARAMETERS
Shear stress (LP) (dyn/cm²): 4.58 [4 ≤ τ ≤ 5.2]
Shear stress (LP, 6–10% depth) (dyn/cm²): 120.41 [−235.14 ≤ τ ≤ 1389.83]
Shear stress (TKE) (dyn/cm²): 2.35
Shear velocity (cm/s): 2.14 [2 ≤ u* ≤ 2.28]
Bottom roughness, Ks (cm): 1.64
Boundary Reynolds number: 350.68 Test: PASS

ADCP DEPLOYMENT DETAILS
Avg. water depth (ft): 9.26
Water mode: 11
Water-cell size (cm): 1
Blanking dist. (cm): 25
Field recorded offset (cm): 21.3
Actual offset (cm): 21.3
Latitude: 44° 27’ 43.5” N
Longitude: 88° 3’ 31.3” W
Field recorded ADCP depth (ft): ---
Field recorded depthfinder depth (ft): 9
Total number of recorded ensembles: 219
Heading: 211.16 ± 2.02
Pitch: 1.68 ± 0.85
Roll: −3.66 ± 1.83
Filename: Vert20040307122733r.csv

NOTES
1) Wind-rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (+/-) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment
Vertically averaged water flow: 1.79 ft/s, to direction 35.7°
Average wind conditions: 15.73 mi/h, from direction 243.1°

CALCULATED SHEAR STRESS PARAMETERS
Shear stress (LP) (dyn/cm²): 15.07 [9.78 ≤ τ ≤ 21.51]
Shear stress (LP, 6–10% depth) (dyn/cm²): 7.1 [4.04 ≤ τ ≤ 11.02]
Shear stress (TKE) (dyn/cm²): 23.13
Shear velocity (cm/s): 3.88 [3.13 ≤ u* ≤ 4.64]
Bottom roughness, Ks (cm): 14.83
Boundary Reynolds number: 5759.45 Test: PASS

ADCP DEPLOYMENT DETAILS
Avg. water depth (ft): 19.89
Water mode: 11
Water-cell size (cm): 2
Blanking dist. (cm): 25
Field recorded offset (cm): 104
Actual offset (cm): 104
Latitude: 44°27′42.8″ N
Longitude: 88°3′28.6″ W
Field recorded ADCP depth (ft): ---
Field recorded depthfinder depth (ft): ---
Total number of recorded ensembles: 221
Heading: 247.76 ± 2.59
Pitch: 2.82 ± 0.24
Roll: -1.87 ± 0.24
Filename: Vert20040307120659r.csv

NOTES
1) Wind-rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (+/-) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment
Appendix: Velocity-Profile Plots for OU–3 and OU–4

Velocity Profile – Lower Fox River – OU4–2D

3/7/2004 11:45:56

Vertically averaged water flow: 1.22 ft/s, to direction 28.1°
Average wind conditions: 15.31 mi/h, from direction 245.4°

CALCULATED SHEAR STRESS PARAMETERS
Shear stress (LP) (dyn/cm²): 5.31 [4.86 ≤ τ ≤ 5.78]
Shear stress (LP, 6–10% depth) (dyn/cm²): 7.71 [4.95 ≤ τ ≤ 11.09]
Shear stress (TKE) (dyn/cm²): 5.23
Shear velocity (cm/s): 2.3 [2.2 ≤ u* ≤ 2.4]
Bottom roughness, Kₘ (cm): 3.93
Boundary Reynolds number: 904.4 Test: PASS

ADCP DEPLOYMENT DETAILS
Avg. water depth (ft): 16.01
Water mode: 11
Water-cell size (cm): 1
Blanking dist. (cm): 25
Field recorded offset (cm): 226
Actual offset (cm): 226
Latitude: 44° 27' 41.5" N
Longitude: 88° 3' 26.5" W
Field recorded ADCP depth (ft): —
Field recorded depthfinder depth (ft): 14.5
Total number of recorded ensembles: 217
Heading: 245.9 ± 4.76
Pitch: −1.27 ± 1.07
Roll: −6.11 ± 3.01
Filename: Vert20040307114556r.csv

DAILY WIND ROSE

NOTES
1) Wind-rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (+/-) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment.
Vertically averaged water flow: 0.15 ft/s, to direction 348.7°
Average wind conditions: 19.46 mi/h, from direction 285°

CALCULATED SHEAR STRESS PARAMETERS
Shear stress (LP) (dyn/cm²): 0.59 [−0.04 ≤ τ ≤ 3.06]
Shear stress (LP, 6–10% depth) (dyn/cm²): 2.97 [0.2 ≤ τ ≤ 8.96]
Shear stress (TKE) (dyn/cm²): 0.86
Shear velocity (cm/s): 0.77 [−0.21 ≤ u* ≤ 1.75]
Bottom roughness, Ks (cm): 19.56
Boundary Reynolds number: 1508.31 Test: PASS

ADCP DEPLOYMENT DETAILS
Avg. water depth (ft): 2.27
Water mode: 11
Water-cell size (cm): 1
Blanking dist. (cm): 25
Field recorded offset (cm): 18.3
Actual offset (cm): 18.3
Latitude: 44° 28' 18.6" N
Longitude: 88° 3' 9.9" W
Field recorded ADCP depth (ft): ---
Field recorded depthfinder depth (ft): 1.5
Total number of recorded ensembles: 268
Heading: 227.46 ± 1.65
Pitch: 3.87 ± 0.29
Roll: 0.6 ± 1.46
Filename: Vert20040307150351r.csv

NOTES
1) Wind-rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (+/-) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment
Velocity Profile – Lower Fox River – OU4–3B
3/7/2004 14:51:16

10–20% depth: \( y = 9.19x^{-6.97} \quad r^2 = 0.96 \)
6–10% depth: \( y = 1.86x^{-2.06} \quad r^2 = 1 \)

Vertically averaged water flow: 0.8 ft/s, to direction 23.9°
Average wind conditions: 19.07 mi/h, from direction 267.8°

CALCULATED SHEAR STRESS PARAMETERS
Shear stress (LP) (dyn/cm²): 1.85 \([1.44 \leq \tau \leq 2.31]\)
Shear stress (LP, 6–10% depth) (dyn/cm²): 45.35 \([30.47 \leq \tau \leq 63.18]\)
Shear stress (TKE) (dyn/cm²): 1.61
Shear velocity (cm/s): 1.36 \([1.2 \leq u^* \leq 1.52]\)
Bottom roughness, \( K_s \) (cm): 0.86
Boundary Reynolds number: 117.33 Test: PASS

ADCP DEPLOYMENT DETAILS
Avg. water depth (ft): 4.72
Water mode: 11
Water-cell size (cm): 1
Blanking dist. (cm): 25
Field recorded offset (cm): 18.3
Actual offset (cm): 18.3
Latitude: 44° 28′ 17.5″ N
Longitude: 88° 3′ 5.9″ W
Field recorded ADCP depth (ft): –
Field recorded depthfinder depth (ft): 4
Total number of recorded ensembles: 234
Heading: 227.8 ± 2.51
Pitch: 3.78 ± 0.37
Roll: −0.3 ± 2.2
Filename: Vert20040307145116r.csv

NOTES
1) Wind–rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour \( (+/−) \) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment.
Velocity Profile – Lower Fox River – OU4–3C
3/7/2004 14:35:16

10–20% depth: $y = 4.51x - 5.48$, $r^2 = 0.52$
6–10% depth: $y = 3.66x - 4.69$, $r^2 = 0.63$

Vertically averaged water flow: 1.54 ft/s, to direction 26°
Average wind conditions: 19.07 mi/h, from direction 267.8°

CALCULATED SHEAR STRESS PARAMETERS
Shear stress (LP) (dyn/cm²): 7.69 [2.62 ≤ τ ≤ 15.42]
Shear stress (LP, 6–10% depth) (dyn/cm²): 11.65 [2.09 ≤ τ ≤ 28.93]
Shear stress (TKE) (dyn/cm²): 25.89
Shear velocity (cm/s): 2.77 [1.62 ≤ u* ≤ 3.93]
Bottom roughness, $K_s$ (cm): 3.81
Boundary Reynolds number: 1055.57 Test: PASS

ADCP DEPLOYMENT DETAILS
Avg. water depth (ft): 16.04
Water mode: 11
Water-cell size (cm): 2
Blanking dist. (cm): 25
Field recorded offset (cm): 18.3
Actual offset (cm): 18.3
Latitude: 44° 28′ 17.3″ N
Longitude: 88° 3′ 2.3″ W
Field recorded ADCP depth (ft): ---
Field recorded depthfinder depth (ft): ---
Total number of recorded ensembles: 241
Heading: 242.72 ± 3.79
Pitch: 3.3 ± 0.21
Roll: -1.48 ± 0.03
Filename: Vert20040307143516r.csv

NOTES
1) Wind-rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (+/-) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment
Velocity Profile – Lower Fox River – OU4–3D
3/7/2004 14:20:27

Vertically averaged water flow: 0.71 ft/s, to direction 15.9°
Average wind conditions: 19.07 mi/h, from direction 267.8°

CALCULATED SHEAR STRESS PARAMETERS
Shear stress (LP) (dyn/cm²): 2.17 [1.4 ≤ τ ≤ 3.11]
Shear stress (LP, 6–10% depth) (dyn/cm²): 65.65 [25.15 ≤ τ ≤ 125.24]
Shear stress (TKE) (dyn/cm²): 5.55
Shear velocity (cm/s): 1.47 [1.18 ≤ u* ≤ 1.76]
Bottom roughness, Ks (cm): 2.76
Boundary Reynolds number: 405.64 Test: PASS

ADCP DEPLOYMENT DETAILS
Avg. water depth (ft): 4.41
Water mode: 11
Water-cell size (cm): 1
Blanking dist. (cm): 25
Field recorded offset (cm): –3018
Actual offset (cm): 18.3
Latitude: 44° 28’ 15.3” N
Longitude: 88° 2’ 57.7” W
Field recorded ADCP depth (ft): ---
Field recorded depthfinder depth (ft): ---
Total number of recorded ensembles: 237
Heading: 240.96 ± 2.65
Pitch: 3.74 ± 0.42
Roll: 0.33 ± 0.07
Filename: Vert20040307142027r.csv

NOTES
1) Wind–rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (+/-) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment
Vertically averaged water flow: 0.75 ft/s, to direction 30.9°
Average wind conditions: 17.63 mi/h, from direction 308.8°

**CALCULATED SHEAR STRESS PARAMETERS**
- Shear stress (LP) (dyn/cm²): 2.42 [1.6 ≤ τ ≤ 3.41]
- Shear stress (LP, 6–10% depth) (dyn/cm²): 29.47 [NaN ≤ τ ≤ NaN]
- Shear stress (TKE) (dyn/cm²): 0
- Shear velocity (cm/s): 1.55 [1.26 ≤ u* ≤ 1.85]
- Bottom roughness, Ks (cm): 3.35
- Boundary Reynolds number: 521.62 Test: PASS

**ADCP DEPLOYMENT DETAILS**
- Avg. water depth (ft): 4.41
- Water mode: 11
- Water-cell size (cm): 1
- Blanking dist. (cm): 25
- Field recorded offset (cm): 18.3
- Actual offset (cm): 18.3
- Latitude: 44° 28’ 42.2” N
- Longitude: 88° 2’ 45.6” W
- Field recorded ADCP depth (ft): 4.4
- Field recorded depthfinder depth (ft): 3.4
- Total number of recorded ensembles: 243
- Heading: 37.29 ± 2.63
- Pitch: 4.91 ± 0.29
- Roll: 0.52 ± 0.31
- Filename: Vert20040307162831r.csv

**NOTES**
1) Wind-rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (+/-) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment
Appendix: Velocity-Profile Plots for OU–3 and OU–4

**Velocity Profile – Lower Fox River – OU–4B**

3/7/2004 16:14:26

Vertically averaged water flow: 1.52 ft/s, to direction 39.7°
Average wind conditions: 17.63 mi/h, from direction 308.8°

**CALCULATED SHEAR STRESS PARAMETERS**

- Shear stress (LP) (dyn/cm²): 8.14 [6.72 ≤ τ ≤ 9.7]
- Shear stress (LP, 6–10% depth) (dyn/cm²): 29.47 [0.56 ≤ τ ≤ 102.16]
- Shear stress (TKE) (dyn/cm²): 7.93
- Shear velocity (cm/s): 2.85 [2.59 ≤ u* ≤ 3.12]
- Bottom roughness, Kₙ (cm): 4.11
- Boundary Reynolds number: 1174.18 Test: PASS

**ADCP DEPLOYMENT DETAILS**

- Avg. water depth (ft): 8.69
- Water mode: 11
- Water-cell size (cm): 1
- Blanking dist. (cm): 25
- Field recorded offset (cm): 18.3
- Actual offset (cm): 18.3
- Latitude: 44° 28' 41" N
- Longitude: 88° 2' 38.9" W
- Field recorded ADCP depth (ft): 8.6
- Field recorded depthfinder depth (ft): 8.2
- Total number of recorded ensembles: 221
- Heading: 69.21 ± 3.44
- Pitch: 4.91 ± 0.31
- Roll: -0.85 ± 0.25
- Filename: Vert20040307161426r.csv

**NOTES**

1) Wind–rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (+/-) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment
Estimates of Shear Stress and Measurements of Water Levels in the Lower Fox River near Green Bay, Wisconsin

Velocity Profile – Lower Fox River – OU4–4C
3/7/2004 15:52:57

Vertically averaged water flow: 0.56 ft/s, to direction 24.6°
Average wind conditions: 19.46 mi/h, from direction 285°

CALCULATED SHEAR STRESS PARAMETERS
Shear stress (LP) (dyn/cm²): 1.57 [0.73 ≤ τ ≤ 2.73]
Shear stress (LP, 6–10% depth) (dyn/cm²): NA [NA ≤ τ ≤ NA]
Shear stress (TKE) (dyn/cm²): 2.16
Shear velocity (cm/s): 1.25 [0.85 ≤ u* ≤ 1.65]
Bottom roughness, Ks (cm): 3.21
Boundary Reynolds number: 402.86 Test: PASS

ADCP DEPLOYMENT DETAILS
Avg. water depth (ft): 3.94
Water mode: 11
Water-cell size (cm): 1
Blanking dist. (cm): 25
Field recorded offset (cm): 18.3
Actual offset (cm): 18.3
Latitude: 44° 28' 37.3" N
Longitude: 88° 2' 22.9" W
Field recorded ADCP depth (ft): ---
Field recorded depthfinder depth (ft): 3.2
Total number of recorded ensembles: 260
Heading: 356.87 ± 2.31
Pitch: 3.46 ± 0.37
Roll: −0.89 ± 0.36
Filename: Vert20040307155257r.csv

NOTES
1) Wind–rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (+/-) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment
Appendix: Velocity-Profile Plots for OU−3 and OU−4

Velocity Profile – Lower Fox River – OU4−5A1

Vertically averaged water flow: 0.08 ft/s, to direction 348.4°
Average wind conditions: 15.55 mi/h, from direction 310°

CALCULATED SHEAR STRESS PARAMETERS
Shear stress (LP) (dyn/cm²): 0.79 [−2.75 ≤ τ ≤ 11.81]
Shear stress (LP, 6–10% depth) (dyn/cm²): NA [NA ≤ τ ≤ NA]
Shear stress (TKE) (dyn/cm²): 0.18
Shear velocity (cm/s): 0.89 [−1.66 ≤ u* ≤ 3.44]
Bottom roughness, Ks (cm): 195.69
Boundary Reynolds number: 17381.96 Test: PASS

ADCP DEPLOYMENT DETAILS
Avg. water depth (ft): 4.5
Water mode: 11
Water-cell size (cm): 1
Blanking dist. (cm): 25
Field recorded offset (cm): 18.3
Actual offset (cm): 18.3
Latitude: 44°29'8.3" N
Longitude: 88°2'24.6" W
Field recorded ADCP depth (ft): 4.4
Field recorded depthfinder depth (ft): 3.6
Total number of recorded ensembles: 237
Heading: 278.91 ± 1.03
Pitch: 2.41 ± 0.13
Roll: 0.18 ± 0.85
Filename: Vert20040308092844r.csv

NOTES
1) Wind−rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (+/−) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment
Estimates of Shear Stress and Measurements of Water Levels in the Lower Fox River near Green Bay, Wisconsin

Velocity Profile – Lower Fox River – OU4–5A2
3/8/2004 9:36:00

10–20% depth: \( y = 37.8x - 3.44 \), \( r^2 = 0.1 \)
6–10% depth: \( y = NAx - 2.872 \), \( r^2 = 0 \)

**PROFILE NOT VALID**

Vertically averaged water flow: 0.08 ft/s, to direction 5.9°
Average wind conditions: 15.55 mi/h, from direction 310°

**CALCULATED SHEAR STRESS PARAMETERS**
- Shear stress (LP) (dyn/cm²): 0.11 [−0.08 ≤ τ ≤ 0.89]
- Shear stress (LP, 6–10% depth) (dyn/cm²): NA [NA ≤ τ ≤ NA]
- Shear stress (TKE) (dyn/cm²): 0
- Shear velocity (cm/s): 0.33 [−0.28 ≤ u* ≤ 0.94]
- Bottom roughness, \( K_b \) (cm): 29.31
- Boundary Reynolds number: 975.15 Test: PASS

**ADCP DEPLOYMENT DETAILS**
- Avg. water depth (ft): 4.54
- Water mode: 11
- Water-cell size (cm): 1
- Blanking dist. (cm): 25
- Field recorded offset (cm): 18.3
- Actual offset (cm): 18.3
- Latitude: 44° 29′ 8.3″ N
- Longitude: 88° 2′ 24.6″ W
- Field recorded ADCP depth (ft): 4.4
- Field recorded depthfinder depth (ft): 3.6
- Total number of recorded ensembles: 238
- Heading: 278.74 ± 0.9
- Pitch: 2.58 ± 0.11
- Roll: 1.31 ± 0.32
- Filename: Vert20040308093600r.csv

**NOTES**
1) Wind-rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (+/-) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment
Vertically averaged water flow: 0.58 ft/s, to direction 44.7°
Average wind conditions: 15.55 mi/h, from direction 310°

CALCULATED SHEAR STRESS PARAMETERS
Shear stress (LP) (dyn/cm²): 0.5 [0.39 ≤ τ ≤ 0.62]
Shear stress (LP, 6–10% depth) (dyn/cm²): 23.03 [13.04 ≤ τ ≤ 35.83]
Shear stress (TKE) (dyn/cm²): 0.42
Shear velocity (cm/s): 0.71 [0.63 ≤ u* ≤ 0.79]
Bottom roughness, K_0 (cm): 0.18
Boundary Reynolds number: 12.88 Test: MAYBE

ADCP DEPLOYMENT DETAILS
Avg. water depth (ft): 8.8
Water mode: 11
Water-cell size (cm): 1
Blanking dist. (cm): 25
Field recorded offset (cm): 18.3
Actual offset (cm): 18.3
Latitude: 44° 29′ 4″ N
Longitude: 88° 2′ 16.1″ W
Field recorded ADCP depth (ft): 8.7
Field recorded depthfinder depth (ft): 8.4
Total number of recorded ensembles: 219
Heading: 314.31 ± 1.49
Pitch: 1.29 ± 0.28
Roll: −1.4 ± 1.09
Filename: Vert20040308091057r.csv

NOTES
1) Wind–rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (+/−) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment
Velocity Profile – Lower Fox River – OU4–5C
3/8/2004 8:53:18

Vertically averaged water flow: 0.46 ft/s, to direction 30.5°
Average wind conditions: 16.1 mi/h, from direction 310°

CALCULATED SHEAR STRESS PARAMETERS
Shear stress (LP) (dyn/cm²): 0.9 [0.78 ≤ τ ≤ 1.03]
Shear stress (LP, 6–10% depth) (dyn/cm²): 0.8 [0.17 ≤ τ ≤ 1.91]
Shear stress (TKE) (dyn/cm²): 0.29
Shear velocity (cm/s): 0.95 [0.88 ≤ u* ≤ 1.02]
Bottom roughness, Ks (cm): 4.53
Boundary Reynolds number: 429.93 Test: PASS

ADCP DEPLOYMENT DETAILS
Avg. water depth (ft): 7.02
Water mode: 11
Water-cell size (cm): 1
Blanking dist. (cm): 25
Field recorded offset (cm): 18.3
Actual offset (cm): 18.3
Latitude: 44° 28’ 57.3” N
Longitude: 88° 2’ 2.3” W
Field recorded ADCP depth (ft): 7
Field recorded depthfinder depth (ft): 6.2
Total number of recorded ensembles: 232
Heading: 277.69 ± 1.18
Pitch: 2.68 ± 0.18
Roll: 2.73 ± 0.77
Filename: Vert20040308085318r.csv

NOTES
1) Wind-rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (+/−) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment
Velocity Profile – Lower Fox River – OU-6A

10-20% depth: $y = 9.36x - 5.02$, $r^2 = 0.97$
6-10% depth: $y = 2.53x + 1.88$, $r^2 = 0.94$

Vertically averaged water flow: 0.68 ft/s, to direction 40.6°
Average wind conditions: 14.4 mi/h, from direction 305.6°

CALCULATED SHEAR STRESS PARAMETERS
Shear stress (LP) (dyn/cm²): 1.94 [1.64 ≤ τ ≤ 2.27]
Shear stress (LP, 6–10% depth) (dyn/cm²): 24.44 [15.28 ≤ τ ≤ 35.74]
Shear stress (TKE) (dyn/cm²): 1
Shear velocity (cm/s): 1.39 [1.28 ≤ u* ≤ 1.51]
Bottom roughness, $K_s$ (cm): 6.06
Boundary Reynolds number: 845.24 Test: PASS

ADCP DEPLOYMENT DETAILS
Avg. water depth (ft): 6.46
Water mode: 11
Water-cell size (cm): 1
Blanking dist. (cm): 25
Field recorded offset (cm): 18.3
Actual offset (cm): 18.3
Latitude: 44° 29′ 22.5″ N
Longitude: 88° 1′ 55.7″ W
Field recorded ADCP depth (ft): 6.4
Field recorded depthfinder depth (ft): 6.4
Total number of recorded ensembles: 233
Heading: 265.09 ± 2.08
Pitch: 2.92 ± 0.14
Roll: −0.79 ± 0.76
Filename: Vert20040308102823r.csv

NOTES
1) Wind–rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (+/-) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment
Velocity Profile – Lower Fox River – OU4–6B1

Vertically averaged water flow: 0.87 ft/s, to direction 41.9°
Average wind conditions: 14.4 mi/h, from direction 305.6°

CALCULATED SHEAR STRESS PARAMETERS
Shear stress (LP) (dyn/cm²): 4.15 [0.22 ≤ τ ≤ 12.97]
Shear stress (LP, 6–10% depth) (dyn/cm²): 3.74 [1.21 ≤ τ ≤ 7.65]
Shear stress (TKE) (dyn/cm²): 15.37
Shear velocity (cm/s): 2.04 [0.47 ≤ u* ≤ 3.6]
Bottom roughness, Kₙ (cm): 16.74
Boundary Reynolds number: 3411.77 Test: PASS

ADCP DEPLOYMENT DETAILS
Avg. water depth (ft): 14.53
Water mode: 11
Water-cell size (cm): 2
Blanking dist. (cm): 25
Field recorded offset (cm): 18.3
Actual offset (cm): 18.3
Latitude: 44° 29′ 20″ N
Longitude: 88° 1′ 49.8″ W
Field recorded ADCP depth (ft): 14.5
Field recorded depthfinder depth (ft): 14.7
Total number of recorded ensembles: 241
Heading: 280.94 ± 1.48
Pitch: 2.82 ± 0.11
Roll: 0.74 ± 1.11
Filename: Vert20040308104255r.csv

NOTES
1) Wind-rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (+/-) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment
Velocity Profile – Lower Fox River – OU4–6B2

Vertically averaged water flow: 0.89 ft/s, to direction 44.1°
Average wind conditions: 14.4 mi/h, from direction 305.6°

CALCULATED SHEAR STRESS PARAMETERS
Shear stress (LP) (dyn/cm²): 0.99 [0.83 ≤ τ ≤ 1.17]
Shear stress (LP, 6–10% depth) (dyn/cm²): 14.12 [8.32 ≤ τ ≤ 21.45]
Shear stress (TKE) (dyn/cm²): 0.79
Shear velocity (cm/s): 1 [0.91 ≤ u* ≤ 1.08]
Bottom roughness, Ks (cm): 0.05
Boundary Reynolds number: 5.15 Test: MAYBE

ADCP DEPLOYMENT DETAILS
Avg. water depth (ft): 14.5
Water mode: 11
Water-cell size (cm): 1
Blanking dist. (cm): 25
Field recorded offset (cm): 195
Actual offset (cm): 195
Latitude: 44° 29' 20" N
Longitude: 88° 1' 49.8" W
Field recorded ADCP depth (ft): 14.5
Field recorded depthfinder depth (ft): 14.7
Total number of recorded ensembles: 219
Heading: 270.34 ± 2.45
Pitch: 0.6 ± 0.59
Roll: −2.16 ± 0.67
Filename: Vert20040308105623r.csv

NOTES
1) Wind–rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (+/−) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment
Velocity Profile – Lower Fox River – OU4–6C

Vertically averaged water flow: 0.8 ft/s, to direction 47.8°
Average wind conditions: 10.36 mi/h, from direction 305.9°

CALCULATED SHEAR STRESS PARAMETERS
Shear stress (LP) (dyn/cm²): 2.11 [1.93 ≤ τ ≤ 2.3]
Shear stress (LP, 6–10% depth) (dyn/cm²): 2.75 [2.17 ≤ τ ≤ 3.39]
Shear stress (TKE) (dyn/cm²): 0.46
Shear velocity (cm/s): 1.45 [1.39 ≤ u* ≤ 1.52]
Bottom roughness, Kₘ (cm): 4.1
Boundary Reynolds number: 594.73 Test: PASS

ADCP DEPLOYMENT DETAILS
Avg. water depth (ft): 16.34
Water mode: 11
Water-cell size (cm): 1
Blanking dist. (cm): 25
Field recorded offset (cm): 226
Actual offset (cm): 226
Latitude: 44° 29' 16.6" N
Longitude: 88° 1' 46.5" W
Field recorded ADCP depth (ft): 15.7
Field recorded depthfinder depth (ft): 15.7
Total number of recorded ensembles: 215
Heading: 267.98 ± 1.4°
Pitch: 2.19 ± 0.28°
Roll: -1.48 ± 0.31°
Filename:Vert20040308111153r.csv

NOTES
1) Wind−rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (+/-) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment
Velocity Profile – Lower Fox River – OU−4−7A

- 10−20% depth: \( y = 7.66x - 8.58 \), \( r^2 = 0.98 \)
- 6−10% depth: \( y = 4.67x - 5.95 \), \( r^2 = 0.99 \)

**CALCULATED SHEAR STRESS PARAMETERS**
- Shear stress (LP) (dyn/cm²): 2.66 [2.44 ≤ τ ≤ 2.9]
- Shear stress (LP, 6–10% depth) (dyn/cm²): 7.16 [6.68 ≤ τ ≤ 7.65]
- Shear stress (TKE) (dyn/cm²): 1.27
- Shear velocity (cm/s): 1.63 [1.56 ≤ u* ≤ 1.7]
- Bottom roughness, \( K_s \) (cm): 0.17
- Boundary Reynolds number: 27.92 Test: MAYBE

**ADCP DEPLOYMENT DETAILS**
- Avg. water depth (ft): 17.4
- Water mode: 11
- Water-cell size (cm): 1
- Blanking dist. (cm): 25
- Field recorded depth (cm): 317
- Actual offset (cm): 317
- Latitude: 44° 31' 2.9" N
- Longitude: 88° 1' 3" W
- Field recorded ADCP depth (ft): 18.8
- Field recorded depthfinder depth (ft): 18.8
- Total number of recorded ensembles: 191
- Heading: 213.61 ± 2.93
- Pitch: -2.43 ± 0.39
- Roll: -1.7 ± 0.87
- Filename: Vert20040308125708r.csv

**DAILY WIND ROSE**

- Vertically averaged water flow: 1.24 ft/s, to direction 39.6°
- Average wind conditions: 8.33 mi/h, from direction 304.6°

**NOTES**
1) Wind–rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (+/−) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment

**VELOCITY AT OIL TANK DEPOT**
Velocity Profile – Lower Fox River – OU4–7B1

Vertically averaged water flow: 1.17 ft/s, to direction 31°
Average wind conditions: 8.33 mi/h, from direction 304.6°

CALCULATED SHEAR STRESS PARAMETERS
Shear stress (LP) (dyn/cm²): 6.73 [3.13 ≤ τ ≤ 11.69]
Shear stress (LP, 6–10% depth) (dyn/cm²): 2.03 [0.94 ≤ τ ≤ 3.52]
Shear stress (TKE) (dyn/cm²): 22.28
Shear velocity (cm/s): 2.59 [1.77 ≤ u* ≤ 3.42]
Bottom roughness, Kₖ (cm): 14.59
Boundary Reynolds number: 3786.17 Test: PASS

ADCP DEPLOYMENT DETAILS
Avg. water depth (ft): 25.43
Water mode: 11
Water-cell size (cm): 2
Blanking dist. (cm): 25
Field recorded offset (cm): 317
Actual offset (cm): 317
Latitude: 44° 31′ 2.1″ N
Longitude: 88° 0′ 59.6″ W
Field recorded ADCP depth (ft): 25.4
Field recorded depthfinder depth (ft): 27.4
Total number of recorded ensembles: 241
Heading: 239.45 ± 4.49
Pitch: -3.05 ± 0.85
Roll: -5.27 ± 0.94
Filename: Vert20040308123251r.csv

NOTES
1) Wind–rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (+/-) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment
Velocity Profile – Lower Fox River – OU4–7B2
3/8/2004 12:38:00

Vertically averaged water flow: 1.32 ft/s, to direction 37.3°
Average wind conditions: 8.33 mi/h, from direction 304.6°

CALCULATED SHEAR STRESS PARAMETERS
Shear stress (LP) (dyn/cm²): 8.89 [4.81 ≤ τ ≤ 14.21]
Shear stress (LP, 6–10% depth) (dyn/cm²): 2.51 [0.86 ≤ τ ≤ 5.04]
Shear stress (TKE) (dyn/cm²): 21.38
Shear velocity (cm/s): 2.98 [2.19 ≤ u* ≤ 3.77]
Bottom roughness, Ks (cm): 14.99
Boundary Reynolds number: 4468.4 Test: PASS

ADCP DEPLOYMENT DETAILS
Avg. water depth (ft): 25.37
Water mode: 11
Water-cell size (cm): 25
Field recorded offset (cm): 317
Actual offset (cm): 317
Latitude: 44° 31.2′ N
Longitude: 88° 0′ 59.6″ W
Field recorded ADCP depth (ft): 25.4
Field recorded depthfinder depth (ft): 27.4
Total number of recorded ensembles: 240
Heading: 241.83 ± 1.77
Pitch: −2.82 ± 0.36
Roll: −5.88 ± 0.67
Filename:Vert20040308123800r.csv

NOTES
1) Wind–rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (+/−) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment
Velocity Profile – Lower Fox River – OU4–7C

Vertically averaged water flow: 0.65 ft/s, to direction 27.8°
Average wind conditions: 8.33 mi/h, from direction 304.6°

CALCULATED SHEAR STRESS PARAMETERS
Shear stress (LP) (dyn/cm²): 0.84 [0.7 ≤ τ ≤ 1]
Shear stress (LP, 6–10% depth) (dyn/cm²): 1.06 [0.96 ≤ τ ≤ 1.17]
Shear stress (TKE) (dyn/cm²): 0.73
Shear velocity (cm/s): 0.92 [0.84 ≤ u* ≤ 1]
Bottom roughness, Kₚ (cm): 0.38
Boundary Reynolds number: 35.13 Test: MAYBE

ADCP DEPLOYMENT DETAILS
Avg. water depth (ft): 17.92
Water mode: 11
Water-cell size (cm): 1
Blanking dist. (cm): 25
Field recorded offset (cm): 317
Actual offset (cm): 317
Latitude: 44° 31′ 0.5″ N
Longitude: 88° 0′ 56.5″ W
Field recorded ADCP depth (ft): ---
Field recorded depthfinder depth (ft): 18
Total number of recorded ensembles: 220
Heading: 223.39 ± 1.67
Pitch: 0.86 ± 0.71
Roll: -1.63 ± 0.95
Filename: Vert20040308121357r.csv

NOTES
1) Wind–rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (+/-) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment
May 2004 Velocity Profiles (OU–4)
Velocity Profile – Lower Fox River – OU4−1A1


Vertical averaged water flow: 1.19 ft/s, to direction 36.2°
Average wind conditions: 9.52 mi/h, from direction 235.2°

CALCULATED SHEAR STRESS PARAMETERS
Shear stress (LP) (dyn/cm²): 3 [2.45 ≤ τ ≤ 3.61]
Shear stress (LP, 6−10% depth) (dyn/cm²): 31.81 [11.92 ≤ τ ≤ 61.28]
Shear stress (TKE) (dyn/cm²): 4.36
Shear velocity (cm/s): 1.73 [1.57 ≤ u* ≤ 1.9]
Bottom roughness, Ks (cm): 0.3
Boundary Reynolds number: 51.89 Test: MAYBE

ADCP DEPLOYMENT DETAILS
Avg. water depth (ft): 5.07
Water mode: 11
Water-cell size (cm): 1
Blanking dist. (cm): 25
Field recorded offset (cm): 24.4
Actual offset (cm): 24.4
Latitude: 44° 27’ 22” N
Longitude: 88° 4’ 4.3” W
Field recorded ADCP depth (ft): 5.1
Field recorded depthfinder depth (ft): 4.3
Total number of recorded ensembles: 191
Heading: 309.21 ± 1.15
Pitch: 1.38 ± 0.27
Roll: 1.32 ± 0.92
Filename: Vert20040525182343r.csv

NOTES
1) Wind−rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (+/−) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment
Appendix: Velocity-Profile Plots for OU−3 and OU−4

Velocity Profile – Lower Fox River – OU4−1A2

5/25/2004 18:29:00

Vertically averaged water flow: 1.22 ft/s, to direction 35.6°
Average wind conditions: 9.52 mi/h, from direction 235.2°

CALCULATED SHEAR STRESS PARAMETERS
Shear stress (LP) (dyn/cm²): 5.36 \([4.41 \leq \tau \leq 6.4]\)
Shear stress (LP, 6−10% depth) (dyn/cm²): 28.1 \([14.36 \leq \tau \leq 46.4]\)
Shear stress (TKE) (dyn/cm²): 3.87
Shear velocity (cm/s): 2.31 \([2.1 \leq u \leq 2.53]\)
Bottom roughness, \(K_s\) (cm): 2.16
Boundary Reynolds number: 499.81 Test: PASS

ADCP DEPLOYMENT DETAILS
Avg. water depth (ft): 5.17
Water mode: 11
Water-cell size (cm): 1
Blanking dist. (cm): 25
Field recorded offset (cm): 24.4
Actual offset (cm): 24.4
Latitude: 44° 27′ 22″ N
Longitude: 88° 4′ 22″ W
Field recorded ADCP depth (ft): 5.1
Field recorded depthfinder depth (ft): 4.3
Total number of recorded ensembles: 233
Heading: 310.25 ± 1.04
Pitch: 1.64 ± 0.19
Roll: 0.69 ± 0.59
Filename: Vert20040525182900r.csv

NOTES
1) Wind−rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (+/−) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment
Velocity Profile – Lower Fox River – OU4–1B

10–20% depth:  
y = 3.81x−5, \( r^2 = 0.99 \)
6–10% depth:  
y = 4x−5, \( r^2 = 0.97 \)

Vertically averaged water flow: 1.44 ft/s, to direction 36.2°
Average wind conditions:  9.52 mi/h, from direction 235.2°

CALCULATED SHEAR STRESS PARAMETERS
Shear stress (LP) (dyn/cm²): 10.76  \([9.55 \leq \tau \leq 12.03]\)
Shear stress (LP, 6–10% depth) (dyn/cm²): 9.75  \([-18.19 \leq \tau \leq 110.47]\)
Shear stress (TKE) (dyn/cm²): 17.44
Shear velocity (cm/s): 3.28  \([3.09 \leq \bar{u} \leq 3.47]\)
Bottom roughness, \( K_s \) (cm): 6.18
Boundary Reynolds number: 2026.52  Test: PASS

ADCP DEPLOYMENT DETAILS
Avg. water depth (ft): 5.23
Water mode: 11
Water-cell size (cm): 1
Blanking dist. (cm): 25
Field recorded offset (cm): 24.4
Actual offset (cm): 24.4
Latitude: 44° 27′ 18.3″ N
Longitude: 88° 4′ 1.5″ W
Field recorded ADCP depth (ft): 5.3
Field recorded depthfinder depth (ft): 4.5
Total number of recorded ensembles: 235
Heading: 264.57° ± 0.87
Pitch: 1.27 ± 0.21
Roll: 0.94 ± 0.47
Filename: Vert20040525181053r.csv

NOTES
1) Wind–rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (+/−) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment
Velocity Profile – Lower Fox River – OU4–1C

5/25/2004 17:58:31

10–20% depth: \( y = 4.82x - 5.63, r^2 = 0.94 \)
6–10% depth: \( y = 3.47x - 4.57, r^2 = 0.94 \)

Vertically averaged water flow: 1.49 ft/s, to direction 44°
Average wind conditions: 8.47 mi/h, from direction 218.5°

CALCULATED SHEAR STRESS PARAMETERS
Shear stress (LP) (dyn/cm²): 7.33 [6.06 \( \leq \tau \leq 8.71 \)]
Shear stress (LP, 6–10% depth) (dyn/cm²): 12.94 [–22.77 \( \leq \tau \leq 143.2 \)]
Shear stress (TKE) (dyn/cm²): 6.15
Shear velocity (cm/s): 2.71 [2.46 \( \leq u^* \leq 2.95 \)]
Bottom roughness, \( K_s \) (cm): 3.29
Boundary Reynolds number: 891.36 Test: PASS

ADCP DEPLOYMENT DETAILS
Avg. water depth (ft): 11.92
Water mode: 11
Water-cell size (cm): 1
Blanking dist. (cm): 25
Field recorded offset (cm): 137
Actual offset (cm): 137
Latitude: 44° 27′ 15.6″ N
Longitude: 88° 3′ 59.1″ W
Field recorded ADCP depth (ft): —
Field recorded depthfinder depth (ft): 13
Total number of recorded ensembles: 224
Heading: 247.6 ± 1.92
Pitch: −0.68 ± 1.02
Roll: −2.54 ± 1
Filename:Vert20040525175831r.csv

NOTES
1) Wind–rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (+–) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment
Vertically averaged water flow: 0.38 ft/s, to direction 194.2°
Average wind conditions: 8.47 mi/h, from direction 218.5°

CALCULATED SHEAR STRESS PARAMETERS
Shear stress (LP) (dyn/cm²): 0.62 [0.48 ≤ τ ≤ 0.78]
Shear stress (LP, 6–10% depth) (dyn/cm²): 0.38 [0.2 ≤ τ ≤ 0.62]
Shear stress (TKE) (dyn/cm²): 0.96
Shear velocity (cm/s): -0.79 [-0.7 ≤ u* ≤ -0.88]
Bottom roughness, Ks (cm): 1792617
Boundary Reynolds number: -141400287.77 Test: FAIL

ADCP DEPLOYMENT DETAILS
Avg. water depth (ft): 12.36
Water mode: 11
Water-cell size (cm): 1
Blanking dist. (cm): 25
Field recorded offset (cm): 137
Actual offset (cm): 137
Latitude: 44° 27' 10.7" N
Longitude: 88° 3' 54.5" W
Field recorded ADCP depth (ft): 12.4
Field recorded depthfinder depth (ft): 13
Total number of recorded ensembles: 112
Heading: 276.72 ± 3
Pitch: 2.14 ± 0.54
Roll: -0.43 ± 1.1
Filename: Vert2004052510r.csv

NOTES
1) Wind-rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (+/-) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment
Velocity Profile – Lower Fox River – OU4–1D2

5/25/2004 17:40:40

Vertically averaged water flow: 0.33 ft/s, to direction 184.2°
Average wind conditions: 8.47 mi/h, from direction 218.5°

CALCULATED SHEAR STRESS PARAMETERS
Shear stress (LP) (dyn/cm²): 0.63 [0.43 ≤ τ ≤ 0.86]
Shear stress (LP, 6–10% depth) (dyn/cm²): 0.85 [−0.39 ≤ τ ≤ 6.1]
Shear stress (TKE) (dyn/cm²): 0.81
Shear velocity (cm/s): −0.79 [−0.66 ≤ u* ≤ −0.92]
Bottom roughness, Kₘ (cm): 473994.4
Boundary Reynolds number: −37510443.94 Test: FAIL

ADCP DEPLOYMENT DETAILS
Avg. water depth (ft): 12.42
Water mode: 11
Water-cell size (cm): 1
Blanking dist. (cm): 25
Field recorded offset (cm): 137
Actual offset (cm): 137
Latitude: 44° 27' 10.7" N
Longitude: 88° 3' 54.5" W
Field recorded ADCP depth (ft): 12.4
Field recorded depthfinder depth (ft): 13
Total number of recorded ensembles: 221
Heading: 275.74 ± 2.63
Pitch: 2.68 ± 0.5
Roll: 0.74 ± 0.8
Filename: Vert20040525174040r.csv

NOTES
1) Wind–rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (+/−) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment
Velocity Profile – Lower Fox River – OU4–2A
5/26/2004 18:33:25

Vertically averaged water flow: 1.21 ft/s, to direction 36.5°
Average wind conditions: 9.17 mi/h, from direction 256.7°

CALCULATED SHEAR STRESS PARAMETERS
Shear stress (LP) (dyn/cm²): 3.11 [2.37 ≤ τ ≤ 3.94]
Shear stress (LP, 6–10% depth) (dyn/cm²): NA [NA ≤ τ ≤ NA]
Shear stress (TKE) (dyn/cm²): 3.88
Shear velocity (cm/s): 1.76 [1.54 ≤ u* ≤ 1.98]
Bottom roughness, Ks (cm): 0.34
Boundary Reynolds number: 59.74 Test: MAYBE

ADCP DEPLOYMENT DETAILS
Avg. water depth (ft): 4.75
Water mode: 11
Water–cell size (cm): 1
Blanking dist. (cm): 25
Field recorded offset (cm): 24.4
Actual offset (cm): 24.4
Latitude: 44° 27′ 43.5″ N
Longitude: 88° 3′ 32.5″ W
Field recorded ADCP depth (ft): 4.8
Field recorded depthfinder depth (ft): 3.7
Total number of recorded ensembles: 181
Heading: 216.43 ± 2.38
Pitch: 2.53 ± 0.75
Roll: −3.84 ± 3.77
Filename: Vert20040526183325r.csv

NOTES
1) Wind–rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (+/−) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment
Velocity Profile – Lower Fox River – OU4–2B
5/26/2004 18:16:25

Vertically averaged water flow: 1.41 ft/s, to direction 40.2°
Average wind conditions: 9.17 mi/h, from direction 256.7°

CALCULATED SHEAR STRESS PARAMETERS
Shear stress (LP) (dyn/cm²): 3.87 [3.31 ≤ τ ≤ 4.49]
Shear stress (LP, 6–10% depth) (dyn/cm²): 4.95 [3.38 ≤ τ ≤ 6.83]
Shear stress (TKE) (dyn/cm²): 2.48
Shear velocity (cm/s): 1.97 [1.82 ≤ u* ≤ 2.12]
Bottom roughness, Kₘ (cm): 0.31
Boundary Reynolds number: 61.55 Test: MAYBE

ADCP DEPLOYMENT DETAILS
Avg. water depth (ft): 7.79
Water mode: 11
Water-cell size (cm): 1
Blanking dist. (cm): 25
Field recorded offset (cm): 24.4
Actual offset (cm): 24.4
Latitude: 44° 27′ 43.2″ N
Longitude: 88° 3′ 31.8″ W
Field recorded ADCP depth (ft): 7.8
Field recorded depthfinder depth (ft): 7.6
Total number of recorded ensembles: 215
Heading: 219.06 ± 1.53
Pitch: 2.97 ± 0.23
Roll: −0.9 ± 0.51
Filename: Vert20040526181625r.csv

NOTES
1) Wind–rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (+/-) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment
Velocity Profile – Lower Fox River – OU4–2C

VELOCITY, IN FEET PER SECOND
DISTANCE ABOVE RIVER BOTTOM, IN FEET
(NATURAL LOG SCALE)

Vertically averaged water flow: 1.71 ft/s, to direction 37.1°
Average wind conditions: 10.06 mi/h, from direction 272.2°

CALCULATED SHEAR STRESS PARAMETERS
Shear stress (LP) (dyn/cm²): 10.82 [8.53 ≤ τ ≤ 13.37]
Shear stress (LP, 6–10% depth) (dyn/cm²): 8.35 [4.81 ≤ τ ≤ 12.85]
Shear stress (TKE) (dyn/cm²): 4.19
Shear velocity (cm/s): 3.29 [2.92 ≤ u* ≤ 3.66]
Bottom roughness, Ks (cm): 5.47
Boundary Reynolds number: 1799.13 Test: PASS

ADCP DEPLOYMENT DETAILS
Avg. water depth (ft): 21.05
Water mode: 11
Water-cell size (cm): 2
Blanking dist. (cm): 25
Field recorded offset (cm): 320
Actual offset (cm): 320
Latitude: 44° 27' 43" N
Longitude: 88° 3' 28.5" W
Field recorded ADCP depth (ft): 21.3
Field recorded depthfinder depth (ft): 20.7
Total number of recorded ensembles: 226
Heading: 209.4 ± 3.69
Pitch: -3.31 ± 1.17
Roll: 2.75 ± 1.55
Filename: Vert20040526175438r.csv

NOTES
1) Wind-rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (+/-) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment
Vertically averaged water flow: 1.43 ft/s, to direction 29.3°
Average wind conditions: 10.06 mi/h, from direction 272.2°

CALCULATED SHEAR STRESS PARAMETERS
Shear stress (LP) (dyn/cm²): 5.64 \([5.2 \leq \tau \leq 6.1]\)
Shear stress (LP, 6–10% depth) (dyn/cm²): 6.42 \([4.78 \leq \tau \leq 8.29]\)
Shear stress (TKE) (dyn/cm²): 4.51
Shear velocity (cm/s): 2.37 \([2.28 \leq u^* \leq 2.47]\)
Bottom roughness, \(K_s\) (cm): 1.63
Boundary Reynolds number: 387.95 Test: PASS

ADCP DEPLOYMENT DETAILS
Avg. water depth (ft): 15.9
Water mode: 11
Water-cell size (cm): 1
Blanking dist. (cm): 25
Field recorded offset (cm): 198
Actual offset (cm): 198
Latitude: 44° 27’ 42” N
Longitude: 88° 3’ 26.2” W
Field recorded ADCP depth (ft): 15.5
Field recorded depthfinder depth (ft): 14.6
Total number of recorded ensembles: 191
Heading: 207.96 ± 4.91
Pitch: −0.22 ± 0.95
Roll: −2.12 ± 0.94
Filename: Vert20040526171311r.csv

NOTES
1) Wind–rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (±1) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment
Vertically averaged water flow: 0.5 ft/s, to direction 27.2°
Average wind conditions: 6.81 mi/h, from direction 286.6°

CALCULATED SHEAR STRESS PARAMETERS
Shear stress (LP) (dyn/cm²): 1.53 [0.88 ≤ τ ≤ 2.35]
Shear stress (LP, 6−10% depth) (dyn/cm²): 15.39 [12.13 ≤ τ ≤ 19.03]
Shear stress (TKE) (dyn/cm²): 1.06
Shear velocity (cm/s): 1.24 [0.94 ≤ u* ≤ 1.53]
Bottom roughness, Ks (cm): 4.14
Boundary Reynolds number: 511.35 Test: PASS

ADCP DEPLOYMENT DETAILS
Avg. water depth (ft): 3.47
Water mode: 11
Water-cell size (cm): 25
Field recorded offset (cm): 24.4
Actual offset (cm): 24.4
Latitude: 44° 28' 18.7" N
Longitude: 88° 3' 9.7" W
Field recorded ADCP depth (ft): 3.3
Field recorded depthfinder depth (ft): 2.7
Total number of recorded ensembles: 200
Heading: 217.51 ± 1.71
Pitch: 3.69 ± 0.13
Roll: -0.3 ± 0.13
Filename: Vert20040526093759r.csv

NOTES
1) Wind−rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (+/−) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment
Velocity Profile – Lower Fox River – OU4–3B


Vertically averaged water flow: 1.12 ft/s, to direction 29.7°
Average wind conditions: 6.81 mi/h, from direction 286.6°

CALCULATED SHEAR STRESS PARAMETERS
Shear stress (LP) (dyn/cm²): 3.12 [2.4 ≤ τ ≤ 3.93]
Shear stress (LP, 6–10% depth) (dyn/cm²): 13.92 [4.67 ≤ τ ≤ 28.09]
Shear stress (TKE) (dyn/cm²): 1.99
Shear velocity (cm/s): 1.77 [1.55 ≤ u ≤ 1.98]
Bottom roughness, Kₚ (cm): 0.88
Boundary Reynolds number: 155.67 Test: PASS

ADCP DEPLOYMENT DETAILS
Avg. water depth (ft): 6.03
Water mode: 11
Water-cell size (cm): 1
Blanking dist. (cm): 25
Field recorded offset (cm): 24.4
Actual offset (cm): 24.4
Latitude: 44° 28' 17.6" N
Longitude: 88° 3' 5.7" W
Field recorded ADCP depth (ft): 5.9
Field recorded depthfinder depth (ft): 4.9
Total number of recorded ensembles: 206
Heading: 232.37 ± 4.53
Pitch: 3.88 ± 0.19
Roll: 0.76 ± 0.36
Filename: Vert20040526095552r.csv

NOTES
1) Wind–rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (+/−) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment
Velocity Profile – Lower Fox River – OU4–3C
5/26/2004 10:20:40

Vertically averaged water flow: 1.65 ft/s, to direction 32°
Average wind conditions: 6.08 mi/h, from direction 287.4°

CALCULATED SHEAR STRESS PARAMETERS
Shear stress (LP) (dyn/cm²): 8.1 [7.43 ≤ τ ≤ 8.81]
Shear stress (LP, 6–10% depth) (dyn/cm²): 5.01 [4.61 ≤ τ ≤ 5.43]
Shear stress (TKE) (dyn/cm²): 3.2
Shear velocity (cm/s): 2.85 [2.73 ≤ u* ≤ 2.97]
Bottom roughness, Kₜ (cm): 1.85
Boundary Reynolds number: 527.46 Test: PASS

ADCP DEPLOYMENT DETAILS
Avg. water depth (ft): 17.73
Water mode: 11
Water-cell size (cm): 1
Blanking dist. (cm): 25
Field recorded offset (cm): 305
Actual offset (cm): 305
Latitude: 44° 28' 17.5" N
Longitude: 88° 3' 1.9" W
Field recorded ADCP depth (ft): 17.9
Field recorded depthfinder depth (ft): 17.8
Total number of recorded ensembles: 211
Heading: 203.98° ± 4.65
Pitch: -2.57° ± 0.45
Roll: 1.52° ± 1.26
Filename: Vert20040526102040r.csv

NOTES
1) Wind–rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (+/-) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment
Appendix: Velocity-Profile Plots for OU−3 and OU−4

Velocity Profile – Lower Fox River – OU4−3D
5/26/2004 10:38:52

Vertically averaged water flow: 0.7 ft/s, to direction 22.7°
Average wind conditions: 6.08 mi/h, from direction 287.4°

CALCULATED SHEAR STRESS PARAMETERS
Shear stress (LP) (dyn/cm²): 1.59 [1.18 ≤ τ ≤ 2.07]
Shear stress (LP, 6–10% depth) (dyn/cm²): 14.17 [6.45 ≤ τ ≤ 24.89]
Shear stress (TKE) (dyn/cm²): 1.71
Shear velocity (cm/s): 1.26 [1.09 ≤ u* ≤ 1.44]
Bottom roughness, Kₘ (cm): 2.09
Boundary Reynolds number: 264.01 Test: PASS

ADCP DEPLOYMENT DETAILS
Avg. water depth (ft): 6.19
Water mode: 11
Water-cell size (cm): 1
Blanking dist. (cm): 25
Field recorded ADCP depth (ft): 6.1
Field recorded depthfinder depth (ft): 4.9
Total number of recorded ensembles: 223
Heading: 241.56 ± 1.54
Pitch: 2.74 ± 0.12
Roll: 1 ± 0.59
Filename: Vert20040526103852r.csv

NOTES
1) Wind–rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (+/-) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment.
Velocity Profile – Lower Fox River – OU4–4A
5/26/2004 12:28:05

Vertically averaged water flow: 0.52 ft/s, to direction 24.8°
Average wind conditions: 7.99 mi/h, from direction 293.4°

CALCULATED SHEAR STRESS PARAMETERS

- Shear stress (LP) (dyn/cm²): 1.51 [1.18 ≤ τ ≤ 1.87]
- Shear stress (LP, 6–10% depth) (dyn/cm²): 5.86 [1.27 ≤ τ ≤ 13.82]
- Shear stress (TKE) (dyn/cm²): 0.71
- Shear velocity (cm/s): 1.23 [1.09 ≤ u* ≤ 1.37]
- Bottom roughness, Ks (cm): 10.51
- Boundary Reynolds number: 1290.39 Test: PASS

ADCP DEPLOYMENT DETAILS

- Avg. water depth (ft): 6.02
- Water mode: 11
- Water-cell size (cm): 1
- Blank ing dist. (cm): 25
- Field recorded offset (cm): 24.4
- Actual offset (cm): 24.4
- Latitude: 44° 28.421” N
- Longitude: 88° 2’ 45.6” W
- Field recorded ADCP depth (ft): 5.9
- Field recorded depthfinder depth (ft): 5.1
- Total number of recorded ensembles: 213
- Heading: 241.32 ± 3.85
- Pitch: 2.82 ± 0.15
- Roll: -0.13 ± 0.46
- Filename: Vert20040526122805r.csv

NOTES
1) Wind–rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (+−) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment
Velocity Profile – Lower Fox River – OU–4B
5/26/2004 12:00:11

Vertically averaged water flow: 1.25 ft/s, to direction 37.1°
Average wind conditions: 7.99 mi/h, from direction 293.4°

CALCULATED SHEAR STRESS PARAMETERS
Shear stress (LP) (dyn/cm²): 10.27 [9.26 ≤ τ ≤ 11.34]
Shear stress (LP, 6–10% depth) (dyn/cm²): 5.26 [4.48 ≤ τ ≤ 6.11]
Shear stress (TKE) (dyn/cm²): 2.04
Shear velocity (cm/s): 3.2 [3.04 ≤ u* ≤ 3.37]
Bottom roughness, Ks (cm): 14.85
Boundary Reynolds number: 4759.54 Test: PASS

ADCP DEPLOYMENT DETAILS
Avg. water depth (ft): 10.26
Water mode: 11
Water-cell size (cm): 1
Blanking dist. (cm): 25
Field recorded offset (cm): 137
Actual offset (cm): 137
Latitude: 44° 28' 41" N
Longitude: 88° 2' 38.8" W
Field recorded ADCP depth (ft): 10.1
Field recorded depthfinder depth (ft): 9.4
Total number of recorded ensembles: 216
Heading: 243.69 ± 3.16
Pitch: 2.61 ± 0.33
Roll: −0.65 ± 1.06
Filename: Vert20040526120011r.csv

NOTES
1) Wind–rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (+/-) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment.
Vertically averaged water flow: 0.58 ft/s, to direction 31.6°
Average wind conditions: 6.89 mi/h, from direction 29.5°

CALCULATED SHEAR STRESS PARAMETERS
Shear stress (LP) (dyn/cm²): 2.26 [1.52 ≤ τ ≤ 3.13]
Shear stress (LP, 6−10% depth) (dyn/cm²): 33.27 [−8.49 ≤ τ ≤ 208.81]
Shear stress (TKE) (dyn/cm²): 3.19
Shear velocity (cm/s): 1.5 [1.23 ≤ u* ≤ 1.77]
Bottom roughness, Ks (cm): 15.77
Boundary Reynolds number: 2368.97 Test: PASS

ADCP DEPLOYMENT DETAILS
Avg. water depth (ft): 6.03
Water mode: 11
Water-cell size (cm): 1
Blanking dist. (cm): 25
Field recorded offset (cm): 24.4
Actual offset (cm): 24.4
Latitude: 44° 28.374” N
Longitude: 88° 2’ 23.1” W
Field recorded ADCP depth (ft): 6
Field recorded depthfinder depth (ft): 4.9
Total number of recorded ensembles: 54
Heading: 244.83 ± 3.64
Pitch: 4.51 ± 0.67
Roll: 0.29 ± 1.89
Filename: Vert20040526113113r.csv

NOTES
1) Wind−rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (+/-) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment
Appendix: Velocity-Profile Plots for OU–3 and OU–4

Velocity Profile – Lower Fox River – OU4–4C3
5/26/2004 11:35:43

Vertically averaged water flow: 0.65 ft/s, to direction 29.8°
Average wind conditions: 6.89 mi/h, from direction 295.5°

CALCULATED SHEAR STRESS PARAMETERS
Shear stress (LP) (dyn/cm²): 0.77 [0.5 ≤ τ ≤ 1.11]
Shear stress (LP, 6–10% depth) (dyn/cm²): 6.51 [−0.36 ≤ τ ≤ 32.55]
Shear stress (TKE) (dyn/cm²): 2.78
Shear velocity (cm/s): 0.88 [0.71 ≤ u* ≤ 1.05]
Bottom roughness, Kₕ (cm): 0.39
Boundary Reynolds number: 34.25 Test: MAYBE

ADCP DEPLOYMENT DETAILS
Avg. water depth (ft): 6.03
Water mode: 11
Water-cell size (cm): 1
Blanking dist. (cm): 25
Field recorded offset (cm): 24.4
Actual offset (cm): 24.4
Latitude: 44° 28’ 37.4” N
Longitude: 88° 2’ 23.1” W
Field recorded ADCP depth (ft): 6
Field recorded depthfinder depth (ft): 4.9
Total number of recorded ensembles: 208
Heading: 242.43 ± 1.94
Pitch: 4.06 ± 0.27
Roll: 0.5 ± 0.6
Filename: Vert20040526113543r.csv

NOTES
1) Wind–rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (± 1) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment
Velocity Profile – Lower Fox River – OU4–5A

Vertically averaged water flow: 0.4 ft/s, to direction 70°
Average wind conditions: 8.75 mi/h, from direction 290°

CALCULATED SHEAR STRESS PARAMETERS
Shear stress (LP) (dyn/cm²): 1.05 [0.7 ≤ τ ≤ 1.47]
Shear stress (LP, 6–10% depth) (dyn/cm²): 8.12 [5.84 ≤ τ ≤ 10.77]
Shear stress (TKE) (dyn/cm²): 0.32
Shear velocity (cm/s): 1.02 [0.83 ≤ u* ≤ 1.21]
Bottom roughness, Ks (cm): 12.28
Boundary Reynolds number: 1255.53 Test: PASS

ADCP DEPLOYMENT DETAILS
Avg. water depth (ft): 5.72
Water mode: 11
Water-cell size (cm): 1
Blanking dist. (cm): 25
Field recorded offset (cm): 24.4
Actual offset (cm): 24.4
Latitude: 44° 29' 8" N
Longitude: 88° 2' 23.8" W
Field recorded ADCP depth (ft): 5.7
Field recorded depthfinder depth (ft): 5.1
Total number of recorded ensembles: 201
Heading: 254.93 ± 1.88
Pitch: 3.12 ± 0.36
Roll: -0.78 ± 0.57
Filename: Vert20040526132801r.csv

NOTES
1) Wind-rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (+/-) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment
**Velocity Profile – Lower Fox River – OU4–5B**


 Vertically averaged water flow: 1.14 ft/s, to direction 53°
Average wind conditions: 8.75 mi/h, from direction 290°

**CALCULATED SHEAR STRESS PARAMETERS**
- Shear stress (LP) (dyn/cm²): 2.93 [2.55 ≤ τ ≤ 3.34]
- Shear stress (LP, 6–10% depth) (dyn/cm²): 5.8 [5.27 ≤ τ ≤ 6.35]
- Shear stress (TKE) (dyn/cm²): 2.01
- Shear velocity (cm/s): 1.71 [1.6 ≤ u* ≤ 1.83]
- Bottom roughness, Ks (cm): 0.65
- Boundary Reynolds number: 112.15 Test: PASS

**ADCP DEPLOYMENT DETAILS**
- Avg. water depth (ft): 10.18
- Water mode: 11
- Water-cell size (cm): 1
- Blanked dist. (cm): 25
- Field recorded offset (cm): 107
- Actual offset (cm): 107
- Latitude: 44° 29' 4" N
- Longitude: 88° 2' 16" W
- Field recorded ADCP depth (ft): 10.2
- Field recorded depthfinder depth (ft): 9.4
- Total number of recorded ensembles: 204
- Heading: 247.55 ± 1.95
- Pitch: 3.37 ± 0.31
- Roll: −2.02 ± 0.89
- Filename: Vert20040526134919r.csv

**NOTES**
1) Wind−rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (+/-) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment
Vertically averaged water flow: 0.79 ft/s, to direction 31.6°
Average wind conditions: 8.8 mi/h, from direction 283.9°

CALCULATED SHEAR STRESS PARAMETERS
Shear stress (LP) (dyn/cm²): 1.99 [1.76 ≤ τ ≤ 2.24]
Shear stress (LP, 6–10% depth) (dyn/cm²): 17.16 [9.83 ≤ τ ≤ 26.52]
Shear stress (TKE) (dyn/cm²): 1.18
Shear velocity (cm/s): 1.41 [1.33 ≤ u* ≤ 1.5]
Bottom roughness, Kₜ (cm): 2.98
Boundary Reynolds number: 421.34 Test: PASS

ADCP DEPLOYMENT DETAILS
Avg. water depth (ft): 8.3
Water mode: 11
Water–cell size (cm): 1
Blanking dist. (cm): 25
Field recorded offset (cm): 24.4
Actual offset (cm): 24.4
Latitude: 44° 28' 57.3" N
Longitude: 88° 2' 2.3" W
Field recorded ADCP depth (ft): 8.2
Field recorded depthfinder depth (ft): 7.4
Total number of recorded ensembles: 204
Heading: 240.35 ± 1.7
Pitch: 3.32 ± 0.36
Roll: -2.88 ± 1.4
Filename: Vert20040526141052r.csv

NOTES
1) Wind–rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (+/−) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment
Velocity Profile – Lower Fox River – OU4–6A
5/26/2004 15:53:42

10–20% depth: \( y = 6.86x - 4.72 \), \( r^2 = 0.97 \)
6–10% depth: \( y = 5.15x - 3.75 \), \( r^2 = 0.96 \)

Vertically averaged water flow: 0.82 ft/s, to direction 47°
Average wind conditions: 8.07 mi/h, from direction 276.7°

CALCULATED SHEAR STRESS PARAMETERS
Shear stress (LP) (dyn/cm²): 3.32 \([2.76 \leq \tau \leq 3.92]\)
Shear stress (LP, 6–10% depth) (dyn/cm²): 5.9 \([4.17 \leq \tau \leq 7.93]\)
Shear stress (TKE) (dyn/cm²): 1.29
Shear velocity (cm/s): 1.82 \([1.66 \leq u^* \leq 1.98]\)
Bottom roughness, \( K_s \) (cm): 8.14
Boundary Reynolds number: 1481.76 Test: PASS

ADCP DEPLOYMENT DETAILS
Avg. water depth (ft): 6.96
Water mode: 11
Water-cell size (cm): 1
Blanking dist. (cm): 25
Field recorded offset (cm): 24.4
Actual offset (cm): 24.4
Latitude: 44° 29' 22.8" N
Longitude: 88° 1' 55.5" W
Field recorded ADCP depth (ft): 7
Field recorded depthfinder depth (ft): --
Total number of recorded ensembles: 210
Heading: 204.05 ± 1.94
Pitch: 2.57 ± 0.61
Roll: 1.87 ± 1.39
Filename: Vert20040526155342r.csv

NOTES
1) Wind–rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour \((\pm)\) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment
Vertically averaged water flow: 1.2 ft/s, to direction 45°
Average wind conditions: 8.07 mi/h, from direction 276.7°

CALCULATED SHEAR STRESS PARAMETERS
Shear stress (LP) (dyn/cm²): 2.08 \([1.88 \leq \tau \leq 2.28]\)
Shear stress (LP, 6–10% depth) (dyn/cm²): 4.74 \([4.09 \leq \tau \leq 5.43]\)
Shear stress (TKE) (dyn/cm²): 1.56
Shear velocity (cm/s): 1.44 \([1.37 \leq u^* \leq 1.51]\)
Bottom roughness, \(K_s\) (cm): 0.1
Boundary Reynolds number: 14.68 Test: MAYBE

ADCP DEPLOYMENT DETAILS
Avg. water depth (ft): 14.75
Water mode: 11
Water-cell size (cm): 1
Blanking dist. (cm): 25
Field recorded offset (cm): 198
Actual offset (cm): 198
Latitude: 44° 29’ 20.2″ N
Longitude: 88° 1’ 49.9″ W
Field recorded ADCP depth (ft): 14.6
Field recorded depthfinder depth (ft): 14
Total number of recorded ensembles: 218
Heading: 222.55 ± 4.63
Pitch: 1.07 ± 0.91
Roll: −0.75 ± 0.98
Filename: Vert20040526153457r.csv

NOTES
1) Wind-rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (+/-) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment
Appendix: Velocity-Profile Plots for OU–3 and OU–4  171

Velocity Profile – Lower Fox River – OU4–6C
5/26/2004 15:10:45

Vertically averaged water flow: 0.97 ft/s, to direction 51.3°
Average wind conditions: 8.07 mi/h, from direction 276.7°

Calculated Shear Stress Parameters
Shear stress (LP) (dyn/cm²): 4.42 \([4.16 \leq \tau \leq 4.68]\)
Shear stress (LP, 6–10% depth) (dyn/cm²): 3.18 \([2.95 \leq \tau \leq 3.42]\)
Shear stress (TKE) (dyn/cm²): 2.02
Shear velocity (cm/s): 2.1 \([2.04 \leq \nu \leq 2.16]\)
Bottom roughness, \(K_s\) (cm): 9.66
Boundary Reynolds number: 2029.7 Test: PASS

ADCP Deployment Details
Avg. water depth (ft): 17.77
Water mode: 11
Water-cell size (cm): 1
Blanking dist. (cm): 25
Field recorded offset (cm): 290
Actual offset (cm): 290
Latitude: 44° 29’ 29.7” N
Longitude: 88° 1’ 46.8” W

Field recorded ADCP depth (ft): 17.7
Field recorded depthfinder depth (ft): 17
Total number of recorded ensembles: 215
Heading: 237.5 ± 1.94
Pitch: −0.31 ± 0.6
Roll: −0.47 ± 1.06
Filename: Vert20040526151045r.csv

Notes
1) Wind–rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (+/-) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment
**Velocity Profile – Lower Fox River – OU4–7A**

**VELOCITY, IN FEET PER SECOND**

**DISTANCE ABOVE RIVER BOTTOM, IN FEET**

(NATURAL LOG SCALE)

**5/27/2004 12:34:40**

Vertically averaged water flow: 0.32 ft/s, to direction 29.2°

Average wind conditions: 7.5 mi/h, from direction 190°

**CALCULATED SHEAR STRESS PARAMETERS**

Shear stress (LP) (dyn/cm²): 0.26 [0.2 ≤ τ ≤ 0.32]

Shear stress (LP, 6–10% depth) (dyn/cm²): 0.2 [0.14 ≤ τ ≤ 0.27]

Shear stress (TKE) (dyn/cm²): 0.17

Shear velocity (cm/s): 0.51 [0.45 ≤ u* ≤ 0.57]

Bottom roughness, Ks (cm): 1.52

Boundary Reynolds number: 77.17 Test: PASS

**ADCP DEPLOYMENT DETAILS**

Avg. water depth (ft): 20.33

Water mode: 11

Water-cell size (cm): 2

Blanking dist. (cm): 25

Field recorded offset (cm): 320

Actual offset (cm): 320

Latitude: 44° 31' 2.2" N

Longitude: 88° 1’ 3.6” W

Field recorded ADCP depth (ft): 20.5

Field recorded depthfinder depth (ft): 20.2

Total number of recorded ensembles: 201

Heading: 190.96 ± 5.78

Pitch: 2.22 ± 0.38

Roll: 1.37 ± 0.28

Filename: Vert20040527123440r.csv

**NOTES**

1) Wind–rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions

2) Average wind conditions calculated for conditions within an hour (+/-) of sampling time

3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment
Velocity Profile – Lower Fox River – OU4–7B

5/27/2004 12:10:56

PROFILE NOT VALID

Vertically averaged water flow: 0.73 ft/s, to direction 33.2°
Average wind conditions:  7.5 mi/h, from direction 190°

CALCULATED SHEAR STRESS PARAMETERS
Shear stress (LP) (dyn/cm²): 8.75 [3.48 ≤ τ ≤ 16.4]
Shear stress (LP, 6–10% depth) (dyn/cm²): 4.39 [1.97 ≤ τ ≤ 7.77]
Shear stress (TKE) (dyn/cm²): 16.92
Shear velocity (cm/s): 2.96 [1.87 ≤ u* ≤ 4.05]
Bottom roughness, Ks (cm): 206.27
Boundary Reynolds number: 61017.35 Test: PASS

ADCP DEPLOYMENT DETAILS
Avg. water depth (ft): 28.87
Water mode: 11
Water-cell size (cm): 2
Blanking dist. (cm): 25
Field recorded offset (cm): 320
Actual offset (cm): 320
Latitude: 44° 31’ 1.3” N
Longitude: 88° 0’ 59.4” W
Field recorded ADCP depth (ft): 29
Field recorded depthfinder depth (ft): 28.7
Total number of recorded ensembles: 209
Heading: 236.4 ± 6.04
Pitch: 0.39 ± 0.42
Roll: −1.68 ± 0.73
Filename: Vert20040527121056r.csv

NOTES
1) Wind–rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (+/-) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment
**Velocity Profile – Lower Fox River – OU4–7C**


Vertically averaged water flow: 1.17 ft/s, to direction 30.5°
Average wind conditions: 10.06 mi/h, from direction 207.8°

**CALCULATED SHEAR STRESS PARAMETERS**

Shear stress (LP) (dyn/cm²): 4.77 \([4.29 < \tau < 5.27]\)
Shear stress (LP, 6−10% depth) (dyn/cm²): 3.15 \([2.82 \leq \tau \leq 3.5]\)
Shear stress (TKE) (dyn/cm²): 3.51
Shear velocity (cm/s): 2.18 \([2.07 \leq u \leq 2.3]\)
Bottom roughness, \(K_s\) (cm): 3.73
Boundary Reynolds number: 815.09  Test: PASS

**ADCP DEPLOYMENT DETAILS**

Avg. water depth (ft): 19.06
Water mode: 11
Water-cell size (cm): 1
Blanking dist. (cm): 25
Field recorded offset (cm): 320
Actual offset (cm): 320
Latitude: 44° 31' 0.3'' N
Longitude: 88° 0' 57.1'' W
Field recorded ADCP depth (ft): 19
Field recorded depthfinder depth (ft): 17.8
Total number of recorded ensembles: 216
Heading: 218.4 ± 2.45
Pitch: -2.22 ± 0.68
Roll: -3.1 ± 1.87
Filename: Vert20040527141316r.csv

**NOTES**

1) Wind-rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (+/-) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment
Velocity Profile – Lower Fox River – OU4–8A
5/27/2004 8:54:47

Vertically averaged water flow: 1.68 ft/s, to direction 6.6°

CALCULATED SHEAR STRESS PARAMETERS
Shear stress (LP) (dyn/cm²): 12.92 [8.56 ≤ τ ≤ 18.18]
Shear stress (LP, 6–10% depth) (dyn/cm²): 6.9 [5.25 ≤ τ ≤ 8.78]
Shear stress (TKE) (dyn/cm²): 29.66
Shear velocity (cm/s): 3.59 [2.93 ≤ u* ≤ 4.26]
Bottom roughness, Kₘ (cm): 14.06
Boundary Reynolds number: 5052.76 Test: PASS

ADCP DEPLOYMENT DETAILS
Avg. water depth (ft): 26.43
Water mode: 11
Water-cell size (cm): 2
Blanking dist. (cm): 25
Field recorded offset (cm): NA
Actual offset (cm): 320
Latitude: 44° 31' 45.5" N
Longitude: 88° 0' 33.1" W
Field recorded ADCP depth (ft): 26.5
Field recorded depthfinder depth (ft): 26.4
Total number of recorded ensembles: 212
Heading: 192.63 ± 2.56
Pitch: −4.33 ± 0.65
Roll: −2.3 ± 0.92
Filename: Vert20040527085447r.csv

NOTES
1) Wind–rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (+/−) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment

SHEAR STRESS, IN DYNES PER CENTIMETER SQUARED

DAILY WIND ROSE

 VELOCITY AT OIL TANK DEPOT

PROFILE NOT VALID
Vertically averaged water flow: 1.24 ft/s, to direction 2.9°

CALCULATED SHEAR STRESS PARAMETERS
Shear stress (LP) (dyn/cm²): 8.18 [5.1 \leq \tau \leq 12]
Shear stress (LP, 6–10% depth) (dyn/cm²): 3.73 [1.81 \leq \tau \leq 6.33]
Shear stress (TKE) (dyn/cm²): 20.58
Shear velocity (cm/s): 2.86 [2.26 \leq u^* \leq 3.46]
Bottom roughness, $K_s$ (cm): 24.22
Boundary Reynolds number: 6928.26 Test: PASS

ADCP DEPLOYMENT DETAILS
Avg. water depth (ft): 27.28
Water mode: 11
Water-cell size (cm): 2
Blanking dist. (cm): 25
Field recorded offset (cm): 320
Actual offset (cm): 320
Latitude: 44° 31′ 45.4″ N
Longitude: 88° 0′ 31.1″ W
Field recorded ADCP depth (ft): 27.3
Field recorded depthfinder depth (ft): 27
Total number of recorded ensembles: 214
Heading: 215.26 ± 2.13
Pitch: -1.62 ± 0.77
Roll: -4.32 ± 1.49
Filename: Vert20040527081623r.csv

NOTES
1) Wind-rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (+/-) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment
Velocity Profile – Lower Fox River – OU4–8B2

5/27/2004 8:30:55

10–20% depth: \( y = 9.34x - 9.78 \), \( r^2 = 0.87 \)
6–10% depth: \( y = 13.1x - 14.0 \), \( r^2 = 1 \)

PROFILE NOT VALID

Vertically averaged water flow: 1.25 ft/s, to direction 357.6°

CALCULATED SHEAR STRESS PARAMETERS
Shear stress (LP) (dyn/cm²): 1.79 \([-27.36 \leq \tau \leq 62.51\])
Shear stress (LP, 6–10% depth) (dyn/cm²): 0.91 \([\text{NaN} \leq \tau \leq \text{NaN}]\)
Shear stress (TKE) (dyn/cm²): 6.29
Shear velocity (cm/s): 1.34 \([-5.23 \leq \*u \leq 7.91\])
Bottom roughness, \( K_s \) (cm): 0.05
Boundary Reynolds number: 6.91 Test: MAYBE

ADCP DEPLOYMENT DETAILS
Avg. water depth (ft): 27.3
Water mode: 1
Water-cell size (cm): 25
Blanking dist. (cm): 25
Field recorded offset (cm): 320
Actual offset (cm): 320
Latitude: 44° 31′ 45.4″ N
Longitude: 88° 0′ 31.1″ W
Field recorded ADCP depth (ft): 27.3
Field recorded depthfinder depth (ft): 27
Total number of recorded ensembles: 283
Heading: 210.61 ± 1.79
Pitch: -2.06 ± 0.49
Roll: 0.79 ± 1.02
Filename: Vert20040527083055r.csv

NOTES
1) Wind–rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (+/-) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment
Velocities of Shear Stress and Measurements of Water Levels in the Lower Fox River near Green Bay, Wisconsin

**Velocity Profile - Lower Fox River - OU4-8B3**

5/27/2004 8:35:50

**Profile Not Valid**

Vertically averaged water flow: 1.32 ft/s, to direction 3°

**Calculated Shear Stress Parameters**

Shear stress (LP) (dyn/cm²): 293.36 [-891.46 ≤ τ ≤ 4110.45]
Shear stress (LP, 6−10% depth) (dyn/cm²): 495.44 [-41004.68 ≤ τ ≤ 61015.3]
Shear stress (TKE) (dyn/cm²): 78.04
Shear velocity (cm/s): 17.13 [-29.86 ≤ u* ≤ 64.11]
Bottom roughness, Ks (cm): 1447.28
Boundary Reynolds number: 2478869.85 Test: PASS

**ADCP Deployment Details**

Avg. water depth (ft): 27.34
Water mode: 1
Water-cell size (cm): 10
Blanking dist. (cm): 25
Field recorded offset (cm): 320
Actual offset (cm): 320
Latitude: 44° 31.454” N
Longitude: 88° 0’ 31.1” W
Field recorded ADCP depth (ft): 27.3
Field recorded depthfinder depth (ft): 27
Total number of recorded ensembles: 104
Heading: 214.03 ± 2.51
Pitch: -2.3 ± 0.44
Roll: 0.84 ± 1.03
Filename: Vert20040527083550r.csv

**Notes**

1) Wind−rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (+/−) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment
Appendix: Velocity-Profile Plots for OU−3 and OU−4

Velocity Profile – Lower Fox River – OU4−SUPP1
5/25/2004 19:12:21

Vertically averaged water flow: 1.23 ft/s, to direction 344°
Average wind conditions: 9.9 mi/h, from direction 245.2°

CALCULATED SHEAR STRESS PARAMETERS
Shear stress (LP) (dyn/cm²): 8.98 [7.14 ≤ τ ≤ 11.04]
Shear stress (LP, 6–10% depth) (dyn/cm²): 23.58 [6.96 ≤ τ ≤ 50.03]
Shear stress (TKE) (dyn/cm²): 3.03
Shear velocity (cm/s): 3 [2.67 ≤ u* ≤ 3.32]
Bottom roughness, Ks (cm): 7.28
Boundary Reynolds number: 2182.63 Test: PASS

ADCP DEPLOYMENT DETAILS
Avg. water depth (ft): 5.17
Water mode: 11
Water-cell size (cm): 1
Blanking dist. (cm): 25
Field recorded offset (cm): 24.4
Actual offset (cm): 24.4
Latitude: 44° 27' 4.6" N
Longitude: 88° 4' 7.4" W
Field recorded ADCP depth (ft): 5.1
Field recorded depthfinder depth (ft): 5.2
Total number of recorded ensembles: 77
Heading: 176.48 ± 3.81
Pitch: 2.65 ± 0.18
Roll: 0.22 ± 0.53
Filename: Vert20040525191221r.csv

DAILY WIND ROSE

NOTES
1) Wind−rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (+−) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment
 Estimates of Shear Stress and Measurements of Water Levels in the Lower Fox River near Green Bay, Wisconsin

VELOCITY PROFILE – LOWER FOX RIVER – OU4–SUPP2

5/26/2004 16:32:10

Vertically averaged water flow: 1.08 ft/s, to direction 43°
Average wind conditions: 9.56 mi/h, from direction 281.6°

CALCULATED SHEAR STRESS PARAMETERS

Shear stress (LP) (dyn/cm²): 2.17 [1.68 ≤ τ ≤ 2.72]
Shear stress (LP, 6–10% depth) (dyn/cm²): 4.39 [0.76 ≤ τ ≤ 11.01]
Shear stress (TKE) (dyn/cm²): 1.37
Shear velocity (cm/s): 1.47 [1.3 ≤ u* ≤ 1.65]
Bottom roughness, Kₜ (cm): 0.19
Boundary Reynolds number: 27.36 Test: MAYBE

ADCP DEPLOYMENT DETAILS

Avg. water depth (ft): 5.75
Water mode: 11
Water–cell size (cm): 1
Blanking dist. (cm): 25
Field recorded offset (cm): 24.4
Actual offset (cm): 24.4
Latitude: 44° 28.4477° N
Longitude: 88° 2’ 29.66’ W
Field recorded ADCP depth (ft): 5.7
Field recorded depthfinder depth (ft): 4.9
Total number of recorded ensembles: 210
Heading: 224.23 ± 1.31
Pitch: 2.62 ± 0.09
Roll: −0.99 ± 0.46
Filename: Vert20040526163210r.csv

NOTES

1) Wind–rose shading in 5 mi/h increments; area proportional to fraction of day with those conditions
2) Average wind conditions calculated for conditions within an hour (+/−) of sampling time
3) Dotted vertical line in velocity plot at right identifies approximate velocities at time of deployment

DAILY WIND ROSE

VELOCITY AT OIL TANK DEPOT
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