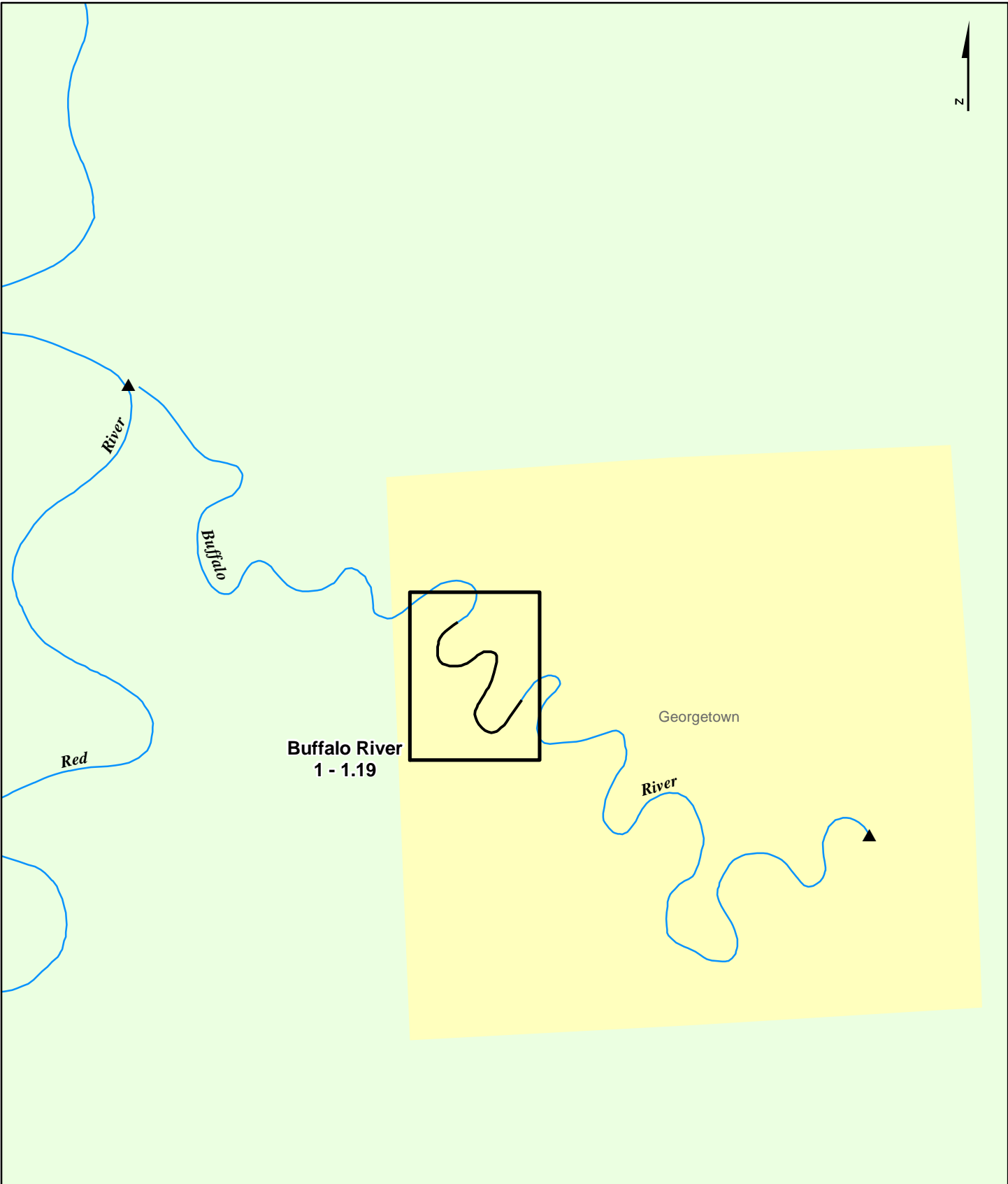


APPENDIX B



FIELD INVESTIGATION RESULTS



**Buffalo River
1 - 1.19**

Georgetown

River

Red

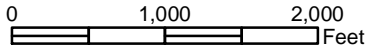
River

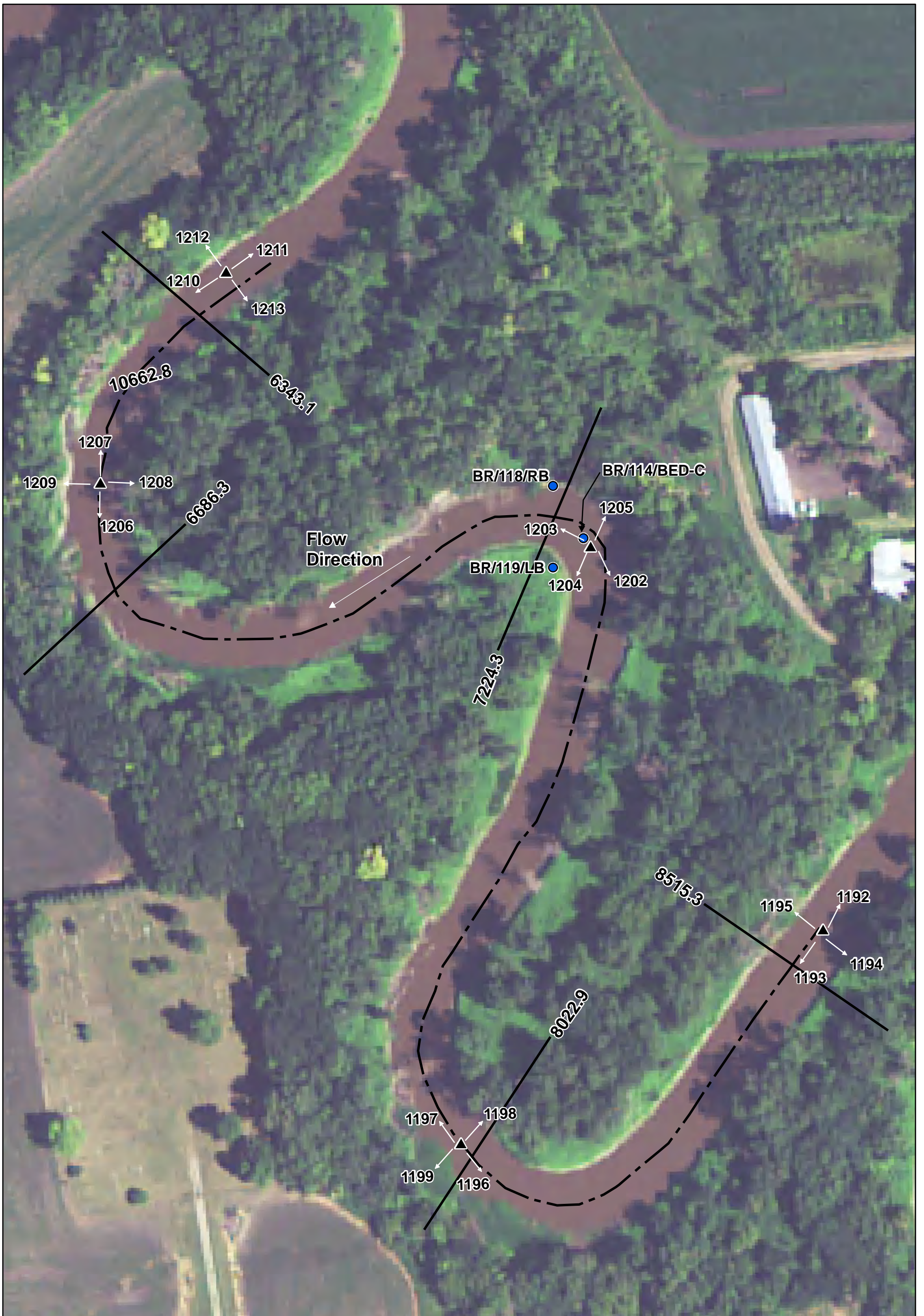
Buffalo



**Detailed Study Reach Locations
Buffalo River**

- ▲ General Study Reach
- Detailed Study Reach





LEGEND

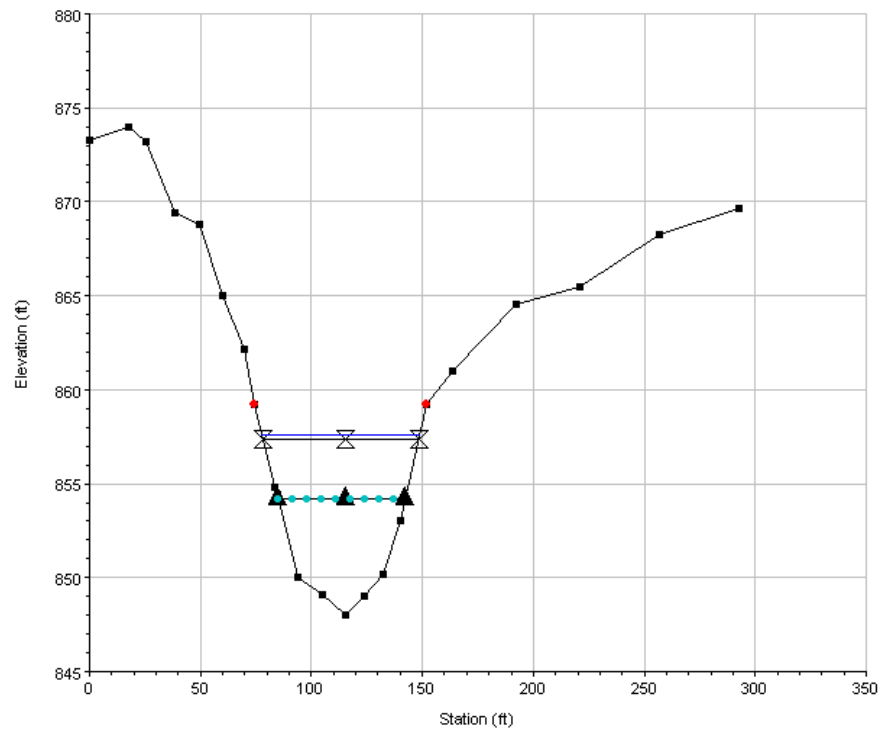
- Cross Section
 - - - Detailed Study Reach
 - Sediment Sample
 - ▲ Field Photos
 - 0750 Direction Arrow and Photo Number
- 0 25 50 100
 Feet



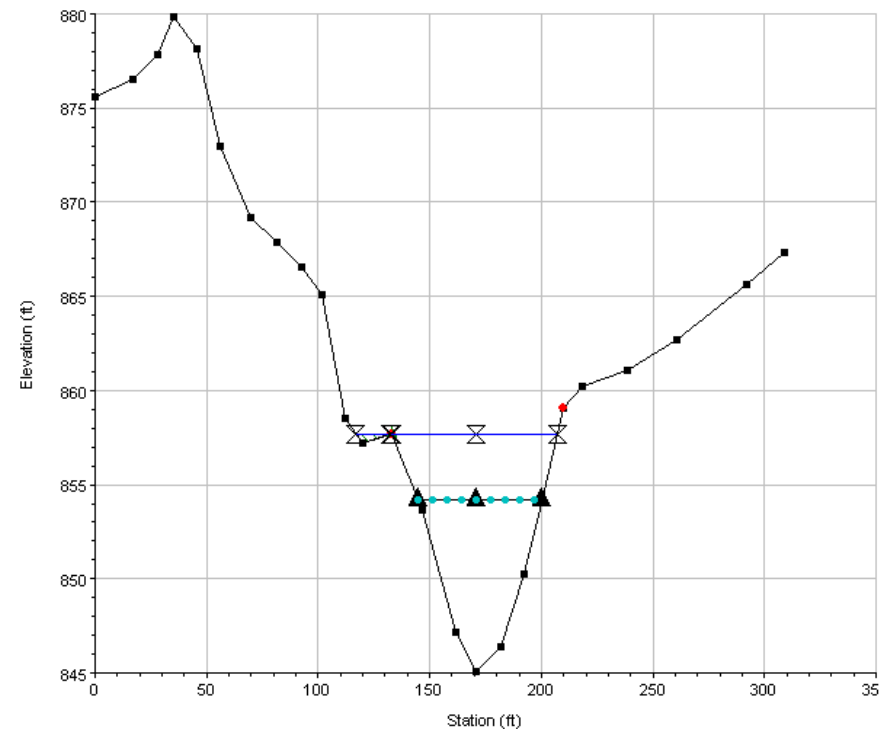
BUFFALO RIVER - 1 - 1.19
Observation Date: September 27, 2011

BUFFALO RIVER – 1 – 1.19

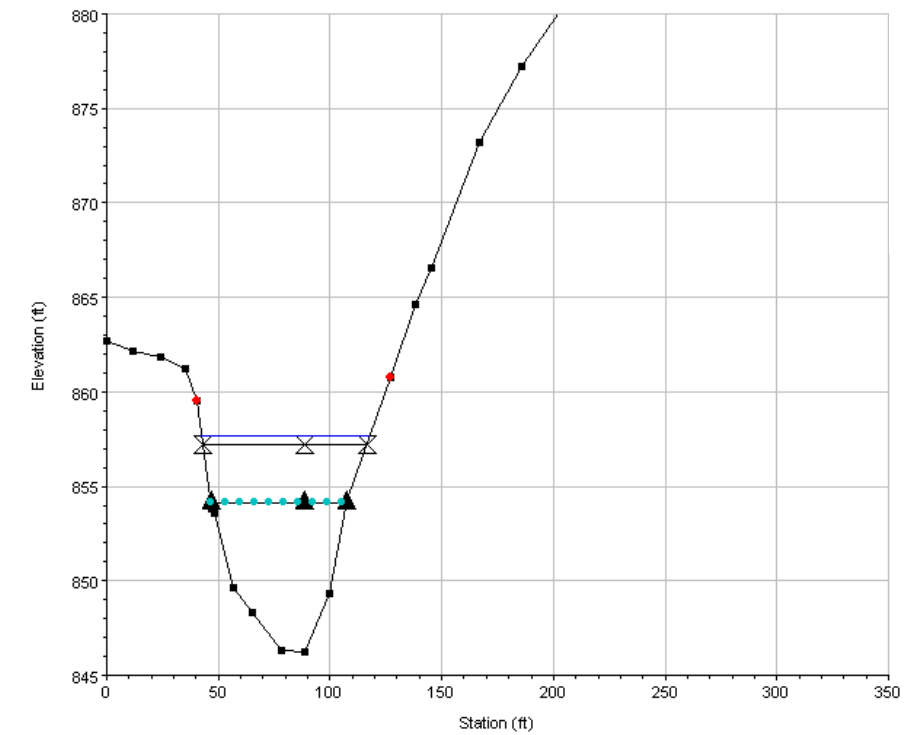
Cross Section 6343.1



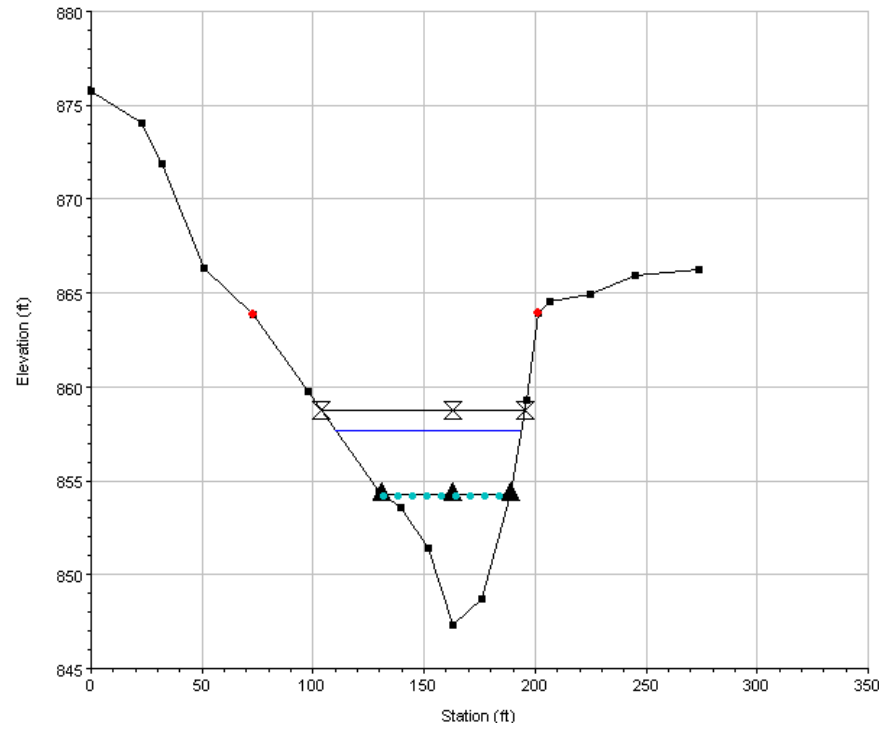
Cross Section 6686.3



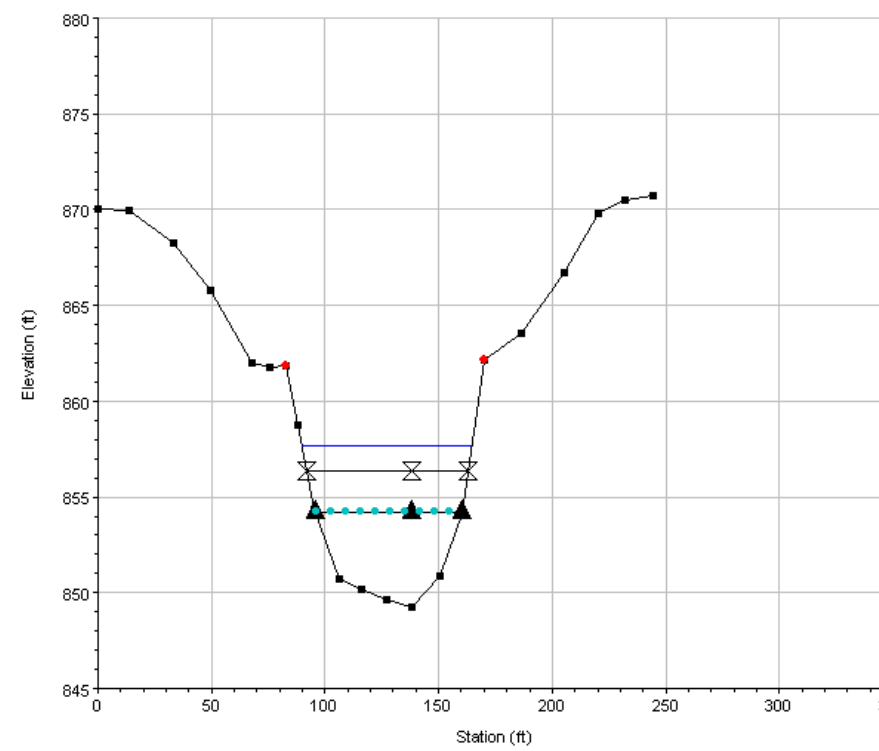
Cross Section 7224.3



Cross Section 8022.9



Cross Section 8515.3



LEGEND

..... Modeled Water Surface Elevation for Day of Survey
 ——— Modeled Bankfull Water Surface Elevation
 —▲— Observed Water Surface Elevation
 —△— Observed Bankfull Water Surface Elevation
 —■— Ground
 ● Bank Stations

BUFFALO RIVER – 1 – 1.19
Observation Date: September 27, 2011



Field Photo 1192



Field Photo 1193



Field Photo 1194



Field Photo 1195



Field Photo 1196



Field Photo 1197

BUFFALO RIVER – 1 – 1.19
Observation Date: September 27, 2011



Field Photo 1198



Field Photo 1199



Field Photo 1202



Field Photo 1203



Field Photo 1204



Field Photo 1205

BUFFALO RIVER – 1 – 1.19
Observation Date: September 27, 2011



Field Photo 1206



Field Photo 1207



Field Photo 1208



Field Photo 1209



Field Photo 1210



Field Photo 1211

BUFFALO RIVER – 1 – 1.19
Observation Date: September 27, 2011



Field Photo 1212



Field Photo 1213



MIDWEST TESTING LABORATORY



Project No.: M1101216

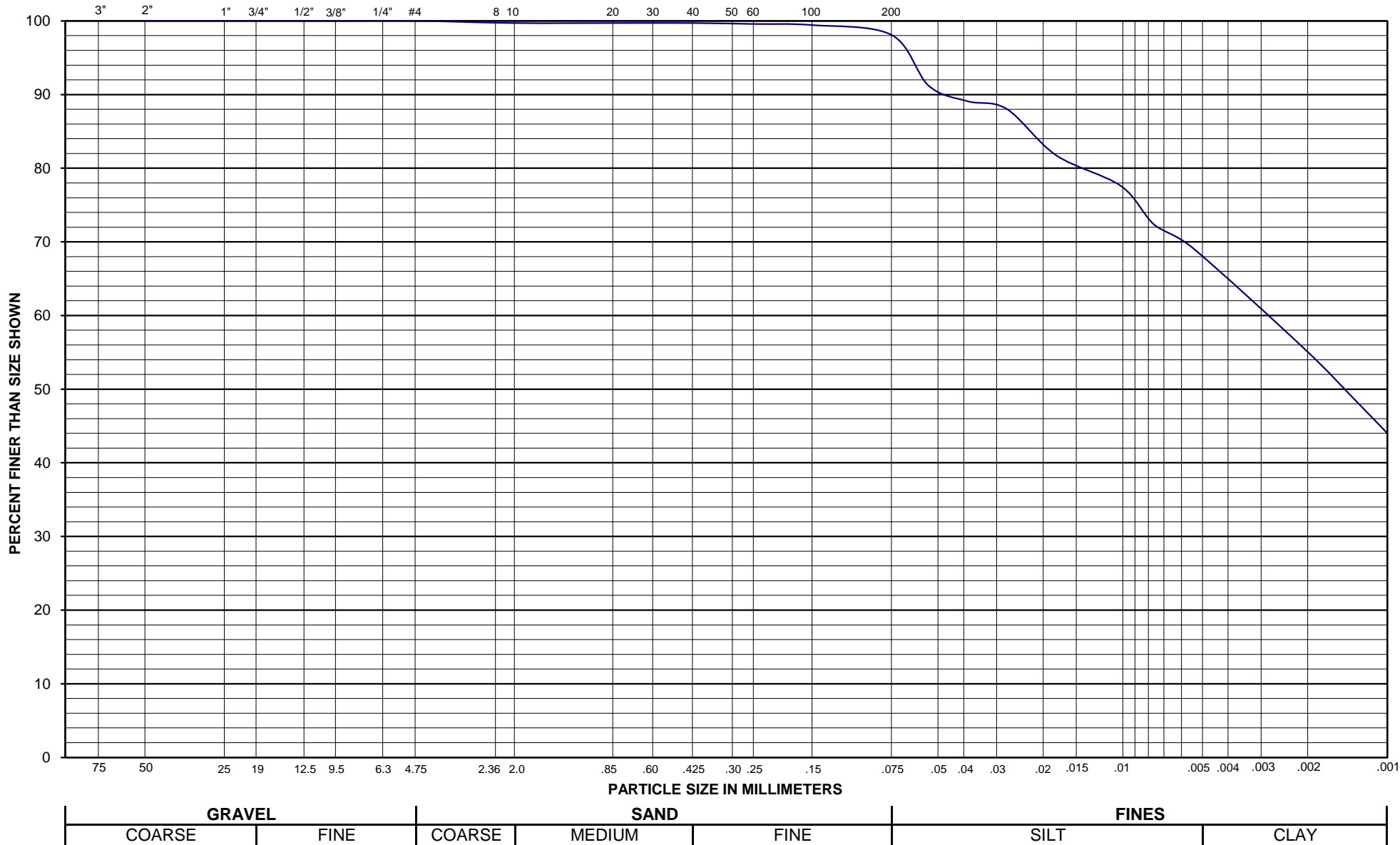
Project: Red River Geomorphic Study
Cass County, North Dakota

Sample Source: #3 (BR/114 Bed-C)

Classification: FAT CLAY - grayish brown (CH)

Reported to: West Consultants, Inc.

GRAIN SIZE DISTRIBUTION CURVE U.S. Standard Sieve Sizes





MIDWEST TESTING LABORATORY



Project No.: M1101216

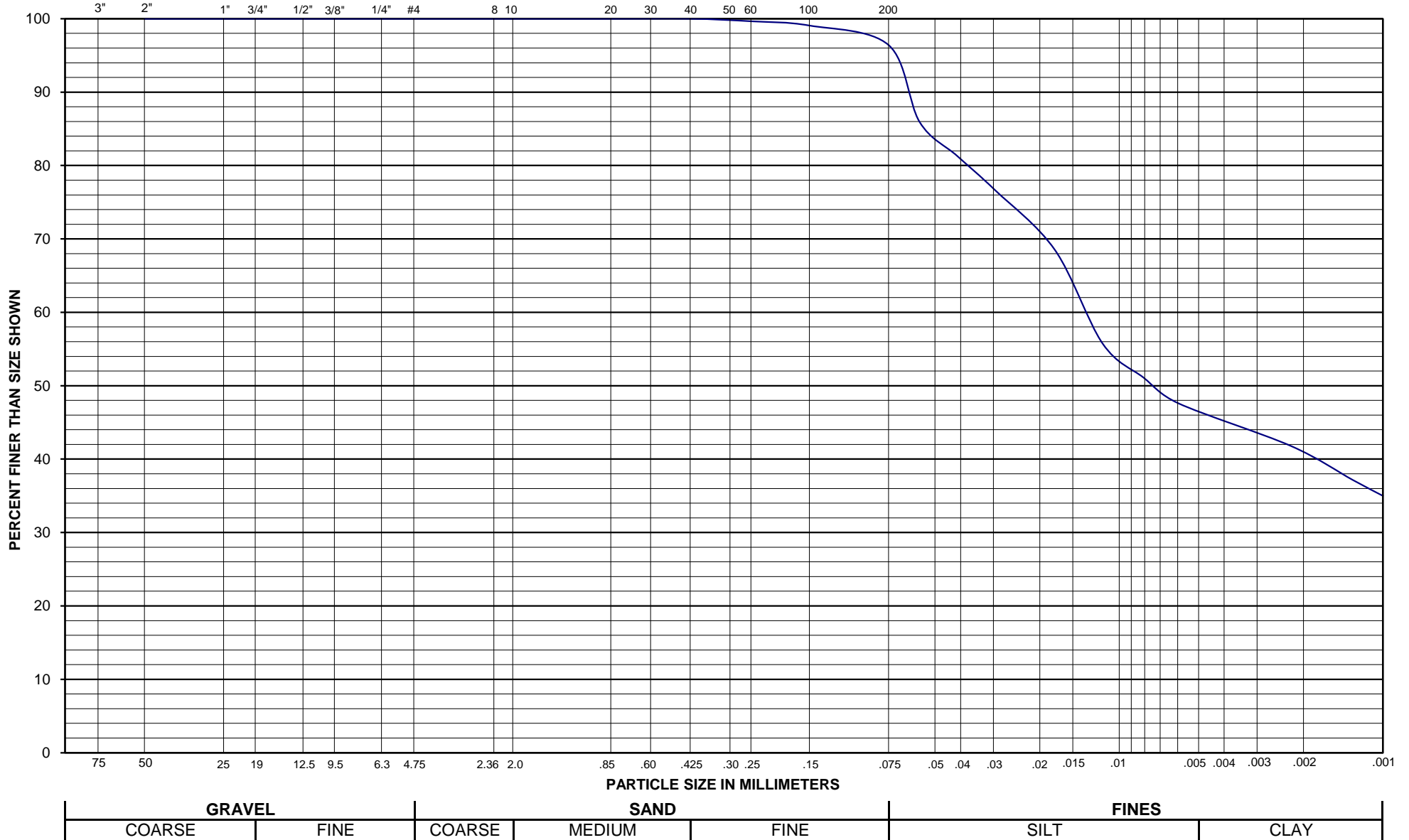
Project: Red River Geomorphic Study
Cass County, North Dakota

Sample Source: #6 (BR/118/RB)

Classification: FAT CLAY - dark brown (CH)

Reported to: West Consultants, Inc.

GRAIN SIZE DISTRIBUTION CURVE U.S. Standard Sieve Sizes





MIDWEST TESTING LABORATORY



Project No.: M1101216

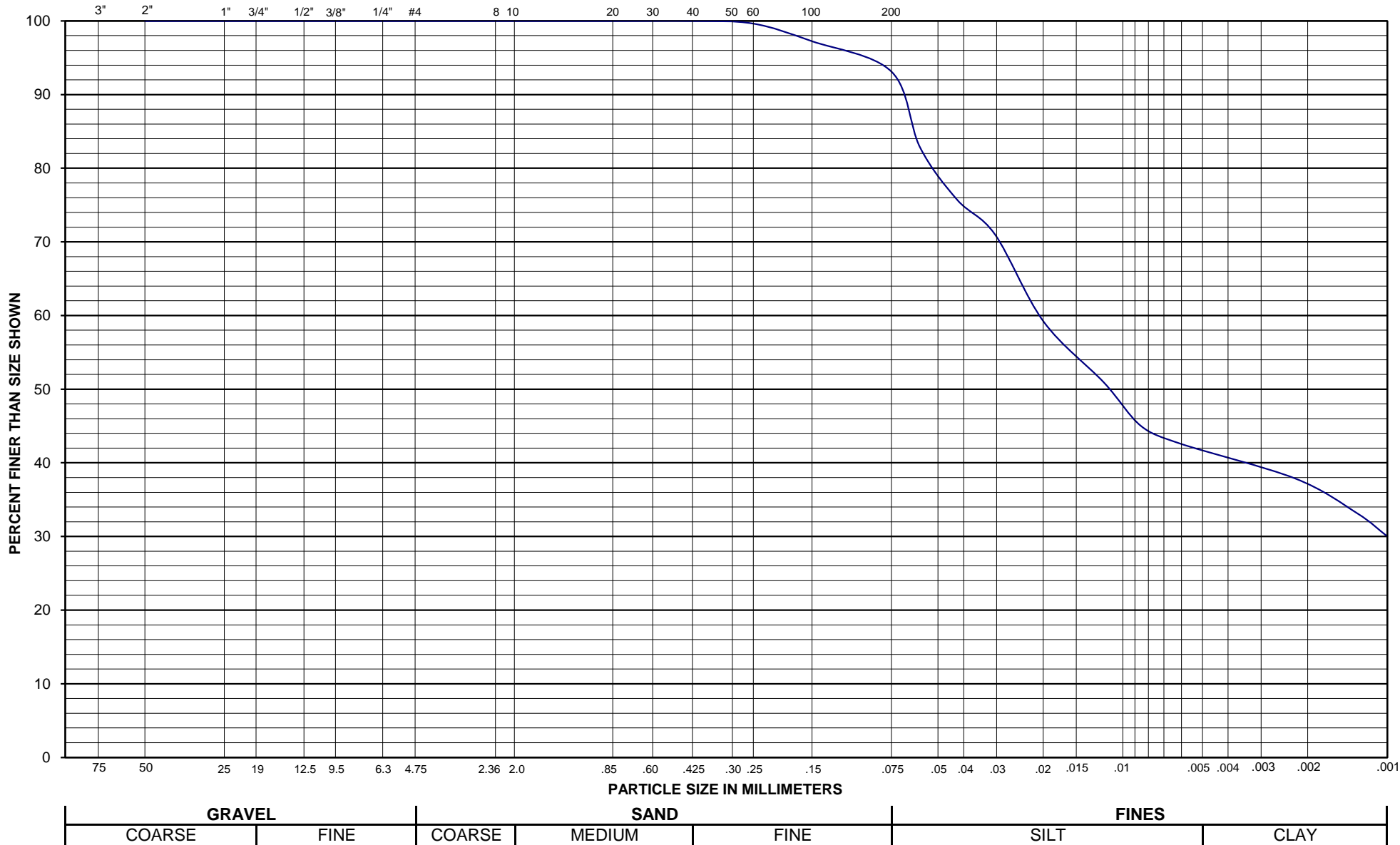
Project: Red River Geomorphic Study
Cass County, North Dakota

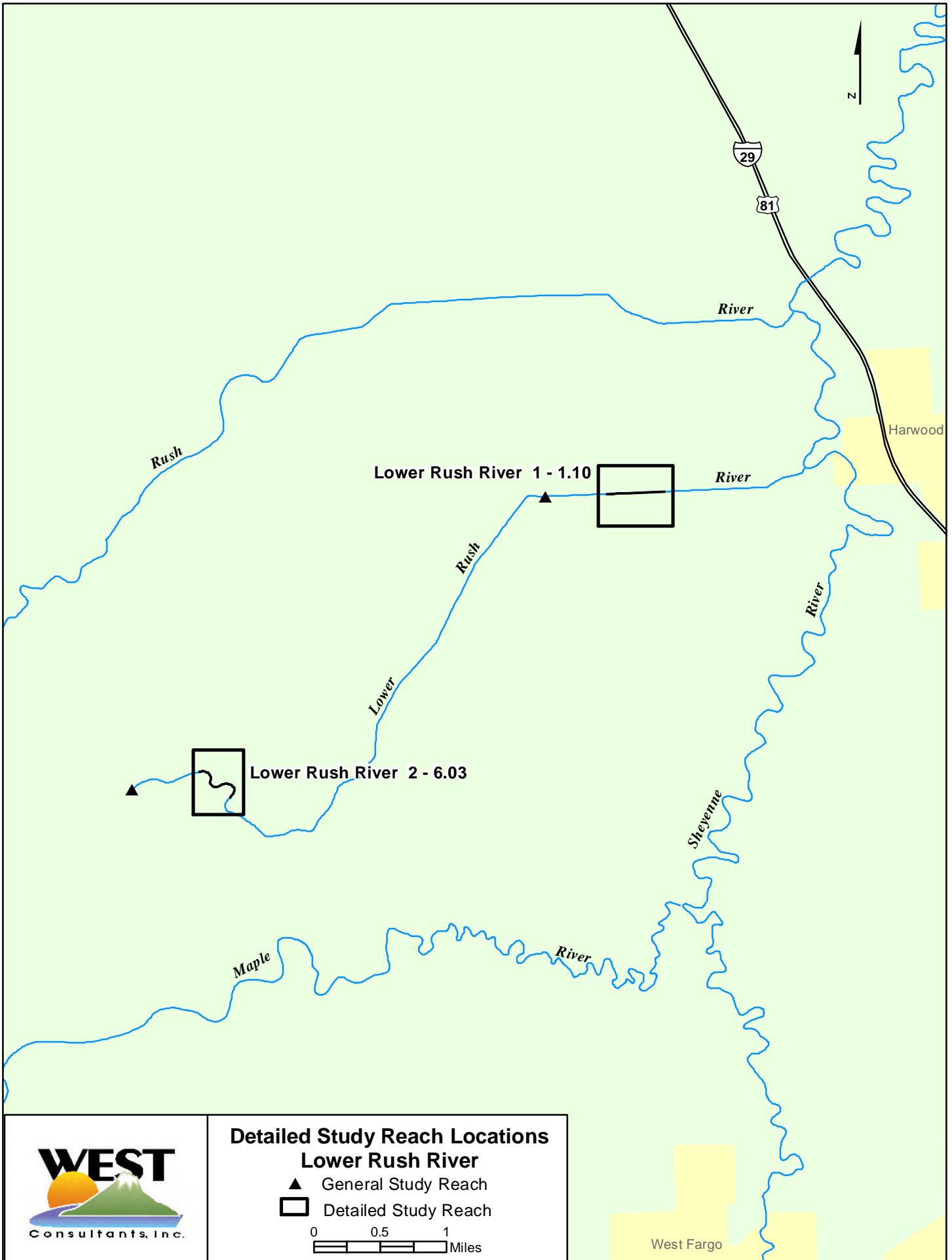
Sample Source: #4 (BR/119/LB)

Classification: FAT CLAY - dark brown (CH)

Reported to: West Consultants, Inc.

GRAIN SIZE DISTRIBUTION CURVE U.S. Standard Sieve Sizes







LEGEND

- Cross Section
 - - - Detailed Study Reach
 - Sediment Sample
 - ▲ Field Photos
 - 0750 Direction Arrow and Photo Number
- 0 45 90 180
 Feet

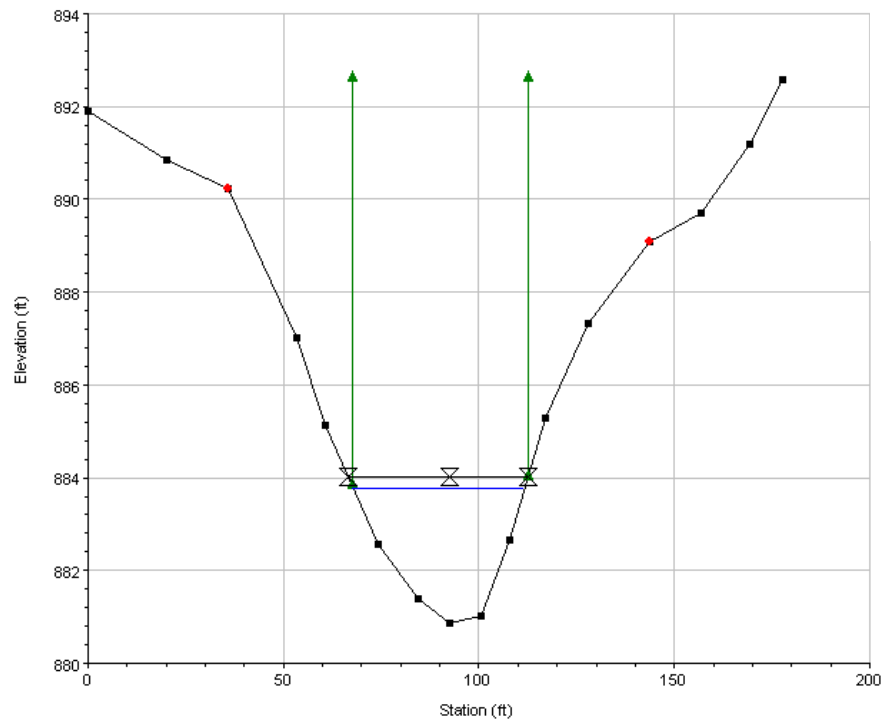


LOWER RUSH RIVER - 1 - 1.10

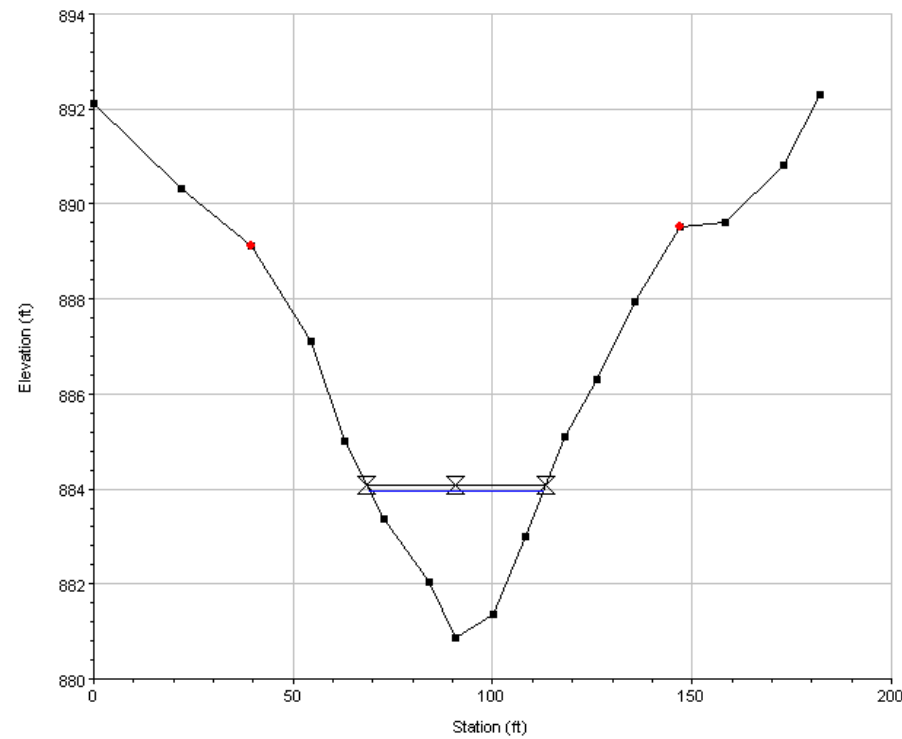
Observation Date: September 29, 2011

LOWER RUSH RIVER – 1 – 1.10

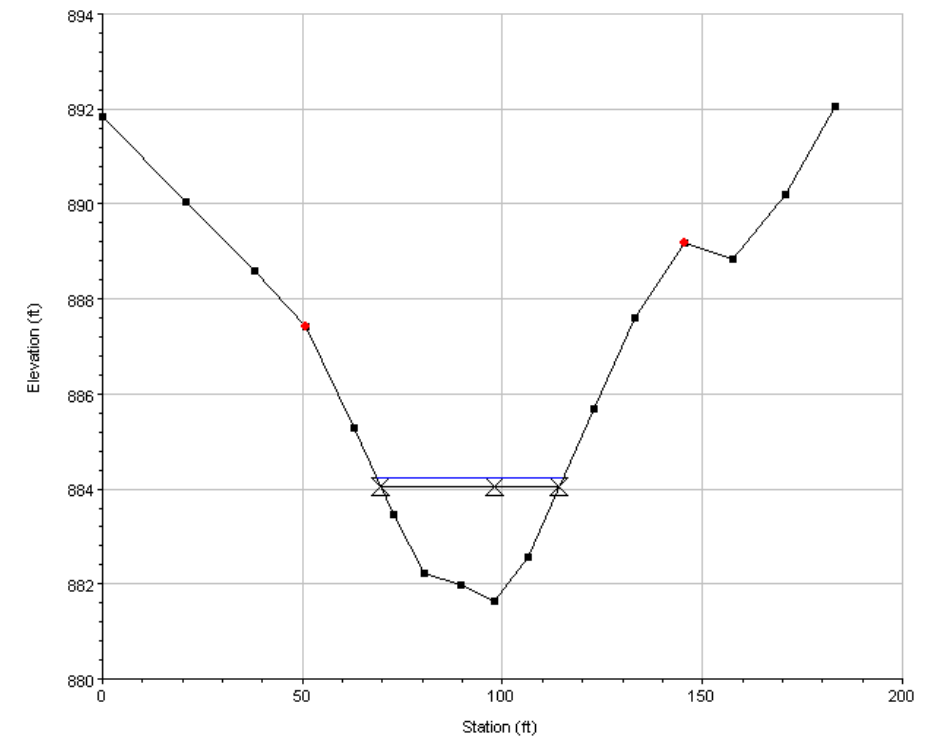
Cross Section 5781.0



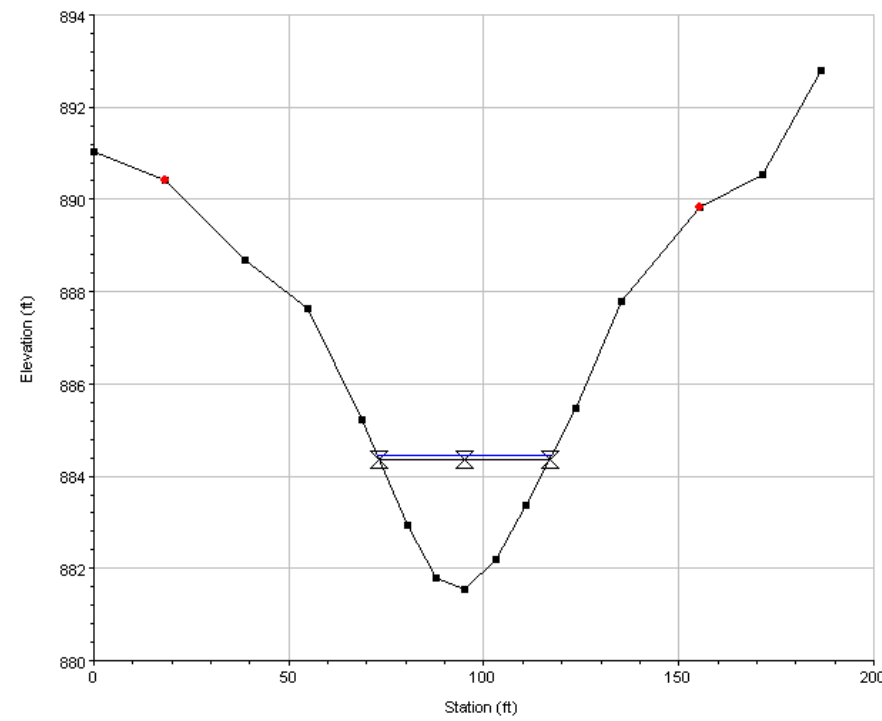
Cross Section 6319.3



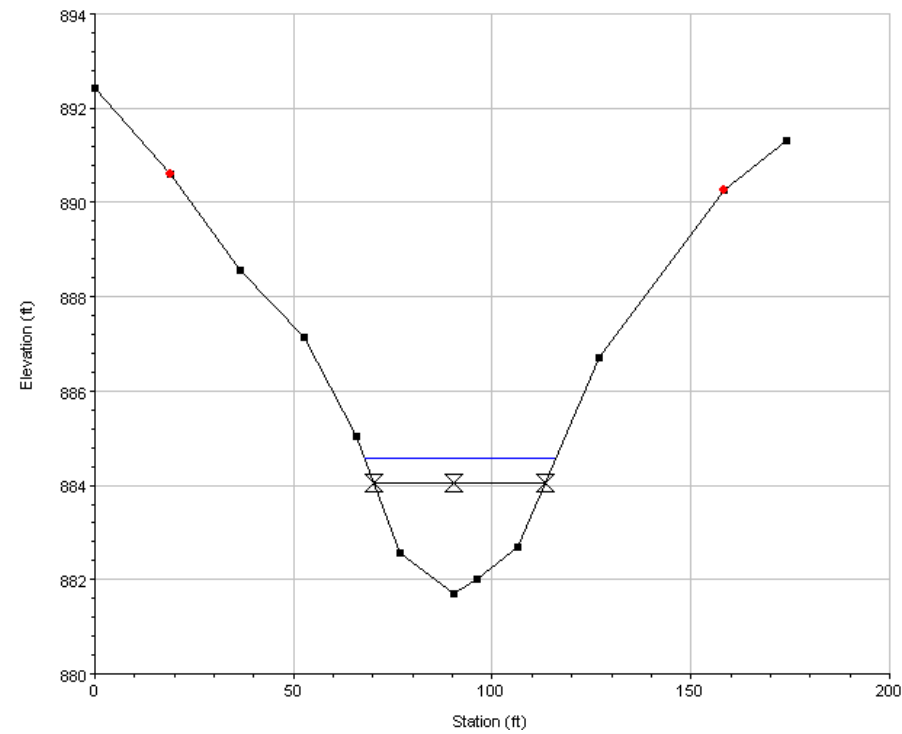
Cross Section 7000.8



Cross Section 7641.2



Cross Section 8147.0



Note: Channel dry during field investigation;
no observed or modeled water surface for day
of survey

LEGEND

●●●●● Modeled Water Surface Elevation for Day of Survey
 — Modeled Bankfull Water Surface Elevation
 —▲— Observed Water Surface Elevation
 —X— Observed Bankfull Water Surface Elevation
 —■— Ground
 ● Bank Stations

LOWER RUSH RIVER – 1 – 1.10
Observation Date: September 29, 2011



Field Photo 0602



Field Photo 0603



Field Photo 0604



Field Photo 0605



Field Photo 0606



Field Photo 0607

LOWER RUSH RIVER – 1 – 1.10

Observation Date: September 29, 2011



Field Photo 0609



Field Photo 0610



Field Photo 0611



Field Photo 0612



Field Photo 0613



Field Photo 0614

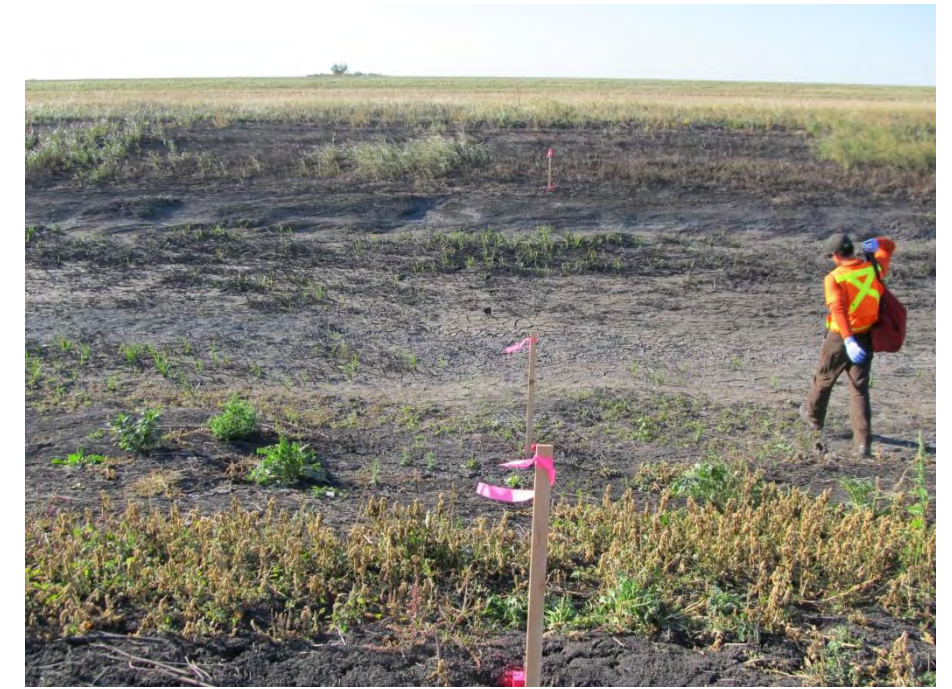
LOWER RUSH RIVER – 1 – 1.10
Observation Date: September 29, 2011



Field Photo 0615



Field Photo 0616



Field Photo 0617



Field Photo 0618



Field Photo 0619



Field Photo 0620

LOWER RUSH RIVER – 1 – 1.10

Observation Date: September 29, 2011



Field Photo 0621



MIDWEST TESTING LABORATORY



Project No.: M1101216

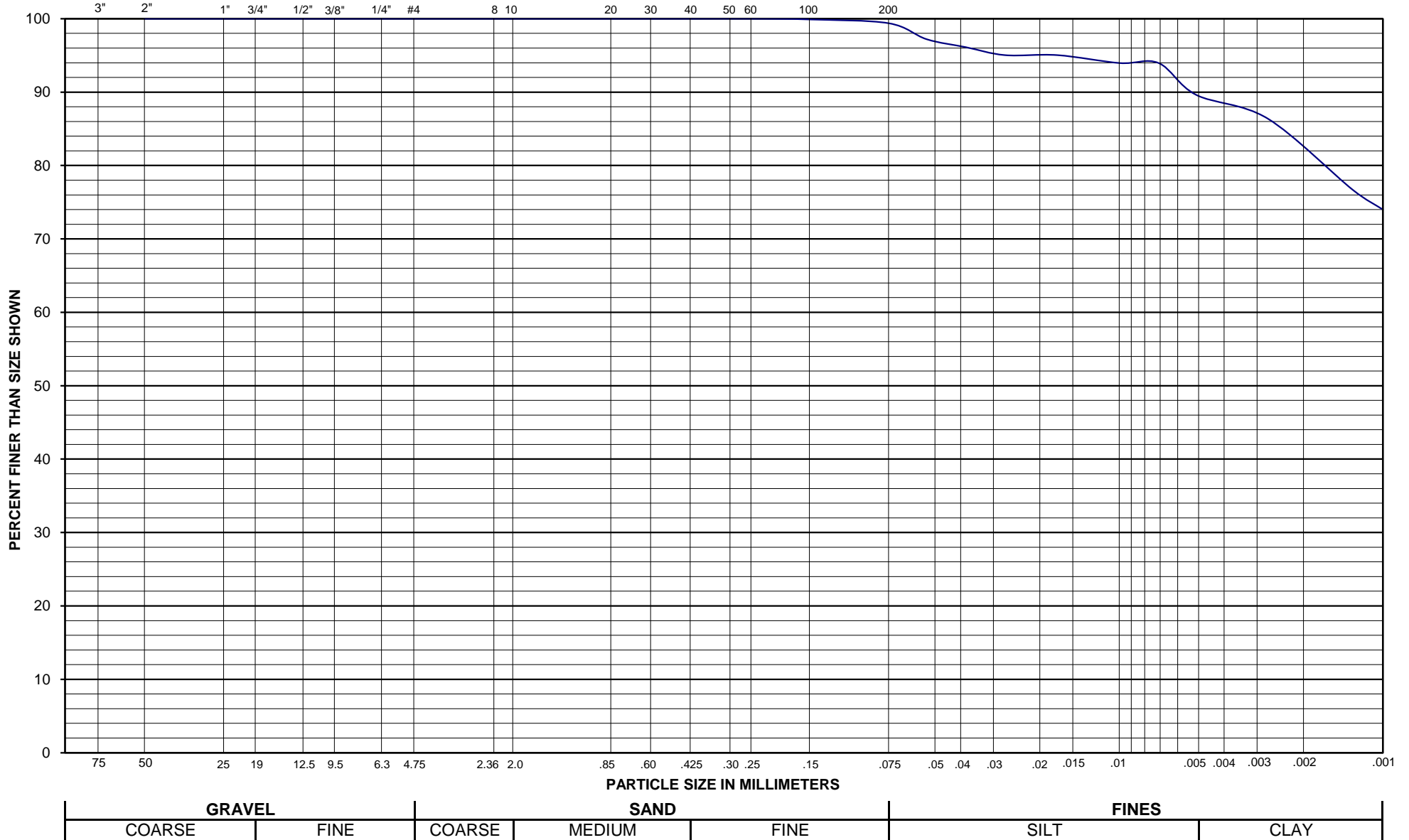
Project: Red River Geomorphic Study
Cass County, North Dakota

Sample Source: #29 (LR1-CH)

Classification: FAT CLAY - dark grayish brown (CH)

Reported to: West Consultants, Inc.

GRAIN SIZE DISTRIBUTION CURVE U.S. Standard Sieve Sizes





MIDWEST TESTING LABORATORY



Project No.: M1101216

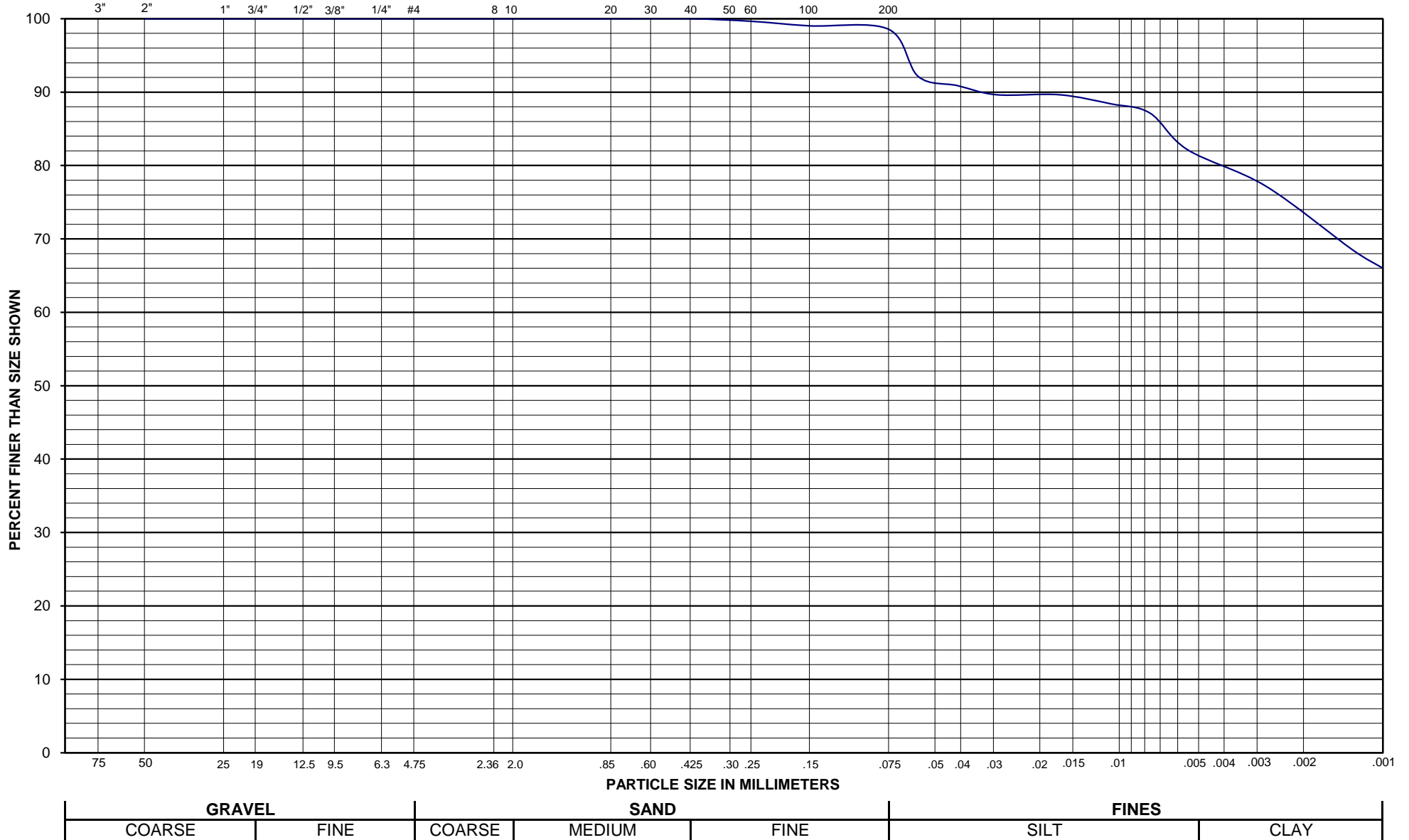
Project: Red River Geomorphic Study
Cass County, North Dakota

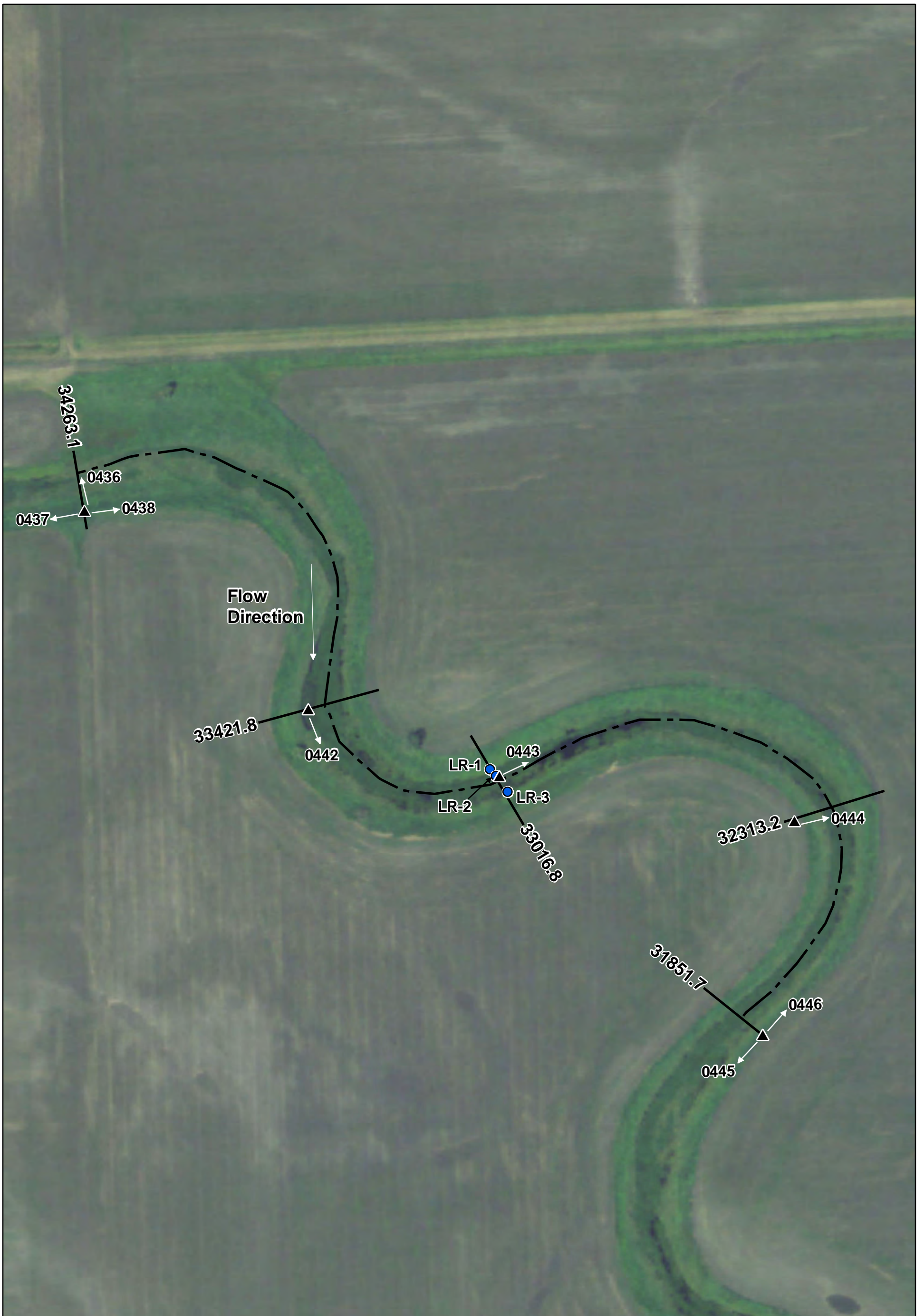
Sample Source: #14 (LR1-LB)

Classification: FAT CLAY - dark brown (CH)

Reported to: West Consultants, Inc.

GRAIN SIZE DISTRIBUTION CURVE U.S. Standard Sieve Sizes





LEGEND

- Cross Section
 - - - Detailed Study Reach
 - Sediment Sample
 - ▲ Field Photos
 - 0750 Direction Arrow and Photo Number
- 0 85 170
 Feet

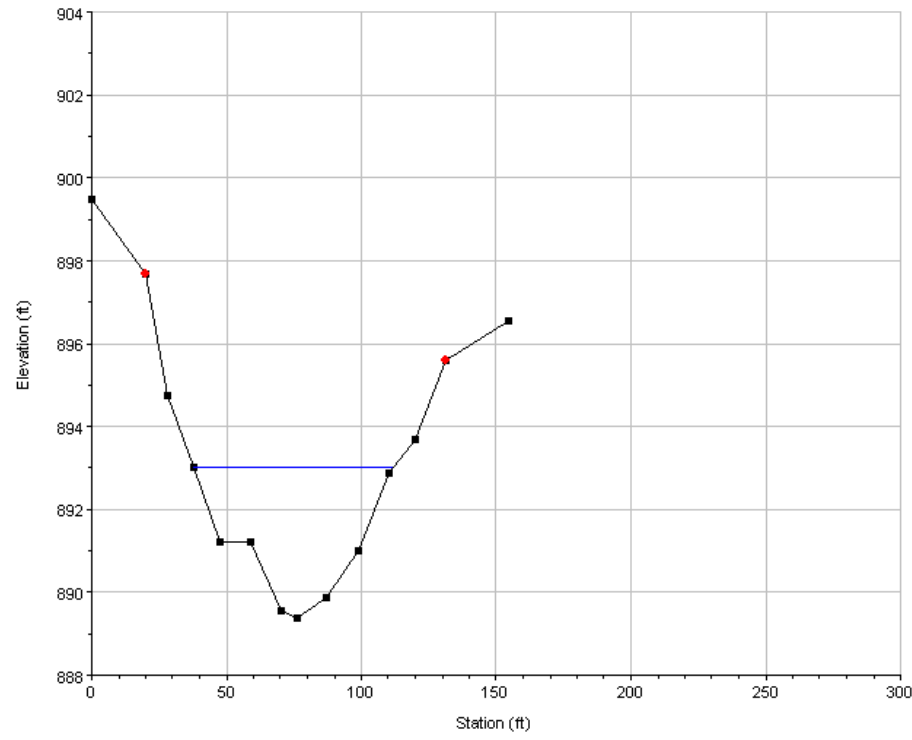


LOWER RUSH RIVER - 2 - 6.03

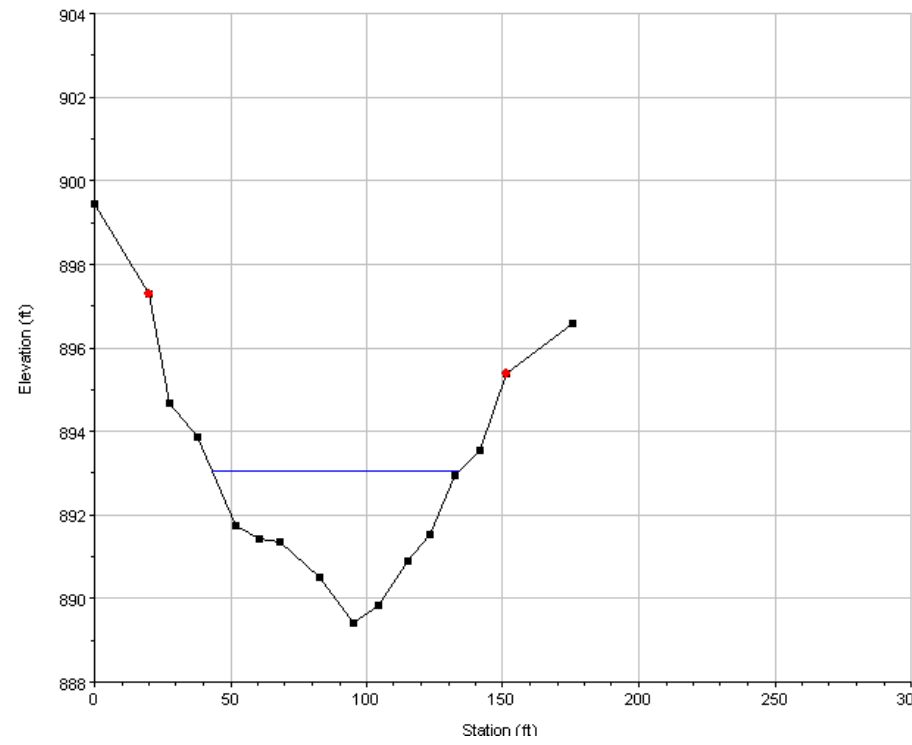
Observation Date: November 18, 2011

LOWER RUSH RIVER – 2 – 6.03

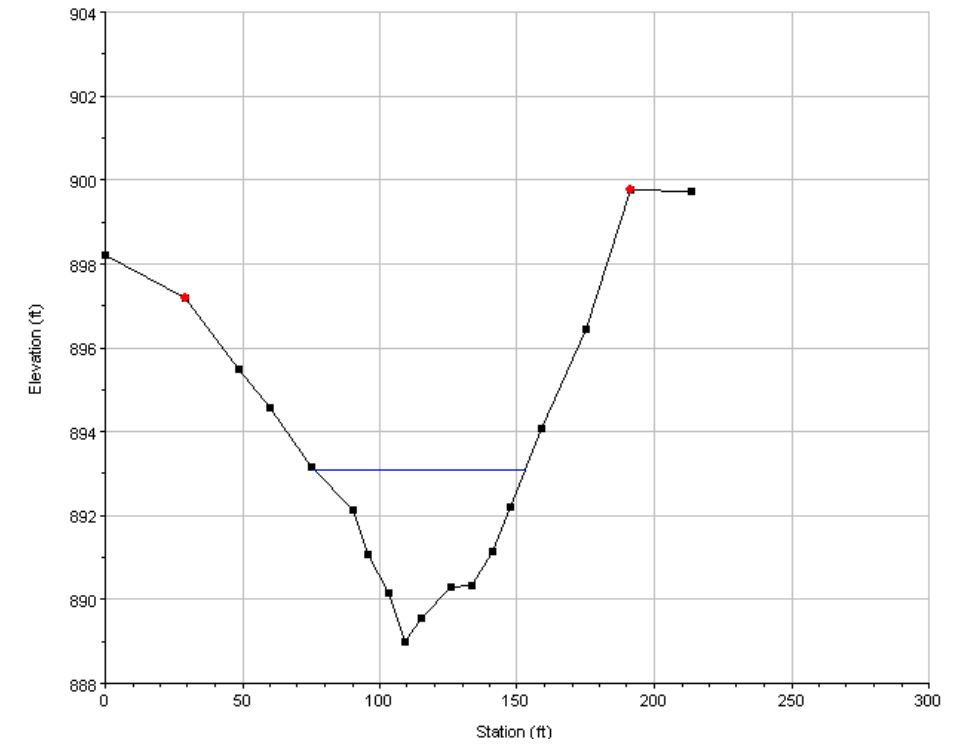
Cross Section 31851.7



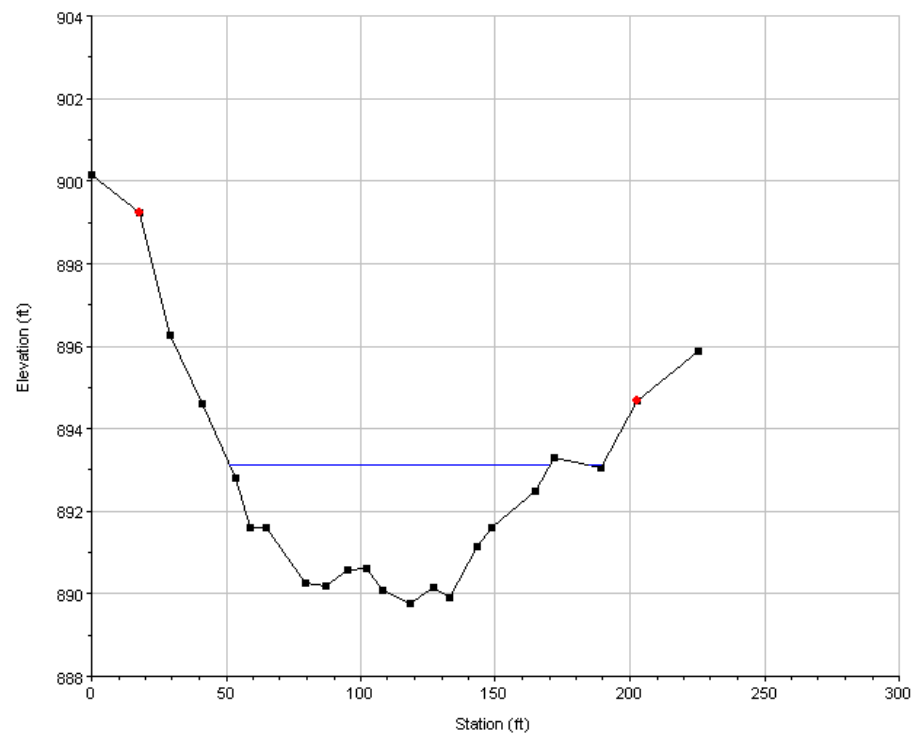
Cross Section 32313.2



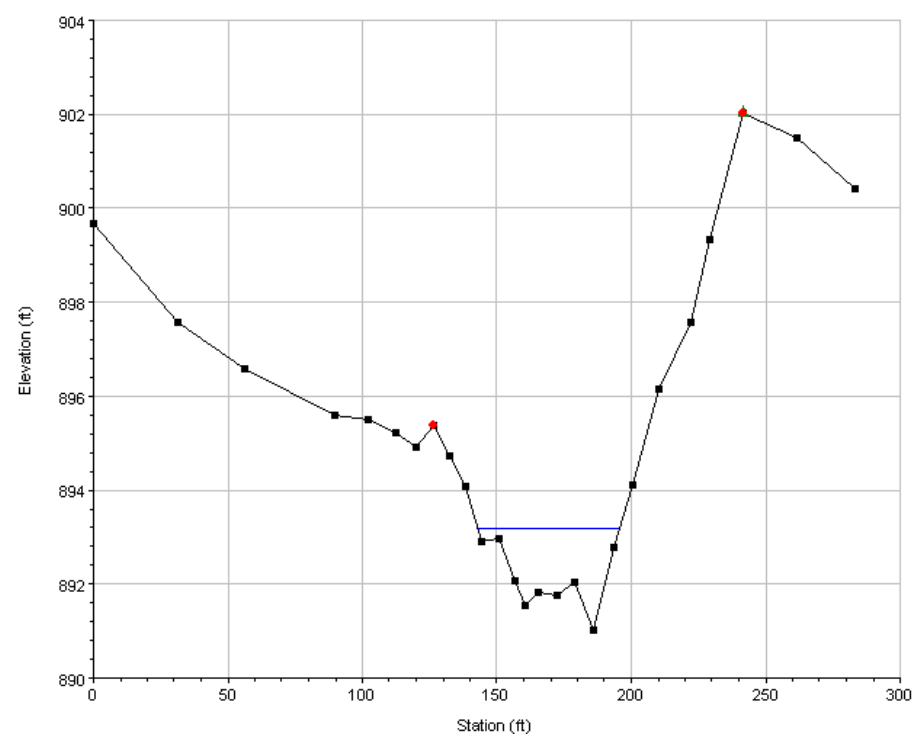
Cross Section 33016.8



Cross Section 33421.8



Cross Section 34263.1



Note: Channel dry during field investigation;
no observed or modeled water surface for day
of survey

LEGEND

- Modeled Water Surface Elevation for Day of Survey
- Modeled Bankfull Water Surface Elevation
- ▲ Observed Water Surface Elevation
- ⊗ Observed Bankfull Water Surface Elevation
- Ground
- Bank Stations

LOWER RUSH RIVER – 2 – 6.03
Observation Date: November 18, 2011



Field Photo 0436



Field Photo 0437



Field Photo 0438



Field Photo 0442



Field Photo 0443



Field Photo 0444

LOWER RUSH RIVER – 2 – 6.03

Observation Date: November 18, 2011



Field Photo 0445



Field Photo 0446



MIDWEST TESTING LABORATORY



Project No.: 16216

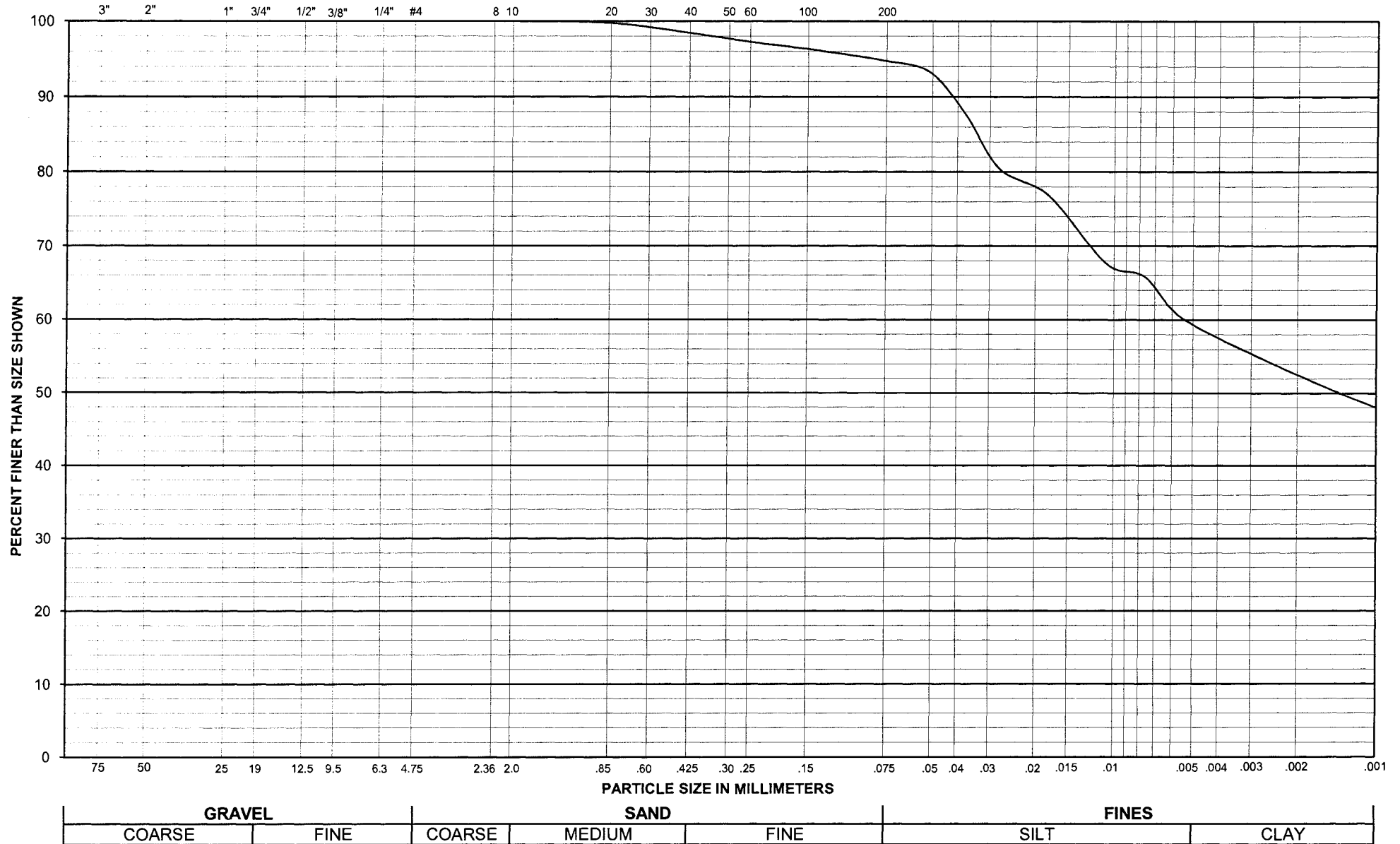
Project: Red River Geomorphic Study
Cass County, North Dakota

Sample Source: TN 7522 - LR-1

Classification: FAT CLAY - very dark brown

Reported to: West Consultants, Inc.

GRAIN SIZE DISTRIBUTION CURVE U.S. Standard Sieve Sizes





MIDWEST TESTING LABORATORY



Project No.: 16216

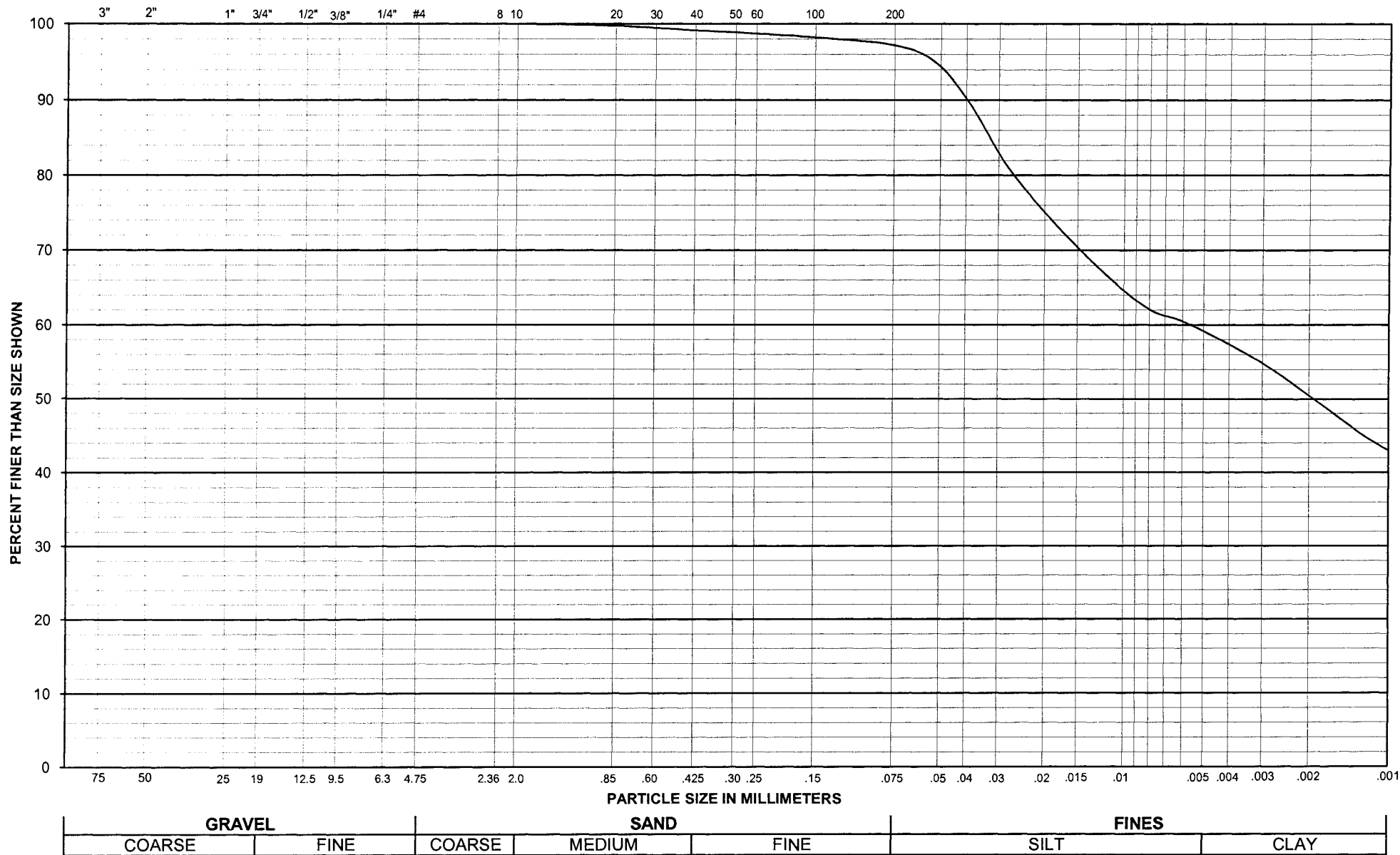
Project: Red River Geomorphic Study
Cass County, North Dakota

Sample Source: TN 7523 - LR-2

Classification: FAT CLAY - very dark brown

Reported to: West Consultants, Inc.

GRAIN SIZE DISTRIBUTION CURVE U.S. Standard Sieve Sizes





MIDWEST TESTING LABORATORY



Project No.: 16216

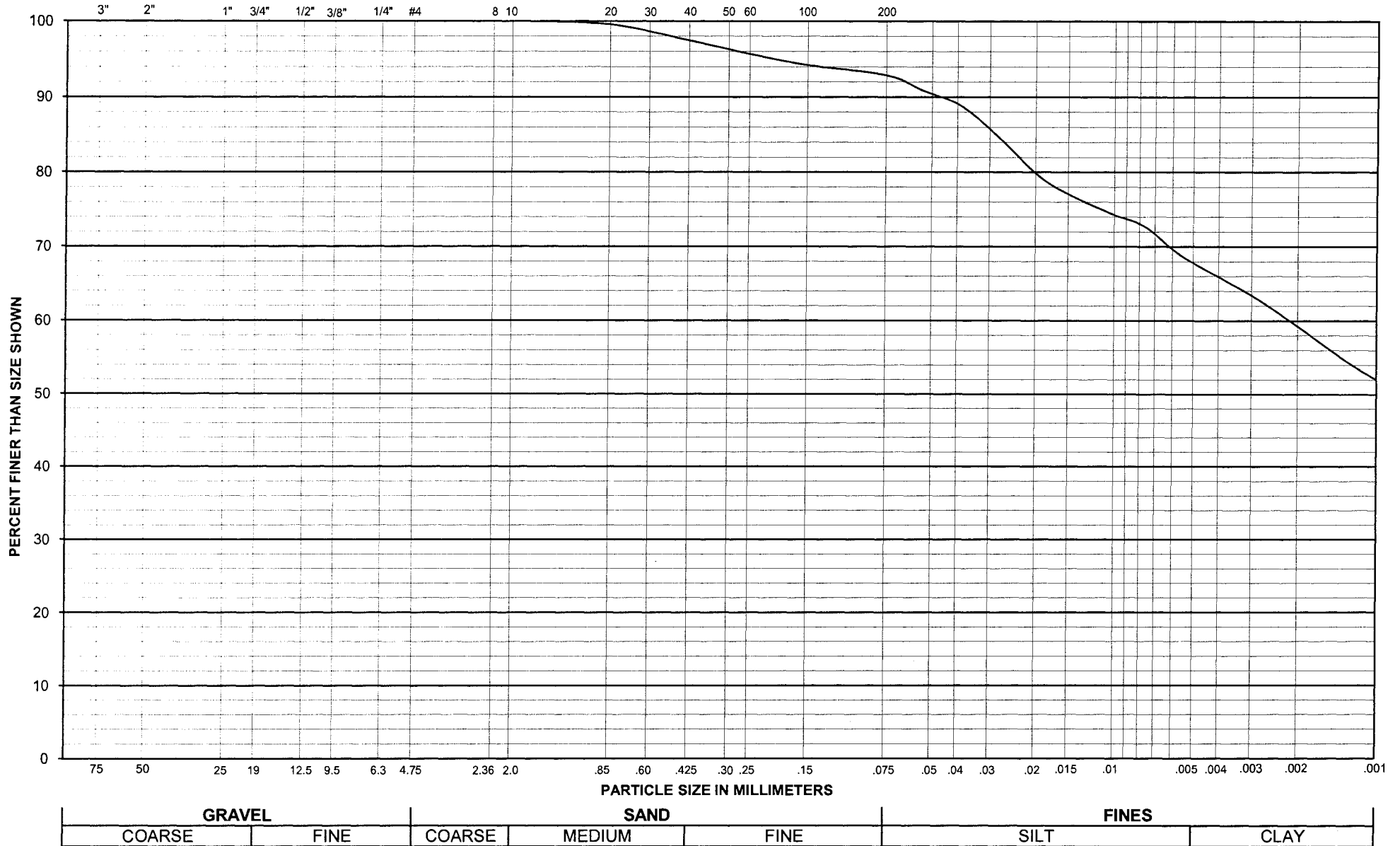
Project: Red River Geomorphic Study
Cass County, North Dakota

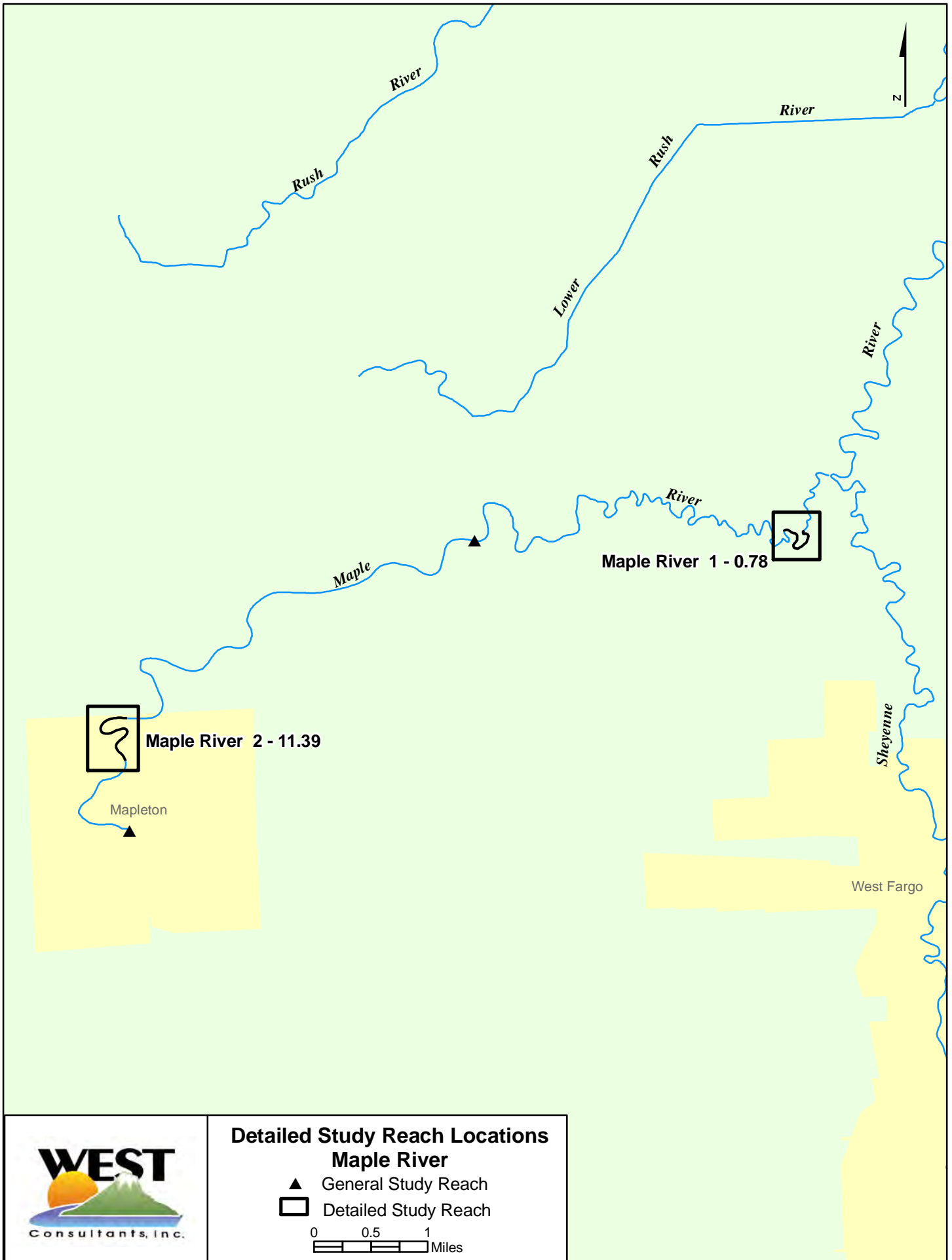
Sample Source: TN 7524 - LR-3

Classification: FAT CLAY - dark gray

Reported to: West Consultants, Inc.

GRAIN SIZE DISTRIBUTION CURVE U.S. Standard Sieve Sizes





**Detailed Study Reach Locations
Maple River**

- ▲ General Study Reach
- Detailed Study Reach

0 0.5 1 Miles



LEGEND

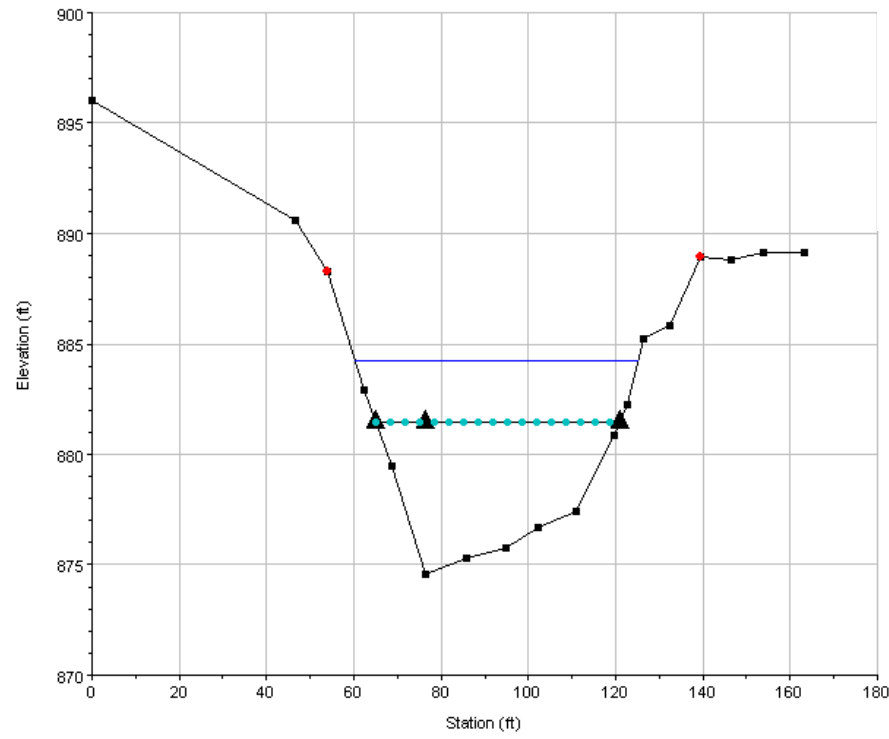
- Cross Section
 - - - Detailed Study Reach
 - Sediment Sample
 - ▲ Field Photos
 - 0750 Direction Arrow and Photo Number
- 0 35 70 140
 Feet



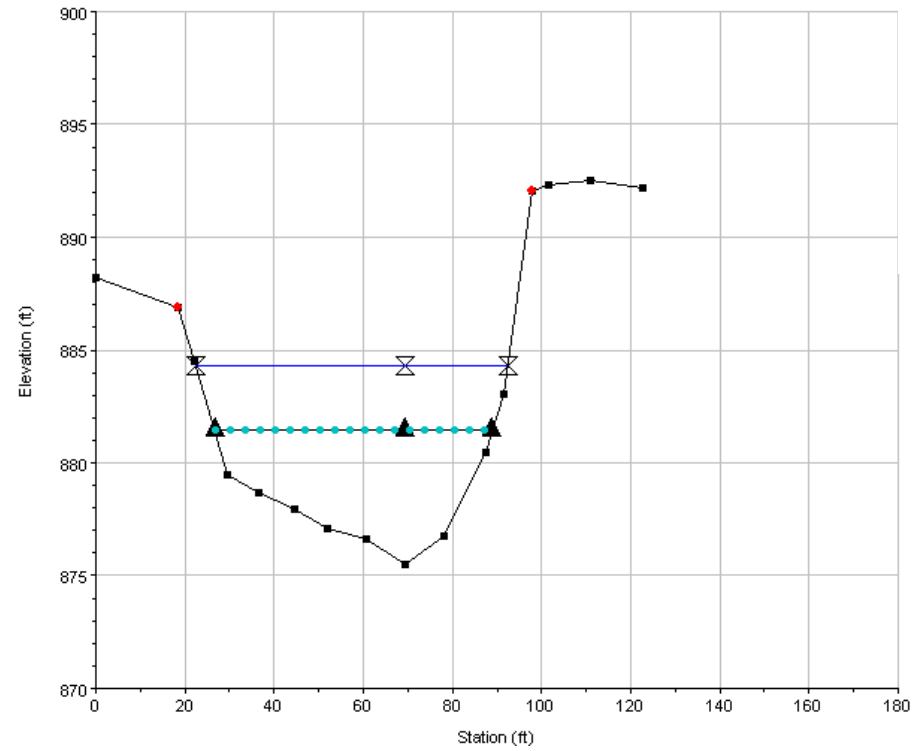
MAPLE RIVER - 1 - 0.78
Observation Dates: November 16, 2010
October 10, 2011

MAPLE RIVER – 1 – 0.78

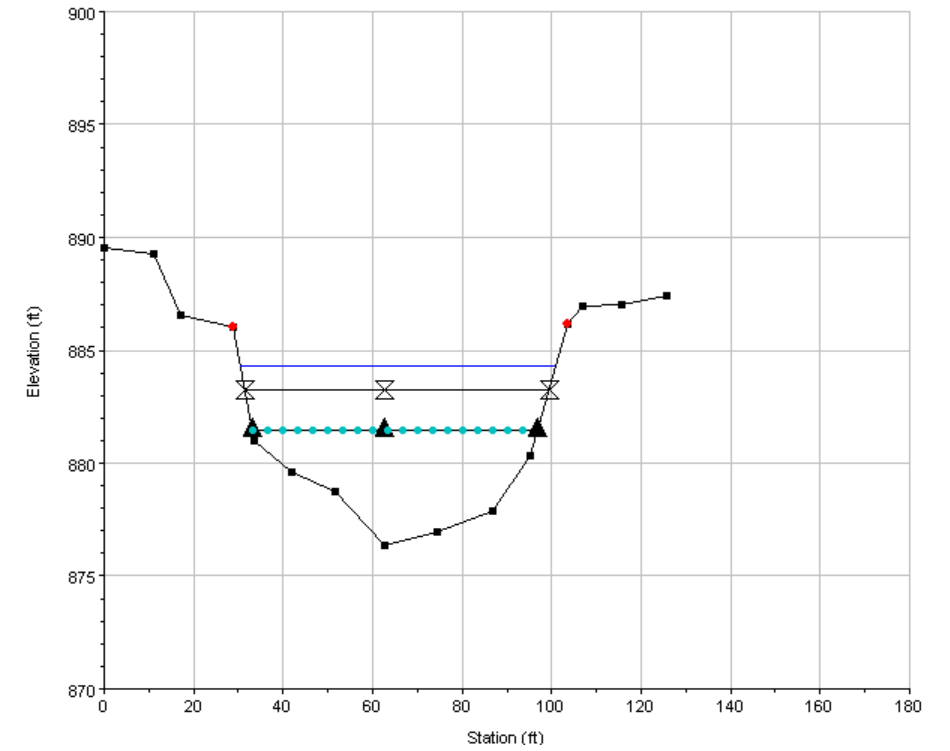
Cross Section 4110.1



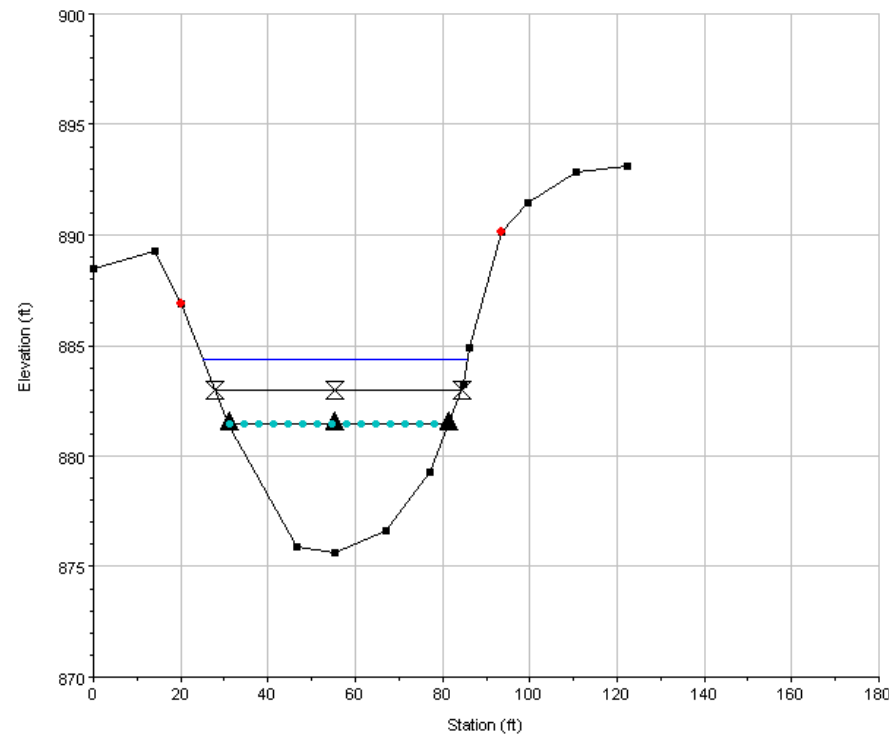
Cross Section 4856.1



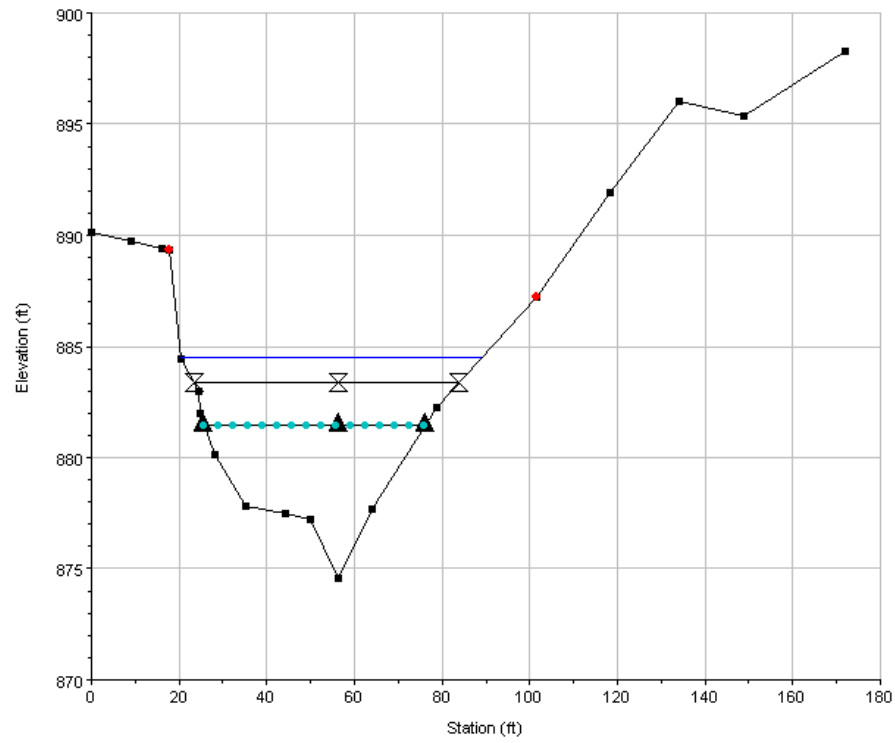
Cross Section 5080.3



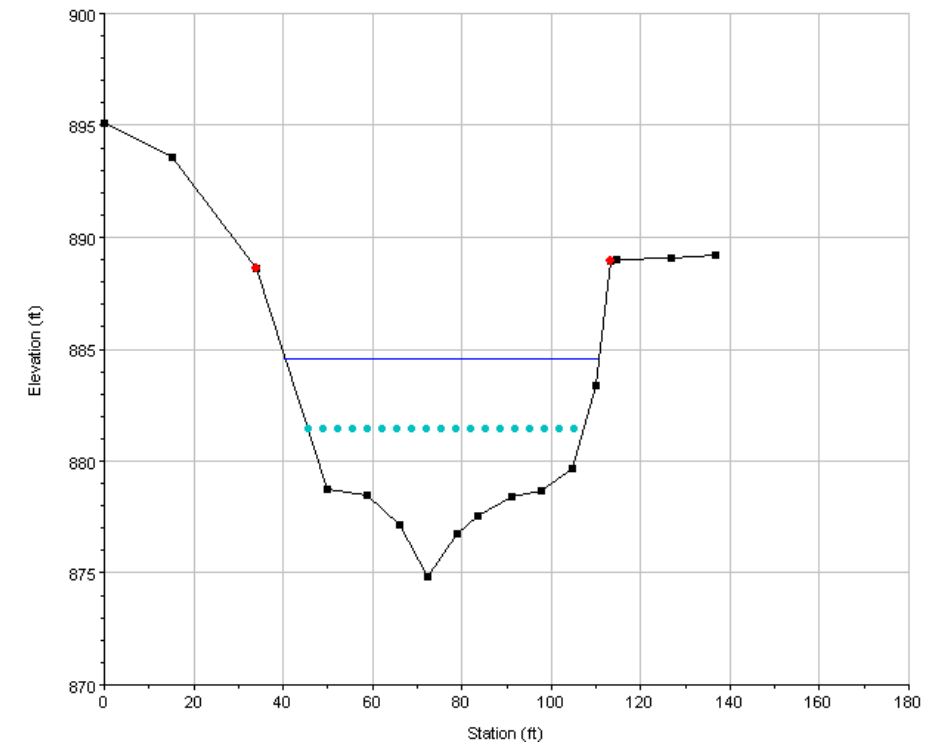
Cross Section 5527.8



Cross Section 6343.1



Cross Section 6926.5



LEGEND

..... Modeled Water Surface Elevation for Day of Survey
 ———— Modeled Bankfull Water Surface Elevation
 —▲— Observed Water Surface Elevation
 —X— Observed Bankfull Water Surface Elevation
 —■— Ground
 ● Bank Stations

MAPLE RIVER – 1 – 0.78
Observation Date: November 16, 2010



Field Photo 0412



Field Photo 0413



Field Photo 0414



Field Photo 0415



Field Photo 0416



Field Photo 0417

MAPLE RIVER – 1 – 0.78
Observation Date: November 16, 2010



Field Photo 0419



Field Photo 0420



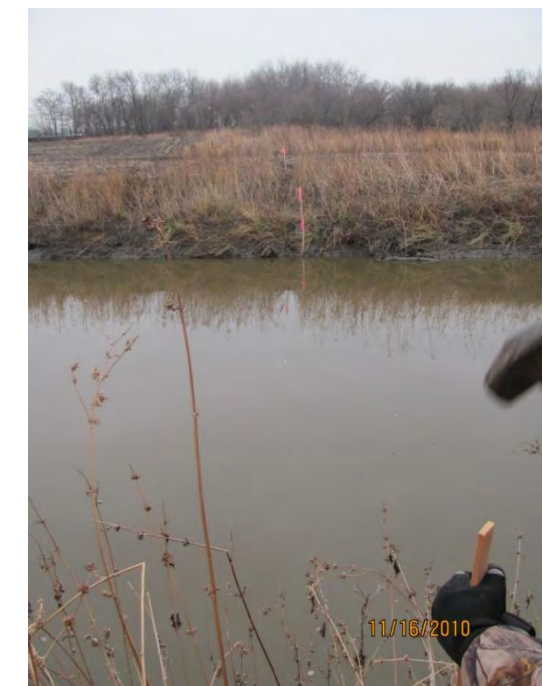
Field Photo 0421



Field Photo 0422



Field Photo 0423



Field Photo 0424



MIDWEST TESTING LABORATORY



Project No.: 16216

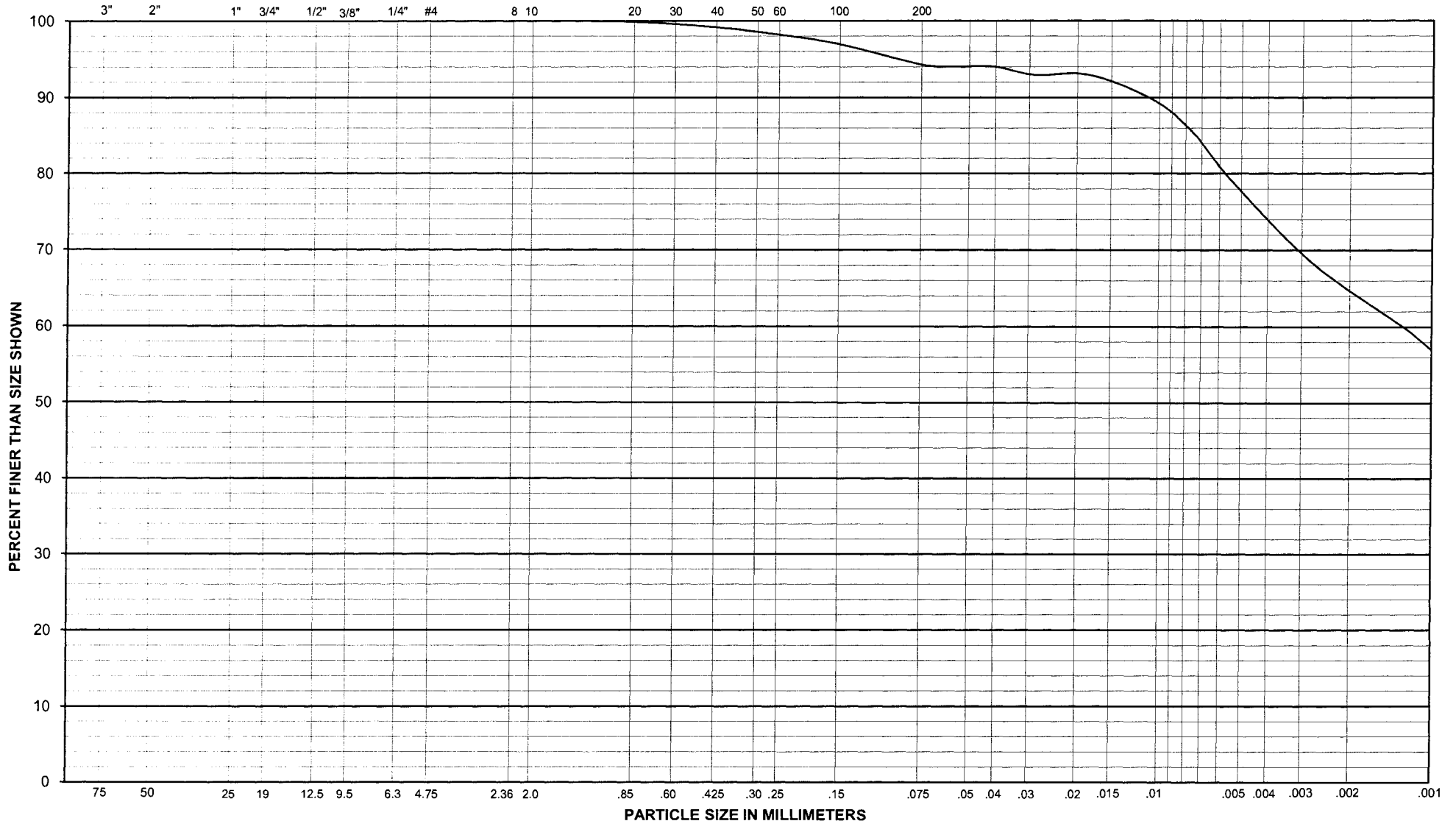
Project: Red River Geomorphic Study
Cass County, North Dakota

Sample Source: TN 7501 - M-01

Classification: FAT CLAY - very dark brown

Reported to: West Consultants, Inc.

GRAIN SIZE DISTRIBUTION CURVE U.S. Standard Sieve Sizes



GRAVEL		SAND			FINES		
COARSE	FINE	COARSE	MEDIUM	FINE	SILT	CLAY	



MIDWEST TESTING LABORATORY



Project No.: 16216

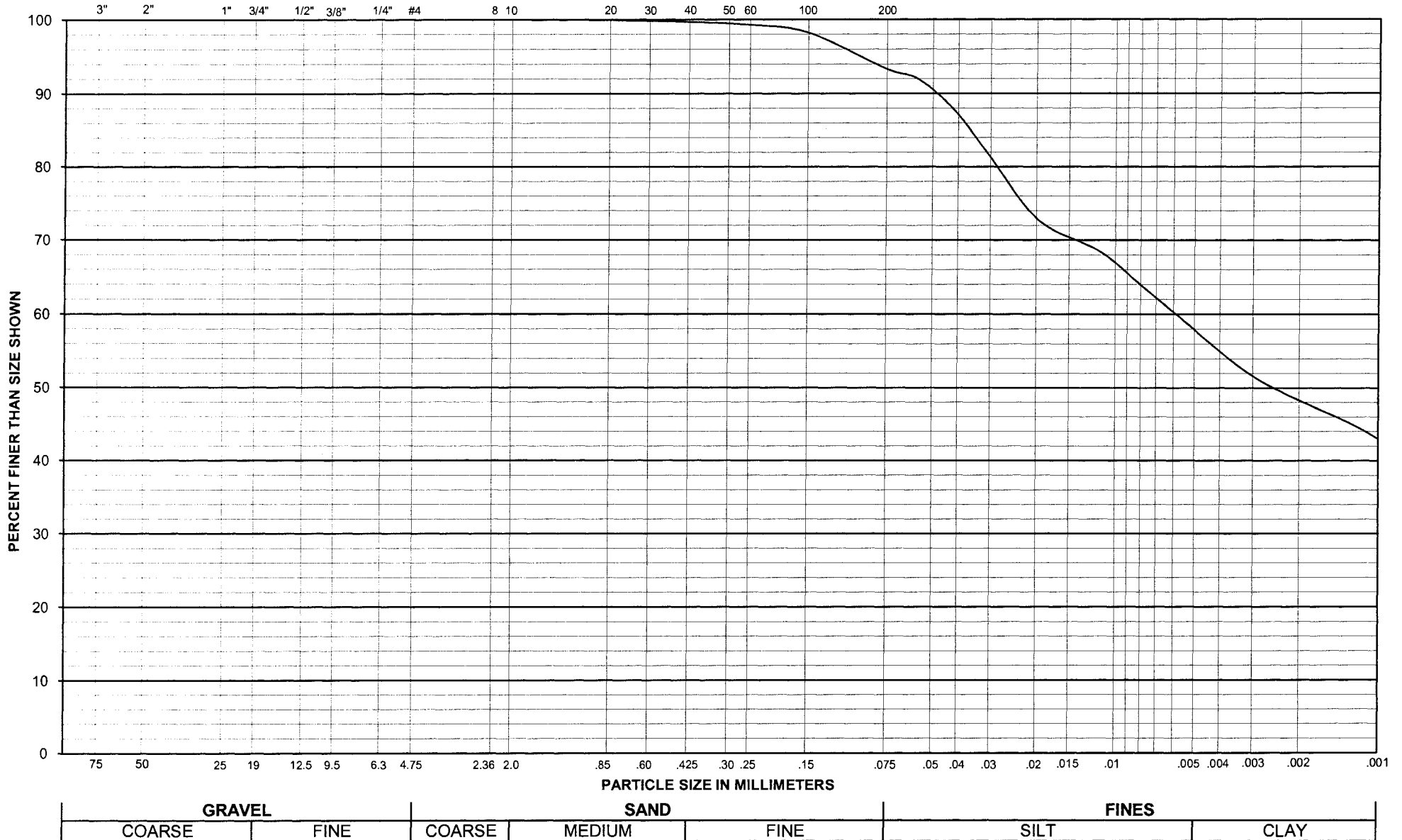
Project: Red River Geomorphic Study
Cass County, North Dakota

Sample Source: TN 7502 - M-02

Classification: FAT CLAY - dark gray

Reported to: West Consultants, Inc.

GRAIN SIZE DISTRIBUTION CURVE U.S. Standard Sieve Sizes





MIDWEST TESTING LABORATORY



Project No.: 16216

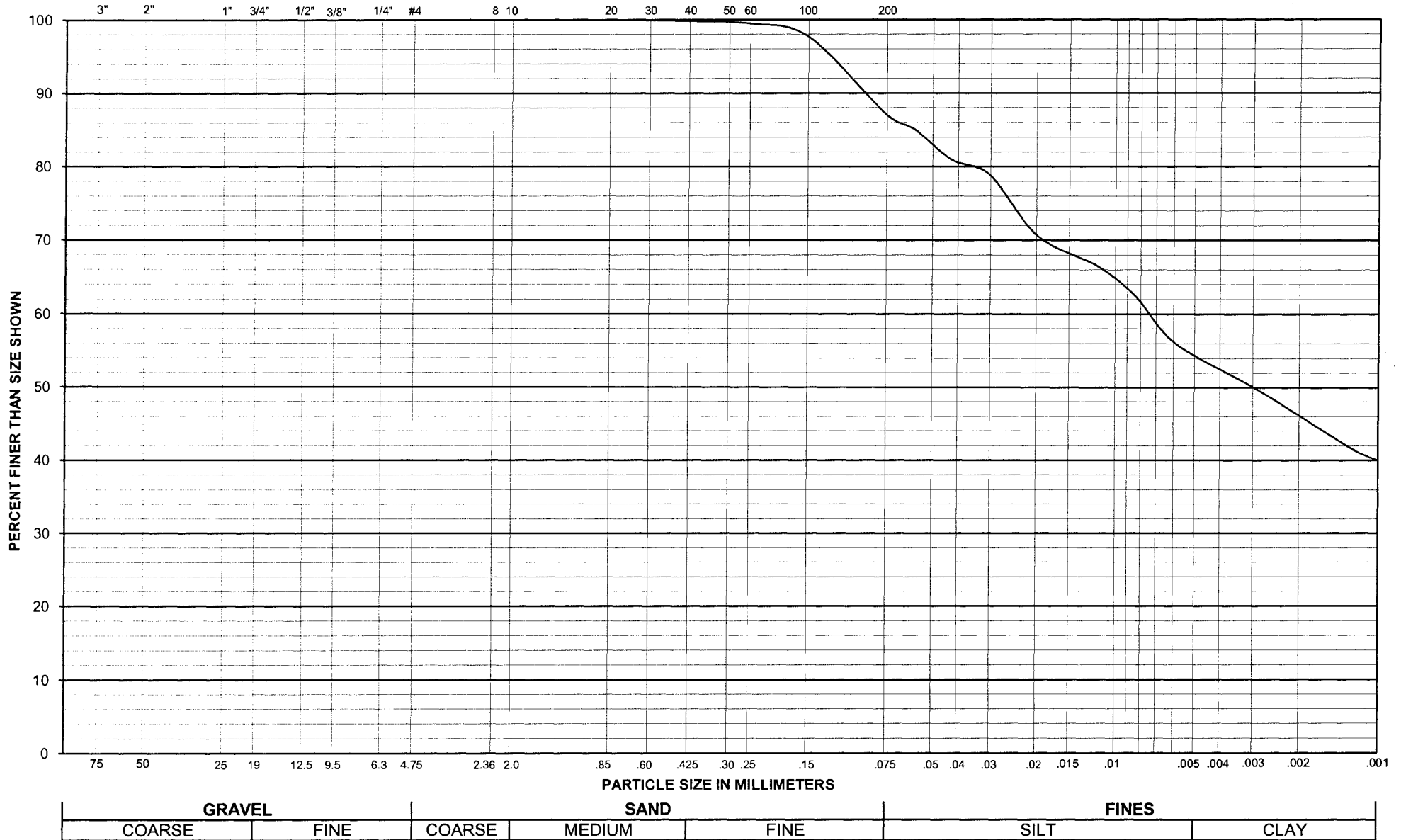
Project: Red River Geomorphic Study
Cass County, North Dakota

Sample Source: TN 7503 - M-03

Classification: FAT CLAY - dark gray

Reported to: West Consultants, Inc.

GRAIN SIZE DISTRIBUTION CURVE U.S. Standard Sieve Sizes





MIDWEST TESTING LABORATORY



Project No.: M1101216

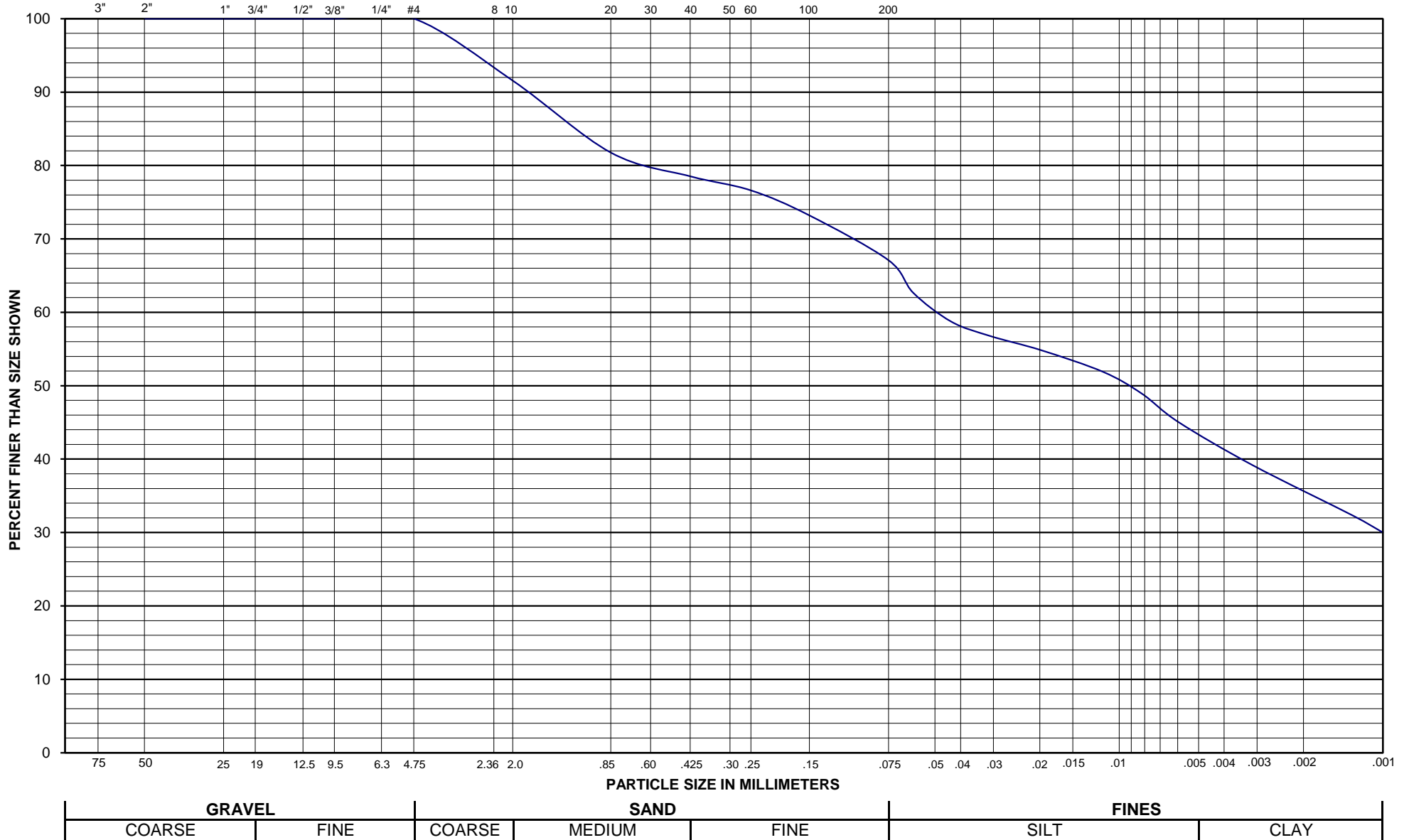
Project: Red River Geomorphic Study
Cass County, North Dakota

Sample Source: #31 (MR1-CH)

Classification: SANDY FAT CLAY - dark grayish brown (CH)

Reported to: West Consultants, Inc.

GRAIN SIZE DISTRIBUTION CURVE U.S. Standard Sieve Sizes





LEGEND

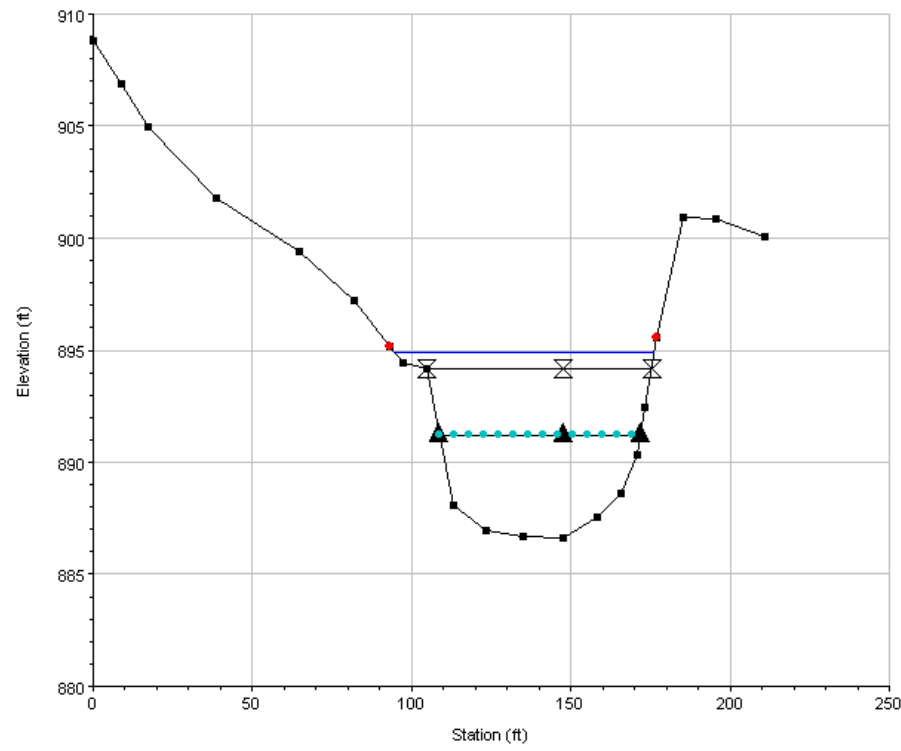
- Cross Section
 - - - Detailed Study Reach
 - Sediment Sample
 - ▲ Field Photos
 - 0750 Direction Arrow and Photo Number
- 0 85 170
Feet



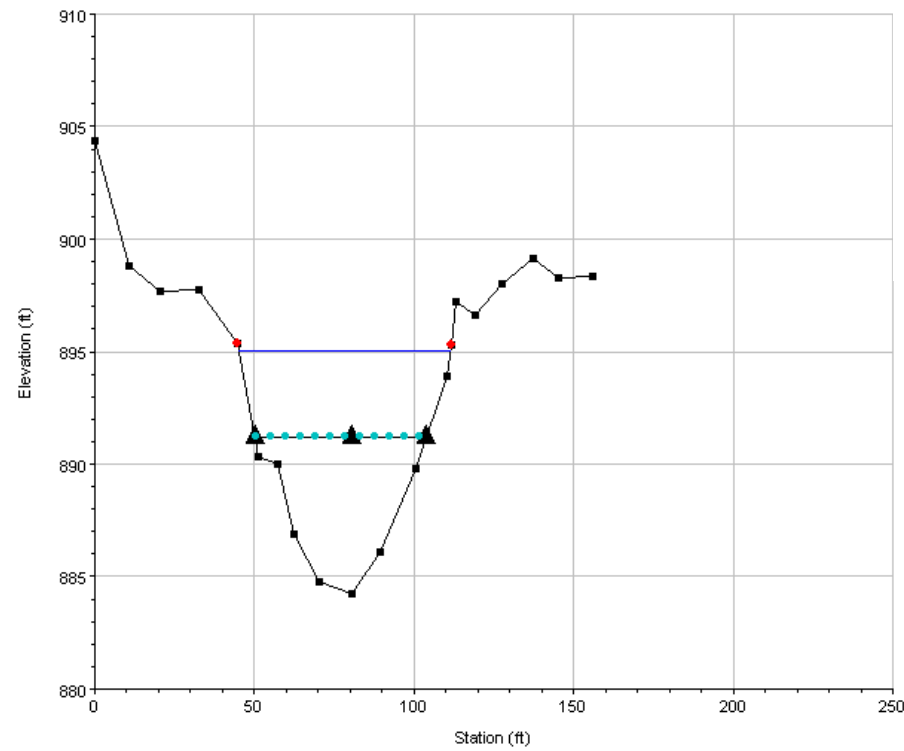
MAPLE RIVER - 2 - 11.39
Observation Date: November 20, 2010
October 3, 2011

MAPLE RIVER – 2 – 11.39

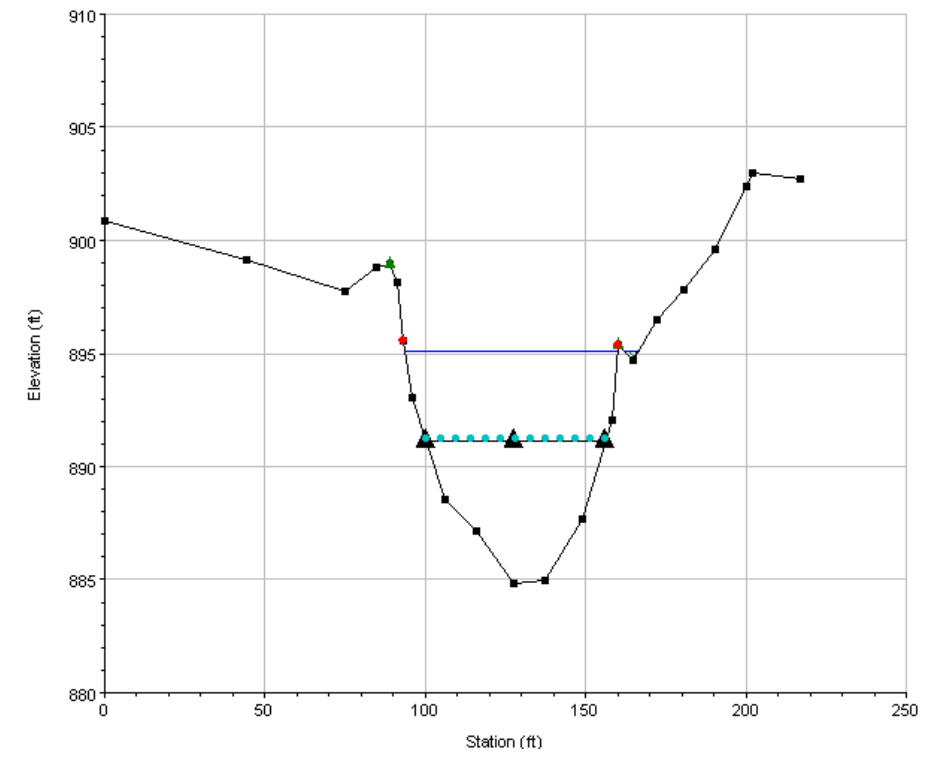
Cross Section 60136.3



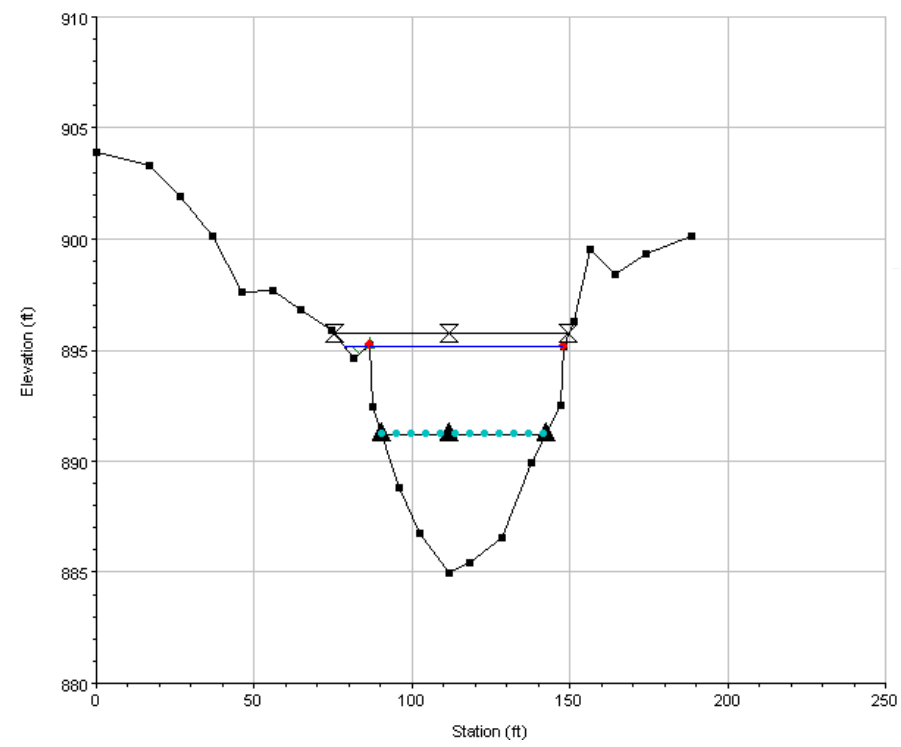
Cross Section 61555.8



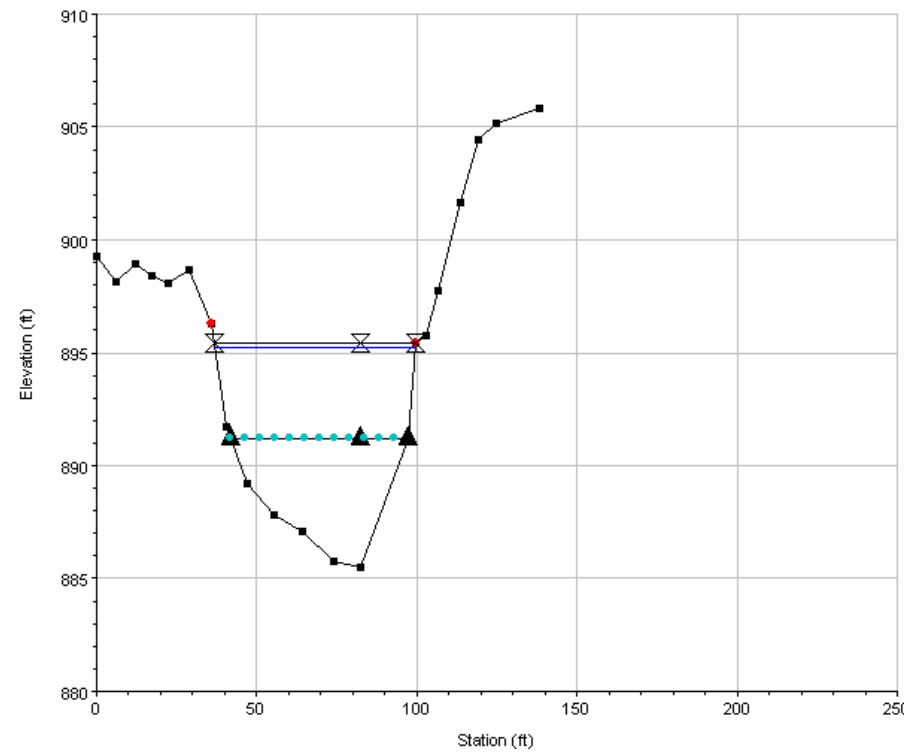
Cross Section 63032.2



Cross Section 63806.5



Cross Section 64786.1



LEGEND

..... Modeled Water Surface Elevation for Day of Survey
 ———— Modeled Bankfull Water Surface Elevation
 —▲— Observed Water Surface Elevation
 —X— Observed Bankfull Water Surface Elevation
 —■— Ground
 ● Bank Stations

MAPLE RIVER – 2 – 11.39
Observation Date: November 20, 2010



Field Photo 0466



Field Photo 0467



Field Photo 0468



Field Photo 0469



Field Photo 0470



Field Photo 0471

MAPLE RIVER – 2 – 11.39
Observation Date: November 20, 2010



Field Photo 0480



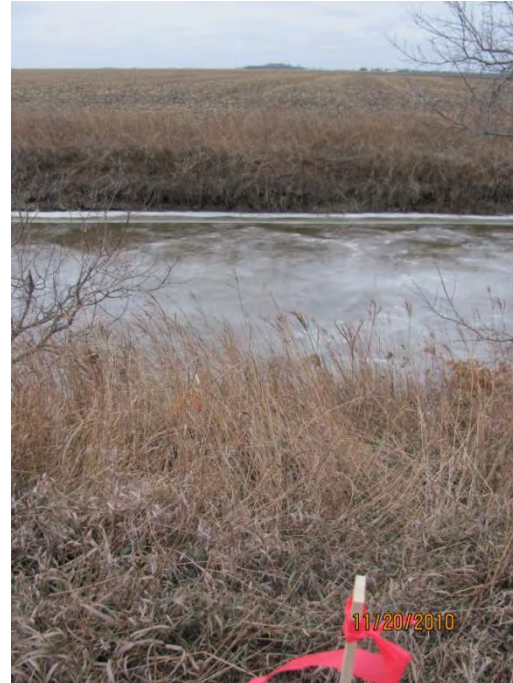
Field Photo 0472



Field Photo 0473



Field Photo 0474



Field Photo 0475



Field Photo 0476

MAPLE RIVER – 2 – 11.39

Observation Date: November 20, 2010



Field Photo 0477



MIDWEST TESTING LABORATORY



Project No.: 16216

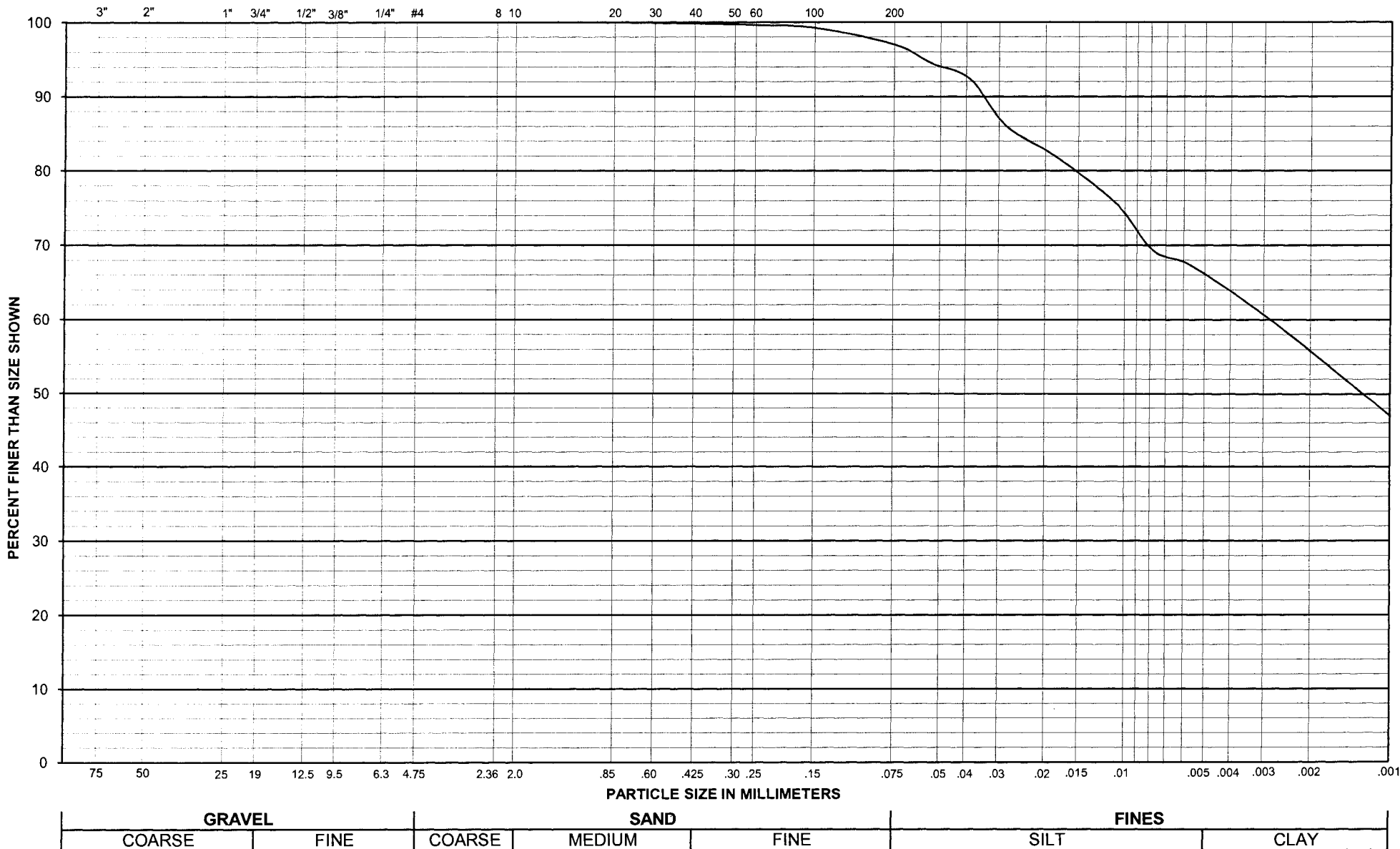
Project: Red River Geomorphic Study
Cass County, North Dakota

Sample Source: TN 7525 - M-B-1

Classification: FAT CLAY - dark gray

Reported to: West Consultants, Inc.

GRAIN SIZE DISTRIBUTION CURVE U.S. Standard Sieve Sizes





MIDWEST TESTING LABORATORY



Project No.: 16216

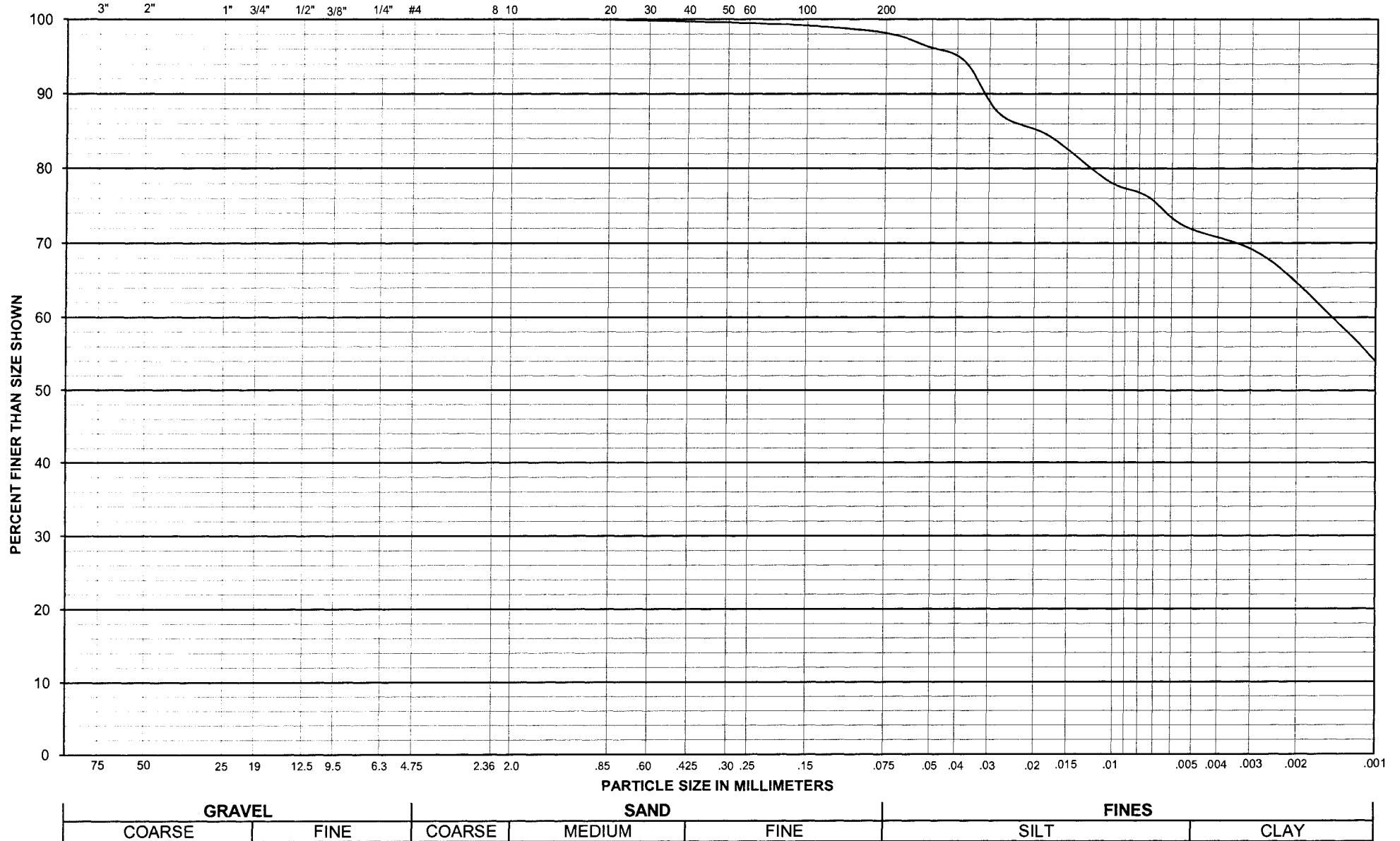
Project: Red River Geomorphic Study
Cass County, North Dakota

Sample Source: TN 7526 - M-B-2

Classification: FAT CLAY - dark gray

Reported to: West Consultants, Inc.

GRAIN SIZE DISTRIBUTION CURVE U.S. Standard Sieve Sizes





MIDWEST TESTING LABORATORY



Project No.: M1101216

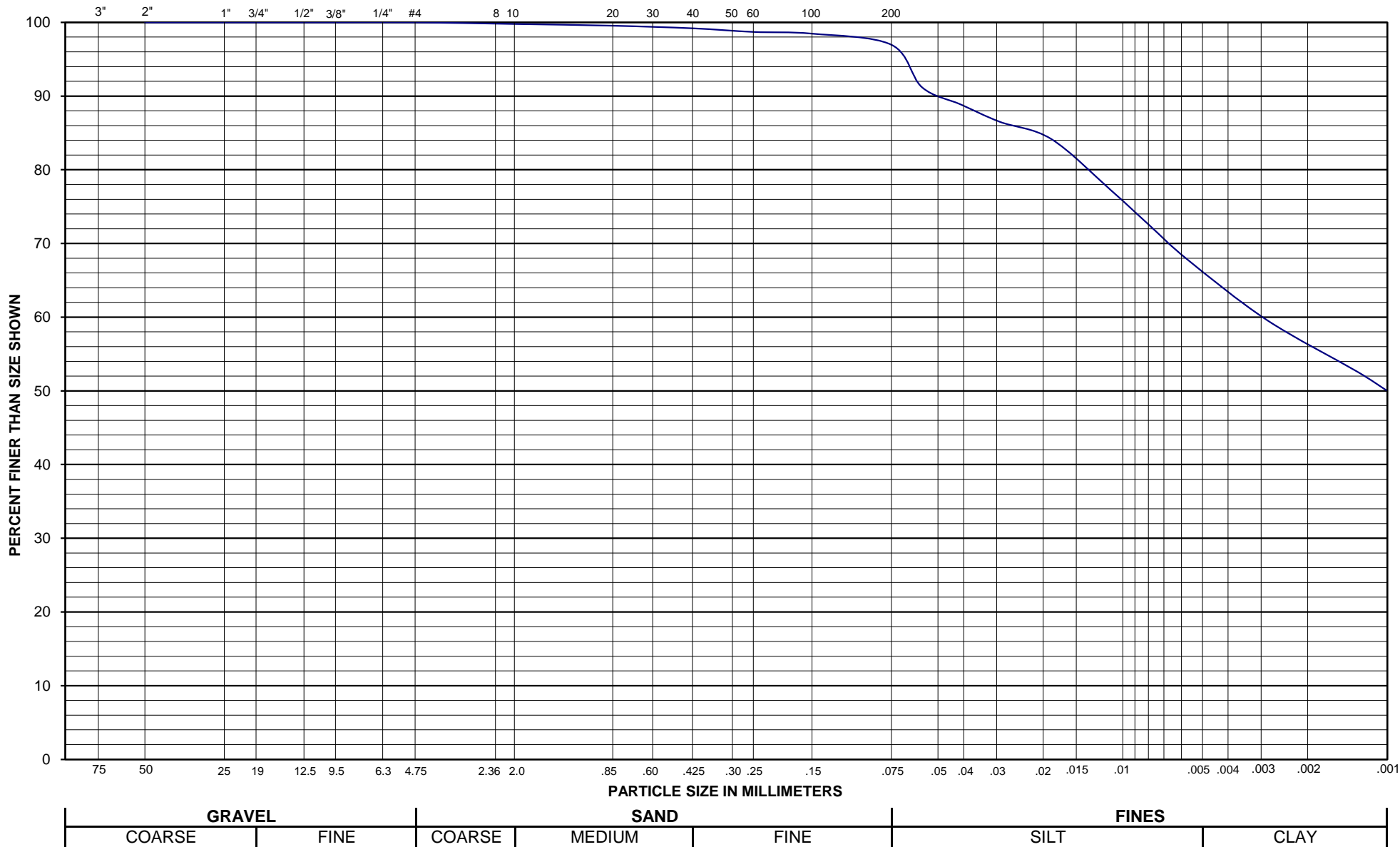
Project: Red River Geomorphic Study
Cass County, North Dakota

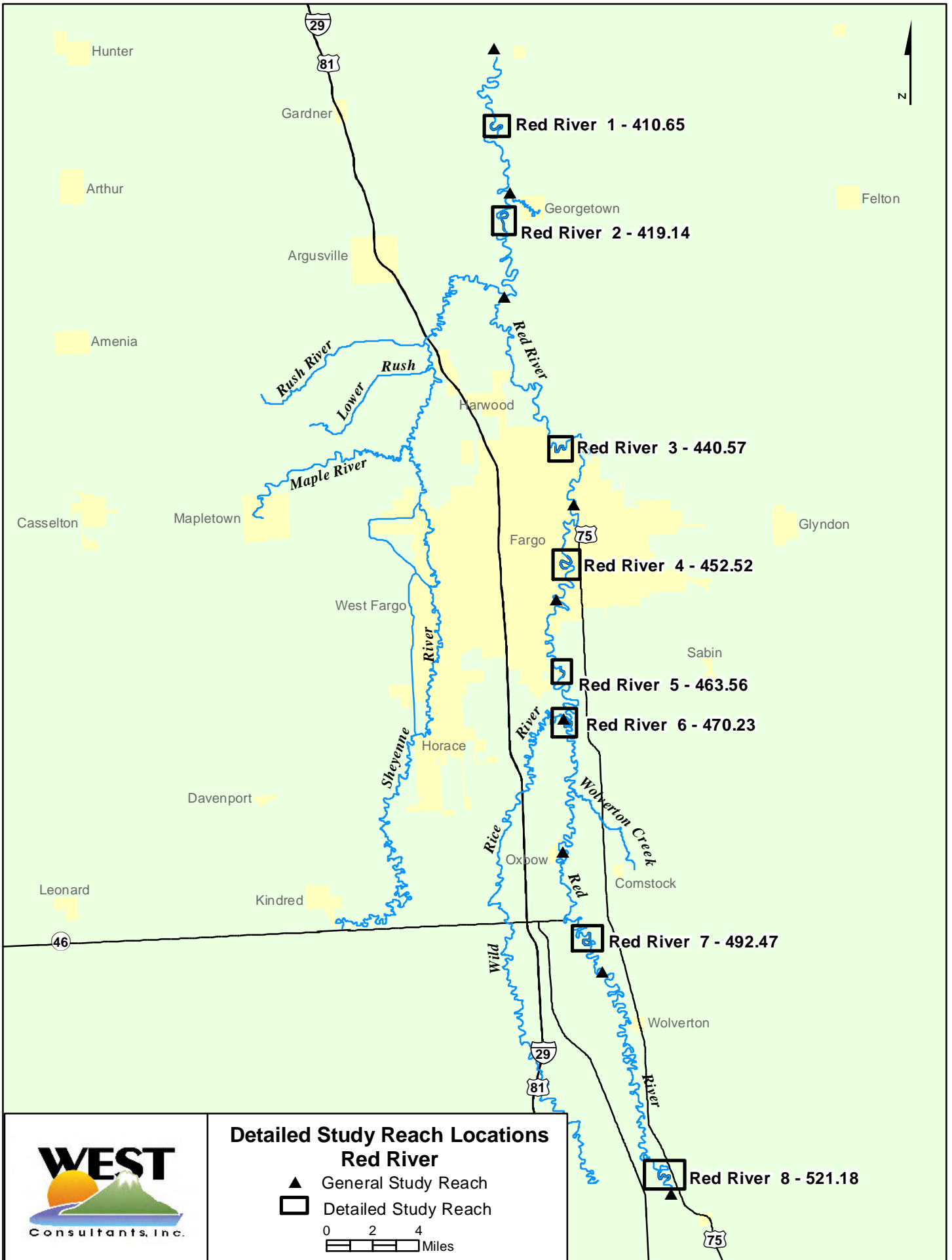
Sample Source: #53 (MR2/3005/CH)

Classification: FAT CLAY - dark brown (CH)

Reported to: West Consultants, Inc.

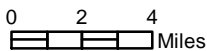
GRAIN SIZE DISTRIBUTION CURVE U.S. Standard Sieve Sizes





**Detailed Study Reach Locations
Red River**

- ▲ General Study Reach
- Detailed Study Reach





LEGEND

- Cross Section
- - - Detailed Study Reach
- Sediment Sample
- ▲ Field Photos
- 0750 Direction Arrow and Photo Number

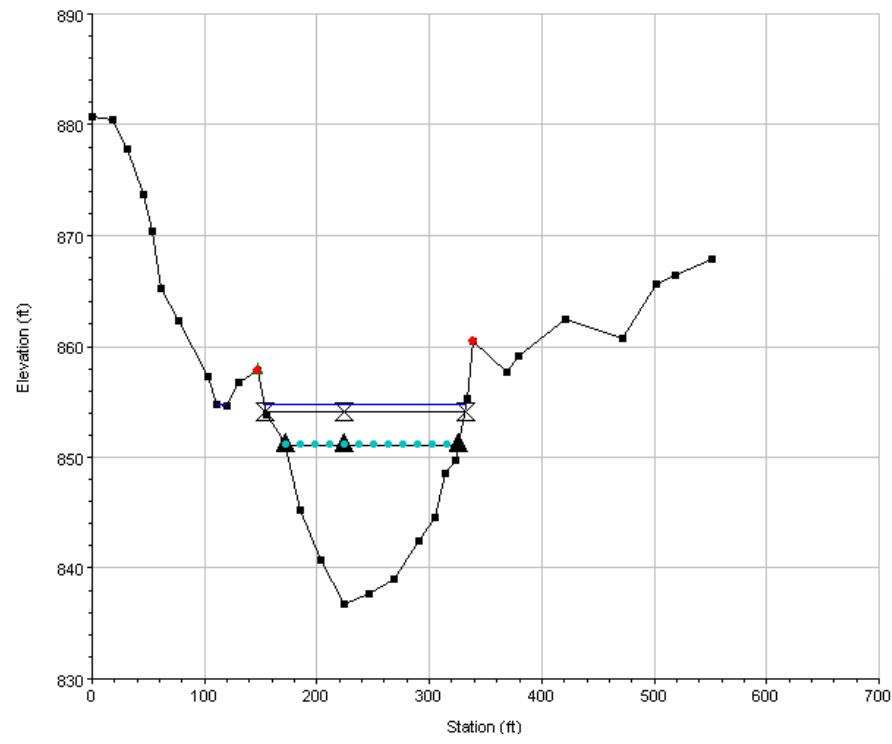
0 150 300
Feet

RED RIVER - 1 - 410.65

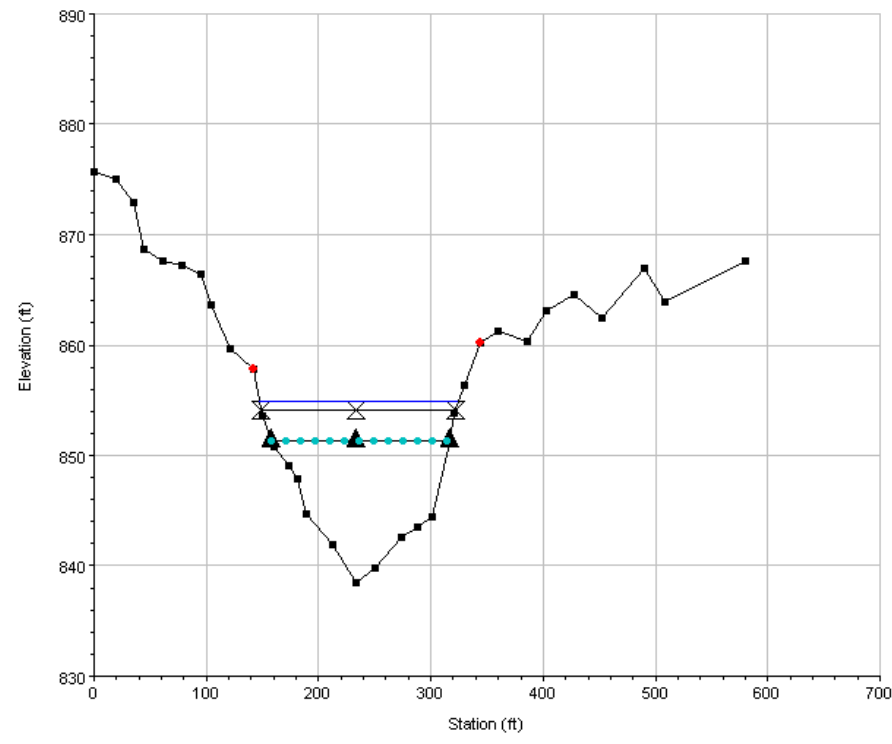
Observation Date: September 28, 2011

RED RIVER – 1 – 410.65

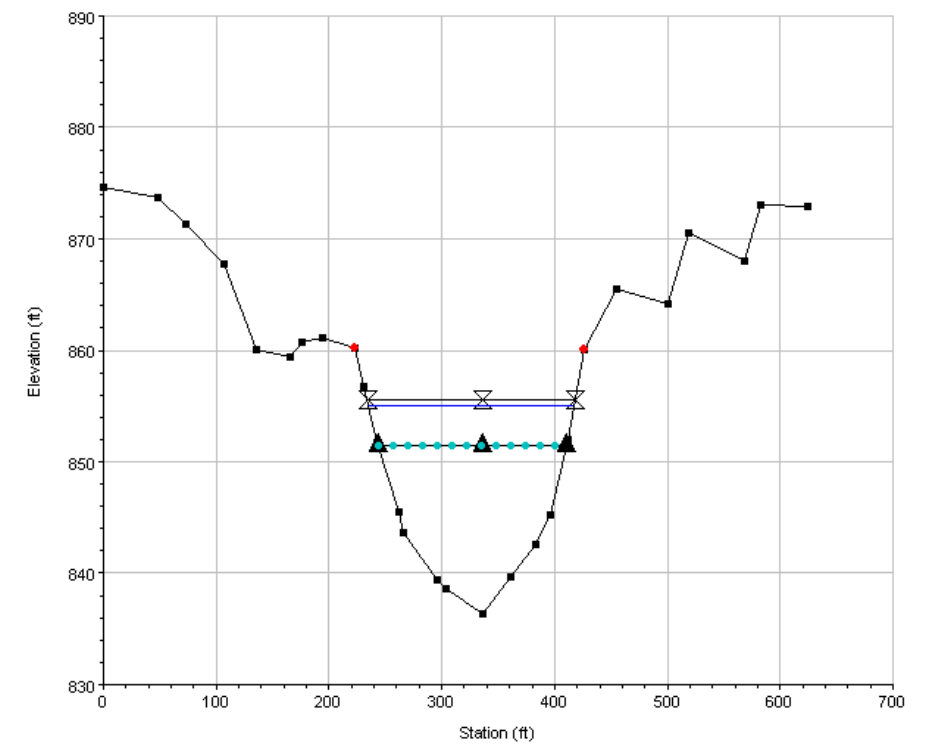
Cross Section 2168242



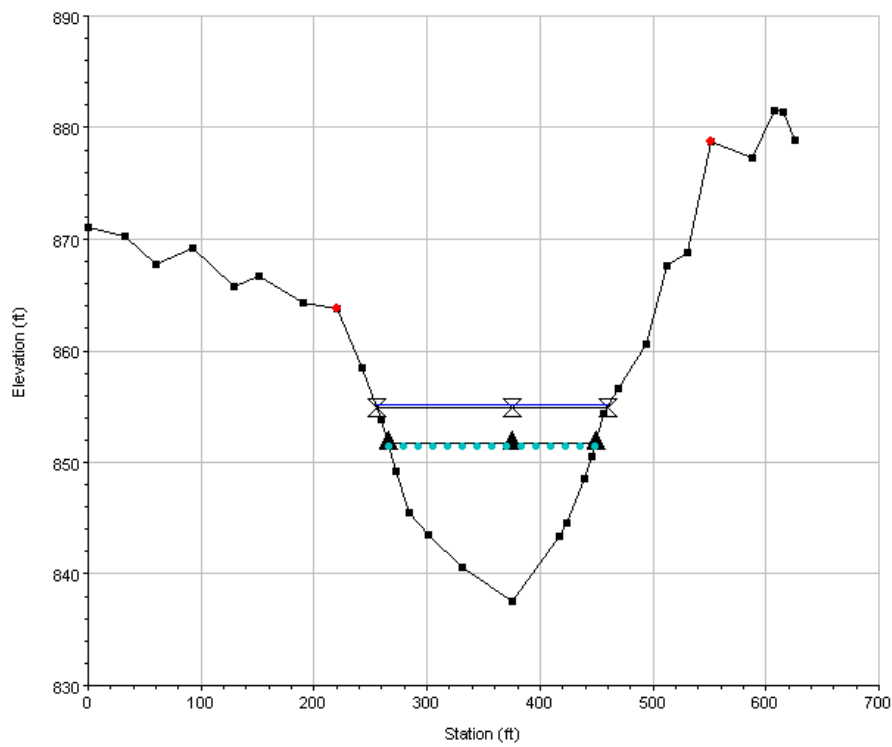
Cross Section 2169815



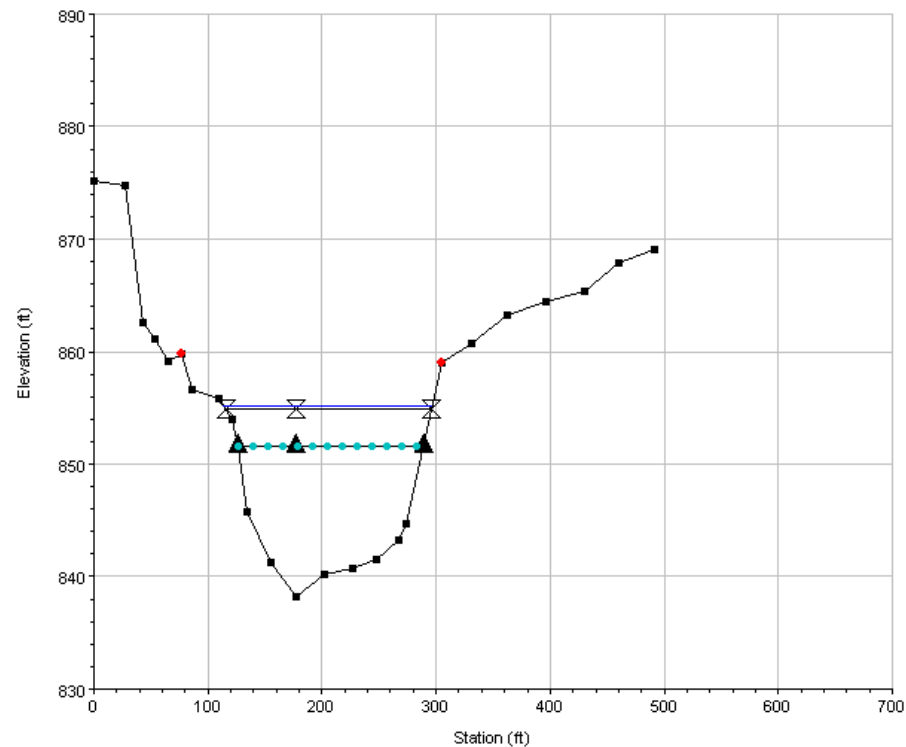
Cross Section 2171662



Cross Section 2172666



Cross Section 2173607



LEGEND

..... Modeled Water Surface Elevation for Day of Survey
 ——— Modeled Bankfull Water Surface Elevation
 —▲— Observed Water Surface Elevation
 —X— Observed Bankfull Water Surface Elevation
 —■— Ground
 ● Bank Stations

RED RIVER – 1 – 410.65
Observation Date: September 28, 2011



Field Photo 1214



Field Photo 1215



Field Photo 1216



Field Photo 1217



Field Photo 1219



Field Photo 1220

RED RIVER – 1 – 410.65
Observation Date: September 28, 2011



Field Photo 1221



Field Photo 1222



Field Photo 1223



Field Photo 1224



Field Photo 1225



Field Photo 1226

RED RIVER – 1 – 410.65
Observation Date: September 28, 2011



Field Photo 1227



Field Photo 1228



Field Photo 1229



Field Photo 1230



Field Photo 1231



Field Photo 1232

RED RIVER – 1 – 410.65
Observation Date: September 28, 2011



Field Photo 1233



Field Photo 1234



MIDWEST TESTING LABORATORY



Project No.: M1101216

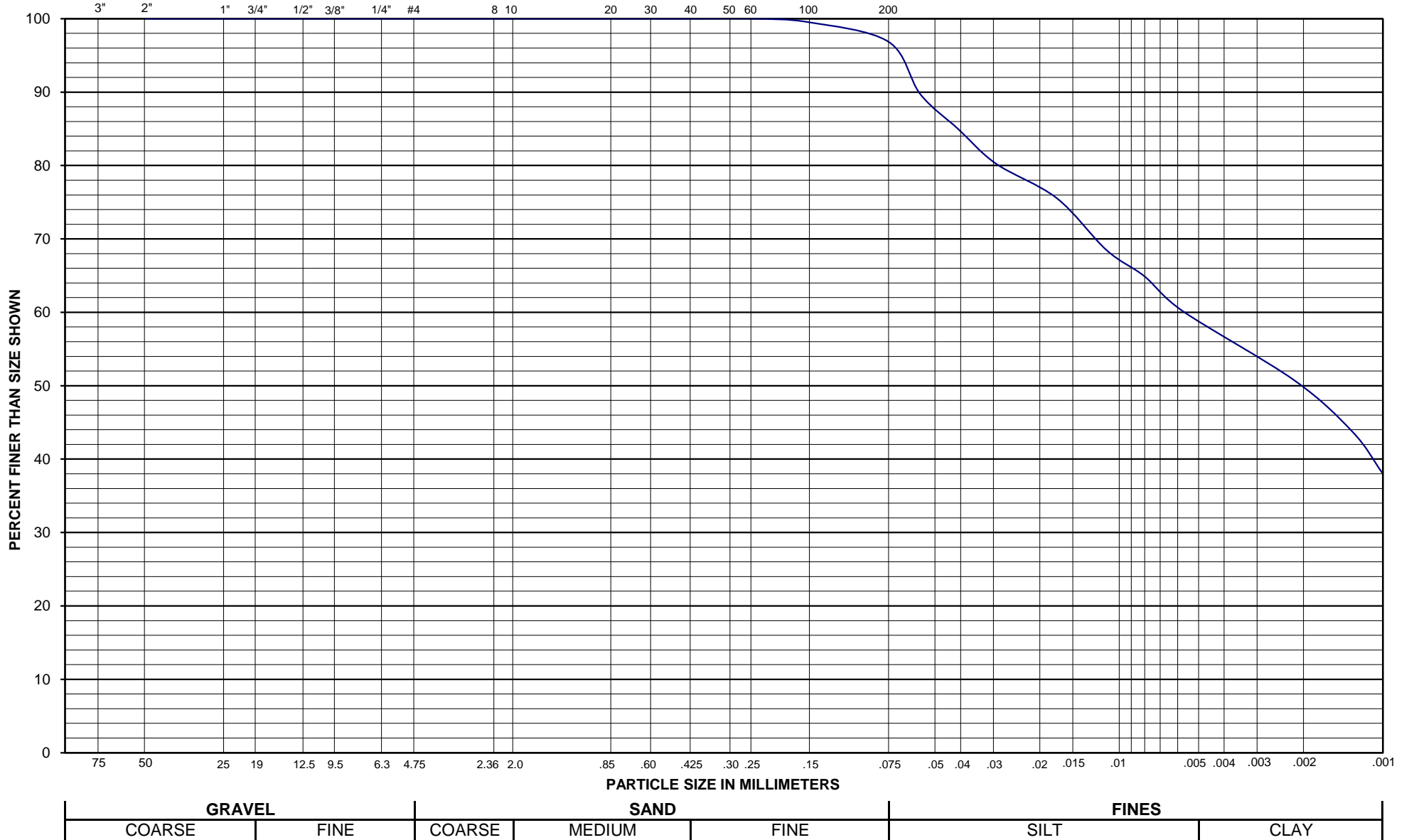
Project: Red River Geomorphic Study
Cass County, North Dakota

Sample Source: #5 (RR/148/LB)

Classification: FAT CLAY - dark brown (CH)

Reported to: West Consultants, Inc.

GRAIN SIZE DISTRIBUTION CURVE U.S. Standard Sieve Sizes





MIDWEST TESTING LABORATORY



Project No.: M1101216

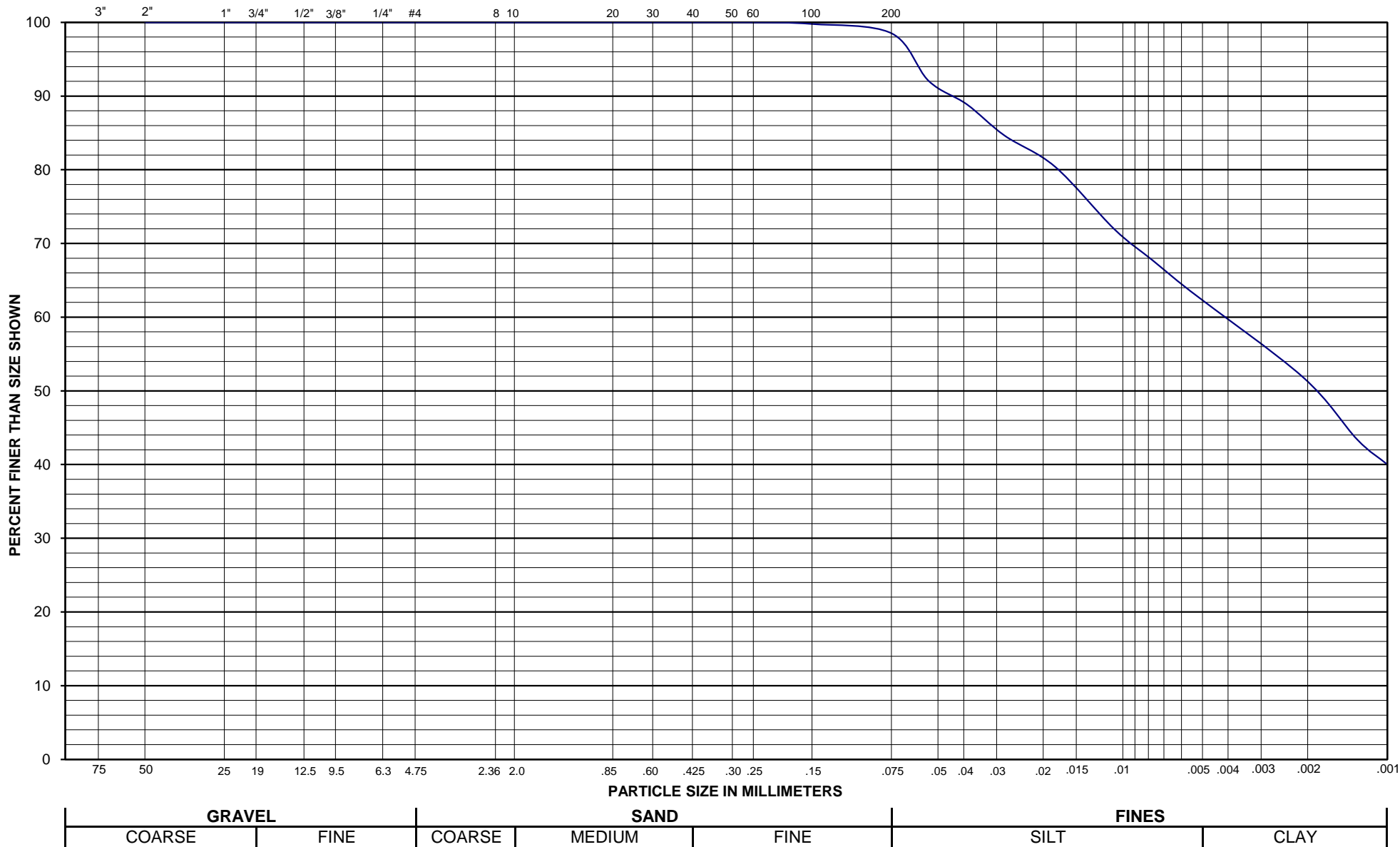
Project: Red River Geomorphic Study
Cass County, North Dakota

Sample Source: #2 (RR/145/Bed-C)

Classification: FAT CLAY - dark brown (CH)

Reported to: West Consultants, Inc.

GRAIN SIZE DISTRIBUTION CURVE U.S. Standard Sieve Sizes





MIDWEST TESTING LABORATORY



Project No.: M1101216

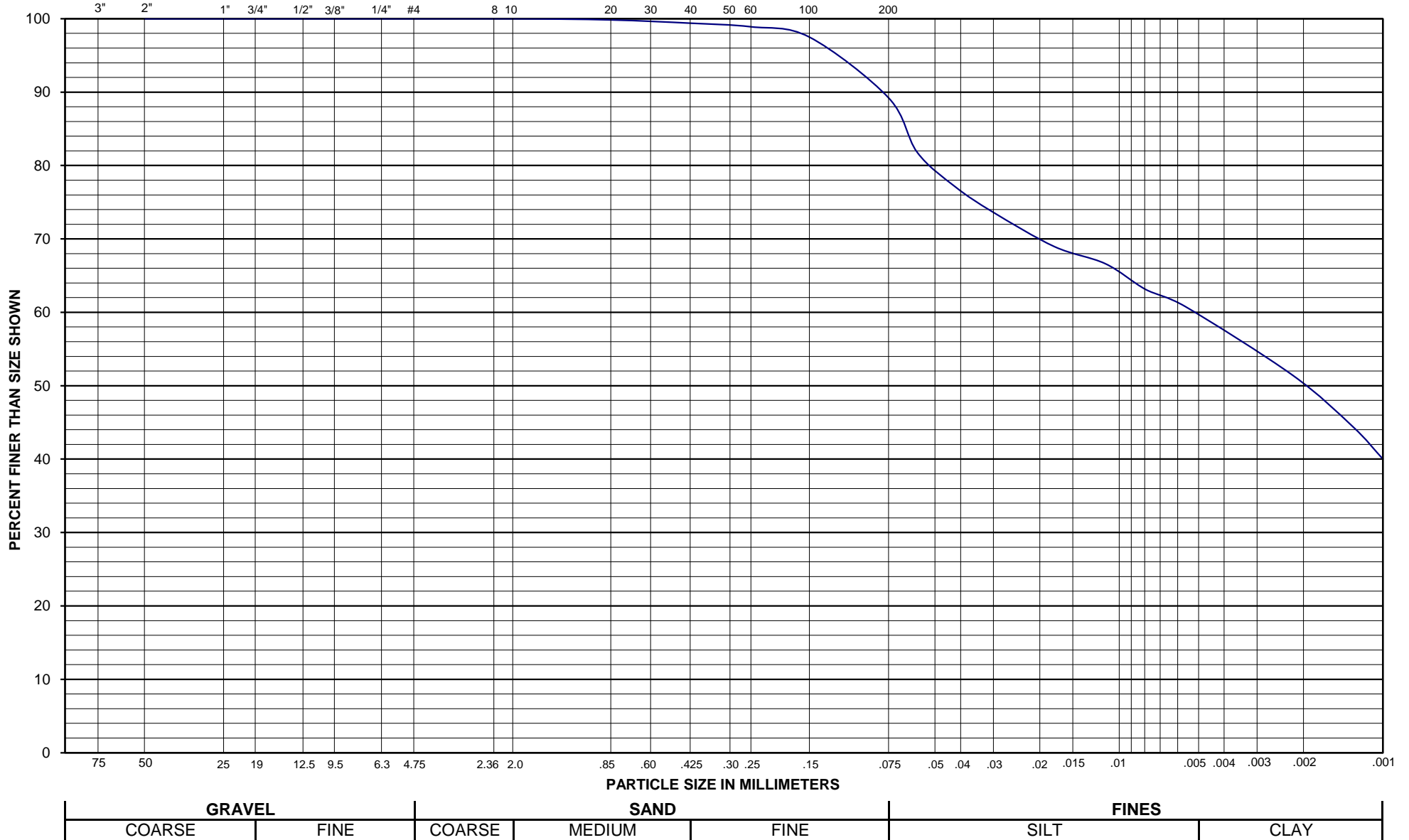
Project: Red River Geomorphic Study
Cass County, North Dakota

Sample Source: #7 (RR/144/RB)

Classification: FAT CLAY - grayish brown (CH)

Reported to: West Consultants, Inc.

GRAIN SIZE DISTRIBUTION CURVE U.S. Standard Sieve Sizes





LEGEND

- Cross Section
- - - Detailed Study Reach
- Sediment Sample
- ▲ Field Photos
- 0750 Direction Arrow and Photo Number

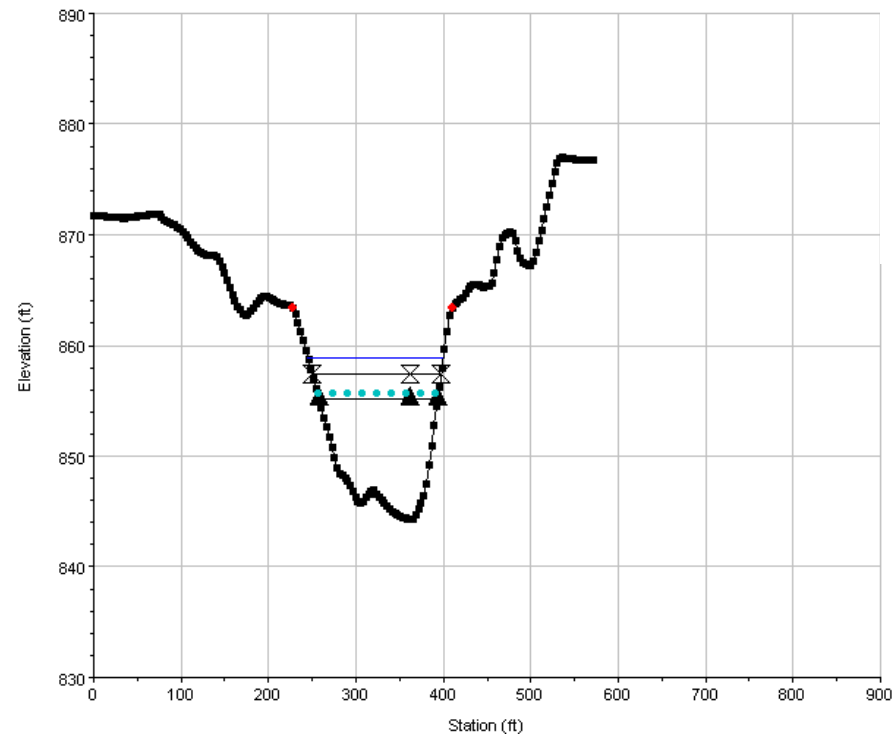
0 175 350
Feet

RED RIVER - 2 - 419.14

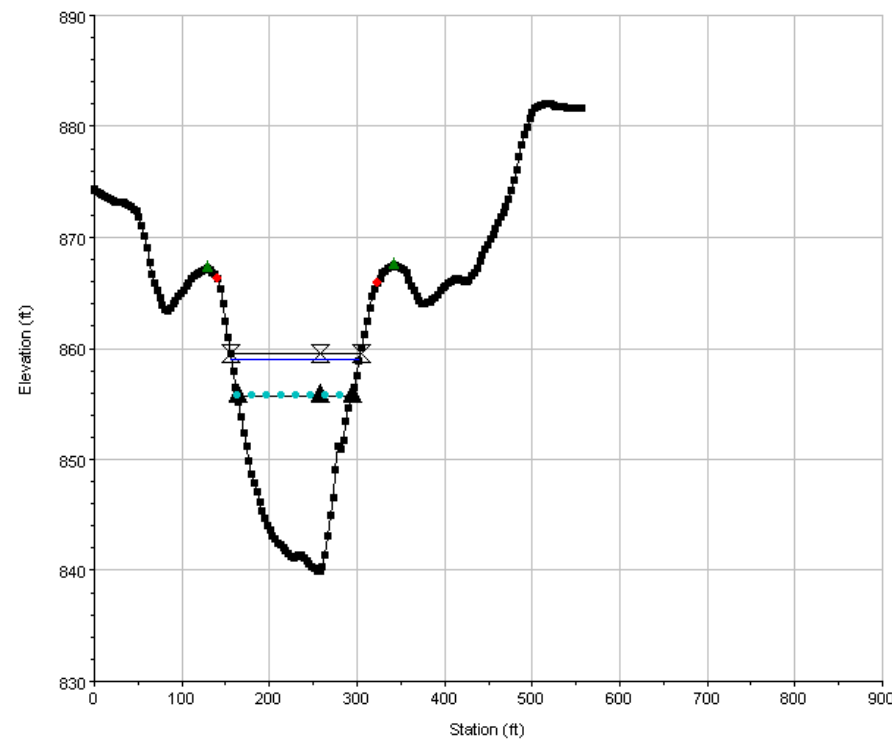
Observation Date: September 29, 2011

RED RIVER – 2 – 419.14

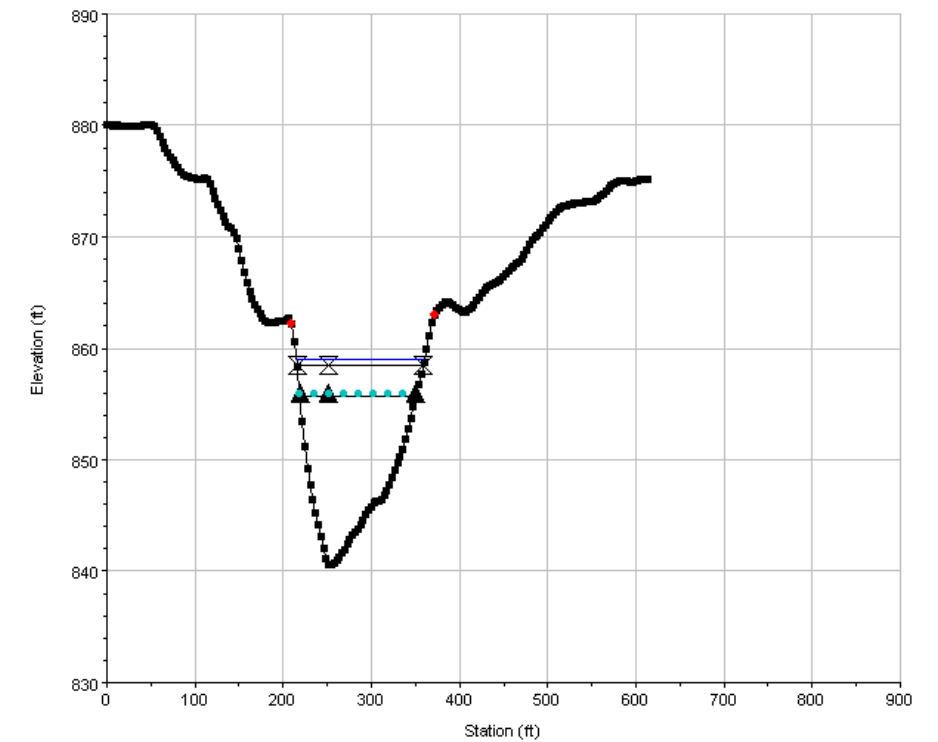
Cross Section 2213063



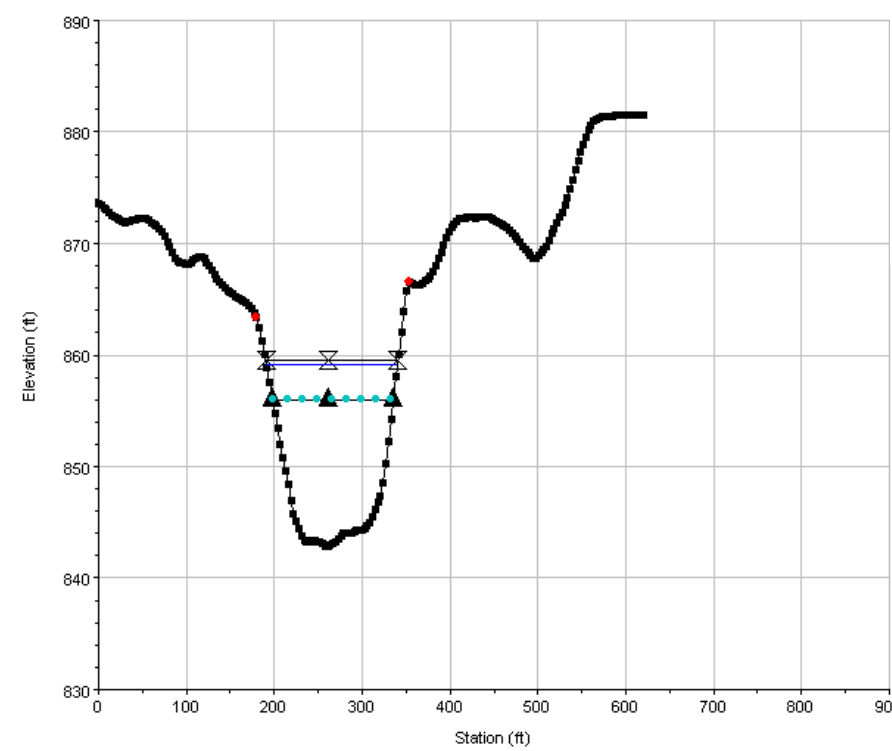
Cross Section 2215461



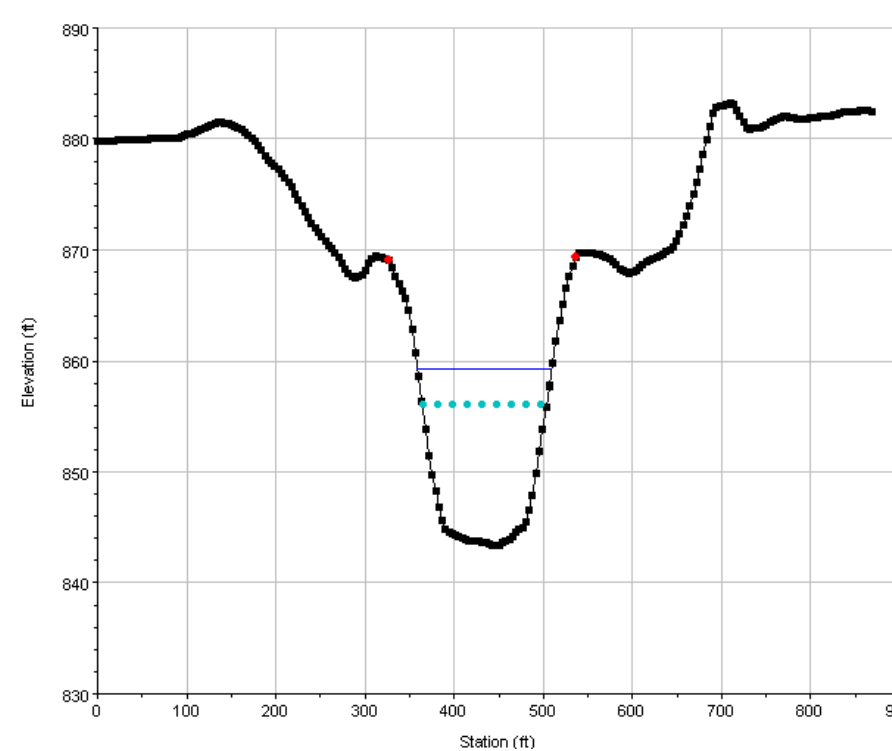
Cross Section 2216297



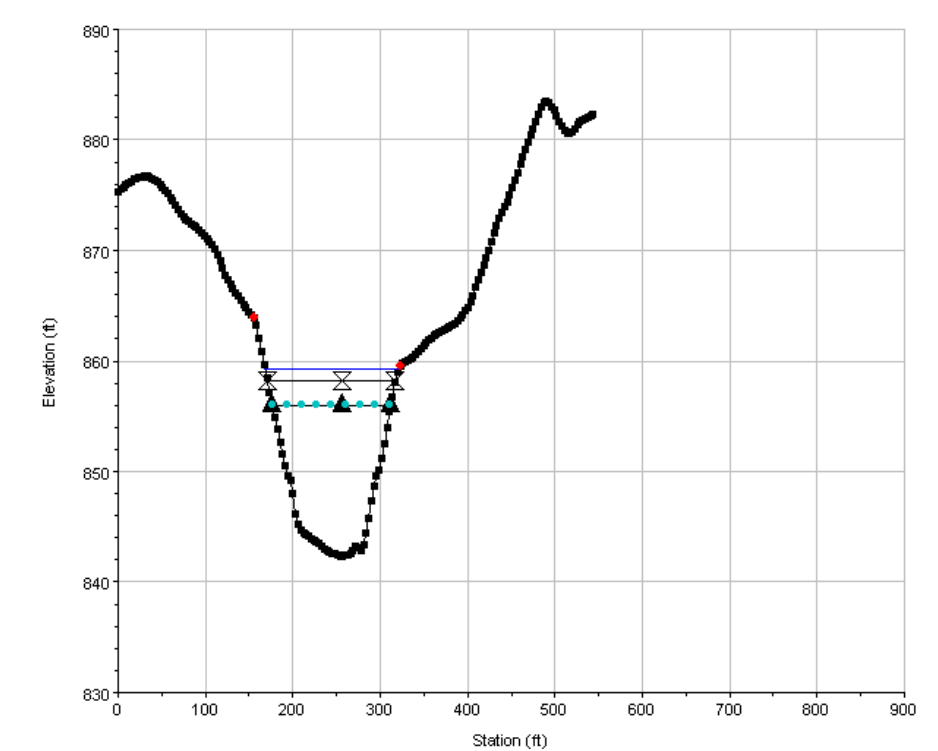
Cross Section 2218040



Cross Section 2219762



Cross Section 2219883



LEGEND

- Modeled Water Surface Elevation for Day of Survey
- Modeled Bankfull Water Surface Elevation
- ▲ Observed Water Surface Elevation
- ⊗ Observed Bankfull Water Surface Elevation
- Ground
- Bank Stations

RED RIVER – 2 – 419.14
Observation Date: September 29, 2011



Field Photo 1235



Field Photo 1236



Field Photo 1237



Field Photo 1238



Field Photo 1239



Field Photo 1240

RED RIVER – 2 – 419.14
Observation Date: September 29, 2011



Field Photo 1241



Field Photo 1242



Field Photo 1246



Field Photo 1247



Field Photo 1248



Field Photo 1249

RED RIVER – 2 – 419.14
Observation Date: September 29, 2011



Field Photo 1250



Field Photo 1251



Field Photo 1252



Field Photo 1253



Field Photo 1254



Field Photo 1255

RED RIVER – 2 – 419.14

Observation Date: September 29, 2011



Field Photo 1256



Field Photo 1257



MIDWEST TESTING LABORATORY



Project No.: M1101216

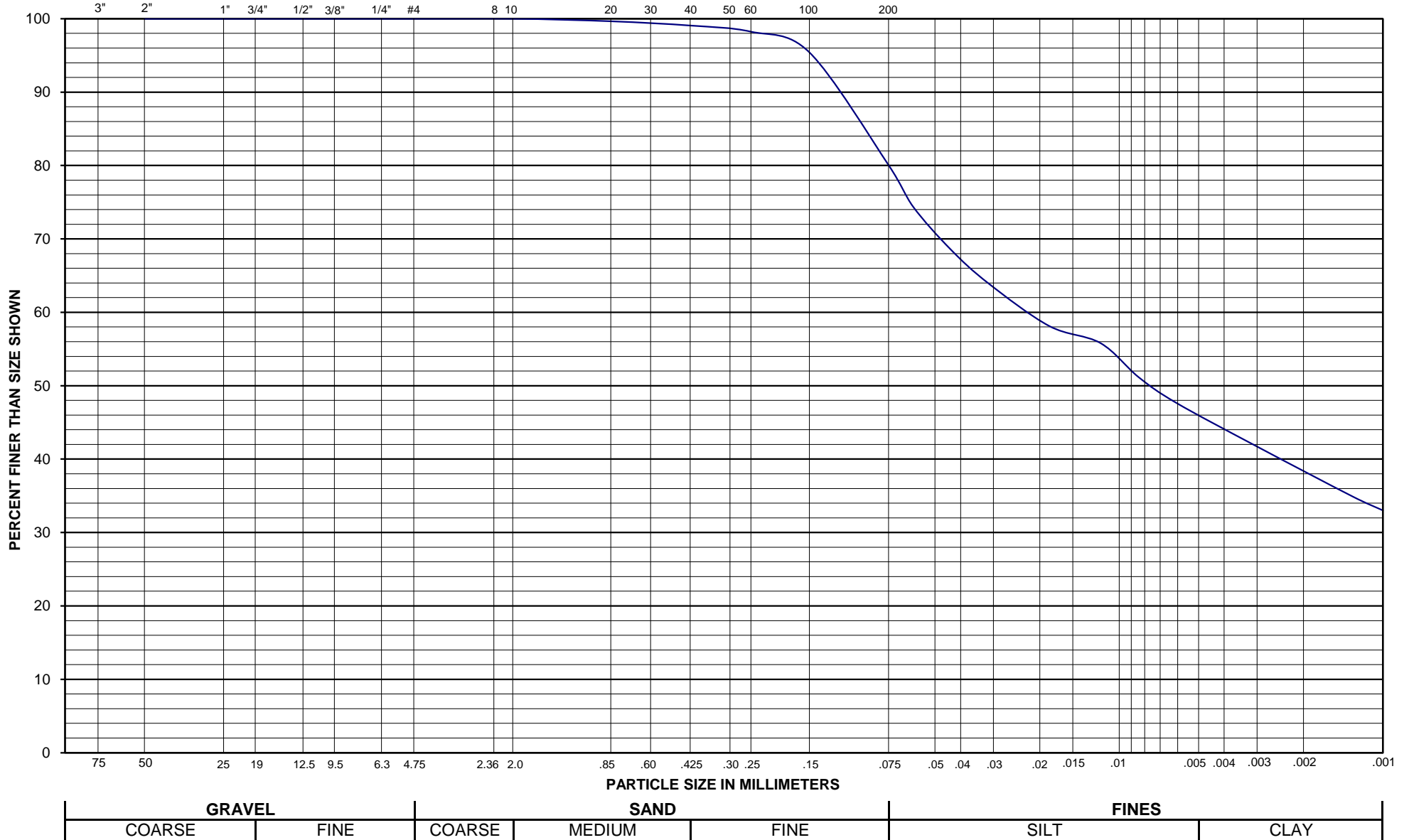
Project: Red River Geomorphic Study
Cass County, North Dakota

Sample Source: #16 (RR/176/RB)

Classification: FAT CLAY WITH SAND - dark brown (CH)

Reported to: West Consultants, Inc.

GRAIN SIZE DISTRIBUTION CURVE U.S. Standard Sieve Sizes





MIDWEST TESTING LABORATORY



Project No.: M1101216

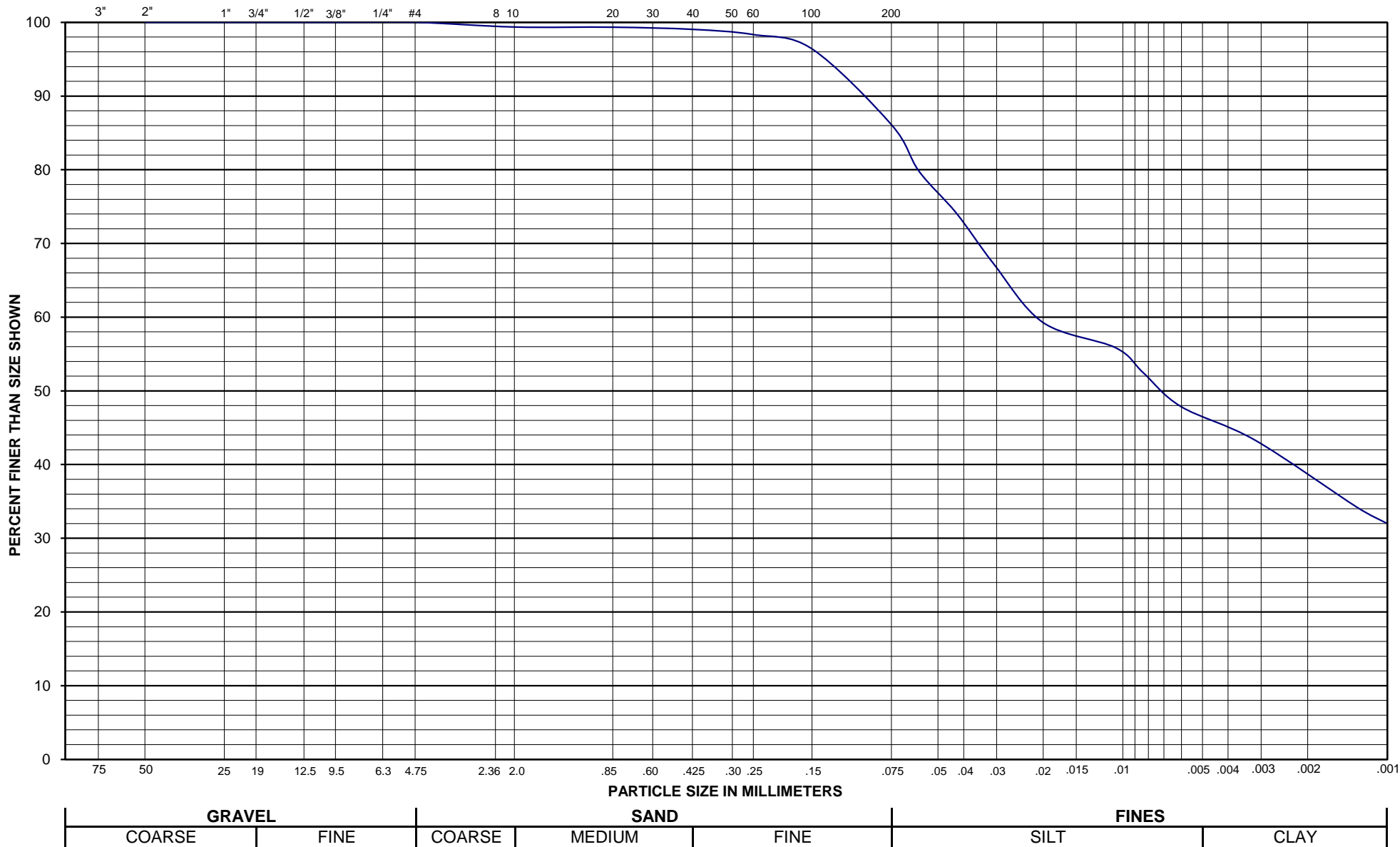
Project: Red River Geomorphic Study
Cass County, North Dakota

Sample Source: #30 (RR/180/LB)

Classification: FAT CLAY - dark grayish brown (CH)

Reported to: West Consultants, Inc.

GRAIN SIZE DISTRIBUTION CURVE U.S. Standard Sieve Sizes





MIDWEST TESTING LABORATORY



Project No.: M1101216

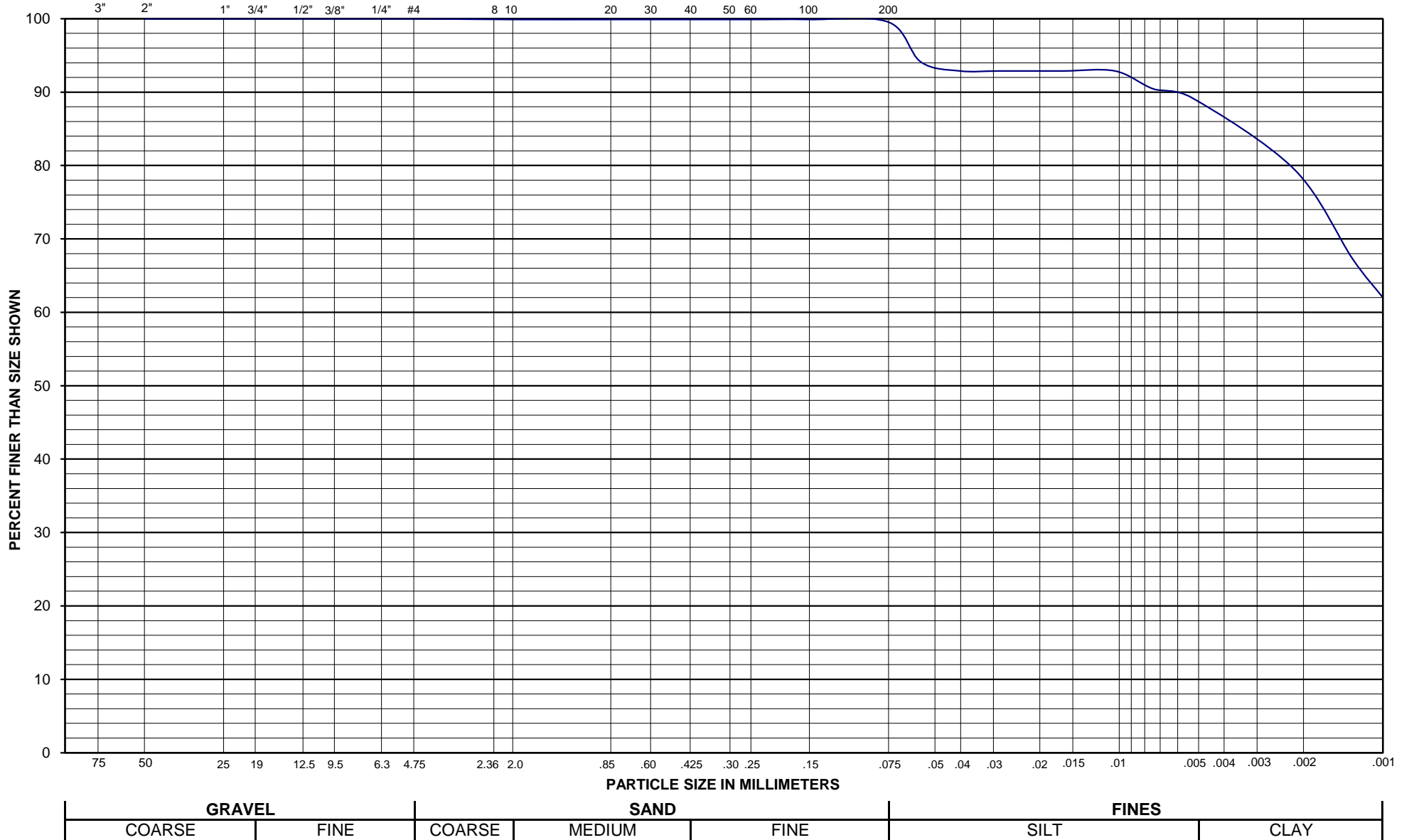
Project: Red River Geomorphic Study
Cass County, North Dakota

Sample Source: #13 (RR/184/Bed C-C)

Classification: FAT CLAY - dark gray (CH)

Reported to: West Consultants, Inc.

GRAIN SIZE DISTRIBUTION CURVE U.S. Standard Sieve Sizes





LEGEND

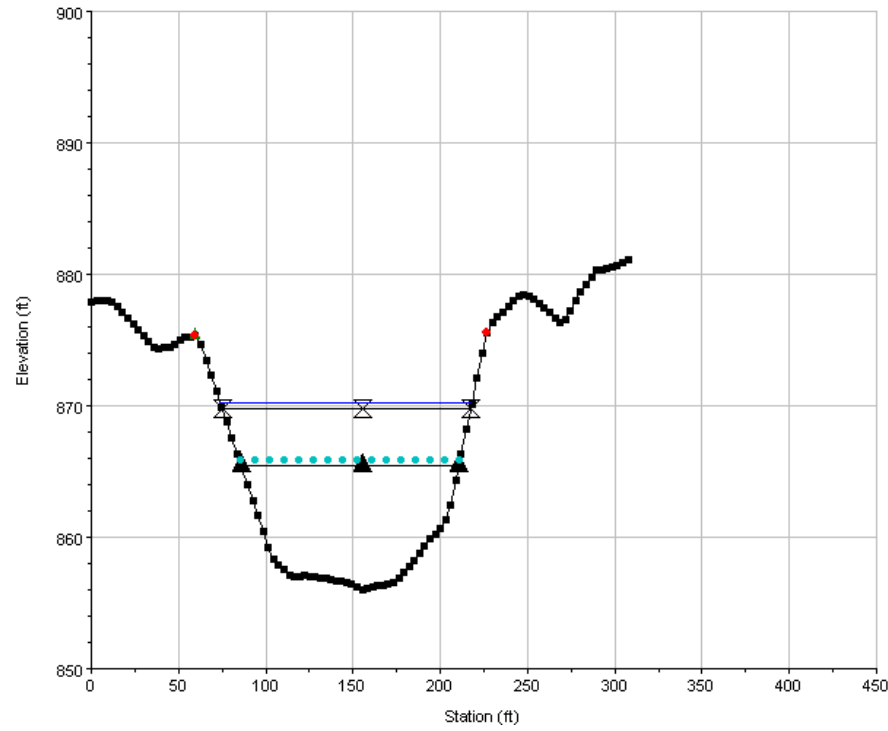
- Cross Section
 - - - Detailed Study Reach
 - Sediment Sample
 - ▲ Field Photos
 - 0750 Direction Arrow and Photo Number
- 0 137.5 275
 Feet



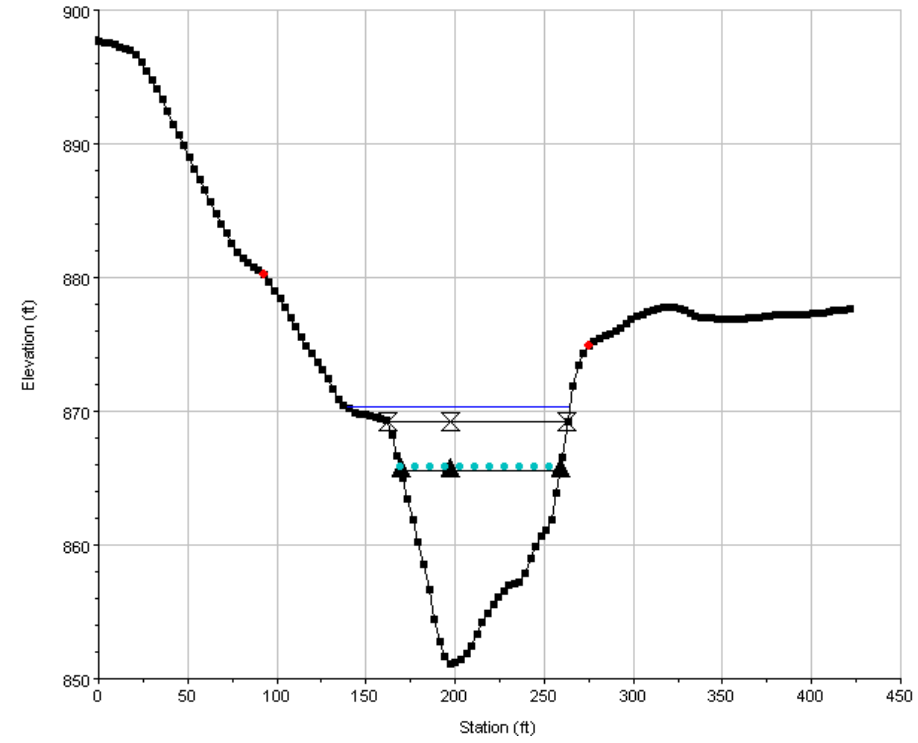
RED RIVER - 3 - 440.57
Observation Date: October 4, 2011

RED RIVER – 3 – 440.57

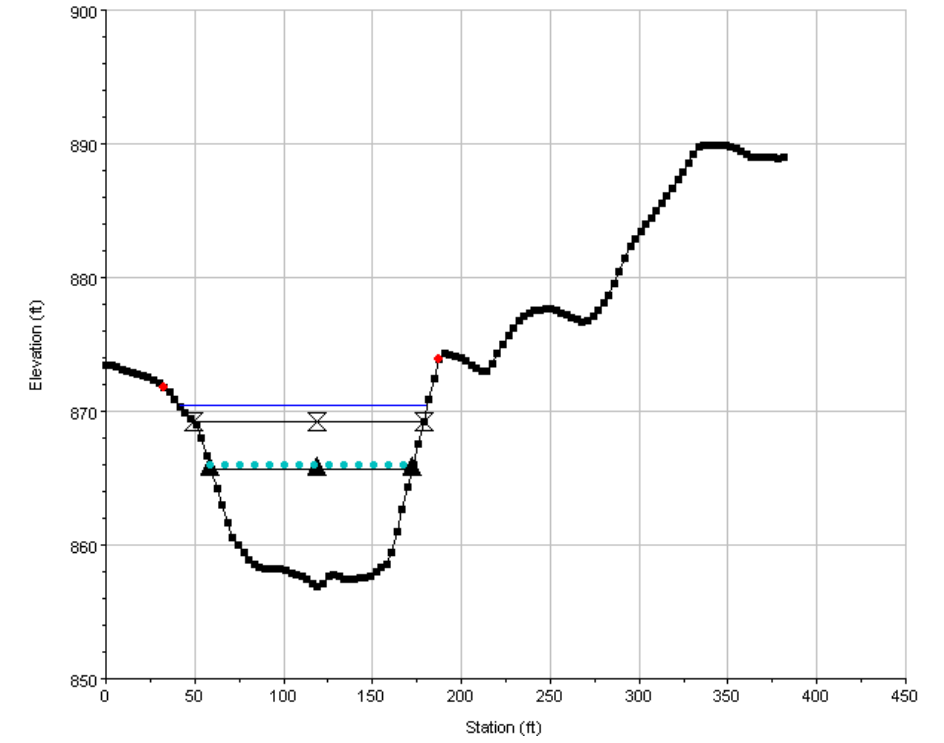
Cross Section 2326223



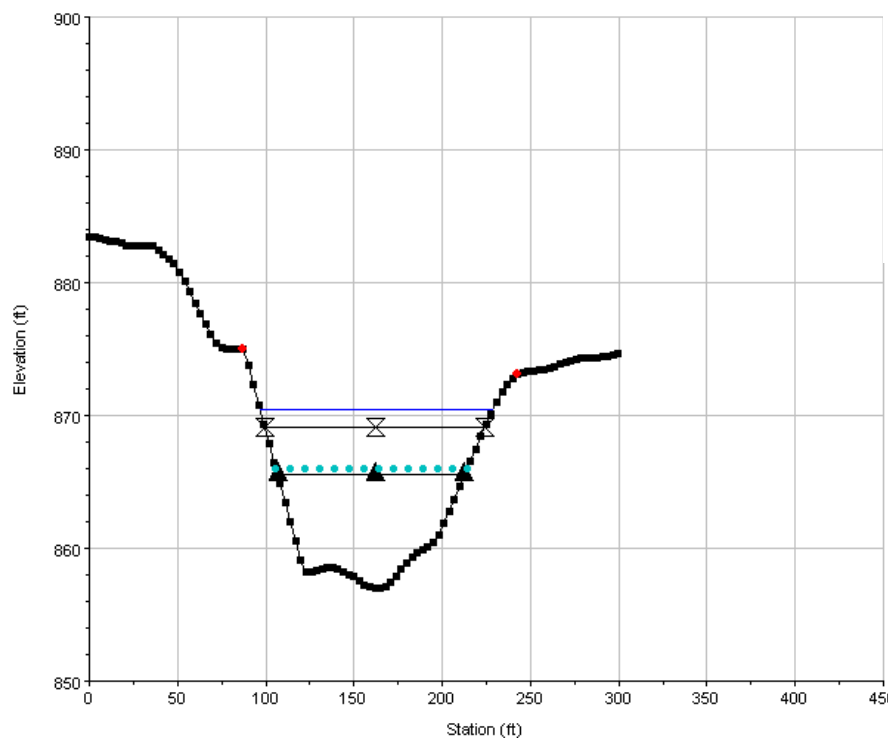
Cross Section 2327829



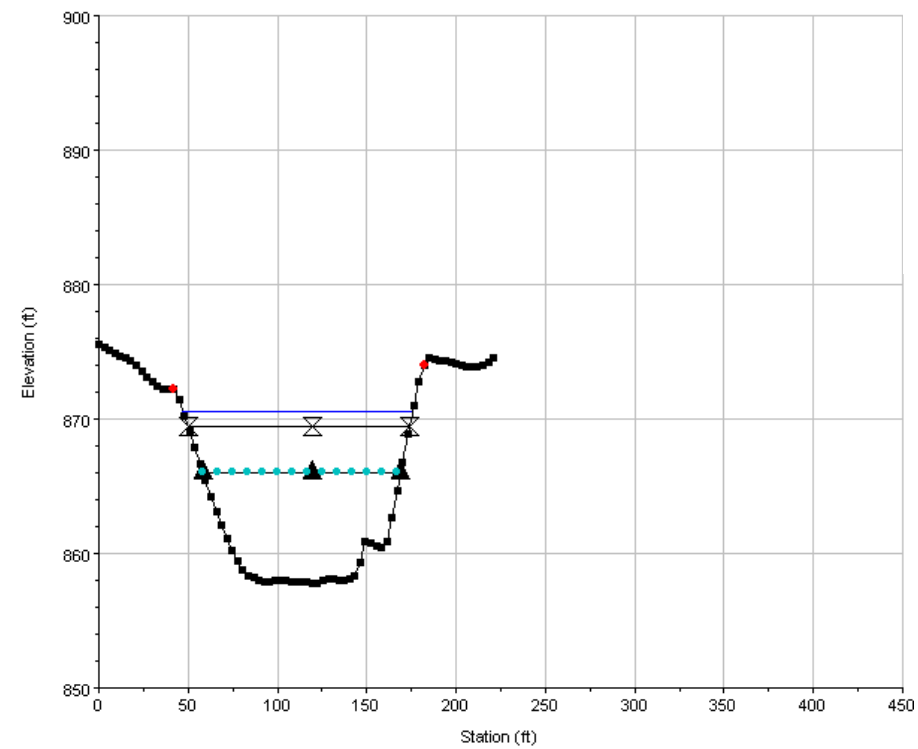
Cross Section 2329144



Cross Section 2330341



Cross Section 2331404



LEGEND

..... Modeled Water Surface Elevation for Day of Survey
 ——— Modeled Bankfull Water Surface Elevation
 —▲— Observed Water Surface Elevation
 —X— Observed Bankfull Water Surface Elevation
 —■— Ground
 ● Bank Stations

RED RIVER – 3 – 440.57
Observation Date: October 4, 2011



Field Photo 1365



Field Photo 1366



Field Photo 1367



Field Photo 1368



Field Photo 1369



Field Photo 1370

RED RIVER – 3 – 440.57
Observation Date: October 4, 2011



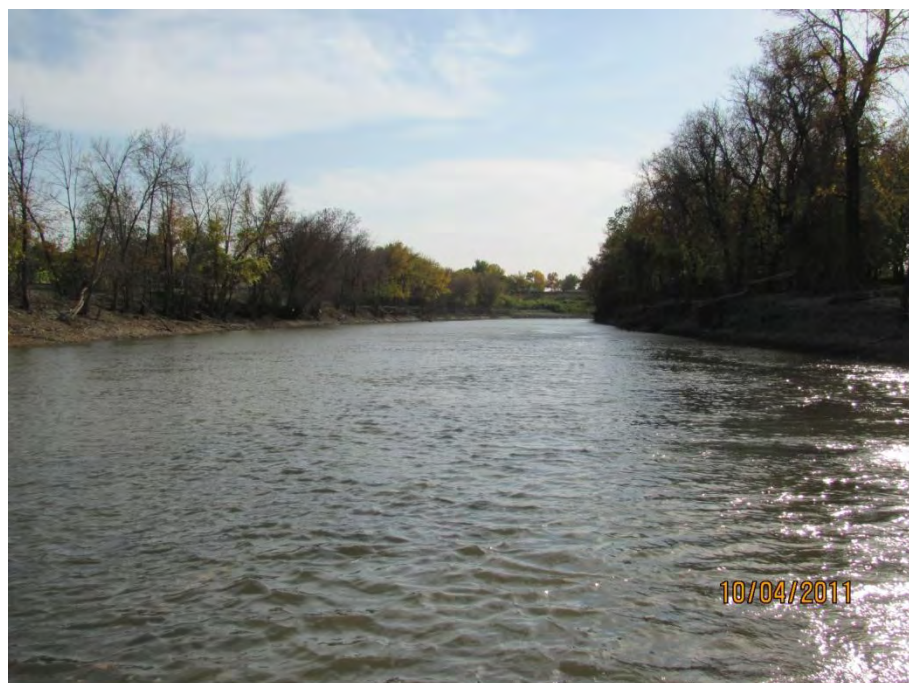
Field Photo 1371



Field Photo 1372



Field Photo 1374



Field Photo 1375



Field Photo 1376



Field Photo 1377

RED RIVER – 3 – 440.57
Observation Date: October 4, 2011



Field Photo 1378



Field Photo 1379



Field Photo 1380



Field Photo 1381



Field Photo 1382



Field Photo 1383

RED RIVER – 3 – 440.57

Observation Date: October 4, 2011



Field Photo 1384



Field Photo 1385

RED RIVER – 3 – 440.57
Observation Date: November 21, 2011



Field Photo 1420



Field Photo 1421



Field Photo 1422



Field Photo 1423



Field Photo 1424



Field Photo 1425

RED RIVER – 3 – 440.57
Observation Date: November 21, 2011



Field Photo 1426



Field Photo 1427



Field Photo 1428



Field Photo 1429



Field Photo 1430



Field Photo 1431

RED RIVER – 3 – 440.57
Observation Date: November 21, 2011



Field Photo 1432



Field Photo 1433



Field Photo 1434



Field Photo 1435



Field Photo 1436



Field Photo 1437

RED RIVER – 3 – 440.57

Observation Date: November 21, 2011



Field Photo 1438



Field Photo 1439



MIDWEST TESTING LABORATORY



Project No.: 16216

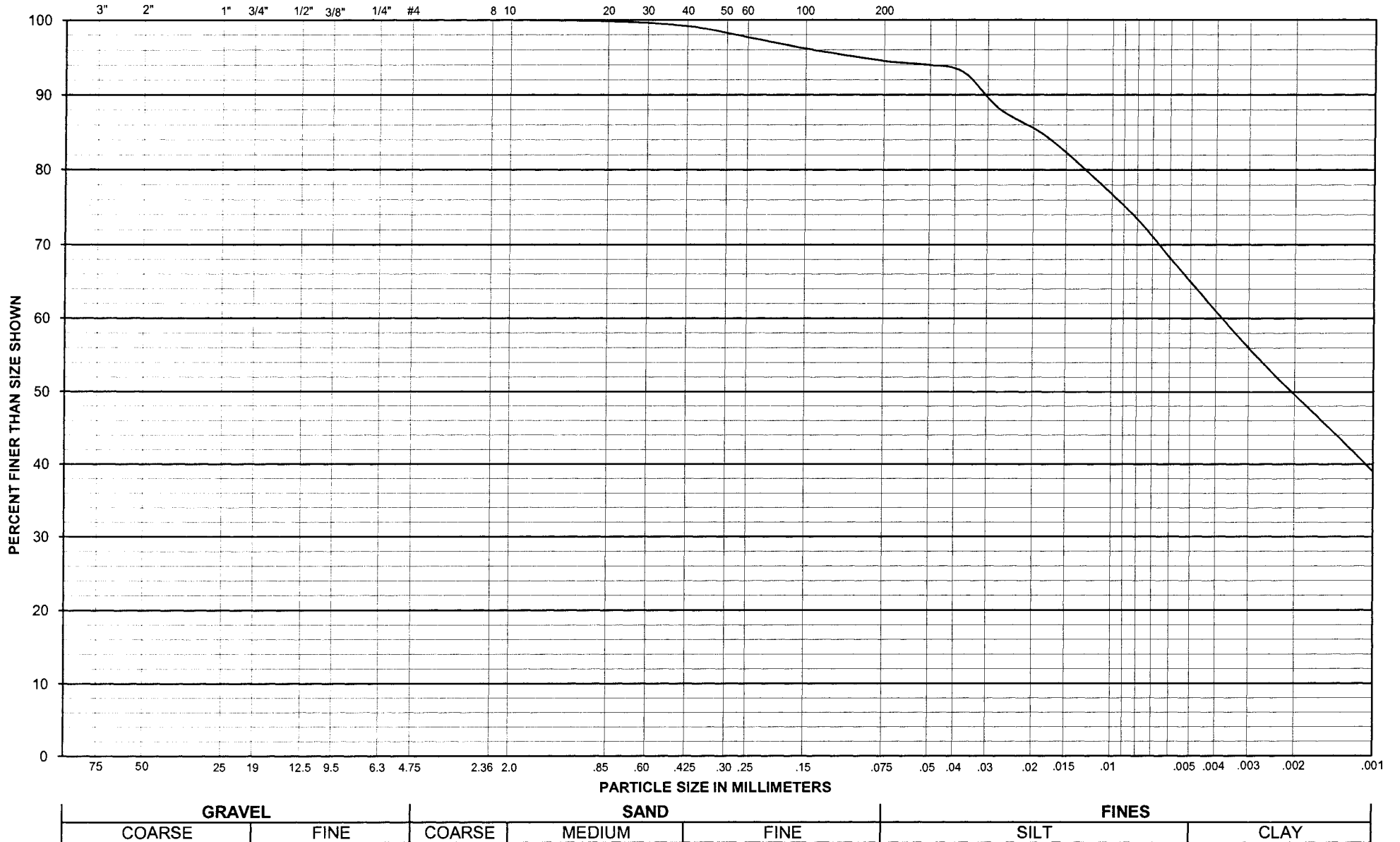
Project: Red River Geomorphic Study
Cass County, North Dakota

Sample Source: TN 7549 - RR-282-BED

Classification: FAT CLAY - very dark brown

Reported to: West Consultants, Inc.

GRAIN SIZE DISTRIBUTION CURVE U.S. Standard Sieve Sizes





MIDWEST TESTING LABORATORY



Project No.: M1101216

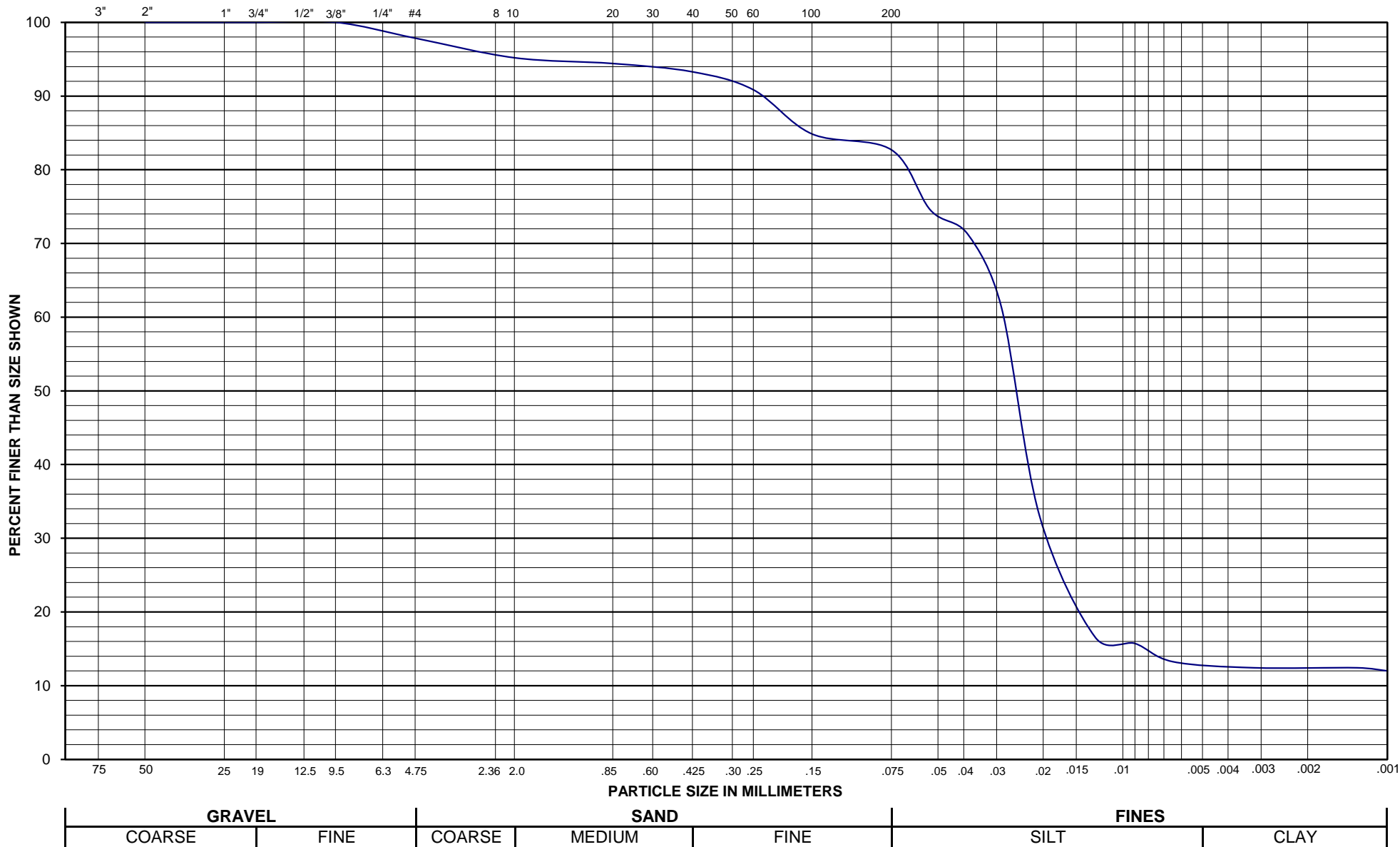
Project: Red River Geomorphic Study
Cass County, North Dakota

Sample Source: #36 (RR/370/BED-C-C)

Classification: SILT WITH SAND - dark brown, with a trace of gravel (ML)

Reported to: West Consultants, Inc.

GRAIN SIZE DISTRIBUTION CURVE U.S. Standard Sieve Sizes





MIDWEST TESTING LABORATORY



Project No.: 16216

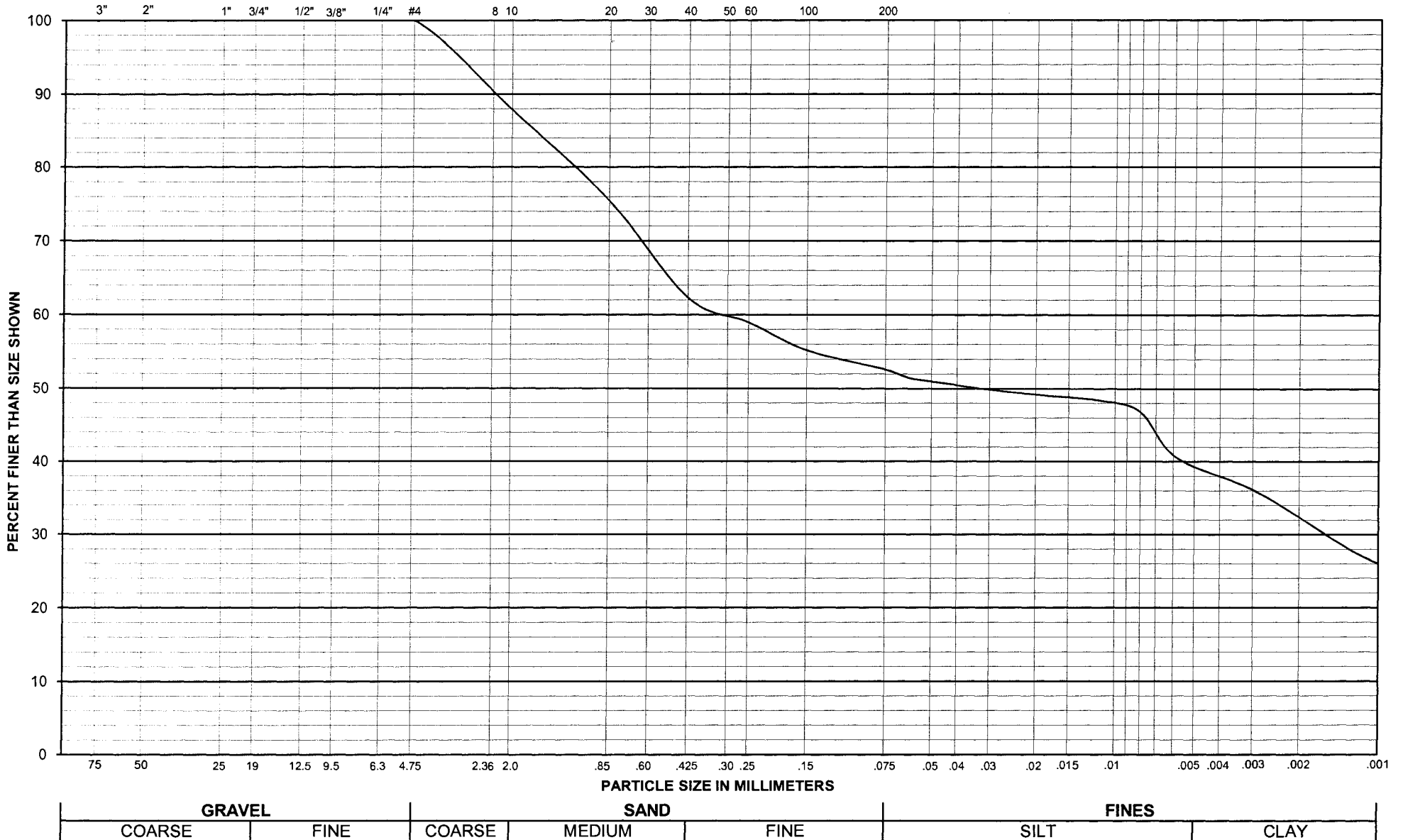
Project: Red River Geomorphic Study
Cass County, North Dakota

Sample Source: TN 7548 - RR-280-BED

Classification: SANDY FAT CLAY - gray, with shells and organic matter

Reported to: West Consultants, Inc.

GRAIN SIZE DISTRIBUTION CURVE U.S. Standard Sieve Sizes





MIDWEST TESTING LABORATORY



Project No.: 16216

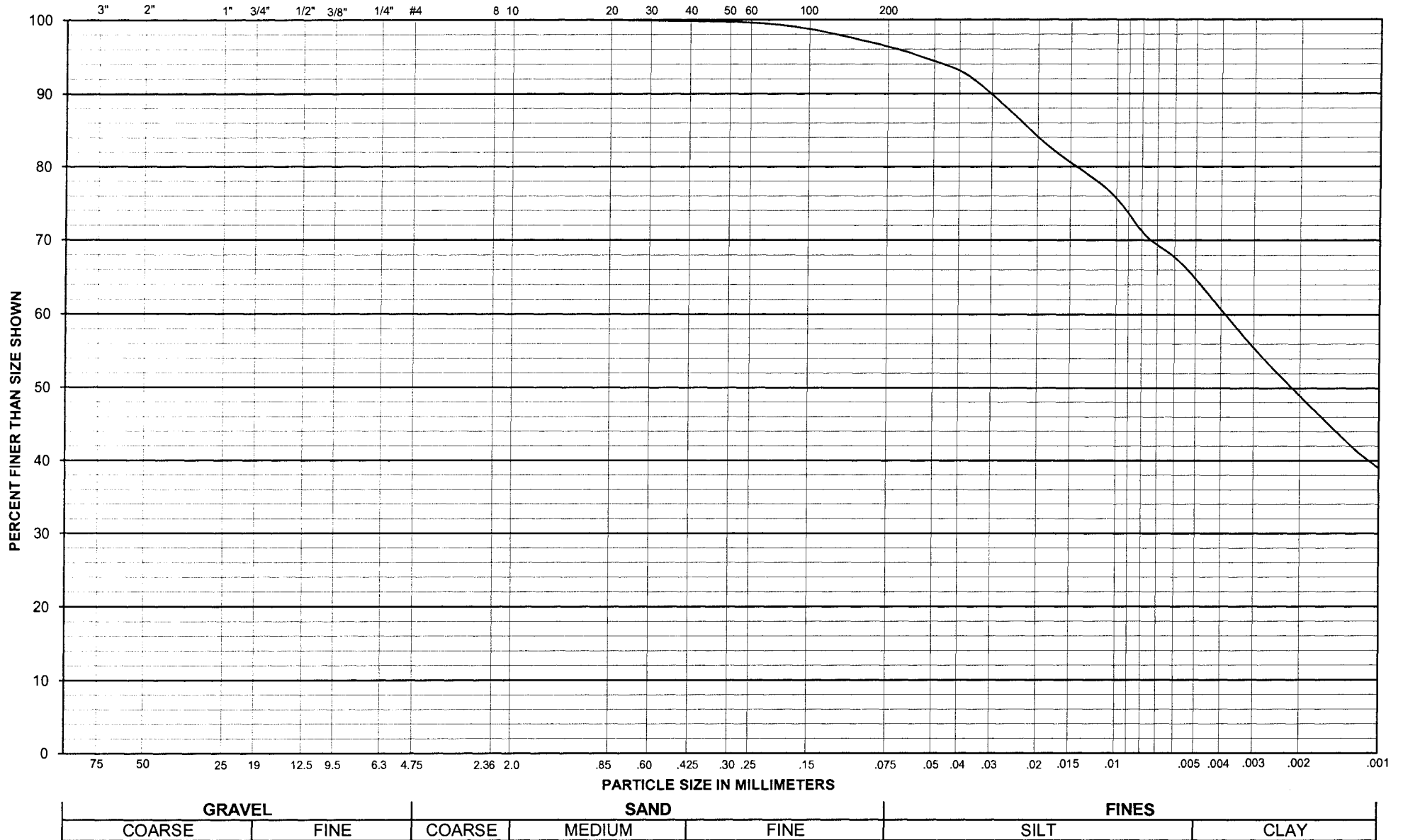
Project: Red River Geomorphic Study
Cass County, North Dakota

Sample Source: TN 7518 - RR-279-LB

Classification: FAT CLAY - dark gray

Reported to: West Consultants, Inc.

GRAIN SIZE DISTRIBUTION CURVE U.S. Standard Sieve Sizes





LEGEND

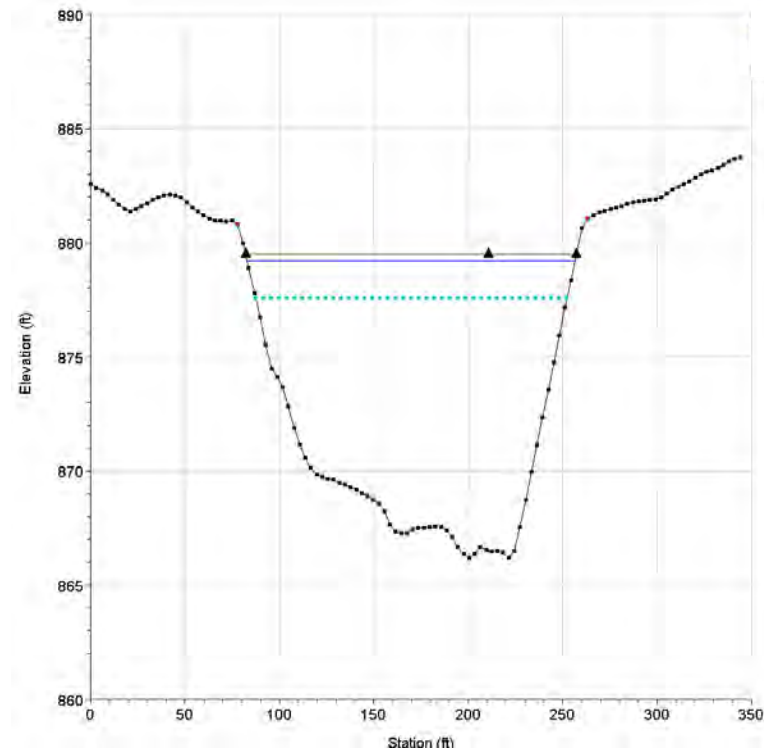
- Cross Section
 - - - Detailed Study Reach
 - Sediment Sample
 - ▲ Field Photos
 - 0750 Direction Arrow and Photo Number
- 0 150 300
Feet



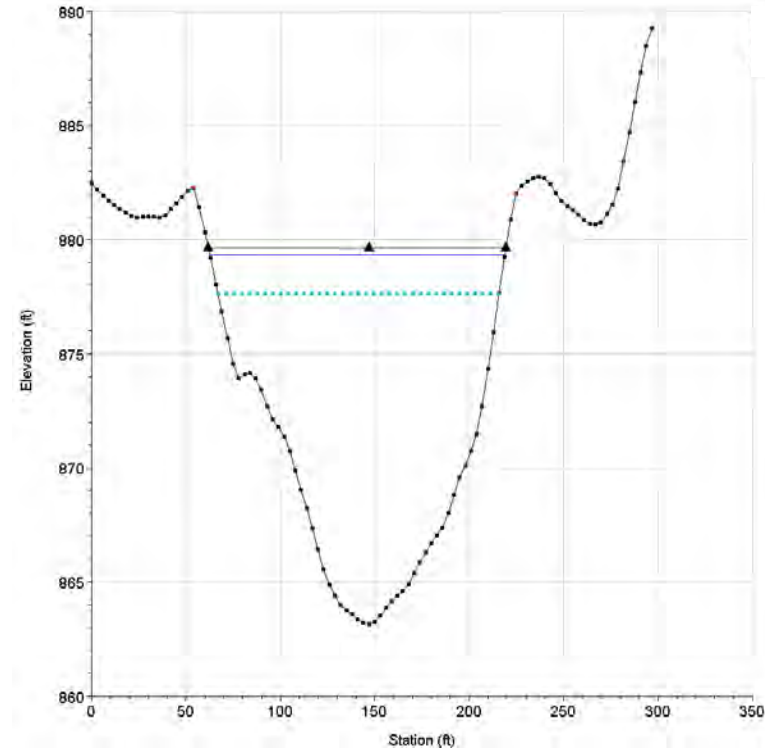
RED RIVER - 4 - 452.52
Observation Date: November 16, 2011

RED RIVER – 4 – 452.52

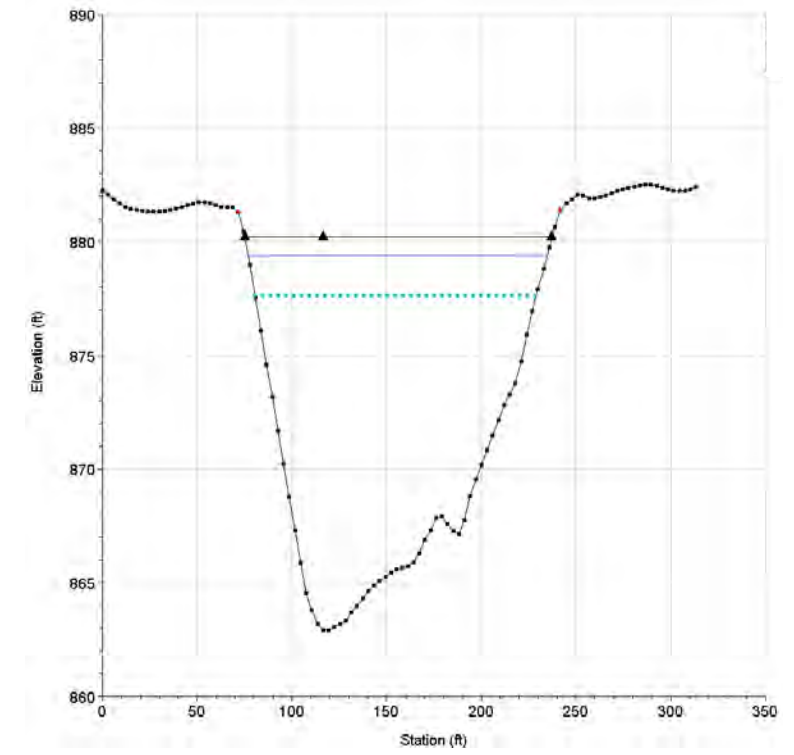
Cross Section 2389326



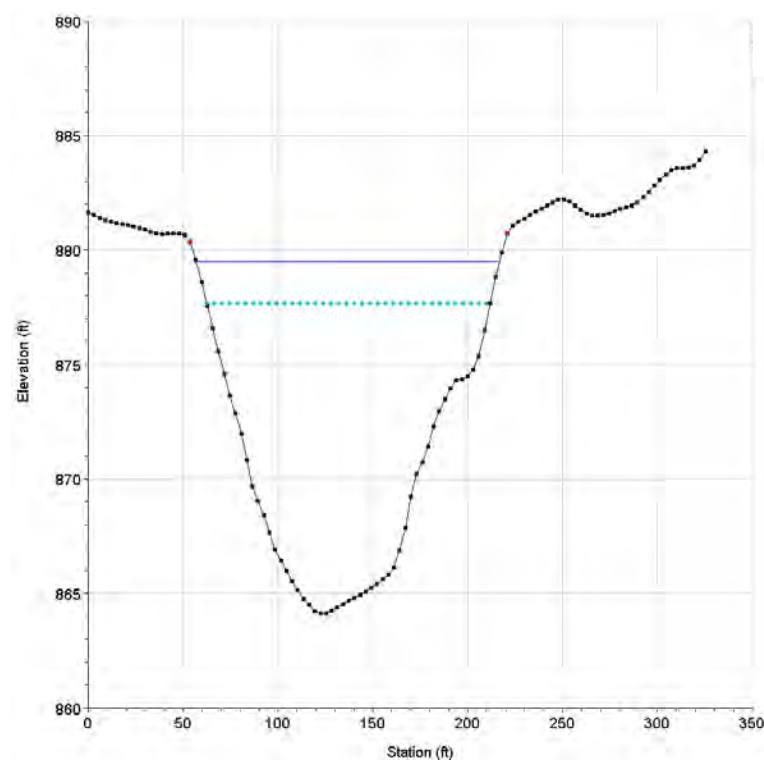
Cross Section 2391645



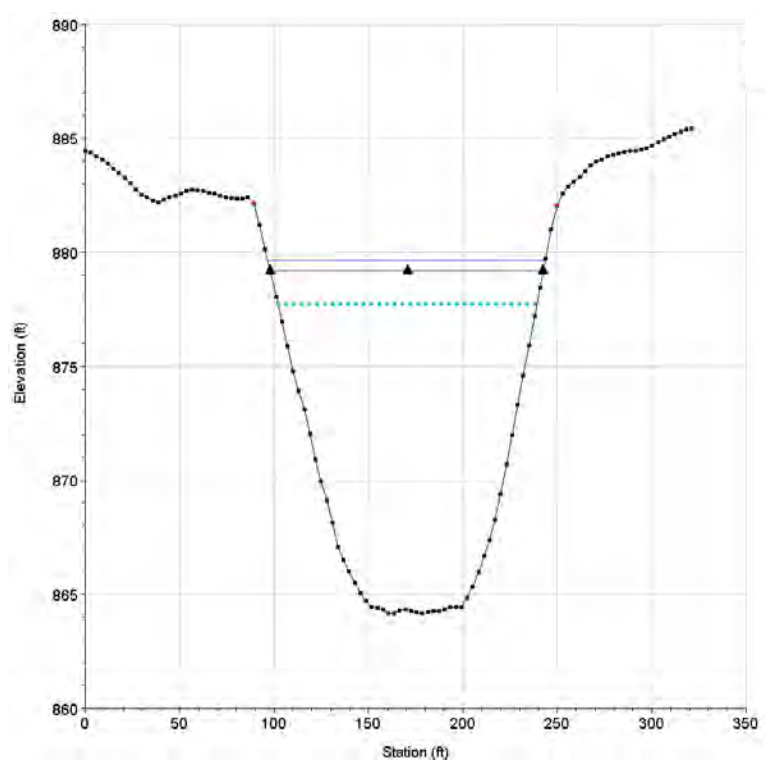
Cross Section 2392726



Cross Section 2394365



Cross Section 2396536



LEGEND

- Modeled Water Surface Elevation for Day of Survey
- Modeled Bankfull Water Surface Elevation
- ▲ Observed Water Surface Elevation
- ⊗ Observed Bankfull Water Surface Elevation
- Ground
- Bank Stations

RED RIVER – 4 – 452.52
Observation Date: November 16, 2011



Field Photo 1296



Field Photo 1297



Field Photo 1298



Field Photo 1299



Field Photo 1300



Field Photo 1301

RED RIVER – 4 – 452.52
Observation Date: November 16, 2011



Field Photo 1302



Field Photo 1303



Field Photo 1304



Field Photo 1305



Field Photo 1306



Field Photo 1307

RED RIVER – 4 – 452.52
Observation Date: November 16, 2011



Field Photo 1308



Field Photo 1309



Field Photo 1310



Field Photo 1311



Field Photo 1312



Field Photo 1313

RED RIVER – 4 – 452.52

Observation Date: November 16, 2011



Field Photo 1314



Field Photo 1315



MIDWEST TESTING LABORATORY



Project No.: 16216

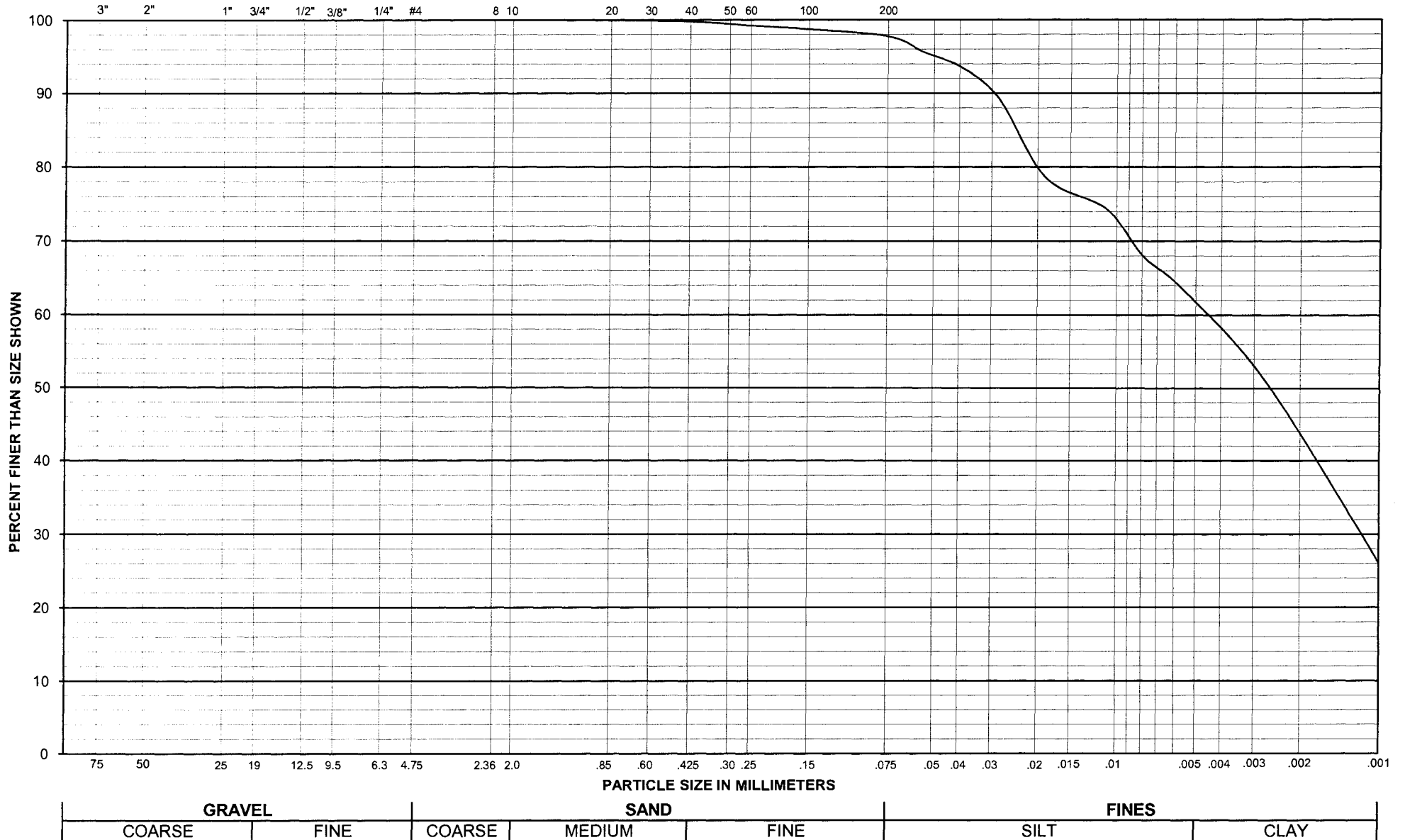
Project: Red River Geomorphic Study
Cass County, North Dakota

Sample Source: TN 7504 - RR/116/RB

Classification: FAT CLAY - dark gray

Reported to: West Consultants, Inc.

GRAIN SIZE DISTRIBUTION CURVE U.S. Standard Sieve Sizes





MIDWEST TESTING LABORATORY



Project No.: 16216

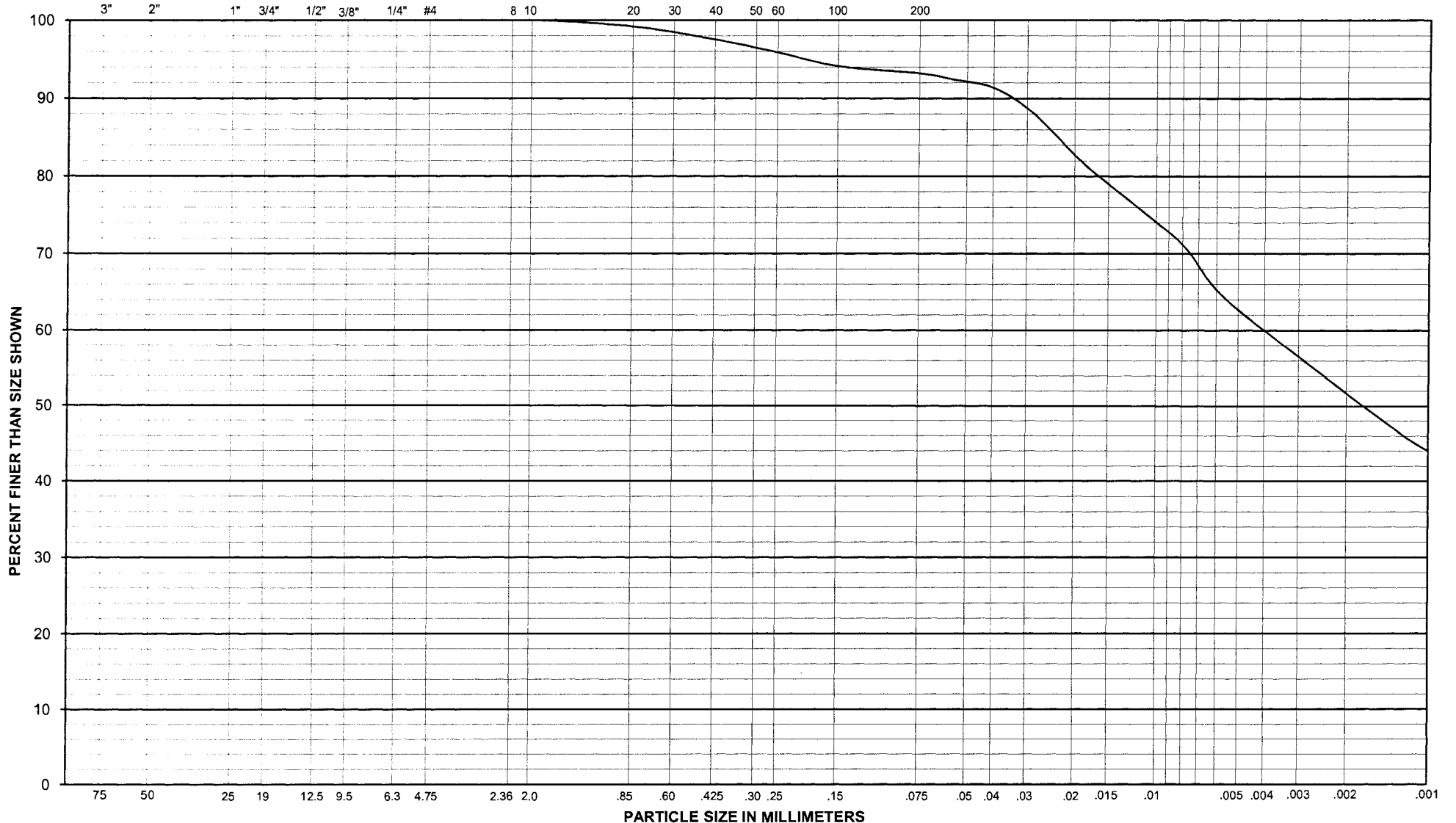
Project: Red River Geomorphic Study
Cass County, North Dakota

Sample Source: TN 7505 - RR/117/LB

Classification: FAT CLAY - dark gray

Reported to: West Consultants, Inc.

GRAIN SIZE DISTRIBUTION CURVE U.S. Standard Sieve Sizes



GRAVEL		SAND			FINES		
COARSE	FINE	COARSE	MEDIUM	FINE	SILT	CLAY	



MIDWEST TESTING LABORATORY



Project No.: 16216

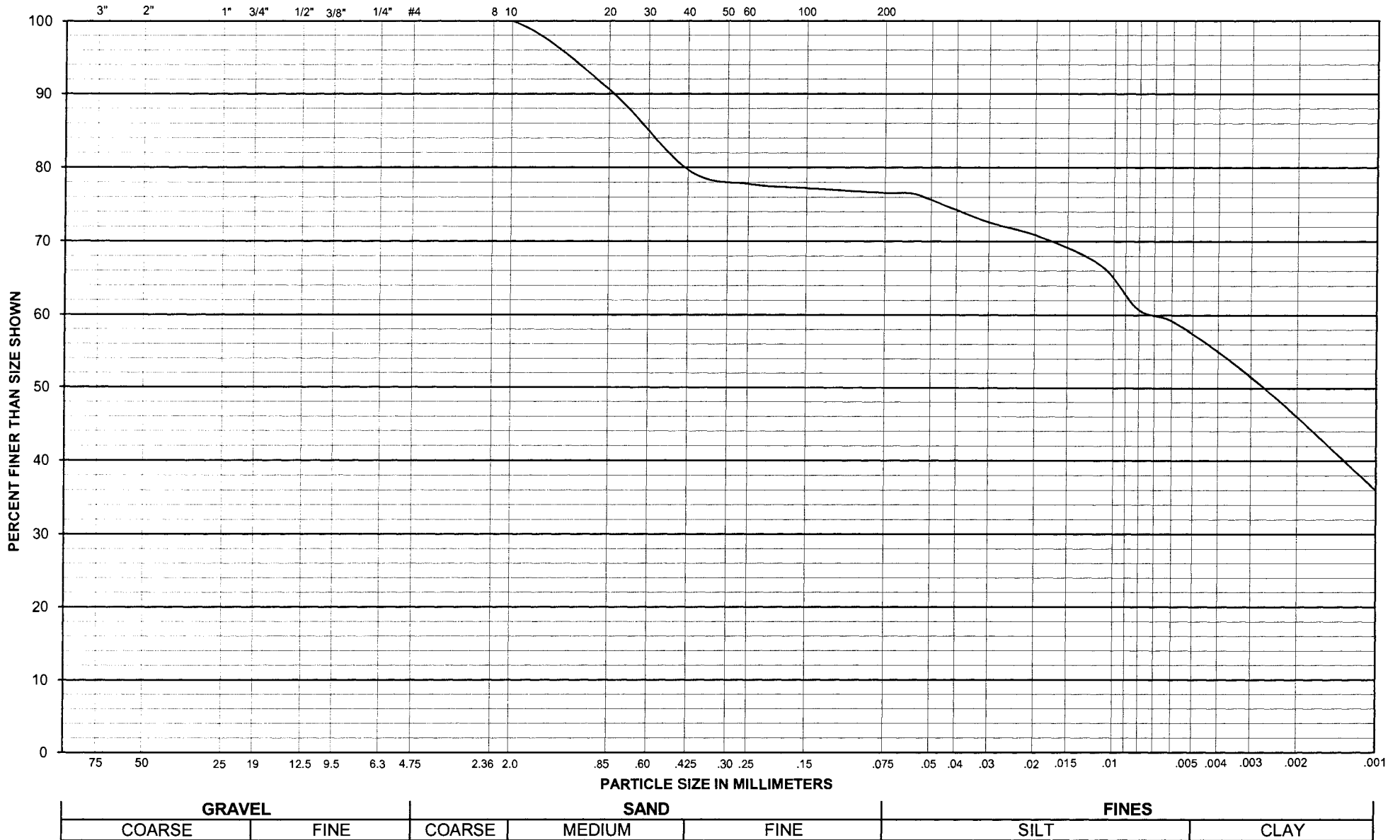
Project: Red River Geomorphic Study
Cass County, North Dakota

Sample Source: TN 7506 - RR/118/Bed

Classification: FAT CLAY WITH SAND - dark gray, with shells

Reported to: West Consultants, Inc.

GRAIN SIZE DISTRIBUTION CURVE U.S. Standard Sieve Sizes





LEGEND

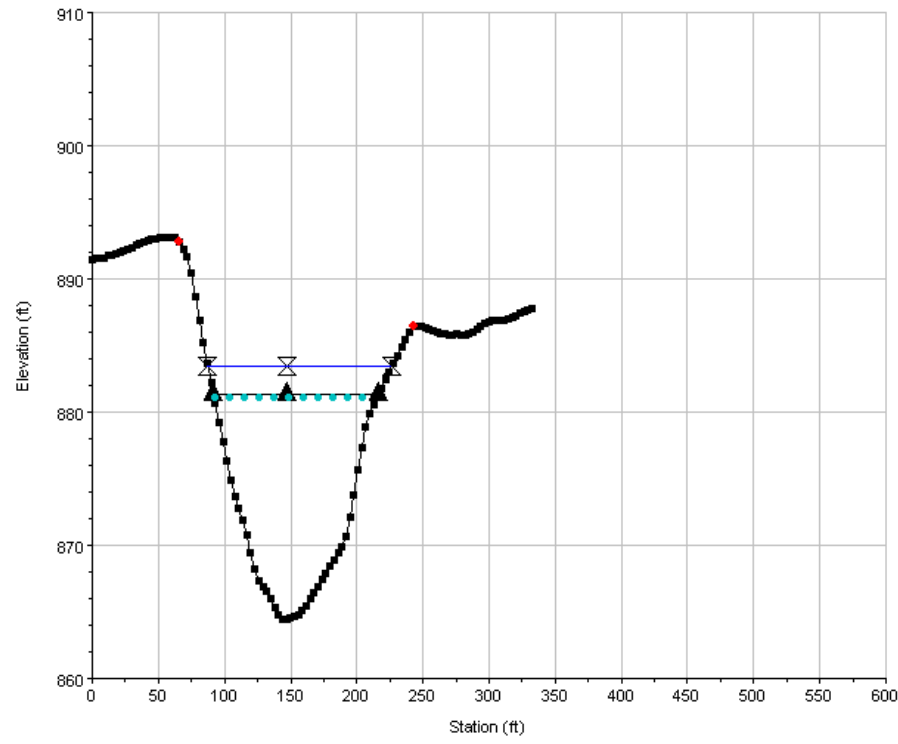
- Cross Section
 - - - Detailed Study Reach
 - Sediment Sample
 - ▲ Field Photos
 - 0750 Direction Arrow and Photo Number
- 0 75 150
Feet



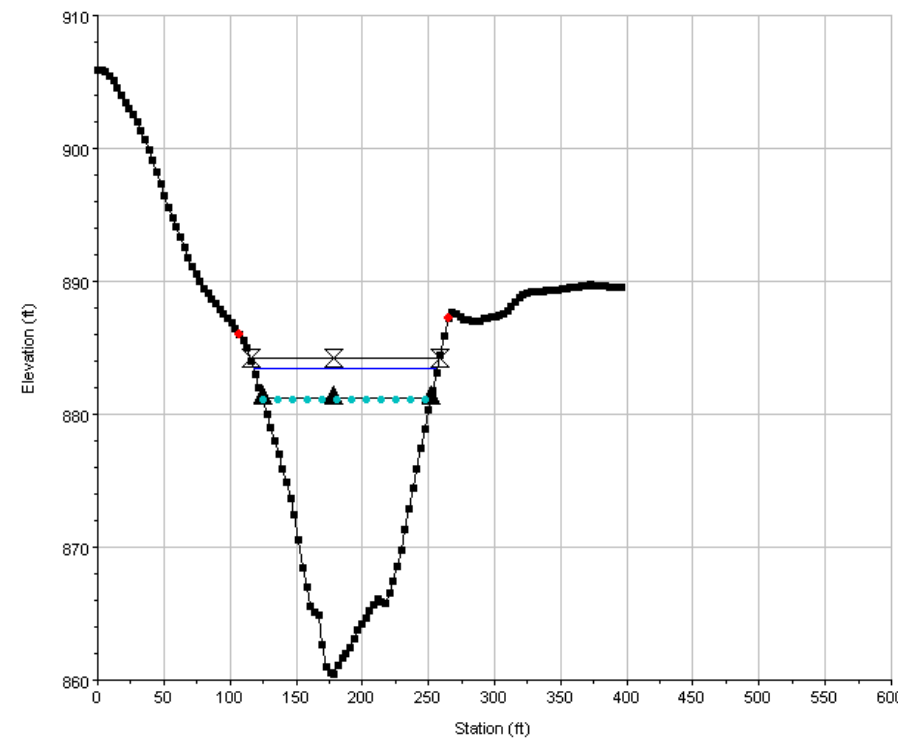
RED RIVER - 5 - 463.56
Observation Dates: November 19, 2010
October 6, 2011

RED RIVER – 5 – 463.56

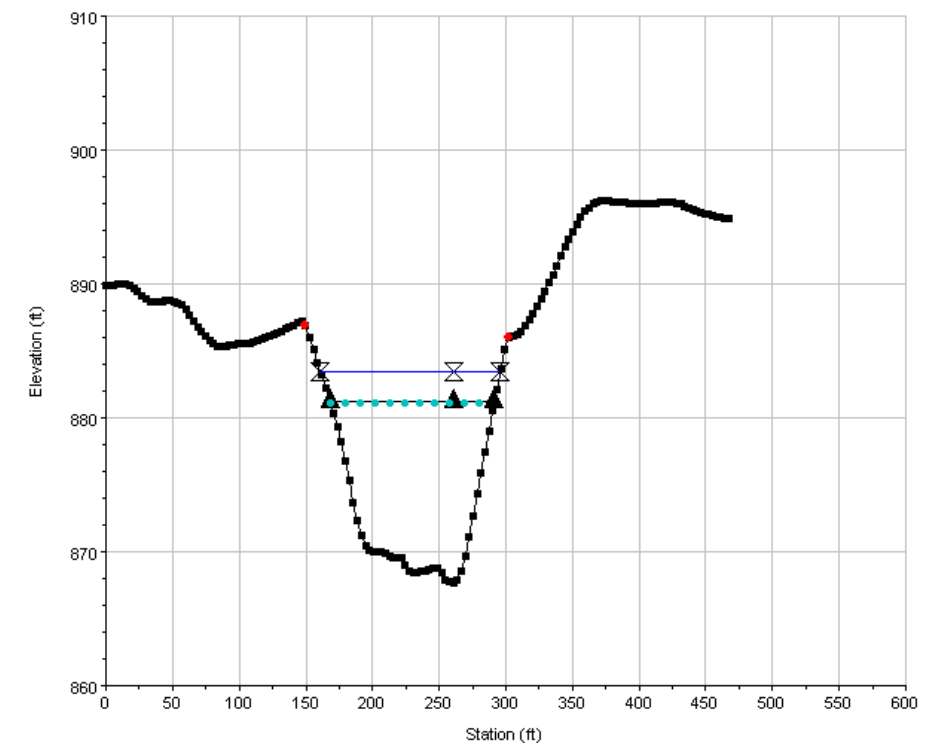
Cross Section 2447638



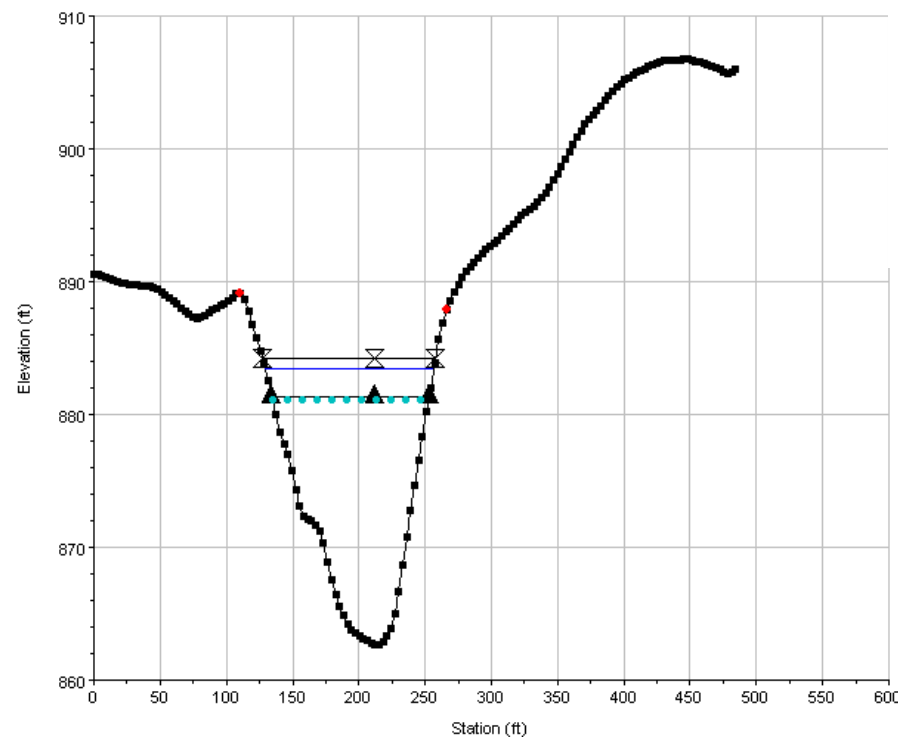
Cross Section 2447861



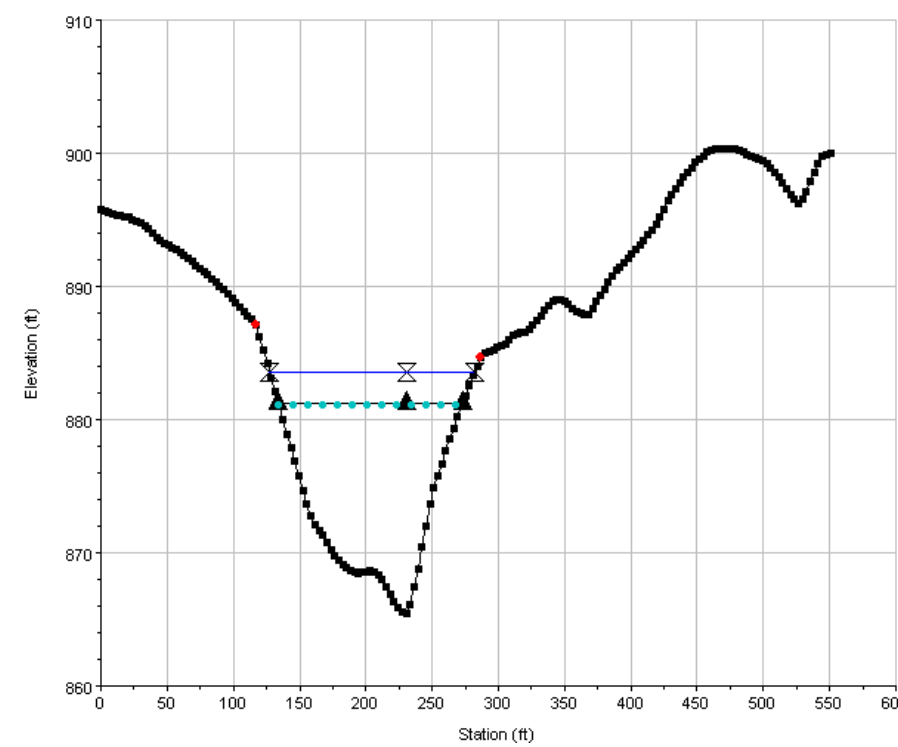
Cross Section 2448376



Cross Section 2448951



Cross Section 2450093



LEGEND

..... Modeled Water Surface Elevation for Day of Survey
 ——— Modeled Bankfull Water Surface Elevation
 —▲— Observed Water Surface Elevation
 —X— Observed Bankfull Water Surface Elevation
 —■— Ground
 ● Bank Stations

RED RIVER – 5 – 463.56
Observation Date: October 6, 2011



Field Photo 1435



Field Photo 1436



Field Photo 1437



Field Photo 1438



Field Photo 1439



Field Photo 1440

RED RIVER – 5 – 463.56
Observation Date: October 6, 2011



Field Photo 1441



Field Photo 1442



Field Photo 1443



Field Photo 1444



Field Photo 1445



Field Photo 1446

RED RIVER – 5 – 463.56
Observation Date: October 6, 2011



Field Photo 1447



Field Photo 1448



Field Photo 1449



Field Photo 1450



Field Photo 1451



Field Photo 1452

RED RIVER – 5 – 463.56

Observation Date: October 6, 2011



Field Photo 1453



Field Photo 1454

RED RIVER – 5 – 463.56
Observation Date: November 19, 2010



Field Photo 1375



Field Photo 1376



Field Photo 1377



Field Photo 1378



Field Photo 1379



Field Photo 1380

RED RIVER – 5 – 463.56
Observation Date: November 19, 2010



Field Photo 1381



Field Photo 1382



Field Photo 1383



Field Photo 1384



Field Photo 1385



Field Photo 1386



MIDWEST TESTING LABORATORY



Project No.: M1101216

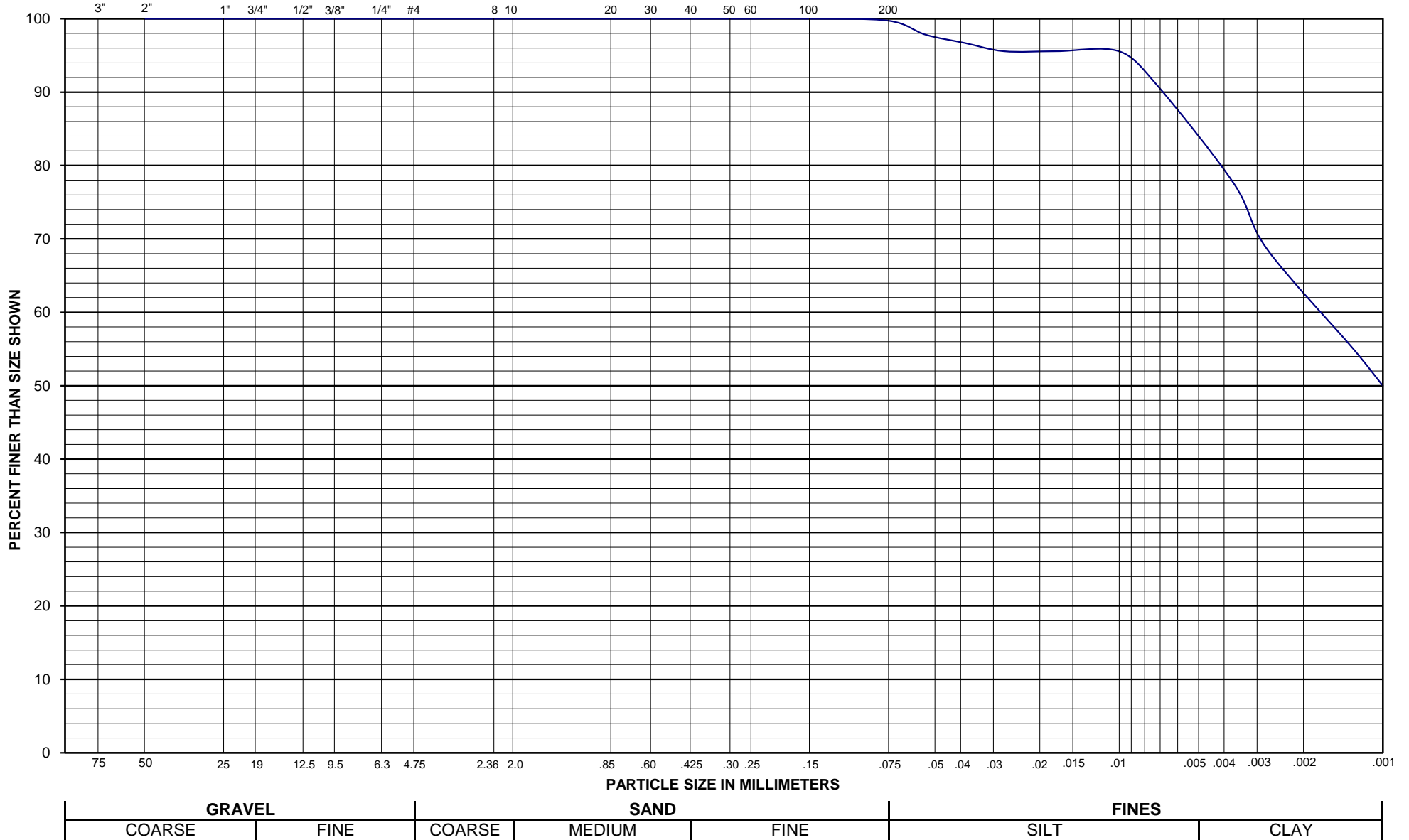
Project: Red River Geomorphic Study
Cass County, North Dakota

Sample Source: #34 (RR/432/BED-C-C)

Classification: FAT CLAY - dark brown (CH)

Reported to: West Consultants, Inc.

GRAIN SIZE DISTRIBUTION CURVE U.S. Standard Sieve Sizes





MIDWEST TESTING LABORATORY



Project No.: 16216

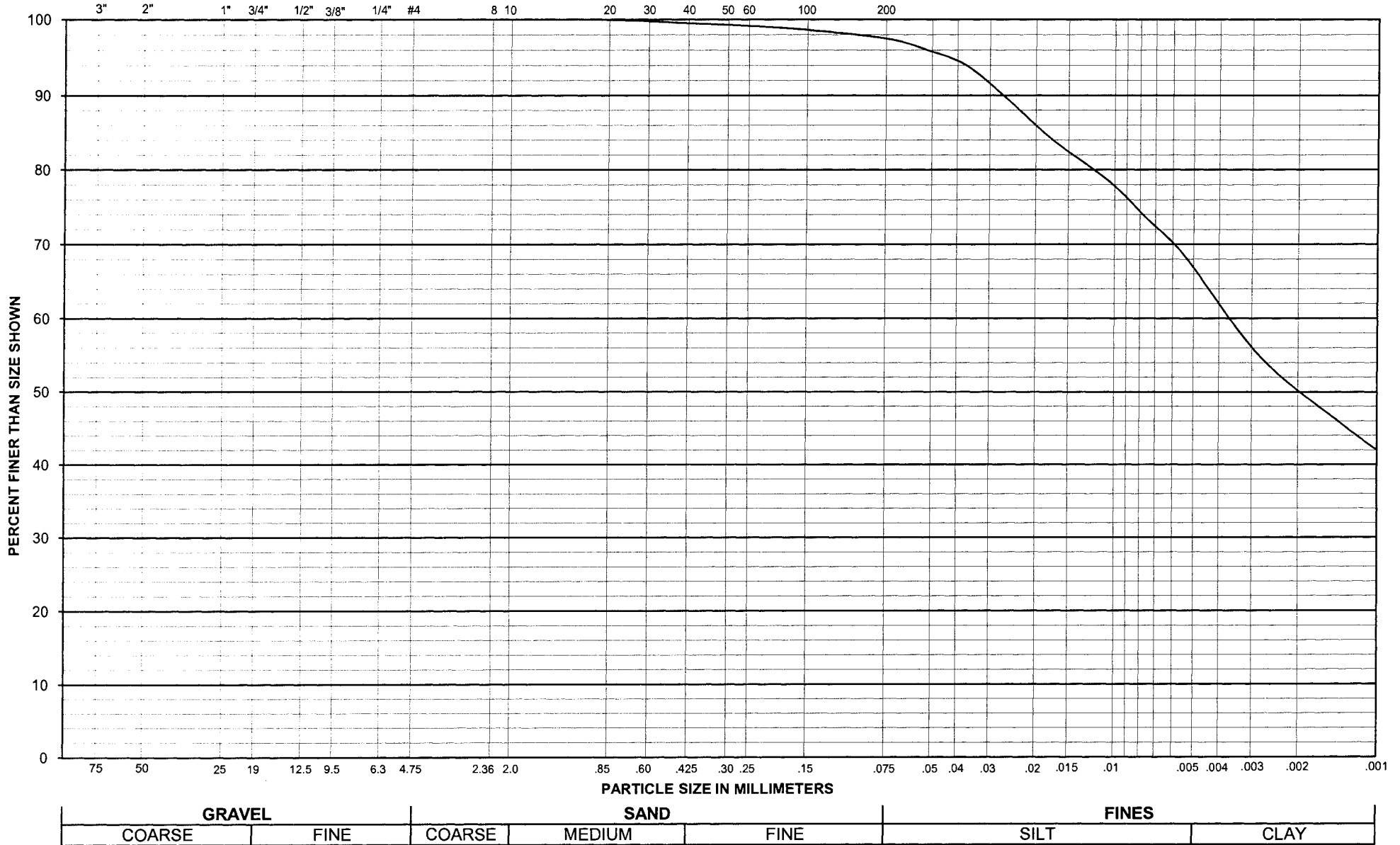
Project: Red River Geomorphic Study
Cass County, North Dakota

Sample Source: TN 7528 - RR-205-RB

Classification: FAT CLAY - dark gray

Reported to: West Consultants, Inc.

GRAIN SIZE DISTRIBUTION CURVE U.S. Standard Sieve Sizes





MIDWEST TESTING LABORATORY



Project No.: 16216

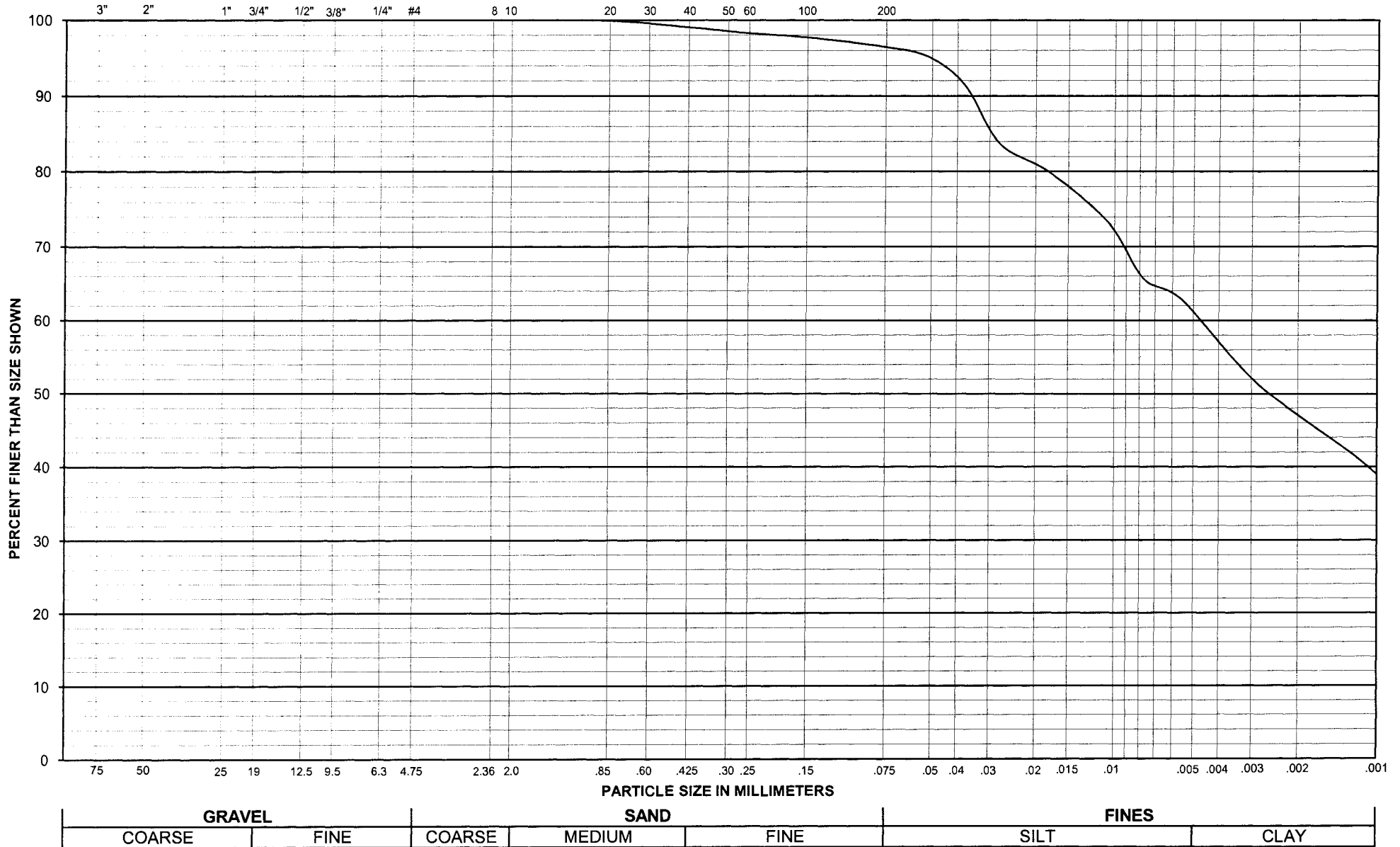
Project: Red River Geomorphic Study
Cass County, North Dakota

Sample Source: TN 7517 - RR-208-LB

Classification: FAT CLAY - dark gray

Reported to: West Consultants, Inc.

GRAIN SIZE DISTRIBUTION CURVE U.S. Standard Sieve Sizes





MIDWEST TESTING LABORATORY



Project No.: 16216

Project: Red River Geomorphic Study
Cass County, North Dakota

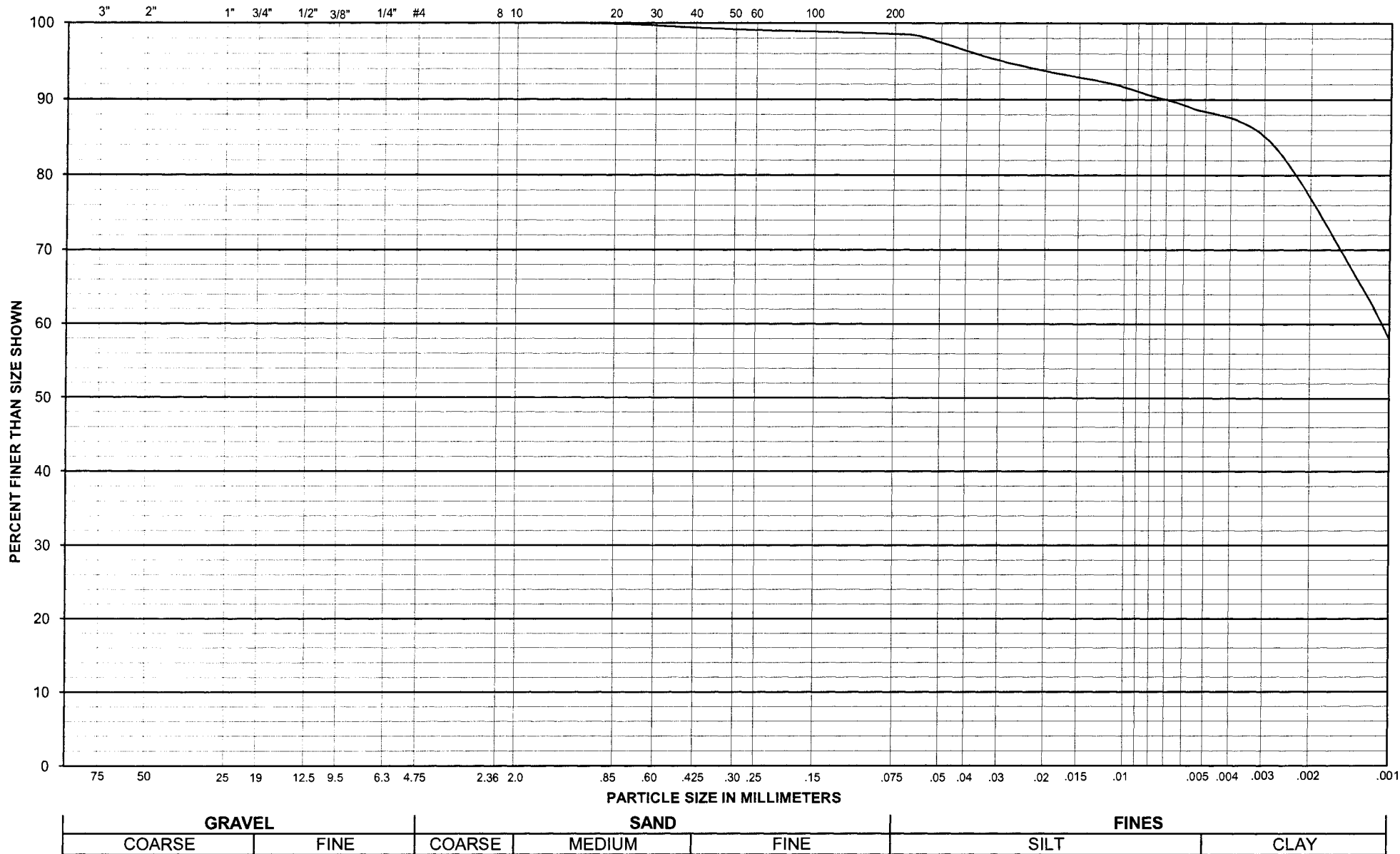
Sample Source: TN 7547 - RR-212-BED

Classification: FAT CLAY - dark gray

Reported to: West Consultants, Inc.

GRAIN SIZE DISTRIBUTION CURVE

U.S. Standard Sieve Sizes





LEGEND

- Cross Section
- - - Detailed Study Reach
- Sediment Sample
- ▲ Field Photos
- 0750 Direction Arrow and Photo Number

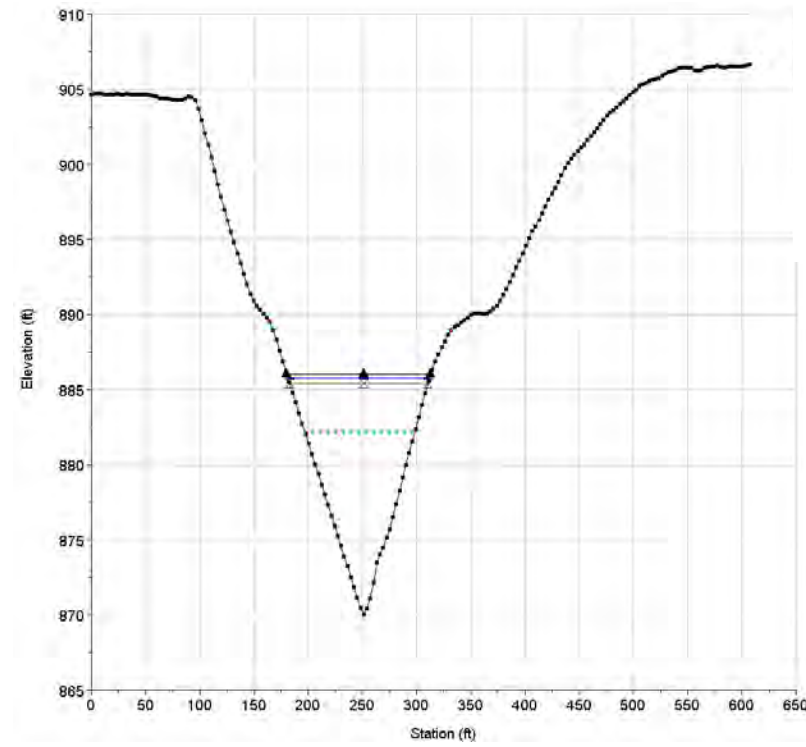
0 100 200
Feet

N

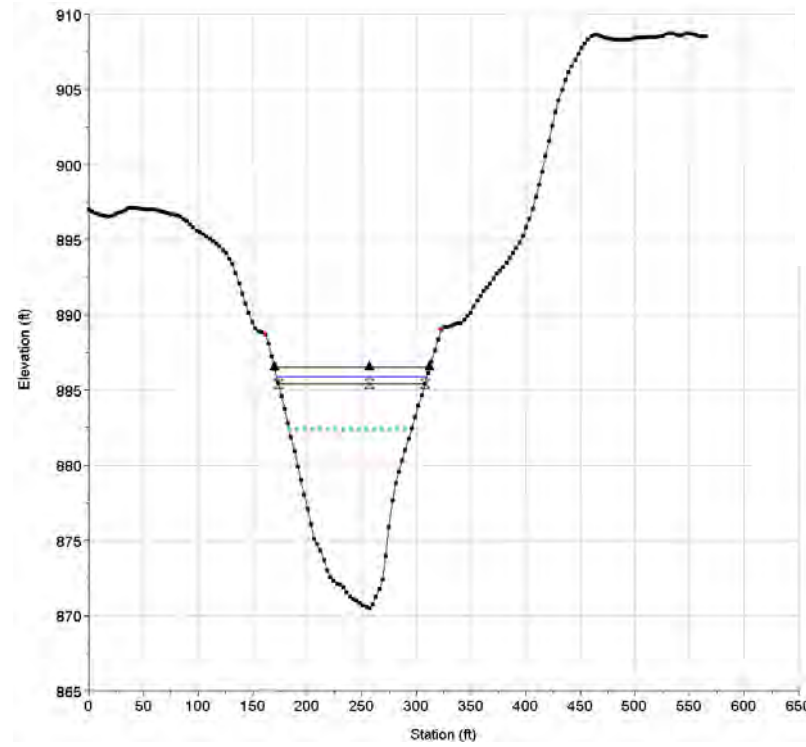
RED RIVER - 6 - 470.23
Observation Dates: November 18, 2010
October 6, 2011

RED RIVER – 6 – 470.23

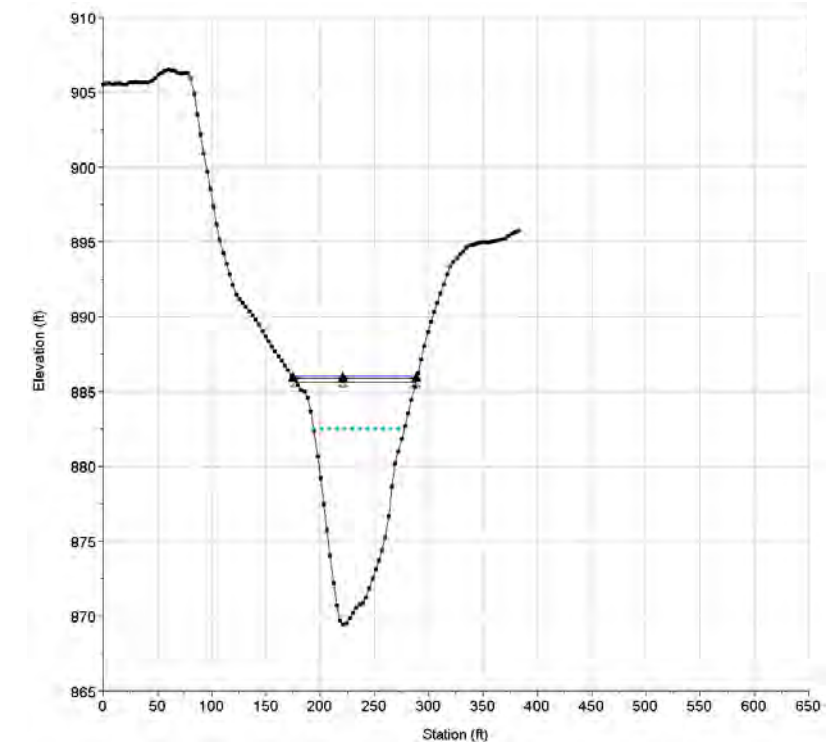
Cross Section 2482650



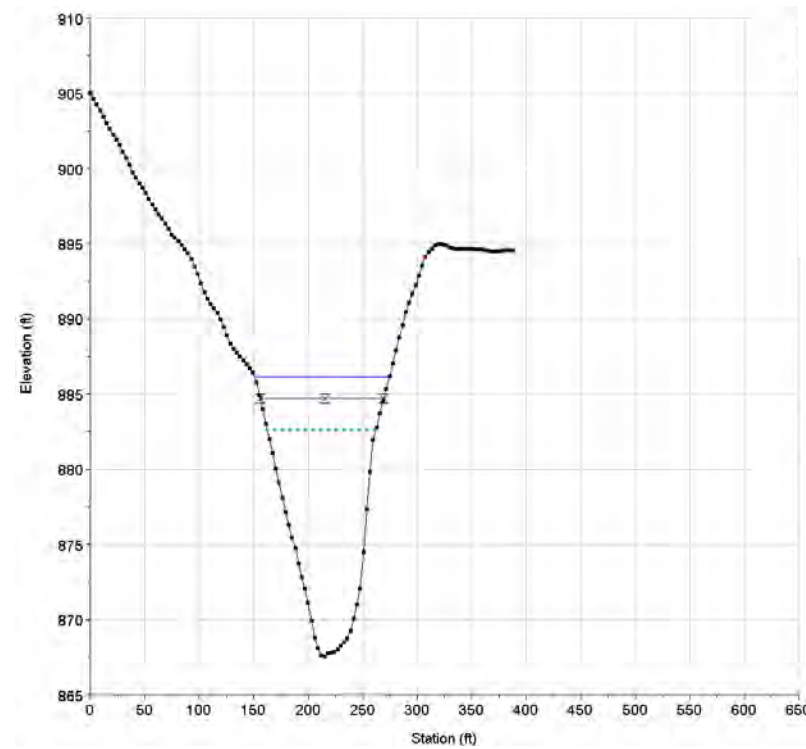
Cross Section 2483883



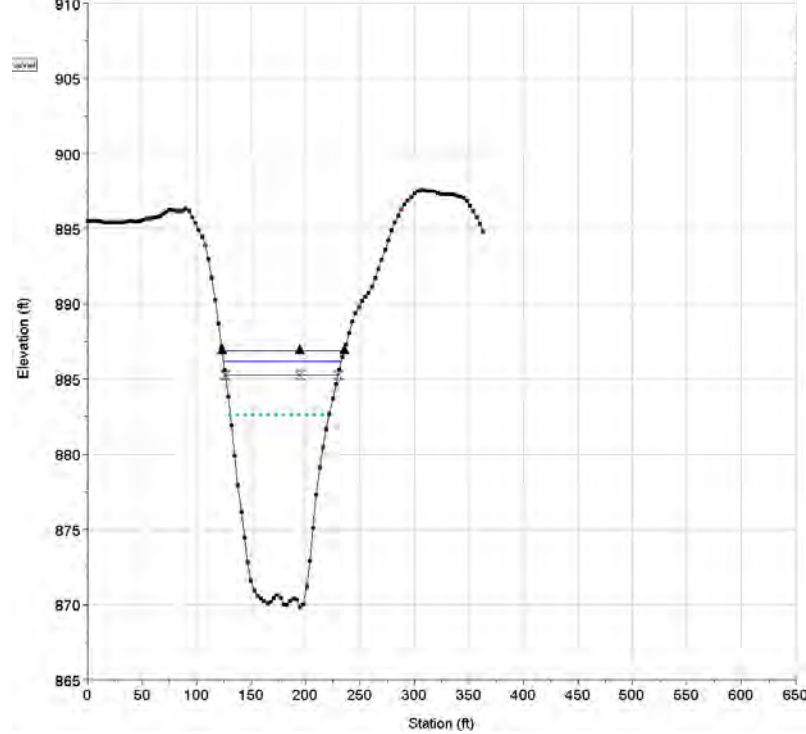
Cross Section 2485429



Cross Section 2486290



Cross Section 2487004



LEGEND

..... Modeled Water Surface Elevation for Day of Survey
 ——— Modeled Bankfull Water Surface Elevation
 ▲ Observed Water Surface Elevation
 ⊗ Observed Bankfull Water Surface Elevation
 —■— Ground
 ● Bank Stations

RED RIVER – 6 – 470.23
Observation Date: October 6, 2011



Field Photo 1414



Field Photo 1415



Field Photo 1416



Field Photo 1417



Field Photo 1418



Field Photo 1419

RED RIVER – 6 – 470.23
Observation Date: October 6, 2011



Field Photo 1420



Field Photo 1421



Field Photo 1422



Field Photo 1423



Field Photo 1424



Field Photo 1425

RED RIVER – 6 – 470.23
Observation Date: October 6, 2011



Field Photo 1427



Field Photo 1428



Field Photo 1429



Field Photo 1430



Field Photo 1431



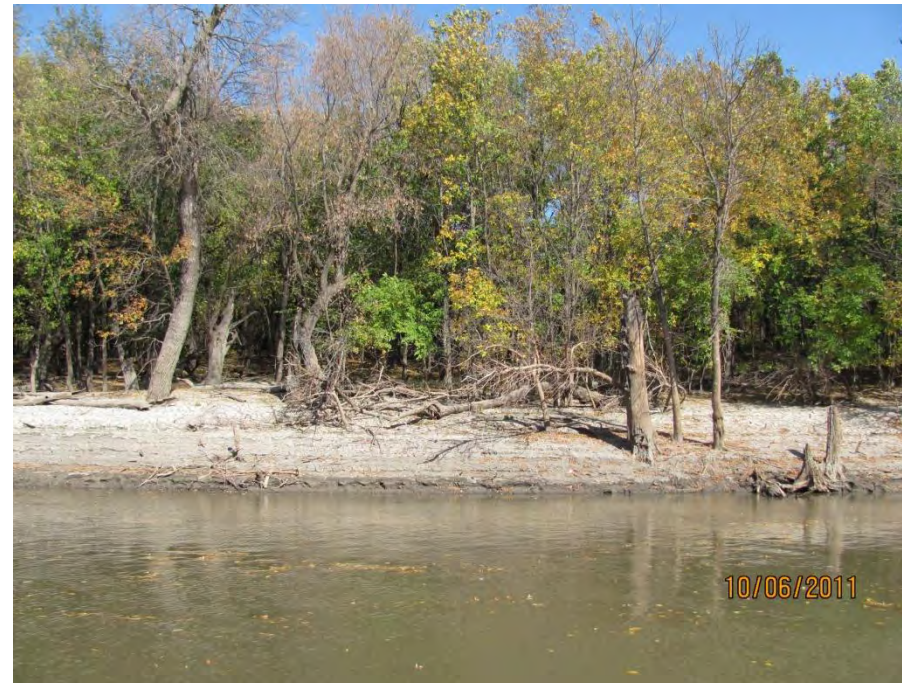
Field Photo 1432

RED RIVER – 6 – 470.23

Observation Date: October 6, 2011



Field Photo 1433



Field Photo 1434

RED RIVER – 6 – 470.23
Observation Date: November 18, 2010



Field Photo 1349



Field Photo 1350



Field Photo 1351



Field Photo 1352



Field Photo 1353



Field Photo 1354

RED RIVER – 6 – 470.23
Observation Date: November 18, 2010



Field Photo 1355



Field Photo 1356



Field Photo 1357



Field Photo 1358



Field Photo 1359



Field Photo 1360

RED RIVER – 6 – 470.23
Observation Date: November 18, 2010



Field Photo 1361



Field Photo 1362



Field Photo 1363



Field Photo 1364



Field Photo 1365



Field Photo 1366

RED RIVER – 6 – 470.23

Observation Date: November 18, 2010



Field Photo 1367



Field Photo 1368



MIDWEST TESTING LABORATORY



Project No.: M1101216

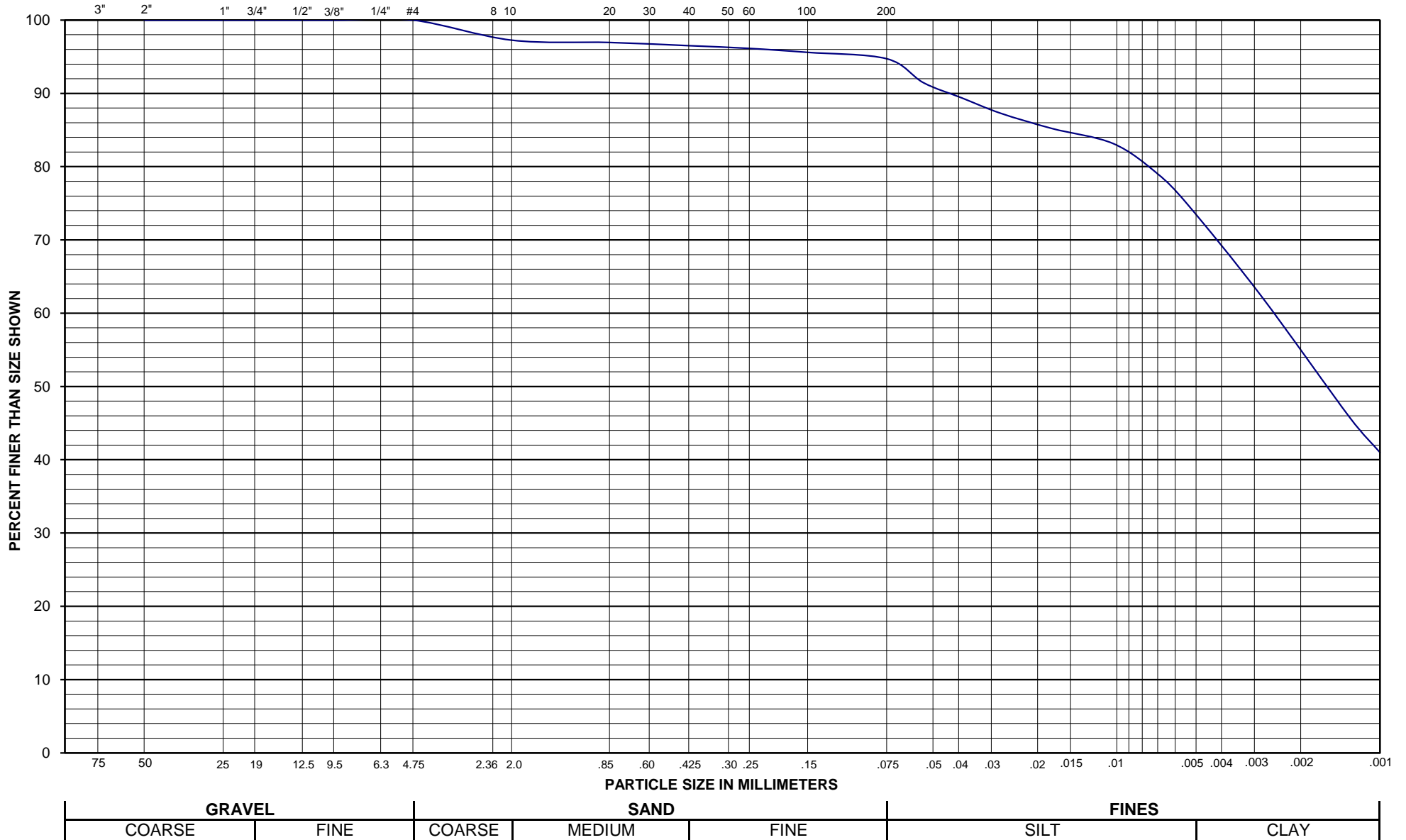
Project: Red River Geomorphic Study
Cass County, North Dakota

Sample Source: #33 (RR/427/B-C-C)

Classification: FAT CLAY - dark grayish brown (CH)

Reported to: West Consultants, Inc.

GRAIN SIZE DISTRIBUTION CURVE U.S. Standard Sieve Sizes





MIDWEST TESTING LABORATORY



Project No.: 16216

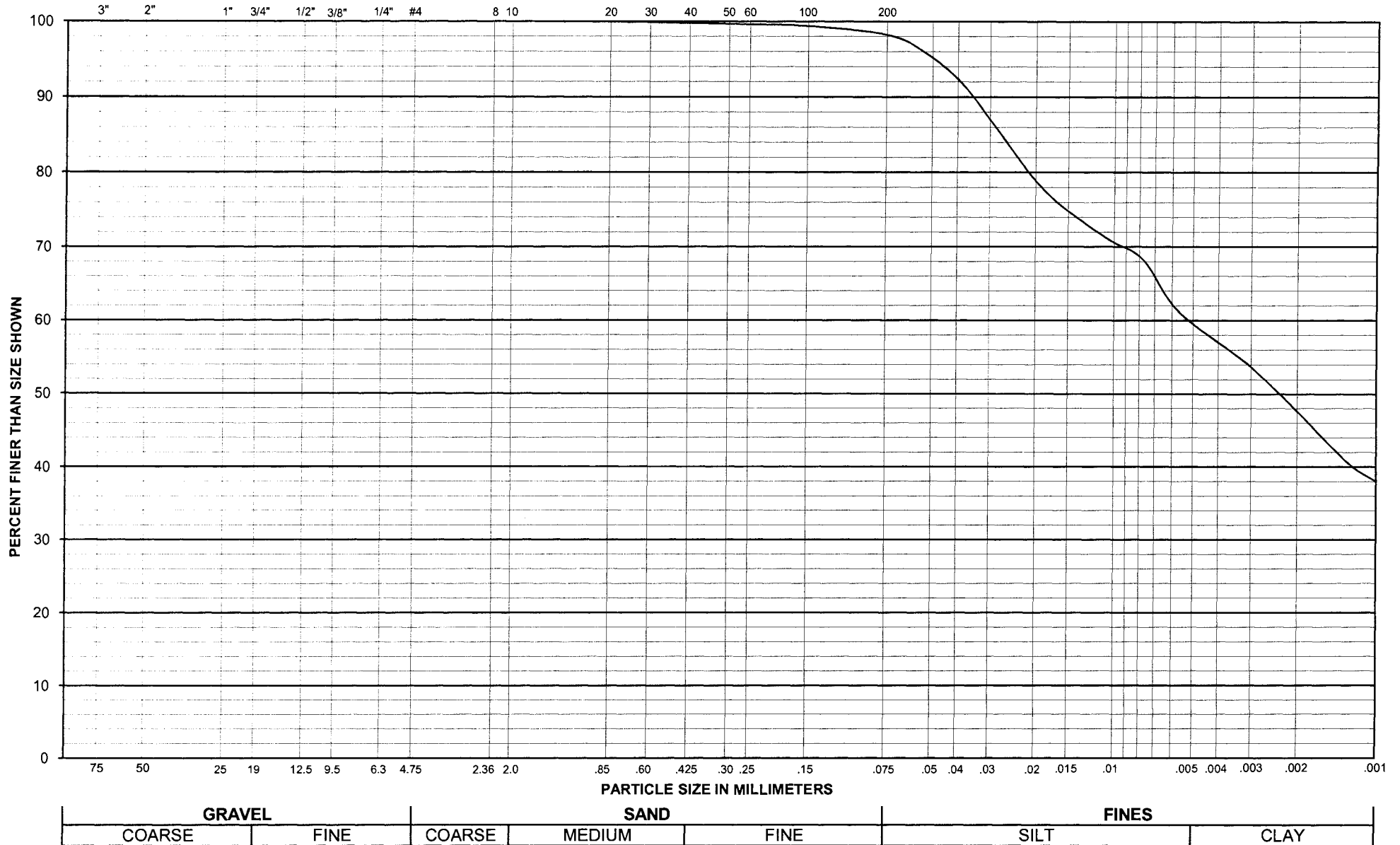
Project: Red River Geomorphic Study
Cass County, North Dakota

Sample Source: TN 7515 - RR-173-LB

Classification: FAT CLAY - dark gray

Reported to: West Consultants, Inc.

GRAIN SIZE DISTRIBUTION CURVE U.S. Standard Sieve Sizes





MIDWEST TESTING LABORATORY



Project No.: 16216

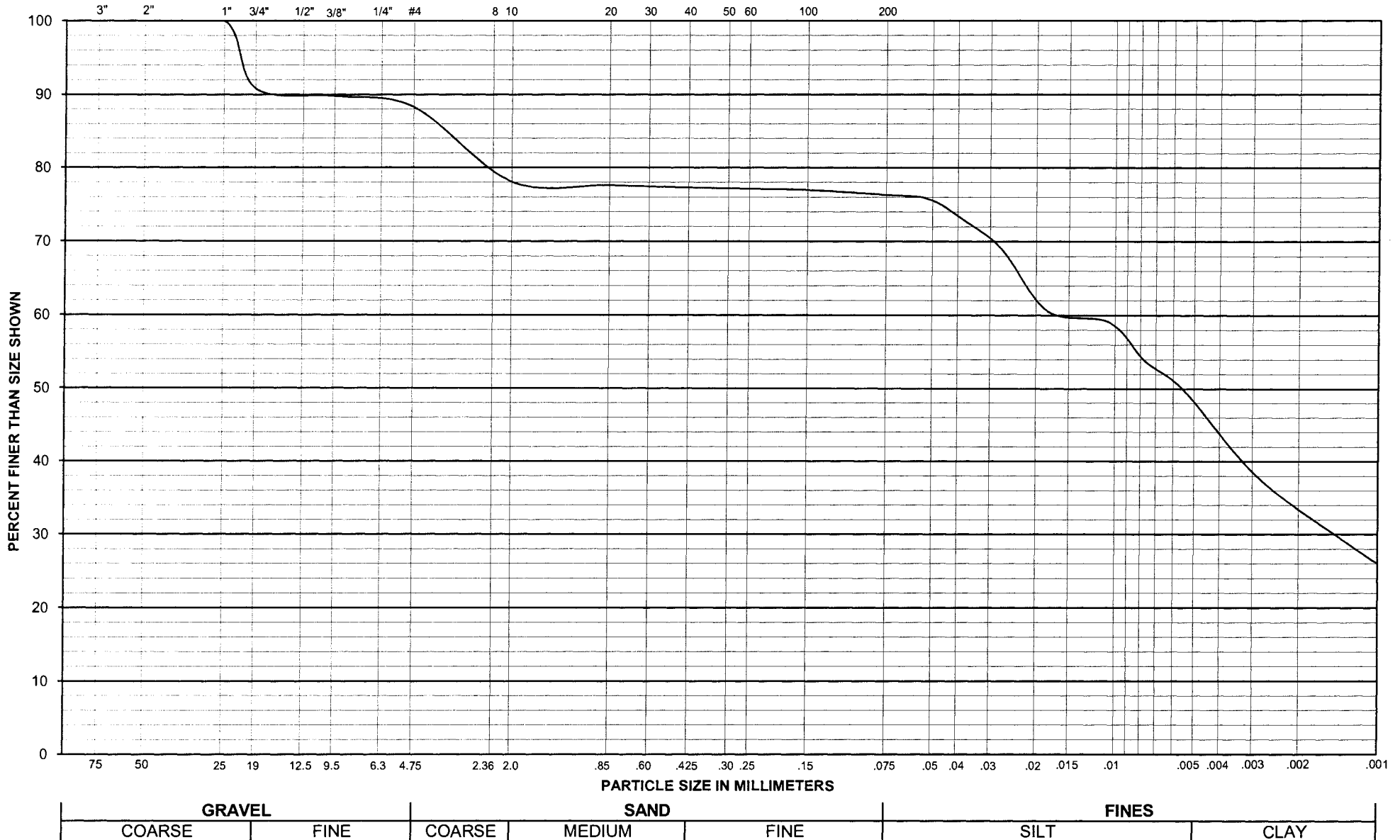
Project: Red River Geomorphic Study
Cass County, North Dakota

Sample Source: TN 7545 - RR-174-BED

Classification: FAT CLAY WITH SAND AND GRAVEL - dark gray

Reported to: West Consultants, Inc.

GRAIN SIZE DISTRIBUTION CURVE U.S. Standard Sieve Sizes





MIDWEST TESTING LABORATORY



Project No.: 16216

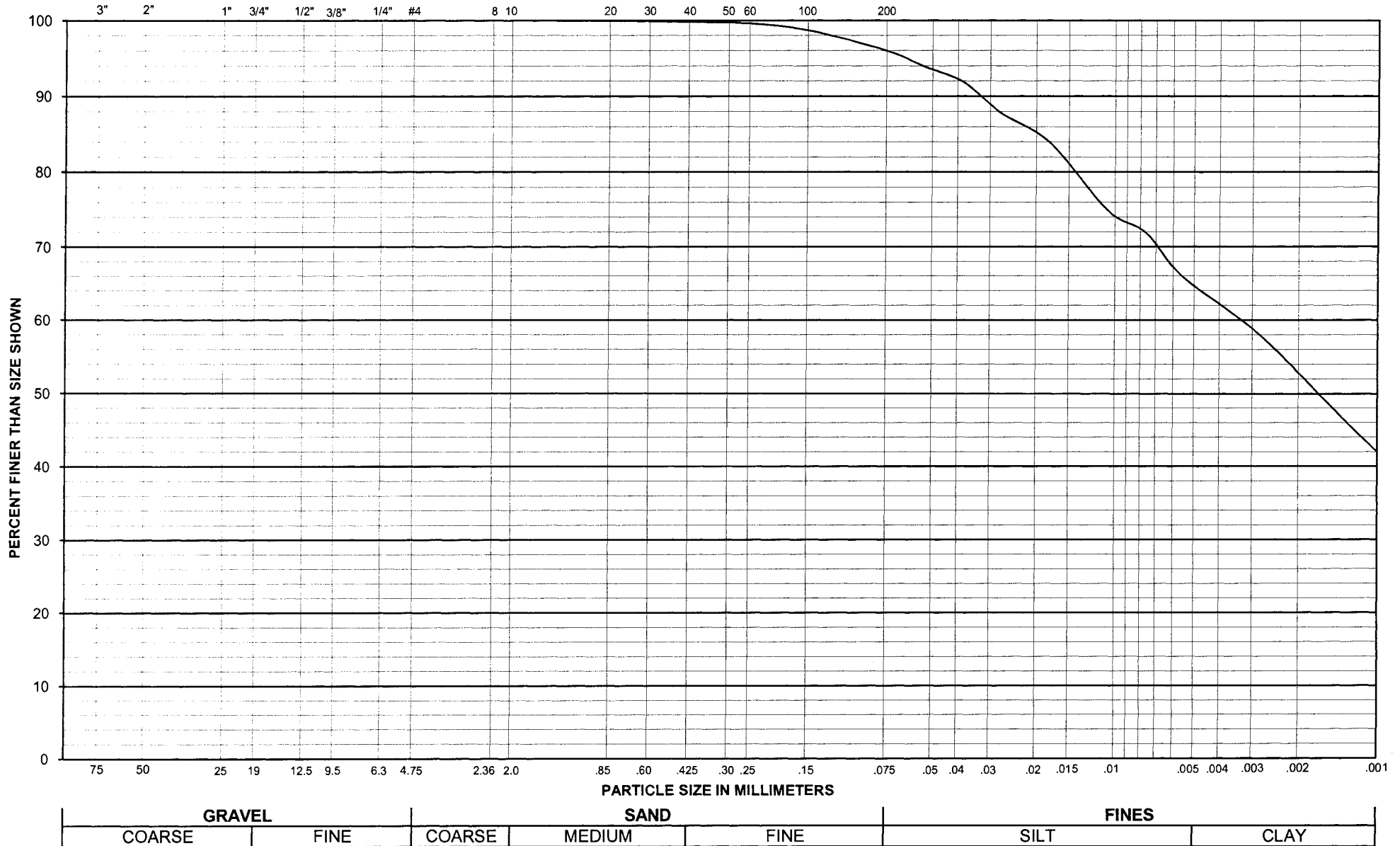
Project: Red River Geomorphic Study
Cass County, North Dakota

Sample Source: TN 7546 - RR-175-BED

Classification: FAT CLAY - dark gray

Reported to: West Consultants, Inc.

GRAIN SIZE DISTRIBUTION CURVE U.S. Standard Sieve Sizes





MIDWEST TESTING LABORATORY



Project No.: 16216

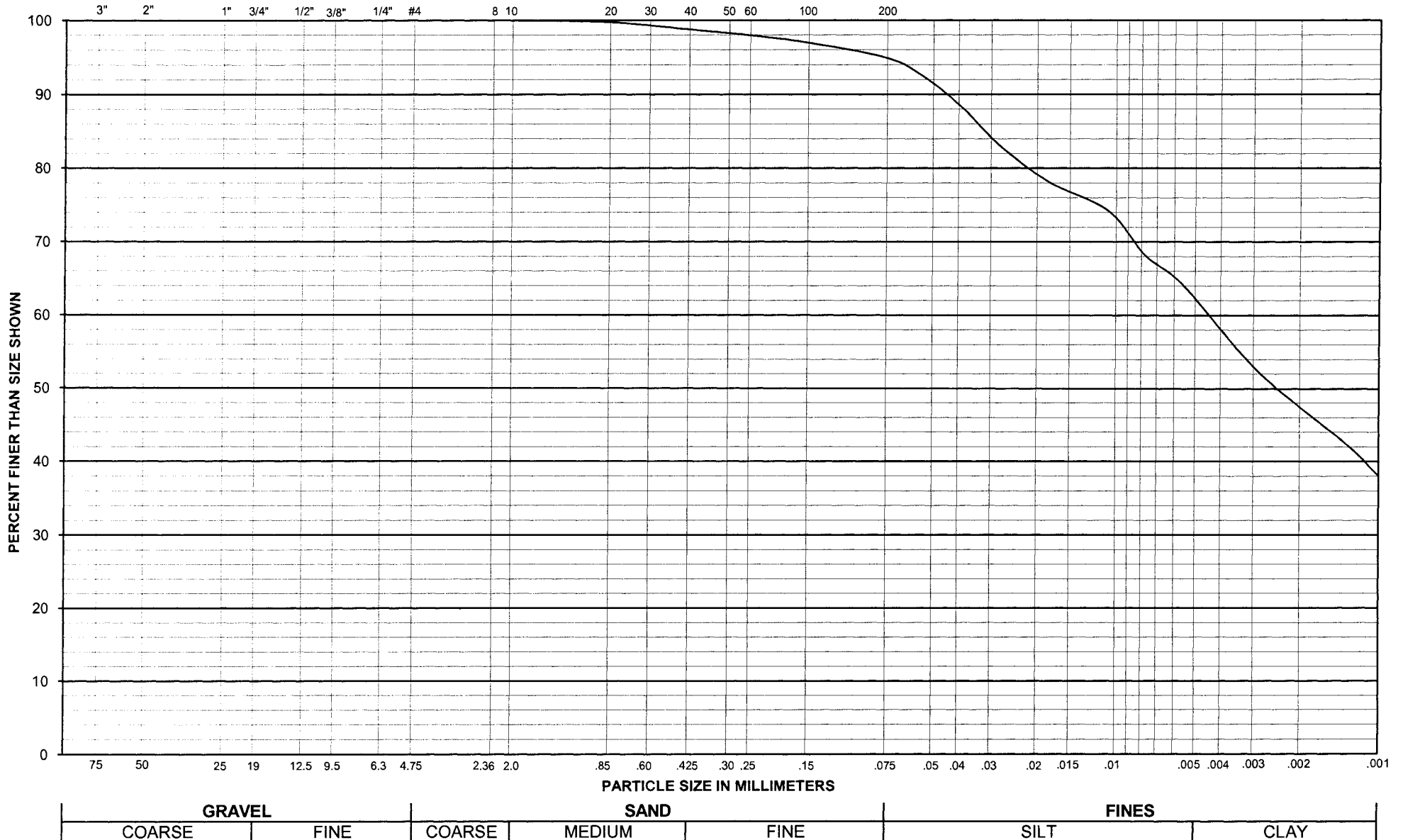
Project: Red River Geomorphic Study
Cass County, North Dakota

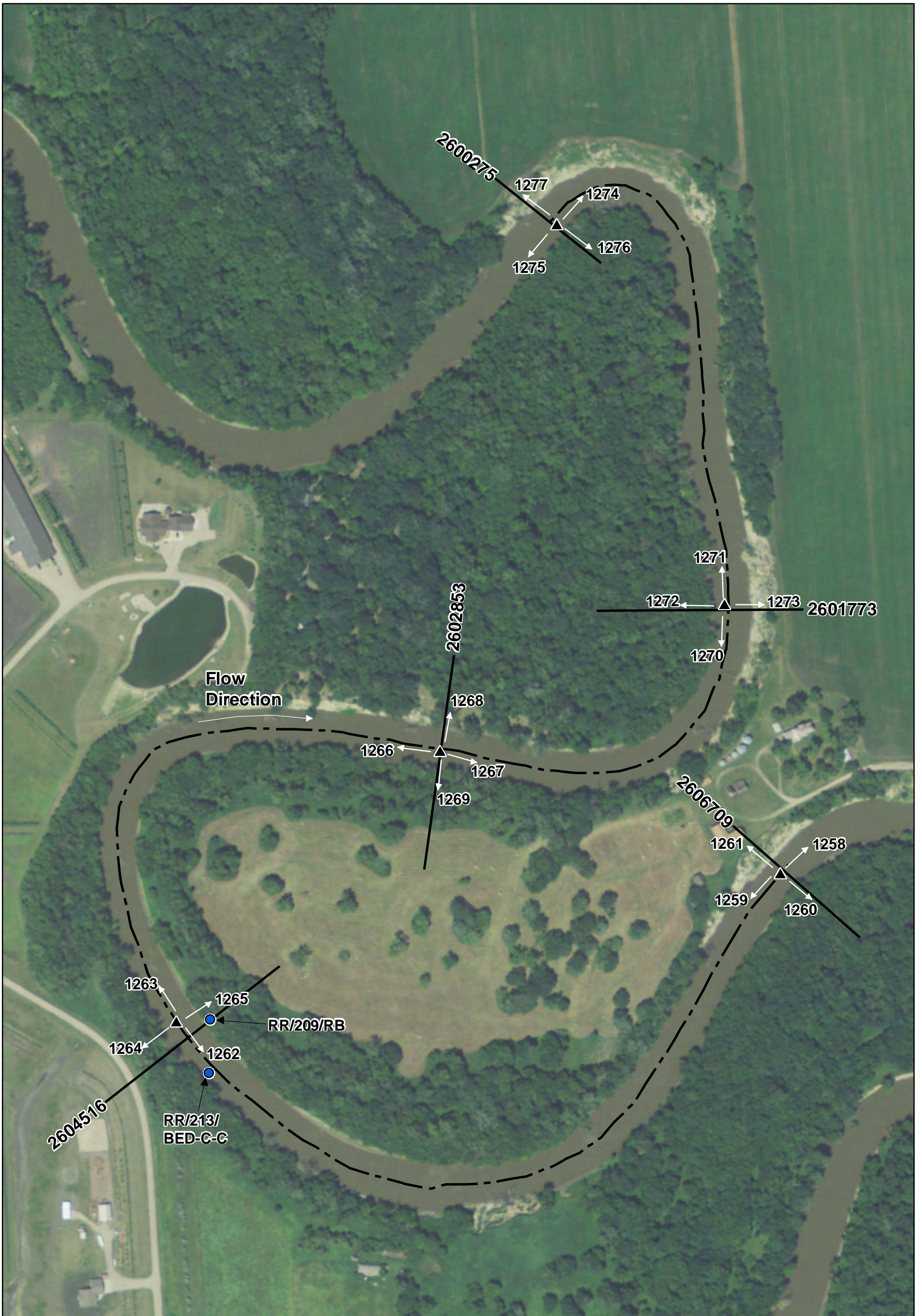
Sample Source: TN 7516 - RR-178-RB

Classification: FAT CLAY - dark gray

Reported to: West Consultants, Inc.

GRAIN SIZE DISTRIBUTION CURVE U.S. Standard Sieve Sizes





LEGEND

- Cross Section
- - - Detailed Study Reach
- Sediment Sample
- ▲ Field Photos
- 0750 Direction Arrow and Photo Number

0 125 250
Feet

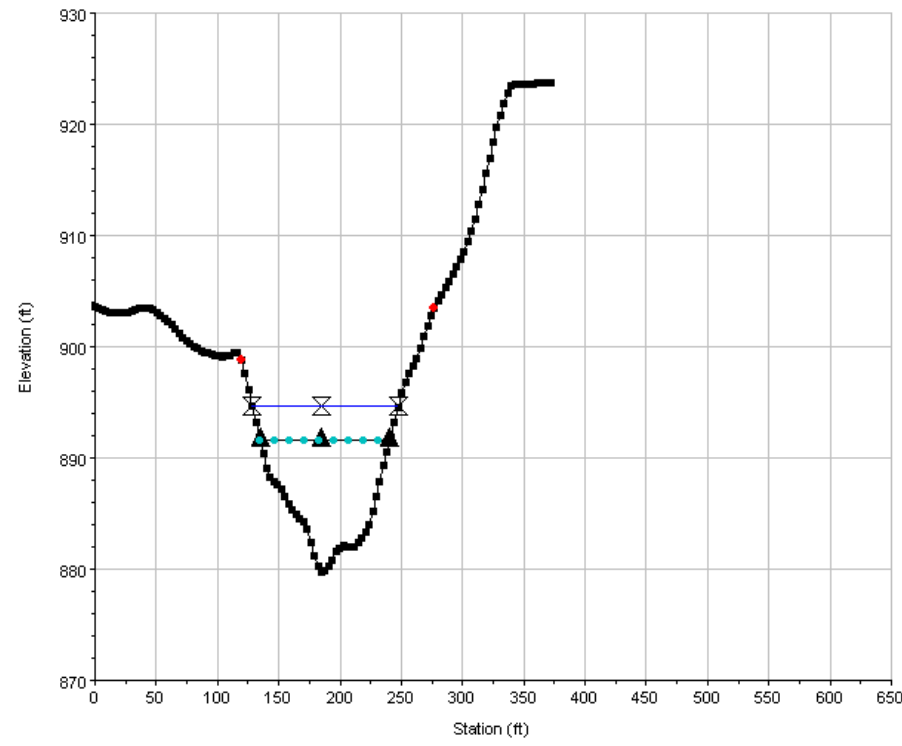
N

RED RIVER - 7 - 492.47

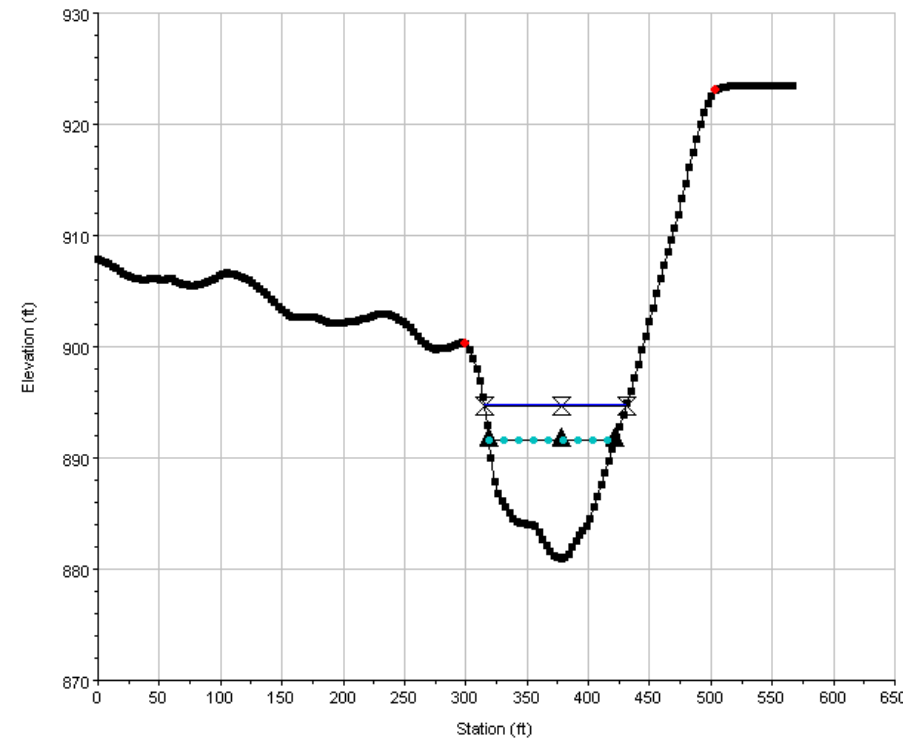
Observation Date: September 30, 2011

RED RIVER – 7 – 492.47

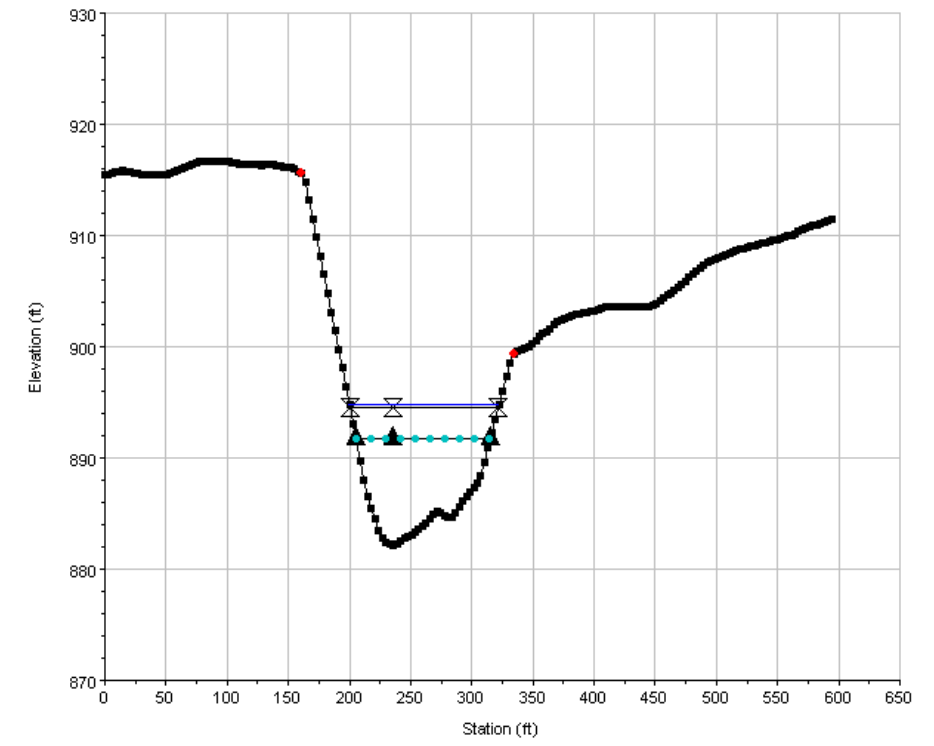
Cross Section 2600275



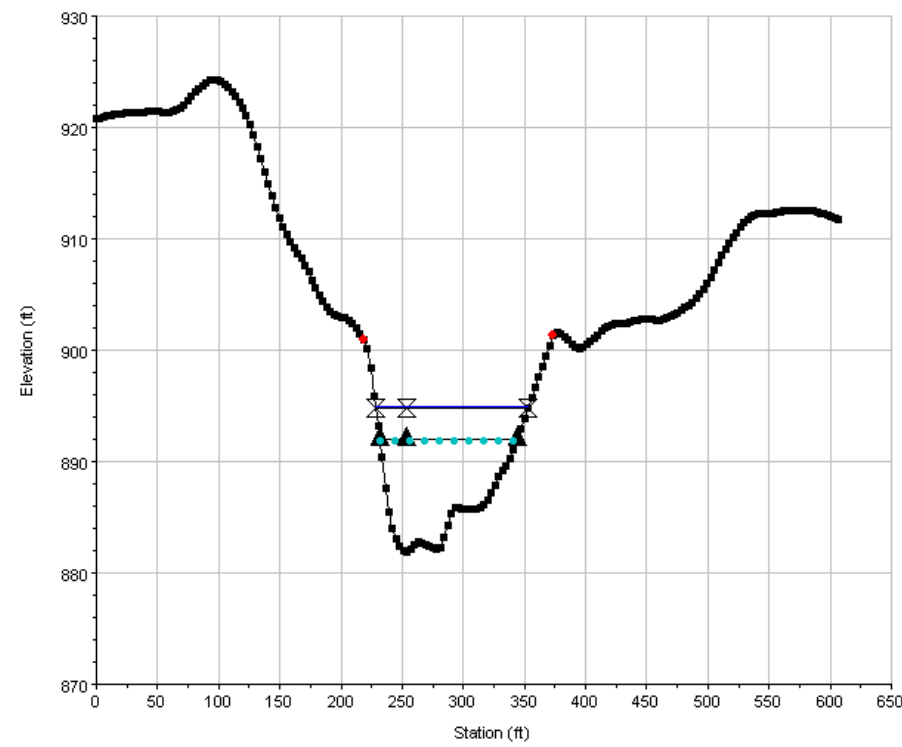
Cross Section 2601773



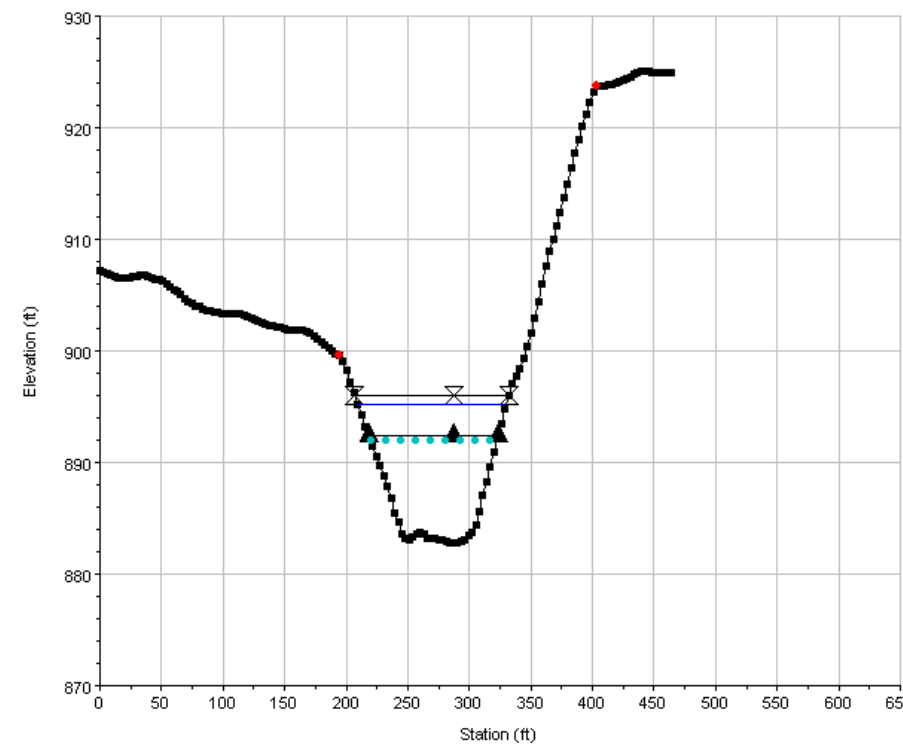
Cross Section 2602853



Cross Section 2604516



Cross Section 2606709



LEGEND

..... Modeled Water Surface Elevation for Day of Survey
 ——— Modeled Bankfull Water Surface Elevation
 —▲— Observed Water Surface Elevation
 —X— Observed Bankfull Water Surface Elevation
 —■— Ground
 ● Bank Stations

RED RIVER – 7 – 492.47
Observation Date: September 30, 2011



Field Photo 1258



Field Photo 1259



Field Photo 1260



Field Photo 1261



Field Photo 1262



Field Photo 1263

RED RIVER – 7 – 492.47
Observation Date: September 30, 2011



Field Photo 1264



Field Photo 1265



Field Photo 1266



Field Photo 1267



Field Photo 1268



Field Photo 1269

RED RIVER – 7 – 492.47
Observation Date: September 30, 2011



Field Photo 1270



Field Photo 1271



Field Photo 1272



Field Photo 1273



Field Photo 1274



Field Photo 1275

RED RIVER – 7 – 492.47

Observation Date: September 30, 2011



Field Photo 1276



Field Photo 1277



MIDWEST TESTING LABORATORY



Project No.: M1101216

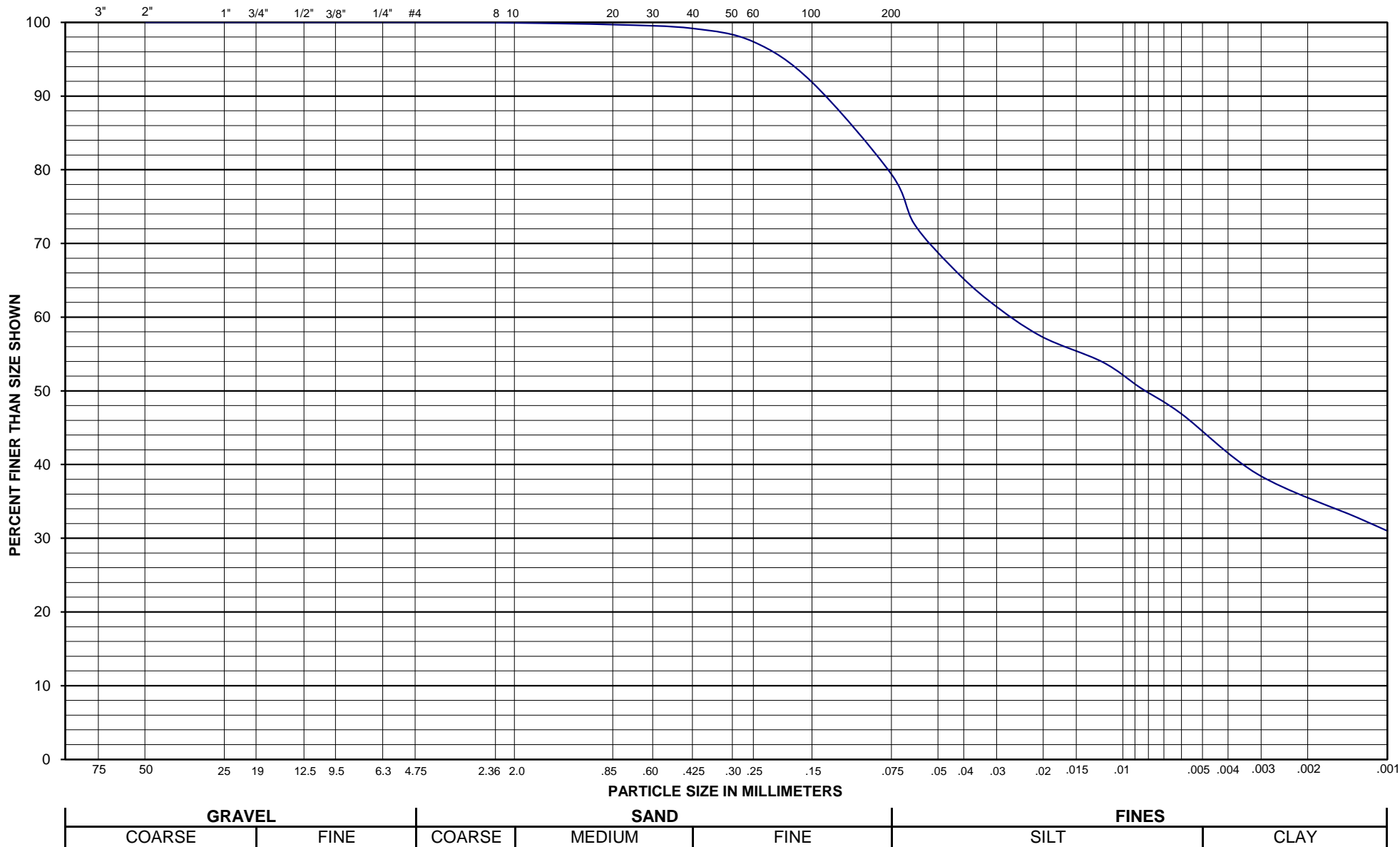
Project: Red River Geomorphic Study
Cass County, North Dakota

Sample Source: #22 (RR/209/RB)

Classification: FAT CLAY WITH SAND - dark brown (CH)

Reported to: West Consultants, Inc.

GRAIN SIZE DISTRIBUTION CURVE U.S. Standard Sieve Sizes





MIDWEST TESTING LABORATORY



Project No.: M1101216

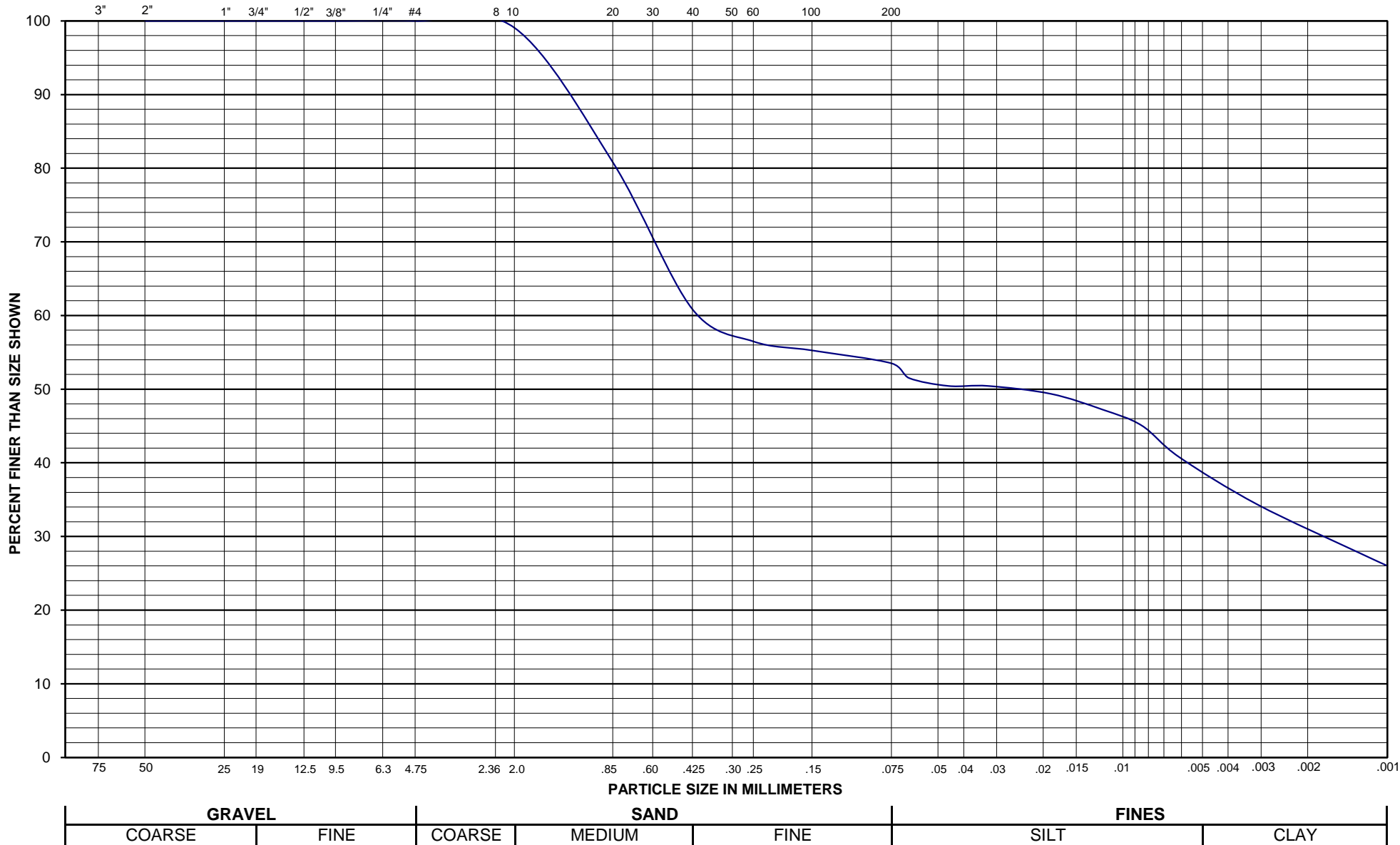
Project: Red River Geomorphic Study
Cass County, North Dakota

Sample Source: #17 (RR/213/BED-C-C)

Classification: SANDY FAT CLAY - dark brown (CH)

Reported to: West Consultants, Inc.

GRAIN SIZE DISTRIBUTION CURVE U.S. Standard Sieve Sizes





LEGEND

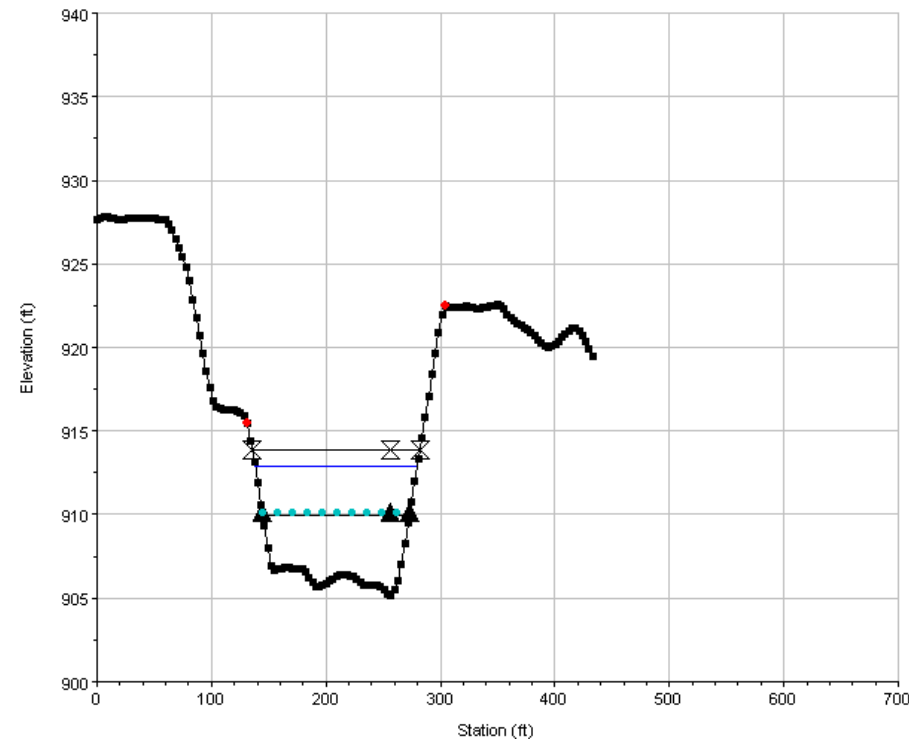
- Cross Section
 - - - Detailed Study Reach
 - Sediment Sample
 - ▲ Field Photos
 - 0750 Direction Arrow and Photo Number
- 0 150 300
Feet



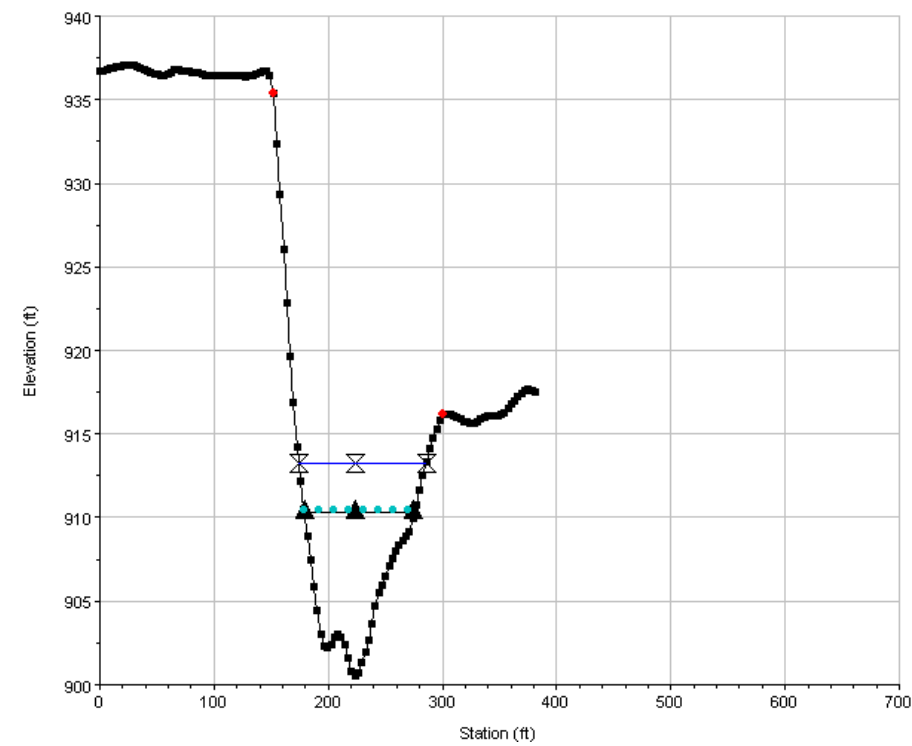
RED RIVER - 8 - 521.18
Observation Date: October 5, 2011

RED RIVER – 8 – 521.18

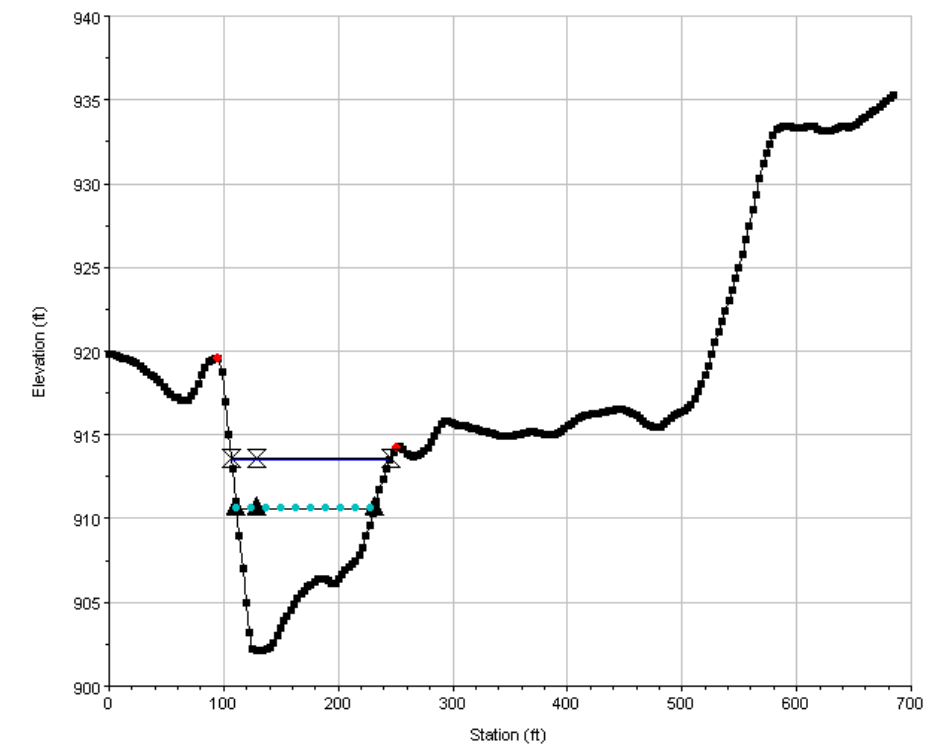
Cross Section 2751865



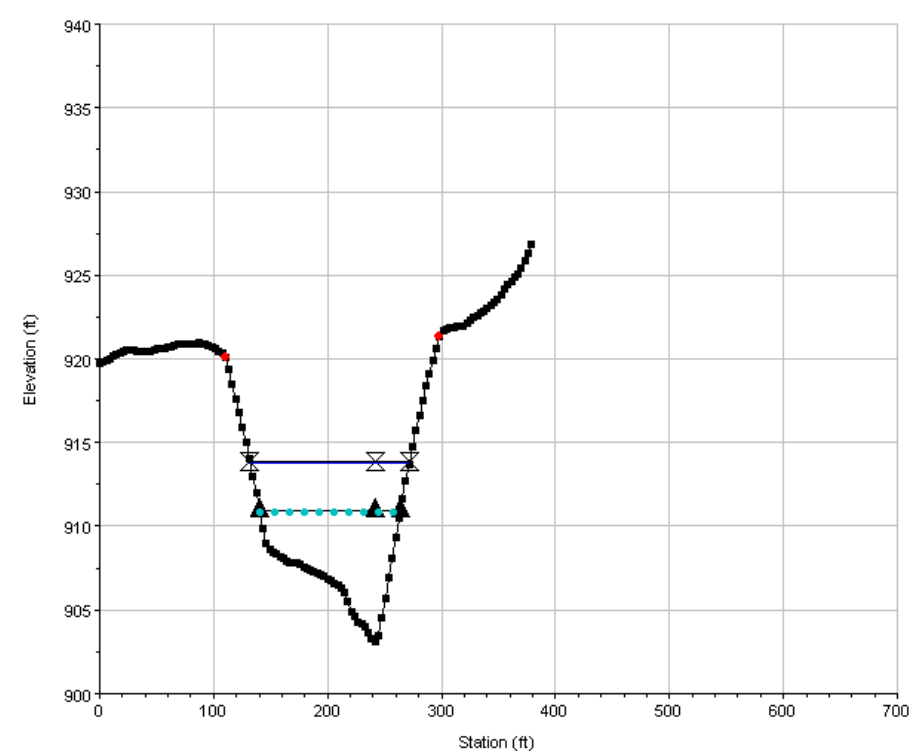
Cross Section 2753951



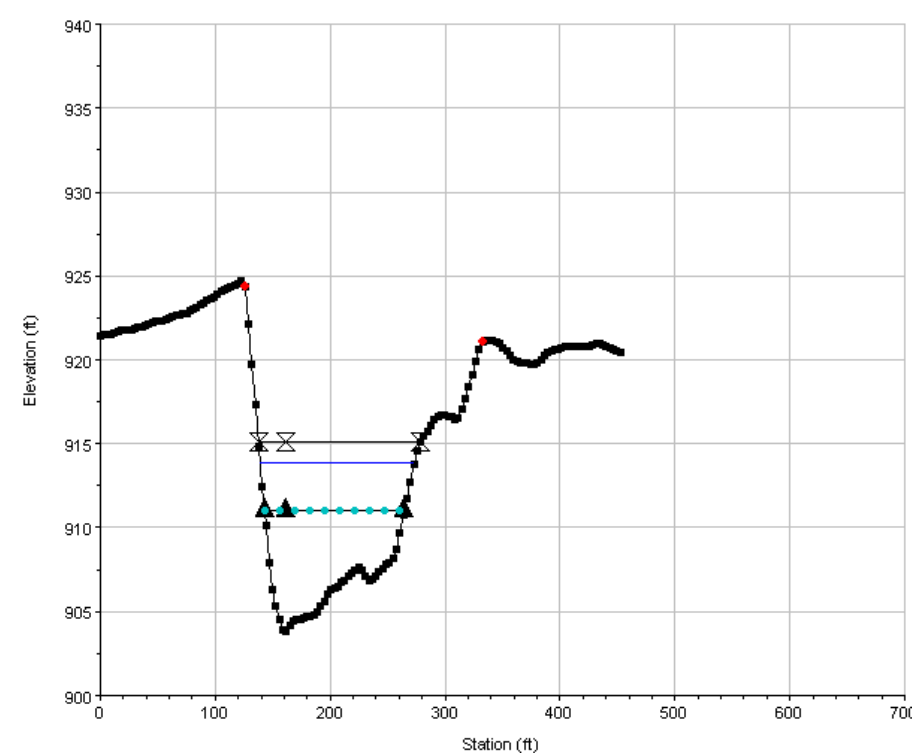
Cross Section 2755907



Cross Section 2757521



Cross Section 2758459



LEGEND

●●●●● Modeled Water Surface Elevation for Day of Survey
 — Modeled Bankfull Water Surface Elevation
 —▲— Observed Water Surface Elevation
 —X— Observed Bankfull Water Surface Elevation
 —■— Ground
 ● Bank Stations

RED RIVER – 8 – 521.18
Observation Date: October 5, 2011



Field Photo 1392



Field Photo 1393



Field Photo 1394



Field Photo 1395



Field Photo 1396



Field Photo 1397

RED RIVER – 8 – 521.18
Observation Date: October 5, 2011



Field Photo 1398



Field Photo 1399



Field Photo 1400



Field Photo 1402



Field Photo 1403



Field Photo 1404

RED RIVER – 8 – 521.18
Observation Date: October 5, 2011



Field Photo 1405



Field Photo 1406



Field Photo 1407



Field Photo 1408



Field Photo 1409



Field Photo 1410

RED RIVER – 8 – 521.18
Observation Date: October 5, 2011



Field Photo 1411



Field Photo 1412



Field Photo 1413



MIDWEST TESTING LABORATORY



Project No.: M1101216

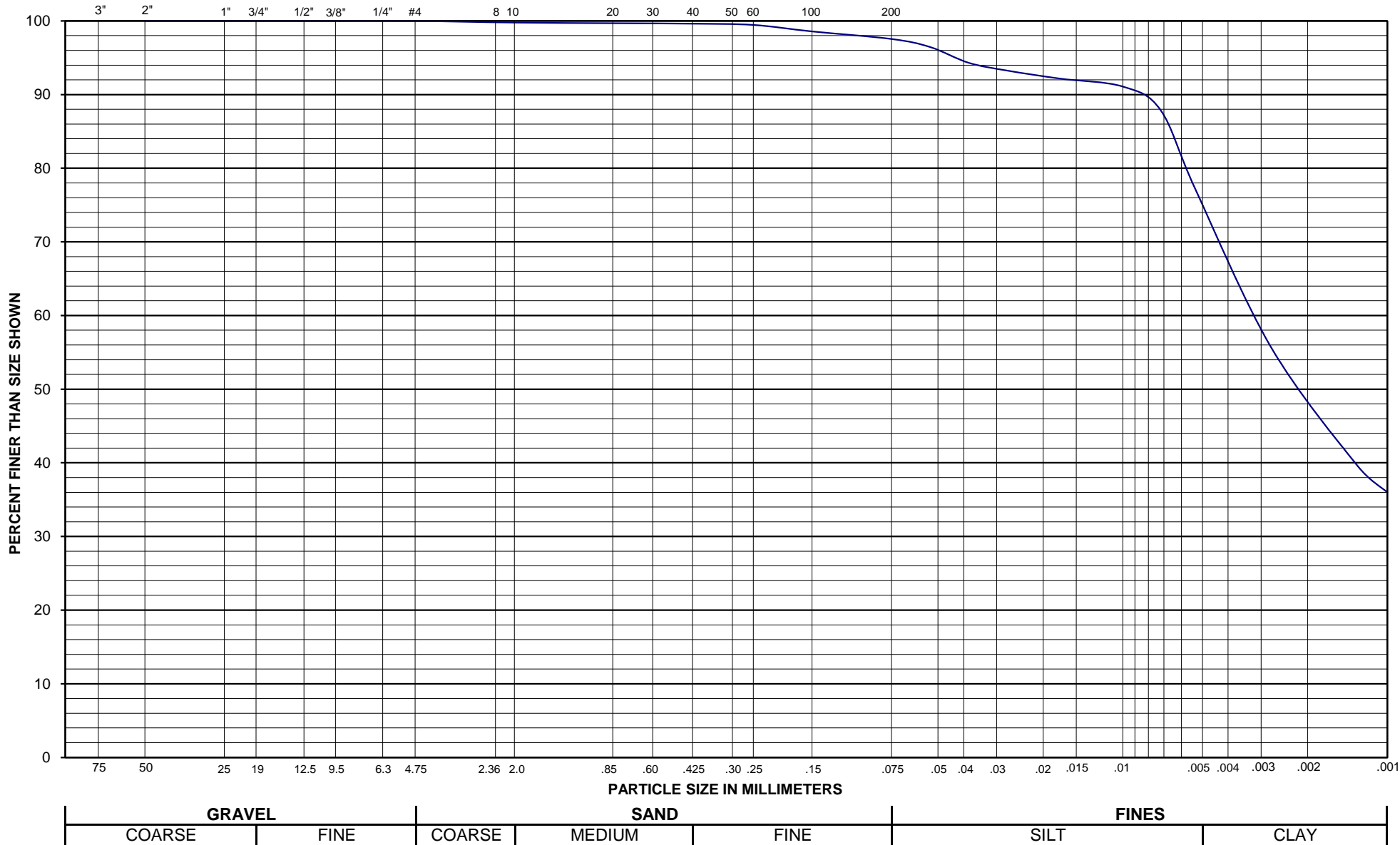
Project: Red River Geomorphic Study
Cass County, North Dakota

Sample Source: #62 (RR/399/LB)

Classification: FAT CLAY - dark brown (CH)

Reported to: West Consultants, Inc.

GRAIN SIZE DISTRIBUTION CURVE U.S. Standard Sieve Sizes





MIDWEST TESTING LABORATORY



Project No.: M1101216

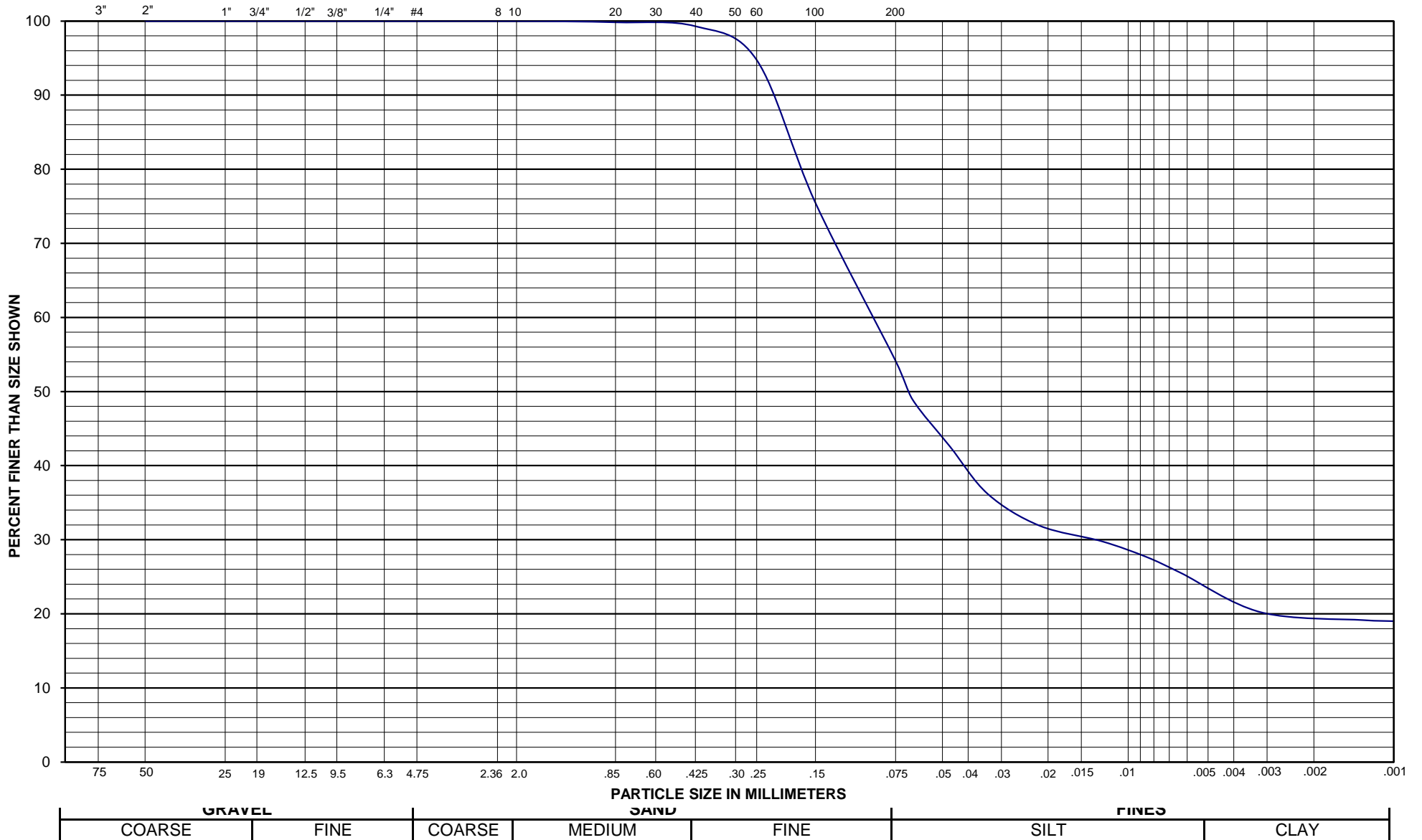
Project: Red River Geomorphic Study
Cass County, North Dakota

Sample Source: #67 (RR/400/RB)

Classification: SANDY FAT CLAY - dark brown (CH)

Reported to: West Consultants, Inc.

GRAIN SIZE DISTRIBUTION CURVE U.S. Standard Sieve Sizes





MIDWEST TESTING LABORATORY



Project No.: M1101216

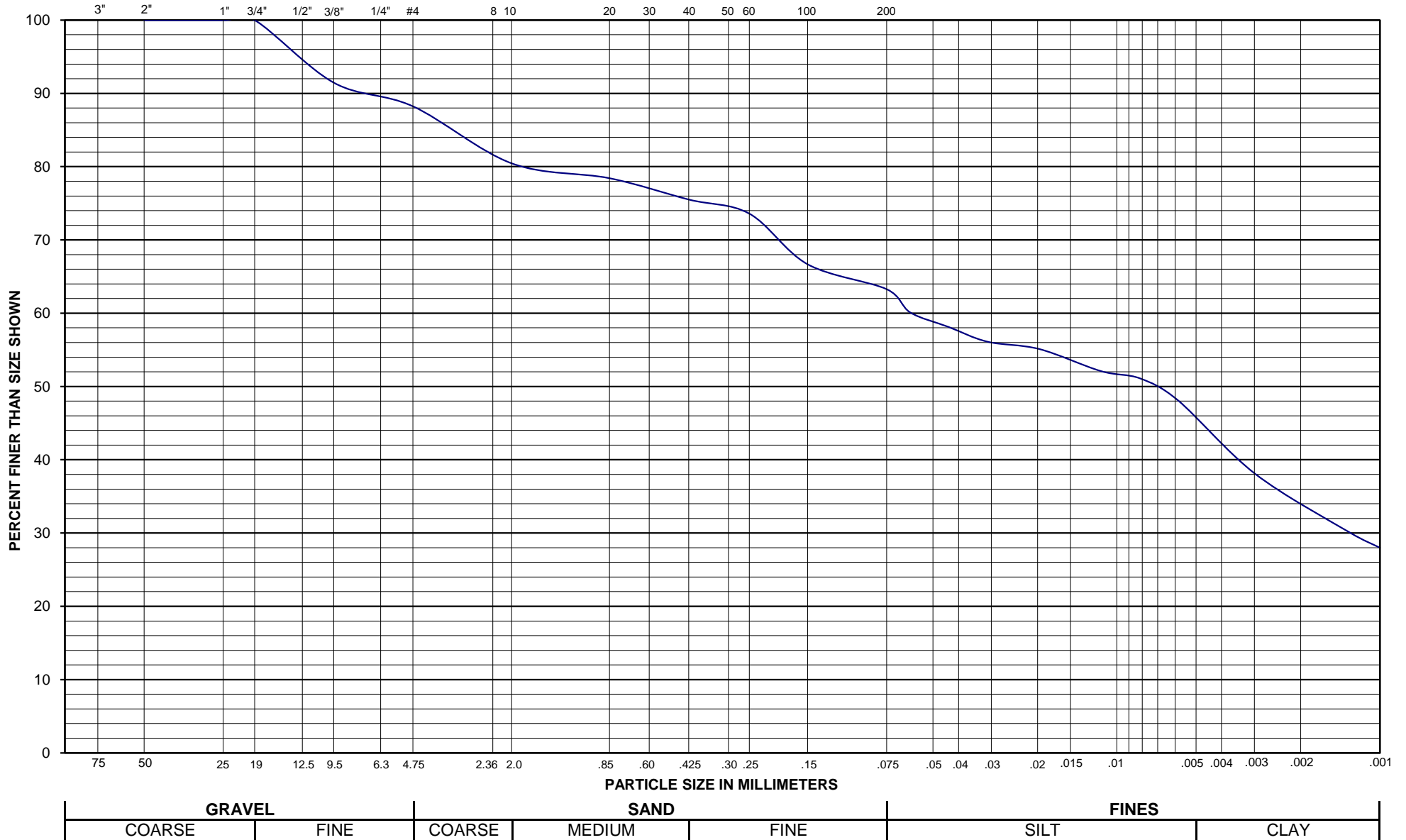
Project: Red River Geomorphic Study
Cass County, North Dakota

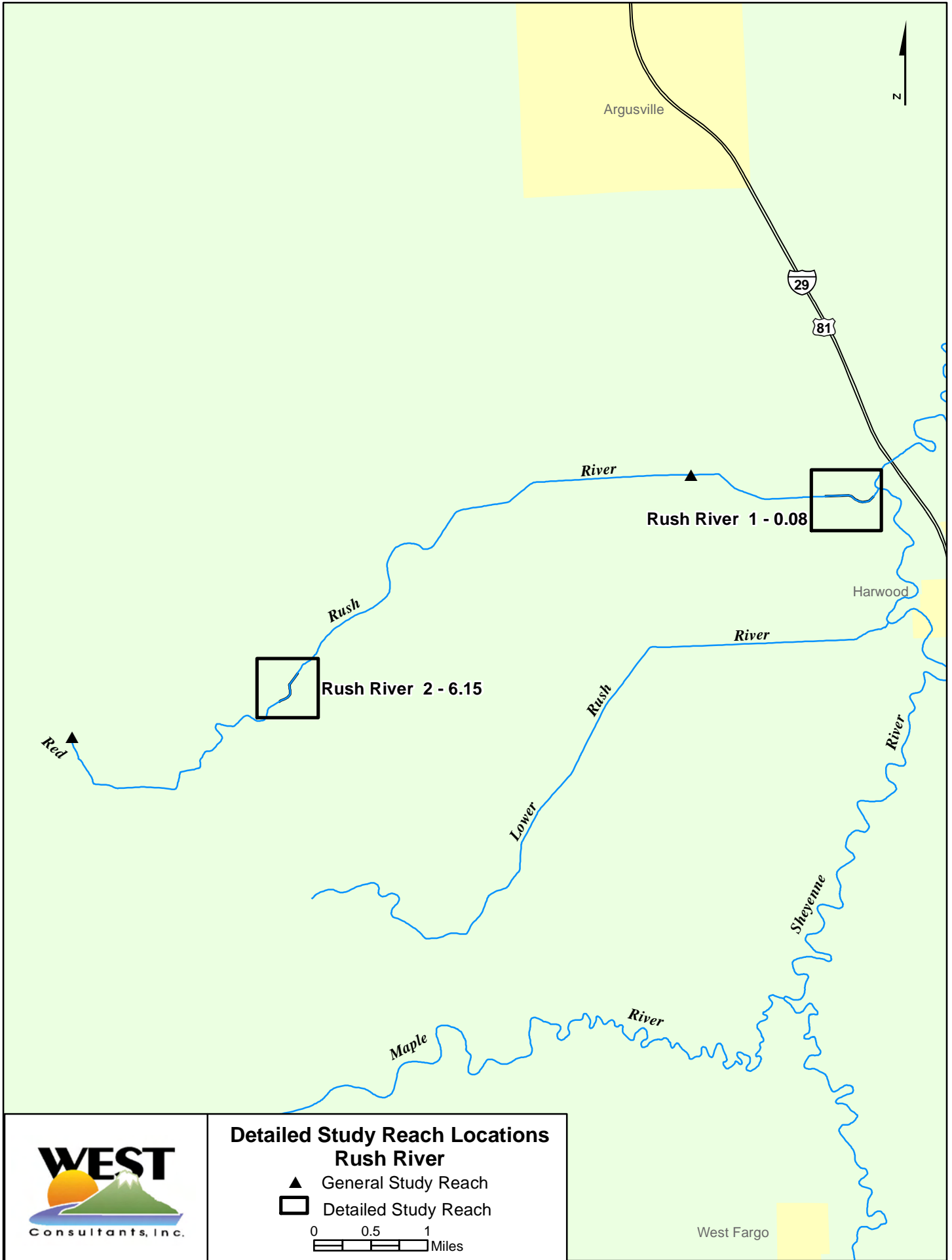
Sample Source: #37 (RR/404/BED-C-C)

Classification: SANDY FAT CLAY - dark brown, with a little gravel (CH)

Reported to: West Consultants, Inc.

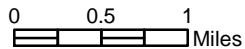
GRAIN SIZE DISTRIBUTION CURVE U.S. Standard Sieve Sizes



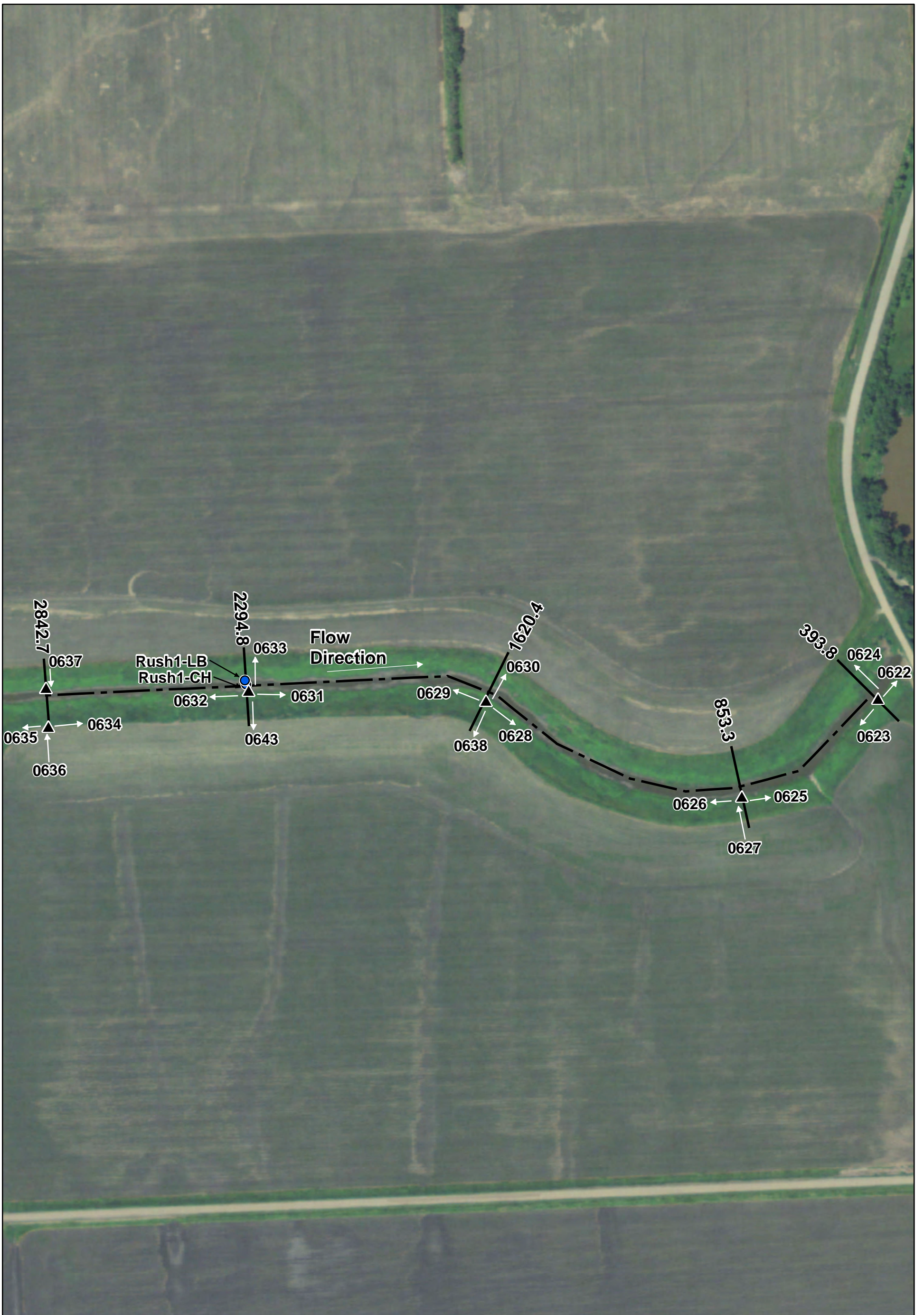


**Detailed Study Reach Locations
Rush River**

- ▲ General Study Reach
- Detailed Study Reach



West Fargo



LEGEND

- Cross Section
- - - Detailed Study Reach
- Sediment Sample
- ▲ Field Photos
- 0750 Direction Arrow and Photo Number

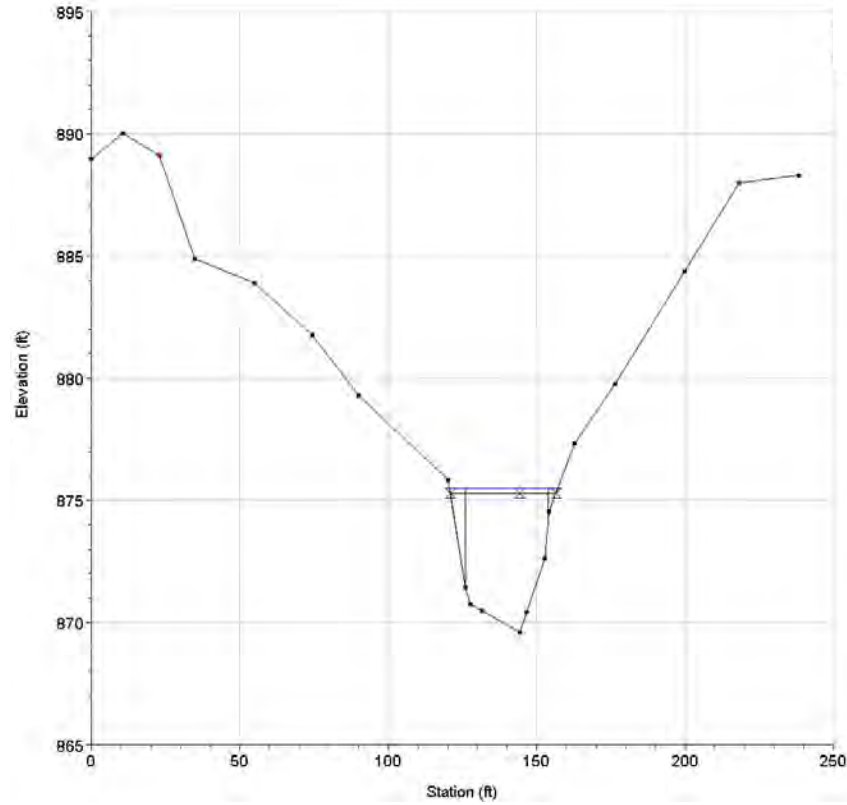
0 125 250
Feet

RUSH RIVER - 1 - 0.08

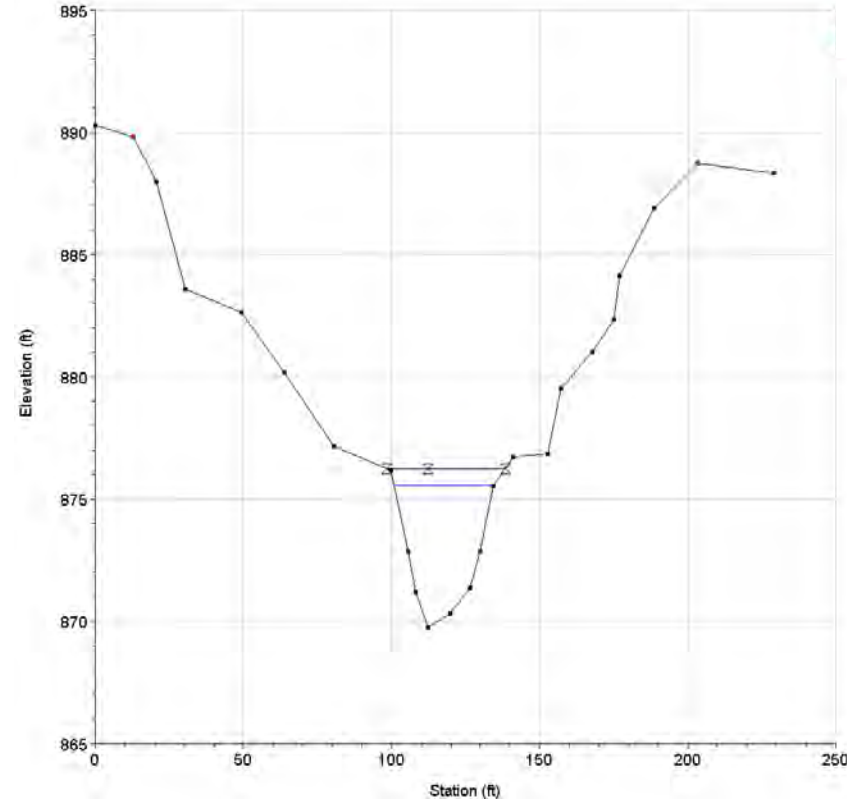
Observation Date: September 29, 2011

RUSH RIVER – 1 – 0.08

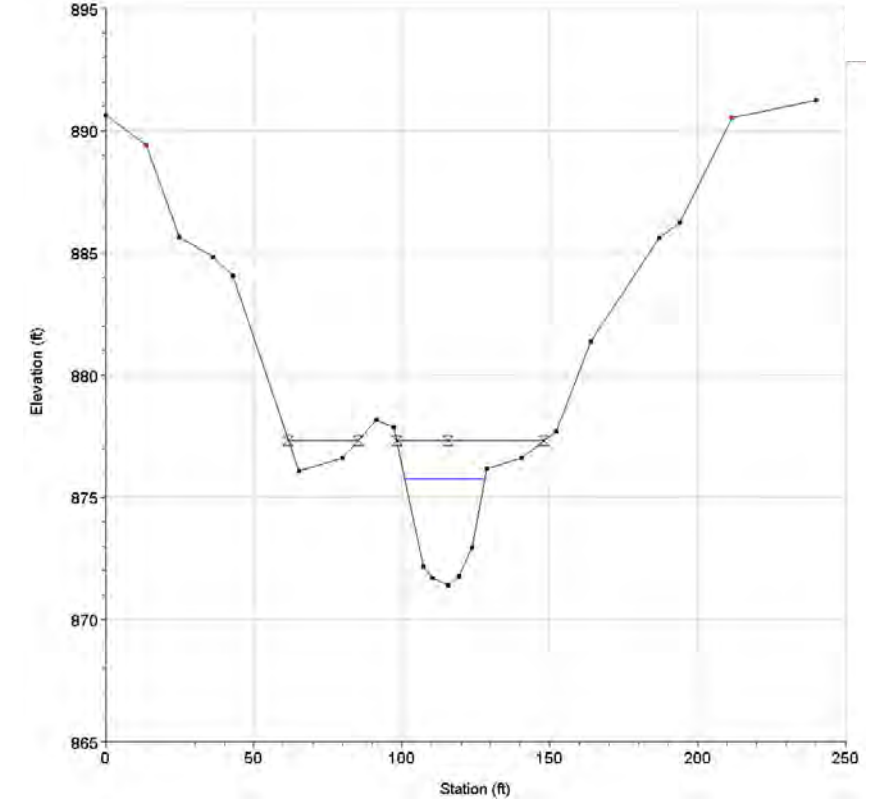
Cross Section 393.8



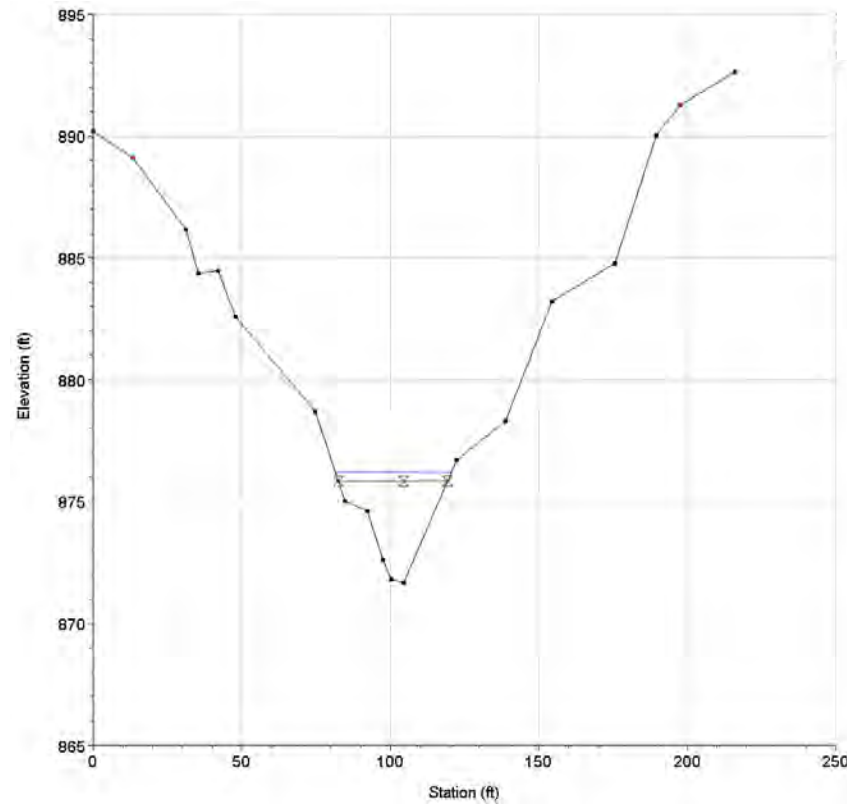
Cross Section 853.3



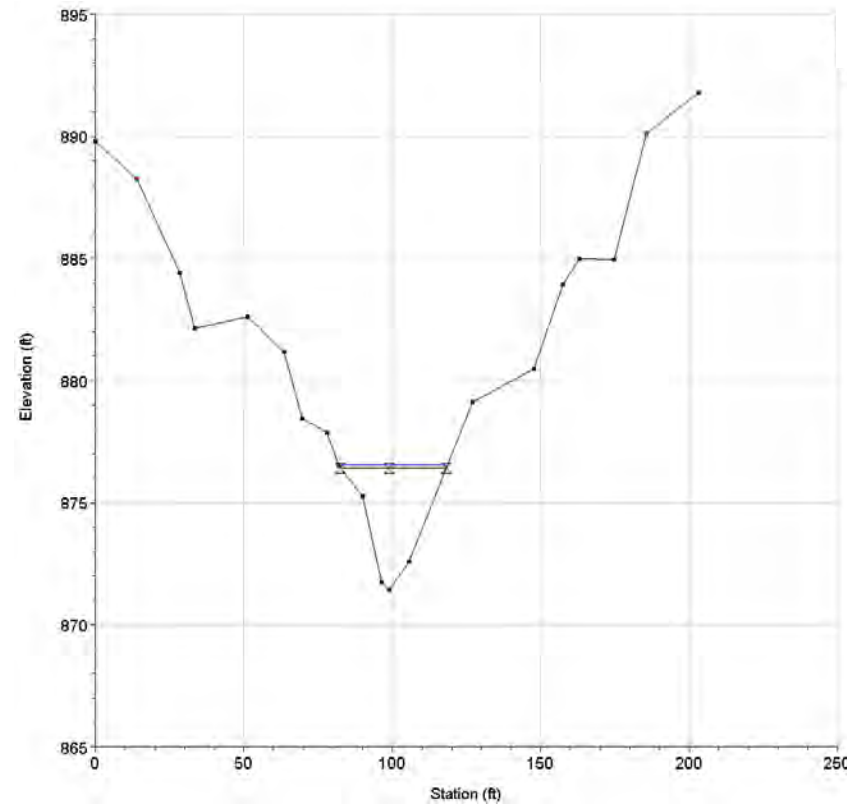
Cross Section 1620.4



Cross Section 2294.8



Cross Section 2842.7



Note: channel dry during field investigation;
no observed or modeled water surface for
day of survey

— Modeled Bankfull Water Surface Elevation

— ⊗ — Observed Bankfull Water Surface Elevation

— ■ — Ground

• Bank Stations

RUSH RIVER – 1– 0.08
OBSERVATION DATE: SEPTEMBER 29, 2011



Field Photo 0622



Field Photo 0623



Field Photo 0624



Field Photo 0625



Field Photo 0626



Field Photo 0627

RUSH RIVER – 1 – 0.08
OBSERVATION DATE: SEPTEMBER 29, 2011



Field Photo 0628



Field Photo 0629



Field Photo 0630



Field Photo 0631



Field Photo 0632



Field Photo 0633

RUSH RIVER – 1 – 0.08
OBSERVATION DATE: SEPTEMBER 29, 2011



Field Photo 0634



Field Photo 0635



Field Photo 0636



Field Photo 0637



Field Photo 0638



Field Photo 0643



MIDWEST TESTING LABORATORY



Project No.: M1101216

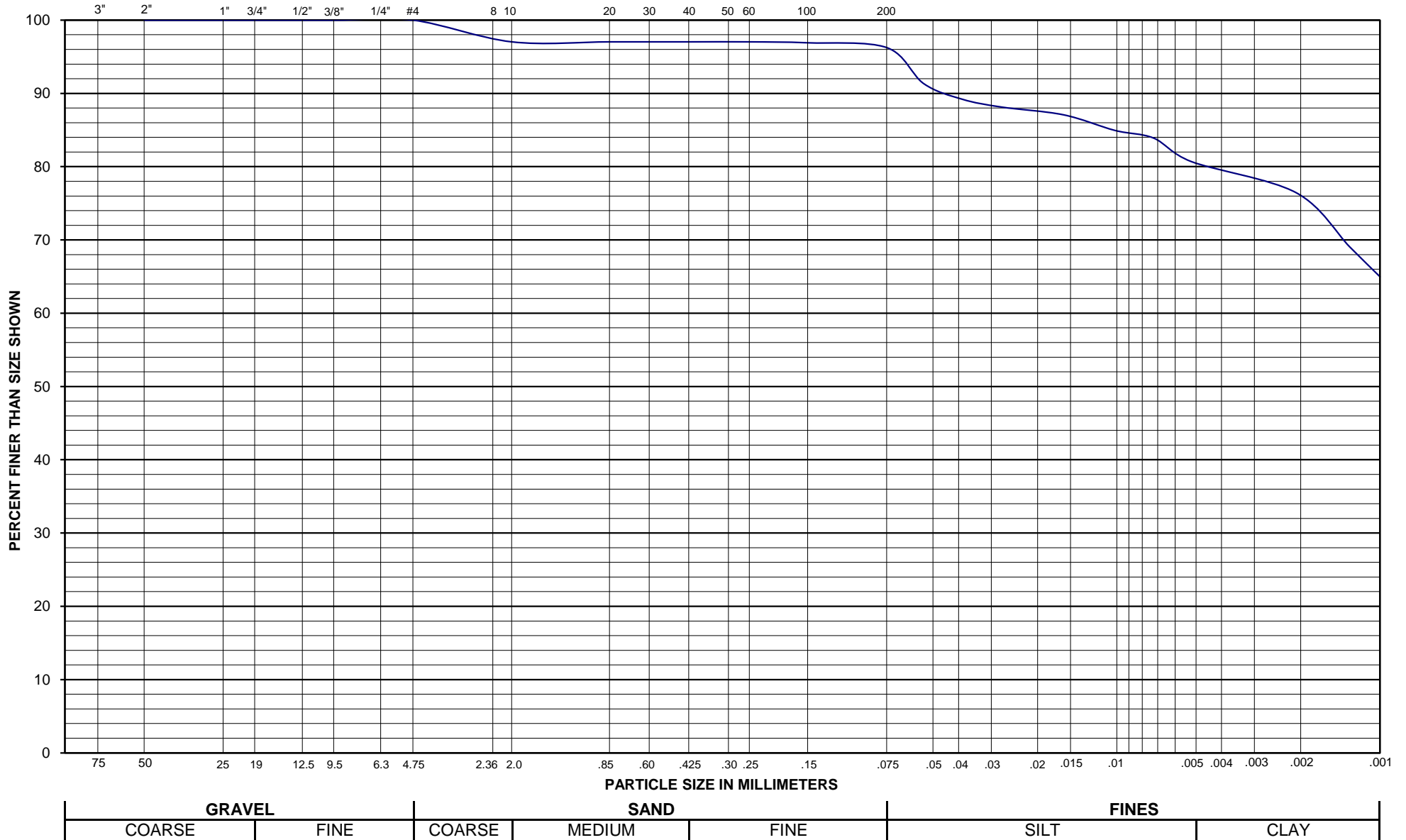
Project: Red River Geomorphic Study
Cass County, North Dakota

Sample Source: #12 (Rush1 - LB)

Classification: FAT CLAY - dark grayish brown (CH)

Reported to: West Consultants, Inc.

GRAIN SIZE DISTRIBUTION CURVE U.S. Standard Sieve Sizes





MIDWEST TESTING LABORATORY



Project No.: M1101216

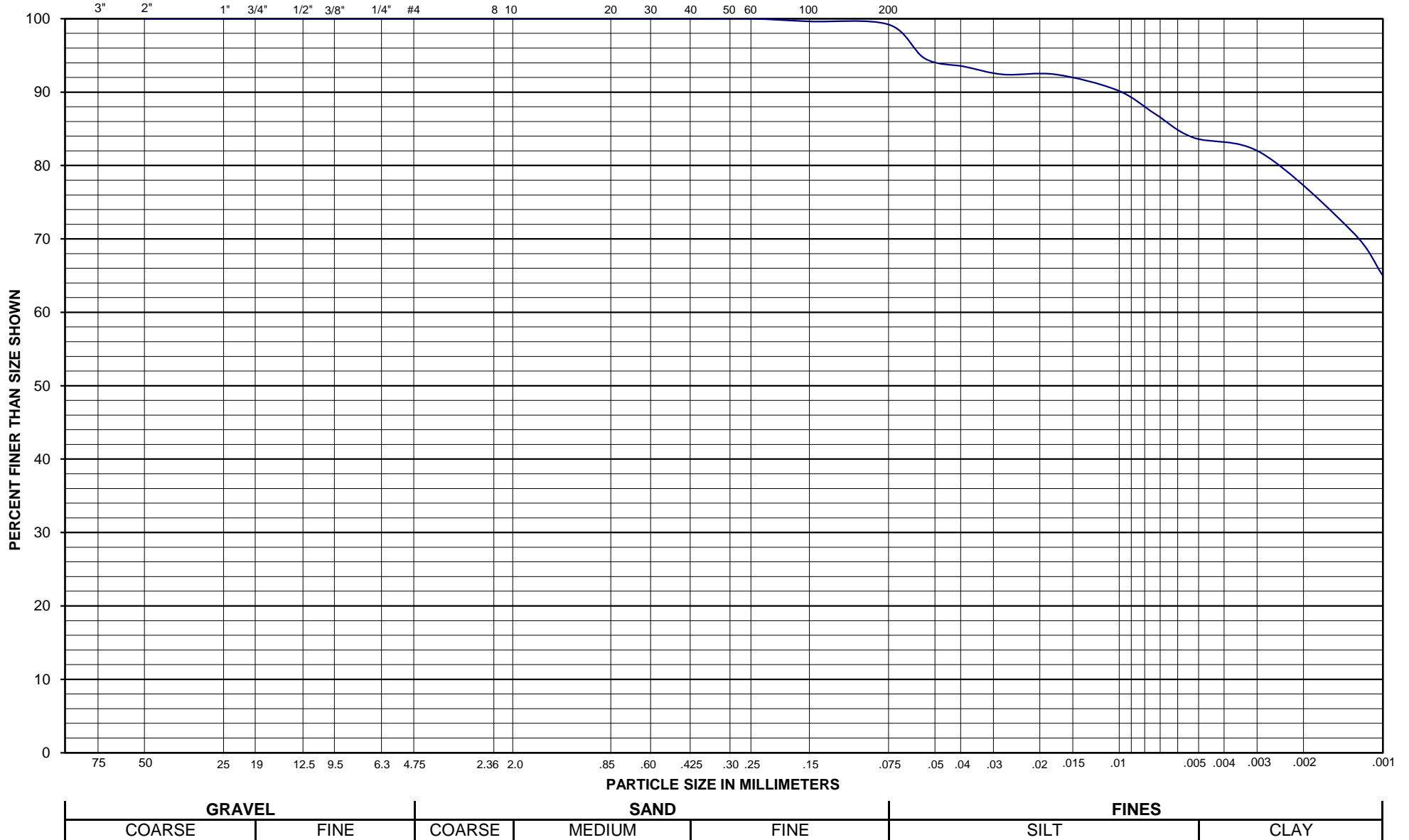
Project: Red River Geomorphic Study
Cass County, North Dakota

Sample Source: #27 (RUSH1-CH)

Classification: FAT CLAY - dark grayish brown (CH)

Reported to: West Consultants, Inc.

GRAIN SIZE DISTRIBUTION CURVE U.S. Standard Sieve Sizes





LEGEND

- Cross Section
 - - - Detailed Study Reach
 - Sediment Sample
 - ▲ Field Photos
 - 0750 Direction Arrow and Photo Number
- 0 60 120
 Feet

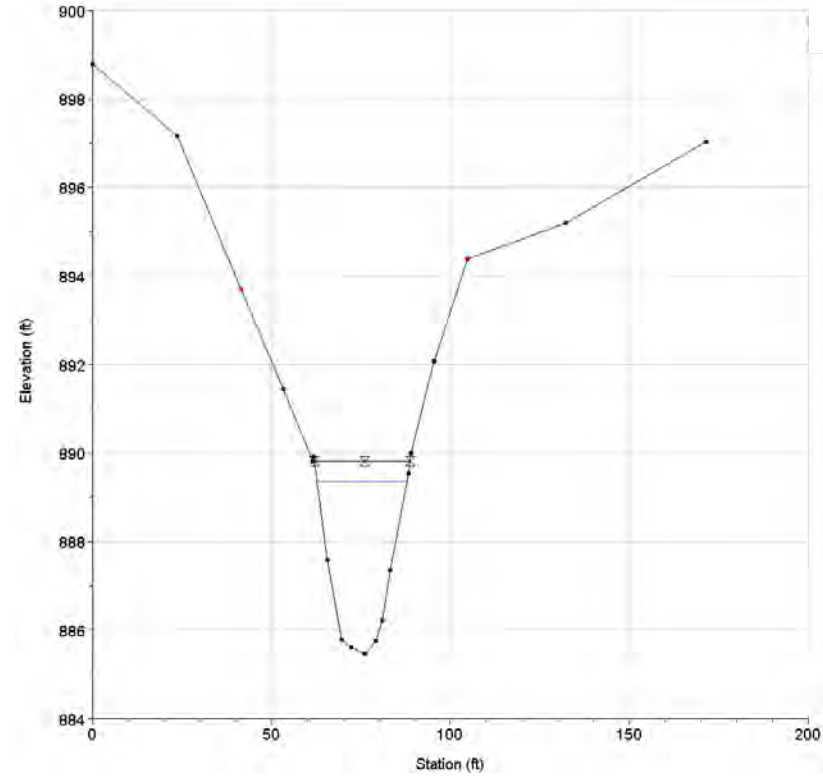


RUSH RIVER - 2 - 6.15

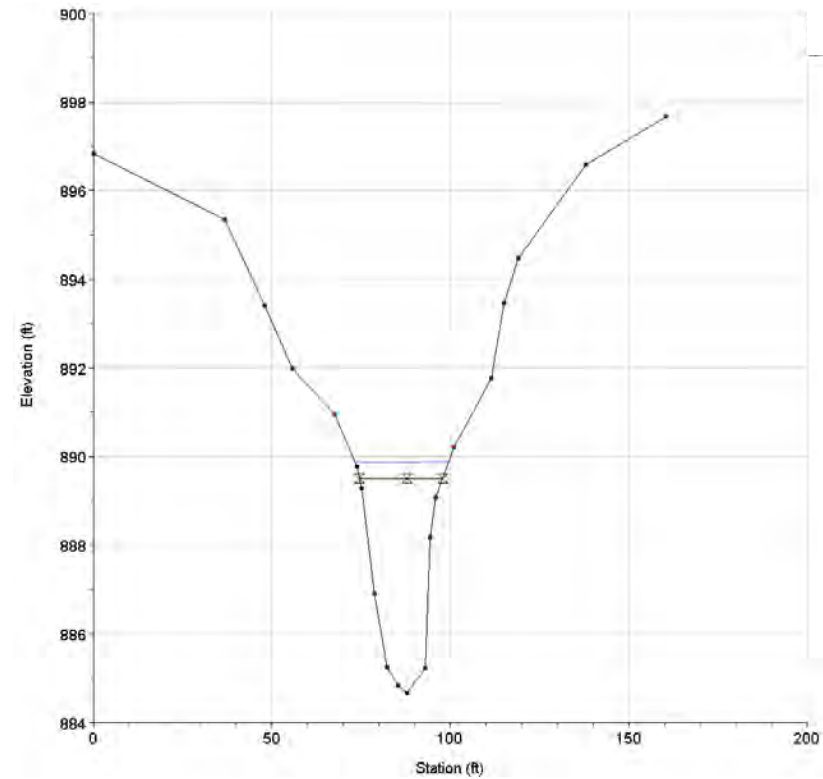
Observation Date: September 27, 2011

RUSH RIVER – 2 – 6.15

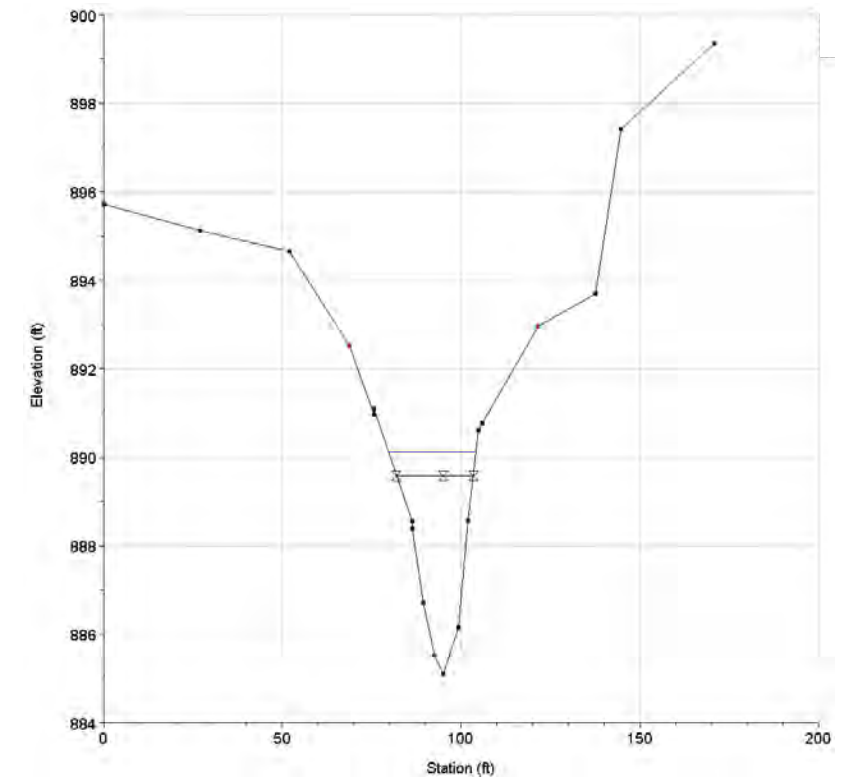
Cross Section 32441



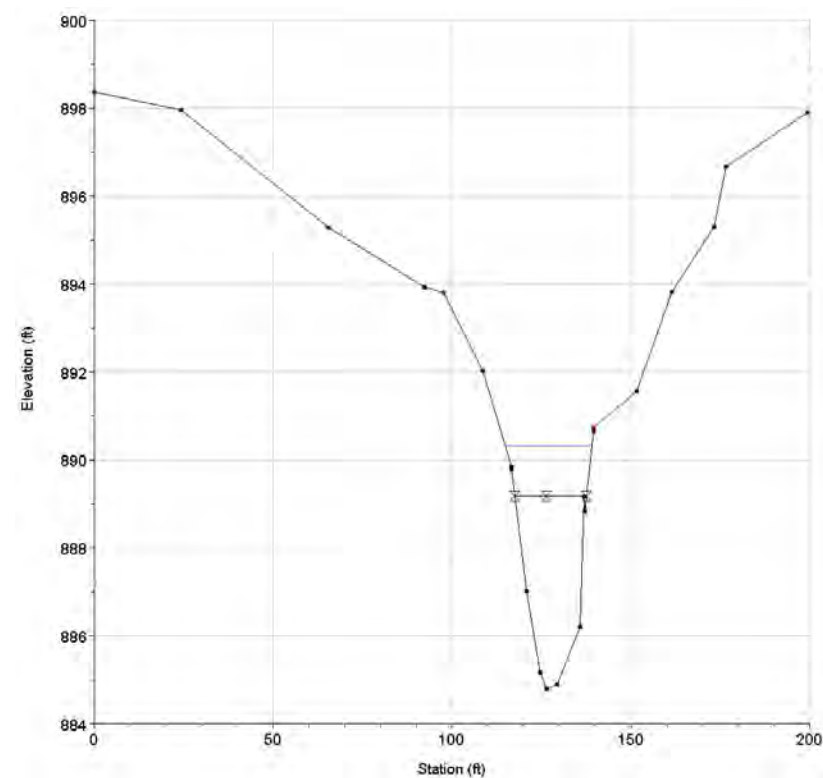
Cross Section 32995



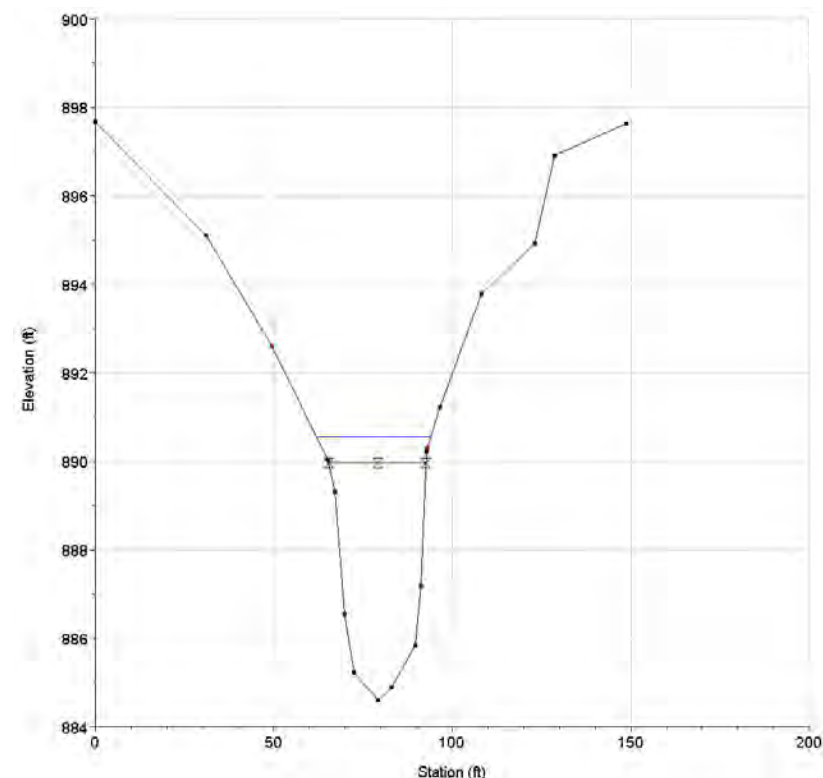
Cross Section 33312



Cross Section 33536



Cross Section 34225



Note: channel dry during field investigation;
no observed or modeled water surface for
day of survey

LEGEND

— Modeled Bankfull Water Surface Elevation

⊗ Observed Bankfull Water Surface Elevation

—■— Ground

● Bank Stations

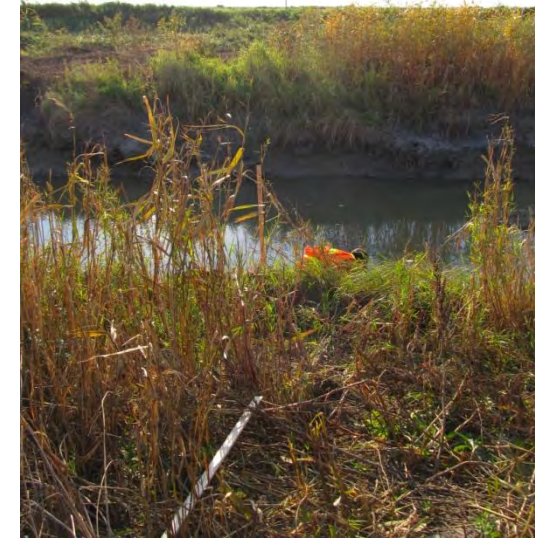
RUSH RIVER – 2– 6.15
OBSERVATION DATE: SEPTEMBER 27, 2011



Field Photo 0550



Field Photo 0551



Field Photo 0552



Field Photo 0553



Field Photo 0554



Field Photo 0555

RUSH RIVER – 2 – 6.15
OBSERVATION DATE: SEPTEMBER 27, 2011



Field Photo 0556



Field Photo 0557



Field Photo 0558



Field Photo 0559



Field Photo 0560



Field Photo 0561

RUSH RIVER – 2 – 6.15
OBSERVATION DATE: SEPTEMBER 27, 2011



Field Photo 0562



Field Photo 0563



Field Photo 0564



Field Photo 0565



Field Photo 0566



Field Photo 0567

RUSH RIVER – 2 – 6.15
OBSERVATION DATE: SEPTEMBER 27, 2011



Field Photo 0568



Field Photo 0569



Field Photo 0570



Field Photo 0571



MIDWEST TESTING LABORATORY



Project No.: M1101216

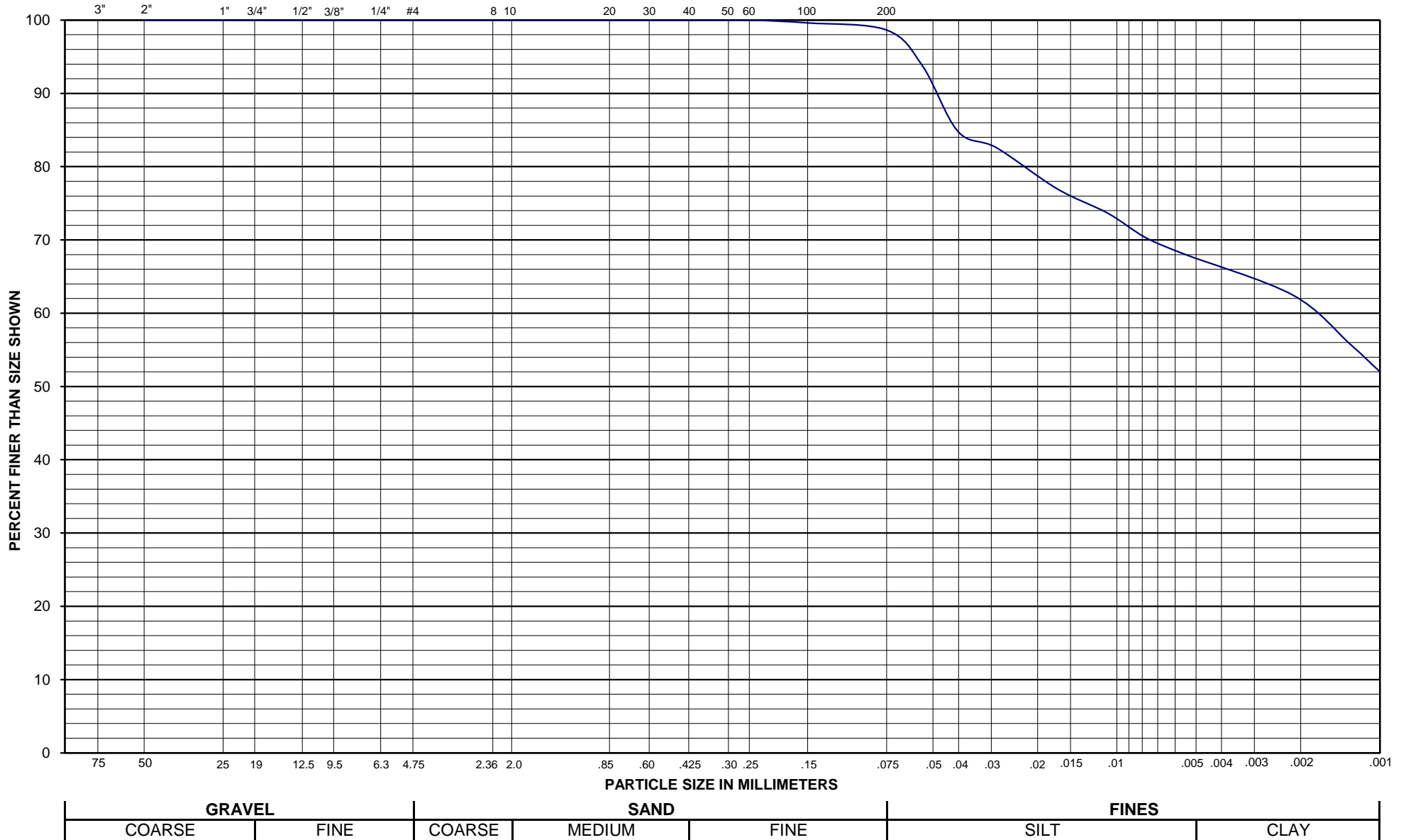
Project: Red River Geomorphic Study
Cass County, North Dakota

Sample Source: #9 (Rush2 - RB)

Classification: FAT CLAY - dark brown (CH)

Reported to: West Consultants, Inc.

GRAIN SIZE DISTRIBUTION CURVE U.S. Standard Sieve Sizes





MIDWEST TESTING LABORATORY



Project No.: M1101216

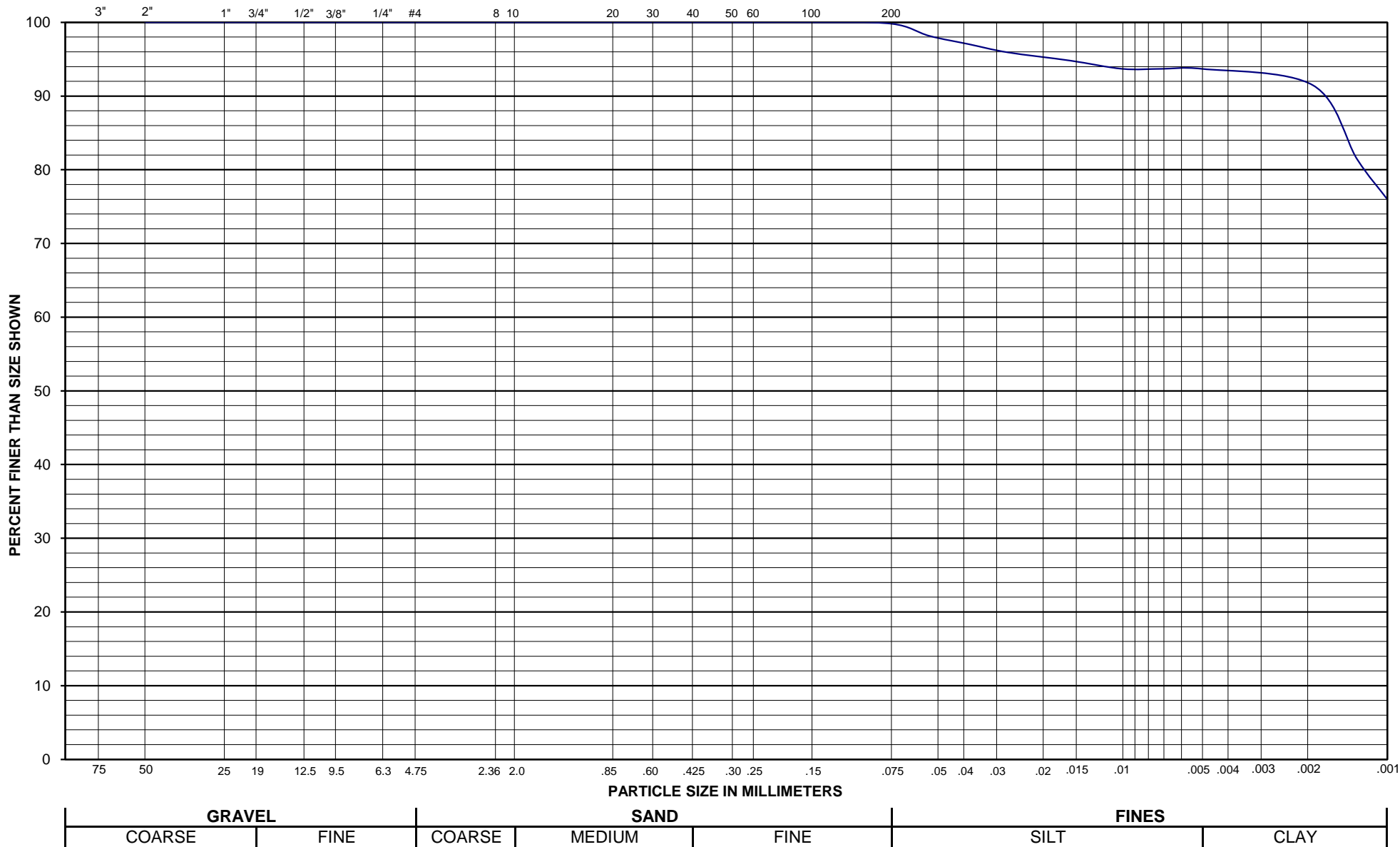
Project: Red River Geomorphic Study
Cass County, North Dakota

Sample Source: #8 (Rush2 - LB)

Classification: FAT CLAY - grayish brown (CH)

Reported to: West Consultants, Inc.

GRAIN SIZE DISTRIBUTION CURVE U.S. Standard Sieve Sizes





MIDWEST TESTING LABORATORY



Project No.: M1101216

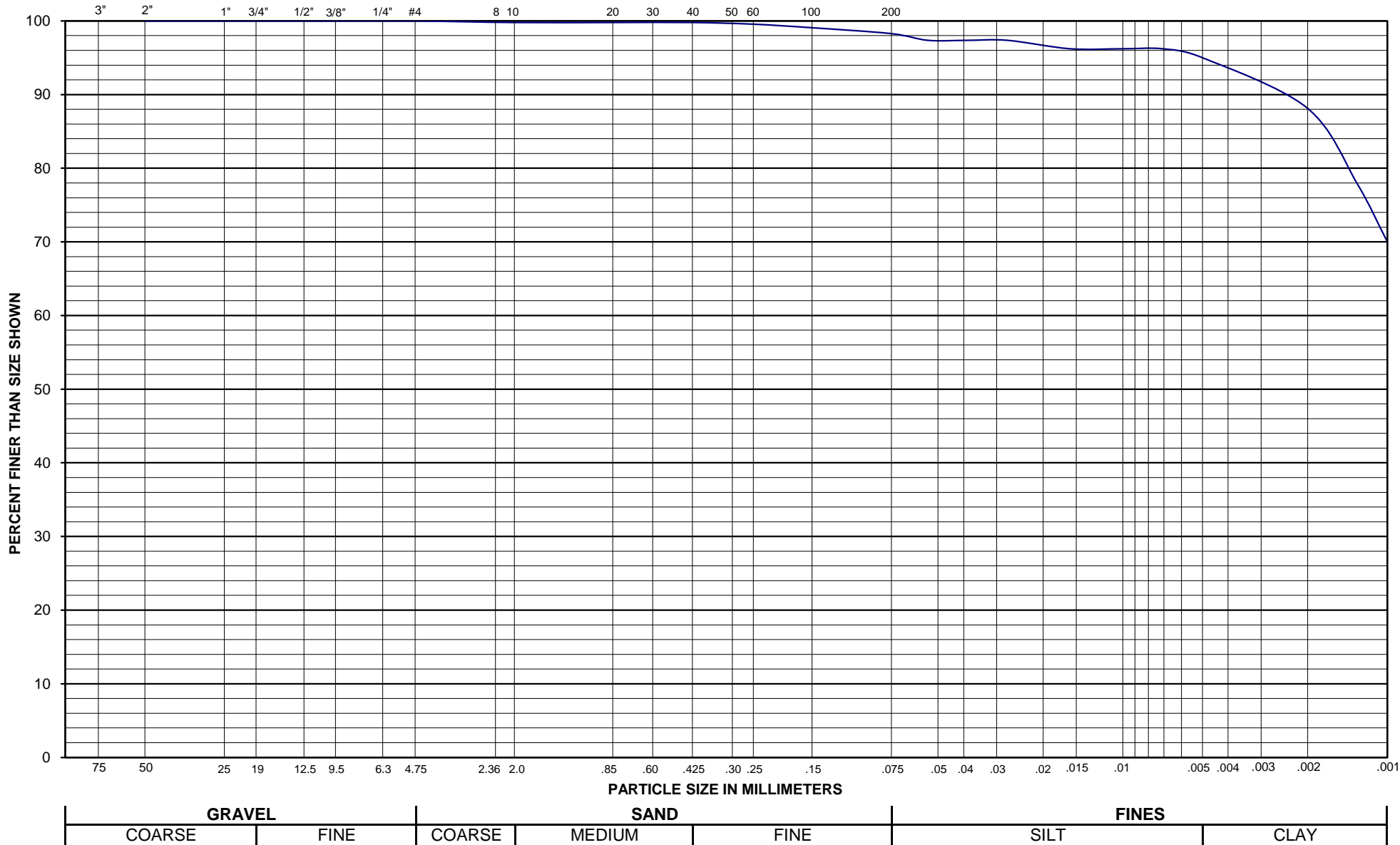
Project: Red River Geomorphic Study
Cass County, North Dakota

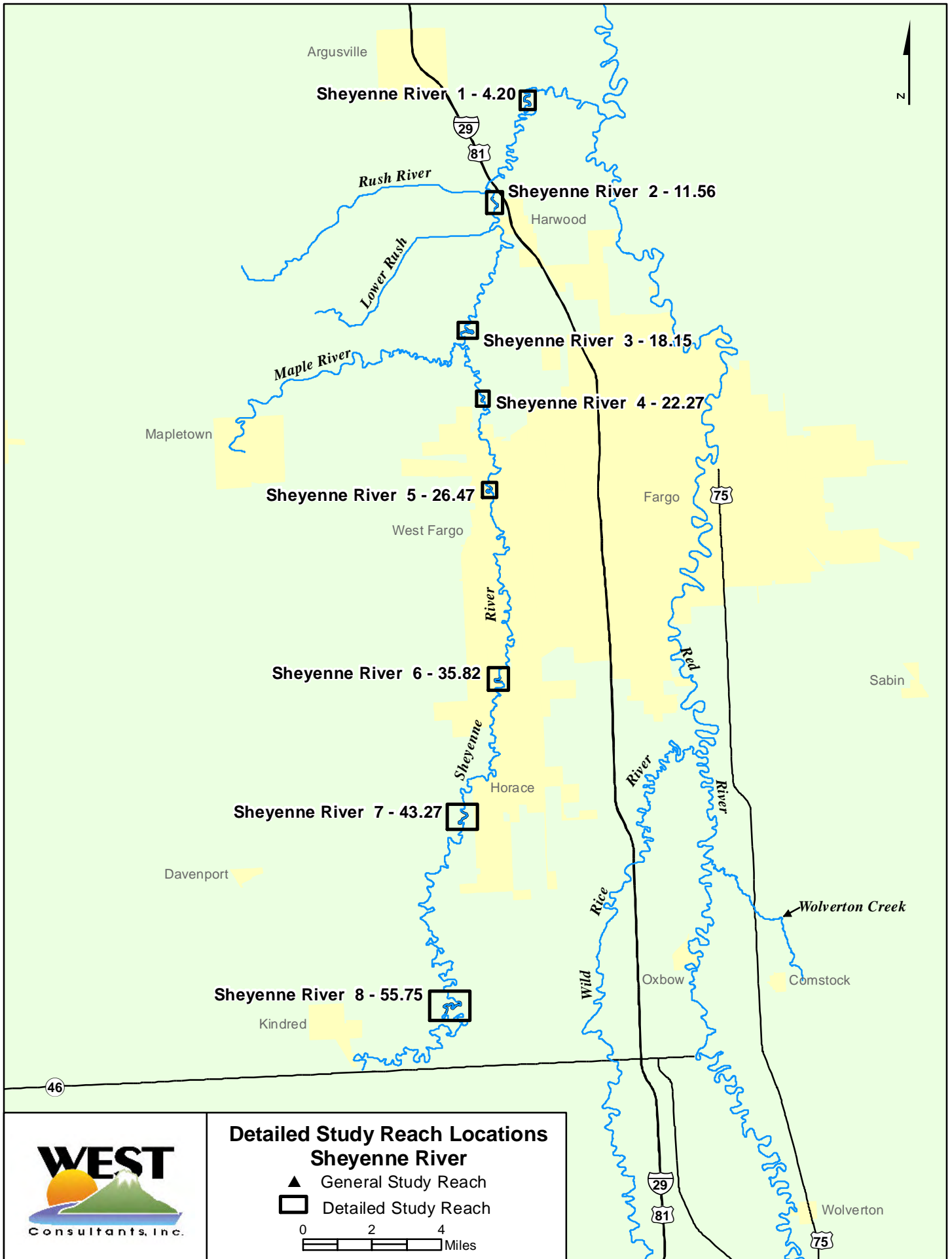
Sample Source: #11 (Rush2 - CH)

Classification: FAT CLAY - grayish brown (CH)

Reported to: West Consultants, Inc.

GRAIN SIZE DISTRIBUTION CURVE U.S. Standard Sieve Sizes





Argusville

Sheyenne River 1 - 4.20

29
81

Rush River

Sheyenne River 2 - 11.56

Harwood

Lower Rush
Maple River

Sheyenne River 3 - 18.15

Mapletown

Sheyenne River 4 - 22.27

Sheyenne River 5 - 26.47

Fargo

75

West Fargo

River

Sheyenne River 6 - 35.82

Sabin

Sheyenne

Horace

Sheyenne River 7 - 43.27

River

Davenport

Rice

Wild

Oxbow

Wolverton Creek

Sheyenne River 8 - 55.75

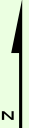
Comstock

Kindred

29
81

Wolverton

75



46



LEGEND

- Cross Section
 - - - Detailed Study Reach
 - Sediment Sample
 - ▲ Field Photos
 - 0750 Direction Arrow and Photo Number
- 0 75 150
Feet

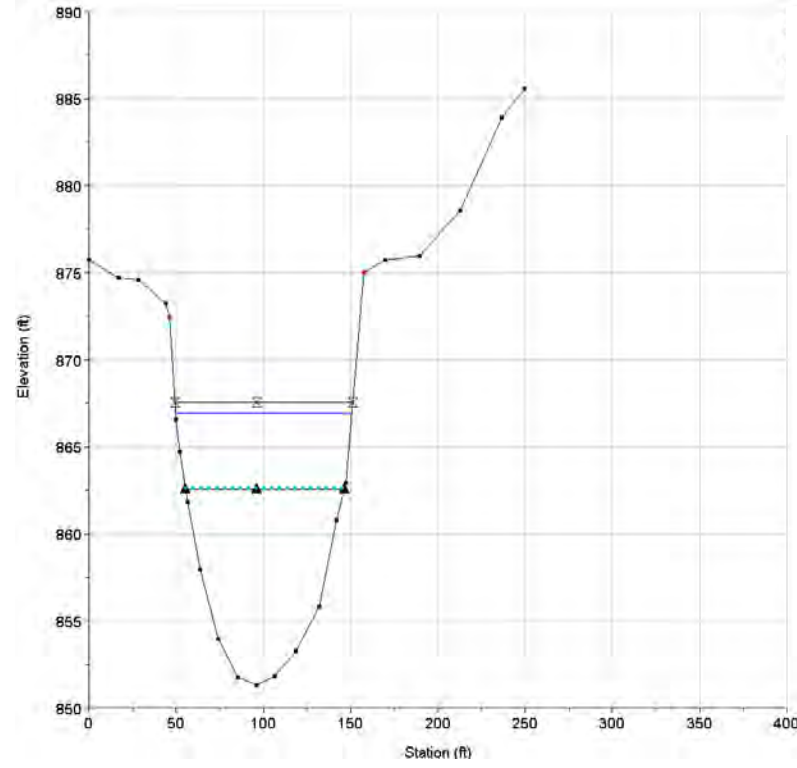


SHEYENNE RIVER - 1 - 4.20

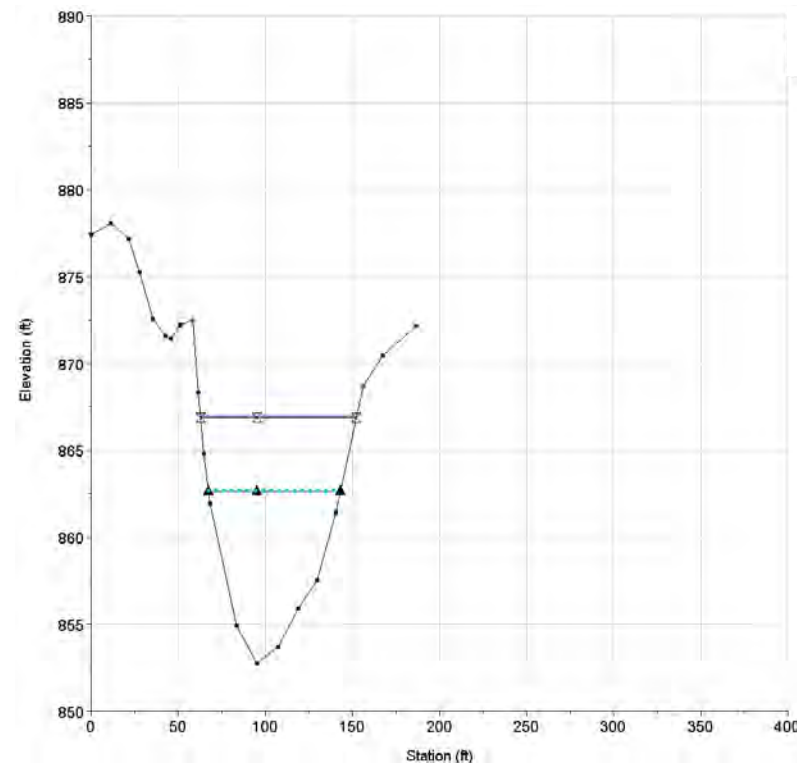
Observation Date: October 6, 2011

SHEYENNE RIVER – 1 – 4.20

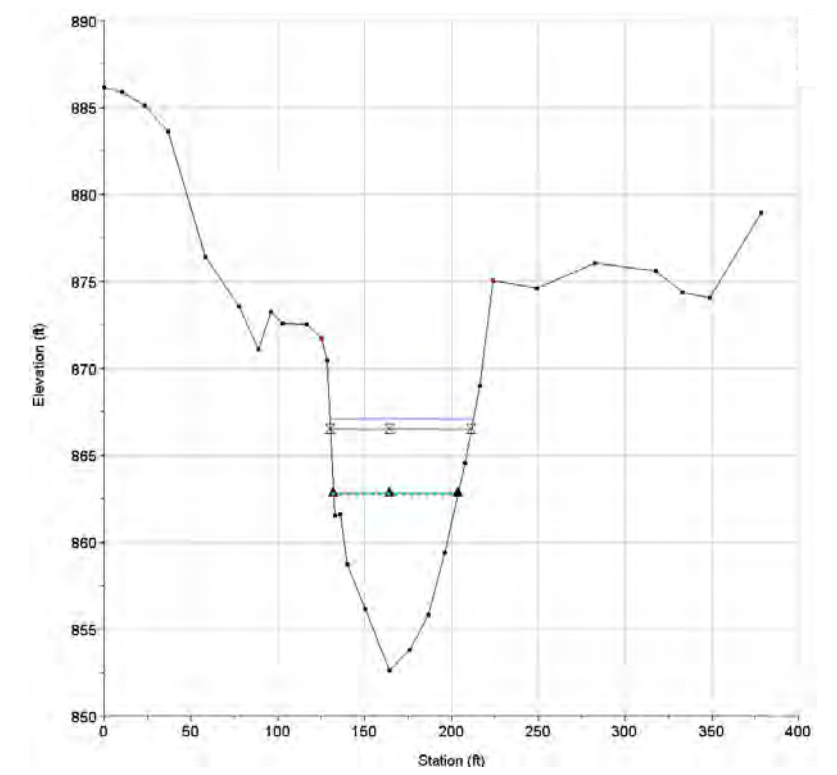
Cross Section 22176.1



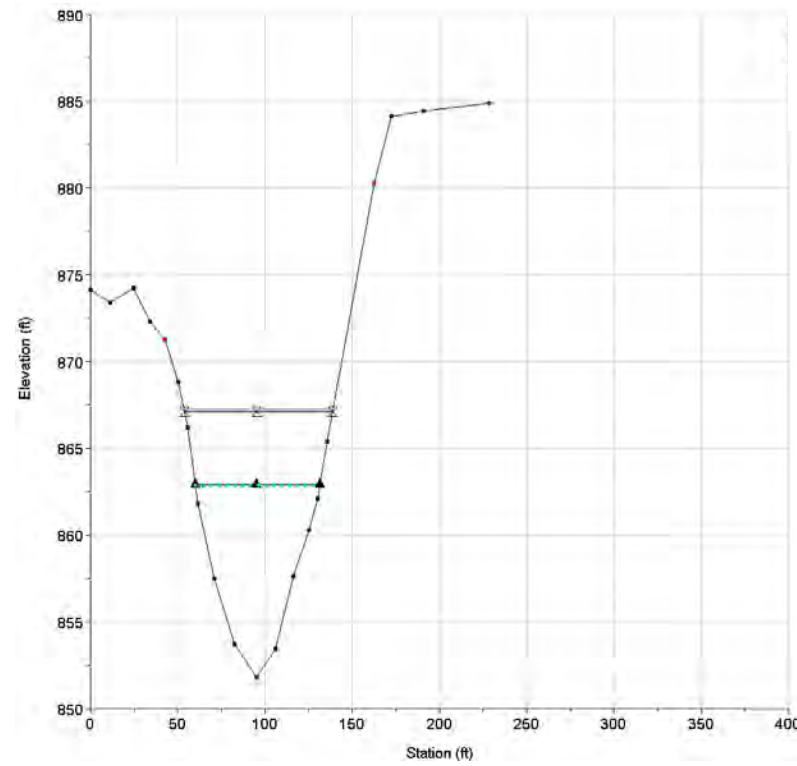
Cross Section 22671.2



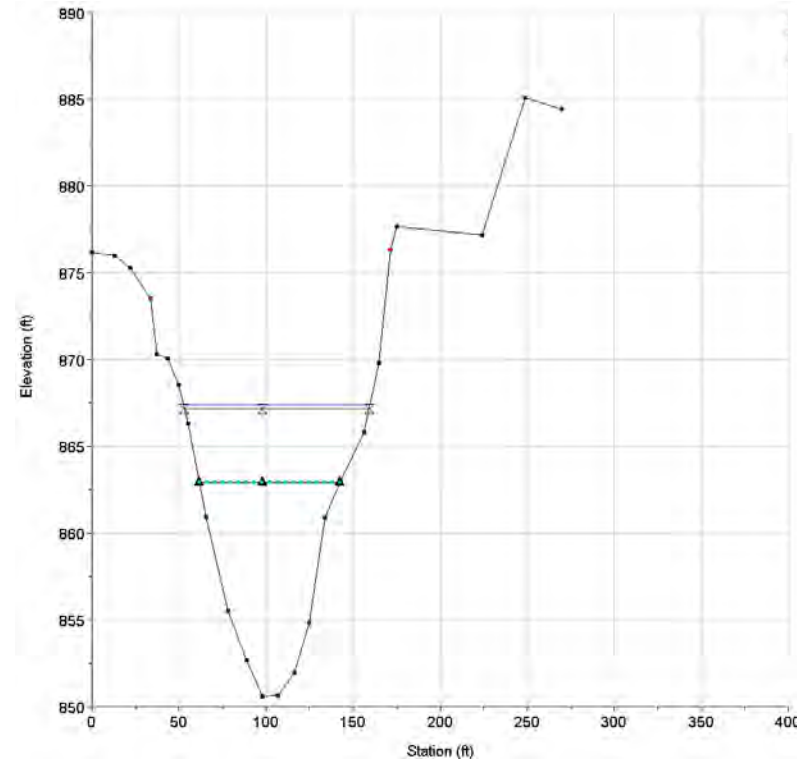
Cross Section 23343.3



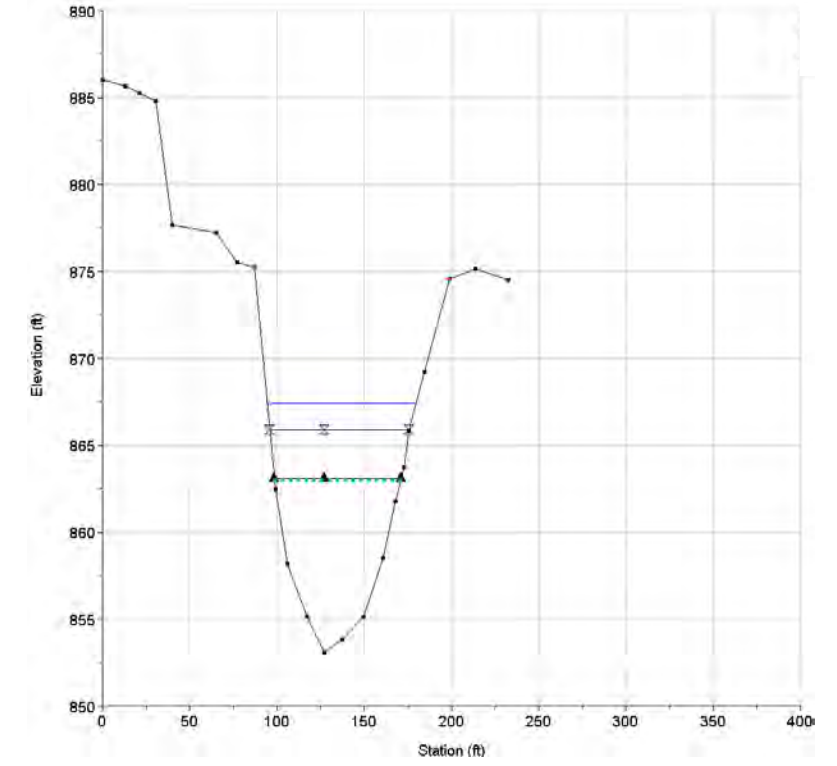
Cross Section 24078.7



Cross Section 24799.5



Cross Section 25280.8



LEGEND

- Modeled Water Surface Elevation for Day of Survey
- Modeled Bankfull Water Surface Elevation
- ▲ Observed Water Surface Elevation
- X— Observed Bankfull Water Surface Elevation
- Ground
- Bank Stations

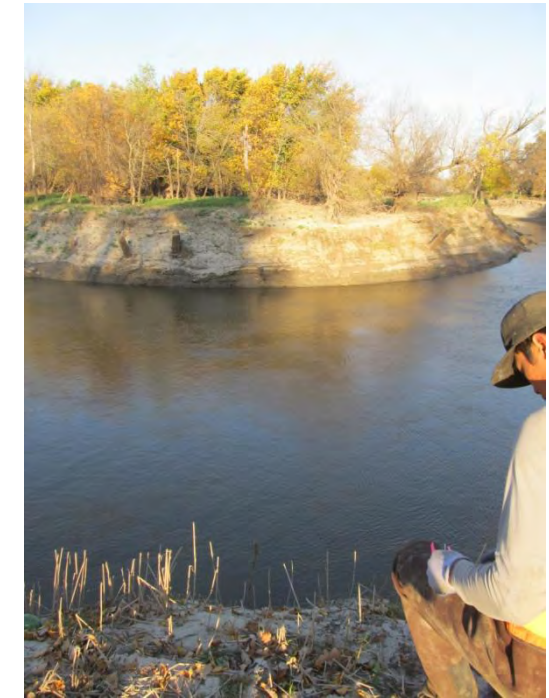
SHEYENNE RIVER – 1 – 4.20
OBSERVATION DATE: OCTOBER 6, 2011



Field Photo 0821



Field Photo 0822



Field Photo 0823



Field Photo 0824



Field Photo 0825



Field Photo 0826

SHEYENNE RIVER – 1 – 4.20
OBSERVATION DATE: OCTOBER 6, 2011



Field Photo 0827



Field Photo 0828



Field Photo 0829



Field Photo 0830



Field Photo 0831



Field Photo 0832

SHEYENNE RIVER – 1 – 4.20
OBSERVATION DATE: OCTOBER 6, 2011



Field Photo 0833



Field Photo 0834



Field Photo 0835



Field Photo 0836



Field Photo 0839



Field Photo 0840

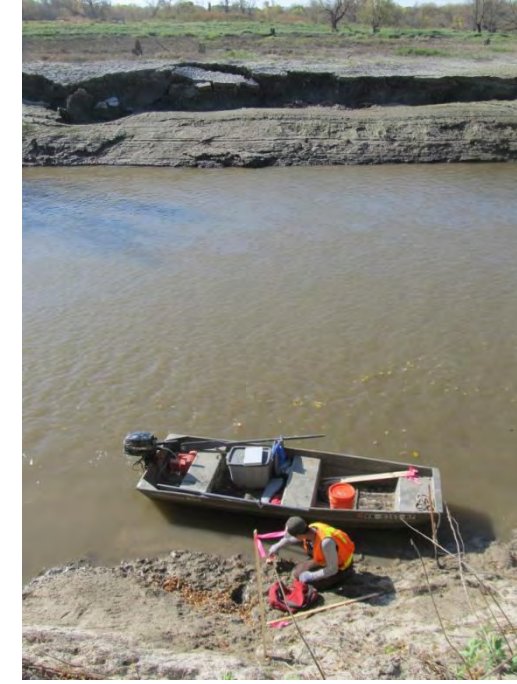
SHEYENNE RIVER – 1 – 4.20
OBSERVATION DATE: OCTOBER 6, 2011



Field Photo 0841



Field Photo 0842



Field Photo 0843



Field Photo 0844



MIDWEST TESTING LABORATORY



Project No.: M1101216

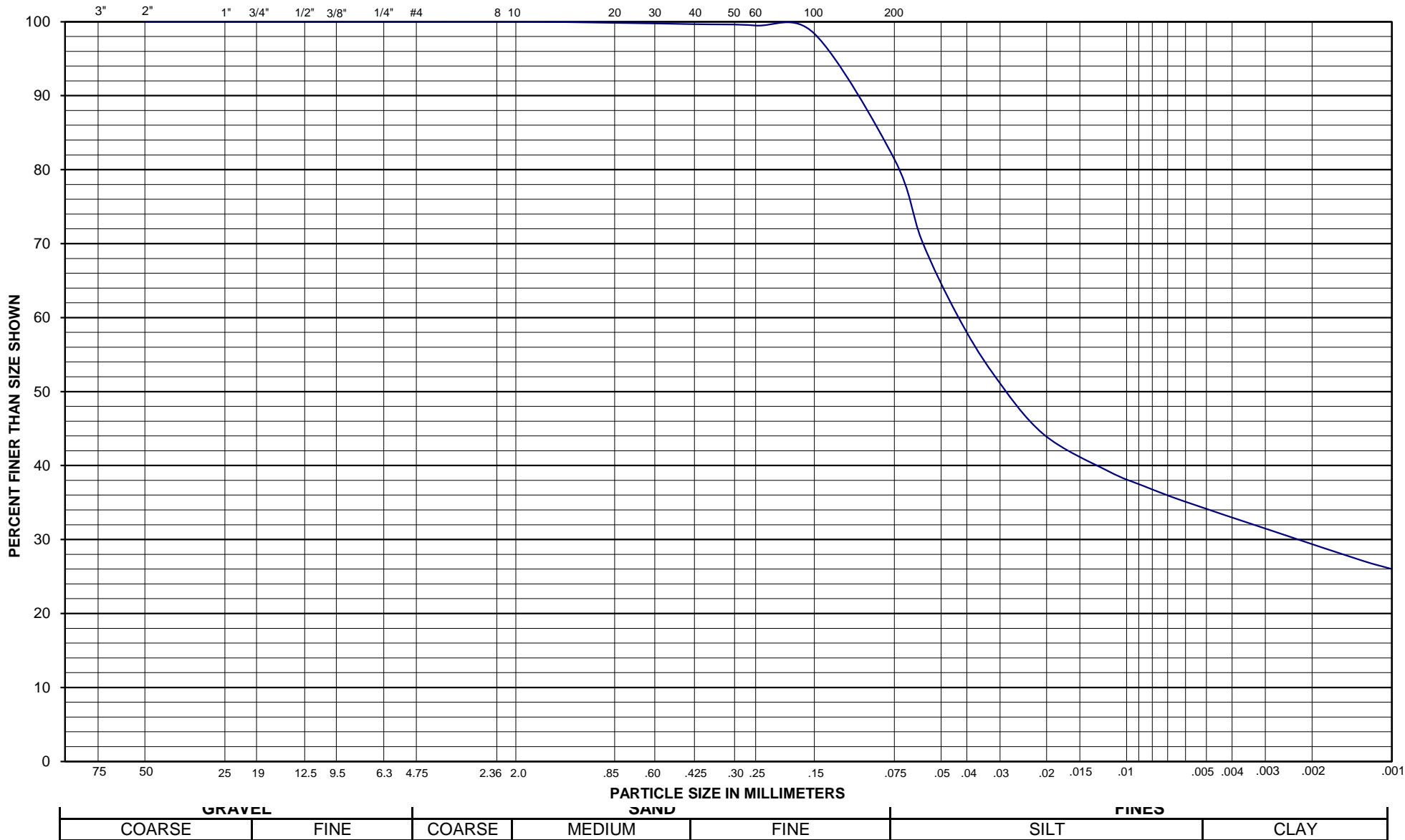
Project: Red River Geomorphic Study
Cass County, North Dakota

Sample Source: #66 (SR/3529/RB)

Classification: FAT CLAY WITH SAND - dark brown (CH)

Reported to: West Consultants, Inc.

GRAIN SIZE DISTRIBUTION CURVE U.S. Standard Sieve Sizes





MIDWEST TESTING LABORATORY



Project No.: M1101216

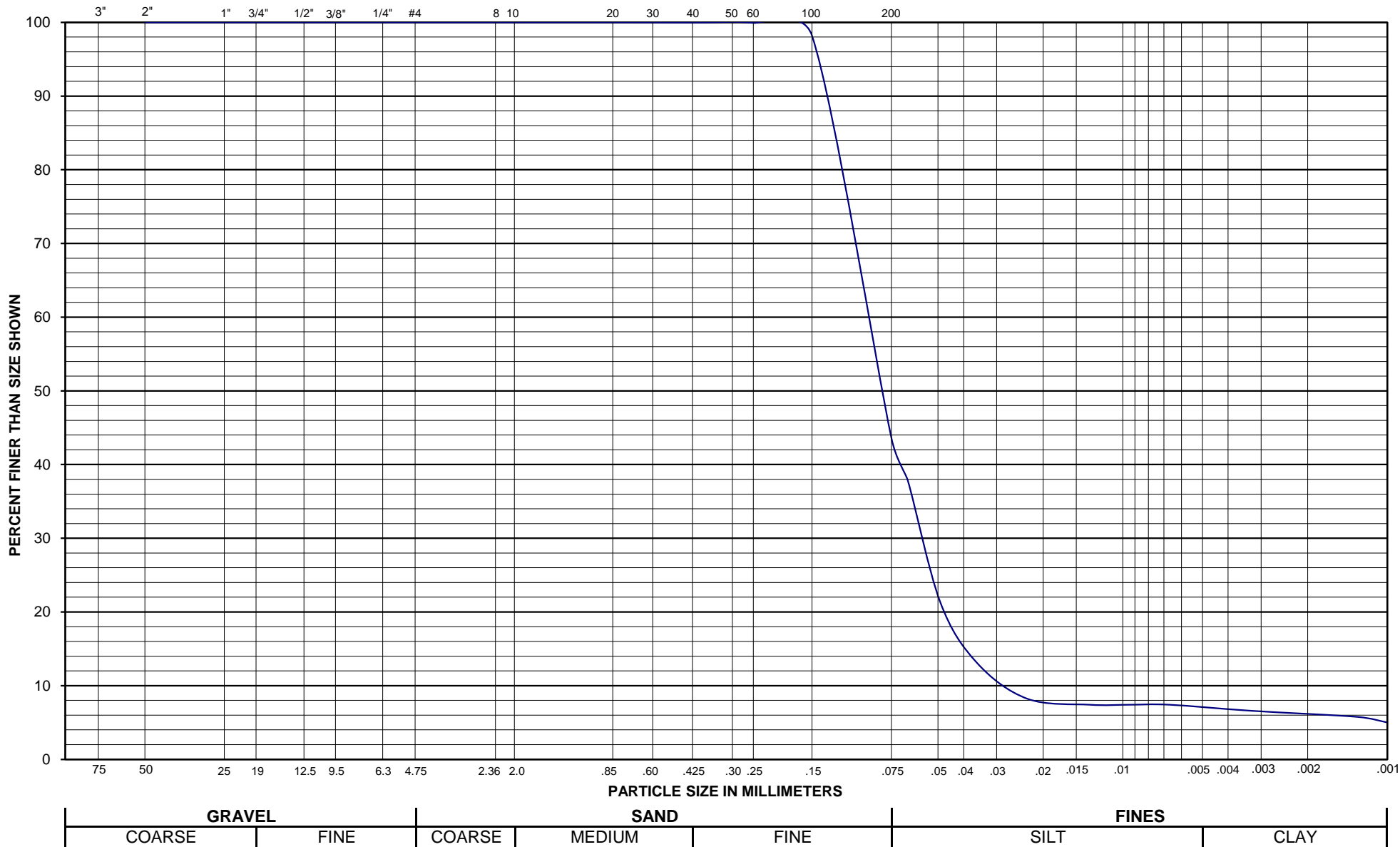
Project: Red River Geomorphic Study
Cass County, North Dakota

Sample Source: #46 (SR1/3525/LB)

Classification: SILTY SAND - dark brown (SM)

Reported to: West Consultants, Inc.

GRAIN SIZE DISTRIBUTION CURVE U.S. Standard Sieve Sizes





MIDWEST TESTING LABORATORY



Project No.: M1101216

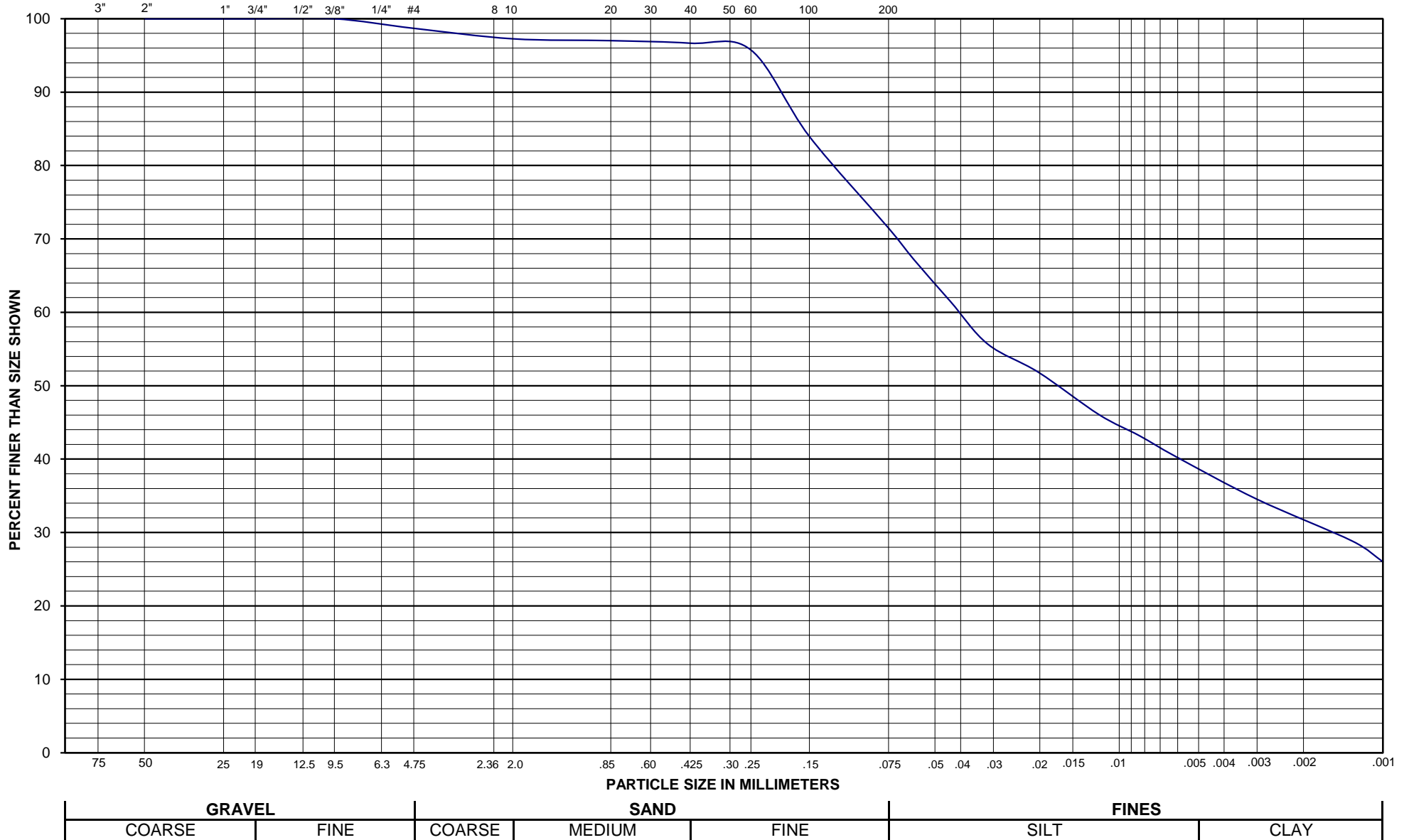
Project: Red River Geomorphic Study
Cass County, North Dakota

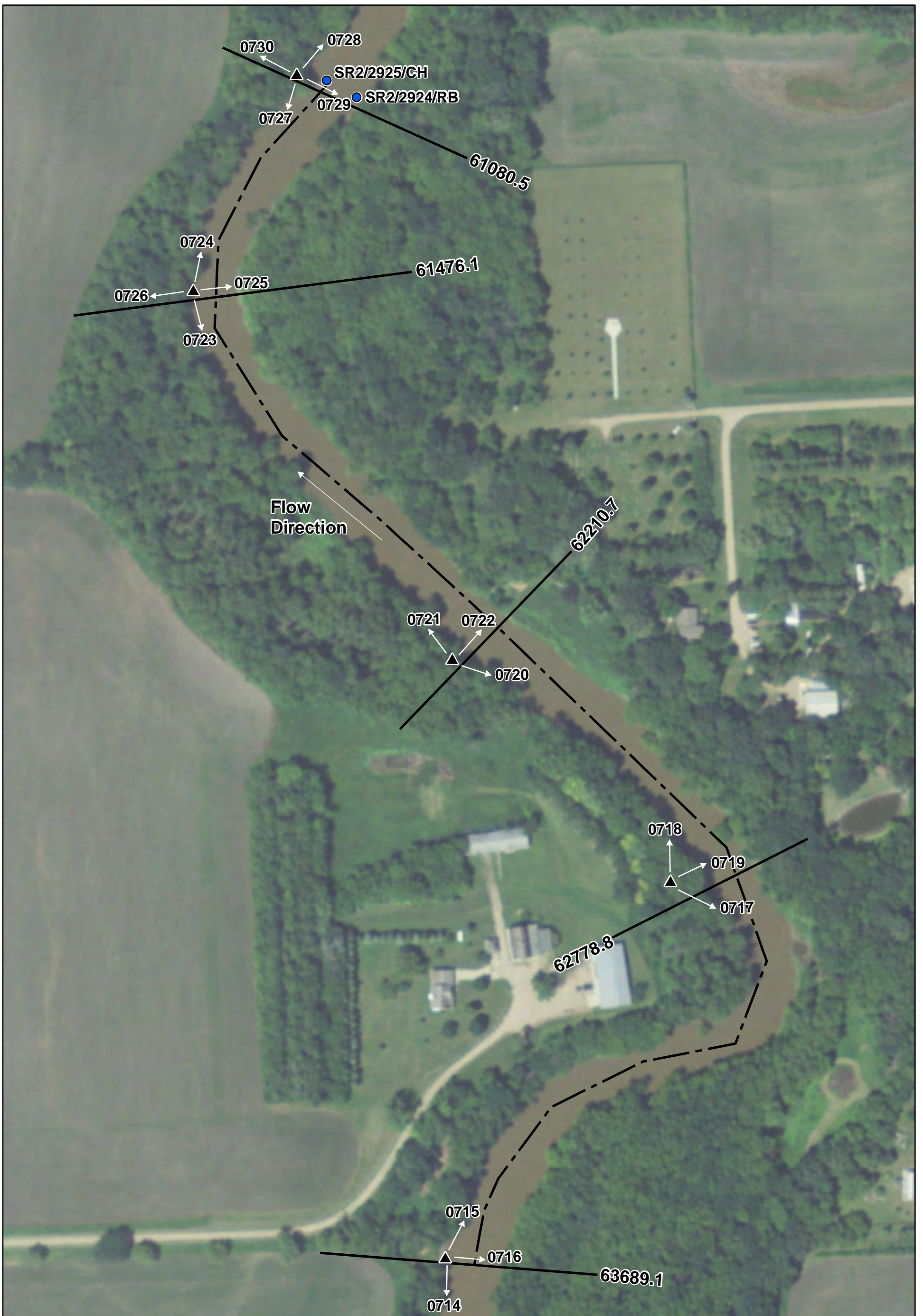
Sample Source: #55 (SR1/3530/CH)

Classification: FAT CLAY WITH SAND - dark grayish brown, with a trace of gravel (CH)

Reported to: West Consultants, Inc.

GRAIN SIZE DISTRIBUTION CURVE U.S. Standard Sieve Sizes





LEGEND

- Cross Section
 - - - Detailed Study Reach
 - Sediment Sample
 - ▲ Field Photos
 - 0750 Direction Arrow and Photo Number
- 0 75 150
Feet

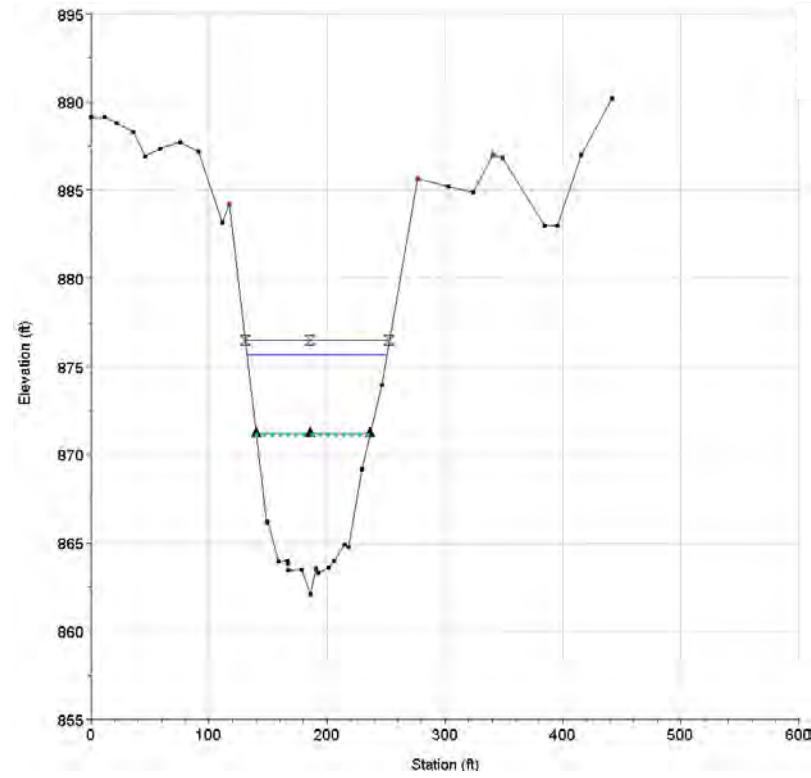


SHEYENNE RIVER - 2 - 11.56

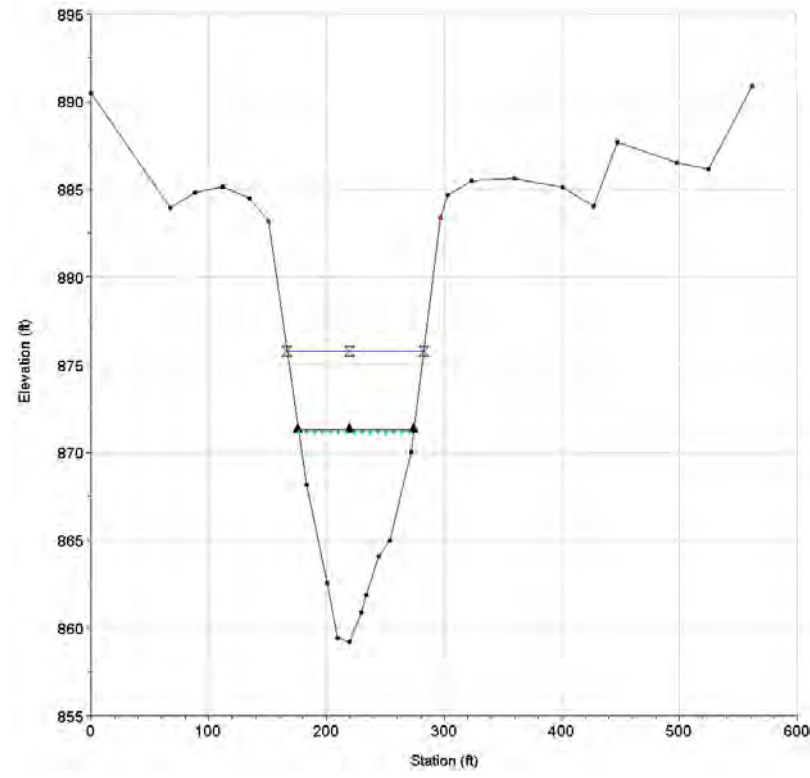
Observation Date: October 11, 2011

SHEYENNE RIVER – 2 – 11.56

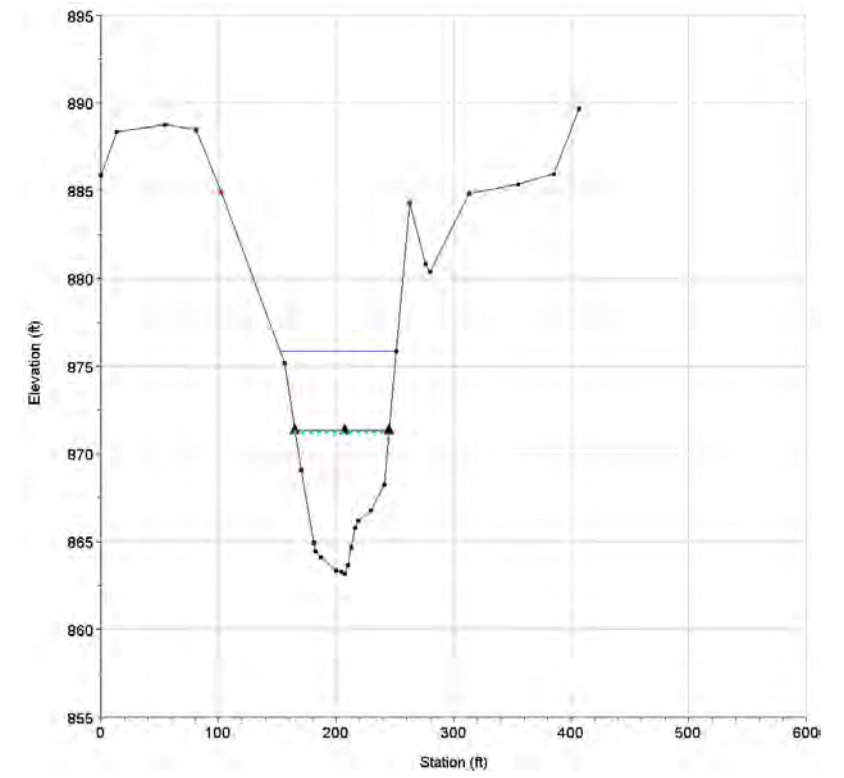
Cross Section 61080.5



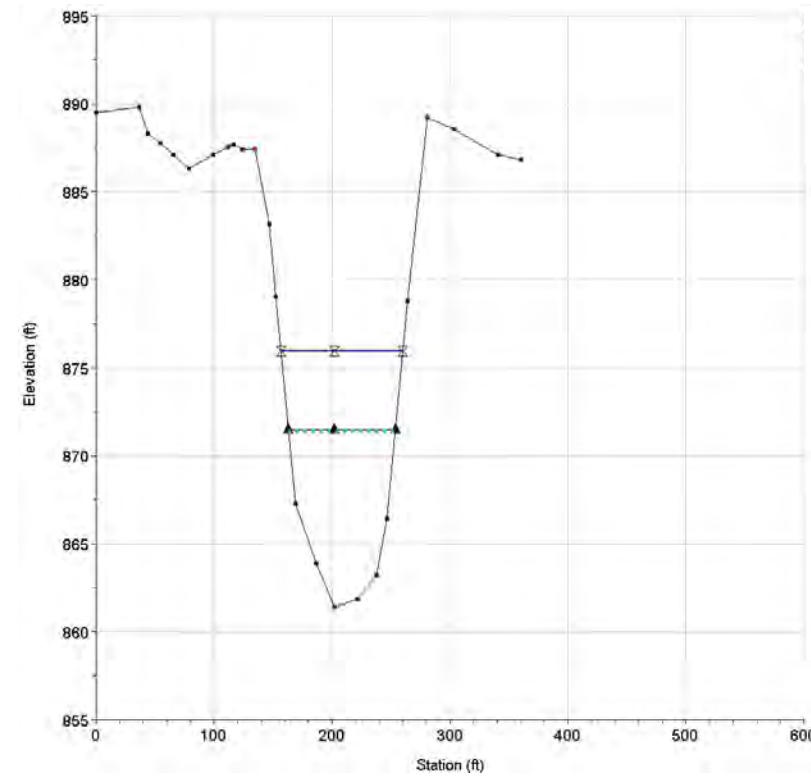
Cross Section 61476.1



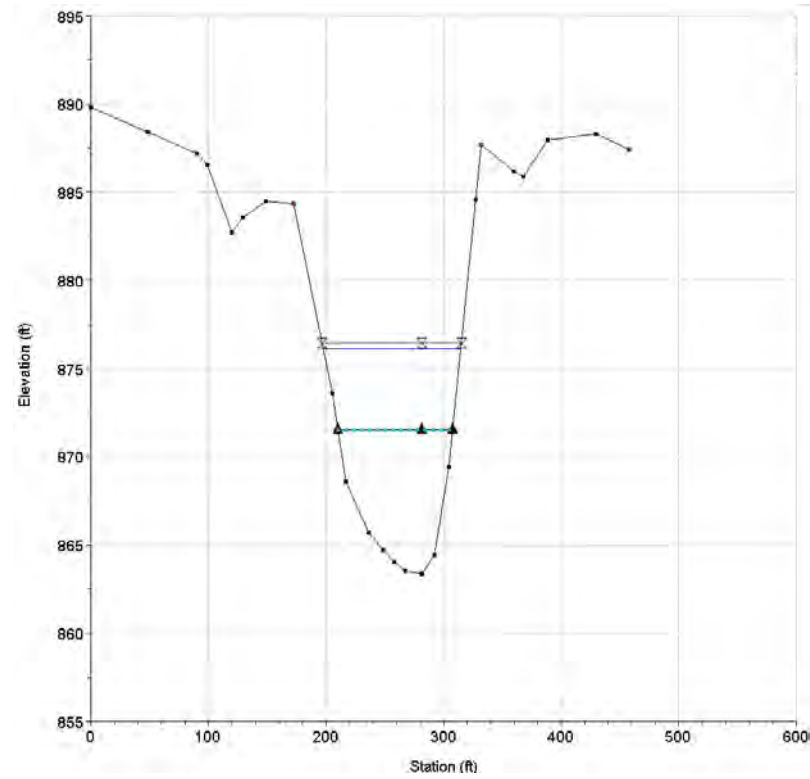
Cross Section 62210.7



Cross Section 62778.8



Cross Section 63689.1



LEGEND

- Modeled Water Surface Elevation for Day of Survey
- Modeled Bankfull Water Surface Elevation
- ▲ Observed Water Surface Elevation
- ⊗ Observed Bankfull Water Surface Elevation
- Ground
- Bank Stations

SHEYENNE RIVER – 2 – 11.56
OBSERVATION DATE: OCTOBER 11, 2011



Field Photo 0714



Field Photo 0715



Field Photo 0716



Field Photo 0717



Field Photo 0718



Field Photo 0719

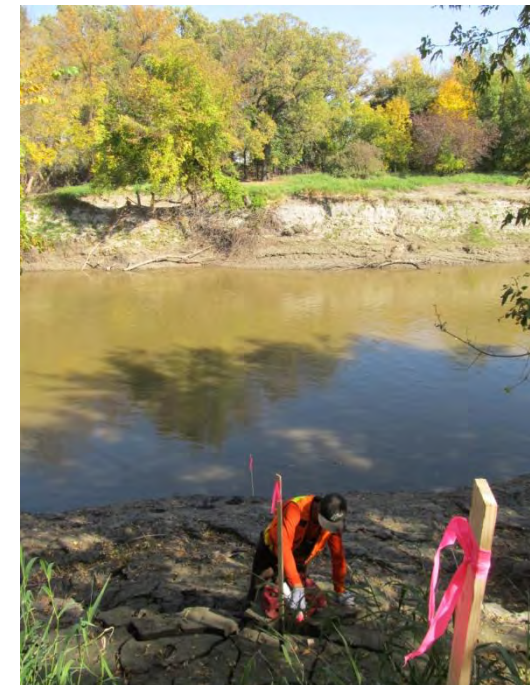
SHEYENNE RIVER – 2 – 11.56
OBSERVATION DATE: OCTOBER 11, 2011



Field Photo 0720



Field Photo 0721



Field Photo 0722



Field Photo 0723



Field Photo 0724



Field Photo 0725

SHEYENNE RIVER – 2 – 11.56
OBSERVATION DATE: OCTOBER 11, 2011



Field Photo 0726



Field Photo 0727



Field Photo 0728



Field Photo 0729



Field Photo 0730



MIDWEST TESTING LABORATORY



Project No.: M1101216

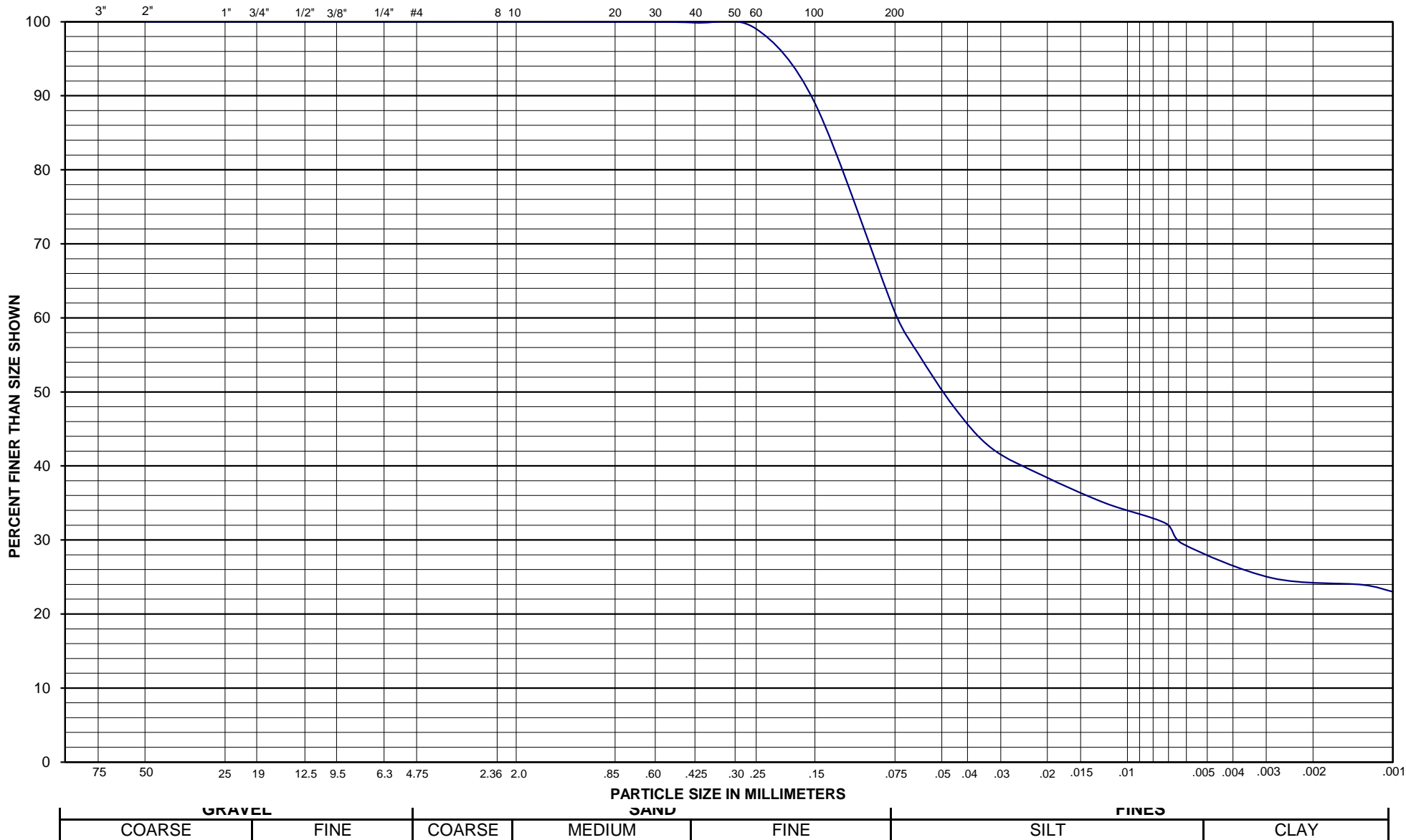
Project: Red River Geomorphic Study
Cass County, North Dakota

Sample Source: #70 SR2/2924/RB

Classification: SANDY FAT CLAY - dark brown (CH)

Reported to: West Consultants, Inc.

GRAIN SIZE DISTRIBUTION CURVE U.S. Standard Sieve Sizes





MIDWEST TESTING LABORATORY



Project No.: M1101216

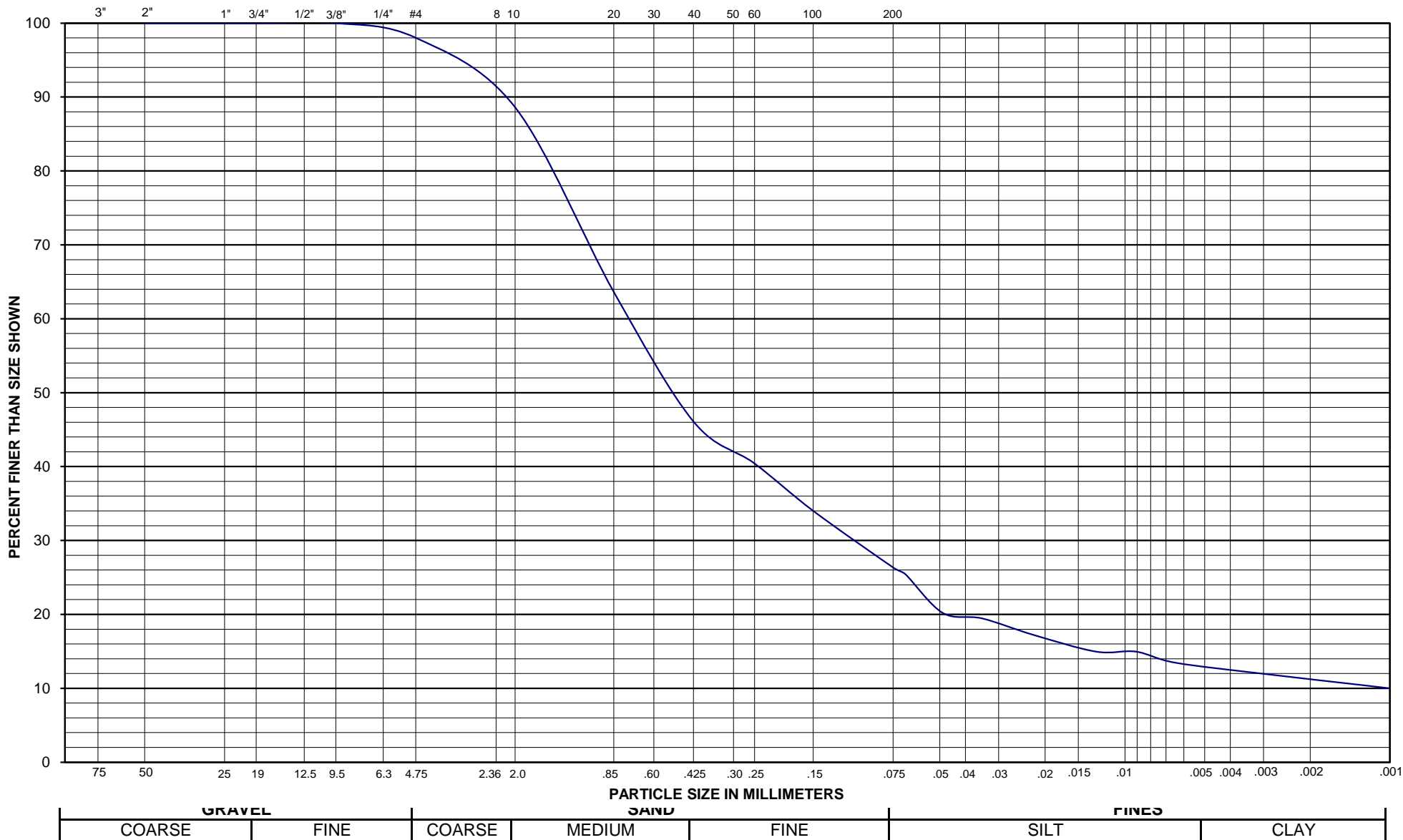
Project: Red River Geomorphic Study
Cass County, North Dakota

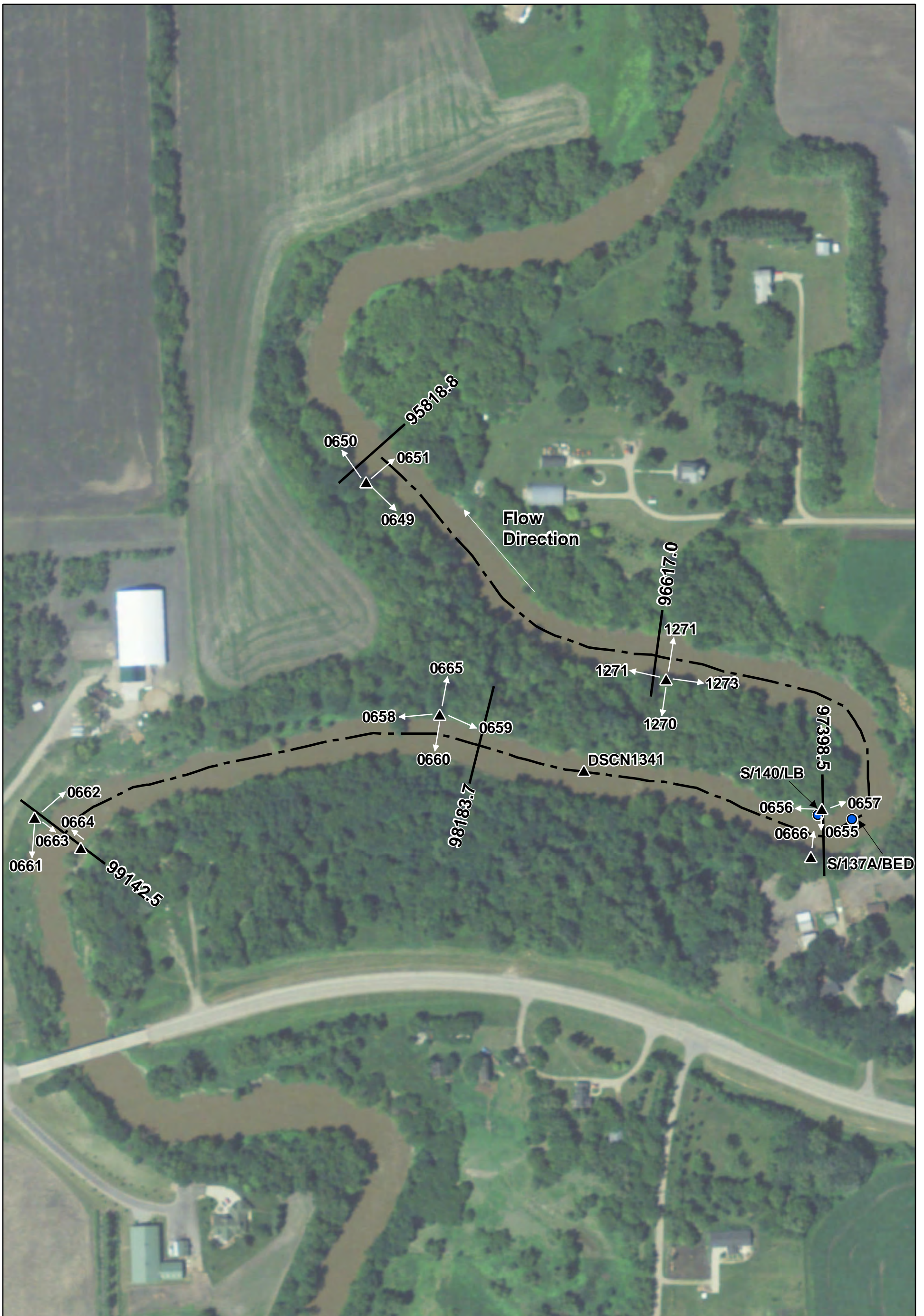
Sample Source: #65 SR2/2925/CH

Classification: POORLY GRADED SAND WITH SILT-dark brown, with a trace of gravel (SP-SM)

Reported to: West Consultants, Inc.

GRAIN SIZE DISTRIBUTION CURVE U.S. Standard Sieve Sizes





LEGEND

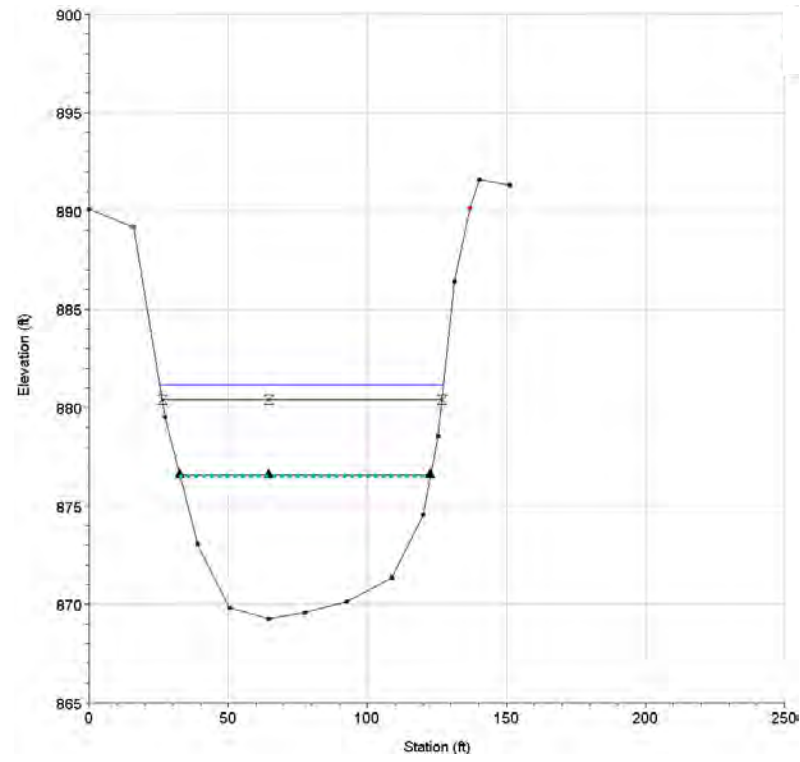
- Cross Section
 - - - Detailed Study Reach
 - Sediment Sample
 - ▲ Field Photos
 - 0750 Direction Arrow and Photo Number
- 0 100 200
Feet



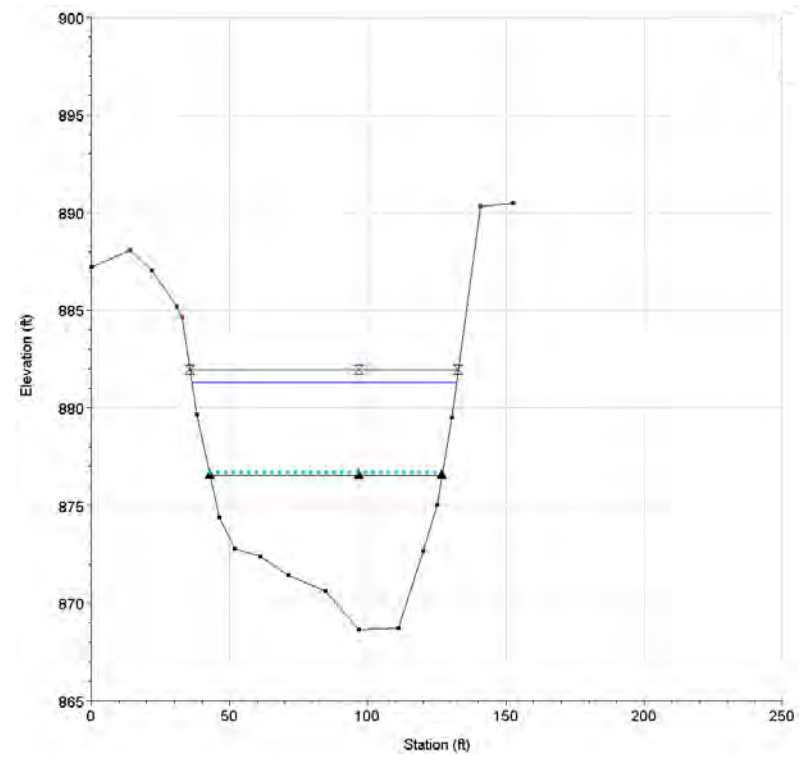
SHEYENNE RIVER - 3 - 18.15
Observation Date: November 17, 2010
September 30, 2011

SHEYENNE RIVER – 3 – 18.15

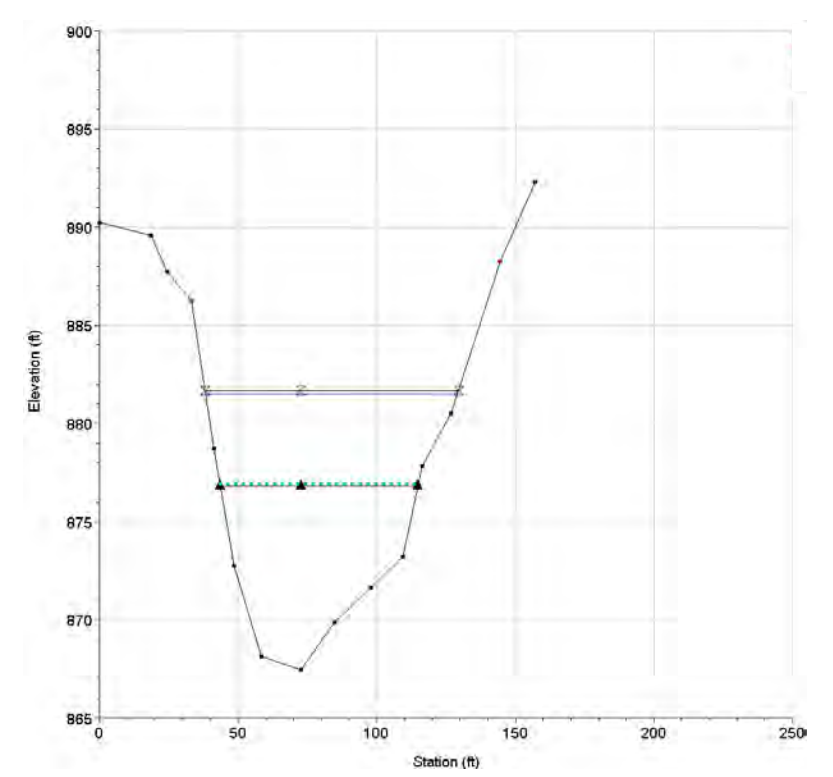
Cross Section 95818.8



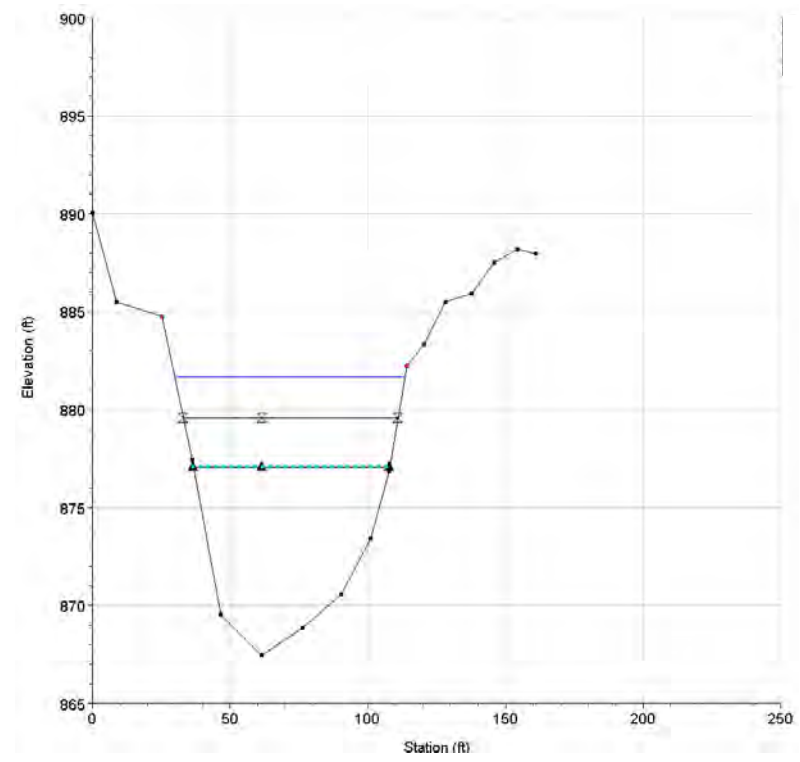
Cross Section 96617.0



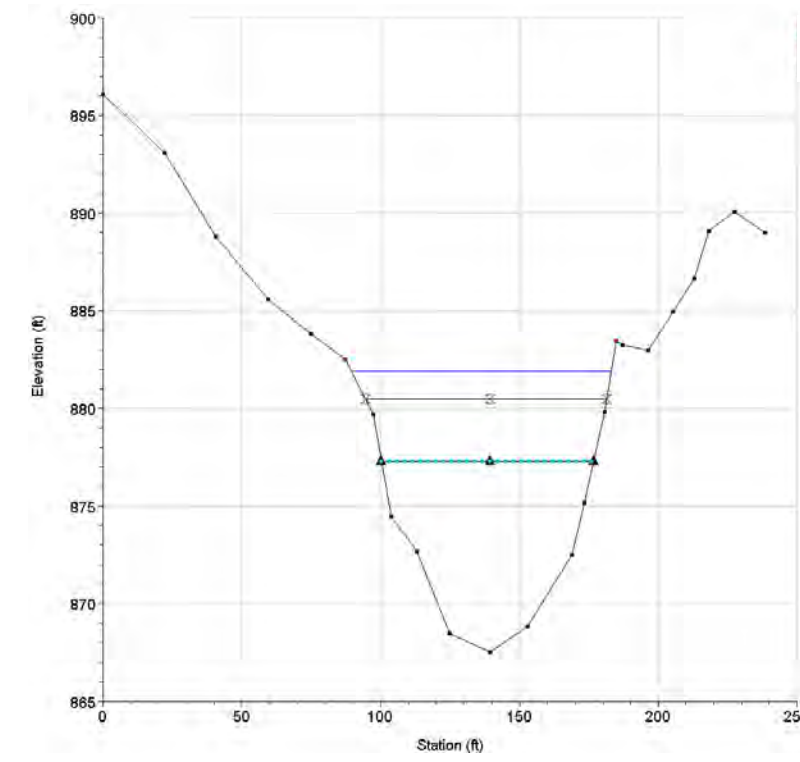
Cross Section 97398.5



Cross Section 98183.7



Cross Section 99142.5



LEGEND

- Modeled Water Surface Elevation for Day of Survey
- Modeled Bankfull Water Surface Elevation
- ▲ Observed Water Surface Elevation
- ⊗ Observed Bankfull Water Surface Elevation
- Ground
- Bank Stations

SHEYENNE RIVER – 3 – 18.15
OBSERVATION DATES: NOVEMBER 17, 2010
SEPTEMBER 30, 2011



Field Photo 0649



Field Photo 0650



Field Photo 0651



Field Photo 0655



Field Photo 0656



Field Photo 0657

SHEYENNE RIVER – 3 – 18.15
OBSERVATION DATES: NOVEMBER 17, 2010
SEPTEMBER 30, 2011



Field Photo 0658



Field Photo 0659



Field Photo 0660



Field Photo 0661



Field Photo 0662



Field Photo 0663

SHEYENNE RIVER – 3 – 18.15
OBSERVATION DATES: NOVEMBER 17, 2010
SEPTEMBER 30, 2011



Field Photo 0664



Field Photo 0665



Field Photo 0666



Field Photo DSCN 1341



Field Photo 1270



Field Photo 1271



Field Photo 1273



MIDWEST TESTING LABORATORY



Project No.: 16216

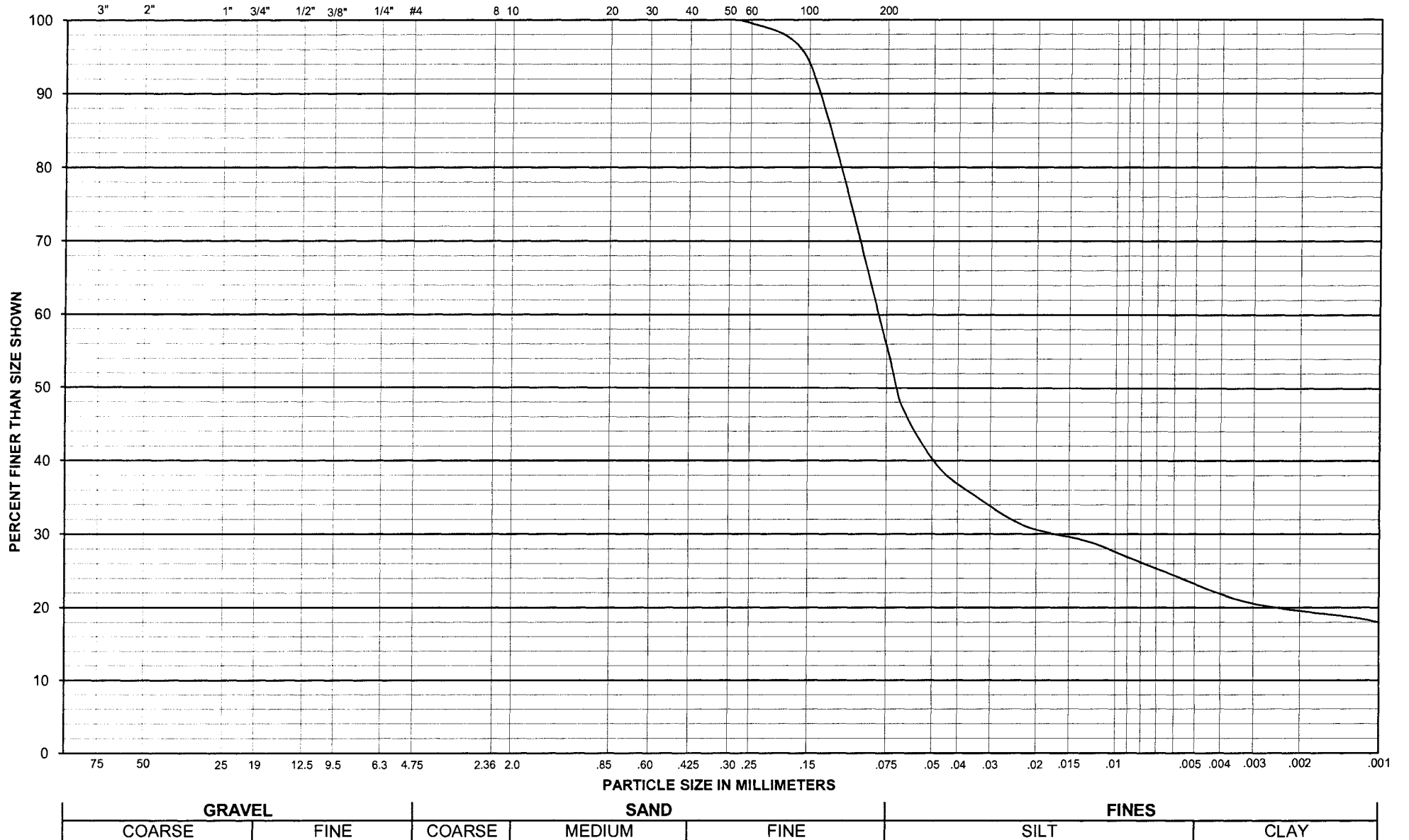
Project: Red River Geomorphic Study
Cass County, North Dakota

Sample Source: TN 7499 - S/137A/Bed

Classification: SANDY SILT - grayish brown

Reported to: West Consultants, Inc.

GRAIN SIZE DISTRIBUTION CURVE U.S. Standard Sieve Sizes





MIDWEST TESTING LABORATORY



Project No.: 16216

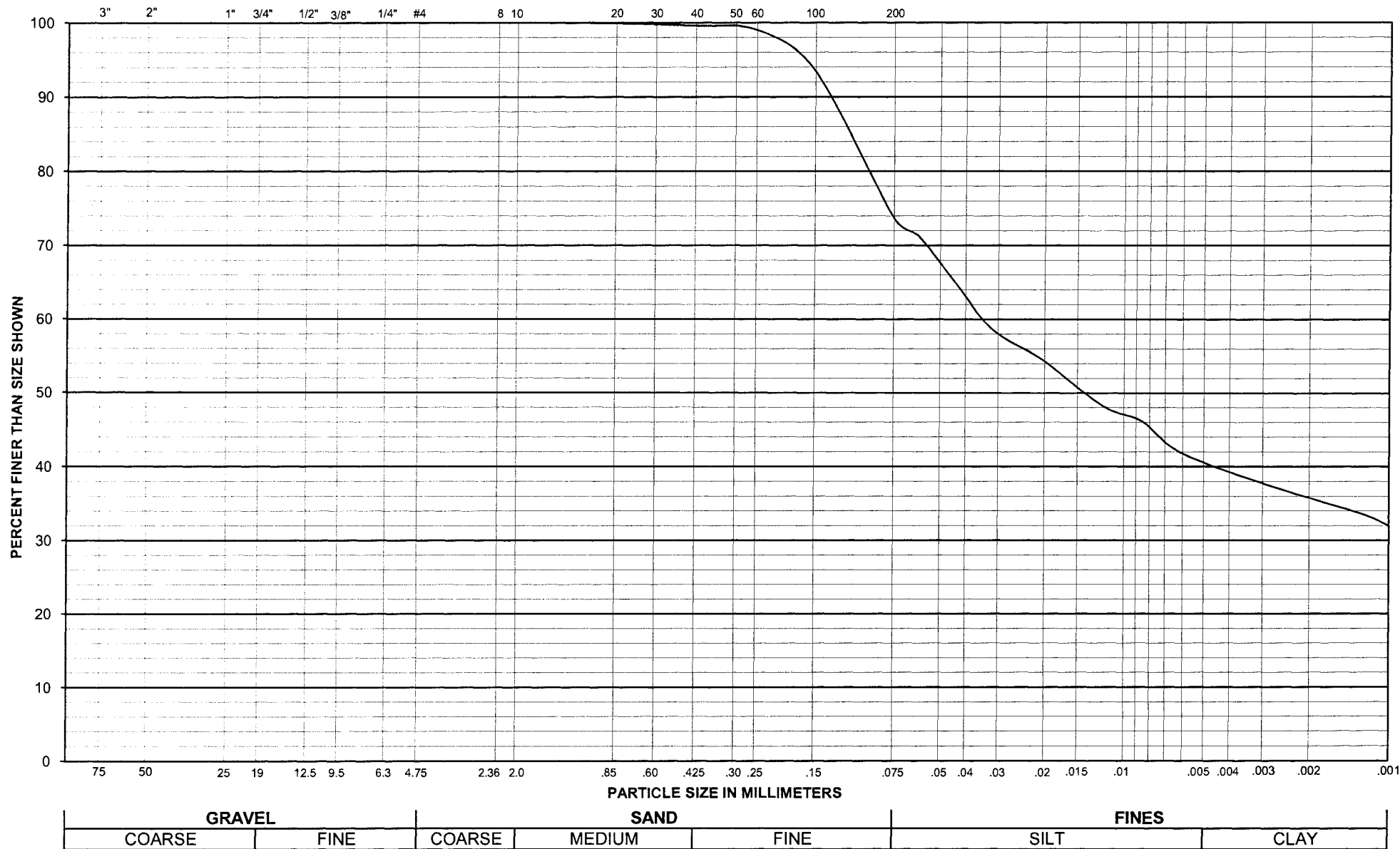
Project: Red River Geomorphic Study
Cass County, North Dakota

Sample Source: TN 7500 - S/140/LB

Classification: LEAN CLAY WITH SAND - dark gray

Reported to: West Consultants, Inc.

GRAIN SIZE DISTRIBUTION CURVE U.S. Standard Sieve Sizes





LEGEND

- Cross Section
 - - - Detailed Study Reach
 - Sediment Sample
 - ▲ Field Photos
 - 0750 Direction Arrow and Photo Number
- 0 37.5 75
 Feet

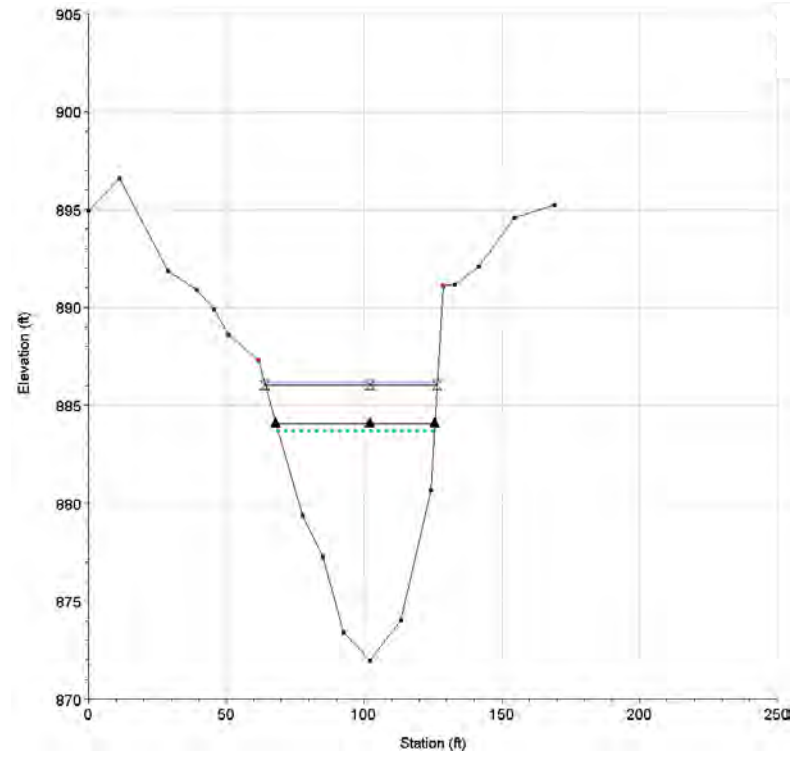


SHEYENNE RIVER - 4 - 22.27

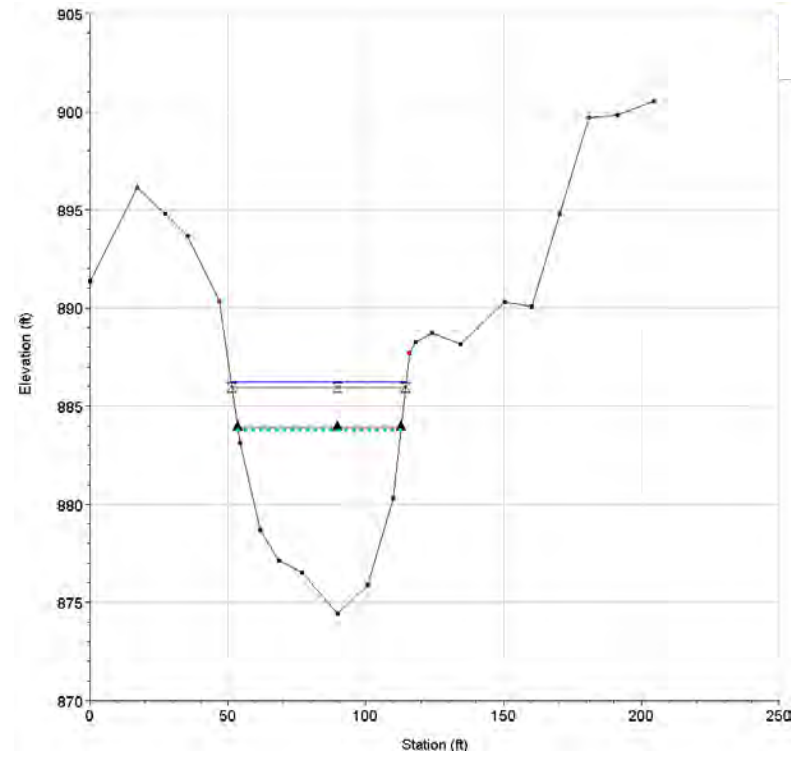
Observation Date: October 1, 2011

SHEYENNE RIVER – 4 – 22.27

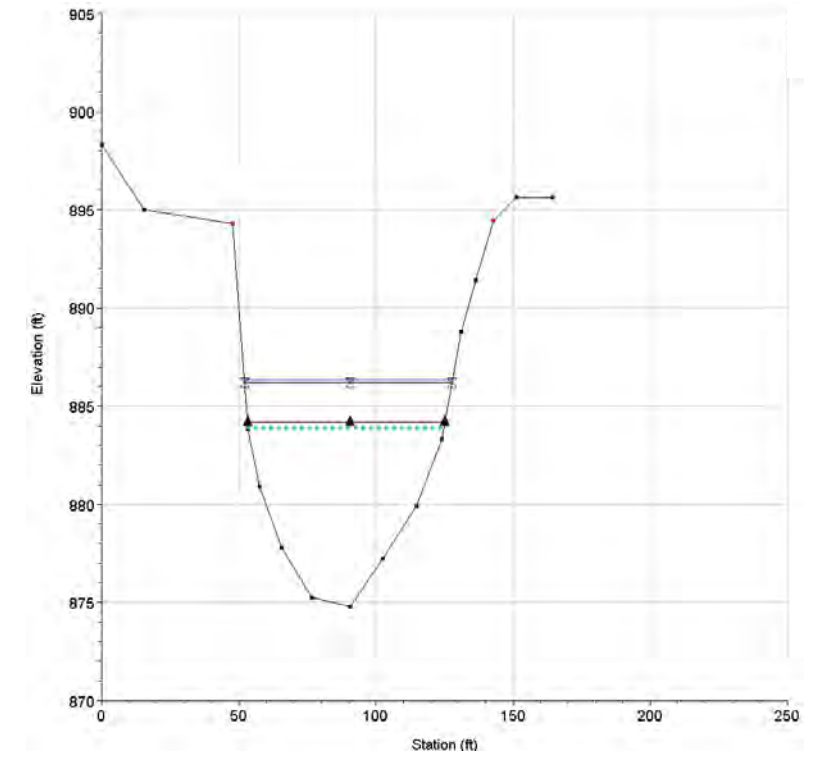
Cross Section 117603.9



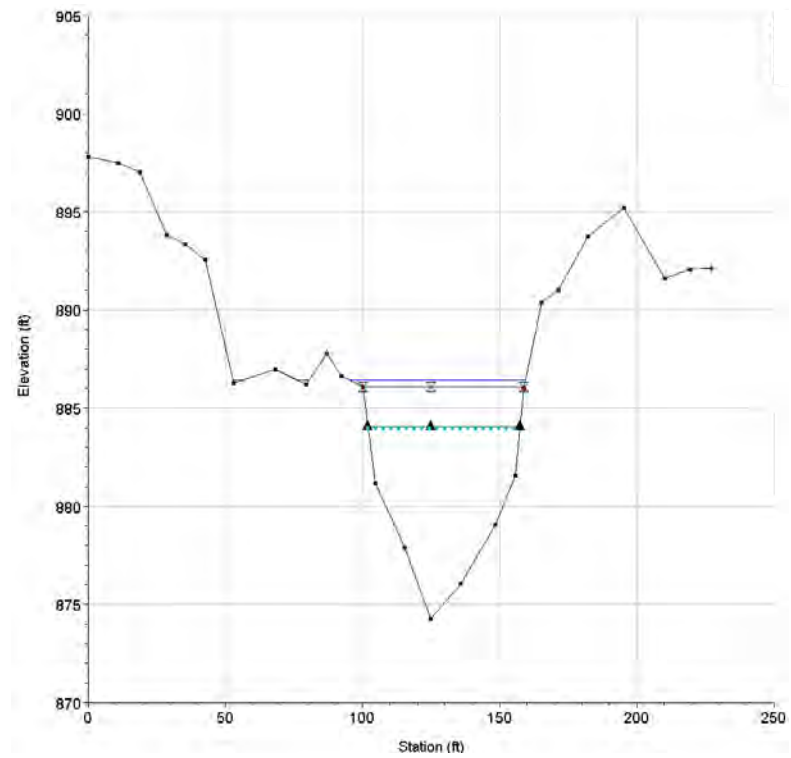
Cross Section 117964.9



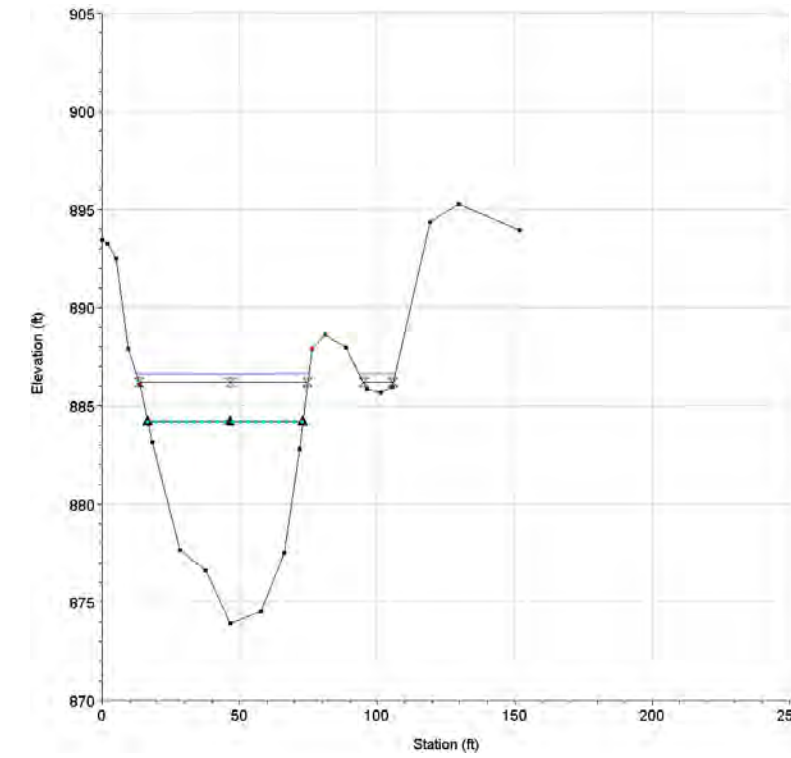
Cross Section 118254.3



Cross Section 118567.1



Cross Section 119044.4



LEGEND

- Modeled Water Surface Elevation for Day of Survey
- Modeled Bankfull Water Surface Elevation
- ▲ Observed Water Surface Elevation
- X— Observed Bankfull Water Surface Elevation
- Ground
- Bank Stations

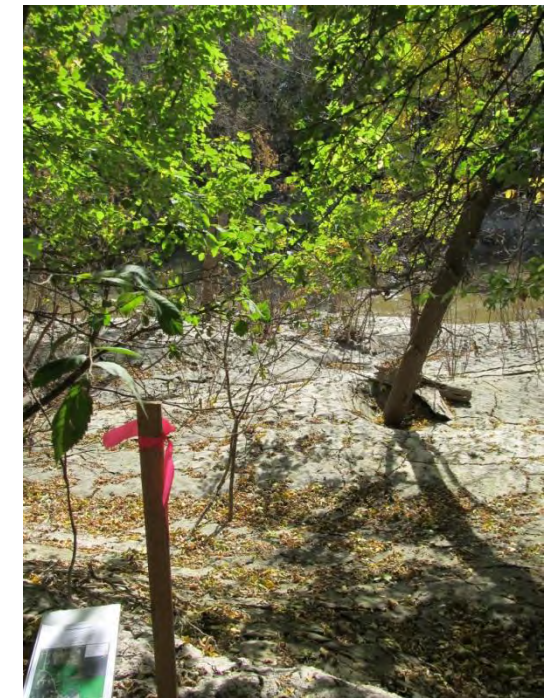
SHEYENNE RIVER – 4 – 22.27
OBSERVATION DATE: OCTOBER 1, 2011



Field Photo 0673



Field Photo 0674



Field Photo 0675



Field Photo 0676



Field Photo 0677



Field Photo 0678

SHEYENNE RIVER – 4 – 22.27
OBSERVATION DATE: OCTOBER 1, 2011



Field Photo 0679



Field Photo 0680



Field Photo 0681



Field Photo 0682



Field Photo 0683



Field Photo 0684

SHEYENNE RIVER – 4 – 22.27
OBSERVATION DATE: OCTOBER 1, 2011



Field Photo 0685



Field Photo 0686



Field Photo 0687



MIDWEST TESTING LABORATORY



Project No.: M1101216

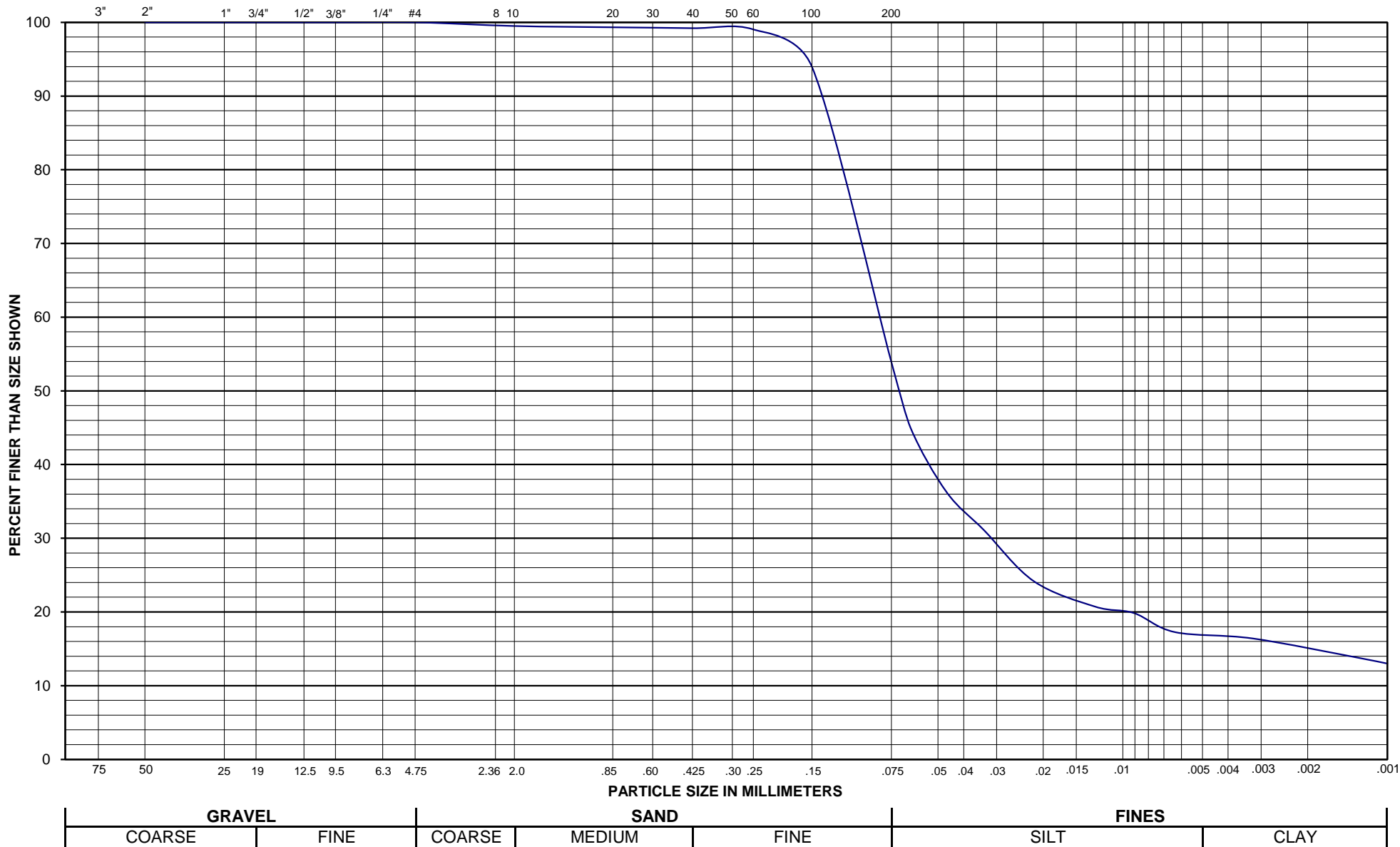
Project: Red River Geomorphic Study
Cass County, North Dakota

Sample Source: #25 (SR4-CH)

Classification: SANDY FAT CLAY - dark brown (CH)

Reported to: West Consultants, Inc.

GRAIN SIZE DISTRIBUTION CURVE U.S. Standard Sieve Sizes





MIDWEST TESTING LABORATORY



Project No.: M1101216

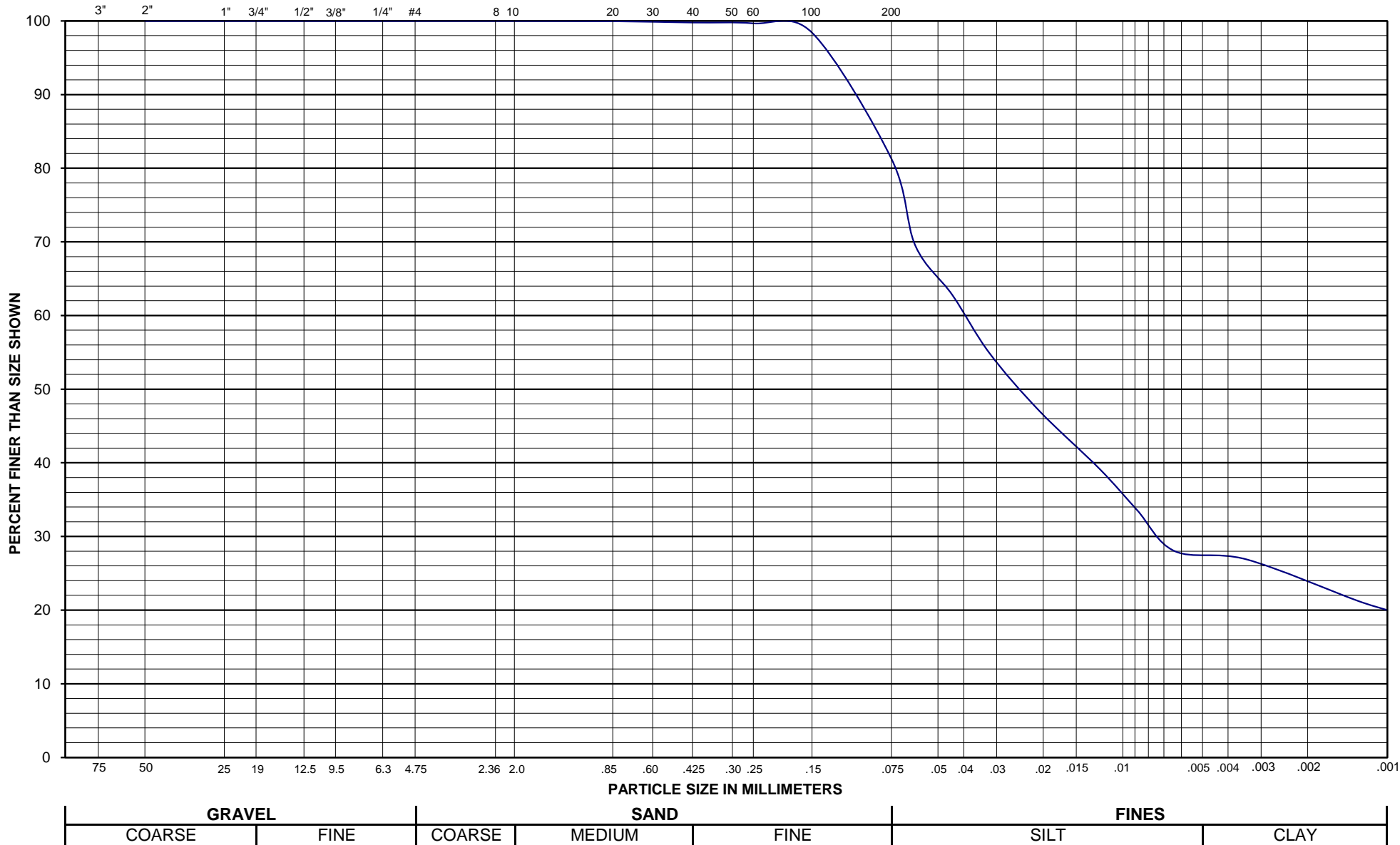
Project: Red River Geomorphic Study
Cass County, North Dakota

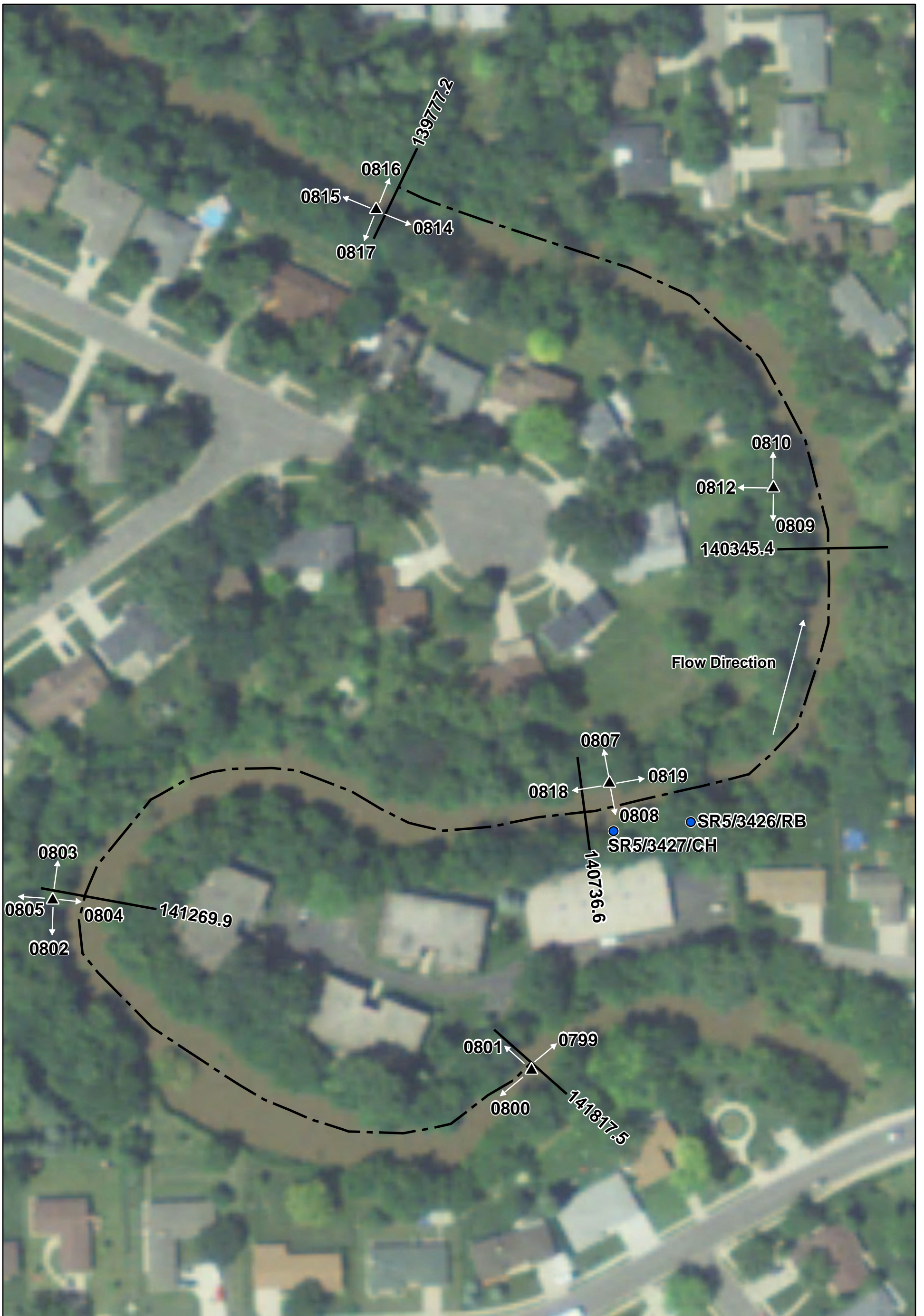
Sample Source: #28 (SR4-RB)

Classification: FAT CLAY WITH SAND - dark grayish brown (CH)

Reported to: West Consultants, Inc.

GRAIN SIZE DISTRIBUTION CURVE U.S. Standard Sieve Sizes





LEGEND

- Cross Section
 - - - Detailed Study Reach
 - Sediment Sample
 - ▲ Field Photos
 - 1247 Direction Arrow and Photo Number
- 0 42.5 85
Feet

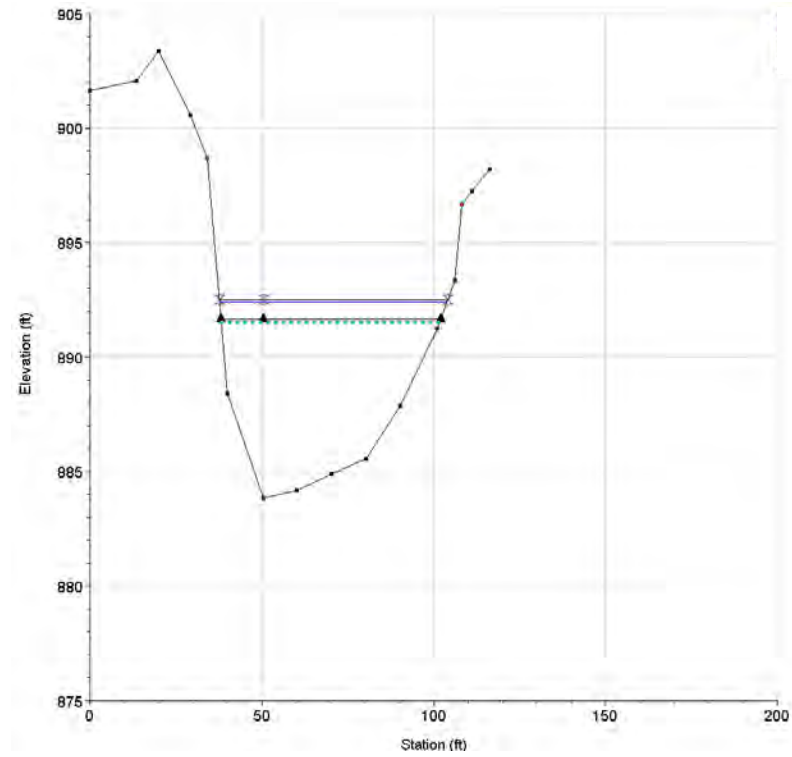


Sheyenne River - 5 - 24.67

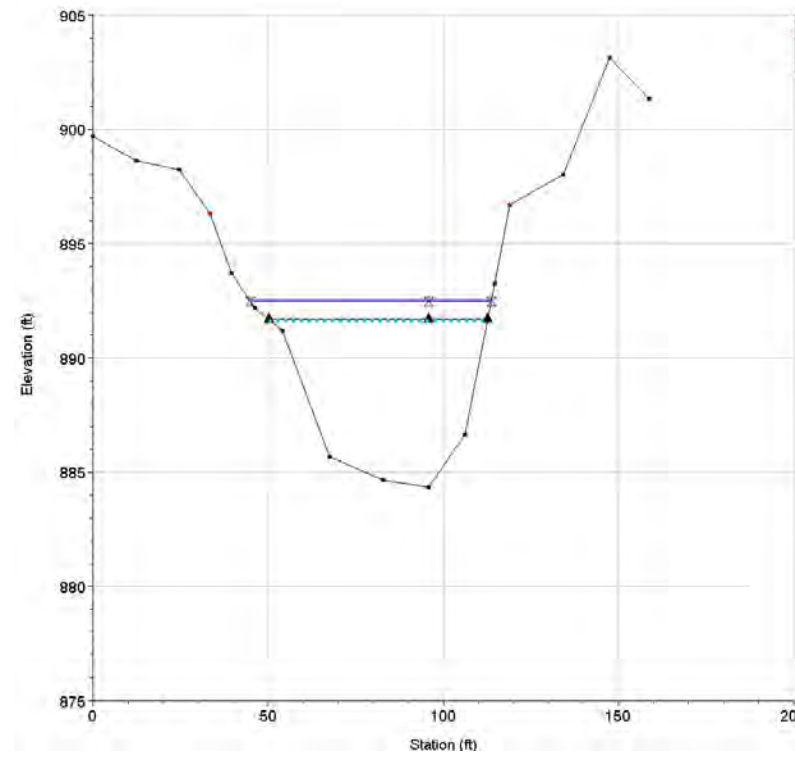
Observation Date: October 3, 2011

SHEYENNE RIVER – 5 – 24.67

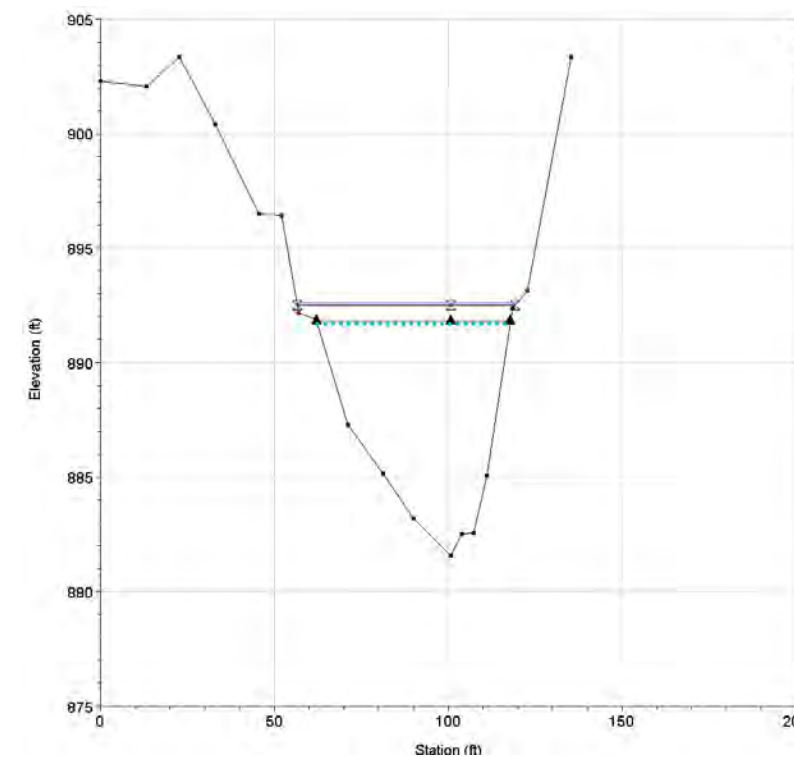
Cross Section 139777.2



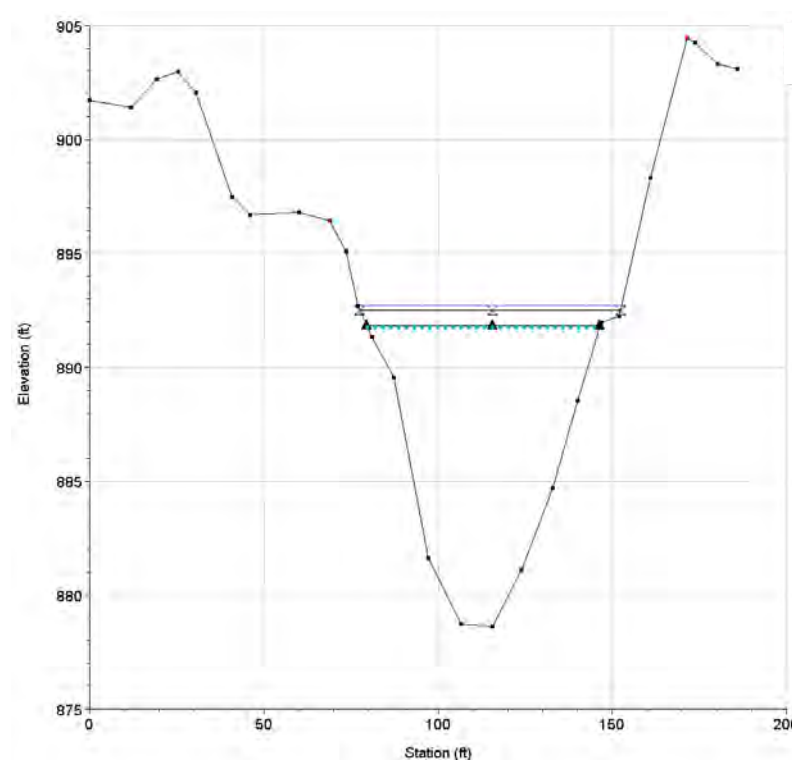
Cross Section 140345.4



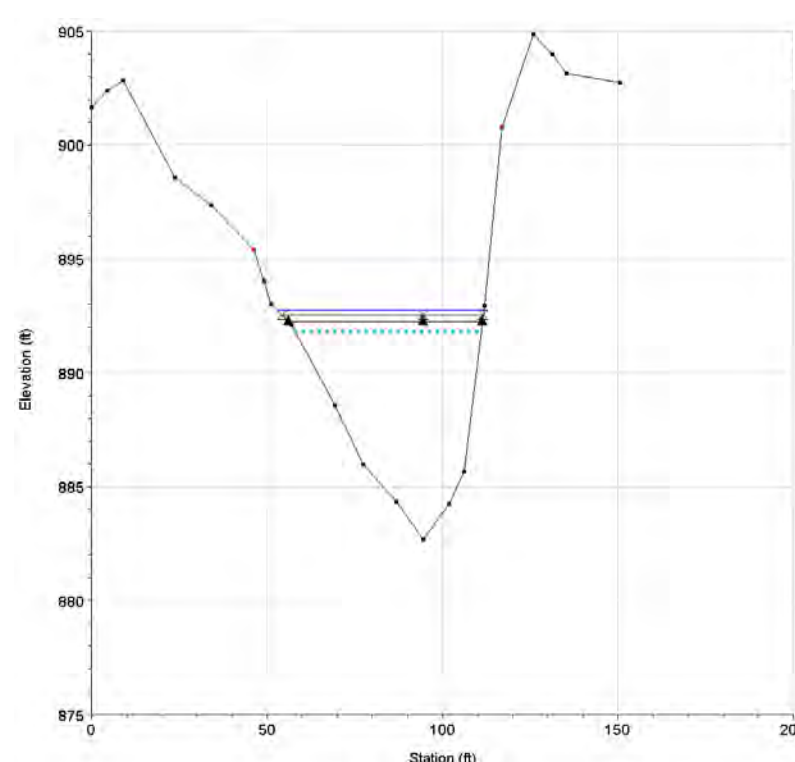
Cross Section 140736.6



Cross Section 141269.9



Cross Section 141817.5



LEGEND

- Modeled Water Surface Elevation for Day of Survey
- Modeled Bankfull Water Surface Elevation
- ▲ Observed Water Surface Elevation
- ⊗ Observed Bankfull Water Surface Elevation
- Ground
- Bank Stations

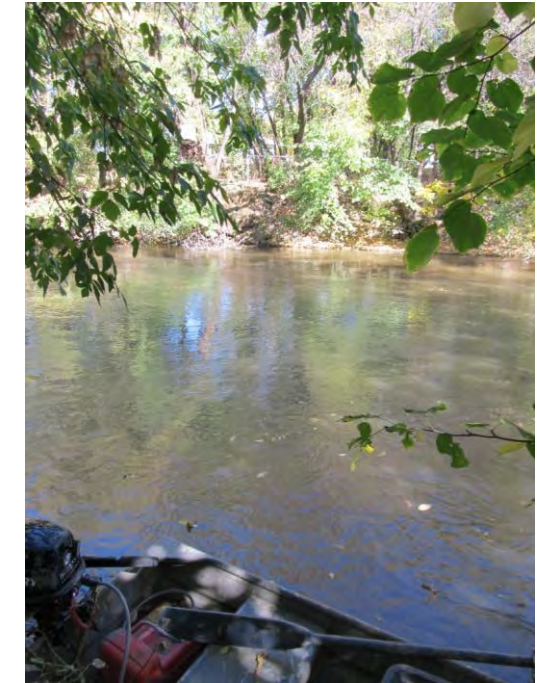
SHEYENNE RIVER – 5 – 24.67
OBSERVATION DATE: OCTOBER 3, 2011



Field Photo 0814



Field Photo 0815



Field Photo 0816



Field Photo 0817



Field Photo 0809

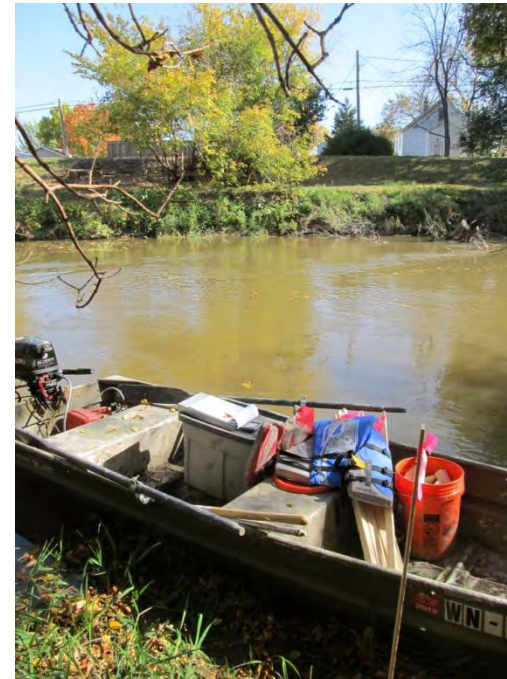


Field Photo 0810

SHEYENNE RIVER – 5 – 24.67
OBSERVATION DATE: OCTOBER 3, 2011



Field Photo 0801



Field Photo 0812



Field Photo 0807



Field Photo 0808



Field Photo 0818



Field Photo 0819

SHEYENNE RIVER – 5 – 24.67
OBSERVATION DATE: OCTOBER 3, 2011



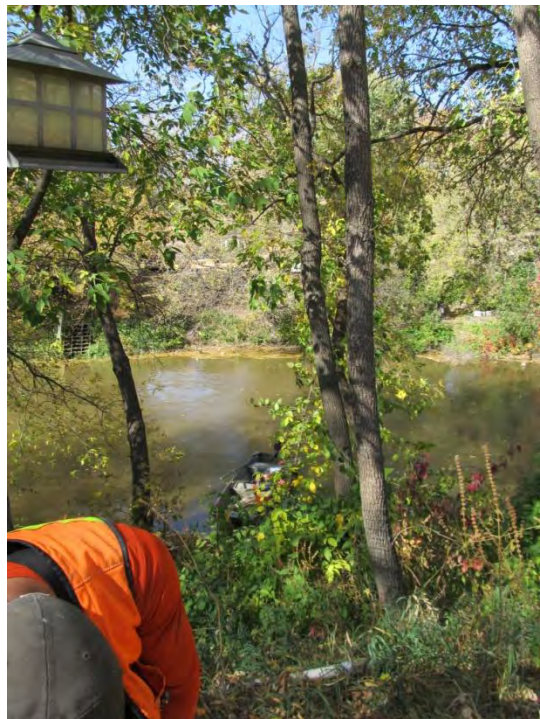
Field Photo 0802



Field Photo 0803



Field Photo 0804



Field Photo 0805



Field Photo 0799



Field Photo 0800



MIDWEST TESTING LABORATORY



Project No.: M1101216

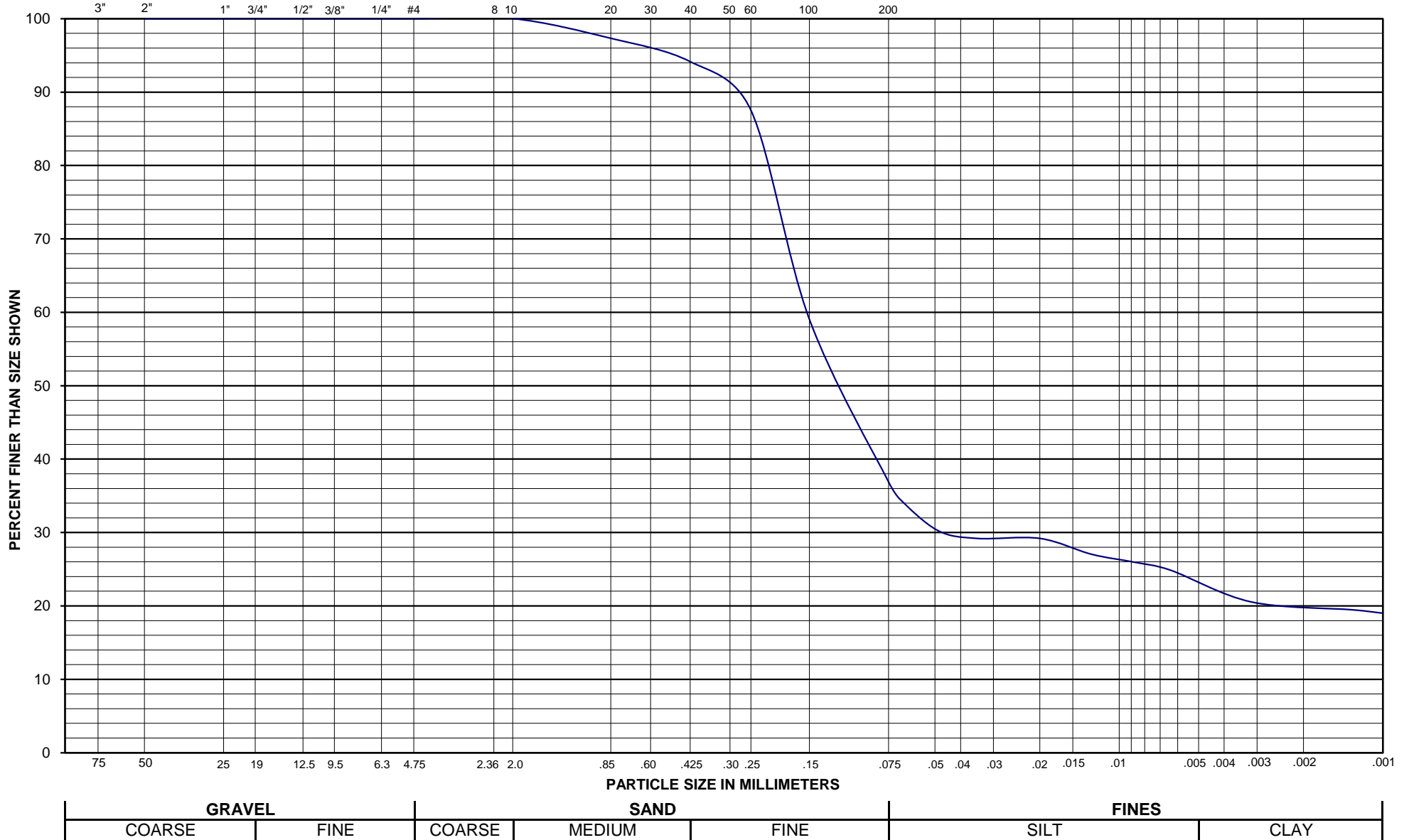
Project: Red River Geomorphic Study
Cass County, North Dakota

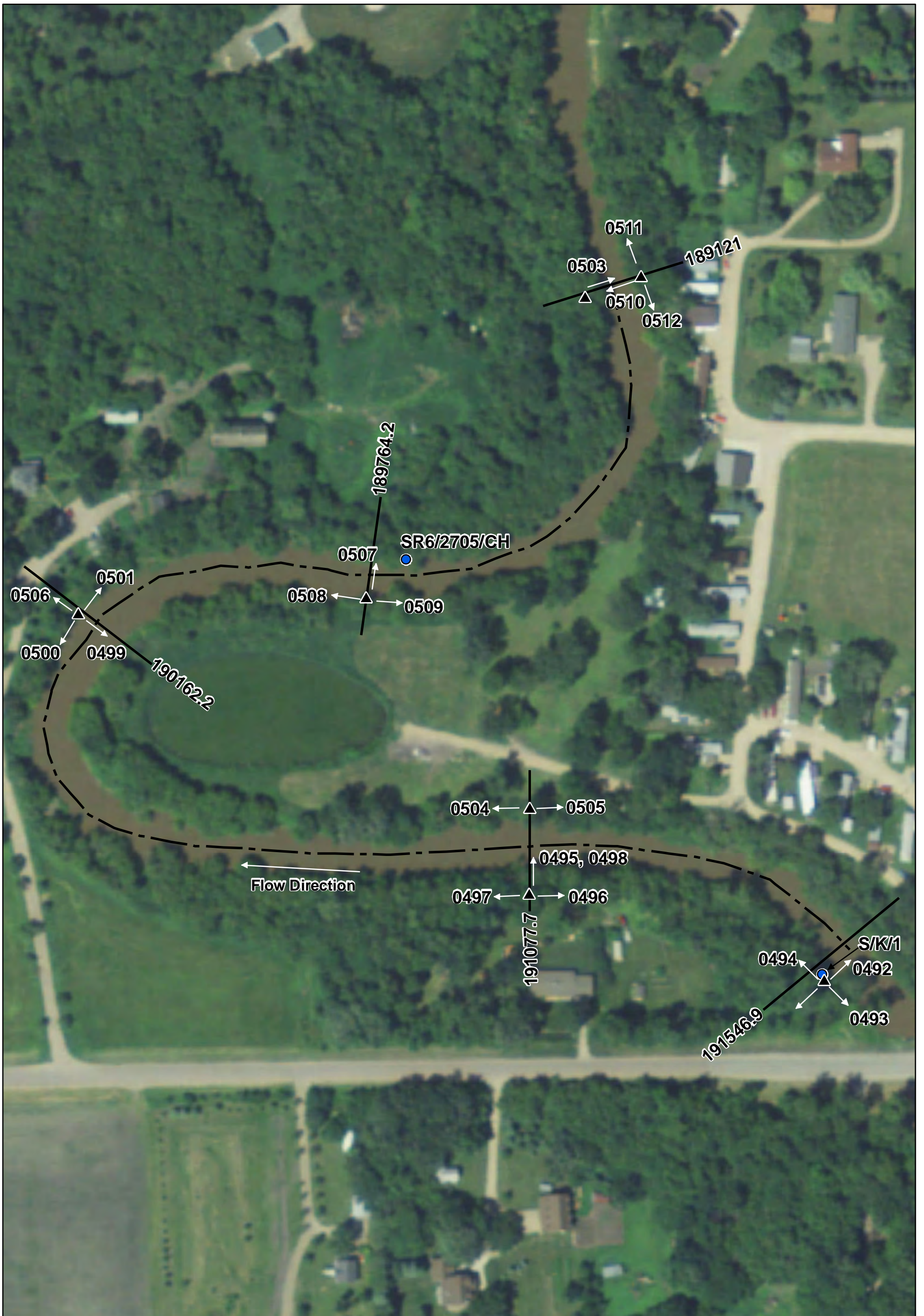
Sample Source: #47 (SR5/3427/CH)

Classification: SILTY SAND - dark brown (SM)

Reported to: West Consultants, Inc.

GRAIN SIZE DISTRIBUTION CURVE U.S. Standard Sieve Sizes





LEGEND

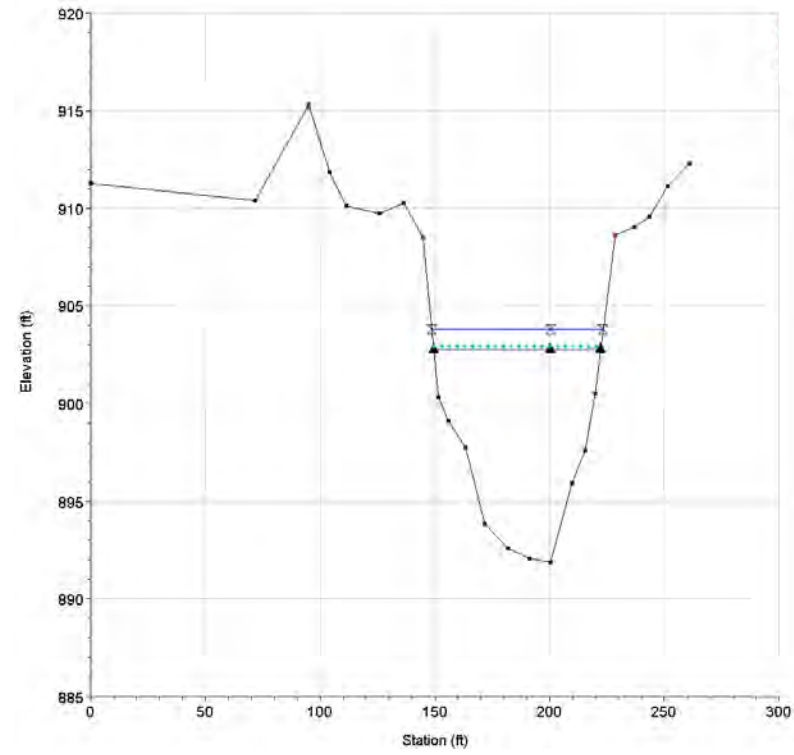
- Cross Section
 - - - Detailed Study Reach
 - Sediment Sample
 - ▲ Field Photos
 - 1247 Direction Arrow and Photo Number
- 0 62.5 125
Feet



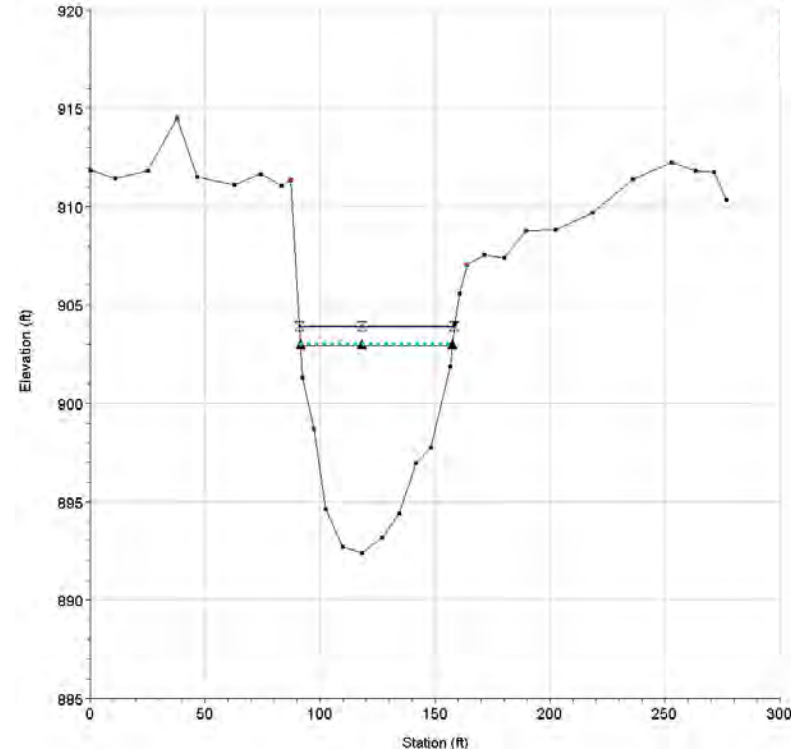
Sheyenne River - 6 - 35.82
Observation Dates: November 21, 2010
October 2, 2011

SHEYENNE RIVER – 6 – 35.82

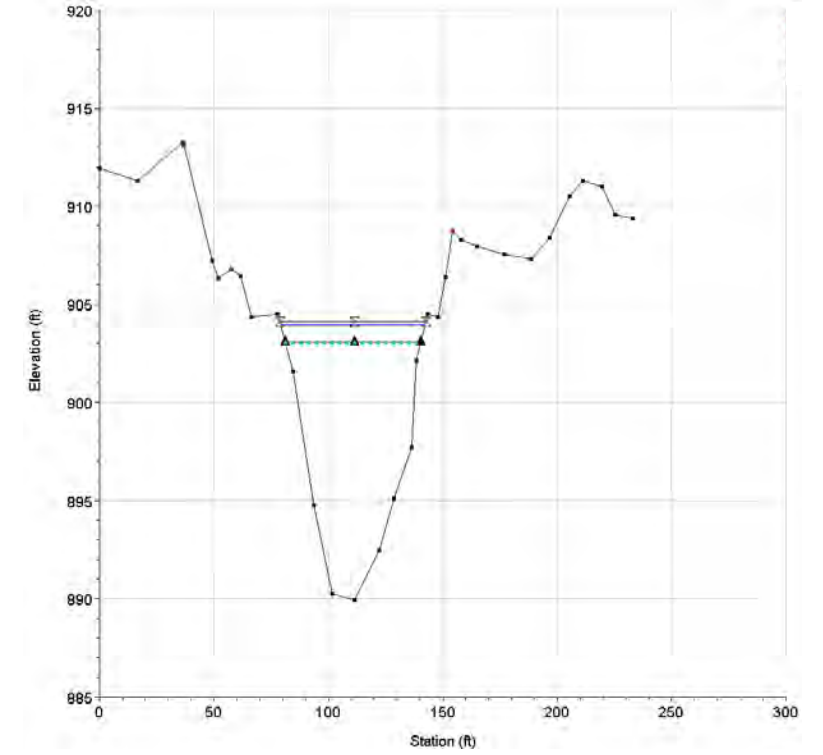
Cross Section 189121.0



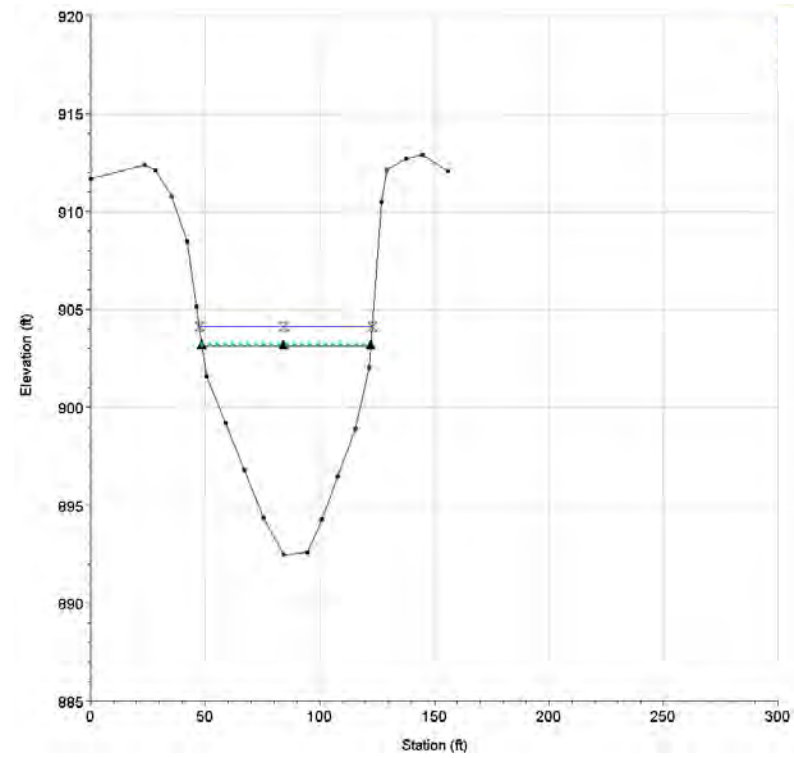
Cross Section 189764.2



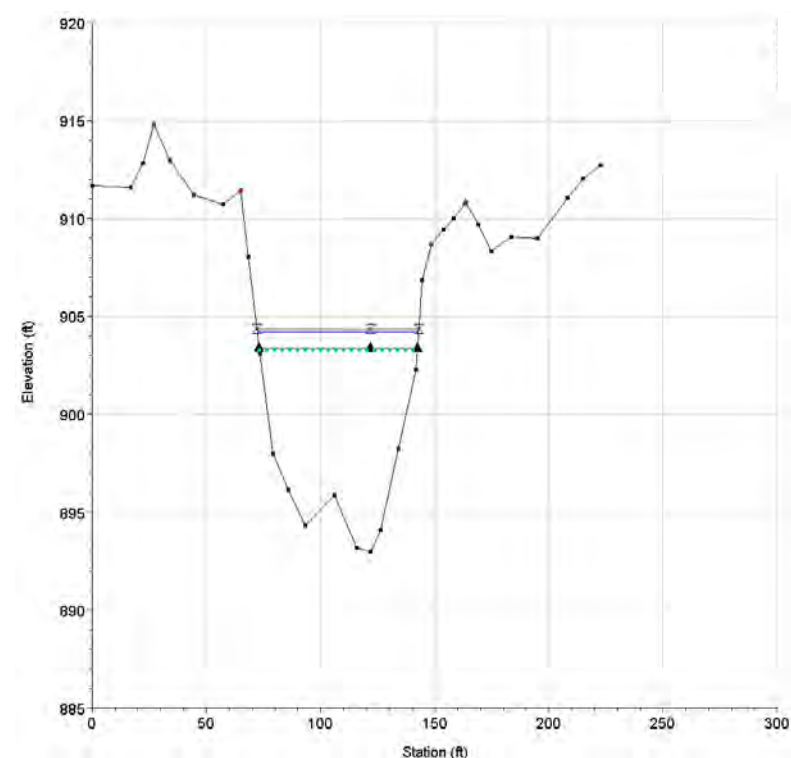
Cross Section 190162.2



Cross Section 191077.7



Cross Section 191546.9



LEGEND

- Modeled Water Surface Elevation for Day of Survey
- Modeled Bankfull Water Surface Elevation
- ▲ Observed Water Surface Elevation
- ⊗ Observed Bankfull Water Surface Elevation
- Ground
- Bank Stations

SHEYENNE RIVER – 6 – 35.82
OBSERVATION DATE: NOVEMBER 21, 2010



Field Photo 0492



Field Photo 0493



Field Photo 0494



Field Photo 0495



Field Photo 0496

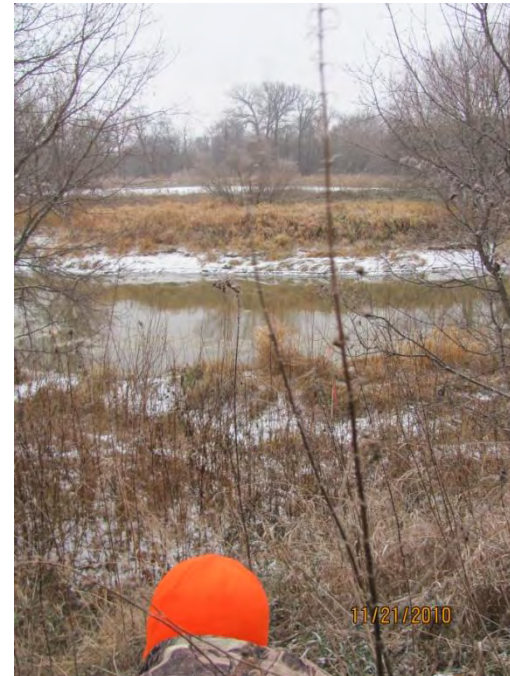


Field Photo 0497

SHEYENNE RIVER – 6 – 35.82
OBSERVATION DATE: NOVEMBER 21, 2010



Field Photo 0498



Field Photo 0499



Field Photo 0500



Field Photo 0501



Field Photo 0503



Field Photo 0504

SHEYENNE RIVER – 6 – 35.82
OBSERVATION DATE: NOVEMBER 21, 2010



Field Photo 0505



Field Photo 0506



Field Photo 0507



Field Photo 0508



Field Photo 0509



Field Photo 0510

SHEYENNE RIVER – 6 – 35.82
OBSERVATION DATE: NOVEMBER 21, 2010



Field Photo 0511



Field Photo 0512



MIDWEST TESTING LABORATORY



Project No.: M1101216

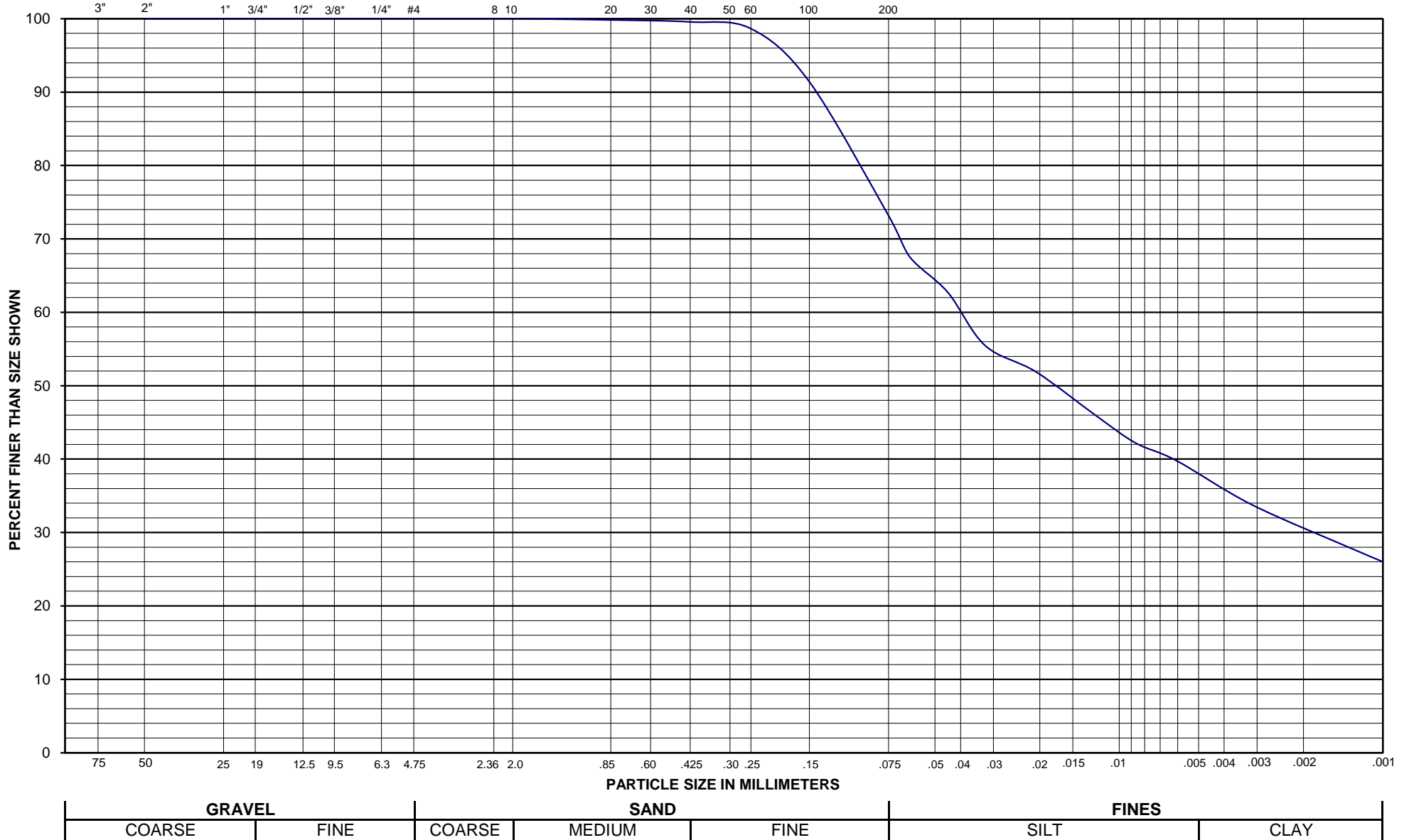
Project: Red River Geomorphic Study
Cass County, North Dakota

Sample Source: #26 (SRL-LH)

Classification: FAT CLAY WITH SAND - dark brown (CH)

Reported to: West Consultants, Inc.

GRAIN SIZE DISTRIBUTION CURVE U.S. Standard Sieve Sizes





MIDWEST TESTING LABORATORY



Project No.: 16216

Project: Red River Geomorphic Study
Cass County, North Dakota

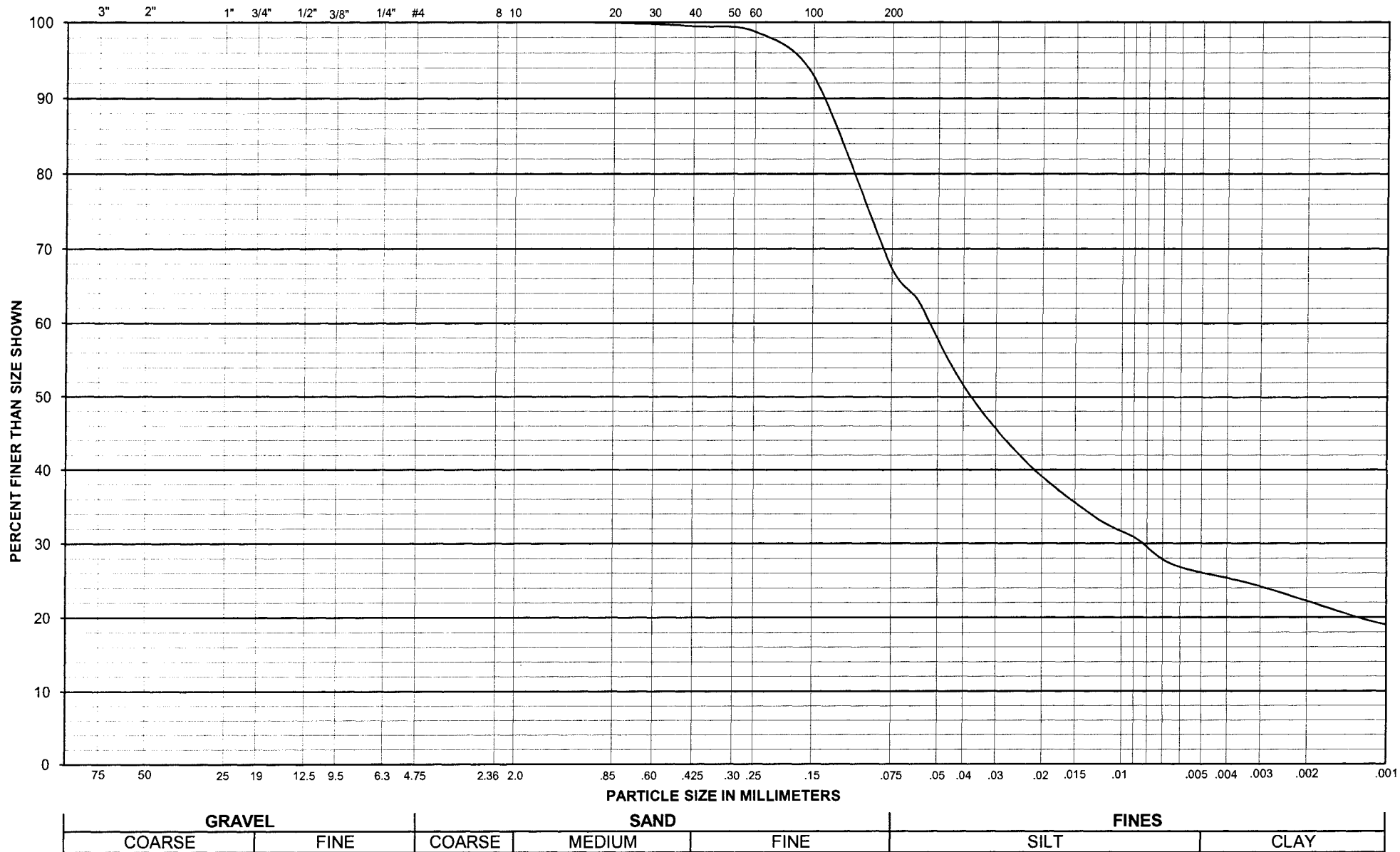
Sample Source: TN 7527 - S-K-1

Classification: SANDY LEAN CLAY - very dark brown

Reported to: West Consultants, Inc.

GRAIN SIZE DISTRIBUTION CURVE

U.S. Standard Sieve Sizes





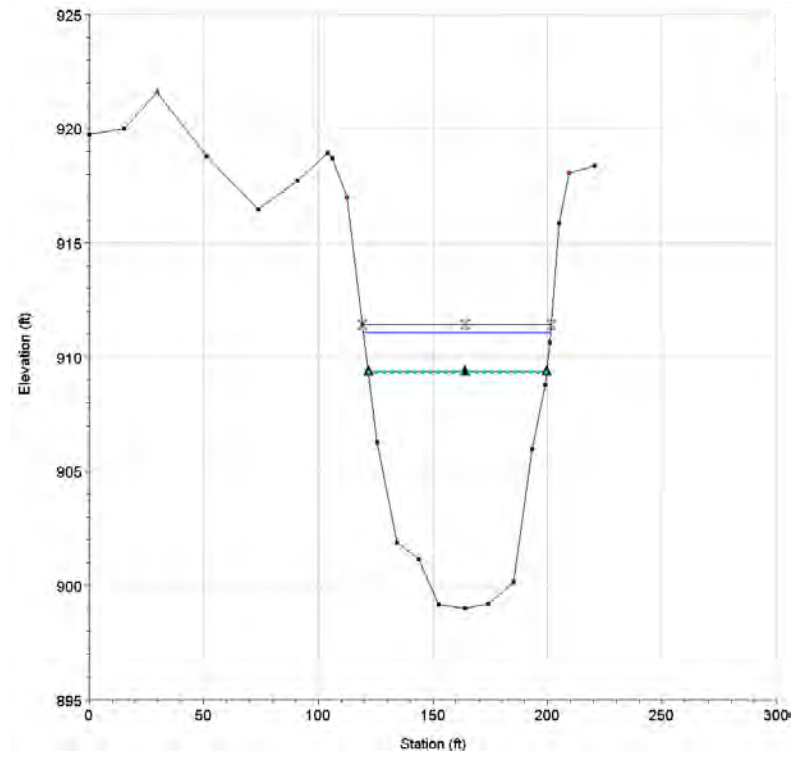
LEGEND

- Cross Section
 - - - Detailed Study Reach
 - Sediment Sample
 - ▲ Field Photos
 - 1247 Direction Arrow and Photo Number
- 0 82.5 165
Feet

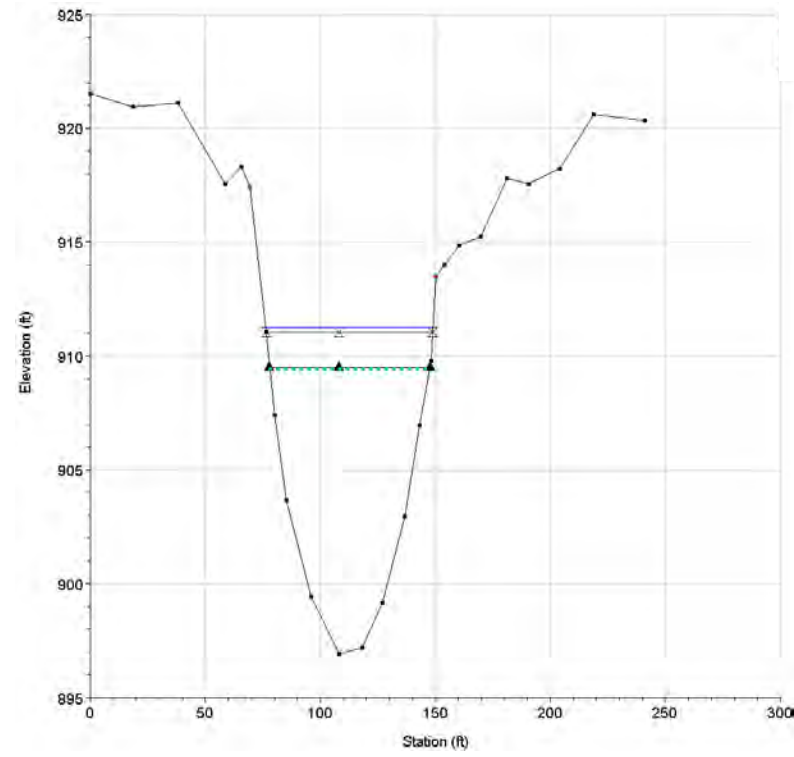
Sheyenne River - 7 - 43.27
Observation Dates: November 20, 2010
October 5, 2011

SHEYENNE RIVER – 7 – 43.27

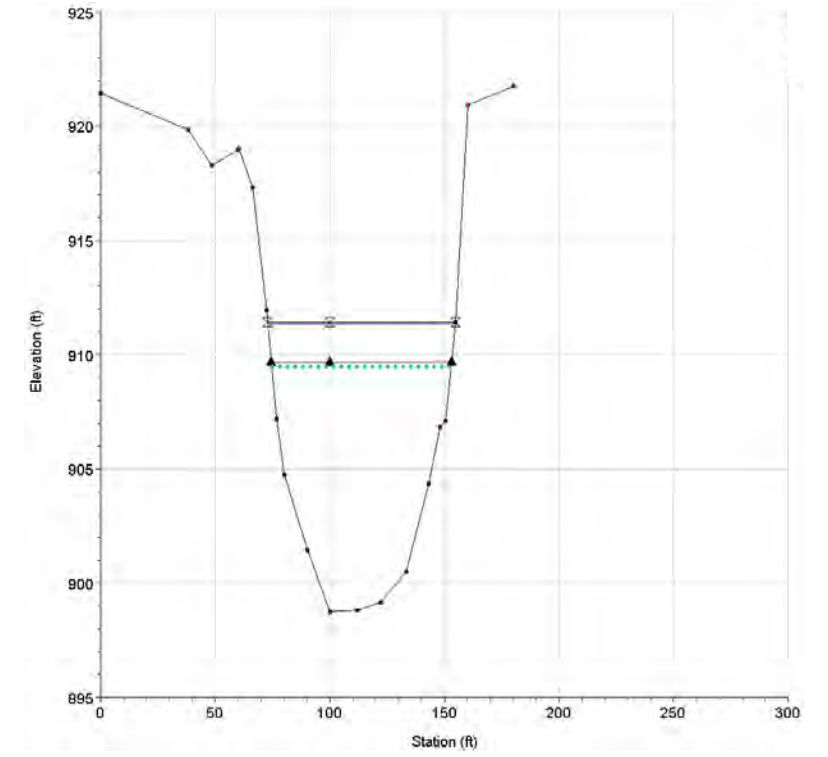
Cross Section 228473.2



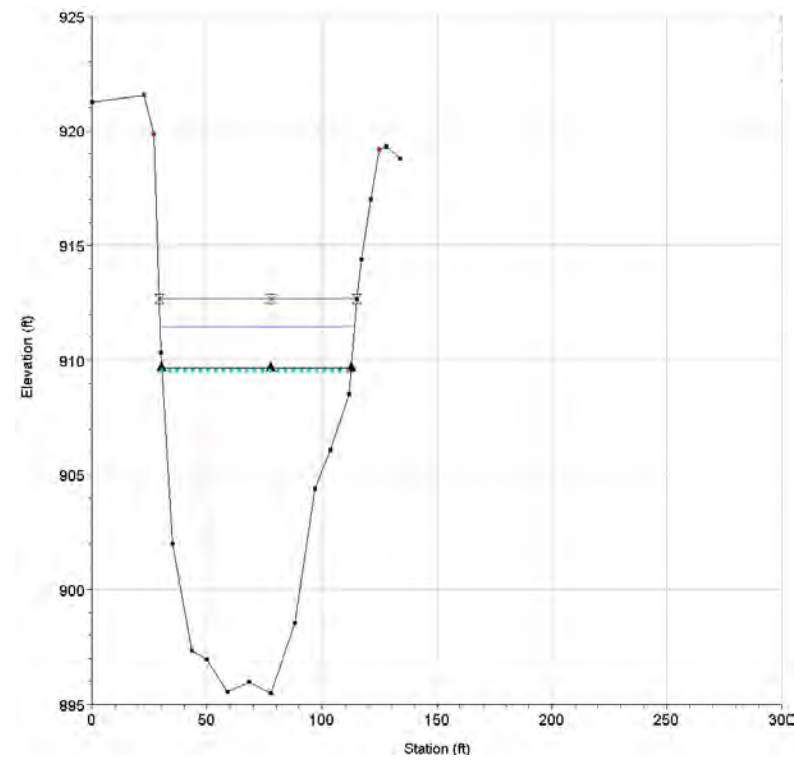
Cross Section 229277.1



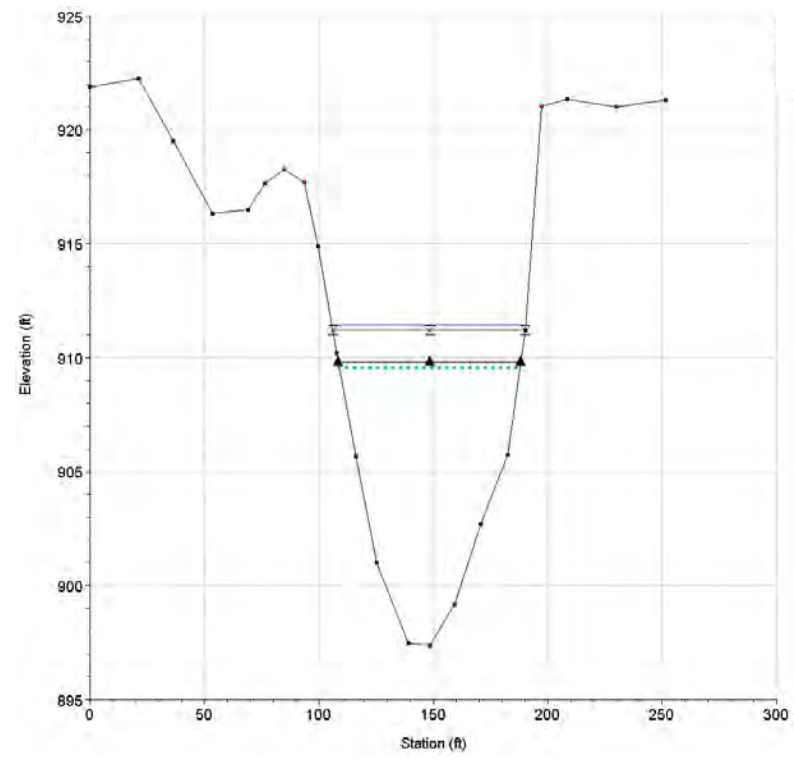
Cross Section 229906.6



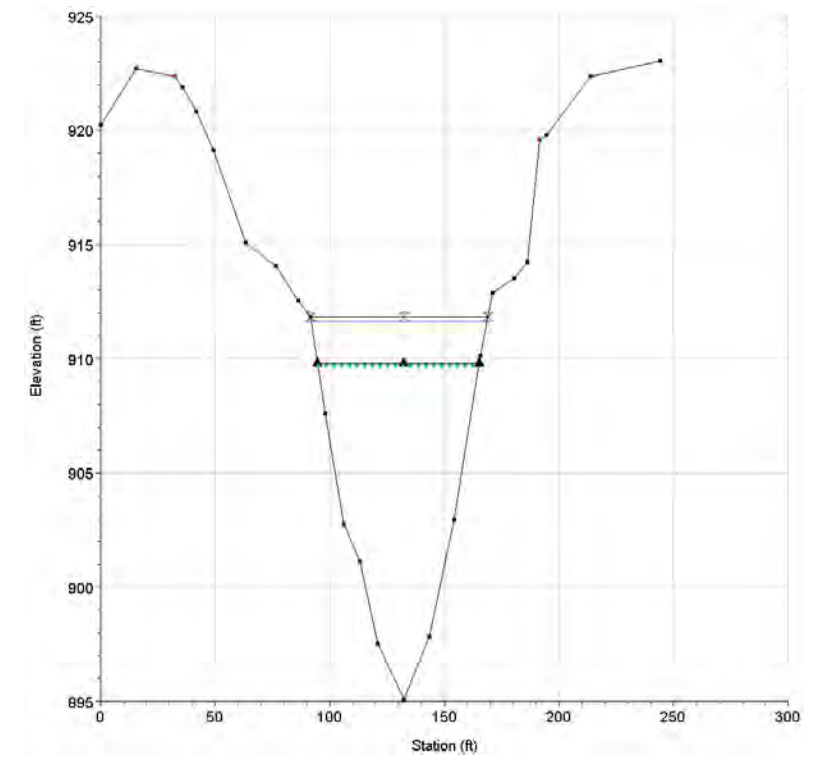
Cross Section 230468.6



Cross Section 230796.9



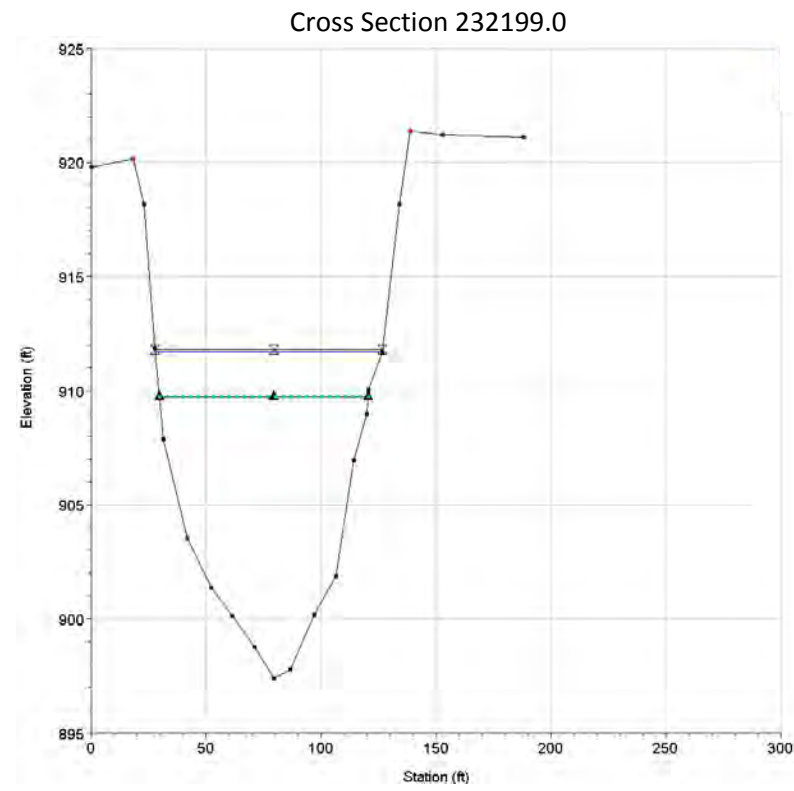
Cross Section 231767.6



LEGEND

- Modeled Water Surface Elevation for Day of Survey
- Modeled Bankfull Water Surface Elevation
- ▲ Observed Water Surface Elevation
- ⊗ Observed Bankfull Water Surface Elevation
- Ground
- Bank Stations

SHEYENNE RIVER – 7 – 43.27



LEGEND

••••• Modeled Water Surface Elevation for Day of Survey — Modeled Bankfull Water Surface Elevation —▲— Observed Water Surface Elevation —⊗— Observed Bankfull Water Surface Elevation —■— Ground • Bank Stations

SHEYENNE RIVER – 7 – 43.27
OBSERVATION DATE: NOVEMBER 20, 2010



Field Photo 1391



Field Photo 1392



Field Photo 1393



Field Photo 1394



Field Photo 1395



Field Photo 1396

SHEYENNE RIVER – 7 – 43.27
OBSERVATION DATE: NOVEMBER 20, 2010



Field Photo 1397



Field Photo 1398



Field Photo 1399



Field Photo 1400



Field Photo 1401



Field Photo 1402

SHEYENNE RIVER – 7 – 43.27
OBSERVATION DATE: NOVEMBER 20, 2010



Field Photo 1404



Field Photo 1405



Field Photo 1406



Field Photo 1407



Field Photo 1408



Field Photo 1409

SHEYENNE RIVER – 7 – 43.27
OBSERVATION DATE: NOVEMBER 20, 2010



Field Photo 1410



Field Photo 1411



Field Photo 1412



Field Photo 1413



Field Photo 1414



Field Photo 1415

SHEYENNE RIVER – 7 – 43.27
OBSERVATION DATE: NOVEMBER 20, 2010



Field Photo 1416



Field Photo 1417



Field Photo 1418



Field Photo 1419



MIDWEST TESTING LABORATORY



Project No.: M1101216

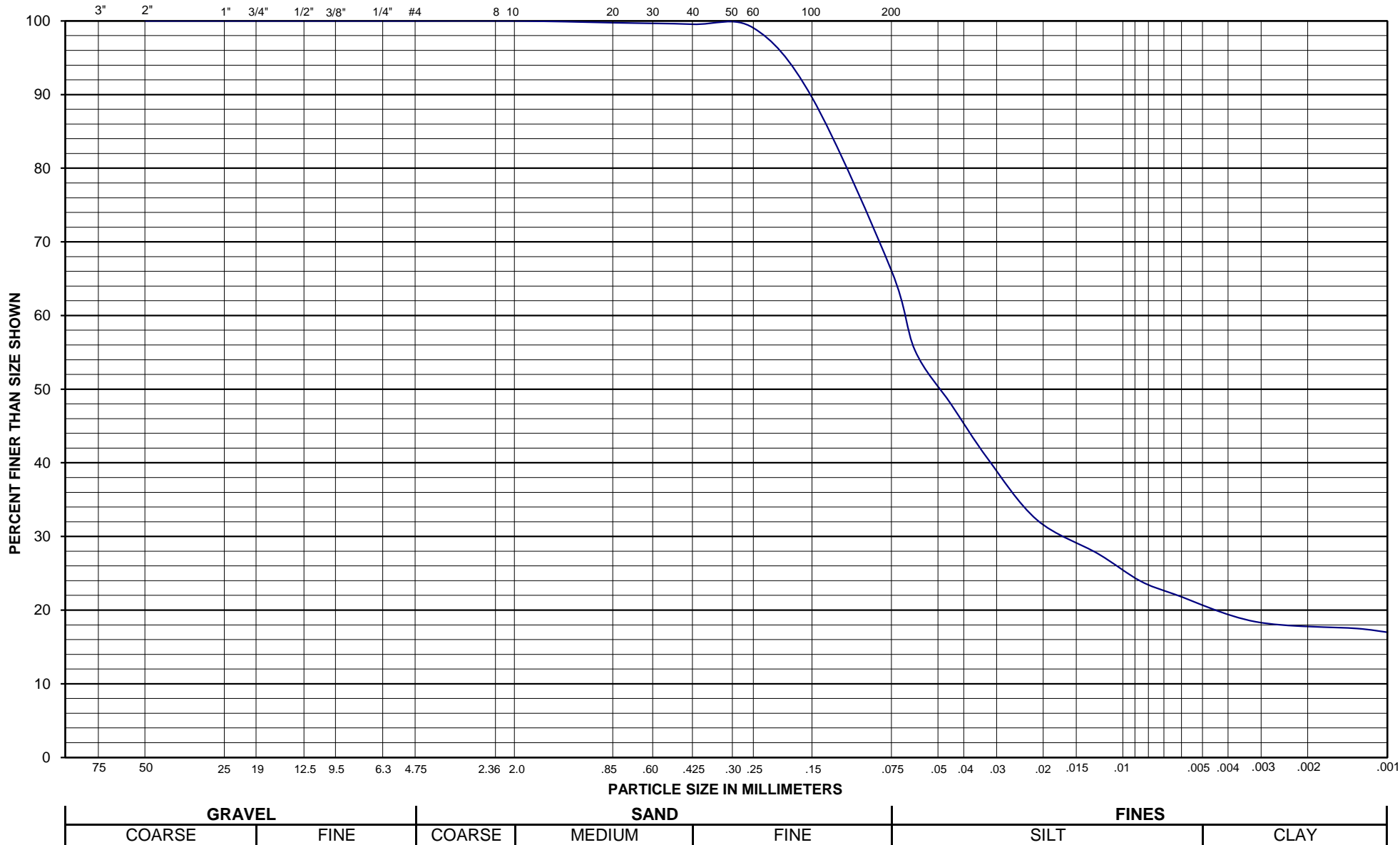
Project: Red River Geomorphic Study
Cass County, North Dakota

Sample Source: #57 (SR7/3306/CH)

Classification: SANDY FAT CLAY - dark brown (CH)

Reported to: West Consultants, Inc.

GRAIN SIZE DISTRIBUTION CURVE U.S. Standard Sieve Sizes





MIDWEST TESTING LABORATORY



Project No.: 16216

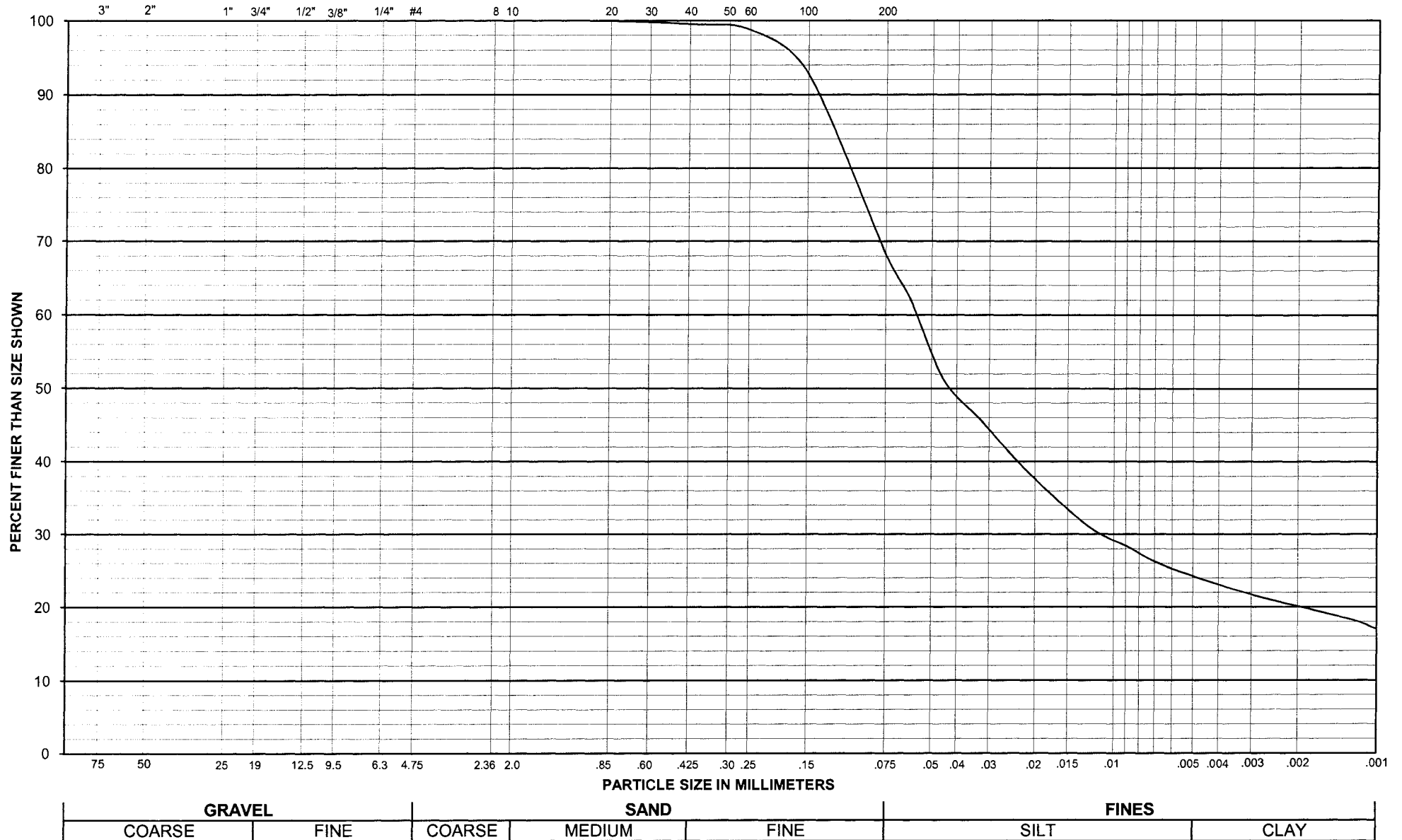
Project: Red River Geomorphic Study
Cass County, North Dakota

Sample Source: TN 7511 - S-249-RB

Classification: SANDY LEAN CLAY - dark brown

Reported to: West Consultants, Inc.

GRAIN SIZE DISTRIBUTION CURVE U.S. Standard Sieve Sizes



GRAVEL		SAND			FINES		
COARSE	FINE	COARSE	MEDIUM	FINE	SILT	CLAY	



MIDWEST TESTING LABORATORY



Project No.: 16216

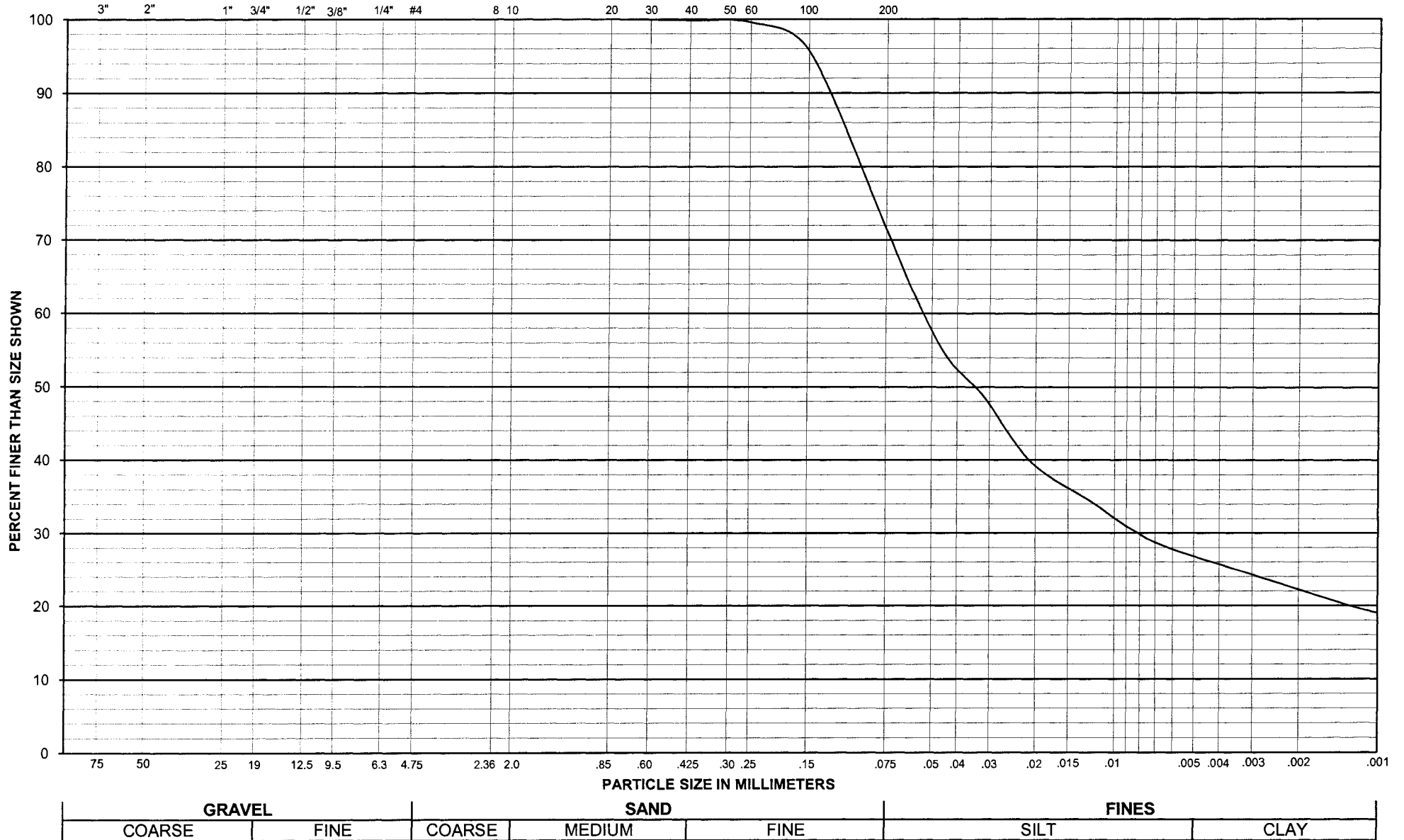
Project: Red River Geomorphic Study
Cass County, North Dakota

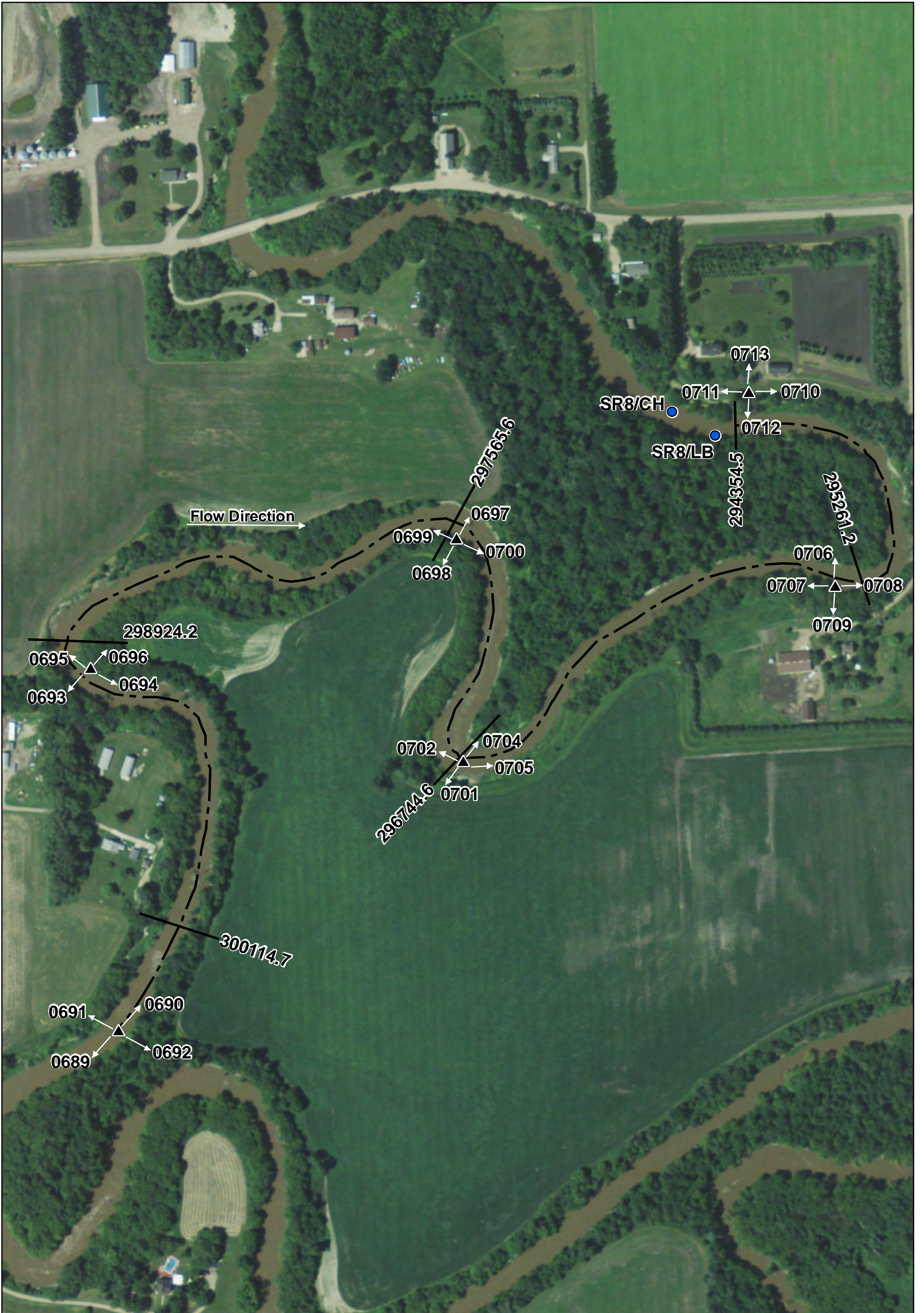
Sample Source: TN 7510 - S-244-LB

Classification: SILT WITH SAND - dark brown

Reported to: West Consultants, Inc.

GRAIN SIZE DISTRIBUTION CURVE
U.S. Standard Sieve Sizes





LEGEND

- Cross Section
 - - - Detailed Study Reach
 - Sediment Sample
 - ▲ Field Photos
 - 1247 Direction Arrow and Photo Number
- 0 80 160
 Feet

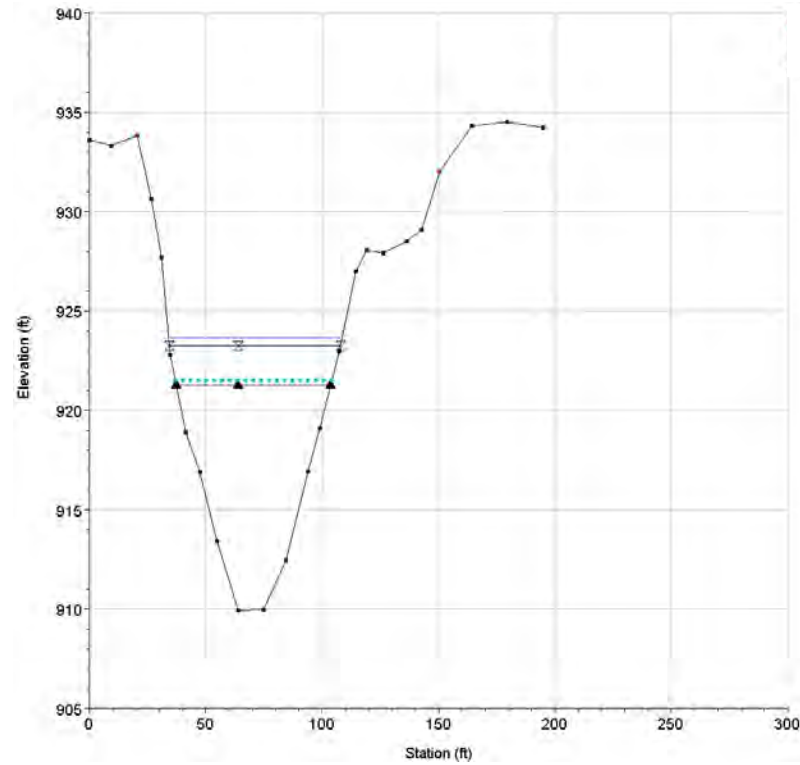


Sheyenne River - 8 - 55.75

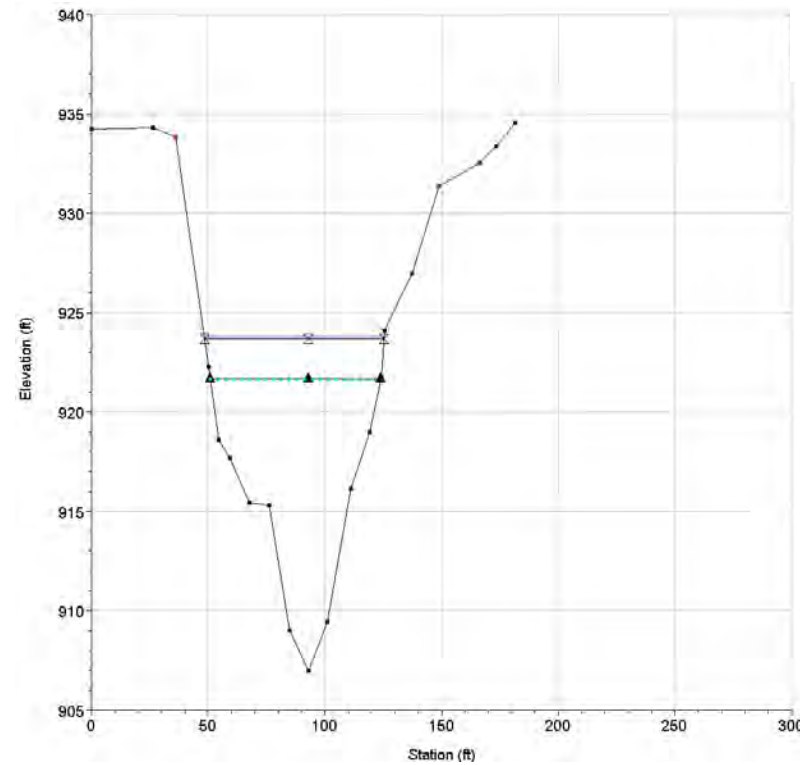
Observation Date: October 2, 2011

SHEYENNE RIVER – 8 – 55.75

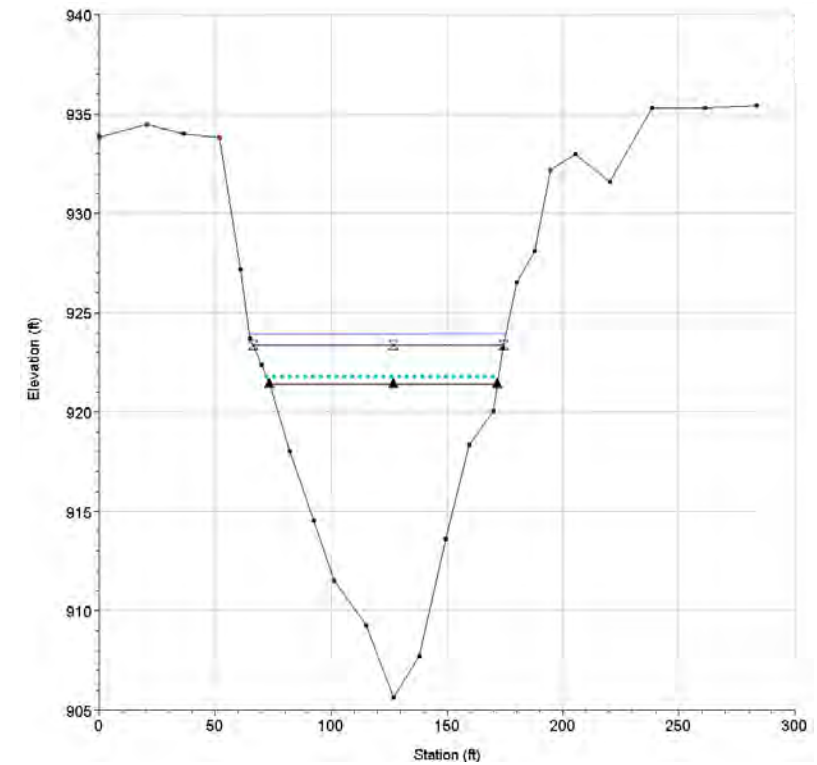
Cross Section 294354.5



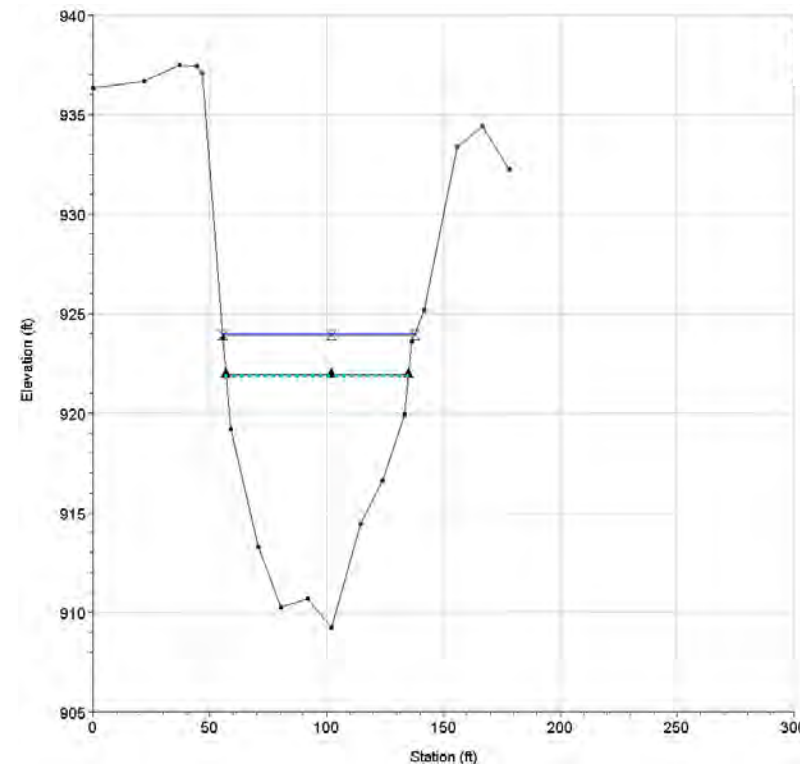
Cross Section 295261.2



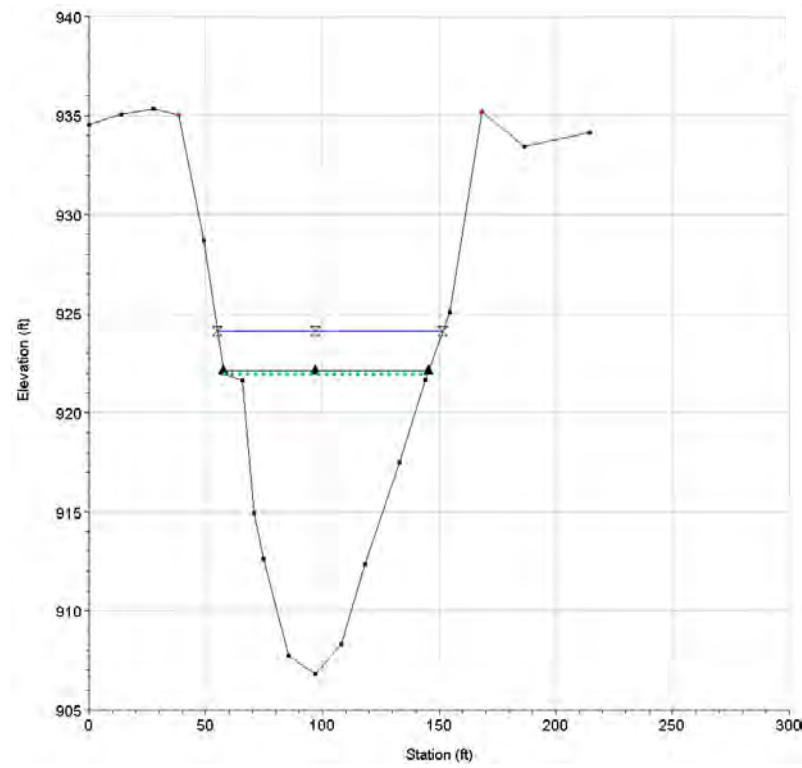
Cross Section 296744.6



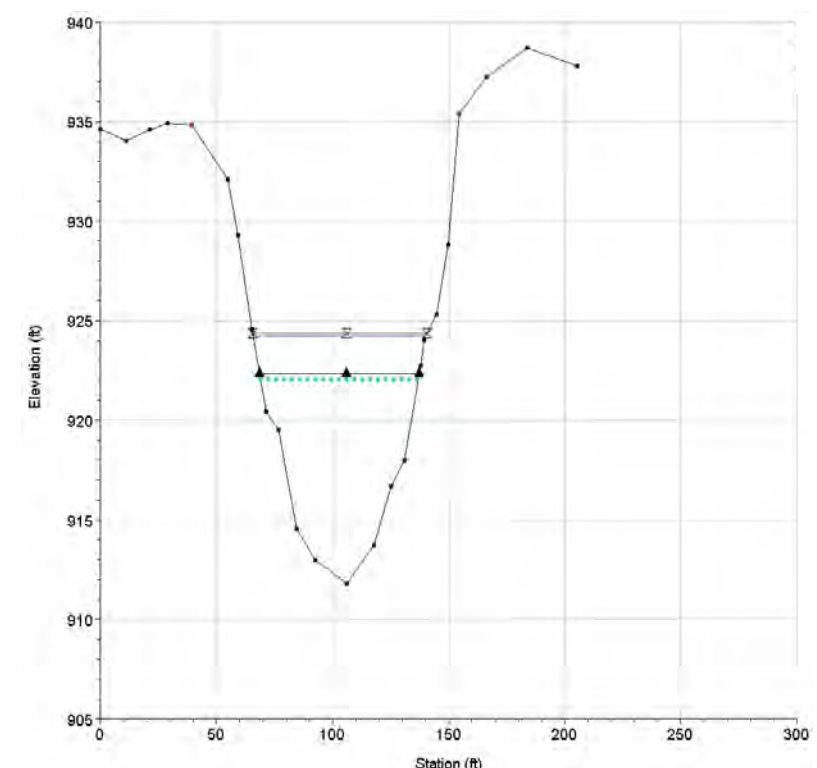
Cross Section 297565.6



Cross Section 298924.2



Cross Section 300114.7



LEGEND

- Modeled Water Surface Elevation for Day of Survey
- Modeled Bankfull Water Surface Elevation
- ▲ Observed Water Surface Elevation
- ⊗ Observed Bankfull Water Surface Elevation
- Ground
- Bank Stations

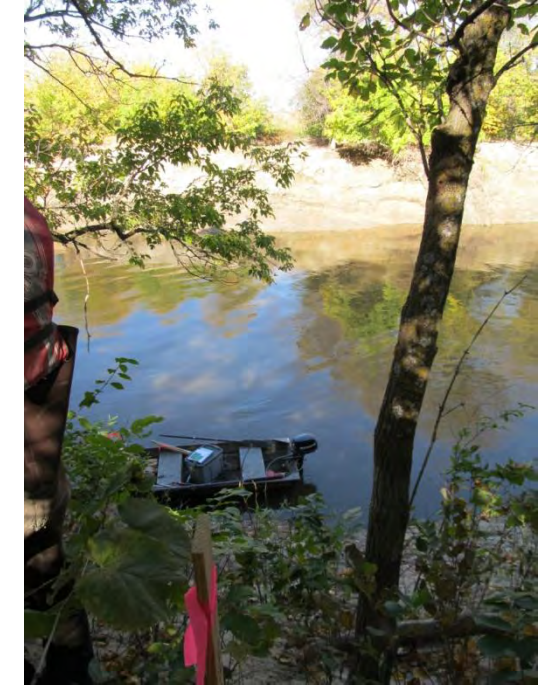
SHEYENNE RIVER – 8– 55.75
OBSERVATION DATE: OCTOBER 2, 2011



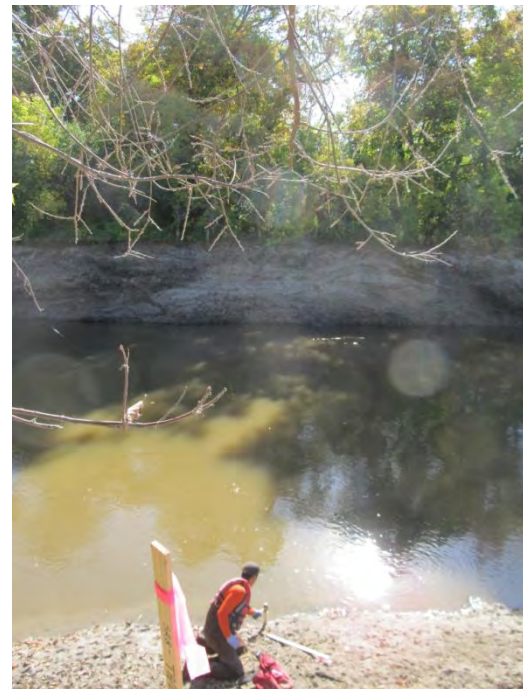
Field Photo 0689



Field Photo 0690



Field Photo 0691



Field Photo 0692



Field Photo 0693

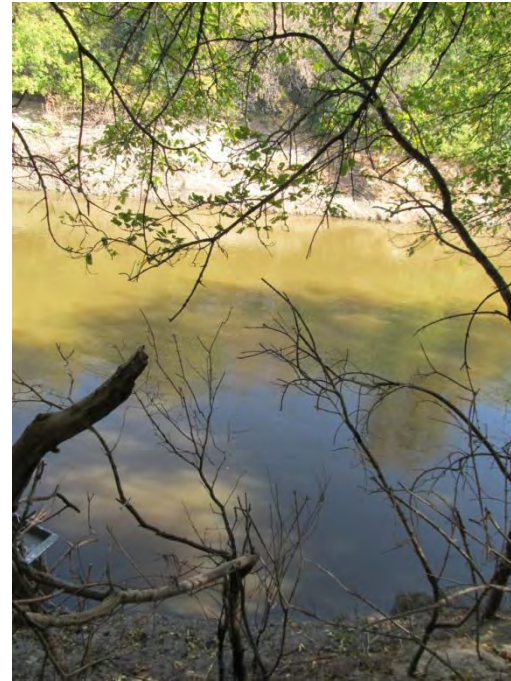


Field Photo 0694

SHEYENNE RIVER – 8 – 55.75
OBSERVATION DATE: OCTOBER 2, 2011



Field Photo 0695



Field Photo 0696



Field Photo 0697



Field Photo 0698



Field Photo 0699



Field Photo 0700

SHEYENNE RIVER – 8 – 55.75
OBSERVATION DATE: OCTOBER 2, 2011



Field Photo 0701



Field Photo 0702



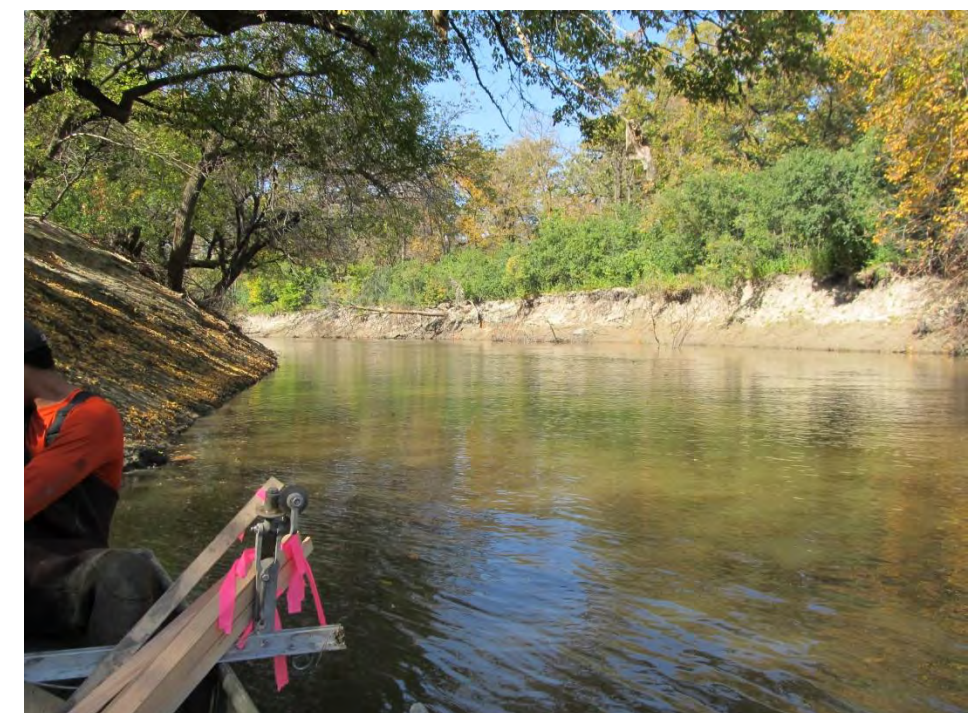
Field Photo 0704



Field Photo 0705



Field Photo 0706



Field Photo 0707

SHEYENNE RIVER – 8– 55.75
OBSERVATION DATE: OCTOBER 2, 2011



Field Photo 0708



Field Photo 0709



Field Photo 0710



Field Photo 0711



Field Photo 0712



Field Photo 0713



MIDWEST TESTING LABORATORY



Project No.: M1101216

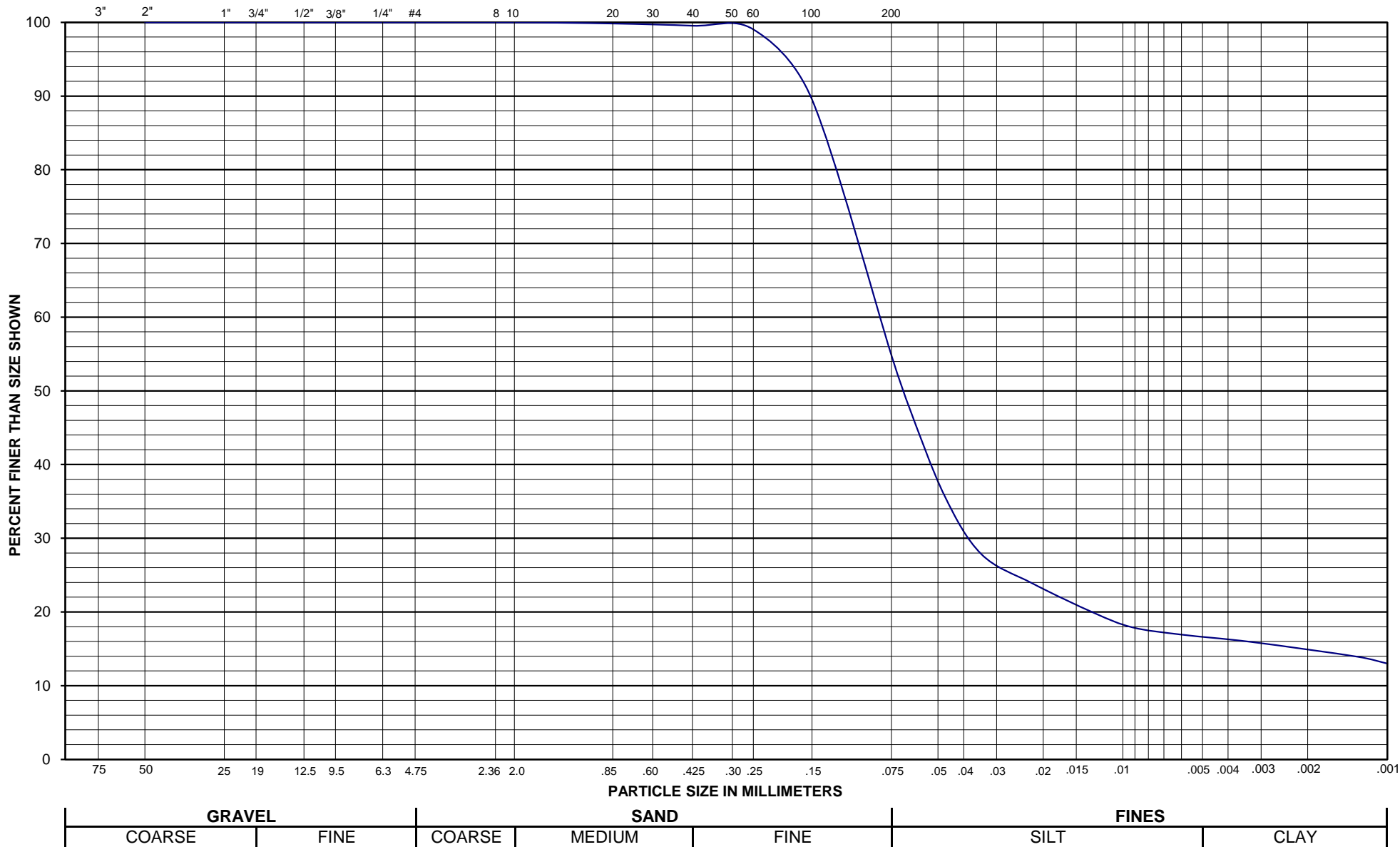
Project: Red River Geomorphic Study
Cass County, North Dakota

Sample Source: #24 (SR8-LB)

Classification: FAT CLAY WITH SAND - dark brown (CH)

Reported to: West Consultants, Inc.

GRAIN SIZE DISTRIBUTION CURVE U.S. Standard Sieve Sizes





MIDWEST TESTING LABORATORY



Project No.: M1101216

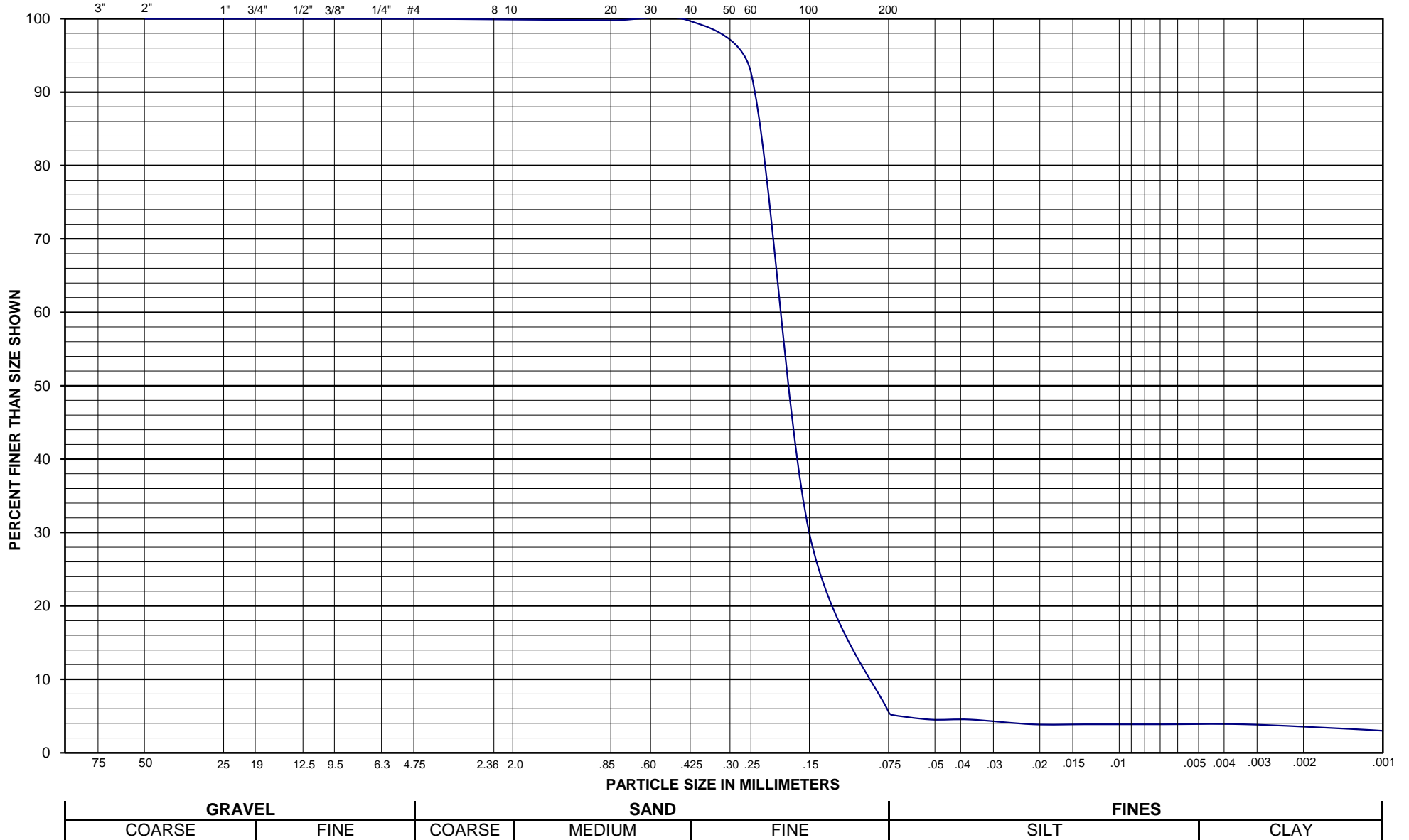
Project: Red River Geomorphic Study
Cass County, North Dakota

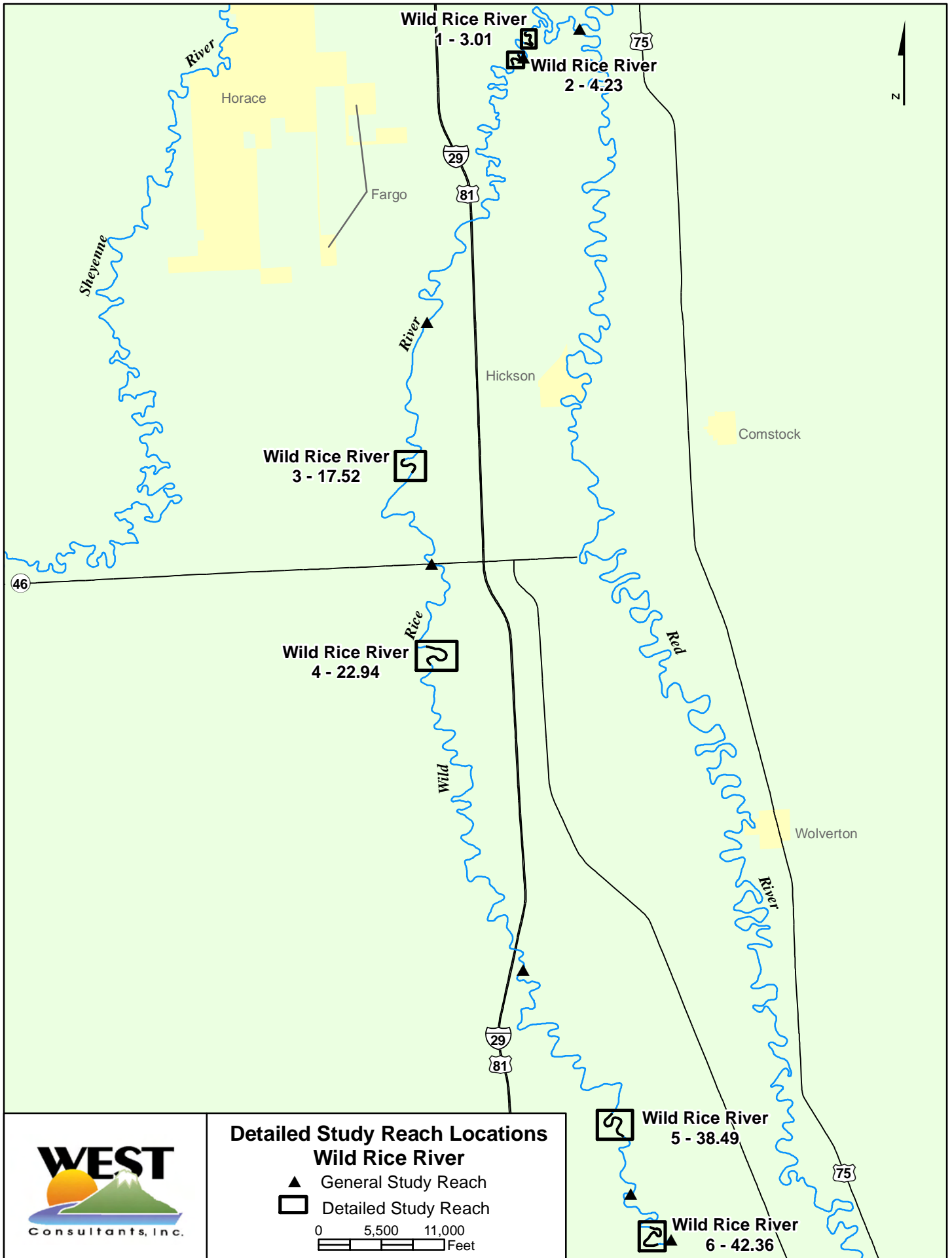
Sample Source: #20 (SR8-CH)

Classification: POORLY GRADED SAND - brown, fine (SP)

Reported to: West Consultants, Inc.

GRAIN SIZE DISTRIBUTION CURVE U.S. Standard Sieve Sizes





**Detailed Study Reach Locations
Wild Rice River**

- ▲ General Study Reach
- Detailed Study Reach

0 5,500 11,000
Feet

Wild Rice River
5 - 38.49

Wild Rice River
6 - 42.36



LEGEND

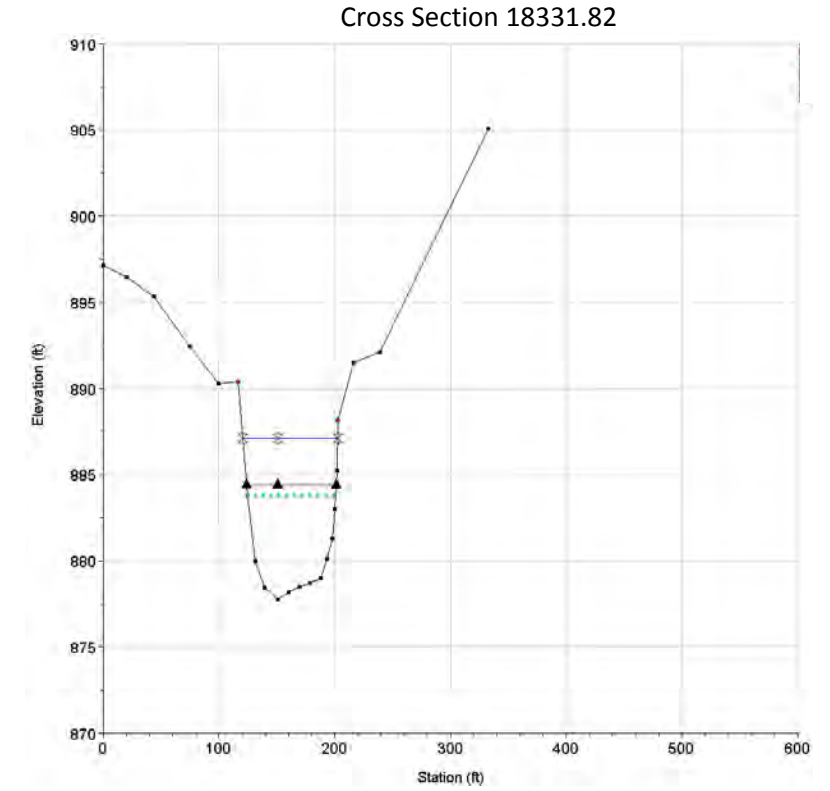
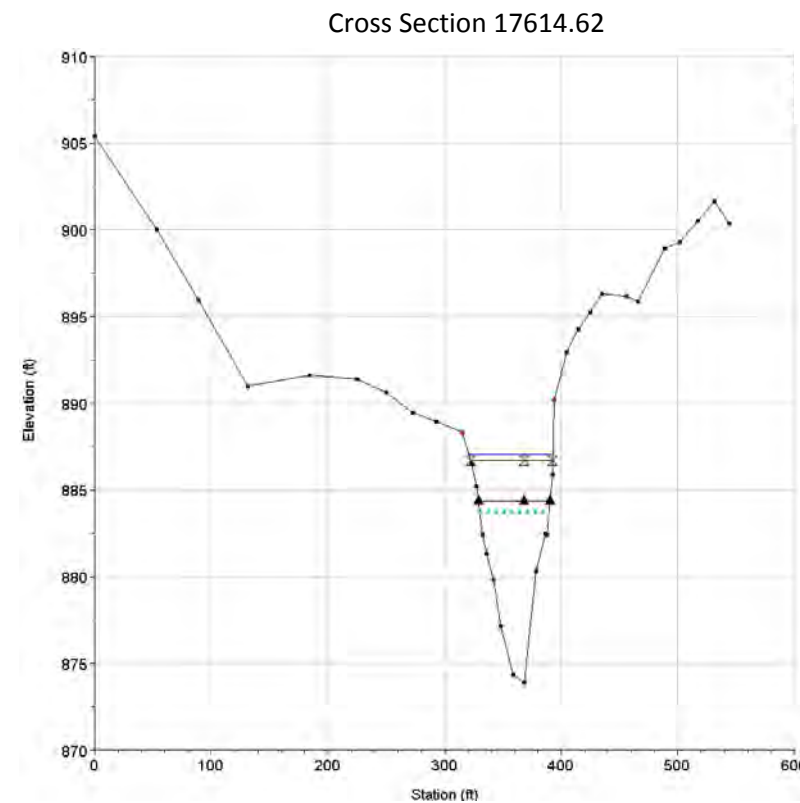
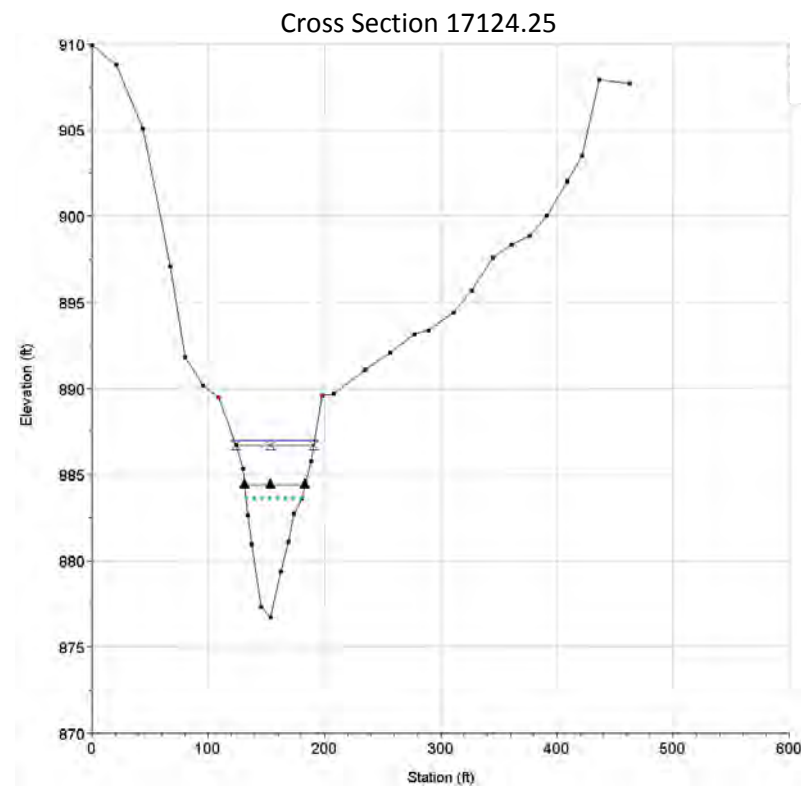
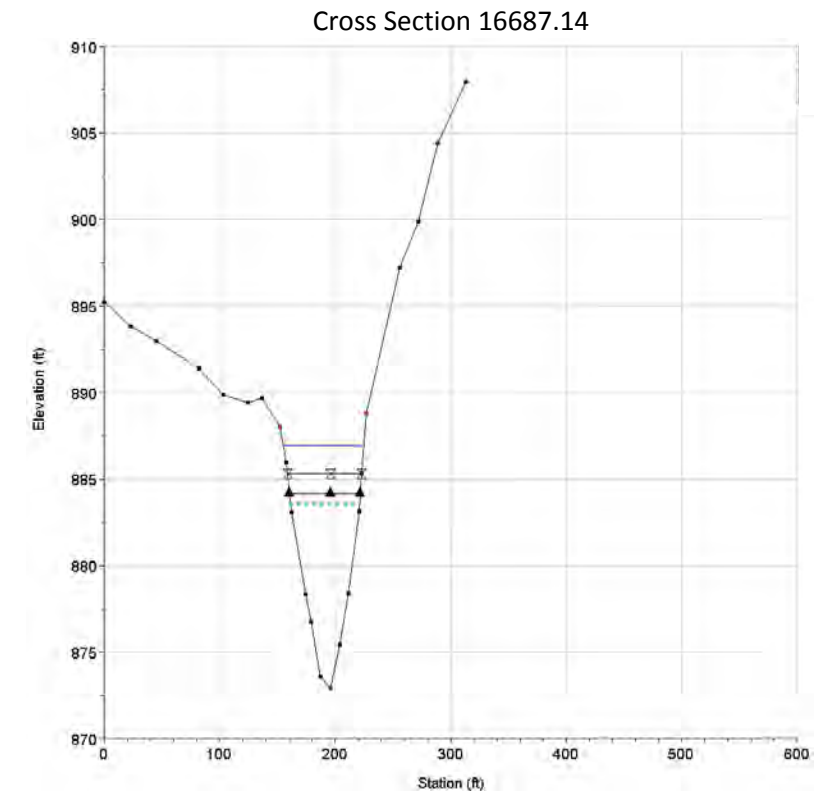
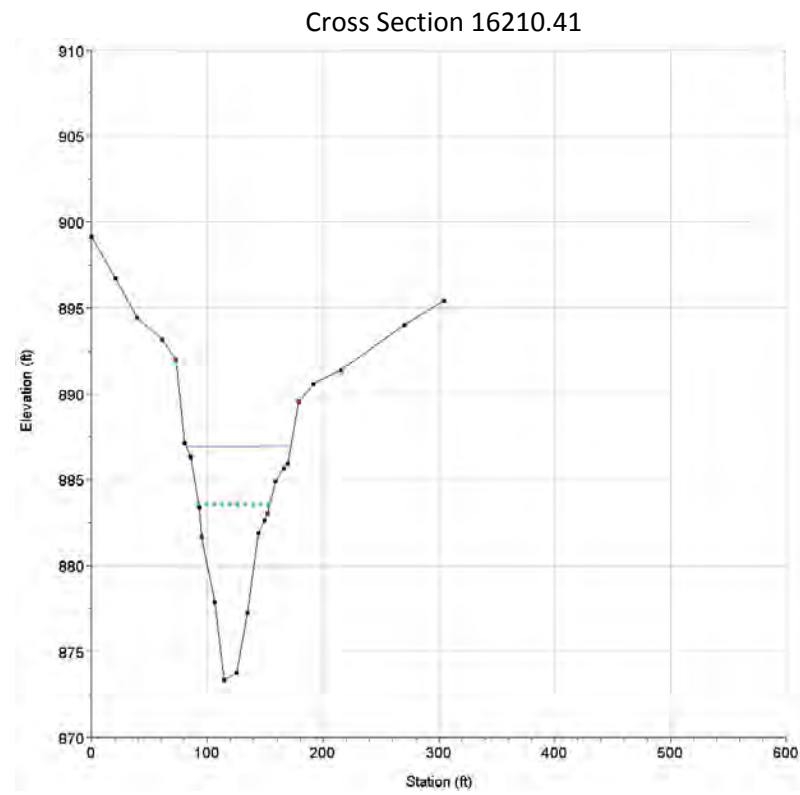
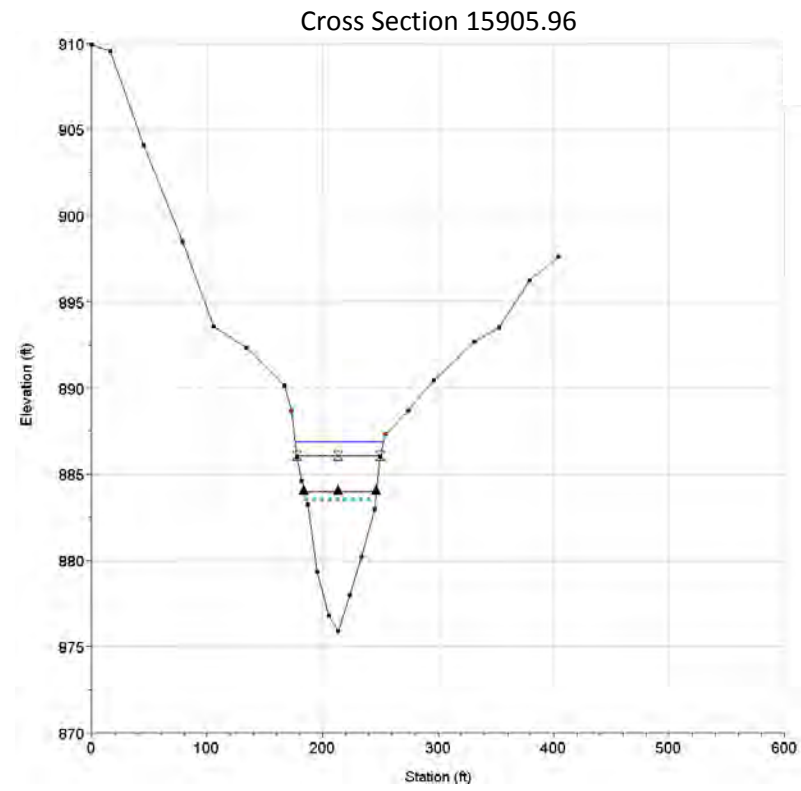
- Cross Section
 - - - Detailed Study Reach
 - Sediment Sample
 - ▲ Field Photos
 - 1247 Direction Arrow and Photo Number
- 0 50 100
Feet



WILD RICE RIVER - 1 - 3.01

Observation Date: October 4, 2011

WILD RICE RIVER – 1 – 3.01



LEGEND

..... Modeled Water Surface Elevation for Day of Survey
 ——— Modeled Bankfull Water Surface Elevation
 ——▲—— Observed Water Surface Elevation
 ——⊗—— Observed Bankfull Water Surface Elevation
 ——■—— Ground
 ● Bank Stations

WILD RICE RIVER – 1 – 3.01
OBSERVATION DATE: OCTOBER 4, 2011



Field Photo 0769



Field Photo 0770



Field Photo 0771



Field Photo 0772



Field Photo 0765



Field Photo 0766

WILD RICE RIVER – 1 – 3.01
OBSERVATION DATE: OCTOBER 4, 2011



Field Photo 0767



Field Photo 0768



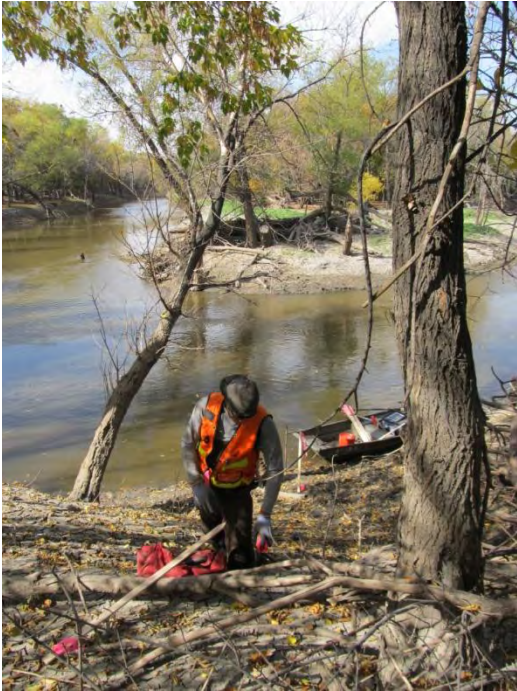
Field Photo 0761



Field Photo 0762



Field Photo 0763



Field Photo 0764

WILD RICE RIVER – 1 – 3.01
OBSERVATION DATE: OCTOBER 4, 2011



Field Photo 0757



Field Photo 0758



Field Photo 0759



Field Photo 0760



Field Photo 0773



Field Photo 0774

WILD RICE RIVER – 1 – 3.01
OBSERVATION DATE: OCTOBER 4, 2011



Field Photo 0775



Field Photo 0776



MIDWEST TESTING LABORATORY



Project No.: M1101216

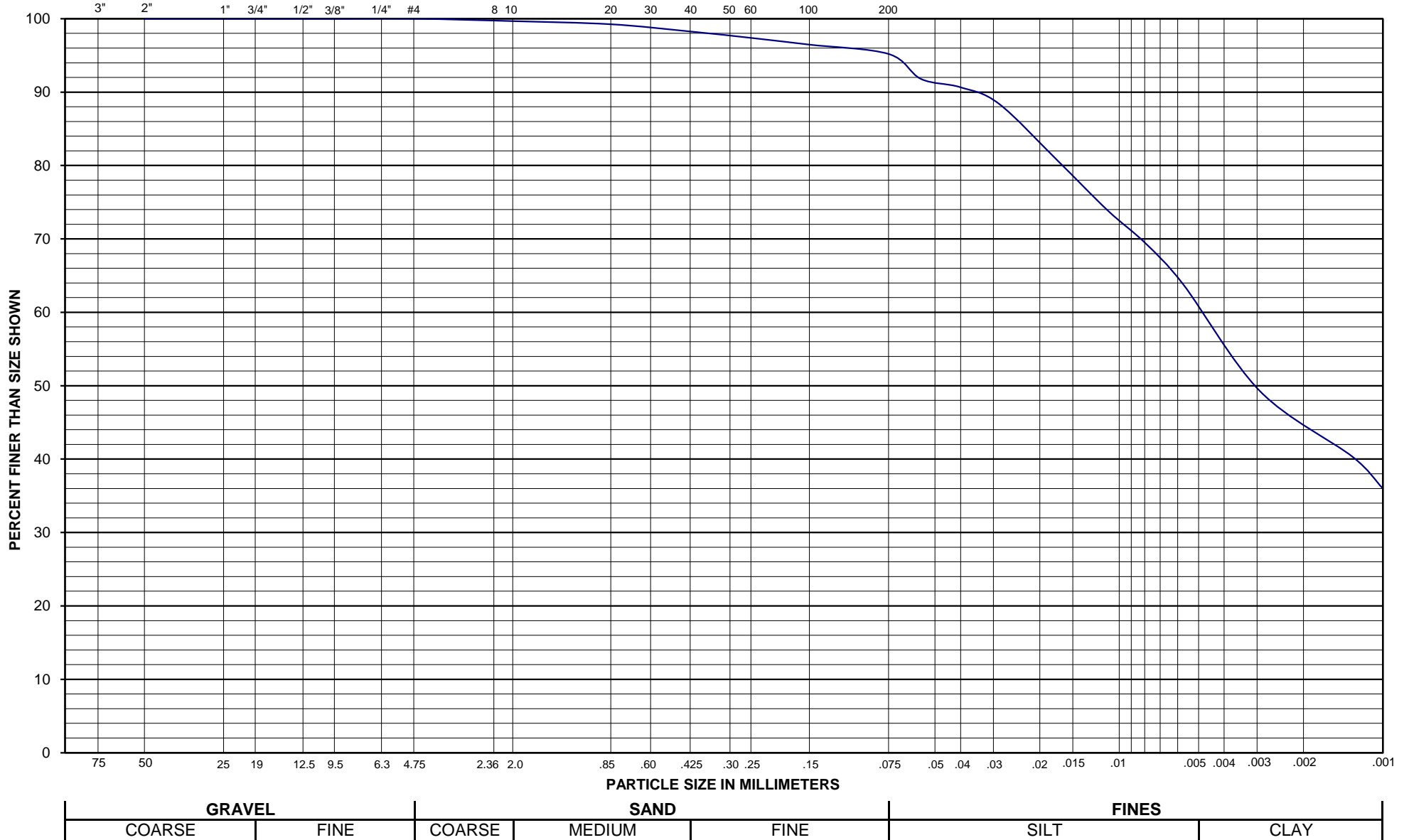
Project: Red River Geomorphic Study
Cass County, North Dakota

Sample Source: #50 (WR/3227/CH)

Classification: FAT CLAY - dark grayish brown (CH)

Reported to: West Consultants, Inc.

GRAIN SIZE DISTRIBUTION CURVE U.S. Standard Sieve Sizes





LEGEND

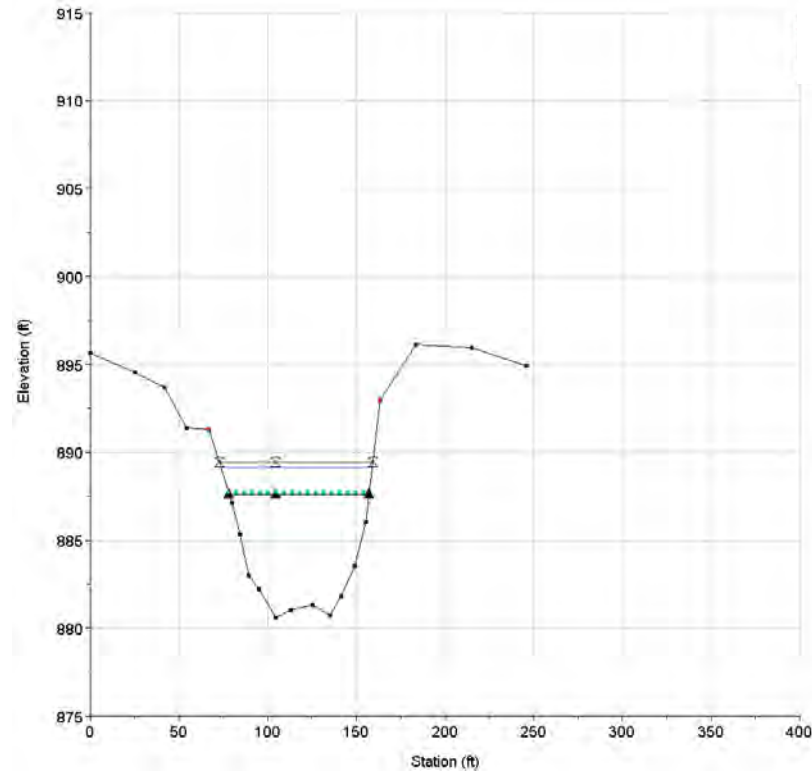
- Cross Section
 - - - Detailed Study Reach
 - Sediment Sample
 - ▲ Field Photos
 - 1247 Direction Arrow and Photo Number
- 0 52 104
 Feet



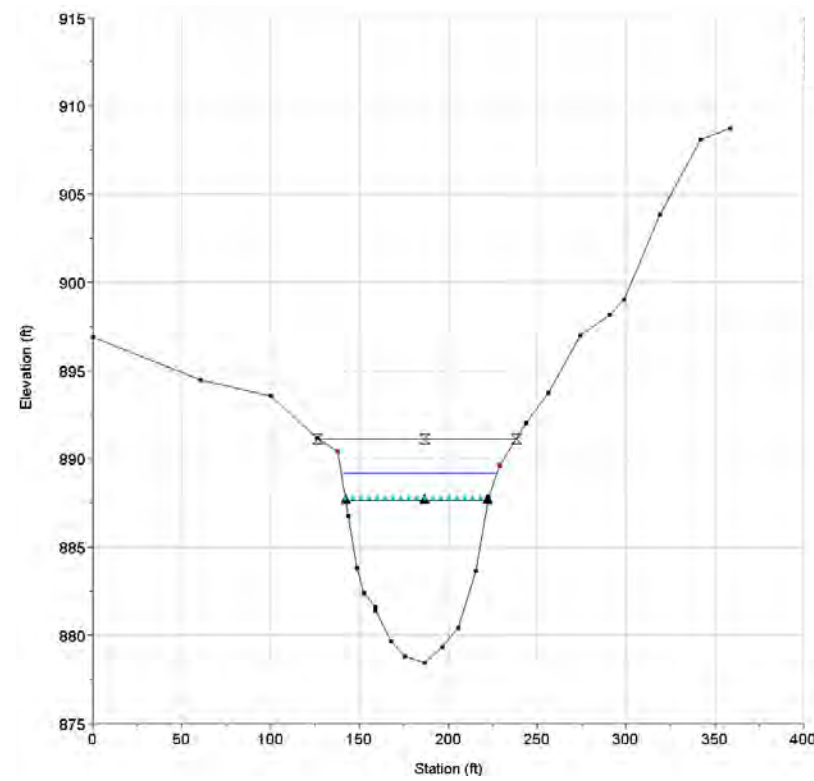
WILD RICE RIVER - 2 - 4.23
Observation Date: October 4, 2011

WILD RICE RIVER – 2 – 4.23

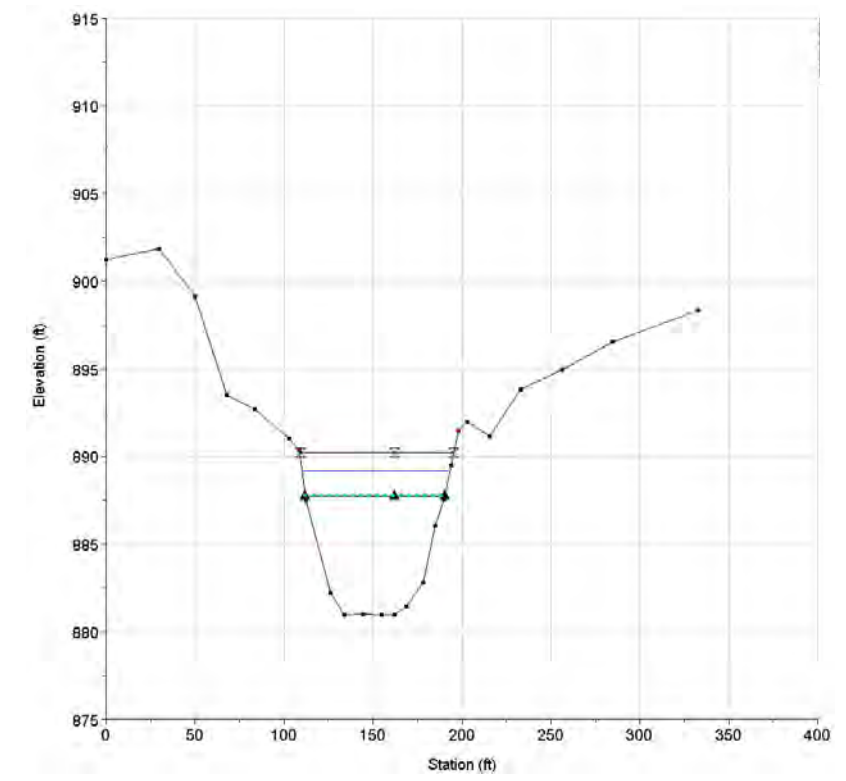
Cross Section 22393.2



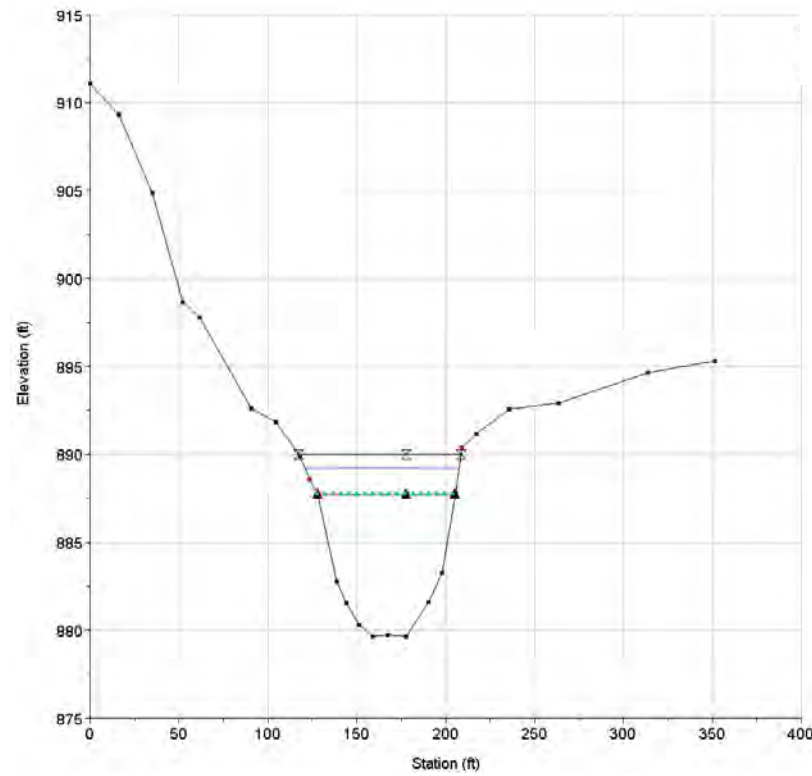
Cross Section 22892.3



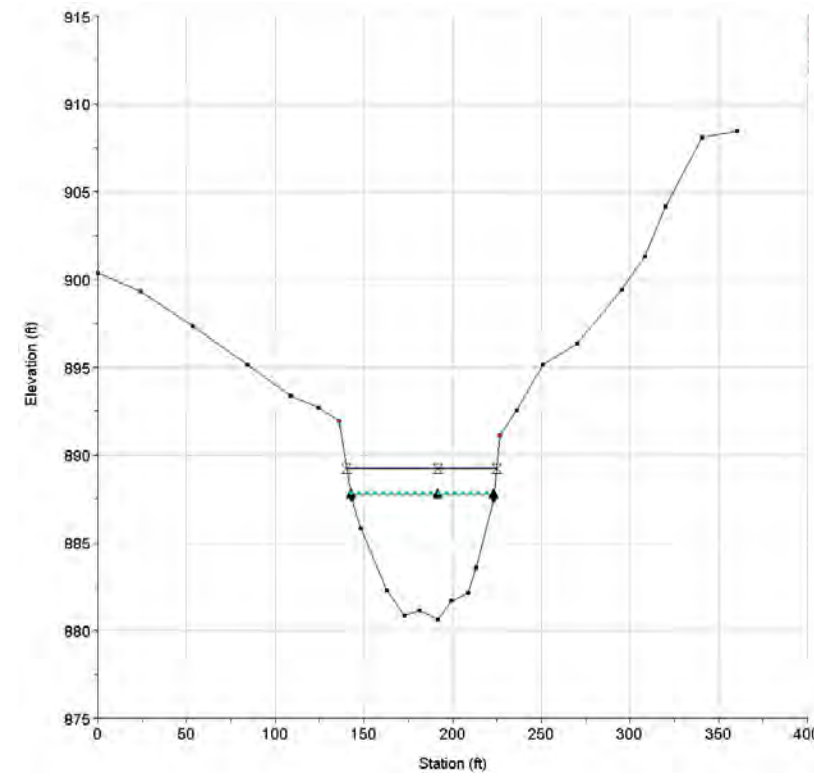
Cross Section 23259.7



Cross Section 23662.6



Cross Section 24208.2



LEGEND

- Modeled Water Surface Elevation for Day of Survey
- Modeled Bankfull Water Surface Elevation
- ▲ Observed Water Surface Elevation
- ⊗ Observed Bankfull Water Surface Elevation
- Ground
- Bank Stations

WILD RICE RIVER – 2 – 4.23
OBSERVATION DATE: OCTOBER 4, 2011



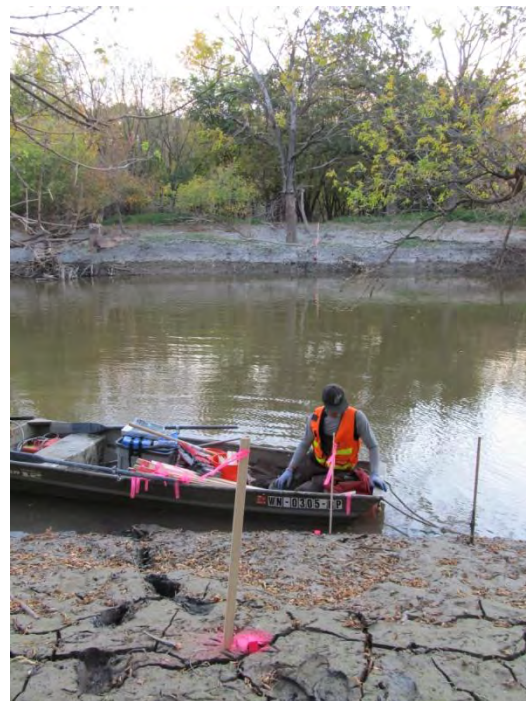
Field Photo 0732



Field Photo 0733



Field Photo 0734



Field Photo 0735

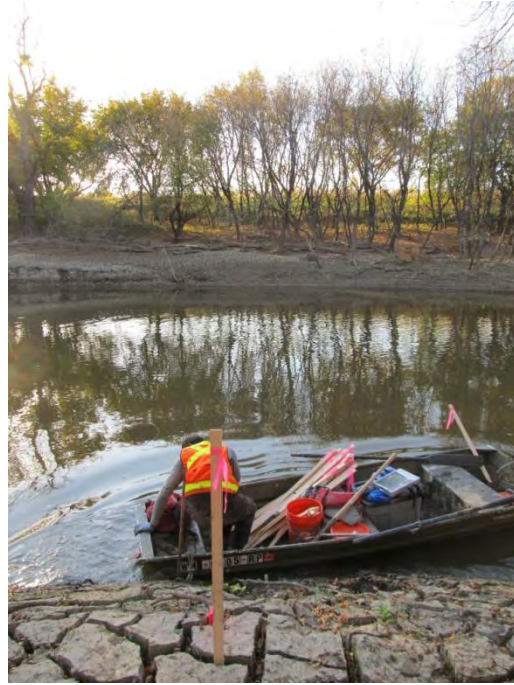


Field Photo 0740



Field Photo 0741

WILD RICE RIVER – 2 – 4.23
OBSERVATION DATE: OCTOBER 4, 2011



Field Photo 0742



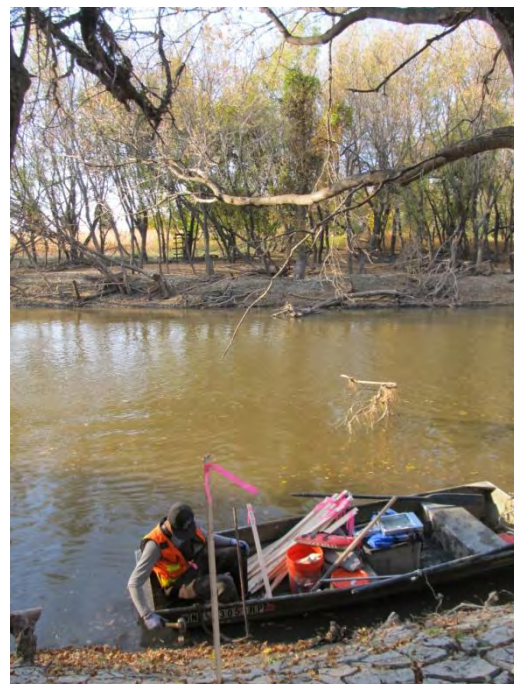
Field Photo 0743



Field Photo 0744



Field Photo 0745



Field Photo 0746



Field Photo 0747

WILD RICE RIVER – 2 – 4.23
OBSERVATION DATE: OCTOBER 4, 2011



Field Photo 0748



Field Photo 0749



Field Photo 0750



Field Photo 0751



Field Photo 0752

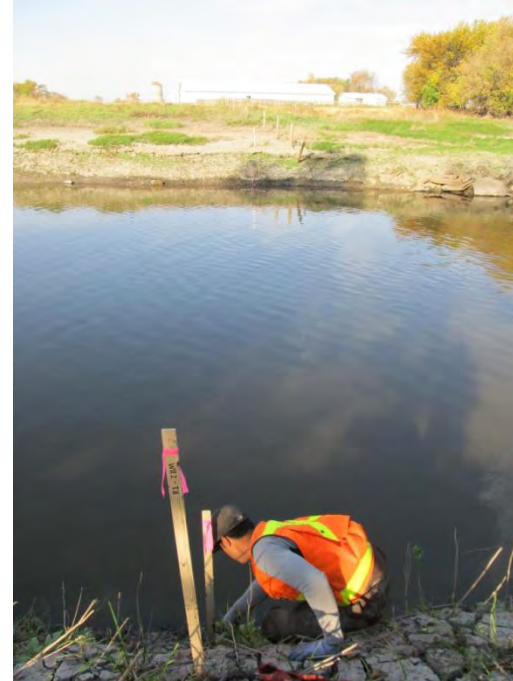


Field Photo 0753

WILD RICE RIVER – 2 – 4.23
OBSERVATION DATE: OCTOBER 4, 2011



Field Photo 0754



Field Photo 0755



MIDWEST TESTING LABORATORY



Project No.: M1101216

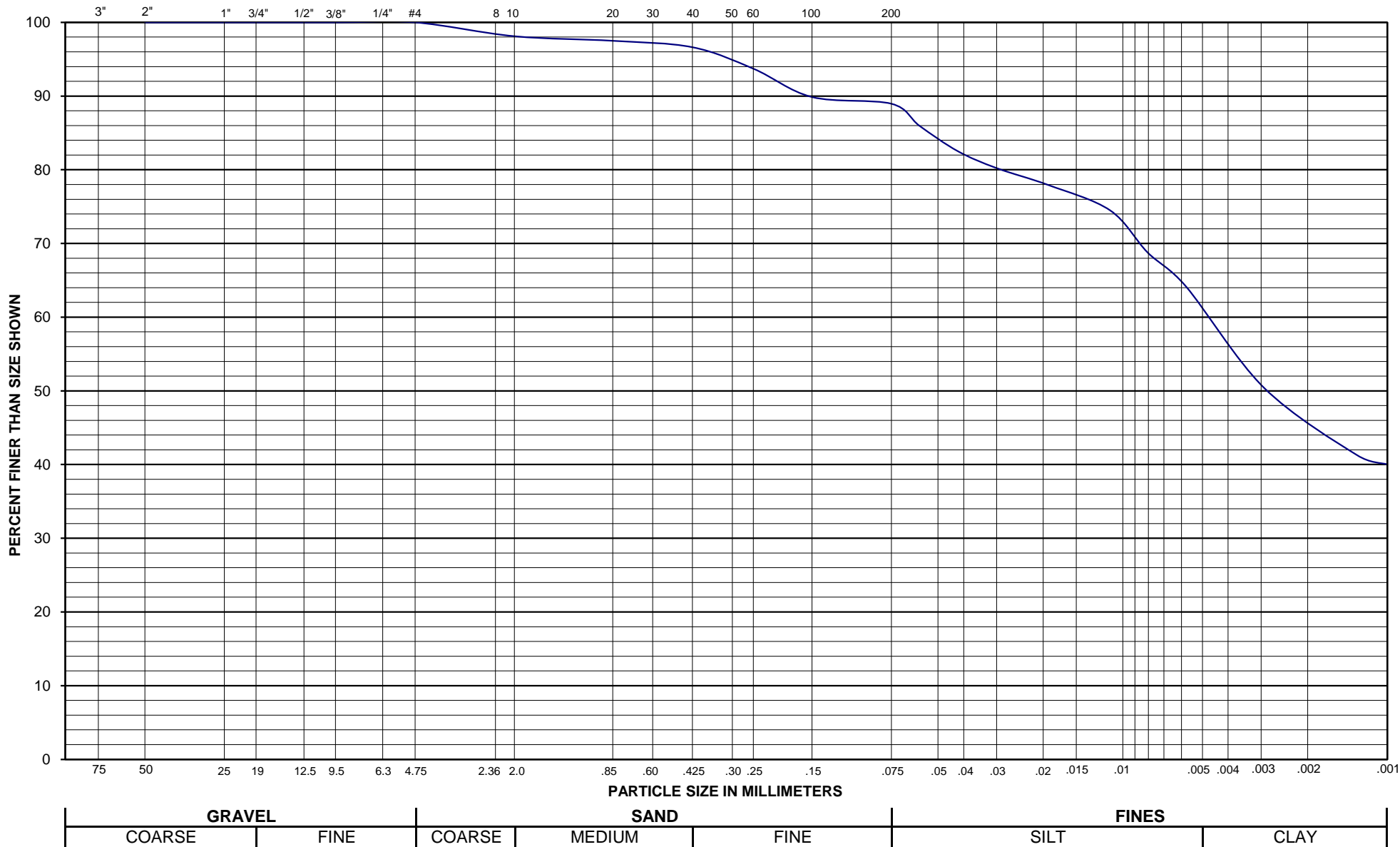
Project: Red River Geomorphic Study
Cass County, North Dakota

Sample Source: #54 (WR2/3126/CH)

Classification: FAT CLAY - dark brown (CH)

Reported to: West Consultants, Inc.

GRAIN SIZE DISTRIBUTION CURVE U.S. Standard Sieve Sizes





MIDWEST TESTING LABORATORY



Project No.: M1101216

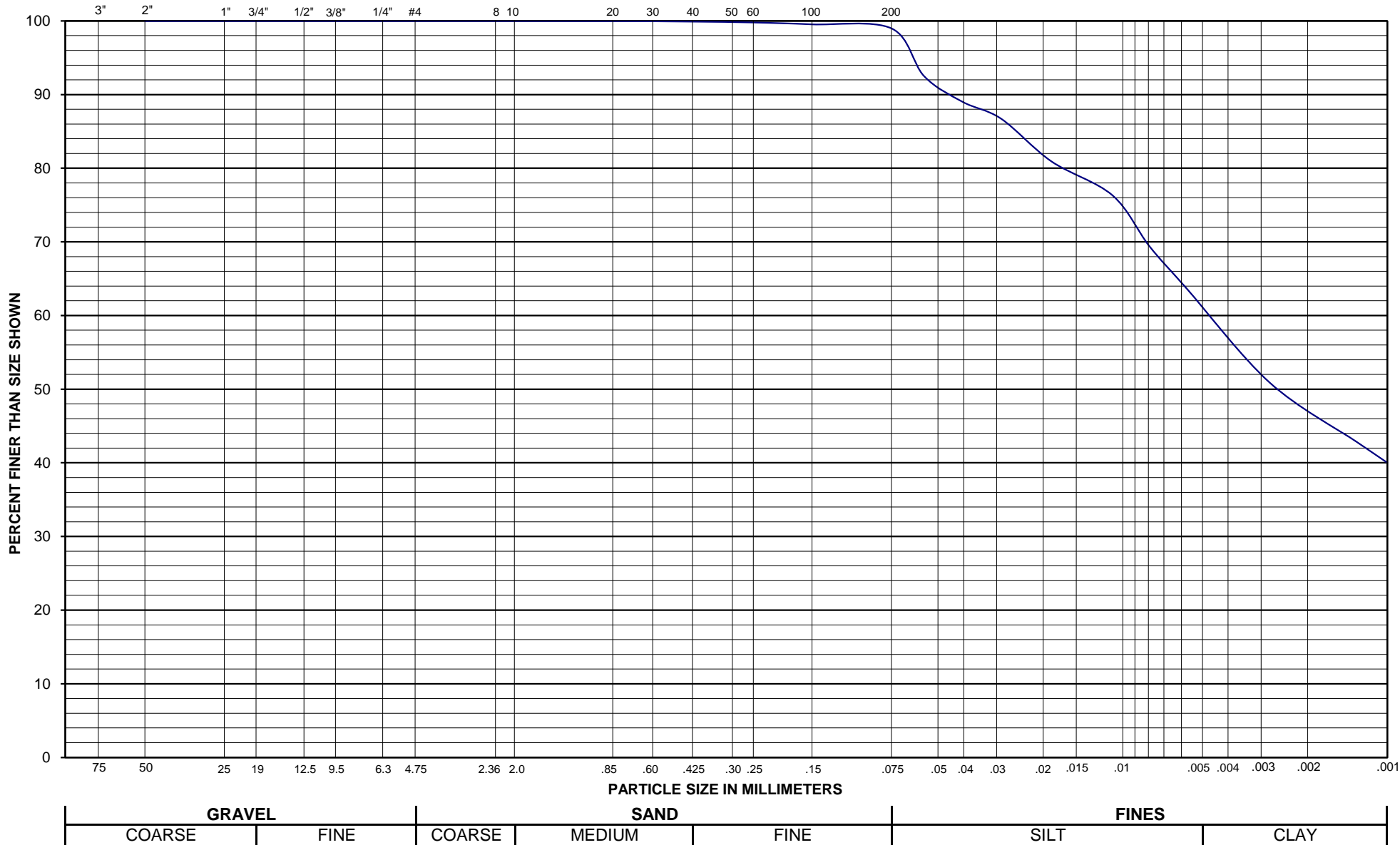
Project: Red River Geomorphic Study
Cass County, North Dakota

Sample Source: #64 (WR2/3125/RB)

Classification: FAT CLAY - dark brown (CH)

Reported to: West Consultants, Inc.

GRAIN SIZE DISTRIBUTION CURVE U.S. Standard Sieve Sizes





LEGEND

- Cross Section
 - - - Detailed Study Reach
 - Sediment Sample
 - ▲ Field Photos
 - 0750 Direction Arrow and Photo Number
- 0 76 152
 Feet

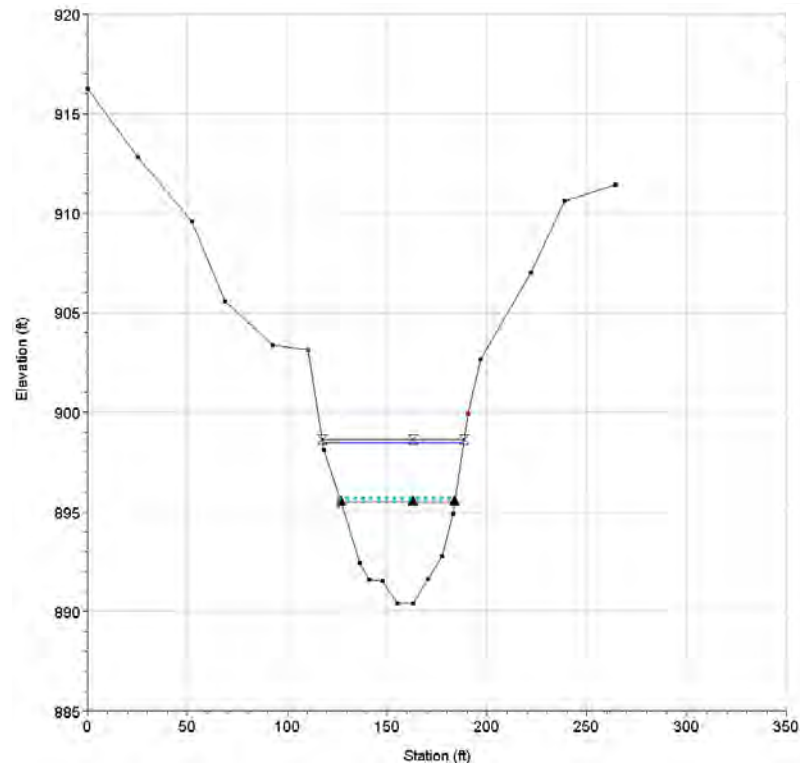


WILD RICE RIVER - 3 - 17.52

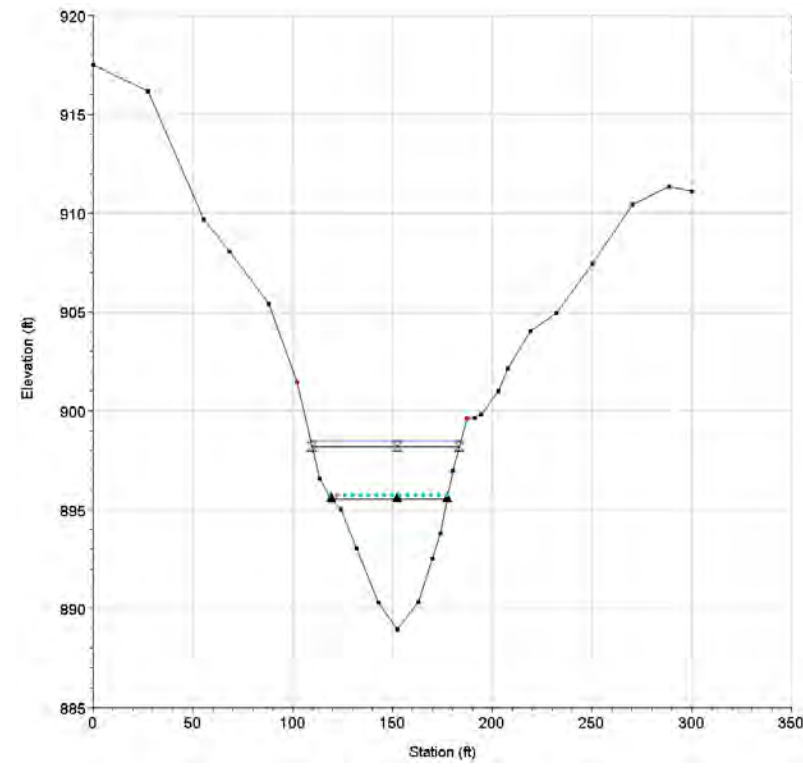
Observation Date: October 4, 2011

WILD RICE RIVER – 3 – 17.52

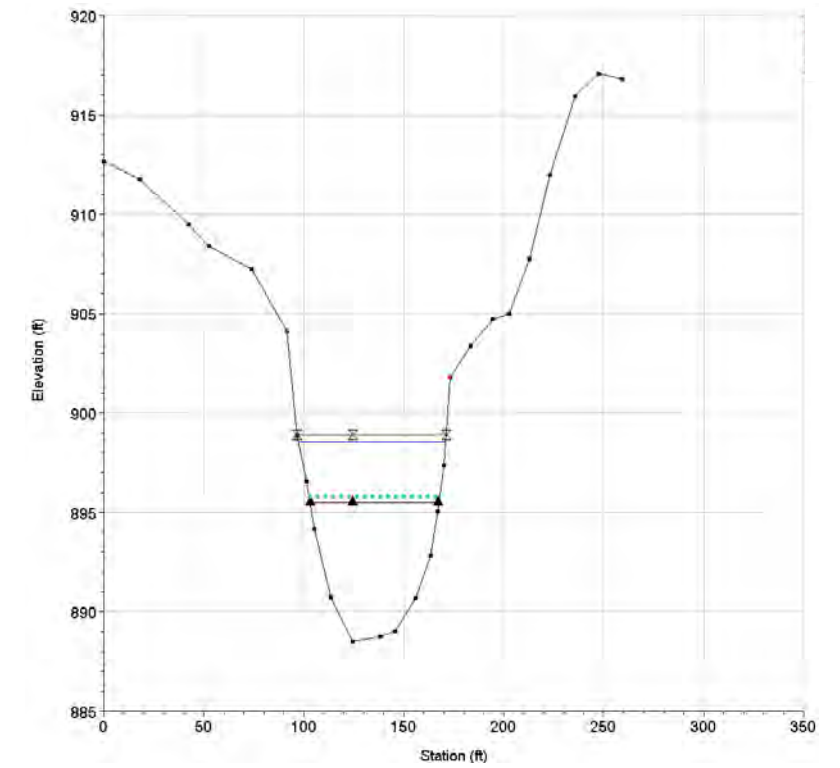
Cross Section 92528.7



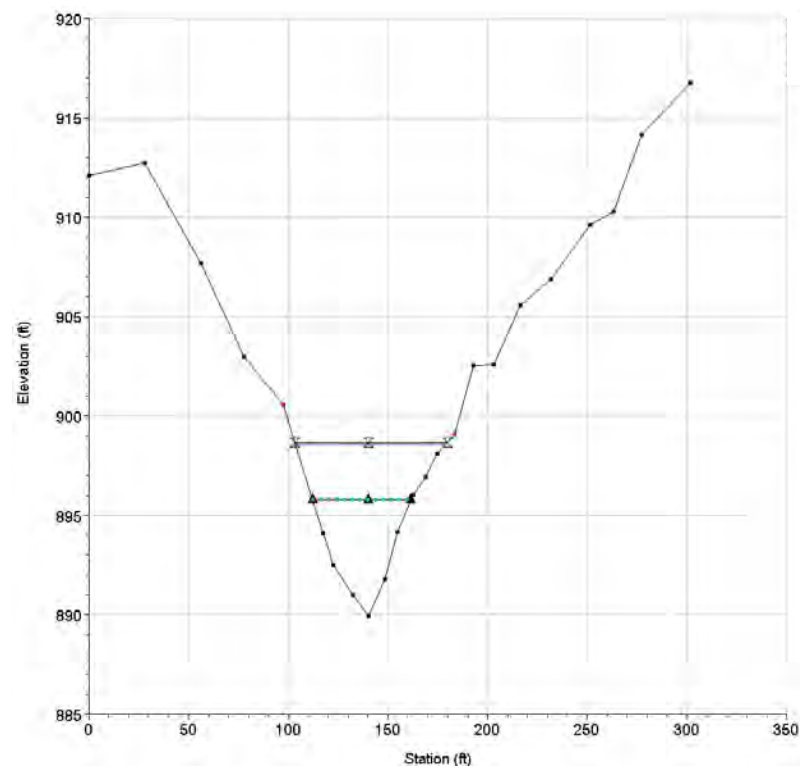
Cross Section 93079.8



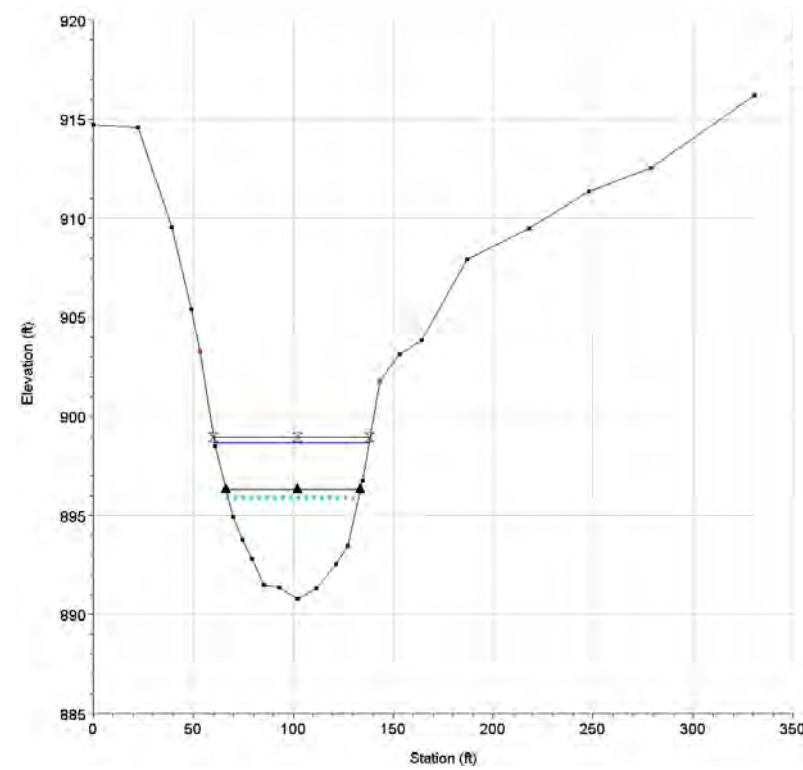
Cross Section 93694.9



Cross Section 94333.0



Cross Section 95136.2



LEGEND

- Modeled Water Surface Elevation for Day of Survey
- Modeled Bankfull Water Surface Elevation
- ▲ Observed Water Surface Elevation
- ⊗ Observed Bankfull Water Surface Elevation
- Ground
- Bank Stations

WILD RICE RIVER – 3 – 17.52
OBSERVATION DATE: OCTOBER 4, 2011



Field Photo 1361



Field Photo 1362



Field Photo 1363



Field Photo 1364

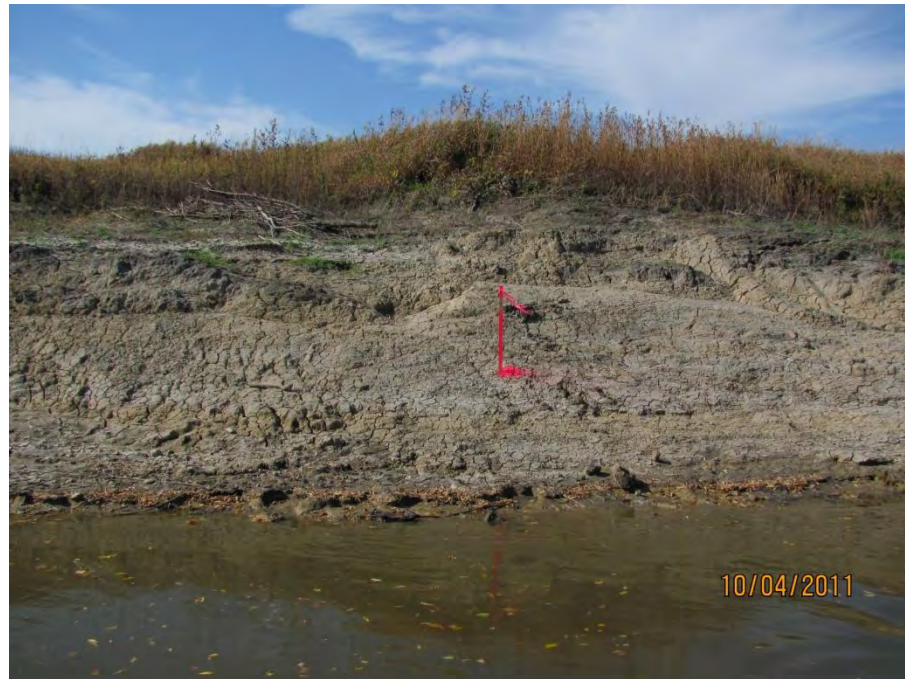


Field Photo 1365



Field Photo 1366

WILD RICE RIVER – 3 – 17.52
OBSERVATION DATE: OCTOBER 4, 2011



Field Photo 1359



Field Photo 1360



Field Photo 1353



Field Photo 1354



Field Photo 1355



Field Photo 1356

WILD RICE RIVER – 3 – 17.52
OBSERVATION DATE: OCTOBER 4, 2011



Field Photo 1349



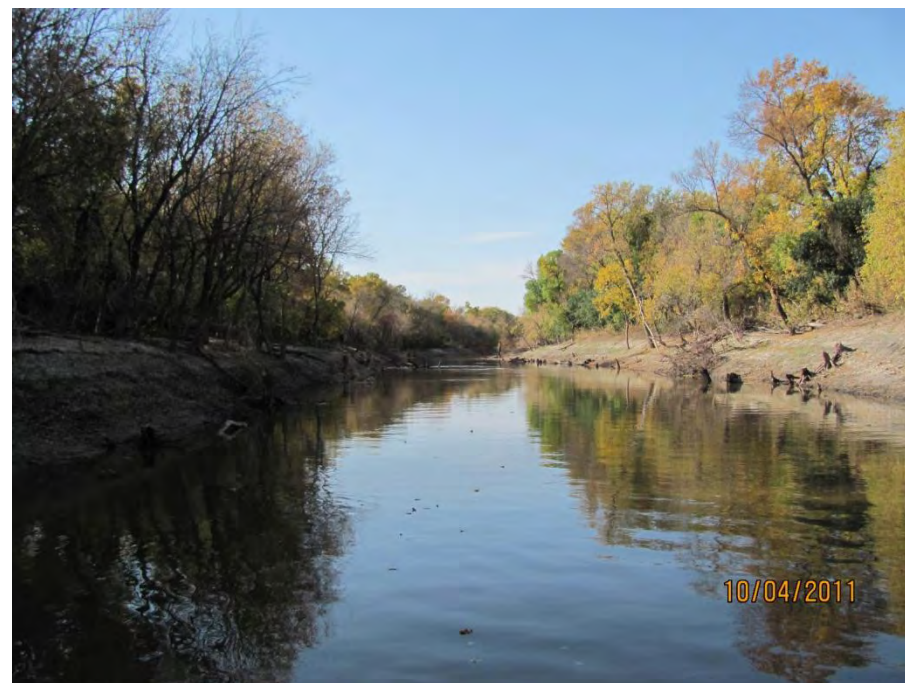
Field Photo 1350



Field Photo 1351



Field Photo 1352



Field Photo 1345



Field Photo 1346

WILD RICE RIVER – 3 – 17.52
OBSERVATION DATE: OCTOBER 4, 2011



Field Photo 1347



Field Photo 1348



MIDWEST TESTING LABORATORY



Project No.: M1101216

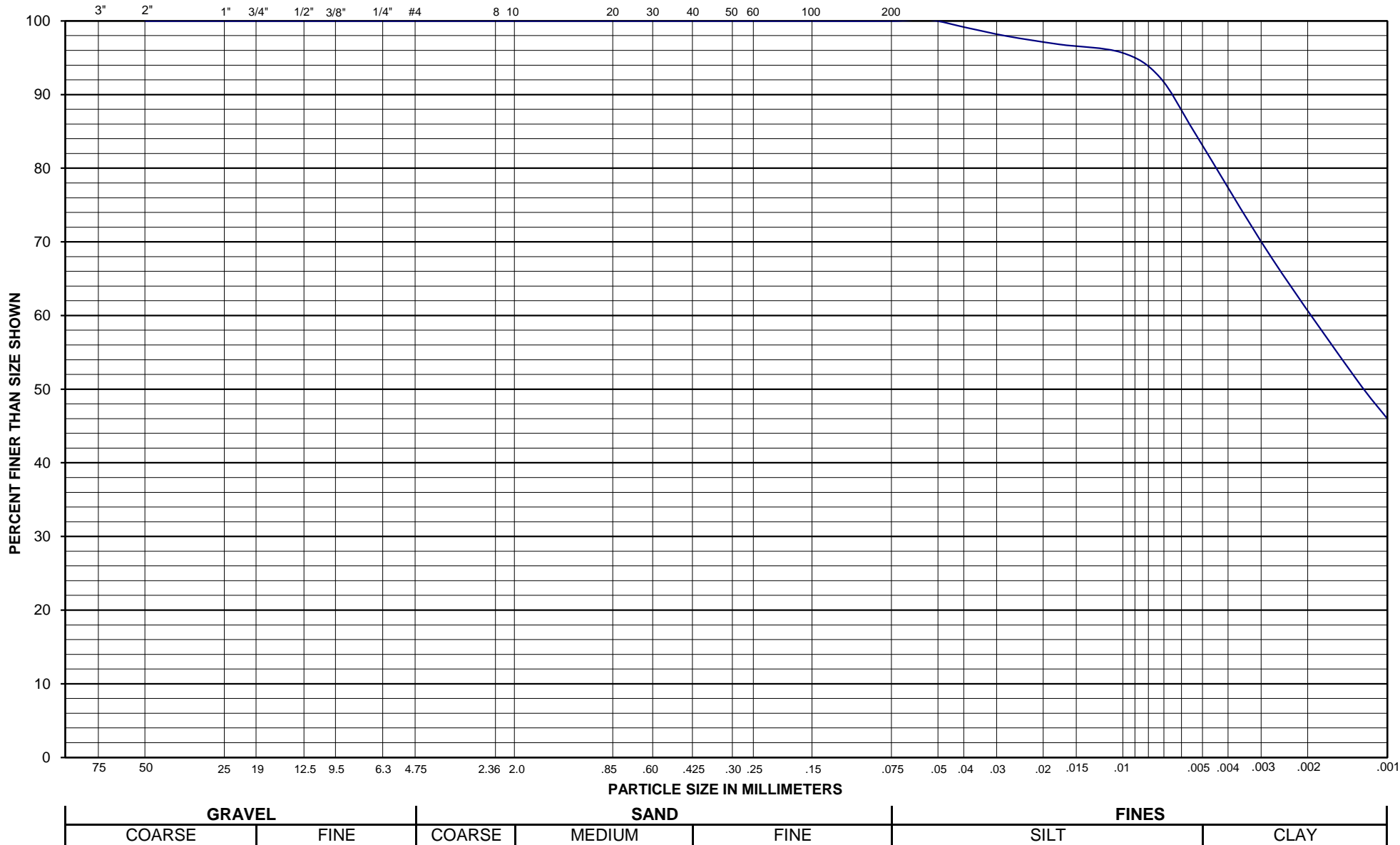
Project: Red River Geomorphic Study
Cass County, North Dakota

Sample Source: #39 (WR/347/LB)

Classification: FAT CLAY - dark grayish brown (CH)

Reported to: West Consultants, Inc.

GRAIN SIZE DISTRIBUTION CURVE U.S. Standard Sieve Sizes





MIDWEST TESTING LABORATORY



Project No.: M1101216

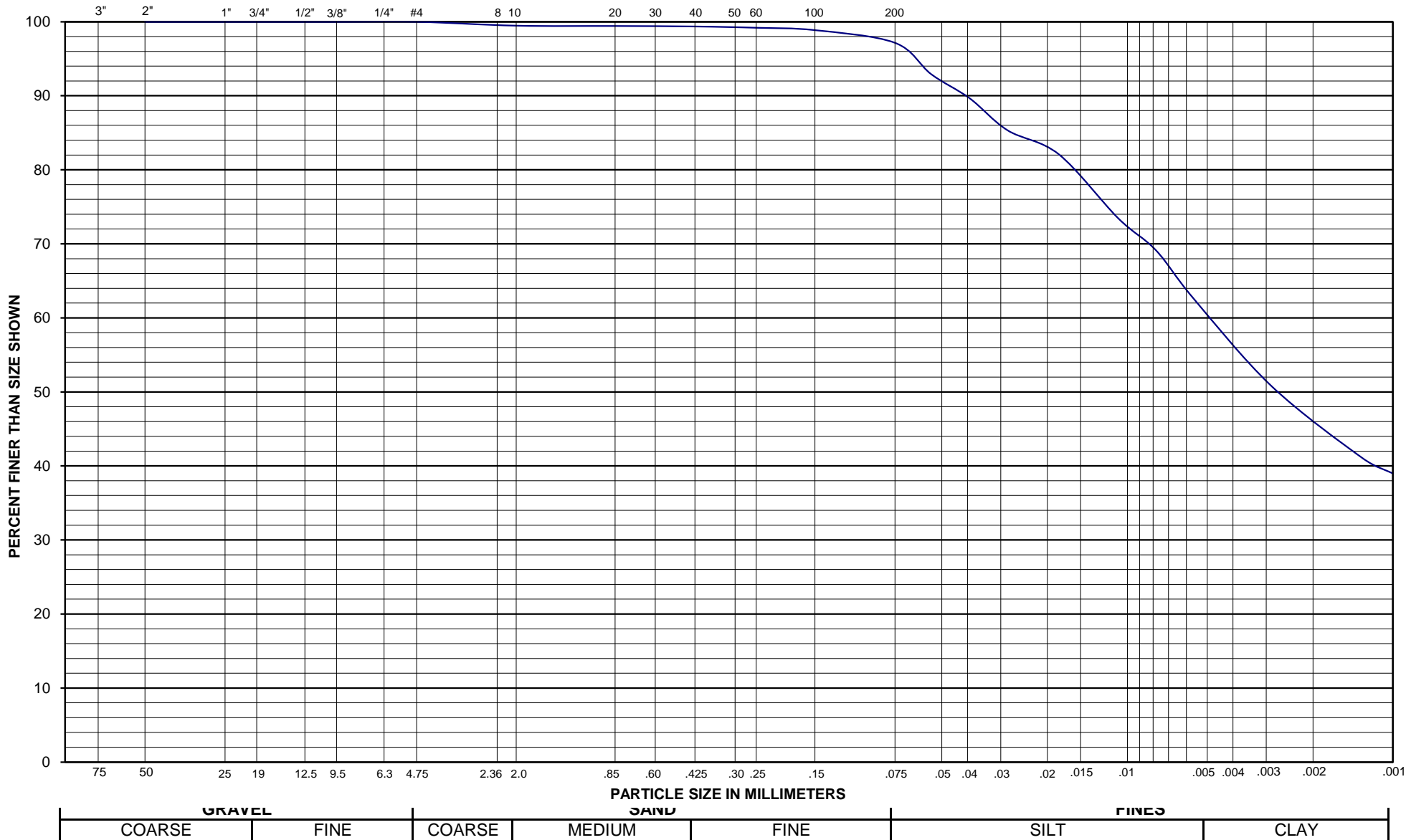
Project: Red River Geomorphic Study
Cass County, North Dakota

Sample Source: #69 (WR/344/RB)

Classification: FAT CLAY - dark brown (CH)

Reported to: West Consultants, Inc.

GRAIN SIZE DISTRIBUTION CURVE U.S. Standard Sieve Sizes





MIDWEST TESTING LABORATORY



Project No.: M1101216

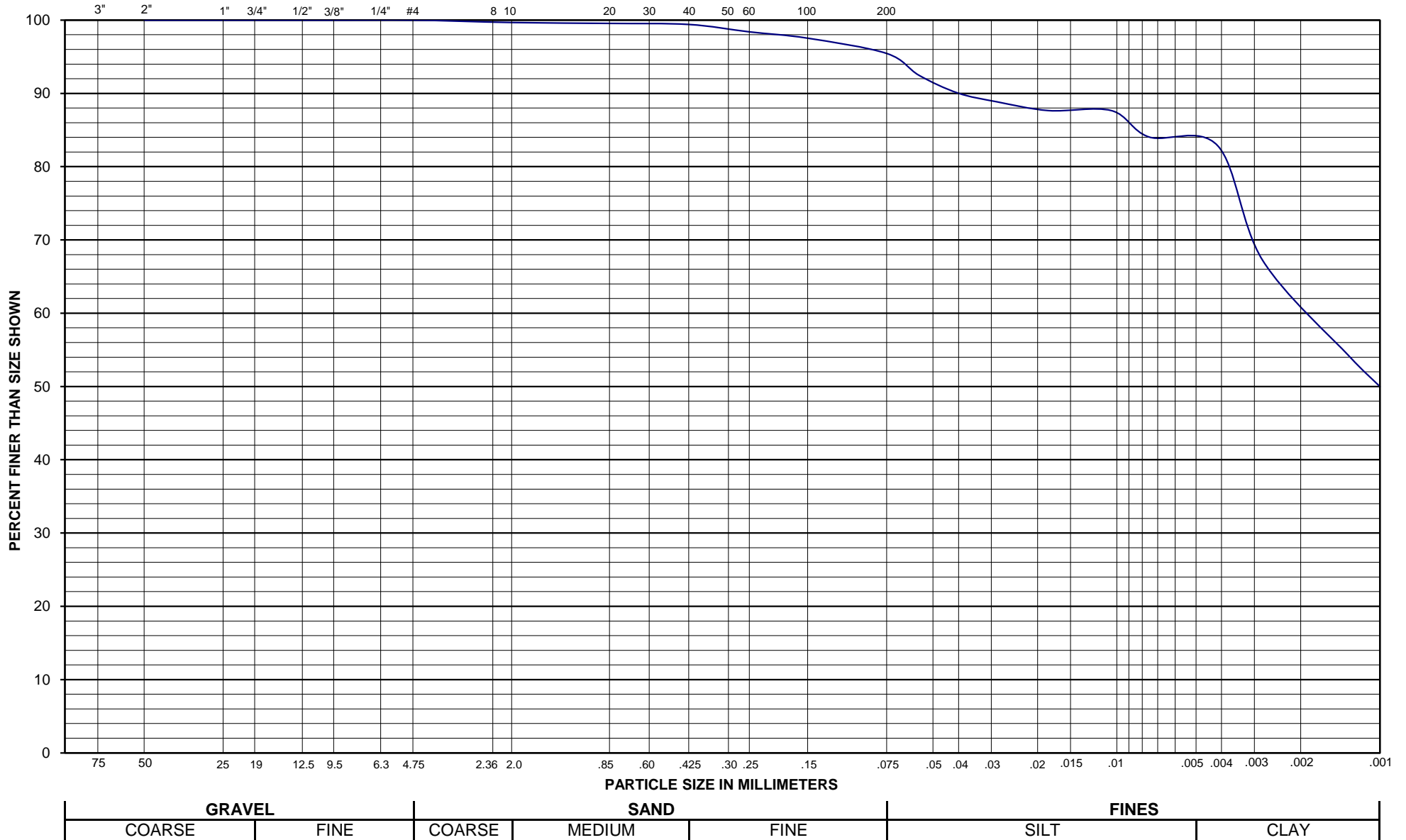
Project: Red River Geomorphic Study
Cass County, North Dakota

Sample Source: #35 (WR/349/BED-C-C)

Classification: FAT CLAY - dark brown (CH)

Reported to: West Consultants, Inc.

GRAIN SIZE DISTRIBUTION CURVE U.S. Standard Sieve Sizes





LEGEND

- Cross Section
- - - Detailed Study Reach
- Sediment Sample
- ▲ Field Photos
- 0750 Direction Arrow and Photo Number

0 98 196
Feet

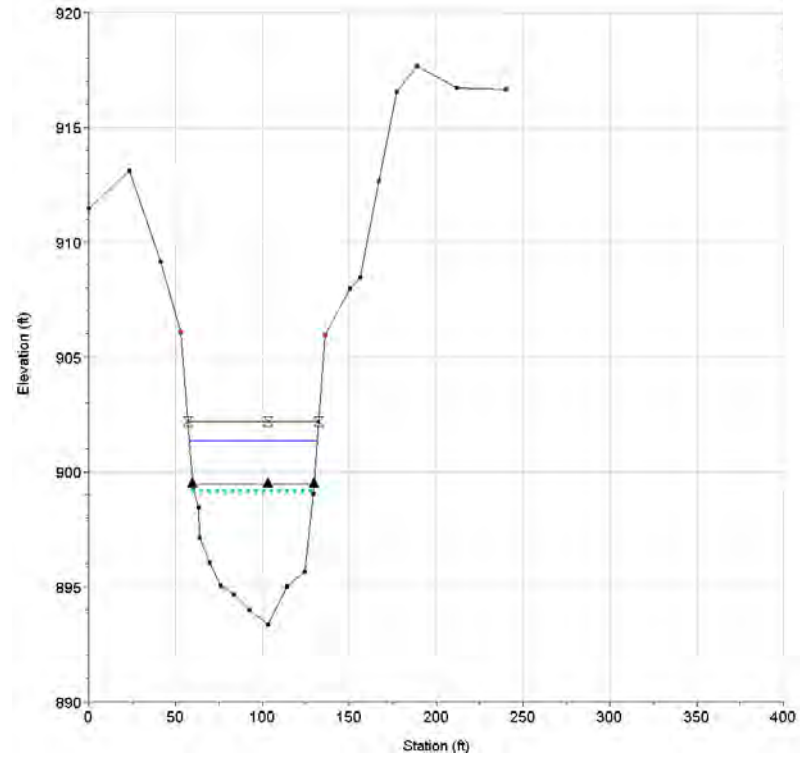
N

WILD RICE RIVER - 4 - 22.94

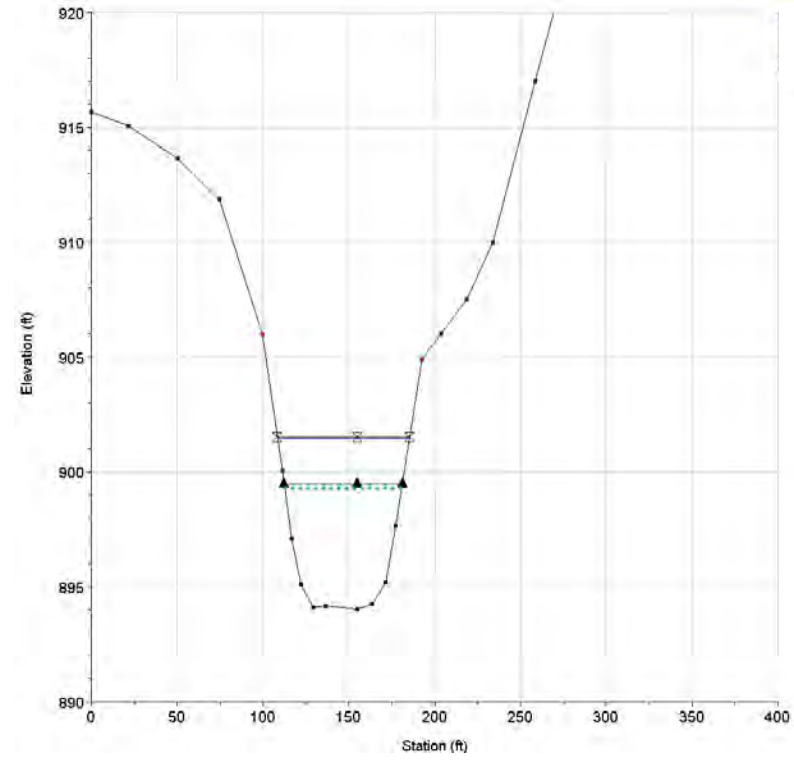
Observation Date: October 3, 2011

WILD RICE RIVER – 4 – 22.94

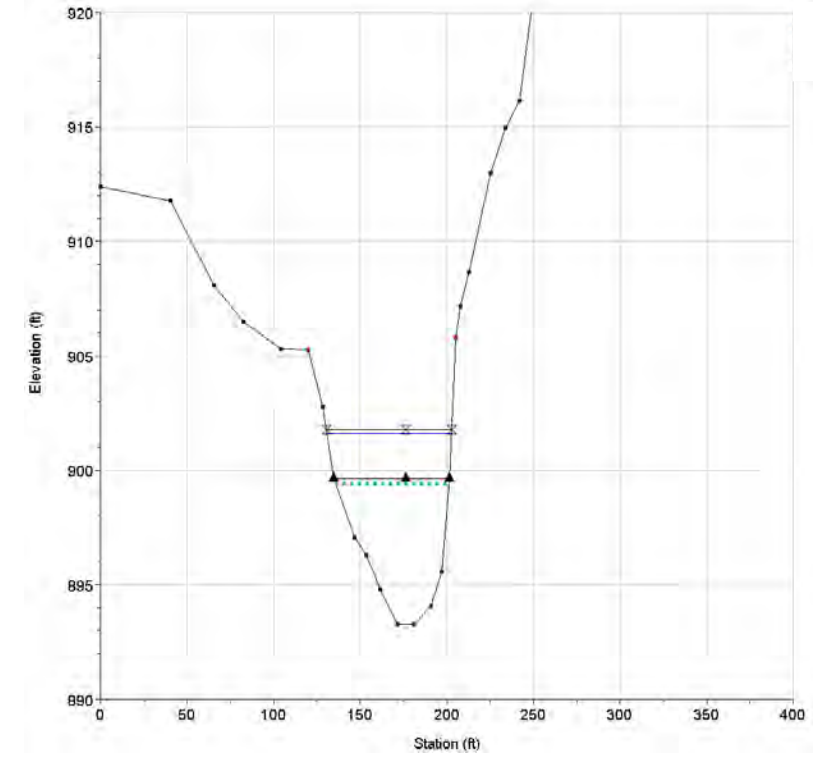
Cross Section 121150.8



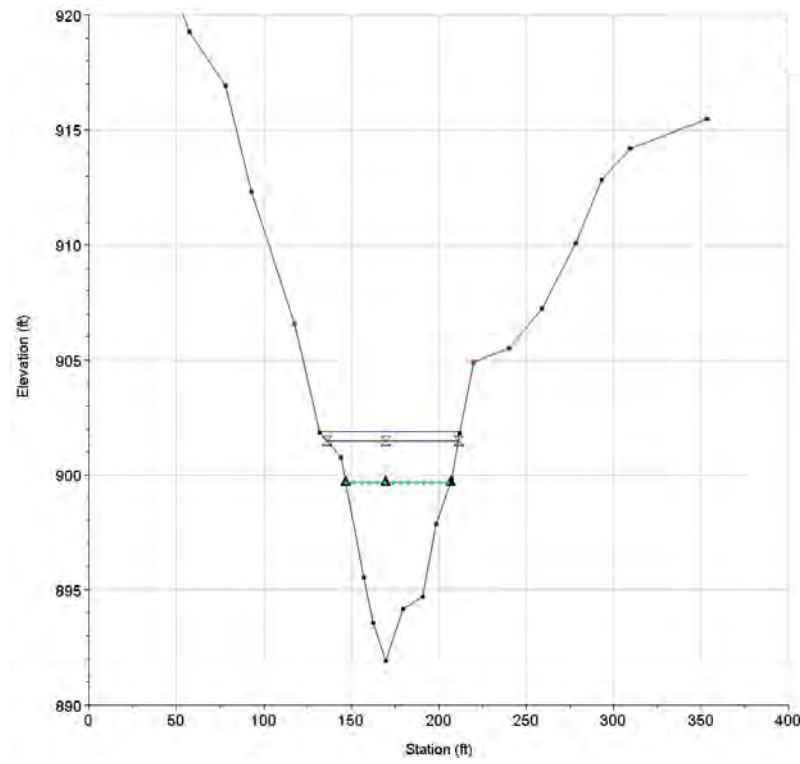
Cross Section 122016.8



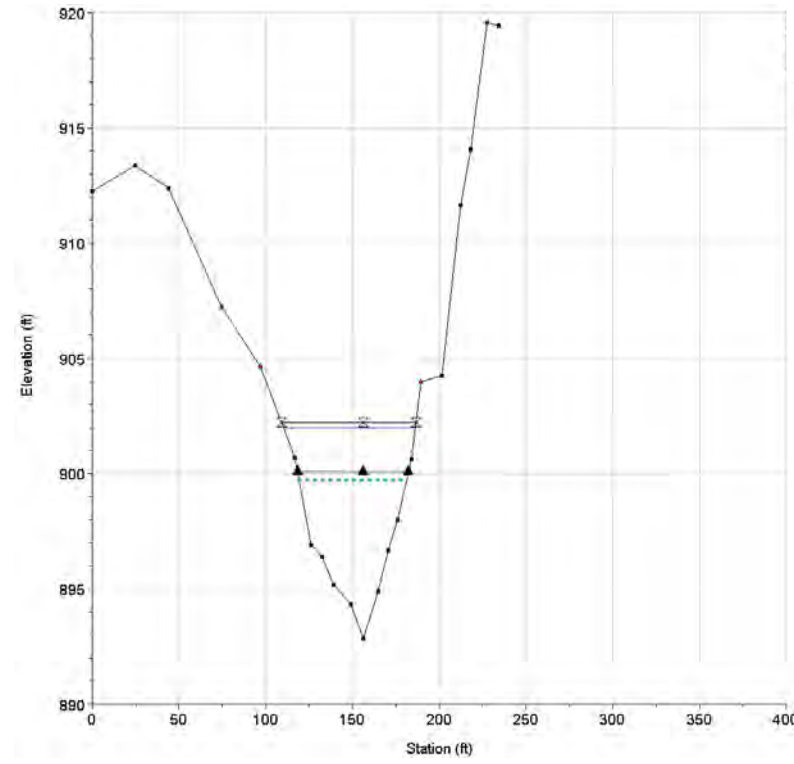
Cross Section 123435.7



Cross Section 125219.8



Cross Section 125885.2



LEGEND

- Modeled Water Surface Elevation for Day of Survey
- Modeled Bankfull Water Surface Elevation
- ▲ Observed Water Surface Elevation
- ⊗ Observed Bankfull Water Surface Elevation
- Ground
- Bank Stations

WILD RICE RIVER – 4 – 22.94
OBSERVATION DATE: OCTOBER 3, 2011



Field Photo 1337



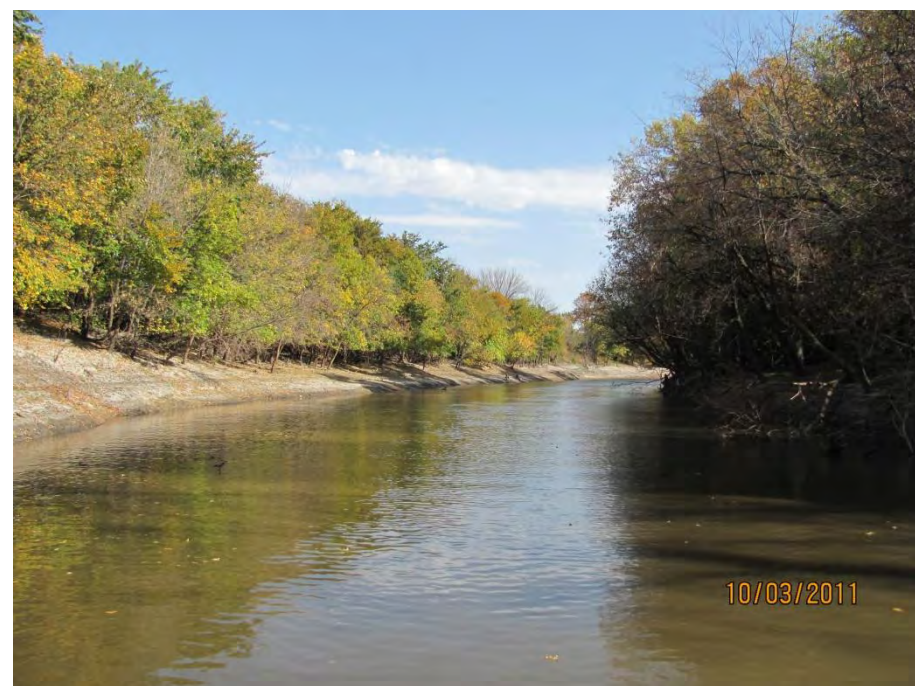
Field Photo 1338



Field Photo 1339



Field Photo 1340



Field Photo 1333



Field Photo 1334

WILD RICE RIVER – 4 – 22.94
OBSERVATION DATE: OCTOBER 3, 2011



Field Photo 1335



Field Photo 1336



Field Photo 1329



Field Photo 1330



Field Photo 1331



Field Photo 1332

WILD RICE RIVER – 4 – 22.94
OBSERVATION DATE: OCTOBER 3, 2011



Field Photo 1325



Field Photo 1326



Field Photo 1327



Field Photo 1328



Field Photo 1321



Field Photo 1322

WILD RICE RIVER – 4 – 22.94
OBSERVATION DATE: OCTOBER 3, 2011



Field Photo 1323



Field Photo 1324



MIDWEST TESTING LABORATORY



Project No.: M1101216

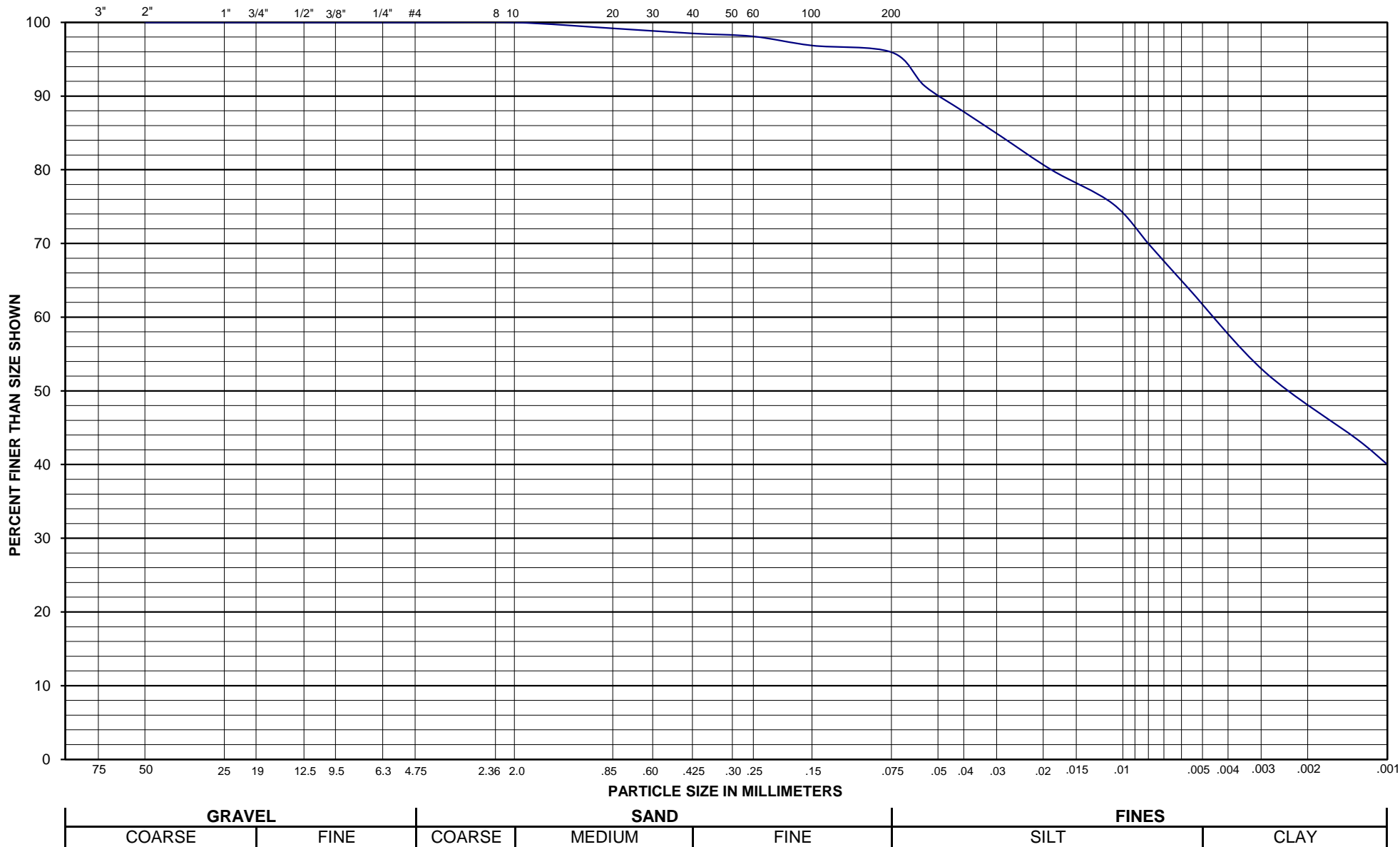
Project: Red River Geomorphic Study
Cass County, North Dakota

Sample Source: #59 (WR/303/BED-C-R)

Classification: FAT CLAY - dark brown (CH)

Reported to: West Consultants, Inc.

GRAIN SIZE DISTRIBUTION CURVE U.S. Standard Sieve Sizes





MIDWEST TESTING LABORATORY



Project No.: M1101216

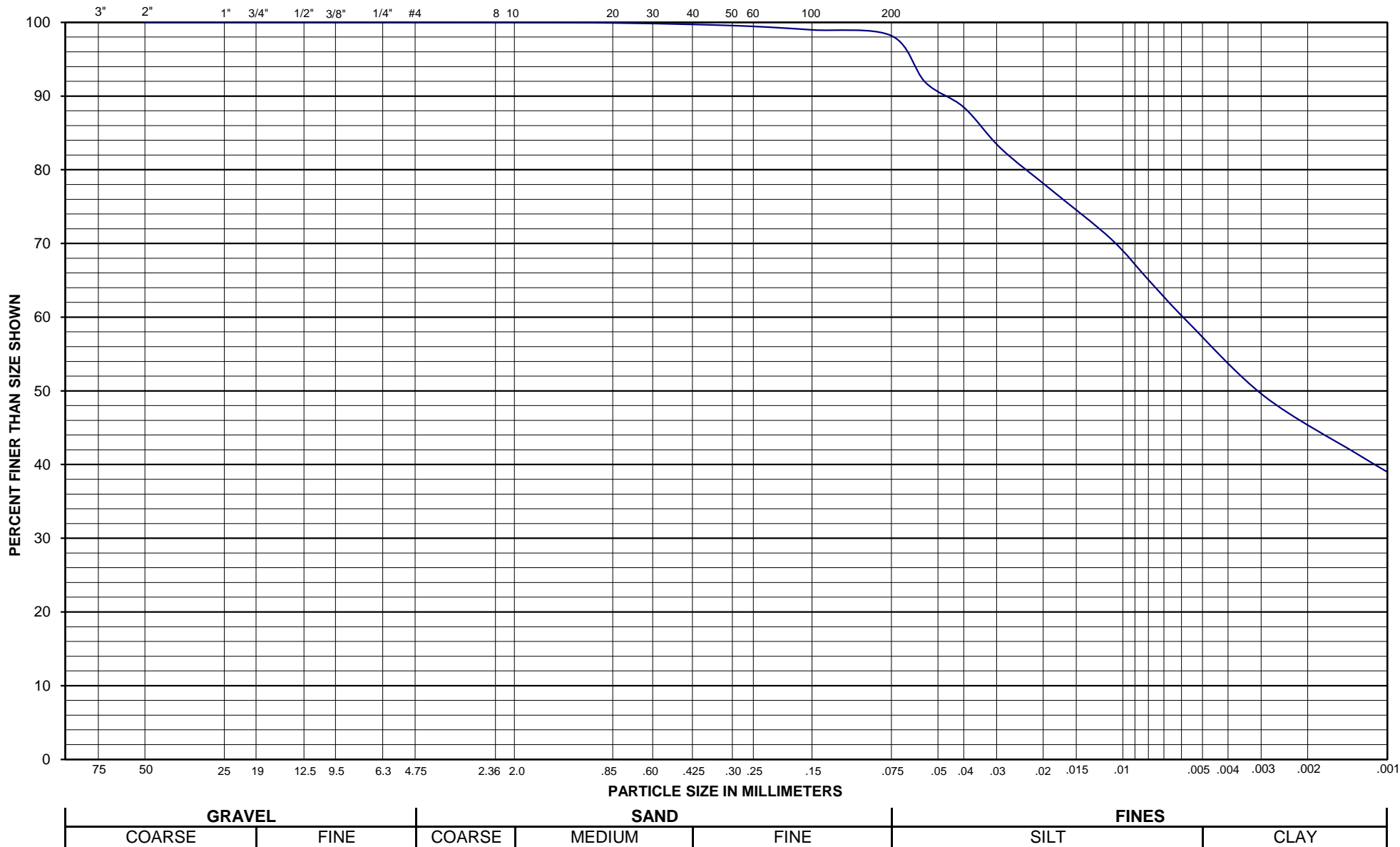
Project: Red River Geomorphic Study
Cass County, North Dakota

Sample Source: #60 (WR/301/LB)

Classification: FAT CLAY - dark brown (CH)

Reported to: West Consultants, Inc.

GRAIN SIZE DISTRIBUTION CURVE U.S. Standard Sieve Sizes





MIDWEST TESTING LABORATORY



Project No.: M1101216

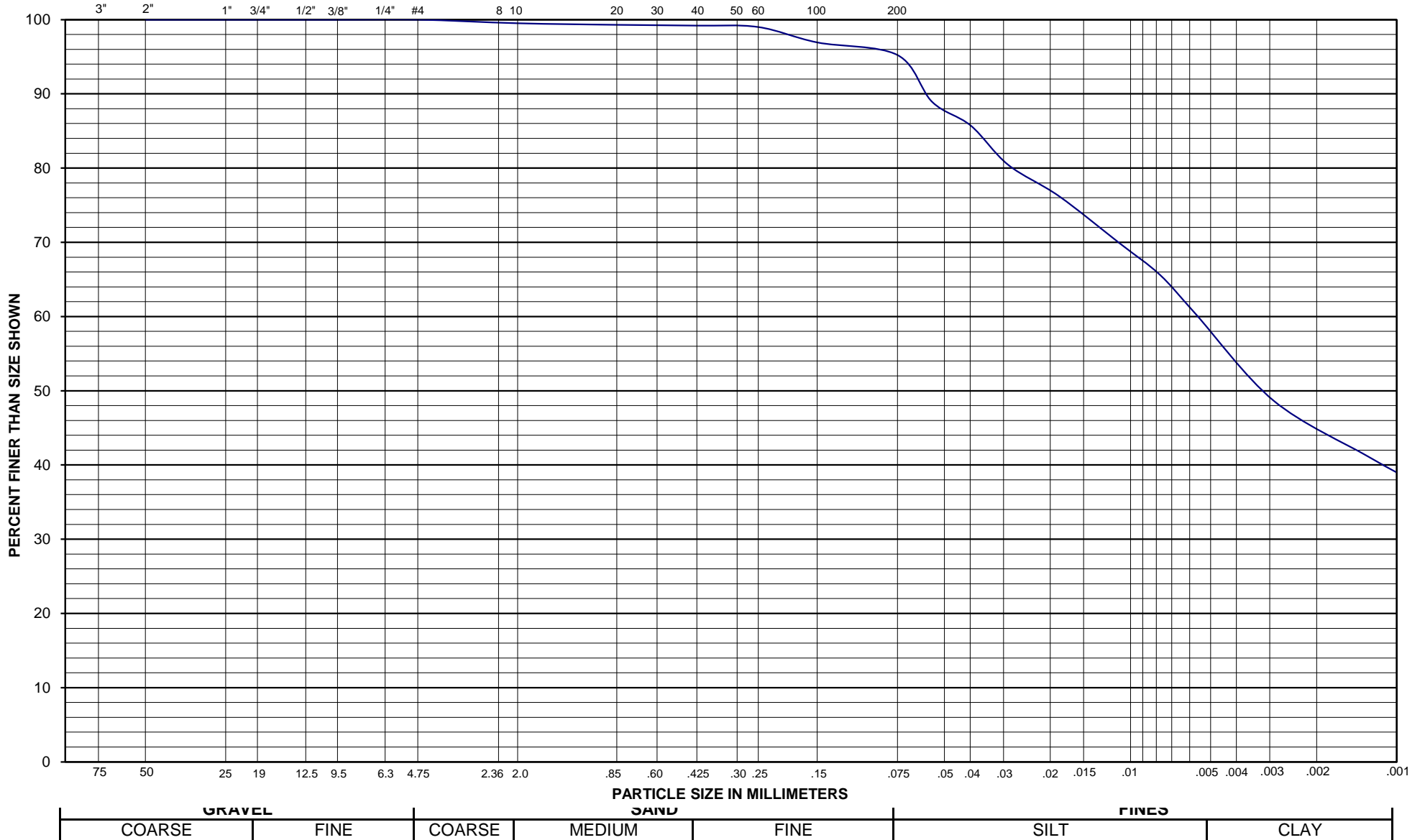
Project: Red River Geomorphic Study
Cass County, North Dakota

Sample Source: #68 (WR/298/RB)

Classification: FAT CLAY - dark brown (CH)

Reported to: West Consultants, Inc.

GRAIN SIZE DISTRIBUTION CURVE
U.S. Standard Sieve Sizes





MIDWEST TESTING LABORATORY



Project No.: M1101216

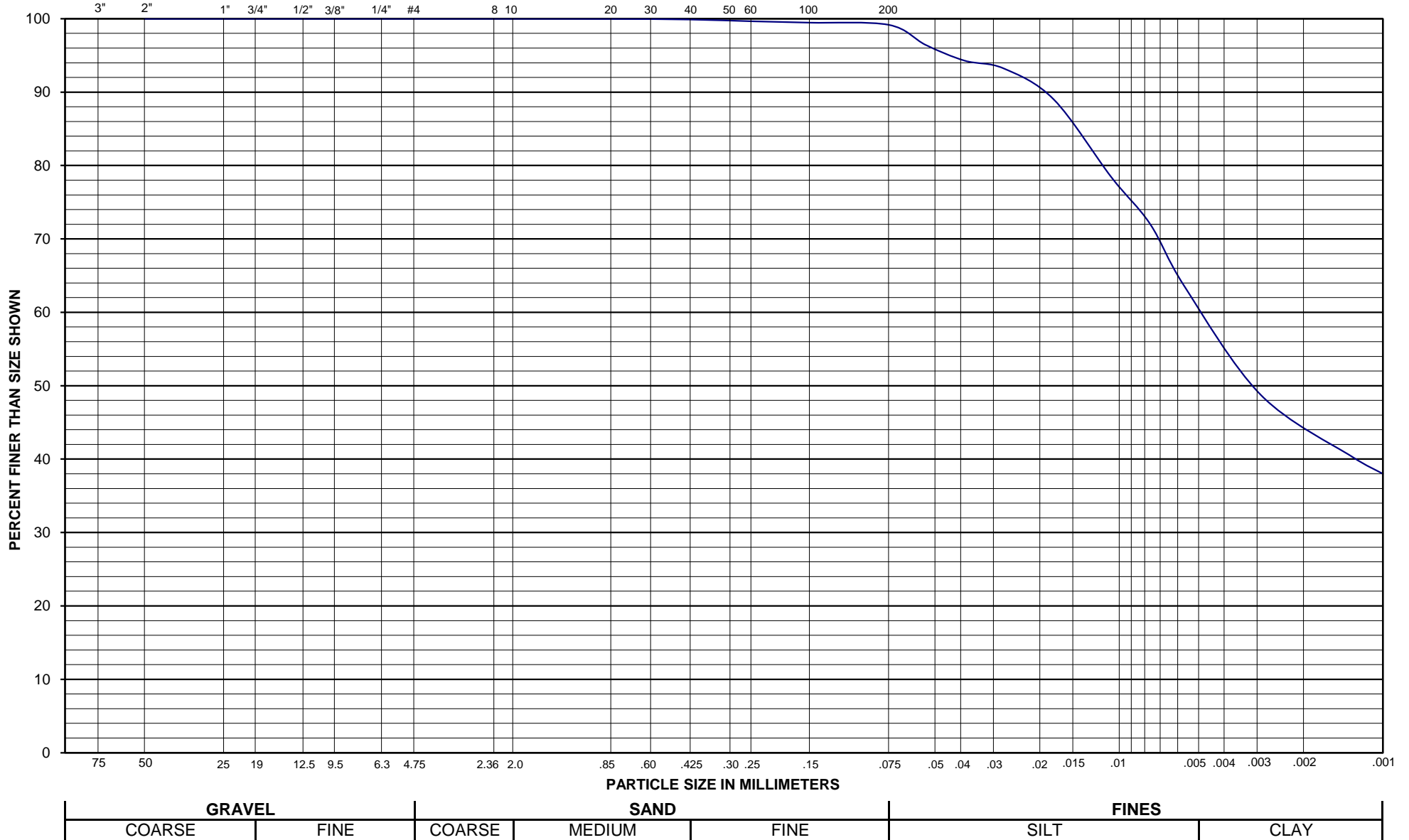
Project: Red River Geomorphic Study
Cass County, North Dakota

Sample Source: #52 (WR/304/BED-C-C)

Classification: FAT CLAY - dark grayish brown (CH)

Reported to: West Consultants, Inc.

GRAIN SIZE DISTRIBUTION CURVE U.S. Standard Sieve Sizes





LEGEND

- Cross Section
 - - - Detailed Study Reach
 - Sediment Sample
 - ▲ Field Photos
 - 0750 Direction Arrow and Photo Number
- 0 92 184
 Feet

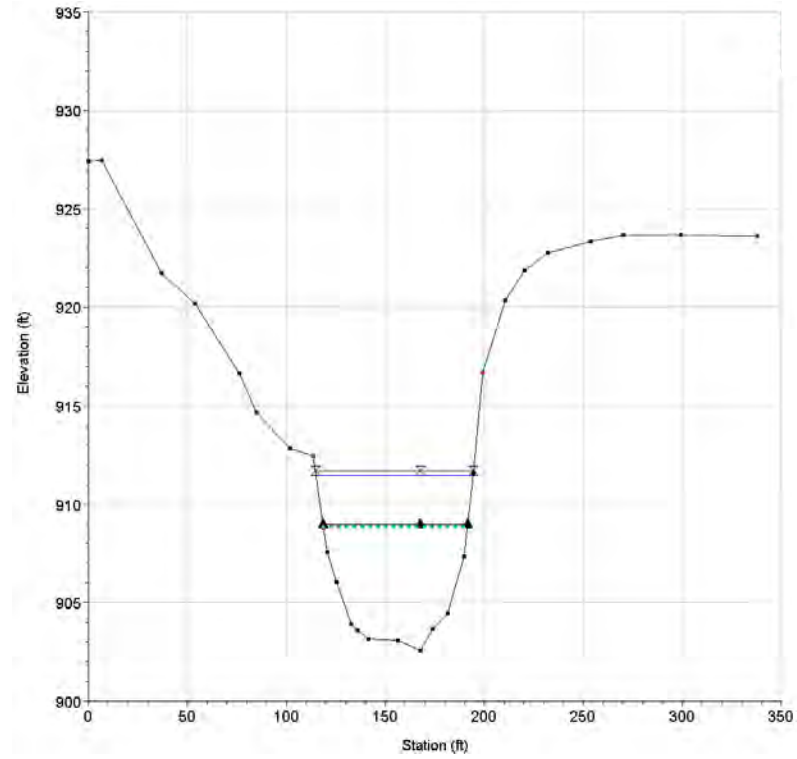


WILD RICE RIVER - 5 - 38.49

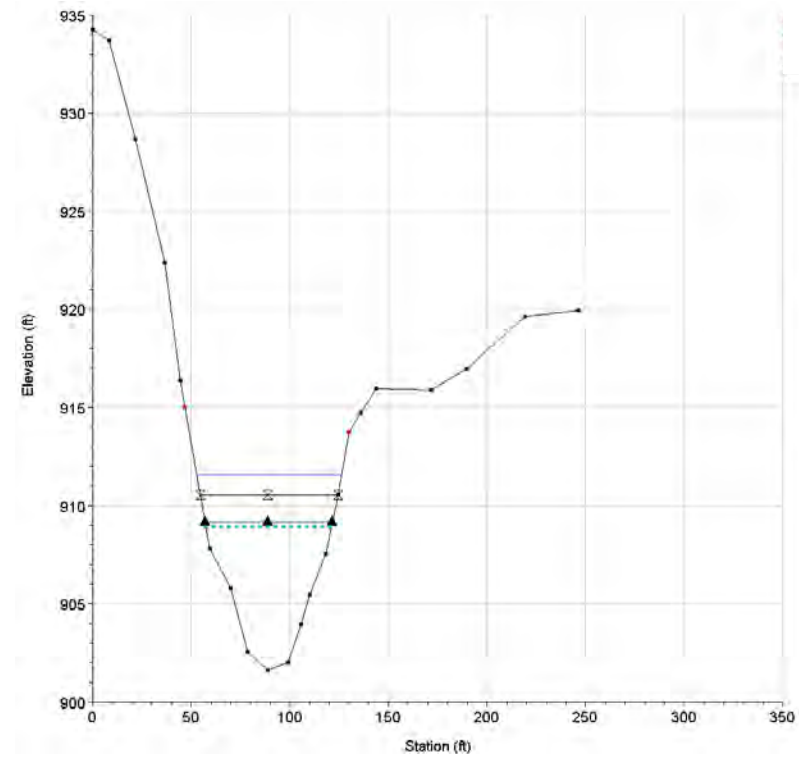
Observation Date: October 2, 2011

WILD RICE RIVER – 5 – 38.49

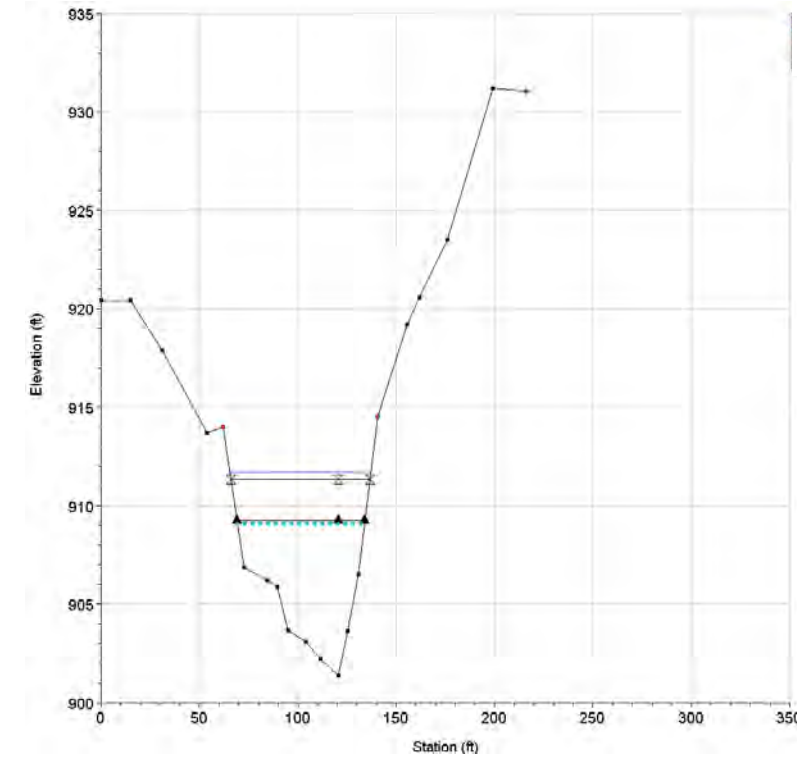
Cross Section 203246.0



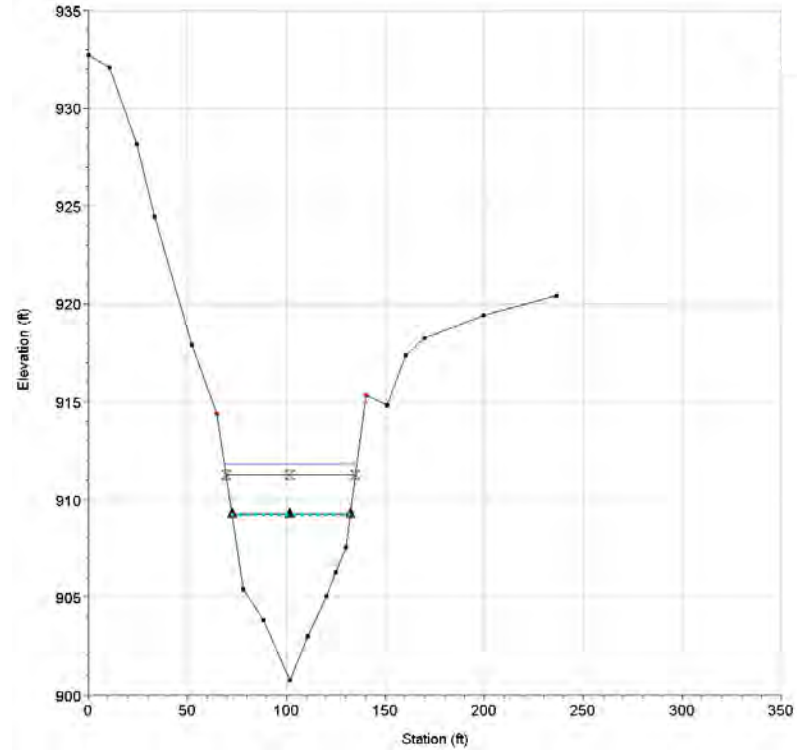
Cross Section 204701.9



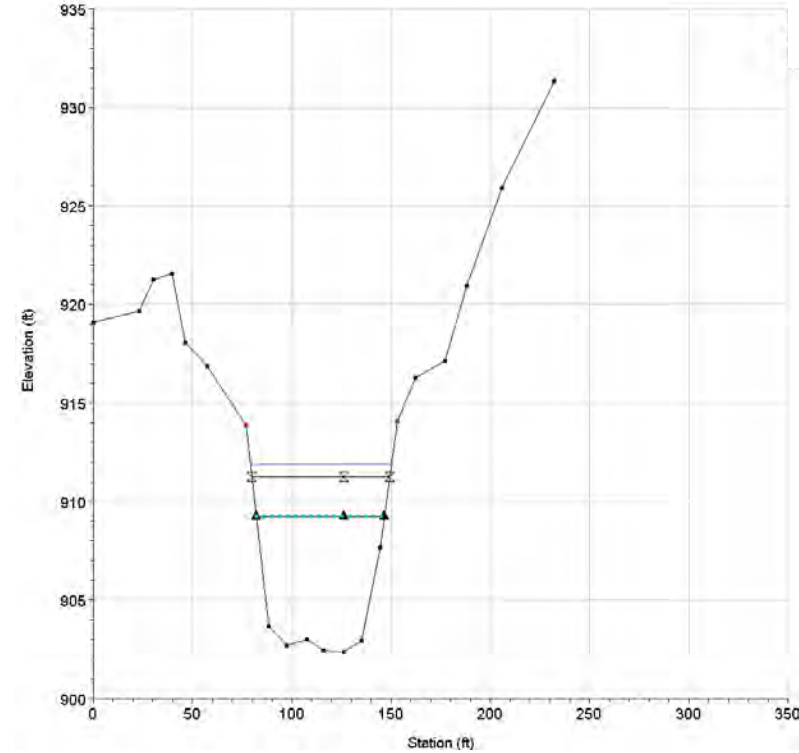
Cross Section 206136.6



Cross Section 207530.8



Cross Section 208338.2



LEGEND

- Modeled Water Surface Elevation for Day of Survey
- Modeled Bankfull Water Surface Elevation
- ▲ Observed Water Surface Elevation
- ⊗ Observed Bankfull Water Surface Elevation
- Ground
- Bank Stations

WILD RICE RIVER – 5 – 38.49
OBSERVATION DATE: OCTOBER 2, 2011



Field Photo 1320



Field Photo 1319



Field Photo 1318



Field Photo 1317



Field Photo 1316



Field Photo 1315

WILD RICE RIVER – 5 – 38.49
OBSERVATION DATE: OCTOBER 2, 2011



Field Photo 1314



Field Photo 1313



Field Photo 1312



Field Photo 1311



Field Photo 1310



Field Photo 1309

WILD RICE RIVER – 5 – 38.49
OBSERVATION DATE: OCTOBER 2, 2011



Field Photo 1308



Field Photo 1307



Field Photo 1306



Field Photo 1305



Field Photo 1304



Field Photo 1303

WILD RICE RIVER – 5 – 38.49
OBSERVATION DATE: OCTOBER 2, 2011



Field Photo 1302



Field Photo 1301



MIDWEST TESTING LABORATORY



Project No.: M1101216

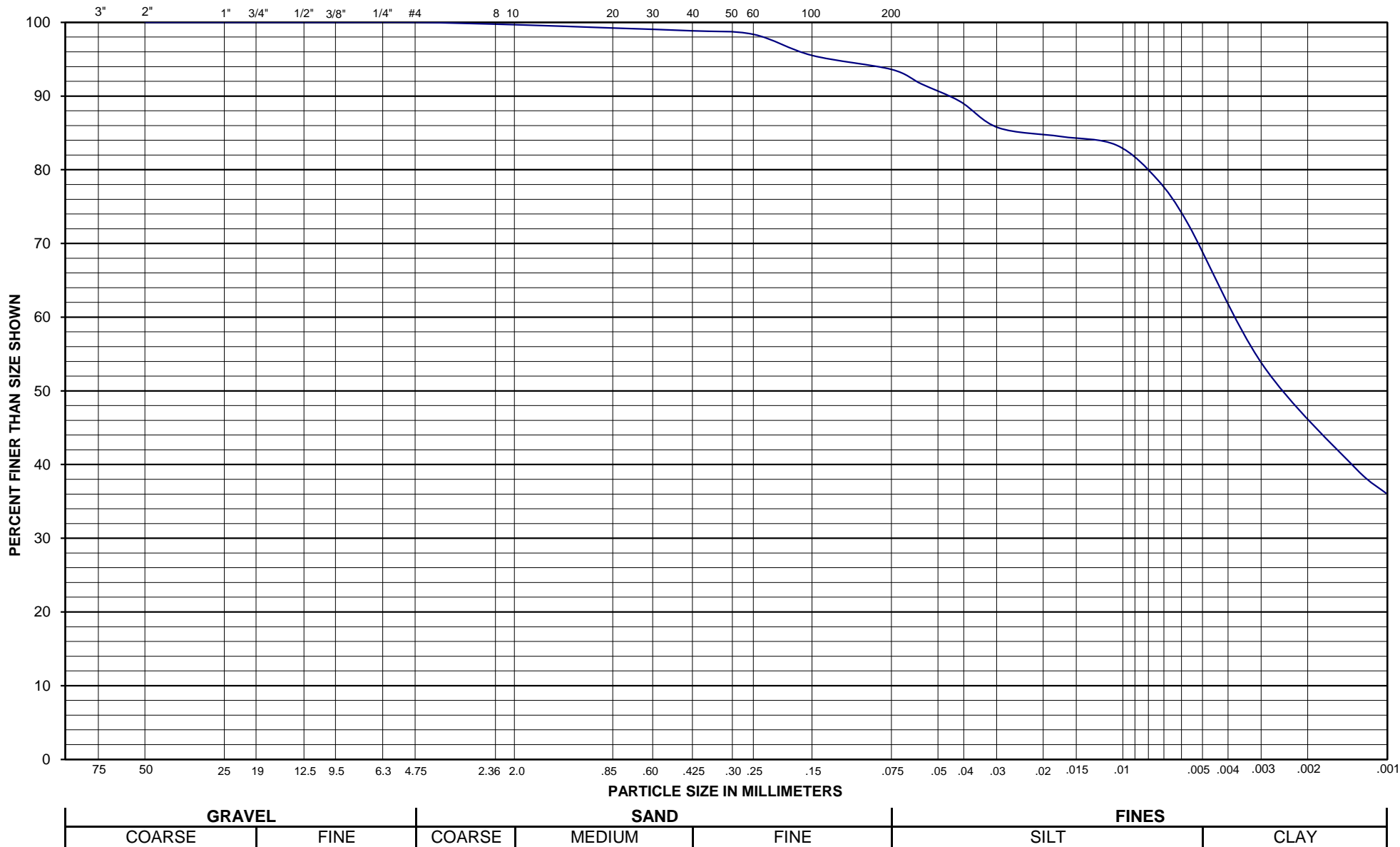
Project: Red River Geomorphic Study
Cass County, North Dakota

Sample Source: #19 (WR/275/BED-C-C)

Classification: FAT CLAY - dark brown (CH)

Reported to: West Consultants, Inc.

GRAIN SIZE DISTRIBUTION CURVE U.S. Standard Sieve Sizes





MIDWEST TESTING LABORATORY



Project No.: M1101216

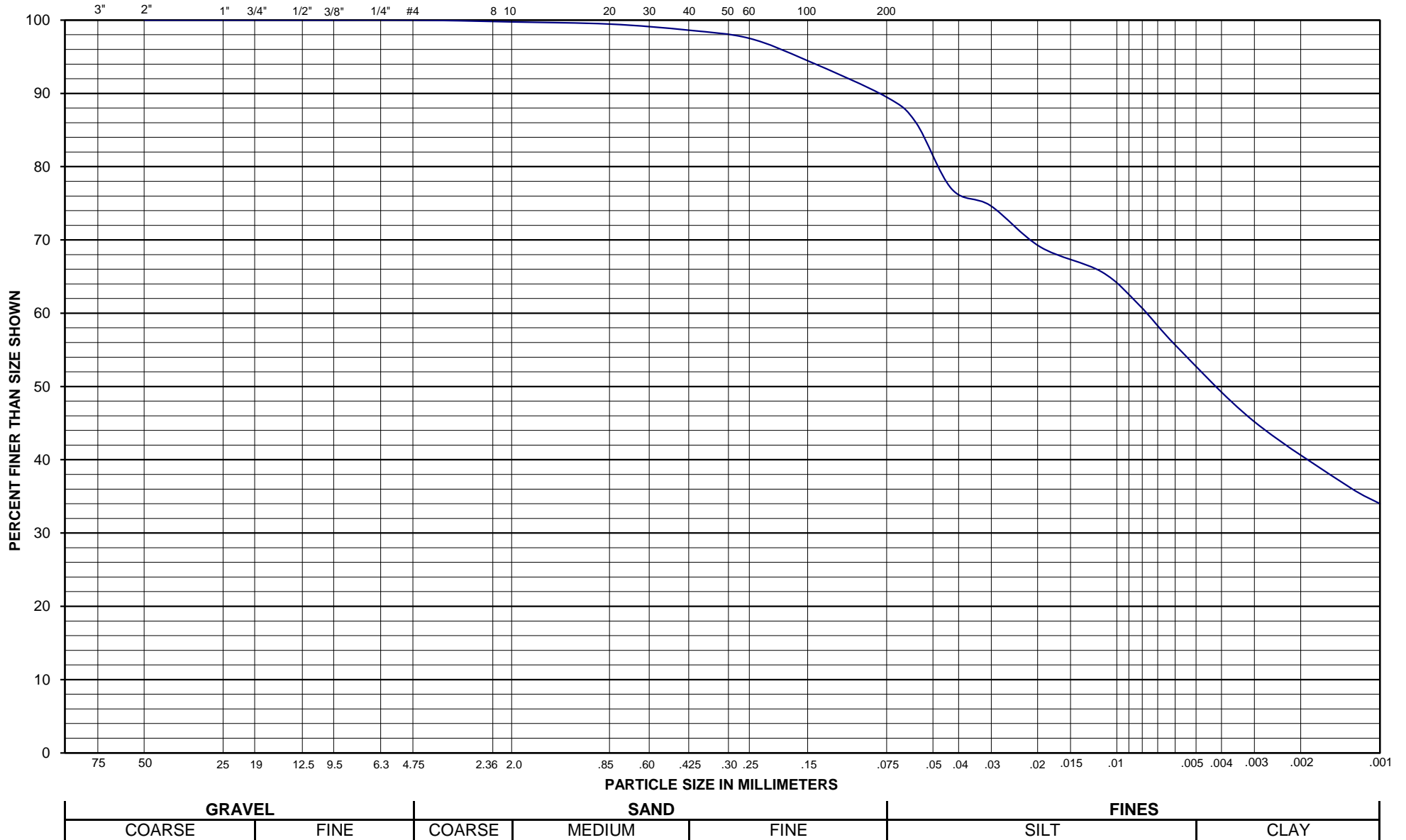
Project: Red River Geomorphic Study
Cass County, North Dakota

Sample Source: #23 (WR/274/RB)

Classification: FAT CLAY - dark brown (CH)

Reported to: West Consultants, Inc.

GRAIN SIZE DISTRIBUTION CURVE U.S. Standard Sieve Sizes





LEGEND

- Cross Section
 - - - Detailed Study Reach
 - Sediment Sample
 - ▲ Field Photos
 - 0750 Direction Arrow and Photo Number
- 0 92 184
 Feet

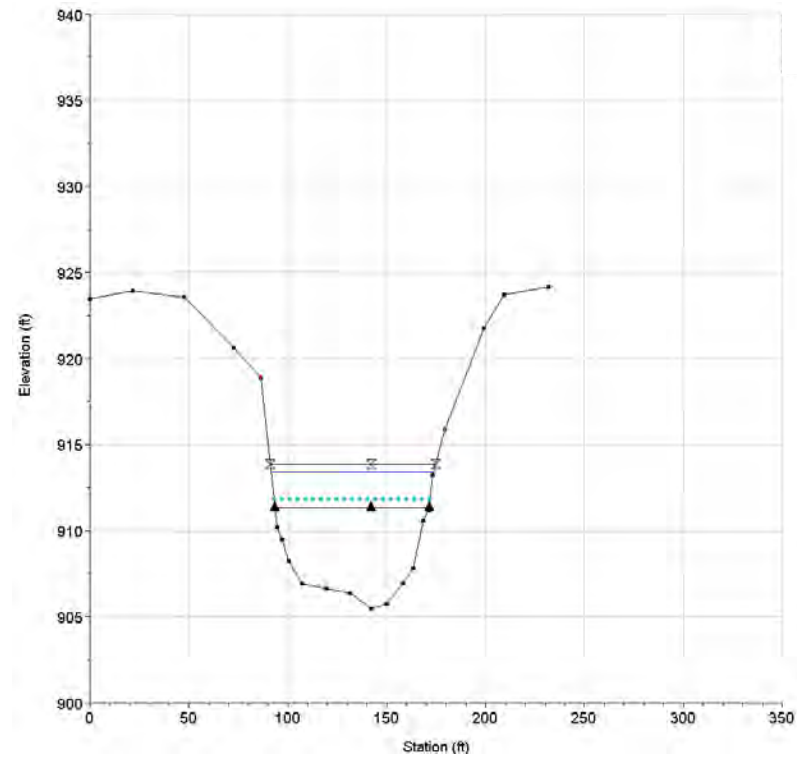


WILD RICE RIVER - 6 - 42.36

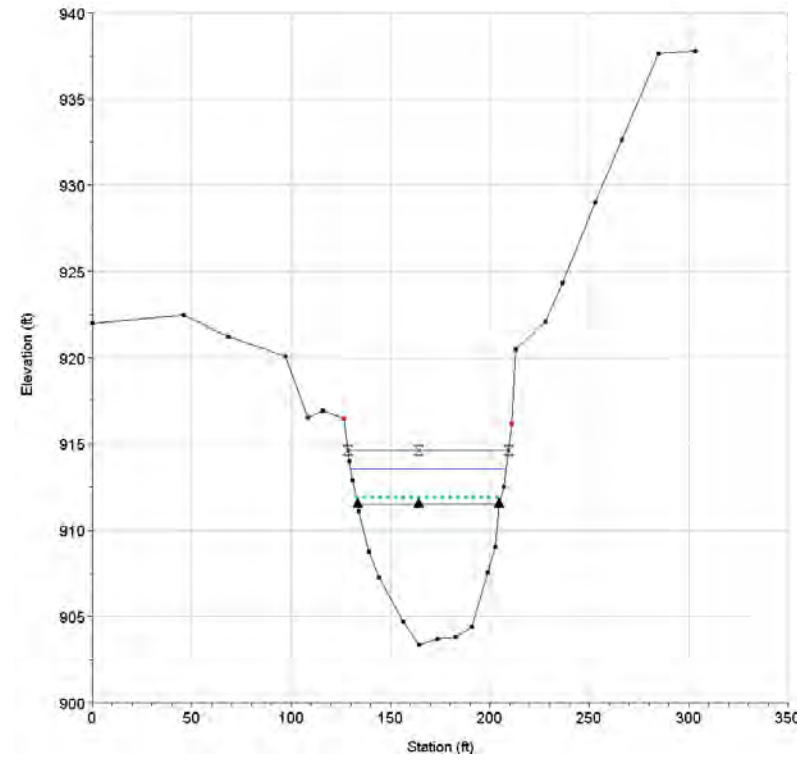
Observation Date: October 1, 2011

WILD RICE RIVER – 6 – 42.36

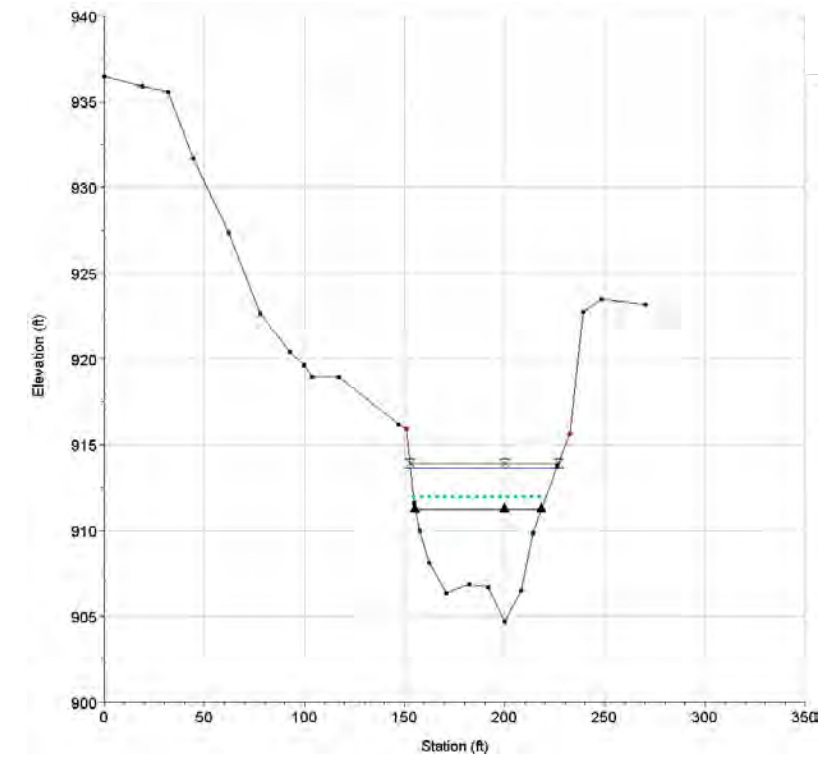
Cross Section 223673.1



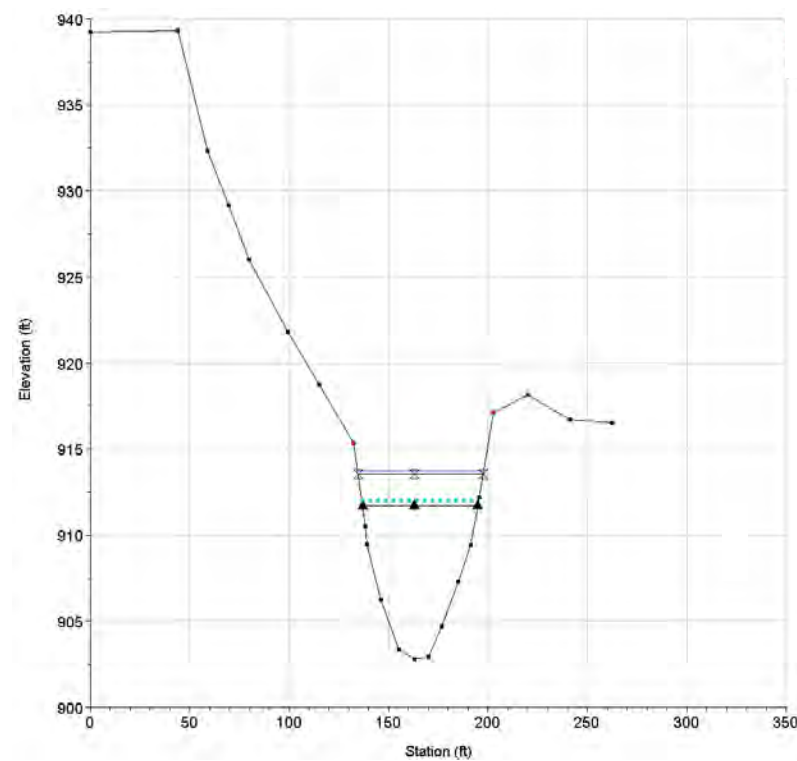
Cross Section 225263.2



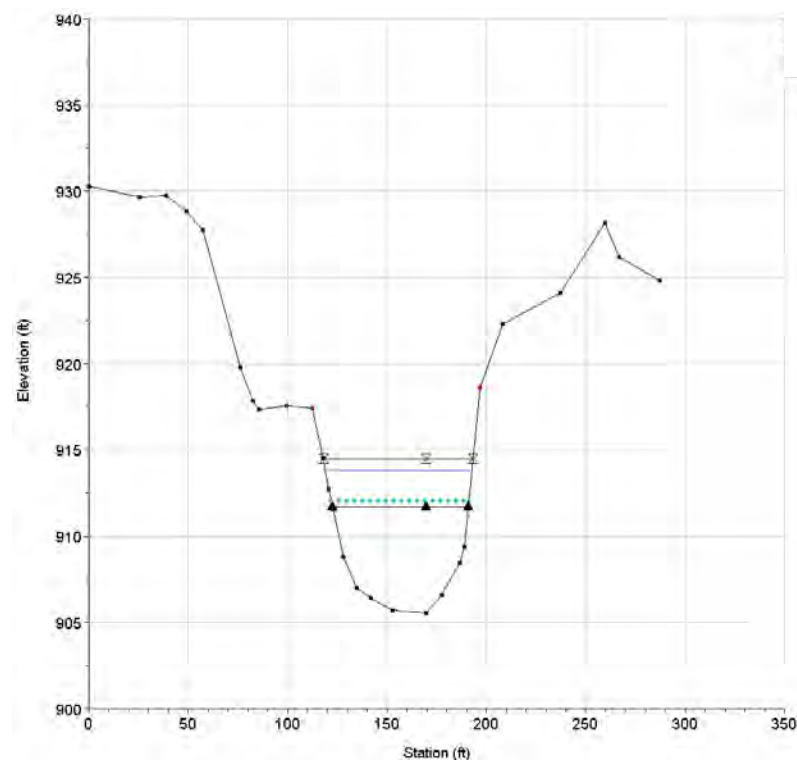
Cross Section 226470.9



Cross Section 227263.3



Cross Section 228534.7



LEGEND

- Modeled Water Surface Elevation for Day of Survey
- Modeled Bankfull Water Surface Elevation
- ▲ Observed Water Surface Elevation
- ⊗ Observed Bankfull Water Surface Elevation
- Ground
- Bank Stations

WILD RICE RIVER – 6 – 42.36
OBSERVATION DATE: OCTOBER 1, 2011



Field Photo 1279



Field Photo 1280



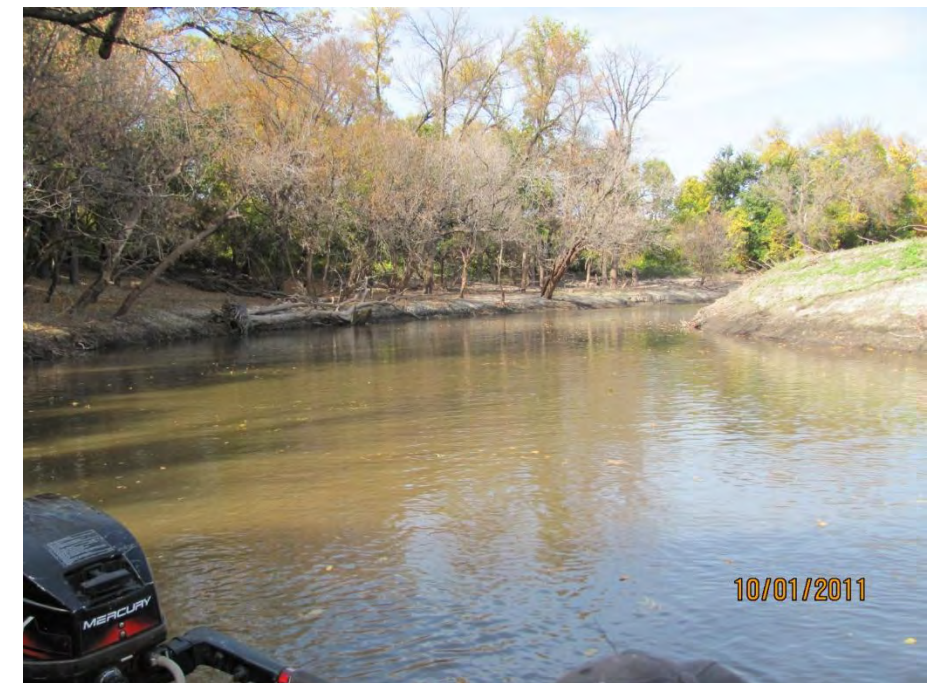
Field Photo 1281



Field Photo 1282



Field Photo 1284



Field Photo 1285

WILD RICE RIVER – 6 – 42.36
OBSERVATION DATE: OCTOBER 1, 2011



Field Photo 1286



Field Photo 1287



Field Photo 1288



Field Photo 1289



Field Photo 1290



Field Photo 1291

WILD RICE RIVER – 6 – 42.36
OBSERVATION DATE: OCTOBER 1, 2011



Field Photo 1292



Field Photo 1293



Field Photo 1294



Field Photo 1295



Field Photo 1296



Field Photo 1297

WILD RICE RIVER – 6 – 42.36
OBSERVATION DATE: OCTOBER 1, 2011



Field Photo 1298



Field Photo 1299



MIDWEST TESTING LABORATORY



Project No.: M1101216

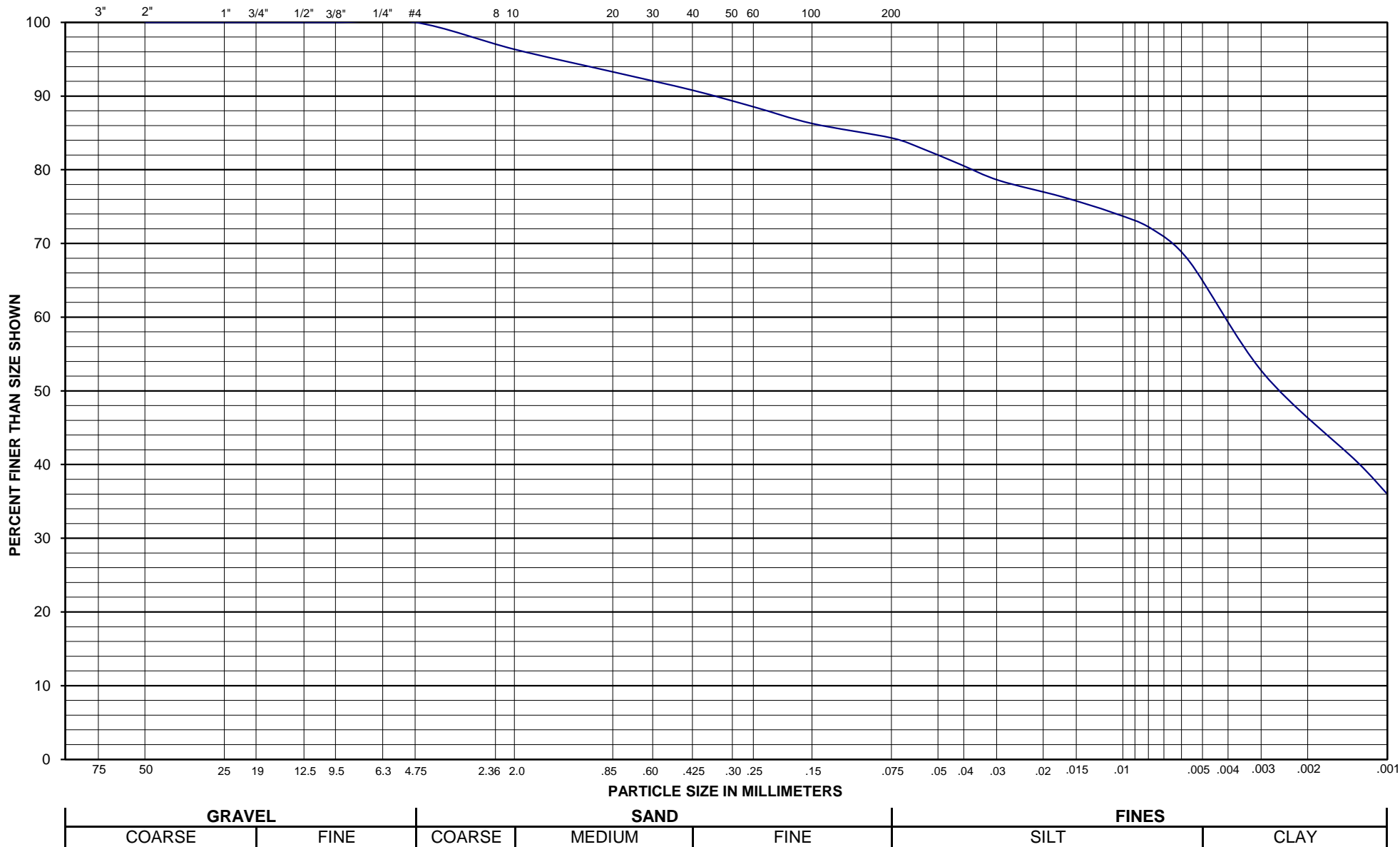
Project: Red River Geomorphic Study
Cass County, North Dakota

Sample Source: #18 (WR/246/BED-C-C)

Classification: FAT CLAY WITH SAND - dark brown (CH)

Reported to: West Consultants, Inc.

GRAIN SIZE DISTRIBUTION CURVE U.S. Standard Sieve Sizes





MIDWEST TESTING LABORATORY



Project No.: M1101216

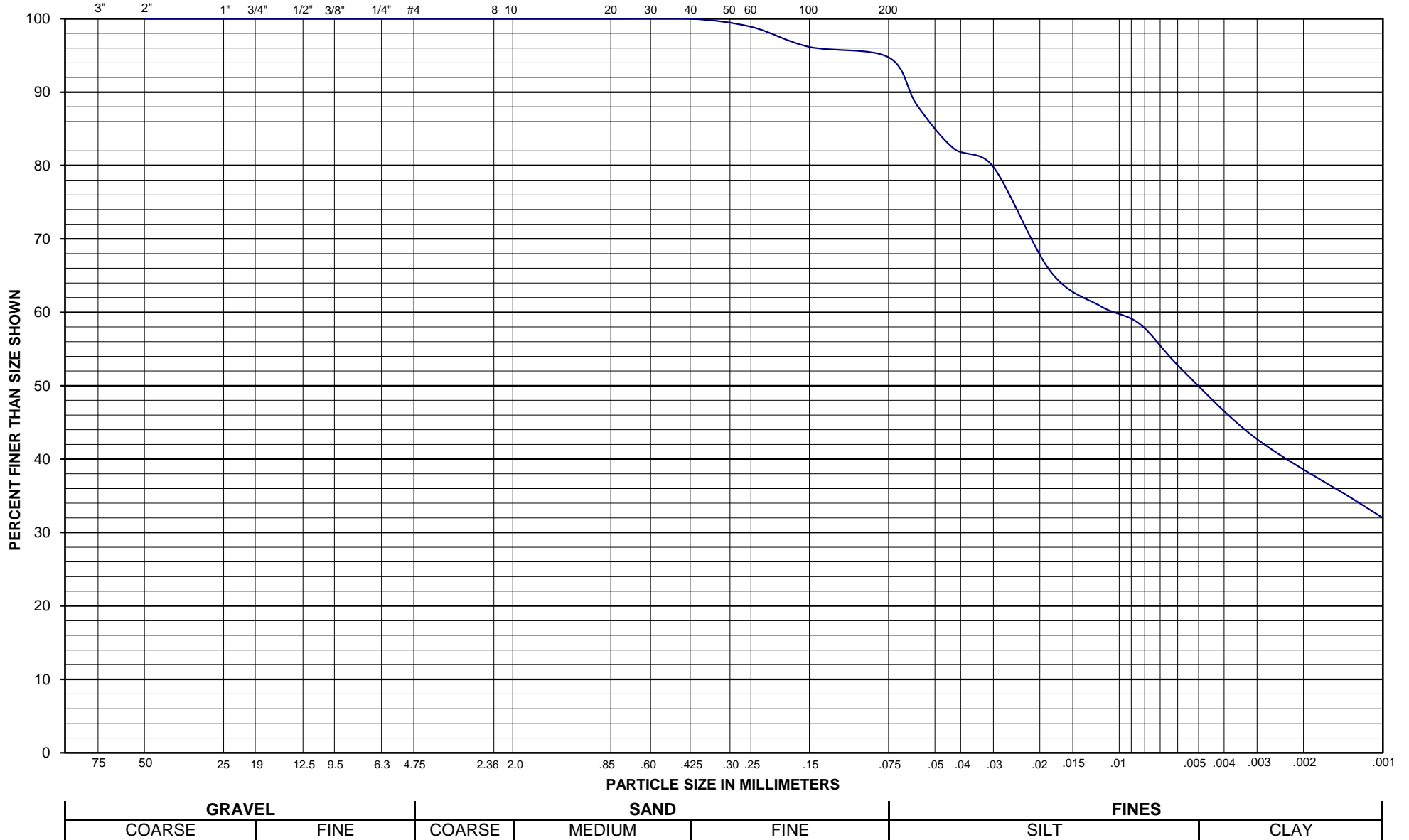
Project: Red River Geomorphic Study
Cass County, North Dakota

Sample Source: #21 (WR/243/LB)

Classification: FAT CLAY - dark brown (CH)

Reported to: West Consultants, Inc.

GRAIN SIZE DISTRIBUTION CURVE U.S. Standard Sieve Sizes





MIDWEST TESTING LABORATORY



Project No.: M1101216

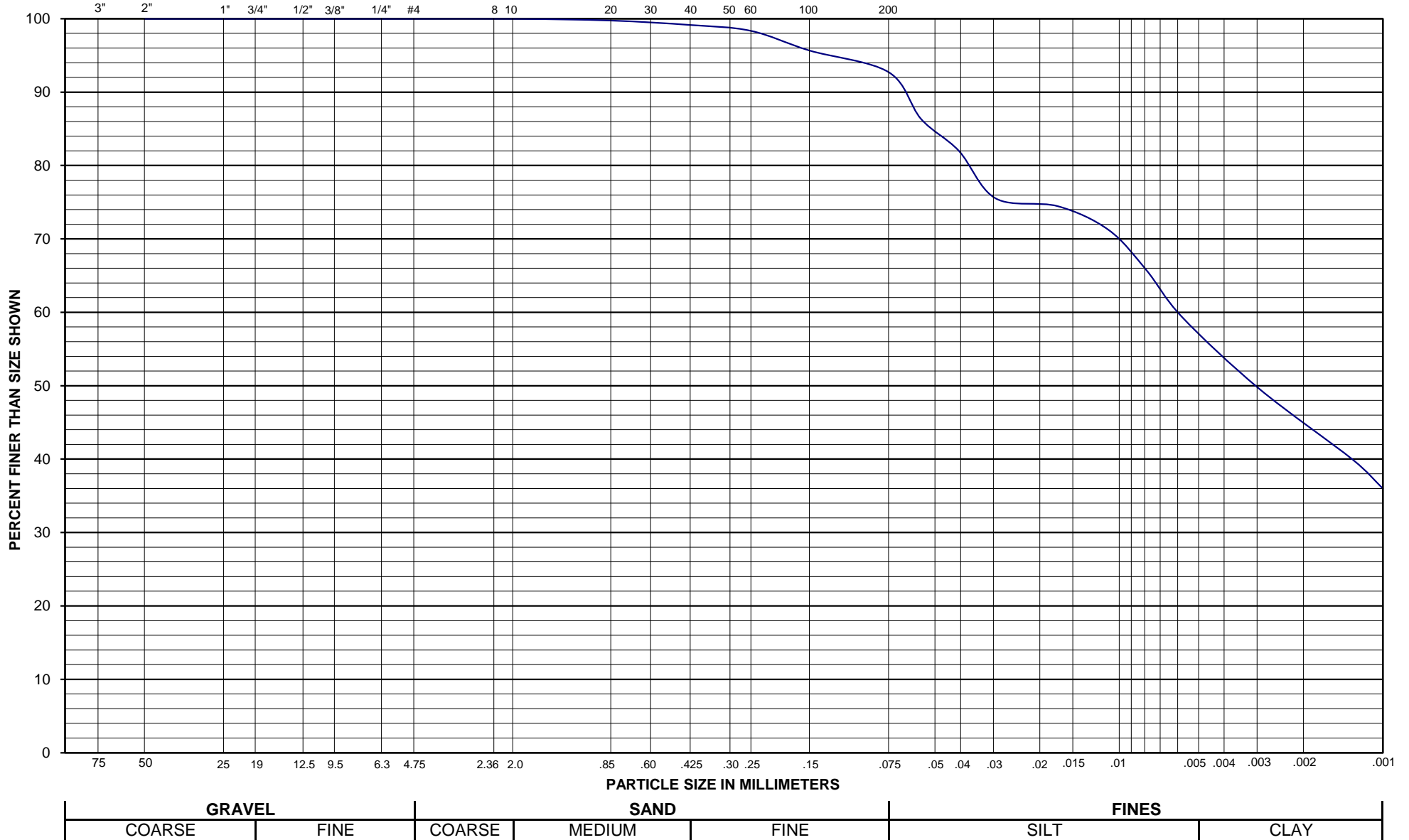
Project: Red River Geomorphic Study
Cass County, North Dakota

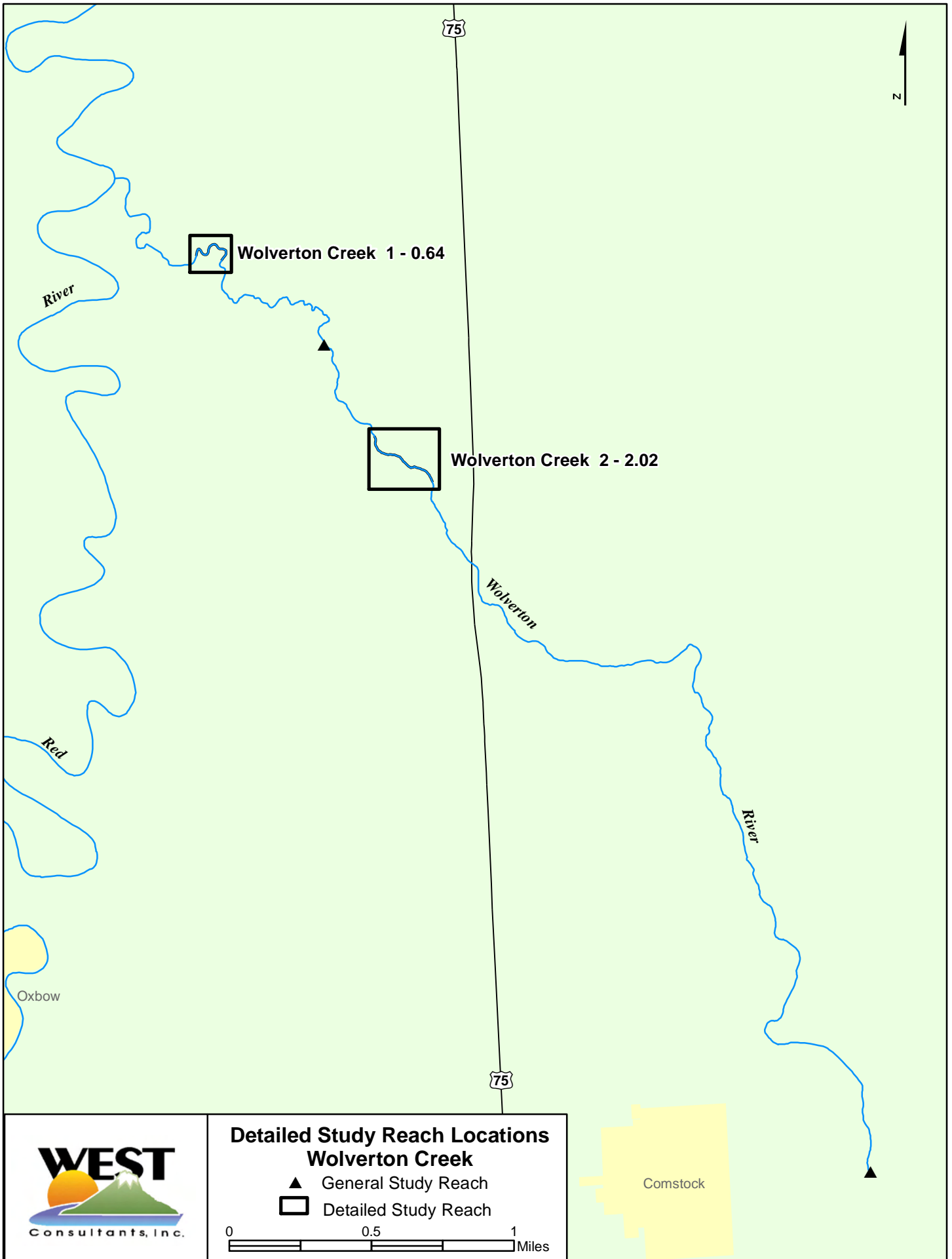
Sample Source: #15 (WR/239/RB)

Classification: FAT CLAY - dark brown (CH)

Reported to: West Consultants, Inc.

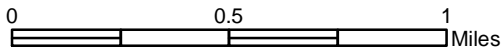
GRAIN SIZE DISTRIBUTION CURVE U.S. Standard Sieve Sizes





**Detailed Study Reach Locations
Wolverton Creek**

- ▲ General Study Reach
- Detailed Study Reach



Comstock



LEGEND

- Cross Section
 - - - Detailed Study Reach
 - Sediment Sample
 - ▲ Field Photos
 - 0750 Direction Arrow and Photo Number
- 0 30 60 120
Feet

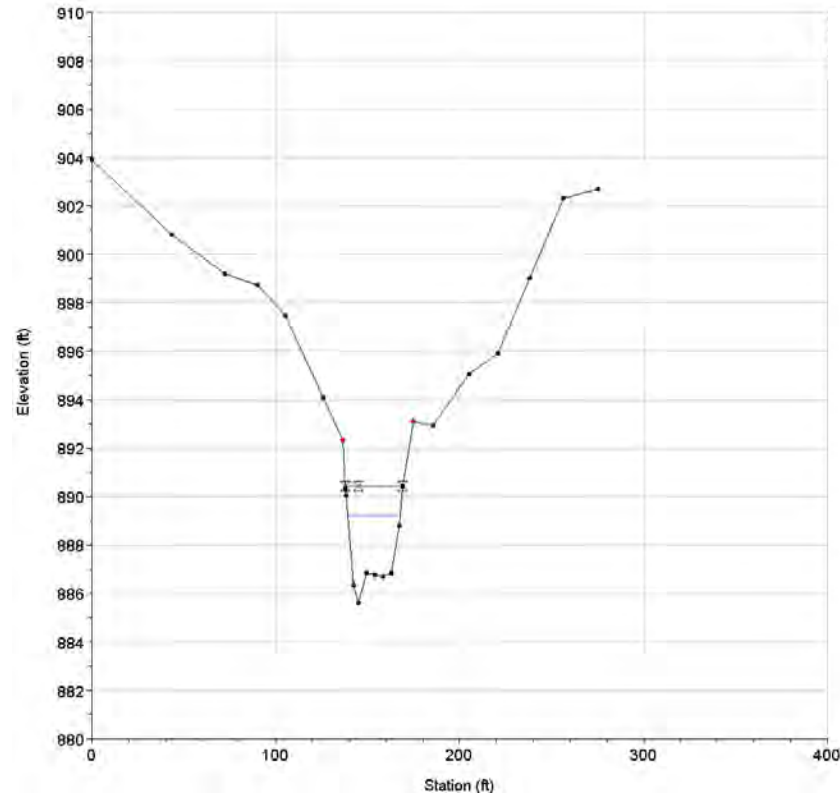


WOLVERTON CREEK - 1 - 0.64

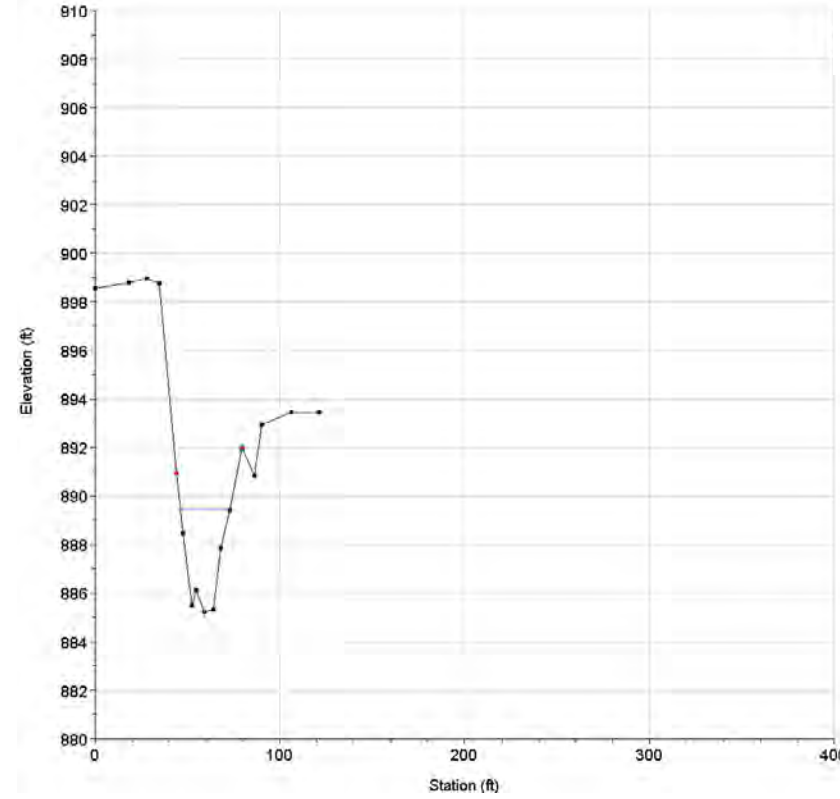
Observation Date: November 19, 2010

WOLVERTON CREEK – 1 – 0.64

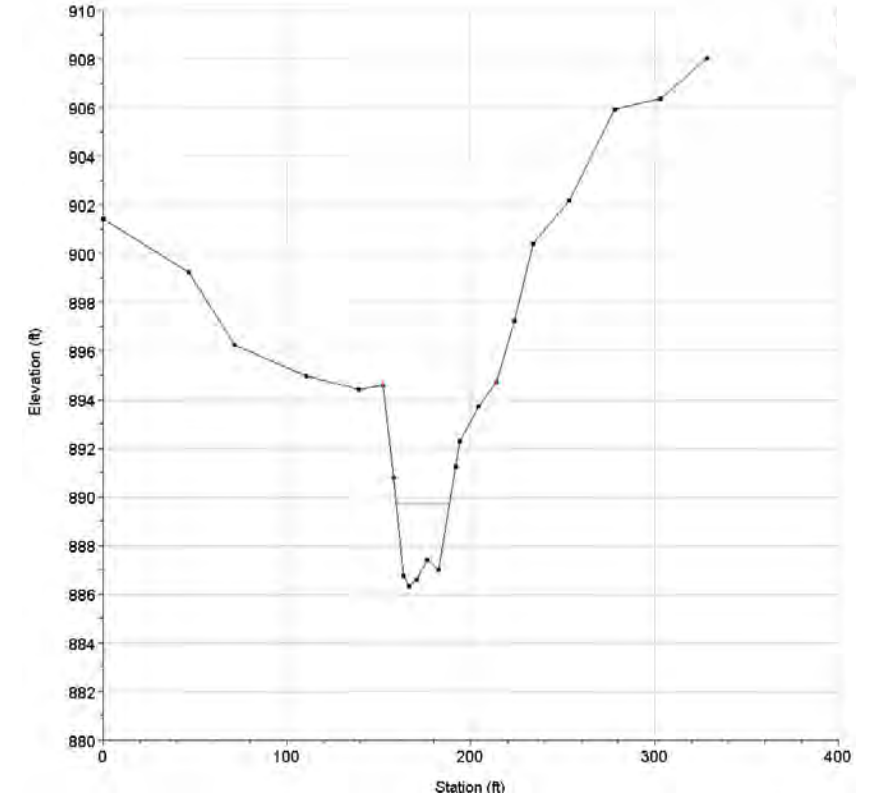
Cross Section 393.8



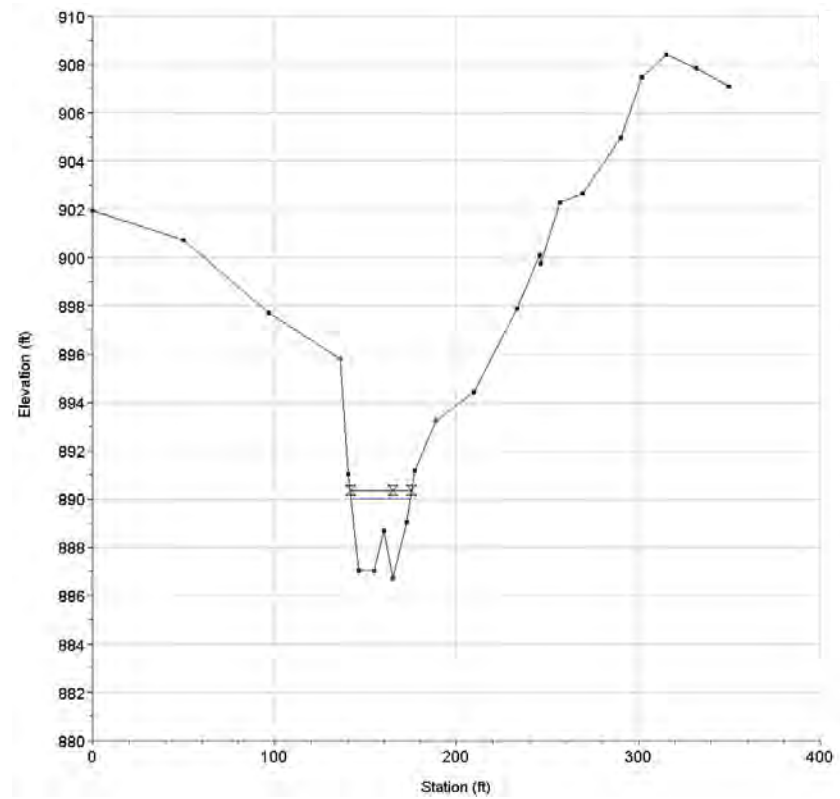
Cross Section 853.3



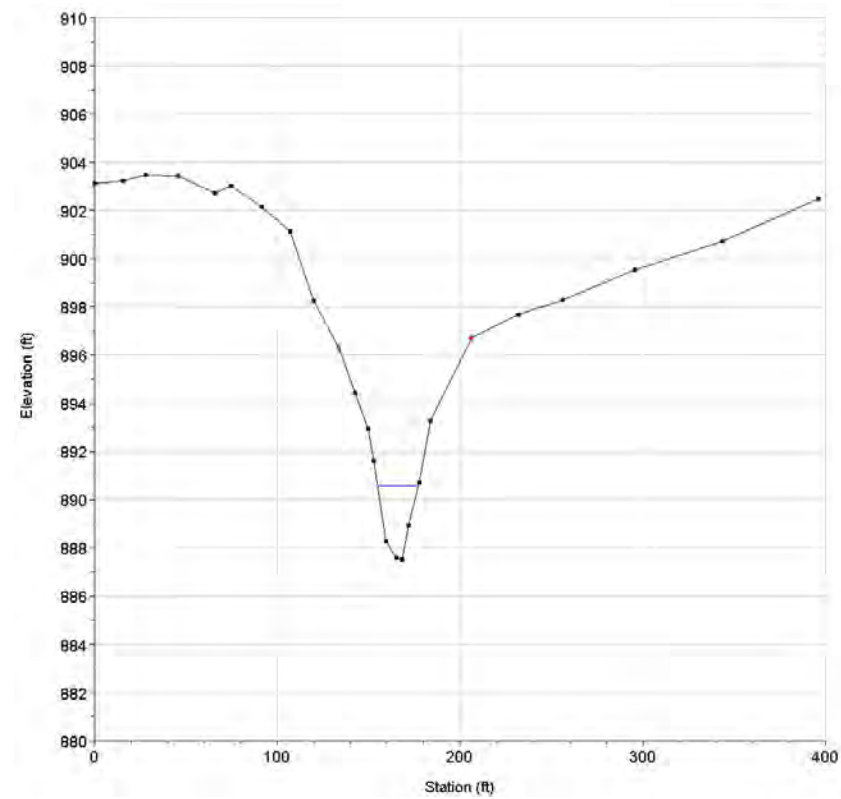
Cross Section 1620.4



Cross Section 2294.8



Cross Section 2842.7



Note: channel frozen during field investigation;
no observed or modeled water surface for day
of survey

— Modeled Bankfull Water Surface Elevation

— X — Observed Bankfull Water Surface Elevation

— ■ — Ground

• Bank Stations

WOLVERTON CREEK – 1– 0.64
OBSERVATION DATE: NOVEMBER 19, 2010



Field Photo 0447



Field Photo 0448



Field Photo 0450



Field Photo 0451



Field Photo 0452



Field Photo 0453

WOLVERTON CREEK – 1 – 0.64
OBSERVATION DATE: NOVEMBER 19, 2010



Field Photo 0455



Field Photo 0456



Field Photo 0457



Field Photo 0458



Field Photo 0459



Field Photo 0460

WOLVERTON CREEK – 1 – 0.64
OBSERVATION DATE: NOVEMBER 19, 2010



Field Photo 0461



Field Photo 0462



Field Photo 0463



Field Photo 0464



MIDWEST TESTING LABORATORY



Project No.: 16216

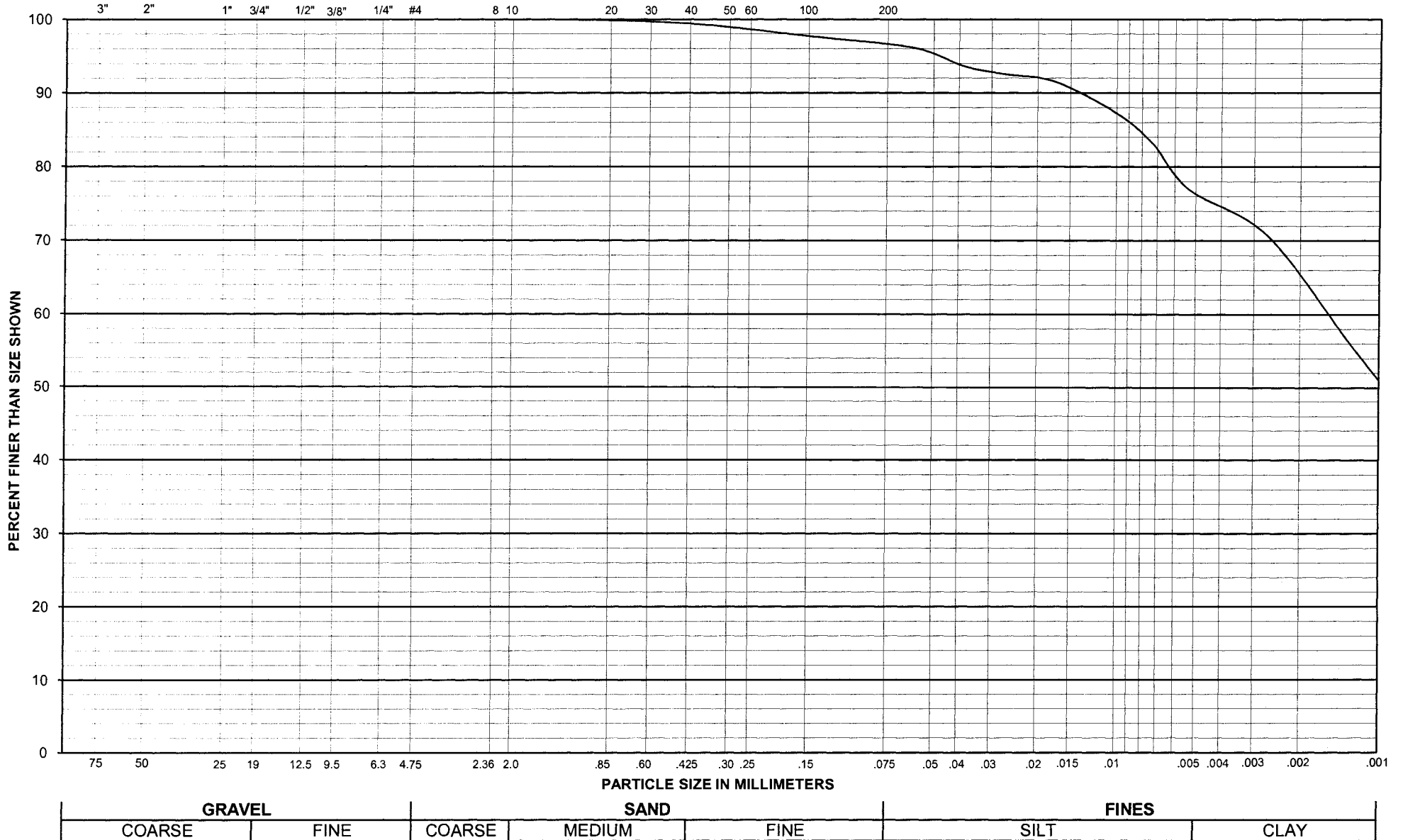
Project: Red River Geomorphic Study
Cass County, North Dakota

Sample Source: TN 7519 - WC-1

Classification: FAT CLAY - very dark brown

Reported to: West Consultants, Inc.

GRAIN SIZE DISTRIBUTION CURVE U.S. Standard Sieve Sizes





MIDWEST TESTING LABORATORY



Project No.: 16216

Project: Red River Geomorphic Study
Cass County, North Dakota

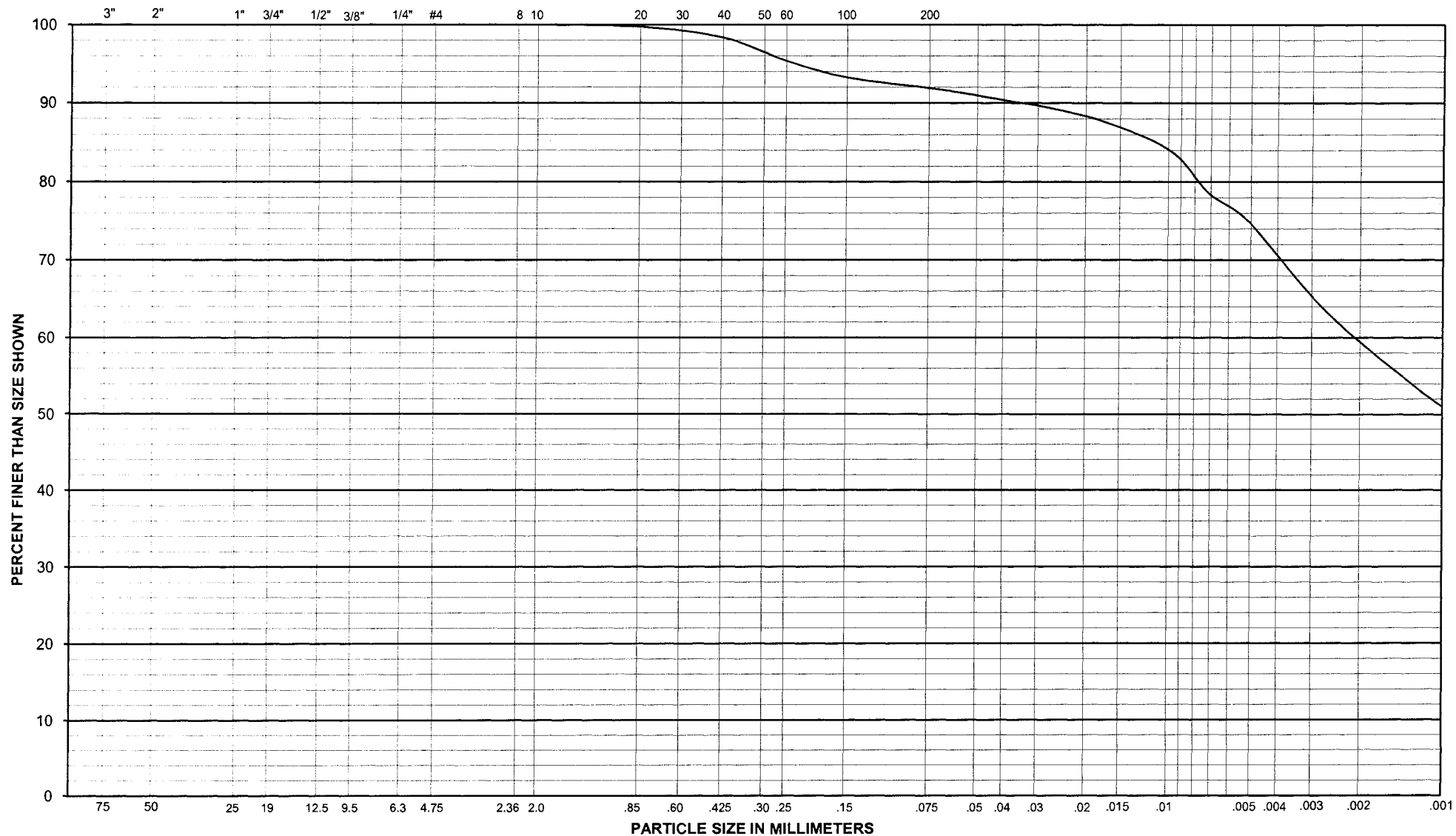
Sample Source: TN 7520 - WC-2

Classification: FAT CLAY - dark gray

Reported to: West Consultants, Inc.

GRAIN SIZE DISTRIBUTION CURVE

U.S. Standard Sieve Sizes



GRAVEL		SAND			FINES		
COARSE	FINE	COARSE	MEDIUM	FINE	SILT	CLAY	



MIDWEST TESTING LABORATORY



Project No.: 16216

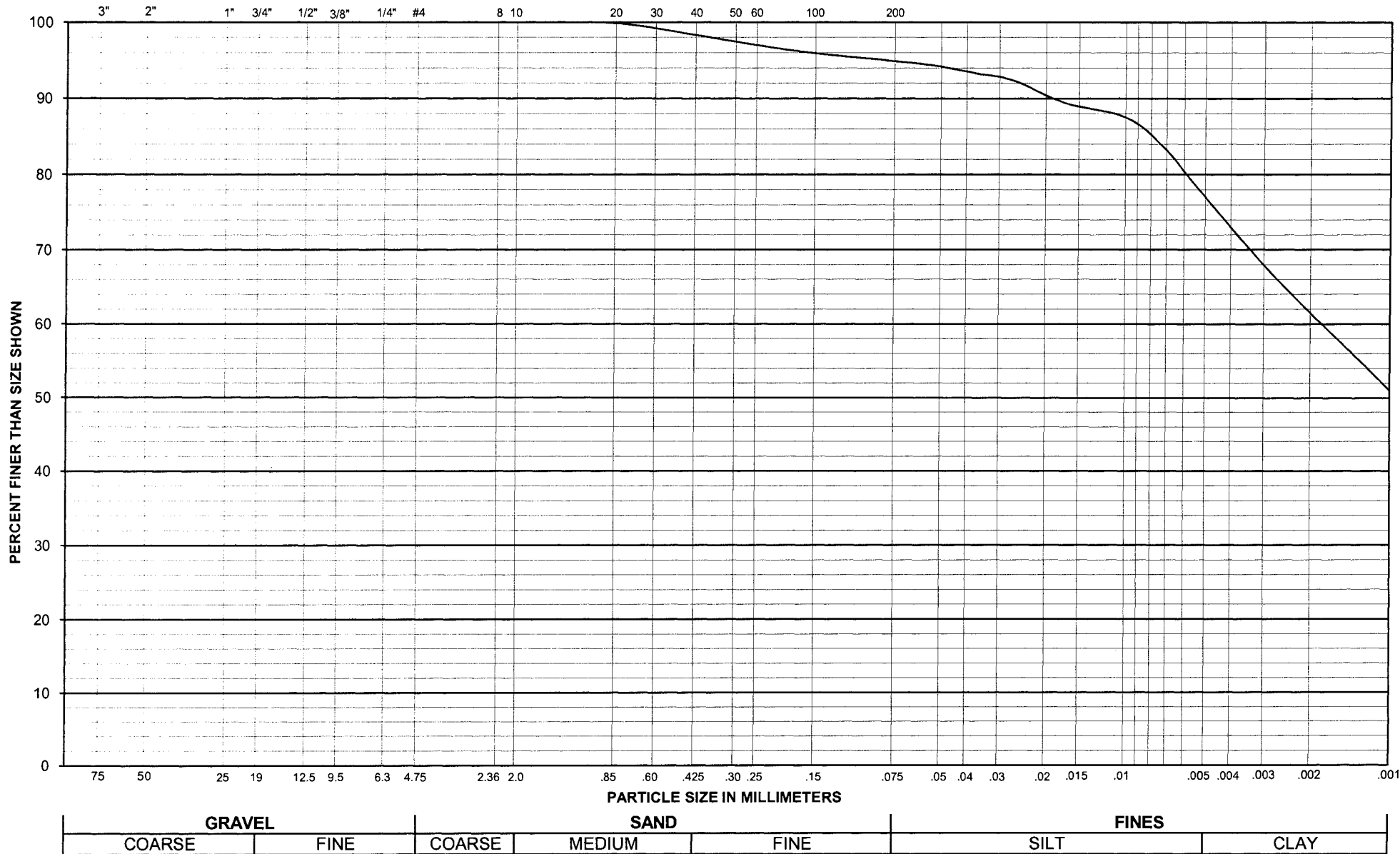
Project: Red River Geomorphic Study
Cass County, North Dakota

Sample Source: TN 7521 - WC-3

Classification: FAT CLAY - very dark brown

Reported to: West Consultants, Inc.

GRAIN SIZE DISTRIBUTION CURVE U.S. Standard Sieve Sizes





LEGEND

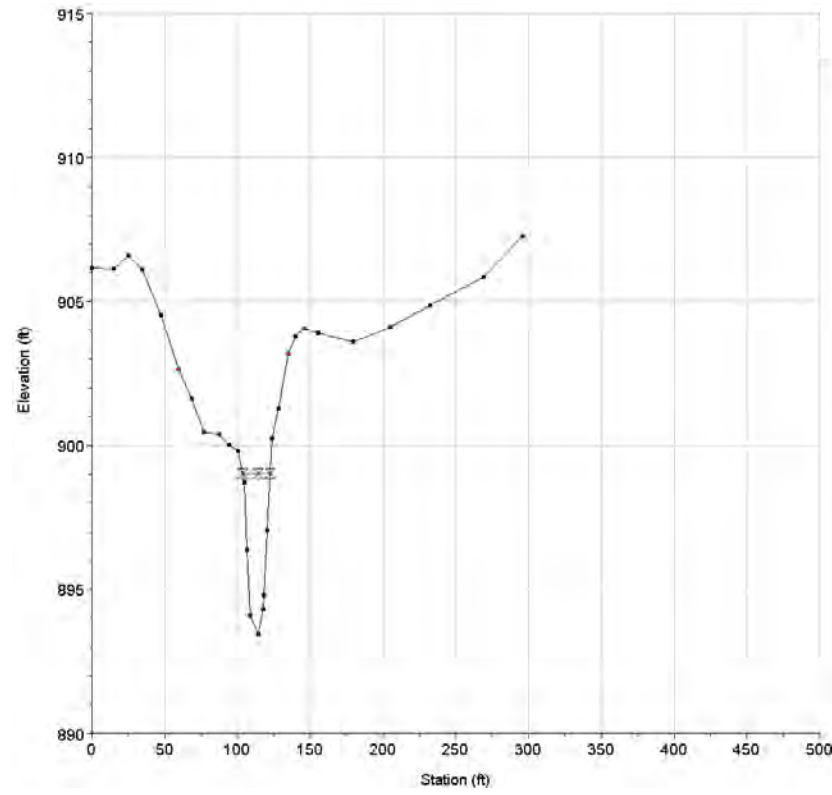
- Cross Section
 - - - Detailed Study Reach
 - Sediment Sample
 - ▲ Field Photos
 - 0750 Direction Arrow and Photo Number
- 0 30 60 120
 Feet

WOLVERTON CREEK - 2 - 2.02

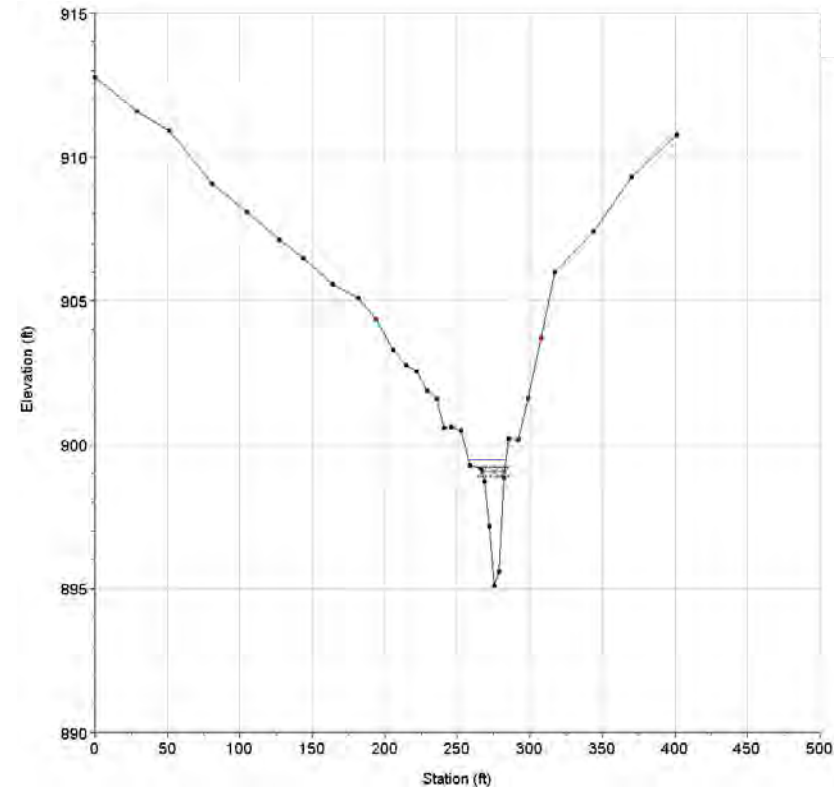
Observation Date: September 28, 2011

WOLVERTON CREEK – 2 – 2.02

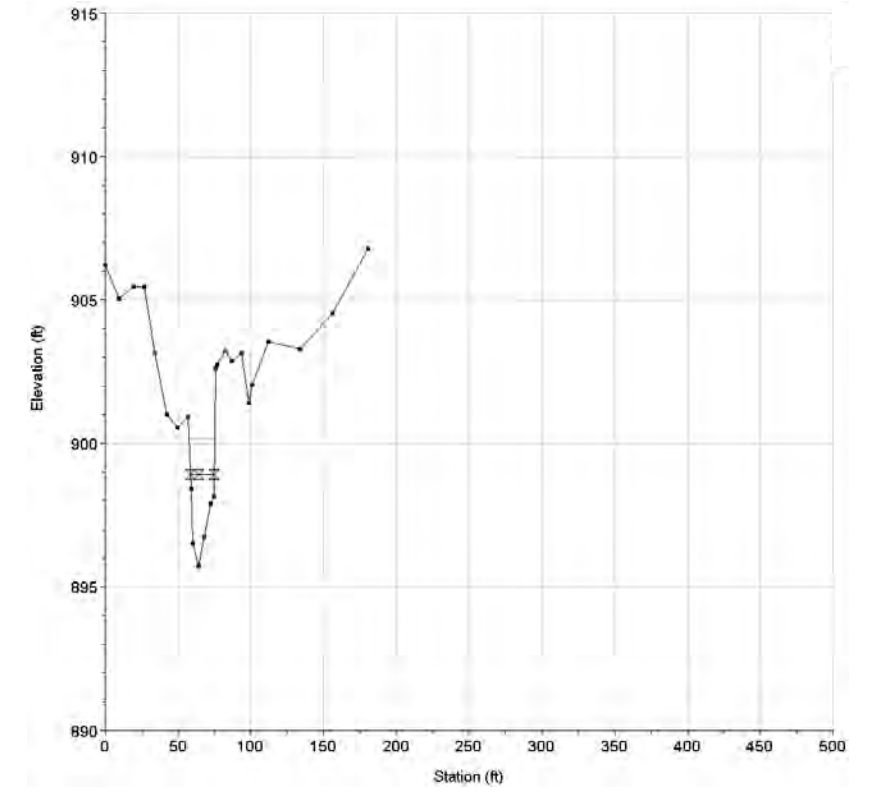
Cross Section 10662.8



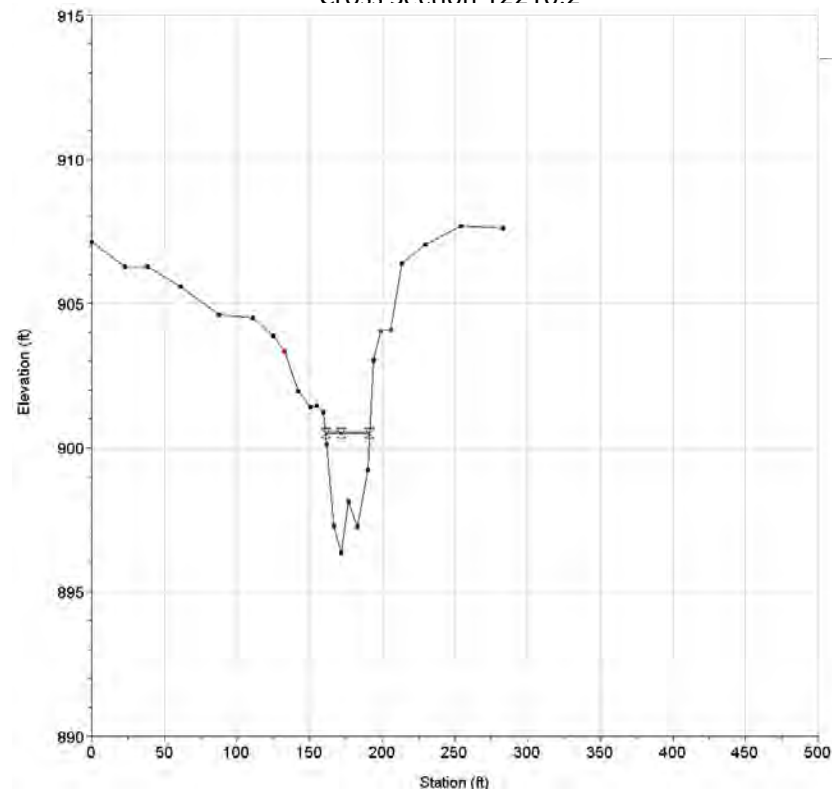
Cross Section 11328.8



Cross Section 11703.6



Cross Section 12210.2



LEGEND

— Modeled Bankfull Water Surface Elevation

— X — Observed Bankfull Water Surface Elevation

— ■ — Ground

● Bank Stations

WOLVERTON CREEK – 2– 2.02
OBSERVATION DATE: SEPTEMBER 28, 2011



Field Photo 0573



Field Photo 0574



Field Photo 0575



Field Photo 0576



Field Photo 0578



Field Photo 0579

WOLVERTON CREEK – 2 – 2.02
OBSERVATION DATE: SEPTEMBER 28, 2011



Field Photo 0580



Field Photo 0584



Field Photo 0585



Field Photo 0586



Field Photo 0587



Field Photo 0588

WOLVERTON CREEK – 2 – 2.02
OBSERVATION DATE: SEPTEMBER 28, 2011



Field Photo 0589



Field Photo 0590



Field Photo 0591



Field Photo 0592



Field Photo 0593



Field Photo 0595

WOLVERTON CREEK – 2 – 2.02
OBSERVATION DATE: SEPTEMBER 28, 2011



Field Photo 0596



MIDWEST TESTING LABORATORY



Project No.: M1101216

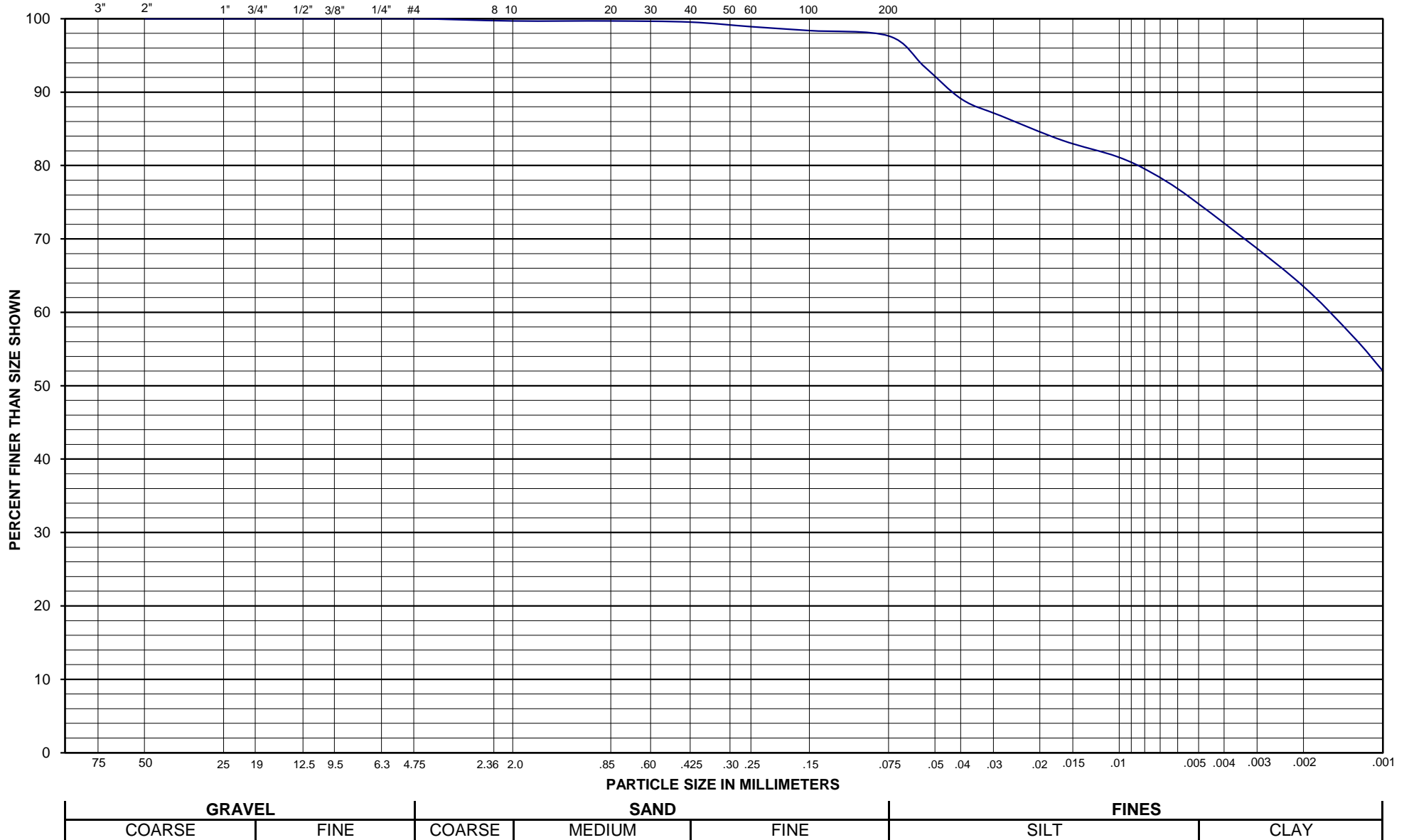
Project: Red River Geomorphic Study
Cass County, North Dakota

Sample Source: #10 (WC2 - LB)

Classification: FAT CLAY - dark brown (CH)

Reported to: West Consultants, Inc.

GRAIN SIZE DISTRIBUTION CURVE U.S. Standard Sieve Sizes





MIDWEST TESTING LABORATORY



Project No.: M1101216

Project: Red River Geomorphic Study
Cass County, North Dakota

Sample Source: #1 (WC2-CH)

Classification: FAT CLAY - very dark brown (CH)

Reported to: West Consultants, Inc.

GRAIN SIZE DISTRIBUTION CURVE U.S. Standard Sieve Sizes

