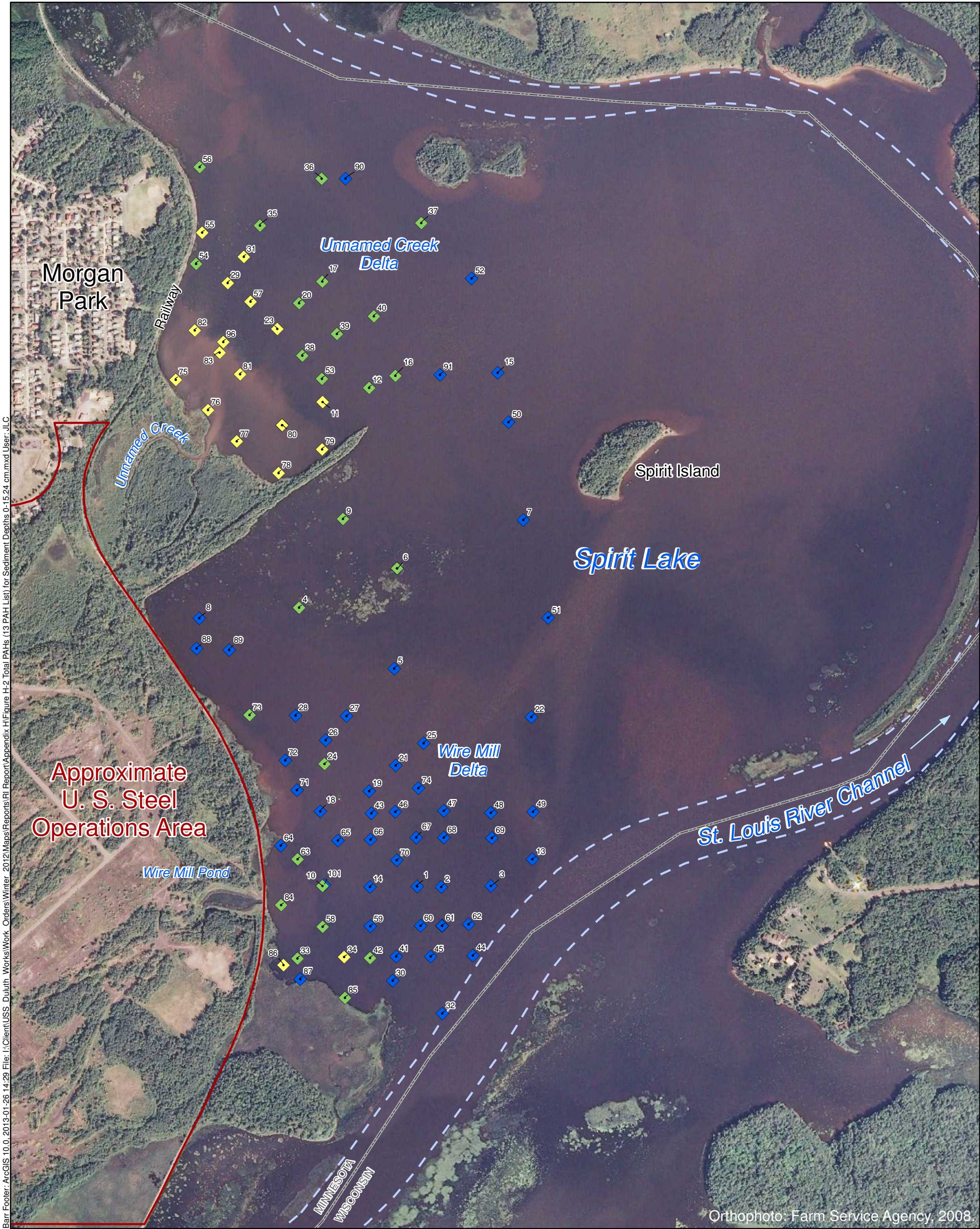


¹U.S. Steel samples collected in 2011 by vibracoring and soil boring methods.
²All of the Sum of PAH13 calculations used non-detects set to 1/2 the laboratory reporting limit.
³SQT = Sediment quality target for the protection of sediment-dwelling organisms (MPCA, 2007).

Figure H-1
**FREQUENCY OF SUM OF 13 PAH
 CONCENTRATIONS BY DATASET**
 Spirit Lake Sediment Site



- Total PAHs less than or equal to 1.6 mg/kg (Level I SQT)
- Total PAHs greater than 1.6 mg/kg (Level I SQT) and less than or equal to 23 mg/kg (Level II SQT)
- Total PAHs greater than 23 mg/kg (Level II SQT)
- Approximate Location of St. Louis River Channel, Based on Orthophoto Interpretation
- Approximate U. S. Steel Operations Area (URS, 2008)
- State Boundary

Notes: SQT = Sediment quality target for the protection of sediment-dwelling organisms (MPCA, 2007)
Results shown are the maximum value for the given depth range.

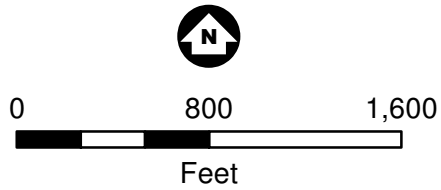
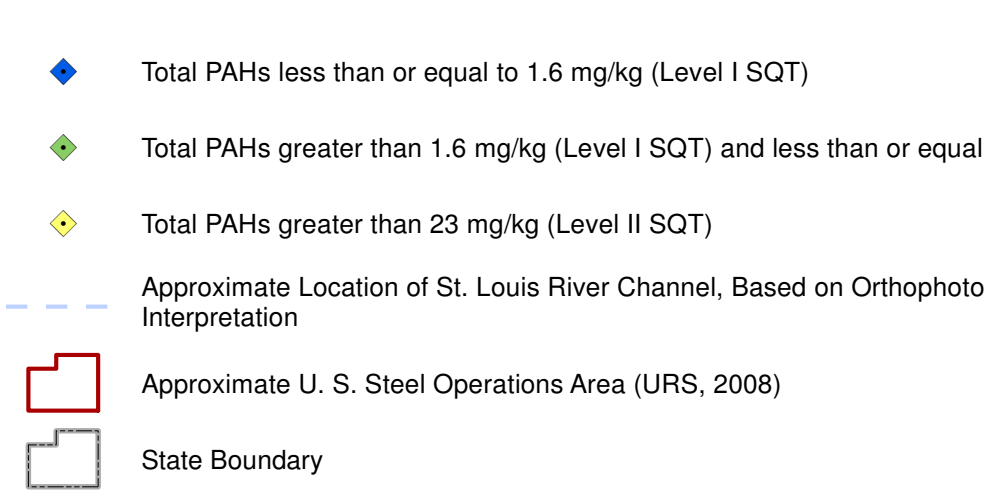


Figure H-2

**TOTAL PAHS (13 PAH LIST)
SEDIMENT DEPTHS
0-15.24 CENTIMETERS**
Spirit Lake Sediment Site -
Former U. S. Steel Duluth Works
Saint Louis River
Duluth, Minnesota

*This figure created at MPCA request for comparison to
St. Louis River Area of Concern Assessment Data.*



Notes: SQT = Sediment quality target for the protection of sediment-dwelling organisms (MPCA, 2007)
Results shown are the maximum value for the given depth range.

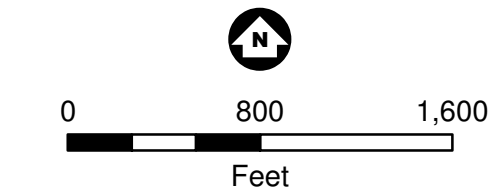
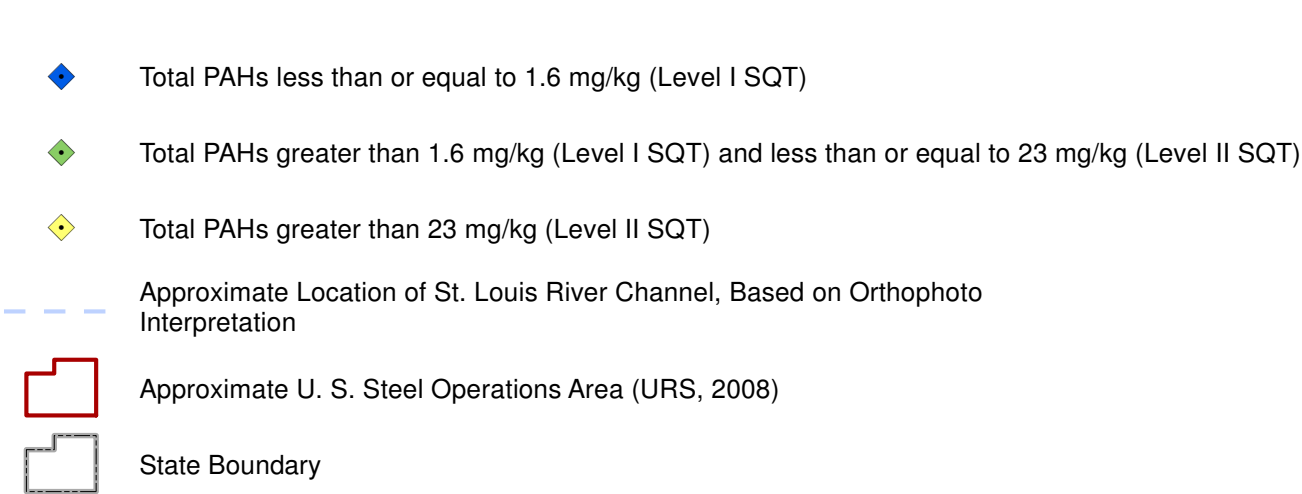
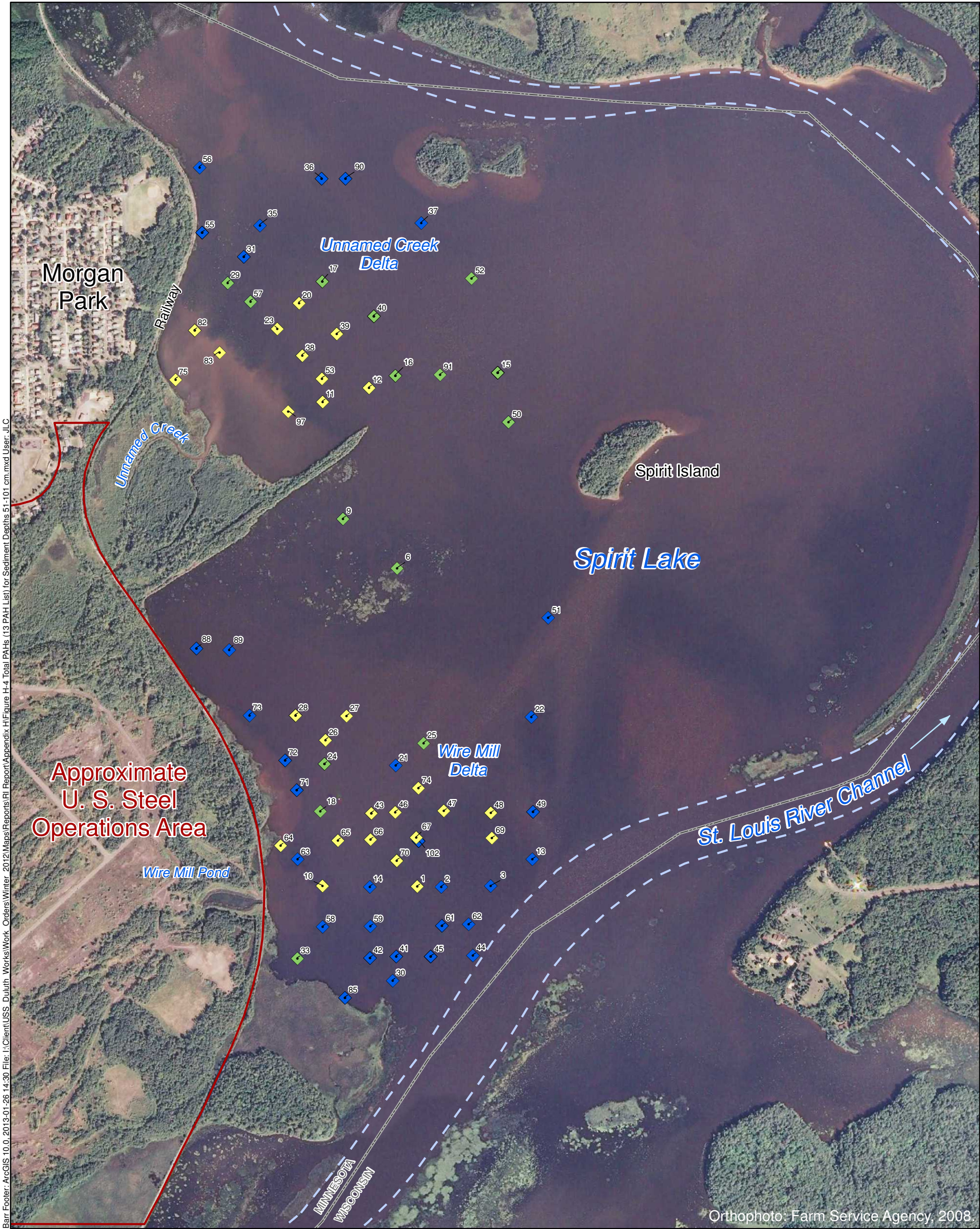


Figure H-3

TOTAL PAHS (13 PAH LIST)
SEDIMENT DEPTHS
15.25-50 CENTIMETERS
Spirit Lake Sediment Site -
Former U. S. Steel Duluth Works
Saint Louis River
Duluth, Minnesota

*This figure created at MPCA request for comparison to
St. Louis River Area of Concern Assessment Data.*



Notes: SQT = Sediment quality target for the protection of sediment-dwelling organisms (MPCA, 2007)
Results shown are the maximum value for the given depth range.

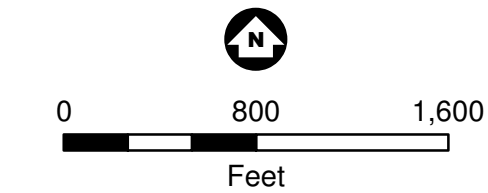
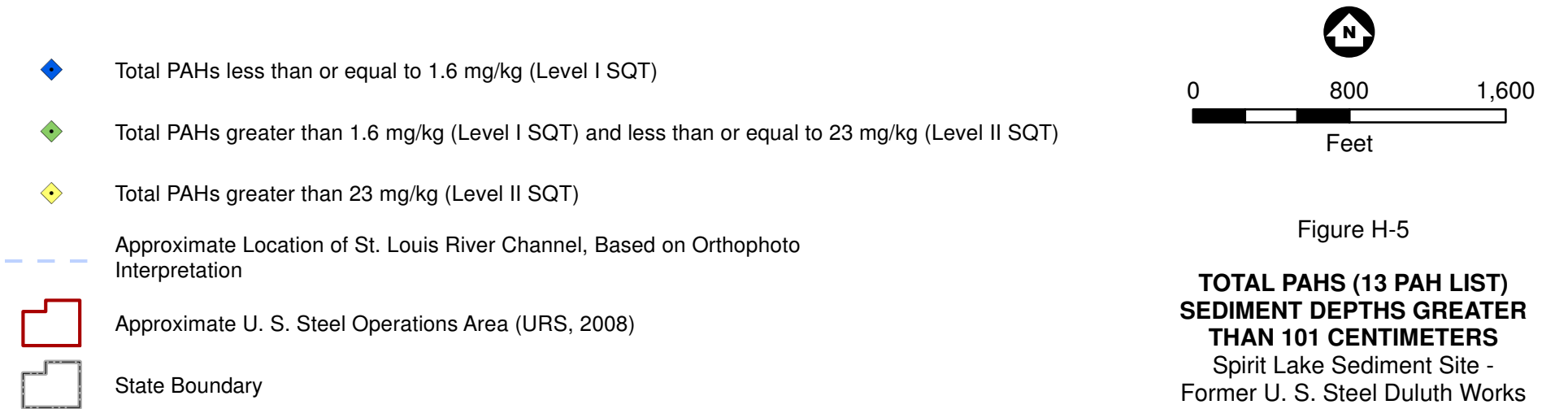
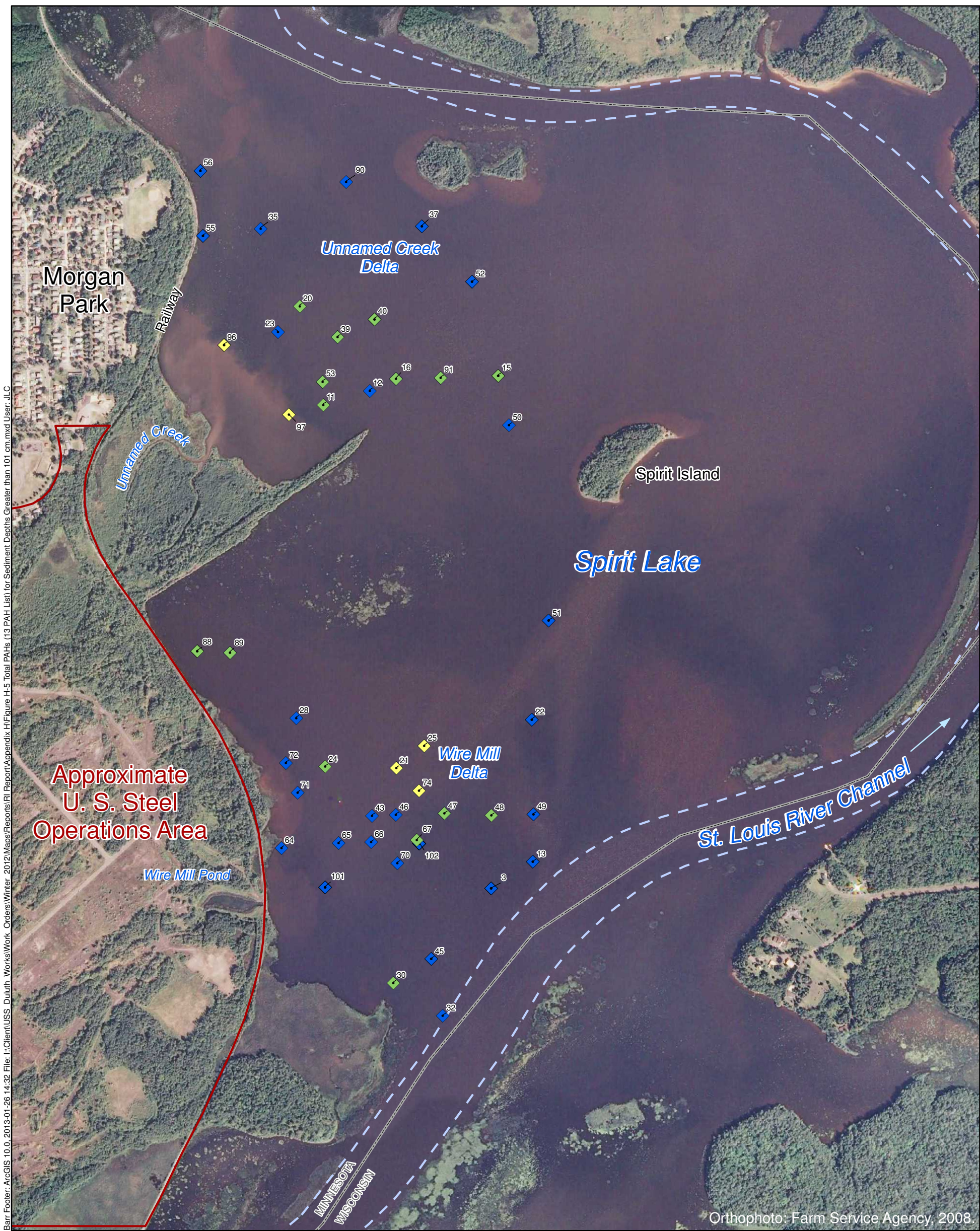


Figure H-4

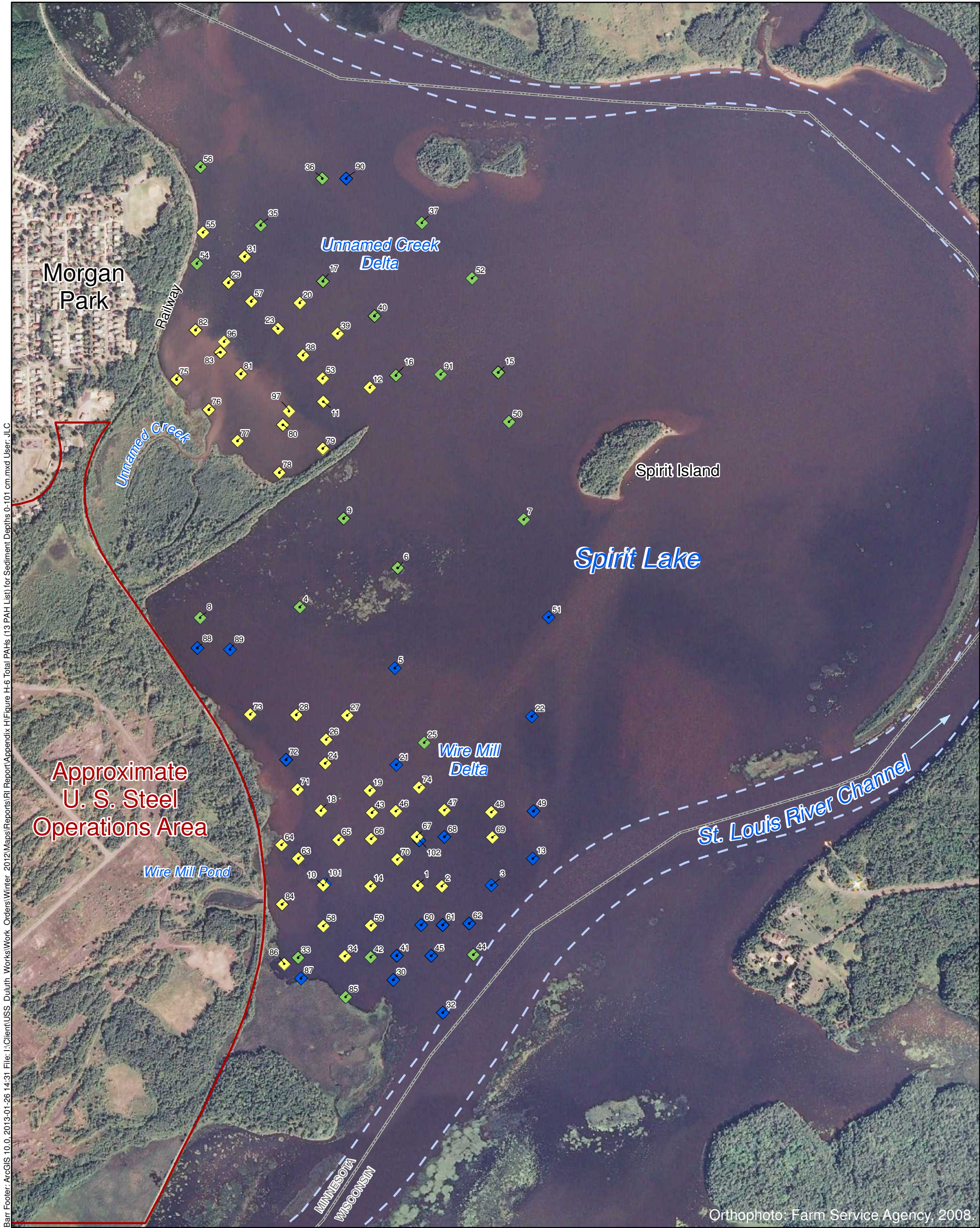
**TOTAL PAHS (13 PAH LIST)
SEDIMENT DEPTHS
51-101 CENTIMETERS**
Spirit Lake Sediment Site -
Former U. S. Steel Duluth Works
Saint Louis River
Duluth, Minnesota

*This figure created at MPCA request for comparison to
St. Louis River Area of Concern Assessment Data.*



Notes: SQT = Sediment quality target for the protection of sediment-dwelling organisms (MPCA, 2007)
Results shown are the maximum value for the given depth range.

This figure created at MPCA request for comparison to St. Louis River Area of Concern Assessment Data.



- Total PAHs less than or equal to 1.6 mg/kg (Level I SQT)
- Total PAHs greater than 1.6 mg/kg (Level I SQT) and less than or equal to 23 mg/kg (Level II SQT)
- Total PAHs greater than 23 mg/kg (Level II SQT)
- Approximate Location of St. Louis River Channel, Based on Orthophoto Interpretation
- Approximate U. S. Steel Operations Area (URS, 2008)
- State Boundary

Notes: SQT = Sediment quality target for the protection of sediment-dwelling organisms (MPCA, 2007)
Results shown are the maximum value for the given depth range.

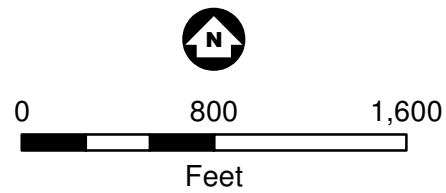
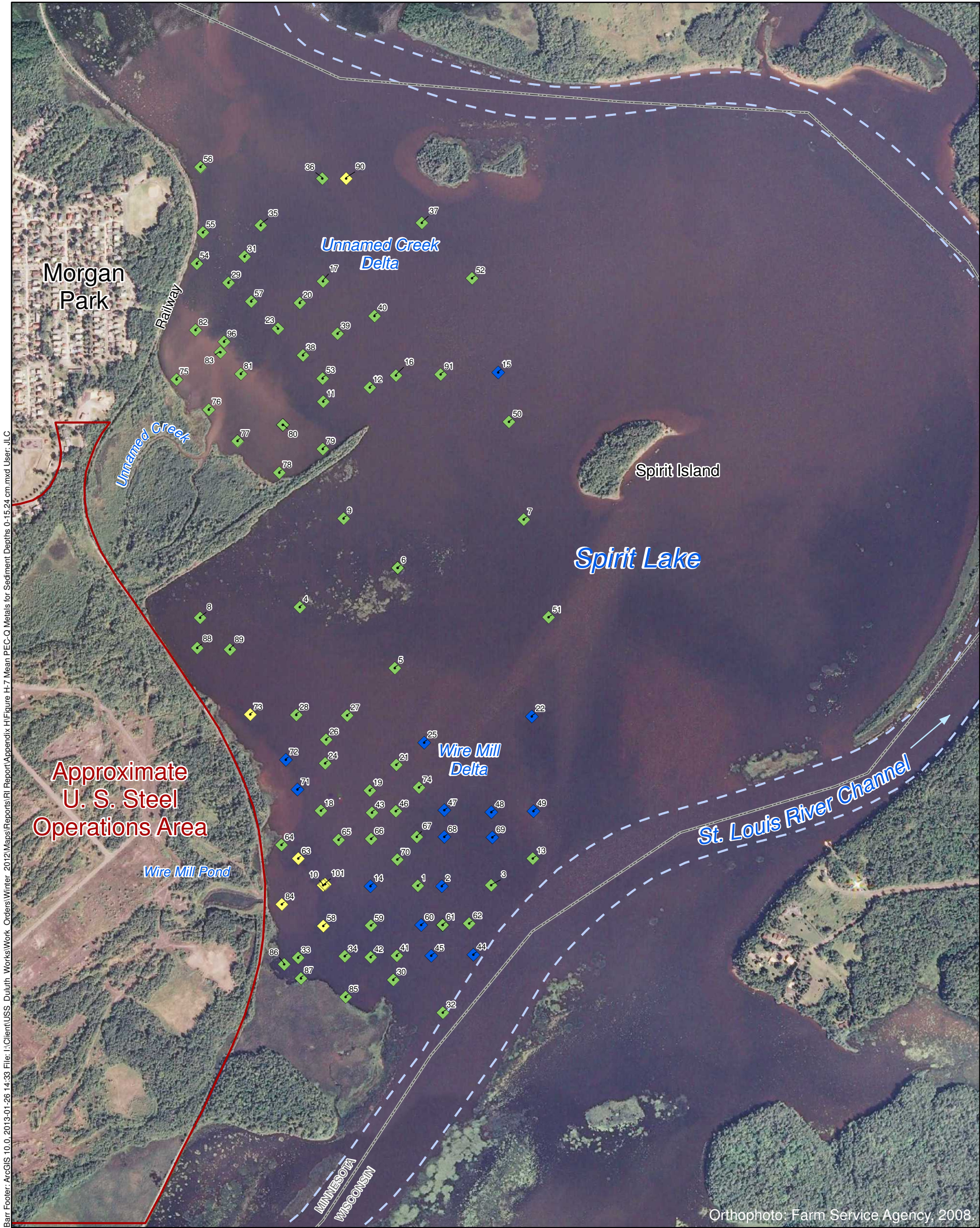


Figure H-6

TOTAL PAHS (13 PAH LIST)
ALL SEDIMENT DEPTHS
Spirit Lake Sediment Site -
Former U. S. Steel Duluth Works
Saint Louis River
Duluth, Minnesota

*This figure created at MPCA request for comparison to
St. Louis River Area of Concern Assessment Data.*



Barr Footer: ArcGIS 10.0, 2013-01-26 14:33 File: I:\Client\USS Duluth Works\Work Orders\Winter 2012\Maps\Reports\RI Report\Appendix H\Figure H-7 Mean PEC-Q Metals for Sediment Depths 0-15.24 cm.mxd User: JLC

- Mean PEC-Q Metals less than or equal to 0.1
- Mean PEC-Q Metals greater than 0.1 and less than or equal to 0.6
- Mean PEC-Q Metals greater than 0.6
- Approximate Location of St. Louis River Channel, Based on Orthophoto Interpretation
- Approximate U. S. Steel Operations Area (URS, 2008)
- State Boundary

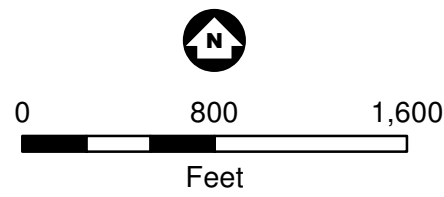
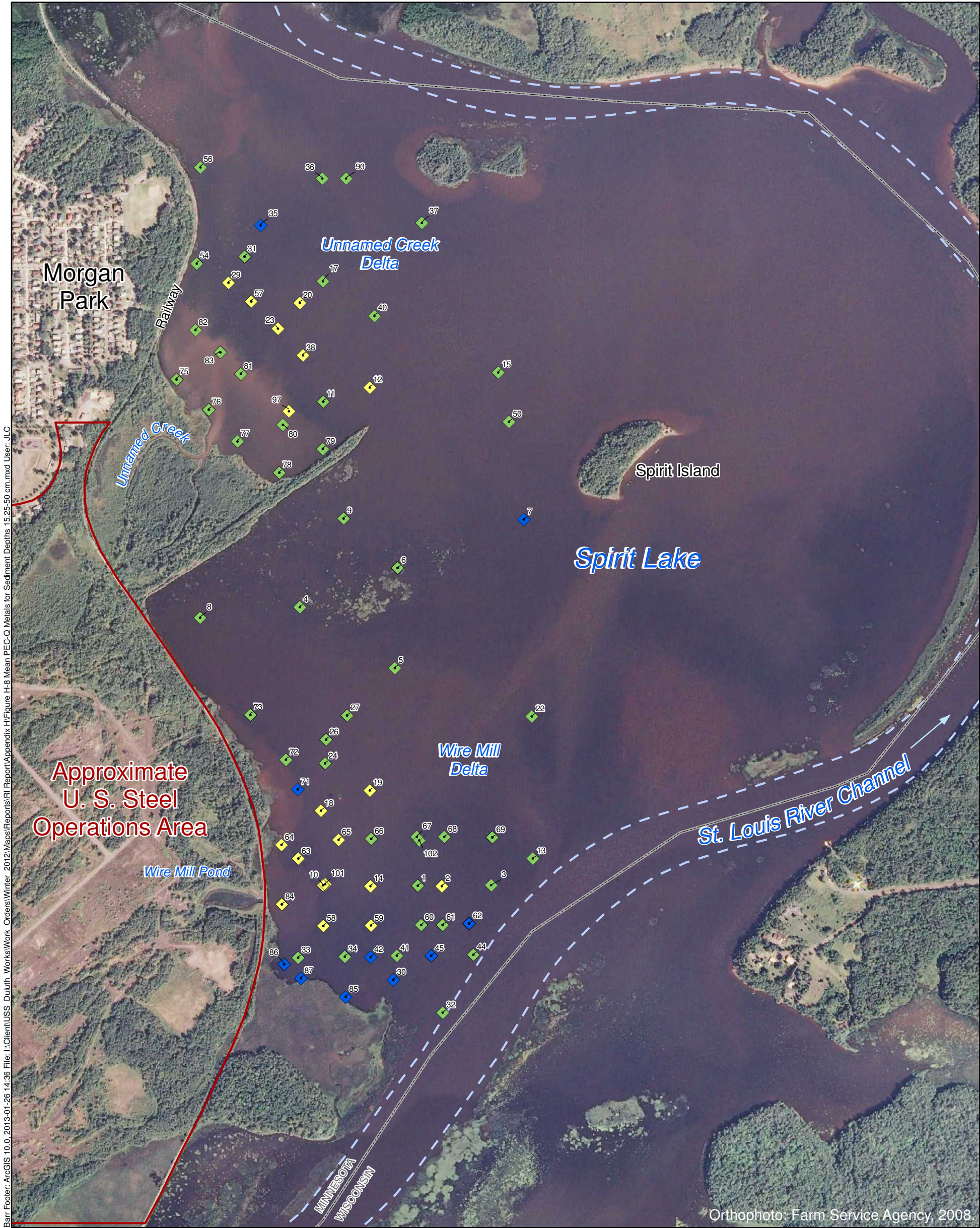


Figure H-7

**MEAN PEC-Q METALS
SEDIMENT DEPTHS
0-15.24 CENTIMETERS**
Spirit Lake Sediment Site -
Former U. S. Steel Duluth Works
Saint Louis River
Duluth, Minnesota

*This figure created at MPCA request for comparison to
St. Louis River Area of Concern Assessment Data.*

Notes: Mean PEC-Q Metals calculated in accordance with the *Guidance for the use and application of sediment quality targets for the protection of sediment-dwelling organisms in Minnesota* (MPCA, 2007) by dividing chemical concentrations by the respective Level II SQTs.
SQT = Sediment quality target for the protection of sediment-dwelling organisms (MPCA, 2007)
Mean PEC-Q = Mean probable effect concentration quotient (MPCA, 2007)
Results shown are the maximum value for the given depth range.



- Mean PEC-Q Metals less than or equal to 0.1
- Mean PEC-Q Metals greater than 0.1 and less than or equal to 0.6
- Mean PEC-Q Metals greater than 0.6
- Approximate Location of St. Louis River Channel, Based on Orthophoto Interpretation
- Approximate U. S. Steel Operations Area (URS, 2008)
- State Boundary

Notes: Mean PEC-Q Metals calculated in accordance with the *Guidance for the use and application of sediment quality targets for the protection of sediment-dwelling organisms in Minnesota* (MPCA, 2007) by dividing chemical concentrations by the respective Level II SQTs.

SQT = Sediment quality target for the protection of sediment-dwelling organisms (MPCA, 2007)
Mean PEC-Q = Mean probable effect concentration quotient (MPCA, 2007)
Results shown are the maximum value for the given depth range.

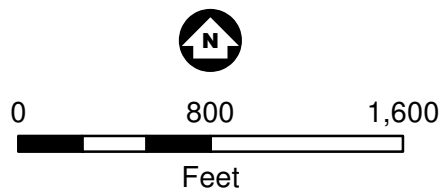
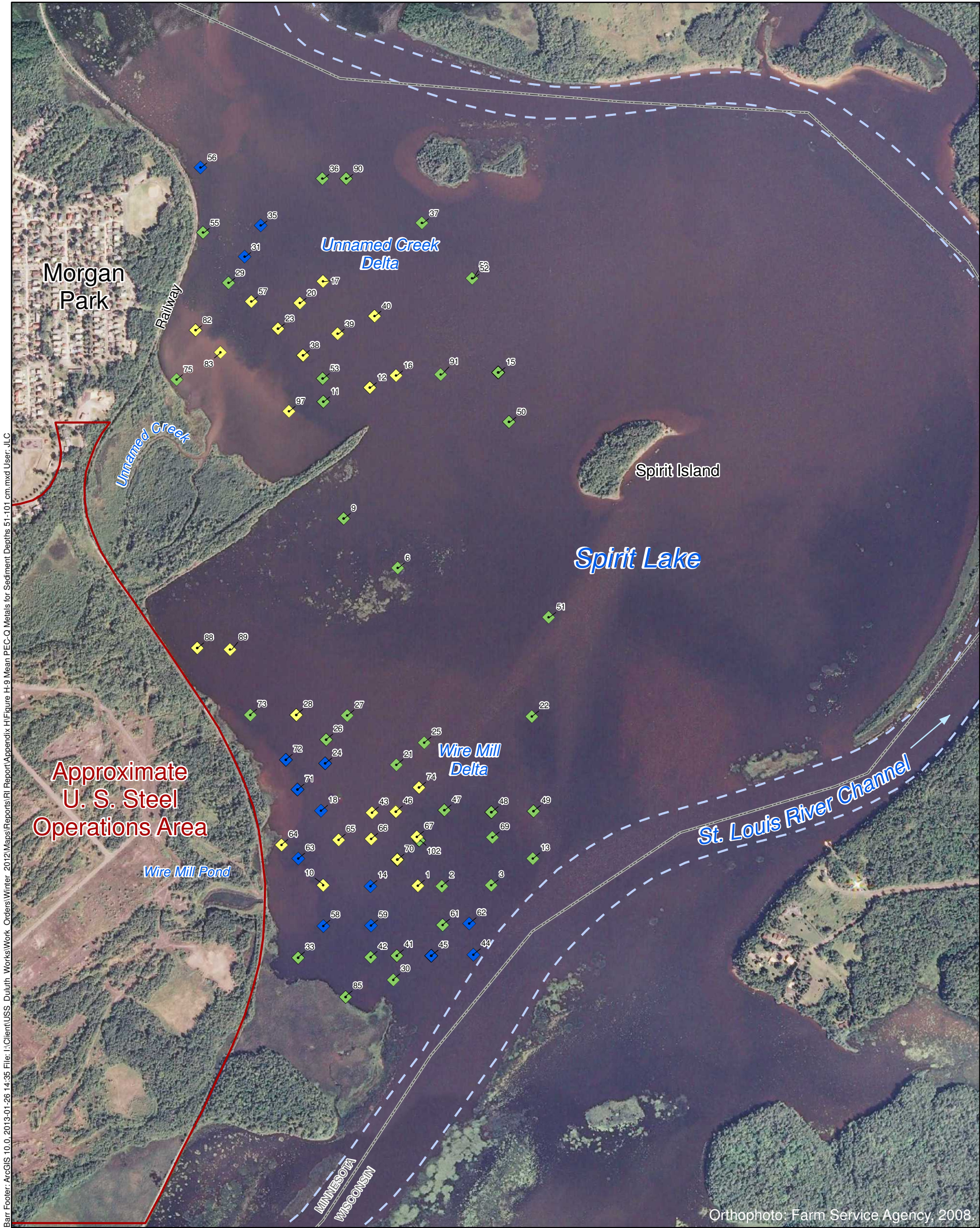


Figure H-8

**MEAN PEC-Q METALS
SEDIMENT DEPTHS
15.25-50 CENTIMETERS**
Spirit Lake Sediment Site -
Former U. S. Steel Duluth Works
Saint Louis River
Duluth, Minnesota

*This figure created at MPCA request for comparison to
St. Louis River Area of Concern Assessment Data.*



- Mean PEC-Q Metals less than or equal to 0.1
- Mean PEC-Q Metals greater than 0.1 and less than or equal to 0.6
- Mean PEC-Q Metals greater than 0.6
- Approximate Location of St. Louis River Channel, Based on Orthophoto Interpretation
- Approximate U. S. Steel Operations Area (URS, 2008)
- State Boundary

Notes: Mean PEC-Q Metals calculated in accordance with the *Guidance for the use and application of sediment quality targets for the protection of sediment-dwelling organisms in Minnesota* (MPCA, 2007) by dividing chemical concentrations by the respective Level II SQTs.

SQT = Sediment quality target for the protection of sediment-dwelling organisms (MPCA, 2007)
Mean PEC-Q = Mean probable effect concentration quotient (MPCA, 2007)
Results shown are the maximum value for the given depth range.

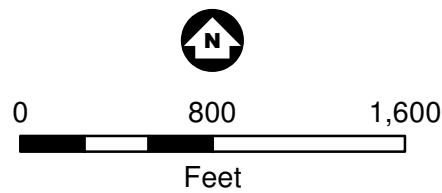


Figure H-9

**MEAN PEC-Q METALS
SEDIMENT DEPTHS
51-101 CENTIMETERS**
Spirit Lake Sediment Site -
Former U. S. Steel Duluth Works
Saint Louis River
Duluth, Minnesota

*This figure created at MPCA request for comparison to
St. Louis River Area of Concern Assessment Data.*

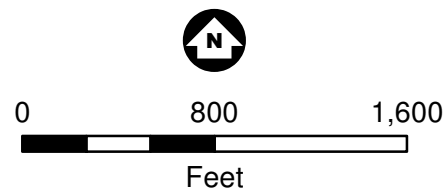
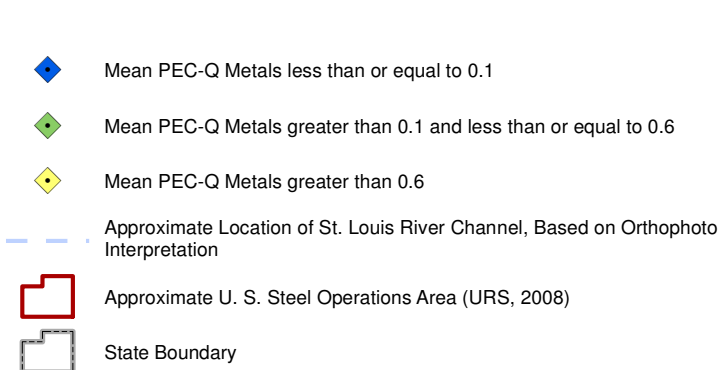
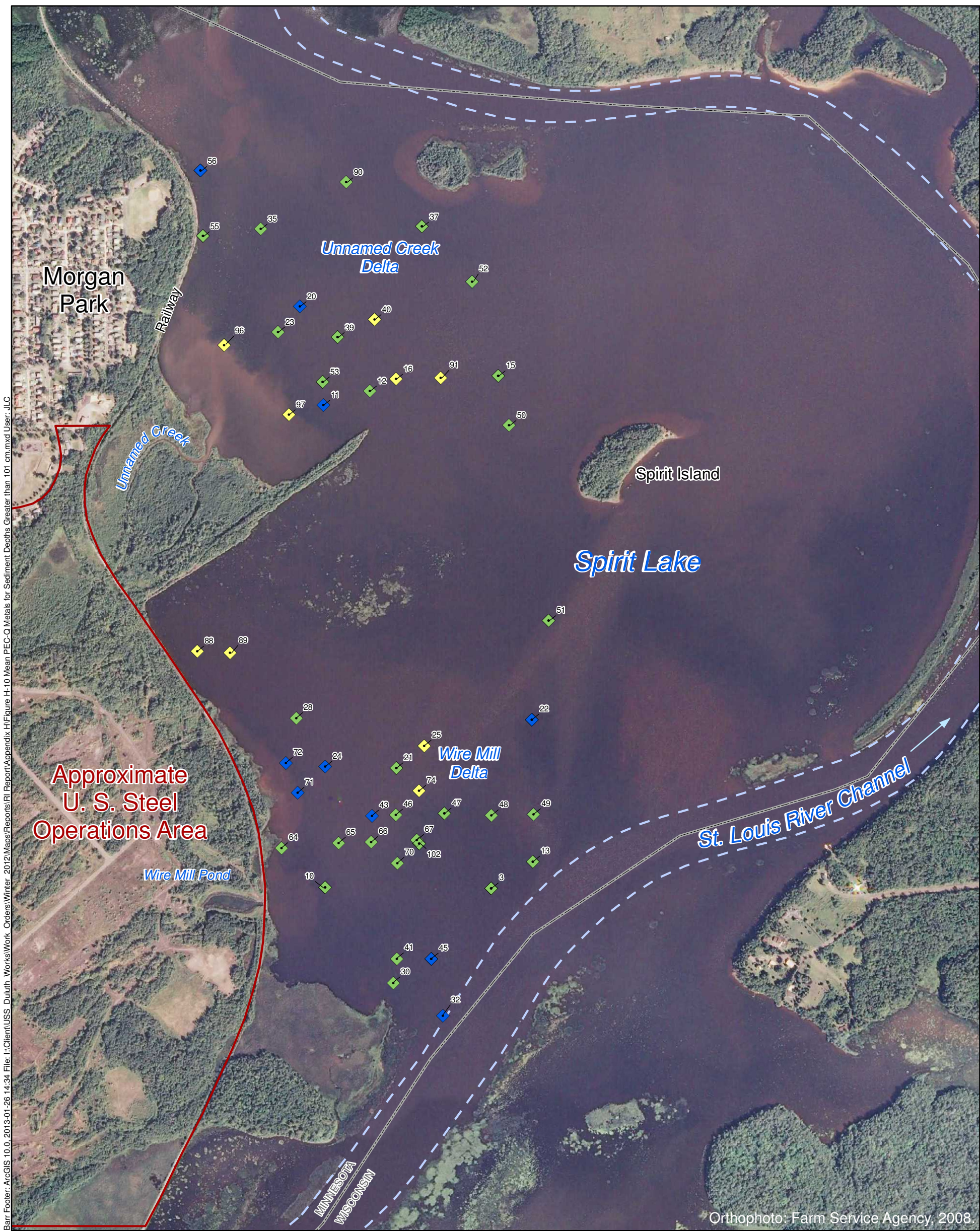


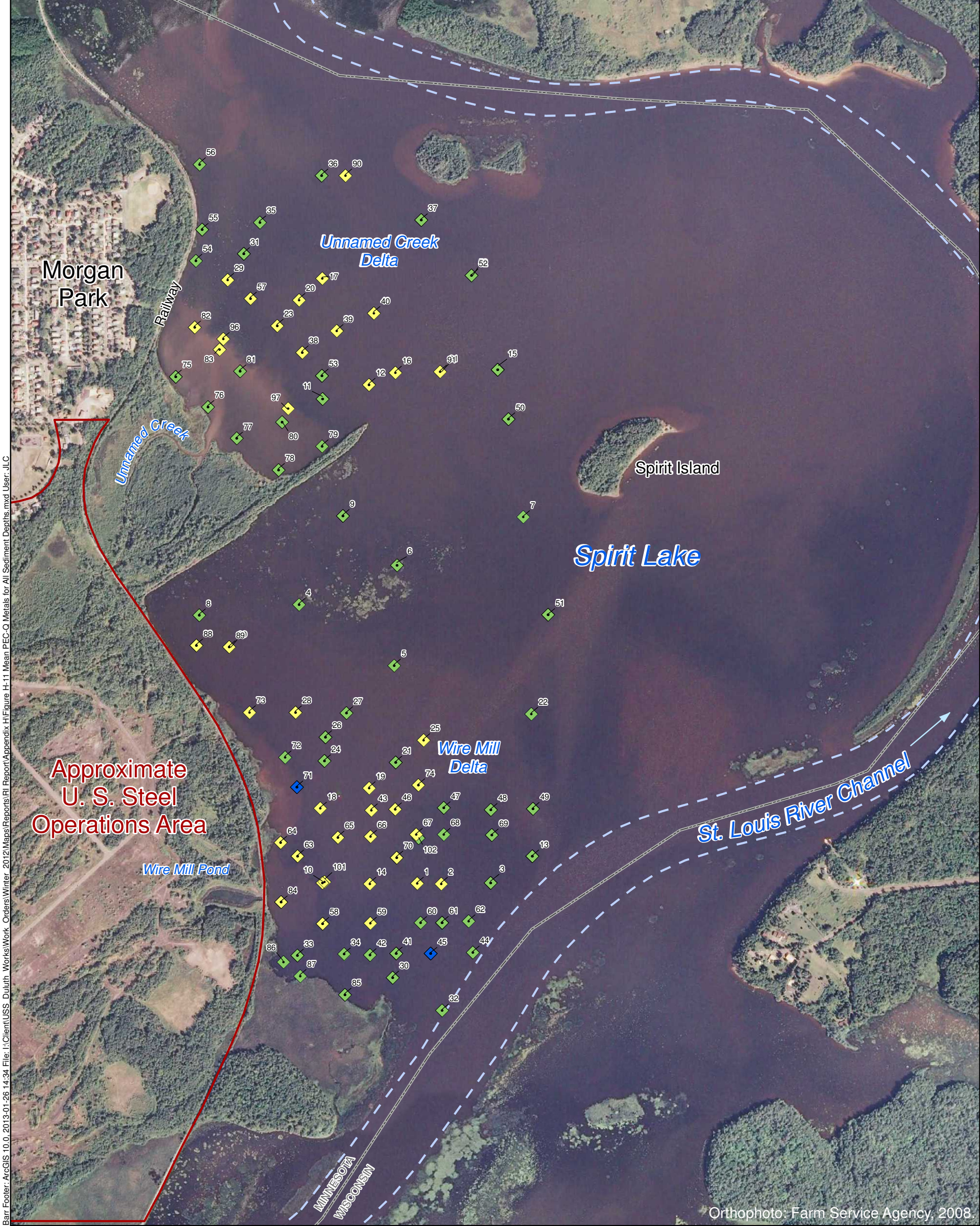
Figure H-10

**MEAN PEC-Q METALS
SEDIMENT DEPTHS GREATER
THAN 101 CENTIMETERS**
Spirit Lake Sediment Site -
Former U. S. Steel Duluth Works
Saint Louis River
Duluth, Minnesota

*This figure created at MPCA request for comparison to
St. Louis River Area of Concern Assessment Data.*

Notes: Mean PEC-Q Metals calculated in accordance with the *Guidance for the use and application of sediment quality targets for the protection of sediment-dwelling organisms in Minnesota* (MPCA, 2007) by dividing chemical concentrations by the respective Level II SQTs.

SQT = Sediment quality target for the protection of sediment-dwelling organisms (MPCA, 2007)
Mean PEC-Q = Mean probable effect concentration quotient (MPCA, 2007)
Results shown are the maximum value for the given depth range.



- Mean PEC-Q Metals less than or equal to 0.1
- Mean PEC-Q Metals greater than 0.1 and less than or equal to 0.6
- Mean PEC-Q Metals greater than 0.6
- Approximate Location of St. Louis River Channel, Based on Orthophoto Interpretation
- Approximate U. S. Steel Operations Area (URS, 2008)
- State Boundary

Notes: Mean PEC-Q Metals calculated in accordance with the *Guidance for the use and application of sediment quality targets for the protection of sediment-dwelling organisms in Minnesota* (MPCA, 2007) by dividing chemical concentrations by the respective Level II SQTs.

SQT = Sediment quality target for the protection of sediment-dwelling organisms (MPCA, 2007)
Mean PEC-Q = Mean probable effect concentration quotient (MPCA, 2007)
Results shown are the maximum value for a given location.

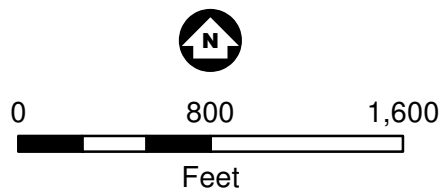


Figure H-11

**MEAN PEC-Q METALS
ALL SEDIMENT DEPTHS**
Spirit Lake Sediment Site -
Former U. S. Steel Duluth Works
Saint Louis River
Duluth, Minnesota

*This figure created at MPCA request for comparison to
St. Louis River Area of Concern Assessment Data.*



- ◆ Arsenic less or equal to 9.8 mg/kg (Level I SQT)
- ◆ Arsenic greater than 9.8 mg/kg (Level I SQT) and less than or equal to 33 mg/kg (Level II SQT)
- ◆ Arsenic greater than 33 mg/kg (Level II SQT)
- - - Approximate Location of St. Louis River Channel, Based on Orthophoto Interpretation
- Approximate U. S. Steel Operations Area (URS, 2008)
- State Boundary

Notes: SQT = Sediment quality target for the protection of sediment-dwelling organisms (MPCA, 2007)
Results shown are the surficial sample for a given location.
Results shown are the maximum value for the given depth range.

* Indicates sample taken at 0'-0.7' depth range.
** Indicates sample taken at 0'-1' depth range.

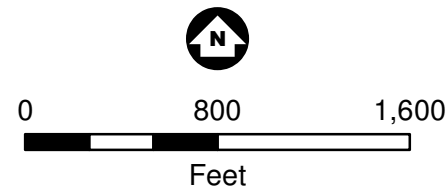
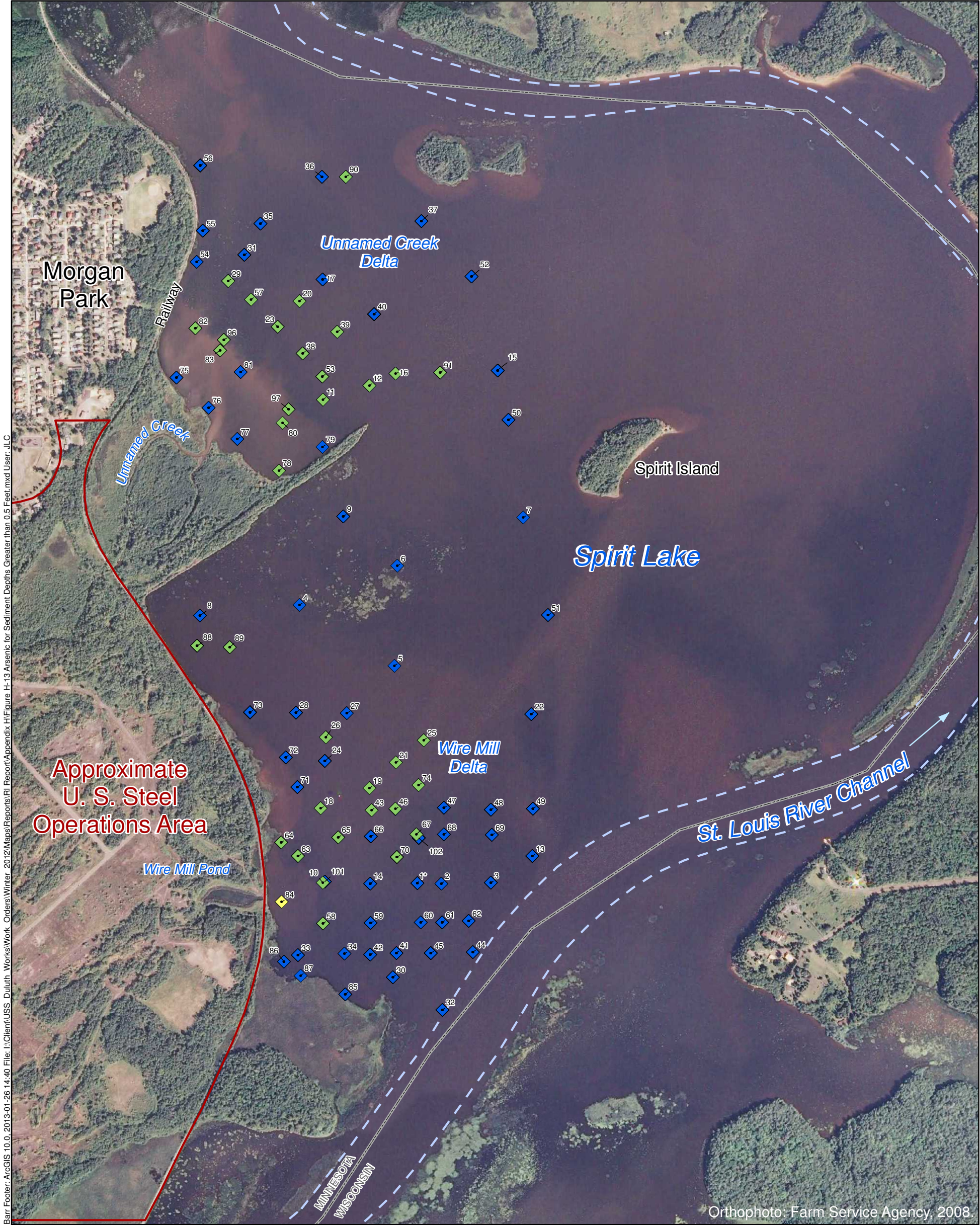


Figure H-12

**ARSENIC
SEDIMENT DEPTHS LESS THAN
OR EQUAL TO 0.5 FEET**
Spirit Lake Sediment Site -
Former U. S. Steel Duluth Works
Saint Louis River
Duluth, Minnesota



- ◆ Arsenic less or equal to 9.8 mg/kg (Level I SQT)
- ◆ Arsenic greater than 9.8 mg/kg (Level I SQT) and less than or equal to 33 mg/kg (Level II SQT)
- ◆ Arsenic greater than 33 mg/kg (Level II SQT)
- Approximate Location of St. Louis River Channel, Based on Orthophoto Interpretation
- Approximate U. S. Steel Operations Area (URS, 2008)
- State Boundary

Notes: SQT = Sediment quality target for the protection of sediment-dwelling organisms (MPCA, 2007)
Results shown are the maximum value for the given depth range.

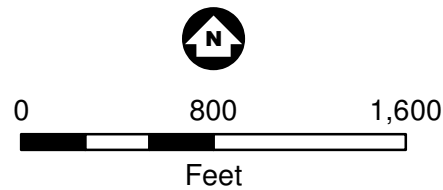
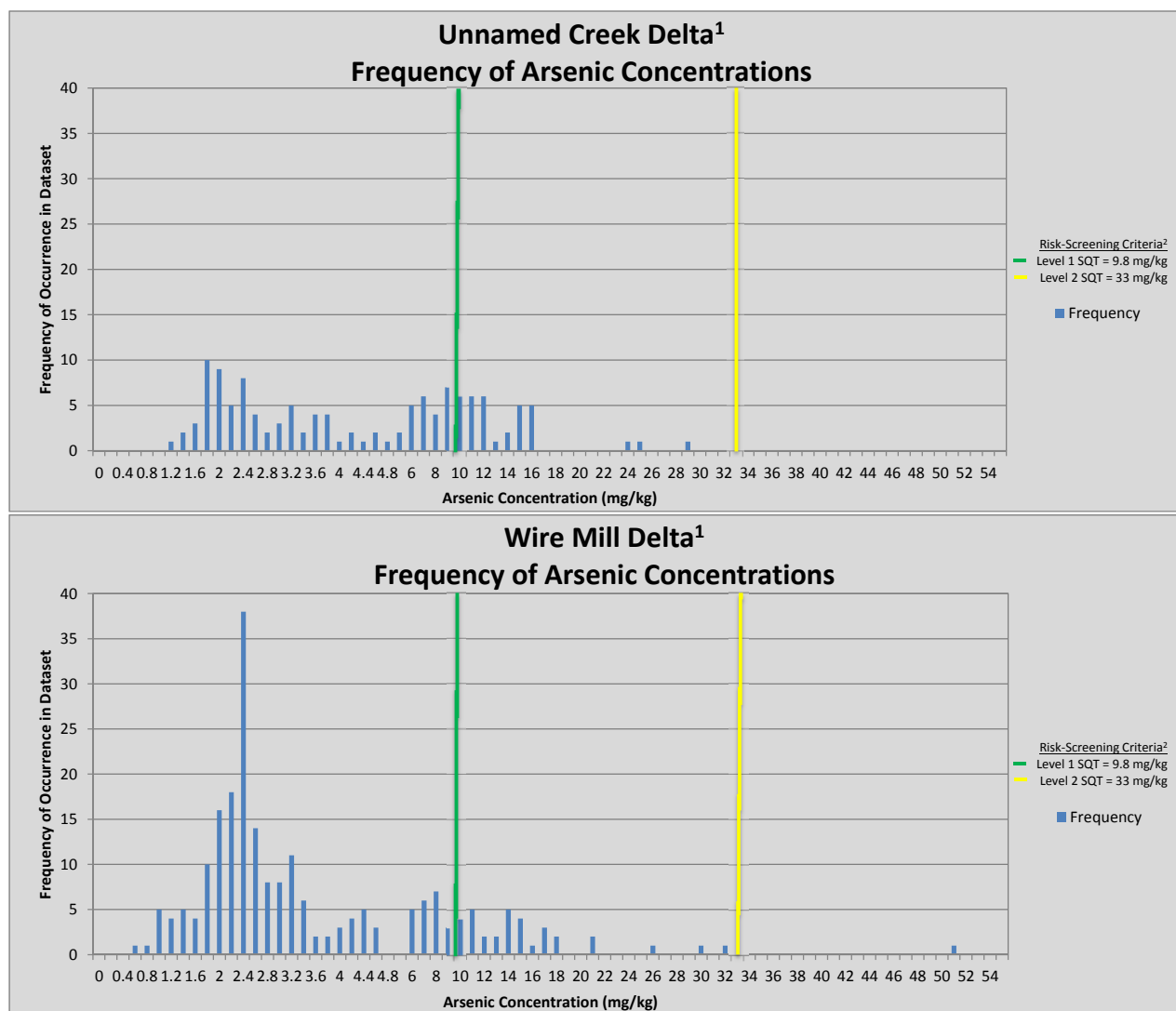


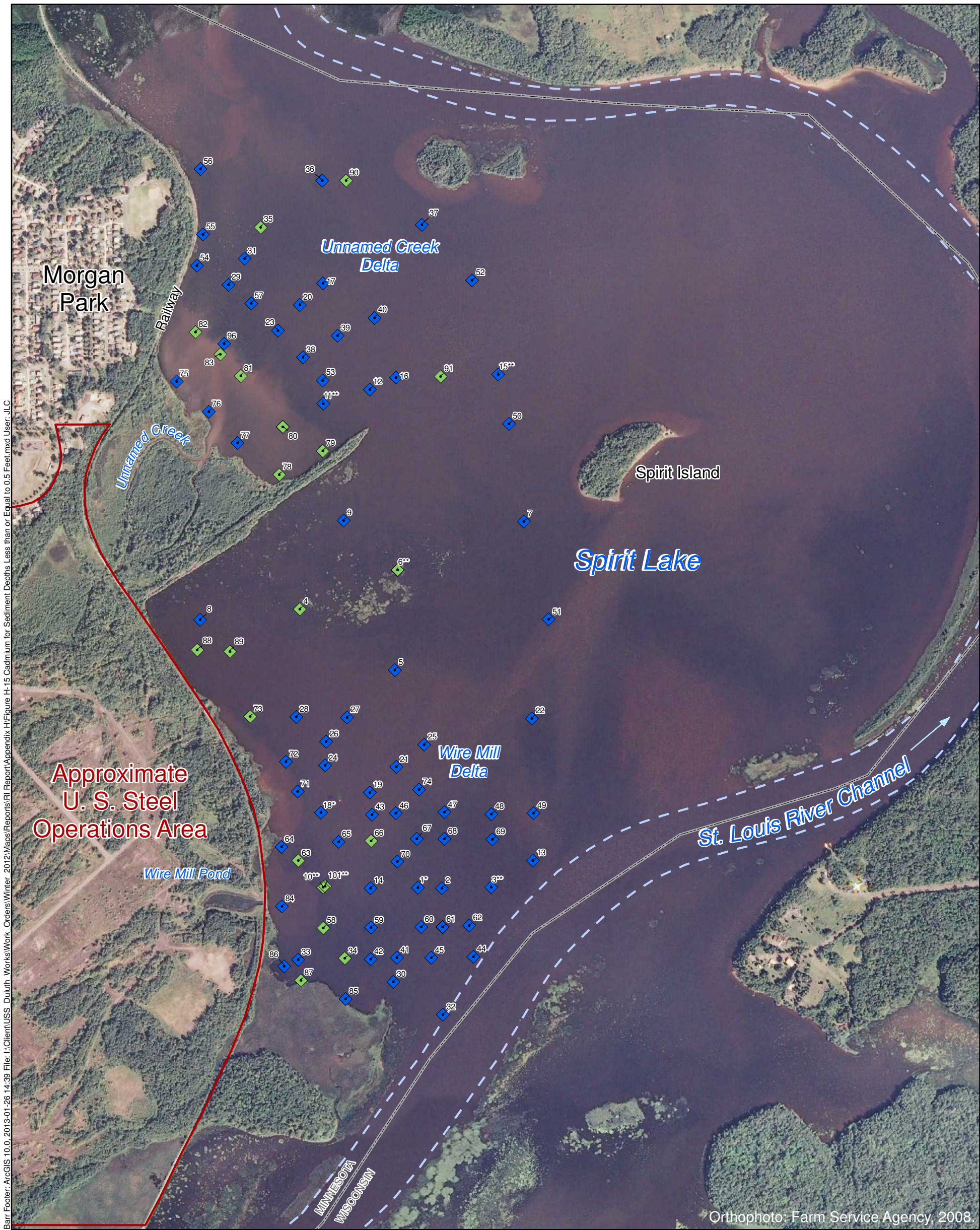
Figure H-13

**ARSENIC
SEDIMENT DEPTHS GREATER
THAN 0.5 FEET**
Spirit Lake Sediment Site -
Former U. S. Steel Duluth Works
Saint Louis River
Duluth, Minnesota



¹U.S. Steel samples collected in 2011 by vibracoring and soil boring methods.
²SQT = Sediment quality target for the protection of sediment-dwelling organisms (MPCA, 2007).

Figure H-14
**FREQUENCY OF ARSENIC
 CONCENTRATIONS BY DATASET**
 Spirit Lake Sediment Site
 U.S. Steel Former Duluth Works



- ◆ Cadmium less than or equal to 0.99 mg/kg (Level I SQT)
- ◆ Cadmium greater than 0.99 mg/kg (Level I SQT) and less than or equal to 5.0 mg/kg (Level II SQT)
- ◆ Cadmium greater than 5.0 mg/kg (Level II SQT)
- - - Approximate Location of St. Louis River Channel, Based on Orthophoto Interpretation
- Approximate U. S. Steel Operations Area (URS, 2008)
- State Boundary

Notes: SQT = Sediment quality target for the protection of sediment-dwelling organisms (MPCA, 2007)
Results shown are the surficial sample for a given location.
Results shown are the maximum value for the given depth range.

* Indicates sample taken at 0'-0.7' depth range.
** Indicates sample taken at 0'-1' depth range.

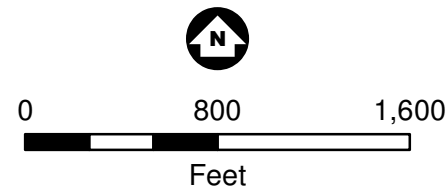
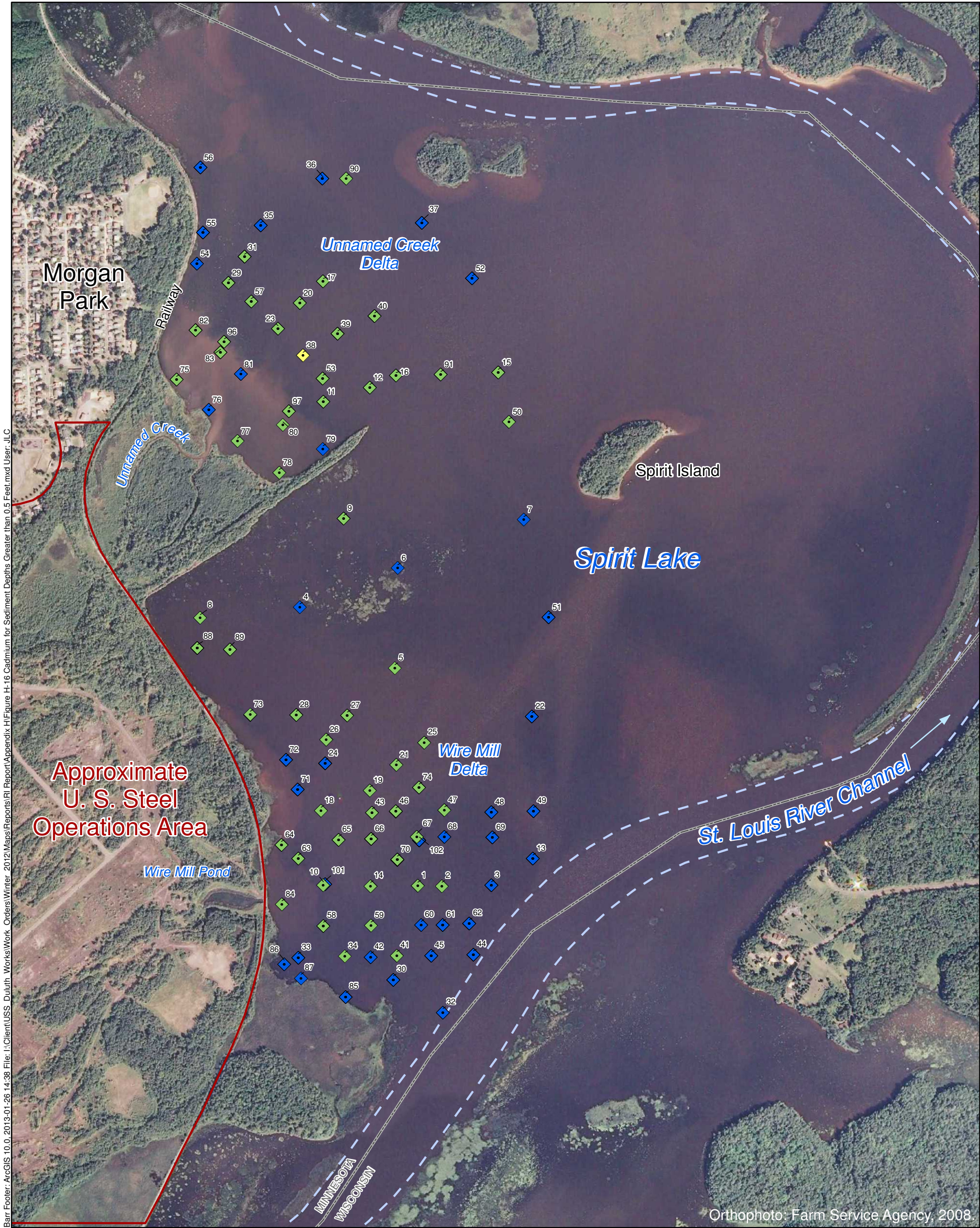


Figure H-15

**CADMIUM
SEDIMENT DEPTHS LESS THAN
OR EQUAL TO 0.5 FEET**
Spirit Lake Sediment Site -
Former U. S. Steel Duluth Works
Saint Louis River
Duluth, Minnesota



- ◆ Cadmium less than or equal to 0.99 mg/kg (Level I SQT)
- ◆ Cadmium greater than 0.99 mg/kg (Level I SQT) and less than or equal to 5.0 mg/kg (Level II SQT)
- ◆ Cadmium greater than 5.0 mg/kg (Level II SQT)
- Approximate Location of St. Louis River Channel, Based on Orthophoto Interpretation
- Approximate U. S. Steel Operations Area (URS, 2008)
- State Boundary

Notes: SQT = Sediment quality target for the protection of sediment-dwelling organisms (MPCA, 2007)
Results shown are the maximum value for the given depth range.

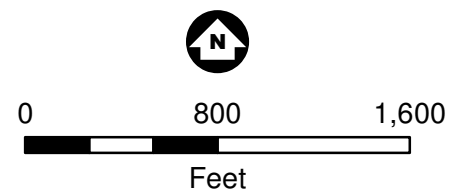
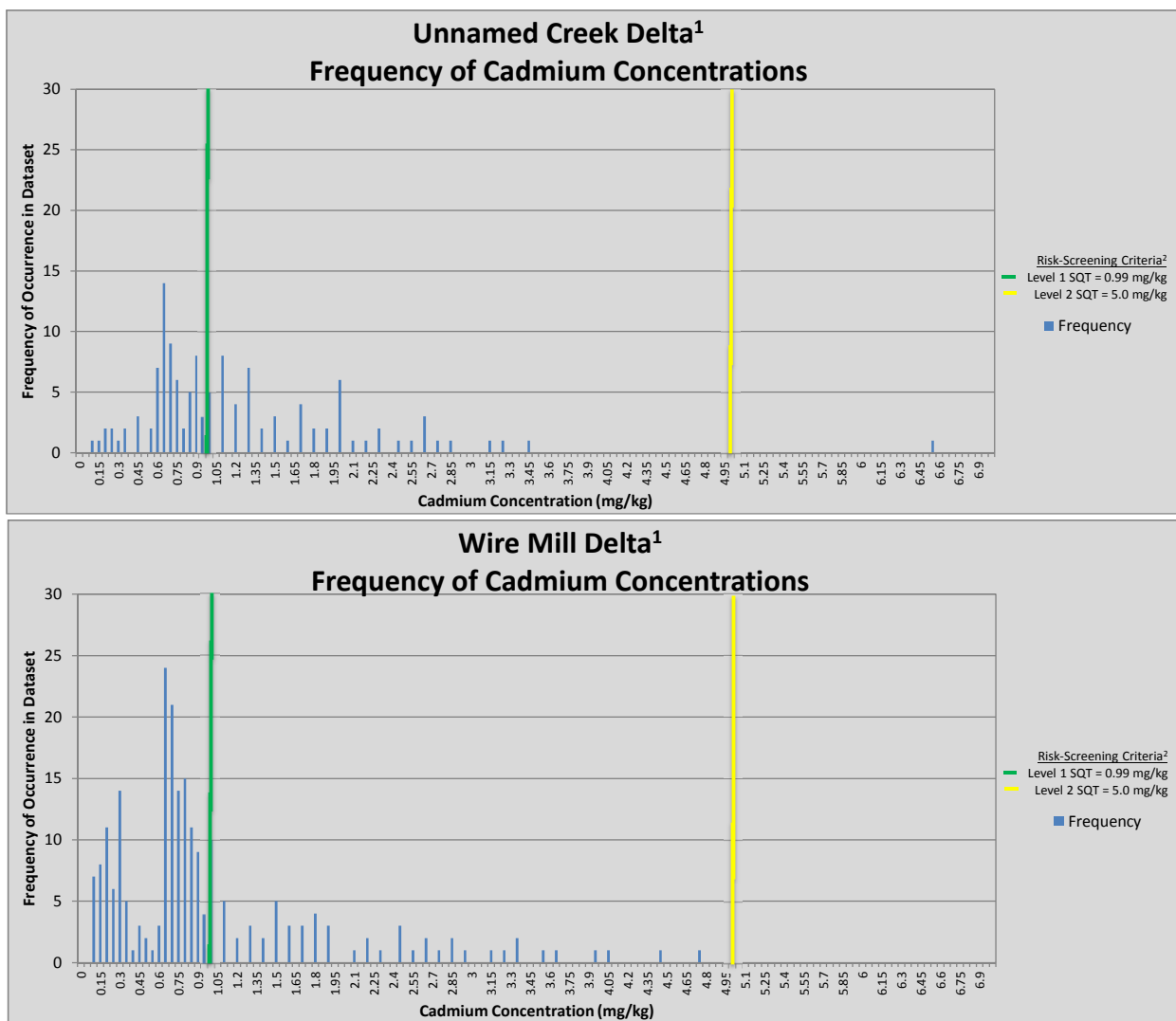


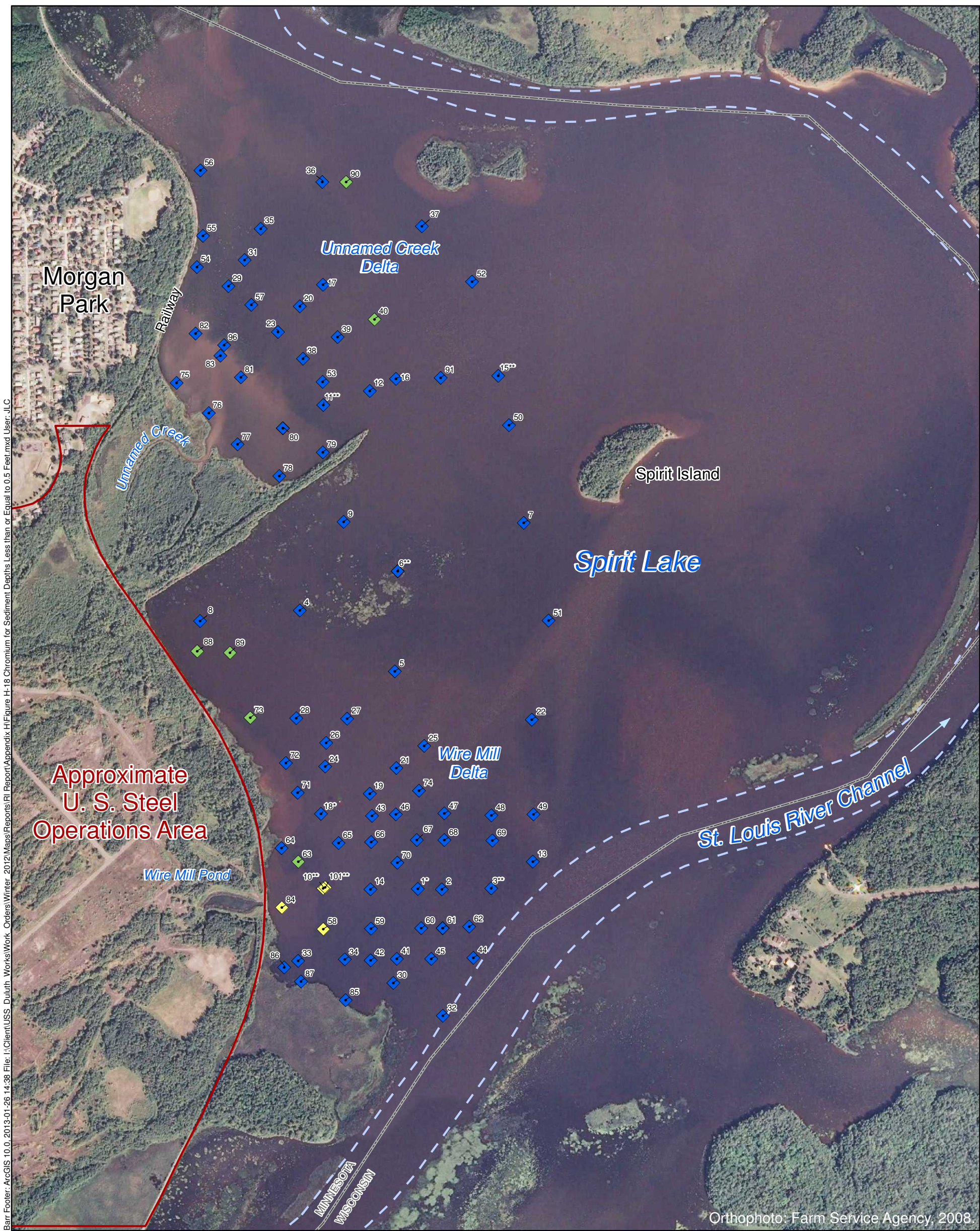
Figure H-16

**CADMIUM
SEDIMENT DEPTHS GREATER
THAN 0.5 FEET**
Spirit Lake Sediment Site -
Former U. S. Steel Duluth Works
Saint Louis River
Duluth, Minnesota



¹U.S. Steel samples collected in 2011 by vibracoring and soil boring methods.
²SQT = Sediment quality target for the protection of sediment-dwelling organisms (MPCA, 2007).

Figure H-17
**FREQUENCY OF CADMIUM
 CONCENTRATIONS BY DATASET**
 Spirit Lake Sediment Site



- ◆ Chromium less than or equal to 43 mg/kg (Level I SQT)
- ◆ Chromium greater than 43 mg/kg (Level I SQT) and less than or equal to 110 mg/kg (Level II SQT)
- ◆ Chromium greater than 110 mg/kg (Level II SQT)
- Approximate Location of St. Louis River Channel, Based on Orthophoto Interpretation
- Approximate U. S. Steel Operations Area (URS, 2008)
- State Boundary

Notes: SQT = Sediment quality target for the protection of sediment-dwelling organisms (MPCA, 2007)
Results shown are the surficial sample for a given location.
Results shown are the maximum value for the given depth range.

* Indicates sample taken at 0'-0.7' depth range.
** Indicates sample taken at 0'-1' depth range.

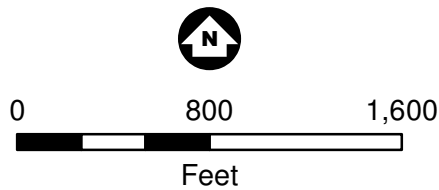
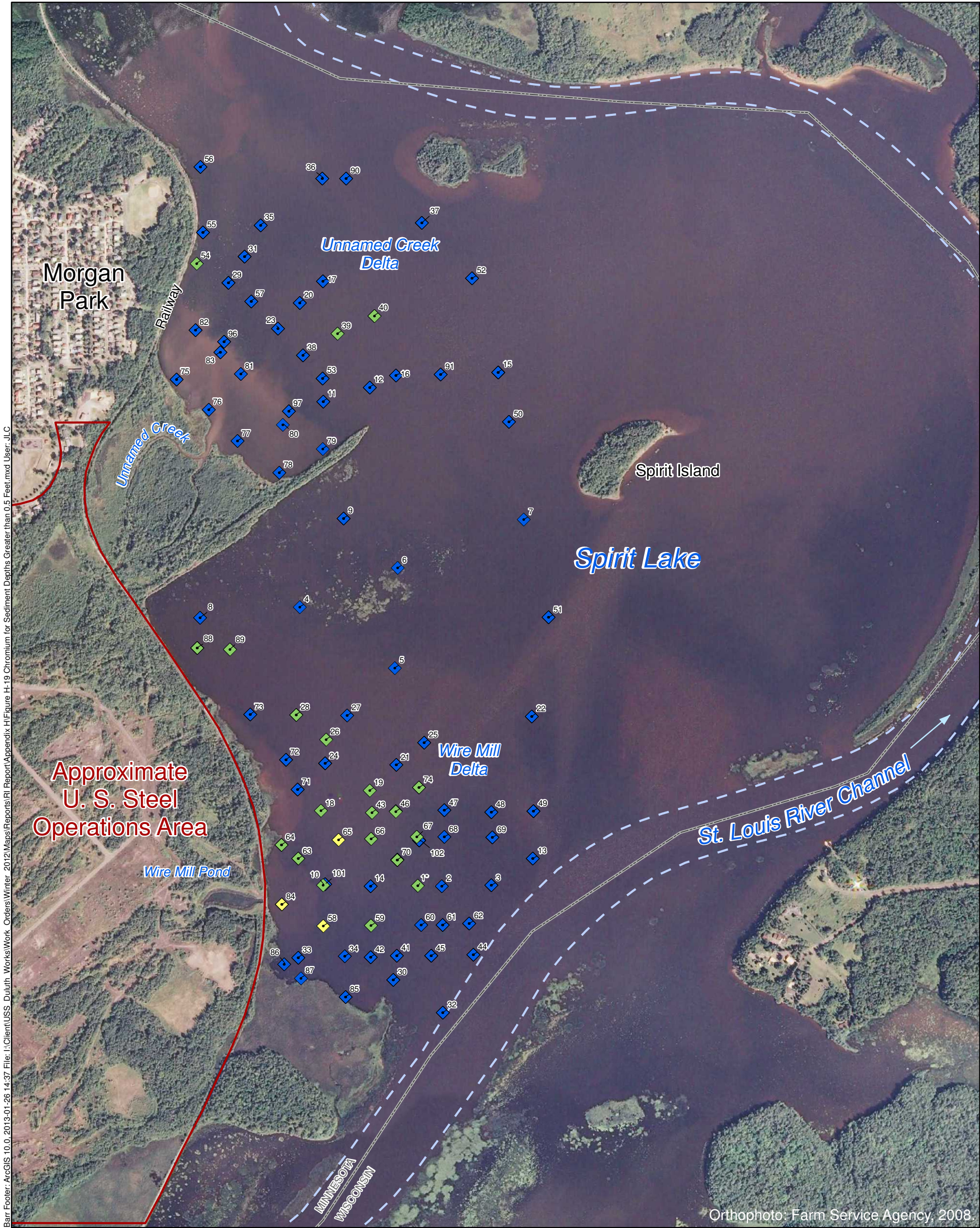


Figure H-18

**CHROMIUM
SEDIMENT DEPTHS LESS THAN
OR EQUAL TO 0.5 FEET**
Spirit Lake Sediment Site -
Former U. S. Steel Duluth Works
Saint Louis River
Duluth, Minnesota



- ◆ Chromium less than or equal to 43 mg/kg (Level I SQT)
- ◆ Chromium greater than 43 mg/kg (Level I SQT) and less than or equal to 110 mg/kg (Level II SQT)
- ◆ Chromium greater than 110 mg/kg (Level II SQT)

— Approximate Location of St. Louis River Channel, Based on Orthophoto Interpretation

□ Approximate U. S. Steel Operations Area (URS, 2008)

□ State Boundary

Notes: SQT = Sediment quality target for the protection of sediment-dwelling organisms (MPCA, 2007)
Results shown are the maximum value for the given depth range.

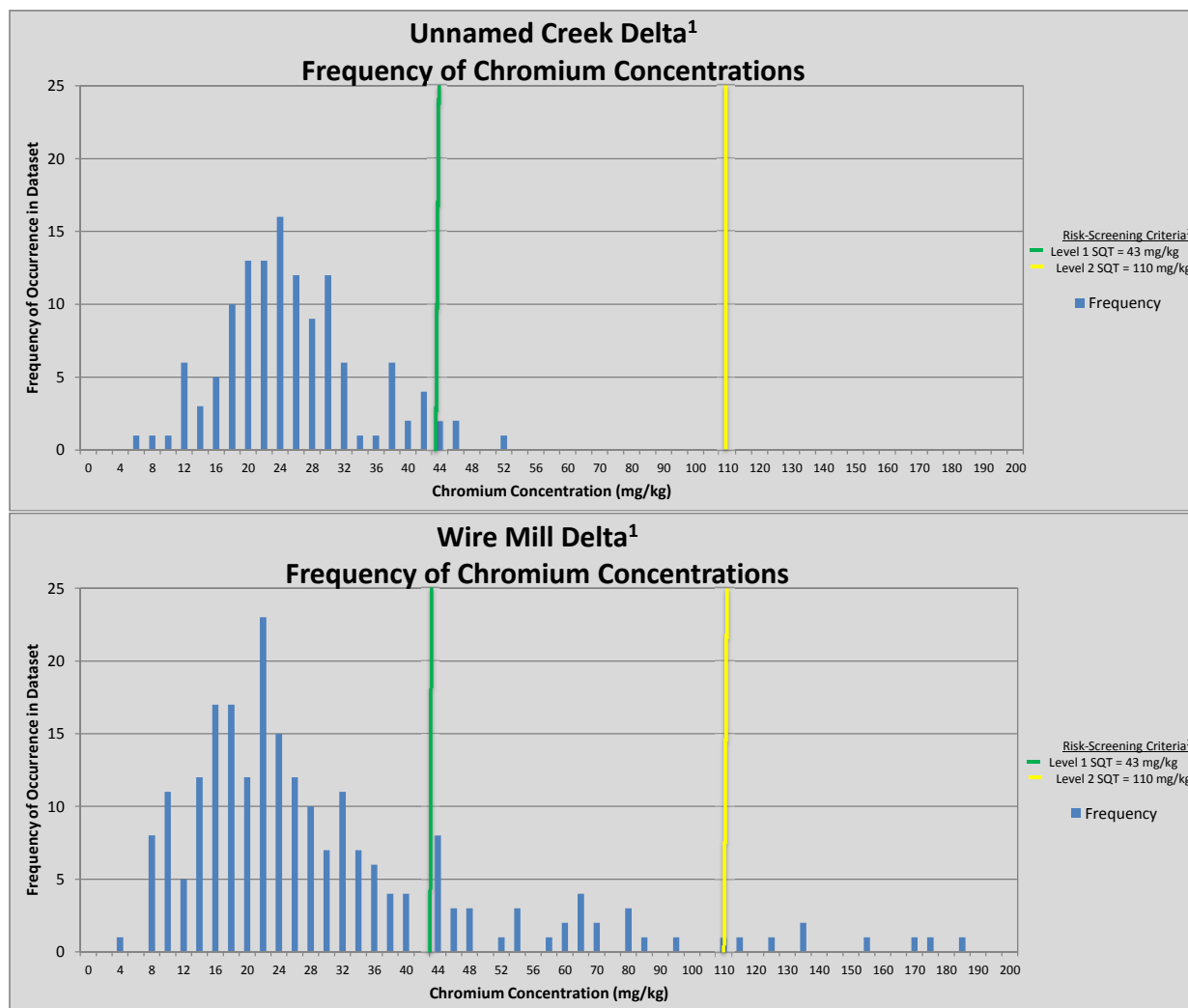


0 800 1,600
Feet

Figure H-19

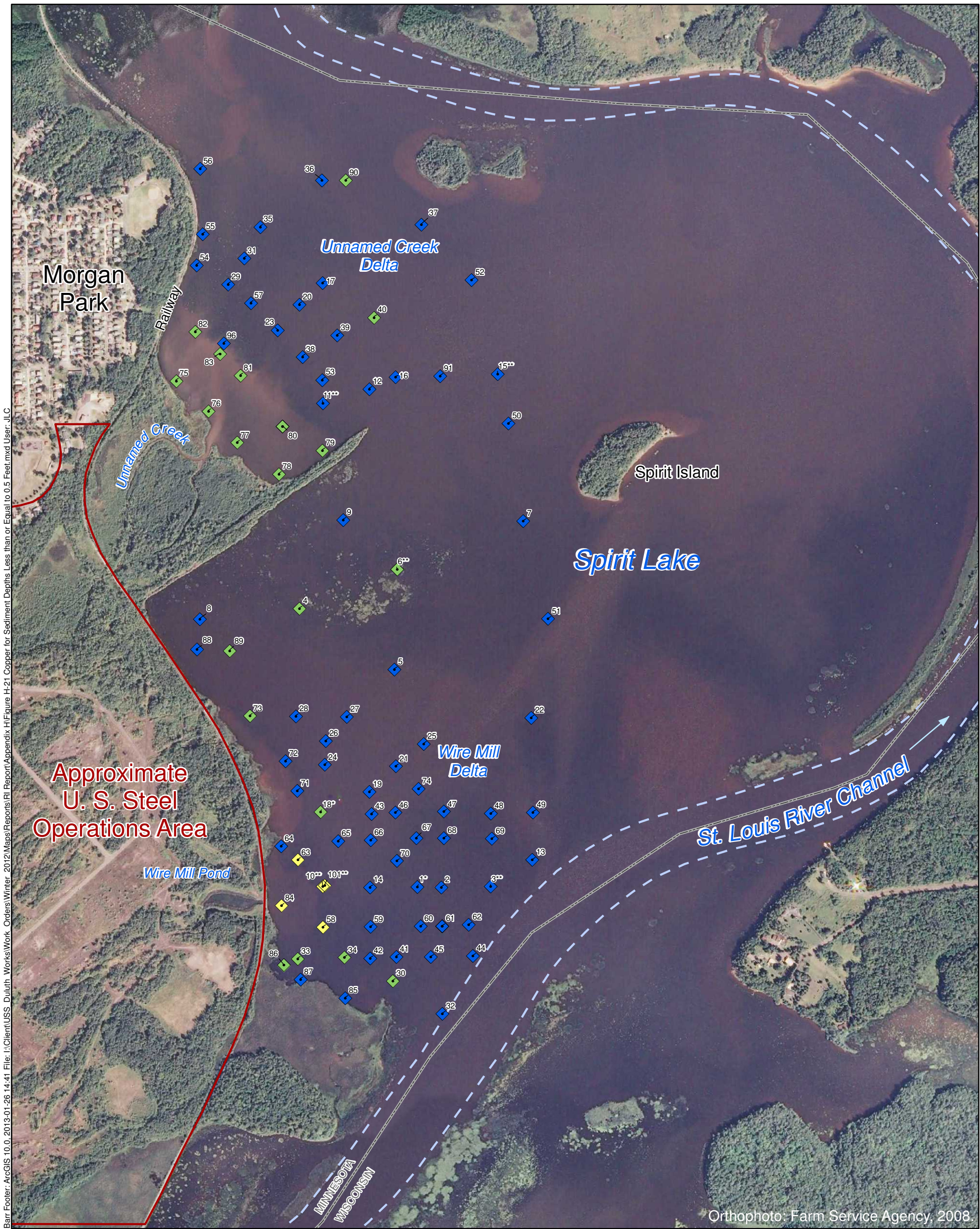
**CHROMIUM
SEDIMENT DEPTHS GREATER
THAN 0.5 FEET**

Spirit Lake Sediment Site -
Former U. S. Steel Duluth Works
Saint Louis River
Duluth, Minnesota



¹U.S. Steel samples collected in 2011 by vibracoring and soil boring methods.
²SQT = Sediment quality target for the protection of sediment-dwelling organisms (MPCA, 2007).

Figure H-20
**FREQUENCY OF CHROMIUM
 CONCENTRATIONS BY DATASET**
 Spirit Lake Sediment Site
 U.S. Steel Former Duluth Works



- Copper less than or equal to 32 mg/kg (Level I SQT)
- Copper greater than 32 mg/kg (Level I SQT) and less than or equal to 150 mg/kg (Level II SQT)
- Copper greater than 150 mg/kg (Level II SQT)
- Approximate Location of St. Louis River Channel, Based on Orthophoto Interpretation
- Approximate U. S. Steel Operations Area (URS, 2008)
- State Boundary

Notes: SQT = Sediment quality target for the protection of sediment-dwelling organisms (MPCA, 2007)
Results shown are the surficial sample for a given location.
Results shown are the maximum value for the given depth range.

* Indicates sample taken at 0'-0.7' depth range.
** Indicates sample taken at 0'-1' depth range.

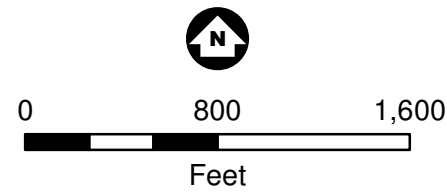
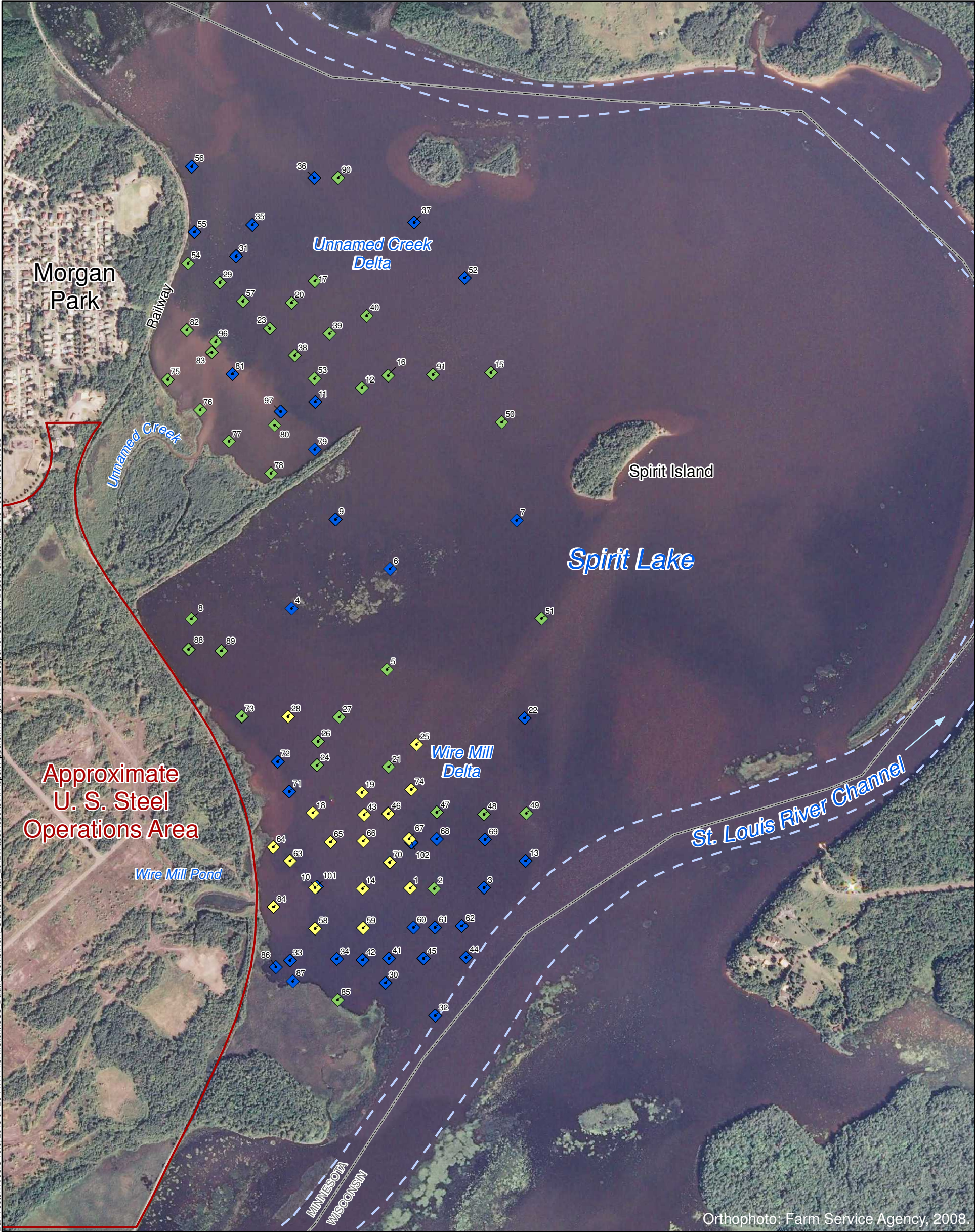


Figure H-21

COPPER
SEDIMENT DEPTHS LESS THAN
OR EQUAL TO 0.5 FEET
Spirit Lake Sediment Site -
Former U. S. Steel Duluth Works
Saint Louis River
Duluth, Minnesota

Barr Footer: ArcGIS 10.0, 2013-01-26 14:44 File: I:\Client\USS Duluth Works\Work Orders\Winter 2012\Maps\Reports\RI Report\Appendix H\Figure H-22 Copper for Sediment Depths Greater than 0.5 Feet.mxd User: JLC



- ◆ Copper less than or equal to 32 mg/kg (Level I SQT)
- ◆ Copper greater than 32 mg/kg (Level I SQT) and less than or equal to 150 mg/kg (Level II SQT)
- ◆ Copper greater than 150 mg/kg (Level II SQT)

— Approximate Location of St. Louis River Channel, Based on Orthophoto Interpretation

□ Approximate U. S. Steel Operations Area (URS, 2008)

□ State Boundary

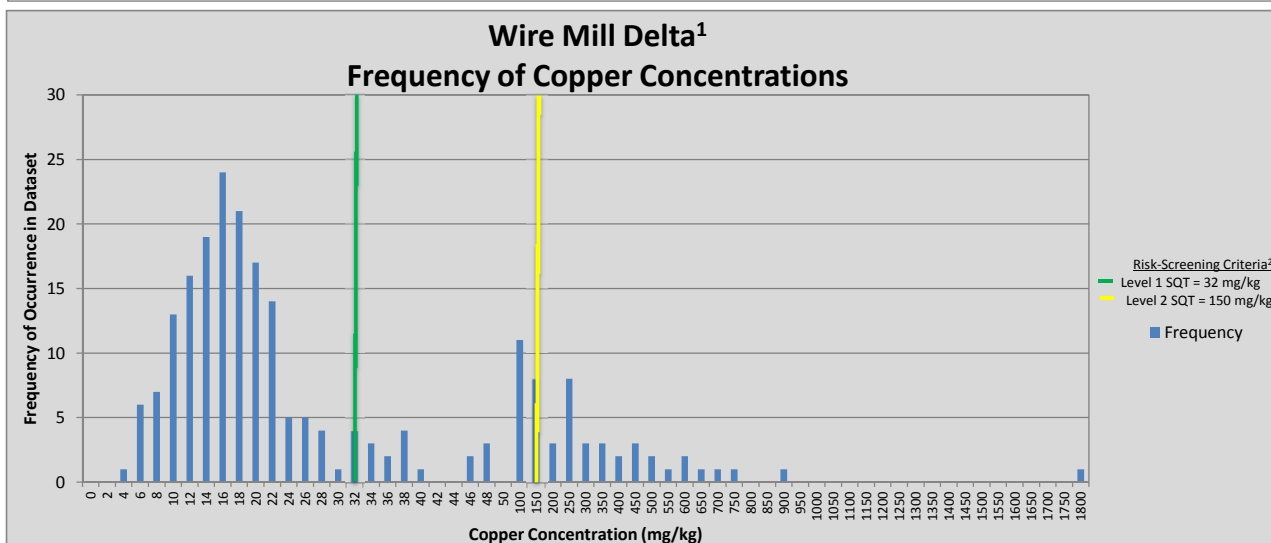
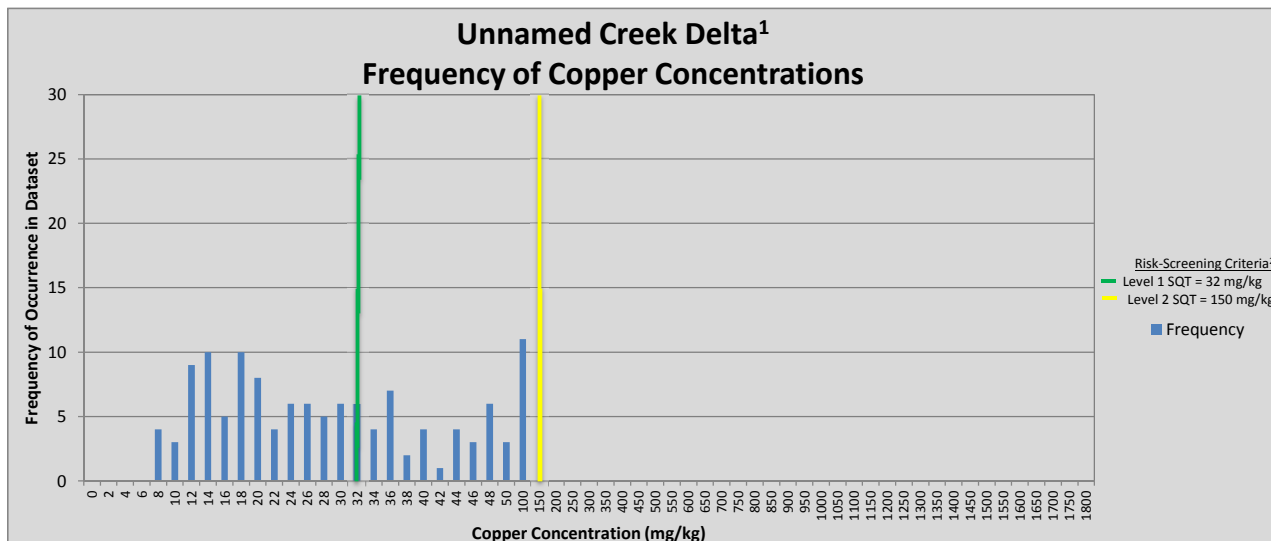
Notes: SQT = Sediment quality target for the protection of sediment-dwelling organisms (MPCA, 2007)
Results shown are the maximum value for the given depth range.



0 800 1,600
Feet

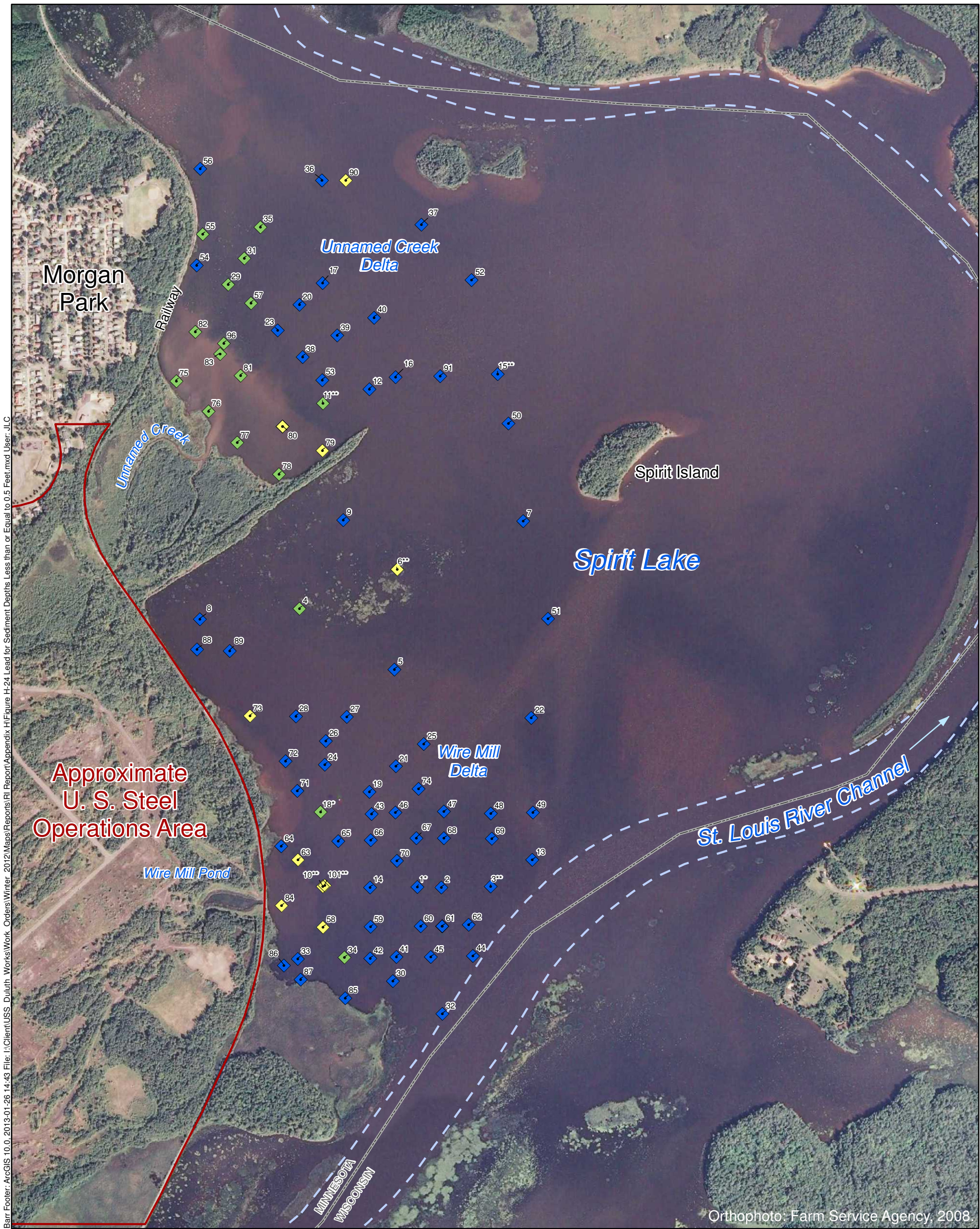
Figure H-22

**COPPER
SEDIMENT DEPTHS GREATER
THAN 0.5 FEET**
Spirit Lake Sediment Site -
Former U. S. Steel Duluth Works
Saint Louis River
Duluth, Minnesota



¹U.S. Steel samples collected in 2011 by vibracoring and soil boring methods.
²SQT = Sediment quality target for the protection of sediment-dwelling organisms (MPCA, 2007).

Figure H-23
**FREQUENCY OF COPPER
 CONCENTRATIONS BY DATASET**
 Spirit Lake Sediment Site



- ◆ Lead less than or equal to 36 mg/kg (Level I SQT)
- ◆ Lead greater than 36 mg/kg (Level I SQT) and less than or equal to 130 mg/kg (Level II SQT)
- ◆ Lead greater than 130 mg/kg (Level II SQT)
- - - Approximate Location of St. Louis River Channel, Based on Orthophoto Interpretation
- Approximate U. S. Steel Operations Area (URS, 2008)
- State Boundary

Notes: SQT = Sediment quality target for the protection of sediment-dwelling organisms (MPCA, 2007)
Results shown are the surficial sample for a given location.
Results shown are the maximum value for the given depth range.

* Indicates sample taken at 0'-0.7' depth range.
** Indicates sample taken at 0'-1' depth range.

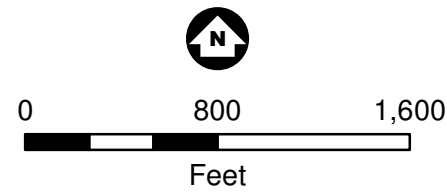
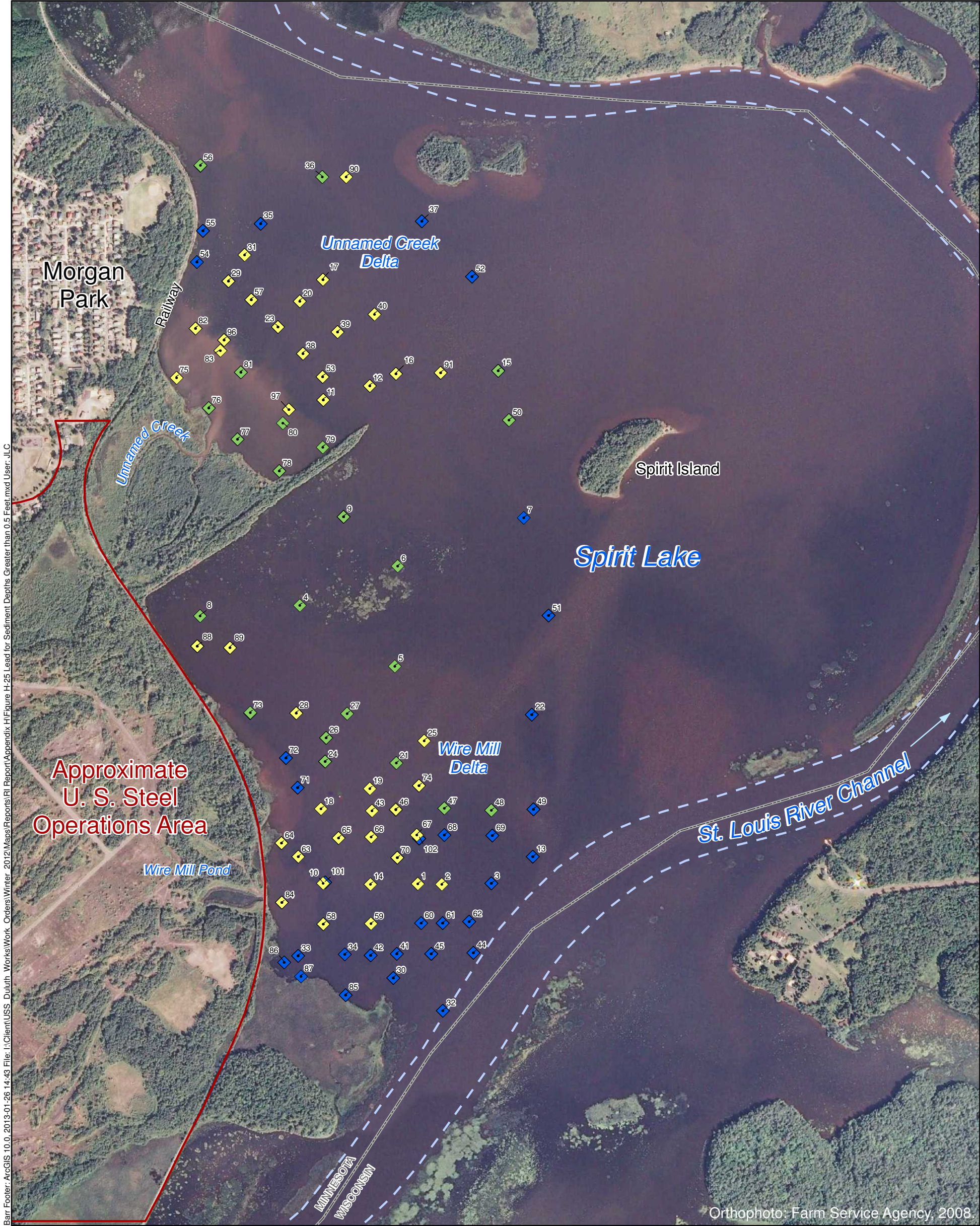


Figure H-24

LEAD
SEDIMENT DEPTHS LESS THAN
OR EQUAL TO 0.5 FEET
Spirit Lake Sediment Site -
Former U. S. Steel Duluth Works
Saint Louis River
Duluth, Minnesota



- ◆ Lead less than or equal to 36 mg/kg (Level I SQT)
- ◆ Lead greater than 36 mg/kg (Level I SQT) and less than or equal to 130 mg/kg (Level II SQT)
- ◆ Lead greater than 130 mg/kg (Level II SQT)
- - - Approximate Location of St. Louis River Channel, Based on Orthophoto Interpretation
- Approximate U. S. Steel Operations Area (URS, 2008)
- State Boundary

Notes: SQT = Sediment quality target for the protection of sediment-dwelling organisms (MPCA, 2007)
Results shown are the maximum value for the given depth range.

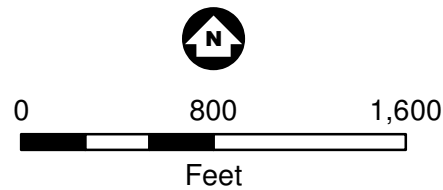
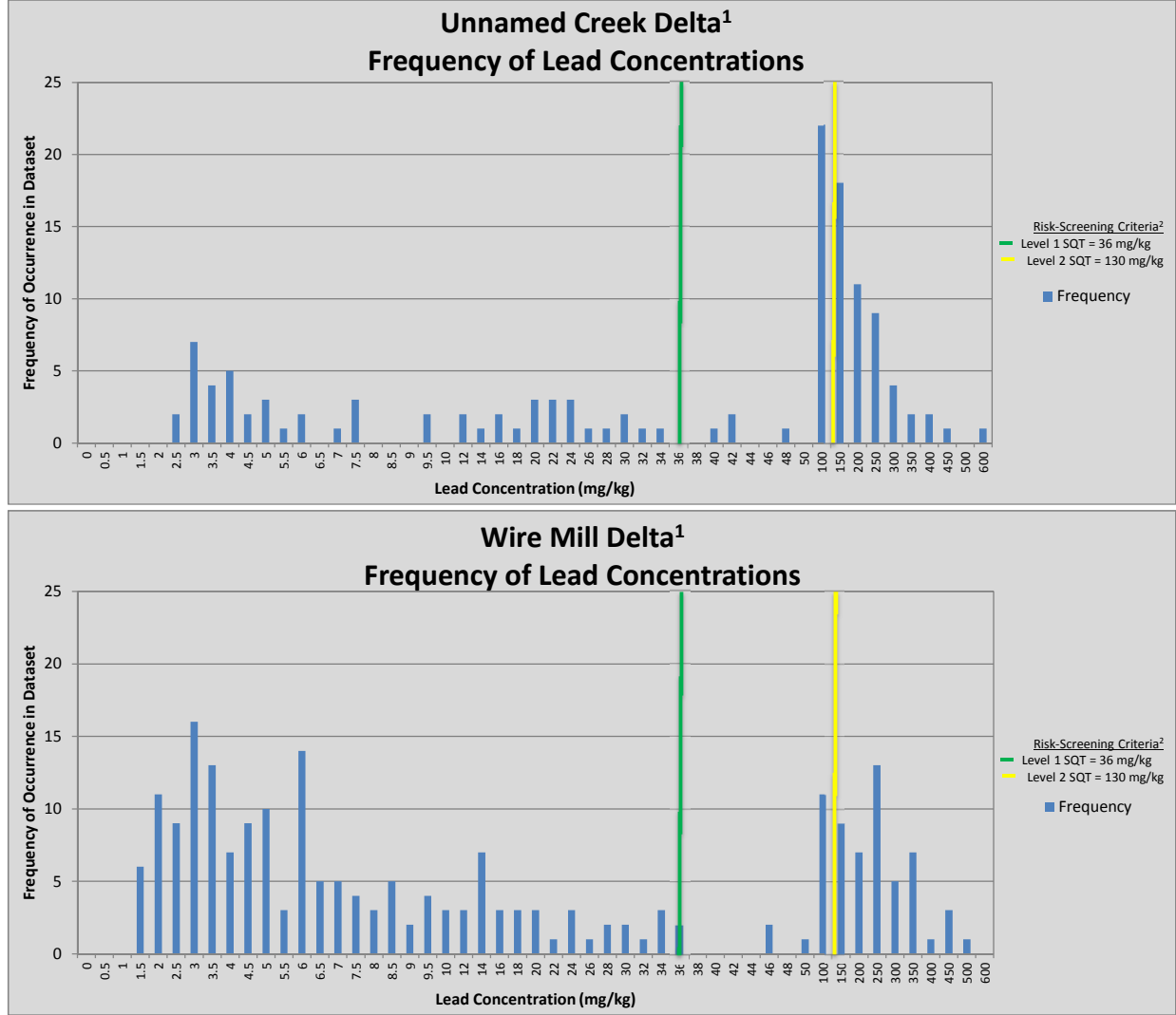


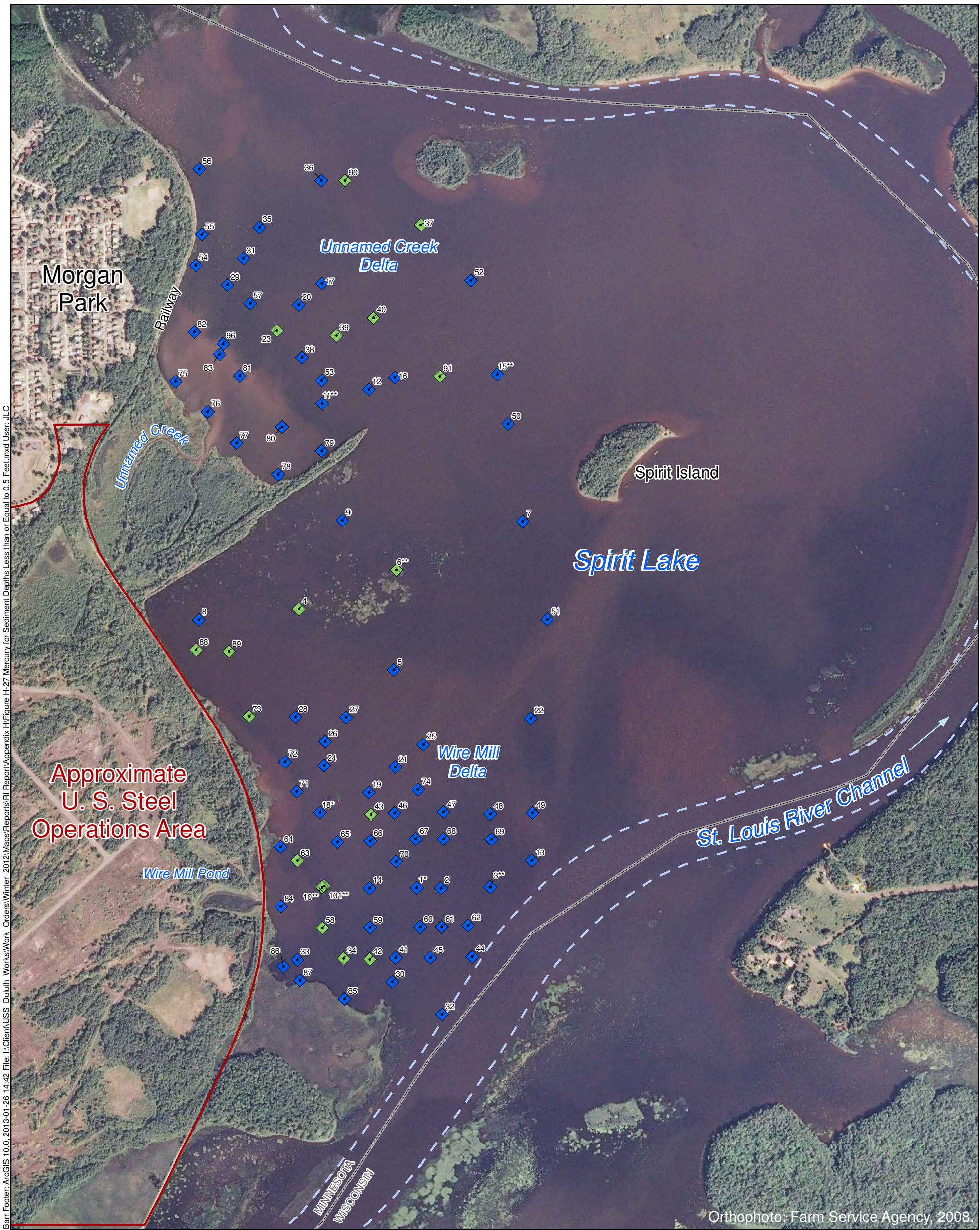
Figure H-25

**LEAD
SEDIMENT DEPTHS GREATER
THAN 0.5 FEET**
Spirit Lake Sediment Site -
Former U. S. Steel Duluth Works
Saint Louis River
Duluth, Minnesota



¹U.S. Steel samples collected in 2011 by vibracoring and soil boring methods.
²SQT = Sediment quality target for the protection of sediment-dwelling organisms (MPCA, 2007).

Figure H-26
**FREQUENCY OF LEAD
 CONCENTRATIONS BY DATASET**
 Spirit Lake Sediment Site



- ◆ Mercury less than or equal to 0.18 mg/kg (Level I SQT)
- ◆ Mercury greater than 0.18 mg/kg (Level I SQT) and less than or equal to 1.10 mg/kg (Level II SQT)
- ◆ Mercury greater than 1.10 mg/kg (Level II SQT)
- - - Approximate Location of St. Louis River Channel, Based on Orthophoto Interpretation
- Approximate U. S. Steel Operations Area (URS, 2008)
- State Boundary

Notes: SQT = Sediment quality target for the protection of sediment-dwelling organisms (MPCA, 2007)
Results shown are the surficial sample for a given location.
Results shown are the maximum value for the given depth range.

* Indicates sample taken at 0'-0.7' depth range.
** Indicates sample taken at 0'-1' depth range.

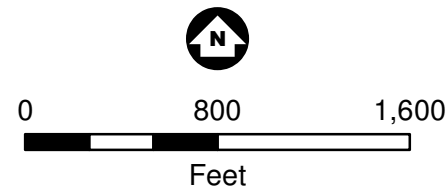
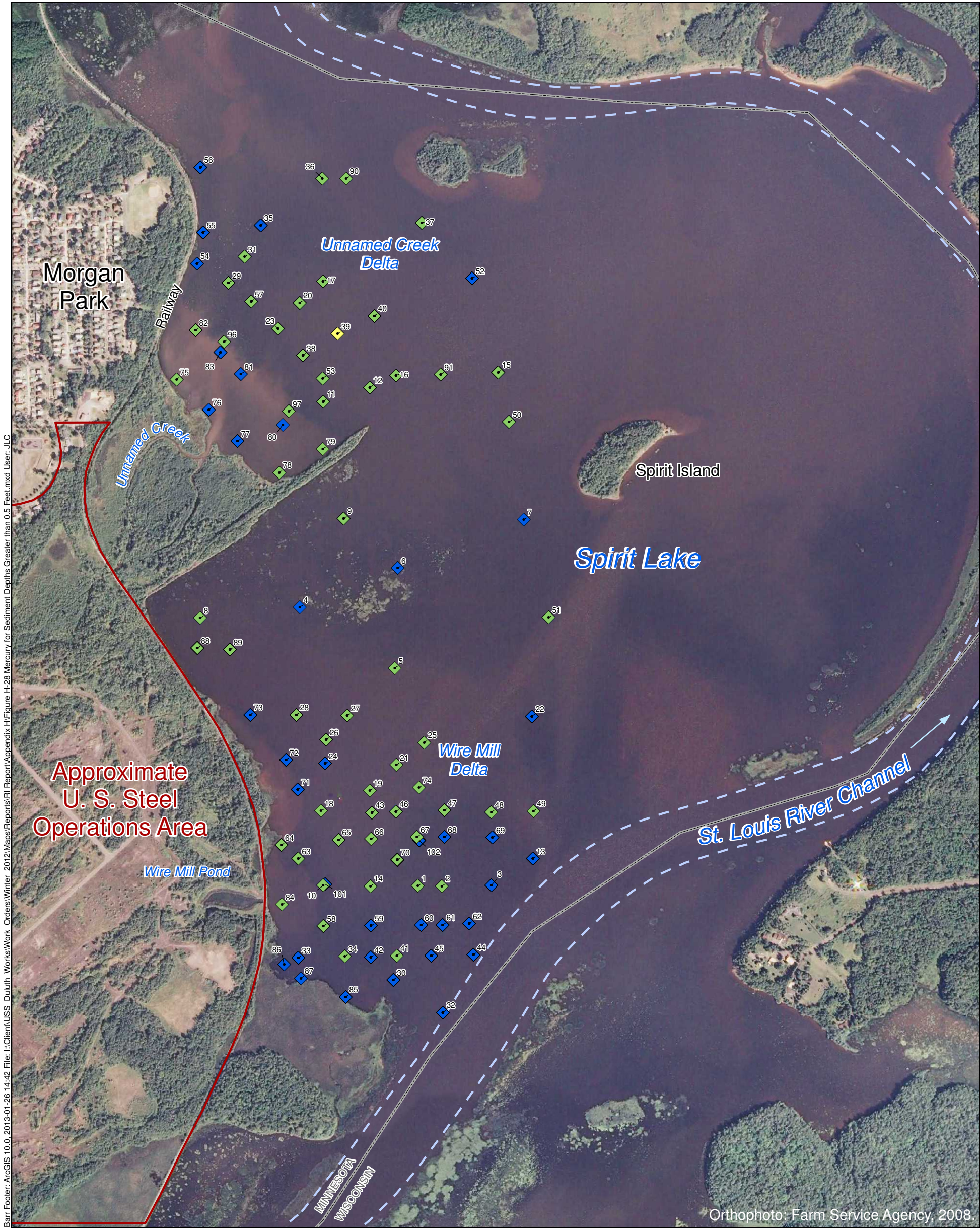


Figure H-27

**MERCURY
SEDIMENT DEPTHS LESS THAN
OR EQUAL TO 0.5 FEET**
Spirit Lake Sediment Site -
Former U. S. Steel Duluth Works
Saint Louis River
Duluth, Minnesota



- ◆ Mercury less than or equal to 0.18 mg/kg (Level I SQT)
- ◆ Mercury greater than 0.18 mg/kg (Level I SQT) and less than or equal to 1.10 mg/kg (Level II SQT)
- ◆ Mercury greater than 1.10 mg/kg (Level II SQT)
- - - Approximate Location of St. Louis River Channel, Based on Orthophoto Interpretation
- Approximate U. S. Steel Operations Area (URS, 2008)
- State Boundary

Notes: SQT = Sediment quality target for the protection of sediment-dwelling organisms (MPCA, 2007)
Results shown are the maximum value for the given depth range.

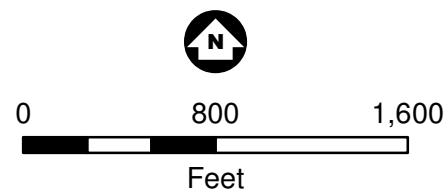
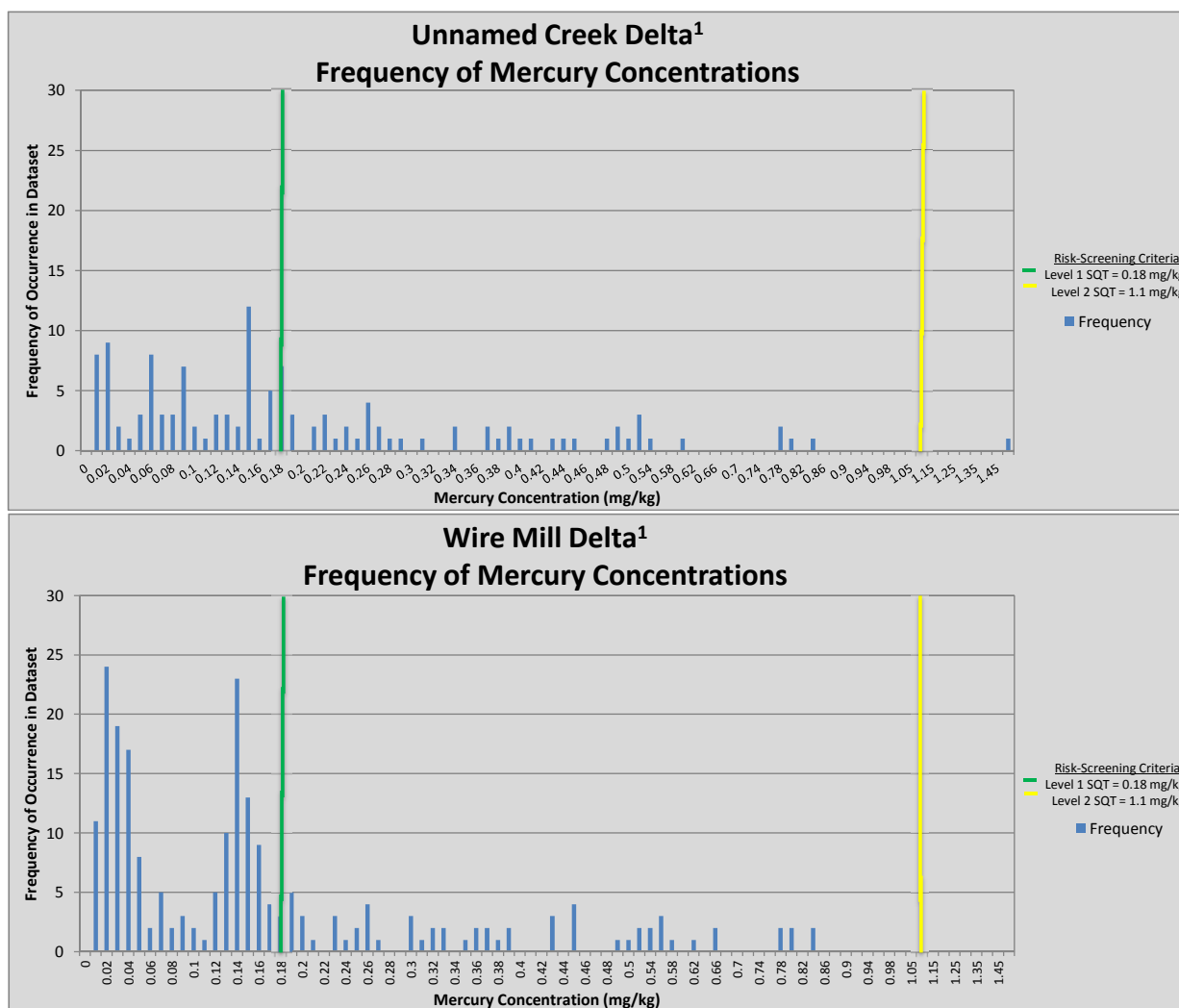


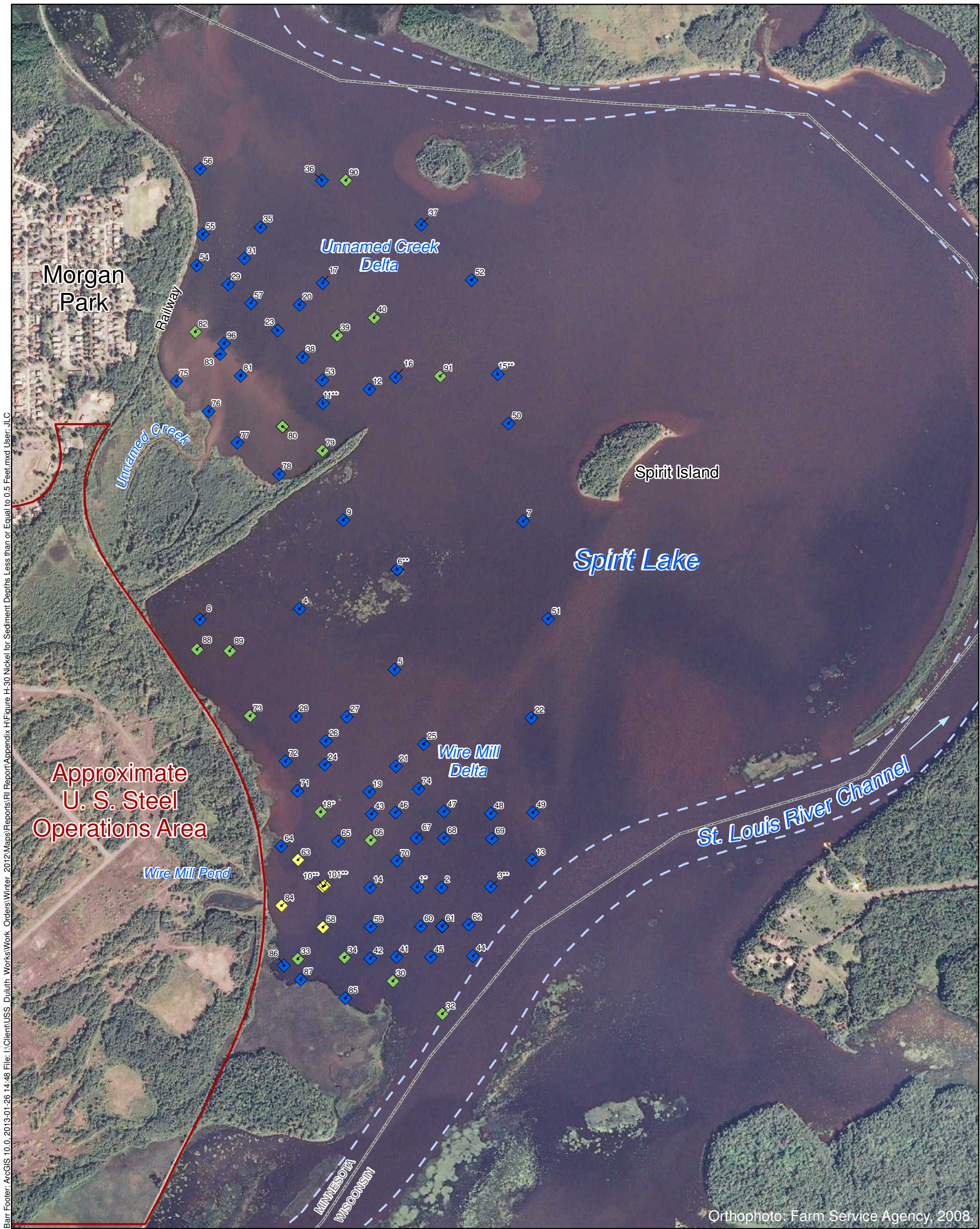
Figure H-28

**MERCURY
SEDIMENT DEPTHS GREATER
THAN 0.5 FEET**
Spirit Lake Sediment Site -
Former U. S. Steel Duluth Works
Saint Louis River
Duluth, Minnesota



¹U.S. Steel samples collected in 2011 by vibracoring and soil boring methods.
²SQT = Sediment quality target for the protection of sediment-dwelling organisms (MPCA, 2007).

Figure H-29
**FREQUENCY OF MERCURY
 CONCENTRATIONS BY DATASET**
 Spirit Lake Sediment Site



- ◆ Nickel less than or equal to 23 mg/kg (Level I SQT)
- ◆ Nickel greater than 23 mg/kg (Level I SQT) and less than or equal to 49 mg/kg (Level II SQT)
- ◆ Nickel greater than 49 mg/kg (Level II SQT)

— Approximate Location of St. Louis River Channel, Based on Orthophoto Interpretation

□ Approximate U. S. Steel Operations Area (URS, 2008)

□ State Boundary

Notes: SQT = Sediment quality target for the protection of sediment-dwelling organisms (MPCA, 2007)
Results shown are the surficial sample for a given location.
Results shown are the maximum value for the given depth range.

* Indicates sample taken at 0'-0.7' depth range.

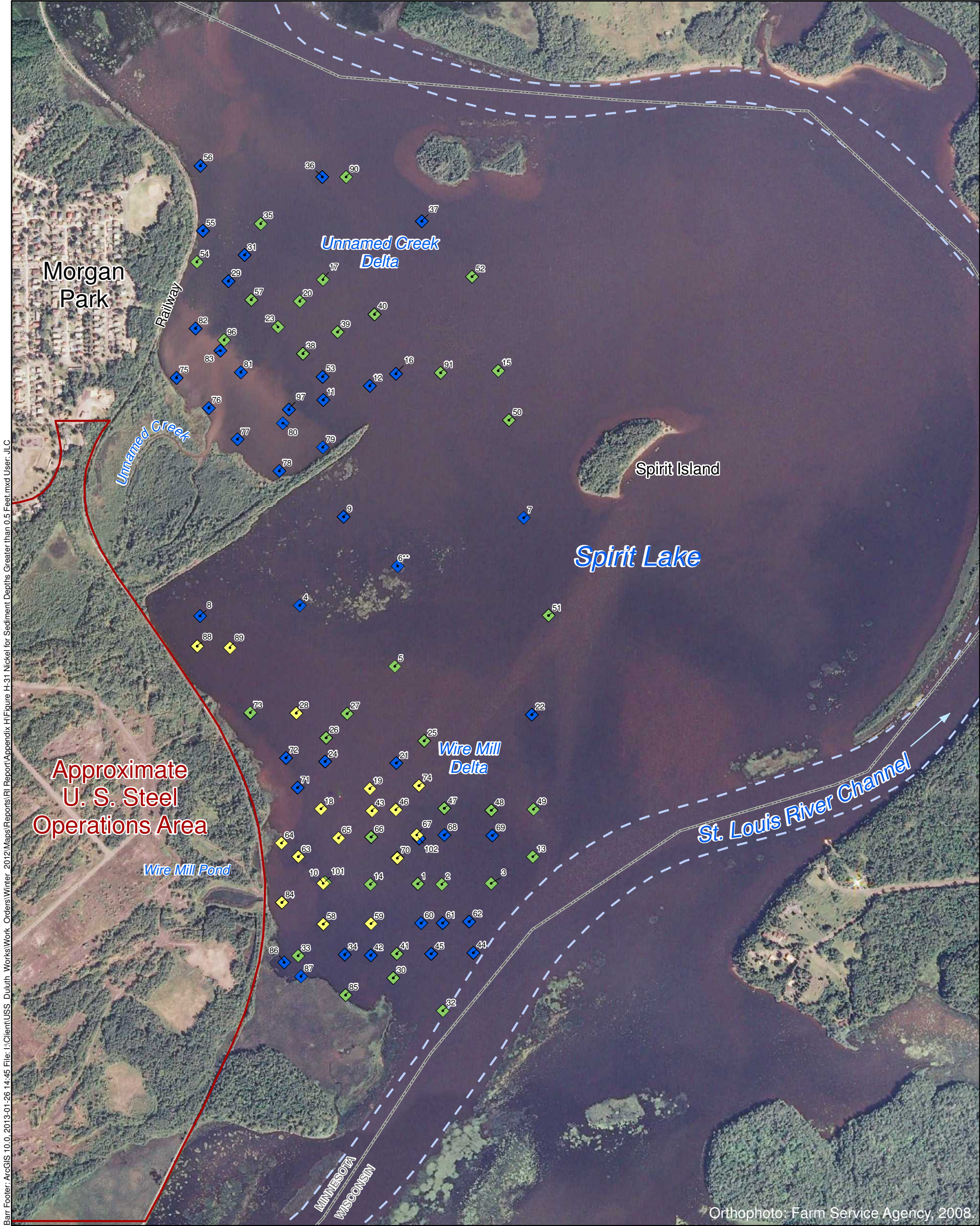
** Indicates sample taken at 0'-1' depth range.









0 800 1,600
Feet

Figure H-30

NICKEL
SEDIMENT DEPTHS LESS THAN
OR EQUAL TO 0.5 FEET
Spirit Lake Sediment Site -
Former U. S. Steel Duluth Works
Saint Louis River
Duluth, Minnesota



-  Nickel less than or equal to 23 mg/kg (Level I SQT)
-  Nickel greater than 23 mg/kg (Level I SQT) and less than or equal to 49 mg/kg (Level II SQT)
-  Nickel greater than 49 mg/kg (Level II SQT)
-  Approximate Location of St. Louis River Channel, Based on Orthophoto Interpretation
-  Approximate U. S. Steel Operations Area (URS, 2008)
-  State Boundary

Notes: SQT = Sediment quality target for the protection of sediment-dwelling organisms (MPCA, 2007)
Results shown are the maximum value for the given depth range.

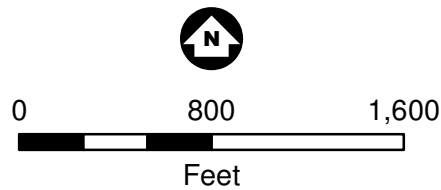
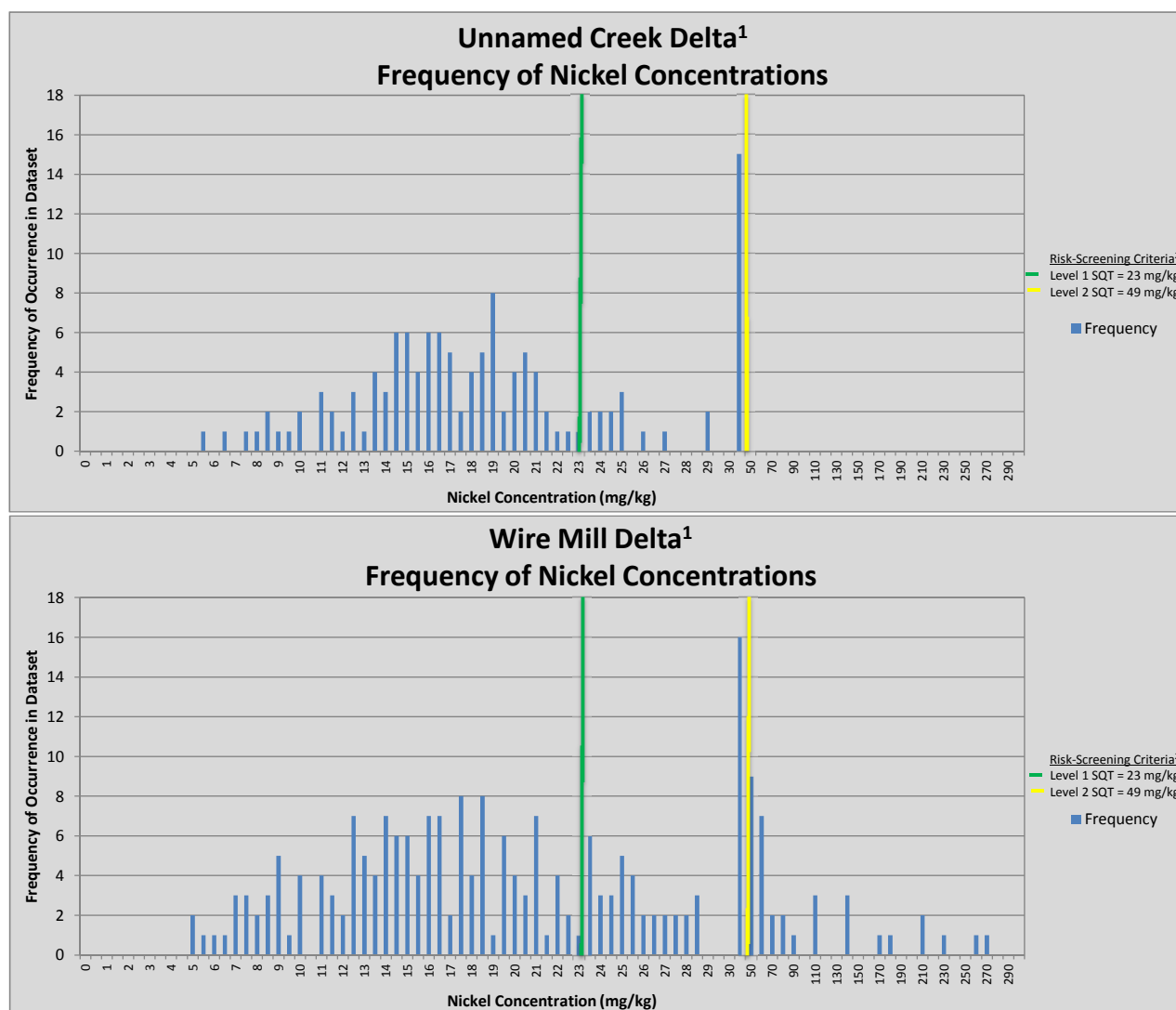


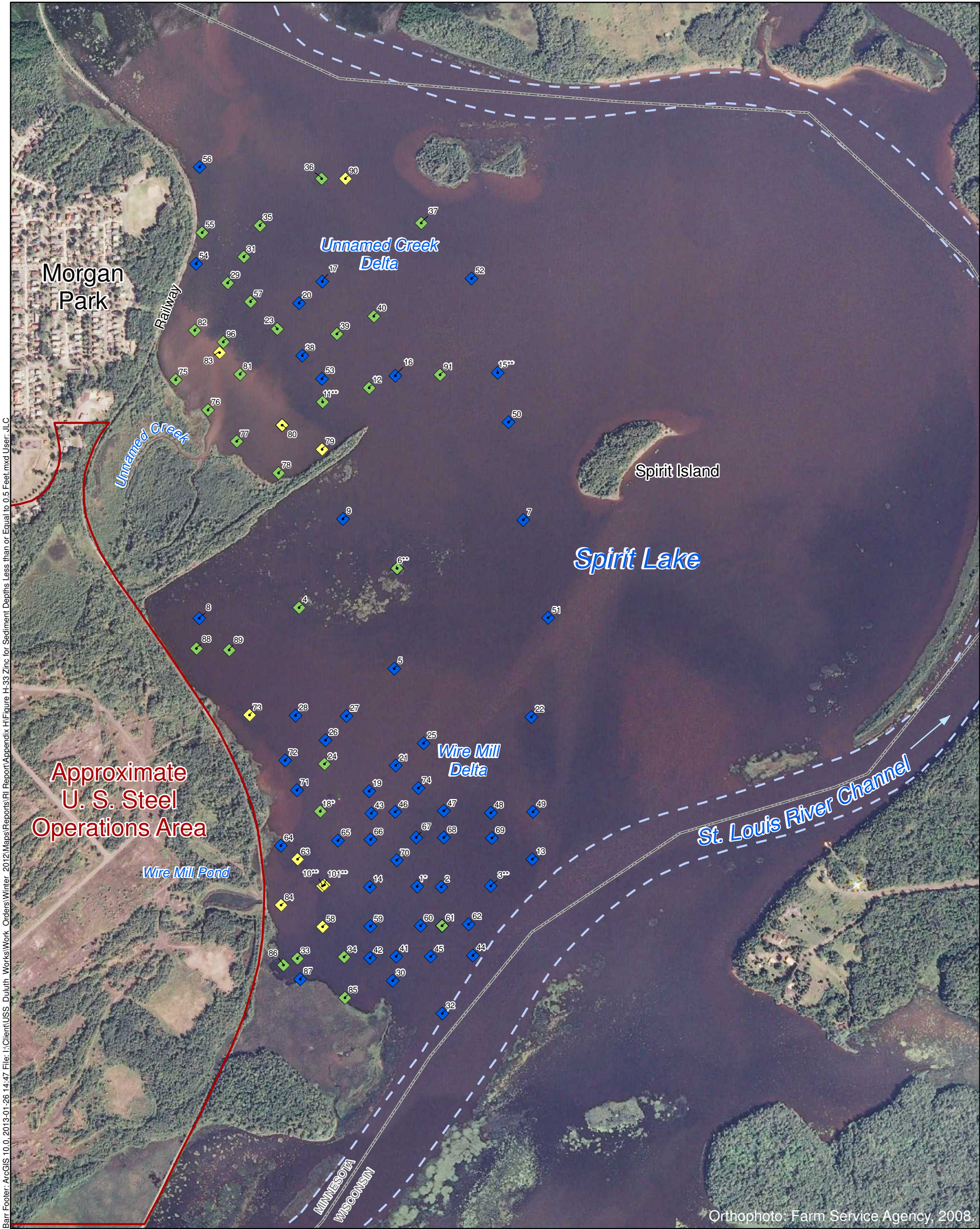
Figure H-31

**NICKEL
SEDIMENT DEPTHS GREATER
THAN 0.5 FEET**
Spirit Lake Sediment Site -
Former U. S. Steel Duluth Works
Saint Louis River
Duluth, Minnesota



¹U.S. Steel samples collected in 2011 by vibracoring and soil boring methods.
²SQT = Sediment quality target for the protection of sediment-dwelling organisms (MPCA, 2007).

Figure H-32
**FREQUENCY OF NICKEL
 CONCENTRATIONS BY DATASET**
 Spirit Lake Sediment Site



- Zinc less than or equal to 120 mg/kg (Level I SQT)
- Zinc greater than 120 mg/kg (Level I SQT) and less than or equal to 460 mg/kg (Level II SQT)
- Zinc greater than 460 mg/kg (Level II SQT)
- Approximate Location of St. Louis River Channel, Based on Orthophoto Interpretation
- Approximate U. S. Steel Operations Area (URS, 2008)
- State Boundary

Notes: SQT = Sediment quality target for the protection of sediment-dwelling organisms (MPCA, 2007)
Results shown are the surficial sample for a given location.
Results shown are the maximum value for the given depth range.

* Indicates sample taken at 0'-0.7' depth range.
** Indicates sample taken at 0'-1' depth range.

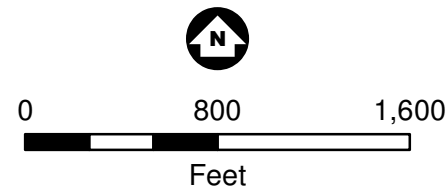
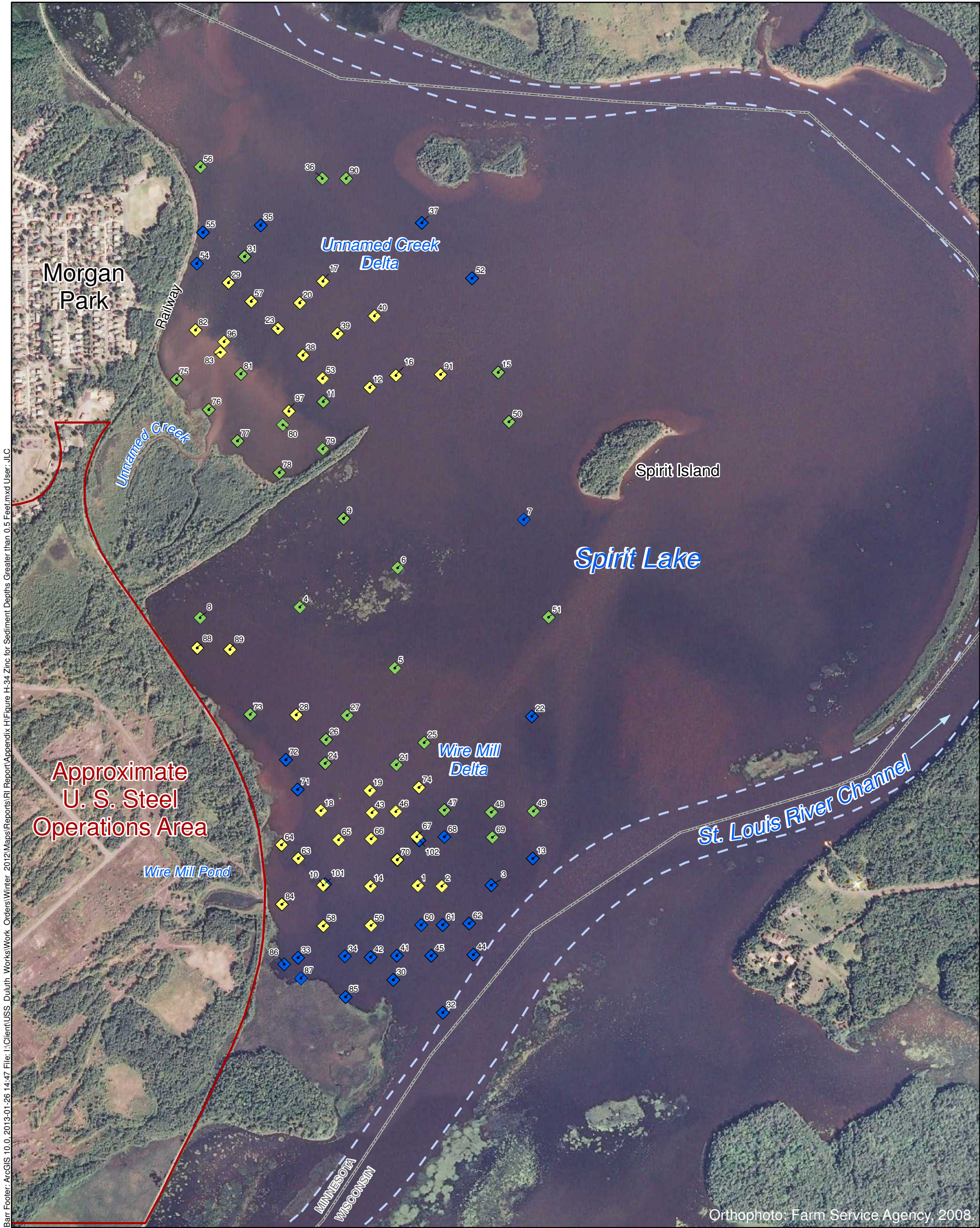


Figure H-33

ZINC
SEDIMENT DEPTHS LESS THAN
OR EQUAL TO 0.5 FEET
Spirit Lake Sediment Site -
Former U. S. Steel Duluth Works
Saint Louis River
Duluth, Minnesota



- ◆ Zinc less than or equal to 120 mg/kg (Level I SQT)
- ◆ Zinc greater than 120 mg/kg (Level I SQT) and less than or equal to 460 mg/kg (Level II SQT)
- ◆ Zinc greater than 460 mg/kg (Level II SQT)

— Approximate Location of St. Louis River Channel, Based on Orthophoto Interpretation

□ Approximate U. S. Steel Operations Area (URS, 2008)

□ State Boundary

Notes: SQT = Sediment quality target for the protection of sediment-dwelling organisms (MPCA, 2007)
Results shown are the maximum value for the given depth range.

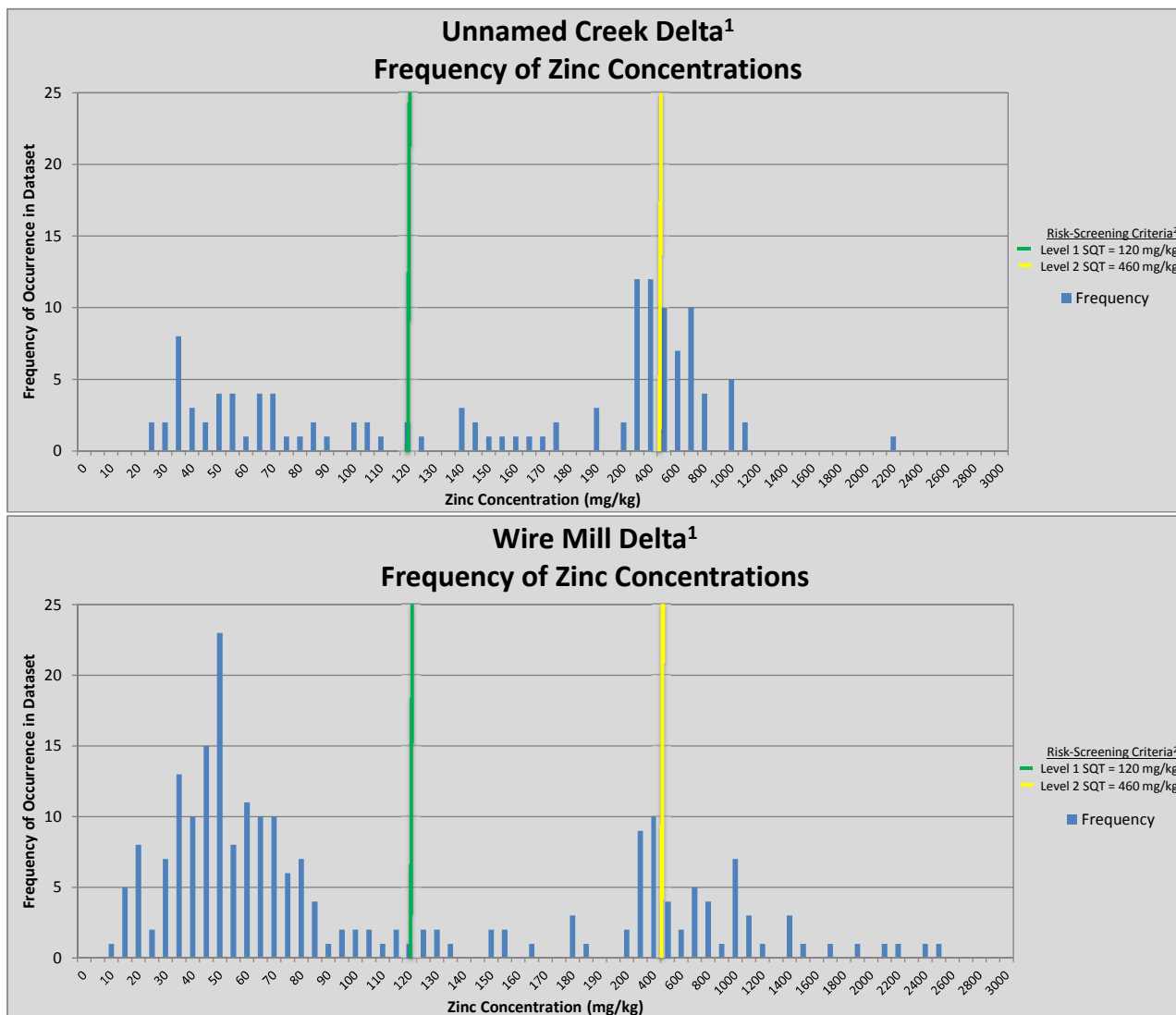


0 800 1,600
Feet

Figure H-34

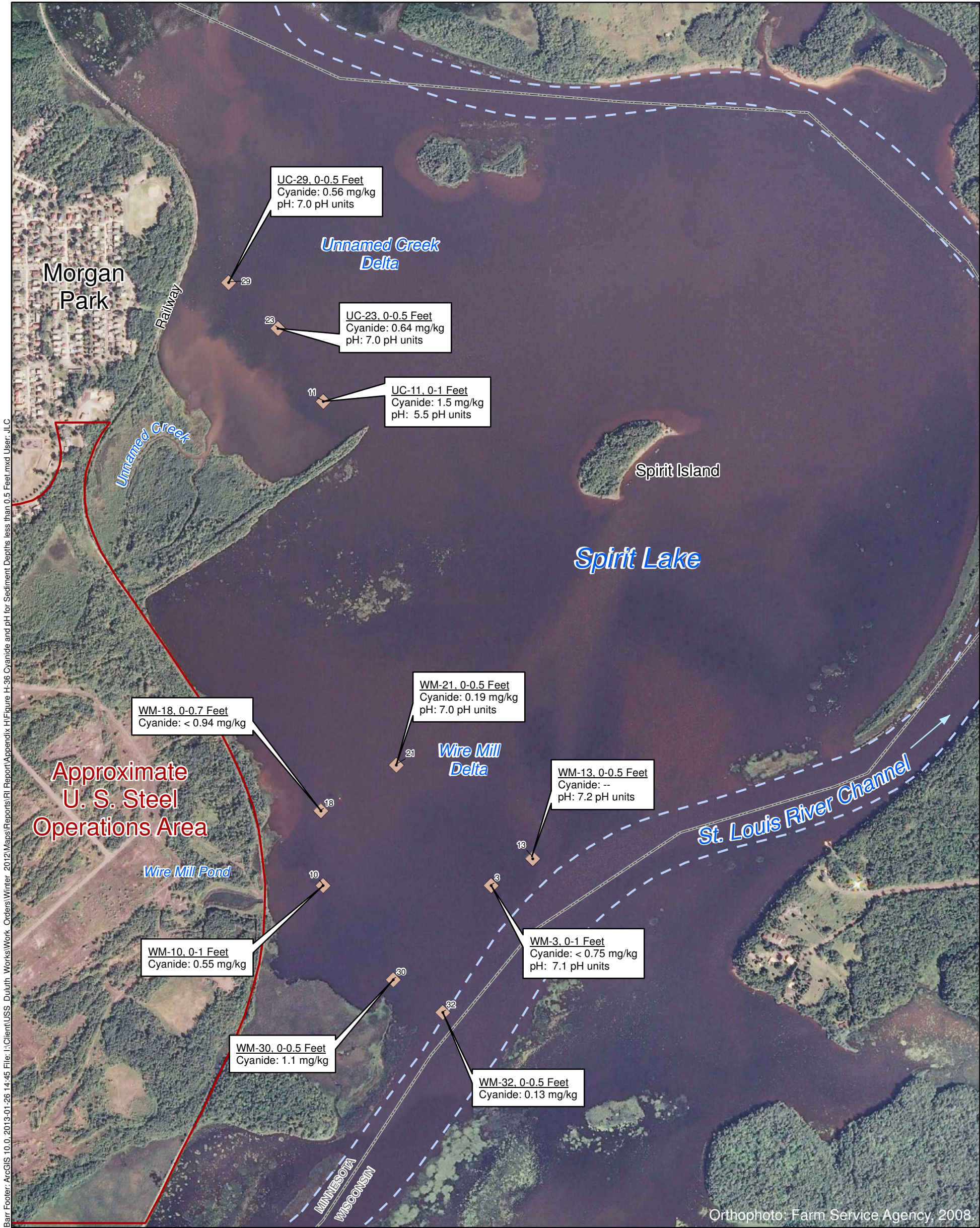
**ZINC
SEDIMENT DEPTHS GREATER
THAN 0.5 FEET**

Spirit Lake Sediment Site -
Former U. S. Steel Duluth Works
Saint Louis River
Duluth, Minnesota



¹U.S. Steel samples collected in 2011 by vibracoring and soil boring methods.
²SQT = Sediment quality target for the protection of sediment-dwelling organisms (MPCA, 2007).

Figure H-35
**FREQUENCY OF ZINC
 CONCENTRATIONS BY DATASET**
 Spirit Lake Sediment Site



- Cyanide and pH Sample Locations - Sediment Depths Less than or Equal to 0.5 Feet
- Approximate Location of St. Louis River Channel, Based on Orthophoto Interpretation
- Approximate U. S. Steel Operations Area (URS, 2008)
- State Boundary

Note: Results shown are the surficial sample for a given location.

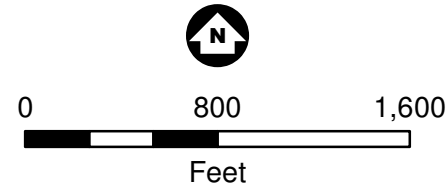
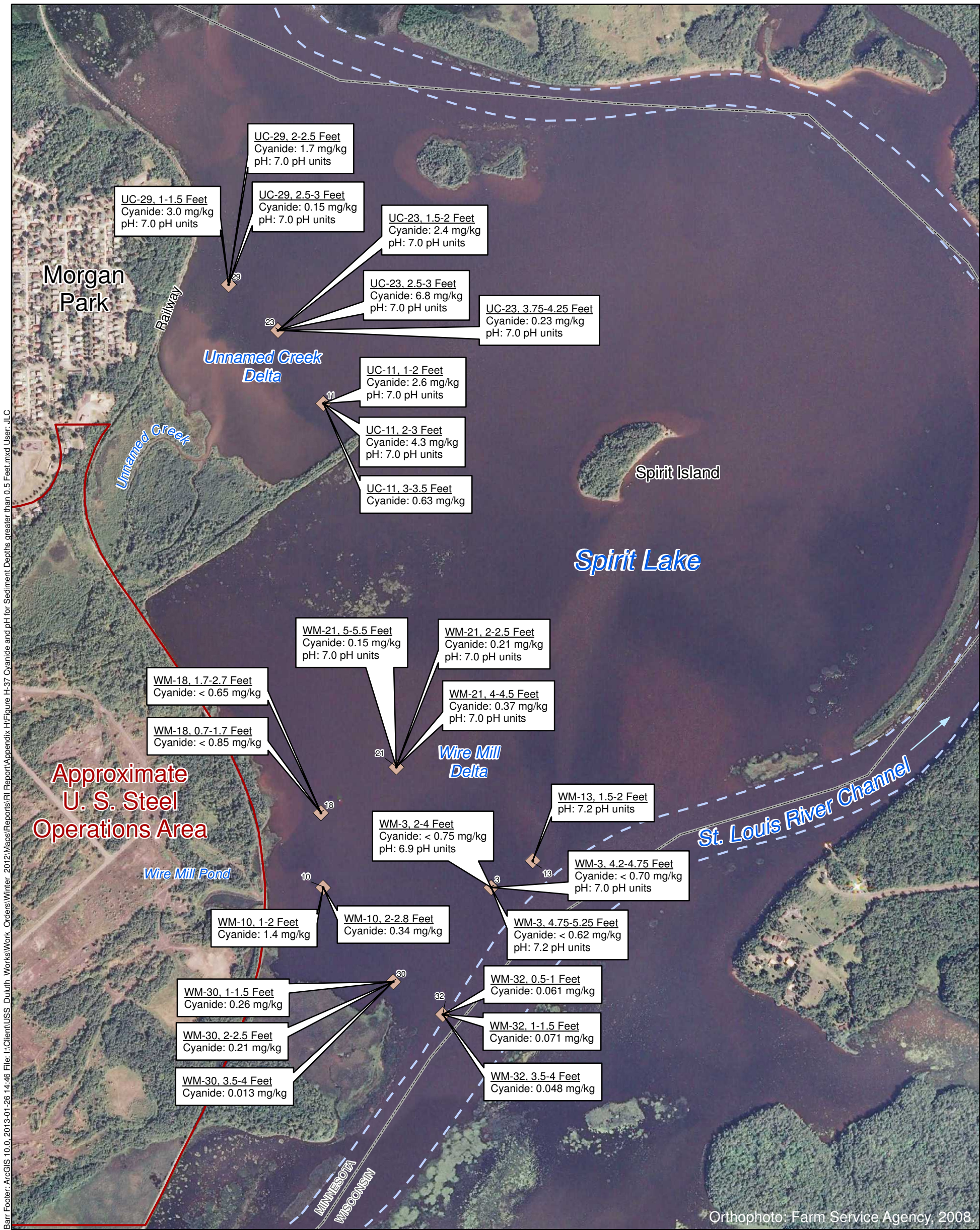






Figure H-36

**CYANIDE AND PH
SEDIMENT DEPTHS LESS THAN
OR EQUAL TO 0.5 FEET**
Spirit Lake Sediment Site -
Former U. S. Steel Duluth Works
Saint Louis River
Duluth, Minnesota



-  Cyanide and pH Sample Locations - Sediment Depths Greater than 0.5 Feet
-  Approximate Location of St. Louis River Channel, Based on Orthophoto Interpretation
-  Approximate U. S. Steel Operations Area (URS, 2008)
-  State Boundary

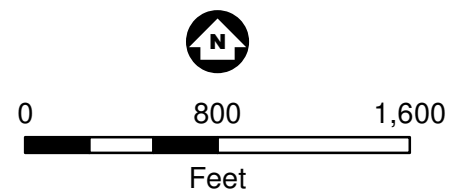


Figure H-37

**CYANIDE AND PH
SEDIMENT DEPTHS
GREATER THAN 0.5 FEET**
Spirit Lake Sediment Site -
Former U. S. Steel Duluth Works
Saint Louis River
Duluth, Minnesota



Barr Footer: ArcGIS 10.0, 2013-01-26 14:48 File: I:\Client\USS Duluth Works\Work Orders\Winter 2012\Maps\Reports\RI Report\Appendix H\Figure H-38 PCBs for Sediment Depths Less than or Equal to 0.5 Feet.mxd User: JLC

- ◆ Total PCBs less than or equal to 0.06 mg/kg (Level I SQT)
- ◆ Total PCBs greater than 0.06 mg/kg (Level I SQT) and less than or equal to 0.68 mg/kg (Level II SQT)
- ◆ Total PCBs greater than 0.68 mg/kg (Level II SQT)
- Approximate Location of St. Louis River Channel, Based on Orthophoto Interpretation
- Approximate U. S. Steel Operations Area (URS, 2008)
- State Boundary

Notes: SQT = Sediment quality target for the protection of sediment-dwelling organisms (MPCA, 2007)
Results shown are the surficial sample for a given location.
Results shown are the maximum value for the given depth range.
* Indicates sample taken at 0'-0.7' depth range.
** Indicates sample taken at 0'-1' depth range.

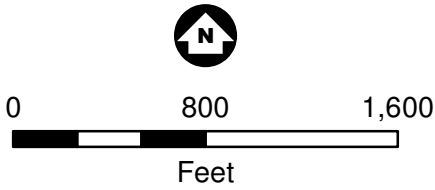
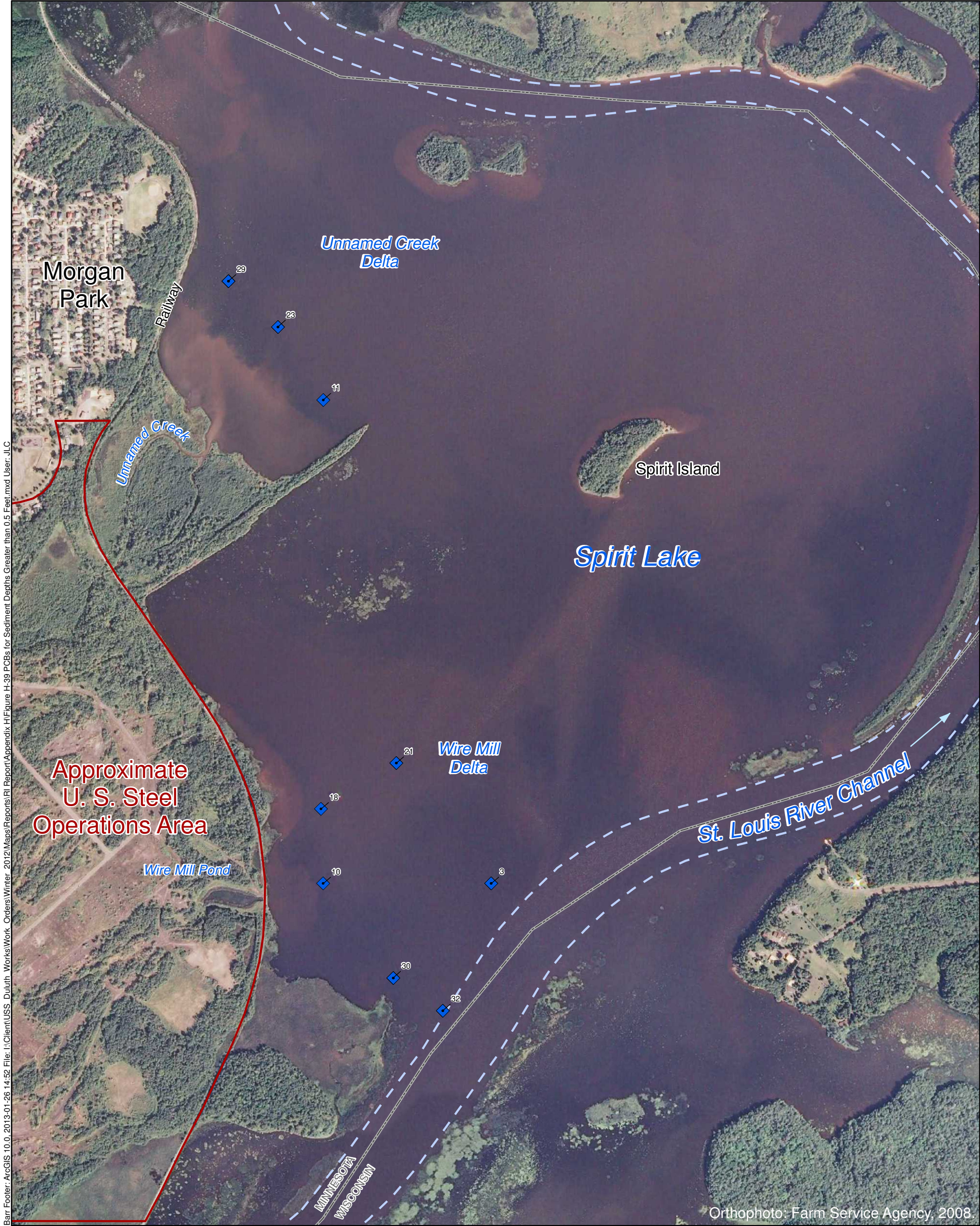


Figure H-38

**TOTAL PCBs
SEDIMENT DEPTHS LESS THAN
OR EQUAL TO 0.5 FEET**
Spirit Lake Sediment Site -
Former U. S. Steel Duluth Works
Saint Louis River
Duluth, Minnesota



- ◆ Total PCBs less than or equal to 0.06 mg/kg (Level I SQT)
- ◆ Total PCBs greater than 0.06 mg/kg (Level I SQT) and less than or equal to 0.68 mg/kg (Level II SQT)
- ◆ Total PCBs greater than 0.68 mg/kg (Level II SQT)
- - - Approximate Location of St. Louis River Channel, Based on Orthophoto Interpretation
- Approximate U. S. Steel Operations Area (URS, 2008)
- State Boundary

Notes: SQT = Sediment quality target for the protection of sediment-dwelling organisms (MPCA, 2007)
Results shown are the maximum value for the given depth range.

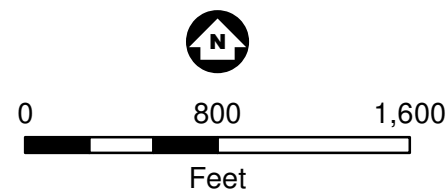


Figure H-39

**TOTAL PCBs
SEDIMENT DEPTHS GREATER
THAN 0.5 FEET**
Spirit Lake Sediment Site -
Former U. S. Steel Duluth Works
Saint Louis River
Duluth, Minnesota



Barr Footer: ArcGIS 10.0, 2013-01-26 14:48 File: I:\Client\USS Duluth Works\Work Orders\Winter 2012\Maps\Reports\RI Report\Appendix H\Figure H-40 TCDD for Sediment Depths Less than or Equal to 0.5 Feet.mxd User: JLC

- ◆ TCDD Equivalent less than or equal to 0.85 ng/kg (Level I SQT)
- ◆ TCDD Equivalent greater than 0.85 ng/kg (Level I SQT) and less than or equal to 21.5 ng/kg (Level II SQT)
- ◆ TCDD greater than 21.5 ng/kg (Level II SQT)
- Approximate Location of St. Louis River Channel, Based on Orthophoto Interpretation
- Approximate U. S. Steel Operations Area (URS, 2008)
- State Boundary

Notes: SQT = Sediment quality target for the protection of sediment-dwelling organisms (MPCA, 2007)
Results shown are the surficial sample for a given location.
Individual sample TCDD TEQs within a single location could be comprised of either non-detects set to 0 or ½, based on the overall frequency of detection(s) of the chemical results. The TCDD TEQs shown were calculated using the World Health Organization 1998 Fish Toxicity Equivalency Factors (TEFs), as referenced in the MPCA Sediment Quality Target guidance (MPCA, 2007).

* Indicates sample taken at 0'-0.7' depth range.
** Indicates sample taken at 0'-1' depth range.

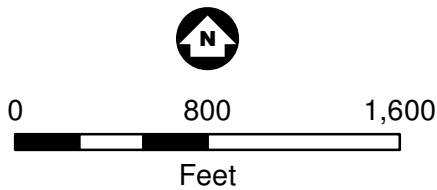
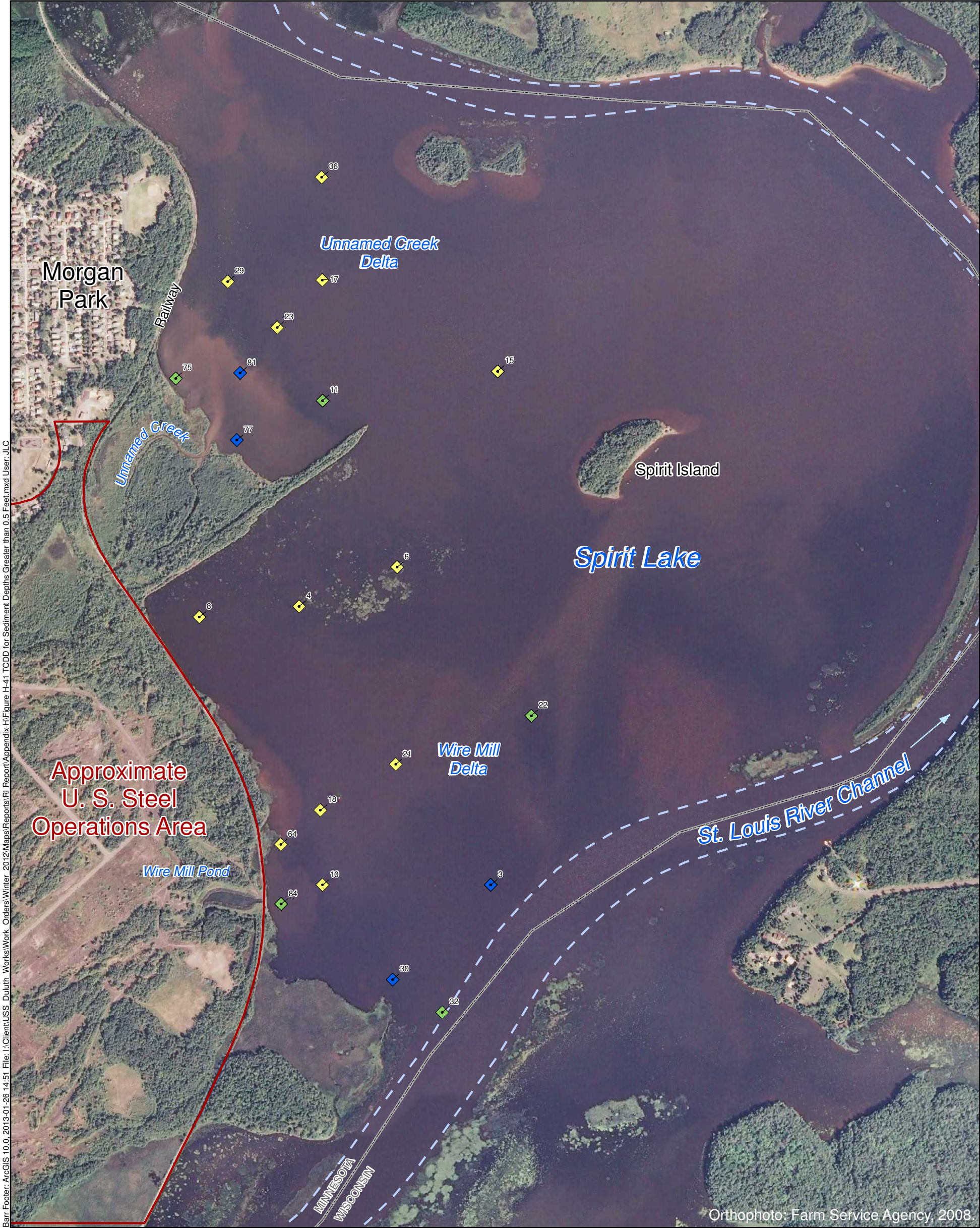


Figure H-40

**TCDD EQUIVALENT
SEDIMENT DEPTHS LESS THAN
OR EQUAL TO 0.5 FEET**
Spirit Lake Sediment Site -
Former U. S. Steel Duluth Works
Saint Louis River
Duluth, Minnesota



- TCDD Equivalent less than or equal to 0.85 ng/kg (Level I SQT)
- TCDD Equivalent greater than 0.85 ng/kg (Level I SQT) and less than or equal to 21.5 ng/kg (Level II SQT)
- TCDD greater than 21.5 ng/kg (Level II SQT)
- Approximate Location of St. Louis River Channel, Based on Orthophoto Interpretation
- Approximate U. S. Steel Operations Area (URS, 2008)
- State Boundary

Notes: SQT = Sediment quality target for the protection of sediment-dwelling organisms (MPCA, 2007)
Results shown are the maximum value for the given depth range. Individual sample TCDD TEQs within a single location could be comprised of either non-detects set to 0 or 1/2, based on the overall frequency of detection(s) of the chemical results. The TCDD TEQs shown were calculated using the World Health Organization 1998 Fish Toxicity Equivalency Factors (TEFs), as referenced in the MPCA Sediment Quality Target guidance (MPCA, 2007).

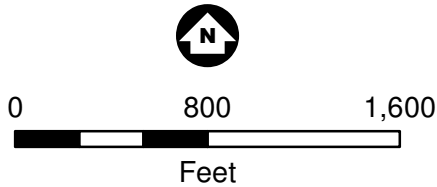


Figure H-41

**TCDD EQUIVALENT
SEDIMENT DEPTHS GREATER
THAN 0.5 FEET**

Spirit Lake Sediment Site -
Former U. S. Steel Duluth Works
Saint Louis River
Duluth, Minnesota



Barr Footer: ArcGIS 10.0, 2013-01-26 14:50 File: I:\Client\USS Duluth Works\Work Orders\Winter 2012\Maps\Reports\RI Report\Appendix H\Figure H-42 TCDD for All Sediment Depths.mxd User: JLC

- TCDD Equivalent less than or equal to 0.85 ng/kg (Level I SQT)
- TCDD Equivalent greater than 0.85 ng/kg (Level I SQT) and less than or equal to 21.5 ng/kg (Level II SQT)
- TCDD greater than 21.5 ng/kg (Level II SQT)
- Approximate Location of St. Louis River Channel, Based on Orthophoto Interpretation
- Approximate U. S. Steel Operations Area (URS, 2008)
- State Boundary

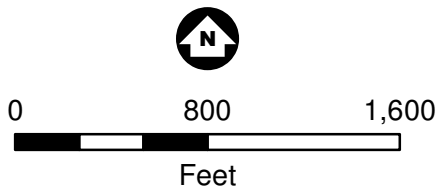
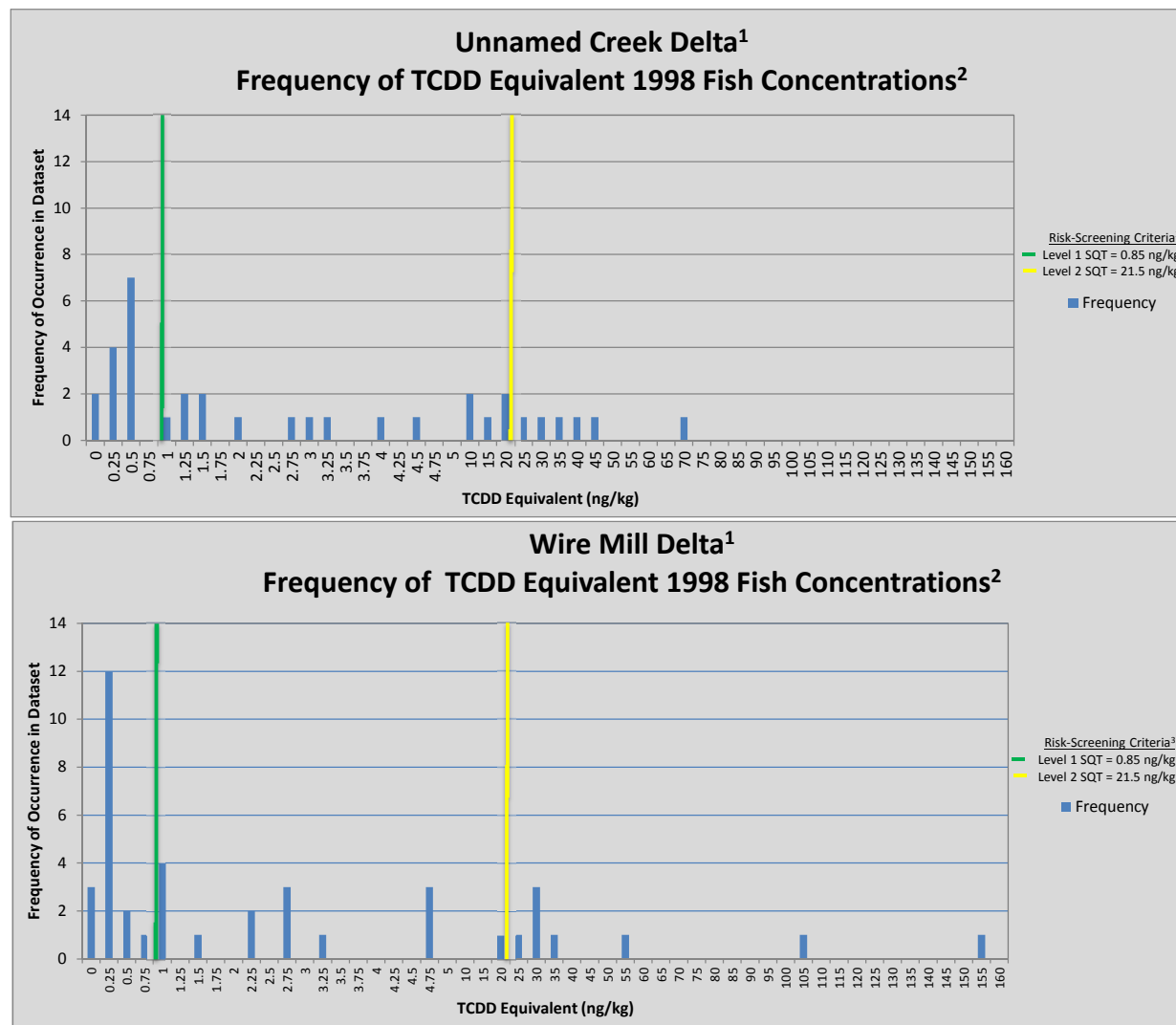


Figure H-42

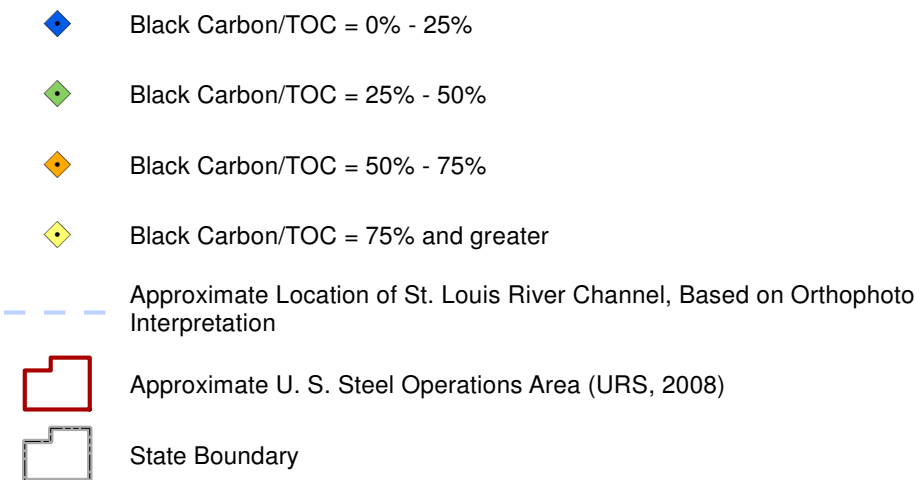
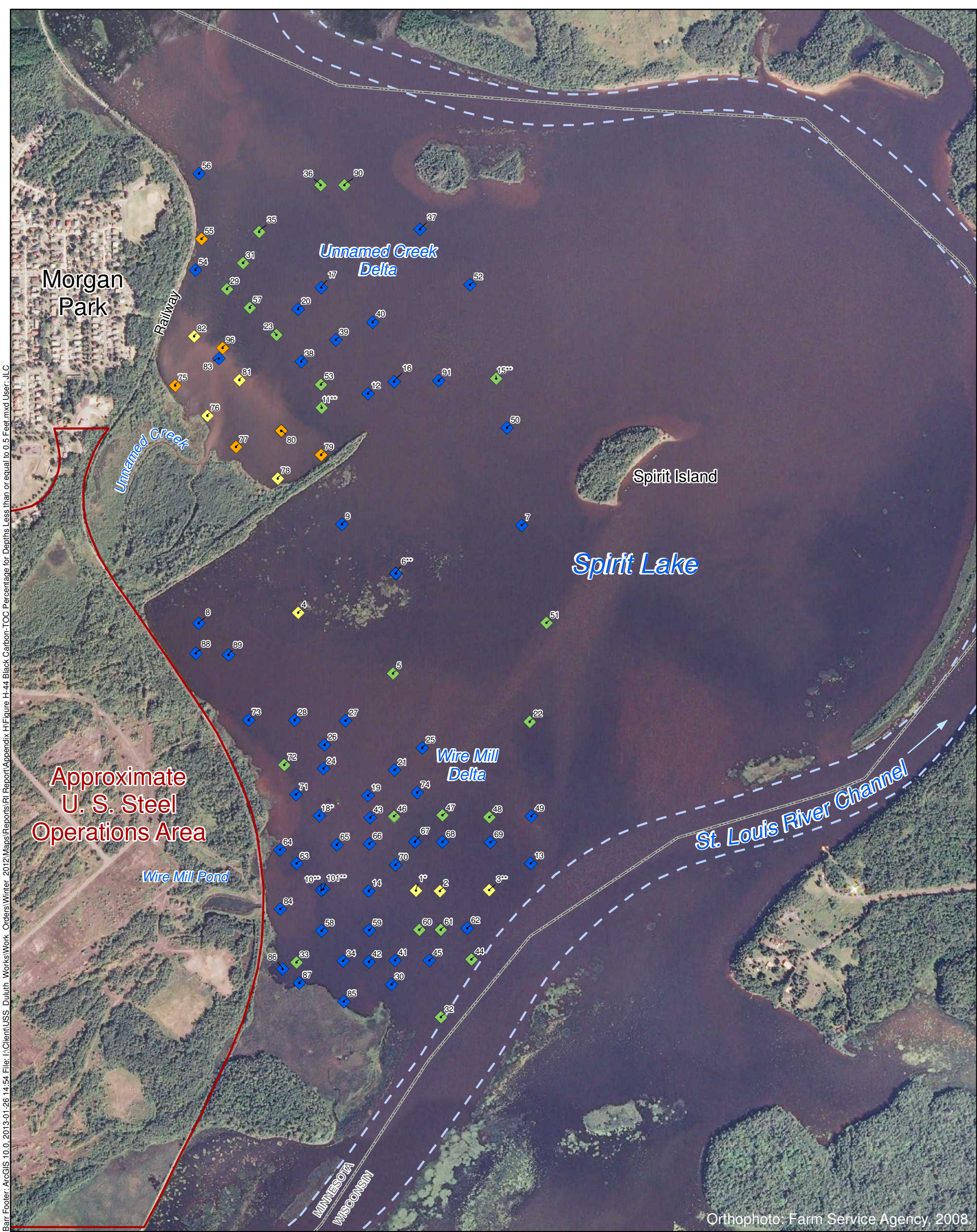
**TCDD EQUIVALENT
ALL SEDIMENT DEPTHS**
Spirit Lake Sediment Site -
Former U. S. Steel Duluth Works
Saint Louis River
Duluth, Minnesota

Notes: SQT = Sediment quality target for the protection of sediment-dwelling organisms (MPCA, 2007)
Results shown are the maximum value for a given location. Individual sample TCDD TEQs within a single location could be comprised of either non-detects set to 0 or 1/2, based on the overall frequency of detection(s) of the chemical results. The TCDD TEQs shown were calculated using the World Health Organization 1998 Fish Toxicity Equivalency Factors (TEFs), as referenced in the MPCA Sediment Quality Target guidance (MPCA, 2007).



¹U.S. Steel samples collected in 2011 by vibracoring and soil boring methods.
²As stated in the Work Plan, TCDD TEQs were calculated using ND equivalent to zero where the majority of the congeners were ND, and where the majority of the congeners were detected, 1/2 the EDL was used in the TEQ calculation.
³SQT = Sediment quality target for the protection of sediment-dwelling organism (MPCA, 2007).

Figure H-43
**FREQUENCY OF TCDD EQUIVALENT
 CONCENTRATIONS BY DATASET**
 Spirit Lake Sediment Site
 U.S. Steel Former Duluth Works



Notes: Results shown are the surficial sample for a given location.
* Indicates sample taken at 0'-0.7' depth range.
** Indicates sample taken at 0'-1' depth range.

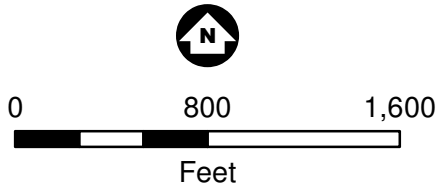
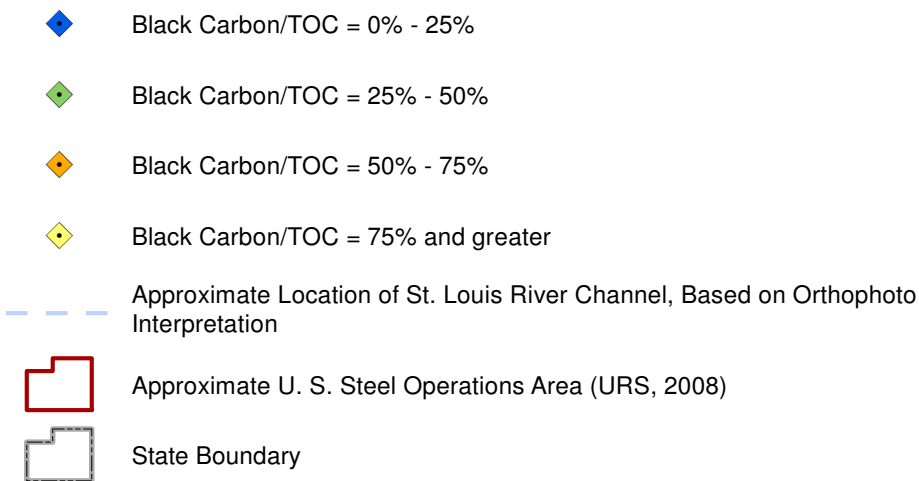
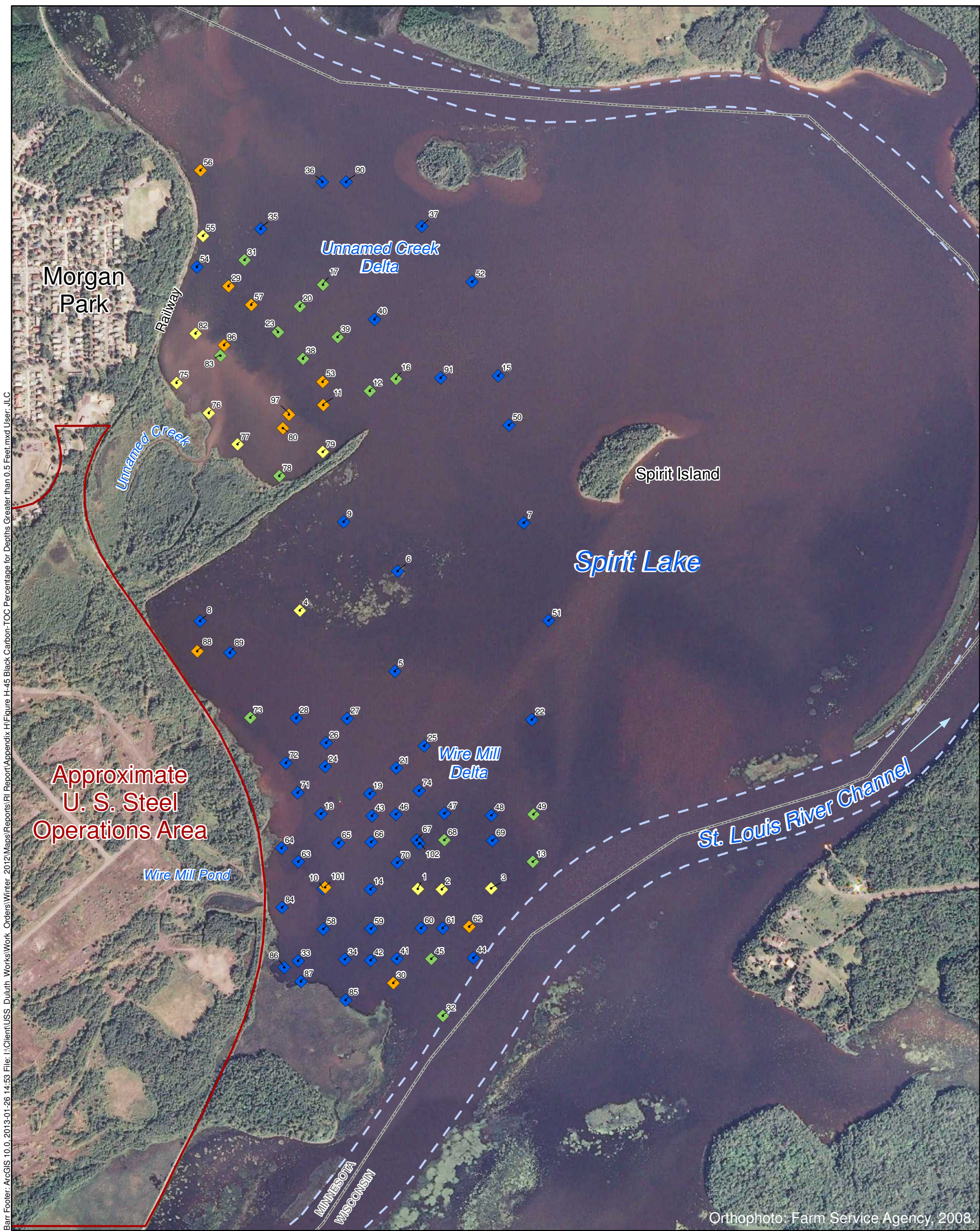


Figure H-44

**BLACK CARBON/TOC
SEDIMENT DEPTHS LESS THAN
OR EQUAL TO 0.5 FEET**
Spirit Lake Sediment Site -
Former U. S. Steel Duluth Works
Saint Louis River
Duluth, Minnesota



Notes: Black carbon/TOC results are depicted for the same sample as the maximum total PAH sample in that core/boring.

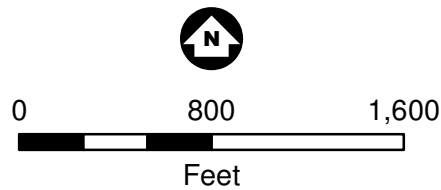
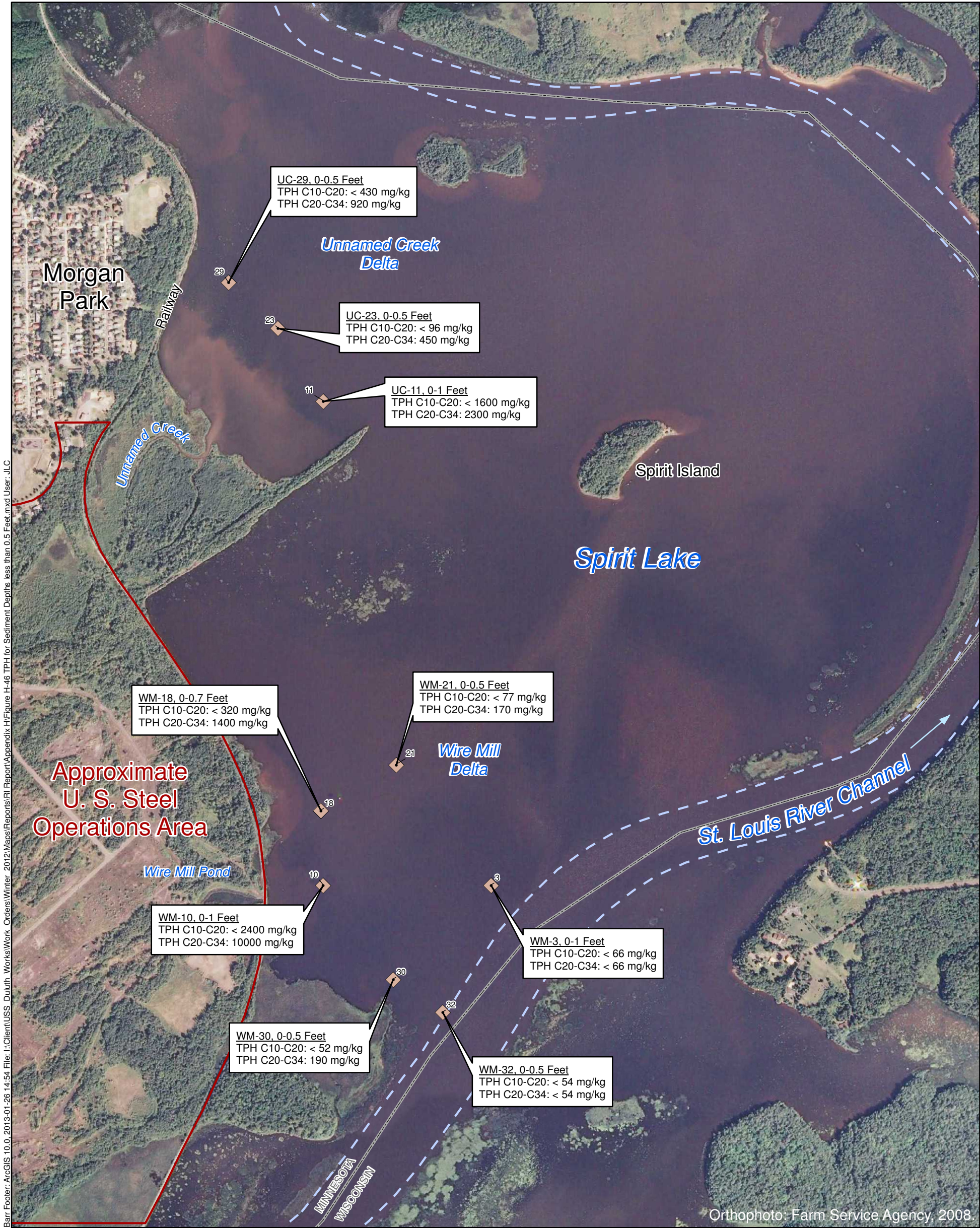


Figure H-45

**BLACK CARBON/TOC
SEDIMENT DEPTHS GREATER
THAN 0.5 FEET**

Spirit Lake Sediment Site -
Former U. S. Steel Duluth Works
Saint Louis River
Duluth, Minnesota



- TPH Sample Locations - Sediment Depths Less than or Equal to 0.5 Feet
- Approximate Location of St. Louis River Channel, Based on Orthophoto Interpretation
- Approximate U. S. Steel Operations Area (URS, 2008)
- State Boundary

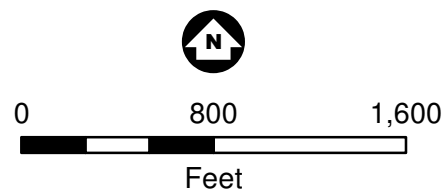
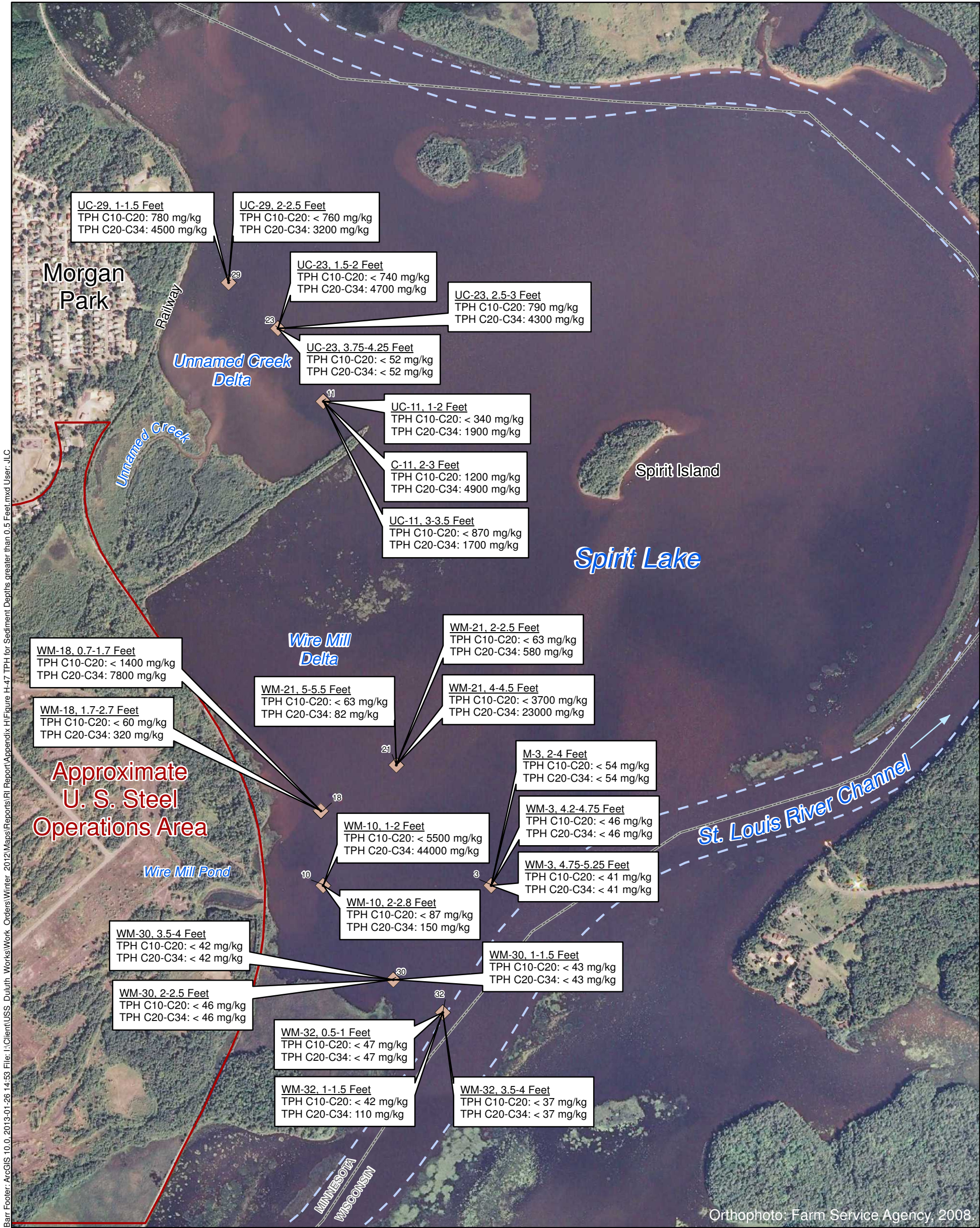


Figure H-46

Note: Results shown are the surficial sample for a given location.

**TOTAL PETROLEUM HYDROCARBONS
SEDIMENT DEPTHS LESS THAN
OR EQUAL TO 0.5 FEET**
Spirit Lake Sediment Site -
Former U. S. Steel Duluth Works
Saint Louis River
Duluth, Minnesota



Barr Footer: ArcGIS 10.0, 2013-01-26 14:53 File: I:\Client\USS Duluth Works\Work Orders\Winter 2012\Maps\Reports\RI Report\Appendix H\Figure H-47 TPH for Sediment Depths greater than 0.5 Feet.mxd User: JLC

- TPH Sample Locations - Sediment Depths Greater than 0.5 Feet
- Approximate Location of St. Louis River Channel, Based on Orthophoto Interpretation
- Approximate U. S. Steel Operations Area (URS, 2008)
- State Boundary

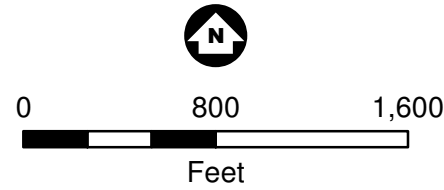
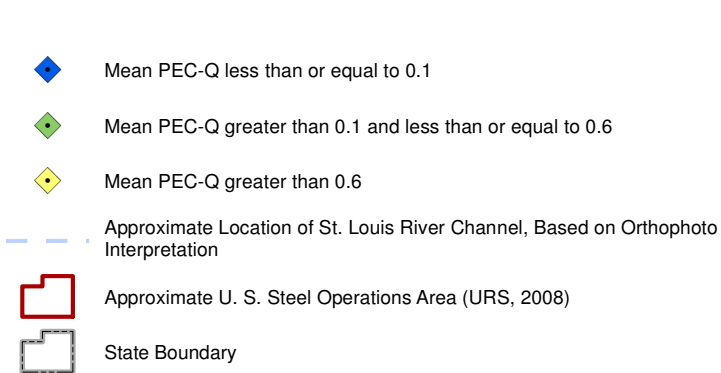
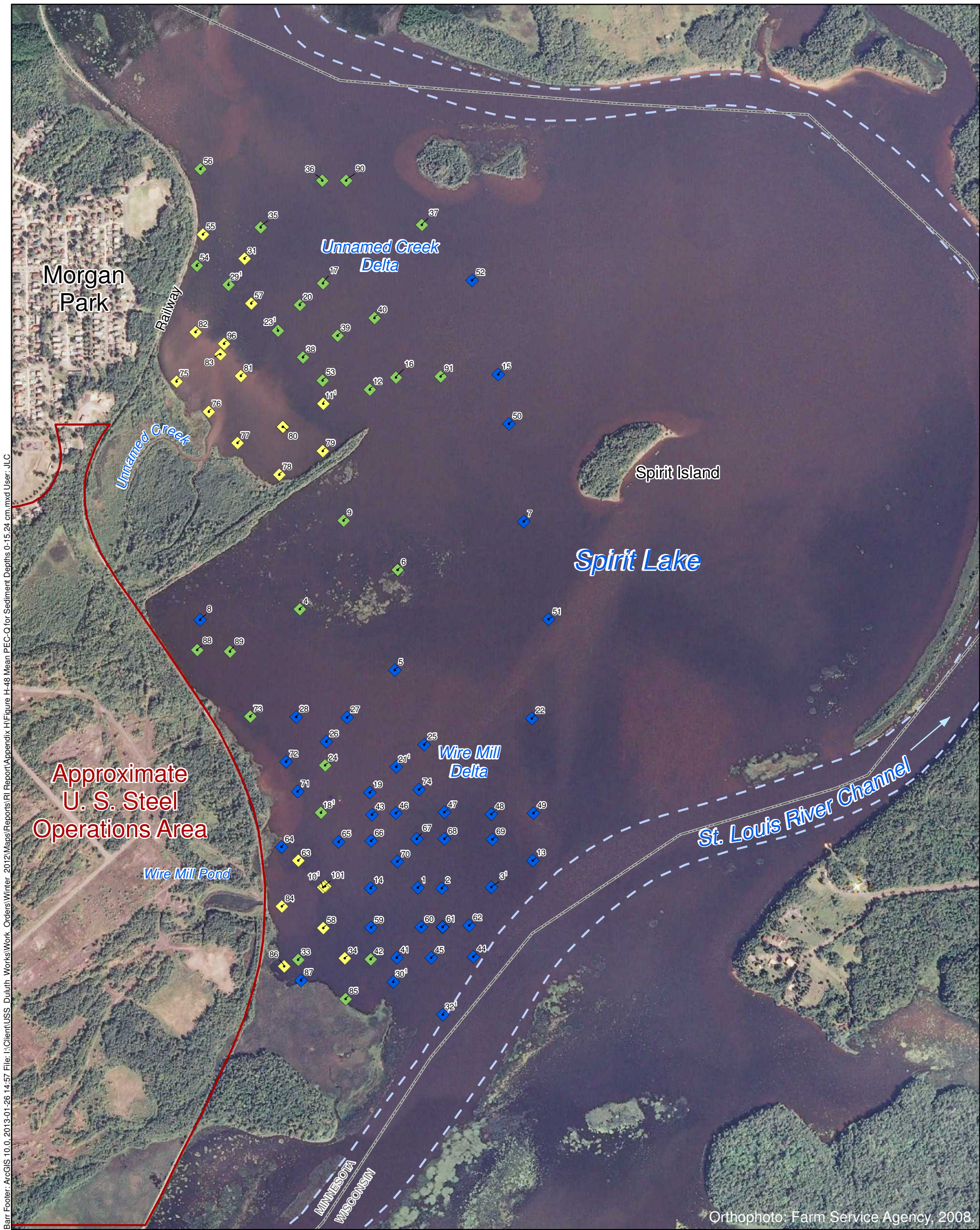


Figure H-47

**TOTAL PETROLEUM HYDROCARBONS
SEDIMENT DEPTHS
GREATER THAN 0.5 FEET**
Spirit Lake Sediment Site -
Former U. S. Steel Duluth Works
Saint Louis River
Duluth, Minnesota



Notes: Mean PEC-Q calculated in accordance with the *Guidance for the use and application of sediment quality targets for the protection of sediment-dwelling organisms in Minnesota* (MPCA, 2007) by dividing chemical concentrations by the respective Level II SQTs.

SQT = Sediment quality target for the protection of sediment-dwelling organisms (MPCA, 2007)
Mean PEC-Q = Mean probable effect concentration quotient (MPCA, 2007)
Results shown are the maximum value for the given depth range.

¹ Indicates samples where PAHs, metals, and PCBs were used to calculate the mean PEC-Q. All other locations shown use PAH and metal concentrations to calculate the mean PEC-Q since PCBs were not analyzed at those locations.

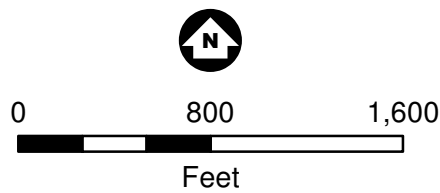
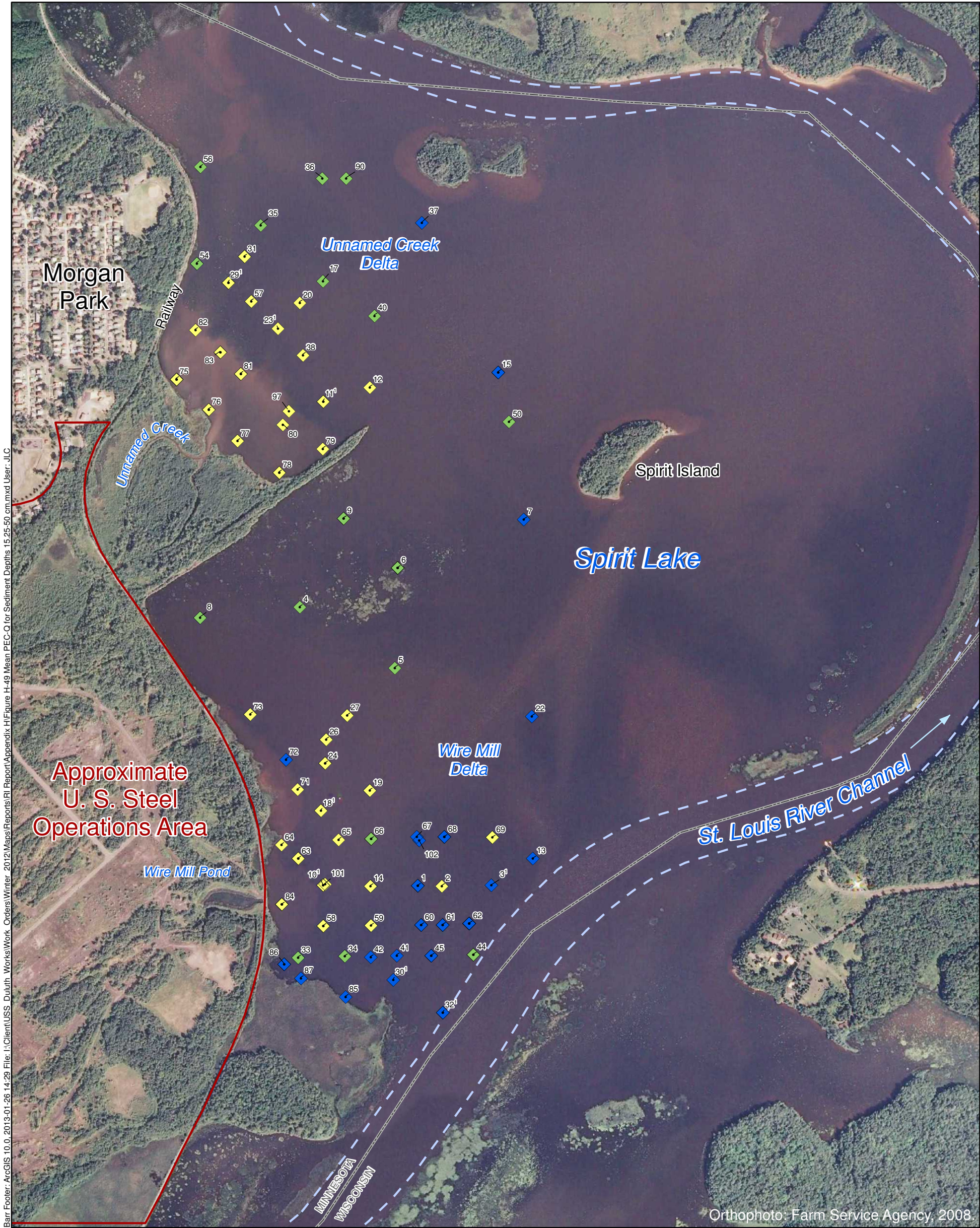


Figure H-48

**MEAN PEC-Q
SEDIMENT DEPTHS
0-15.24 CENTIMETERS**
Spirit Lake Sediment Site -
Former U. S. Steel Duluth Works
Saint Louis River
Duluth, Minnesota

*This figure created at MPCA request for comparison to
St. Louis River Area of Concern Assessment Data.*



Barr Footer: ArcGIS 10.0, 2013-01-26 14:28 File: I:\Client\USS Duluth Works\Work Orders\Winter 2012\Maps\Reports\RI Report\Appendix H\Figure H-49 Mean PEC-Q for Sediment Depths 15.25-50 cm.mxd User: JLC

- Mean PEC-Q less than or equal to 0.1
- Mean PEC-Q greater than 0.1 and less than or equal to 0.6
- Mean PEC-Q greater than 0.6
- Approximate Location of St. Louis River Channel, Based on Orthophoto Interpretation
- Approximate U. S. Steel Operations Area (URS, 2008)
- State Boundary

Notes: Mean PEC-Q calculated in accordance with the *Guidance for the use and application of sediment quality targets for the protection of sediment-dwelling organisms in Minnesota* (MPCA, 2007) by dividing chemical concentrations by the respective Level II SQTs.

SQT = Sediment quality target for the protection of sediment-dwelling organisms (MPCA, 2007)
Mean PEC-Q = Mean probable effect concentration quotient (MPCA, 2007)
Results shown are the maximum value for the given depth range.

¹ Indicates samples where PAHs, metals, and PCBs were used to calculate the mean PEC-Q. All other locations shown use PAH and metal concentrations to calculate the mean PEC-Q since PCBs were not analyzed at those locations.

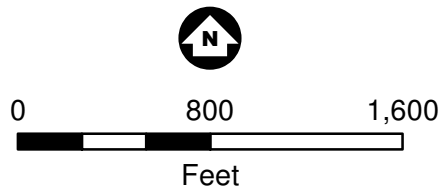
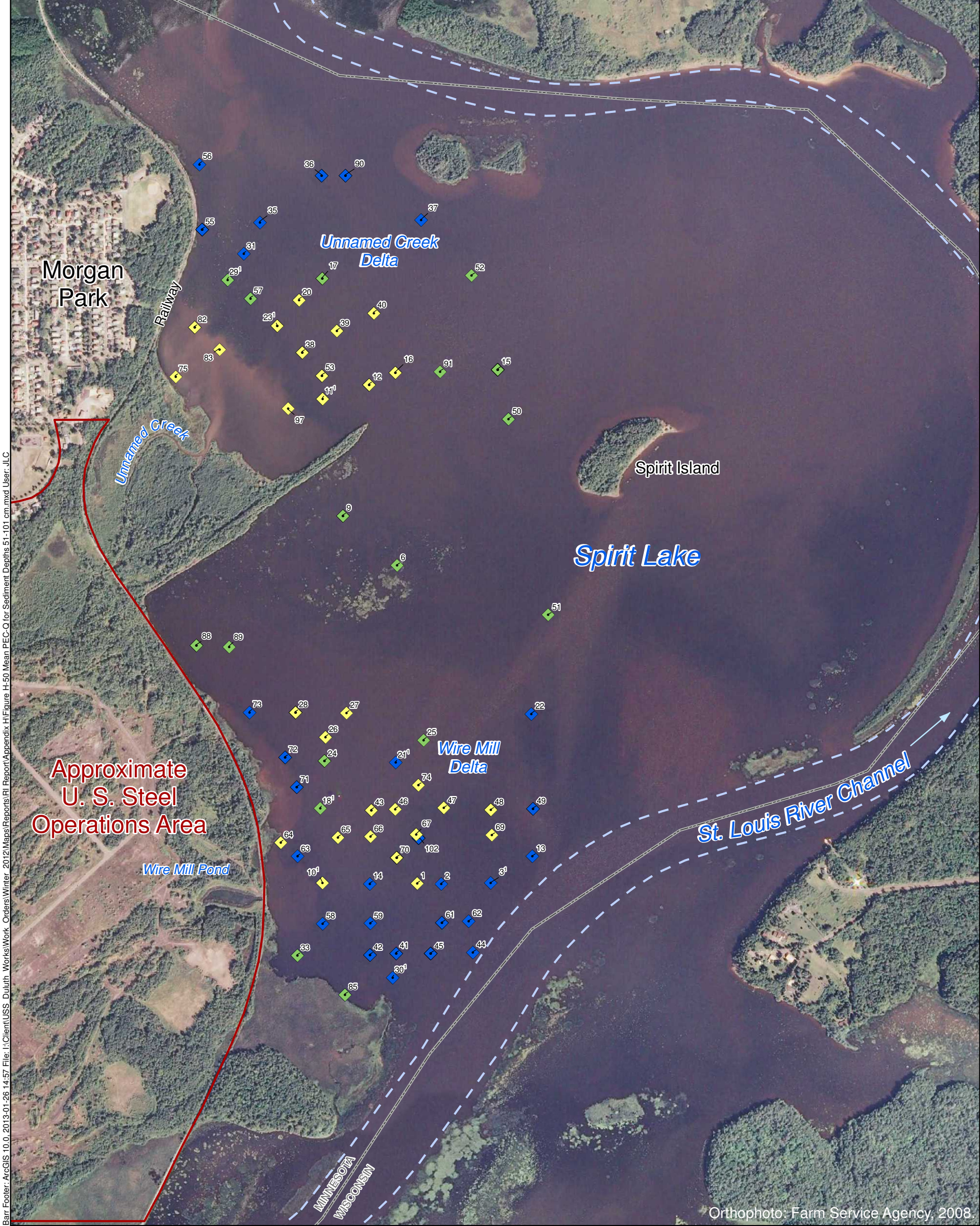


Figure H-49

**MEAN PEC-Q
SEDIMENT DEPTHS
15.25-50 CENTIMETERS**
Spirit Lake Sediment Site -
Former U. S. Steel Duluth Works
Saint Louis River
Duluth, Minnesota

This figure created at MPCA request for comparison to St. Louis River Area of Concern Assessment Data.



- Mean PEC-Q less than or equal to 0.1
- Mean PEC-Q greater than 0.1 and less than or equal to 0.6
- Mean PEC-Q greater than 0.6
- Approximate Location of St. Louis River Channel, Based on Orthophoto Interpretation
- Approximate U. S. Steel Operations Area (URS, 2008)
- State Boundary

Notes: Mean PEC-Q calculated in accordance with the *Guidance for the use and application of sediment quality targets for the protection of sediment-dwelling organisms in Minnesota* (MPCA, 2007) by dividing chemical concentrations by the respective Level II SQTs.

SQT = Sediment quality target for the protection of sediment-dwelling organisms (MPCA, 2007)
Mean PEC-Q = Mean probable effect concentration quotient (MPCA, 2007)
Results shown are the maximum value for the given depth range.

¹ Indicates samples where PAHs, metals, and PCBs were used to calculate the mean PEC-Q. All other locations shown use PAH and metal concentrations to calculate the mean PEC-Q since PCBs were not analyzed at those locations.

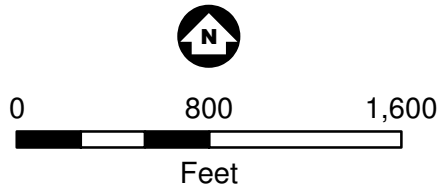


Figure H-50

**MEAN PEC-Q
SEDIMENT DEPTHS
51-101 CENTIMETERS**
Spirit Lake Sediment Site -
Former U. S. Steel Duluth Works
Saint Louis River
Duluth, Minnesota

This figure created at MPCA request for comparison to St. Louis River Area of Concern Assessment Data.

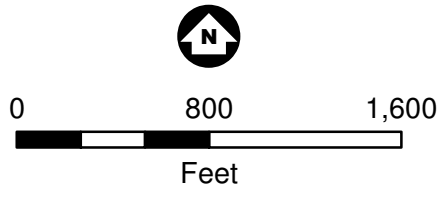
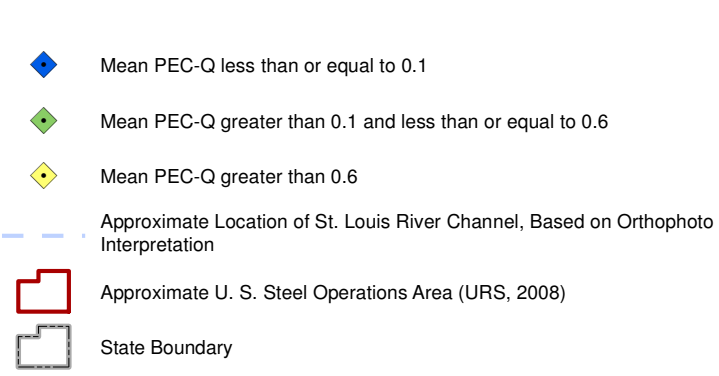
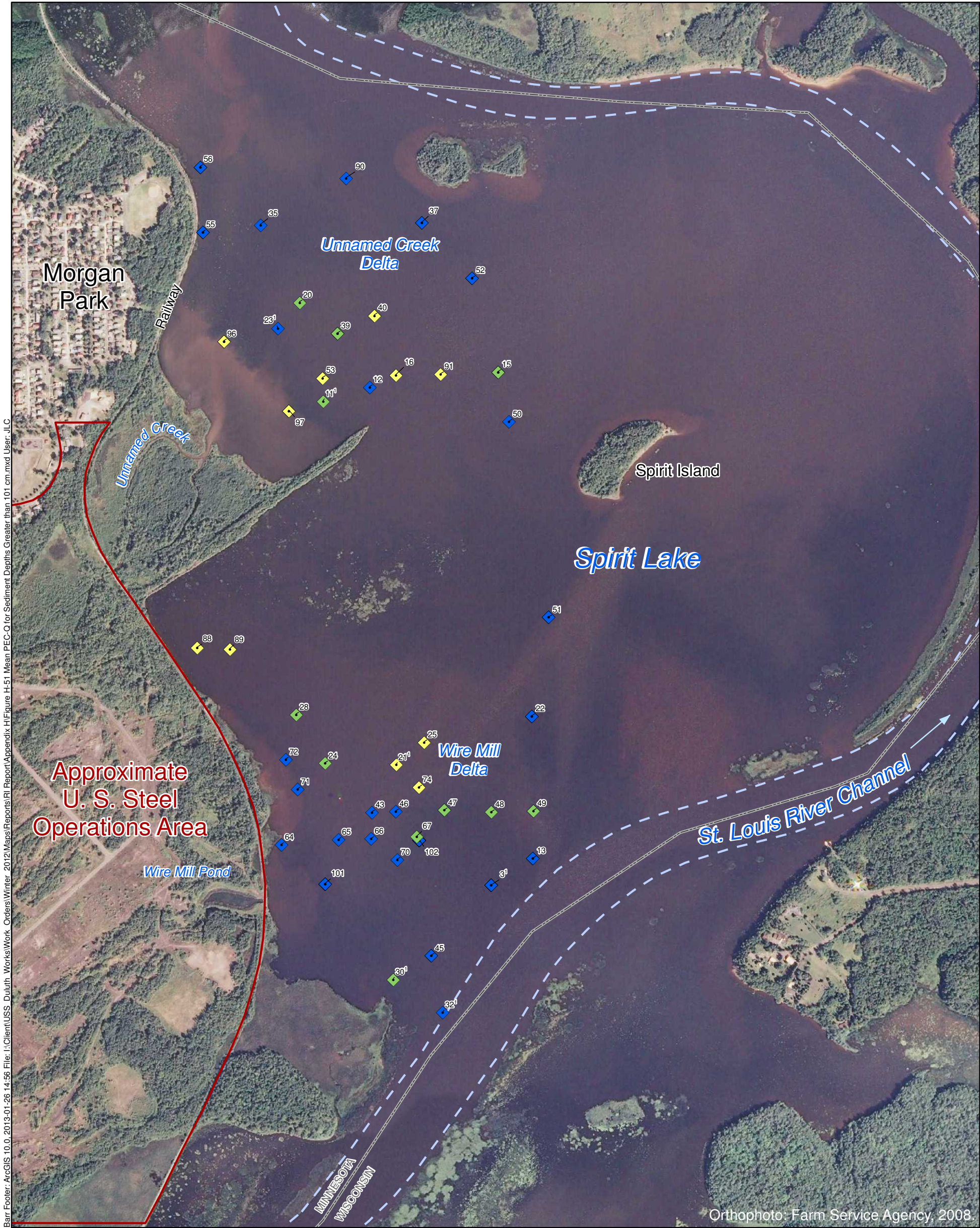


Figure H-51

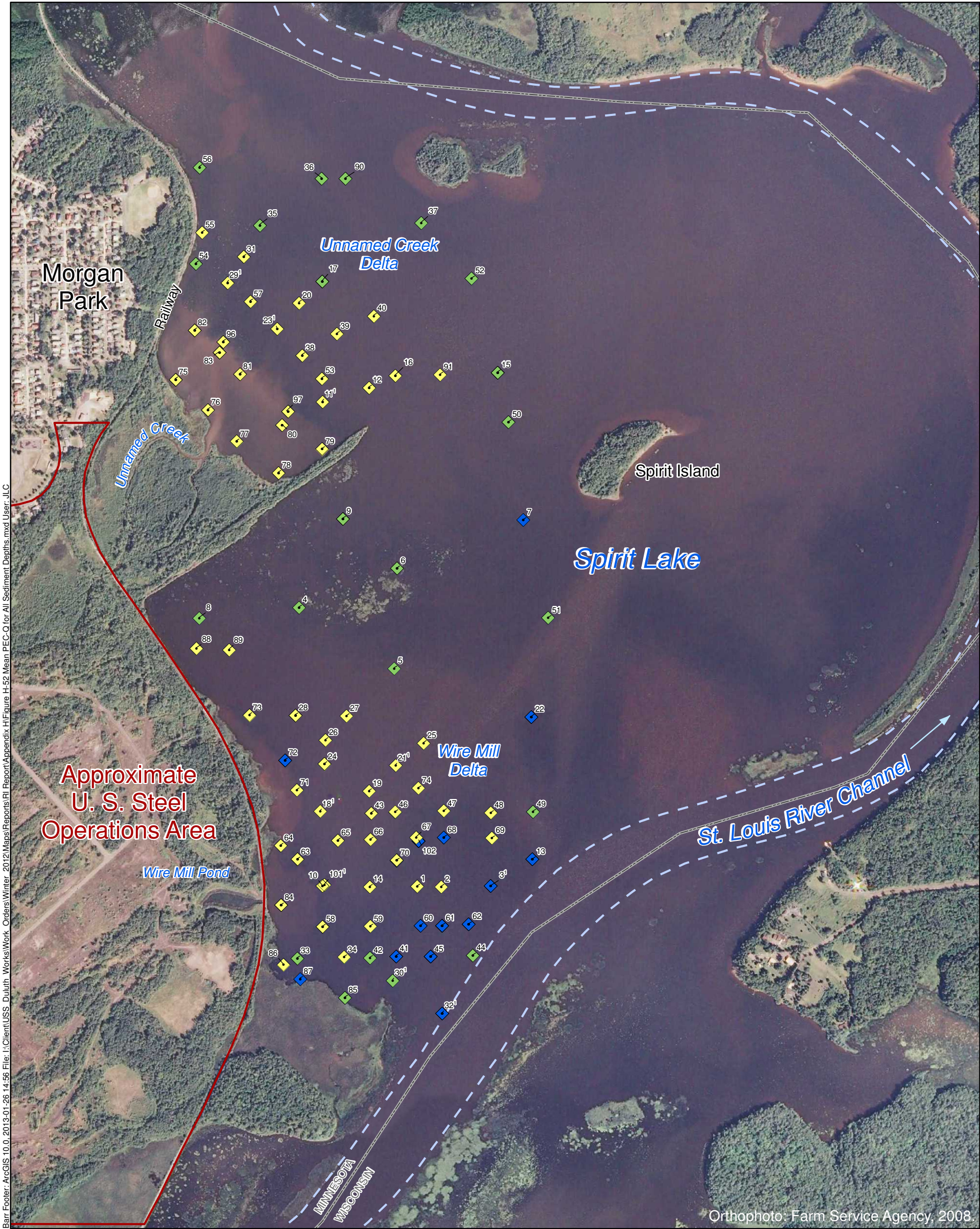
**MEAN PEC-Q
SEDIMENT DEPTHS GREATER
THAN 101 CENTIMETERS**
Spirit Lake Sediment Site -
Former U. S. Steel Duluth Works
Saint Louis River
Duluth, Minnesota

*This figure created at MPCA request for comparison to
St. Louis River Area of Concern Assessment Data.*

Notes: Mean PEC-Q calculated in accordance with the *Guidance for the use and application of sediment quality targets for the protection of sediment-dwelling organisms in Minnesota* (MPCA, 2007) by dividing chemical concentrations by the respective Level II SQTs.

SQT = Sediment quality target for the protection of sediment-dwelling organisms (MPCA, 2007)
Mean PEC-Q = Mean probable effect concentration quotient (MPCA, 2007)
Results shown are the maximum value for the given depth range.

¹ Indicates samples where PAHs, metals, and PCBs were used to calculate the mean PEC-Q. All other locations shown use PAH and metal concentrations to calculate the mean PEC-Q since PCBs were not analyzed at those locations.



- ◆ Mean PEC-Q less than or equal to 0.1
- ◆ Mean PEC-Q greater than 0.1 and less than or equal to 0.6
- ◆ Mean PEC-Q greater than 0.6
- Approximate Location of St. Louis River Channel, Based on Orthophoto Interpretation
- Approximate U. S. Steel Operations Area (URS, 2008)
- State Boundary

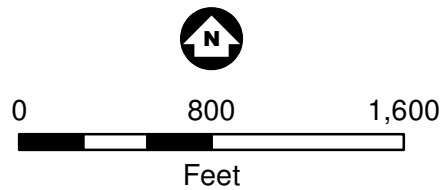


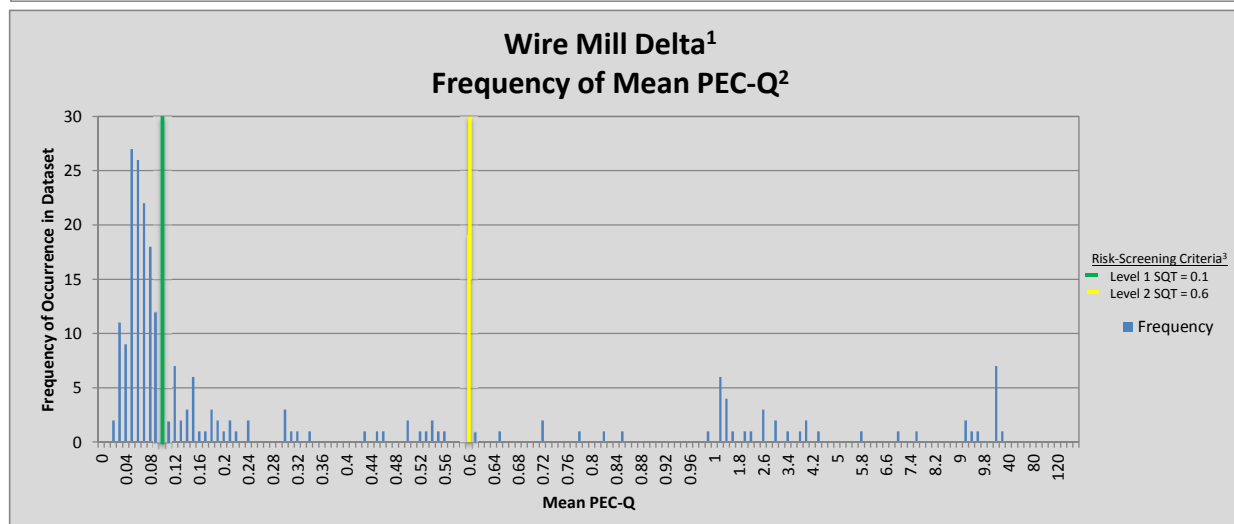
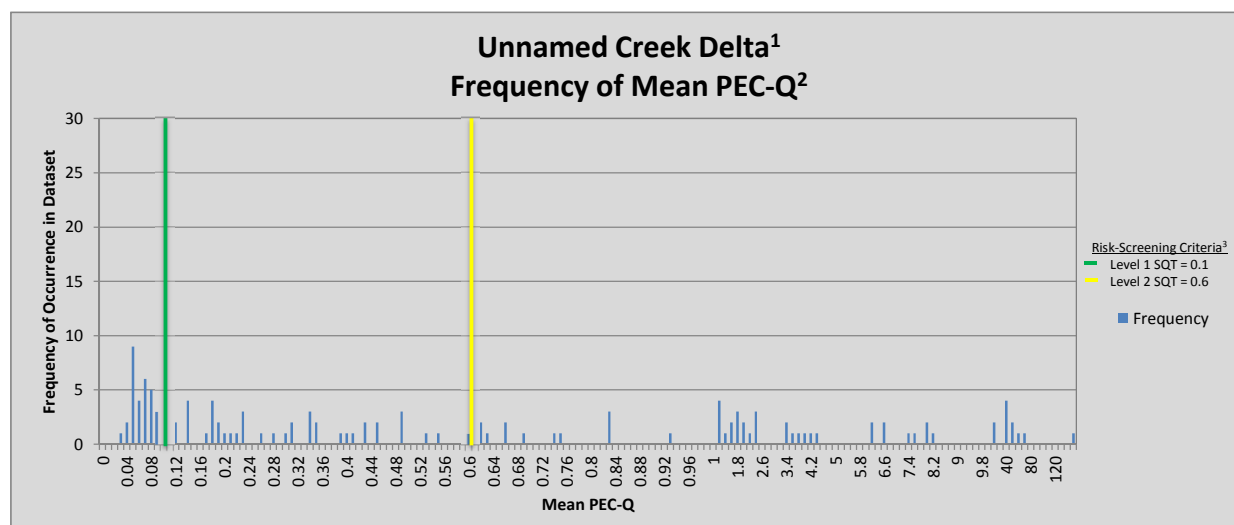
Figure H-52

**MEAN PEC-Q FOR
ALL SEDIMENT DEPTHS**
Spirit Lake Sediment Site -
Former U. S. Steel Duluth Works
Saint Louis River
Duluth, Minnesota

Notes: Mean PEC-Q calculated in accordance with the *Guidance for the use and application of sediment quality targets for the protection of sediment-dwelling organisms in Minnesota* (MPCA, 2007) by dividing chemical concentrations by the respective Level II SQTs.

SQT = Sediment quality target for the protection of sediment-dwelling organisms (MPCA, 2007)
Mean PEC-Q = Mean probable effect concentration quotient (MPCA, 2007)
Results shown are the maximum value for the given depth range.

¹ Indicates samples where PAHs, metals, and PCBs were used to calculate the mean PEC-Q. All other locations shown use PAH and metal concentrations to calculate the mean PEC-Q since PCBs were not analyzed at those locations.



¹U.S. Steel samples collected in 2011 by vibracoring and soil boring methods.
²With the exception of PCB PEC-Q, all PEC-Q data contains results scaled to 1/2 the laboratory reporting limit for censored data (ND results).
³SQT = Sediment quality target for the protection of sediment-dwelling organisms (MPCA, 2007).

Figure H-53
**FREQUENCY OF MEAN PEC-Q
 BY DATASET**
 Spirit Lake Sediment Site