

APPENDIX A

Wetland and WUS Delineation and Environmental Sampling Report

Teach AML Reclamation Project

Ottumwa, Iowa

December 13, 2012

Terracon Project No. 08127120



Prepared for:

Trihydro Corporation
Laramie, Wyoming

Prepared by:

Terracon Consultants, Inc.
Des Moines, Iowa

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December 13, 2012

Ms. Donna Jones
United States Army Corps of Engineers
Rock Island District – Clock Tower Building
PO Box 2004
Rock Island, IL 61204-2004

Re: Wetland and WUS Delineation and Environmental Sampling Report
Teach AML Reclamation Site
220th Avenue
Ottumwa, Iowa
Terracon Project No. 08127120

Dear Ms. Jones:

Terracon is pleased to submit the Wetland Delineation and Environmental Sampling Report prepared for Trihydro Corporation. This report describes the technical criteria, field indicators, and other sources of information used to identify and delineate wetlands. Based on the results of the delineation, 0.30 acres of wetlands, 5,660 linear feet of WUS, 770 linear feet of erosional features, and approximately 2.6 acres of pond were identified on the project site. At this time, we are requesting that you perform a Jurisdictional Determination for the project and advise our client if a permit will be required for the proposed impacts.

If you have any questions concerning this report, please contact Eva at 515-244-3184 or by e-mail at esmoritz@terracon.com.

Sincerely,
TERRACON CONSULTANTS, INC.


Eva S. Moritz, P.E.
Environmental Engineer


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Senior Associate

Copies to: Addressee (1)
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Geotechnical



Environmental



Construction Materials



Facilities

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APPENDIX A – EXHIBITS

- Exhibit 1 – Topographic Site Map
- Exhibit 2 – National Wetland Inventory Map
- Exhibit 3 – Wapello County Soil Survey Map
- Exhibit 4 – Hillshade from LIDAR
- Exhibit 5 – Wetland Delineation Map
- Exhibit 6 – Topographic Site Map with Wetland Locations
- Exhibit 7 – Culvert Locations
- Exhibit 8 – Surface Water Sampling Locations

APPENDIX B – AERIAL PHOTOGRAPHS

APPENDIX C – WETLAND DETERMINATION DATA FORMS

APPENDIX D – GROUND PHOTOGRAPHS

APPENDIX E – ANALYTICAL RESULTS

**WETLAND AND WUS DELINEATION AND
ENVIRONMENTAL SAMPLING REPORT
TEACH AML RECLAMATION SITE
220TH AVENUE
OTTUMWA, IOWA
Terracon Project No. 08127120
December 13, 2012**

1.0 INTRODUCTION

Terracon Consultants, Inc. (Terracon) was retained by Trihydro Corporation on behalf of the Iowa Department of Agricultural and Land Stewardship division to perform a wetland delineation for the Teach AML Reclamation Project, hereafter referred to as the subject site. The subject site covers approximately 28 acres and is located in Section 9, Township 72 North, Range 15 West, Ottumwa, Iowa as depicted on Exhibit 1 in Appendix A.

Terracon understands that Trihydro Corporation is preparing plans to reclaim a coal strip mine by incorporation geomorphically stable natural landform designing to help preclude erosion. The design component includes degrading the site spoils, overburden, and coal refuse, to backfill an existing water-filled pit.

The purpose of performing the wetland delineation was to assess if wetlands or Waters of the United States (WUS) are present and, if so, to identify the boundaries. The wetland delineation was performed in accordance with the 1987 Corps of Engineers Wetlands Delineation Manual and the 2010 Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Midwest Region. According to U.S. Army Corps of Engineers (USACE) guidelines, wetlands generally have three essential characteristics: hydrophytic (wetland) vegetation, hydric soils, and wetland hydrology.

2.0 SCOPE OF SERVICES

Terracon performed the following scope of work:

- Reviewed map and aerial photograph resources to assist with identifying suspect WUS and wetland areas at the subject site.
- Mobilized to the site to conduct the wetland delineation.
- Prepared a wetland delineation map showing WUS and wetland areas identified during the site visit, if any.

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- Completed a Wetland Delineation Report that included delineation rationale, a discussion of applicable data, and recommendations for the site.
- Collected size information for upstream controls (e.g. culverts, weirs, or road crossings) that may affect the amount of water reporting to the creek on the east side of the site.
- Collected three surface water samples to characterize the water quality of the site.

3.0 PRELIMINARY DATA GATHERING AND ANALYSIS

Prior to performing the delineation, several map and aerial photograph resources were reviewed to assist with identifying WUS and wetland areas at the subject site. Each source of data is described in detail below.

3.1 Topographic Map

The United States Department of the Interior Geologic Survey (USGS) 7.5-Minute Topographic Map of the subject site was reviewed to identify drainages or WUS within the project area. A portion of the *Chillicothe*, Iowa Quadrangle can be seen as Exhibit 1 in Appendix A. As shown on Exhibit 1, an intermittent tributary is adjacent to the south side of the site.

3.2 National Wetland Inventory Map

The National Wetland Inventory (NWI) Map of the subject site was reviewed to identify potential wetland areas. The map for the subject site was published by the U.S. Department of the Interior's Fish and Wildlife Service and depicts probable wetland areas based on stereoscopic analysis of high altitude aerial photographs. The NWI map identified a Palustrine Unconsolidated Bottom Permanently Flooded Excavated (PUBHx) waterbody in the southwest portion of the site. A Palustrine Emergent Seasonally Flooded Excavated (PEMCx) was identified adjacent to the eastern portion site. A portion of the NWI map can be seen as Exhibit 2 in Appendix A.

3.3 Soil Survey of Wapello County, Iowa

The Soil Survey of Wapello County, Iowa was reviewed to identify soil types, including hydric soils, in the area of the subject site. The document was published in 1981 by the U.S. Department of Agriculture Soil Conservation Service, now known as the Natural Resource Conservation Service (NRCS). Terracon also utilized the NRCS on-line Web Soil survey

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(WSS)¹ to identify soil types and hydric soils. The NRCS soil survey map can be seen as Exhibit 3 in Appendix A; however, this map does not depict all of the identified soil types found in the WSS.

The following soil types were identified within the project area based on an area of inquiry search of the WSS:

- Pits-dumps complex, mines (5020): Pits-dumps complex, mines, are areas used in previous mining areas. Pits-dumps complex is not listed on the Wapello County hydric soils list or national hydric soils list.
- Nodaway-Cantril complex, 2 to 5 percent slopes (730B): Nodaway series consists of very deep, moderately well drained soils formed in alluvium. These soils are on flood plains, upland drainageways, and alluvial fans. Cantril soils consist of very deep, somewhat poorly drained soils formed in loamy local alluvium and or/ colluvium. These soils are on base slopes on dissected till plains and alluvial fans. Nodaway-Cantril complex is listed on the Wapello County and national hydric soils lists.
- Galland loam, 9 to 14 percent slopes, moderately eroded (594D2): Galland loams consists of deep, somewhat poorly drained, slowly permeable soils formed in loamy and clayed alluvial sediments derived from glaciers. They are on high stream terraces. Galland loam is not listed on the Wapello County or the national hydric soils list.
- Weller silty clay loam, benches, 5 to 9 percent slopes, moderately eroded (832C2): Weller silty clay loam, benches soils consists of deep, moderately well drained, slowly permeable soils formed in loess on upland and high stream benches. Weller silty clay loam, benches is not listed on the Wapello County or the national hydric soils list.
- Weller silty clay loam, 9 to 14 percent slopes, moderately eroded (732D2): Weller silty clay loam soils consists of deep, moderately well drained, slowly permeable soils formed in loess on upland and high stream benches. Weller silty clay loam is listed on the Wapello County and the national hydric soils list.
- Gosport silt loam (1313E2): Gosport silt loam consists of moderately deep, moderately well drained soils from in 0 to 40 centimeters of silty or loamy materials of unknown origin and in the underlying residuum from brown and gray acid Pennsylvania shales with clayey shale. These soils are on convex side

¹ Posted at: <http://websoilsurvey.nrcs.usda.gov/app/HomePage.htm>

slopes and escarpment-like areas that parallel major streams. Gosport silt loam is not listed on the Wapello County or the national hydric soils list.

- **Mystic silt loam, 5 to 9 percent slopes, moderately eroded (592C2):** Mystic silt loam consists of very deep, somewhat poorly drained soils formed in alluvial sediments derived from glaciers. These soils are on treads and risers of high structural benches that border valleys of major stream and their tributaries. Mystic silt loam is not listed on the Wapello County or the nation hydric soils list.

3.4 Aerial Photographs

Terracon reviewed aerial photographs obtained from the ISU GIS Support and Research Facility to identify suspected wetland areas on the subject site. Aerial photographs from the 1930s, 1950s, 1960s, 1970s, 1980s, 1990s, 2002, 2004, 2006, 2008, 2010, and 2011 were reviewed and have been included in Appendix B. Aerial photographs from 2005, 2007, and 2009 were also reviewed; those aeriels were not included in this report but can be provided upon request.

- **1930's & 1950's:** An apparent drainage runs along the western boundary of the site in an approximately northwest to southeast orientation. Another drainage was observed in the eastern portion of the site in an approximate northwest to southeast orientation. Four tributaries to this drainage were observed on the northern and eastern portion of the site.
- **1970's:** The eastern portion of the site appears to be an active mining site and the east drainage observed on the previous aeriels appears to be disturbed.
- **1980's-2011:** The area of disturbance expanded to encompass a majority of the site. A pond was observed in the southwest portion of the project site. The drainage on the east side of the site appears to have been re-graded. As time progresses, the drainages appear to become more vegetated with tree species.

3.5 Hillshade Map

Terracon reviewed the Hillshade Map of the site obtained from the ISU GIS Support and Research Facility to assist in identifying potential lowland areas. The Hillshade Map uses Light Detection and Ranging (LIDAR) data to depict the approximate topography of the site. The Hillshade Map, including a transparent aerial photograph, can be seen as Exhibit 4 in Appendix A. As shown on Exhibit 4, the site consists of a highly disturbed area with several drainage channels.

4.0 WETLAND DELINEATION FIELD TECHNIQUES

An experienced Terracon wetland scientist used technical criteria, field indicators, historic aerial photographs, and other sources of information to evaluate the subject site. The evaluation methods generally followed the routine on-site determination method referenced in the 1987 USACE Manual and 2010 Midwest Supplement.

Wetlands generally have three essential characteristics: hydrophytic (wetland) vegetation, hydric soils, and wetland hydrology. Several representative observation locations were selected within each suspect wetland area. Vegetation, soils and hydrology were evaluated within each suspect area to determine if wetland characteristics were present. The techniques for evaluating the plant community, soils, and hydrology are described in the following sections.

4.1 Plant Community Assessment

Suspect areas were visually observed to assess the species and absolute percentage of ground cover for four stratum of plant community types. Herbs were generally observed within a five-foot radius, shrubs/saplings within a fifteen-foot radius, and trees and vines within a thirty-foot radius of the observation location. Several representative observation locations were selected within each suspected wetland area to generally represent the vegetation characteristics of the whole community. The vegetation for each selected area was identified using A Manual on Aquatic Plants (Fassett, 1957), Midwestern Wetland Flora, A Field Office Guide to Plant Species (Mohlenbrock and Mohlenbrock), and Wildflowers and Other Plants of Iowa Wetlands (Runkel and Roosa, 1999).

For each species of vegetation observed, their wetland indicator status was evaluated. Indicator status was assessed using the USACE North American Digital Flora: National Wetland Plant List and the National List of Plant Species that Occur in Wetlands - Region 3 (Reed, 1988). Indicator categories for vegetation are presented below:

- **Obligate Wetland (OBL)** - occur almost always (estimated probability greater than 99%) under natural conditions in wetlands.
- **Facultative Wetland (FACW)** - usually occur in wetlands (estimated probability 67% - 99%) but occasionally found in non-wetlands.
- **Facultative (FAC)** - equally likely to occur in wetlands or non-wetlands (estimated probability 34% - 66%).
- **Facultative Upland (FACU)** - usually occur in non-wetlands (estimated probability 67% - 99%) but occasionally found in wetlands.

- **Obligate Upland (UPL)** – rarely occur in wetlands, but occur almost always (estimated probability greater than 99%) under natural conditions in non-wetlands.

The percent cover of each stratum was assessed and dominance was evaluated. Dominant species were the most abundant species that accounted for more 20 percent of the absolute percent coverage of the stratum. The number of dominant species with an indicator status of OBL, FACW, and/or FAC was compared to the total number of dominant species across all strata. Typically, when more than 50 percent of the dominant species had an indicator status of OBL, FACW, and/or FAC, hydrophytic vegetation was present.

If the percentage of dominant species with an indicator status of OBL, FACW, and/or FAC was less than 50 percent, prevalence index and morphological adaptations may have been evaluated to confirm if hydrophytic vegetation was present or absent.

4.2 Hydric Soils Assessment

After Terracon evaluated wetland vegetation, subsurface soil samples were collected using a soil probe. The samples were collected to a depth of approximately 24 inches below ground surface and were visually compared to [Munsell Soil Color Charts](#) (Munsell, 1994), which aided in the evaluation of hydric soil characteristics. The soil samples were further examined for hydric soil indicators including, but not limited to, histosol, thick dark surface, sandy gleyed matrix, sandy redox, loamy gleyed matrix, redox dark surface, and/or redox depressions. If these or other hydric soil indicators were observed in the subsurface soil sample, the observation location was considered to have hydric soil.

4.3 Wetland Hydrology Assessment

Visual indicators of wetland hydrology were evaluated. Examples of primary wetland hydrology indicators include, but are not limited to, surface water, high water table, soil saturation, water marks, sediment deposits, drift deposits, iron deposits, inundation visible on aerial imagery, sparsely vegetated concave surface, and water-stained leaves. If at least one primary or two secondary indicators were observed, the observation location was considered to have wetland hydrology.

4.4 Classification of Wetlands

Upon completion of the review of the three wetland criteria at each area, a wetland determination was made. Under normal circumstances, if one or more of the wetland criteria were not identified, the area was not considered to be a wetland. If all three wetland indicators were identified, the area was classified as wetland. Additional observations were made

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throughout the wetland area to define the wetland/non-wetland boundary, which was mapped with GPS technology or flagged and surveyed by traditional methods. Vegetation, soil and hydrology assessment data from at least one location within the wetland and one upland location outside of the wetland were recorded on a USACE Wetland Determination Form. The recorded data forms for the subject site can be found in Appendix C and the data point location can be seen on Exhibit 5 in Appendix A. The wetland locations plotted on the USGS topographic map can be seen as Exhibit 6 in Appendix A.

4.5 WUS Observations

Terracon also made observations of any site features that may be considered a WUS. If a potential WUS was identified, observations regarding its characteristics were recorded. The following definitions were used when describing the WUS:

- Flow Characteristics:
 - Perennial: contains water at all times except during extreme drought.
 - Intermittent: carries water a considerable portion of the time, but ceases to flow occasionally or seasonally.
 - Ephemeral: carries water only during and immediately after periods of rainfall or snowmelt.
- Ordinary High Water Mark: The limit line on the shore established by the fluctuation of the water surface. It is shown by such things as a clear line impressed on the bank, shelving, changes in soil character, destruction of terrestrial vegetation, the presence of litter and debris or other features influenced by the surrounding area.
- Bank Shape Descriptions:
 - Undercut: banks that overhang the stream channel
 - Steep: bank slope of approximately greater than 30 degrees
 - Gradual: bank slope of approximately 30 degrees or less
- Aquatic Habitat Descriptions:
 - Pool: deeper portion of a stream where water flows slower than in neighboring, shallower portions, smooth surface, and finer substrate
 - Riffle: shallow area in a stream where water flows swiftly over gravel and rock or other coarse substrate resulting in a rough flow and a turbulent surface
 - Run: section of a stream with a low or high velocity and with little or no turbulence on the surface of the water.

5.0 WETLAND DELINEATION FIELD OBSERVATIONS RESULTS

On November 7, 2012, Terracon performed fieldwork and identified three wetland areas, six WUS, two erosional features (EF), and one pond on the subject site. The areas are designated as Wetland Areas 1 through 3, WUS-1 through WUS-4, EF-5, EF-6, WUS-7 and WUS-8, and Pond 1 as shown on Exhibit 5 in Appendix A. A fourth wetland was identified outside of the project limits. Wetland Determination Data Forms for each wetland area can be found in Appendix C. Ground photographs, included in Appendix D, provide an indication of the physical characteristics observed during the site visit.

5.1 Wetland Area 1

Wetland Description			
Wetland ID	WL-1		
Size	0.02 acres		
Sampling Point(s)	DP-6		
Photo ID	5		
Association w/ WUS	Adjacent to WUS-2		
Wetland Description	Topographic elevation is approximately 15 to 30 feet below the surrounding area on a stream bench.		
NWI Map	None		
Cowardin Classification	Palustrine		
Wetland Type	Emergent		
Vegetative Cover	Evenly mixed with non-vegetated		
Dominant Wetland Vegetation	<u>Common Name</u> Yellow bristle grass Reed canary grass Great ragweed	<u>Scientific Name</u> <i>Setaria pumila</i> <i>Phalaris arundinacea</i> <i>Ambrosia trifida</i>	<u>WL Indicator</u> FAC FACW FAC
Hydrogeomorphic Class	Riverine		
Soil Type (soil survey)	Pits-Dumps Complex Mines		
Soil Type (field obs.)	Sandy loam		
Soil Characteristics	Depleted Matrix		
Hydrology Characteristics	Saturation		
Hydrology Source	WUS-2 and surrounding land		
Other Information			
Non-Wetland (Upland) Description			
Data Point(s)	DP-7		
Habitat Type	Eroded, disturbed mining area		
Was there a marked difference between the wetland and upland	Yes		
Was there a gradual change in vegetation between the wetland and upland creating a "transition zone"	No		
Was there an abrupt topographic change between the wetland and upland	Yes		

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5.2 Wetland Area 2

Wetland Description			
Wetland ID	WL-2		
Size	0.13 acres		
Sampling Point(s)	DP-10		
Photo ID	7		
Association w/ WUS	Adjacent to WUS-6		
Wetland Description	Topographic elevation is approximately three to six feet below the surrounding area in a depressional area.		
NWI Map	None		
Cowardin Classification	Palustrine		
Wetland Type	Emergent		
Vegetative Cover	Evenly mixed with non-vegetated		
Dominant Wetland Vegetation	<u>Common Name</u>	<u>Scientific Name</u>	<u>WL Indicator</u>
	Annual bluegrass	<i>Poa annua</i>	FAC
	Broad-leaf cat-tail	<i>Typha latifolia</i>	OBL
	Sedge species	<i>Carex</i> species	FACW
Hydrogeomorphic Class	Depression		
Soil Type (soil survey)	Pits-Dumps Complex Mines		
Soil Type (field obs.)	Silt loam		
Soil Characteristics	Depleted Matrix		
Hydrology Characteristics	Oxidized Rhizospheres on Living Roots, Drainage Patterns, FAC-Neutral Test		
Hydrology Source	Surrounding land and WUS-6		
Other Information			
Non-Wetland (Upland) Description			
Data Point(s)	DP-11		
Habitat Type	Bareground and grassland, disturbed mining area		
Was there a marked difference between the wetland and upland	Gradual		
Was there a gradual change in vegetation between the wetland and upland creating a "transition zone"	Yes Width of transition zone ~ eight feet		
Was there an abrupt topographic change between the wetland and upland	No		

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5.3 Wetland Area 3

Wetland Description			
Wetland ID	WL-3		
Size	0.15 acres		
Sampling Point(s)	DP-13		
Photo ID	8		
Association w/ WUS	Adjacent to Pond 1		
Wetland Description	Adjacent to Pond 1		
NWI Map	None		
Cowardin Classification	Fringe		
Wetland Type	Emergent		
Vegetative Cover	Sparse		
Dominant Wetland Vegetation	<u>Common Name</u> Common spikerush Chufa Yellow bristle grass	<u>Scientific Name</u> <i>Elocharis palustis</i> <i>Cyperus esculentus</i> <i>Setaria pumila</i>	<u>WL Indicator</u> OBL FACW FAC
Hydrogeomorphic Class	Fringe		
Soil Type (soil survey)	Water/Pits-Dumps complex Mines		
Soil Type (field obs.)	Silt loam		
Soil Characteristics	Depleted Matrix		
Hydrology Characteristics	Oxidized Rhizosphers on Living Roots		
Hydrology Source	Pond 1 and surrounding land		
Other Information			
Non-Wetland (Upland) Description			
Data Point(s)	DP-12		
Habitat Type	Disturbed mining area		
Was there a marked difference between the wetland and upland	Gradual		
Was there a gradual change in vegetation between the wetland and upland creating a "transition zone"	Yes Width of transition zone ~ four feet		
Was there an abrupt topographic change between the wetland and upland	No		

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**5.4 Waters of the United States 1**

Waters of the United States Description	
WUS ID	WUS-1
Approximate Length Onsite	1,730 feet, 1,150 feet on-site (GPS surveyed)
Name of Water Body	Unnamed tributary of South Avery Creek
Location	Southwestern portion of site
WUS Type	Manipulated
Flow Characteristics	Intermittent
Ordinary High Water Mark (OHWM)	No
Defined Bed & Bank	Yes
Channel Width Across OHWM	NA
Channel Width Across Bank Top	6 to 13 feet
Channel Width Across Water Surface or Dry Bottom	6 to 12 feet
Water Depth	NA
Water Clarity	NA
Water Color	NA
Stream Flow	NA
Stream Flow Direction	Northwest to southeast
Bank Height	Left Bank: 3-5 feet
	Right Bank: 4-7 feet
% Slope On Banks	Left Bank: Gradual
	Right Bank: Undercut
Bank Substrate	30% Gravel/Rock, 20% Sand, 30% Soil, 30% Organic
Bed Substrate	50%, Gravel/Rock, 20% Sand, 20% Soil, 10% Organic
Riparian Vegetation Descr. & Width	Bareground and trees
Wetland Fringe	None
Aquatic Organisms	None observed
Aquatic Habitat	NA

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**5.5 Waters of the United States 2**

Waters of the United States Description	
WUS ID	WUS-2
Approximate Length Onsite	1,890 feet (GPS surveyed)
Name of Water Body	Unnamed tributary of South Avery Creek
Location	Eastern portion of site
WUS Type	Manipulated
Flow Characteristics	Intermittent
Ordinary High Water Mark (OHWM)	Yes
Defined Bed & Bank	Yes
Channel Width Across OHWM	4 to 6 feet
Channel Width Across Bank Top	6 to 13 feet
Channel Width Across Water Surface or Dry Bottom	4 to 12 feet
Water Depth	0 to 6 inches
Water Clarity	Very turbid
Water Color	Yellow
Stream Flow	Pooled
Stream Flow Direction	Northwest to southeast
Bank Height	Left Bank: 10-15 feet
	Right Bank: 8-15 feet
% Slope On Banks	Left Bank: Undercut/Eroded
	Right Bank: Undercut/Eroded
Bank Substrate	20% Gravel/Rock, 60% Soil, 20% Organic
Bed Substrate	20% Gravel/Rock, 80% Soil
Riparian Vegetation Descr. & Width	Bareground and mine pilings
Wetland Fringe	Wetland 1
Aquatic Organisms	None observed
Aquatic Habitat	Pool

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**5.6 Waters of the United States 3**

Waters of the United States Description	
WUS ID	WUS-3
Approximate Length Onsite	510 feet (GPS surveyed)
Name of Water Body	Unnamed
Location	Northern portion of site, flows into WUS-2
WUS Type	Manipulated
Flow Characteristics	Ephemeral
Ordinary High Water Mark (OHWM)	No
Defined Bed & Bank	Yes
Channel Width Across OHWM	1 to 3
Channel Width Across Bank Top	4 to 8 feet
Channel Width Across Water Surface or Dry Bottom	1 to 4 feet
Water Depth	0 to 3 inches
Water Clarity	Very turbid
Water Color	Brown and yellow
Stream Flow	Pooled
Stream Flow Direction	Southwest to northeast
Bank Height	Left Bank: 5-12 feet
	Right Bank: 5-15 feet
% Slope On Banks	Left Bank: Steep/Eroded
	Right Bank: Steep/Eroded
Bank Substrate	10% Gravel/Rock, 30% Soil, 60% Organic
Bed Substrate	20% Gravel/Rock, 80% Soil
Riparian Vegetation Descr. & Width	Grassland and forested
Wetland Fringe	None
Aquatic Organisms	None observed
Aquatic Habitat	pool

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**5.7 Waters of the United States 4**

Waters of the United States Description	
WUS ID	WUS-4
Approximate Length Onsite	810 feet (GPS surveyed)
Name of Water Body	Unnamed
Location	Northeastern portion of site, flows into WUS-2
WUS Type	Manipulated
Flow Characteristics	Ephemeral
Ordinary High Water Mark (OHWM)	Yes
Defined Bed & Bank	Yes
Channel Width Across OHWM	1 to 3
Channel Width Across Bank Top	2 to 6 feet
Channel Width Across Water Surface or Dry Bottom	1 to 3 feet
Water Depth	0 to 2 inches
Water Clarity	Very turbid
Water Color	Brown and yellow
Stream Flow	Pooled
Stream Flow Direction	East to west
Bank Height	Left Bank: 7-20 feet
	Right Bank: 7- 20 feet
% Slope On Banks	Left Bank: Steep/Eroded
	Right Bank: Steep/Eroded
Bank Substrate	20% Gravel/Rock, 80% Soil
Bed Substrate	20% Gravel/Rock, 80% Soil
Riparian Vegetation Descr. & Width	Bareground and mind pilings
Wetland Fringe	None
Aquatic Organisms	None observed
Aquatic Habitat	pool

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**5.8 Erosional Feature 5**

Erosional Feature Description	
ID	EF-5
Approximate Length Onsite	170 feet (GPS surveyed)
Name of Water Body	Unnamed
Location	Northern portion of site, flows into WUS-3
Type	Manipulated
Flow Characteristics	Ephemeral
Ordinary High Water Mark (OHWM)	No
Defined Bed & Bank	Yes
Channel Width Across OHWM	NA
Channel Width Across Bank Top	2 to 6 feet
Channel Width Across Water Surface or Dry Bottom	1 to 3 feet
Water Depth	NA
Water Clarity	NA
Water Color	NA
Stream Flow	NA
Stream Flow Direction	South to north
Bank Height	Left Bank: 5-12 feet
	Right Bank: 4-10 feet
% Slope On Banks	Left Bank: Steep/Eroded
	Right Bank: Steep/Eroded
Bank Substrate	20% Gravel/Rock, 80% Soil
Bed Substrate	20% Gravel/Rock, 80% Soil
Riparian Vegetation Descr. & Width	Bareground and mind pilings
Wetland Fringe	None
Aquatic Organisms	None observed
Aquatic Habitat	NA

Wetland Delineation Report

Teach AML Reclamation Site ■ Ottumwa, Iowa

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**5.9 Erosional Feature 6**

Erosional Feature Description	
ID	EF-6
Approximate Length Onsite	600 feet (GPS surveyed)
Name of Water Body	Unnamed
Location	Central portion of site, flows into Pond 1
Type	Artificial
Flow Characteristics	Ephemeral
Ordinary High Water Mark (OHWM)	No
Defined Bed & Bank	Yes
Channel Width Across OHWM	NA
Channel Width Across Bank Top	2 to 6 feet
Channel Width Across Water Surface or Dry Bottom	1 to 3 feet
Water Depth	NA
Water Clarity	NA
Water Color	NA
Stream Flow	NA
Stream Flow Direction	South to north
Bank Height	Left Bank: 5-10 feet
	Right Bank: 4-8 feet
% Slope On Banks	Left Bank: Steep/Eroded
	Right Bank: Steep/Eroded
Bank Substrate	20% Gravel/Rock, 80% Soil
Bed Substrate	20% Gravel/Rock, 80% Soil
Riparian Vegetation Descr. & Width	Bareground and mind pilings
Wetland Fringe	None
Aquatic Organisms	None observed
Aquatic Habitat	NA

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Teach AML Reclamation Site ■ Ottumwa, Iowa

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**5.10 Waters of the United States 7**

Waters of the United States Description	
WUS ID	WUS-7
Approximate Length Onsite	310 feet (estimated with aerial photography)
Name of Water Body	Unnamed
Location	Northern portion of site, flows into WUS-2
WUS Type	Manipulated
Flow Characteristics	Ephemeral
Ordinary High Water Mark (OHWM)	No
Defined Bed & Bank	Yes
Channel Width Across OHWM	NA
Channel Width Across Bank Top	1 to 4 feet
Channel Width Across Water Surface or Dry Bottom	½ to 3 feet
Water Depth	NA
Water Clarity	NA
Water Color	NA
Stream Flow	NA
Stream Flow Direction	Northeast to southwest
Bank Height	Left Bank: 2-6 feet
	Right Bank: 2-6 feet
% Slope On Banks	Left Bank: Gradual to Steep
	Right Bank: Gradual to Steep
Bank Substrate	20% Gravel/Rock, 20% Soil, 60% Organic
Bed Substrate	20% Gravel/Rock, 40% Soil, 40% Organic
Riparian Vegetation Descr. & Width	Forested
Wetland Fringe	None
Aquatic Organisms	None observed
Aquatic Habitat	NA

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5.11 Waters of the United States 8

Waters of the United States Description	
WUS ID	WUS-8
Approximate Length Onsite	410 feet (estimated with aerial photography)
Name of Water Body	Unnamed
Location	Northern portion of site, flows into WUS-2
WUS Type	Manipulated
Flow Characteristics	Ephemeral
Ordinary High Water Mark (OHWM)	No
Defined Bed & Bank	Yes
Channel Width Across OHWM	NA
Channel Width Across Bank Top	1 to 4 feet
Channel Width Across Water Surface or Dry Bottom	½ to 3 feet
Water Depth	NA
Water Clarity	NA
Water Color	NA
Stream Flow	NA
Stream Flow Direction	Northeast to southwest
Bank Height	Left Bank: 2-6 feet Right Bank: 2-6 feet
% Slope On Banks	Left Bank: Gradual to Steep Right Bank: Gradual to Steep
Bank Substrate	20% Gravel/Rock, 20% Soil, 60% Organic
Bed Substrate	20% Gravel/Rock, 50% Soil, 30% Organic
Riparian Vegetation Descr. & Width	Forested and grassland
Wetland Fringe	None
Aquatic Organisms	None observed
Aquatic Habitat	NA

5.12 Waters of the United States - Pond 1

Waters of the United States Description	
WUS ID	Pond 1
Approximate Area	2.6 acres (est. with aerial photography)
Name of Water Body	Unnamed
Location	Southwest portion of site
WUS Type	Artificial
Bank Description	Eroded
Riparian Vegetation Descr. & Width	Sparse vegetation
Wetland Fringe	WL-3 on northeastern edge of pond
Aquatic Organisms	None observed

6.0 WETLAND AND WATERS OF THE UNITES STATES SUMMARY

This report details the procedures used to identify wetlands on the project site. In accordance with the field procedures described in this report, wetlands and WUS were identified at the subject site. The following table summarizes the sizes of the delineated wetland within the subject site.

	Wetland Area (acre)
WL-1	0.02
WL-2	0.13
WL-3	0.15
Total	0.30

The following table summarizes the approximate lengths of WUS and erosional features based on GPS survey results and aerial photograph estimations.

	WUS/EF Length (feet)
WUS-1	1,730
WUS-2	1,890
WUS-3	510
WUS-4	810
EF-5	170
EF-6	600
WUS-7	310
WUS-8	410
Total	6,430

The following table summarizes the approximate sizes of ponds based on aerial photograph estimations.

	WUS Area (acres)
Pond-1	2.6
Total	2.6

The approximate wetland boundaries and WUS locations are depicted on the Wetland Delineation Map (Exhibit 5 in Appendix A).

7.0 WETLAND AND WUS DELINEATION RECOMMENDATIONS

According to survey results, 0.30 acres of wetlands, 5,660 linear feet of WUS, 770 linear feet of erosional features, and approximately 2.6 acres of pond were identified on the subject site. Only the USACE can make the final determination on the jurisdictional status of wetlands or WUS, and on the need for permit processing and compensatory mitigation.

If wetland or WUS impacts are proposed, a color copy of this report should be submitted along with a signed Section 404 Permit to the USACE for confirmation of findings and an official USACE Jurisdictional Determination regarding the proposed impacts. The USACE can be reached at the following address:

United States Army Corps of Engineers
Rock Island District – Clock Tower Building
PO Box 2004
Rock Island, IL 61204-2004

8.0 UPSTREAM WATER CONTROL STRUCTURES

During the site visit, Terracon collected size information for upstream controls (e.g. culverts, weirs, or road crossings) that may affect the amount of water reporting to the creek on the east side of the site. Eight culverts were identified within approximately 2,000 feet of the site. The culvert locations and sizes can be seen on Exhibit 7 in Appendix A. Photos of the culverts can be found in Appendix D.

Please note that a culvert outlet was not identified at the smaller pond northeast of the project area (near the 4' x 4' culvert identified on Exhibit 7 in Appendix A). Terracon investigated this area and spoke to the property owner who confirmed that there was not a culvert outlet for the small pond.

9.0 SURFACE WATER SAMPLING

Terracon collected surface water samples to characterize the water quality of the site. Three surface water samples were collected at locations determined by Trihydro Corporation. One sample was collected from the water-filled pit (Pond 1), a second sample was collected from WUS-2 upgradient of the site, and the third sample was collected in WUS-2 downstream of the acidic spoils. The surface water sampling locations can be seen on Exhibit 8 in Appendix A.

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Prior to sample collection, Terracon calibrated the water quality instrument and recorded calibrations in the field log. Samples were collected using the grab collection method. When collecting the sample, Terracon did not allow the collection container to touch the bottom of the creek or pond. Terracon avoided stirring up sediment to prevent suspended sediment from being captured in the samples. Samples were collected in flowing reaches of the creek and not in stagnant water and in accordance with standard collection and laboratory (field) practices. Terracon collected one extra unpreserved bottle for field measurements (pH, temperature, and conductivity) and performed metering at stream side using a field calibrated YSI Mode4I 556.

Sampling equipment was decontaminated between each water sample collection to minimize the risk of cross contamination. Decontamination was completed by using a small amount of Simple Green (or other biodegradable cleaning product) and clean tap water. Use of decontaminated equipment was utilized for each sample location.

Terracon prepared a field log including descriptions of field measurement data (e.g. pH, temperature, conductivity, and flow [if applicable]) and the sampler's interpretation of the water quality conditions (visual observations) between samples. Terracon submitted the water samples to an approved analytical laboratory. Each sample was analyzed by the laboratory for the properties listed below:

1. Acidity
2. pH
3. Total suspended solids
4. Total dissolved solids
5. Total and dissolved Iron
6. Total and dissolved Manganese
7. Chloride
8. Sulfate

Wetland Delineation Report

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9.1 Surface Water Results

Analyte	Units	SW-1	SW-2	SW-3
Acidity	mg/L	111	426	174
pH	Unitless	4.4	4.4	3.4
Total Dissolved Solids	mg/L	450	5000	1150
Total Dissolved Iron	mg/L	1.75	34.8	6.55
Total Iron	mg/L	10.5	57.1	8.92
Total Dissolved Manganese	mg/L	412	55.9	10.7
Total Manganese	mg/L	2.91	50.0	11.0
Total Suspended Solids	mg/L	412	126	12.7
Chloride	mg/L	<5.0	863	<5.0
Sulfate	mg/L	337	3350	1010
Temperature (field recorded)	°C	5.52	6.83	8.67
pH (field recorded)	Unitless	3.32	4.18	3.39
Conductivity (field recorded)	mS/cm	1.878	5.488	1.475

Samples were collected/measured on November 16, 2012

The pHs for all the samples were below the limits of domestic water supply (5-9 pH) and aquatic life (6.5-9 pH).

Total Suspended Solids (TSS) does not have state or federal standards. However, a guideline used for aquatic life and most recreation is 58 mg/L. SW-1 (412 mg/L) and SW-2 (126 mg/L) exceeded the TSS guideline.

The Iowa Department of Resources (IDNR) has recommended a 1 mg/L of total iron for aquatic life as a general criterion. All samples exceeded this criterion, with SW-2 having the highest reading with 57.1 mg/L.

Sulfate and Total Dissolved Solids currently do not have federal or state water quality standards. Iowa has a recommended guideline for livestock watering with a value of 1,000 mg/L for Sulfate (IDNR, 2009). The SW-3 sample had a result of 1,010 mg/L which was the only sampled that exceeded the guideline. Iowa's Total Dissolved Solids (TDS) criterion is 750 mg/L. The SW-2 and SW-3 exceeded this criterion with results of 5,000 mg/L and 1,150 mg/L respectively (IDNR, 2007).

Chloride was below detectable limits in the SW-1 and SW-3 samples. In the SW-2 sample chloride was above the acute parameter (860mg/L) and the chronic parameter (230 mg/L) national criteria for aquatic life (IDNR, 2011).

Wetland Delineation Report

Teach AML Reclamation Site ■ Ottumwa, Iowa
December 13, 2012 ■ Terracon Project No. 08127120



All the properties analyzed for were highest in the downgradient sample, SW-2, except for TSS.

The laboratory analytical results for the surface water samples can be found in Appendix E.

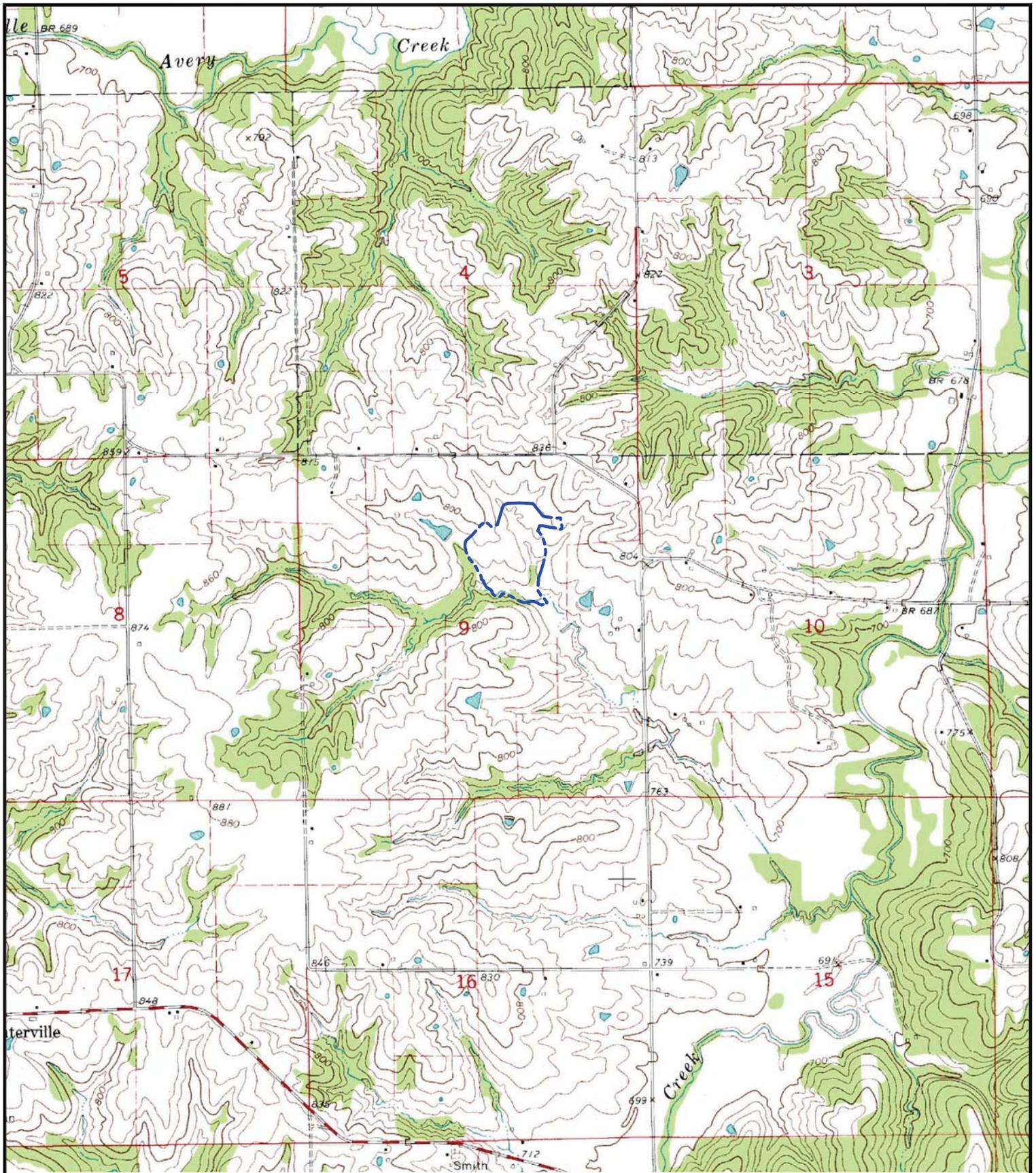
10.0 GENERAL COMMENTS

The wetland delineation was performed using the USACE Manual and Midwest Supplement. The manual provides assistance for delineating wetlands based on the three criteria discussed. However, the manual alone may not have provided enough information to document whether or not the three criteria were met. Various physical properties or other visual signs used to evaluate whether the three wetland identification criteria areas were satisfied may not be straightforward, especially in disturbed or problem areas. The manual also allows the user to visually estimate certain indicators such as the percentage of area covered by dominant species for the entire community. Terracon did not attempt to identify every possible plant species and did not classify soil type by laboratory methods. Due to seasonal changes, Terracon cannot guarantee the area to exhibit or not to exhibit wetland characteristics at all times of the year. The limitations of this wetland delineation should be recognized.

This report has been prepared in accordance with generally accepted scientific and engineering evaluation practices. This report is for the exclusive use of the client for the project being discussed. No warranties, either express or implied, are intended or made.

APPENDIX A

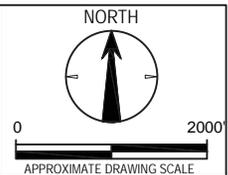
Exhibits



TOPOGRAPHIC IMAGE FROM IOWA GEOGRAPHIC MAP SERVER MAINTAINED BY IOWA STATE UNIVERSITY AND MIT - <http://cairo.gis.iastate.edu/map.html>

LEGEND

--- - BOUNDARY OF ASSESSED AREA

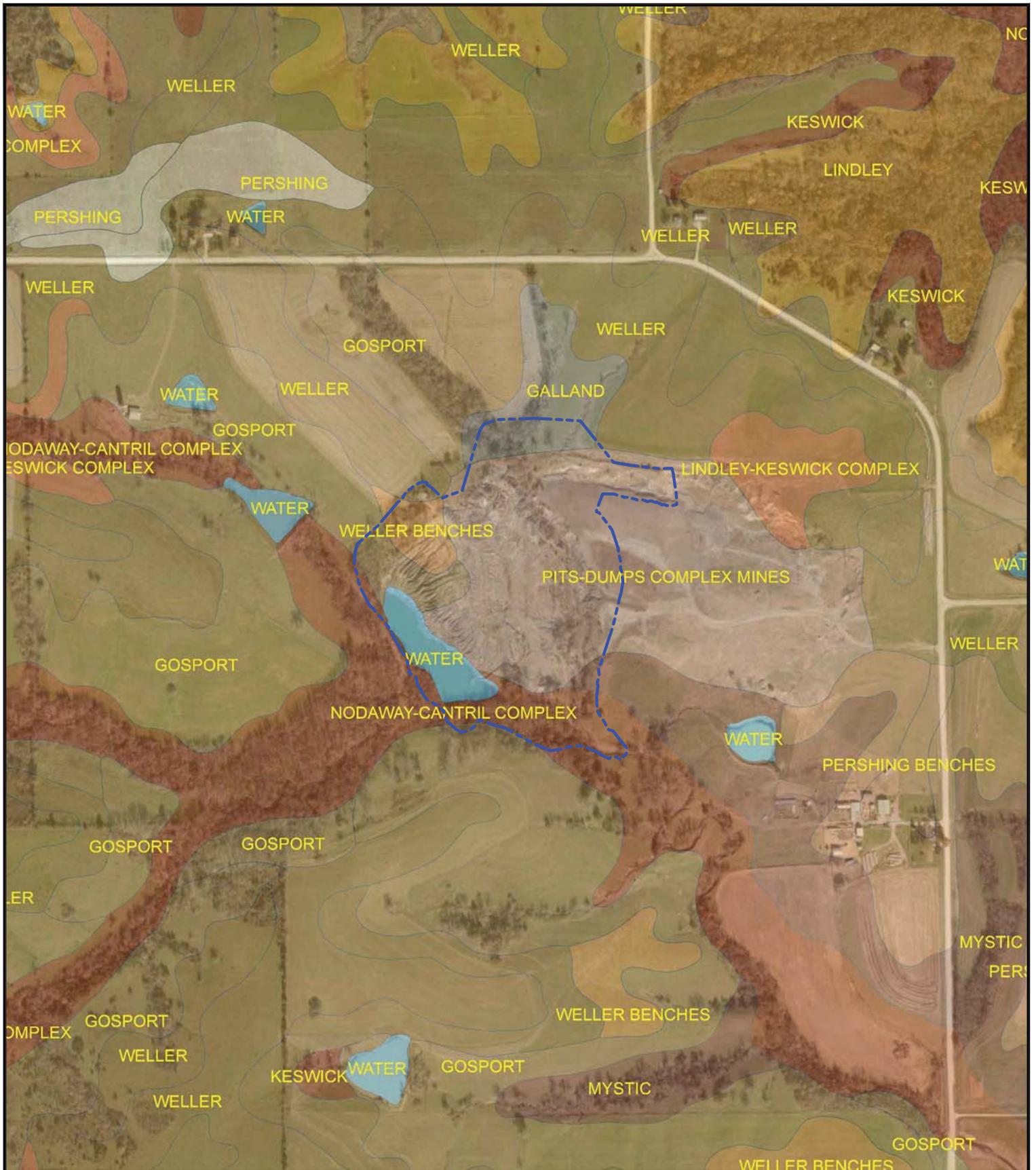


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08127120	11/26/12
Project Mngr:	Drawn By:
ESM	KEK
File Name:	
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Layout Name:	
E1	

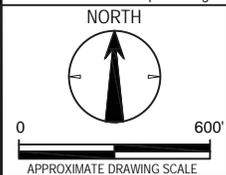
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Consulting Engineers and Scientists

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PH. (515) 244-3184 FAX. (515) 244-5249

TOPOGRAPHIC SITE MAP	EXHIBIT
TEACH AML RECLAMATION PROJECT TRIYHDRO CORPORATION 220TH AVENUE OTTUMWA, IOWA	1



GIS INFO FROM NATURAL RESOURCES GEOGRAPHIC INFORMATION SYSTEMS LIBRARY <http://www.igsb.uiowa.edu/~nrgislib/>



Project No:	Date:
08127120	11/26/12
Project Mngr:	Drawn By:
ESM	KEK
File Name:	
08127120-01.dwg	
Layout Name:	
E3	

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LEGEND

----- - BOUNDARY OF ASSESSED AREA

SOIL SURVEY MAP	EXHIBIT
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AERIAL PHOTO FROM IOWA GEOGRAPHIC MAP SERVER MAINTAINED BY IOWA STATE UNIVERSITY AND MIT - <http://cairo.gis.iastate.edu/map.html>

LEGEND

----- - BOUNDARY OF ASSESSED AREA

NORTH

0 500'

APPROXIMATE DRAWING SCALE

Project No.	Date:
08127120	11/26/12
Project Mngr:	Drawn By:
ESM	KEK
File Name:	
08127120-01.dwg	
Layout Name:	
E4	

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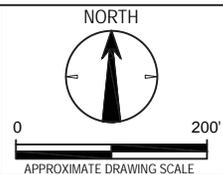
HILLSHADE FROM LIDAR AND AERIAL PHOTO	EXHIBIT
TEACH AML RECLAMATION PROJECT TRIYHDRO CORPORATION 220TH AVENUE OTTUMWA, IOWA	4



LEGEND

- - - - BOUNDARY OF ASSESSED AREA
- - WATERS OF THE U.S. (WUS)
- - EROSIONAL FEATURE (EF)
- WETLAND AREA
- - DATA POINT LOCATION
- P - PHOTO LOCATION & DIRECTION

AERIAL PHOTO FROM IOWA GEOGRAPHIC MAP SERVER MAINTAINED BY IOWA STATE UNIVERSITY AND MIT - <http://cairo.gis.iastate.edu/map.html>



Project No.	Date:
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Project Mngnr:	Drawn By:
ESM	ESM
File Name:	
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Layout Name:	
E5	

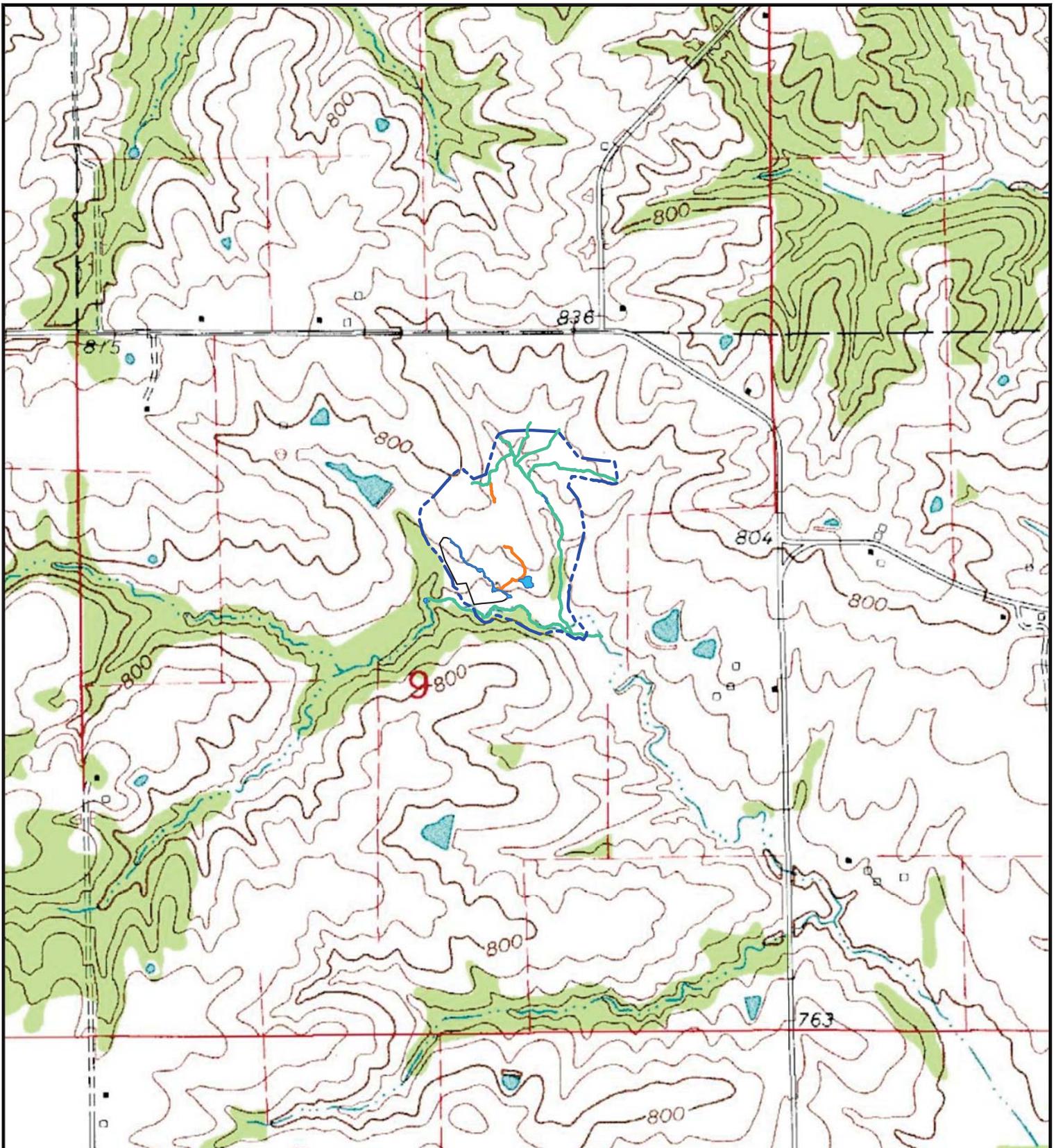
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WETLAND DELINEATION MAP
TEACH AML RECLAMATION PROJECT
TRIYHDRO CORPORATION
220TH AVENUE
OTTUMWA, IOWA

EXHIBIT

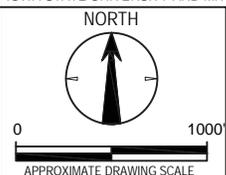
5



LEGEND

- Dashed blue line - BOUNDARY OF ASSESSED AREA
- Solid green line - WATERS OF THE U.S. (WUS)
- Solid orange line - EROSIONAL FEATURE (EF)
- Blue hatched area - WETLAND AREA
- Blue area - POND

TOPOGRAPHIC IMAGE FROM IOWA GEOGRAPHIC MAP SERVER MAINTAINED BY IOWA STATE UNIVERSITY AND MIT - <http://cairo.gis.iastate.edu/map.html>



Project No:	Date:
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Project Mgr:	Drawn By:
ESM	ESM
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08127120-01.dwg	
Layout Name:	
E6	

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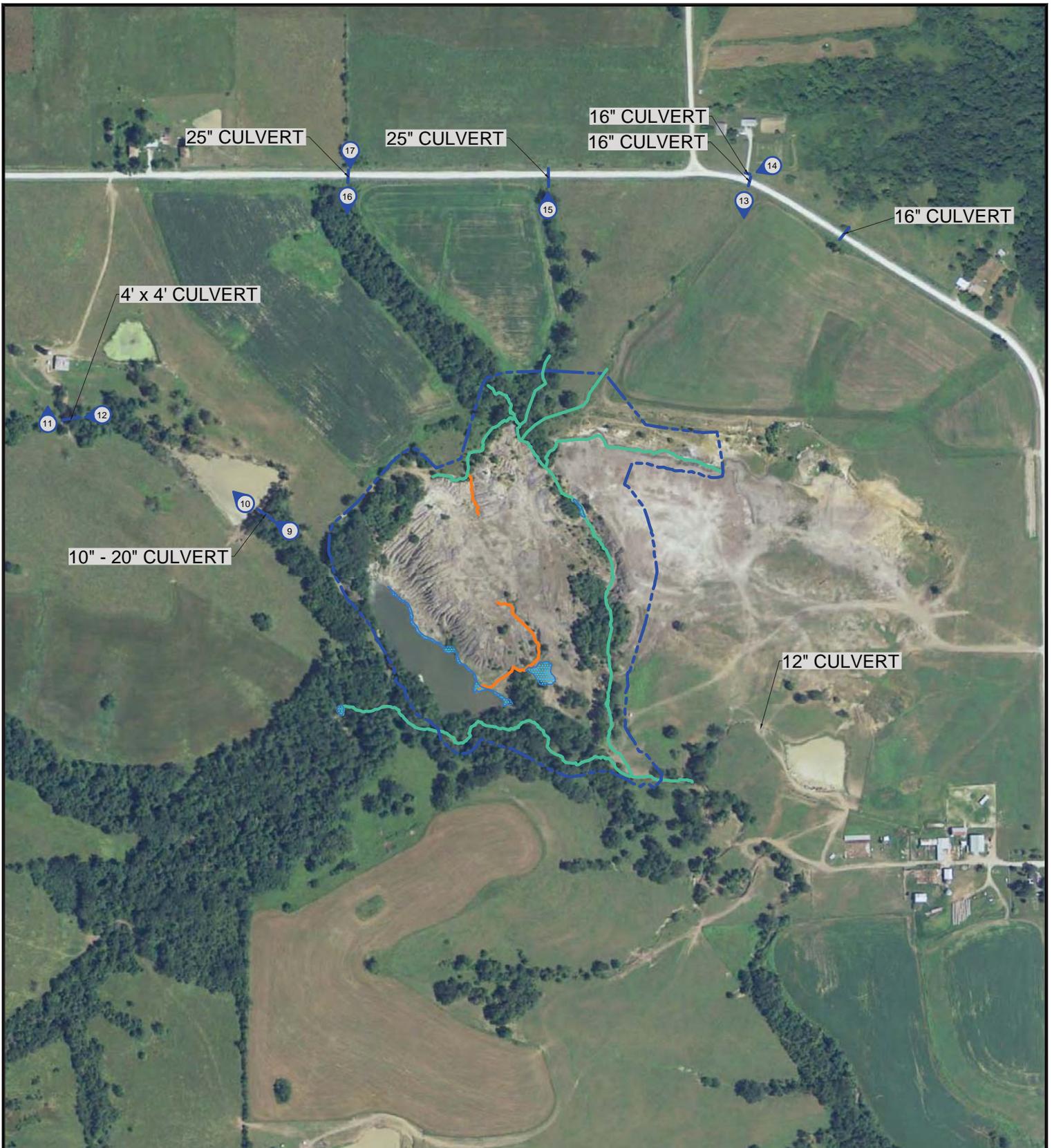
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TOPOGRAPHIC SITE MAP WITH WETLAND/WUS LOCATIONS

TEACH AML RECLAMATION PROJECT
TRIYHRO CORPORATION
220TH AVENUE
OTTUMWA, IOWA

EXHIBIT

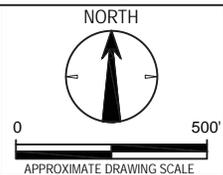
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LEGEND

- - BOUNDARY OF ASSESSED AREA
- - WATERS OF THE U.S. (WUS)
- - EROSIONAL FEATURE (EF)
- WETLAND AREA
- ▶ - PHOTO LOCATION & DIRECTION

AERIAL PHOTO FROM IOWA GEOGRAPHIC MAP SERVER MAINTAINED BY IOWA STATE UNIVERSITY AND MIT - <http://cairo.gis.iastate.edu/map.html>



Project No:	Date:
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Project Mngr:	Drawn By:
ESM	KEK
File Name:	
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Layout Name:	
E5	

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CULVERT LOCATIONS
TEACH AML RECLAMATION PROJECT TRIYHORO CORPORATION 220TH AVENUE OTTUMWA, IOWA

EXHIBIT
7



LEGEND

- - - - BOUNDARY OF ASSESSED AREA
- - WATERS OF THE U.S. (WUS)
- - EROSIONAL FEATURE (EF)
- WETLAND AREA
- - SURFACE WATER SAMPLE LOCATION

AERIAL PHOTO FROM IOWA GEOGRAPHIC MAP SERVER MAINTAINED BY IOWA STATE UNIVERSITY AND MIT - <http://cairo.gis.iastate.edu/map.html>

NORTH

0 200'

APPROXIMATE DRAWING SCALE

Project No. 08127120	Date: 11/26/12
Project Mngr: ESM	Drawn By: KEK
File Name: 08127120-01.dwg	
Layout Name: E8	

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SURFACE WATER SAMPLING LOCATIONS
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EXHIBIT
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