# WATERSHED LAND TRUST, INC. IN-LIEU FEE PROGRAM MISSION CREEK STREAM, RIPARIAN, AND WETLAND MITIGATION PLAN
# Brown County, Kansas

***Submitted to*:**

**United States Army Corps of Engineers**
**Kansas City District Office**

***Submitted by*:**

**Watershed Land Trust, Inc.**


Missouri Office
140 Cherry Hill Dr.
Belton, MO 64012

Kansas Corporate Office
7211 W. 98th Terr., Ste. 140
Overland Park, KS

Kansas Field Office
1200 SW Executive Dr.
Topeka, KS 66615


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# INTRODUCTION

In 1924, City Horton, Kansas had Mission Lake constructed for public water supply and recreation purposes by impounding Mission Creek. Due to sedimentation, the water supply volume decreased substantially. In 2008, the City of Horton participated in a pilot dredging project under the Multipurpose Small Lakes Program administered by the Department of Agriculture Division of Conservation (DOC). Dredging activities included removal of approximately 1 million cubic yards of sediment and construction of a Confined Disposal Facility (CDF) to store the dredged materials. CDF construction impacted 2,200 feet of jurisdictional stream channel on an unnamed tributary to Mission Creek.

In September 2008, the U.S. Army Corps of Engineers (USACE) notified the City of Horton that the aquatic habitat loss of 2,200 feet of stream channel required compensatory mitigation under Section 404 of the Clean Water Act (CWA). USACE administers a permit program for both the discharge of dredge and fill materials into waters and wetlands of the United States under Section 404 of the CWA and for activities in navigable waters under Section 10 of the Rivers and Harbors Act. The Section 404 permit program relies on the use of compensatory mitigation to offset unavoidable aquatic resource impacts by replacing functions and values lost to authorized activities.

To assess pre-construction stream habitat quality, the Kansas Water Office (KWO) proposed a compensatory mitigation plan for the impacts to the water of the United States (WOUS) associated with the Mission Lake Dredging project (KWO 2009). A copy of the KWO mitigation plan is included in Appendix A. Table 1 shows the scores KWO used to derive the impact debit calculation using the Kansas Stream Mitigation Guidance (KSMG). KWO's impact debit score totaled 11,544. USAC approved WOUS impacts outlined in the compensatory mitigation plan.

**Table 1:** Adverse Impact Factors Worksheet

| Factor | CDF Fill Impact |
|---|---|
| Stream Type Impacted | 0.4 |
| Stream Status | 0.4 |
| Existing Condition | 0.8 |
| Duration | 0.3 |
| Activity | 2.5 |
| Total Project Impact | 0.8 |
| Sum of Factors | **M** = 5.2 |
| Linear Feet of Stream Impacted | **LF** = 2,200 |
| M x LF | **11,544** |

To meet the mitigation requirements set forth by USACE, the City of Horton chose to use an USACE approved In-Lieu Fee (ILF) program. An ILF program involves the restoration, establishment, enhancement, and/or preservation of aquatic resources through funds paid to an approved natural resource management entity or to a government body by a USACE permit recipient in order to satisfy compensatory mitigation requirements outlined in the USACE permit (USACE 2010a). City of Horton chose the ILF program administered by the Watershed Land, Trust (WLT). WLT provides the required ILF program financial and legal expertise, and uses the Watershed Institute, Inc. (TWI) to assist with the technical expertise for mitigation implementation and monitoring. TWI is a not-for-profit natural resources agency with staff experience in stream and wetland design, fluvial geomorphology, stream ecology, wildlife biology, endangered species conservation, and environmental and water rights law. TWI has identified an appropriate mitigation strategy and extent of land to preserve through a conservation easement held by the WLT within City of Horton property. This stream, riparian, and wetland mitigation plan will provide information on the mitigation strategy as outlined in *In-Lieu Fee Program Instrument Outline for Proposed In-Lieu Fee Programs in the States of Kansas and Missouri* (USACE 2010b).

## OBJECTIVES

WLT's objective is to fully offset the aquatic habitats (stream and wetland) lost from 14 ILF program projects, including CDF construction. All 14 projects are located within the Kansas Service Area (SA) (see Appendix B, Figure 1) as defined by the WLT ILF Program Instrument (WLT 2013). The WLT ILF program serves the entire state of Kansas, but divides the state into 11 unique service areas. A SA is a region where landscape properties are similar that influence

stream habitat conditions and functional processes. Kansas City District USACE and the Kansas Interagency Review Team (IRT) determined that the USGS Hydrologic Unit Code (HUC) watersheds are the appropriate basis to develop service area boundaries. The WLT ILF Instrument identifies 11 unique service areas within the state of Kansas, including the Kansas SA. WLT discusses in detail projects offset by the Mission Creek Mitigation Site in the Determination of Credits section.

All mitigation activities are in the Mission Lake watershed and have similar aquatic resources and landscape positions as CDF impacts. Stream mitigation activities include stabilizing the streambed and streambanks, and enhancing aquatic habitats for 1,640 feet of a third-order, Rosgen C6 perennial channel; stabilizing 1,020 feet of a second-order, Rosgen C6 channel; stabilizing 445 feet of a second order, Rosgen F6 perennial channel; stabilizing 755 feet of a first-order, Rosgen F6 intermittent channel. Riparian buffer activities include creating riparian buffers along 3,860 feet of perennial and intermittent stream channel and preserving 361 feet of riparian buffer along a first-order ephemeral stream channel. Wetland mitigation activities include enhancing 1.35 acres of seasonal wetlands and creating 0.22 acres of seasonal wetlands to filter nutrients and sediments from overland flow. Proposed mitigation activities will help reduce lake sedimentation, a continued concern to Mission Lake watershed stakeholders. Maximizing riparian buffers, enhancing in-channel stability, and enhancing and creating wetlands will reduce sediments delivered to the channel, reduce in-channel erosion, and improve aquatic habitats. TWI has the expertise to design in-channel habitat enhancement structures, to design wetland features, and to plant and establish riparian plantings.

## SITE SELECTION

The mitigation project is located in the eight-digit Delaware River HUC watershed (10270103), an identified high priority watershed in the same HUC 8 as the authorized activity (see Appendix B, Figure 2). More specifically, the mitigation site is in the West ½ of Section 16, Township 4 South, and Range 17 East; north of Mission Lake on Mission Creek in Brown County, Kansas (see Appendix B, Figure 3). The mitigation property includes two separate property tracts (identified in this report as North Tract and South Tract) of land generally bordered on the north by County Road 140, the half-section line on the east, City of Horton and private lands on the west, and

County Road 130 on the south (see Appendix B, Figure 4). Mitigation activities are located in the same section as the CDF aquatic impacts.

Mission Creek—a perennial WOUS—flows through both north and south tracts (see Appendix B, Figure 2-3). Between the two tracts, a Little Delaware-Mission Creek Joint District No. 5 watershed structure impounds Mission Creek. In the north tract, Mission Creek bankfull width is 19.68-feet and transitions from an incised, Rosgen F6 stream to a Rosgen C6 stream. The Mission Creek channel in the south tract is a Rosgen C6 stream with a bankfull width of 21.74-feet and the mean average flow is 0.92 cubic feet per second (U.S. Geological Survey [USGS] 2011). Table 2 lists the flow duration for Mission Creek. Mission Creek channel has incised and is slowly developing a new floodplain that is narrow and discontinuous. The unnamed intermittent tributary in the north tract is an incised Rosgen F6 stream with an average bankfull width of 13.35-feet. In the south tract, the ephemeral tributary narrow, entrenched channel. During each site visit to date, TWI has observed water in both tributary channels, and it appears that springs provide prolonged periods of flow. USGS (2011) does not list a mean annual flow for either tributary.

**Table 2:** Flow Duration (in cfs) for Mission Creek (USGS 2011).

| Flow Duration | Mission Creek |
|---|---|
| 90 | 0.00 |
| 75 | 0.00 |
| 50 | 0.07 |
| 25 | 1.15 |
| 10 | 5.01 |

The Delaware (10270103) sub-basin is a watershed identified by Kansas Department of Health and Environment (KDHE) and U.S. Department of Agriculture Natural Resources Conservation Service (NRCS) to be in need of restoration. Of the 92 HUC 8 watersheds in Kansas, KDHE and NRCS (1998) ranked the Delaware watershed 3$^{rd}$ highest priority for restoration (KDHE & NRCS 1998). Additionally, KDHE and NRCS (1998) ranked the adjacent Lower Kansas (10270104), Lower Big Blue (10270205), Middle Kansas (10270102), Upper Kansas (10270101), Lower Missouri-Crooked (10300101), and Lower Little Blue (10270107) as 1$^{st}$, 2$^{nd}$, 4$^{th}$, 22$^{nd}$, 32$^{nd}$, and 53$^{rd}$ priority watersheds, respectively (see Appendix B, Figure 1).

KDHE do not list Total Maximum Daily Load (TMDL) impairments for Mission Creek; however, KDHE has identified three TMDL impairments—eutrophication, siltation, and atrazine—for Mission Lake. The source of impairments KDHE identified is runoff from agricultural fields (KDHE 2014). KDHE has also identified three TMDL impairments for Grasshopper Creek, the receiving stream to Mission Creek. Grasshopper Creek's TMDL impairments include E. coli, atrazine, and total phosphorus (KDHE 2014). The Delaware River Watershed Restoration and Protections Strategy (WRAPS) – Nine Element Watershed Plan specifically addresses plans to improve the impaired Mission Lake (for siltation) and Grasshopper Creek (for bacteria) (Delaware WRAPS 2011). The WRAPS plan identifies multiple best management practice strategies for cropland and streambank erosion and livestock land use. For eroding croplands, the WRAPS plan intends to initiate projects that will create vegetative buffers with permanent vegetation, grassed waterways, retention structures, no-till systems, and sub-surface fertilizer application. For eroding streambanks, the WRAPS plan intends to initiate projects that will include tree planting buffers, bank re-shaping, stone-toe bank protection, and rock vanes and weirs to reduce water velocities in the near bank region. For livestock land use areas, the WRAPS plan intends to initiate projects that will include vegetative filter strips with permanent vegetation, relocation of feedlots and feeding pens, relocation of grazing pastures, off-stream watering systems, and rotational grazing practices (Delaware WRAPS 2011).

The Mission Creek mitigation project site is ecologically suitable for wetland and stream mitigation due to its location within a high priority watershed, existing natural resources, position along Mission Creek, topography, hydrology, and soils. Mitigation within the Delaware River watershed is encouraged because this waterway qualifies as a primary priority area under the KSMG (USACE 2010c). KSMG primary priority areas are defined as streams and riverine systems (including associated tributaries) that provide very important contributions to biodiversity on an ecosystem scale or high levels of function contributing to landscape, social, economic or human values (USACE 2010c).

Figure 5 (Appendix B) is the soil survey map TWI used to determine property characteristics (USDA NRCS 2015). Six soil series—two of which are listed as hydric—are found on the property: Wamego silty clay loam (4832), Kennebec silt loam (7051), Mayberry clay loam (7415),

Pawnee clay loam (7501), Wymore silty clay loam – 1 to 3 percent slopes (7681), and Wymore silty clay loam – 3 to 6 percent slopes (7683) (USDA NRCS 2005).

- *Wamego silty clay loam (3 to 7 percent slopes)* – Wamego silty clay loam are well-drained soils located on side slopes (USDA NRCS 2005). These soils formed in sandy and silty residuum derived from shale, with a depth to the water table of greater than 72 inches. No flooding or ponding occurs.
- *Kennebec silt loam, frequently flooded (0 to 2 percent slopes)* – very deep, moderately well drained soils formed in clayey silty alluvium in paleoterraces, with a depth to a water table of more than 80 inches.
- *Mayberry clay loam (3 to 7 percent slopes)* – very deep, moderately well drained upland soil formed in reworked, weathered glacial till. Slow to very slow permeability with depth to water table at 9 to 14 inches. No flooding or ponding occurs.
- *Pawnee clay loam (4 to 8 percent slopes)* – very deep, moderately well drained upland soils that were formed in glacial till. Slow to very slow permeability with depth to water table at 7 to 18 inches. No flooding or ponding occurs.
- *Wymore silty clay loam (1 to 3 percent slopes)* – Soils consist of very deep, moderately well drained upland soils that formed in loess. Permeability is slow to very slow with depth to water table at 12 to 36 inches. No flooding or ponding occurs.
- *Wymore silty clay loam (3 to 6 percent slopes)* – Soils consist of very deep, moderately well drained upland soils that formed in loess. Permeability is low to very slow with depth to water table at 12 to 36 inches. No flooding or ponding occurs.

NRCS lists two of the soil types as hydric due to inclusions of 1) Zook soils for the Kennebec complex when occurring in floodplains and 2) aquolls for Kennebec soils and Mayberry soils when occurring in depressions, along drainageways, and/or on hillslopes (USDA NRCS 2014).

There are no National Wetland Inventory (NWI) wetlands identified in the two tracts (U.S. Fish and Wildlife Service [USFWS] 1981). However, the combination of seeps and ponding in conservation field terraces has created small, emergent wetlands in both tracts.

The mitigation site is within the Nebraska and Kansas Loess-Drift Hills major land resource area (MLRA). Tall grasses in the uplands and trees along streams and intermittent drainageways

characterize the historic plant community (USDA NRCS 2006). Dominant tall grass species include big bluestem (*Andropogon gerardii*), little bluestem (*Schizachyrium scoparium*), switchgrass (*Panicum virgatum*), Indiangrass (*Sorghastrum nutans*), porcupinegrass (*Miscanthus spartea*), and sideoats grama (*Bouteloua curtipendula*) (USDA NRCS 2006). For trees, dominant native species include hackberry (*Celtis occidentalis*), oak (*Quercus sp*), boxelder (*Acer negundo*), black walnut (*Juglans nigra*), and maple (*Acer sp*) (USDA NRCS 2006). Prior to WLT filing the conservation easement, the City of Horton farmed the uplands. Trees and vines TWI observed along the drainageways include honey locust (*Gleditsia triacanthos*), Osage orange (*Maclura pomifera*), black willow (*Salix nigra*), hackberry, eastern cottonwood (*Populus deltoides*), red elm (*Ulmus rubra*), black cherry (*Prunus serotina*), red mulberry (*Morus rubra*), Siberian Elm (*Ulmus pumila*), red cedar (*Juniperus virginiana*), roughleaf dogwood (*Cornus drummondii*), false indigo (*Amorpha fruticosa*), and riverbank grape (*Vitis riparia*).

Kansas Department of Wildlife, Parks, and Tourism (KDWPT) considers the aquatic health fair in the hydrologic unit code HUC 10270103 watershed (KDWPT 2006). KDWPT has one Mission Creek aquatic sampling site downstream from Mission Lake. Based on three sampling events, KDWPT found the macroinvertebrate biotic index (MBI) to be highly impacted from nutrient and oxygen demanding pollutants (KDWPT 2006). Index for Biological Integrity (IBI) scores for sampled fish indicates fair stability in the fish community (KDWPT 2006). Mission Lake and the watershed dam do impair aquatic habitat connectivity. Other impairments to aquatic habitat connectivity include perched culverts resulting from streambed degradation.

The Mission Lake watershed is predominately farmland occupying about 54 percent of landcover (KDHE 2012). Based on aerial photo interpretation by TWI, the riparian corridor widths are variable with most streams having a narrow wooded riparian corridor. Most landowners have converted ephemeral channels to grass waterways to support drainage of agricultural lands. Proposed mitigation activities include converting approximately 50 acres of farmland to native grass and maximizing riparian buffer widths. The mitigation tracts encompass about 65 acres, 1.2-percent of Mission Lake's 5,513-acre watershed. Approximately 3,105 feet of Mission Creek flows through the mitigation tracts—about 20 percent of Mission Creek's total length above Mission Lake.

The WLT ILF program serves the entire state of Kansas; however, the Kansas City District USACE and the Kansas IRT determined that the USGS HUCs are the appropriate basis to develop service area boundaries. The WLT ILF Instrument identifies 11 unique service areas within the state of Kansas, including the Kansas SA. The Kansas SA – approximately 8,130 square miles ($mi^2$) – is a diverse region encompassing parts of four different ecoregions: Central Great Plains, Flint Hills, Western Cornbelt Plains, and Central Irregular Plains (Chapman et al. 2001). This diversity leads to a variety of topographic settings, land uses, and stream conditions. Predominate land cover in the Kansas SA include grasslands (42%), cropland (33%), woodlands (18%), and urban areas (i.e. Kansas City, Lawrence, Topeka, etc.) (4%) (KWO 2009).

TWI foresees effects of mitigation activities to improve terrestrial habitat connectivity by converting farmland to native grasses and maximizing riparian corridor widths; reducing overland flow; increasing in-channel habitats using constructed riffles; removing foreign materials from the channels; and clearing stream obstructions.

## SITE PROTECTION INSTRUMENT

Ownership of the mitigation areas will remain with the City of Horton. However, a conservation easement is recorded with Brown County, Kansas (May 5, 2011), naming WLT as the grantee. WLT is responsible for preserving and protecting all mitigation measures on the protected property. A copy of the filed conservation easement is in Appendix C. In preparation for filing the conservation easement, TWI completed a Baseline Documentation Report (BDR) that includes a property description, photographic points, and a summary of grantors' rights and restrictions. The BDR provides information on the easement property location as well as landuse, topography, soils, and water and wildlife resources descriptions. The BDR is located in Appendix D. WLT contact information is:

Frank Austenfeld, J.D.
Executive Director
Watershed Land Trust, Inc.
140 Cherry Hill Dr.
Belton, MO 64012
913/685-4600
E-mail: frank@watershedinstitute.biz

## BASELINE INFORMATION

WLT has chosen two tracts of land owned by the City of Horton, Kansas to complete stream, riparian buffer, and wetland mitigation activities (see Appendix B, Figure 3). TWI collected information on the existing vegetation, aquatic biological community, channel morphology, and wetlands. The purpose of the baseline information is to ensure WLT will meet proposed performance-based standards.

### *Vegetation*

The historic plant community was bluestem prairie in the uplands with wooded riparian corridors (USDA NRCS 2006). No remnants of bluestem prairie exist, as upland landuse is row crop agriculture. There are wooded riparian corridors along Mission Creek and the unnamed tributaries. Woody species TWI observed include honey locust, Osage orange, black willow, hackberry, eastern cottonwood, red elm, black cherry, red mulberry, Siberian elm, red cedar, roughleaf dogwood, false indigo, and riverbank grape. The dominant species include red elm, honey locust, and Osage orange—a departure from the historic hackberry, oak, boxelder, black walnut, and maple community outlined in USDA NRCS (2006). Most seedlings and saplings TWI observed were honey locust, Osage orange and Siberian elm, and TWI anticipates continued recruitment of these pioneer successional species.

### *Biological Communities*

TWI completed stream surveys on December 12, 2012 and June 18 and 20, 2014 to establish a baseline documentation of biota currently inhabiting Mission Creek and its unnamed tributary. TWI used modifications of the U.S. Environmental Protection Agency (EPA) rapid bioassessment protocols (RBP) for streams and wadeable rivers (Barbour et al 1999), the KDHE stream biological monitoring program (Cringan and Angelo 2000), and KDWPT stream assessment and monitoring field survey protocols. Kirk Mammoliti, TWI aquatic biologist, led the macroinvertebrate and fish sampling activities (KDWPT Collection Permit # SC-066-2014).

In addition to TWI's data collection, TWI obtained historical macroinvertebrate and fish data sets from Grasshopper Creek, Mission Creek's receiving stream. KDWPT (2006) sampled Grasshopper Creek as part of its Stream Assessment and Monitoring Program in June and July of

1996, 1997, and 1998. TWI will use these data sets as a reference for biotic integrity within the Mission Creek watershed. The data from Grasshopper Creek was chosen as a reference for biotic integrity because of its similar Strahler stream order (third order) and because the stream is not impounded or fragmented. In addition, to avoid potential data gaps created by seasonal variation, TWI conducted sampling events in winter and in early summer. All biological data have the potential to exhibit considerable natural variability, and certain species are often more abundant during different seasons (Lillie et al. 2003). Seasonal data sets will allow TWI to make comparisons between current and historical data.

Macroinvertebrate Sampling

Instream aquatic macrohabitat types consisted of runs and pools that ranged in depths from 5 centimeters (cm) to greater than (>) 10 cm. Flow velocity within these macrohabitats did not exceed 0.3 meters per second and the dominant substrates in all macrohabitat types were silt/clay (approximately 95 percent). The remaining 5-percent was sand, small gravels, and debris snags. TWI identified macrophytes in a few pools and runs that included broadleaf arrowhead (*Sagittaria latifolia*), coon's tail (*Ceratophyllum demersum*) and duckweed (*Lemnoideae sp*.).

To assess the quality of the instream habitat, TWI used the Habitat Development Index (HDI) as described by Huggins and Moffett (1988). The HDI considers the presence and/or absence and relative abundance of instream habitats to be key factors in influencing the benthic macroinvertebrate fauna. TWI used the HDI in conjunction with macroinvertebrate sampling to describe the instream habitat(s) utilized by the aquatic insect community. In addition, the HDI can help explain discrepancies found between biotic index values and associated known pollutants (Huggins and Moffett 1988). HDI values TWI calculated were determined by scoring macrohabitats (i.e. riffles, runs, and pools) sampled for macroinvertebrates. Individual macrohabitat scoring criteria included average depths, velocity range, substrate, organic detritus and debris, algal masses, macrophytes, and bank vegetation. For each unique macrohabitat type, TWI summed the total scores to compute the overall HDI score—a score of 19. A copy of the HDI scoring sheet is in Appendix E.

Benthic macroinvertebrate sampling protocol was patterned after the USEPA RBP (as described by Plafkin et al 1989), KDHE's Stream Biological Monitoring Program (Cringan and Angelo

2000), and KDWPT's stream assessment and monitoring program. TWI used a quantitative, multi-habitat approach to acquire a sample representative of each macrohabitat type. Specifically, TWI collected macroinvertebrates from available macrohabitats (runs and pools) and from microhabitats (various depths, velocities, and substrata) over a combined period of one hour using a D-frame dip 0.3 meter (m) wide and 0.3 m tall, 500-micrometer mesh seine. Specifically, samples were taken at 15 transects throughout the stream reach near proposed riffle locations. TWI collected specimens by kicking substrata in order to dislodge organisms, sweeping through submerged or floating aquatic vegetation and wood debris, and by sieving fine sediments. TWI then removed macroinvertebrates from the D-frame nets and placed them in a 500-milliliter Nalgene sample bottle containing a 10-percent buffered formalin solution. TWI identified and enumerated the macroinvertebrate specimens using a stereo microscope at TWI headquarters.

Fish Sampling

TWI patterned fish sampling protocols after the EPA RBP (Plafkin et al 1989). However, due to equipment availability, TWI used a 3.175-millimeter (mm) mesh straight seine measuring 2.4 m by 1.8 m to sample each unique macrohabitat (runs, and pools). For pools and runs, TWI set block nets at upstream and downstream boundaries and seined until depletion (i.e. less than or equal to 3 fish captured). At narrow runs, TWI employed a kick seining method for at least three kick attempts or until depletion. TWI stored collected fish in a five-gallon bucket with fresh stream water until depletion. TWI identified and enumerated (by species) all captured fish and eventually released the individuals in the macrohabitat from where they were collected.

***Biological Analytical Methods***

TWI selected several biotic indices and statistical analyses to quantify the habitat, macroinvertebrate community, and fish population. Specifically, the biotic indices included the Kansas Biotic Index (KBI), the Family Level Biotic Index (FBI), the Percent of *Ephemeroptera, Plecoptera,* and *Trichoptera* (EPT) index, and the Index of Biologic Integrity (IBI) based on stream-fish communities.

For macroinvertebrates, TWI used several biotic indices to assess characteristics of instream quality and macroinvertebrate communities. Pollution tolerance indices, such as the FBI and KBI,

use numerical values to weight macroinvertebrate abundance as an estimate of overall pollution. Hilsenhoff (1988) used the FBI to evaluate the effects of nutrients and oxygen-demanding pollutants on macroinvertebrate communities based on the relative abundance and tolerance values assigned to specific indicator taxa. Kansas Biological Survey (KBS) developed the KBI, and KDHE adopted the index because it is the most suitable tolerance index for macroinvertebrate communities and stream conditions in Kansas (Huggins and Moffett 1988). The percent of EPT index is the percentage of all individuals collected belonging to the orders *Ephemeroptera*, *Plecoptera*, and *Trichoptera* relative to the entire sample, providing a measure of relative abundance. Low percentage EPT index scores are often associated with increased instream perturbations.

For fish, TWI used similarity measures to compare the subject reach community to the reference community from Grasshopper Creek. TWI used the IBI to address the fish assemblage. For biotic indices as it relates to fish, the EPA RBP recognizes the IBI as the only principal evaluation mechanism (Barbour et al 1999). The IBI is an ecologically based index developed by Karr (1981), which integrates zoogeographic, ecosystem, community, and population aspects of the fish assemblage. To analyze fish assemblage data, the IBI aggregates 12 biological metrics based on taxonomic and trophic composition and the abundance and condition of the fish. TWI evaluated the fish assemblage using an IBI protocol developed by the USEPA Region 7 Environmental Monitoring and Assessment Program. USEPA patterned the IBI protocol after Karr et al. (1986) and stratified the protocol using Omernik's (1987) ecoregions of the conterminous United States. TWI used USEPA's IBI 6 "Lowlands" scoring protocol that includes Western Corn Belt Plains, Central Irregular Plains, and the Flint Hill ecoregions.

Additionally, TWI calculated species richness ($S$), species diversity, and species evenness to address the current and historic condition of macroinvertebrate and fish assemblages. Species richness is an expression of diversity and is simply the number of distinct taxa within a certain assemblage (Resh et al. 1995). To evaluate species diversity and evenness, TWI calculated diversity using the Shannon-Wiener Diversity Index ($H'$). TWI used $H'$ to calculate Pielou's index of evenness ($J'$), which expresses the distribution of abundances amongst an assemblage (see Equation 1),

**Equation 1:** Pielou's index of evenness

$$J' = \frac{H'}{H'_{\max}}$$

where *J'* is equal to the quotient of *H'* (numerator) and the natural logarithm of *S* ($H'_{max}$); and is constrained between 0 and 1. Therefore, the closer the *J'* is to 1, the more variation occurs within an assemblage.

***Biological Community Results***

The following section provides the results of the data analyses of the macroinvertebrate and fish assemblages.

Macroinvertebrate results

TWI collected 237 individuals and 9 unique taxa during the December 2012 sampling event and 1,864 individuals and 20 unique taxa during the June 2014 sampling event (see Table 3). Species from three families contributed to 77.4 % of all collected macroinvertebrates: *Caenidae* (36.1 %), *Chironomidae* (16.1 %), and *Hydropsychidae* (25.2 %). FBI calculations yielded scores of 4.68 (good water quality) and 5.39 (fair water quality) in 2012 and 2014, respectively. TWI captured 14 individuals from the Order *Ephemeroptera* and 90 individuals from the Order *Trichoptera* in 2012, indicating the study reach is partially supporting (% EPT = 0.33) of these pollution intolerant species. In 2014, TWI captured 776 individuals from *Ephemeroptera* and 562 individuals from *Trichoptera*, indicating that the study reach is fully supporting (% EPT = 69.3). TWI calculated KBI scores of 1.43 (fully supporting of intolerant taxa) and 2.98 (partially supporting of intolerant taxa) in 2012 and 2014, respectively. In 2012, TWI's calculations for the Shannon-Wiener Index (*H'*= 1.74) and Pielou's Index (*J'*= 0.79) show that diversity and evenness of taxa are low. In 2014, TWI's calculations were *H'* = 1.17 and *J'* = 0.39 indicating the macroinvertebrate community is diverse and uneven.

In general, historical macroinvertebrate data collected by KDWPT (2006) from Grasshopper Creek in 1996, 1997, and 1998 showed similar scores for all biotic indices and results for species diversity and evenness. Specifically, the data from the three sampling events yielded biotic index scores

indicative of poor to fair water quality and macroinvertebrate assemblages with low species diversity and an uneven community. Table 4 below provides all current and historic biotic index scores and assemblage data for the site reach and KDWPT's site.

**Table 3:** Macroinvertebrate sampling results with KDWPT (2006) data

| Order | Family | Individuals Collected by Date | | | | |
|---|---|---|---|---|---|---|
| | | Mission Creek - ILF | | Grasshopper Creek | | |
| | | Dec-12 | Jun-14 | Jul-96 | Jun-97 | Jul-98 |
| *Coleoptera* | *Dryopidae* | - | - | 2 | - | - |
| | *Dytiscidae* | 8 | 91 | - | 1 | - |
| | *Elmidae* | 8 | 20 | 6 | - | 11 |
| | *Haliplidae* | - | - | - | 1 | - |
| | *Hydrophilidae* | - | 2 | 3 | - | - |
| | *Scirtidae* | - | 31 | - | - | - |
| *Diptera* | *Chaoboridae* | - | 8 | - | - | - |
| | *Chironimdae* | 62 | 282 | 96 | 29 | 139 |
| | *Tabanidae* | - | 2 | 1 | - | - |
| *Ephemeroptera* | *Baetidae* | - | 4 | 11 | 2 | - |
| | *Caenidae* | - | 770 | 56 | 8 | 4 |
| | *Ephemeridae* | - | 1 | - | 1 | 1 |
| | *Heptageniidae* | 19 | 1 | 87 | 2 | 25 |
| | *Isonychiidae* | - | - | 8 | - | 50 |
| | *Leptophlebiidae* | - | - | 4 | - | - |
| *Hemiptera* | *Corixidae* | 6 | 14 | - | 4 | 1 |
| | *Gerridae* | 6 | 10 | - | 1 | 1 |
| | *Hydrometridae* | - | 3 | - | - | - |
| | *Mesoveliidae* | - | 2 | - | - | - |
| | *Veliidae* | - | 27 | 2 | - | - |
| *Odonata* | *Coenagrionidae* | 19 | 64 | 2 | 2 | - |
| | *Corduliidae* | 19 | - | - | - | - |
| | *Gomphidae* | - | - | 4 | 2 | 1 |
| | *Libellulidae* | - | 1 | - | - | - |
| *Simuliidae* | | - | - | 1 | 54 | - |
| *Trichoptera* | *Helicopsychidae* | - | - | 7 | - | - |
| | *Hydropsychidae* | 90 | 537 | 32 | - | 10 |
| | *Polycentropodidae* | - | 25 | - | - | - |

**Table 4:** Current and historic (KDWPT 2006) macroinvertebrate biotic index scores and assemblage summary

| Biotic Index | Date Collected | | | | |
|---|---|---|---|---|---|
| | Mission Creek - ILF | | Grasshopper Creek | | |
| | Dec-12 | Jun-14 | Jul-96 | Jun-97 | Jul-98 |
| FBI | 4.68 | 5.39 | 5.58 | 6.52 | 5.92 |
| KBI | 1.43 | 2.98 | 2.65 | 2.93 | 2.64 |
| % EPT | 46.9% | 69.3% | 63.1% | 12.0% | 36.9% |
| Shannon-Wiener Diversity Index (*H'*) | 1.74 | 1.17 | 1.97 | 1.53 | 1.33 |
| Pielou's Index of Evenness (J') | 0.79 | 0.39 | 0.70 | 0.59 | 0.55 |
| Species Richness (S) | 9 | 20 | 17 | 13 | 11 |

Fish Results

TWI collected 375 fishes during the December 2012 (71 total fish) and June 2014 (304 total fish) field surveys and included 10 unique taxa (see Table 5). Green sunfish (*Lepomis cyanellus*) was the most abundant species, accounting for 25.9% of all fishes collected. The IBI scores were 79 and 80 for the 2012 and 2014 sampling events, respectively, indicating the fish assemblage is in good condition. For the December 2012 sampling event, TWI's Shannon-Wiener Index (*H'*= 1.21) and Pielou's Index (*J'*= 0.28) results show diversity and evenness of fish assemblage is low. However, TWI's results from the June 2014 sampling event (H'=1.83 and J'=0.83) suggest that evenness of the fish assemblage increases during warmer seasons. In addition, this may suggest that seasonal movement of fish assemblages between the southern site reach (below the watershed dam) and Mission Creek downstream of the easement (southern culvert) is possible. However, the watershed dam and the culverts (during low-flow months) at the upstream and downstream mitigation extents do not allow for aquatic organism passage, which reduces the seasonal movement of fish. Fish assemblage evenness improved in the June 2014 sampling event; otherwise, site reach results did not vary much from the Grasshopper Creek reference reach (KDWPT 2006) when comparing index scores and assemblage summaries (see Table 6).

**Table 5:** Fish sampling results with KDWPT (2006) data

| Family | Species | Individuals Collected by Date | | | | |
|---|---|---|---|---|---|---|
| | | Site Reach | | KDWPT Sites | | |
| | | Dec-12 | Jun-14 | Jul-96 | Jun-97 | Jun-98 |
| *Catostomidae* | River carpsucker (*Carpiodes carpio*) | - | - | - | 1 | 2 |
| | White sucker (*Catostomus commersonii*) | - | - | - | - | 1 |
| | Shorthead redhorse (*Moxostoma macrolepidotum*) | - | - | - | - | 4 |
| *Centrarchidae* | Green sunfish (*Lepomis cyanellus*) | 45 | 52 | 3 | 7 | - |
| | Blugill (*Lepomis machrochirus*) | | 49 | - | 1 | - |
| | Largemouth Bass (*Micropterus salmoides*) | 5 | 1 | - | - | 2 |
| | White crappie (*Pomoxis annularis*) | - | - | 1 | - | 1 |
| *Clupeidae* | Gizzard shad (*Dorosoma cepedianum*) | - | - | 13 | - | - |
| *Cyprinidae* | Bigmouth shiner (*Hybopsis dorsalis*) | - | - | - | 12 | 14 |
| | Central stoneroller (*Campostoma anomalum*) | - | - | 5 | 5 | 41 |

**Table 5: (Continued)**

| Family | Species | Individuals Collected by Date | | | | |
|---|---|---|---|---|---|---|
| | | Site Reach | | KDWPT Sites | | |
| | | Dec-12 | Jun-14 | Jul-96 | Jun-97 | Jun-98 |
| *Cyprinidae* | Red shiner (*Cyprinella lutrensis*) | 9 | 17 | 191 | 254 | 307 |
| | Golden shiner (*Notemigonus crysoleucas*) | 1 | - | - | 6 | - |
| | Sand shiner (*Notropis stramineus*) | - | - | 32 | 150 | 168 |
| | Suckermouth minnow (*Phenacobius mirabilis*) | - | - | 29 | 29 | 44 |
| | Bluntnose minnow (*Pimephales notatus*) | 1 | 40 | 6 | 20 | 32 |
| | Fathead minnow (*Pimephales promelas*) | - | 62 | - | 5 | 3 |
| | Bullhead minnow (*Pimephales vigilax*) | 7 | 22 | - | - | - |
| | Creek chub (*Semotilus atromaculatus*) | - | - | 13 | 38 | 51 |
| *Ictaluridae* | Black bullhead (*Ameiurus melas*) | - | 8 | - | 3 | 1 |
| | Yellow bullhead (*Ameiurus natalis*) | - | - | 2 | - | 1 |
| | Channel catfish (*Ictalurus punctatus*) | - | - | - | 2 | - |
| | Stonecat (*Noturus flavus*) | 3 | - | - | - | 6 |

**Table 6:** Current and historic (KDWPT 2006) fish biotic index scores and assemblage summary

| Biotic Index | Date Collected | | | | |
|---|---|---|---|---|---|
| | Site Reach | | KDWPT Site | | |
| | Dec-12 | Jun-14 | Jul-96 | Jun-97 | Jun-98 |
| IBI | 32 | 32 | 34 | 34 | 36 |
| Shannon-Wiener Diversity Index (*H'*) | 1.22 | 1.83 | 1.78 | 1.69 | 1.67 |
| Pielou's Index of Evenness (J') | 0.63 | 0.83 | 0.71 | 0.7 | 0.67 |
| Species Richness (S) | 7 | 9 | 12 | 11 | 12 |

***Geomorphology***

TWI completed two fluvial geomorphology surveys—one for documenting baseline conditions associated with the ILF project and the other in 2008 in which TWI teamed with Gulf South Research Corporation (GSRC) to conduct fluvial geomorphology assessments in northeast Kansas (GSRC 2008).

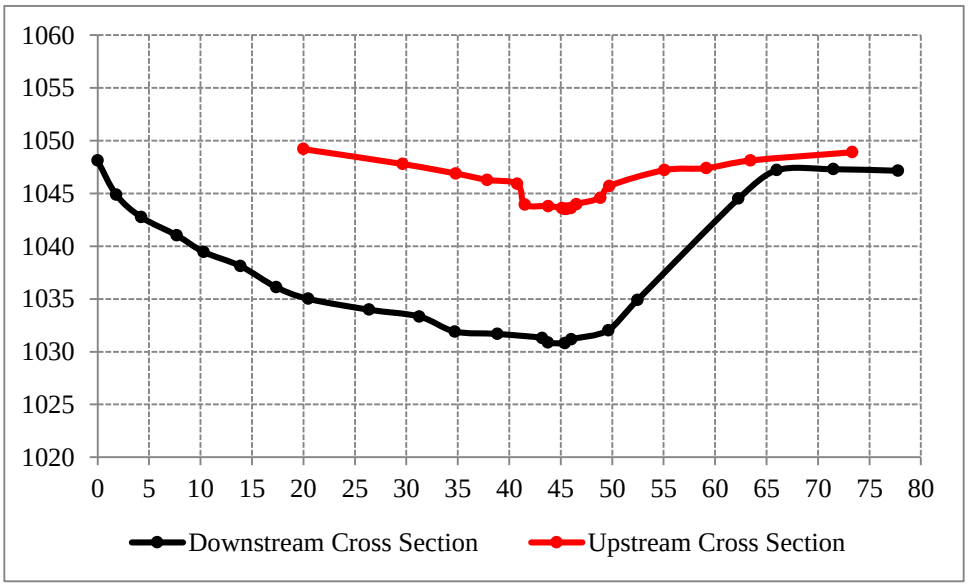
For the 2008 survey, GSRC and TWI conducted a fluvial geomorphology survey on the intermittent tributary in the north tract (GSRC 2008). The fluvial geomorphology survey involved channel dimension, pattern, and profile surveys and a streambank erosion potential assessment. The survey began at 140$^{th}$ Street and went downstream about 800 feet. Table 7 shows the geomorphology data summary. TWI classified the intermittent tributary as a Rosgen (1996) F6 stream type, an incised channel. The channel is straight and much of the streambed is composed of fine sediments. 140$^{th}$ Street (north easement boundary) is the upstream terminus of a knickpoint. Knickpoint erosion has created a perched culvert there is a plunge pool below the outfall. There is concrete rubble dumped throughout this area in an apparent attempt to reduce the erosion surrounding the outfall. To document the change in Mission Creek channel dimensions upstream and downstream of 140$^{th}$ Street, GSRC (2008) surveyed a cross sections on each side of 140$^{th}$

Street, and found that the downstream cross section area (from top of bank) had increased 1,700-percent when compared to the upstream cross section area (see Figure 5).

**Table 7:** Intermittent tributary geomorphology summary data

| Geomorphic Feature | Measurement |
|---|---|
| Bankfull Width (ft) | 24.2 |
| Bankfull Mean Depth (ft) | 1.3 |
| Bankfull Maximum Depth (ft) | 2.4 |
| Bankfull Cross Section Area (sq ft) | 31.4 |
| Channel Materials $D_{50}$ (mm) | 0.03 |
| Average Water Surface Slope (ft/ft) | 0.00781 |
| Sinuosity | 1.1 |
| Floodprone Width (ft) | 33.7 |
| Entrenchment Ratio (ft) | 1.4 |
| Width/Depth Ratio (ft/ft) | 18.6 |
| Rosgen (1996) Classification | F6 |

**Figure 6:** Mission Creek cross section upstream and downstream of 140th Street




GSRC used the Bank Erodibility Hazard Index (BEHI) to estimate streambank erosion potential. Most of the survey reach had a BEHI score of moderate. Using streambank erosion prediction curves developed by Sass and Keane (2012), TWI estimated the survey reach had an erosion rate of 0.53 tons/year/foot.

In October 2011, TWI completed a Mission Creek fluvial geomorphology survey on the south tract. The dimension, pattern, and profile data is in Table 8. The average water surface slope is much less when compared to the north tract survey, and the channel is not incised. Mission Creek does flow against high banks, but generally, one bank is low. The low bank either is at the bankfull elevation or is within the floodprone width. The streambed and streambanks are predominately silt/clay particles. **Table 8:** Mission Creek geomorphology summary data

**Table 8:** Mission Creek Geomorphology Summary Data

| Geomorphic Feature | Measurement |
|---|---|
| Bankfull Width (ft) | 20.4 |
| Bankfull Mean Depth (ft) | 1.3 |
| Bankfull Maximum Depth (ft) | 2.4 |
| Bankfull Cross Section Area (sq ft) | 27.0 |
| Channel Materials $D_{50}$ (mm) | 0.03 |
| Average Water Surface Slope (ft/ft) | 0.00166 |
| Sinuosity | 1.1 |
| Floodprone Width (ft) | 107.7 |
| Entrenchment Ratio (ft) | 5.3 |
| Width/Depth Ratio (ft/ft) | 15.5 |
| Rosgen (1996) Classification | C6 |

***Wetlands***

On June 3, August 25, and September 19, 2014, TWI completed wetland delineations to determine the extent of existing wetlands and to verify if areas of proposed wetland enhancement met WOUS jurisdiction. TWI evaluated the property for soil, vegetation, and hydrologic conditions indicative of wetlands and potential WOUS. In total, TWI delineated 1.35-acres of wetland. A full delineation report for the mitigation site is located in Appendix F.

Using the *Ohio Rapid Assessment Method for Wetlands v. 5.0* (ORAM) (Mack 2001), TWI assessed the ecological quality and level of function of each delineated wetland. This method quantifies six specific metrics of individual wetlands which results in a score that falls within a range of three categories. These categories correspond to wetlands of low, medium, and high "quality". A summary of these categories is in Table 9. The metrics used to score each wetland include size, upland buffers and surrounding land use, hydrology, habitat alteration and development, special wetlands, and plant communities, interspersion, and microtopography.

Table 10 below provides a summary of scores for each wetland delineated. A copy of scoring sheets completed for each delineated wetland are located in Appendix G.

**Table 9:** Ohio Rapid Assessment Method for Wetlands Version 5.0 Category Summary

| Category | Category Description | Scoring Range |
|---|---|---|
| Category 1 | Emergent, isolated wetlands dominated by cattails with little or no upland buffers often located in active agricultural fields. Typically disturbed by grazing activities, stormwater inputs, or hydrologic modifications. Considered a degraded resource that with limited potential for restoration that are of low functionality. | 0 -34.9 |
| Category 2 (Degraded but Restorable) | Wetlands that support moderate wildlife habitat, or hydrological or recreational functions, but are degraded and have a reasonable potential for reestablishing lost wetland functions. | 35 - 44.9 |
| Category 2 | Wetlands that support moderate wildlife habitat, or hydrological, or recreational functions dominated by native species, but generally are without the presence of, or habitat for, rare, threatened or endangered species; and degraded wetlands but have a reasonable potential for reestablishing lost wetland functions. May relatively lack human disturbance and considered natural with moderate quality. | 45 - 64.9 |
| Category 3 | Wetlands that have superior habitat, or superior hydrological or recreational functions. They are are typified by high levels of diversity, a high proportion of native species, and/or high functional values. | 65 - 100 |

**Table 10:** Mission Creek ILF Site Wetland *ORAM* Scores

| Wetland ID | ORAM Score | Category |
|---|---|---|
| 04 | 54 | 2 |
| 05 | 55 | 2 |
| 08 | 54 | 2 |
| 09 | 78 | 3 |
| 10 | 58 | 2 |
| 11 | 45 | 2 |
| 12 | 54 | 2 |

## DETERMINATION OF CREDITS

TWI's objective is to fully offset the aquatic habitats (stream and wetland) lost from 14 ILF program projects, including CDF construction. TWI also proposes to offset the impacts from the Zenger Enforcement ILF project. The permittee paid into WLT's ILF program as part of a

settlement for violation of the CWA. The amount paid to WLT was a fine as part of an order for compliance on consent, not based on stream credits. In order to develop mitigation credits, TWI is dividing the settlement payment by TWI's cost per stream credit. Additional stream credits purchased from the ILF Program prior to the establishment of the current Instrument and KSMG standards include Escalade Heights (Permit #NWK-2006-3500), K-7 Meadow View (Permit #NWK-2006-3294), and Seefried/Home Depot (Permit #NWK-2009-00027). Table 11 below provides a summary of the credit calculations for each of the aforementioned projects.

**Table 11:** Credit Calculations for Sites without Associated KSMG Stream Credits

| Project Name | Permit Number | Credit Calculation |
|---|---|---|
| Escalade Heights | NWK-2006-3500 | 92 |
| Zenger Enforcement | N/A | 314 |
| K-7 Meadow View | NWK-2006-3294 | 37 |
| Seefried/Home Depot | NWK-2006-00027 | 636 |

In addition, WLT is using portions of credit obligations from two projects to satisfy the credits generated by the Mission Creek Mitigation site. This includes the Olson & Associates/Union Pacific project (Permit #NWK-2008-02130) in which WLT proposes to use 0.21 of 2.06 (approximately 10.2 percent) wetland credits to address all available wetland credits at the mitigation site. For the Kansas Department of Transportation (KDOT) – Wyandotte County project (Permit #NWK-2011-01319), 1,879.79 of 6,664.74 (approximately 28.0 percent) will be used to address all available stream credits at the mitigation site.

Mitigation to offset the impacts occurs within five reaches (see Appendix B, Figures 7 and 8):

- Reach 1: Unnamed intermittent tributary to Mission Creek located in north tract.
- Reach 2: Mission Creek above unnamed intermittent tributary confluence located in north tract.
- Reach 3: Mission Creek below unnamed tributary confluence in north tract.
- Reach 4: Mission Creek located in south tract.
- Reach 5: Unnamed tributary to Mission Creek located in south tract.

Mitigation activities include streambed and streambank stabilization, in-stream aquatic habitat enhancement; buffer creation, enhancement, and preservation; and wetland enhancement and creation. TWI considered the following information to calculate credits accruing from the proposed mitigation:

*Stream Type* –Mission Creek is a perennial WOUS with a bankfull width ranging from 15- to 30-feet. Reach 1 is an intermittent channel with pools and reach 5 is a small, intermittent channel without pools. TWI considers the channel ephemeral/intermittent. Given the variety of stream types, the stream type score ranged from 0.6 to 0.05.

*Priority Status* – The mitigation channels are tributaries to Mission Lake that KDHE (2014) lists as impaired for atrazine, siltation, and eutrophication. In addition, the mitigation reaches are tributaries to Grasshopper Creek that KDHE (2014) lists as impaired for fecal coliform bacteria, atrazine, and total phosphorus. Therefore, TWI scored the priority area as secondary = 0.2.

*Existing Condition* – Reaches 1 and 2 are Rosgen F6 streams, indicative of an incised stream and considered unstable. TWI rated these two reaches as functionally impaired. Reach 3 has five stream impacts within one-half mile upstream or downstream. Impacts include two channel modifications, two perched culverts, and one impoundment. TWI rated this reach as functionally impaired. Finally, TWI considered Reach 4 as functionally impaired due to little riparian buffer on the west bank

*Net Benefit (Channel)* – Reach 1 channel activities include constructing a rock apron below the perched culvert to reduce scour and erosion from the road ditches. TWI is also constructing two rock riffles to stabilize the streambed and remove large woody debris that is constricting the channel. TWI scored these stream restoration actions as moderate = 2.0.

Reach 2 channel activities involve constructing a rock apron below a concrete box culvert to reduce scour and road ditch erosion. Other activities will involve removing debris and trash from the active channel area. TWI scored these stream restoration actions as moderate = 2.0.

Reach 3 channel activities include large woody debris removal and TWI scored this activity as minimal = 1.0.

Reach 4 channel activities involve constructing a series of rock riffles to improve streambed stability and increase aquatic habitats, install root-wad revetments to stabilize a streambank, and remove large woody debris that is constricting the channel. TWI scored these stream restoration actions as moderate = 2.0.

*Net Benefit (Riparian)* – There is five riparian buffer activities associated with this mitigation plan. TWI used a Leica TCR407 total station to determine the riparian buffer areas. On both streamsides, TWI surveyed the ordinary high water mark (OHWM), the existing buffer extent, and the created buffer extent. TWI identified the OHWM as the break in bank slope or bankfull elevation. TWI delineated the area between the OHWM and existing buffer extent and the area between the existing buffer extent and the created buffer extent to determine the average buffer widths and the buffer creation percentage. TWI included the grass buffers as part of the created riparian buffer. The grass buffers serve an important purpose within the riparian area for providing native grass habitats and reducing sediment inputs to Mission Creek. The grass buffers also provide habitat connectivity between proposed wetland activities and Mission Creek. The following lists each of the five buffer activities and their associated net benefit scores.

1. *Reach 1:* This stream segment is 755 feet in length. Along the west streamside, the existing riparian buffer encompasses 1.12 acres. The created riparian buffer is 0.43 acres of trees and 2.07 acres of native grass. Using all three acreages, the average buffer width is 209 feet, with 69 percent of the area designated as created riparian buffer. Therefore, TWI used the 200-foot buffer creation score of 0.48.

   For the east streamside, riparian buffer enhancement encompasses 1.36 acres. Enhancement activities will include girdling pioneer successional species and planting native bare root seedlings. The average buffer width is 78 feet. TWI used the 75-foot buffer enhancement score of 0.12.

2. *Reach 2:* This stream segment is 445 feet long. Along the west streamside exists 1.06 acres of riparian buffer. TWI will enhance this area by girdling pioneer successional tree species and planting native bare root seedlings. The average buffer width is 106 feet. TWI used the 100-foot buffer enhancement score of 0.16.

For the east streamside, the existing buffer encompasses 0.62 acres. The newly created buffer encompasses 0.57 acres of trees and 1.74 acres of native grass. Between the existing and created riparian buffers, the average buffer width is 289 feet, with 79 percent of area newly created. TWI used the 275-foot buffer creation score of 0.54.

3. *Reach 3:* This stream segment is 1,020 feet long. Along the west streamside, the existing riparian corridor encompasses 1.28 acres. The newly created riparian area is 1.33 acres of trees and 16.62 acres of native grasses. Overall, the average buffer width is 821 feet with 93 percent as newly created buffer. TWI used the 300-foot buffer creation score of 0.56.

   For the east streamside, the existing riparian buffer encompasses 1.40 acres and the newly created buffer encompasses 1.03 acres in trees and 1.40 acres in native grass. The average buffer width is 164 feet with 63 percent as created riparian buffer. TWI used the 150-foot buffer creation score of 0.40.

4. *Reach 4:* This stream segment is 1,640 feet long. The existing riparian corridor on both streambanks is 4.05 acres. The newly created riparian buffer includes 3.79 acres of trees and 19.06 acres of native grass. This produces an average buffer width of 357 feet for both streamsides. In addition, 85 percent is buffer creation; therefore, TWI used the 300-foot buffer creation score of 0.56 for both streamsides.

5. *Reach 5:* This stream segment is 361 feet long. The existing riparian corridor is 0.86 acres. The average buffer width for both streamsides is 52 feet. TWI used the 50-foot buffer preservation score of 0.04 for both streamsides.

*Control Site Protection* – WLT has recorded a conservation easement between the City of Horton and WLT with Brown County, Kansas (see Appendix C). This site protection qualifies as a USACE approved site protection recorded with third party grantee, or transfer of title to a conservancy. TWI scored this component as 0.4 for stream credits and 0.2 for riparian credits.

*Mitigation Construction Timing* – All mitigation activities are after the WOUS impacts have occurred. TWI scored this component at 0.0.

*Temporal Lag* – TWI used a score of -0.2 for buffer creation, a score of -0.1 for buffer enhancement, and a score of 0.0 for buffer preservation. If the reach had several riparian activities, then TWI used a score of -0.1.

Using the KSMG (USACE 2010c) *Riparian Buffer Creation, Enhancement, Restoration and Preservation*, TWI calculated the total credits to be 20,738 (see Tables 12 and 13).

**Table 12:** KSMG In-Stream Enhancement Worksheet

| **Factors** | **Reach 1** | **Reach 2** | **Reach 3** | **Reach 4** |
|---|---|---|---|---|
| Stream Type | 0.4 | 0.6 | 0.6 | 0.6 |
| Priority Area | 0.2 | 0.2 | 0.2 | 0.2 |
| Existing Condition | 0.4 | 0.4 | 0.4 | 0.4 |
| Net Benefit | 2.0 | 2.0 | 1.0 | 2.0 |
| Control/Site Protection | 0.4 | 0.4 | 0.4 | 0.4 |
| Mitigation construction Timing | 0 | 0 | 0 | 0 |
| Sum Factors (**M**) | 3.4 | 3.6 | 2.6 | 3.6 |
| Stream length in Reach (**LF**) | 755 | 445 | 1,020 | 1,640 |
| Credits (**C**) = **M** x **LF** | 2,567 | 1,602 | 2,652 | 5,904 |
| Site Factor (**SF**) pg 19 | 1 | 1 | 1 | 1 |
| Additional Credits (A) pg 19 | | | | |
| Total Credits Generated **(C x SF) + A** = | **2,567** | **1,602** | **2,652** | **5,904** |

**Table 13:** KSMG Riparian Buffer Credits

| **Factors** | **Reach 1** | **Reach 2** | **Reach 3** | **Reach 4** | **Reach 5** |
|---|---|---|---|---|---|
| Stream Type | 0.4 | 0.4 | 0.4 | 0.4 | 0.05 |
| Priority Status | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 |
| Net Benefit (stream side A) | 0.48 | 0.16 | 0.56 | 0.56 | 0.04 |
| Net Benefit (stream side B) | 0.12 | 0.54 | 0.40 | 0.56 | 0.04 |
| Supplemental Buffer Credit | 0.24 | 0.24 | 0.4 | 0.56 | 0.04 |
| Control / Site Protection | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 |
| Mit. Construction Timing (side A) | 0 | 0 | 0 | 0 | 0 |
| Mit. Construction Timing (side B) | 0 | 0 | 0 | 0 | 0 |
| Temporal Lag (years) | -0.1 | -0.1 | -0.2 | -0.2 | 0 |
| Sum Factors (**M**) = | 1.42 | 1.42 | 1.8 | 2.28 | 0.57 |
| Linear Feet of Stream buffer (**LF**) | 755 | 445 | 1,020 | 1,640 | 361 |
| Credits (**C**) = **M** x **LF** | 1072.1 | 631.9 | 1836 | 3739.2 | 205.77 |
| Site Factor (**SF**) pg.19 | 1 | 1 | 1 | 1 | 1 |
| Total Credits Generated **C** x (**SF**) | **1,208** | **779** | **2,081** | **3,739** | **206** |

For the wetland acres enhanced or created, TWI proposes that enhanced wetland acres have a 1:2 (Credits: Acres) ratio and that created wetland acres have a 1:1 credit ratio. The resulting credits are in Table 14. Wetland enhancement activities will include removing debris, removing noxious weeds, removing undesirable vegetation, and sediment removal, and improving hydrology. The final acres will be determined in the as-built survey.

**Table 14:** Proposed Wetland Credits

| Wetland Activity | Area | Credit Ratio (Credits:Acres) | Wetland Credits |
|---|---|---|---|
| PEMAh Wetland Creation – South Depression in North Tract | 0.29 | 1:1 | 0.29 |
| PEMAh Wetland Creation – North Depression in North Tract | 0.21 | 1:1 | 0.21 |
| PEMF Wetland Enhancement North Tract | 0.28 | 1:2 | 0.14 |
| PEMC Wetland Enhancement North Tract | 0.49 | 1:2 | 0.24 |
| PEMC Wetland Enhancement North Tract | 0.14 | 1:2 | 0.07 |
| PEMC Wetland Enhancement North Tract | 0.11 | 1:2 | 0.05 |
| PEMFh Wetland Enhancement South Tract | 0.22 | 1:2 | 0.11 |
| PEMAh Wetland Enhancement South Tract | 0.07 | 1:2 | 0.03 |
| PEMAh Wetland Enhancement South Tract | 0.04 | 1:2 | 0.02 |
| PEMAh Wetland Creation South Tract | 0.24 | 1:1 | 0.24 |
| **TOTAL WETLAND CREDITS** | | | **1.40** |

Table 15 below provides a summary (including credit calculations) for each WLT ILF project that WLT proposes to offset wetland and stream credits using the Mission Lake mitigation site.

**Table 15**: Kansas Service Area In-Lieu Fee Projects Offset by Mission Creek Mitigation Site

| Date of Sale | ILF Project Name | Permit Number | HUC 8 Watershed | County | Credits Offset | Collective Credit Total |
|---|---|---|---|---|---|---|
| **Wetland Impacts – 1.40 Credits Generated at Mission Creek Mitigation Site** | | | | | | |
| 7/30/2007 | K-7/Meadow View | NWK-2006-03294 | 10270104 | Johnson | 0.44 | 0.44 |
| 5/27/2009 | Olson & Associates/UP Seg 1 | NWK-2008-02130 | 10270205<br>10270102 | Marshall<br>Pottawatomie | 0.21 | 0.65 |
| 7/19/2012 | Wyandotte County - Prairie Heights | NWK-2006-02779 | 10270104 | Wyandotte | 0.08 | 0.73 |
| 11/27/2012 | Douglas County | NWK-2011-01654 | 10270104 | Douglas | 0.37 | 1.10 |
| 2/28/2014 | Ridge Development | NWK-2011-00080 | 10300101 | Johnson | 0.30 | **1.40** |
| **Stream Impacts – 20,738.00 Credits Generated at Mission Creek Mitigation Site** | | | | | | |
| 2/2/2007 | Escalade Heights | NWK-2006-03500 | 10270104 | Wyandotte | 92.00 | 92.00 |
| 5/11/2007 | Zenger Enforcement | - | 10270207 | Republic | 314.00 | 406.00 |
| 7/30/2007 | K-7/Meadow View | NWK-2006-03294 | 10270104 | Johnson | 37.00 | 443.00 |
| 3/17/2009 | Seefried/Home Depot | NWK-2009-00027 | 10270102 | Shawnee | 636.00 | 1,079.00 |
| 6/25/2009 | City of Horton/Mission Lake | NWK-2007-01875 | 10270103 | Brown | 11,544.00 | 12,623.00 |
| 7/19/2012 | Wyandotte County - Prairie Heights | NWK-2006-02779 | 10270104 | Wyandotte | 2,177.30 | 14,800.30 |
| 12/7/2012 | C&H Development | NWK-2006-02683 | 10300101 | Johnson | 2,658.91 | 17,549.21 |
| 12/24/2012 | St. Andrew Christian Church | NWK-2011-00639 | 10300101 | Johnson | 538.00 | 17,997.21 |
| 2/15/2013 | KDOT - Wyandotte Co. | NWK-2011-01319 | 10270104 | Wyandotte | 1,865.79 | 19863.00 |
| 4/24/2013 | Jo Co 137th & Mission Oddo Dev. | NWK-2012-00433 | 10300101 | Johnson | 875.00 | **20,738.00** |

Upon approval by USACE, in consultation with the Kanas IRT, the generated credits will become available for use by WLT in accordance with the following schedule. Since areas in the mitigation property are different ecological habitats, performance milestones may occur at different times. As a result, the Sponsor may request the release of wetland credits and stream credits together or separately.

1. 20-percent of the total number of projected wetland and stream credits shall be available to satisfy the aforementioned Kansas Service Area projects when: (1) USACE approves the mitigation plan; (2) WLT's financial assurances have been appropriately established and funded; and (3) WLT records the conservation easement with Brown County, Kansas.

2. 30-percent of the total number of the generated wetland and stream credits shall become available to satisfy the aforementioned Kansas Service Area projects when construction and plantings are complete and WLT submits an As-Built report USACE approves in consultation with the Kansas IRT. TWI will submit required local, state, and federal permit applications and receive permit approval prior to construction.

3. 30-percent of the total number of generated wetland and stream credits shall become available to satisfy the aforementioned Kansas Service Area projects when WLT satisfies wetland, buffer, and in-stream enhancement performance standards. WLT requests USACE in consultation with the Kansas IRT release a total not to exceed 10 percent of the generated wetland and stream credits submittal of annual monitoring reports demonstrating WLT is satisfying in-stream, buffer, and wetland enhancement performance standards.

4. The remaining 20-percent of generated wetland and stream credits shall become available to satisfy the aforementioned Kansas Service Area projects when USACE, in consultation with the Kansas IRT, approves all performance standards.

USACE, in consultation with the Kansas IRT, shall release credits to WLT following the proposed credit release schedule. WLT will submit documentation to USACE to support completed performance milestones. USACE will supply WLT's documentation to the Kansas IRT. The Kansas IRT must provide comments to USACE within 15 days of receipt of documentation. USACE will schedule a site visit with Kansas IRT members as soon as possible to assess performance milestones. After USACE has received comments from Kansas IRT members, USACE will accept or reject the performance milestones. USACE shall make this determination within 30 days of the end of the comment period and shall notify WLT and the Kansas IRT of their decision.

USACE, in consultation with the Kansas IRT, may modify the credit release schedule, adjust the number of available credits, or suspend credit sales or transfers if USACE determines there are deficiencies in the ecological performance standards or mitigation plan requirements.

## MITIGATION WORK PLAN

The mitigation work plan consists of three components. The first component is in-channel enhancement of Mission Creek and the unnamed intermittent tributary (reach 1). TWI has included a set of engineer-reviewed and sealed drawings (see Appendix H) that show the design in plan-view form, structure details, channel profile, and geomorphology analysis. TWI will obtain a USACE 404 permit and a Department of Agriculture Division of Water Resources (DWR) Stream Obstruction Permit prior to any in-channel work.

Construction will begin upon approval of the mitigation plan and the issuance of required permits. Construction methods are outlined in a construction specification document that has been engineer-reviewed and sealed (see Appendix I). Construction will consist of building rock riffles, rootwad revetments, rock aprons, and rock ditches and removing foreign debris and large woody debris jams. Bank shaping will not be completed as the goal of the mitigation project is to preserve as much of the wooded riparian corridor as possible. Wooded riparian maintenance will be part of the construction process, and will include girdling undesired species.

The second component includes the establishment of upland and riparian buffer areas. TWI will plant 3,075 bare root seedlings as outlined in sheet 4 of the construction drawings (see Appendix F). The species will consist of black walnut, bur oak, American plum (*Prunus americana*), and fragrant sumac (*Rhus aromatica*). TWI will plant the bare root seedlings using a tractor and an attached tree planter. Prior to planting, TWI will treat the planting area with a broadcast application of glyphosate herbicide if vegetation is present. TWI will follow establishment methods outlined in *Kansas Forestry Technical Note KS-9* (USDA NRCS 2002) to ensure proper planting procedures. TWI will install T-posts on the outside of the planned riparian area boundary. In addition, TWI will install T-posts at the end of each shrub row and every 150 feet within the row. For black walnut and bur oak rows, TWI will place tree tubes on every fourth tree to protect against deer browse/rub and rodent damage and TWI will drive the tree tube stakes 1-foot into the ground. Within the existing riparian corridors, TWI will girdle honey locust, Osage orange, and red cedar trees to open up the canopy. Within sections of open canopy, TWI will plant hackberry and silver maple bare root seedlings to enhance the riparian corridor with historic species. TWI

will place a tree tube on every bare root seedling planted within the existing corridor to reduce deer and rodent damage.

In addition to the riparian plantings, TWI will seed 40.6 acres—that were previously cultivated—with a native grass and forb mixture (see Table 16). TWI will plant the grass/forb seeding mixture using a no-till grass drill. TWI will drill the native grass seed mix between March 15 and May 15 and will provide permanent cover in the uplands and floodplain.

**Table 16:** Native Grass and Forb Mixture

| Variety | Pure Live Seed (Lbs/Acre) | Pure Live Seed (%) | Total Pure Live Seed (Lbs) | Total Bulk (Lbs) |
|---|---|---|---|---|
| **Native Grass** | | | | |
| Little Bluestem (*Schizachyrium scoparium*) | 1.00 | 63.83 | 50.0 | 78.33 |
| Sideoats Grama (*Bouteloua curtipendula*) | 0.90 | 85.35 | 45.0 | 52.72 |
| Indiangrass (*Sorgastrum nutans*) | 0.18 | 84.08 | 9.0 | 10.70 |
| Big Bluestem (*Andropogon gerardii*) | 0.18 | 47.78 | 9.0 | 18.84 |
| Switchgrass (*Panicum virgatum*) | 0.12 | 90.98 | 6.0 | 6.59 |
| **Forbs** | | | | |
| Alfalfa (*Psoralidium tenuiflorum*) | 0.20 | 89.55 | 10.0 | 11.17 |
| Partridge Pea (*Chamaecrista fasciculata*) | 0.17 | 92.97 | 8.5 | 9.14 |
| Illinois Bundleflower (*Desmanthus illinoensis*) | 0.15 | 96.87 | 7.5 | 7.74 |
| Engleman Daisy (*Engelmannia peristenia*) | 0.15 | 78.92 | 7.5 | 9.50 |
| Maximillian Sunflower (*Helianthus maximiliani*) | 0.10 | 89.82 | 5.0 | 5.57 |
| Plains Coreopsis (*Coreopsis tinctoria*) | 0.08 | 86.24 | 4.0 | 4.64 |
| Blacksamson (*Echinacea angustifolia*) | 0.07 | 95.06 | 3.5 | 3.68 |
| Upright Prairie Coneflower (*Ratibida columnifera*) | 0.06 | 90.02 | 3.0 | 3.33 |
| Purple Prairie Clover (*Dalea purpurea*) | 0.06 | 92.72 | 3.0 | 3.24 |
| Blackeyed Susan (*Rudbeckia hirta*) | 0.05 | 90.52 | 2.5 | 2.76 |

**Table 16:** Native Grass and Forb Mixture (continued)

| Variety | Pure Live Seed (Lbs/Acre) | Pure Live Seed (%) | Total Pure Live Seed (Lbs) | Total Bulk (Lbs) |
|---|---|---|---|---|
| New England Aster (*Symphyotrichum novae-angliae*) | 0.04 | 75.08 | 2.0 | 2.66 |
| Greyheaded Coneflower (*Ratibida pinnata*) | 0.04 | 90.49 | 2.0 | 2.21 |

The third component of the mitigation work plan includes the creation and enhancement of emergent wetlands at the site. Specifically, TWI will enhance 1.35 acres of existing wetlands on the north and south tracts by vegetative management, buffer establishment, hydrological improvements, and debris removal. Prior to project improvements, cultivated lands surrounded all but one wetlands. TWI will establish suitable buffers through the second phase of this work plan by planting native grasses and forbs. Vegetation within all of the existing wetlands are generally comprised of diverse, native communities; however, TWI did observe small patches of non-native invasive species along wetland boundaries. These species included Siberian elm, Sericea lespedeza, and Phragmites. Management practices to control these species will include selective herbicide treatments and methods of mechanical removal when the species is located within the wetland boundaries. In addition, TWI will remove a fallen barn located in a large emergent wetland on the western portion of north tract in order to expand its boundaries and improve vegetation growth.

For the two proposed created wetlands in the north tract, TWI will grade small depressions with a rock chute outlets where two ephemeral gullies drain into Mission Creek. These small depressions will temporary hold runoff and trap sediments. Currently, there are hydric soils and some hydrophytic vegetation in these ephemeral gullies. Proposed grading will create the hydrology needed to develop wetlands. TWI will plant wet tolerate plants from existing seed sources. In addition, by ponding water temporarily, up gradient, wild seed sources will have the ability to accumulate and germinate in the depressions. For the proposed created wetland in the south tract, TWI will plug the tile outlet that will improve hydrology. TWI will seed the wetland by harvesting on-site seed sources and planting them in the proposed wetland area.

## OPERATION AND MAINTENANCE PLAN

The operation and maintenance plan describes the maintenance required during establishment to aid in survival of the plant species and to meet performance standards. WLT proposes vegetation establishment defined as the first three years following planting. TWI will consult with KFS and the USDA NRCS field office throughout the operation and maintenance period to ensure best management practices.

For the bare root seedlings, TWI will complete the following activities during the first year. TWI will broadcast a pre-emergent herbicide mixture of Pendulum and Princep or equivalent over the riparian buffer before grass and weeds germinate. In June, TWI will complete a site visit to determine if weeds and grass are present. If they are present, TWI will apply a post-emergent herbicide when vegetation is 6-12 inches tall. For the grass herbicide, TWI will apply Fusilade II or equivalent and Transline or equivalent for broadleaf weeds. In July, TWI will disk or mow between rows no closer than 12 inches to trees and shrubs. If disked, TWI will apply another pre-emergent herbicide mixture of Pendulum and Princep or equivalent over the planting area.

TWI will complete the following maintenance activities during the second and third years following the bare root plantings. In mid to late March, TWI will apply a pre-emergent herbicide mixture of Pendulum or Princep or equivalent before weeds and grasses germinate. In June, TWI will inspect the site to determine if weeds and grass are present. If they are present, TWI will apply a post-emergent herbicide when vegetation is 6-12 inches tall. For the grass herbicide, TWI will use Fusilade II or equivalent and Transline or equivalent for broadleaf weeds. In July, TWI will disk or mow between rows no closer than 12 inches to trees and shrubs. If disked, TWI will apply another pre-emergent herbicide mixture of Pendulum and Princep (or equivalent).

For operation and maintenance during the grass-planting establishment, the following activities will occur. In early to mid-March, TWI will complete a site visit to inspect the seeded area. TWI will consult with the local USDA NRCS district conservationist for burning recommendations. For burning, TWI will have seeded areas burned in early April with help from the City of Horton fire department. In June, TWI will inspect the seeded areas excessive weed growth. If excessive weed growth is present, then TWI will use either herbicide applications or mowing to control the weed growth. TWI will use herbicide application to control patches of excessive weed growth.

TWI will apply Transline or equivalent on the weeds when they reach a height of 6 to 12 inches. If TWI finds excessive weed growth consistently in the seeded area, TWI will mow the area when the weeds reach a height of 6 to 12 inches. TWI will not mow on days when the maximum air temperature exceeds 95 degrees and the humidity is below 30 percent to avoid dehydration of the seeded plants (USDA NRCS 2011). TWI will not mow later than July 15 except during years of abnormal high moisture that may promote excess weed production (USDA NRCS 2011).

For operation and maintenance activities of the north tract constructed wetlands, TWI will inspect the rock chute water control structures. Specifically, TWI will check for buildup of debris and check for signs of structure degradation. In addition, TWI will check the vegetative communities established within the created wetlands regularly for invasive species; which TWI will removed appropriately, if present.

## PERFORMANCE STANDARDS

The mitigation activities will enhance—for in-channel features—approximately 3,860 feet of channel and create a native riparian buffer. The creation and enhancement of a native riparian buffer will include the planting of 3,075 native, bare root seedling trees and shrubs that encompasses an area of 7.43 acres adjacent to Mission Creek and north tract unnamed tributary. TWI will remove non-native species within the established riparian buffer via mechanical and/or chemical control. Riparian buffer creation and enhancement activities will reduce excess amounts of sediment, nutrients, and pesticides associated with surface runoff into Mission Creek from adjacent agricultural fields. The riparian buffer will also reduce the amounts of the aforementioned detriments entering in the shallow groundwater flow within the alluvial aquifer. In-stream improvements will consist of building rock riffles, rootwad revetments, rock aprons, and rock ditches and removing foreign debris and large woody debris jams. Creating riffle-run and riffle-pool sequences in Mission Creek will enhance habitat availability diversity along the mitigation reach that aquatic organism will utilize. These sequences will provide heterogeneous stream flows that will re-aerate Mission Creek flows. Shallow backwater pools will provide important breeding and nursery areas for fishes, amphibians and macroinvertebrates. TWI will use rootwad revetments to stabilize eroding streambanks, while removing large woody and foreign debris from the stream will reduce scouring during high flows. Each of the planned activities will improve in-

stream habitat and water quality in Mission Creek by reducing pollutants carried in sediment. The following sections outline performance standards to measure success of the mitigation activities.

### *In-Stream Physical Habitat Features*

The riffles will provide stable in-channel features diversifying habitat conditions in the mitigation reaches.

*Performance Standards*

1. Constructed riffles will maintain a minimum slope of 20:1.

2. Increase the HDI score of 19 for macrohabitats at the site by 25-percent (or 4.75 points) within five years of construction. The HDI score is based on three in-stream macrohabitats (riffles, runs, and pools). TWI chose a scoring increase of 25-percent as this proposed score reflects best potential macrohabitat improvements.

### *Riparian Buffer Creation*

WLT has divided the riparian buffer into two zones: wood riparian corridor zone and native grass and forb zone. Using Kansas Agronomy Technical Note KS-27 (USDA NRCS 1989) for Assessing Stand Density, TWI will assess the stand density of planted seedlings in the grass/forb riparian buffer. An acceptable stand will be with an average stand count of 2 or more planted seedlings per frame.

*Performance Standards*

1. Wooded riparian buffer plantings will maintain 80 percent survival of the planted vegetation at the end of five years.

2. Grass/forb riparian buffer will maintain a stand density score of 2 or higher.

Species listed on the Kansas noxious weed list (see Table 17) will be eradicated upon observation and shall not cover more than 5-percent absolute aerial coverage of the planted areas.

**Table 17:** Noxious Weeds of Kansas

| Scientific Name | Common Name |
|---|---|
| *Cirsium vulgare* | Bull Thistle |
| *Ambrosia grayii* | Bur Ragweed |
| *Cirsium arvense* | Canada Thistle |
| *Convolvulus arvensis* | Field Bindweed |
| *Cardaria draba* | Hoary Cress |
| *Sorghum halepense* | Johnsongrass |
| *Pueraria lobata* | Kudzu |
| *Euphorbia esula* | Leafy Spurge |
| *Rosa multiflora* | Multiflora Rose |
| *Carduus nutans* | Musk Thistle |
| *Hoffmannseggia densiflora* | Pignut |
| *Agropyron repens* | Quackgrass |
| *Acroptilon repens* | Russian Knapweed |
| *Lespedeza cuneata* | Sericea Lespedeza |
| *Tamarisk spp** | Salt Cedar |
| *Lythrum salicaria** | Purple Loosestrife |
| *Phalaris arundinacea** | Reed Canarygrass |
| *Centaurea solstitialis** | Yellow Starthistle |
| *Hydrilla verticillata** | Hydrilla |
| *Cynanchum louiseae** | Black Swallow-Wort |

*Species not on the official noxious weed control list but identified as noxious and invasive by Kansas Department of Agriculture Plant Protection and Weed Control Program.

***Wetland Creation and Enhancement***

WLT's mitigation strategy will create 0.74-acre of wetland and enhance 1.35 acres of existing wetland. TWI will create two wetlands on the west half of the north tract totaling 0.50 acre in areas that are ditched and drain up-gradient farmland and a 0.24-acre wetland on the west half of the south tract. For grass/forb wetland buffers, WLT will use the Kansas Agronomy Technical Note KS-27 for assessing stand density. An acceptable stand will be an average stand count of 2 or more planted seedlings per frame resulting.

*Performance Standards – Created Wetlands*

1. Created wetlands will meet all wetland criteria based on the 1987 Corps of Engineers Wetland Delineation Manual (Environmental Laboratory 1987) and the Midwest Region supplement within five years of construction.

2. Created wetlands shall score as a Category 2 wetland (45 – 59.9) using the *ORAM Version 5.0* quantitative scoring (Mack 2001). A Category 2 wetland supports moderate wildlife habitat, hydrological, and recreational functions; dominated by native species; potential for reestablishing lost wetland function; and refers to a "good" quality wetland rating (Ohio EPA 2001).

3. Aerial cover of native, herbaceous wetland species will be at least 70 percent facultative or wetter at the end of five years.

4. Grass/forb riparian buffer will maintain a stand density score of 2 at the end of five years.

*Performance Standards – Enhanced Wetlands*

1. Enhanced wetlands will maintain a Category 2 score of 45 – 59.9 using the *ORAM version 5.0* quantitative scoring (Mack 2001).

2. Enhanced wetlands will maintain at least 70-percent cover of native, herbaceous wetland vegetation with has a facultative or wetter indicator status at the end of five years.

3. Grass/forb riparian buffer will maintain a stand density score of 2 at the end of five years.

## MONITORING REQUIREMENTS

TWI will monitor the Mission Creek ILF project for a minimum of five years post-construction to ensure performance standards are met and to determine if maintenance or adaptive management is needed. Further monitoring may be extended or waived by the USACE based upon whether or not performance standards are met. USACE, through coordination with the Kansas IRT, maintains the authority to modify, extend or waive monitoring requirements. WLT will submit to USACE and Kansas IRT an annual monitoring report that includes information described in this section.

***Streambank Stabilization Structures***

On an annual basis, TWI will inspect the general characteristics of the riffle, rock apron, rock ditch, and rootwad structures, and the condition of each structure. TWI will complete monitoring during base flow conditions when the structures are the most visible and accessible. General characteristic measurements will include structure slope of each rock structure, height above bed for each riffle, and photos of each structure.

To assess the conditions of each stabilization structure, TWI will visually inspect each structure and note whether the structure is visible, below water, buried, fully intact, eroded, and whether or not the structure key is visible. TWI will also complete HDI assessments on an annual basis for five years. Assessment techniques will be commensurate with protocols outlined in the baseline section.

***Riparian Buffer Creation***

On an annual basis, TWI will inspect the bare root seedlings and seeded native grass/forb acreage. Since it normally takes three years to establish the vegetation, the first three years will be devoted to operation and maintenance activities. At the end of the third growing season, TWI will determine the survival percentage of the woody species by inspecting each bare root seedling. If any species falls below 80 percent survival, then TWI will flag seedlings to be replaced and replant the following spring. Natural recruitment of desirable species may count toward the species survival rates. For any replanted tree, TWI will perform operation and maintenance activities for three years as outlined in the operation and maintenance plan, but localized to areas around the replanted trees.

At the end of the third growing season for the native grass/forb area, TWI will perform a stand density assessment. TWI will count a minimum of 10 random samples per 10 acres to collect a representative sample of conditions. TWI will determine latitude/longitude sample locations prior to arriving on-site. For each sample, TWI will count plants within a 24-inch by 11.5-inch clipping frame. TWI will record the counts in a stand evaluation worksheet that is included in Appendix H. An acceptable stand will be an average stand count of 2 or more planted seedlings per frame. The Kansas Agronomy Technical Note KS-27 (USDA NRCS 1989) for assessing stand density

states that at an average of two or more planted seedlings per frame should allow for natural recruitment in the following seasons allowing for a successful planting. For average stand counts that fall between 1- and 2-planted seedlings, TWI will solicit professional judgment from a USDA NRCS range specialist to determine if reseeding is necessary. If stand counts average less than 1-planted seedling per frame, then reseeding will be required (USDA NRCS 1989). For any reseeded area, TWI will perform operation and maintenance activities for three years as outlined in the operation and maintenance plan.

***Wetland Creation and Enhancement***

TWI will use a modified monitoring protocol based on Section E of Environmental Laboratory (1987) manual to monitor the created and enhanced wetlands. TWI will establish permanent sampling transects that run north and south for the two created north wetlands. Sampling transects will run northeast to southwest for the wetland enhancement areas and south created wetland. On a yearly basis, TWI will establish random sampling locations along these transects. TWI will sample a minimum of three random locations along each transect to evaluate native species percent cover and mean wetland indicator status of the community. TWI will use the Kansas Floristic Quality Assessment mean wetland quality coefficients (Freeman 2012) to evaluate mean wetland indicator status. In addition, TWI will establish photo points prior to construction and will use them to document wetlands conditions. TWI will monitor wetland hydrology and vegetation for five years. TWI will complete hydrology monitoring along the sampling transects, to be conducted between April and June and be sufficient to show wetland hydrology for at least 11 consecutive days.

## LONG TERM MANAGEMENT PLAN

WLT will be responsible for long-term management. The site's conservation easement will be held in perpetuity and shall stay with the property in the instance that the title of the property is transferred to another entity.

WLT will carry out maintenance of the mitigation property for a minimum of ten years following approval of all performance standards. After the ten years, the in-channel and riparian ecosystems will be self-sustainable. Long-term maintenance needs will likely be vegetation management, in-

channel structure maintenance, removal of trash, and property inspections to ensure that no activities occur that are inconsistent with the purpose of the conservation easement. WLT will complete annual inspections that will identify maintenance needs. Likely vegetation maintenance activities will be eradication of invasive species and reseeding of bare spots with native vegetation. The rock riffle structures are designed for long-term success, but are susceptible to damage from floods and rock degradation. WLT will use TWI staff to assess whether any damages/changes to the streambank stabilization structures require corrective actions. Additional maintenance tasks include trash removal and vandalism repairs. A schedule of maintenance activities and estimated costs are in Table 18.

**Table 18:** Long-Term Maintenance Schedule (Based on 2012 Prices)

| Maintenance Item | Requirement | Acres | Percent of Area | Cost per Unit | Schedule | Yearly Cost |
|---|---|---|---|---|---|---|
| Site Inspection | 1 Visit | 65.0 | 100 | $16.00 | Yearly | $1,040 |
| Buffer Reseeding | 7 # PLS / acre | 40.6 | 5 | $60.00 | Yearly | $121.80 |
| Invasive Species Removal | 1 Visit | 65.0 | 1 | $150 | Yearly | $97.50 |
| In-Stream Structure Maintenance | 1 visit | N/A | N/A | $786.80 | Every 5 Years | $157.36 |
| Trash removal | 1 Visit | N/A | N/A | $577.20 | Yearly | $577.20 |
| Miscellaneous | 1 Visit | N/A | N/A | $120.00 | Yearly | $120.00 |
| | | | | | **Yearly Total** | **$2,113.86** |

WLT agrees to provide the following financial assurances for work associated with this mitigation project. WLT has paid a sum of $20,000 U.S. Dollars as a stewardship fee to ensure compliance, monitoring, and legal defense in perpetuity with the conservation easement.

## ADAPTIVE MANAGEMENT PLAN

If the project cannot be constructed as designed in Appendix E, WLT will notify USACE. Significant modifications to the original design will require USACE approval, in consultation with the Kansas IRT, prior to construction. WLT will use an adaptive management approach to deal with unforeseen issues. TWI has experience with planting bare root seedlings and seeding grass and has the necessary tools to complete operation and maintenance activities. TWI is prepared to complete activities that are necessary as appropriate for the long-term management of the site.

Unforeseen activities may include planting alternate, but desirable species and timber stand improvements in preserved riparian areas.

If unforeseen circumstances arise so that the mitigation project cannot meet performance standards, then WLT will approach USACE with suggestions or changes that are commensurate toward meeting mitigation objectives. If necessary, performance standards may require revising. Any revisions will be commensurate or superior to original performance standards.

## FINANCIAL ASSURANCES

The WLT ILF Program is committed to funding quality compensatory mitigation project sites that construct, monitor, and provide long-term management for aquatic natural resources throughout the state of Kansas. The WLT ILF Program has incorporated financial assurances into its cost-per-credit. WLT will retain financial assurances in a contingency fund within a Certificate of Deposit (CD) account at Argentine Federal Savings for $150,000. This ensures a high level of confidence that the WLT ILF Program Mission Creek Stream, Riparian, and Wetland Mitigation Site will be successfully completed and maintained in accordance with applicable performance standards. WLT will notify USACE at least 120 days in advance of any withdrawal from the contingency fund or termination of the account.

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***APPENDIX A***

***KWO COMPENSATORY MITIGATION PLAN***

# Mission Lake Dredging Project
# Brown County, KS

# Compensatory Mitigation Plan

**Prepared for**
**City of Horton, KS**
**205 East 8th Street**
**P.O. Box 30**
**Horton, KS 66439**

**Prepared by**
**Kansas Water Office**
**901 S. Kansas Avenue**
**Topeka, KS 66612**

**February 2009**

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## Background

Mission Lake was constructed in 1924 by damming Mission Creek. The reservoir was constructed primarily as a raw water source for potable public water supply and for recreation purposes. Sediment has accumulated within the lake since the dam was constructed and has significantly reduced the reservoir's water storage capacity. As such, the City of Horton is now relying on water from groundwater wells to serve the residents of the City and the town of Willis. The reservoir remains used as an attraction for boaters, skiers, and fisherman.

The City of Horton is participating as a pilot project under the Multipurpose Small Lakes Program (MPSL) administered by the State Conservation Commission (SCC). As a participant of this program, the City will receive cost share assistance for the renovation of Mission Lake. Renovation of the lake will include removal of approximately 1,000,000 cubic yard (620 acres) of sediment and construction of a Confined Disposal Facility (CDF) within the unnamed tributary to Mission Creek for the purpose of depositing the dredged material upstream of the CDF.

In September 2008, the U.S. Army Corps of Engineers provided a response to a request for a Jurisdictional Determination (JD) for the portion of land proposed for construction of the CDF and deposit of dredged material (Site E). According to the findings under the JD, 2,220 linear feet of non-relatively permanent waters (RPW) that flow directly or indirectly into traditionally navigable waters (TNW) are located within the project area and are jurisdictional based on the presence of an established ordinary high water mark (OHWM).

Following is the proposed compensatory mitigation plan for the impacts to the Waters of the United States (WOUS) associated with the Mission Lake Dredging Project. Considerations for the development of this mitigation plan were based on the Kansas Stream Mitigation Guidance drafted by a Stream Mitigation Task Force that included the U.S. Army Corps of Engineers, Kansas City District and other state and federal agencies in 2008.

# Calculation of Impacts and Required Mitigation

Following is a description of the existing conditions of an unnamed tributary to Mission Creek that will be impacted as a result of project activities. In addition, up to one million cubic yards of sediment will be removed from Mission Lake in an effort to restore water supply capacity, improve in-lake water quality conditions, and renovate the recreational potential of the lake.

### *Dredging Activities*

Accumulated sediment will be removed from Mission Lake using a hydraulic dredge operation. The operation shall consist of removing up to 1,000,000 (one million) cubic yards of sediment. This work shall remove only the sediment that has accumulated since the construction of the lake, not the original undisturbed bottom. The material will be moved via pipeline to the Confined Disposal Facility (CDF). Excess water will be returned to the lake through the natural channel. The sediment accumulated in Mission Lake is almost exclusively silt and clay, with a negligible sand volume.

A site map and plans for disposal of dredged material are show in Appendix B and C.

### *Stream Type*

Approximately 2,220 linear feet of an ephemeral stream are located within the project area and would be impacted by project activities. Estimated average flow events for this stream range from 11 to 20 events per year. The stream conveys stormwater flows from surrounding agricultural areas. (See photos in Appendix A).

### *Stream Priority Status*

Stream priority status is a factor used to determine the importance of the stream that would be impacted or used for mitigation. This status will influence the amount of stream credits generated. The unnamed tributary located within the project area is a secondary priority according to the criteria described in the Kansas Stream Mitigation Guidance. In 2002, the Kansas Department of Health and Environment (KDHE) issued Total Maximum Daily Load (TMDLs) for atrazine and eutrophication for Mission Lake and fecal coliform bacteria in the Delaware River watershed above Perry Lake.

### *Existing Conditions*

Existing condition is a reflection of the functional state of a stream before any project impacts that would occur from an applicant’s proposed project. This is a measure of the stream's natural stability and resilience relative to the physical, chemical and biological integrity of the system. The unnamed tributary located within the project area is moderately functional.

The unnamed tributary is a natural stream with an average width of four (4) feet, and average depth of one (1) foot, and an average slope of 2 to 1. The primary tributary substrate is silt and the channel geometry is meandering. A riparian buffer is present throughout most of the stream corridor with widths ranging from 5-25 feet on either bank. Forested riparian vegetation is absent in the upper reaches of the stream.

Scattered vegetation on the stream banks are predominately upland species with a few scattered hydrophytes. The dominants include Smooth Brome *(Bromus inermis*), Black Walnut (*Juglans nigra*), and Reed Canary Grass (*Phalaris arundinacea*). Of these, only Reed Canary Grass is considered a hydrophyte. Other species

present, but not dominant, are Giant Ragweed (*Ambrosia trifida*), Field Thistle (*Cirsium arvense*), Pokeweed (*Phytolacca americana*) and Prickly Lettuce (*Lactuca serriola*). Adjacent land use is agricultural cropland. The site is bordered to the west by Highway 73 and to the south by 130th Street.

### *Duration*

Impacts resulting from this project will be permanent. A schedule showing earliest start and latest completion dates for all significant activities is included in Appendix D.

### *Impact Activity*

Impact activity is the type of impact proposed that will diminish the functional integrity of the riparian system. The primary impact activity for this project is fill.

### *Total Project Impact and Linear Feet of Stream Impacted in Reach*

The total length of stream, in feet, that will be impacted by a project, as authorized under Section 404 of the Clean Water Act, and for which mitigation will be required is 2,220 feet.

Because the impacts are greater than 1,000 linear feet (LF), a scale factor of 0.2 per 500 LF of impact in addition to the remained LF was applied.

| Factor | Impact Calculation |
|---|---|
| Stream Type Impacted | 0.4 |
| Stream Status | 0.4 |
| Existing Condition | 0.8 |
| Duration | 0.3 |
| Activity | 2.5 |
| Total Project Impact | 0.8 |
| Linear Feet of Stream Impacted | 2,220 |
| Sum of Factors | 5.2 |
| Factors x Linear Feet | 11,544 |

# Mitigation

### *Avoidance and Minimization of Impacts*

Six potential site locations (Sites A through F) in the Mission Lake watershed were analyzed for suitability as an upland CDF for the disposal of dredged material from Mission Lake. Landowners of Sites A through D and Site F were not willing to sell. The landowner of Site E was interested in selling. The City of Horton vigorously wished to avoid eminent domain proceedings to obtain land for this project. As such, the City of Horton elected to negotiate the purchase of land associated with Site E. Thus, the land designated Site E plus additional land surrounding Site E was purchased by City of Horton in early 2008 for the disposal of dredged material from the Mission Lake Renovation Project.

One alternative for the disposal of sediment in other dredge projects is land application. For this project, the quantity of land needed for slurry application would be significantly more than the land purchased and is not practicable or feasible.

As described in the *Preliminary Renovation Plan completed by Black and Veatch in September of 2007*:

"In spite of the overall good suitability of the watershed to provide potential CDF sites, roughly the east half of the watershed was eliminated from the detailed study of CDF locations (i.e., CDF volume calculations). There are several reasons for this. First, the east half, especially near Mission Lake, generally has a larger amount of apparent residential development than the west half. Second, the topography in the area offers slightly steeper slopes than the west half, resulting in smaller created volumes behind embankments placed in valleys. Third, for several specific valleys, the existing county roads are in locations that would eliminate otherwise potentially attractive CDF locations. Finally, the town of Willis in the watershed's northeast corner diminishes that area's suitability."

It was also noted in the Preliminary Renovation Plan that any considered CDF should be within the watershed upstream of Mission Lake to avoid intra-basin transfer and to minimize lost processes water. In addition, the CDF should be near the upstream watershed boundary and be as close to the lake as possible. Site E meets all of these considerations.

The 404(b)(1) Guidelines, Part 230.10, Restrictions on Discharge, state that no discharge shall be permitted if there is a practicable alternative which would have less impact on the aquatic ecosystem. An alternative is practicable if it is available and capable of being done after taking into consideration cost, existing technology, and logistics, in light of overall project purposes. The City of Horton has expended nearly $1 million for the acquisition of Site E for this project. Cost is a prohibitive factor in selecting an alternative site for the CDF.

According to a project review by Kansas Department of Wildlife and Parks (KDWP) (Larson, September 28, 2007) the site selected for this project (Site E) appears to offer the least impacts to existing wildlife habitat. The project was reviewed for potential impacts on crucial wildlife habitats, current state-listed threatened and endangered species, and public recreation areas for which KDWP has administrative authority. KDWP encouraged the project sponsors to minimize the loss of existing habitat and manage the completed CDP for wildlife habitat – both of which are existing goals of the project.

According to correspondence with the U.S. Fish and Wildlife Service (USFWS), there are no federally threatened or endangered species likely to be present in the project area.

A Watershed Restoration and Protection Strategy (WRAPS) plan has been prepared for the Delaware Watershed (Mission Lake is within the Delaware Watershed). The WRAPS plan provides detailed information about the watershed area, water quality concerns within the watershed, and goals and objectives for addressing those concerns. A key concern in the WRAPS plan is sedimentation in Perry Reservoir and Mission Lake. The WRAPS plan provides the framework for implementation of practices aimed at reducing future sediment contributions to these lakes. In addition, the Kansas Water Office is working with many state, local and federal partners on a Reservoir Sustainability Initiative. The Initiative is aimed at targeting of appropriate management practices to reduce erosion to protect the storage in our lakes.

While we take efforts to reduce the future contribution of sediment to Mission Lake, it is still necessary to remove some of the sediment that has accumulated in the lake since construction. Restoration of water supply is the intent of the SCC Water Supply Restoration Program.

### *Additional Project Benefits*

Mission Lake is critical to the water supply for the City of Horton and vital to southern Brown County's long-term economic growth. The benefits of the restoration of Mission Lake through dredging are much greater than providing additional public water supply for the City of Horton. The dredging of Mission Lake will help the state meet the water quality goal to control eutrophication and reduce Atrazine loads to acceptable levels.

As noted in "Potential Water Quality Enhancement Strategies, Mission Lake" by BG Consultants, Inc. in 2004, "to stop the internal phosphorous cycling from the phosphorous in the sediment, the sediment must be removed." Sediment removal has the potential to significantly improve the eutrophication conditions in the lake.

Mission Lake also offers considerable recreational opportunities. The Lakeview Golf Club is located immediately east of Mission Lake. Local residents and visitors to the area enjoy golfing and the recreational activities afforded by Mission Lake. Recreational activities on Mission Lake include boating, fishing, camping, and skiing. Observations indicate that Mission Lake is used heavily in the summer.

The golf course hosts a number of large and small tournaments, and is currently working negotiating with a regional recreation management company that will potentially bring new activity opportunities (e.g., establishment of local fitness club) to further enhance Horton's overall long-range planning.

With respect to future real property development around Mission Lake, there are considerable opportunities for more residential construction. There are currently 15 developed lots with an average assessed dwelling value of over $140,000 on these comparatively larger lake lots (i.e., average 3.5 - 4 acres in size). With an additional seven undeveloped modest-sized lots overlooking Mission Lake (i.e., 1 - 3 acres) currently available in inventory, and yet another 20 acres of lakeside property considered having potential for future home building in a nice recreational setting, the economic expansion prospects for this particular area of Horton are generally considered very promising.

Kansas Department of Wildlife and Parks (KDWP) has been participating on an inter-agency team with the City of Horton for the planning of the Mission Lake renovation project. KDWP notes that the dredging project presents a "once in a lifetime opportunity to renovate a very poor fishery."

According to KDWP, turbidity is a chronic problem in Mission Lake, often with a Secchi disk reading of 4" or less. Stunted white crappie dominate this fishery with common carp, yellow bullhead and freshwater drum causing problems as well. The Mission Lake fishery has been rated poor in several popular fish species for well over 20 years. Numerous management options have been exercised however none have succeeded.

Water clarity is the key to having a well balanced fishery with a largemouth bass as the top predator. Previous lake renovations throughout Kansas demonstrate that as the fishery matures the lake use increases dramatically. Balanced fishery and improved water clarity also result in increased wildlife usage. A good fishery will draw people from other counties and even other states. Access to Mission Lake is great with two major highways and paved entrances.

Mission Lake currently provides a water skiing and pleasure boating. These activities are expected to increase with improved water clarity and some added amenities: new boat ramp, breakwater and possibly a courtesy dock. Planned dredging activities will greatly expand the safe area in which boaters can operate.

Renovation of Mission Lake will positively affect the City of Horton and the surrounding community more than can be stated in these few paragraphs.

***Compensation for Impacts***

## Site Selection

In 2008, the U.S. Army Corps of Engineers, Kansas City District contracted Gulf South Research Corporation to conduct stream channel morphological/riparian assessments identifying future sediment control opportunities within the Kansas River basin. Gulf South subcontracted with The Watershed Institute, Inc. (TWI) to complete some of the project tasks. The study area encompassed sub-watersheds above Perry Reservoir, including the sub-watershed contributing to Mission Lake. A survey site from this project within the Mission Lake watershed has been selected for compensation of impacts resulting from the CDF construction.

## Site Restoration and Protection

Several Best Management Practices (BMPs) were recommended in the Gulf South report for remediation of the surveyed site, including the installation of rock chutes and vegetation of drainage ditches. The City of Horton plans to purchase in-lieu fee credits through TWI. These credits will be dedicated to the restoration of the above-described survey site.

Calculation of compensation credits, a description of mitigation goals, and monitoring for this project will be coordinated through TWI.

## Appendix A:
## Photographs of Impacted Area

Unnamed tributary to Mission Creek. Proposed to be impacted through fill for the purpose of CDF construction and placement of dredged materials.

Unnamed tributary to Mission Creek. Proposed to be impacted through fill for the purpose of CDF construction and placement of dredged materials.

Unnamed tributary to Mission Creek. Proposed to be impacted through fill for the purpose of CDF construction and placement of dredged materials.

Unnamed tributary to Mission Creek. Proposed to be impacted through fill for the purpose of CDF construction and placement of dredged materials.

Unnamed tributary to Mission Creek. Proposed to be impacted through fill for the purpose of CDF construction and placement of dredged materials.

Field at head of tributary to Mission Creek. Proposed to be impacted through fill for the purpose of CDF construction and placement of dredged materials.

Field at head of tributary to Mission Creek. Proposed to be impacted through fill for the purpose of CDF construction and placement of dredged materials.

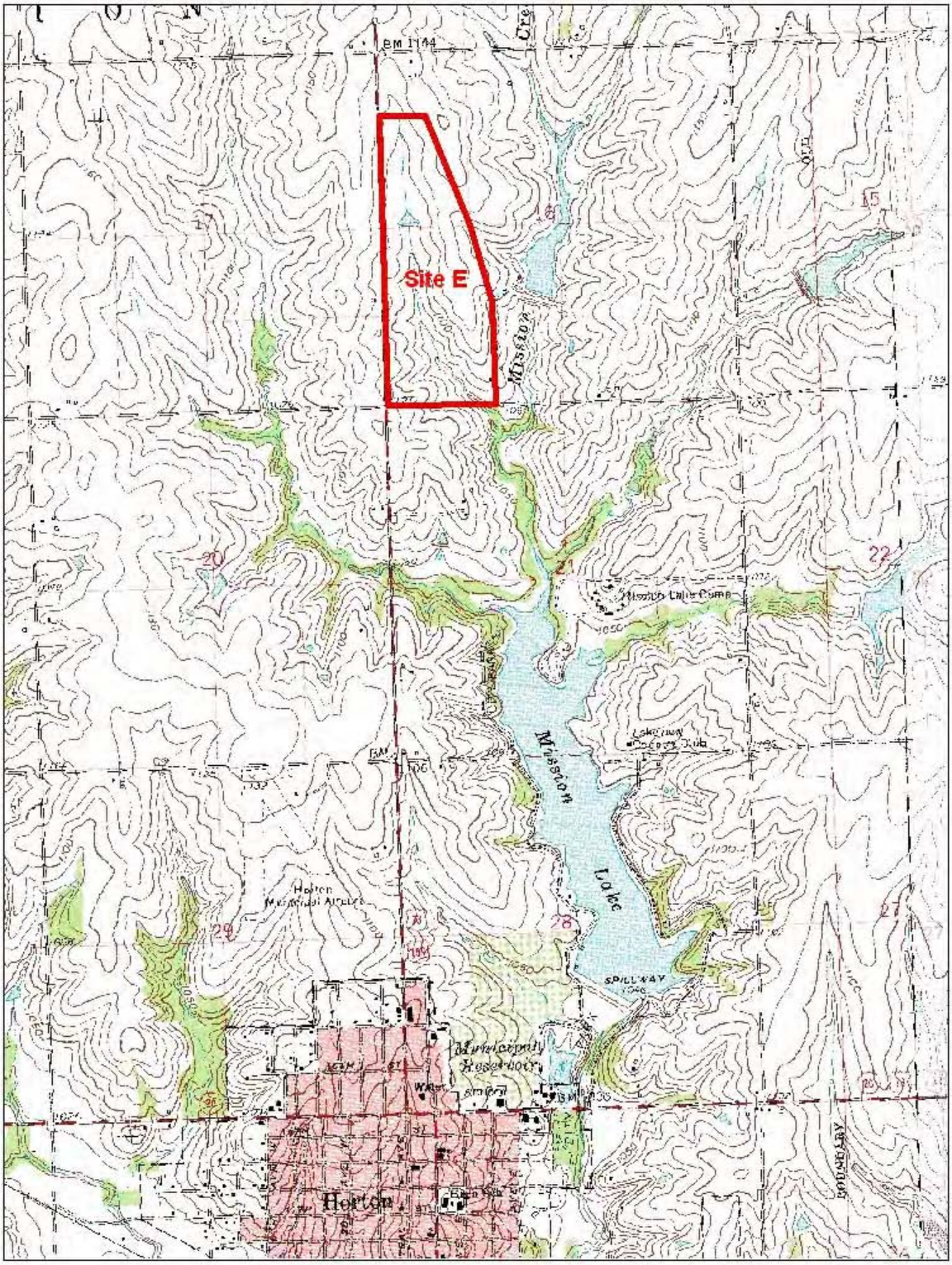
View of “Site E” from the corner of Highway 73 and 130th Street.

Mission Lake. Proposed for dredging of up to 1 million cubic yards of sediment.

**Appendix B:**
**Project Plans**

**Conceptual basin design** – (not to scale). Dredge discharge pipe flows into 1st distilling basin and across overflow weir into second basin. Blue line is permanent 4" PVC line that will ensure spring water is carried to lower stream. This will be trenched prior to dredging.

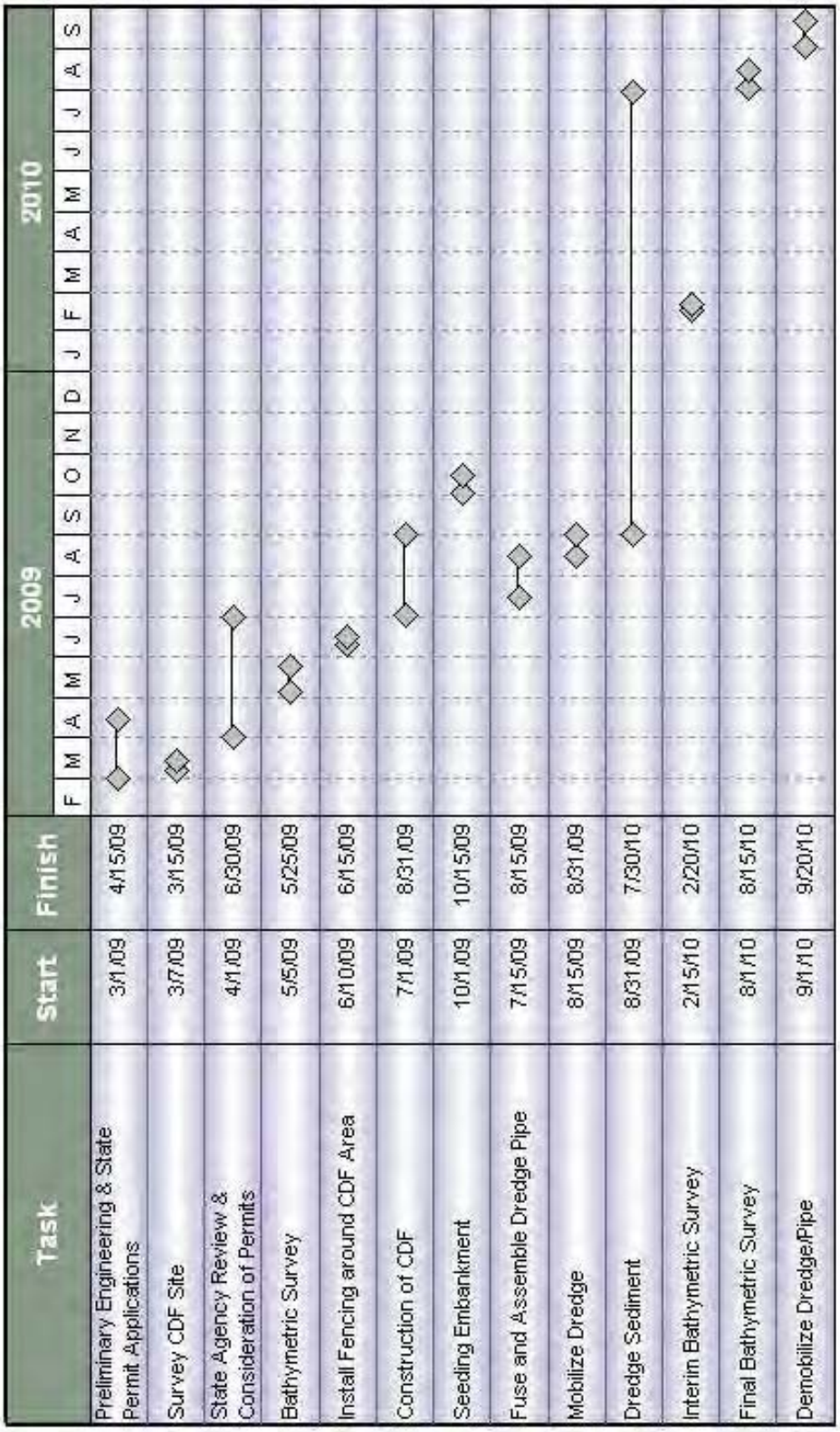
**Appendix C:**
**County Road Map/ U.S. Geological Quadrangle Map**



**Appendix D:**
**Schedule**

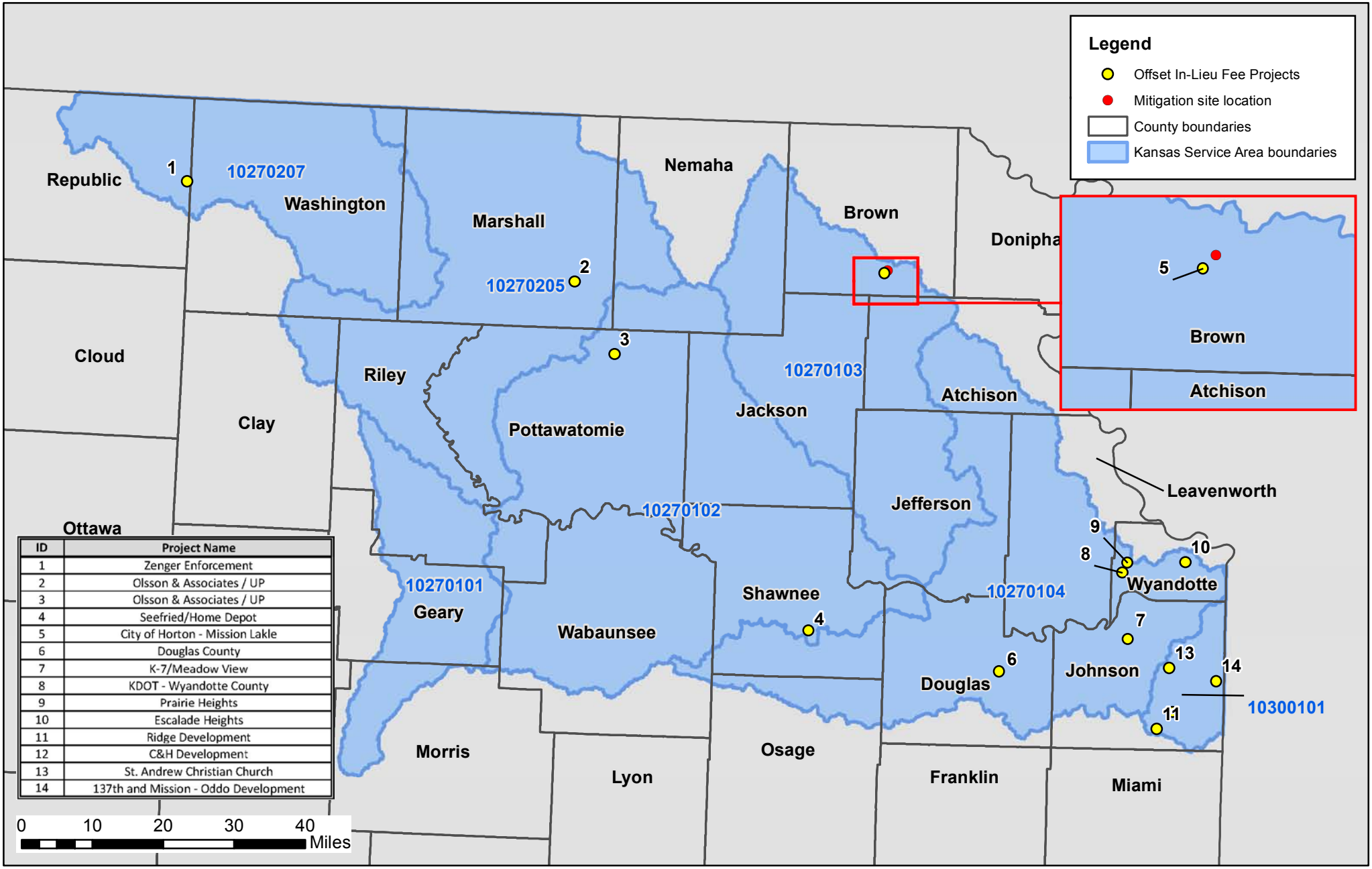
# Mission Lake
## Design-Dredge Project Schedule

| Task | Start | Finish |
|---|---|---|
| Preliminary Engineering & State Permit Applications | 3/1/09 | 4/15/09 |
| Survey CDF Site | 3/7/09 | 3/15/09 |
| State Agency Review & Consideration of Permits | 4/1/09 | 6/30/09 |
| Bathymetric Survey | 5/5/09 | 5/25/09 |
| Install Fencing around CDF Area | 6/10/09 | 6/15/09 |
| Construction of CDF | 7/1/09 | 8/31/09 |
| Seeding Embankment | 10/1/09 | 10/15/09 |
| Fuse and Assemble Dredge Pipe | 7/15/09 | 8/15/09 |
| Mobilize Dredge | 8/15/09 | 8/31/09 |
| Dredge Sediment | 8/31/09 | 7/30/10 |
| Interim Bathymetric Survey | 2/15/10 | 2/20/10 |
| Final Bathymetric Survey | 8/1/10 | 8/15/10 |
| Demobilize Dredge/Pipe | 9/1/10 | 9/20/10 |



# *APPENDIX B*

# *FIGURES*




| ID | Project Name |
|---|---|
| 1 | Zenger Enforcement |
| 2 | Olsson & Associates / UP |
| 3 | Olsson & Associates / UP |
| 4 | Seefried/Home Depot |
| 5 | City of Horton - Mission Lakle |
| 6 | Douglas County |
| 7 | K-7/Meadow View |
| 8 | KDOT - Wyandotte County |
| 9 | Prairie Heights |
| 10 | Escalade Heights |
| 11 | Ridge Development |
| 12 | C&H Development |
| 13 | St. Andrew Christian Church |
| 14 | 137th and Mission - Oddo Development |

THE WATERSHED INSTITUTE AND LAND TRUST

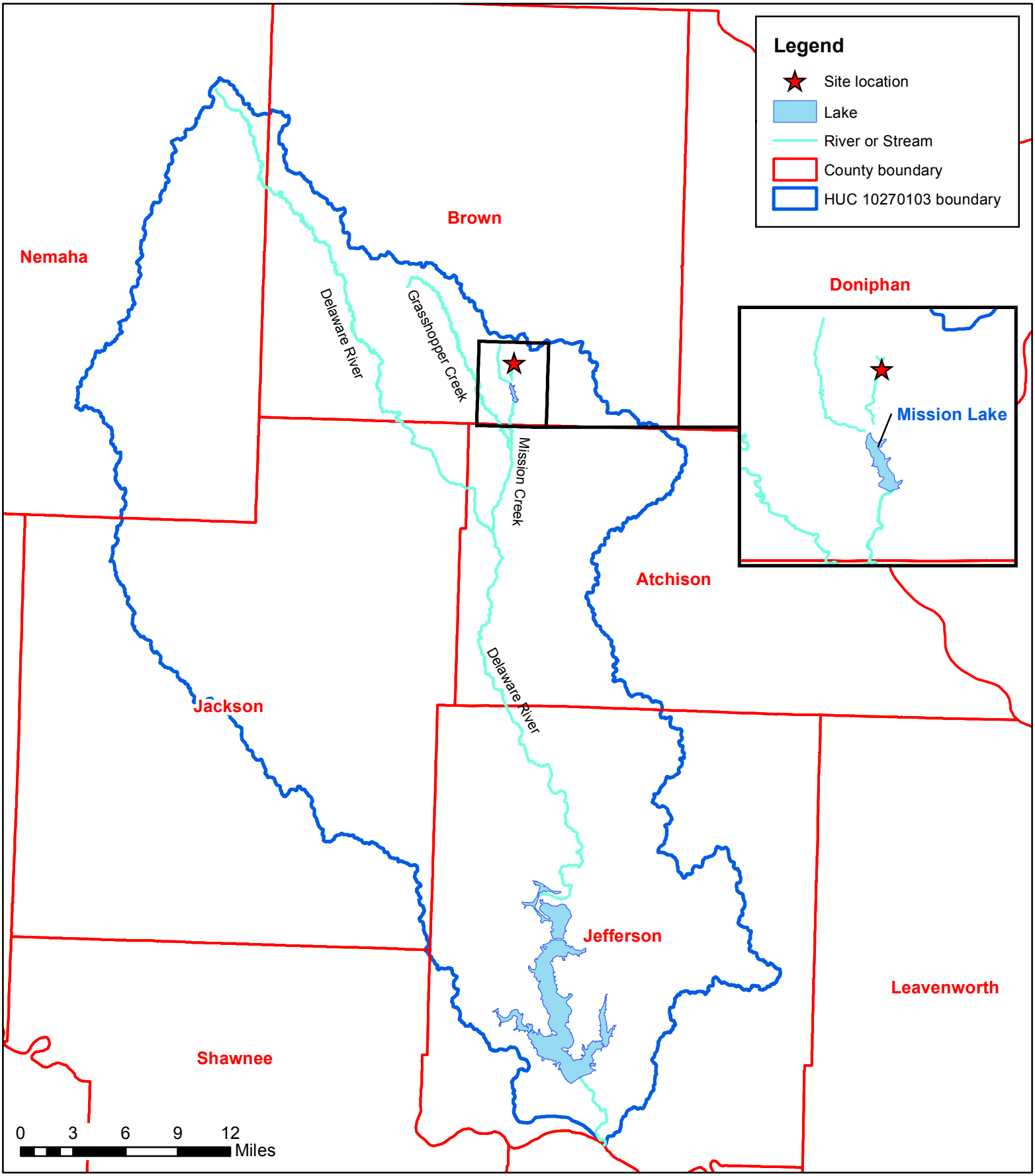
Figure 1
Expanded Site Location/Service Area Map

**Watershed Land Trust ILF Program - Mission Creek**
**Brown County, Kansas**

N W E S

Date: July 2015

Source: Kansas Data Access and Support Center




THE WATERSHED INSTITUTE AND LAND TRUST

Figure 2
HUC 10270103 Boundary Map

**Watershed Land Trust ILF Program - Mission Creek**
**Brown County, Kansas**

N
W E
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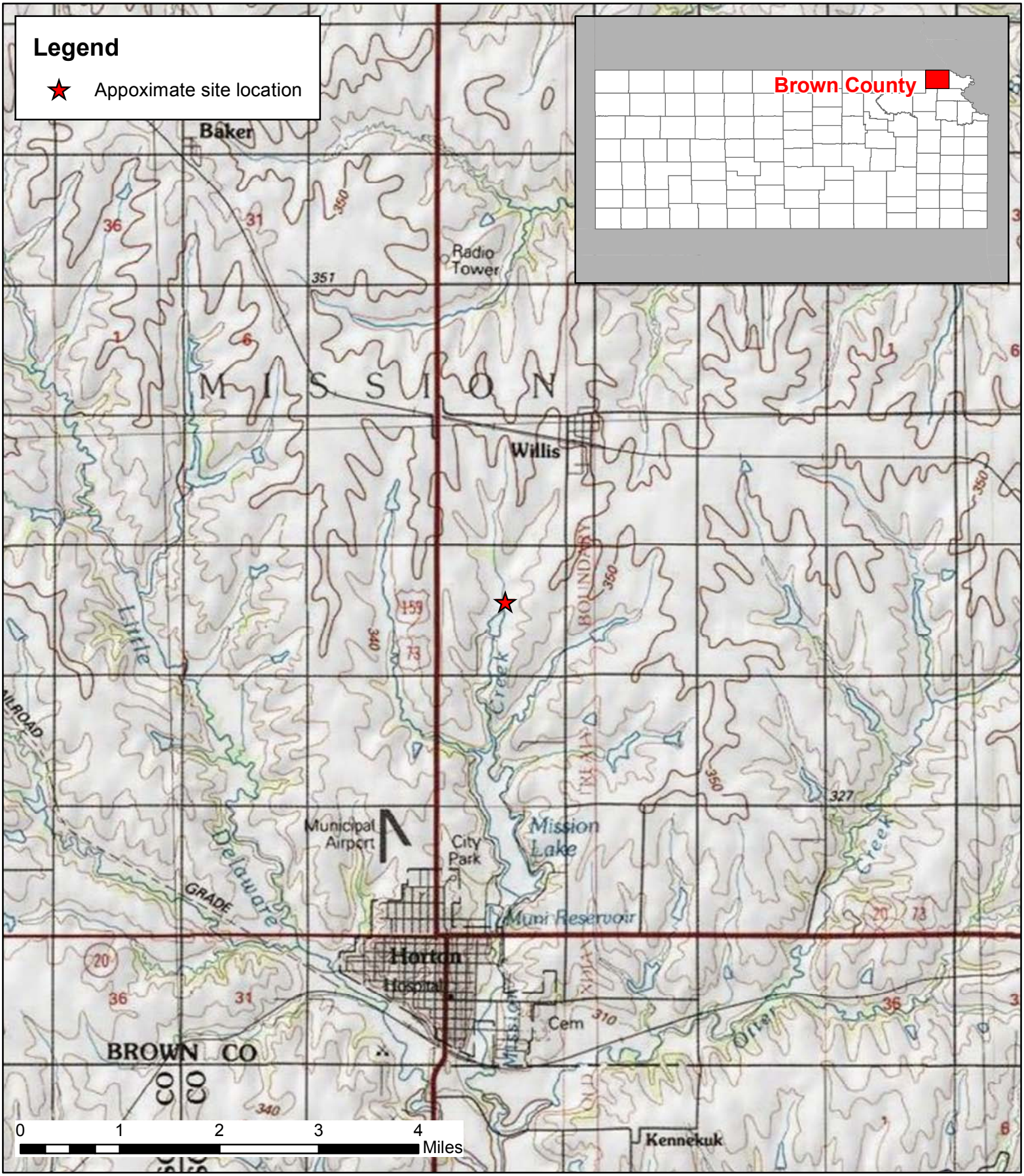
Date: July 2015

Source: Kansas Data Access and Support Center




THE WATERSHED INSTITUTE AND LAND TRUST

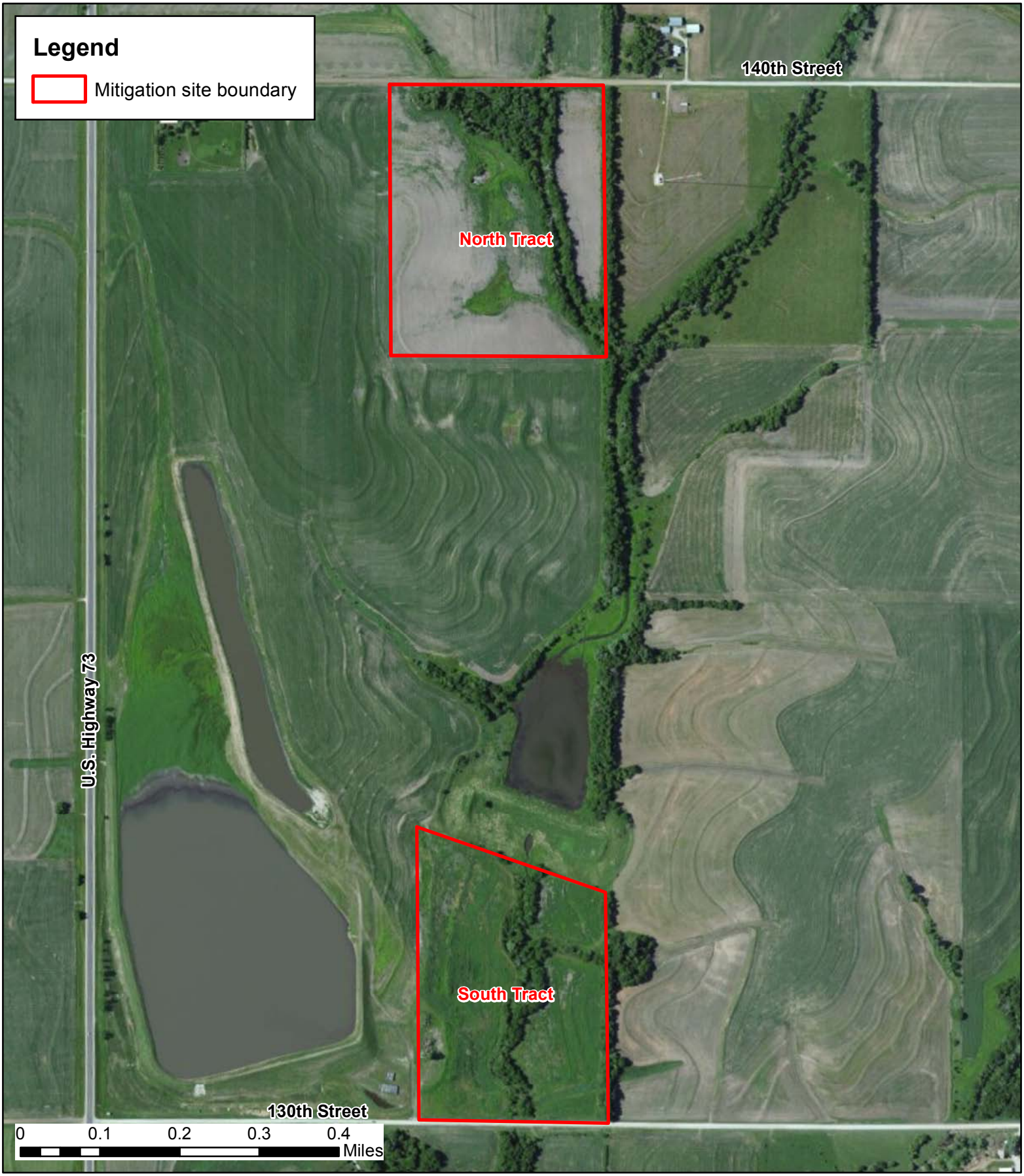
Figure 3
Site Location Map

**Watershed Land Trust ILF Program - Mission Creek**
**Brown County, Kansas**

N W E S

Date: July 2015

Source: USGS 30 x 60-minute Topo, Atchison, 1985




THE WATERSHED INSTITUTE AND LAND TRUST

Figure 4
Site Aerial Map

**Watershed Land Trust ILF Program - Mission Creek**
**Brown County, Kansas**

N
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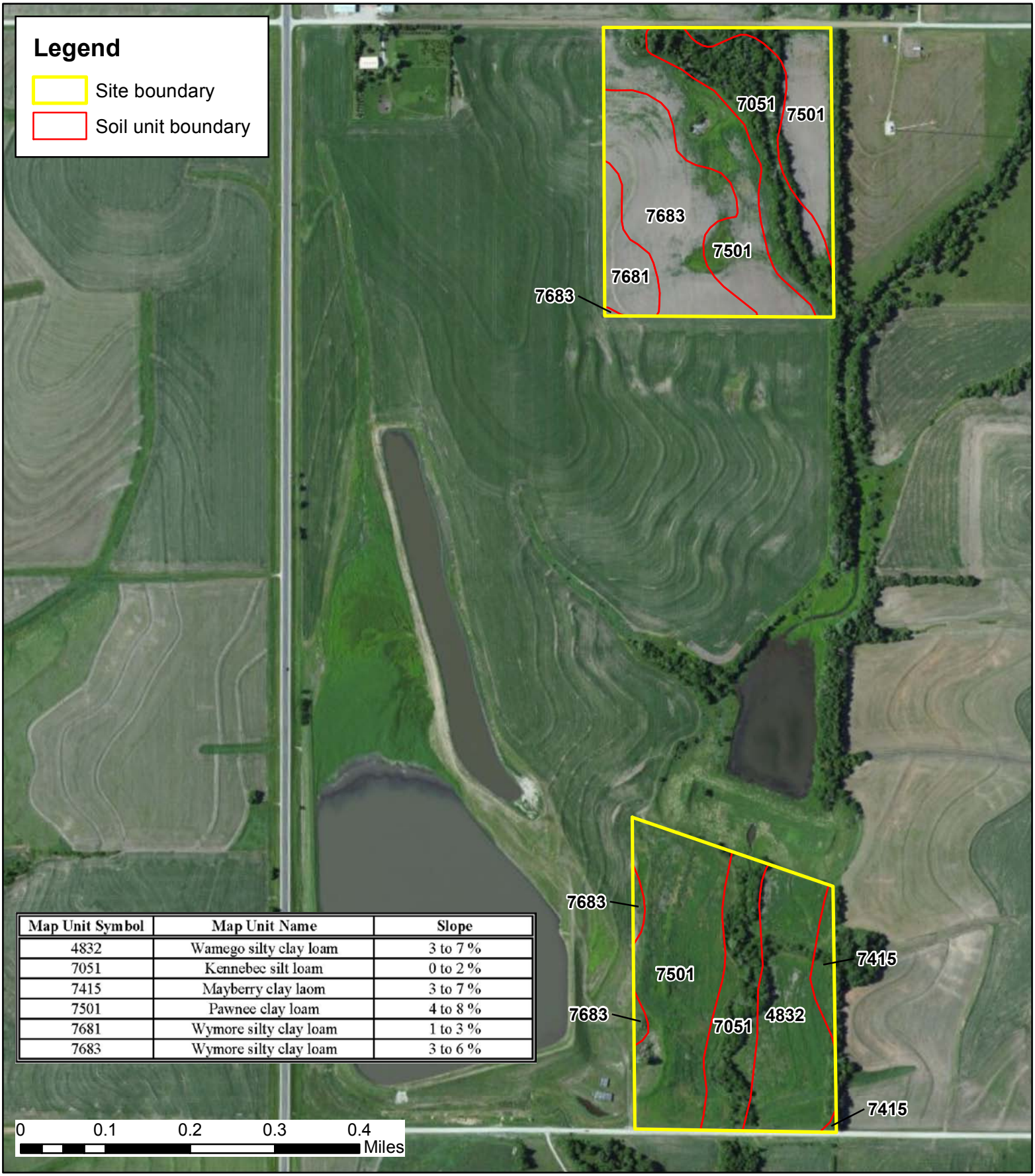
Date: July 2015

Source: ESRI Basemaps, Aerial Imagery, 2014




| Map Unit Symbol | Map Unit Name | Slope |
|---|---|---|
| 4832 | Wamego silty clay loam | 3 to 7 % |
| 7051 | Kennebec silt loam | 0 to 2 % |
| 7415 | Mayberry clay laom | 3 to 7 % |
| 7501 | Pawnee clay loam | 4 to 8 % |
| 7681 | Wymore silty clay loam | 1 to 3 % |
| 7683 | Wymore silty clay loam | 3 to 6 % |

THE WATERSHED INSTITUTE AND LAND TRUST

Figure 5
NRCS Soils Map

**Watershed Land Trust ILF Program - Mission Creek**
**Brown County, Kansas**

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Date: July 2015

Source: USDA NRCS Web Soil Survey, 2015
ESRI Basemaps, Aerial Imagery, 2011

THE WATERSHED INSTITUTE AND LAND TRUST

Figure 7
Mitigation Site Reach Location Map - North Parcel

**Watershed Land Trust ILF Program - Mission Creek**
**Brown County, Kansas**

N
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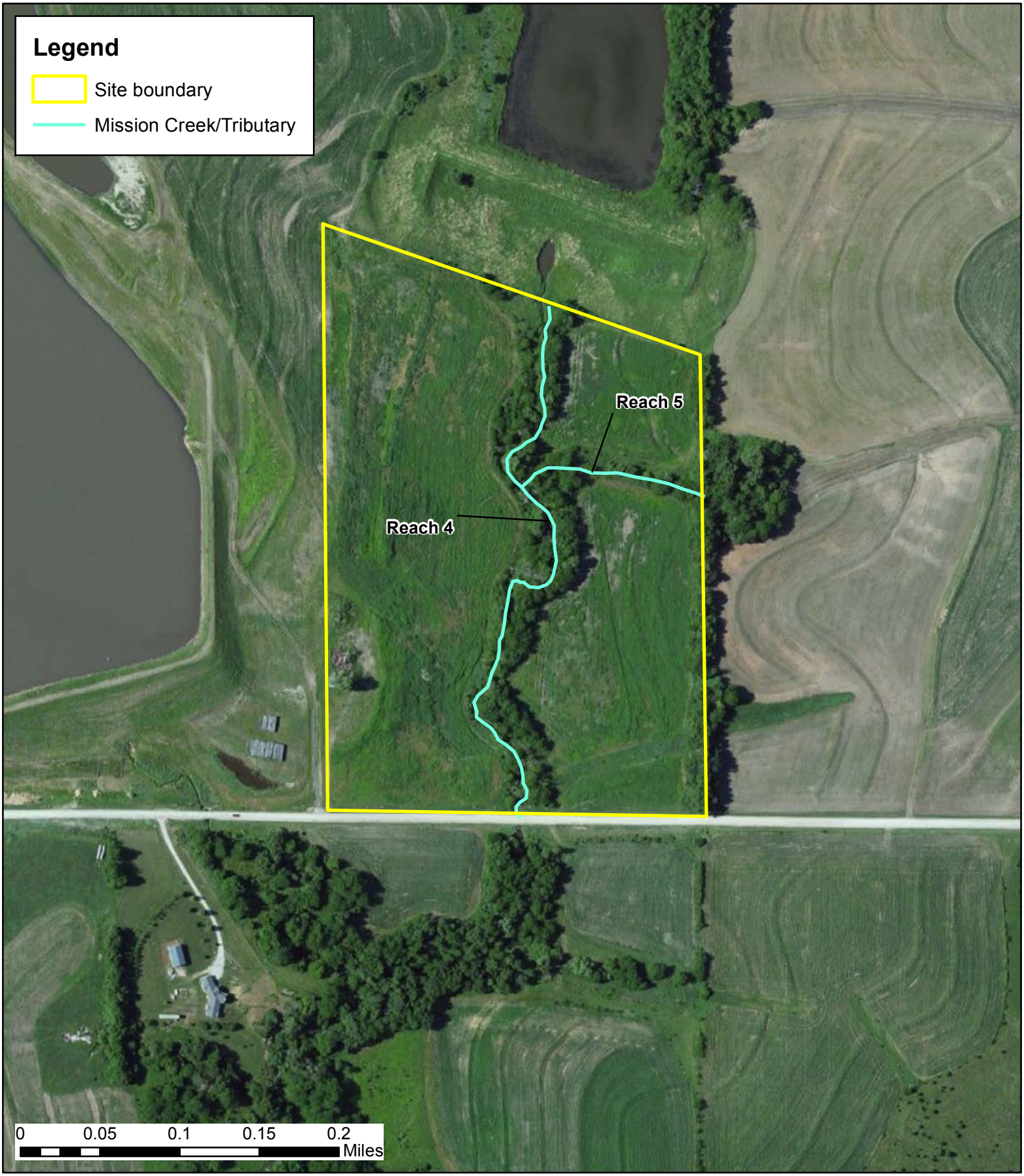
Date: July 2015

Source: ESRI Basemaps, Aerial Imagery, 2015




THE WATERSHED INSTITUTE AND LAND TRUST

Figure 8
Mitigation Site Reach Location Map - South Parcel

**Watershed Land Trust ILF Program - Mission Creek**
**Brown County, Kansas**

N
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Date: July 2015

Source: ESRI Basemaps, Aerial Imagery, 2015

***APPENDIX C***

***RECORDED CONSERVATION EASEMENT***

DEED OF CONSERVATION EASEMENT

THIS GRANT DEED OF CONSERVATION EASEMENT ("Easement") is made this 10th day of May, 2011, by City of Horton, Horton City Hall, 205 E. 8th, Horton, KS, 66439 ("Grantors"), in favor of Watershed Land Trust, Inc., a non-profit Kansas corporation qualified to do business in Kansas, having an address at 7211 W. 98th Terr. #140, Overland Park, KS 66212 ("Grantee").

WITNESSETH:

WHEREAS, Grantors are the sole owners in fee simple of certain real property in Brown County, Kansas, more particularly described below and hereinafter referred to as the "Protected Property";

Tract "A": A tract of land in the N.W. Quarter of Section 16, Township 4 South, Range 17 East of the 6th P.M., in Brown County, Kansas. Beginning at the North Quarter corner of said section, thence North 89 deg. 46 min. 35 sec. West, on the North line of the Northwest Quarter, 1100.00 feet, thence South 0 deg. 07 min 03 sec West, parallel with the East line of the Northwest Quarter, 1400.00 feet, thence South 89 deg. 46 min. 35 sec. East parallel with the North line of the Northwest Quarter, 1100.00 feet, thence North 0 deg. 07 min. 03 sec. East on the East line of the Northwest Quarter, 1400.00 feet, to the point of Beginning, containing 35.35 acres more or less.

Tract "B": A tract of land in the S.W. Quarter of Section 16, Township 4 South, Range 17 East of the 6th P.M., in Brown County, Kansas. Beginning at the South Quarter corner of said section, thence North 89 deg. 43 min 42 sec. West, on the South line of the Southwest Quarter, 953.00 feet, thence North 0 deg. 07 min. 03 sec. West, parallel with the East line of the Southwest Quarter, 1519.17 feet, thence South 70 deg. 34 min. 56 sec. East, 1009.74 feet, thence South 0 deg. 07 min. 03 sec. West on the East line of the Southwest Quarter, 1188.00 feet, to the point of Beginning, containing 29.61 acres more or less.

WHEREAS, the Protected Property possesses ecological, educational, scenic, agricultural, open space, historical, and/or recreational values (collectively, "Conservation Values") of great importance to Grantors, the people of Brown County and the people of the State of Kansas;

WHEREAS, the specific Conservation Values of the Protected Property are documented in an inventory of relevant features of the Protected Property, on file at the offices of Grantee which consists of a species list, reports, maps, photographs, and other documentation that the parties agree provide, collectively, an accurate representation of the Protected Property as of the date of this Easement and which is intended to serve as an objective, though nonexclusive, information baseline for monitoring compliance with the terms of this grant ("Baseline Documentation");

WHEREAS, in particular, the Protected Property consists of tract A 35.35 acres of stream and riparian land including agricultural and tract B of 29.61 acres of stream and riparian land including agricultural;

WHEREAS, as of the date of this Easement, the Protected Property is planted to native grass and trees;

WHEREAS, Grantors intend that the Conservation Values of the Protected Property be preserved and maintained by permitting only those land uses on the Protected Property that do not significantly impair or interfere with the Conservation Values, which include land uses relating to erosion protection and wildlife habitat existing as of the date of this Easement; and

WHEREAS, riparian zones cumulatively play a significant role in moderating storm flows to streams thereby reducing downstream flooding, provide flood storage capacity and groundwater recharge, and provide shade to the water body providing a more stable aquatic habitat for a variety of aquatic and terrestrial species, for the benefit of the public; and

WHEREAS, Grantors further intend, as owners of the Protected Property, to convey to Grantee the right to preserve and protect the Conservation Values of the Protected Property in perpetuity;

WHEREAS, Grantee is a publicly supported, tax-exempt non-profit organization, qualified under Section 501(c)(3) and 170(h), respectively, of the Internal Revenue Code of 1986, as amended, and the regulations promulgated thereunder (the "Internal Revenue Code"), whose primary purpose is the protection and preservation of lands of ecological, historical, scenic, agricultural or recreational significance in Kansas; and

WHEREAS, Grantee agrees by accepting this Easement to honor the intentions of Grantors stated herein and to preserve and protect in perpetuity the Conservation Values of the Protected Property for the benefit of this generation and the generations to come;

NOW, THEREFORE, in consideration of the above and the mutual covenants, terms, conditions, and restrictions contained herein, and pursuant to the Laws of the State of Kansas and in particular the Kansas Uniform Conservation Easement Act, Kansas Statutes Annotated 58-3810 et seq., the Grantors hereby voluntarily grant and convey to Grantee this Easement in perpetuity over the Protected Property of the nature and character and to the extent hereinafter set forth.

1. PURPOSE. All of the above recitals of fact are incorporated herein as if fully set forth. It is the purpose of this Easement to assure that the Protected Property will be retained forever predominantly in its natural, scenic, historic, agricultural, and open space and restored condition and to prevent any use of the Protected Property that will significantly impair or interfere with the Conservation Values of the Protected Property. Grantors intend that this Easement will confine the use of the Protected Property to such activities, including, without limitation, those involving wildlife habitat, ecological research, recreation and public education as are consistent with the purpose of this Easement.

2. RIGHTS OF GRANTEE. To accomplish the purpose of this Easement the following rights are conveyed to Grantee by this Easement:

(a) To preserve and protect the Conservation Values of the Protected Property;

(b) To enter upon the Protected Property annually at reasonable times in order to monitor Grantors' compliance with the terms of this Easement in accordance with Section 6. Except in cases where Grantee determines that immediate entry is required to prevent, terminate, or mitigate a violation of the Easement, such entry shall be upon prior reasonable notice to Grantors, and Grantee shall not in any case unreasonably interfere with Grantors' use and quiet enjoyment of the Protected Property; To enter upon the Protected Property as necessary to comply with the requirements of Section 2 (f).

(c) To prevent any activity on or use of the Protected Property that is inconsistent with the purpose of this Easement and to require the restoration of such areas or features of the Protected Property that may be damaged by any inconsistent activity or use, pursuant to the remedies set forth in Section 6; and

(d) To enter onto the Protected Property, in accordance with Section 7, for special access for educational purposes.

(e) To install and display signage on the Protected Property stating that Watershed Land Trust, Inc. has preserved the Protected Property in perpetuity.

(f) To enroll said property in governmental and non-governmental conservation programs including but not limited to the Continuous Conservation Reserve Program (CCRP). Grantee as either principal or agent for Grantor will be responsible for the installation, maintenance and cost associated with said program(s) and will also be entitled to payments, whether continuous or not, related to said program(s). Grantor agrees to assist by executing whatever required documents are necessary to enable the terms of this paragraph.

3. PROHIBITED USES. Any activity on or use of the Protected Property inconsistent with the purpose of this Easement is prohibited. Without limiting the generality of the foregoing, the following activities and uses are expressly prohibited:

3.1 **Structures.** There shall be no construction or placing of any Structure (defined hereafter) on the Protected Property, except as allowed in Sections 4.4, 4.7, 4.8, 4.9, 4.10 and 4.13. The term "Structure" includes, but is not limited to a house, garage, barn or other building, recreational courts or playing fields, landing strip, mobile home, swimming pool, asphalt, concrete or asphalt pavement, billboard, sign, antenna, storage tank, utility poles, utility lines, utility system, tower, lights, any other temporary or permanent improvement of a similar nature or with similar characteristics.

3.2 **Subdivision**. The Protected Property may not be divided, partitioned, subdivided or conveyed except in its current configuration as a single unit.

3.3 **Mining**. There shall be no hard rock, sand, gravel, or soil mining on the Protected Property.

3.4 **Minerals and Gas**. There shall be no exploration for, development of or extraction of minerals, gas or hydrocarbons on the Protected Property.

3.5 **Soil and Water**. Any use or activity that causes or is likely to cause significant soil degradation or erosion or significant depletion or pollution of any surface or subsurface waters is prohibited. Alteration of topography through excavation,



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grading and/or placement of fill, except as allowed by the riparian zone compensation plan.

3.6 **Watershed and Wetlands**. There shall be no damming, impoundment or channelization of the streams or watercourses on the Protected Property; except as allowed in Section 4.7. There shall be no alteration or manipulation of existing ponds, wetlands or streams, except after consultation with and written permission from the Grantee, pursuant to Sections 5.1 and 5.2 of this Easement. Draining, filling, dredging, diking or other alteration of any wetland areas is also prohibited.

3.7 **Topography**. There shall be no ditching, draining, diking, filling, excavation, extracting or removal of topsoil, sod, sand, gravel, rock, or other materials, or any change in the topography of the Protected Property in any manner; except as allowed in Section 4.7, 4.8, 4.9, 4.10, and 4.13. Exposed rock and rock outcrops provide habitat for a diverse array of animals and contribute to the biological diversity of both flora and fauna and shall not be removed or disturbed.

3.8 **Plowing**. There shall be no tilling or plowing of the Protected Property; except as allowed in Section 4.10.

3.9 **Dumping**. There shall be no dumping of trash, lumber, trees, metal, garbage, hazardous or toxic substances or other substance or material on the Protected Property. There shall be no storage of unsecured material.

3.10 **Roads.** There shall be no building of new roads or creation of impervious surfaces involving excavation of the surface or establishment of other rights-of-way on the Protected Property.

3.11 **Plant Removal and Introduction**. Excavation and/or removal of native plants in the Forest and Riparian Areas is prohibited. No non-native trees, grasses or other plant species shall be planted in the Forest and Riparian Areas.

3.12 **Timber Harvest**. There shall be no commercial timber harvest from the Protected Property.

3.13 **Spraying**. There shall be no use of insecticides, fungicides, or rodenticides on the Protected Property. Herbicides may be used for the control of state-designated noxious weeds and/or for the control of other invasive woody plants species and in the assistance of establishment and maintenance of restoration activities by the Watershed Land Trust, but their use will be designed to minimize the impact on the plant diversity of native species. Herbicides shall be used only in those amounts and with a frequency of application that constitute the minimum necessary for control and shall be used in compliance with all governmental regulations. Aerial spraying or general broadcast spraying of herbicides shall not be permitted on the Protected Property, except as allowed in Section 4.11.

3.14 **Reptiles and Amphibians**. There shall be no removal of native reptiles and amphibians from the Protected Property.

3.15 **Vehicles**. Except as otherwise provided in this Easement, motorized vehicles, including but not limited to, cars, trucks, tractors and recreational vehicles, such as snowmobiles, dune buggies, motorcycles, all-terrain vehicles, shall not be operated on the Protected Property.



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3.16 **Commercial Activities**. Commercial activities shall not be permitted on the Protected Property either by Grantors, Grantors' agents, or Grantors' personal representatives, heirs, successors, and assigns. Commercial recreational activities are prohibited.

3.17 **Animal Confinement**. There shall be no commercial confinement facilities for livestock, swine or poultry on the Protected Property.

4. GRANTORS' RESERVED RIGHTS. Grantors reserve to themselves, and to their personal representatives, heirs, successors, and assigns, all rights accruing from their ownership of the Protected Property, including the right to engage in, or permit or invite others to engage in, all uses of the Protected Property that are not expressly prohibited herein and are not inconsistent with the purpose of this Easement. Without limiting the generality of the foregoing, the following rights are expressly reserved:

4.1 **Conveyance**. Grantors may sell, give, mortgage, lease or otherwise convey the Property, provided that such conveyance is subject to this Easement and written notice is provided to the Watershed Land Trust in accordance with Section 14 below.

4.2 **Timber**. Cutting of trees and woody shrubs may be accomplished to maintain the character of the Protected Property, to maintain fences, to keep permitted pathways and trails open and to prevent invasion of woody plants on the Agricultural Area. Clearing of brush, fallen trees and limbs are allowed. Trees cut for authorized purposes may be utilized for personal use as firewood. Grantors may, after consultation with and written permission from the Grantee pursuant to Sections 5.1 and 5.2 add natural surface recreational trails in the Forest Area. Grantors may maintain the additional and existing natural surfaces of the recreational trails located within the Forest Area.

4.3 **Fences**. Grantors shall be responsible for complying with Kansas fence laws. Grantors may construct, repair, replace, maintain, improve or remove any additional fencing as the Grantors deem necessary for agricultural purposes and to manage or secure the Protected Property.

4.4 **Signs**. Grantors may place interpretive signs and "no hunting or trespassing without written permission" or similar signs on the Protected Property.

4.5 **Educational Use**. Grantor may make the Protected Property accessible to the public to enjoy the ecological, open space, aesthetic and conservation benefits of this Easement and to learn about the benefits of conservation easements in general. In order to protect the Conservation Values for which this Easement is granted, Grantor agrees to consult with Grantee before opening the land to public use.

4.6 **Vehicles**. Motorized vehicles may be operated on the Protected Property to transport educational groups with special needs, to maintain fences, to carry out activities associated with property maintenance, to remove trees and shrubs in order to maintain the character of the Protected Property, and golf carts or other small vehicles for the limited recreational use of disc golf, for giving tours of the Protected Property and for educational use. Use of permitted vehicles should, however, be in a manner that will minimize impact on vegetation and generally

be confined to the driveways and a few trails and pathways when and where feasible.

4.7 **Restoration**. The Grantor consents to restore the Agricultural Area to replanted native prairie, the Forest Area to forest and appropriate portions of Protected Property to wetlands and may make improvements in the Riparian Area for the purpose of improving water quality, any such restoration or improvement after consultation with and written permission from the Grantee pursuant to Sections 5.1 and 5.2.

4.8 **Existing Structures**. The following is a complete list of all existing structures and improvements located on the Protected Property as of the date of this Easement (the approximate location of each structure is depicted in the BDR): (i) One storage shed. The Grantor may maintain, modify, restore and replace the existing structures on the Protected Property.

4.9 **Recreational Uses**. Grantor, and its licensees and invitees, may make normal and customary non-commercial recreational uses of the Protected Property, such as horse riding, hiking, hunting and fishing, and disc golf as long as the same does not adversely affect the Conservation Values of the Protected Area. In making such recreational uses, Grantor may make use of existing pathways and trails on the Protected Property, and Grantor may establish new trails or pathways as long as the same does not adversely affect Conservation Values. The trails or pathways surface will be unpaved with natural surface. The Grantor may install small crossings over ditches, including stone or limited crossing structures after consultation with and written permission from the Grantee, pursuant to Sections 5.1 and 5.2 of this Easement.

4.10 **Agricultural Use**. Grantors may engage in the following activities: None

4.11 **Spraying**. If used, herbicides shall be applied by spot applications of government approved chemicals only in those amounts and with a frequency of application that constitute the minimum necessary for control and shall be used in compliance with all ordinances, laws, rules and regulations. Broadcast spraying of herbicides may be permitted on the Agricultural Area.

4.12 **Composting**. Compost organic matter may be generated on the Protected Property so long as it is in accordance with generally accepted best management practices (**'BMP"**) of biodegradable waste or garbage. Biodegradable is defined as capable of being broken down into innocuous products by the actions of micro-organisms. Provided that such composting is in compliance with all applicable laws, rules and regulations.

5. NOTICE AND APPROVAL.

5.1 **Notice of Intention to Undertake Certain Permitted and Previously Unspecified Actions.** Grantors agree to notify Grantee prior to undertaking any activity specified in Section 4 that may have a material adverse impact on the Conservation Values of the Protected Property Also, Grantors agree to notify Grantee and obtain approval prior to undertaking activity covered by Sections 4.7, 4.9, 4.10 and 4.13 or any enlarging or replacing of any structure whatsoever on the Protected Property. Whenever notice is required, Grantors shall notify Grantee in writing not less than sixty (60) days prior to the date Grantors intend to undertake the activity in question. The notice shall describe the nature, scope,

design, location, timetable, and any other material aspect of the proposed activity in sufficient detail to permit Grantee to make an informed judgment whether to approve the activity based on its consistency with the purpose of this Easement.

5.2 **Grantee's Approval**. Where Grantee's approval is required as set forth in Section 5.1, Grantee shall grant or withhold its approval in writing within thirty (30) days of receipt of Grantors' written request therefore. Grantee's approval may be withheld only upon a reasonable determination by Grantee that the action as proposed would be inconsistent with the purpose of this Easement.

5.3 **Mediation**. If a dispute arises between the parties concerning the consistency of any proposed use or activity with the purpose of this Easement, either party may refer the dispute to mediation by request made in writing to the other. Upon such a request by Grantee, Grantors agree that, pending resolution of the dispute, Grantors shall not proceed with the planned activity. Within ten (10) days of the receipt of such a request, the parties shall select a single trained and impartial mediator. If the parties are unable to agree on the selection of a single mediator, then the parties shall, within fifteen (15) days of receipt of the initial request, each appoint a person to act as mediator. These two persons shall select a third person, and that person shall mediate the dispute subject to the following guidelines:

(a) Purpose. The purpose of the mediation is to: (i) promote discussion between the parties; (ii) assist the parties to develop and exchange pertinent information concerning the issues in dispute; and (iii) assist the parties to develop proposals which will enable them to arrive at a mutually acceptable resolution of the controversy. The mediation shall not result in any express or de facto modification or amendment of the terms, conditions, or restrictions of this Easement; and

(b) Participation. The mediator may meet with the parties and their counsel jointly or individually. The parties agree that they will participate in the mediation process in good faith and expeditiously, attending all sessions scheduled by the mediator. Representatives of the parties with settlement authority will attend mediation sessions as requested by the mediator; and

(c) Confidentiality. All information presented to the mediator shall be deemed confidential and shall be disclosed by the mediator only with the consent of the parties or their respective counsel. The mediator shall not be subject to subpoena by any party. No statements made or documents prepared for mediation sessions shall be disclosed in any subsequent proceeding or construed as an admission of a party; and

(d) Time Period. Neither party shall be obligated to continue the mediation process beyond a period of ninety (90) days from the date of receipt of the initial request or if the mediator concludes that there is no reasonable likelihood that continuing mediation will result in a mutually agreeable resolution of the dispute; and

(e) Costs. The costs of the mediator shall be borne equally by Grantors and Grantee; the parties shall bear their own expenses, including attorneys' fees, individually.

6. GRANTEE'S REMEDIES.

6.1 **Notice of Violation; Corrective Action**. If Grantee determines that a violation of the terms of this Easement has occurred or is threatened, Grantee shall give written notice to Grantors of such violation and demand corrective action sufficient to cure the violation and, where the violation involves injury to the Protected Property, resulting from any use or activity inconsistent with the purpose of this Easement, to restore the portion of the Protected Property so injured to its prior condition in accordance with a plan approved by Grantee.

6.2 **Injunctive Relief.** If Grantors fail to cure the violation within thirty (30) days after receipt of notice thereof from Grantee, or under circumstances where the violation cannot reasonably be cured within a thirty (30) day period, fails to begin curing such violation within the thirty (30) day period, or fails to continue diligently to cure such violation until finally cured, Grantee may bring an action at law or in equity in a court of competent jurisdiction to enforce the terms of this Easement, to enjoin the violation, by temporary or permanent injunction (*ex parte* as necessary), and to require the restoration of the Protected Property to the condition that existed at the time of this grant.

6.3 **Damages**. Grantee shall be entitled to recover damages for violation of the terms of this Easement or injury to any Conservation Values protected by this Easement, including, without limitation, damages for the loss of scenic, aesthetic, or environmental values. Without limiting Grantors' liability therefore, Grantee, in its sole discretion, may apply any damages recovered to the cost of undertaking any corrective action on the Protected Property.

6.4 **Emergency Enforcement**. If Grantee, in its sole discretion, determines that circumstances require immediate action to prevent or mitigate significant damage to the Conservation Values of the Protected Property, Grantees may pursue its remedies under this Section 6 without prior notice to Grantors or without waiting for the period provided for cure to expire.

6.5 **Scope of Relief**. Grantee's rights under this Section 6 apply equally in the event of either actual or threatened violations of the terms of this Easement. Grantors agree that Grantee's remedies at law for any violation of the terms of this Easement are inadequate and that Grantee shall be entitled to the injunctive relief described in Section 6.2, both prohibitive and mandatory, in addition to such other relief to which Grantee may be entitled, including specific performance of the terms of this Easement, without the necessity of proving either actual damages or the inadequacy of otherwise available legal remedies. Grantee's remedies described in this Section 6 shall be cumulative and shall be in addition to all remedies now or hereafter existing at law or in equity.

6.6 **Cost of Enforcement**. All reasonable costs incurred by Grantee in enforcing the terms of this Easement against Grantors, including, without limitation, costs and expenses of litigation, including expert witness fees and reasonable attorneys'

fees, and any costs of restoration necessitated by Grantors'' violation of the terms of this Easement shall be borne by Grantors; provided, however, that if Grantors ultimately prevail in a judicial enforcement action each party shall bear its own costs.

6.7 **Forbearance**. Forbearance by Grantee to exercise its rights under this Easement in the event of any breach of any term of this Easement by Grantors shall not be deemed or construed to be a waiver by Grantee of such term or of any subsequent breach of the same or any other term of this Easement or any of Grantee's rights under this Easement. No delay or omission by Grantee in the exercise of any right or remedy upon any breach by Grantors shall impair such right or remedy or be construed as a waiver.

6.8 **Waiver of Certain Defenses**. Grantors hereby waive any defense of laches, estoppels, or prescription.

6.9 **Acts Beyond Grantors' Control**. Nothing contained in this Easement shall be construed to entitle Grantee to bring any action against Grantors for any injury to or change in the Protected Property resulting from causes beyond Grantors'' control, including, without limitation, fire, flood, storm, and earth movement, or from any prudent action taken by Grantors under emergency conditions to prevent, abate or mitigate significant injury to the Protected Property resulting from such causes. Before taking such emergency action, however, Grantors shall notify Grantee by the best means practicable.

7. ACCESS. No right of access by the general public to any portion of the Protected Property is conveyed by this Easement; however, with prior arrangements and approval by the Grantors, the Watershed Land Trust may conduct occasional educational nature walks for its members and others. The Grantee is assured that special access for educational purposes will be provided at least once annually.

8. COSTS, LIABILITIES, TAXES, AND ENVIRONMENTAL COMPLIANCE.

8.1 **Costs, Legal Requirements, and Liabilities**. Grantors retain all responsibilities and shall bear all costs and liabilities of any kind related to the ownership, operation, upkeep, and maintenance of the Protected Property, including the maintenance of adequate liability insurance coverage. Grantors remain solely responsible for obtaining any applicable government permits and approvals for any activity or use permitted by this Easement, and all such activity or use shall be undertaken in accordance with all applicable federal, state, and local laws, regulations and requirements. Grantors shall keep the Protected Property free of any liens arising out of any work performed for, materials furnished to, or obligations incurred by Grantors.

8.2 **Taxes**. Grantors shall pay before delinquency all taxes, assessments, fees and charges of whatever description levied on or assessed against the Protected Property by competent authority (collectively "taxes"), including any taxes imposed upon, or incurred as a result of this Easement, and shall furnish Grantee with satisfactory evidence of payment upon request.

8.3 **Representation and Warranties**. Grantors represent and warrant that, after reasonable investigation and to the best of their knowledge:



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(a) No substance defined, listed, or otherwise classified pursuant to any environmental act as solid, hazardous, toxic, polluting, or otherwise contaminating to the air, water, or soil, or in any way harmful or threatening to human health or the environment exists or has been released, generated, treated, stored, used, disposed of, deposited, abandoned, or transported in, on, from, or across the Protected Property; and

(b) There are not now any underground storage tanks located on the Protected Property, whether presently in service or closed, abandoned, or decommissioned, and no underground storage tanks have been removed from the Protected Property; and

(c) Grantors and the Protected Property are in compliance with all federal, state, and local laws, regulations, and requirements applicable to the Protected Property and its use; and

(d) There is no pending or threatened litigation in any way affected, involving, or relating to the Protected Property; and

(e) No civil or criminal proceedings or investigations have been instigated at any time or are now pending, and no notices, claims, demands, or orders have been received, arising out of any violation or alleged violation of, or failure to comply with, any federal, state, or local law, regulation, or requirement applicable to the Protected Property or its use, nor do there exist any facts or circumstances that Grantors might reasonably expect to form the basis for any such proceeding, investigations, notices, claims, demands, or orders.

(f) Grantors hereby warrant and represent that the Grantors are seized of the Protected Property in fee simple and have good right to grant and convey this Easement, that the Protected Property is free and clear of any and all encumbrances and that Grantee and its successors and assigns shall have the use of and enjoy all of the benefits derived from and arising out of this Easement.

8.4 **Removal and Remediation**. If, at any time, there occurs, or has occurred, a release, threatened release, or presence in, on , or about the Protected Property of any substance now or hereafter defined, listed, or otherwise classified pursuant to any environmental act as solid, hazardous, toxic, polluting, or otherwise contaminating to the air, water, or soil, or in any way harmful or threatening to human health or the environment, Grantors agree to take all steps necessary to assure its containment and/or removal and remediation, including any cleanup that may be required.

8.5 **Control**. Nothing in this Easement shall be construed as giving rise, in the absence of a judicial decree, to any right or ability in Grantee to exercise physical or managerial control over the day-to-day operations of the Protected Property, or any of the Grantors' activities on the Protected Property, or otherwise to become an operator with respect to the Protected Property within the meaning of any environmental act.

8.6 **Hold Harmless**. Grantors hereby release and agree to hold harmless, indemnify, and defend Grantee and its members, directors, officers, employees, agents, and contractors and the heirs, personal representatives, successors, and assigns of each of them (collectively "Indemnified Parties") from and against

any and all liabilities, penalties, fines, charges, costs, losses, damages, expenses, causes of action, claims, demands, orders, judgments or administrative actions, including, without limitation, costs and expenses of litigation, including expert witness' fees and reasonable attorneys' fees, arising from or in any way connected with: (a) injury to or the death of any person, or physical damage to any property, resulting from any act, omission, condition, or other matter related to or occurring on or about the Protected Property, unless due solely to the intentional or gross negligent action of any of the Indemnified Parties; (b) the violation or alleged violation of, or other failure to comply with, any environmental act, in any way affecting, involving, or relating to the Protected Property; (c) the release, threatened release or presence in, on, from, or about the Protected Property, at any time, of any substance now or hereafter defined, listed, or otherwise classified pursuant to any environmental act as solid, hazardous, toxic, polluting, or otherwise contaminating to the air, water, or soil, or in any way harmful or threatening to human health or the environment; (d) the obligations, covenants, representations, and warranties of Sections 8.1 through 8.5; and (e) enforcement of this indemnity clause by the Grantee in an action in which the Grantee prevails.

8.7 **"Environmental Act" Defined.** As used in this agreement, the term "environmental act" includes, but is not limited to, the Comprehensive Response, Compensation and Liability Act (CERCLA), the Resource, Conservation and Recovery Act (RCRA), or successor statutes to either, their state or local counterparts or any federal, state, or local enactment or regulation relating to the clean up, disposal or control of waste, or any other federal, state or local enactment or regulation relating to the protection of the environment, or the protection of natural resources such as air, water or soil or relating to the protection of human health and welfare. The term also includes any rule of common law, including but not limited to nuisance, relating to any of the above.

9. EXTINGUISHMENT AND CONDEMNATION.

9.1 **Extinguishment.** If circumstances arise in the future that render the purpose of this Easement impossible to accomplish, this Easement can only be terminated or extinguished, whether in whole or in part, by judicial proceedings, in a court of competent jurisdiction. Grantors and Grantee agree that the terms of this Easement shall survive any merger of the fee and easement interests in the Protected Property. The amount of the proceeds to which Grantee shall be entitled, after the satisfaction of prior claims, from any sale, exchange, or involuntary conversion of all or any portion of the Protected Property subsequent to such termination or extinguishment, shall be the stipulated fair market value of the Easement, or proportionate part thereof, as determined in accordance with Section 9.2.

9.2 **Valuation.** This easement constitutes a real property interest immediately vested in Grantee, which, for the purposes of Section 9.1, the parties stipulate to have a fair market value determined by multiplying (a) the fair market value of the Protected Property unencumbered by the Easement (minus any increase in value after the date of the grant attributable to improvements) by (b) the ratio

($x/y$) of the value of the Easement at the time of this grant ($x$) to the value of the Protected Property, without deduction for the value of the Easement, at the time of this grant ($y$). The values at the time of this grant shall be those values used to calculate the deduction for federal income tax purposes allowable by reason of this grant, pursuant to Section 170(h) of the Internal Revenue Code. For the purposes of this Section, the ratio of the value of the Easement to the value of the Protected Property unencumbered by the Easement shall remain constant.

9.3 **Condemnation**. If all or any part of the Protected Property is taken by exercise of the power of eminent domain or acquired by purchase in lieu of condemnation, whether by public, corporate, or other authority, so as to terminate this Easement, in whole or in part, Grantors and Grantee shall act jointly to recover the full value of the interests in the Protected Property subject to the taking or in lieu purchase and all direct or incidental damages resulting therefrom. All expenses reasonably incurred by Grantors and Grantee in connection with the taking or in lieu purchase shall be paid out of the amount recovered. Grantee's share of the balance of the amount recovered shall be determined by multiplying that balance by the ratio set forth in Section 9.2.

9.4 **Application of Proceeds**. Grantee shall use any proceeds received under the circumstances described in this Section 9 in a manner consistent with its conservation purposes, which are exemplified by this grant.

10. AMENDMENT. If circumstances arise under which an amendment to or modification of this Easement would be appropriate, Grantors and Grantee are free to jointly amend this Easement; provided that no amendment shall be allowed that will affect the qualification of this Easement or the status of Grantee under any applicable laws, including Kansas Statutes Annotated 58-3810 et seq. or Section 170(h) of the Internal Revenue Code, and any amendment shall be consistent with the purpose of this Easement, and shall not affect its perpetual duration. Any such amendment shall be recorded in the official records of Brown County, Kansas.

11. SUBORDINATION. Grantors represent and warrant, at the time of the conveyance of this Easement, the Protected Property is not subject to a mortgage. If there is an existing mortgage, Grantors shall be required to obtain from the holder of said mortgage a subordination agreement, in a form acceptable to Grantee, which the lender subordinates its rights in the Protected Property to the extent necessary to permit Grantee to enforce the purposes of this Easement in perpetuity and to prevent any modification or extinguishment of this Easement by the exercise of any rights of the mortgage holder.

12. ASSIGNMENT. This Easement is transferable, but Grantee may assign its rights and obligations under this Easement only to an organization that is a qualified organization at the time of transfer under Section 170(h) of the Internal Revenue Code (or any successor provision then applicable), and the applicable regulations promulgated thereunder, and authorized to acquire and hold conservation easements under Kansas Statutes Annotated 58-3810 et seq. (or any successor provision then applicable) or the laws of the United States. As a condition of such transfer, Grantee shall require that the conservation purpose that this grant is intended to advance continue to be carried out.

Grantee agrees to give written notice to Grantors of an assignment at least thirty (30) days prior to the date of such assignment. The failure of Grantee to give such notice shall not affect the validity of such assignment nor shall it impair the validity of this Easement or limit its enforceability in any way.

13. EXECUTORY LIMITATION. If Grantee shall cease to exist or to be a qualified organization under Section 170(h)(3) of the Internal Revenue Code, or to be authorized to acquire and hold conservation easements under Kansas statutes, then Grantee's rights and obligations under this Easement shall become immediately vested in an organization mutually agreed upon by Grantors and Grantee which qualifies as an exempt organization under the provisions of Section 501(c)(3) of the Internal Revenue Code and which qualifies according to that organization's Articles of Incorporation, or such organization as a court of competent jurisdiction shall direct pursuant to applicable Kansas law and consistent with the requirements for an assignment pursuant to Section 12.

14. SUBSEQUENT TRANSFERS. Grantors agree to incorporate the terms of this Easement by reference in any deed or other legal instrument by which they divest themselves of any interest in all or a portion of the Protected Property, including, without limitation, a leasehold interest. Grantors further agree to give written notice to Grantee of the transfer of any interest at least twenty (20) days prior to the date of such transfer. The failure of Grantors to perform any act required by this paragraph shall not impair the validity of this Easement or limit its enforceability in any way.

15. ESTOPPEL CERTIFICATES. Upon request by Grantors, Grantee shall within twenty (20) days execute and deliver to Grantors, or to any party designated by Grantors, any document, including an estoppel certificate, which certifies, to the best of Grantee's knowledge, Grantors' compliance with any obligation of Grantors contained in the Easement or otherwise evidences the status of this Easement. Such certification shall be limited to the condition of the Protected Property as of Grantee's most recent inspection. If Grantors request more current documentation, Grantee shall conduct an inspection, at Grantors' expense, within thirty (30) days of receipt of Grantors' written request therefore.

16. NOTICES. Any note, demand, request, consent, approval, or communication that either party desires or is required to give to the other shall be in writing and either served personally or sent by first class mail, postage prepaid, addressed as follows:

To Grantors: City of Horton
Horton City Hall
205 E. 8th
Horton, KS, 66439

To Grantee: Watershed Land Trust, Inc.
7211 W. 98th Terr. #140
Overland Park, KS 66212



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or to such other address as either party from time to time shall designate by written notice to the other.

17. RECORDATION. Grantee shall record this instrument in timely fashion in the official records of Brown County, Kansas, and may re-record it at any time as may be required to preserve its rights in this Easement.

18. GENERAL PROVISIONS.

18.1 **Controlling Law**. The interpretation and performance of this Easement shall be governed by the laws of the State of Kansas.

18.2 **Liberal Construction**. Any general rule of construction to the contrary notwithstanding, this Easement shall be liberally construed in favor of the grant to affect the purpose of this Easement and the policy and purpose of Kansas Statutes Annotated

18.3 **Severability**. If any provision of this Easement, or the application thereof to any person or circumstances, is found to be invalid, the remainder of the provisions of this Easement, or the application of such provision to persons or circumstances other than those as to which it is found to be invalid, as the case may be, shall not be affected thereby.

18.4 **Entire Agreement**. This instrument sets forth the entire agreement of the parties with respect to this Easement and supersedes all prior discussions, negotiations, understandings, or agreements relating to the Easement, all of which are merged herein. No alteration or variation of this instrument shall be valid or binding unless contained in an amendment that complies with Section 10.

18.5 **No Forfeiture**. Nothing contained herein will result in a forfeiture or reversion of Grantors' title in any respect.

18.6 **Joint Obligation**. The obligations imposed by this Easement upon Grantors shall be joint and several.

18.7 **Successors**. The covenants, terms, conditions, and restrictions of this Easement shall be binding upon Grantors and their personal representatives, heirs, successors and assigns, and inure to the benefit of the Grantee and its successors and assigns, and shall continue as a servitude running in perpetuity with the Protected Property. The terms "Grantors" and "Grantee" wherever used herein, and any pronouns used in place there, shall include, respectively, the above-named Grantors and their personal representatives, heirs, successors, and assigns, and the above-named Grantee and its successors and assigns.

18.8 **Termination of Rights and Obligations**. A party's rights and obligations under this Easement terminate upon transfer of the party's interest in this Easement or Protected Property, except that liability for acts or omissions occurring prior to transfer shall survive transfer.

18.9 **Captions**. The captions in this instrument have been inserted solely for convenience of reference and are not a part of this instrument and shall have no effect upon construction or interpretation.

18.10 **Counterparts**. The parties may execute this instrument in two or more counterparts, which shall, in the aggregate, be signed by both parties; each

counterpart shall be deemed an original instrument as against any party who has signed it. In the event of any disparity between the counterparts produced, the recorded counterpart shall be controlling.

19. MITIGATION BANKING. Grantors hereby grant all rights, benefits, and inure of wetland and/or stream mitigation banking as approved by the U.S. Army Corps of Engineers as well as any wildlife and/or endangered species mitigation to Grantee and agree to comply with the terms and conditions therewith. Grantors further grant all rights, benefits, and inure of wetland and/or stream mitigation pursuant to the In Lieu Fee Program as approved by the U.S. Army Corps of Engineers as well as any wildlife and/or endangered species mitigation to Grantee and agree to comply with the terms and conditions therewith.

TO HAVE AND TO HOLD unto Grantee, its successors, and assigns forever.

IN WITNESS WHEREOF Grantors and Grantee have set their hands on the day and year first above written.

Grantors:

GRANTOR
City of Horton

Grantee:
Watershed Land Trust, Inc.

By: FRANK L. AUSTENFELD,
Executive Director

SCHEDULE OF EXHIBITS

A. Map of Property.

ACKNOWLEDGEMENT

State of Kansas, Johnson County, ss:

This instrument was acknowledged before me this 10 day of May, 2011, by Tim Lentz, City of Horton.

NOTARY PUBLIC

My Commission Expires:

NOTARY PUBLIC - State of Kansas
CANDICE S. SCHMITT
My Appt. Exp. 12-19-11

December 19, 2011

CORPORATE ACKNOWLEDGEMENT

State of Kansas, Johnson County, ss:

This instrument was acknowledged before me this 10 day of May, 2011, by Frank Austenfeld, Executive Director of Watershed Land Trust, Inc., a non-profit Kansas corporation and Frank Austenfeld duly acknowledged the execution of the same as the act and deed of said corporation.

Candice S. Schmitt
NOTARY PUBLIC

My Commission Expires:

December 19, 2011

NOTARY PUBLIC - State of Kansas
CANDICE S. SCHMITT
My Appt. Exp. 12-19-11

State of Kansas, Brown County SS.
Filed for record 05/10/2011 at 02:45 PM
Book 451 Page 359-375 Fee: $72.00
Nellie M. Brockhoff
REGISTER OF DEEDS
By _____ Deputy
Index 00626 ✓ Comp ✓ Org ✓ Image ✓
SVQ#: UCC#:



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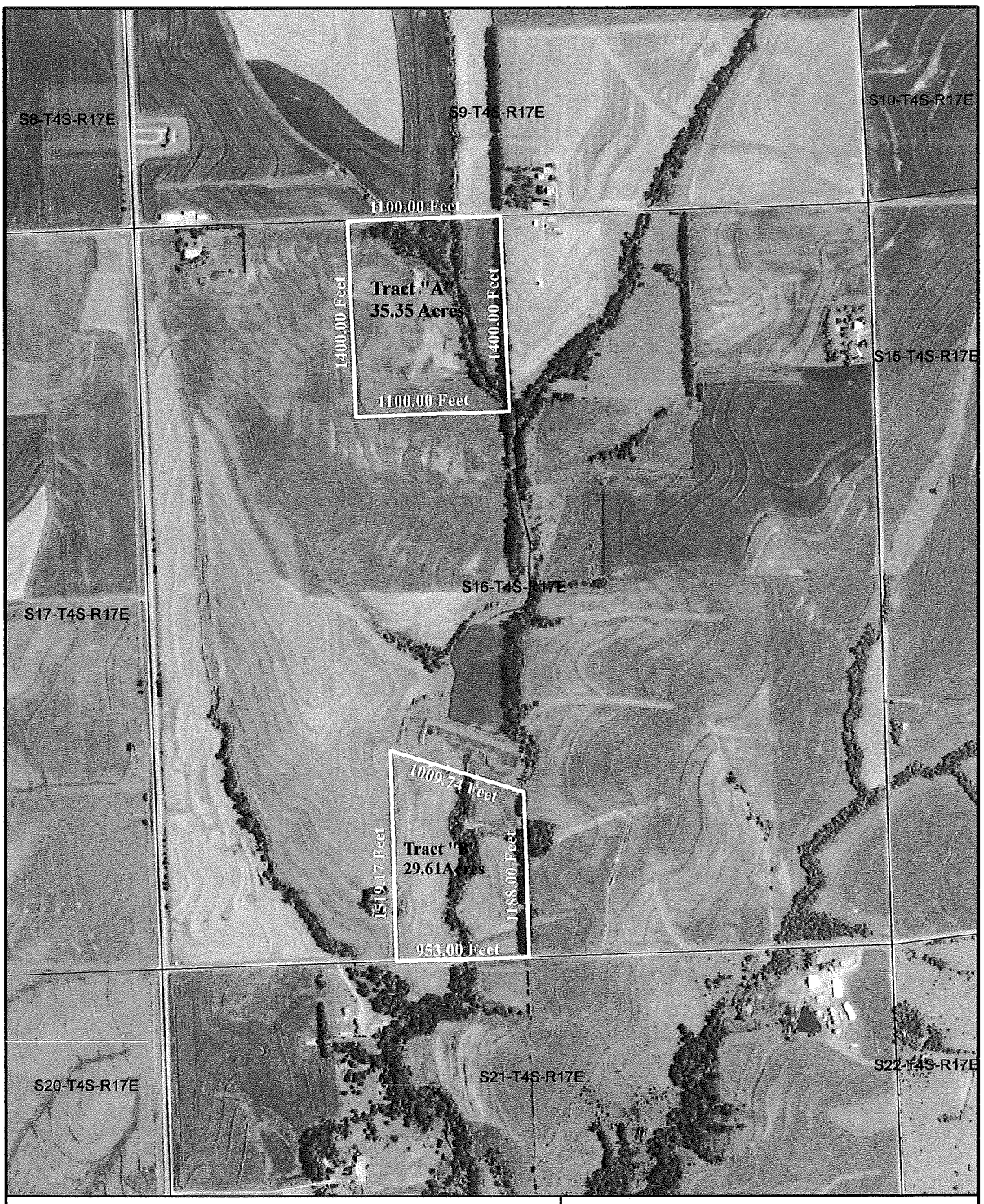


**Legend**
Approximate Easement Boundary
Section Line

0 1,000
Feet

Source: http://www.kansasgis.org/
http://giselle.kgs.ku.edu/arcgis/services

Mission Lake In-Lieu Fee Easement
Brown County, Kansas

**Figure 1**
Easement Location

THE WATERSHED INSTITUTE



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***APPENDIX D***

***BASELINE DOCUMENT REPORT***

# BASELINE DOCUMENTATION REPORT

## IN-LIEU FEE AQUATIC RESOURCE MITIGATION PROGRAM

# CITY OF HORTON PROPERTY
# HORTON, KANSAS


**PREPARED BY:**
**WATERSHED LAND TRUST, INC**
**7211 W. 98TH Terrace**
**Windmill Village, Building 4, Suite 140**
**Overland Park, Kansas 66212**

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*WILDLIFE HABITAT/CONSERVATION RESOURCES* ..... 4
*SCENIC, RECREATIONAL, EDUCATIONAL, AND HISTORIC RESOURCES* ..... 5
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## INTRODUCTION

The purpose of this document is to describe the physical features and current land uses of the City of Horton Property on which the development rights, perpetual conservation easement, and restrictions are being conveyed to the Watershed Land Trust, Inc. (WLT) and recorded in the Brown County, Kansas, Land Records.

This report is based in part on multiple site evaluations by the Watershed Institute (TWI)—technical liaison for the WLT. Chris Mammoliti (TWI Biologist) and Ryan McCurdy (Land Survey Technician) conducted the evaluation. TWI assembled the report, figures, and photographic log, while the WLT provided property description and other pertinent legal documentation.

## BACKGROUND

TWI and the WLT are sister companies implementing a U.S. Army Corps of Engineers (USACE) approved in-lieu fee (ILF) aquatic resource mitigation program. The USACE administers a permit program for both the discharge of dredge and fill materials into waters and wetlands of the United States under Section 404 of the Clean Water Act (CWA) and for activities in navigable waters under Section 10 of the Rivers and Harbors Act. The Section 404 permit program relies on the use of compensatory mitigation to offset unavoidable aquatic resource impacts by replacing functions and values lost to authorized activities. The TWI/WLT ILF program establishes the mechanism to compensate for adverse impacts to wetlands, streams, and riparian areas (aquatic resources) throughout Kansas. Federal guidance (Federal Register, April 10, 2008: Compensatory Mitigation for Loss of Aquatic Resources – Final Rule) requires long-term legal protection of aquatic resource sites preserved or enhanced using ILF funds.

In 2009, TWI/WLT received ILF funds for aquatic resource impacts derived from restoration of Mission Lake in Horton, Kansas. Renovation of the lake included removal of approximately 1,000,000 cubic yard of sediment and construction of a Confined Disposal Facility (CDF). The CDF is located within 2,200 feet of an unnamed tributary to Mission Creek. In September 2008, the USACE notified the City of Horton that the loss of 2,200 feet of the unnamed tributary required compensatory mitigation under Section 404. Consequently, the City chose to use the ILF program to meet mitigation requirements. Field reconnaissance and regular communication among the City, TWI, and the WLT identified an appropriate mitigation strategy and extent of land to preserve through a conservation easement held by the WLT.

**EASEMENT PURPOSE**

The WLT will hold an easement on the described City of Horton property to protect Mission Creek and manage adjacent lands for conservation purposes. It is the mission of the WLT to acquire land to preserve watersheds, waterways, streams, rivers, lakes, wetlands, and adjacent (riparian) corridors and green space primarily for the benefit of water quality, ecosystems, and open space. Similarly, the City of Horton supports conserving natural areas and wildlife habitats with an emphasis on water quality protection.

**PROPERTY DESCRIPTION**

Located in the West ½ of Section 16, Township 4 South, Range 17 East, the property under easement is north of Mission Lake on Mission Creek (see Appendix A, Figure 1). The easement property includes two separate parcels of land generally bordered on the north by County Road 140, the half-section line on the east, City of Horton lands on the west, and County Road 130 on the south. A specific legal description is provided below. Land cover includes riparian woodlands, wooded windbreaks, and agricultural crops (see Appendix B, Photographs 1 and 2). Mission Creek, a perennial tributary to the Delaware River, enters both parcels from the north and flows south to Mission Lake (see Appendix B, Photographs 3 and 4).

*OWNER CONTACT*: Tim Lentz, Mayor
205 East 8th St
Horton, KS 66439
785-486-2681

*LEGAL DESCRIPTION* : Parcel "A" – a tract of land in the Northwest Quarter of Section 16, Township 4 South, Range 17 East of the 6th P.M., in Brown County, Kansas. Beginning at the North Quarter corner of said section, thence North 89 deg. 46 min. 35 sec. West, on the North line of the Northwest Quarter, 1100.00 feet, thence South 0 deg. 07 min 03 sec West, parallel with the East line of the Northwest Quarter, 1400.00 feet, thence South 89 deg. 46 min. 35 sec. East parallel with the North line of the Northwest Quarter, 1100.00 feet, thence North 0 deg. 07 min. 03 sec. East on the East line of the Northwest Quarter, 1400.00 feet, to the point of Beginning, containing 35.35 acres more or less.

And,

Parcel "B" – a tract of land in the S.W. Quarter of Section 16, Township 4 South, Range 17 East of the 6th P.M., in Brown County, Kansas. Beginning at the South Quarter corner of said section, thence North 89 deg. 43 min 42 sec. West, on the South line of the Southwest Quarter, 953.00 feet, thence North 0 deg. 07 min. 03 sec. West, parallel with the East line of the Southwest Quarter, 1519.17 feet, thence South 70 deg.

34 min. 56 sec. East, 1009.74 feet, thence South 0 deg. 07 min. 03 sec. West on the East line of the Southwest Quarter, 1188.00 feet, to the point of Beginning, containing 29.61 acres more or less.

*LAND COVER/USE*: At the northern-most boundary, two tributaries enter Parcel A and join approximately 430 feet into the Parcel. Land between the tributaries supports native grasses, trees, and shrubs, including some wetland species. Approximately 2,130 feet of Mission Creek and a tributary occurs within Parcel A. A narrow band of riparian woodland extends south along both banks of the channels in Parcel A. Adjacent lands are terraced and row cropped, being planted to soybeans in 2010.

Parcel B lies south of an existing floodwater retarding dam. Approximately 1,320 feet of Mission Creek meanders south to County Road 130. A narrow band of riparian woodland borders the creek channel. Adjacent lands are terraced and row cropped, being planted to corn in 2010. Two grass waterways carry overland flow west to Mission Creek. Occasional seeps and overland runoff accumulate water in the low point of some terraces creating small and seasonal wetlands (see Appendix B, Photographs 5 and 6).

TWI observed the following vegetation during site evaluation:

| GRASSES AND FORBS | |
|---|---|
| Barnyard Grass | *Echinochloa muricata* |
| Big Bluestem | *Andropogon girardii* |
| Giant Foxtail | *Setaria faberi* |
| Green Foxtail | *Setaria viridis* |
| Purpletop | *Tridens flavus* |
| Purple Lovegrass | *Eragrostis spectabilis* |
| Yellow Nut Grass | *Cyperus esculentus* |
| Broadleaf Cattail | *Typha latifolia* |
| Swamp Smartweed | *Polygonum amphibium* |
| Giant Ragweed | *Ambrosia trifida* |
| Horseweed | *Conyza Canadensis* |
| Daisy Fleabane | *Erigeron strigosus* |
| Cocklebur | *Xanthium strumarium* |
| Pokeweed | *Phytolacca Americana* |
| TREES, SHRUBS, AND WOODY VINES | |
| Honey Locust | *Gleditsia triacanthos* |
| Osage Orange | *Maclura pomifera* |
| Black Willow | *Salix nigra* |
| Hackberry | *Celtis occidentalis* |
| Cottonwood | *Populus deltoids* |
| Red Mulberry | *Morus rubra* |
| Roughleaf Dogwood | *Cornus drummondii* |
| False Indigo | *Amorpha fructicosa* |
| Riverbank Grape | *Vitis riparia* |

*TOPOGRAPHY*: Level to nearly level floodplain lies adjacent to Mission Creek. In general, east and west boundaries are higher (approximately 1,100 feet above sea level) dropping 30 to 40 feet in elevation to the south and east toward Mission Creek. Crop terraces provide an undulating topography and create sporadic depressions that hold water and prevent crop production. Figure 2 displays the property topography.

*SOILS*: The following soils occur on the Horton Property (see Appendix A, Figure 3).

| Map Unit Symbol | Map Unit Name |
|---|---|
| 4832 | Wamego silty clay loam, 3 to 7% slopes |
| 7051 | Kennebec silt loam, frequently flooded |
| 7504 | Pawnee clay loam, 7 to 12% slopes |
| 7683 | Wymore silty clay, 3 to 6% slopes |

Pawnee clay loam covers all of Parcel A with the exception of the Mission Creek floodplain, which is Kennebec silt loam. Wymore silty clay lies adjacent the Pawnee soils along the west boundary of Parcel A. Pawnee also covers Parcel B west of the floodplain while Wamego silty clay loam lies on the eastern hill slope. Kennebec silt loam covers the floodplain along Mission Creek. Approximately 1% of Kennebec soils may be inclusions of Zook silt clay loam, a hydric soil.

*AGRICULTURAL RESOURCES*: The majority of both parcels are terraced and currently used for crop production, as it has been historically. In 2010, Parcel A was planted to soybeans and Parcel B to corn. The property lies within a complex of other similar agricultural land use.

*WATER RESOURCES*: Both parcels of the property contain a segment of Mission Creek. Mission Creek is a perennial water of the United States (see Appendix A, Figure 4). Mission Creek enters Parcel A from the north and flows south, leaving City of Horton property—and the easement area—approximately 1,400 feet south of County Road 140. After discharge from a flood retarding dam—that lies outside the easement—Mission Creek enters Parcel B from the north and flows south, exiting the Parcel at County Road 130. An intermittent channel, contained within a grassed waterway, provides seasonal standing water (see Appendix B, Photographs 7 and 8). Low points in crop terraces provide sporadic seasonal wetland habitats. Additionally, Parcel A contains a large area of moist soil, unfarmable in most years (see Appendix B, Photograph 9).

*WILDLIFE HABITAT/CONSERVATION RESOURCES*: While the majority of each parcel is crop land, a narrow but mature stand of riparian timber borders Mission Creek. Conservation opportunities on the cropped land include enhancing small wetlands in the crop terraces and reestablishing native vegetation

throughout the easement areas. Timber stand improvement and tree/shrub plantings to widen the riparian corridor will increase wildlife habitat and water quality protection. In-channel habitat restoration of Mission Creek will increase fish and macroinvertebrate diversity. Signs of white-tailed deer (*Odocoileus virginianus*), wild turkey (*Melleagris gallopavo*), Eastern cottontail (*Sylvilagus floridanus*), and coyote (*Canis latrans*) were observed during the site visit. Wildlife signs included scat, prints, and feathers. Based on existing information, there is a limited likelihood that rare species use the property. The wooded riparian corridor, stream channel, windbreaks, and seasonal wetlands make it likely that the easement parcels are used by a variety of wildlife including a diverse bird community, mammals, reptiles, and amphibians. Adjacent crop lands limit habitat connectivity to the floodplain and riparian corridor.

*SCENIC, RECREATIONAL, EDUCATIONAL, and HISTORIC RESOURCES*: This property is characteristic of the local agricultural and native forest landscape. It contains approximately 0.50 miles of road frontage along County Roads 140 and 130, making it somewhat visible to the local public. Due to parcel landscape position and easement limitations, recreational activities are restricted to WLT-approved actions. Local educational opportunities may include demonstration projects for aquatic and terrestrial habitat restoration, and school district natural resource activities. The property contains no known important cultural resources.

*HUMAN-MADE FEATURES*: Human-made features on the property include: a dilapidated stone barn, crop terraces and grassed waterways along with miscellaneous boundary fences (see Appendix B, Photographs 10 and 11).

**EXCLUDED PARCELS**

All areas within the described parcels are included in the easement. There are no excluded parcels.

**MONITORING ACCESS**

The City of Horton has given the WLT an easement for right-of-entrance to the property for purposes of monitoring and enforcement.

**PHOTOGRAPHIC POINTS**

During site reconnaissance, the WLT established 12 photo points (PP) to document current conditions throughout the property. Each PP was monumented with ½" diameter × 18" long rebar with an aluminum cap and driven flush with the ground (see Appendix B, Photograph 12). Lettering on each cap identifies the location as an easement PP. Figure 5 provides the location of each PP and Appendix C provides photographs taken at each of the 12 locations.

**SUMMARY OF GRANTORS' RIGHTS AND RESTRICTIONS**

Conservation rights and restrictions allow the protected property to be used for forestry, education, preapproved non-commercial recreation, natural habitats, and open space purposes. Restricted and permitted uses are outlined in the accompanying Deed of Conservation Easement.

**APPENDIX A**

**FIGURES**

**Legend**
Approximate Easement Boundary

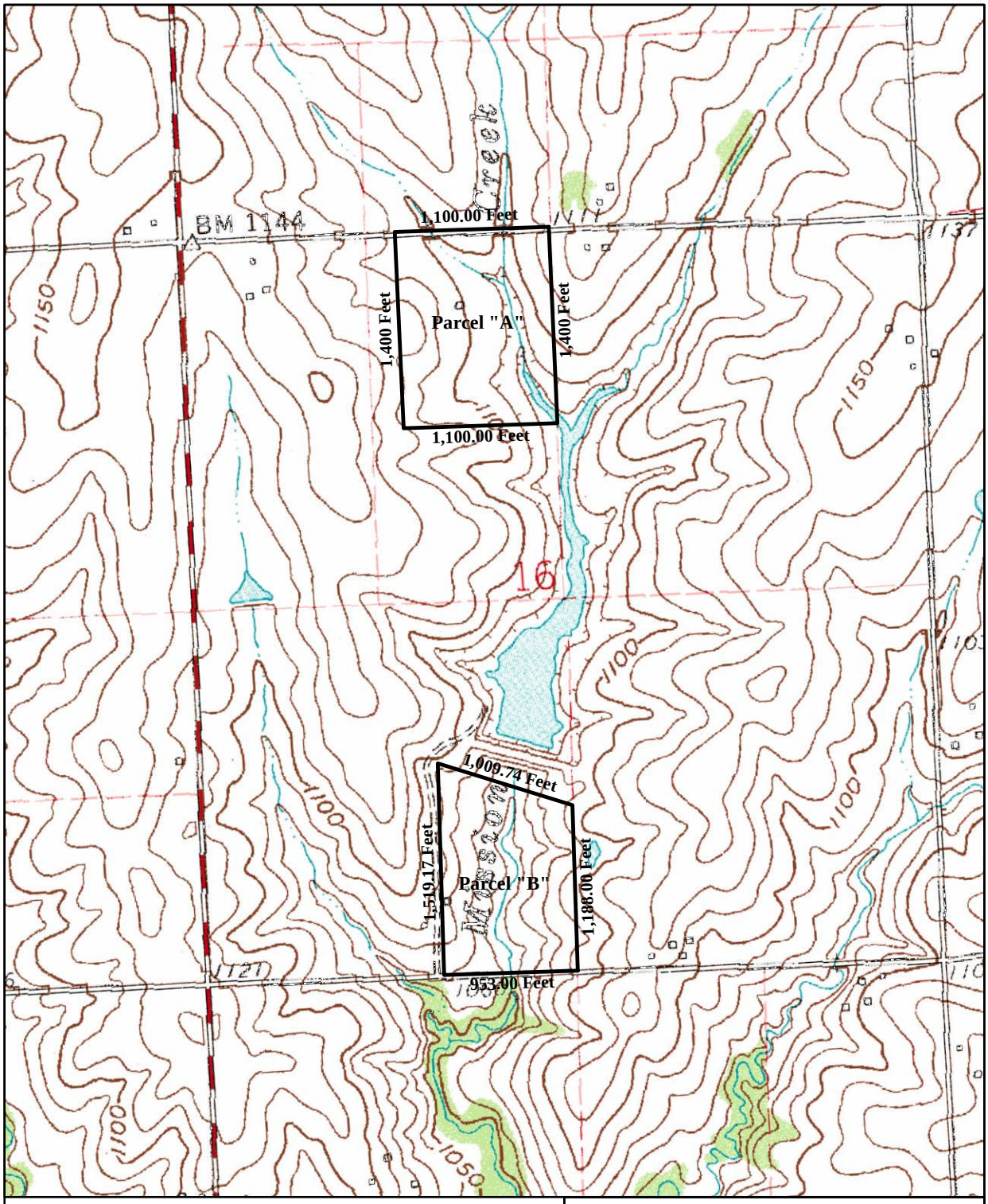
0 1,000
Feet

Source: http://giselle.kgs.ku.edu/arcgis/services

Mission Lake In-Lieu Fee Easement
Brown County, Kansas

**Figure 1**
Easement Locations

THE WATERSHED INSTITUTE




**Legend**

Approximate Easement Boundary

0 1,000

Feet

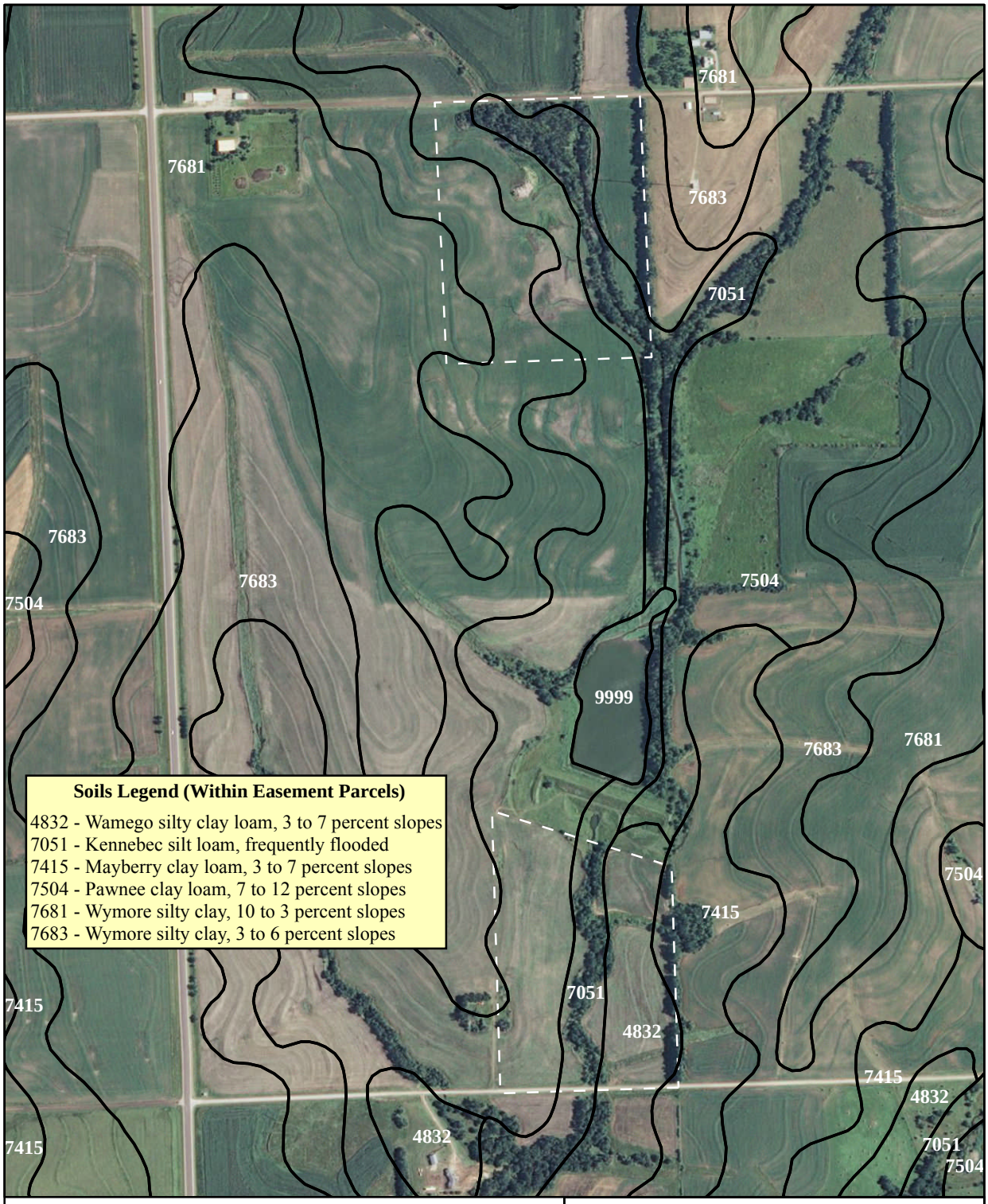
Source: http://giselle.kgs.ku.edu/arcgis/services

Mission Lake In-Lieu Fee Easement
Brown County, Kansas

**Figure 2**

Easement Topography

THE WATERSHED INSTITUTE




**Legend**

Approximate Easement Boundary

Soils Boundary

0 750

Feet

N W E S

Source: http://giselle.kgs.ku.edu/arcgis/services
http://soildatamart.nrcs.usda.gov/County.aspx?State=KS

Mission Lake In-Lieu Fee Easement
Brown County, Kansas

**Figure 3**

Soils

THE WATERSHED INSTITUTE

**Legend**

- Approximate Easement Boundary
- Stream Channel

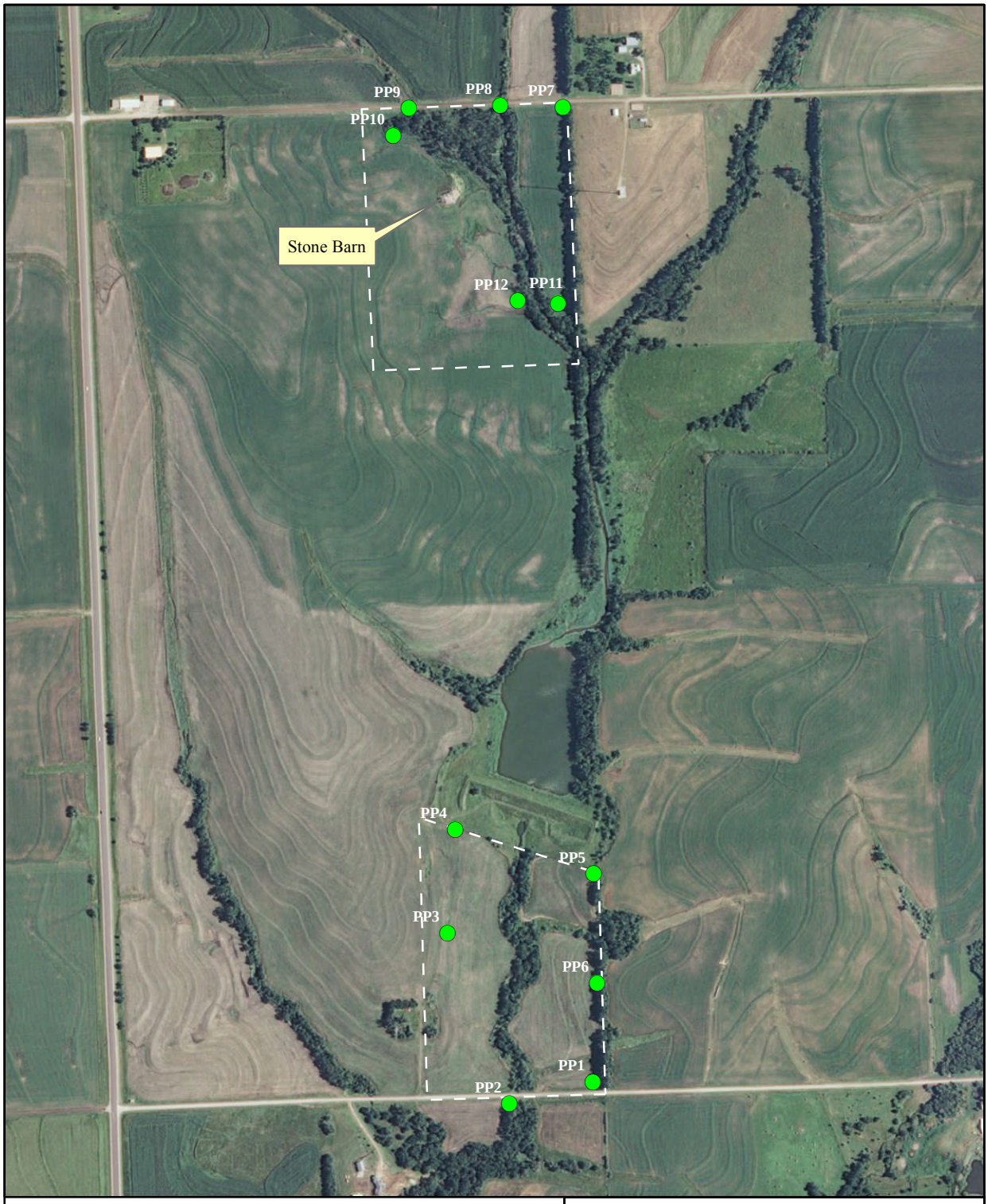
0 750
Feet

Source: http://giselle.kgs.ku.edu/arcgis/services

Mission Lake In-Lieu Fee Easement
Brown County, Kansas

**Figure 4**
Aquatic Resources

THE WATERSHED INSTITUTE




**Legend**

Approximate Easement Boundary

0 750

Feet

Source: http://giselle.kgs.ku.edu/arcgis/services

Mission Lake In-Lieu Fee Easement
Brown County, Kansas

**Figure 5**

Photo Points

THE WATERSHED INSTITUTE

**APPENDIX B**

**PROPERTY PHOTOGRAPHS**

| | | | |
|---|---|---|---|
| Mission Lake Conservation Easement | DESCRIPTION | Typical conditions on Parcel A | 1 |
| | LOCATION | Photo Point #10 | Date |
| Direction: South | PHOTOGRAPHER | Chris Mammoliti | Oct 5, 2010 |

| | | | |
|---|---|---|---|
| Mission Lake Conservation Easement | DESCRIPTION | Typical conditions on Parcel B | 2 |
| | LOCATION | Photo Point #3 | Date |
| Direction: East | PHOTOGRAPHER | Chris Mammoliti | Oct 5, 2010 |

| | | | |
|---|---|---|---|
| Mission Lake Conservation Easement | DESCRIPTION | Mission Creek | 3 |
| | LOCATION | County Road 140 | Date |
| Direction: South | PHOTOGRAPHER | Chris Mammoliti | Oct 5, 2010 |

| | | | |
|---|---|---|---|
| Mission Lake Conservation Easement | DESCRIPTION | Mission Creek | 4 |
| | LOCATION | County Road 130 | Date |
| Direction: North | PHOTOGRAPHER | Chris Mammoliti | Oct 5, 2010 |

| | | | |
|---|---|---|---|
| Mission Lake Conservation Easement | DESCRIPTION | Seep with hydrophytic vegetation. | 5 |
| | LOCATION | Parcel B, west of Mission Creek. | Date |
| Direction: Northeast | PHOTOGRAPHER | Chris Mammoliti | Oct 5, 2010 |

| | | | |
|---|---|---|---|
| Mission Lake Conservation Easement | DESCRIPTION | Seep with hydrophytic vegetation | 6 |
| | LOCATION | Parcel B, east of Mission Creek | Date |
| Direction: South | PHOTOGRAPHER | Chris Mammoliti | Oct 5, 2010 |

| | | | |
|---|---|---|---|
| Mission Lake Conservation Easement | DESCRIPTION | Intermittent channel in grassed waterway | 7 |
| | LOCATION | Parcel B, east of Mission Creek | Date |
| Direction: East | PHOTOGRAPHER | Chris Mammoliti | Oct 5, 2010 |

| | | | |
|---|---|---|---|
| Mission Lake Conservation Easement | DESCRIPTION | Intermittent channel in grassed waterway | 8 |
| | LOCATION | Parcel B, east of Mission Creek | Date |
| Direction: West | PHOTOGRAPHER | Chris Mammoliti | Oct 5, 2010 |

| | | | |
|---|---|---|---|
| Mission Lake Conservation Easement | DESCRIPTION | Wet, unfarmed area | 9 |
| | LOCATION | Parcel A, west of Mission Creek | Date |
| Direction: Southwast | PHOTOGRAPHER | Chris Mammoliti | Oct 5, 2010 |

| | | | |
|---|---|---|---|
| Mission Lake Conservation Easement | DESCRIPTION | Dilapidated stone barn | 10 |
| | LOCATION | Parcel A, west of Mission Creek | Date |
| Direction: Northeast | PHOTOGRAPHER | Chris Mammoliti | Oct 5, 2010 |

| | | | |
|---|---|---|---|
| Mission Lake Conservation Easement | DESCRIPTION | Terraced cropland and fences | 11 |
| | LOCATION | Photo Point #4 | Date |
| Direction: West | PHOTOGRAPHER | Chris Mammoliti | Oct 5, 2010 |

| | | | |
|---|---|---|---|
| Mission Lake Conservation Easement | DESCRIPTION | Photo Point marker | 12 |
| | LOCATION | Photo Point #7 | Date |
| Direction: Down | PHOTOGRAPHER | Chris Mammoliti | Oct 5, 2010 |

**APPENDIX C**

**PHOTOPOINTS**

| | | | |
|---|---|---|---|
| Mission Lake Conservation Easement | DESCRIPTION | Parcel B, Photo Point #1 | 1 |
| | LOCATION | From Southeast corner of Parcel B. | Date |
| Direction: Northwest | PHOTOGRAPHER | Chris Mammoliti | Oct 5, 2010 |

| | | | |
|---|---|---|---|
| Mission Lake Conservation Easement | DESCRIPTION | Parcel B, Photo Point #2 | 2 |
| | LOCATION | At County Road 130 | Date |
| Direction: North | PHOTOGRAPHER | Chris Mammoliti | Oct 5, 2010 |

| | | | |
|---|---|---|---|
| Mission Lake Conservation Easement | DESCRIPTION | Parcel B, Photo Point #3 | 3 |
| | LOCATION | From crop terrace to County Road 130 | Date |
| Direction: Southeast | PHOTOGRAPHER | Chris Mammoliti | Oct 5, 2010 |

| | | | |
|---|---|---|---|
| Mission Lake Conservation Easement | DESCRIPTION | Parcel B, Photo Point #4 | 4 |
| | LOCATION | From fence line below watershed dam | Date |
| Direction: South | PHOTOGRAPHER | Chris Mammoliti | Oct 5, 2010 |

| | | | |
|---|---|---|---|
| Mission Lake Conservation Easement | DESCRIPTION | Parcel B, Photo Point #5 | 5 |
| | LOCATION | From Northeast corner of Parcel B | Date |
| Direction: Southwest | PHOTOGRAPHER | Chris Mammoliti | Oct 5, 2010 |

| | | | |
|---|---|---|---|
| Mission Lake Conservation Easement | DESCRIPTION | Parcel B, Photo Point #6 | 6 |
| | LOCATION | From east fence line to Mission Creek | Date |
| Direction: West | PHOTOGRAPHER | Chris Mammoliti | Oct 5, 2010 |

| | | | |
|---|---|---|---|
| Mission Lake Conservation Easement | DESCRIPTION | Parcel A, Photo Point #7 | 7 |
| | LOCATION | From Northeast corner of Parcel A | Date |
| Direction: Southeast | PHOTOGRAPHER | Chris Mammoliti | Oct 5, 2010 |

| | | | |
|---|---|---|---|
| Mission Lake Conservation Easement | DESCRIPTION | Parcel A, Photo Point #8 | 8 |
| | LOCATION | Mission Creek, from County Road 140 | Date |
| Direction: South | PHOTOGRAPHER | Chris Mammoliti | Oct 5, 2010 |

| | | | |
|---|---|---|---|
| Mission Lake Conservation Easement | DESCRIPTION | Parcel A, Photo Point #9 | 9 |
| | LOCATION | Mission Creek tributary from County Road 140 | Date |
| Direction: South | PHOTOGRAPHER | Chris Mammoliti | Oct 5, 2010 |

| | | | |
|---|---|---|---|
| Mission Lake Conservation Easement | DESCRIPTION | Parcel A, Photo Point #10 | 10 |
| | LOCATION | South of tree line in Northwest corner of Parcel A | Date |
| Direction: South | PHOTOGRAPHER | Chris Mammoliti | Oct 5, 2010 |

| | | | |
|---|---|---|---|
| Mission Lake Conservation Easement | DESCRIPTION | Parcel A, Photo Point #11 | 11 |
| | LOCATION | Tree line at south end of Parcel A, east of Mission Crk | Date |
| Direction: North | PHOTOGRAPHER | Chris Mammoliti | Oct 5, 2010 |

| | | | |
|---|---|---|---|
| Mission Lake Conservation Easement | DESCRIPTION | Parcel A, Photo Point #12 | 12 |
| | LOCATION | Tree line along Mission Creek, Parcel A | Date |
| Direction: Northwest | PHOTOGRAPHER | Chris Mammoliti | Oct 5, 2010 |

***APPENDIX E***

# ***HABITAT DEVELOPMENT INDEX SCORING WORKSHEET***

# HABITAT DEVELOPMENT INDEX (HDI)

Date: Winter 2012 Summer 2014 Collector (s): Mammoliti, Emmert

Stream Name: Mission Creek Site #:

Legal Description: _____/4, _____/4, Sec. _____, T_____, R_____, Brown Co.

**Macrohabitat Type(s)**
Fill in macrohabitat type(s) - riffle (**RF**) run (**RN**), and/or pool (**P**) which are sampled in the site. If all 3 macrohabitat types are present (and sampled), score each. If the site is predominately runs with some pools, then score 2 runs and 1 pool. If only runs are present, score 3 runs. Multiple samples of a single macrohabitat type should be properly identified (e.g. **RN #1, RN #2, RN #3**)

| | | Macrohabitat Type (s) | | |
|---|---|---|---|---|
| | | RF | RN | PL |
| Minimum Habitat Score | Score = 3 for each macrohabitat sample collected in the site | ~~3~~ 0 | 3 | 3 |
| Average Depths | Riffles: <5 cm. = 0; 5 - 10 cm. = 1; >10 cm. = 2<br>Runs: <15 cm. = 0; 15 - 45 cm. = 1; >45 cm. = 2<br>Pools: <30 cm. = 0; 30 - 60 cm. = 1; >60 cm. = 2 | 0 | 1 | 1 |
| Velocity Range (m./sec.) | Riffles: <0.3 = 0; both < and • •0.3 = 1<br>Runs: <0.3 = 0; both < and • •0.3 = 1<br>Pools: <0.1 = 0; • •0.1 = - 1 | 0 | 1 | 0 |
| Riffle Substrate Score | % Cobble: Score A<br>0 - 10% = 0; 11 - 25% = 1; 26 - 50% = 2; >50% = 3<br>If % cobble is • •10% and boulders or bedrock are present, Score A = 1<br>Score A [ ]<br>% Embeddedness: Score B<br>0 - 25% = 0; 26 - 75% = - 1; >75% = - 2<br>Record score in riffle column(s) only if Score A + Score B > 0<br>Score B [ ] | 0 | 0 | 0 |
| Organic Detritus and Debris | None = 0; Sparsely scattered bits of detritus = 1; large leaf packs or large amounts of scattered detritus = 2; Detritus, debris, logs = 3 | 0 | 1 | 2 |
| Algal Masses | No Algal masses = 0; Algal masses = 1 | 0 | 0 | 0 |
| Macrophytes | None = 0; Few or Small Patches = 1; Large areas of dense growth = 2 | 0 | 1 | 2 |
| Bank Vegetation | None = 0; Small amounts or thin = 1; Submerged tree roots or thick vegetation = 2 | 0 | 2 | 2 |
| | | Total Score | Total Score | Total Score |
| Total Scores | Sum each column and enter sums into Total Score boxes | 0 | 9 | 10 |
| HDI Score | Compute HDI by summing the Total Scores for each unique macrohabitat sample. **If a macrohabitat was sampled more than once, only use the highest Total Score for that macrohabitat to compute the HDI score.** Examples: 1P and 2RN were sampled, HDI score = P sample Total Score + RN sample with the highest Total Score. **If one macrohabitat was sampled and scored three times, HDI Score = column with highest Total Score.** | | **HDI Score** 19 | |

TRANSECT SAMPLING: # POOLS [ ] # RIFFLES [ ]

CORBICULA RELEASED: hdi ____ trans_____
CRAYFISH RELEASED: hdi_____ trans_____
POUCH SNAILS: hdi_____ trans_____

Definitions on back

***APPENDIX F***

# ***WETLAND DELINEATION REPORT***

# WATERSHED LAND TRUST, INC. IN-LIEU FEE PROGRAM
# MISSION CREEK
# WETLAND DELINEATION REPORT

Prepared by

WATERSHED INSTITUTE, INC.
1200 SW Executive Drive
Topeka, Kansas 66615

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**Appendix**

A FIGURES
B PHOTOGRAPHIC LOG
C ROUTINE WETLAND DETERMINATION FORMS

## INTRODUCTION

The Watershed Institute, Inc. (TWI) conducted a wetland and waters of the United States (WOUS) determination on Watershed Land Trust Inc. In-Lieu Fee (ILF) Program's Mission Creek mitigation site. The site is located north of Mission Lake on Mission Creek, Brown County, Kansas (see Appendix A, Figure 1). On June 3, August 25, and September 19, 2014, TWI completed wetland delineations to determine the extent of existing wetlands and to verify if areas of proposed wetland enhancement met WOUS jurisdiction. TWI evaluated the property for soil, vegetation, and hydrologic conditions indicative of wetlands and potential WOUS. During preliminary review, TWI examined aerial photography (US Department of Agriculture Farm Services Agency [USDA FSA] 1991-2014), National Wetlands Inventory (NWI) maps (US Geological Survey [USGS] 2004), the *Brown County Soil Survey* (USDA Natural Resource Conservation Service [NRCS] 2005), and the *National Hydric Soils* list (USDA NRCS 2014). This report provides project background information and outlines TWI's field methodology and observations. Report figures, a photographic log, and routine wetland determination data forms are provided in Appendices A, B, and C, respectively.

## SITE DESCRIPTION

Encompassing approximately 64 acres in the West ½ of Section 16, Township 4 South, and Range 17 East; the mitigation property includes two separate tracts of land generally bordered to the north by County Road 140; the half-section line to the east; City of Horton and private lands on the west; and County Road 130 on the south. Mission Creek—a perennial WOUS—flows through both north and south tracts, and is impounded by a Little Delaware-Mission Creek Joint District No. 5 watershed structure (see Appendix A, Figure 2).

The mitigation site is within the Nebraska and Kansas Loess-Drift Hills major land resource area (MLRA). The historic plant community is characterized by tall grasses in the uplands and trees along streams and intermittent drainageways (USDA NRCS 2006). Dominant tall grass species include big bluestem (*Andropogon gerardii*), little bluestem (*Schizachyrium scoparium*), switchgrass (*Panicum virgatum*), Indiangrass (*Sorghastrum*

*nutans*), porcupinegrass (*Miscanthus spartea*), and sideoats grama (*Bouteloua curtipendula*) (USDA NRCS 2006). For trees, dominant native species include hackberry (*Celtis occidentalis*), oak (*Quercus sp*), boxelder (*Acer negundo*), black walnut (*Juglans nigra*), and maple (*Acer sp*) (USDA NRCS 2006). All uplands in the mitigation property have been converted to farmland. Trees and vines TWI observed along the drainageways include honey locust (*Gleditsia triacanthos*), Osage orange (*Maclura pomifera*), black willow (*Salix nigra*), hackberry, eastern cottonwood (*Populus deltoides*), red elm (*Ulmus rubra*), black cherry (*Prunus serotina*), red mulberry (*Morus rubra*), Siberian Elm (*Ulmus pumila*), red cedar (*Juniperus virginiana*), roughleaf dogwood (*Cornus drummondii*), false indigo (*Amorpha fruticosa*), and riverbank grape (*Vitis riparia*).

***Hydrology***

In the north tract, Mission Creek bankfull width is 19.68-feet and transitions from an incised, Rosgen F6 stream to a Rosgen C6 stream. The Mission Creek channel in the south tract is a Rosgen C6 stream with a bankfull width of 21.74-feet and the mean average flow is 0.92 cubic feet per second (USGS 2011). Table 2 lists the flow duration for Mission Creek. Mission Creek channel has incised and is slowly developing a new floodplain that is narrow and discontinuous. The unnamed intermittent tributary in the north tract is an incised Rosgen F6 stream with an average bankfull width of 13.35-feet. In the south tract, the ephemeral tributary does not have a well-defined channel as water flows in a small swale. During each site visit to date, TWI has observed water in both tributary channels, and it appears that the hydrology is affected by springs. USGS (2011) does not list a mean annual flow for either tributary. NWI did not identify any wetlands at the mitigation site.

There are also several seeps that daylight in the uplands and slowly flow down gradient. TWI observed seeps in the north and south tracts. Water from some of the seeps collect behind terraces creating saturated soil and open water.

***Soils***

Figure 3 (Appendix A) is the soil survey map TWI used to determine property characteristics (USDA NRCS 2015). Six soil series—two of which are listed as hydric—

are found on the property: Wamego silty clay loam (4832), Kennebec silt loam (7051), Mayberry clay loam (7415), Pawnee clay loam (7501), Wymore silty clay loam – 1 to 3 percent slopes (7681), and Wymore silty clay loam – 3 to 6 percent slopes (7683) (USDA NRCS 2005).

- *Wamego silty clay loam (3 to 7 percent slopes)* – Wamego silty clay loam are well-drained soil located on side slopes (USDA NRCS 2005). These soils formed in sandy and silty residuum derived from shale, with a depth to the water table of greater than 72 inches. No flooding or ponding occurs.
- *Kennebec silt loam, frequently flooded (0 to 2 percent slopes)* – very deep, moderately well drained soils formed in clayey silty alluvium in paleoterraces, with a depth to a water table of more than 80 inches.
- *Mayberry clay loam (3 to 7 percent slopes)* – very deep, moderately well drained upland soil formed in reworked, weathered glacial till. Slow to very slow permeability with depth to water table at 9 to 14 inches. No flooding or ponding occurs.
- *Pawnee clay loam (4 to 8 percent slopes)* – very deep, moderately well drained upland soils that were formed in glacial till. Slow to very slow permeability with depth to water table at 7 to 18 inches. No flooding or ponding occurs.
- *Wymore silty clay loam (1 to 3 percent slopes)* – Soils consist of very deep, moderately well drained upland soils that formed in loess. Permeability is slow to very slow with depth to water table at 12 to 36 inches. No flooding or ponding occurs.
- *Wymore silty clay loam (3 to 6 percent slopes)* – Soils consist of very deep, moderately well drained upland soils that formed in loess. Permeability is low to very slow with depth to water table at 12 to 36 inches. No flooding or ponding occurs.

USDA NRCS (2014) lists two of the soil types as hydric due to inclusions of 1) Zook soils for the Kennebec complex when occurring in floodplains and 2) aquolls for Kennebec soils and Mayberry soils when occurring in depressions, along drainageways, and/or on hillslopes.

***Vegetation***

The historic plant community was bluestem prairie in the uplands with wooded riparian corridors (USDA NRCS 2006). No remnants of bluestem prairie exist as all uplands have been converted to row crop agriculture. There are wooded riparian corridors along Mission Creek and the unnamed tributaries. Woody species TWI observed include honey locust, Osage orange, black willow, hackberry, eastern cottonwood, red elm, black cherry, red mulberry, Siberian elm, red cedar, roughleaf dogwood, false indigo, and riverbank grape. The dominant species include red elm, honey locust, and Osage orange—a departure from the historic hackberry, oak, boxelder, black walnut, and maple community outlined in USDA NRCS (2006). Most seedlings and saplings TWI observed were honey locust, Osage orange and Siberian elm.

## METHODOLOGY

TWI field methods followed procedures outlined in the *Regional Supplement of Engineers Wetland Delineation Manual: Midwest Region (Version 2.0)* (U.S. Army Corps of Engineers [USACE] 2010) and the *Field Guide for Wetland Delineation: 1987 Corps of Engineers Manual* (Wetland Training Institute 1995). TWI performed a preliminary office review assessing existing information in preparation of on-site work. On June 3, August 25, and September 18, 2014, TWI conducted a thorough walk-through identifying locations exhibiting vegetation, soil, and hydrology wetland indicators. TWI targeted NWI areas, depressional features, and other lands where frequent flooding and ponding may develop anaerobic soil conditions and favor the growth of hydrophytic plants. TWI collected 20-inch soil bores at 12 locations to examine soil characteristics and help define potential wetland boundaries (see Appendix A, Figure 4). Additionally, TWI identified the dominant herbaceous vegetation within a five-foot radius plot around each soil sample point (SSP). For woody vines, shrubs, and saplings, TWI identified species within a 15-foot radius plot and trees within a 30-foot radius plot around each SSP. Field references TWI used included the *National List of Plant Species that Occur in Wetlands: Central Plains (Region 5)* (United States Fish and Wildlife Service [USFWS] 1988); *Trees, Shrubs, and Woody Vines in Kansas* (Stephens 1969); *Field Guide to the Common Weeds of Kansas*

(Barkley 1983); Munsell Soil Color Charts (Kollmorgen Instruments Corporation 2000); and *Wildflowers and Grasses of Kansas* (Haddock 2005).

## FINDINGS

Of the 12 locations investigated, TWI delineated seven potential jurisdictional wetlands (approximately 1.35 acres) at sample locations 04, 05, 08, 09, 10, 11, and 12 (see Appendix A, Figure 4). Sample location 04 is located on the western portion of the north tract and receives hydrology from a groundwater seep. The vegetation is dominated by *Typha angustifolia* (OBL) and *Phalaris arundinacea* (FACW), soils were determined to be A3 (black histic), and surface water was present at a depth of 1 inch. The potential wetland is approximately 0.28 acre is size and appears can be classified as a palustrine freshwater emergent wetland that is semipermanently flooded (PEMF).

Sample location 05 is located on the eastern portion of the south tract and appears to be the result of precipitation accumulation along a field terrace. The vegetation is dominated by *Persicaria pennsylvanica* (OBL), soils were determined to be F6 (redox dark surface), and hydrologic indicators included B3 (drift deposits) and (B8) sparsely vegetated surface. The potential wetland is approximately 0.04 acre in size and appears to be human-induced. TWI classified the wetland as diked/impounded palustrine freshwater emergent that is temporarily flooded (PEMAh).

Sample location 08 is located on the western portion of south tract and accumulates water from precipitation and groundwater seepage along a field terrace. TWI cited *Carex hystericina* (OBL) as the dominant vegetation, determined soils to be F6, and observed soil saturation at 6-inches. The potential wetland is approximately 0.22 acre and TWI classified the wetland as a diked/impounded palustrine freshwater emergent that is semipermanently flooded (PEMFh). A previous landowner installed a tile outlet along the terrace that drains water to Mission Creek.

Sample location 09 is located on the western portion of the north tract and receives hydrology from a groundwater seep. The vegetation is dominated by *Leersia oryzoides* (OBL) and *Ambrosia artemisiifolia* (FACU); however, the Prevalence Index calculations

resulted in a 2.03 indicating that hydrophytic vegetation was present. In addition, soils were determined to be F6, and surface water was present at a depth of 3-inches. The potential wetland is approximately 0.49 acre and TWI classified the wetland as palustrine freshwater emergent that is seasonally flooded (PEMC).

Sample location 10 is located on the western portion of the north tract and receives hydrology from a groundwater seep. TWI noted *Phalaris arundinacea* (FACW) and *Leersia oryzoides* (OBL) as the dominant vegetation, determined soils to be F6, and found the water table at 16-inches below ground surface. The potential wetland is approximately 0.14 acre and TWI classified the wetland as palustrine freshwater emergent that is seasonally flooded (PEMC).

Sample location 11 is located on the western portion of the south tract and hydrology appears to be the result of precipitation accumulating along a field terrace. TWI cited *Carex vulpinoidea* (FACW) as the dominant vegetation, determined soils to be F3 (depleted matrix), and observed soil saturation from 0- to 5-inches. The potential wetland is approximately 0.07 acre and TWI classified the wetland as diked/impounded palustrine freshwater emergent that is temporarily flooded (PEMAh).

Sample location 12 is located on the northern portion of the north tract and receives hydrology from a groundwater seep. TWI found vegetation dominated by *Leersia oryzoides* (OBL), determined soils to be black histic (A3) and hydrogen sulfide (A4). In addition, TWI observed surface water at a depth of 2-inches. The potential wetland is approximately 0.11 acre and TWI classified the wetland as palustrine freshwater emergent that is seasonally flooded (PEMC).

Five sample locations (01, 02, 03, 06, and 07) did not meet all three wetland indicator criteria. Sample location 01 is located approximately 100 meters down gradient (east) of the potential wetland at sample location 09 and the bottom of a swale. TWI observed hydric soil and hydrology at this sample location; however, a dominant hydrophytic vegetation community was not present. Sample location 02 is located adjacent to the south of sample location 01 at the top of the grassed waterway bank and did not have wetland soil, vegetation, or hydrology indicators. Sample location 03 is a small depression at the

bottom of a swale that did not have wetland soil indicators and was not connected to WOUS. Sample location 06 was located along a field terrace and did not have wetland hydrology indicators. Sample location 07 is a small depression located along a field berm and did not have wetland soil or hydrology indicators. Photographic documentation and wetland determination data forms for each sample location are included in Appendix B and Appendix C, respectively. Sample location points and potential jurisdictional wetland delineation boundaries are included in Figure 4 of Appendix A.

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# APPENDIX A

# FIGURES

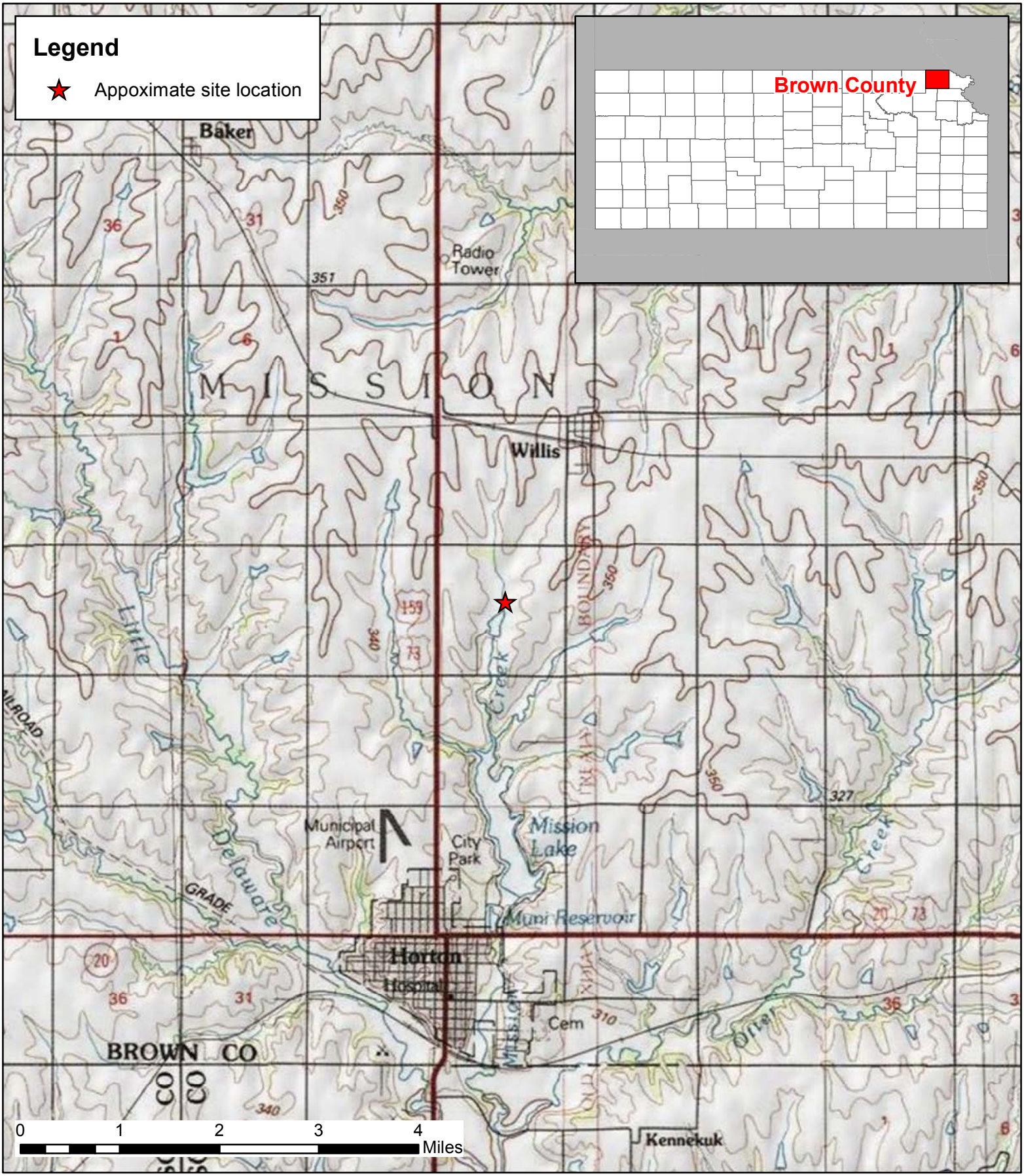


Figure 1
Site Location Map

**Watershed Land Trust ILF Program - Mission Creek**
**Brown County, Kansas**

Date: January 2015

Source: USGS 30 x 60-minute Topo, Atchison, 1985

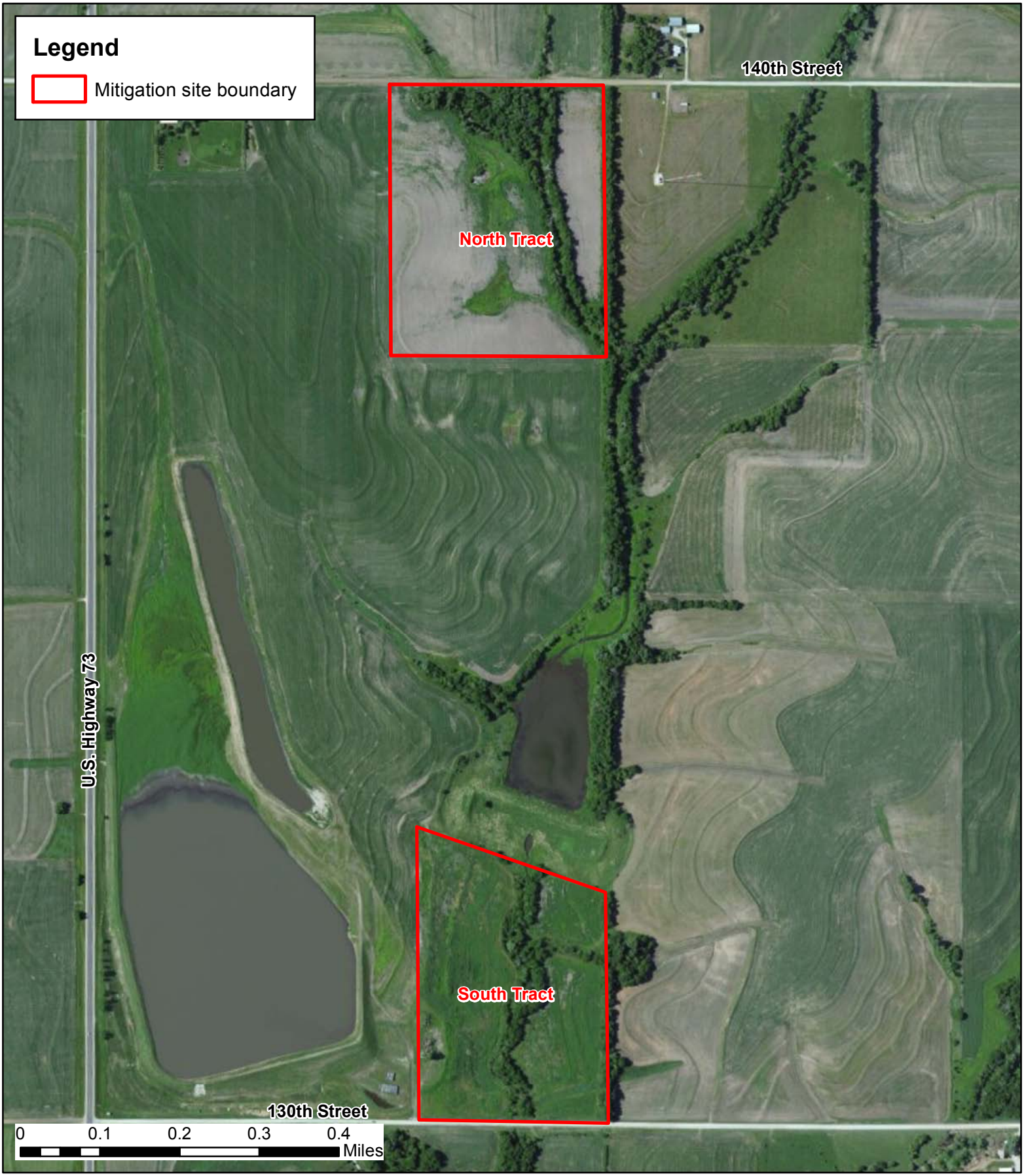


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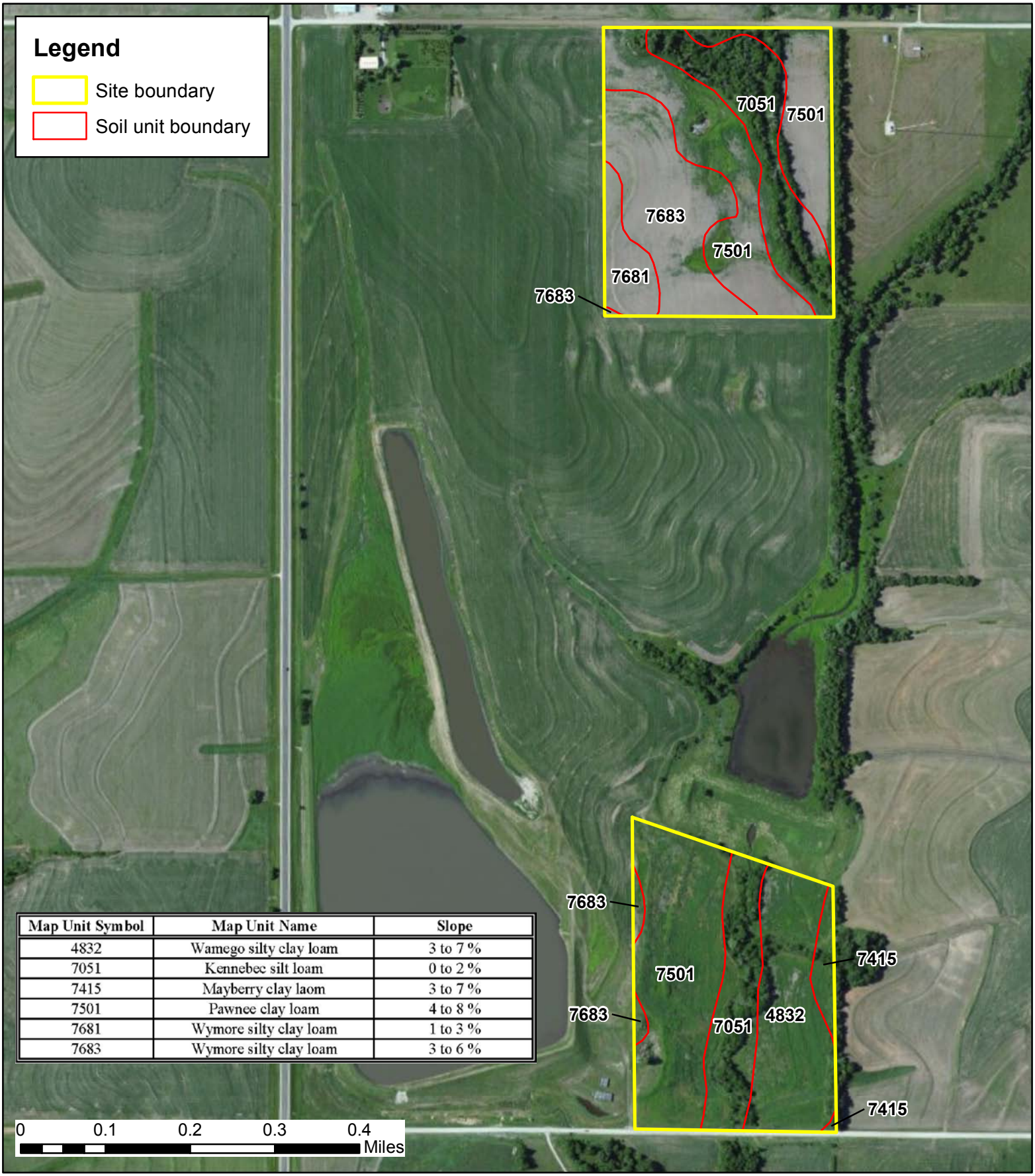
Figure 2
Site Aerial Map

N
W
E
S

**Watershed Land Trust ILF Program - Mission Creek**
**Brown County, Kansas**

Date: January 2015

Source: ESRI Basemaps, Aerial Imagery, 2014




| Map Unit Symbol | Map Unit Name | Slope |
|---|---|---|
| 4832 | Wamego silty clay loam | 3 to 7 % |
| 7051 | Kennebec silt loam | 0 to 2 % |
| 7415 | Mayberry clay laom | 3 to 7 % |
| 7501 | Pawnee clay loam | 4 to 8 % |
| 7681 | Wymore silty clay loam | 1 to 3 % |
| 7683 | Wymore silty clay loam | 3 to 6 % |

THE WATERSHED INSTITUTE AND LAND TRUST

Figure 3
NRCS Soils Map

**Watershed Land Trust ILF Program - Mission Creek**
**Brown County, Kansas**

N
W E
S

Date: January 2015

Source: USDA NRCS Web Soil Survey, 2015
ESRI Basemaps, Aerial Imagery, 2011

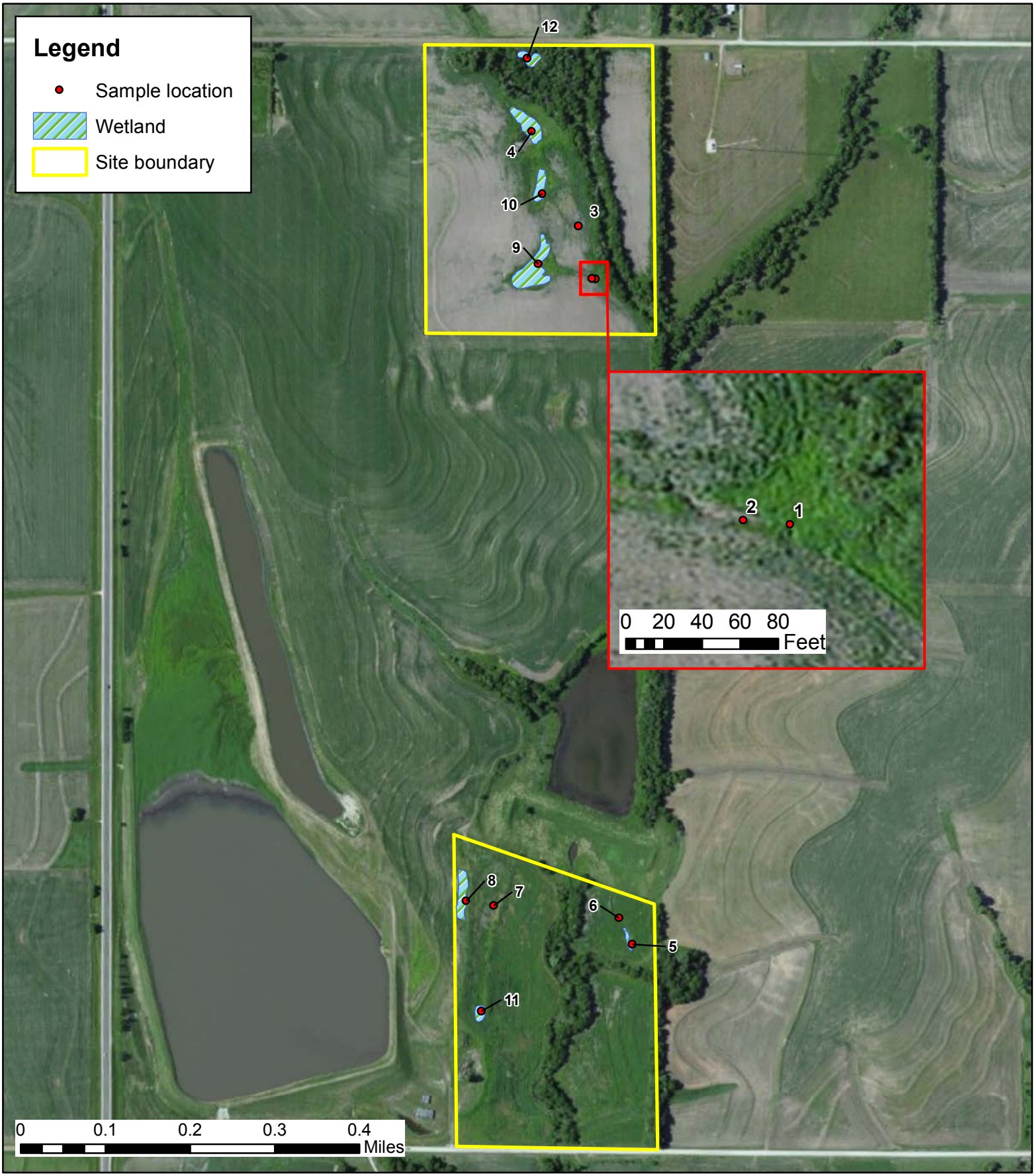



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Figure 4
Sample Point and Wetland Map

**Watershed Land Trust ILF Program - Mission Creek**
**Brown County, Kansas**

N
W E
S

Date: January 2015

Source: ESRI Basemaps, Aerial Imagery, 2011

# APPENDIX B

# PHOTOGRAPHIC LOG

| | | |
|---|---|---|
| Client: Interagency Review Team | Description: Photograph of TWI personnel conducting delineation at sample plot 01 and sample plot 02 is identified by arrow. Neither of these sample plots were determined to have all criteria necessary for a wetland. | Photograph Number: 1 |
| Direction: East | Photographer: Kirk Mammoliti | Date: 6/3/2014 |

| | | |
|---|---|---|
| Client: Interagency Review Team | Description: Photograph of TWI conducting delineation at sample plot 03 at bottom of field drainage feature. This plot was determined to not have all criteria necessary for a wetland. | Photograph Number: 2 |
| Direction: North | Photographer: Kirk Mammoliti | Date: 6/3/2014 |

| | | |
|---|---|---|
| Client: Interagency Review Team | Description: Photograph of wetland containing sample plot 04. This wetland was classified as a palustrine emergent wetland that is seasonally flooded by a groundwater seep and is 0.28 acre in size. | Photograph Number: 3 |
| Direction: Northwest | Photographer: Kirk Mammoliti | Date: 6/3/2014 |

| | | |
|---|---|---|
| Client: Interagency Review Team | Description: Photograph of a wetland containing sample plot 05. This wetland was classified as a palustrine emergent wetland that is temporarily flooded and is 0.04 acre in size. | Photograph Number: 4 |
| Direction: South | Photographer: Kirk Mammoliti | Date: 6/27/2014 |

| | | |
|---|---|---|
| Client: Interagency Review Team | Description: Photograph of TWI personnel conducting delineation at sample plot 06 along a field terrace. This plot was determined to not have all criteria necessary for a wetland. | Photograph Number: 5 |
| Direction: North | Photographer: Kirk Mammoliti | Date: 6/3/2014 |

| | | |
|---|---|---|
| Client: Interagency Review Team | Description: Photograph of wetland containing sample plot 09. This wetland was classified as a palustrine emergent wetland that is seasonally flooded by a groundwater seep and is 0.50 acre in size. | Photograph Number: 6 |
| Direction: North | Photographer: Kirk Mammoliti | Date: 8/25/2014 |

| | | |
|---|---|---|
| Client: Interagency Review Team | Description: Photograph of the wetland containing sample plot 10. This wetland was classified as a palustrine emergent wetland that is seasonally flooded by a groundwater seep and is 0.14 acre in size. | Photograph Number: 7 |
| Direction: North | Photographer: Kirk Mammoliti | Date: 8/25/2014 |

| | | |
|---|---|---|
| Client: Interagency Review Team | Description: Photograph of the wetland containing sample plot 12. This wetland was classified as a palustrine emergent wetland that is occasionally flooded and is 0.10 acre in size. | Photograph Number: 8 |
| Direction: Northeast | Photographer: Kirk Mammoliti | Date: 9/18/2014 |

# APPENDIX C

# ROUTINE WETLAND DETERMINATION FORMS

## WETLAND DETERMINATION DATA FORM – Midwest Region

Project/Site: ILF- Mission Creek City/County: Brown Sampling Date: 6-3-14

Applicant/Owner: TWI State: KS Sampling Point: 01

Investigator(s): Mammoliti, Emmert Section, Township, Range: S16, T4S, R17E

Landform (hillslope, terrace, etc.): Swale Local relief (concave, convex, none): Concave

Slope (%): 0 to 2 Lat: 39.707706 Long: -95.518859 Datum: WGS 1984

Soil Map Unit Name: Kennebec silt loam NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

### SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

| | | | |
|---|---|---|---|
| Hydrophytic Vegetation Present? | Yes _____ | No X | Is the Sampled Area within a Wetland? Yes _____ No X |
| Hydric Soil Present? | Yes X | No _____ | |
| Wetland Hydrology Present? | Yes X | No _____ | |

Remarks:
Sample plot located at bottom of field drainage ditch

### VEGETATION – Use scientific names of plants.

| Tree Stratum (Plot size: NA) | Absolute % Cover | Dominant Species? | Indicator Status |
|---|---|---|---|
| 1. | | | |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| 5. | | | |
| | _____ = Total Cover | | |

| Sapling/Shrub Stratum (Plot size: NA) | Absolute % Cover | Dominant Species? | Indicator Status |
|---|---|---|---|
| 1. | | | |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| 5. | | | |
| | _____ = Total Cover | | |

| Herb Stratum (Plot size: 6' radius) | Absolute % Cover | Dominant Species? | Indicator Status |
|---|---|---|---|
| 1. Trifolium repens | 5 | | FACU |
| 2. Ambrosia trifida | 20 | X | FAC |
| 3. Galium aparine | 25 | X | FACU |
| 4. Carex vulpinoidea | 10 | | FACW |
| 5. Conium maculatum | 5 | | FACW |
| 6. | | | |
| 7. | | | |
| 8. | | | |
| 9. | | | |
| 10. | | | |
| | 65 = Total Cover | | |

| Woody Vine Stratum (Plot size: NA) | Absolute % Cover | Dominant Species? | Indicator Status |
|---|---|---|---|
| 1. | | | |
| 2. | | | |
| | _____ = Total Cover | | |

**Dominance Test worksheet:**

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0.5 (A/B)

**Prevalence Index worksheet:**

| Total % Cover of: | | Multiply by: | |
|---|---|---|---|
| OBL species | 0 | x 1 = | 0 |
| FACW species | 15 | x 2 = | 30 |
| FAC species | 20 | x 3 = | 60 |
| FACU species | 30 | x 4 = | 120 |
| UPL species | 0 | x 5 = | 0 |
| Column Totals: | 65 (A) | | 210 (B) |

Prevalence Index = B/A = 3.23

**Hydrophytic Vegetation Indicators:**

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- ___ 2 - Dominance Test is >50%
- ___ 3 - Prevalence Index is ≤3.0[1]
- ___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

**Hydrophytic Vegetation Present?** Yes _____ No X

Remarks: (Include photo numbers here or on a separate sheet.)
Remainder of area is bare ground

## SOIL

Sampling Point: 01

**Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)**

| Depth (inches) | Matrix Color (moist) | Matrix % | Redox Features Color (moist) | Redox % | Type[1] | Loc[2] | Texture | Remarks |
|---|---|---|---|---|---|---|---|---|
| 0-4 | 10 YR 2/1 | 100 | | | | | | |
| 4-20 | 10 YR 4/2 | 93 | 10 YR 5/6 | 7 | RM | M | SCL | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

**Hydric Soil Indicators:**

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- X Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

**Indicators for Problematic Hydric Soils[3]:**

- ___ Coast Prairie Redox (A16)
- ___ Dark Surface (S7)
- ___ Iron-Manganese Masses (F12)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

**Restrictive Layer (if observed):**

Type: ___

Depth (inches): ___

**Hydric Soil Present?** Yes X No ___

Remarks:

## HYDROLOGY

**Wetland Hydrology Indicators:**

Primary Indicators (minimum of one is required: check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- X Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- X Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- X Geomorphic Position (D2)
- ___ FAC-Neutral Test (D5)

**Field Observations:**

Surface Water Present? Yes ___ No X Depth (inches): ___

Water Table Present? Yes ___ No X Depth (inches): ___

Saturation Present? (includes capillary fringe) Yes ___ No X Depth (inches): ___

**Wetland Hydrology Present?** Yes ___ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

## WETLAND DETERMINATION DATA FORM – Midwest Region

Project/Site: ILF Mission City/County: Brown Sampling Date: 6-3-14

Applicant/Owner: TWI State: KS Sampling Point: 02

Investigator(s): Mammolitti, Emmert Section, Township, Range: S16, T4S, R17E

Landform (hillslope, terrace, etc.): Swale Local relief (concave, convex, none): Concave

Slope (%): 0-2 Lat: 39.707712 Long: -95.518927 Datum: WGS 1984

Soil Map Unit Name: Kennebec Silt loam NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

### SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

| | | | |
|---|---|---|---|
| Hydrophytic Vegetation Present? | Yes ____ | No X | Is the Sampled Area within a Wetland? Yes ____ No X |
| Hydric Soil Present? | Yes ____ | No X | |
| Wetland Hydrology Present? | Yes ____ | No X | |

Remarks:
Sample plot located at bottom of field drainage ditch

### VEGETATION – Use scientific names of plants.

| Tree Stratum (Plot size: NA) | Absolute % Cover | Dominant Species? | Indicator Status |
|---|---|---|---|
| 1. | | | |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| 5. | | | |
| | ____ = Total Cover | | |

| Sapling/Shrub Stratum (Plot size: NA) | | | |
|---|---|---|---|
| 1. | | | |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| 5. | | | |
| | ____ = Total Cover | | |

| Herb Stratum (Plot size: 6' radius) | | | |
|---|---|---|---|
| 1. Ambrosia trifida | 30 | X | FAC |
| 2. Galium aparine | 60 | X | FACU |
| 3. Conium maculatum | 5 | | FACW |
| 4. Mentha arvensis | 5 | | FACW |
| 5. | | | |
| 6. | | | |
| 7. | | | |
| 8. | | | |
| 9. | | | |
| 10. | | | |
| | ____ = Total Cover | | |

| Woody Vine Stratum (Plot size: NA) | | | |
|---|---|---|---|
| 1. | | | |
| 2. | | | |
| | ____ = Total Cover | | |

**Dominance Test worksheet:**

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0.5 (A/B)

**Prevalence Index worksheet:**

| Total % Cover of: | | Multiply by: | |
|---|---|---|---|
| OBL species | 0 | x 1 = | 0 |
| FACW species | 10 | x 2 = | 20 |
| FAC species | 30 | x 3 = | 90 |
| FACU species | 60 | x 4 = | 240 |
| UPL species | 0 | x 5 = | 0 |
| Column Totals: | 100 (A) | | 350 (B) |

Prevalence Index = B/A = ____

**Hydrophytic Vegetation Indicators:**

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- ___ 2 - Dominance Test is >50%
- ___ 3 - Prevalence Index is ≤3.0[1]
- ___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

**Hydrophytic Vegetation Present?** Yes ____ No X

Remarks: (Include photo numbers here or on a separate sheet.)

## SOIL

Sampling Point: 02

**Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)**

| Depth (inches) | Matrix Color (moist) | Matrix % | Redox Features Color (moist) | Redox % | Type[1] | Loc[2] | Texture | Remarks |
|---|---|---|---|---|---|---|---|---|
| 0-20 | 10 YR 2/1 | 100 | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

**Hydric Soil Indicators:**

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

**Indicators for Problematic Hydric Soils[3]:**

- ___ Coast Prairie Redox (A16)
- ___ Dark Surface (S7)
- ___ Iron-Manganese Masses (F12)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

**Restrictive Layer (if observed):**

Type: ___

Depth (inches): ___

**Hydric Soil Present?** Yes ___ No X

Remarks:

No hydric indicators

## HYDROLOGY

**Wetland Hydrology Indicators:**

Primary Indicators (minimum of one is required: check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- X Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- X Geomorphic Position (D2)
- ___ FAC-Neutral Test (D5)

**Field Observations:**

Surface Water Present? Yes ___ No X Depth (inches): ___

Water Table Present? Yes ___ No X Depth (inches): ___

Saturation Present? (includes capillary fringe) Yes ___ No X Depth (inches): ___

**Wetland Hydrology Present?** Yes ___ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

## WETLAND DETERMINATION DATA FORM – Midwest Region

Project/Site: ILF Mission City/County: Brown Sampling Date: 6-3-14
Applicant/Owner: TWI State: KS Sampling Point: 03
Investigator(s): Emmert, Mammoliti Section, Township, Range: S16, T4S, R17E
Landform (hillslope, terrace, etc.): Local relief (concave, convex, none): None
Slope (%): 4 to 8 Lat: 39.708401 Long: -95.519158 Datum: WGS 1984
Soil Map Unit Name: Pawnee clay loam NWI classification: None
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____
Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

### SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

| | | | |
|---|---|---|---|
| Hydrophytic Vegetation Present? | Yes X | No ____ | Is the Sampled Area within a Wetland? Yes ____ No X |
| Hydric Soil Present? | Yes X | No ____ | |
| Wetland Hydrology Present? | Yes ____ | No X | |

Remarks:
Sample plot located at bottom of swale/grass waterway

### VEGETATION – Use scientific names of plants.

| Tree Stratum (Plot size: NA) | Absolute % Cover | Dominant Species? | Indicator Status |
|---|---|---|---|
| 1. | | | |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| 5. | | | |
| | 1 = Total Cover | | |

| Sapling/Shrub Stratum (Plot size: NA) | | | |
|---|---|---|---|
| 1. | | | |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| 5. | | | |
| | = Total Cover | | |

| Herb Stratum (Plot size: 6' radius) | | | |
|---|---|---|---|
| 1. Ambrosia trifida | 70 | X | FAC |
| 2. Persicaria pensylvanica | 10 | | FACW |
| 3. Thalspi arvense | 5 | | FACU |
| 4. Carex vulpinodea | 0.5 | | FACW |
| 5. Solidago gigantea | 0.5 | | FACW |
| 6. | | | |
| 7. | | | |
| 8. | | | |
| 9. | | | |
| 10. | | | |
| | 86 = Total Cover | | |

| Woody Vine Stratum (Plot size: ____) | | | |
|---|---|---|---|
| 1. | | | |
| 2. | | | |
| | = Total Cover | | |

**Dominance Test worksheet:**
Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)
Total Number of Dominant Species Across All Strata: 1 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 1 (A/B)

**Prevalence Index worksheet:**

| Total % Cover of: | | Multiply by: |
|---|---|---|
| OBL species | 0 | x 1 = |
| FACW species | 11 | x 2 = |
| FAC species | 70 | x 3 = |
| FACU species | 5 | x 4 = |
| UPL species | 0 | x 5 = |
| Column Totals: | 86 (A) | 252 (B) |

Prevalence Index = B/A = 2.93

**Hydrophytic Vegetation Indicators:**
- ____ 1 - Rapid Test for Hydrophytic Vegetation
- X 2 - Dominance Test is >50%
- X 3 - Prevalence Index is ≤3.0[1]
- ____ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

**Hydrophytic Vegetation Present?** Yes X No ____

Remarks: (Include photo numbers here or on a separate sheet.)
Prevelance of FACW species low; however abundance of A. trifida equates to Wet veg presence

## SOIL

Sampling Point: 03

**Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)**

| Depth (inches) | Matrix Color (moist) | Matrix % | Redox Features Color (moist) | Redox % | Type[1] | Loc[2] | Texture | Remarks |
|---|---|---|---|---|---|---|---|---|
| 0-3 | 10YR 2/1 | 100 | | | | | | |
| 3-20 | 10YR 2/1 | 80 | 5YR 4/1 | 20 | C | PL | SCL | |

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

**Hydric Soil Indicators:**

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- X Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

**Indicators for Problematic Hydric Soils[3]:**

- ___ Coast Prairie Redox (A16)
- ___ Dark Surface (S7)
- ___ Iron-Manganese Masses (F12)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

**Restrictive Layer (if observed):**

Type: ___

Depth (inches): ___

**Hydric Soil Present?** Yes X No ___

Remarks:

## HYDROLOGY

**Wetland Hydrology Indicators:**

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- X Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ FAC-Neutral Test (D5)

**Field Observations:**

Surface Water Present? Yes ___ No X Depth (inches): ___

Water Table Present? Yes ___ No ___ Depth (inches): ___

Saturation Present? (includes capillary fringe) Yes ___ No ___ Depth (inches): ___

**Wetland Hydrology Present?** Yes ___ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

## WETLAND DETERMINATION DATA FORM – Midwest Region

Project/Site: ILF Mission City/County: Brown Sampling Date: 6-3-14

Applicant/Owner: TWI State: KS Sampling Point: 04

Investigator(s): Mammoliti, Emmert Section, Township, Range: S16, T4S, R17E

Landform (hillslope, terrace, etc.): Local relief (concave, convex, none): none

Slope (%): 4 to 8 Lat: 39.709637 Long: -95.519949 Datum: WGS 1984

Soil Map Unit Name: Pawnee clay loam NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

### SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

| | | | |
|---|---|---|---|
| Hydrophytic Vegetation Present? | Yes X | No _____ | Is the Sampled Area within a Wetland? Yes X No _____ |
| Hydric Soil Present? | Yes X | No _____ | |
| Wetland Hydrology Present? | Yes X | No _____ | |

Remarks:
Sample plot is located in a large groundwater seep

### VEGETATION – Use scientific names of plants.

| Tree Stratum (Plot size: NA) | Absolute % Cover | Dominant Species? | Indicator Status |
|---|---|---|---|
| 1. | | | |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| 5. | | | |
| | _____ = Total Cover | | |

| Sapling/Shrub Stratum (Plot size: NA) | | | |
|---|---|---|---|
| 1. | | | |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| 5. | | | |
| | _____ = Total Cover | | |

| Herb Stratum (Plot size: 6' radius) | | | |
|---|---|---|---|
| 1. Scirpus atrovirens | 10 | | OBL |
| 2. Phalaris arundinacea | 30 | X | FACW |
| 3. Typha angustifolia | 50 | X | OBL |
| 4. Carex vulpinoidea | 5 | | FACW |
| 5. Carex hystericina | 2 | | OBL |
| 6. Persicaria pensylvanica | 0.5 | | FACW |
| 7. Acorus americanus | 0.5 | | OBL |
| 8. Eleocharis palustris | 0.5 | | OBL |
| 9. | | | |
| 10. | | | |
| | _____ = Total Cover | | |

| Woody Vine Stratum (Plot size: NA) | | | |
|---|---|---|---|
| 1. | | | |
| 2. | | | |
| | _____ = Total Cover | | |

**Dominance Test worksheet:**

Number of Dominant Species That Are OBL, FACW, or FAC: _____ (A)

Total Number of Dominant Species Across All Strata: _____ (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: _____ (A/B)

**Prevalence Index worksheet:**

| Total % Cover of: | | Multiply by: |
|---|---|---|
| OBL species | _____ | x 1 = _____ |
| FACW species | _____ | x 2 = _____ |
| FAC species | _____ | x 3 = _____ |
| FACU species | _____ | x 4 = _____ |
| UPL species | _____ | x 5 = _____ |
| Column Totals: | _____ (A) | _____ (B) |

Prevalence Index = B/A = _____

**Hydrophytic Vegetation Indicators:**

X 1 - Rapid Test for Hydrophytic Vegetation

__ 2 - Dominance Test is >50%

__ 3 - Prevalence Index is ≤3.0[1]

__ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

__ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

**Hydrophytic Vegetation Present?** Yes X No _____

Remarks: (Include photo numbers here or on a separate sheet.)
Community is hydrophytic, dominated by cattail + reed canary

## SOIL

Sampling Point: 04

**Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)**

| Depth (inches) | Matrix Color (moist) | Matrix % | Redox Features Color (moist) | Redox % | Type[1] | Loc[2] | Texture | Remarks |
|---|---|---|---|---|---|---|---|---|
| 0-20 | 10YR 2/1 | 100 | | | | | | Rooted throughout |

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

**Hydric Soil Indicators:**

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- X Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

**Indicators for Problematic Hydric Soils[3]:**

- ___ Coast Prairie Redox (A16)
- ___ Dark Surface (S7)
- ___ Iron-Manganese Masses (F12)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

**Restrictive Layer (if observed):**

Type: ___

Depth (inches): ___

**Hydric Soil Present?** Yes X No ___

Remarks:

## HYDROLOGY

**Wetland Hydrology Indicators:**

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ FAC-Neutral Test (D5)

**Field Observations:**

Surface Water Present? Yes X No ___ Depth (inches): 1

Water Table Present? Yes ___ No ___ Depth (inches): ___

Saturation Present? (includes capillary fringe) Yes X No ___ Depth (inches): ___

**Wetland Hydrology Present?** Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

## WETLAND DETERMINATION DATA FORM – Midwest Region

Project/Site: ILF Mission City/County: Brown Sampling Date: 6-3-14

Applicant/Owner: TWI State: KS Sampling Point: 05

Investigator(s): Emmert, Mammoliti Section, Township, Range: S16, T4S, R17E

Landform (hillslope, terrace, etc.): Terrace Local relief (concave, convex, none): concave

Slope (%): 3 to 7 Lat: 39.698972 Long: -95.518236 Datum: WGS 1984

Soil Map Unit Name: Wamego silt clay loam NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

### SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

| | | | |
|---|---|---|---|
| Hydrophytic Vegetation Present? | Yes X | No ____ | Is the Sampled Area within a Wetland? Yes X No ____ |
| Hydric Soil Present? | Yes X | No ____ | |
| Wetland Hydrology Present? | Yes X | No ____ | |

Remarks:
Sample plot is located on concave portion of field terrace

### VEGETATION – Use scientific names of plants.

| Tree Stratum (Plot size: NA) | Absolute % Cover | Dominant Species? | Indicator Status |
|---|---|---|---|
| 1. | | | |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| 5. | | | |
| | ____ = Total Cover | | |

| Sapling/Shrub Stratum (Plot size: NA) | | | |
|---|---|---|---|
| 1. | | | |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| 5. | | | |
| | ____ = Total Cover | | |

| Herb Stratum (Plot size: 6' radius) | | | |
|---|---|---|---|
| 1. Juncus interior | 0.5 | | FAC |
| 2. Persicaria pensylvanica | 60 | X | FACW |
| 3. Carex vulpinoidea | 2 | | FACW |
| 4. | | | |
| 5. | | | |
| 6. | | | |
| 7. | | | |
| 8. | | | |
| 9. | | | |
| 10. | | | |
| | 62.5 = Total Cover | | |

| Woody Vine Stratum (Plot size: NA) | | | |
|---|---|---|---|
| 1. | | | |
| 2. | | | |
| | ____ = Total Cover | | |

**Dominance Test worksheet:**

Number of Dominant Species That Are OBL, FACW, or FAC: ____ (A)

Total Number of Dominant Species Across All Strata: ____ (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: ____ (A/B)

**Prevalence Index worksheet:**

| Total % Cover of: | Multiply by: |
|---|---|
| OBL species ____ | x 1 = ____ |
| FACW species ____ | x 2 = ____ |
| FAC species ____ | x 3 = ____ |
| FACU species ____ | x 4 = ____ |
| UPL species ____ | x 5 = ____ |
| Column Totals: ____ (A) | ____ (B) |

Prevalence Index = B/A = ____

**Hydrophytic Vegetation Indicators:**

X 1 - Rapid Test for Hydrophytic Vegetation

__ 2 - Dominance Test is >50%

__ 3 - Prevalence Index is ≤3.0[1]

__ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

__ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

**Hydrophytic Vegetation Present?** Yes X No ____

Remarks: (Include photo numbers here or on a separate sheet.)
Community is hydrophytic + dominated by smartweed

## SOIL

Sampling Point: 65

**Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)**

| Depth (inches) | Matrix Color (moist) | Matrix % | Redox Features Color (moist) | Redox % | Type[1] | Loc[2] | Texture | Remarks |
|---|---|---|---|---|---|---|---|---|
| 0-20 | 10 YR 2/2 | 95 | 5 YR 3/4 | 5 | C | PL | SL | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

**Hydric Soil Indicators:**

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- X Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

**Indicators for Problematic Hydric Soils[3]:**

- ___ Coast Prairie Redox (A16)
- ___ Dark Surface (S7)
- ___ Iron-Manganese Masses (F12)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

**Restrictive Layer (if observed):**

Type: _____

Depth (inches): _____

**Hydric Soil Present?** Yes X No ___

Remarks:

## HYDROLOGY

**Wetland Hydrology Indicators:**

Primary Indicators (minimum of one is required: check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- X Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- X Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ FAC-Neutral Test (D5)

**Field Observations:**

Surface Water Present? Yes ___ No X Depth (inches): _____

Water Table Present? Yes ___ No X Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes ___ No X Depth (inches): _____

**Wetland Hydrology Present?** Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

## WETLAND DETERMINATION DATA FORM – Midwest Region

Project/Site: ILF Mission City/County: Brown Sampling Date: 6-3-14
Applicant/Owner: TWI State: KS Sampling Point: 06
Investigator(s): Mammoliti, Emmert Section, Township, Range: S16, T4S, R17E
Landform (hillslope, terrace, etc.): Terrace Local relief (concave, convex, none): Concave
Slope (%): 3 to 7 Lat: 39.699471 Long: -95.525194 Datum: WGS 1984
Soil Map Unit Name: Wamego silty clay loam NWI classification: None
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____
Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

### SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

| | | |
|---|---|---|
| Hydrophytic Vegetation Present? | Yes X No ____ | Is the Sampled Area within a Wetland? Yes ____ No X |
| Hydric Soil Present? | Yes X No ____ | |
| Wetland Hydrology Present? | Yes ____ No X | |

Remarks: Sample plot located on same terrace as SP5 at an upgradient location

### VEGETATION – Use scientific names of plants.

| Tree Stratum (Plot size: na) | Absolute % Cover | Dominant Species? | Indicator Status |
|---|---|---|---|
| 1. | | | |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| 5. | | | |
| | ____ = Total Cover | | |

| Sapling/Shrub Stratum (Plot size: NA) | | | |
|---|---|---|---|
| 1. | | | |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| 5. | | | |
| | ____ = Total Cover | | |

| Herb Stratum (Plot size: 6' radius) | | | |
|---|---|---|---|
| 1. Bromus tectorum | 15 | X | FACU |
| 2. Carex vulpinoidea | 30 | X | FACW |
| 3. Juncus interior | 10 | | FAC |
| 4. Juncus torreyi | 13 | | FACW |
| 5. Ambrosia artemisiifolia | 5 | | FACU |
| 6. Ambrosia trifida | 2 | | FAC |
| 7. Thlaspi arvense | 0.5 | | FAC,U |
| 8. Potentilla simplex | 0.5 | | FACU |
| 9. | | | |
| 10. | | | |
| | 76% = Total Cover | | |

| Woody Vine Stratum (Plot size: NA) | | | |
|---|---|---|---|
| 1. | | | |
| 2. | | | |
| | ____ = Total Cover | | |

**Dominance Test worksheet:**

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0.5 (A/B)

**Prevalence Index worksheet:**

| Total % Cover of: | | Multiply by: |
|---|---|---|
| OBL species | 0 | x 1 = 0 |
| FACW species | 43 | x 2 = 86 |
| FAC species | 12 | x 3 = 36 |
| FACU species | 21 | x 4 = 84 |
| UPL species | 0 | x 5 = |
| Column Totals: | 76 (A) | 196 (B) |

Prevalence Index = B/A = 2.57

**Hydrophytic Vegetation Indicators:**

- ____ 1 - Rapid Test for Hydrophytic Vegetation
- X 2 - Dominance Test is >50%
- X 3 - Prevalence Index is ≤3.0[1]
- ____ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

**Hydrophytic Vegetation Present?** Yes X No ____

Remarks: (Include photo numbers here or on a separate sheet.)

## SOIL

Sampling Point: 06

**Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)**

| Depth (inches) | Matrix Color (moist) | Matrix % | Redox Features Color (moist) | Redox % | Type[1] | Loc[2] | Texture | Remarks |
|---|---|---|---|---|---|---|---|---|
| 0-4 | 10 YR 2/2 | 100% | | | | | SL | |
| 4-8 | 10 YR 2/2 | 100% | | | | | SCL | |
| 8-20 | 10 YR 2/2 | 90 | 10 YR 4/2 | 10 | C | M | SCL | |

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

**Hydric Soil Indicators:**

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- X Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

**Indicators for Problematic Hydric Soils[3]:**

- ___ Coast Prairie Redox (A16)
- ___ Dark Surface (S7)
- ___ Iron-Manganese Masses (F12)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

**Restrictive Layer (if observed):**

Type: ___

Depth (inches): ___

**Hydric Soil Present?** Yes X No ___

Remarks:

## HYDROLOGY

**Wetland Hydrology Indicators:**

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- X Geomorphic Position (D2)
- X FAC-Neutral Test (D5)

**Field Observations:**

Surface Water Present? Yes ___ No X Depth (inches): ___

Water Table Present? Yes ___ No X Depth (inches): ___

Saturation Present? (includes capillary fringe) Yes ___ No X Depth (inches): ___

**Wetland Hydrology Present?** Yes ___ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Hydrological indicators very weak

## WETLAND DETERMINATION DATA FORM – Midwest Region

Project/Site: ILF Mission City/County: Brown Sampling Date: 6-3-14
Applicant/Owner: TNI State: KS Sampling Point: 07
Investigator(s): Mammoliti, Emmert Section, Township, Range: S16, T4S, R17E
Landform (hillslope, terrace, etc.): Terrace Local relief (concave, convex, none): Concave
Slope (%): 4-8 Lat: 39.699448 Long: -95.5206001 Datum: WGS 1984
Soil Map Unit Name: Pawnee clay loam NWI classification: none
Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ____ (If no, explain in Remarks.)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ____
Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

### SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

| | | | |
|---|---|---|---|
| Hydrophytic Vegetation Present? | Yes ____ | No X | Is the Sampled Area within a Wetland? Yes ____ No X |
| Hydric Soil Present? | Yes ____ | No X | |
| Wetland Hydrology Present? | Yes ____ | No ✓ | |

Remarks: Sample plot located within concave feature of field terrace

### VEGETATION – Use scientific names of plants.

| Tree Stratum (Plot size: na) | Absolute % Cover | Dominant Species? | Indicator Status |
|---|---|---|---|
| 1. | | | |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| 5. | | | |
| | ____ = Total Cover | | |

| Sapling/Shrub Stratum (Plot size: na) | | | |
|---|---|---|---|
| 1. | | | |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| 5. | | | |
| | ____ = Total Cover | | |

| Herb Stratum (Plot size: 6' radius) | | | |
|---|---|---|---|
| 1. Ambrosia trifida | 15 | X | FAC |
| 2. Ambrosia artemisiifolia | 20 | ✓ | FACU |
| 3. Apocynum cannibinum | 25 | ✓ | FAC |
| 4. Solidago gigantea | 5 | | FACW |
| 5. Thlaspi arvense | 5 | | FACU |
| 6. Bromus tectorum | 5 | | FACU |
| 7. | | | |
| 8. | | | |
| 9. | | | |
| 10. | | | |
| | 75 = Total Cover | | |

| Woody Vine Stratum (Plot size: ____) | | | |
|---|---|---|---|
| 1. | | | |
| 2. | | | |
| | ____ = Total Cover | | |

**Dominance Test worksheet:**

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0.66 (A/B)

**Prevalence Index worksheet:**

| Total % Cover of: | | Multiply by: |
|---|---|---|
| OBL species | 0 | x 1 = 0 |
| FACW species | 5 | x 2 = 10 |
| FAC species | 40 | x 3 = 120 |
| FACU species | 30 | x 4 = 120 |
| UPL species | 0 | x 5 = |
| Column Totals: | 75 (A) | 250 (B) |

Prevalence Index = B/A = 3.33

**Hydrophytic Vegetation Indicators:**

- ____ 1 - Rapid Test for Hydrophytic Vegetation
- X 2 - Dominance Test is >50%
- ____ 3 - Prevalence Index is ≤3.0[1]
- ____ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

**Hydrophytic Vegetation Present?** Yes ____ No X

Remarks: (Include photo numbers here or on a separate sheet.)

## SOIL

Sampling Point: 07

**Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)**

| Depth (inches) | Matrix Color (moist) | Matrix % | Redox Features Color (moist) | Redox % | Type[1] | Loc[2] | Texture | Remarks |
|---|---|---|---|---|---|---|---|---|
| 0-8 | 10 YR 3/1 | 100 | | | | SL | | |
| 8-20 | 10 YR 3/1 | 100 | | | | SCL | | |

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

**Hydric Soil Indicators:**

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

**Indicators for Problematic Hydric Soils[3]:**

- ___ Coast Prairie Redox (A16)
- ___ Dark Surface (S7)
- ___ Iron-Manganese Masses (F12)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

**Restrictive Layer (if observed):**

Type: _____

Depth (inches): _____

**Hydric Soil Present?** Yes _____ No X

Remarks:

## HYDROLOGY

**Wetland Hydrology Indicators:**

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- X Geomorphic Position (D2)
- ___ FAC-Neutral Test (D5)

**Field Observations:**

Surface Water Present? Yes _____ No X Depth (inches): _____

Water Table Present? Yes _____ No X Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No X Depth (inches): _____

**Wetland Hydrology Present?** Yes _____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

## WETLAND DETERMINATION DATA FORM – Midwest Region

Project/Site: ILF Mission City/County: Brown Sampling Date: 6-3-14
Applicant/Owner: TNI State: KS Sampling Point: 08
Investigator(s): Mammoliti, Emmert Section, Township, Range: S16, T4S, R17E
Landform (hillslope, terrace, etc.): Terrace Local relief (concave, convex, none): concave
Slope (%): 4-8 Lat: 39.699537 Long: -95.521073 Datum: WGS 1984
Soil Map Unit Name: Pawnee Clay loam NWI classification: none
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ____
Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

### SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

| | | |
|---|---|---|
| Hydrophytic Vegetation Present? | Yes X No ____ | Is the Sampled Area within a Wetland? Yes X No ____ |
| Hydric Soil Present? | Yes X No ____ | |
| Wetland Hydrology Present? | Yes X No ____ | |

Remarks: Sample plot located in PEM wetland within field terrace

### VEGETATION – Use scientific names of plants.

| Tree Stratum (Plot size: N/A) | Absolute % Cover | Dominant Species? | Indicator Status |
|---|---|---|---|
| 1. | | | |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| 5. | | | |
| | ____ = Total Cover | | |

| Sapling/Shrub Stratum (Plot size: NA) | | | |
|---|---|---|---|
| 1. | | | |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| 5. | | | |
| | ____ = Total Cover | | |

| Herb Stratum (Plot size: 6' radius) | | | |
|---|---|---|---|
| 1. Equisetum hyemale | 8 | | FACW |
| 2. Ambrosia trifida | 3 | | FAC |
| 3. Apocynum cannibium | 5 | | FAC |
| 4. Persicaria pensylvanicum | 1 | | OBL |
| 5. Carex hystericina | 56 | X | OBL |
| 6. Galium aparine | 3 | | FACU |
| 7. | | | |
| 8. | | | |
| 9. | | | |
| 10. | | | |
| | 75 = Total Cover | | |

| Woody Vine Stratum (Plot size: NA) | | | |
|---|---|---|---|
| 1. | | | |
| 2. | | | |
| | ____ = Total Cover | | |

**Dominance Test worksheet:**

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 1.00 (A/B)

**Prevalence Index worksheet:**

| Total % Cover of: | Multiply by: |
|---|---|
| OBL species ____ | x 1 = ____ |
| FACW species ____ | x 2 = ____ |
| FAC species ____ | x 3 = ____ |
| FACU species ____ | x 4 = ____ |
| UPL species ____ | x 5 = ____ |
| Column Totals: ____ (A) | ____ (B) |

Prevalence Index = B/A = ____

**Hydrophytic Vegetation Indicators:**

X 1 - Rapid Test for Hydrophytic Vegetation
__ 2 - Dominance Test is >50%
__ 3 - Prevalence Index is ≤3.0[1]
__ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
__ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

**Hydrophytic Vegetation Present?** Yes X No ____

Remarks: (Include photo numbers here or on a separate sheet.)

## SOIL

Sampling Point: 08

**Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)**

| Depth (inches) | Matrix Color (moist) | Matrix % | Redox Features Color (moist) | Redox % | Type[1] | Loc[2] | Texture | Remarks |
|---|---|---|---|---|---|---|---|---|
| 0-14 | 10YR 3/1 | 100 | | | | | SL | |
| 14-20 | 10YR 3/1 | 93-95 | 10YR 5/6 | 5-7 | C | PL | CL/LM | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

**Hydric Soil Indicators:**

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- X Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

**Indicators for Problematic Hydric Soils[3]:**

- ___ Coast Prairie Redox (A16)
- ___ Dark Surface (S7)
- ___ Iron-Manganese Masses (F12)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

**Restrictive Layer (if observed):**

Type: ___

Depth (inches): ___

**Hydric Soil Present?** Yes X No ___

Remarks:

## HYDROLOGY

**Wetland Hydrology Indicators:**

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ FAC-Neutral Test (D5)

**Field Observations:**

Surface Water Present? Yes ___ No X Depth (inches): ___

Water Table Present? Yes ___ No X Depth (inches): ___

Saturation Present? (includes capillary fringe) Yes X No ___ Depth (inches): 6

**Wetland Hydrology Present?** Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

# WETLAND DETERMINATION DATA FORM – Midwest Region

Project/Site: Mission Creek City/County: Brown Sampling Date: 8-25-14

Applicant/Owner: TWI State: KS Sampling Point: 09

Investigator(s): Mammoliti, Roth Section, Township, Range: _____

Landform (hillslope, terrace, etc.): Terrace Local relief (concave, convex, none): Concave

Slope (%): _____ Lat: 39.7078 9730 Long: -95.51984291 Datum: WGS 1984

Soil Map Unit Name: _____ NWI classification: _____

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.) Recent shower

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? No Are "Normal Circumstances" present? Yes X No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? No (If needed, explain any answers in Remarks.)

## SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

| | | |
|---|---|---|
| Hydrophytic Vegetation Present? | Yes X No _____ | Is the Sampled Area within a Wetland? Yes X No _____ |
| Hydric Soil Present? | Yes X No _____ | |
| Wetland Hydrology Present? | Yes X No _____ | |

Remarks: PEM wetland located at the top of a swale

Put in pdf

## VEGETATION – Use scientific names of plants.

| Tree Stratum (Plot size: N/A) | Absolute % Cover | Dominant Species? | Indicator Status |
|---|---|---|---|
| 1. | | | |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| 5. | | | |
| | _____ = Total Cover | | |
| **Sapling/Shrub Stratum (Plot size: 15' rad)** | | | |
| 1. Salix amygdaloides | 2.5 | | FACW |
| 2. Salix nigra | 2.5 | | OBL |
| 3. | | | |
| 4. | | | |
| 5. | | | |
| | 5 = Total Cover | | |
| **Herb Stratum (Plot size: 6' rad)** | | | |
| 1. Eleocharis spp | 2 | | OBL |
| 2. Typha angustifolia | 2 | | OBL |
| 3. Scirpus atrovirens | 10 | | OBL |
| 4. Ambrosia artemisiifolia | 20 | X | FACU |
| 5. Leersia oryzoides | 32.5 | X | OBL |
| 6. Carex gravida | 5 | | FACU |
| 7. Carex vulpinoidea | 10 | | FACW |
| 8. Juncus spp | 1 | | OBL |
| 9. Ambrosia trifida | 1 | | FAC |
| 10. Verbena stricta | 1 | | UPL |
| Pesicaria punctata T | OBL 84.5 | = Total Cover | |
| **Woody Vine Stratum (Plot size: N/A)** | | | |
| 1. | | | |
| 2. | | | |
| | _____ = Total Cover | | |

OBL Schoenoplectus tabernaemontani T

Desmanthus illinoensis T FACU

**Dominance Test worksheet:**

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0.5 (A/B)

**Prevalence Index worksheet:**

| Total % Cover of: | | Multiply by: |
|---|---|---|
| OBL species | 50 | x 1 = 50 |
| FACW species | 13.5 | x 2 = 27 |
| FAC species | 0.5 | x 3 = 1.5 |
| FACU species | 25.5 | x 4 = 102 |
| UPL species | 0.5 | x 5 = 2.5 |
| Column Totals: | 90 (A) | 183 (B) |

Prevalence Index = B/A = 2.03

**Hydrophytic Vegetation Indicators:**

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- ___ 2 - Dominance Test is >50%
- X 3 - Prevalence Index is ≤3.0[1]
- ___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

**Hydrophytic Vegetation Present?** Yes X No _____

Remarks: (Include photo numbers here or on a separate sheet.)
Rice cutgrass + common ragweed dominant community w/ many wetland species intermixed.

## SOIL

Sampling Point: 09

**Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)**

| Depth (inches) | Matrix Color (moist) | Matrix % | Redox Features Color (moist) | Redox % | Type[1] | Loc[2] | Texture | Remarks |
|---|---|---|---|---|---|---|---|---|
| 0-8 | 10YR 3/1 | 100 | | | | | SCL | |
| 8-20 | 10YR 3/1 | 95 | 5YR 3/4 | 5 | C | PL | CL | |

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

**Hydric Soil Indicators:**

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- X Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

**Indicators for Problematic Hydric Soils[3]:**

- ___ Coast Prairie Redox (A16)
- ___ Dark Surface (S7)
- ___ Iron-Manganese Masses (F12)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

**Restrictive Layer (if observed):**

Type: ___

Depth (inches): ___

**Hydric Soil Present?** Yes X No ___

Remarks:

## HYDROLOGY

**Wetland Hydrology Indicators:**

Primary Indicators (minimum of one is required; check all that apply)

- X Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- X Geomorphic Position (D2)
- X FAC-Neutral Test (D5)

**Field Observations:**

Surface Water Present? Yes X No ___ Depth (inches): 3

Water Table Present? Yes ___ No X Depth (inches): ___

Saturation Present? (includes capillary fringe) Yes ___ No X Depth (inches): ___

**Wetland Hydrology Present?** Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Surface water present under vegetation; Sample point located at a seep on top of a swale

## WETLAND DETERMINATION DATA FORM – Midwest Region

Project/Site: Mission Creek City/County: Brown Sampling Date: 8-25-14

Applicant/Owner: TWI State: KS Sampling Point: 10

Investigator(s): Mammoliti, Emmert, Roth Section, Township, Range: _____

Landform (hillslope, terrace, etc.): _____ Local relief (concave, convex, none): _____

Slope (%): _____ Lat: 39.70882463 Long: -95.61976973 Datum: WGS 1984

Soil Map Unit Name: _____ NWI classification: _____

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.) Recent shower

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? No. Are "Normal Circumstances" present? Yes X No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? No (If needed, explain any answers in Remarks.)

### SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

| | | |
|---|---|---|
| Hydrophytic Vegetation Present? | Yes X No _____ | Is the Sampled Area within a Wetland? Yes X No _____ |
| Hydric Soil Present? | Yes X No _____ | |
| Wetland Hydrology Present? | Yes X No _____ | |

Remarks: PEM wetland in depression at top of swale

### VEGETATION – Use scientific names of plants.

| Tree Stratum (Plot size: 30' rad) | Absolute % Cover | Dominant Species? | Indicator Status |
|---|---|---|---|
| 1. Salix amygdaloides | 12.5 | | FACW |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| 5. | | | |
| | 12.5 = Total Cover | | |
| **Sapling/Shrub Stratum** (Plot size: N/A) | | | |
| 1. | | | |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| 5. | | | |
| | = Total Cover | | |
| **Herb Stratum** (Plot size: 6 ft) | | | |
| 1. Phalaris arundinacea | 52.5 | X | FACW |
| 2. Leersia oryzoides | 52.5 | X | OBL |
| 3. Schoenoplectus tabernaemontani | 2.5 | | OBL |
| 4. | | | |
| 5. | | | |
| 6. | | | |
| 7. | | | |
| 8. | | | |
| 9. | | | |
| 10. | | | |
| | 107.5 = Total Cover | | |
| **Woody Vine Stratum** (Plot size: NA) | | | |
| 1. | | | |
| 2. | | | |
| | = Total Cover | | |

**Dominance Test worksheet:**

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 1 (A/B)

**Prevalence Index worksheet:**

| Total % Cover of: | Multiply by: |
|---|---|
| OBL species _____ | x 1 = _____ |
| FACW species _____ | x 2 = _____ |
| FAC species _____ | x 3 = _____ |
| FACU species _____ | x 4 = _____ |
| UPL species _____ | x 5 = _____ |
| Column Totals: _____ (A) | _____ (B) |

Prevalence Index = B/A = _____

**Hydrophytic Vegetation Indicators:**

X 1 - Rapid Test for Hydrophytic Vegetation

X 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

**Hydrophytic Vegetation Present?** Yes X No _____

Remarks: (Include photo numbers here or on a separate sheet.)

Rice cut grass + reed canary dominant community

## SOIL

Sampling Point: 10

**Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)**

| Depth (inches) | Matrix Color (moist) | Matrix % | Redox Features Color (moist) | Redox % | Type[1] | Loc[2] | Texture | Remarks |
|---|---|---|---|---|---|---|---|---|
| 0-12 | 10 YR 2/2 | 100 | 5 YR 3/4 | 5-7 | C | PL | Silt Clay Loam | |
| 12-20 | 10 YR 2/1 | 100 | 10 YR 5/6 | 7-10 | C | PL | Clay loam | |

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

**Hydric Soil Indicators:**

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- X Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

**Indicators for Problematic Hydric Soils[3]:**

- ___ Coast Prairie Redox (A16)
- ___ Dark Surface (S7)
- ___ Iron-Manganese Masses (F12)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

**Restrictive Layer (if observed):**

Type: _____

Depth (inches): _____

**Hydric Soil Present?** Yes X No ___

Remarks:

## HYDROLOGY

**Wetland Hydrology Indicators:**

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- X Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- X Geomorphic Position (D2)
- ___ FAC-Neutral Test (D5)

**Field Observations:**

Surface Water Present? Yes ___ No X Depth (inches): _____

Water Table Present? Yes X No ___ Depth (inches): 16 inches

Saturation Present? (includes capillary fringe) Yes X No ___ Depth (inches): 0 inches

**Wetland Hydrology Present?** Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

# WETLAND DETERMINATION DATA FORM – Midwest Region

Project/Site: Mission City/County: Brown Sampling Date: 8-25-14

Applicant/Owner: TWI State: KS Sampling Point: 11

Investigator(s): Mammoliti, Roth, Emmert Section, Township, Range: _____

Landform (hillslope, terrace, etc.): Terrace Local relief (concave, convex, none): _____

Slope (%): _____ Lat: 39.48809609 Long: 95.52081361 Datum: _____

Soil Map Unit Name: _____ NWI classification: _____

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? No Are "Normal Circumstances" present? Yes X No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? No (If needed, explain any answers in Remarks.)

## SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

| | | |
|---|---|---|
| Hydrophytic Vegetation Present? | Yes X No _____ | Is the Sampled Area within a Wetland? Yes X No _____ |
| Hydric Soil Present? | Yes X No _____ | |
| Wetland Hydrology Present? | Yes X No _____ | |

Remarks:

PEM below constructed terrace at highest elevation of swale

## VEGETATION – Use scientific names of plants.

| Tree Stratum (Plot size: N/A) | Absolute % Cover | Dominant Species? | Indicator Status |
|---|---|---|---|
| 1. | | | |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| 5. | | | |
| | _____ = Total Cover | | |

| Sapling/Shrub Stratum (Plot size: N/A) | Absolute % Cover | Dominant Species? | Indicator Status |
|---|---|---|---|
| 1. | | | |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| 5. | | | |
| | _____ = Total Cover | | |

| Herb Stratum (Plot size: 6' rad) | Absolute % Cover | Dominant Species? | Indicator Status |
|---|---|---|---|
| 1. Ambrosia artemisiifolia | 5 | | FACU |
| 2. Ambrosia trifida | T | | FAC |
| 3. Carex vulpinoidea | 60 | X | FACW |
| 4. Typha angustifolia | 2.5 | | OBL |
| 5. Leersia oryzoides | 2.5 | | OBL |
| 6. Scirpus atrovirens | 2.5 | | OBL |
| 7. Persicaria pubescens | T | | OBL |
| 8. Polygonum ramosissimum | T | | FACU |
| 9. Iva annua | T | | FAC |
| 10. | | | |
| | 77 = Total Cover | | |

| Woody Vine Stratum (Plot size: _____) | Absolute % Cover | Dominant Species? | Indicator Status |
|---|---|---|---|
| 1. | | | |
| 2. | | | |
| | _____ = Total Cover | | |

**Dominance Test worksheet:**

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 1 (A/B)

**Prevalence Index worksheet:**

| Total % Cover of: | Multiply by: |
|---|---|
| OBL species _____ | x 1 = _____ |
| FACW species _____ | x 2 = _____ |
| FAC species _____ | x 3 = _____ |
| FACU species _____ | x 4 = _____ |
| UPL species _____ | x 5 = _____ |
| Column Totals: _____ (A) | _____ (B) |

Prevalence Index = B/A = _____

**Hydrophytic Vegetation Indicators:**

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- X 2 - Dominance Test is >50%
- ___ 3 - Prevalence Index is ≤3.0[1]
- ___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

**Hydrophytic Vegetation Present?** Yes X No _____

Remarks: (Include photo numbers here or on a separate sheet.)

Community mixed w/ fox sedge as dominant

Sampling Point: 11

## SOIL

**Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)**

| Depth (inches) | Matrix Color (moist) | Matrix % | Redox Features Color (moist) | Redox % | Type[1] | Loc[2] | Texture | Remarks |
|---|---|---|---|---|---|---|---|---|
| 0-2 | 10 YR 3/1 | | | | | | Silt Clay Loam | |
| 2-20 | 10 YR 4/2 | | 10 YR 5/6 | 20 | C | M | ↓ | |

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

**Hydric Soil Indicators:**

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- X Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

**Indicators for Problematic Hydric Soils[3]:**

- ___ Coast Prairie Redox (A16)
- ___ Dark Surface (S7)
- ___ Iron-Manganese Masses (F12)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

**Restrictive Layer (if observed):**

Type: ___

Depth (inches): ___

**Hydric Soil Present?** Yes X No ___

Remarks:

Depleted soils from 2-20" with redox concentrations throughout the matrix

## HYDROLOGY

**Wetland Hydrology Indicators:**

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- X Geomorphic Position (D2)
- ___ FAC-Neutral Test (D5)

**Field Observations:**

Surface Water Present? Yes ___ No X Depth (inches): ___

Water Table Present? Yes ___ No X Depth (inches): ___

Saturation Present? (includes capillary fringe) Yes X No ___ Depth (inches): 0-5

**Wetland Hydrology Present?** Yes ___ No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

## WETLAND DETERMINATION DATA FORM – Midwest Region

Project/Site: Mission Creek - ILF City/County: Brown Sampling Date: 9-18-14

Applicant/Owner: TWI State: KS Sampling Point: 12

Investigator(s): Mammoliti, Roth Section, Township, Range: S16 T4S, R17E

Landform (hillslope, terrace, etc.): _____ Local relief (concave, convex, none): _____

Slope (%): _____ Lat: 39.7101603 Long: -95.520029 Datum: WGS 1984

Soil Map Unit Name: _____ NWI classification: _____

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? No Are "Normal Circumstances" present? Yes X No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? No (If needed, explain any answers in Remarks.)

### SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

| | | |
|---|---|---|
| Hydrophytic Vegetation Present? | Yes X No _____ | Is the Sampled Area within a Wetland? Yes X No _____ |
| Hydric Soil Present? | Yes X No _____ | |
| Wetland Hydrology Present? | Yes X No _____ | |

Remarks: PEM wetland that is a groundwater seep between Mission Creek + unnamed trib

### VEGETATION – Use scientific names of plants.

| Tree Stratum (Plot size: N/A) | Absolute % Cover | Dominant Species? | Indicator Status |
|---|---|---|---|
| 1. | | | |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| 5. | | | |
| | _____ = Total Cover | | |
| **Sapling/Shrub Stratum (Plot size: 15' rad)** | | | |
| 1. Ulmus pumila | T | | UPL |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| 5. | | | |
| | 0.5 = Total Cover | | |
| **Herb Stratum (Plot size: 6' rad)** | | | |
| 1. Leersia oryzoides | 92.5 | X | OBL |
| 2. Scirpus atrovirens | 2.5 | | OBL |
| 3. Persicaria punctata | T | | OBL |
| 4. Asclepias incarnata | T | | OBL |
| 5. Conium maculatum | T | | FACU |
| 6. | | | |
| 7. | | | |
| 8. | | | |
| 9. | | | |
| 10. | | | |
| | 96.5 = Total Cover | | |
| **Woody Vine Stratum (Plot size: N/A)** | | | |
| 1. | | | |
| 2. | | | |
| | _____ = Total Cover | | |

**Dominance Test worksheet:**

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 1.00 (A/B)

**Prevalence Index worksheet:**

| Total % Cover of: | | Multiply by: |
|---|---|---|
| OBL species | _____ | x 1 = _____ |
| FACW species | _____ | x 2 = _____ |
| FAC species | _____ | x 3 = _____ |
| FACU species | _____ | x 4 = _____ |
| UPL species | _____ | x 5 = _____ |
| Column Totals: | _____ (A) | _____ (B) |

Prevalence Index = B/A = _____

**Hydrophytic Vegetation Indicators:**

X 1 - Rapid Test for Hydrophytic Vegetation

X 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

**Hydrophytic Vegetation Present?** Yes X No _____

Remarks: (Include photo numbers here or on a separate sheet.)

Rice cutgrass dominated community; Remnants of typha visible; Encroaching elms are sickly

## SOIL

Sampling Point: 12

**Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)**

| Depth (inches) | Matrix Color (moist) | Matrix % | Redox Features Color (moist) | Redox % | Type[1] | Loc[2] | Texture | Remarks |
|---|---|---|---|---|---|---|---|---|
| 0-10 | 10 YR 2/1 | | | | | | CL | Rooted + organic; wet |
| 12-24 | 10 YR 2/1 | | | | | | CL | No roots; wet |

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

**Hydric Soil Indicators:**

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- X Black Histic (A3)
- X Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

**Indicators for Problematic Hydric Soils[3]:**

- ___ Coast Prairie Redox (A16)
- ___ Dark Surface (S7)
- ___ Iron-Manganese Masses (F12)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

**Restrictive Layer (if observed):**

Type: ___

Depth (inches): ___

**Hydric Soil Present?** Yes X No ___

Remarks:

Soil is a saturated black clay that is rooted and contains ~30% organic material in the upper 10-12". Below 12" soil is a black, saturated clay. Sulfur smell strong throughout soil horizon

## HYDROLOGY

**Wetland Hydrology Indicators:**

Primary Indicators (minimum of one is required; check all that apply)

- X Surface Water (A1)
- ___ High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- X Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- X FAC-Neutral Test (D5)

**Field Observations:**

Surface Water Present? Yes X No ___ Depth (inches): 2-3

Water Table Present? Yes ___ No ___ Depth (inches): ___

Saturation Present? (includes capillary fringe) Yes ___ No ___ Depth (inches): ___

**Wetland Hydrology Present?** Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Surface water present beneath dense vegetation mat (rice cut). Hydrolody appears to be the result of a groundwater seep.

***APPENDIX G***

# ***OHIO RAPID ASSESSMENT METHOD FOR WETLANDS SCORING WORKSHEET***

| Site: Wetland 04 | Rater(s): Kirk Mammolitti | Date: 6-3-14 |
|---|---|---|

## Metric 1. Wetland Area (size).

| 1 | 1 |
|---|---|
| max 6 pts. | subtotal |

Select one size class and assign score.

- [ ] >50 acres (>20.2ha) (6 pts)
- [ ] 25 to <50 acres (10.1 to <20.2ha) (5 pts)
- [ ] 10 to <25 acres (4 to <10.1ha) (4 pts)
- [ ] 3 to <10 acres (1.2 to <4ha) (3 pts)
- [ ] 0.3 to <3 acres (0.12 to <1.2ha) (2pts)
- [x] 0.1 to <0.3 acres (0.04 to <0.12ha) (1 pt)
- [ ] <0.1 acres (0.04ha) (0 pts)

## Metric 2. Upland buffers and surrounding land use.

| 12 | 13 |
|---|---|
| max 14 pts. | subtotal |

2a. Calculate average buffer width. Select only one and assign score. Do not double check.

- [x] WIDE. Buffers average 50m (164ft) or more around wetland perimeter (7)
- [ ] MEDIUM. Buffers average 25m to <50m (82 to <164ft) around wetland perimeter (4)
- [ ] NARROW. Buffers average 10m to <25m (32ft to <82ft) around wetland perimeter (1)
- [ ] VERY NARROW. Buffers average <10m (<32ft) around wetland perimeter (0)

2b. Intensity of surrounding land use. Select one or double check and average.

- [ ] VERY LOW. 2nd growth or older forest, prairie, savannah, wildlife area, etc. (7)
- [x] LOW. Old field (>10 years), shrub land, young second growth forest. (5)
- [ ] MODERATELY HIGH. Residential, fenced pasture, park, conservation tillage, new fallow field. (3)
- [ ] HIGH. Urban, industrial, open pasture, row cropping, mining, construction. (1)

## Metric 3. Hydrology.

| 23 | 36 |
|---|---|
| max 30 pts. | subtotal |

3a. Sources of Water. Score all that apply.

- [ ] High pH groundwater (5)
- [x] Other groundwater (3)
- [x] Precipitation (1)
- [ ] Seasonal/Intermittent surface water (3)
- [ ] Perennial surface water (lake or stream) (5)

3b. Connectivity. Score all that apply.

- [ ] 100 year floodplain (1)
- [x] Between stream/lake and other human use (1)
- [x] Part of wetland/upland (e.g. forest), complex (1)
- [x] Part of riparian or upland corridor (1)

3c. Maximum water depth. Select only one and assign score.

- [ ] >0.7 (27.6in) (3)
- [ ] 0.4 to 0.7m (15.7 to 27.6in) (2)
- [x] <0.4m (<15.7in) (1)

3d. Duration inundation/saturation. Score one or dbl check.

- [ ] Semi- to permanently inundated/saturated (4)
- [x] Regularly inundated/saturated (3)
- [ ] Seasonally inundated (2)
- [ ] Seasonally saturated in upper 30cm (12in) (1)

3e. Modifications to natural hydrologic regime. Score one or double check and average.

- [x] None or none apparent (12)
- [ ] Recovered (7)
- [ ] Recovering (3)
- [ ] Recent or no recovery (1)

Check all disturbances observed

- [ ] ditch
- [ ] tile
- [ ] dike
- [ ] weir
- [ ] stormwater input
- [ ] point source (nonstormwater)
- [ ] filling/grading
- [ ] road bed/RR track
- [ ] dredging
- [ ] other_____

## Metric 4. Habitat Alteration and Development.

| 14 | 50 |
|---|---|
| max 20 pts. | subtotal |

4a. Substrate disturbance. Score one or double check and average.

- [ ] None or none apparent (4)
- [x] Recovered (3)
- [ ] Recovering (2)
- [ ] Recent or no recovery (1)

4b. Habitat development. Select only one and assign score.

- [ ] Excellent (7)
- [ ] Very good (6)
- [x] Good (5)
- [ ] Moderately good (4)
- [ ] Fair (3)
- [ ] Poor to fair (2)
- [ ] Poor (1)

4c. Habitat alteration. Score one or double check and average.

- [ ] None or none apparent (9)
- [x] Recovered (6)
- [ ] Recovering (3)
- [ ] Recent or no recovery (1)

Check all disturbances observed

- [ ] mowing
- [ ] grazing
- [ ] clearcutting
- [ ] selective cutting
- [x] woody debris removal
- [ ] toxic pollutants
- [x] shrub/sapling removal
- [ ] herbaceous/aquatic bed removal
- [ ] sedimentation
- [ ] dredging
- [ ] farming
- [ ] nutrient enrichment

| 50 |
|---|
| subtotal this page |

last revised 1 February 2001 jjm

| Site: Wetland 04 | Rater(s): KM | Date: 6-3-14 |
|---|---|---|

50
subtotal first page

## Metric 5. Special Wetlands.

| 0 | 50 |
|---|---|
| max 10 pts. | subtotal |

Check all that apply and score as indicated.

- [ ] Bog (10)
- [ ] Fen (10)
- [ ] Old growth forest (10)
- [ ] Mature forested wetland (5)
- [ ] Lake Erie coastal/tributary wetland-unrestricted hydrology (10)
- [ ] Lake Erie coastal/tributary wetland-restricted hydrology (5)
- [ ] Lake Plain Sand Prairies (Oak Openings) (10)
- [ ] Relict Wet Prairies (10)
- [ ] Known occurrence state/federal threatened or endangered species (10)
- [ ] Significant migratory songbird/water fowl habitat or usage (10)
- [ ] Category 1 Wetland. See Question 1 Qualitative Rating (-10)

[x] N/A

## Metric 6. Plant communities, interspersion, microtopography.

| 4 | 54 |
|---|---|
| max 20 pts. | subtotal |

6a. Wetland Vegetation Communities. Score all present using 0 to 3 scale.

- [ ] Aquatic bed
- [x] Emergent
- [ ] Shrub
- [ ] Forest
- [ ] Mudflats
- [ ] Open water
- [ ] Other_____

6b. horizontal (plan view) Interspersion. Select only one.

- [ ] High (5)
- [ ] Moderately high(4)
- [x] Moderate (3)
- [ ] Moderately low (2)
- [ ] Low (1)
- [ ] None (0)

6c. Coverage of invasive plants. Refer to Table 1 ORAM long form for list. Add or deduct points for coverage

- [ ] Extensive >75% cover (-5)
- [x] Moderate 25-75% cover (-3)
- [ ] Sparse 5-25% cover (-1)
- [ ] Nearly absent <5% cover (0)
- [ ] Absent (1)

6d. Microtopography. Score all present using 0 to 3 scale.

- [1] Vegetated hummucks/tussucks
- [0] Coarse woody debris >15cm (6in)
- [0] Standing dead >25cm (10in) dbh
- [2] Amphibian breeding pools

**Vegetation Community Cover Scale**

| | |
|---|---|
| 0 | Absent or comprises <0.1ha (0.2471 acres) contiguous area |
| 1 | Present and either comprises small part of wetland's vegetation and is of moderate quality, or comprises a significant part but is of low quality |
| 2 | Present and either comprises significant part of wetland's vegetation and is of moderate quality or comprises a small part and is of high quality |
| 3 | Present and comprises significant part, or more, of wetland's vegetation and is of high quality |

**Narrative Description of Vegetation Quality**

| | |
|---|---|
| low | Low spp diversity and/or predominance of nonnative or disturbance tolerant native species |
| mod | Native spp are dominant component of the vegetation, although nonnative and/or disturbance tolerant native spp can also be present, and species diversity moderate to moderately high, but generally w/o presence of rare threatened or endangered spp |
| high | A predominance of native species, with nonnative spp and/or disturbance tolerant native spp absent or virtually absent, and high spp diversity and often, but not always, the presence of rare, threatened, or endangered spp |

**Mudflat and Open Water Class Quality**

| | |
|---|---|
| 0 | Absent <0.1ha (0.247 acres) |
| 1 | Low 0.1 to <1ha (0.247 to 2.47 acres) |
| 2 | Moderate 1 to <4ha (2.47 to 9.88 acres) |
| 3 | High 4ha (9.88 acres) or more |

**Microtopography Cover Scale**

| | |
|---|---|
| 0 | Absent |
| 1 | Present very small amounts or if more common of marginal quality |
| 2 | Present in moderate amounts, but not of highest quality or in small amounts of highest quality |
| 3 | Present in moderate or greater amounts and of highest quality |

54

**End of Quantitative Rating. Complete Categorization Worksheets.**

| Site: Wetland 05 | Rater(s): K. Mammoliti | Date: 6-3-14 |
|---|---|---|

## Metric 1. Wetland Area (size). 0.038 acres

| 0 | 0 |
|---|---|
| max 6 pts. | subtotal |

Select one size class and assign score.

- [ ] >50 acres (>20.2ha) (6 pts)
- [ ] 25 to <50 acres (10.1 to <20.2ha) (5 pts)
- [ ] 10 to <25 acres (4 to <10.1ha) (4 pts)
- [ ] 3 to <10 acres (1.2 to <4ha) (3 pts)
- [ ] 0.3 to <3 acres (0.12 to <1.2ha) (2pts)
- [ ] 0.1 to <0.3 acres (0.04 to <0.12ha) (1 pt)
- [✓] <0.1 acres (0.04ha) (0 pts)

## Metric 2. Upland buffers and surrounding land use.

| 12 | 0 |
|---|---|
| max 14 pts. | subtotal |

2a. Calculate average buffer width. Select only one and assign score. Do not double check.

- [X] WIDE. Buffers average 50m (164ft) or more around wetland perimeter (7)
- [ ] MEDIUM. Buffers average 25m to <50m (82 to <164ft) around wetland perimeter (4)
- [ ] NARROW. Buffers average 10m to <25m (32ft to <82ft) around wetland perimeter (1)
- [ ] VERY NARROW. Buffers average <10m (<32ft) around wetland perimeter (0)

2b. Intensity of surrounding land use. Select one or double check and average.

- [ ] VERY LOW. 2nd growth or older forest, prairie, savannah, wildlife area, etc. (7)
- [X] LOW. Old field (>10 years), shrub land, young second growth forest. (5)
- [ ] MODERATELY HIGH. Residential, fenced pasture, park, conservation tillage, new fallow field. (3)
- [ ] HIGH. Urban, industrial, open pasture, row cropping, mining, construction. (1)

## Metric 3. Hydrology.

| 16 | 28 |
|---|---|
| max 30 pts. | subtotal |

3a. Sources of Water. Score all that apply.

- [ ] High pH groundwater (5)
- [X] Other groundwater (3)
- [X] Precipitation (1)
- [ ] Seasonal/Intermittent surface water (3)
- [ ] Perennial surface water (lake or stream) (5)

3b. Connectivity. Score all that apply.

- [ ] 100 year floodplain (1)
- [X] Between stream/lake and other human use (1)
- [ ] Part of wetland/upland (e.g. forest), complex (1)
- [X] Part of riparian or upland corridor (1)

3c. Maximum water depth. Select only one and assign score.

- [ ] >0.7 (27.6in) (3)
- [ ] 0.4 to 0.7m (15.7 to 27.6in) (2)
- [X] <0.4m (<15.7in) (1)

3d. Duration inundation/saturation. Score one or dbl check.

- [ ] Semi- to permanently inundated/saturated (4)
- [ ] Regularly inundated/saturated (3)
- [X] Seasonally inundated (2)
- [ ] Seasonally saturated in upper 30cm (12in) (1)

3e. Modifications to natural hydrologic regime. Score one or double check and average.

- [ ] None or none apparent (12)
- [X] Recovered (7)
- [ ] Recovering (3)
- [ ] Recent or no recovery (1)

Check all disturbances observed

- [X] ditch
- [ ] tile
- [ ] dike
- [ ] weir
- [ ] stormwater input
- [ ] point source (nonstormwater)
- [ ] filling/grading
- [ ] road bed/RR track
- [ ] dredging
- [ ] other_____

## Metric 4. Habitat Alteration and Development.

| 14 | 42 |
|---|---|
| max 20 pts. | subtotal |

4a. Substrate disturbance. Score one or double check and average.

- [ ] None or none apparent (4)
- [X] Recovered (3)
- [ ] Recovering (2)
- [ ] Recent or no recovery (1)

4b. Habitat development. Select only one and assign score.

- [ ] Excellent (7)
- [ ] Very good (6)
- [X] Good (5)
- [ ] Moderately good (4)
- [ ] Fair (3)
- [ ] Poor to fair (2)
- [ ] Poor (1)

4c. Habitat alteration. Score one or double check and average.

- [ ] None or none apparent (9)
- [X] Recovered (6)
- [ ] Recovering (3)
- [ ] Recent or no recovery (1)

Check all disturbances observed

- [ ] mowing
- [X] grazing
- [ ] clearcutting
- [ ] selective cutting
- [ ] woody debris removal
- [ ] toxic pollutants
- [ ] shrub/sapling removal
- [ ] herbaceous/aquatic bed removal
- [ ] sedimentation
- [ ] dredging
- [ ] farming
- [ ] nutrient enrichment

| 42 |
|---|
| subtotal this page |

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| Site: Wetland 05 | Rater(s): K. Mammoliti | Date: 6-3-14 |
|---|---|---|

42
subtotal first page

## Metric 5. Special Wetlands.

0 (max 10 pts.) | 42 (subtotal)

Check all that apply and score as indicated.

☒ N/A

- [ ] Bog (10)
- [ ] Fen (10)
- [ ] Old growth forest (10)
- [ ] Mature forested wetland (5)
- [ ] Lake Erie coastal/tributary wetland-unrestricted hydrology (10)
- [ ] Lake Erie coastal/tributary wetland-restricted hydrology (5)
- [ ] Lake Plain Sand Prairies (Oak Openings) (10)
- [ ] Relict Wet Prairies (10)
- [ ] Known occurrence state/federal threatened or endangered species (10)
- [ ] Significant migratory songbird/water fowl habitat or usage (10)
- [ ] Category 1 Wetland. See Question 1 Qualitative Rating (-10)

## Metric 6. Plant communities, interspersion, microtopography.

13 (max 20 pts.) | 55 (subtotal)

6a. Wetland Vegetation Communities. Score all present using 0 to 3 scale.

- [ ] Aquatic bed
- [x] Emergent
- [ ] Shrub
- [ ] Forest
- [ ] Mudflats
- [ ] Open water
- [ ] Other_____

6b. horizontal (plan view) Interspersion. Select only one.

- [x] High (5)
- [ ] Moderately high(4)
- [ ] Moderate (3)
- [ ] Moderately low (2)
- [ ] Low (1)
- [ ] None (0)

6c. Coverage of invasive plants. Refer to Table 1 ORAM long form for list. Add or deduct points for coverage

- [ ] Extensive >75% cover (-5)
- [ ] Moderate 25-75% cover (-3)
- [ ] Sparse 5-25% cover (-1)
- [ ] Nearly absent <5% cover (0)
- [x] Absent (1)

6d. Microtopography. Score all present using 0 to 3 scale.

- [1] Vegetated hummucks/tussucks
- [0] Coarse woody debris >15cm (6in)
- [2] Standing dead >25cm (10in) dbh
- [3] Amphibian breeding pools

**Vegetation Community Cover Scale**

| | |
|---|---|
| 0 | Absent or comprises <0.1ha (0.2471 acres) contiguous area |
| 1 | Present and either comprises small part of wetland's vegetation and is of moderate quality, or comprises a significant part but is of low quality |
| 2 | Present and either comprises significant part of wetland's vegetation and is of moderate quality or comprises a small part and is of high quality |
| (3) | Present and comprises significant part, or more, of wetland's vegetation and is of high quality |

**Narrative Description of Vegetation Quality**

| | |
|---|---|
| low | Low spp diversity and/or predominance of nonnative or disturbance tolerant native species |
| mod | Native spp are dominant component of the vegetation, although nonnative and/or disturbance tolerant native spp can also be present, and species diversity moderate to moderately high, but generally w/o presence of rare threatened or endangered spp |
| high | A predominance of native species, with nonnative spp and/or disturbance tolerant native spp absent or virtually absent, and high spp diversity and often, but not always, the presence of rare, threatened, or endangered spp |

**Mudflat and Open Water Class Quality**

| | |
|---|---|
| 0 | Absent <0.1ha (0.247 acres) |
| 1 | Low 0.1 to <1ha (0.247 to 2.47 acres) |
| 2 | Moderate 1 to <4ha (2.47 to 9.88 acres) |
| 3 | High 4ha (9.88 acres) or more |

**Microtopography Cover Scale**

| | |
|---|---|
| 0 | Absent |
| 1 | Present very small amounts or if more common of marginal quality |
| 2 | Present in moderate amounts, but not of highest quality or in small amounts of highest quality |
| 3 | Present in moderate or greater amounts and of highest quality |

55

**End of Quantitative Rating. Complete Categorization Worksheets.**

| Site: Wetland 08 | Rater(s): K. Mammoliti | Date: 6-3-14 |
|---|---|---|

| 1 | 1 |
|---|---|
| max 6 pts. | subtotal |

## Metric 1. Wetland Area (size).

Select one size class and assign score.

- [ ] >50 acres (>20.2ha) (6 pts)
- [ ] 25 to <50 acres (10.1 to <20.2ha) (5 pts)
- [ ] 10 to <25 acres (4 to <10.1ha) (4 pts)
- [ ] 3 to <10 acres (1.2 to <4ha) (3 pts)
- [ ] 0.3 to <3 acres (0.12 to <1.2ha) (2pts)
- [x] 0.1 to <0.3 acres (0.04 to <0.12ha) (1 pt)
- [ ] <0.1 acres (0.04ha) (0 pts)

| 10 | 11 |
|---|---|
| max 14 pts. | subtotal |

## Metric 2. Upland buffers and surrounding land use.

2a. Calculate average buffer width. Select only one and assign score. Do not double check.

- [x] WIDE. Buffers average 50m (164ft) or more around wetland perimeter (7)
- [ ] MEDIUM. Buffers average 25m to <50m (82 to <164ft) around wetland perimeter (4)
- [ ] NARROW. Buffers average 10m to <25m (32ft to <82ft) around wetland perimeter (1)
- [ ] VERY NARROW. Buffers average <10m (<32ft) around wetland perimeter (0)

2b. Intensity of surrounding land use. Select one or double check and average.

- [ ] VERY LOW. 2nd growth or older forest, prairie, savannah, wildlife area, etc. (7)
- [ ] LOW. Old field (>10 years), shrub land, young second growth forest. (5)
- [x] MODERATELY HIGH. Residential, fenced pasture, park, conservation tillage, new fallow field. (3)
- [ ] HIGH. Urban, industrial, open pasture, row cropping, mining, construction. (1)

| 17 | 28 |
|---|---|
| max 30 pts. | subtotal |

## Metric 3. Hydrology.

3a. Sources of Water. Score all that apply.

- [ ] High pH groundwater (5)
- [x] Other groundwater (3)
- [x] Precipitation (1)
- [ ] Seasonal/Intermittent surface water (3)
- [ ] Perennial surface water (lake or stream) (5)

3b. Connectivity. Score all that apply.

- [ ] 100 year floodplain (1)
- [x] Between stream/lake and other human use (1)
- [ ] Part of wetland/upland (e.g. forest), complex (1)
- [x] Part of riparian or upland corridor (1)

3c. Maximum water depth. Select only one and assign score.

- [ ] >0.7 (27.6in) (3)
- [ ] 0.4 to 0.7m (15.7 to 27.6in) (2)
- [x] <0.4m (<15.7in) (1)

3d. Duration inundation/saturation. Score one or dbl check.

- [ ] Semi- to permanently inundated/saturated (4)
- [x] Regularly inundated/saturated (3)
- [ ] Seasonally inundated (2)
- [ ] Seasonally saturated in upper 30cm (12in) (1)

3e. Modifications to natural hydrologic regime. Score one or double check and average.

- [ ] None or none apparent (12)
- [x] Recovered (7)
- [ ] Recovering (3)
- [ ] Recent or no recovery (1)

Check all disturbances observed

- [x] ditch
- [x] tile
- [ ] dike
- [ ] weir
- [ ] stormwater input
- [ ] point source (nonstormwater)
- [ ] filling/grading
- [ ] road bed/RR track
- [ ] dredging
- [ ] other_____

| 14 | 42 |
|---|---|
| max 20 pts. | subtotal |

## Metric 4. Habitat Alteration and Development.

4a. Substrate disturbance. Score one or double check and average.

- [ ] None or none apparent (4)
- [x] Recovered (3)
- [ ] Recovering (2)
- [ ] Recent or no recovery (1)

4b. Habitat development. Select only one and assign score.

- [ ] Excellent (7)
- [ ] Very good (6)
- [x] Good (5)
- [ ] Moderately good (4)
- [ ] Fair (3)
- [ ] Poor to fair (2)
- [ ] Poor (1)

4c. Habitat alteration. Score one or double check and average.

- [ ] None or none apparent (9)
- [x] Recovered (6)
- [ ] Recovering (3)
- [ ] Recent or no recovery (1)

Check all disturbances observed

- [ ] mowing
- [ ] grazing
- [ ] clearcutting
- [ ] selective cutting
- [ ] woody debris removal
- [ ] toxic pollutants
- [ ] shrub/sapling removal
- [ ] herbaceous/aquatic bed removal
- [ ] sedimentation
- [ ] dredging
- [x] farming
- [ ] nutrient enrichment

| 42 |
|---|
| subtotal this page |

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|---|---|---|

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subtotal first page

## Metric 5. Special Wetlands.

| 0 | 42 |
|---|---|
| max 10 pts. | subtotal |

Check all that apply and score as indicated.

- [ ] Bog (10)
- [ ] Fen (10)
- [ ] Old growth forest (10)
- [ ] Mature forested wetland (5)
- [ ] Lake Erie coastal/tributary wetland-unrestricted hydrology (10)
- [ ] Lake Erie coastal/tributary wetland-restricted hydrology (5)
- [ ] Lake Plain Sand Prairies (Oak Openings) (10)
- [ ] Relict Wet Prairies (10)
- [ ] Known occurrence state/federal threatened or endangered species (10)
- [ ] Significant migratory songbird/water fowl habitat or usage (10)
- [ ] Category 1 Wetland. See Question 1 Qualitative Rating (-10)

☒ N/A

## Metric 6. Plant communities, interspersion, microtopography.

| 12 | 54 |
|---|---|
| max 20 pts. | subtotal |

6a. Wetland Vegetation Communities.
Score all present using 0 to 3 scale.

- [0] Aquatic bed
- [2] Emergent
- [0] Shrub
- [0] Forest
- [0] Mudflats
- [0] Open water
- [ ] Other_____

6b. horizontal (plan view) Interspersion.
Select only one.

- [X] High (5)
- [ ] Moderately high(4)
- [ ] Moderate (3)
- [ ] Moderately low (2)
- [ ] Low (1)
- [ ] None (0)

6c. Coverage of invasive plants. Refer to Table 1 ORAM long form for list. Add or deduct points for coverage

- [ ] Extensive >75% cover (-5)
- [ ] Moderate 25-75% cover (-3)
- [ ] Sparse 5-25% cover (-1)
- [ ] Nearly absent <5% cover (0)
- [X] Absent (1)

6d. Microtopography.
Score all present using 0 to 3 scale.

- [2] Vegetated hummucks/tussucks
- [0] Coarse woody debris >15cm (6in)
- [0] Standing dead >25cm (10in) dbh
- [2] Amphibian breeding pools

**Vegetation Community Cover Scale**

| | |
|---|---|
| 0 | Absent or comprises <0.1ha (0.2471 acres) contiguous area |
| 1 | Present and either comprises small part of wetland's vegetation and is of moderate quality, or comprises a significant part but is of low quality |
| (2) | Present and either comprises significant part of wetland's vegetation and is of moderate quality or comprises a small part and is of high quality |
| 3 | Present and comprises significant part, or more, of wetland's vegetation and is of high quality |

**Narrative Description of Vegetation Quality**

| | |
|---|---|
| low | Low spp diversity and/or predominance of nonnative or disturbance tolerant native species |
| mod | Native spp are dominant component of the vegetation, although nonnative and/or disturbance tolerant native spp can also be present, and species diversity moderate to moderately high, but generally w/o presence of rare threatened or endangered spp |
| high | A predominance of native species, with nonnative spp and/or disturbance tolerant native spp absent or virtually absent, and high spp diversity and often, but not always, the presence of rare, threatened, or endangered spp |

**Mudflat and Open Water Class Quality**

| | |
|---|---|
| 0 | Absent <0.1ha (0.247 acres) |
| 1 | Low 0.1 to <1ha (0.247 to 2.47 acres) |
| 2 | Moderate 1 to <4ha (2.47 to 9.88 acres) |
| 3 | High 4ha (9.88 acres) or more |

**Microtopography Cover Scale**

| | |
|---|---|
| 0 | Absent |
| 1 | Present very small amounts or if more common of marginal quality |
| 2 | Present in moderate amounts, but not of highest quality or in small amounts of highest quality |
| 3 | Present in moderate or greater amounts and of highest quality |

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**End of Quantitative Rating. Complete Categorization Worksheets.**

| Site: Wetland 09 | Rater(s): K. Mammoliti | Date: 8-25-14 |
|---|---|---|

| 2 | 2 |
|---|---|
| max 6 pts. | subtotal |

## Metric 1. Wetland Area (size).

Select one size class and assign score.

- [ ] >50 acres (>20.2ha) (6 pts)
- [ ] 25 to <50 acres (10.1 to <20.2ha) (5 pts)
- [ ] 10 to <25 acres (4 to <10.1ha) (4 pts)
- [ ] 3 to <10 acres (1.2 to <4ha) (3 pts)
- [x] 0.3 to <3 acres (0.12 to <1.2ha) (2pts)
- [ ] 0.1 to <0.3 acres (0.04 to <0.12ha) (1 pt)
- [ ] <0.1 acres (0.04ha) (0 pts)

| 12 | 24 |
|---|---|
| max 14 pts. | subtotal |

## Metric 2. Upland buffers and surrounding land use.

2a. Calculate average buffer width. Select only one and assign score. Do not double check.

- [x] WIDE. Buffers average 50m (164ft) or more around wetland perimeter (7)
- [ ] MEDIUM. Buffers average 25m to <50m (82 to <164ft) around wetland perimeter (4)
- [ ] NARROW. Buffers average 10m to <25m (32ft to <82ft) around wetland perimeter (1)
- [ ] VERY NARROW. Buffers average <10m (<32ft) around wetland perimeter (0)

2b. Intensity of surrounding land use. Select one or double check and average.

- [ ] VERY LOW. 2nd growth or older forest, prairie, savannah, wildlife area, etc. (7)
- [x] LOW. Old field (>10 years), shrub land, young second growth forest. (5)
- [ ] MODERATELY HIGH. Residential, fenced pasture, park, conservation tillage, new fallow field. (3)
- [ ] HIGH. Urban, industrial, open pasture, row cropping, mining, construction. (1)

| 23 | 47 |
|---|---|
| max 30 pts. | subtotal |

## Metric 3. Hydrology.

3a. Sources of Water. Score all that apply.

- [ ] High pH groundwater (5)
- [x] Other groundwater (3)
- [x] Precipitation (1)
- [ ] Seasonal/Intermittent surface water (3)
- [ ] Perennial surface water (lake or stream) (5)

3b. Connectivity. Score all that apply.

- [ ] 100 year floodplain (1)
- [x] Between stream/lake and other human use (1)
- [x] Part of wetland/upland (e.g. forest), complex (1)
- [x] Part of riparian or upland corridor (1)

3c. Maximum water depth. Select only one and assign score.

- [ ] >0.7 (27.6in) (3)
- [ ] 0.4 to 0.7m (15.7 to 27.6in) (2)
- [x] <0.4m (<15.7in) (1)

3d. Duration inundation/saturation. Score one or dbl check.

- [ ] Semi- to permanently inundated/saturated (4)
- [x] Regularly inundated/saturated (3)
- [ ] Seasonally inundated (2)
- [ ] Seasonally saturated in upper 30cm (12in) (1)

3e. Modifications to natural hydrologic regime. Score one or double check and average.

- [x] None or none apparent (12)
- [ ] Recovered (7)
- [ ] Recovering (3)
- [ ] Recent or no recovery (1)

Check all disturbances observed

- [ ] ditch
- [ ] tile
- [ ] dike
- [ ] weir
- [ ] stormwater input
- [ ] point source (nonstormwater)
- [ ] filling/grading
- [ ] road bed/RR track
- [ ] dredging
- [ ] other_____

| 18 | 65 |
|---|---|
| max 20 pts. | subtotal |

## Metric 4. Habitat Alteration and Development.

4a. Substrate disturbance. Score one or double check and average.

- [x] None or none apparent (4)
- [ ] Recovered (3)
- [ ] Recovering (2)
- [ ] Recent or no recovery (1)

4b. Habitat development. Select only one and assign score.

- [ ] Excellent (7)
- [ ] Very good (6)
- [x] Good (5)
- [ ] Moderately good (4)
- [ ] Fair (3)
- [ ] Poor to fair (2)
- [ ] Poor (1)

4c. Habitat alteration. Score one or double check and average.

- [x] None or none apparent (9)
- [ ] Recovered (6)
- [ ] Recovering (3)
- [ ] Recent or no recovery (1)

Check all disturbances observed

- [ ] mowing
- [ ] grazing
- [ ] clearcutting
- [ ] selective cutting
- [ ] woody debris removal
- [ ] toxic pollutants
- [ ] shrub/sapling removal
- [ ] herbaceous/aquatic bed removal
- [ ] sedimentation
- [ ] dredging
- [ ] farming
- [ ] nutrient enrichment

| 105 |
|---|
| subtotal this page |

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| Site: Wetland 09 | Rater(s): K. Mammoliti | Date: 8-25-14 |
|---|---|---|

65
subtotal first page

## Metric 5. Special Wetlands.

| 0 | 65 |
|---|---|
| max 10 pts. | subtotal |

Check all that apply and score as indicated.

☒ N/A

- [ ] Bog (10)
- [ ] Fen (10)
- [ ] Old growth forest (10)
- [ ] Mature forested wetland (5)
- [ ] Lake Erie coastal/tributary wetland-unrestricted hydrology (10)
- [ ] Lake Erie coastal/tributary wetland-restricted hydrology (5)
- [ ] Lake Plain Sand Prairies (Oak Openings) (10)
- [ ] Relict Wet Prairies (10)
- [ ] Known occurrence state/federal threatened or endangered species (10)
- [ ] Significant migratory songbird/water fowl habitat or usage (10)
- [ ] Category 1 Wetland. See Question 1 Qualitative Rating (-10)

## Metric 6. Plant communities, interspersion, microtopography.

| 13 | 78 |
|---|---|
| max 20 pts. | subtotal |

6a. Wetland Vegetation Communities.
Score all present using 0 to 3 scale.

- [0] Aquatic bed
- [3] Emergent
- [1] Shrub
- [0] Forest
- [0] Mudflats
- [0] Open water
- [0] Other_____

6b. horizontal (plan view) Interspersion.
Select only one.

- [X] High (5)
- [ ] Moderately high(4)
- [ ] Moderate (3)
- [ ] Moderately low (2)
- [ ] Low (1)
- [ ] None (0)

6c. Coverage of invasive plants. Refer to Table 1 ORAM long form for list. Add or deduct points for coverage

- [ ] Extensive >75% cover (-5)
- [ ] Moderate 25-75% cover (-3)
- [ ] Sparse 5-25% cover (-1)
- [X] Nearly absent <5% cover (0)
- [ ] Absent (1)

6d. Microtopography.
Score all present using 0 to 3 scale.

- [3] Vegetated hummucks/tussucks
- [0] Coarse woody debris >15cm (6in)
- [0] Standing dead >25cm (10in) dbh
- [1] Amphibian breeding pools

**Vegetation Community Cover Scale**

| | |
|---|---|
| 0 | Absent or comprises <0.1ha (0.2471 acres) contiguous area |
| 1 | Present and either comprises small part of wetland's vegetation and is of moderate quality, or comprises a significant part but is of low quality |
| 2 | Present and either comprises significant part of wetland's vegetation and is of moderate quality or comprises a small part and is of high quality |
| 3 | Present and comprises significant part, or more, of wetland's vegetation and is of high quality |

**Narrative Description of Vegetation Quality**

| | |
|---|---|
| low | Low spp diversity and/or predominance of nonnative or disturbance tolerant native species |
| mod | Native spp are dominant component of the vegetation, although nonnative and/or disturbance tolerant native spp can also be present, and species diversity moderate to moderately high, but generally w/o presence of rare threatened or endangered spp |
| high | A predominance of native species, with nonnative spp and/or disturbance tolerant native spp absent or virtually absent, and high spp diversity and often, but not always, the presence of rare, threatened, or endangered spp |

**Mudflat and Open Water Class Quality**

| | |
|---|---|
| 0 | Absent <0.1ha (0.247 acres) |
| 1 | Low 0.1 to <1ha (0.247 to 2.47 acres) |
| 2 | Moderate 1 to <4ha (2.47 to 9.88 acres) |
| 3 | High 4ha (9.88 acres) or more |

**Microtopography Cover Scale**

| | |
|---|---|
| 0 | Absent |
| 1 | Present very small amounts or if more common of marginal quality |
| 2 | Present in moderate amounts, but not of highest quality or in small amounts of highest quality |
| 3 | Present in moderate or greater amounts and of highest quality |

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**End of Quantitative Rating. Complete Categorization Worksheets.**

| Site: Wetland 10 | Rater(s): K. Mammoliti | Date: 8-25-14 |
|---|---|---|

| 1 | 1 |
|---|---|
| max 6 pts. | subtotal |

## Metric 1. Wetland Area (size).

Select one size class and assign score.

- [ ] >50 acres (>20.2ha) (6 pts)
- [ ] 25 to <50 acres (10.1 to <20.2ha) (5 pts)
- [ ] 10 to <25 acres (4 to <10.1ha) (4 pts)
- [ ] 3 to <10 acres (1.2 to <4ha) (3 pts)
- [ ] 0.3 to <3 acres (0.12 to <1.2ha) (2pts)
- [x] 0.1 to <0.3 acres (0.04 to <0.12ha) (1 pt)
- [ ] <0.1 acres (0.04ha) (0 pts)

| 12 | 13 |
|---|---|
| max 14 pts. | subtotal |

## Metric 2. Upland buffers and surrounding land use.

2a. Calculate average buffer width. Select only one and assign score. Do not double check.

- [x] WIDE. Buffers average 50m (164ft) or more around wetland perimeter (7)
- [ ] MEDIUM. Buffers average 25m to <50m (82 to <164ft) around wetland perimeter (4)
- [ ] NARROW. Buffers average 10m to <25m (32ft to <82ft) around wetland perimeter (1)
- [ ] VERY NARROW. Buffers average <10m (<32ft) around wetland perimeter (0)

2b. Intensity of surrounding land use. Select one or double check and average.

- [ ] VERY LOW. 2nd growth or older forest, prairie, savannah, wildlife area, etc. (7)
- [x] LOW. Old field (>10 years), shrub land, young second growth forest. (5)
- [ ] MODERATELY HIGH. Residential, fenced pasture, park, conservation tillage, new fallow field. (3)
- [ ] HIGH. Urban, industrial, open pasture, row cropping, mining, construction. (1)

| 22 | 35 |
|---|---|
| max 30 pts. | subtotal |

## Metric 3. Hydrology.

3a. Sources of Water. Score all that apply.

- [ ] High pH groundwater (5)
- [x] Other groundwater (3)
- [x] Precipitation (1)
- [ ] Seasonal/Intermittent surface water (3)
- [ ] Perennial surface water (lake or stream) (5)

3b. Connectivity. Score all that apply.

- [ ] 100 year floodplain (1)
- [x] Between stream/lake and other human use (1)
- [x] Part of wetland/upland (e.g. forest), complex (1)
- [x] Part of riparian or upland corridor (1)

3c. Maximum water depth. Select only one and assign score.

- [ ] >0.7 (27.6in) (3)
- [ ] 0.4 to 0.7m (15.7 to 27.6in) (2)
- [x] <0.4m (<15.7in) (1)

3d. Duration inundation/saturation. Score one or dbl check.

- [ ] Semi- to permanently inundated/saturated (4)
- [ ] Regularly inundated/saturated (3)
- [x] Seasonally inundated (2)
- [ ] Seasonally saturated in upper 30cm (12in) (1)

3e. Modifications to natural hydrologic regime. Score one or double check and average.

- [x] None or none apparent (12)
- [ ] Recovered (7)
- [ ] Recovering (3)
- [ ] Recent or no recovery (1)

Check all disturbances observed

- [ ] ditch
- [ ] tile
- [ ] dike
- [ ] weir
- [ ] stormwater input
- [ ] point source (nonstormwater)
- [ ] filling/grading
- [ ] road bed/RR track
- [ ] dredging
- [ ] other_____

| 17 | 52 |
|---|---|
| max 20 pts. | subtotal |

## Metric 4. Habitat Alteration and Development.

4a. Substrate disturbance. Score one or double check and average.

- [x] None or none apparent (4)
- [ ] Recovered (3)
- [ ] Recovering (2)
- [ ] Recent or no recovery (1)

4b. Habitat development. Select only one and assign score.

- [ ] Excellent (7)
- [ ] Very good (6)
- [x] Good (5)
- [ ] Moderately good (4)
- [ ] Fair (3)
- [ ] Poor to fair (2)
- [ ] Poor (1)

4c. Habitat alteration. Score one or double check and average.

- [x] None or none apparent (9)
- [ ] Recovered (6)
- [ ] Recovering (3)
- [ ] Recent or no recovery (1)

Check all disturbances observed

- [ ] mowing
- [ ] grazing
- [ ] clearcutting
- [ ] selective cutting
- [ ] woody debris removal
- [ ] toxic pollutants
- [ ] shrub/sapling removal
- [ ] herbaceous/aquatic bed removal
- [ ] sedimentation
- [ ] dredging
- [ ] farming
- [ ] nutrient enrichment

| 52 |
|---|
| subtotal this page |

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|---|---|---|

52
subtotal first page

## Metric 5. Special Wetlands.

| 0 | 52 |
|---|---|
| max 10 pts. | subtotal |

Check all that apply and score as indicated.

- [ ] Bog (10)
- [ ] Fen (10)
- [ ] Old growth forest (10)
- [ ] Mature forested wetland (5)
- [ ] Lake Erie coastal/tributary wetland-unrestricted hydrology (10)
- [ ] Lake Erie coastal/tributary wetland-restricted hydrology (5)
- [ ] Lake Plain Sand Prairies (Oak Openings) (10)
- [ ] Relict Wet Prairies (10)
- [ ] Known occurrence state/federal threatened or endangered species (10)
- [ ] Significant migratory songbird/water fowl habitat or usage (10)
- [ ] Category 1 Wetland. See Question 1 Qualitative Rating (-10)

[x] N/A

## Metric 6. Plant communities, interspersion, microtopography.

| 6 | 58 |
|---|---|
| max 20 pts. | subtotal |

6a. Wetland Vegetation Communities. Score all present using 0 to 3 scale.

- [3] Aquatic bed
- [3] Emergent
- [1] Shrub
- [0] Forest
- [0] Mudflats
- [0] Open water
- [0] Other_____

6b. horizontal (plan view) Interspersion. Select only one.

- [ ] High (5)
- [ ] Moderately high(4)
- [x] Moderate (3)
- [ ] Moderately low (2)
- [ ] Low (1)
- [ ] None (0)

6c. Coverage of invasive plants. Refer to Table 1 ORAM long form for list. Add or deduct points for coverage

- [ ] Extensive >75% cover (-5)
- [x] Moderate 25-75% cover (-3)
- [ ] Sparse 5-25% cover (-1)
- [ ] Nearly absent <5% cover (0)
- [ ] Absent (1)

6d. Microtopography. Score all present using 0 to 3 scale.

- [1] Vegetated hummucks/tussucks
- [0] Coarse woody debris >15cm (6in)
- [0] Standing dead >25cm (10in) dbh
- [1] Amphibian breeding pools

**Vegetation Community Cover Scale**

| | |
|---|---|
| 0 | Absent or comprises <0.1ha (0.2471 acres) contiguous area |
| 1 | Present and either comprises small part of wetland's vegetation and is of moderate quality, or comprises a significant part but is of low quality |
| 2 | Present and either comprises significant part of wetland's vegetation and is of moderate quality or comprises a small part and is of high quality |
| 3 | Present and comprises significant part, or more, of wetland's vegetation and is of high quality |

**Narrative Description of Vegetation Quality**

| | |
|---|---|
| low | Low spp diversity and/or predominance of nonnative or disturbance tolerant native species |
| mod | Native spp are dominant component of the vegetation, although nonnative and/or disturbance tolerant native spp can also be present, and species diversity moderate to moderately high, but generally w/o presence of rare threatened or endangered spp |
| high | A predominance of native species, with nonnative spp and/or disturbance tolerant native spp absent or virtually absent, and high spp diversity and often, but not always, the presence of rare, threatened, or endangered spp |

**Mudflat and Open Water Class Quality**

| | |
|---|---|
| 0 | Absent <0.1ha (0.247 acres) |
| 1 | Low 0.1 to <1ha (0.247 to 2.47 acres) |
| 2 | Moderate 1 to <4ha (2.47 to 9.88 acres) |
| 3 | High 4ha (9.88 acres) or more |

**Microtopography Cover Scale**

| | |
|---|---|
| 0 | Absent |
| 1 | Present very small amounts or if more common of marginal quality |
| 2 | Present in moderate amounts, but not of highest quality or in small amounts of highest quality |
| 3 | Present in moderate or greater amounts and of highest quality |

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**End of Quantitative Rating. Complete Categorization Worksheets.**

| Site: Wetland 11 | Rater(s): K. Mammoliti | Date: 8-25-14 |
|---|---|---|

## Metric 1. Wetland Area (size).

| 0 | 0 |
|---|---|
| max 6 pts. | subtotal |

Select one size class and assign score.

- [ ] >50 acres (>20.2ha) (6 pts)
- [ ] 25 to <50 acres (10.1 to <20.2ha) (5 pts)
- [ ] 10 to <25 acres (4 to <10.1ha) (4 pts)
- [ ] 3 to <10 acres (1.2 to <4ha) (3 pts)
- [ ] 0.3 to <3 acres (0.12 to <1.2ha) (2pts)
- [ ] 0.1 to <0.3 acres (0.04 to <0.12ha) (1 pt)
- [x] <0.1 acres (0.04ha) (0 pts)

## Metric 2. Upland buffers and surrounding land use.

| 7 | 7 |
|---|---|
| max 14 pts. | subtotal |

2a. Calculate average buffer width. Select only one and assign score. Do not double check.

- [ ] WIDE. Buffers average 50m (164ft) or more around wetland perimeter (7)
- [x] MEDIUM. Buffers average 25m to <50m (82 to <164ft) around wetland perimeter (4)
- [ ] NARROW. Buffers average 10m to <25m (32ft to <82ft) around wetland perimeter (1)
- [ ] VERY NARROW. Buffers average <10m (<32ft) around wetland perimeter (0)

2b. Intensity of surrounding land use. Select one or double check and average.

- [ ] VERY LOW. 2nd growth or older forest, prairie, savannah, wildlife area, etc. (7)
- [ ] LOW. Old field (>10 years), shrub land, young second growth forest. (5)
- [x] MODERATELY HIGH. Residential, fenced pasture, park, conservation tillage, new fallow field. (3)
- [ ] HIGH. Urban, industrial, open pasture, row cropping, mining, construction. (1)

## Metric 3. Hydrology.

| 17 | 24 |
|---|---|
| max 30 pts. | subtotal |

3a. Sources of Water. Score all that apply.

- [ ] High pH groundwater (5)
- [x] Other groundwater (3)
- [x] Precipitation (1)
- [ ] Seasonal/Intermittent surface water (3)
- [ ] Perennial surface water (lake or stream) (5)

3b. Connectivity. Score all that apply.

- [ ] 100 year floodplain (1)
- [x] Between stream/lake and other human use (1)
- [x] Part of wetland/upland (e.g. forest), complex (1)
- [x] Part of riparian or upland corridor (1)

3c. Maximum water depth. Select only one and assign score.

- [ ] >0.7 (27.6in) (3)
- [ ] 0.4 to 0.7m (15.7 to 27.6in) (2)
- [x] <0.4m (<15.7in) (1)

3d. Duration inundation/saturation. Score one or dbl check.

- [ ] Semi- to permanently inundated/saturated (4)
- [ ] Regularly inundated/saturated (3)
- [x] Seasonally inundated (2)
- [ ] Seasonally saturated in upper 30cm (12in) (1)

3e. Modifications to natural hydrologic regime. Score one or double check and average.

- [ ] None or none apparent (12)
- [x] Recovered (7)
- [ ] Recovering (3)
- [ ] Recent or no recovery (1)

Check all disturbances observed

- [x] ditch
- [x] tile
- [ ] dike
- [ ] weir
- [ ] stormwater input
- [ ] point source (nonstormwater)
- [ ] filling/grading
- [ ] road bed/RR track
- [ ] dredging
- [ ] other_____

## Metric 4. Habitat Alteration and Development.

| 14 | 38 |
|---|---|
| max 20 pts. | subtotal |

4a. Substrate disturbance. Score one or double check and average.

- [ ] None or none apparent (4)
- [x] Recovered (3)
- [ ] Recovering (2)
- [ ] Recent or no recovery (1)

4b. Habitat development. Select only one and assign score.

- [ ] Excellent (7)
- [ ] Very good (6)
- [x] Good (5)
- [ ] Moderately good (4)
- [ ] Fair (3)
- [ ] Poor to fair (2)
- [ ] Poor (1)

4c. Habitat alteration. Score one or double check and average.

- [ ] None or none apparent (9)
- [x] Recovered (6)
- [ ] Recovering (3)
- [ ] Recent or no recovery (1)

Check all disturbances observed

- [ ] mowing
- [ ] grazing
- [ ] clearcutting
- [ ] selective cutting
- [ ] woody debris removal
- [ ] toxic pollutants
- [ ] shrub/sapling removal
- [ ] herbaceous/aquatic bed removal
- [ ] sedimentation
- [ ] dredging
- [ ] farming
- [ ] nutrient enrichment

| 48 |
|---|
| subtotal this page |

last revised 1 February 2001 jjm

| Site: Wetland 11 | Rater(s): K. Mammoliti | Date: 8-25-14 |
|---|---|---|

38
subtotal first page

## Metric 5. Special Wetlands.

0 (max 10 pts.) | 38 (subtotal)

Check all that apply and score as indicated.

- [ ] Bog (10)
- [ ] Fen (10)
- [ ] Old growth forest (10)
- [ ] Mature forested wetland (5)
- [ ] Lake Erie coastal/tributary wetland-unrestricted hydrology (10)
- [ ] Lake Erie coastal/tributary wetland-restricted hydrology (5)
- [ ] Lake Plain Sand Prairies (Oak Openings) (10)
- [ ] Relict Wet Prairies (10)
- [ ] Known occurrence state/federal threatened or endangered species (10)
- [ ] Significant migratory songbird/water fowl habitat or usage (10)
- [ ] Category 1 Wetland. See Question 1 Qualitative Rating (-10)

[x] N/A

## Metric 6. Plant communities, interspersion, microtopography.

7 (max 20 pts.) | 45 (subtotal)

6a. Wetland Vegetation Communities. Score all present using 0 to 3 scale.

- 0 Aquatic bed
- 3 Emergent
- 0 Shrub
- 0 Forest
- 0 Mudflats
- 0 Open water
- 0 Other_____

6b. horizontal (plan view) Interspersion. Select only one.

- [ ] High (5)
- [ ] Moderately high(4)
- [x] Moderate (3)
- [ ] Moderately low (2)
- [ ] Low (1)
- [ ] None (0)

6c. Coverage of invasive plants. Refer to Table 1 ORAM long form for list. Add or deduct points for coverage

- [ ] Extensive >75% cover (-5)
- [ ] Moderate 25-75% cover (-3)
- [ ] Sparse 5-25% cover (-1)
- [x] Nearly absent <5% cover (0)
- [ ] Absent (1)

6d. Microtopography. Score all present using 0 to 3 scale.

- 1 Vegetated hummucks/tussucks
- 0 Coarse woody debris >15cm (6in)
- 0 Standing dead >25cm (10in) dbh
- 0 Amphibian breeding pools

**Vegetation Community Cover Scale**

| | |
|---|---|
| 0 | Absent or comprises <0.1ha (0.2471 acres) contiguous area |
| 1 | Present and either comprises small part of wetland's vegetation and is of moderate quality, or comprises a significant part but is of low quality |
| 2 | Present and either comprises significant part of wetland's vegetation and is of moderate quality or comprises a small part and is of high quality |
| 3 | Present and comprises significant part, or more, of wetland's vegetation and is of high quality |

**Narrative Description of Vegetation Quality**

| | |
|---|---|
| low | Low spp diversity and/or predominance of nonnative or disturbance tolerant native species |
| mod | Native spp are dominant component of the vegetation, although nonnative and/or disturbance tolerant native spp can also be present, and species diversity moderate to moderately high, but generally w/o presence of rare threatened or endangered spp |
| high | A predominance of native species, with nonnative spp and/or disturbance tolerant native spp absent or virtually absent, and high spp diversity and often, but not always, the presence of rare, threatened, or endangered spp |

**Mudflat and Open Water Class Quality**

| | |
|---|---|
| 0 | Absent <0.1ha (0.247 acres) |
| 1 | Low 0.1 to <1ha (0.247 to 2.47 acres) |
| 2 | Moderate 1 to <4ha (2.47 to 9.88 acres) |
| 3 | High 4ha (9.88 acres) or more |

**Microtopography Cover Scale**

| | |
|---|---|
| 0 | Absent |
| 1 | Present very small amounts or if more common of marginal quality |
| 2 | Present in moderate amounts, but not of highest quality or in small amounts of highest quality |
| 3 | Present in moderate or greater amounts and of highest quality |

45

**End of Quantitative Rating. Complete Categorization Worksheets.**

| Site: Wetland 12 | Rater(s): K. Mammoliti | Date: 9-18-14 |
|---|---|---|

## Metric 1. Wetland Area (size).

| max 6 pts. | subtotal |
|---|---|
| 1 | 1 |

Select one size class and assign score.

- [ ] >50 acres (>20.2ha) (6 pts)
- [ ] 25 to <50 acres (10.1 to <20.2ha) (5 pts)
- [ ] 10 to <25 acres (4 to <10.1ha) (4 pts)
- [ ] 3 to <10 acres (1.2 to <4ha) (3 pts)
- [ ] 0.3 to <3 acres (0.12 to <1.2ha) (2pts)
- [x] 0.1 to <0.3 acres (0.04 to <0.12ha) (1 pt)
- [ ] <0.1 acres (0.04ha) (0 pts)

## Metric 2. Upland buffers and surrounding land use.

| max 14 pts. | subtotal |
|---|---|
| 4 | 5 |

2a. Calculate average buffer width. Select only one and assign score. Do not double check.

- [ ] WIDE. Buffers average 50m (164ft) or more around wetland perimeter (7)
- [ ] MEDIUM. Buffers average 25m to <50m (82 to <164ft) around wetland perimeter (4)
- [x] NARROW. Buffers average 10m to <25m (32ft to <82ft) around wetland perimeter (1)
- [ ] VERY NARROW. Buffers average <10m (<32ft) around wetland perimeter (0)

2b. Intensity of surrounding land use. Select one or double check and average.

- [ ] VERY LOW. 2nd growth or older forest, prairie, savannah, wildlife area, etc. (7)
- [ ] LOW. Old field (>10 years), shrub land, young second growth forest. (5)
- [x] MODERATELY HIGH. Residential, fenced pasture, park, conservation tillage, new fallow field. (3)
- [ ] HIGH. Urban, industrial, open pasture, row cropping, mining, construction. (1)

## Metric 3. Hydrology.

| max 30 pts. | subtotal |
|---|---|
| 22 | 27 |

3a. Sources of Water. Score all that apply.

- [ ] High pH groundwater (5)
- [x] Other groundwater (3)
- [x] Precipitation (1)
- [ ] Seasonal/Intermittent surface water (3)
- [ ] Perennial surface water (lake or stream) (5)

3b. Connectivity. Score all that apply.

- [ ] 100 year floodplain (1)
- [x] Between stream/lake and other human use (1)
- [x] Part of wetland/upland (e.g. forest), complex (1)
- [x] Part of riparian or upland corridor (1)

3c. Maximum water depth. Select only one and assign score.

- [ ] >0.7 (27.6in) (3)
- [ ] 0.4 to 0.7m (15.7 to 27.6in) (2)
- [x] <0.4m (<15.7in) (1)

3d. Duration inundation/saturation. Score one or dbl check.

- [ ] Semi- to permanently inundated/saturated (4)
- [ ] Regularly inundated/saturated (3)
- [x] Seasonally inundated (2)
- [ ] Seasonally saturated in upper 30cm (12in) (1)

3e. Modifications to natural hydrologic regime. Score one or double check and average.

- [x] None or none apparent (12)
- [ ] Recovered (7)
- [ ] Recovering (3)
- [ ] Recent or no recovery (1)

Check all disturbances observed

- [ ] ditch
- [ ] tile
- [ ] dike
- [ ] weir
- [ ] stormwater input
- [ ] point source (nonstormwater)
- [ ] filling/grading
- [ ] road bed/RR track
- [ ] dredging
- [ ] other_____

## Metric 4. Habitat Alteration and Development.

| max 20 pts. | subtotal |
|---|---|
| 17 | 44 |

4a. Substrate disturbance. Score one or double check and average.

- [x] None or none apparent (4)
- [ ] Recovered (3)
- [ ] Recovering (2)
- [ ] Recent or no recovery (1)

4b. Habitat development. Select only one and assign score.

- [ ] Excellent (7)
- [ ] Very good (6)
- [ ] Good (5)
- [x] Moderately good (4)
- [ ] Fair (3)
- [ ] Poor to fair (2)
- [ ] Poor (1)

4c. Habitat alteration. Score one or double check and average.

- [x] None or none apparent (9)
- [ ] Recovered (6)
- [ ] Recovering (3)
- [ ] Recent or no recovery (1)

Check all disturbances observed

- [ ] mowing
- [ ] grazing
- [ ] clearcutting
- [ ] selective cutting
- [ ] woody debris removal
- [ ] toxic pollutants
- [ ] shrub/sapling removal
- [ ] herbaceous/aquatic bed removal
- [ ] sedimentation
- [ ] dredging
- [ ] farming
- [ ] nutrient enrichment

44

subtotal this page

last revised 1 February 2001 jjm

| Site: Wetland 12 | Rater(s): K. Mammoliti | Date: 9-18-14 |
|---|---|---|

44
subtotal first page

## Metric 5. Special Wetlands.

0 (max 10 pts.) | 44 (subtotal)

Check all that apply and score as indicated.

- [ ] Bog (10)
- [ ] Fen (10)
- [ ] Old growth forest (10)
- [ ] Mature forested wetland (5)
- [ ] Lake Erie coastal/tributary wetland-unrestricted hydrology (10)
- [ ] Lake Erie coastal/tributary wetland-restricted hydrology (5)
- [ ] Lake Plain Sand Prairies (Oak Openings) (10)
- [ ] Relict Wet Prairies (10)
- [ ] Known occurrence state/federal threatened or endangered species (10)
- [ ] Significant migratory songbird/water fowl habitat or usage (10)
- [ ] Category 1 Wetland. See Question 1 Qualitative Rating (-10)

[X] N/A

## Metric 6. Plant communities, interspersion, microtopography.

10 (max 20 pts.) | 54 (subtotal)

6a. Wetland Vegetation Communities.
Score all present using 0 to 3 scale.

- [0] Aquatic bed
- [3] Emergent
- [1] Shrub
- [0] Forest
- [0] Mudflats
- [0] Open water
- [0] Other_____

6b. horizontal (plan view) Interspersion.
Select only one.

- [ ] High (5)
- [ ] Moderately high(4)
- [X] Moderate (3)
- [ ] Moderately low (2)
- [ ] Low (1)
- [ ] None (0)

6c. Coverage of invasive plants. Refer to Table 1 ORAM long form for list. Add or deduct points for coverage

- [ ] Extensive >75% cover (-5)
- [ ] Moderate 25-75% cover (-3)
- [ ] Sparse 5-25% cover (-1)
- [X] Nearly absent <5% cover (0)
- [ ] Absent (1)

6d. Microtopography.
Score all present using 0 to 3 scale.

- [1] Vegetated hummucks/tussucks
- [0] Coarse woody debris >15cm (6in)
- [2] Standing dead >25cm (10in) dbh
- [0] Amphibian breeding pools

**Vegetation Community Cover Scale**

| | |
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| 0 | Absent or comprises <0.1ha (0.2471 acres) contiguous area |
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**Narrative Description of Vegetation Quality**

| | |
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| | |
|---|---|
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| 3 | High 4ha (9.88 acres) or more |

**Microtopography Cover Scale**

| | |
|---|---|
| 0 | Absent |
| 1 | Present very small amounts or if more common of marginal quality |
| 2 | Present in moderate amounts, but not of highest quality or in small amounts of highest quality |
| 3 | Present in moderate or greater amounts and of highest quality |

54

**End of Quantitative Rating. Complete Categorization Worksheets.**

***APPENDIX H***

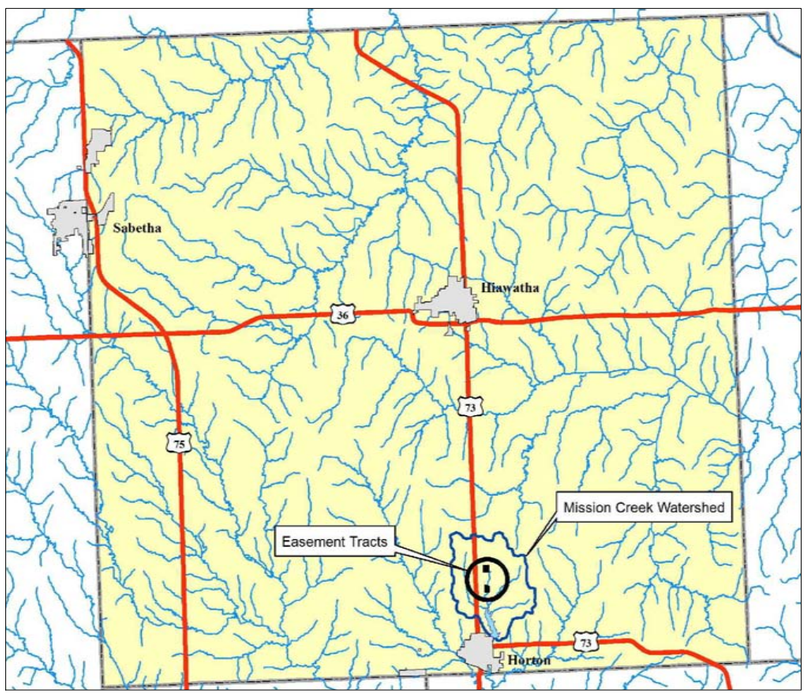
# ***IN-STREAM AND RIPARIAN ENHANCEMENT DESIGN***

# MISSION CREEK CHANNEL AND RIPARIAN ENHANCEMENTS

# BROWN COUNTY, KANSAS

## CITY OF HORTON, KANSAS

## W 1/2 SECTION 16, T4S, R17E




BROWN COUNTY MAP

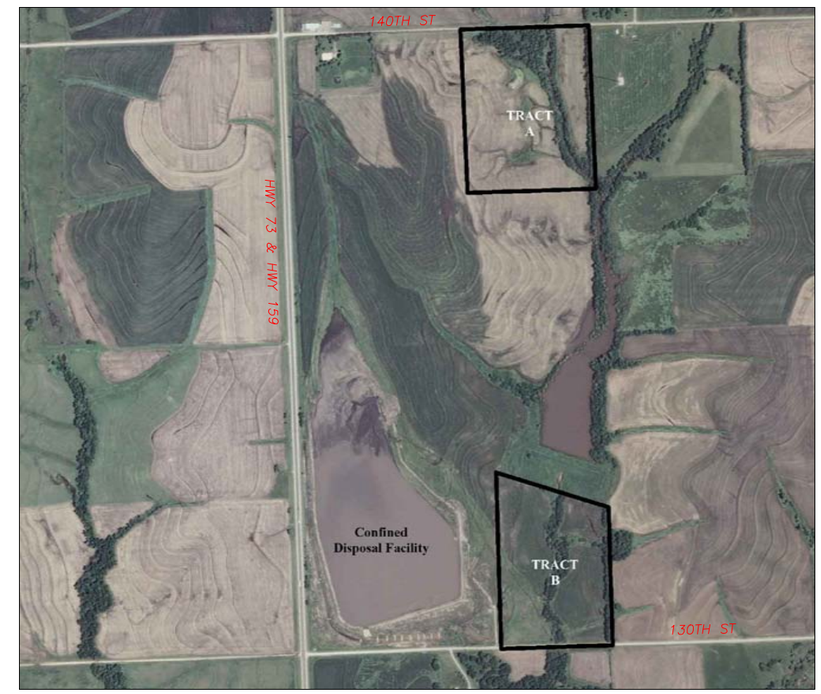
NOT TO SCALE

Sheet Index

| Sheet Number | Sheet Title |
|---|---|
| 1 | Cover Sheet |
| 2 - 3 | Plan Sheets |
| 4 | General Notes Sheet |
| 5 | Detail Sheet |
| 6 - 10 | Profile Sheets |

**SITE QUANTITIES**

| Quantities List | |
|---|---|
| 12-Inch Limestone Riprap:Tons | 713 |
| 18-Inch Limestone Riprap:Tons | 237 |
| 24-Inch Poorly Sorted Limestone :Tons | 641 |
| 36-Inch Limestone Boulders | 36 |
| Soil moving (Cut) : Cubic Yds | 1,422 |
| Soil moving (Fill) : Cubic Yds | 18 |
| Bare Root Trees | 3,075 |
| Native Grass Seeding : acres | 40.6 |
| Geotextile Fabric : Square yds | 160 |



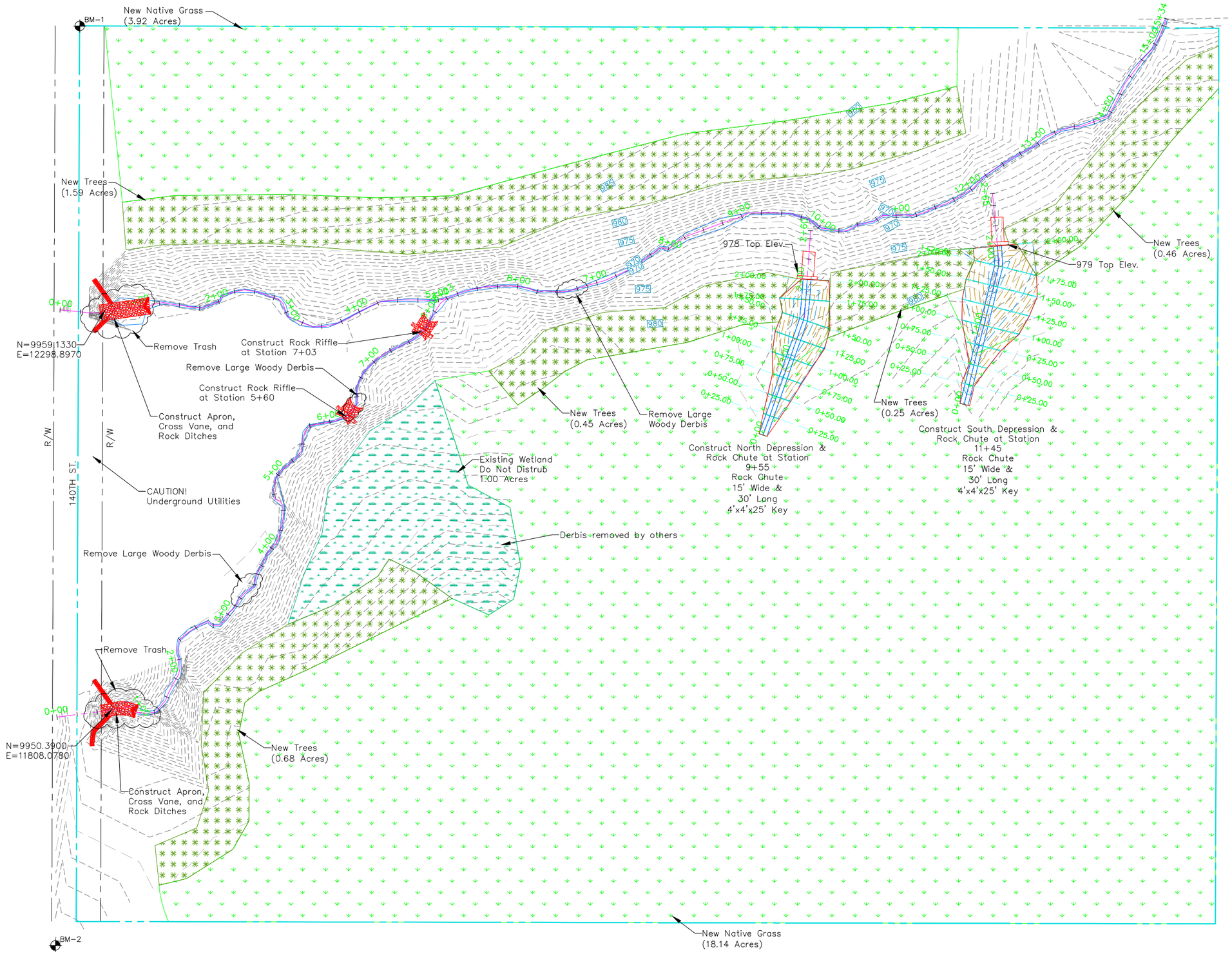

SITE LOCATION MAP

NOT TO SCALE


THE WATERSHED INSTITUTE AND LAND TRUST
1200 SW Executive Dr. Topeka, Kansas 66615 785-272-2252

BROWNING ENVIRONMENTAL SOLUTIONS, INC.
16377 S. KAW STREET OLATHE, KS 66062
913-708-0670


BRIAN BROWNING LICENSED 10599 8-15-12 KANSAS PROFESSIONAL ENGINEER




**TRACT A**

60 0 60 120

REFERENCE POINTS

| BM-1 | BM-2 |
|---|---|
| N 9989.6640 | N 10019.6830 |
| E 12648.3698 | E 11518.4830 |
| Elev. 1002.62 | Elev. 999.23 |
| 350.8' ENE of Mission Creek Sta. 0+00, NE Property Corner | 297.8' WNW of Tributary Sta. 0+00, 39.4' NW of NW Property Corner |

LEGEND

BM-100 Bench Mark

Existing 1' Contour Line

Existing 5' Contour Line

THE WATERSHED INSTITUTE AND LAND TRUST
1200 SW Executive Dr. Topeka, Kansas 66615 785-272-2252

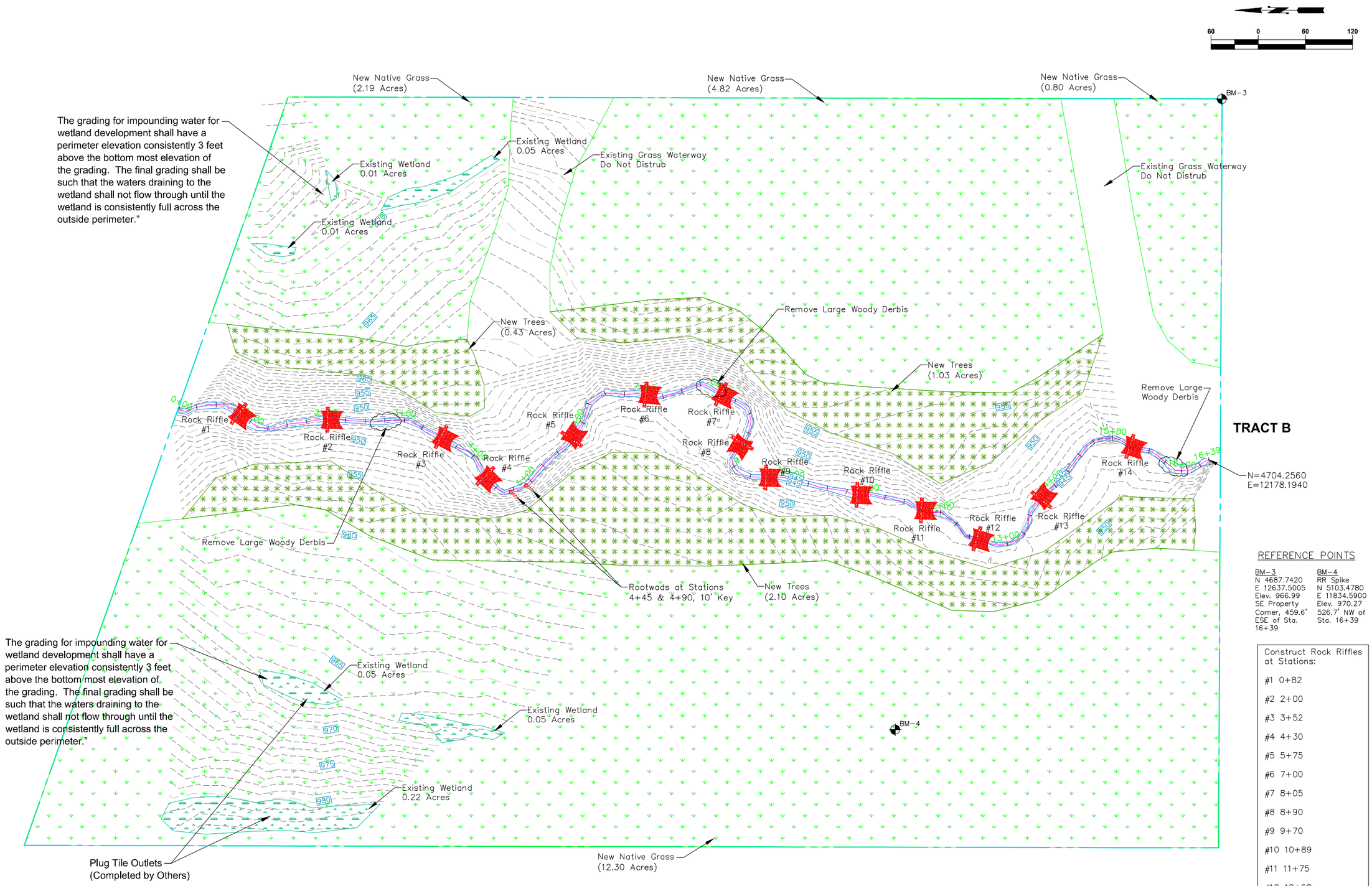
BROWNING ENVIRONMENTAL SOLUTIONS, INC.
16377 S. KAW STREET OLATHE, KS 66062
913-708-0670

**MISSION CREEK CHANNEL AND RIPARIAN ENHANCEMENTS BROWN COUNTY, KANSAS**

CITY OF HORTON, KANSAS
PLAN SHEET - TRACT A

JOHN A. BROWNING
LICENSED
10599
8-13-12
KANSAS
PROFESSIONAL ENGINEER

| | |
|---|---|
| DESIGNED | BAE |
| DRAWN BY: | JAG |
| APPROVED BY: | JNB |
| DESIGN PROJ: | 14668.088 |
| CONST | ----- |
| SCALE: | AS NOTED |
| DATE: | 6/13/2012 |
| DRAWING NO: | CO2 |
| SHEET NO: | 2 of 9 |




## REFERENCE POINTS

| BM-3 | BM-4 |
|---|---|
| N 4687.7420 | RR Spike |
| E 126637.5005 | N 5103.4780 |
| Elev. 966.99 | E 11834.5900 |
| SE Property Corner, 459.6' ESE of Sta. 16+39 | Elev. 970.27 526.7' NW of Sta. 16+39 |

Construct Rock Riffles at Stations:

| | |
|---|---|
| #1 | 0+82 |
| #2 | 2+00 |
| #3 | 3+52 |
| #4 | 4+30 |
| #5 | 5+75 |
| #6 | 7+00 |
| #7 | 8+05 |
| #8 | 8+90 |
| #9 | 9+70 |
| #10 | 10+89 |
| #11 | 11+75 |
| #12 | 12+60 |
| #13 | 13+75 |
| #14 | 15+25 |

THE WATERSHED INSTITUTE AND LAND TRUST
1200 SW Executive Dr. Topeka, Kansas 66615 785-272-2252

BROWNING ENVIRONMENTAL SOLUTIONS, INC.
16377 S. KAW STREET OLATHE, KS 66062
913-708-0670

# MISSION CREEK CHANNEL AND RIPARIAN ENHANCEMENTS BROWN COUNTY, KANSAS

## CITY OF HORTON, KANSAS PLAN SHEET - TRACT B

BRIAN A. BROWNING LICENSED 10599 8-15-12 KANSAS PROFESSIONAL ENGINEER

| | |
|---|---|
| DESIGNED | BAE |
| DRAWN BY: | JAG |
| APPROVED BY: | JNB |
| DESIGN PROJ: | 14668.088 |
| CONST | ----- |
| SCALE: | AS NOTED |
| DATE: | 6/13/2012 |
| DRAWING NO: | CO3 |
| SHEET NO: | 3 of 9 |

## Structure Specification Sheet

| Project Name | Stream | County | State | Bank | |
|---|---|---|---|---|---|
| ILF-City of Horton | Mission Creek | Brown | Kansas | Length | Height |
| | | | | Shaped 0 / Total 4,221 | Varies |

| Number | Type | Spacing (ft) | Angle (Degrees) | Height (ft) | Length (ft) | Key Length (ft) | Volume ($yd^3$) | Key Volume ($yd^3$) | Tons | Material Specifications |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | **Tract A** | | | | |
| 1 | CMP Apron (West Crossing) | - | - | - | 51 | - | 101 | - | 152 | Poorly Sorted Limestone ($D_{50}$ = 24-Inch) |
| 1 | Cross Vane (West Crossing) | - | 30 | - | 30 | - | 10 | - | 15 | 36-Inch Limestone Boulders |
| 1 | Ditch Let Downs (West Crossing) | - | - | - | 80 | 0 | 30 | - | 45 | Sorted Limestone Rock ($D_{50}$ = 12-Inch) |
| 2 | RCB Apron (East Crossing) | - | - | - | 64 | - | 326 | - | 489 | Poorly Sorted Limestone ($D_{50}$ = 24-Inch) |
| 2 | Cross Vane (East Crossing) | - | 30 | - | 40 | - | 14 | - | 21 | 36-Inch Limestone Boulders |
| 1 | Ditch Let Downs (East Crossing) | - | - | - | 80 | 0 | 21 | - | 32 | Sorted Limestone Rock ($D_{50}$ = 12-Inch) |
| 1 | Rock Riffle | - | - | Varies | Varies | 30 | 20 | 9 | 44 | Sorted Limestone Riprap (See Rock Riffle Detail) |
| 2 | Rock Riffle | 143 | - | Varies | Varies | 30 | 22 | 9 | 47 | Sorted Limestone Riprap (See Rock Riffle Detail) |
| 1 | Rock Chute | - | - | 2 | 30 | 25 | 34 | 15 | 74 | Sorted Limestone Rock ($D_{50}$ = 12-Inch) |
| 2 | Rock Chute | - | - | 2 | 30 | 25 | 34 | 15 | 74 | Sorted Limestone Rock ($D_{50}$ = 12-Inch) |
| | | | | | | **Tract B** | | | | |
| 1 | Rock Riffle | - | - | Varies | Varies | 32 | 20 | 10 | 45 | Sorted Limestone Riprap (See Rock Riffle Detail) |
| 2 | Rock Riffle | 118 | - | Varies | Varies | 32 | 20 | 10 | 45 | Sorted Limestone Riprap (See Rock Riffle Detail) |
| 3 | Rock Riffle | 152 | - | Varies | Varies | 32 | 20 | 10 | 45 | Sorted Limestone Riprap (See Rock Riffle Detail) |
| 4 | Rock Riffle | 78 | - | Varies | Varies | 32 | 20 | 10 | 45 | Sorted Limestone Riprap (See Rock Riffle Detail) |
| 5 | Rock Riffle | 145 | - | Varies | Varies | 32 | 23 | 10 | 50 | Sorted Limestone Riprap (See Rock Riffle Detail) |
| 6 | Rock Riffle | 125 | - | Varies | Varies | 32 | 18 | 10 | 42 | Sorted Limestone Riprap (See Rock Riffle Detail) |
| 7 | Rock Riffle | 105 | - | Varies | Varies | 32 | 16 | 10 | 39 | Sorted Limestone Riprap (See Rock Riffle Detail) |
| 8 | Rock Riffle | 85 | - | Varies | Varies | 32 | 27 | 10 | 56 | Sorted Limestone Riprap (See Rock Riffle Detail) |
| 9 | Rock Riffle | 80 | - | Varies | Varies | 32 | 20 | 10 | 45 | Sorted Limestone Riprap (See Rock Riffle Detail) |
| 10 | Rock Riffle | 119 | - | Varies | Varies | 32 | 11 | 10 | 32 | Sorted Limestone Riprap (See Rock Riffle Detail) |
| 11 | Rock Riffle | 86 | - | Varies | Varies | 32 | 20 | 10 | 45 | Sorted Limestone Riprap (See Rock Riffle Detail) |
| 12 | Rock Riffle | 85 | - | Varies | Varies | 32 | 25 | 10 | 53 | Sorted Limestone Riprap (See Rock Riffle Detail) |
| 13 | Rock Riffle | 115 | - | Varies | Varies | 32 | 20 | 10 | 45 | Sorted Limestone Riprap (See Rock Riffle Detail) |
| 14 | Rock Riffle | 150 | - | Varies | Varies | 32 | 24 | 10 | 51 | Sorted Limestone Riprap (See Rock Riffle Detail) |
| | | | | | | | 896 | 188 | 1627 | |
| | | | | | | Total yds3 | 1084 | | | |

### Site Information

| | | | | | |
|---|---|---|---|---|---|
| Structure Height (ft) | Varies | BkF Elev | 947.1 | At Station | 8+20 |
| Crest Width (ft) | - | Rosgen Classification | | C6 | |
| Finished Slope Grade / H:V | - | Width/Depth Ratio | | 15.5 | |
| Schumm Channel Stage | IV | Entrenchment Ratio | | 5.0 | |
| Radius of Curvature (ft) | Varies | Channel Width (ft) | | 22 | |
| Maximum Structure Spacing (ft) | - | Tortuosity | | - | |
| Regular Structure Spacing (ft) | - | Shear Stress ($lbs/ft^2$) | | 0.13 | |
| Hydraulic Radius (ft) | 1.3 | Slope = (ft/ ft) | | 0.00166 | |
| Mean Depth (ft) | 1.4 | Wetted Perimeter (ft) | | 23 | |
| Cross Sectional Area ($ft^2$) | 29 | Manning's n | | 0.033 | |
| Bank Full Discharge (cfs) | 64 | Mean Velocity (ft/sec) | | 2.18 | |
| $Q_5$ Discharge (cfs) | 1,970 | Drainage Area ($mi^2$) | | 2.0 | |

### Quantities List

| | |
|---|---|
| 12-Inch Limestone Riprap/Tons | 713 |
| 18-Inch Limestone Riprap/Tons | 237 |
| 24-Inch Poorly Sorted Limestone /Tons | 641 |
| 36-Inch Limestone Boudlers | 36 |
| Soil moving (Cut) / Cubic Yds | 1,422 |
| Soil moving (Fill) / Cubic Yds | 18 |
| Bare Root Trees | 3,075 |
| Native Grass Seeding / acres | 40.6 |
| Geotextile Fabric / Square yds | 160 |

### Mitigation Vegetation Plantings

| Vegetation Type | Quantity |
|---|---|
| Bare Root Seedlings / ea. | 3,075 |
| Seeding/ acres | 40.6 |

| | |
|---|---|
| Easement Holder | Watershed Land Trust, Inc. |
| % | Frank Austenfeld |
| Address | 16813 S. Highland Ridge Dr. |
| City, State Zip | Belton, MO 64012 |
| Phone | 913-685-4600 |
| Legal | W1/2 Sec. 16 T4S, R17E |
| Date | April 9, 2012 |

## GENERAL NOTES

1. Before any construction activity, the contractor is responsible for calling Kansas One Call at 800–344–7233 (800–DIG–SAFE).

2. Accepted Erosion Control practices will be applied to all disturbed areas.

3. Corps of Engineers 404 and applicable state permits will be obtained prior to project construction.

4. The information shown in these plans concerning type and location of underground utilities is not guaranteed to be accurate or all inclusive. Existing utilities and their locations, as shown on the plans, represent the best information obtained for the design. Location information has been obtained from the various utility companies and is either from company record drawings or company provided field locations. The plans locations shown are not guaranteed. Additional existing utilities may also be encountered. The contractor is responsible for making his own determinations as to the type and location of underground utilities as may be necessary to avoid damage thereto.

5. Contractor shall maintain construction limits within the existing and/or proposed rights–of–way and easements.

6. The engineer has not performed property or right–of–way surveys for any of the locations shown on this project. Right–of–way or property lines shown on the plans are approximate and are shown for general orientation only. Property corners or other survey markers have not been located. Unless specifically called out on the plans.

7. Coordinate and topographic information is taken from a project by Hamm, Inc.

8. Soil moving calculation are based on available information. Contractor shall inspect the site and make an evaluation of existing conditions.

9. Excavation areas and structure locations to be field staked by Watershed Institute, Inc.


THE WATERSHED INSTITUTE
1200 SW Executive Dr. Topeka, Kansas 66615 785-272-2252

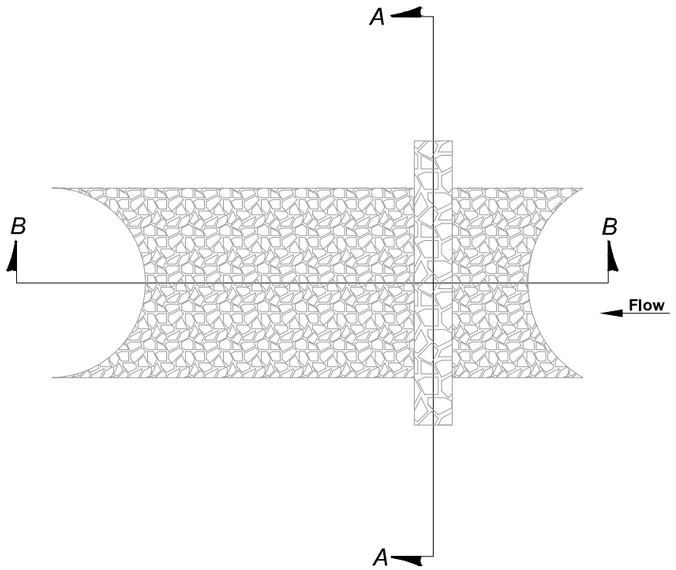
BROWNING ENVIRONMENTAL SOLUTIONS, INC.
16377 S. KAW STREET OLATHE, KS 66062
913-708-0670


**MISSION CREEK CHANNEL AND RIPARIAN ENHANCEMENTS**
**BROWN COUNTY, KANSAS**

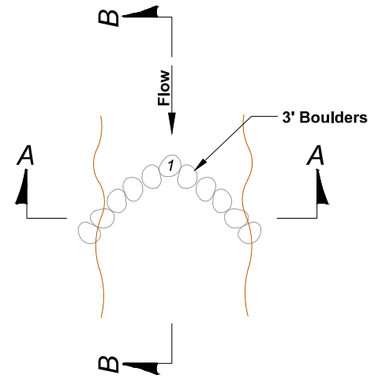
CITY OF HORTON, KANSAS
GENERAL NOTES SHEET

JOHN A. BROWNING LICENSED 10599 8-13-12 KANSAS PROFESSIONAL ENGINEER

| | |
|---|---|
| DESIGNED | BAE |
| DRAWN BY: | JAG |
| APPROVED BY: | JNB |
| DESIGN PROJ: | 14668.089 |
| CONST | ----- |
| SCALE: | AS NOTED |
| DATE: | 6/13/2012 |
| DRAWING NO: | CO4 |
| SHEET NO: | 4 of 10 |

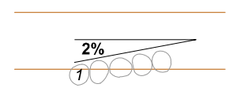



ROCK RIFFLE PLAN VIEW
NOT TO SCALE




CROSS VANE PLAN

CROSS VANE SECTION A-A

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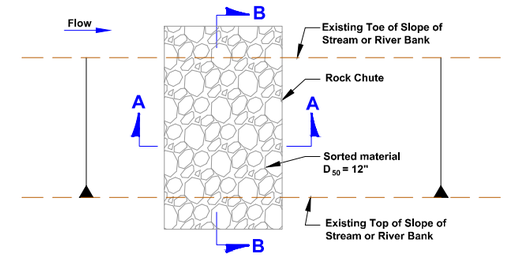


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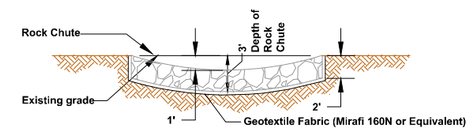


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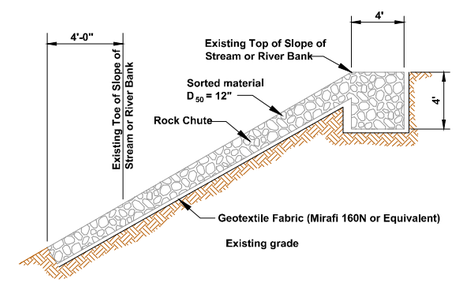


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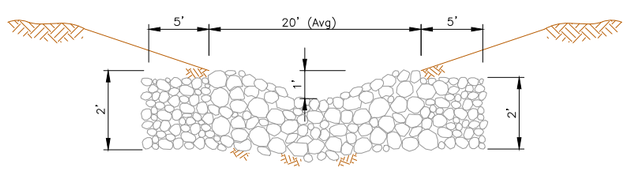


TYPICAL ROCK RIFFLE
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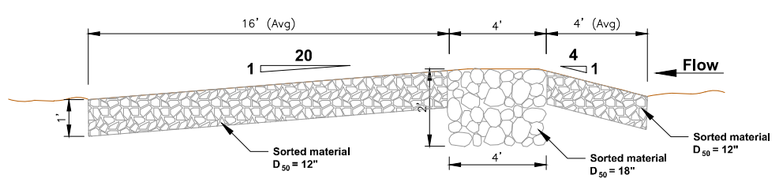
NOT TO SCALE

**PRELIMINARY**
NOT FOR CONSTRUCTION

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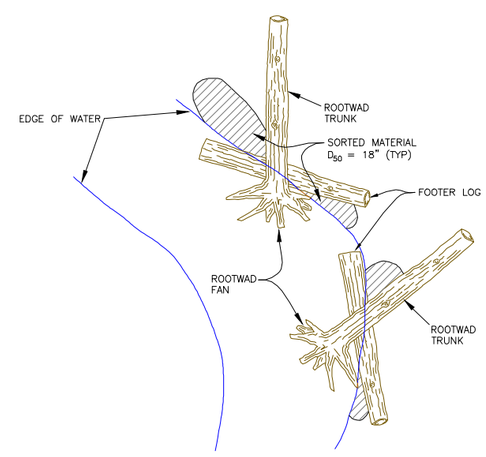
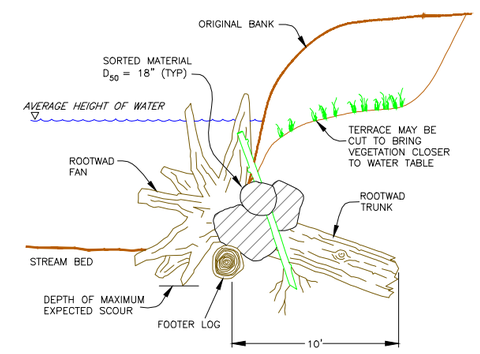



ROOTWAD PLAN VIEW
NOT TO SCALE




ROOTWAD SECTION VIEW
NOT TO SCALE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BROWNING ENVIRONMENTAL SOLUTIONS, INC.
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913-708-0670


**MISSION CREEK CHANNEL AND RIPARIAN ENHANCEMENTS BROWN COUNTY, KANSAS**

**CITY OF HORTON, KANSAS DETAIL SHEET**

RYAN N. BROWNING LICENSED 10599 8-15-12 KANSAS PROFESSIONAL ENGINEER

| | |
|---|---|
| DESIGNED | BAE |
| DRAWN BY: | JAG |
| APPROVED BY: | JNB |
| DESIGN PROJ: | 14668.089 |
| CONST | ----- |
| SCALE: | AS NOTED |
| DATE: | 6/13/2012 |
| DRAWING NO: | CO5 |
| SHEET NO: | 5 of 10 |

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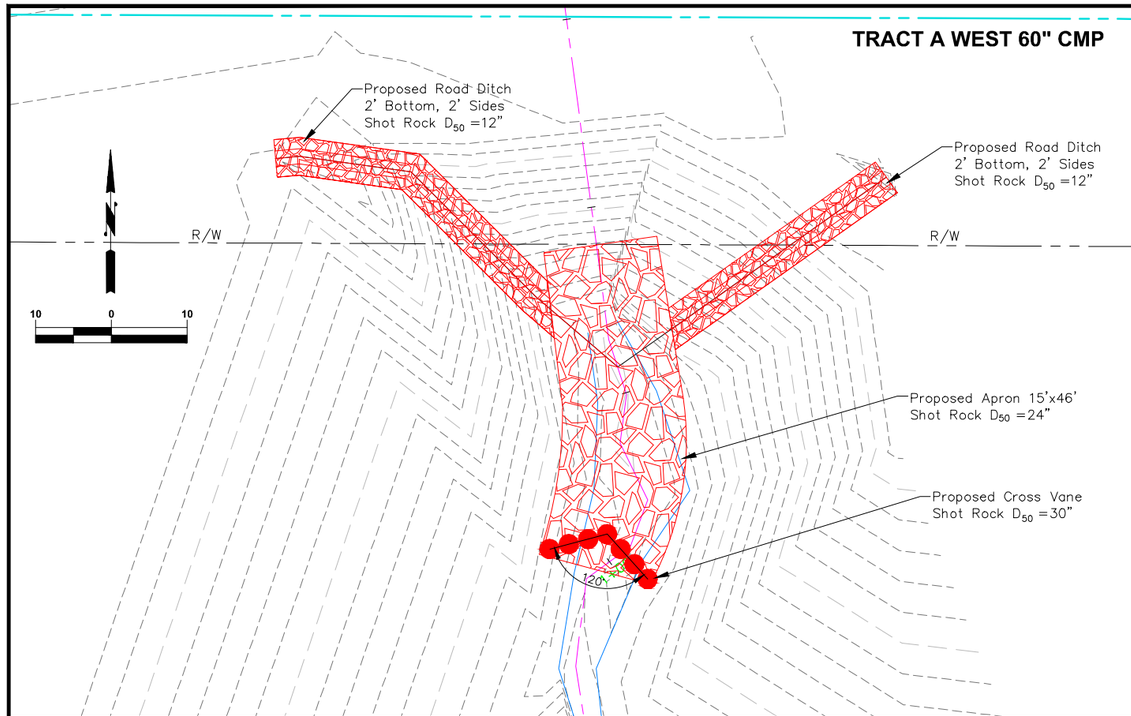


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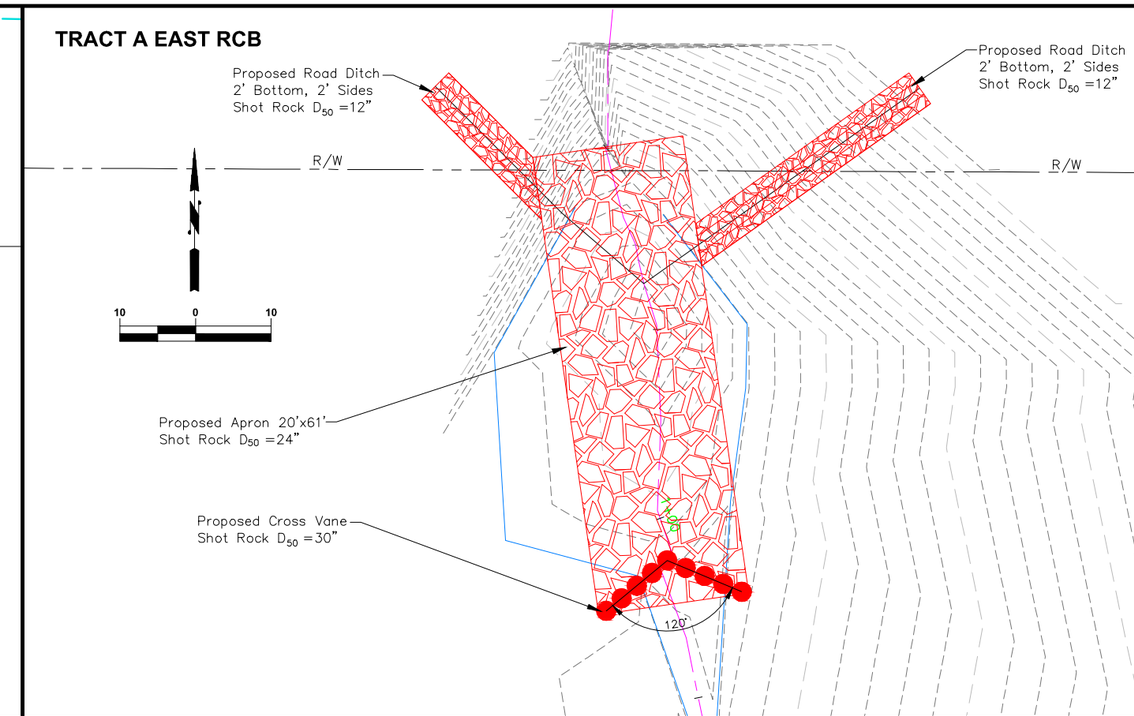


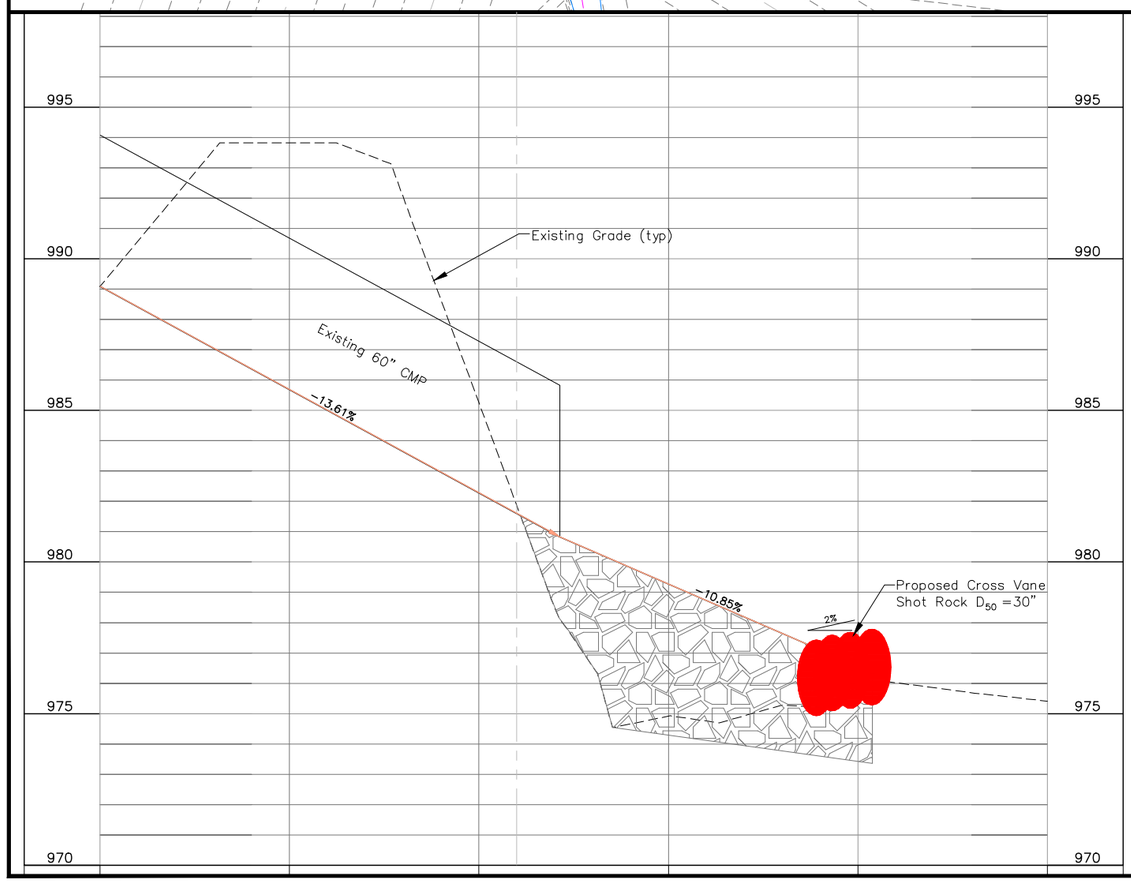


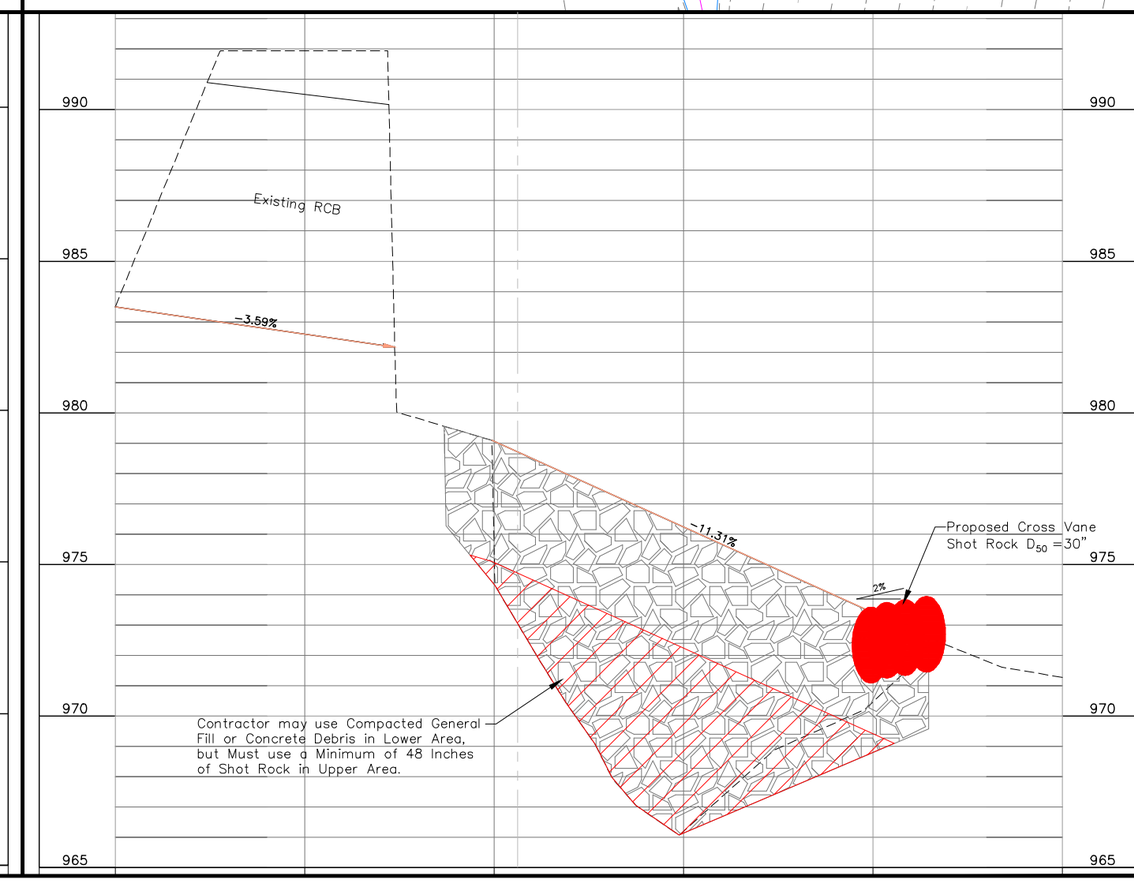



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913-708-0670


**MISSION CREEK CHANNEL AND RIPARIAN ENHANCEMENTS**
**BROWN COUNTY, KANSAS**

**CITY OF HORTON, KANSAS**
**CMP & RCB PROFILE SHEET**

JOHN N. BROWNING
LICENSED
10599
8-13-12
KANSAS
PROFESSIONAL ENGINEER

| | |
|---|---|
| DESIGNED | BAE |
| DRAWN BY: | JAG |
| APPROVED BY: | JNB |
| DESIGN PROJ: | 14668.088 |
| CONST | ----- |
| SCALE: | AS NOTED |
| DATE: | 6/13/2012 |
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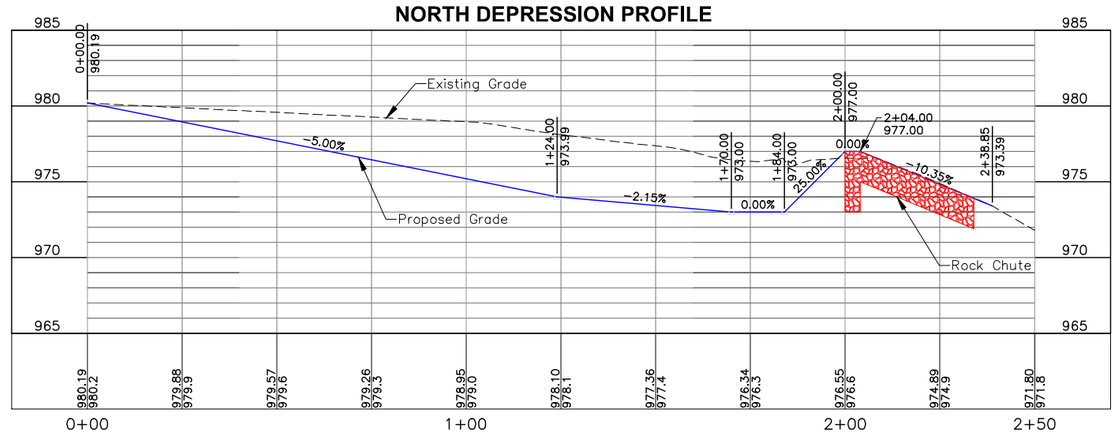
| SHEET NO: | 6 of 10 |

## TRACT A
## NORTH DEPRESSION PROFILE

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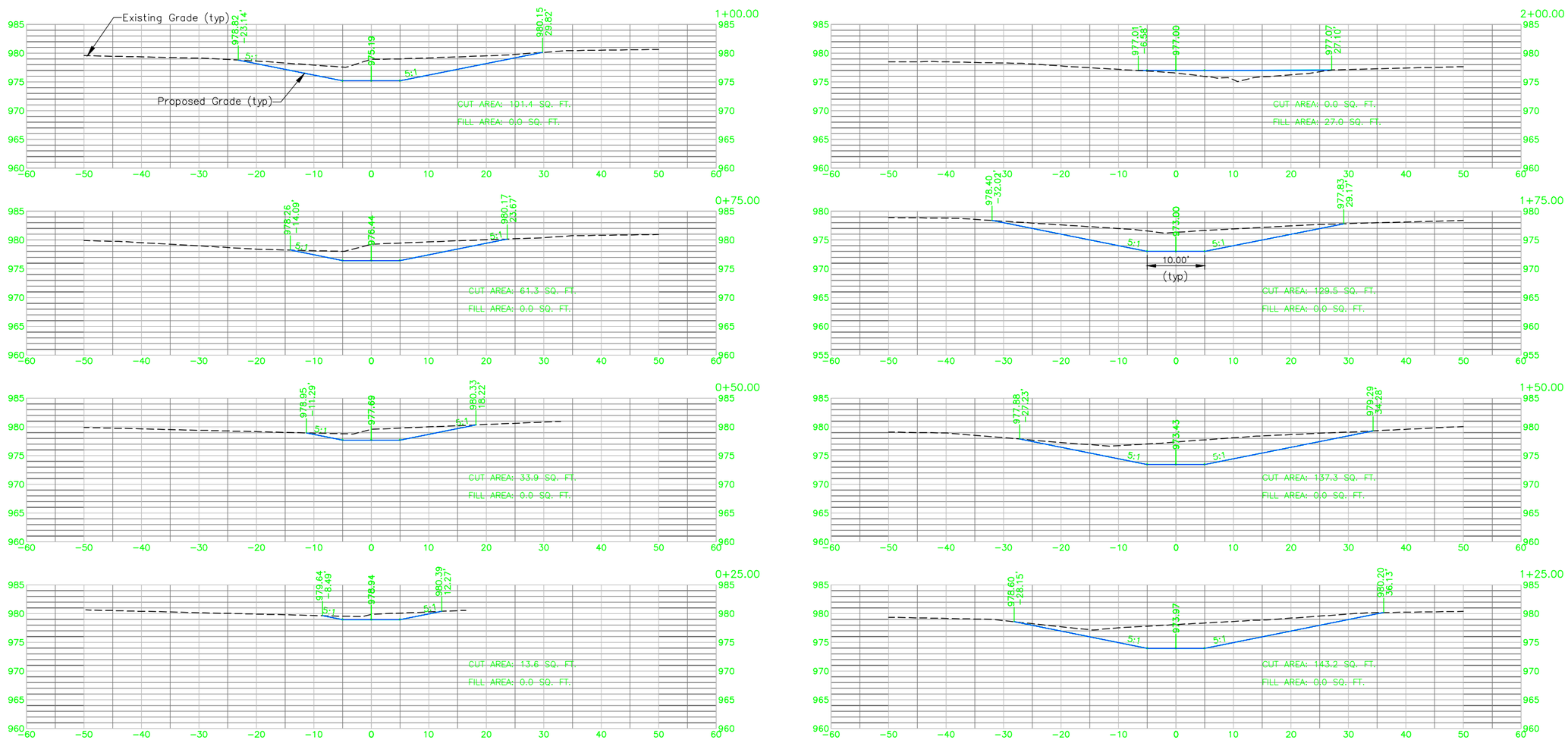



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BROWNING ENVIRONMENTAL SOLUTIONS, INC.
16377 S. KAW STREET OLATHE, KS 66062
913-708-0670

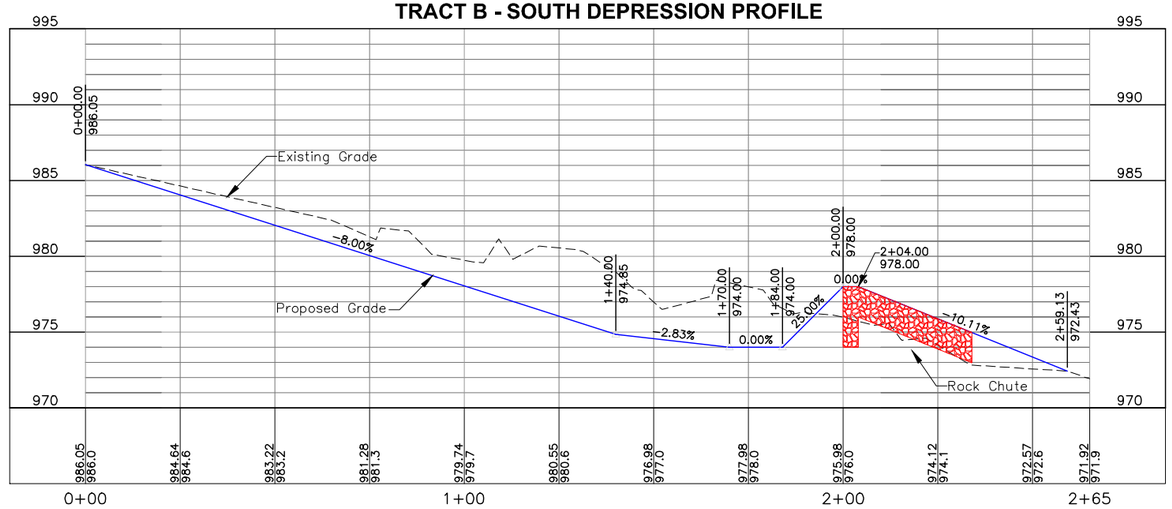

**MISSION CREEK CHANNEL AND RIPARIAN ENHANCEMENTS**
**BROWN COUNTY, KANSAS**

CITY OF HORTON, KANSAS
NORTH DEPRESSION PROFILE SHEET

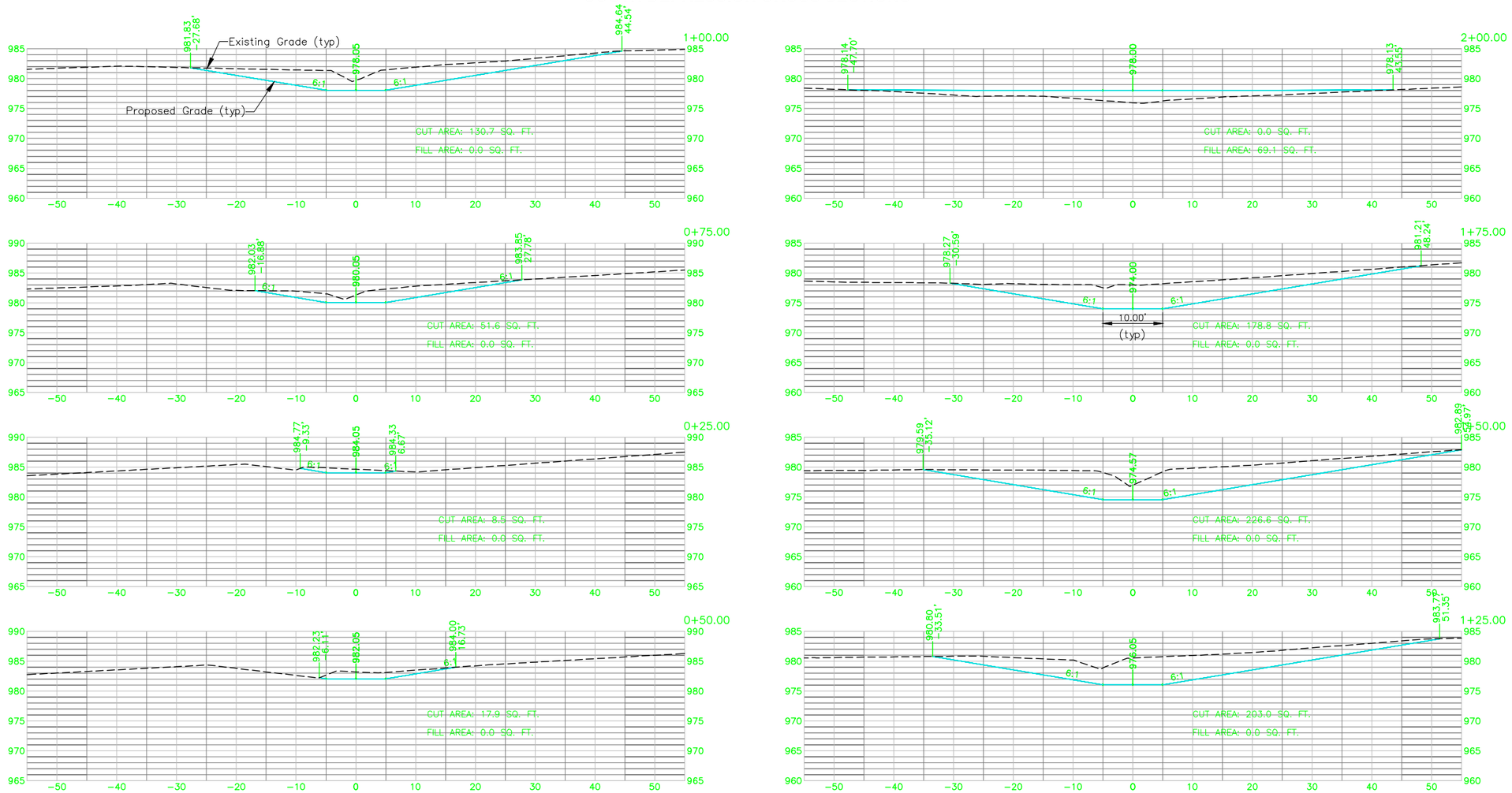
JOHN N. BROWNING
10599
8-15-12
KANSAS
PROFESSIONAL ENGINEER

| | |
|---|---|
| DESIGNED | BAE |
| DRAWN BY: | JAG |
| APPROVED BY: | JNB |
| DESIGN PROJ: | 14668.088 |
| CONST | ----- |
| SCALE: | AS NOTED |
| DATE: | 6/13/2012 |
| DRAWING NO: | CO7 |
| SHEET NO: | 7 of 10 |

## TRACT B - SOUTH DEPRESSION PROFILE




## SOUTH DEPRESSION CROSS SECTIONS

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913-708-0670

**MISSION CREEK CHANNEL AND RIPARIAN ENHANCEMENTS**
**BROWN COUNTY, KANSAS**

CITY OF HORTON, KANSAS
SOUTH DEPRESSION PROFILE SHEET

JOHN N. BROWNING LICENSED 10599 8-15-12 KANSAS PROFESSIONAL ENGINEER

| | |
|---|---|
| DESIGNED | BAE |
| DRAWN BY: | JAG |
| APPROVED BY: | JNB |
| DESIGN PROJ: | 14668.088 |
| CONST | ----- |
| SCALE: | AS NOTED |
| DATE: | 6/13/2012 |
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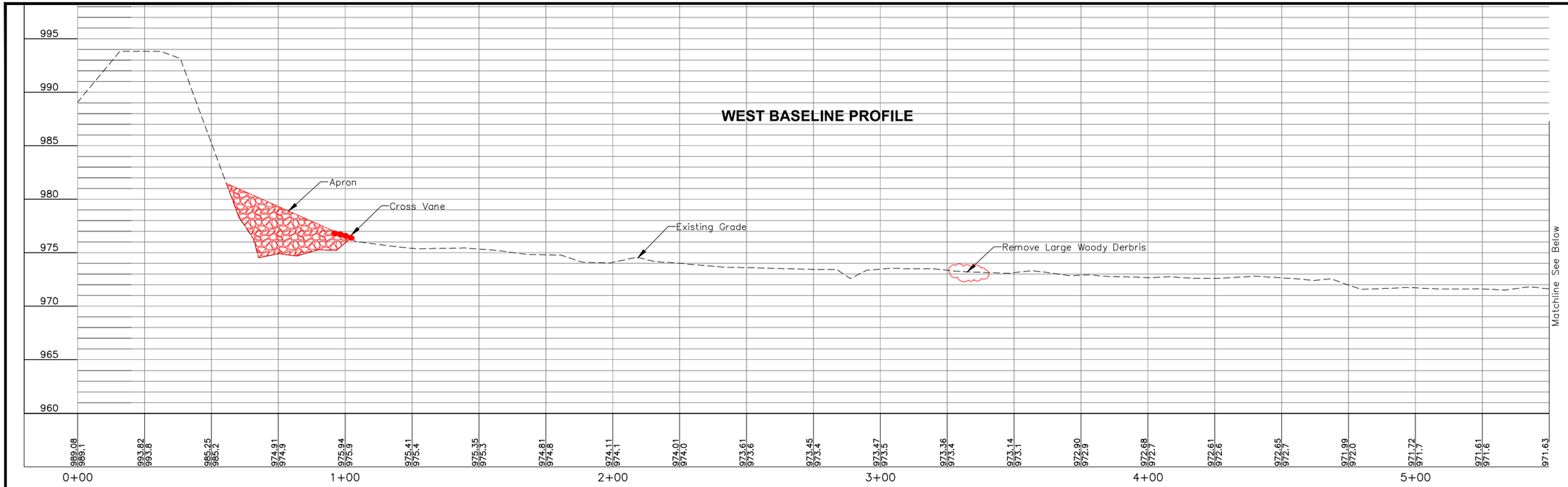


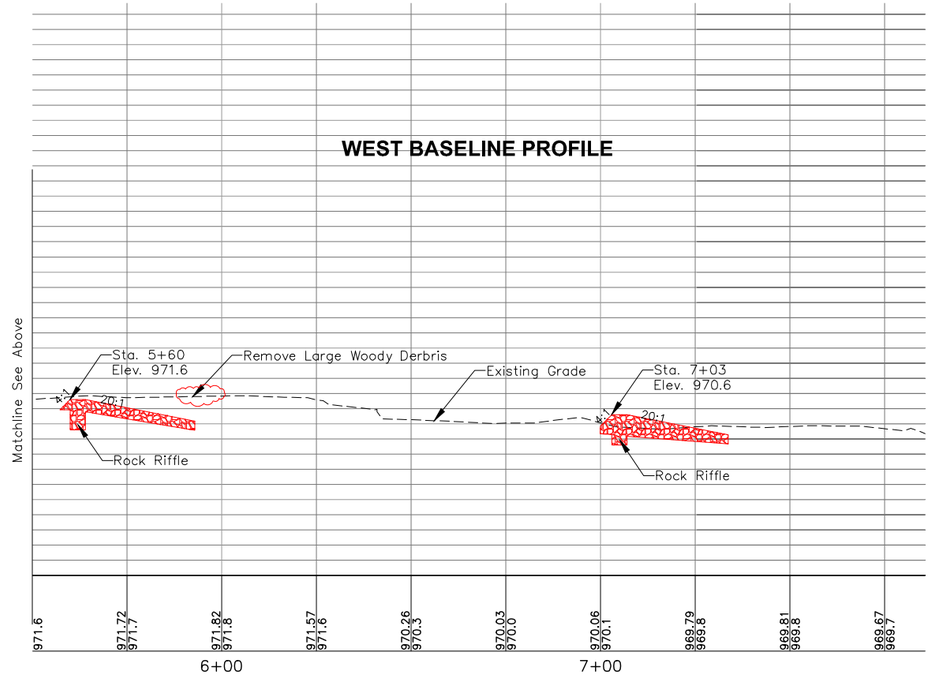


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BROWNING ENVIRONMENTAL SOLUTIONS, INC.
16377 S. KAW STREET OLATHE, KS 66062
913-708-0670

**MISSION CREEK CHANNEL AND RIPARIAN ENHANCEMENTS**
**BROWN COUNTY, KANSAS**

**CITY OF HORTON, KANSAS**
**WEST BASELINE PROFILE SHEET**

JOHN N. BROWNING LICENSED 10599 8-13-12 KANSAS PROFESSIONAL ENGINEER

| | |
|---|---|
| DESIGNED | BAE |
| DRAWN BY: | JAG |
| APPROVED BY: | JNB |
| DESIGN PROJ: | 14668.088 |
| CONST | ----- |
| SCALE: | AS NOTED |
| DATE: | 6/13/2012 |
| DRAWING NO: | **CO9** |
| SHEET NO: | 9 of 10 |

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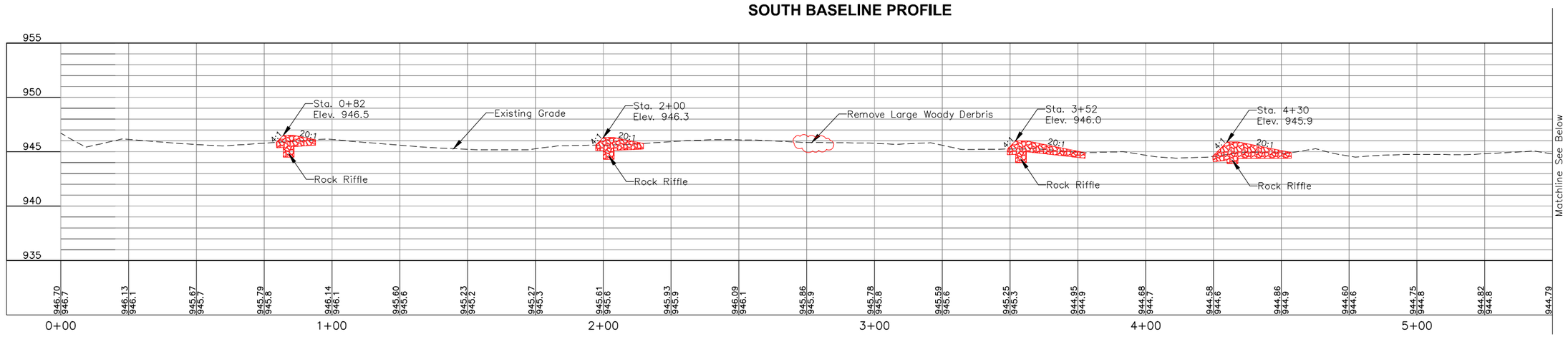


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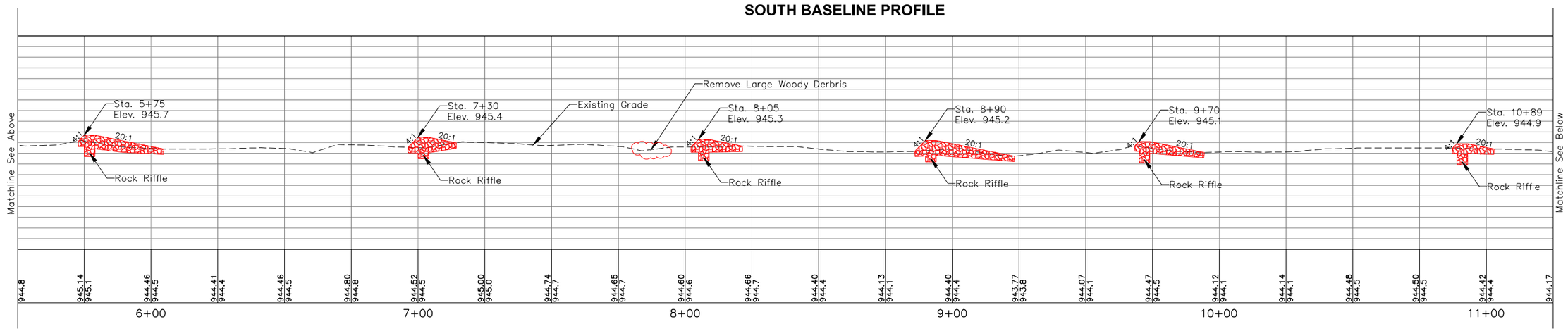


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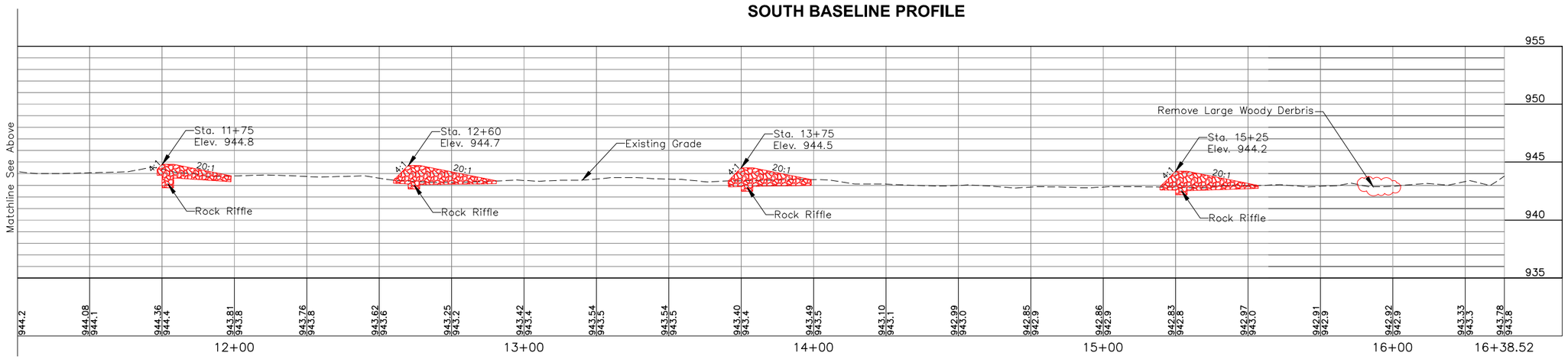



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1200 SW Executive Dr. Topeka, Kansas 66615 785-272-2252

BROWNING ENVIRONMENTAL SOLUTIONS, INC.
16377 S. KAW STREET OLATHE, KS 66062
913-708-0670


**MISSION CREEK CHANNEL AND RIPARIAN ENHANCEMENTS**
**BROWN COUNTY, KANSAS**

**CITY OF HORTON, KANSAS**
**SOUTH BASELINE PROFILE SHEET**

JOHN M. BROWNING LICENSED 10599 8-15-12 KANSAS PROFESSIONAL ENGINEER

| | |
|---|---|
| DESIGNED | BAE |
| DRAWN BY: | JAG |
| APPROVED BY: | JNB |
| DESIGN PROJ: | 14668.088 |
| CONST | ----- |
| SCALE: | AS NOTED |
| DATE: | 6/13/2012 |
| DRAWING NO: | CO10 |
| SHEET NO: | 10 of 10 |

# *APPENDIX I*

# *CONSTRUCTION SPECIFICATIONS*

**CONSTRUCTION SPECIFICATIONS**
**INDEX**

**MISSION CREEK CHANNEL AND RIPARIAN ENHANCEMENTS**
**BROWN COUNTY, KANSAS**

**For**

**WATERSHED LAND TRUST, INC IN-LIEU FEE PROFRAM**

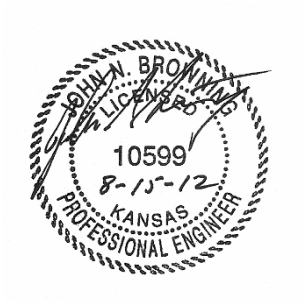
**August 15, 2012**

**Prepared By:**

**Watershed Institute, Inc.**
**1200 SW Executive Drive**
**Topeka, Kansas 66615**
**785-228-3147**

**and**

**Browning Environmental Solutions, Inc.**
**16377 S. Kaw Street**
**Olathe, KS 66062**
**913-708-0670**



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01002 – Special Conditions
01003 – Summary

DIVISION 2 – SITEWORK

02102 – Clearing and Grubbing
02200 – Excavating, Filling, and Grading
02205 – Geotextile and Filter Fabric
02840 – Rock Riprap for Rock Chutes
02900 – Protection of Soil and Vegetation
02903 – Rootwad Revetments
02901 – Channel Bank Vegetation
02906 – Mulching

DIVISION 3 – CONCRETE AND ROCK STABILIZATION STRUCTURES

03162 – Rock Structure for Stabilization

DIVISION 4 THROUGH 16 NOT USED

SECTION 01001 – GENERAL REQUIREMENTS

PART 1 – GENERAL

1.1 GENERAL

A. These General Requirements are incorporated herein to clarify and expand the provisions previously set forth in the Contract Documents which these specifications and drawings are a part thereof.

B. In the event of conflicts or discrepancies among the Contract Documents, interpretations will be based on the following priorities:

1. The Agreement
2. Addenda, with those of later date having precedence over those of earlier date
3. The Supplemental General Conditions
4. The General Conditions of the Contract for Construction
5. Drawings and Specifications
6. Latest version of the NRCS Specifications

C. In the case of an inconsistency between Drawings and Specifications or within either Document not clarified by addendum, the more stringent condition shall be provided in accordance with the Engineer's interpretation.

D. The quality of workmanship shall be an important consideration in acceptance or rejection of work. It is expected that the Contractor shall provide qualified workmen who can produce a first quality project, as defined by approved samples. Work that fails to achieve a first quality standard may be considered defective and rejected. Such work shall be removed and replaced with new work of first quality, as defined by approved samples.

E. The Contractor, being experienced in his trade, prior to submitting his bid, having made an inspection of the existing facilities and conditions; a thorough review of the Contract Documents; understanding that all systems are new; acknowledges that the installation of these systems must be complete and operational. Accordingly, all necessary parts, equipment, accessories and components must be supplied and installed, and must pass all final testing and operations. If a system component is missing in the Contract Documents, notify Engineer for clarification.

1.2 DRAWINGS AND SPECIFICATIONS

A. Do not scale drawings for dimensions. Accurately layout such work from dimensions indicated on engineering drawings or by use of field verified dimensions. Consult the Engineer for interpretations concerning locations of equipment.

B. Where drawings indicate a portion of the work and the remainder is shown in outline, the parts drawn out apply to other like portions of the work. Where detail is indicated by starting only, such detail shall continue to apply throughout the courses or parts in which it occurs and apply to similar parts of work unless otherwise indicated.

C. Unless otherwise indicated, a detail indicates the general application of work at all locations where it logically applies, and other related work incident thereto shall be provided as

required to fully complete the work in a manner consistent in the detail and other related details, and as approved by Engineer.

1.3 ENGINEER'S SELECTION AND APPROVAL OF MATERIALS

A. Where approval of Engineer for material or equipment is required, secure such approval prior to bidding in a written request.

B. The aesthetic values of every material and installation, such as shape, proportion, texture, finish and color, will be an important consideration to Engineer and his decisions concerning same shall be final, within the scope of the Contract Documents.

1.4 APPROPRIATE MATERIALS AND INSTALLATIONS

A. Furnish materials and equipment that have been properly inspected and tested in accordance with accepted industry standards. Make field laboratory test where specified herein, the cost of such being paid for by the Contractor, unless otherwise specified.

B. Before submitting any bids, the Contractor, and the Contractor's subcontractors and material suppliers shall observe the drawings and project manual and should any material and/or its installation be indicated or specified in a manner not approved by the material manufacturer, notify the Engineer and receive his instructions.

1.5 SITE ACCESS

A. Contractor shall provide adequate access to the site at the locations shown on the attached map, or other access routes that may be negotiated with individual homeowners by the contractor with approval of the Sponsor or Contracting Officer.

1.6 USE OF SITE

A. Site storage shall be confined to areas indicated on the site plan or as directed by Sponsor.

B. The Contractor shall obtain and pay for any additional storage or work areas needed for construction operations.

C. The Contractor shall be responsible for site maintenance within the construction area. Site maintenance includes trash pickup, and other actions that are required to maintain a neat and orderly site.

D. The Contractor shall be responsible for maintenance beyond the construction area for areas affected by construction operations. Maintenance includes removal of trash, mud, gravel, and other debris.

E. The Contractor is responsible for the security of the work area and for any building materials and equipment stored on the site. Maintain security of existing buildings where affected by work of this Contract.

1.7 PROTECTION OF WORK AND PROPERTY

A. The Contractor shall take charge of and assume full responsibility for proper protection of the construction areas.

B. Protect existing buildings and previously placed work by suitable coverings or other protections during installation of subsequent work. Clean off any foreign materials accidentally deposited on finish surfaces and, where such would stain, corrode or otherwise disfigure, clean it immediately with material that will not damage finished work.

C. Protect work in place requiring job finishing until such finishing has been completed. In cold weather, protect work form damage from frost and freezing. In hot weather, protect work from rapid drying.

D. Dumping on site of any liquid wastes including oils, fuels, concrete or mortar cleaning activities, paint, etc., is prohibited.

1.8 INSTALLATION

The Contractor shall:

A. Furnish, apply, install, connect, erect, clean and condition manufactured articles, materials and equipment per manufacturer's printed directions, unless otherwise indicated or specified.

B. The manufacturer's printed directions must be on job prior to and during installation of materials and equipment.

C. Make field check of actual dimensions before fabricating products.

D. Install materials only when conditions of temperature, moisture, humidity, and condition of adjacent components are conducive to achieving best installation results.

E. Handle materials in a manner to prevent scratching, abrading, distortion, chipping, breaking or other disfigurement.

F. Fabricate and install materials true to line, plumb and level, unless indicated otherwise. Leave finished surfaces smooth and flat or of smooth contour where indicated, free from wrinkles, warps, scratches, dents and other imperfections.

G. Conduct work in a manner to avoid injury to previously placed work.

1.9 CLOSING-IN WORK

A. Notify the Engineer to inspect any work when placing of subsequent work would prevent observation of previous work.

1.10 DEFECTIVE WORK

A. Unless the Engineer grants permission to repair any defective work, remove defective work from project and replace with new work in accordance with Contract Documents. If permission is granted, repair according to Engineer's direction. Permission to repair any such work shall not constitute a waiver of Engineer's right to require complete replacement of defective work if repair operation does not restore quality and appearance of member or surface to Engineer's satisfaction.

1.11 UNSUITABLE CONSTRUCTION CONDITIONS

A. During unfavorable weather, wet ground, or other unsuitable construction conditions, the Contractor shall confine operations to work which will not be affected adversely thereby. No portion of the work shall be constructed under conditions which would adversely affect the quality of efficiency thereof, unless special means of precautions are taken by the Contractor to perform the work in a proper and satisfactory manner.

1.12 PERFORMANCE

A. Where Drawings and/or Specifications designate a standard of performance, the completed installation shall perform at least to the designated standard.

1.13 TESTS OF MATERIALS

A. Furnish materials and equipment that have been properly inspected and tested in accordance with accepted industry standards. Make field or laboratory tests where specified herein, the costs of such being paid for by Contractor, unless otherwise specified.

B. Should such tests or visual observation indicate failure of materials or construction to meet requirements of the Drawings and/or Specifications, Contractor shall make and pay for additional tests, as directed by Engineer until compliance has been proven, and should such work fail to comply, Contractor shall replace it at his expense.

1.14 RECEIVING AND STORING MATERIALS

A. On receipt of materials, check for in-transit damage in ample time to replace any damaged materials prior to installation time.

B. Store materials in a manner to prevent deterioration, staining, soiling and intrusion of foreign materials. Provide waterproof, well-ventilated enclosures for materials subject to deteriorating by dampness. Adequately protect those materials subject to damage by freezing and frost.

C. Remove from premises and replace with new, any materials showing deterioration or damage.

1.15 EXISTING UNDERGROUND INSTALLATIONS

A. Existing underground installations such as water mains, gas mains, oil pipelines, sewers, telephone lines, power lines, and buried structures in the vicinity of the work to be done hereunder are indicated on the drawings only to the extent such information has been made available to or discovered by the Engineer in preparing the Drawings. There is no guarantee as to the accuracy or completeness of such information, and all responsibility for the accuracy or completeness thereof is expressly disclaimed. Generally, service connections are not indicated on the Drawings.

B. It is the Contractor's responsibility to contact 1-800-DIG-SAFE. The Contractor shall be solely responsible for contacting all utility companies and locating all existing underground installations, including service connections, in advance of excavating or trenching, by contacting the owners thereof and prospecting. The Contractor shall use his own information

and shall not rely upon any information shown on the drawings concerning existing underground installations.

C. Any delay, additional work, or extra cost to the Contractor caused by existing underground installations shall not constitute a claim for extra work, additional payment, or damages.

1.16 PRESERVATION OF MONUMENTS AND STAKES

A. The Contractor shall carefully preserve all monuments, benchmarks, property markers, reference points, and stakes. In case of his destruction thereof, the Contractor will be charged with the expense of replacement and shall be responsible for any mistake or loss of time that may be caused. In the cases of permanent monuments or benchmarks which must be removed or disturbed, the Contractor shall furnish material and assistance for the proper replacement of such monuments or benchmarks.

1.17 APPROPRIATE MATERIALS AND INSTALLATIONS

A. Before submitting bid, Contractor, his subcontractors, and material suppliers shall observe existing conditions, Specifications, Drawings, and Addenda thereto and should any material and/or its installation be indicated or specified in a manner not approved by the material manufacturer, notify Engineer and receive his instructions. Failing to do so, Contractor shall provide other equivalent materials, suitable for the installation, as selected by Engineer or if not discovered until after installation, Contractor shall replace materials with such other equivalent suitable materials as approved by Engineer, and in either event at no added cost. If additional or other types of work are required for desired satisfactory results and specified guarantee, the additional or other work shall be included in bid amount and shall not constitute a basis of claim for “extra work” during or upon completion of this project.

1.18 CONSTRUCTION REQUIREMENTS

A. Staking: A survey with benchmarks located is included in Drawings for Contractor’s use. All other surveying and staking will be the responsibility of the Contractor at his own expense.

B. Geotechnical Reports: Subsurface data has not been obtained for design purposes. The bidder shall make his own interpretations of existing conditions and shall be expected to obtain additional data at his own expense if required to satisfy himself as to the conditions to be encountered.

C. Storage: All equipment and materials to be incorporated into the work shall be stored in a manner to prevent damage from the elements, work, or handling. No damaged or deteriorated materials will be accepted. All storage, to include Owner-provided items, will be at the expense of the Contractor.

1.19 ADMINISTRATIVE REQUIREMENTS

A. Coordination: The Contractor shall perform the activities necessary to properly coordinate the material and equipment procurement and the work provided by him and his subcontractors. The Contractor also shall coordinate his work with the Sponsor when required for the best overall coordination of the project.

B. Progress Meetings: The Contractor shall hold progress meetings on the site with the Sponsor and Engineer, to discuss job-related problems. Persons designated by the Contractor to attend and participate in the meetings shall have all required authority to commit the Contractor to solutions agreed upon in the project meeting.

C. Progress Schedule: The Contractor shall submit to the Sponsor, prior to construction, a progress schedule. The schedule shall be detailed enough to reasonably allow the Sponsor to follow the progress of the work. The schedule shall be updated periodically as required by the work and as requested by the Sponsor.

D. All materials resulting from clearing and grubbing activities shall be removed and disposed of in an acceptable manner at an acceptable facility conforming to all applicable regulations.

END OF SECTION 01001

SECTION 01002 – SPECIAL CONDITIONS

PART 1 – GENERAL

1.1 RELATIONSHIP TO GENERAL CONDITIONS

A. Should conflict occur between these Special Conditions and the General Requirements, these Special Conditions shall take precedence. When these Special Conditions modify a portion of the General Conditions, the unaltered portions of the General Conditions shall remain in effect.

1.2 LOCATIONS, LINES AND LEVELS

A. Contractor shall establish location of new work on property and establish and maintain all other grades, lines, levels, and benchmarks; check and compare all drawings, verifying grades, lines, levels, and dimensions indicated thereon, and report all inconsistencies to Engineer and receive Engineer's instructions before commencing work.

1.3 DOCUMENTS FURNISHED

A. Contractor will be responsible for obtaining all necessary Drawings and Project Manuals, including all modifications thereof, as required, including distribution to subcontractors and suppliers.

B. Contractor shall pay the actual cost of reproduction for all additional sets requested by him.

1.4 LAWS TO BE OBSERVED

A. The Contractor shall at all times observe and comply with all federal and state laws, local laws, ordinances, orders, decrees and regulations existing or enacted subsequent to the execution of the Contract, which in any manner affect the prosecution of the work. The Contractor and his Surety shall indemnify and save harmless the Sponsor, the Sponsor's Architects, Engineers, and their representatives, agents, and employees against any claim or liability arising from or based on the violation of any such law, ordinance, regulation, order or decree, whether by himself, his employees or his subcontractors.

1.5 CONSTRUCTION OBSERVATION

A. The undertaking of periodic site visits by the Engineer or representative shall not be construed as supervision of actual construction nor make him responsible for providing a safe place for the performance of work by contractors or contractor's employees, or those of suppliers or subcontractors, or for access, visits, use, work, travel, or occupancy by any person.

1.6 CONSTRUCTION COORDINATION

A. Before starting any construction, a meeting shall be held with Sponsor, Contractor, Subcontractors, and Engineer to plan and coordinate the schedule of construction and to review intent of Contract Documents. Contractor and Subcontractor shall follow instructions received at this meeting in prosecuting the work.

END OF SECTION 01002

SECTION 01003 – SUMMARY

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Work covered by the Contract Documents
2. Type of Contract
3. Use of premises
4. Owner's occupancy requirements
5. Work restrictions
6. Specification formats and conventions

B. Related Sections include the following:

1. Division1 Section "General Requirements" for limitations and procedures governing temporary use of Sponsor's facilities.

1.3 WORK COVERED BY CONTRACT DOCUMENTS

A. The Work consists of the following:

1. The site work including addition of wooden, soil bioengineering, and rock structures, reconfiguration of existing streambank, planting of cover crop, mulching, and native plantings.

1.4 TYPE OF CONTRACT

A. Project will be constructed under a single prime contract.

1.5 USE OF PREMISES

A. General: Contractor shall have limited use of premises for construction operations as indicated on Drawings.

B. Use of Site: Limit use of premises to areas within the Contract limits indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.

1.6 OWNER'S OCCUPANCY REQUIREMENTS

A. Partial Owner Occupancy: Homeowners will occupy the premises during entire construction period, with the exception of areas under construction. Cooperate with Homeowners during construction operations to minimize conflicts and facilitate homeowner’s usage. Perform the Work so as not to interfere with Homeowners’ operations.

1. Provide not less than 72 hours' notice to homeowner of activities that will affect Homeowner's operations.

1.7 WORK RESTRICTIONS

A. On-Site Work Hours: Contractor’s normal working hours are acceptable. Any work expected during evenings or weekends should be coordinated with Homeowner’s schedule.

1. Provide not less than 72 hours' notice to Homeowners of activities outside normal working hours.

B. Existing Utility Interruptions:

1. Notify Engineer and Sponsor not less than three days in advance of proposed utility interruptions.

2. Do not proceed with utility interruptions without Engineer’s written permission.

1.8 SPECIFICATION FORMATS AND CONVENTIONS

A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:

1. Abbreviated Language: Language used in the Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated, shall be inferred as the sense requires. Singular words shall be interpreted as plural and plural words shall be interpreted as singular where applicable as the context of the Contract Documents indicates.

2. Imperative mood and streamlined language are generally used in the Specifications. Requirements expressed in the imperative mood are to be performed by Contractor. Occasionally, the indicative or subjunctive mood may be used in the Section Text for clarity to describe responsibilities that must be fulfilled indirectly by Contractor or by others when so noted.

3. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.

END OF SECTION 01003

SECTION 02102 – CLEARING AND GRUBBING

PART 1 – GENERAL

1.1 WORK INCLUDED IN THIS SECTION:

A. Clearing and grubbing required for this work includes, but is not necessarily limited to:

1 Removal of trees, stumps, debris, and brush.
2 Trimming and cutting of trees into sections and the satisfactory disposal of the trees and other vegetation designated for removal.
3 Removal and disposal of miscellaneous abandoned subsurface structures and debris that may be discovered during the work.

1.2 RELATED WORK IN OTHER SECTIONS:

A. Excavating, Filling and Grading Section B

1.3 JOB CONDITIONS:

A. Dust Control:

1. Use all means necessary to control dust on and near the work and on and near all borrow areas.

1.4 LINES AND GRADES:

A. All clearing and grubbing shall be done within the lines and grades shown on the drawings.

PART 2 – INSTALLATION

2.1 CLEARING:

A. Contractor shall only clear trees, stumps, brush, snags and other vegetation when necessary for the installation of the overall project. All other trees and vegetation shall be left standing. Trees and vegetation to be left standing shall be protected from damage during the completion of the work.

2.2 GRUBBING:

A. In areas requiring excavation, Contractor shall grub and remove material to a depth necessary to complete excavation to the limits indicated and complete required work. Material to be grubbed shall include stumps, roots larger than one inch in diameter, matted roots, and any miscellaneous subsurface structures and debris that may be encountered. Trees shall be Trees and plants to be relocated: Any tree or plants moved shall be done in a timely manner so as not to delay construction progress. The Contractor shall take extra measures to protect trees during the relocation by erecting barricades, staking, trimming, etc. as required. Trees shall be completely removed with stump ground down to a minimum depth below the grade of six (6) inches.

2.3 PROTECTION:

A. Contractor shall take precautions to protect any trees, vegetation, structures, benchmarks and survey stakes, and utilities not intended to be removed. Prior to beginning work, Contractor shall be responsible for field verifying that there are no utilities within the work area. Contractor shall be responsible for repairing and/or replacing, at no additional cost to the Sponsor, items that are damaged during construction that were not intended to be removed.

2.4 DISPOSAL OF MATERIAL:

A. All materials resulting from clearing and grubbing activities shall be removed and disposed of in an acceptable manner at an acceptable facility conforming to all applicable regulations. Materials suitable for use as aquatic habitat enhancement (stumps, logs, etc.) shall be stockpiled as directed by the Engineer.

PART 3 – MEASUREMENT AND PAYMENT

3.1 METHOD OF MEASUREMENT:

A. The quantity of Clearing and Grubbing will not be measured for payment unless the construction limits are changed. Clearing and Grubbing shall be considered subsidiary to Excavating, Filling, and Grading. No adjustment will be made for changes involving less than 0.1 acre (0.04 ha).

3.2 BASIS OF PAYMENT:

A. The amount of work completed and approved, as stated above, shall be paid for as part of the contract lump sum price. Such payment shall constitute full compensation for all labor, equipment, tools and all other items necessary and incidental to completion of the work.

B. In the event of a change in construction limits, the Contractor shall submit a unit price for Clearing and Grubbing to be approved by the Engineer.

END OF SECTION 02102

SECTION 02200 – EXCAVATING, FILLING AND GRADING

PART 1 – GENERAL

A.1 WORK INCLUDED IN THIS SECTION:

A. Excavating, filling and grading required for this work includes, but is not necessarily limited to:

1. Excavating, filling and backfilling for streambank stabilization.

2. Rough and finish grading of streambank.

3. Preparation of sub-grade for areas to be seeded, planted with trees and shrubs, and/or mulched.

1.2 RELATED WORK IN OTHER SECTIONS:

A. Clear and Grubbing: Section 02101

1.3 JOB CONDITIONS:

A. Dust Control:

1. Use all means necessary to control dust on and near the work and on and near all offsite borrow areas, if such dust is caused by the Contractor's operations during performance of the work, or if resulting from the condition in which the Contractor leaves the site.

B. Protection: Use all means necessary to protect all materials of this section before, during, and after installation, and to protect all objects designated to remain. In the event of damage, immediately make all repairs and replacements necessary to the approval of the Engineer and at no additional cost to the Sponsor. Protect tops, trunks and roots of existing trees on project site which are to remain.

C. Notification: The Contractor shall notify the Engineer prior to installation of specified portions of the work to allow the inspector sufficient time to inspect the work and shall obtain approval of all material prior to commencing construction. Any portion of the work installed without inspection may be removed to allow for inspection. Any eventual difficulty or loss of time caused by the Contractor failing to meet permit requirements shall be borne solely by the Contractor.

1.4 LINES AND GRADES:

A. All excavation, filling and backfill shall be done to the lines and grades shown on the drawings.

1.5 BENCH MARKS AND MONUMENTS:

A. Maintain carefully all bench marks and reference points, which are shown on the drawings. The Contractor shall pay for the replacement of such reference points if disturbed by the Contractor during construction.

1.6 REFERENCES:

A. The publications listed below form a part of this specification. The latest revision of the following standards shall apply to work hereunder:

Associated General Contractors of America, Inc.
"Manual of Accident Prevention in Construction"

PART 2 – PRODUCTS

2.1 FILL MATERIAL, GENERAL:

A. All fill material for embankment construction shall come from onsite unless otherwise specified by the engineer. All fill material shall be subject to approval of the Engineer.

2.2 IMPORTED FILL MATERIAL:

A. If imported fill material is required to finish embankments or sub-grade. The Contractor shall be responsible for providing a borrow area for imported fill.

2.3 TOPSOIL:

A. All areas disturbed by construction operations, which are not to be paved or rocked under this contract, shall be provided with a 12-inch uncompacted layer of topsoil approved by the Engineer. Topsoil from areas within the project limits may be stockpiled and used where such topsoil is considered satisfactory to sustain plant growth. Additional materials, if required, shall be brought to final grade, as shown on the drawings, and shall be lightly compacted.

2.4 OTHER MATERIAL:

A. All other materials not specifically described, but required for proper completion of the work of this section, shall be as selected by the Contractor, subject to the approval of the Engineer.

PART 3 – INSTALLATION

3.1 GENERAL:

A. Familiarization: Prior to all work in this section, become thoroughly familiar with the site, the site conditions, and all portions of the work falling within this section.

B. Backfilling Prior to Approval

1. Do not allow or cause any of the work installed to be covered up or enclosed by work of this section prior to all required inspections, tests, and approval.

2. Should any of the work be so enclosed or covered up before it has been approved, uncover all such work at no additional cost to the Sponsor.

C. Site Drainage: During construction, excavation and fill shall be performed in a manner and sequence that will provide drainage at all times.

3.2 EXCAVATION AND FILLING:

A. General: Excavation, as hereinafter specified, shall comprise the satisfactory removal and disposition of all material. After topsoil removal has been done, excavation of every description and of whatever substances encountered, shall be performed to the lines and grades indicated on the drawings. After backfilling of key trenches has been completed, any surplus of excavated material shall be known as "waste" and shall be disposed of at the location approved by the Engineer. Any additional fill material required, that is not available from excavation within the immediate project area, shall be obtained from borrow area locations approved by the Engineer. During construction, excavation, key trenching, and backfilling shall be performed in a manner and sequence that will provide drainage at all times.

1. Classification of Excavation: Excavation shall be unclassified.

2. Earth and Rock Excavation shall be unclassified. Earth and Rock Excavation shall include earth, clay, silt, sand, gravel, hard pan, loose shale, loose stone masses, boulders, rock material in ledges, bedded deposits, unstratified masses, and conglomerate deposits so firmly cemented that they possess the characteristics of solid rock, which cannot be removed without systematic drilling.

B. Depressions Resulting from Removal of Obstructions: Where depressions result from, or have resulted from, the removal of surface or subsurface obstructions, open the depression to equipment working width and remove all debris and soft material, as directed by the Engineer.

C. Sloped Surfaces: Sloped ground surfaces steeper than 1 vertical to 4 horizontal, on which fill is to be placed, shall be plowed, stepped (benched) or broken up, in such manner that the fill material will bond with the existing surface.

D. Fill and Backfill: All fill or backfill material shall consist of earth or other approved material with all undesirable material removed. Unless otherwise specified, all fill shall be uniformly placed uniform layers to achieve a 3H:1V slope or as specified by the Drawings and then compacted in 9-inch lifts by equipment.

E. Over-excavation: Backfill and compact all over-excavation areas, as specified for fill, at no additional cost to the Sponsor.

F. Unfavorable Weather: Ground frozen or too wet - do not place, spread, or roll any fill material during unfavorable weather conditions. Do not resume operations until moisture content and fill density are satisfactory to the Engineer.

G. Overbank flow: To prevent erosion of finished slopes from overland flow, provide berms and rock chutes or slope drain devices along sections of disturbed bank where drainage is towards the disturbed bank.

H. Soften Sub-grade: Where soil has been softened or eroded by flooding or placement during unfavorable weather, remove all damaged areas and re-compact as specified for fill and compaction below.

I. Dewatering: Provide and maintain at all times during construction, ample means and devices with which to promptly remove and dispose of all water from every source entering the excavations or other parts of the work. Dewater by means, which will insure dry excavation and the preservation of the final lines and grades of bottoms of excavation.

3.3 BACKFILLING:

A. General Backfill: Unless otherwise specified by the Drawings, all channel slopes shall be shaped to a 3H:1V slope which smoothly transitions into the existing slope at each end of the project.

B. Responsibility of Contractor for Backfill Settlement:

1. The Contractor shall be responsible for the satisfactory compaction and maintenance of all backfill of any description required under this contract. If, prior to the final acceptance of this entire contract, any backfilled areas are found to have settled, they shall immediately be reworked by the Contractor and restored to the specified grades.

3.4 FINISH GRADING

A. The finishing of side slopes, cuts and fills shall be to reasonably smooth uniform surfaces that will merge with the adjacent terrain without noticeable break. Finishing shall be done in accordance with grades shown on the drawings, and without variations that are readily discernible.

B. Finish grading shall be performed to the lines and grades shown on the drawings. All areas disturbed by the Contractor during construction operations shall be bladed smooth, shaped, and compacted, as specified herein before. The finished grade shall provide for topsoil that is free from perennial vegetation and is loosened to depth of twelve (12) inches for areas disturbed under this contract.

C. Newly graded areas shall be protected from traffic, erosion, and any settlement or washing away that may occur from any cause, prior to acceptance, shall be repaired and grades reestablished to the required elevations and slopes. Damaged areas shall be re-vegetated, if necessary.

D. Haul roads into the work sites shall be ripped to loosen compacted soils prior to removing equipment from the project site.

3.5 BORROW AND SPOIL AREAS:

A. Borrow and spoil areas shall be graded to promote positive drainage at the completion of the work. No borrow or spoil slopes shall be greater than 3 horizontal to 1 vertical.

B. Erosion controls shall be implemented to prevent erosion into waterways.

C. Borrow and spoil areas shall be seeded and mulching shall be applied at the completion of construction.

3.6 CLEANING UP:

A. Upon completion of the work of this section, immediately remove all debris and excess earth materials from the site.

PART 4 – MEASUREMENT AND PAYMENT

4.1 METHOD OF MEASUREMENT:

A. Work will be measured by bid quantity of cubic yards of soil. Contractor shall maintain weight tickets for soil trucked to the site. Material moved on site by earth moving equipment will be paid at the contract unit price and units indicated.

4.2 Basis of Payment:

A. The amount of work completed and approved, as stated above, shall be paid for at the contract unit price. Such payment shall constitute full compensation for all labor, equipment, tools and all other items necessary and incidental for the completion of the work.

END OF SECTION 02200

SECTION 02205 – GEOTEXTILE AND FILTER FABRIC

PART 1 – GENERAL

1.1 DESCRIPTION:

A. This section covers filter fabric to be used at various locations within the project area. Items include, but are not necessarily limited to:

1. Procurement, storage and protection of all filter fabric.

2. Preparation of fabric sub-grade.

3. Installation, anchoring, and covering filter fabric.

1.2 RELATED WORK IN OTHER SECTIONS:

A. Excavating, Filling and Grading: Section 02200

B. Riprap for Rock Chutes: Section 02840

C. Vegetated Geogrid: Section 02935

D. Rock Structures for Stabilization: Section 03162

1.3 REFERENCES:

A. The publications listed below form a part of this specification to the extent referenced. The latest revision of the following standards shall apply to work hereunder:

1. ASTM D1117: Standard Test Method for Water Absorption

2. ASTM D3786: Standard Test Method for Bursting Strength of Textile Materials

3. ASTM D4355: Standard Test Method for Deterioration of Geotextiles for Exposure to Ultraviolet Light and Water

4. ASTM D4632: Standard Test Method for Breaking Force and Elongation of Textile Fabrics

5. ASTM D4751: Standard Test Method for Apparent Opening Size

6. ASTM D4833: Standard Test Method for Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products

7. ASTM D5262: Standard Test Method for Plastics: Dynamic Mechanical Properties

8. ASTM D6475: Standard Test Method for Measuring Mass Per Unit Area of Erosion Control Blankets

9. ASTM D6637: Standard Test Method for Determining Tensile Properties of Geogrids by the Single or Multi-Rib Tensile Method

10. ASTM D6818: Standard Test Method for Ultimate Tensile Properties of Turf Reinforcement Mats

1.4 LINES AND GRADES:

A. All placement of filter fabric shall conform to the lines and grades shown on the Drawings or on the plans.

PART 2 – PRODUCTS

2.1 FILTER FABRIC:

A. Geotextiles shall be manufactured from randomly oriented synthetic long chain or continuous polymeric filaments or yarns (such as polypropylene, polyethylene, polyester, polyamide or polyvinylidene-chloride) bonded together by the needle-punched process. In addition, one side may be slightly heat-bonded. The geotextile shall be formed into a stable network of filaments or yarns that retain their relative position to each other; are inert to commonly encountered chemicals; and are resistant to ultraviolet light, heat, hydrocarbons, mildew, rodents and insects. The geotextile shall be free of any chemical treatment or coating that might significantly reduce its permeability and shall have no flaws or defects that significantly alter its physical properties.

B. The filter fabric shall be Mifafi 160N or equivalent and meet the following minimum requirements:

| **PROPERTY** | **Test Method** | **Minimum Value** |
|---|---|---|
| Tensile Strength | ASTM D4632 | 160 lbs |
| Bursting Strength | ASTM D3786 | 305 psi |
| Elongation | ASTM D4632 | > 50% |
| Puncture | ASTM D4833 | 95 lbs |
| UV Resistance @ 150 hours | ASTM D4355 | 70% |
| Apparent Opening Size | ASTM D4751 | #70 (max) |

C. Geogrid shall be manufactured from high molecular weight, high tenacity polyester multifilament yarns which are woven in tension and finished with a PVC coating. The geogrid shall be formed into a stable network of filaments or yarns that retain their relative position to each other; are inert to commonly encountered chemicals; and are resistant to ultraviolet light, heat, hydrocarbons, mildew, rodents and insects. The geogrid shall be free flaws or defects that significantly alter its physical properties.

D. The geogrid material shall be Mirafi 3XT or equivalent and meet the following minimum requirements:

| PROPERTY | Test Method | Minimum Value |
|---|---|---|
| Tensile Strength | ASTM D6637 | 3500 lbs/ft. |
| Tensile Strength @ 5% Strain | ASTM D6637 | 1056 lbs/ft. |
| Creep Reduced Strength | ASTM D5262 | 2215 lbs/ft. |
| Grid Aperture Size | - | 0.875 in |
| Grid Aperture Size – Cross | - | 1.0 in. |
| Roll Width | - | 12 ft. |

E. Erosion Control Blanket (ECM) shall be designated as short-term, extended-term, and long-term temporary protection.

1. Short-term ECM shall be N. American Green S75 or equivalent and manufactured from 100% agricultural straw matrix and have a functional longevity of approximately 12 months. The straw shall be evenly distributed over the entire area of the mat. The blanket shall be covered on top with lightweight polypropylene netting. The ECB shall be free flaws or defects that significantly alter its physical properties.

2. Extended-term ECM shall be North American Green SC150 or equivalent and manufactured from a 70% straw and 30% coconut fiber matrix and have a functional longevity of approximately 24 months. The straw/coconut fiber shall be evenly distributed over the entire area of the mat. The blanket shall be covered on top with heavyweight polypropylene netting having ultraviolet additives to delay breakdown. The bottom side shall be covered with lightweight photodegradable polypropylene netting. The ECB shall be free flaws or defects that significantly alter its physical properties.

3. Long-term ECM shall be North American Green C125 or equivalent and manufactured from a 100% coconut fiber matrix and have a functional longevity of approximately 36 months. The coconut fiber shall be evenly distributed over the entire area of the mat. The blanket shall be covered on top and bottom with heavy weight polypropylene netting having ultraviolet additives to delay breakdown. The ECB shall be free flaws or defects that significantly alter its physical properties.

F. The Erosion Control Blanket shall meet the following minimum requirements:

Short-Term Temporary Protection

| PROPERTY | Test Method | Minimum Value |
|---|---|---|
| MD Tensile Strength | ASTM D6818 | 130.8 lbs/ft. |
| TD Tensile Strength | ASTM D6818 | 85.2 lbs/ft. |
| TD Elongation | ASTM D6818 | 26.8 % |
| Weight | ASTM D6475 | 11.97 oz/yd$^2$. |
| Thickness | ASTM D6525 | 0.37 in. |
| Water Absorption | ASTM D1117 | 426% |

Extended-Term Temporary Protection

| PROPERTY | Test Method | Minimum Value |
|---|---|---|
| MD Tensile Strength | ASTM D6818 | 146.6 lbs/ft. |
| TD Tensile Strength | ASTM D6818 | 146.6 lbs/ft. |
| TD Elongation | ASTM D6818 | 25.2 % |
| Weight | ASTM D6475 | 11.44 oz/yd$^2$. |
| Thickness | ASTM D6525 | 0.39 in. |
| Water Absorption | ASTM D1117 | 285% |

Long-Term Temporary Protection

| PROPERTY | Test Method | Minimum Value |
|---|---|---|
| MD Tensile Strength | ASTM D6818 | 294 lbs/ft. |
| TD Tensile Strength | ASTM D6818 | 205.2 lbs/ft. |
| TD Elongation | ASTM D6818 | 28.4 % |
| Weight | ASTM D6475 | 8.00 oz/yd$^2$. |
| Thickness | ASTM D6525 | 0.31 in. |
| Water Absorption | ASTM D1117 | 220% |

G. The geotextile shall be shipped in rolls wrapped with a protective covering to keep out mud, dirt, dust, debris and direct sunlight. Each roll of geotextile shall be clearly marked to identify the brand, type and the individual production run.

2.2 STAPLES AND FASTENERS:

A. The Contractor shall provide staples, fasteners, pins, etc. that are biodegradable resin, polyethylene, or metal. Fasteners shall be a minimum of 3/16 of an inch in diameter and 12 inches in length. A flat washer shall be used with metal pins, and shall be a minimum of 1-½ inches in diameter.

PART 3 – INSTALLATION

3.1 GEOTEXTILE AND FILTER FABRIC:

A. The Contractor shall install materials as shown on the Drawings. ECB shall be installed in a directional manner as recommended by the manufacturer.

B. The Contractor shall assume a 20% scrap factor above that specified in the bid quantities (overlap and burial loss) for filter fabric. Material will be trenched at the top and bottom of the slopes and shall be installed to match the final graded contour of the riprap. A minimum lap of 24 inches is required if the fabric is installed in more than one piece or for splicing of new rolls. The Contractor shall account for all scrap and trench-secured quantities in his/her quotation. Such quantities are considered incidental and non-payable for the project.

C. Place filter fabric over entire bedding material as shown on the Drawings. The filter fabric shall be loosely laid (not stretched) such that it will conform to any minor surface irregularities. No cuts or punctures in the fabric will be permitted.

D. The filter fabric shall be anchored to a minimum depth of 12 inches into the trench.

E. The filter fabric shall not be left exposed for more than 48 hours.

3.2 STAPLES AND FASTENERS:

A. Staples, fasteners, pins, etc. shall be installed as per the recommendations of the manufacturer.

3.3 FIELD QUALITY CONTROL:

A. Notification: The Contractor shall notify the Engineer 24 hours prior to installation of any portion of the work to allow the Engineer sufficient time to inspect the work and shall obtain approval of all material prior to commencing construction. Any portion of the work installed without inspection may be removed to uncover sufficient portions of the work to allow inspection.

PART 4 – MEASUREMENT AND PAYMENT

4.1 METHOD OF MEASUREMENT:

A. Work will be measured by square yards of material placed.

4.2 BASIS OF PAYMENT:

A. The amount of work completed and approved, as stated above, shall be paid for subsidiary to the rock chute, vegetated geogrid, or other structure requiring geotextile or filter fabric.

END OF SECTION 02205

SECTION 02840 – ROCK RIPRAP FOR ROCK CHUTES

PART 1 – GENERAL

1.1 DESCRIPTION:

A. This section covers rock riprap to be used at various locations within the project area. Items include, but are not necessarily limited to:

1. Procurement, storage and handling of riprap.

2. Preparation of subgrade for installation of riprap.

3. Installation of riprap.

1.2 RELATED WORK IN OTHER SECTIONS:

A. Excavation, Filling, and Grading: Section 02200

B. Filter Fabric: Section 02205

1.3 REFERENCES:

A. The publications listed below form a part of this specification to the extent referenced. The latest revision of the following standards shall apply to work hereunder:

1. ASTM C 88: Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate

2. ASTM C 127-88: Standard Test Method for Specific Gravity and Absorption of Coarse Aggregate

3. ASTM D 5312-92: Standard Test Method for Evaluation of Durability of Rock for Erosion Control under Freezing and Thawing Conditions

1.4 LINES AND GRADES:

A. All placement of riprap shall conform to the lines and grades shown on the drawings.

PART 2 – PRODUCTS

2.1 ROCK RIPRAP:

A. Material shall be free from dirt, clay, sand, rock fines and other materials not meeting the required gradation limits.

B. The rock shall be dense, sound and free from cracks, seams and other defects conducive to accelerated weathering. Except as otherwise specified, the rock shall be angular to sub rounded in shape. The least dimension of an individual rock fragment shall not less than one-third the greatest dimension of the fragment.

C. The riprap materials shall be reasonably well graded by weight within the limits stated on the Drawings:

PART 3 – INSTALLATION

3.1 INSTALLING ROCK RIPRAP:

A. The sub-grade surfaces on which the rock riprap, filter, bedding or geotextile is to be placed shall be cut and graded to the lines and grades shown on the drawings. The surface to which the riprap is to be placed shall be reasonably smooth and free of mounds, dips, or windrows.

B. The riprap shall be placed by equipment on the surfaces and to the depths specified. The riprap shall be installed to the full course thickness in one operation and in such a manner as to avoid serious displacement of the underlying material. The riprap shall be delivered and placed in a manner that will ensure that the riprap shall be reasonably homogeneous with the larger rocks uniformly distributed and firmly in contact one to another with the smaller rocks and spalls filling the voids between the larger rocks. Riprap shall be placed in a manner to prevent damage to structures. Hand placing will be required as necessary to prevent damage to any new and existing structures.

3.2 MAINTENANCE:

A. If, at any time before 12 months after the completion and acceptance of the work, there shall be any settlement requiring repairs to be made in any property along the line of work, or should any defect appear in the work due to neglect, carelessness or improper construction on the part of the Contractor, the Contracting Officer will notify the Contactor to make such repairs and remedy any defects. The Contractor shall, within 5 days after such notice, begin and carry out such repairs at no additional cost to the Owner.

END OF SECTION 02840

SECTION 02900 – PROTECTION OF SOIL AND VEGETATION

PART 1 – GENERAL

1.1 WORK INCLUDED IN THIS SECTION:

A. This section governs measures and sets environmental protection performance, restoration, and design standards for protecting and restoring native soils and vegetation that are impacted by heavy construction equipment and other site construction activities.

1.2 RELATED WORK IN OTHER SECTIONS:

A. Excavating, Filling and Grading Section 02200

1.3 REFERENCES:

A. The following standards are referenced directly in this section. The latest version of these standards shall be used.

1. NRCS Planning and Design Manual, NRCS, 1998

2. Home Landscapes, Planting, Design and Management, E.C. Martin, Jr., and Pete Melby, Timber Press

3. American Standard for Nursery Stock

PART 2 – PRODUCTS:

2.1 STANDARDS

A. All materials used during this portion of the work shall meet or exceed applicable federal, state, county and local laws and regulations. The use of any herbicide shall follow directions given on the herbicide label. In the case of a discrepancy between these specifications and the herbicide label, the label shall prevail.

2.2 MATERIALS

A. Prior to delivery of any materials to the site, submit to the Engineer a complete list of all materials to be used during this portion of the work. Include complete data on source, amount and quality. This submittal shall in no way be construed as permitting substitution for specific items described on the plans or in these specifications unless approved in writing by the Engineer.

PART 3 – INSTALLATION

3.1 GENERAL

A. Selective Clearing is removal of undesirable trees and underbrush around specimen trees and brush as designated on the drawings and/or instructed by the Engineer.

B. Soil and specimen trees as shown on the drawings and/or instructed by the Engineer to save, shall be protected from damage incident to clearing, grubbing, and construction operations.

3.2 PLANT PRESERVATION

A. The Engineer shall mark all plant materials on the site to be saved and/or relocated. No plant material may be removed from the site prior to the Engineer's inspection. All plant material to be saved/or relocated will be protected from injury to the roots and to the branches, to a distance five feet beyond the drip-line. No grading, trenching, pruning, or storage of materials may go in this area, except as approved by the Engineer.

B. Trees and plants to be relocated: Any tree or plants moved shall be done in a timely manner so as not to delay construction progress. The CONTRACTOR shall take extra measures to protect the tree during the relocation by erecting barricades, staking, trimming, etc. as required.

3.3 FIELD QUALITY CONTROL

A. Qualifications of workmen: provide at least one person who shall be present at all times during execution of this portion of the work, who shall be thoroughly familiar with this type of work and the type of materials being used. Said person shall be competent at identification of soils and plant materials to be removed and to be preserved during the season (summer, winter) work is to be completed. Said person shall also direct all work performed under this section.

END OF SECTION 02900

SECTION 02903 – ROOTWAD REVETMENTS

SUMMARY: The work described herein consists of harvesting and installing rootwad revetments for bank toe stabilization. The Contractor shall perform all soil preparation, placement, and such additional extra and incidental work as may be necessary to complete the work in accordance with the specification and plans. The Contractor shall furnish all required materials, equipment, tools, labor, and incidentals, unless otherwise provided in the specifications or Drawings.

PART 1 - GENERAL

1.1 DESCRIPTION:

A. Rootwad revetments are structures constructed from interlocking tree materials. These structures are continuous and resistive type methods and are designed to resist erosive flows. These structures are located along the outside bend of stream meanders. These structures are intended to mimic natural systems and improve the aquatic habitat. This method should only be considered if the natural materials are found on-site. This work shall consist of furnishing and installing the necessary materials as specified in the Drawings. This section includes but is not limited to:

Harvesting of wood

Preparation of placement sites

Installing rootwads

B. Related Work in Other Sections:

Excavating, Filling and Grading: Section 02200

1.2 QUALITY ASSURANCE:

A. Qualification of Workmen: Provide at least one person who shall be present at all times during execution of this portion of the work and who shall be thoroughly familiar with the type of materials being installed and the best methods for their installation and who shall direct all work performed under this Section.

B. Wood Requirements:

The root fan should be of sufficient diameter to reach from the depth of the maximum scour to the annual high water elevation. If the root fan is not sufficient, then several root fans can be stacked to achieve the proper diameter. The length of rootwad fan should be four times the projected scour behind the rootwad. Typically, the fan lengths are 10 feet on small streams and over 20 feet on larger rivers. The trunk should be firmly attached to the root fan. The footer log should have a diameter of at least three-quarters the rootwad trunk.

PART 2 - MATERIALS

2.1 PLANT MATERIALS:

A. General: Existing wood materials should be located on-site. Care should be taken to select trees that are free of physical damage.

2.2 HARVESTING WOOD:

A. Trees

1. Trees should be removed by machinery so that the root mass and trunk are intact. The trunk then must be cut to the appropriate length.

B. Transportation, Storage, and Handling:

1. All wood materials are located on-site, and should be removed by machinery provided by contractor.

C. Site Disturbances:

1. Take precautions to insure that equipment and vehicles do not disturb or damage existing grading, seeding, or other site improvements.

2. Repair and/or return to original condition any damage at no cost to Sponsor.

PART 3 - INSTALLATION

3.1 SURFACE CONDITIONS:

A. Inspection:

Prior to all work of this Section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where these installations may properly commence.

Verify that planting, seeding and related construction work may be completed in accordance with the Drawings and the referenced standards.

B. Discrepancies:

In the event of discrepancy, immediately notify the Engineer. Do not proceed with installation in areas of discrepancy until all such discrepancies have been fully resolved.

3.2 PLACEMENT

A. Wood

1. The root fan should be oriented into oncoming flow. The rootwad should be placed at an elevation such the fan reaches the maximum scour depth. The rootwad trunk is excavated into the bank.

2. The footer log should be parallel to the streambank and extend past the root fan on both ends to protect the bank against eddying. The footer should be placed at an elevation to support the rootwad and is typically above the maximum scour depth. Rootwads are typically spaced three to four times the length of root mass. When both pieces are placed, the rootwad should be set on top of the footer log diagonally, forming and "X".

B. Rock

1. Place ballast rock in accordance with the Drawings in a manner to secure the rootwad. The ballast rock shall not exceed 5 percent fines.

3.3 SPREADING OF TOP SOIL:

A. Finish Grading: All finish grading will be performed according to Section 02002 of these Specifications, in all graded areas.

3.4 INSPECTION:

A. In addition to normal progress inspections, schedule and conduct the following formal inspections, giving the Engineer at least 24 hours prior notice of readiness for inspection:

Final inspection after completion of planting; schedule this inspection sufficiently in advance, and in cooperation with the Engineer, so that final inspection may be conducted within 24 hours after completion of placement.

Clean-up: During the progress of this work, and upon completion, thoroughly clean the project area and remove and properly dispose of all resultant dirt, debris and other waste materials.

PART 4 - MEASUREMENT AND PAYMENT

4.1 METHOD OF MEASUREMENT:

A. Work shall be subsidiary to rock vanes and longitudinal peak stone toe protection (LPSTP).

4.2 BASIS OF PAYMENT:

A. The amount of work completed and approved, as stated above, shall be paid as a lump sum subsidiary to the rock vanes and LPSTP.

END OF SECTION 02903

SECTION 03162 – CONCRETE AND ROCK STABILIZATION STRUCTURES

PART 1 – GENERAL

1.1 DESCRIPTION:

A. This section covers rock check dams, rock vanes, cross vanes, engineered rock riffles, bendway weirs, and longitudinal peaked stone toe protection (LPSTP) to be used at various locations within the project area as shown on the project design sheet. Items include, but are not limited to:

1. Rock gradation, procurement, storage, and handling.

2. Sub-grade preparation prior to rock installation.

3. Rock installation.

B. Types of structures covered by this specification:

1. Rock Blanket

2. Rock Channel

3. Rock Vanes

4. Rock Berm

5. Rock Bendway Weirs

6. Rock Base

7. LPSTP

8. Rock Chute

9. Stream Barbs

10. Check Dams

11. Rock Apron

12. Rock Ditch

13. Rootwad Revetments

C. Related Work in Other Sections:

1. Excavating, Back Filling, and Grading: Section 02200

1.2 REFERENCES:

A. The publications listed below form a part of this specification to the extent referenced. The latest revision of the following standards shall apply to work hereunder:

1. ASTM C 88: Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate

2. ASTM C 127-88: Standard Test Method for Specific Gravity and Absorption of Coarse Aggregate

3. ASTM D 5312-92: Standard Test Method for Evaluation of Durability of Rock for Erosion Control under Freezing and Thawing Conditions

1.3 LINES AND GRADES:

A. Rock placement shall conform to the lines and grades shown on the technical drawings.

PART 2 – PRODUCTS

2.1 MATERIALS:

A. Material shall be reasonably free from dirt, clay, sand, rock fines and other materials not meeting the required gradation limits.

B. Except as otherwise specified, the rock shall be angular to sub rounded in shape. The rock shall be dense, sound and free from cracks, seams and other defects conducive to accelerated weathering. The least dimension of an individual rock fragment shall not be less than one-third the greatest dimension of the fragment. Except as otherwise provided, the rock shall be tested and shall have the following properties:

1. Bulk Specific Gravity (saturated surface-dry basis) shall not be less than 2.4 when tested in accordance with ASTM C 127.

2. Absorption shall not be more than 4 percent when tested in accordance with ASTM C 127.

3. The weight loss in 5 cycles shall not be more than 20 percent when sodium sulfate is used or more than 25 percent when magnesium sulfate is used when tested in accordance with ASTM C 88 for soundness

4. Rock that fails to meet the requirements stated above in 1, 2, or 3 may be accepted only if similar rock from the same source has been demonstrated to be sound after 5 years or more of service under conditions of weather, wetting and drying, and erosive forces similar to those anticipated for the rock to be installed under this specification.

C. Poorly sorted rock materials shall be reasonably well graded by weight and poorly sorted by size, within the limits stated below or on the Drawings to meet the following requirements:

**Aggregate Gradation A ($D_{50}$ = 24 in.)**

| Size (lbs) | Percent Heavier |
|---|---|
| 10 | 90 |
| 450 | 50 |
| 1000 | 0-10 |

**Aggregate Gradation A ($D_{50}$ = 18 in.)**

| Size (lbs) | Percent Heavier |
|---|---|
| 10 | 85-100 |
| 100 | 60-80 |
| 250 | 30-60 |
| 600 | 0-10 |

**Aggregate Gradation A ($D_{50}$ = 12 in.)**

| Size (lbs) | Percent Heavier |
|---|---|
| 5 | 85-100 |
| 50 | 50-70 |
| 100 | 5-15 |
| 400 | 0 |

D. Sorted riprap rock material shall be well graded by weight and size; within the limits stated below or on the Drawings to meet the following requirement. Riprap shall be free from earth, soapstone, shale, shalelike or other easily disintegrated material that decreases material durability after placement.

**Aggregate Gradation B ($D_{50}$ = 18 in.)**

| Size (lbs) | Percent Heavier |
|---|---|
| 5 | 90 |
| 100 | 50 |
| 250 | 0-10 |

**Aggregate Gradation B ($D_{50}$ = 12 in.)**

| Size (lbs) | Percent Heavier |
|---|---|
| 5 | 90 |
| 75 | 50 |
| 200 | 0-10 |

**Aggregate Gradation B ($D_{50}$ = 3 in.)**

| Size (In.) | Percent Retained on Sieve Size |
|---|---|
| 1 1/2 | 85 |
| 3 | 50 |
| 4 | 15 |

E. Crushed rock for filter course material shall be within the limits stated blow or on the Drawings to meet the following requirement.

**Aggregate gradation C (Crushed Rock)**

| Size (In.) | Percent Retained on Sieve Size |
|---|---|
| No. 4 | 70-95 |
| 3/8 | 55-85 |
| 1 | 25-60 |
| 2 | 10-40 |
| 4 | 0-5 |

PART 3 – INSTALLATION

3.1 INSTALLING ROCK STRUCTURES:

A. The sub-grade surfaces on which the rock, filter, bedding, or geotextile is to be placed shall be cut and graded to the lines and grades shown on technical drawings. The surface to which the rock is to be placed shall be reasonably smooth and free of mounds, dips, or windrows.

B. The rock shall be placed by equipment on the surfaces and to the depths specified. The rock shall be installed to the full course thickness in one operation and in such a manner as to avoid serious displacement of the underlying material. The rock shall be delivered and placed in a manner that will ensure the rock shall be reasonably homogeneous with the larger rocks uniformly distributed and firmly in contact one to another with the smaller rocks and spalls filling the voids between the larger rocks. Rock shall be placed in a manner to prevent damage to existing structures. Hand placing will be required as necessary to prevent damage to any new and existing structures.

C. Side slopes should be the natural angle of repose, which approximates 1.5 ft. horizontal to 1 ft. vertical.

3.2 MAINTENANCE:

A. If, at any time before 12 months after the completion and acceptance of the work, there shall be any settlement requiring repairs to be made along the line of work, or should any defect appear in the work due to neglect, carelessness or improper construction on the part of the Contractor, the Contracting Officer will notify the Contactor to make such repairs and remedy any defects. The Contractor shall, within 5 days after such notice, begin and carry out such repairs at no additional cost to the owner.

PART 4 – MEASUREMENT AND PAYMENT

4.1 METHOD OF MEASUREMENT:

A. Work will be measured by tons of rock placed.

4.2 BASIS OF PAYMENT:

A. The amount of work completed and approved, as stated above, shall be paid for at the contract unit price.

END OF SECTION 03162

***APPENDIX J***

***STAND EVALUATION WORKSHEET***

# Grass/Legume Stand Evaluation

**Name:**

**Field Location:**

**Transect No:**

**Date:**

**Completed By:**

| Species and/or Variety | Plants / Square Foot Plot | | | | | | | | | | | | | | | | | | | | | | | | | Total | Average |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | | |
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| **Totals Per Count** | | | | | | | | | | | | | | | | | | | | | | | | | | | |

**Indicate how field was sampled:**

Seeding Direction

Total Acres

**Total number of plots:** 0

Average Density (plant/sq. foot):

Plant Vigor: Low ☐ Medium ☐ High ☐

Weed Competition:

Comments:

**Recommendations to Cooperator:**

**Guidelines:**

→ Sample in a systematic and uniform manner

→ Minimum of 10 plots for each 10 acres or less of field size

→ Avoid areas that may have been double-seeded

→ Sample perpendicular or diagonal to drill rows

Minimum density of seeded species should be:
(3 - 5 plants per square foot) Practices 512, 550
(1 - 2 plant per square foot) Practice 327
(the lower limit for rhizomatous species; upper limit for bunch-type or mixtures) See part 9 of "Herbaceous Vegetation Establishment Guide" for additional guidance.

→ Use a 1 square foot frame (12 in. X 12 in.) or count parallel drill rows:

| Row spacing | No. of rows | Length |
|---|---|---|
| 6 inches | 2 rows | 12.0 inches |
| 7 inches | 2 rows | 10.3 inches |
| 8 inches | 2 rows | 9.0 inches |