TERRA TECHNOLOGIES

Final
Mitigation Banking Instrument

For the

Smith Creek
Wetland & Stream Mitigation Bank

January 2015

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I. INTRODUCTION OF THE MITIGATION BANK SITE

A. *Location of Mitigation Bank*

The Sponsor of this wetland and stream mitigation bank, Swallow Tail, LLC, owns approximately 175.33 acres of land, including the water rights, in unincorporated Moniteau County, Missouri for which the Sponsor has developed a mitigation plan to establish, enhance and maintain wetlands, streams, riparian buffers and upland buffers on the property and then operate the site as the Smith Creek Wetland & Stream Mitigation Bank (the Bank). The approximate center of the proposed Bank site is located at latitude 38.592521° North longitude 92.688442° West. The proposed Bank site is located predominantly in the northwest quarter of Section 9 of Township 44 North Range 16 West in Moniteau County, Missouri. The Sponsor has provided the Kansas City District of the U.S. Army Corps of Engineers (Corps) with a shape file of the site boundaries. Image 1 shows the general location of the Bank which is approximately 7.1 miles southwest of the intersection of U.S. Highway 50 and Missouri Route 87 in California, Missouri and roughly 2.1 miles north of the town of Latham, Missouri. Image 2 shows the boundaries of the property which is surrounded by agricultural properties on all sides. The majority of the property was previously in agricultural production with tree and shrub cover focused along Smith Creek and its tributaries.

Image 1. Location of Smith Creek Wetland & Stream Mitigation Bank

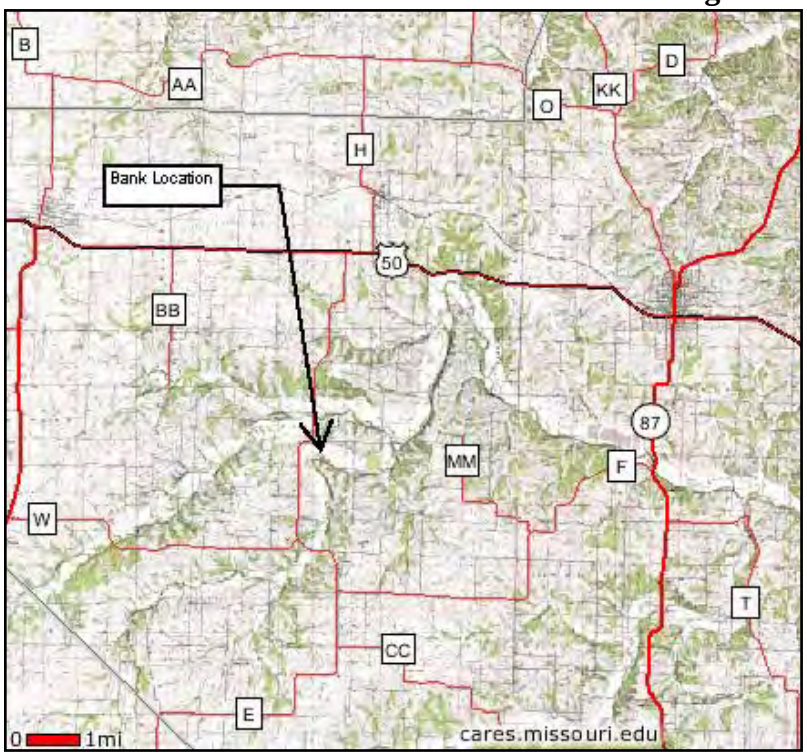
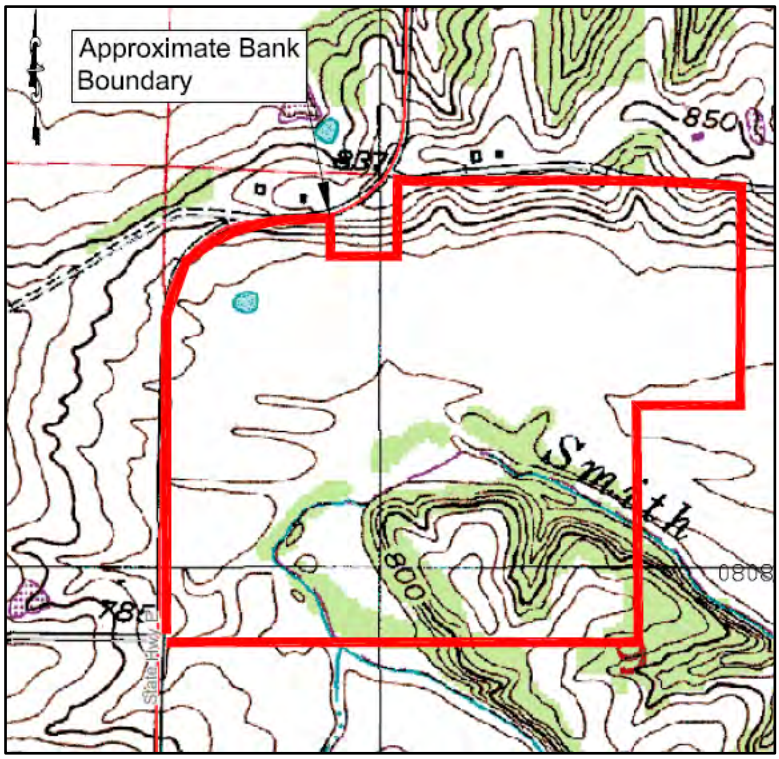


Image 2. Approximate Site Boundaries



In order to reach the site from Interstate 70 take the exit for Missouri Route 5 (Exit 101), then travel south on Missouri Route 5 for approximately 19.7 miles. Where the road dead ends into U.S. Highway 50 turn left to travel east on U.S. Highway 50/Missouri Route 5. Travel a total of roughly 10.3 miles, including through the town of Tipton, and then turn south on Missouri Highway E. Go approximately 4.17 miles and turn left onto the property.

The Bank's location surrounding a sharp outer bend of a medium-sized perennial stream meant that the site's pre-settlement morphology and ecology would be largely shaped by the alluvial processes of Smith Creek as well as those of the small tributary streams that flowed across the property. As a result, before agricultural conversion the Bank existed predominately as a large riparian and floodplain area with deep poorly draining soils. Agricultural conversion lessened the strong hydrologic influences on the Bank through the creation of a levee along Smith Creek, the migration of the Smith Creek channel to the south, the construction of a diversion berm along the northern limit of the floodplain area, the channelization of the largest tributary streams and the grading activities that first changed the smallest streams into drainage channels and then into gentle swales. The Sponsor has restored the property to again be dominated by riparian and wetland conditions by breaching the Smith Creek levee and the diversion berm, restoration of the tributary streams and establishment of riparian buffers and floodplain wetlands.

B. *Establishment and Operation of Bank*

The Corps approval of this Instrument constitutes the regulatory approval required for the Smith Creek Wetland and Stream Mitigation Bank to be used to provide compensatory mitigation for Department of the Army permits pursuant to 33 C.F.R. 332.8(a)(1). This Instrument is not a contract between the Sponsor or the Property Owner and the Corps or any other agency of the federal government. Any dispute arising under the Instrument will not give rise to any claim by the Sponsor or the Property Owner for monetary damages. This provision is controlling notwithstanding any other provision or statement in the Instrument to the contrary.

This Mitigation Banking Instrument will serve as a binding agreement regarding the establishment, use, operation and maintenance of the Smith Creek Wetland & Stream Mitigation Bank and is made and entered into, by, and among the Sponsor and the members of the Interagency Review Team (IRT). The IRT will be chaired by the Corps and will also include as members the U.S. Environmental Protection Agency (EPA), the U.S. Fish and Wildlife Service (FWS), the Missouri Department of Conservation (MDC) and the Missouri Department of Natural Resources (MDNR).

This Mitigation Banking Instrument will become valid on the date of the last signatory's signature. This Mitigation Banking Instrument may be amended or modified with the written approval of all signatory parties as described in the Final Mitigation Rule at 33 C.F.R. Part 332.8(d). Any of the IRT members may terminate their participation upon written notification to all signatory parties. Participation of the IRT members will terminate 30 days after written notification.

The Sponsor shall create the wetland and stream habitats shown in the Bank Development Plan in Appendix D or as shown in any subsequent As-Built Figures and shall operate the Bank in accordance with the provisions of this Mitigation Banking Instrument. The Sponsor shall receive wetland credits and stream credits upon satisfaction of the ecological performance standards contained in Section IV.H and according to the credit release schedule contained in Section V.B. After all ecological performance standards have been met and after all credits have been released to the Sponsor, the Bank will have received a total of 69.50 wetland credits and a total of 111,348.06 stream credits to use as compensatory mitigation for impacts to waters of the U.S., including wetlands, in accordance with all applicable requirements. Credits will be sold to third parties at appropriate market rates to be determined by the Sponsor. Per the Final Mitigation Rule at 33 C.F.R. 332.3(j)(1)(ii), proposed restoration activities may address requirements of multiple regulatory programs and authorities for the same activity.

To the extent that specific language in this document changes, modifies, or deletes terms and conditions contained in those documents that are incorporated into the Mitigation Banking Instrument by reference, and that are not legally binding, the specific language within the Mitigation Banking Instrument shall be controlling. If any provision or provisions of this Mitigation Banking Instrument shall be held to be invalid, illegal, unenforceable or in conflict with the law of any jurisdiction, the validity, legality and enforceability of the remaining provisions shall not in any way be affected or impaired

thereby unless the deletion of such provision or provisions would result in such a material change so as to cause completion of the responsibilities described in this document to be unreasonable.

C. *Current and Long-Term Ownership Arrangements and Long-Term Management Strategy*

The Sponsor owns the Bank site, including the water rights, in unincorporated Moniteau County, Missouri and has developed a mitigation plan to establish, restore, enhance and maintain wetlands, streams, riparian buffers and upland buffers. There are no short-term or long-term plans to transfer title of the Bank to another party. It is the intention of the Sponsor to maintain the Bank in perpetuity as highly functioning habitat in accordance with the terms of the Long-Term Management Plan included as Section IV.J and the site's conservation easement. The conservation easement shall restrict any development of the site in perpetuity and shall stay with the Bank property in the unlikely instance that the title to the Bank property is transferred to another party.

The goal of the long-term management strategy for the Bank is to provide limited maintenance and management of the Bank property as needed after all parties have determined that the Bank is successful and more intensive monitoring and management is no longer necessary. This strategy will include the implementation of the Long-Term Management Plan as described in Section IV.J beginning at the termination of the Operation and Maintenance phase of the Bank which will occur at a point fifteen (15) years after the substantial completion of Bank construction or until all credits are released (unless the remaining credits are indefinitely suspended or removed), whichever is later. At this point, the ecosystems within the Bank property will be self-sustaining and self-regulating. As described more fully in Section IV.J, long-term management will include continued maintenance of the site for purposes of such activities as controlling invasive species, maintaining water control berms, prescribed burning, prevention of trespassing, and removal of litter, as necessary. Costs associated with these activities will be paid for by the revenues from credit sales.

D. *Sponsor Qualifications*

The Sponsor operates five existing approved wetland and stream mitigation banks within the Kansas City District of the Corps. Project descriptions of these mitigation banks are included in Appendix H. These approved wetland and stream mitigation banks together encompass roughly 474 acres and include more than 150 acres of floodplain wetland establishment, restoration and enhancement as well as many acres of wetlands established within riparian buffers that function solely as stream mitigation. These approved mitigation banks have also legally protected both sides of almost 4.7 miles of streams and more than 3.25 miles of streams on one side and have expanded riparian buffers on these streams with more than 223 acres of new riparian buffer plantings. The Sponsor also has four proposed wetland and stream mitigation banks in the Corps' Kansas City District and two proposed wetland and stream mitigation banks in the Corps' Little Rock District under current review that are either entirely or partially constructed. The design, construction, management and monitoring of these proposed mitigation banks further

demonstrates the Sponsor's qualifications to perform mitigation related to wetland, riparian, stream and upland habitats.

Specific to the design and construction of stream channel restoration projects, the Sponsor's approved Stranger Creek Wetland & Stream Mitigation Bank included the restoration of more than a half mile of two highly degraded farm ditches to their natural condition as intermittent stream channels with appropriate channel morphology and riparian buffers. Also as part of that project, a longitudinal peak stone toe bank stabilization was engineered and constructed along about 300 feet of Stranger Creek to address an area experiencing extreme erosion. In addition, willow plantings along perennial stream banks have been utilized at two of the Sponsor's approved mitigation banks in order to stabilize eroding stream banks utilizing natural methods.

Services related to project planning and design as well as construction oversight and monitoring of the Bank will be contracted to the scientists and engineers at Terra Technologies, Inc. (Terra Technologies). Terra Technologies is an environmental engineering company with offices in Leawood, Kansas and St. Louis, Missouri. The firm has significant experience with compensatory mitigation projects with approximately 600 successful mitigation sites in Kansas and Missouri since the company's founding in 1992. Additionally, Terra Technologies has extensive expertise in the planning, design and construction of large-scale wetland and stream mitigation projects as the firm has designed and overseen construction of all of the Sponsor's approved and proposed mitigation banks. Additional information regarding Terra Technologies' qualifications is included in Appendix H.

Terra Technologies is recognized as one of the area's leading engineering and natural resources consulting firms that focuses on stream systems. A partial list of clients in Missouri for which Terra Technologies has provided stream design or stream geomorphic analysis includes the following:

- U.S. Army Corps of Engineers Kansas City District
- City of Columbia
- City of St. Charles
- City of St. Peters
- City of O'Fallon
- City of Independence
- Metropolitan St. Louis Sewer District
- City of Liberty
- City of Raymore
- Platte County
- City of Crestwood
- Boone County Public Works Department
- City of Arnold
- City of Sunset Hills
- City of Trenton
- City of Wentzville

- City of Maryland Heights
- City of Wildwood
- City of Ellisville
- Millstone-Bangert Properties
- Civil Design, Inc.
- Camp, Dresser & McKee, Inc.
- Purler-Cannon-Schulte, Inc./ Renaissance Partnership
- JHB Properties, Inc.
- Ross Road Development, LLC

E. *Legal Responsibility For Compensatory Mitigation*

Once a Department of the Army permit applicant has purchased credits from the Sponsor and the Corps has recorded the purchase of those credits from the Bank as satisfying all or a portion of the mitigation responsibilities of the permit applicant, the legal responsibilities for providing compensatory mitigation for the project impacts to jurisdictional waters of the U.S. represented by the credit purchase is transferred from the permit applicant to the Sponsor.

II. WATERSHED APPROACH TO MITIGATION BANK

A. *Watershed Boundary*

The Sponsor has used a watershed selection process as part of the siting of this Bank in order to maintain and improve the quality and quantity of aquatic resources within the Bank's geographical service area. Through the establishment and use of this mitigation bank the Sponsor seeks to provide a wide variety of landscapes, resources and habitat types to establish, enhance, restore and protect aquatic resource functions to improve water quality and wildlife habitat within the Bank's watershed.

The watershed boundary considered by the Sponsor in the location and establishment of the Bank is the Ozark Highlands / Moreau / Loutre Ecological Drainage Unit (EDU) in Missouri with the exception of the portion of this EDU located in St. Louis and St. Charles Counties. This watershed boundary is also the service area of the Bank. This EDU consists of the immediate watersheds that drain into the Missouri River in central and eastern Missouri. Of the subwatersheds that make up this watershed, the two largest are those of the Moreau River and the Loutre River.

Smith Creek is a tributary to North Moreau Creek which flows into the Moreau River. Located south of the Missouri River, the Moreau River flows in a generally easterly direction until it enters into the Missouri River. Smith Creek is a part of the 8-digit Hydrologic Unit Code (HUC) 10300102 watershed and originates in rural Morgan County northeast of Versailles, Missouri and flows in a generally northeast direction to join North Moreau Creek in Moniteau County northeast of Latham, Missouri. Land use in the Smith Creek basin is primarily cropland, grassland and woodland. The area is characterized by

rolling upland topography, with some prairie found in the Smith Creek watershed near Latham. Smith Creek is a fourth order stream with a total of 16.6 total stream miles.

The other namesake waterway in this EDU, the Loutre River, is a primary tributary of the Missouri River. It begins north of the Missouri River as Little Loutre Creek in Audrain County and flows in a generally southeastern direction until it joins the Missouri River in Montgomery County just north of the City of Hermann. The Loutre River is the largest river within the 10300200 8-digit HUC and its watershed consists of the very western portion of the HUC. This subwatershed is located downstream and to the east of the Moreau River watershed where the Bank is located. Land use in this subwatershed is primarily wooded and agricultural with some wine grape production in the southern portion of Montgomery County. Even including the portion of this watershed in the St. Louis metropolitan area, 83% of this HUC consists of agricultural land use (NRCS, undated). The topography is rolling prairie sloping gradually down to the Missouri River (Williams, 1913). The water quality status within the Loutre River 10300200 8-digit HUC is likely relatively good. The only waterbody on the Section 303(d) list of impaired waters is the Missouri River (MDNR, 2009). Additionally, Whetstone Creek within the Whetstone Creek Conservation Area is listed as an Outstanding State Resource Water (MDNR, 2010). Notably, the Loutre River and some of its major tributaries contain one of the remaining populations of the blacknose shiner (*Notropis heterolepis*) which has been extirpated from other streams in the northern Ozarks. This species is particularly vulnerable to water pollution and other large disturbances (Pflieger, 1997). Its presence within the Loutre River watershed is a sign of good water quality.

The IRT established the major Missouri watersheds, defined as EDUs, as mitigation bank service areas. Although the Bank, like all previously approved mitigation banks, is located on one side of the largest river in the EDU (in this case the Missouri River), it offers benefits to the overall watershed by improving water quality within and downstream of the watershed. The IRT followed this logic by approving the Sni-A-Bar Creek Wetland & Stream Mitigation Bank with a service area of the Central Plains / Blackwater / Lamine EDU which encompasses both sides of the Missouri River although that mitigation bank is located only south of the Missouri River. The Bank is located in the upstream portion of the watershed so its water quality benefits will affect the majority of the watershed. Additionally, it is within the same 8-digit HUC as the vast majority of the portion of the watershed north of the Missouri River.

B. *Historic and Current Wetland and Wildlife Habitat Loss*

Since European settlement, there has been significant and widespread alteration and destruction of wetland and stream habitats throughout Missouri. Approximately 87% of Missouri's original 4.8 million acres of wetlands have been lost over the past 200 years as a result of conversion to agriculture, levee construction, river management and navigation programs, urban development activities and other actions (Dahl, 1990). Historic channelization and dredging of the Missouri River for navigation, along with the construction of levees that opened up large floodplain areas for agricultural development, resulted in massive losses of wetland and wildlife habitats within the watershed. Outside of the immediate floodplain of the Missouri River, other causes of historic wetland and

wildlife habitat loss within the Bank's watershed include agricultural conversion, urbanization, and sedimentation caused by detrimental land use practices.

Current land use trends include rapid urbanization and development. The Bank's watershed contains one rapidly growing urban area along with several small towns. The City of Columbia grew in population by 10.4% (USCB, 2010a) between 2000 and 2006 in comparison to the Missouri average of 4.4%. However, during the same period, the population of Jefferson City shrank by 2.0% (USCB, 2010b). The development within the Columbia area, as well as at all other locations within the watershed has undoubtedly had an impact on the extent and quality of wetlands and wildlife habitat.

C. *Water Quality Issues*

According to MDNR, the only major water quality areas of concern in the Bank's watershed is atrazine and other herbicides in many drinking water reservoirs at all times of year and in streams used for drinking water during spring and summer (MDNR, 1996). Waterbodies on the 2008 Clean Water Act Section 303(d) list of impaired waters includes the following (MDNR, 2009):

- Willow Fork [Moniteau County] (Low Dissolved Oxygen)
- Tributary to Willow Fork [Moniteau County] (Low Dissolved Oxygen from Tipton Waste Water Treatment Plant)
- Straight Fork [Morgan County] (Chloride & Low Dissolved Oxygen from Versailles Waste Water Treatment Plant)
- Hinkson Creek [Boone County] (Low Dissolved Oxygen)
- Bonne Femme Creek [Boone County] (Bacteria from Urban and Rural Non-Point Sources)
- Phillips Lake [Boone County] (Mercury from Atmospheric Deposition)
- Lake of the Woods [Boone County] (Mercury from Atmospheric Deposition)
- Grindstone Creek [Boone County] (Unknown pollutant(s) from Urban Runoff & Urban Non-Point Sources; Bacteria from Unknown Source)
- Cedar Creek [Callaway County] (Unknown pollutant(s))
- Tributary to Cedar Creek [Callaway County] (Low Dissolved Oxygen)
- Foster Creek [Boone County] (Ammonia from the Ashland Waste Water Treatment Plant)
- Fowler Creek [Boone County] (Low Dissolved Oxygen)
- Stinson Creek [Callaway County] (Low Dissolved Oxygen from Unknown Source & Organic Sediment from Fulton Waste Water Treatment Plant)
- Missouri River [Downstream From the Mouth of the Gasconade River] (Bacteria)

Within the watershed, likely sources of nonpoint source pollution include: runoff from row crop agriculture, livestock grazing and dairy operations, sedimentation from erosion in disturbed watersheds, sludge application from waste water treatment facilities, seepage from septic tanks, and urban runoff.

Specific to Smith Creek, the beneficial uses include livestock and wildlife watering, protection of aquatic life (to allow human consumption of fish) and whole body contact recreation-category A (MDNR, 2008).

D. *Immediate and Long-Term Wildlife Habitat and Water Quality Needs of the Watershed*

The immediate needs of the watershed are reducing the amount of urban runoff in the Columbia and Jefferson City areas and decreasing the amount of point source discharges from municipal waste water treatment plants. Over the long term, improving water quality will be achieved by achieving the above goals and by reducing the amount of nonpoint source nutrient inputs within the watershed.

Within the Moreau River watershed, objectives identified in the MDC Moreau River Watershed document involve improving habitat for aquatic fauna. Additionally, MDC identifies the clearing of riparian buffers as a problem in the Moreau and Loutre River watersheds. They state that 16% of stream banks in the Moreau River have no tree buffer and 40% had 1 row to 25 meters (82 feet) of tree coverage. They indicate an appropriate goal for a wooded riparian border is 100 to 300 feet wide (MDC, 2002). The plantings along Smith Creek as part of the Bank Development Plan are 300 feet wide and the Riparian Buffer Restoration areas along the onsite tributaries to Smith Creek will be a maximum of 100-feet wide for ephemeral streams. The document mentions in Objective 3.1 that Smith Creek "would be an appropriate stream to inventory in the future, given its size" (MDC, 2002). Specific problems identified in this report include, but are not limited to:

- Insufficient wooded riparian buffers
- Declining aquatic biodiversity and aquatic habitats
- Need to improve water quality
- Potential for agricultural or livestock-related erosion/pollution
- Soil erosion
- In-stream erosion

The establishment of the Bank would help accomplish these goals by establishing riparian buffers adjacent to Smith Creek and its on-site tributaries, creating and enhancing aquatic habitat and reducing erosion by keeping soil in place, and improving water quality by reducing sediment and agricultural chemicals from entering the stream. Additionally, the conversion of the Bank site from an active row crop agricultural site with denuded riparian buffers to a protected restoration site will reduce the amount of agricultural runoff entering Smith Creek. Because the restored habitats have been functioning well since their construction in 2008, including the maintenance of wetland hydrology at all sampled wetland locations during the historic drought year of 2012, the site has proven itself to be a suitable site for wetland and riparian restoration.

E. *Historic and Current State of the Bank Site and Adjacent Lands*

The physical and ecological nature of the Bank site has been shaped by its landscape position at a severe outer bend of a medium-sized perennial Ozark stream. The in-channel and flood flows of Smith Creek and its small onsite tributaries led to a pre-settlement condition dominated by riparian and wetland habitats.

Before mitigation activities commenced, the majority of the Bank site consisted of row crop agricultural areas north of Smith Creek and wooded areas and pasture south of Smith Creek. Tall fescue (*Festuca arundinacea*) and other undesirable plants are the current dominant species growing in the pasture area. The stream banks along Smith Creek have some erosion problems which are increasing the width of the creek while washing sediment created from the erosion downstream. Smith Creek had a minimal amount of trees growing along its western and northern banks which could not provide the necessary characteristics needed for the water quality benefits of a fully functional riparian buffer. According to the Jurisdictional Assessment report, there was 0.52 acre of degraded wetlands within the row crop fields. Before agricultural conversion, the Bank site was likely a mixture of forested and open areas.

Pertinent to the restoration design of the Bank, as part of the agricultural conversion of the Bank site decades ago, several activities were undertaken to decrease the significant hydrological influence on this poorly draining site in order to be more favorable to row crop production. These included the relocation of the Smith Creek channel to the south, the construction of a diversion berm at the north end of the farm field to keep storm runoff from the adjacent hillsides from reaching the main farm field, completely eliminating all or part of four ephemeral stream channels located in the fields and channelizing three additional ephemeral streams that carried enough hydrology to require the farmer to maintain some kind of active drainageway. Historical U.S. Geological Survey (USGS) topographic maps from 1951 and 1985 and aerial photographs of the Bank and its immediate vicinity from 1941 to 2012 are provided in Appendix B. The 1951 USGS map of the Bank is also provided below as Image 3 and the map of the Bank from the 1953 Moniteau County Soil Survey is included as Image 4. Pertinent to the hydrology of the site, these images and the historical aerial photographs show evidence of the channelization of the ephemeral waterways and the creation of linear drainage channels made to concentrate the flow flowing onto the fields to the north of Smith Creek from the adjacent property to the west. These drainage channels are in roughly the locations that the Sponsor has restored ephemeral streams and these figures provide evidence of the historical presence of small ephemeral streams similar to those restored on the Bank by the Sponsor.

Image 3. 1951 U.S. Geological Survey Topography Map of Bank Indicating the Presence of Historic Ephemeral Stream Channels

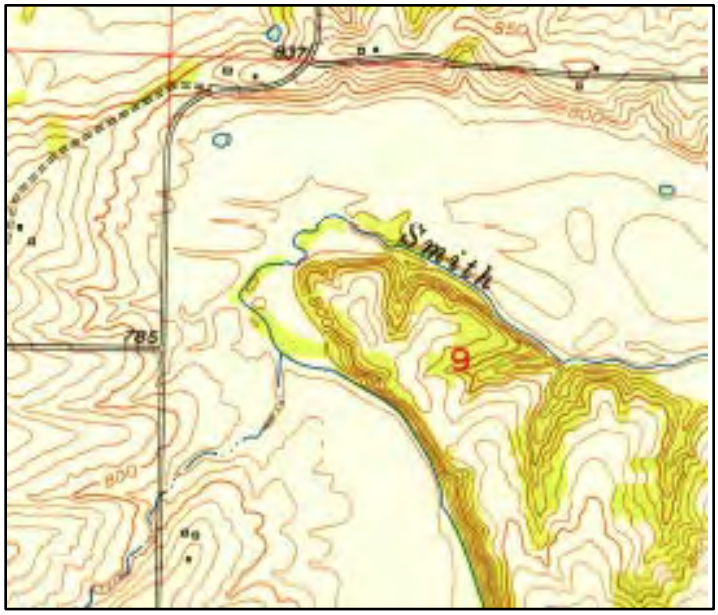
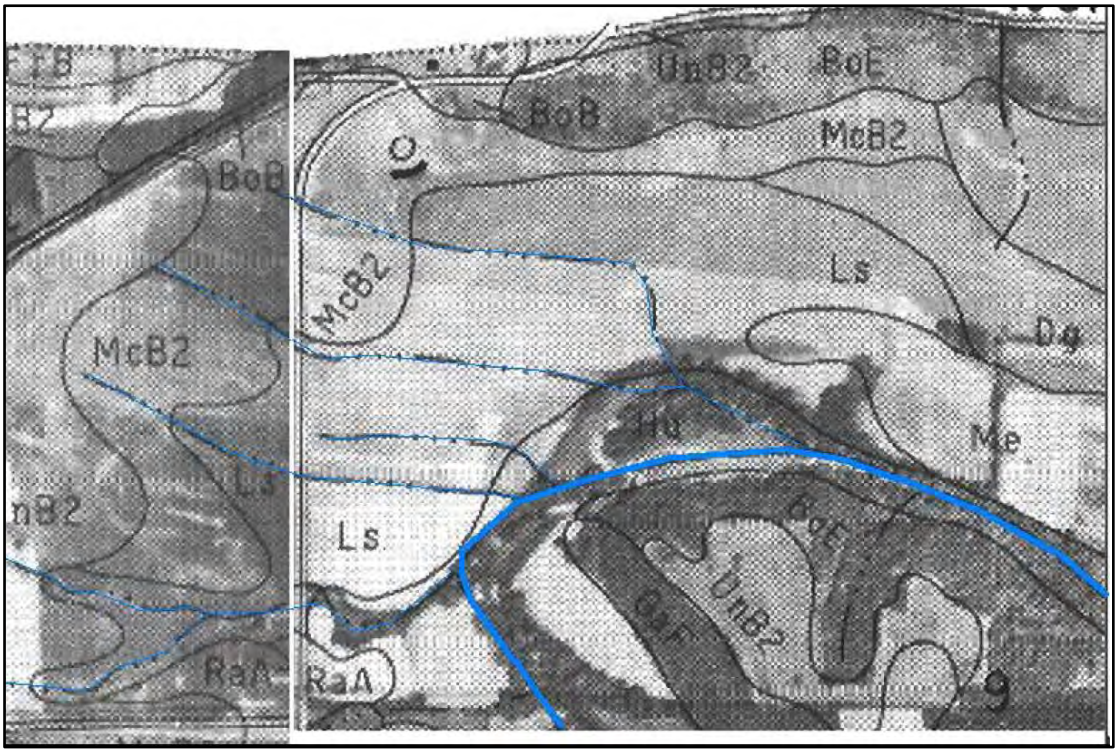


Image 4. 1953 Moniteau County Soil Survey of Bank Indicating the Presence of Historic Ephemeral Stream Channels



The Bank site is ecologically suitable for wetland and riparian buffer restoration. It contains long stretches of perennial and ephemeral streams that are all somewhat to mostly denuded of riparian buffers. As a result, the parcel has great potential for increasing riparian buffer width along these stream systems. Additionally, the Bank lands are capable of supporting wetlands and have done so for several years. Sufficient hydrology flows across the site for wetland conditions to develop. The size of the proposed wetland areas is in proper relation to the size of the watershed that drains to the Bank and to the size of drainage area immediately across the Bank from the upland hillsides. Restoring wetland areas has increased habitat opportunities for species that require or frequent shallow ephemeral wetlands including several species of frogs, toads and salamanders as well as many reptiles, wading birds and waterfowl. The onsite wetlands will decrease the amount of nutrients travelling to downstream waters and the expanded riparian buffers will reduce the amount of sediment eroding from the stream banks into Smith Creek.

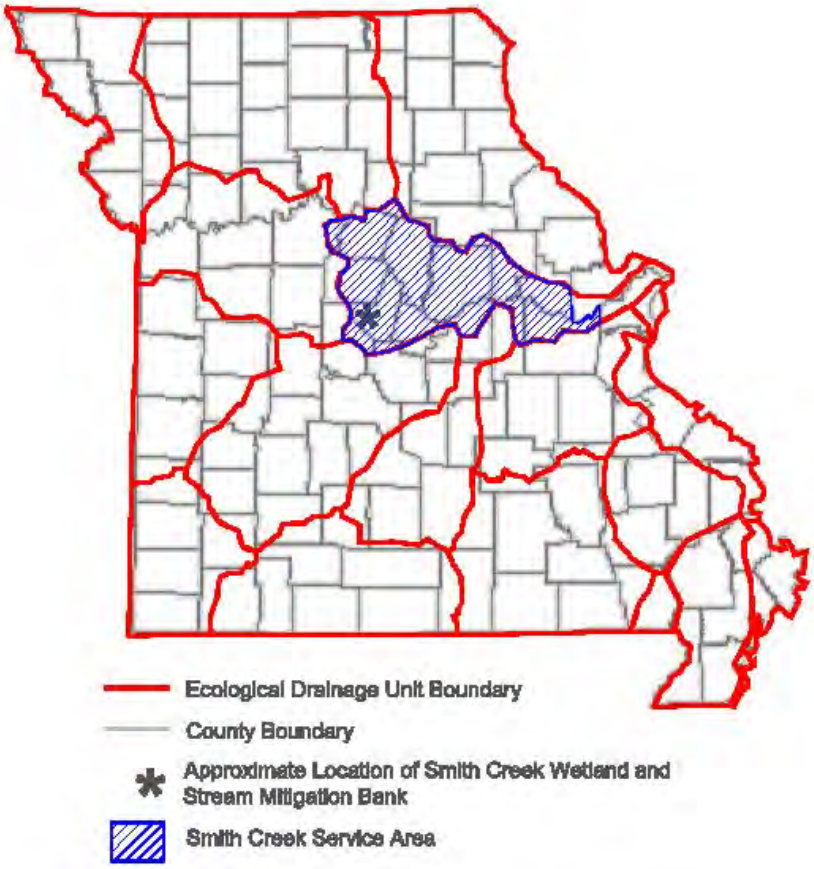
F. *Short-Term and Long-Term Off-Site Threats*

There are no foreseen short-term or long-term threats to the site and the Sponsor owns the water rights and mineral rights to the property. The site's remote location removes surrounding urbanization as a potential threat. Additionally, the surrounding properties are rural and agricultural in nature so there are no foreseeable hazards to the site caused by incompatible surrounding land uses.

III. SERVICE AREA

The service area of the Bank is the Ozark/Moreau/Loutre EDU with the exception of the portion of this EDU within St. Louis and St. Charles Counties. The boundaries of this EDU are shown below in Image 5 along with the location of the Bank. On a case-by-case basis the Corps, in consultation with the IRT, may approve mitigation credits at the Bank to be sold to offset impacts from Department of the Army permit impacts that occur outside this Bank's service area. If determined appropriate, the Corps will determine the number of credits needed to be purchased at the Bank in order to adequately replace the aquatic resources lost at the Department of the Army permit site. The Sponsor has provided the Corps with a shapefile of this service area boundary.

Image 5. Missouri Ecological Drainage Unit Boundaries
With Smith Creek Wetland & Stream Mitigation Bank Location and Service Area



IV. MITIGATION PLAN

A. *Objectives*

Under this Mitigation Banking Instrument, the Sponsor will create the Smith Creek Wetland & Stream Mitigation Bank which will be approximately 175.33 acres in area. To achieve this goal, the Sponsor proposes to:

- Restore 45.60 acres of Riparian Buffer
- Enhance 24.87 acres of existing Riparian Buffer
- Establish 58.93 acres of Herbaceous Wetlands
- Rehabilitate/restore 0.19 acre of existing Herbaceous Wetlands
- Enhance 0.21 acre of existing Herbaceous Wetlands
- Establish 6.74 acres of Upland Buffer
- Enhance 34.30 acres of existing Upland Buffer

The remaining acreage within the Bank beyond the totals described above corresponds to the area of the onsite stream channels, berms between wetland pools and Missouri Highway E. The Sponsor shall then preserve the Bank as natural habitat in perpetuity although natural ecological successional processes will be allowed to occur. The aquatic resources provided by the mitigation activities described above will address the loss of such habitats within the service area of the Bank. In addition, all these mitigation activities will address the needs of the watershed as they are proven to prevent erosion, capture sediment from other sources, absorb nutrients from stream flows and nonpoint source agricultural runoff, and otherwise improve water quality and wildlife habitat. The habitat improvements on the Bank will improve water quality by filtering surface and subsurface water that drains across the property in addition to flood waters from Smith Creek.

The restoration and enhancement activities described above are technically feasible. The Bank site has already been constructed and shows visual signs of wetland hydrology and hydrophytic vegetation.

B. *Site Selection*

The Bank property was selected by the Sponsor because of its potential for beneficial water quality and wildlife habitat improvements to the watershed. Some of the attractive qualities of the Bank site as a mitigation parcel include: the long length of perennial stream channel that has a relatively thin riparian buffer, the existence of wetlands on the parcel and favorable topography and soils for new wetland development.

The Bank has a landscape position within the watershed that will allow it to provide significant water quality and wildlife habitat benefits. The property's location along Smith Creek will create important benefits for the watershed as agricultural and highway runoff will be filtered as it flows across the Bank property. Additionally, occasional flood

waters from Smith Creek will be filtered in the established wetlands which will also store flood waters and provide substantial wildlife benefits.

The bank site is ecologically suitable for wetland and riparian restoration. It is capable of supporting wetlands because there is sufficient hydrology that flows across the site, because of the dominance of hydric soils on the property, and because tens of acres of wetlands have been sustained on the site since construction in 2008 even during the historic drought year of 2012. The size of the proposed wetland areas is in proper relation to the size of the watershed that drains to the Bank and the Sponsor owns the water rights to the property.

Additionally, the fact that so many agricultural conversion activities were necessary to decrease the influence of hydrology on the site combined with the feasibility of reversing those activities make this location a good stream and wetland mitigation site. The protection of more than a half mile of both sides of Smith Creek and any biologically important fauna that reside there is another benefit that was attractive to the Sponsor along with the ability of the site to sustain large amounts of floodplain wetlands.

In addition to the diverse blends of native seed mixes and containerized plants, there are wooded areas in the immediate vicinity of the Bank that would be a seed source for natural recruitment for upland riparian buffers. The ecological benefits that the Bank provides are consistent with the resource needs identified in the MDC Moreau River Watershed document (MDC, 2002).

Environmentally threatened species listed for Moniteau County include the bald eagle (*Haliaeetus leucocephalus*), pallid sturgeon (*Scaphirhynchus albus*), Topeka shiner (*Notropis topeka*) and running buffalo clover (*Trifolium stoloniferum*) (FWS, 2009). The pallid sturgeon is known to occur in the Missouri River. The reduction of agricultural pollutants and sediments into Smith Creek as a result of the creation of the Bank will provide some benefit to habitat downstream in the Missouri River for pallid sturgeon. The Topeka shiner is not known to occur in Smith Creek or Moreau River but use of the Bank by migrating bald eagles is a possibility, especially since individuals have been seen flying over the property and roosting in the trees surrounding the wetland pools. Running buffalo clover is found in disturbed bottomland meadows and is recorded to occur in Boone County, across the Missouri River from Moniteau County. The Bank property could be an ideal location for a test plot if an appropriate land management agency would be willing to provide individuals for translocation.

The Bank site will be completely compatible with the rural land use on adjacent properties. Residential and commercial expansion in upstream areas is unlikely in the foreseeable future because of the remote rural location of the Bank. Once the bank is fully functional it is reasonable to believe that a slight increase of harmful chemicals entering the Bank from future commercial and residential expansion would not affect the aquatic functions provided by a mitigation site of this size.

The site has been surveyed for cultural resources and correspondence from the Missouri State Historic Preservation Office (SHPO) is included in Appendix I. SHPO has stated

that they agree that there is one site of archaeological interest on the site and that project activities should avoid this area. The preservation of archaeological sites is of prime concern to the Sponsor and the restoration activities associated with Bank development will not affect this site.

There are no approved mitigation banks within the Bank's service area. Federally protected land within the watershed includes one unit of the Mark Twain National Forest as well as portions of the Big Muddy National Wildlife Refuge. The State of Missouri owns Finger Lakes State Park, Graham Cave State Park, Rock Bridge Memorial State Park and numerous MDC-owned properties.

C. *Site Protection Instrument*

The Sponsor owns the land that contains the Bank. To ensure that the Site remains as natural habitat in perpetuity, the entire area will be protected by means of conservation easement which will preserve the Bank lands as undeveloped wildlife habitat. A draft conservation easement is included in Appendix G. The terms of the easement will be enforceable by the Corps and the Midwest Mitigation Oversight Association, a non-profit group that will monitor the Sponsor's compliance with the conservation easement. After the Bank is approved, copies of the finalized and recorded conservation easement shall be provided to the Corps.

The Midwest Mitigation Oversight Association is a conservation-based non-profit corporation established in 2007 with the sole purpose of holding and monitoring natural resource mitigation conservation easements. The Midwest Mitigation Oversight Association has been approved by the Kansas City, St. Louis & Little Rock Districts of the Corps as a legally-binding recipient of conservation easements for mitigation sites and currently holds easements on thousands of acres of federal mitigation parcels in Missouri and Kansas. The board of directors consists of professionals whom all meet stringent requirements in order to be on the board, including the possession of a broad scientific background related to natural resources, conservation science or applied ecology. These board members have experience as natural resource professionals and one is a former regulatory official. The board members have more than fifty combined years of experience in wetland and stream regulations, maintenance and construction.

There are no short-term or long-term plans to transfer title of the property to another party. It is the intention of the Sponsor to preserve the property in perpetuity as highly functioning habitat in accordance with the terms of the long-term management plan and conservation easement. However, in the instance that the title to the property is transferred to another party the conservation easement shall stay with the property.

D. *Baseline Information*

The approximate center of the proposed Bank site is located at latitude 38.592521° North longitude 92.688442° West. A map showing the boundaries of the Bank is included in Section I.A of this document and the Sponsor has provided the Corps with a shapefile of the property boundaries. Figures 1 and 2 in Appendix A shows the Bank's location along

with area topography as shown on the USGS topographic map. Photographic documentation of the Bank is provided in Appendix C. The property is surrounded by agricultural properties on all sides. The majority of the property was previously in agricultural production with tree and shrub cover focused along the Smith Creek and its tributaries.

The Bank resides in the River Hills Level IV Ecoregion but is very close to the border with the Prairie Ozark Border Level IV Ecoregion so its landscape position is likely within a transitional zone between these two areas. The River Hills Ecoregion itself is defined by the ecotone between riverside slopes, bluffs and karst features to loess-covered hills that occurs along the Missouri River and its tributaries from just west of Boonville to St. Charles and along the tributaries to the Mississippi River from north of Hannibal to south St. Louis County. This ecoregion has a history of more forested vegetated habitats than the northern Central Plains Ecoregions but not as forested as the Ozark ecoregions to the south. The Prairie Ozark Border Ecoregion is also a transitional area between the wooded Ozarks and the prairie landscape of the Central Plains and consists of loess-deposited soils on smooth to gently sloping plains (Chapman *et al*., 2001).

The topographical map published by the United States Geological Survey (USGS) indicates the presence of one blue-line tributary, Smith Creek (Figure 2). The site is mapped by the FWS' National Wetland Inventory (NWI) which shows six forested wetlands and one pond within the limits of the property (Figure 3). Additionally, the Natural Resources Conservation Service (NRCS) has mapped two farmed wetlands onsite (Figure 4). Much of the property is within the 100-year floodplain while the northern and southeastern portions of the site are outside of the floodplain (Figure 5).

According to the National Cooperative Soil Survey's Web Soil Survey (http://websoilsurvey.nrcs.usda.gov/app/) administered by the NRCS, soils on the site are mapped as McGirk silt loam, 2-5% slopes (10103); Moniteau silt loam, 0-2% slopes, frequently flooded (56000); Maplewood silt loam, 2-5% slopes, eroded (73040); Wrengart silt loam, 3-8% percent slopes, eroded (73046); Ocie very gravelly silt loam, 15-35% slopes (73255); Wrengart silt loam 3-8% slopes (73592); Wrengart silt loam, 8-15% slopes, eroded (73977); Sturkie silt loam, 0-2% slopes, frequently flooded (75378), and; Lamine silt loam, 0-2% slopes, occasionally flooded (75490). The Moniteau silt loam is listed as all hydric and the McGirk silt loam and Sturkie silt loam are listed as partially hydric for Moniteau County, Missouri. The hydric soil map of the site is shown as Figure 6.

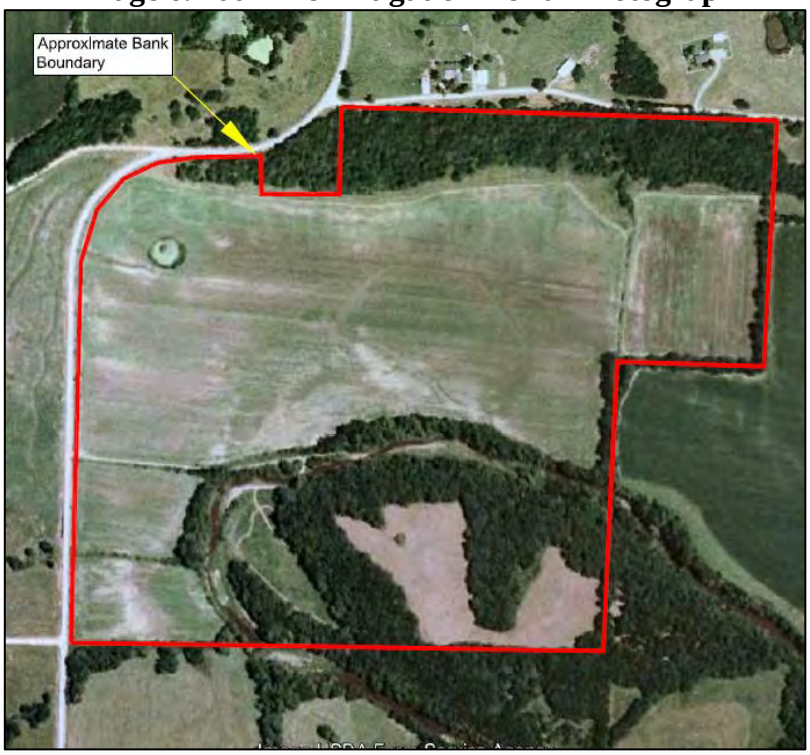
In the summer of 2007 scientists with Terra Technologies visited the site for the collection and evaluation of scientific data necessary to determine the extent, magnitude, and spatial limits of jurisdictional environs. Figure 7 shows the results of the Jurisdictional Assessment of the Site. It is the opinion of Terra Technologies that the Site contained three existing farmed wetlands encompassing 0.52 acre as well as 3,380 linear feet of one relatively permanent (perennial) water (Smith Creek), and 5,257 linear feet of associated non-relatively permanent waters. The Corps has issued a Preliminary Jurisdictional Determination for the Site. The pre-restoration tributaries all flowed into Smith Creek. One pre-restoration wetland had a likely surface water connection to a

tributary to Smith Creek, another existed within an isolated pond and the remaining wetland consisted of a low point in the northern portion of the eastern farm field outside of the 100-year floodplain.

Historical USGS topography of the Bank and its immediate vicinity from 1951 to the present and aerial photographs from 1941 to 2012 are provided in Appendix B. The topographic maps show the migration and loss of sinuosity of the Smith Creek channel and also show the straightened drainage ditches that were formerly natural ephemeral stream channels. The aerial photographs illustrate that before restoration activities commenced the majority of the Bank site consisted of row crop agricultural areas with wooded areas along Smith Creek and on the hillsides to the south of Smith Creek and to the north of the farm fields as well as along Ephemeral #1 before its channelization which occurred between 1958 and 1965. These photographs also illustrate the forced migration of the Smith Creek channel to the south and the resulting conversion of part of the historical riparian buffer to agriculture. Also shown is the fact that most of the onsite ephemeral streams had been converted to drainage swales or ditches by 1941 and then later completely graded into gentle swales before the Sponsor's mitigation activities in 2008. Other observations include the fact that the land had been converted to agriculture well before 1941 and that the diversion berm to the north of the farm fields and the pond in the northwest corner of the Bank were created between 1941 and 1948.

The stream banks along Smith Creek have some erosion problems which are widening the stream while washing sediment created from the erosion downstream. Smith Creek had a minimal amount of trees growing along its western and northern banks which could not provide the necessary characteristics needed for the water quality benefits of a fully functional riparian buffer.

Image 6. 2007 Pre-Mitigation Aerial Photograph



The pre-mitigation site conditions are shown in Image 6 as well as in Appendices A, B, C, E and J. The plant communities that existed on the site before the initiation of mitigation activities are described in the following paragraphs. Starting at the northern limit of the Bank and moving in order generally southward, the pre-mitigation vegetative communities include the following:

Hillside Forest (At Northern Bank Boundary): A generally 300-foot-wide forested area existed, and continues to do so, at the northern limit of the Bank. This area features a roughly 20% slope with shallow soils and common loose surface rocks. Dominant and common species present include Osage orange (*Maclura pomifera*), bur oak (*Quercus macrocarpa*), eastern hackberry (*Celtis occidentalis*), honey locust (*Gleditsia triacanthos*), eastern red cedar (*Juniperus virginiana*), American elm (*Ulmus americanus*), northern red oak (*Quercus rubra*), shagbark hickory (*Carya ovata*), green ash (*Fraxinus pennsylvanica*), red bud (*Cercis canadensis*), coral-berry (*Symphoricarpos orbiculatus*), multiflora rose (*Rosa multiflora*), Japanese honeysuckle (*Lonicera japonica*), poison ivy (*Toxicodendron radicans*), Pennsylvania sedge (*Carex pennsylvanica*), fowl mannagrass (*Glyceria striata*), honewort (*Cryptotaenia canadensis*) and Virginia creeper (*Parthenocissus quinquefolia*). This plant community and landscape position is consistent with a significantly degraded Dry-Mesic Limestone/Dolomite Forest natural community as described in *The Terrestrial Natural Communities of Missouri* (Nelson, 2005). The widespread presence of eastern red cedars, Osage orange, honey locust, Japanese honeysuckle and multiflora rose is indicative of a degraded early successional forested area. This area can be ecologically improved by removing the previously listed early successional woody species in order to stimulate the growth of the existing and more ecologically valuable late successional woody species, eradicating the

invasive Japanese honeysuckle and multiflora rose and by improving wildlife habitat by planting a diversity of woody species to increase species richness and the amount of mast- and fruit-producing trees and shrubs.

Northern Foothill Pasture: Immediately south of the hillside forest at the Bank's northern boundary there was a roughly 50-foot-wide area planted with pasture grasses that stretched east to west. This area contains a diversion berm that intercepted the surface water that flowed down the adjacent hillside, preventing it from reaching the agricultural fields to the south and instead conveying it to Ephemeral #4. The Sponsor has since restored some of the natural watershed hydrology of this area by installing a pipe through this diversion berm to reestabish the historical Ephemeral #3 flows. The tall fescue (*Festuca arundinacea*) that heavily dominated this area was established by the previous farmer because of its low maintenance needs. This area was ecologically improved by the previously described disabling of the diversion berm and the replacement of the monoculture of tall fescue, an exotic pasture grass, with native prairie grasses.

Upland Row Crop Fields: The most extensive pre-mitigation plant community on the Bank was a monoculture of common agricultural crops such as corn or soybeans. It was present across the vast majority of the portion of the Bank north of Smith Creek, encompassing all of the floodplain area north of Smith Creek with the exception of any existing wetlands and the relatively thin existing Floodplain Forest that constituted the northern and western portions of the Smith Creek riparian buffer. In addition to the heavy domination of planted agricultural row crops, scattered and infrequent agricultural weeds were present. Some examples included marestail (*Conyza canadensis*), shepherd's-purse (*Capsella bursa-pastoris*), roughfruit amaranth (*Amaranthus tuberculatus*), kidney-leaf buttercup (*Ranunculus abortivus*) and prickly lettuce (*Lactuca serriola*). Images of this plant community are included in Appendix C as Photos #2, #3, #4, #6 and #7. There was a great need for ecological improvement of these floodplain monoculture agricultural fields and they have been replaced by the Sponsor with vast amounts of wetland pools, restored stream channels and riparian buffers.

Existing Wetlands: Three existing wetlands totaling 0.52 acre were delineated on the site before mitigation actions were initiated. The locations of these wetlands are shown on the Jurisdictional Assessment figure (Figure 4 in Appendix A). Wetland #1 was a 0.12-acre oval-shaped depressional wetland in the northern agricultural fields in the very eastern portion of the Bank. An image of this wetland is shown in Appendix C as Photo #5. The concave nature of this wetland collected enough surface water runoff to saturate the soil. This prevented agricultural crops from growing and allowed for the development of wetland conditions. The dominant plant species present were sedges (*Carex* spp.), cocklebur (*Xanthium strumarium*), roughfruit amaranth (*Amaranthus rudis*) and wing-angle loosestrife (*Lythrum alatum*). Wetland #2 existed within the 0.32-acre farm pond in the northwestern portion of the Bank. Based on the consistent water levels observed in this pond even during the historic 2012 drought, it is likely that this pond is fed by an underground seep or spring. The dominant plant species were rice cutgrass (*Leersia oryzoides*), floating primrose-willow (*Ludwigia peploides*) and dark green bulrush (*Scirpus atrovirens*). Wetland #3 existed in a shallow manmade drainage path in the east-central portion of the section of the Bank north of Smith Creek. This 0.08-acre wetland

was dominated by tufted meadow-foxtail (*Alopecurus carolinianus*), roughfruit amaranth (*Amaranthus tuberculatus*) and valley redstem (*Ammannia coccina*). All of these wetland habitats were highly degraded and have been rehabilitated by increasing the degree of wetland hydrology to be that of shallow marsh habitat (for Wetlands #1 and #3), incorporating them into much larger wetland areas, and improving the quality of the plant communities.

Floodplain Forest: This plant community consists of the existing riparian forests north of Smith Creek and the floodplain (non-hillside) riparian forests south of Smith Creek. Images of this plant community are included in Appendix C as Photos #1, #8 and #10. The dominant and common plant species in this area were black walnut (*Juglans nigra*), American sycamore (*Platanus occidentalis*), American elm (*Ulmus americana*), silver maple (*Acer saccharinum*), green ash (*Fraxinus pennsylvanica*), common hackberry (*Celtis occidentalis*), paw paw (*Asimina triloba*) [south of Smith Creek], Kentucky coffeetree (*Gymnocladus dioicus*) [south of Smith Creek], box elder (*Acer negundo*), Ohio buckeye (*Aesculus glabra*), Canada woodnettle (*Laportea canadensis*), poison ivy (*Toxicodendron radicans*), Virginia creeper (*Parthenocissus quinquefolia*), Virginia wild rye (*Elymus virginiana*), showy tick-trefoil (*Desmodium canadense*), pale-leaf woodland sunflower (*Helianthus strumosus*), largebract tick-trefoil (*Desmodium cuspidatum*) and Ohio spiderwort (*Tradenscantia ohiensis*). Taking into account the species present and the site topography and geology, portions of this plant community could be described as the Riverfront Forest natural community as described in *The Terrestrial Natural Communities of Missouri* although some sporadic floodplain areas south or east of Smith Creek would qualify as inclusions of the Mesic Limestone/Dolomite Forest natural community. North of Smith Creek, the riparian buffer varied from totally absent to roughly 125 feet in width. South of Smith Creek, a 300-foot wide riparian area is largely covered by this plant community with the exception of about 11% of this area which includes the Floodplain Pasture plant community. This Floodplain Forest plant community, although generally ecologically intact, needed to be ecologically improved by the planting of tree and shrub species to increase species richness and the amount of mast- and fruit-producing trees and shrubs. Additionally, there was a need to expand it into the adjacent Floodplain Pasture plant community.

Hillside Forest (South of Smith Creek): To the south and east of Smith Creek, a steep (~20-25% slope), roughly 40-foot tall hillside rises from the Smith Creek floodplain. This hillside is entirely forested. Species commonly encountered in this plant community included chinkapin oak (*Quercus muehlenbergii*), shingle oak (*Quercus imbricaria*), slippery elm (*Ulmus rubra*), American elm (*Ulmus americana*), white oak (*Quercus alba*), common hackberry (*Celtis occidentalis*), coral-berry (*Symphoricarpos orbiculatus*), Missouri gooseberry (*Ribes missouriense*), multiflora rose (*Rosa multiflora*), Virginia wild rye (*Elymus virginiana*), black snakeroot (*Sanicula odorata*), white snakeroot (*Ageratina altissima*), hairy sunflower (*Helianthus hirsutus*) and Ohio spiderwort (*Tradenscantia ohiensis*). The vegetation and landscape position of this plant community is consistent with the description of the Mesic Limestone/Dolomite Forest natural community as described in *The Terrestrial Natural Communities of Missouri*. Although this plant community is generally of good ecological quality, the planting of additional

mast- and fruit-producing tree and shrub species would increase species richness and the wildlife value of the area.

Floodplain Pasture: This plant community was present in the low-lying area south and east of Smith Creek on the inside bend of Smith Creek's significant curve to the east. The dominant plants present were tall fescue (*Festuca arundinacea*), Kentucky bluegrass (*Poa pratensis*), cupplant (*Silphium perfoliatum*), cheatgrass (*Bromus tectorum*), wingstem (*Verbesina alternifolia*), deer-tongue rosette grass (*Dichanthelium clandestinum*), red clover (*Trifolium pratense*) and eastern daisy fleabane (*Erigeron annuus*). That collection of species is indicative of a pasture grass plant community along with a perceptible amount of colonizing herbaceous riparian species. This anthropogenic plant community was ecologically improved by the eradication of pasture grasses, seeding of native prairie species and the planting of tree and shrub species to widen the Smith Creek riparian buffer.

Hilltop Pasture: This plant community was present on the generally flat hilltop in the Bank's southernmost southeastern corner. An image of this area is included as Photo #9 in Appendix C. The plant community was heavily dominated by tall fescue (*Festuca arundinacea*) but some other species were present in small amounts. These included coral-berry (*Symphoricarpos orbiculatus*) and largebract ticktrefoil (*Desmodium cuspidatum*) along with scattered saplings and shrubs such as shingle oak (*Quercus imbricaria*), chinkapin oak (*Quercus muehlenbergii*), green ash (*Fraxinus pennsylvanica*), northern red oak (*Quercus rubra*) and smooth sumac (*Rhus glabra*). As a heavily managed anthropogenic plant community, this area was ecologically improved by control of the pasture grasses and introduction of native prairie species as well as by plantings to expand the riparian buffers of Ephemerals #5 and #6.

The site has been surveyed for cultural resources and correspondence from SHPO is included in Appendix I. SHPO has stated that they agree that there is one location of archaeological interest on the site and that project activities should avoid this area. The preservation of archaeological sites is of prime concern to the Sponsor and the restoration activities associated with Bank development will not affect this location.

E. *Determination of Credits*

1. Wetland Credits

Wetland credits are generated by the establishment, enhancement, rehabilitation or preservation of wetland areas or of upland buffer areas that protect and/or enhance neighboring wetland functions from disturbances associated with adjacent land uses. Upon approval of this document, the Corps, in consultation with the IRT, grants the Bank the proposed quantity of wetland credits shown in Table 1. The release of these credits shall follow the schedule described in Section V.B. Areas proposed to receive wetland credits for establishment (at a one credit to one acre ratio) have been observed to not contain all three criteria necessary for wetland determination (wetland hydrology, hydrophytic plant community and hydric soils) before restoration activities were initiated. The rehabilitation of existing wetlands that possess all three wetland criteria but that

provide limited ecological function as a result of degradation from agricultural impacts will receive credits at a one credit to one acre ratio. Existing wetlands that have not been dramatically affected by agriculture will be enhanced with additional plantings and/or with a beneficial hydrologic modification. Wetland establishment, enhancement, rehabilitation or preservation within areas of stream mitigation credit generation such as Riparian Buffer Restoration or Riparian Buffer Enhancement areas cannot generate wetland credits although such wetland restoration activities can be used to generate stream credits if allowed in the State of Missouri Stream Mitigation Method.

Table 1. Wetland Credit Amounts

Mitigation Activity	Area (Acres)	Credit Ratio (Credits:Acres)	Resulting Credits
Herbaceous Wetland Establishment	58.93	1:1	58.93
Herbaceous Wetland Restoration	0.19	1:1	0.19
Herbaceous Wetland Enhancement	0.21	1:2	0.11
Upland Buffer Establishment	6.74	1:4	1.69
Upland Buffer Enhancement	34.30	1:4	8.58
		TOTAL WETLAND CREDITS:	**69.50**

The calculation of the amount of total potential wetland credits approved at the Bank will be based on the credit assessment methods approved and in use by the Corps at the time the Bank is approved. If, after the Bank is approved, the wetland credit assessment methods change then the amount of wetland credits granted to the Sponsor will not be altered except as described in this paragraph even if the total amount of proposed wetland credits have not been released to the Sponsor. If any change in credit assessment methods would reduce the calculated potential credit total at this Bank, the approved potential credits at the Bank will be grandfathered and will not be altered. If the change in assessment methods causes the potential for additional credits beyond those that are approved at this Bank, the Corps, in consultation with the IRT, can approve additional potential credits that can later be released if the ecological performance standards are achieved.

The enhancement of existing forested upland areas will consist of using management techniques such as selective thinning and fire to remove undesirable early successional species and planting mast-producing late successional species as well as underrepresented herbaceous and woody species. In upland pasture areas, undesirable pasture grasses will be replaced by prairie grasses and forbs. These activities will improve the aquatic resources within the Bank by filtering some of the agricultural runoff and by preventing the establishment of undesirable vegetation through the creation of a mature perennial plant community.

2. Stream Credits

Stream credits are generated through activities that create, restore, enhance or preserve in-stream or riparian ecosystem functions. Wetland establishment, enhancement, rehabilitation or preservation within areas of stream mitigation credit generation such as

Riparian Buffer Restoration or Riparian Buffer Enhancement areas can be used to generate stream credits (but not wetland credits) if allowed in the State of Missouri Stream Mitigation Method. Upon signature of this document, the Corps, in consultation with the IRT, grants the Bank the quantity of stream credits shown in Table 3. The release of these credits shall follow the schedule described in Section V.B.

The number of stream credits was determined by using the Stream Mitigation Bank Credit Assessment Worksheet contained within the State of Missouri Stream Mitigation Method manual dated February 2007. The calculation of the amount of total potential stream credits approved at the Bank will be based on the credit assessment methods approved and in use by the Corps at the time the Bank is approved. If, after the Bank is approved, the stream credit assessment methods change then the amount of stream credits granted to the Sponsor will not be altered except as described in this paragraph even if the total amount of proposed stream credits have not been released to the Sponsor. If any change in credit assessment methods would reduce the calculated potential credit total at this Bank, the approved potential credits at the Bank will be grandfathered and will not be altered. If the change in assessment methods causes the potential for additional credits beyond those that are approved at this Bank, the Corps, in consultation with the IRT, can approve additional potential credits that can later be released if the ecological performance standards are achieved.

The Sponsor is proposing to restore 45.60 acres of riparian buffer surrounding the onsite streams and enhance 24.87 acres of existing riparian buffer. Riparian buffer restoration will be achieved by planting trees and shrubs and by seeding appropriate herbaceous species in order to expand the existing buffers of perennial streams to 300 feet per side and ephemeral streams to a maximum of 100 feet per side, as shown in the Bank Development Plan in Appendix D and as described in Tables 2 & 3. The enhancement of existing riparian buffers will involve planting mast-producing late successional species and underrepresented herbaceous and woody species and will be maintained using management techniques such as selective thinning and prescribed burning to remove undesirable early successional species.

The Bank Development Plan shows some areas of wetland establishment and enhancement within riparian buffer boundaries. These wetland areas within the riparian buffer are proposed for stream credits only and their acreage totals are included within the riparian buffer totals and not within any wetland acreage total.

The Monitoring/Contingency Plan will be Level II for all Net Benefit areas because the Sponsor will provide photographic documentation and plant survival percentages as part of the monitoring of the Bank. Every restored stream channel will be inspected and photo documented for evidence of instability. Finally, all Net Benefit (Riparian) values in Riparian Buffer Restoration areas are multiplied by a factor of 1.2 because these riparian buffer areas contain established or restored wetlands with the exception of those in Net Benefits 2 and 16, along the right descending banks of Net Benefits 9 and 14, and along the left descending banks of Net Benefits 4, 5 and 6. The Net Benefit areas are described below in Table 2 and in Image 7.

Table 2. Net Benefit Area Descriptions

Net Benefit Area	Location / Description	Average Width (Feet)
1	This Net Benefit area extends for the entire length of Smith Creek within the property. Riparian Buffer Enhancement along 2,980 linear feet of the right descending bank of Smith Creek (Perennial #1). Riparian Buffer Restoration along 2,980 feet of the left descending bank of Perennial #1. Private levee removal to restore floodplain functionality.	300 (left descending bank), 300 (right descending bank)
2	This Net Benefit area extends from the upstream limit of existing Ephemeral #5 and continues until the stream enters Net Benefit #3. Riparian Buffer Enhancement along 152 linear feet of the right descending bank of existing Ephemeral #5 and Riparian Buffer Restoration along the left descending bank.	100 (right descending bank), 100 (left descending bank)
3	This Net Benefit area extends along 372 linear feet of the middle section of existing Ephemeral #5 from the downstream limit of Net Benefit #2 until the stream enters Net Benefit #1 (the Smith Creek riparian buffer). Riparian Buffer Enhancement along both sides of the stream.	100 (right descending bank), 100 (left descending bank)
4	This Net Benefit area extends from where existing Ephemeral #1 enters the property to the edge of Net Benefit #1 (the Smith Creek riparian buffer). Riparian Buffer Restoration along both banks of existing Ephemeral #1 for a distance of 575 linear feet. Restoration of 575 linear feet of Ephemeral #1 stream channel with appropriate morphologic patterns including stream sinuosity and width/depth ratio.	100 (right descending bank) 75 (left descending bank)

Net Benefit Area	Location / Description	Average Width (Feet)
5	This Net Benefit area extends from where existing Ephemeral #2 enters the property to the edge of Net Benefit #1 (the Smith Creek riparian buffer). Riparian Buffer Restoration along both banks of existing Ephemeral #2 for a distance of 736 linear feet. Restoration of 736 linear feet of existing Ephemeral #2 stream channel with appropriate morphologic patterns including stream sinuosity and width/depth ratio.	100 (right descending bank) 50 (left descending bank)
6	This Net Benefit area corresponds to the portion of restored Ephemeral #7 upstream of its confluence with restored Ephemeral #8. Riparian Buffer Restoration along both banks of restored Ephemeral #7 for a distance of 924 linear feet. Restoration of 924 linear feet of restored Ephemeral #7 stream channel with appropriate morphologic patterns including stream sinuosity and width/depth ratio.	100 (right descending bank) 50 (left descending bank)
7	This Net Benefit area corresponds to the portion of restored Ephemeral #7 downstream of its confluence with restored Ephemeral #8 and upstream of Net Benefit area #8. Riparian Buffer Restoration along both banks of restored Ephemeral #7 for a distance of 508 linear feet. Restoration of 508 linear feet of restored Ephemeral #7 stream channel with appropriate morphologic patterns including stream sinuosity and width/depth ratio.	100 (right descending bank) 100 (left descending bank)
8	This Net Benefit area corresponds to the portion of restored Ephemeral #7 downstream of Net Benefit #7 but upstream of Wetland Pool #11 (as shown in Figure 3 in Appendix D). Riparian Buffer Restoration along both banks of restored Ephemeral #7 for a distance of 212 linear feet. Restoration of 212 linear feet of restored Ephemeral #7 stream channel with appropriate morphologic patterns including stream sinuosity and width/depth ratio.	100 (right descending bank) 54 (left descending bank)

Net Benefit Area	Location / Description	Average Width (Feet)
9	This Net Benefit area extends from the upstream limit of restored Ephemeral #8 to that stream's confluence with restored Ephemeral #7. Riparian Buffer Restoration along both banks of restored Ephemeral #8 for a distance of 581 linear feet. Restoration of 581 feet of restored Ephemeral #8 stream channel with appropriate morphologic patterns including stream sinuosity and width/depth ratio.	40 (right descending bank) 100 (left descending bank)
10	This Net Benefit area extends along restored Ephemeral #9 from its upstream limit to where it enters Wetland Pool #11. Riparian Buffer Restoration along both banks of restored Ephemeral #9 for a distance of 1,395 linear feet. Restoration of 1,395 feet of restored Ephemeral #9 stream channel with appropriate morphologic patterns including stream sinuosity and width/depth ratio.	50 (right descending bank) 100 (left descending bank)
11	This Net Benefit area extends from the upstream limit of existing Ephemeral #3 to the southern end of the existing woods. Riparian Buffer Enhancement along both banks of existing Ephemeral #3 for a distance of 403 linear feet.	100 (right descending bank) 100 (left descending bank)
12	This Net Benefit area begins where restored Ephemeral #3 emerges from the border between the woods and the former fields and ends where the stream enters one of the wetland pools in the floodplain of Smith Creek. Riparian Buffer Restoration along both banks of restored Ephemeral #3 for a distance of 415 linear feet. Restoration of 415 feet of restored Ephemeral #3 stream channel with appropriate morphologic patterns including stream sinuosity and width/depth ratio.	100 (right descending bank) 75 (left descending bank)
13	This Net Benefit area extends from the upstream limit of existing Ephemeral #4 to the southern end of the existing woods. Riparian Buffer Enhancement along both banks of existing Ephemeral #4 for a distance of 311 linear feet.	100 (right descending bank) 100 (left descending bank)

Net Benefit Area	Location / Description	Average Width (Feet)
14	This Net Benefit area is the restored portion of Ephemeral #4. Riparian Buffer Restoration along both banks of existing Ephemeral #4 for a distance of 1,202 linear feet. Restoration of 1,202 feet of existing Ephemeral #4 stream channel with appropriate morphologic patterns including stream sinuosity and width/depth ratio.	75 (right descending bank) 100 (left descending bank)
15	This Net Benefit area begins where Ephemeral #4 enters an existing riparian buffer at the southern end of the former agricultural fields and ends when the stream enters Net Benefit #1 (the widened Smith Creek riparian buffer). Riparian Buffer Restoration along the right descending bank of existing Ephemeral #4 for a distance of 356 linear feet. Riparian Buffer Enhancement along the left descending bank of existing Ephemeral #4 for a distance of 356 linear feet.	75 (right descending bank) 50 (left descending bank)
16	This Net Benefit area encompasses the most upstream portion of existing Ephemeral #6. Riparian Buffer Restoration along both banks of existing Ephemeral #6 for a distance of 41 linear feet.	100 (right descending bank) 100 (left descending bank)

Image 7. Net Benefit Areas

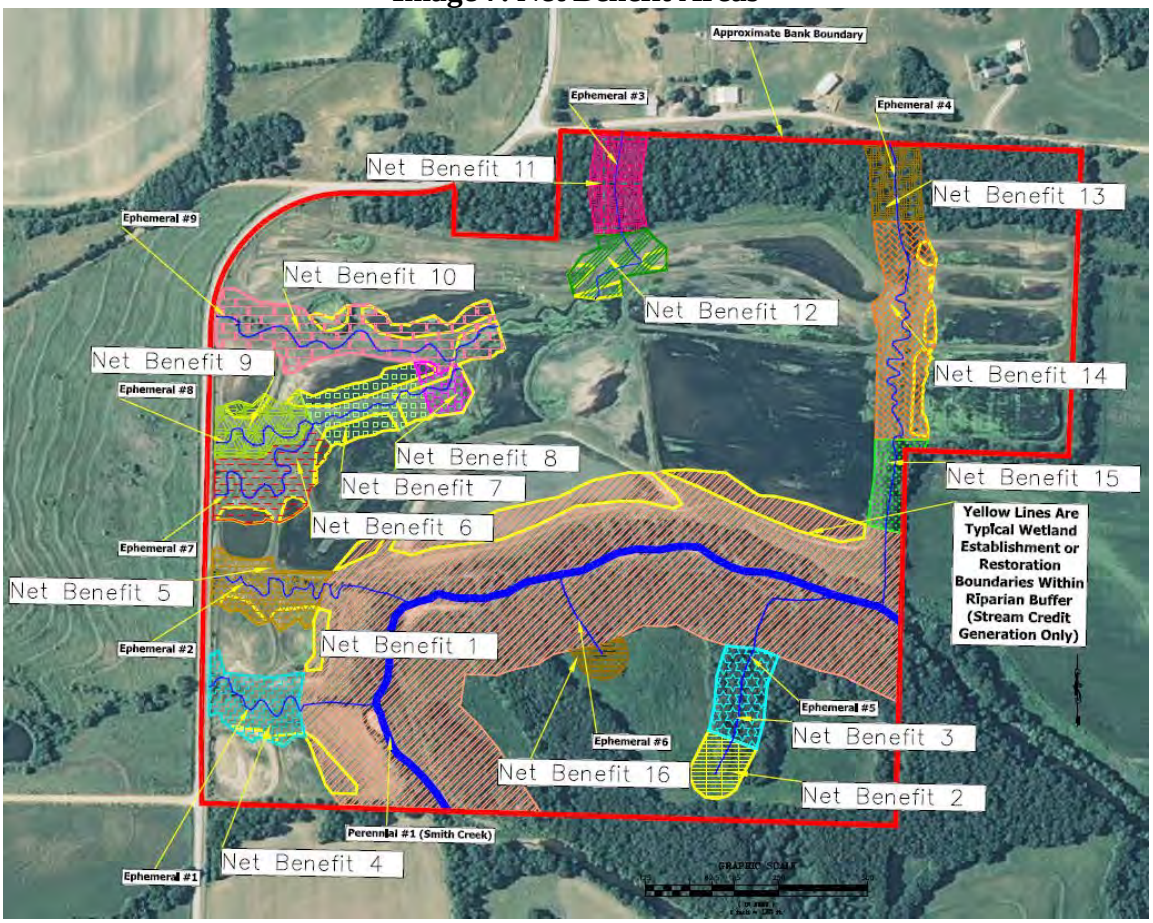


Table 3. Stream Mitigation Bank Credit Assessment Worksheets

Stream Type	Ephemeral 0.1	Intermittent 0.6	Perennial			
			<15' 0.8	15'-30' 1.0	30'-50' 1.2	>50' 1.4
Priority Area	Tertiary 0.1	Secondary 0.4	Primary 0.8			
Net Benefit [Riparian (for each side of stream)]	Additional Improvements (select values from Table 1 times 1.2 multiplier)	Riparian Creation, Enhancement, Restoration, and Preservation Factors (select values from Table 1) (MBW = Minimum Buffer Width = 25' + 2' / 1% slope)				
System Protection Credit	Condition : MBW restored or protected on both streambanks To calculate:(Net Benefit Stream Side A + Net Benefit Stream Side B) / 2					
Net Benefit (Stream)	Moderate 1.0	Good 2.0	Excellent 3.5			
Monitoring/ Contingency (for each side of stream)	Level I 0.075	Level II 0.3	Level III 0.5			
Control /Site Protection	Corps approved site protection without third party grantee 0.075	Corps approved site protection recorded with third party grantee, or transfer of title to a conservancy 0.3				

Factors		Net Benefit 1	Net Benefit 2	Net Benefit 3	Net Benefit 4	Net Benefit 5	Net Benefit 6	Net Benefit 7
Stream Type		1.2	0.1	0.1	0.1	0.1	0.1	0.1
Priority Area		0.8	0.4	0.4	0.4	0.4	0.4	0.4
Net Benefit (Riparian)	Stream Side A (Right Descending)	1.4	0.8	0.8	1.92	1.92	1.92	1.92
	Stream Side B (Left Descending)	3.36	1.6	0.8	1.2	0.8	0.8	1.92
System Protection Credit Condition Met (Buffer on both sides)		2.38	1.2	0.8	1.56	1.36	1.36	1.92
Net Benefit (Stream)		3.5	0	0	3.5	3.5	3.5	3.5
Monitoring/ Contingency	Stream Side A	0.3	0.3	0.3	0.3	0.3	0.3	0.3
	Stream Side B	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Control /Site Protection	Stream Side A	0.3	0.3	0.3	0.3	0.3	0.3	0.3
	Stream Side B	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Sum Factors	(M)=	13.84	5.3	4.1	9.88	9.28	9.28	10.96
Linear Feet of Stream Buffer (LF)= (don't count each bank separately)		2,980	152	372	575	736	924	508
Total Credits (C) =M X LF		41,243.20	805.60	1,525.20	5,681.00	6,830.08	8,574.72	5,567.68

Factors		Net Benefit 8	Net Benefit 9	Net Benefit 10	Net Benefit 11	Net Benefit 12	Net Benefit 13	Net Benefit 14
Stream Type		0.1	0.1	0.1	0.1	0.1	0.1	0.1
Priority Area		0.4	0.4	0.4	0.4	0.4	0.4	0.4
Net Benefit (Riparian)	Stream Side A (Right Descending)	1.92	0.4	0.96	0.8	1.92	0.8	1.2
	Stream Side B (Left Descending)	0.96	1.92	1.92	0.8	1.44	0.8	1.92
System Protection Credit Condition Met (Buffer on both sides)		1.44	1.16	1.44	0.8	1.68	0.8	1.56
Net Benefit (Stream)		3.5	3.5	3.5	0	3.5	0	3.5
Monitoring/	Stream Side A	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Contingency	Stream Side B	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Control /Site Protection	Stream Side A	0.3	0.3	0.3	0.3	0.3	0.3	0.3
	Stream Side B	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Sum Factors	(M)=	9.52	8.68	9.52	4.1	10.24	4.1	9.88
Linear Feet of Stream Buffer (LF)= (don't count each bank separately)		212	581	1,395	403	415	311	1,202
Total Credits (C) =M X LF		2,018.24	5,043.08	13,280.40	1,652.30	4,249.60	1,275.10	11,875.76

Factors		Net Benefit 15	Net Benefit 16					
Stream Type		0.1	0.1					
Priority Area		0.4	0.4					
Net Benefit (Riparian)	Stream Side A (Right Descending)	1.2	1.6					
	Stream Side B (Left Descending)	0.4	1.6					
System Protection Credit Condition Met (Buffer on both sides)		0.8	1.6					
Net Benefit (Stream)		0	0					
Monitoring/	Stream Side A	0.3	0.3					
Contingency	Stream Side B	0.3	0.3					
Control /Site Protection	Stream Side A	0.3	0.3					
	Stream Side B	0.3	0.3					
Sum Factors	(M)=	4.1	6.5	0	0	0	0	0
Linear Feet of Stream Buffer (LF)= (don't count each bank separately)		356	41					
Total Credits (C) =M X LF		1,459.60	266.50	0.00	0.00	0.00	0.00	0.00

Total Credits Generated = 111,348.06

F. *Mitigation Work Plan*

Site construction commenced in November 2008 and was substantially completed according to the two as-built figures included in the Bank Development Plan in Appendix D. The first as-built figure shows the location and elevations of berms and inlet and outlet water control structures along with wetland pool numbers and arrows indicating water flow directions. The second as-built figure provides information regarding the elevations of the pipe inlets on the other side of Highway E and the flowline elevations of the culverts and pipes under that road. The longitudinal profiles of each restored stream are provided in the Stream Restoration Design and Geomorphic Assessment in Appendix E. Please note that the stream lengths in the Stream Restoration Design and Geomorphic Assessment represent the original proposed lengths of restored stream channels which are longer than the final lengths in some instances. Deviation from the approved Bank Development Plan is subject to review and written approval by the Corps, in consultation with the IRT.

Earthwork was the first stage of the project followed by planting. Areas of the site were excavated and spoil material was used to create berms. Erosion control measures prevented sediment from entering Smith Creek or any of its tributaries.

Sinuosity was restored to Ephemeral #1, Ephemeral #2, and Ephemeral #4 which had been channelized by earlier agricultural activities. Additionally, the Sponsor restored four streams or stream sections that were entirely graded out as part of the agricultural conversion of the site (a portion of Ephemeral #3 and all of Ephemeral #7, Ephemeral #8 and Ephemeral #9). These stream channels were restored in the approximate location of their historical paths after field investigations and historical aerial photograph analysis by the Sponsor. The result of these field investigations is included in Appendix J. The four stream channels that were restored after being completely removed by grading activities all end in wetland pools that flow eventually into Smith Creek. Although Smith Creek may occasionally flood the site, direct precipitation, onsite stream flows and sheet flow runoff will be the primary sources of any wetland hydrology. Streams that terminate in wetlands which then themselves flow into a receiving stream are uncommon but not unheard of. Examples of this phenomenon occur at the Grasshopper Hollow Natural Area in Mark Twain National Forest, the Oumessourit Natural Area in Van Meter State Park, Swan Lake National Wildlife Refuge and Squaw Creek National Wildlife Refuge. The natural situation that the Bank's stream and wetland complex was loosely modeled on is a floodplain oxbow wetland that has migrated away from the outer bend of a stream but receives inflow from tributary streams. The oxbow wetland is connected to the stream channel either when the wetland fills with water and overtops into the stream channel or when the stream enters its floodplain during high flow events.

The restoration design of the seven ephemeral stream channels sought to restore natural sinuosity and channel morphology to three streams that had been channelized and four additional streams or stream sections that had been completely removed by past farming practices. The hydrologic and hydraulic analyses in the Stream Restoration Design & Geomorphic Assessment report included as Appendix E show that these streams were restored within normal ranges for sinuosity, velocity, slope and channel cross section.

Unfortunately, almost all of the research and engineering on stream systems has been focused on perennial systems with extremely little devoted to ephemeral channels. Consequently, because of the hydrologic and hydraulic differences between perennial and ephemeral streams, the design standards, rules of thumb and predictive theories of behavior based on stream cross section and alignment that have been developed for perennial streams do not necessarily hold true for ephemeral channels. Despite these limitations, the restored streams on the Bank were constructed to meet general design parameters of a slope less than 2%, a moderate to high sinuosity (greater than 1.2) and stream velocities less than seven cubic feet per second. Post-construction surveying showed that the restored streams had slopes between roughly 0.5% and 1.3%, sinuosity ranging from 1.15 to 1.37 and modeled velocities from one to five feet per second. Channel cross sections are also determined to be acceptable for the modeled flows at this stage of channel evolution.

It is our estimate that the lowest wetland pool overtops and contributes surface flow to Smith Creek roughly three to four times per year assuming normal precipitation conditions although the wetland pools also maintain a hydrologic connection to Smith Creek via groundwater that is likely virtually constant. This conclusion about the frequency of wetland pool overflow into Smith Creek is based on hydrologic calculations that found that it takes about 2.9 inches of rainfall to fill all wetland pools so that the lowest pool overtops into Smith Creek. The 10-day duration design storm was used to estimate how often this much rainfall occurs on the site. This duration was selected because, due to the Bank's poorly drained soils that efficiently hold surface water within the wetland pools and the relatively seasonal frequency and magnitude of storm events in Missouri, it is important to take into account the cumulative rainfall from multiple storms in succession as well as single very large storm events that alone would provide the necessary 2.9 inches of precipitation. After taking into account some level of percolation and evapotranspiration, the necessary amount of rainfall to produce flow into Smith Creek occurs somewhere between the three month and four month recurrence intervals according to the storm frequencies calculated in the Rainfall Frequency Atlas of the Midwest (Huff & Angel, 1992).

After excavation was completed, the site was planted with a diverse mixture of native wetland, forest and prairie plants. The formerly agricultural portions of the site were seeded with native seed blends appropriate for either upland or wetland habitats. Tree and shrub plantings within the Riparian Buffer Restoration and Riparian Buffer Enhancement areas consisted of supercell plugs and three-gallon individuals grown using the air prune method of production. Herbaceous species were acquired in either deep cell plugs or 1- or 2-quart containers.

Previously unforested Riparian Buffer Restoration and Riparian Buffer Enhancement areas were planted at a density of 109 trees per acre (20-foot spacing between each tree or shrub to coincide with a 100% replanting of those areas). Already forested Riparian Buffer Enhancement areas were planted at a density of 17 trees per acre (50-foot spacing between each tree or shrub to coincide with a 16% replanting of those areas). Riparian Buffer Restoration and Enhancement areas will be maintained by utilizing such management techniques as selective thinning and prescribed burning. Weed mats and

flagging were placed for each individual. Seed mixes and tree planting lists are included in the Bank Development Plan in Appendix D. All plant stock was acquired from a nursery specializing in native plants and was installed by a qualified restoration contractor.

The Riparian Buffer Enhancement and Upland Buffer Enhancement areas within the Bank play an important part in the achievement of the Bank objectives. The inclusion of these buffer areas improves the ability of the Bank to restore and maintain the chemical, physical and biological integrity of the Nation's waters by buffering the onsite wetlands and stream systems from the adjacent land use to the north and south, allowing for the protection of both sides of more than half a mile of Smith Creek, portions of Ephemeral #3, Ephemeral #4, Ephemeral #5 and Ephemeral #6 and the natural watershed conditions within the uplands to the north and south of the bank. These enhancement areas provide many important ecosystem functions including streambank stabilization, the production of organic matter important for aquatic habitats on the Bank and in downstream waters, erosion control, nutrient processing, wildlife habitat and water temperature control through shading. As evidence of the importance of including the Upland Buffer Enhancement areas in the Bank, a house is planned in the forested notch in the Upland Buffer Enhancement area along the northern border of the Bank.

The Riparian Buffer Enhancement areas and forested Upland Buffer Enhancement areas will be improved through the expansion of the Smith Creek riparian corridor on the south side of that stream and through the planting of additional beneficial tree and shrub species that will provide a lift to wildlife habitat through the production of additional food and shelter, a stated need in the Baseline Information section of this document. In addition, the removal of invasive Japanese honeysuckle and multiflora rose as well as colonizing eastern red cedars, Osage orange and honey locust in the forested Upland Buffer Enhancement area at the northern Bank border will ecologically improve that area. The Upland Buffer Establishment areas were ecologically improved by converting pasture and row crop areas to native prairie plant communities which will protect the adjacent wetland areas from sediment, nutrient and chemical pollution and provide important upland habitat for species that utilize the wetlands for only part of their feeding, hydration, resting, and/or reproductive needs. Additionally, the herbaceous Upland Buffer Enhancement areas in the very southern part of the Bank will be converted from fescue-dominated pasture to deep-rooted native prairie grasses. This enhancement will increase wildlife habitat and will decrease the amount of surface water runoff to Ephemerals #5 and #6 which will reduce scouring forces and therefore the sediment levels in Smith Creek. Additionally, the prairie grasses will improve groundwater infiltration and therefore supplement the local groundwater delivered to Smith Creek between storm events which will help to maintain aquatic habitat in the stream during dry times. Specifically, the Riparian Buffer Enhancement areas (as well as the Upland Buffer Enhancement areas) were enhanced by planting more than 10% of the area to improve wildlife habitat as allowed in the State of Missouri Stream Mitigation Method. Ten percent of a full planting (defined as trees and shrubs planted on 20-foot spacing) is equal to 11 trees per acre while the Sponsor has completed a 16% replacement planting of trees in these areas. These Riparian Buffer Enhancement areas will then be legally preserved in perpetuity along with the rest of the Bank, which allows the Sponsor to improve and then

protect both sides of every stream on the property. Selective thinning of early successional species such as eastern red cedars (*Juniperus virginiana*) which is common in the Upland Buffer Enhancement areas on the northern boundary of the Bank and the planting of mast-producing hardwood species and other valuable wildlife plantings throughout all Upland Buffer Enhancement areas would be valuable at this site based on vegetative assessments. Tree and shrub planting lists in these areas are based on species that are mast-producing or bear fruit or otherwise provide wildlife habitat. Survival data will be taken to ensure that planted trees and shrubs will be replaced if too many are lost to wildlife damage and other sources of mortality. Undesirable plant species will be managed as described in the Operation and Maintenance Plan for the site as described in Section IV.G.

Plant species were selected to meet the Bank objectives of establishing the intended stream, riparian and wetland habitats. To accomplish this, the species selected are appropriate for the habitat type (*e.g.* riparian buffer or herbaceous wetland) where they were installed. In addition, the planting lists include species that are common in early to mid-successional environments such as silver maples (*Acer saccharinum*), common persimmons (*Diospyros virginiana*), green ash (*Fraxinus pennsylvanica*), beggar's ticks (*Bidens* spp.) and chufa (*Cyperus esculentus*) so that the Bank would be well vegetated with plants that will prosper and spread in the initial stages of the restoration process. In addition, many late successional species such as oaks (*Quercus* spp.), sedges (*Carex* spp.), big bluestem (*Andropogon gerardii*) and indiangrass (*Sorghastrum nutans*) have been installed across the Bank to establish the species that will dominate the site in its more mature ecological state. Some species, such as nannyberry (*Viburnum lentago*) and southern arrowwood (*Viburnum dentatum*), which are susceptible to anthropogenic disturbance and therefore uncommon locally but present in nearby counties, have been planted on the Bank in order to help restore their previous range. All plant species established on the Bank provide food and/or shelter to wildlife and many hydrophytic species assist in the nitrogen transformation processes that occur in wetland soils and also absorb phosphorus, both of which remove some of the nutrients from agricultural runoff and improve water quality.

G. *Operation and Maintenance Plan*

Active maintenance of the Bank property will be governed by the Operation and Maintenance Plan and will be carried out by the Sponsor for fifteen (15) years after the substantial completion of Bank construction or until all credits are released (unless the remaining credits are indefinitely suspended or removed), whichever is later. After this described time period, the Bank maintenance and management will be governed by the stipulations of the Long-Term Management Plan. As part of the Operation and Maintenance Plan, the Sponsor agrees to assess the maintenance needs of the Bank during a minimum of three visits per year during the Operation and Maintenance phase of the Bank's operation. The Sponsor also agrees to perform all necessary maintenance work to ensure that the Bank achieves the ecological performance standards described in Section IV.H, including, but not limited to, such routine tasks as the replanting of vegetation, the removal of invasive species, mowing of areas as appropriate, replacement or repair of stream restoration improvements, minor adjustments to outlet elevations from wetland

pools, accumulating and clumping woody debris to create small mammal habitat and the potential use of prescribed burning. Additional warranted maintenance may include the pickup and piling of wind-fall limb debris and the cutting and removal of fallen trees. Deviation from the approved Bank Development Plan caused by activities associated with Operations and Maintenance is subject to review and written approval by the Corps, in consultation with the IRT. This does not include minor field changes in planned excavation limits or substitutions of plant species with substantially similar species in the same genus.

The management of invasive species will be undertaken to maintain biodiversity and wetland function. There shall be two categories of invasive plants: Highly Aggressive Invasive Species and Undesirable Species as shown in Tables 4 & 5.

Table 4. Highly Aggressive Invasive Species

Scientific Name	Common Name
Alliaria petiolata	Garlic Mustard
Carduus nutans	Musk Thistle
Cirsium arvense	Canada Thistle
Dipsacus fullonum	Common Teasel
Dipsacus lanciniatus	Cut-leaf Teasel
Elaeagnus umbellata	Autumn Olive
Euonymus fortunei	Wintercreeper
Euphorbia esula	Leafy Spurge
Lespedeza cuneata	Sericea lespedeza
Lonicera japonica	Japanese Honeysuckle
Lonicera morrowii & Lonicera maackii	Bush Honeysuckles
Lythrum salicaria	Purple Loosestrife
Melilotus alba & Melilotus officinalis	Sweet Clover (White & Yellow)
Phalaris arundinacea	Reed Canarygrass
Pueraria lobata	Kudzu
Rhamnus cathartica	Common Buckthorn
Rosa multiflora	Multiflora Rose
Securigera varia	Crown Vetch
Sesbania exaltata	Sesbania
Sorghum halepense	Johnson Grass

Table 5. Undesirable Species

Scientific Name	Common Name	Month	Factor	Method
Abutilon spp.	Velvet Leaf	July-Oct	Discovery	1,2
Anthriscus spp.	Parsley	April-July	Discovery	1,3
Arctium spp.	Burdock	July-Sept	Height=1 feet	1,3,4
Cannabis spp.	Hemp	July-Sept	Discovery	1,2
Carduus spp.	Musk Thistle	May-Sept	Discovery	3
Centaurea spp.	Knapweed	May-Sept	Height=2 feet	3
Chenopodium spp.	Lamb's Quarters	May-Sept	Height=2 feet	1,2
Cicuta spp.	Water Hemlock	June-Sept	Height=2 feet	1,3
Cirsium spp.	Thistles (All)	May-Sept	Discovery	3
Conium spp.	Poison Hemlock	May-Aug	Height=2 feet	1,3
Croton spp.	Wooly Croton	July-Sept	Height=2 feet	1,2
Datura spp.	Jimson Weed	July-Sept	Discovery	1,3
Kochia spp.	Fireweed, Mexican	July-Sept	Height=1 feet	1,2
Lactuca spp.	Prickly Lettuce	June-Oct	Discovery	1,3
Lotus spp.	Birdsfoot Trefoil	May-Sept	Discovery	3
Maclura pomifera	Osage Orange	June-Oct	Discovery	2,3
Sonchus spp.	Sow Thistle	May-Oct	Discovery	1,3
Sorghum spp.	Sorghum hybrids	June-Nov	Discovery	3
Vicia spp.	Vetch	May-Oct	Discovery	1,3
Xanthium spp.	Cocklebur	July-Nov	Discovery	1,3

Methods of removal include:

(1) Extirpation
(2) Hand cut
(3) Chemical spray
(4) Seedhead separation

The methods of removal described above will be used to control undesirable vegetation on the Bank. Extirpation refers to the removal of the plant and roots from the ground. After pulling, the plant can be left on the ground. For other species, hand cutting or power trimming to a height of twelve inches will suffice to prevent the plant material from making a seed head. Chemical spraying should be completed with a product containing glyphosate, including one approved for use in or near aquatic environments if applicable (Rodeo or equivalent). Control of tree saplings should utilize Tordon RTU or equivalent. All label directions and safety precautions will be followed while using approved herbicides. Herbicides will be applied with a back-pack or bottle sprayer for best results and to minimize overspray onto desirable native plant materials.

The Bank has been designed to ensure natural hydrology and landscape features will ensure long-term sustainability. Any long-term management such as prescribed burns or invasive species control will be conducted as needed. The water rights are owned by the Sponsor.

All funding necessary to achieve the goals of the Operation and Maintenance Plan will come from the sale of credits. Site maintenance activities after the cessation of active

management of the Bank under the Operation and Maintenance Plan will then be undertaken as part of the Long-Term Management Plan and be paid for from the revenues from credit sales.

H. *Ecological Performance Standards*

The following criteria will be used to assess project success.

1. Wetland Credits

All areas proposed for wetland establishment, restoration or enhancement must meet all of the following wetland performance standards. Areas proposed for upland buffer need only meet wetland performance standards *iii* (Vegetative Cover) and *vi* (Invasive Species).

i. Wetland Hydrology

All areas proposed for wetland establishment, restoration rehabilitation, enhancement or preservation must show evidence of wetland hydrology. The attainment of wetland hydrology will be determined by the presence of sufficient indicators to satisfy the wetland hydrology criteria included in the 1987 *Corps of Engineers Wetlands Delineation Manual* (Environmental Laboratory, 1987) and its appropriate regional supplement across the vast majority of the planned wetland areas for 14 or more consecutive days of flooding or ponding, or a water table 12 inches or less below the soil surface. For the first three of the six credit releases, which corresponds to 60% of the total wetland credits, the vast majority of the planned wetland areas is defined as all but two or fewer of the permanent wetland sample points, which corresponds to roughly 90% of all current wetland sample point locations on the Bank. For the fourth and fifth of the six credit releases, which total 20% of the total wetland credits, the vast majority of the planned wetland areas is defined as all but one or fewer of the permanent wetland sample points, which corresponds to roughly 95% of all current wetland sample point locations on the Bank. However, the failure of any permanent wetland sampling point to demonstrate wetland hydrology must be taken into consideration in the final wetland credit release. Should one or more permanent wetland sampling point not meet this performance standard by the end of the monitoring period, and the Corps decides that default proceedings are not warranted, the Sponsor must either initiate adaptive management to remedy the deficiency or provide the Corps a revised as-built figure showing the Bank's final wetland boundaries as part of the accounting associated with the final credit release which could result in a decrease in the amount of wetland credits granted in the final wetland credit release.

Hydrologic monitoring will continue for a number of years to be determined appropriate by the Corps, in consultation with the IRT. This period of time will be a minimum of five years. The Wetland Hydrology performance standard is based on evidence of saturation and/or inundation of soil areas during "normal" precipitation years as defined in Chapter 19 "Hydrology Tools for Wetland Determination" of the NRCS' Engineering Field Handbook (NRCS, 1997) or any future guidance that may supplement or replace that

document. The soil areas meeting this Wetland Hydrology requirement, along with the Hydric Soil and Hydrophytic Vegetation performance standards, during these "normal" precipitation years will be the extent of the acres on the Bank that generate wetland credits. If "normal" precipitation years do not occur during the five year monitoring period, the monitoring period can be extended until a sufficient number of "normal" years have occurred to establish the existence of wetland hydrology.

ii. Hydrophytic Vegetation

All areas proposed for wetland establishment, rehabilitation, enhancement or preservation must meet the required hydrophytic vegetation criteria in the 1987 *Corps of Engineers Wetlands Delineation Manual* and its appropriate regional supplement. In order to assure that the Bank will contain high quality plant communities, vegetation not included on the planting or seeding lists in the Bank Development Plan will not be considered in the evaluation of this performance standard in wetland establishment, restoration, rehabilitation areas. In wetland enhancement or preservation areas this restriction will not apply because of the predominance of existing vegetation.

iii. Vegetative Cover

All areas that will generate wetland credits, including wetlands and upland buffers, will reach a minimum 80% absolute vegetative cover, except in areas of near constant or semi-permanent inundation because of the resulting disturbance to plant growth and establishment. In order to assure that the Bank will contain high quality plant communities, vegetation not included on the planting or seeding lists in the Bank Development Plan will not be considered in the evaluation of this performance standard.

iv. Hydric Soils

All areas proposed for wetland establishment, rehabilitation, enhancement or preservation must show evidence of hydric soils by meeting the criteria described in the 1987 *Corps of Engineers Wetlands Delineation Manual* and its appropriate regional supplement. Evidence of wetland hydrology will be sufficient to show that the hydric soils criterion is being met as it may take many years before certain indicators of hydric soils develop.

v. Establishment of Wetland Conditions

Before the final credits can be released, as detailed in Section V, the presence of hydric soils, wetland hydrology, and hydrophytic plants will be demonstrable for all areas that will generate wetland credits through wetland establishment, rehabilitation, enhancement or preservation following the methods described in the 1987 *Corps of Engineers Wetlands Delineation Manual* and its appropriate regional supplement. It will be the decision of the Corps, in consultation with the IRT, to determine that areas proposed for wetland establishment shall have met all three criteria described in the 1987 *Corps of Engineers Wetlands Delineation Manual* and its appropriate regional supplement with sufficient regularity to prove the establishment of wetland conditions across all areas intended for wetland development. Should any permanent wetland sample point location not show

sufficient evidence of wetland conditions by the end of the monitoring period, and the Corps decides that default proceedings are not warranted, the Sponsor must either initiate adaptive management to remedy the deficiency or provide the Corps a revised as-built figure showing the Bank's final wetland boundaries as part of the accounting associated with the final credit release which could result in a decrease in the amount of wetland credits granted in the final wetland credit release.

vi. Invasive Species

Management of invasive species will be undertaken as is suitable to maintain biodiversity and ecological function. Until fifteen (15) years after the substantial completion of Bank construction or until all credits are released (unless the remaining credits are indefinitely suspended or removed), whichever is later, invasive species shall be controlled as follows. Species on the list of Highly Aggressive Invasive Species (Table 4) will be eradicated upon observation and shall not, in the aggregate, cover more than 5% of the absolute cover of the Bank. Species on the list of Highly Aggressive Invasive Species (Table 4) will be eradicated upon observation and shall not, in the aggregate, cover more than 5% of the absolute cover of the Bank. In addition, a combination of the absolute cover of species on the Highly Aggressive Invasive Species list and the absolute cover of species on the Undesirable Species list (Table 5) shall not comprise more than 10% of the Bank property.

2. Stream Credits

All areas proposed for the generation of stream credits must meet the following criteria:

i. Vegetative Cover

All riparian buffer areas on the Bank will have at least an 80% absolute vegetative cover, except in areas of near constant or semi-permanent inundation because of the resulting disturbance to plant growth and establishment.

ii. Tree and Shrub Survival Rate

Trees and shrubs planted on the Bank as part of the riparian restoration shall have an overall 75% survival rate. Natural recruitment of species on the Bank planting list will count towards meeting the 75% survival rate as long as the recruit trees and shrubs are greater than one meter tall in order to meet the definition of sapling or shrub in the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Midwest Region* (Corps, 2010). If areas do not meet any requirements related to overall survival rate or species survival rate, appropriate planting activities will be initiated.

iii. Invasive Species

Management of invasive species will be undertaken as is suitable to maintain biodiversity and ecological function. Until fifteen (15) years after the substantial completion of Bank construction or until all credits are released (unless the remaining credits are indefinitely

suspended or removed), whichever is later, invasive species shall be controlled as follows. Species on the list of Highly Aggressive Invasive Species (Table 4) will be eradicated upon observation and shall not, in the aggregate, cover more than 5% of the absolute cover of the Bank. In addition, a combination of the absolute cover of species on the Highly Aggressive Invasive Species list and the absolute cover of species on the Undesirable Species list (Table 5) shall not comprise more than 10% of the Bank property.

iv. Stream Channel Restoration

Net Benefit areas that include stream credit generation from the restoration of stream channels with appropriate sinuosity shall be monitored through visual inspection and photographic documentation to ensure that the restored stream channels are functioning properly. Restored stream channels shall be absent of substantial evidence of such potential problems as channel instability beyond minor post-construction channel adjustments which should be expected. This includes down-cutting, deposition and bank erosion and/or the loss of an ordinary high water mark for a significant length of channel (as indicated by either channel occlusion due to sediment deposition or by substantial vegetative growth within the entire channel bottom including the thalweg of the scoured channels). Because several of the restored stream channels flow into wetlands, there is some natural amount of uncertainty about the final locations of the transitions between stream and wetland conditions. In consequence, the stream channel restoration lengths included in this mitigation banking instrument are approximate and will be finalized after approval of the document based on monitoring results as reviewed and approved by the Corps in consultation with the IRT, including site visits if requested. It is important to note that the lack of stream conditions in these areas would result from the attainment of wetland conditions. Therefore, rather than constituting a failure to meet this performance standard, or justification for any kind of default proceedings, the nonattainment of this performance standard because of the presence of wetland conditions for a significant length of channel will only result in a reclassification of habitats from streams to wetlands, along with the subsequent changes in stream and wetland credit amounts.

I. *Monitoring Requirements*

The Sponsor agrees to perform all necessary work to monitor the Bank to demonstrate compliance with the performance standards established in this Mitigation Banking Instrument. Permanent sampling plots have been placed along transects that run north to south according to the methodology described in Section E of the 1987 *Corps of Engineers Wetlands Delineation Manual* regarding Comprehensive Determinations. Permanent photo points have also been established across the site.

The Bank will be monitored for a period of at least five years. Hydrologic monitoring will show the presence of wetland hydrology for at least 11 consecutive days at the vast majority of sampling plots. This sampling will occur for at least the first five years after approval of the final mitigation banking instrument. Since the routine determination methods used to determine the presence or absence of wetland hydrology in the 1987 *Corps of Engineers Wetlands Delineation Manual* and its regional supplements are the

definitive standard, they will be used to monitor the Bank's hydrology to determine if wetland hydrology has been established as a result of restoration activities. The methods described in the 1987 *Corps of Engineers Wetlands Delineation Manual* and its regional supplements provide a snapshot view of wetland conditions at one moment in time, but by assessing data taken repeatedly this monitoring method will provide information on wetland conditions along a timeline, specifically the frequency and duration of wetland hydrology. Hydric soils will be monitored yearly according to the routine determination procedures in the 1987 *Corps of Engineers Wetlands Delineation Manual* and its appropriate regional supplement. Evidence of wetland hydrology will be sufficient to show that the hydric soils criterion is being met as it may take many years before certain indicators of hydric soils develop. The site will be monitored for invasive species and animal damage during these visits. In addition, during the Bank's active monitoring period the Sponsor will monitor the integrity of all rock water control structures associated with the wetland pools, including the outlet of the lowest pool to Smith Creek, on at least an annual basis to assess maintenance needs.

Vegetation will be monitored yearly, or more often at the discretion of the Sponsor, in order to determine if vegetative performance standards are being met. The methods used shall match those described in the 1987 *Corps of Engineers Wetlands Delineation Manual* regarding routine determinations as well as those of the appropriate regional delineation supplement except as described in the following text. Tree and shrub survival shall be sampled within a 26.3-foot radius circle from the center of the sampling plot, resulting in a 0.05-acre sample plot for ease of survival rate calculations. However, the Sponsor's agent may choose to assess woody vegetation survival within an 11.8-foot radius circle from the center of the sampling plot, resulting in a 0.01-acre sample plot, in areas of dense vegetative growth that would make use of the 26.3-foot radius circle very difficult and potentially inaccurate. Additionally, in habitat types planted at low densities, such as Riparian Buffer Enhancement, will have woody vegetation assessed within a 50-foot radius circle from the center of the sampling plot with no possibility of decreasing the sample radius. Vegetation will be identified and wetland indicator status will be determined in planned wetland areas.

Restored stream channels will be observed for signs of loss of ordinary high water mark and evidence of stream instability such as down-cutting, deposition and bank erosion. Photographs will be taken at representative locations.

J. *Long-Term Management Plan*

Active maintenance of the Bank property under the Operation and Maintenance Plan will be carried out by the Sponsor for a minimum of fifteen (15) years after the substantial completion of Bank construction or until all credits are released (unless the remaining credits are indefinitely suspended or removed), whichever is later. After this described time period, the Bank maintenance and management will be governed by the stipulations of the Long-Term Management Plan as described in this subsection. Adherence to the Long-Term Management Plan is required in perpetuity and funding of the plan must comply with Section 332.7(d) of the 2008 Final Mitigation Rule.

Long-term maintenance needs will focus on vegetation management and the removal of trash. The removal of invasive species will be one of the most important long-term management tasks in all plant communities. Invasive species will be removed upon discovery during two maintenance visits each year using methods of removal such as cutting, burning and chemical spraying. Reseeding of bare spots will be the primary native vegetation maintenance task to be assessed on a yearly basis and implemented if necessary within herbaceous wetland and upland buffer communities. It is estimated that no greater than 5% of the grass buffers will require supplemental seeding in a one year period. Prescribed burnings, supplemental tree and shrub plantings, supplemental wetland (herbaceous) plantings and mowing will be the primary long-term management tasks which are anticipated to be implemented on an every other year rotation. The actual frequency of the implementation of these management activities will be determined by the Sponsor depending on site conditions. Additional maintenance tasks like trash removal and vandalism repairs within all habitat types will be conducted as identified at bi-yearly maintenance visits. A full schedule of maintenance tasks and cost estimates based upon 2012 prices is shown below in Table 6.

Table 6. Long-Term Financial Assurances Calculation

Maintenance Item	Require-ment	Acres	% of Area	$ Cost/Unit	Schedule	Annual Cost
Prescribed Burning	1 Visit	175.33	50%	$10/Acre	Every 2 Years	$438.33
Tree & Shrub Supplemental Plantings	109 / Acre	45.60	1.5%	$25/Plant	Every 2 Years	$931.95
Herbaceous Supplemental Plantings	1,742 / Acre	59.33	1%	$3/Plant	Every 2 Years	$1,550.29
Buffer Reseeding	20 # PLS / Acre	41.04	5%	$50/Acre	Yearly	$102.60
Water Control Berm & Outlet Structure Maintenance	1 Visit	N/A	N/A	$700/Visit	Yearly	$700.00
Buffer Mowing	1 Visit	6.74	100%	$50/Acre	Every 2 Years	$168.50
Invasive Species Removal	2 Visits	175.33	1%	$150/Acre	Every 6 Months	$525.99
Trash Removal	1 Visit	N/A	N/A	$300/Visit	Every 2 Years	$150.00
Miscellaneous	1 Visit	N/A	N/A	$250/Visit	Yearly	$250.00
					Total:	**$4,817.66**

Long-term management will be paid from funds accumulated from credit sales. Long-term management financial assurances will be established to guarantee that the necessary management activities occur should the Sponsor be unable to accomplish those tasks. These long-term management financial assurances are described in Section IV.L.2.

There are no long-term plans to transfer title of the property to another party. However, if the Sponsor encounters a future inability to maintain the long-term management of the Bank (*e.g.*, due to a planned transfer of the necessary interest in the land or intent to transfer the long-term management of the Bank) to a currently unknown entity, the Sponsor will notify the Corps prior to the transfer of the long-term management responsibilities. In addition, the appropriate long-term management funding mechanism will be determined at that time which will comply with the requirements outlined in the Final Mitigation Rule at 33 C.F.R. 332.7(d). It is the intention of the Sponsor to maintain the property in perpetuity as highly functioning habitat in accordance with the terms of the long-term management plan and conservation easement which will be held by the Midwest Mitigation Oversight Association. The site's conservation easement shall stay with the property in the instance that the title to the property is transferred to another party and any new property owner would be bound by all requirements of this document.

K. *Adaptive Management Plan*

The site has been constructed in accordance with the As-Built drawing. The Sponsor shall maintain the property using an adaptive management approach that will provide flexibility when dealing with unforeseen issues. The Sponsor shall implement all facets of site maintenance in perpetuity. In addition, the Sponsor will monitor the site for any potential unforeseen management or maintenance issues that could threaten the Bank's aquatic resources and will address any issues in a manner necessary and appropriate to the individual issue.

Some examples of anticipated potential management/maintenance issues not discussed in other sections of this banking instrument include animal damage or erosion to the berms built across the site to create the wetland pools, erosion or sedimentation caused when Smith Creek floods the site and vandalism. The periodic monitoring of the Bank will detect evidence of damage to the berms caused by burrowing animals or erosion and the Sponsor will rebuild the damaged berms and add additional temporary or permanent erosion control measures as necessary. If the flooding of the site by Smith Creek causes damage to the Bank that is not deemed by the Sponsor and the Corps, in consultation with the IRT, to be a desirable ecological event, the Sponsor will undertake the necessary earthwork and replanting to restore any damaged part of the Bank to its pre-flooding state. Similarly, any vandalism that damages or threatens the aquatic resources on the Bank will be repaired or otherwise addressed as soon as is practical.

The Sponsor and Terra Technologies have extensive experience with successional plant assemblages and the Bank site has been planted with an initial planting assemblage that contains species that are adapted to early successional conditions as well as plentiful sunlight in addition to young mast hardwood plantings that will eventually be the dominant tree species. As the site matures and as shaded conditions proliferate, the Sponsor shall continue to plant herbaceous and woody species at the site that are appropriate to each successional stage in order to accentuate the species assemblages as deemed appropriate given the site conditions at the time of assessment. The Sponsor is prepared to remove softwood species if necessary if they become overly prevalent as appropriate for the long-term management of the site.

Additionally, if the site is not able to be constructed or maintained to match the Bank Development Plan or if site monitoring and maintenance activities determine that the project as planned is unable to meet the ecological performance standards contained in Section IV.H, then the Sponsor will approach the Corps with suggestions of design changes, site modifications or revisions to monitoring or maintenance requirements in order to ensure that the Bank provides aquatic resource benefits similar to the objectives described in Section IV.A. If necessary, the ecological performance standards contained in Section IV.H may have to be revised to address deficiencies in the compensatory mitigation project or in management strategies or objectives if the new standards provide for ecological benefits that are comparable or superior to the approved compensatory mitigation project. No other revisions to performance standards will be allowed except in the case of natural disasters as described in Section VIII.A. The Sponsor will notify the

Corps if any adjustments in the outlet elevation of a wetland pool are needed that would alter the limits of wetland conditions in that pool in a manner that would differ from that shown in the Bank Development Plan or any subsequent as-built figure. Similar to any other adaptive management process, the Sponsor would suggest a remedy to the problem for review and approval and would change credit amounts if necessary. However, the Sponsor may make minor adjustments to the outlet elevations of wetland pools in order to fine tune hydrologic conditions to optimize habitat quality without Corps or IRT review as long as the adjustment would not change the limits of wetland conditions from what is shown in the Bank Development Plan or any subsequent as-built figure.

L. *Financial Assurances*

1. Short-Term Financial Assurances

The Sponsor agrees to provide the following short-term financial assurances for the work described in this Mitigation Banking Instrument. The Sponsor shall provide the sum of $40,000 U.S. Dollars as an Irrevocable Letter of Credit from a financial institution that is a member of the Federal Deposit Insurance Corporation to the Midwest Mitigation Oversight Association, a non-profit group that will monitor compliance with the conservation easement. The irrevocable letter of credit will be automatically renewed on an annual basis and will state that the Corps will receive notification of at least 120 calendar days in advance of any termination or revocation of said letter.

These short-term financial assurance funds shall be termed contingency funds and shall be used by a third party to be designated by the Midwest Mitigation Oversight Association in the event that the Sponsor fails to comply with the terms of this Banking Instrument or to rectify any unforeseen events as determined by the Corps, in consultation with the IRT. The Sponsor will submit an annual statement regarding the state of the short-term financial assurance funding to the Corps along with the annual credit ledger report as described in Section VII.C. A standby trust account will be established to hold the funds paid by the short-term financial assurance provider to be used by the Midwest Mitigation Oversight Association in accordance with the Corps' instructions of how to rectify any site deficiency should the Sponsor not be able to perform those duties.

The said sum shall be reduced to $8,750 after the Corps, in consultation with the IRT, has agreed that the Bank has completed all initial construction and planting activities and has had several years of successful monitoring results. This shall occur at the time of Credit Release #5. The remaining contingency funds shall remain until the Sponsor receives a letter from the Corps, in consultation with the IRT, stating that they are satisfied that the Bank is sustainable and has met all of its performance standards. This shall occur at the termination of the Operation and Maintenance phase of the Bank and the initiation of the Long-Term Management phase of the Bank which will occur at a point fifteen (15) years after the substantial completion of Bank construction or when all credits are released (unless the remaining credits are indefinitely suspended or removed), whichever is later. The terms of the irrevocable letters of credit for the short-term and long-term financial assurances are not tied to a defined period of time. Instead, the irrevocable letters of credit are only changed as a result of a specified event, which in the case of the Bank is

the receipt of correspondence from the Corps stating that the amount of the irrevocable letter of credit can be reduced or eliminated according to the terms stated in this document. A draft copy of a letter of credit is included in Appendix F.

The amount of short-term financial assurances was derived by calculating the costs necessary to perform significant remedial activities across one quarter of the Bank and to monitor the site for five years as described below. Because the Sponsor has completed site construction several years ago, no short-term financial assurances are implemented for site construction. The Sponsor holds an unencumbered fee simple title to the bank site; therefore, no short-term financial assurances are required for land acquisition.

Post-construction maintenance tasks at a mitigation bank include replanting of trees and shrubs, selective spraying of invasive species, site mowing, reseeding and monitoring. On several other mitigation banks owned by the Sponsor, historical averages for maintenance are as follows;

Tree/Shrub Replacement:	20% of original planting
Spraying of Invasive Species:	2% of total acreage
Mowing of Site:	Reseeded areas only
Reseeding of Site:	10% of original planting
Monitoring of Site:	$1,750 per year

These historical averages provide guidance for future budgeted maintenance activities. For the purpose of short-term financial assurance determination, these averages are multiplied by a factor of 1.25 in order to provide additional funds for unplanned expenses including inflation.

The Bank encompasses 175.33 acres. Providing planned maintenance of twenty five percent (25%) of all establishment and enhancement areas yields 44 acres of size. Assuming the restoration standard of 109 trees and shrubs per acre (one per 20 lineal feet) for riparian buffer restoration and forested wetland establishment and native seeding at 20 pounds pure live seed (# PLS) per acre, and utilizing standard "for-hire" installation costs, the calculated required short-term financial assurances are as follows:

Table 7. Short-Term Financial Assurances Calculation

Item	Requirement	Acres	% Failure	$ Cost/Unit	Total Cost
Trees & Shrubs	109/Acre	44	20% x 1.25	$25/Plant	$29,975
Reseeding	20 # PLS/Acre	44	10% x 1.25	$50/Acre	$275
Mowing	1 Visit	44	10% x 1.25	$50/Acre	$275
Spraying	3 Visits	44	2% x 1.25	$200/Acre	$660
Monitoring	5 Years	---	---	$1,750/Year	$8,750
				TOTAL:	**$39,935**

2. Long-Term Management Financial Assurances

The financial assurances that will be used for long-term management of the Bank after it becomes self-sustaining should the Sponsor be unable to perform those duties will be in the form of an irrevocable letter of credit that will be automatically renewed on an annual basis and adjusted yearly for inflationary costs per the Consumer Price Index. The irrevocable letter of credit will be from a financial institution that is a member of the Federal Deposit Insurance Corporation to the Midwest Mitigation Oversight Association and will contain a requirement for advance notice to the Corps prior to any cancellation by the lending authority. The starting value of these long-term management financial assurances will be US$4,825.00 which is based on the values included in Table 6. These long-term management financial assurances will remain in effect until the Corps approves a statement from the Sponsor that the Bank is self-sustaining and does not need additional maintenance. An annual report of the long-term management funding will be included along with the annual ledger report submitted to the Corps summarizing all of the Bank transactions of the previous year as described in Section VII.

V. CREDIT RELEASE SCHEDULE

A. *Credit Release Provisions*

Credits shall be released to the Sponsor by the Corps, in consultation with the IRT, following the credit release schedule described below. As the Sponsor reaches the stated performance milestones, documentation shall be submitted to the Corps demonstrating that the appropriate milestones for credit release have been achieved along with a request for the release of credits.

The Corps, in consultation with the IRT, may modify the credit release schedule, reduce the number of available credits or suspend credit sales or transfers altogether if the Sponsor is not achieving expected performance standards or if specific requirements of the instrument have not been met.

B. *Credit Release Schedule*

Upon submittal of all appropriate documentation by the Sponsor and subsequent written approval by the Corps, in consultation with the other members of the IRT, it is agreed that credits will become available for use by the Sponsor or for transfer to a third party in accordance with the following schedule which is summarized in Table 8. Because the areas within the Bank that are designated for wetland credit creation or stream credit creation may achieve performance milestones at different times, the Sponsor may request the release of wetland credits and stream credits either together or separately.

Table 8. Credit Release Schedule Summary

Credit Release	Necessary Event(s)	Percentage of Credits Released
Credit Release #1	• Mitigation Banking Instrument approval, • Implementation of short-term financial assurances, and • Recording of conservation easement	20%
Credit Release #2	• Completion of initial construction and planting, • Approval of as-built figure, and • Corps approves the first monitoring report of data collected after site construction that shows achievement of wetland hydrology performance standards at all or virtually all wetland sample locations (requirement applicable to wetland credits only)	30%
Credit Release #3	• Corps approves the second monitoring report as showing achievement of wetland and/or stream performance standards. This monitoring report shall be based on data collected after approval of the final mitigation banking instrument.	10%
Credit Release #4	• Corps approves the third monitoring report as showing achievement of wetland and/or stream performance standards. This monitoring report shall be based on data collected after approval of the final mitigation banking instrument.	10%
Credit Release #5	• Corps approves the fourth monitoring report as showing achievement of wetland and/or stream performance standards. This monitoring report shall be based on data collected after approval of the final mitigation banking instrument.	10%
Credit Release #6	• Approval of Long-Term Management Plan • Corps approves the fifth monitoring report as showing achievement of all wetland and/or stream performance standards. This monitoring report shall be based on data collected after approval of the final mitigation banking instrument.	20%

Credit Release #1: 20% of the total number of projected wetland and stream credits shall be available for debiting immediately after all of the following are completed: (1) the final

signature is recorded on this Mitigation Banking Instrument; (2) the Corps accepts the Sponsor's demonstration of the establishment and funding of the Bank's short-term financial assurances; and (3) the Corps acknowledges receipt of the Sponsor's demonstration of the recording of a conservation easement for the Bank site.

Credit Release #2: An additional 30% of the total number of anticipated wetland and/or stream credits shall be available for debiting immediately after all of the following are completed: (1) construction and planting have been completed; (2) the Corps approves the as-built figure submitted by the Sponsor to the IRT through the Corps; and (3) the Corps approves the first monitoring report of data collected after site construction that shows achievement of wetland hydrology performance standards at all or virtually all wetland sample locations. The third requirement is applicable to wetland credits only.

Credit Releases #3, #4 & #5: An additional 30% of the total number of anticipated wetland and stream credits shall be released as the Ecological Performance Standards are met during the five-year monitoring period. This shall occur in three equal increments of 10% of the total number of anticipated wetland and/or stream credits each. In order for the Sponsor to receive each release of 10% of the total number of anticipated wetland credits, the monitoring results from one growing season, as approved by the Corps, shall show that the Bank met the Wetland Hydrology, Hydrophytic Vegetation, Vegetative Cover and Invasive Species performance standards for that year in an annual monitoring report approved by the Corps. In order for the Sponsor to receive each release of 10% of the total number of anticipated stream credits, the monitoring results from one growing season, as approved by the Corps, shall show that the Bank met all stream credit performance standards. The monitoring results necessary to trigger these three credit releases must be based on monitoring data collected after approval of the final banking instrument.

Credit Release #6: The remaining credits will be released after the Corps approves the Long-Term Management Plan (including the funding mechanism) for the Bank and also approves the results of the monitoring report based on data collected in the fifth year after approval of the mitigation banking instrument as showing that the Bank has met all Ecological Performance Standards at all monitoring points. If not all performance standards are met at a very small number of monitoring points, and the Corps decides that default proceedings are not warranted, then the Sponsor must either initiate adaptive management to remedy any deficiencies or provide the Corps a revised as-built figure as part of the accounting associated with the final credit release which could result in adjustments in the amount of credits granted in this final credit release. If the Sponsor initiates adaptive management to address deficiencies at a few select locations, the Corps, in consultation with the IRT, will have the sole discretion to release credits to the Sponsor from areas that have met all of their performance standards should that be deemed appropriate. For all stream credits to be released, any in-stream structures (should the Corps and IRT approve any that may be proposed by the Sponsor in the future) must remain intact following at least one documented bank-full flow event. The Corps may extend the monitoring period and delay the release of the final credits, or a portion thereof, should the Bank not have sufficiently met all of its Ecological Performance Standards. As described in Section VIII.A, the final amount of credits released may be

determined by the degree to which the Ecological Performance Standards are met as described should the Sponsor not be able to fully meet all performance standards after following any default proceedings.

C. *Credit Release Review Schedule*

The credit release approval process shall follow the schedule described in the Final Mitigation Rule (33 C.F.R. 332.8(o)(9)). Specifically, after the Sponsor submits documentation to the Corps demonstrating that the appropriate milestones for credit release have been achieved and requests the release of credits, the Corps will provide copies of this documentation to the IRT members for review. The IRT members must provide any comments to the Corps within 15 days of receiving this documentation. However, if the Corps determines that a site visit is necessary, the IRT members must provide any comments to the Corps within 15 days of the site visit. The Corps must schedule the site visit so that it occurs as soon as it is practicable, but the site visit may be delayed by seasonal considerations that affect the ability of the Corps and the IRT to assess whether the applicable credit release milestones have been achieved. After full consideration of any comments received, the Corps will determine whether the milestones have been achieved and the credits can be released. The Corps shall make a decision within 30 days of the end of that comment period and shall notify the Sponsor and the IRT. The Corps or any IRT member will provide the Sponsor a minimum of 24 hours' notice before any compliance inspection or other visit to the Bank site.

VI. CREDIT ACCOUNTING PROCEDURES

A. *Use of Credits*

The Corps, in consultation with the IRT as necessary, will determine the eligibility of projects to use the Bank for compensatory mitigation on a case-by-case basis. Projects that can be considered will be determined by the Corps and will include those requiring authorization under Section 404 and/or Section 401 of the Clean Water Act and/or Section 10 of the Rivers and Harbors Act, as well as mitigation projects, Supplemental Environmental Projects, unauthorized activities, non-compliance actions, and after-the-fact permits. The Corps will determine the number and type(s) of credits required to compensate for the authorized impacts of each Department of the Army permit. MDNR will determine the number and type(s) of credits required to compensate for any impacts that are solely authorized under Section 401 of the Clean Water Act.

B. *Credit Ledger*

The Sponsor will establish and maintain a credit ledger for the Bank in order to account for all credit transactions. This credit ledger will show all credit transactions for the Bank and will include the beginning and current balance of available credits for each credit type (wetland and stream), all additions and subtractions of credits, and any other changes in credit availability, such as additional credits released or suspended credit sales. The

Sponsor will notify the Corps in writing each time a credit transaction occurs and will supply the Corps with an updated ledger after each transaction.

VII. REPORTING

A. *Monitoring Reports*

The Sponsor shall submit to the Corps, for distribution to the other members of the IRT, an annual monitoring report in accordance with Regulatory Guidance Letter 08-03, and/or any future relevant guidance, for a period not less than five years after approval of the final mitigation banking instrument. The monitoring report will be of sufficient content to accurately describe the progress, or lack thereof, of the Bank in meeting the performance standards. Monitoring reports will include as-built drawings, maps and ground photography illustrating the site conditions and interpretation of the current site conditions. If available, approved wetland and/or stream assessment methods that provide qualitative measures of the functions of the resource will be submitted.

B. *Credit Ledger Accounting Reports*

A credit ledger report will be submitted to the Corps on an annual basis after the first of each calendar year and will be part of the administrative record for the Bank. The credit ledger report will show the beginning and ending balance of available credits and permitted impacts for each resource type, including types of credits debited, all additions and subtractions of credits, and any other changes in credit availability (*e.g.*, additional credits released, credit sales suspended). The Corps will distribute copies of this ledger to the other IRT members.

C. *Financial Assurances Reports*

The Sponsor will also provide the Corps a report of the financial assurance funding along with the submittal of the credit ledger report. This financial assurance report will show the beginning and ending balances, including deposits into and any withdrawals from the accounts providing funds for financial assurances. The status of those assurances will also be stated as well as their potential expiration.

VIII. DEFAULT AND CLOSURE PROVISIONS

A. *Default Provisions*

If the Corps determines that the Bank is not meeting performance standards that are expected to be achieved at the Bank's current level of development or is not complying with the terms of this Banking Instrument, appropriate action will be taken. Such actions may include, but are not limited to, suspending credit sales, adaptive management,

decreasing available credits, utilizing financial assurances, and terminating the instrument.

If the Corps, in consultation with the IRT, determines that the Bank, or a specific portion of the Bank, fails to achieve the performance standards specified in Section IV.H of this Mitigation Banking Instrument, the Corps shall give written notice to the Sponsor of such violation and demand corrective action sufficient to cure the violation and, where the violation involves injury to the Bank resulting from any use or activity inconsistent with the purpose of this Mitigation Banking Instrument to restore the portion of the Bank to its prior condition in accordance with a plan approved by Corps. If the Corps determines that the Bank is operating at a deficit, the Sponsor will be notified that debiting of credits from that Bank should immediately cease. The Sponsor shall cure the violation and notify the Corps of the remedial site activities within 60 days after receipt of notice thereof from the Corps, or under circumstances where the violation cannot reasonably be cured within a 60 day period, update the Corps of the situation and begin curing such violation within the 60 day period and diligently pursue such cure to completion. In the event the Sponsor fails to implement remedial actions necessary to address a failure in meeting the performance standards or for a credit deficit within 60 calendar days, the Corps will notify the Sponsor that debiting from the Bank is indefinitely suspended and will authorize the Midwest Mitigation Oversight Association to draw on the contingency funds to implement the necessary remedial actions.

In the event that a natural disaster destroys all or part of the Bank, all debiting from the Bank shall cease immediately. Such natural disasters include floods, tornados, fires, earthquakes, droughts, disease, regional pest infestation, *etc*., which the Corps, in consultation with the IRT, determines is beyond the control of the Sponsor to prevent or mitigate. The Sponsor shall not be responsible for restoring acreage for credits which were sold prior to any such natural disaster. However, the Sponsor shall be responsible for restoring acreage for which credits have been released to the Sponsor if those credits are unsold at the time of the natural disaster. If the damage is so severe that the Sponsor and the Corps, in consultation with the IRT, determine that project success is unattainable, then the Sponsor will not be obligated to restore any portion of the Bank and any unsold credits shall be indefinitely suspended or removed from the credit ledger.

B. *Closure Provisions*

Bank closure will occur when the terms and conditions of this instrument have been determined by the Corps, in consultation with the IRT, to be fully satisfied or until all credits have been debited, whichever is later. Subsequent to bank closure, site management and maintenance will remain the responsibility of the Sponsor.

If adaptive management strategies are unsuccessful and performance standards are unattainable, the Sponsor may request early closure of the Bank and forfeiture of the remaining anticipated credits.

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X. EXECUTION AND AGENCY CONCURRENCE

The Kansas City District, Corps of Engineers, along with the members of the Interagency Review Team, have participated with the bank sponsor (Swallow Tail, LLC) in the development of the Smith Creek Wetland and Stream Mitigation Bank and this banking instrument.

I have determined that the final banking instrument is complete and that the establishment of the Smith Creek Wetland and Stream Mitigation Bank will provide appropriate compensation for impacts to wetlands and streams associated with unavoidable impacts to these resources that result from activities authorized by the Kansas City District's issuance of Department of the Army Permits.

_____ Date:_____

Mark D. Frazier, Chief
Regulatory Branch
Operations Division
Corps of Engineers

IRT CONCURRENCE:

The U.S. Environmental Protection Agency, along with the members of the Interagency Review Team, has participated with the bank sponsor (Swallow Tail, LLC) in the development of the Smith Creek Wetland and Stream Mitigation Bank and this banking instrument.

I concur that the final banking instrument is complete and that the establishment of the Smith Creek Wetland and Stream Mitigation Bank will provide appropriate compensation for impacts to wetlands and streams associated with unavoidable impacts to these resources that result from activities authorized by the Kansas City District's issuance of Department of the Army Permits.

_____ Date:_____

Karen A. Flournoy, Director
Water, Wetlands, and Pesticides Division
U.S. Environmental Protection Agency, Region VII

IRT CONCURRENCE:

The U.S. Fish and Wildlife Service, along with the members of the Interagency Review Team, has participated with the bank sponsor (Swallow Tail, LLC) in the development of the Smith Creek Wetland and Stream Mitigation Bank and this banking instrument.

I concur that the final banking instrument is complete and that the establishment of the Smith Creek Wetland and Stream Mitigation Bank will provide appropriate compensation for impacts to wetlands and streams associated with unavoidable impacts to these resources that result from activities authorized by the Kansas City District's issuance of Department of the Army Permits.

_____ Date:_____

Amy Salveter
Field Supervisor,
U.S. Fish and Wildlife Service

IRT CONCURRENCE:

The Missouri Department of Conservation, along with the members of the Interagency Review Team, has participated with the bank sponsor (Swallow Tail, LLC) in the development of the Smith Creek Wetland and Stream Mitigation Bank and this banking instrument.

I concur that the final banking instrument is complete and that the establishment of the Smith Creek Wetland and Stream Mitigation Bank will provide appropriate compensation for impacts to wetlands and streams associated with unavoidable impacts to these resources that result from activities authorized by the Kansas City District's issuance of Department of the Army Permits.

_____ Date:_____

Tim Ripperger
Deputy Director
Missouri Department of Conservation

IRT CONCURRENCE:

The Missouri Department of Natural Resources, along with the members of the Interagency Review Team, has participated with the bank sponsor (Swallow Tail, LLC) in the development of the Smith Creek Wetland and Stream Mitigation Bank and this banking instrument.

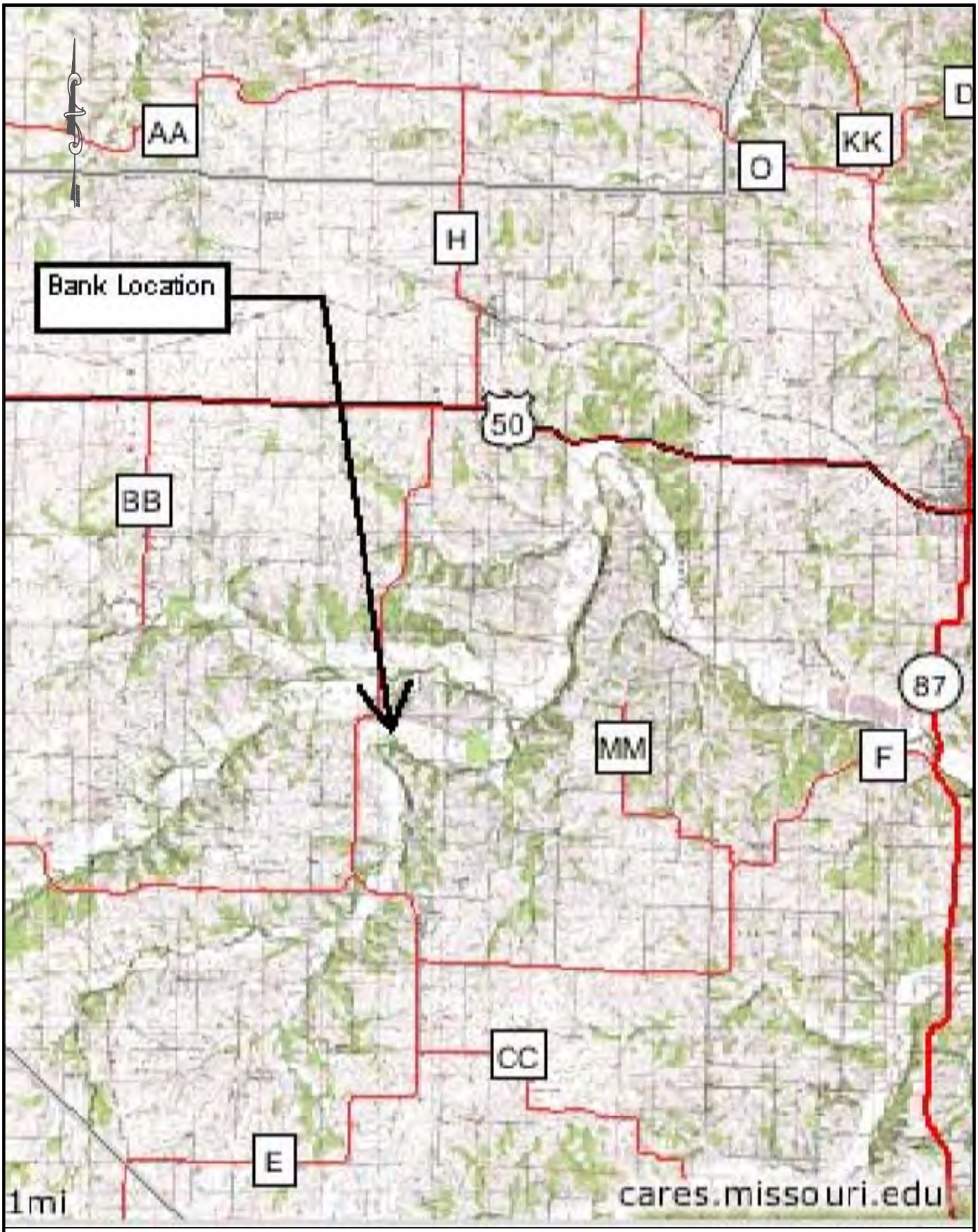
I concur that the final banking instrument is complete and that the establishment of the Smith Creek Wetland and Stream Mitigation Bank will provide appropriate compensation for impacts to wetlands and streams associated with unavoidable impacts to these resources that result from activities authorized by the Kansas City District's issuance of Department of the Army Permits.

_____ Date:_____

Leanne Tippett-Mosby
Director, Division of Environmental Quality
Missouri Department of Natural Resources

APPENDIX A

FIGURES



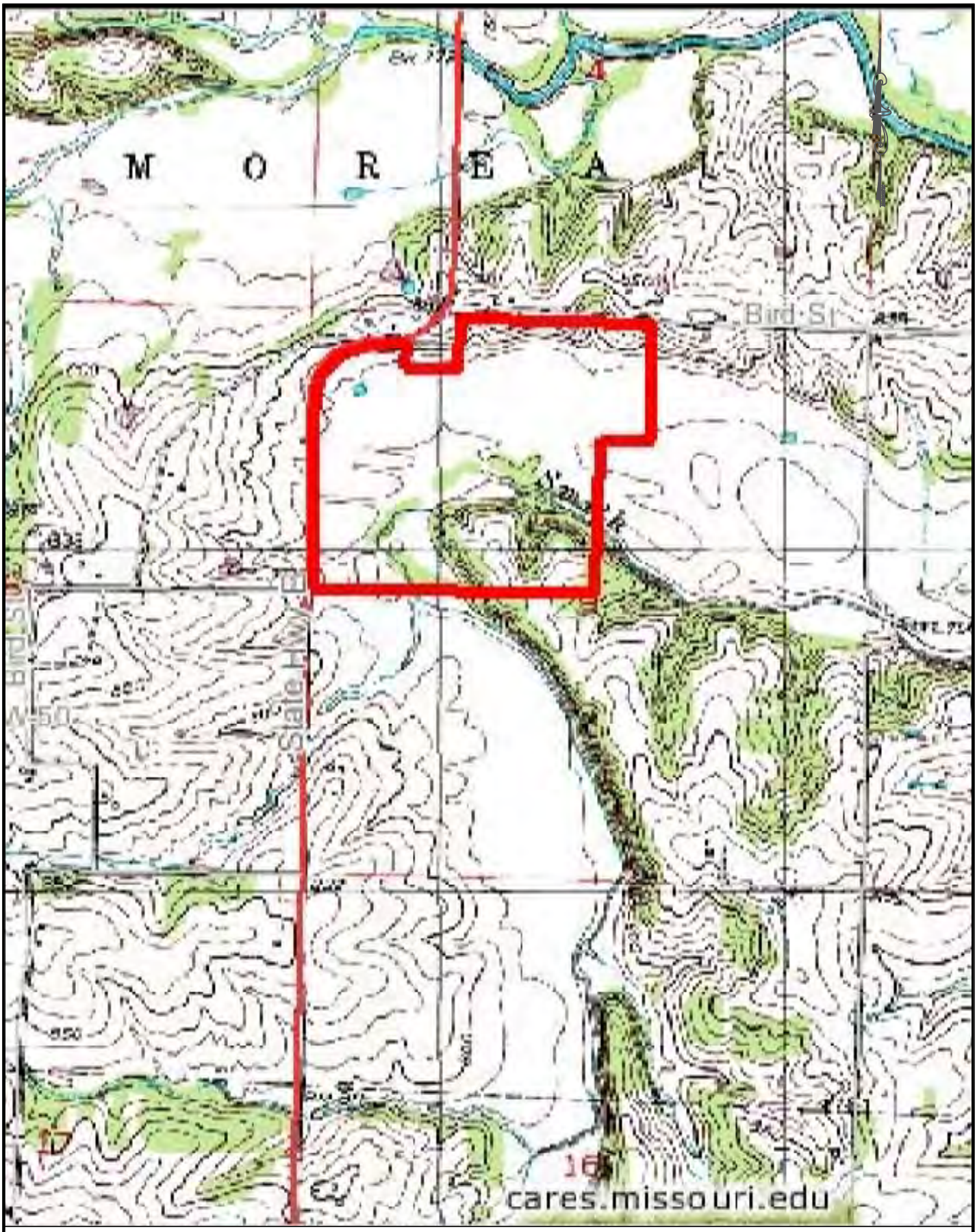
Revisions		
No.	Description	Date

Terra Technologies
1920 West 143rd Street, Suite 140 Leawood, KS 66224

Smith Creek
Wetland & Stream
Mitigation Bank
Moniteau County
Missouri

Bank Location Map

DRAWING	DATE
FIG 1	JAN 2011



Revisions		
No.	Description	Date

Terra Technologies

1920 West 143rd Street, Suite 140 Leawood, KS 66224

Smith Creek
Wetland & Stream
Mitigation Bank
Moniteau County
Missouri

USGS Topographic Map

DRAWING	DATE
FIG 2	JAN 2011

Revisions		
No.	Description	Date

Terra Technologies

1920 West 143rd Street, Suite 140 Leawood, KS 66224

Smith Creek
Wetland & Stream
Mitigation Bank
Moniteau County
Missouri

NWI & Township, Section, and Range

DRAWING	DATE
FIG 3	JAN 2011

Revisions		
No.	Description	Date

Terra Technologies

1920 West 143rd Street, Suite 140 Leawood, KS 66224

Smith Creek
Wetland & Stream
Mitigation Bank
Moniteau County
Missouri

NRCS Farmed
Wetlands Map

DRAWING	DATE
FIG 4	JAN 2011

Revisions		
No.	Description	Date

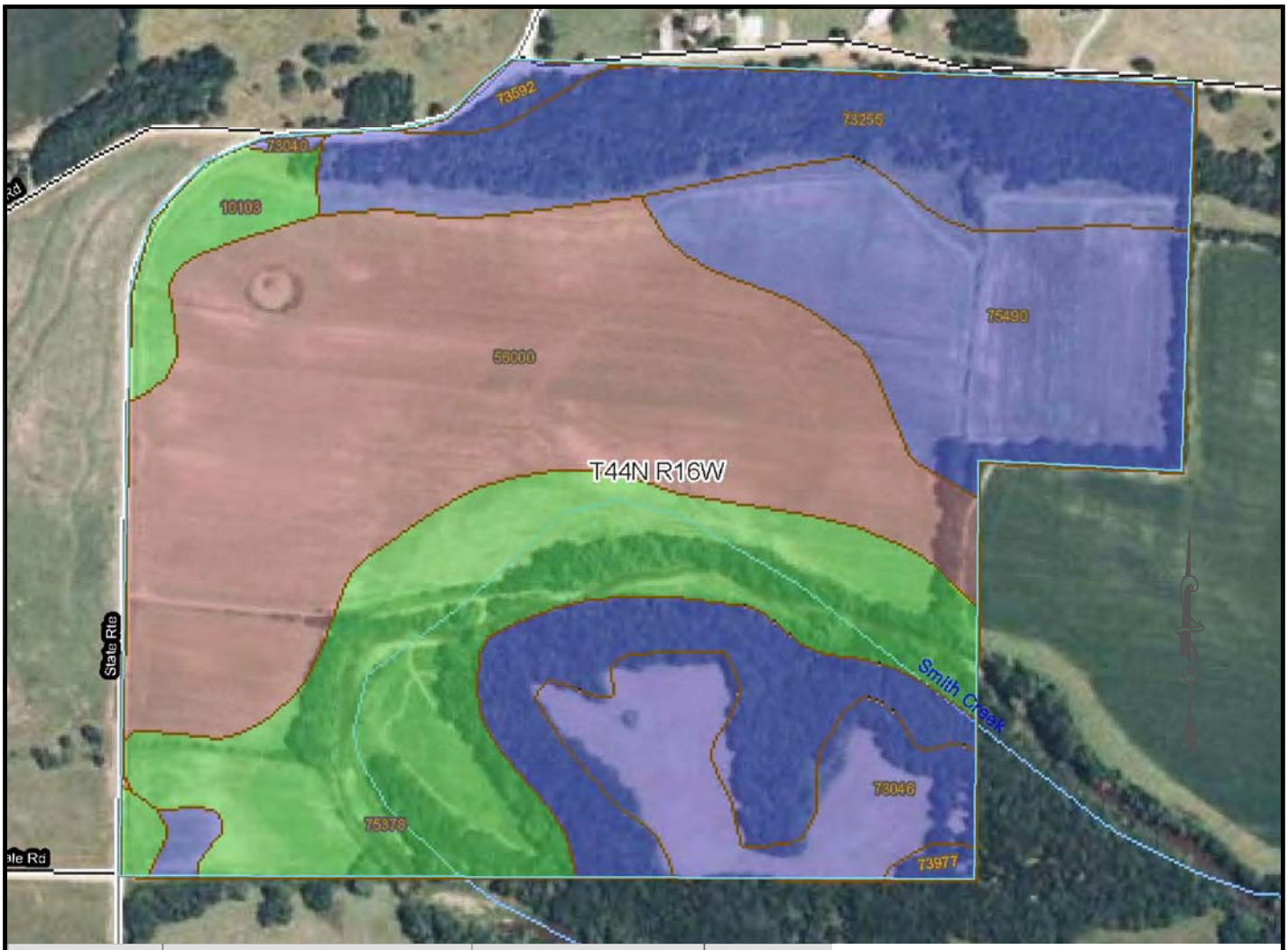
Terra Technologies

1920 West 143rd Street, Suite 140 Leawood, KS 66224

Smith Creek
Wetland & Stream
Mitigation Bank
Moniteau County
Missouri

100/500 Year
Floodplain Map

DRAWING	DATE
FIG 5	JAN 2011



Map unit symbol	Map unit name	Rating	Acres in AOI
10103	McGirk silt loam, 2 to 5 percent slopes	Partially Hydric	5.2
56000	Moniteau silt loam, 0 to 2 percent slopes, frequently flooded	All Hydric	59.1
73040	Maplewood silt loam, 2 to 5 percent slopes, eroded	Not Hydric	0.2
73046	Wrengart silt loam, 3 to 8 percent slopes, eroded	Not Hydric	12.8
73255	Ocie very gravelly silt loam, 15 to 35 percent slopes, extremely stony	Not Hydric	38.6
73592	Wrengart silt loam, 3 to 8 percent slopes	Not Hydric	1.7
73977	Wrengart silt loam, 8 to 15 percent slopes, eroded	Not Hydric	0.7
75378	Sturkie silt loam, 0 to 2 percent slopes, frequently flooded	Partially Hydric	35.9
75490	Lamine silt loam, 0 to 2 percent slopes, occasionally flooded	Not Hydric	25.7
Totals for Area of Interest			**179.8**

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Units

Soil Ratings

- All Hydric
- Partially Hydric
- Not Hydric
- Unknown Hydric
- Not rated or not available

Political Features

- Cities

Water Features

- Oceans
- Streams and Canals

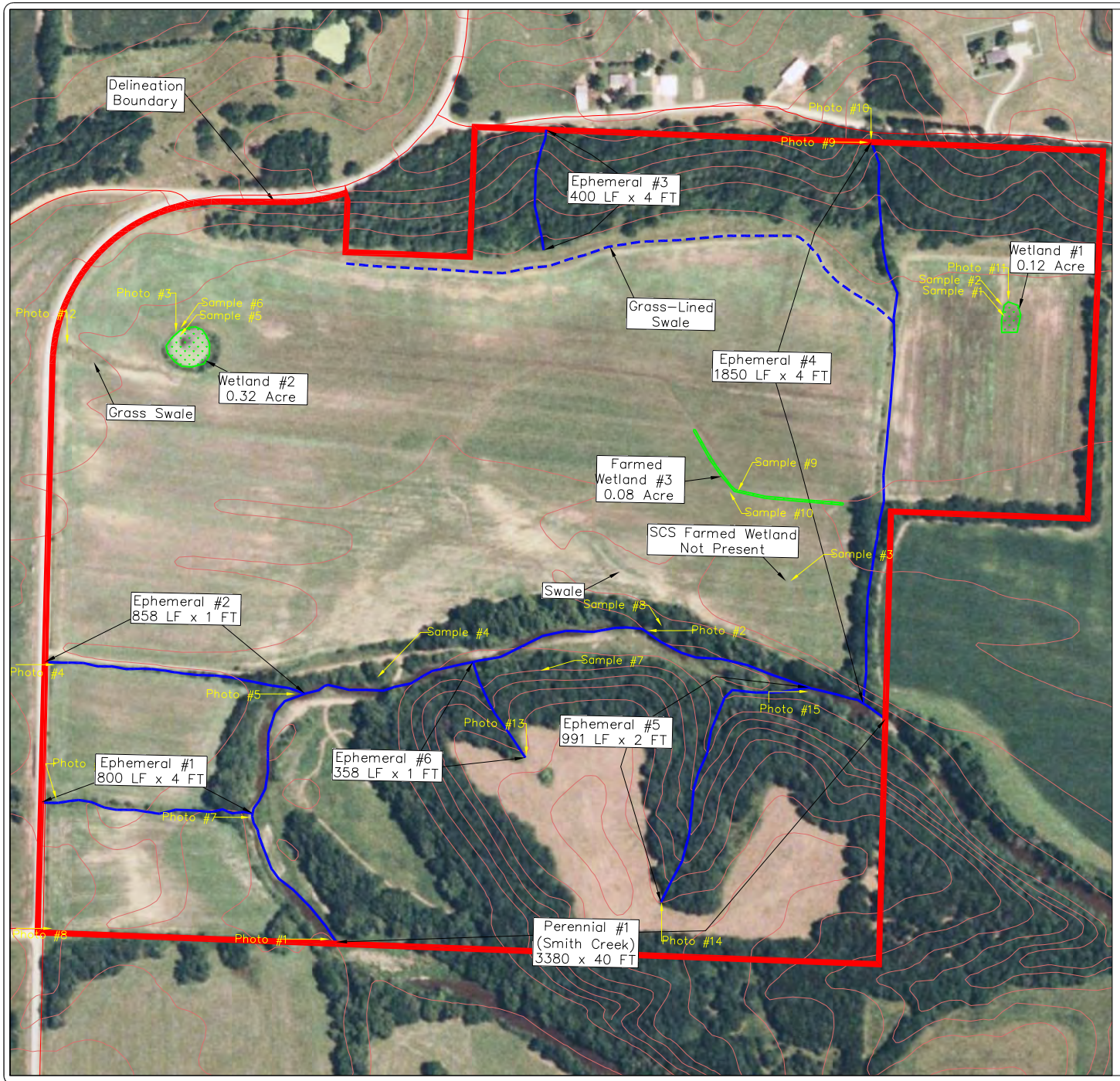
Revisions		
No.	Description	Date

Terra Technologies
1920 West 143rd Street, Suite 140 Leawood, KS 66224

Smith Creek
Wetland & Stream
Mitigation Bank
Moniteau County
Missouri

NRCS Soils
Survey Map

DRAWING	DATE
FIG 6	JAN 2011



JURISDICTIONAL ASSESSMENT

Wetland #1: 0.12 Acre
Wetland #2: 0.32 Acre
Farmed Wetland #3: 0.08 Acre
TOTAL WETLAND AREA: 0.52 ACRE

Ephemeral #1: 800 LF, Avg. Width at OHWM: 4 FT
Ephemeral #2: 858 LF, Avg. Width at OHWM: 1 FT
Ephemeral #3: 400 LF, Avg. Width at OHWM: 4 FT
Ephemeral #4: 1,850 LF, Avg. Width at OHWM: 4 FT
Ephemeral #5: 991 LF, Avg. Width at OHWM: 2 FT
Ephemeral #6: 358 LF, Avg. Width at OHWM: 1 FT
TOTAL EPHEMERAL LENGTH: 5,257 LF

Perennial #1 (Smith Creek): 3,380 LF,
Avg. Width at OHWM: 40 FT
TOTAL PERENNIAL LENGTH: 3,380 LF

SITE LOCATION
T44N - R16W - S9
Moniteau County, Missouri

GRAPHIC SCALE
150 0 75 150 300 600
(IN FEET)
1 inch = 150 ft.

Terra Technologies
1920 W. 143rd St., Ste. 140
Leawood, Kansas
66224
Tel 913.385.9560 Fax 913.385.5295

Figure 7

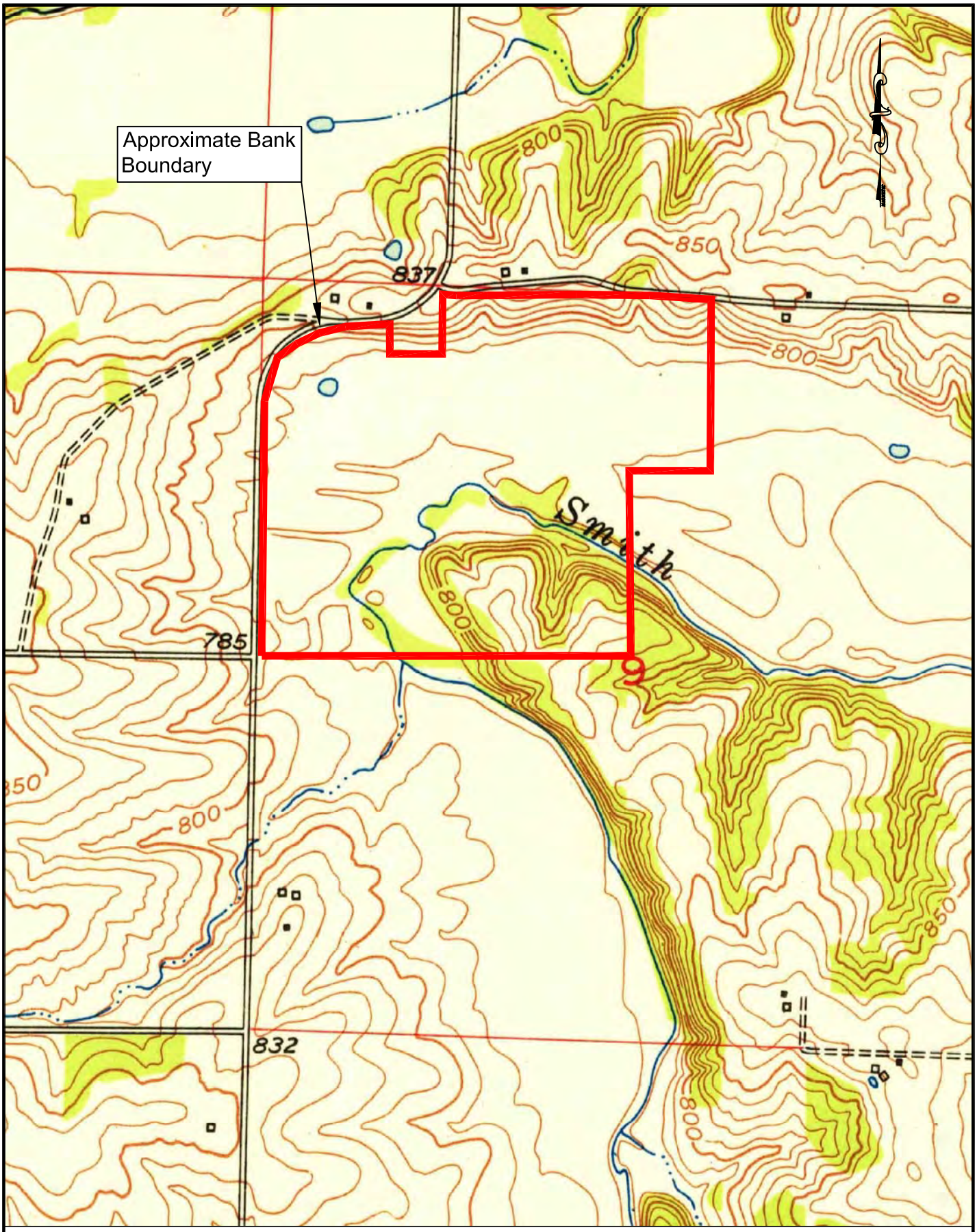
SHEET TITLE: JURISDICTIONAL ASSESSMENT
PROJECT: SMITH CREEK WETLAND AND STREAM MITIGATION BANK
CLIENT: SWALLOW TAIL, LLC

REVISIONS	
DATE	DESCRIPTION
6/18/08	Add pts./samples
11/13/12	Eph. Flow Regimes

DATE 06/10/08
CHECKED BY DLF
DRAWN BY JMG
SHEET NO. JA
JOB NO. XXX

APPENDIX B

HISTORICAL TOPOGRAPHIC MAPS & AERIAL PHOTOGRAPHS



Revisions		
No.	Description	Date

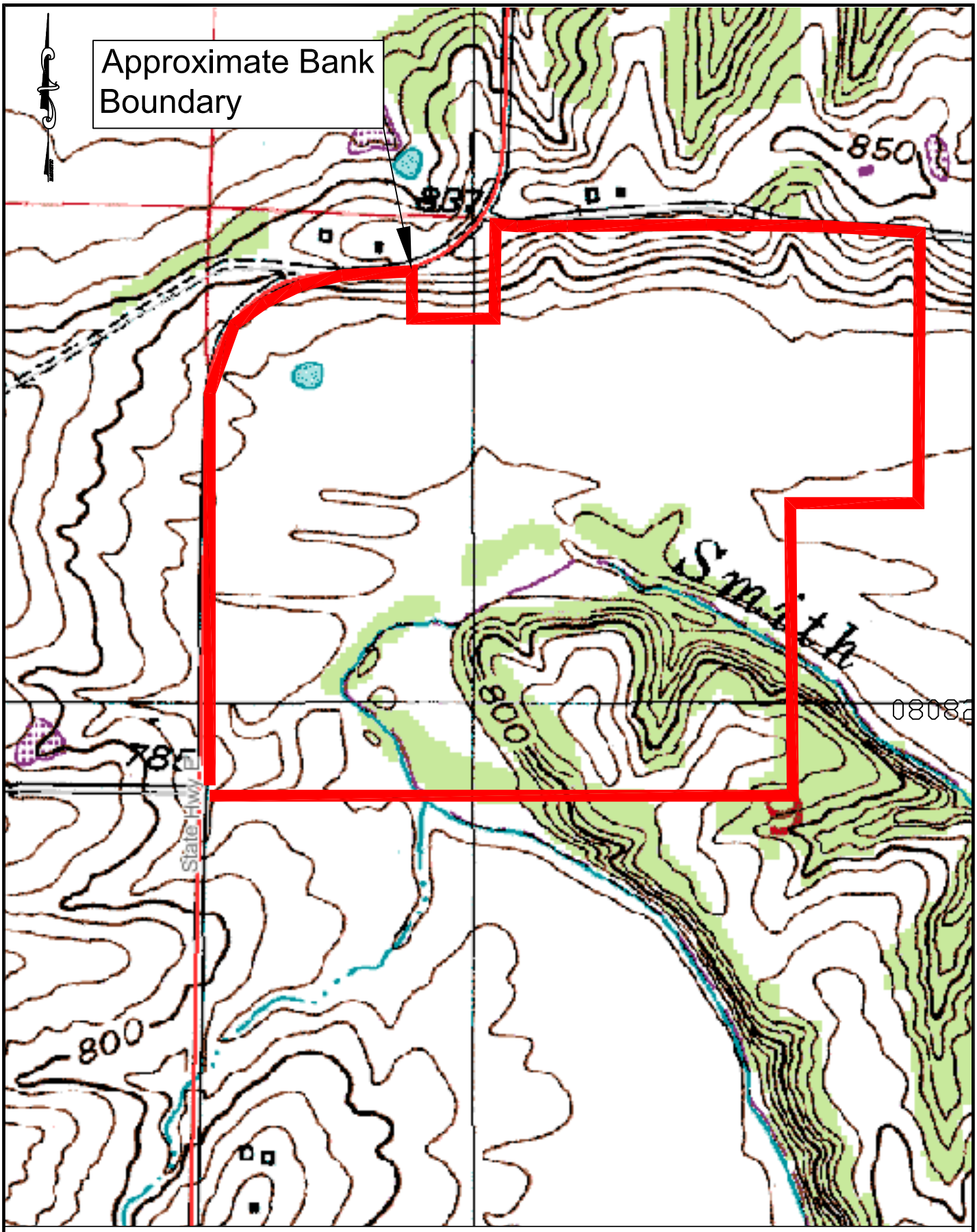
Terra Technologies

1920 West 143rd Street, Suite 140 Leawood, KS 66224

Smith Creek
Wetland & Stream
Mitigation Bank
Moniteau County
Missouri

U.S. Geological Survey
1951
Topography Map

DRAWING	DATE
1	NOV 2012



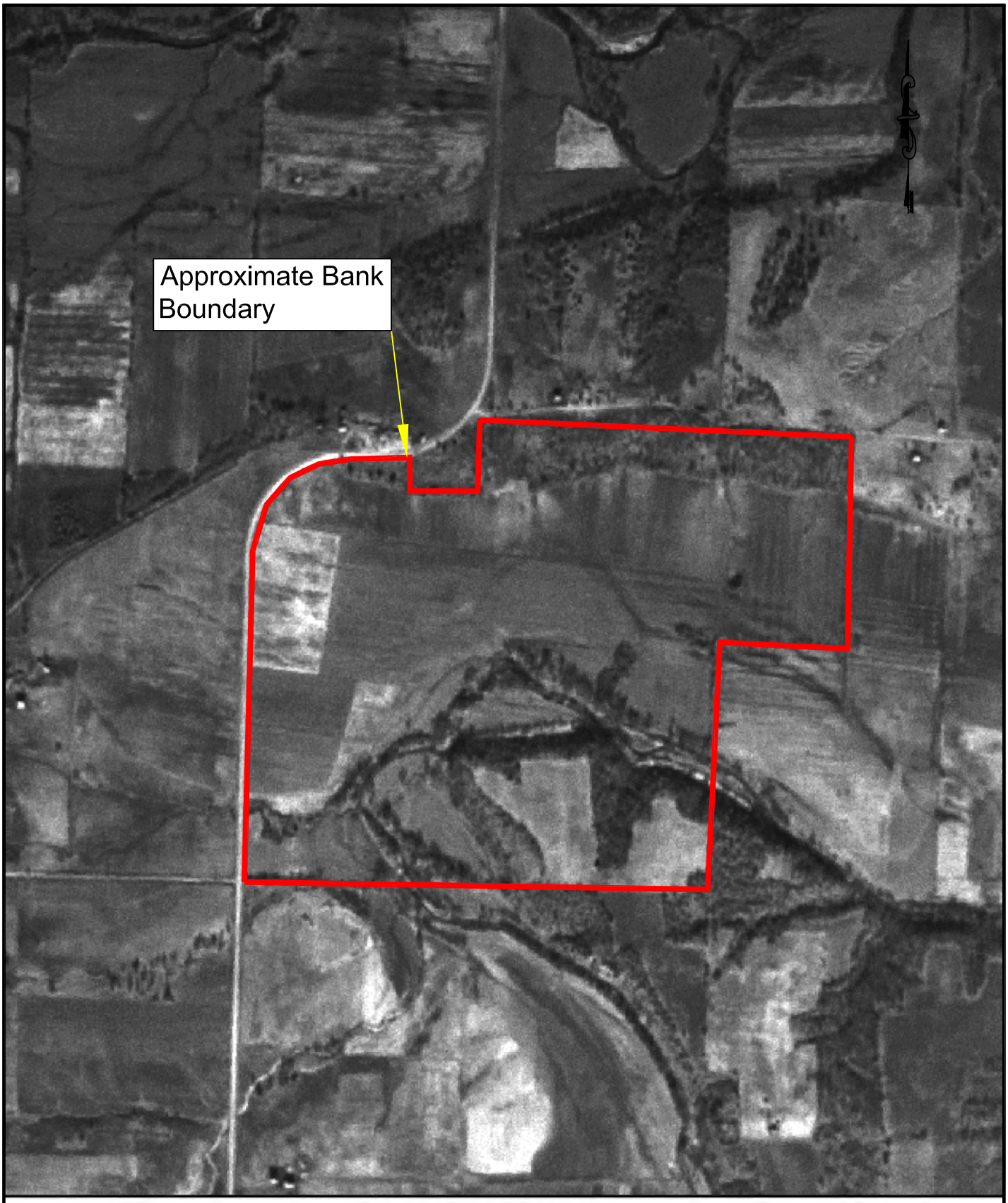
Revisions		
No.	Description	Date

Terra Technologies
1920 West 143rd Street, Suite 140 Leawood, KS 66224

Smith Creek
Wetland & Stream
Mitigation Bank
Moniteau County
Missouri

U.S. Geological Survey
1985
Topography Map

DRAWING	DATE
2	NOV 2012



Historical Aerial Photo
1941

N

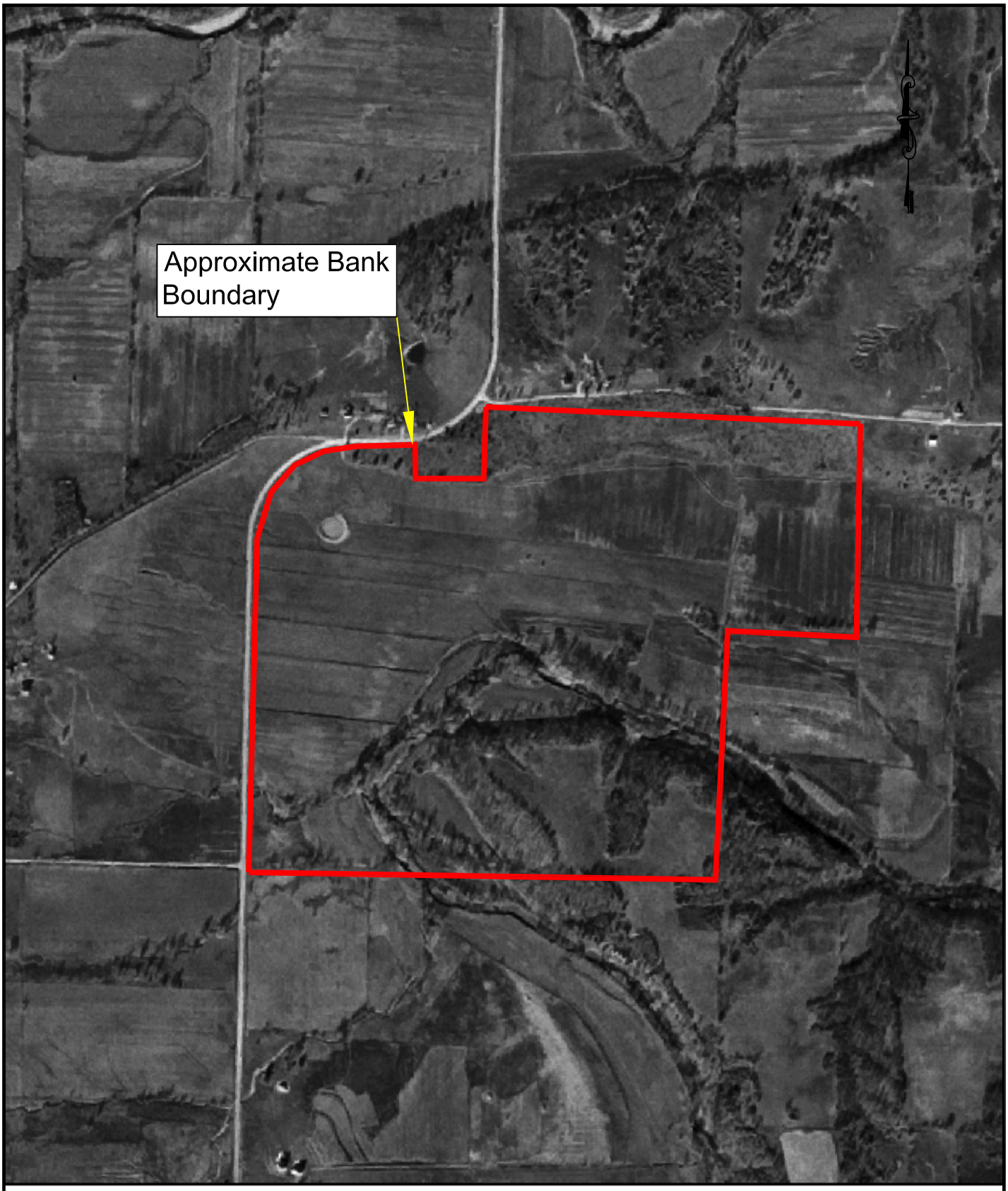
Revisions		
No.	Description	Date

Terra Technologies
1920 West 143rd Street, Suite 140 Leawood, KS 66224

Smith Creek
Wetland & Stream
Mitigation Bank
Moniteau County
Missouri

Aerial Photograph
1941

DRAWING	DATE
3	NOV 2012



Historical Aerial Photo
1947

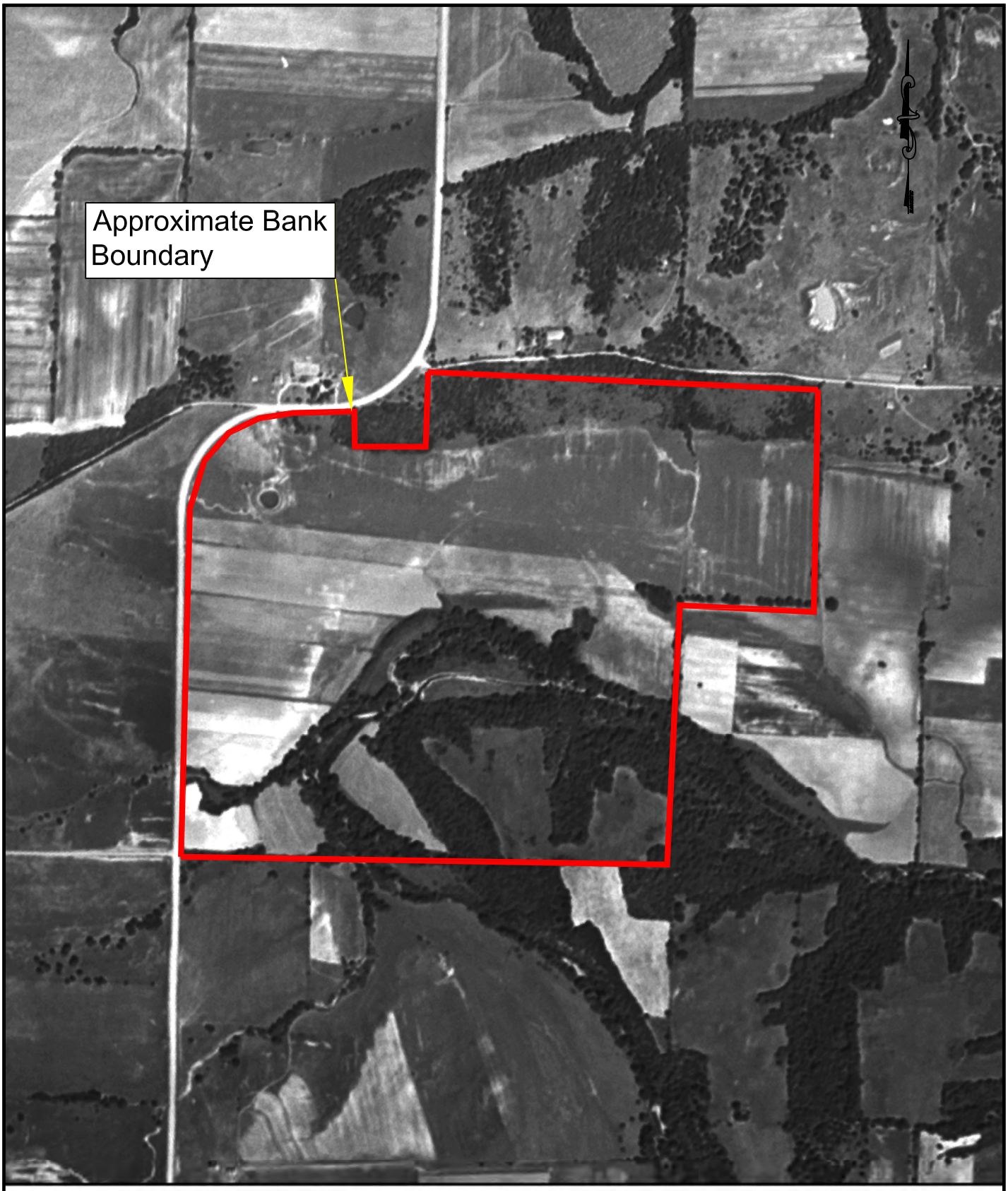
Revisions		
No.	Description	Date

Terra Technologies
1920 West 143rd Street, Suite 140 Leawood, KS 66224

Smith Creek
Wetland & Stream
Mitigation Bank
Moniteau County
Missouri

Aerial Photograph
1947

DRAWING	DATE
4	NOV 2012



Historical Aerial Photo
1953

Revisions		
No.	Description	Date

Terra Technologies
1920 West 143rd Street, Suite 140 Leawood, KS 66224

Smith Creek
Wetland & Stream
Mitigation Bank
Moniteau County
Missouri

Aerial Photograph
1953

DRAWING	DATE
5	NOV 2012

Historical Aerial Photo
1958

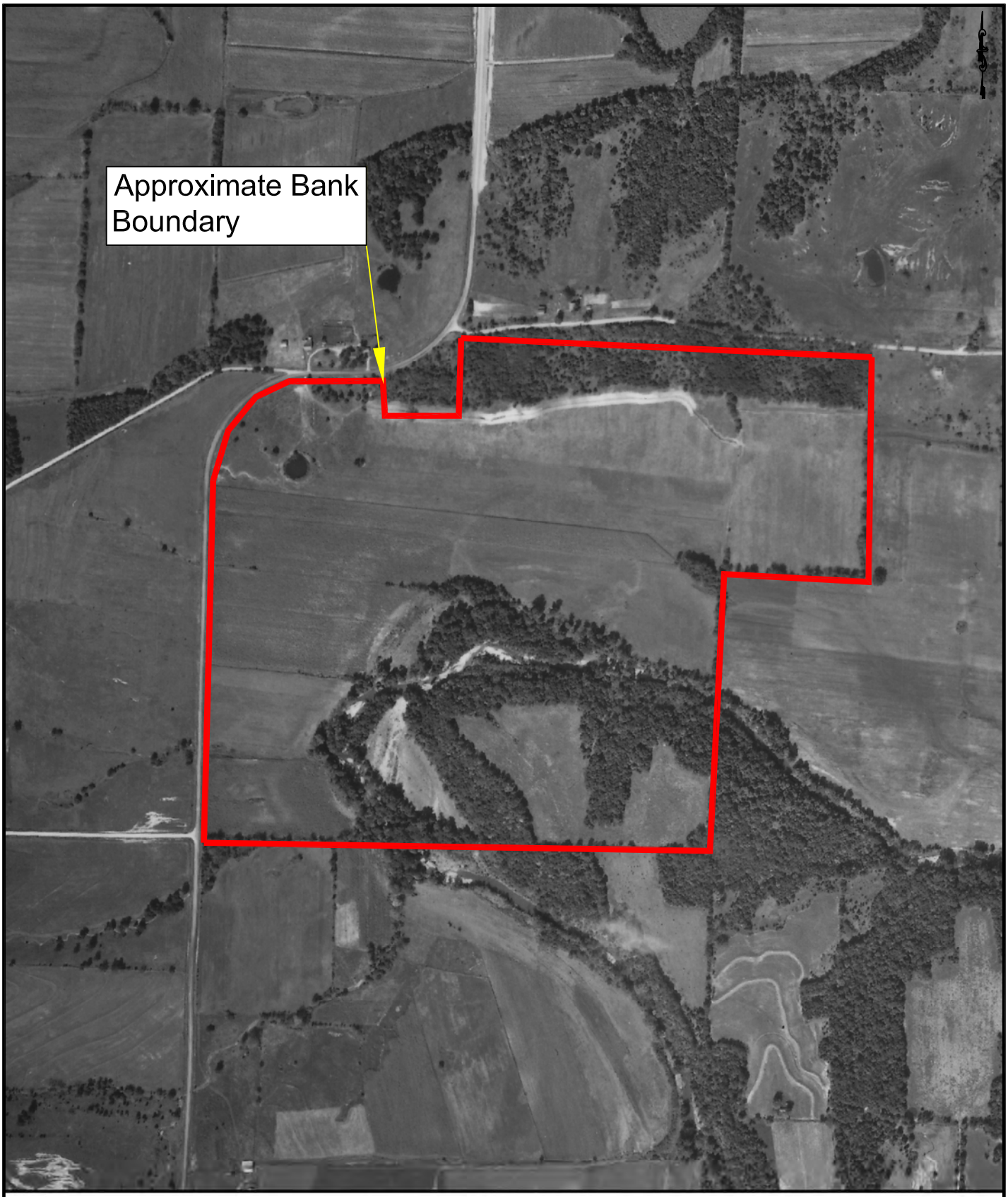
Revisions		
No.	Description	Date

Terra Technologies
1920 West 143rd Street, Suite 140 Leawood, KS 66224

Smith Creek
Wetland & Stream
Mitigation Bank
Moniteau County
Missouri

Aerial Photograph
1958

DRAWING	DATE
6	NOV 2012



Historical Aerial Photo
1965

Revisions		
No.	Description	Date

Terra Technologies
1920 West 143rd Street, Suite 140 Leawood, KS 66224

Smith Creek
Wetland & Stream
Mitigation Bank
Moniteau County
Missouri

Aerial Photograph
1965

DRAWING	DATE
7	NOV 2012

Revisions		
No.	Description	Date

Terra Technologies

1920 West 143rd Street, Suite 140 Leawood, KS 66224

Smith Creek
Wetland & Stream
Mitigation Bank
Moniteau County
Missouri

Aerial Photograph

1974

DRAWING	DATE
8	NOV 2012

Revisions		
No.	Description	Date

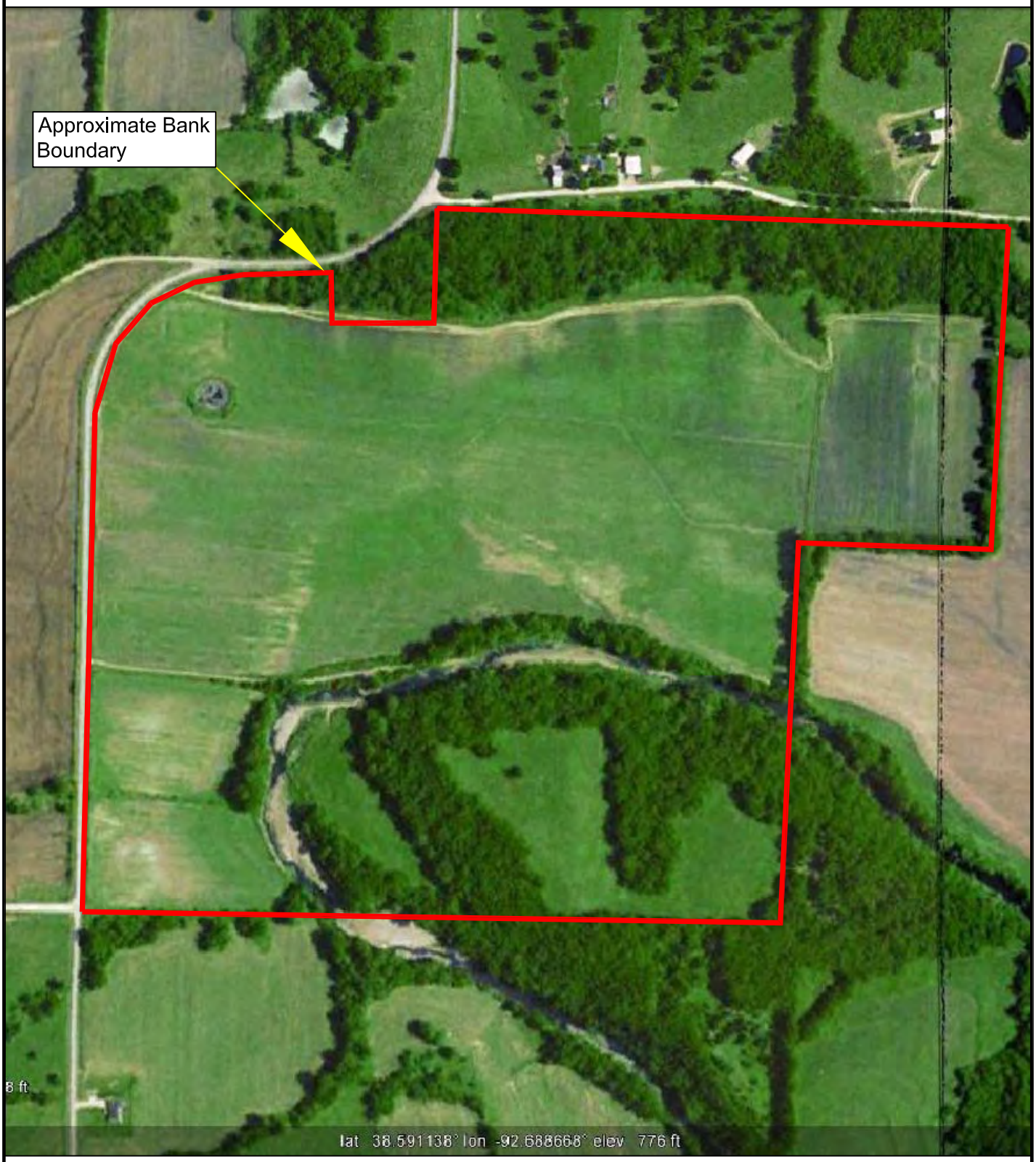
Terra Technologies
1920 West 143rd Street, Suite 140 Leawood, KS 66224

Smith Creek
Wetland & Stream
Mitigation Bank
Moniteau County
Missouri

Aerial Photograph

April 1, 1995

DRAWING	DATE
9	NOV 2012



Revisions		
No.	Description	Date

Terra Technologies

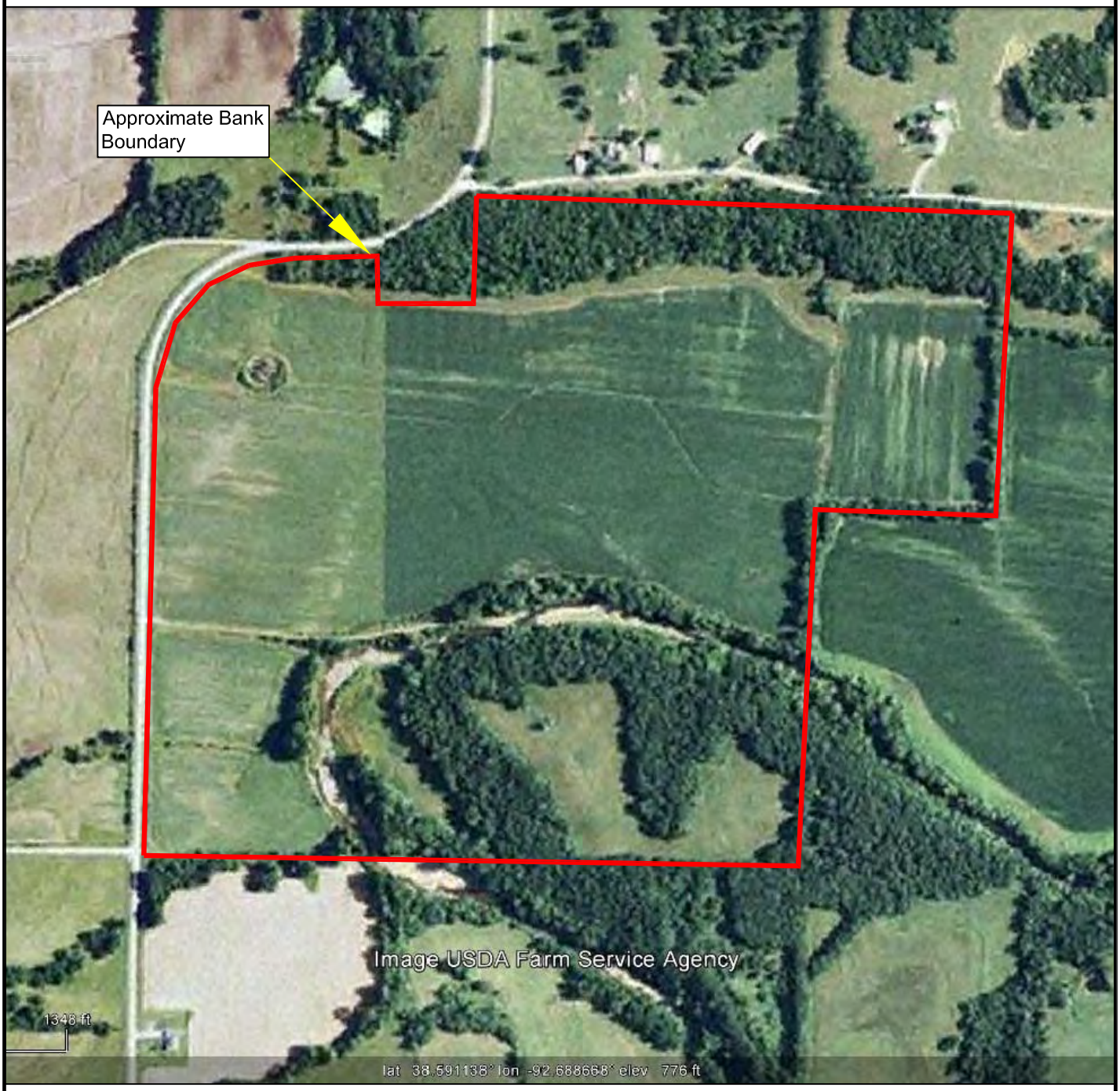
1920 West 143rd Street, Suite 140 Leawood, KS 66224

Smith Creek
Wetland & Stream
Mitigation Bank
Moniteau County
Missouri

Aerial Photograph

2002

DRAWING	DATE
10	NOV 2012



Revisions		
No.	Description	Date

Terra Technologies

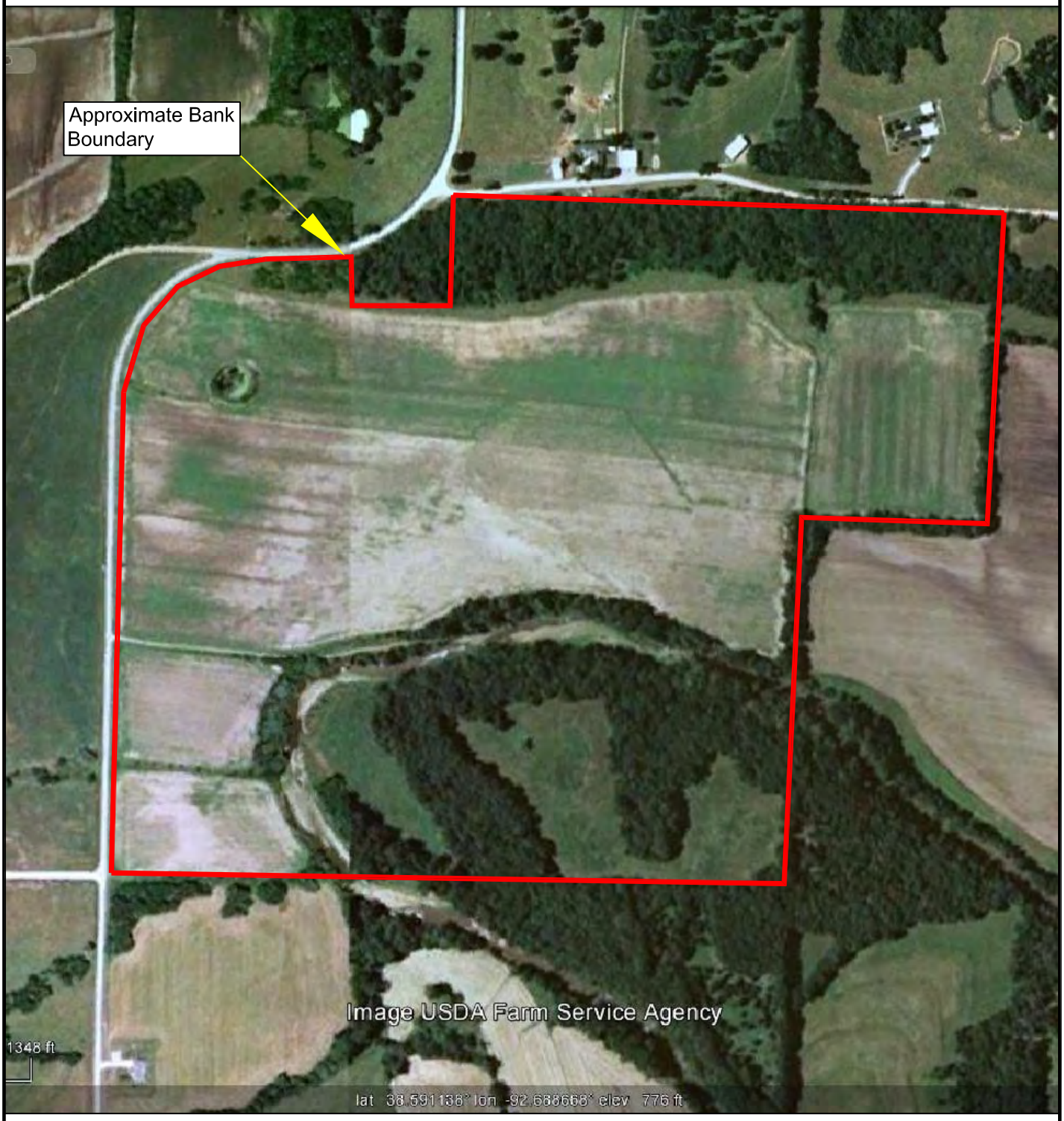
1920 West 143rd Street, Suite 140 Leawood, KS 66224

Smith Creek
Wetland & Stream
Mitigation Bank
Moniteau County
Missouri

Aerial Photograph

July 28, 2004

DRAWING	DATE
11	NOV 2012



Revisions		
No.	Description	Date

Terra Technologies

1920 West 143rd Street, Suite 140 Leawood, KS 66224

Smith Creek
Wetland & Stream
Mitigation Bank
Moniteau County
Missouri

Aerial Photograph

June 14, 2005

DRAWING	DATE
12	NOV 2012

Revisions		
No.	Description	Date

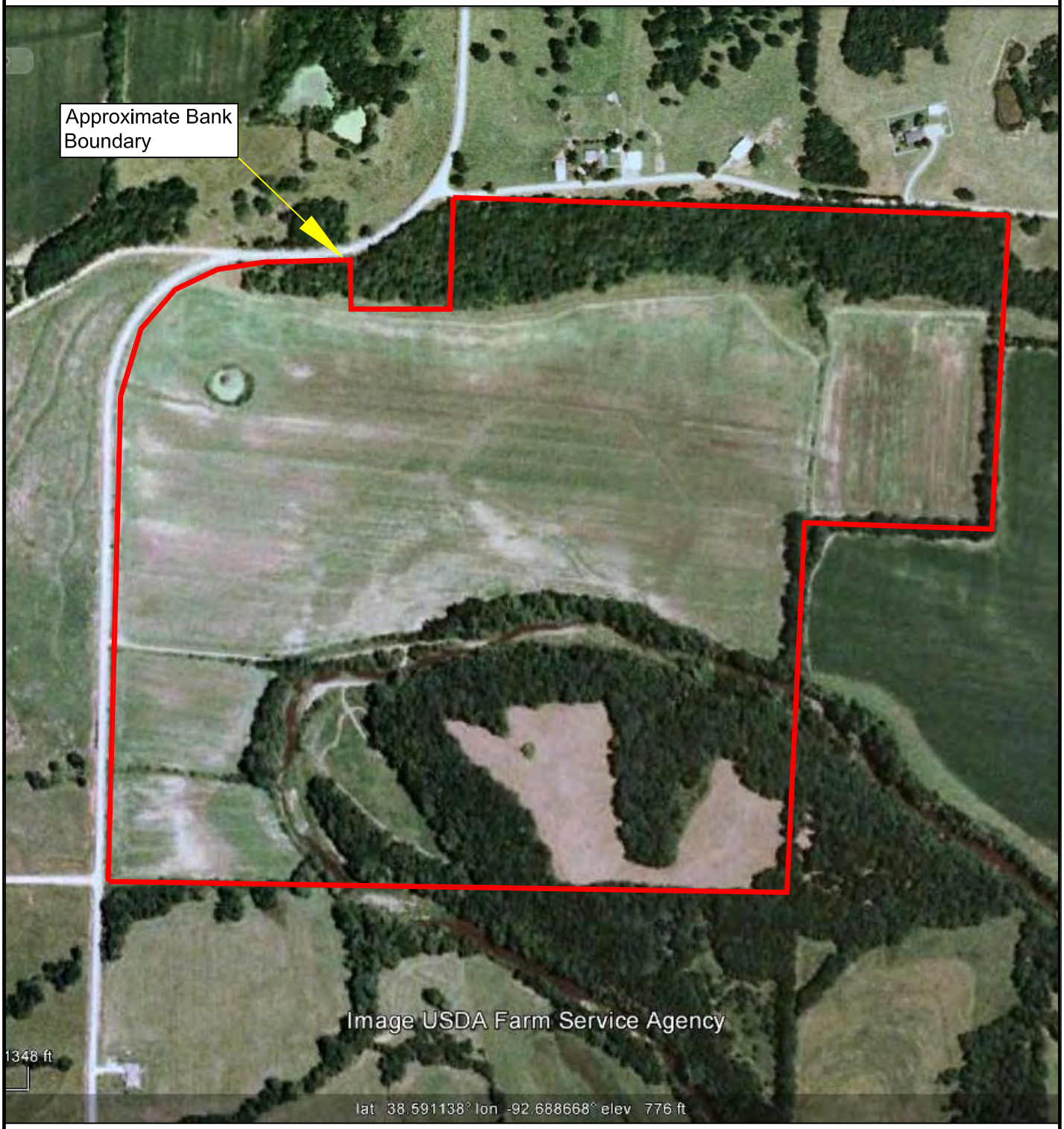
Terra Technologies
1920 West 143rd Street, Suite 140 Leawood, KS 66224

Smith Creek
Wetland & Stream
Mitigation Bank
Moniteau County
Missouri

Aerial Photograph

June 9, 2006

DRAWING	DATE
13	NOV 2012



Revisions		
No.	Description	Date

Terra Technologies

1920 West 143rd Street, Suite 140 Leawood, KS 66224

Smith Creek
Wetland & Stream
Mitigation Bank
Moniteau County
Missouri

Aerial Photograph

June 14, 2007

DRAWING	DATE
14	NOV 2012

Revisions		
No.	Description	Date

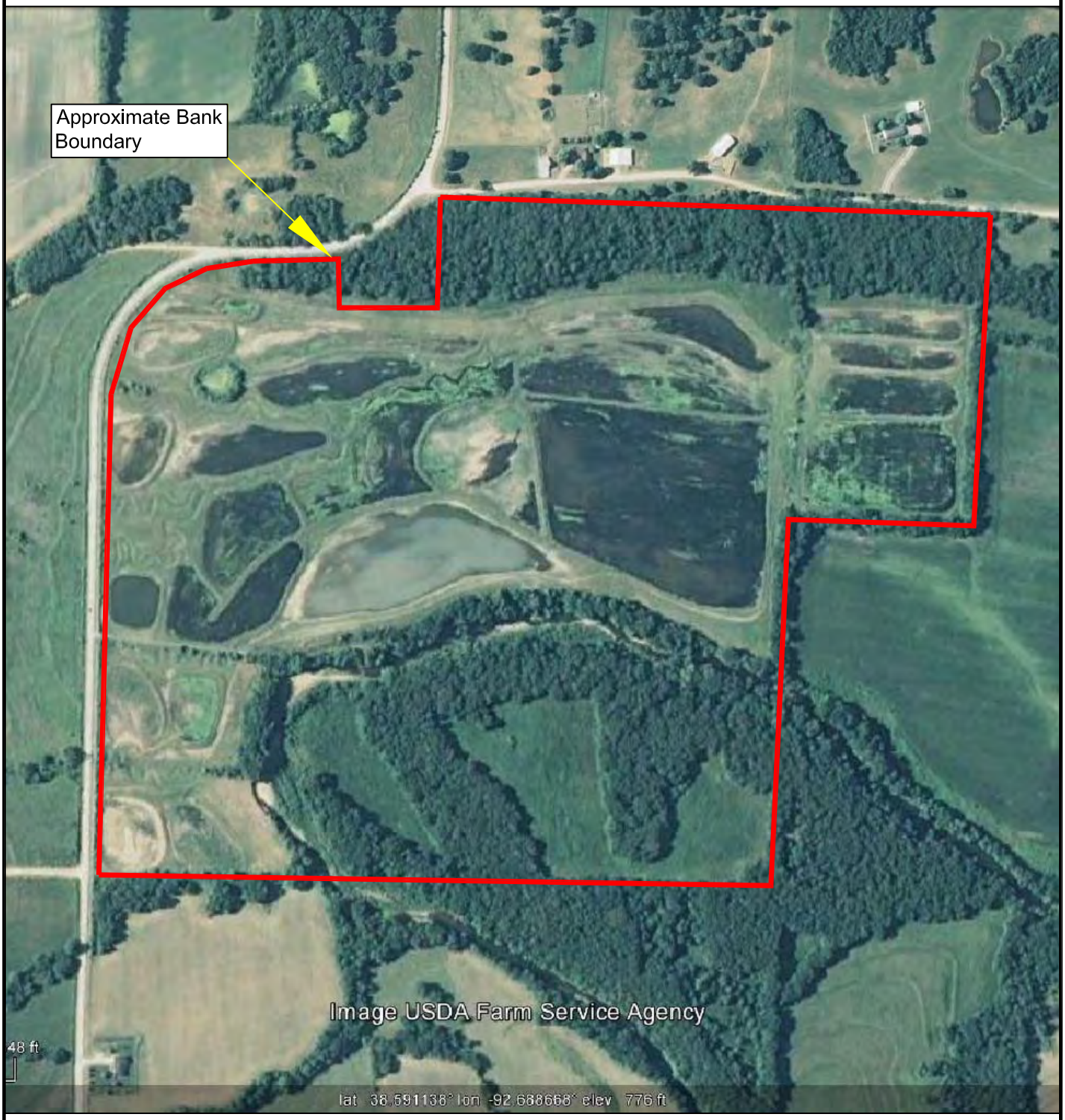
Terra Technologies
1920 West 143rd Street, Suite 140 Leawood, KS 66224

Smith Creek
Wetland & Stream
Mitigation Bank
Moniteau County
Missouri

Aerial Photograph

June 15, 2009

DRAWING	DATE
15	NOV 2012



Revisions		
No.	Description	Date

Terra Technologies
1920 West 143rd Street, Suite 140 Leawood, KS 66224

Smith Creek
Wetland & Stream
Mitigation Bank
Moniteau County
Missouri

Aerial Photograph

July 8, 2010

DRAWING	DATE
16	NOV 2012

Revisions		
No.	Description	Date

Terra Technologies

1920 West 143rd Street, Suite 140 Leawood, KS 66224

Smith Creek
Wetland & Stream
Mitigation Bank
Moniteau County
Missouri

Aerial Photograph

July 18, 2011

DRAWING	DATE
17	NOV 2012

Revisions		
No.	Description	Date

Terra Technologies

1920 West 143rd Street, Suite 140 Leawood, KS 66224

Smith Creek
Wetland & Stream
Mitigation Bank
Moniteau County
Missouri

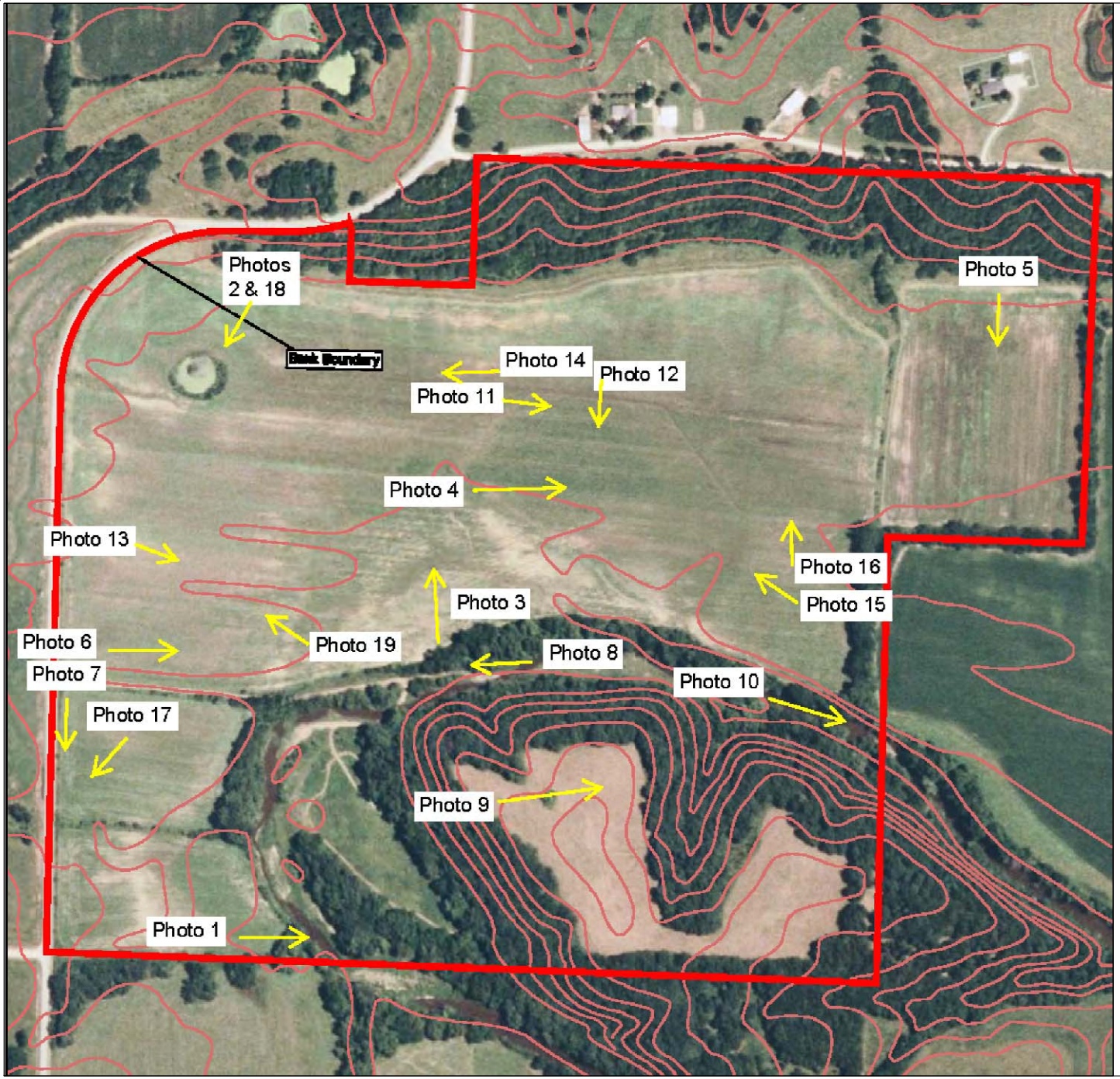
Aerial Photograph

September 2, 2012

DRAWING	DATE
18	NOV 2012

APPENDIX C

PHOTOGRAPHIC DOCUMENTATION



Note: While the aerial photograph in this figure shows pre-restoration conditions, the photographs in this appendix are of both pre-restoration and post-restoration conditions.

Terra Technologies
1920 W. 143rd St., Ste. 140
Leawood, Kansas
66224
Tel 913.385.9560 Fax 913.385.5295

Appendix C

SHEET TITLE: Aerial Photograph with Location of Photo Points

PROJECT: SMITH CREEK WETLAND AND STREAM MITIGATION BANK

CLIENT: SWALLOW TAIL, LLC

REVISIONS

DATE	DESCRIPTION
12/10/12	Added Photos

DATE 01/27/11

CHECKED BY SCS DRAWN BY JMG

SHEET NO. 1

JOB NO. XXX

PHOTO LOG

DATE: 7/2/2007 TAKEN BY: GW	SITE NAME: Smith Creek Wetland & Stream Mitigation Bank
COMMENTS: Photo of Smith Creek at the approximate location where it enters the property on the southern property line. View faces east and looks upstream. PHOTO #: 1	

DATE: 8/7/2007 TAKEN BY: GW	SITE NAME: Smith Creek Wetland & Stream Mitigation Bank
COMMENTS: <u>Pre-Restoration:</u> Photo of the northwest part of the property showing an existing pond and the farm fields in the background. View faces southwest. PHOTO #: 2	

PHOTO LOG

DATE: 7/17/2007 TAKEN BY: GW	SITE NAME: Smith Creek Wetland & Stream Mitigation Bank
COMMENTS: <u>Pre-Restoration:</u> Photo of the farm field looking toward the woods on the northwest side of the property. View faces north. PHOTO #: 3	

DATE: 7/17/2007 TAKEN BY: GW	SITE NAME: Smith Creek Wetland & Stream Mitigation Bank
COMMENTS: <u>Pre-Restoration:</u> Photo of the farm field looking toward the east. PHOTO #: 4	

PHOTO LOG

DATE: 8/7/2007 TAKEN BY: GW	SITE NAME: Smith Creek Wetland & Stream Mitigation Bank
COMMENTS: <u>Pre-Restoration:</u> Photo of the farmed wetland and representative conditions in the field on the east side of the property. View faces south. PHOTO #: 5	

DATE: 6/29/2007 TAKEN BY: GW	SITE NAME: Smith Creek Wetland & Stream Mitigation Bank
COMMENTS: <u>Pre-Restoration:</u> Photo of the west side of the property during a summer rain from near the site entrance. This field road separates the fields on the west side at the property entrance and the channelized Ephemeral #2 exists immediately to the right of the road. View faces east. PHOTO #: 6	

PHOTO LOG

DATE: 6/29/2007 TAKEN BY: GW	SITE NAME: Smith Creek Wetland & Stream Mitigation Bank
COMMENTS: <u>Pre-Restoration:</u> Photo of the farm fields on the southwest side of the property during a summer rain. The channelized ditch that contained Ephemeral #2 is in the foreground. View faces south. PHOTO #: 7	

DATE: 10/12/2007 TAKEN BY: GW	SITE NAME: Smith Creek Wetland & Stream Mitigation Bank
COMMENTS: Photo of Smith Creek looking upstream showing where it bends to the south in the background. View faces west. PHOTO #: 8	

PHOTO LOG

DATE: 7/18/2007 TAKEN BY: GW	SITE NAME: Smith Creek Wetland & Stream Mitigation Bank
COMMENTS: <u>Pre-Restoration:</u> Photo of conditions in the fields south of Smith Creek. View faces east. PHOTO #: 9	

DATE: 10/12/2007 TAKEN BY: GW	SITE NAME: Smith Creek Wetland & Stream Mitigation Bank
COMMENTS: Photo of Smith Creek looking toward the east side of the property where Smith Creek exits. View faces east. PHOTO #: 10	

PHOTO LOG

DATE: 5/23/2012 TAKEN BY: SCS	SITE NAME: Smith Creek Wetland & Stream Mitigation Bank
COMMENTS: <u>Post-Restoration:</u> Established wetland conditions in the center of the Smith Creek floodplain to the north of the location where Photo #4 was taken. View faces east. PHOTO #: 11	

DATE: 5/23/2012 TAKEN BY: SCS	SITE NAME: Smith Creek Wetland & Stream Mitigation Bank
COMMENTS: <u>Post-Restoration:</u> View facing south of established wetland conditions from the center of the Smith Creek floodplain. PHOTO #: 12	

PHOTO LOG

DATE: 5/23/2012 TAKEN BY: SCS	SITE NAME: Smith Creek Wetland & Stream Mitigation Bank
COMMENTS: <u>Post-Restoration:</u> Photograph facing downstream of the restored Ephemeral #7 channel and its immediate surroundings. PHOTO #: 13	

DATE: 5/9/2012 TAKEN BY: SCS	SITE NAME: Smith Creek Wetland & Stream Mitigation Bank
COMMENTS: <u>Post-Restoration:</u> Established wetland conditions in the north of the Smith Creek floodplain with six egrets foraging in one wetland pool. View faces west. PHOTO #: 14	

PHOTO LOG

DATE: 6/23/2012 TAKEN BY: SCS	SITE NAME: Smith Creek Wetland & Stream Mitigation Bank
COMMENTS: <u>Post-Restoration:</u> Photograph to the northwest of wetland conditions in the large pool just north of Smith Creek near the eastern Bank boundary. PHOTO #: 15	

DATE: 6/23/2012 TAKEN BY: SCS	SITE NAME: Smith Creek Wetland & Stream Mitigation Bank
COMMENTS: <u>Post-Restoration:</u> Photograph to the north of the wetland conditions in the large pool just north of Smith Creek near the eastern Bank boundary. PHOTO #: 16	

PHOTO LOG

DATE: 6/17/2010 TAKEN BY: DTD	SITE NAME: Smith Creek Wetland & Stream Mitigation Bank
COMMENTS: <u>Post-Restoration:</u> View to the southwest of a wetland pool just south of Ephemeral #2. This is roughly the same location as shown in Photo #7. PHOTO #: 17	

DATE: 6/17/2010 TAKEN BY: DTD	SITE NAME: Smith Creek Wetland & Stream Mitigation Bank
COMMENTS: <u>Post-Restoration:</u> Photo of the northwest part of the property from the same location that Photo #2 was taken almost three years earlier. View faces southwest. PHOTO #: 18	

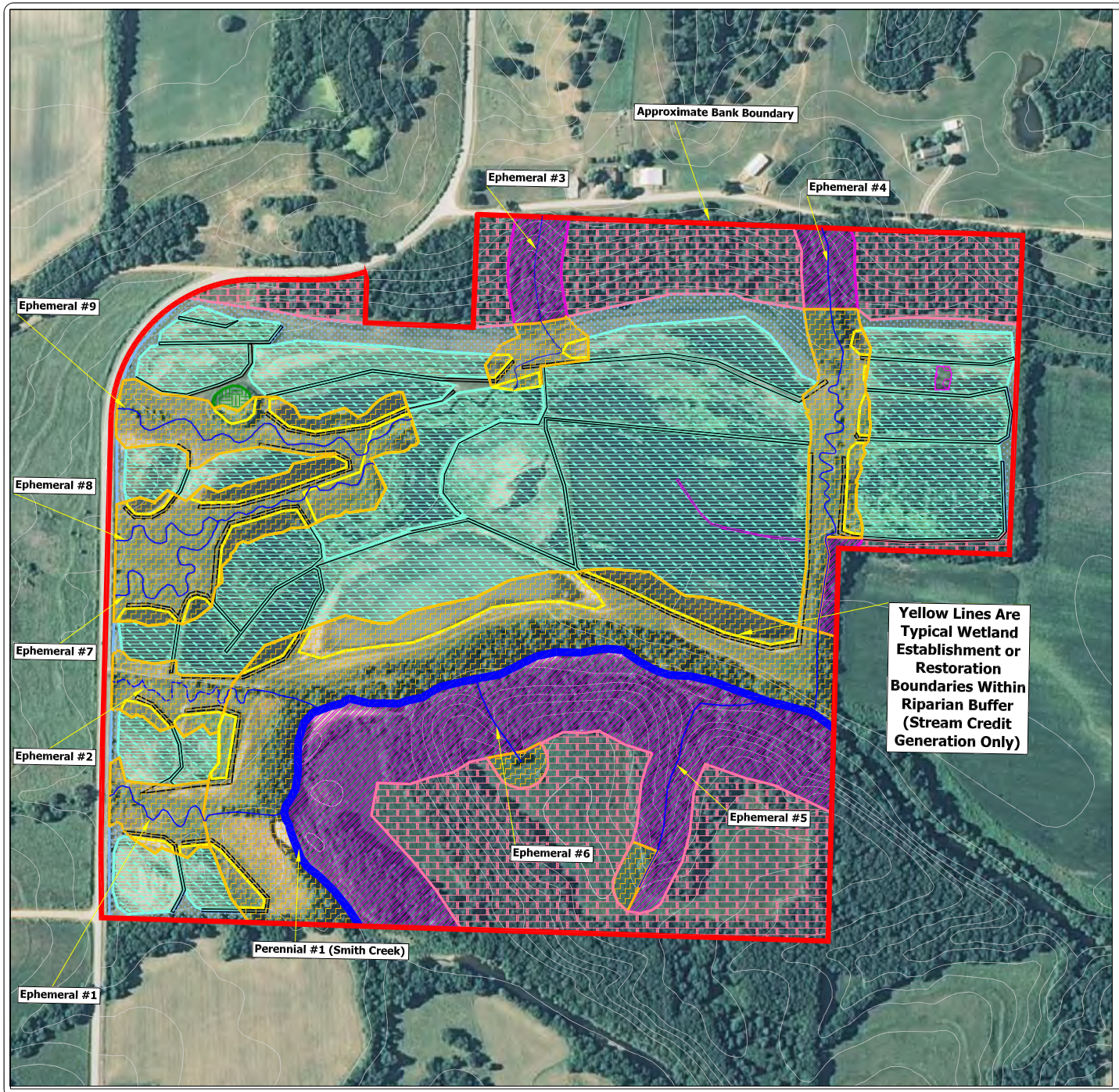
PHOTO LOG

DATE: 5/9/2012 TAKEN BY: DTD	SITE NAME: Smith Creek Wetland & Stream Mitigation Bank
COMMENTS: <u>Post-Restoration:</u> Photograph of mute swans which resided at the Bank for several months during 2011 and 2012. PHOTO #: 19	

DATE: 5/9/2012 TAKEN BY: DTD	SITE NAME: Smith Creek Wetland & Stream Mitigation Bank
COMMENTS: <u>Post-Restoration:</u> Photo of restored stream in the northwest portion of the Bank. PHOTO #: 20	

APPENDIX D

BANK DEVELOPMENT PLAN



LEGEND

- Riparian Buffer Restoration 45.60 Acres
- Riparian Buffer Enhancement 24.87 Acres
- Herbaceous Wetland Establishment 58.93 Acres
- Herbaceous Wetland Restoration 0.19 Acre
- Herbaceous Wetland Enhancement 0.21 Acre
- Upland Buffer Establishment 6.74 Acres
- Upland Buffer Enhancement 34.30 Acres
- Site Boundary
- Stream
- Wetland Establishment or Restoration Within Riparian Buffer
- USGS 10-Foot Contours

GRAPHIC SCALE

175 0 87.5 175 350 700

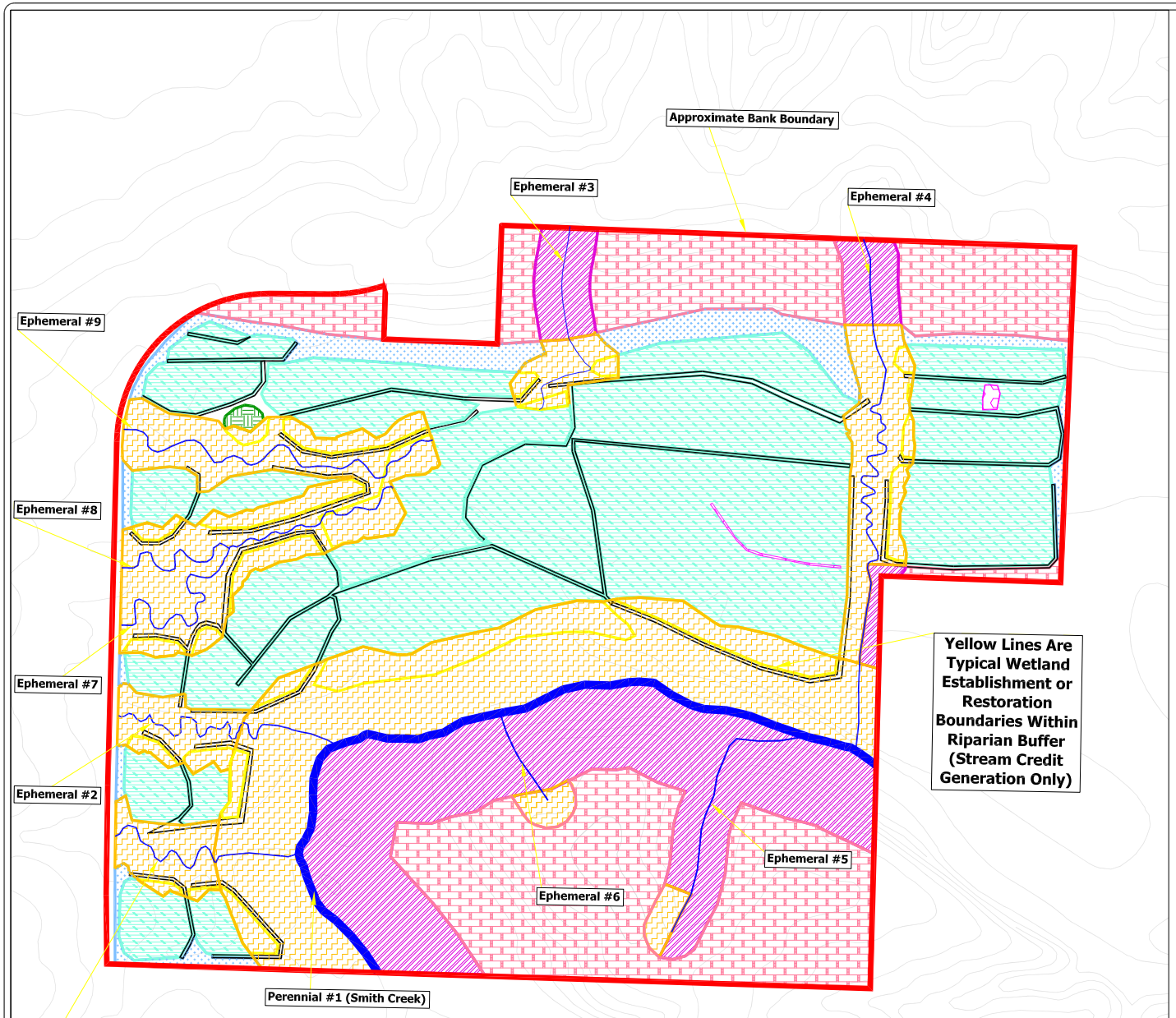
(IN FEET)
1 inch = 175 ft.

Terra Technologies
1920 W. 143rd St., Ste. 140
Leawood, Kansas
66224
Tel 913.385.9560 Fax 913.385.5295

SHEET TITLE: RESTORATION DESIGN
PROJECT: SMITH CREEK WETLAND AND STREAM MITIGATION BANK
CLIENT: SWALLOW TAIL, LLC

REVISIONS	
DATE	DESCRIPTION

DATE 01/06/15
CHECKED BY DLF
DRAWN BY DTD/SCS
SHEET NO. 1
JOB NO. .



LEGEND

- Riparian Buffer Restoration 45.60 Acres
- Riparian Buffer Enhancement 24.87 Acres
- Herbaceous Wetland Establishment 58.93 Acres
- Herbaceous Wetland Restoration 0.19 Acre
- Herbaceous Wetland Enhancement 0.21 Acre
- Upland Buffer Establishment 6.74 Acres
- Upland Buffer Enhancement 34.30 Acres
- Site Boundary
- Stream
- Wetland Establishment or Restoration Within Riparian Buffer
- USGS 10-Foot Contours

GRAPHIC SCALE

175 0 87.5 175 350 700

(IN FEET)
1 inch = 175 ft.

Terra Technologies
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Leawood, Kansas
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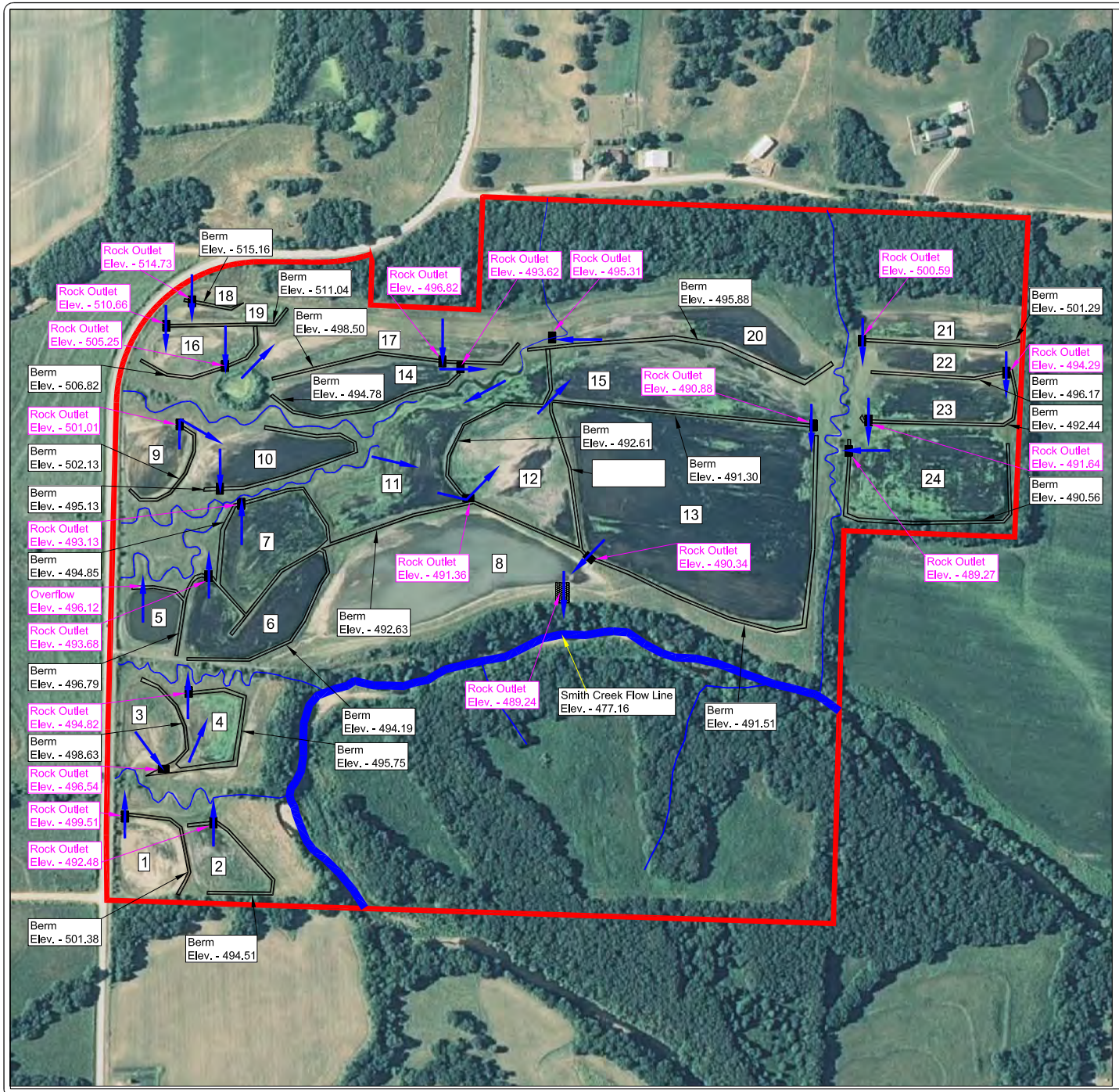
SHEET TITLE: RESTORATION DESIGN (WITHOUT AERIAL PHOTOGRAPH)
PROJECT: SMITH CREEK WETLAND AND STREAM MITIGATION BANK
CLIENT: SWALLOW TAIL, LLC

REVISIONS

DATE	DESCRIPTION

DATE 01/06/15
CHECKED BY DLF
DRAWN BY DTD/SCS
SHEET NO. 2
JOB NO. .



LEGEND

- Site Boundary
- Stream
- Berm
- Rock Outlet / Inlet
- Direction of Water Flow
- 1 Pool Number

GRAPHIC SCALE

175 0 87.5 175 350 700

(IN FEET)
1 inch = 175 ft.

Terra Technologies
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Leawood, Kansas
66224
Tel 913.385.9560 Fax 913.385.5295

SHEET TITLE: AS BUILT FIGURE – BERMS & WATER FLOW

PROJECT: SMITH CREEK WETLAND AND STREAM MITIGATION BANK

CLIENT: SWALLOW TAIL, LLC

REVISIONS

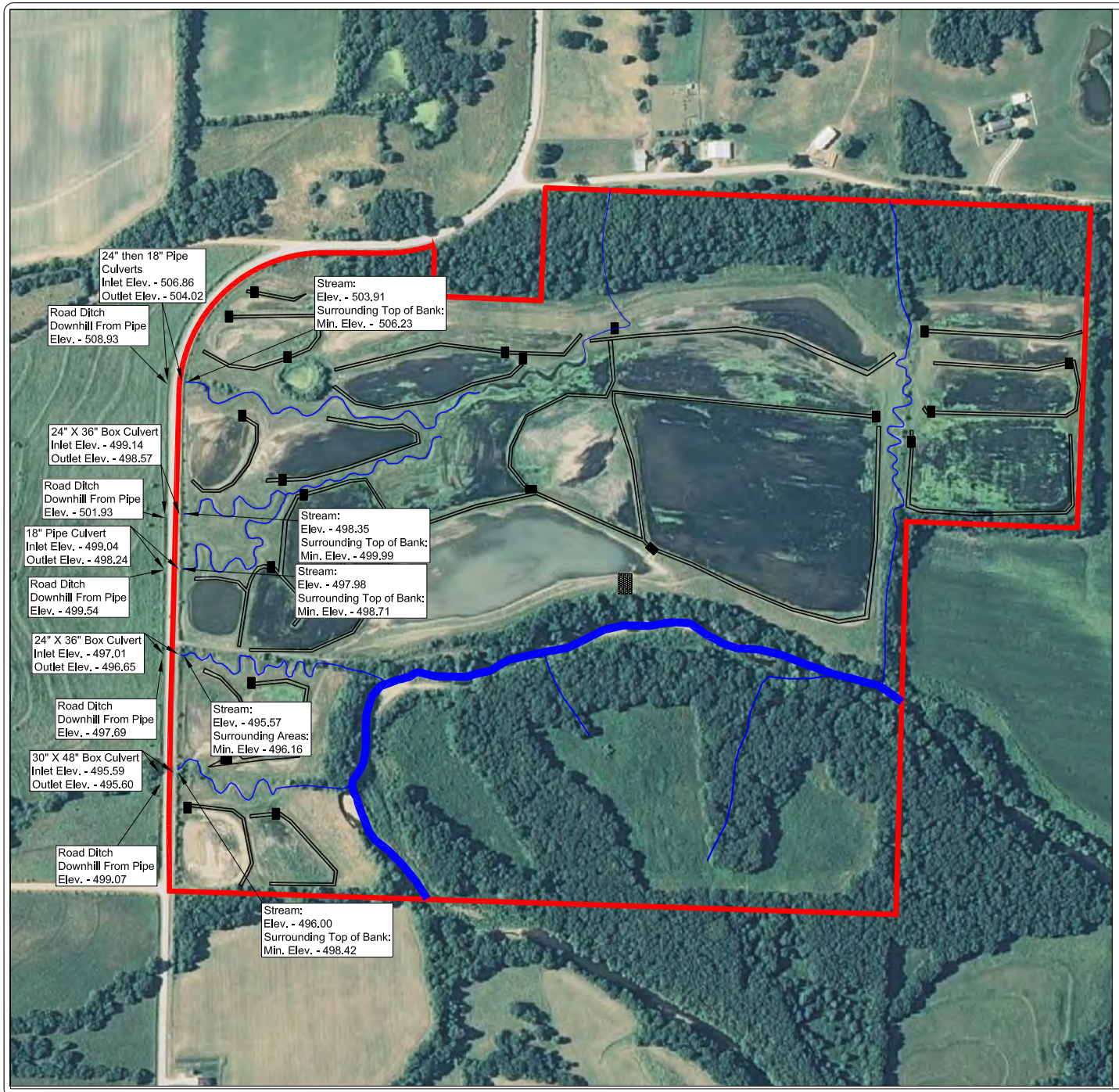
DATE	DESCRIPTION

DATE 01/06/15

CHECKED BY SCS DRAWN BY DTD

SHEET NO. 3

JOB NO.



LEGEND

- Site Boundary
- Stream
- Berm
- Rock Outlet

GRAPHIC SCALE

175 0 87.5 175 350 700

(IN FEET)
1 inch = 175 ft.

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1920 W. 143rd St., Ste. 140
Leawood, Kansas
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Tel 913.385.9560 Fax 913.385.5295

SHEET TITLE: ELEVATIONS AROUND STREAM ENTRANCES TO BANK

PROJECT: SMITH CREEK WETLAND AND STREAM MITIGATION BANK

CLIENT: SWALLOW TAIL, LLC

REVISIONS

DATE	DESCRIPTION

DATE 01/06/15

CHECKED BY SCS DRAWN BY DTD

SHEET NO. 4

JOB NO. .

Riparian Buffer Restoration and Upland Buffer Establishment Seed List	
Scientific Name	Common Name
Achillea millefolium	Common Yarrow
Andropogon gerardii	Big Bluestem
Aquilegia canadensis	Red Columbine
Asclepias syriaca	Common Milkweed
Asclepias tuberosa	Butterfly Milkweed
Baptisia alba	White Wild Indigo
Baptisia australis	Blue Wild Indigo
Bouteloua curtipendula	Sideoats Grama
Bouteloua dactyloides	Buffalo Grass
Cacalia atriplicifolia	Pale Indian Plantain
Coreopsis grandiflora	Grandflower Tickseed
Coreopsis lanceolata	Lanceleaf Tickseed
Coreopsis palmata	Prairie Tickseed
Coreopsis tripteris	Tall Tickseed
Dalea candida	White Prairie-Clover
Dalea purpurea	Purple Prairie-Clover
Desmanthus illinoensis	Prairie Bundle-Flower
Elymus canadensis	Nodding Wild Rye
Elymus virginicus	Virginia Wild Rye
Eryngium yuccifolium	Button Eryngo
Helianthus mollis	Ashy Sunflower
Helianthus occidentalis	Few-Leaf Sunflower
Heliopsis helianthoides	Smooth Oxeye
Heterotheca camporum	Hairy Golden Aster
Lespedeza capitata	Round-Head Bush-Clover
Liatris pycnostachya	Cat-Tail Gayfeather
Monarda fistulosa	Oswego-Tea
Oenothera macrocarpa	Bigfruit Evening Primrose
Oenothera speciosa	Pinkladies
Oligoneuron rigidum	Hard-Leaf Flat-Top-Goldenrod
Panicum virgatum	Switchgrass
Penstemon digitalis	Foxglove Beardtongue
Pycnanthemum tenuifolium	Narrow-Leaf Mountain-Mint
Pycnanthemum virginianum	Virginia Mountain-Mint
Ratibida columnifera	Upright Prairie Coneflower
Ratibida pinnata	Pinnate Prairie Coneflower
Rudbeckia fulgida	Orange Coneflower
Rudbeckia missouriensis	Missouri Orange Coneflower
Rudbeckia subtomentosa	Sweet Coneflower
Senna marilandica	Maryland Wild Sensitive-Plant
Silphium integrifolium	Rosinweed
Silphium laciniatum	Compassplant
Silphium perfoliatum	Cup-Plant
Sorghastrum nutans	Yellow Indian Grass
Symphyotrichum laeve	Smooth Blue American-Aster
Symphyotrichum lateriflorum	Farewell-Summer
Symphyotrichum oblongifolium	Aromatic Aster
Symphyotrichum oolentangiense	Skyblue Aster
Tridens flavus	Purpletop Tridens
Tripsacum dactyloides	Eastern Mock Gamma
Vernonia spp.	Ironweed
Triticum x Agropyron	Regreen Sterile Wheat (Cover Crop)

Riparian Buffer Restoration Tree and Shrub Plantings		
Scientific Name	Common Name	Tree or Shrub
Acer saccharinum	Silver Maple	Tree
Asimina triloba	Common Paw Paw	Tree
Celtis laevigata	Sugar-Berry	Tree
Celtis occidentalis	Common Hackberry	Tree
Diospyros virginiana	Common Persimmon	Tree
Fraxinus pennsylvanica	Green Ash	Tree
Platanus occidentalis	American Sycamore	Tree
Quercus alba	Northern White Oak	Tree
Quercus bicolor	Swamp White Oak	Tree
Quercus macrocarpa	Burr Oak	Tree
Quercus muehlenbergii	Chinkapin Oak	Tree
Quercus palustris	Pin Oak	Tree
Quercus rubra	Northern Red Oak	Tree
Salix amygdaloides	Peach-Leaf Willow	Tree
Salix nigra	Black Willow	Tree
Ulmus americana	American Elm	Tree
Cephalanthus occidentalis	Common Buttonbush	Shrub
Cercis canadensis	Redbud	Shrub
Cornus amomum	Silky Dogwood	Shrub
Cornus drummondii	Rough-Leaf Dogwood	Shrub
Cornus florida	Flowering Dogwood	Shrub
Crataegus mollis	Downy Hawthorn	Shrub
Sambucus nigra	Black Elder	Shrub
Symphoricarpos orbiculatus	Coral-Berry	Shrub
Viburnum dentatum	Sourthern Arrow-Wood	Shrub
Viburnum lentago	Nanny Berry	Shrub

Riparian Buffer Enhancement and Upland Buffer Enhancement Tree and Shrub Plantings		
Scientific Name	Common Name	Tree or Shrub
Aesculus glabra	Ohio Buckeye	Tree
Asimina triloba	Common Paw Paw	Tree
Celtis laevigata	Sugar-Berry	Tree
Crataegus viridis	Green Hawthorn	Tree
Diospyros virginiana	Common Persimmon	Tree
Fraxinus pennsylvanica	Green Ash	Tree
Quercus shumardii	Shumard's Oak	Tree
Quercus bicolor	Swamp White Oak	Tree
Quercus imbricaria	Shingle Oak	Tree
Quercus macrocarpa	Burr Oak	Tree
Quercus muehlenbergii	Chinkapin Oak	Tree
Quercus palustris	Pin Oak	Tree
Staphylea trifolia	American Bladdernut	Tree
Cercis canadensis	Redbud	Shrub
Cornus drummondii	Rough-Leaf Dogwood	Shrub
Cornus florida	Flowering Dogwood	Shrub
Symphoricarpos orbiculatus	Coral-Berry	Shrub

Revisions		
No.	Description	Date

Terra Technologies
1920 West 143rd St., Suite 140, Leawood, KS 66224

Smith Creek
Wetland & Stream
Mitigation Bank
Moniteau County
Missouri

Planting and Seeding Lists

DRAWING	DATE
5	FEB 2013

Herbaceous Wetland Establishment, Restoration & Enhancement Plantings & Seed List			
Scientific Name	Common Name	Scientific Name	Common Name
Acorus calamus	Single-Vein Sweetflag	*Heliopsis helianthoides*	Smooth Oxeye
Agrostis stolonifera	Spreading Bent	*Hibiscus* spp.	Rose-Mallow Mix
Alisma subcordatum	American Water-Plantain	*Iris virginica*	Virginia Blueflag
Alisma triviale	Northern Water-Plantain	*Juncus effusus*	Lamp Rush
Ammannia coccinea	Valley Redstem	*Juncus tenuis*	Lesser Poverty Rush
Angelica atropurpurea	Purple-Stem Angelica	*Juncus torreyi*	Torrey's Rush
Asclepias incarnata	Swamp Milkweed	*Leersia oryzoides*	Rice Cut Grass
Beckmannia syzigachne	American Sloughgrass	*Leersia virginica*	White Grass
Bidens aristosa	Bearded Beggarticks	*Liatris spicata*	Dense Gayfeather
Bidens cernua	Nodding Burr-Marigold	*Lobelia cardinalis*	Cardinal-Flower
Bidens frondosa	Devil's-Pitchfork	*Lobelia siphilitica*	Great Blue Lobelia
Boltonia asteroides	White Doll's Daisy	*Ludwigia alternifolia*	Seedbox
Calamagrostis canadensis	Bluejoint	*Ludwigia palustris*	Marsh Primrose-Willow
Carex aquatilis	Leafy Tussock Sedge	*Lycopus americanus*	Cut-Leaf Water-Horehound
Carex atherodes	Wheat Sedge	*Lythrum alatum*	Wing-Angle Loosestrife
Carex bicknellii	Bicknell's Sedge	*Mimulus ringens*	Allegheny Monkey-Flower
Carex comosa	Bearded Sedge	*Oligoneuron rigidum*	Hard-Leaf Flat-Top-Goldenrod
Carex crinita	Fringed Sedge	*Oligoneuron riddellii*	Riddell's Flat-Top-Goldenrod
Carex frankii	Frank's Sedge	*Panicum virgatum*	Switchgrass
Carex hystericina	Porcupine Sedge	*Peltandra virginica*	Green Arrow-Arum
Carex lacustris	Lakebank Sedge	*Penstemon digitalis*	Foxglove Beardtongue
Carex lasiocarpa	Woolly-Fruit Sedge	*Penstemon grandiflora*	Large-Flowered Beardtongue
Carex lupulina	Hop Sedge	*Penthorum sedoides*	Ditch-Stonecrop
Carex muskingumensis	Muskingum Sedge	*Persicaria spp. / Polygonum* spp.	Knotweed mix
Carex nebrascensis	Nebraska Sedge	*Physostegia virginiana*	Obedient-Plant
Carex normalis	Greater Straw Sedge	*Pontederia cordata*	Pickerelweed
Carex scoparia	Pointed Broom Sedge	*Potamogeton spp.*	Pondweed mix
Carex shortiana	Short's Sedge	*Rudbeckia fulgida*	Orange Coneflower
Carex spp.	Sedge mix	*Rudbeckia subtomentosa*	Sweet Coneflower
Carex stipata	Stalk-Grain Sedge	*Sagittaria* spp.	Arrowhead mix
Carex vulpinoidea	Common Fox Sedge	*Saururus cernuus*	Lizard's-Tail
Cephalanthus occidentalis	Buttonbush (Enhancement Areas Only)	*Schoenoplectus acutus*	Hard-Stem Club-Rush
Chamaecrista fasciculata	Sleepingplant	*Schoenoplectus americanus*	Chairmaker's Club-Rush
Cyperus esculentus	Chufa	*Schoenoplectus fluviatilis*	River Club-Rush
Cyperus spp.	Flatsedge mix	*Schoenoplectus tabernaemontani*	Soft-Stem Club-Rush
Diarrhena americana	American Beakgrain	*Scirpus atrovirens*	Dark-Green Bulrush
Echinochloa muricata	Rough Barnyard Grass	*Scirpus cyperinus*	Cottongrass Bulrush
Eleocharis palustris	Common Spike-Rush	*Sparganium americanum*	American Burr-Reed
Eleocharis spp.	Spikerush Mix	*Sparganium eurycarpum*	Broad-Fruit Burr-Reed
Elymus canadensis	Nodding Wild Rye	*Spartina pectinata*	Freshwater Cord Grass
Elymus riparius	River-Bank Wild Rye	*Symphyotrichum novae-angliae*	New England American-Aster
Elymus villosus	Hairy Wild Rye	*Symphyotrichum puniceum*	Purple-Stem American-Aster
Eupatorium perfoliatum	Common Boneset	*Symphyotrichum* spp.	Aster mix
Eupatorium serotinum	Late-Flowering Thoroughwort	*Tradescantia ohiensis*	Bluejacket
Eutrochium maculatum	Spotted Trumpetweed	*Tripsacum dactyloides*	Eastern Mock Grama
Eutrochium purpureum	Sweet-Scented Joe-Pye-Weed	*Verbena hastata*	Simpler's-Joy
Glyceria striata	Fowl Manna Grass	*Veronicastrum virginicum*	Culver's-Root
Helenium autumnale	Fall Sneezeweed	*Zizia aurea*	Golden Alexanders
		Triticum x Agropyron	Regreen Sterile Wheat (Cover Crop)

Revisions		
No.	Description	Date

Terra Technologies
1920 West 143rd St., Suite 140, Leawood, KS 66224

Smith Creek
Wetland & Stream
Mitigation Bank
Moniteau County
Missouri

Planting and Seeding Lists

DRAWING	DATE
6	FEB 2013

APPENDIX E

STREAM RESTORATION DESIGN & GEOMORPHIC ASSESSMENT

TERRA TECHNOLOGIES

Engineers • Scientists • Permit Specialists

Smith Creek
Wetland & Stream Mitigation Bank

Stream Restoration Design & Geomorphic Assessment

Prepared for
Swallow Tail, LLC

January 2013

1920 West 143rd Street, Suite 140 • Leawood, Kansas 66224
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Attachment A: **Hydrologic & Hydraulic Calculations**

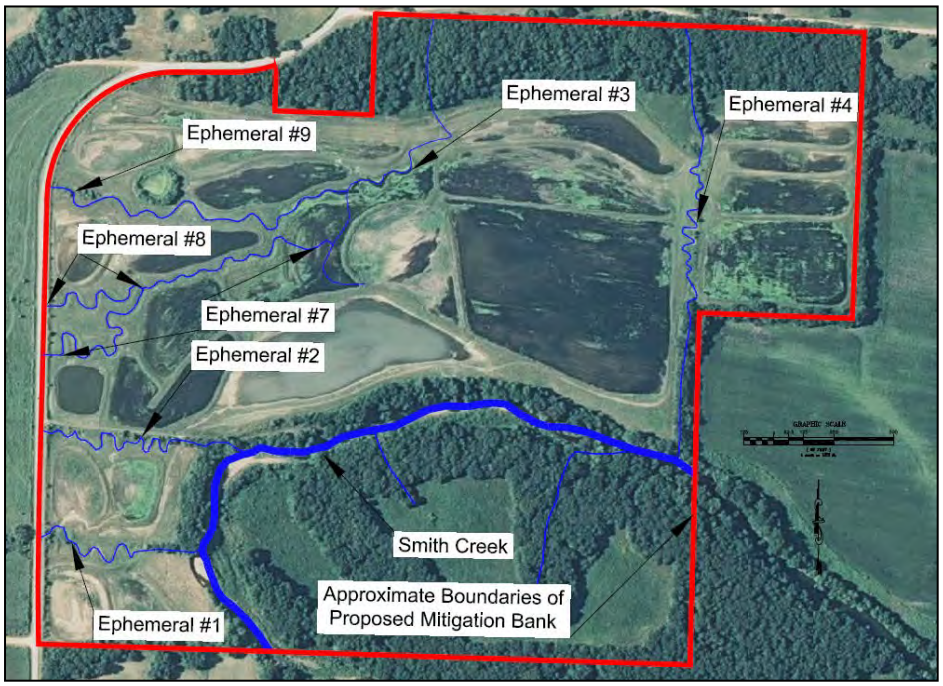
Attachment B: **Photographic Documentation**

1.0 INTRODUCTION

This document describes the design of the restored ephemeral stream channels at the proposed Smith Creek Wetland & Stream Mitigation Bank (the Bank) and discusses whether the construction of these channels was accomplished within appropriate parameters for stream channels in similar hydrologic, hydraulic and landscape conditions. To facilitate the review of this report it is structured to closely resemble the format of the Natural Channel Design Review Checklist (Harman & Starr, 2011) which is a document commissioned by the U.S. Environmental Protection Agency and the U.S. Fish & Wildlife Service to serve as a guidance tool for individuals reviewing natural channel designs.

Seven stream channels were restored as part of the construction of the Bank by Swallow Tail, LLC (the Sponsor). Three existing streams that had been channelized as part of past agricultural activities have had natural sinuosity and channel cross section reestablished (Ephemeral #1, Ephemeral #2 and Ephemeral #4). In addition, four streams or stream sections that were entirely graded out as part of the agricultural conversion of the site have been re-established (a portion of Ephemeral #3 and all of Ephemeral #7, Ephemeral #8 and Ephemeral #9). The locations of all streams described in this document are shown below in Image 1.

Image 1. Assessed Ephemeral Stream Channel Locations



Evidence that these channels previously existed was found in the form of rock/gravel layers excavated during the project planning phase before wetland pool construction. Additionally, erosional channels through the tilled fields are evident in historical aerial photographs in the same approximate locations as the restored streams. However, the visible channels in the aerial photographs were likely disturbed repeatedly during tillage so that the required geomorphic form for long-term stability was not present.

2.0 FLUVIAL GEOMORPHOLOGY OF PERENNIAL AND EPHEMERAL STREAMS

Fluvial Geomorphology is the science that describes how streams form in response to watershed conditions. Typically this field of study is applied to perennial streams either in order to understand why channel instability is occurring or to newly designed channels intended for relocation or restoration. While almost all attention and study in this field has focused upon larger perennial streams, very little research has been performed on smaller ephemeral channels. This is mostly because perennial streams are often associated with significant hydraulic forces and flood events that need to be studied and then taken into account by engineering projects while ephemeral channels can be easily altered by construction activities to accommodate new post-development site conditions. Unfortunately for the formal assessment of ephemeral streams, they fulfill somewhat different hydrologic and hydraulic functions than perennial streams and the parameters that affect ephemeral channel stability are somewhat different than the parameters that affect perennial stream stability. As a result, the design standards, rules of thumb and predictive theories of behavior based on stream cross section and alignment that have been developed for perennial streams do not necessarily hold true for ephemeral channels.

Hydraulically, the primary difference between perennial and ephemeral channels is that ephemeral channels have no base flow. This is an important distinction because the constant base flow in perennial streams that continues to push sediments through the channel during non-peak flow periods results in meaningful morphological changes to the stream channel that do not occur in the same manner or time scale in ephemeral channels. In contrast, ephemeral channels only convey water and sediments following a significant precipitation event which coincides with the flow regime that also contains the highest rate of suspended sediments. There is no base flow to transport excess sediment between precipitation events to downstream receiving waters. Therefore, ephemeral channels require greater power to push sediments through the system than do perennial streams and also take more time to “evolve.” Consequently, some of the stream types within the Rosgen stream classification system (Rosgen, 1996) are extremely rare in ephemeral form in our current landscape, primarily the

flatter gradient stream types such as Types C and E. The perennial examples of these stream types typically exist within broad, flat floodplains and wind sinuously back and forth.

When ephemeral channels encounter flatter gradients in areas of fine sediments they typically occur as an alternating pattern of somewhat vegetated channels in zones of flat topography joined by more conventional stream channel segments in stretches with a steeper gradient. Overbank bank morphology is maintained outside and above the thalweg, formed by scour forces during bankfull precipitation events. Viewed together, the complex of partially vegetated and scoured channel segments still forms a "stream" but not one that readily fits into the perennial-focused Rosgen stream classification system. The closest approximation would be a Type Da stream but because of the very small scale of the stream cross section the channels through the vegetated areas may not be sufficiently defined to meet all of the criteria for this stream type. This alternating pattern between vegetated and clearly scoured stream channel is functionally analogous to the pool and riffle complex system in intermittent and perennial systems but the lack of a base flow in ephemeral streams makes it more likely that vegetation will become established within the stream channel in locations that would be pooled in perennial or intermittent streams. Since the locations where these types of floodplain ephemeral channels form are also some of the most fertile, easily tilled soils, very few of these types of ephemeral channels have been allowed to exist by the nation's farmers. Instead, the channels have been straightened or graded out entirely to maximize row crop production. As a result, there are essentially no reference reaches to compare to the restored ephemeral channels on the Smith Creek Wetland and Stream Mitigation Bank.

Despite these limitations the Rosgen stream classification system is still a good guide in the analysis of ephemeral channels but it must be modified to reflect the ephemeral nature of the channel. Type A and B ephemeral channels are the most common types found, possibly because they are located in steeper landscape positions that are the least likely to be modified by humans. These stream types exist with low levels of sinuosity and moderately high gradients. The steeper channel gradient provides enough power to push sediments through the system. Type D streams are also relatively common ephemeral channel types in locations with high sediment loading and limited hydrology. Ephemeral streams can also exist as Type F channels, but this channel type is not typically a desirable design goal since it generally represents unstable streams in transition from one form to another. As described above, when ephemeral streams encounter landforms and topography that would typically form a Type C or E channel some of the channel sinuosity and variation in stream bed elevation that would be expected in a perennial stream is replaced by alternating vegetated and scoured stream channel segments and the guidelines for entrenchment ratio and width/depth ratios that have been developed for perennial systems do not typically apply. The smaller the watershed the greater this tendency becomes. Very small channels may still be observable within the vegetated stretches but they likely will not classifiable within the Rosgen system. Where the

channel slope clearly exceeds 1% the channel-forming scour forces tend to prevent vegetative establishment and the classification system becomes more directly relevant.

Another factor influencing ephemeral stream form is the frequency of flows. In some ephemeral channels stormwater flow occurs with insufficient frequency so that the stream bed and banks can become partially colonized with vegetation in some locations. This changes the resistance to shear stresses such that an ephemeral Type B6 channel (defined as being dominated by silts and clays) can behave in the expected manner of a Type B3 channel that is characterized by the presence of a cobble stream base. Similarly, a Type C6 channel can behave like a Type C3 channel. Put another way, this difference in shear stresses between ephemeral and perennial streams in similar landscape positions means that the predictive nature of common stream classification and engineering theories that are based on perennial conditions breaks down when applied to ephemeral channels. In perennial streams, stream banks made of cohesive materials such as clay and silt can lose cohesion as a result of saturation, therefore requiring much lower shear stresses to cause erosion. In ephemeral streams this is often not the case and even if cohesion is lost, the root systems of the stream bank vegetation will hold the soil mass together longer. Consequently, ephemeral channel form requires longer time frames to achieve a state of dynamic equilibrium and the deposition of organic matter can often completely overcome the forces of channel erosion. This is primarily what happens in locations where a Type C or E ephemeral channel would be expected to form. Water supply is high and erosive forces are low allowing for the potential for vegetation to build up in certain locations and potentially choke the drainage paths that would normally be expected to form a channel. From a water quality perspective, this condition greatly enhances downstream water quality because much of the eroded material from the watershed is trapped in these low gradient areas rather than being transported downstream. In steeper channel corridors it is more difficult for vegetation to resist hydraulic shear so traditional stream channels are maintained.

The ephemeral channels in the floodplain areas of the Smith Creek Wetland & Stream Mitigation Bank will be analyzed for this report using the Rosgen stream classification system, despite the above mentioned limitations. However, if conditions warrant a Type C or E stream the sinuosity criteria will not apply if streambed slope is low and sinuosity may be replaced by an expected vegetated zone.

3.0 WATERSHED AND GEOMORPHIC ASSESSMENTS

3.1 Watershed Assessment Methodology

Because of the small drainage areas and relatively uniform watershed conditions for all assessed stream channels, a detailed watershed assessment was not needed. As part of the hydrologic calculations for this project, the watershed area of each restored stream was calculated from the U.S. Geological Survey 1:24,000 topographic map. In addition, the land use within each stream's watershed was noted as part of the selection of the appropriate runoff coefficient. This information is included below in Table 1.

3.2 Watershed Hydrology

The drainage area of each restored stream is included below in Table 1 along with other pertinent information related to watershed hydrology. Because of significantly different drainage areas and gradients, the upstream and downstream portions of the Ephemeral #3 watershed and channel were analyzed separately. The upstream portion is defined to be the northern hillside and wetland pool #20 (which receives flows from the hillside ephemeral before overtopping back into the channel) while the downstream portion includes the entire drainage area flowing to the very downstream limit of this stream, including the upstream portion of the Ephemeral #3 watershed and the drainage areas of Ephemerals #7, #8 and #9. The nomenclature for all wetland pools on this site is illustrated in the as-built figure showing berms and water flow within the Bank Development Plan of the Final Mitigation Banking Instrument. Hydrologic calculations are provided in Attachment A.

Table 1. Watershed Conditions

Restored Stream	Drainage Area (Square Miles)	Impervious Cover	Pre-Mitigation Land Use	Likely Future Land Use
Ephemeral #1	0.0616	Very minimal. The runoff coefficient used in the Rational Equation takes impervious area into account.	Pasture	Pasture/Mitigation
Ephemeral #2	0.0301		Pasture	Pasture/Mitigation
Ephemeral #3 (Upstream portion)	0.0299		Forest	Forest/Mitigation
Ephemeral #3 (Downstream portion)	0.1345		Pasture / Row Crops	Pasture/Mitigation
Ephemeral #4	0.0445		Pasture	Pasture/Mitigation
Ephemeral #7	0.0243		Pasture	Pasture/Mitigation
Ephemeral #8	0.0246		Pasture	Pasture/Mitigation
Ephemeral #9	0.0262		Pasture	Pasture/Mitigation

Contributing watershed drainage areas are all undeveloped with minimal impervious surface area. Land use is predominantly agricultural tillage with terraced fields or hydrologically similar landscapes. Watersheds are small with short times of concentration, assumed to be 30 minutes except for the watershed of the hillside portion of Ephemeral #3 which required a longer time of concentration as described below. Soils in the watershed are predominantly in hydrologic group B resulting in a Natural Resources Conservation Service (NRCS) curve number of approximately 70. To simplify calculations, a 2-year return interval storm event was utilized to develop the channel-forming peak flows. This was done because the calculation of the 1.5 or 1.6-year return interval storm would have been significantly more difficult to accurately determine with only a marginal increase in modeling accuracy. Via the Rational Method of peak flow calculation, an intensity of 2.5 inches/hour was utilized based upon regional curves and a runoff factor of 0.30 was utilized. The results from these Rational Method calculations are shown in the peak flow table below. These results were cross-checked with the NRCS TR-55 methodology and similar results were obtained.

The peak flow rate calculation for the upper portion of Ephemeral #3 utilized a longer time of concentration and correspondingly lower rainfall intensity because of the in-line position of wetland Pool #20 which must fill before flows continue down the channel. As a result, the rainfall intensity for the upper portion of Ephemeral #3 is 2.0 inches/hour based upon a 45 minute time of concentration rather than 30 minutes. Flows for lower Ephemeral #3 are simply the combined peak flow rates for Ephemerals #7, #8, #9 and upper Ephemeral #3 since all of these channels come together to form lower Ephemeral #3 and the channel lengths of all are reasonably short. This is technically inaccurate due to the longer time of concentration and intensities for the various channels, but produces a similar result to calculating the total lower Ephemeral #3 watershed peak flow rates with the longer time of concentration.

Table 2. Peak Flow Rates

Feature Name	Peak Flow Rate
Ephemeral #1	29.58 cubic feet / second
Ephemeral #2	13.72 cubic feet / second
Ephemeral #3 (Upstream portion)	14.35 cubic feet / second
Ephemeral #3 (Downstream portion)	47.58 cubic feet / second
Ephemeral #4	21.34 cubic feet / second
Ephemeral #7	11.68 cubic feet / second
Ephemeral #8	11.83 cubic feet / second
Ephemeral #9	12.59 cubic feet / second

3.3 Hydraulic Assessment

A basemap of the 1-foot contour topography in the vicinity of the restored streams was used for hydraulic calculations. Because of the ephemeral nature of the assessed streams a limited hydraulic analysis was all that was warranted which conforms with the direction provided in the Natural Channel Design Review Checklist that the "level of [hydraulic] assessment will vary based on the complexity of the project."

The calculated velocities all ranged from one to five feet per second which is well within the range of normal high flows and should not by itself result in excessive scouring. A qualitative assessment of the expected shear stresses and stream power also concluded that these variables would be within normal ranges for streams of this type.

3.4 Bankfull Verification

As described above, the peak flows for each assessed stream were calculated using a regional curve as part of the Rational Method. The results were then compared to the output of the NRCS TR-55 methodology for verification. The expected water surface elevation of the modeled bankfull flows for each stream was then calculated using Manning's equation and a cross section of each stream channel. Images 2 through 8, which are included in Section 4.3 of this document, illustrate the results of this analysis and the design implications are discussed in the Natural Channel Design and Conclusions sections of this report.

3.5 Project Reach Geomorphic Assessment

Pre-Mitigation Conditions

Historically, the study area existed as a floodplain for Smith Creek, likely covered with wooded wetlands along with the historical ephemeral channels. More recently the study area was an agricultural field used primarily for row crop production. Historical aerial photography reveals multiple drainages in this floodplain area but all available photographs show the site in agricultural production. The drainages appear to be moderately straight and show signs of frequent disturbance via the lack of riparian vegetation.

A geomorphic assessment was not possible for those streams that were previously completely removed by agricultural practices because there were no such stream channels to evaluate. The remaining streams, which carried sufficient flows for the farmer to have to accommodate their presence, were visually assessed at a level appropriate for these relatively small stream channels. None showed extreme lateral or vertical instability as the stream channels had

essentially reached a somewhat stable state in the short term. Despite the lack of head cuts or other signs of vertical instability, there was a mild amount of lateral stream bank erosion. Additionally, the past channelization and stream base incision had severed these streams' connection to their floodplains. Although there were no locations of extreme instability observed, because of the channelization and entrenchment of these streams there is little doubt that they were trending towards future instability. The severed connection to the floodplain had concentrated all of the stream power within the channel during all storm events which was leading to widening stream banks and eventually the creation of a new stream valley with its own floodplain and natural meander pattern. The most likely stream type succession scenario (utilizing the terminology of the Rosgen stream classification system) would be starting from the historical "C" stream type to their agricultural pre-restoration "G" stream type with the eventual widening of the channel into the "F" stream type and the cutting of a new smaller channel and the transition of the rest of the formerly widened stream channel into the floodplain of the resulting "C" stream type channel.

As a result of the geomorphic assessments of the channels, the projected trend towards future instability and the lack of constraints to the restoration of these streams within the Bank property, all stream channel reaches were determined to have high restoration potential with the possibility of re-establishing most or all healthy stream functions anticipated for streams of this nature.

Post-Mitigation Conditions

As a result of the Sponsor's mitigation activities, the ephemeral channels have been restored via site grading in locations based upon subsurface evidence of previous channels. Photographs of the stream locations before and after mitigation activities are included in Attachment B. Measurement of the existing channel sinuosity was done using the information provided by a Professional Land Surveyor and the results are recorded in the table below.

Table 3. Measured Stream Sinuosity

Feature Name	Measured Sinuosity	Low (<1.2) Moderate (1.2 – 1.5) Or High (>1.5) Sinuosity
Ephemeral #1	1.34	Moderate
Ephemeral #2	1.37	Moderate
Ephemeral #3	1.15	Low
Ephemeral #4	1.16	Low
Ephemeral #7	1.37	Moderate
Ephemeral #8	1.31	Moderate
Ephemeral #9	1.18	Low

Channel slope gradient was also measured and is presented in the table below. The slope/gradient is presented as an absolute number rather than as a percentage.

Table 4. Measured Stream Slope / Gradient

Feature Name	Slope / Gradient
Ephemeral #1	0.013
Ephemeral #2	0.0097
Ephemeral #3	0.0046
Ephemeral #4	0.0132
Ephemeral #7	0.0046
Ephemeral #8	0.012
Ephemeral #9	0.013

In reviewing the site conditions, the most likely channel to be present on the site is a Type C6 stream due to the limited gradients and hydrology. Type A, B, and G, channels typically exist in locations of steeper gradient and braided streams represented by Type D channels are not common to the region. Some level of vegetative establishment within the channel of a flat gradient stream could result in what could be considered a braided channel but the capacity of any channel threads within the vegetation is so low compared to bankfull conditions that individual channel threads would all merge together even during slightly elevated flow conditions. Any vegetated areas that form would be created by still water rather than the presence of sufficient scouring forces so it is assumed that any such conditions would not represent a braided channel. However, it is possible that any zones of vegetative establishment that form could be considered to represent a Type D channel classification. To maintain compliance with the Rosgen Stream Classification system, vegetated zones that are expected to form will be classified as type Da streams. Insufficient base flow will exist to

form Type E streams. Type F streams are generally considered to be transitional stream forms and should be avoided if possible when performing restoration.

Landforms surrounding the channels are best characterized as having low to moderate relief. The landforms of each stream's entire watershed cannot be readily characterized in this way but the ephemeral channels are not directly influenced by the overall watershed landforms. Instead, the localized landform in the immediate vicinity of each channel is what will influence channel form since the channel lengths are short compared to perennial streams with large watersheds. Channel bed composition is silt and clay. Some small gravel accumulations have begun to form in a few locations but overall there is little to no rock present in the channel beds. Channel entrenchment is difficult to determine since this calculation is based upon bankfull dimensions and it is not yet known if the current bankfull capacity of each channel represents a fully stable channel configuration. However, general topography surrounding the channels is of moderately low relief so it can be assumed that the streams will exhibit a low degree of channel entrenchment, no matter what bankfull channel capacity is required. For similar reasons, the width to depth ratio of the channels is difficult to determine since this is a parameter of bankfull flow conditions and the channels have not been in place for a sufficient time period to know whether their form is representative of their final evolved state. However, as was true for the entrenchment ratio, the surrounding topography and the highest possible channel gradients will limit each stream's ability to create depth in the channel. If the watersheds were larger supporting a longer flow regime, a Type E channel might be possible to form. However, with such small watersheds, the study area flow regimes will be short and will be unlikely to support a Type E channel. Therefore, an assumption will be made that larger width to depth ratios will be the natural result of the watershed conditions, indicating that these channels will tend to be shallow and wide. As a result, any future evolutionary change in channel cross section is more likely to be lateral rather than vertical.

The post-mitigation state of the streams appears to show a very acceptable amount of channel stability as there is a lack of significant stream erosion that would indicate that the streams are eroding rapidly to better meet their watershed hydrology although it should be noted that 2012 was a year of drought conditions with correspondingly fewer precipitation events that would help to shape the assessed channels. The channel of the upper portion of Ephemeral #3 is well defined despite the fact that wetland pool #20 has to fill in order for water to flow into a portion of this stream. The downstream portions of Ephemerals #3, #7 and #9 which exist in Pool #11 have all aggraded due to the inundated wetland conditions throughout this pool. It is proposed that the outlet elevation of this pool be lowered and new channels be dug in this area to re-establish stream conditions. Additionally, erosion in the upstream portion of Ephemeral #1 has allowed some of this stream's flows to enter an adjacent wetland pool. Some maintenance is needed to address this situation properly.

4.0 DESIGN

4.1 Goals and Restoration Potential

The goal of this project is to improve or re-establish hydraulic, geomorphic and physicochemical functioning of previously channelized or eliminated streams that provided very minimal ecosystem function if any in the Bank's pre-restoration state. In order to achieve this goal, the following objectives were identified:

- Restore natural flow dynamics
- Increase floodplain connectivity
- Reduce water temperature and provide organic matter to downstream food webs through the re-establishment of healthy riparian corridors
- Increase processing of nutrients from upstream sources by maximizing the amount of soil-water contact through additional sinuosity

As stated earlier, the restoration potential for these stream channels was determined to be high. The restoration strategy was to re-establish new ephemeral stream channels of a cross section and plan view similar to what would be expected in their historical pre-settlement setting in a gently sloping floodplain dominated by silty clay loam soils surrounding a medium-sized perennial stream channel. Sufficient sinuosity was established in order to decrease the slope of the streams and subsequently limit flow velocities and scouring forces. In many cases, the stream channels have been established with a close relationship with the surrounding large wetland pools in order to provide additional nutrient cycling and sediment removal of runoff from upstream properties.

4.2 Design Criteria

Because of the nature of these streams as small headwater ephemeral channels with very small drainage areas, the use of multiple methods to generate the design criteria was not necessary. Additionally, because of the lack of reference reaches and sufficient academic and professional study of similar ephemeral streams, there is not an accepted set of reliable and precise design criteria to compare to the assessed streams.

Instead, the expected stream type for this landscape position and soil type was determined using the Rosgen stream classification system to be a C6 stream type and then the assessed streams were compared to that stream type. The comparison was somewhat approximate because of the previously stated pitfalls of applying the Rosgen stream classification system

and established perennial stream design guidelines to these assessed ephemeral streams. The sinuosity was expected to be either moderate or high (greater than roughly 1.2) and the stream velocities should be below seven feet per second to not generate excessive scouring. Additionally, the modeled bankfull discharge is expected to flood the adjacent riparian areas to each scoured channel as described in more detail later in this report. Vertical instability is not expected in these flat floodplain streams but there should not be signs of significant head cuts. However, additional slope would be beneficial to these streams, so some small amount of vertical incision would not be undesirable.

4.3 Natural Channel Design

As presented above, Image 1 shows the alignment of all restored streams. Images 2 through 8 are included below as cross sections of each stream channel that show the modeled bankfull flows which represents the peak water surface elevation during a two-year storm. Please note that the cross section for Ephemeral #3 is of the upstream portion of this channel as there is no currently clearly defined channel within its downstream reach in wetland pool #11. Because of the hillside nature of this upstream channel section a measured slope of 0.0205 was used to determine the cross sectional area instead of the overall Ephemeral #3 stream slope. Images 9 through 15 are the profiles of each stream. The riparian vegetation established adjacent to these restored streams is described fully in the Bank's Final Mitigation Banking Instrument.

Image 2. Ephemeral #1 Cross Section

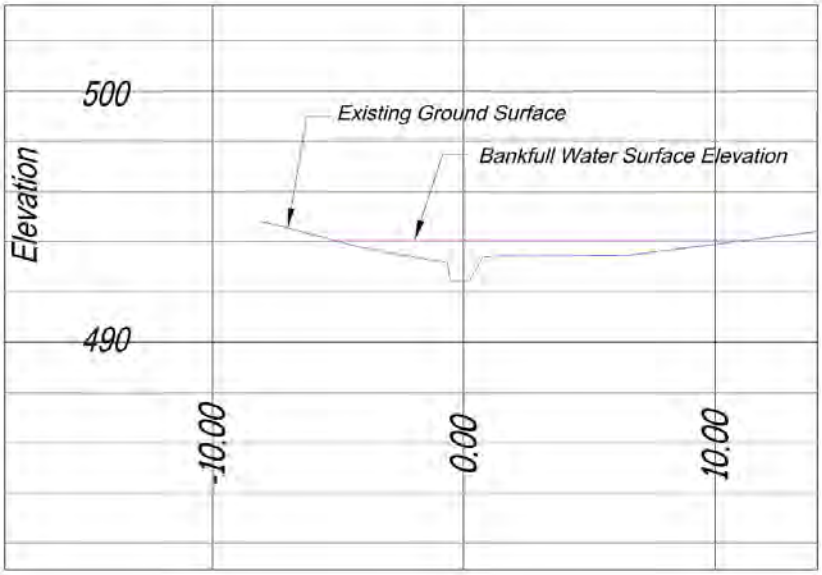


Image 3. Ephemeral #2 Cross Section

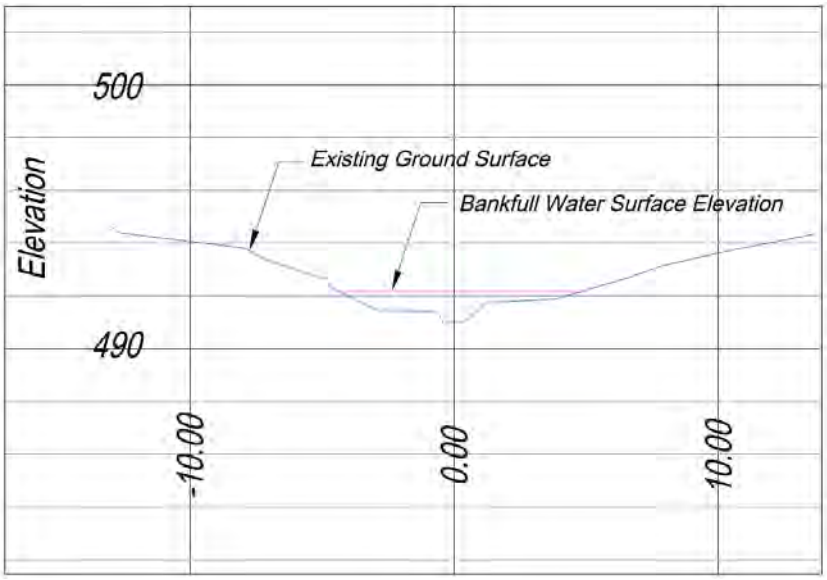


Image 4. Ephemeral #3 Cross Section

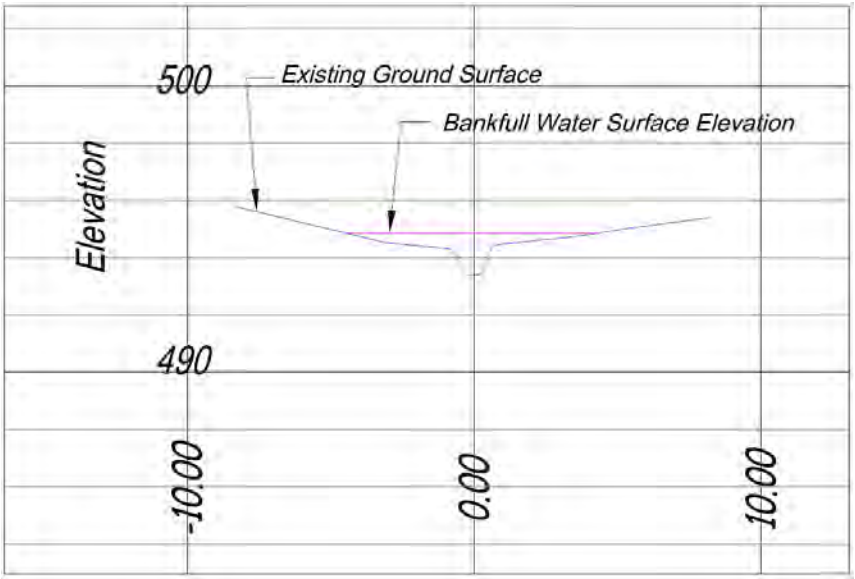


Image 5. Ephemeral #4 Cross Section

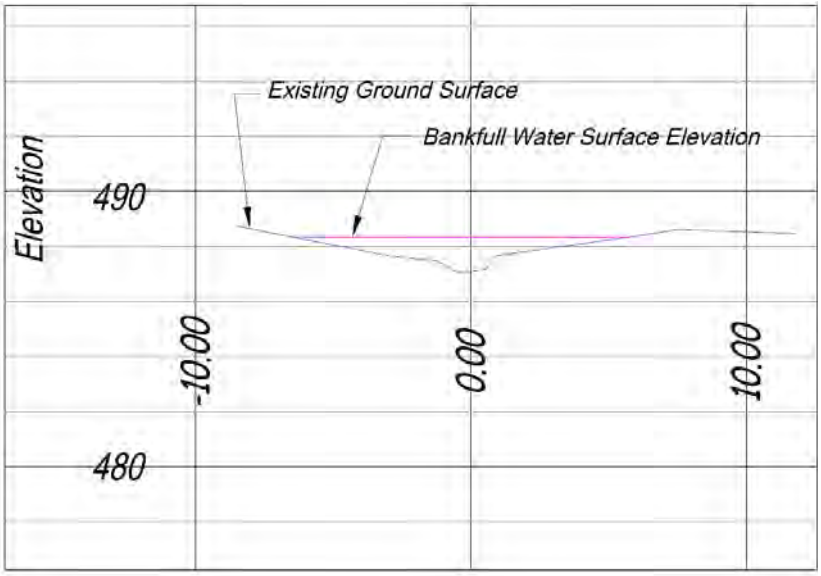


Image 6. Ephemeral #7 Cross Section

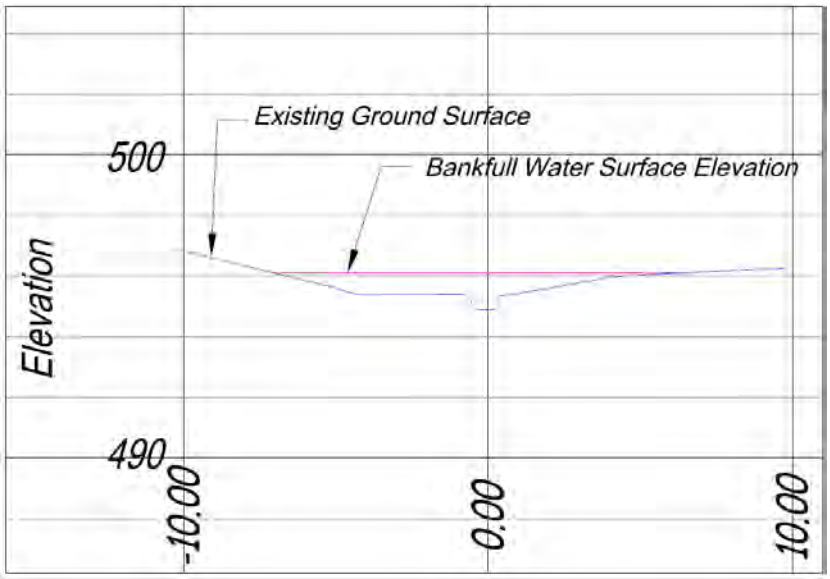


Image 7. Ephemeral #8 Cross Section

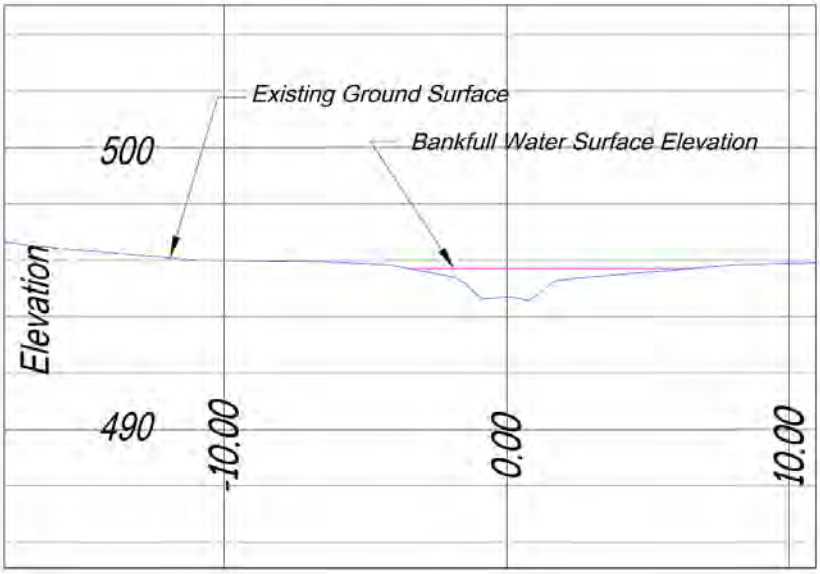


Image 8. Ephemeral #9 Cross Section

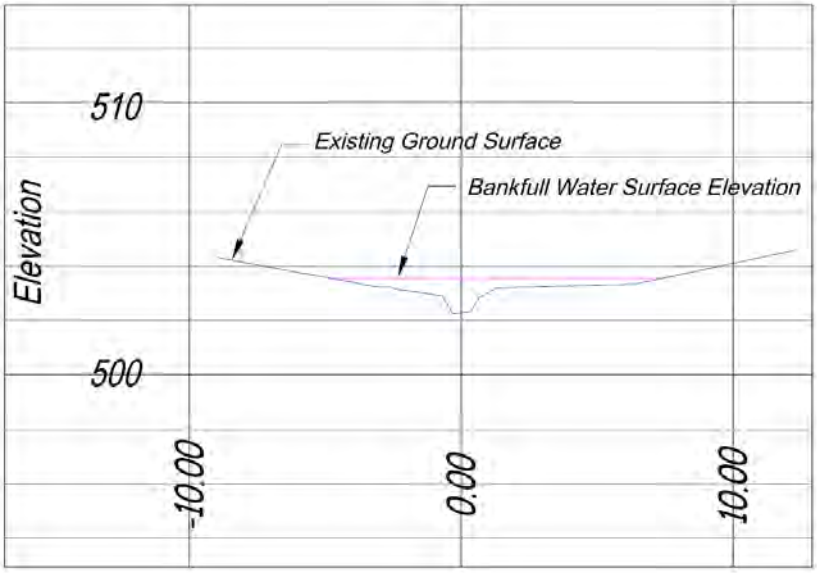


Image 9. Ephemeral #1 Stream Profile

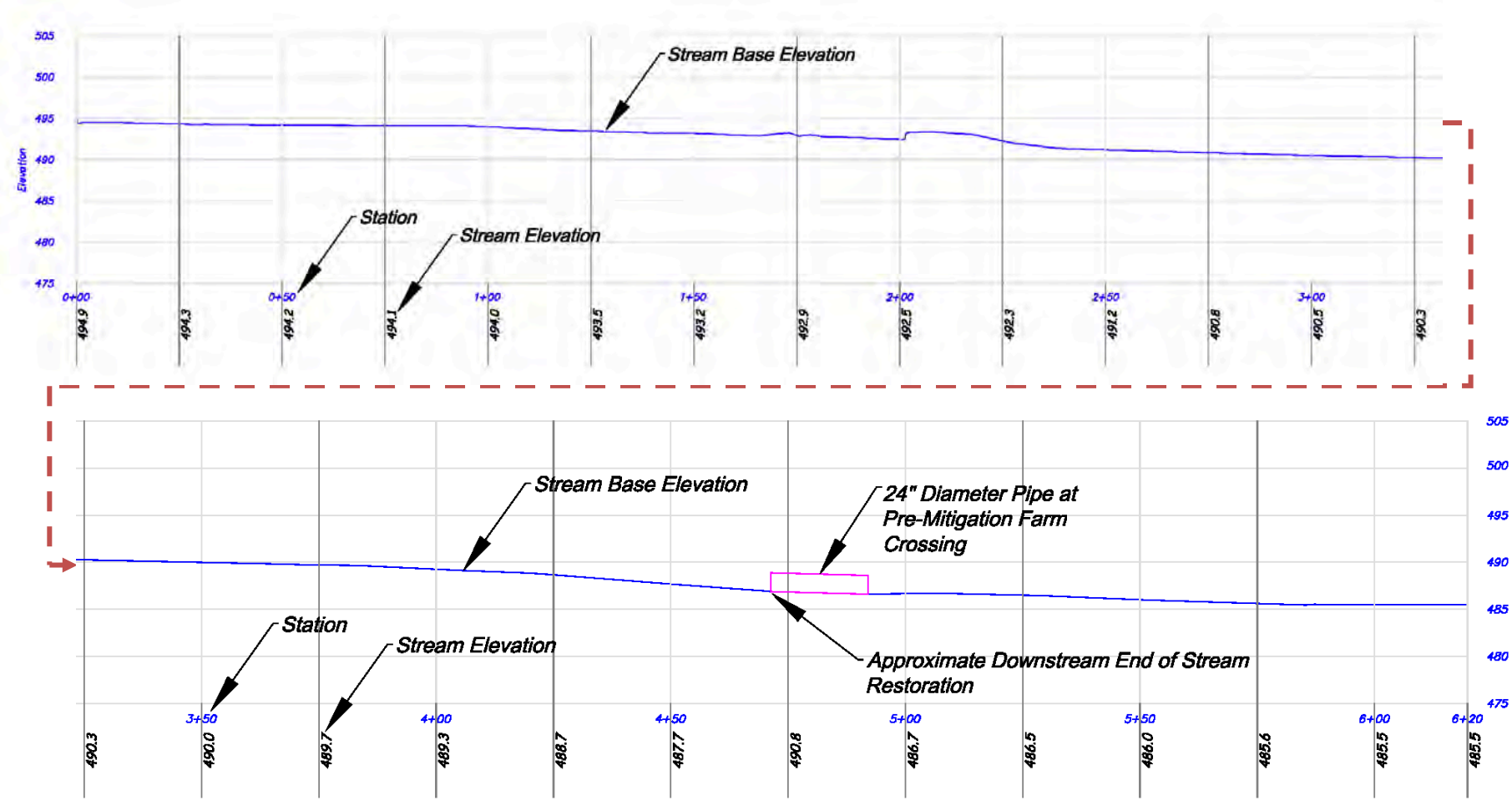


Image 10. Ephemeral #2 Stream Profile

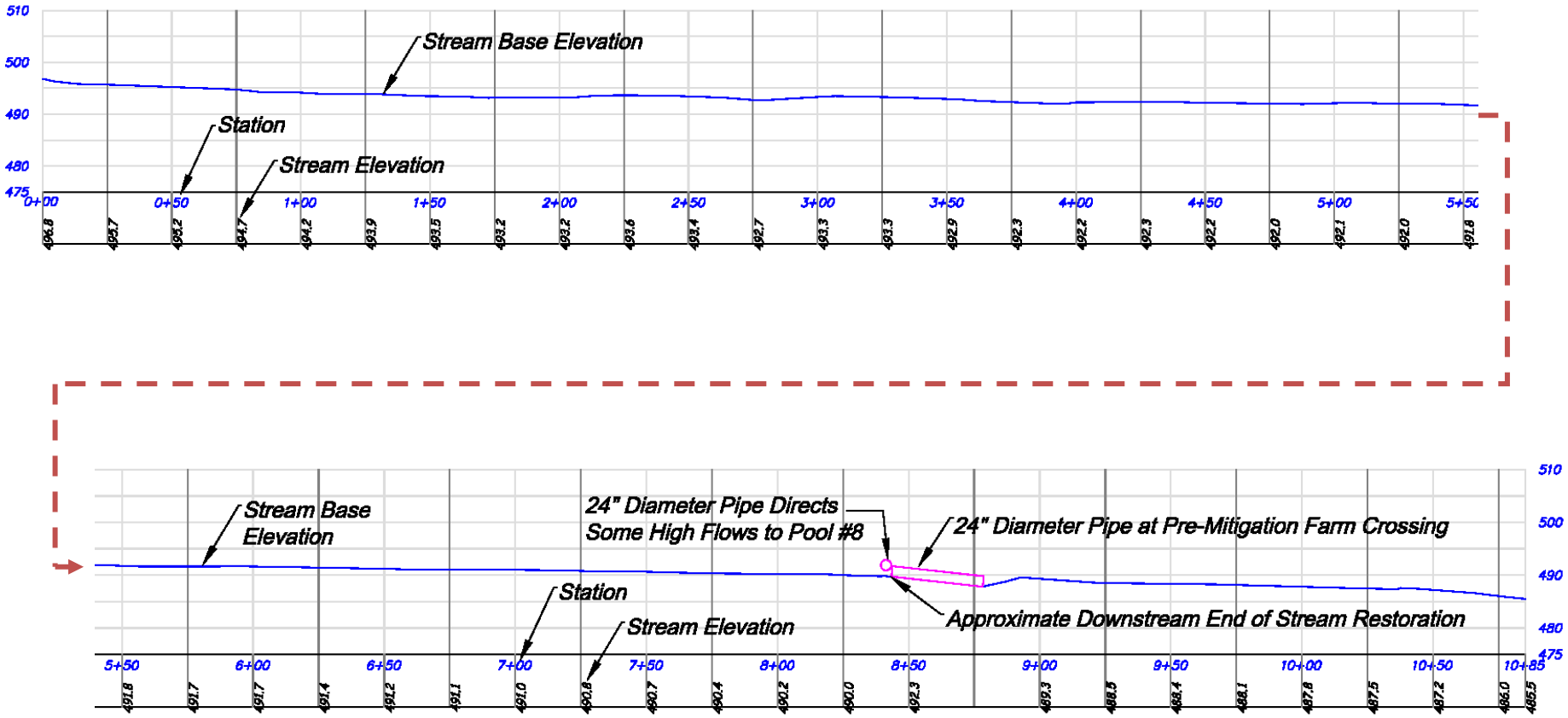


Image 11. Ephemeral #3 Stream Profile

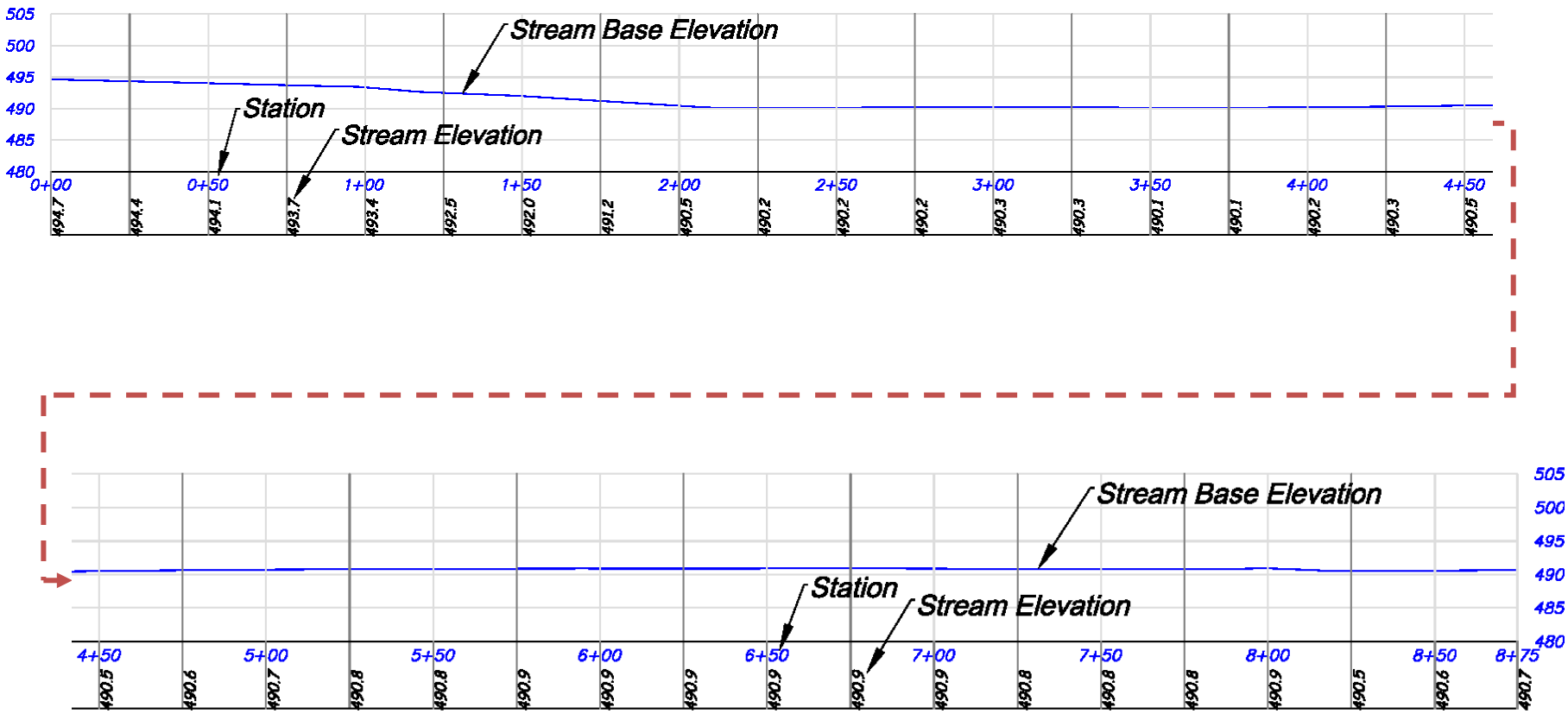


Image 12. Ephemeral #4 Stream Profile

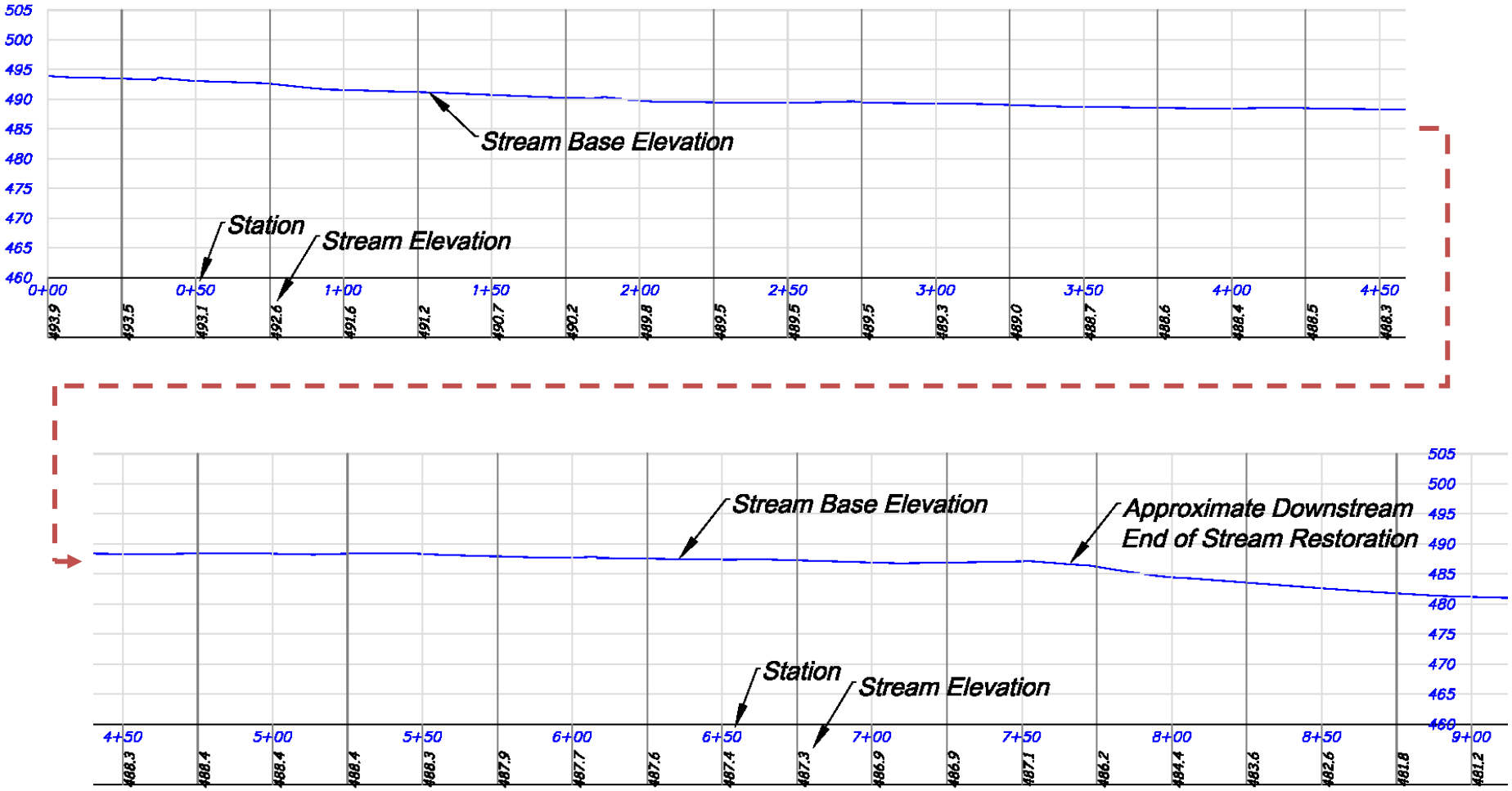
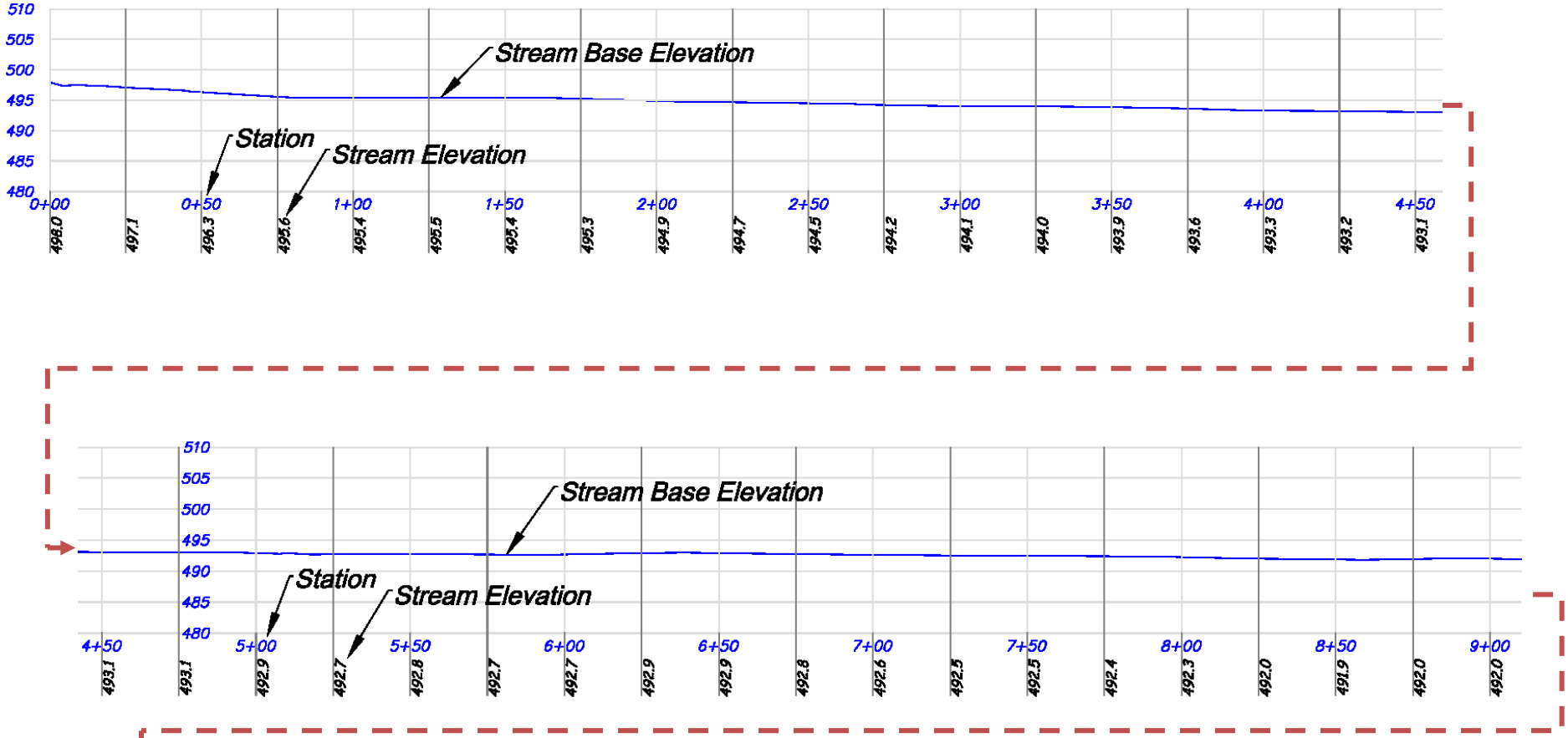


Image 13. Ephemeral #7 Stream Profile



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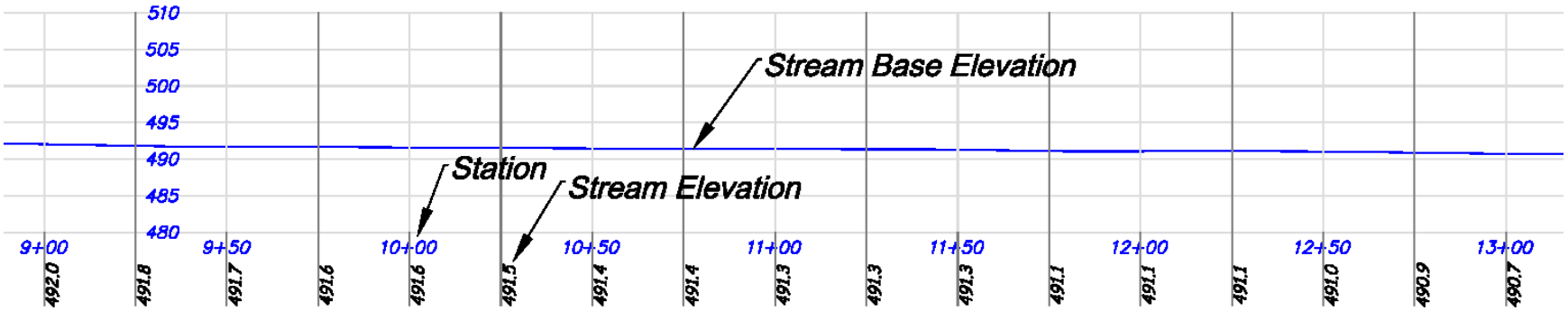


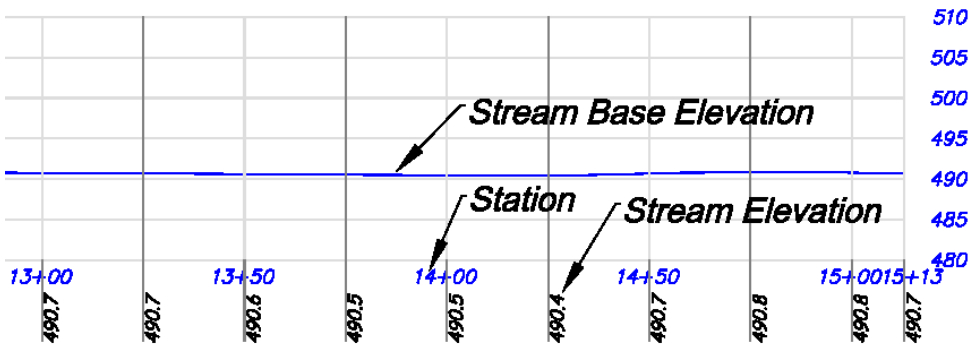


Image 14. Ephemeral #8 Stream Profile

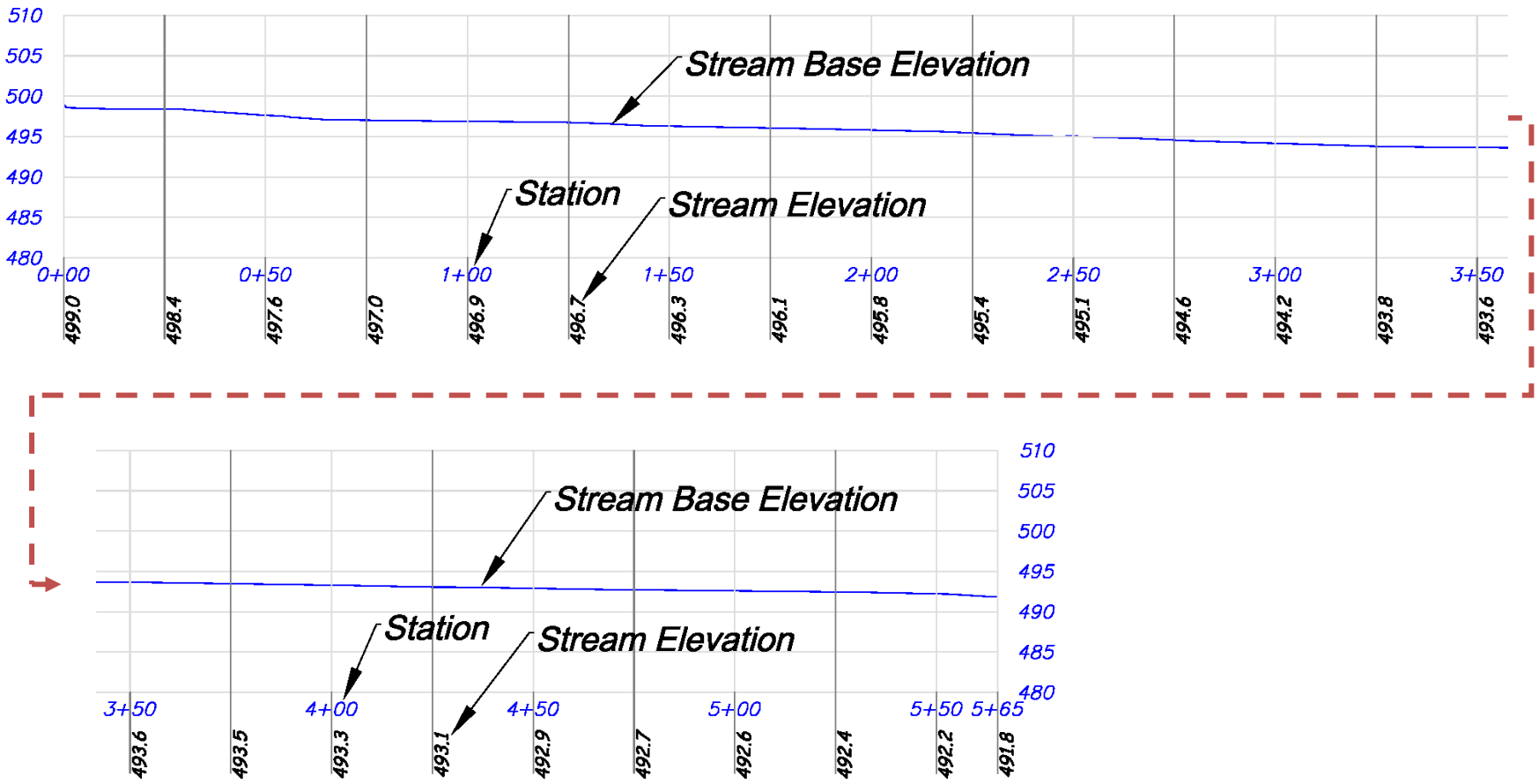
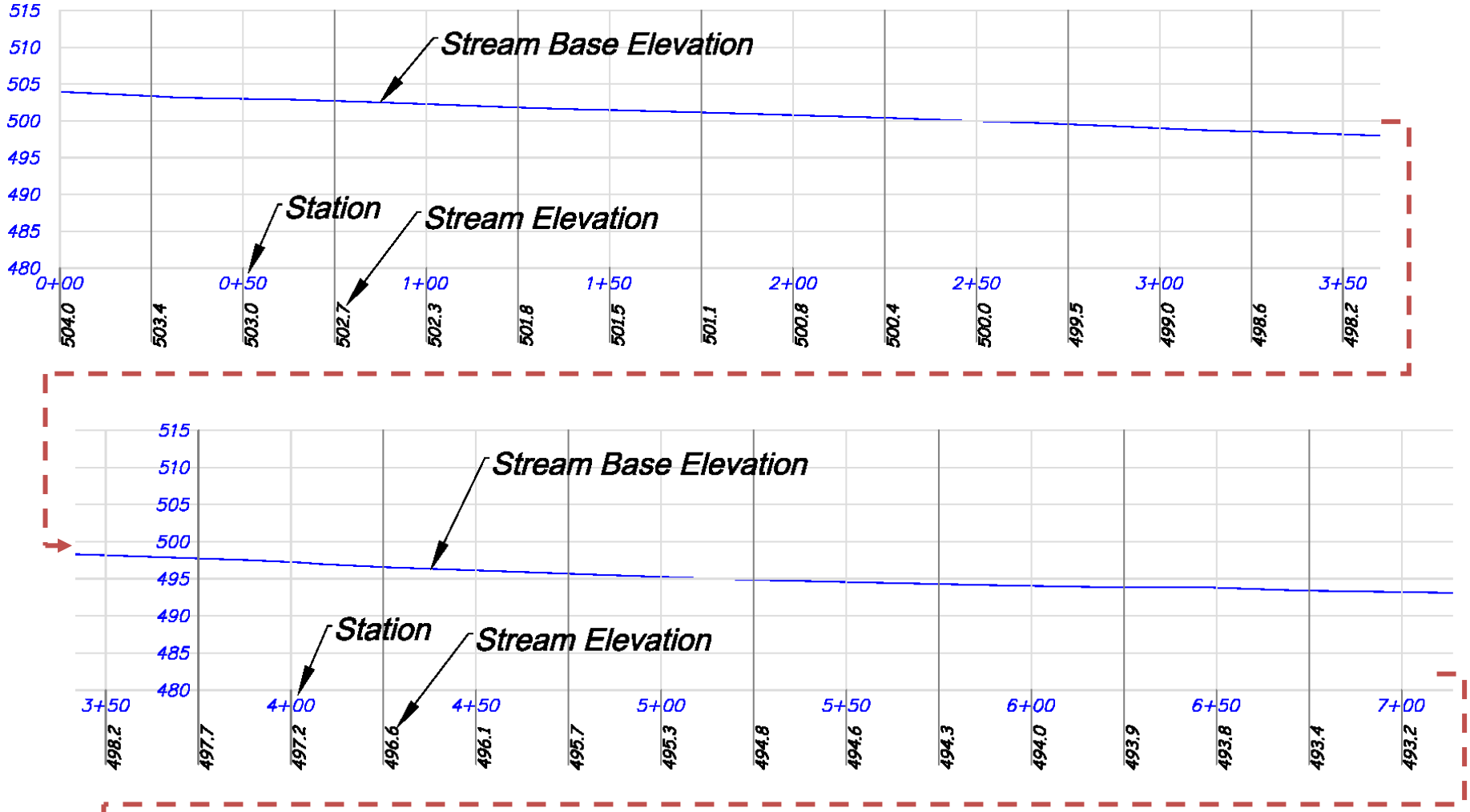


Image 15. Ephemeral #9 Stream Profile



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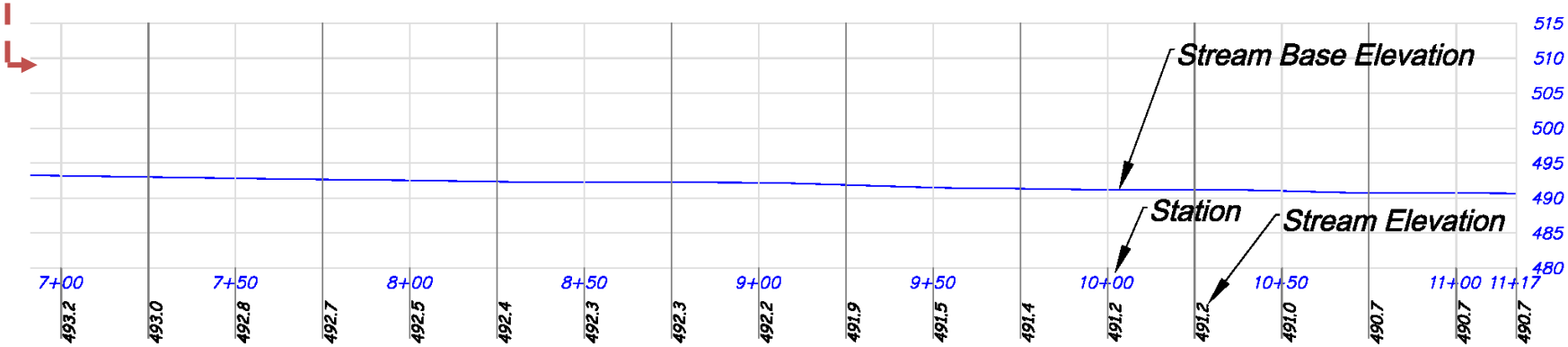


The alignment, profile and cross section dimensions of the restored stream channels were within the expected boundaries for streams of this type. The alignments of some streams had slightly lower than expected sinuosity, particularly Ephemerals #3 and #9. However, this is not likely to lead to meaningful stream instability. As shown in the stream channel cross sections, the restored streams other than Ephemeral #8 easily overflow the banks of the small scoured channels during modeled bankfull flows. While the small scoured channels are seen as "the stream channel" from a regulatory standpoint, from the perspective of fluvial geomorphology the channel bottom is in fact the small scoured channel plus the surrounding floodbench areas. As an analogy to a perennial stream system, the small scoured ephemeral channels should be viewed as the thalweg and the floodbenches are equivalent to in-stream alternate bars. The thalweg always has water in it during flow events (which is at all times in a perennial stream) but the alternate bars are only inundated during larger storm events. The same situation occurs in the assessed ephemeral channels except that the flow events through the thalweg are sporadic instead of constant. While a perennial thalweg is devoid of vegetation because of constant flows, the ephemeral scoured channels in the assessed streams remain free of vegetation because they receive a sufficient frequency and duration of abrasive storm flows. This is in contrast with the surrounding floodbench areas which are able to maintain a vegetated cover because of the relative infrequency of flows which have insufficiently short duration, velocity and shear stress to prevent vegetative establishment. The silty clay loam substrate also allows for a greater amount of plant cover than is found in the analogous perennial alternate bars which usually consist of cobble or gravel and support the partial colonization by plant species. As time passes and more channel-forming flows travel through these streams, more recognizable indicators of bankfull channel conditions will likely become apparent. One other result of this bankfull verification analysis is that it is even clearer that there was historically a sufficient amount of storm flows in these locations to produce ephemeral streams.

4.4 Construction Means and Methods

The floodbenches of the restored stream channels were constructed using a bulldozer and the small channels were dug using a mini excavator. A diverse mixture of native seed was spread within the riparian areas surrounding each stream channel and then biodegradable / photodegradable straw erosion control blankets were used to stabilize the soil from the top of each small stream bank to any limit of potential erosion in the immediate vicinity of each stream channel. Native trees and shrubs were then planted along each restored stream channel. The erosion control blankets that were utilized have a maximum permissible unvegetated shear stress value of 1.75 lbs/ft^2 (84 Pa) and an associated unvegetated maximum velocity of 6.00 ft/s which was appropriate for these stream channels. Because of the generally flat alluvial nature of the restored streams, angular rock for any in-stream structures

was not needed other than the use of 6-12 inch diameter rock to construct rock blankets at the upstream entry onto the property of Ephemerals #7, #8 and #9 from road culvert pipes. These rock blankets were constructed at roughly existing grade with a swale in the center of each blanket with the goal of preventing erosion at the road culvert pipe outlets. Additionally, a plastic pipe was used to replace the road culvert pipe for Ephemeral #2, a pipe was installed to carry some high flows from Ephemeral #2 to wetland Pool #8 and another plastic pipe was installed through the diversion berm that was built by the farmer at the north edge of the former farm fields. This pipe has allowed Ephemeral #3 to once again flow freely into the Smith Creek alluvial terrace rather than be diverted and dissipated north of the former farm fields.

4.5 Sediment Transport Analysis

These restored streams exist as small headwater ephemeral channels with very small drainage areas. A traditional sediment transport analysis would have limited utility in this instance because the existing widely accepted computer models used for sediment transport analysis were designed to assess larger scale systems and are not capable of accurately predicting results on scales this small due primarily to limitations in the hydraulic calculation methodology. As a result, these models would not provide the level of precision or accuracy that would be needed to generate useable information on the assessed streams. Consequently, a formal sediment transport analysis was not conducted. Instead, an informal qualitative assessment was done which found that the pasture and mitigation land uses within the watersheds of these restored reaches makes it likely that the amount of sediment received by these ephemeral channels will be within normal expected limits.

4.6 In-Stream Structures

Because of the generally flat alluvial and ephemeral nature of the restored streams, excessive vertical instability is not expected. As a result, in-stream structures were not utilized in the restored reaches other than the rock blanket structures at the upstream entry onto the property of Ephemerals #7, #8 and #9 as described above.

4.7 Vegetation Design

A diverse mixture of native vegetation was established along the restored streams. The soils, landscape position and hydrology of each stream channel and of the Bank site in general were all taken into consideration when creating the seeding and planting lists for the riparian buffer areas along with other factors. The seeding lists contained species adapted for quick establishment and immediate erosion control as well as many perennial species that already

provide permanent cover in riparian areas. The native trees and shrubs that have been established along the stream channels provide additional erosion control.

The Riparian Buffer Creation seeding and planting lists are included in the Bank Development Plan of the Final Mitigation Banking Instrument.

5.0 MONITORING AND MAINTENANCE

5.1 Monitoring Plan

As described more completely in the Bank's Final Mitigation Banking Instrument, the restoration of these stream channels will be monitored for a minimum of five years. Each restored stream reach will be visually assessed annually and photographic documentation will be taken. As part of the visual assessment of each stream, the monitoring party will record any substantial evidence of instability, including down-cutting, deposition and bank erosion beyond an expected amount of minor channel adjustment that should be anticipated as these streams evolve after their construction.

In addition, the restored streams and their riparian vegetation will have to meet several measurable performance standards. These include the maintenance of an ordinary high water mark without substantial vegetative growth within the entire channel bottom including the thalweg of the scoured channels, a lack of channel instability beyond minor post-construction channel adjustments which should be expected, a 75% survival rate of planted riparian trees and shrubs, an 80% absolute vegetative cover in riparian areas (except in areas of near constant or semi-permanent inundation because of the resulting disturbance to plant growth and establishment), and a maximum riparian cover of 5% of species on the Highly Aggressive Invasive Species list as well as a maximum combined cover of 10% of species on the Highly Aggressive Invasive Species list and species on the Undesirable Species list.

At this time and for the foreseeable future, monitoring is conducted by the Sponsor's technical consultant, Terra Technologies, whose contact information is provided on the cover sheet of this report.

5.2 Maintenance Plan

The monitoring of the restored stream channels as described above will identify any potential maintenance needs associated with these streams. Maintenance will first be conducted under the Operation and Maintenance Plan during the Bank's active management period. After the

Bank is deemed to be fully successful, maintenance will be governed by the Long-Term Management Plan.

Maintenance under the Operation and Maintenance Plan will be conducted and paid for by the Sponsor to ensure that the restoration activities on the Bank, including those involving the restored stream channels, achieves the stated ecological performance standards as described above. Maintenance tasks pertinent to stream restoration include, but are not limited to, such routine tasks as the replanting of vegetation, the removal of invasive species, mowing of areas as appropriate, replacement or repair of stream restoration improvements and the potential use of prescribed burning. Additional warranted maintenance may include the pickup and piling of wind-fall limb debris and the cutting and removal of fallen trees.

The goal of the Bank's Long-Term Management Plan is to provide limited maintenance and management of the Bank property in perpetuity as needed after all parties have determined that the Bank is successful and more intensive monitoring and management is no longer necessary. Long-term management will include continued maintenance of the site for purposes of such activities as controlling invasive species, maintaining water control berms, prescribed burning, prevention of trespassing and removal of litter, as necessary.

6.0 CONCLUSIONS

The purpose of this assessment was to describe the design and construction of seven restored ephemeral streams in order to determine whether their current alignment, slope and channel dimensions are within normal design parameters and therefore anticipated to be geomorphically stable or if substantial channel evolution is expected. In order to accomplish this, it was important to take into consideration the hydraulic and geomorphic differences between perennial and ephemeral streams and then perform hydrologic and hydraulic analysis at a level of detail appropriate to the scale and complexity of these small channels and their hydraulic nature.

It is important to note that because of the number of variables involved and the complexity of natural systems, the results of a hydraulic and geomorphic assessment of a watershed and its existing stream channels should not be expected to produce an exact description of the ideal channel cross section and alignment that represents the one true answer to the question being asked. Instead, it is more appropriate to state whether or not the existing stream channels fit within a normal range of parameters such as cross sectional area and sinuosity. In the case of the assessed streams on the proposed Smith Creek Wetland & Stream Mitigation Bank, the

streams are within the typical range of stream characteristics expected for the topography, soils and watershed conditions that are present.

The Sponsor has restored seven ephemeral stream reaches within the Bank with a clear goal of improving the ecosystem functions of these streams as well as of downstream waters. The assessed ephemeral channels are attempts to recreate historical conditions within the confines of the existing site environment. Their current form has been recently constructed and does not necessarily represent a fully evolved stable geomorphic form although their current form is within the expected boundaries of channel cross section, slope and alignment and there are clear monitoring and maintenance plans to observe and remedy potential problems.

All assessed channels have been constructed to be either within or close enough to the expected range of sinuosity for a Type C stream. Sinuosity ranges from 1.15 to 1.37 with the less sinuous channels having reaches of steeper gradient that limit meander amplitude. Excess sinuosity was not observed. In fact, according to Rosgen's classification of low, moderate and high sinuosity, three of the assessed streams had low sinuosity and the remaining four streams were all safely in the range of moderate sinuosity. The streams with low sinuosity may be expected to have some lateral migration as they adjust over time but these changes are not anticipated to be dramatic.

Similarly, channel gradients are within acceptable ranges for a Type C channel. Some short reaches of channel have moderately high gradients and others become nearly flat in some locations. This would be expected in streams that have naturally evolved and is appropriate for channel restoration. Overall average streambed gradient ranges from 0.0046 to 0.0132 with some reaches approaching zero or negative gradients in the flatter segments and 0.02 in the steeper segments. Flow velocities based on Manning's calculations range from 1 ft/sec to 5 ft/sec depending upon location and streambed gradient. A Manning's n coefficient of 0.035 was utilized to make these calculations. This range of velocities would be considered appropriate for a functioning stream. Based upon this analysis, the evaluated channels are expected to function as intended over extended periods of time without major transitions being required. Thalweg realignment may occur throughout each channel but the channels will not require substantially larger or smaller cross sections to convey storm flows and sediments. While evidence of clear ordinary high water mark formation such as shelving and associated stream bed scour is present, some flatter channel segments are expected to support some growth of vegetation in the stream bed. As described above, this formation of partially vegetated channel segments could be described as transition to a Type Da stream interconnected by segments of Type C6 stream in the steeper channel reaches. Substantial head cuts are not anticipated to propagate upstream through the channels due to the relatively low streambed gradient and resulting low stream power from the expected hydrologic and hydraulic conditions.

Only Ephemerals #1, #2, and #4 flow directly to Smith Creek. If Smith Creek substantially incises over time, this could affect grade stability on these channels and grade control may need to be considered to prevent future propagation of head cuts upstream through these channels. All other ephemeral channels analyzed flow into constructed wetland pools and would be unaffected by any potential future incision of Smith Creek. Some channels have begun to form a self-armoring layer of gravel and small stones on the bottom, a visual indicator that the channels are performing as intended. No substantial erosion was observed, indicating that the flow regime experienced since construction of the channels has not caused hydraulic shear in excess of what the channel bed and bank can resist.

Continued monitoring should be performed and the only proposed maintenance actions are for the outlet from Wetland Pool #11 to be lowered and the downstream portions of Ephemerals #3, #7 and #9 within this pool to be re-established and for the upstream portion of Ephemeral #1 to be repaired so that all stream flows stay within the intended channel.

More time will be required before these channels mature into fully functioning ephemeral stream systems but there is no evidence to suggest that the maturation process will cause any substantial negative repercussions. It is expected that these channels will evolve to some degree over time, resulting in somewhat altered channel cross sections and alignments. However, none of the expected changes are expected to be very significant. This evolutionary time period should be on the order of roughly five years or less assuming normal precipitation patterns.

7.0 REFERENCES

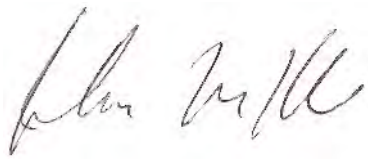
Harman, W., R. Starr. 2011. Natural Channel Design Review Checklist. US Fish and Wildlife Service, Chesapeake Bay Field Office, Annapolis, MD and US Environmental Protection Agency, Office of Wetlands, Oceans, and Watersheds, Wetlands Division. Washington, D.C. EPA 843-B-12-005

Rosgen, D. L. 1996. Applied River Morphology. Wildland Hydrology Books, 1481 Stevens Lake Road, Pagosa Springs, Co. 81147.

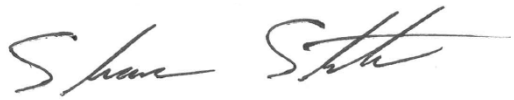
8.0 QUALIFICATIONS OF STAFF

Curricula vitae and project experience is included immediately following this report.

Sincerely,
TERRA TECHNOLOGIES, INC.



John M. Kahl, P.E.
Principal Geomorphologist / Civil Engineer



Shane C. Staten, PWS
Senior Wetland Ecologist

TERRA TECHNOLOGIES

JOHN KAHL, P.E. — Principal Geomorphologist / Civil Engineer

Mr. Kahl has significant experience in stream geomorphology assessment, civil and biotechnical engineering design projects and stormwater/flood control project experience. Prior to joining Terra Technologies, Mr. Kahl was the administrator of the Stormwater Management Program for Johnson County, Kansas Public Works Department with an approximate annual budget of over $8,000,000. Through Mr. Kahl's efforts, the concept of biotechnical engineering techniques was introduced to Johnson County, Kansas through a pilot project constructed in Mission Hills, Kansas. Since that time, numerous other projects have been initiated as part of the Stormwater Management Program, utilizing biotechnical engineering principals. Mr. Kahl has been an integral part of these subsequent projects throughout the Midwest, urging city officials to fully explore the limits of these techniques as part of the Stormwater Management Program.

PROFESSIONAL AFFILIATIONS

- *Professional Engineer, Missouri*
- *Professional Engineer, Kansas*

EDUCATION

- *B.S. Civil Engineering, University of Kansas, 1987*
- *Coursework in Natural Channel Design, Fluvial Geomorphology and Biotechnical Engineering Concepts*

Terra Technologies
1920 West 143rd Street, Suite 140
Leawood, KS 66224
(913) 385-9560 (Phone)
(913) 385-5295 (Fax)
www.terratechnologies.com

Rock Creek Stormwater Improvements, Lenexa, Kansas – Mr. Kahl performed a geomorphic analysis and provided workable natural channel design and biotechnical engineering solutions that addressed flooding and erosion concerns and were acceptable to the residents in the area. Grade control structures were installed to address geomorphic instability caused when the original development truncated approximately 1,000 linear feet of stream length. The proposed solutions restore the existing stream to a more stable natural configuration by reconnecting the channel to its floodplain via flood benching. The project was constructed in 2000 and the stream continues to function as designed.

Turkey Creek Flood Control Project - Kansas City, Kansas & Kansas City, Missouri – Mr. Kahl performed a study to determine the applicability of biotechnical engineering solutions on channel improvements to Turkey Creek. A geomorphic and horticultural survey was performed to document the existing riparian conditions prior to the design of any improvements. Terra Technologies provided applicable bioengineering design for four separate reaches of the stream section. This project was the largest major stream relocation in the U.S. Army Corps of Engineers Kansas City District.

Dykes Branch Channel Improvements, Leawood, Kansas – The City of Leawood wanted to address flooding concerns for 18 homes without affecting the natural aesthetics of the stream corridor. A geomorphic assessment of the stream led to design solutions that focused on re-connecting the stream to a constructed floodplain via creation of extensive flood benches adjacent to the channel. The stream was allowed to self-define a new low-flow channel as conditions required, but the original channel thalweg was left largely undisturbed by construction activities. The outer channel corridor limits were protected via a combination of hard and soft armoring solutions to prevent future channel migration into adjacent landscaping. The channel corridor was re-vegetated with native shrubs, grasses, and wildflowers. A significant storm event occurred in the summer of 2008 and the project area performed as expected.

City Hall Channel Improvements - Leawood, Kansas – Terra Technologies was retained by a developer to evaluate existing and future channel stability if an upstream development was constructed. The existing natural channel was highly incised and unstable. Channel instability would have been aggravated if site detention was required for the development. The developer was allowed to proceed without providing detention if they addressed channel instability in the assessed area. A geomorphic assessment revealed the need for grade control structures and reconnection of the channel to a floodplain. Mr. Kahl designed extensive flood benching throughout the channel reach and specified Newbury weirs to act as grade control structures, soft armoring and native vegetation along the channel banks and hard armoring in some critical locations to prevent channel migration beyond allowable limits.

TERRA TECHNOLOGIES

SHANE C. STATEN, PWS — Project Manager/Senior Wetland Ecologist

Mr. Staten manages the Terra Technologies St. Louis office and is responsible for Clean Water Act Section 404 and 401 permits for eastern Missouri. As the head of Terra Technologies' Wetland & Stream Mitigation Banking Division, he designs large scale wetland and riparian restoration projects. In addition, he assists in the design of biotechnical engineering stream stabilization projects and performs construction oversight on stream stabilization and wetland and stream restoration projects.

PROFESSIONAL AFFILIATIONS & CERTIFICATIONS

- *Certified Professional Wetland Scientist*
- *Past President, Society of Wetland Scientists Central Chapter*
- *Member of International Board of Directors, Society of Wetland Scientists 2006-2007*
- *Fellow, Doris Duke Charitable Foundation Conservation Fellows Program*
- *Semester-long Wetland Delineation Class at Duke University Wetland Center*
- *Approved Special Inspector for Major Land Disturbance Projects in St. Louis County*

EDUCATION

- *Masters of Environmental Management, Duke University School of the Environment and Earth Sciences, 2001*
- *B.A. Integrative Biology, Minor: Conservation Resource Studies, University of California, Berkeley, 1999*

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Wetland and Stream Mitigation Banks – Missouri & Kansas – Mr. Staten has been a primary designer and project manager for eleven approved and proposed wetland and stream mitigation banks across Missouri and Kansas encompassing more than 1,400 acres of restored wetland, riparian corridor and stream habitats. This has resulted in significant improvements in water quality and wildlife habitat because of the protection of miles of stream channels with greatly expanded riparian corridors, restoration of almost 2.5 miles of historical stream channels and the creation of hundreds of acres of floodplain wetlands which filter pollutants, store flood waters and provide high quality habitat for many species of wildlife. In addition, Mr. Staten has helped guide these projects through the complicated and always evolving regulatory approval process and performed construction inspection, monitoring, and group site visits, including hosting two conference field trips and senior EPA officials.

Metropolitan St. Louis Sewer District Sewer & Channel Design General Services Contract – St. Louis County, Missouri – Mr. Staten was the Project Manager for seven stream bank stabilization and storm sewer design projects located throughout St. Louis County. In addition to client, subcontractor and staff coordination, Mr. Staten performed quality assurance and quality control supervision and handled the Clean Water Act permitting for the stream bank stabilization projects.

Emergency Creek Bank Stabilization Projects – St. Charles, Missouri – As Project Manager, Mr. Staten performed quality assurance and quality control for the concurrent design and Clean Water Act permitting of four separate high priority stream bank stabilization projects. This involved the supervision of multiple subcontractors regarding geotechnical soils analysis, hydraulic modeling and FEMA floodplain permitting.

Tributary B Geomorphic Study – Sunset Hills, Missouri - Mr. Staten was the primary author of the feasibility study that evaluated the basic geomorphic stream characteristics and overall ecology of a 10,800 foot stretch of Tributary B and suggested biotechnical engineering alternatives to stabilize this stream reach.

Villas At Woodland Creek Bank Stabilization, St. Louis County Missouri - Mr. Staten performed significant design and plan preparation assistance of this private residential bank stabilization project which involved extensive communications with the client and multiple permitting agencies. He was also responsible for sheparding the project through the Section 404 & 401 permitting process as well as for ensuring MSD and County approval.

Calwood Area C Stormwater Improvements – St. Peters, Missouri - Mr. Staten oversaw construction and maintenance of native plantings and biotechnical engineering stream bank improvements for a 4,000 linear foot long stream bank stabilization project adjacent to multiple subdivisions.

ATTACHMENT A

HYDROLOGIC AND HYDRAULIC CALCULATIONS

$t_c \cong 30$ minutes $\Rightarrow i \Rightarrow 2.5$ in/hr

$t_c \cong 45$ minutes $\Rightarrow i \Rightarrow 2.0$ in/hr

$Q = CiA \quad \Rightarrow C = 0.30$

$t_c = 30$ minutes

$Q_1 = 29.58$ cfs

$Q_2 = 13.72$ cfs

$t_c = 45$, $i = 2.0$ $\quad Q_{3\,upper} = 14.35$ cfs

$Q_4 = 21.34$ cfs

$Q_7 = 11.68$ cfs

$Q_8 = 11.83$ cfs

~~$t_c = 45$~~ min $Q_9 = 12.59$ cfs

$t_c = 45$ minutes $\Rightarrow Q_3$ lower $= 51.65$ cfs

Hydraulics

$$Q = \frac{1.49}{n} A R^{2/3} S^{1/2}$$

$n = 0.035$

Ephemeral #1

$S = 1.34 \qquad Q = 29.58$ ft/sec

$$0.60 = (1.73y^2)(0.43y)^{2/3}$$

$y \cong 3' \qquad V \cong 1.9$ ft/sec

ATTACHMENT B

PHOTOGRAPHIC DOCUMENTATION

PHOTO LOG

DATE: 07/02/2007 TAKEN BY: GW	SITE NAME: Smith Creek Wetland & Stream Mitigation Bank
COMMENTS: <u>Pre-Construction:</u> Photo of Ephemeral #2 discharging from a culvert under Route E. View faces East. There had been trace precipitation the day before this photograph was taken and then rain during the four days prior to that totaling 3.75 inches, the majority of that falling four days before this photograph. PHOTO #: 1	

DATE: 07/02/2007 TAKEN BY: GW	SITE NAME: Smith Creek Wetland & Stream Mitigation Bank
COMMENTS: <u>Pre-Construction:</u> Photo of Ephemeral #1 facing downstream from near the point where it enters the property. View faces southeast. PHOTO #: 2	

PHOTO LOG

DATE: 6/5/2008 TAKEN BY: GW	SITE NAME: Smith Creek Wetland & Stream Mitigation Bank
COMMENTS: <u>Pre-Construction:</u> Photo to the north before any construction showing confined flows in the current vicinity of Ephemeral #9. The previous day had 0.21 inch of rainfall along with a total of 0.17 inch in the two days before that. The evidence of these flows was used to determine that stream restoration was possible in this location.	
PHOTO #: 3	

DATE: 6/6/2008 TAKEN BY: GW	SITE NAME: Smith Creek Wetland & Stream Mitigation Bank
COMMENTS: <u>Pre-Construction:</u> Another photo to the north before any construction showing confined flows in the current vicinity of Ephemeral #9.	
PHOTO #: 4	

PHOTO LOG

DATE: 6/5/2008 TAKEN BY: GW	SITE NAME: Smith Creek Wetland & Stream Mitigation Bank
COMMENTS: <u>Pre-Construction:</u> Photo to the east before any construction showing confined flows in the current vicinity of Ephemeral #9.	
PHOTO #: 5	

DATE: 6/5/2008 TAKEN BY: GW	SITE NAME: Smith Creek Wetland & Stream Mitigation Bank
COMMENTS: <u>Pre-Construction:</u> Another photo to the east before any construction showing confined flows in the current vicinity of Ephemeral #9. At this location overflows from the pond to the north are contributing to the flows shown in the photograph.	
PHOTO #: 6	

PHOTO LOG

DATE: 7/3/2008 TAKEN BY: GW	SITE NAME: Smith Creek Wetland & Stream Mitigation Bank
COMMENTS: <u>Pre-Construction:</u> Photograph to the northwest facing upstream of concentrated flows after a roughly 1.7-inch storm near the vicinity of the current location of Ephemeral #9.	
PHOTO #: 7	

DATE: 7/3/2008 TAKEN BY: GW	SITE NAME: Smith Creek Wetland & Stream Mitigation Bank
COMMENTS: <u>Pre-Construction:</u> Photograph from the same location as Photo #7 facing downstream of concentrated flows right after a storm near the vicinity of the current location of Ephemeral #9.	
PHOTO #: 8	

PHOTO LOG

DATE: 5/9/2012 TAKEN BY: DTD	SITE NAME: Smith Creek Wetland & Stream Mitigation Bank
COMMENTS: <u>Post-Restoration:</u> Photo of restored stream in the northwest portion of the Bank. The exact location of this photograph is unknown. PHOTO #: 9	

DATE: 5/9/2012 TAKEN BY: DTD	SITE NAME: Smith Creek Wetland & Stream Mitigation Bank
COMMENTS: <u>Post-Restoration:</u> Photo of a restored stream in the northwest portion of the Bank, presumably from the same location as Photo #9 but facing the other direction. PHOTO #: 10	

PHOTO LOG

DATE: 5/23/2012 TAKEN BY: SCS	SITE NAME: Smith Creek Wetland & Stream Mitigation Bank
COMMENTS: <u>Post-Restoration:</u> Photograph facing downstream of the restored Ephemeral #8 channel and its immediate surroundings.	
PHOTO #: 11	

DATE: 5/23/2012 TAKEN BY: SCS	SITE NAME: Smith Creek Wetland & Stream Mitigation Bank
COMMENTS: <u>Post-Restoration:</u> Photograph facing upstream of the restored Ephemeral #8 channel and its immediate surroundings from the same location that Photo #11 was taken.	
PHOTO #: 12	

PHOTO LOG

DATE: 5/23/2012 TAKEN BY: SCS	SITE NAME: Smith Creek Wetland & Stream Mitigation Bank
COMMENTS: <u>Post-Restoration:</u> Photograph facing upstream of a small head cut in the Ephemeral #1 channel. The head cut is about one foot in height.	
PHOTO #: 13	

DATE: 5/23/2012 TAKEN BY: SCS	SITE NAME: Smith Creek Wetland & Stream Mitigation Bank
COMMENTS: <u>Post-Restoration:</u> Photograph facing upstream of a representative portion of the Ephemeral #1 channel.	
PHOTO #: 14	

PHOTO LOG

DATE: 5/23/2012 TAKEN BY: DTD	SITE NAME: Smith Creek Wetland & Stream Mitigation Bank
COMMENTS: <u>Post-Restoration:</u> Photograph facing downstream of a representative portion of the Ephemeral #1 channel from the same location of Photo #14.	
PHOTO #: 15	

DATE: 5/23/2012 TAKEN BY: SCS	SITE NAME: Smith Creek Wetland & Stream Mitigation Bank
COMMENTS: <u>Post-Restoration:</u> Photo facing upstream of Ephemeral #2 at a representative location.	
PHOTO #: 16	

PHOTO LOG

DATE: 5/23/2012 TAKEN BY: SCS	SITE NAME: Smith Creek Wetland & Stream Mitigation Bank
COMMENTS: <u>Post-Restoration:</u> Photo facing downstream of Ephemeral #2 at a representative location at the same location of Photo #16.	
PHOTO #: 17	

DATE: 5/23/2012 TAKEN BY: SCS	SITE NAME: Smith Creek Wetland & Stream Mitigation Bank
COMMENTS: <u>Post-Restoration:</u> Photo facing downstream of Ephemeral #7 in its downstream reach where the channel was inundated by backwater from Pool #11.	
PHOTO #: 18	

PHOTO LOG

DATE: 5/23/2012 TAKEN BY: SCS	SITE NAME: Smith Creek Wetland & Stream Mitigation Bank
COMMENTS: <u>Post-Restoration:</u> Photo facing upstream of Ephemeral #7 at the same general location as Photo #18. The stream is inundated by backwater from Pool #11. PHOTO #: 19	

DATE: 5/23/2012 TAKEN BY: SCS	SITE NAME: Smith Creek Wetland & Stream Mitigation Bank
COMMENTS: <u>Post-Restoration:</u> Photo facing upstream of Ephemeral #7 just upstream of its confluence with Ephemeral #8. PHOTO #: 20	

PHOTO LOG

DATE: 5/23/2012 TAKEN BY: SCS	SITE NAME: Smith Creek Wetland & Stream Mitigation Bank
COMMENTS: <u>Post-Restoration:</u> Photo facing downstream of Ephemeral #7.	
PHOTO #: 21	

DATE: 5/23/2012 TAKEN BY: SCS	SITE NAME: Smith Creek Wetland & Stream Mitigation Bank
COMMENTS: <u>Post-Restoration:</u> Photo facing upstream of Ephemeral #7 from the same location as Photo #21. Upstream of this location the stream channel contains significantly less vegetation.	
PHOTO #: 22	

PHOTO LOG

DATE: 5/23/2012 TAKEN BY: SCS	SITE NAME: Smith Creek Wetland & Stream Mitigation Bank
COMMENTS: <u>Post-Restoration:</u> Photo facing downstream of Ephemeral #9 on the edge of Pool #11. The channel is under backwater conditions.	
PHOTO #: 23	

DATE: 5/23/2012 TAKEN BY: SCS	SITE NAME: Smith Creek Wetland & Stream Mitigation Bank
COMMENTS: <u>Post-Restoration:</u> Photo facing upstream of Ephemeral #9 from a location just southeast of the farm pond.	
PHOTO #: 24	

PHOTO LOG

DATE: 5/23/2012 TAKEN BY: SCS	SITE NAME: Smith Creek Wetland & Stream Mitigation Bank
COMMENTS: <u>Post-Restoration:</u> Photo facing downstream of Ephemeral #9 from the same location as Photo #24 just southeast of the farm pond. PHOTO #: 25	

DATE: 5/23/2012 TAKEN BY: SCS	SITE NAME: Smith Creek Wetland & Stream Mitigation Bank
COMMENTS: <u>Post-Restoration:</u> Photo facing downstream of Ephemeral #9. PHOTO #: 26	

PHOTO LOG

DATE: 5/23/2012 TAKEN BY: SCS	SITE NAME: Smith Creek Wetland & Stream Mitigation Bank
COMMENTS: <u>Post-Restoration:</u> Photo facing upstream of Ephemeral #9 just south of the farm pond. PHOTO #: 27	

DATE: 5/23/2012 TAKEN BY: SCS	SITE NAME: Smith Creek Wetland & Stream Mitigation Bank
COMMENTS: <u>Post-Restoration:</u> Photo facing upstream of Ephemeral #3 from where the stream flows into Pool #11. PHOTO #: 28	

PHOTO LOG

DATE: 5/23/2012 TAKEN BY: SCS	SITE NAME: Smith Creek Wetland & Stream Mitigation Bank
COMMENTS: <u>Post-Restoration:</u> Photo facing downstream of Ephemeral #3 where it flows into Pool #11, from the same location that Photo #28 was taken. PHOTO #: 29	

DATE: 5/23/2012 TAKEN BY: SCS	SITE NAME: Smith Creek Wetland & Stream Mitigation Bank
COMMENTS: <u>Post-Restoration:</u> Photo of Ephemeral #3 facing downstream from a location north of Pool #11. PHOTO #: 30	

PHOTO LOG

DATE: 5/23/2012 TAKEN BY: DTD	SITE NAME: Smith Creek Wetland & Stream Mitigation Bank
COMMENTS: <u>Post-Restoration:</u> Photo facing downstream of a typical location in the upstream portion of Ephemeral #4.	
PHOTO #: 31	

DATE: 5/23/2012 TAKEN BY: DTD	SITE NAME: Smith Creek Wetland & Stream Mitigation Bank
COMMENTS: <u>Post-Restoration:</u> Photo facing upstream of a typical location in the upstream portion of Ephemeral #4. This picture was taken from the same location as Photo #31.	
PHOTO #: 32	

PHOTO LOG

DATE: 5/23/2012 TAKEN BY: DTD	SITE NAME: Smith Creek Wetland & Stream Mitigation Bank
COMMENTS: <u>Post-Restoration:</u> Photo facing upstream of a typical location in the upstream portion of Ephemeral #3.	
PHOTO #: 33	

DATE: 5/23/2012 TAKEN BY: DTD	SITE NAME: Smith Creek Wetland & Stream Mitigation Bank
COMMENTS: <u>Post-Restoration:</u> Photo facing west of the upstream portion of Ephemeral #3.	
PHOTO #: 34	

PHOTO LOG

DATE: 5/23/2012 TAKEN BY: DTD	SITE NAME: Smith Creek Wetland & Stream Mitigation Bank
COMMENTS: <u>Post-Restoration:</u> Photo facing east of Ephemeral #3 near the northern border of Wetland Pool #11.	
PHOTO #: 35	

APPENDIX F

FINANCIAL ASSURANCES:
LETTER OF CREDIT EXAMPLE

Country Club Bank®

July 7, 2014

Midwest Mitigation Oversight Association
21301 Shelby Lane
Belton, Missouri 64012

Gentlemen:

We hereby open our irrevocable credit in favor of the Midwest Mitigation Oversight Association for the sum or sums not to exceed a total of FORTY THOUSAND AND N0/100 DOLLARS ($40,000.00), to be made available by the request of the United States Army Corps of Engineers for payment at sight upon the presentation of a draft accompanied by the following statement:

"The undersigned certifies that a claim is presented against Swallow Tail, L.L.C., as it has been determined by the United States Army Corps of Engineers that Swallow Tail, L.L.C. has defaulted on some or all of the obligations, covenants, terms, and conditions of the Smith Creek Stream and Wetland Stream Mitigation Bank Instrument, and the amount of the drawing will be used to implement corrective measures for the mitigation bank. Under Letter of Credit No. 75201211-75013, we are providing this documentation instructing Country Club Bank to pay proceeds in the amount of $40,000.00 (or a lesser amount determined by the United States Army Corps of Engineers to be sufficient to bring the mitigation bank back into compliance with its Mitigation Banking Instrument) to the Midwest Mitigation Oversight Association to direct the activities requested by the United States Army Corps of Engineers. Please wire said proceeds to the Midwest Mitigation Oversight Association's current account at the financial institution of its choice."

This Letter of Credit must remain valid until Swallow Tail, L.L.C. receives a letter of notification from the United States Army Corps of Engineers stating that Swallow Tail, L.L.C. has met all of the success criteria as well as all of the terms and conditions contained within the Smith Creek Stream and Wetland Stream Mitigation Bank Instrument and Bank Development Plan or until all compensatory mitigation credits have been sold at the bank, whichever is later.

The annual expiration date for this Letter of Credit is July 7, 2015. **However, this Letter of Credit is automatically renewed for each subsequent year, following annual expiration, until such time that the United States Army Corps of Engineers provides the letter of notification releasing Swallow Tail, L.L.C. from its requirement to maintain this Letter of Credit at Country Club Bank.** Country Club Bank and Swallow Tail, L.L.C. will notify the United States Army Corps of Engineers, annually, that the value of the required Letter of Credit

is in full force and effect for the annual renewal period. Swallow Tail, L.L.C. and/or Country Club Bank must notify the United States Army Corps of Engineers immediately upon the commencement of any bankruptcy proceedings. This notification must be sent to United States Army Corps of Engineers, 635 Federal Building, 601 East 12th Street, Kansas City, Missouri 64106-2824 (Attn: OD-R, Suite 402).

If Country Club Bank can no longer provide a valid Letter of Credit, the Corps of Engineers and Swallow Tail, L.L.C. must be notified at least 120-days prior to the annual, or any other, expiration date of the current Letter of Credit.

This Letter of Credit is subject to the Uniform Customs and Practice for Documentary Credits, 2007 Revision, ICC Publication No. 600.

COUNTRY CLUB BANK

Bryan Mallory
Senior Vice President

APPENDIX G

SITE PROTECTION INSTRUMENT EXAMPLE

CONSERVATION EASEMENT

THIS DEED OF CONSERVATION EASEMENT is given this _____ day of _____, 20___, by _____, having an address of _____ ("Grantor") to _____, having an address of _____ ("Grantee"). As used herein, the term "Grantor" shall include any and all heirs, successors, or assigns of the Grantor, and all subsequent owners of the Property (as hereinafter defined), and the term "Grantee" shall include any successor or assignee of Grantee.

WITNESSETH:

WHEREAS, Grantor is the sole owner in fee simple title of certain lands situated in _____ County, Missouri, more particularly described in Exhibit A, attached hereto and incorporated herein ("Property"); and

WHEREAS, Department Permit No. _____of the U.S. Army Corps of Engineers ("Corps") (hereinafter referred to as the "Permit") authorizes certain activities which affect waters of the United States; and

WHEREAS, the Permit requires that Grantor preserve, enhance, restore, or mitigate wetlands or uplands located on the Property; and

WHEREAS, Grantor, in consideration of the issuance of the Permit to construct and operate the permitted activity, and as an inducement to the issuance of the Permit, is willing to grant a perpetual Conservation Easement over the Property; and

NOW THEREFORE, in consideration of the above and mutual covenants, terms conditions, and restrictions contained herein, together with other good and valuable consideration, the adequacy and receipt of which is hereby acknowledged, Grantor hereby voluntarily grants and conveys a perpetual Conservation Easement for and in favor of Grantee upon the property, which shall run with the land and be binding upon the Grantor, and shall remain in full force and effect forever.

The scope, nature, and character of this Conservation Easement shall be as follows:

1. **Purpose:** The purpose of this Conservation Easement is to retain and maintain land or water areas on the Property in their natural, vegetative, hydrologic, scenic, open, or wooded condition and to retain such areas as suitable habitat for fish, plants, or wildlife. Those wetland or upland areas that are to be restored, enhanced, created, or preserved on the Property shall be retained and maintained in the restored, enhanced, created, or preserved condition as described in the Permit and/or in the associated compensatory mitigation plan for the Property.

2. **Rights of Grantee:** The following rights are conveyed to the Grantee and to the Corps by this easement:

a. The right to take action to preserve and protect the environmental value of the Property; and

b. The right to prevent any activity on or use of the Property that is inconsistent with the purpose of this Conservation Easement, and to require the restoration of areas or features of the Property that may be damaged by any inconsistent activity or use;

c. The right to enter upon and inspect the Property in a reasonable manner and at reasonable times to determine if Grantor is complying with the covenants and prohibitions contained in this Conservation Easement; and

d. The right to proceed at law or in equity to enforce the provisions of this Conservation Easement, and to prevent the occurrence of any of the prohibited activities hereinafter set forth.

3. **Prohibited Uses:** Except for restoration, creation, enhancement, preservation, maintenance, and monitoring activities, or surface water management improvements, required by the Permit, or required by the compensatory mitigation plan, or are otherwise approved by the Corps, the following activities are prohibited on the Property:

a. Construction of any structure or object (i.e., buildings, roads, above or below ground utilities, signs, billboards etc.) without written approval from the Corps of Engineers prior to construction;

b. Dumping or placing of soil or other substance or material as landfill, or dumping or placing of trash, waste, or unsightly or offensive materials;

c. Removal or destruction of trees, shrubs, or other vegetation, except for the removal of nuisance, exotic, or non-native vegetation in accordance with a maintenance plan approved by Corps;

d. Planting of nuisance, exotic, or non-native plants as listed by the State of Missouri;

e. Exploration for, or extraction of, oil or gas in such a manner as to affect the surface, or excavation, dredging, or removal of coal, loam, peat, gravel, soil, rock, or other material substance;

f. Use of motorized and non-motorized vehicles, the keeping or riding of horses, grazing, livestock confinement, or other surface use that may affect the natural condition of the Property, except for vehicle use for purposes of maintenance and upkeep;

g. Tilling, plowing, planting of crops, digging, mining, or other activities that are or may be detrimental to drainage, flood control, water conservation, water quality, erosion

control, soil conservation, or fish and wildlife habitat preservation, including but not limited to ditching, diking, and fencing;

h. The extraction of water from the Property or the impoundment of water on the Property so as to affect the hydrology of the Property;

i. Acts or uses detrimental to the aforementioned retention and maintenance of land or water areas;

j. Acts or uses detrimental to the preservation of the structural integrity or physical appearance of sites or properties of historical, architectural, archaeological, or cultural significance.

4. **Reserved Rights:** Grantor reserves all rights as owner of the Property, including the right to engage in uses of the Property that are not prohibited herein, and that are not inconsistent with the intent and purposes of this Conservation Easement.

5. **Taxes:** Grantor shall pay any and all applicable real property taxes and assessments levied by competent taxing authority on the Property.

6. **Maintenance:** Grantor shall, at Grantor's sole expense, operate, maintain and keep up the Property consistent with the purpose of this Conservation Easement. Grantor shall remove from the Property any nuisance, exotic, or non-native plants as listed by the State of MISSOURI/KANSAS and shall maintain the hydrology of the Property as it currently exists or as otherwise required by the Permit or as required by the compensatory mitigation plan or as required by the Corps approved final mitigation banking instrument.

7. **Hazardous Waste:** Grantor covenants that if any hazardous substances or toxic waste exist or has been generated, treated, stored, used, disposed of, or deposited in or on the Property, or there are or have been any underground storage tanks on the Property, Grantor shall be responsible for any and all necessary costs of remediation.

8. **Public Access:** No right of access by the general public to any portion of the Property is conveyed by this Conservation Easement.

9. **Liability:** Grantor shall continue to retain all liability for any injury or damage to the person or property of third parties that may occur on the Property arising from ownership of the Property. Neither Grantor, nor any person claiming by or through Grantor, shall hold Grantee liable for any damage or injury that may occur on the Property.

10. **Recording Requirements:** Grantor must record this Conservation Easement in the official records of _____ County, Missouri, and shall re-record it at any time Grantee or the Corps may require to preserve their rights. Grantor shall pay all recording costs, fees and taxes necessary at any time to record this Conservation Easement in the public records. Grantor shall thereafter insert the terms and restrictions of this Conservation Easement in any subsequent deed or other legal instrument by which Grantor divests himself/herself/itself of any interest in

the Property, and shall provide a photocopy of the recorded Conservation Easement to the new owner(s).

11. **Enforcement:** The terms and conditions of this Conservation Easement may be enforced in an action at law or equity by the Grantee or the Corps against the Grantor violating or attempting to violate these Restrictions. Venue for any such action shall be in _____ County, Missouri. Enforcement of this Conservation Easement shall be at the reasonable discretion of the Grantee or the Corps, and any forbearance on behalf of Grantee or the Corps to exercise its or their rights hereunder in the event of any breach by Grantor shall not be deemed or construed to be a waiver of rights. Any costs incurred in enforcing, judicially or otherwise, the terms, provisions, and restrictions of this Conservation Easement, including without limitation, the costs of suit, and attorney's fees, shall be borne by and recoverable against the non-prevailing party in such proceedings, except that such costs shall not be recoverable against the Corps. In addition, if the Grantee or the Corps shall prevail in an enforcement action, such party shall also be entitled to recover that party's cost of restoring the land to the natural vegetative and hydrologic condition existing at the time of execution of these Restrictions or to the vegetative and hydrologic condition required by the Permit and/or as required by the associated compensatory mitigation plan.

12. **Assignment of Rights:** Grantee shall hold this Conservation Easement exclusively for conservation purposes. Grantee will not assign its rights and obligations under this Conservation Easement, except to another legal entity qualified to hold such interests under applicable state and federal laws and committed to holding this Conservation Easement exclusively for the purposes stated herein. Grantee shall notify the Corps in writing of any intention to reassign this Conservation Easement to a new grantee at least sixty (60) days in advance thereof, and the Corps must accept the assignment in writing. The new grantee shall then deliver a written acceptance to the Corps. The assignment instrument must then be recorded and indexed in the same manner as any other instrument affecting title to real property and a copy of the assignment instrument shall be furnished to the Corps. Failure to comply with the assignment procedure herein stated shall result in invalidity of the assignment. In the event of dissolution of the Grantee or any successor, or failure for 60 days or more to execute the obligations of this Conservation Easement, the Grantee shall transfer this Conservation Easement to a qualified and willing grantee. Upon failure of the Grantee or any successor to so transfer the Conservation Easement, the Corps shall have the right to sue to force such an assignment to a grantee to be identified by the Court.

13. **Successors:** The covenants, terms, conditions, and restrictions of this Conservation Easement shall be binding upon, and inure to the benefit of the parties hereto and their respective personal representatives, heirs, successors, and assigns, and shall continue as a servitude running in perpetuity with the Property.

14. **Notices:** All notices, consents, approvals, or other communications hereunder shall be in writing and shall be deemed properly given if sent by United States certified mail, return receipt requested, addressed to the appropriate party or successor-in-interest.

15. **Severability:** If any provision of this Conservation Easement or the application thereof to any person or circumstances is found to be invalid, the remainder of the provisions of this Conservation Easement shall not be affected thereby, as long as the purpose of the Conservation Easement is preserved.

16. **Alteration or Revocation:** This Conservation Easement, granted in perpetuity, may be amended, altered, released, canceled, or revoked only by written agreement between the parties hereto or their heirs, assigns, or successors in interest, which shall be filed in the public records of _____ County, Missouri. No action shall be taken, however, without advance written approval thereof by the Corps. Corps approval shall be by letter attached as an exhibit to the document amending, altering, canceling, or revoking the Conservation Easement, and said letter shall be informal and shall not require notarization. It is understood and agreed that Corps approval requires a minimum of sixty (60) days written notice, and that the Corps may require substitute or additional mitigation, a separate conservation easement or alternate deed restrictions, or other requirements as a condition of approval. Any amendment, alteration, release, cancellation, or revocation together with written Corps approval thereof shall then be filed in the public records of _____ County, Missouri, within 30 days thereafter.

17. **Controlling Law:** The interpretation and performance of this Conservation Easement shall be governed by the laws of the State of Missouri.

GRANTOR FURTHER COVENANTS that Grantor is lawfully seised of said Property in fee simple; that the Property is free and clear of all encumbrances that are inconsistent with the terms of this Conservation Easement and that no mortgages or other liens exist; that Grantor has good right and lawful authority to convey this Conservation Easement, and that it hereby fully warrants and defends the title to the Conservation Easement hereby conveyed against the lawful claims of all persons whomsoever.

TO HAVE AND TO HOLD, the Grantor covenants that he, she, or they are vested with good title to the easement area and will warrant and defend the same on behalf of the Grantee against all claims and demands. The Grantor covenants to comply with the terms and conditions enumerated in this document for the use of the easement area and adjacent lands for access, and to refrain from any activity not specifically allowed or that is inconsistent with the purposes of this easement deed. The covenants, terms, conditions, restrictions, and purpose imposed with this Conservation Easement shall be binding upon Grantor, and shall continue as a servitude running in perpetuity with the Property.

Dated this_____day of_____, 20_____

Grantor(s):_____
Print Name

_____
Signature

Signature(s) continued:

_____
Print Name

_____
Signature

ACKNOWLEDGEMENT

STATE OF MISSOURI

COUNTY OF _____

On this ____day of _____ in the year 20___, before me, the undersigned notary public, personally appeared _____, known to me to be the person(s) whose name(s) is/are subscribed to the within instrument and acknowledged that he/she/they executed the same for the purposes therein contained. In witness whereof, I hereunto set my hand and official seal.

_____
Notary Public

Residing at _____

_____

My Commission
Expires _____

ACCEPTANCE BY GRANTEE:

I _____(print name), _____ (title), being the duly authorized representative of the Grantee, do hereby accept this Conservation Easement Deed with respect to the rights and duties of the, Grantee.

Dated this _____ day of _____, 20____.

_____
Signature

_____
Title

APPENDIX H

SPONSOR QUALIFICATIONS

Clear Fork Wetland & Stream Mitigation Bank
Johnson County, Missouri

Swallow Tail operates the 212-acre Clear Fork Wetland & Stream Mitigation Bank which will serve as compensatory mitigation for impacts to wetlands and streams across most of the Missouri portion of the Kansas City metropolitan area as well as much of the west-central part of the state.

This former agricultural property includes over a mile of both sides of the Clear Fork of the Blackwater River and more than a mile and a third of tributary streams. Almost all of these streams were surrounded by row crop fields with only narrow riparian buffers and a stretch of Clear Fork more than 1,000 feet in length was entirely devoid of riparian vegetation along one side. The mitigation activities completed on the site have addressed the needs of the property and the watershed through the planting of 98 acres of new riparian buffers and the establishment of about 60 acres of herbaceous wetlands, 18 acres of forested wetlands and 5 acres of scrub-shrub wetlands. In addition, roughly 19 acres of existing riparian buffers were enhanced and about 10 acres of upland buffers were established or preserved.

These habitat improvements will provide important water quality and wildlife habitat benefits. In particular, agricultural runoff from approximately 570 acres of surrounding farmland is diverted into the roughly 60 acres of contiguous wetlands in the southern portion of the mitigation bank which allows for significant pollutant removal, flood abatement and wildlife habitat creation. Additionally, because this mitigation bank is situated along Clear Fork between Knob Noster State Park and the Ralph and Martha Perry Memorial Conservation Area, it will serve as a valuable stopover point for wildlife traveling between these two important protected areas.

SWALLOW TAIL, LLC

Osage Plains Wetland & Stream Mitigation Bank
Cass County, Missouri

Swallow Tail is the Sponsor of the first approved private wetland and stream mitigation bank in western Missouri. The primary restoration activities on this roughly 40-acre property included the widening of the riparian corridor of the East Branch of the South Grand River to 300 feet on one side for more than a half mile and the restoration and enhancement of about 20 acres of wetlands in a diversity of habitats and landscape positions. These improvements to water quality and wildlife habitat are used for compensatory mitigation for impacts to waters of the United States in the Central Plains / Osage / South Grand Ecological Drainage Unit which encompasses the upper portion of the Osage River watershed in Missouri.

Swallow Tail recognized that the site, which had been in row crop production for decades, had a significant amount of local topographic variability and a favorable position in the landscape for wetland development. The enhancement of the site's intricate topography has led to a wide variety of microhabitats along a hydrologic gradient which allowed for the establishment of a high amount of botanical diversity because of Swallow Tail's extensive planting of a wide diversity of appropriate native plant species to match the unique topography, soil and hydrologic conditions of the site.

The site receives almost 400 acres of local runoff from adjacent agricultural properties via several small streams that flow across the property into the East Branch of the South Grand River. By detaining much of that runoff in the site's restored and enhanced floodplain wetlands, the Sponsor was able to decrease the amount of nutrients, sediment and agricultural pollution that flows into the East Branch of the South Grand River and downstream waters, including Truman Lake and Lake of the Ozarks. In addition, the East Branch of the South Grand River floods the site at least annually so the development of a significant amount of floodplain wetlands on the site also provides some level of water quality improvement of those flood waters. Moreover, the excavation of the eastern floodplain areas and the creation of floodplain pools in the western half of the site has significantly increased the flood storage capacity of the property.

Wildlife has responded very favorably to the restoration of the site's riparian, wetland and upland buffer habitats. A variety of frogs and salamanders now inhabit the site along with a diversity of waterfowl, wading birds, turtles and other species adapted to the shallow marsh habitat that is the site's dominant feature.

The Bank has completed its final year of formal monitoring having met all of its performance standards successfully.

Sni-A-Bar Creek Wetland & Stream Mitigation Bank
Jackson County, Missouri

Swallow Tail restored this roughly 70-acre mitigation bank adjacent to Sni-A-Bar Creek, which is a primary tributary of the Missouri River. This site previously consisted of two row crop fields and a moderately thin existing riparian corridor along the stream. Some of the attributes of this property that made it a good candidate for restoration included its position in the floodplain, the long length of perennial streams along the periphery of the site and the presence of poorly drained hydric soils. In addition, the observation of several small degraded wetlands existing in shallow depressions was a sign of the potential of this site to support a much greater amount of wetlands under the right conditions.

In order to improve water quality and wildlife habitat on the property, several activities were undertaken to restore the mitigation bank to its likely pre-settlement state. The riparian corridor of Sni-A-Bar Creek was widened to 300 feet on one side for more than a mile and the same was done to roughly 750 linear feet of an unnamed perennial tributary. Additionally, the connection between the stream and its floodplain was enhanced by creating multiple holes in two agricultural levees that regularly protected the farm fields from flooding. Roughly 27.5 acres of forested and herbaceous wetlands were established on the floodplain in order to provide water quality, wildlife habitat and flood abatement benefits.

The increase in quality and quantity of stream, riparian and wetland ecosystems is being used as compensatory mitigation for unavoidable impacts to waters of the United States throughout the Central Plains / Blackwater / Lamine Ecological Drainage Unit which includes the watersheds of the primary tributaries to the Missouri River from Kansas City to mid-Missouri.

Approved in 2009, this site is continuing to mature and progress through the appropriate stages of ecological succession that have been accelerated by Swallow Tail's planting of a diversity of early, mid- and late successional herbaceous and woody species throughout the site.

Stranger Creek Wetland & Stream Mitigation Bank
Leavenworth County, Kansas

Swallow Tail owns and operates the 65-acre Stranger Creek Wetland & Stream Mitigation Bank which has been approved as the first stream mitigation bank in Kansas and the first wetland mitigation bank outside of Johnson County.

This property contains one side of a half mile of Stranger Creek, the largest tributary to the Lower Kansas River. Although it is listed by the State of Kansas as a High-Priority Fishery Resource, Stranger Creek is heavily impacted by agriculture in the vicinity of this property. Before the initiation of restoration activities, this parcel was a row crop farm field with relatively thin riparian corridors along Stranger Creek and an intermittent tributary. The Stranger Creek stream bank was highly eroded along a portion of this property and two small intermittent streams that carry runoff from the adjacent agricultural properties across the site had been previously channelized into functionally impaired drainage ditches. As a result of these factors and the presence of similar conditions throughout its watershed, Stranger Creek is listed as being impaired biologically by excess nutrients and/or sediments downstream of this restoration site.

Swallow Tail recognized the restoration potential of this site and initiated several important ecological improvements. These included reducing stream bank erosion along Stranger Creek by constructing a 300-foot long longitudinal peaked stone toe bank stabilization project and planting willow cuttings along 1,800 feet of the Stranger Creek bank, widening the Stranger Creek riparian corridor to 300 feet, creating or restoring more than 18 acres of floodplain wetlands and restoring more than 3,000 linear feet of the channelized intermittent streams to natural stream channels in their likely historic alignment with 200-foot wide riparian corridors.

As a result of these restoration activities, this mitigation bank is reducing the amount of nutrients and sediment flowing to Stranger Creek across the property, is providing additional flood storage capacity and is acting as valuable habitat for wildlife. After only two full growing seasons, the site is supporting a variety of reptiles, amphibians, waterfowl and wading birds. The ecological restoration and enhancement of the wetland and stream habitats on this property are being used as compensation for impacts to those habitats in much of northeastern Kansas, including most of Johnson County.

Camp Branch Wetland & Stream Mitigation Bank
Cass County, Missouri

Swallow Tail owns and operates an 87-acre wetland and stream mitigation bank located along more than a mile of the Camp Branch of Big Creek south of the Kansas City metropolitan area. The mitigation activities on this property serve as compensation for impacts to wetlands and streams in the unglaciated portion of the Osage River watershed within Missouri which encompasses the very west-central part of the state.

Before the Sponsor's mitigation activities much of this property existed as a mixture of farm fields, stream corridors and bottomland woods. The landscape position of this site within the floodplain has resulted in the presence of hydric soils throughout almost all of the property and a large number of small wetlands continued to exist despite many years of agricultural activity. All of these qualities along with relatively thin riparian corridors made this site very suitable for wetland and stream restoration and enhancement.

Camp Branch is listed as potentially impaired by habitat degradation because of rural non-point source pollution, which means that there is some indication of impairment but there is not enough data to properly list the stream as officially impaired.

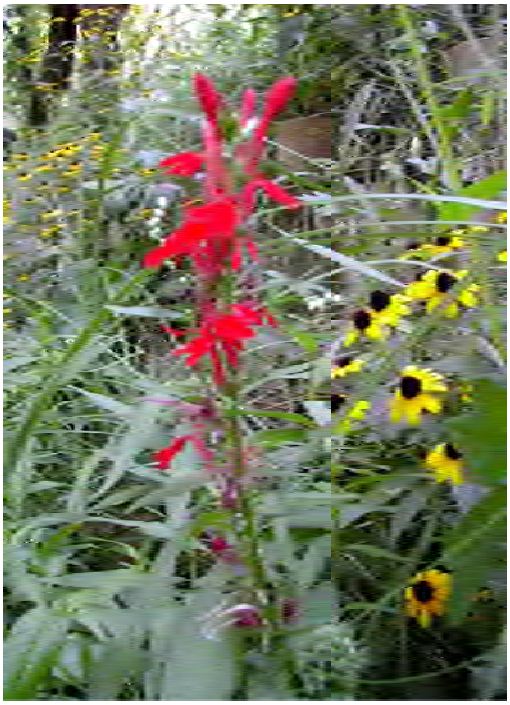
The upper Osage River watershed which includes Camp Branch has been largely converted to agricultural land uses and stream channelization, levee construction, impoundment and the clearing of riparian corridors have been common practices. These activities have resulted in stream incision, loss of floodplain connectivity, loss of stream and wetland habitats and excess sediment and nutrient levels in waterways.

In response to the needs of the watershed, this mitigation bank includes more than ten acres of floodplain wetlands and in excess of forty acres of newly planted riparian buffer. Existing riparian buffers have been enhanced and almost two miles of streams have been protected on both sides with another third of a mile protected on one side. These additional riparian buffers and wetlands will help to absorb and filter sediment and agricultural pollution from more than 350 acres of adjacent agricultural land that drains across the site and from flood flows from Camp Branch. Additionally, the restored habitats which were constructed in 2009 provide high quality habitat to a number of wildlife species.

INTRODUCTION

Terra Technologies Inc. is an innovative consulting firm with a focus on Clean Water Act Section 404 and 401 permitting and compensatory mitigation as well as biotechnical and environmental engineering. This focus requires an extensive amount of horticultural and biological expertise that also has application in a broad range of areas including large and small scale wetland and stream system development, wildlife habitat enhancement projects, ecologically-sensitive stream stabilization design and environmental remediation. The scientists and engineers at Terra Technologies provide a wide array of services including Clean Water Act 404/401/402 permit applications, compensatory mitigation design, rare and endangered species audits, environmental investigations, development of erosion and sediment control plans, and rain garden/natural stream channel design.

Terra Technologies has successfully completed numerous biotechnical design projects across the Midwest. No less than 40 mitigation, constructed wetland, and stream bank stabilization projects are currently in construction or design in the greater St. Louis, Columbia, and Kansas City areas. Our scientists will also perform 100+ wetland delineations, covering approximately 15,000 development acres annually.



Terra Technologies combines the skills and experience of licensed professional engineers with the fields of wetland ecology, horticulture, soil bioengineering, stream geomorphology, agrohistology, botany, wildlife biology and agronomy. This unique combination allows for the consideration and implementation of a broad range of solutions for Clean Water Act permitting, compensatory mitigation and storm water problems in both urban and rural areas. With a professional staff of experienced scientists and engineers, our clients have the advantage of diversified resources and the expertise of the entire firm.

Terra Technologies has been involved with numerous compensatory mitigation projects, including several large wetland and stream mitigation banks. Our design approach considers the existing site topography, hydrology, soils, and vegetation and then increases the amount of surface hydrology

through the manipulation of water inputs and the creation of extensive and varied microtopography. This microtopography creates a variety of hydrologic gradients within the onsite soils which leads to a diversity of microhabitats that support a wide diversity of plant life. All compensatory projects are seeded and planted with a large number of appropriate native herbaceous and woody species.

Our firm also has extensive expertise with stream stabilization and restoration projects. Terra Technologies can specify and implement a variety of materials and techniques including erosion control blankets, turf reinforcing matrices, wire reinforced turf reinforcing matrices, geocellular confinement, biogabions, preplanted coir fiber logs, landscaped open-face modular wall systems, articulated concrete block systems, pool and riffle systems, bonded fiber matrices, and others. Terra Technologies constantly looks at new applications for existing products that can be used for biotechnical solutions. When appropriate, pure vegetative stabilization approaches can also be effective. In all of our compensatory mitigation approaches Terra Technologies strives to provide long term solutions that work with, rather than against, natural environmental processes.

The key to any compensatory mitigation project is the long-term establishment of appropriate site hydrology as well as self-sustaining and low maintenance vegetation that is indigenous to the area. If the vegetation fails to establish, the long-term success of the project is in serious question. Pioneering vegetation often invades the initial establishment phase but is usually considered undesirable over the long term. Many of the initial plant materials mature and die within the first few growing seasons or dominate the environment such that more desirable plant materials cannot become established. A mature restoration project should contain

a balanced mix of desirable riparian vegetation and grasses that do not require extensive maintenance to preserve the balance and control undesirable vegetation. Therefore, a complete understanding of the succession of plant communities is necessary to assure the long-term success of the project. Terra Technologies brings the necessary knowledge of agrohistology, horticulture, soil bioengineering, and botany to the project to assure long-term success.

Terra Technologies is comprised of highly qualified professionals with extensive experience and a range of engineering and scientific disciplines. We are recognized by our clients for providing value-added environmental engineering alternatives while responding rapidly to clients' needs. In total, more than 600 mitigation projects have been completed since the Company was founded in 1992.

APPENDIX I

MISSOURI STATE HISTORIC PRESERVATION OFFICE CORRESPONDENCE

STATE OF MISSOURI
Matt Blunt, Governor • Doyle Childers, Director
DEPARTMENT OF NATURAL RESOURCES
www.dnr.mo.gov

July 25, 2008

David Flick
Swallow Trail LLC
4707 West 135th Street, Suite 280
Leawood, Kansas 66224

Re: Smith Creek Tract (COE) Moniteau County, Missouri

Dear Mr. Flick:

Thank you for submitting information on the above referenced project for our review pursuant to Section 106 of the National Historic Preservation Act (P.L. 89-665, as amended) and the Advisory Council on Historic Preservation's regulation 36 CFR Part 800, which requires identification and evaluation of cultural resources.

We have reviewed the July 2008 report entitled *Cultural Resource Investigations, Phase I Survey, Smith Creek Tract, Moniteau County, Missouri* by the Environmental Research Center of Missouri, Inc.. Based on this review it is evident that a thorough and adequate cultural resources survey has been conducted of the project area. We concur with the investigator's recommendation that archaeological site 23MU1184 may be eligible for inclusion in the National Register of Historic Places under Criterion D, potential to yield information important to the understanding of prehistoric settlement patterns and subsistence strategies.

If at all possible, the proposed project should be designed to avoid 23MU1184. Plans detailing the redesign of the project should be submitted to this office in order to document successful avoidance. If avoidance is not feasible, subsurface archaeological testing should be conducted in order to determine if this site is eligible for inclusion in the National Register of Historic Places. The results of the evaluation should be submitted to the State Historic Preservation Office in accordance with the Council's regulations. Pending completion of this process, no actions should be taken that would foreclose consideration of alternatives to avoid or satisfactorily mitigate any adverse effects to historic properties.

We also concur that 23MU1185, 23MU1186, 23MU1187, 23MU1188 and 23ME1189 lack integrity and are not eligible for inclusion in the National Register of Historic Places. If you have any questions, please write Judith Deel at State Historic Preservation Office, P.O. Box 176, Jefferson City, Missouri 65102 or call 573/751-7862. Please be sure to include the SHPO Log Number **(005-MU-08)** on all future correspondence or inquiries relating to this project.

Sincerely,

STATE HISTORIC PRESERVATION OFFICE

Mark A. Miles
Director and Deputy
State Historic Preservation Officer

c Joe Cothern, EPA
Gary W. Lenz, COE/JC
Craig Sturdevant, ERC

Recycled Paper

APPENDIX J

HISTORIC STREAM INFORMATION

PHOTO LOG

DATE: 08/07/2008 TAKEN BY: GW	SITE NAME: Smith Creek Wetland & Stream Mitigation Bank
COMMENTS: Photo showing trench on hillside north of the existing pond. No soil color change or rocks suggesting a stream channel at this site. View faces north. PHOTO #: 1	

DATE: 08/07/2008 TAKEN BY: GW	SITE NAME: Smith Creek Wetland & Stream Mitigation Bank
COMMENTS: Photo of area south of the berm at the previous location of Intermittent #5. Excavation shows rocks and a change in soil color indicating previous hydric characteristics consistent with this being the previous location of a stream that ran into the floodplain of Smith Creek. View faces north. PHOTO #: 2	

PHOTO LOG

DATE: 08/07/2008 TAKEN BY: GW	SITE NAME: Smith Creek Wetland & Stream Mitigation Bank
COMMENTS: Photo of excavation at location on western side of property where no stream likely existed. View faces north. PHOTO #: 3	

DATE: 08/07/2008 TAKEN BY: GW	SITE NAME: Smith Creek Wetland & Stream Mitigation Bank
COMMENTS: Photo of excavation at the previous location of Ephemeral #3. No signs of hydric soil changes which is consistent with ephemeral hydrologic conditions. However, historic upstream topography indicates the presence of an ephemeral drainage. View faces north. PHOTO #: 4	

PHOTO LOG

DATE: 08/07/2008 TAKEN BY: GW	SITE NAME: Smith Creek Wetland & Stream Mitigation Bank
COMMENTS: Photo of excavation of previous location of Ephemeral #4. Silt located in center of photo indicates a swale has been filled in through cultivation. View faces west.	
PHOTO #: 5	

APPENDIX K

RESPONSES TO COMMENTS

Responses to Comments
Regarding 2013 Mitigation Banking Instrument

Note: *Underlined text in italics indicates comments received.*
Unformatted text indicates a response of the Sponsor.

U.S. ARMY CORPS OF ENGINEERS (CORPS) COMMENTS

1. The identified length of the restored ephemeral stream channel three (ES3) must be reduced from the current 1,284 linear feet to 415 linear feet. This reduction is due to the inundation of the major portion of channel ES3 within wetland pools 11 and 12. This revision results in a reduction of proposed stream credits for Net Benefit 12 from 13,148.16 to 4,249.6 stream credits. You must revise the length of restored stream channel and the resulting stream credits on the Missouri Stream Mitigation Method worksheet and anywhere else in the MBI that lists total feet of restored stream at the Bank.

The requested changes were made.

2. Similarly, the restored lengths of ephemeral stream channels 7 (ES7) and 9 (ES9) must be revised in the MBI along with the total potential stream credits associated with Net Benefits 7, 8, and 10 (NB7, NB8, NB10). We have measured the length of ES7, as identified using Google Earth Pro, to be 720 linear feet. This distance is measured from the confluence of ES7 and ES8 to the inlet of pool 11. The MBI identifies 824 linear feet of channel restoration for ES7. Using off-site map tools we could not discern accurately the boundary of NB7 and NB8. Therefore, the difference of 100 linear feet must be divided between the two channels and a reduction of 50 linear feet must be applied to NB7 and to NB8. This reduces NB7 by 548 stream credits and it reduces NB8 by 476 stream credits. Together, this is a reduction of 1,024 stream credits for these net benefit areas. In addition, an off-site measurement of ES9 resulted in a length of 1,395 linear feet. The sponsor proposed 1,452 linear feet. The reduction of 57 feet of restored channel results in a reduction of 542.64 stream credits for Net Benefit 10. A more accurate measurement of the restored streams will be determined in the field as a part of the performance monitoring requirements and the IRT's credit release review.

The requested changes were made with two minor modifications.

First, since the reduction in stream length of Ephemeral #7 (as measured downstream of its confluence with Ephemeral #8) from 824 to 720 linear feet is 104 feet instead of the 100 feet

mentioned in the above comment, the lengths of Net Benefit 7 and 8 were reduced by 52 linear feet each rather than the 50 linear feet each mentioned in the comment.

Second, during the revision of the Bank's AutoCAD drawings it was discovered that the previous lengths of Ephemerals #1, #2, #7 and #8 extended part of the way under Highway E. Similarly, the Upland Buffer Establishment and Riparian Buffer Restoration areas bordering Highway E extended into the road. These errors were corrected so that Net Benefit #4 (for Ephemeral #1), Net Benefit #5 (for Ephemeral #2), Net Benefit #6 (for Ephemeral #7) and Net Benefit #9 (for Ephemeral #8) were shortened by 33, 34, 33 and 23 linear feet to lengths of 575, 736, 924 and 581, respectively. Also, the Upland Buffer Establishment and Riparian Buffer Restoration areas' western limits now match their actual on-the-ground boundaries and do not extend into the road.

Please note that the text of the Stream Channel Restoration performance standard was altered to address the Corps' comment, "A more accurate measurement of the restored streams will be determined in the field as a part of the performance monitoring requirements and the IRT's credit release review." Because the Corps' stream measurements were based on aerial photography and because several of the restored stream channels flow into wetlands, there is some natural amount of uncertainty about the final locations of the transitions between stream and wetland conditions. As a result, the Stream Channel Restoration performance standard now reflects the fact that the stream channel restoration lengths included in this mitigation banking instrument are approximate and will be finalized after approval of the document based on monitoring results as reviewed and approved by the Corps in consultation with the IRT, including site visits if requested. That way, after approval of the Bank, the final lengths of these streams will be determined based on field observations and Corps' and IRT review. Because any lack of stream conditions in these transition areas would result from the attainment of wetland conditions, the nonattainment of the Stream Channel Restoration performance standard because of the presence of wetland conditions for a significant length of channel will only result in a reclassification of habitats from streams to wetlands, along with the subsequent changes in stream and wetland credit amounts.

This approach of approving an approximate length of stream channel improvements and then finalizing the amount based on monitoring results will also be important for future mitigation projects that are approved before construction. Adopting this technique addresses the uncertainty about post-construction stream lengths. It also ensures that the Sponsor only receives credits that can be supported by monitoring results, but is not penalized if post-construction conditions do not exactly meet design assumptions in this somewhat unpredictable discipline of ecosystem restoration.

3. You must revise the wetland hydrology performance standard to describe the required 14 days of inundation or the presence of a water table within 12 inches of the soil surface, rather than the 5% of the growing season (assumed to be 11 days) that is currently contained within the MBI for

wetland hydrology. The above hydrology standard is outlined on page 70 of the Midwest Regional Supplement to the Corps' 1987 Wetland Delineation Manual.

The requested change was made. The 11 day period was a remnant of using the 1987 Wetlands Delineation Manual for that information rather than the Midwest Regional Supplement.

4. The U.S. Army Corps of Engineers, in a memorandum dated July 9, 2014, announced the following mandatory provision that must be included in all approved MBI's and in-lieu fee program instruments. You must add the following provision as the first paragraph in the Establishment and Operation of the Bank section of the final MBI.

> *The U.S. Army Corps of Engineers (USACE) approval of this Instrument constitutes the regulatory approval required for the Smith Creek Wetland and Stream Mitigation Bank to be used to provide compensatory mitigation for Department of the Army permits pursuant to 33 C.F.R. 332.8(a)(l). This Instrument is not a contract between the Sponsor or the Property Owner and the USACE or any other agency of the federal government. Any dispute arising under the Instrument will not give rise to any claim by the Sponsor or the Property Owner for monetary damages. This provision is controlling notwithstanding any other provision or statement in the Instrument to the contrary.*

The requested text was added in order to be considered for Corps' approval with only one minor alteration. Since the U.S. Army Corps of Engineers was already identified as "the Corps" earlier in the mitigation banking instrument, the term "the Corps" was used instead of "U.S. Army Corps of Engineers" or "USACE."

U.S. ENVIRONMENTAL PROTECTION AGENCY COMMENTS

These comments responds to a Kansas City District's letter dated July 14, 2014, that proposes to authorize a Final Mitigation Banking Instrument dated February 2013 for the Smith Creek Wetland and Stream Mitigation Bank located in Moniteau County, Missouri. Through follow-up communications with the Corps of Engineers described below, we understand that the Corps has decided to treat the February 2013 instrument as a revised instrument and accept comments.

The EPA has been actively engaged in the review process for this bank, providing detailed comments on the draft prospectus in November 2008, responding to questions from the Corps regarding appropriate riparian corridor widths in February 2011, providing detailed comments on the instrument in April 2012, participating in a site visit on June 5, 2012; and again providing

detailed comments on the instrument in a letter dated June 20, 2012. We have also been an active participant in Interagency Review Team meetings, the most recent of which was August 14, 2014. We also participated in a conference call with Kansas City District on August 21, 2014, to discuss our objections with this instrument. We appreciate that the Kansas City District has recognized the value in correcting the credit inconsistencies in the instrument and inviting comment on the February 2013 Final Mitigation Banking Instrument.

In preparing the next version of the Mitigation Banking Instrument we request that the sponsor submit a version of the document, including track changes, in order to expedite our review. Additionally, the final mitigation rule at 40 CFR 230.98(d)(8) and 33 CFR 332.8(d)(8) requires the sponsor to submit a document outlining how the final instrument addresses the comments provided by the IRT and we request this documentation accompany the next version of the instrument.

Along with the January 2015 submission of the Mitigation Banking Instrument the Sponsor has enclosed a version of that document marked using the Document Compare process (equivalent to track changes) to show the changes to the document in comparison to the February 2013 version. This Appendix K constitutes the requested document that shows how the January 2015 version of the Final Mitigation Banking Instrument specifically addresses the IRT comments.

The IRT is currently reviewing a Final Mitigation Banking Instrument for the Smith Creek Wetland and Stream Mitigation Bank dated February 2013. However, since February 2013, there have been performance issues on site requiring maintenance. On September 24, 2013, the sponsor submitted to the Kansas City District a letter describing such maintenance and recognizing that some of their stream construction has failed and that it would be necessary to receive wetland rather than stream credits for a portion of the site. The letter states, "Consequently, after receiving any comments regarding the February 2013 Final Mitigation Banking Instrument, the Sponsor will provide the US Army Corps of Engineers and the Interagency Review Team a new Final Mitigation Banking Instrument that addresses those comments and that includes a revised Bank Development Plan where Ephemeral #1, #7, and #9 channels end at the edge of Poo1 #11 which will be shown as an Herbaceous Wetland Establishment Area."

The District re-reviewed the instrument and determined that corrections were needed on ephemeral channels 3, 7 and 9, as described in Net Benefits 7, 8, 10 and 12 and would reduce the available stream credits in the bank from 123,002 to 112,533 (rounded to the nearest credit), for an 8.5% reduction in potential steam credits. The District stated in their August 26, 2014, email to EPA: "we have concluded that we will require the sponsor to correct this in the final instrument and that we will reissue it for approval/rejection by the IRT agencies. We request that you provide in writing any other concerns with the instrument to us at this time so we can evaluate those for possible inclusion in the modified instrument."

These credit reduction estimates listed above may be close to what is actually on site, however for the most accurate current length of functioning stream we recommend that in preparing the next version of the Mitigation Banking Instrument the sponsor verify the length of stream that has not aggraded, has an OHWM, and is not vegetated. The sponsor should update the credit worksheets, net benefit descriptions, and site plan maps. Since two years have passed since the last site visit, we may request that a site visit be held this so the IRT has the opportunity to confirm the measurements at the site.

As described in the response to the Corps' Comments #1 and #2, the Sponsor has provided a revised Final Mitigation Banking Instrument that complies with the above comments by changing Pool #11 to show wetland conditions instead of stream channels and riparian habitats and adjusting the related stream lengths accordingly. The credit amounts were adjusted to roughly match those stated by the EPA with some minor alterations as described in the response to Corps' Comment #2. Finally, the Sponsor altered the Stream Channel Restoration performance standard to allow for any future revision of the restored stream channel lengths based on monitoring results as reviewed and approved by the Corps and IRT, including site visits if requested.

Regarding the stream channel restoration areas, due to the Sponsor's team's many years of experience delineating and describing streams proposed to be impacted as part of Clean Water Act Section 404/401 permitting, the Sponsor believes that all proposed stream restoration lengths not at any downstream stream/wetland transition area would meet the criteria for ephemeral stream designation for impact projects. Therefore, the Sponsor asks that the same standards be used in the identification of stream mitigation areas. It should be noted here, as it is in the Stream Restoration Design & Geomorphic Assessment for the Bank contained in Appendix E, that the pool and riffle stream bed pattern found in perennial and intermittent streams is occasionally replaced in floodplain ephemeral streams by the functionally analogous alternating pattern of conventional stream channel segments and somewhat vegetated channels in zones of flat topography. So it should be expected that there will be some degree of vegetation in some locations of stream channel restoration. But, just as for impact projects, relatively short lengths of some vegetation or brief interruptions in ordinary high water mark formation should not preclude the designation of the overall stream length as being that of an ephemeral stream.

For your convenience, we have attached a copy of the June 20, 2012, letter. Many of the issues in our June 20, 2012, letter were not addressed in the February 2013 instrument and continue to remain unresolved and we expand upon them in this letter.

Baseline Data:

One of our chief concerns with the Mitigation Banking Instrument is the lack of baseline information for the site. 40 CFR 230.98(d)(6)(iii)(A) requires that a complete instrument must include a mitigation plan that includes all applicable items listed under 40 CFR 230.94(c)(2) through (14); 40

CFR 230.94(c)(5) requires the sponsor to provide baseline information for the site. Construction was initiated at this site prior to approval from the IRT, and the EPA has always maintained that our approach to reviewing this bank will be to evaluate functional lift and determine if proposed credits are appropriate. Sufficient documentation of pre-construction baseline conditions is necessary to evaluate this functional lift, and lacking pre-construction baseline data advanced construction of the site in effect creates a new baseline for the site. Credits should only be granted for activities that improve aquatic resource functions and services. Additional discussion on the need for baseline data appears throughout this letter.

The Sponsor has increased the amount of baseline information in the final mitigation banking instrument and responds below to each EPA comment regarding baseline information as listed in the rest of their letter.

Jurisdictional Determinations:

The EPA has also requested jurisdictional determinations for the waters on site, consistent with 40 CFR 230.94(c)(5). To date, only a Preliminary Jurisdictional Determination has been provided. The EPA requests the jurisdictional status of all waters on site, including the channels that enter the site from the west. The EPA also requests complete documentation of which construction activities required authorization under CWA Section 404, how those activities were regulated, and the date of authorization.

This comment is directed to the Corps and not the Sponsor.

Stream Baseline Data, Design, and Monitoring:

There is a particular need for additional information regarding the stream channels on the mitigation site. The limited data provided in the instrument does not fully support many of the conclusions presented in the instrument. Baseline information and field measurements are needed for all stream channels. The Natural Stream Channel Design checklist also identifies key stream morphological characteristics, as well as information on these characteristics, that are needed to complete the review of the stream channels on-site. This checklist is available at:

> *http://water.epa.gov/lawsregs/guidance/wetlands/upload/Natural_Channel_Design_Checklist_5_16_12.pdf*

The sponsor should utilize this checklist and complete the Stream Morphology Tables found on pages F7 and F8 of the document.

The Sponsor is familiar with the Natural Channel Design report the EPA references and holds it in high regard as an excellent technical document. However, it is not necessary to document the pre-

mitigation stream conditions to the degree requested in order to justify the stream mitigation actions at the Bank. No in-channel work in Smith Creek has been proposed, so it is not necessary to describe the conditions within that stream. Additionally, the tributary streams were either obviously channelized or graded out of existence. This is clearly evident from the numerous aerial photographs provided in the Banking Instrument so exact in-stream measurements are not necessary to support this conclusion (and would not be possible for the streams that were eradicated by past farming practices and restored by the Sponsor). Moreover, baseline information is provided as on-the-ground pre-mitigation photographs of the tributary stream conditions in Appendix E of the Mitigation Banking Instrument.

In addition, in Appendix E (Stream Restoration Design & Geomorphic Assessment), the Corps and IRT have been provided with information on the current state of the onsite Smith Creek tributaries, including modeled peak flow rates, sinuosity, slope, channel cross sections and profiles.

The sponsor states that they will visually inspect streams so that there is no down cutting, deposition, erosion or loss of OHWM, but does not provide what level would be considered acceptable or how they would measure this. The instrument should be revised to include measurable and specific performance standards. Specific and quantifiably measurable performance standards will ensure the IRT and the sponsor have the same expectations as to what constitutes success at the site. In developing these performance standards, the EPA recommends that the sponsor review the Function-Based Framework for Stream Assessment and Restoration Projects, available at:

> *http://water.epa.gov/lawsregs/guidance/wetlands/upload/A Function-Based Framework-2.pdf*

Consistent with the approach recommended in this document, the EPA requests the development of measurable and specific performance standards for the following components:

- *Bank Height Ratio*
- *Entrenchment Ratio*
- *Large Woody Debris Index*
- *Bankfull Velocity*
- *Evolution of Channel Type*
- *Meander Width Ratio*
- *Lateral Erosion Rate*
- *Percent Riffle*
- *Pool to Pool Spacing Ratio*
- *Depth Variability (pool max depth ratio)*
- *Bed Material Composition*

Measuring each of the requested attributes at each restored stream channel would be unnecessarily time-consuming and would not necessarily address the fundamental question of monitoring these stream channels which is: Are these channels functioning naturally and generally like the small channels whose impacts they are mitigating for? In addition, many of these suggested performance standards are not appropriate for such small channels. For instance, large woody debris would not be expected in these channels which are usually roughly two feet wide. Also, being ephemeral streams, they do not have pools. Similarly, due to their small drainage area sizes and resulting 30-45 minute times of concentration, it is not realistically possible to accurately measure bankfull velocities during a storm event.

Instead, visual inspections and photographic evidence of the state of the restored streams with particular attention to down-cutting, deposition, bank erosion, and maintenance of ordinary high water marks is sufficient to judge the success of the stream channel restoration efforts. As stated earlier, the Corps and IRT will be able to review the monitoring results and view the onsite conditions as part of the credit release process, thus minimizing the possibility of credits being released that cannot be justified by site conditions.

The Corps has commented that they feel the sinuosity is similar to other streams in the area; however, the sponsor stated that they could not find any reference streams to confirm that the designed streams are appropriate. There should be reference streams and riparian areas somewhere in the watershed on which to base the mitigation site design. In their current form, the cross sections provided do not provide enough information to evaluate all of the streams. However, in interpreting the limited information available, there appears to be some instances where the Rosgen methodology is being used incorrectly. The sponsor makes generalizations about all of the streams, but instead should provide an individual assessment of each of the streams and collect morphological parameters for all the streams that they want credit for. There are several times the sponsor makes statements about the Rosgen and natural channel design methodologies not being applicable to ephemeral streams. We disagree with these conclusions. The EPA requests the removal of these statements or to have them supported via a citation to a peer-reviewed document.

The Corps' statement that they consider the sinuosity of the Bank's restored streams to be similar to that of nearby streams may have been based in part on the Sponsor's consultant's memo to the Corps dated May 31, 2012 regarding the design of the restored stream channels on the Bank. To the Sponsor's knowledge, the Corps then forwarded this memo to the IRT for their review. The memo's exhibits of historical aerial photographs showed some of the pre-channelization stream channels on the Bank property, sinuous erosional features both on and adjacent to the Bank property and the sinuosity of nearby streams. These nearby streams show a significant amount of meandering although less than the restored streams because the nearby streams have greater slopes.

These historic stream conditions and past sinuous erosional channels that provide insight regarding site hydrology before agricultural conversion no longer exist, so it is not possible to acquire any in-stream measurements other than sinuosity. Additionally, given the very small amount of public land in the vicinity of the Bank, most of the streams in the area are on private land and it should not be assumed that the Sponsor can always be able to visit any potential reference locations owned by other private entities. Please also note that by their very nature, floodplain ephemeral streams are extremely unlikely to have reference locations that still exist because this stream type is found on the portions of the landscape that are the most likely to be productive farmland and therefore the most likely to be highly impacted and greatly altered from their natural state.

Regarding the applicability of Rosgen's classification system and restoration methodologies to ephemeral streams, the Sponsor agrees that the Rosgen classification system is applicable to ephemeral streams as this is stated by Rosgen in his Stream Classification System paper (Rosgen, 1994), although the Sponsor contends that the primary focus of this classification system are perennial and intermittent streams. Additionally, after several long searches, the Sponsor has found no explicit evidence stating either way whether it is appropriate to apply any restoration methodologies described by Rosgen to ephemeral streams. With the lack of explicit statements either way, it is impossible to prove anything conclusively especially to the level required by a peer-reviewed journal. The implicit evidence of photographs and project examples strongly indicates that these methods are primarily intended for perennial or intermittent channels.

The disciplines of stream engineering and stream restoration have been primarily focused on perennial and intermittent streams because these stream flow regimes are typically more biologically important and because they carry flow of sufficient magnitude and duration to force engineers and site planners to either accommodate or alter the streams' flows, both actions that require study and modeling. In contrast, ephemeral streams can generally be graded out of existence with little effort or complicated engineering. Consequently, many of the principles of stream engineering and/or stream restoration have been developed for perennial and intermittent streams and while many of those principles can legitimately be assumed to be applicable to ephemeral streams, that should not be taken as a given in all instances. As an example, regarding natural channel design methodologies, it is worth noting that *A Function-Based Framework* (Harman *et al.*, 2012) states on page 63 that:

> "The Stream Functions Pyramid Framework is more applicable to some types of projects and less to others. Stream restoration projects that involve physical manipulation to intermittent and perennial stream projects can benefit from the Stream Functions Pyramid. Stormwater Best Management Practices, regenerative design (Flores et al., 2011), Low Impact Development, *and other practices that occur in ephemeral channels* and uplands may benefit less from using the Pyramid (emphasis added)."

As a final point, the Sponsor recognizes that this issue is one of professional opinion that qualified professionals can disagree about and feels that is not of sufficient importance to prevent the approval of the Bank.

Crediting Methodology:

As mentioned above, there are portions of the site where the design did not perform as originally planned and that maintenance and changes in site design were needed, thus impacting the crediting for the bank. In addition to the stream performance issues discussed above, the EPA has also identified several additional areas where credits may be inappropriate or need adjustment, including how net benefit areas are measured, how enhancement and establishment of buffers is credited, and issues with proposed upland buffers.

What is acceptable enhancement continues to be an issue with this sponsor at this and other sites. There needs to be baseline data of what the existing site looks like before enhancement work, justification that the work is needed, and that the work will create measurable environmental lift. The sponsor has not provided justification for why the existing riparian or upland buffers needed improvement, particularly as some of the areas being proposed for credits have been forested for decades. Documentation needs to be presented as to what species will be removed and what the current percent cover or number of individuals exists at these locations. A vegetative assessment such as a Floristic Quality Index should be completed. Completing a vegetative assessment before the work is conducted as well as after will allow for tracking of site improvement over time. This is a common requirement for other banks in the region and the instrument should not be considered complete until this basic, baseline data is provided.

The environmental lift of work in these enhancement areas appears to be minimal and potentially harmful depending on the approach for removing and planting the trees as the equipment used may compact understory vegetation. The mitigation rule notes that buffers are appropriate, "...where necessary to ensure the long-term viability of those [aquatic] resources. Buffers may also provide habitat or corridors necessary for the ecological function of aquatic resources" (40 CFR 230.93(i)). In reviewing this instrument the IRT and the Corps should consider the appropriateness of the buffer proposal, the value the buffers will provide, and whether these buffers will meet the requirements of the mitigation rule. If the enhancement areas are already in good or high quality condition and the enhancement activities would damage and degrade the functions, then credit should not be awarded.

The Sponsor has responded to this comment by significantly increasing the amount of information in Section IV.D (Baseline Information) related to the pre-mitigation ecosystems found on the Bank, especially regarding the areas proposed for enhancement and the specific mitigation needs of each area. This information was then used to justify the proposed mitigation activities and the resulting environmental lift. The discussion of the enhancement and buffer areas in the Mitigation Work Plan in Section IV.F was expanded to show how the mitigation activities directly address the mitigation

needs as described in the Baseline Information section. The justifications for riparian buffer enhancement and the inclusion of upland buffers on the site are included in the responses to specific EPA comments below.

After a site visit in June 2012 the IRT and the Corps agreed to buffer limits of 300 feet for perennial streams when using the Missouri Stream Mitigation Method. Unfortunately, several of the buffer areas on-site continue to exceed these limits. The south portion of the bank along Smith Creek shows a 300-foot riparian buffer, plus a 600-foot upland buffer. This 600-foot buffer does not buffer any wetlands but is proposed for wetland credit. This portion of the bank has the least amount of threat and arguably the least need for a substantial buffer, whereas the area along the road that would most benefit from a wider buffer as it has the narrowest buffer at the mitigation site. This is just one example of where the sponsor has requested credit for excessive amounts of buffer and there are several instances of "buffer buffering buffer" or a buffer in the middle of the bank with wetland on either side. These areas do not add value to the aquatic resources at the site, and thus do not meet the criteria for buffer credit presented in the mitigation rule. Accordingly, these credits should be adjusted.

The Upland Buffer Enhancement area south of Smith Creek, referred to in the above comment as the 600-foot upland buffer, should be allowed to be included in the Bank because doing so contributes to the long-term viability of the adjacent aquatic resources. If this Upland Buffer Enhancement area was not contained within the Bank, then the previous pasture and timber production land uses in this area would be permitted and allowances would need to be incorporated into the banking instrument to allow for access to this area by the necessary personnel and mechanized equipment. These vehicles would use the existing crossing through Smith Creek which would cause obvious water quality issues. Therefore, the incorporation of this Upland Buffer Enhancement area does benefit the Bank's aquatic resources and should be allowed to remain in the Bank. In addition, some wildlife will use both the Bank's wetlands and streams and the forested and prairie habitats on this Upland Buffer Enhancement area. Many animals, including several kinds of birds, bats and insects, forage for food in wetlands but roost or otherwise take shelter in nearby upland areas. Those species and many others visit wetlands as a source of drinking water as well. The transfer of nutrients and seeds between the buffer and wetland habitats also constitutes an important ecological functional relationship between these areas. Consequently, whether there are native prairie and forest species present in the buffer area instead of hay pasture and any associated invasive species present would affect the ecological functioning of the Bank's wetlands and other aquatic resources. After all, if this buffer were not included within the Bank it would not be subject to the beneficial land use restrictions in the Bank's conservation easement. Even more importantly, without the inclusion of this area in the Bank, the IRT would not to be able to enforce compliance with the invasive species performance standard in this area adjacent to the Smith Creek riparian buffer.

Regarding the buffers referred to at the end of the above comment, the Sponsor has complied with an earlier EPA request to remove all upland buffer areas from the berms that separate the wetland pools so that those areas do not generate any credits. The remaining buffer areas north of Smith Creek, with one exception, are adjacent to the Bank's boundaries and consequently protect the Bank's aquatic resources from disturbances associated with the neighboring land uses. The EPA's comment about "buffer buffering buffer" in these areas likely refers to the fact that these buffer areas are often split into separate but adjacent Upland Buffer Establishment and Upland Buffer Enhancement areas, the difference between these habitat designations being based entirely on whether an area was forested prior to the construction of the Bank. Consequently, the two adjacent buffer types function as one contiguous buffer to the adjacent wetlands and are only distinguished from each other because of the different previous land uses.

The exception mentioned earlier was an Upland Buffer Establishment area north of the Herbaceous Wetland Enhancement area in the farm pond in the northwestern portion of the Bank. That Upland Buffer Establishment area was removed from the Bank in the 2015 Final Mitigation Banking Instrument to comply with the EPA's comment.

The IRT should also carefully consider the credit ratios used for awarding buffer credits. The document gives the same credit 1:4 for both buffer establishment and enhancement. This is a substantial difference in effort, for example, planting over 100 trees per acre for establishment versus 17 trees per acre for enhancement. Given the issues in this banking instrument surrounding buffers, the EPA recommends the IRT have a policy discussion regarding buffer crediting.

This comment appears to be addressed to the rest of the IRT.

The sponsor has also requested restoration or enhancement credit for areas of existing riparian forest. Given that these areas are existing riparian forest, it is likely that these areas would be more appropriately called preservation. However, in order to qualify as preservation under the Mitigation Rule the site must meet the five-part test outlined in 40 CFR 230.93(h). The sponsor must demonstrate that these preservation criteria are met or provide more detailed baseline data, as well as greater documentation as to the specific work planned on-site, in order to show how this work would meet the criteria for restoration or enhancement. We note that restoration involves improving a whole suite of functions on-site while enhancement allows for the improvement of just one function.

The granting of enhancement credit for the Riparian Buffer Enhancement area south of Smith Creek (part of Net Benefit #1) is justified because the tree plantings in the portion of the former floodplain pasture area at Smith Creek's roughly 90-degree turn to the east within the Bank represent a roughly 11% planting of the entire portion of Net Benefit #1 south of Smith Creek. That is within the 10%-

50% planting requirement that qualifies for Riparian Buffer Enhancement according to the State of Missouri Stream Mitigation Method. Therefore, the plantings in that area alone qualify the entire riparian buffer along the right descending side of Smith Creek for Riparian Buffer Enhancement so any additional plantings in the already forested areas are just an added ecological benefit provided by the Sponsor. However, the final mitigation banking instrument now includes a clear ecological justification of all Riparian Buffer Enhancement areas based on the Baseline Information.

To collect baseline vegetation data in the buffer enhancement areas the EPA recommends that the Land Condition-Trend Analysis (LCTA) Plot Inventory Field Methodology developed by the U.S. Army Construction Engineering Research Laboratory be utilized for such purposes. This method establishes permanent 100-meter by 6-meter plots that includes both a 100-meter point-intercept line transect and a 6-meter belt transect. These methods provide baseline data on plant species frequency, composition, and vegetation condition trend changes (for example, invasive species cover) upon which to monitor vegetation dynamics at the mitigation site.

The sponsor should utilize the methodology to establish baseline vegetation characteristics upon which to track functional lift by measuring the parameters listed above as well as the survivability of any planted tree and shrub species. Equal numbers of sampling plots oriented both perpendicularly and parallel to the stream or wetland resources being buffered should be established at the site. These plots should also be distributed so that locations slated for enhancement include sites already vegetated as well as those locations planted by the sponsor. The placing of transects in this fashion will ensure that tree and shrub plantings completed by the sponsor are successful and functioning as predicted. In addition, approximately 10 percent of the area (at a minimum) for each of the locations being designated as created, restored, or enhanced should be surveyed to obtain an appropriate number of samples upon which to base mitigation success.

In addition to the LCTA method, the EPA also recommends that the sponsor utilize the nested cover quadrat methodology as described by Prosser, et. al. 2003 (Comparison of 2 techniques for monitoring vegetation on military lands). This methodology measures species richness and composition by using quadrat sampling locations within the LCTA core plot. The nested cover quadrat methodology provides the sponsor with a concise way as to measure functional lift of proposed enhancement activities at the bank, such as burning and over-seeding activities. It should be noted that species determinations within the nested quads should be identified to specific epithet and that generic level determinations should be avoided.

In combination with the LCTA and nested cover quadrat methodologies, the EPA requests that a baseline Floristic Quality Assessment be completed for the site utilizing the plant species discovered within the nested quadrats and LCTA sampling plots. Once a baseline value is calculated, a quantitative performance standard should be developed for enhancement and restoration areas on the bank. This value should rise continuously for three or more consecutive years and ultimately

attain a value close to the combination of the baseline data species and those plant species over-seeded into enhancement and restoration locations. Clear, quantitative performance standards will ensure the IRT, the Corps, and the Sponsor all understand what constitutes success.

The Sponsor appreciates the specificity of the EPA's recommendations. The mention of exact vegetative sampling methodologies shows that a lot of thought was put into those suggestions. However, the objective of describing the baseline state of pre-mitigation plant communities is to accurately portray their existing condition in order to identify any mitigation needs that the Sponsor could address. This can be done adequately at this Bank site by listing the dominant and common species present, classifying the plant community per *The Terrestrial Plant Communities of Missouri* by Paul Nelson if possible and generally describing the habitats as being of high, medium or low ecological quality without the use of the complicated vegetative sampling methods mentioned. In other words, highly precise and time- and cost-intensive studies are not necessary when a general ecological assessment is adequate to characterize whether an area is of high, medium or low quality and to identify any ecological needs.

Performance Standards & Monitoring:

Earlier in this comment letter we have provided detailed recommendations of methods to establish baseline data, and we suggest this data collected be used to develop clear quantitative performance standards for this bank. The recommended methodologies should also be used to prepare monitoring reports to track the progress toward these performance standards. However, in addition, we offer the following comments on the monitoring suggested by the sponsor.

The radius proposed for sampling varies and does not match the regional supplement. Days of hydrology also does not match the Midwest Regional Supplement (11 days versus 14 days). We request that the sponsor select approaches consistent with the regional supplement or provide a reference for their sampling and monitoring methodology and document why this radius was selected.

The concern about the sampling radius for trees and shrubs is the result of an understandable misreading of the minute details of the monitoring process. We use the Wetland Delineation Manual Regional Supplements for any monitoring related to performance standards that relate to wetland conditions. Specifically, the 30-foot tree sampling radius described in the Wetland Delineation Manual Regional Supplements is the accepted standard for hydrophytic vegetation analysis and we do use the 30-foot radius in our visual assessment of tree percent cover for the hydrophytic vegetation performance standard. In contrast, the final mitigation banking instrument states that the 26.3-foot and 11.8-foot sample radii will be used for tree and shrub survival calculations because they make the math significantly easier with less chance for errors. Since tree and shrub survival calculations are not related to any kind of assessment of wetland conditions, the provisions of the Wetland Delineation Manual Regional Supplements do not necessarily need to apply. The 50-foot

sample radius is only occasionally used and its justification is that a 26.3-foot sample radius would only capture a small number of the less densely planted trees and shrubs in already forested areas and be a less reliable predictor of the true planted tree and shrub density.

The number of consecutive days for wetland hydrology was changed from 11 to 14.

The methodology and metrics outlined in the wetlands delineation manual and the Midwest regional supplement for trees and shrubs should be used in establishing performance standards for the site. We request including DBH measures as part of the performance standards as well as adding height and diversity requirements for trees and shrubs and a diversity requirement for understory. Performance standards should also require planted vegetation to meet an 80% survival rate.

The applicability of the wetland delineation manual and the Midwest regional supplement to tree and shrub performance standards was addressed in the previous response.

The DBH and height measurements for all trees observed would be very time consuming and while that information would provide some detailed information about the vegetation on the site, it wouldn't offer any additional insight regarding the primary question of whether there is a sufficient density of desirable trees and shrubs. Similarly, the other requested performance standards would significantly increase the time needed to monitor the site with little increase in the overall quality of the Bank's habitat. Also, an increase in the minimum tree and shrub survival rate from 75% to 80% would not provide any substantial improvement in the habitats provided by the Bank as a 75% survival rate is adequate to ensure that a sufficiently dense tree and shrub community has become established.

Vegetation monitoring needs to occur during the growing season. The instrument also includes a discussion of relative cover versus dominance. The EPA contends that 51% of the dominants need to be FAC, FACW, or OBL. The 51% is in addition to the regional supplement as it is a measure of quality and increased function.

In the description of the different credit release events, the monitoring is described as coming from each growing season so the EPA's comment is already addressed in the final mitigation banking instrument.

The 51% requirement mentioned above is not necessarily a measure of ecosystem quality and function. It is technically only a measure of how hydrophytic a plant community is. The Midwest regional supplement to the 1987 Corps' Wetlands Delineation Manual contains three different non-rapid methods of determining whether hydrophytic vegetation is present. The 51% dominant requirement mentioned by the EPA refers to the dominance test which is the most conservative of

the three non-rapid methods, meaning that it requires a higher degree of hydrophytic conditions than the other two methods. If all wetland areas on the Bank (and future mitigation banks if this performance standard is adopted) have to meet the dominance test as the EPA describes, then the Bank would only include wetland areas that are strongly hydrophytic enough to meet the dominance test. Consequently, wetland habitat types at impact sites that qualify as wetlands but are on the drier side of that definition (*i.e.*, those that do not pass the dominance test but meet the prevalence index or morphological adaptations tests) would not be represented at mitigation banks and therefore mitigation banks would not be adequately representing the wetland types being impacted within the watershed.

If monitoring shows that any of the wetlands areas are predominately open water and unable to meet vegetation performance standards, then full credit should not be given. There is discussion in the document about not all of the monitoring points needing to meet wetland parameters. EPA does not agree with this statement. In order to be considered a wetland and receive credits, the monitoring points need to meet the wetlands parameters outlined in the delineation manual and the regional supplement. The annual reporting should include a report of how many wetlands acres on the site meet the three parameters, and how many feet of stream are functioning.

Many wetlands have some portion of open water and some relatively minor amount of open water is actually beneficial to wildlife due to the added habitat complexity. So we would suggest that it would not be appropriate to include such a broad statement like if "any" of the wetland areas are predominantly open water.

Regarding the portion of the comment about not all wetlands having to meet wetland parameters, the final mitigation banking instrument states that all proposed wetland areas must show evidence of wetland conditions by the time of the final credit release. The provision about the definition of the "vast majority of planned wetland areas" means that if the Bank is largely meeting its wetland performance standards, the lack of success at a small minority of areas will not prevent the Sponsor from receiving credits for their success across the rest of the site while, by the end of the project life, still not allowing any credits to be released that can't be justified by a proven amount of functioning wetlands. While it may be desirable, it is not realistic to assume that these large mitigation sites will perform exactly as predicted immediately upon construction and that the slightest adjustment to the site is therefore an admonition of failure. It is more appropriate to allow some reasonable amount of adaptive management to take place while also not releasing credits to the Sponsor that are not justified by site conditions.

As written, the amount of invasive species allowed by the performance standards is too great. There needs to be a change to performance standards to allow only 1% Highly Aggressive Invasive Species and 5% Undesirable Species.

While the Sponsor agrees that it is a worthy goal to have invasive and undesirable species cover be as limited as possible, the thresholds mentioned are unreasonably low. Having 2% invasive species cover or 6% undesirable species cover would not indicate that the Bank as a whole would not be successful in meeting its objectives of creating functioning wetland, stream, riparian and upland buffer habitats.

Long-Term Funding:

A letter of credit is not an appropriate long-term funding mechanism as letters of credit need to be regularly renewed. This is not acceptable as this financial mechanism is expected to provide funding for the maintenance of the site into perpetuity. Additionally, the letter or credit proposed by the sponsor only covers the cost of annual maintenance for one year which obviously is not sufficient to provide for the long-term care of the site. Consistent with the Mitigation Rule, the EPA recommends a non-wasting endowment is established where the yearly interest generated is sufficient to cover the annual management and maintenance costs, without necessitating expenditure of the principle.

In order to address this comment, the last sentences of Section I.C (Current and Long-Term Ownership Arrangements and Long-Term Management Strategy) and Section IV.G (Operation and Maintenance Plan) were changed to state that long-term management will be paid for from the revenues from credit sales rather than from the letter of credit used for long-term management financial assurances.

As part of long term management, a statement needs to be added that during each visit there should be confirmation that the easement boundaries are not being encroached upon by adjacent landowners or trespassers. A discussion about mineral rights at the site should also be included.

The Sponsor is responsible for long-term management while monitoring compliance with the easement boundaries is a duty of the Midwest Mitigation Oversight Association. Therefore, it should not be required that the two tasks be mandated to be performed simultaneously. The Sponsor owns the mineral rights on the Bank and the Short-Term and Long-Term Offsite Threats subsection of the Mitigation Banking Instrument was revised to state this fact. Please note that the Bank's conservation easement will prevent mineral exploration and extraction.

Other Comments:

The proposed third-party easement holder is Midwest Mitigation Oversight Association. The banking instrument needs to provide more information to qualify MMOA as an appropriate third-party easement holder; the instrument lacks documentation to determine whether MMOA has any

direct experience enforcing site protections and what experience MMOA's has in natural resource land management.

Section IV.C of the final mitigation banking instrument describes the general natural resources qualifications of the MMOA. Also, as some background regarding the MMOA's history, the MMOA has enforced the terms of a Section 404-related conservation easement when an easement grantor (who is not the Sponsor) had violated the terms of their easement with generally minor infractions. Communication, including a written letter to both the easement grantor and the Corps, was initiated by the MMOA in order to fix the violation. A follow-up inspection has occurred and the MMOA continues to press for compliance with the easement.

The previous version of the instrument included a statement that credit sales were non-refundable and we would like to request a clarification regarding this deletion. The EPA's expectation is that once a transaction for an impact occurs and is part of a permit then the credits need to be debited and there should not be a refund. Under what circumstances does the sponsor envision a refund could occur?

Not all planned permitted impacts are actually carried out and therefore the Sponsor wanted to reserve the right to refund credit sales in such an instance. Also, the Sponsor decided that it was not appropriate to codify this business practice (a contractual matter between itself and the permittee) into a legal document with the IRT (*i.e.*, the banking instrument).

We encourage discussions between the landowner to the west and the sponsor about future land use at the adjacent site. Land use at this site may make meeting performance standards difficult as nutrients, pesticides, and herbicide will travel into the channels and into the pools from the neighboring site with no buffer. The sponsor could work with the landowner assure that hydrology continues to flow into the channels on the mitigation site.

The Sponsor has no legal right to tell the landowner to the west how to manage their land. The fact that the aquatic resources provided at the Bank will intercept the pollution mentioned by the EPA before it reaches Smith Creek is one of the main water quality benefits of the Bank.

EPA has concerns with the site's long-term viability given the issues with performance of stream design trending towards aggradation, maintenance already required in several locations and that this site is highly engineered with 24 different berms and water structures. In order to address the long-term risk associated with this site that will continue to require substantial maintenance, we request the next version of the instrument incorporate our requests in this comment letter for more

substantial performance standards, monitoring, and long-term management funding, as well as a conservative credit release schedule to offset this risk.

The EPA recommends additional credits need to be reserved until the final credit release to assure that the streams are meeting their performance standards versus converting to wetland or open water. Presently, we are requesting reserving 40% of the stream credits until the final credit release. Under this approach, enough credits in each type need to be reserved to determine where the "normal" line between stream and wetland function is located. Before final credit release we recommend that the Corps and the IRT measure these distances independently for final credit determination. A third party independent measurement may also be an acceptable option. This may require walking the site with a GPS and wheel measure as a team at a future site visit.

The Sponsor has addressed the root concern of this comment (minimizing the risk of unsupported stream credit releases associated with stream channel restoration) by reducing the length of stream channel restoration. Therefore, increasing the final credit release amount from 20% of total anticipated stream credits to 40% is not necessary.

One additional way to address risk at the site within the document is to state that the ephemeral stream credits should only be used to offset ephemeral stream impacts. This would help reduce the risk of the unproven stream design. We also hope that the Corps will be consistent and determine similar resources to be impacted as jurisdictional if credit is being given to the streams on the site. There is a portion of the credits along Smith Creek that are acceptable for use as perennial/intermittent stream mitigation.

Stream credits in Missouri are not divided into perennial, intermittent and ephemeral stream credit types. Instead, the flow regimes of impacted and mitigation stream lengths are taken into account in the State of Missouri Stream Mitigation Method calculations. Deviating from this method would require a policy decision by the Corps and IRT.

For the sponsor's benefit we note that the sponsor has built a wetland complex, however the proposed stream channels are not functioning as streams by the time water reaches Smith Creek. This is highly engineered and would be likely impossible to find in nature. Future banks need to be designed to be self-sustaining, less engineered, and based on reference sites in the watershed.

We would suggest that one of the types of stream habitat restored to the site (where local tributaries flow into floodplain wetlands and then the floodplain wetlands connect to the larger receiving stream) was not extremely rare in pre-settlement conditions before virtually all flat floodplain land was converted to row crop agriculture. As some proof of this, the figure below of a specific progression of floodplain wetland development was provided to the Sponsor by a previous Missouri

Department of Conservation IRT member because it reminded him conceptually of the Smith Creek site. It shows streams flowing into the floodplain wetland with no direct channel connection to the receiving stream.

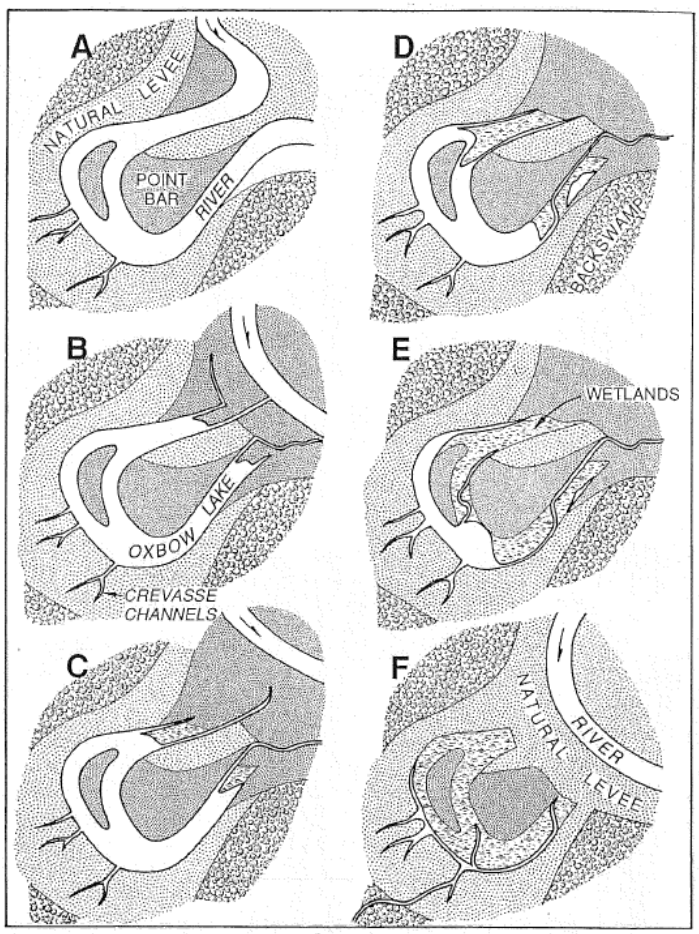


Figure 2.6. The life cycle of a typical neck cutoff in the MAV (from Saucier 1994). (A and B) Sand bars quickly form after a neck cutoff takes place, (C) batture channels develop which connect the abandoned channel to the active river channel, thus aiding in deposition of sediment, and (D - F) the abandoned channel is eventually filled with sediment and converted to a hardwood swamp (from Saucier 1994).

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If requested, we can provide a marked-up version of the transmittal letter and instrument pdf's with highlights and comments so you can see the pages we had concerns with that are addressed in these comments. Due to the documents sizes they will need to be providing via an alternate format. When changes to the site plan and net benefit areas, stream channels, and wetland pool boundaries are updated, please provide the EPA with the GIS files used to create the images in the instrument. We expect that the receipt of a revised version of the instrument will be accompanied by a response to comments from the IRT as required by at 40 CFR 230.98(d)(8) and 33 CPR 332.8(d)(8). Additionally, the receipt of a new, final instrument will restart the final instrument review process, and we expect IRT members will have 45 days to review the draft instrument, with the Corps

indicating whether or not they intend to approve the instrument after 30 days as outlined in 40 CFR 230.98(d)(8) and 33 CFR 332.8(d)(8).

GIS shapefiles of the mitigation area boundaries created in AutoCAD are submitted on compact disks along with the 2015 Final Mitigation Banking Instrument. The other portions of this comment appear to be addressed to the Corps.

References:

Harman, W., R. Starr, M. Carter, K. Tweedy, M. Clemmons, K. Suggs, C. Miller. 2012. A Function-Based Framework for Stream Assessment and Restoration Projects. US Environmental Protection Agency, Office of Wetlands, Oceans, and Watersheds, Washington, DC EPA 843-K-12-006.

Rosgen, D.L. 1994. A Stream Classification System. Catena Vol 22, 169199. Elsevier Science, Amsterdam. p. 180.