Jacks Fork River Mitigation Site
Shannon County, MO

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Introduction

The main objective of the mitigation project is to restore and preserve functional perennial stream habitats within the Current River watershed. The proposed activities will provide enhanced water quality and wildlife habitat in the region. The proposed mitigation project would restore, protect, and/or preserve approximately 14 acres of forested riparian buffer and 3,025 linear feet of perennial stream channel. This project will benefit habitat types that have historically been a part of the Current River watershed but are increasingly threatened by recreational development. The Current River watershed is largely protected by federal lands, but areas downstream within the watershed and near high-use recreational stream reaches are becoming increasingly impaired by development. The restoration and protection of riparian habitats, such as the ones proposed, will help slow runoff and prevent further reduction of water quality within the Current River watershed. This mitigation project represents a welcomed opportunity to restore and protect high quality habitat in an area with high ecological value.

Mitico, LLC (the Plan Sponsor, or "Sponsor") has developed a Mitigation Plan (Plan) for the Missouri Highways and Transportation Commission to provide mitigation for impacts associated with U.S. Army Corps of Engineers (USACE or Corps) project number SWL-2021-00025. The Compensatory Mitigation Plan Requirements (33 CFR, Part 332 and 40 CFR 230) detail the requirements for Permittee Responsible mitigation sites and how to initiate the planning and review process of the appropriate agencies. The Sponsor has identified a suitable site and secured agreements from the landowners to allow the development of a stream mitigation project that will produce the necessary mitigation credits to offset the impacts of Corps project number SWL-2021-00025.

This mitigation site consists of aquatic resource(s) that are restored and preserved expressly for the purpose of providing compensatory mitigation for authorized impacts. The purpose of the mitigation plan is to establish guidelines and responsibilities for the maintenance and protection of the restored wetland habitats. The restored and preserved habitats will be used to provide compensatory mitigation for the authorized impact to waters of the United States. The mitigation plan may be amended in accordance with the procedures used to establish the plan and subject to agreement by the signatories.

The establishment, maintenance and protection of special aquatic sites of the mitigation area is carried out in accordance with the following authorities:

1. Federal:

a. The Clean Water Act (33 U.S.C. 1344)
b. Compensatory Mitigation for Losses of Aquatic Resources (FR, Vol. 73, No. 70, Pages 19594-19705, April 10, 2008)
c. Rivers and Harbors Act of 1899, Section 10 (33 U.S.C. 403 *et. seq.*)
d. Environmental Protection Agency, Section 404 (b)(1) Guidelines (40 CFR Part 230). Guidelines for Specification of Disposal Sites for Dredged or Fill Material.
e. Department of the Army, Section 404 Permits Regulations (33CFR Parts 320-332). Policies for evaluating permit applications to discharge dredged or fill material.
f. Memorandum of Agreement between the Environmental Protection Agency and the Department of the Army concerning the Determination of Mitigation under the Clean Water Act, Section 404 (b)(1) Guidelines (February 6, 1990).
g. Title XII Food Security Act of 1985 as amended by the Food, Agriculture, Conservation and Trade Act of 1990 (16 U.S.C. 3801 *et. seq.*)
h. National Environmental Policy Act (42 U.S.C. 4321 *et. seq.*), including the Council on Environmental Quality's implementing regulations (40 CFR Parts 1500-1508).
i. Fish and Wildlife Coordination Act (16 U.S.C. 661 *et. seq.*)

j. Fish and Wildlife Service Mitigation Policy (46 FR pages 7644-7663, 1981).
k. National Historic Preservation Act, Section 106 (16 U.S.C. 470).

2. State:

a. Missouri State Water Quality Certification (10 CSR 20-6.060.).
b. Missouri State Water Quality Standards (10 CSR 20-7.031.).
c. State of Missouri Wetland Mitigation Method
d. State of Missouri Aquatic Resources Mitigation Guidelines
e. Missouri Clean Water Law

The main objective of the proposed mitigation site is to restore, protect, and preserve a perennial stream and the associated riparian corridor in accordance with conditions specified on page 20 under the ecological performance standards to facilitate enhanced water quality and wildlife habitat in the Current River watershed. The mitigation site will restore and protect 14 acres of forested riparian corridor and 3,025 feet of perennial stream corridor. The protection of these habitats will create wildlife habitat and reduce sediment loads entering the Current River watershed. Stream restoration and protection, as proposed, will help slow and filter runoff and protect a highly valuable watershed.

Watershed Approach to Mitigation Site Selection

The proposed mitigation site is located along the Jacks Fork River near Eminence, Missouri. The Jacks Fork River is a 5th order perennial stream at the proposed mitigation site, and continues eastward through Ozark National Scenic Riverways to join the Current River.

The Current River watershed covers approximately 1.7 million acres in Southern Missouri and Northern Arkansas. This includes portions of Texas, Dent, Reynolds, Shannon, Howell, Oregon, Carter, Butler, and Ripley Counties in Missouri. The Jacks Fork River portion of the Current River watershed occupies approximately 284,800 acres of land. There are more than 420,500 acres of public land in the Missouri portion of the Current River Watershed, with the United States Forest Service owning the largest amount, totaling 235,279 acres. Other protected lands in the watershed include Ozark National Scenic Riverways and multiple state parks and conservation areas.

The watershed is characterized by karst topography and historically was predominately forested. Currently, 80% of the watershed remains forested, with the second highest land cover being grassland at approximately 16% and cropland accounting for approximately 0.1% of the total watershed area. Historical logging practices were responsible for the initial clearing of forested areas, and many such places have remained in cattle production since they were cleared for timber harvest. The primary water quality threats to both surface water and groundwater are non-point pollution and nutrient laden runoff from livestock operations.

Water quality in the Current River watershed is generally good. There are five streams in the Current River watershed that are listed as impaired for various reasons, including mercury in fish tissue, *E. coli* contamination, and low dissolved oxygen. Common non-native species such as carps and Asian Clams occur in the Current River and its tributaries. The clean, clear waters of the Current River watershed support many recreational users and very diverse aquatic ecosystems. Many sensitive species call the Current River watershed home, including endemic species like the Ozark Hellbender. Other sensitive species known in the watershed include Virginia Sneezeweed, Indiana Bat, Tri-colored Bat, Alligator Snapping Turtle, and Monarch Butterfly. The Sponsor will implement construction provisions that are designed to minimize harm to these and other sensitive species. These provisions are outlined below at page 18.

Mitigation Site Goals and Objectives

The objectives of the Jacks Fork River Mitigation Site are to restore aquatic habitats that have historically been part of the Current River Watershed, including forested riparian corridor and stable perennial stream channels. Each of these habitat types has been depleted over time to accommodate expanded agricultural and recreational development, and the proposed site is located in a strategic position to meet the needs of the watershed. The proposed mitigation site will restore and protect 12 acres of riparian corridor and 3,025 linear feet of perennial stream channel, generating 7,694.45 stream credits. These restored habitats will reduce sedimentation and runoff into the Current River Watershed while supporting a diverse community of native plants. Riparian habitats form an important link between aquatic and terrestrial ecosystems and will support native wildlife including species of conservation concern found in the watershed. The restored bank stability and roots from native vegetation will reduce erosion and sedimentation and help protect sensitive aquatic species. The proposed site is proximate to other restored and protected lands and contains current uses that are compatible with restoration.

Site Selection

The proposed mitigation site was chosen based on characteristics that will meet the needs of the Current River Watershed. The watershed is healthy overall, but some sensitive species are threatened by sedimentation and water quality impairments due to recreational development, including loss of forested habitats. This site will address multiple functions of the watershed by restoring stable streambanks and riparian corridors. Its location is proximate to other restored and protected lands and high enough in the watershed to benefit a lengthy stretch downstream of the site. The proposed mitigation site will provide additional protected habitat in an area that is highly sought after for development due to its proximity to Ozark National Scenic Riverway.

The site lies on the Jacks Fork River just upstream of Ozark National Scenic Riverways. Restoring and protecting land adjacent to this protected area will provide additional habitat to sensitive species in the area and create a continuous corridor of healthy stream and riparian habitats. This region of Missouri is home to many sensitive aquatic species, including many species of conservation concern, that could benefit from the restored habitats on the proposed mitigation site.

Figure 1. Jacks Fork River Mitigation Site Vicinity

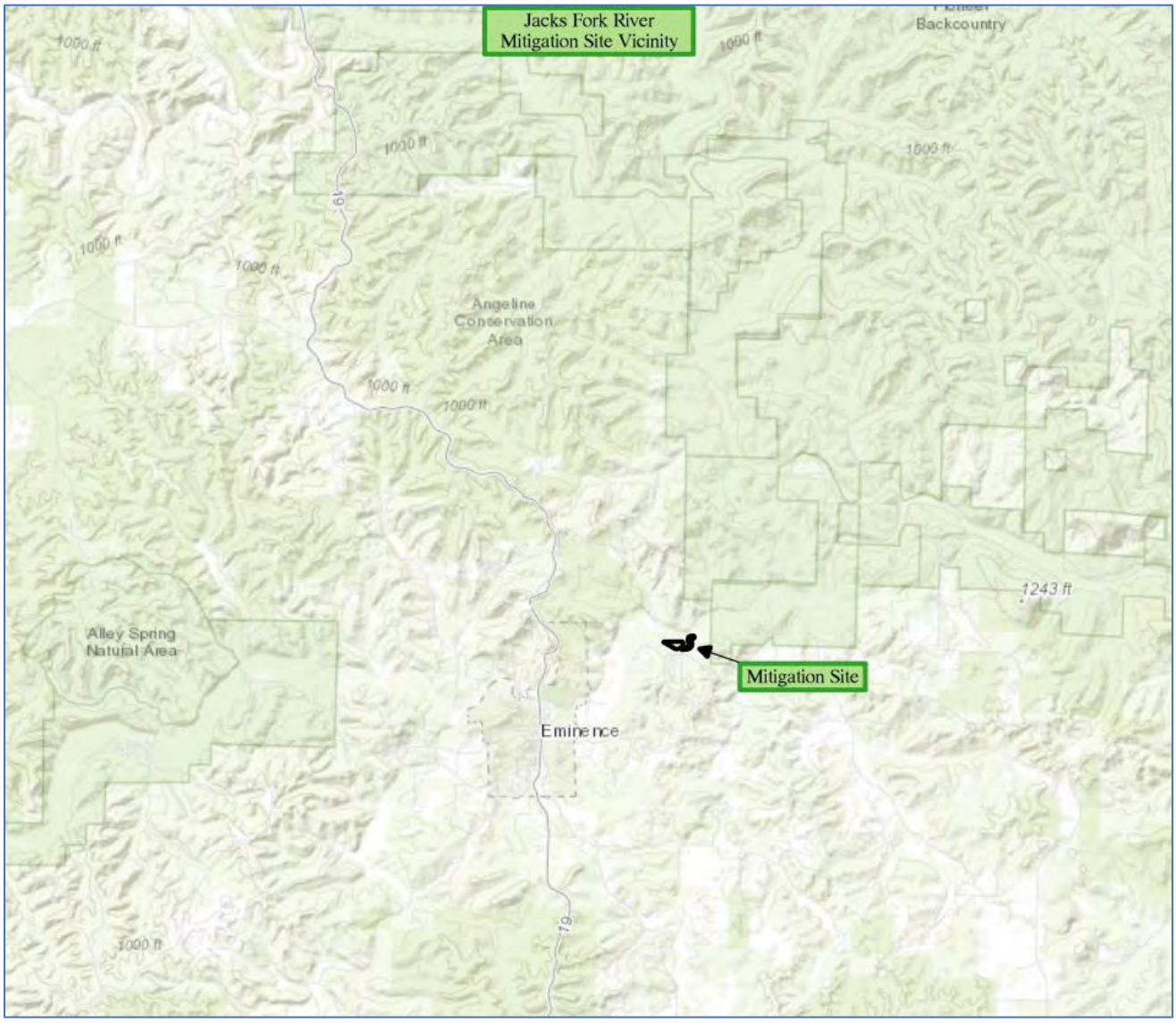
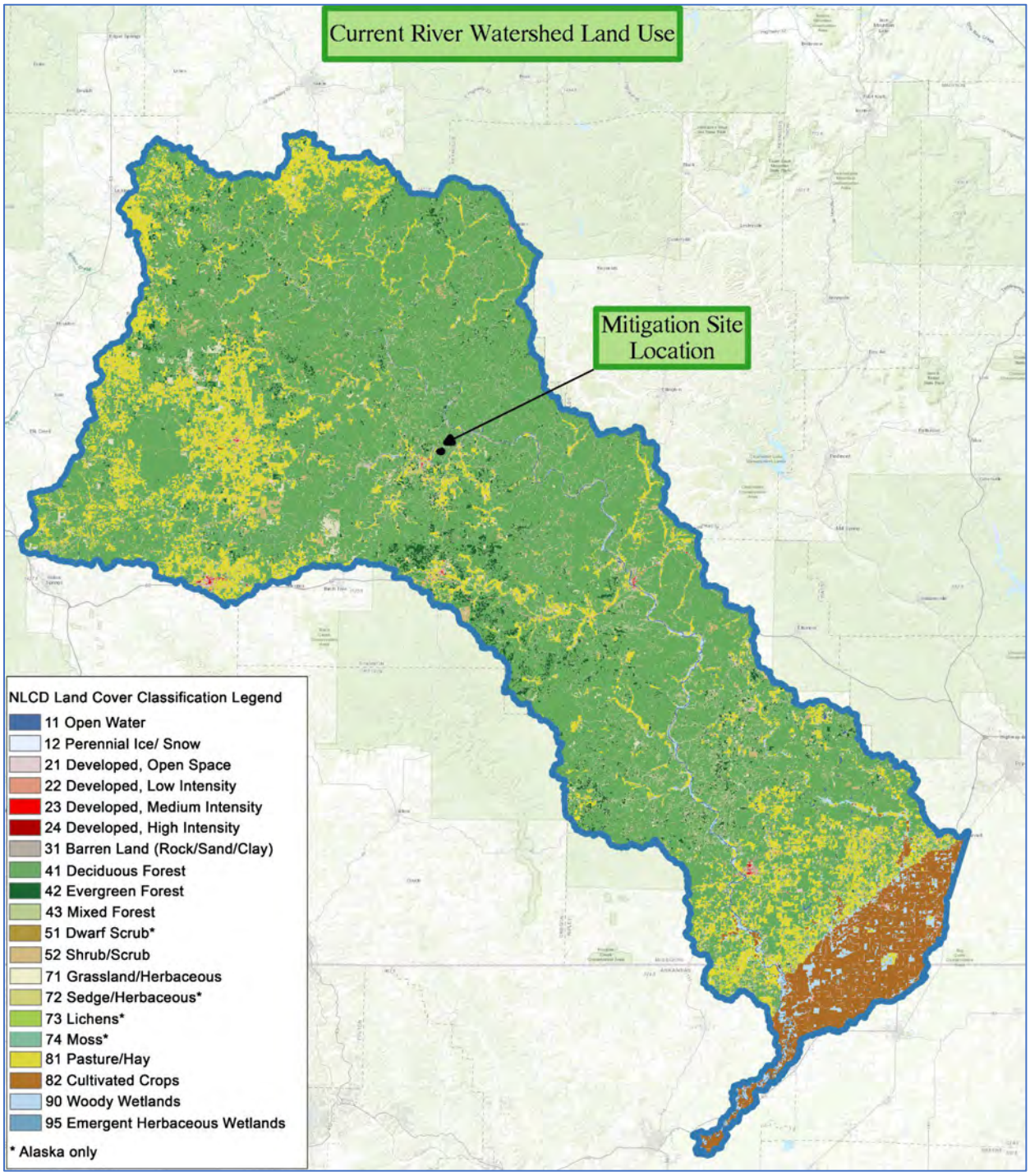


Figure 2. Jacks Fork River Mitigation Site Location and Surrounding Land Use



Site Protection Instrument

The areas that will be restored and preserved will be placed under a Deed Restriction in perpetuity.

A USACE approved Deed Restriction for mitigation sites will be filed and recorded with the Shannon County Recorder of Deeds to ensure that the mitigation site is protected in perpetuity. A copy of the Deed Restriction that shall be used to deed restrict the mitigation site is included as Exhibit B.

Baseline Information

Overview

The proposed mitigation site is a 12-acre tract including portions of three parcels of land that are part of a recreational development. Current land use of the project area includes forest, fallow fields, and a mowed field that is maintained for recreation.

Aquatic Resources

The site is bisected by the Jacks Fork River, which flows west to east through the site. The Jacks Fork River is a 5th order perennial stream at the proposed site with clear water and a gravel to cobble substrate. Most of the riparian corridor on site is forested, except for a reach approximately 880 feet in length. In this area, the streambank is actively eroding, and has moved as much as 200 feet laterally since 1995, inputting an estimated 10,000 cubic yards of soil into the Jacks Fork River during that time.

Photos

1 – Overview of eroding bank facing upstream from the midpoint of the proposed bank stabilization area.

2 – Overview of eroding bank and riparian restoration area facing downstream from the upstream end of the proposed bank stabilization area.

3 – Detail view of eroding bank near the upstream end of the proposed bank stabilization area.

4 – Overview of mature riparian corridor to be preserved near the downstream end of the proposed bank stabilization area.

5 – Overview of eroding bank and riparian restoration area looking downstream from the upstream end of the proposed bank stabilization area following a high flow event.

Determination of Credits

Stream credits were calculated using the Missouri Stream Mitigation Method (MSMM, 2013). Each credit generating element is defined below. Net Benefit areas are defined in **Figure 3**, below.

Stream Type: The Jacks Fork River is a 5th order perennial stream at the proposed mitigation site.

Priority Waters: The Jacks Fork River is a primary priority water under the MSMM. It is designated as an Outstanding National Resource Water, which are considered a primary priority water under the MSMM.

Riparian net benefits: the proposed riparian work includes restoration (>50% of riparian zone) through tree planting, native grass and wildflower seeding, and invasive species removal. Riparian areas that are already greater than 90% forested will be preserved under a deed restriction and invasive species will be removed.

Supplemental buffer credit: the proposed work will take place on both sides of the Jacks Fork River, but no project area is immediately across from another, so no supplemental credit is generated.

Site Protection: The project area will be protected under a perpetual deed restriction enforced by the Corps.

Credit Schedule: 80 to 100 percent of construction and planting activities proposed will take place before the stream impacts associated with Corps project number SWL-2021-00025. This is considered Credit Schedule 1 under the MSMM.

Temporal Lag: the trees planted in the riparian restoration zone will take 10 to 20 years to mature. There is no temporal lag for riparian preservation.

In-Stream Net Benefits: the proposed work will stabilize a highly eroded streambank using minimal rock combined with biological materials and native plantings. This approach is treated as a "good" net benefit under the MSMM.

Location and kind: the MSMM dictates the use of a Location and Kind Factor of 1.0 for "permittee-responsible mitigation proposed within the 8-digit HUC watershed in which the impacts occurred." This project occurs in the same 8-digit HUC as the stream impacts associated with Corps project number SWL-2021-00025, and therefore qualifies for the use of Location and Kind Factor 1.0.

In-stream and riparian stream credits generated by the proposed project are detailed in **Tables 1 & 2**, below.

Table 1. Riparian Credit Factors for Jacks Fork River Mitigation Site

		Net Benefit 1	Net Benefit 2	Net Benefit 3	Net Benefit 4
Stream Type		Perennial - 0.40	Perennial - 0.40	Perennial - 0.40	Perennial - 0.40
Priority Waters		Primary - 0.40	Primary - 0.40	Primary - 0.40	Primary - 0.40
Net Benefit	Side A	--	50’ Restoration – 0.50	100' Restoration - 0.70	125' Preservation - 0.19
	Side B	275' Preservation - 0.26	--	--	--
Supplemental Buffer		0	0	0	0
Site Protection		Deed Restriction - 0.20	Deed Restriction - 0.20	Deed Restriction - 0.20	Deed Restriction - 0.20
Credit Schedule	Side A	--	Schedule 1 - 0.15	Schedule 1 - 0.15	Schedule 1 - 0.15
	Side B	Schedule 1 - 0.15	--	--	--
Temporal Lag		--	10 to 20 years - (-0.2)	10 to 20 years - (-0.2)	--
Sum of Factors		1.41	1.45	1.65	1.34
Stream Length Benefited		1,470 ft	345 ft	510 ft	700 ft
Location and Kind		1.0	1.0	1.0	1.0
Credits		2,072.7	500.25	841.5	938

Total Riparian Credits Generated: 4,352.45

Table 2. In-Stream Credit Factors for Jacks Fork River Mitigation Site

	Net Benefit 1 (Bank Stabilization)
Stream Type	Perennial - 0.40
Priority Waters	Tertiary – 0.40
Net Benefit	Bank Stabilization (good) – 2.40
Site Protection	Deed Restriction - 0.40
Credit Schedule	Schedule 1 - 0.30
Sum of Factors	3.9
Stream Length Benefited	880
Location and Kind	1.0
Credits	3,342

Total In-Stream Credits Generated: 3,342

Total Stream Credits: 7,694.45[1]

[1] This amount is sufficient for, and exceeds, the Sponsor’s requirements for Phase 1b and 2 of US Route 67 (I-57) upgrade project.

Figure 3. Jacks Fork River Mitigation Site Net Benefits

Note: Access to areas 2 and 3 for monitoring and maintenance will be along pathway(s) sufficient for offroad vehicles identified and managed by the property title holder.

Mitigation Work Plan

Bank Stabilization

Bank stabilization will use a combination of rock vanes, longitudinal peak stone toe protection, live vegetative staking, and brush layering. A full technical description can be found in Exhibit A.

At the proposed site, 880 feet of streambank are actively eroding. The first 400 feet are relatively straight and will be stabilized using longitudinal peak stone toe protection with live staking and bank shaping. The stone toe protection will be placed in front of the eroding bank in order to ease the harsh curve of the bankline near the upstream end. Fresh willow and sycamore stakes harvested on site will be placed behind the toe of the bank and then will be buried when the area behind the stone toe protection is back filled with bank material. This will create a stable slope for additional native tree and shrub planting, and the live stakes will speed restoration and enhance local habitat.

The downstream section of the proposed bank stabilization has a severe curve and exhibits the highest rates of lateral movement. This area will be stabilized using three stream barbs to redirect the thalweg of the stream away from the eroding bank. The stone keys and the areas between the structures will be staked with additional native vegetation to speed restoration and enhance local habitat.

Construction Provisions to Minimize Potential Impact on Species

To minimize any potential impact to the endangered species that may be present near the site, the Sponsor will adopt the following procedures during site construction:

Site conditions: All construction will take place during low water conditions, when flow through the side channel is minimal, so in-stream structures can be installed without working in the water, to the extent possible. The construction crew will monitor weather forecasts daily and avoid work on days with potential for rising flows.

Spill Prevention, Control, and Countermeasures: Equipment and any flammable or hazardous materials will be stored upland, away from the construction site to reduce the risk of accidental releases to the river or impact from high water events. All fueling and maintenance of equipment will likewise take place upland and away from the construction site. Contractors will be required to have appropriate training in spill prevention, control, and countermeasures, and a spill kit will be kept onsite to facilitate immediate response to any accidental oil or chemical release.

Sediment controls: Soil disturbance will occur in areas where a rock structure is being constructed. Bank shaping will not be performed between the proposed stream barbs, which will minimize soil disturbance in areas where sediment might enter the stream channel. Equipment will be operated from dry ground as much as possible. Any increase in turbidity during construction will occur only temporarily and will be contained within the side channel. To minimize erosion due to potential high flow events during construction, bank shaping, and other earth work will be completed following construction of rock structures. Areas of disturbed earth will be staked with live willow cuttings during construction and seeded with grass immediately upon completion of construction.

Additional measures: The Sponsor is open to including additional protective measures and best management practices based on recommendations and input from the Corps.

Riparian Corridor Restoration

The riparian zone of the Jacks Fork River will be restored as described in **Figure 3**, above.

Native trees will be planted from container stock of 3-gallon size or larger with 20 foot by 20 foot spacing. This is a total of 109 trees per acre. Trees will be planted during the months of February-April as appropriate. For some species, fall planting leads to increased survival rates, so supplemental planting will be performed during the months of October – December. Subject to availability, the Sponsor will plant equal numbers of the species found in **Table 3**. If equal numbers of each species cannot be obtained at the time of planting, no species will account for more than 10% of the individuals planted. Herbaceous vegetation in the riparian corridor will be established naturally from the existing seed bank. If supplemental seeding is necessary, the appropriate area will be seeded with a mix of native grasses and forbs found in **Table 4**.

Riparian Corridor Preservation

Intact wooded riparian corridors such as those presently on site provide important ecological functions for stream systems. Their roots help hold bank material in place and the drag created by woody stems can help slow flood waters and prevent soil loss. Shade from wooded corridors and input of woody debris into stream systems create important habitat features for fish and other aquatic animals. They also serve as habitat for terrestrial and avian species that have important ecological links to aquatic systems. Native riparian vegetation serves another important role by improving soil infiltration, which can reduce chemical and nutrient pollution input into waterways. Each of these chemical, biological, and physical benefits are

especially important in the Current River Watershed, which is home to many sensitive aquatic species. Therefore, the preservation buffers are a key aspect of this plan to protect important habitats in the watershed. A perpetual deed restriction will ensure that further natural forested habitats are not lost to development.

Table 3. Riparian Buffer Tree Planting Mix

Common Name	Scientific Name	Common Name (cont.)	Scientific Name (cont.)
Red Maple	*Acer Rubrum*	Buttonbush	*Cephalanthus occidentalis*
Silver maple	*Acer saccarinum*	Persimmon	*Diospyros virginiana*
Pawpaw	*Asimina triloba*	Black Walnut	*Juglans nigra*
River birch	*Betula nigra*	Sycamore	*Platanus occidentalis*
Pecan	*Carya illinoinensis*	Cottonwood	*Populus deltoides*
Shellbark Hickory	*Carya lacinosa*	Bur oak	*Quercus macrocarpa*
Shagbark hickory	*Carya ovata*	Chinquapin oak	*Quercus muehlenbergii*
Hackberry	*Celtis occidentalis*	Pin oak	*Quercus palustris*
Roughleaf dogwood	*Cornus drummondii*	Shumard's oak	*Quercus shumardii*
Gray dogwood	*Cornus foemina*	American elm	*Ulmus americana*

Table 4. Riparian Buffer Seed Mix

Common Name	Scientific Name	Common Name (cont.)	Scientific Name (cont.)
Small Yellow Fox Sedge	*Carex annectens*	Shrubby St. John's Wort	*Hypericum prolificum*
Brown Fox Sedge	*Carex vulpinoidea*	Prairie Blazing Star	*Liatris pycnostachya*
Canada Wild Rye	*Elymus canadensis*	Seedbox	*Ludwigia alternifolia*
Virginia Wild Rye	*Elymus virginicus*	Wild Bergamont	*Monarda fistulosa*
Switch Grass	*Panicum virgatum*	Common Evening Primrose	*Oenothera biennis*
Plains Coreopsis	*Coreopsis tinctorial*	Foxglove Beardtongue	*Penstemon digitalis*
Swamp Milkweed	*Asclepias incarnata*	Purple Prairie Clover	*Petalostemum purpureum*
Common Milkweed	*Asclepias syriaca*	Obedient Plant	*Physostegia virginiana*
Partridge Pea	*Cassia fasciculata*	Slender Mountain Mint	*Pycnanthemum tenuifolium*
Buttonbush	*Cephalanthus occidentalis*	Grayhead Coneflower	*Ratibida pinnata*
Lance-leaved Coreopsis	*Coreopsis lanceolata*	Black-eyed Susan	*Rudbeckia hirta*
Illinois Bundle Flower	*Desmanthus illinoensis*	Stiff Goldenrod	*Solidago rigida*
Showy Tick Trefoil	*Desmodium canadense*	New England Aster	*Symphyotrichum novae-angliae*
Purple Coneflower	*Echinacea purpurpea*	Blue Vervain	*Verbena hastata*
Rattlesnake Master	*Eryngium yuccifolium*	Culvers Root	*Veronicastrum virginicum*
False Sunflower	*Heliopsis helianthoides*	Golden Alexanders	*Zizia aurea*

Maintenance Plan

The mitigation site will be operated and maintained by Mitico, a Missouri limited liability company, until all performance standards have been met, and performance will be assured through the bond described in this Plan at page 22. The Sponsor has obtained a binding agreement with the property owners to place the property under a perpetual deed restriction in a form approved by the Corps and attached to this Plan as Exhibit B. Monitoring, maintenance and long-term management will conform with the details outlined below at pages 20 – 22. As noted at Figure 3, access to areas 2 and 3 for monitoring and maintenance will be along pathway(s) sufficient for offroad vehicles identified and managed by the property title holder.

Ecological Performance Standards

Riparian Buffer Performance Standards

The riparian buffers will be evaluated for performance based on objective attributes consistent with 33 CFR 332.5 and based on the standards described in **Table 5**, below.

Table 5. Forested Buffer Performance Standards

Forested Riparian Buffer		
Performance Standards	**Years 1-3**	**Years 4-5**
Vegetation	• 80% survival of planted trees; no species shall account for more than 30% of surviving planted trees • No more than 25% of vegetative cover is comprised of undesirable or non-native species	• 70% survival of planted trees; no species shall account for more than 30% of surviving planted trees • No more than 5% of vegetative cover is comprised of undesirable or non-native species

Stream Channel Performance Standards

The bank stabilization will be evaluated for performance based on objective attributes consistent with 33 CFR 332.5. Due to the method of stabilization and the existing bank conditions, some changes in bank conditions may continue to occur as the bank establishes a stable slope. The bank stabilization will be determined successful if the rock structures remain functionally in place following high flow events, and the bank line does not move beyond what would reasonably be expected for normal stream dynamics and morphology.

Function of in-stream structures will be evaluated by measuring the rate of lateral erosion. Rebar bank pins will be installed at two locations, one within the reach of stone toe protection and the other within the reach stabilized using stream barbs. During the first year, we expect the banks to settle as they naturally achieve a stable slope. For monitoring year 1, a lateral erosion rate of less than one foot will be considered successful. Thereafter, lateral movement of the bank less than six inches per monitoring year will be considered successful. These metrics are based on an EPA publication (Harman et al, 2012).

Monitoring Plan

Annual monitoring will be conducted by the Sponsor, or its authorized agent, consistent with 33 CFR 332.6 to determine whether the compensatory mitigation project is meeting key performance milestones. Monitoring will begin prior to the end of the first growing season (May 1 to November 1) during which construction is complete or substantially complete and continue during each subsequent growing season for a minimum of five years (monitoring cycles). It may be extended if the Corps determines that performance standards are not being met or that the mitigation site is not on track to meet them.

In addition, during the first two growing seasons of and following construction, Sponsor will conduct a visual survey following any bankfull or out-of-bank event to confirm the integrity of instream construction elements and will notify the Corps and proposed remedial action if any structure is compromised.

Monitoring will include a site visit, ideally between June 15 and September 15, with a schedule of monitoring events and a visual analysis showing site conditions and progress toward achieving performance standards consistent with Corps' Regulatory Guidance Letter 08-03 Minimum Monitoring Requirements for Compensatory Mitigation Projects Involving the Restoration, Establishment, and/or Enhancement of Aquatic Resources as it may be revised or updated from time to time.

For each monitoring year, 10% of the total area will be evaluated through transects or randomized plots as determined to be appropriate by the Sponsor. Annual monitoring will document conditions and establish a photo point at each structure to visually document conditions. During the first two years following construction, the Sponsor will inspect the site following precipitation events that cause bankfull or out-of-bank conditions in order to verify the integrity of constructed elements and plantings. The Sponsor will take any needed remedial actions, including repair of constructed elements and replanting, consistent with adaptive management principles. Once the Sponsor determines that the construction and vegetation have performed under such conditions, the Sponsor will rely on annual monitoring to confirm site integrity and performance.

If monitoring reveals site conditions or ecological responses that were not anticipated in the plan or that call for a change in plan design or parameters, the Sponsor will notify the Corps immediately and propose an adaptive management strategy.

Monitoring findings will be documented in a written report provided to the USACE for review within 60 days of the completion of each monitoring visit. The report, in accordance with Regulatory Guidance Letter 08-03, will identify how the observed site conditions have progressed toward and/or achieved the ecological performance standards identified in this plan. The report will also include a list of invasive/undesirable plant species, and their coverage, along with recommendations for control, and a narrative description of any damage to the rock structures and any damage from wildlife or insects. The report will also contain a photographic summary of all relevant features that support its findings.

If, at the end of the five-year monitoring period, the USACE has determined that the performance standards and mitigation objectives have been met, the mitigation will be considered self-sustaining, and further annual monitoring is not required. If five-year performance standards are met prior to the end of five years, monitoring will nevertheless continue to the fifth year. However, if the USACE determines that the mitigation project has not met the performance standards by the end of five years, then the USACE at its discretion may require additional monitoring, and/or corrective actions for an additional period.

Long-Term Management and Maintenance

After performance standards are met and annual monitoring is discontinued, the Sponsor will enter into a contractual arrangement with Land Learning Foundation, a Missouri nonprofit corporation and land trust, (LLF) to manage the site for conservation consistent with adaptive management principles pursuant to the provisions of 33 CFR 332.7(c). This will include, when needed, addressing any serious condition that threatens project integrity consistent with adaptive management principles, and repairing or replacing damaged signs.

To ensure that sufficient resources are available for long-term management as required by 33 CFR 332.7(d)(3), the Sponsor will transfer funds to LLF for deposit to a nonwasting stewardship endowment.

The amount of transfer is based on an actuarial risk-based model derived from the Land Trust Alliance that calculates the present value of annual long-term site management. It is estimated that an endowed fund of $25,000 will be sufficient to cover these costs.

Should LLF for any reason wish to transfer long-term management responsibilities of the site to a third party, LLF will notify the Corps prior to transfer and the requirements of 33 CFR 332.7(d) will be met.

Adaptive Management plan

If the compensatory mitigation project cannot be constructed in accordance with this plan, or if monitoring or other information indicates that the compensatory mitigation project is not progressing toward performance standard milestones as anticipated the Sponsor will notify the USACE pursuant to 33 CFR 332.7(c). The Sponsor will provide relevant details and submit a plan to address any deficiencies, including any needed modification of the project or revision of performance standards. The USACE will evaluate and approve or pursue measures to address deficiencies. Any significant modification of the project requires USACE approval. In evaluating and approving corrective measures or modifications, the USACE will consider whether the compensatory mitigation project is providing ecological benefits comparable to the original objectives of the compensatory mitigation project.

Financial Assurances

In accordance with 33 CFR 332.3(n), financial assurances will be in the form of a performance bond. The bond issuer will enter an agreement with the Sponsor to fund fulfillment of mitigation obligations at the site in the event it is determined by USACE that the Sponsor has failed to meet those obligations as outlined in this Plan. The USACE has the sole authority to determine compliance with those obligations.

Should the USACE determine that remedial action is necessary because mitigations obligations have not been met the Sponsor will develop and implement an action plan in coordination with the USACE. The Sponsor assumes the financial and actual responsibility to implement that plan. If the Sponsor fails to complete the remedial action within 120 calendar days after approval of the remedial action plan, the USACE may make a claim by providing written notice to the bond issuer.

If such a claim is made, the bond issuer will satisfy any deficiencies determined by the USACE through payment to an approved USACE-designee. A claim can only be made by the USACE, and any corrective measures must be approved by the USACE.

The amount was determined in accordance with 33 CFR 332.3(n)(2) based on the size and complexity of the compensatory mitigation contemplated by this Plan, the degree of completion of the project, the likelihood of success, and the past performance of the project sponsor. Construction and maintenance cost estimates are set forth in the table below and are based on the Sponsor's experience with multiple restoration and mitigation sites throughout the State of Missouri. They reflect the best estimate of costs to complete the required element if remedial action becomes necessary.

Land has already been secured for this project plan, and administrative costs (design, legal, etc.) already expended. Therefore, based on 332.3(n)(2) factors, the initial dollar limit of liability secured by the bond will be 50% of initial construction and planting costs. The post-construction bond amount will be the estimated costs of repairs to constructed elements and replanting if needed.

Once construction and planting are complete and approved by the Corps, the initial bond amount will be reduced to the post-construction bond amount. Thereafter, should a claim not be made, the dollar limit of liability for the post-construction bond will be reduced by fifty percent (50%) after the second year's

performance standards are met and bonding will terminate after the fifth year's performance standards are met. Any endorsement by the Corps acknowledging that these milestones have been met must be provided in writing to the bond issuer. The issuer may then reduce or adjust the limit of liability accordingly by issuing an endorsement to the Policy setting forth the new limit of liability.

Table 6. Financial Assurance Amounts

Element	Estimated Cost
Construction Cost, Including Planting	$50,000
Total Initial Bond Amount	**$25,000**
Forested Buffer Re-planting	$5,000
Rock Structure Repairs (Material & Labor)	$10,000
Post-Construction Maintenance Bond Amount	**$15,000**

Other Provisions

In the event of a complete or partial mitigation site failure attributed to natural catastrophes, such as a flood of historic proportion, fire, wind, drought, disease, regional pest infestation, etc.; the sponsor will contact the USACE to evaluate the physical and functional changes to the mitigation area. If such events occur before performance standards are met, the USACE will determine the extent of site changes. Mitico in consultation with USACE will request changes to any corrective actions, modification to the performance standards, or credit availability for the mitigation site. Mitico may not be held responsible for natural catastrophes that may occur after the mitigation site has successfully met performance standards. If such events occur after performance standards are met the site will be evaluated to determine if additional efforts are necessary.

Mitico shall not grant easements, rights of way, or any other property interest to the site without the written consent of the Landowners and USACE.

References

Current River Watershed and Inventory Assessment. Thomas F. Wilkerson Jr., Missouri Department of Conservation (2003).

A Function-Based Framework for Stream Assessment & Restoration Projects. Will Harman et al, United States Environmental Protection Agency (2012).

Missouri Spatial Data Information Service (https://msdis.missouri.edu/)

Exhibits

Exhibit A: Construction Plan. 16 Pages.

Exhibit B: Deed Restriction. 1 Page.

Exhibit A: Construction Plan

MIDWEST STREAMS, INC

STREAMS

Wayne Kinney, Stream Specialist

6324 Wilson Road

Oakdale, IL 62268

Phone 618-830-6318

Email: streamdoc1@gmail.com

Dec. 10, 2022

Eric Dannenmaier

Zach Morris

RE: Jack's Fork near Eminence, MO

Eric and Zach,

I visited Jack's Fork near Eminence, Mo. on Dec. 8, 2022 when we were able to take some surveyed measurements.

First some details and history of the site:

1) Jack's Fork drains 411 sq. miles and has a predicted 2 yr. flow of 11,800 cfs according to the USGS Streamstats program.
2) The "bankfull width" from aerial's and from USGE Streamstats measurements appear to be about 170 ft.
3) At the site of the Island—the total width from the north bank measures 350 ft. and the island averages about 150 ft. in width.
4) A surveyed cross section at the shallow point of flow upstream of the island was completed and the "bankfull" width was determined to be 179 ft.
5) Jacks Fork at this point overflows to the north bank at a depth of 6.5 ft., but doesn't overflow on the south bank until a depth of 8.5 ft.
6) There is also a dense maturing woody habitat on the island and on the north bank.
7) The current "main channel" is approx. 60 ft.-70 ft. wide

8) At the upstream end of the island there is a large gravel bar that prevents low flow from entering the channel on the south side of the island. This gravel bar was measured at 2 ft. higher in elevation than the waterline of Jack's Fork at the time of investigation (morning of Dec. 8)
9) Review of aerial photos from 1995 thru 2022 indicate that the south bankline has moved laterally about 150 ft. since 1995 or an average of 5 to 6 ft. per year.
10) The downstream end of the "high flow channel" south of the island has a very sharp bend to the left with a radius of 120 ft.

From these observations there are several conclusions that can be drawn.

1) Since the channel width to the north of the island is only 60 to 70 ft. wide, and removal of the island will not be permittable, it seems that the only technically sound solution is to maintain both channels and protect the south bank. To attempt to direct all the flow to the north side of the island is not feasible and would destabilize the north channel if it were successful. Given the mature woody vegetation on both sides of this north channel we must abandon that option.
2) It appears that the heavy bedload is being deposited on the large gravel bar at the upstream end of the island. As the channel becomes overwidened at this point the flow velocity is reduced and the heavy bedload is deposited. As the channel continues to "widen" to the south, this problem increases.
3) As the gravel bar is composed of heavy gravel the silt loam material on the south bank is much easier for the stream flow to pick up and carry, i.e., erode. As the south bank erodes and widens the stream, more gravel is deposited and thus "drives" the channel erosion on the south bank.
4) The sharp 120 ft. radius curve of the high flow channel toward the end of the island is the apex of the curve and the most critical erosion and most rapid lateral movement is occurring at this point.
5) Therefore, the entrance area of the high flow channel and the apex of the curve 400 ft. downstream are very dissimilar and will likely require different solutions.

The best solution then appears to be a combination of Stone Toe Protection in the relatively straight upper reach of the high flow channel followed by a series of Stream Barbs near the apex of the curve to redirect flow thru the small radius bend. Even with redirection of flow in the apex, it is likely that larger flows will continue to cause out of bank scouring along the top bank in this area. Therefore, I recommend anchoring woody material on the top bank to protect the area from scour damage.

One positive aspect of the large gravel bar at the upper end of the high flow channel is that during much of the time there will be no flow through the high flow channel. During our visit on Thursday the USGS gage at Eminence was measuring flow at about 220 cfs and the gravel bar was still 1.5 to 2 ft. from being overtopped. Based on our single cross section it is estimated that flows under 700 cfs will not enter the high flow channel as long as the gravel bar remains in place. (Fig. 1)

A review of gage records from Dec. 2021 to Dec. 2022 shows that by these calculations the high flow channel was functioning for a short period in Dec. 2021 and Jan 2022 and

then again for an extended period from late February 2022 thru June 2022 when it was operational consistently. (Fig. 2)

Nevertheless, if this is a typical pattern, once we stabilize the lower portion of the bank with stone, the upper bank should be able to be established with woody vegetation that will not be undercut by an eroding bank toe and will therefore stabilize the upper bank.

Therefore, the recommendation for this site is to use Stone toe Protection at the rate of 0.6 ton per foot of bank aligned to take out the irregularities in the current bankline. This treatment will be used for the upper 400 ft. of the high flow channel. In addition, the area behind the STP will be planted with “live poles” of willow and sycamore harvested on site from the island. (Fig. 3-- plan details)

Below the end of the STP at Sta. 4+00 a series of three (3) Stream Barbs will be placed at 75 ft. intervals with the upstream barb being 80 ft long and barbs 2 and 3 with a length of 60 ft. Each barb will have maximum height of 4 ft. and be “keyed” into the bank with a 20 ft. section of STP behind each “key” on Barbs 1 and 2, with Barb 3 requiring 50 ft. of STP below the key. (See the planview for locations)

Angles, azimuths and quantities are provided in this report; however field verification and adjustments will be made by Midwest Streams, Inc prior to installation to ensure that any changes in the channel caused by continued lateral movement are accounted for and necessary adjustments made to maintain technical adequacy.

The anticipated stone quantities and plant material needed to complete this project are:

Stone Toe Protection----Sta. 0+00 thru 4+00 ---313 tons of 12-15” stone

Stream Barbs (with STP)—Sta. 5+00 to 7+00 ---333 tons of 18-24” stone

Willow and Sycamore “poles” ---------- 700 pole

I did visit Crider Bros. quarry near Eminence to visually check the quality and size of the available RipRap. This is not limestone, but Dolomite material and the size and hardness seemed to be very satisfactory for this site. Mr. Crider also seemed to be agreeable to sizing the stone as per our requirements if the existing material was not suitable.

Hope this provides all the information you need, but call or email with any questions or thoughts.

Sincerely,

Wayne Kinney, Pres.

Midwest Streams, Inc.

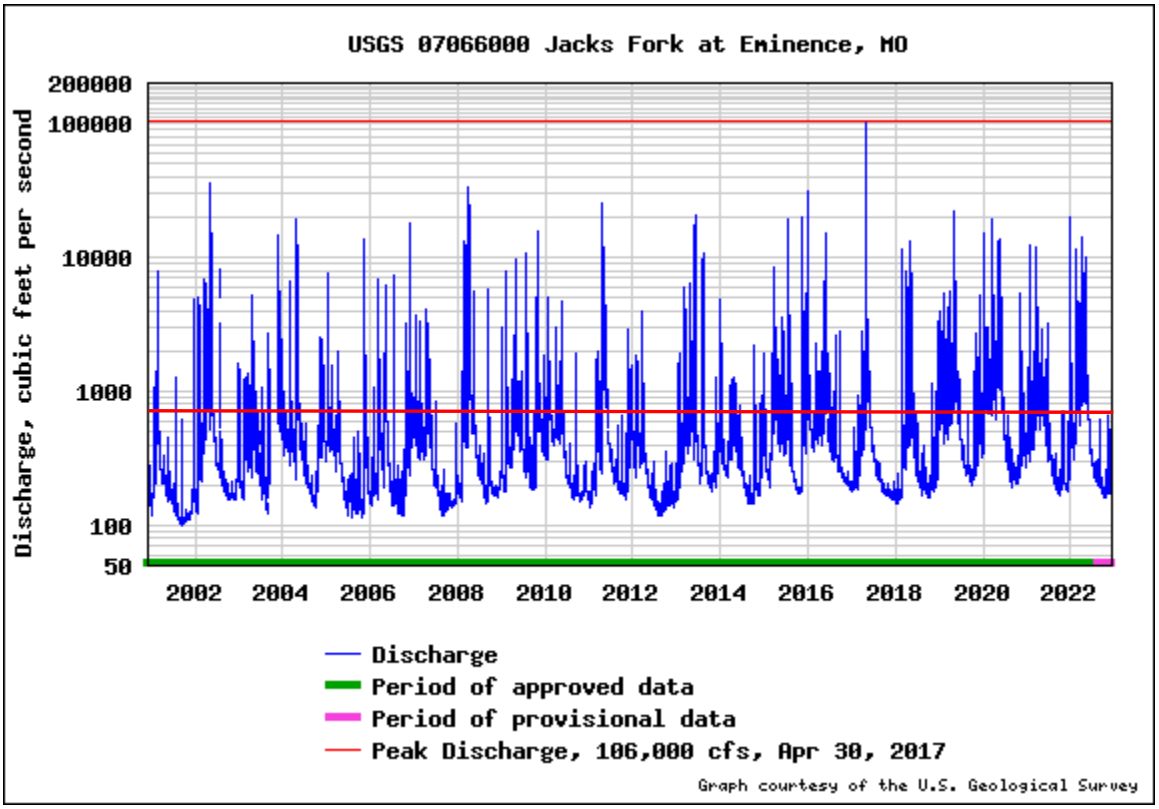


Fig. 1--20-year history of flow exceeding 700 cfs that will cause flow in high flow channel

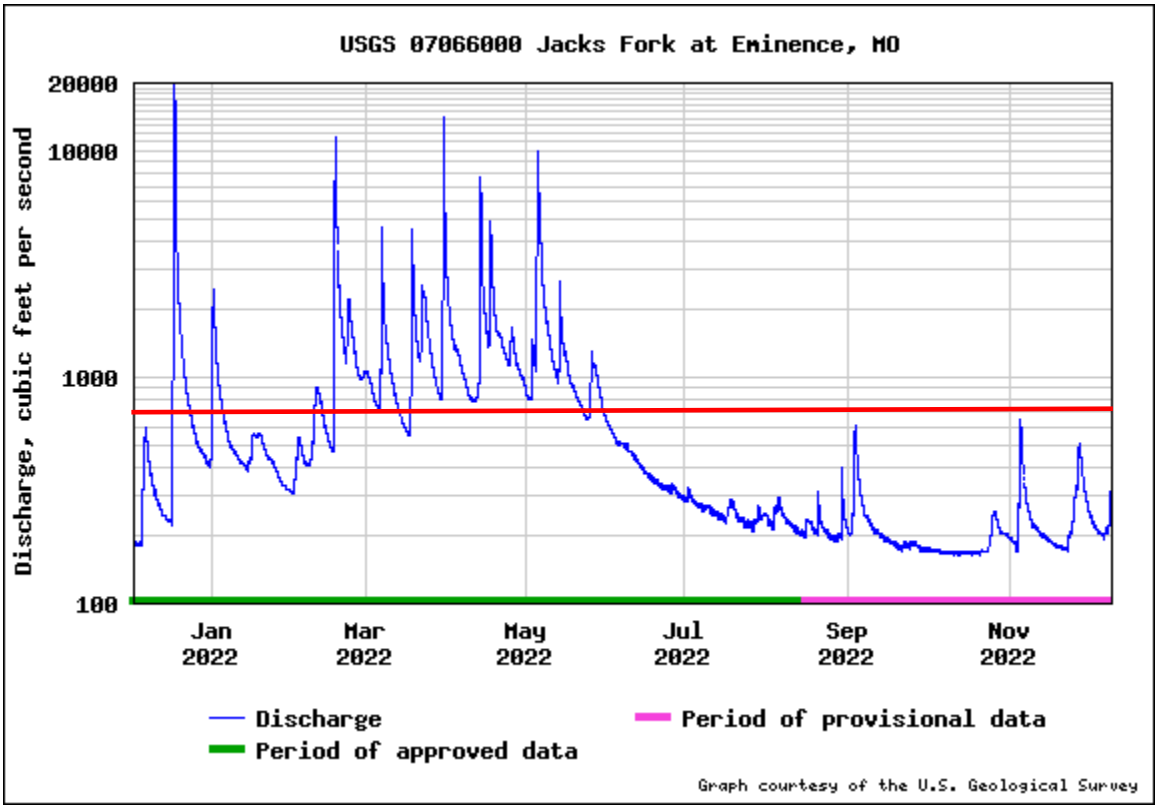
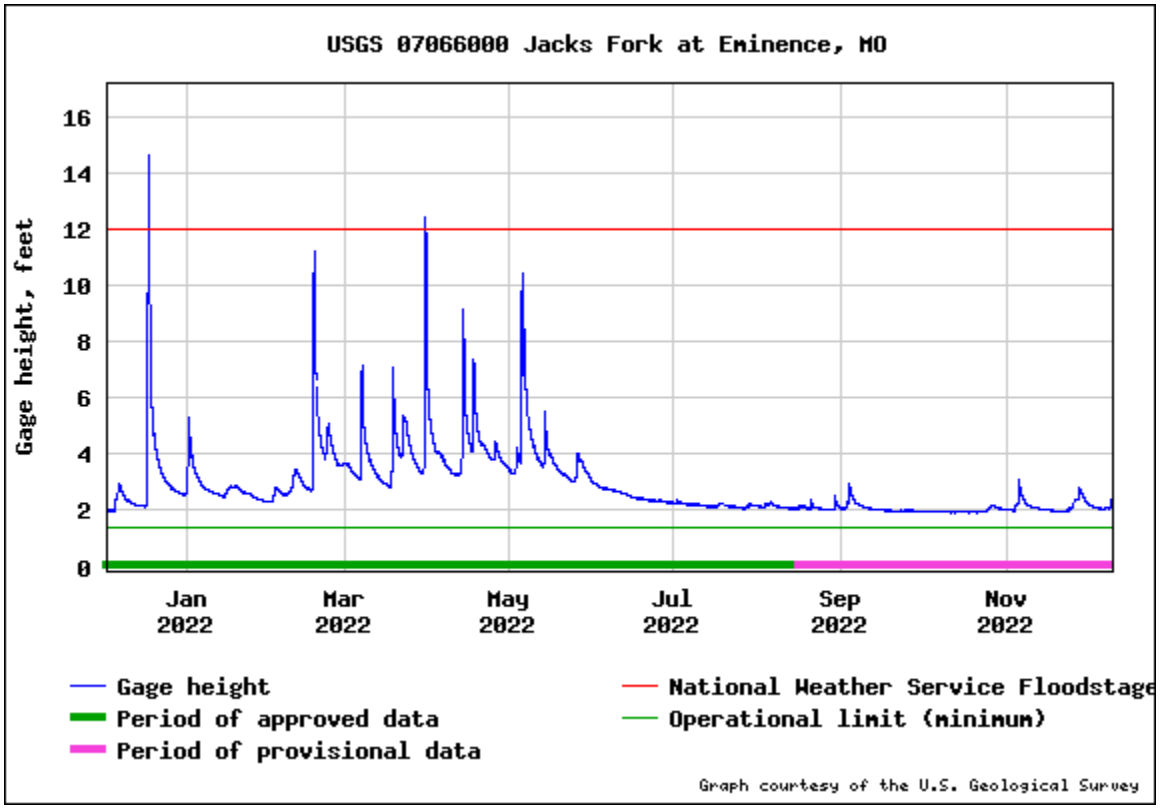


Fig. 2--Recent record of flows exceeding the 700 cfs threshold for the high flow channel to operate


USGS 07066000 Jacks Fork at Eminence, MO
Gage height, feet
16
14
12
10
8
6
4
2
0
Jan 2022
Mar 2022
May 2022
Jul 2022
Sep 2022
Nov 2022
Gage height
Period of approved data
Period of provisional data
National Weather Service Floodstage
Operational limit (minimum)
Graph courtesy of the U.S. Geological Survey

Typical Live Pole Planting w/ Stone Toe Protection

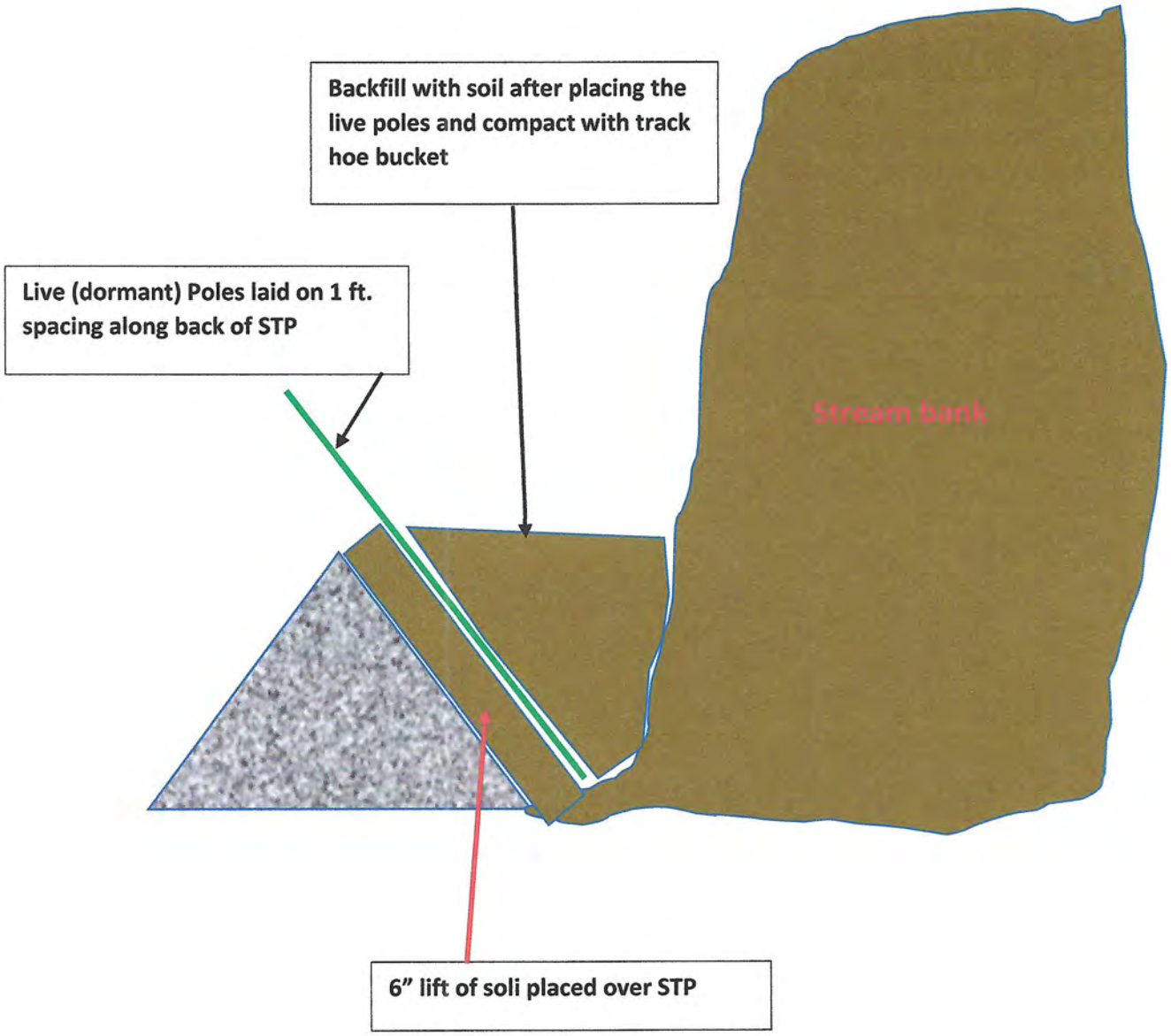
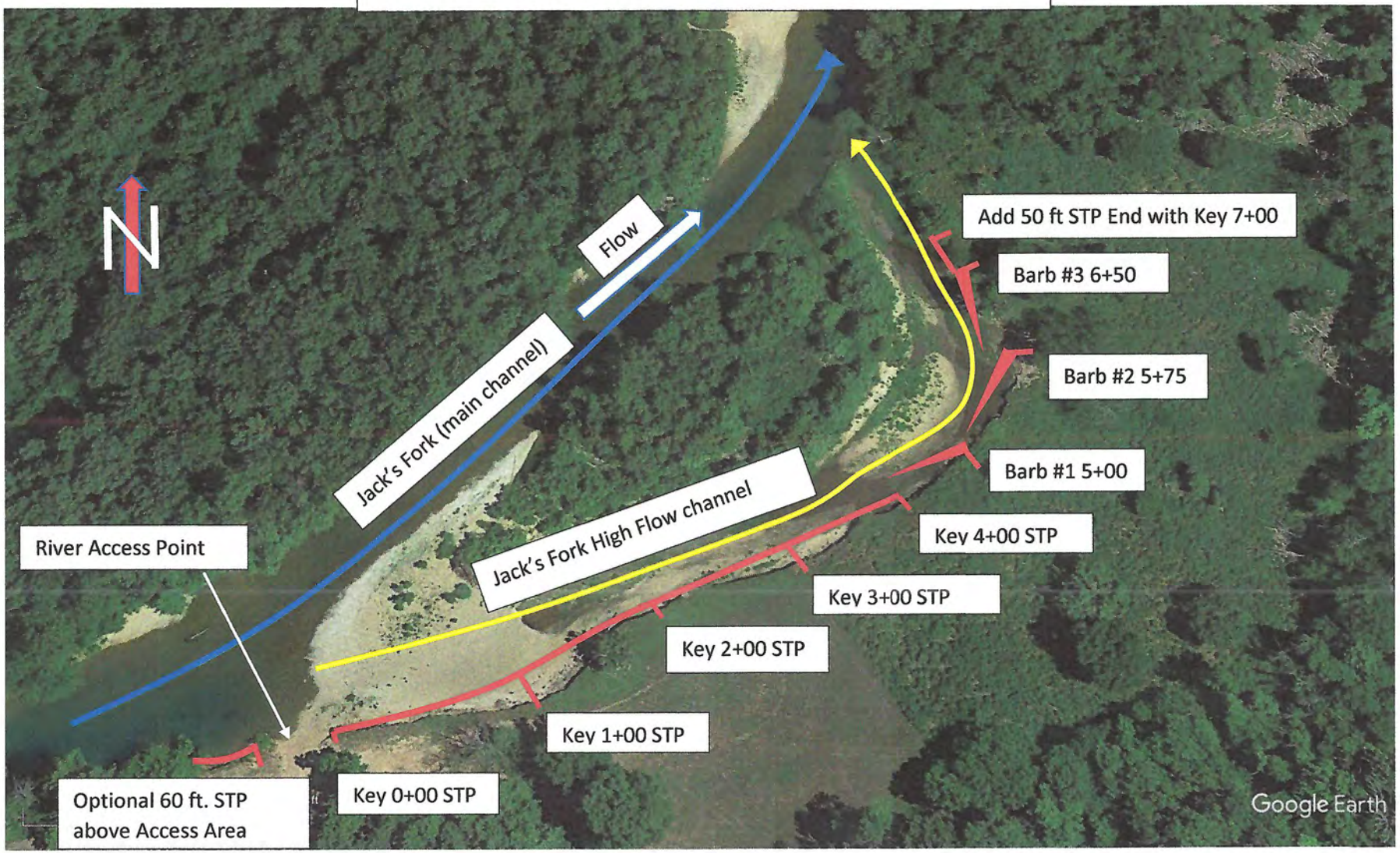


Fig. 3 Typical "live pole" planting scheme

Jack's Fork Stream Mitigation Stabilization Plan T29N, R3W, Sec. 19

Shannon County, Mo. (Lat. 37.16533 Lon. -91.32651)



Stream Stabilization I & E Form

Midwest Streams - Version 4.0 - modified 10/2019 P. Nuemberger

County | T. 29N | R. 3W | Sec. 19

Date: 11/9/22 | By: Wayne kinney

Stream Name: Jack's Fork | UTM Coord.: 37.16533 -91.32651

Landowner Name: Mitico

Drainage Area: 411 sq. mi. | Clear Cells

Regional Curve Predictions:

Bankfull dimensions				
	Width	155 ft.	Cross Sectional Area	1332 sq. ft.
	Depth	8.6 ft.		

Reference Stream Gage:

none | Station No. - | Gage Q_2 -

0 - | Drainage Area - | Regression -

REFERENCE STREAM DATA ONLY

USGS Flood-Peak Discharge Predictions:

Valley Slope: *ft./mi. (user-entered)*

ft/mi (from worksheet) | Rainfall 3.50 in *(2 yr, 24 hr)* | Regression Q_2

ft./ft. | Regional Factor 0.983 | Adjusted Q_2 -

Typical Range for Bankfull Discharge:

Local Stream Morphology:

Channel Description: (c) Clean, winding, some pools and shoals

Manning's "n": 0.04

Basic Field Data:

Bankfull Width	179 ft.	Stream Length		ft.
Mean Bankfull Depth	4.23 ft.	Valley Length		ft.
Width/Depth Ratio	42.32	Contour Interval		feet
Max. Bankfull Depth	ft.	Estimated Sinuosity		
Width at twice max. depth	ft.			
Entrenchment Ratio	0.00			

Channel Slope:

Surveyed: 0.0018 *ft./ft.*

Estimated: *ft./ft.*

Radius of Curvature (Rc): 120 ft.

Rc/Bankfull width: 0.67

Bankfull Q from:

Cross-Section	2950	*cfs*
Basic field data	3131	*cfs*
Selected Q	3100	*cfs*

Bankfull Velocity Check: *(typical Illinois streams will have average bankfull velocity between 3 and 5 ft/sec.)*

Bedload: D_{90} 5 *in.* | D_{50} *in.*

GOAL: Develop confidence by matching velocities from different sources.

Velocity required to move D_{90}:	4.6	*ft./sec.*
Velocity from Cross-Section data:	3.89	*ft./sec.*
Velocity from basic field data:	4.14	*ft./sec.*
Velocity from selected Q:	4.1	*ft./sec.*

Channel Evolution Stage: IV | Stream Type (Rosgen):

Notes

Natural Open Channel Flow

back to I&E form

Project:	Mitico
Assisted by:	Wayne kinney
Date:	11/9/2022
Channel Slope (*S*):	0.001800 ft/ft
Manning's *n*:	0.040
Flow Depth:	ft

$$Q = \frac{1.486}{n} A R^{\frac{2}{3}} S^{\frac{1}{2}}$$

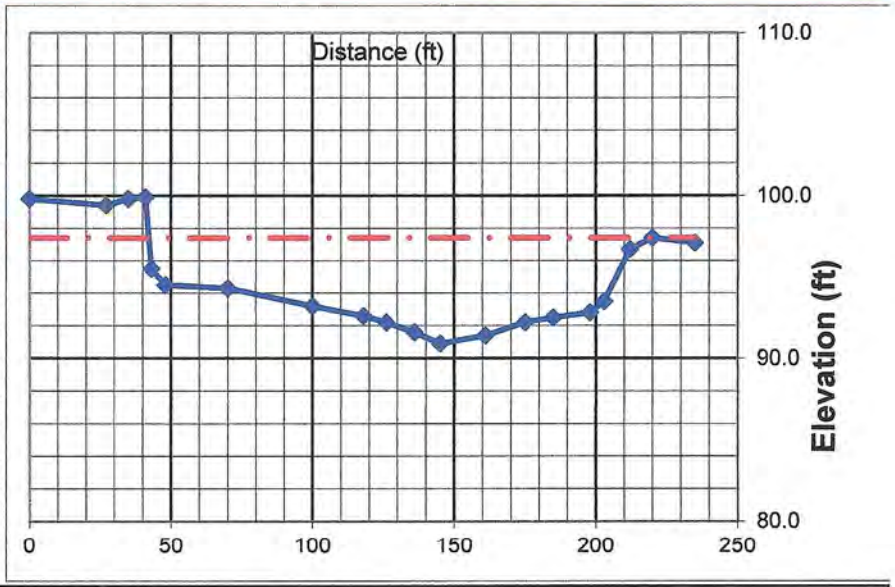
assuming uniform, steady flow

☑ Use this Cross-Section for Bankfull Determination

		Trial Depth 2	*Trial Depth 3*
Selected Flow Depth:	6.5 *ft*	6.5	
Channel Flow (*Q*):	2,949.8 *cfs*	2,949.8	
Channel Velocity:	3.9 *ft/sec*	3.9	
Cross-Sectional Area (*A*):	757.3 *sq.ft.*	757.3	
Hydraulic Radius (*R*):	3.9 *ft*	3.9	

Survey Data:

Elevation *(ft)*	Distance *(ft)*
99.8	0
99.4	27
99.8	35
99.9	41
95.5	43
94.5	48
94.3	70
93.2	100
92.6	118
92.2	126
91.6	136
90.9	145
91.4	161
92.2	175
92.5	185
92.8	198
93.5	203
96.7	212
97.4	220
97.1	235



COMMENTS:

Natural Open Channel Flow

back to I&E form

Project:	Mitico	
Assisted by:	Wayne kinney	
Date:	11/9/2022	
Channel Slope (**S**):	0.001800	ft/ft
Manning's **n**:	0.040	
Flow Depth:	8.5	ft

$$Q = \frac{1.486}{n} A R^{\frac{2}{3}} S^{\frac{1}{2}}$$

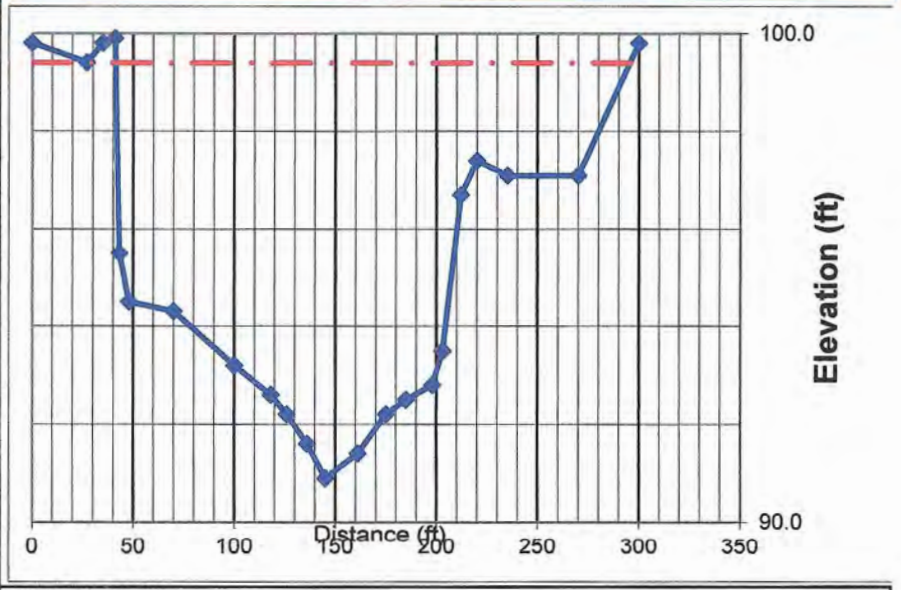
assuming uniform, steady flow

☐ Use this Cross-Section for Bankfull Determination

		Trial Depth 2	*Trial Depth 3*
Selected Flow Depth:	8.5 *ft*	8.9	
Channel Flow (**Q**):	5,673.0 *cfs*	5,926.8	
Channel Velocity:	4.5 *ft/sec*	4.3	
Cross-Sectional Area (**A**):	1,253.8 *sq.ft.*	1,363.5	
Hydraulic Radius (**R**):	4.9 *ft*	4.6	

Survey Data:

Elevation (ft)	Distance (ft)
99.8	0
99.4	27
99.8	35
99.9	41
95.5	43
94.5	48
94.3	70
93.2	100
92.6	118
92.2	126
91.6	136
90.9	145
91.4	161
92.2	175
92.5	185
92.8	198
93.5	203
96.7	212
97.4	220
97.1	235
97.1	270
99.8	300



COMMENTS:
Projected flow to overflow right bank (common area)

Longitudinal Peaked Stone Toe (STP) Design Drawing Preparation

Landuser: Mitico
Stream: Jack's Fork

Location: 37.16533 -91.32651
Sec.: 19 Twp.: 29N Range: 3W

Date: 11/9/2022
By: Wayne kinney

Selected rock gradation: 4

Typical Riprap Section STP Sideslope: 1 : 1

Key Depth 5 ft

REFERENCE TABLE		
IDOT Class	Largest Rock(D_{100})	D_{50}
4	1.3 *ft*	7.4 *in*
5	1.7 *ft*	9.8 *in*
6	2.0 *ft*	12.1 *in*
7	2.5 *ft*	14.6 *in*

NOTE: Gradation 5 is the same as former RR-5.

STP Reach 1

Bank: Left or Right Side Looking Downstream: Left

Beginning (Upstream) Station: 0+00
Beginning Station Description:

Benchmark EL: 100.00 ft.
Description: 16P nail in Box Elder Tree South side of lane at Sta. 0+00

NOTE: Reach 1

Approx. Key Spacing: 100 ft.
Downstream Riffle Elevation: 92.0 ft.
Peaked Stone Level Crest EL: 96.5 ft.
Average STP height: 2.8 ft.
Total Length of STP: 400 ft. *USE*
Average Tons/Ft. for STP: 0.53 0.6 *Tons/ft.*

For definitions of dimensions, refer to IL-ENG-152

Key	STA	h_1 *(ft.)*	W_1 *(ft.)*	Est. Rock *(Tons)* Calculated	*USE*
1	0+00	5.0	2.0	9	9
2	1+00	5.0	33.0	28	28
3	2+00	5.0	7.0	12	12
4	3+00	5.0	12.0	15	15
5	4+00	5.0	2.0	9	9

Average Tons Per Key: 15 *Tons*
Total Rock Amount (Estimate): 313 *Tons*

STP Reach 2

Bank: Left or Right Side Looking Downstream: Left

Beginning (Upstream) Station:
Beginning Station Description:

Benchmark EL: ft.
Description:

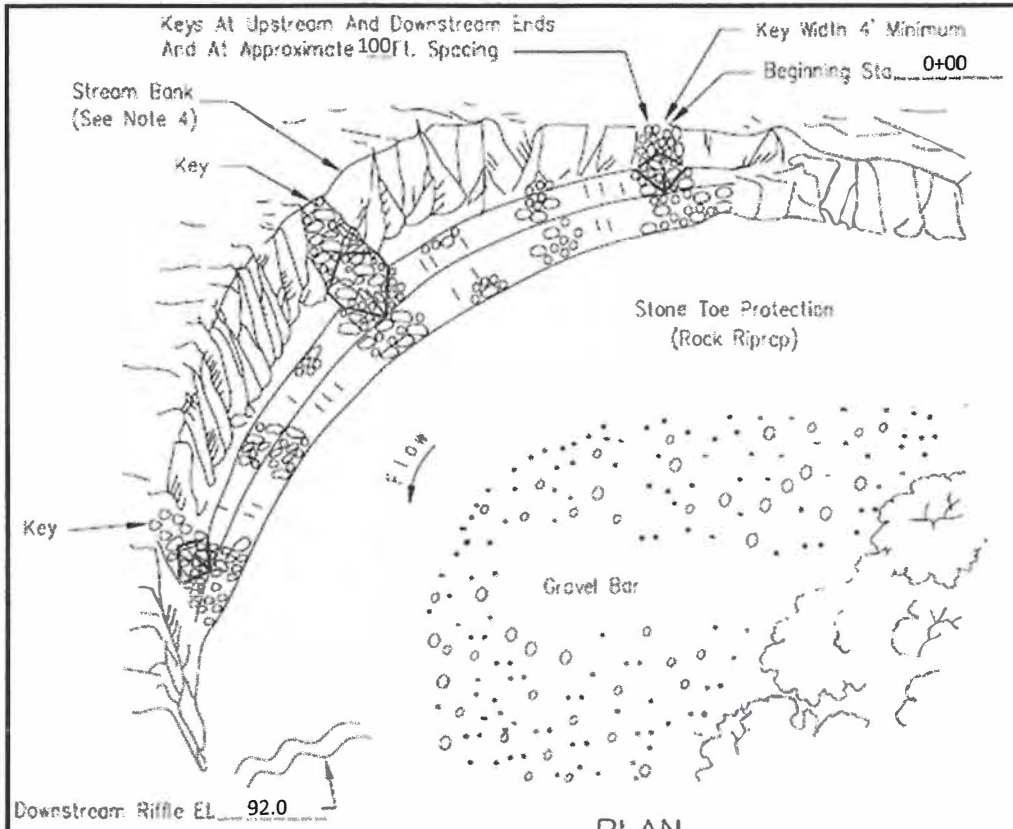
NOTE: Reach 2

Approx. Key Spacing: ft.
Downstream Riffle Elevation: ft.
Peaked Stone Level Crest EL: ft.
Average STP height: ft.
Total Length of STP: 0 ft. *USE*
Average Tons/Ft. for STP: *Tons/ft.*

For definitions of dimensions, refer to IL-ENG-152

Key	STA	h_1 *(ft.)*	W_1 *(ft.)*	Est. Rock *(Tons)* Calculated	*USE*

Average Tons Per Key: *Tons*
Total Rock Amount (Estimate): *Tons*



PLAN

Key	Sta.	h_1	W_1	Level Crest El.
1	0+00	5.0	2.0	96.5
2	1+00	5.0	33.0	96.5
3	2+00	5.0	7.0	96.5
4	3+00	5.0	12.0	96.5
5	4+00	5.0	2.0	96.5

NOTE: Reach 1

Benchmark EL. 100.00

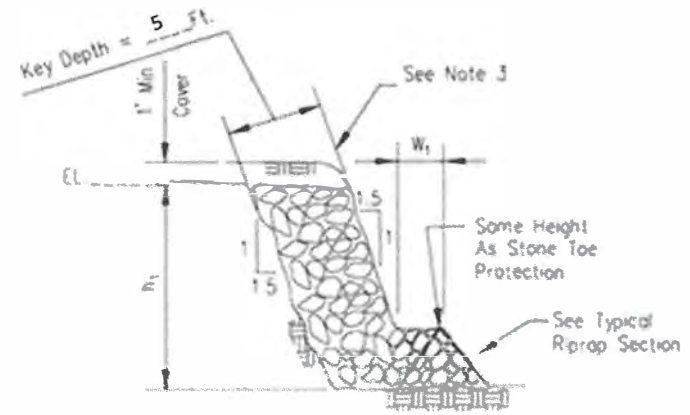
Description

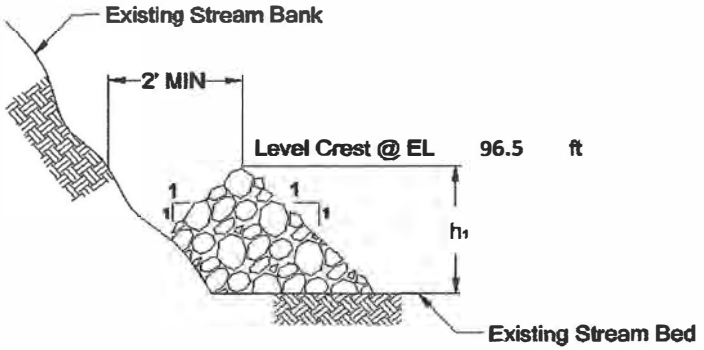
16P nail in Box Elder Tree South side of lane at Sta. 0+00

Beginning Sta. Description

Notes:

1. Rock gradation shall meet IDOT requirements for GRAD. NO. 4 riprpap, quality designation "A", or as designated by engineer.
2. Stone Toe 400 ft. @ 0.60 Tons / Ft. average
   Keys 5 @ 15 Tons Each
   Total Rock Amount (Estimate): 313 Tons
3. Key shall be constructed so that the vertical section remains embedded in the existing stream bank.
4. Location Left side of streambank looking downstream.





TYPICAL RIPRAP SECTION

NOT TO SCALE

Date 11/9/22 10/2019
Designed Wayne kinney
Drawn: PEN
Checked:
Approved:

STREAM BANK STABILIZATION
STONE TOE PROTECTION

MIDWEST STREAMS TECHNICAL RESOURCE EVALUATION AND MANAGEMENT SERVICES INC.
6324 Wilson Road, Oakdale, IL 62268 618-630-6318

File No. MWS-ENG-152
Drawing No.
Sheet 1 of 1

Landowner	Mitico	Stream	Jack's Fork	Location	Sec. 19 T29N R3W

Stream Barb Design Drawing Preparation

Landuser: Mitico
Stream: Jack's Fork
Location: 37.16533 -91.32651 Sec.: 19
Twp.: 29N Range: 3W

Date: 11/9/2022
By: Wayne kinney

Beginning (Upstream) Station: 5+00
Beginning Station Description: 100 ft. downstream of End of STP

Benchmark EL: 100.00 ft.
Description: 16P nail in Box elder tree on south sode of lane at access point (sta. 0+00)

Key Depth: 5.0 ft.
Key Width: 4.0 ft.
Base Flow Width: 52.0 ft.
Downstream Riffle Elevation: 92.0 ft.
Typical Bank Slope at Barb: :1

☐ Bedrock or Shale Streambed (no bedkey needed)

REFERENCE TABLE		
IDOT Gradation	h_2 (D_{100})	D_{50}
4	1.3 *ft*	7.4 *in*
5	1.7 *ft*	9.8 *in*
6	2.0 *ft*	12.1 *in*
7	2.5 *ft*	14.6 *in*

Selected rock gradation: 5

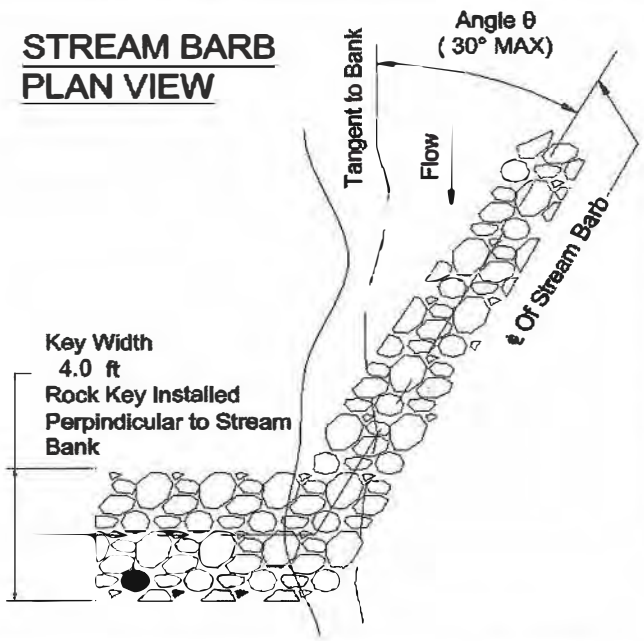
NOTE: Gradation 5 is the same as former RR-5.

For definitions of dimensions, refer to IL-ENG-167 and IL-ENG-168

Barb	*Bank	STA	Total Barb Length *(ft)*	Effective Length *(ft)*	Control EL *(ft)*	Barb ht. h_1 *(ft.)*	Bedkey h_2 *(ft.)*	Bank key h_3 *(ft.)*	Slope *z:1*	Angle ϕ *(deg.)*	Azim *(deg.)*	Est. Rock *(Tons)*	
												Calculated	*USE*
1	Right	5+00	80	21	96.0	4.0	1.7	6.0	34.8 : 1	15	245	107	120
2	Right	5+75	60	25	96.0	4.0	1.7	6.0	26.1 : 1	25	205	82	96
3	Right	6+50	60	16	96.0	4.0	1.7	6.0	26.1 : 1	15	175	82	117
4													
5													
6													
7													
8													
9													
10													
11													
12													
13													
14													
15													
										Total Stone *(Tons)*:		333	

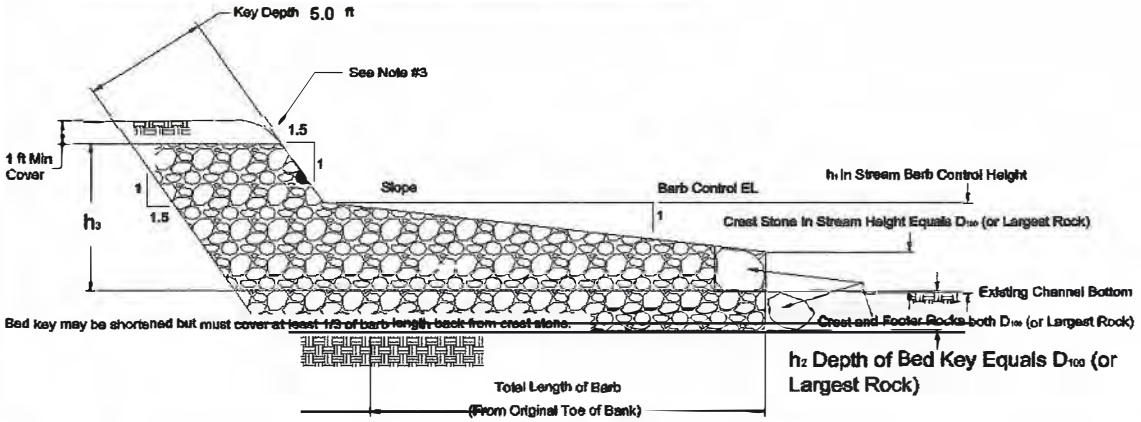
Notes:
Quantities include STP at 0.7 ton/ft. below "key" on each Barb--20 ft. on Barbs 1 and 2---and 50 ft, on Barb 3

STREAM BARB PLAN VIEW



Barb	*Bank	Station	Total Length Of Barb	Barb Control Elevation	h_1	h_2	h_3	Slope	Angle ϕ	** Azimuth	Tons
1	Right	5+00	80	96.0	4.0	1.7	6.0	35 : 1	15	245	120
2	Right	5+75	60	96.0	4.0	1.7	6.0	26 : 1	25	205	96
3	Right	6+50	60	96.0	4.0	1.7	6.0	26 : 1	15	175	117
4											
5											
6											
7											
8											
9											
10											
11											
12											
13											
14											
15											
								Total Stone			333

TYPICAL PROFILE, CENTERLINE OF STREAM BARB AND KEY



Notes:
1. ** Azimuth is the compass reading from magnetic north along the centerline of barb.
2. *Bank - left side or right side looking downstream.
3. Key shall be constructed so that the vertical section remains embedded in the existing stream bank.
4. Rock gradation shall meet IDOT requirements for GRAD. NO. 5 riprap, quality designation "A", or as designated by engineer.

NOT TO SCALE

REFERENCE TABLE		
GRAD. NO.	h_4 (D_{100})	D_{50}
A-4	1.3 *ft*	7.4 *in*
A-5	1.7 *ft*	9.8 *in*
A-6	2.0 *ft*	12.1 *in*
A-7	2.5 *ft*	14.6 *in*

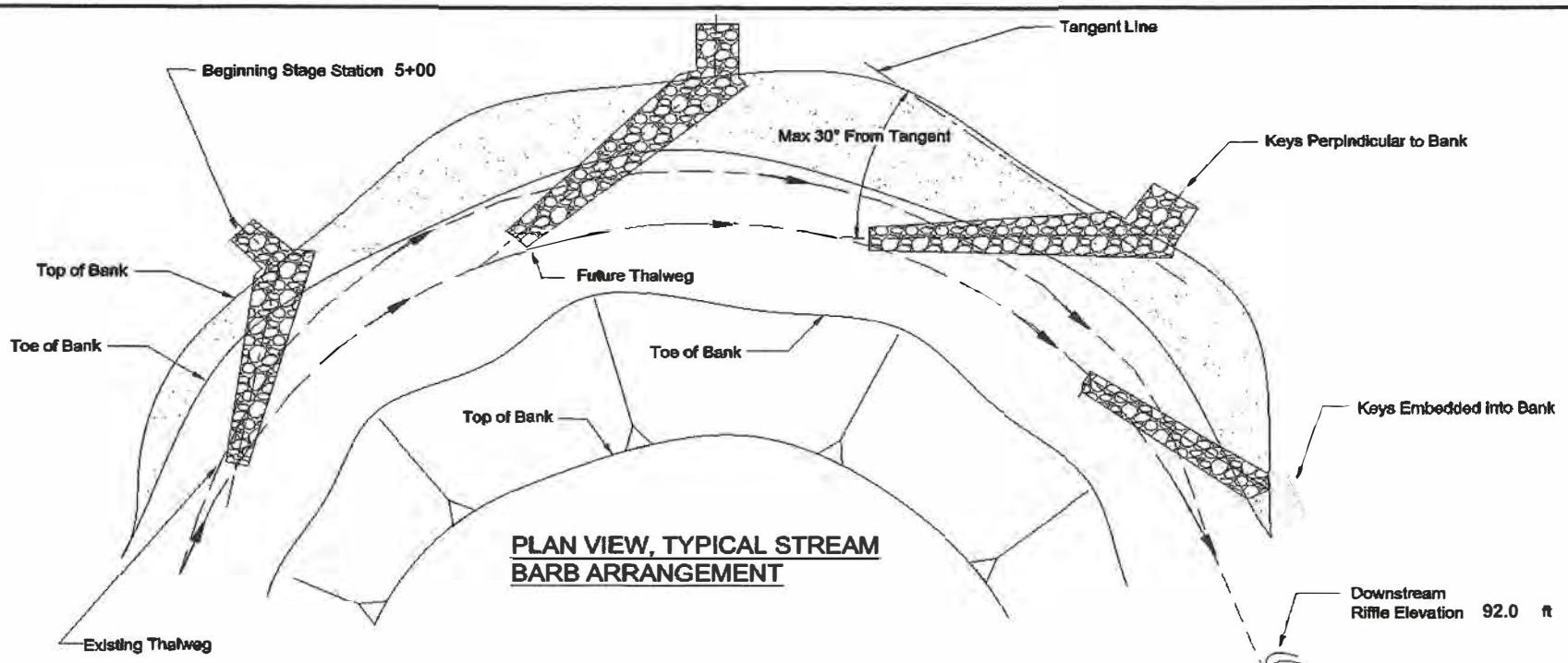
Date 11/9/22 10/2019
Designed: Wayne kinney
Drawn: PEN
Checked:
Approved:

STREAM BANK STABILIZATION
STREAM BARB

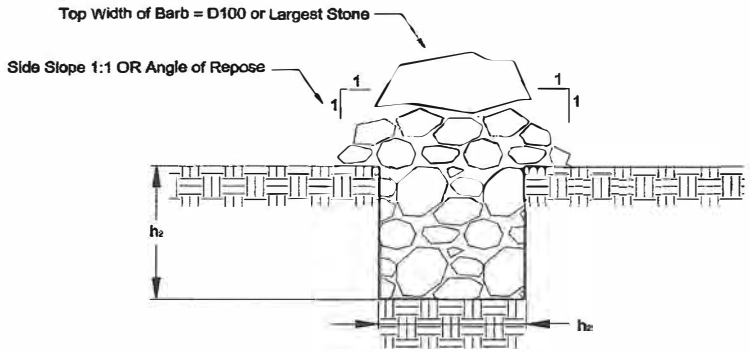
MIDWEST STREAMS TECHNICAL RESOURCE EVALUATION AND MANAGEMENT SERVICES INC.
©3324 Wilson Road, Oakdale, IL 62268 618-630-6318

File No. MWS-ENG-168
Drawing No.

Landowner	Mitico	Stream	Jack's Fork	Location	Sec. 19 T29N R3W	Sheet 2 of 2



PLAN VIEW, TYPICAL STREAM BARB ARRANGEMENT



TYPICAL BARB CROSS SECTION
SEE SHEET TWO FOR ADDITIONAL DETAILS

NOT TO SCALE

Benchmark EL.	100.00
Description	16P nail in Box elder
at access point (sta. 0+00)	
Beginning Sta. Description	
100 ft. downstream of End of STP	

Landowner	Mitico	Stream	Jack's Fork	Location	Sec. 19 T29N	R3W

Date 11/9/22 10/2019
Designed: Wayne Kinney
Drawn: PEN
Checked:
Approved:

STREAM BANK STABILIZATION
STREAM BARB

MIDWEST STREAMS TECHNICAL RESOURCE EVALUATION AND MANAGEMENT SERVICES INC.
6324 Wilson Road, Oakdale, IL 62268 618-830-6318

File No. MWS-ENG-167
Drawing No.

Exhibit B: Deed Restriction

NOTICE OF DEED RESTRICTION

STATE OF MISSOURI
COUNTY OF _____

KNOW ALL MEN BY THESE PRESENTS THAT _____ is the owner of that real property more particularly described in the enclosed legal description and shown in the enclosed map of the mitigation site based on a survey performed by a registered professional land surveyor; the legal description and the map attached as Exhibit A are both made a part hereof. For all purposes throughout this document, that real property will be referred to as the "Property." As of the date executed, the Property has been designated as a mitigation site associated with US Army Corps of Engineers Section 404 Permit No. *<<Action Number>>*, or a revision thereof. The permit grants authorization to the Missouri Department of Transportation for the placement of fill material in waters of the United States, and the mitigation site on the Property is intended to offset the impact of that placement. Any purchaser of all or any part of the Property or any person having an interest in or proposing to acquire an interest in all or any part of the Property, or any person proposing to develop or improve all or any part of the Property, is hereby notified of the following development restriction affecting the Property:

Any activity on the Property must comply with the terms and special conditions described in US Army Corps of Engineers Section 404 Permit No. *<<Action Number>>*, or a revision thereof. It should be noted that the Property has been designated to be preserved for riparian buffer and wildlife habitat mitigation, and may not be converted to another use, including but not limited to: clearing, logging, bushhogging, mowing, spraying with herbicides, filling, leveling, draining, dumping, construction of any structure other than for wildlife enhancement, or any other activity that would adversely impact the natural state of the area. Natural resource management or wildlife enhancement activities involving alteration of the Property would require prior approval from the Little Rock District Corps of Engineers.

EXECUTED this _____ day of _____, 20__ By:

_____ _____

SUBSCRIBED AND SWORN TO BEFORE ME by _____, on this ___ day of _____, 20__ to certify which witness my hand and seal of office.

_____
Notary Public in and for the State of Missouri

My Commission expires: Printed Name of Notary: