UPPER BABBLING BROOK MULTI-BMP PROJECT

Section 319 Project Evaluation and Report

Illinois EPA Agreement No. 3191305

Illinois Environmental Protection Agency

Bureau of Water
Nonpoint Source Unit

July 31, 2015

Program Administered by:

State of Illinois
Illinois Environmental Protection Agency
Bureau of Water
1021 North Grand Avenue East
Springfield, Illinois 62702

Report Submitted by:

Lost Nation/New Landing River Conservancy District of Illinois
205 Cuyahoga Drive, Suite A
Dixon, Illinois 61021

Report Prepared by:

Olson Ecological Solutions, LLC
111 North 6th Street #4631
Rockford, Illinois 61110

Funding for this project was provided, in part, by the
Illinois Environmental Protection Agency through Section 319 of the Clean Water Act.

TABLE OF CONTENTS

UPPER BABBLING BROOK MULTI-BMP

PROJECT EVALUATION AND REPORT

PROJECT OVERVIEW

Background

The Lost Nation/New Landing River Conservancy District (RCD) and Bettner Farms partnered with the Illinois Environmental Protection Agency to design a project to address the most severe pollution loading within the first 3.18 miles of Babbling Brook via Grant #3191305.

Babbling Brook, one of the two main tributaries to Lost Nation Lake (AUID IL_RPZF) consists of 2,707 acres of crop land, pasture, and woodland. It does not have any recognized floodplain and is subject to flashy hydrology during storm events. Farm fields have been drained with tile. Hydric soils upstream that would have been wetlands at one time no longer appear on the National Wetlands Inventory, suggesting that they have been subject to land use changes, altering their ability to function as water storage and filtration.

Lost Nation Lake has impairments of aesthetic quality as listed in the Illinois Environmental Protection Agency's (ILEPA) *Illinois Integrated Water Quality Report & Section 303(d) List, 2014.* ILEPA named total suspended solids (TSS) and total phosphorous (TP) as causes of impairment: Aquatic algae was a cause of impairment identified in 2012 that had been removed. The project also benefits aquatic life in Babbling Brook and Lost Nation Lake and primary contact recreation in Lost Nation Lake.

Babbling Brook is part of the 11,300-acre Clear Creek Watershed (HUC 0709000506), for which there has been developed the *Clear Creek Watershed Action Plan* dated October 2011. The plan suggests best management practices that will have the most significant impact on Lost Nation Lake's aesthetic impairments by addressing phosphorous, total suspended solids, and aquatic algae caused by nonpoint source pollutants from the surrounding and upstream areas. Stream bank and shoreline stabilization ranked as a high priority best management practices within the plan, along with wetland restoration, conservation tillage, nutrient management on agricultural fields, sediment basin installation, livestock exclusion, and wildlife upland habitat management.

The Babbling Brook Multi-BMP Project used a variety of highly prioritized best management practices (BMPs) to reduce phosphorous, total suspended solids, and other pollutants from entering the stream. BMPs included stabilizing streambanks, creating stream meanders, excluding cattle from the stream, planting filter strips, and tiling severely eroded drainages within active pastures. The project also included constructing a sediment basin and wetlands at the downstream end of the project in order to catch remaining pollutants.

Downstream of the project area, the rest of Babbling Brook has been stabilized to its confluence with Lost Nation Lake. It first enters restored prairie and savannah on land owned by The Nature Conservancy, and then it runs through private residential properties where it is stabilized using a variety of techniques funded in part by the Environmental Protection Agency Section 319 Program (Grant No. 3191003). Finally, it terminates into Lost Nation Lake, which carries the water into the lower branch of Clear Creek and then the Rock River.

Project Location

The project addressed 3.18 miles of Babbling Brook, beginning at its headwaters. Babbling Brook is a tributary to Clear Creek, which runs into the Rock River in north-central Illinois near Dixon. The project location is illustrated in Figure 1.

Figure 1. Project location.

Project Team

The project team consisted of the following members: Ed Bettner (Bettner Farms), Tina Bettner (Bettner Farms), Steve Larry (RCD), Becky Breckenfelder (RCD), Jim Brown (RCD) Dick Baumann (Wendler Engineering), Joe Rush (JadEco Natural Resources Consulting), Rebecca Olson (Olson Ecological Solutions), Martin & Company, and Rick Masterson. Each individual's responsibilities are outlined below:

- General Project Leader: Larry was responsible for the project overall. He was kept informed of the key issues and dates of meetings from the other team members via monthly reports. He approved all spending and other major decisions.
- Engineering Manager: Baumann completed all engineering requirements and permitting.
- Stabilization Design/Construction Manager: Rush insured that construction was on target and according to plan. He provided input on the engineering design, including what stabilization techniques to use and where.
- Construction Contractor: Martin & Company constructed the stream meanders and sediment basin, and they laid rip rap.
- Construction Foreman: Ed Bettner was responsible for the construction of the fencing, cattle crossings, tile installation, invasive tree removal, native and pasture vegetation installation, and turf reinforcement mat installation.
- Grant Administrator and Wetland and Native Vegetation Consultant: Olson oversaw all grant requirements and provided necessary reports, among other responsibilities, insuring that the RCD honored their commitment and agreement to the ILEPA. She worked with Breckenfelder to insure that the RCD billed correctly and timely. Finally, she designed the site preparation, planting, and managing of any vegetation used for stream bank stabilization or wetland creation in concert with bioengineering techniques.
- Administrative Assistant for RCD: Breckenfelder assisted with any necessary administrative duties, such as billing, correspondence, website management, preparation and follow up of meetings and tours, and newsletter postings.
- Administrative Assistant for Bettner Farms: Tina Bettner provided administrative duties for Bettner Farms, which were submitted to Breckenfelder.
- Photographer: Rick Masterson provided photographic documentation of construction.

PROJECT EXECUTION

Pre and Post Conditions

Site conditions are described below for the entire length of Babbling Brook and for the project site, which covered the first 3.18 miles of Babbling Brook beginning at its headwaters. Land uses along Babbling Brook include row crops, pasture, and woodlands (Figure 2). Land uses within the project area included row crops and pasture. No natural floodplain exists along Babbling Brook, which is subject to flashy hydrology (Figure 3). Hydric soils along Babbling Brook have been converted from wetlands to agricultural lands (Figure 4). No floodplain or hydric soils were considered within the project area.

Figure 2. Land uses along Babbling Brook.

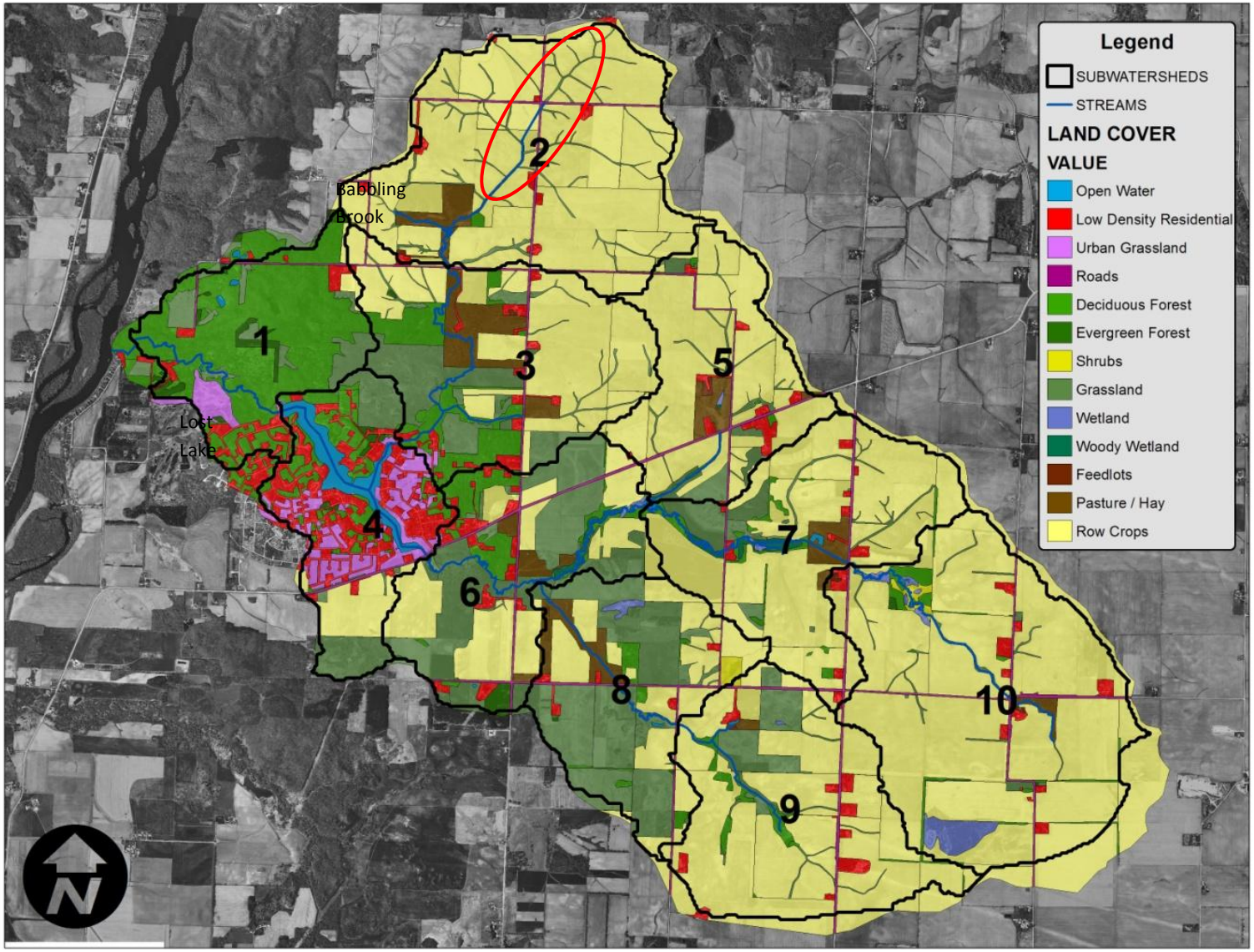


Figure 2. Floodplain along Babbling Brook.

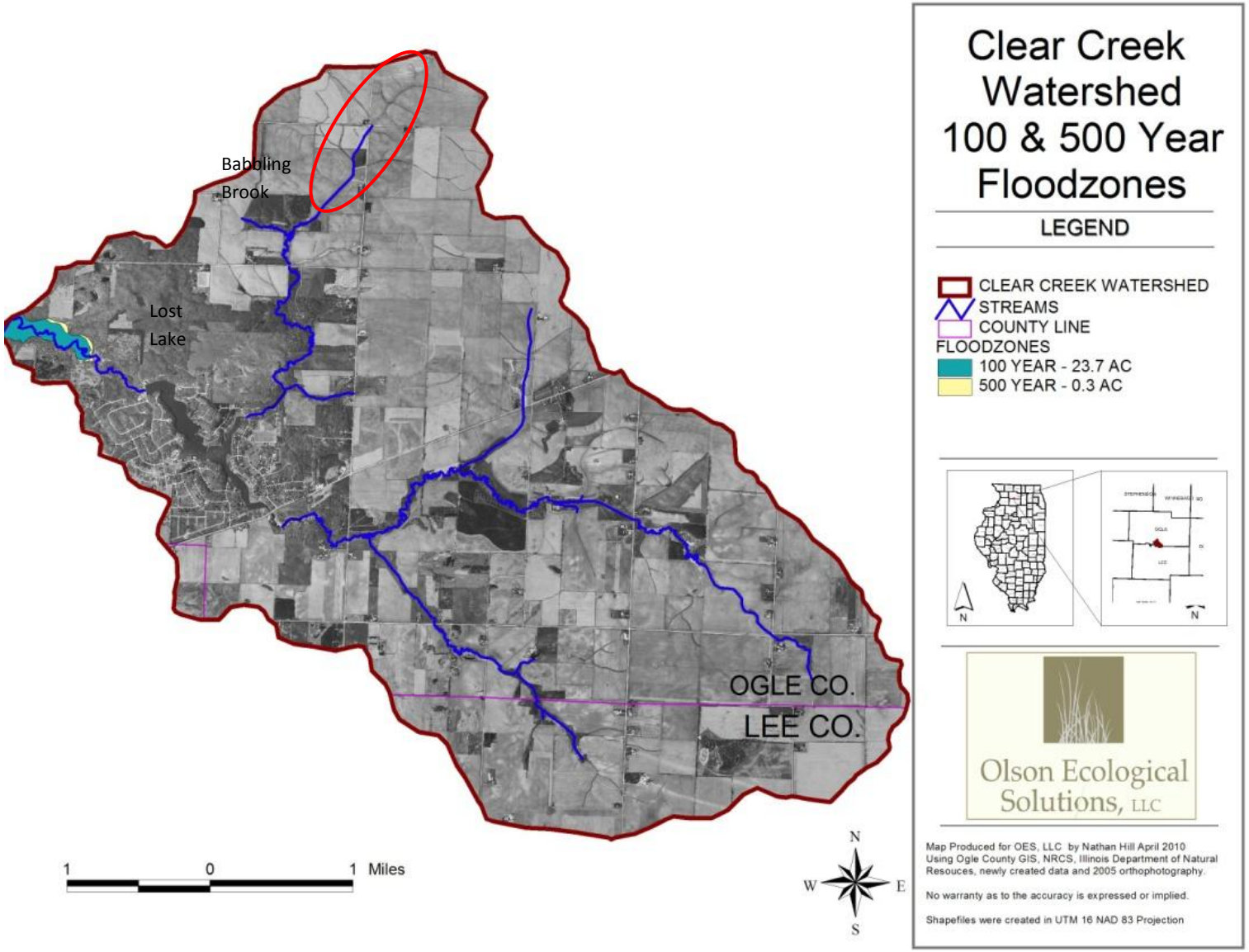
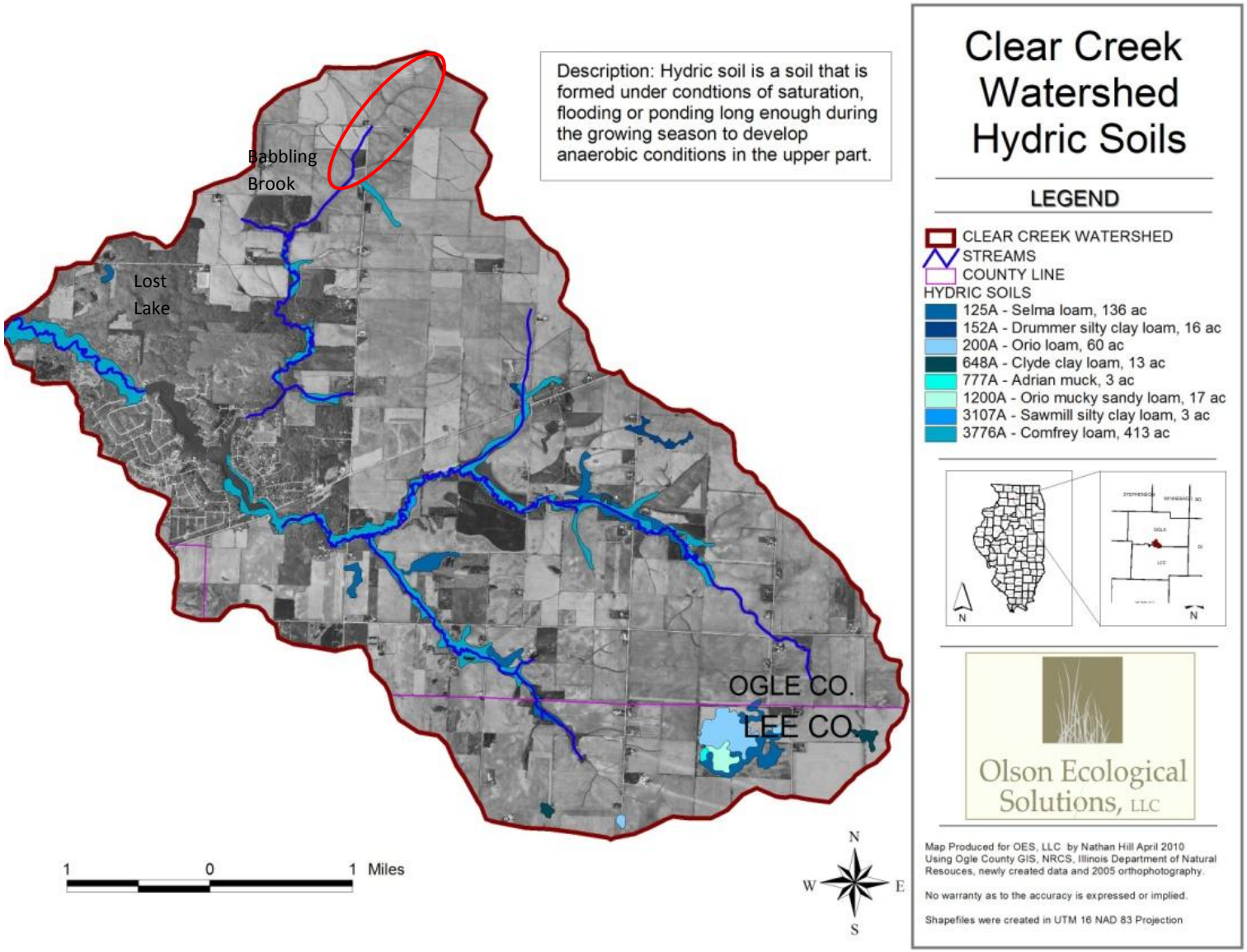


Figure 3. Hydric soils along Babbling Brook.



Along the 3.18-mile project site, the following conditions were found:

- tile outlets from row-cropped fields as headwaters;
- straightened channels mixed with natural meanders;
- eroded streambanks varying from highly eroded to slightly eroded;
- eroded drainage areas through active pastures;
- free cattle access to the stream; and
- sandy, loamy soils.

These conditions were evaluated for pollutant loading, and those that contributed the most pollution to the stream were addressed with best management practices as described below. Photographic documentation of typical conditions before and after installation of BMPs is documented in Figures 5 through 13. More photographs documenting design installation are provided in Attachment A.

Figure 5. Typical conditions before and after BMP installation of channel re-meanders.

Meander #1 Before…

Meander #1 After…

Meander #2 Before…

Meander #2 After…

Meander #3 Before…

Meander #3 After…

Meander #4 Before…

Meander #4 After…

Meander #5 Before…

Meander #5 After…

Figure 6. Typical conditions before and after BMP installation of rip rap along streambanks.

Before…

After…

Figure 7. Typical conditions before and after BMP installation of cattle crossings.

Before…

After…

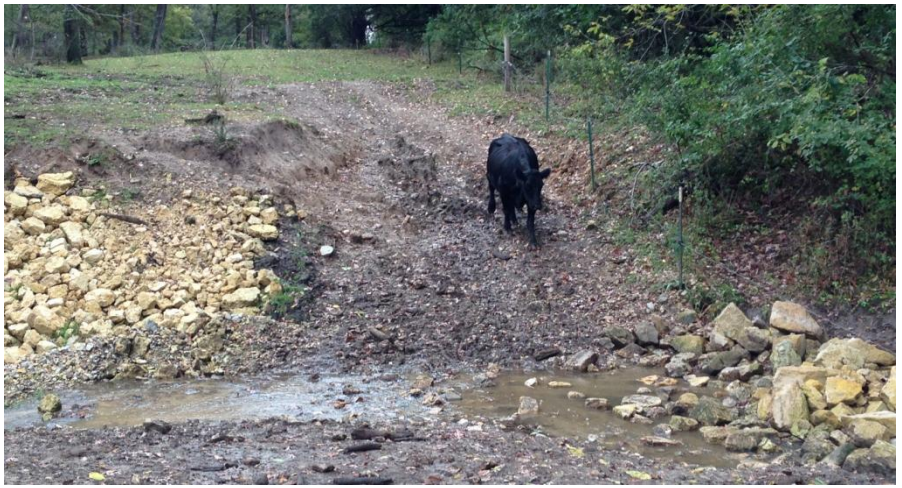


Figure 8. Typical conditions before and after BMP installation of filter strips along streambanks.

Before…

After…

Figure 9. Typical conditions before and after BMP installation of sediment basin.

Before…

After…

Figure 10. Typical conditions before and after BMP installation of rock riffle.

Before…

After…

Figure 11. Typical conditions before and after BMP installation of constructed emergent wetlands.

Before…

After…

Figure 12. Typical conditions before and after BMP installation of constructed submergent wetlands.

Before…

After…

Figure 13. Typical conditions before and after BMP installation of tile.

Before…

After…

Type, Location, and Design of Practices

Multiple best management practices were implemented to improve stream conditions, including meandering the channelized segments of the stream, stabilizing streambank with rip rap and vegetative remediation, erecting cattle exclusion fencing, providing cattle stream crossings, replacing eroded ditches through active pasture with tiles, constructing a sediment basin, and planting filter strips and wetlands. These activities were broken into two phases. The first phase addressed the stream and associated BMPs as illustrated in Figure 14. The second phase addressed the silt basin and associated BMPs as illustrated in Figure 15. Each BMP is discussed below.

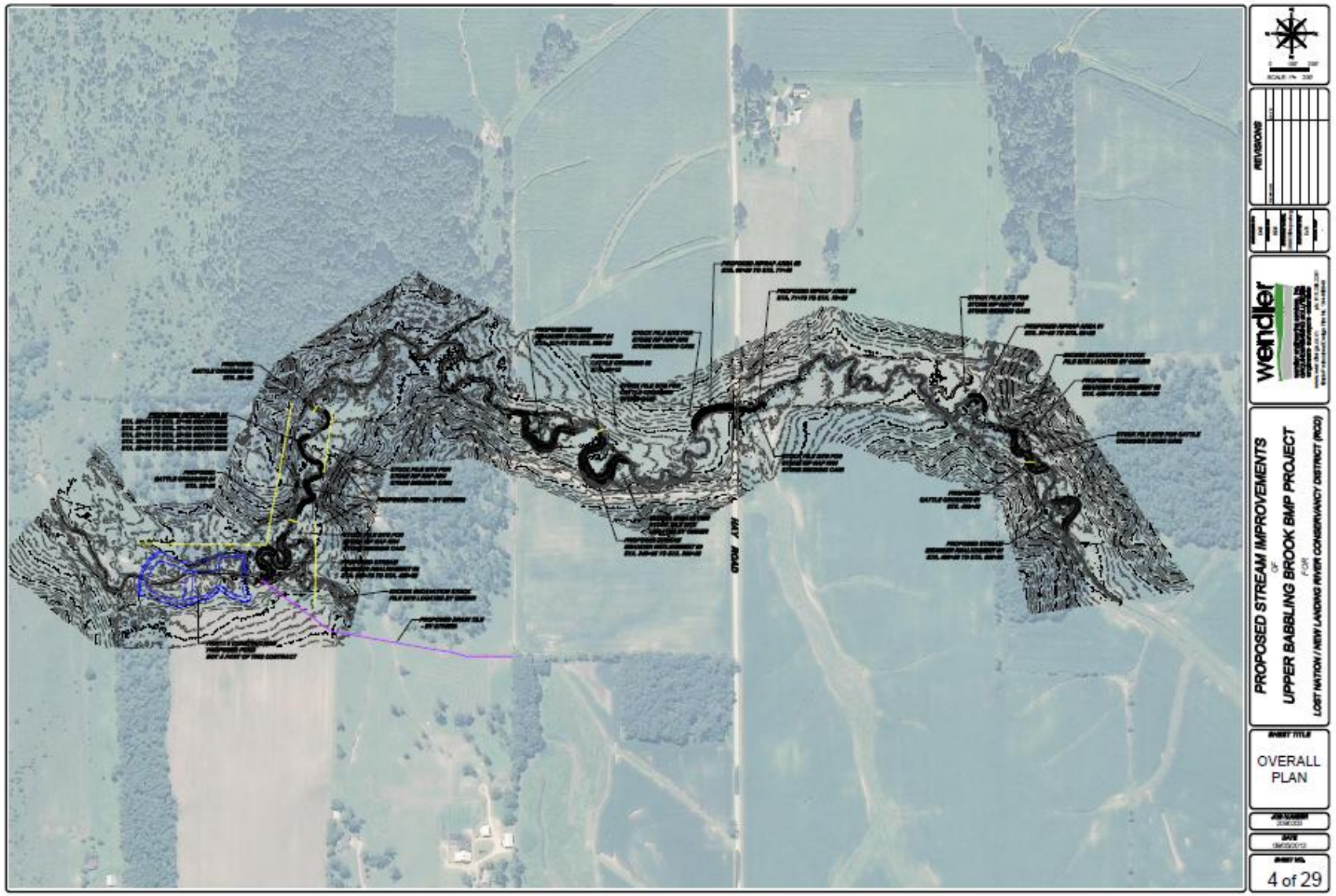
The function and purpose of best management practices were to stabilize the soils and remove channels and ditches in order to slow water velocity and prevent nonpoint source pollutants from entering Babbling Brook. We chose the techniques based on site condition evaluations and an assessment of needs for land owners and the land, which is a working farm and ranch. The areas were evaluated to determine where the flood conditions provided the most damaging effects. Within a given budget, we determined what could be effectively completed that would provide the greatest stream improvement. Re-meandering channels and installing rip rap soothed the most severe erosion and slowed water velocity. For areas that did not receive direct force from water velocity, grading and turf reinforcement mats with native vegetation were used to naturalize and stabilize the streambanks. Installing filter strips and controlling cattle access to the stream further prevented pollutants from entering the stream. A sediment basin was placed at the downstream end of the project site to capture pollutants still entering the stream and slow water velocity prior to the stream leaving the project site.

Channel re-meanders, rip rap, cattle crossings, basin construction with associated rock riffles wetland planting beds, berms, and outlets followed approved engineered designs. The designs for each of these BMPs are presented below in Figures 15 through 32. Vegetation of filter strips and wetlands were designed according to an approved plan. Plant materials are listed in Figures 25, 31, and 33. Fencing and tile were installed according to customary practices by professional contractors.

<u>Phase 1: BMP Type, Location, and Design</u>

Phase 1 included all BMPs from Meander #1 at the headwaters to Meander #5 just upstream from the basin. BMPs included channel re-meanders, rip rap, cattle crossings, turf reinforcement matting, and filter strips of native vegetation.

Figure 14. Overview of Phase 1: Stream and associated BMPs.



Channel Re-meandering

Five channeled segments of stream were rerouted into constructed meanders according to the designs presented in Figures 15 through 18. Banks were graded to a 3:1 slope and planted with native vegetation or reinforced with rip rap. A turf reinforcement mat (North American Green SC250) was placed along the toe of the outside bend of each meander slope. Straw blanket covered the remainder of each slope. Locations were:

Meander#	Station	to	Station
1	499+50		503+50
2	449+50		454+00
3	349+50		355+50
4	299+75		305+25
5	399+75		406+50

Figure 15. Design for Meanders #1 and 2

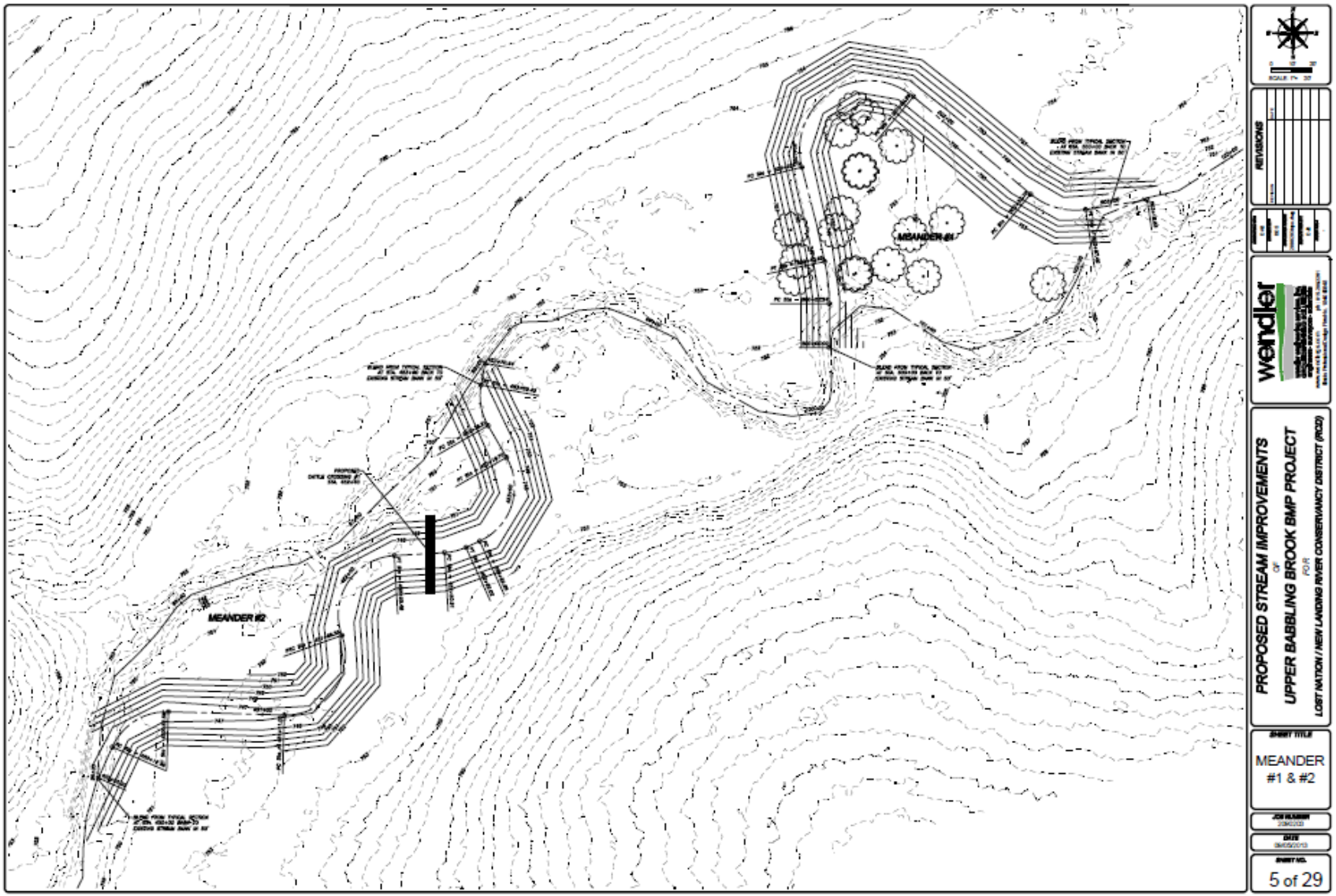


Figure 16. Design for Meander #3.

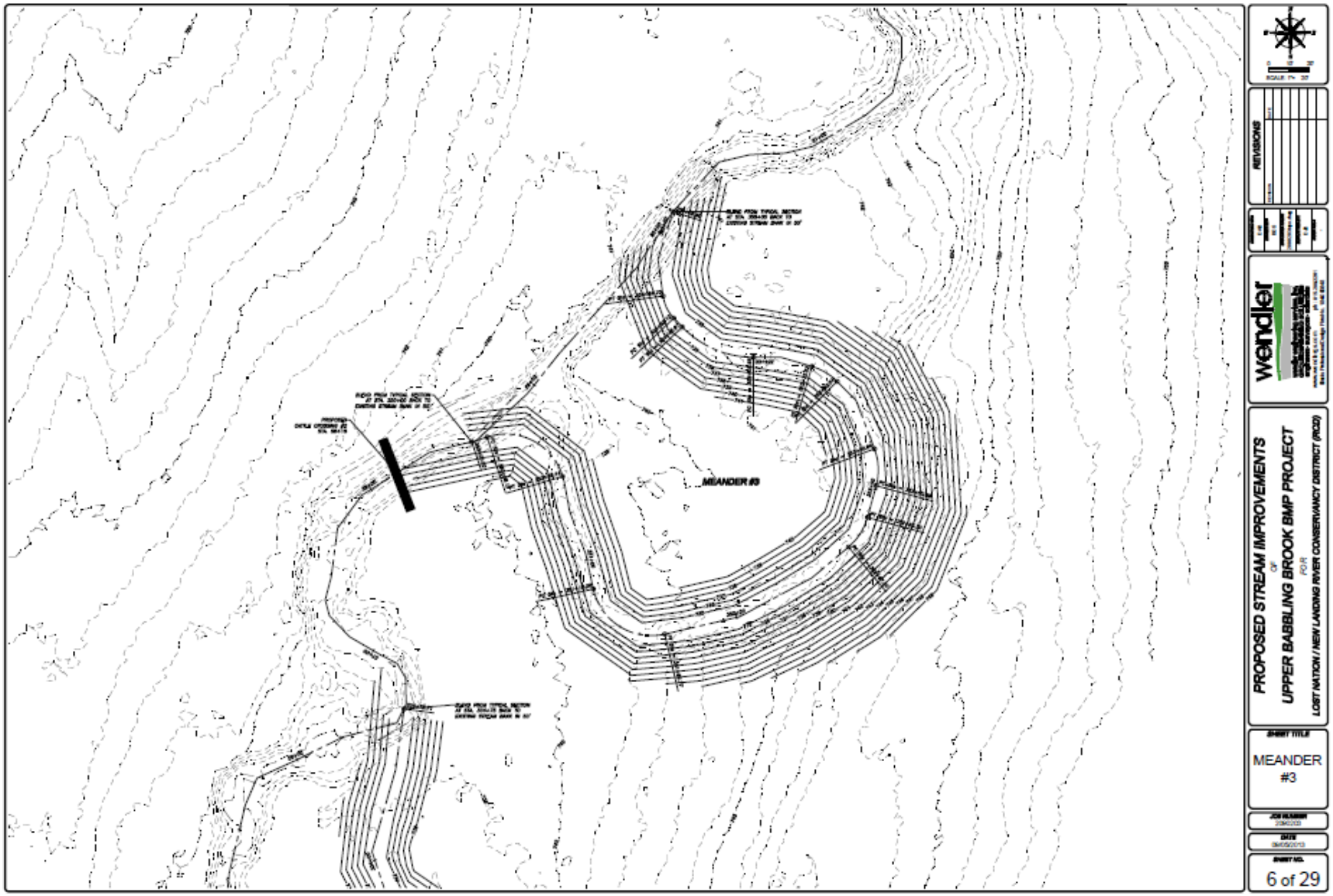


Figure 17. Design for Meander #4.

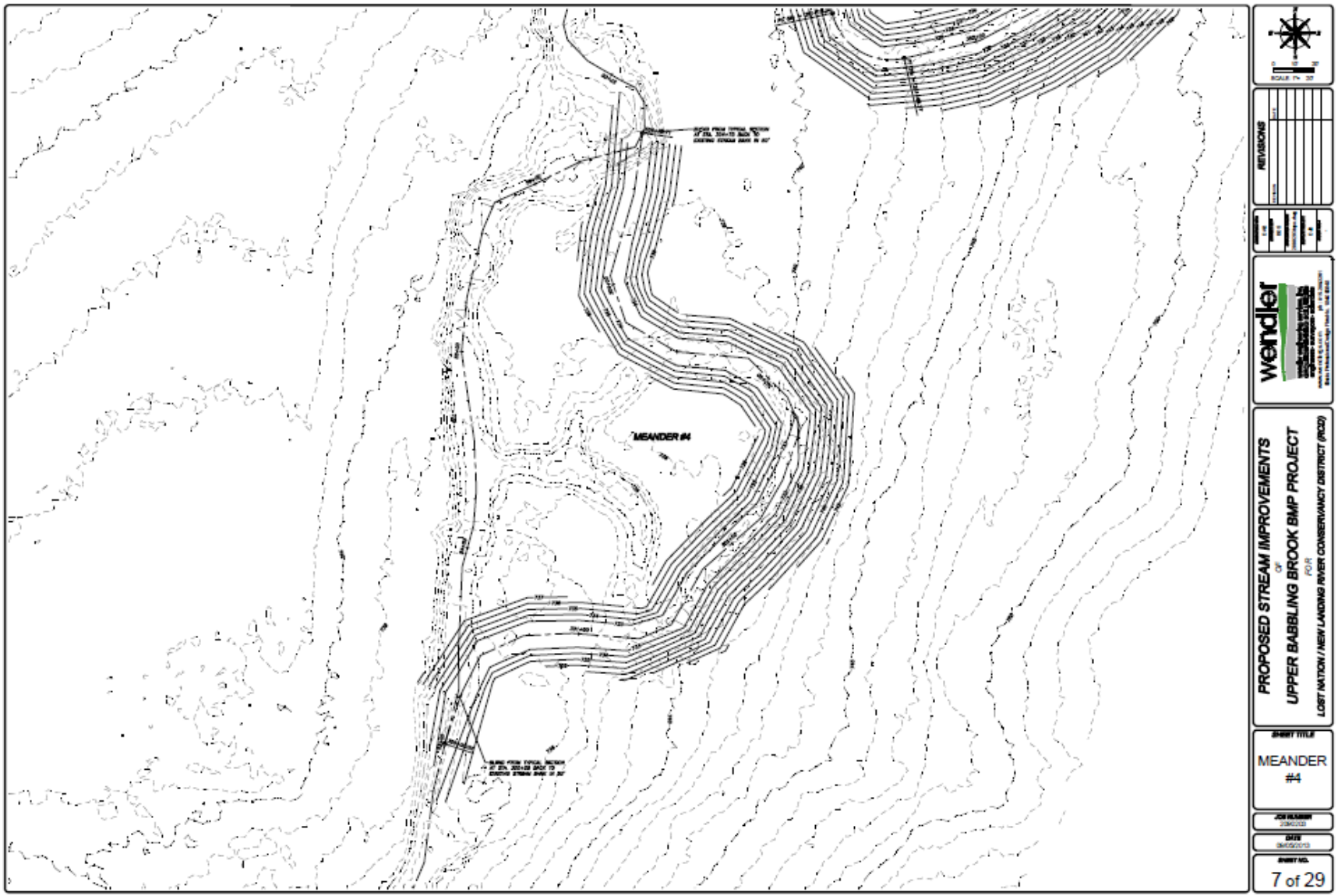
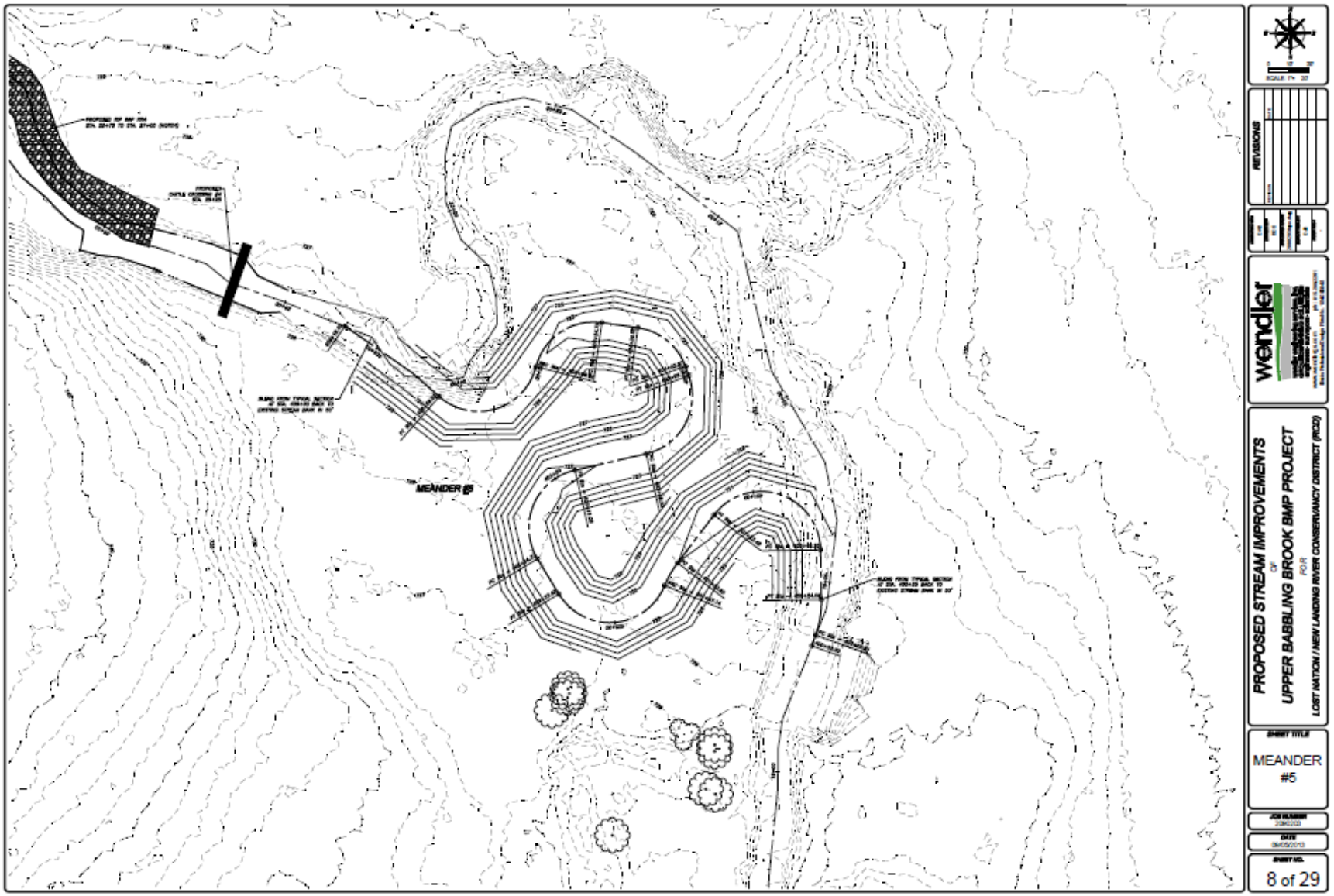


Figure 18. Design for Meander #5.



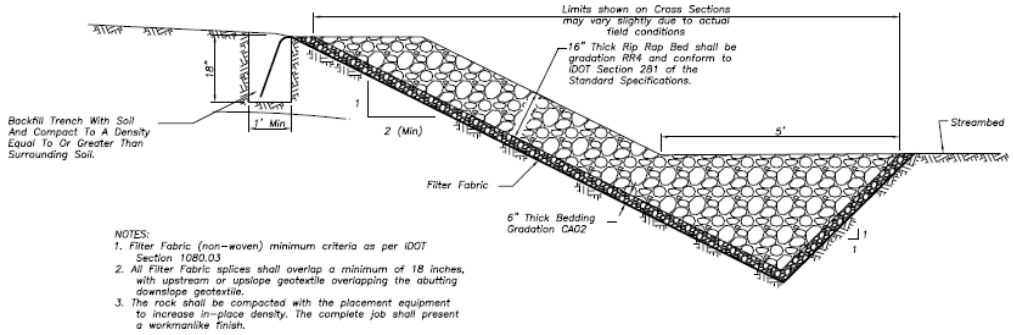
Rip Rap

Rip rap was used to reinforce outer bends of the meanders and other select locations that received the greatest stress from the stream's current. Either RR4 or RR5 rock was used according to the typical cross sections illustrated in Figures 19 and 20. Locations were:

RipRap#	Station	to	Station
1	91+00		92+25
2	71+75		73+00
3	69+00		71+40
4	25+75		33+00

In addition to these locations, an additional rip rap was added, including 60 linear feet to Meander #1, 200 linear feet to Meander #3, 90 linear feet to Meander #4, and much of Meander #5.

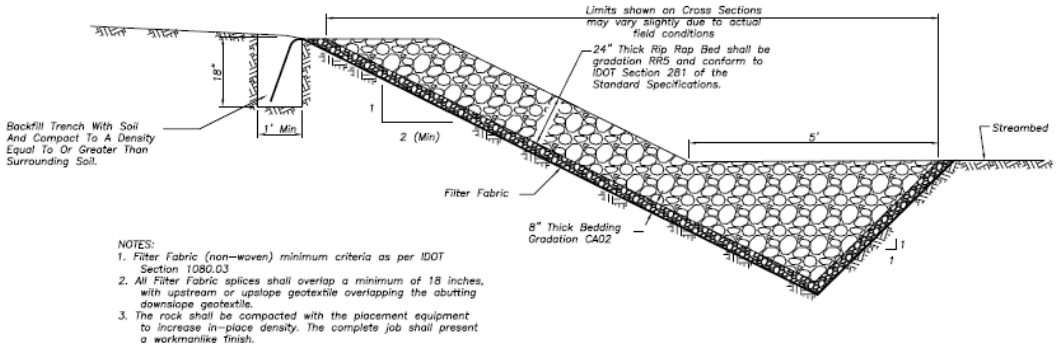
Figure 19. Typical cross section of Rip Rap with RR4.



TYPICAL SECTION RIPRAP-RR4

STA. 25+75 – STA. 27+00 NORTH SIDE
STA. 27+00 – STA. 27+75 SOUTH SIDE
STA. 27+75 – STA. 29+25 NORTH SIDE
STA. 29+25 – STA. 31+25 SOUTH SIDE
STA. 32+00 – STA. 33+00 NORTH SIDE
STA. 71+75 – STA. 73+00 EAST SIDE
STA. 91+00 – STA. 92+25 WEST SIDE

Figure 20. Typical cross section of Rip Rap with RR5.



TYPICAL SECTION RIPRAP-RR5

STA. 69+00 – STA. 71+40 WEST SIDE

Rip rap was placed along the outer bends of the banks that had the most severe erosion and were likely contributing the greatest amount of pollutant loading to Babbling Brook. Placements are illustrated below in Figures 21 through 23.

Figure 21. Placement of Rip Rap #1.

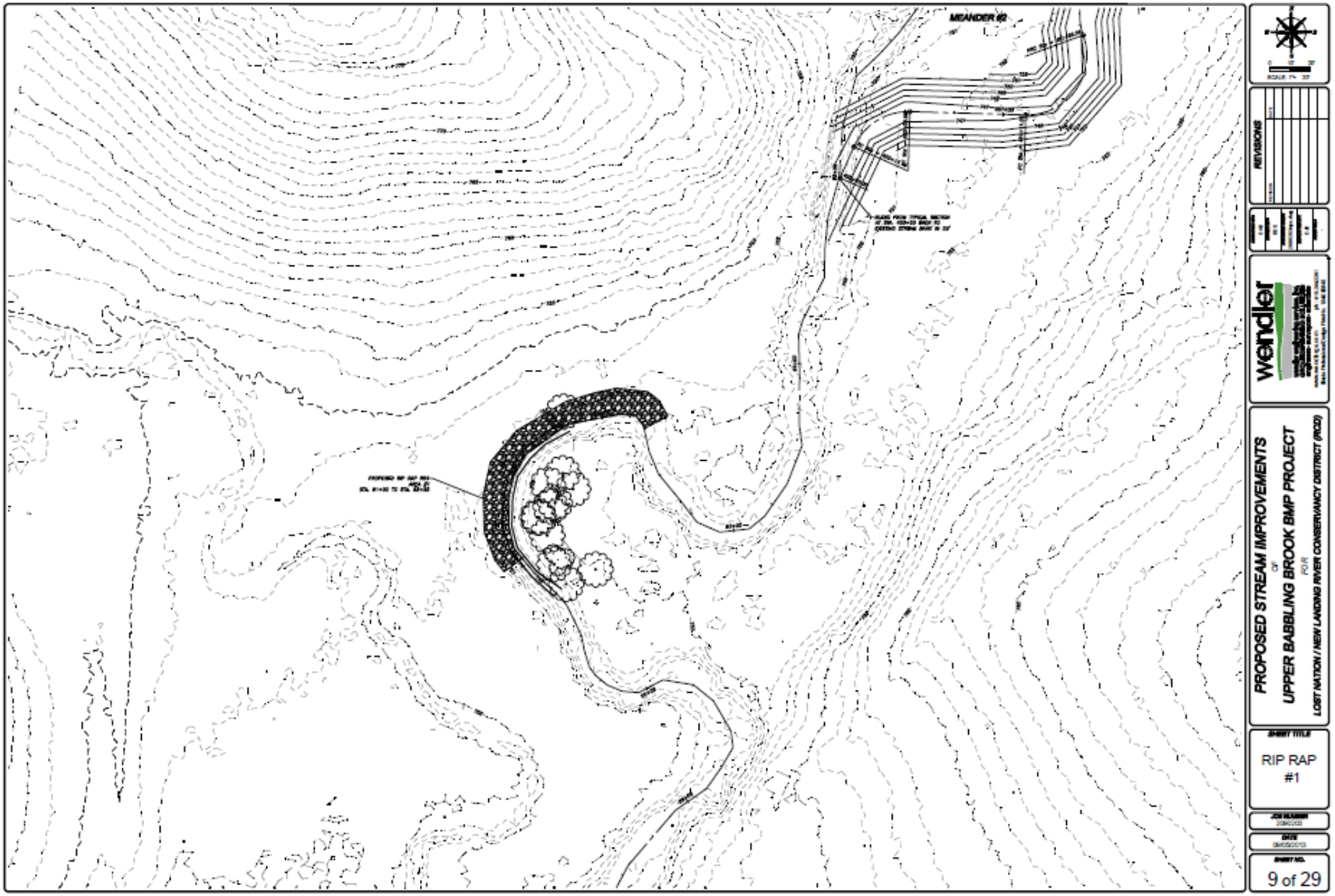


Figure 22. Placement of Rip Rap #2 and #3.

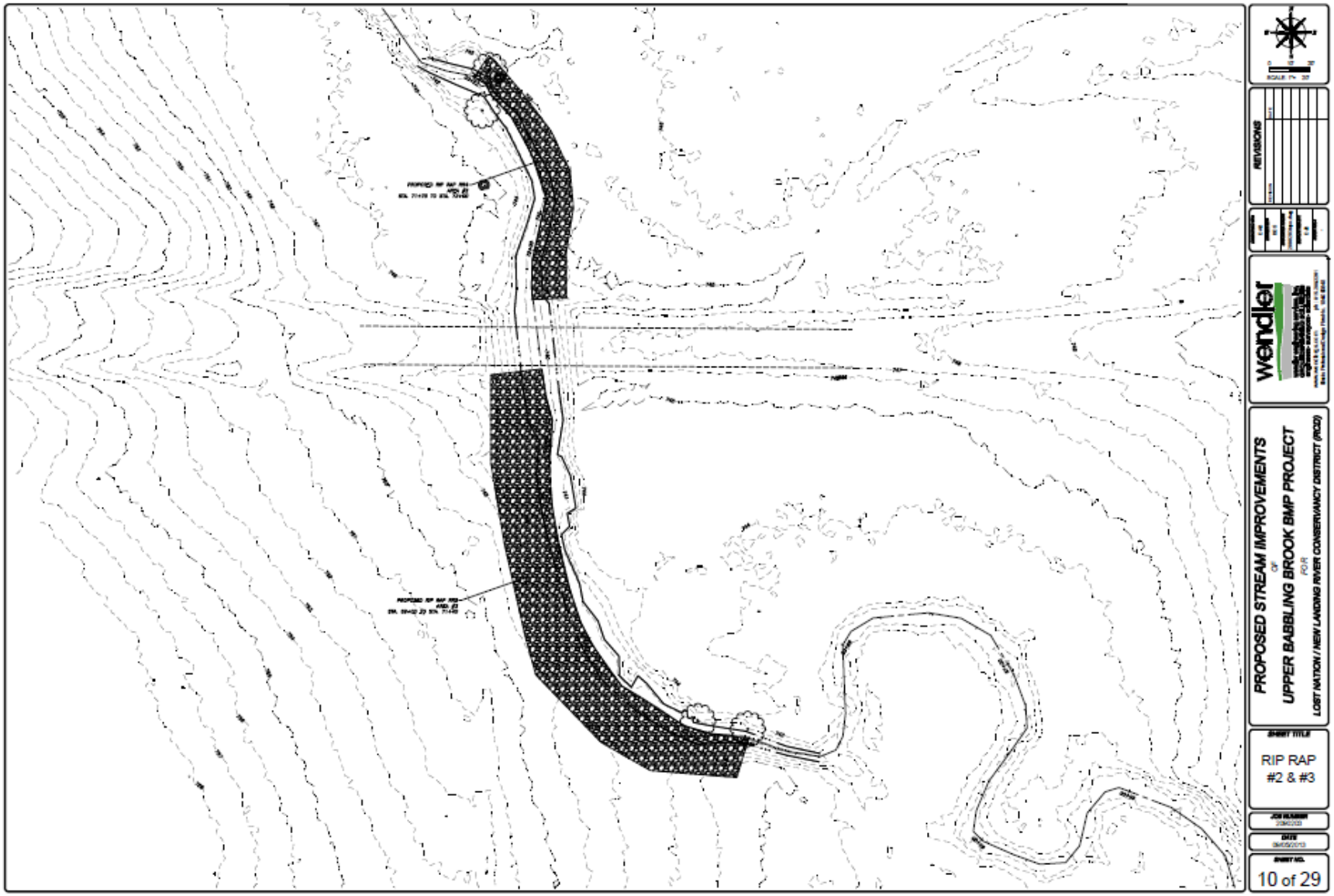
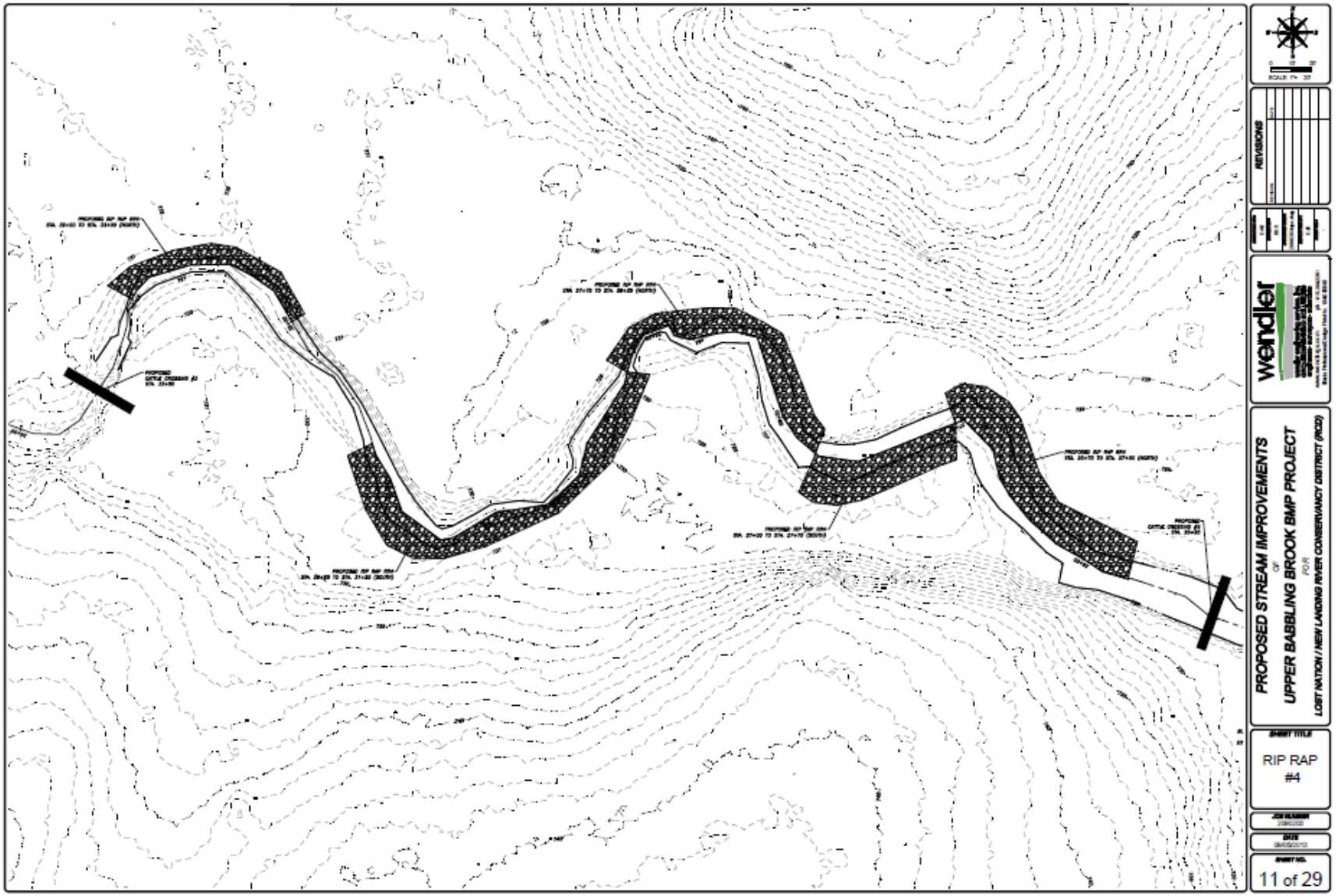


Figure 23. Placement of Rip Rap #4

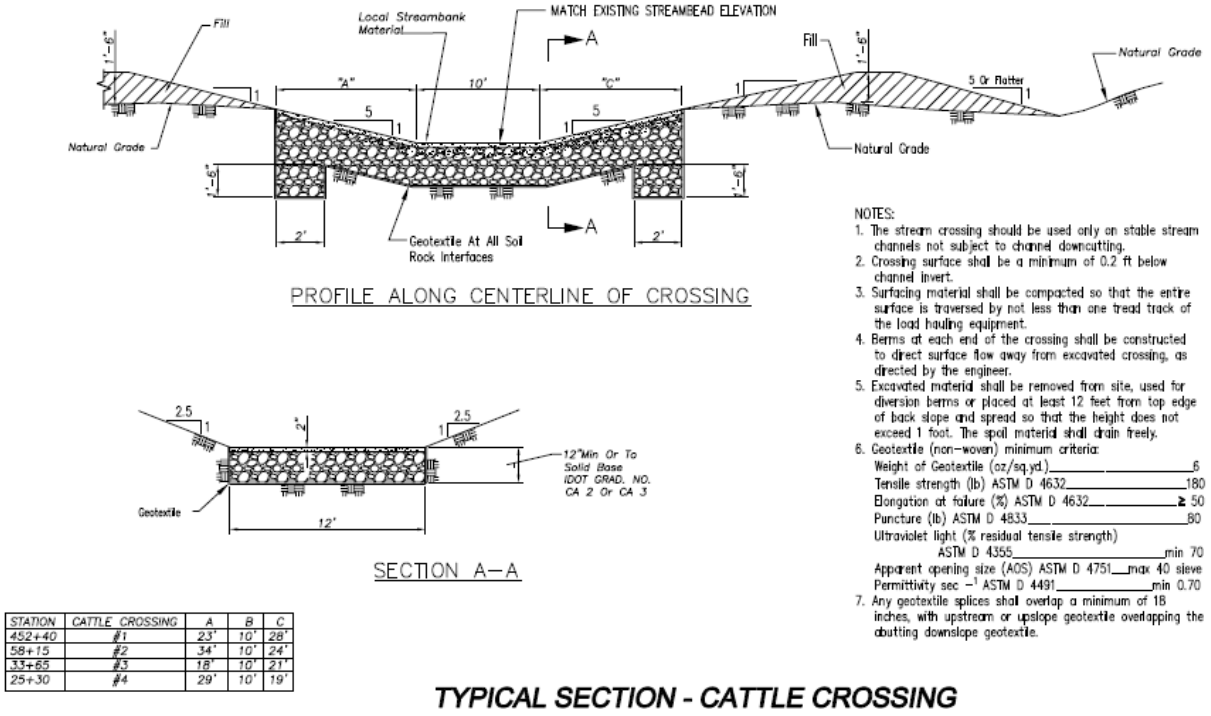


Cattle Crossings

Four cattle crossings were spaced throughout the stream reach to direct cattle traffic as shown in Figure 24. Locations were:

Crossing#	Station
1	103+00
2	58+15
3	33+50
4	25+25

Figure 24. Typical cross section of cattle crossing.



Filter Strip

Native vegetation was planted in all disturbed areas along the stream and basin to create filter strips. Disturbed areas included banks and approximately 30 feet beyond the bank along the stream near the location of each BMP. The disturbed area surrounding the basin included the entire cattle enclosure, as depicted by the fencing locations in Figure 14. The entire filter strip area totaled approximately 12.5 acres. The Filter Strip Mix, listed in Figure 25, was planted with a cover crop of Annual Oats *(Avena sativa).*

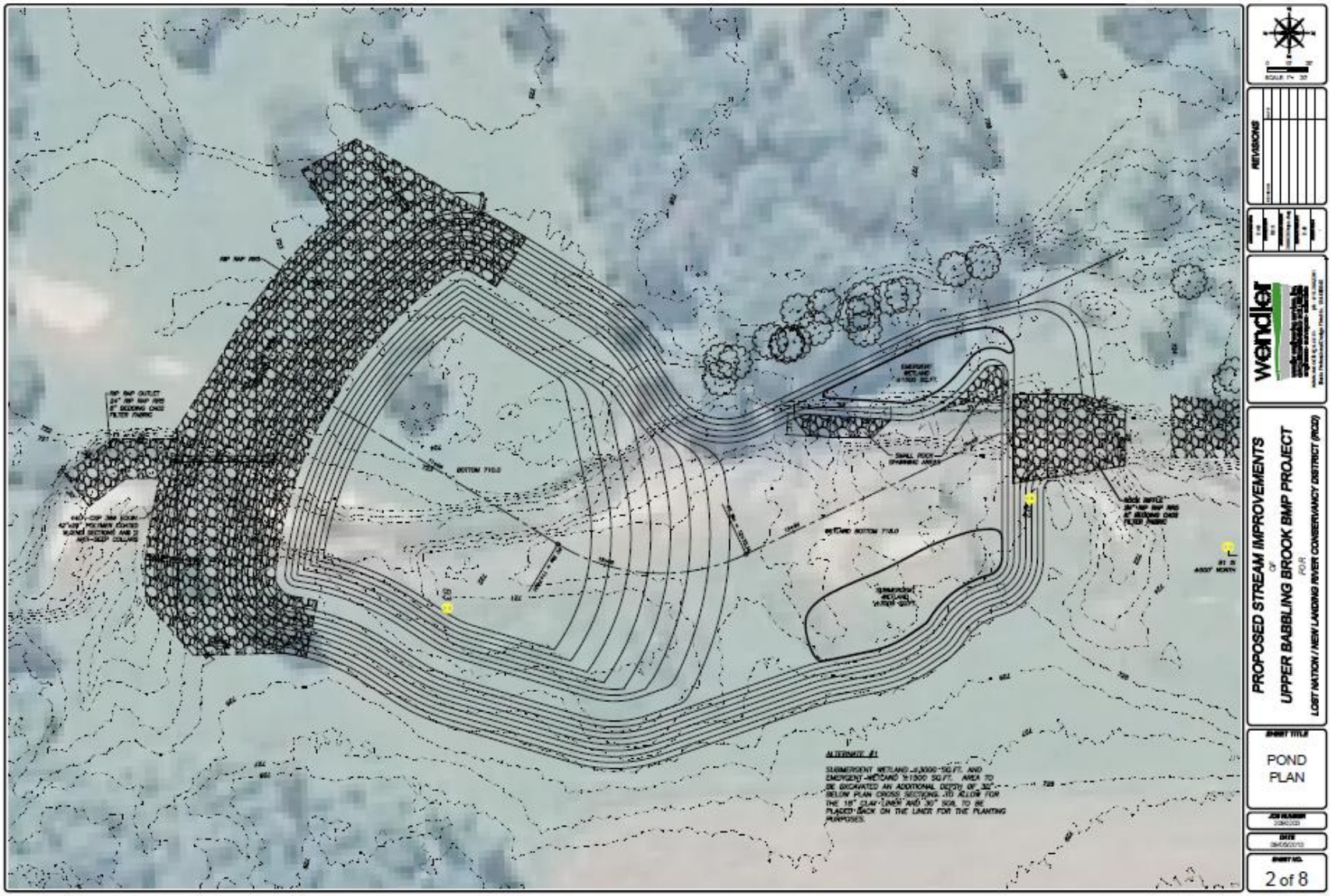
Figure 25. Filter Strip Mix.

Dry-Mesic Filter Strip		lbs/ac
Elymus trachycaulum	Slender Wheat Grass	2.000
Schizachyrium scoparium	Little Bluestem	7.000
Bouteloua curtipendula	Side-oats Grama	3.000
Carex bicknellii	Copper-shouldered Oval Sedge	0.250
Carex brevior	Plains Oval Sedge	0.250
Elymus virginicus	Virginia Wild Rye	2.000
	Total lbs/ac	14.500

Phase 2: BMP Type, Location, and Design

Phase 2 included all BMPs downstream of Meander #5 to the southern property line. BMPs included rock riffle, sediment basin, emergent wetland planting bed, submergent wetland planting bed, rip rap, turf reinforcement matting, and filter strips of native vegetation, livestock exclusion fencing, and tile with grassed waterways. An overview of these BMPs is illustrated below in Figure 26.

Figure 26. Overview of Phase 2: Basin and associated BMPs.



Sediment Basin

A 2.55-acre sediment basin was constructed immediately after Meander 5 and continued to the south boundary of the property as illustrated in Figure 26. The basin was originally designed to be lined with an 18 in clay liner. Soil testing after basin excavation indicated that the basin would hold water without using a clay liner, so the pond was left over-excavated by 18 in to allow for more sediment to be captured. Features such as constructed wetlands and outlets were filled to the originally designed elevations. Banks were graded to 3:1 slopes. Final elevations of basin features were as follows:

Feature	*Elevation*	
Deep Bottom	708.5	ft
Shallow Bottom	716.5	ft
Shelf	717	ft
Normal Pool	721	ft
Top of Berm	725	ft

Basin features included rock riffle entrance (Figures 27 and 28), rip rap at the bottom of the slope (1 ft above and 1 ft below pool and 6 ft wide), and a berm with overflow outlet on the downstream side (Figure 29).

Figure27. Rock riffle design.

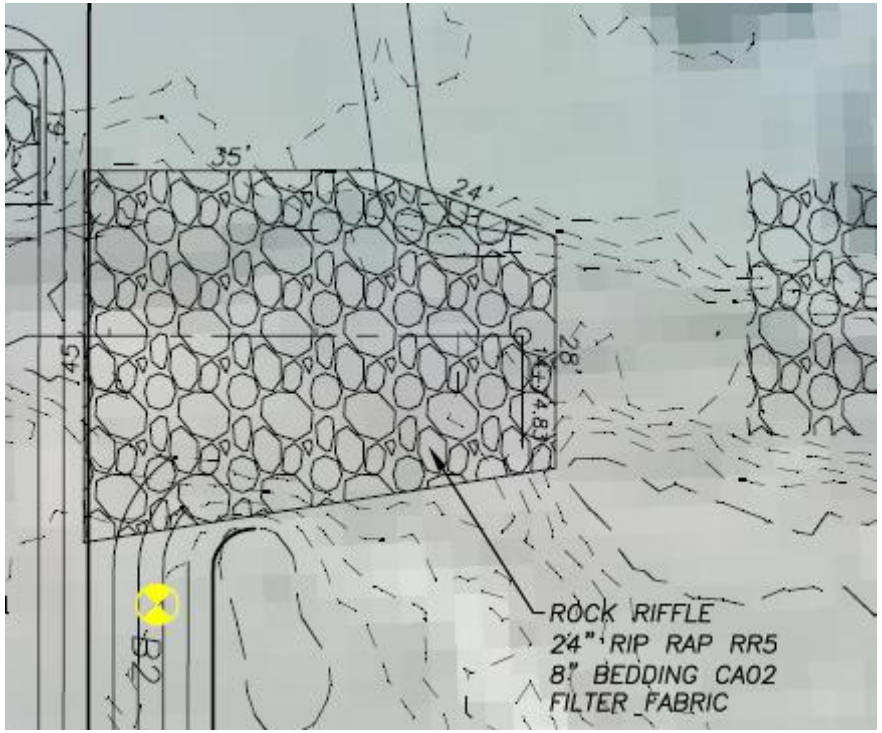


Figure 28. Rock riffle cross section.

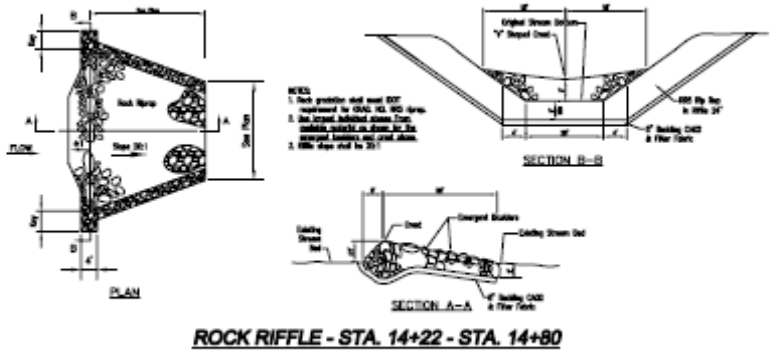
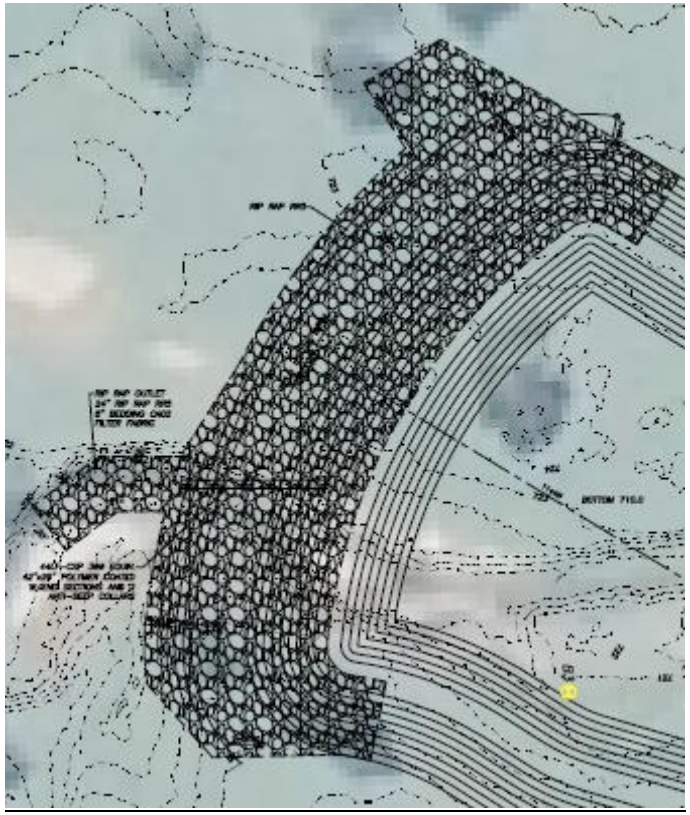


Figure 29. Berm with overflow outlet.



Constructed Emergent Wetlands

Native, emergent wetland vegetation was planted within the sediment basin as a seed mix along the water's edge and as plugs in a 1,500-sq ft bed in the northwest corner as illustrated in Figure 30. It was protected from the current and elevated to slope from pool level (721 ft) to six inches below pool (720.5 ft) with rock. The rock also provided spawning areas for fish and had the dimensions 49 ft x 11 ft and 31 ft x 19 ft (see Figure 30). Species in the seed mix planted along the water's edge are listed in Figure 31. Plugs planted within the emergent wetland are listed in Figure 33. Emergent wetland vegetation should spread to shallow depths within the basin over time.

Figure 30. Emergent wetland planting bed.

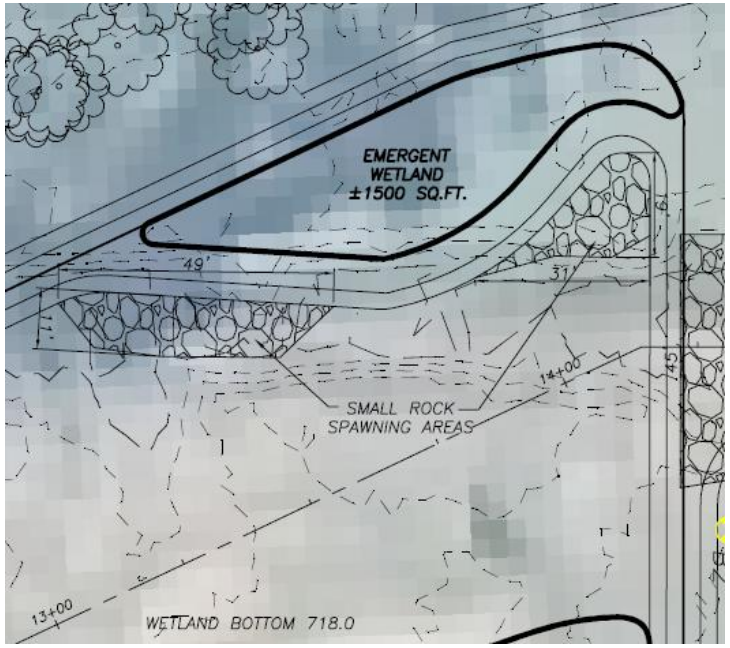


Figure 31. Wetland Edge native seed mix.

Wetland Edge		lbs/ac
Acorus americanus	Sweet Flag	0.125
Alisma subcordatum	Mud Plantain	0.500
Asclepias incarnata	Swamp Milkweed	0.250
Aster novae-angliae	New England Aster	0.250
Carex stipata	Common Fox Sedge	0.125
Carex vulpinoidea	Brown Fox Sedge	1.000
Eleocharis palustris major	Great Spike Rush	0.188
Eupatorium perfoliatum	Common Boneset	0.063
Glyceria striata	Fowl Manna Grass	0.500
Helenium autumnale	Sneezeweed	0.250
Iris virginica shrevei	Southern Blue Flag	0.125
Juncus effusus	Common Rush	0.063
Leersia oryzoides	Rice Cut Grass	0.250
Lobelia cardinalis	Cardinal Flower	0.031
Lobelia siphilitica	Great Blue Lobelia	0.031
Lycopus americanus	Water Horehound	0.063
Mimulus ringens	Monkey Flower	0.063
Polygonum spp.	Smart Weed	1.000
Pontederia cordata	Pickerel Weed	0.250
Sagittaria latifolia	Common Arrowhead	0.250
	Total lbs/ac	5.377

<u>Constructed Submergent Wetlands</u>

Native, submergent wetland vegetation was planted within shallow depths of the sediment basin as plugs in a 3,000-sq ft bed in the northeast corner as illustrated in Figure 32. It was protected from the current and elevated with rock to 719 ft above mean sea level. Vegetation is expected to spread throughout the shallow portions of the sediment basin over time.

Figure 32. Submergent wetland planting bed.

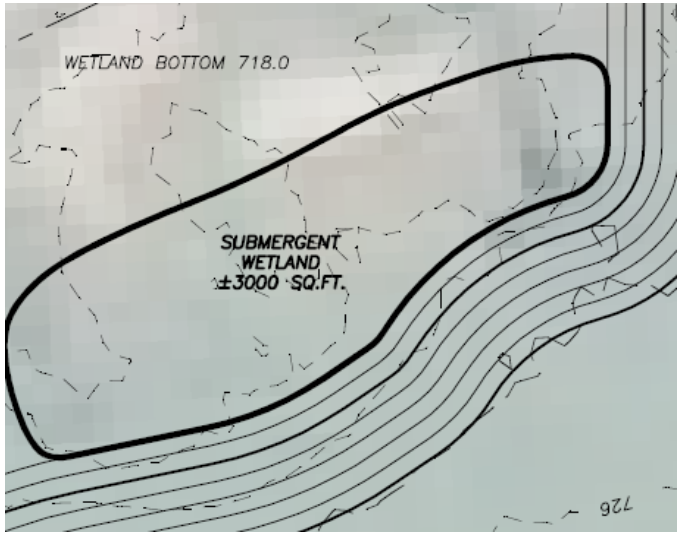


Figure 33. Native plug list for emergent and submergent wetlands.

Scientific Name	Common Name	# plugs
Emergent Wetland		
Acorus calamus	Sweet Flag	64
Carex comosa	Bristly Sedge	32
Carex lacustris	Common Lake Sedge	32
Carex lurida	Sallow Sedge	32
Carex vulpinoidea	Brown Fox Sedge	32
Iris virginica shrevei	Southern Blue Flag	32
Juncus effusus	Common Rush	32
Leersia oryzoides	Rice Cut Grass	32
Lycopus americanus	Water Horehound	32
Pontederia cordata	Pickerel Weed	32
Sagittaria latifolia	Common Arrowhead	64
Submergent Wetland		
Nelumbo lutea	Water lotus	150
Nuphar advena	Spatterdock	50
Nymphaea odorata	Fragrant water lily	50
Nymphaea tuberosa	White water lily	50
Potamogeton nodosus	Long leaf pondweed	50
Potamogeton pectinatus	Sago pondweed	150
Sparganium americanum	American bur reed	100
Sparganium eurycarpum	Common bur reed	100
Zizania aquatica	Wild Rice	50
	Total plugs	1166

Filter Strip

A filter strip of native vegetation was planted on the slopes above the wetland edge mix and extended to the livestock exclusion fencing. The seed mix is listed in Figure 25 above.

Livestock Exclusion Fencing

Approximately 4,500 feet of fencing excludes cattle from the silt basin. Location of the fencing is shown in yellow in Figure 14 above.

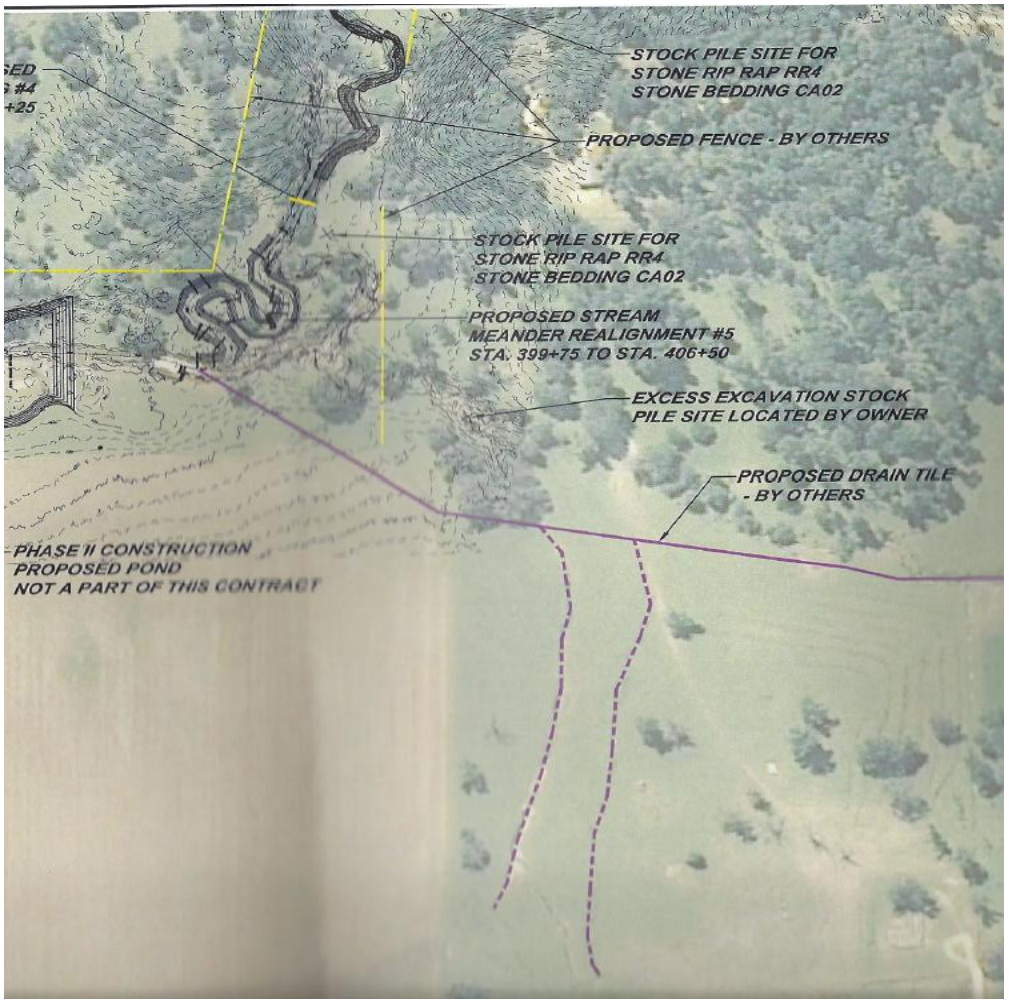
Tile

Within the active pasture, two tile lines were laid. The main feeder stretched approximately 1,100 feet and two bilateral feeders totaled 1,000 feet (see Figure 34).

Tile was installed according to standard procedure, outlined in the steps below.

1. The area to trench was marked in the field.
2. Tile was laid on a gradual grade using GPS- guided equipment.
3. Tile was laid 3-4' below the surface. The size of the tiles were 8-10" for the main (north to south) line and 4" for the two feeder lines.
4. Tile was laid within a 2'-wide trench and then back filled with soil.
5. Outlet was reinforced with a steel pipe. Outlet fell directly into the stream between Meander #5 and the sediment basin.
6. Soil from pond excavation was used to fill eroded sections and restored to a natural grade to from a grassed waterway to accept surface runoff.
7. Grassed waterway was seeded with a pasture mix that included 3-4 grasses and 2 legumes at a rate of 8-10 lbs/ac. A cover crop of annual oats was sown at a rate of 32 lb/ac.

Figure __. Tiling plan.



Methods of Installation

The project was divided into two phases, and each phase was bid separately and had its own timeline. Phase 1 addressed the stream from Meander #1 (headwaters) to Meander #5. Construction was completed on Phase 1 while bids were accepted for Phase 2, which included the sediment basin and wetlands. A professional contractor, Martin & Company was hired to re-meander channels, install rip rap, and build the sediment basin. A foreman, Ed Bettner, volunteered his time to remove trees, install turf reinforcement mats, plant native vegetation, and install cattle crossings. For additional rip rap, fencing, and tile installation, Bettner hired a small contractor, Jeff Winterland, to assist. The design team provided monitoring and inspections during construction and approved the final installation and provided further suggestions.

EVALUATION OF PROJECT SUCCESS

Water Quality Improvements

The project was estimated to significantly reduce nonpoint source pollutants entering the stream from the severely eroded streambanks and ditches treated with various BMPs. Using the ILEPA pollutant load estimate reduction worksheets for all project sites, we estimated that each year the project would reduce pollutants totaling approximately:

318,202 pounds/year of total suspended solids,
1,509 tons/year of sediment,
1,523 pounds/year of total phosphorous, and
2,565 pounds/year of nitrogen.

A breakdown of pollutant load reduction estimates per BMP is provided below in Figure 35. Reducing nonpoint source pollution entering Babbling Brook will aid in removing the impairment status of Lost Lake for aesthetic quality. Effects of improved water quality will carry downstream to the Rock River.

Figure 35. Pollutant load reduction estimates per BMP.

PHASE 1							
BMP Number	BMP Name	Feet	Nitrogen Load Reduction (lbs/year)	Phosphorus Load Reduction (lbs/Year)	Sediment Load Reduction (tons/year)	Total Suspended Solids Reduction (lbs/Year)	Comment
3191305001	Stream Channel Restoration (9)	850	101.2	50.6	50.6		Stream meander realignment no. 1 and 2
3191305002	Stream Channel Restoration (9)	1150	274.2	137.1	137.1		Stream meander realignment number 3 and 4
3191305003	Stream Channel Restoration (9)	675	216.3	108.2	108.2		Stream meander realignment number 5 (including 40,500 sq. ft. of native plant filter strip)
3191305004	Streambank and Shoreline Protection (580)	125	38.1	19.0	19.0		Streambank stabilization (riprap and reseeding of disturbed areas) RR area 1
3191305005	Streambank and Shoreline Protection (580)	365	31	15.5	15.5		Streambank stabilization (riprap and reseeding of disturbed areas sq. ft. of native plant filter strip) RR area 2 and 3
3191305006	Streambank and Shoreline Protection (580)	650	130.1	65.1	65.1		Streambank stabilization (riprap and 39,000 sq. ft. of native plant filter strip) RR area 4
3191305007	Stock Trails and Walkways (575)	12	N/A	N/A	N/A		Stream cattle crossing #1
3191305008	Stock Trails and Walkways (575)	12	N/A	N/A	N/A		Stream cattle crossing #2
3191305009	Stock Trails and Walkways (575)	12	N/A	N/A	N/A		Stream cattle crossing #3
3191305010	Stock Trails and Walkways (575)	12	N/A	N/A	N/A		Stream cattle crossing #4
PHASE 2							
3191305011	Livestock Exclusion Fencing	4500	N/A	N/A	N/A	N/A	No estimates associated with fencing.
3191305012	Sediment Basin (acres)	2.55	N/A	220.4	N/A	250,637	
3191305013	Grass Swales	2200	413.6	182.3	168.3	31,824	
3191305014	Filter Strip (acres)	7.92	1360	725	567	35,741	

Other Improvements

The project will also improve habitat for fish, migratory waterfowl, macro invertebrates, and other members of healthy stream and lake communities.

PROJECT TASKS

The project was conducted according to the schedule (Figure 36) and costs (Figure 37) below.

Schedule – *Figure 36. Schedule.*

Quarter	Category	Activities
May-July 2013	Design Specifications	Project team initial meeting.
	Permits	Illinois Historic Review completed and approved.
	Landowner Agreements	Landowner between RCD and Bettner signed and submitted to RCD.
	Sign	Sign designed.
Aug-Oct 2013	Design Specifications	Phase 1 design specifications completed and approved.
	Permits	Army Corps of Engineers permit issued. Illinois Department of Natural Resources declared no DNR permit necessary.
	Design Implementation	Bid notices for Phase 1 published in local paper.
	Sign	Sign design approved.
Nov 2013-Jan 2014	Design Implementation	Phase 1 bid awarded. Access routes created. Invasive trees removed within filter strip areas.
	Sign	Sign erected along Hay Road.
Feb-Apr 2014	Design Specifications	Phase 2 design specifications completed and approved.
	Design Implementation	Phase 1 earthwork completed and rip rap placed. Phase 2 bid published in local paper and submitted from bidders to RCD. Photographic documentation of construction taken.
May-Jul 2014	Design Implementation	Phase 2 construction initiated.
Aug-Oct 2014	Design Implementation	Phase 1 and 2 final grading completed and seeding and TRM installed. Additional rip rap placed.
Nov 2014-Apr 2015	Design Implementation	Additional rip rap placed.
May-Jul 2015	Design Implementation	Emergent and submergent plugs planted.

Costs

The project was managed and partially funded by three parties. The largest portion of funding assistance (60% of the total budget) was procured from the Illinois Environmental Protection Agency (ILEPA) through Section 319 of the Clean Water Act. The remaining 40% came from two private parties. Bettner Farms, the landowner of the project area, supplied 20% of the funding in the form of cash and in-kind services. The Lost Nation/New Landing River Conservancy District provided the remaining 20% of the funding, also in the form of cash and in-kind services. They are a government body charged with managing Lost Nation Lake (located downstream of the project area) and supported by a Special Assessment Area within the immediate vicinity of the lake. The budget breakdown is outlined below.

Funding was provided by the RCD, Bettner Farms, and the ILEPA through Section 319 of the Clean Water Act as follows:

ILEPA:	$360,000
RCD and Bettner Farms:	$240,000
Total:	$600,000

Actual costs for each line item are provided in Figure 37, and the breakdown of match contributions is outlines in Figure 38.

Figure 37. Actual costs per line item.

	Actual Costs ($)
Expense	
1. Direct Labor	
Administration	
Admin-Becky B.	2,663.05
Admin.-Tina B.	744.15
Newspaper Bid Notices	464.10
Total Administration	3,871.30
Professional/Technical	11,625.00
Total 1. Direct Labor	15,496.30
4. Equip., Materials, Supplies	
Native Plant Materials	
4. Equip., Materials, Supplies - Other	
Total 4. Equip., Materials, Supplies	33,919.12
5. Subcontracts	
Basin/Meander/Stabil.Contractor	
Basin	249,193.15
Meander	36,593.50
Stabilization	88,829.74
Total Basin/Meander/Stabil.Contractor	374,616.39
Construct Facilitation (JadEco)	34,570.47
Engineering Design & Inspection	42,751.25
Grant Administration (OES)	13,751.45
Tile/Fence/Cross/Plant Foreman	68,452.88
Wetland & Filter Contract.(OES)	16,442.14
Total 5. Subcontracts	550,584.58
Total Expense	600,000.00

Figure 38. Cash and in-kind contributions from matching funding sources.

Source	Cash	In-Kind Services	Total
RCD	$108,375.00	$ 11,625.00	$120,000.00
Bettner Farms	$ 27,422.30	$ 92,577.70	$120,000.00
Total	$135,797.30	$104,202.70	$240,000.00

SUMMARY OF PROJECT FINDINGS

Cost-effectiveness of practices

The process of determining cost effective BMPs to implement for the project began with a fixed budget from which a project was designed. The RCD decided on a project budget that would fit within their overall budget, Bettner Farms pledged the same amount, and an overall project budget was determined given the total matching funds. A project was then designed to address the stream conditions contributing the greatest amount of nonpoint source pollutants to Babbling Brook. In order to address as many of these stream conditions as possible, the project engineer determined which BMPs would be most effective, and the most cost effective of those were chosen.

FURTHER RECOMMENDATIONS

The completed project is a major step to meeting the goals of improving the aesthetic impairment of Lost Nation Lake, although more work within the watershed upstream from the lake is planned for long-term success. The *Clear Creek Watershed Action Plan* recommends additional work within the watershed upstream from the lake and within the lake community, including agricultural, hydrologic, and urban treatments. If all recommended projects within the plan were implemented, it was originally estimated by the plan to be possible to reduce sediment by 2,600 tons, phosphorous by 5,129 pounds, and nitrogen by 41,339 pounds per year. This project reduced pollutant loading by 1,509 tons/yr of sediment, 1,523 lb/yr phosphorous, and 2,565 lb/yr nitrogen. There is ample opportunity for reducing more nonpoint source pollutants within the watershed; probably more than originally projected by the plan.

The completed project was the third along Babbling Brook. It was predicated by the Babbling Brook and Lost Lake Stabilization Project (Grant #3191003) and The Nature Conservancy's purchase and restoration of lands previously managed as a large cattle operation. Together these projects cover the entire length of Babbling Brook, except of one segment that runs through private property neighboring Bettner Farms. It is recommended that BMPs be installed on the neighboring property to further reduce pollutants flowing into the completed project areas and eventually into Lost Nation Lake. The landowner has initiated contact to the RCD about implementing a similar project on his property, and the RCD Board of Directors has elected to pursue this opportunity.

LITERATURE CITED

Illinois Environmental Protection Agency. 2014. Illinois Integrated Water Quality Report and Section 303(d) List-Volume I: Surface Water – 2014, Appendix A-1. 303(d) List. Springfield, IL: ILEPA Bureau of Water. http://www.epa.state.il.us/water/tmdl/303-appendix/2014/appendix-a2.pdf

Illinois Environmental Protection Agency. 2010 (July 22). "Region 5 Load Estimation Spreadsheet Model." Last updated 11-23-09. http://it.tetratech-ffx.com/steplweb/models$docs.htm

ATTACHMENT A
PHOTOGRAPHIC DOCUMENTATION OF DESIGN INSTALLATION

See more photographs at www.babblingbrook.smugmug.com.

Sign at Hay Road

Invasive tree removal

Creation of meanders

Rip rap – sloping the banks and material