Kickapoo Creek Project – Phase I
IEPA 319 Grant

Final Report
Grant #3190713

Submitted By:

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For

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Prepared for:
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EXECUTIVE SUMMARY

The City of Bloomington was awarded a $950,000 IEPA 319 Grant to implement several strategies to control nonpoint source pollution, including sediment and nutrients, along Kickapoo Creek in McLean County, IL. The project site is located at the junction of two headwater tributaries of Kickapoo Creek, approximately 6 ¼ miles east of downtown Bloomington, where a new 450 acre subdivision is being constructed. The watersheds of the two tributaries are markedly different; with the smaller northern tributary urbanizing while the larger, eastern tributary remains agricultural for the foreseeable future. The site provided a unique opportunity to study and implement several strategies for nonpoint source pollution control by restoring the channel and floodplain within an 88-acre City park.

The existing channel was characterized as a straightened, trapezoidal ditch with steep side slopes and a deep channel, essentially cutting off its connection with the adjacent floodplain during all but extreme events. The adjacent floodplain was cultivated agricultural land with limited buffer between it and the creek. The channel experienced high sediment and nutrient loads and its altered geometry resulted in an aggressive flow causing significant channel bank erosion and in-stream deposition of sediment.

The project was challenged with many different design objectives, many of which conflicted. Controlling sediment, stabilizing the channel, and restoring habitat often conflicted with hydraulic objectives involving detention, flow restriction, and flood levels. The solution included a high flow restriction at the downstream end to provide flow control and detention at the higher levels, while maintaining adequate velocities to convey upstream sediment loads. Additional riparian wetlands at the storm sewer outlets and a reconnection of the floodplain to the channel provided detention, water quality improvement, and habitat restoration at the lower flows.

The construction of the adjacent subdivision began in the summer of 2006 while study and design of the creek restoration was completed in the spring of 2008. A $1,360,000 site work contract was completed in November of 2008, which included the restoration and protection of approximately 2800 lineal feet of creek and approximately 40 acres of floodplain restoration and the construction of 4.5 acres of riparian wetlands. A second, $250,000 landscaping contract was completed in June 2009 with the native plantings and erosion controls in the 40 acres of restored wetlands. Additional monies were secured and used for approximately 3,000 live plantings in the riparian wetlands.

The restored channel and floodplain have responded well to numerous high-flow events experienced since their completion. Challenges encountered during the installation of the native plant seed have been overcome and germination and growth is occurring. Under separate study, monitoring of the sediments, water quality, flow and aquatic species is occurring for submission under separate report. Construction of the second phase of the channel restoration, upstream of the phase constructed with this grant, is scheduled for this fall. Several lessons learned during the design and construction of this phase will be implanted in the second phase and continued success in restoration of Kickapoo creek is anticipated.

INTRODUCTION

The project site is located in Section 9, Township 23N, Range 3E along the upper reaches of Kickapoo Creek in central McLean County, IL, approximately 6 ¼ miles southeast of the City of Bloomington's downtown business district. The southern boundary of the project site is Ireland Grove Road, approximately 1 ¼ mile east of its intersection with Towanda-Barnes Road. Two tributaries of Kickapoo Creek come together immediately north of the Ireland Grove Road bridge and flow southward toward the Village of Downs, approximately 4 ¼ miles south of the site. The northern tributary's headwaters originate near the Central Illinois Regional Airport on the east side of Bloomington. The other tributary flows from the east, with its headwaters near the Village of Arrowsmith in eastern McLean County. The upstream limit of the project site on the north tributary is approximately 4000 lineal feet upstream of Ireland Grove Road and at Township Road 2100E, approximately 5400 lineal feet upstream of Ireland Grove Road, on the eastern tributary. The project site and its limits are shown in Figure 1. The tributaries and their respective watersheds are shown in Figure 2.

The project site provides a unique opportunity to identify the impacts that development might have on an agricultural watershed and utilize BMP's to reduce nonpoint source water pollution occurring in the reach. In 2005, the City of Bloomington annexed approximately 450 acres surrounding Kickapoo Creek along the project site for planned single family housing development. An elementary school was also proposed for a 50 acre parcel in the extreme southeast corner of the development. The site has previously been in agricultural use, in a corn and beans rotation.

Additionally, the two tributaries that join immediately upstream of Ireland Grove Road also have differing land uses because of urban development. The northern tributary, while smaller, runs along the east side of the City of Bloomington draining subdivisions and a portion of the Central Illinois Regional Airport. While current and future development in the watershed will be subject to the City of Bloomington's Stormwater Control Ordinance, the northern tributary is currently undergoing a change in land-use from agricultural to sub-urban. In contrast, the eastern tributary, approximately two (2) times larger than the northern tributary in terms of watershed size, is likely to remain agricultural for the foreseeable future, because of its distance from the City of Bloomington. A summary of selected watershed characteristics of the two tributaries is provided in Table 1.

Prior to initiation of the project, the existing channel along both reaches was typical of agricultural drainage ditches in Illinois. The channel was a straightened agricultural ditch with a bottom width of approximately six (6) feet, 1:1 side slopes and a top of bank height varying from six (6) to seven (7) feet above normal water level. This artificial cross section exacerbated flood conditions, resulting in stream bank erosion and down cutting, loss of flood storage, and decreased habitat availability for aquatic organisms. The stream corridor was absent of any riparian buffer and was subject to high sediment and nutrient loads from the adjacent agricultural fields.

As part of the annexation agreement with the City of Bloomington, the development group agreed to donate 88 acres of land along the two reaches for the purposes of restoring the riparian corridor and providing an aesthetic feature for the surrounding neighborhood. The City of Bloomington subsequently applied for and received a 319 Grant to assist in a comprehensive channel and floodplain restoration in which BMP's would be implemented to reduce sediment and nutrient loads to the creek so that aquatic

and terrestrial habitat could be restored to the channel and floodplain. The restoration included the introduction of five (5) strategies to achieve this objective:

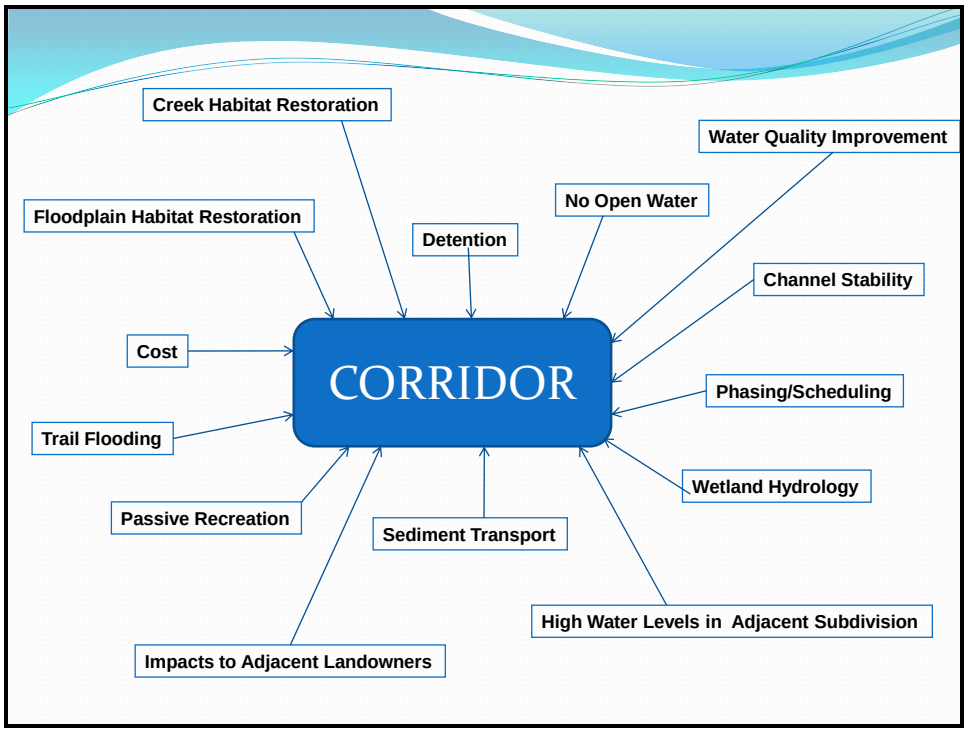
1. Stream re-meandering,
2. Reintroduction of the riffle-pool complexes and enhancement of aquatic habitats,
3. Reintroduction of a floodplain corridor,
4. Construction of riparian wetlands, and
5. Planting vegetative buffers along the stream.

The grant was provided for Phase I of the project, which included approximately 2800 lineal feet of stream restoration and approximately 40 acres of adjacent floodplain restoration concentrated on the lower end of the project site. The grant, coupled with additional monies from the City of Bloomington Stormwater Fund, was utilized to complete implement the strategies listed above in this first Phase of the creek/floodplain restoration.

The construction on the adjacent subdivision began in the summer of 2006. In October 2007, a ground breaking ceremony was held for the floodplain restoration project and the 319 grant awarded to the City of Bloomington for design and construction of Phase I of the project. Design and permitting took place over the winter and in the summer of 2008, the project was bid and the construction contract awarded. Construction began in August of 2008 and site work was completed in November. Native plantings and erosion controls were completed in June 2009. Currently, bids are being sought for the construction of the second phase of the project under a second 319 grant.

DISCUSSION

The project included the design and permitting of the first phase of the restoration of Kickapoo Creek. Previously, sediment studies and baseline biological and water quality monitoring had been completed to provide valuable data for the design of the channel restoration. The design team was faced with numerous criteria, many of which were often conflicting. These criteria are summarized in the graphic below:



Previous studies of the system had shown that the upstream watershed possessed an elevated sediment load consistent with its agricultural land-use. However, the design objective of reducing velocities, stabilizing the banks, re-connecting the floodplain and generally controlling the flood pulse through the system would actually enhance the deposition of the upstream sediment in the system, eventually choking it in sediment and negatively impacting any water quality or biological improvements that had been provided. A two-fold solution was provided to provide the hydraulics necessary to meet many of the design criteria. First, an in-line, high flow restriction (an undersized pedestrian bridge) was designed to provide detention, flow control, access and an aesthetic component, while low-flow riparian wetlands and connecting the floodplain back to the creek via excavation provided storage, low flow water quality improvement and habitat restoration. The project consisted of a large-scale restoration of approximately 2,800 lineal feet of Kickapoo Creek and approximately 40 acres of the adjacent floodplain. The stream excavation included earthwork, rock armorment of the stream bank and introduction of a riffle-pool complex. The floodplain restoration included the creation of over four (4) acres of riparian wetland and restoration of almost 40 acres in native vegetation.

Stream Excavation

Stream Meandering

The previous alignment of the creek is shown in Figure 3. It existed as a straightened trapezoidal channel, with 1:1 or steeper banks 6-7 feet high with the purpose of moving waters through the system as quickly as possible. Periodic maintenance had been performed to remove deposited channel sediments, repair bank erosion and restore the flood carrying capacity of the cross section.

The project involved the re-meandering and bank stabilization of 2,775 lineal feet of the two tributaries of Kickapoo Creek that come together at the south end of the project area. As previously discussed, the re-meandered creek system could not reduce velocities significantly for fear of facilitating the deposition of the upstream sediment load in the system. Subsequently, the revised meander belt is subtle and appropriate for the flow and sediment loads experienced by the system. The reconstructed channel alignment for the entire project area is shown in Figure 4 with the completed Phase I project highlighted.

As part of the re-meandering of the channel, an emphasis was placed on bank stabilization. Increased flows resulting from development and other upstream land-uses, coupled with the channel modifications made within and upstream of the project reach make the channel susceptible to in-stream bank erosion. Subsequently, significant study and modeling was conducted to determine the most appropriate stream bank armorment for the existing and future flows anticipated in the creek. A revised cross section with a slightly wider bottom, flatter banks and shallower depth was developed, with significant rock armorment on the outside bends of the created meanders. Typical cross sections and construction details are summarized in Figure 5.

Riffle-Pool Complex Construction

As part of both a bank stabilization and habitat creation effort, a riffle-pool complex was reintroduced in to the restored channel reach. Within the meander belt, inline structures called Newbury Weirs were constructed to provide channel stabilization, grade control, and riffle habitat to the restored channel. A total of eight (8) weirs were designed for the restored reaches, each consisting of more than 20 tons of large rip rap stone, keyed into the channel and the stream banks. Under low flow conditions, the weirs provide an aesthetic feature and fast moving water for habitat. During higher flow conditions, the weirs restrict flows, accelerating them through the downstream pool, providing a self-scouring feature to prevent sediment buildup in the channel and creating deeper-water habitat for aquatic species.

Floodplain Restoration

Riparian Wetland Construction

While the channel modifications concentrated on providing conveyance of water and sediment, protection of the stream banks and provision of in-stream habitat, the floodplain restoration was conducted to maximize flood storage, restore habitat, provide a large riparian buffer and address stormwater flows from the adjacent subdivision. A major part of the floodplain restoration was the creation of almost 4.5 acres of riparian wetlands within the corridor. The western wetland, immediately adjacent to the subdivision intercepts storm sewer discharge from approximately 6.5 acres of the subdivision, using the flow as a supplement to its hydrologic regime and providing treatment of the storm flow prior to discharge to the stream. The wetlands were designed to be disconnected from the channel flows at events smaller than approximately the 5-year event and be inundated with flood flows when large-scale flooding of the stream occurs. However, as discussed earlier, this scenario provides a detention and water quality benefit at the low flows when the pedestrian bridge restriction is less effective and provides significant floodplain storage at high flows when maximum detention is provided in the floodplain as a whole.

Some micro-contouring of the wetland basin itself was conducted during construction to provide a gradient of elevations within the wetland itself to enhance the planting zones and increase diversity. A forebay was also designed at the outlet of the storm sewer to provide a dedicated, sacrificial volume for collection of the sediments expected to be coming off the adjacent subdivision as it was developed and homes constructed.

The central wetland, smaller in size, does not and will not receive storm sewer effluent from the subdivision and will rely entirely on direct rainfall, flooding from the creek and near-surface groundwater for its hydrology. However, during high flow events in the channel, it will provide floodplain storage and water quality benefit as water is stored and biological and physical processes provide nutrient reduction to flood waters prior to release back into the creek.

Native Plantings

Previously, very little vegetative buffer existed between the channel and the surrounding agricultural fields. Vegetation in the riparian zone lacked biodiversity; dominated by aggressive non-natives, including reed canary grass. As part of the restoration, approximately 40 acres of floodplain, riparian wetland, stream bank and future pedestrian trail were planted with native species to provide biodiversity, habitat, and aesthetic value to the system. Appropriate, native riparian vegetation will also serve to shade, filter and provide habitat for the restored channel. Within the created wetlands, the native vegetation will provide significant nutrient uptake of the storm flows entering the wetlands from the upstream subdivision. The design called for all seeding to occur in the first two weeks of October, 2008 to allow for the cover crops to establish prior to the winter months, protecting the channel, floodplain and its associated native seed bank for spring germination. As discussed in subsequent sections, unforeseen delays in planting and erosion control affected the early success of the native plantings.

RESULTS

Stream Excavation

The channel excavation began in August 2008 at the downstream end of the project. Photos 1, 2 and 3 in Appendix A show the previous channel and its agricultural floodplain prior to construction. The deep, straight, trapezoidal channel and lack of vegetative diversity can be identified in the photos. Photo 4 shows a post-project view of the western tributary for comparison to Photo 3. The meandering flowline, laid-back banks, and rock bank stabilization are apparent.

Photos 5, 6 and 7 in Appendix A show construction details of the channel construction. A total of 68,000 cubic yards of earth were removed from the floodplain and used in the adjacent upland subdivision. This provides significant additional floodplain storage, particularly in conjunction with the high-flow restriction of the pedestrian bridge backing water up during extreme events. Approximately 8,200 tons of large stone rip rap (IDOT gradation RR5) was used in the bank protection for these 2,775 lineal feet of channel restoration. An additional 2,400 tons of rock was used to create the 8 Newbury weirs shown in Figure 8.

The pedestrian bridge restriction consisted of a 54-foot span pre-constructed, three-sided bridge installed downstream of the confluence of the two restored reaches. Photos are included Appendix A (photos 9 and 10). Additional photographs of the completed channel remeandering are shown in photos 11 and 12.

Floodplain Restoration

The restoration of the floodplain was achieved, although challenges encountered during construction and over the winter created many unexpected hardships. The site contractor completed Division A by the contracted deadline of October 1st, 2008 – the installation of the pedestrian bridge notwithstanding, which had a separate deadline of November 15th, 2008. At that time, the project was turned over to a second, separate landscaping contactor for Division B. Labor issues and the landscaping contractor's inability to mobilize created delays of over a month, resulting in little to no germination of the cover crop or installation of the erosion controls necessary to prevent erosion and protect the native seeds during the winter months. A photo of the initial fall/winter seeding is provided in Appendix B, photo 1. The lack of cover vegetation and subsequent loss of erosion controls is evident in photos 2 and 3 taken during the spring and winter.

Compounding the lack of established erosion protection in the restored floodplain, the site was inundated with five (5) major, high-flow events from initial excavation until eventual establishment of the designed vegetative and structural erosion controls. An example is provided in photo 4 with some of the impacts to the site shown in photos 5 and 6. The lack of established protection of the soils was illuminated by these flood events, resulting in erosion, sedimentation, loss of cover and loss of native seed throughout the restoration.

In the spring of 2009, after lengthy discussion and negotiation with the landscaping contractor, the floodplain was re-seeded with native vegetation and erosion control blankets were installed in critical

areas along the creek (photos 7-9). Unfortunately, the live plantings in the wetlands were eliminated to accomplish the necessary re-seeding of the floodplain. However, additional grant monies were utilized to conduct limited live plantings in some of the wetland areas (photos 10 and 11). Throughout the spring, cover crops and some native vegetation has begun to emerge (photo 12) and re-vegetation of the floodplain is well underway (photos 13 and 14).

Other Items

The creek restoration project, in conjunction with the large residential subdivision being constructed adjacent to the site, has provided several opportunities to enhance community involvement and bring awareness to the project. In the fall of 2007, a ground breaking ceremony was held where Agency officials, local administrators, the development group, the design group, stakeholder groups, and local citizens all had an opportunity to gather on site, discuss the project, and kick off the design and construction of the first phase. Photos are provided in Appendix C, photos 1-3. During that project, numerous meetings with various stakeholder groups, including the Friends of the Kickapoo, have been held and educational seminars have been held with local contractors regarding construction site erosion and sediment control. In June, 2009 a ribbon cutting ceremony was held on site where, again, all stakeholders gathered to review the first phase of the construction, elicit community feedback and provide an educational opportunity for those in attendance (photo 4).

Lessons Learned

As described in earlier sections, the project involved a significant level of complexity seeking satisfactory solutions to achieving multiple, often conflicting, objectives. The multi-disciplinary design team, incorporating expertise from a wide range of fields, with the strong oversight, cooperation and input from the stakeholders (including the City of Bloomington, IEPA, IDNR, development group and Friends of the Kickapoo) ultimately provided the successful completion of the first phase of the restoration project. However, there are several suggestions for future projects of a similar nature:

<u>Impacts from Neighboring Development</u>

As described in earlier sections, this project offered a unique opportunity to explore the restoration of a creek and floodplain within a developing subdivision where agricultural fields previously existed. The project was continually challenged by the impacts of the neighboring development and the importance of recognizing these impacts and planning for their mitigation was highlighted during construction. The complete and consistent control of erosion on the individual lots within the subdivision was insufficient at the beginning of the project and rapidly improved through the later stages. The project clearly identified the direct impacts that activities within the subdivision had on the amount of sedimentation and erosion in the floodplain, particularly at the storm sewer outfalls in the wetland cells. While forebays were designed to collect and trap any sediment, future projects should consider enlarging them for higher than anticipated loads. The issued *did* provide an opportunity to begin to educate the adjacent landowners on how activities on their property directly impact the neighboring waterways.

Construction Timing

The project timeline called for the completion of earthmoving to be completed by October 1st and the seeding (both native species and cover crop) to be completed by the second week of October. These dates were established to allow ample time for the cover crop to establish by winter to control erosion, stabilize the system and protect the native seeds for spring germination. When delays prevented the cover crop from being installed and ultimately establishing itself prior to winter, significant erosion occurred and native seed was lost or buried. In subsequent phases, cover crop will be well established over all exposed soils before it is mowed and the native seed installed through it, in the spring, for germination and growth in a stabilized condition.

Establish Expectations

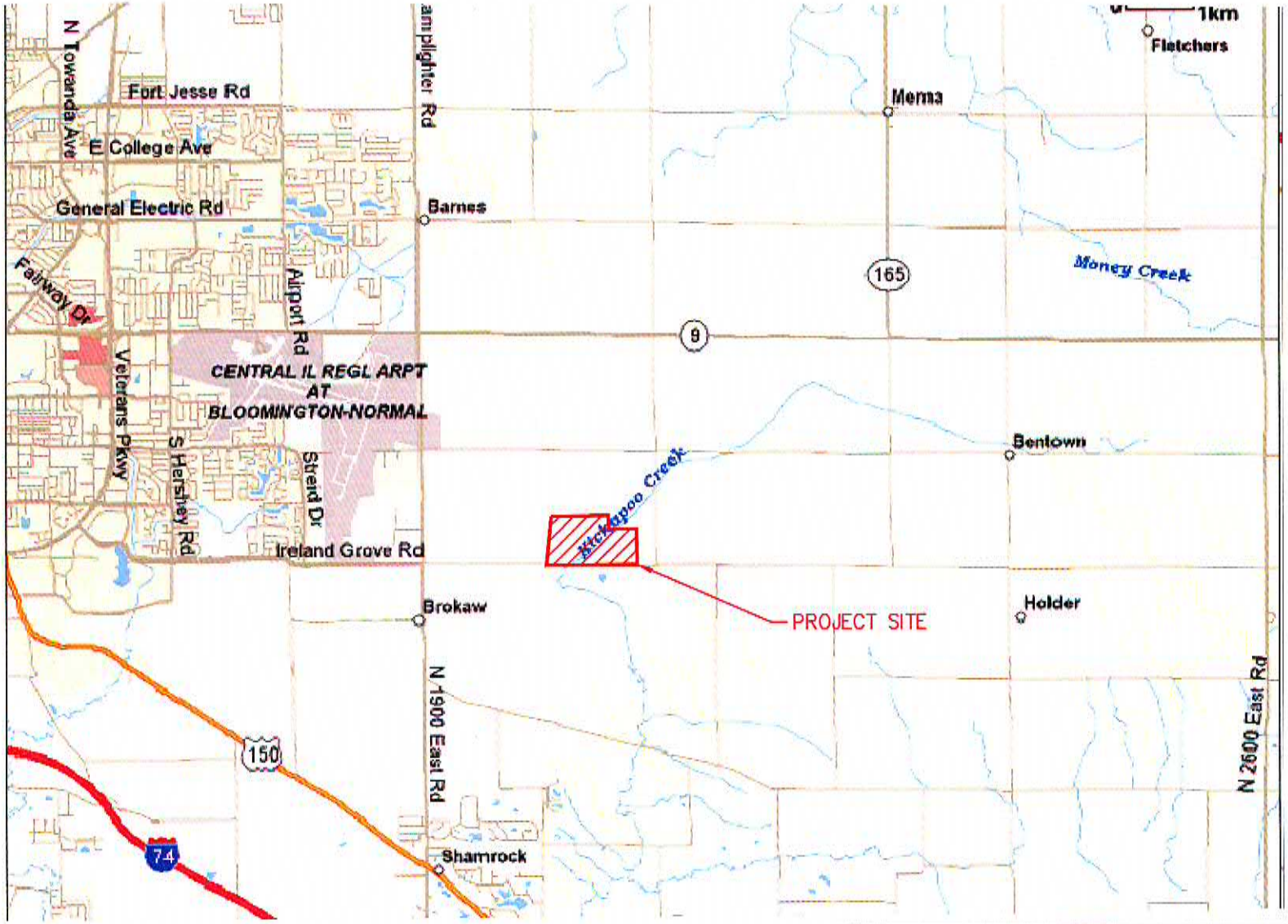
While the design team and stakeholders worked closely during the planning and design of the project, it is important for all persons affected by the project to fully understand its complexities and to have realistic expectations of what will be achieved and the timeline to achieve it. At this time, the earthwork, rock stabilization and floodplain restoration has been constructed and planted, but it may be several growing seasons until the full success of the project can be measured. Continued impacts from adjacent land uses may also affect the performance of the restored reach until they are either completed or more completely mitigated. Continued communication amongst all parties with interests in the project regarding its performance and the establishment of the vegetation will be important.

Table 1
Summary of Watershed Characteristics

Basin	Land Use	Area (sq mi)	Length (mi)	Slope (%)	Time of Concentration (hr)
East Tributary	Urbanizing	9.05	7.20	0.10	6.41
North Tributary	Agricultural	4.78	2.65	0.20	2.22

TABLE 2
SUMMARY OF CONSTRUCTION

QUANTITY	*UNIT*	*ITEM*
68,000	CY	EARTH EXCAVATION
15,000	CY	TOPSOIL EXCAVATION & PLACEMENT
5	EA	INLETS, TYPE A,
5	EA	IPP FLEXSTORM INLET FILTER
60	LF	EMERGENCY OVERFLOW WALL
1	EA	FIRE HYDRANTS TO BE ADJUSTED
2	EA	WATER VALVES TO BE ADJUSTED
520	LF	STORM SEWERS, TYPE 1, REINFORCED CONCRETE PIPE, STORM DRAIN AND SEWER PIPE, CLASS IV, 12"
25	LF	PIPE CULVERT REMOVAL (12")
90	LF	PIPE CULVERT REMOVAL (15")
25	LF	PIPE CULVERT REMOVAL (18")
1	EA	REMOVE & RELOCATE END SECTIONS
5	EA	TEMPORARY DITCH CHECK (STRAW BALES)
130	SY	STABILIZED CONSTRUCTION ENTRANCE
8	EA	NEWBURY WEIRS, SIZE VARIES
520	SY	STONE RIP-RAP, CLASS A5
1,630	SY	STONE RIP-RAP, CLASS A5, 2.5' DEEP
30	SY	TEMPORARY DITCH CHECK (RIPRAP DAM)
1,610	LF	BANK STABILIZATION, TYPE A
1,465	LF	BANK STABILIZATION, TYPE B
52	EA	ROCK VANE STABILIZATION
40	AC	SEEDING, CLASS 7
3,600	LB	NITROGEN FERTILIZER NUTRIENT
3,600	LB	PHOSPHORUS FERTILIZER NUTRIENT
3,600	LB	POTASSIUM FERTILIZER NUTRIENT
1	TN	AGRICULTURAL GROUND LIMESTONE
1	LS	TREE PROTECTION & PRESERVATION
75	CY	POROUS GRANULAR EMBANKMENT,SPECIAL
88.2	CY	CONCRETE STRUCTURES
11,140	LB	REINFORCEMENT BARS, EPOXY COATED
1,802	LF	FURNISHING STEEL PILES, HP12 x 63
1,802	LF	DRIVING PILES
2	EA	TEST PILE STEEL, HP12 x 63
15	LF	3-SIDED PRECAST CONC STRUCT., 54' x 10'
1	LS	CONSTRUCTION LAYOUT STAKING
14.38	AC	MIX 1 DRY MESIC PRAIRIE
5.13	AC	MIX 2 WET MESIC PRAIRIE
0.41	AC	MIX 3 WET PRAIRIE
2.34	AC	MIX 4 DRY MESIC SAVANNA
2.56	AC	MIX 5 WET MESIC SAVANNA
0.53	AC	MIX 6 WET SAVANNA
0.17	AC	MIX 7 FOREBAY
6.56	AC	MIX 8 TRAIL MIX / LAWN
2.40	AC	MIX 9 DETENTION BASIN MIX
~~15,000~~	~~EA~~	~~LIVE PLANTS~~
25	AC	MULCH
1	LS	REMOVAL OF ROCK EROSION CONTROLS
~~5,000~~	~~LF~~	~~DEPREDATION BARRIER~~
13,550	SY	EROSION CONTROL BLANKET



1 OF 1

Project No:	
Book No:	
Drawn by:	TAW
Approved:	RBL
Date:	07-24-09

KICKAPOO CREEK - 319 GRANT - PHASE 1
FINAL REPORT

LOCATION MAP
FIGURE 1

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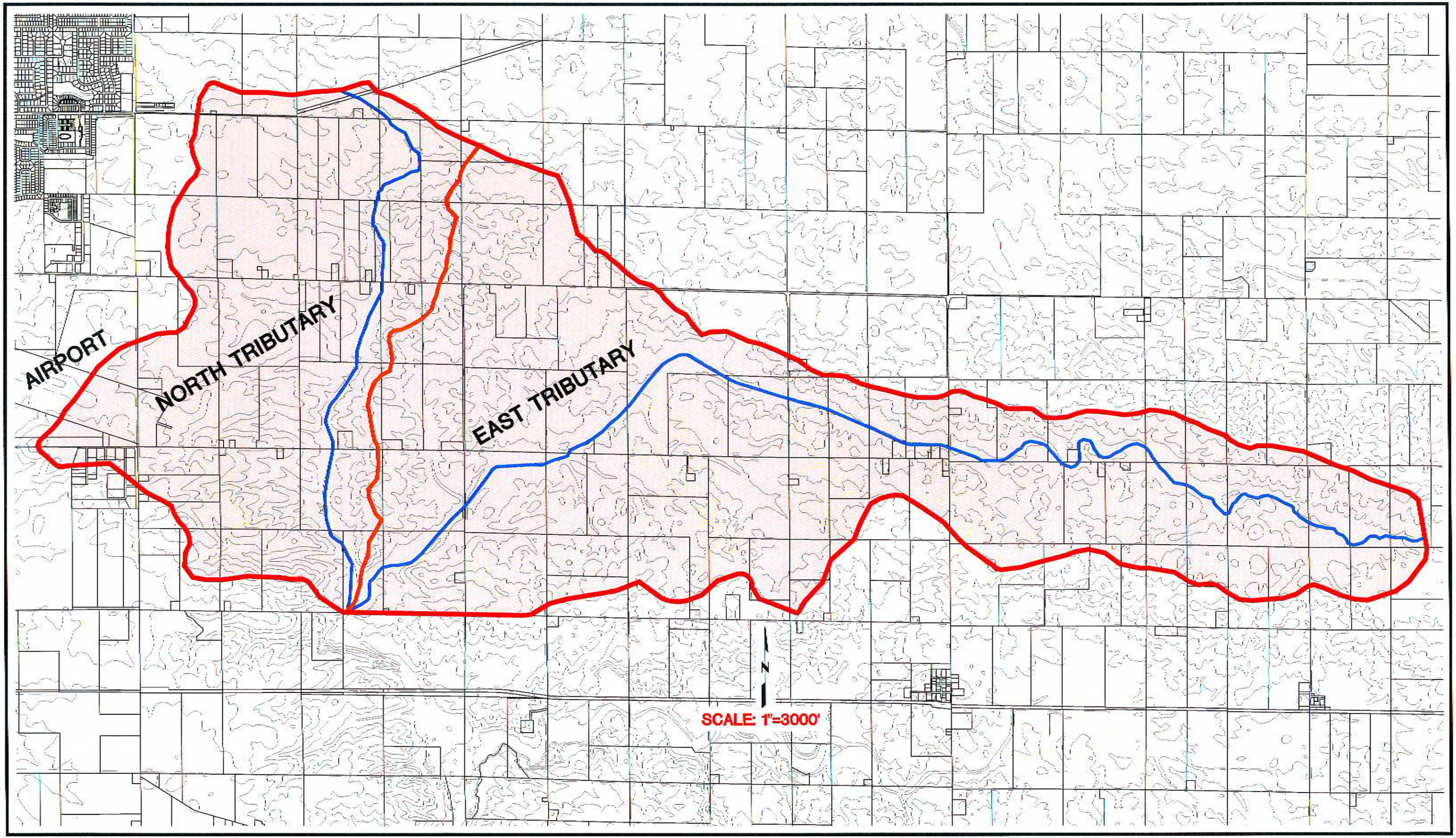

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KICKAPOO CREEK - 319 GRANT - PHASE 1
FINAL PLAT

WATERSHED MAP

Project No:	
Book No:	NONE
Drawn by:	RLW
Approved:	
Date:	07-24-09

FIGURE 2

N

NTS

LEGEND

EXISTING CHANNEL

EXISTING CHANNEL

IRELAND GROVE ROAD

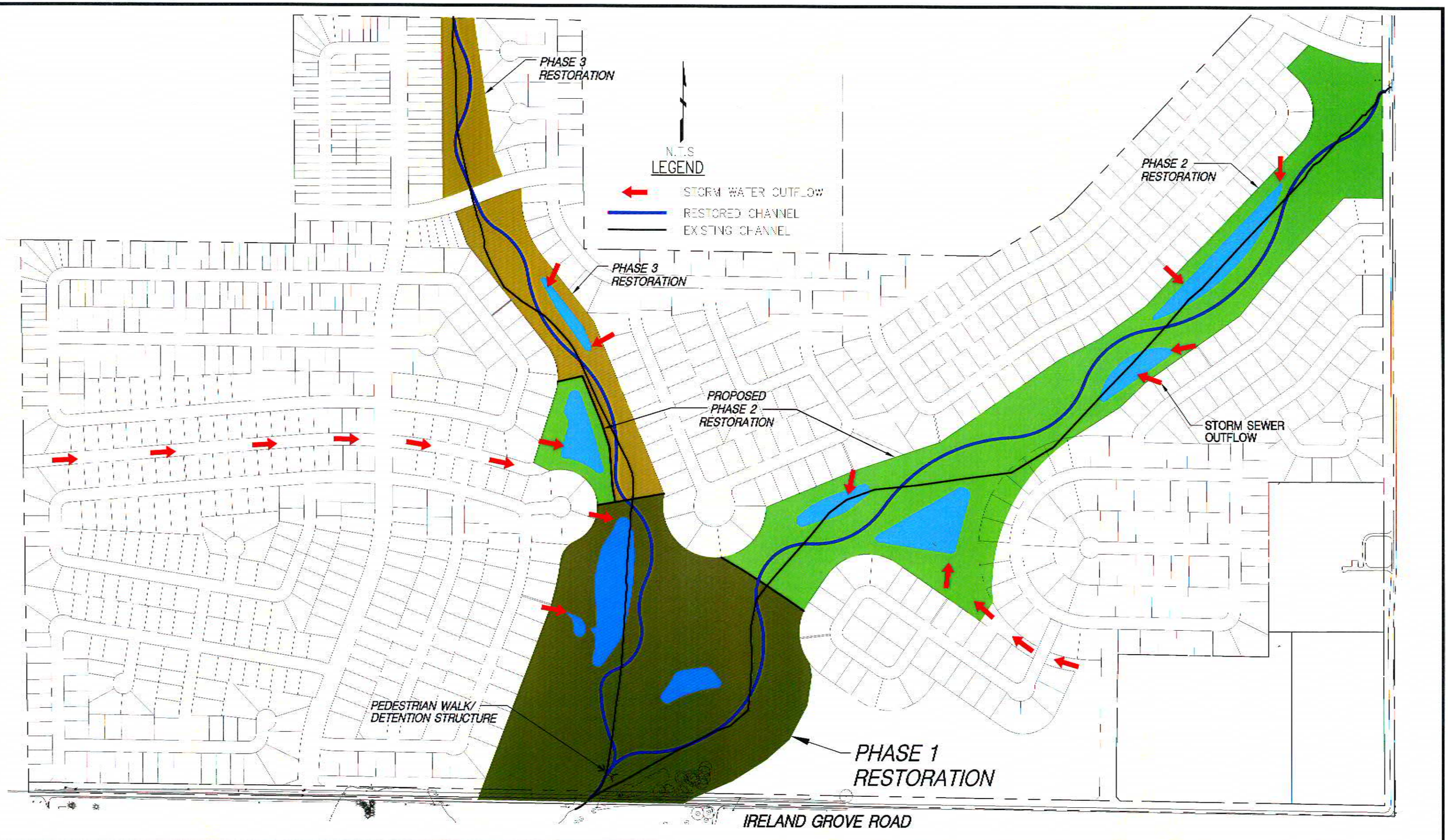
Farnsworth GROUP
2709 McGRAW DRIVE
BLOOMINGTON, ILLINOIS 61704
(309) 663-8435 / (309) 663-1571 Fax

KICKAPOO CREEK - 319 GRANT - PHASE 1
FINAL REPORT

EXISTING CONDITIONS

Project No:
Book No:
Drawn by: TAW
Reviewed: RBL
Date: 07-24-09

FIGURE 3



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KICKAPOO CREEK - 319 GRANT - PHASE 1
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PROPOSED CONDITIONS

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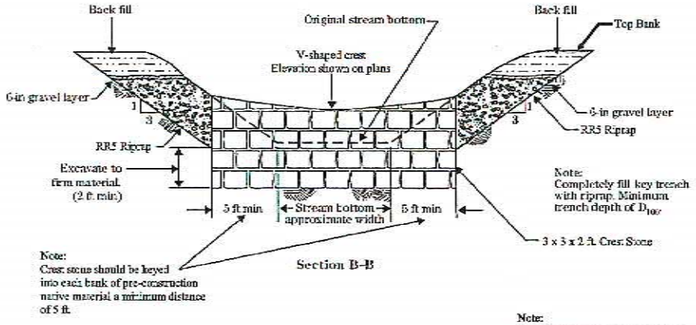
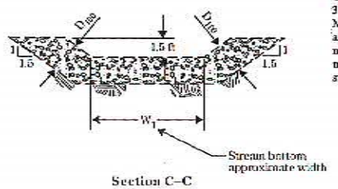
FIGURE 4



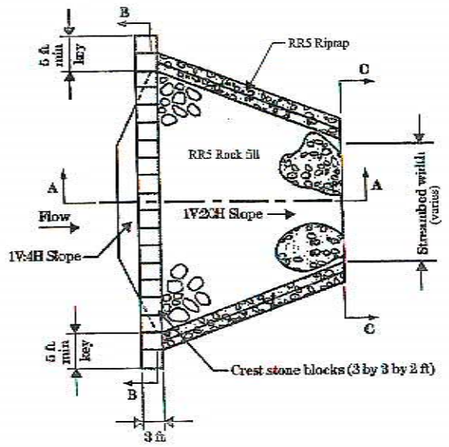
Section B–B



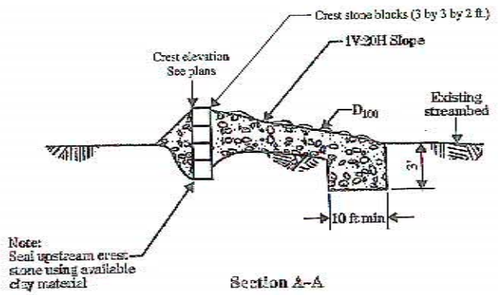
Section C–C

Note: Crest stone should be approximately 3 by 3 by 2 ft. limestone block from Prairie Materials Pontiac Pit or approved equivalent and should fit together relatively tightly. Do not pick larger stone from specified riprap mixture; this would result in undersized crest stone and improper riprap gradation.

Not to scale



Plan



Section A–A

1 WEIR DETAILS

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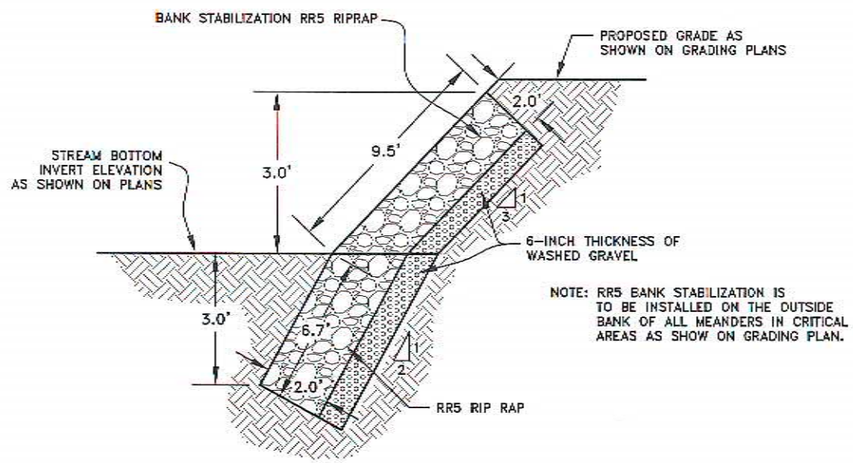

2 BANK STABILIZATION DETAIL TYPE B

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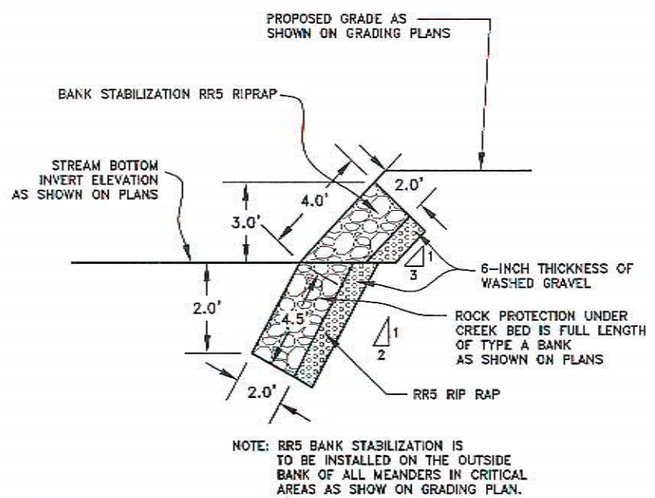

3 BANK STABILIZATION DETAIL TYPE A

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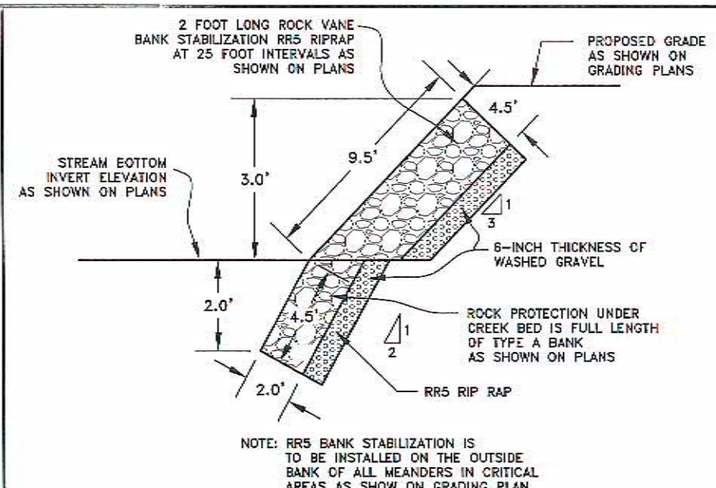

4 ROCK VANE STABILIZATION DETAIL TYPE A

Scale: NOT TO SCALE

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PROPOSED CHANNEL CROSS SECTION DETAILS

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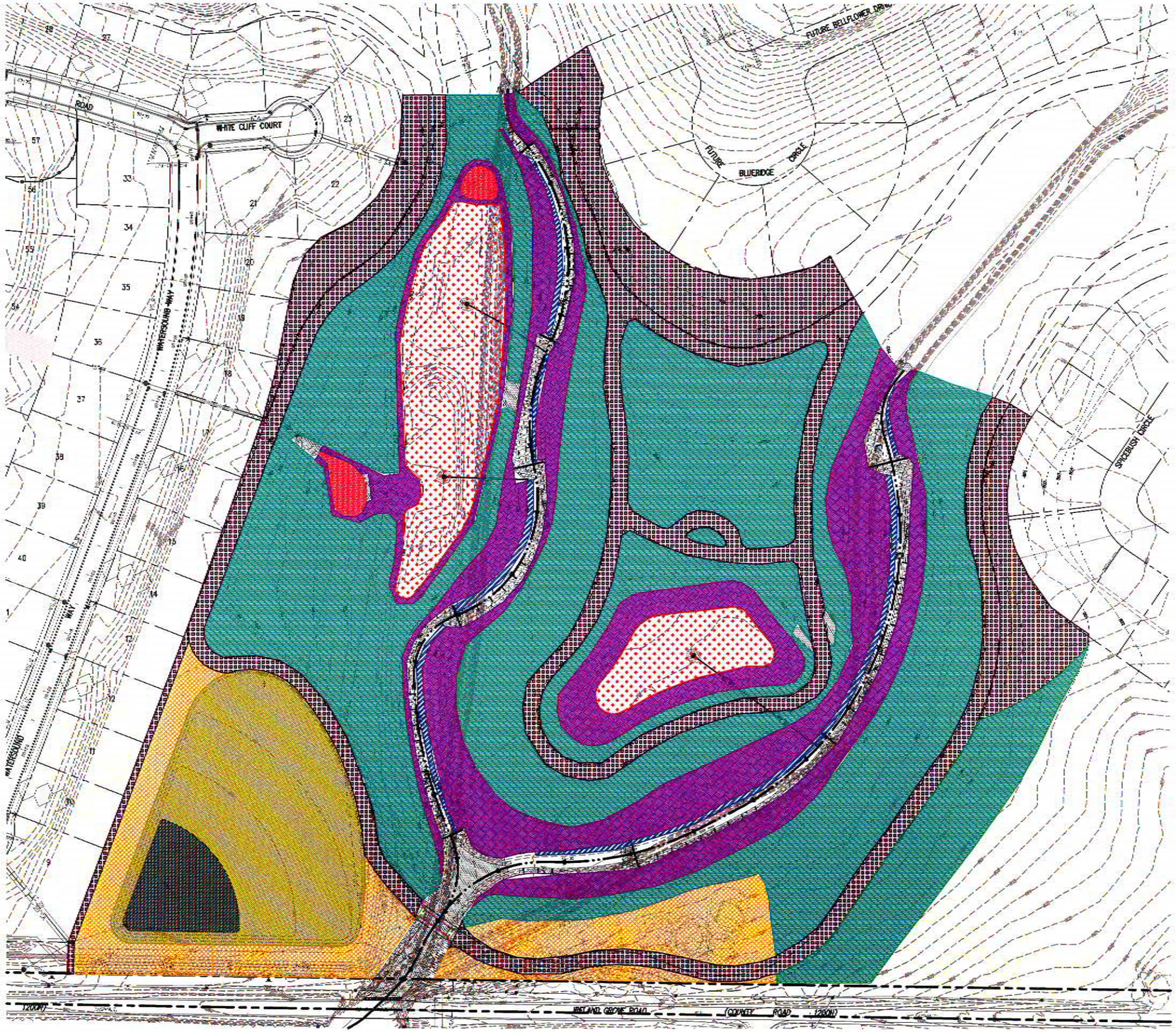
Date: 07–24–09

FIGURE 5



N

0 40 80 160

SCALE: 1"=80'

LEGEND

- DRY MESIC PRAIRIE–14.38 ACRES
- WET MESIC PRAIRIE–5.13 ACRES
- WET PRAIRIE–0.41 ACRES
- DRY MESIC SAVANNA–2.34 ACRES
- WET MESIC SAVANNA–2.56 ACRES
- WET SAVANNA–0.53 ACRES
- FOREBAY–0.17 ACRES
- TRAIL MIX/LAWN–6.56 ACRES
- DETENTION BASIN MIX–2.40 ACRES
- RIP–RAP BANK PROTECTION (BY OTHERS)
- RIP–RAP CHANNEL PROTECTION (BY OTHERS)

Farnsworth GROUP
2709 McGRAW DRIVE
BLOOMINGTON, ILLINOIS 61704
(309) 663-8435 / (309) 663-1571 Fax
www.f-w.com

KICKAPOO CREEK - 319 GRANT
PHASE 1
FINAL REPORT

PLANTING PLAN
FIGURE 6

Drawn:	TAW	Date:	07-24-09
Designed:	RBL	Checked:	BWC

Book No.: 270/284 Sheet No.: 1 OF 1

Project No.: 0070748.00 File No.: -

Appendix A

Photo Documentation

Stream Excavation

1. Confluence of tributaries prior to project. Note straight, deep trapezoidal channel.

2. Looking downstream in channel prior to start of construction. Note tall, steep banks and reed canary grass vegetation.

3. View up northern tributary. Note adjacent subdivision construction to left (west) of channel.

4. View up northern tributary after stream excavation.

5. Channel excavation.

6. Fabric, and bedding under rip rap channel bank protection.

7. Floodplain excavation.

8. Completed rock riffle.

9. Pedestrian bridge construction

10. Completed bridge.

11. Completed rock riffle.

12. Completed east branch.

Appendix B

Photo Documentation

Floodplain Restoration

1. Initial seeding.

2. Spring 2009. Note loss of mulch and lack of cover crop.

3. Winter 2009

4. Site was hit with 5 major floods between initial excavation and permanent seeding/erosion control.

5. Debris in floodplain after destructive winds and major rainfall. Note impact to un-vegetated floodplain.

6. Western wetland during high flow event. Note lack of vegetation.

7. Erosion control installation, spring 2009.

8. Erosion control blanket installation, spring 2009.

9. Re-vegetation, spring 2009.

10. Live plantings in wetland, summer 2009.

11. Live plantings in wetland, summer 2009.

12. Emergence of vegetation, spring 2009.

13. Central wetland at emergence of vegetation, spring 2009.

14. Central wetland, summer 2009.

Appendix C

Photo Documentation

Miscellaneous Photos

1. Fish tank as park of educational component at ground breaking, fall 2007.

2. Ground breaking, 2007.

3. Presentation of grant.

4. Stream table as part of educational component at ribbon cutting, June 2009.