APPENDIX E.

Farber Farm Stream Restoration Project
- East Kill -

IMPLEMENTATION & MONITORING REPORT

Farber Farm Project - Jewett, Greene County, NY

UPDATED
May 2006

Farber Farm Restoration Project

Implementation & Monitoring Report

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Project Partners

NYC Watershed Agricultural Council

NYCDEP Stream Management Program

Natural Resources Conservation Service

NYS Dept. of Agriculture & Markets

J.J. Farber Farm

Kaaterskill Engineering

Trout Unlimited

For Additional Information
www.gcswcd.com

Farber Farm Restoration Project
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1.0 Project Background

Image of subsurface stream flow condition during summer base flow.

In response to the January 1996 high flow event, the Farber Farm stream reach was channelized and levees were constructed to alleviate future risk and potential damage from future high flow events. These modifications had left the reach in a over widened condition limiting sediment transport. Assessments of the condition in 1997 and 1998 documented excessive sediment deposition throughout the reach which was potentially due to the modified channel condition. Typically, excessive sediment deposition increases channel bed elevation, which increases the risk of flooding of adjacent properties. Further, the loss of riparian vegetation due to stream side grazing of livestock had led to degradation of the reach's ecological potential and contributed to an increase in downstream channel and bank erosion.

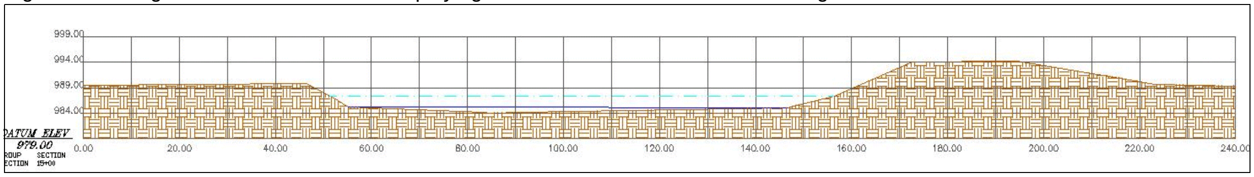
The restoration of the Farber Farm project reach is the first effort implemented in the East Kill stream corridor with the goals of promoting principles of natural channel design and stream corridor restoration. These approaches incorporate a watershed perspective in the planning and design process and typically incorporate multiple project objectives and benefits.

The project reach is located in the center of the East Kill mainstem in the Town of Jewett. The project is located downstream of a private bridge crossing owned by the Farber family, and runs 2,400 feet parallel with County Route 23C. The project represents a cooperative effort between Greene County Soil and Water Conservation District (GCSWCD), New York City Watershed Agricultural Council (NYS WAC), New York City Department of Environmental Protection Stream Management Program (NYCDEP SMP), Natural Resources Conservation Service (NRCS), NY State Department of Agriculture & Markets (NYS AGMKT) and stakeholders of the East Kill watershed. In the sections that follow, planning and coordination, assessment, design, construction and monitoring components of the project are described.

1.1 Project Reach Stability Assessment

The Farber Farm project reach receives flow from a 18.6 mi^2 drainage area. The reach is positioned laterally along a broad alluvial valley containing multiple alluvial river terraces and floodplain. Historically, the stream channel alignment has been heavily manipulated, resulting in the current straightened alignment. Initial field assessments, begun in 1997, classified the channel as a Rosgen C4 stream type; dominated by coarse gravel channel sediment. Channel measurements indicated that the channel bankfull width/depth ratios were greater than 40, which depicts an extremely over-widened condition. Typically, this condition results in inefficient sediment transport through the reach thus promoting sediment deposition and increasing bank erosion potential.

Figure 1 Existing condition cross section displaying over widened condition and berming.



Inventories during low flow conditions documented subsurface flows during the summer thus limiting aquatic habitat. The existing channel did not exhibit the bed diversity that is typical of a natural riffle/pool sequenced stream channel.

Several areas of the project reach exhibited evidence of streambank erosion. Historic aerial photography depicted excessive channel lateral migration in the lower portion of the reach near the confluence with an unnamed tributary. The migration and existing eroded streambank were suspected to be negatively affecting water quality, which may have been further amplified by excessive sedimentation and point bar development. The most significant bank erosion located in the middle of the channelized portion of the project reach and was characterized by several hundred feet ut exposed bank.

Image of excessive deposition and bar formation at the bottom of project reach.

Riparian buffers are crucial in maintaining stream stability within this stream type and valley setting. The riparian area through the Farber Farm reach was primarily maintained as pasture land. Livestock historically grazed on the riparian vegetation, leaving the banks more exposed to erosive forces, and had direct access to the stream channel, which may have impacted water quality.

2.0 Project Goals and Objectives

As the project partners reviewed the condition of the reach and its potential for restoration, a number of issues were identified. Historic management and anthropogenic channel modifications included gravel mining, destruction of the reach riparian buffer, and recent channelization to mitigate flooding. These modifications potentially led to a degradation in fisheries habitat, excessive bank erosion and channel instability. It is believed that if the stream reach were to be left undisturbed, the increased channel width and “flattened” slope would increase deposition, further affecting stream habitat. The existing over-widened shallow channel and lack of

Image of livestock in channel and grazing on streambank vegetation.

overhead cover increased water temperatures. When combined with the lack of pool-riffle complexes, the potential for aquatic habitat is extremely degraded.

The channel modifications also potentially promoted streambank erosion which affected water quality due to excessive entrainment of streambank soils. The partners proposed that the restoration of the reach presented the opportunity to meet a wide range of objectives and provide a number of environmental benefits.

The primary goal of the project was to provide long term channel stabilization while maintaining the integrity and benefit of a naturally functioning channel and floodplain. Secondary project goals included improvement of aquatic and riparian habitat within the project area while maintaining the aesthetic values of a natural stream channel. Thirdly, water quality was to be improved by addressing stream bank erosion and by modifying management and grazing practices.

The project design needed to address channel stability and processes and work within the existing physical site constraints. The physical constraints included manmade and natural limitations which were inventoried, and incorporated into the final design. The pre-construction monitoring identified several distinct instabilities and associated problems through the project reach. Ultimately, the restoration design needed to correct channel plan form, profile and cross section parameters in order to meet the goals and objectives of the project and to provide for potential long-term channel stability.


Image of stream bank erosion near bottom of project reach.

The acceptance of the project by the landowners had substantial bearing on the success of the restoration. Landowner approval and access to the project area was identified as a critical project constraint. The need for approval by multiple primary and secondary landowners within the project area generated the need to educate the owners about stream instability and the apparent need for mitigative action. The planning and design process required utilizing the landowners' knowledge of the site and incorporating owner concerns into the project when practical. The provision of landowner approval was set forth using Landowner Project Agreements, which are temporary agreements between the landowner and the GCSWCD allowing for project construction, maintenance and monitoring.

The restoration of the Farber Farm site required permits to be issued by the Army Corps of Engineers (ACOE), the New York State Department of Environmental Conservation (NYSDEC), and the New York City Department of Environmental Protection (NYCDEP).

3.0 Restoration Methodology and Strategy

Alternative strategies that best reflected the project objectives were evaluated to reach a common consensus between landowners and project partners. The reach was unstable and it was believed that current channel processes would continue to negatively impact the adjacent landowners and the East Kill resource. To meet the numerous goals, set forth by project stakeholders, a restoration strategy focusing on the geomorphic channel form was chosen. This required classification of the current condition and the development of a preferred physical morphology for the restored channel. The following strategy for restoration was developed after refinement of project goals and the identification of constraints:

- Develop a channel geometry and profile that will provide stability, maintain equilibrium (form), and maximize the stream's natural potential while appropriately conveying the sediment supply.

- Maintain and/or increase the availability of the stream channel to utilize the active floodplain during flow events which meet or exceed bankfull stage.

- Utilize a combination of geomorphic structures paired with bioengineering techniques to reduce and protect against bank erosion, provide grade control and promote increased physical habitat.

- Obtain needed fill materials from on-site sources where possible by re-contouring the floodplain

- Create a single defined channel through the braided area that is capable of transporting a range a flow and provide for increased sediment transport.

- Establish an effective and beneficial riparian buffer consisting of trees, shrubs and deep rooted grasses to assist in providing long-term stability of the stream channel and floodplain.

- Provide habitat, recreation and aesthetic enhancements concurrent with the development of a naturally functioning channel morphology and floodplain.

In 1998, the GCSWCD initiated the development of a restoration design for the project reach. A topographic survey was conducted and supplemented with geomorphic assessments. Since a stable reference reach for the appropriate stream type could not be found, it was determined that the assessment and design would utilize data collected from adjacent stream reaches and existing aerial photography and would be supplemented with regime analysis, analytical methods and typical reference values developed by other sources.

3.1 Channel Morphology

The dimensions and scale of the proposed stream channel were designed to accommodate a full range of flows and to meet considerations for sediment transport and channel boundary conditions. Regime and tractive force analyses and other analytical tools were utilized in order to develop an appropriate reconfiguration. Unlike traditional channel sizing, the design channel continually transforms between channel features which change in shape, length and spacing.

A goal for the channel realignment was to develop a stable plan form, in order to accelerate the channel's evolution toward a more stable state. After reviewing the historic trends of channel alignment, it was determined that the channel was manually straightened and had a low sinuosity. Natural streams in this valley setting would have a meandering alignment with higher sinuosity. The final design included the realignment of a majority of the 2,400 feet of stream channel. The channel alignment was created using regime and reference conditions and other hydraulic considerations.

The channel profile was created by utilizing slope characteristics of the valley, the existing channel and floodplain terraces and regime and reference conditions. The channel profile was also designed to provide for bed feature variation, simulating a more natural riffle/pool complex in order to provide for increased channel habitat and energy dissipation. These variations are common in natural riffle-pool complexes. The channel profile and bed diversity were enhanced using grade control devices in order to promote natural erosion and deposition characteristics throughout the reach.

The cross sectional dimensions of the channel were altered to promote proper sediment and flow transport through the reach during a range of flow events. A multi-staged channel was created through the reach in order to provide for a defined bankfull channel, physical habitat during low flow and increased floodplain function for large flow events. Improving the width-depth dimensions through the over-widened sections and creating a single channel in the braided area of the reach potentially provides for more efficient sediment conveyance. Further, the channel dimensions of the base flow channel are potentially enhanced by the creation of pools at the outside of meanders and behind in-stream structures. A summary of general reach characteristics has been described in Table 1.

Table 1: Comparison of morphological values.

Variables	Existing Channel	Proposed
Stream Type (Reach)	C4	C4
Bankfull Width (ft.)	105.1	60.0
Bankfull Mean Depth (ft.)	2.5	3.1
Width/Depth Ratio	42.0	19.6
Bankfull Cross Sectional Area (sq. ft.)	264.3	183.3
Bankfull Maximum Depth (ft.)	3.5	4.9
Width of Flood Prone Area (ft.)	>232	279.4
Entrenchment Ratio	>2.2	4.7
Sinuosity	1.06	1.13
Average Water Surface Slope (ft./ft.)	0.005	0.004

3.2 In-stream Structures

The design incorporated two general types of in-stream structures to promote channel stabilization. A combination of rock vanes and cross vanes were used to achieve multiple benefits including channel grade control, streambank stabilization, improved physical habitat, efficiency of sediment conveyance, dissipation of excess channel energy and maintenance of bed form variation.

Fifteen rock vanes were incorporated along four constructed meander bends to assist in reducing shear stress and bank erosion, while allowing for the long term establishment of vegetation. Additionally, rock vanes provide bed form variation by maintaining scour pools downstream of the vane arms. The design incorporated three cross vane structures at the top of channel cross over segments. The cross vanes provide grade control, impede head ward erosion, and reduce shear stress and bank erosion. Material for the construction of the rock structures were obtained from local quarries and transported to the project reach.

3.3 Riparian Vegetation

The project design planned for the use of traditional bioengineering practices to provide increased streambank stability and to initiate riparian vegetation growth in disturbed areas. Live fascines, native sod mats and large willow transplants were combined with the installation of live stakes, posts, and bare root transplants. The design proposed installation of more than 1,200 feet of live fascines, installed in a double row, on the outside of all meander bends and high stress areas. Locally harvested willow and alder species provided materials for the bioengineering efforts. A seed and mulch mixture was used to provide short term stabilization of disturbed areas.

The design proposed the placement of large transplanted willow clumps along significant areas of potential high stress (i.e. along bank keys where rock structures tie into the streambank). Secondary benefits of the transplants included accelerated re-vegetation and channel shading. The willow clumps were harvested from an on-site borrow area located along the western side of the of the project.

Native sod mats were proposed in the design, and were to be placed along the top of the streambanks to accelerate streambank re-vegetation. Additionally, sod mats were used to reduce sediment runoff from construction activities in the floodplain and channel until complete ground cover was established. Upon completion of bioengineering applications, a conservation seed and mulch mixture was applied to the entire project area.

4.0 Project Implementation

The restoration project was authorized by NYSDEC under Article 15 of ECL, and approved by the USACOE pursuant to Section 404 of the Clean Water Act, in August of 1998. A Stormwater Pollution Prevention Plan was submitted to the New York City Department of Environmental Protection.

4.1 Project Bidding

A project bid package was developed to include drawings and specifications for the proposed project. The project was publically bid using a competitive bid process. A mandatory site showing was attended by several contractors, and four bids were submitted for the construction. The final accepted project bid was awarded to Fastracs Inc. for a project cost of $135,100.00.

4.2 Project Construction Time Line

Project construction commenced the first week of August 2000. Construction of the new stream channel and in-stream structures required approximately 14 calendar days. Bioengineering components were initiated immediately following the channel construction and continued until late fall of 2000.

4.3 Project Construction Details

Construction details and specifications were created within the project bid package and can be obtained from the GCSWCD. Detailed construction drawings can be found in Appendix C and photographs highlighting project construction are in Appendix B. A general summary of project construction details are provided below.

- A temporary access road was created to provide entry to the project area. The access road utilized an existing driveway and an agricultural utility road. The areas were modified to allow for access by heavy equipment and transported material into the project area.

- An water barrier structure was installed above the project reach to dam stream flow while the active work zone was de-watered by pumping all upstream flow around the work area. Stream flow was diverted using a 12" diesel pump and a sealed pipeline. A controlled geotextile outlet was used to discharge the flow into a natural channel which discharged back into the East Kill below the project area.

- Sediment control was accomplished by collecting turbid water at the bottom of the reach and pumping the turbid water to a vegetated floodplain area for natural filtration.

- Stream channel excavation of the new meander bends was initiated in the upper portion of the project reach and progressed downstream. Material generated during the excavation of the meander bends was used to fill and re contour the existing channel.

- The installation of rock structures was initiated at the bottom of the reach and continued upstream following the rough grading of stream channel. The project included the installation of rock structures, which required rock to be hauled from a local quarry to the project site.

- Final grading was completed in the stream channel after the installation of the rock structures and continued in the floodplain areas as fill material was generated. Upon completion of the finished grading, exposed areas were seeded and mulched to provide temporary stabilization.

- Additional bioengineering and plantings including, live willow fascines, live stakes and posts, and bare root seedlings, were installed by GCSWCD staff and a group of local Trout Unlimited volunteers when the plant material entered dormancy.

- The planted areas were irrigated after planting in order to improve establishment and survivability.

4.4 Project Constructability

Access to the project area, through private property, was acquired through landowner agreements prior to the start of construction. Mobilization of construction equipment to the work area was achieved through the adjacent landowners driveway and a agricultural utility road. Site conditions were generally considered favorable for equipment mobilization and construction activities.

4.5 Project Construction Cost

The final construction cost was $135,564.13. which included two change orders. This included additional pumping costs, construction of temporary stormwater sediment ponds, and improvements to the passive dewatering system at the outlet of the sealed pipeline.

5.0 Project Monitoring and Performance

In order to document the stability and performance of the restoration project and to provide baseline conditions for comparison against pre-construction conditions, regular inspections and annual monitoring surveys are to be conducted. Project inspections include photographic documentation of the project reach and a visual inspection of the rock structures, channel stability, bioengineering and riparian vegetation. The inspections are to be conducted annually during the project site survey as well as during and after significant flow events. The project monitoring surveys are to include both physical channel and structural stability assessments.

5.1 Project Physical Performance

Restoration projects using geomorphic and natural channel design techniques incorporate principles that seek to re-establish the dynamic equilibrium of the stream channel. This includes the channel's ability to make minor adjustments over time as the project experiences a range of flow events. A channel in dynamic equilibrium typically experiences minor variations in channel shape and form which are necessary for the maintenance of a stable morphology. In order to document the changes in morphology and project stability, monitoring surveys have been initiated in the project reach.

The monitoring of the project includes pre-construction surveys, an as-built survey and multiple sets of post-construction monitoring. The physical performance of the channel is monitored using surveys which minimally include a longitudinal profile, multiple monumented cross sections and sediment analysis. The relationship of channel morphology "at-a-station" and general morphology trends through the reach will be analyzed using the collected data. These physical measures will be further refined by stream feature specific data. The comparison of time intervals and change in physical parameters will be determined, as well as the characterization of hydrologic inputs from storm events.

These data can be further developed by comparisons within the reach, against regional values, stream channel classification indexes, and reference reach data. The channel parameters can be applied to channel evolution models to review the effectiveness of treatment in halting or accelerating channel processes.

In the case of long term monitoring data, the individual treatments can be compared, quantified and delineated. As the project monitoring progresses, future analyses will be used to determine the effectiveness, in terms of worth of the project at multiple scales, in comparison to other natural channel design projects and treatments in the watershed. Specific project inspections and monitoring reports are summarized in Appendix F.

6.0 Operation and Maintenance

Proper operation and maintenance is a critical element for the success of restoration projects that use geomorphic and natural channel design techniques. Based upon experience with local conditions, the GCSWCD believes that attaining acceptable channel stability requires an extended period for the project to become established. While site and hydrological conditions strongly influence the amount of time a project needs to become established, it appears that at least a two-year establishment period must be considered. This establishment period must include allowances for re-vegetation and adjustments/repairs to rock structures. It is critical to have a clear understanding that typically, restoration goals are not achieved the day the excavation is completed and that evaluation of project's success must be based on performance over a longer period of time.

During the initial years after establishment, as the restoration site experiences a range of flows and the sediment regime becomes "naturalized", projects usually require modifications and design enhancements. Project sponsors must be prepared to undertake adjustments in the channel form and/or rock structures as indicated by the project monitoring. It is believed that as project vegetation becomes established the overall operation and maintenance of the project will decrease.

A management plan and strategy is being developed for the East Kill stream corridor by the GCSWCD and NYCDEP SMP. The plan will provide a working document to assist with resource management in the watershed, which will also assist in the operation and maintenance of the project reach.

6.1 Rock Structures

In-stream rock structures may require some modification and enhancement. The monitoring and inspections performed by project partners will assist in prescribing the modification of rocks to ensure structural integrity, intended functions of the vane and debris and sediment maintenance considerations. The annual project status reports will document these needs and modifications.

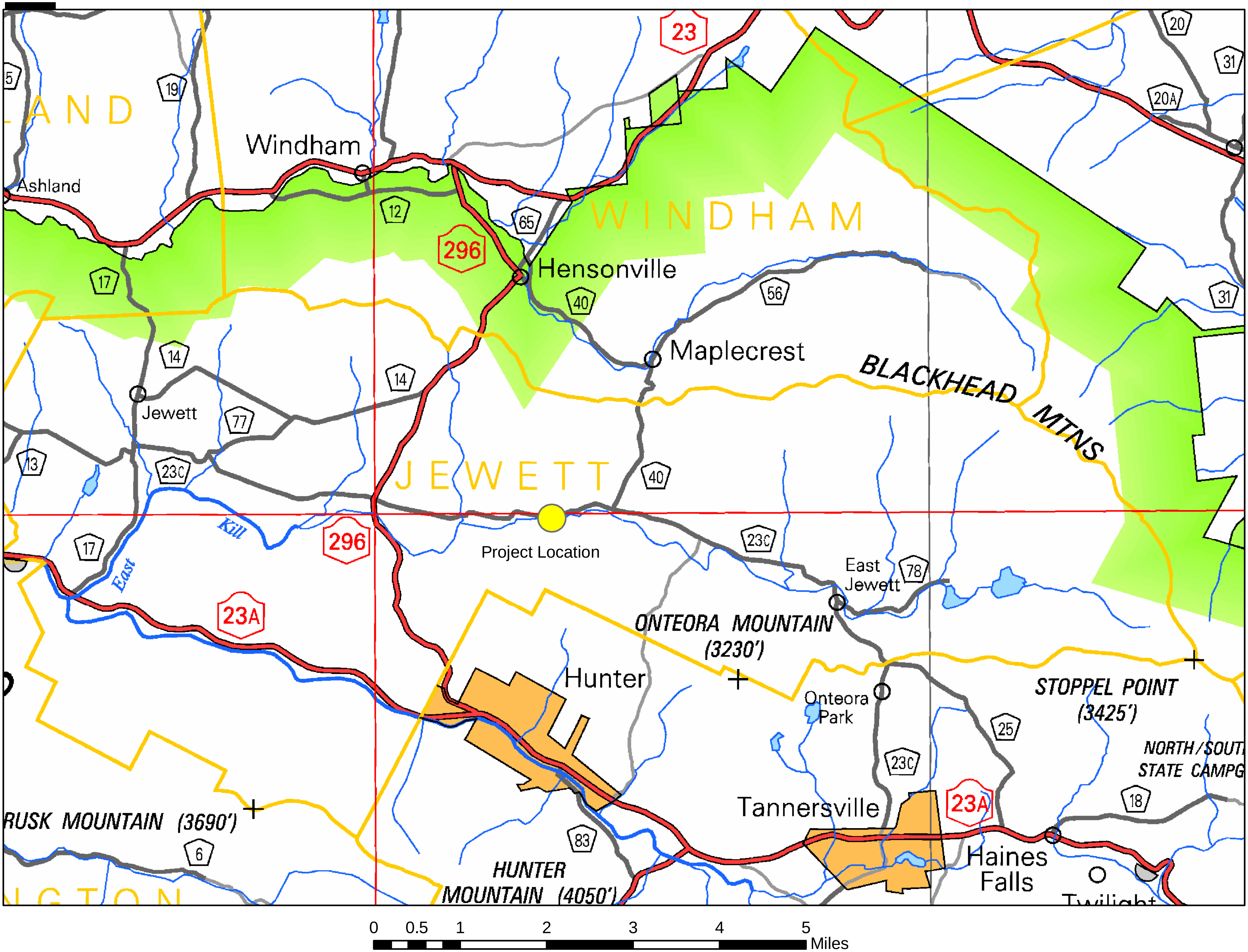
6.2 Vegetation

Vegetative establishment in the project area is a critical component of the project's long term stability. General site constraints and gravelly soil conditions limit the success and establishment of the designated vegetative element of the project. Careful planning, monitoring and maintenance is required for all of the installed vegetation. Increased browsing pressure from animals, potential for disease, and extreme weather conditions can reduce the success of the plant materials. Inspection and monitoring of the plant materials throughout the initial stage of development will assist in ensuring plant viability.

Supplemental installation of plant material, as needed, in the form of bioengineering and riparian planting will ensure effective riparian establishment. During supplemental planting, a variety of bio-engineering techniques will be used to increase woody vegetation at the site. These plantings will require maintenance to ensure proper moisture at critical times. The monitoring plan for vegetation is included in Appendix D.

Appendix A
Maps

A.1 Project Location Map



Windham
Ashland
Hensonville
Maplecrest
WINDHAM
BLACKHEAD MTNS
Jewett
JEWETT
Project Location
East Jewett
ONTEORA MOUNTAIN
(3230')
Hunter
Onteora Park
STOPPEL POINT
(3425')
Tannersville
Haines Falls
RUSK MOUNTAIN (3690')
HUNTER MOUNTAIN (4050')
East Kill
23
296
23A
0 0.5 1 2 3 4 5
Miles

Appendix B

Photographs and Descriptions

B.1 Pre-Construction

B.2 Project Construction - De-Watering

B.3 Project Construction - Grading / Vane Construction

B.4 Project Construction - Bioengineering

B.1 Pre-Construction

Photograph 1: Image of over widened channel below bridge at top of project.

Photograph 2: Image displaying livestock grazing on along streambanks.

Photograph 3: Excessive deposition displaying summer subsurface low flow near middle of project reach.

Photograph 4: Bar formation and excessive sedimentation at bottom of project site near confluence with tributary.

Photograph 5: Aerial photograph displaying project extent. Image displays lack of vegetation along streambanks and limited channel sinuosity due to channelization and floodplain berms.

Photograph 6: Close up view of severe bank erosion at bottom of the project reach near the confluence tributary.

B.2 Project Construction - De-watering

Photograph 7: Water structure located at the top of project reach.

Photograph 8: Pumped diversion lines out letting to existing grassed drainage channel.

Photograph 9: Natural channel used to divert water around project area.

Photograph 10: Intake line located at upstream bridge.

Photograph 11: Sediment control pump being mobilized downstream disturbed work area.

Photograph 12: Image of channel during initial de-watering.

B.3 Project Construction - Grading / Vane Construction

Photograph 13: Initial rough grading of floodplain.

Photograph 14: Image of final grading middle of project reach.

Photograph 15: Example of stone used in the vane construction.

Photograph 16: Rock vane construction.

Photograph 17: Point bar grading and vane construction

Photograph 18: Final grading and application of topsoil.

B.4 Project Construction - Bioengineering

Photograph 19: GCSWCD staff performing hydro seeding.

Photograph 20: Trout Unlimited volunteers tying fascines.

Photograph 21: Brush layering at first meander.

Photograph 22: Completed section of brush layering downstream of first cross vane.

Photograph 23: Brush layering at second meander.

Photograph 24: Example of brush mattress.

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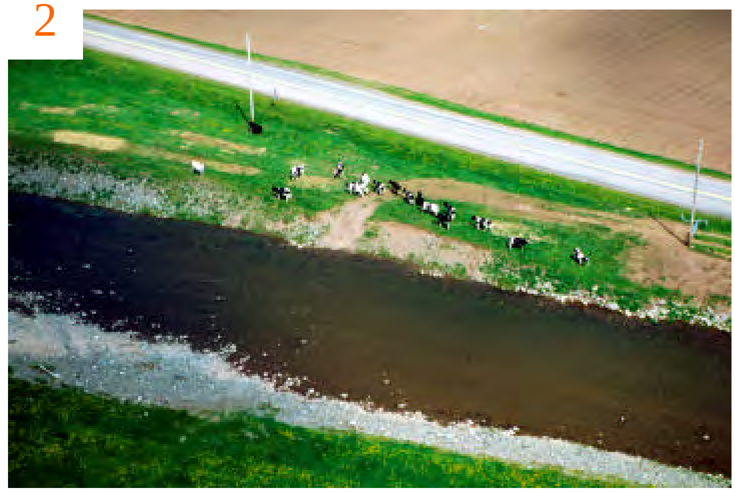

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Farber Farm Stream Restoration Project
Pre-Construction

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Farber Farm Stream Restoration Project
Project Construction 2000

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Farber Farm Stream Restoration Project
Project Construction 2000

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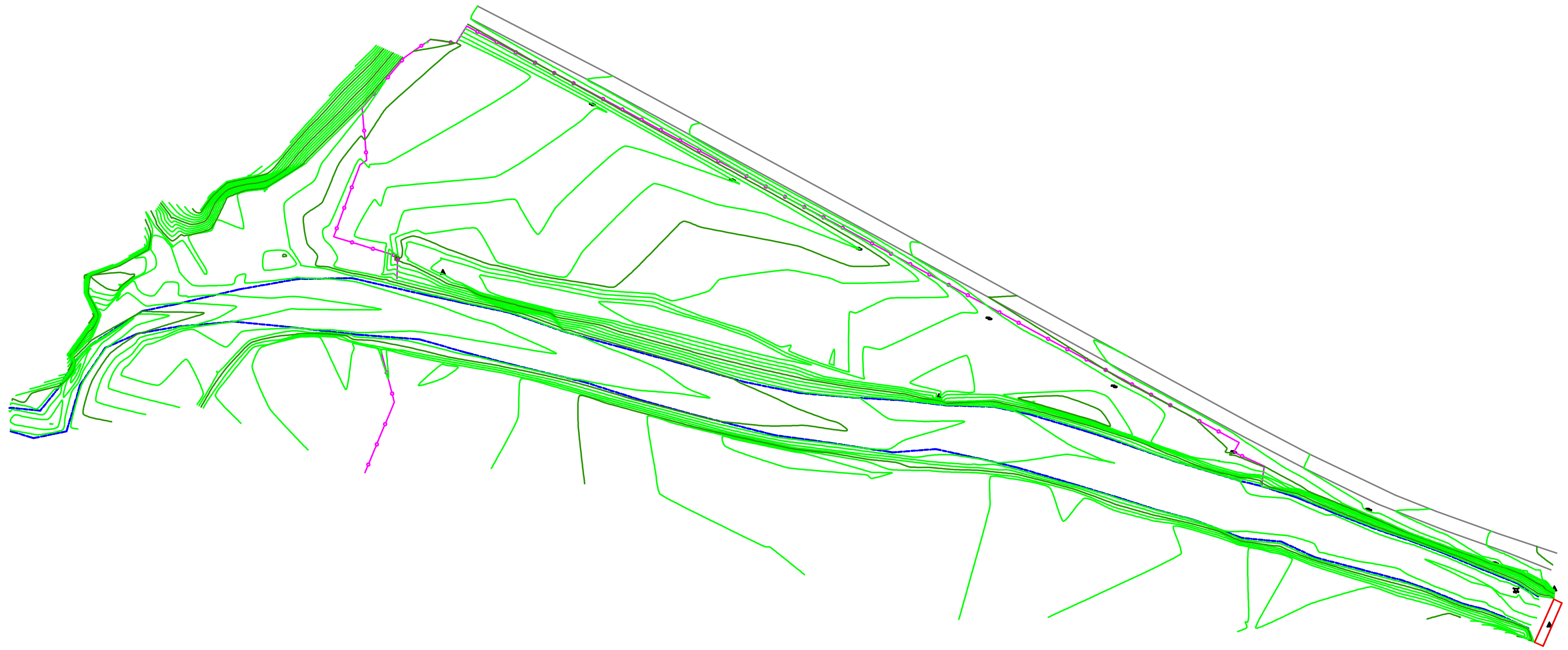
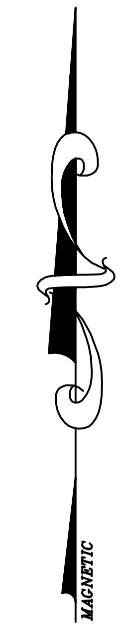
Farber Farm Stream Restoration Project
Bioengineering 2000





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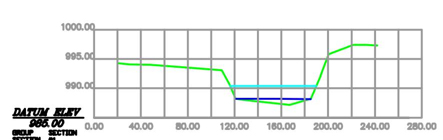

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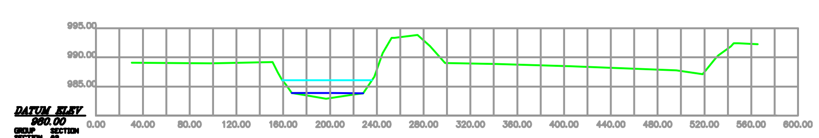
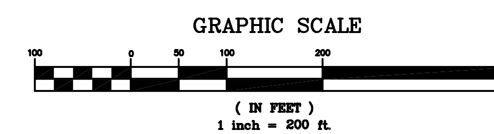
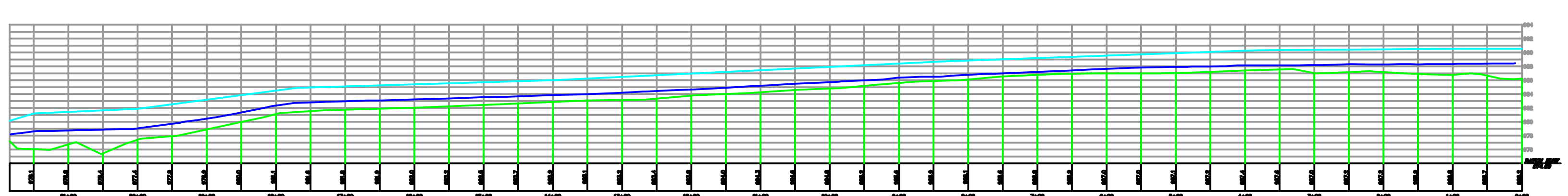




LONGITUDINAL PROFILE



J.J. FARBER FARMSTEAD
STREAM RESTORATION PROJECT
SITE PLAN

WATERSHED AGRICULTURAL PROGRAM

Designed ______	Date ______	Approved by ______
Drawn ______	______	Title ______
Traced ______	______	Sheet No. / Drawing No.
Checked ______	______	of / EXISTING CONDITIONS

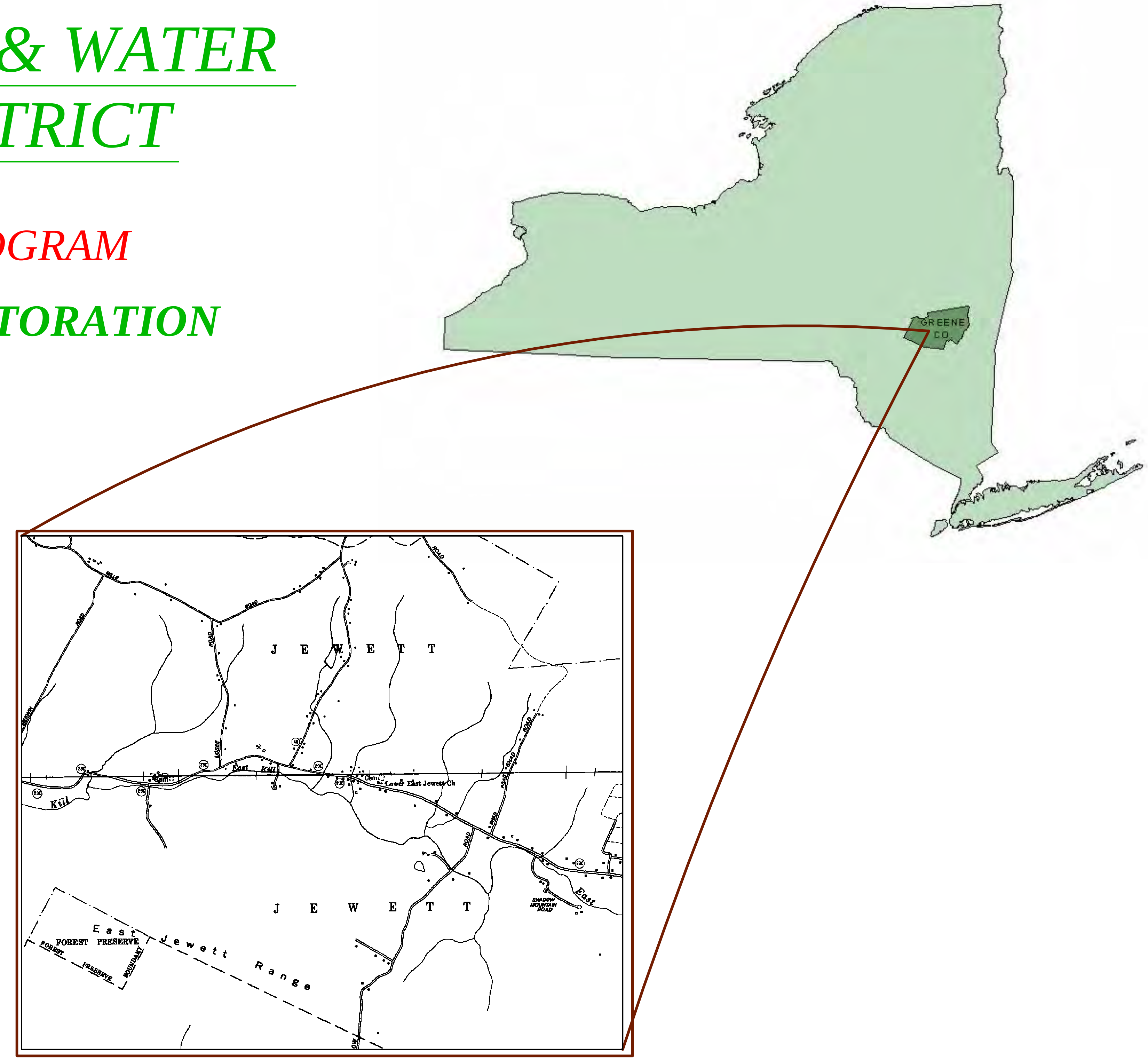
Appendix C

Project Design

GREENE COUNTY SOIL & WATER CONSERVATION DISTRICT

STREAM MANAGEMENT PROGRAM

"FARBER FARM" STREAM RESTORATION PROJECT



INDEX OF DRAWINGS

LEGEND

REVISIONS

J.J. FARBER FARM
STREAM RESTORATION PROJECT

TOWN OF JEWETT	COUNTY OF GREENE
MAY 18, 2000	NOT TO SCALE

GREENE COUNTY SOIL & WATER CONSERVATION DISTRICT
BOX 907 GREENE COUNTY OFFICE BUILDING, CAIRO, NY 12414
PHONE (518) 622-3620
FAX (518) 622-0344

STREAM MANAGEMENT PROGRAM

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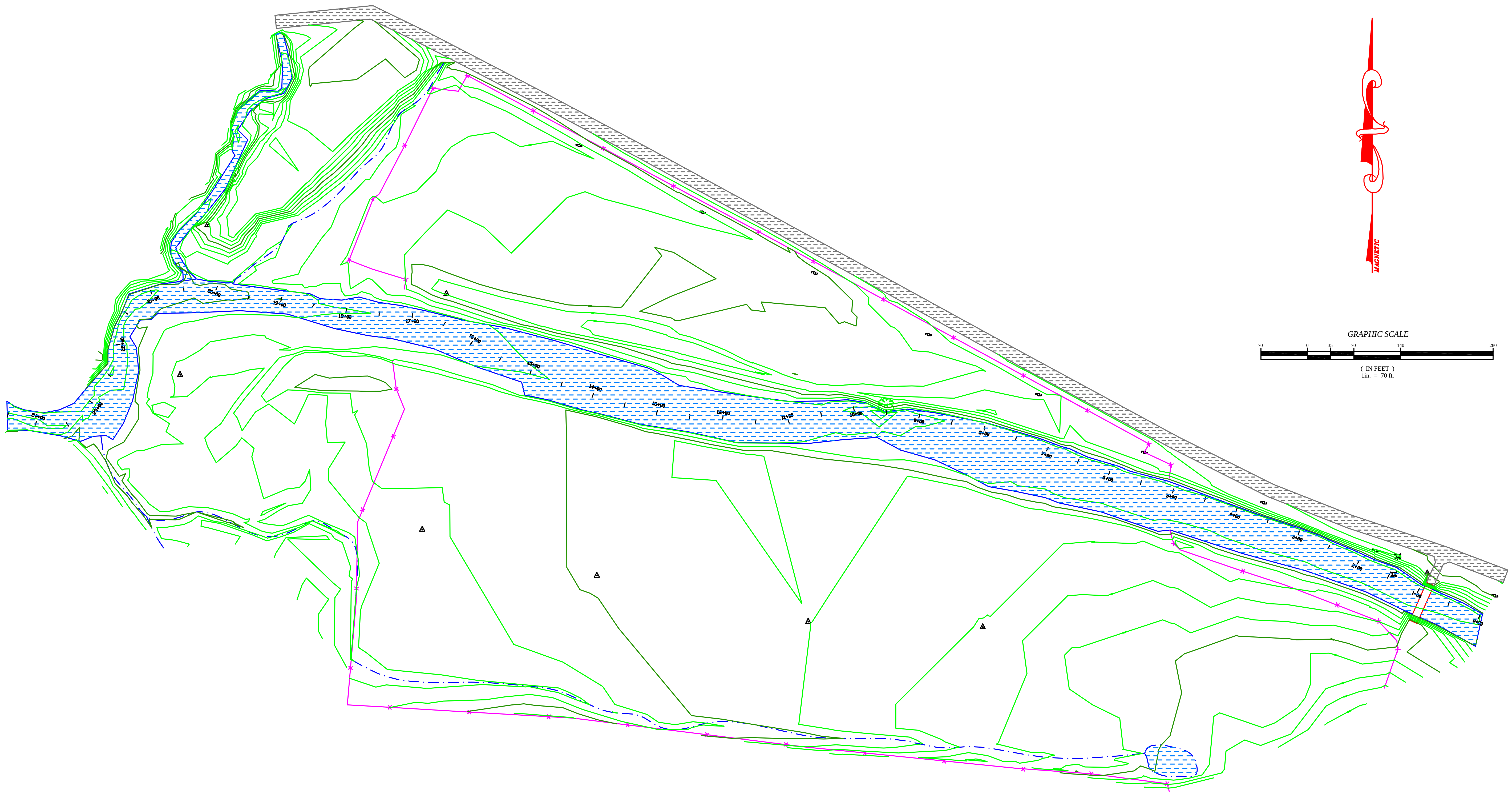
DRAWN BY: DOUG DEKOSKIE	DRAWING #: ESP-99.01
SHEET 1 OF 10	TITLE PAGE



J.J. FARBER FARM
STREAM RESTORATION PROJECT

EAST JEWETT, NY	COUNTY OF GREENE
MAY 18, 2000	SCALE: 1" = 70'

GREENE COUNTY SOIL & WATER
CONSERVATION DISTRICT

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REVISIONS

STREAM MANAGEMENT PROGRAM

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DRAWN BY: DOUG DEKOSKIE	DRAWING #: ESP-99.01
SHEET 2 OF 10	EXISTING TOPOGRAPHIC MAP

LEGEND

- WATER SURFACE
- CONTROL PIN
- UTILITY POLE
- FENCE LINE
- DITCH CENTERLINE

KEA

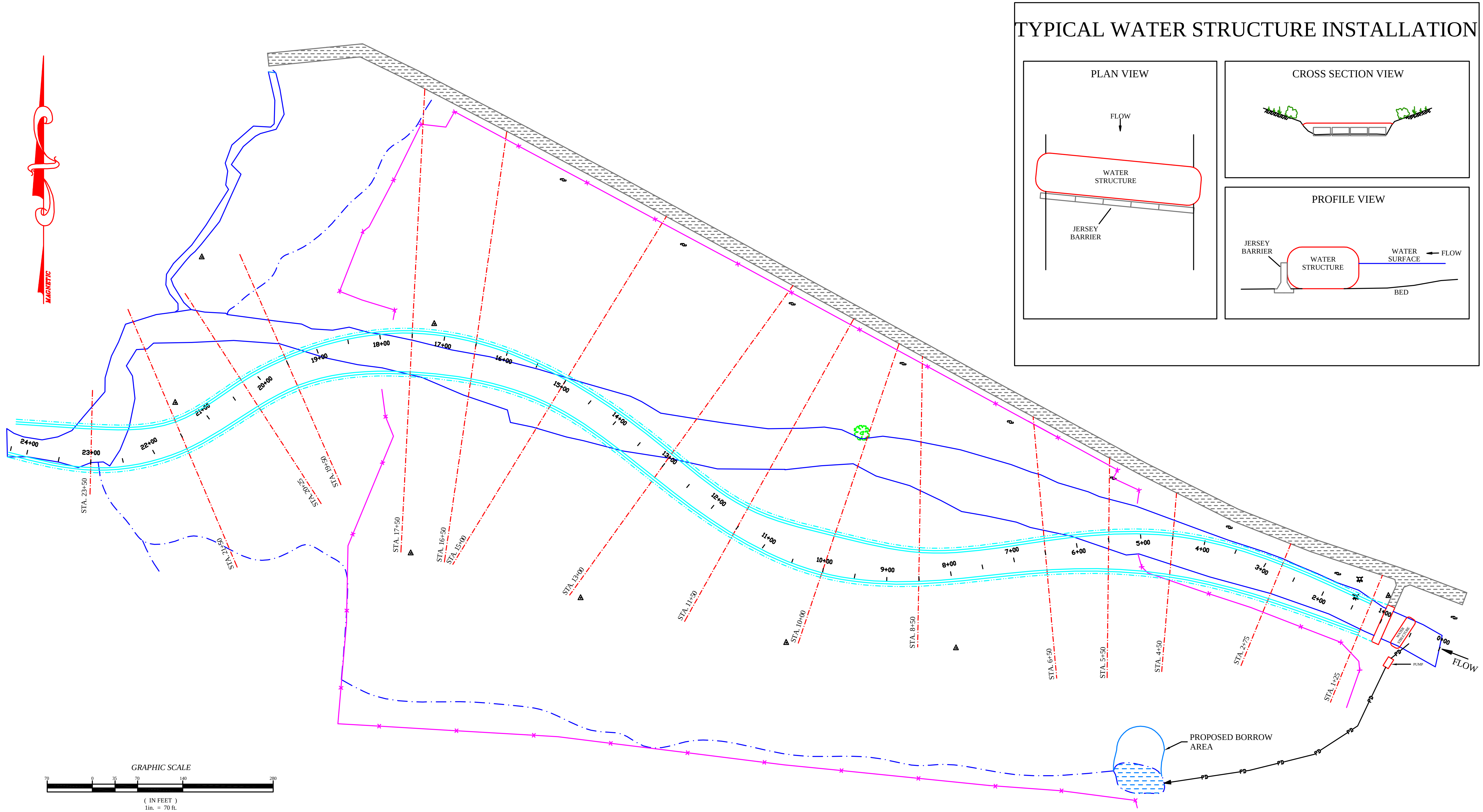
KAATERSKILL ENGINEERING ASSOCIATES, PC

CAIRO, NY 518-622-9667 TANNERSVILLE, NY 518-589-3034

NOTE

Existing topographic survey performed in March 2000.

Initial elevation, northing, and easting were assumed values. The entire survey is relative to these assumptions



NOTE

Existing topographic survey performed in March 2000.

Initial elevation, northing, and easting were assumed values. The entire survey is relative to these assumptions

KEA

KAATERSKILL ENGINEERING ASSOCIATES, PC

CAIRO, NY 518-622-9667 TANNERSVILLE, NY 518-589-3034

LEGEND

- EXISTING WATER SURFACE
- PROPOSED BANKFULL CHANNEL
- PUMPED DIVERSION (PD)
- FENCE LINE
- DITCH CENTERLINE

REVISIONS

J.J. FARBER FARM
STREAM RESTORATION PROJECT

EAST JEWETT, NY	COUNTY OF GREENE
MAY 18, 2000	SCALE: 1" = 70'

GREENE COUNTY SOIL & WATER CONSERVATION DISTRICT

BOX 907 GREENE COUNTY OFFICE BUILDING, CAIRO, NY 12414
PHONE (518) 622-3620
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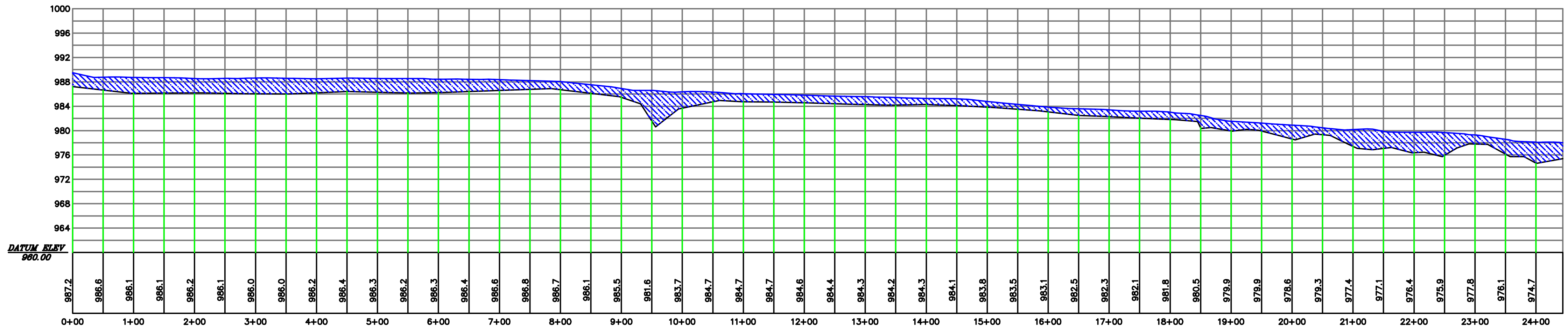
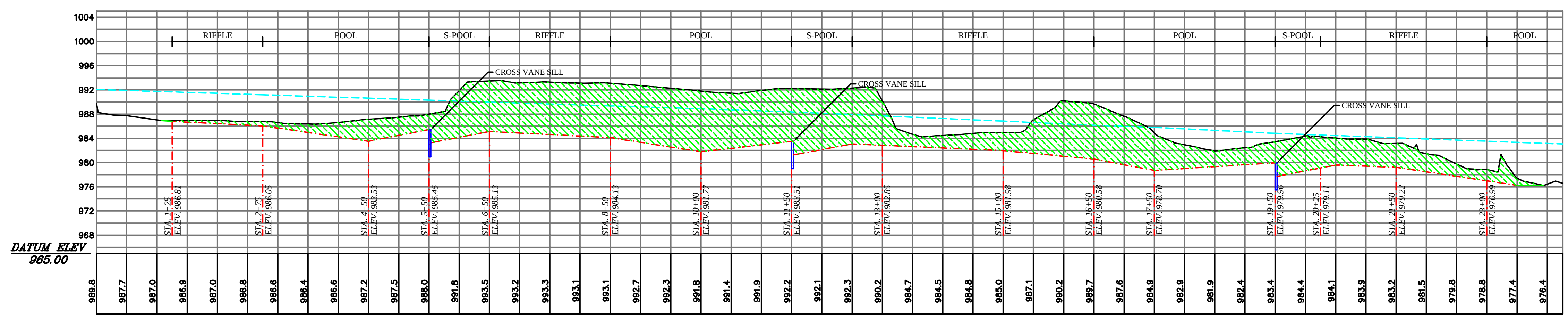
STREAM MANAGEMENT PROGRAM

CHECKED BY:	PROJECT #: ESP-99.01
DRAWN BY: DOUG DEKOSKIE	DRAWING #: ESP-99.01
SHEET 3 OF 10	PROPOSED PLAN VIEW (W/ DEWATERING PLAN)

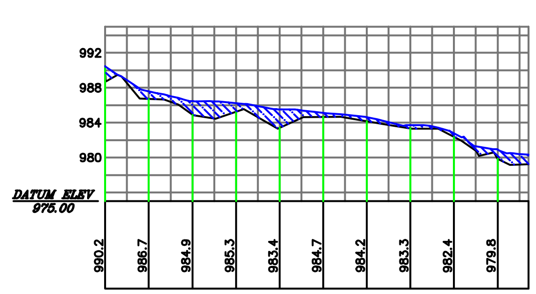
EXISTING LONGITUDINAL PROFILE



PROPOSED LONGITUDINAL PROFILE



EXISTING TRIBUTARY PROFILE



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LEGEND

PROPOSED BANKFULL SURFACE	
PROPOSED THALWEG	
AREA TO CUT	
EXISTING GROUND SURFACE	

REVISIONS

J.J. FARBER FARM
STREAM RESTORATION PROJECT

TOWN OF JEWETT	COUNTY OF GREENE
MAY 19, 2000	SCALE: 1" = 100'

GREENE COUNTY SOIL & WATER CONSERVATION DISTRICT

BOX 907 GREENE COUNTY OFFICE BUILDING, CAIRO, NY 12414
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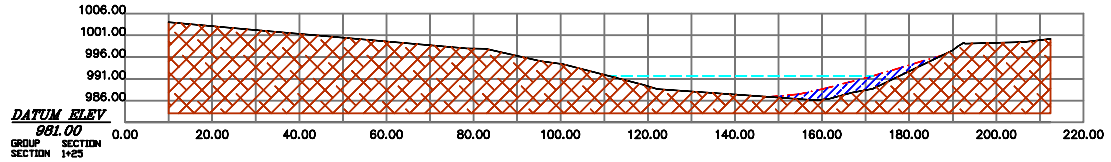
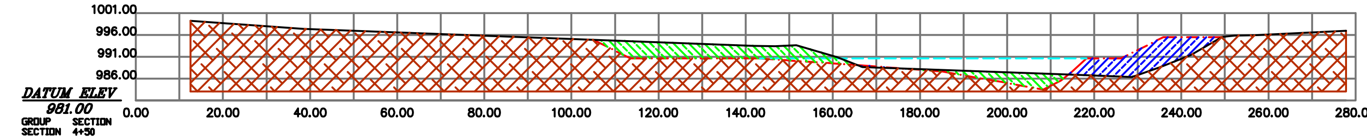
STREAM MANAGEMENT PROGRAM

CHECKED BY:	PROJECT #: ESP-99.01
DRAWN BY: DOUG DEKOSKIE	DRAWING #: ESP-99.01
SHEET 4 OF 10	PROPOSED LONGITUDINAL PROFILE

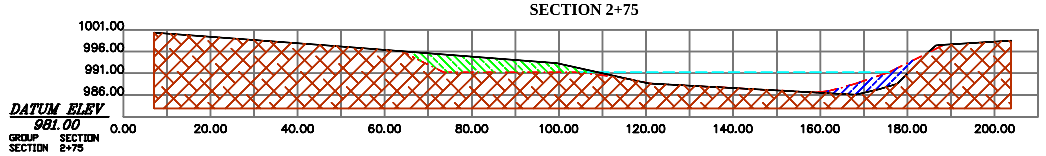
SECTION 1+25



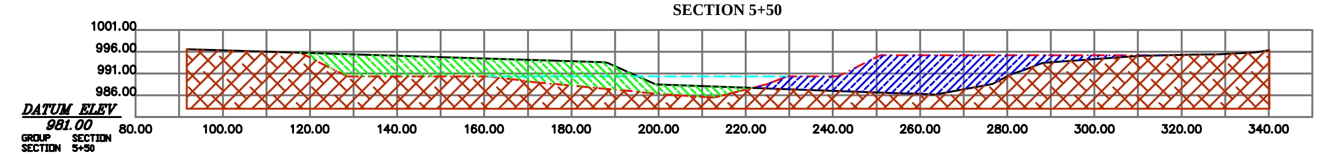
SECTION 4+50



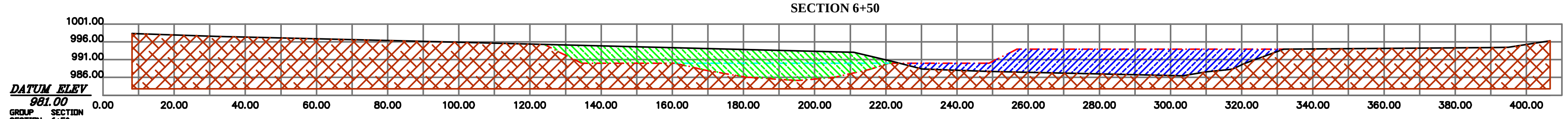
SECTION 2+75



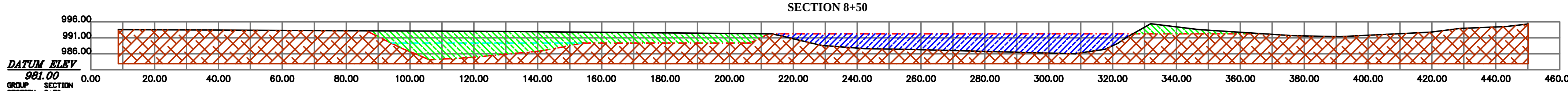
SECTION 5+50



SECTION 6+50



SECTION 8+50



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LEGEND	
PROPOSED GROUND	— · — · —
BANKFULL SURFACE	- - - - -
EXISTING GROUND	———
AREA TO CUT	(green hatch)
AREA TO FILL	(blue hatch)

REVISIONS

J.J. FARBER FARM
STREAM RESTORATION PROJECT

TOWN OF JEWETT	COUNTY OF GREENE
MAY 18, 2000	SCALE: 1" = 20'

GREENE COUNTY SOIL & WATER CONSERVATION DISTRICT

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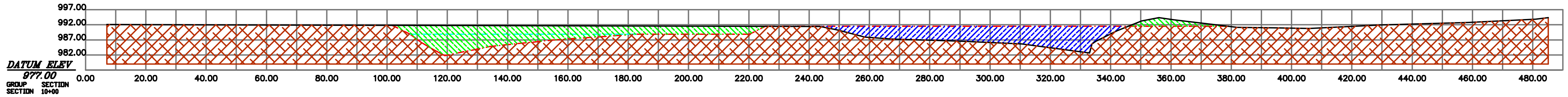
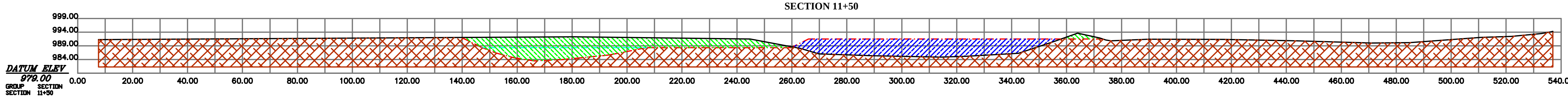
STREAM MANAGEMENT PROGRAM

CHECKED BY:	PROJECT #: ESP-99.01
DRAWN BY: DOUG DEKOSKIE	DRAWING #: ESP-99.01
SHEET 5 OF 10	PROPOSED CROSS SECTIONS (1+25 - 8+50)

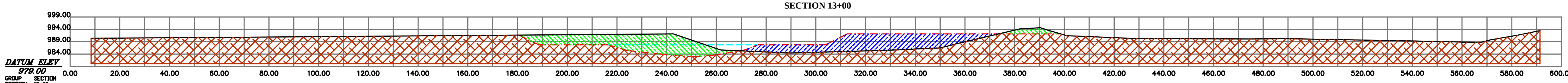
SECTION 10+00



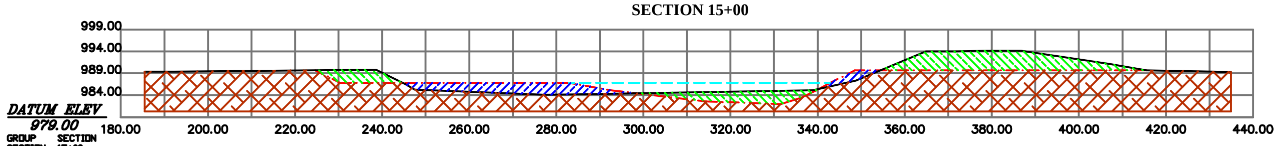
SECTION 11+50



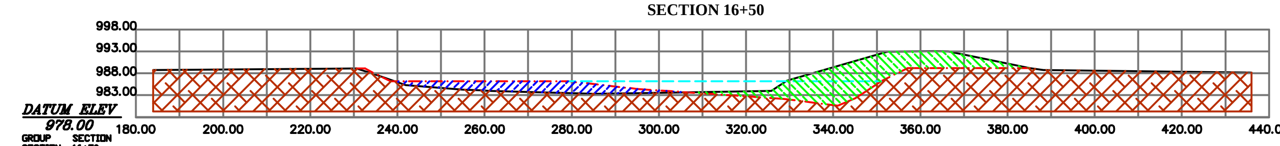
SECTION 13+00



SECTION 15+00



SECTION 16+50



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LEGEND	
PROPOSED GROUND	
BANKFULL SURFACE	
EXISTING GROUND	
AREA TO CUT	
AREA TO FILL	

REVISIONS

J.J. FARBER FARM
STREAM RESTORATION PROJECT

TOWN OF JEWETT	COUNTY OF GREENE
MAY 18, 2000	SCALE: 1" = 20'

GREENE COUNTY SOIL & WATER CONSERVATION DISTRICT

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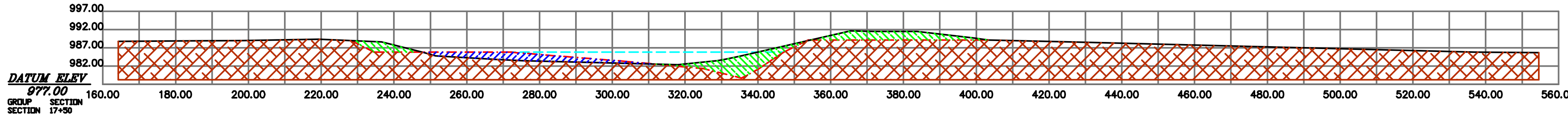
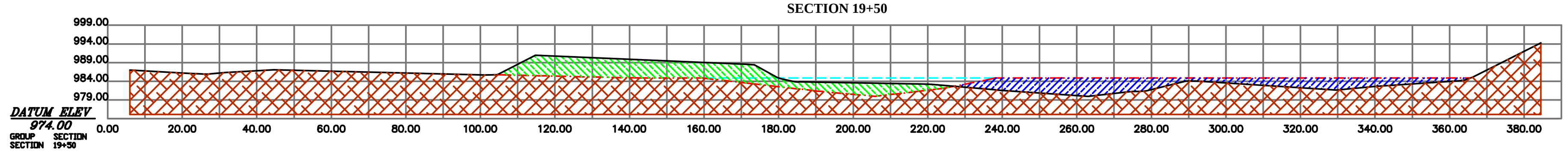
STREAM MANAGEMENT PROGRAM

CHECKED BY:	PROJECT #: ESP-99.01
DRAWN BY: DOUG DEKOSKIE	DRAWING #: ESP-99.01
SHEET 6 OF 10	PROPOSED CROSS SECTIONS (10+00 - 16+50)

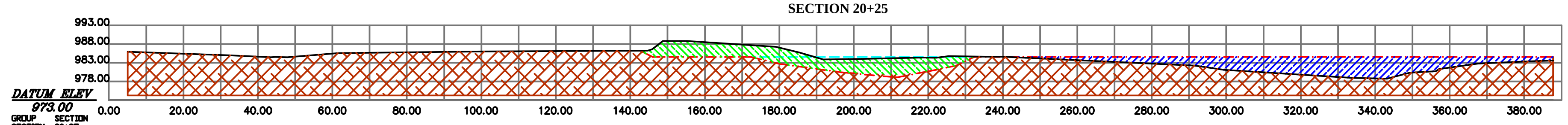
SECTION 17+50



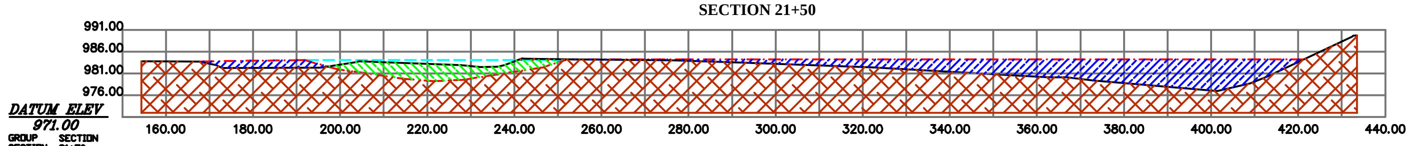
SECTION 19+50



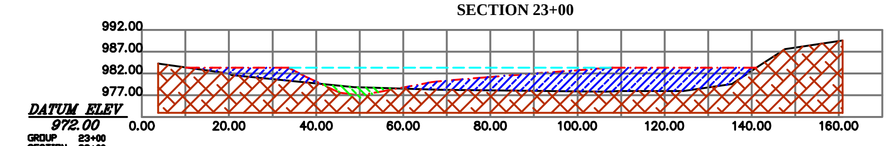
SECTION 20+25



SECTION 21+50



SECTION 23+00



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LEGEND

- PROPOSED GROUND
- BANKFULL SURFACE
- EXISTING GROUND
- AREA TO CUT
- AREA TO FILL

REVISIONS

J.J. FARBER FARM
STREAM RESTORATION PROJECT

TOWN OF JEWETT	COUNTY OF GREENE
MAY 18, 2000	SCALE: 1" = 20'

GREENE COUNTY SOIL & WATER CONSERVATION DISTRICT

BOX 907 GREENE COUNTY OFFICE BUILDING, CAIRO, NY 12414
PHONE (518) 622-3620
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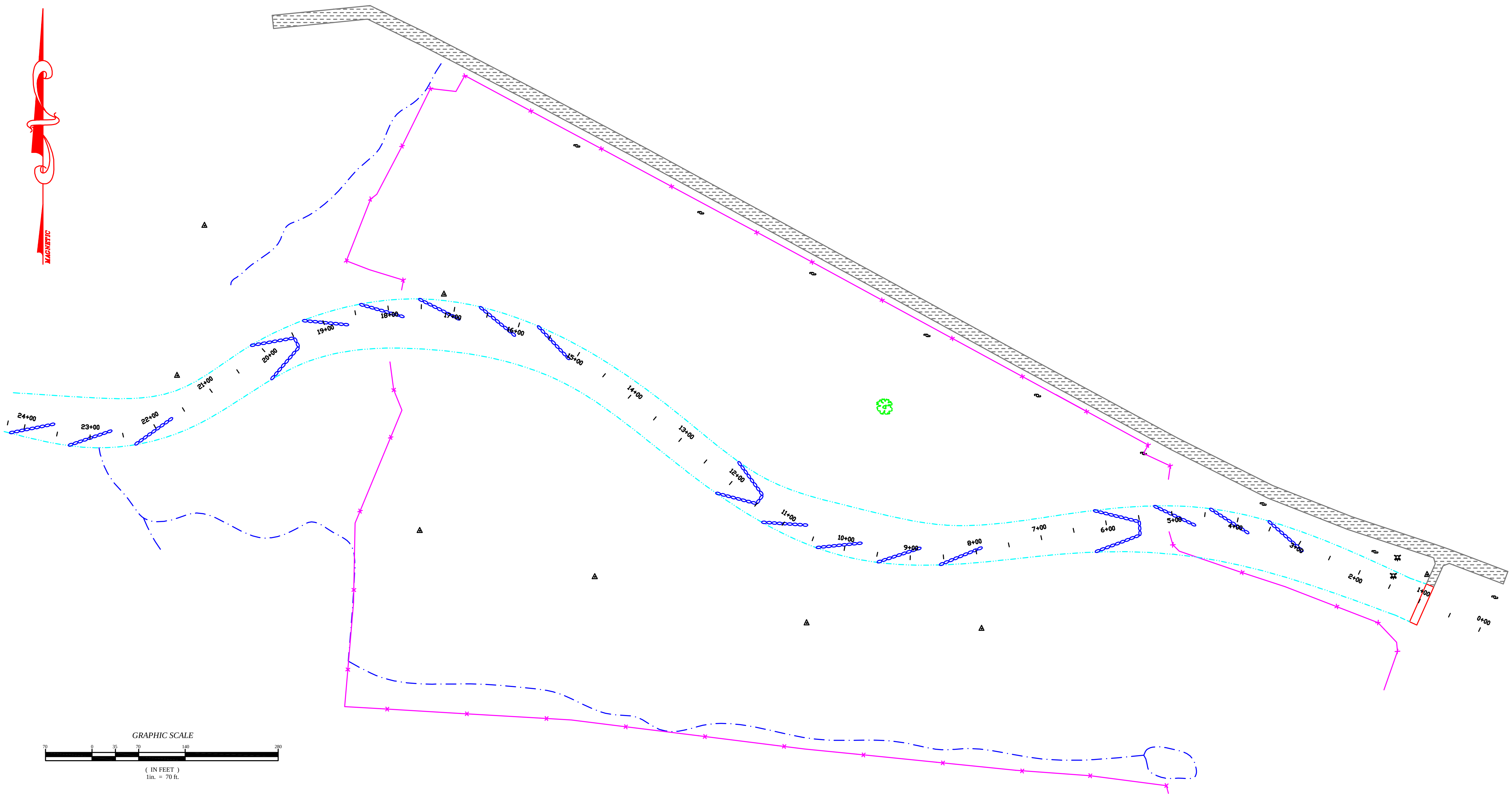
STREAM MANAGEMENT PROGRAM

CHECKED BY:	PROJECT #: ESP-99.01
DRAWN BY: DOUG DEKOSKIE	DRAWING #: ESP-99.01
SHEET 7 OF 10	PROPOSED CROSS SECTIONS (17+50 - 23+50)



NOTE

Existing topographic survey performed in March 2000.

Initial elevation, northing, and easting were assumed values. The entire survey is relative to these assumptions

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LEGEND

PROPOSED BANKFULL CHANNEL	
PROPOSED STRUCTURE	
CONTROL PIN	
DITCH CENTERLINE	

REVISIONS

J.J. FARBER FARM
STREAM RESTORATION PROJECT

EAST JEWETT, NY	COUNTY OF GREENE
MAY 18, 2000	SCALE: 1" = 70'

GREENE COUNTY SOIL & WATER CONSERVATION DISTRICT

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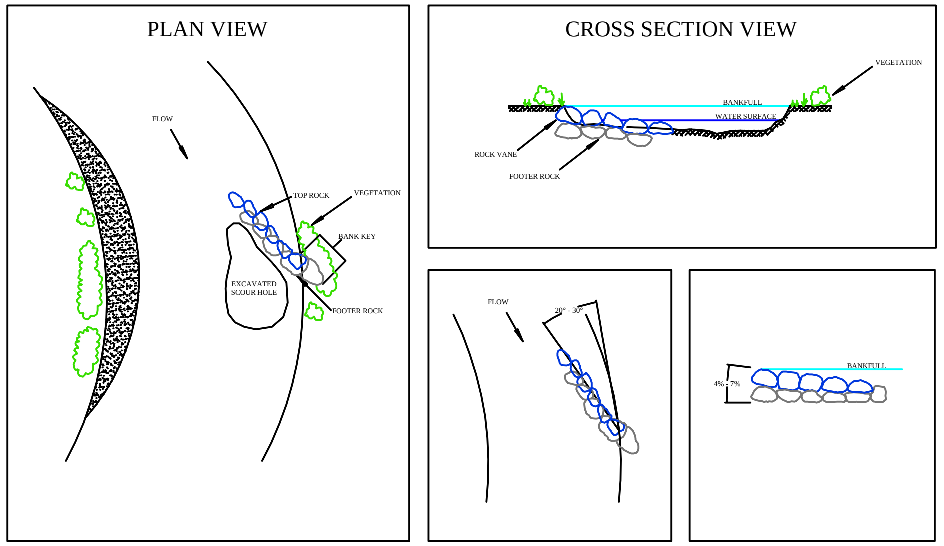
PHONE (518) 622-3620
FAX (518) 622-0344

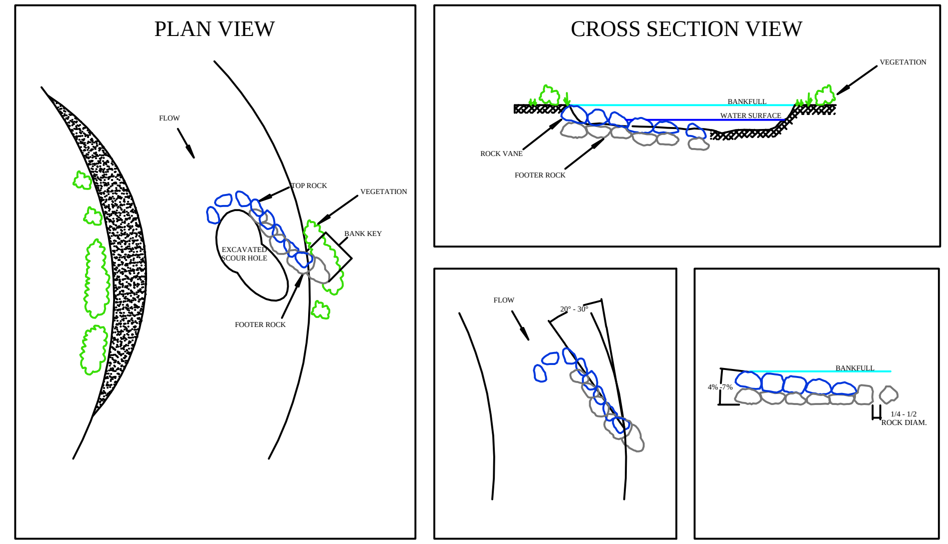
STREAM MANAGEMENT PROGRAM

CHECKED BY:	PROJECT #: ESP-99.01
DRAWN BY: DOUG DEKOSKIE	DRAWING #: ESP-99.01
SHEET 8 OF 10	PROPOSED PLAN VIEW (W/ STRUCTURE PLACEMENT)

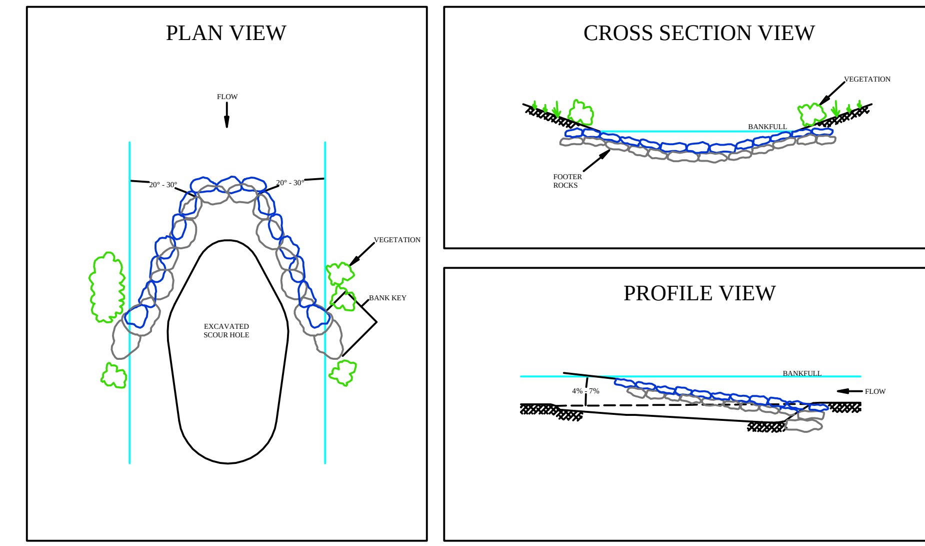
ROCK VANE (SR-01)



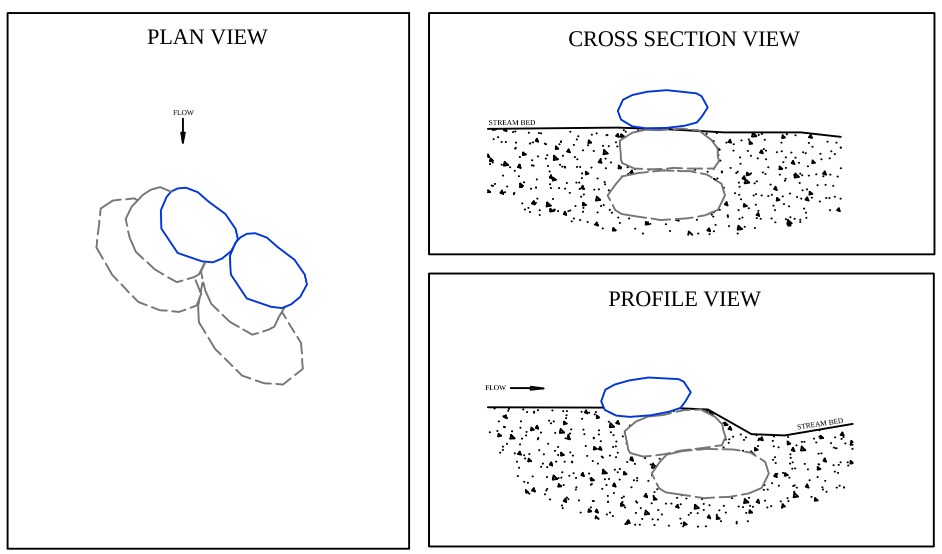
J-HOOK VANE (SR-02)



ROCK CROSS VANE (SR-03)



FOOTER ROCK PLACEMENT



CONSTRUCTION NOTES

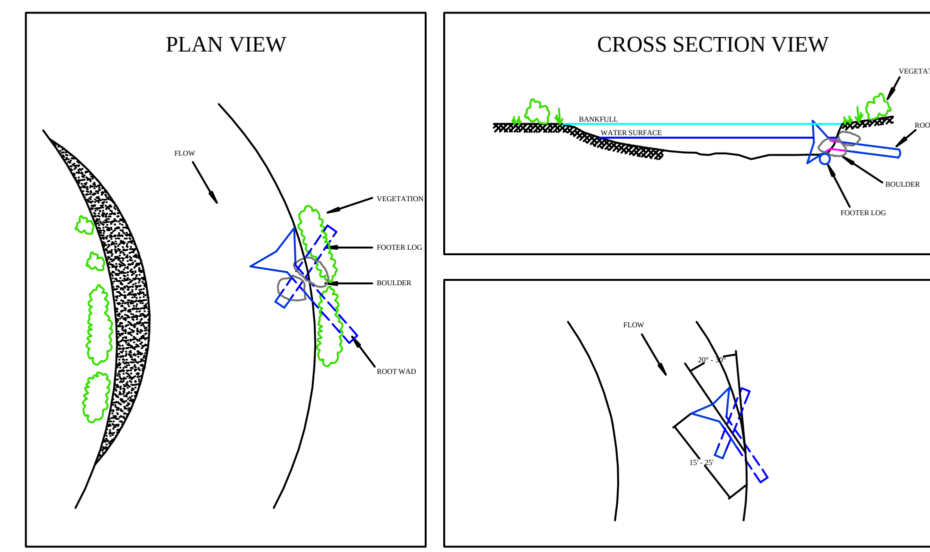
1. The construction of all structures will done in the presence of a designated contracting officer.

2. The size and placement of scour holes will be determined by the contracting officer. See construction specifications.

3. The bank key for all rock structures will be a minimum of eight feet (8') in length.

4. Vegetative transplants are to be placed in the immediate area upstream and downstream of the installed structure as designated by the contracting officer.

ROOT WAD (SR-06)



MATERIAL SPECIFICATIONS

1. Rock Size

	A-axis	B-axis	C-axis
Minimum Size	4'	3'	2'
Maximum Size	8'	6'	5'

2. Root wads and footer logs will be identified and flagged by the contracting officer.

3. Root wads should have a minimum root diameter of four feet (4') with a minimum length of fifteen feet (15') and a trunk diameter of at least eighteen inches (18").

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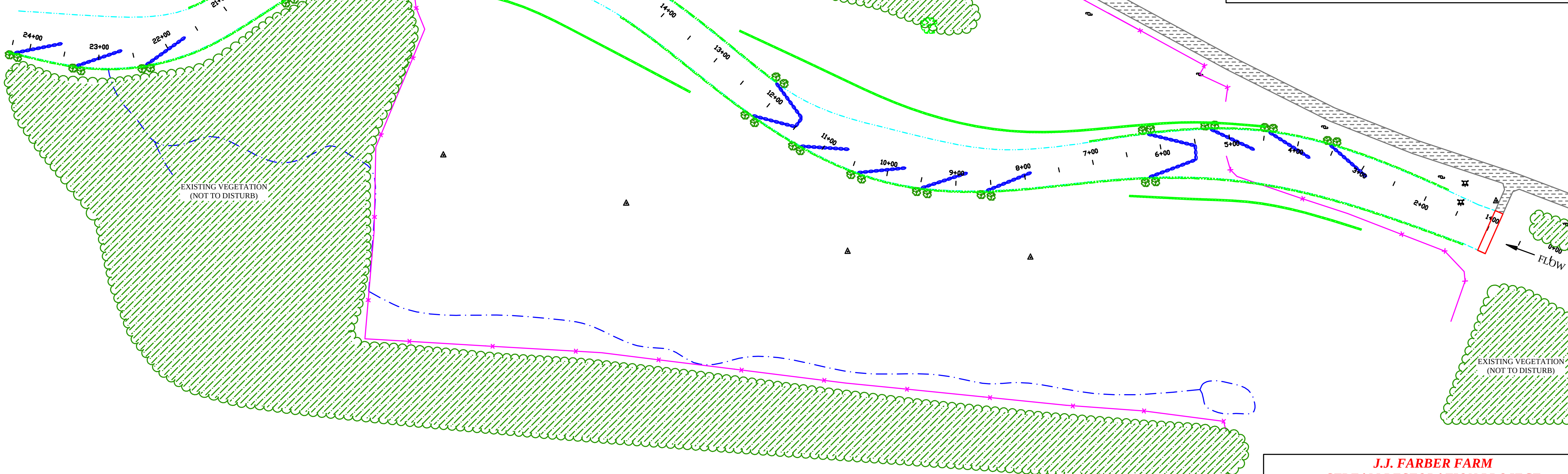
LEGEND

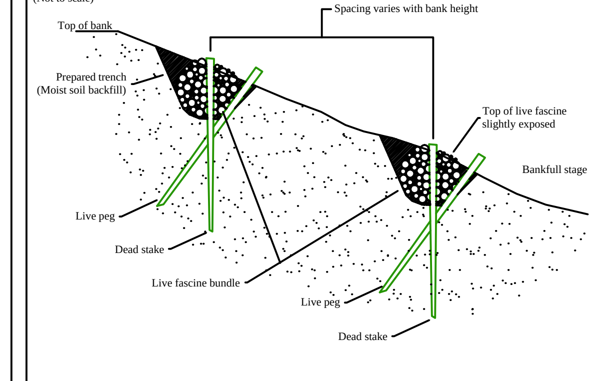
REVISIONS

J.J. FARBER FARM STREAM RESTORATION PROJECT	
TOWN OF WINDHAM	COUNTY OF GREENE
MAY 18, 2000	SCALE (PER DRAWING)
GREENE COUNTY SOIL & WATER CONSERVATION DISTRICT BOX 907 GREENE COUNTY OFFICE BUILDING, CAIRO, NY 12414 PHONE (518) 622-3620 FAX (518) 622-0344	
STREAM MANAGEMENT PROGRAM	
CHECKED BY:	PROJECT #: ESP-99.01
DRAWN BY: DOUG DEKOSKIE	DRAWING #: ESP-99.01
SHEET 9 OF 10	CONSTRUCTION DETAILS

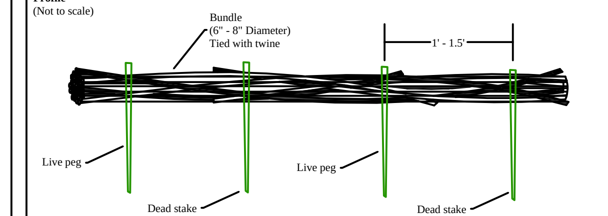


LIVE FASCINE DETAIL (VS-01)

Cross Section
(Not to scale)



Profile
(Not to scale)



GRAPHIC SCALE

70 0 35 70 140 280

(IN FEET)
1in. = 70 ft.

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CAIRO, NY 518-622-9667 TANNERSVILLE, NY 518-589-3034

LEGEND	
PROPOSED BANKFULL CHANNEL	
PROPOSED STRUCTURE	
FASCINE	
TRANSPLANT	

REVISIONS

J.J. FARBER FARM
STREAM RESTORATION PROJECT

EAST JEWETT, NY	COUNTY OF GREENE
MAY 18, 2000	SCALE: 1" = 70'

GREENE COUNTY SOIL & WATER CONSERVATION DISTRICT

BOX 907 GREENE COUNTY OFFICE BUILDING, CAIRO, NY 12414
PHONE (518) 622-3620
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STREAM MANAGEMENT PROGRAM

CHECKED BY:	PROJECT #: ESP-99.01
DRAWN BY: DOUG DEKOSKIE	DRAWING #: ESP-99.01
SHEET 10 OF 10	PROPOSED PLANTING DETAIL

Appendix D

Project Physical Monitoring Plan

Farber Farm Restoration Project
Monitoring Plan

1.0 Introduction

In recent years, there has been increasing focus on the use of fluvial geomorphic restoration techniques to provide channel stabilization while targeting a range of additional multi-objective project goals. The techniques, generally referred to as natural stream channel design, typically include the development of an appropriate channel geometry, which mimics a natural stable form of the channel. Combinations of rock and log structures and various bioengineering practices are typically used to promote increased, long term bank and channel stability, promote fisheries habitat, and facilitate flood and sediment transport.

A natural channel maintains it's stability while making continual adjustments in geometry over time as a result of changes in stream flow and sediment load. Restoration projects that are constructed to imitate the natural equilibrium of stable channels are subject to these adjustments and remain particularly vulnerable prior to the establishment of vegetation.

A critical element to the long term success of these projects is in monitoring the restoration site to provide for baseline conditions and to verify results of the restoration effort. Monitoring the restoration project can be used to meet permit requirements, measure the performance and success, and provide increased knowledge in the design and construction procedures.

The following document describes the proposed physical monitoring plan for the Farber Farm Restoration Project.

2.0 Permit Requirements - Monitoring

A condition of the permit, issued by the Army Corps of Engineers for the Farber Farm Restoration Project, requires the Greene County Soil & Water Conservation District to submit annual reports documenting the status of the project, for three years following the completion of construction. The report to the New York District of the Army Corps must include:

- the current stream type of the reach
- the condition of the planted vegetation
- the condition of upstream and downstream reaches
- color photographs taken during normal low flow, and following an annual or bankfull event to include:
    - the reconfigured channel
    - the re-vegetated areas
    - upstream and downstream reaches

3.0 General Monitoring Strategy

The physical monitoring of the project will include pre-construction, as-built, and post-construction surveys to include a complete longitudinal profile, multiple cross sections, and sediment sampling. Additionally, the project reach will be inspected on a routine basis and will have a detailed inspection after each flow event that meets or exceeds bankfull discharge. Photo documentation of the project site will be used to monitor change over time, as well as to meet the project permit requirements. A five year monitoring program will be initiated in order to fulfill the permit requirements as well as provide a longer period for data collection and comparison given the uncertainty of flow events and vegetative establishment.

4.0 Surveys and Sampling Locations

The following surveys will be performed to document physical performance:

4.1 Topographic Survey (As-built)

The completed restoration projects are surveyed immediately after construction to document the "as-built" condition of the new channel and the adjoining floodplain area. The as-built survey includes:

- topographic ground surface
- location of structures
- longitudinal profile along the thalweg
- multiple cross sections
- bankfull stage
- water surface
- locations of installed bioengineering components.

4.2 Cross Sections

At the time of the as-built survey, monumented cross sections will be installed for use in detailed monitoring efforts. Cross sections are monumented using capped rebar pins, which are located in the topographic survey and recorded using GPS.

Cross sections are placed in various locations along the completed project reach to monitor stream process. These include sections through potential high stress areas and across varying stream features (pools, riffles, etc.) in order to document stability, stream classification, and potential erosion and scour. Additional cross sections will be established across or near stabilization structures (rock vanes, cross vanes, etc.) in order to monitor performance.

4.3 Longitudinal Profile

Longitudinal profile surveys include the sampling of ground surface point at slope breaks along the thalweg of the channel to document physical channel dimensions. The profile survey also includes the daily water surface slope as well as the elevation of bankfull indicators along the channel. The sampling is tied to the project datum so future modeling efforts can be initiated. The profile survey can be used to indicate channel vertical stability and channel efficiency, as well as correlate morphological channel parameters such as feature characteristics, increase in channel storage, and riffle-pool measurements.

4.4 Sediment Samples

Sediment sampling is used to provide indicators of channel process, as well as for stream classification and monitoring. The primary sediment analysis is based on the Wolman pebble count. Pebble counts are conducted using composite methods for classification, as well as detailed sampling at designated cross sections for hydraulic analysis and to monitor shifts in particle size. Additional pebble counts may be conducted in specific features (i.e. pools) to monitor changes in the sediment stratification as the project adjusts to the natural bed load supply in the system.

The Greene County Soil & Water Conservation District also intends to conduct bar sample analyses within the project reach. Bar sample analyses are not recommended for a period of time after construction, and will not be completed until such time that the GCSWCD feels that the channel has reached a natural sediment regime. As a minimum, bar sampling analysis of the restoration reach should not be conducted until the reach has experienced at least one, preferably more, bankfull flows.

5.0 Assessment Procedures

The monitoring data will be analyzed using two general scales. Relationships will be made to annually to determine general morphological trends occurring through the project reach as well as comparisons made "at-a-station" using direct comparisons between monitored stations. Monitoring data can additionally be correlated to flow events which occur between monitoring intervals.

Surveys will be matched and analyzed in order to review the change in channel dimensions and geometry of individual surveys. This technique will assist in quantifying physical change at a station and used to review processes through the reach. The assessment can be conducted at multiple scales at various time increments in order to provide annual performance data as well as after significant flow events.

A simple comparison between surveys (annual or storm) can indicate channel progression, changes in channel efficiency, and deviation of channel morphology from the design channel parameters. Analysis of the physical data may also determine the appropriateness of a channel design technique and may show the sensitivity of certain techniques to channel processes. In terms of management (operation and maintenance), the overlays provide indicators of the trajectory of the rebuilt channel, therefore the analysis can be used to quantify further modification of the channel. The assessment can be further developed using comparisons within the reach, against regional values, stream channel classification indexes, and reference reach data. The channel parameters can be applied to channel evolution models to review the effectiveness of a treatment in halting or accelerating a channel process.

6.0 Reporting

Several project status reports will be generated in order to document the specific type and timing of the project monitoring and assessment. Status reporting will include a combination of various site inspection reports, annual status reports, a post-construction report, and a final assessment report. A brief summary of each report is listed as follows:

6.1 Post-construction Report

The as-built survey report will include the following:

- Field adjustments made during the project construction
- Project construction implementation
- Location of post-construction monitoring stations (sections, profile)
- Location and placement of installed structures

- Photographs taken throughout construction and immediately following construction

6.2 Periodic Site Inspections

Periodic site inspections will include the following:

- General site inspection
- Inspection of structures
- Inspection of vegetation
- General channel stability
- Representative photographs through the reach and adjacent areas
- General notes and recommendations

6.3 Annual Status Reports

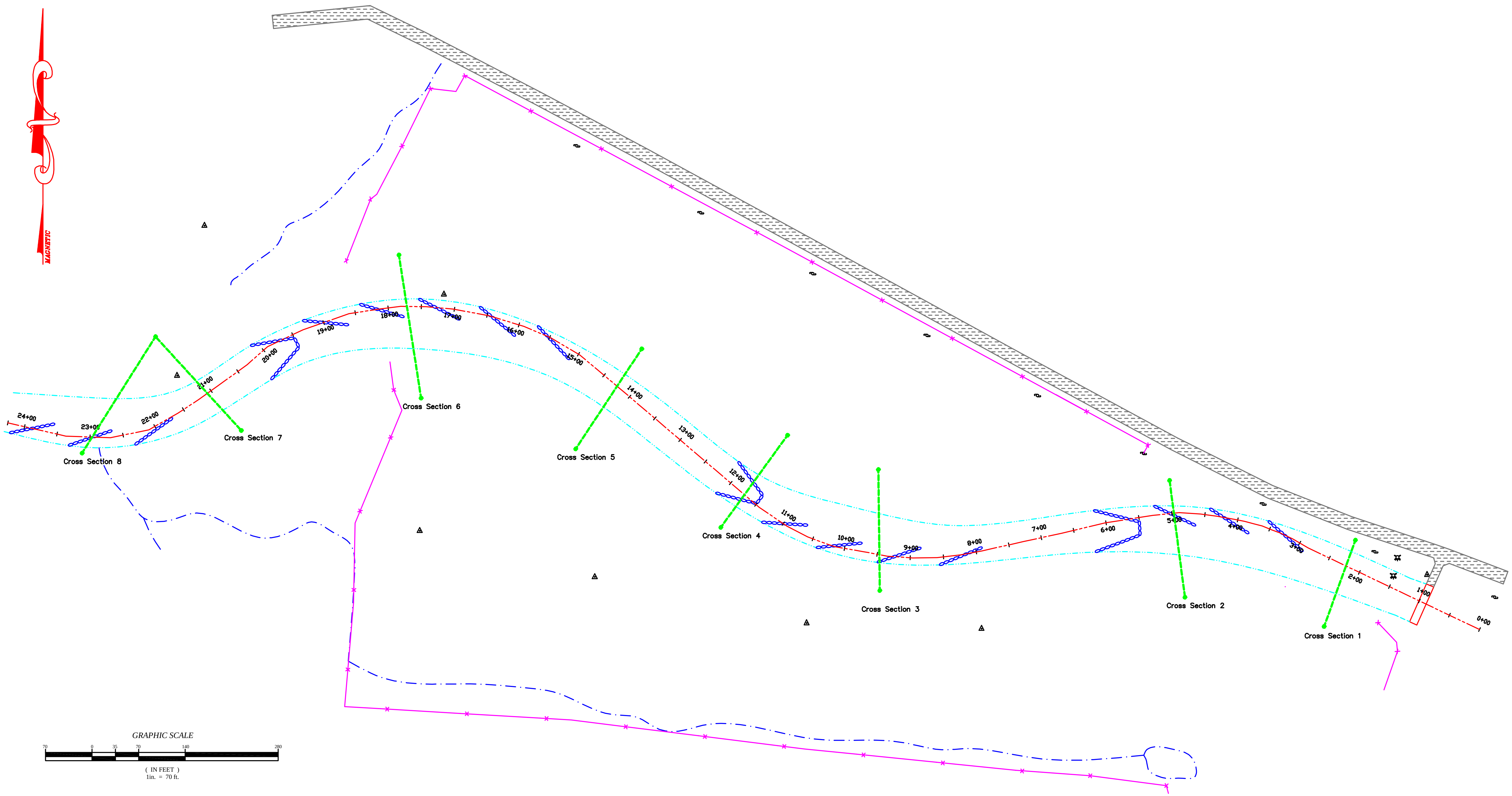
The annual status reports will include the following:

- General site inspection
- Inspection of structures
- Inspection of vegetation
- General channel stability
- Monitoring surveys and assessment
- Representative photographs through the reach and adjacent areas
- General notes and recommendations

6.4 Assessment Reports

The assessment report will include the following:

- Summary of the overall project stability
- Analysis of monitoring surveys and assessments
- Representative photographs through the reach and adjacent areas
- General notes and recommendations



NOTE

Cross section locations overlayed on design planform.

Initial elevation, northing, and easting were assumed values. The entire survey is relative to these assumptions

KEA

KAATERSKILL ENGINEERING ASSOCIATES, PC

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LEGEND

PROPOSED BANKFULL CHANNEL

PROPOSED STRUCTURE

CONTROL PIN

CROSS SECTIONS

REVISIONS

J.J. FARBER FARM
STREAM RESTORATION PROJECT

EAST JEWETT, NY	COUNTY OF GREENE
MAY 1, 2006	SCALE: 1" = 150'

GREENE COUNTY SOIL & WATER CONSERVATION DISTRICT

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PHONE (518) 622-3620
FAX (518) 622-0344

STREAM MANAGEMENT PROGRAM

CHECKED BY:	PROJECT #: ESP-99.01
DRAWN BY: JRB/MM	DRAWING #: ESP-99.01
SHEET 1 OF 1	MONUMENTED SECTION LOCATIONS

Appendix E

Fish & Habitat Monitoring

Preliminary results of fish-community surveys at East Kill study reaches, 2000 and 2002.
B.P. Baldigo

Background -- The U.S. Geological Survey (USGS) in cooperation with the New York City Department of Environmental Protection (NYCDEP) and the Greene County Soil and Water Conservation District (GCSWCD) inventoried fish communities in geomorphically stable and unstable reaches from several streams in southeastern New York State as part of a stream restoration-demonstration program. Major objectives of the fishery monitoring effort are to determine (1) if fish populations and communities differ between stable (reference) and unstable (control and project) stream reaches and (2) if improved stability of restored reaches is reflected by improvements in affected fish populations and communities. Fish inventories were completed in the summer of 2000 at three reaches in the East Kill before restoration of the unstable project (treatment) reach was completed in fall of 2000 (Fig. 1). Another set of inventories was completed at the same three study reaches in 2002. Additional surveys of fisheries at these reaches are currently not planned, but surveys will continue at several other restoration-demonstration streams in the Catskill Region.

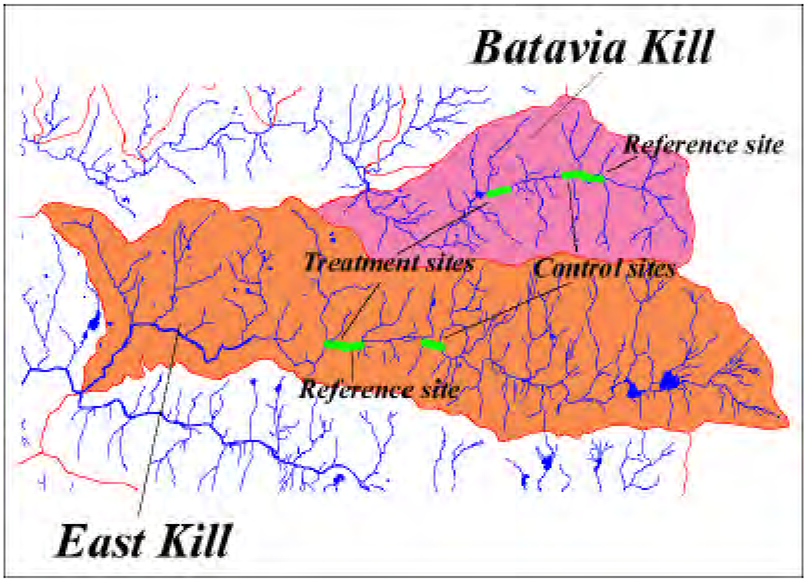

Figure 1. Approximate location of study reaches on the East Kill (and upper Batavia Kill) in the eastern Catskill Mountain Region of New York State.

Results -- Preliminary results from the 2000 and 2002 surveys (Table 1) show that, before restoration fish communities at the stable East Kill reference site had comparable numbers of fish species (richness), somewhat higher species diversity, and lower density and biomass than observed at both unstable control and treatment reaches. These pre-restoration data suggest that geomorphic stability may have a relatively small effect on fish communities. After restoration in the fall of 2000, fish communities (in 2002) at the 3 study reaches had comparable richness, density, biomass, and diversity. Basin-wide factors appear to contribute to these alterations because increases in richness, density, and biomass were similar across reaches. The addition of 3 species and increase in species diversity were greater at the restored reach than at the control and reference reach and suggest that these changes were due, in part, to restoration of the treatment reach. The basis for this change in diversity will become more evident after examining population data below. Community biomass and density estimates are based on unit-area samples and vary with discharge, thus, interpretations of annual trends or changes in each index need to be standardized against flow. Though specific habitat data is unavailable for these reaches, provisional information suggests that differences in reach surface area (and volume) due to the restoration design did not account for changes in either estimate. Additional fish and habitat surveys and more complete data analyses are needed to confirm these findings.

Table 1. Fish-community indices from treatment, control, and reference reaches in the East Kill during summer 2000 and 2002, following the fall 2000 restoration.

Community Index	Treatment reach	Control reach	Reference reach
Year 2000 (untreated)			
Richness (number of fish species)	9	11	10
Density (number of fish/sq. meter)	2.6	2.5	0.9
Biomass (grams of fish/sq. meter)	5.1	5.1	3.7
Species diversity	2.67	3.23	3.41
Year 2002 (restored)			
Richness (number of fish species)	11	12	12
Density (number of fish/sq. meter)	4.8	6.4	5.2
Biomass (grams of fish/sq. meter)	12.1	13.1	16.6
Species diversity	3.16	3.49	3.38

Changes in species populations help explain community trends caused by restoration. Density of fish populations at the treatment reach in 2000 and 2002 (Fig. 2) show that communities at the treatment reach in 2000 consisted primarily of blacknose and longnose dace (92%) and had 2 brown trout (<1%). The fish community at the reference reach (not shown) also consisted mainly of dace (76%), but had 13 brown and 1 brook trout (1% of total density). The community at the control reach was intermediate, with no trout and 86% dace. Dace were still dominant at the treatment reach after restoration, but community changes were evident (Fig. 2). Three additional species were collected at the treatment reach. Dace decreased to 56% of total and density of all other species increased. Ten brown trout were collected, but made up <1% of the total community density.

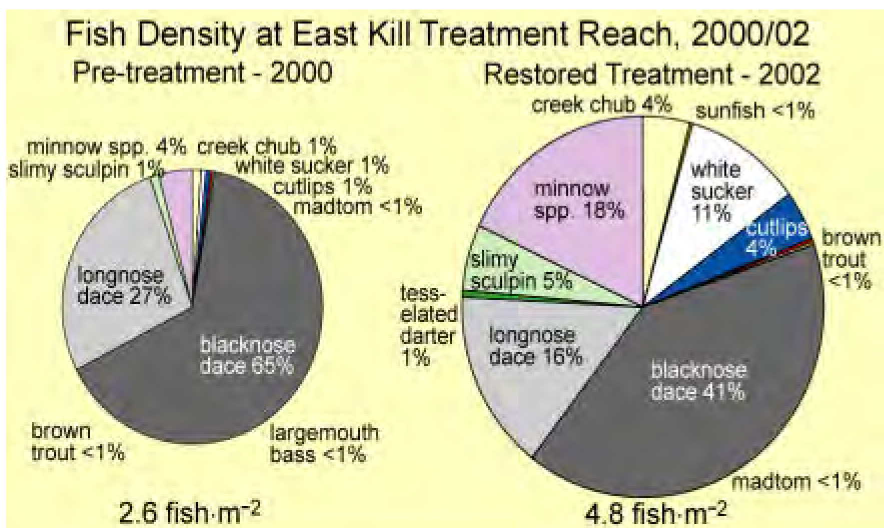

Figure 2. Density of fish populations from the East Kill treatment reach in 2000 before restoration, and in 2002 following restoration (done in the fall of 2000).

Estimates of species biomass at the treatment reach before restoration (2000) illustrate patterns similar to density, where dace made up 88%, and trout were <1%, of total community biomass (Fig. 3). After restoration, biomass of the two dace species fell from 88% to 28% of the community total (Fig. 3). These declines corresponded to an increase in trout biomass from <1 to 23% of the community total. Though brown trout dominate community biomass after restoration, the species distribution was more evenly balanced than that which occurred before restoration. Aside from increased community evenness and decreased dominance, increases in the brown trout population were not limited only to adult fish. Though a few adults were observed, most (60%) were young-of-the-year (yoy) fish (Fig. 4).

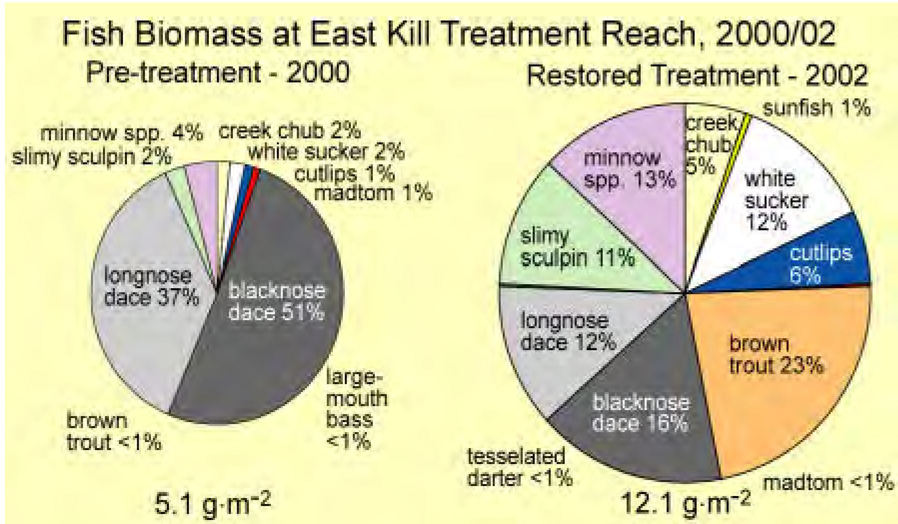

Figure 3. Biomass of fish populations from the East Kill treatment reach in 2000 before restoration, and in 2002 following restoration (done in the fall of 2000).

In summary, the fish community at the stable reference reach before restoration was typical of productive middle-basin systems of the Catskill Region; juvenile and mature brown trout, blacknose and longnose dace, and cyprinid minnows were present in low to moderate numbers. Fish communities at both unstable treatment and control sites were somewhat unusual; large numbers of dace were present, no, or only a few brown trout were observed along with several warmwater fish species. After restoration of the treatment reach, moderate changes in the fish community were evident, but density and biomass of brown trout increased and dace populations decreased dramatically. Because total density and biomass increased similarly at the control and reference reaches, changes in fish communities at all reaches could be attributed partly to changes in basin-wide factors, such as, precipitation, stream flow, and temperature. The incidence or increased density and biomass of brown trout, however, appear to be a direct response to channel restoration. Though additional sampling and data analyses are needed to verify causes for population and community trends, these preliminary findings indicate channel restorations had a positive effect on fish communities in the treated reach of this Catskill Mountain stream.

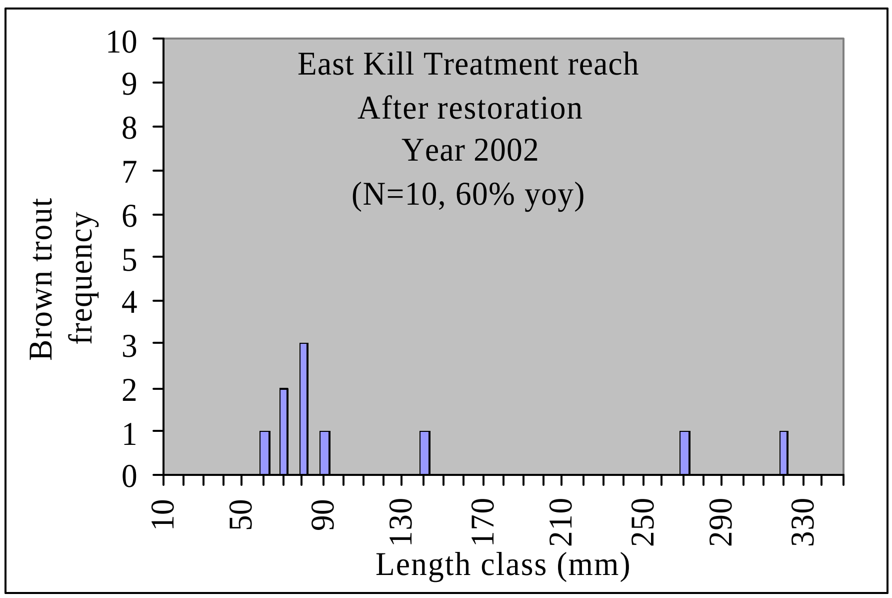

Figure 4. Biomass of fish populations at the Batavia Kill control and treatment reaches, 2000-02.

Appendix F

Project Status Reports

F.1 Project Status: As-Built (2000)

F.2 Project Status: 2001-2002 Inspections

F.3 Project Status: 2003 Inspection - Survey

F.4 Project Status: 2004 Inspection - Survey

F.5 Project Status: Flood Event Inspection (April 2005)

F.1 Farber Farm 2000 - Project Status As-Built

In 2000, the GCSWCD staff performed the as-built survey to document channel alterations and survey benchmarks for future monitoring, and to show the modifications that were made to the project design during construction, on a reach along the East Kill referred to as the Farber Farm site.

Cross Section Survey

During the as-built survey, eight cross sections were installed for use in future detailed monitoring efforts. Cross sections were monumented using capped rebar pins, which were located within the topographic survey as well as recorded using G.P.S.. Cross sections were stationed at various locations along the channel profile in order to provide monitoring for stream process and stability. The cross sections were installed through various stream features (pools, riffles, etc.) and structures to document stream classification, potential erosion and scour, and the overall channel stability.

Table 1 Channel Geometry of existing, proposed, and as-built conditions.

Variables	Existing Channel	Proposed Reach	As-Built
Stream Type	C4	C4	C4
Bankfull Width (ft.)	105.1	60.0	86.2
Bankfull Mean Depth (ft.)	2.5	3.1	2.7
Bankfull Max. Depth (ft.)	3.3	4.9	4.3
Riffle Bankfull Cross Sectional Area (sq. ft.)	264.3	183.3	230.0
Pool Bankfull Cross Sectional Area (sq. ft.)	276.3	217.7	239.1
Maximum Pool Depth (ft.)	3.9	7.1	6.2
Pool Width (ft.)	99.7	75.0	85.5

The values presented in Table 1 are the averages of measurements taken through specified features in the project reach. Values for riffle comparisons were obtained from cross section #'s 1,5 and 7 while values for pool comparisons were obtained from cross section #'s 2-4,6 and 8. The average bankfull channel parameters for the proposed reach design are also shown.

Table 2 displays the bankfull channel measures at each cross section performed during the as-built survey. These values will be used to review trends in channel adjustment at-a-station and through the entire reach. The planned monitoring surveys will assist in evaluating the need for further channel modification and future performance evaluations. The dimensions are based on field called bankfull elevations and may include the bias associated with the identification of bankfull indicators. The lack of sufficient bankfull identifiers may skew these data and one may expect to see more accurate results in the following years after several large flows have more clearly defined the channel.

Longitudinal Profile

Physical channel dimensions were determined through longitudinal profile surveys, which included the sampling of the ground surface at slope breaks along the thalweg of the channel. The profile survey also sampled the water surface and bankfull indicators along the channel. The sampling

Table 2 Brandywine cross section as-built bankfull geometry data.

Cross Section	Station	Feature	BF Area	Width	Max Depth	Mean Depth
1	1+31.76	Riffle	253.91	81.39	5.09	3.12
2	4+01.74	Pool	181.63	92.13	4.37	1.97
3	8+58.47	Pool	221.08	81.99	6.04	2.70
4	10+84.69	Pool	318.00	90.47	7.78	3.52
5	13+47.61	Riffle	196.00	88.80	3.86	2.21
6	17+07.45	Pool	252.32	90.14	6.70	2.80
7	20+51.93	Riffle	240.00	88.38	4.05	2.72
8	22+35.77	Pool	222.64	72.93	6.08	3.05
Average Riffles			229.97	86.19	4.34	2.68
Average Pools			239.13	85.53	6.19	2.81

was tied to the original pre-restoration datum and topographic survey. The profile plot was sampled from a Triangular Irregular Network (TIN) surface, created from the post-construction topographic survey (as-built) of the site.

Summary

The as-built survey data shows that the proposed stream type was built in 2000 and the bankfull parameters met the construction specifications detailed by GCSWCD. The as-built survey was reviewed by GCSWCD staff and the project was documented as-built within acceptable tolerances.

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Farber Farm Stream Restoration Project
Asbuilt Stream Channel

F.1 2000 Project Status: Photographs and Descriptions

Photograph 1: A constructed cross vane at station 11+50 and the downstream scour pool.

Photograph 2: The constructed channel near station 5+00.

Photograph 3: A constructed cross vane at station 5+50 and the downstream scour pool and riffle.

Photograph 4: A constructed rock vane at station 5+00.

Photograph 5: The constructed channel and bioengineering installation near station 15+00.

Photograph 6: An aerial view of the post-construction project site.

GREENE COUNTY SOIL & WATER CONSERVATION DISTRICT

NYCDEP STREAM MANAGEMENT PROGRAM

"FARBER FARM" STREAM RESTORATION PROJECT

2000 AS-BUILT SURVEY

INDEX OF DRAWINGS

REV	DATE	DESCRIPTION	APP.

REVISIONS

GREENE COUNTY SOIL & WATER CONSERVATION DISTRICT
BOX 907 GREENE COUNTY OFFICE BUILDING, CAIRO, NY 12413
PHONE (518) 622-3620
FAX (518) 622-0344

FARBER FARM
FOR
ACOE
COUNTY ROUTE 23C
TOWN OF JEWETT GREENE COUNTY, NY
TITLE SHEET

PROJECT:
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SCALE: AS NOTED
DRAWN BY: JRB/MM
DESIGN BY:

DRAWING:
FF-1
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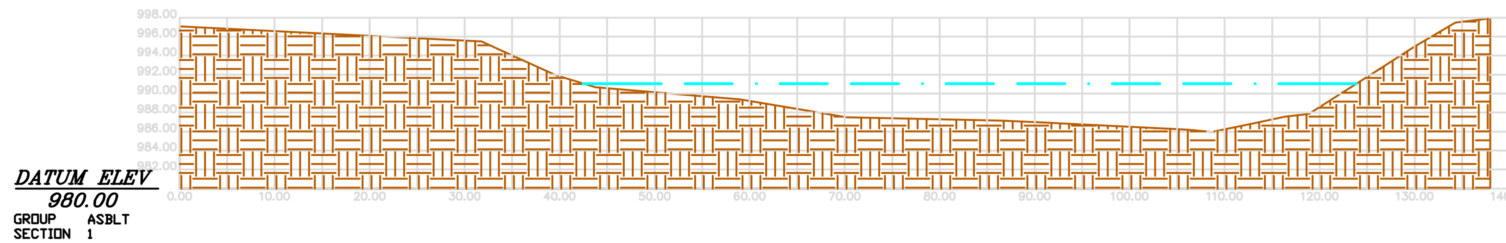

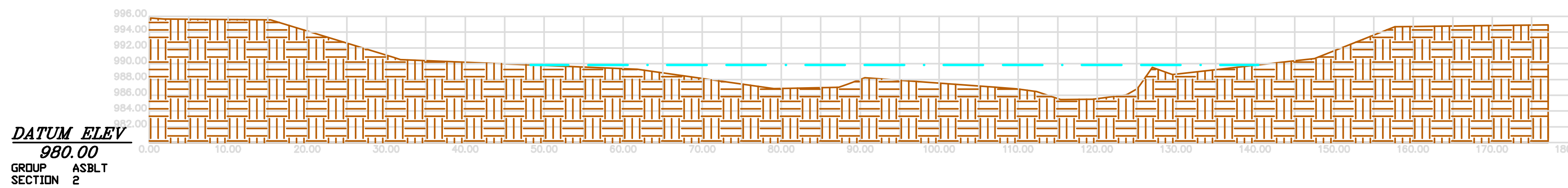

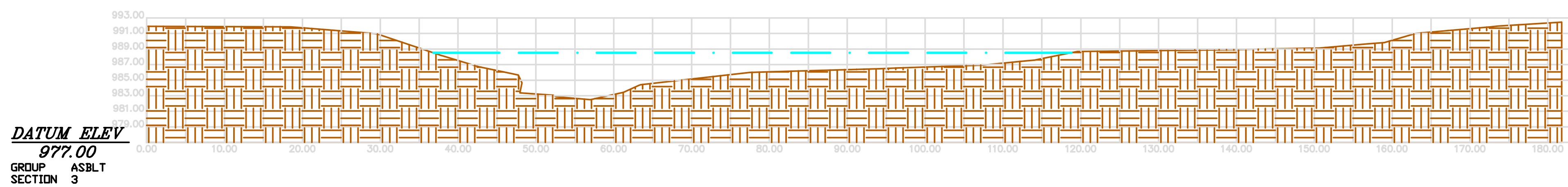

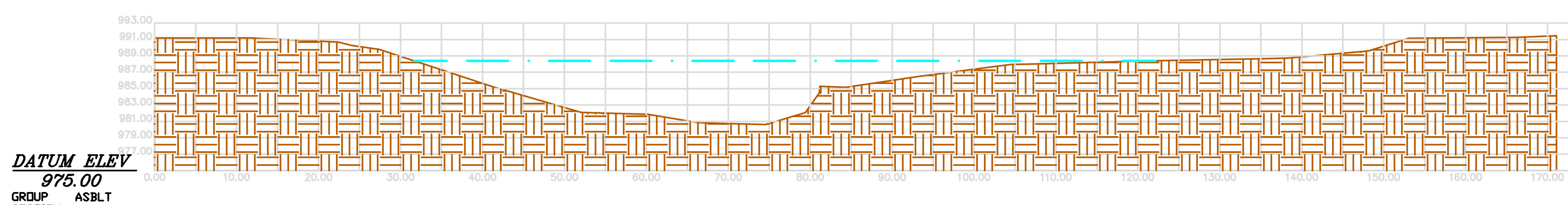

REV	DATE	DESCRIPTION	APP.

REVISIONS

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FARBER FARM
FOR
ACOE
COUNTY ROUTE 23C
TOWN OF JEWETT GREENE COUNTY, NY

CROSS SECTION 1-4

PROJECT:
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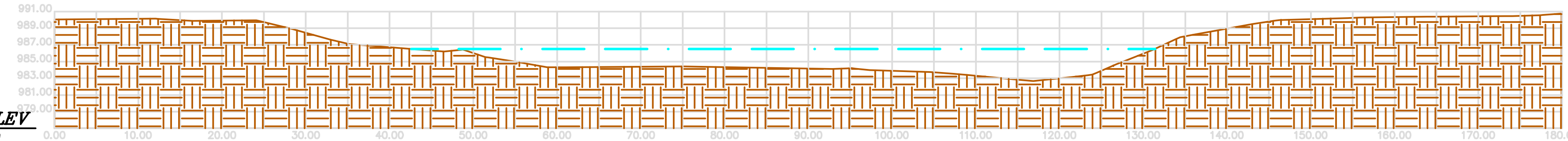
DRAWN BY: JRB/MM
DESIGN BY:

DRAWING:
FF-2
SHEET 2 OF 4



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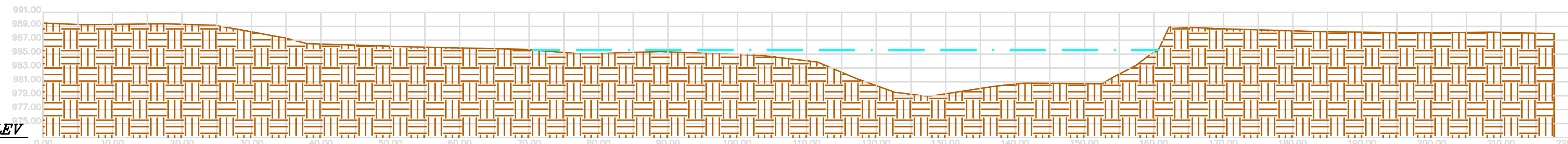

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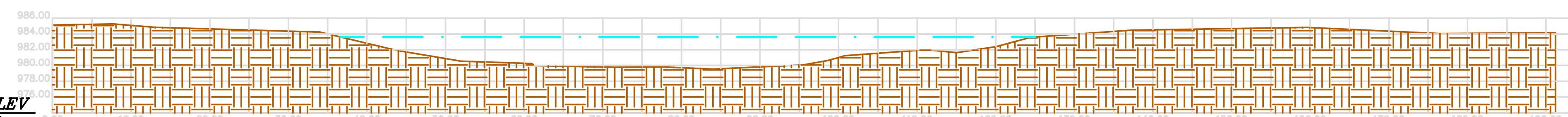

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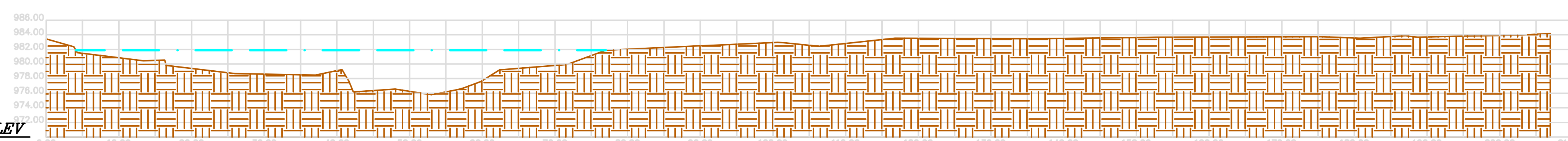

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REV	DATE	DESCRIPTION	APP.

REVISIONS

GREENE COUNTY SOIL & WATER CONSERVATION DISTRICT
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FARBER FARM
FOR
ACOE
COUNTY ROUTE 23C
TOWN OF JEWETT GREENE COUNTY, NY

CROSS SECTION 5-8

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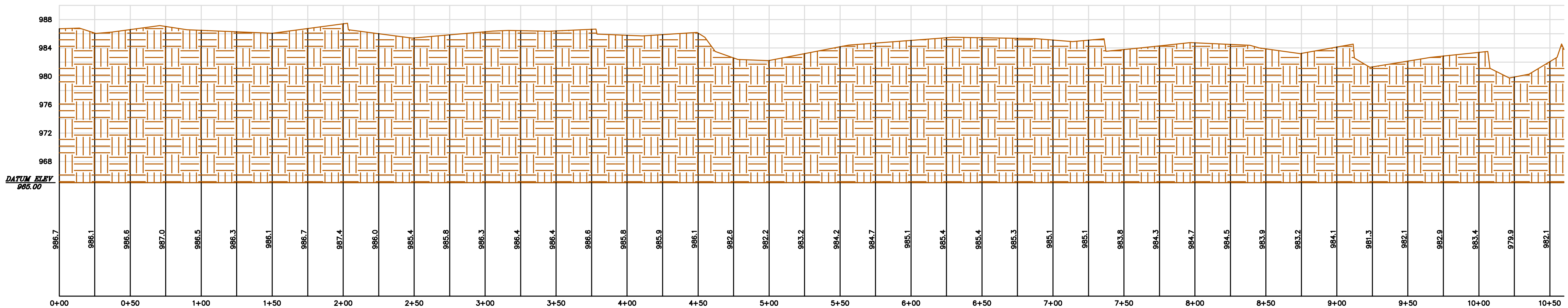
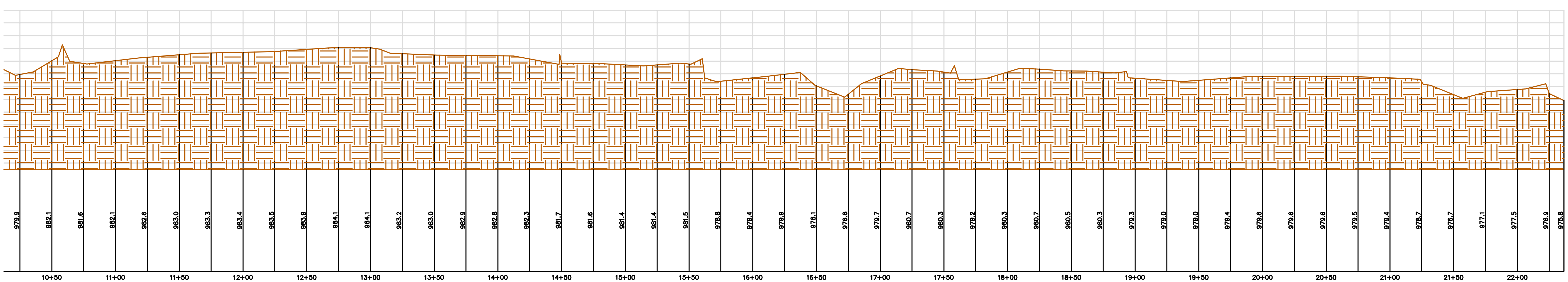
DRAWING:
FF-3
SHEET 3 OF 4





REV	DATE	DESCRIPTION	APP.

REVISIONS

GREENE COUNTY SOIL & WATER CONSERVATION DISTRICT

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FARBER FARM

FOR

ACOE

COUNTY ROUTE 23C

TOWN OF JEWETT — GREENE COUNTY, NY

PROFILE

PROJECT:
DATE: 4/26/06
SCALE: 1"=80' H
DRAWN BY: JRB/MM
DESIGN BY:

DRAWING: **FF-4**

SHEET 4 OF 4

F.2 Farber Farm 2001-2002 - General Observations

In 2001 and 2002, the GCSWCD staff performed a monitoring survey to monitor the stream restoration project that was constructed in 2000. Due to a computer failure, all of the field collected data was lost. This appendix will describe general stream observations that were documented during various site visits throughout the two years.

Cross Sections

During the as-built survey, eight cross sections were installed for use in future detailed monitoring efforts. Cross sections were monumented using capped rebar pins, which were located within the topographic survey as well as recorded using G.P.S. Cross sections were stationed at various locations along the channel profile in order to provide monitoring for stream process and stability. The cross sections were installed through various stream features (pools, riffles, etc.) and structures to document stream classification, potential erosion and scour, and the overall channel stability. All cross section monuments were located in 2001and 2002 and were found to be undisturbed.

Minor bank erosion was noted centered near station 17+00 and may be the result of a damaged rock vane in the vicinity. The erosion appears to be contained between structurally sound rock vanes both upstream and downstream.

Rock Structures

The rock structures on the project site are primarily functioning as designed. The utility of several structures, however, may have diminished as their structural integrity was compromised during high flows early in 2001, the most significant of which is that rock vane at station 17+00. This vane was undermined, causing several large structural boulders to be dislodged, thus altering the rock vane's ability to affect sediment deposition along the upstream periphery of the structure.

Longitudinal Profile

Physical channel dimensions were determined through longitudinal profile surveys, which included the sampling of the ground surface at slope breaks along the thalweg of the channel. Completion of the longitudinal profile allowed staff to make observations along the entire length of the restoration project.

GCSWCD staff observed no significant erosional or depositional features along the project reach. The channel pavement had become imbricated with gravels and small cobbles after several large flow events had passed through the channel. The site inspection during 2002 noted no significant changed from the observations made during 2001. Reaches upstream and downstream of the project reach appeared to show no evidence of apparent erosion, deposition, or accelerated lateral migration. Photo documentation and descriptions have been included at the end of this appendix.

Vegetation

During the spring of 2001, the GCSWCD initiated a large scale planting effort to re-vegetate the project area. This effort utilized fascines, hydroseed and bareroot material. Planting included several thousand bareroot seedling and transplants of the following species: Streamco Willow, hybrid poplar, green ash, red oak, concolor fir and red osier. The installed fascines amounted to approximately 800 feet and the hydroseed was applied to 1200 feet of stream banks.

Summary

Computer malfunctions have precluded an extensive data set from being developed for the Farber Farm stream restoration project for the years 2001 and 2002. General observations of the site indicate that the project is functioning as designed. Monitoring efforts will resume during the summer of 2003.

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Farber Farm Stream Restoration Project
2001-2002 Observations

F.2 2001-2002 Project Status: Photographs and Descriptions

Photograph 1: The top of the project site during a site visit in April 2001.

Photograph 2: A rock vane at station 22+00 functioning as designed during a high flow event in 2001.

Photograph 3: A rock vane at station 23+50 functioning as designed during a high flow event in 2001.

Photograph 4: The top of the project site with successful vegetation in 2002.

Photograph 5: A cross vane at station 11+50 functioning as designed in 2002.

Photograph 6: A cross vane at station 19+50 functioning as designed in 2002 with several sedges in the foreground.

F.3 Project Status: Summer 2003 Inspection - Survey

Site Inspection and Monitoring Survey

In August of 2003 the project site was inspected and surveyed by GCSWCD staff in order to review the project status and to document the physical condition and stability of the stream channel. The inspection included a review of the overall stability, rock structures, and riparian vegetation. The monitoring survey included surveying the monumented cross sections and complete longitudinal profile and stream pavement sampling. A summary of the inspection results and recommendations is provided below. Photographs taken during various site visits in 2003 are included following this appendix.

In stream Structures:

Inspection of the cross vanes revealed no visual damage, erosion, or problems associated with the structures. Minor voids in the vane arms and sills were noted, allowing small volumes of water to penetrate the structures during low flow periods, but do not seem to pose any significant problems with the structural integrity or vane function. Regular deposition along the upstream portions of the vane arms appears normal and the vanes all appear to be functioning properly during various flow stages. The cross vanes appear to be effective at reducing the erosion and scour which potentially would have resulted prior to the installation of the project. Most rock vanes appear to be functioning as designed, however, the rock vane at station 17+00 has not been repaired and still remains compromised.

Riparian Vegetation:

The bioengineering was installed during the spring of 2001 by GCSWCD and a number of volunteers. The vegetation included willow fascines and stakes posts transplants and seedlings. The plants were placed along the streambanks and in the adjacent floodplain areas and conservation grasses were applied with hydro-mulch in all disturbed areas.

The bioengineering and planting's appear to be establishing appropriately. Livestock have been fenced out of the stream channel and the adjacent riparian area allowing for more vigorous vegetative establishment.

Channel Stability:

The channel showed no evidence of large-scale deposition (aggradation) or incision (degradation) through the reach. Minor bank erosion was visible on the right bank near station 17+00. Further, no glacial clays were visibly present in the channel bottom.

Visual inspection of the reaches located upstream and downstream of the project area indicates no evidence of significant apparent erosion, deposition, or accelerated lateral migration. The inspections have not shown any visual indication of turbidity in the adjacent reaches.

Recommendations include:

1. Continue to monitor erosion along right stream bank at station 17+00.
2. Investigate applicability of repairing the rock vane at station 17+00.

Project Reach Survey:

A monitoring survey was initiated in August of 2003 to document the annual project status and physical condition of the stream channel. The monitoring included surveying the eight monumented cross sections and complete longitudinal profile, performing composite pebble counts, and writing a summary of conditions.

Cross Section Survey

At the time of the as-built survey, eight monumented cross sections were installed for use in future detailed monitoring efforts. Cross sections were monumented using capped rebar pins which were located during the topographic survey and were recorded using GPS. Cross sections were stationed at various locations along the channel profile in order to provide monitoring for stream process and stability. The cross sections were installed through various stream features (pools, riffles, etc.) and structures in order to document stream classification, potential erosion and scour, and to document the overall channel stability.

The values presented in Table 1 for the 2003 survey are averages taken from multiple cross sections. Values for riffle comparisons were obtained from cross sections 1, 5 and 7 while values for pool comparisons were obtained from cross sections 2, 3,4, 6 and 8.

Table 2 represents the measurements taken at the eight sections in the August survey. Also provided are feature specific averages and averages including all sections (pool and riffles).

Table 1 Average bankfull channel dimensions.

Variables	As-Built	2003
Stream Type	C4	C4
Bankfull Width (ft.)	86.2	81.8
Bankfull Mean Depth (ft.)	2.7	2.7
Bankfull Max. Depth (ft.)	4.3	4.1
Bankfull Cross Sectional Area (sq. ft.)	230.0	217.9
Pool Bankfull Cross Sectional Area (sq. ft.)	239.1	233.9
Maximum Pool Depth (ft.)	6.2	6.0
Pool Width (ft.)	85.5	81.9

Table 2 Cross section bankfull channel dimensions Survey 2003.

Cross Section	Station	Feature	BF Area	Width	Max Depth	Mean Depth
1	1+31.76	Riffle	237.65	78.77	4.66	3.02
2	4+01.74	Pool	179.31	84.51	4.24	2.12
3	8+58.47	Pool	210.53	80.25	5.84	2.62
4	10+84.69	Pool	325.40	78.96	8.15	4.12
5	13+47.61	Riffle	184.01	81.76	3.61	2.25
6	17+07.45	Pool	237.57	92.58	6.07	2.57
7	20+51.93	Riffle	231.93	84.84	4.14	2.73
8	22+35.77	Pool	216.74	73.00	5.89	2.97
Average Riffles			217.86	81.79	4.14	2.67
Average Pools			233.91	81.86	6.04	2.88

Longitudinal Profile

The longitudinal profile survey included the sampling of ground and water surface elevations along the slope breaks of the thalweg. The 2003 survey included a detailed profile beginning and ending at the top and bottom of the project reach. Bankfull elevations were added by reviewing cross sectional data and transposing the bankfull elevation and station to the longitudinal profile.

The stationing along the thalweg of each channel varies between the two years resulting from the selection of features by the field staff and minor changes in thalweg plan form.

Channel Pattern

Channel alignment changes were analyzed by reviewing the cross sections and lateral alignment of the thalweg of the stream profile. Although minor erosion and deposition were noted through isolated areas of the project reach there appears to be no evidence of unstable lateral migration or plan form change of meander radius, meander length, or sinuosity.

Sediment Characteristics

Pavement samples within the bankfull channel were collected during the survey of the reach. The inventory included sampling stream pavement under each cross-section. The results were averaged and then stratified based on feature type. The sampling method that was employed was the modified Wolman method. Table 3 displays the samples stratified into common percentiles, and classes in millimeters.

Table 3: Common percentiles of sampled sediment

	Riffle	Pool
D95 =	308	226
D84 =	167	116
D50 =	43	51
D35 =	28	36
D15 =	5	5

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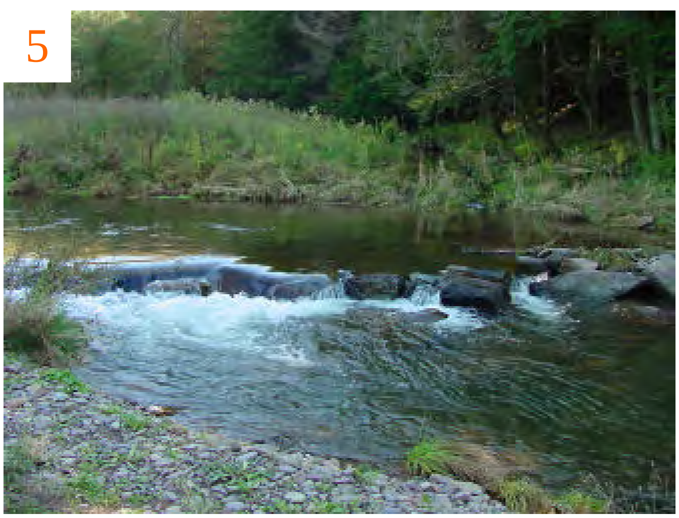

6

Farber Farm Stream Restoration Project
2003 Project Site Inspection

F.3 2003 Project Status: Photographs and Descriptions

Photograph 1: The upstream extent of the project site.

Photograph 2: Three rock vanes used in succession near the upstream extent of the project site.

Photograph 3: A rock vane functioning as designed at station 8+00.

Photograph 4: A rock vane at station 15+00 with installed bioengineering successfully established.

Photograph 5: The final rock vane of the project functioning as designed.

Photograph 6: The final 500 feet of the project site with a rock vane and cross vane used in succession.

GREENE COUNTY SOIL & WATER CONSERVATION DISTRICT

"FARBER FARM" STREAM RESTORATION PROJECT

2003 MONITORING SURVEY

INDEX OF DRAWINGS

REV	DATE	DESCRIPTION	APP.

REVISIONS

GREENE COUNTY SOIL & WATER CONSERVATION DISTRICT

BOX 907 GREENE COUNTY OFFICE BUILDING, CAIRO, NY 12413
PHONE (518) 622-3620
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FARBER FARM
FOR
ACOE
COUNTY ROUTE 23C

TOWN OF JEWETT — GREENE COUNTY, NY

TITLE SHEET

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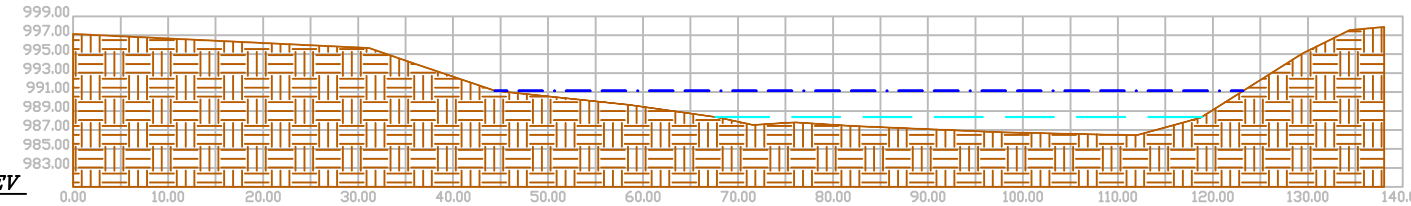
DATE: 4/21/06
SCALE: AS NOTED
DRAWN BY: JRB/MM
DESIGN BY:

DRAWING: **FF-1**

SHEET 1 OF 4



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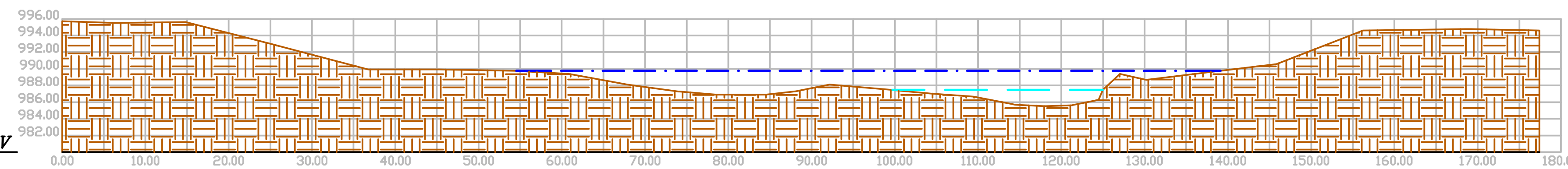

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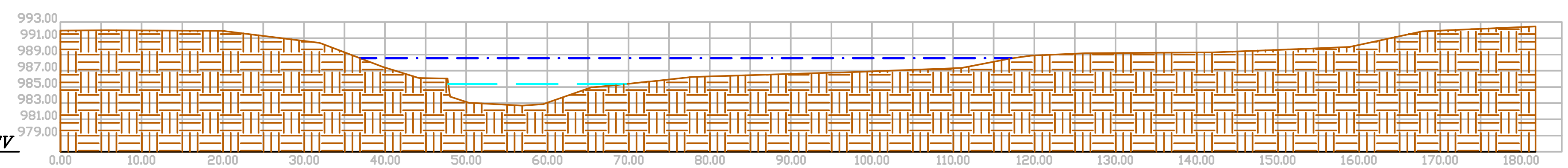

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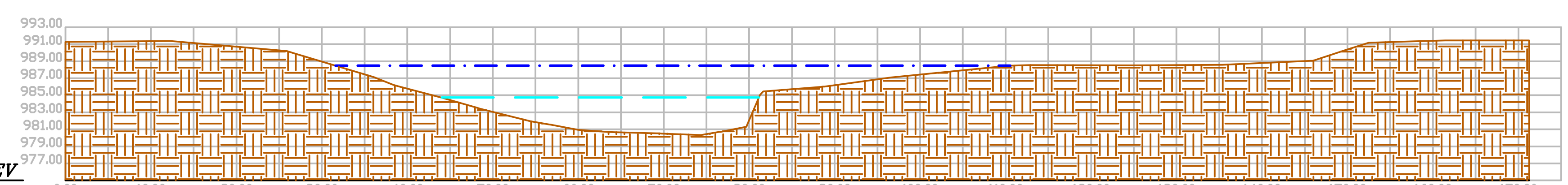

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GROUP XS
SECTION XS4_03

REV	DATE	DESCRIPTION	APP.

REVISIONS

GREENE COUNTY SOIL & WATER CONSERVATION DISTRICT

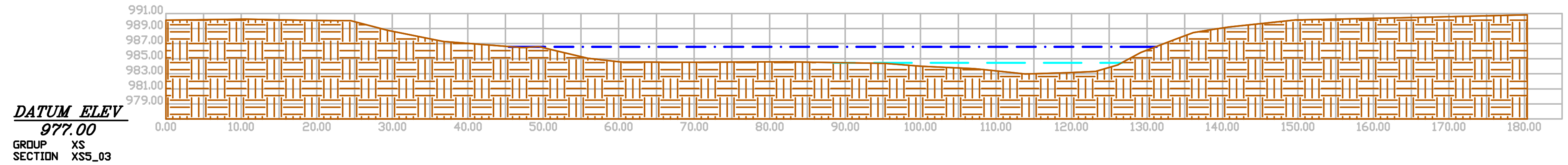
BOX 907 GREENE COUNTY OFFICE BUILDING, CAIRO, NY 12413
PHONE (518) 622-3620
FAX (518) 622-0344

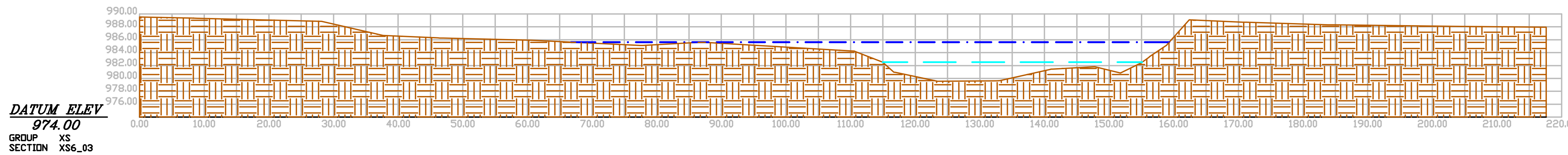
FARBER FARM
FOR
ACOE
COUNTY ROUTE 23C
TOWN OF JEWETT GREENE COUNTY, NY

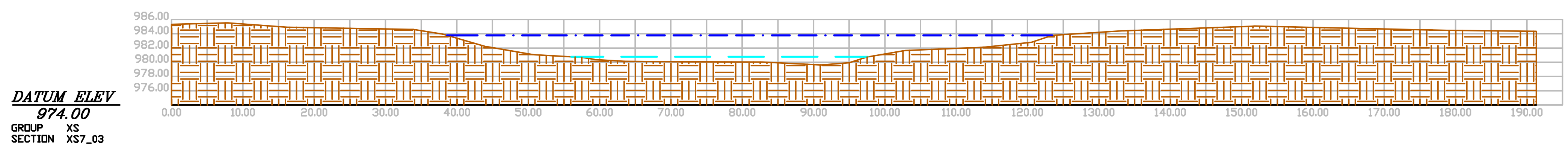
CROSS SECTION 1-4

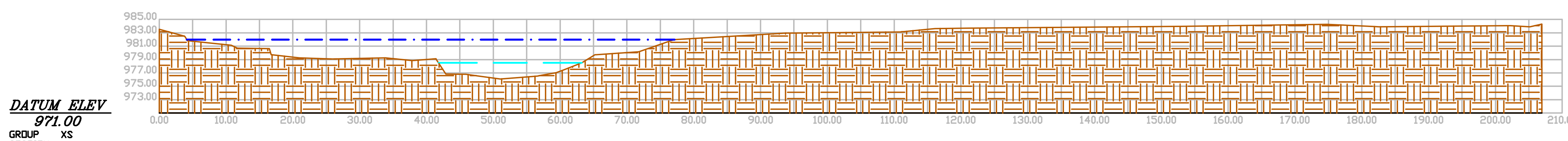
PROJECT:
DATE: 4/21/06
SCALE: 1"=20'
DRAWN BY: JRB/MM
DESIGN BY:

DRAWING:
FF-2
SHEET 2 OF 4









REV	DATE	DESCRIPTION	APP.

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GREENE COUNTY SOIL & WATER CONSERVATION DISTRICT

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FARBER FARM

FOR

ACOE

COUNTY ROUTE 23C

TOWN OF JEWETT GREENE COUNTY, NY

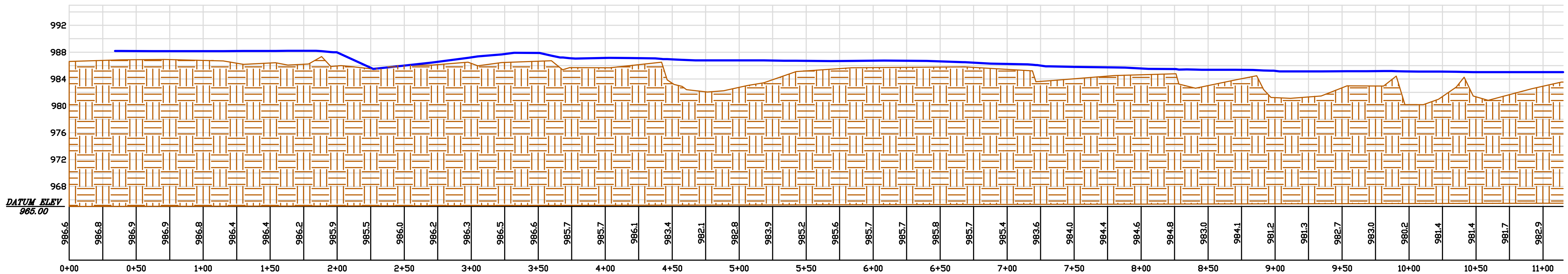
CROSS SECTION 5-8

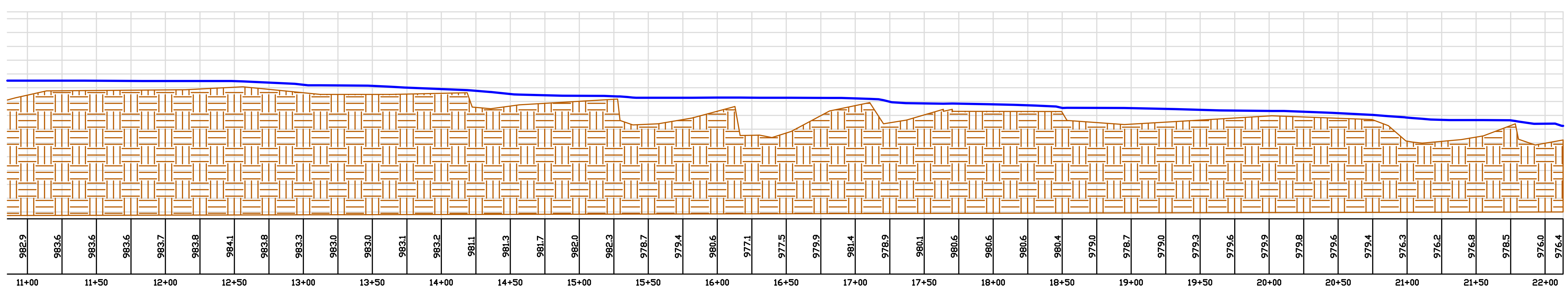
PROJECT:
DATE: 4/21/06
SCALE: 1"=20'
DRAWN BY: JRB/MM
DESIGN BY:

DRAWING:

FF-3

SHEET 3 OF 4





REV	DATE	DESCRIPTION	APP.

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FARBER FARM

FOR

ACOE

COUNTY ROUTE 23C

TOWN OF JEWETT

GREENE COUNTY, NY

CROSS SECTION 5-8

PROJECT:
DATE: 4/21/06
SCALE: 1"=80' H
DRAWN BY: JRB/MM
DESIGN BY:

DRAWING:

FF-4

SHEET 4 OF 4

F.4 Project Status: Summer 2004 Inspection - Survey

Site Inspection and Monitoring Survey

In August of 2004 the project site was inspected and surveyed by GCSWCD staff in order to review the project status and to document the physical condition and stability of the stream channel. The inspection included a review of the overall stability, rock structures, and riparian vegetation. The monitoring survey included surveying the monumented cross sections and complete longitudinal profile and stream pavement sampling. A summary of the inspection results and recommendations is provided below. Photographs taken during various site visits in 2004 are included following this appendix as well as drawings of the cross-sections and profile.

In stream Structures:

Inspection of the cross vanes revealed no visual damage, erosion, or problems associated with the structures. Minor voids in the vane arms and sills were noted, allowing small volumes of water to penetrate the structures during low flow periods, but do not seem to pose any significant problems with the structural integrity or vane function. Regular deposition along the upstream portions of the vane arms appears normal and the vanes all appear to be functioning properly during various flow stages. The cross vanes appear to be effective at reducing the erosion and scour which potentially would have resulted prior to the installation of the project. The rock vanes appear to be working effectively with no visually apparent structural changes. The rock vane at station 17+00 has not been repaired and remains compromised.

Riparian Vegetation:

The bioengineering was installed during the project repair in the spring of 2001 by GCSWCD and a number of volunteers. The vegetation included willow fascines and stakes posts transplants and seedlings. The plants were placed along the streambanks and in the adjacent floodplain areas and conservation grasses were applied with hydro-mulch in all disturbed areas.

The bioengineering and planting's appear to be establishing appropriately.

Channel Stability:

The channel showed no evidence of large-scale deposition (aggradation) or incision (degradation) through the reach. Minor bank erosion was visible on the right bank near station 17+00. Further, no glacial clays were visibly present in the channel bottom.

Visual inspection of the reaches located upstream and downstream of the project area indicates no evidence of significant apparent erosion, deposition, or accelerated lateral migration. The inspections have not shown any visual indication of turbidity in the adjacent reaches.

Recommendations include:

1. Continue to monitor erosion along right stream bank at station 17+00.
2. Evaluate applicability of repair of rock vane at station 17+00.

Project Reach Survey:

A monitoring survey was initiated in August of 2004 to document the annual project status and physical condition of the stream channel. The monitoring included surveying the eight monumented cross sections and complete longitudinal profile, performing composite pebble counts, and writing a summary of conditions.

Cross Section Survey

At the time of the as-built survey, eight monumented cross sections were installed for use in future detailed monitoring efforts. Cross sections were monumented using capped rebar pins which were located during the topographic survey and were recorded using GPS. Cross sections were stationed at various locations along the channel profile in order to provide monitoring for stream process and stability. The cross sections were installed through various stream features (pools, riffles, etc.) and structures in order to document stream classification, potential erosion and scour, and to document the overall channel stability.

The values presented in Table 1 for the 2004 survey are averages taken from multiple cross sections. Values for riffle comparisons were obtained from cross sections 1, 5 and 7 while values for pool comparisons were obtained from cross sections 2, 3, 4, 6 and 8.

Table 1 Average bankfull channel dimensions.

Variables	As-Built	2003	2004
Stream Type	C4	C4	C4
Bankfull Width (ft.)	86.2	81.8	82.7
Bankfull Mean Depth (ft.)	2.7	2.7	2.7
Bankfull Max. Depth (ft.)	4.3	4.1	4.3
Bankfull Cross Sectional Area (sq. ft.)	230.0	217.9	221.6
Pool Bankfull Cross Sectional Area (sq. ft.)	239.1	233.9	237.7
Maximum Pool Depth (ft.)	6.2	6.0	6.0
Pool Width (ft.)	85.5	81.9	79.7

Table 2 represents the measurements taken at the eight sections in the August survey. Also provided are feature specific averages and averages including all sections (pool and riffles)

Longitudinal Profile

The longitudinal profile survey included the sampling of ground and water surface elevations along the slope breaks of the thalweg. The 2001 survey included a detailed profile beginning and ending at the top and bottom of the project reach. Bankfull elevations were added by reviewing cross sectional data and transposing the bankfulll elevation and station to the longitudinal profile.

The stationing along the thalweg of each channel varies between the two years resulting from the selection of features by the field staff and minor changes in thalweg plan form.

Table 2 Cross section bankfull channel dimensions Survey 2004.

Cross Section	Station	Feature	BF Area	Width	Max Depth	Mean Depth
1	1+31.76	Riffle	215.58	78.83	4.15	2.76
2	4+01.74	Pool	156.38	83.18	4.28	1.88
3	8+58.47	Pool	203.06	79.26	5.83	2.56
4	10+84.69	Pool	293.46	79.95	7.16	3.67
5	13+47.61	Riffle	195.08	83.86	3.87	2.33
6	17+07.45	Pool	299.50	69.73	7.48	4.29
7	20+51.93	Riffle	254.08	85.36	4.88	2.98
8	22+35.77	Pool	236.14	77.40	5.42	3.05
Average Riffles			221.58	82.69	4.30	2.68
Average Pools			237.71	77.91	6.03	3.09

Channel Pattern

Channel alignment changes were analyzed by reviewing the cross sections and lateral alignment of the thalweg of the stream profile. Although minor erosion and deposition were noted through isolated areas of the project reach there appears to be no evidence of unstable lateral migration or plan form change of meander radius, meander length, or sinuosity.

Sediment Characteristics

Pavement samples within the bankfull channel were collected during the survey of the reach. The inventory included sampling stream pavement under each cross-section. The results were averaged and then stratified based on feature type. The sampling method that was employed was the modified Wolman method. Table 3 displays the samples stratified into common percentiles, and classes in millimeters.

Table 3: Common percentiles of sampled sediment

	Riffle	Pool
D95 =	253	212
D84 =	116	95
D50 =	50	43
D35 =	36	26
D15 =	5	7

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Farber Farm Stream Restoration Project
2004 Project Site Inspection

F.4 2004 Project Status: Photographs and Descriptions

Photograph 1: A cross vane at station 5+50 with multiple sedges lining the river banks.

Photograph 2: A point bar with establishing grasses and sedges.

Photograph 3: A rock vane at station 10+00 functioning as designed.

Photograph 4: A rock vane at station 17+00 with the expected sediment deposition upstream of the vane arm.

Photograph 5: Two rock vanes used in succession near the downstream extent of the project site.

Photograph 6: The final rock vane on the project site.

GREENE COUNTY SOIL & WATER CONSERVATION DISTRICT

"FARBER FARM" STREAM RESTORATION PROJECT

2004 MONITORING SURVEY

INDEX OF DRAWINGS

REV	DATE	DESCRIPTION	APP.

REVISIONS

GREENE COUNTY SOIL & WATER CONSERVATION DISTRICT
BOX 907 GREENE COUNTY OFFICE BUILDING, CAIRO, NY 12413
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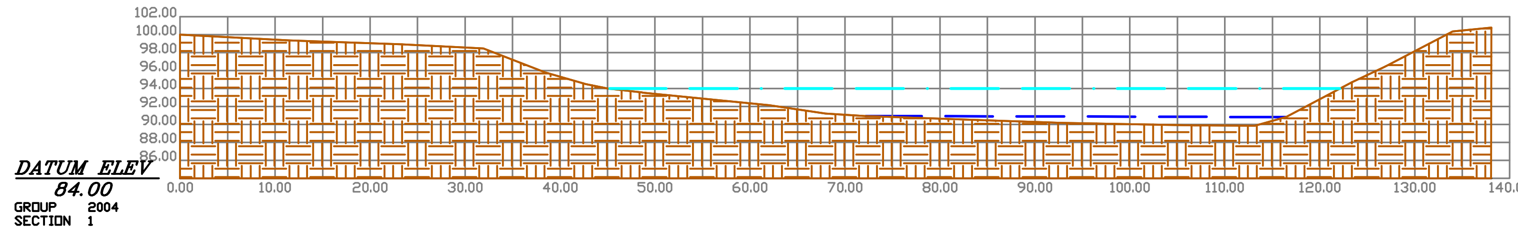
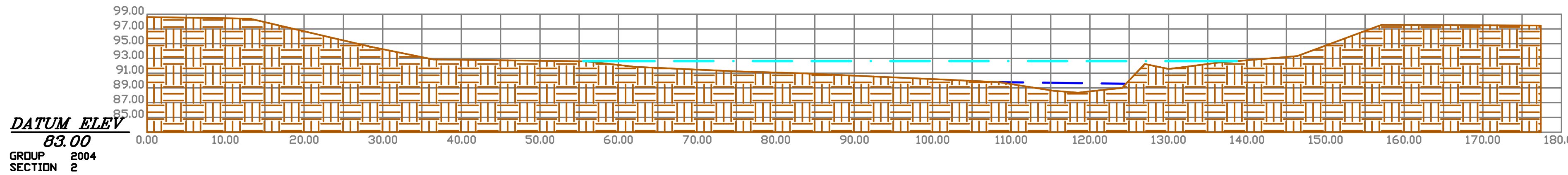
FARBER FARM
FOR
ACOE
COUNTY ROUTE 23C
TOWN OF JEWETT
GREENE COUNTY, NY
TITLE SHEET

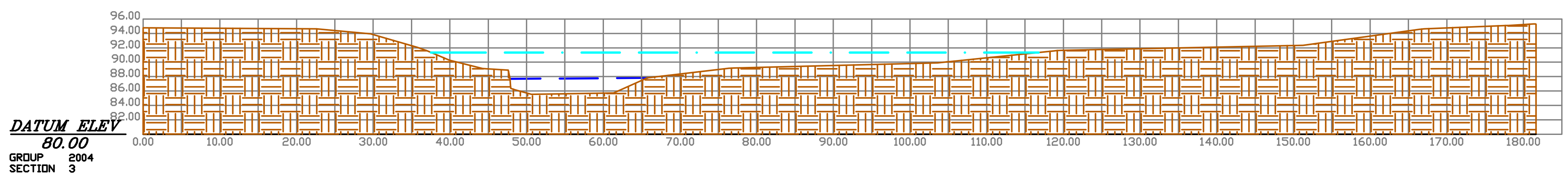
PROJECT:
DATE: 3/24/06
SCALE: AS NOTED
DRAWN BY: JRB/MM
DESIGN BY:

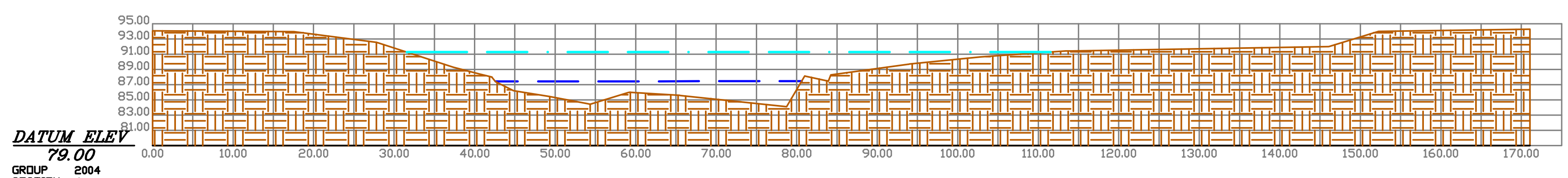
DRAWING: FF-1

SHEET 1 OF 4









REV	DATE	DESCRIPTION	APP.

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FARBER FARM

FOR

ACOE

COUNTY ROUTE 23C

TOWN OF JEWETT — GREENE COUNTY, NY

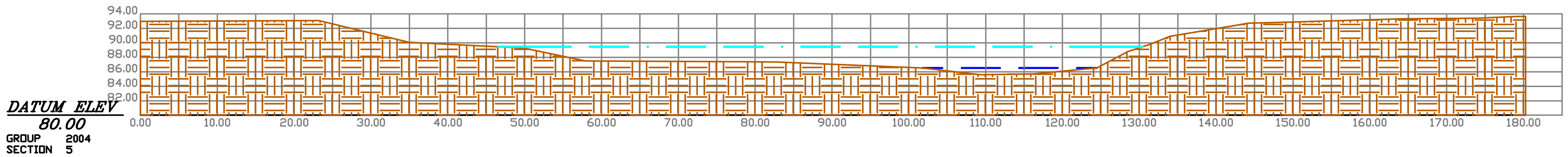
CROSS SECTIONS 1-4

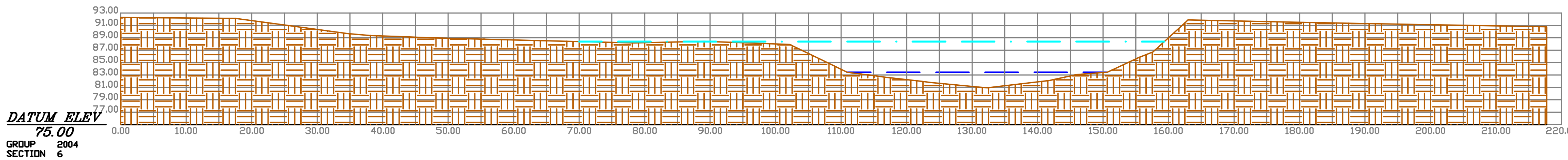
PROJECT:
DATE: 4/24/06
SCALE: 1"=20'
DRAWN BY: JRB/MM
DESIGN BY:

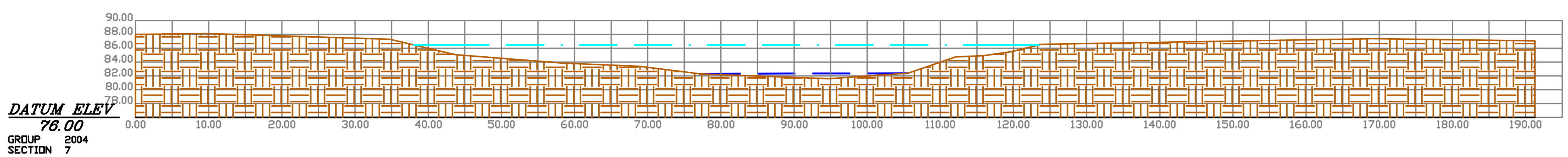
DRAWING:

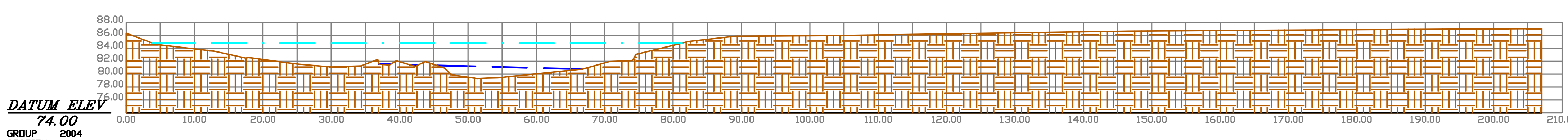
FF-2

SHEET 2 OF 4









REV	DATE	DESCRIPTION	APP.

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FARBER FARM

FOR

ACOE

COUNTY ROUTE 23A

TOWN OF JEWETT GREENE COUNTY, NY

CROSS SECTIONS 5-8

PROJECT:
DATE: 4/24/06
SCALE: 1"=20'
DRAWN BY: JRB/MM
DESIGN BY:

DRAWING:

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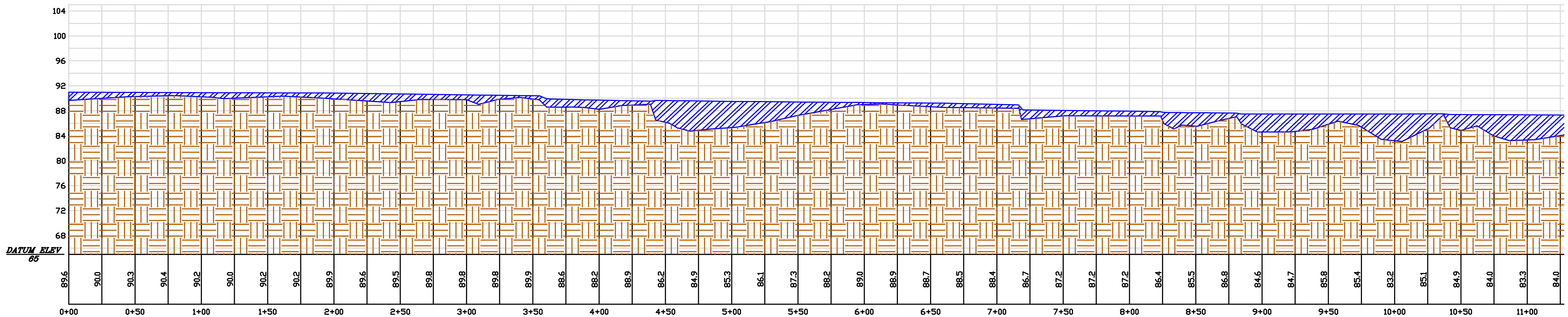
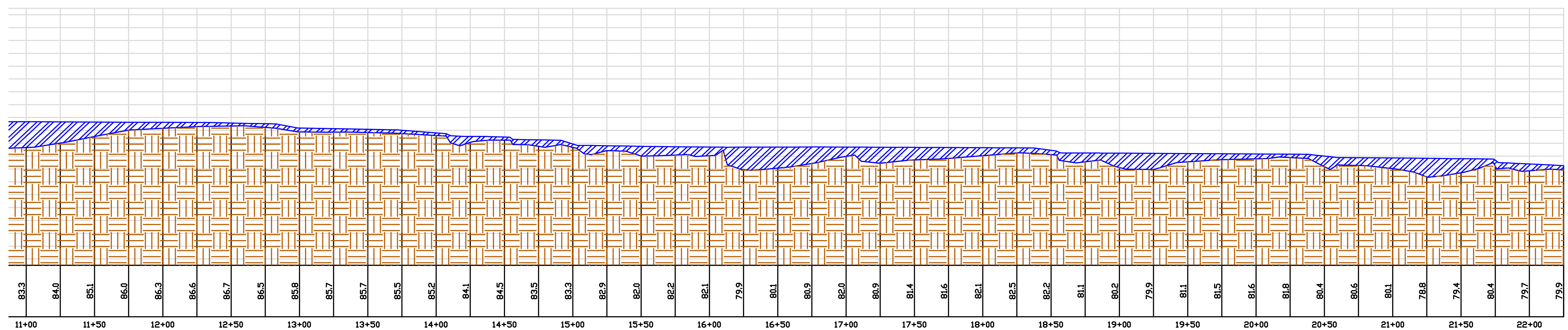
SHEET 3 OF 4





REV	DATE	DESCRIPTION	APP.

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GREENE COUNTY SOIL & WATER CONSERVATION DISTRICT

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FARBER FARM
FOR
ACOE
COUNTY ROUTE 23C
TOWN OF JEWETT GREENE COUNTY, NY
PROFILE

PROJECT:
DATE: 4/24/06
SCALE: 1"=80' H
DRAWN BY: JRB/MM
DESIGN BY:

DRAWING:
FF-4
SHEET 4 OF 4

F.5 Project Status: Flood Event Inspection (April 2005)

On April 3, 2005, the East Kill watershed experienced several inches of rain on snow resulting in a peak flow through the stream channel exceeding the bankfull flood stage. The mean daily flow recorded at the USGS Gage Station (#01349700) on the East Kill near Jewett Center for April 3rd 2005 was 2,590 cfs. The Farber Farm Restoration Project was inspected several times during and after the flow event to document the flow conditions and project performance. The following written description is a summary of the inspected project components. Photo documentation and descriptions are included at the end of this appendix.

Rock Structures:

Four of the eighteen rock structures experienced damage as a potential result of the flood flow. One rock vane structure at station 17+00 originally sustained damage during previous high flow events. The damaged structures include rock vanes located at stations 15+00 and 17+00 and cross vanes located at stations 5+50 and 19+50.

The damage to the rock vane structures included rotational collapse and movement of top rocks along the vane arm as well as undesirable scour along the stream beds and banks.

The damage to the cross vane structures included rotational collapse and movement of top rocks along the vane arms as well as undesirable stream bank scour (5+50) and a flanked bank keyway (19+50).

Although isolated problems occurred at four of the eighteen structures, the remaining structures appeared to function properly during and after the flood flow. The cross vanes and rock vanes appear to have been effective at reducing the erosion and scour which potentially would have resulted prior to the installation of the project. Grass vegetation remained along the majority of the streambanks to the base water surface elevation.

Recommendations pertaining to the project site include continued monitoring of the project site and determining applicability of repairing the damaged rock structures.

Channel Stability:

Bank erosion was present centered at station 17+00, extending for approximately 100 feet in each direction, where two rock vanes have sustained damage. One additional area of erosion was noted between station 10+50 and 12+50. A small back channel appears to have formed between stations 13+00 and 14+50. The erosion near station 17+00 was present prior to this flow event. The bank erosion starting at station 10+50 and the back channel formation starting at station 13+00 are of a scale that does not appear to be threatening to the overall stability of the project.

Riparian Vegetation:

The installed vegetation included willow fascines, live transplants, and stakes, which were placed along the streambanks and in the adjacent floodplain areas, as well as conservation grass which was applied with hay mulch. Subsequent plantings were installed in the floodplain by GCSWCD staff and volunteers.

Establishment of vegetation appears poor considering the amount and density of the installed material. It is felt that the lack of established vegetation exacerbated the damage through the project site. It is presumed that if the vegetation had become more established the damages would have been limited and in some areas avoided.

Recommendations and proposed repair/modification:

- Monitoring of the entire site should be completed prior to the initiation of any modification or repair.

- Monitoring of the site should include surveying all monumented cross sections, flood stage profile through the entire site, a composite pebble count and a longitudinal profile.

- Repair to the project site should only commence following monitoring activities and only if it is determined that failure to repair will be detrimental to the stability of the project. It is felt that the project may not have been damaged beyond natural repair. Monitoring of the project should extend over several large flow events to determine if the project is trending towards its asbuilt state.

- Development of monitoring protocol focusing on vegetation establishment.

F.4 2005 Project Status: Photographs and Descriptions

April 2005 Storm Event- 04/04/05-04/05/05

Photograph 1: The possible high water mark near station 4+00.

Photograph 2: The cross vane at station 5+50 with minor erosion of the left bank.

Photograph 3: Erosion along the right bank from approximately station 6+50 to 8+00.

Photograph 4: A wide angle shot of erosion of the left bank from approximately station 8+00 to 10+00.

Photograph 5: A close up of the erosion as described in 4.

Photograph 6: The stream channel splitting around vegetation near station 13+00.

Photograph 7: Debris on the left floodplain at approximately station 13+50.

Photograph 8: A wide angle shot an eroding bank and a re-graded point bar at station 17+50.

Photograph 9: A close up of the eroding bank as described in 8.

Photograph 10: A close up of the re-graded point bar as described in 8.

Photograph 11: The rock vane near station 15+00 with a downed tree possibly helping to strengthen the structure.

Photograph 12: The rock vane near station 16+00 with transplanted vegetation possibly helping to strength the structure.

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Farber Farm Stream Restoration Project
2005 April High Flow Event


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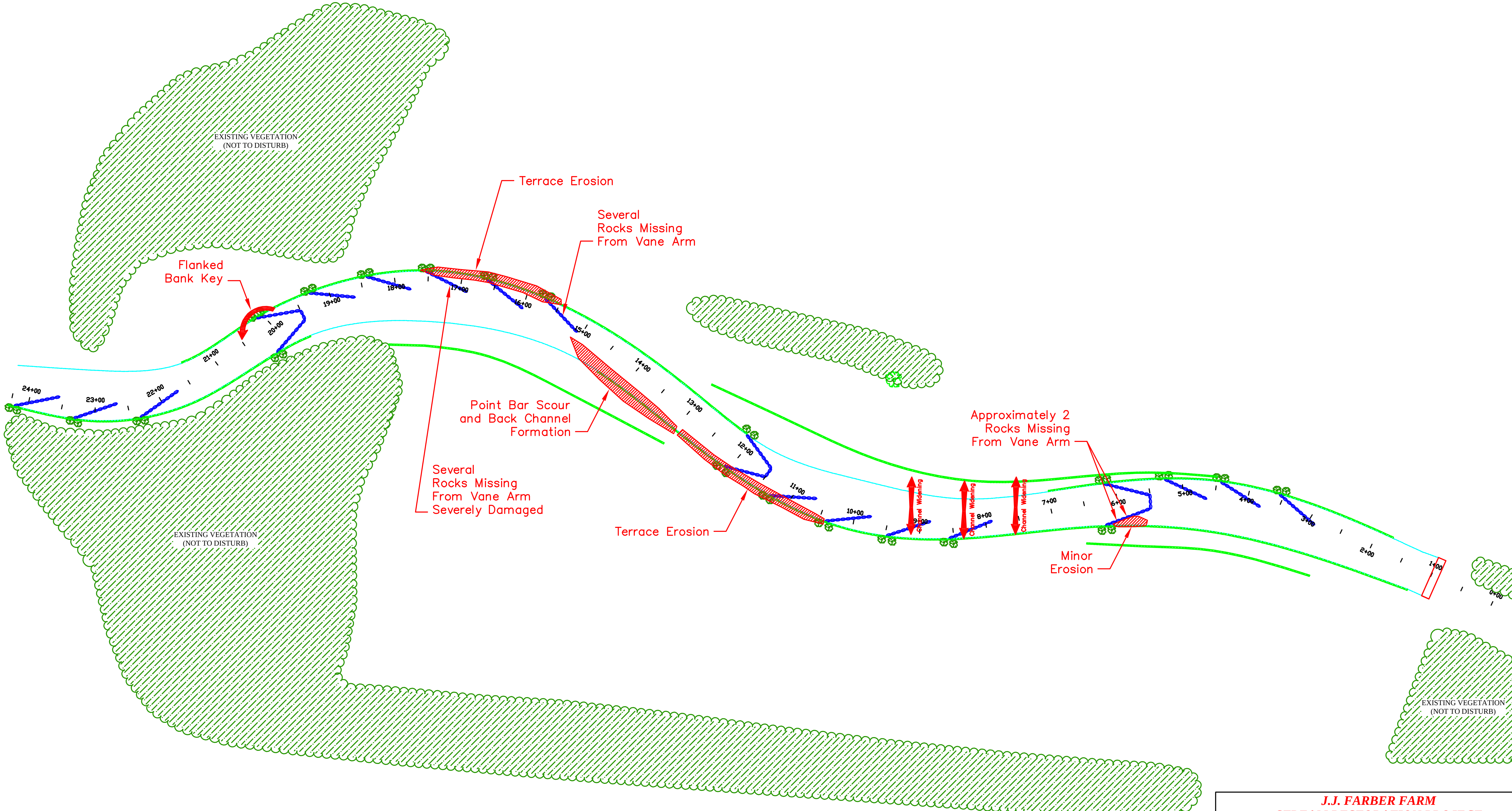
Farber Farm Stream Restoration Project
2005 April High Flow Event



GRAPHIC SCALE

70 0 35 70 140 280

(IN FEET)
1in. = 70 ft.

KEA

KAATERSKILL ENGINEERING ASSOCIATES, PC

CAIRO, NY 518-622-9667 TANNERSVILLE, NY 518-589-3034

LEGEND	
PROPOSED BANKFULL CHANNEL	
PROPOSED STRUCTURE	
FASCINE	
TRANSPLANT	

REVISIONS

J.J. FARBER FARM
STREAM RESTORATION PROJECT

EAST JEWETT, NY	COUNTY OF GREENE
MAY 1, 2006	SCALE: 1" = 70'

GREENE COUNTY SOIL & WATER
CONSERVATION DISTRICT

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PHONE (518) 622-3620
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STREAM MANAGEMENT PROGRAM

CHECKED BY:	PROJECT #: ESP-99.01
DRAWN BY: DOUG DEKOSKIE	DRAWING #: ESP-99.01
SHEET 10 OF 10	APRIL 2005 STORM DAMAGES