Pine Branch Mining LLC
Terrell Fork 2 Mitigation Site
Wolfe County, Kentucky

Mitigation Plan
July 2014

EcoSource, Inc. 104 Boston Square, Georgetown, Kentucky 40324 Telephone (502) 868-5200

EcoSource, Inc.
104 Boston Square
Georgetown, Kentucky 40324

Telephone (502) 868-5200
Fax (502) 868-5282

July 17, 2014

Mr. David Baldridge
Army Corps of Engineers
845 Sassafras Creek Road
Sassafras, KY 41759

RE: Pine Branch Mining LLC
Terrell Fork 2 Mitigation Site
Nationwide 27 Application

David:

Attached is an application package for the above referenced project. If you have any questions concerning the enclosed, please feel free to contact me at your convenience.

Sincerely,

Debbie Collinsworth
Principal Scientist

Att.

C: Ed Brown, Pine Branch Mining LLC

Pine Branch Mining LLC
Terrell Fork 2 Mitigation Site
Wolfe County, Kentucky

Mitigation Plan
July 2014

Submitted to:

Louisville District
Army Corps of Engineers,
Sassafras Field Office

EcoSource, Inc.
104 Boston Square, Georgetown, Kentucky 40324 Telephone (502) 868-5200

ENG FORM 4345

U.S. ARMY CORPS OF ENGINEERS

APPLICATION FOR DEPARTMENT OF THE ARMY PERMIT

33 CFR 325. The proponent agency is CECW-CO-R.

Form Approved - OMB No. 0710-0003 Expires: 31-AUGUST-2013

Public reporting for this collection of information is estimated to average 11 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of the collection of information, including suggestions for reducing this burden, to Department of Defense, Washington Headquarters, Executive Services and Communications Directorate, Information Management Division and to the Office of Management and Budget, Paperwork Reduction Project (0710-0003). Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to any penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number. Please DO NOT RETURN your form to either of those addresses. Completed applications must be submitted to the District Engineer having jurisdiction over the location of the proposed activity.

PRIVACY ACT STATEMENT

Authorities: Rivers and Harbors Act, Section 10, 33 USC 403; Clean Water Act, Section 404, 33 USC 1344; Marine Protection, Research, and Sanctuaries Act, Section 103, 33 USC 1413; Regulatory Programs of the Corps of Engineers; Final Rule 33 CFR 320-332. Principal Purpose: Information provided on this form will be used in evaluating the application for a permit. Routine Uses: This information may be shared with the Department of Justice and other federal, state, and local government agencies, and the public and may be made available as part of a public notice as required by Federal law. Submission of requested information is voluntary, however, if information is not provided the permit application cannot be evaluated nor can a permit be issued. One set of original drawings or good reproducible copies which show the location and character of the proposed activity must be attached to this application (see sample drawings and/or instructions) and be submitted to the District Engineer having jurisdiction over the location of the proposed activity. An application that is not completed in full will be returned.

(ITEMS 1 THRU 4 TO BE FILLED BY THE CORPS)

1. APPLICATION NO.	2. FIELD OFFICE CODE	3. DATE RECEIVED	4. DATE APPLICATION COMPLETE

(ITEMS BELOW TO BE FILLED BY APPLICANT)

5. APPLICANT'S NAME	8. AUTHORIZED AGENT'S NAME AND TITLE (agent is not required)
First - Ed Middle - Last - Brown	First - Debbie Middle - Last - Collinsworth
Company - Pine Branch Mining LLC	Company - EcoSource Inc.
E-mail Address - ebrown@blackhawkmining.com	E-mail Address - ecosource@hotmail.com
6. APPLICANT'S ADDRESS:	**9. AGENT'S ADDRESS:**
Address- 3228 Summit Square Place, Suite 180	Address- 104 Boston Square
City - Lexington State - KY Zip - 40509 Country - USA	City - Georgetown State - KY Zip - 40324 Country - USA
7. APPLICANT'S PHONE NOs. w/AREA CODE	**10. AGENTS PHONE NOs. w/AREA CODE**
a. Residence b. Business 859-543-0515 c. Fax	a. Residence b. Business 502-868-5200 c. Fax

STATEMENT OF AUTHORIZATION

11. I hereby authorize, EcoSource Inc. to act in my behalf as my agent in the processing of this application and to furnish, upon request, supplemental information in support of this permit application.

E. Edward Brown 7/14/2014

SIGNATURE OF APPLICANT DATE

NAME, LOCATION, AND DESCRIPTION OF PROJECT OR ACTIVITY

12. PROJECT NAME OR TITLE (see instructions)

Terrell Fork 2 Mitigation Project

13. NAME OF WATERBODY, IF KNOWN (if applicable)	14. PROJECT STREET ADDRESS (if applicable)
Unnamed Tributaries to Terrell Fork	Address
15. LOCATION OF PROJECT Latitude: °N 37.688369°, Longitude: °W -83.440853°.	City - State- Zip-

16. OTHER LOCATION DESCRIPTIONS, IF KNOWN (see instructions)

State Tax Parcel ID Municipality

Section - Township - Range -

17. DIRECTIONS TO THE SITE

In Wolfe Couinty, Kentucky travel south from Campton on S.R. 15 to the intersection with S.R. 15 and S.R. 1261. Turn left onto S.R. 1261 and travel 2.3 miles to intersection with Terrell Fork Road. Turn right onto Terrell Fork Road and travel 1.2 miles to a locked gate. Access is via a private, gravelled road.

18. Nature of Activity (Description of project, include all features)

The proposed project is stream mitigation within four hollows that contain unnamed tributaries to Terrell Fork. The improvements will include rehabilitation, enhancement, and preservation of stream reaches.

19. Project Purpose (Describe the reason or purpose of the project, see instructions)

The purpose of the project is aquatic restoration and preservation of an aquatic resource to be used to offset future project impacts.

USE BLOCKS 20-23 IF DREDGED AND/OR FILL MATERIAL IS TO BE DISCHARGED

20. Reason(s) for Discharge

Construction of streams will require grading and reforming of the stream channel.

21. Type(s) of Material Being Discharged and the Amount of Each Type in Cubic Yards:

Type Amount in Cubic Yards	Type Amount in Cubic Yards	Type Amount in Cubic Yards
clean soils - 520	sandstone rock - 700	

22. Surface Area in Acres of Wetlands or Other Waters Filled (see instructions)

Acres

or

Linear Feet 9,350 (which will be rehabilitated or enhanced)

23. Description of Avoidance, Minimization, and Compensation (see instructions)

Avoidance, minimization, and compensation are not applicable to this project.

24. Is Any Portion of the Work Already Complete? ☐ Yes ☒ No IF YES, DESCRIBE THE COMPLETED WORK

25. Addresses of Adjoining Property Owners, Lessees, Etc., Whose Property Adjoins the Waterbody (if more than can be entered here, please attach a supplemental list).

a. Address- Pine Branch Mining LLC, 3228 Summit Square Place, Suite 180

City - Lexington State - KY Zip - 40509

b. Address-

City - State - Zip -

c. Address-

City - State - Zip -

d. Address-

City - State - Zip -

e. Address-

City - State - Zip -

26. List of Other Certificates or Approvals/Denials received from other Federal, State, or Local Agencies for Work Described in This Application.

AGENCY	TYPE APPROVAL*	IDENTIFICATION NUMBER	DATE APPLIED	DATE APPROVED	DATE DENIED
KY DNR, DMP	401 WQC		Pending		

* Would include but is not restricted to zoning, building, and flood plain permits

27. Application is hereby made for permit or permits to authorize the work described in this application. I certify that this information in this application is complete and accurate. I further certify that I possess the authority to undertake the work described herein or am acting as the duly authorized agent of the applicant.

SIGNATURE OF APPLICANT 7/14/2014 DATE SIGNATURE OF AGENT 7-16-2014 DATE

The Application must be signed by the person who desires to undertake the proposed activity (applicant) or it may be signed by a duly authorized agent if the statement in block 11 has been filled out and signed.

18 U.S.C. Section 1001 provides that: Whoever, in any manner within the jurisdiction of any department or agency of the United States knowingly and willfully falsifies, conceals, or covers up any trick, scheme, or disguises a material fact or makes any false, fictitious or fraudulent statements or representations or makes or uses any false writing or document knowing same to contain any false, fictitious or fraudulent statements or entry, shall be fined not more than $10,000 or imprisoned not more than five years or both.

PINE BRANCH MINING, LLC

Written Action by Manager
in Lieu of a Meeting

October 1, 2012

The undersigned, being the sole manager of PINE BRANCH MINING, LLC, a Kentucky limited liability company (the "Company"), and pursuant to KRS 275.175, and in lieu of a meeting, hereby waives notice of the time, place and purpose of a meeting, adopts the following resolutions and consents to the actions contemplated thereby:

> RESOLVED, that D. Edward Brown, Vice President- Engineering of the Company ("Brown") is duly authorized by the Manager, on behalf of the Company, to execute and file all applications, documents, instruments, and papers as may be necessary for the Company to comply with requirements of any federal or state mining regulatory agency or regulations promulgated by any federal or state mining regulatory agency.
>
> RESOLVED, that all authority conferred by these resolutions shall be deemed retroactive and any and all acts permitted or authorized hereunder but performed prior to the adoption of these resolutions are hereby ratified, affirmed and approved.

IN WITNESS WHEREOF, the undersigned has executed this written action to be effective as of the date first set forth above.

BLACKHAWK MINING, LLC, its Manager

By: JMP Blackhawk, LLC, its Manager

By: JMP Coal Holdings, LLC, its Manager

John M Potter

John M. Potter, its Manager

COMMONWEALTH OF KENTUCKY
COUNTY OF Fayette

This is to certify that the foregoing instrument was acknowledged before me on this 1st day of October, 2012, by John M. Potter, as Manager of JMP Coal Holdings, LLC, the Manager of JMP Blackhawk, LLC, the Manager of Blackhawk Mining, LLC, the Manager of Pine Branch Mining, LLC, behalf of the Company

My commission expires: 1-31-2016.

Sharon Miller

NOTARY PUBLIC

ADDENDUM DOCUMENTATION

TABLE OF CONTENTS

I. BASELINE INFORMATION

Pine Branch Mining LLC proposes to construct the Terrell Fork 2 Mitigation Site for the purpose of replacing past unsuccessful mitigation and also to have readily available stream mitigation credit. This credit will then be applied to future impacts in the appropriate watershed area.

A. Site Location

The location of the mitigation site can be seen on the General and Specific Location Maps (reference the Appendix). The site consists of four distinct hollows labeled as Areas A, B, C, and D. Based on the Landsaw, Kentucky USGS 7.5' topographic quadrangle, all four hollows are classified as first order stream reaches. The project area lies at a coordinate location of N37.688369°, W-83.440853°.

B. USGS 8-digit Watershed

The Terrell Fork 2 mitigation site lies within the drainage area of the North Fork Kentucky River (HUC 05100201) 8-digit HUC watershed.

C. Surrounding Land Use

The Terrell Fork watershed has a drainage area of 4 square miles or 2,600 acres as measured at the confluence with Kelse Holland Fork. Both forks flow into Holly Creek of the North Fork Kentucky River. The significant impacts within the Terrell Fork watershed include agricultural, silvicultural, and residential land uses. All of the streams within the valley bottoms have been historically, relocated and channelized. Any gently sloping land has been used for houses and attendant structures, hay fields, or pasture. Row crop farming is not common in this watershed. The specific land uses within the mitigation site are forest/scrub land and a minor amount of hay land at the mouth of each hollow.

D. Classification

The streams within the very upper reaches with high gradients originate as A channels that feed into B or G channels. The majority of the lower streams are either B or G channels. Past farming practices included relocating the streams along the valley bottoms to run parallel with the adjacent hillside and at the toe of the slope. This allowed for maximum crop planting area and improved space for mechanized maintenance of the crops. Along these realigned reaches, vertical banks and no riparian cover are prevalent. Within the upper reaches where logging was the greatest single impact, the streams continue to be influenced by fill placement for road crossings and subsequent eroded channels and banks.

E. Landscape Conditions

The proposed mitigation site consists of four separate hollows that have a combined area of 0.4 square mile or 254 acres. The applicant completed and is currently monitoring another stream mitigation project immediately upstream of the Terrell Fork 2 mitigation project. This previous project is named the Terrell Fork mitigation project. The original project is the headwater for Terrell Fork and has a drainage area of 0.29 square mile or 186 acres. The combined area of the Terrell Fork and Terrell Fork 2 mitigation sites is 0.69 square mile or 437 acres. The drainage areas of these constructed and proposed mitigation sites encompass 17% of the Terrell Fork watershed as measured at the confluence with Kelse Holland Fork.

The drainages feeding the four hollows have been extensively timbered along the hillsides and historically farmed within the valley bottoms. The logging was performed approximately ten years ago. The standing timber on the hillside consists of vestiges of hickory, oak, sycamore, sweetgum, beech, and smaller subcanopy species. The majority of the standing timber will provide a substantial volunteer seed source for adjacent cleared areas that will complement the planted species

F. Climate

The climatic information for the general area of the mitigation is provided in the Powell and Wolfe Counties soil survey.[1] The annual precipitation averages 46 inches, 55% usually falls in April through September. This rainy period also corresponds loosely to the growing season. Average seasonal snowfall is +16 inches. The average relative humidity in the midafternoon is about 60%, with an increase in the evening and an average of 80% at dawn. Sunlight occurs 65% of the time possible in the summer and 45% in the winter. Prevailing wind is from the south, with the highest wind speed occurring in spring.

G. Water Quality

The water quality within the proposed mitigation area was measured for specific conductivity as required by the Eastern Kentucky Stream Assessment Protocol (EKSAP). The measured specific conductivity was <100 µS in all four hollows. No further quantification or qualification of water quality was performed. However, due to the presence of eroding banks, a lack of riparian cover, and unstable channel pattern, the water quality would be diminished by these impairments. Stream rehabilitation and enhancement will work toward ameliorating the sediment load from this site. In addition, tree plantings within the riparian zone will help to decrease water temperature and increase nutrient input.

H. Functional Assessment Tool

In order to determine the functional value of the mitigated streams, the EKSAP for high gradient streams was applied. In addition, best professional judgment and presence of bed and bank features were used to determine jurisdiction. The baseline information provided for the jurisdictional determination area contained in the JD document titled “Pine Branch Mining LLC, Terrell Fork 2 Mitigation Site, Wolfe County, Kentucky, Jurisdictional Determination” dated November 2013.

I. Maps

The following mapping and figures illustrating the features discussed in this document are included in the Appendix.

- General Location Map
- Specific Location Map
- Base Map
- Area A Stream Modifications
- Area B Stream Modifications
- Area C Stream Modifications Sheets 1 and 2
- Area D Stream Modifications
- Area A Proposed Conditions
- Area A Proposed Sections
- Area B Proposed Conditions
- Area B Proposed Sections
- Area C Proposed Conditions Sheets 1 and 2
- Area C Proposed Sections
- Area D Proposed Conditions
- Area D Proposed Sections
- Stream Details
- Wetland Details

[1] USDA, Soil Conservation Service. September 1993. Soil Survey of Powell and Wolfe Counties, Kentucky.

J. Responsible Parties

Applicant: Pine Branch Mining LLC
3228 Summit Square Place, Suite 180
Lexington, KY 40509
Contact: Ed Brown (859-543-0515)

Consultant: EcoSource, Inc.
104 Boston Square
Georgetown, KY 40324
Contact: (502-868-5200)

Ownership of Mitigation Site:
Pine Branch Mining LLC
3228 Summit Square Place, Suite 180
Lexington, KY 40509

II. GOALS AND OBJECTIVES

A. Function and Values

The current land use for the majority of the project area is upland forest. Timbering was performed about ten years ago, with abundant regeneration occurring along many of the ephemeral stream reaches. Some of the upper portions of the intermittent reaches have also benefitted from the regeneration of the woody species. However, much of the mitigation areas lack riparian cover and small portions are used for hay production.

Most of the stream channels are deeply incised with eroding banks. In addition, headcuts are a common feature throughout the project area. The surrounding forest was select cut, leaving many larger specimens that are +20 years of age. The woodlands provide habitat for small mammals, amphibians, birds, and white tailed deer. Immediately downstream of all four hollows are hayfields that originate upstream at the base of the original Terrell Fork mitigation site and extend one-half mile downstream of Area D.

The proposed mitigation will minimize erosion by reconstructing the stream with a natural pattern and profile, with a direct connection to the floodplain. In addition, tree planting will over time, work to lower stream temperature, increase nutrients, and hold the soil within the floodplain. Upon maturation, functions will exceed those provided by the mitigation area at this time. As proposed, the mitigation site will also provide some wetland habitat where none currently exists. The wetland habitats are proposed as vernal and groundwater fed features. A wider array of habitats will yield a greater diversity of species that will use the area on a temporary or permanent basis.

B. Functions Present

The existing functional value at the mitigation site was originally provided in the JD documentation. Table 1 provides a summary of the existing values. As noted, a slight increase ephemeral stream length was documented in Area A due to more in-depth field reconnaissance. This increase is noted in the table. The existing value within the four streams is 7,500.82 EIU's from a total of 13,016 linear feet of streams.

C. Functions Projected

Based on the proposed mitigation plan, a total of 13,772 linear feet of streams will be enhanced, rehabilitated, or preserved. Table 2 provides a summary of the projected values. As proposed, the EIU's that will be generated from enhancement and rehabilitation work will total 7,583.68 EIU's, at maturity. In addition, 2,538.8 EIU's of existing value will be protected through preservation. For the streams noted for preservation only, a debiting ratio of 10:1 is proposed. Thus, with 2,538.8 EIU's of existing streams set aside for preservation, ***253.9 EIU's*** can be debited for mitigation credit. The calculation sheets for the projected EII's are located in the Appendix.

The combined gain of ***2,621.66 EIU's*** on Areas A-D can be summarized as follows:

Pre-construction = 7,500.82 EIU's
- Preservation = 2,538.8 EIU's
- Non-preservation (enhancement/rehabilitation) = 4,962.02 EIU's

Post-construction = 10,122.48 EIU's
- Preservation = 2,538.8 EIU's
- Non-preservation (enhancement/rehabilitation) = 7,583.68 EIU's

Total Gain = 7,583.68 EIU's – 4,962.02 EIU's = 2,621.66 EIU's

Table 1. Existing Functional Values

Mitigation Area	Mitigation Reach	Flow Regime	Existing Stream Length (ft)	Existing Norm. Habitat Index*	Existing Norm. Spec. Cond. Index*	Existing Ecological Integrity Index	Existing Ecological Integrity Units
A	A-1	Intermittent	1,075	0.19 (109)	1.0 (78)	0.60	645.00
	A-2*	Intermittent	835	0.27 (117)	1.0 (78)	0.64	534.40
	A-3*	Ephemeral	676	0.23 (113)	1.0 (78)	0.62	419.12
	A-4	Ephemeral	475	0.18 (108)	1.0 (78)	0.59	280.25
	A-5	Intermittent	135	0.24 (114)	1.0 (78)	0.62	83.70
	A-6	Intermittent	130	0.11 (101)	1.0 (78)	0.56	72.80
	A-7	Ephemeral	875	0.15 (105)	1.0 (78)	0.58	507.50
TOTAL			***4,201***				***2,542.77***
B	B-1	Intermittent	1,660	0.15 (105)	1.0 (62)	0.58	962.80
	B-2	Ephemeral	435	0.10 (94)	1.0 (62)	0.55	239.25
TOTAL			***2,095***				***1,202.05***
C	C-1	Perennial	835	0.19 (109)	1.0 (85)	0.60	501.00
	C-2	Intermittent	1,865	0.10 (97)	1.0 (85)	0.55	1,025.75
	C-3	Ephemeral	385	0.10 (97)	1.0 (85)	0.55	211.75
	C-4	Ephemeral	150	0.10 (93)	1.0 (85)	0.55	82.50
	C-5	Ephemeral	290	0.10 (98)	1.0 (85)	0.55	159.50
	C-6	Intermittent	335	0.10 (100)	1.0 (85)	0.55	184.25
	C-7	Ephemeral	390	0.10 (95)	1.0 (85)	0.55	214.50
TOTAL			***4,250***				***2,379.25***
D	D-1	Intermittent	1,825	0.11 (101)	1.0 (96)	0.56	1,022.00
	D-2	Ephemeral	230	0.10 (96)	1.0 (96)	0.55	126.50
	D-3	Ephemeral	415	0.10 (96)	1.0 (96)	0.55	228.25
TOTAL			***2,470***				***1,376.75***
TOTAL LENGTH:			***13,016***				***7,500.82***

- Measured or calculated values are represented within the parentheses. Further details are provided in the JD document titled "Pine Branch Mining LLC, Terrell Fork 2 Mitigation Site, Wolfe County, Kentucky, Jurisdictional Determination" dated November 2013.
- The stream lengths for Mitigation reaches A2 and A3 were extended after additional field reconnaissance. The original lengths reported in the November 2013 JD document were A2-820' and A3-630'.

D. Identification of Potential Challenges

Bush and vining honeysuckle, are present within the riparian zone. However, these species and any other controllable non-natives can be eradicated with herbicides or mechanical means, including on-site burial.

In the event some component of the proposed mitigation plan fails, remediation of the failure will consist of either repairing the problem situation or the substitution of an alternate mitigation site. However at this time, no overt remedial efforts are anticipated.

E. Environmental Goals and Objectives

The overall goal and objective of the project is to provide adequate and appropriate mitigation for the losses caused by existing and future impacts from off-site impacts. Final success will be determined by the habitat scores reaching the defined goal at no less than 5-year maturity and a stable channel will be present. The mitigation site was selected due to its proximity to the existing and future impacts, presence of a restorable resource, availability of restrictive covenants or easements, and the need for watershed improvements in the 8-digit watershed.

Table 2. Projected Functional Values

Mitigation Area	Mitigation Reach	Flow Regime	Type of Stream Modification (ft)			Projected Total Stream Length (ft)	Projected EIU Immediately after Construction (at 5 years)		Projected Total EIU Immediately after Construction (at 5 years)	Projected EIU at Maturity (20 years)		Projected Total EIU at Maturity (20 years)	Total EIU
			Enhancement	Rehabilitation	Preservation		Enhancement	Rehabilitation		Enhancement	Rehabilitation		Preservation
A	A-1	Intermittent		1,104		1,104		750.72	750.72		938.4	938.40	
	A-2	Intermittent		635	220	855		419.10	419.10		514.35	514.35	140.80
	A-3	Ephemeral	188	84	404	676	118.44	47.04	165.48	127.84	55.44	183.28	250.48
	A-4	Ephemeral			475	475							280.25
	A-5	Intermittent		90	33	123		59.40	59.40		72.9	72.90	20.46
	A-6	Intermittent		346		346		228.36	228.36		280.26	280.26	
	A-7	Ephemeral		18	857	875		10.08	10.08		11.88	11.88	497.06
TOTAL			***188***	***2,277***	***1,989***	***4,454***	***118.44***	***1514.70***	***1633.14***	***127.84***	***1873.23***	***2001.07***	***1189.05***
B	B-1	Intermittent	100	1,580		1,680	69.00	1042.80	1111.80	81.00	1279.8	1360.80	
	B-2	Ephemeral			435	435							239.25
TOTAL			***100***	***1,580***	***435***	***2,115***	***69.00***	***1042.80***	***1111.80***	***81.00***	***1279.8***	***1360.80***	***239.25***
C	C-1	Perennial	108	875		983	68.04	603.75	671.79	75.60	761.25	836.85	
	C-2	Intermittent	467	1002		1469	294.21	681.36	975.57	326.90	851.7	1178.60	
	C-2A	Intermittent	432			432	298.08		298.08	349.92		349.92	
	C-3	Ephemeral	35		350	385	22.05		22.05	23.80		23.80	192.50
	C-4	Ephemeral			150	150							82.50
	C-5	Ephemeral			290	290							159.50
	C-6	Intermittent		300		300		198.00	198.00		243	243.00	
	C-6A	Intermittent		89		89		58.74	58.74		72.09	72.09	
	C-7	Ephemeral		35	355	390		19.60	19.6		23.1	23.1	195.25
TOTAL			***1,042***	***2,301***	***1,145***	***4,488***	***682.38***	***1561.45***	***2243.83***	***776.22***	***1951.14***	***2727.36***	***629.75***
D	D-1	Intermittent		1,845	225	2,070		1217.70	1217.70		1494.45	1494.45	126.00
	D-2	Ephemeral			230	230							126.50
	D-3	Ephemeral			415	415							228.25
TOTAL			***0***	***1,845***	***870***	***2,715***		***1217.70***	***1217.70***		***1494.45***	***1494.45***	***480.75***
TOTALS			***1,330***	***8,003***	***4,439***	***13,772***	***869.82***	***5,336.65***	***6,206.47***	***985.06***	***6,598.62***	***7,583.68***	***2,538.80***

Ephemeral Total ***Intermittent Total*** ***Perennial Total***

III. MITIGATION WORK/IMPLEMENTATION

A. Site Preparation

1. Plans.

a. Grading

Grading will be performed within the valley area of each hollow. The purpose of the grading work will be to reestablish the connection of the stream channel to the floodplain. Generally, the stream channel and resultant floodplain will be reconstructed from a chosen location within the headwaters of each hollow. BMP's will be instituted to prevent downstream transport of soil and to prevent a degradation of water quality.

b. Hydrologic Changes

Water will not be rerouted during construction, so the BMP's must be constantly monitored and maintained. The construction of groundwater dams will expectantly elevate the existing water table in select reaches.

c. Exotic Vegetation Control

Non-natives are present within the mitigation area. All attempts will be made to eradicate these species during construction. However, no guarantee is provided that all exotic species will be removed. All appropriate measures will be used including application of herbicides and mechanical removal.

d. Erosion Control

BMP's will be instituted including silt fences or straw bales for erosion control. As noted on the plan maps, GEOCOIR biodegradable geotextiles are to be used along the stream edge to promote vegetation establishment and to provide additional protection during precipitation events.

e. Equipment and Procedures to be Used

The construction supervisor will select the appropriate size excavator to perform the grading work and stream reconstruction. All necessary safeguards will be implemented to insure the mitigation sites do not become compacted from equipment passage.

f. Site Access Control

During restoration activities, vehicular access will be limited due to a lack of serviceable roads. After restoration is completed, the existing logging trails/roads will be eliminated or made impassable by vehicular traffic. No plans exist to fence the area in order to further limit access. No problems are anticipated from trespassers causing damage to the project area. In the event problems do arise, appropriate actions will be taken to protect the restoration areas.

g. Strategy for Minimizing Soil Compaction

During stream construction, all measures will be taken to prevent overcompaction of the work area. All other vehicular traffic will be severely limited or excluded on the mitigation area.

h. Stream, Pattern, Profile and Dimension

The proposed pattern, profile, and dimension for the streams are provided in the drawings in the appendix.

2. Soil/Substrate

The existing substrate in the stream channel is small gravels with a minor amount of silt. This composition is not anticipated to change after restoration. Any rock brought onto the site will be a non-toxic, durable sandstone. The streams will be allowed the opportunity to naturally redevelop. The only substrate that will be added is a shallow layer of rock along select areas of the stream channel.

3. Hydrology

The four hollows combined contain perennial, intermittent, and ephemeral flow regimes. These regimes will not be altered by construction. However, duration of flow will probably be increased with the construction of the groundwater dams.

4. Planting Plan

The proposed plantings are to be performed using Root Prune Method (RPM) trees. These trees were planted on the Terrell Fork mitigation site and their success has been documented. Those specimens were obtained from the Forrest Keeling Nursery, but planting stock can be obtained from any other provider. The following table provides a list of species to be planted, with a concentration on hard mast species. Regardless of the composition, at least eight species are to be planted within the riparian zone. The standard 3-gallon size tree should be planted. At least half of the species planted are to be hard mast species. No less than 150 trees/shrubs per acre are to be planted of RPM stock. Trees and shrubs are to be planted in a randomized pattern and not in rows. Shrub placement starts at the bankfull elevation and extends up the slope for a distance of 10-15’ from the edge of stream. Trees are to be planted throughout the riparian zone. Shrub plantings should consist of no less than 3 shrub species.

Table 3. List of trees for planting

Scientific Name	Common Name	Scientific Name	Common Name
Acer rubrum	red maple	*Diospyros virginiana*	Persimmon
Acer saccharum	sugar maple	*Juglans nigra*	black walnut
Aesculus glabra	ohio buckeye	*Liquidambar styraciflua*	Sweetgum
Asimina triloba	Papaw	*Liriodendron tulipifera*	yellow poplar
Betula nigra	river birch	*Platanus occidentalis*	american sycamore
Carya glabra	pignut hickory	*Quercus alba*	white oak
Carya ovata	shagbark hickory	*Quercus prinus*	chestnut oak
Carya tomentosa	mockernut hickory	*Quercus rubra*	northern red oak

Planting of the trees will occur as soon after construction is completed, but when the growing period is appropriate. Uncontrollable climatic conditions such as extreme amounts of precipitation or drought can cause tree planting to be delayed until soil conditions are more suitable.

Table 4. List of shrubs for planting

Scientific Name	Common Name	Scientific Name	Common Name
Alnus serrulata	alder	*Cornus stolonifera*	red stem dogwood
Carpinus caroliniana	american hornbeam	*Corylus americana*	hazelnut
Cercis canadensis	redbud	*Oxydendron arboreum*	sourwood
Cornus amomum	silky dogwood	*Prunus serotina*	wild black cherry
Cornus drummondii	rough leaf dogwood	*Prunus virginiana*	chokecherry

The following seed mix is an example of a preferred mix for any bare areas. Another seeding mix can be substituted as necessary. However, the mix should include at least 50% native species by composition. All bare areas are to be seeded as soon as possible. Wetlands are to be seeded with a temporary, quick growing species such as annual rye or winter oats. A wetland, wildflower mix can be used on the wetland areas at the desire of the applicant.

Table 5. Seeding Mix

Scientific Name	Common Name	#'s / Acre
Andropogon gerardii	Big bluestem	3
Glyceria striata	Fowl manna grass	2
Elmyus hystix (Hystrix patula)	Bottle brush grass	2
Panicum virgatum	Switchgrass	2
Lolium multiflorum	Annual rye	4

5. Schedule

Grading work will be performed as weather allows. Tree planting is anticipated for the first appropriate growing season after completion of construction. Usually, tree planting is performed in mid-Spring or late Fall. After the initial growing season has passed, the first monitoring report can be submitted.

6. Construction Monitoring

Monitoring of the grading activities will be provided on a daily basis. Also during tree planting, a planting supervisor will be present. The construction monitor will have the appropriate knowledge of all elements of stream restoration that are needed to understand how to achieve the desired end product.

B. As-Built Conditions

Once the stream construction is completed and one growing season has passed, an initial monitoring report will be submitted. This report will include an assessment of the stream construction, planting list, description of site conditions, any information on additional efforts required to achieve success, and photographs. The perimeter of the mitigation sites will be adequately marked with permanent signs.

C. Financial Assurances

The applicant takes full responsibility for the continued maintenance of the mitigation site. The company has an annual budget for remedial work at any of their restoration sites, and these sites would fall within that budget.

IV. SUCCESS CRITERIA

A. Minimum Success Criteria

1. STREAMS

a. Channel Pattern, Profile, and Dimension

The pattern, profile, and dimension will be detailed in a final as-built survey that will be obtained during the final growing season before project release. Detailed information will be provided on the channel including length, mean width and depth, slope, sinuosity, incision, bankfull dimensions, and bank characteristics. The goal is to achieve a stable channel that shows little to no incision or bank failure. When this is achieved, the project will be considered a success.

b. Substrate Stability and Composition

A pebble count will be performed in Year 2 and Year 5 of monitoring. However, no target D50 size is recommended. The post-construction counts will be compared to the pre-construction counts. As long as the channel is stable, and composition does not show a drastic change, the project will be considered a success. Some sedimentation within the reconstructed stream lengths is anticipated immediately after construction, but this condition is expected to decrease with time.

c. Large Woody Debris

Since the proposed mitigation site will take decades to reach maturity, the presence of naturally occurring large woody debris (LWD) would not be anticipated for many years. Woody debris can be obtained in the nearby woods or from removal during construction, and incorporated into the stream channel. Logs can be placed at grade between bends, or buried in pools. Also, large woody debris can be placed in the floodplain for perches and to provide decaying material for wildlife usage.

d. Channel Habitat Types

Generally, the in-stream facet features of pools, riffles, and runs will vary based upon channel type. No fixed percentage of these facet features is offered.

e. Canopy Cover

Since full maturity will not be achieved during the monitoring period, full canopy coverage is not anticipated. However, RPM stock is being used to assure the lowest mortality rates, while providing woody stock that has the potential to produce mast before the monitoring period is over. Canopy coverage from this tree stock will occur more quickly than with bare root plantings. Beyond assurance of tree health and meeting success standard for trees/acre, no further offer of success is proposed.

f. Riparian Vegetation Structure and Complexity

The planting list provided in III.A.4 will assure adequate variety exists in the planted riparian zone. The establishment of volunteer will not be prohibited. The success standard for woody species will be 120 trees per acre. This total will include the RPM stock and any volunteer species.

g. Sustainability

Natural channel design was incorporated into the mitigation plan. Based on this plan A, B, C/E (in grade-control wetlands) channels are proposed throughout the area. However, braiding of channels will not be discouraged. Of course a primary channel will exist, but smaller contiguous drainage channels will probably develop over time. The presence of any braiding channels will not go toward devaluing the final success of the stream mitigation.

h. Water Quality

No change in the water chemistry is anticipated. However, improved stream pattern and profile and planting of the riparian zone should decrease erosion and sedimentation. No monitoring of water quality is offered at this time.

V. MONITORING

A. Monitoring Reports

1. Timing

Monitoring reports will be submitted on an annual basis. The first report will be due after one full growing season has been completed. Each report will be due in the Corp's office by January 30th of each year. On-site inspections of the mitigation sites will be daily during construction, and no less than monthly for the first year following construction.

2. On-Site Method

Photo stations will be established in the first monitoring report. These photo locations will be repeated for each subsequent monitoring report in order to provide repeatable documentation of the mitigation site. These photo stations will be set forth on a map that will be submitted with each report. The EPA RBP habitat sheets will be used when evaluating the success criteria of the stream.

3. Documentation

A written narrative will be included that discusses the progression of the sites toward meeting the success goals. Also included will be a discussion of any modifications or remediation that was performed during the year represented by the report. The report will be broken down into the categories listed in Section IV. Success Criteria.

4. Responsible Parties

Pine Branch Mining LLC, as the applicant and project owner, will retain full responsibility for assuring project completion and success. Within the monitoring report, contact information for all participants will be identified by name, address, and phone number.

B. Assessment of Function/Value Replacement

A discussion will be provided of how functional/value replacement is being achieved through time, as compared to the baseline condition. This discussion will be tied in with the measured performance standards for that monitoring year. The RBP habitat sheets will be used as the basis for the discussion.

C. Release from Monitoring

A final monitoring report will provide a summary of the project, how success goals have been met, and a comparison of the baseline to the final product. This submission will be followed by a coordinated field visit to the mitigation site to be attended by agency representatives and the applicant.

VI. CONTINGENCY PLAN

In the event success criteria cannot be met in a given year, remedial measures will be presented to the agencies outlining a course of action. Included in this outline will be an analysis of the cause of failure. In the unlikely event that the mitigation site is deemed a failure, the applicant reserves the right to offer an alternative mitigation site or enter into discussions with the Corps to determine a strategy for providing mitigation for the non-compensated impact.

MAPS & FIGURES

- **General Location Map**
- **Specific Location Map**
- **Base Map**
- **Area A Stream Modifications**
- **Area B Stream Modifications**
- **Area C Stream Modifications Sheets 1 and 2**
- **Area D Stream Modifications**
- **Area A Proposed Conditions**
- **Area A Proposed Sections**
- **Area B Proposed Conditions**
- **Area B Proposed Sections**
- **Area C Proposed Conditions Sheets 1 and 2**
- **Area C Proposed Sections**
- **Area D Proposed Conditions**
- **Area D Proposed Sections**
- **Stream Details**
- **Wetland Details**

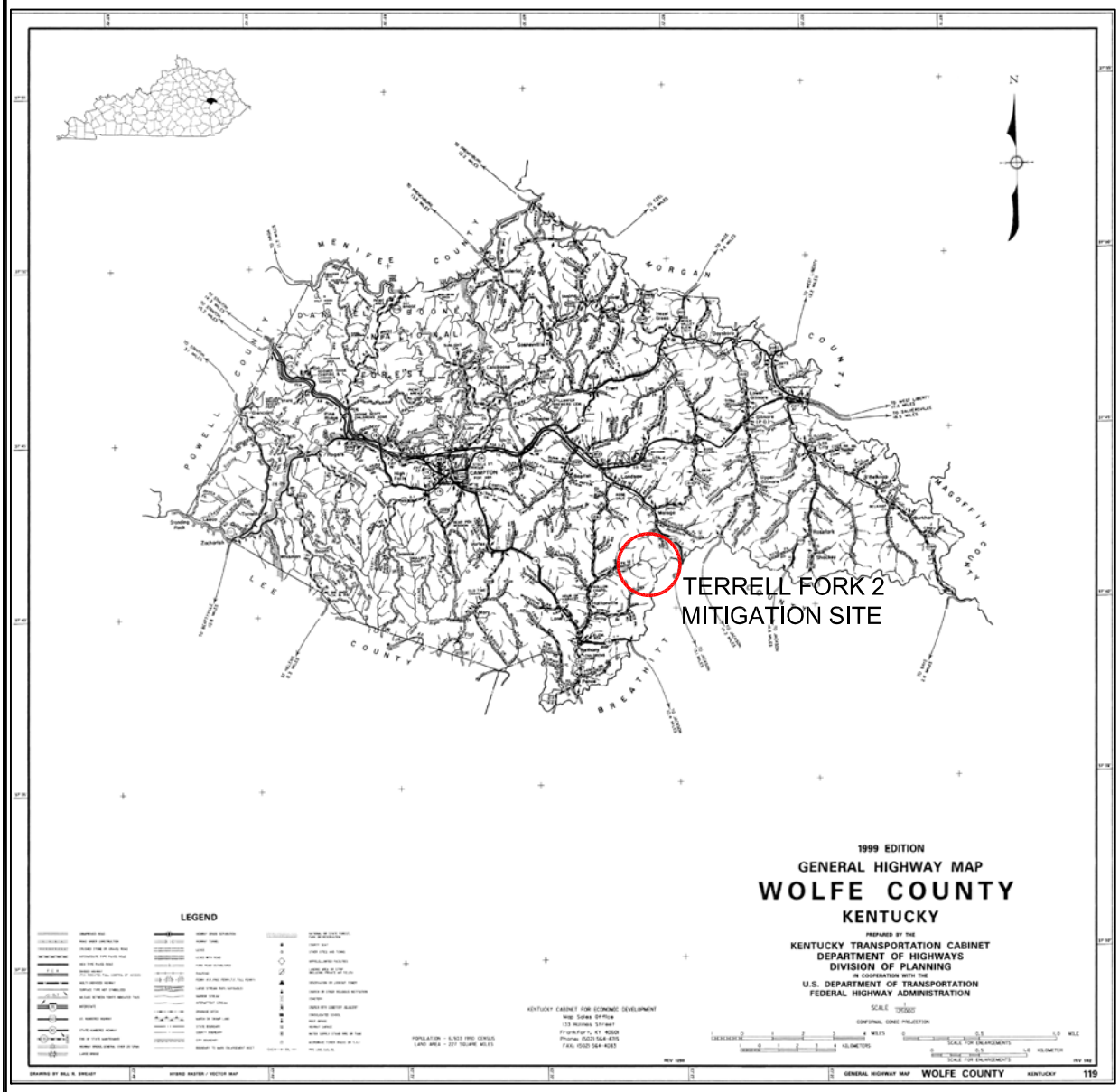

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FIGURE: Terrell Fork 2 Mitigation Site General Location Map	
CO. PROJECT NAME: Terrell Fork 2	*APPLICANT:* Pine Branch Mining LLC
COE ID NO.:	*Scale:* not to scale

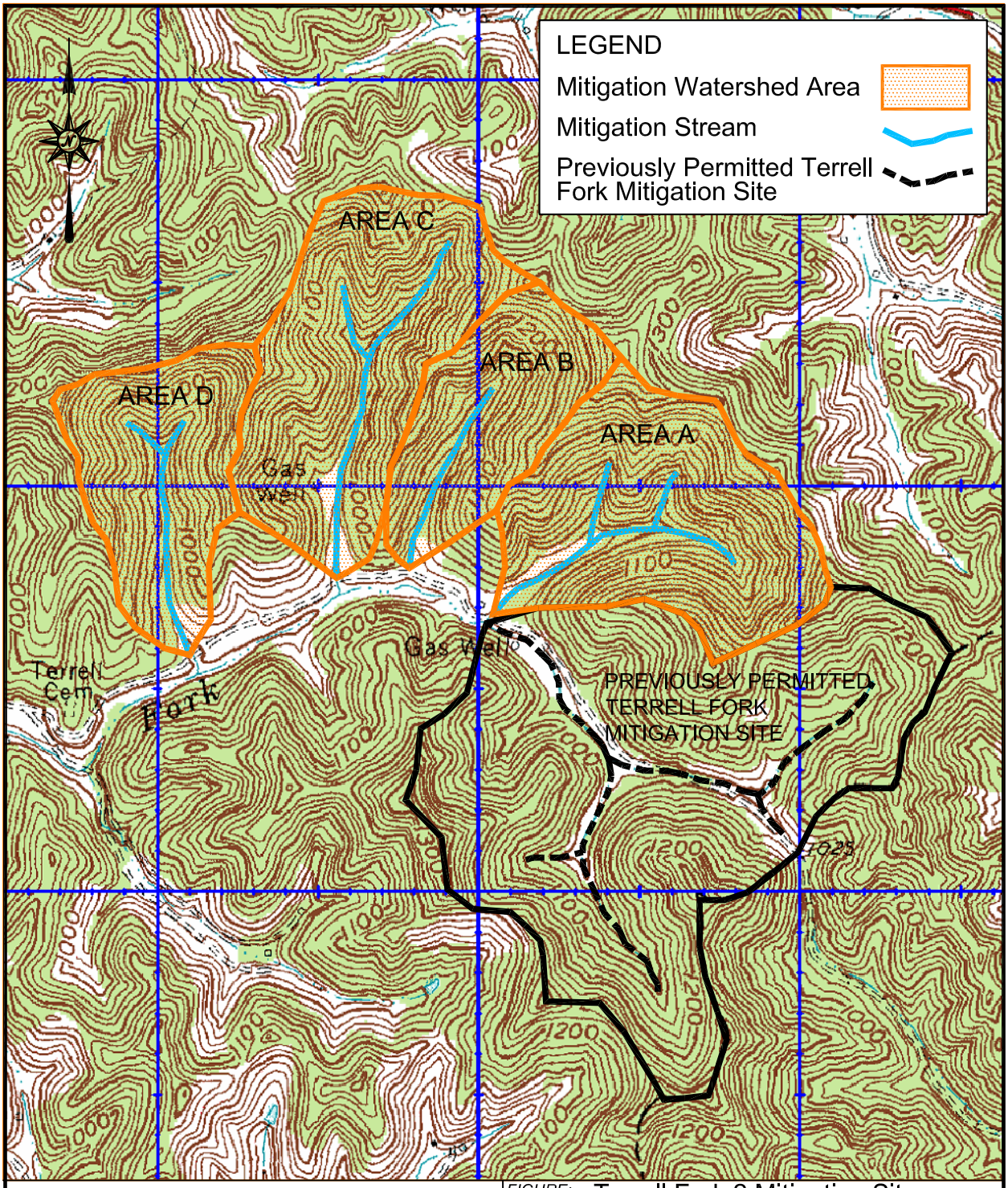

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FIGURE: Terrell Fork 2 Mitigation Site Specific Location Map *(Landsaw, KY 7.5' USGS Topographic Map)*	
CO. PROJECT NAME: Terrell Fork 2	*APPLICANT:* Pine Branch Mining LLC
COE ID NO.:	*Scale:* 1" = 1000'

AREA C

AREA B

AREA D

AREA A

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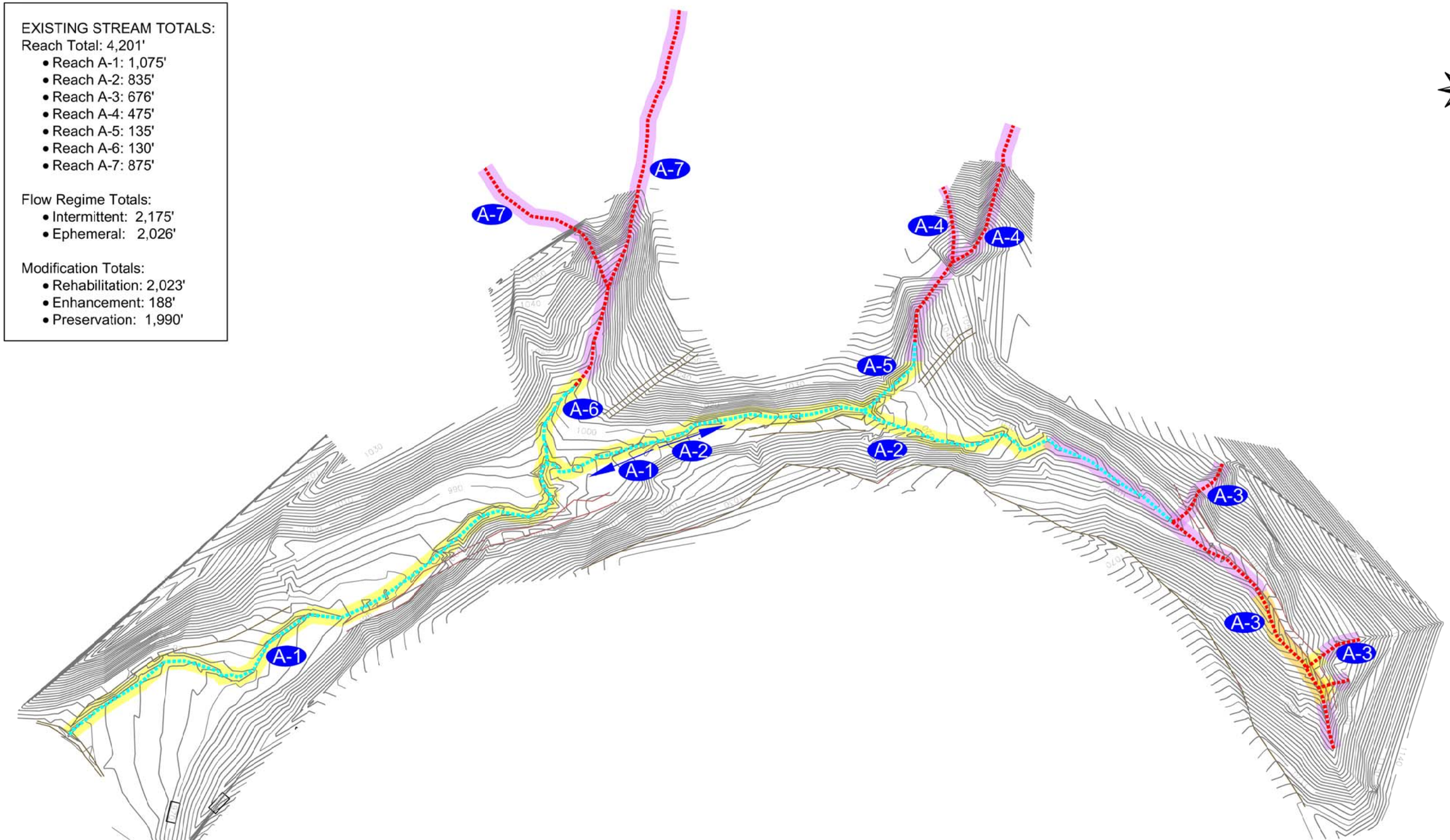
FIGURE: Terrell Fork 2 Mitigation Site Base Map	
CO. PROJECT NAME: Terrell Fork 2	APPLICANT: Pine Branch Mining LLC
COE ID NO.:	SCALE: 1" = 400'

EXISTING STREAM TOTALS:
Reach Total: 4,201'
- Reach A-1: 1,075'
- Reach A-2: 835'
- Reach A-3: 676'
- Reach A-4: 475'
- Reach A-5: 135'
- Reach A-6: 130'
- Reach A-7: 875'

Flow Regime Totals:
- Intermittent: 2,175'
- Ephemeral: 2,026'

Modification Totals:
- Rehabilitation: 2,023'
- Enhancement: 188'
- Preservation: 1,990'



Perennial Stream	
Intermittent Stream	
Ephemeral Stream	
Stream Rehabilitation	
Stream Enhancement	
Stream Preservation	
Reach Tag	A-1

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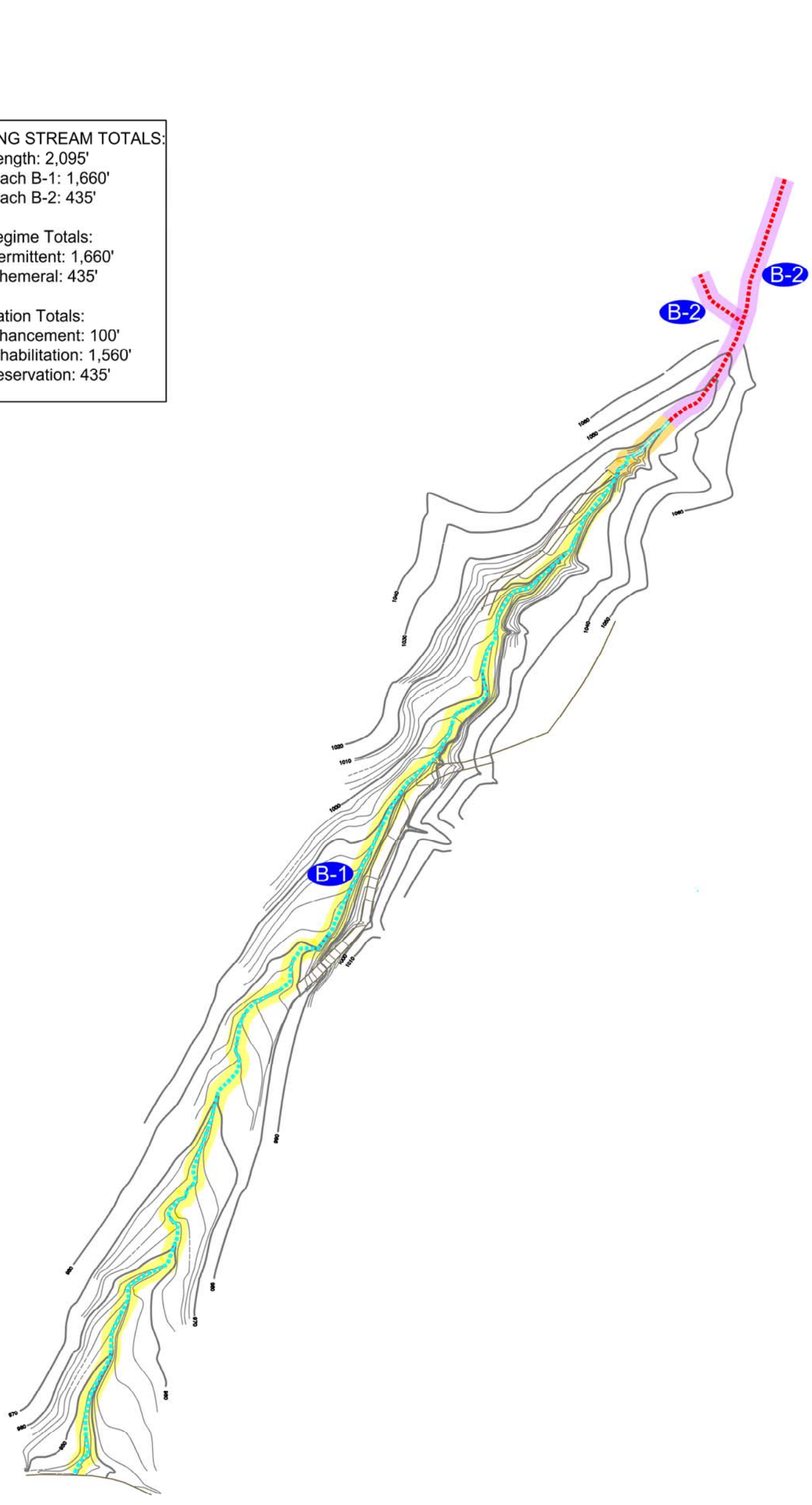
FIGURE: Terrell Fork 2 Mitigation Site AREA A Stream Modifications	
PROJECT NAME: Terrell Fork 2	APPLICANT: Pine Branch Mining LLC
COE ID NO.:	SCALE: 1"-150'

EXISTING STREAM TOTALS:
Total Length: 2,095'
- Reach B-1: 1,660'
- Reach B-2: 435'

Flow Regime Totals:
- Intermittent: 1,660'
- Ephemeral: 435'

Modification Totals:
- Enhancement: 100'
- Rehabilitation: 1,560'
- Preservation: 435'



Perennial Stream
Intermittent Stream
Ephemeral Stream
Stream Rehabilitation
Stream Enhancement
Stream Preservation
Reach Tag B-1

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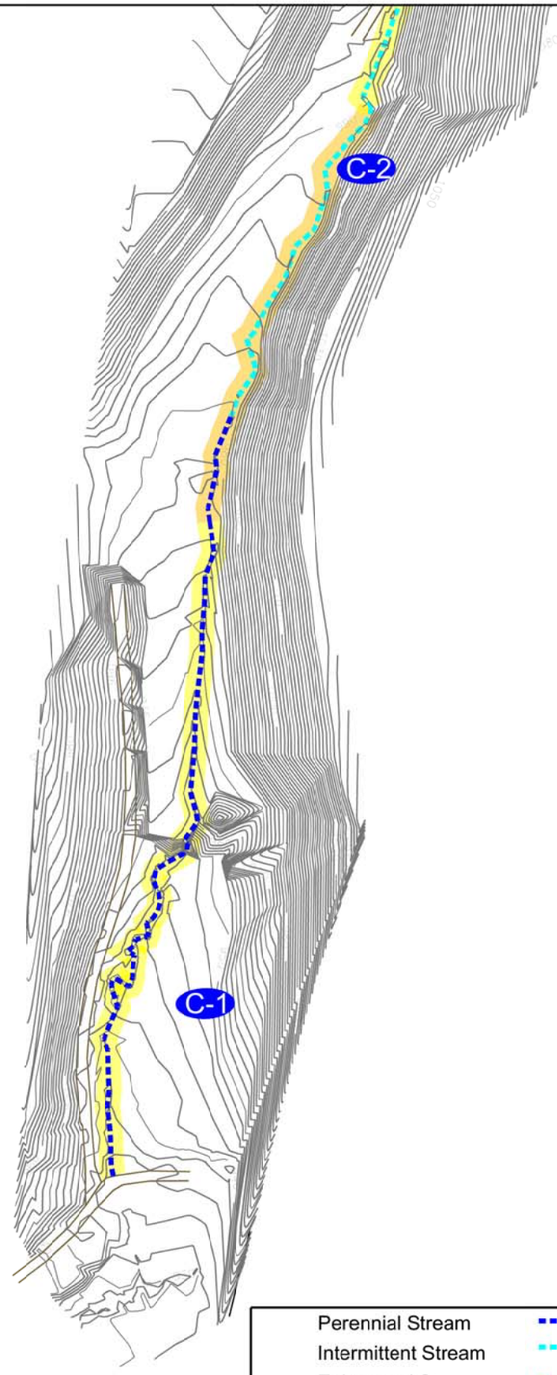
FIGURE: Terrell Fork 2 Mitigation Site
AREA B Stream Modifications

PROJECT NAME:	APPLICANT:
Terrell Fork 2	Pine Branch Mining LLC
COE ID NO.:	SCALE: 1"-150'



Reach Total: 4,250'
- Reach C-1: 835'
- Reach C-2: 1865'
- Reach C-3: 385'
- Reach C-4: 150'
- Reach C-5: 290'
- Reach C-6: 335'
- Reach C-7: 390'

Flow Regime Totals:
- Perennial: 835'
- Intermittent: 2,200'
- Ephemeral: 1,215'

Modification Totals:
- Rehabilitation: 2,064'
- Enhancement: 1,043'
- Preservation: 1,143'

Perennial Stream
Intermittent Stream
Ephemeral Stream
Stream Rehabilitation
Stream Enhancement
Stream Preservation
Reach Tag C-1

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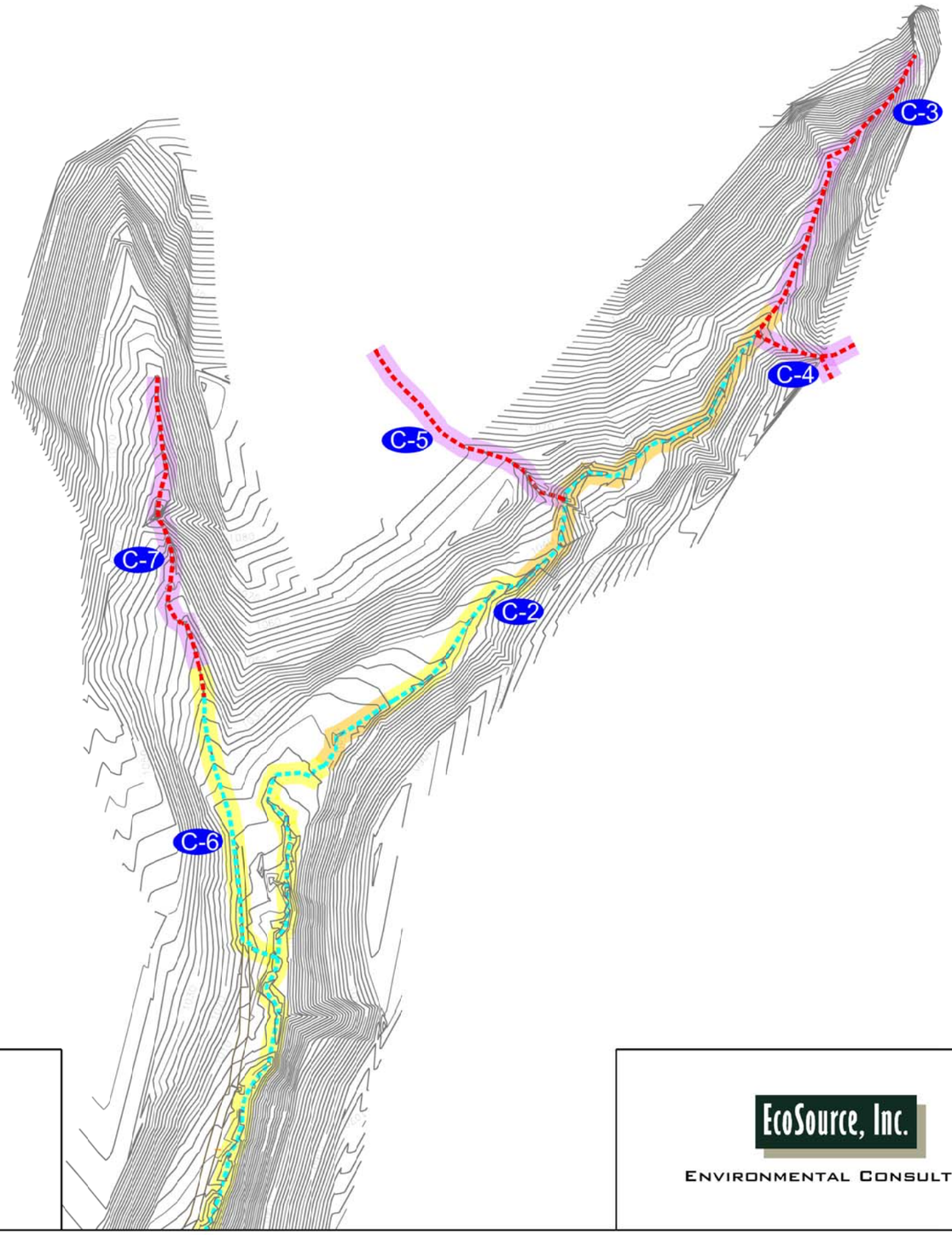
FIGURE: Terrell Fork 2 Mitigation Site AREA C Stream Modifications Sheet 1

PROJECT NAME:	APPLICANT:
Terrell Fork 2	Pine Branch Mining LLC
COE ID NO.:	SCALE: 1"-150'



Reach Total: 4,250'
- Reach C-1: 835'
- Reach C-2: 1865'
- Reach C-3: 385'
- Reach C-4: 150'
- Reach C-5: 290'
- Reach C-6: 335'
- Reach C-7: 390'

Flow Regime Totals:
- Perennial: 835'
- Intermittent: 2,200'
- Ephemeral: 1,215'

Modification Totals:
- Rehabilitation: 2,064'
- Enhancement: 1,043'
- Preservation: 1,143'

Perennial Stream
Intermittent Stream
Ephemeral Stream
Stream Rehabilitation
Stream Enhancement
Stream Preservation
Reach Tag C-1

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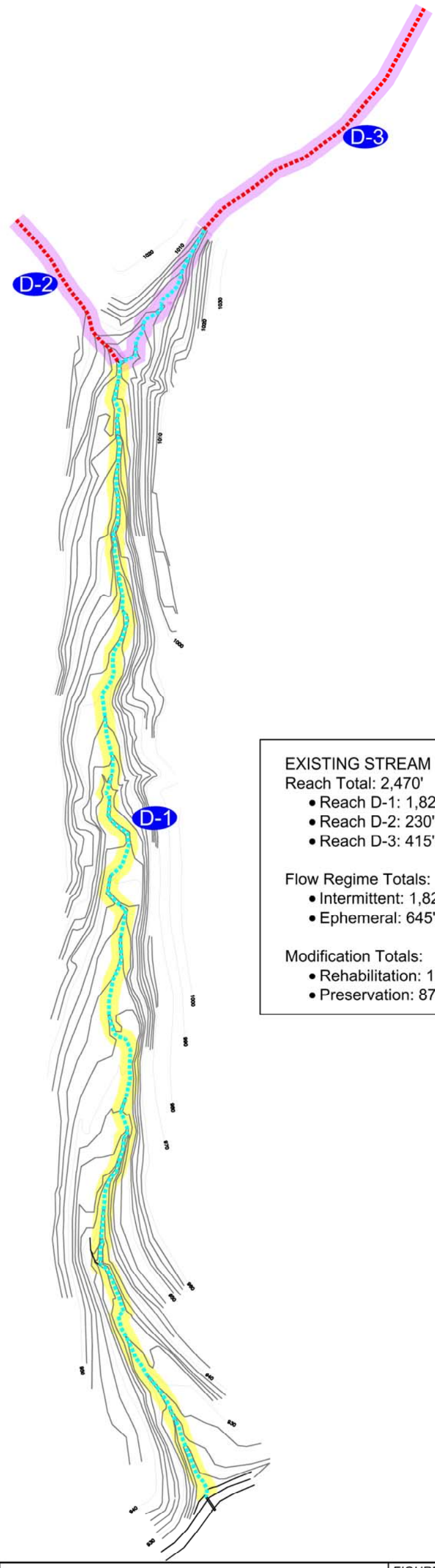
FIGURE: Terrell Fork 2 Mitigation Site AREA C Stream Modifications Sheet 2

PROJECT NAME:	APPLICANT:
Terrell Fork 2	Pine Branch Mining LLC
COE ID NO.:	SCALE: 1"-150'



EXISTING STREAM TOTALS:
Reach Total: 2,470'
- Reach D-1: 1,825'
- Reach D-2: 230'
- Reach D-3: 415'

Flow Regime Totals:
- Intermittent: 1,825'
- Ephemeral: 645'

Modification Totals:
- Rehabilitation: 1,600'
- Preservation: 870'

Perennial Stream
Intermittent Stream
Ephemeral Stream
Stream Rehabilitation
Stream Enhancement
Stream Preservation
Reach Tag D-1

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FIGURE: Terrell Fork 2 Mitigation Site
AREA D Stream Modifications

PROJECT NAME: Terrell Fork 2

APPLICANT: Pine Branch Mining LLC

COE ID NO.:

SCALE: 1"-150'

PROJECTED STREAM TOTALS:
Total Length = 4,454'
- Reach A-1: 1,104'
- Reach A-2: 855'
- Reach A-3: 676'
- Reach A-4: 475'
- Reach A-5: 123'
- Reach A-6: 346'
- Reach A-7: 875'

Flow Regime Totals:
- Intermittent: 2,428'
- Ephemeral: 2,026'

Modification Totals:
- Rehabilitation: 2,277'
- Enhancement: 188'
- Preservation: 1,989'

NOTES:

VERNAL WETLANDS ARE TO BE BUILT WHERE SPACE ALLOWS. THE LOCATIONS SHOWN ARE ILLUSTRATIVE. WETLAND BOUNDARIES CAN BE ADJUSTED AS NECESSARY TO FIT THE SITE CONDITIONS AT THAT LOCATION.

GRADE CONTROL WETLANDS AND GROUNDWATER WETLANDS ARE NOT ILLUSTRATIVE AND ARE INTENDED TO BE CONSTRUCTED IN THE LOCATIONS SHOWN.

THE OVERALL % GRADIENT SHOWN ON THE PROFILE IS A GOAL FOR CONSTRUCTION. THE % GRADIENT CAN VARY SLIGHTLY DEPENDING UPON SPECIFIC CONDITIONS WITHIN THAT STREAM REACH.

THE RIPARIAN ZONE WIDTH IS ANTICIPATED TO BE 60' FROM THE EDGE OF THE RECONSTRUCTED CHANNEL. ALL WOODY VEGETATION PLANTED IN THIS ZONE WILL BE AS SPECIFIED IN THE MITIGATION PLAN.

THE PROPOSED STREAM PATTERN IS TO BE RECONSTRUCTED AS ILLUSTRATED.

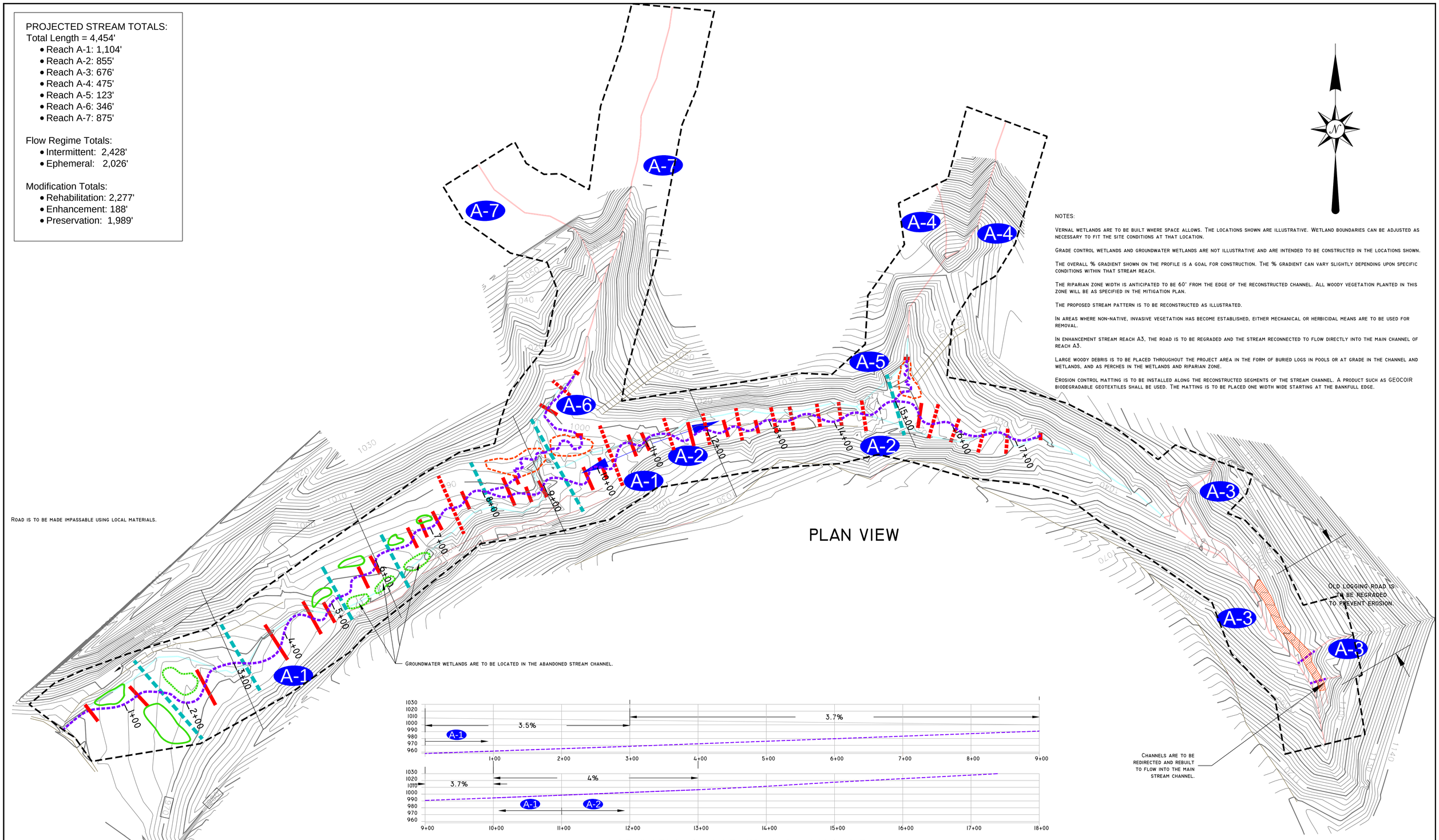
IN AREAS WHERE NON-NATIVE, INVASIVE VEGETATION HAS BECOME ESTABLISHED, EITHER MECHANICAL OR HERBICIDAL MEANS ARE TO BE USED FOR REMOVAL.

IN ENHANCEMENT STREAM REACH A3, THE ROAD IS TO BE REGRADED AND THE STREAM RECONNECTED TO FLOW DIRECTLY INTO THE MAIN CHANNEL OF REACH A3.

LARGE WOODY DEBRIS IS TO BE PLACED THROUGHOUT THE PROJECT AREA IN THE FORM OF BURIED LOGS IN POOLS OR AT GRADE IN THE CHANNEL AND WETLANDS, AND AS PERCHES IN THE WETLANDS AND RIPARIAN ZONE.

EROSION CONTROL MATTING IS TO BE INSTALLED ALONG THE RECONSTRUCTED SEGMENTS OF THE STREAM CHANNEL. A PRODUCT SUCH AS GEOCOIR BIODEGRADABLE GEOTEXTILES SHALL BE USED. THE MATTING IS TO BE PLACED ONE WIDTH WIDE STARTING AT THE BANKFULL EDGE.

ROAD IS TO BE MADE IMPASSABLE USING LOCAL MATERIALS.



PLAN VIEW

PROJECTED PROFILE AI AND A2

NOTE: OVERALL GRADE IS MEASURED AT THE TOP OF RIFFLE STRUCTURES AND GROUNDWATERDAMS

NOTES:

PROJECTED PROFILES FOR THE RECONSTRUCTED STREAM REACHES NOTED AS A5, A6, AND A7 ARE NOT PROVIDED. THE STREAMS ARE TO BE REDIRECTED TO THE GRADE-CONTROL WETLANDS, AS SHOWN. GRADE OF THE STREAM IS TO BE MAINTAINED AT <2%.

PROJECTED PROFILES FOR THE RECONSTRUCTED STREAM REACHES NOTED AS A3 ARE NOT PROVIDED. THE ROAD FILL WITHIN THESE REACHES IS TO BE REMOVED AND THE CHANNEL APPROPRIATELY STABILIZED.

Perennial Stream
Intermittent Stream
Ephemeral Stream
New Stream
Reach Tag (A-1)
General Riparian Protection Zone
Vernal Wetland
Groundwater Wetland
Grade Control Wetland
Groundwater Dam
Valley-wide Constructed Riffle
Constructed Riffle
Road Regrade

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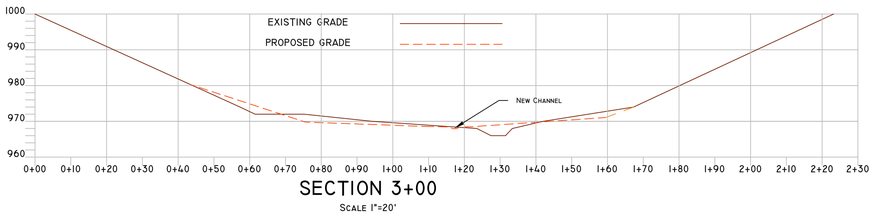
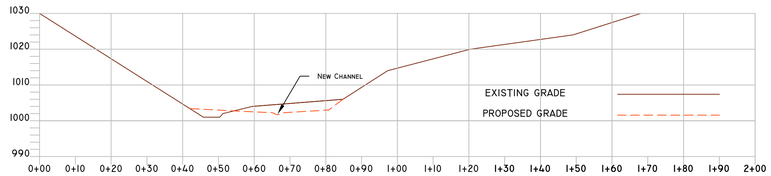
FIGURE: Terrell Fork 2 Mitigation Site AREA A Proposed Conditions
PROJECT NAME: Terrell Fork 2
APPLICANT: Pine Branch Mining LLC
COE ID NO.:
SCALE: 1"-60'



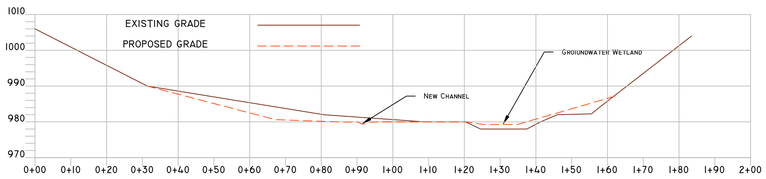
SECTION 3+00

SCALE 1"=20'



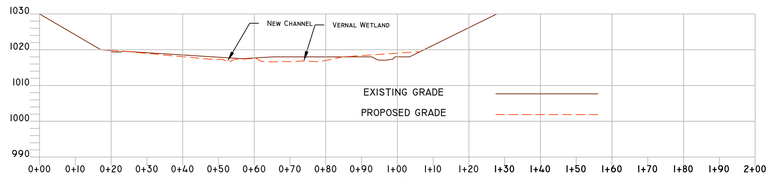
SECTION 12+00

SCALE 1"=20'



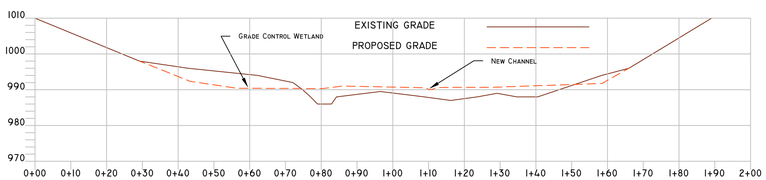
SECTION 6+00

SCALE 1"=20'



SECTION 15+00

SCALE 1"=20'



SECTION 9+00

SCALE 1"=20'

STREAM REACH	CHANNEL DIMENSIONS AT RIFFLE		CHANNEL DIMENSIONS AT POOL	
	BANKFULL WIDTH	BANKFULL DEPTH	BANKFULL WIDTH	BANKFULL DEPTH
A1/A2 TO JUNCTION WITH A5	3'	0.5'	4-5'	2-3'
A2 AT A5 JUNCTION TO A3	2.5'	0.5'	3.5-4.5'	1-2'
A5	2.5'	0.5'	3.5--4.5'	1-2'
A6	2.5'	0.5'	3.5-4.5'	1-2'

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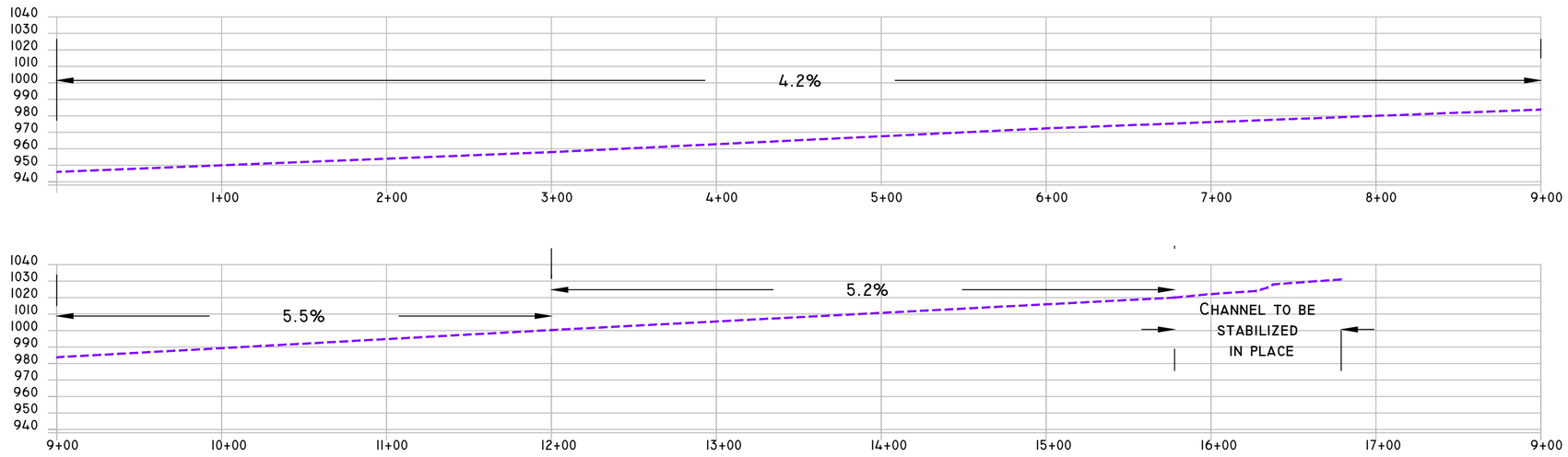
FIGURE: Terrell Fork 2 Mitigation Site
AREA A Proposed Sections

PROJECT NAME: Terrell Fork 2

APPLICANT: Pine Branch Mining LLC

COE ID NO.:

SCALE: as shown



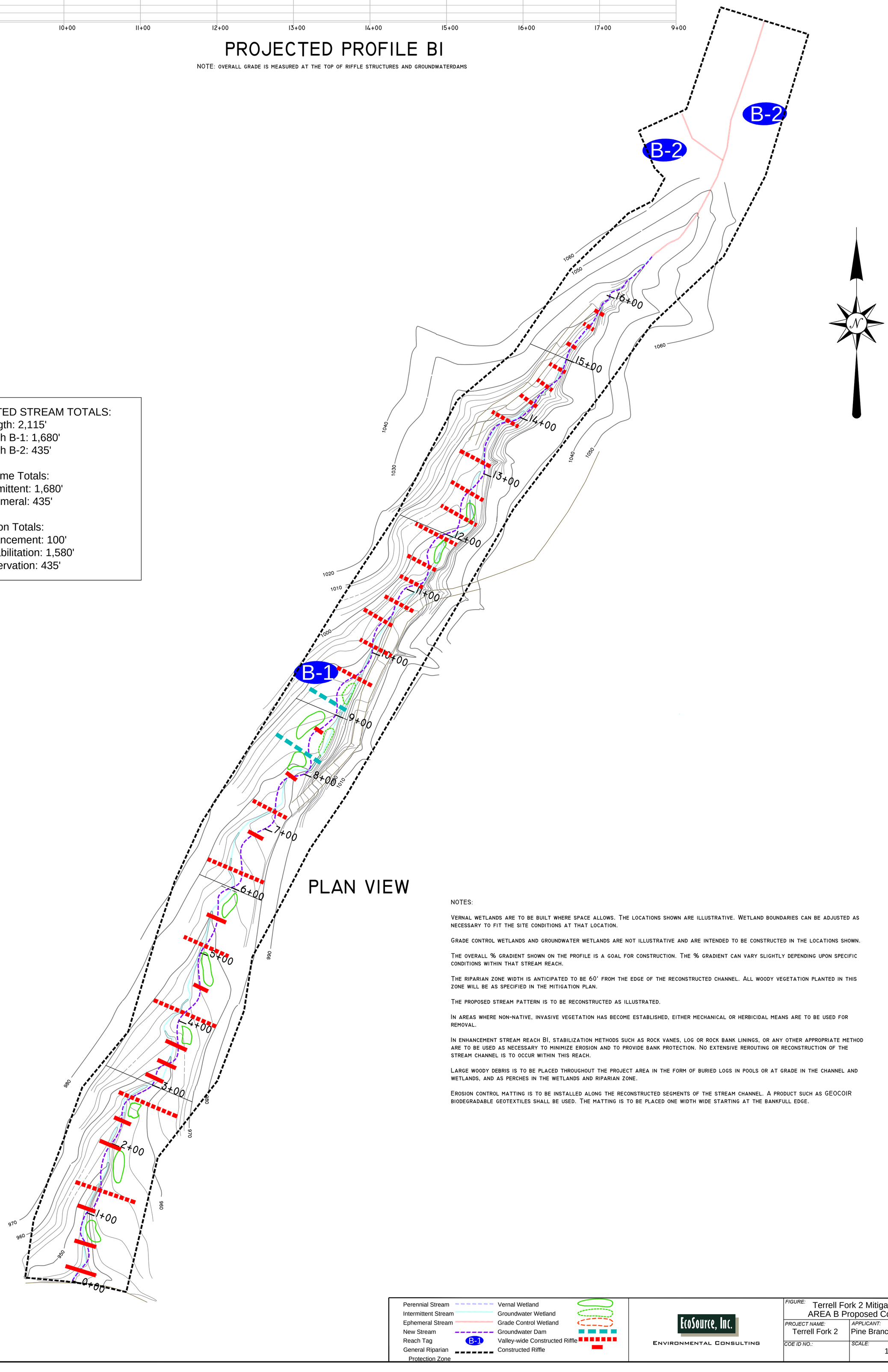
PROJECTED PROFILE B1

NOTE: OVERALL GRADE IS MEASURED AT THE TOP OF RIFFLE STRUCTURES AND GROUNDWATERDAMS

PROJECTED STREAM TOTALS:
Total Length: 2,115'
- Reach B-1: 1,680'
- Reach B-2: 435'

Flow Regime Totals:
- Intermittent: 1,680'
- Ephemeral: 435'

Modification Totals:
- Enhancement: 100'
- Rehabilitation: 1,580'
- Preservation: 435'



PLAN VIEW

NOTES:

VERNAL WETLANDS ARE TO BE BUILT WHERE SPACE ALLOWS. THE LOCATIONS SHOWN ARE ILLUSTRATIVE. WETLAND BOUNDARIES CAN BE ADJUSTED AS NECESSARY TO FIT THE SITE CONDITIONS AT THAT LOCATION.

GRADE CONTROL WETLANDS AND GROUNDWATER WETLANDS ARE NOT ILLUSTRATIVE AND ARE INTENDED TO BE CONSTRUCTED IN THE LOCATIONS SHOWN.

THE OVERALL % GRADIENT SHOWN ON THE PROFILE IS A GOAL FOR CONSTRUCTION. THE % GRADIENT CAN VARY SLIGHTLY DEPENDING UPON SPECIFIC CONDITIONS WITHIN THAT STREAM REACH.

THE RIPARIAN ZONE WIDTH IS ANTICIPATED TO BE 60' FROM THE EDGE OF THE RECONSTRUCTED CHANNEL. ALL WOODY VEGETATION PLANTED IN THIS ZONE WILL BE AS SPECIFIED IN THE MITIGATION PLAN.

THE PROPOSED STREAM PATTERN IS TO BE RECONSTRUCTED AS ILLUSTRATED.

IN AREAS WHERE NON-NATIVE, INVASIVE VEGETATION HAS BECOME ESTABLISHED, EITHER MECHANICAL OR HERBICIDAL MEANS ARE TO BE USED FOR REMOVAL.

IN ENHANCEMENT STREAM REACH B1, STABILIZATION METHODS SUCH AS ROCK VANES, LOG OR ROCK BANK LININGS, OR ANY OTHER APPROPRIATE METHOD ARE TO BE USED AS NECESSARY TO MINIMIZE EROSION AND TO PROVIDE BANK PROTECTION. NO EXTENSIVE REROUTING OR RECONSTRUCTION OF THE STREAM CHANNEL IS TO OCCUR WITHIN THIS REACH.

LARGE WOODY DEBRIS IS TO BE PLACED THROUGHOUT THE PROJECT AREA IN THE FORM OF BURIED LOGS IN POOLS OR AT GRADE IN THE CHANNEL AND WETLANDS, AND AS PERCHES IN THE WETLANDS AND RIPARIAN ZONE.

EROSION CONTROL MATTING IS TO BE INSTALLED ALONG THE RECONSTRUCTED SEGMENTS OF THE STREAM CHANNEL. A PRODUCT SUCH AS GEOCOIR BIODEGRADABLE GEOTEXTILES SHALL BE USED. THE MATTING IS TO BE PLACED ONE WIDTH WIDE STARTING AT THE BANKFULL EDGE.

Perennial Stream	Vernal Wetland
Intermittent Stream	Groundwater Wetland
Ephemeral Stream	Grade Control Wetland
New Stream	Groundwater Dam
Reach Tag (B-1)	Valley-wide Constructed Riffle
General Riparian Protection Zone	Constructed Riffle

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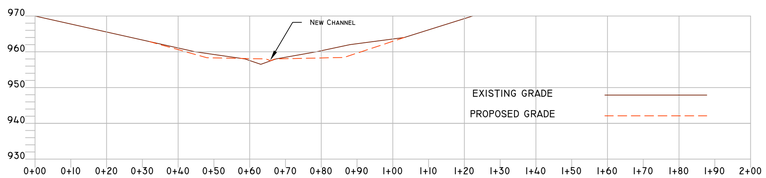
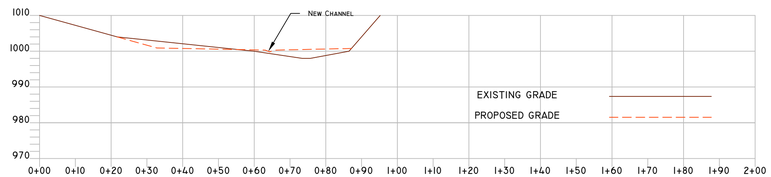
FIGURE: Terrell Fork 2 Mitigation Site
AREA B Proposed Conditions

PROJECT NAME: Terrell Fork 2	APPLICANT: Pine Branch Mining LLC
COE ID NO.:	SCALE: 1"-60'



SECTION 3+00

SCALE 1"=20'



SECTION 12+00

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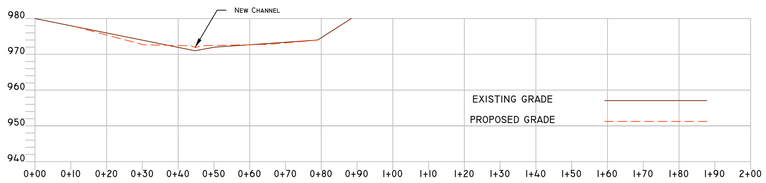
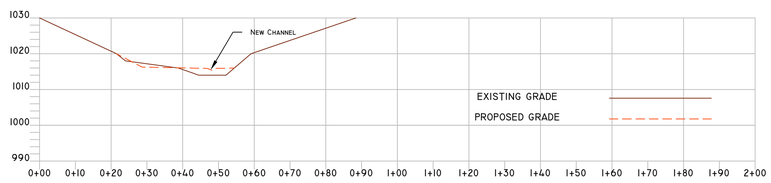


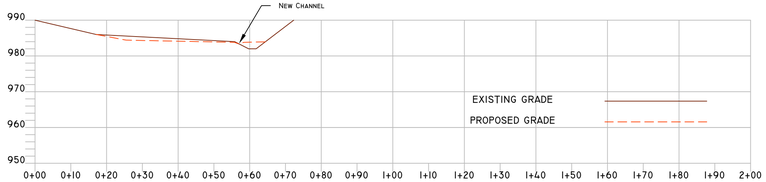
SECTION 6+00

SCALE 1"=20'



SECTION 15+00

SCALE 1"=20'



SECTION 9+00

SCALE 1"=20'

PROPOSED CHANNEL DIMENSIONS				
STREAM REACH	CHANNEL DIMENSIONS AT RIFFLE		CHANNEL DIMENSIONS AT POOL	
	BANKFULL WIDTH	BANKFULL DEPTH	BANKFULL WIDTH	BANKFULL DEPTH
BI	2.5-3'	0.5'	3.5-4.5'	1-2'

EcoSource, Inc.
ENVIRONMENTAL CONSULTING

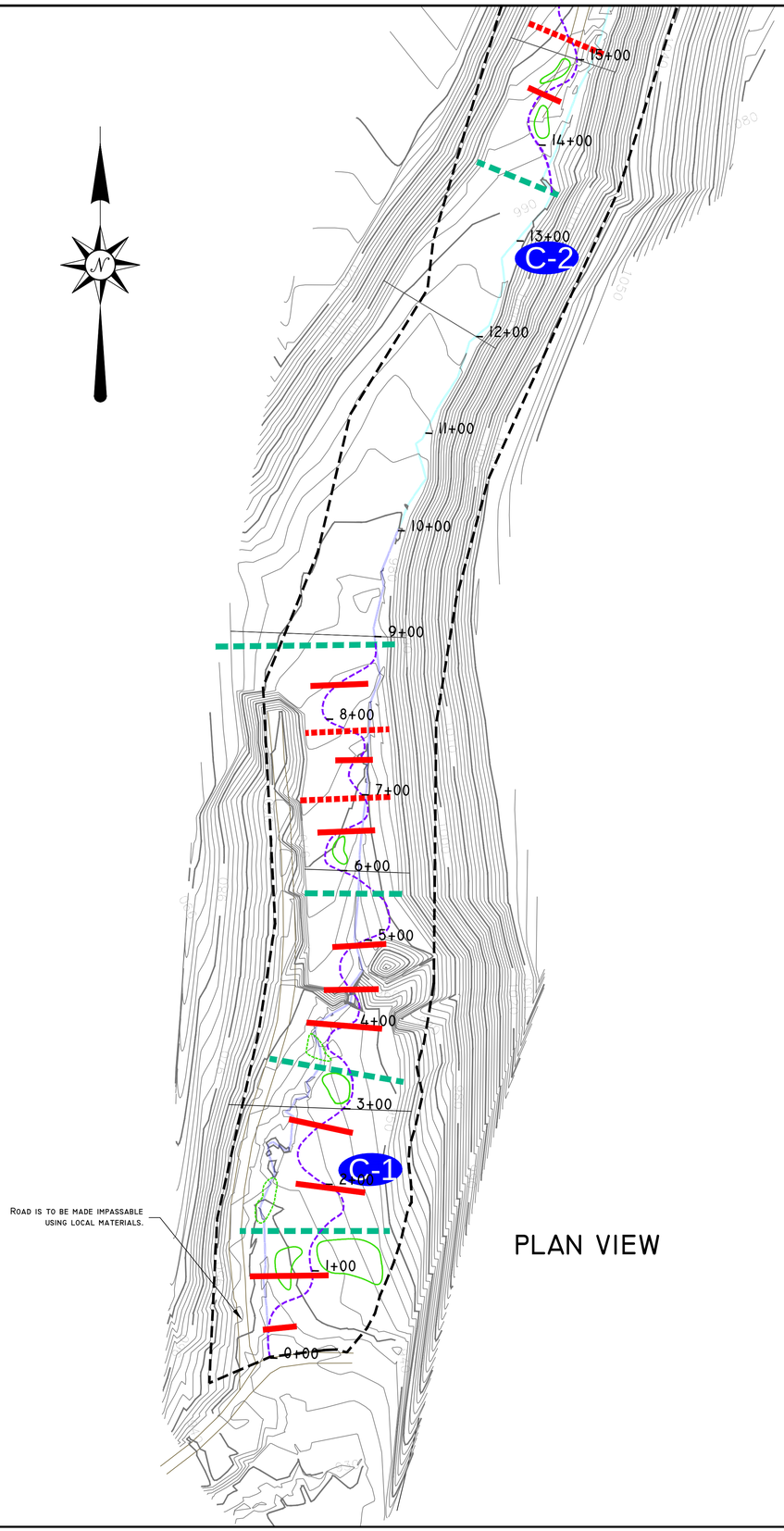
FIGURE: Terrell Fork 2 Mitigation Site AREA B Proposed Sections

PROJECT NAME: Terrell Fork 2

APPLICANT: Pine Branch Mining LLC

COE ID NO.:

SCALE: as shown



PLAN VIEW

NOTES:

VERNAL WETLANDS ARE TO BE BUILT WHERE SPACE ALLOWS. THE LOCATIONS SHOWN ARE ILLUSTRATIVE. WETLAND BOUNDARIES CAN BE ADJUSTED AS NECESSARY TO FIT THE SITE CONDITIONS AT THAT LOCATION.

GRADE CONTROL WETLANDS AND GROUNDWATER WETLANDS ARE NOT ILLUSTRATIVE AND ARE INTENDED TO BE CONSTRUCTED IN THE LOCATIONS SHOWN.

THE OVERALL % GRADIENT SHOWN ON THE PROFILE IS A GOAL FOR CONSTRUCTION. THE % GRADIENT CAN VARY SLIGHTLY DEPENDING UPON SPECIFIC CONDITIONS WITHIN THAT STREAM REACH.

THE RIPARIAN ZONE WIDTH IS ANTICIPATED TO BE 60' FROM THE EDGE OF THE RECONSTRUCTED CHANNEL. ALL WOODY VEGETATION PLANTED IN THIS ZONE WILL BE AS SPECIFIED IN THE MITIGATION PLAN.

THE PROPOSED STREAM PATTERN IS TO BE RECONSTRUCTED AS ILLUSTRATED.

IN AREAS WHERE NON-NATIVE, INVASIVE VEGETATION HAS BECOME ESTABLISHED, EITHER MECHANICAL OR HERBICIDAL MEANS ARE TO BE USED FOR REMOVAL.

IN ENHANCEMENT STREAM REACHES C1 AND C2 WOODY DEBRIS IS TO BE INTRODUCED WITH PERCHES AND AT GRADE LOGS IN THE CHANNEL.

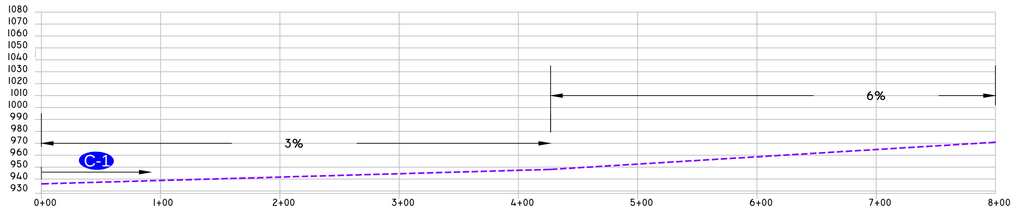
IN ENHANCEMENT STREAM REACH C2A, STABILIZATION METHODS SUCH AS ROCK VANES, LOG OR ROCK BANK LININGS, OR ANY OTHER APPROPRIATE METHOD ARE TO BE USED AS NECESSARY TO MINIMIZE EROSION AND TO PROVIDE BANK PROTECTION. NO EXTENSIVE REROUTING OR RECONSTRUCTION OF THE STREAM CHANNEL IS TO OCCUR WITHIN THIS REACH.

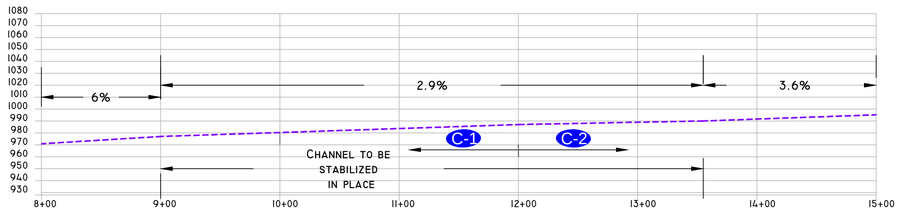
EROSION CONTROL MATTING IS TO BE INSTALLED ALONG THE RECONSTRUCTED SEGMENTS OF THE STREAM CHANNEL. A PRODUCT SUCH AS GEOCOIR BIODEGRADABLE GEOTEXTILES SHALL BE USED. THE MATTING IS TO BE PLACED ONE WIDTH WIDE STARTING AT THE BANKFULL EDGE.

PROJECTED STREAM TOTALS:
Total Length = 4,488'
- Reach C-1: 983'
- Reach C-2: 1,901'
- Reach C-3: 385'
- Reach C-4: 150'
- Reach C-5: 290'
- Reach C-6: 300'
- Reach C-6A: 89'
- Reach C-7: 390'

Flow Regime Totals:
- Perennial: 983'
- Intermittent: 2,290'
- Ephemeral: 1,215'

Modification Totals:
- Rehabilitation: 2,300'
- Enhancement: 1,043'
- Preservation: 1,145'





PROJECTED PROFILE C1 AND C2

NOTE: OVERALL GRADE IS MEASURED AT THE TOP OF RIFFLE STRUCTURES AND GROUNDWATERDAMS

Perennial Stream
Intermittent Stream
Ephemeral Stream
New Stream
Reach Tag (A-1)
General Riparian Protection Zone
Vernal Wetland
Groundwater Wetland
Grade Control Wetland
Groundwater Dam
Valley-wide Constructed Riffle
Constructed Riffle

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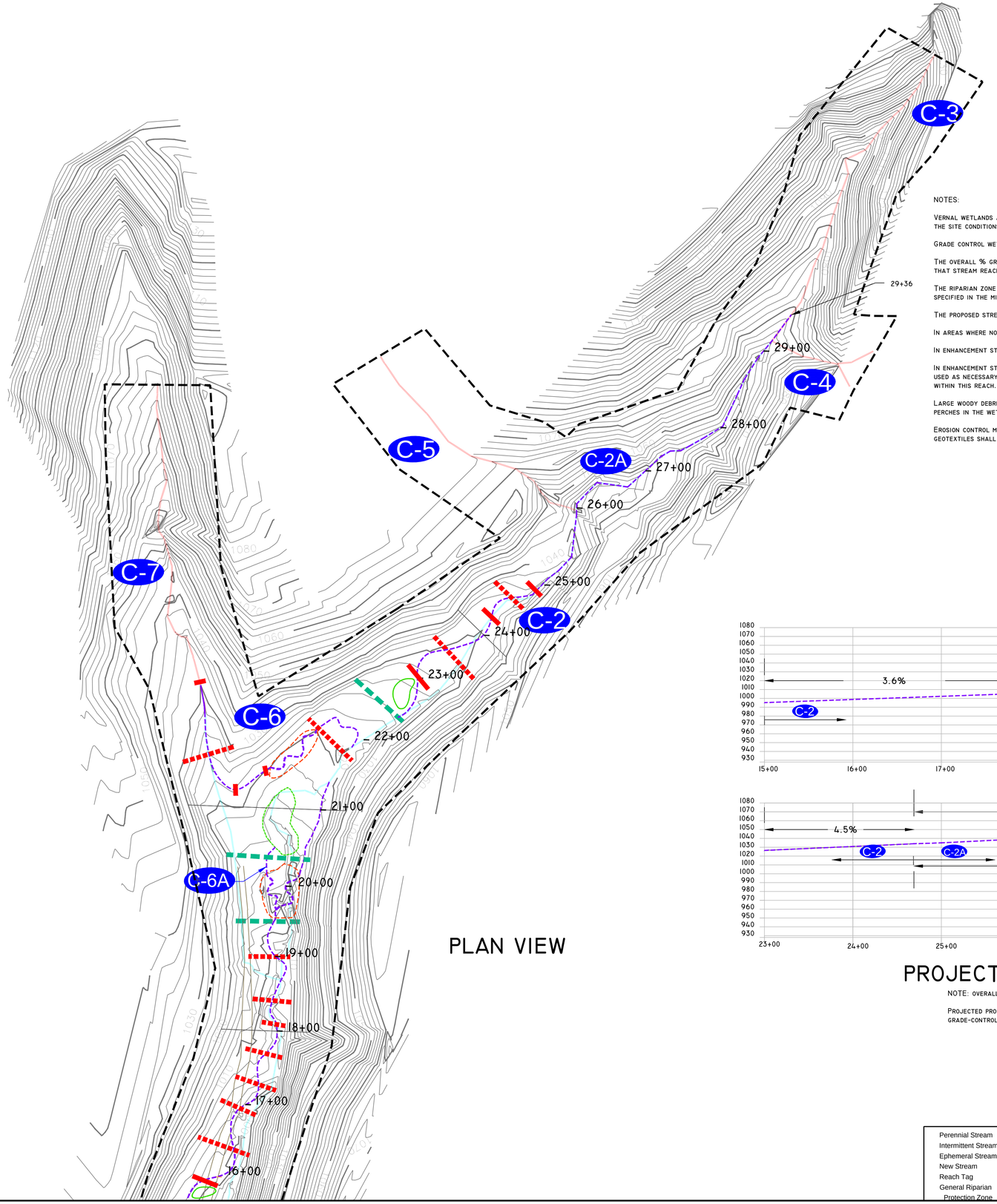
ENVIRONMENTAL CONSULTING

FIGURE: Terrell Fork 2 Mitigation Site AREA C Proposed Conditions Sheet 1
PROJECT NAME: Terrell Fork 2
APPLICANT: Pine Branch Mining LLC
COE ID NO.:
SCALE: 1"-60'

PROJECTED STREAM TOTALS:
Total Length = 4,488'
- Reach C-1: 983'
- Reach C-2: 1,469'
- Reach C-2A: 432'
- Reach C-3: 385'
- Reach C-4: 150'
- Reach C-5: 290'
- Reach C-6: 300'
- Reach C-6A: 89'
- Reach C-7: 390'

Flow Regime Totals:
- Perennial: 983'
- Intermittent: 2,290'
- Ephemeral: 1,215'

Modification Totals:
- Rehabilitation: 2,300'
- Enhancement: 1,043'
- Preservation: 1,145'



PLAN VIEW

NOTES:

Vernal wetlands are to be built where space allows. The locations shown are illustrative. Wetland boundaries can be adjusted as necessary to fit the site conditions at that location.

Grade control wetlands and groundwater wetlands are not illustrative and are intended to be constructed in the locations shown.

The overall % gradient shown on the profile is a goal for construction. The % gradient can vary slightly depending upon specific conditions within that stream reach.

The riparian zone width is anticipated to be 60' from the edge of the reconstructed channel. All woody vegetation planted in this zone will be as specified in the mitigation plan.

The proposed stream pattern is to be reconstructed as illustrated.

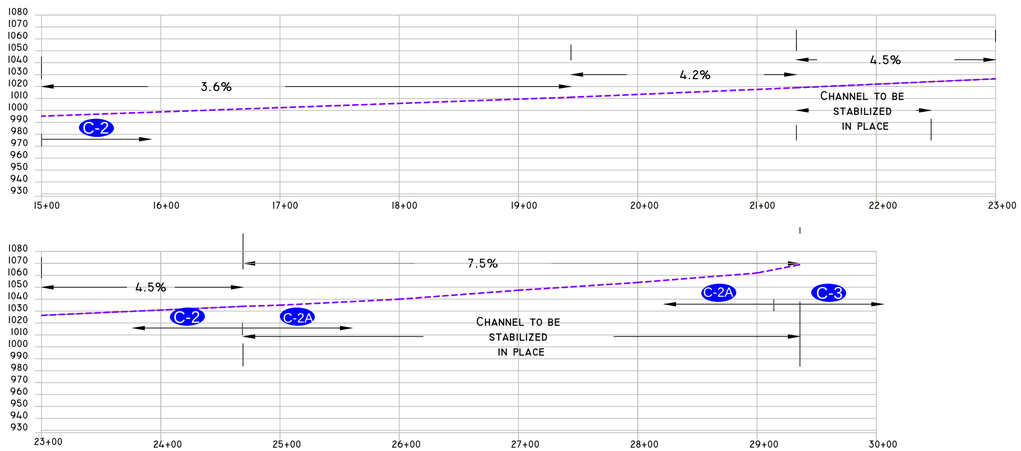
In areas where non-native, invasive vegetation has become established, either mechanical or herbicidal means are to be used for removal.

In enhancement stream reaches C1 and C2 woody debris is to be introduced with perches and at grade logs in the channel.

In enhancement stream reach C2A, stabilization methods such as rock vanes, log or rock bank linings, or any other appropriate method are to be used as necessary to minimize erosion and to provide bank protection. No extensive rerouting or reconstruction of the stream channel is to occur within this reach.

Large woody debris is to be placed throughout the project area in the form of buried logs in pools or at grade in the channel and wetlands, and as perches in the wetlands and riparian zone.

Erosion control matting is to be installed along the reconstructed segments of the stream channel. A product such as GEOCOIR biodegradable geotextiles shall be used. The matting is to be placed one width wide starting at the bankfull edge.



PROJECTED PROFILE C2, C2A, AND C3

NOTE: OVERALL GRADE IS MEASURED AT THE TOP OF RIFFLE STRUCTURES AND GROUNDWATER DAMS

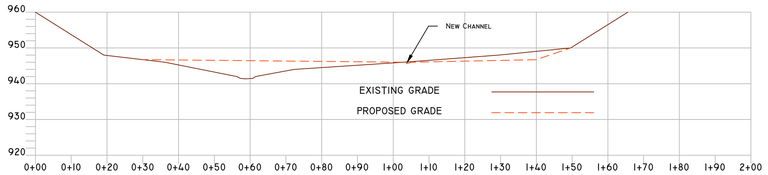
PROJECTED PROFILE FOR THE RECONSTRUCTED STREAM REACH NOTED AS C6 AND C6A IS NOT PROVIDED. THE STREAM IS TO BE REDIRECTED TO THE GRADE-CONTROL WETLAND, AS SHOWN. GRADE OF THE STREAM IS TO BE MAINTAINED AT <2%.

Perennial Stream
Intermittent Stream
Ephemeral Stream
New Stream
Reach Tag (A-1)
General Riparian Protection Zone
Vernal Wetland
Groundwater Wetland
Grade Control Wetland
Groundwater Dam
Valley-wide Constructed Riffle
Constructed Riffle

EcoSource, Inc.
Environmental Consulting

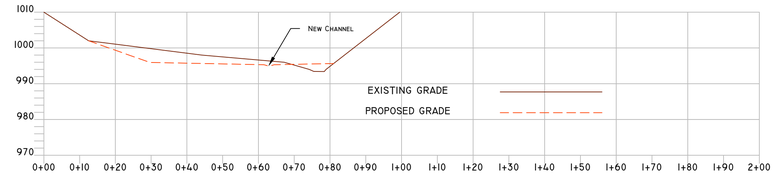
FIGURE: Terrell Fork 2 Mitigation Site
AREA C Proposed Conditions Sheet 2

PROJECT NAME:	APPLICANT:
Terrell Fork 2	Pine Branch Mining LLC
COE ID NO.:	SCALE: 1"-60'



SECTION 3+00

SCALE 1"=20'



SECTION 15+00

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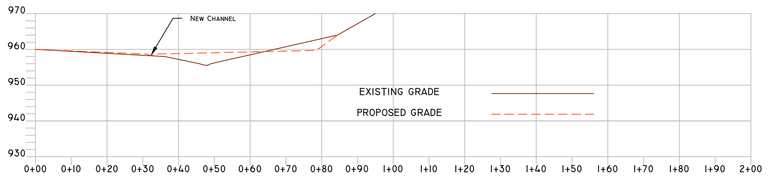

SECTION 6+00

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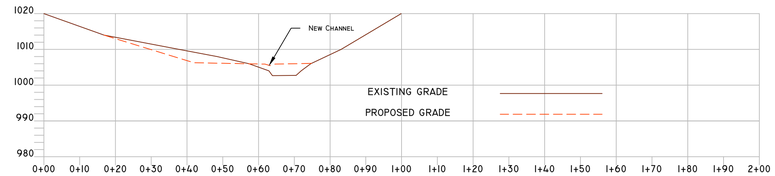

SECTION 18+00

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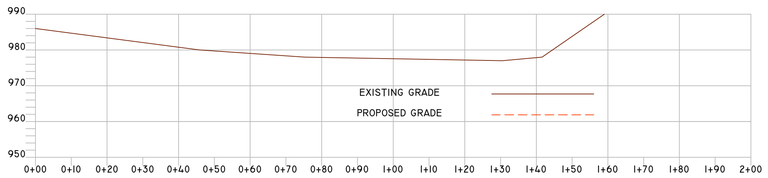

SECTION 9+00

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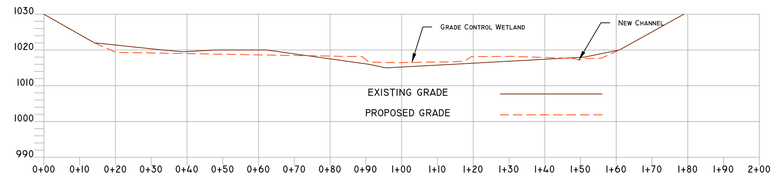

SECTION 21+00

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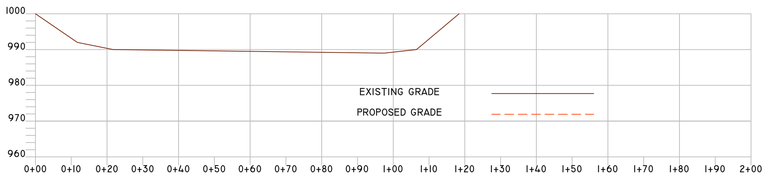
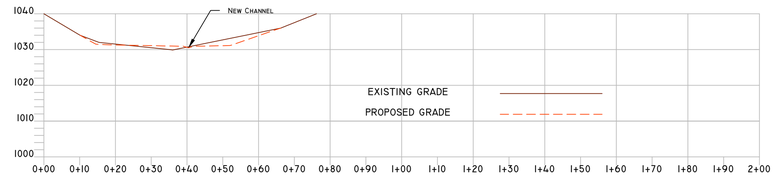


SECTION 12+00

SCALE 1"=20'



SECTION 24+00

SCALE 1"=20'

PROPOSED CHANNEL DIMENSIONS				
STREAM REACH	CHANNEL DIMENSIONS AT RIFFLE		CHANNEL DIMENSIONS AT POOL	
	BANKFULL WIDTH	BANKFULL DEPTH	BANKFULL WIDTH	BANKFULL DEPTH
C1	3'	0.5'	4-5'	2-3'
C2	2.5'	0.5'	3.5-4.5'	1-2'
C6	2.5'	0.5'	3.5--4.5'	1-2'
C6A	2.5'	0.5'	3.5-4.5'	1-2'

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ENVIRONMENTAL CONSULTING

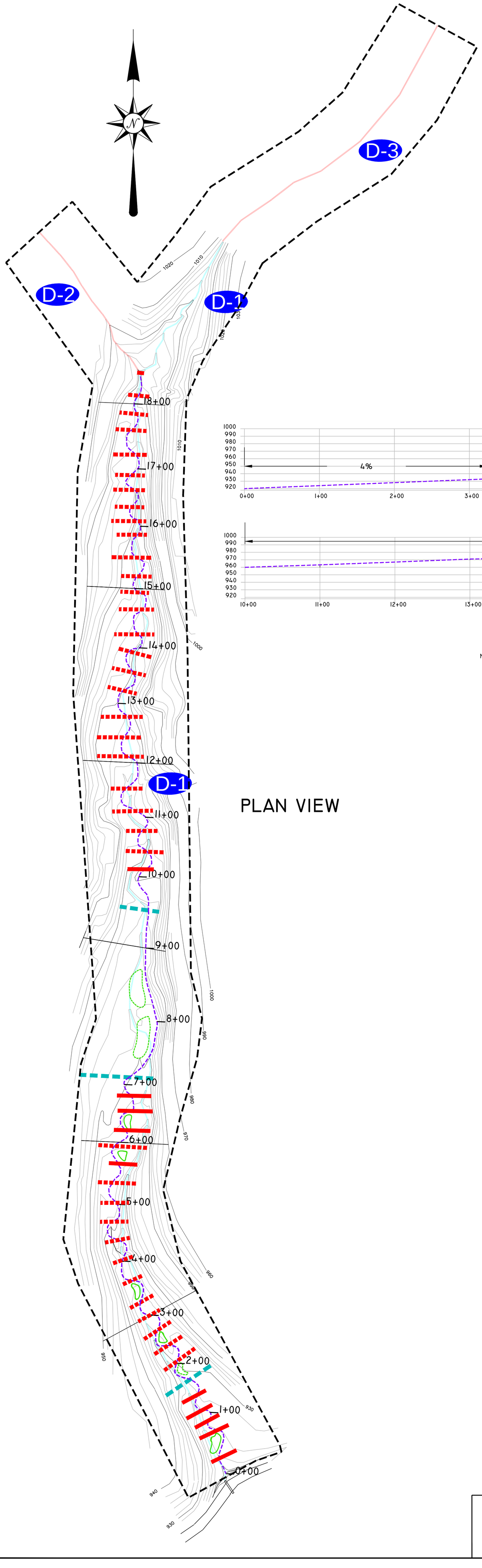
FIGURE: Terrell Fork 2 Mitigation Site AREA C Proposed Sections

PROJECT NAME: Terrell Fork 2

APPLICANT: Pine Branch Mining LLC

COE ID NO.:

SCALE: as shown



PLAN VIEW

NOTES:

Vernal wetlands are to be built where space allows. The locations shown are illustrative. Wetland boundaries can be adjusted as necessary to fit the site conditions at that location.

Grade control wetlands and groundwater wetlands are not illustrative and are intended to be constructed in the locations shown.

The overall % gradient shown on the profile is a goal for construction. The % gradient can vary slightly depending upon specific conditions within that stream reach.

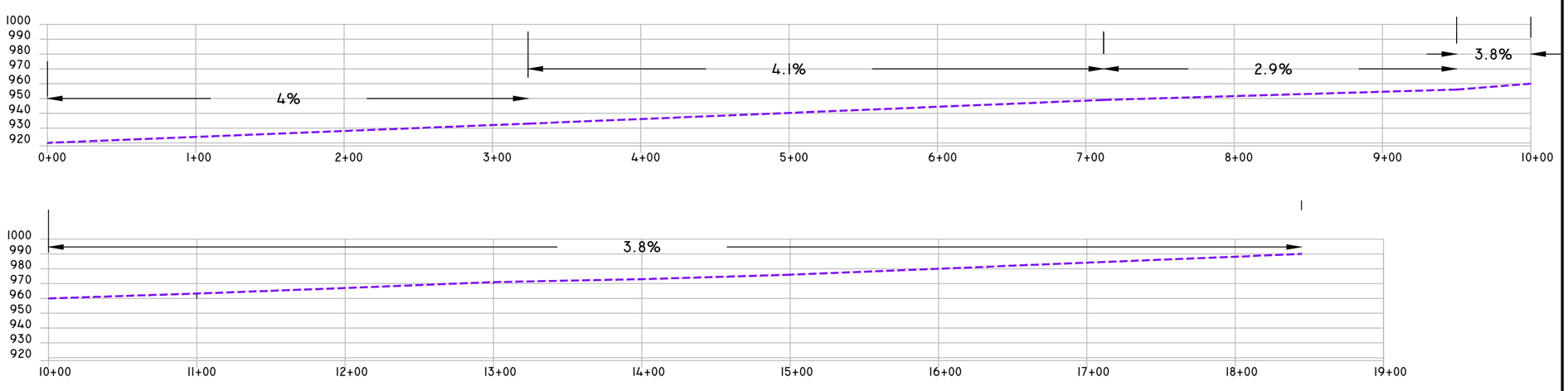
The riparian zone width is anticipated to be 60' from the edge of the reconstructed channel. All woody vegetation planted in this zone will be as specified in the mitigation plan.

The proposed stream pattern is to be reconstructed as illustrated.

In areas where non-native, invasive vegetation has become established, either mechanical or herbicidal means are to be used for removal.

Large woody debris is to be placed throughout the project area in the form of buried logs in pools or at grade in the channel and wetlands, and as perches in the wetlands and riparian zone.

Erosion control matting is to be installed along the reconstructed segments of the stream channel. A product such as GEOCOIR biodegradable geotextiles shall be used. The matting is to be placed one width wide starting at the bankfull edge.



PROJECTED PROFILE DI

NOTE: OVERALL GRADE IS MEASURED AT THE TOP OF RIFFLE STRUCTURES AND GROUNDWATERDAMS

PROPOSED STREAM TOTALS:
Reach Total: 2,715'
- Reach D-1: 2,070'
- Reach D-2: 230'
- Reach D-3: 415'

Flow Regime Totals:
- Intermittent: 2,070'
- Ephemeral: 645'

Modification Totals:
- Rehabilitation: 1,845'
- Preservation: 870'

Perennial Stream
Intermittent Stream
Ephemeral Stream
New Stream
Reach Tag (D-1)
General Riparian Protection Zone
Vernal Wetland
Groundwater Wetland
Grade Control Wetland
Groundwater Dam
Valley-wide Constructed Riffle
Constructed Riffle

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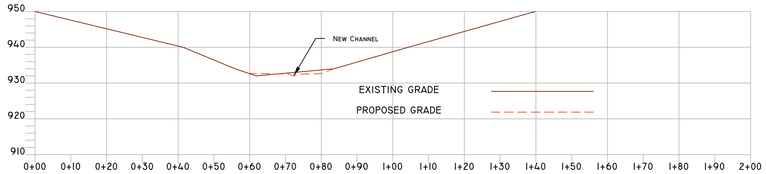
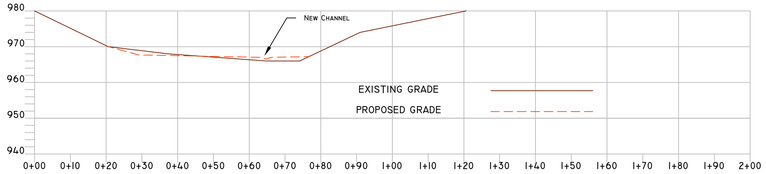
Environmental Consulting

FIGURE: Terrell Fork 2 Mitigation Site AREA D Proposed Conditions
PROJECT NAME: Terrell Fork 2
APPLICANT: Pine Branch Mining LLC
COE ID NO.:
SCALE: 1"-60'



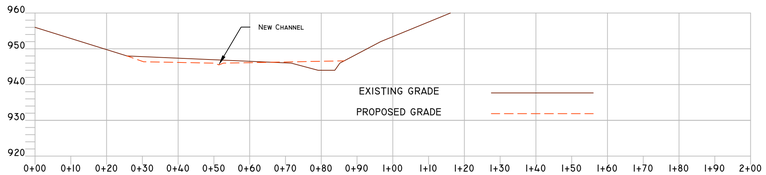
SECTION 3+00

Scale 1"=20'



SECTION 12+00

Scale 1"=20'



SECTION 6+00

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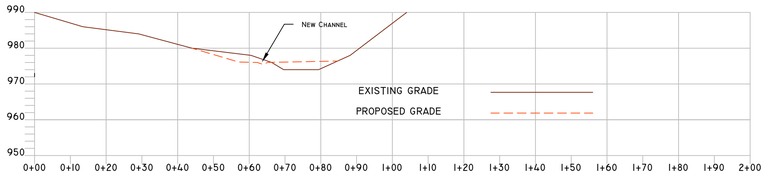
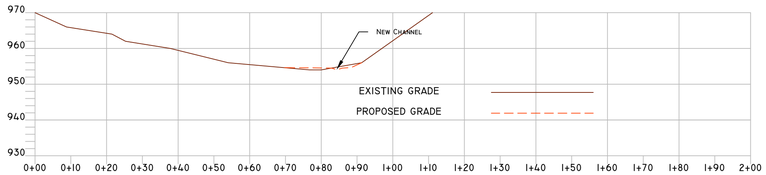


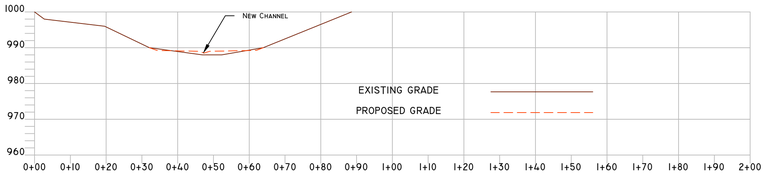
SECTION 15+00

Scale 1"=20'



SECTION 9+00

Scale 1"=20'



SECTION 18+00

Scale 1"=20'

PROPOSED CHANNEL DIMENSIONS				
STREAM REACH	CHANNEL DIMENSIONS AT RIFFLE		CHANNEL DIMENSIONS AT POOL	
	BANKFULL WIDTH	BANKFULL DEPTH	BANKFULL WIDTH	BANKFULL DEPTH
DI	2.5-3'	0.5'	3.5-4.5'	1-2'

EcoSource, Inc.
Environmental Consulting

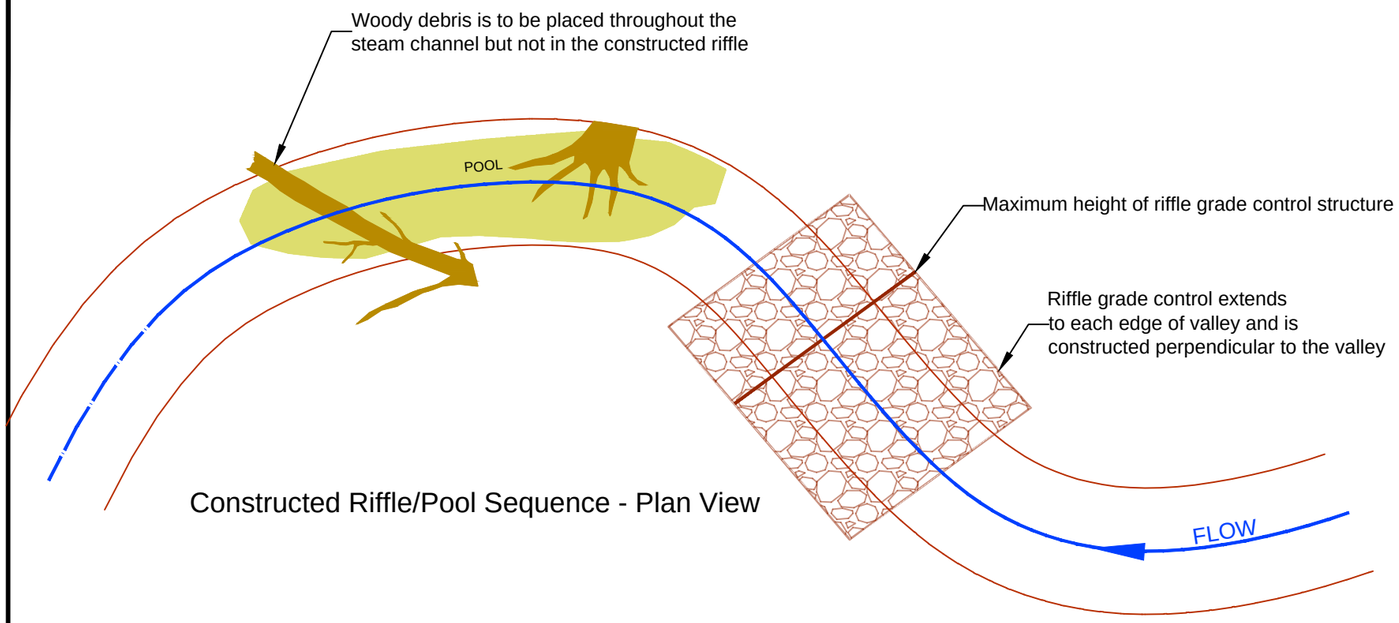
FIGURE: Terrell Fork 2 Mitigation Site
AREA D Proposed Sections

PROJECT NAME: Terrell Fork 2

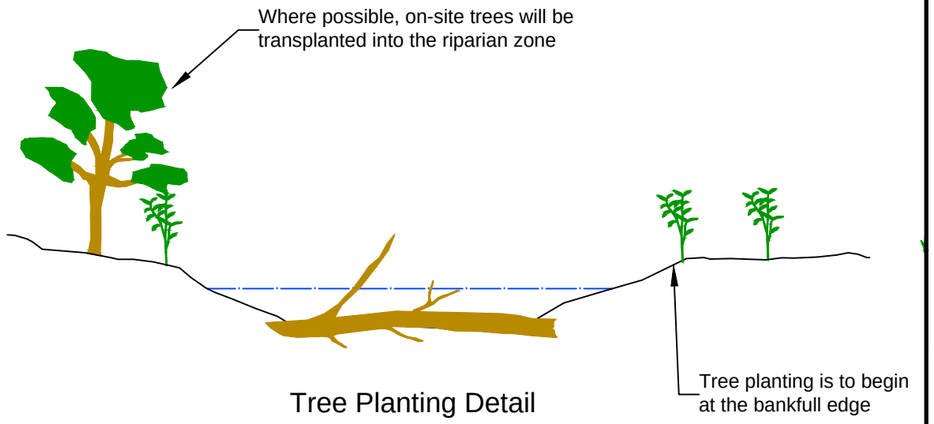
APPLICANT: Pine Branch Mining LLC

COE ID NO.:

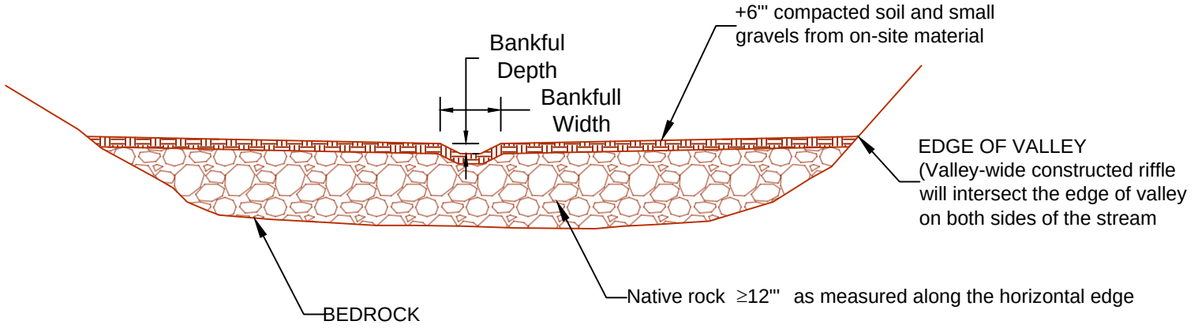
SCALE: as shown



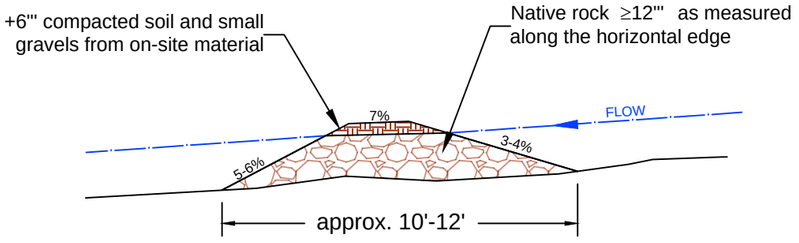
Constructed Riffle/Pool Sequence - Plan View



Tree Planting Detail



Constructed Riffle - Cross Section

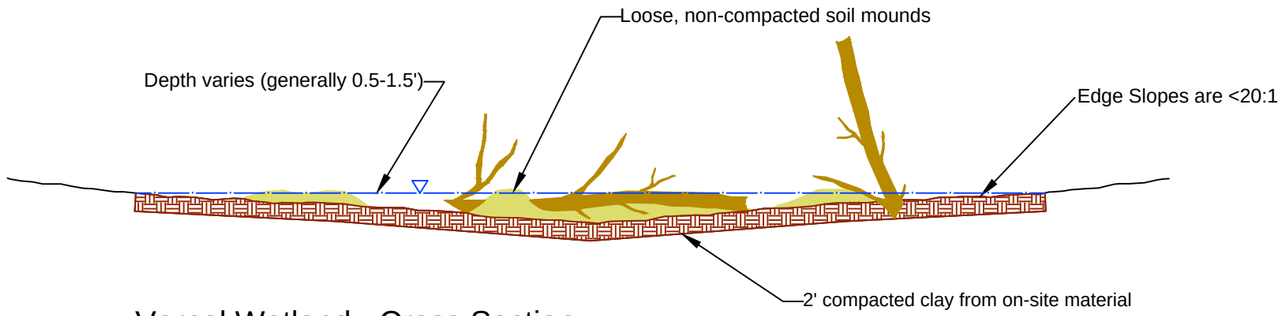


Constructed Riffle - Profile

NOTES:
Riffle control structures are to be placed perpendicular to the valley.
The maximum height of riffle is based upon the desired stream gradient.
The valley-wide riffle control structure extends from one edge of the valley to the opposite valley.
The base of the riffle control structure shall intercept bedrock.

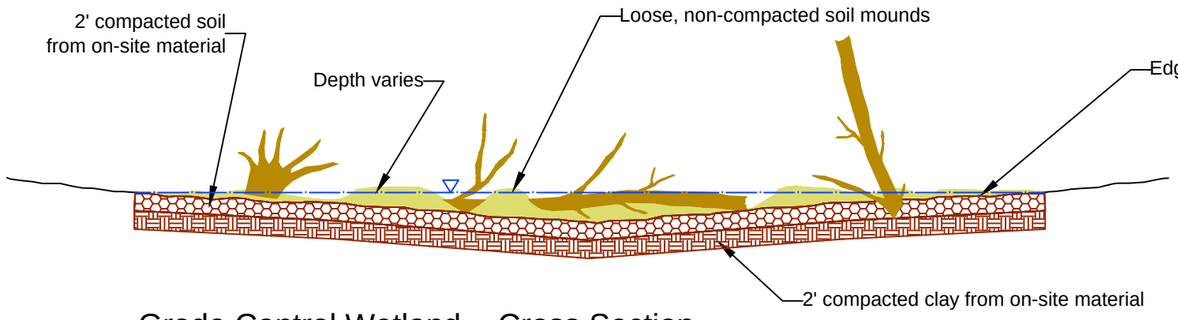
EcoSource, Inc.
Environmental Consulting

FIGURE: Terrell Fork 2 Mitigation Site Stream Details	
CO. PROJECT NAME: Terrell Fork 2	*APPLICANT:* Pine Branch Mining LLC
COE ID NO.:	*SCALE:* not to scale

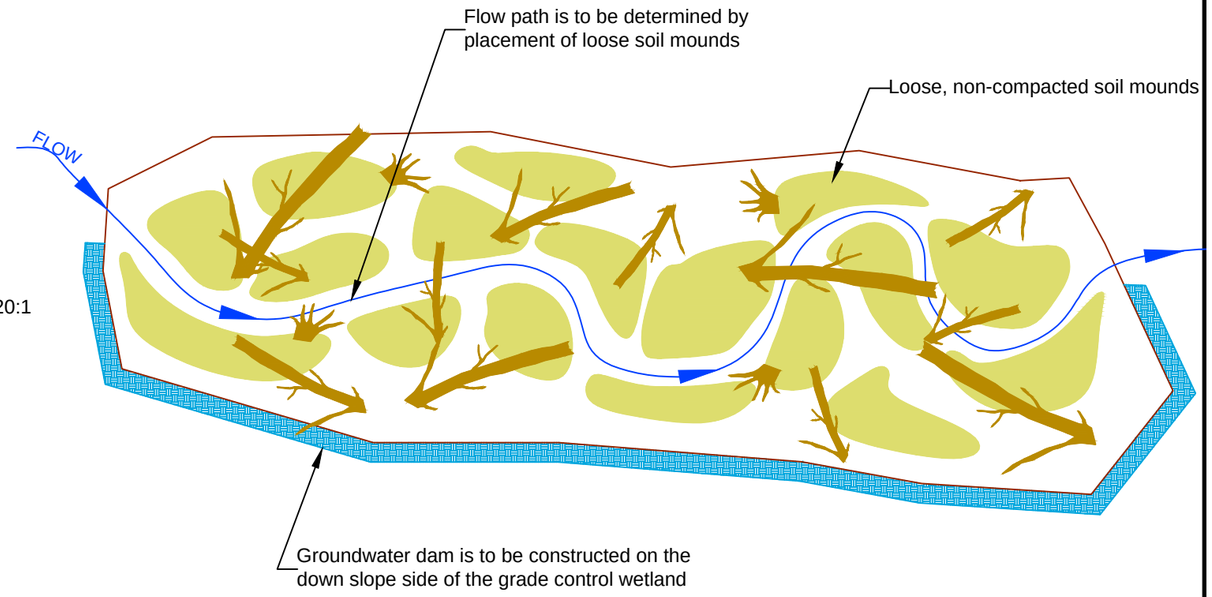


Vernal Wetland - Cross Section

Groundwater Wetland - Cross Section



Grade Control Wetland - Cross Section



Grade Control Wetland - Plan View

NOTES:
Large woody debris is to be scattered throughout all wetland types..

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FIGURE: Terrell Fork 2 Mitigation Site Wetland Details	
CO. PROJECT NAME: Terrell Fork 2	APPLICANT: Pine Branch Mining LLC
COE ID NO.:	SCALE: not to scale

PROJECTED ECOLOGICAL INTEGRITY INDEX CALCULATION SHEETS

SUMMARY OF PROJECTED ECOLOGICAL INTEGRITY INDEX VALUES

Habitat Parameter	A3, C3 Ephemeral (Enhancement)		A3, A7, C7 Ephemeral (Rehabilitation)		B1, C2A Intermittent (Enhancement)		C2 Intermittent (Enhancement)		A1, C2 Intermittent (Rehabilitation)		A2, A5, A6, B1, C6, C6A, D1 Intermittent (Rehabilitation)		C1 Perennial (Enhancement)		C1 Perennial (Rehabilitation)	
Maturity Stage	5 yrs	20 yrs	5 yrs	20 yrs	5 yrs	20 yrs	5 yrs	20 yrs	5 yrs	20 yrs	5 yrs	20 yrs	5 yrs	20 yrs	5 yrs	20 yrs
Epifaunal substrate	11	11	11	11	11	15	11	11	11	15	11	15	11	11	11	15
Embeddedness	11	11	10	11	11	15	11	11	11	15	11	15	11	11	11	15
Velocity/ depth regime	6	6	6	6	10	10	10	10	11	11	10	10	10	10	11	11
Sediment deposition	11	13	11	13	11	13	11	11	11	13	11	13	11	11	11	13
Channel flow status	2	2	2	2	11	11	11	11	13	13	11	11	11	11	15	15
Channel alteration	16	16	16	16	16	16	11	11	16	16	16	16	11	11	16	16
Frequency of riffles	13	13	8	8	13	13	10	10	15	15	13	13	10	10	15	15
Bank stability	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16
Vegetative protection	16	18	12	18	14	18	13	18	12	18	12	18	13	18	12	18
Riparian width	14	20	10	20	14	20	11	20	10	20	10	20	11	20	10	20
	116	126	102	121	127	147	115	129	126	152	121	147	115	129	128	154

EII Calculation for High Gradient Streams in Eastern Kentucky Coalfield (Version 2002.6)

(Family Level Taxonomy - All Habitats)

Project ID:	Pine Branch Mining LLC - Terrell Fork 2
Stream/Reach:	Ephemeral Enhancement - A3,C3
Assessment Objectives:	immediately after work at 5 yrs maturity

EII	Model
NA	Ecological Integrity Index (MBI + Habitat Integrity + Conductivity)
0.63	Ecological Integrity Index (Habitat Integrity + Conductivity)

Variables	Measure	Units	
>>>>>>>	Enter quantitative or categorical measure from Field Data Sheet in shaded cells		
RBP Habitat Parameters			
1. Epifaunal Substrate	11	no units	
2. Embeddedness	11	no units	
3. Velocity/Depth Regime	6	no units	
4. Sediment Deposition	11	no units	
5. Channel Flow Status	2	no units	
6. Channel Alteration	16	no units	
7. Freq. Of Riffles (bends)	13	no units	
8. Bank stability (both combined)	16	no units	
9. Veg. Protection (both combined)	16	no units	
10. Riparian Width (both combined)	14	no units	
Total Habitat Score	116	no units	Subindex
Habitat Integrity Index			0.26
Macroinvertebrate Data - Family Level (All Habitats)			
11. Family Taxa Richness	0	# of taxa sampled	
12. Family EPT Richness	0	# of EPT species sampled	
13. % Ephemeroptera	0	% Mayflies (0-100)	
14. % Chironomidae & Oligochaeta	0	% Midges & Worms (0-100)	
15. mFBI	0	no units	
Macroinvertebrate Bioassessment	NA	no units	NA
Conductivity	100	microMHOs	1.00

EII Calculation for High Gradient Streams in Eastern Kentucky Coalfield (Version 2002.6)

(Family Level Taxonomy - All Habitats)

Project ID:	Pine Branch Mining LLC - Terrell Fork 2
Stream/Reach:	Ephemeral Enhancement - A3,C3
Assessment Objectives:	Maturity (20 yrs)

EII	Model
NA	Ecological Integrity Index (MBI + Habitat Integrity + Conductivity)
0.68	Ecological Integrity Index (Habitat Integrity + Conductivity)

>>>>>>>

Enter quantitative or categorical measure from Field Data Sheet in shaded cells

Variables	Measure	Units	Subindex
RBP Habitat Parameters			
1. Epifaunal Substrate	11	no units	
2. Embeddedness	11	no units	
3. Velocity/Depth Regime	6	no units	
4. Sediment Deposition	13	no units	
5. Channel Flow Status	2	no units	
6. Channel Alteration	16	no units	
7. Freq. Of Riffles (bends)	13	no units	
8. Bank stability (both combined)	16	no units	
9. Veg. Protection (both combined)	18	no units	
10. Riparian Width (both combined)	20	no units	
Total Habitat Score	126	no units	
Habitat Integrity Index			0.36
Macroinvertebrate Data - Family Level (All Habitats)			
11. Family Taxa Richness	0	# of taxa sampled	
12. Family EPT Richness	0	# of EPT species sampled	
13. % Ephemeroptera	0	% Mayflies (0-100)	
14. % Chironomidae & Oligochaeta	0	% Midges & Worms (0-100)	
15. mFBI	0	no units	
Macroinvertebrate Bioassessment	NA	no units	NA
Conductivity	100	microMHOs	1.00

EII Calculation for High Gradient Streams in Eastern Kentucky Coalfield (Version 2002.6)

(Family Level Taxonomy - All Habitats)

Project ID:	Pine Branch Mining LLC - Terrell Fork 2
Stream/Reach:	Ephemeral Rehabilitation - A3,A7,C7
Assessment Objectives:	Immediately after work at 5 yrs maturity

EII	Model
NA	Ecological Integrity Index (MBI + Habitat Integrity + Conductivity)
0.56	Ecological Integrity Index (Habitat Integrity + Conductivity)

Variables	Measure	Units	Subindex
>>>>>>>	Enter quantitative or categorical measure from Field Data Sheet in shaded cells		
RBP Habitat Parameters			
1. Epifaunal Substrate	11	no units	
2. Embeddedness	10	no units	
3. Velocity/Depth Regime	6	no units	
4. Sediment Deposition	11	no units	
5. Channel Flow Status	2	no units	
6. Channel Alteration	16	no units	
7. Freq. Of Riffles (bends)	8	no units	
8. Bank stability (both combined)	16	no units	
9. Veg. Protection (both combined)	12	no units	
10. Riparian Width (both combined)	10	no units	
Total Habitat Score	102	no units	
Habitat Integrity Index			0.12
Macroinvertebrate Data - Family Level (All Habitats)			
11. Family Taxa Richness	0	# of taxa sampled	
12. Family EPT Richness	0	# of EPT species sampled	
13. % Ephemeroptera	0	% Mayflies (0-100)	
14. % Chironomidae & Oligochaeta	0	% Midges & Worms (0-100)	
15. mFBI	0	no units	
Macroinvertebrate Bioassessment	NA	no units	NA
Conductivity	100	microMHOs	1.00

EII Calculation for High Gradient Streams in Eastern Kentucky Coalfield (Version 2002.6)

(Family Level Taxonomy - All Habitats)

Project ID:	Pine Branch Mining LLC - Terrell Fork 2
Stream/Reach:	Ephemeral Rehabilitation - A3,A7,C7
Assessment Objectives:	Maturity (20 yrs)

EII	Model
NA	Ecological Integrity Index (MBI + Habitat Integrity + Conductivity)
0.66	Ecological Integrity Index (Habitat Integrity + Conductivity)

Variables	Measure	Units	
>>>>>>>	Enter quantitative or categorical measure from Field Data Sheet in shaded cells		
RBP Habitat Parameters			
1. Epifaunal Substrate	11	no units	
2. Embeddedness	11	no units	
3. Velocity/Depth Regime	6	no units	
4. Sediment Deposition	13	no units	
5. Channel Flow Status	2	no units	
6. Channel Alteration	16	no units	
7. Freq. Of Riffles (bends)	8	no units	
8. Bank stability (both combined)	16	no units	
9. Veg. Protection (both combined)	18	no units	
10. Riparian Width (both combined)	20	no units	
Total Habitat Score	121	no units	Subindex
Habitat Integrity Index			0.31
Macroinvertebrate Data - Family Level (All Habitats)			
11. Family Taxa Richness	0	# of taxa sampled	
12. Family EPT Richness	0	# of EPT species sampled	
13. % Ephemeroptera	0	% Mayflies (0-100)	
14. % Chironomidae & Oligochaeta	0	% Midges & Worms (0-100)	
15. mFBI	0	no units	
Macroinvertebrate Bioassessment	NA	no units	NA
Conductivity	100	microMHOs	1.00

EII Calculation for High Gradient Streams in Eastern Kentucky Coalfield (Version 2002.6)

(Family Level Taxonomy - All Habitats)

Project ID:	Pine Branch Mining LLC - Terrell Fork 2
Stream/Reach:	Intermittent Enhancement - B1, C2A
Assessment Objectives:	immediately after work at 5 yr maturity

EII	Model
NA	Ecological Integrity Index (MBI + Habitat Integrity + Conductivity)
0.69	Ecological Integrity Index (Habitat Integrity + Conductivity)

Variables	Measure	Units	
>>>>>>>	Enter quantitative or categorical measure from Field Data Sheet in shaded cells		
RBP Habitat Parameters			
1. Epifaunal Substrate	11	no units	
2. Embeddedness	11	no units	
3. Velocity/Depth Regime	10	no units	
4. Sediment Deposition	11	no units	
5. Channel Flow Status	11	no units	
6. Channel Alteration	16	no units	
7. Freq. Of Riffles (bends)	13	no units	
8. Bank stability (both combined)	16	no units	
9. Veg. Protection (both combined)	14	no units	
10. Riparian Width (both combined)	14	no units	
Total Habitat Score	127	no units	Subindex
Habitat Integrity Index			0.37
Macroinvertebrate Data - Family Level (All Habitats)			
11. Family Taxa Richness	0	# of taxa sampled	
12. Family EPT Richness	0	# of EPT species sampled	
13. % Ephemeroptera	0	% Mayflies (0-100)	
14. % Chironomidae & Oligochaeta	0	% Midges & Worms (0-100)	
15. mFBI	0	no units	
Macroinvertebrate Bioassessment	NA	no units	NA
Conductivity	100	microMHOs	1.00

EII Calculation for High Gradient Streams in Eastern Kentucky Coalfield (Version 2002.6)

(Family Level Taxonomy - All Habitats)

Project ID:	Pine Branch Mining LLC - Terrell Fork 2
Stream/Reach:	Intermittent Enhancement - B1, C2A
Assessment Objectives:	Maturity (20 yrs)

EII	Model
NA	Ecological Integrity Index (MBI + Habitat Integrity + Conductivity)
0.81	Ecological Integrity Index (Habitat Integrity + Conductivity)

	Variables	Measure	Units	Subindex
>>>>>>>	Enter quantitative or categorical measure from Field Data Sheet in shaded cells			
	RBP Habitat Parameters			
	1. Epifaunal Substrate	15	no units	
	2. Embeddedness	15	no units	
	3. Velocity/Depth Regime	10	no units	
	4. Sediment Deposition	13	no units	
	5. Channel Flow Status	11	no units	
	6. Channel Alteration	16	no units	
	7. Freq. Of Riffles (bends)	13	no units	
	8. Bank stability (both combined)	16	no units	
	9. Veg. Protection (both combined)	18	no units	
	10. Riparian Width (both combined)	20	no units	
	Total Habitat Score	147	no units	
	Habitat Integrity Index			**0.62**
	Macroinvertebrate Data - Family Level (All Habitats)			
	11. Family Taxa Richness	0	# of taxa sampled	
	12. Family EPT Richness	0	# of EPT species sampled	
	13. % Ephemeroptera	0	% Mayflies (0-100)	
	14. % Chironomidae & Oligochaeta	0	% Midges & Worms (0-100)	
	15. mFBI	0	no units	
	Macroinvertebrate Bioassessment	NA	no units	**NA**
	Conductivity	100	microMHOs	**1.00**

EII Calculation for High Gradient Streams in Eastern Kentucky Coalfield (Version 2002.6)

(Family Level Taxonomy - All Habitats)

Project ID:	Pine Branch Mining LLC - Terrell Fork 2
Stream/Reach:	Intermittent Enhancement - C2
Assessment Objectives:	immediately after work at 5 yr maturity

EII	Model
NA	Ecological Integrity Index (MBI + Habitat Integrity + Conductivity)
0.63	Ecological Integrity Index (Habitat Integrity + Conductivity)

	Variables	Measure	Units	Subindex
>>>>>>>	Enter quantitative or categorical measure from Field Data Sheet in shaded cells			
	RBP Habitat Parameters			
	1. Epifaunal Substrate	11	no units	
	2. Embeddedness	11	no units	
	3. Velocity/Depth Regime	10	no units	
	4. Sediment Deposition	11	no units	
	5. Channel Flow Status	11	no units	
	6. Channel Alteration	11	no units	
	7. Freq. Of Riffles (bends)	10	no units	
	8. Bank stability (both combined)	16	no units	
	9. Veg. Protection (both combined)	13	no units	
	10. Riparian Width (both combined)	11	no units	
	Total Habitat Score	115	no units	
	Habitat Integrity Index			0.25
	Macroinvertebrate Data - Family Level (All Habitats)			
	11. Family Taxa Richness	0	# of taxa sampled	
	12. Family EPT Richness	0	# of EPT species sampled	
	13. % Ephemeroptera	0	% Mayflies (0-100)	
	14. % Chironomidae & Oligochaeta	0	% Midges & Worms (0-100)	
	15. mFBI	0	no units	
	Macroinvertebrate Bioassessment	NA	no units	NA
	Conductivity	100	microMHOs	1.00

EII Calculation for High Gradient Streams in Eastern Kentucky Coalfield (Version 2002.6)

(Family Level Taxonomy - All Habitats)

Project ID:	Pine Branch Mining LLC - Terrell Fork 2
Stream/Reach:	Intermittent Enhancement - C2
Assessment Objectives:	Maturity (20 yrs)

EII	Model
NA	Ecological Integrity Index (MBI + Habitat Integrity + Conductivity)
0.70	Ecological Integrity Index (Habitat Integrity + Conductivity)

Variables	Measure	Units	
>>>>>>>	Enter quantitative or categorical measure from Field Data Sheet in shaded cells		
RBP Habitat Parameters			
1. Epifaunal Substrate	11	no units	
2. Embeddedness	11	no units	
3. Velocity/Depth Regime	10	no units	
4. Sediment Deposition	11	no units	
5. Channel Flow Status	11	no units	
6. Channel Alteration	11	no units	
7. Freq. Of Riffles (bends)	10	no units	
8. Bank stability (both combined)	16	no units	
9. Veg. Protection (both combined)	18	no units	
10. Riparian Width (both combined)	20	no units	
Total Habitat Score	129	no units	Subindex
Habitat Integrity Index			0.39
Macroinvertebrate Data - Family Level (All Habitats)			
11. Family Taxa Richness	0	# of taxa sampled	
12. Family EPT Richness	0	# of EPT species sampled	
13. % Ephemeroptera	0	% Mayflies (0-100)	
14. % Chironomidae & Oligochaeta	0	% Midges & Worms (0-100)	
15. mFBI	0	no units	
Macroinvertebrate Bioassessment	NA	no units	NA
Conductivity	100	microMHOs	1.00

EII Calculation for High Gradient Streams in Eastern Kentucky Coalfield (Version 2002.6)

(Family Level Taxonomy - All Habitats)

Project ID:	Pine Branch Mining LLC - Terrell Fork 2
Stream/Reach:	intermittent Rehabilitation - A1,C2
Assessment Objectives:	immediately after work at 5 yrs maturity

EII	Model
NA	Ecological Integrity Index (MBI + Habitat Integrity + Conductivity)
0.68	Ecological Integrity Index (Habitat Integrity + Conductivity)

	Variables	Measure	Units	Subindex
>>>>>>>	Enter quantitative or categorical measure from Field Data Sheet in shaded cells			
	RBP Habitat Parameters			
	1. Epifaunal Substrate	11	no units	
	2. Embeddedness	11	no units	
	3. Velocity/Depth Regime	11	no units	
	4. Sediment Deposition	11	no units	
	5. Channel Flow Status	13	no units	
	6. Channel Alteration	16	no units	
	7. Freq. Of Riffles (bends)	15	no units	
	8. Bank stability (both combined)	16	no units	
	9. Veg. Protection (both combined)	12	no units	
	10. Riparian Width (both combined)	10	no units	
	Total Habitat Score	126	no units	
	Habitat Integrity Index			0.36
	Macroinvertebrate Data - Family Level (All Habitats)			
	11. Family Taxa Richness	0	# of taxa sampled	
	12. Family EPT Richness	0	# of EPT species sampled	
	13. % Ephemeroptera	0	% Mayflies (0-100)	
	14. % Chironomidae & Oligochaeta	0	% Midges & Worms (0-100)	
	15. mFBI	0	no units	
	Macroinvertebrate Bioassessment	NA	no units	NA
	Conductivity	100	microMHOs	1.00

EII Calculation for High Gradient Streams in Eastern Kentucky Coalfield (Version 2002.6)
****(Family Level Taxonomy - All Habitats)****

Project ID:	Pine Branch Mining LLC - Terrell Fork 2
Stream/Reach:	Intermittent Rehabilitation - A1,C2
Assessment Objectives:	Maturity (20 yrs)

EII	Model
NA	Ecological Integrity Index (MBI + Habitat Integrity + Conductivity)
0.85	Ecological Integrity Index (Habitat Integrity + Conductivity)

	Variables	Measure	Units	
>>>>>>>	Enter quantitative or categorical measure from Field Data Sheet in shaded cells			
	RBP Habitat Parameters			
	1. Epifaunal Substrate	15	no units	
	2. Embeddedness	15	no units	
	3. Velocity/Depth Regime	11	no units	
	4. Sediment Deposition	13	no units	
	5. Channel Flow Status	13	no units	
	6. Channel Alteration	16	no units	
	7. Freq. Of Riffles (bends)	15	no units	
	8. Bank stability (both combined)	16	no units	
	9. Veg. Protection (both combined)	18	no units	
	10. Riparian Width (both combined)	20	no units	
	Total Habitat Score	152	no units	**Subindex**
	Habitat Integrity Index			**0.70**
	Macroinvertebrate Data - Family Level (All Habitats)			
	11. Family Taxa Richness	0	# of taxa sampled	
	12. Family EPT Richness	0	# of EPT species sampled	
	13. % Ephemeroptera	0	% Mayflies (0-100)	
	14. % Chironomidae & Oligochaeta	0	% Midges & Worms (0-100)	
	15. mFBI	0	no units	
	Macroinvertebrate Bioassessment	**NA**	no units	**NA**
	Conductivity	**100**	microMHOs	**1.00**

EII Calculation for High Gradient Streams in Eastern Kentucky Coalfield (Version 2002.6)

(Family Level Taxonomy - All Habitats)

Project ID:	Pine Branch Mining LLC - Terrell Fork 2
Stream/Reach:	Intermittent Rehabilitation - A2,A5,A6,B1,C6,C6A,D1
Assessment Objectives:	immediately after work at 5 yrs maturity

EII	Model
NA	Ecological Integrity Index (MBI + Habitat Integrity + Conductivity)
0.66	Ecological Integrity Index (Habitat Integrity + Conductivity)

Variables	Measure	Units	Subindex
>>>>>>>	Enter quantitative or categorical measure from Field Data Sheet in shaded cells		
RBP Habitat Parameters			
1. Epifaunal Substrate	11	no units	
2. Embeddedness	11	no units	
3. Velocity/Depth Regime	10	no units	
4. Sediment Deposition	11	no units	
5. Channel Flow Status	11	no units	
6. Channel Alteration	16	no units	
7. Freq. Of Riffles (bends)	13	no units	
8. Bank stability (both combined)	16	no units	
9. Veg. Protection (both combined)	12	no units	
10. Riparian Width (both combined)	10	no units	
Total Habitat Score	121	no units	
Habitat Integrity Index			0.31
Macroinvertebrate Data - Family Level (All Habitats)			
11. Family Taxa Richness	0	# of taxa sampled	
12. Family EPT Richness	0	# of EPT species sampled	
13. % Ephemeroptera	0	% Mayflies (0-100)	
14. % Chironomidae & Oligochaeta	0	% Midges & Worms (0-100)	
15. mFBI	0	no units	
Macroinvertebrate Bioassessment	NA	no units	NA
Conductivity	100	microMHOs	1.00

EII Calculation for High Gradient Streams in Eastern Kentucky Coalfield (Version 2002.6)

(Family Level Taxonomy - All Habitats)

Project ID:	Pine Branch Mining LLC - Terrell Fork 2
Stream/Reach:	Intermittent Rehabilitation - A2,A5,A6,B1,C6,C6A,D1
Assessment Objectives:	Maturity (20 yrs)

EII	Model
NA	Ecological Integrity Index (MBI + Habitat Integrity + Conductivity)
0.81	Ecological Integrity Index (Habitat Integrity + Conductivity)

>>>>>>>

Enter quantitative or categorical measure from Field Data Sheet in shaded cells

Variables	Measure	Units	Subindex
RBP Habitat Parameters			
1. Epifaunal Substrate	15	no units	
2. Embeddedness	15	no units	
3. Velocity/Depth Regime	10	no units	
4. Sediment Deposition	13	no units	
5. Channel Flow Status	11	no units	
6. Channel Alteration	16	no units	
7. Freq. Of Riffles (bends)	13	no units	
8. Bank stability (both combined)	16	no units	
9. Veg. Protection (both combined)	18	no units	
10. Riparian Width (both combined)	20	no units	
Total Habitat Score	147	no units	
Habitat Integrity Index			0.62
Macroinvertebrate Data - Family Level (All Habitats)			
11. Family Taxa Richness	0	# of taxa sampled	
12. Family EPT Richness	0	# of EPT species sampled	
13. % Ephemeroptera	0	% Mayflies (0-100)	
14. % Chironomidae & Oligochaeta	0	% Midges & Worms (0-100)	
15. mFBI	0	no units	
Macroinvertebrate Bioassessment	NA	no units	NA
Conductivity	100	microMHOs	1.00

EII Calculation for High Gradient Streams in Eastern Kentucky Coalfield (Version 2002.6)

(Family Level Taxonomy - All Habitats)

Project ID:	Pine Branch Mining LLC - Terrell Fork 2
Stream/Reach:	Perennial Enhancement - C1
Assessment Objectives:	Immediately after work at 5 yr maturity

EII	Model
NA	Ecological Integrity Index (MBI + Habitat Integrity + Conductivity)
0.63	Ecological Integrity Index (Habitat Integrity + Conductivity)

Variables	Measure	Units	
>>>>>>>	Enter quantitative or categorical measure from Field Data Sheet in shaded cells		
RBP Habitat Parameters			
1. Epifaunal Substrate	11	no units	
2. Embeddedness	11	no units	
3. Velocity/Depth Regime	10	no units	
4. Sediment Deposition	11	no units	
5. Channel Flow Status	11	no units	
6. Channel Alteration	11	no units	
7. Freq. Of Riffles (bends)	10	no units	
8. Bank stability (both combined)	16	no units	
9. Veg. Protection (both combined)	13	no units	
10. Riparian Width (both combined)	11	no units	
Total Habitat Score	115	no units	Subindex
Habitat Integrity Index			0.25
Macroinvertebrate Data - Family Level (All Habitats)			
11. Family Taxa Richness	0	# of taxa sampled	
12. Family EPT Richness	0	# of EPT species sampled	
13. % Ephemeroptera	0	% Mayflies (0-100)	
14. % Chironomidae & Oligochaeta	0	% Midges & Worms (0-100)	
15. mFBI	0	no units	
Macroinvertebrate Bioassessment	NA	no units	NA
Conductivity	100	microMHOs	1.00

EII Calculation for High Gradient Streams in Eastern Kentucky Coalfield (Version 2002.6)

(Family Level Taxonomy - All Habitats)

Project ID:	Pine Branch Mining LLC - Terrell Fork 2
Stream/Reach:	Perennial Enhancement - C1
Assessment Objectives:	Maturity (20 yrs)

EII	Model
NA	Ecological Integrity Index (MBI + Habitat Integrity + Conductivity)
0.70	Ecological Integrity Index (Habitat Integrity + Conductivity)

Variables	Measure	Units
>>>>>>>	Enter quantitative or categorical measure from Field Data Sheet in shaded cells	
RBP Habitat Parameters		
1. Epifaunal Substrate	11	no units
2. Embeddedness	11	no units
3. Velocity/Depth Regime	10	no units
4. Sediment Deposition	11	no units
5. Channel Flow Status	11	no units
6. Channel Alteration	11	no units
7. Freq. Of Riffles (bends)	10	no units
8. Bank stability (both combined)	16	no units
9. Veg. Protection (both combined)	18	no units
10. Riparian Width (both combined)	20	no units
Total Habitat Score	129	no units
Habitat Integrity Index		Subindex: 0.39
Macroinvertebrate Data - Family Level (All Habitats)		
11. Family Taxa Richness	0	# of taxa sampled
12. Family EPT Richness	0	# of EPT species sampled
13. % Ephemeroptera	0	% Mayflies (0-100)
14. % Chironomidae & Oligochaeta	0	% Midges & Worms (0-100)
15. mFBI	0	no units
Macroinvertebrate Bioassessment	NA	no units — Subindex: NA
Conductivity	100	microMHOs — Subindex: 1.00

EII Calculation for High Gradient Streams in Eastern Kentucky Coalfield (Version 2002.6)

(Family Level Taxonomy - All Habitats)

Project ID:	Pine Branch Mining LLC - Terrell Fork 2
Stream/Reach:	Perennial Rehabilitation - C1
Assessment Objectives:	Immediately after work at 5 yr maturity

EII	Model
NA	Ecological Integrity Index (MBI + Habitat Integrity + Conductivity)
0.69	Ecological Integrity Index (Habitat Integrity + Conductivity)

Variables	Measure	Units	Subindex
>>>>>>>	Enter quantitative or categorical measure from Field Data Sheet in shaded cells		
RBP Habitat Parameters			
1. Epifaunal Substrate	11	no units	
2. Embeddedness	11	no units	
3. Velocity/Depth Regime	11	no units	
4. Sediment Deposition	11	no units	
5. Channel Flow Status	15	no units	
6. Channel Alteration	16	no units	
7. Freq. Of Riffles (bends)	15	no units	
8. Bank stability (both combined)	16	no units	
9. Veg. Protection (both combined)	12	no units	
10. Riparian Width (both combined)	10	no units	
Total Habitat Score	128	no units	
Habitat Integrity Index			0.38
Macroinvertebrate Data - Family Level (All Habitats)			
11. Family Taxa Richness	0	# of taxa sampled	
12. Family EPT Richness	0	# of EPT species sampled	
13. % Ephemeroptera	0	% Mayflies (0-100)	
14. % Chironomidae & Oligochaeta	0	% Midges & Worms (0-100)	
15. mFBI	0	no units	
Macroinvertebrate Bioassessment	NA	no units	NA
Conductivity	100	microMHOs	1.00

EII Calculation for High Gradient Streams in Eastern Kentucky Coalfield (Version 2002.6)

(Family Level Taxonomy - All Habitats)

Project ID:	Pine Branch Mining LLC - Terrell Fork 2
Stream/Reach:	Perennial Rehabilitation - C1
Assessment Objectives:	Maturity (20 yrs)

EII	Model
NA	Ecological Integrity Index (MBI + Habitat Integrity + Conductivity)
0.87	Ecological Integrity Index (Habitat Integrity + Conductivity)

>>>>>>> Enter quantitative or categorical measure from Field Data Sheet in shaded cells

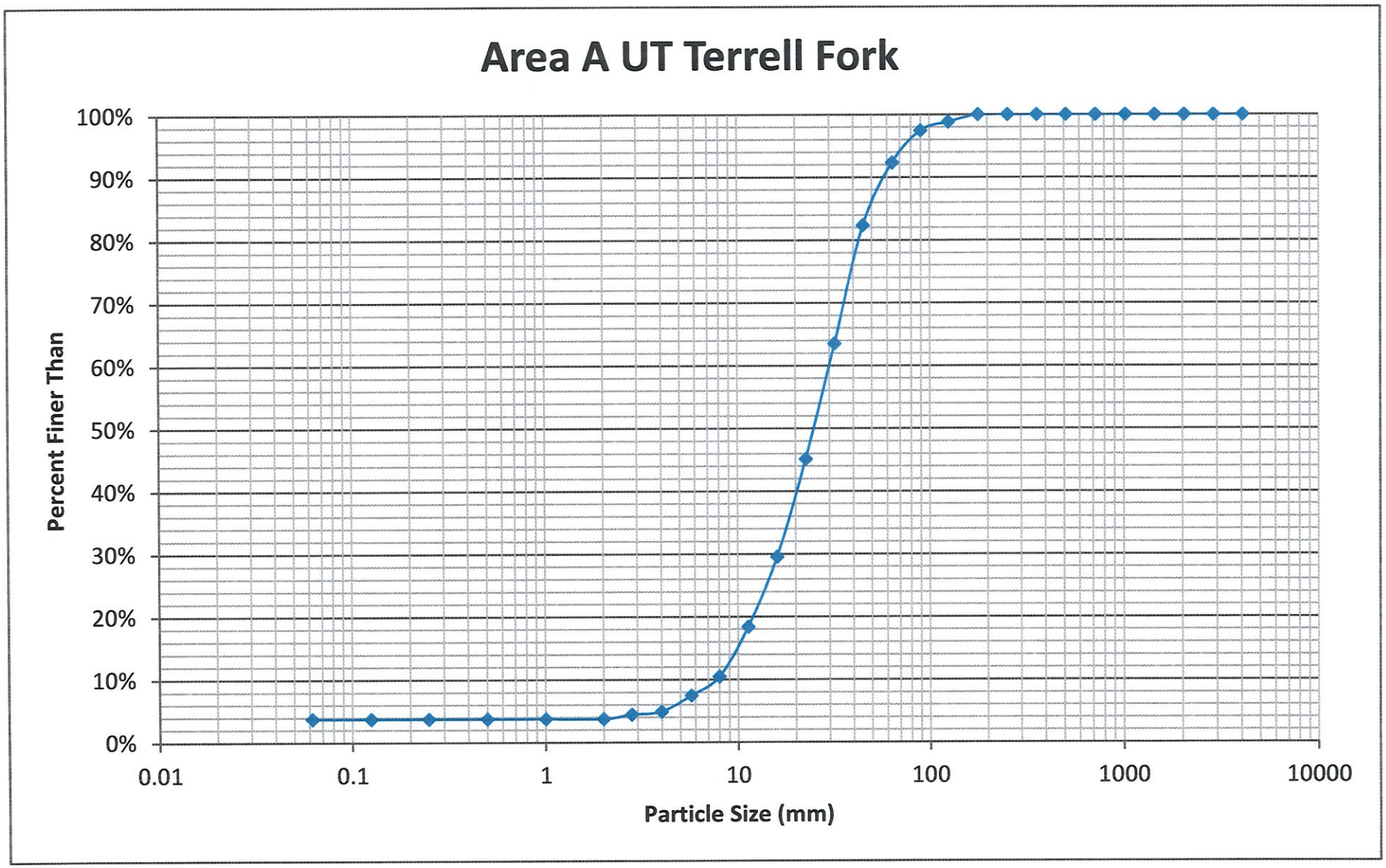
Variables	Measure	Units	Subindex
RBP Habitat Parameters			
1. Epifaunal Substrate	15	no units	
2. Embeddedness	15	no units	
3. Velocity/Depth Regime	11	no units	
4. Sediment Deposition	13	no units	
5. Channel Flow Status	15	no units	
6. Channel Alteration	16	no units	
7. Freq. Of Riffles (bends)	15	no units	
8. Bank stability (both combined)	16	no units	
9. Veg. Protection (both combined)	18	no units	
10. Riparian Width (both combined)	20	no units	
Total Habitat Score	154	no units	Subindex
Habitat Integrity Index			0.73
Macroinvertebrate Data - Family Level (All Habitats)			
11. Family Taxa Richness	0	# of taxa sampled	
12. Family EPT Richness	0	# of EPT species sampled	
13. % Ephemeroptera	0	% Mayflies (0-100)	
14. % Chironomidae & Oligochaeta	0	% Midges & Worms (0-100)	
15. mFBI	0	no units	
Macroinvertebrate Bioassessment	NA	no units	NA
Conductivity	100	microMHOs	1.00

PEBBLE COUNT SHEETS

AREA A

	Particle Size Distribution				
	Upper Limit, mm	Riffles		Cumulative	
		tot #	% cum	tot #	% cum
1	0.062	16	3.7%	16	3.7%
2	0.125	0	3.7%	0	3.7%
3	0.25	0	3.7%	0	3.7%
4	0.5	0	3.7%	0	3.7%
5	1	0	3.7%	0	3.7%
6	2	0	3.7%	0	3.7%
7	2.8	3	4.4%	3	4.4%
8	4	2	4.9%	2	4.9%
9	5.7	11	7.4%	11	7.4%
10	8	13	10.5%	13	10.5%
11	11.3	34	18.4%	34	18.4%
12	16	48	29.5%	48	29.5%
13	22.6	67	45.1%	67	45.1%
14	32	79	63.5%	79	63.5%
15	45	81	82.3%	81	82.3%
16	64	43	92.3%	43	92.3%
17	90	22	97.4%	22	97.4%
18	126	6	98.8%	6	98.8%
19	180	5	100.0%	5	100.0%
20	256	0	100.0%	0	100.0%
21	362	0	100.0%	0	100.0%
22	512	0	100.0%	0	100.0%
23	724	0	100.0%	0	100.0%
24	1024	0	100.0%	0	100.0%
25	1450	0	100.0%	0	100.0%
26	2048	0	100.0%	0	100.0%
27	2900	0	100.0%	0	100.0%
28	4096	2	100.0%	0	100.0%
	TOTALS	432		430	

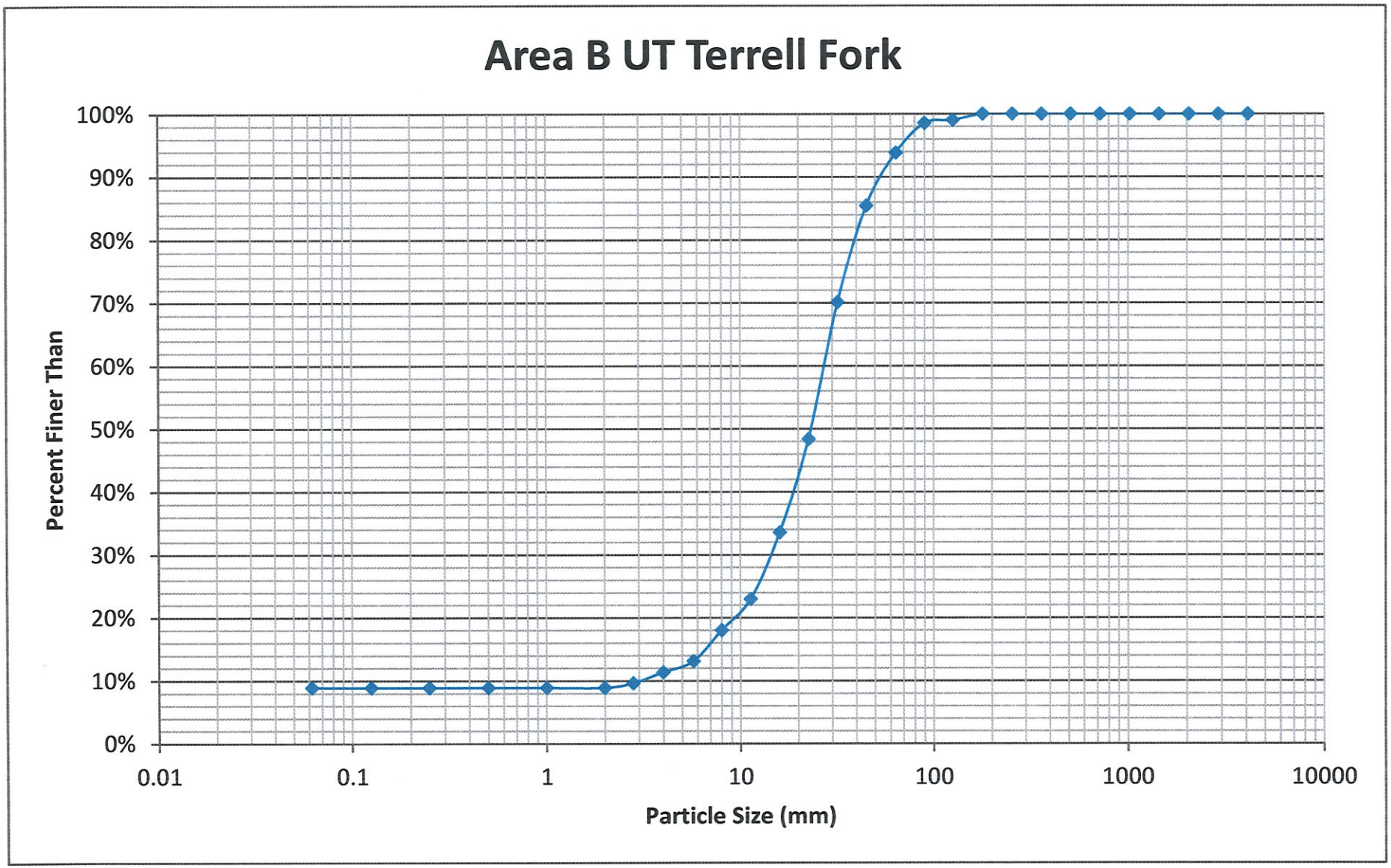
	Particle Size Determination		
D_{xx}	Variable	ds, mm	Plot
D_{16}	0.16	10.31	
	10	10.31	100.00%
D_{35}	0.35	18.31493	
	12	18.31493	100.00%
D_{50}	0.50	25.09873	
	13	25.09873	100.00%
D_{84}	0.84	48.2	
	15	48.2	100.00%
D_{95}	0.95	77.59091	
	16	77.59091	100.00%


Area A UT Terrell Fork
Percent Finer Than
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
0.01
0.1
1
10
100
1000
10000
Particle Size (mm)

AREA B

	Particle Size Distribution				
	Upper Limit, mm	Riffles		Cumulative	
		tot #	% cum	tot #	% cum
1	0.062	36	8.9%	36	8.9%
2	0.125	0	8.9%	0	8.9%
3	0.25	0	8.9%	0	8.9%
4	0.5	0	8.9%	0	8.9%
5	1	0	8.9%	0	8.9%
6	2	0	8.9%	0	8.9%
7	2.8	3	9.6%	3	9.6%
8	4	7	11.4%	7	11.4%
9	5.7	7	13.1%	7	13.1%
10	8	20	18.0%	20	18.0%
11	11.3	20	23.0%	20	23.0%
12	16	43	33.6%	43	33.6%
13	22.6	60	48.4%	60	48.4%
14	32	88	70.1%	88	70.1%
15	45	62	85.4%	62	85.4%
16	64	34	93.8%	34	93.8%
17	90	19	98.5%	19	98.5%
18	126	2	99.0%	2	99.0%
19	180	4	100.0%	4	100.0%
20	256	0	100.0%	0	100.0%
21	362	0	100.0%	0	100.0%
22	512	0	100.0%	0	100.0%
23	724	0	100.0%	0	100.0%
24	1024	0	100.0%	0	100.0%
25	1450	0	100.0%	0	100.0%
26	2048	0	100.0%	0	100.0%
27	2900	0	100.0%	0	100.0%
28	4096	0	100.0%	0	100.0%
	TOTALS	405		405	

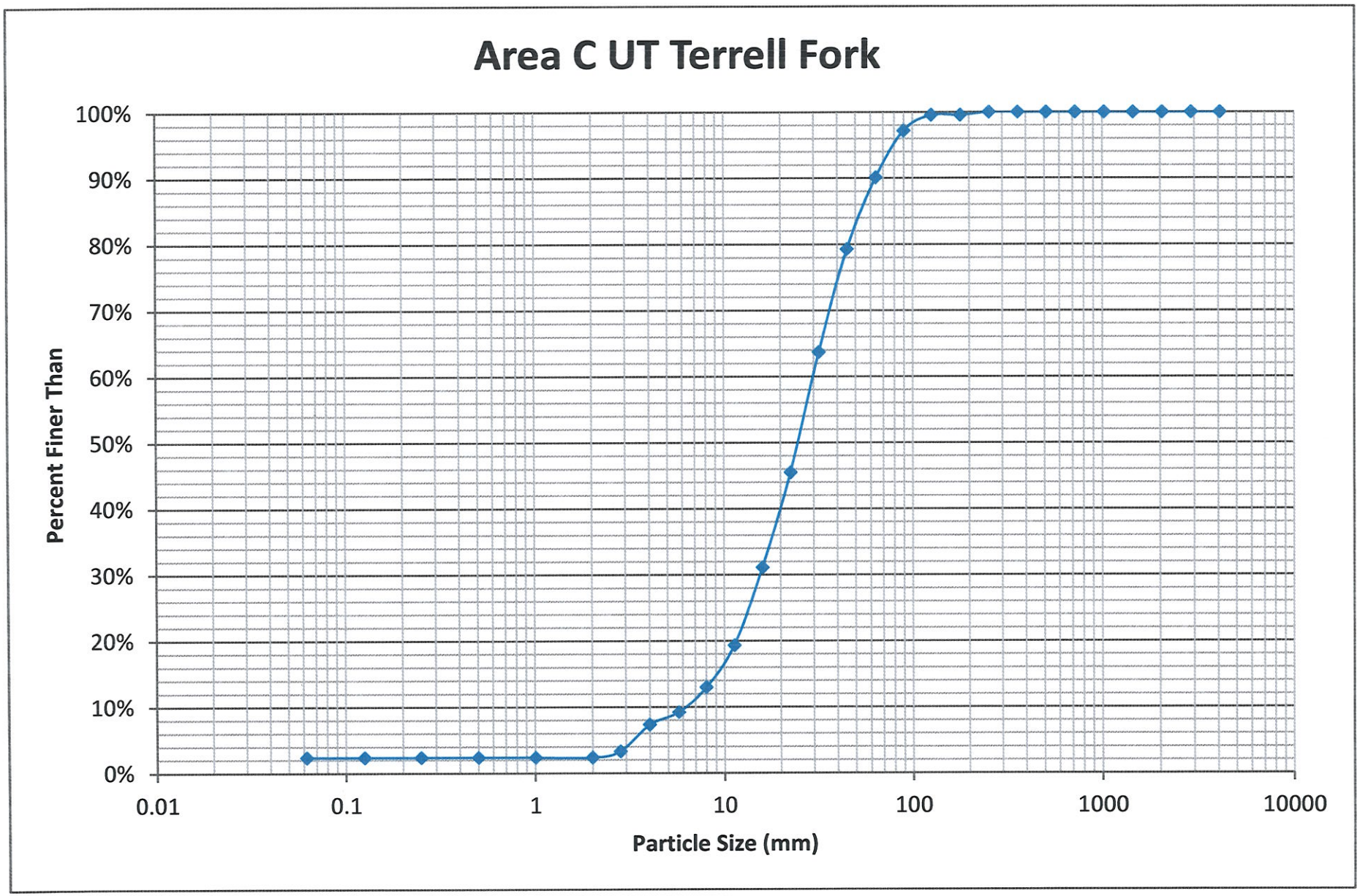
	Particle Size Determination		
D_{xx}	Variable	ds, mm	Plot
D_{16}	0.16	7.057	
	9	7.057	100.00%
D_{35}	0.35	16.6325	
	12	16.6325	100.00%
D_{50}	0.50	23.29432	
	13	23.29432	100.00%
D_{84}	0.84	43.8	
	14	43.8	100.00%
D_{95}	0.95	70.5	
	16	70.5	100.00%


Area B UT Terrell Fork
Percent Finer Than
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
0.01
0.1
1
10
100
1000
10000
Particle Size (mm)

AREA C

	Particle Size Distribution				
	Upper Limit, mm	Riffles		Cumulative	
		tot #	% cum	tot #	% cum
1	0.062	10	2.4%	10	2.4%
2	0.125	0	2.4%	0	2.4%
3	0.25	0	2.4%	0	2.4%
4	0.5	0	2.4%	0	2.4%
5	1	0	2.4%	0	2.4%
6	2	0	2.4%	0	2.4%
7	2.8	4	3.3%	4	3.3%
8	4	17	7.3%	17	7.3%
9	5.7	8	9.2%	8	9.2%
10	8	16	13.0%	16	13.0%
11	11.3	27	19.3%	27	19.3%
12	16	50	31.1%	50	31.1%
13	22.6	61	45.5%	61	45.5%
14	32	77	63.7%	77	63.7%
15	45	66	79.2%	66	79.2%
16	64	46	90.1%	46	90.1%
17	90	30	97.2%	30	97.2%
18	126	10	99.5%	10	99.5%
19	180	0	99.5%	0	99.5%
20	256	2	100.0%	2	100.0%
21	362	0	100.0%	0	100.0%
22	512	0	100.0%	0	100.0%
23	724	0	100.0%	0	100.0%
24	1024	0	100.0%	0	100.0%
25	1450	0	100.0%	0	100.0%
26	2048	0	100.0%	0	100.0%
27	2900	0	100.0%	0	100.0%
28	4096	0	100.0%	0	100.0%
	TOTALS	424		424	

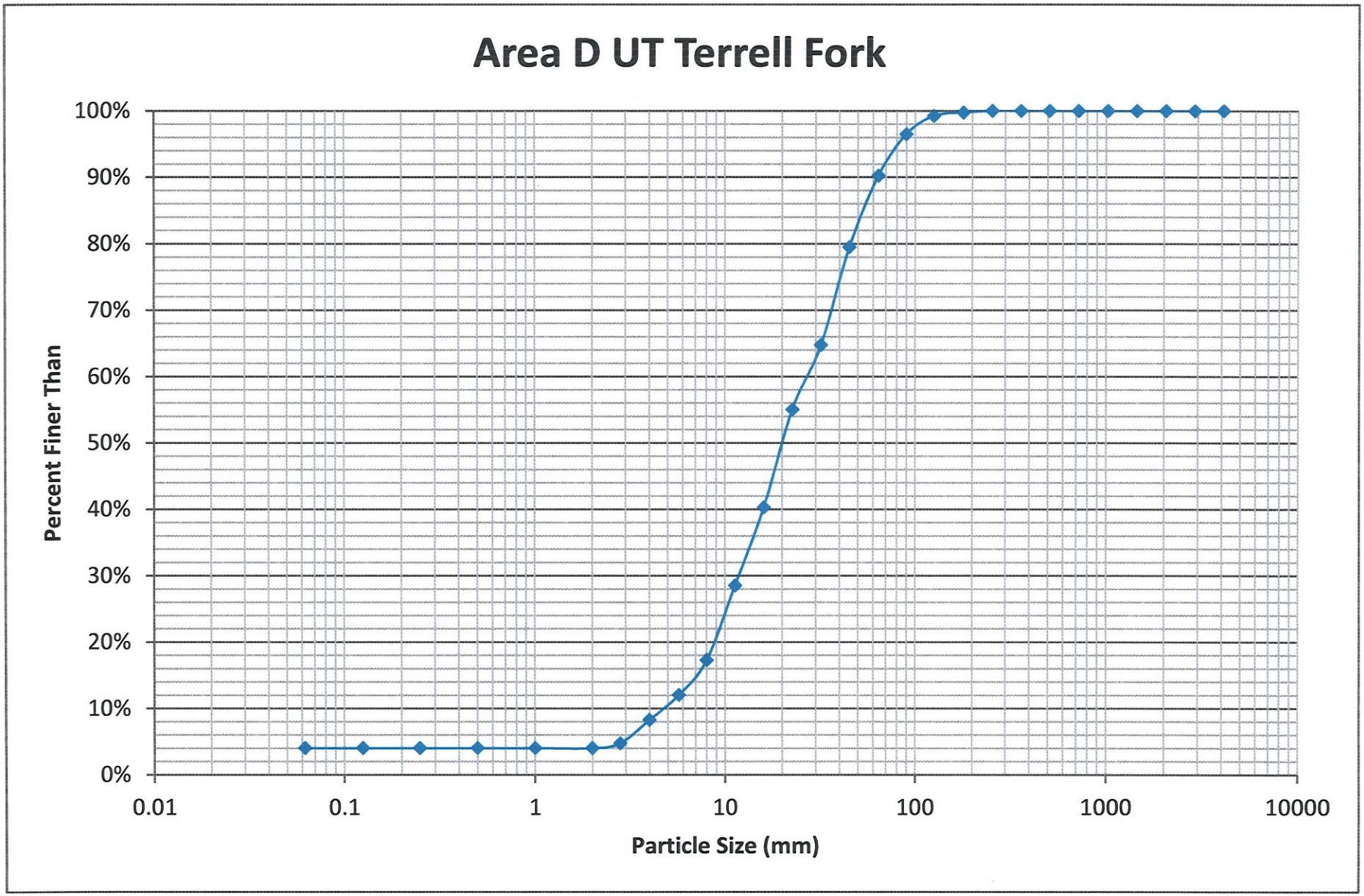
	Particle Size Determination		
D_{xx}	Variable	ds, mm	Plot
D_{16}	**0.16**	9.569333	
	10	9.569333	100.00%
D_{35}	**0.35**	17.77443	
	12	17.77443	100.00%
D_{50}	**0.50**	24.91948	
	13	24.91948	100.00%
D_{84}	**0.84**	53.3	
	15	53.3	100.00%
D_{95}	**0.95**	82.02667	
	16	82.02667	100.00%


Area C UT Terrell Fork
Percent Finer Than
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
0.01
0.1
1
10
100
1000
10000
Particle Size (mm)

AREA D

	Particle Size Distribution				
	Upper Limit, mm	Riffles		Cumulative	
		tot #	% cum	tot #	% cum
1	0.062	16	4.0%	16	4.0%
2	0.125	0	4.0%	0	4.0%
3	0.25	0	4.0%	0	4.0%
4	0.5	0	4.0%	0	4.0%
5	1	0	4.0%	0	4.0%
6	2	0	4.0%	0	4.0%
7	2.8	3	4.8%	3	4.8%
8	4	14	8.3%	14	8.3%
9	5.7	15	12.0%	15	12.0%
10	8	21	17.3%	21	17.3%
11	11.3	45	28.5%	45	28.5%
12	16	47	40.3%	47	40.3%
13	22.6	59	55.0%	59	55.0%
14	32	39	64.8%	39	64.8%
15	45	59	79.5%	59	79.5%
16	64	43	90.3%	43	90.3%
17	90	25	96.5%	25	96.5%
18	126	11	99.3%	11	99.3%
19	180	2	99.8%	2	99.8%
20	256	1	100.0%	1	100.0%
21	362	0	100.0%	0	100.0%
22	512	0	100.0%	0	100.0%
23	724	0	100.0%	0	100.0%
24	1024	0	100.0%	0	100.0%
25	1450	0	100.0%	0	100.0%
26	2048	0	100.0%	0	100.0%
27	2900	0	100.0%	0	100.0%
28	4096	0	100.0%	0	100.0%
	TOTALS	400		400	

	Particle Size Determination		
D_{xx}	Variable	ds, mm	Plot
D_{16}	0.16	7.452381	
	9	7.452381	100.00%
D_{35}	0.35	13.9	
	11	13.9	100.00%
D_{50}	0.50	20.36271	
	12	20.36271	100.00%
D_{84}	0.84	53.0	
	15	53.0	100.00%
D_{95}	0.95	83.76	
	16	83.76	100.00%


Area D UT Terrell Fork
Percent Finer Than
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
0.01
0.1
1
10
100
1000
10000
Particle Size (mm)