Mitigation Plan
for
Stream Impacts

P Ridge South Pit Mine, Amend. No. 1 Site
Ohio County, Kentucky

Prepared for:

Western Kentucky Minerals

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Owensboro, KY 42303

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Stream Mitigation Plan

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C. Compensatory Mitigation: P Ridge South Pit, Amendment No. 1 Mine Site

(1) Goals and Objectives

Streams will be replaced on site and will perform the same functions as the existing streams as described in the baseline report. The goal of stream mitigation will be to provide in-stream habitat and to construct stable stream systems that convey the bankfull discharge and sediment supplied by the watershed. Stream dimensions, patterns, and profiles will be constructed so as to create stream types that would naturally occur within the proposed valleys and hydrologic conditions. The stream plans were developed and designed by consultants and applicant staff with training and experience in Rosgen natural stream design methodologies. They have additional training and experience in hydrology, and construction. The stream mitigation will be performed concurrent with phased mining and reclamation. Wetland mitigation will be performed in conjunction with the mitigation proposed for an intermittent stream (INT-1); see wetland mitigation plan for details. Open waters will be replaced by three ponds to be left post-mining. Although their configurations will not be determined until reclamation, Western Kentucky Minerals will provide at least 1.011 acres of final open waters at the locations indicated on the exhibits.

(2) Site Selection

Site selection for stream mitigation was based on the principal of replacing the aquatic resource impacted on-site and in-kind. Several streams will be located so that upstream undisturbed stream reaches will be re-established to their downstream undisturbed reaches. The most practical way to replace the existing stream functions and contribute to the aquatic resource needs of the watershed is to create stream systems and drainage networks that are similar to, or better than, the existing conditions. The mitigation sites chosen have a great potential for success and improvement over existing conditions. The mainline intermittent streams have large watersheds to provide more than adequate hydrology for maintaining flow regime status and overbank flooding. The broad valley floodplain allows for establishment of proper stream meanders and floodprone widths.

Challenges to the stream mitigation plan include the re-creation of watersheds similar in size and slope during reclamation. Like any construction site of this size, variability in topography, erosion and sediment control/maintenance will have to be addressed; especially during the time vegetation is first being established. To lessen impacts from erosion and excessive sedimentation, efforts will be made for channel construction to be performed during dry conditions. Seed mixes and trees will have to be checked for viability and prevention of unwanted species being introduced. In-stream structure placement and other critical

construction points will require the presence of trained staff or consultant personnel. Although mitigation construction presents challenges, it can be successfully performed.

(3) Baseline Information

(a) All stream mitigation that will be performed on-site will be at the approximate location of existing streams. See Section A of the IP Application for impacts discussion.

(b) It is proposed that a total of 2653 feet of ephemeral stream and 3854 feet of intermittent stream will be restored on-site. As proposed, the ephemeral streams will be restored at a 0.5:1 ratio; the mitigation lengths for intermittent streams will be at a 1.2:1 ratio.

(c) The aquatic resource type includes ephemeral and intermittent streams.

(d) Please refer to the "Stream Habitat Assessment and Wetland Delineation Report" prepared for Western Kentucky Minerals, for existing conditions of streams. Elevations of the project site range from around 435 feet to 520 feet MSL. The nearest defined 100-year flood floodplain is indicated as being less than 430 feet above mean sea level (according to FEMA flood mapping). The site is within one HUC-12 watershed; the Barnett Creek (HUC 051100040506), an area of approximately 39 mi^2. According to NRCS climate data, the region receives approximately 48 inches of rainfall per year.

(4) Mitigation Work Plan

(a) Boundaries of the proposed mitigation sites are provided in the exhibits.

(b) Stream construction will be conducted concurrently with the reclamation phases of the project. Stream construction will be integrated within valleys and floodplains having characteristics corresponding to appropriate stream types. Valley stream morphology will consist of landform features that will correspond to proposed stream system morphology including meander plan-form (radius of curvature, wavelength, belt width and sinuosity), channel profile morphology (riffle/pool or step/pool bed features) and cross section dimensions (low flow, bankfull and flood prone).

Stream construction sequence will be as follows:

1. Locate and flag proposed thalweg.
2. Excavate corresponding bankfull width to bankfull elevation as indicated on plans.
3. Excavate bankfull channel to dimensions indicated on profile and cross sections.
4. Grade side slopes to obtain appropriate flood prone width.
5. Grade side slopes to tie into existing ground.
6. Install in-stream structures.
7. Add substrate in riffle and run sections if necessary to provide armoring and riffle habitat.
8. Prepare streambanks and riparian area for seeding.

9. Seed area with native seed mixture as indicated on planting detail sheet.

10. Install erosion control blanket as needed.

11. Plant native trees and shrubs.

(c) Proposed streams will have similar drainage patterns and connectivity as existing conditions.

(d) Native vegetation to be planted along stream banks and riparian zones include the following species or species available at the time of ordering and approved by USACE:

Grasses - Virginia wild rye (*Elymus virginicus*), Switchgrass (*Panicum virgatum*), Rough barnyard grass (*Echinochloa muricata*), Big bluestem *(Andropogon gerardii)*, Forking panic grass/smooth panic grass *(Dichanthelium dichotomum/dichotomiflorum)* and Annual rye (*Lolium perenne*).

Shrubs – Rough-leaf dogwood (*Cornus drummondii*), Strawberry bush (*Euonymus americanus*), and Indigo-bush (*Amorpha fruticosa*). Shrubs will be 3-gallon container grown, planted along the streambanks at high shear locations (ex., outside bends).

Trees – For perennial/intermittent streams: Pignut hickory (*Carya glabra*), Red oak (*Quercus rubra*), Chestnut oak (*Quercus orinus*), Black walnut *(Juglans nigra)*, and White oak (*Quercus alba*). For ephemeral streams: Shagbark hickory *(Carya ovata)*, Black cherry *(Prunus serotina)*, Black oak *(Quercus velutina)*, Flowering dogwood *(Cornus florida)*, and Red bud *(Ceris canadensis).* Trees will be either 3-gallon container grown RPM planted at the rate of 60 trees per acre, or 3-gallon non-RPM planted at a rate of 120 trees per acre, or non-RPM bare root seedlings (minimum of 30 inches in height) planted at a rate of 300 stems per acre.

Per Kentucky Division of Mine Permits (KDMP) requirements: planting of woody species will occur during first dormant season following stream restoration.

(e) Any vegetation that would hinder planting or provide excessive competition to natural regeneration of planted species will be removed with appropriate treatment, and documented in each annual monitoring report.

(f) Exotic vegetation control: The following efforts will be made to reduce introduction and dispersal of invasive species: removal of exotic species before mitigation begins, cleaning equipment before it reaches the site, inspecting labels on seed mixtures and mulch for composition and vegetative monitoring during the required monitoring period. Volunteers, invasives, and/or exotic vegetation along riparian zones and/or in wetland mitigation areas will be removed by mowing, digging, spraying, burning or a combination of these during annual maintenance; and documented in each annual monitoring report.

(g) The proposed mitigation plan sheets provide relative elevation and slope details for stream designs.

(h) Erosion control methods will consist of the following: constructing stream channels during low or no flow periods, allowing vegetation to become established before flow is allowed into the channels, applying seed and installing erosion control blanket immediately after final grading, planting trees and shrubs and installing silt fence as needed. Stream restoration will proceed in a downstream direction to avoid re-suspension of sediment.

(i) The proposed stream design is based on geomorphic and hydrologic principles incorporated with natural channel design techniques utilizing in-stream structures for habitat diversity and stream bank protection.

(j) The proposed stream plans indicate stream type, pattern, profile and dimensions for each stream. Stream morphology was determined by using regional curve data, collecting and studying data from the existing streams, sediment transport and hydrologic calculations, and experience designing and constructing streams.

(k) Natural channel design methods, in-stream structures and habitat enhancement features have been incorporated into the mitigation plan. The “C” Rosgen Stream Types are typically low relief channels found in well-developed floodplains, and have been designed to be more sinuous, with J-hooks, cross-vanes and/or pools placed at high shear locations along outside bends. "E” Rosgen Stream Types have been designed to maintain a high resistance to bank erosion and downcutting. The relatively narrow and deep channel (low width/depth ratio) will help maintain transport capacity and the wide active floodplain will reduce shear stresses during high flow events. Habitat enhancement features will consist of root wads, log overhangs and submerged logs. These features will also provide bank stability while vegetation becomes established. Step-pool structures will be installed on “B” Stream Types. Through a series of rapids and scour pools, stream energy is dissipated and channel stability maintained. Pool to pool spacing will be based on bankfull width and stream gradient. In general, the steeper the slope the closer the pool to pool spacing will be. The ephemeral mitigation will include in-stream structures, such as log weirs and log overhangs for habitat and stability, and a wide riparian zone. If it is determined during stream construction that adequate riffle material is not present, then appropriately sized material will be supplied to riffle and run sections.

(l) Mitigation sites will be permanently protected and maintenance will be provided as needed throughout the monitoring period. Site protection will be provided through use of a restrictive/protective covenant. Maintenance will include elimination of volunteer species by use of general or spot applications of herbicides, hand picking and mowing where appropriate.

(m) A representative from the design team will be on site during critical phases of the construction process. The representative will make periodic site visits and will familiarize construction personnel with design plans and restoration methods.

(5) Performance Standards/Success Criteria

(a) Standards for assessing mitigation goals include:

1. Streams must be constructed to meet the dimension, pattern and profile of the indicated Rosgen Stream Type.

2. There should be no signs of excessive stream bank erosion or severe headcutting.

3. At the end of the monitoring period, the streams shall have average riffle cross section dimensions reflective of the indicated Rosgen Stream Type.

4. At the end of the monitoring period, the streams shall be progressing toward a minimum EPA Rapid Bioassessment Protocol Score in the sub-optimal range.

5. Root Production Method (RPM) trees will be planted at a rate of 60 trees per acre, or non-RPM 3-gallon container trees will be planted at a rate of 120 trees per acre, or bare root seedlings (minimum height - 30 inches) will be planted at a rate of 300 trees per acre.

6. Riparian vegetation, if using bare root seedlings, shall have at least an 80% survival rate of the initial planting of 300 stems per acre. Before release from monitoring, regardless of time required, 50% of the surviving trees shall reach 15 feet in height and have a 3 inch dbh. Riparian vegetation, if using RPM trees or non-RPM 3-gallon container grown, shall have at least a 90% survival rate of the initial planting of 60 trees per acre. For all planting options (RPM, bare root, etc.) no one species shall comprise more than 25 percent of the surviving plantings.

7. Riparian vegetation will consist of no volunteer species at the end of the monitoring period, although native volunteer hard mast species (oak and hickory spp.) may be allowed based on approval from the USACE.

8. Per Kentucky Division of Mine Permits (KDMP) requirements: one measure of project success will be final stream data sheet scores that equal or exceed pre-project scores.

9. In the riparian areas, herbaceous plantings must provide a minimum of 70 percent ground cover; with no one species accounting for more than 40 percent ground cover.

10. Linear footage and flow regimes will match the USACE approved mitigation plan.

11. Streams will have a definable bed and bank, with an Ordinary High Water Mark.

12. Stream channel and in-stream structures must be stable and functioning as designed.

13. Stream morphology must meet the proposed Rosgen classification (i.e., stream slope, sinuosity, belt width, meanders, bankfull cross-sectional area, width/depth ratios).

14. Annual monitoring should indicate that mitigation is progressing toward meeting success criteria.

(b) Adaptive Management

If success criteria are not met for any portion of the monitoring year and/or final success criteria are not satisfied, an analysis of the contributing conditions will be conducted and documented. Remedial action, if required by USACE, will be performed and documented by the applicant. Remedial actions may include replanting trees and shrubs, reseeding grasses, adjusting in-stream structures and repairing eroded banks. These actions will be performed at least three times at the same location. Should these efforts not show indications of success an alternative off-site location will be found to replace failed sections of the mitigation site and a mitigation plan will be proposed. The payment of an in-lieu fee is another option to compensate for sections of streams that do not meet performance standards, based on the length of stream that does not support its intended function during the monitoring period.

(c) Project Performance Evaluations

All stream mitigation sites will be monitored in accordance with the Mitigation Final Rule, 2008. In general, the following guidelines will be used:

1. The monitoring period must be sufficient to demonstrate that the compensatory mitigation has met performance standards. The monitoring period length shall be a minimum of five years unless performance standards are met in less than five years. In this case, the monitoring period length can be reduced if there are at least two consecutive monitoring reports that demonstrate that performance standards have been met. The applicant can petition for early release if success is assured.
2. Biannual inspections will be conducted each year during the first and last month of the growing season.
3. The first monitoring report will be due after the first full growing season following the initial planting. That report will include as-built drawings for the constructed stream mitigation (including longitudinal profiles of each stream), watershed drainage area, and reclaimed geomorphological landscape. In the reports for Years 3 and 5 of the monitoring period, longitudinal profiles of each stream will again be provided as a demonstration of stream stability and morphology.
4. Monitoring reports are due to USACE by January 31 for the previous year, and to the Kentucky Division of Mine Permits (KDMP) by December 31 for the same monitoring year.
5. Photo stations and monitoring stations will be at the same location.
6. Monitoring stations will be set at a minimum of 1 per 1500 feet of ephemeral stream, and a minimum of 1 per 500 feet of intermittent stream.
7. The same monitoring stations shall be used every year.
8. Personnel familiar with natural stream design principles will perform monitoring tasks.

9. Stream monitoring will consist of assessing stream parameters and documenting vegetation survival.

10. Stream channel form and in-stream stability will be monitored to ensure stream functionality. Maintenance will be performed if the following conditions develop: excessive bank erosion occurs (RBP scores in the marginal range for bank stability), erosion around or under structures that would render them ineffective or cause collapse, excessive siltation of pools that reduces their effectiveness in reducing energy and/or adversely affects pool habitat, and upstream vertical bed erosion (headcutting) that would jeopardize structure stability and lead to unstable channel conditions (RBP scores in the marginal range for epifaunal/substrate cover or sediment deposition). Channels will be inspected frequently by design and/or stream construction team. Stream channel maintenance will be performed as needed to ensure stream stability, function and value.

11. Monitoring reports will include a discussion of inspection findings. Conditions such as bank erosion, streambed characteristics and vegetation survival will be documented. Stream assessments will be conducted and RBP scores will be compared to pre-disturbance scores and previous monitoring scores to determine if mitigation is progressing towards meeting goals. Any problems will be identified and remedial action taken.

12. Monitoring reports will include RPB assessments with conductivity, pH, and temperature readings. They will include photographic documentation of streams and riparian vegetation. In addition, riparian vegetation will be inspected and density, survivorship, composition, percent cover, and any non-native species will be documented.

13. Parties responsible for monitoring will be Armstrong personnel familiar with the project and natural channel design, or USACE-approved consultants.

14. When petitioning the Corps for release of mitigation requirements a full stream delineation for the mitigation site will be provided (e.g., linear footage, Rosgen, RBP, flow regimes, riffle/pool count, riparian vegetation survivability).

(6) Project Success

The applicant will be responsible for all mitigation including construction oversight, monitoring and reports, corrective measures, site access control and protection. The surface mining operation will obtain and submit to KDMP a certification from a registered professional engineer that all mitigation work has been completed in accordance with the conditions of the Water Quality Certification.

(7) Site Protection

All mitigation property will be permanently protected through a restrictive/protective covenant. The covenant will be executed after completion of the mitigation construction. It will be recorded within 60 days after mitigation construction completion, with USACE notification of recording at the time of execution. Durable signs will be placed identifying all mitigation sites as areas not to be disturbed. They will be placed on approximately 500 foot intervals along streams. The mitigation sites will be integrated into the reclamation plan, with site access limited.

(8) Contingency Plan

If success criteria are not met for any portion of the monitoring year and/or final success criteria are not satisfied, an analysis of the contributing conditions will be conducted and documented. Remedial action, if required by USACE, will be performed and documented by the applicant. Should these efforts not resolve the problem, the contingency plan for proposed streams will be payment of in-lieu fees. Contingency payment will be based on the type and length of stream that does not support its intended function during the monitoring period.

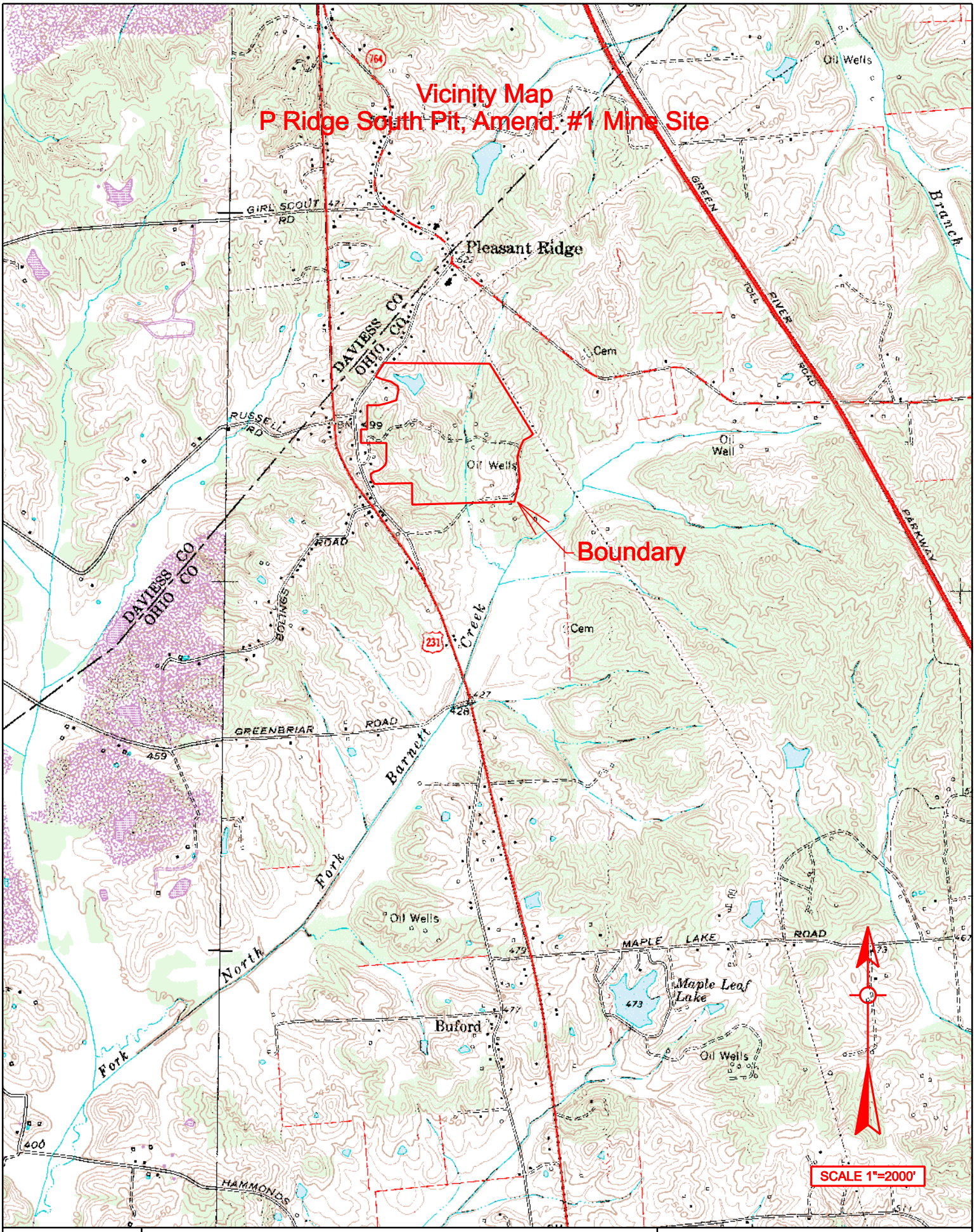
(9) Monitoring and Long-Term Management

(a) The applicant will be responsible for accomplishing, maintaining, and monitoring all mitigation sites. Long-term management will include a restrictive/protective covenant to be recorded with property deeds. The covenant will be filed once mitigation has been completed.

(b) Monitoring plans will be provided as discussed under Performance Standards.

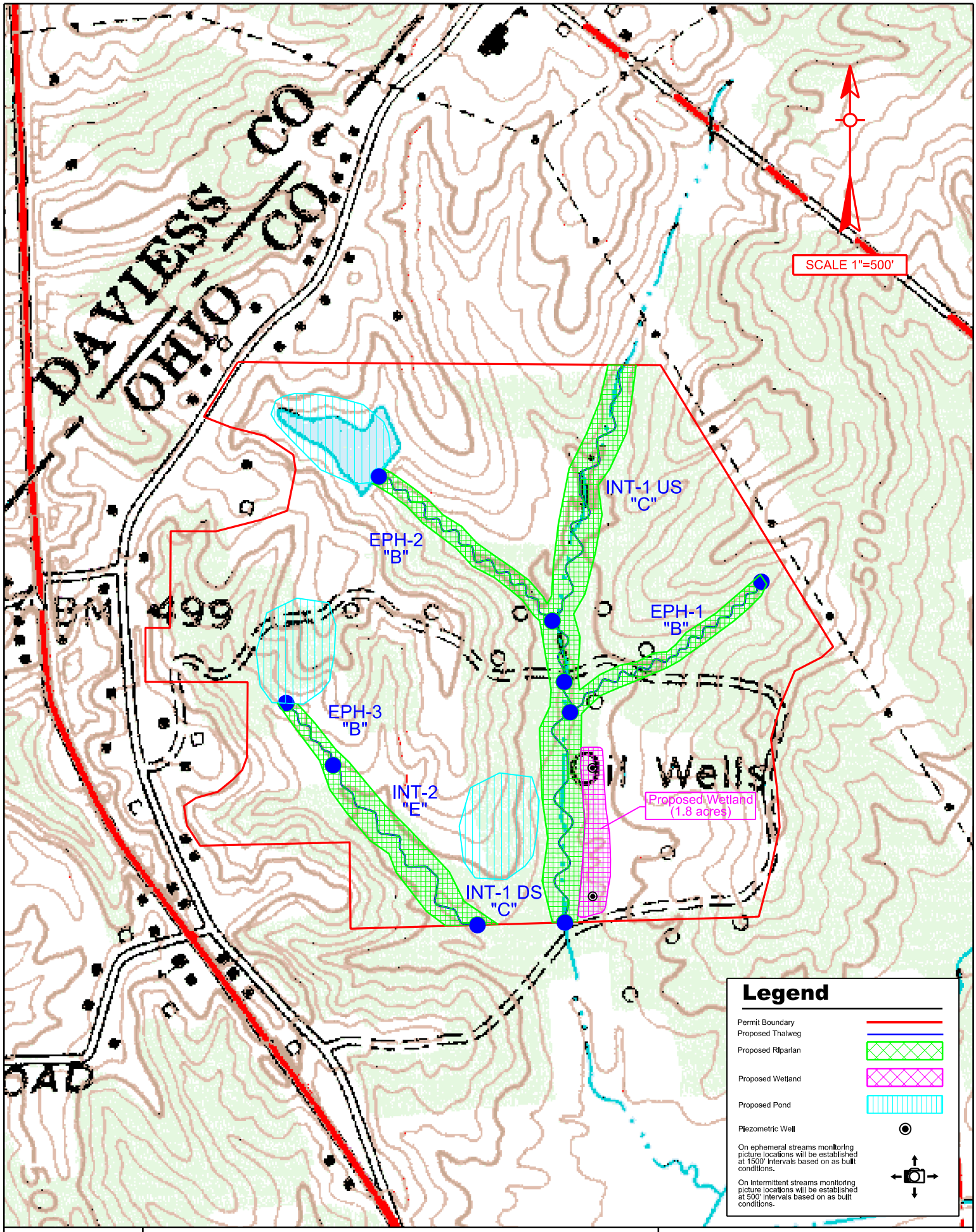
(10) Financial Assurances

The applicant will be responsible for managing any financial assurances and contingency funds set-aside for remedial measures. The USACE, Louisville District, currently does not have the means to handle financial assurances; therefore, no USACE-managed financial assurances are proposed for this project.



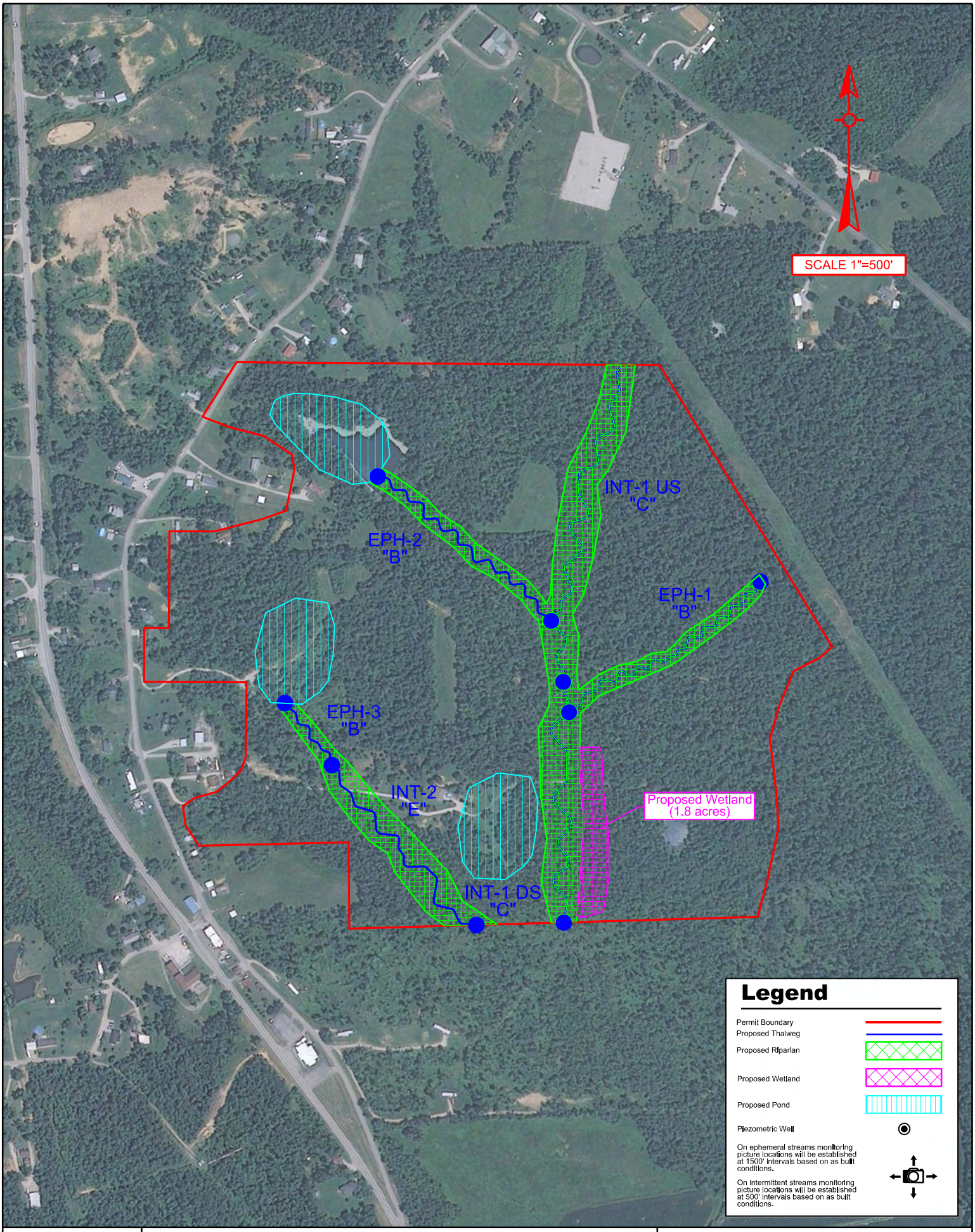
T.H.E. Engineers, Inc.	PROJECT: P RIDGE SOUTH PIT, AMEND. #1 MINE SITE - PROPOSED MITIGATION			STREAMS: UT'S OF NORTH FORK BARNETT CREEK	
	COUNTY: OHIO	STATE: KY	NEAR: PLEASANT RIDGE	ITEM: VICINITY MAP	EXHIBIT 1

DATE:



T.H.E. Engineers, Inc.	PROJECT: P RIDGE SOUTH PIT, AMEND. #1 MINE SITE - PROPOSED MITIGATION			STREAM: UT's OF NORTH FORK BARNETT CREEK	
	COUNTY: OHIO	STATE: KY	NEAR: PLEASANT RIDGE	ITEM: QUAD MAP	EXHIBIT 2

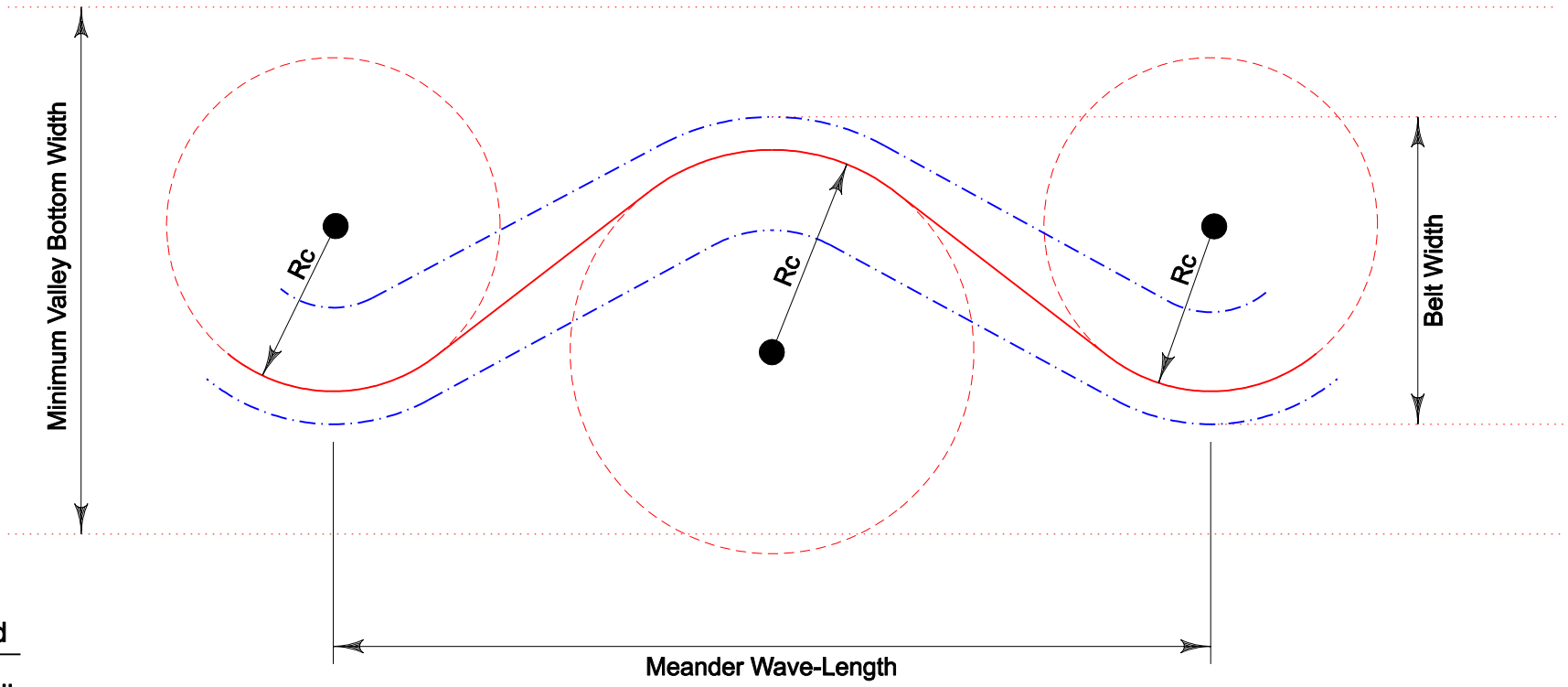
DATE:



T.H.E. Engineers, Inc.	PROJECT: P RIDGE SOUTH PIT, AMEND. #1 MINE SITE - PROPOSED MITIGATION			STREAM: UT's OF NORTH FORK BARNETT CREEK	
	COUNTY: OHIO	STATE: KY	NEAR: PLEASANT RIDGE	ITEM: AERIAL MAP	EXHIBIT 3

DATE:

Typical Meander Pattern for Rosgen Stream Type "C"
Stream INT-1 DS



Legend

Bankfull

Thalweg

Bankfull Width=11.77'
Radius of Curvature (Rc) Ranges from 29' to 35.5'
Belt Width Ranges from 94 to 129'
Meander Wave-Length Ranges from 106' to 165'
Approximate Proposed Reach Length = 1187'
Proposed Sinuosity 1.2 or greater
Proposed Stream Gradient Ranges from 0.25% to 0.83%
Proposed Valley Slope Ranges from 0.3% to 1.0%
Minimum Valley Bottom Width = 140'

T.H.E. Engineers, Inc.

PROJECT: P RIDGE SOUTH PIT, AMEND. #1 MINE SITE - PROPOSED MITIGATION

STREAM: INTERMITTENT IDS

COUNTY: OHIO

STATE: KY

NEAR: PLEASANT RIDGE

ITEM: PROPOSED TYPICAL MEANDOR PATTERN

EXHIBIT 4

DATE:

EROSION CONTROL BLANKET (may be used as needed)

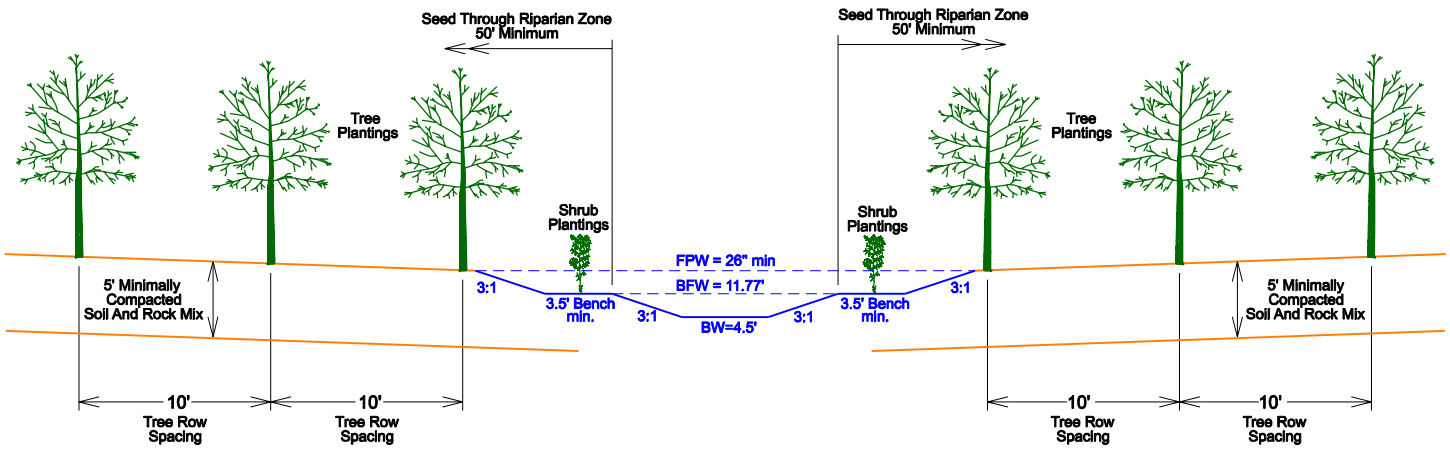
E.C.B. I shall meet the following specifications:
* Netting:Biodegradable, natural fiber.
* Matrix Material:100% coconut fiber.
* Stitching:Biodegradable thread on 1.5 inch centers.
* Shear stress:2.35 lbs / SQ. FT.
* Velocity:10 feet per second.
* Longevity:up to 24 months.
* North American Green C125 BN or equivalent shall be used.

E.C.B. 2 shall meet the following specifications:
* Netting:100% Biodegradable, natural fiber.
* Matrix Material:100% straw.
* Stitching:Biodegradable thread on 1.5 inch centers.
* Shear stress:1.855 lbs. / SQ. FT.
* Velocity:6 feet per second.
* Longevity:up to 12 months.
* North American Green S150 BN or equivalent shall be used.

Note
* E.C.B. 1, E.C.B. 2, straw mulch or a combination of each will be used to prevent erosion and assist vegetation establishment along stream banks and throughout the riparian zone. Straw mulch will be crimped, tacked, or held in place with a biodegradable net, as needed.

Proposed Channel Dimensions

Bankfull Width (BFW) = 11.77'
Bankfull Max. Depth = 1.21'
Bankfull Area = 9.86 sq. ft.
Bankfull Mean Depth = 0.84'
Flood-Prone Width (FPW) = 26' Min
W/D Ratio = 14.05
Entrenchment Ratio = 2.2 or greater
Bench Width = 3.5' Min



Note
* Tree spacing shown (10' x 10') is based on bare root seedlings. See mitigation plan for other tree planting options.

Typical Riffle Cross Section Stream Int-1 DS
Rosgen Stream Type "C"
Scale: 1"=10'

T.H.E. Engineers, Inc.

PROJECT: P RIDGE SOUTH PIT, AMEND. #1 MINE SITE - PROPOSED MITIGATION

COUNTY: OHIO | STATE: KY | NEAR: PLEASANT RIDGE | ITEM: PROPOSED TYPICAL RIFFLE CROSS SECTION | STREAM: INTERMITTENT I DS | EXHIBIT 5

DATE:

EROSION CONTROL BLANKET (may be used as needed)

E.C.B. I shall meet the following specifications:
* Netting:Biodegradable, natural fiber.
* Matrix Material:100% coconut fiber.
* Stitching:Biodegradable thread on 1.5 inch centers.
* Shear stress:2.35 lbs / SQ. FT.
* Velocity:10 feet per second.
* Longevity:up to 24 months.
* North American Green C125 BN or equivalent shall be used.

E.C.B. 2 shall meet the following specifications:
* Netting:100% Biodegradable, natural fiber.
* Matrix Material:100% straw.
* Stitching:Biodegradable thread on 1.5 inch centers.
* Shear stress:1.855 lbs. / SQ. FT.
* Velocity:6 feet per second.
* Longevity:up to 12 months.
* North American Green S150 BN or equivalent shall be used.

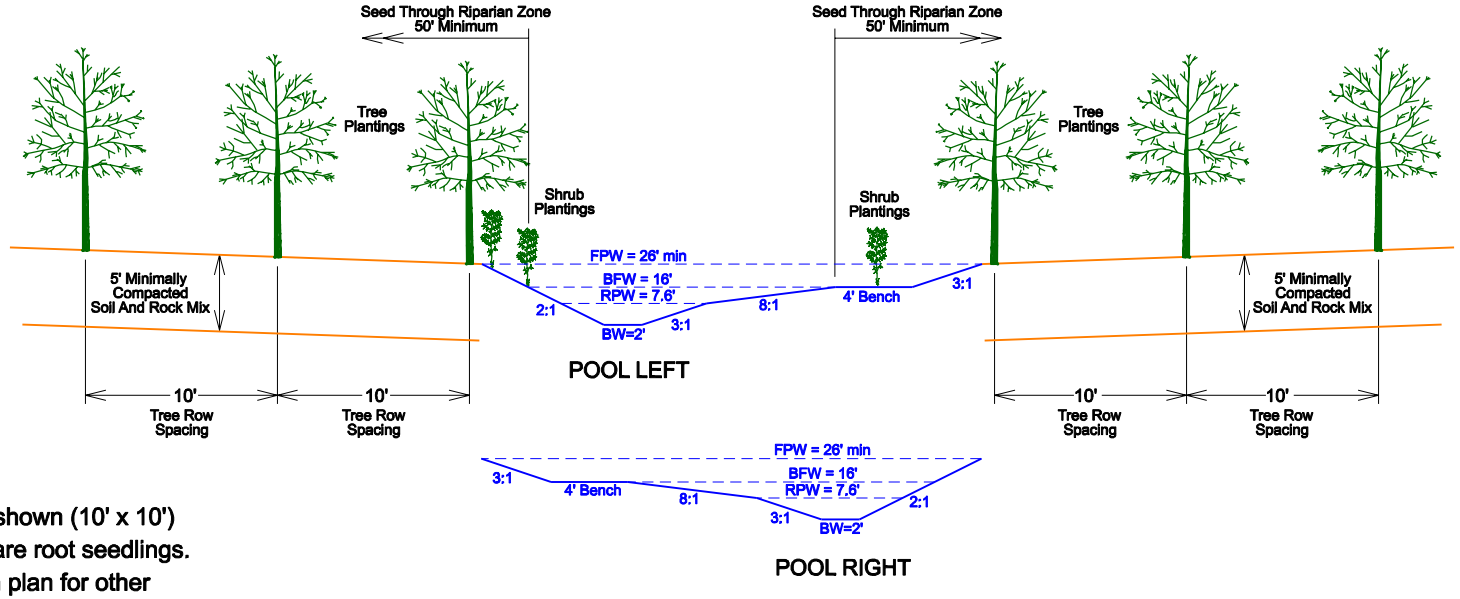
In bend sections, the outside bend may be stabilized with a combination of Erosion Control Blanket Type 1 (E.C.B. 1) and shrub plantings. E.C.B. 1 shall be anchored in at residual pool elevation and extend to Flood Prone Elevation. Beyond this elevation E.C.B. 2 may be placed throughout the riparian zone. In bend sections where structures (J-Hooks, Cross Vanes, etc.) are specified, E.C.B. 1 installation shall begin just above the structure location.

In bend sections, E.C.B. 1 may be placed along the inside bend (Point Bar). Blanket installation shall begin at the bottom of the point bar slope (just above Residual Pool Elevation) and extend to Flood Prone Elevation. E.C.B. 2 may be placed beyond this location as needed.

Proposed Channel Dimensions

Bankfull Width (BFW) = 16.0'
Bankfull Max. Depth = 1.96'
Bankfull Area = 15.3 sq. ft.
Bankfull Mean Depth = 0.96'
Flood-Prone Width (FPW) = 26' Min
W/D Ratio = 16.73
Residual Pool (RP) Max. Depth = 1.12'
Residual Pool (RP) Width = 7.6'

Note
* Durable rock may be used instead of ECB 1 along outside bends. The rock shall be placed at bottom of pool and extend to bankfull elevation. ECB 1 may be used above this elevation, rock size shall be a minimum of 1' diameter and shall be keyed into bank and bottom of channel.



Note
* Tree spacing shown (10' x 10') is based on bare root seedlings. See mitigation plan for other tree planting options.

Typical Pool Cross Section Stream Int-1 DS
Rosgen Stream Type "C"
Scale: 1"=10'

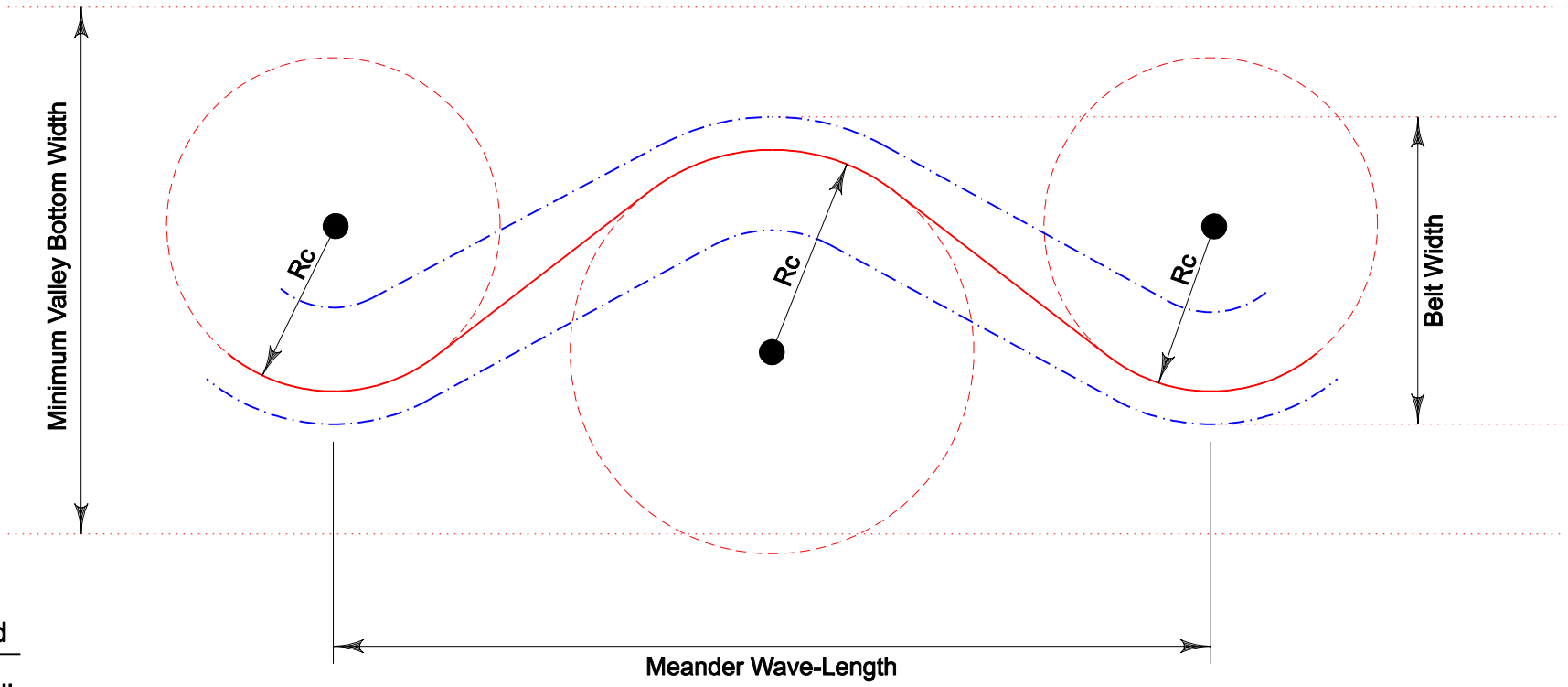
T.H.E. Engineers, Inc.

PROJECT: P RIDGE SOUTH PIT, AMEND. #1 MINE SITE - PROPOSED MITIGATION

COUNTY: OHIO | STATE: KY | NEAR: PLEASANT RIDGE | ITEM: PROPOSED TYPICAL POOL CROSS SECTION | STREAM: INTERMITTENT I DS | EXHIBIT 6

DATE:

Typical Meander Pattern for Rosgen Stream Type "C"
Stream INT -1 US



Legend

Bankfull

Thalweg

Bankfull Width=9.4'
Radius of Curvature (Rc) Ranges from 23' to 29'
Belt Width= 75' to 103'
Meander Wavelength= 84' to 132'
Approximate Proposed Reach Length = 1611'
Proposed Sinuosity 1.2 or greater
Proposed Stream Gradient Ranges from 0.83% to 1.67%
Proposed Valley Slope Ranges from 1.0% to 2.0%
Minimum Valley Bottom Width = 115'

T.H.E. Engineers, Inc.

PROJECT: P RIDGE SOUTH PIT, AMEND. #1 MINE SITE - PROPOSED MITIGATION

COUNTY: OHIO | STATE: KY | NEAR: PLEASANT RIDGE | ITEM: PROPOSED TYPICAL MEANDOR PATTERN | STREAM: INTERMITTENT 1 US | EXHIBIT 7

DATE:

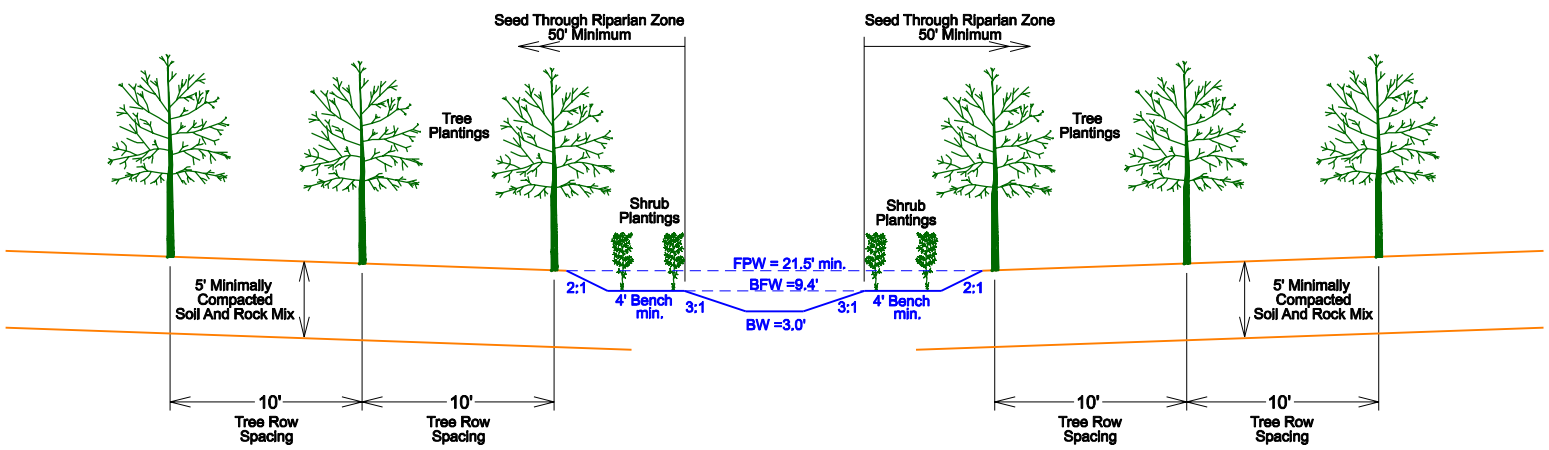
EROSION CONTROL BLANKET (may be used as needed)

E.C.B. I shall meet the following specifications:
* Netting:Biodegradable, natural fiber.
* Matrix Material:100% coconut fiber.
* Stitching:Biodegradable thread on 1.5 inch centers.
* Shear stress:2.35 lbs / SQ. FT.
* Velocity:10 feet per second.
* Longevity:up to 24 months.
* North American Green C125 BN or equivalent shall be used.

E.C.B. 2 shall meet the following specifications:
* Netting:100% Biodegradable, natural fiber.
* Matrix Material:100% straw.
* Stitching:Biodegradable thread on 1.5 inch centers.
* Shear stress:1.855 lbs. / SQ. FT.
* Velocity:6 feet per second.
* Longevity:up to 12 months.
* North American Green S150 BN or equivalent shall be used.

Note
* E.C.B. 1, E.C.B. 2, straw mulch or a combination of each will be used to prevent erosion and assist vegetation establishment along stream banks and throughout the riparian zone. Straw mulch will be crimped, tacked, or held in place with a biodegradable net, as needed.

Proposed Channel Dimensions
* Bankfull Width (BFW) = 9.4'
* Bankfull Max. Depth = 1.07'
* Bankfull Area = 6.6SF
* Bankfull Mean Depth = 0.7'
* Flood-Prone Width (FPW) = 21.5' min
* W/D Ratio = 13.4
* Entrenchment Ratio = 2.2 or greater
* Bench Width = 4.0' min



Note
* Tree spacing shown (10' x 10') is based on 3 gallon container grown trees. If RPM Trees are used the spacing will be 25' x 25'.

Typical Riffle Cross Section Stream INT-1 US
Rosgen Stream Type "C"
Scale: 1"=10'

T.H.E. Engineers, Inc.

PROJECT: P RIDGE SOUTH PIT, AMEND. #1 MINE SITE - PROPOSED MITIGATION

COUNTY: OHIO | STATE: KY | NEAR: PLEASANT RIDGE | ITEM: PROPOSED TYPICAL RIFFLE CROSS SECTION | STREAM: INTERMITTENT I US | EXHIBIT 8

DATE:

EROSION CONTROL BLANKET (may be used as needed)

E.C.B. I shall meet the following specifications:
* Netting:Biodegradable, natural fiber.
* Matrix Material:100% coconut fiber.
* Stitching:Biodegradable thread on 1.5 inch centers.
* Shear stress:2.35 lbs / SQ. FT.
* Velocity:10 feet per second.
* Longevity:up to 24 months.
* North American Green C125 BN or equivalent shall be used.

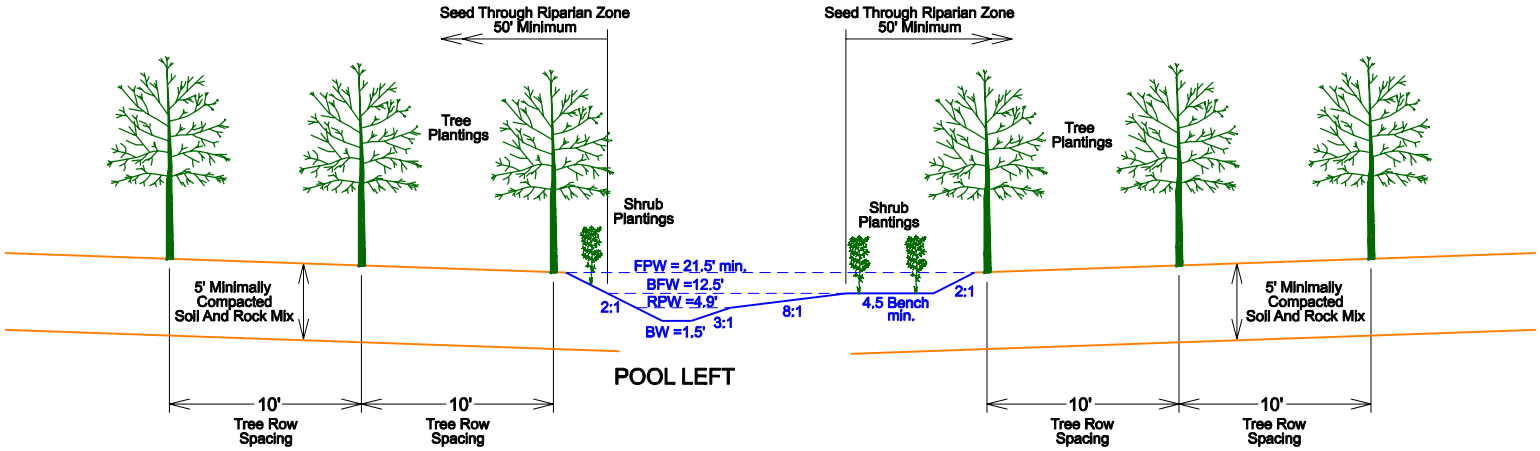
E.C.B. 2 shall meet the following specifications:
* Netting:100% Biodegradable, natural fiber.
* Matrix Material:100% straw.
* Stitching:Biodegradable thread on 1.5 inch centers.
* Shear stress:1.855 lbs. / SQ. FT.
* Velocity:6 feet per second.
* Longevity:up to 12 months.
* North American Green S150 BN or equivalent shall be used.

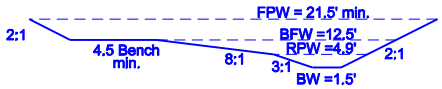
For this reach of stream, it is recommended that E.C.B. 1 or E.C.B. 2 be place along the outside bends beginning at Residual Pool elevation and extending to Flood Prone elevation. In bend sections where structures (J-Hooks, Cross Vanes, etc.) are specified, E.C.B. 1 or E.C.B. 2 installation shall begin just above the structure location.

E.C.B. 1, E.C.B. 2, straw mulch or a combination of each will be used to prevent erosion and assist vegetation establishment along stream banks and throughout the riparian zone. Straw mulch will be crimped, tacked, or held in place with a biodegradable net, as needed.

Proposed Channel Dimensions
* Bankfull Width (BFW) = 12.5'
* Bankfull Max. Depth = 1.44'
* Bankfull Area = 8.78SF
* Bankfull Mean Depth = 0.7'
* Flood-Prone Width (FPW) = 21.5' min
* W/D Ratio = 17.8
* Residual Pool (RP) Max. Depth = 0.68 '
* Residual Pool (RP) Width = 4.9'

Note
* Durable rock may be used instead of E.C.B. 1 or E.C.B. 2 along outside bends. The rock shall be placed at bottom of pool and extend to bankfull elevation. E.C.B. 1 or E.C.B. 2 may be used above this elevation, rock size shall be a minimum of 1.5' diameter and shall be keyed into bank and bottom of channel.





Note
* Tree spacing shown (10'x 10') is based on 3 gallon container grown trees. If RPM Trees are used the spacing will be 25' x 25'.

Typical Pool Cross Section Stream INT-1 US
Rosgen Stream Type "C"
Scale: 1"=10'

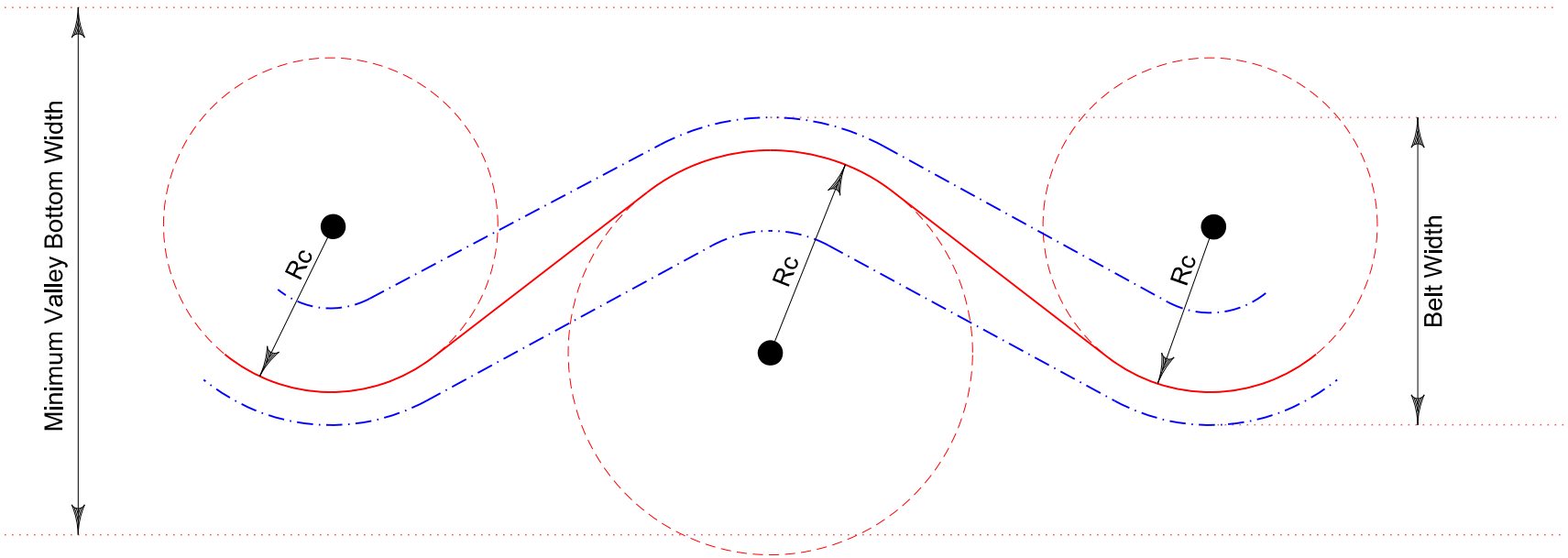
T.H.E. Engineers, Inc.

PROJECT: P RIDGE SOUTH PIT, AMEND. #1 MINE SITE - PROPOSED MITIGATION

COUNTY: OHIO | STATE: KY | NEAR: PLEASANT RIDGE | ITEM: PROPOSED TYPICAL POOL CROSS SECTION | STREAM: INTERMITTENT I US | EXHIBIT 9

DATE:

Typical Meander Pattern for Rosgen Stream Type "E"
Stream INT - 2



Legend

Bankfull

Thalweg

Bankfull Width= 6.75'
Radius Of Curvature (Rc) Ranges From 16.5' To 20.5'
Belt Width Ranges From 67' To 122'
Meander Wavelength Ranges From 67' To 95'
Approximate Proposed Reach Length = 1056'
Proposed Sinuosity 1.5 or greater
Proposed Stream Gradient Ranges From 0.67% To 1.3%
Proposed Valley Slope Ranges From 1.0% To 2.0%
Minimum Valley Bottom Width = 135'

T.H.E. Engineers, Inc.

PROJECT: P RIDGE SOUTH PIT, AMEND. "I MINE SITE - PROPOSED MITIGATION

STREAM: INTERMITTENT 2

COUNTY: OHIO

STATE: KY

NEAR: PLEASANT RIDGE

ITEM: PROPOSED TYPICAL MEANDOR PATTERN

EXHIBIT 10

DATE:

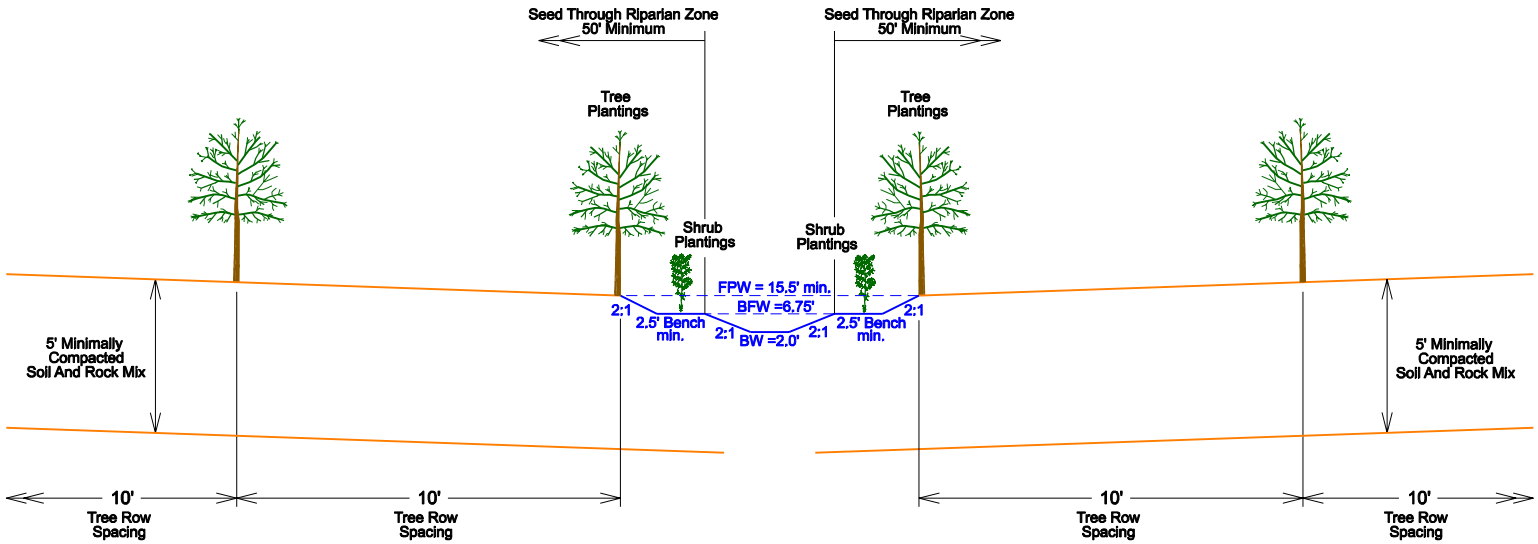
EROSION CONTROL BLANKET (may be used as needed)

E.C.B. I shall meet the following specifications:
* Netting:Biodegradable, natural fiber.
* Matrix Material:100% coconut fiber.
* Stitching:Biodegradable thread on 1.5 inch centers.
* Shear stress:2.35 lbs / SQ. FT.
* Velocity:10 feet per second.
* Longevity:up to 24 months.
* North American Green C125 BN or equivalent shall be used.

E.C.B. 2 shall meet the following specifications:
* Netting:100% Biodegradable, natural fiber.
* Matrix Material:100% straw.
* Stitching:Biodegradable thread on 1.5 inch centers.
* Shear stress:1.855 lbs. / SQ. FT.
* Velocity:6 feet per second.
* Longevity:up to 12 months.
* North American Green S150 BN or equivalent shall be used.

Note
* E.C.B. 1, E.C.B. 2, straw mulch or a combination of each will be used to prevent erosion and assist vegetation establishment along stream banks and throughout the riparian zone. Straw mulch will be crimped, tacked, or held in place with a biodegradable net, as needed.

Proposed Channel Dimensions
* Bankfull Width (BFW) = 6.75'
* Bankfull Max. Depth = 0.95'
* Bankfull Area = 4.16 sq. ft.
* Bankfull Mean Depth = 0.62'
* Flood-Prone Width (FPW) = 15.5' (Minimum)
* W/D Ratio = 10.95
* Entrenchment Ratio = 2.2 or greater
* Bench Width = 2.5' (Minimum)



Note
* Tree spacing shown (10' x 10') is based on 3 gallon container grown trees. If RPM Trees are used the spacing will be 25' x 25'.

Typical Riffle Cross Section Stream INT - 2
Rosgen Stream Type "E"
Scale: 1"=5'

T.H.E. Engineers, Inc.

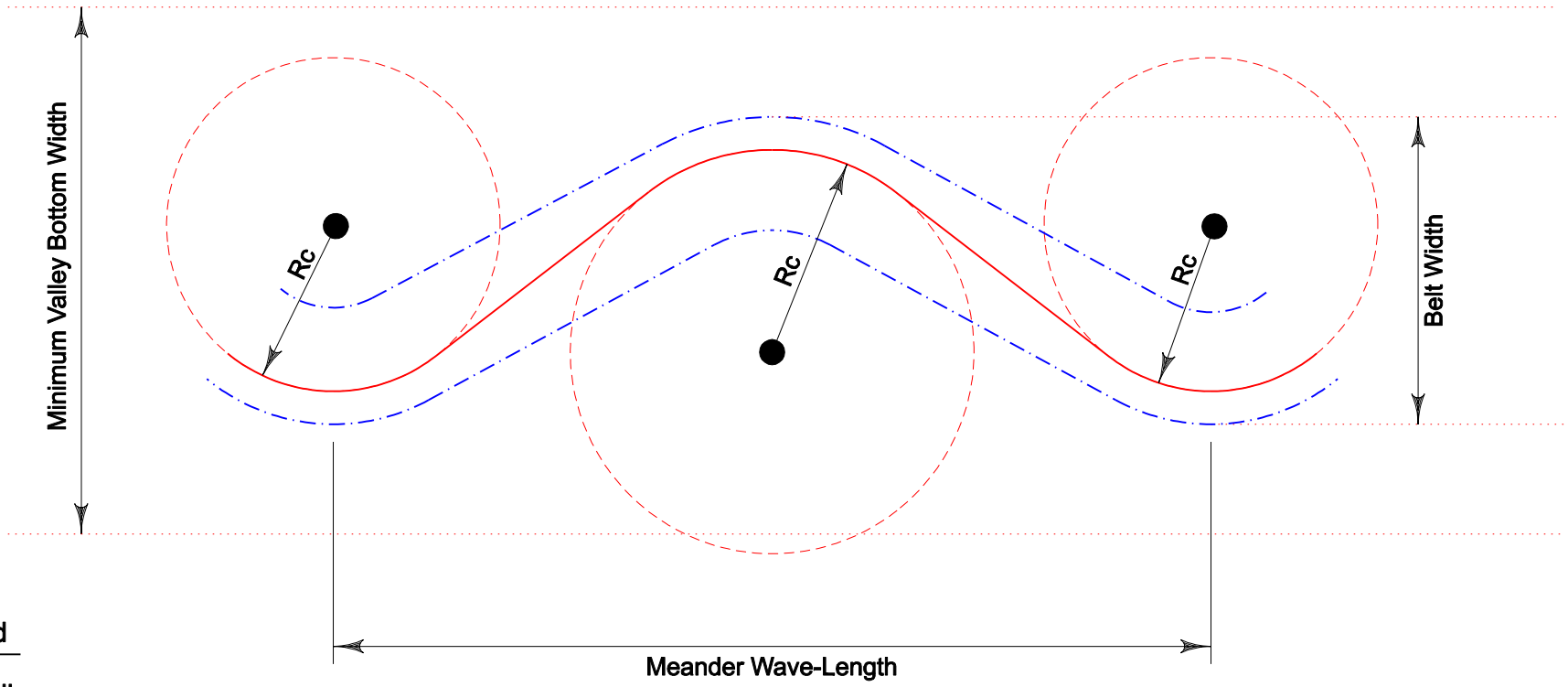
PROJECT: P RIDGE SOUTH PIT, AMEND. #1 MINE SITE - PROPOSED MITIGATION

COUNTY: OHIO | STATE: KY | NEAR: PLEASANT RIDGE | STREAM: INTERMITTENT 2

ITEM: PROPOSED TYPICAL RIFFLE CROSS SECTION | EXHIBIT II

DATE:

Typical Meander Pattern for Rosgen Stream Type "B"
Stream EPH-1



Legend

Bankfull

Thalweg

Bankfull Width=5.0'
Radius of Curvature (Rc) Ranges from 12.5' to 15'
Belt Width Range= 20' TO 25'
Meander Wave-Length NA
Approximate Proposed Reach Length = 1146'
Proposed Sinuosity 1.2 or greater
Proposed Stream Gradient Ranges from 2.1% to 2.9%
Proposed Valley Slope Ranges from 2.5% to 3.5%
Minimum Valley Bottom Width = 35'

T.H.E. Engineers, Inc.

PROJECT: P RIDGE SOUTH PIT, AMEND. #1 MINE SITE - PROPOSED MITIGATION

STREAM: EPHEMERAL 1

COUNTY: OHIO | STATE: KY | NEAR: PLEASANT RIDGE | ITEM: PROPOSED TYPICAL MEANDOR PATTERN | EXHIBIT 12

DATE:

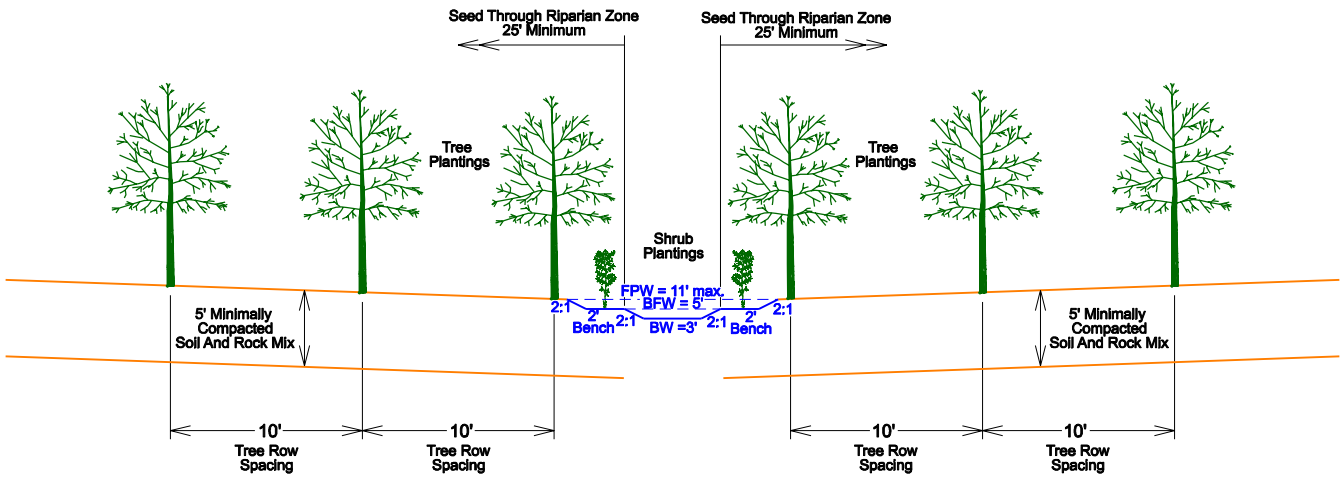
EROSION CONTROL BLANKET (may be used as needed)

E.C.B. I shall meet the following specifications:
* Netting:Biodegradable, natural fiber.
* Matrix Material:100% coconut fiber.
* Stitching:Biodegradable thread on 1.5 inch centers.
* Shear stress:2.35 lbs / SQ. FT.
* Velocity:10 feet per second.
* Longevity:up to 24 months.
* North American Green C125 BN or equivalent shall be used.

E.C.B. 2 shall meet the following specifications:
* Netting:100% Biodegradable, natural fiber.
* Matrix Material:100% straw.
* Stitching:Biodegradable thread on 1.5 inch centers.
* Shear stress:1.855 lbs. / SQ. FT.
* Velocity:6 feet per second.
* Longevity:up to 12 months.
* North American Green S150 BN or equivalent shall be used.

Note
* E.C.B. 1, E.C.B. 2, straw mulch or a combination of each will be used to prevent erosion and assist vegetation establishment along stream banks and throughout the riparian zone. Straw mulch will be crimped, tacked, or held in place with a biodegradable net, as needed.

Proposed Channel Dimensions
* Bankfull Width (BFW) = 5.0'
* Bankfull Max. Depth = 0.5'
* Bankfull Area = 2.0SF
* Bankfull Mean Depth = 0.4'
* Flood-Prone Width (FPW) = 11.0' Max
* W/D Ratio = 12.5
* Entrenchment Ratio = 2.2 (Range 1.4 - 2.2)
* Bench Width = 2'



Note
* Tree spacing shown (10' x 10') is based on 3 gallon container grown trees. If RPM Trees are used the spacing will be 25' x 25'.

Typical Riffle Cross Section Stream EPH-1
Rosgen Stream Type "B"
Scale: 1"=10'

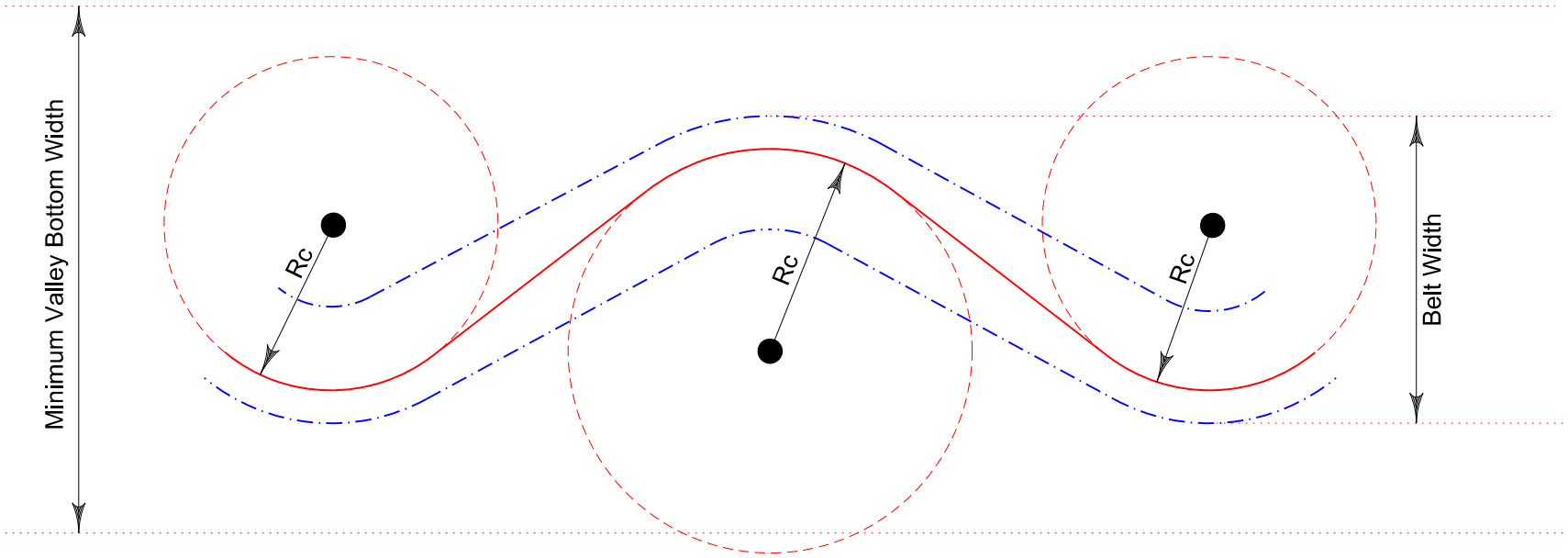
T.H.E. Engineers, Inc.

PROJECT: P RIDGE SOUTH PIT, AMEND. #1 MINE SITE - PROPOSED MITIGATION

COUNTY: OHIO | STATE: KY | NEAR: PLEASANT RIDGE | ITEM: PROPOSED TYPICAL RIFFLE CROSS SECTION | STREAM: EPHEMERAL 1 | EXHIBIT 13

DATE:

Typical Meander Pattern for Rosgen Stream Type "B"
Stream EPH - 2, EPH-3



Legend

Bankfull

Thalweg

Bankfull Width= 5.9'
Radius of Curvature (Rc) Ranges from 14.5' to 18'
Belt Width= 23' to 30'
Meander Wavelength= NA
Approximate Proposed Reach Length = 1148' (EPH-2), 359' (EPH-3)
Proposed Sinuosity 1.2 or greater
Proposed Stream Gradient Ranges from 1.25% to 2.1%
Proposed Valley Slope Ranges from 1.5% to 2.5%
Minimum Valley Bottom Width = 45'

T.H.E. Engineers, Inc.

PROJECT: P RIDGE SOUTH PIT, AMEND. *1 MINE SITE - PROPOSED MITIGATION

COUNTY: OHIO | STATE: KY | NEAR: PLEASANT RIDGE | ITEM: PROPOSED TYPICAL MEANDOR PATTERN | STREAM: EPHEMERAL 2, EPHEMERAL 3 | EXHIBIT 14

DATE:

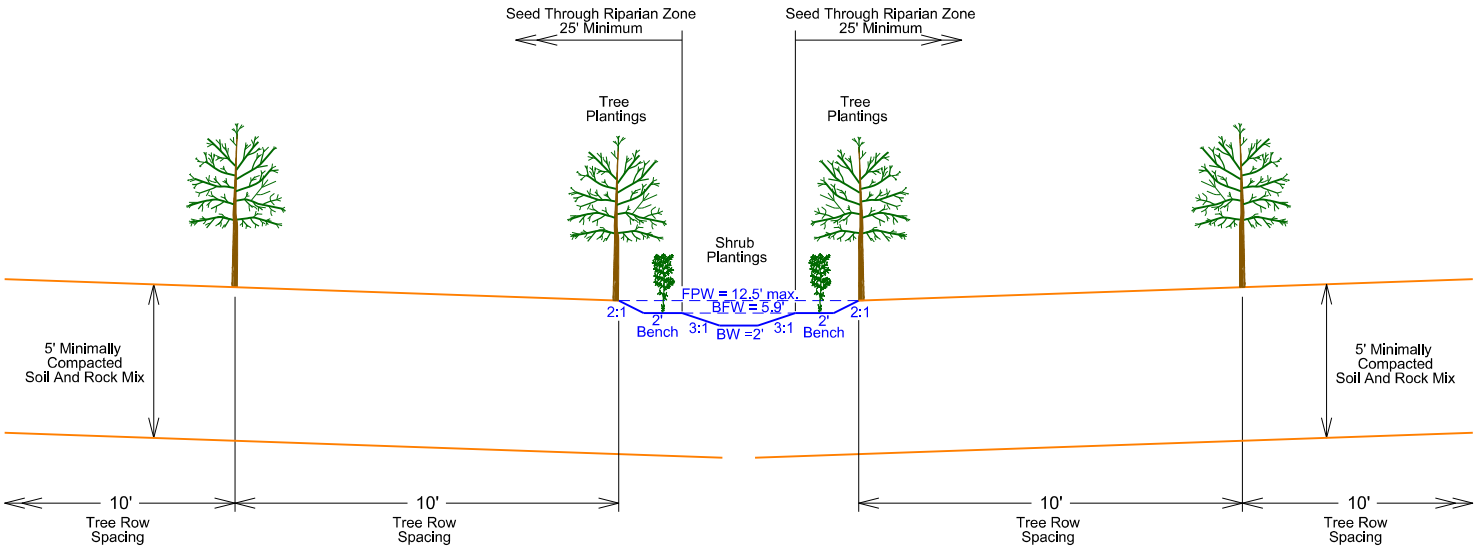
EROSION CONTROL BLANKET (may be used as needed)

E.C.B. I shall meet the following specifications:
* Netting:Biodegradable, natural fiber.
* Matrix Material:100% coconut fiber.
* Stitching:Biodegradable thread on 1.5 inch centers.
* Shear stress:2.35 lbs / SQ. FT.
* Velocity:10 feet per second.
* Longevity:up to 24 months.
* North American Green C125 BN or equivalent shall be used.

E.C.B. 2 shall meet the following specifications:
* Netting:100% Biodegradable, natural fiber.
* Matrix Material:100% straw.
* Stitching:Biodegradable thread on 1.5 inch centers.
* Shear stress:1.855 lbs. / SQ. FT.
* Velocity:6 feet per second.
* Longevity:up to 12 months.
* North American Green S150 BN or equivalent shall be used.

Note
* E.C.B. 1, E.C.B. 2, straw mulch or a combination of each will be used to prevent erosion and assist vegetation establishment along stream banks and throughout the riparian zone. Straw mulch will be crimped, tacked, or held in place with a biodegradable net, as needed.

Proposed Channel Dimensions
* Bankfull Width (BFW) = 5.9'
* Bankfull Max. Depth = 0.65'
* Bankfull Area = 2.57SF
* Bankfull Mean Depth = 0.43'
* Flood-Prone Width (FPW) = 12.5' max
* W/D Ratio = 13.54
* Entrenchment Ratio = 2.12 (Range 1.4 - 2.2)
* Bench Width = 2.0' max



Note
* Tree spacing shown (10' x 10') is based on 3 gallon container grown trees. If RPM Trees are used the spacing will be 25' x 25'.

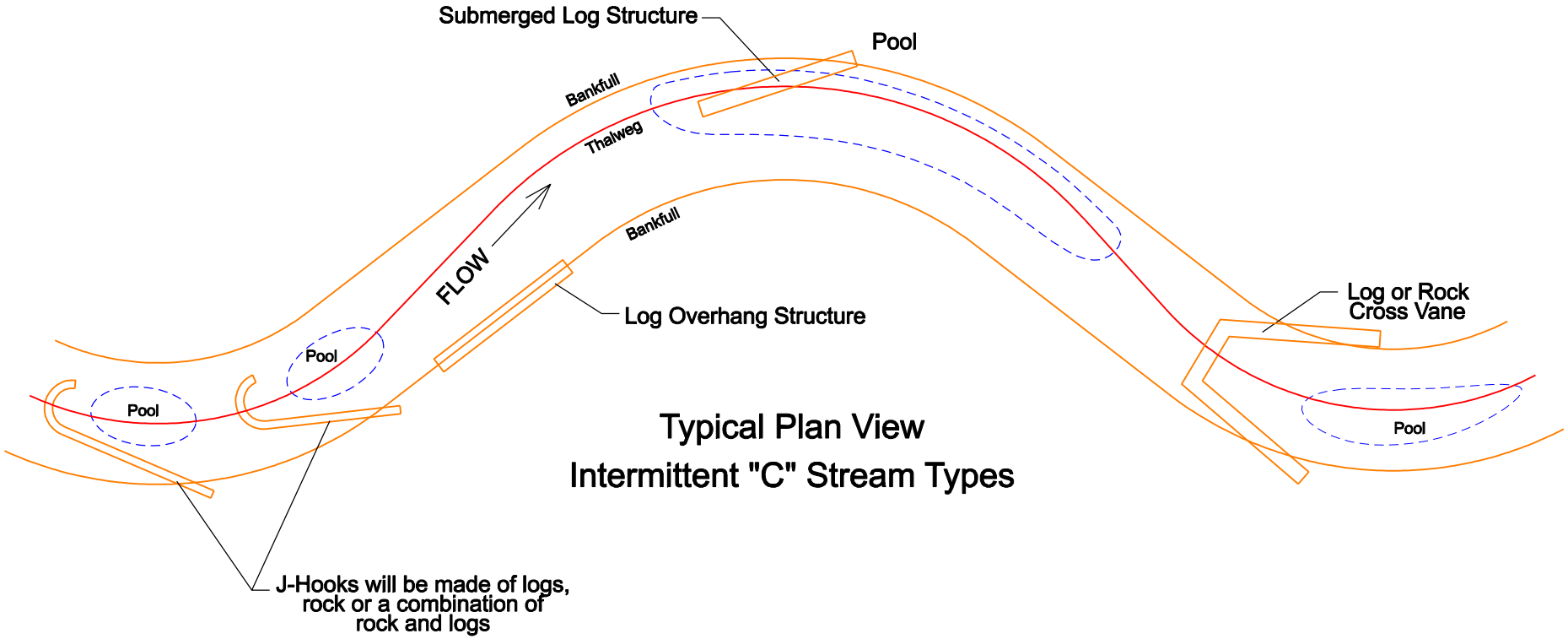
Typical Riffle Cross Section Stream EPH - 2, EPH-3
Rosgen Stream Type "B"
Scale: 1"=5'

T.H.E. Engineers, Inc.

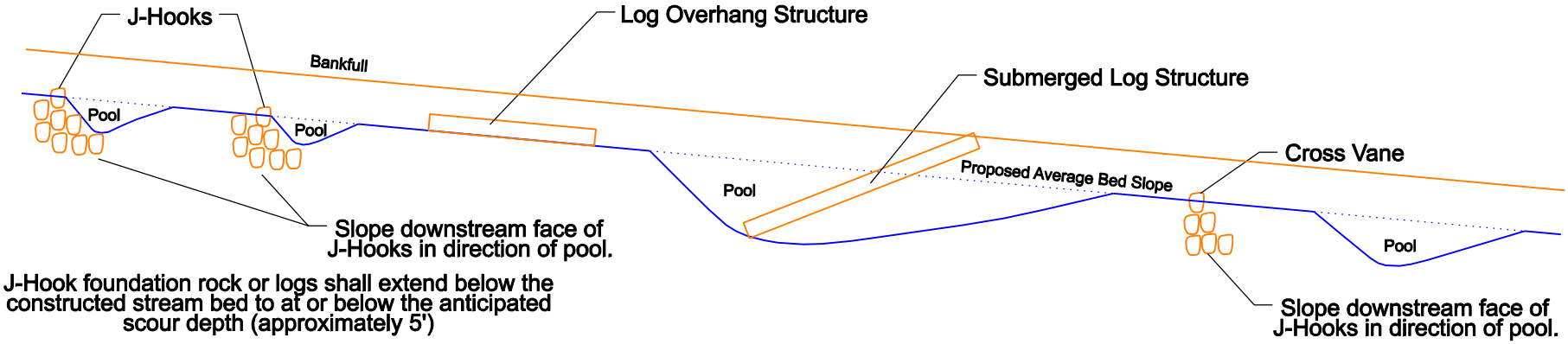
PROJECT: P RIDGE SOUTH PIT, AMEND. "I MINE SITE - PROPOSED MITIGATION

COUNTY: OHIO | STATE: KY | NEAR: PLEASANT RIDGE | ITEM: PROPOSED TYPICAL RIFFLE CROSS SECTION | STREAM: EPHEMERAL 2, EPHEMERAL 3 | EXHIBIT 15

DATE:



Typical Plan View
Intermittent "C" Stream Types



J-Hook foundation rock or logs shall extend below the constructed stream bed to at or below the anticipated scour depth (approximately 5')

Cross Vane foundation rock or logs shall extend below the constructed stream bed to at or below the anticipated scour depth (approximately 5')

Pools, J-Hooks, Cross Vanes or submerged logs will be placed in outside meander bends on Intermittent "C" Stream Types. Structure dimensions, including rock and log diameter will be based on channel size and slope. Log Overhang Structures will be placed in straight or tangent sections of the stream. The frequency and randomness of structure placement will be determined as the stream is constructed.

Typical Profile View
Intermittent "C" Stream Types

T.H.E. Engineers, Inc.

PROJECT: P RIDGE SOUTH PIT, AMEND. #1 MINE SITE

COUNTY: OHIO

STATE: KY

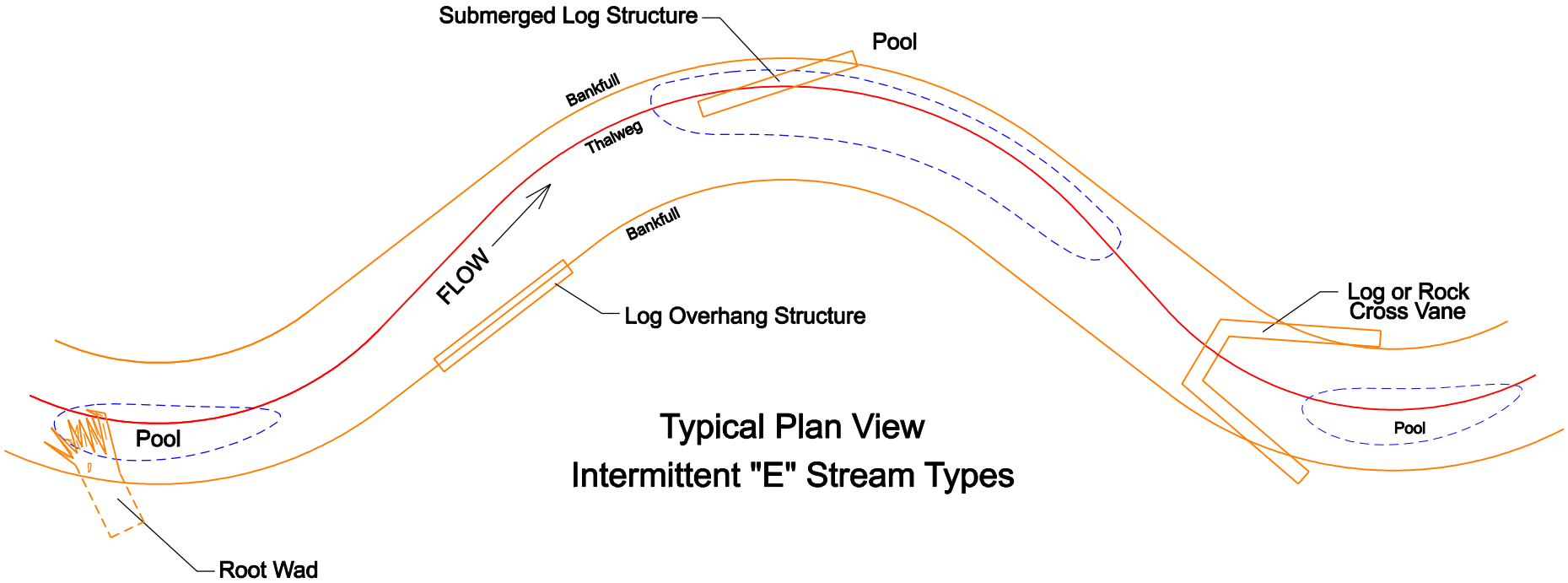
NEAR: PLEASANT RIDGE

ITEM: TYPICAL PLAN AND PROFILE VIEW

STREAM: UT'S OF NORHT FORK BARNETT CREEK

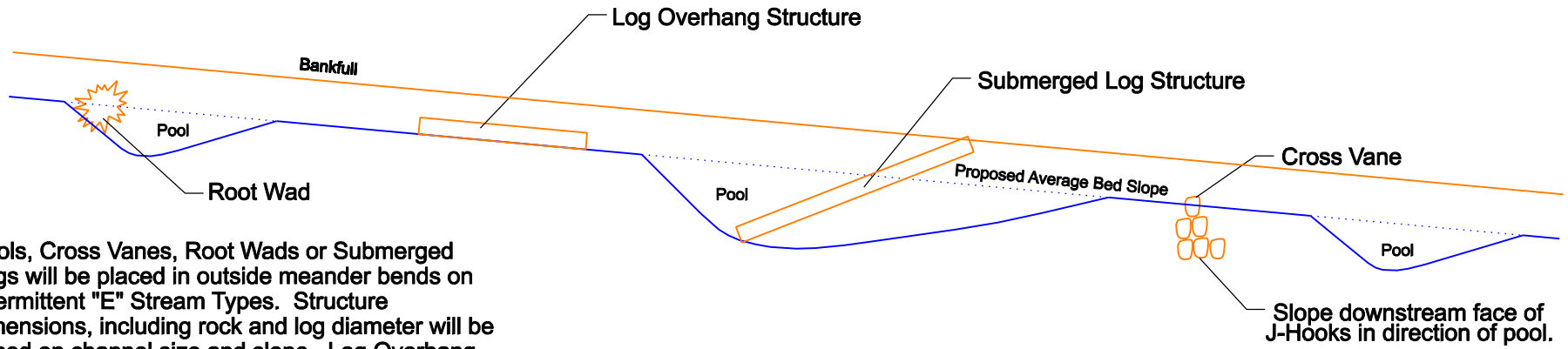
EXHIBIT 16

DATE:



Typical Plan View
Intermittent "E" Stream Types

Maximum pool depth
to be 1' to 2'.



Pools, Cross Vanes, Root Wads or Submerged Logs will be placed in outside meander bends on Intermittent "E" Stream Types. Structure dimensions, including rock and log diameter will be based on channel size and slope. Log Overhang Structures will be placed in straight or tangent sections of the stream. The frequency and randomness of structure placement will be determined as the stream is constructed.

Cross Vane foundation rock or logs shall extend below the constructed stream bed to at or below the anticipated scour depth (approximately 5')

Typical Profile View
Intermittent "E" Stream Types

T.H.E. Engineers, Inc.

PROJECT: P RIDGE SOUTH PIT, AMEND. #1 MINE SITE

COUNTY: OHIO

STATE: KY

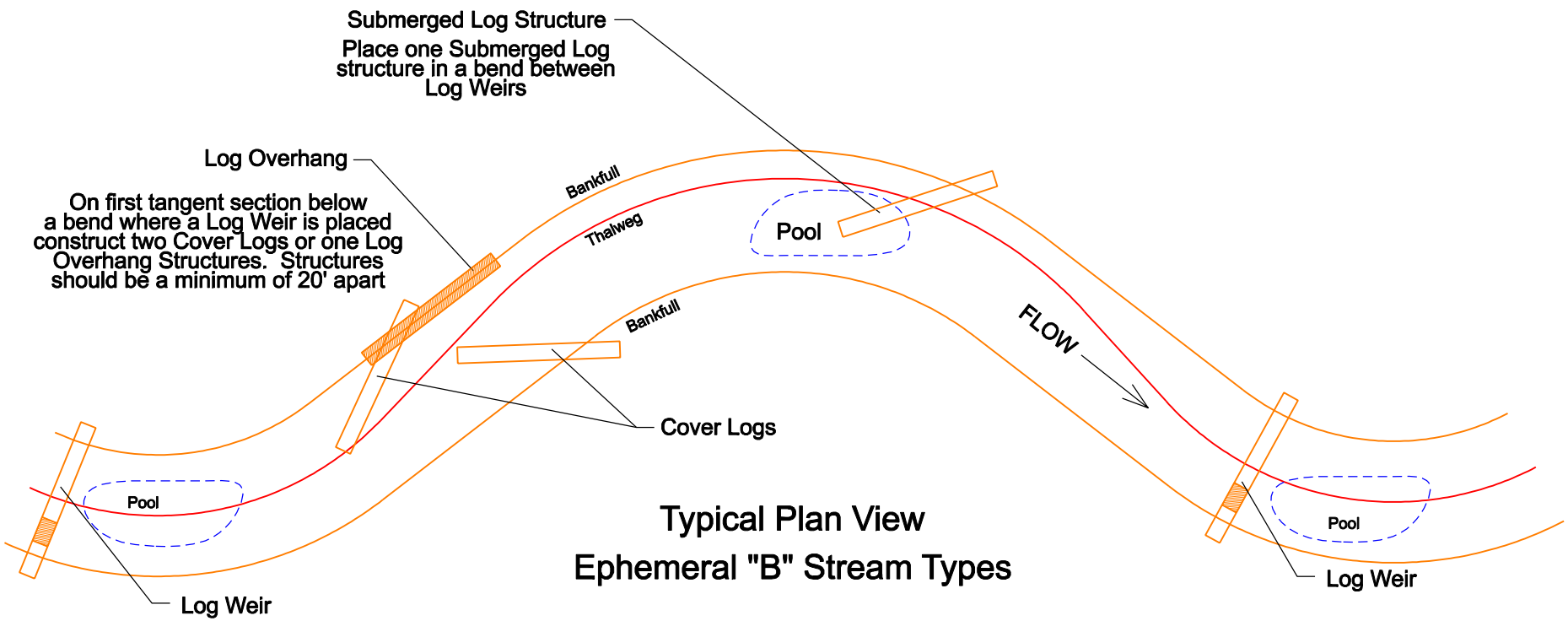
NEAR: PLEASANT RIDGE

ITEM: TYPICAL PLAN AND PROFILE VIEW

STREAM: UT'S OF NORHT FORK BARNETT CREEK

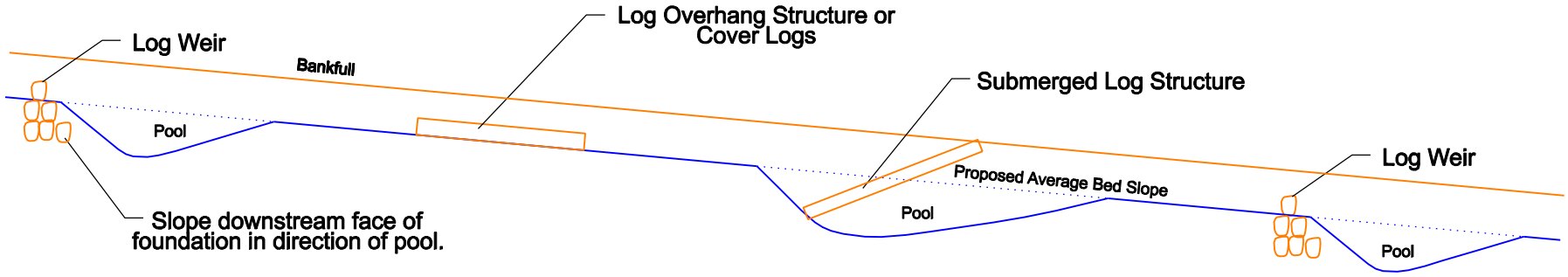
EXHIBIT I7

DATE:



Typical Plan View
Ephemeral "B" Stream Types

Max pool depths to be 1' to 2'.



Foundation logs below the exposed weir log shall extend below the constructed stream bed to at or below the anticipated scour depth (approximately 5').

Note: Meander Length may vary. Generally place a Log Weir every 150'-250' along the stream reach at the beginning of a bend in the stream.

Typical Profile View
Ephemeral "B" Stream Types

T.H.E. Engineers, Inc.

PROJECT: P RIDGE SOUTH PIT, AMEND. #1 MINE SITE

COUNTY: OHIO

STATE: KY

NEAR: PLEASANT RIDGE

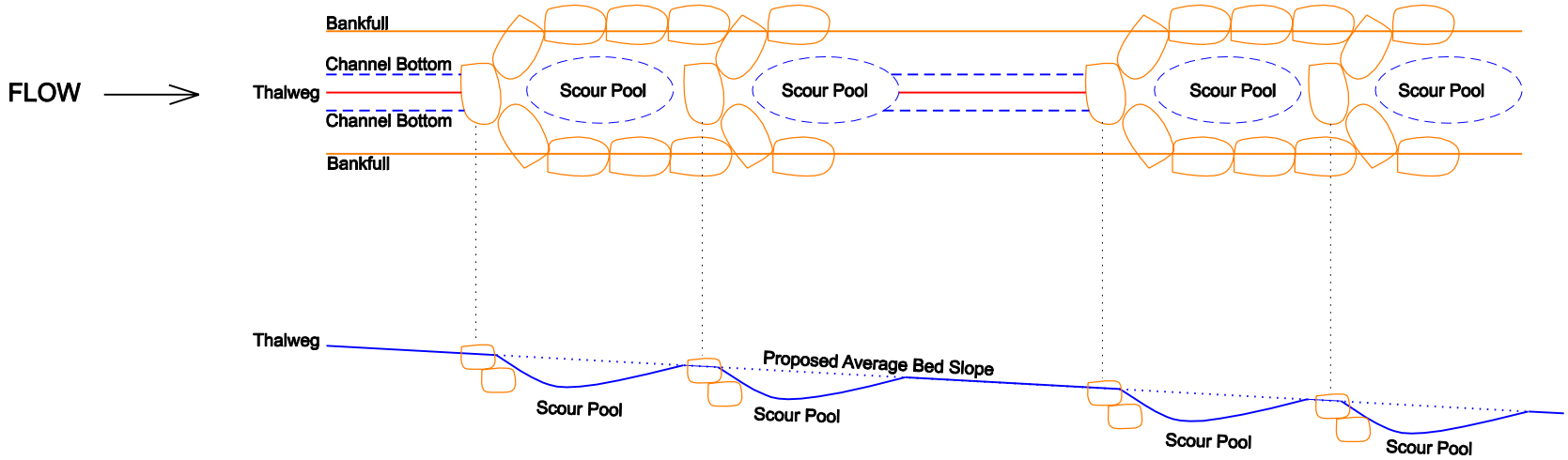
ITEM: TYPICAL PLAN AND PROFILE VIEW

STREAM: UT'S OF NORHT FORK BARNETT CREEK

EXHIBIT 18

DATE:

Typical Plan View
Rock Step Structure
Alternate Ephemeral "B" Stream Types

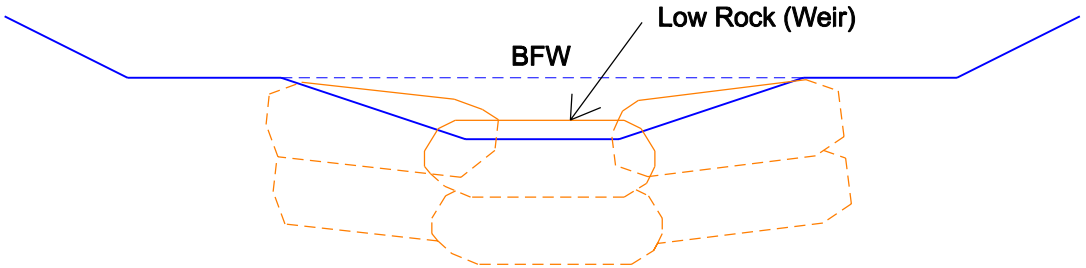


Typical Profile of Alaternate Ephemeral "B" Stream Types
Step-Pool Channel

Spacing of Rock Step Structures and size of rock used will be based on channel size and channel slope. These structures will be used on Ephemeral "B" Stream Types as alternatives.

Pools are to be excavated just downstream of low rock (weir). Pool depths will vary from 0.5 foot to 1.0 foot.

When rock is not available, logs spanning the stream bottom and buried into the banks at least 1/2 the bankfull stream width can be substituted. Top of the logs need to be placed so that they are level with the bankfull elevation and a notch cut out to form a weir at least 1/2 the bank full depth and running 1/3 of the length of the bankfull width. Logs should be buried below the stream bottom to prevent scour.



Typical Section of Rock Step Structure

T.H.E. Engineers, Inc.

PROJECT: P RIDGE SOUTH PIT, AMEND. #1 MINE SITE

COUNTY: OHIO

STATE: KY

NEAR: PLEASANT RIDGE

ITEM: TYPICAL PLAN AND PROFILE VIEW

STREAM: UT'S OF NORHT FORK BARNETT CREEK

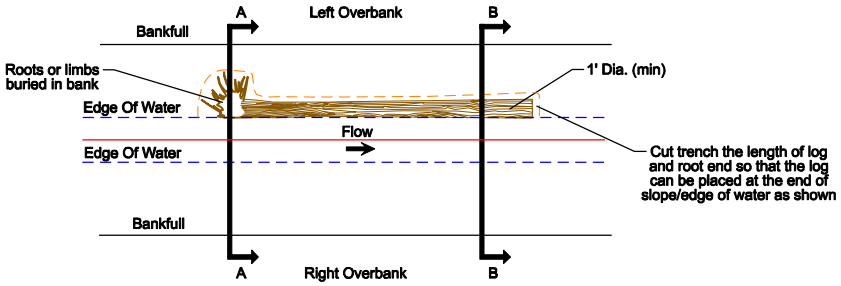
EXHIBIT 19

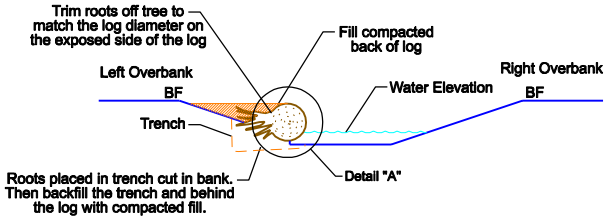
DATE:

Habitat Structure Details

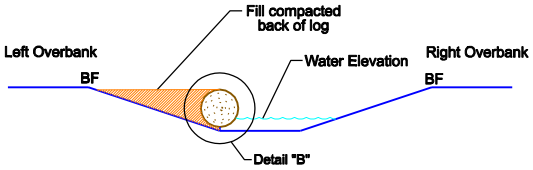
Intermittent "E" &"C" Type Streams

Log Overhang Structure

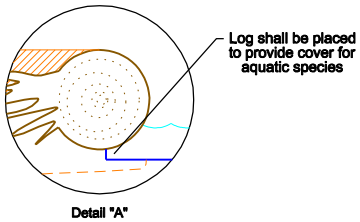


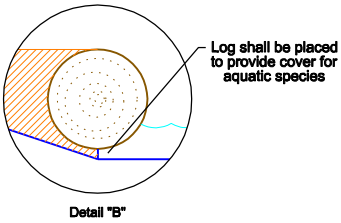


Section A-A

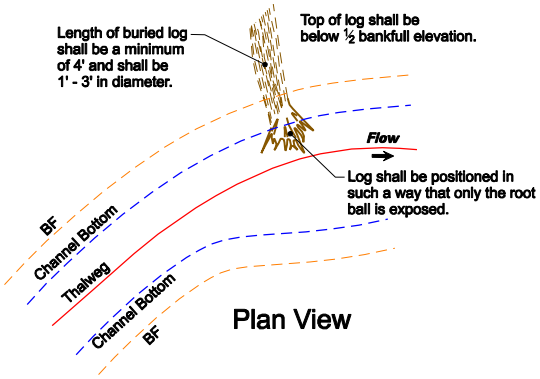


Section B-B



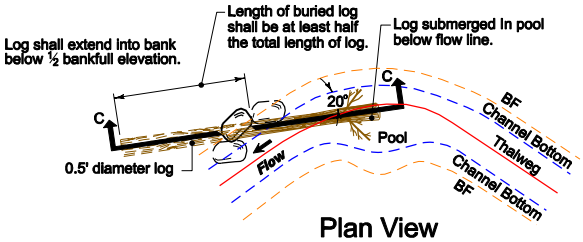


Root Wad

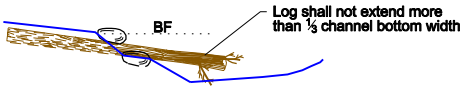


Plan View

Submerged Log Structure



Plan View



Section C-C

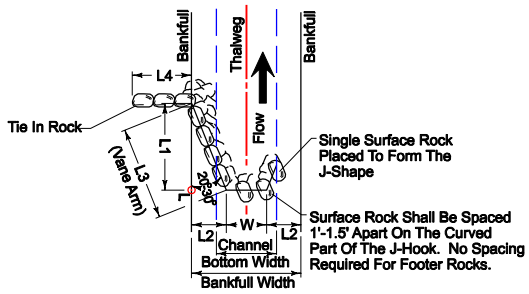
T.H.E. Engineers, Inc.	PROJECT: P RIDGE SOUTH PIT, AMEND. #1 MINE SITE				
	COUNTY: OHIO	STATE: KY	NEAR: PLEASANT RIDGE	ITEM: HABITAT STRUCTURE DETAILS	EXHIBIT 20

DATE:

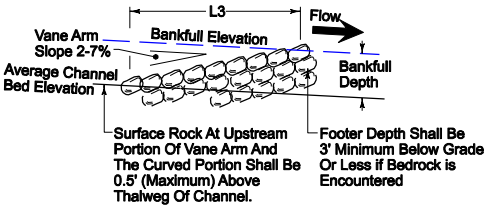
Stability And Habitat Structure Details

Intermittent "E" &"C" Type Streams

Rock J-Hook

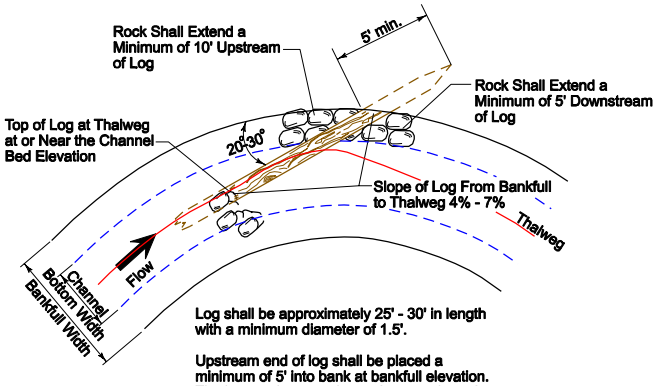


(Plan View)



(Profile Along Vane Arm)

Log Vane With J-Hook



Log shall be approximately 25' - 30' in length with a minimum diameter of 1.5'.

Upstream end of log shall be placed a minimum of 5' into bank at bankfull elevation. The log can be sawed at a sharp angle and driven into bank or placed in trench and backfilled.

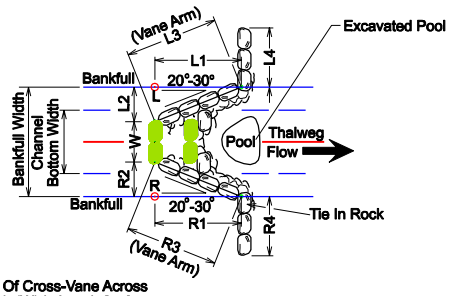
Downstream end of log shall be placed in the channel bottom at center of thalweg.

Rock protection shall be placed along the bank upstream and downstream of the log. Rock placement shall begin at channel bottom toe of slope and extend to bankfull elevation. Rock shall be a minimum of 1.5' diameter and keyed into channel bank.

Rock that is to be placed in the channel to form the J shape shall meet same specifications as those required on Rock J-Hook Structures.

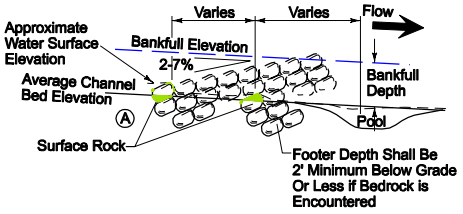
The log at bankfull shall be buried into the channel bank a minimum of 5'.

Double Invert Cross Vane



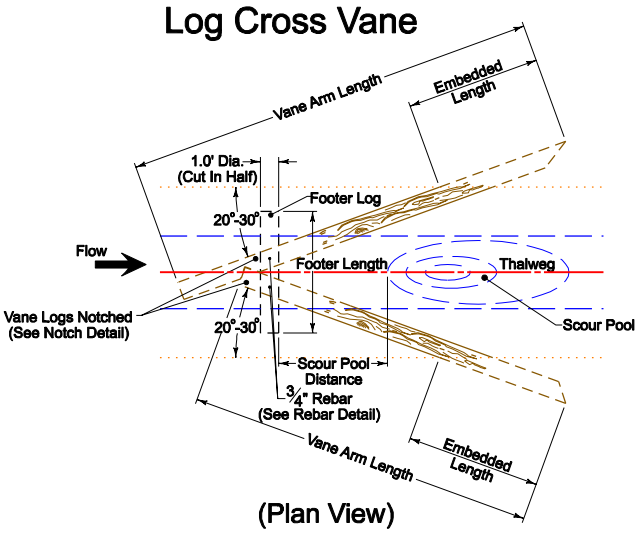
Top Of Cross-Vane Across Width (W) Is Level. Surface Rock In This Level (Upstream) Portion Is 0.5' (Maximum) Above Thalweg Of Channel.

(Plan View)

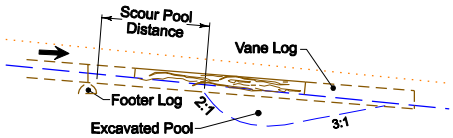


(Profile)

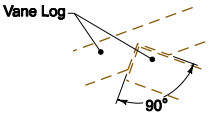
Log Cross Vane



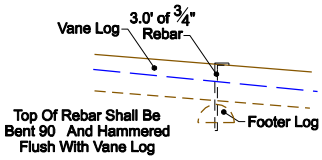
(Plan View)



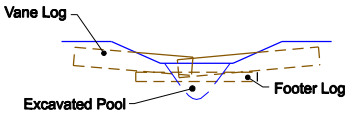
(Profile)



(Notch Detail)



(Rebar Detail)



(Cross Section View)

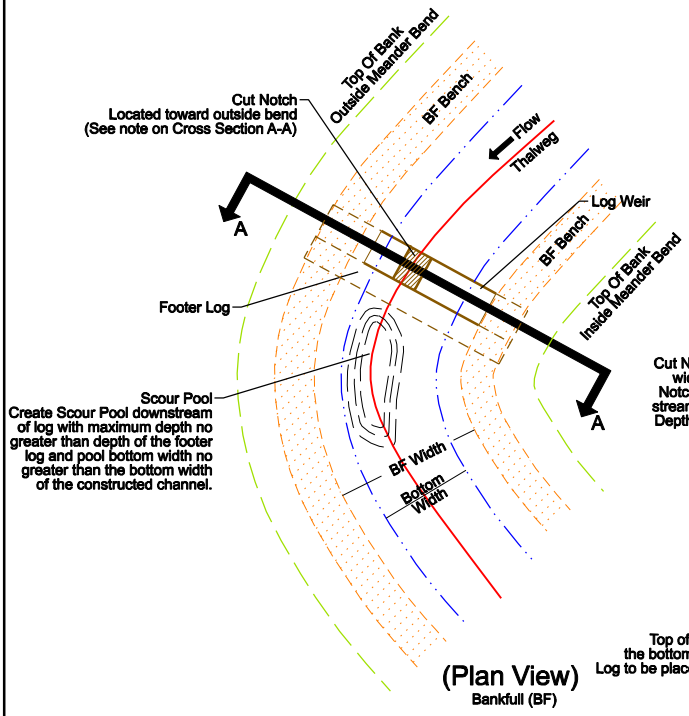
T.H.E. Engineers, Inc.	PROJECT: P RIDGE SOUTH PIT, AMEND. #1 MINE SITE				
	COUNTY: OHIO	STATE: KY	NEAR: PLEASANT RIDGE	ITEM: HABITAT STRUCTURE DETAILS	EXHIBIT 21

DATE:

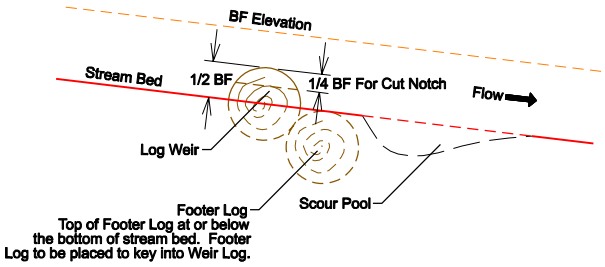
Habitat Structure Details

Ephemeral "B" Type Streams

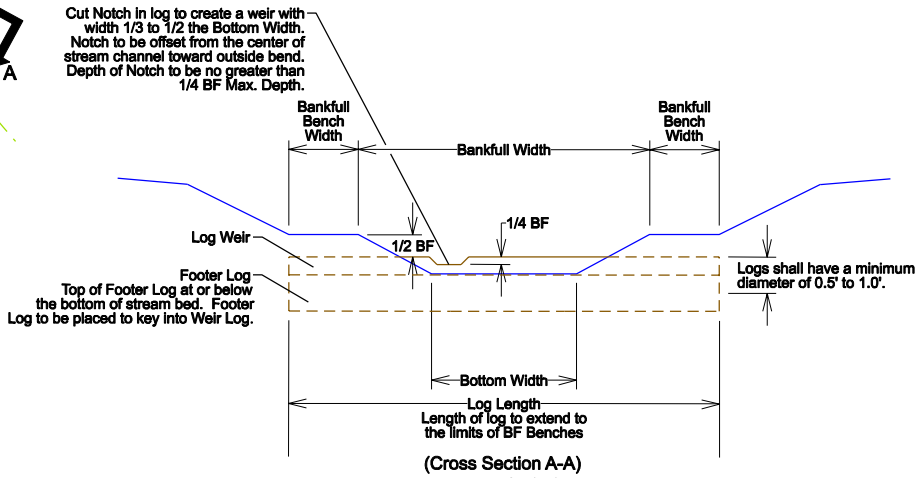
Log Weir



(Plan View)
Bankfull (BF)

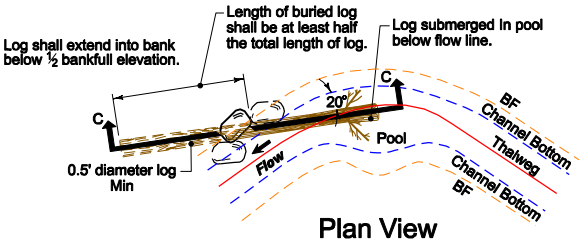


(Profile)
Bankfull (BF)

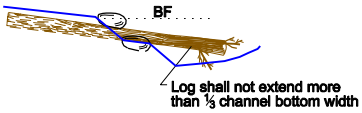


(Cross Section A-A)
Bankfull (BF)

Submerged Log Structure



Plan View



Section C-C

Note: Placement and need of habitat structures to be determined by engineer at time of construction.

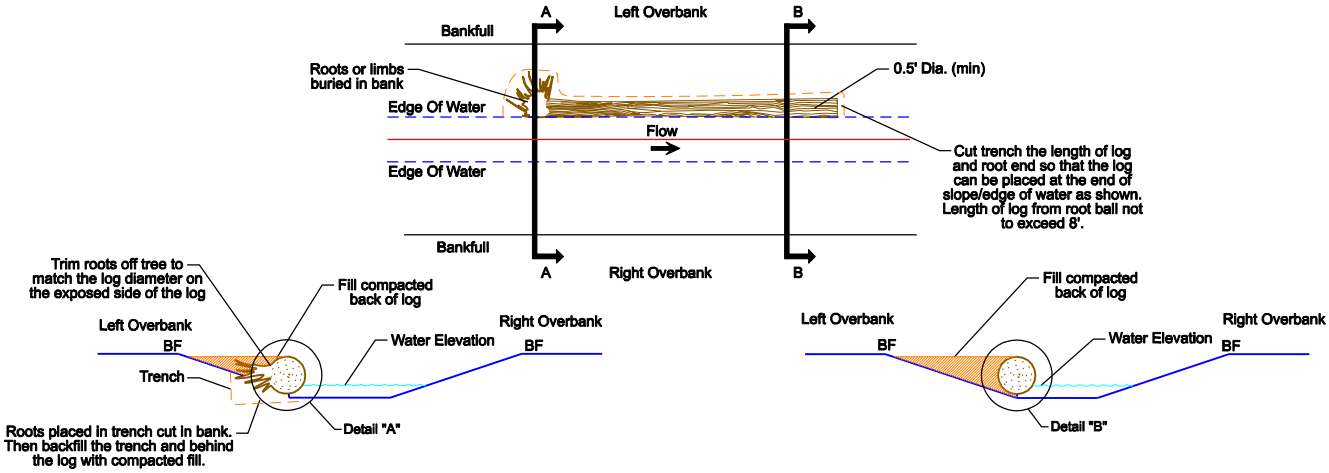
T.H.E. Engineers, Inc.	PROJECT: P RIDGE SOUTH PIT, AMEND. #1 MINE SITE				
	COUNTY: OHIO	STATE: KY	NEAR: PLEASANT RIDGE	ITEM: HABITAT STRUCTURE DETAILS	EXHIBIT 22

DATE:

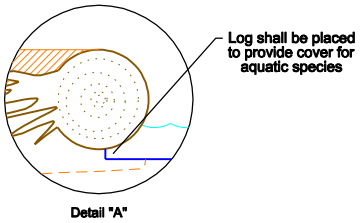
Habitat Structure Details

Ephemeral "B" Type Streams

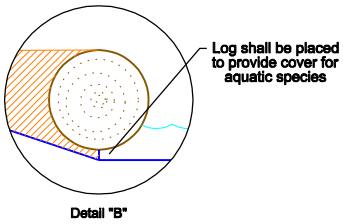
Log Overhang Structure



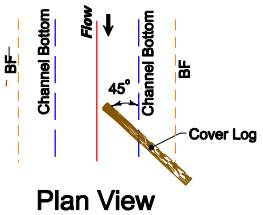
Section A-A



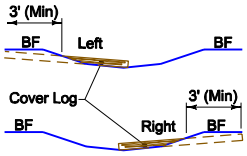
Section B-B



Cover Log



Plan View



Cross Section View

Cover log shall consist of a 0.5' to 1.0' diameter log placed flush on channel bottom. One end of log will extend a minimum of 3.0' into channel bank and other end will extend to ¼ to⅓ channel bottom width. The log shall be angled in upstream direction.

Log will alternate sides. (See Plan Sheets)

Note: Placement and need of habitat structures to be determined by engineer at time of construction.

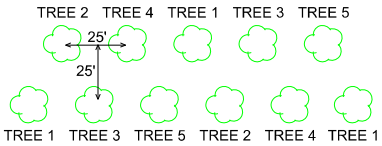
T.H.E. Engineers, Inc.	PROJECT: P RIDGE SOUTH PIT, AMEND. #1 MINE SITE				
	COUNTY: OHIO	STATE: KY	NEAR: PLEASANT RIDGE	ITEM: HABITAT STRUCTURE DETAILS	EXHIBIT 23

DATE:

RIPARIAN ZONE PLANTING NOTES

(USE OPTION ONE OR OPTION TWO FOR TREE PLANTINGS)

PLAN VIEW: PLANTING DETAIL RPM Riparian Trees (Option One)



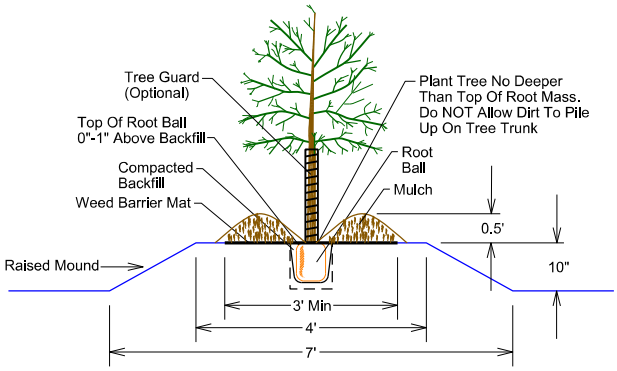
RPM RIPARIAN TREE PLANTINGS (OPTION ONE)

1. Only trees that have been produced by the Root Production Method (RPM) shall be planted in the Riparian zone.
2. The trees shall be three gallon container grown.
3. The trees shall be planted between the dates of October 1 and December 15.
4. Trees in the same row shall be planted on 25 foot spacing.
5. ✱ The first row of trees nearest the channel shall be planted approximately 8 feet beyond the shrub plantings.
6. The second row shall be planted 25 feet behind the first row. The subsequent rows will also be on 25 foot spacing.
7. The trees shall be planted in a staggered pattern, not one directly behind the other.
8. ✱ The trees shall be planted with alternating species.

RECOMMENDED PROCEDURES FOR PLANTING RPM TREES

1. Site preparation - trees are to be planted on a raised mound of existing soil. The mound shall be 8-10 inches high after mild compaction. The base of the mound shall have a minimum width of seven feet with a flat crown (top) at approximately four feet.
2. The hole shall be approximately the same size as the container (10 inch diameter-8 inch depth).
3. ✱ After unloading trees, they shall be watered thoroughly and protected from excessive heat or cold. Do not allow rootball to freeze or dry out.
4. ✱ If the trees are not to be planted for several days or weeks, they should be watered every 3-4 days and again immediately before planting.
5. ✱ Remove the plastic container in which the trees have been growing prior to planting. Do not disturb rootball after container has been removed.
6. ✱ Do not plant trees any deeper than the level at which they were growing in the container. It is acceptable to plant the trees 1 inch above the level they were growing in the container.
7. Trees planted between October 1 and December 15, will require the application of a slow release fertilizer after planting. 1-1 1/2 tablespoons around drip zone is recommended. An analysis of 27-3-7 with I.B.D.U. or similar is recommended.

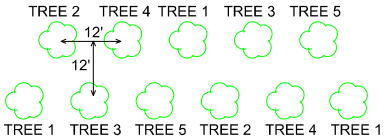
RPM TREE PLANTING DETAIL



Raised mound not required if soil within the 7' diameter root zone is broken up to a depth of at least one foot.

Mound hardwood mulch chips around base of each tree. Diameter of mulch placed around tree trunk can vary from 3' to 4'. Maximum depth of mulch to be 0.5' one foot from center of tree trunk. Lessen depth of mulch closer to the trunk to provide a minimal layer of mulch over the top of the root ball. Mounding should form a cone area near the trees trunk that will trap water around the tree. During the first growing season, trees should be watered thoroughly at least once a week.

PLAN VIEW: PLANTING DETAIL NON - RPM Riparian Trees (Option Two)



TREE PLANTING (OPTION TWO)

1. Trees shall be contalner grown or bare root.
2. Bare root stock must be a minimum 30" (inches) In helght and planted on 12' x 12' spacing In a staggered pattern.
3. Three-gallon trees shall be planted on 19' x 19' spacing in a staggered pattern.
4. NOTE: Option One notes with ✱ also apply to Option Two

THE FOLLOWING TREES WILL BE USED FOR BOTH OPTIONS

An equal amount of the following trees are to be planted throughout the riparian zone.

INTERMITTENT/PERENNIAL TREE LIST	EPHEMERAL STREAM TREE LIST
Tree 1: Black walnut (Juglans nigra)	Tree 1: Shagbark hickory (Carya glabra)
Tree 2: Pignut hickory (Carya glabra)	Tree 2: Black cherry (Prunus serotina)
Tree 3: Chestnut oak (Quercus orinus)	Tree 3: Black oak (Quercus velutina)
Tree 4: Red oak (Quercus rubra)	Tree 4: FLowering dogwood (Cornus florida)
Tree 5: White oak (Quercus alba)	Tree 5: Red bud (Ceris canadensis)

SHRUB PLANTINGS (These will not be RPM Plantings)

PLAN VIEW: SHRUB PLANTING DETAIL

The following shrubs are to be planted near bankfull elevation. See typical cross sections for number of rows and placement.

Shrub 1: Rough-leaf Dogwood (Cornus drummondii)
Shrub 2: Strawberry Bush (Euonymus americanus)
Shrub 3: Indigo Bush (Amorpha fruiticosa)

Three gallon container shrubs shall be planted on approximate 4' spacing with an equal amount of each species planted in random sequence.

SEEDING:

The following native grasses will be sown along both stream banks and throughout the riparian zone:

Switchgrass (Panicum virgatum)	20%
Virginia Wild Rye (Elymus virginicus)	20%
Rough Barnyard Grass (Echinochloa muricata)	10%
Annual Rye (Lolium perenne)	10%
Big bluestream (Andropogon gerardii)	20%
Forking panic grass/smooth panic grass (Dichanthelium dichotomum/ dichotomiflorum)	20%

Apply seed at a rate of 20 pounds/acre or as recommended by seed supplier.

Straw mulch or erosion control blanket shall be placed immediately following seeding.

Additional native species may be substituted based on approval of Army Corps of Engineers

Riparian Zone Width will be a minimum of 100' for intermittent streams

Shrub plantings and seeding will be the same for each option.

T.H.E. Engineers, Inc.	PROJECT: P RIDGE SOUTH PIT, AMEND. #1 MINE SITE				
	COUNTY: DAVIESS	STATE: KY	NEAR: PLEASANT RIDGE	ITEM: HABITAT STRUCTURE DETAILS	EXHIBIT 24

DATE:

Streams To Be Mitigated On Site
P Ridge South Pit Mine, Amendment No. 1

Stream	Proposed Stream Stream Length (ft)
INT-1DS	1187
INT-1US	1611
INT-2	1056
EPH-1	1146
EPH-2	1148
EPH-3	359
For Stream Impact Lengths See Baseline/PCN	
TOTAL IMPACTS IN BASELINE Total Intermittent (INT)= 3252' Total Ephemeral (EPH)= 5149'	TOTAL PROPOSED MITIGATION Total Intermittent (INT)= 3854' Total Ephemeral (EPH)= 2653'

T.H.E. Engineers, Inc.	PROJECT: P RIDGE SOUTH PIT, AMEND. #1 MINE SITE - PROPOSED MITIGATION				
	COUNTY: OHIO	STATE: KY	NEAR: PLEASANT RIDGE	ITEM: PROPOSED MITIGATION TABLE	EXHIBIT 25

DATE: