IN THE UNITED STATES DISTRICT COURT
FOR THE SOUTHERN DISTRICT OF WEST VIRGINIA
CHARLESTON DIVISION

UNITED STATES OF AMERICA and the STATE OF WEST VIRGINIA by and through the WEST VIRGINIA DEPARTMENT OF ENVIRONMENTAL PROTECTION, Plaintiffs, v. PATRIOT COAL CORP.; MAGNUM COAL CO.; APOGEE COAL CO., LLC; CATENARY COAL CO., LLC; COYOTE COAL CO. LLC; DAKOTA LLC; HOBET MINING, LLC; JUPITER HOLDINGS LLC; LITTLE CREEK LLC; MIDLAND TRAIL ENERGY LLC; PANTHER LLC; REMINGTON LLC; WILDCAT, LLC; BLACK STALLION COAL CO., LLC; BLACK WALNUT COAL CO.; COLONY BAY COAL CO.; EASTERN ASSOCIATED COAL, LLC; HILLSIDE MINING CO.; JARRELL'S BRANCH COAL CO.; KANAWHA EAGLE COAL, LLC; LOGAN FORK COAL CO.; MARTINKA COAL CO., LLC; MOUNTAIN VIEW COAL CO., LLC; PINE RIDGE COAL CO., LLC; RIVERS EDGE MINING, INC.; and WINIFREDE DOCK LLC, Defendants.	CONSENT DECREE

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I. BACKGROUND

A. Concurrent with the lodging of this Consent Decree, Plaintiffs, the United States of America, on behalf of the United States Environmental Protection Agency ("EPA"), and the State of West Virginia (the "State") by and through the West Virginia Department of Environmental Protection ("WVDEP"), have filed a Complaint in this action against Defendants Patriot Coal Corporation, et al.[1]

B. The Complaint alleges that Defendants violated Sections 301 and 402 of the Federal Water Pollution Control Act as amended by the Clean Water Act of 1977 and the Water Quality Act of 1987 ("CWA" or the "Act"), 33 U.S.C. §§ 1311 and 1342, and the West Virginia Water Pollution Control Act ("WPCA"), W. Va. Code § 22-11-8. Specifically, the Complaint alleges that Defendants discharged and continue to discharge pollutants into State waters and waters of the United States in violation of Section 301 of the Act, 33 U.S.C. § 1311 and Section 8 of the WPCA, W. Va. Code § 22-11-8, and of the conditions and limitations of National Pollutant Discharge Elimination System ("NPDES") permits issued to Defendants by the State pursuant to Section 402 of the Act, 33 U.S.C. § 1342, and Section 8 of the WPCA, W. Va. Code § 22-11-8.

C. On January 25, 2008, EPA issued an information request to Magnum Coal Co. ("Magnum") pursuant to Section 308(a) of the Clean Water Act, 33 U.S.C. § 1318(a), requesting that Magnum provide information on behalf of itself and its subsidiaries, which include Apogee Coal

[1] Patriot Coal Corp.; Magnum Coal Co.; Apogee Coal Co., LLC; Catenary Coal Co., LLC; Coyote Coal Co. LLC; Dakota LLC; Hobet Mining, LLC; Jupiter Holdings LLC; Little Creek LLC; Midland Trail Energy LLC; Panther LLC; Remington LLC; Wildcat, LLC; Black Stallion Coal Co., LLC; Black Walnut Coal Co.; Colony Bay Coal Co.; Eastern Associated Coal, LLC; Hillside Mining Co.; Jarrell's Branch Coal Co.; Kanawha Eagle Coal, LLC; Logan Fork Coal Co.; Martinka Coal Co., LLC; Mountain View Coal Co., LLC; Pine Ridge Coal Co., LLC; Rivers Edge Mining, Inc.; and Winifrede Dock LLC.

Co., LLC; Catenary Coal Co., LLC; Coyote Coal Co. LLC; Dakota LLC; Hobet Mining, LLC; Jupiter Holdings LLC; Little Creek LLC; Midland Trail Energy LLC; Panther LLC; Remington LLC; and Wildcat LLC (collectively, the "Magnum Subsidiaries").

D. On April 7, 2008, Patriot Coal Corp. ("Patriot") initiated negotiations with the State regarding NPDES violations for certain of its West Virginia subsidiaries. On July 23, 2008, Patriot acquired Magnum. In light of the foregoing negotiations, the Parties have agreed that civil penalties for Patriot's non-Magnum subsidiaries in West Virginia, specifically Black Stallion Coal Co., LLC; Black Walnut Coal Co.; Colony Bay Coal Co.; Eastern Associated Coal, LLC; Hillside Mining Co.; Jarrell's Branch Coal Co.; Kanawha Eagle Coal, LLC; Logan Fork Coal Co.; Martinka Coal Co., LLC; Mountain View Coal Co., LLC; Pine Ridge Coal Co., LLC; Rivers Edge Mining, Inc.; and Winifrede Dock LLC (collectively, the "non-Magnum Subsidiaries"), for violations disclosed to the State through March 31, 2008 will be addressed in a State administrative settlement. All provisions of this Consent Decree shall apply to the non-Magnum Subsidiaries except for Section V (Civil Penalty).

E. On September 5, 2008, WVDEP settled a lawsuit filed against Hobet Mining, LLC ("Hobet"), a subsidiary of Magnum, for discharges of selenium and other pollutants into state waters in violation of the West Virginia Water Pollution Control Act. The settlement resolves state claims associated with the following four NPDES permits: WV0099392, WV1016776, WV1020889, and WV1021028. Under the state settlement, Hobet agreed to pay state civil penalties and to implement injunctive relief measures for those four NPDES permits identified in the state settlement. The four Hobet permits addressed in the state settlement are also included in this Consent Decree and all provisions of this Consent Decree shall apply except for Section V (Civil Penalty).

F. The Parties recognize, and the Court by entering this Consent Decree finds, that this

Consent Decree has been negotiated by the Parties in good faith and will avoid litigation among the Parties, and that this Consent Decree is fair, reasonable, and in the public interest.

NOW, THEREFORE, with the consent of the Parties, IT IS HEREBY ADJUDGED, ORDERED, AND DECREED as follows:

II. JURISDICTION AND VENUE

1. This Court has jurisdiction over the Parties and over the subject matter of this action, pursuant to 28 U.S.C. §§ 1331, 1345, 1355, and 1367, and Section 309(b) of the Clean Water Act, 33 U.S.C. § 1319(b).

2. Venue is proper in the Southern District of West Virginia pursuant to 28 U.S.C. §§ 1391(b) and (c) and 1395(a), as well as Section 309(b) of the Clean Water Act, 33 U.S.C. § 1319(b), because it is the judicial district in which Defendants are located, reside, and/or are doing business, and/or in which the violations alleged in the Complaint occurred.

3. For purposes of this Decree, or any action to enforce this Decree, Defendants consent to the Court's jurisdiction over this Decree and consent to venue in this judicial district.

4. For purposes of this Decree, Defendants agree that the Complaint states claims upon which relief may be granted pursuant to Sections 301 and 402 of the Act, 33 U.S.C. §§ 1311 and 1342, and West Virginia Code § 22-11-1 *et seq*.

III. APPLICABILITY

5. The provisions of this Consent Decree apply to and are binding upon the United States and the State, and upon Defendants and any successors, assigns, or other entities, or persons otherwise bound by law.

6. No transfer of ownership or operation of any Facility, whether in compliance with the procedures of this Paragraph or otherwise, shall relieve Defendants of their obligation to ensure that

the terms of the Decree are implemented. Prior to any transfer, the applicable Defendant(s) shall provide a copy of this Consent Decree to the proposed transferee and require the transferee to provide written confirmation acknowledging the terms of the Decree. Within five Days of such transfer, the applicable Defendant(s) shall provide written notice of the transfer, together with a copy of any written agreements effectuating such a transfer and the aforementioned acknowledgement letter, to EPA Region 3, the State, and the United States Department of Justice ("DOJ"), in accordance with Section XVI of this Decree (Notices). Any attempt to transfer ownership or operation of the Facility without complying with this Paragraph constitutes a violation of this Decree.

7. Defendants shall provide a copy of this Consent Decree to all officers, employees, and agents whose duties might reasonably include compliance with any provision of this Decree, as well as to any contractor retained to perform work required under this Consent Decree. Defendants shall condition any such contract upon performance of the work in conformity with the terms of this Consent Decree.

8. In any action to enforce this Consent Decree, Defendants shall not raise as a defense the failure by any of their officers, directors, employees, agents, or contractors to take any actions necessary to comply with the provisions of this Consent Decree.

IV. DEFINITIONS

9. Terms used in this Consent Decree that are defined in the Act or in regulations promulgated pursuant to the Act shall have the meanings assigned to them in the Act or such regulations, unless otherwise provided in this Decree. Whenever the terms set forth below are used in this Consent Decree, the following definitions shall apply:

a. “Audit Findings” shall mean a written summary of all instances of noncompliance with the EMS Manual noted during the EMS Audit conducted pursuant to Paragraph 32 of this Decree, and all areas of concern identified during the course of that audit which, in the EMS Auditor’s judgment, merit further review or evaluation for potential EMS, environmental, or regulatory impacts;

b. “Audit Response and Action Plan” shall mean a comprehensive plan for bringing the Facilities into full compliance with the EMS Manual and fully addressing all Audit Findings identified in the EMS Audit Report;

c. “Complaint” shall mean the complaint filed by the United States and the State in this action concurrent with the lodging of this Decree;

d. “Consent Decree” or “Decree” shall mean this Decree and all appendices attached hereto (listed in Section XXV);

e. “Daily Violation” shall mean (i) any exceedance of a maximum daily discharge limitation for any parameters set forth in Defendants’ NPDES permits, as determined by a DMR Sample, or (ii) any failure to attain a minimum daily discharge limitation for pH set forth in Defendants’ NPDES permits, as determined by a DMR Sample;

f. “Day” shall mean a calendar day unless expressly stated to be a business day. In computing any period of time under this Consent Decree, where the last day would fall on a Saturday, Sunday, or federal holiday, the period shall run until the close of business of the next business day;

g. “Defendants” shall mean the persons or entities named in the Complaint;

h. “Discharge Monitoring Report Sample” or “DMR Sample” shall mean a sample taken in accordance with approved test procedures under 40 C.F.R. Part 136;

i. “Effective Date” shall have the definition provided in Section XVII;

j. “Effluent Limit Violation” shall mean a Daily Violation or a Monthly Violation;

k. “Environmental Management System” or “EMS” refers to the integrated system created by the EMS Consultant pursuant to Paragraph 27.b, meeting the requirements set forth in Appendix A;

l. “EMS Auditor” shall mean the independent third party meeting the requirements of Paragraph 31, who is approved by EPA, in consultation with the State, and contracted by the Defendants to perform the duties set forth in Paragraph 32, including an evaluation of the adequacy of EMS implementation relative to the EMS Manual;

m. “EMS Audit Report” shall mean a report setting forth the Audit Findings resulting from the EMS Audit conducted pursuant to Paragraph 32 of this Decree, which meets all the requirements set forth in Paragraph 32.b;

n. “EMS Consultant” shall mean the independent third party meeting the requirements of Paragraph 26, who is approved by EPA, in consultation with the State, and contracted by the Defendants to perform the duties set forth in Paragraph 27, including the development of an EMS and EMS Manual for Defendants;

o. “EMS Manual” shall mean the document created by the EMS Consultant and approved by EPA pursuant to Paragraph 27.c, which describes and documents the integrated EMS developed for the Defendants and contains an EMS implementation schedule;

p. “EPA” shall mean the United States Environmental Protection Agency and any of its successor departments or agencies;

q. "Facility" or "Facilities" shall mean Defendants' mining operations, including but not limited to, surface and underground mines, coal processing and preparation plants, coal transportation facilities, Reclaimed Sites, and all associated operations;

r. "Initial Review and Evaluation" shall mean an evaluation of Defendants' existing environmental management practices and documents to identify where systems or subsystems have not been adequately developed or implemented, or need to be enhanced, or new management systems or subsystems need to be developed to adequately address the elements set forth in Appendix A;

s. "Monthly Violation" shall mean any exceedance of an average monthly discharge limitation for any parameters set forth in Defendants' NPDES permits, as determined by a DMR Sample;

t. "NOVs" shall mean notices of violation under the West Virginia Surface Coal Mining and Reclamation Act, W.Va. Code § 22-3-17 (2004);

u. "NPDES" shall mean the National Pollutant Discharge Elimination System defined in 40 C.F.R. § 122.2 and any State-issued NPDES permit;

v. "Outlet" shall mean an NPDES permitted discharge point;

w. "Paragraph" shall mean a portion of this Decree identified by an Arabic numeral;

x. "Parties" shall mean the United States, the State of West Virginia, and Defendants;

y. "Persistent Noncompliance Issues" shall mean three or more Effluent Limit Violations of a given parameter at an Outlet within any 12-month period;

z. "Reclaimed Sites" shall mean Facilities that have been regraded to "Phase I" bond release standards under the Surface Mining Control and Reclamation Act, 30 U.S.C. § 1201, *et seq*.;

aa. "Section" shall mean a portion of this Decree identified by a Roman numeral;

bb. "State" shall mean the State of West Virginia; and

cc. "United States" shall mean the United States of America, acting on behalf of EPA.

V. CIVIL PENALTY

10. Within 60 Days after the Effective Date of this Consent Decree, Defendants shall pay a total of $6,500,000 as a civil penalty to the United States and the State, plus an additional sum for interest. Beginning on the 31st Day after the Effective Date, interest shall accrue on the total civil penalty amount at the rate provided for in 28 U.S.C. § 1961. Defendants may accelerate their payment of civil penalty, and interest due on the accelerated payment shall be reduced accordingly.

11. Fifty five percent of the civil penalty and accrued interest under this Section shall be paid to the United States and forty-five percent of the civil penalty and accrued interest under this Section shall be paid to the State.

12. Defendants shall make payments to the United States under this Section by FedWire Electronic Funds Transfer ("EFT") to the U.S. Department of Justice in accordance with written instructions to be provided to Defendants, following entry of this Consent Decree, by the Financial Litigation Unit of the U.S. Attorney's Office for the Southern District of West Virginia, U.S. Courthouse, 300 Virginia St. S.E., Charleston, WV 25301, 304-345-2200. At the time of payment, Defendants shall send a copy of the EFT authorization form and the EFT transaction record, together with a transmittal letter, which shall state that the payment is for the civil penalty owed pursuant to

this Consent Decree in *United States v. Patriot Coal Corp., et al.*, and shall reference the DOJ case number, 90-5-1-1-09476, to the United States in accordance with Section XVI of this Decree (Notices); by email to acctsreceivable.CINWD@epa.gov; and by mail to:

EPA Cincinnati Finance Office
26 Martin Luther King Drive
Cincinnati, Ohio 45268

13. Defendants shall make payments to the State under this Section by certified or cashier's check to the WVDEP for deposit in the WVDEP's Stream Restoration Fund. Payments shall be mailed to:

Jeff McCormick, Assistant Director
Division of Mining and Reclamation,
West Virginia Department of Environmental Protection
601 57th Street, SE, Charleston, WV 25304

Notice of payment shall be provided to: Chief Inspector, Environmental Enforcement, West Virginia Department of Environmental Protection, 601 57th Street, SE, Charleston, WV 25304.

14. Defendants shall not deduct any penalties paid under this Decree pursuant to this Section or Section X (Stipulated Penalties) in calculating its federal or state or local income tax.

VI. COMPLIANCE REQUIREMENTS

15. This Consent Decree in no way affects or relieves Defendants of their responsibility to comply with applicable federal, state, and local laws, regulations, and permits.

16. Defendants shall perform the work required by this Consent Decree in compliance with the requirements of all applicable federal, state, and local laws, regulations, and permits. This Consent Decree should not be considered as a permit issued pursuant to any federal, state, or local statute or regulation.

17. Approval of Deliverables. After review of any plan, report, or other item that is

required to be submitted pursuant to this Consent Decree, EPA, after consultation with the State, shall in writing: (a) approve the submission; (b) approve the submission upon specified conditions; (c) approve part of the submission and disapprove the remainder; or (d) disapprove the submission.

18. If the submission is approved pursuant to 17(a), Defendants shall take all actions required by the plan, report, or other document, in accordance with the schedules and requirements of the plan, report, or other document, as approved. If the submission is conditionally approved or approved only in part, pursuant to Paragraph 17(b) or 17(c), Defendants shall, upon written direction from EPA, after consultation with the State, take all actions required by the approved plan, report, or other item that EPA, after consultation with the State, determines are technically severable from any disapproved portions, subject to Defendants' right to dispute only the specified conditions or the disapproved portions, under Section XII of this Decree (Dispute Resolution).

19. If the submission is disapproved in whole or in part pursuant to Paragraph 17(c) or (d), Defendants shall, within 45 Days of receipt of disapproval or such other time as the Parties agree to in writing, correct all deficiencies and resubmit the plan, report, or other item, or disapproved portion thereof, for approval, in accordance with the preceding Paragraphs. If the resubmission is approved in whole or in part, Defendants shall proceed in accordance with the preceding Paragraph.

20. Any stipulated penalties applicable to the original submission, as provided in Section X of this Decree (Stipulated Penalties), shall accrue during the 45-Day period or other specified period, but shall not be payable unless the resubmission is untimely or is materially disapproved in whole or in part; provided that, if the original submission was so deficient as to constitute a material breach of Defendants' obligations under this Decree, the stipulated penalties applicable to the original submission shall be due and payable notwithstanding any subsequent resubmission.

21. If a resubmitted plan, report, or other item, or portion thereof, is disapproved in whole

or in part, EPA, after consultation with the State, may again require Defendants to correct any deficiencies, in accordance with the preceding Paragraphs, subject to Defendants' right to invoke Dispute Resolution under Section XII and the right of EPA to seek stipulated penalties as provided in the preceding Paragraph.

22. Permits. Where any compliance obligation under this Section requires Defendants to obtain a federal, state, or local permit or approval, Defendants shall submit timely and substantially complete applications and take all other actions necessary to obtain all such permits or approvals. Defendants may seek relief under the provisions of Section XI of this Consent Decree (Force Majeure) for any delay in the performance of any such obligation resulting from a failure to obtain, or a delay in obtaining, any permit or approval required to fulfill such obligation, if Defendants have submitted timely and substantially complete applications and have taken all other actions necessary to obtain all such permits or approvals.

23. Contractors Protocol. Within 5 Days of entry of this Consent Decree, Defendants shall provide a copy of the Decree to all contractors with responsibilities under this Decree. Within 15 Days of entry of this Consent Decree, Defendants shall refine protocols for contractors with responsibility for conducting Outlet sampling to comply with the requirements of Paragraph 35. Within 60 Days of the entry of this Consent Decree, Defendants shall refine protocols for all other contractors with responsibilities under this Decree to comply with the terms of this Decree. Within 60 Days of the approval of the EMS Manual pursuant to Paragraph 27.c, Defendants shall refine protocols for all contractors with responsibilities under the EMS Manual to comply with the terms of the Manual.

24. Defendants and their contractors shall exercise best efforts to comply with all deadlines in Paragraphs 27, 38, and 42. If however, despite best efforts by Defendants and their

contractors, Defendants are unable to meet the deadlines in Paragraphs 27, 38, and 42, Defendants may apply to EPA for an extension of time. Defendants must apply for an extension in writing at least 10 business days prior to the expiration of the deadline. Such application shall include an explanation and description of the reasons for delay and all supporting documentation, including documentation from the contractor, along with the requested extension of time and basis for the amount of time requested.

a. If EPA, after reasonable opportunity for review and comment by the State, agrees that the delay was warranted, EPA shall notify Defendants in writing of the length of the extension. An extension of time pursuant to this Paragraph shall not, of itself, extend the time for performance of any other obligation.

b. If EPA, after a reasonable opportunity for review and comment by the State, does not agree that the delay was warranted, EPA will notify Defendants in writing of its decision.

VII. INJUNCTIVE RELIEF

Environmental Management System

25. In accordance with the procedure set forth in Paragraph 26, Defendants shall hire an EMS Consultant to complete an Initial Review and Evaluation and develop an integrated Environmental Management System for Defendants. Defendants shall bear all costs associated with the EMS Consultant, cooperate fully with the EMS Consultant, and provide the EMS Consultant with access to all records, employees, contractors, and Facilities that the EMS Consultant deems reasonably necessary to effectively perform the duties described in Paragraph 27.

26. Selection of EMS Consultant. No later than 10 Days after the Effective Date of this Consent Decree, Defendants shall submit to EPA and the State a list of two or more proposed consultants to serve as EMS Consultant, along with (a) the name, affiliation, and address of the

proposed consultants; (b) information demonstrating how each proposed consultant satisfies the EMS auditor qualification requirements of Table 1 in ISO 19011 (First edition, 2002-10-01) and has experience in developing and implementing an EMS; (c) information demonstrating that the team proposed to conduct the Initial Review and Evaluation, in composite, has a working process knowledge of the Facilities or similar operations, and has a working knowledge of federal and state environmental requirements which apply to the Facilities; and (d) descriptions of any previous work contracts, or financial relationships with Defendants.

a. Within 30 Days of receiving the list of proposed consultants, EPA, in consultation with the State, shall notify Defendants of whether it approves any consultant(s) on the list. If EPA, after consultation with the State, does not approve any of the proposed consultants on Defendants' list, then Defendants shall submit another list of proposed consultants to EPA and the State within 30 Days of receipt of EPA's written notice. If after Defendants have submitted a third list of consultants, which must be submitted within 30 Days of receipt of written notice that EPA has not approved any of the consultants on Defendants' second list, the Parties are unable to agree on an EMS Consultant, the Parties agree to resolve the selection of the EMS Consultant through the Dispute Resolution process in Section XII.

b. Within 10 Days after receipt of EPA's approval, Defendants shall select one consultant from those approved by EPA and shall enter into a contract with the consultant to perform all duties described in Paragraph 27. In the event the consultant(s) approved by EPA are no longer available or willing to accept the work described in Paragraph 27 when notified of their selection by Defendants, then Defendants shall select another consultant approved by EPA and enter into the contract to perform all duties described in Paragraph 27 within 30 Days.

27. Duties of the EMS Consultant. Defendants' contract with the EMS Consultant shall

require the EMS Consultant to perform the following duties:

a. Conduct and complete an Initial Review and Evaluation for all Defendants, prepare a report of the results, and provide such report to Defendants within 60 Days of the date of the contract. This report shall also be provided to EPA and the State, upon request;

b. Based on the Initial Review and Evaluation results, the requirements of this Consent Decree, and any other relevant information, develop an integrated EMS for the Defendants addressing, at a minimum, the 12 key elements in Appendix A;

c. Within 8 months of the date of the contract, draft and submit to EPA and the State for review and approval an EMS Manual which describes and documents the integrated EMS developed for the Defendants pursuant to Paragraph 27.b and contains an EMS implementation schedule for each of the described systems and subsystems not already fully implemented. The EMS Manual shall (i) describe or contain, as appropriate, overarching policies, procedures, and programs that compose the EMS framework, and respective management systems, subsystems, and tasks for the elements listed in Appendix A, and (ii) describe specific procedures for implementing the requirements of this Consent Decree set forth in Paragraphs 34-51, including but not limited to (1) protocols for Outlet Inspections, Internal Environmental Audits, and Third-Party Environmental Audits pursuant to Paragraphs 35-37; (2) specifications for the annual training required by Paragraphs 50 and 51, and (3) a framework and set of requirements for environmental organizational management and management notification of environmental violations.

28. Upon Defendants' receipt of EPA's approval of the EMS Manual, Defendants shall commence implementation of the EMS in accordance with the schedule contained in the EMS Manual. Managers responsible for environmental compliance at each Facility shall thereafter include a certification of compliance with the approved EMS Manual in quarterly reports to

appropriate management at Patriot and Magnum pursuant to Paragraph 48, or, for any noncompliance, shall submit in the quarterly reports an explanation of the cause of the noncompliance, remedial steps to be taken, and a date for achieving compliance.

29. Revisions of the EMS Manual. Any revisions to the EMS Manual subsequent to its initial approval must be submitted to EPA for review. Material revisions must be approved by EPA. EPA shall notify Defendants within 30 Days of its receipt of the proposed revisions whether approval of those revisions will be required.

EMS Audit

30. In accordance with the procedure set forth in Paragraph 31, Defendants shall hire an EMS Auditor to conduct an EMS Audit pursuant to Paragraph 32. Defendants shall bear all costs associated with the EMS Auditor, cooperate fully with the EMS Auditor, and provide the EMS Auditor with access to all records, employees, contractors, and Facilities that the EMS Auditor deems reasonably necessary to effectively perform the duties described in Paragraph 32.

31. Selection of EMS Auditor. Within 1 year of EPA's approval of the EMS Manual, Defendants shall propose to EPA and the State for approval the selection of two or more proposed EMS Auditors who meet the qualification requirements of Table 1 in ISO 19011 (First edition, 2002-10-01) and have expertise and competence in the regulatory programs under federal and state environmental laws. The proposed EMS Auditors must have no direct financial stake in the outcome of the EMS Audit conducted pursuant to this Consent Decree. Defendants shall disclose to EPA any past or existing contractual or financial relationships when the proposed EMS Auditors are identified.

a. Within 30 Days of receiving the list of proposed EMS Auditors, EPA, in consultation with the State, shall notify Defendants of whether it approves any auditor(s) on the list.

If EPA, after consultation with the State, does not approve any of the proposed EMS Auditors on Defendants' list, then Defendants shall submit another list of proposed EMS Auditors to EPA and the State within 30 Days of receipt of EPA's written notice. If after Defendants have submitted a third list of proposed EMS Auditors, which must be submitted within 30 Days of receipt of written notice that EPA has not approved any of the auditors on Defendants' second list, the Parties are unable to agree on an EMS Auditor, the Parties agree to resolve the selection of the EMS Auditor through the Dispute Resolution process in Section XII.

b. Within 10 Days of the date that EPA notifies Defendants of the approval of the proposed EMS Auditor, Defendants shall retain the proposed EMS Auditor, thereafter designated the "EMS Auditor," to perform an EMS Audit as further described in Paragraph 32 below.

32. Duties of the EMS Auditor. Defendants' contract with the EMS Auditor shall require the EMS Auditor to perform the following duties:

a. Within 90 Days of the date of its contract with Defendants, the EMS Auditor shall perform an audit of Defendants' EMS (the "EMS Audit"). The EMS Audit shall evaluate the adequacy of EMS implementation relative to the EMS Manual and identify areas of concern, from top management down, throughout each major organizational unit with responsibilities under the EMS Manual. The EMS Audit shall be conducted in accordance with ISO 19011 (First edition, 2002-10-01), and shall determine the following:

(i) Whether there is a defined system, subsystem, program, or planned task for the respective EMS element;

(ii) To what extent the system, subsystem, program, or task has been implemented, and is being maintained;

(iii) The adequacy of each Facility's internal self-assessment procedures

for programs and tasks composing the EMS;

(iv) Whether Defendants are effectively communicating environmental requirements to affected parts of the organization, or those working on behalf of the organization;

(v) Whether further improvements should be made to the EMS and EMS Manual; and

(vi) Whether there are deviations from Defendants' written requirements or procedures.

b. Within 30 Days following the completion of the EMS Audit, the EMS Auditor shall develop and concurrently submit an EMS Audit Report to Defendants, EPA, and the State. The EMS Audit Report shall contain: (i) a summary of the audit process, including any obstacles encountered; (ii) detailed Audit Findings, including the basis for each finding and each area of concern identified; (iii) identification of any Audit Findings corrected or areas of concern addressed during the audit; (iv) recommendations for resolving any area of concern or otherwise achieving full implementation of the EMS Manual; and (v) certification that the EMS Audit was conducted in accordance with the provisions of this Decree.

33. Follow-Up Corrective Measures. Within 60 Days of receiving the EMS Audit Report, Defendants shall submit to EPA and the State for review and approval a report responding to the Audit Findings and areas of concern identified in the EMS Audit Report and providing an action plan for expeditiously coming into full conformance with the provisions in the EMS Manual (the "Audit Response and Action Plan"). The Audit Response and Action Plan shall include the result of any root cause analysis, specific deliverables, responsibility assignments, and an implementation schedule for the identified actions and measures, including those that may have already been

completed.

a. EPA, after consultation with the State, will provide comments on the Audit Response and Action Plan and Defendants shall, within 30 Days of receipt of EPA's comments on the Audit Response and Action Plan, submit to EPA a Final Audit Response and Action Plan responding to and addressing EPA's comments.

b. After making any necessary modifications to the Audit Response and Action Plan based on EPA comments, if any, Defendants shall implement the final Audit Response and Action Plan in accordance with the schedules set forth therein.

Audits and Inspections

34. Initial Treatment Systems Audits. Defendants shall conduct an audit of the treatment systems for each Outlet to determine whether the treatment systems in place are adequate to maintain environmental compliance at the Facilities.

a. The Initial Treatment Systems Audits shall be conducted according to the following schedule:

(i) Within 30 Days of entry of this Consent Decree, Defendants shall audit all Outlets for which a chemical treatment system is currently installed to control any parameter in any NPDES permit and all Outlets with Persistent Noncompliance Issues;

(ii) Within 60 Days of entry of this Consent Decree, Defendants shall audit all Outlets for which a sediment pond is currently installed to control any parameters within an NPDES permit, with the exception of Outlets with on-bench sediment treatment control;

(iii) Within 90 Days of entry of this Consent Decree, Defendants shall audit all remaining Outlets.

b. Initial Treatment System Audits under Subparagraph 34.a.i shall be conducted

by a third-party consultant with at least five years of experience with the requirements of NPDES and SMCRA permits and with treatment systems for and control of relevant effluent parameters in Defendants' NPDES permits. Initial Treatment System Audits under Subparagraphs 34.a.ii and 34.a.iii and subsequent Treatment System Audits pursuant to Paragraph 36 shall be conducted under the direction or supervision of a registered professional engineer with experience with NPDES and SMCRA requirements and with treatment systems for and control of relevant effluent parameters in Defendants' NPDES permits.

c. Based on the results of the audits, Defendants shall identify for each Outlet any alterations and/or maintenance measures to its associated treatment systems that must be taken to achieve and maintain environmental compliance and a schedule for such alterations and/or maintenance measures.

d. All alterations and/or maintenance measures identified by the Initial Treatment System Audits must be completed within 120 Days of the entry of this Consent Decree.

35. Outlet Inspections. Starting with the first full month after the entry of this Consent Decree, Defendants shall conduct Outlet Inspections at least twice a month, at the time of DMR Sampling. Outlet Inspections shall be conducted pursuant to an Outlet Inspection Checklist created by Defendants, which shall include entries for whether: (a) the Outlet is accessible; (b) the Outlet is unobstructed; (c) discharge markers are visible at the Outlet; (d) there is any water flow at the Outlet; (e) there are any visual indications of overtopping of the pond or other drainage system; (f) there is a buildup of sediment at the Outlet or any other location in the pond or other drainage system; (g) there is any indication of erosion or other damage to the embankment of the pond or other drainage system; (h) baffles and retention curtains are in place; (i) chemical treatment systems are operational; and (j) required lock boxes are in place on chemical treatment valves. The Outlet

Inspection Checklist shall be completed at the time of each Outlet Inspection, shall indicate the date and time of completion, and shall be signed by the individual completing the Outlet Inspection.

36. Internal Environmental Audits. Defendants shall conduct Internal Environmental Audits at each Facility, which shall be conducted under the direction or supervision of a registered professional engineer who may be a contractor selected to undertake the requirements established by this Paragraph.

a. The Internal Environmental Audits shall include, but not be limited to: (i) a treatment system audit pursuant to the requirements of Paragraph 34, (ii) visual inspections to assess the structural integrity of all slurry pipes, and (iii) an evaluation of compliance in the following areas: (1) Trash and Scrap Metal; (2) Drainage and Sediment Control; (3) Oil and Fuel Handling; (4) Roads; (5) Septic Systems; and (6) Batteries.

b. Internal Environmental Audits shall be conducted at each Reclaimed Site on an annual basis, and shall include all elements of Paragraph 36.a, as applicable. Internal Environmental Audits shall be conducted at all other Facilities on a quarterly basis, and shall include all elements of Paragraph 36.a.

37. Third-Party Environmental Audits. Defendants shall conduct Third-Party Environmental Audits annually at each Facility. Audits under this Paragraph shall evaluate compliance with this Consent Decree and with the following statutes: Clean Air Act, Clean Water Act, Comprehensive Environmental Response, Compensation and Liability Act, Emergency Planning and Community Right to Know Act, Resource Conservation and Recovery Act, Toxic Substances Control Act, and environmental provisions of the Surface Mining, Control and Reclamation Act.

38. Audit Database. The results of each of the audits and inspections conducted pursuant

to Paragraphs 34-37 shall be entered into an electronic Audit Database within 48 hours of completion. The Audit Database shall include: (a) the date of the audit/inspection; (b) the names of the individuals conducting the audit/inspection; (c) a description of any noncompliances or other areas of concern; (d) the applicable permit number and Outlet; and (e) the planned response to any noncompliances or areas of concern, the individuals responsible for the response, the deadline for the response, and the date of completion of the response. Responses to a noncompliance or other problem identified by an audit or inspection conducted pursuant to Paragraphs 34-37 shall be completed as expeditiously as possible, and in no event shall take longer than 45 Days to complete, unless an extension of time is granted by EPA. Responses that are not completed by the deadline initially assigned in the Audit Database shall be reported to appropriate management at Magnum and Patriot as part of the quarterly report identified in Paragraph 48. Defendants may combine this database with the Violations Database required by Paragraph 42.

39. Defendants shall provide access to the Audit Database to EPA and the State upon request. In addition, Defendants shall produce any requested information from the Audit Database to EPA and the State within 10 Days of the request.

40. Prior to completion of the Audit Database, Defendants shall implement interim data-tracking measures meeting the requirements of Paragraph 38, which are the functional equivalent of the Audit Database.

DMR Sample Notification and Violation Tracking

41. Electronic Notification: Within 10 Days of entry of this Consent Decree, Defendants shall implement a system which provides for electronic notification within 48 hours of all DMR Sample results to the manager responsible for environmental compliance at the related Facility. The notification shall include all pollutants that are regulated under effluent limits contained in

Defendants' NPDES permits, and shall indicate where laboratory results show an Effluent Limit Violation, identifying the Outlet and date when the violation occurred.

42. Violations Database. Within 6 months of entry of this Consent Decree, Defendants shall create an electronic Violations Database for each Facility that includes the following information for each Effluent Limit Violation at each Outlet over the preceding five years:

a. Identification of Outlet by NPDES and SMCRA permit numbers, permittee, and latitude and longitude;

b. Dates of DMR Samples and DMR Sample results;

c. NPDES effluent limit that was exceeded;

d. Percentage by which the limit was exceeded;

e. Number of Effluent Limit Violations in a row for the same parameter;

f. Number of Effluent Limit Violations for that particular parameter over the preceding 12 months; and

g. Total number of Effluent Limit Violations at that particular Outlet over the preceding 12 months.

43. The Violations Database shall be updated with all Effluent Limit Violations immediately upon receipt of electronic notice pursuant to Paragraph 41. In addition to the information required by Subparagraphs 42.a-42.g, updates to the Violations Database under this Paragraph shall include the following information:

a. A description of the cause of the Effluent Limit Violation and the planned response to the Effluent Limit Violation, taking into account any applicable information in the Audit Database and any required actions under Paragraph 49 (Effluent Limit Violation Response);

b. Applicable stipulated penalties; and

c. Date that Effluent Limit Violation ended (if applicable).

44. The Violations Database shall also include entries for any additional CWA violations that occur subsequent to the creation of the Database pursuant to Paragraph 42, including NOVs or unauthorized discharges, along with the following information:

a. Permit number;

b. Description of violation;

c. Date of violation;

d. Cause of violation and planned response, taking into account any applicable information in the Audit Database; and

e. Date that noncompliance ended (if applicable).

45. Prior to completion of the Violations Database, Defendants shall implement interim data-tracking measures meeting the requirements of Paragraphs 42-44, which are the functional equivalent of the Violations Database.

46. Defendants shall provide access to the Violations Database to EPA and the State upon request. In addition, Defendants shall produce any requested information from the Violations Database to EPA and the State within 10 Days of the request.

47. Where any Effluent Limit Violation occurs, Defendants shall provide on a weekly basis the following information to the West Virginia Department of Environmental Protection: (a) permit number, (b) Outlet identification, (c) pollutant parameter, and (d) DMR Sample result.

Quarterly Reports

48. The manager responsible for environmental compliance at each Facility shall submit quarterly reports to appropriate management at Magnum and Patriot, EPA, and the State on issues related to CWA and Consent Decree compliance. The quarterly reports shall be due at the end of the

month following the end of each quarter (i.e. by April 30, July 31, October 31, and January 31). The quarterly reports shall contain, at a minimum, the following:

a. Information regarding any CWA violation, including (i) a summary of Effluent Limit Violations at the Facility, including total number of Effluent Limit Violations, total number of Outlets with two or more Effluent Limit Violations in a row of the same parameter, total number of Outlets with Persistent Noncompliance Issues, and total number of stipulated penalties accrued during that quarter; (ii) a summary of any additional CWA violations, including NOVs or unauthorized discharges; (iii) a summary of steps taken or planned steps to remedy the violations identified in (i) and (ii); and (iv) a copy of the Violations Database entries for the relevant quarter;

b. A summary of any instances in which an audit response was not completed by the deadline initially assigned in the Audit Database; and

c. A certification of compliance with the approved EMS Manual, or, for any noncompliance, an explanation of the cause of the noncompliance and remedial steps taken or to be taken.

Effluent Limit Violation Response

49. Within 60 Days of entry of this Consent Decree, Defendants shall implement a response plan for Effluent Limit Violations, which shall provide for investigation of Effluent Limit Violations and implementation of actions necessary to achieve compliance with the applicable NPDES permit limits. This response plan shall, at a minimum, provide for the following response actions at all Outlets in addition to the requirements of Paragraph 43:

a. Daily Violation Response

(i) Category 1 Daily Violation. Upon notification of the first Daily Violation at any Outlet, Defendants shall begin daily monitoring and sampling of discharges and

implement treatment measures until the Outlet returns to compliance (i.e. one compliant DMR Sample result). Any sample taken within 48 hours of notification of the first Daily Violation that results in a Daily Violation for the same pollutant parameter at the same Outlet is a Category 1 Daily Violation.

(ii) Category 2 Daily Violation. Any sample taken after 48 hours of notification of the first Daily Violation that results in a Daily Violation for the same pollutant parameter at the same Outlet and is not subject to Paragraph 49.a.iii or 49.a.iv is a Category 2 Daily Violation. Upon notification of the first Category 2 Daily Violation, Defendants shall either (1) continue daily monitoring, sampling, and treatment until the Outlet returns to compliance, or (2) hire a third-party consultant and comply with the terms of Paragraph 49.a.iv.

(iii) Category 3 Daily Violation. Any sample taken after 48 hours of notification of the first Category 2 Daily Violation that results in a Daily Violation for the same pollutant parameter at the same Outlet and is not subject to Paragraph 49.a.iv is a Category 3 Daily Violation. Upon notification of the first Category 3 Daily Violation for the same pollutant parameter at the same Outlet, Defendants shall (1) continue daily monitoring, sampling, and treatment, (2) consult with an individual with substantial expertise in Clean Water Act compliance and in treatment systems for and control of relevant effluent parameters in Defendants' NPDES permits, and (3) implement measures recommended by that individual until the Outlet returns to compliance. Alternatively, Defendants may hire a third-party consultant and comply with the terms of Paragraph 49.a.iv of this Decree.

(iv) Category 4 Daily Violation. Any sample taken after 48 hours of notification of the first Category 3 Daily Violation that results in a Daily Violation for the same pollutant parameter at the same Outlet is a Category 4 Daily Violation, until the Outlet returns to

compliance. Upon notification of the first Category 4 Daily Violation, Defendants shall hire a third-party consultant to examine the problem. Defendants shall continue daily monitoring, sampling, and treatment of discharges unless the consultant determines that daily monitoring, sampling, and treatment will not assist in examining and/or resolving the noncompliance. The consultant shall prepare a report detailing: (1) the cause of the continuing violations; (2) the appropriate level of monitoring and sampling; and (3) a plan to address the continuing violations. Defendants shall implement the proposed plan according to the consultant's recommendations within 30 Days of receipt of the report. The consultant's report and any documentation of actions taken shall be submitted to EPA, the State, and appropriate management at Magnum and Patriot in the quarterly report required by Paragraph 48.

b. Monthly Violation Response

(i) Category 1 Monthly Violation. Upon notification of the first Monthly Violation of a pollutant parameter at any Outlet ("Category 1 Monthly Violation"), Defendants shall conduct monitoring, sampling, and treatment as appropriate until the Outlet returns to compliance (i.e. until the Outlet meets the monthly average effluent limit).

(ii) Category 2 Monthly Violation. Upon notification of the second Monthly Violation in a row of the same pollutant parameter at the same Outlet ("Category 2 Monthly Violation"), Defendant shall either (1) conduct daily monitoring, sampling, and treatment until the Outlet returns to compliance, or (2) hire a third-party consultant and comply with the terms of Paragraph 49.b.iv of this Decree.

(iii) Category 3 Monthly Violation. Upon notification of the third Monthly Violation in a row of the same pollutant parameter at the same Outlet ("Category 3 Monthly Violation"), Defendants shall (1) continue daily monitoring, sampling, and treatment, (2) consult

with an individual with substantial expertise in Clean Water Act compliance and in treatment systems for and control of relevant effluent parameters in Defendants' NPDES permits, and (3) implement measures recommended by that individual until the Outlet returns to compliance. Alternatively, Defendants may hire a third-party consultant and comply with the terms of Paragraph 49.b.iv of this Decree.

(iv) Category 4 Monthly Violation. Upon notification of the fourth and any subsequent Monthly Violation in a row of the same pollutant parameter at the same Outlet ("Category 4 Monthly Violation"), Defendants shall hire a third-party consultant to examine the problem. Defendants shall continue daily monitoring, sampling, and treatment of discharges unless the consultant determines that daily monitoring, sampling, and treatment will not assist in examining and/or resolving the noncompliance. The consultant shall prepare a report detailing: (1) the cause of the continuing violations; (2) the appropriate level of monitoring and sampling; and (3) a plan to address the continuing violations. Defendants shall implement the proposed plan according to the consultant's recommendations within 30 Days of receipt of the report. The consultant's report and any documentation of actions taken shall be submitted to EPA, the State, and appropriate management at Magnum and Patriot in the quarterly report required by Paragraph 48.

c. If an Outlet is subject to Paragraph 49.a and/or 49.b for the same pollutant parameter five separate times within a 12-month period, then Defendants shall comply with the response actions identified in Paragraph 49.a.iii or 49.b.iii.

Training

50. Defendants shall provide and require annual formal training for all individuals with environmental management responsibilities including, but not limited to: (a) Clean Water Act compliance, including sediment control technologies; (b) hazardous waste management compliance;

(c) requirements in the EMS Manual; and (d) obligations in this Consent Decree.

51. Defendants shall provide and require appropriate annual training for all individuals, including all independent contractors, responsible for carrying out activities pursuant to this Consent Decree and/or any requirements in the EMS Manual.

VIII. ADDITIONAL INJUNCTIVE RELIEF

52. Water Quality Testing. Defendants shall conduct Whole Effluent Toxicity ("WET") testing immediately downstream of ten different Outlets per year with specific conductance greater than 1500 uS/cm. Such testing shall be conducted on a semi-annual basis each year to capture variations in flow (low flow summer/fall and high flow winter/spring) pursuant to EPA Test Method Number 1002. Defendants shall have samples processed by a NELAC certified laboratory. Within 30 Days of entry of this Decree, Defendants shall submit a list of ten testing sites for approval to EPA. Within 30 Days of the end of a calendar year (i.e. December 31), Defendants shall submit to EPA a list of ten testing sites for approval for WET testing in the upcoming year. Once each year, Defendants shall perform a macroinvertebrate Rapid Bioassessment Protocol ("RBP", genus-level) at each test site along with a RBP Habitat Assessment at the same time samples are collected for WET testing. RBP assessments shall be made in accordance with the most recent WVDEP methodology. All test results shall be sent to EPA annually pursuant to Section IX (Reporting Requirements).

53. Stream Restoration. Defendants shall implement five stream restoration projects in watersheds of the State, in accordance with the principles expressed in the "Stream Restoration Plan for a 25-Mile Section of the Little Coal River," dated August 31, 2006, attached as Appendix B of this Consent Decree. Within 30 Days of entry of this Consent Decree, WVDEP, in consultation with EPA, will identify to the Defendants qualifying projects in watersheds impacted by Defendants'

Facilities. Within 60 Days of identification by WVDEP, Defendants shall submit to WVDEP and EPA for approval a plan and schedule for completion of five of the identified projects. All five stream restoration projects implemented pursuant to this Paragraph shall be completed within three years of entry of this Consent Decree.

54. Defendants are responsible for the satisfactory completion of the Additional Injunctive Relief under this Section in accordance with the requirements of this Decree. Defendants may use contractors or consultants in planning and implementing the Additional Injunctive Relief.

55. For all requirements under this Section, Defendants certify the truth and accuracy of each of the following:

a. that, as of the date of executing this Decree, Defendants are not required to perform or develop any portion of this Additional Injunctive Relief by any federal, state, or local law or regulation and are not required to perform or develop this Additional Injunctive Relief by agreement, grant, or as injunctive relief awarded in any other action in any forum;

b. that Defendants were not planning or intending to perform this Additional Injunctive Relief other than in settlement of the claims resolved in this Decree; and

c. that Defendants have not received and shall not receive credit for any portion of this Additional Injunctive Relief in any other enforcement action.

IX. REPORTING REQUIREMENTS

56. Defendants shall submit to EPA and the State semi-annual reports at the end of the month following the end of the second and fourth quarters (i.e. July 31 and January 31). Each written semi-annual report shall include:

a. The status of EMS implementation;

b. The status of Consent Decree implementation, including the status of any

construction or compliance measures, and problems encountered or anticipated, together with implemented or proposed solutions;

c. A description of any noncompliance with the requirements of this Consent Decree and an explanation of the violation's likely cause and the remedial steps taken, or to be taken, to prevent or minimize such violation;

d. A description of each Decree violation for which Defendants have submitted to EPA an unresolved Force Majeure claim or intend to submit a Force Majeure claim pursuant to Section XI of this Consent Decree;

e. Notice of payment of stipulated penalties pursuant to Paragraphs 75-76;

f. A copy of any consultant reports generated pursuant to Paragraph 49 during the previous quarter, and any documentation of actions taken in response to the report(s); and

g. A copy of the Report submitted to Patriot and Magnum management pursuant to Paragraph 48.

57. Defendants shall submit to EPA and the State an annual report within 30 Days after the end of each calendar year, which shall (a) detail the responses taken or responses planned for each finding of noncompliance in the annual Third Party Environmental Audit and (b) provide results of all WET testing undertaken pursuant to Paragraph 52.

58. If Defendants violate, or have reason to believe that they may violate, any requirement of this Consent Decree, Defendants shall notify the United States and the State of such violation and its likely duration, in writing, within 7 Days of the day Defendants first become aware of the violation, with an explanation of the violation's likely cause and of the remedial steps taken, or to be taken, to prevent or minimize such violation. If the cause of a violation cannot be fully explained at the time the report is due, Defendants shall so state in the report. Defendants shall

investigate the cause of the violation and shall then submit an amendment to the report, including a full explanation of the cause of the violation, within 30 Days of the day Defendants become aware of the cause of the violation. Nothing in this Paragraph or the following Paragraph relieves Defendants of their obligation to provide the notice required by Section XI of this Consent Decree (Force Majeure).

59. Whenever any violation of this Consent Decree or of any applicable permit or any other event affecting Defendants' performance under this Decree, or the performance of its Facilities, may pose an immediate threat to the public health or welfare or the environment, Defendants shall notify EPA and the State orally or by electronic or facsimile transmission as soon as possible, but no later than 24 hours after Defendants first knew of the violation or event. This procedure is in addition to the requirements set forth in the preceding Paragraph.

60. All reports shall be submitted to the persons designated in Section XVI of this Consent Decree (Notices).

61. Each report submitted by Defendants under this Section shall be signed by an official of the submitting party and include the following certification:

> I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

This certification requirement does not apply to emergency or similar notifications where compliance would be impractical.

62. The reporting requirements of this Consent Decree do not relieve Defendants of any reporting obligation required by the Act or implementing regulations, or by any other federal, state, or local law, regulation, permit, or other requirement.

63. Any information provided pursuant to this Consent Decree may be used by the United States in any proceeding to enforce the provisions of this Consent Decree and as otherwise permitted by law.

X. STIPULATED PENALTIES

64. Defendants shall be liable for stipulated penalties to the United States and the State for violations as specified below, unless excused under Section XI (Force Majeure). A violation includes failing to perform any obligation required by the terms of this Decree, including any work plan or schedule approved under this Decree, according to all applicable requirements of this Decree and within the specified time schedules established by or approved under this Decree.

65. Stipulated penalties under this Section shall begin to accrue on the Day after performance is due or on the Day a violation occurs, whichever is applicable, and shall continue to accrue until performance is satisfactorily completed or until the violation ceases. Stipulated penalties shall accrue simultaneously for separate violations of this Consent Decree.

66. Either Plaintiff may in the unreviewable exercise of its discretion, reduce or waive stipulated penalties otherwise due it under this Consent Decree.

67. Stipulated penalties shall continue to accrue as provided in Paragraph 65 during any Dispute Resolution under Section XII, but need not be paid until the following:

a. If the dispute is resolved by agreement or by a decision of EPA or the State that is not appealed to the Court, Defendants shall pay accrued penalties determined to be owing, together with interest, to the United States and the State within 30 Days of the Effective Date of the

agreement or the receipt of EPA's or the State's decision or order.

b. If the dispute is appealed to the Court and the United States or the State prevails in whole or in part, Defendants shall pay all accrued penalties determined by the Court to be owing, together with interest, to the United States and the State within 60 Days of receiving the Court's decision or order, except as provided in subparagraph (c), below.

c. If any Party appeals the Court's decision, Defendants shall pay all accrued penalties determined to be owing, together with interest, within 15 Days of receiving the final appellate court decision.

68. If Defendants fail to pay stipulated penalties according to the terms of this Consent Decree, Defendants shall be liable for interest on such penalties, as provided for in 28 U.S.C. § 1961, accruing as of the date payment became due. Nothing in this Paragraph shall be construed to limit the United States or the State from seeking any remedy otherwise provided by law for Defendants' failure to pay any stipulated penalties.

69. Subject to the provisions of Section XIV of this Consent Decree (Effect of Settlement/Reservation of Rights), the stipulated penalties provided for in this Consent Decree shall be in addition to any other rights, remedies, or sanctions available to the United States or the State for Defendants' violation of this Consent Decree or applicable law. Where a violation of this Consent Decree is also a violation of relevant statutory or regulatory requirements, Defendants shall be allowed a credit, for any stipulated penalties paid, against any statutory penalties imposed for such violation.

70. The Defendant shall pay fifty percent of the total stipulated penalty amount due to the United States and fifty percent to the State.

71. Non-Compliance with Consent Decree. The following stipulated penalties shall

accrue per violation per Day for each violation of any requirement of this Consent Decree, except for the Reporting Requirements of Section IX (Reporting Requirements):

Penalty Per Violation Per Day	Period of Noncompliance
$1,000 per Day or portion thereof	1st through 14th Day
$2,500 per Day or portion thereof	15th through 30th Day
$4,500 per Day or portion thereof	31st Day and beyond

72. Non-Compliance with Reporting Requirements. The following stipulated penalties shall accrue per violation per Day for each violation of the Reporting Requirements under Section IX of this Consent Decree:

Penalty Per Violation Per Day	Period of Noncompliance
$250 per Day or portion thereof	1st through 14th Day
$500 per Day or portion thereof	15th through 30th Day
$1,250 per Day or portion thereof	31st Day and beyond

73. Defendants shall pay any stipulated penalty pursuant to Paragraphs 71 and 72 to the United States and the State within 30 Days of receiving a written demand by either Plaintiff. The Plaintiff making a demand for payment of a stipulated penalty shall simultaneously send a copy of the demand to the other.

74. Defendants shall pay stipulated penalties owing to the United States pursuant to Paragraphs 71 and 72 in the manner set forth in Paragraph 12 and with the confirmation notices and transmittal letter information required by Paragraph 12, except that the transmittal letter shall state that the payment is for stipulated penalties and shall state for which violation(s) the penalties are being paid. Defendants shall pay stipulated penalties owing to the State pursuant to Paragraphs 71 and 72 in the manner set forth in Paragraph 13 and with the confirmation notice required by Paragraph 13, except that the notice shall state that the payment is for stipulated penalties and shall state for which violation(s) the penalties are being paid.

75. Non-Compliance with NPDES Permit Limits. The following stipulated penalties

shall accrue for each Effluent Limit Violation by one of Defendants' Facilities after the Effective Date of this Consent Decree:

Per Daily Violation	Period of Noncompliance
$1,000	1st Daily Violation; Category 1 Daily Violation
$2,500	Category 2 Daily Violation
$5,000	Category 3 Daily Violation; Category 4 Daily Violation

Per Monthly Violation	Period of Noncompliance
$2,000	Category 1 Monthly Violation
$5,000	Category 2 Monthly Violation
$10,000	Category 3 Monthly Violation; Category 4 Monthly Violation

76. Defendants shall pay any stipulated penalties due as a result of Effluent Limit Violations under Paragraph 75 at the end of the month following the end of each quarter (i.e., by April 30, July 31, October 31, and January 31), except as provided in Paragraph 77. Defendants shall make payments to the United States by FedWire Electronic Funds Transfer following the procedure specified in Paragraph 12, and notice of such payment shall be sent to EPA with Defendants' semi-annual reports required by Paragraph 56. Defendants shall make payments to the State following the procedure specified in Paragraph 13, and notice of such payment shall be sent to the State with Defendants' semi-annual reports required by Paragraph 56.

77. Stipulated penalties under Paragraph 75 shall not apply to the permits subject to the pending and pre-existing State settlements specifically referenced in Paragraphs D or E of this Consent Decree during the term of either such settlement. Upon termination of either such State settlement, stipulated penalties under Paragraph 75 shall apply.

XI. FORCE MAJEURE

78. "Force Majeure," for purposes of this Consent Decree, is defined as any event arising from causes beyond the control of Defendants, of any entity controlled by Defendants, or of

Defendants' contractors, that delays or prevents the performance of any obligation under this Consent Decree despite Defendants' best efforts to fulfill the obligation. The requirement that Defendants exercise "best efforts to fulfill the obligation" includes using best efforts to anticipate any potential Force Majeure event and best efforts to address the effects of any such event (a) as it is occurring and (b) after it has occurred to prevent or minimize any resulting delay to the greatest extent possible. "Force Majeure" does not include Defendants' financial inability to perform any obligation under this Consent Decree.

79. If any event occurs or has occurred that may delay the performance of any obligation under this Consent Decree, whether or not caused by a Force Majeure event, Defendants shall provide notice orally or by electronic or facsimile transmission to EPA and the State within 72 hours of when Defendants first knew that the event might cause a delay. Within 7 Days thereafter, Defendants shall provide in writing to EPA and the State an explanation and description of the reasons for the delay; the anticipated duration of the delay; all actions taken or to be taken to prevent or minimize the delay; a schedule for implementation of any measures to be taken to prevent or mitigate the delay or the effect of the delay; Defendants' rationale for attributing such delay to a Force Majeure event if it intends to assert such a claim; and a statement as to whether, in the opinion of Defendants, such event may cause or contribute to an endangerment to public health, welfare or the environment. Defendants shall include with any notice all available documentation supporting the claim that the delay was attributable to a Force Majeure. Failure to comply with the above requirements shall preclude Defendants from asserting any claim of Force Majeure for that event for the period of time of such failure to comply, and for any additional delay caused by such failure. Defendants shall be deemed to know of any circumstance of which Defendants, any entity controlled by Defendants, or Defendants' contractors knew or should have known.

80. If EPA, after a reasonable opportunity for review and comment by the State, agrees that the delay or anticipated delay is attributable to a Force Majeure event, the time for performance of the obligations under this Consent Decree that are affected by the Force Majeure event will be extended by EPA, after a reasonable opportunity for review and comment by the State, for such time as is necessary to complete those obligations. An extension of the time for performance of the obligations affected by the Force Majeure event shall not, of itself, extend the time for performance of any other obligation. EPA will notify Defendants in writing of the length of the extension, if any, for performance of the obligations affected by the Force Majeure event.

81. If EPA, after a reasonable opportunity for review and comment by the State, does not agree that the delay or anticipated delay has been or will be caused by a Force Majeure event, EPA will notify Defendants in writing of its decision.

82. If Defendants elect to invoke the dispute resolution procedures set forth in Section XII (Dispute Resolution), it shall do so no later than 15 Days after receipt of EPA's notice. In any such proceeding, Defendants shall have the burden of demonstrating by a preponderance of the evidence that the delay or anticipated delay has been or will be caused by a Force Majeure event, that the duration of the delay or the extension sought was or will be warranted under the circumstances, that best efforts were exercised to avoid and mitigate the effects of the delay, and that Defendants complied with the requirements of Paragraphs 78 and 79, above. If Defendants carry this burden, the delay at issue shall be deemed not to be a violation by Defendants of the affected obligation of this Consent Decree identified to EPA and the Court.

XII. DISPUTE RESOLUTION

83. Unless otherwise expressly provided for in this Consent Decree, the Dispute Resolution procedures of this Section shall be the exclusive mechanism to resolve disputes arising

under or with respect to this Consent Decree. Defendants' failure to seek resolution of a dispute under this Section shall preclude Defendants from raising any such issue as a defense to an action by the United States or the State to enforce any obligation of Defendants arising under this Decree.

84. Informal Dispute Resolution. Any dispute subject to Dispute Resolution under this Consent Decree shall first be the subject of informal negotiations. The dispute shall be considered to have arisen when Defendants send the United States and the State a written Notice of Dispute. The Notice of Dispute shall state clearly the matter in dispute. The period of informal negotiations shall not exceed 30 Days from the date the dispute arises, unless that period is modified by written agreement. If the Parties cannot resolve a dispute by informal negotiations, then the position advanced by the United States, after consultation with the State, shall be considered binding unless, within 10 Days after the conclusion of the informal negotiation period, Defendants invoke formal dispute resolution procedures as set forth below.

85. Formal Dispute Resolution. Defendants shall invoke formal dispute resolution procedures, within the time period provided in the preceding Paragraph, by serving on the United States and the State a written Statement of Position regarding the matter in dispute. The Statement of Position shall include, but need not be limited to, any factual data, analysis, or opinion supporting Defendants' position and any supporting documentation relied upon by Defendants.

86. The United States shall serve its Statement of Position within 45 Days of receipt of Defendants' Statement of Position. The United States' Statement of Position shall include, but need not be limited to, any factual data, analysis, or opinion supporting that position and any supporting documentation relied upon by the United States, and shall be developed in consultation with the State. The United States' Statement of Position shall be binding on Defendants, unless Defendants file a motion for judicial review of the dispute in accordance with Paragraph 88.

87. An administrative record of the dispute shall be maintained by EPA and shall contain all Statements of Position, including supporting documentation, submitted pursuant to this Section.

88. Defendants may seek judicial review of the dispute by filing with the Court and serving on the United States and the State, in accordance with Section XVI of this Consent Decree (Notices), a motion requesting judicial resolution of the dispute. The motion must be filed within 10 Days of receipt of the United States' Statement of Position pursuant to Paragraph 86. The motion shall contain a written statement of Defendants' position on the matter in dispute, including any supporting factual data, analysis, opinion, or documentation, and shall set forth the relief requested and any schedule within which the dispute must be resolved for orderly implementation of this Consent Decree.

89. The United States and/or the State shall respond to Defendants' motion within the time period allowed by the Local Rules of this Court. Defendants may file a reply memorandum, to the extent permitted by the Local Rules.

90. Standard of Review

a. Disputes Concerning Matters Accorded Record Review. Except as otherwise provided in this Consent Decree, in any dispute brought under Paragraph 85 pertaining to the adequacy or appropriateness of plans, procedures to implement plans, schedules or any other items requiring approval by EPA under this Consent Decree; the adequacy of the performance of work undertaken pursuant to this Consent Decree; and all other disputes that are accorded review on the administrative record under applicable principles of administrative law, Defendants shall have the burden of demonstrating, based on the administrative record, that the position of the United States is arbitrary and capricious or otherwise not in accordance with law.

b. Other Disputes. Except as otherwise provided in this Consent Decree, in any

other dispute brought under Paragraph 85, Defendants shall bear the burden of demonstrating that its position fulfills the terms, conditions, requirements, and objectives of this Consent Decree.

91. The invocation of Dispute Resolution procedures under this Section shall not, by itself, extend, postpone, or affect in any way any obligation of Defendants under this Consent Decree, unless and until final resolution of the dispute so provides. Stipulated penalties with respect to the disputed matter shall continue to accrue from the first Day of noncompliance, but payment shall be stayed pending resolution of the dispute as provided in Paragraph 67. If Defendants do not prevail on the disputed issue, stipulated penalties shall be assessed and paid as provided in Section X (Stipulated Penalties).

XIII. INFORMATION COLLECTION AND RETENTION

92. The United States, the State, and their representatives, including attorneys, contractors, and consultants, shall have the right of entry onto any property under the ownership or control of the Defendants, at all reasonable times, upon presentation of credentials, to:

a. monitor the progress of activities required under this Consent Decree;

b. verify any data or information submitted to the United States in accordance with the terms of this Consent Decree;

c. obtain samples and, upon request, splits of any samples taken by Defendants or its representatives, contractors, or consultants;

d. obtain documentary evidence, including photographs and similar data; and

e. assess Defendants' compliance with this Consent Decree.

93. Upon request, Defendants shall provide EPA and the State or their authorized representatives splits of any samples taken by Defendants. Upon request, EPA and the State shall provide Defendants splits of any samples taken by EPA or the State.

94. Until five years after the termination of this Consent Decree, Defendants shall retain, and shall instruct its contractors and agents to preserve, all non-identical copies of all documents, records, or other information (including documents, records, or other information in electronic form) in its or its contractors' or agents' possession or control, or that come into its or its contractors' or agents' possession or control, and that relate in any manner to Defendants' performance of its obligations under this Consent Decree. This information-retention requirement shall apply regardless of any contrary corporate or institutional policies or procedures. At any time during this information-retention period, upon request by the United States or the State, Defendants shall provide copies of any documents, records, or other information required to be maintained under this Paragraph.

95. At the conclusion of the information-retention period provided in the preceding Paragraph, Defendants shall notify the United States and the State at least 90 Days prior to the destruction of any documents, records, or other information subject to the requirements of the preceding Paragraph and, upon request by the United States or the State, Defendants shall deliver any such documents, records, or other information to EPA or the State. Defendants may assert that certain documents, records, or other information is privileged under the attorney-client privilege or any other privilege recognized by federal law. If Defendants assert such a privilege, they shall provide the following: (a) the title of the document, record, or information; (b) the date of the document, record, or information; (c) the name and title of each author of the document, record, or information; (d) the name and title of each addressee and recipient; (e) a description of the subject of the document, record, or information; and (f) the privilege asserted by Defendants. However, no documents, records, or other information created or generated pursuant to the requirements of this Consent Decree shall be withheld on grounds of privilege.

96. Defendants may also assert that information required to be provided under this Section is protected as Confidential Business Information ("CBI") under 40 C.F.R. Part 2. As to any information that Defendants seek to protect as CBI, Defendants shall follow the procedures set forth in 40 C.F.R. Part 2.

97. This Consent Decree in no way limits or affects any right of entry and inspection, or any right to obtain information, held by the United States or the State pursuant to applicable federal or state laws, regulations, or permits, nor does it limit or affect any duty or obligation of Defendants to maintain documents, records, or other information imposed by applicable federal or state laws, regulations, or permits.

XIV. EFFECT OF SETTLEMENT/RESERVATION OF RIGHTS

98. This Consent Decree resolves the civil claims of the United States and the State alleged in the Complaint filed in this action as follows:

a. With respect to Magnum and the Magnum Subsidiaries, this Consent Decree resolves the civil claims of the United States and the State for civil penalties and injunctive relief for the violations alleged in Appendices A and B of the Complaint.

b. With respect to Patriot and the non-Magnum Subsidiaries, this Consent Decree resolves the civil claims of the United States and the State for injunctive relief for the violations alleged in the Complaint.

99. The United States and the State reserve all legal and equitable remedies available to enforce the provisions of this Consent Decree, except as expressly stated in Paragraph 98. This Consent Decree shall not be construed to limit the rights of the United States or the State to obtain penalties or injunctive relief under the Act or implementing regulations, or under other federal or state laws, regulations, or permit conditions, except as expressly specified in Paragraph 98.

100. Water-quality based effluent limits for selenium are the subject of pre-existing enforcement actions, including the settlement with Hobet identified in Paragraph E above, are addressed in the appeal to the Circuit Court of Kanawha County, West Virginia, Civil Action No. 08-AA-76 of the June 12, 2008 decision of the Environmental Quality Board, and are considered in individual permitting actions taken by the State in issuing and revising NPDES permits. EPA recognizes the ongoing efforts by the State in developing policies to limit and treat selenium. In the interest of creating a consistent approach to addressing selenium, this Consent Decree is not intended to impose injunctive relief or other legal sanctions with respect to that pollutant. Notwithstanding, the United States and the State reserve all rights and claims with respect to selenium in accordance with Paragraph 101 below.

101. In any subsequent administrative or judicial proceeding initiated by the United States or the State for injunctive relief, civil penalties, or other appropriate relief relating to the Defendants' violations, Defendants shall not assert, and may not maintain, any defense or claim based upon the principles of waiver, res judicata, collateral estoppel, issue preclusion, claim preclusion, claim-splitting, or other defenses based upon any contention that the claims raised by the United States or the State in the subsequent proceeding were or should have been brought in the instant case, except with respect to claims that have been specifically resolved pursuant to Paragraph 98 of this Section.

102. This Consent Decree is not a permit, or a modification of any permit, under any federal, state, or local laws or regulations. Defendants are responsible for achieving and maintaining complete compliance with all applicable federal, state, and local laws, regulations, and permits; and Defendants' compliance with this Consent Decree shall be no defense to any action commenced pursuant to any such laws, regulations, or permits, except as set forth herein. The United States and the State do not, by their consent to the entry of this Consent Decree, warrant or aver in any manner

that Defendants' compliance with any aspect of this Consent Decree shall result in compliance with provisions of the Act, 33 U.S.C. § 1311, *et seq.*, or with any other provisions of federal, state, or local laws, regulations, or permits. Application for construction grants, State Revolving Loan Funds, or any other grants or loans, or other delays caused by inadequate Facility planning or plans and specifications on the part of Defendants shall not be cause for extension of any required compliance date in this Consent Decree.

103. This Consent Decree does not limit or affect the rights of Defendants or of the United States or the State against any third parties, not party to this Consent Decree, nor does it limit the rights of third parties, not party to this Consent Decree, against Defendants, except as otherwise provided by law.

104. This Consent Decree shall not be construed to create rights in, or grant any cause of action to, any third party not party to this Consent Decree.

105. By the execution of this Consent Decree, Defendants release and shall hold harmless the United States and the State, their instrumentalities, agents, and employees, in their official and personal capacities, of any and all liability or claims arising out of or otherwise related to the negotiations leading to this Consent Decree and all matters contained therein.

XV. COSTS

106. The Parties shall bear their own costs of this action, including attorneys' fees, except that the United States and the State shall be entitled to collect the costs (including attorneys' fees) incurred in any action necessary to collect any portion of the civil penalty or any stipulated penalties due but not paid by Defendants.

XVI. NOTICES

107. Unless otherwise specified herein, whenever notifications, submissions, reports, or

communications are required by this Consent Decree, they shall be made in writing and addressed as follows:

To the United States:

Chief, Environmental Enforcement Section
Environment and Natural Resources Division
U.S. Department of Justice
P.O. Box 7611
Washington, D.C. 20044-7611
Re: DOJ No. 90-5-1-1-09476

To EPA:

Director, Office of Civil Enforcement
U.S. Environmental Protection Agency
Ariel Rios Building, 2241A
1200 Pennsylvania Ave., N.W.
Washington, D.C. 20460

NPDES Enforcement Branch Chief
U.S. EPA Region III
1650 Arch Street, 3WP42
Philadelphia, PA 19103

To the State

Chief Inspector, Environmental Enforcement
West Virginia Department of Environmental Protection
601 57th Street, SE
Charleston, WV 25304

Director, Division of Mining and Reclamation
West Virginia Department of Environmental Protection
601 57th Street, SE
Charleston, WV 25304

Chief, Office of Legal Services
West Virginia Department of Environmental Protection
601 57th Street, SE
Charleston, WV 25304

To Defendants:

Joseph W. Bean
Senior Vice President, General Counsel & Secretary
Patriot Coal Corporation
12312 Olive Boulevard
St. Louis, Missouri 63141

Paul H. Vining
President and Chief Operating Officer
Patriot Coal Corporation
500 Lee Street, E., Suite 900
Charleston, WV 25301

108. Any Party may, by written notice to the other Parties, change its designated notice recipient or notice address provided above.

109. Notices submitted pursuant to this Section shall be deemed submitted upon mailing, unless otherwise provided in this Consent Decree or by mutual agreement of the Parties in writing.

XVII. EFFECTIVE DATE

110. The Effective Date of this Consent Decree shall be the date upon which this Consent Decree is entered by the Court or a motion to enter this Consent Decree is granted, whichever occurs first, as recorded on the Court's docket.

XVIII. RETENTION OF JURISDICTION

111. The Court shall retain jurisdiction over this case until termination of this Consent Decree, for the purpose of resolving disputes arising under this Decree or entering orders modifying this Decree, pursuant to Sections XII (Dispute Resolution) or XIX (Modification) or effectuating or enforcing compliance with the terms of this Decree.

XIX. MODIFICATION

112. The terms of this Consent Decree, including any attached appendices, may be

modified only by a subsequent written agreement signed by all the Parties. Where the modification constitutes a material change to this Decree, it shall be effective only upon approval by the Court.

113. Any disputes concerning modification of this Decree shall be resolved pursuant to Section XII of this Decree (Dispute Resolution); provided, however, that, instead of the burden of proof provided by Paragraph 90, the Party seeking the modification bears the burden of demonstrating that it is entitled to the requested modification in accordance with Federal Rule of Civil Procedure 60(b).

XX. TERMINATION

114. After Defendants have completed the requirements of Section VI (Compliance Requirements) and Paragraphs 25-33 (Environmental Management System and EMS Audit) of this Decree, have thereafter maintained continuous satisfactory compliance with this Consent Decree for a period of three years, have complied with all other requirements of this Consent Decree, including those relating to the Injunctive Relief under Section VII and Additional Injunctive Relief required by Section VIII of this Consent Decree, and have paid the civil penalty and any accrued stipulated penalties as required by this Consent Decree, Defendants may serve upon the United States and the State a Request for Termination, stating that Defendants have satisfied those requirements, together with all necessary supporting documentation.

115. Following receipt by the United States and the State of Defendants' Request for Termination, the Parties shall confer informally concerning the Request and any disagreement that the Parties may have as to whether Defendants have satisfactorily complied with the requirements for termination of this Consent Decree. If the United States, after consultation with the State, agrees that the Decree may be terminated, the Parties shall submit, for the Court's approval, a joint stipulation terminating the Decree.

116. If the United States, after consultation with the State, does not agree that the Decree may be terminated, Defendants may invoke Dispute Resolution under Section XII of this Decree. However, Defendants shall not seek Dispute Resolution of any dispute regarding termination, under Paragraph 85 of Section XII, until 60 Days after service of its Request for Termination.

XXI. PUBLIC PARTICIPATION

117. This Consent Decree shall be lodged with the Court for a period of not less than 30 Days for public notice and comment in accordance with 28 C.F.R. § 50.7. The United States reserves the right to withdraw or withhold its consent if the comments regarding this Consent Decree disclose facts or considerations indicating that this Consent Decree is inappropriate, improper, or inadequate. Defendants consent to entry of this Consent Decree without further notice and agree not to withdraw from or oppose entry of this Consent Decree by the Court or to challenge any provision of the Decree, unless the United States has notified Defendants in writing that it no longer supports entry of the Decree.

XXII. SIGNATORIES/SERVICE

118. Each undersigned representative of the Defendants, the Assistant Attorney General for the Environment and Natural Resources Division of the Department of Justice, and the undersigned representative of the State certifies that he or she is fully authorized to enter into the terms and conditions of this Consent Decree and to execute and legally bind the Party he or she represents to this document.

119. This Consent Decree may be signed in counterparts, and its validity shall not be challenged on that basis. Defendants agree to accept service of process by mail with respect to all matters arising under or relating to this Consent Decree and to waive the formal service requirements set forth in Rules 4 and 5 of the Federal Rules of Civil Procedure and any applicable Local Rules of

this Court including, but not limited to, service of a summons.

XXIII. INTEGRATION

120. This Consent Decree constitutes the final, complete, and exclusive agreement and understanding among the Parties with respect to the settlement embodied in the Decree and supersedes all prior agreements and understandings, whether oral or written, concerning the settlement embodied herein. Other than deliverables that are subsequently submitted and approved pursuant to this Decree, no other document, nor any representation, inducement, agreement, understanding, or promise, constitutes any part of this Decree or the settlement it represents, nor shall it be used in construing the terms of this Decree.

XXIV. FINAL JUDGMENT

121. Upon approval and entry of this Consent Decree by the Court, this Consent Decree shall constitute a final judgment of the Court as to the United States, the State, and Defendants. The Court finds that there is no just reason for delay and therefore enters this judgment as a final judgment under Fed. R. Civ. P. 54 and 58.

XXV. APPENDICES

122. The following appendices are attached to and part of this Consent Decree:

Appendix A: Compliance Focused Environmental Management System Elements

Appendix B: "Stream Restoration Plan for a 25-Mile Section of the Little Coal River," dated August 31, 2006.

SO ORDERED THIS _____ DAY OF _____, 2009.

_____
United States District Judge
Southern District of West Virginia

THE UNDERSIGNED PARTIES enter into this Consent Decree in the matter of *United States v. Patriot Coal Corp., et al.,*

FOR THE UNITED STATES OF AMERICA

Date: 2/3/09

JOHN CRUDEN
Acting Assistant Attorney General
Environment and Natural Resources Division
U.S. Department of Justice
Washington, D.C. 20530

Date: 2/4/09

LAURA A. THOMS
BRITTA G. HINRICHSEN
Trial Attorneys
Environmental Enforcement Section
Environment and Natural Resources Division
U.S. Department of Justice
P.O. Box 7611
Washington, D.C. 20044

THE UNDERSIGNED PARTIES enter into this Consent Decree in the matter of *United States v. Patriot Coal Corp., et al.,*

FOR THE UNITED STATES OF AMERICA

CHARLES T. MILLER
United States Attorney

Date: _____ _____

CAROL A. CASTO
Assistant United States Attorney
WV State Bar Number 890
P.O. Box 1713
Charleston, WV 25326

THE UNDERSIGNED PARTIES enter into this Consent Decree in the matter of *United States v. Patriot Coal Corp., et al.*

FOR THE UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

Date: 1/23/09

CATHERINE McCABE
Acting Assistant Administrator
Office of Enforcement and Compliance Assurance
U.S. Environmental Protection Agency
Ariel Rios Building, 2201A
1200 Pennsylvania Ave., N.W.
Washington, D.C. 20460

THE UNDERSIGNED PARTIES enter into this Consent Decree in the matter of *United States v. Patriot Coal Corp., et al.*

FOR THE UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

Date: 1/5/09

DONALD S. WELSH
Regional Administrator
U.S. Environmental Protection Agency, Region III
1650 Arch Street
Philadelphia, PA 19103-2029
215-814-2900
215-814-2901 (fax)

Date: 12/30/08

WILLIAM C. EARLY
Regional Counsel
U.S. Environmental Protection Agency, Region III
1650 Arch Street
Philadelphia, PA 19103-2029
215-814-2606
215-814-2603 (fax)

THE UNDERSIGNED PARTIES enter into this Consent Decree in the matter of *United States v. Patriot Coal Corp., et al.,*.

FOR THE WEST VIRGINIA DEPARTMENT OF ENVIRONMENTAL PROTECTION

Date: 12-23-08

HEATHER CONNOLLY
Chief, Office of Legal Services
West Virginia Department of Environmental Protection
601 57th Street, SE
Charleston, WV 25304

THE UNDERSIGNED PARTIES enter into this Consent Decree in the matter of *United States v. Patriot Coal Corp., et al.,*

FOR DEFENDANTS PATRIOT COAL CORP.; MAGNUM COAL CO.; APOGEE COAL CO., LLC; CATENARY COAL CO., LLC; COYOTE COAL CO. LLC; DAKOTA LLC; HOBET MINING, LLC; JUPITER HOLDINGS LLC; LITTLE CREEK LLC; MIDLAND TRAIL ENERGY LLC; PANTHER LLC; REMINGTON LLC; WILDCAT LLC; BLACK STALLION COAL CO., LLC; BLACK WALNUT COAL CO.; COLONY BAY COAL CO.; EASTERN ASSOCIATED COAL, LLC; HILLSIDE MINING CO.; JARRELL'S BRANCH COAL CO.; KANAWHA EAGLE COAL, LLC; LOGAN FORK COAL CO.; MARTINKA COAL CO., LLC; MOUNTAIN VIEW COAL CO., LLC; PINE RIDGE COAL CO., LLC; RIVERS EDGE MINING, INC.; AND WINIFREDE DOCK LLC.

Date: January 12, 2009

PAUL H. VINING
President and Chief Operating Office
Patriot Coal Corporation
500 Lee Street, E., Suite 900
Charleston, WV 25301

APPENDIX A

APPENDIX A

COMPLIANCE-FOCUSED ENVIRONMENTAL MANAGEMENT SYSTEM ELEMENTS

United States v. Patriot Coal Corp., et al.

1. Environmental Policy

a. This policy, upon which the EMS is based, must clearly communicate management commitment to achieving compliance with applicable federal, state, and local environmental statutes, regulations, enforceable agreements, and permits (hereafter, "environmental requirements"), minimizing risks to the environment from unplanned or unauthorized releases of hazardous or harmful contaminants, and continual improvement in environmental performance. The policy should also state management's intent to provide adequate personnel and other resources for the EMS.

2. Organization, Personnel, and Oversight of EMS

a. Identifies and defines specific duties, roles, responsibilities, and authorities of key environmental staff in implementing and sustaining the EMS (e.g., could include position descriptions and/or performance standards for all environmental department personnel, and excerpts from others having specific environmental duties, and regulatory compliance responsibilities).

b. Includes organization charts that identify units, line management, and other individuals having environmental duties and regulatory compliance responsibilities.

c. Includes ongoing means of communicating environmental issues and information among the various levels and functions of the organization, to include all persons working for or on behalf of the organization (e.g., on-site service providers and contractors who function as *de facto* employees), and for receiving and addressing their concerns.

3. Accountability and Responsibility

a. Specifies accountability and environmental responsibilities of organization's managers, and managers of other organizations acting on its behalf for environmental protection and risk reduction measures, assuring compliance, required reporting to regulatory agencies, and corrective actions implemented in their area(s) of responsibility.

b. Describes incentive programs for managers and employees to perform in

accordance with compliance policies, standards, and procedures.

c. Describes potential consequences for departure from specified operating procedures, including liability for civil/administrative penalties imposed as a result of noncompliance.

4. Environmental Requirements

a. Describes process for identifying potentially applicable environmental requirements; interpreting their applicability to specific operations, emissions, and waste streams; and effectively communicating those applicable environmental requirements to affected persons working for or on behalf of the organization.

b. Describes a process for developing, implementing and maintaining ongoing internal compliance monitoring to ensure that facility activities conform to applicable environmental requirements. Compliance monitoring shall include inspections and measurements, as appropriate.

c. Describes procedures for prospectively identifying and obtaining information about changes and proposed changes in environmental requirements, and incorporating those changes into the EMS (i.e., regulatory "change management").

d. Describes a procedure for communicating with regulatory agencies regarding environmental requirements and regulatory compliance.

5. Assessment, Prevention, and Control

a. Identifies an ongoing process for assessing operations, for the purposes of preventing, controlling, or minimizing reasonably foreseeable releases, environmental process hazards, and risks of noncompliance with environmental requirements. This process shall include identifying operations and waste streams where equipment malfunctions and deterioration, and/or operator errors or deliberate malfeasance, are causing, or have the potential to cause: (1) unplanned or unauthorized releases of hazardous or harmful contaminants to the environment, (2) a threat to human health or the environment, or (3) noncompliance with environmental requirements.

b. Describes process for identifying operations and activities where documented operating criteria, such as standard operating procedures (SOPs), are needed to prevent noncompliance or unplanned/unauthorized releases of hazardous or harmful contaminants, and defines a uniform process for developing, approving and implementing the documented operating criteria.

c. Describes a system for conducting and documenting routine, objective, self-

inspections by department supervisors and trained staff, especially at locations identified by the process described in (a) above, to check for malfunctions, deterioration, worker adherence to operating criteria, unusual situations, and unauthorized or unplanned releases.

d. Describes a "management of change" process to ensure identification and consideration of environmental requirements, the environmental aspects/impacts, and potential operator errors or deliberate malfeasance during planning, design, and operation of ongoing, new, and/or changing buildings, processes, equipment, maintenance activities, and products.

6. Environmental Incident and Non-compliance Investigations

a. Describes standard procedures and requirements for internal and external reporting of environmental incidents and noncompliance with environmental requirements.

b. Establishes procedures for investigation, and prompt and appropriate correction of noncompliance. The investigation process includes root-cause analysis of identified problems to aid in developing the corrective actions.

c. Describes a system for development, tracking, and effectiveness verification of corrective and preventative actions.

7. Environmental Training, Awareness, and Competence

a. Identifies specific education and training required for organization personnel or those acting on its behalf, as well as process for documenting training provided

b. Describes program to ensure that organization employees or those acting on its behalf are aware of its environmental policies and procedures, environmental requirements, and their roles and responsibilities within the environmental management system.

c. Describes program for ensuring that personnel responsible for meeting and maintaining compliance with environmental requirements are competent on the basis of appropriate education, training, and/or experience.

d. Identifies training on how to recognize operations and waste streams where equipment malfunctions and deterioration, and/or operator errors or deliberate malfeasance, are causing, or have the potential to cause: (1) unplanned or unauthorized releases of hazardous or harmful contaminants to the environment, (2) a threat to human health or the environment, or (3) noncompliance with environmental requirements.

8. Environmental Planning and Organizational Decision-Making

a. Describes how environmental planning will be integrated into organizational decision-making, including plans and decisions on capital improvements, product and process design, training programs, and maintenance activities.

b. Requires establishing, on an annual basis, written targets, objectives, and action plans for improving environmental performance, by at least each operating organizational subunit with environmental responsibilities, as appropriate, including those for contractor operations conducted at the facility, and how specified actions will be tracked and progress reported. Targets and objectives must include actions that reduce the risk of noncompliance with environmental requirements and minimize the potential for unplanned or unauthorized releases of hazardous or harmful contaminants.

9. Maintenance of Records and Documentation

a. Identifies the types of records developed in support of the EMS (including audits and reviews), who maintains them and, where appropriate, security measures to prevent their unauthorized disclosure, and protocols for responding to inquiries and requests for release of information.

b. Specifies the data management systems for any internal waste tracking, environmental data, and hazardous waste determinations.

c. Specifies document control procedures.

10. Pollution Prevention

a. Describes an internal process or procedure for preventing, reducing, recycling, reusing, and minimizing waste and emissions, including incentives to encourage material substitutions. Also includes mechanisms for identifying candidate materials to be addressed by the pollution prevention program and tracking progress.

11. Continuing Program Evaluation and Improvement

a. Describes program for periodic (at least annually) evaluation of the EMS, which specifies a process for translating assessment results into EMS improvements. The program shall include communicating findings and action plans to affected organization employees or those acting on its behalf.

b. Describes a program for periodic audits (at least annually) of facility compliance with environmental requirements by an independent auditor(s). Audit results are

reported to upper management and instances of noncompliance are addressed through the process described in element 6 above.

12. Public Involvement/Community Outreach

a. Describes a program for ongoing community education and involvement in the environmental aspects of the organization's operations and general environmental awareness.

APPENDIX B

STREAM RESTORATION PLAN FOR A 25-MILE SECTION OF THE LITTLE COAL RIVER LOCATED BETWEEN DANVILLE AND THE CONFLUENCE OF THE BIG COAL RIVER

Conducted For:

INDEPENDENCE COAL COMPANY, INC
HC 78, BOX 1800
MADISON, WEST VIRGINIA 25130

By:

R. E. I. CONSULTANTS, INCORPORATED
225 INDUSTRIAL PARK ROAD
BEAVER, WEST VIRGINIA 25813

ED J. KIRK, DIRECTOR - BIOLOGICAL DIVISION

31 AUGUST 2006

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INTRODUCTION

This report has been developed by REI Consultants, Incorporated, and is being furnished at the request of Independence Coal Company, Incorporated (hereafter, referred to as Independence Coal). As part of a settlement agreement with the West Virginia Department of Environmental Protection, Independence Coal has agreed to develop a written assessment of the sedimentation on the Little Coal River between US Route 119 at Danville and the confluence of the Big Coal River. The agreement did not include implementation of the plan. According to the agreement, the assessment is to identify sections of river that would benefit from the installation of restoration structures, in order to reduce sedimentation, along with providing more favorable aquatic habitat for instream fauna.

This report is to serve as a guideline for the enhancements on the Little Coal River, and is not meant to represent a "Detailed Construction Plan" detailing every aspect needed during construction or installation of the proposed enhancement features. This report is supplied in order to describe the individual enhancements proposed on the Little Coal River, so that contractors will have a good interpretation of the degree of work required for this project. Once it is determined whom will implement the plan, it is assumed that the implementation of this plan will be conducted with adequate amount of understanding and experience with this type of work.

The proposed structures on the Little Coal River are expected to improve overall habitat and morphology of the river by reducing bank erosion, facilitating sediment transport, enhancing fisheries habitat, maintaining width/depth ratios, improving recreational boating during moderate to high flow events, and maintaining overall stability and capacity (Rosgen 2002a). Consequently, the enhancements are expected to create an ecological lift by improving the overall function of the river.

BASELINE DATA METHODS

During the development of a restoration or enhancement plan, it is important to document the existing conditions in areas that are being assessed to provide background & baseline data to be used during the monitoring phases of the plan (see MITIGATION WORK PLAN section of this plan). This way, one can easily compare morphological components of a stream during the pre-restoration and post-restoration phases. When channels are both vertically and laterally stable, their size and shape are naturally designed to handle the wide fluctuations of flows which all streams encounter throughout any given year. Rosgen-type measurements such as bankfull widths, floodprone widths, pool and riffle cross sections, and substrate composition are therefore critical because these measurements describe the channel in its current state (DIAGRAMS 1 & 2). Likewise, data on longitudinal profiles and instream habitat is important so that these components can be compared during the monitoring stages of the plan.

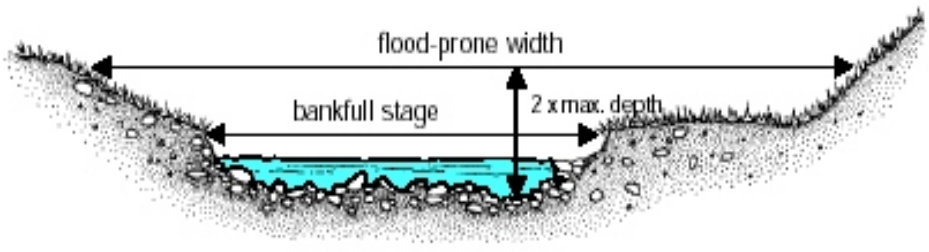


DIAGRAM 1. Cross-sectional view of a stream defining bankfull stage and flood-prone width using Rosgen Stream Classification System (Harmen & Jennings, 1999).

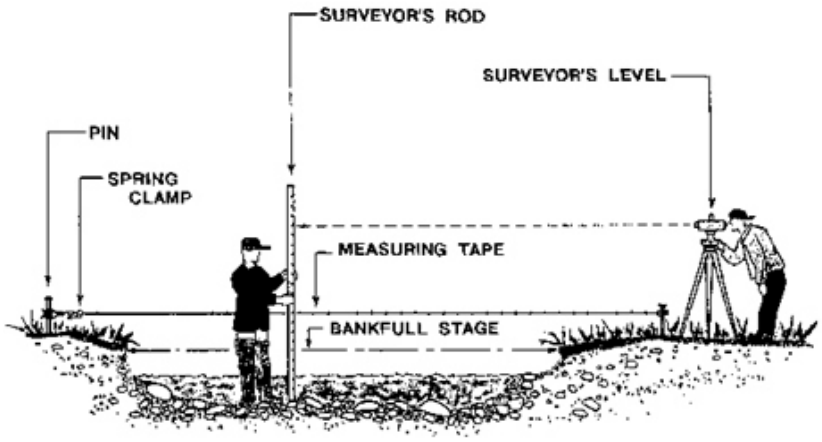


DIAGRAM 2. Cross-sectional view of a stream defining bankfull stage and field methods for collecting stream elevation data using Rosgen Stream Classification System (Rosgen, 1996).

During the months of May through July, approximately 25 miles of the Little Coal River between Danville and the confluence of the Big Coal River was floated and evaluated. The 25-mile enhancement reach was broken into three different sections for evaluation. Brief section descriptions are listed below:

Section 1: Confluence of the Big Coal River, upstream near the mouth of Mannings Branch (~ 5 miles)

38° 16' 21.1" Latitude and 81° 47' 59.8" Longitude to
38° 13' 47.1" Latitude and 81° 48' 37.0" Longitude

Section 2: Approximate mouth of Mannings Branch, upstream near McCorkle and the mouth of Lick Branch (~ 4 miles)

38° 13' 47.1" Latitude and 81° 48' 37.0" Longitude to
38° 13' 20.7" Latitude and 81° 49' 53.0" Longitude

Section 3: Mouth of Lick Branch near McCorkle, upstream to the Route 119 crossing at Danville (~ 16 miles)

38° 13' 20.7" Latitude and 81° 49' 53.0" Longitude to
38° 05' 2.10" Latitude and 81° 50' 20.7" Longitude

Throughout the reach, detailed Rosgen-type morphological parameters including cross-sections and longitudinal profiles, habitat, water chemistry, and benthic macroinvertebrate data was collected to provide baseline data on the existing conditions for purposes of restoration and enhancement. Once implemented, these parameters can then be utilized during the monitoring phases of the plan. Basic field measurements followed EPA Field operations and methods manual for measuring the ecological condition of wadeable streams (EPA/620/R-94/004F), EPA Rapid bioassessment protocols for use in streams and wadeable rivers (EPA 841-B-99-002), as well as methods outlined in "Interim Chemical/Biological Monitoring Protocol for Coal Mining Permit Applications" (January 19, 2000, US EPA, Region III) and the "Programmatic Environmental Impact Statement (A Survey of the Condition of Streams in the Primary Region of Mountain Top Removal/ Valley Fill Coal Mining - March 1999, US EPA, Region III)".

Habitat

Habitat was assessed and rated on ten parameters in three categories using a version of the EPA Rapid bioassessment protocols for use in streams and wadeable rivers (EPA 841-B-99-002) in accordance with the "Programmatic Environmental Impact Statement (A Survey of the Condition of Streams in the Primary Region of Mountain Top Removal/ Valley Fill Coal Mining - March 1999, U.S. EPA, Region III)." Due to the size and slope of the Little Coal River throughout this evaluation reach, the "low gradient" habitat sheet was used. The primary scores

include Parameters 1 through 3. The secondary scores include Parameters 4 through 7. The tertiary scores include Parameters 8 through 10.

Several habitat measurements were calculated for each of the sampling stations. The individual parameters are described in the following pages.

Parameter 1. Epifaunal Substrate/Available Cover- Includes the relative quantity and variety of natural structures in the channel. A wide variety and/or abundance of submerged structures in the channel provides macroinvertebrates and fish with a large number of niches, thus increasing habitat diversity.

HABITAT PARAMETER	OPTIMAL	SUB-OPTIMAL	MARGINAL	POOR
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate la-oracle for epifaunal colonization and fish cover, mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at a stage to allow full colonization potential (i.e. logs/snags that are not new fall and not transient.)	40 to 70% mix of stable habitat well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of new fall, but not yet prepared for colonization (may rate at high end of scale.)	20 to 40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE:	20 19 18 17	15 14 13 12	10 9 8 7 6	5 4 3 2 1

Parameter 2. Pool Substrate Characterization- Evaluates the type and condition of bottom substrates found in pools. Firmer sediment types and rooted aquatic plants support a wider variety of organisms than a pool substrate dominated by mud, bedrock, or no plants.

HABITAT PARAMETER	OPTIMAL	SUB-OPTIMAL	MARGINAL	POOR
2. Pool Substrate Characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may	All mud or clay or sand bottom; little or no root	Hard-pan clay or bedrock; no root mat or
SCORE:	20 19 18 17 16	15 14 13 12	10 9 8 7 6	5 4 3 2 1 0

Parameter 3. Pool Variability- Rates the overall mixture of pool types found in streams, according to size and depth. A stream with many pool types will support a wide variety of aquatic species. Rivers with low sinuosity and monotonous pool characteristics do not have sufficient quantities and types of habitat to support a diverse aquatic community.

HABITAT PARAMETER	OPTIMAL	SUB-OPTIMAL	MARGINAL	POOR
3. Pool Variability	Even mix of large-shallow, large-deep, small shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
SCORE:	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

Parameter 4. Sediment Deposition- Measures the amount of sediment that has accumulated in pools and the changes that have occurred to the channel bottom as a result of deposition. Deposition occurs from large-scale movement of sediment. High levels of sediment deposition are symptoms of an unstable and continually changing environment that becomes unsuitable for many organisms.

HABITAT PARAMETER	OPTIMAL	SUB-OPTIMAL	MARGINAL	POOR
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment 5 to 30% of the bottom affected; slight deposition in pools	Moderate deposition of new gravel, sand or fine sediment on old and new bars 30 to 50% of the bottom affected; sediment deposits at obstructions, constrictions and bends; moderate deposition of	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE:	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

Parameter 5. Channel Flow Status- The degree to which the channel is filled with water. The flow status will change as the channel enlarges (e.g., aggrading channel beds with actively widening channels) or as flow decreases as a result of dams and other obstructions, diversions for irrigation, or drought. When water does not cover much of the streambed, the amount of suitable substrate for aquatic organisms is limited.

HABITAT PARAMETER	OPTIMAL	SUB-OPTIMAL	MARGINAL	POOR
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrates exposed.	Water fills 25-75% of the available channel and/or riffle substrate are mostly exposed	Very little water in channel and mostly present as standing pools.
SCORE:	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

Parameter 6. Channel Alteration- A measure of large-scale changes in the shape of the channel. Channel alteration is present when artificial embankments, rip-rap, and other forms of artificial bank stabilization or structures are present. Such streams have far fewer natural habitats for fish, macroinvertebrates, and plants than do naturally meandering channels.

HABITAT PARAMETER	OPTIMAL	SUB-OPTIMAL	MARGINAL	POOR
6. Channel Alteration	Channelization or dredging absent or minimal ; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e. dredging (greater past 20yrs) may be present, but recent	Channelization may be extensive ; embankments or shoring structures present on both banks; and 40-80% of stream reach channelized and disrupted.	Banks shared with gabion or cement, over 80% of the stream reach channelized and disrupted. In stream habitat greatly altered or removed entirely.
SCORE:	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

Parameter 7. Channel Sinuosity - Evaluates the meandering or sinuosity of the stream. A high degree of sinuosity provides for diverse habitat and fauna, and the stream is better able to handle surges when the stream fluctuates as a result of storms.

HABITAT PARAMETER	OPTIMAL	SUB-OPTIMAL	MARGINAL	POOR
7. Channel Sinuosity	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note- channel braiding is considered normal in coastal plains and other low-lying areas. This	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
SCORE:	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

Parameter 8. Bank Stability - Measures whether the banks are eroded (or have the potential for erosion). Signs of erosion include crumbling, un-vegetated banks, exposed tree roots, and exposed soil. Eroded banks indicate a problem of sediment movement and deposition, and suggest a scarcity of cover and organic input to streams.

HABITAT PARAMETER	OPTIMAL	SUB-OPTIMAL	MARGINAL	POOR
8. Bank Stability (score each blank) NOTE: determine left or right side	Bank stable; evidence of erosion or bank failure absent or minimal, little potential for future problems. <5% of bank affected.	Moderately stable: infrequent, small areas of erosion mostly healed over 5-30% of bank in reach has areas of erosion.	Moderately unstable 30-60% of bank in reach has areas of erosion, high erosion potential during floods.	Unstable; many eroded areas, "raw" areas frequent along straight sections and bends; obvious bank sloughing ; 60-100% of bank has erosional scars.
SCORE: (Left Bank)	LB 10 9	8 7 6	5 4 3	2 1 0
SCORE: (Right Bank)	RB 10 9	8 7 6	5 4 3	2 1 0

Parameter 9. Bank Vegetative Protection- Measures the amount of vegetative protection afforded to the bank and the near-stream portion of the riparian zone. This parameter supplies information on the ability of the bank to resist erosion as well as some additional information on the uptake of nutrients by the plants, the control of instream scouring, and shading. Banks that have full, natural plant growth are better for fish and macroinvertebrates than are banks without vegetative protection or those shored up with concrete or rip-rap.

HABITAT PARAMETER	OPTIMAL	SUB-OPTIMAL	MARGINAL	POOR
9. Bank Vegetative Protection (score each bank)	More than 90% of the stream bank surface and immediate riparian zones covered by native vegetation, including trees, understory shrubs or non-woody macrophytes; vegetative disruption through grazing or mowing minimal or not evident;	70-90% of the stream bank surfaces covered by native vegetation, but one class of plant is not well represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height	50-70% of the stream bank surface covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining .	Less than 50% of the stream bank surfaces covered by vegetation; disruption of stream bank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE: (Left Bank)	LB 10 9	8 7 6	5 4 3	2 1 0
SCORE: (Right Bank)	RB 10 9	8 7 6	5 4 3	2 1 0

Parameter 10. Riparian Vegetation Zone Width- Measures the width of natural vegetation from the edge of the bank out through the riparian zone. The vegetative zone serves as a buffer to pollutants entering a channel from runoff, controls erosion, and provides habitat and nutrient input into the channel.

HABITAT PARAMETER	OPTIMAL	SUB-OPTIMAL	MARGINAL	POOR
10. Riparian Vegetation Zone Width (score each bank riparian zone)	Width of riparian zone > 18 meters; human activities (i.e. parking lots, roadbeds, clear cuts, lawns or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 8-12 meters; human activities have impacted zone a great deal.	Width of riparian zone < 6 meters; little or no riparian vegetation due to human activities.
SCORE: (Left Bank)	LB 10 9	8 7 6	5 4 3	2 1 0
SCORE: (Right Bank)	RB 10 9	8 7 6	5 4 3	2 1 0

Riparian Evaluation

Riparian evaluations were conducted to document existing conditions at some stations throughout the Little Coal River enhancement reach. Evaluations were conducted for both the left and right banks (facing downstream) by methods outlined in the Field operations and methods manual for measuring the ecological condition of wadeable streams (EPA/620/R-94/004F).

Channel Morphology

Detailed channel morphology field measurements followed River Morphology and Applications techniques (Rosgen 2002), and classification of streams was in conformity with Rosgen (1994). Most of the parameters measured are explained in the next two pages:

Bankfull Discharge - the discharge and corresponding stage at the incipient point of flooding. It is often associated with a return period, on the average, of 1.5 years. It is expressed as the momentary maximum or instantaneous peak flows rather than the mean daily discharge.

Bankfull Width - the surface width of the channel measured at the bankfull stage.

Bankfull Mean Depth - the mean depth of flow at the bankfull stage, determined as the cross-sectional area divided by the bankfull surface width.

Bankfull Stage - the elevation of the water surface associated with the bankfull discharge.

Belt Width - the width of the full lateral extent of the bankfull channel measured perpendicular to the fall of the valley.

Confinement - the lateral containment of rivers as quantitatively determined by meander width ratio.

Entrenchment Ratio - the quantitative index of the vertical containment of rivers as determined by dividing the floodprone area width by the bankfull width. The floodprone area width is measured at twice the maximum bankfull depth.

Floodplain - the flat adjacent to the bankfull channel which is constructed by the river in the modern climate. It is available to the river to accommodate flows greater than the bankfull discharge. There is not a constant frequency of occurrence of flood discharge associated with the floodplain as the depth of flow over the floodplain is a function of the width of the floodplain and the magnitude of the flood peak.

Floodprone Area Width - the width associated with a value of twice the maximum bankfull depth. It is the area including the floodplain of the river and often the low terrace of alluvial channels. This value when divided by the bankfull width is used to determine entrenchment ratio.

Meander Length - a longitudinal (down/parallel with valley) distance between the apex (furthest lateral extent) of two sequential meanders that occupy the same side of the valley. Value is negatively correlated with sinuosity.

Meander Length Ratio - the meander length divided by the bankfull width.

Meander Width Ratio - the quantitative expression of confinement (lateral containment of rivers) and is determined by the ratio of belt width / bankfull width.

Pebble Counts - characterizes the bed material at the surveyed cross section during field surveys. Bankfull to bankfull pebble count data throughout a given reach is then used for Rosgen-type stream classification. An additional wetted width only pebble count data set is performed in a representative riffle area, and is used in hydraulic calculations.

Radius of Curvature - a measure of the tightness of an individual meander and is negatively correlated with sinuosity.

Sinuosity - the ratio of channel length to down valley distance. It is also the ratio of valley slope to channel slope.

Channel Slope - determined by the change in elevation of the bed surface over a measured length of channel. It is expressed as a ratio of elevation (rise) over distance (run).

Flow or discharge - the rate at which a volume of water flows past a point over some unit of time. This parameter is an important factor morphologically because of its relationship to the form of the channel; i.e. flow increases and channels become larger in the downstream direction.

Thalweg Distance - the length of the channel down its deepest path.

Water Surface Slope - the slope of the channel as measured at the water surface rather than the bed surface. It is often used as the average energy grade of the channel.

Width / Depth Ratio - determined by the ratio of bankfull surface width to bankfull mean depth.

Benthic Macroinvertebrate Collection

The EPA Rapid Bioassessment Protocols For Use in Streams and Wadeable Rivers (EPA 841-B-99-002), as well as methods outlined in "Interim Chemical/Biological Monitoring Protocol For Coal Mining Permit Applications" (January 19, 2000, US EPA, Region III) and the "Programmatic Environmental Impact Statement (A Survey of the Condition of Streams in the Primary Region of Mountain Top Removal/ Valley Fill Coal Mining - March 1999, US EPA, Region III)" were followed in the collection of the benthic macroinvertebrate specimens. At each station, macroinvertebrate collections were made via a 0.25 m^2 "D-Frame" kick-net sampler. Four semi-quantitative "D-Frame" kick-net samples were composited from a riffle area to equal 1-m^2 sampling area. Samples were placed in 1-liter plastic containers, preserved in 35% formalin, and returned to the laboratory for processing. Samples were then picked under a microscope and detrital material was discarded only after a second check to insure that no macroinvertebrates had been missed. All macroinvertebrates were identified to lowest practical taxonomic level and enumerated. Several benthic macroinvertebrate metrics were then calculated for each station.

Benthic Macroinvertebrate Metrics

Several benthic macroinvertebrate measurements were calculated for each of the sampling stations. The individual metrics are described in the next two pages.

Metric 1. Taxa Richness - Reflects the health of the community through a measurement of the variety of taxa present. Generally increases with increasing water quality, habitat diversity, and habitat suitability. However, the majority should be distributed in the pollution sensitive groups, a lesser amount in the facultative groups, and the least amount in the tolerant groups. Polluted streams shift to tolerant dominated communities.

Metric 2. Modified Hilsenhoff Biotic Index - This index was developed by Hilsenhoff (1987) to summarize overall pollution tolerance of the benthic arthropod community with a single value. Calculated by summarizing the number in a given taxa multiplied by its tolerance value, then divided by the total number of organisms in the sample.

Metric 3. Ratio of Scraper and Filtering Collector Functional Feeding Groups - This ratio reflects the riffle/run community food base and provides insight into the nature of potential disturbance factors. The relative abundance of scrapers and filtering collectors indicate the periphyton community composition, availability of suspended Fine Particulate Organic Material (FPOM) and availability of attachment sites for filtering. Filtering collectors are sensitive to toxicants bound to fine particles and should be the first group to decrease when exposed to steady sources of bound toxicants.

Metric 4. Ratio of Ephemeroptera, Plecoptera, Trichoptera (EPT) and Chironomidae Abundances - This metric uses relative abundance of these indicator groups as a measure of community balance. Good biotic condition is reflected in communities having a fairly even distribution between all four major groups and with substantial representation in the sensitive groups Ephemeroptera, Plecoptera, and Trichoptera. Skewed populations with large amounts of Chironomidae in relation to the EPT indicates environmental stress.

Metric 5. Percent Contribution of Mayflies - This is a measure of community health. A community dominated by relatively few species and individuals of mayflies would possibly indicate environmental stress. An optimal benthic community contains many mayflies from many taxa.

Metric 6. Percent Contribution of Dominant Family - This is also a measure of community balance. A community dominated by relatively few species would indicate environmental stress. A healthy community is dominated by pollution sensitive representation in the Ephemeroptera, Plecoptera, and Trichoptera groups.

Metric 7. EPT Index - This index is the total number of distinct taxa within the Orders: Ephemeroptera, Plecoptera, and Trichoptera. The EPT Index generally increases with increasing water quality. The EPT index summarizes the taxa richness within the pollution sensitive insect orders.

Metric 8. Ratio of Shredder Functional Feeding Group and Total Number of Individuals Collected - Allows evaluation of potential impairment as indicated by the shredder community. Shredders are good indicators of riparian zone impacts.

Metric 9. Simpson's Diversity Index - This index ranges from 0 (low diversity) to almost 1 (high diversity). A healthy benthic macroinvertebrate community should have a higher Simpson's Diversity Index.

Metric 10. Shannon-Wiener Diversity Index - Measures the amount of order in the community by using the number of species and the number of individuals in each species. The value increases with the number of species in the community. A healthy benthic macroinvertebrate community should have a higher Shannon-Wiener Diversity Index.

Metric 11. Shannon-Wiener Evenness - Measures the evenness, or equatability of the community by scaling one of the heterogeneity measures relative to its maximal value when each species in the sample is represented by the same number of individuals. Ranges from 0 (low equatability) to 1 (high equatability).

Metric 12. The West Virginia Stream Condition Index (WV-SCI) is used as a primary indicator of ecosystem health and can identify impairment with respect to a reference (or natural) condition. The index includes six biological attributes (metrics) that represent elements of the structure and function of the bottom-dwelling macroinvertebrate assemblage.

Range	**Rank**
78 to 100	"Very Good"
68 to 78	"Good"
45 to 68	"Fair"
22 to 45	"Poor"
0 to 22	"Very Poor"

SITE SELECTION

The 25-mile Little Coal River study area was located in Kanawha, Lincoln, and Boone Counties, West Virginia (FIGURE 1). The enhancement reach extended throughout the Alum Creek, Julian, and Madison USGS Quadrangles. Surface owner information on the 25-mile Little Coal River reach can be found in APPENDIX E of this plan. Detailed habitat, riparian, and Rosgen-type morphological parameters were collected at several locations within the proposed enhancement reach. The data collected from these stations will be used as baseline data for pre-restoration conditions during the monitoring phases.

The Little Coal River meets with the Big Coal River to form the Coal River just south of Alum Creek, West Virginia (FIGURE 1). During the evaluation process, the Little Coal River enhancement reach was divided into three sections. Section 1 (see APPENDIX A), which extended approximately 5 miles, was located from the confluence of the Big Coal River (38° 16' 21.1" Latitude and 81° 47' 59.8" Longitude), upstream near the mouth of Mannings Branch (38° 13' 47.1" Latitude and 81° 48' 37.0" Longitude). Section 2 (see APPENDIX B), which extended approximately 4 miles, was located from the approximate mouth of Mannings Branch, upstream just north of McCorkle, West Virginia and north of the mouth of Lick Branch (38° 13' 20.7" Latitude and 81° 49' 53.0" Longitude), a tributary on the north side of the river. Section 3 (see APPENDIX C), which extended approximately 16 miles, extended from the mouth of Lick Branch near McCorkle, upstream to the Route 119 crossing at Danville (38° 05' 2.10" Latitude and 81° 50' 20.7" Longitude).

A functional assessment of the entire Little Coal River reach was determined to identify deficient morphological features for purposes of enhancement. Throughout the reach, habitat and morphology parameters were collected at several different stations referred to as “Improvement Points” (IP); and will serve as data monitoring points for both the pre- and post-restoration phases. For monitoring purposes, benthic macroinvertebrate and physical and chemical water chemistry were collected at stations (see APPENDIX D) throughout the entire reach:

Station 1	Benthic and Water Quality Station (bad habitat) 38° 15' 5.9" Latitude and 81° 48' 16.6" Longitude
Station 2	Benthic and Water Quality Station (good habitat) 38° 14' 32.8" Latitude and 81° 49' 14.4" Longitude
Station 3	Benthic Station (good habitat) 38° 13' 8.1" Latitude and 81° 49' 4.4" Longitude
Station 4	Benthic & Water Quality Station (good habitat) 38° 06' 17.5" Latitude and 81° 50' 41.5" Longitude
Station 5	Benthic & Water Quality Station (bad habitat) 38° 10' 59.8" Latitude and 81° 50' 54.8" Longitude

RESTORATION WORK PLAN

The restoration work plan for the Little Coal River enhancement reach will incorporate the measurement of existing, baseline data before construction and post-restoration data after construction (see Sections I -VI below). This document specifically, presents the existing or baseline conditions to be used during the monitoring stages for comparison after restoration. The primary attributes measured for enhancement projects included bank stability, riparian quality, substrate composition, elevation and slope, quantity of instream structures, and instream habitat types. These detailed and quantitative measurements provided the background data to allow for the reaches to be restored, reconstructed, and enhanced. Once this plan is implemented, sampling stations, also referred to as Improvement Points (IP), on the Little Coal River should be monitored at least once a year. The stations should be routinely monitored to assure that no disturbances or problems have occurred. A designated consultant should conduct the monitoring for at least 5 years after implementation of the plan, and problems or corrective actions should be reported.

Baseline data includes:

I. SPECIFIC STATION LOCATIONS & PHYSICAL DESCRIPTION RESULTS

II. PHYSICAL AND CHEMICAL WATER QUALITY ANALYSIS

III. HABITAT RESULTS

IV. RIPARIAN EVALUATION RESULTS

V. MORPHOLOGICAL EVALUATION RESULTS

VI. BENTHIC MACROINVERTEBRATE RESULTS

I. SPECIFIC STATION LOCATIONS & PHYSICAL DESCRIPTIONS

Sections 1 - 3

Physical characterizations of the Little Coal River enhancement reach revealed the overall reach to be marginal. Some sections throughout the reach were in stable and optimal condition, however the majority of the reach contained very poor substrate and cover. Field measurements, including habitat and riparian evaluations, and substrate measurements were taken throughout the reach. Overall, relative amount of coarse particulate organic matter (CPOM) was sparse, relative amount of large woody debris (LWD) was moderate to heavy in sections, and the bank steepness was recorded as being moderate. The substrate was comprised mostly of 100% sand throughout the entire enhancement reach. In some reaches, small gravel and cobble particles dominated the reach with large amounts of sand. These substrate compositions would provide poor aquatic habitat due to the lack of larger sized substrates, such as cobble and boulder. For the most part, this reach was located in a forested area, which was adjacent to a railroad and access or county roads.

II. PHYSICAL AND CHEMICAL WATER QUALITY ANALYSIS

Water quality is an important factor in determining the viability of the aquatic habitat. Although flow, substrate, and geomorphology are also important, water quality is the most limiting, therefore aquatic organisms are classified according to their tolerance of pollution.

Water quality table addressing the ranges of some chemical water quality constituents within West Virginia watersheds.

Water Quality Parameter	Range for Freshwater Organisms	Source
pH	6 to 9	Stumm and Morgan 1996
Acidity	not available	
Alkalinity	10 to 400 mg/L	Jenkins et al. 1995
Calcium	4 to 160 mg/L	Heinen 1996
Chloride	< 230 mg/L	46CSR WV DEP
Conductivity	not available	
TDS	not available	
Sulfate	< 850 mg/L	Jenkins et al. 1995
Iron	< 1 mg/L	Jenkins et al. 1995
Magnesium	< 28 mg/L	Heinen 1996
Manganese	< 1.0 mg/L	Heinen 1996; Jenkins et al. 1995
Selenium	< 0.005 mg/L	US EPA 1986
Aluminum	< 0.087 mg/L	Jenkins et al. 1995
Hardness	10 to 400 mg/L	Heinen 1996

Little Coal River Stations

Water quality at the Little Coal River stations showed overall good water quality (APPENDIX D). Levels of pH were within the typical range of 6 to 9 for natural waters presented by Stumm and Morgan (1996). Conductivity levels were moderately high during the sampling events. Acidity levels appeared to be normal and well below alkalinity levels. At some of the Little Coal River stations there were elevated levels of total aluminum, however, in most cases the dissolved aluminum levels were below recommended limits. Magnesium levels appeared to be elevated at some stations, which may be limiting to some sensitive benthic macroinvertebrates. Most other metals, including iron, manganese, and selenium, were undetectable and within recommended ranges for freshwater organisms (APPENDIX D).

III. HABITAT RESULTS

Sections 1 - 3

Overall, these sections received poor to marginal substrate and instream cover (primary) ratings, poor to optimal channel morphology (secondary) ratings, and poor to optimal riparian and bank structure (tertiary) ratings (see APPENDIX A-C). A very high amount of sand was present in the substrate throughout the reach, adversely effecting several habitat parameters. "Epifaunal Substrate/Available Cover" frequently received low marginal scores due to the absent of fish cover, snags, submerged logs, undercut banks, and cobble and gravel habitats. "Pool Substrate Characteristics" received a marginal scores since the channel bottom was comprised of up to 100% sand in most sections and had no submerged vegetation. "Pool Variability" also received only marginal scores shallow pools were much more prevalent than deep ones. The majority of the pools were either absent or located around existing large woody debris. "Sediment Deposition" received poor scores due to heavy deposition of materials and bar developments throughout the reach. In most sections, "Bank Stability" and "Vegetative Protection" were both sub-optimal to optimal on both banks of the channel. However, some stations had only moderately unstable banks due to erosional areas. The "Riparian Zone Width" was usually low sub-optimal on both banks due to the presence of county roads and a paralleling railroad. In most cases, these structures did not impact the zone a great deal. Average habitat scored a 101 out of a possible 200, and was considered to be marginal.

Station 1

This station received poor to marginal substrate and instream cover (primary) ratings, poor to optimal channel morphology (secondary) ratings, and marginal to sub-optimal riparian and bank structure (tertiary) ratings (see APPENDIX D). A large amount of sand was present in the substrate at this station, adversely effecting several habitat parameters. This station received a poor score for "Epifaunal Substrate/Available Cover" since there was less than 10% of stable habitat present and the substrate was obviously lacking. "Pool Substrate Characteristics" received a marginal score since the channel bottom was all sand and had no submerged vegetation. "Pool Variability" also received only a poor score since the majority of pools were small and shallow. "Sediment Deposition" received a poor score due to heavy deposition of materials and bar developments. The banks were moderately unstable on both sides. Habitat scored a 105 out of a possible 200, and was considered to be poor.

Station 2

This station received poor to marginal substrate and instream cover (primary) ratings, poor to optimal channel morphology (secondary) ratings, and marginal to sub-optimal riparian and bank structure (tertiary) ratings (see APPENDIX D). A very high amount of sand was present in the substrate at this station, adversely effecting several habitat parameters. This station received a poor score for "Epifaunal Substrate/Available Cover" since there was less than 10% of stable habitat present and the substrate was obviously

lacking. "Pool Substrate Characteristics" received a marginal score since the channel bottom was all sand and had no submerged vegetation. "Pool Variability" also received only a poor score since the majority of pools were small and shallow. "Sediment Deposition" received a poor score due to heavy deposition of materials and bar developments. "Channel Sinuosity" received a marginal score since the bends in the channel increased the length 1 to 2 times. "Bank Stability" was sub-optimal on the right bank and is considered to be moderately stable. The left bank received a marginal score and was considered to be moderately unstable. "Vegetative Protection" and "Riparian Zone Width" were both sub-optimal. Habitat scored a 86 out of a possible 200, and was considered to be poor.

Station 3

This station received poor to sub-optimal substrate and instream cover (primary) ratings, marginal to optimal channel morphology (secondary) ratings, and sub-optimal riparian and bank structure (tertiary) ratings (see APPENDIX D). This station received a marginal score for "Epifaunal Substrate/Available Cover" since there was only a 10-30% mix of stable habitat present and the substrate was frequently disturbed. "Pool Substrate Characteristics" received a sub-optimal score since the channel bottom was a mixture of soft sand, mud, and clay; and had some submerged vegetation and root mats. "Pool Variability" also received only a poor score since the majority of pools were small and shallow. "Bank Stability", "Vegetative Protection", and "Riparian Zone Width" were all sub-optimal on both banks of the channel. Habitat scored a 127 out of a possible 200, and was considered to be marginal to sub-optimal.

Station 4

This station received sub-optimal to optimal substrate and instream cover (primary) ratings, marginal to optimal channel morphology (secondary) ratings, and sub-optimal to optimal riparian and bank structure (tertiary) ratings (see APPENDIX D). This station had no limiting parameters. Due to some slight sand in the substrate and sparse submerged vegetation, the "Pool Characterization" score was low sub-optimal. There appeared to be an even mix of large/small and deep/shallow pools. Sinuosity throughout this section was marginal. The banks were stable on both sides. Habitat scored a 154 out of a possible 200, and was considered to be optimal.

Station 5

This station received poor to marginal substrate and instream cover (primary) ratings, poor to optimal channel morphology (secondary) ratings, and marginal to sub-optimal riparian and bank structure (tertiary) ratings (see APPENDIX D). This station received a marginal score for "Epifaunal Substrate/Available Cover" since there was only approximately 10% mix of stable habitat present and the substrate was frequently disturbed. "Pool Substrate Characteristics" received a marginal score since the channel bottom was comprised of sand. Only small and shallow pools were present throughout this station. The banks were moderately unstable on both banks. "Vegetative Protection"

was sub-optimal and “Riparian Zone Width” was marginal. Habitat scored a 84 out of a possible 200, and was considered to be poor.

IV. RIPARIAN EVALUATION RESULTS

Section 1 (good)

This riparian evaluation had a deciduous canopy both the right and left banks. The canopy cover on the left bank had a heavy density of large (> 0.3 m DBH) trees and a moderate density of small (< 0.3 m DBH) trees. The canopy cover on the right bank had a heavy density of large (> 0.3 m DBH) trees and a heavy density of small (< 0.3 m DBH) trees. The deciduous understory on the left bank had a moderate amount of woody shrubs and saplings, and a moderate amount of non-woody herbs, grasses, and forbes. The mixed understory on the right bank had a heavy amount of woody shrubs and saplings, and a moderate amount of non-woody herbs, grasses, and forbes. The groundcover on the left bank had a moderate amount of woody shrubs and saplings and a heavy amount non-woody herbs, grasses, and forbes. The groundcover on the right bank had a heavy amount of woody shrubs and saplings and a heavy amount non-woody herbs, grasses, and forbes. There was some sparse amounts of barren and bare dirt on both banks. The total vegetation score, excluding barren, bare dirt, and duff, was 14 out of a possible 24 on the left bank and 17 out of a possible 24 on the right bank (see APPENDIX A). Therefore, this reach would increase available habitat, providing a strong food base for macroinvertebrates and nutrient input.

Section 2

No riparian evaluations were conducted on Section 2 of the Little Coal River reach. Overall riparian vegetation throughout this particular reach appeared to be in sub-optimal to optimal condition, having a variety of deciduous species, including silver maple, buckeye, beech, birch, ironwood, sycamore, box elder, elm, and willow. Throughout the reach, most of the enhancement areas had optimal cover, understory, and groundcover.

Section 3 (good)

This riparian evaluation had a deciduous canopy both the right and left banks. The canopy cover both banks had a moderate density of large (> 0.3 m DBH) trees and a moderate density of small (< 0.3 m DBH) trees. The deciduous understory on both banks had a sparse amount of woody shrubs and saplings, and a moderate amount of non-woody herbs, grasses, and forbes. The groundcover on both banks had a sparse amount of woody shrubs and saplings and a moderate amount non-woody herbs, grasses, and forbes. There was some sparse amounts of barren and bare dirt on the left bank. The total vegetation score, excluding barren, bare dirt, and duff, was 10 out of a possible 24 on both banks (see APPENDIX C). Therefore, this reach would increase available habitat, providing a strong food base for macroinvertebrates and nutrient input.

Section 3 (bad)

This riparian evaluation had no canopy cover nor understory on either the right or left banks. The groundcover on the left bank had a sparse amount of woody shrubs and saplings and a moderate amount non-woody herbs, grasses, and forbes. The groundcover

on the right bank had a sparse amount of woody shrubs and saplings and a sparse amount non-woody herbs, grasses, and forbes. There was some sparse amounts of barren and bare dirt on both banks. The total vegetation score, excluding barren, bare dirt, and duff, was 3 out of a possible 24 on the left bank and a 2 out of a possible 24 on the right bank (see APPENDIX C). Therefore, this reach would provide poor available habitat, providing a weak food base for macroinvertebrates and nutrient input.

V. MORPHOLOGICAL RESULTS

Sections 1 - 3

Field measurements, including cross-sections and longitudinal profiles (see APPENDIX A-C) were collected throughout the Little Coal River reach. The sections evaluated appeared to be in moderately stable condition, having banks with grasses as well as a moderately dense riparian zone in most sections. However, the sand dominated stream caused overall substrate and instream cover to be very poor. Due to deposition and alterations, the channel appeared to be wide in some sections. By installing structures such as cross vanes, the overall width/depth ratios and cross-sectional areas will be corrected, allowing for deposition to flush through the stream, while deeper pool habitats develop for additional aquatic habitat for instream fauna.

Throughout the entire Little Coal River mitigation reach, overall substrate is very poor. In most sections, the substrate is comprised of 100% sand, causing very poor epifaunal substrate and cover, embeddedness, deposition, and lack of pool habitats. In other sections, there appears to be more favorable substrate, such as at Station 3, having cobble, gravel, and boulder compositions. Because of the wide range in substrate compositions throughout the Little Coal reach, the Rosgen stream type changes from a F5 stream type in the sand reaches to a F3/F4 stream type in the cobble and gravel dominated reaches.

Station 1

Field measurements were taken on the Little Coal River approximately at 38° 15' 05.9" latitude and 81° 48' 16.6" longitude. The section evaluated appeared to be in relatively unstable condition having only moderately unstable banks with marginal to sub-optimal immediate vegetation.

At the riffle site, bankfull width was measured to be 111.5 ft with a mean bankfull depth of 4.77 ft, giving a width/depth ratio of 23.40. Max bankfull depth at the thalweg measured 6.73 ft. Cross sectional area at riffle bankfull was 531.31 ft^2, and width of the floodprone area was measured to be 129.5 ft, giving an entrenchment ratio of 1.16 (see APPENDIX D). The slope was 0.01. The slope, entrenchment ratio, and width depth ratio were consistent with a Rosgen™ F5 stream type within the reach surveyed. The D50 particle size of 0.40 mm was consistent with a sand channel. The D84 particle size from the wetted width riffle area was measured to be greater than 1.00 mm which then provides a relative roughness (R/D84) of 1385.22, a friction factor (u/u*) of 20.61, and a roughness coefficient (Mannings n) of 0.020 (see APPENDIX D). These data then calculate to equal a mean velocity at bankfull of 19.72 ft/s, and a calculated bankfull discharge (Q) of 10479.89 cfs.

Station 2

Field measurements were taken on the Little Coal River approximately at 38° 14' 32.8" latitude and 81° 49' 14.4" longitude. The section evaluated appeared to be in relativley stable

condition having moderately stable banks with sub-optimal immediate vegetation. This station had a calculated flow of 199.87 cfs during the sampling date.

At the riffle site, bankfull width was measured to be 115 ft with a mean bankfull depth of 4.45 ft, giving a width/depth ratio of 25.83. Max bankfull depth at the thalweg measured 6.90 ft. Cross sectional area at riffle bankfull was 511.93 ft^2, and width of the floodprone area was measured to be 134 ft, giving an entrenchment ratio of 1.17 (see APPENDIX D). The slope was 0.01. The slope, entrenchment ratio, and width depth ratio were consistent with a Rosgen™ F4/F3 stream type within the reach surveyed. The D50 particle size of 61.6 mm was consistent with a very coarse gravel/small cobble channel. The D84 particle size from the wetted width riffle area was measured to be greater than 125 mm which then provides a relative roughness (R/D84) of 10.06, a friction factor (u/u*) of 8.51, and a roughness coefficient (Mannings n) of 0.030 (see APPENDIX D). These data then calculate to equal a mean velocity at bankfull of 12.63 ft/s, and a calculated bankfull discharge (Q) of 6467.64 cfs.

Station 3

Field measurements were taken on the Little Coal River approximately at 38° 13' 08.1" latitude and 81° 49' 04.4" longitude. The section evaluated appeared to be in relatively stable condition having moderately unstable to moderately stable banks. Banks were vegetated with grasses and had between 70% to 90% immediate coverage. This station had a calculated flow of 160.89 cfs during the sampling date.

At the riffle site, bankfull width was measured to be 132.3 ft with a mean bankfull depth of 4.69 ft, giving a width/depth ratio of 28.20. Max bankfull depth at the thalweg measured 6.04 ft. Cross sectional area at riffle bankfull was 620.76 ft^2, and width of the floodprone area was measured to be 159.8 ft, giving an entrenchment ratio of 1.21 (see APPENDIX D). The slope was 0.01. The slope, entrenchment ratio, and width depth ratio were consistent with a Rosgen™ F3 stream type within the reach surveyed. The D50 particle size of 75.9 mm was consistent with cobble channel. The D84 particle size from the wetted width riffle area was measured to be greater than 311 mm which then provides a relative roughness (R/D84) of 7.76, a friction factor (u/u*) of 7.87, and a roughness coefficient (Mannings n) of 0.033 (see APPENDIX D). These data then calculate to equal a mean velocity at bankfull of 16.02 ft/s, and a calculated bankfull discharge (Q) of 9942.99 cfs.

Station 4

Field measurements were taken on the Little Coal River approximately at 38° 06' 17.5" latitude and 81° 50' 41.5" longitude. The section evaluated appeared to be in very stable condition. Banks were well vegetated with grasses as well as a moderately dense riparian zone. Banks were moderately sloped which aided in stability and allowed for elevated flows to easily spread out onto the floodplane in both directions. This station had a calculated flow of 75.178 cfs during the sampling date.

At the riffle site, bankfull width was measured to be 112 ft with a mean bankfull depth of 4.91 ft, giving a width/depth ratio of 22.82. Max bankfull depth at the thalweg measured 6.30 ft. Cross sectional area at riffle bankfull was 549.60 ft^2, and width of the floodprone area was measured to be 118.5 ft, giving an entrenchment ratio of 1.06 (see APPENDIX D). The slope was 0.01. The slope, entrenchment ratio, and width depth ratio were consistent with a Rosgen™ F4 stream type within the reach surveyed. The D50 particle size of 51.8 mm was consistent with a very coarse gravel channel. The D84 particle size from the wetted width riffle area was measured to be greater than 119 mm which then provides a relative roughness (R/D84) of 11.53, a friction factor (u/u*) of 8.83, and a roughness coefficient (Mannings n) of 0.028 (see APPENDIX D). These data then calculate to equal a mean velocity at bankfull of 14.35 ft/s, and a calculated bankfull discharge (Q) of 7884.56 cfs.

Station 5

Field measurements were taken on the Little Coal River approximately at 38° 10' 59.8" latitude and 81° 50' 54.8" longitude. The section evaluated appeared to be in relatively unstable condition. Banks were moderately unstable, having approximately 70% of the immediate surfaces covered with native vegetation. This station had a calculated flow of 68.421 cfs during the sampling date.

At the riffle site, bankfull width was measured to be 112 ft with a mean bankfull depth of 3.33 ft, giving a width/depth ratio of 33.59. Max bankfull depth at the thalweg measured 5.40 ft. Cross sectional area at riffle bankfull was 373.50 ft^2, and width of the floodprone area was measured to be 132 ft, giving an entrenchment ratio of 1.18 (see APPENDIX D). The slope was 0.01. The slope, entrenchment ratio, and width depth ratio were consistent with a Rosgen™ F5 stream type within the reach surveyed. The D50 particle size of 0.40 mm was consistent with a sand channel. The D84 particle size from the wetted width riffle area was measured to be greater than 0.00 mm which then provides a relative roughness (R/D84) of 2070.41, a friction factor (u/u*) of 21.60, and a roughness coefficient (Mannings n) of 0.020 (see APPENDIX D). These data then calculate to equal a mean velocity at bankfull of 15.48 ft/s, and a calculated bankfull discharge (Q) of 5571.47 cfs.

VI. BENTHIC MACROINVERTEBRATE RESULTS

Station 1

The total abundance of benthic macroinvertebrates at this station comprised 204 individuals representing 9 taxa (see APPENDIX D). One pollution sensitive (intolerant) taxa (5.9% of the total abundance), four facultative (intermediate tolerance) taxa (68.6% of the total abundance), and four tolerant taxa (25.5% of the total abundance) were collected. The sensitive mayfly, Stenonema (Family: Heptageniidae), accounted for 3.9% of the total station abundance. The facultative mayfly, Acentrella (Family: Baetidae), contributed 25.5% to the total abundance, and was the most abundant taxa of aquatic insect at this station. The pollution tolerant midge, Chironomidae, accounted for 23.5% of the total station abundance. Six EPT groups (see APPENDIX D) were present, and the EPT: Chironomidae Ratio (148:48) indicated a benthic community in very good biotic condition. Additionally, the West Virginia Stream Condition Index (WV-SCI) was 68.5 which was considered characteristic of a stream in good biotic condition. Most of the major functional feeding groups were present; shredders were absent from this station. A good variety and modest abundance of mayflies and caddisflies were collected; stoneflies were absent. The Simpson's and Shannon-Wiener Diversity indices reflected a community with good diversity, and the Shannon-Wiener Evenness value of 0.85 indicated that abundances were very well distributed among the taxa present. The Modified Hilsenhoff Biotic Index (HBI) and the relative percentages of the three tolerance groups (sensitive, facultative, and tolerant) indicated an unbalanced and slightly unhealthy, facultative macroinvertebrate community. The low overall station abundance, low taxa richness, and poor representation of the shredder functional feeding group, along with other metrics, were all indications of a possible water quality problem and/or a lack of desirable aquatic habitat at this station.

Station 2

The total abundance of benthic macroinvertebrates at this station comprised 2,466 individuals representing 18 taxa (see APPENDIX D). Three pollution sensitive (intolerant) taxa (9.4% of the total abundance), nine facultative (intermediate tolerance) taxa (58.3% of the total abundance), and six tolerant taxa (32.3% of the total abundance) were collected. The sensitive mayfly, Isonychia (Family: Isonychiidae), accounted for 2.4% of the total station abundance. The facultative caddisfly, Cheumatopsyche (Family: Hydropsychidae), contributed 24.2% to the total abundance, and was the most abundant taxa of aquatic insect at this station. The pollution tolerant midge, Chironomidae, accounted for 22.9% of the total station abundance. Nine EPT groups (see APPENDIX D) were present, and the EPT: Chironomidae Ratio (1412:564) indicated a benthic community in excellent biotic condition. Additionally, the West Virginia Stream Condition Index (WV-SCI) was 69.8 which is considered characteristic of a stream in good biotic condition. All major functional feeding groups were present, and were fairly well represented. A good variety and abundance of mayflies and caddisflies were collected; stoneflies were represented by only one taxa. The Simpson's and Shannon-

Wiener Diversity indices reflected a community with good diversity, and the Shannon-Wiener Evenness value of 0.74 indicated that abundances were well distributed among the taxa present. The Modified Hilsenhoff Biotic Index (HBI) and the relative percentages of the three tolerance groups (sensitive, facultative, and tolerant) indicated an unbalanced yet fairly healthy, facultative macroinvertebrate community. The good overall station abundance, good taxa richness, very good HBI score, excellent EPT:Chironomidae ratio, good diversity, and good WV-SCI score, along with other metrics, were all indications of sub-optimal aquatic habitat at this station.

Station 3

The total abundance of benthic macroinvertebrates at this station comprised 2,388 individuals representing 13 taxa (see APPENDIX D). Two pollution sensitive (intolerant) taxa (3.4% of the total abundance), seven facultative (intermediate tolerance) taxa (26.8% of the total abundance), and three tolerant taxa (69.8% of the total abundance) were collected. The sensitive mayfly, Stenonema (Family: Heptageniidae), accounted for 1.0% of the total station abundance. The facultative caddisfly, Dibusa (Family: Hydroptilidae), contributed 15.8% to the total station abundance. The pollution tolerant midge, Chironomidae, and the pollution tolerant aquatic worm, Oligochaeta, both accounted for 34.8% of the total station abundance, and were the most abundant taxas of aquatic insect at this station. Seven EPT groups (see APPENDIX D) were present, and the EPT:Chironomidae Ratio (576:832) indicated a benthic community in poor biotic condition. In addition, the West Virginia Stream Condition Index (WV-SCI) was 49.2, which was indicative of a stream in fair biotic condition. All of the major functional feeding groups were present, and were relatively well represented. A small variety and modest abundance of mayflies were collected; a small variety and fair abundance of were present; stoneflies were absent from this station. The Simpson's and Shannon-Wiener Diversity indices reflected a community with fair to good diversity, and the Shannon-Wiener Evenness value of 0.62 indicated that abundances were fairly well distributed among the taxa present. The Modified Hilsenhoff Biotic Index (HBI) and the relative percentages of the three tolerance groups (sensitive, facultative, and tolerant) indicated an unbalanced and somewhat unhealthy, tolerant macroinvertebrate community. The very low EPT:Chironomidae ratio, poor representations of EPT taxa, and fair WV-SCI score, along with other metrics, were all indications of a lack of marginal to sub-optimal aquatic habitat at this station.

Station 4

The total abundance of benthic macroinvertebrates at this station comprised 432 individuals representing 8 taxa (see APPENDIX D). Zero pollution sensitive (intolerant) taxa (0.0% of the total abundance), six facultative (intermediate tolerance) taxa (80.6% of the total abundance), and two tolerant taxa (19.4% of the total abundance) were collected. The facultative caddisfly, Cheumatopsyche (Family:Hydropsychidae), contributed 36.1% to the total abundance, and was the most abundant taxa of aquatic insect at this station. The pollution tolerant midge, Chironomidae, accounted for 16.7% of the total station

abundance. Four EPT groups (see APPENDIX D) were present, and the EPT:Chironomidae Ratio (284:72) indicated a benthic community in very good biotic condition. In addition, the West Virginia Stream Condition Index (WV-SCI) was 61.5, which was indicative of a stream in fair biotic condition. Most of the major functional feeding groups were present; shredders were absent. A small variety and abundance of mayflies and caddisflies were collected; stoneflies were absent from this station. The Simpson's and Shannon-Wiener Diversity indices reflected a community with moderately good diversity, and the Shannon-Wiener Evenness value of 0.81 indicated that abundances were very well distributed among the taxa present. The Modified Hilsenhoff Biotic Index (HBI) and the relative percentages of the three tolerance groups (sensitive, facultative, and tolerant) indicated an unbalanced, yet fairly healthy, facultative macroinvertebrate community. The very good HBI score, excellent EPT:Chironomidae ratio, good representations of mayflies, good diversity, and fair WV-SCI score, along with other metrics, were all indications of fair water quality and desirable aquatic habitat at this station.

Station 5

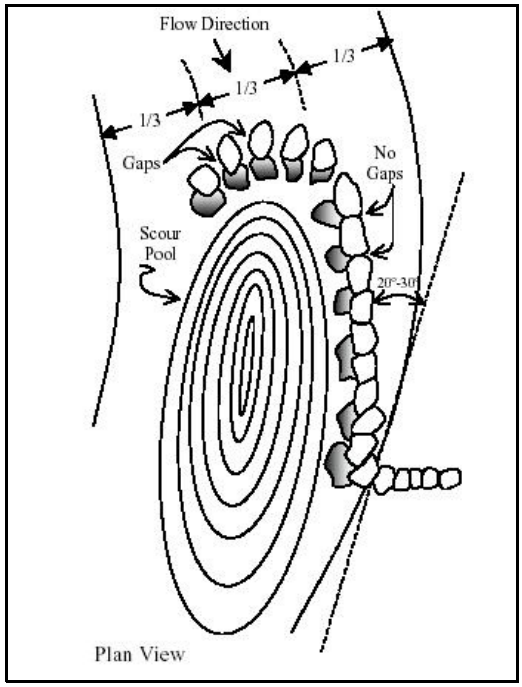
The total abundance of benthic macroinvertebrates at this station comprised 16 individuals representing 2 taxa (see APPENDIX D). Zero pollution sensitive (intolerant) taxa (0.0% of the total abundance), one facultative (intermediate tolerance) taxa (25.0% of the total abundance), and one tolerant taxa (75.0% of the total abundance) were collected. The facultative caddisfly, Cheumatopsyche (Family:Hydropsychidae), contributed 25.0% to the total station abundance. The pollution tolerant midge, Chironomidae, accounted for 75.0% of the total abundance, and was the most abundant taxa of aquatic insect at this station. One EPT group (see APPENDIX D) was present, and the EPT:Chironomidae Ratio (4:12) indicated a benthic community in very poor biotic condition. In addition, the West Virginia Stream Condition Index (WV-SCI) was 47.2, which was indicative of a stream in fairly poor biotic condition. The collector/filterer functional feeding group was represented by only four individuals; scrapers and shredders were absent from this station. Mayflies and stoneflies were absent and caddisflies were represented by only four individuals from one taxa. The Simpson's and Shannon-Wiener Diversity indices reflected a community with poor diversity, however the Shannon-Wiener Evenness value of 1.01 indicated that abundances were very well distributed among the taxa present. The Modified Hilsenhoff Biotic Index (HBI) and the relative percentages of the three tolerance groups (sensitive, facultative, and tolerant) indicated an unbalanced and and very unhealthy, tolerant macroinvertebrate community. The very low EPT:Chironomidae ratio, poor representations of EPT taxa, poor diversity, and fairly poor WV-SCI score, along with other metrics, were all indications of a lack of desirable aquatic habitat at this station.

Little Coal River

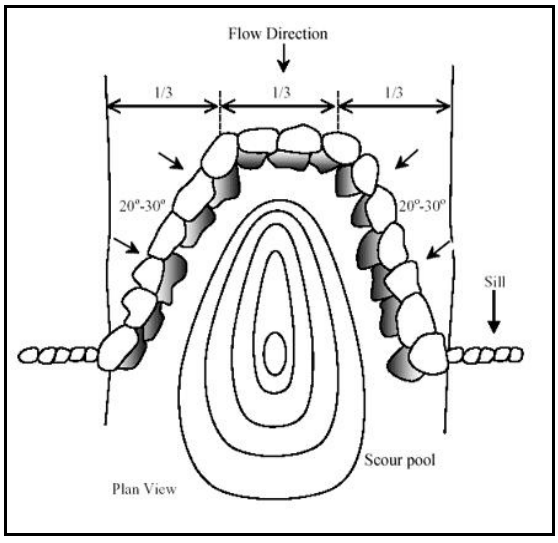
The Little Coal River, a tributary of the Coal River, was chosen as a restoration site because the channel has an obvious need for instream habitat enhancements due to the large amount of sedimentation. A detailed summary, station map, photographs, and installation guidelines for the proposed enhancements on the Little Coal River reach are located in APPENDIX A - C and on the ATTACHED "Stream Enhancement Maps". The enhancement features will are located within a 25-mile reach of the Little Coal River from the confluence of the Big Coal River located approximately at 38° 16' 21.1" Latitude and 81° 47' 59.8" Longitude, and extending upstream near the Route 119 crossing at Danville approximately at 38° 5' 2.1" Latitude and 81° 50' 20.7" Longitude. These enhancements are discussed in detail below.

Throughout the entire Little Coal River mitigation reach, overall substrate is very poor. In most sections, the substrate is comprised of 100% sand, causing very poor epifaunal substrate and cover, embeddedness, deposition, and lack of pool habitats. In other sections, there appears to be more favorable substrate, such as at Station 3, having cobble, gravel, and boulder compositions. Because of the wide range in substrate compositions throughout the Little Coal Reach, the Rosgen stream type changes from a F5 stream type in the sand reaches to a F3/F4 stream type in the cobble and gravel dominated reaches.

In the F3 stream type sections, which are the majority of the IP stations, structures such as j-hook vanes, cross vanes, and rock vanes should be installed. Rosgen (1996) shows a "Good" rating for both of these structures in this stream type. In addition to facilitating sediment transport, vanes are designed to protect the bank from further erosion, maintain proper width/depth ratios and hence stability, while also enhancing fisheries habitat, and creating recreational boating areas. In order to create additional structure diversity within the Little Coal River reach, along with utilizing existing materials, some vanes described below can be constructed out of large trees or root-wad materials (see the STRUCTURE DIAGRAMS section of this plan).



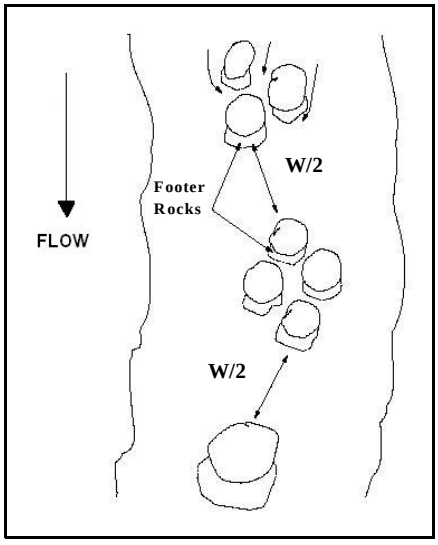
Traditional vanes will be constructed out of large, rounder-shaped, boulders approximately 3 (minimum size) - 5 feet in diameter, which are directed upstream lying against the flow. The vane portion of the cross vane and j-hook vane will occupy 1/3 of the bankfull width (approximately 10 feet) and the "hook" portion of the j-hook vane structure will contain 1/4 - 1/3 rock diameter gaps between the rocks. The vane of a rock vane occupies 2/3 of the bankfull width and contains no "hook" or apex. The center or apex of the cross vane rocks will be at or near bed level to permit fish passage at low flows. The vane portion of the boulders will be angled between 20 - 30 degrees, measured from the tangent line where the vane intercepts the bank. Typically, the length of bank protected is approximately 2 times the length of the vane, or up to 3 times the length of the vane if the structures are a maximum spacing (Rosgen 2002a). The slope of the vane will be between 2 and 7 percent. The boulder structures will only extend to the bankfull stage elevation, therefore allowing water to pass freely over the structures. The top row of rocks will rest on top of footer rocks. Because the structures will be installed on a sand bed, extra footer rocks will be needed, which will also need to be installed on geotextile material. The footer will need to be installed first, which is normally, for sand, 6 times the protrusion height of the installed boulders (on cobble/gravel, 3 times the protrusion height of installed boulders).



Throughout the Little Coal River reach, there appears to be several large woody debris jams in the middle of the channel. Because of the sedimentation issues in this river, the structures are causing large depositions, which will ultimately cause channel alterations. These structures should be removed or repositioned. If some of the structures are large enough and are not starting to decompose, they can be utilized as vane structures. Structures similar to root-wads, can be pinned along the banks and angled upstream, rather than in the center of the channel, to provide additional bank habitat.

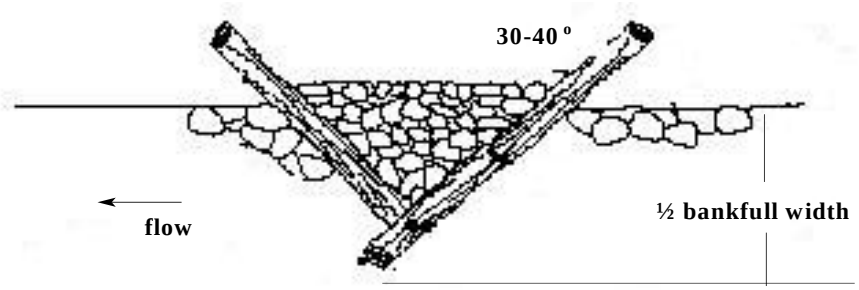
In the cobble and gravel sections of the Little Coal River reach, single wing deflectors and/or random boulder clusters will be beneficial to maintain flow in the thalweg, increase velocities, and form additional scour pools. Single wing deflectors also protect banks redirecting higher flows away from the banks, along with facilitate gravel deposition upstream enhancing fish habitat. The deflector or frame portion of the structure can consist of either a log or large rocks, like those used in the vane construction. When using logs, the should be firmly anchored into the bank a minimum of 5 to 6 feet. When two or more logs are used in a frame, they need to be firmly anchored to each other with rebar, driven through at least 4 inches and the rebar bent in the downstream direction. The deflector is extended to ½ the bankfull width, installed approximately at a 30 - 40 degrees from the bank, and installed on geotextile material since the majority of the substrate is sand. The logs then need secured to the bottom using 3 to 5 foot rebar pins spaced at 5 foot intervals. Larger stones are then placed at the connections on the outside of the frame for added stability and erosion control. Smaller stone can then be tightly packed into the frame deflector. If using rocks as the frame, 3 - 5 feet diameter rocks can be used, dense angular rock from 4 to 30 inches in diameter should be used for the fill material (MDE 2000).

Random boulder placement and cluster boulder placement will create more profitable fisheries habitat and cover. By placing random boulders throughout Hopkins Fork, velocities will be increased to create scouring pools around the structures. These structures, normally range in size from 3 (minimum size) to 5 feet in diameter, can be of any shape (normally blocky and angular rather than round), and can be placed in groups, which normally provides more desirable habitats (FISRWG. 1998), or singly in a random manner (see PROPOSED HABITAT ENHANCEMENTS). When placed in groups or clusters, they will consist of 3 to 5 boulders and placed in a triangular manner (see DIAGRAM, MDE 2000). The boulder clusters will be spaced a minimum of 15 feet apart. The boulders will rest on top of footer rocks. However, the boulders will not be more than 25 to 30% of the bankfull depth after partial embedment (MDE 2000).



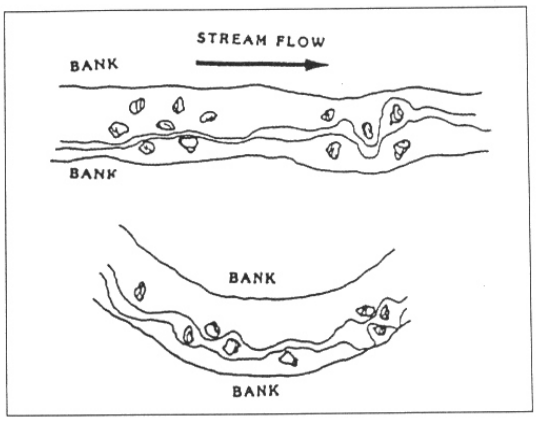
PROPOSED HABITAT ENHANCEMENTS

A. SINGLE WING DEFLECTORS



Deflectors are intended to direct flow, create scouring pools, and provide instream cover for aquatic fauna such as fish and aquatic invertebrates, along with protecting unstable banks. Deflectors can be created out of either rock or log frames and filled tightly with smaller rock. Boulders are normally placed on the banks of both ends of the frame for further erosion control.

B. RANDOM BOULDER CLUSTERS



By appropriately placing boulders, usually in riffles or guilds, increased velocities are generated to provide scouring pools (Orth & White, 1993). Depending on the stream size, boulders are usually three to five feet in diameter or larger. Boulders, along with logs, can also be placed along the channel banks to provide instream cover and pools, increase structural complexity, form substrates for invertebrates and fish, trap gravel for spawning habitats, organic matter supply, and increase channel stability (Orth & White, 1993). Bank revetments protect unstable banks deflecting high water velocities away from the bank. By placing boulders or other materials, including large woody debris, on the outside of meander bends, erosion on banks is decreased due to water being forced in front of the structures rather than behind or underneath them.

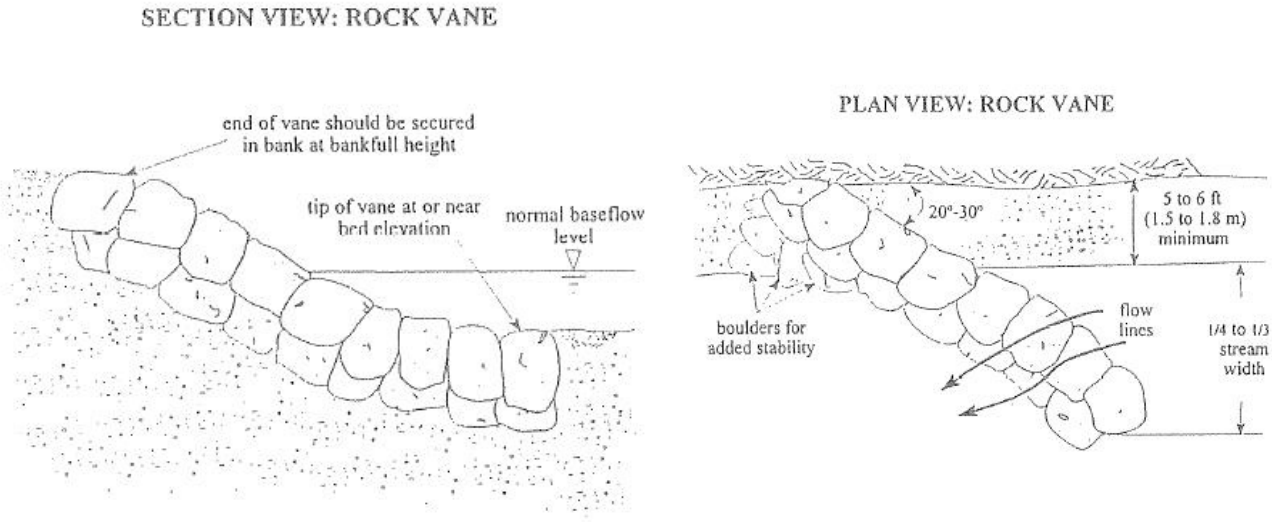
C. CROSS VANES

Instream structures, such as cross vanes are normally used in larger order streams. These structures are used to protect banks, direct flow, regulate channel velocities, and produce scouring pools for fisheries resources. In addition to providing available instream habitat and cover, these structures provide improved recreational boating areas, and improved fish and benthic breeding substrates.

D. J-HOOK VANES

Instream structures, such as j-hook vanes, are normally used in larger order streams. These structures are used to protect banks, direct flow, regulate channel velocities, and produce scouring pools for fisheries resources. In addition to providing available instream habitat and cover, these structures provide improved recreational boating areas, and improved fish and benthic breeding substrates.

E. ROCK VANES



Rock Vane & J-Hook Vane

Instream structures, such as rock vanes, are normally used in larger order streams. These structures are used to protect banks, direct flow, regulate channel velocities, and produce scouring pools for fisheries resources. In addition to providing available instream habitat and cover, these structures provide improved recreational boating areas, and improved fish and benthic breeding substrates.

CONSTRUCTION METHODS

Enhancements:

Phase I. Installation of bank stabilization and pool producing structures (i.e. cross vanes, rock vanes, step pools) in needed areas within mitigation sites

Phase II. Reestablish riparian vegetation that was disturbed during construction

During the construction phases of the restoration site, high-visibility hazard fencing should be used along the sites and any surrounding water bodies to assist with protection around the areas and to protect the sites from further impacts. The work should be conducted in the late summer, after spring run-off, when the soils are dry to avoid any further sedimentation problems downstream. A construction barrier fence should also be temporarily installed to prevent equipment from disturbing soils and vegetation.

Discussion

Phase I.

Pool producing structures, such as vanes, deflectors, and boulders, will be installed after any large woody debris or tire debris is removed from the station. Detailed installation guidelines are provided at the end of this report. After installation, all banks will be repaired and re-vegetated.

Phase II.

After installing the instream structures, the area will be cleaned properly, and if necessary; trees will be planted to provide additional canopy cover. Trees will be planted during the spring or fall to ensure for proper root growth and allow time to establish proper feeder roots prior to the growing season (Palone & Todd 1998). For success, trees are more likely to sustain by transplanting them, rather than seeding. Tree spacing, mixtures, soil tolerance, and additional information can be found in TABLES 1 through 5.

Trees or saplings are normally available with bare roots, with soil wrapped in burlap or another container, or tree spaded. Bare rooted trees will be planted with a tree spade (see PROPOSED HABITAT ENHANCEMENTS). Depending on the diameter of the tree, they are normally placed in a 2 to 4 foot diameter hole with approximately one-third of the root ball above ground (Palone & Todd 1998). The tree or sapling will be placed straight up, covered with surrounding soil, packed firmly, and watered. A mulch mixture will then be spread in a three to four inch diameter around the tree trunk. Container wrapped trees will be planted in a hole that has a diameter of 12 inches for each inch of tree diameter. The container and surrounding soil

mixture will be removed to expose the root system. Additional top soil or peat moss will be added to the hole before backfilling. The surrounding area will be watered and mulched (NRCS, Code 612: Tree/Shrub Establishment).

At times, additional protection surrounding the newly planted trees is necessary. As mentioned above, chicken wire or silt fences will be placed around the renovated area or the base of the trees can be wrapped with a fabric wrap until they become firmly established (NRCS, Code 612: Tree/Shrub Establishment). Transplanted trees may also need vertical stakes or wires for additional support. Wires will be attached directly above the first branch of the tree, with a rubber hose in between the wire and the tree (NRCS, Code 612: Tree/Shrub Establishment).

INSTALLATION GUIDELINES

During the construction phases of the mitigation sites, high-visibility hazard fencing should be used. All construction work conducted in or near a stream should be conducted when the soils are dry and water flow is at its lowest to avoid any sedimentation problems downstream. A construction barrier fence should also be temporarily installed to prevent equipment from disturbing soils and vegetation. If necessary, water will be diverted away from the construction site using best management practices. All soil or material removed from the area should be disposed of properly.

Riparian Vegetation:

Live Stakes: Live stakes, approximately 2 to 3 feet long, should be cut from the surrounding areas and should have a diameter between 0.75 and 1.5 inches. The top of the stake should be flat and the rooting area should be tapered. The rooting areas of the cuttings should be soaked in water for 24 to 48 hours prior to installation (MDE 2000). Approximately 20% of the live stake, and a minimum of two lateral buds, should be exposed above the ground. Cuttings should be spaced a distance of 2 to 3 feet apart in a triangular pattern. Low story tree or shrub species: Silky dogwood, Hawthorn, Blackberry, Raspberry, Black willow, or Arrowwood. Medium to Large tree or shrub species: Oak, Birch, Ironwood, Maple, Sycamore.

Plantings: *Bare rooted trees* should be planted with a tree spade. Depending on the diameter of the tree, they are normally placed in a 2 to 4 foot diameter hole with approximately one-third of the root ball above ground. The tree or sapling should be placed straight up, covered with surrounding soil, packed firmly, and watered. A mulch mixture should then be spread in a three to four inch diameter around the tree trunk. *Container wrapped trees* should be planted in a hole that has a diameter of 12 inches for each inch of tree diameter. The container and surrounding soil mixture should be removed to expose the root system. Additional top soil or peat moss should be added to the hole before backfilling. The surrounding area should be watered and mulched. *Transplanted trees* may need vertical stakes or wires for additional support. Wires should be attached directly above the first branch of the tree, with a rubber hose in between the wire and the tree.

Instream Structures:

Boulder Placement: Boulders should range in size from 3 to 5 feet in diameter, can be of any shape (normally blocky and angular rather than round), and can be placed in groups, or individually in a random manner. When placed in groups or clusters, they should consist of 3 to 5 boulders and placed in a triangular manner. The boulder clusters should be spaced a minimum of 15 feet

apart. The boulders will rest on top of footer rocks. However, the boulders should not be more than 25 to 30% of the bankfull depth after partial embedment.

Bank Boulders: The area should be re-graded and gently sloped if unstable. Additional fill material may be required to obtain proper gradients along the banks. Boulders to be installed should range in size from 3 to 5 feet in diameter, can be of any shape (normally large and flat rather than round), and can be placed closely together along the banks.

Rock Vane: The structures should be constructed out of large, round-shaped, boulders ranging from 3.0 to 5.0 feet diameter, with a minimum weight of 200 pounds, which are directed upstream lying against the stream flow and tapering down to a 2 to 7 percent slope. The boulder structures should only extend to the bankfull stage elevation. The top row of rocks will rest on top of a line of long and flat footer rocks so that each vane rock rests upon two halves of each footer rock below and sits offset in the upstream direction. The footer will obviously need to be installed first, which is normally 3 times the protrusion height of the installed boulders. The vane portion of the structure should occupy 2/3 of the bankfull width. The vane portion of the boulders should be angled between 20 - 30 degrees, measured from the tangent line where the vane intercepts the bank.

J-Hook Vane: The structures should be constructed out of large, round-shaped, boulders ranging from 3.0 to 5.0 feet diameter, with a minimum weight of 200 pounds, which are directed upstream lying against the stream flow and tapering down to a 2 to 7 percent slope. The boulder structures should only extend to the bankfull stage elevation. The top row of rocks will rest on top of a line of long and flat footer rocks so that each vane rock rests upon two halves of each footer rock below and sits offset in the upstream direction. The footer will obviously need to be installed first, which is normally 3 times the protrusion height of the installed boulders. The vane portion of the structure should occupy 1/3 of the bankfull width and the "hook" should occupy the center 1/3 of the stream channel. The "hook" portion of the structure should contain 1/4 - 1/3 rock diameter gaps between the rocks. The vane portion of the boulders should be angled between 20 - 30 degrees, measured from the tangent line where the vane intercepts the bank. The individual structures should be placed between 45 and 50 feet apart to create profitable habitats for fisheries resources.

Cross Vane: Cross Vane structures should be constructed out of large boulders ranging in size from 3.0 to 5.0 feet in diameter. The vane will be facing upstream, viewed as a "U" when looking downstream. The vane portions of the

structure should occupy 1/3 of the bankfull width and all rocks should touch adjacent to each other to form a tight fit. The vane portions of the boulders should be angled between 20 - 30 degrees, measured from the tangent line where the vane intercepts the bank. The slope of the vane should be between 2 and 7 percent. The center or apex of the vane rocks should be at or near the bed level to permit fish passage at low flows, and the end rocks on either bank should be a bankfull stage elevation. The top row of rocks will rest on top of a line of long and flat footer rocks so that each vane rock sits upon two halves of each footer rock below and rests offset in the upstream direction. The footer will need to be installed first, which is normally 3 times the protrusion height of the installed boulders.

Single Wing Deflector

The deflector or frame portion of the structure can consist of either a log or large rocks, like those used in the vane construction. When using logs, the should be firmly anchored into the bank a minimum of 5 to 6 feet. When two or more logs are used in a frame, they need to be firmly anchored to each other with rebar, driven through at least 4 inches and the rebar bent in the downstream direction. The deflector is extended to ½ the bankfull width, installed approximately at a 30 - 40 degrees from the bank, and installed on geotextile material since the majority of the substrate is sand. The logs then need secured to the bottom using 3 to 5 foot rebar pins spaced at 5 foot intervals. Larger stones are then placed at the connections on the outside of the frame for added stability and erosion control. Smaller stone can then be tightly packed into the frame deflector. If using rocks as the frame, 3 - 5 feet diameter rocks can be used, dense angular rock from 4 to 30 inches in diameter should be used for the fill material.

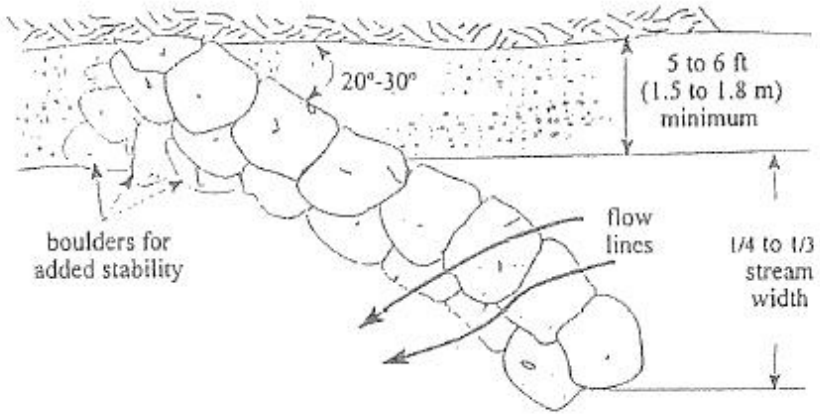
Log Vane:

Log Vanes should face upstream. The structure should be anchored with rods at a minimum of 5 to 6 feet into the slope and angled approximately 20^{o} to 30^{o} upstream. The rods should be driven in until a 4 inch tail remains, which then gets bent onto the log in the downstream position. Additional cables or rocks placed at the downstream end of the structure may be necessary to secure the log in the proper position.

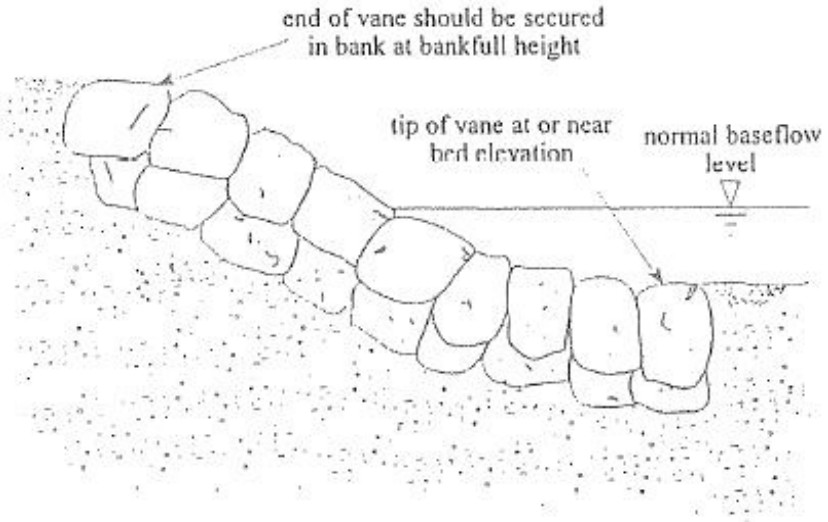
STRUCTURE DIAGRAMS

Rock Vane
(Johnson et al 2002)**:**

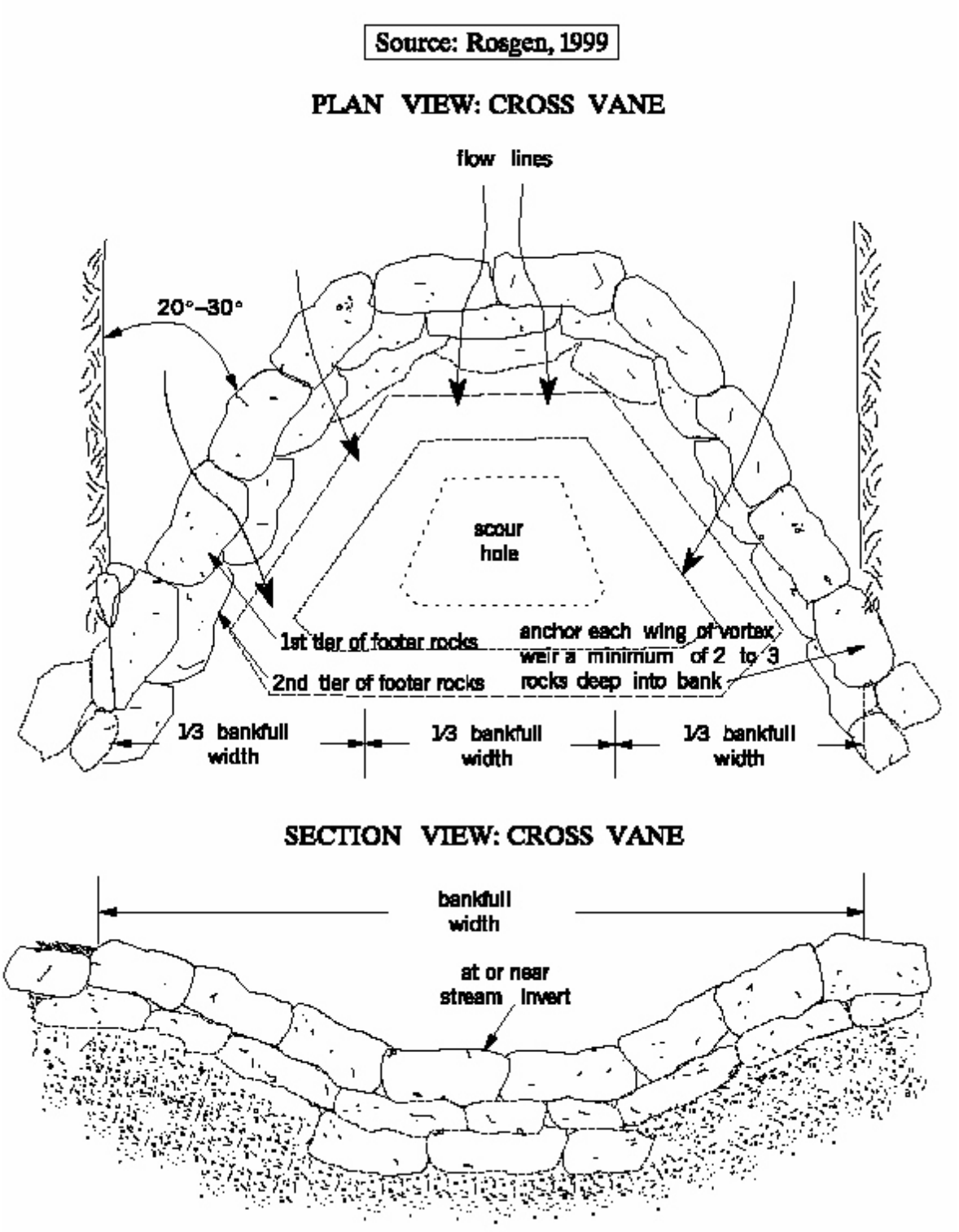
PLAN VIEW: ROCK VANE



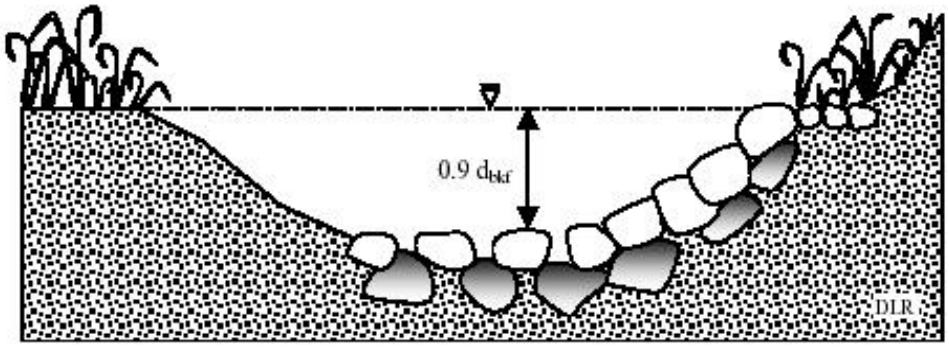
SECTION VIEW: ROCK VANE



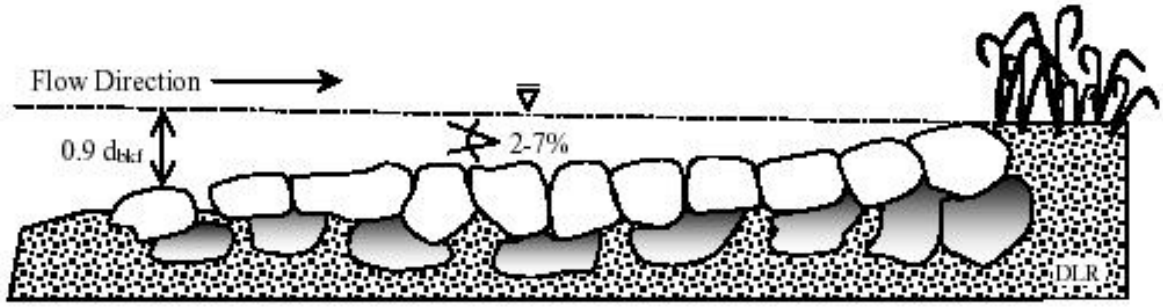
Cross Vane
(Rosgen 1999)**:**



J-Hook Vane
Rosgen (2002):

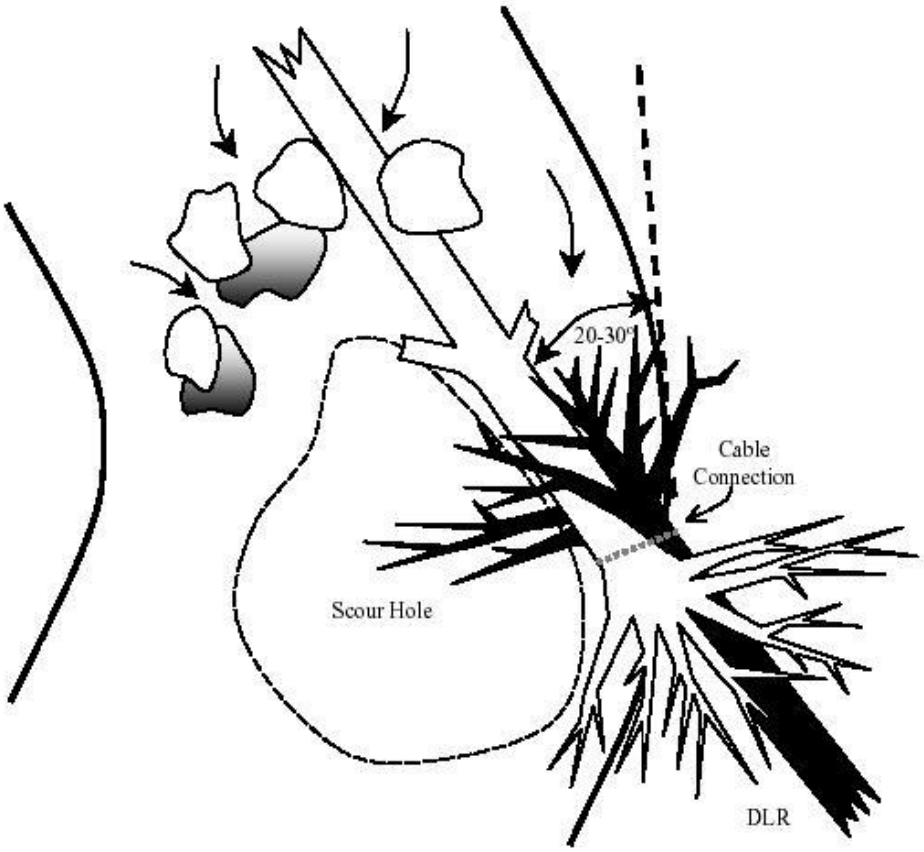


Cross Section View

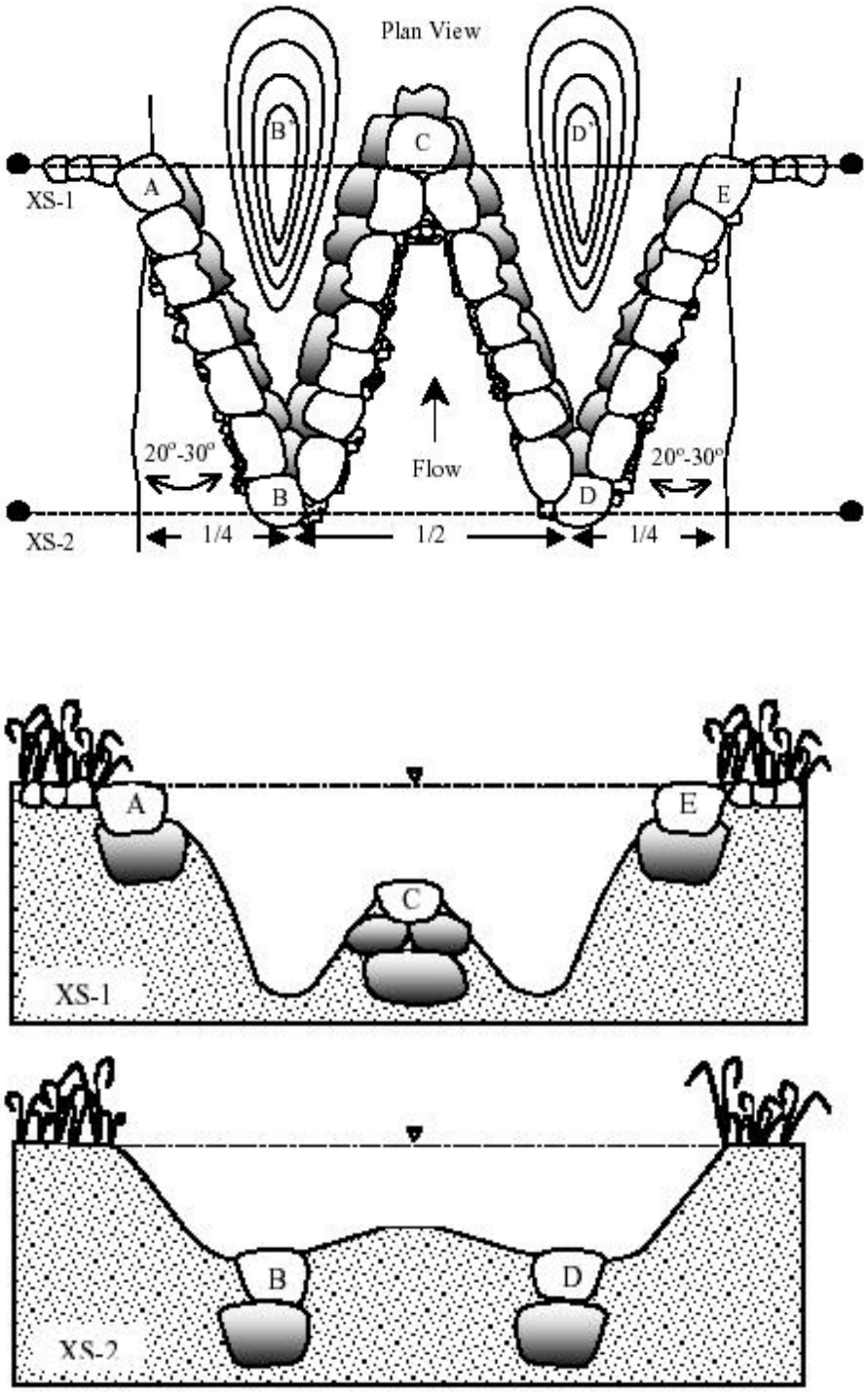


Profile View

J-Hook Vane/Root-wad Combo
Rosgen (2002):



W-Weir
Rosgen (2002):



Stream Restoration Plan for a Section of the Little Coal River between Danville and the Confluence of the Big Coal River. R.E.I. Consultants, Inc., August 2006.

MONITORING PLAN

In order to assess whether the restoration efforts on the Little Coal River are achieving their planned goals, annual inspections should take place. A functional assessment to ensure that the restoration sites are developing, or has developed into the desired habitat should be included within the yearly inspections. Like pre-installation procedures (see the RESTORATION WORK PLAN section of this plan), the same baseline parameters including detailed morphology, habitat, substrate, and riparian parameters should be measures at the restoration sites. The primary attributes normally measured for success of restoration projects included bank stability, riparian quality, substrate composition, elevation and slope, quantity of instream structures, and instream habitat types. These detailed and quantitative measurements will provide the data to assure that these enhancements on the Little Coal River are improving habitat for both benthic macroinvertebrate and fish populations inhabiting these streams.

The success of the restoration efforts should be based upon several criteria:

1. Photographs should be taken yearly to confirm the channels stability and proper construction by observing deficiencies such as inadequate flow, washed away structures, and formation of sediment depositions or channel alteration.

2. Annual habitat assessments should be conducted annually at the restoration sites to examine ecological integrity of the river. Habitat scores will determine the quality of instream and riparian habitat that influences the structure and function of the aquatic community in the channel. Total habitat scores should be compared annually to baseline scores as a measurement of success. Specific parameters to be examined on include:

a) Epifaunal Substrate/Available Cover - by adding instream structures substrate will be more favorable for colonization and cover.

b) Pool Substrate Characterization - by adding instream structures the mixture of substrate materials and vegetation will improve.

c) Pool Variability - by adding instream structures there will be an even mix of pool sizes.

d) Sediment Deposition - by adding instream structures, larger substrates such as cobble, gravel, and boulder should deposit. The structures should also help “flush” out large amounts of sand deposits.

e) Bank Stability - by installing bank stabilization structures and bank protection structures bank stability will improve from unstable to stable

3. Pebble counts should also be performed in order to monitor sedimentation by increases and decreases in sand.

4. Rosgen-type morphological cross-sections and longitudinal profiles should be collected to determine the change in morphology. Bankfull widths, bankfull depths, width/depth ratios and cross-sectional areas should be used to demonstrate the change in morphology pre- and post-structure placements.

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See Terrain Navigator:
Southwest CD: Julian, etc CD's

LCR FIGURE 1_Topo pdf.

FIGURE 1. Topographical map showing the approximate location of the 25-mile Little Coal River enhancement reach. REI Consultants, Inc., June 2005.

TABLE 1. Temporary seeding recommendations for grasses in West Virginia as described by the Natural Resources Conservation Service, Critical Area Planting, Code 342. NRCS 2002.

TEMPORARY SEEDING RECOMMENDATIONS

SPECIES/MIXTURE	SEEDING RATE LBS./ACRE	OPTIMUM SEEDING DATES	SOIL - SITE ADAPTATION DEPTH/ DRAINAGE	pH RANGE
Annual Ryegrass	40	3/1 - 6/15 8/15 - 9/15	Shallow - Deep; Well - Poorly	5.5 - 7.5
Field Bromegrass	40	3/1 - 6/15 8/15 - 9/15	Shallow - Deep; Well - Mod. Well	6.0 - 7.0
Spring Oats	96	3/1 - 6/15	Shallow - Deep; Well - Poorly	5.5 - 7.0
Sudangrass	40	5/15 - 8/15	Shallow - Deep; Well - Poorly	5.5 - 7.5
Winter Rye	168	8/15 - 10/15	Shallow - Deep; Well - Poorly	5.5 - 7.5
Winter Wheat	180	8/15 - 11/15	Shallow - Deep; Well - Mod. Well	5.5 - 7.0
Japanese Millet	30	6/15 - 8/15	Shallow - Deep; Well	4.5 - 7.0
Redtop	5	3/1 - 6/15	Shallow - Deep; Well	4.0 - 7.5
Annual Ryegrass and Spring Oats	26 64	3/1 - 6/15	Shallow - Deep; Well - Poorly	5.5 - 7.5

TABLE 2. Temporary seeding recommendations for permanent herbaceous cover in West Virginia as described by the Natural Resources Conservation Service, Critical Area Planting, Code 342. NRCS 2002.

PERMANENT HERBACEOUS COVER SEEDING RECOMMENDATIONS

SPECIES AND /OR MIXTURE	SEEDING RATE LBS. PER ACRE		SOIL - SITE ADAPTATION		SEEDING RATES[1]
	PREPARED SEEDBED	UNPREPARED SEEDBED	SOIL DEPTH & DRAINAGE	pH RANGE	
Orchardgrass	10	15	Shallow - Deep;	5.5 - 7.5	3/1 - 6/15;
Ladino Clover	2	3	Well - Mod. Well		8/15 - 9/15
Redtop	3	4.5			
Birdsfoot Trefoil	10	15	Shallow - Deep;	5.0 - 7.5	3/1 - 6/15;
Or Ladino Clover	3	4.5	Well - Mod. Well		8/15 - 9/15
Tall Fescue	30	45			
Weeping Lovegrass	1 - 2	1.5 - 3			
Or Redtop	3	4.5			
Crownvetch	10 - 15	15 - 22.5	Shallow - Deep;	5.0 - 7.5	3/1 - 6/15;
Tall Fescue	30	45	Well - Mod. Well		8/15 - 9/15
Crownvetch	10 - 15	15 - 22.5	Shallow - Deep;	5.0 - 7.5	3/1 - 6/15;
Perennial Ryegrass	20	30	Well - Mod. Well		8/15 - 9/15
Flatpea Or	20	30	Shallow - Deep;	4.0 - 8.0	3/1 - 6/15;
Perennial Pea	20	30	Well - Mod. Well		8/15 - 9/15
Tall Fescue	15	22.5			
Deertongue	15	22.5	Shallow - Deep;	4.0 - 7.0	3/1 - 6/15;
Birdsfeet Trefoil	10	15	Well - Mod. Well		8/15 - 9/15
Weeping Lovegrass	1 - 2	1.5 - 3			

TABLE 2. Continued.

PERMANENT HERBACEOUS COVER
SEEDING RECOMMENDATIONS

SPECIES AND /OR MIXTURE	SEEDING RATE LBS. PER ACRE		SOIL - SITE ADAPTATION		SEEDING RATES[1]
	PREPARED SEEDBED	UNPREPARED SEEDBED	SOIL DEPTH & DRAINAGE	pH RANGE	
Tall Fescue	30	45	Shallow - Deep;	4.5 - 7.5	3/1 - 6/15;
Serecia Lespedeza	25	37.5	Well - Mod. Well		8/15 - 9/15
Ladino Clover	2	3			
Tall Fescue	40	60	Shallow - Deep;	5.0 - 7.5	3/1 - 6/15;
Ladino Clover	3	4.5	Well - Mod. Well		8/15 - 9/15
Redtop	3	4.5			
Crownvetch	10	15	Shallow - Deep;	5.0 - 7.5	3/1 - 6/15;
Tall Fescue	20	30	Well - Mod. Well		8/15 - 9/15
Redtop	3	4.5			
Tall Fescue	40	60	Shallow - Deep;	5.0 - 7.5	3/1 - 6/15;
Birdsfoot Trefoil	10	15	Well - Mod. Well		8/15 - 9/15
Redtop	3	4.5			
Serecia Lespedeza	25	37.5	Shallow - Deep;	4.5 - 7.5	3/1 - 6/15;
Tall Fescue	30	45	Well - Mod. Well		8/15 - 9/15
Redtop	3	4.5			
Tall Fescue	30	45	Shallow - Deep;	4.5 - 7.5	3/1 - 6/15;
Reed Canarygrass	20	30	Well - Poorly		8/15 - 9/15
Redtop	3	4.5			
Ladino Clover	2	3.5			

TABLE 2. Continued.

PERMANENT HERBACEOUS COVER
SEEDING RECOMMENDATIONS

SPECIES AND /OR MIXTURE	SEEDING RATE LBS. PER ACRE		SOIL - SITE ADAPTATION		SEEDING RATES[1]
	PREPARED SEEDBED	UNPREPARED SEEDBED	SOIL DEPTH & DRAINAGE	pH RANGE	
Kentucky Bluegrass	20	30	Shallow - Deep;	5.5 - 7.5	3/1 - 6/15;
Redtop	3	4.5	Well - Mod. Well		8/15 - 9/15
White Clover Or	2	3			
Birdsfoot Trefoil	10	15			
Reed Canarygrass	25	37.5	Mod. Deep - Deep;	4.5 - 7.5	3/1 - 6/15;
Weeping Lovegrass	1	1.5	Well - Poorly		8/15 - 9/15
Tall Fescue Or	10	15	Shallow - Deep;	5.5 - 7.5	3/1 - 6/15;
Reed Canarygrass	10	15	Well - Poorly		8/15 - 9/15
Birdsfoot Trefoil	10	15			
Timothy	5	7.5	Shallow - Deep;	6.5 - 8.0	3/1 - 6/15;
Alfalfa	12	18	Well - Mod. Well		8/15 - 9/15
Timothy	5	7.5	Shallow - Deep;	5.5 - 7.5	3/1 - 6/15;
Birdsfoot Trefoil	8	12	Well - Poorly		8/15 - 9/15
Tall Fescue,					
Red Or Hard	30	45	Shallow - Deep;	5.0 - 7.5	3/1 - 6/15;
Redtop	3	4.5	Well - Mod. Well		8/15 - 9/15
Reed Canarygrass	20	30	Shallow - Deep;	5.5 - 7.5	3/1 - 6/15;
Birdsfoot Trefoil	10	20	Well - Poorly		8/15 - 9/15
Redtop	3	4.5			

TABLE 2. Continued.

PERMANENT HERBACEOUS COVER SEEDING RECOMMENDATIONS

SPECIES AND /OR MIXTURE	SEEDING RATE LBS. PER ACRE		SOIL - SITE ADAPTATION		SEEDING RATES[1]
	PREPARED SEEDBED	UNPREPARED SEEDBED	SOIL DEPTH & DRAINAGE	pH RANGE	
Tall Fescue	50	75	Shallow - Deep; Well - Poorly	4.5 - 7.5	3/1 - 6/15; 8/15 - 9/15
Switchgrass	10	15	Shallow - Deep; Well - Mod. Well	5.0 - 7.5	3/1 - 4/15
Switchgrass Birdsfoot Trefoil	10 6	15 9	Shallow - Deep; Well - Mod. Well	5.0 - 7.5	3/1 - 4/15
Switchgrass Serecia Lespedeza	10 20	15 30	Shallow - Deep; Well - Mod. Well	5.0 - 7.5	3/1 - 4/15
Switchgrass Big Bluestem Indiangrass Eastern Gamagrass Little Bluestem Costal Panicgrass	2 3 1 2 2 1	3 4 2 3 3 2	Shallow - Deep; Well - Mod. Well	5.0 - 7.5	3/1 - 4/15
Big Bluestem Indiangrass Little Bluestem Sideoats Grama Switchgrass	1 1 2 1 1	2 2 3 2 2	Shallow - Deep; Well - Mod. Well	5.0 - 7.5	3/1 - 4/15

[1] If permanent seeding is not feasible during these dates and the decision maker is willing to assume a high risk of failure and increased costs, use the recommended seeding and mulching rates in WV Agronomy Field Letter Number 9. (Attached)

TABLE 3. Temporary seeding recommendations for trees and shrubs in West Virginia as described by the Natural Resources Conservation Service, Critical Area Planting, Code 342. NRCS 2002.

TREES AND SHRUBS RECOMMENDED FOR PLANTING ON CRITICAL AREAS[1]

SPECIES	LOWER LIMIT Ph TOLERANCE	TOLERANCE TO COMPETITION AND SHADE[2]	ELEVATION
CONIFERS			
Shortleaf pine	4.0 - 4.5	intolerant	below 2500 ft.
Austrian pine	4.0	intermediate	
Red pine	4.0 - 4.5	intermediate	above 2000 ft.
Pitch pine	4.0	intolerant	
White pine	4.5	tolerant	
Scotch pine	4.0	intolerant	
Virginia pine	4.0	intolerant	below 2500 ft.
Japanese larch	4.0	intermediate	
HARDWOODS			
European (black) alder	3.5	intolerant	below 2500 ft.
Sweet birch	4.5	tolerant	
River birch	4.0	intermediate	below 2500 ft.
Eastern cottonwood	4.5	intolerant	
Tulip or yellow poplar	4.5	intolerant	below 3000 ft.
Sycamore	5.5	intolerant	below 2500 ft.
Sawtooth oak	5.0	intolerant	
Red oak	5.0	intermediate	
Black locust	4.0	intolerant	below 3000 ft.
Hybrid poplar	4.5	intolerant	
Bigtooth aspen	4.5	intolerant	
Chinese chestnut	5.0	intermediate	

TABLE 3. Continued.

TREES AND SHRUBS RECOMMENDED FOR PLANTING ON CRITICAL AREAS[1] (continued)

SPECIES	LOWER LIMIT Ph TOLERANCE	TOLERANCE TO COMPETITION AND SHADE[2]	ELEVATION
SHRUBS			
Indigobush	4.0	intermediate	
Silky cornel	4.5	tolerant	
Gray dogwood	5.0	intermediate	
Flowering dogwood	5.0	tolerant	
Bicolor lespedeza	4.5 - 5.0	intolerant	
Shrub lespedeza 'Amquail'	4.5 - 5.0	intolerant	
Amur privet	4.5 - 5.0	tolerant	
Crabapple	4.5 - 5.0	intolerant	
Fragrant sumac	4.5	tolerant	
Shining sumac	4.0	intermediate	
Smooth sumac	4.5	intermediate	
Coralberry	5.0	tolerant	
Arrowwood viburnum	4.5	tolerant	
Cranberrybush	4.5	intermediate	

[1] For bank or riparian zones use Riparian Forest Buffer (391) standard Table 1.

[2] Shade Tolerance of species is defined as follows:
Tolerant - can withstand completely shaded conditions.
Intermediate - partial shade is tolerated; plant requires some sunlight.
Intolerant - plant requires full sunlight.

TABLE 4. Suitable shrubs for establishment in West Virginia. Natural Conservation Practice Standards, Code 342: Critical Area Planting.

SHRUBS	Soil Drainage Class[1]	Shade Tolerance[2]	Height at 20 Years[3]	Aprox. Height at Maturity[4]	Native[5]	Suitable Use (s)				Wildlife Spacing	Plant Information Sheet Available[8]	Remarks	Commercial Availability[9]
						Visual Screens or Barriers[6]	Wildlife[7]						
							Food	Cover	Corridors				
Alder, Smooth *(Alnus serrulata)*	Somewhat Poorly-Poorly	Tolerant	10 ft	20 ft	Yes		X		X	5-8 ft	Plant Sheet	Adapted to wetter sites and along streams below 2600 ft.	Readily
Arrowwood *(Viburnum dentatum)*	Moderately Well-Poorly	Intermediate	10 ft	10 ft	Yes		X	X	X	3-6 ft	Plant Guide	Excellent wildlife food source. Adapted for wetter conditions.	Somewhat Available
Blueberry, Highbush *(Vaccinium corymbosum)*	Moderately Well-Poorly	Intolerant	6 ft	10 ft	Yes		X			3-6 ft	Plant Guide	Adapted to acidic wet conditions. Sometimes hard to establish.	Readily
Buttonbush *(Cephalanthus occientalis)*	Somewhat Poorly-Poorly	Tolerant	10 ft	20 ft	Yes		X	X		5-8 ft	Plant Sheet	Only suited for very wet sites. Will tolerate inundation. Provides food and cover for waterfowl.	Rarely
Dogwood, Flowering *(Cornus florida)*	Well-Somewhat Poorly	Tolerant	30 ft	40 ft	Yes	2-3 ft	X	X		4-8 ft	Plant Sheet	Berries eaten by songbirds, grouse, turkey, quail, squirrels; browsed by deer, rabbits. Often used as an ornamental.	Readily
Dogwood, Silky *(Cornus Amomum)*	Well-Somewhat Poorly	Tolerant	12 ft	12 ft	Yes	2-3 ft	X	X	X	3-6 ft	Plant Sheet	Stolonifrerous. Produces fruit in 3-5 years. Excellent wildlife plant.	Readily
Elderberry *(Sambucus canadensis)*	Well-Somewhat Poorly	Intolerant	7 ft	7 ft	Yes		X	X	X	3-6 ft	Plant Sheet Plant Guide	Excellent all around wildlife plant. Suckers freely. Many species of birds and mammals utilize the fruit.	Readily
Hawthorn, Washington *(Crataegus phaenopyrum)*	Well-Somewhat Poorly	Intermediate	25 ft	25 ft	Yes	3-6 ft		X	X	5-8 ft	No	Provides excellent wildlife cover. Not as prone to spreading as some introduced hawthorns.	Somewhat Available
Hazelnut, American *(Corylus americana)*	Well-Moderately Well	Tolerant	10 ft	10 ft	Yes		X	X		3-6 ft	Plant Guide	Provides cover and nesting for wildlife. The leaves, twigs, and catkins are browsed by rabbits and deer.	Somewhat Available
Holly, American *(Ilex opaca)*	Well-Somewhat Poorly	Tolerant	20 ft	60 ft	Yes	3-6 ft		X	X	5-8 ft	Plant Sheet	Evergreen. It is important to plant males as well as females if berry production is desired. Used as winter cover and ornamental.	Readily
Hornbeam, American *(Carpinus caroliniana)*	Moderately Well-Somewhat Poorly	Tolerant	15 ft	40 ft	Yes		X		X	5-8 ft	Plant Guide	This species produces large amounts of seed eaten by many birds and mammals. Found along streams and rivers. Excellent riparian species.	Somewhat Available
Locust, Bristly *(Robinia hispida)*	Well-Moderately Well	Intolerant	7 ft	7 ft	Yes	3-6 ft				--	Plant Sheet	Excellent for erosion control. Minimal wildlife value. Mainly used for reclamation of mined sites. Many varieties available.	Readily
Spicebush, Northern *(Lindera benzoin)*	Moderately Well-Poorly	Intermediate	12 ft	15 ft	Yes		X			5-8 ft	Plant Guide	Attractive fragrant understory tree common throughout the state. Sometimes planted as an ornamental.	Readily
Winterberry *(Ilex verticilata)*	Somewhat Poorly-Poorly	Intermediate	10 ft	10 ft	Yes	3-6 ft	X	X	X	3-6 ft	Plant Sheet	Fruit is poisonous to humans. Higher elevation deciduous holly suited to the eastern mountain counties. Excellent for wildlife.	Readily
Willow, Purpleosier *(Salix purpurea)*	Well-Poorly	Intolerant	10 ft	10 ft	No	2-3 ft				--	Plant Sheet	Excellent streambank stbilization and bioengineering plant suitable to dormant whip type plantings. Many cultivars are available.	Somewhat Available
Witch Hazel (*Hamamelis virginiana)*	Well-Somewhat Poorly	Intermediate	15 ft	20 ft	Yes		X			5-8 ft	No	Good native wildlife food source. Sometimes hard to establish.	Somewhat Available

TABLE 5. Suitable trees for establishment in West Virginia. Natural Conservation Practice Standards, Code 342: Critical Area Planting.

TREES	Soil Drainage Class	Shade Tolerance	Height at 20 Years	Aprox. Height at Maturity	Native	Suitable Use(s)						Plant Information Sheet Available	Remarks	Commercial Availability
						Windbreaks Screens Barriers or Other	Wildlife			Wildlife Spacing	Timber Production Spacing			
							Food	Cover	Corridors					
Alder, European Black *(Alnus glutinosa)*	Well-Moderately Well	Intermediate	40 ft	60 ft	No	8-12 ft*			X	8-12 ft		Plant Sheet	Excellent for reclamation. Nitrogen fixer. Good for hedgerow and windbreaks where non-natives are acceptable.	Readily
Ash White *(Fraxinus americana*)	Well-Somewhat Poorly	Intermediate	50 ft	80 ft	Yes	8-12 ft	X	X	X	8-12 ft	20 X 20 ft	Plant Guide	Excellent all purpose ornamental, wildlife and shade tree. Has commercial timber value.	Readily
Basswood *(Tilia americana*)	Well-Moderately Well	Intermediate	45 ft	80 ft	Yes	8-12 ft	X		X	8-12 ft	6-8 ft	Plant Guide	Basswood is good browse and buds are important for birds and deer in winter. Planted as shade tree or ornamental.	Readily
Birch, Black *(Betula nigra*)	Well-Somewhat Poorly	Intolerant	40 ft	80 ft	Yes			X	X	8-12 ft		Plant Sheet	Native riparian tree. Its young twigs, buds, foliage and seeds are used by a variety of wildlife.	Somewhat Available
Blackgum *(Nyssa sylvatica)*	Well-Somewhat Poorly	Tolerant	30 ft	95 ft	Yes		X			8-12 ft		Plant Sheet	Black bears, foxes, wood ducks, wild turkeys, robins, brown thrashers, and flickers frequently eat the fruit.	Readily
Boxelder *(Acer negundo)*	Well-Poorly	Intermediate	35 ft	60 ft	Yes				X	8-12 ft		Plant Guide	Very quick growing. Found along streams and frequently flooded areas. Relatively short lived and often disease prone.	Readily
Cedar, Northern White *(Thuja occidentalis*)	Well-Somewhat Poorly	Intermediate	25 ft	50 ft	Yes	8-12 ft		X		8-12 ft		Plant Guide	Also called Arborvitae. Popular ornamental for screens and hedgerows in limestone areas. Provides some nesting cover.	Readily
Cherry, Black *(Prunus serotina)*	Well-Somewhat Poorly	Intolerant	40 ft	100 ft	Yes	8-12 ft	X		X	8-12 ft	20 X 20 ft	Plant Guide	Valuable food source for many wildlife species. Used for commercial timber and ornamental purposes on a wide variety of soils.	Readily
Chesnut, Chinese *(Castanea mollissima*)	Well-Moderately Well	Intolerant	25 ft	70 ft	No	8-12 ft	X			8-12 ft		No	Mostly planted as an ornamental. Some wildlife utilize the chesnuts.	Readily
Cucumber-Tree *(Magnolia acuminata)*	Well-Moderately Well	Intolerant	40 ft	100 ft	Yes	8-12 ft			X	8-12 ft	6-8 ft	No	Beautiful native tree common throughout West Virginia. Minimal wildlife value. Sometimes used as an ornamental and timber species.	Readily
Fir, Douglas *(Pseudotsuga menziesl*)	Well-Moderately Well	Intermediate	40 ft	200 ft	No	8-12 ft		X		8-12 ft		Plant Guide Plant Sheet	One of the world's most important timber species. Excellent as wildlife, windbreak, and Christmas tree.	Readily
Hackberry *(Celtis occidentalis*)	Well-Somewhat Poorly	Intermediate	40 ft	70 ft	Yes	8-12 ft	X		X	8-12 ft		Plant Sheet	Birds use the mature trees for nesting sites and feed on the fruit. Young stands also provide shelter for game birds and rabbits.	Readily

TABLE 5. Continued.

TREES	Soil Drainage Class	Shade Tolerance	Height at 20 Years	Aprox. Height at Maturity	Native	Suitable Use(s)						Plant Information Sheet Available	Remarks	Commercial Availability
						Windbreaks Screens Barriers or Other	Wildlife			Wildlife Spacing	Timber Production Spacing			
							Food	Cover	Corridor					
Hemlock, Eastern *(Tsuga canadensis*)	Well- Somewhat Poorly	Tolerant	20 ft	100 ft	Yes	8-12 ft		X	X	8-12 ft		Plant Guide	This tree is versatile as a hedge, large timber species, screen and wildlife tree. Different cultivars exist. Native and attractive.	Readily
Hickory, Shagbark *(Carya ovata)*	Well- Moderately Well	Intermediate	15 ft	90 ft	Yes		X			8-12 ft		No	Develops deep taproot in the first few years. Needs deep alluvial soils. Slow growing. Excellent nut producer. Some timber value.	Readily
Honeylocust (*Gleditsia triacanthos)*	Well- Somewhat Poorly	Intolerant	35 ft	80 ft	No	8-12 ft						Plant Guide	Planted as a hardy and fast-growing ornamental. Minimal wildlife value. Highly regarded in urban settings with many cultivars.	Readily
Locust, Black *(Robinia pseudoacacia*)	Well- Somewhat Poorly	Intermediate	40 ft	80 ft	Yes	8-12 ft*	X		X	8-12 ft		Plant Sheet	Easy to establish. Early successional species and may be relatively short lived. Bee attractant. Nitrogen fixing species.	Readily
Maple, Red *(Acer rubrum)*	Well- Poorly	Intermediate	40 ft	90 ft	Yes	8-12 ft		X	X	8-12 ft		Plant Sheet Plant Guide	Valued as a native ornamental. Early blooming and important as an ear;y pollinator for many insects. Grows in almost any condition.	Readily
Maple, Silver *(Acer saccharinum)*	Moderately Well- Poorly	Intermediate	45 ft	80 ft	Yes	8-12 ft		X	X	8-12 ft		Plant Guide Plant Sheet	Important as cavity tree and somewhat important as a wildlife food source. May be disease prone and susceptible to storm damage.	Readily
Maple, Sugar *(Acer saccharum)*	Well- Somewhat Poorly	Tolerant	20 ft	100 ft	Yes	8-12 ft		X	X	8-12 ft		Plant Guide	Popular and long-lived shade and ornamental tree. Tolerates a wide range of conditions. Important for cavity nesting wildlife.	Readily
Oak, Northern Red *(Quercus rubra)*	Well- Moderately Well	Intermediate	35 ft	100 ft	Yes	8-12 ft	X		X	8-12 ft	20 X 20 ft	Plant Guide	One of our most important and handsome oaks. Important as a wildlife food source, timber species and ornamental.	Readily
Oak, Pin *(Quercus palustris*)	Moderately Well- Poorly	Intolerant	40 ft	100 ft	Yes	8-12 ft	X			8-12 ft		Plant Sheet	Adapted to wetter sites. Good mast producer and attractive ornamental. Utilized by various wildlife especially wood ducks.	Readily
Oak, Shingle *(Quercus imbricaria)*	Well- Moderately Well	Intolerant	30 ft	45 ft	Yes	8-12 ft			X	8-12 ft		No	An ornamental and shade tree. It is suitable for hedges, screens and windbreaks. Relatively low wildlife value among oaks.	Readily
Oak, White *(Quercus alba)*	Well- Moderately Well	Intermediate	30 ft	100 ft	Yes	8-12 ft	X		X	8-12 ft	20 X 20 ft	Plant Sheet	Extremely important as a timber and wildlife food tree. Slow growing and often difficult to establish.	Readily

TABLE 5. Continued.

TREES	Soil Drainage Class	Shade Tolerance	Height at 20 Years	Aprox. Height at Maturity	Native	Suitable Use(s)						Plant Information Sheet Available	Remarks	Commercial Availability
						Windbreaks Screens Barriers or Other	Wildlife			Wildlife Spacing	Timber Production Spacing			
							Food	Cover	Corridor					
Pine, Eastern White *(Pinus strobus)*	Well- Somewhat Poorly	Intolerant	40 ft	130 ft	Yes	6-7 ft		X	X	8-12 ft	6-8 ft	Plant Sheet	Squirrels and 16 species of songbirds have been known to eat the seed. Native pine with commercial timber and ornamental value.	Readily
Poplar, Yellow *(Liridendron tulipifera*)	Moderately Well- Somewhat Poorly	Intolerant	60 ft	120 ft	Yes		X		X	10-15 ft		Plant Sheet	Fast growing. Attractive ornamental but very large. Important timber species in WV. Provides some secondary wildlife food.	Somewhat Available
Redbud, Eastern *(cercis canadensis)*	Well- Somewhat Poorly	Tolerant	16 ft	16 ft	Yes		X			5-8 ft		Plant Guide	Many birds, including bobwhite quails eat the seeds. Honeybees use the blossoms. Often planted as an ornamental.	Readily
Redcedar, Eastern *(Juniperus virginniana*)	Well- Somewhat Poorly	Intermediate	25 ft	80 ft	Yes	8-12 ft	X	X		8-12 ft		Plant Sheet Plant Guide	Eastern redcedar provides habitat for a variety of wildlife. Specific to limestone associated sites. Cedar-apple rust host.	Readily
Serviceberry, Common *(Amelanchier arborea)*	Well- Somewhat Poorly	Tolerant	20 ft	50 ft	Yes	8-12 ft	X			8-12 ft		Plant Guide	At least 40 bird species, rabbits, chipmunks,mice, voles, foxes,and black bears eat the fruit. Widely used as as ornamental.	Readily
Spruce, Norway *(Picea abies)*	Well- Somewhat Poorly	Intermediate	35 ft	120 ft	No	8-12 ft*		X		8-12 ft		No	Important as a windbreak, screen, and ornamental. Winter cover for some resident birds. Mourning doves utilize this tree for nesting.	Readily
Spruce, White *(Picea glauca)*	Well- Somewhat Poorly	Intermediate	30 ft	100 ft	No	8-12 ft	X	X		8-12 ft		Plant Guide	Important as a screen, timber and ornamental. Winter cover and food for some birds. Hybridizes freely. Native to the northeast.	Readily
Sycamore, American *(Platanus occidentalis)*	Moderately Well- Poorly	Intermediate	65 ft	100 ft	Yes				X	8-12 ft		Plant Guide	Very quick growing and large. Slow decaying leaves. Prone to disease. Found along streambanks and a variety of other sites.	Readily
Sweetgum *(Liquidambar styraciflua*)	Well- Somewhat Poorly	Intolerant	50 ft	100 ft	Yes	8-12 ft			X	8-12 ft		Plant Sheet Plant Guide	Prefers deep soils for root development. Important as a timber, wildlife and ornamental. Tolerates a variety of sites and conditions.	Readily
Walnut, Black *(Juglans nigra)*	Well- Moderately Well	Intermediate	35 ft	100 ft	Yes		X		X	10-20 ft	20 X 20 ft	Plant Sheet	Prefers deep well drained soils. Important as a timber and nut crop tree. Produces juglone that inhibits competition.	Readily