US Army Corps
of Engineers
Huntington District

Marlinton, West Virginia Local Protection Project
Draft
Detailed Project Report and
Environmental Impact Statement

Marlinton, West Virginia November 5, 1985

September 2001

U.S. Army Corps of Engineers
Huntington District
Huntington, West Virginia

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Abstract: The U.S. Army Corps of Engineers has evaluated measures for flood damage reduction for the Town of Marlinton, Pocahontas County, West Virginia (Marlinton Local Protection Project). Following a detailed screening process, three alternatives were carried forward for analysis in this report. Two levee/floodwall alternatives with alternative measures for managing flooding from Knapps Creek are considered in detail in addition to the No Federal Action alternative. This Integrated Draft DPR/EIS identifies the baseline environmental conditions and provides an analysis of potential impacts from the construction and operation of the two structural alternatives and the No Action alternative. Comments this Draft DPR/EIS are being requested and should be provided by December 21, 2001, the close of the public comment period. Comments or requests for additional information should be directed to:

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1.0 EXECUTIVE SUMMARY

In accordance with the requirements of the National Environmental Policy Act (NEPA), the U.S. Army Corps of Engineers, Huntington District has prepared this Draft Detailed Project Report and Environmental Impact Statement (DPR/EIS) in response to Section 579 of the Water Resources Development Act of 1996 (WRDA 96) which authorizes the Corps to design and implement flood damage reduction measures for certain named communities in the Greenbrier River Valley. This report focuses on providing protection for the Town of Marlinton, Pocahontas County, West Virginia against flooding such as occurred in November 1985, January 1996 and May 1996. In accordance with the requirements of the National Environmental Policy Act (NEPA), the potential impacts to the natural, physical, and human environment associated with a proposed flood damage reduction measure for the Town of Marlinton (Marlinton Local Protection Project) are evaluated.

Marlinton and the Greenbrier Valley have a history of flooding with the largest recorded floods of recent occurrence. The flood of record occurred in November 1985 and inundated almost the entire Town of Marlinton. This flood event had an estimated frequency of 350 years, causing over $100 million (October 2001 price level) in damages basin-wide and resulting in five deaths. Another major flood occurred in January 1996, with basin wide damages again estimated to be nearly $100 million (October 2001 price level). During those floods, the damages in Marlinton alone were estimated at $25 to $30 million (October 2001 price level).

Feasibility studies of the Greenbrier River Basin, including the Town of Marlinton, originated in the mid 1960's as a part of the Kanawha River Basin Comprehensive Study. A channel improvement project with a low level of protection was considered the most feasible alternative at Marlinton just prior to the 1985 flood. After the 1985 flood, emphasis shifted back to basin wide measures such as multipurpose reservoirs and tributary impoundments. A draft Evaluation Report dated July 1994 indicated that only a dry dam on the mainstem Greenbrier River was economically feasible. A river corridor management plan completed in 1996 included evaluation of a number of nonstructural measures, but only a flood warning system was determined to be economically feasible. Prior to completion of a basin-wide, feasibility report, two major floods occurred in the Greenbrier Basin in 1996. In response to this latest major flooding, Congress authorized the Corps (1996 WRDA) to investigate flood damage reduction at several named communities in the basin including the major damage centers of Marlinton, Ronceverte, and Alderson. The least costly alternative was identified for each community. Funds were provided in the FY99 Congressional Appropriation Act to initiate preparation of a DPR for a flood control project to protect the Town of Marlinton. This report contains the results of the detailed project studies for Marlinton, including the most cost-effective plan.

The area of concern (See Figure 2-1) is located entirely within the State of West Virginia on the Greenbrier River, 109 miles (175 kilometers) upstream from its confluence with the New River. The proposed project area includes approximately 4 miles (6.4 km) of the Greenbrier River, the lower mile (1.6 km) of Knapps Creek, and along Stony Creek downstream of the community of Campbelltown. Marlinton is served by WV Route 39 (WV 39) and US Route 219 (See Figure 2-2.). The tributaries of Stony Creek (drainage area of 23 sq. mi. or 60 sq. km) and Knapps Creek (drainage area of 134 sq. mi. or 348

sq. km) both enter the Greenbrier River within the project Area. The drainage area for the Greenbrier River at Marlinton is approximately 518 square miles (1,347 sq. km).

Marlinton and the surrounding area have abundant natural resources. These resources are very important to the area from a social as well as economic standpoint. Therefore, impacts to these resources must be carefully considered in selection of a plan for flood protection for Marlinton. Potential significant impacts from the floodwall/levee alternatives include those to aesthetics, aquatic and terrestrial resources, and historic resources. Social impacts would be those associated with construction: principally traffic, noise and economic gains and losses; and those of community cohesion due to the prominence the levee/floodwall would have in the community. This document includes a detailed description of the existing environment at Marlinton and details impacts anticipated from the final flood damage reduction alternatives considered including the No Action alternative.

Detailed project studies have included consideration of a number of basin-wide and local flood damage reduction alternatives including mainstem dams and reservoirs, tributary impoundments, floodwall/levee combinations, channel improvement and various non-structural measures. As part of the study, various alternatives considered were found to be effective for protecting Marlinton from the 1985 flood of record, including: floodwall/levee, floodwall/levee with diversion of the lower portion of Knapps Creek, and floodproofing and structure relocation options. More detailed evaluations determined that all the alternatives except levee/floodwall combinations and stream diversion were either very costly and/or too disruptive to the community. The most effective plans are a levee/floodwall combination for Marlinton including Riverside, and a levee/floodwall combination with diversion of Knapps Creek. These two alternatives along with the no action alternative have been evaluated in detail and the results documented in this report and EIS.

Both the levee/floodwall plan for Marlinton and Riverside and the levee/floodwall plan with the Knapps Creek diversion are effective and provide nearly total protection against a recurrence of the 1985 flood. However, after more detailed evaluation and engineering studies, the plan with the Knapps Creek diversion was estimated to cost about 22% more. The environmental impacts would also be much greater with the diversion because of the channel construction through Buckley Mountain and the alteration of natural flow conditions in lower Knapps Creek. The No Action alternative means no federal flood damage reduction measures would be implemented for Marlinton. Under the No Action alternative, Marlinton would continue to sustain damage from major floods to both residential and commercial structures. Following complete evaluation of these three alternatives, the levee/floodwall combination has been selected as the most cost-effective plan that provides the authorized level of protection.

The Town of Marlinton will serve as the non-Federal sponsor for the project. Based on Section 103 of Public Law 99-662, the non-Federal share has been calculated to be 10% of the total project cost of $76.3 million, or $7.6 million. The Town will be responsible for obtaining necessary real estate (Lands, Easements, Rights-of-way, Relocations, and Disposal areas, or LERRDs) as well as operation and maintenance (O&M) of the completed project.

The Draft Environmental Impact Statement (EIS) for the Marlinton Local Protection Project (Marlinton LPP) is an integrated part of this report. The EIS provides for better decision-making in evaluation of environmental impacts of the alternatives described above. A Public Scoping meeting was held on April 11, 2000 in Marlinton to gain input from interested agencies, organizations, and the general public concerning the content of the EIS, issues and impacts to be addressed in the EIS, and alternatives that should be analyzed. To further provide for the public input, as required by NEPA, this report is being circulated to state and federal resources agencies and interested groups and the public for comment. A public meeting to discuss the findings in the document will be held during the public review period and is being scheduled for early December 2001. Comments should be directed to S. Michael Worley, Chief, Planning Branch, at the address specified on the cover sheet.

2.0 INTRODUCTION

This section provides background information about the Marlinton Local Protection Project, including the Congressional authority that provided for this study, the study purpose and need and other important information necessary for understanding the content and purpose of this report. As a reference for those readers not familiar with the Marlinton area, Figure 2-1, below, identifies topographic features frequently referred to in this document.

2.1 AUTHORITY

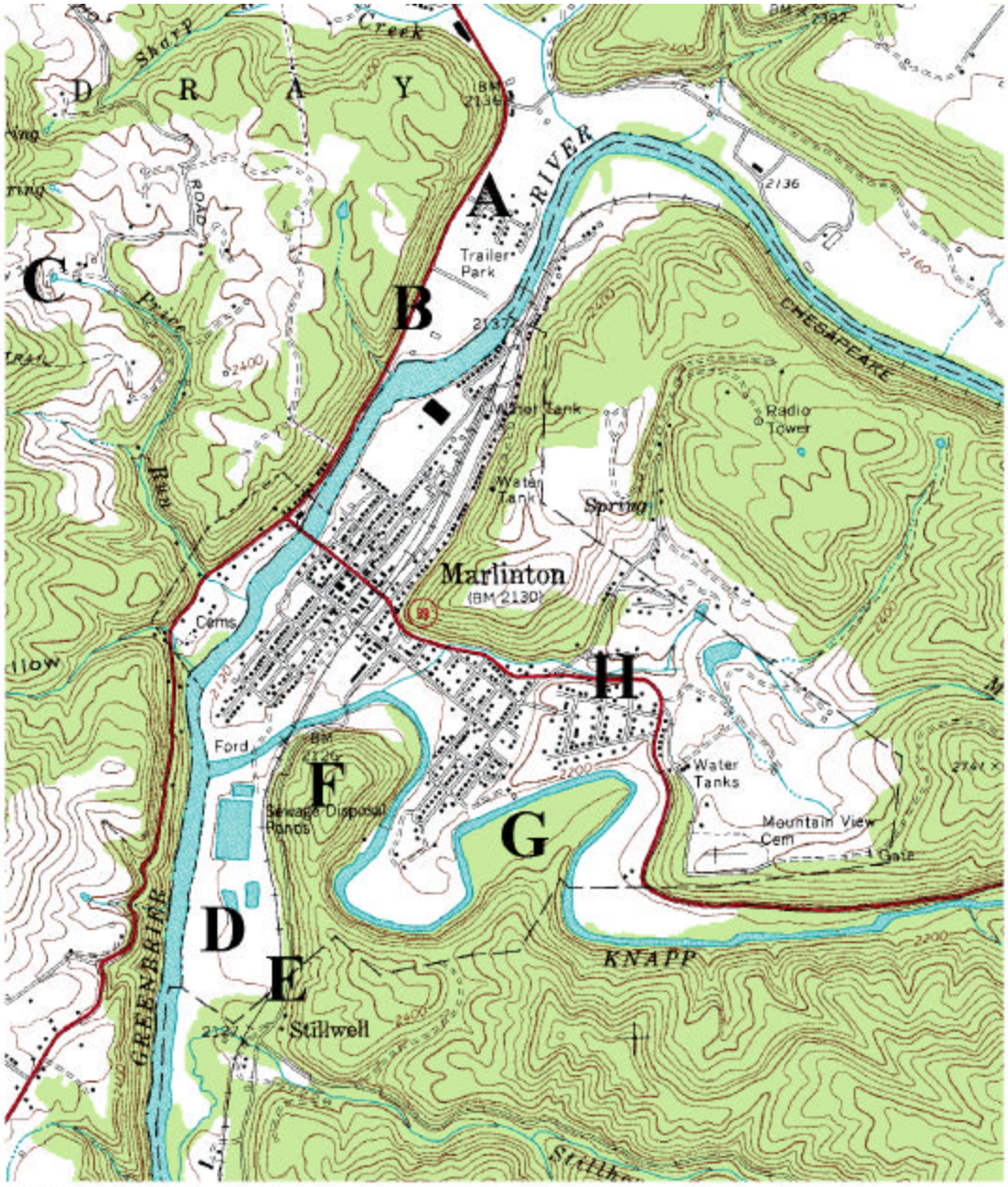
Section 579 of the Water Resources Development Act of 1996 (WRDA 96) authorizes the U.S. Army Corps of Engineers to conduct flood damage reduction studies in the Greenbrier River Basin, including Marlinton. Pertinent sections of that authorization are quoted below:

> *(a) In General. – The Secretary may design and implement a flood damage reduction program for the Greenbrier River Basin, West Virginia, in the vicinity of Durbin, Cass, Marlinton, Renick, Ronceverte, and Alderson as generally presented in the District Engineer draft Greenbrier River Basin Study Evaluation Report, dated July 1994, to the extent provided under subsection (b) to afford such communities a level of protection against flooding sufficient to reduce future losses to such communities from the likelihood of flooding such as occurred in November 1985, January 1996, and May 1996.*
>
> *(b) Flood Protection Measures. – The flood damage reduction program referred to in subsection (a) may include the following as the Chief of Engineers determines necessary and advisable in consultation with the communities referred to in subsection (a):*
>
> > *(1) Local protection projects such as levees, floodwalls, channelization, small tributary stream impoundments, and nonstructural measures such as individual floodproofing.*
> >
> > *(2) Floodplain relocations and resettlement site developments, floodplain evacuations, and a comprehensive river corridor and watershed management plan generally in accordance with the District Engineer's draft Greenbrier River Corridor Management Plan, Concept Study, dated April 1996.*

2.2 PURPOSE AND NEED FOR AGENCY ACTION

The need for local flood protection measures at Marlinton is well documented as flooding has played a significant role in the town's history. Because of Marlinton's location near the headwaters of the Greenbrier River, flood-warning times are short and flooding can be severe because of the extent of the watershed and the velocity of the discharge. Virtually the entire town (2000 population estimate of 1,204) lies within the 100-year floodplain of the Greenbrier River. Within the town, approximately 424 structures (both residential and nonresidential) stand within the 100-year floodplain and annual average

damages for this reach of the Greenbrier River are estimated to be $2.0 million (October 2001 price level).



A-Riverside Area
B-US Route 219
C-Abandoned Waco Quarry
D-Marlinton Municipal Park
E-Stillwell Road WV 39/2
F-Buckley Mountain
G-Wilson's Field
H-State Route 39

Figure 2-1. Marlinton and vicinity.

The largest known floods in the basin occurred in 1877, 1985, and 1996 (2), while at least eleven other major (but less severe) floods occurred in the 20th Century. Throughout the 20th Century, Marlinton has endured a significant flooding event more frequently than once a decade.

The 1985 event is the flood of record at Marlinton and in the upper portion of the basin resulting in an estimated $100 million (October 2001 price level) in damages and five deaths. Although no deaths resulted from the 1996 event, approximately $100 million (October 2001 price level) were incurred in damages. Approximately 30 percent of the total damages throughout the entire basin for the 1985 flood occurred in Marlinton.

The purpose of the Corps' investigation is to evaluate alternative local protection measures that would reduce or eliminate the damages associated with flooding of the Greenbrier River and Knapps Creek near Marlinton such as occurred in 1985, the flood of record.

2.3 PROJECT HISTORY

The Corps has studied the flooding problem in the Greenbrier basin since the mid-1960s. Initial investigations considered large-scale basin management plans as part of the Kanawha River Basin Comprehensive study but these plans were considered infeasible. Following the 1985 flood, local interests requested the Corps to investigate measures that would provide local protection from major floods. Between 1985 and 1988, the Corps conducted a feasibility study to reconsider basin-wide plans such as headwater dams, tributary dams, main stem dams, local protection projects and nonstructural alternatives, such as floodproofing structures and floodplain evacuation. Local requests for evaluation of additional structural alternatives and changes in design criteria altered the scope of the study and depleted funding and the study was suspended in 1989.

The study was again funded in 1993 and the Corps reinitiated the study identifying an array of structural and nonstructural alternatives to address the flooding problem. Emerging alternatives included a dry dam concept with maximized flood storage, a wet dam and a river corridor management plan, which included a Flood Warning and Emergency Evacuation Plan (FWEEP). The State of West Virginia served as a full participant in the development of a comprehensive river corridor management plan, which examined additional aspects including voluntary floodplain evacuation, voluntary flood proofing, floodplain restoration and a comprehensive watershed management plan. The results of a cost-benefit analysis concluded that the only feasible alternatives were the nonstructural approaches for a low level of protection and a FWEEP.

Section 579 of the Water Resources Development Act of 1996 authorized the Corps of Engineers to design and implement flood damage reduction measures within the Greenbrier River Basin, including Marlinton. Specifically, the local protection projects were to examine floodwalls, levees, channelization, small tributary impoundments, and nonstructural measures such as floodproofing and floodplain evacuation. The results of an initial investigation under this authority were summarized in the Greenbrier Limited Evaluation Report (1997).

The Greenbrier Limited Evaluation Report reevaluated the economic analysis of structural alternatives using updated property valuation data. Three alternatives emerged from the 1997 study for local flood protection at Marlinton:

(1) A levee/floodwall alternative that protects Marlinton along the Greenbrier River and Knapps Creek, and an area along the right descending bank locally referred to as Riverside,
(2) A levee/floodwall alternative that incorporates a proposed Knapps Creek diversion structure, and
(3) A nonstructural alternative that included voluntary floodproofing and acquisition of the flooded structures.

These, along with the no-action alternative were evaluated in this Draft DPR/EIS. The Draft DPR/EIS work included completion of field studies, gathering of environmental, socioeconomic and hydrologic baseline information.

2.4 PUBLIC INVOLVEMENT

After publishing the Notice of Intent to Prepare the EIS on March 27, 2000 (65 FR 59 16191-16192), the Corps held a public scoping meeting to gain input from interested agencies, organizations, and the general public concerning the content of the EIS, issues and impacts to be addressed in the EIS, and alternatives to be analyzed. The public meeting was held April 11, 2000 from 7:00-10:00 P.M. in the auditorium of the Marlinton Municipal Building. In addition to the scoping meeting, the Corps held numerous informational meetings in Marlinton to keep the public apprised of the progress of the study. Further, since the study's inception, the Corps has participated in monthly Marlinton Town Council meetings to provide better communication between the Corps and the project sponsor in formulation of project alternatives.

The Corps invited full public participation to promote open communication and better decision-making. Persons and organizations interested in the Greenbrier River flooding problems as they affect the community of Marlinton, West Virginia and the surrounding environment were urged to participate in this public environmental analysis process.

As stated in the Notice of Intent, public comments are welcomed anytime throughout the NEPA process. Formal opportunities for public participation include: (1) Public meetings held near the community of Marlinton; (2) Anytime during the NEPA process via mail, telephone or e-mail; (3) During Review and Comment on the Draft DPR/EIS— presented approximately November-December 2001; and, (4) Review of the Final DPR/EIS —early 2002. Schedules and locations for public meetings will be announced in local news media. Interested parties may also request to be included on the mailing list for public distribution of meeting announcements and documents.

To ensure that all issues related to the proposed project are addressed, the Corps has conducted an open process to define the scope of the DPR/EIS. Recommendations from interested agencies, local and regional stakeholders and the general public were encouraged as input in identifying areas of concern, issues and impacts to be addressed in the DPR/EIS, and the alternatives that would be analyzed.

Comments on the Draft DPR/EIS should be sent to: S. Michael Worley, Chief, Planning Branch, PM-PD, U.S. Army Corps of Engineers, Huntington District, 502 Eighth Street, Huntington, West Virginia 25701-2070. Telephone: (304)529-5636. E-mail: Stephen.M.Worley@lrh01.usace.army.mil.

For additional information about the proposed project, contact Karen Miller, PM–PD-F, U.S. Army Corps of Engineers, Huntington District, 502 Eighth Street, Huntington, West Virginia, 25701–2070. Telephone: 304–529–5638. Electronic mail: Karen.V.Miller@lrh01.usace.army.mil

2.5 OBJECTIVES OF THE ENVIRONMENTAL IMPACT STATEMENT

NEPA established a national environmental policy and goals for the protection, maintenance and enhancement of the environment. It also provides a process for implementing these goals within Federal agencies. It requires all Federal agencies to incorporate environmental considerations in planning and decision-making. NEPA also established the President's Council on Environmental Quality (CEQ) and empowered them to develop regulations by which all Federal agencies would comply with NEPA. These regulations are published in the Code of Federal Regulations (CFR) at 40 CFR 1500-1508.

The Corps has promulgated its own Procedures for Implementing NEPA (33 CFR Part 230) to provide guidance for the procedural provisions of NEPA. ER 200-2-2 supplements, and is used in conjunction with, the CEQ regulations.

Within the NEPA Regulations and ER 200-2-2, a process is set forth where all agencies must assess the environmental impact of proposed Federal actions and consider reasonable alternatives to their proposed actions. For those actions with the greatest potential to create significant environmental effects, the consideration of the proposed action and alternatives is presented in an EIS.

The Corps of Engineers has incorporated environmental values throughout the decision-making process. The information gathered during the development of the Draft DPR/EIS has led to alterations in project design and mitigation measures. It also has allowed the Corps to address compliance with other environmental laws as part of a single review process rather than through separate reviews thereby reducing paperwork while ensuring comprehensiveness.

2.6 CONNECTED, CUMULATIVE AND SIMILAR ACTIONS

The CEQ Regulations require "connected actions, cumulative actions, and similar actions" (40 CFR 1508.25) be considered together in a single EIS. Connected actions are defined as actions that: (i) automatically trigger other actions, which may require environmental impact statements, (ii) cannot or will not proceed unless other actions are taken previously or simultaneously, and (iii) are interdependent parts of a larger action and depend on the larger action for their justification. Cumulative actions, when viewed with other proposed actions have cumulatively significant impacts and should therefore be discussed in the same impact statement. Similar actions are defined as actions which, when viewed with other reasonably foreseeable or proposed agency actions,

have similarities that provide a basis for evaluating their environmental consequence together, such as timing or geography.

The 1997 Greenbrier Limited Evaluation Report examined flood damage reduction measures at major damage centers (Marlinton, Pocahontas County; Ronceverte, Greenbrier County; and Alderson, Greenbrier and Monroe County) in the Greenbrier basin. Flood damage reduction measures being developed within any of these communities could be considered similar or cumulative actions (40 CFR 1508.25) but as of this time, no formal plans have been developed for either Ronceverte or Alderson. Assessing potential cumulative impacts without any actual proposal would be highly speculative and beyond what NEPA requires of federal agencies in the consideration of "reasonably foreseeable actions."

In addition, flood protection measures for each of these municipalities are not interdependent in order to function; they have independent utility. Flood protection projects at these major damage centers are too speculative, geographically diverse, and discrete to collectively constitute either a "major Federal action" or activities sufficiently "systematic and connected" to require a programmatic EIS to address flood protection within the entire basin. The scope of the EIS will therefore, be limited to addressing the specific local flood protection for Marlinton.

3.0 PRIOR STUDIES AND REPORTS

In the early 1980's, flood control studies led to the recommendation of a local protection project (LPP) for Marlinton. The Marlinton LPP study concluded that no basin-wide flood control or multipurpose projects were economically feasible. The Marlinton LPP was a combination channel improvement/nonstructural plan with a low level of protection (about 25-year frequency). As studies for the Marlinton LPP were being completed, the basin-wide flood of record occurred in November 1985. The Marlinton LPP would have offered little protection at the November 1985 flood level or any other major flood event. Consequently, local interests requested the Huntington District investigate broader, basin-wide measures that would effectively reduce damages from a major flood such as occurred in 1985.

Flood damage reduction studies during the next few years included considerations of headwater dams, mainstem reservoirs, local protection projects at major damage centers, and nonstructural measures such as floodproofing and floodplain evacuation. A preliminary report in 1988 indicated that the only alternatives that warranted further investigations were mainstem dam alternatives and, due to Corps planning guidelines, nonstructural measures. The Greenbrier Basin study was then suspended for several years because of funding limitations. Studies resumed in 1993 and a Draft Evaluation Report was completed in 1994. This report contained evaluations of a mainstem flood control dam, a multipurpose reservoir, local protection projects and nonstructural measures. Report findings indicated that a dry dam optimized for flood control was marginally feasible, and all other alternatives were not economically feasible. As a follow up to this report, a corridor management plan was completed in 1996, and was incorporated as an addendum to the Draft Evaluation Report. The corridor plan included various nonstructural measures such as relocation of structures, a flood warning system and comprehensive watershed management. Conclusions in the addendum indicated that only the flood warning system was economically feasible.

As the addendum to the Draft Report was being finalized, two major flood events occurred in the basin – January and May 1996. The January 1996 flood was higher in the lower basin than the 1985 flood and the May 1996 flood was higher in the headwater areas than the 1985 flood. However, at Marlinton, the November 1985 remained the flood of record. These two major flood events drastically changed the flood frequencies used in the Draft Report and addendum, as it became apparent that major flood events occurred more frequently than previously estimated.

In response to the major floods of 1996, Congress authorized the Corps in the 1996 WRDA to design and implement flood damage reduction programs in the Greenbrier River Basin in the vicinity of several communities including Marlinton. In response to this authorization, Huntington District investigated flood damage reduction measures at three locations – Marlinton in Pocahontas County, Ronceverte in Greenbrier County, and Alderson in Greenbrier and Monroe County. The results of the investigations were included in a Limited Evaluation Report, dated December 1997. The most cost effective (least costly) alternative was identified for each of the three above named communities. In addition, preliminary investigations were conducted for the other communities named in the legislation - Cass, Durbin, and Renick. However, the annual costs exceeded the annual benefits (BCR less than 1.0) for all the projects investigated with the exception of a flood control project at Ronceverte. Based upon the findings and local support for a

project, the FY 99 Congressional Appropriations Act included funds and direction for the Corps to initiate preparation of a Detailed Project Report (DPR) with design and cost estimates for a flood control project at Marlinton.

4.0 AFFECTED ENVIRONMENT

Introduction and Study Area

The Corps has compiled relevant information about the environment that could be affected from the implementation of the Marlinton flood control project. This information establishes the baseline against which potential impacts are measured.

Marlinton is located in the central-southern portion of Pocahontas County, West Virginia (Figure 4-1). The study area is limited, for each environmental aspect discussed below, to the area reasonably anticipated to be influenced by a Marlinton project. This approach focuses the analysis on areas with the potential to be discernibly affected by implementation of a project.

The area of influence for the direct impacts includes the reach of the Greenbrier River in proximity to Marlinton, West Virginia, the lower reaches of Knapps Creek and Stony Creek, as well as the riparian areas that would most likely be affected by construction of flood protection measures. This area also includes those portions of Marlinton and Riverside that would be directly impacted by construction activities as well as those areas that would be used for borrow or fill materials.

Indirect and cumulative impacts may occur beyond the areas where direct impacts take place. Therefore, where appropriate, the affected environment presented will reflect a geographically larger area of influence. As an example for the analysis of socioeconomic impacts; the DPR/EIS considers the potential area of influence to include nearby surrounding communities and Pocahontas County as a whole when examining the secondary and cumulative affects of the proposed action and alternatives.

The baseline environmental information used to develop this section was derived from many sources including scientific literature, Federal agency reports, West Virginia agency reports, personal communications with knowledgeable sources and interested individuals, field studies and reconnaissance for this assessment, and other related environmental impact studies. Assessment of the potential effects of the alternatives relative to the baseline conditions presented in the affected environment is presented in Section 5.5, Environmental Consequences.

4.1 LAND USE/LAND COVER

Pocahontas County is largely rural and sparsely populated with lumber and tourism representing the primary industries. Agricultural commodities include livestock, poultry, potatoes, maple products, and honey (USACE 1997).

The Town of Marlinton and the project study area is within the Greenbrier River watershed which has a drainage area of 1,644 square miles (4,250 square kilometers). The Greenbrier River at the mouth of Knapps Creek has a drainage area of 518 square miles (1,347 square kilometers), including both Stony Creek and Knapps Creek drainages. The drainage areas for Knapps Creek and Stony Creek are 110 square miles (286 square kilometers) and 23 square miles (60 square kilometers), respectively (USGS 1982).

This 518 square mile (1,347 square kilometers) area includes the following land use/land cover types occur: low intensity developed (0.1%), high intensity developed (0.02%), hay, pasture, grass (3%), crops (3%), probable crops (6%), forest (12%), mixed forest (16%), deciduous forest (59%), and wetlands (0.8%) (WVDEP 2000). Land use in the Marlinton vicinity is shown in Figure 4-2.

Figure 4-1. Location of Marlinton, West Virginia

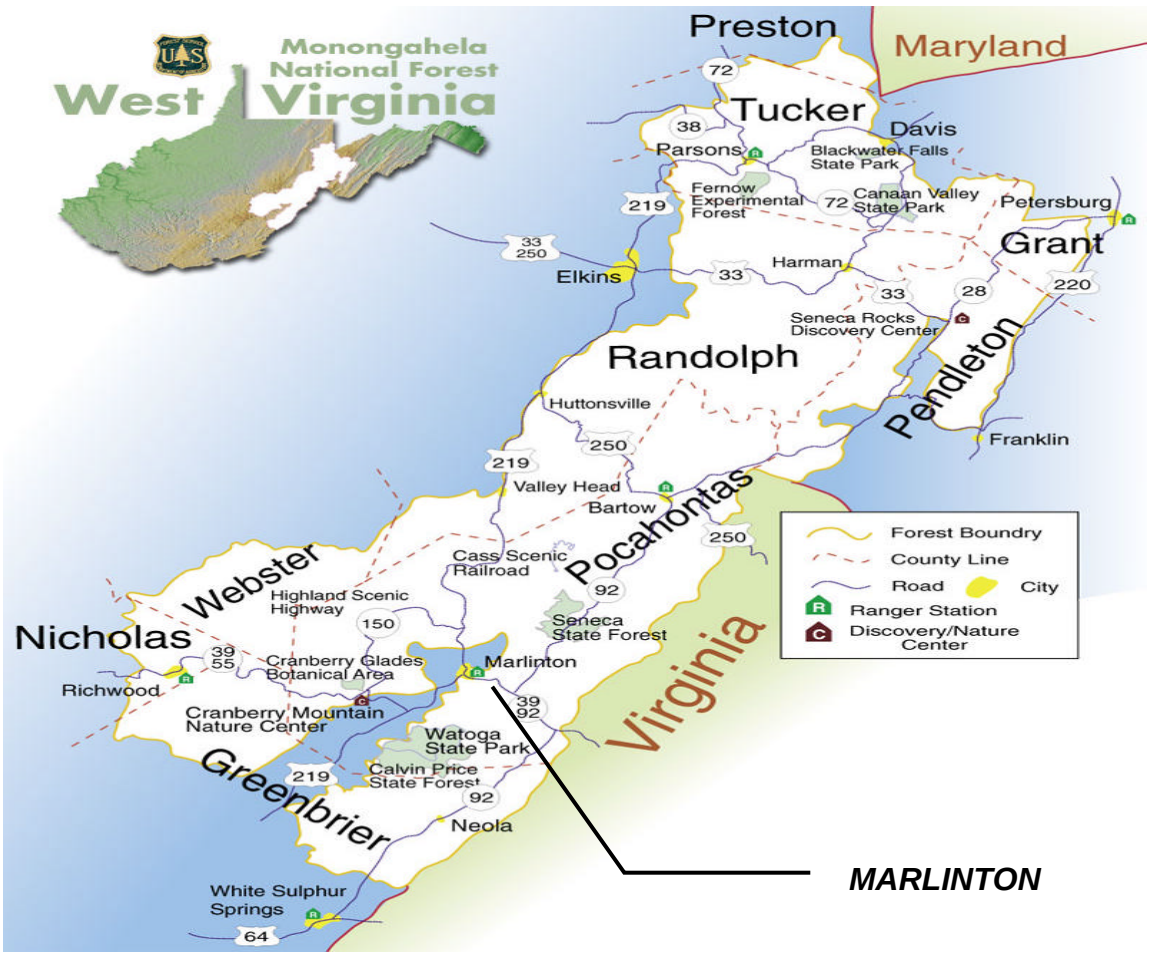
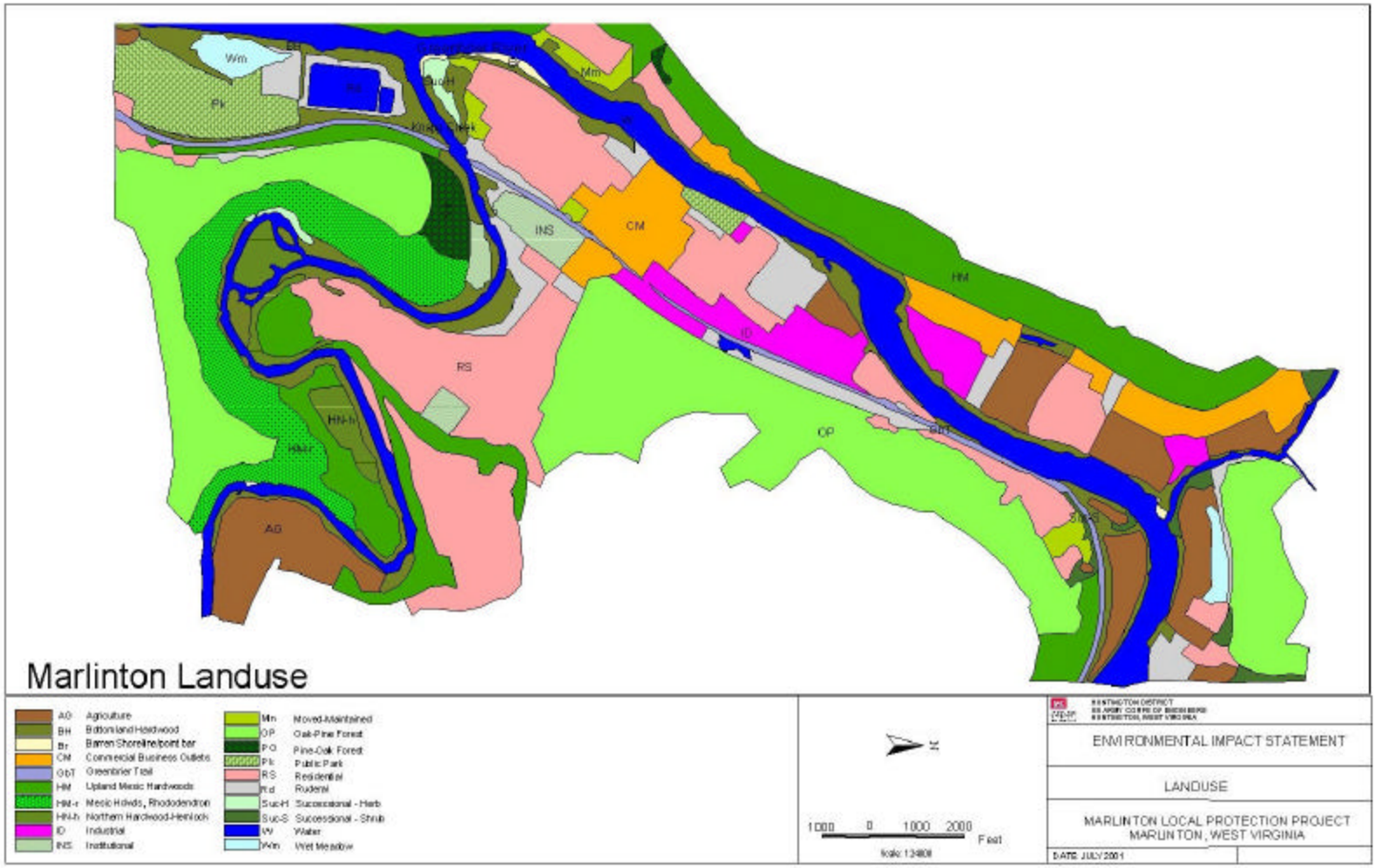


Figure 4-2. Land Use Map



Land use within the boundaries of project area itself consists of a mix of commercial and residential development, agricultural and open vegetated land, and forested land. Figure 4-2 is a map of the land uses and vegetation in the Marlinton vicinity. This map is based on interpretation of low-altitude stereo aerial photographs obtained in 1997 (Aerometrics 1997) for the preparation of detailed project area topographic and planimetric maps, supplemented by field mapping. The project maps, compiled by Atlantic Technologies, LTD in 1999, have been used as the background for land use and vegetation mapping. Land uses were field checked during August and September 2000. There has been no attempt to follow property lines in delineating land use polygons. Street centerlines were often used as boundaries between polygons. Land use classifications shown in Figure 4-2 are explained below.

Residential - RS: This mapping classification includes apparent residential structures; driveways, house gardens and surrounding maintained landscapes.

Commercial - CM: This classification includes stores, shops, hotels/motels, gas stations, convenience stores and apparent access, parking, loading and delivery areas that may be associated with them. Second floor residential uses or small intervening residences are mapped as this category.

Industrial - IND: This land use polygon includes manufacturing, handling and storage facilities, and their associated parking, circulation, loading and other outdoor work areas.

Institutional - INS: Included in this mapping classification are public buildings, such as schools and adjacent athletic fields, libraries, and government offices. Also included are hospitals and churches.

Agricultural - AG: This category includes pasture, hay fields, row crops and all associated residences, barns, feed lots, small ponds and other farm-related features.

Maintained - Mm, Park, GBT: This mapping polygon includes larger non-agricultural, routinely mowed areas (typically not roadsides), public parks and the Greenbrier Trail.

Disturbed and unused areas - Rd, Suc-H, Suc-S, Wm: Included in these typically vegetated mapping polygons are various disturbed non-maintained or infrequently maintained areas. These may include abandoned areas recently subject to profound soil disturbance, such as former factory or home sites, abandoned agricultural fields. Such areas, classified as "ruderal (Rd)", are usually relatively dry sites dominated by native and alien weeds. Wet meadows (Wm) are often subject to recent disturbance, such as excavation or plowing similar to ruderal sites, but due to proximity to groundwater or riverine hydrology, support herbaceous wetland, often of a weedy nature. Areas abandoned from other uses for longer period begin to succeed to native plant associations. Those successional, abandoned land areas aged 3 to 5 years since disturbance support native herbaceous vegetation and are coded as Suc-h. Those lands free from disturbance for about 5 to 20 years, supporting native shrubs and saplings, are coded as Suc-S.

Forested - BH, HM, HN-h, HN-r, OP, and PO: The dominant, mature, undisturbed (at least for several decades) land cover in this region is forest.

Water - W: This category includes the open surface waters of the Greenbrier River, Knapps Creek, Stony Creek and larger ponds in the project vicinity.

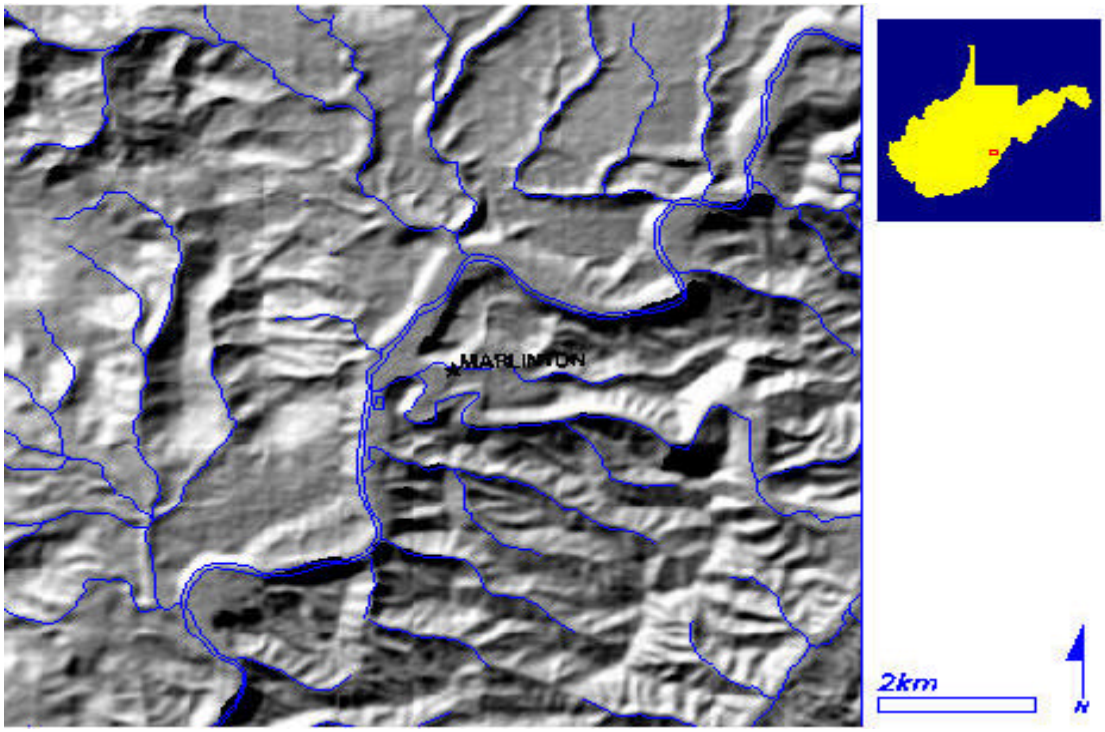
Nearly all of the commercial structures in the town of Marlinton reside within the 100-yr floodplain. The main commercial area of Marlinton is located downtown and slightly north of town on the left descending (east) bank of the Greenbrier River. Marlinton's business district contains commercial establishments such as restaurants, car dealers, gas stations, grocery stores, banks and other small shops.

The town's water treatment plant is located on the right descending bank of Knapps Creek and the sewage treatment facility is on the left descending bank of the Greenbrier River southeast of the Knapps Creek/Greenbrier confluence (USACE 1997).

4.2 TOPOGRAPHY/DRAINAGE

Because Marlinton is situated between two different physiographic provinces, drainage patterns differ between the east and west sides of the Greenbrier River. The Appalachian Plateau province to the west of Marlinton is characterized by steep valley slopes and broad winding ridges. A dendritic (treelike) drainage pattern characterizes the area. The Ridge and Valley province is characterized by wide valleys with steep slopes and narrow ridges and, therefore, has a trellis drainage pattern in which a stream and its tributaries resemble the pattern of a vine on a trellis. The tributaries to the east of Marlinton tend to flow perpendicular into the Greenbrier River and at regular intervals. Figure 4-3 shows the topography and drainage differences east and west of the Greenbrier River.

Figure 4-3. Topography and River Drainage Patterns Near Marlinton, WV.



Marlinton was developed on a narrow (1,700 feet wide, 518 meters), relatively flat (elevation 2,120 to 2,130 feet (646-649 meters) National Geodetic Vertical Datum, or NGVD) river valley floodplain at the confluence of the Greenbrier River and Knapps Creek.

The elevation of the Greenbrier River ranges from approximately 2,110 feet (643 meters) NGVD below the confluence with Knapps Creek to 2,124 feet (647 meters) NGVD upstream near the confluence of Stony Creek. The gradient of the Greenbrier River within the project area is approximately 0.14 % (7.5 ft/mile or 1.42 meters/km), measured from the mouth of Stony Creek to the mouth of Sunday Lick, located 1 ½ miles (2.4 km) south of the Knapps Creek/Greenbrier River confluence (USACE, 1985). Knapps Creek ranges in elevation from 2,110 feet (643 meters) NGVD near the Greenbrier River confluence to 2,139 feet (652 meters) NGVD approximately 10,000 feet (3050 meters) upstream (to the east). The gradient of Knapps Creek is approximately 0.30 %. The central part of Marlinton ranges in elevation between 2,120 (646 meters) and 2,137 feet (651 meters) NGVD while the southeast section of Marlinton ranges in elevation from 2,208 feet (673 meters) and 2,224 feet (678 meters) NGVD. The side slopes surrounding Marlinton are generally greater than 60%, with surrounding peaks between 2,400-2,600 feet (732-792 meters) NGVD in elevation.

4.3 GEOLOGY AND SOILS

4.3.1 Geology

West Virginia is composed of two physiographic provinces (Figure 4-4.). The western two-thirds is the Appalachian Plateau Province, which is characterized by relatively flat-lying rocks from the Pennsylvanian and Permian strata. All West Virginia mineable coal is located in this province. The eastern one-third is in the Valley and Ridge Province, which is composed of folded and faulted rocks from the late Ordovician to the early Mississippian. The valleys are primarily less-resistant shale and siltstone, while the mountain ridges are resistant sandstone and limestone (West Virginia Geological and Economic Survey, 2001).

Pocahontas County lies in both the Appalachian Plateau and the Ridge and Valley provinces. The west side of the Greenbrier River roughly divides these two areas. The western part of the county is generally higher in elevation (4,842 feet or 1,476 meters NGVD at Bald Knob) than the eastern part of the county (1,952 feet or 595 meters NGVD in elevation at the lowest point). Pocahontas County surface rocks are of sedimentary origin. The geologic features of the Marlinton/Greenbrier River area are part of the Mississippian System and include the following geologic strata:

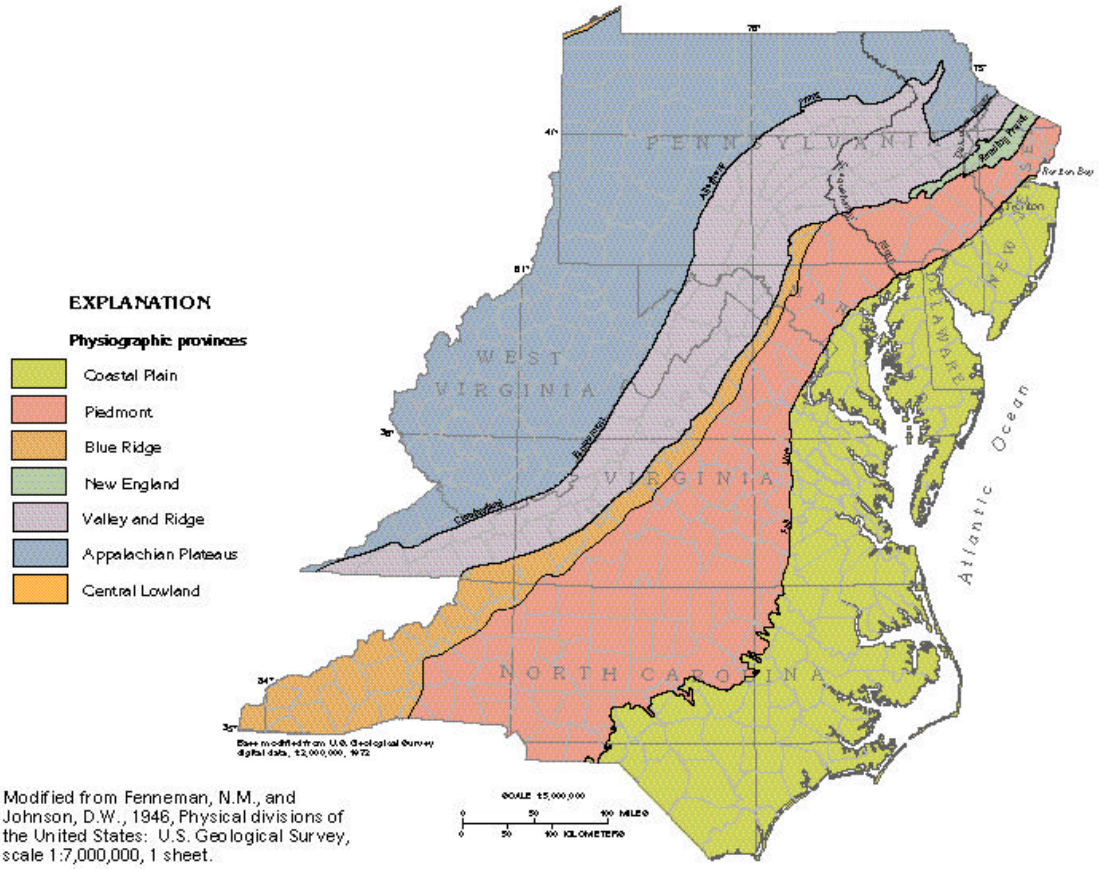
- The high elevations immediately to the west of the Greenbrier River corridor consist of the Bluefield Formation of the Mauch Chunk Group that is characterized by olive brown siltstone and shale.

- The Greenbrier Group, directly below the Bluefield Formation, is exposed along the slope of Bucks Mountain west of the Greenbrier River. This group consists of limestone and calcareous shale.

- The Pocono Group consists of hard sandstone members that form many of the ridges and flats near the Greenbrier River. It also contains shale and siltstone.

East of the Greenbrier River, the geologic features are from upper and middle Devonian formations and are characterized by mainly shale and sandstone (USDA, 1992).

Figure 4-4. Physiographic Provinces of Mid-Atlantic States.



Bedrock at the project site is composed of sandstone and shale members of the Mississippian aged Pocono Group. The bedrock surface below the Knapps Creek and Greenbrier River floodplains is assumed competent rock, possibly a sandy shale member. Bedrock at the site reportedly dips one to four degrees to the west.

The elevation of the top of rock surface varies along the diversion channel centerline. Top of rock is assumed to be at or near the streambed elevation (2,128 feet/649 meters NGVD) in the Knapps Creek valley, 0 to 5 feet (0 to1.5 meters) below the surface of the Buckley Mountain, and near the riverbed elevation (2,106 feet/642 meters NGVD) within the Greenbrier River Valley (USACE, 1997).

The Greenbrier limestone formations, which have productive water yielding aquifers and springs, are common in Pocahontas County. Caves and karst features occur in Pocahontas County due to water-soluble limestone and calcareous shale deposits in the bedrock near the Greenbrier River. However, karst is not present in the project area. There are at least three known caves within the Marlinton U.S. Geological Survey 7.5 Minute Quadrangle: Kee Caves

#1 and #2 and Nancy Sharp Pit. They all occur west of the Greenbrier River between 0.3 and 1.5 miles (0.4 to 2.4 km) from Marlinton (WVDEP, 2001).

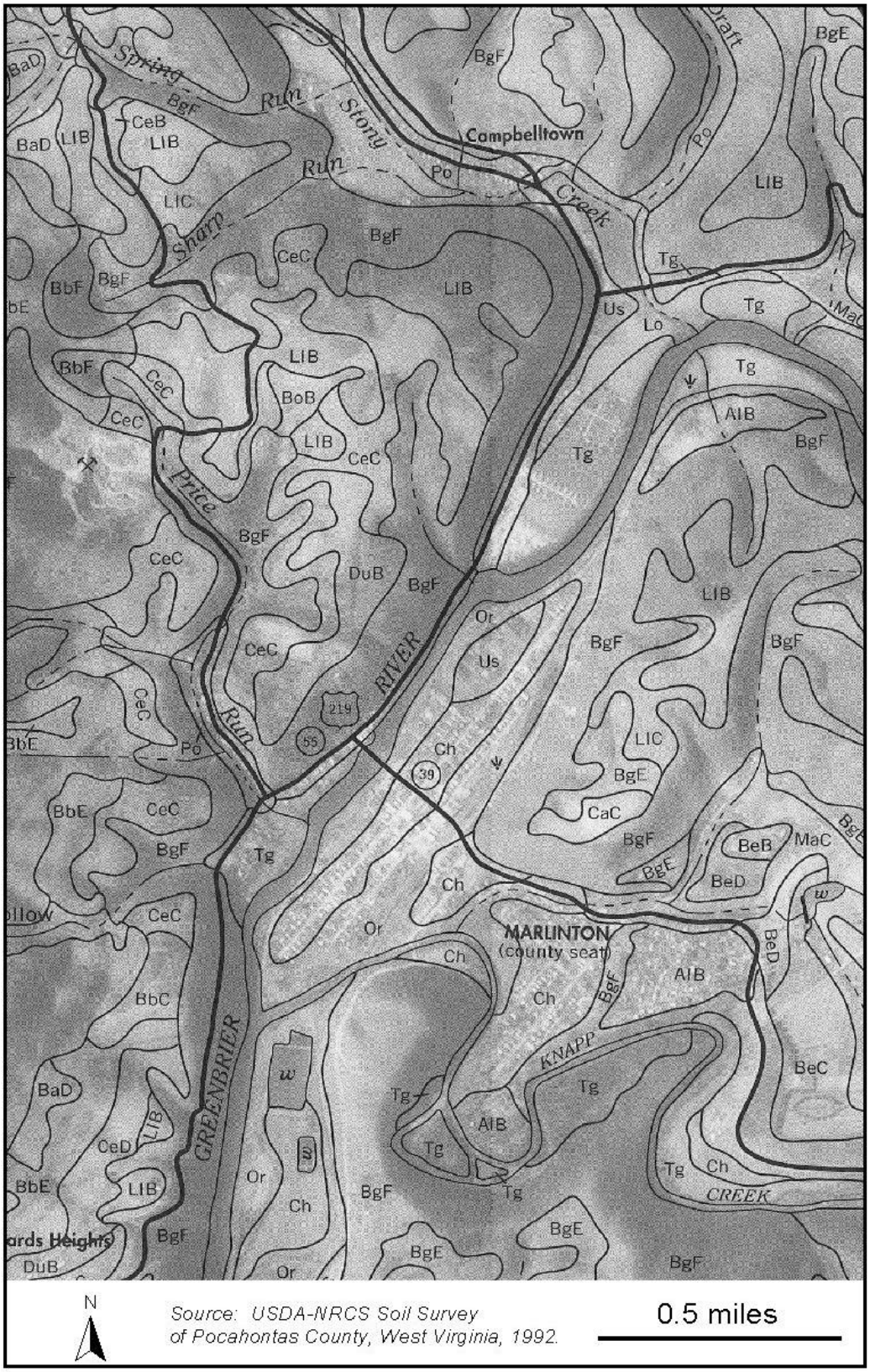
Seismic activity is not significant in West Virginia. Activity within the last eight years has occurred primarily in central West Virginia. In 1995, an earthquake measuring 2.3 mb magnitude (intensity as measured on the Richter Scale) occurred near the Pocahontas County border in Sinking Creek Virginia. The largest earthquake on record occurred in southern West Virginia in 1969 and measured 4.3 mb magnitude (VTSO, 2001).

Although mineral resources, including coal, oil/gas, and limestone, are found in Pocahontas County, none are present in the project area. One oil/gas well is located approximately 1.2 miles (2 km) west of Marlinton, just north of Knapps Creek (WVMHS&T, 2001).

4.3.2 Soils

Soils in the Marlinton area are within two General Soil Map Units. Potomac-Tioga-Holly soils, which are deep, dominantly mesic soils, were formed in alluvium derived from sandstone, siltstone, shale, limestone, or chert. These soils occur in the floodplain of the Greenbrier River and several are considered prime farmland soils. However, developed lands in the project area are not considered prime farmland. Berks-Weikert soils occur on gently sloping to extremely steep ground. They are moderately deep, shallow and well-drained loamy soils formed in siltstone, shale and sandstone. They occur on the uplands immediately surrounding the Greenbrier River. Soil types in the Marlinton area are shown in Figure 4-5 and detailed descriptions of the soils in the project area are provided below.

Figure 4-5. Soils in the Project Area.



Source: USDA-NRCS Soil Survey of Pocahontas County, West Virginia, 1992.

N

0.5 miles

Bottomland Soils

Tg – Tioga fine sandy loam soil is characterized by deep nearly level well-drained soil which occurs on the floodplains of the Greenbrier and its tributaries. The surface layer is dark yellowish brown and about 10 inches (0.25 meters) thick. The subsoil is brown and about 28 inches (0.71 meters) thick. The hazard of erosion is slight. This soil is considered prime farmland soil.

Us – Udorthents, smoothed are nearly level to extremely steep, are well drained, and are in areas that have been disturbed by road construction, and industrial and urban development. They are mainly along the highways and areas within the town of Marlinton. The soils are commonly red, brown, yellow or olive. They can be loamy to clayey.

Lo – Lobdell silt loam is a very deep, level, and moderately well drained soil that occurs on the floodplains of the Greenbrier River. The surface layer is dark brown and about 10 inches (0.25 meters) thick. The subsoil is about 18-inches (0.46 meters) thick and ranges from dark yellowish brown to dark yellowish brown with grayish brown and yellowish brown mottles. The depth to bedrock is more than 60 inches (1.5 meters). This soil is considered a prime farmland soil.

Or – Orrville silt loam soils are very deep, nearly level, and somewhat poorly drained. They are typical on floodplains of the Greenbrier River. The surface layer is dark grayish brown and about 9 inches (0.23 meters). The subsoil is about 31 inches (0.79 meters) thick and ranges from yellowish brown to grayish brown with yellowish red, reddish yellow and gray mottles. The depth to bedrock is more than 60 inches (1.5 meters). The hazard of erosion is slight.

Ch – Chavies fine sandy loams are very deep, nearly level, and well drained. They occur on low stream terraces along the Greenbrier River. The surface layer is dark yellowish brown and about 8 inches thick (0.20 meters), and the subsoil is dark yellowish brown and about 33 inches (0.84 meters) thick. The depth to bedrock is greater than 60 inches (1.5 meters). The hazard of erosion is slight. This soil is considered prime farmland soil.

Upland Soils (Buckley Mountain)

BgF – Berks-Dekalb complex, 35 to 55 percent slopes, very stony. These soils are moderately-steep to steep, well drained, moderately deep, and occur on steep to very steep slopes near the Greenbrier River and tributaries. Stones cover 1 to 3 percent of the surface. The surface layer of Berks soil is usually dark brown and about 2 inches thick (5 centimeters). The subsoil is yellowish brown and about 20 inches thick (51 cm). The surface layer of the Dekalb soil is very dark grayish brown and about 4 inches thick (10 cm). The subsoil is yellowish brown and about 22 inches thick (56 cm). Hard sandstone bedrock is at a depth of 31 to 36 inches (71-91 cm).

4.4 AIR QUALITY AND CLIMATE

This section discusses the climate patterns and existing air quality in the vicinity of Marlinton, and Pocahontas County as a whole.

4.4.1 Climate

Pocahontas County has four distinct seasons. Winters are cold and snowy at higher elevations while the valley bottoms have intermittent thaws that preclude long-lasting snow cover. Summers range from warm on mountain slopes to very warm and sometimes hot in the valleys. Spring and fall are typically a smooth transition between the seasons. The Allegheny

Mountains, which run through the center of the county, form a “rain shadow” that shields the eastern half of the county from the prevailing storm systems that move from northwest to southeast. Marlinton is situated within the mountains in the center of Pocahontas County. As expected, the western part of the county shows lower average temperatures and higher average precipitation than the eastern part. Normal annual precipitation is adequate for all crops (USDA 1992).

The average growing season in Buckeye, West Virginia (4.5 miles or 7.2 km south of Marlinton) is approximately 146 days between the May 12th and October 4th. The average winter temperature at Buckeye is 29 degrees F (-1.7 C). The average daily minimum temperature in winter is 17 degrees F, and the lowest recorded temperature was minus 26 degrees F (-3.3 C) in 1985. The average winter snowfall is about 39 inches (1 meter) at Buckeye, but it varies greatly from year to year. In summer, the average temperature is 68 degrees F (20 C) with an average daily maximum of 81 degrees F (27 C) and a highest recorded temperature of 95 degrees F (35 C) in 1983. Total annual precipitation at Buckeye is 45 inches (114 cm); about 23 inches (58 cm) fall in April through September. Most thunderstorms occur in summer and periods of heavy rainfall can cause flash floods in narrow valleys. The sun shines 65 % of the time in summer and 55 % of the time in winter (USDA 1992).

Two distinct types of storms result in floods: summer (May to October) and winter-type (December to March) storms. Summer storms are typically high intensity, short duration and relatively small in aerial extent. The winter-type storms are characterized by less intense rainfall of extended duration falling over a large area. Occasionally, stagnation and stationary developments produce prolonged precipitation. Snow cover, saturated or frozen ground, or the combinations thereof increase runoff rates and volumes. Meteorological records indicate that winter and spring storms occur more frequently and produce more major floods than storms during the summer and fall.

4.4.2 Air Quality

The US Environmental Protection Agency (EPA) has established air quality guidelines for several different pollutants, referred to as criteria pollutants, based on the protection of public health and the environment. These air quality guidelines, the National Ambient Air Quality Standards (NAAQS), set limits for the following criteria pollutants: nitrogen oxides (NO_x), carbon monoxide (CO), ozone (O_3), sulfur dioxide (SO_2), lead (Pb), and inhalable particulate matter (PM_{10}). Based on the ambient (outdoor) levels of the criteria pollutants, EPA evaluates individual Air Quality Control Regions (AQCRs) to establish whether or not they meet the NAAQS. Areas that meet the NAAQS are classified as attainment areas, and areas that exceed the NAAQS are classified as non-attainment areas.

West Virginia is divided into 10 EPA AQCRs; all of Pocahontas County, within AQCR No. 9, is an attainment area for all criteria pollutants. The West Virginia Department of Environmental Protection (WVDEP) monitors air quality and regulates emissions of air pollutants from industrial and commercial facilities to protect the NAAQS. Ambient air quality sampling sites are located throughout West Virginia. These sites monitor air pollutants on a continuous or periodic basis.

The air pollutants monitored include:

- Carbon Monoxide (CO)
- Hazardous Air Pollutants (metals)
- Hydrogen Sulfide (H_2S)
- Inhalable Particulate Matter (PM_{10})
- Nitrogen Oxides (NO_X)
- Ozone (O_3)
- Precipitation (rain/snow): pH, conductivity, total acidity, anions, and metals
- Specific Volatile Organic Compounds (VOC's)
- Sulfur Dioxide (SO_2)
- Total Suspended Particulates (TSP)
- Water-soluble Sulfates and Nitrates

There are limited areas of West Virginia that are non-attainment for PM_{10} and SO_2; however, these areas are in the northern tip of West Virginia, over 100 miles (161 km) from Marlinton.

In addition to regulating criteria pollutants, EPA works with state and local governments to reduce toxic pollutants. The EPA's Toxic Release Inventory (TRI) lists one facility in Marlinton (USEPA 2001a). As shown in Table 4-1, the Hanover Shoe Company, Marlinton Plant released approximately 90,000 pounds (40,500 kilograms) of acetone and 71,000 pounds (32,000 kilograms) of toluene to the air between 1988 and 1993. There were no reported releases of chemicals to the water, land, or underground during this period.

Table 4-1. Reported Air Emissions (lbs/year) by Hanover Shoe Company[1], Marlinton, 1988-1993

Chemical	1988	1989	1990	1991	1992	1993	Total
Acetone	18,119	17,666	14,288	13,924	8,576	16,366	88,939
Toluene	14,370	16,120	12,612	10,691	6,986	10,056	70,835
Total Releases	32,489	33,786	26,900	24,615	15,562	26,422	159,774

[1]TRI Facility ID: 24954HNVRS3002N; EPA Facility ID: WVD000800722

Source: USEPA (2001a)

Hanover Shoe Company went out of business in 1993 and the facility was then briefly owned by West Virginia Shoe Company. The current owner of the facility, Gardner Shoe Company of West Virginia, took ownership in September 1999. Gardner Shoe has an air permit from WVDEP.

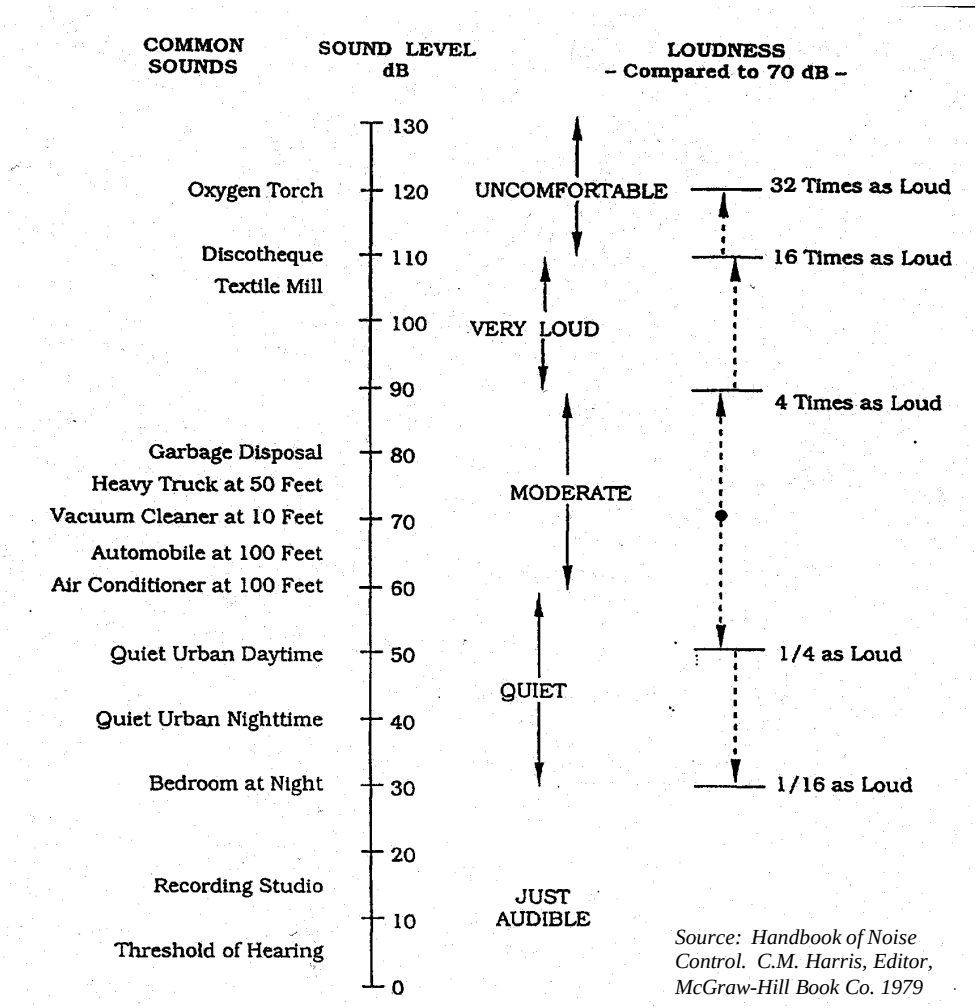
4.5 NOISE

This section discusses the existing noise levels in the Marlinton area, and describes the basic measurements used for sound. Noise is a potential environmental issue associated primarily with construction and excavation activities. The description of the existing sound environment requires a general understanding of how sound is measured and its effects on the human environment.

Noise is defined as sound that is undesirable because it interferes with speech, communication, or hearing; is intense enough to damage hearing; or is otherwise annoying. The measurement and human perception of sound involves two basic physical characteristics: intensity and frequency. Intensity is a measure of the sound energy of the vibrations, and frequency is the measure of the tone or pitch of the sound.

The physical unit most commonly used to compare the intensity of sounds is the decibel (dB). The higher the energy carried by the sound, the louder the perception of that sound, and thus, the higher the dB rating of the sound. A sound level of just above 0 dB is approximately the threshold of human hearing and is barely audible under extremely quiet listening conditions. Normal speech has a sound level of approximately 60 dB. The maximum sound levels of typical events are shown in Figure 4-6.

Figure 4-6. Sound Levels for Common Sounds.



The second important characteristic of sound is its tone or frequency, which is the number of times per second the air vibrates, measured in Hertz (Hz). All sounds in a wide range of frequencies are not heard equally well by the human ear, which is most sensitive to frequencies in the 1,000 to 4,000 Hz range. To account for this variable response of the human ear to different tones, decibels may be adjusted to A-weighted decibels. The adjusted decibels (dBA) represent the human hearing response to sound.

In addition to measuring a single sound event, a time-average sound level can be calculated (also in dBA) to represent the average sound over a specified length of time. For the evaluation

of community noise effects, and particularly construction noise effects, the Day-Night Average Sound Level (DNL) is often used. The DNL averages construction sound levels at a location over a complete 24-hour period, with a 10-decibel adjustment added to those noise events that take place between 10:00 p.m. and 7:00 am. This 10-decibel "penalty" represents the added intrusiveness of sounds that occur during normal sleeping hours, both because of the increased sensitivity to noise during those hours and because ambient sound levels during nighttime are typically about 10 dB lower than during daytime hours.

It is important to distinguish between the measurement of a single sound event and the calculation of a time-averaged DNL, both of which are often represented in dBA. Because the DNL is a measurement of an average, a DNL of 50 dBA could result from a few noisy events or a large number of quieter events. DNL does not represent the sound level heard at any particular time, but rather represents the total sound exposure.

The U.S. Department of Housing and Urban Development established a DNL standard of 65 dBA for eligibility for federally guaranteed home loans. In 1974, the EPA identified noise levels that could be used to protect public health and welfare, including prevention of hearing damage, sleep disturbance, and communication disruption. Outdoor DNL values of 55 dBA were identified as desirable to protect against activity interference and hearing loss in residential areas and at educational facilities.

For a single sound event, the minimum change in the sound level that an average human ear can detect is approximately 3 dBA. A change in sound level of about 10 dB is usually perceived by the average person as a doubling (or halving) of the sound's loudness, both for loud sounds and for quieter sounds. Changes in sound levels of +/-10 dBA within a short time span may be perceived by humans as “dramatic” and changes in sound levels of +/-20 dBA within a short time span may be perceived as “striking” (DOE 2001).

In the Marlinton project area, current levels of noise are very low as is typical in and around a small town in a rural area. Based on the population density and activity of Marlinton, the current background noise level is estimated to be approximately 30 dBA (Canter 1977). All existing noise levels are well below what is normally considered compatible with residential land uses and other noise impact guidelines. The primary sources of noise are: 1) everyday vehicular traffic along nearby roadways and bridges; 2) minor construction activities related to maintenance of roadways, bridges, and the other structures and facilities located within Marlinton and along its waterways; 3) recreation (e.g., groups of hikers, canoeists, fishermen, etc.); 4) natural sounds of the river and wildlife; and 5) military jet flyovers (up to several each day, as Marlinton is below a routine military flight path). No interstate highways or other high-volume roadways pass near the project area. Noise derived from construction and recreation is generally intermittent and highly variable depending on the time of day and year. In addition, the river is not suitable for major navigation and thus barges and other large ships do not pass through Marlinton.

4.6 WATER RESOURCES

4.6.1 Surface Water and Floodplain Management

Hydrology

Due to the highly variable topography of the surrounding region, the Greenbrier River, Knapps Creek, and Stony Creek are subject to rapid changes in flow and runoff. Stream flow values for the Greenbrier River have been recorded from September 1929 to the present at the station in Buckeye, West Virginia, 4.5 miles (7.2 km) downriver from Marlinton. Data from this station indicates that the stream flow of the Greenbrier River tends to be highest January through April and lowest July through October. Both the highest daily mean flow (44,400 ft^3/s or 1,257 m^3/s at Buckeye gage) and highest instantaneous peak flow (82,000 ft^3/s or 2,321 m^3/s at Buckeye gage) on the Greenbrier River occurred on November 5, 1985. The peak stage at Buckeye of the 1985 Flood was recorded at 23.19 feet. Based on 1929-present data, high flow (10% exceeding) is approximately 2,100 ft^3/s (59 m^3/s), average flow (50% exceeding) is 425 ft^3/s (12 m^3/s), and low flow (90% exceeding) is 54 ft^3/s (1.5 m^3/s) at Buckeye.

Hydrology of flows for Knapps Creek from the confluence with the Greenbrier River (upstream 3 miles) were previously developed by the Corps (1997). In addition to the 1985 flood, water surface profiles were developed for the 1, 2, 5, 10, 20, 50, 100, 200, and 500-year frequency floods. Information contained in a 1989 Federal Emergency Management Agency (FEMA) Pocahontas County Flood Insurance Study as well as historical high water marks were referenced to verify the discharge of the 1985 flood event. For Knapps Creek, the 1985 peak flow was estimated at 27,000 ft^3/s (764 m^3/s), the 100-year event was estimated at 18,300 ft^3/s (518 m^3/s), and the 5-year event was estimated at 5,600 ft^3/s (159 m^3/s).

Similar historic flow data are not available for Stony Creek. However, Stony Creek is roughly one-fourth the size (22,400 acres or 8,960 hectares) of the Greenbrier River above Marlinton and one-third the size of the Knapps Creek watershed. The flooding problems in Marlinton along the lower reach of Stony Creek are associated with the backwater flooding from the Greenbrier River.

Water Quality

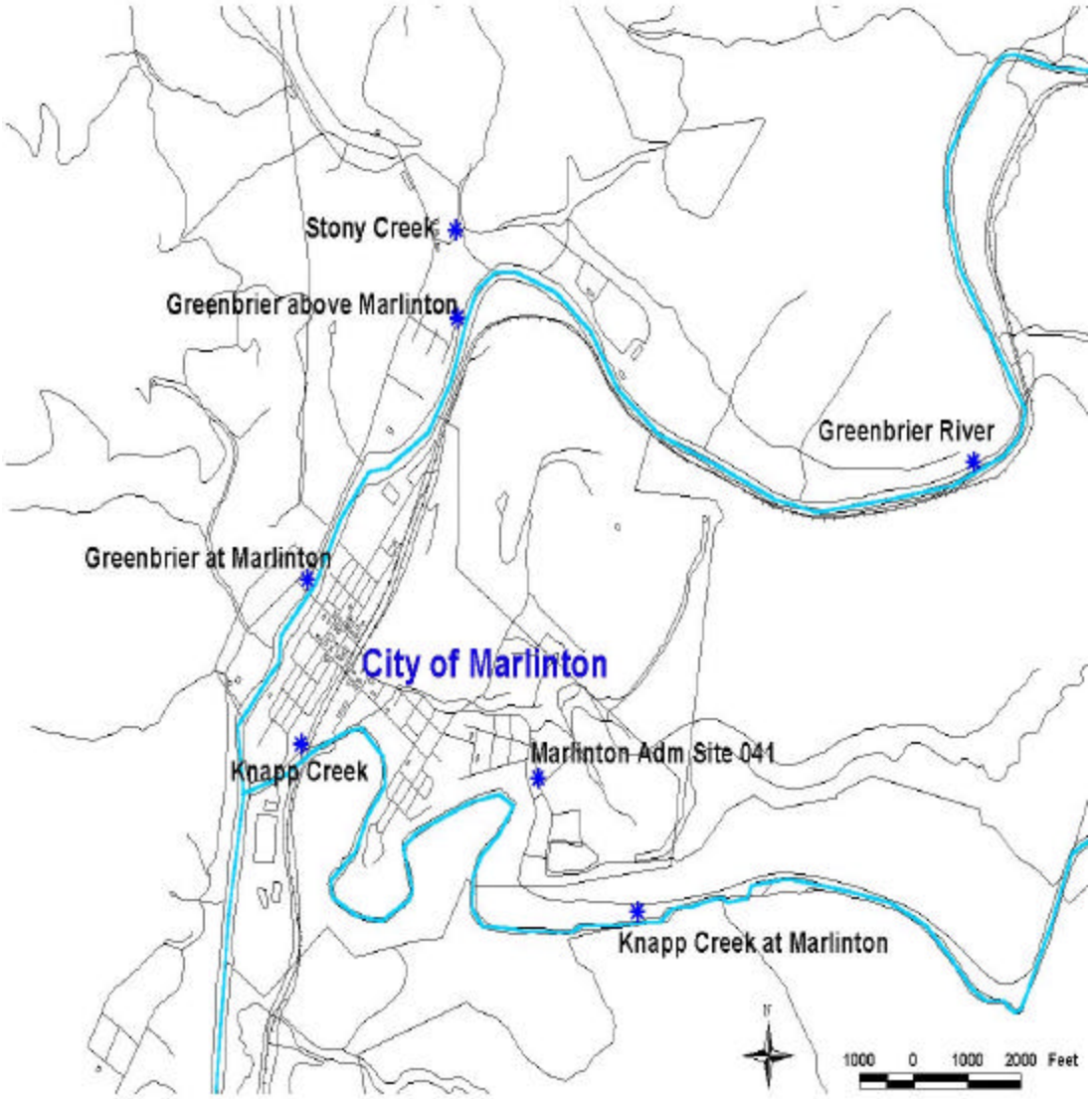
The Office of Water Resources under the WVDEP regulates and monitors water quality throughout West Virginia by delegation from the USEPA, Region 3.

The most recent assessment of water quality for the Greenbrier River watershed was completed in 1999, however, the most recently published data for the project area are from 1988 (STORET, WVDEP and USEPA). Figure 4-7 shows the names and locations of the water sampling stations that are located near Marlinton. Table 4-2 lists the stations by name, number, operating agency, and beginning and ending dates of collection, according to STORET. Also included in the table are known exceedances, if any, of water quality standards.

Data from the 1980's indicate that water quality was generally high and met state water quality standards. The water quality in the project area continues to be good, as indicated by the presence of fish and other aquatic organisms known to require high quality water habitat, such as the Northern hogsucker (*Hypentelium nigricans*), which was confirmed to be present in on the Greenbrier near Marlinton during field sampling in August 2000.

The town of Marlinton obtains drinking water from Knapps Creek. The treatment plant is located approximately 0.5 miles (0.8 km) upstream on Knapps Creek, east of its confluence with the Greenbrier River.

Figure 4-7. Location of Water Sampling Stations Near Marlinton, W.V.



Source: West Virginia Department of Environmental Protection (http:\\www.dep.state.wv.us/mapping.html)

Six facilities in Marlinton have current individual NPDES discharge permits. Table 4-3 provides the facility name, NPDES Identification (ID) number, USEPA facility ID number, permit issued and expiration dates, and facility type.

Table 4-2. Water Quality Sampling Station Information and Water Quality Data.

Station Name	Station Number	Operating Agency[1]	Data Collection Dates	Water Quality Exceedances[2]
Knapps Creek at Marlinton	03182000	USGS	10/13/66 – 09/08/76	None
Knapps Creek	1KRBW0002	USACE Huntington	10/22/80 – 04/25/88	Dissolved beryllium: measured 1 ug/L in 1981, 1982, 1986 and 10 ug/L from 1987-1988. [human health, drinking water limit = 0.0077 ug/L] Total antimony: measured 100 ug/L from 1986-1987. [human health, drinking water limit = 14 ug/L]
Marlinton Adm Site 041	210032	USFS Region 9	11/10/70 – 09/06/78	Total iron: measured 570 ug/L in 1978. [aquatic life, chronic exposure limit: 500 ug/L]
Greenbrier River at Marlinton	1KRBW0007	USFS Region 9	06/23/81 – 04/07/82	Dissolved beryllium: measured 1 ug/L from 1981-1982. [Human health, drinking water limit = 0.0077 ug/L]
Greenbrier River above Marlinton	1KRBW0008	USACE Huntington	06/23/81 – 04/25/88	Dissolved beryllium: measured 1 ug/L in 1981, 1982 and 1986 and 10 ug/L from 1987-1988. [human health, drinking water limit = 0.0077 ug/L] Total antimony: measured 100 ug/L from 1986-1987. [human health, drinking water limit = 14 ug/L]
Stony Creek	1KRBW0003	USACE Huntington	10/22/80 – 10/22/80	None
Greenbrier River	1KRBW0004	USACE Huntington	10/22/80 – 04/08/82	Total manganese: measured 300,100 ug/L in 1980. [[human health, drinking water limit = 1,000 ug/L]

[1] USGS = United States Geological Survey; USFS = United States Forest Service; USACE = United States Army Corps of Engineers

[2] Water quality parameters measured at these stations include the following: aluminum; ammonia; antimony; barium; beryllium; calcium; carbon; chloride; copper; fluoride; iron; lead; magnesium; manganese; nitrate; nitrogen (total); oxygen; pH; phosphorus; potassium; sodium; specific conductance; stream flow; sulfate; temperature; total alkalinity; total filterable residue; total hardness; and zinc. Note: parameters measured varied by station and year. ug/L= micrograms per liter.

Source: USEPA, Office of Water, STORET (http://www.epa.gov/storet)

4.6.2 Groundwater

During detailed engineering investigations performed by the Corps of Engineers for the Marlinton LPP, soil borings were installed in various spots along the proposed levee alignment to collect geotechnical data and to determine groundwater levels. Piezometers were also

installed in select borings to monitor groundwater levels over time. A brief summary of the data collected is presented below.

Hydrology

Data from the piezometers shows that groundwater was encountered at depths of 6 to 15 feet (1.8 to 4.6 meters) below the ground surface in Riverside; 5 to 21 feet (1.5 to 6.4 meters) along the left descending bank of the Greenbrier River through Marlinton, although most readings were between 5 and 10 feet (1.5 to 3.0 meters); and from 7 to 45 feet (2.1 to 13.7 meters) below the surface in the saddle of Buckley Mountain.

The water levels measured on Buckley Mountain are representative of the bedrock aquifer, as bedrock was encountered at depths of 5 to 7 feet (1.5 to 2.1 meters). Conversely, groundwater levels measured elsewhere in the project area are indicative of the alluvial aquifer, as these borings were terminated before reaching bedrock.

Groundwater level fluctuations were monitored between the summer of 1999 and January 2001. The results indicate minor fluctuations during most of the monitoring period, with the exception of three multiple-month periods: January/February/March 2000, August/September 2000, and December 2000/January 2001. During these periods, water levels in most piezometers fluctuated 2 to 4 feet (0.6 to 1.2 meters).

No other data is available on the groundwater hydraulics of the project area.

Table 4-3. National Pollution Discharge Elimination System Water Discharge Permits (NPDES).

Facility Name	NPDES ID/ USEPA Facility ID	Current Permit Issued Expires	Facility Type Description	Required Monitoring		Other
				Parameter	Violations	
Town of Marlinton	WV0024473/ WV0001680743	09/29/00 -- 09/28/04	Sewerage Systems	From 10-29-00 to 9-28-04: • 5-day BOD • pH • total suspended solids • nitrogen, total ammonia • flow, in conduit or through treatment plant • total residual chlorine • fecal coliform • total copper • total recoverable zinc • total recoverable aluminum • total recoverable lead	• Total suspended solids on 10-31-00 and 3-31-01	Compliance schedule violations: • Discharge Monitoring Report/ Compliance Schedule, not received (1-1-97) • Compliance & Implementation Technology Based Controls, not received (1-1-97)
Ambassadors for Christ Campground	WVG550415/ 000007939618	03/09/99 -- 12/03/03	Sporting & Rec. Camps	USEPA has no records of permitted discharges for this facility.		
Beckley Oil Co. / Pocahontas Fuel	WVG610102/ 000007934276	04/28/99 -- 12/10/04	Petroleum Bulk Stations & Terminals	USEPA has no records of permitted discharges for this facility.		
W. M. Cramer Lumber Co.	WVG610246/ 000007932786	10/22/99 -- 02/10/04	Sawmills & Planing Mills	USEPA has no records of permitted discharges for this facility.		
Web Management. Inc. / DBA Marlinton	WVG550519/ 000007938628	05/14/99 -- 12/03/03	Hotels & Motels	USEPA has no records of permitted discharges for this facility.		
WV Division of Natural Resources – Watoga State Park	WV0080659/ WV0000531806	01/05/96 -- 01/04/01	Sporting & Rec. Camps	USEPA has no records of permitted discharges for this facility.		
Source: USEPA (2001b)						

4.7 ECOLOGICAL RESOURCES

The project area includes approximately 4 miles (6.4 kilometers) of the Greenbrier River between the confluences of Stony Creek and Knapps Creek, and the lower most one-mile of both Stony Creek and Knapps Creek. The drainage areas of the affected watersheds are as follows: Knapps Creek: 134 square miles (347 square kilometers); Stony Creek: 23 square miles (60 square kilometers); and the Greenbrier River to Marlinton: 131 square miles (330 square kilometers).

4.7.1 Aquatic Resources

The Greenbrier River and Knapps Creek are both listed by the WVDNR as high quality streams. Substrates within the project area are predominately rubble and cobble interspersed with areas of sand. Water quality is good to excellent (See Section 4.6.1). These factors coupled with low siltation rates allow the area to support wide diversity of fish and macroinvertebrates, including many species of mussels, crayfish, and snails. (USFWS 2001f).

Fish

The fish species known to occur in the general vicinity of the project area, based on various West Virginia Department of Natural Resources (WVDNR) reports, are shown below in Table 4-4.

A field survey was conducted by Bledsoe (1981) from July to September 1981 at six sites along the Greenbrier River and Knapps Creek, including three sites near Marlinton. The species identified by Bledsoe (1981) are all found in the table below, with the exception of the bluegill sunfish, a single specimen of which was collected. Below Marlinton on the Greenbrier River, the most abundant fish (number of individuals collected) were silver shiner (1,832 fish, or 33.7% of the total), bigmouth chub (1,104, 20.3%), striped shiner (469, 8.6%), and fantail darter (455, 8.4%). Game fish were smallmouth bass (261, 4.8%), rock bass (206; 3.8%), redbreast sunfish (135; 2.5%) and flathead catfish (55; 1.0%). In terms of total weight of fish, hogsucker (32.0%), bigmouth chub (19.2%), and smallmouth bass (12.4%) contributed more than other species. Upstream of the bridge on Knapps Creek, rock bass (106; 22.0%), smallmouth bass (99; 20.5%), and striped shiner (79; 16.4%) were the most abundant species. Rock bass and smallmouth bass made up 50.1% and 24.4%, respectively, of the total weight. At the mouth of Knapps Creek, the dominant species were all rough/forage fish: stoneroller (475; 25.0%), bluntnose minnow (383; 20.1%), striped shiner (355; 18.7%), and mimic shiner (302; 15.8%). Other than rock bass (96; 5.1%) and smallmouth bass (47; 2.5%), all other game fish species accounted for less than one percent of the total number of fish collected. The most dominant fish by weight were stoneroller (32.5%), striped shiner (17.6%), and rock bass (15.6%).

Table 4-4. Fish Species Documented to Occur in the Marlinton Project Area.

Group	Common Name
Trout	Brown trout
Minnows	Central stoneroller
	Tonguetied minnow
	Bigmouth chub
	Striped shiner
	Rosyface shiner
	New River shiner
	Silver shiner
	Spotfin shiner
	Telescope shiner
	Mimic shiner
	Kanawha minnow
	Mountain redbelly dace
	Bluntnose minnow
	Longnose dace
	Blacknose dace
	Creek chub
Suckers	White sucker
	Northern hogsucker
Catfishes	Flathead catfish
Sunfishes & Basses	Rock bass
	Redbreast sunfish
	Green sunfish
	Smallmouth bass
	Largemouth bass
Darters	Greenside darter
	Fantail darter
	Finescale saddled darter
	Blackside darter
	Johnny darter
Sculpins	Mottled sculpin
	Banded sculpin
Source: WVDNR (Bledsoe 1981)	

In order to augment the existing available data and to characterize the aquatic habitat specific to the Marlinton project area, additional field sampling was conducted August 28-31, 2000 as part of the Corps investigation for the Marlinton LPP. The study area encompassed portions of the Greenbrier River, Knapps Creek, and Stony Creek adjacent to the town of Marlinton. The field sampling resulted in the collection of 20 species of fishes. One species, the Roanoke darter (*Percina roanoka*), was not included in previous collections by the WVDNR. All other species identified during the August 2000 sampling event had been found previously in the project area by WVDNR.

Within the project area, the Greenbrier River maintains a strong current, particularly in the upstream portion of the project area near Stony Creek. Approximately 1 mile downstream of the confluence with Knapps Creek water depth increases and the river velocity is reduced. Within the upper portion of the project area, the dominant habitat is shallow water (less than 2 feet or 0.6 meters deep) with strong current, over a hard substrate of rocks and cobble imbedded into sand/gravel/clay substrate. Throughout the Greenbrier River in the project area, patches of water willow thrive in shallow water and gravel bar areas. Some backwater, soft substrate

areas are present along the shoreline. Within the downstream portion of the project area, water depth increases and habitats include deeper pool areas with soft sediments. Patches of other aquatic macrophytes (principally wild celery and coontail) are present. Patches of water willow, common throughout the Greenbrier gravel bars and shoreline in the project area, are also present downstream.

Knapps Creek near the mouth of the Greenbrier River contains a variety of habitats including riffles, pools (including an old beaver dam), and areas of aquatic vegetation (wild celery, coontail, Elodea, and pondweeds). The fish population of Knapps Creek near the mouth of the Greenbrier River is diverse, which appears to be associated with habitat diversity at this location. The specimen of the Roanoke darter was collected in the first riffle upstream from the confluence with the Greenbrier.

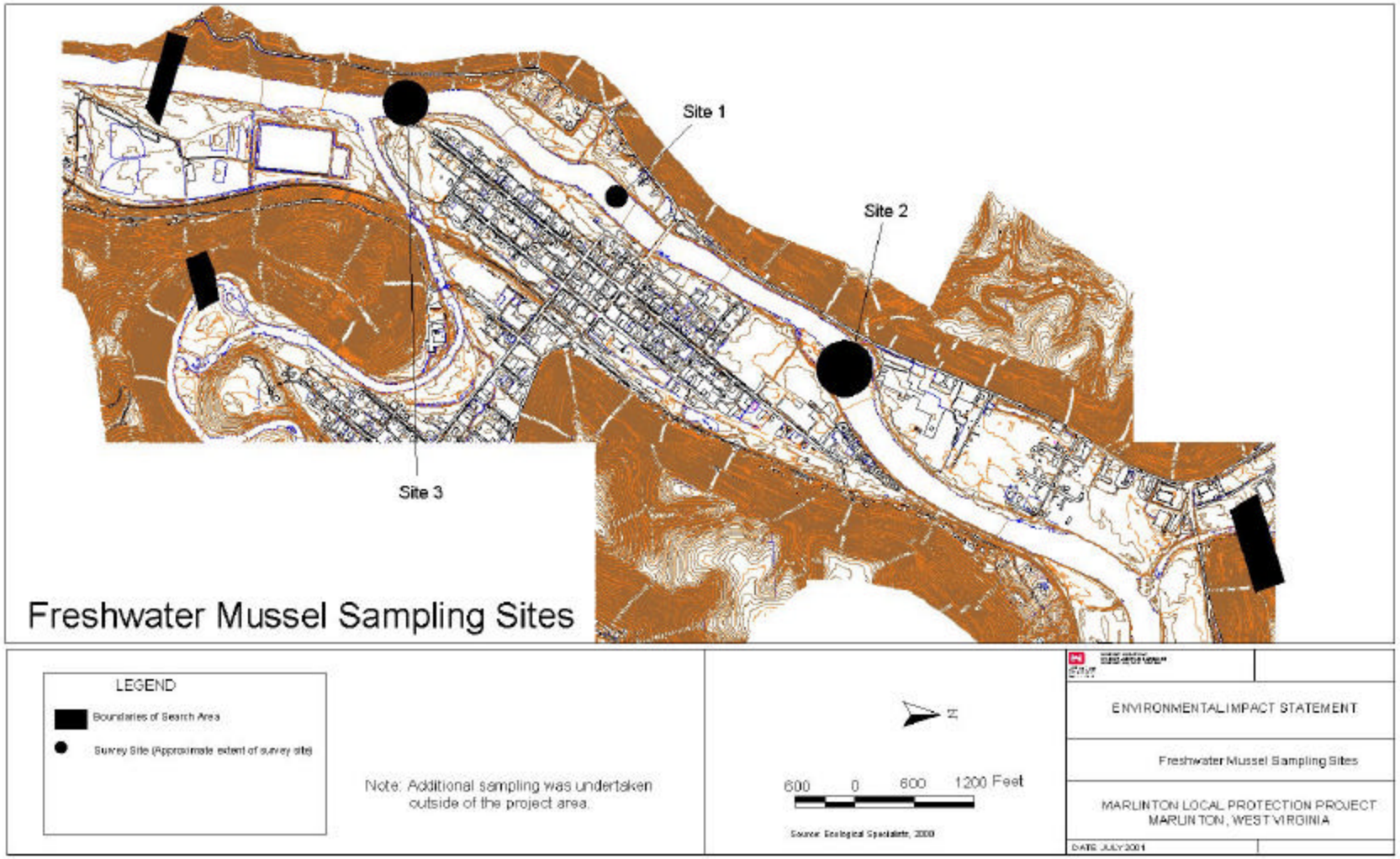
Knapps Creek maintains a rather homogeneous habitat throughout the up-stream reach of the study area. Most of Knapps Creek contained predominantly moderate current over a bedrock bottom. Scattered areas of boulders and cobble were also present. Rock/gravel riffles were infrequent, scattered and small. In general, Knapps Creek (except near the confluence with the Greenbrier) contains a low diversity of fishes associated with the homogenous habitat in the study area.

Stony Creek is a small creek that contains three principal aquatic habitats: 1) riffles containing lose rocks and gravel, moderate current, and water depths less than 1 foot (0.30 m); 2) pools with reduced current, softer substrates, and water depths 1 to 4 feet (0.3-1.2 m); and 3) scattered pools with bedrock bottoms/outcroppings. Some raw domestic sewage discharges into the creek were noted near the Route 219 Bridge. The fish assemblage within Stony Creek is typical of a small stream with moderate diversity. Central stonerollers and mottled sculpins were common in the Stony Creek samples.

Freshwater Mussels

A recent freshwater mussel field survey was conducted on the Marlinton portions of the Greenbrier River, Knapps Creek, and Stony Creek (Ecological Specialists 2000). An initial search covered the Greenbrier River and the mouths of both tributary creeks, however since no mussels were found in either creek, more intensive surveys were limited to five sites on the Greenbrier River (including two sites upstream of Marlinton that were sampled in an earlier survey). The survey sites are shown in Figure 4-8.

Figure 4-8. Freshwater Mussel Survey Areas



Mussel surveys conducted in 2000 as part of this study found 36 live freshwater mussels representing five species in the Greenbrier River (Ecological Specialists – 2000). No freshwater mussels were found in any of the surveyed portions of Knapps and Stony Creeks, however the portion of Knapps Creek between the railroad bridge and the confluence with the Greenbrier River appeared to contain suitable freshwater mussel habitat. A summary of the specimens collected is presented in Table 4-5 below.

Table 4-5. Freshwater Mussels Collected in the Greenbrier River near Marlinton, October 2000.

Species	Sites Within the Project Area					Other Sites Outside the Project Area	
	Site I	Site II	Site III	Other Areas	Project Area Totals	Site IV	Site V
Elktoe (*Alasmidonta marginata*)	4	7	1	WD	12 (33%)	1	0
Spike (*Elliptio dilatata*)	6	WD	1	WD	7 (19%)	1	1
Plain pocketbook (*Lampsilis cardium*)	1	0	0	0	1 (3%)	0	0
Wavyrayed lampmussel (*Lampsilis fasciola*)	7	4	1	2	14 (39%)	WD	0
Green floater (*Lasmigona subviridis*)	0	2	WD	0	2 (6%)	FD	6
Total Number of Individuals	*18*	*13*	*3*	*2*	*36*	*2*	*7*

Notes: Simplified site numbering shown here differs from original study, where various alphanumeric labels were selected to coincide with earlier studies conducted in the project area (Site I = "Site A"; Site II = "Site 3"; Site III = "Site 4"; Site IV = "Site 1"; and Site V = "Site 2"). WD = weathered dead shell; FD = freshly dead shell.

Source: Ecological Specialists 2000

The most productive freshwater mussel habitat was found to be just downstream of the WV Route 39 bridge along the right descending bank of the channel (Site I in Table 4-5). Although relatively small in spatial extent (approximately 164 feet x 33 feet [50 meters 10 meters]), this area had the highest density of freshwater mussels. Another site sampled near the bend in the Greenbrier River south of the Riverside area (Site II in Table 4-5) contained a similar number of freshwater mussels, yet was larger in size and thus had a smaller population density.

Two of the species found during the survey, the elktoe mussel (*Alasmidonta marginata*) and green floater (*Lasmigona subviridis*) are listed by the U.S. Fish and Wildlife Service (USFWS) as species of concern. (See Section 4.7.4 for further discussion of protected species and their listing definitions.) Elktoe mussels and green floaters are usually found in fast-flowing, clean water in substrates that contain relatively firm rubble, gravel, and sand substrates swept free from siltation (VDGIF 2000a, 2000b). They are generally found buried in the substrate in shallow riffle and shoal areas. The green floater is able to thrive in very small creeks and streams where other mussels are not often found. The primary threats to both species are water pollution, siltation and construction of dams. Both the elktoe and green floater are filter feeders that trap suspended materials, including detritus (decaying organic material) and zooplankton (small aquatic crustaceans and other animals).

Twelve live elktoe mussels and two live green floaters were found during the survey, in addition to a single weathered (dead) shell of each of these species. With respect to these two species, the findings were consistent with a study conducted previously by Stihler and Wallace (1997). The site downstream of the Route 39 bridge contained a low-density population of the elktoe mussel. The site near the bend in the Greenbrier River south of the Riverside area appeared to

support low-density populations of both elktoe mussels and green floaters. An additional six green floaters, one elktoe mussel, and a single freshly dead green floater shell were identified during limited sampling outside the project area further upstream (Site IV and V) the Greenbrier River.

Benthic Macroinvertebrates

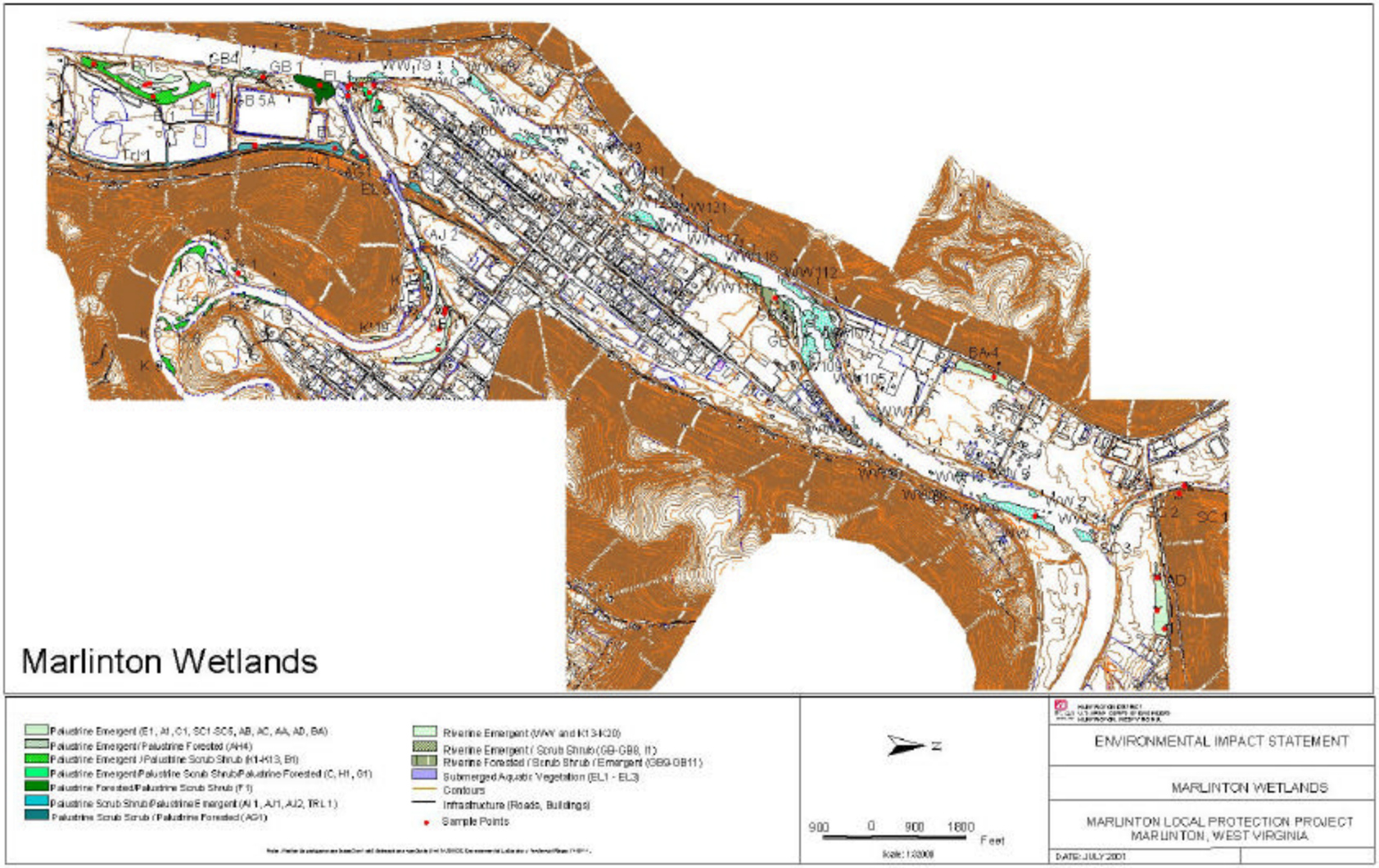
The diversity of non-mussel benthic (bottom-dwelling) macroinvertebrates in the Greenbrier River and Knapps Creek is high. A day and night survey was performed on June 23, 1981 from the Knapps Creek bridge to the confluence of the Greenbrier River and upstream of the Route 39 bridge along the Greenbrier River (Tolin 1981). Species identified included: mayfly larvae (various genera); caddisfly larvae (various genera); stonefly (*Acroneuria* spp.) larvae; black fly (*Simulium nigricoxum*) larvae; crayfish (*Cambarus* spp.); variegated false water penny beetle (*Dicranopselaphus variegatus*); fingernail moonsnail (*Haliotinella patinaria*); and various species of midges. The presence of these species is generally indicative of good water quality.

Wetlands

Wetland habitats are also scattered throughout the project area and total about 27 acres. Figure 4-9 shows the locations of these wetlands. Palustrine scrub - shrub habitats are particularly prominent in the downstream portions of the project area near the confluence of Knapps Creek. The dominant species in this habitat type is river birch (*Betula nigra*), sycamore (*Platanus occidentalis*), black willow (*Salix nigra*), silky dogwood (*Cornus obliqua*), and alder (*Alnus serrulata*). Herbaceous species include grass-leaved goldenrod (*Solidago graminifolia*), spike-rush (*Eleocharis spp.),* and jewelweed. The interspersion of these wetland habitat types with bottomland hardwoods and the riverine community creates greater habitat diversity and increases the fish and wildlife resource values of the area.

Emergent and submergent riverine wetlands are present throughout the project area. Dominant species in the area are water willow (*Justicia americana*), and waterweed (*Elodea canadensis*), with the waterweed beds occurring primarily near the confluence of Knapps Creek. These areas provide excellent feeding and nursery areas for fish and macroinvertabrates, including mussels.

Figure 4-9. Locations of Wetlands in the Project Area



4.7.2 Terrestrial Resources

The terrestrial communities along Knapps Creek and the Greenbrier River south of Knapps Creek offer habitat for all but the most secretive wildlife species (USACE 1985). Some of the species most intolerant to human disturbance (e.g., turkey, bear, bobcat) are not commonly found in the study area. Most birds of prey and some forest interior dwelling birds require isolated contiguous forest cover and are less likely to utilize the residential areas. The interspersion of bottomland riparian, upland forest, and old-field habitats make this area suitable for small game mammals and birds that utilize the diverse vegetative communities.

Vegetation

The Greenbrier river corridor and surrounding area are in the Allegheny Mountain section of the Eastern Mixed Mesophytic forest region of North America (Braun 1950). Deciduous, broadleaf evergreen, northern hardwood, mixed, and coniferous forest types may reach maturity in this region. Table 4-6 shows percentages of some vegetation types estimated to occur in three sections of the Greenbrier River watershed in the vicinity of the Marlinton area.

Table 4-6. Vegetation Along the Greenbrier River Valley Near Marlinton.

Section Name	Size (sq. mi.)	hay/past/grass %	conifer %	mixed %	deciduous %
Greenbrier River	131	1.98	10.57	14.22	61.79
Knapps Creek	134	2.3	14.38	19.13	55.17
Stony Creek	23	6.08	2.79	8.38	62.70
Source: WVDEP 2000					

A number of repetitive and recognizable forest type, shrubby and herbaceous plant groupings are found in the Marlinton area. Such groupings, or associations, occur naturally in response to environmental gradients in moisture availability, slope, aspect, mountain-induced microclimate and substrate composition. Disturbance of vegetation and soils through human activity also has had a profound effect on presently observable plant associations. The intensity, duration and time since last disturbance have affected most vegetation in the Marlinton area, renders the landscape into a pattern of successional reestablishment stages. Typically, the steep and inaccessible lands support reverting forest composed of trees in the 120 to 150 year age class. Such areas have not been significantly disturbed since post-Civil War days. The ridge top and 80-degree slope along the left descending bank of Knapps Creek support such trees. Areas near repeated human activity support pioneer or early successional vegetation composed of annual weeds, perennial herbs and persistent shrubs and saplings, depending on the frequency of maintenance.

The more common naturally occurring vegetation associations found in the Marlinton project area are described in the following sections. The composition of these are based on a survey conducted for the Huntington District in 1988 and, more specifically, on botanical field surveys conducted in August and September 2000. The locations of these vegetation associations, along with land use features, within the vicinity of the project area were presented in Figure 4-2

in Section 4.1, Land Use/Land Cover. The plant species identified during the 2000 field surveys are listed in Table 4-7.

In addition to native species, exotic or invasive species including the Japanese Knotweed *(Polygonum caspidatum)*, are present in the project area.

Mapped Vegetation Associations

Mesic Hardwoods - Hm: This is a moist forest type occurring on north-facing slopes, along the lower terraces of south facing mountain slopes, in well-watered (but not wet) coves along stream courses and on the highest flood plain terraces. Soils tend to be deeply weathered and thickly covered with organic material. This type is composed of a highly diverse mixture of hardwood species with occasional pine (Pinus sp.) and eastern hemlock (*Tsuga canadensis*). Tree cores collected with an increment bore revealed that this forest type in the project vicinity is about 80 to 120 years in age. Average diameter at breast height (DBH) of forest trees was measured to be about 14 inches (36 cm).

Important species include yellow-poplar (*Liriodendron tulipifera*), sugar maple (*Acer saccharum*), pignut hickory (*Carya glabra*), American basswood (*Tilia americana*), yellow buckeye (*Aesculus octandra*), sweet birch (*Betula lenta*) and cucumber tree (*Magnolia acuminata*). Rhododendron (*Rhododendron maximum*), several azaleas, spicebush (*Lindera benzoin*), paw-paw (*Asimina triloba*) and flowering dogwood (*Cornus florida*) populate the understory. Lianas are common and represented by Virginia creeper (*Parthenocissus quinquefolia*), various grapes (Vitis sp.) and interestingly, the unusual Dutchman's pipe vine (*Aristolochia maurophylla*). Ground cover is typically dense and floristically rich. Such species as maidenhair fern (*Adiantum pedatum*), silvery spleenwort (*Asplenium angustum*), Christmas fern (*Polystichum acrostichoides*), wild yam (*Discorea sp.*), gall-of-the-earth (*Prenanthoides alba*), wild ginger (*Asarum canadensis*) and blue cohosh (*Caulophyllum thalictroides*) occupied the forest floor during the survey period

Oak/Pine Uplands - OP: Much of the steep, excessively well-drained, south, southeast and southwest mountain slopes surrounding Marlinton support stands of upland oak with about 10 percent by stem density of pitch and Virginia pine (*Pinus rigida* and *P. virginiana*). The fractured, rocky soils support two dominant oaks; black oak (*Quercus velutina*) and chestnut oak (*Q. prinus*). White oak (*Q. alba*), pignut hickory and sugar maple are occasionally present. Prominent understory shrubs and saplings include mountain laurel (*Kalmia latifolia*), low-bush blueberry (*Vaccinium vacillans*), black huckleberry (*Gaylussacia baccata*), and notably, persistent root crown sports of American chestnut (*Castanea dentata*). Ground cover is scant, with only bracken (*Pteridium aquilinum*) and wintergreen (*Gaultheria procumbens)* able to tolerate both the shade and the nutrient poor soils. This forest type covers the southern face of the ridge above Stillwell Road (cut-through for the diversion alternative). While bole diameters average about 13 inches (33 cm) DBH, core samples reveal stand age to vary between about 85 years for the pine fraction and about 145 years for the oaks.

Pine/hemlock/Oak Coves - PO: This type occurs on steep south and southwest facing slope on the poorest soils. Pitch pine, common in the oak/pine type establishes dominance in these areas. White pine and hemlock become more important in more mesic coves, often accompanied by such transitional woody pioneers as black locust *(Robinia pseudoacacia*).

Northern Forest - HN: West Virginia's higher mountains (usually over 3500 feet) often support northern forest types. Examples of this distinctive species composition are found steep, cool, north-facing slopes and in deep protected ravines in the project area at elevations of less than 2500 feet. Generally a remnant type found in the more inaccessible sites for past forest harvesting activities, this forest type appears to be oldest (measured at about 150 years) and largest in average stem DBH (15 inches or 38 cm). Signature species for this type include yellow birch (*Betula alleghaniensis*), northern red oak (*Q. rubra*) and American beech (*Fagus grandifolia*). Hemlock is common to dominant (such as found on the island on Knapps Creek below Wilson's Field). Great rhododendron (*Rhododendron maximum*) often becomes a monotypic sub canopy on rocky sites, such found along the left descending hillside above Knapps Creek. Sugar maple, basswood, wild black cherry (*Prunus serotina*), white pine (*Pinus strobus*) are also common canopy trees. Common shrubs include hobble-bush (*Viburnum alnifolium*), witch-hazel (*Hamamelis virginiana*) and mountain holly (*Ilex montanum*). The northern component is expressed in the ground cover by partridge berry (*Mitchella repens*), wild leek (*Allium tricoccum*) and Canada mayflower (*Maianthemum canadense*).

Bottomland Hardwood - BH: This forest type occurs on first and second river terraces, usually within the 100-year flood plain. Dominant species include those tolerant of repeated flood damage and extended period of soil saturation. The most common species, black willow, green ash (*Fraxinus pennsylvanica*) sycamore, cottonwood (*Populus deltoides*), red and silver maple (*Acer rubrum* and *A. saccharinum*), are those which have evolved to take advantage of the vegetative reproduction facilitated by frequent flood dismemberment. Other forest species, typically important on the higher flood terraces, include box elder (*Acer negundo*), tulip poplar, yellow buckeye, river birch (*Betula nigra*) and ironwood (*Carpinus caroliniana*). Large canopy openings are common in this type due to frequent tree falls and washouts. Openings are quickly colonized by tall and rank riparian herbaceous perennials. Dominant species include wing-stem (*Actinomeris alternifolia*), ironweed (*Vernonia noveboracensis*), joe-pye weed (*Eupatorium maculatum*). The riparian zone within the project area is predominately river birch, sycamore, black willow, silky dogwood, and alder. The riparian zone is more consistently of high quality downstream of the Route 39 bridge and along Knapps Creek, than through the main part of Marlinton, however some riparian areas in town such as near the old tannery are of high quality and some riparian areas, such as just downstream of the Route 219 Stony Creek bridge, are poor.

Successional Shrubs and Saplings - Suc-S: This type supports older shrubs and saplings in the 5 to 20 year old age range on mildly disturbed lands abandoned from a prior human use. Species composition is highly variable depending on site physical and microclimate conditions. Typically the surrounding native canopy dominant trees provide reseeding stock for such sites. Common species on all such mid-successional stands include black locust, black cherry, cottonwood and, if subject to frequent soil saturation, black willow and alder.

Successional Herbs (Old field) - Suc-H: Old Field Communities are represented in small acreage throughout this mountainous region. Sites are typically abandoned agricultural fields aged 2 to 5 years since suspension of farming activities. The composition is often native annual and perennial, weedy species. The herbaceous-dominated association is often composed of several species of goldenrod including *Solidago juncea*, S. canadensis, *S. graminifolia*, and *S. gigantea* and common grasses such as red fescue (Festuca rubra) bluegrass (*Poa pratensis)*, and deer-tongue (*Panicum clandestinum)*. Other common early successional plants include broom-sedge (*Andropogon virginicus*), dewberry (*Rubus flagelaris*), and cinquefoil (*Potentilla simplex*). The fields also contain reestablishing low shrubs and saplings such as blackberry

(*Rubus allegheniensis* and others) black locust and Virginia pine (*Pinus virginiana*), winged sumac (*Rhus coppalina*), red maple, Sassafras (*Sassafras albidum*) and crab apple (*Malus coronaria*).

Wet Meadows- Wm: This type occurs in frequently wet, moderately or repeatedly disturbed sites, such as seasonally wet agricultural fields and mowed bottomlands. The type often supports dense obligate hydrophyte monocultures. Cattail (*Typha latifolia*) and reed-grass (*Phalaris arundinaceae*) were the noted commonly dominant species. Tearthumb (Polygonum saggitatum), ditch stonecrop (*Penthorum sedioides*) and various sedges (*Carex sp.*), bulrushes (*Scirpus* sp.), spike rushes (*Eleocharis* sp.) and common rush (*Juncus* sp.) also occur frequently.

Mowed/maintained - Mm: This type includes larger sites subject to frequent mowing to maintain an active human use. Vegetation is the typical planted grasses and sprawling herbaceous, often weedy plants. Roadsides and park areas make up most of this type.

Ruderal - Rd: This type occurring on highly disturbed or chemically contaminated soils. It is identified by a high percentage of alien weeds and invasive plants that follow transportation corridors. The plant association along the Greenbrier hiking/biking Trail (although mapped separately), for example is primarily ruderal, composed of many midwestern prairie species and alien weeds, including big bluestem (*Andropogon gerardii*), Indiangrass (*Sorghastrum nutans*), and guara (*Guara biennis*). Given time for organic material deposition and soil development, these associations will eventually support old-field and woody successional communities.

Beach/Semi-barren - Br: This type includes the often extensive, sparsely vegetated, cobbley or sandy shoals and point bars along the Greenbrier River and the lower reaches of its major tributaries. Only the larger examples of this type are mapped. Species composition is a random mix of water-borne and usually hydrophytic native species such as water-willow (*Justicea americana*), cardinal flower (*Lobelia cardinalis*), any of several water-peppers (*Polygonum* sp.), various sedges and rushes (*Carex, Scirpus, Cyperus, Eleocharis* and *Juncus*), alder (*Alnus serrulata*) and black willow seedlings (*Salix nigra*). The extent and shape of these dynamic associations probably changes annually, as the river reconfigures mobile substrates.

A cliff face community, often found above the Greenbrier River high water line, supports many uncommon plants such as milkvetch (*Astragalus canadensis*), bellflower (*Campanula divaricata*), wild indigo (*Baptesia tinctoria*), Canada yew (*Taxus canadensis*) and Fraser's sedge (*Cymophyllus fraserii*). This type was found on steep, north-facing slopes in the project area, but in very small sites that were not mapped. More common plants are also found on the cliff faces including mountain laurel, great rhododendron, wild hydrangea (*Hydrangea aborescens*), jewelweed (*Impatiens capensis*), and Christmas fern.

Table 4-7. Plant Species Observed in Marlinton Project Area

Actinomeris alternifolia (*Wingstem*)
Achillea millifolium (Yarrow)
Acer negundo (Box Elder)
Actea pachypoda (White Baneberry)
*Acalypha rhomboidea (*Three-seeded Mercury)
Acer rubrum (Red Maple)
Acer saccharum (Sugar Maple)
Acer saccharinum (Silver Maple)
Aconitum uncinatum (Monk's Hood)
Adiantum pedatum (Maidenhair Fern)
Aesculus octandra (Yellow Buckeye)
Agrostis hyemalis (Winter Bentgrass)
Agrostis tenuis (Colonial Bentgrass)
Althea rosea (Holly Hock)
Alnus serrulata (Speckled Alder)
Alisma subcordatum (Water Plantain)
Amelanchier arborea (Downy Serviceberry)
Amphicarpa bracteata (Hog Peanut)
Angelica atropurpurea (Great Angelica)
Andropogon scoparius (Little Bluestem)
Anemone virginiana (Thimbleweed)
Apocynanum cannibium (Indian Hemp)
Aristolochia macrophylla (Dutchman's Pipe)
Arctium minus (Common Burdock)
Asplenium angustum (Northern Lady Fern)
Asarum Canadensis (Wild Ginger)
Aster divarcatus (White Wood Aster)
Asclepias incarnata (Swamp Milkweed)
Aster prenanthoides (Crookedstem Aster)
Aster puniceus (Red Stalked Aster)
Asclepias syricia (Common Milkweed)
Asclepias tuberosa (Butterfly Weed)
Aster umbellatus (Tall White Aster)
Athyrium thelypteroides (Silvery Spleenwort)
Baptisia tintoria (Wild Indigo)
Betula nigra (River Birch)
Berberis thunbergii (Japanese Barberry)
Bidens cernua (Tick Seed)
Bidens frondosa (Tick Seed)
Bidens vulgata (Tick Seed)
Blephilla hirsute (Wood Mint)
Bohemaria cylindrical (Wood Nettle)
Bromus cilliatus (Brome Grass)
Campanula americana (Bell Flower)
Carpinus caroliniana (Ironwood)
Carya cordiformis (Bitternut)
Carex crinita (Drooping Sedge)
Castanea dentate (American Chestnut)
Carex frankii (Frank's Sedge)
Carya glabra (Red Hickory)
Carex intemescens (Sedge)
Carex lupulina (Sedge)
Carex lurida (Sedge)
Carya ovata (Sedge)
Caltha palustris (Marsh Merrygold)
Cardamine pennsylvanica (Pennsylvania Cress)
Carex scoparia (Blunt Sedge)
Carex stricta (Sedge)
Carex swanii (Sedge)
Caulophyllum thalictroides (Baneberry)
Carya tomentosa (Sedge)
Carex tribuloides (Sedge)
Carex vulpinoidea (Sedge)
Centaurea maculosa (Spotted Knapweed)
Cephlanthus occidentalis (Buttonbush)
Chelone glabra (Turtlehead)
Chrysanthemum leucanthemum (Oxeye Daisy)
Cinna arundinacea (Woodreed)
Circium discolor (Thistle)
Circea quadrisculata (SmallEnchanters Nightshade)
Clematis virginiana (Virgins Bower)
Cornus ammomum (Swamp Dogwood)
Collinsonia canadensis (Collinsia)
Cornus florida (Flowering Dogwood)
Conium maculatum (Water Hemlock)
Convolvulus sepium (Hedge Bindweed)
Corinilla varia (Crown Vetch)
Commelina virginiana (Dayflower)
Cryptotaenia Canadensis (Honewort)
Cuscuta gronovii (Dodder)
Cuphea viscosissima (Cuphea)
Cyperus rivularis (Stinkgrass)
Cyperus strigosus (Umbrellagrass)
Daucus carrota (Queen Anne's Lace)
Dactylis glomerata (Orchardgrass)
Desmodium perplexum (Ticktreefoil)
Dennstaedia punctiloba (Hayscented Fern)
Dianthus armeria (Depford Pink)
Dicanthelium clandestinum (Deer Tongue)
Digitaria ischemum (Crabgrass)
Dioscorea quaternata (Wild Yam)
Dipsacus sylvestris (Peasel)
Dioscorea villosa (Wild Yam)
Diospyros virginiana (Persimmon)
Echinochloa pungens (Barnyard Grass)
Eleocharis acicularis (Least Spikerush)
Elodea canadensis (Elodea)
Eleocharis obtuse (Blunt Spikerush)
Elymus virginicus (Virginia Wild Rye)
Epilobium coloratum (Fireweed)
Epigea repens (Trailing Arbutus)
Epifagus virginiana (Beech Drops)
Equisetum arvense (Field Horsetail)
Erigeron annuus (Daisy Fleabane)
Erigeron philidelphicus (Daisy Fleabane)
Euphorbia corollata (Spurge)
Euphorbia dentate (Spurge)
Euphorbia lathyris (Spurge)
Eupatorium maculatum (Thoroughwort)
Euphorbia maculata (Spotleaf Spurge)
Eupatorium perfoliatum (Boneset)
Eupatorium purpureum (Joepye Weed)
Eupatorium rugosum (Thoroughwort)
Fagus grandifolia (Beech)
Festuca ovina (Sheep Fescue)
Festuca rubra (Red Fescue)
Fraxinus pennsylvanica (Green Ash)
Galium aparine (Cleavers)
Galium tinctorium (Swamp Bedstraw)
Gaylussacia baccata (Huckelberry)
Gaura biennis (Gaura)

Table 4-7. Plant Species Observed in Marlinton Project Area (continued)

Gaultheria procumbens (Wintergreen)
Galium trifolium (Bedstraw)
Gerardia tenufolia (Gerardia)
Gnapthalum uliginosum (Cudweed)
Gymnocladus dioca (Kentucky Coffeetree)
Hamamelis virginiana (Witch-Hazel)
Helenium autumnale (Sneezeweed)
Helianthus decapetalus (Wild Sunflower)
Helianthus divarcatus (Wild Sunflower)
Helianthus giganteus (Wild Sunflower)
Helianthus tuberosus (Jerusalem Artichoke)
Hieracium venosum (Rattlesnake Master)
Hordeum vulgare (Barley)
Hypericum canadense (St. John's Wort)
Hypericum ellipticum (St. John's Wort)
Hypericum mutilum (St. John's Wort)
Hystrix patula (Bottlebrush)
Hypericum prolificum (St. John's Wort)
Hypericum virginicum (St. John's Wort)
Impatiens capensis (Touch-me-not)
Impatiens pallida (Touch-me-not)
Ipomoea purpurea (Morning Glory)
Justicea Americana (Water Willow)
Juglans cineria (White Walnut)
Juncus effuses (Soft Rush)
Juglans nigra (Black Walnut)
Juncus subcaudatus (Rush)
Juncus tenuis (Rush)
Juniperus virginiana (Eastern Red Cedar)
Kalmia latifolia (Mountain Laurel)
Lathyrus latifolia (Sweet Pea)
Lespedeza hirta (Lespedeza)
Lespedeza nuttalii (Lespedeza)
Leersia oryzoides (Rice Cut-grass)
Leersia virginica (White Grass)
Lindernaria dubia (Prestonweed)
Liriodenron tulipfera (Tulip Tree)
Lobelia cardinalis (Cardinal Flower)
Lobelia inflata (Indian Tobacco)
Lonicera japonica (Japenese Honeysuckle)
Lobelia puberella (Downy Lobelia)
Lobelia siphilitica (American Lobelia)
Lonicera tartarica (Tartaria Honesuckle)
Ludwidgia alternifolia (Seedbox)
Ludwidgia palustris (Ditchweed)
Lycopus americana (Waterhorehound)
Lysimachia ciliata (Loostrife)
Lysimachia numularia (Moneywort)
Magnolia acuminata (Cucumber Tree)
Maianthemum canadense (Canada Lilly)
Mentha piperita (Peppermint)
Mimulus alata (Winged Monkeyflower)
Mithella repens (Partridgeberry)
Minulus ringens (Monkey Flower)
Monotropa uniflora (Indian Pipe)
Nyssa sylvatica (Black Gum)
Oenethera biennis (Evening Primrose)
Oenethera parvifolia (Primrose)
Onoclea sensibilis (Sensitive Fern)
Osmorhiza longistylus (Sweet Cicely)
Osmunda regalis (Royal Fern)
Oxydendron arborea (Sourwood)
Oxalis corniculata (Woodsorrel)
Oxalis stricta (Woodsorrel)
Panicum cappilare (Witch Grass)
Paspalum circulare (Paspalum Grass)
Parthenocissus quinquifolia (Virginia Creeper)
Panicum sphaerocarpon (Round-seeded Panic)
Penthorum sediodes (Ditch Stonecrop)
Phytolacca americana (Pokeweed)
Phalaris arundinaceae (Canary Grass)
Phryma leptostachya (Phryma)
Physocarpus opulifolius (Ninemark)
Phlox ovata (Mountain Phlox)
Phleum pratensis (Timothy)
Pinus echinata (Shortleaf Pine)
Pilea pumilla (Clearweed)
Pinus strobes (White Pine)
Pinus tadea (Loblolly Pine)
Pinus virginiana (Virginia Pine)
Plantago lanceolata (English Plantain)
Plantago major (Common Plantain)
Plantanus occidentalis (Sycamore)
Polystichum acrostichoides (Christmas Fern)
Polygonum aviculare (Knotweed)
Polygonatum biflorum (Solomon's Seal)
Polygonum coccineum (Water Smartweed)
Populus deltoids (Cottonwood)
Potamogeton foliosus (Leafy Pondweed)
Polygonum hydropiperoides (Mild WaterPepper)
Polygonum hydropiper (Smartweed)
Poa palustris (Bluegrass)
Polygonum pensylvanicum (Pinkweed)
Poa pratensis (Kentucky Bluegrass)
Polygonum saggitattum (Tear-thumb)
Polygonum scandens (False Buckwheat)
Prenanthes serpentaria (Rattlesnake Root)
Prunus serotina (Black Cherry)
Pteridium aquilinum (Bracken Fern)
Quercus alba (White Oak)
Quercus illicifolia (Scrub Oak)
Quercus imbricaria (Shingle Oak)
Quercus palustris (Pin Oak)
Quercus prinus (Chestnut Oak)
Quercus rubra (Red Oak)
Quercus velutina (Black Oak)
Ranunculus acris (Buttercup)
Rhus glabra (Smooth Sumac)
Rhododendron maximum (Great Laurel)
Rhododendron nudifolium (Purple Azalea)
Rhus typina (Staghorn Sumac)
Rosa multiflora (Multifloral Rose)
Rosa palustris (Swamp Rose)
Robinia psuedoacacia (Black Locust)
Rubus allgheniensis (Common Blackberry)
Rumex crispus (Yellow Dock)
Rudbeckia lacinata (Tall Coneflower)
Rudbeckia media (Black-Eyed Susan)
Rumex obtusifolia (Bitter Dock)
Rubus occidentalis (Black Raspberry)
Sassafras albidum (Sassafras)
Salix amygladoides (Peachleaf Willow)
Sambucus canadensis (Elderberry)
Sanguinaria canadensis (Bloodroot)
Saggitaria latifolia (Arrowhead)
Salix nigra (Black Willow)

Table 4-7. Plant Species Observed in Marlinton Project Area (continued)

Saponaria officialis (Bounce Bet)	*Sanicula trifoliate (Snakeroot)*	
Scirpus americanus	*Solidago gigantean*	*Trifolium alba (WhiteClover)*
(American Rush)	*(Giant Goldenrod)*	*Trifolium repens (Hop-Clover)*
Scirpus atrovirens	*Solidago graminifolia*	*Trifolium rubra (Red Clover)*
(Green Bull Rush)	*(Flat topped Goldenrod)*	*Tsuga canadensis*
Scirpus cyperinus (Wool Grass)	*Solidago juncea (Early Goldenrod)*	*(Eastern Hemlock)*
Scutellaria laterifolia (Scullcap)	*Solidago nemoralis*	*Tussilago farfara (Colt's Foot)*
Scirpus validus (Softstem Rush)	*(Gray Goldenrod)*	*Typha lattifolia*
Selanginella apoda (Swlanginella)	*Sorgastrum nutans (Indian Grass)*	*(Common Broadleaf Cattail)*
Setaria vulgaris (Common Foxtail)	*Spiranthes cernua*	*Ulmus americana (American Elm)*
Sicyos angulatus (Wild Cucumber)	*(Fringed Ladiestresses)*	*Vallisneria americana (Eel Grass)*
Sium suave (Water Hemlock)	*Sparganium chlorocarpum*	*Vaccinium vacillans*
Smilax glauca (Glaucous	*(Green Burr-Reed*	*(Low Late Blueberry)*
Greenbrier)	*Stellaria media*	*Verbascum blattaria*
Smilax hispida (Brisling	*(Common Chickweed)*	*(Moth mullien)*
Greenbrier)	*Stellaria pubera*	*Verbena hastate (Purple Vervain)*
Smilax rotundifolia (Roundleaf	*(Downy Chickweed)*	*Vernonia noveboracensis*
Greenbrier)	*Symplocarpus foetidus*	*(New York Ironweed)*
Solidago altissima (Tall	*(Skunk Cabbage)*	*Verbascum thapsus*
Goldenrod)	*Thalictrum polygamum*	*(Flannel Mullien)*
Solidago canadensis (Canada	*(Meadow-rue)*	*Verbena urticifolia*
Goldenrod)	*Tilia americana (Basswood)*	*(Nettle-leafed Vervain)*
Solanum carolinence (Bittersweet)	*Toxicodendron radicans*	*Vicia americana (Common Vetch)*
Solanum dulcamara (Nightshade)	*(Poison Ivy)*	*Vitis riparia (River Bank Grape)*
	Tovara virginica (Knotweed)	*Zizia trifoliate (Golden Alexanders*

4.7.3 Wildlife

Surveys conducted within the Monongahela National Forest account for 70 species of resident birds (year-round), 89 neo-tropical migrants (breed in Pocahontas County but winter elsewhere), and 71 non-breeding migratory birds (stops in the area to rest and/or feed during migration) (USFS 2000). Birds observed in the Marlinton area during the August 2000 fieldwork are listed phylo-genetically in Table 4-8. Of the 15 most widespread species in the state (Buckelew et al. 1994), 11 were observed during the August 2000 fieldwork; there were no rare or protected species observed.

The interspersion of wetland habitat types with bottomland hardwoods and the riverine community creates greater habitat diversity and increases the fish and wildlife resource values of the area. American toad (*Bufo americanus*), wood frog (*Rana sylvatica*), green frog (*Rana clamitans melanota*), snapping turtle (*Chelydra serpentina*), box turtle (*Terrapene carolina carolina*), northern ringneck snake (*Diadophis punctatus edwardsi*), black rat snake (*Elaphe obsoleta*), northern water snake (*Nerodia sipedon sipedon*), and a number of salamanders can be expected to occur within the project area. A herpetofauna (reptilian and amphibian) survey was conducted in July 1986 along tributaries of a 30-mile (48 km) section of the Greenbrier River north of Marlinton (USFWS 1987). Although the southernmost sampling point was over one mile north of Marlinton, the species identified in this survey are likely similar to those found in the immediate Marlinton vicinity and consideration of these results is important given the lack of herpetofauna data specific to the Marlinton area. The survey was conducted in the water and up to 300 feet (91 m) away on either bank, in addition to two upland areas adjacent to the river. USFWS (1987) identified 17 species of reptiles and amphibians, as shown in Table 4-9. The sampling effort was sufficient to determine the presence of the majority of species, however the

high variability of captures among the various streams indicates that there were "likely to be many more individuals present than were detected" (USFWS 1987).

Table 4-8. Bird Species Observed in Marlinton Project Area

Mallard	*Anas platyrhynchos*	Yellow-breasted Chat	*Icteria virens*
Wood Duck	*Aix sponsa*	Red-Winged Blackbird	*Agelaius phoeniceus*
Muscovy	*Cairina moschata*	Common Grackle	*Quiscalus quiscula*
Great Blue Heron	*Ardea herodias*	European Starling	*Sturnus vulgaris*
Green Heron	*Butorides striatus*	House Sparrow	*Passer domesticus*
Red-Tailed Hawk	*Buteo jamaicensis*	Northern Cardinal	*Cardinalis cardinalis*
Osprey	*Pandion haliaetus*	House Finch	*Carpodacus mexicanus*
Turkey Vulture	*Cathartes aura*	American Goldfinch	*Carduelis tristis*
Mourning Dove	*Zenaida macroura*	Indigo Bunting	*Passerina cyanea*
Rock Dove	*Columba livia*	Rufous-sided Towhee	*Pipilo erythrophthalmus*
Ruby-throated Hummingbird	*Archilochus colubris*	Song Sparrow	*Melospiza melodia*
Belted Kingfisher	*Megaceryle alcyon*	Field Sparrow	*Spizella pusilla*
Pileated Woodpecker	*Dryocopus pileatus*	Cedar Waxwing	*Bombycilla garrulus*
Yellow-bellied Sapsucker	*Sphyrapicus varius*	Yellow-Rumped Warbler	*Dendroica coronata*
Northern Flicker	*Colaptes auratus*	Yellow Warbler	*Dendroica petechia*
Downy Woodpecker	*Picoides pubescens*	Black-throated Green Warbler	*Dendroica virens*
Hairy Woodpecker	*Picoides villosus*	Common Yellow-Throat	*Geothlypis trichas*
Eastern Kingbird	*Tyrannus tyrannus*		
Eastern Pewee	*Contopus virens*		
American Crow	*Corvus brachyrhynchos*		
Blue Jay	*Cyanocitta cristata*		
Black-capped Chickadee	*Parus atricapillus*		
Tufted Titmouse	*Parus bicolor*		
White Breasted Nuthatch	*Sitta carolinensis*		
House Wren	*Troglodytes aedon*		
Gray Catbird	*Dumetella carolinensis*		
Northern Mockingbird	*Mimus polyglottos*		
American Robin	*Turdus migratorius*		

Table 4-9. Amphibian and Reptile Species Identified along the Greenbrier River, July 1986.

SPECIES	NUMBER OBSERVED
Amphibians	
Seal salamander (*Desmognathus monticola*)	74
Mountain dusky salamander (*Desmognathus ochrophaeus*)	58
Northern two-lined salamander (*Eurycea bislineata*)	16
Red-spotted newt (*Notophthalmus viridescens*)	14
Slimy salamander (*Plethodon glutinosus*)	10
Long-tailed salamander (*Eurycea longicauda*)	9
Northern dusky salamander (*Desmognathus fuscus*)	3
Northern red salamander (*Pseudotriton ruber*)	3
American toad (*Bufo americanus*)	2
Wood frog (*Rana sylvatica*)	2
Green frog *(Rana clamitans)*	1
Reptiles	
Northern water snake (*Nerodia sipedon*)	2
Northern ringneck snake (*Diadophis punctatus*)	1
Black rat snake (*Elaphe obsoleta*)	1
Eastern timber rattlesnake (*Crotalus horridus*)	1
Snapping turtle (*Chelydra serpentina*)	1
Eastern box turtle (*Terrapene carolina*)	1

Source: USFWS 1987

Mammals

Evidence of riparian furbearers, especially muskrat, raccoon, and beaver has historically been abundant throughout the project reach (USACE 1985) and was confirmed in the August 2000 field survey. Evidence of raccoon foraging (footprints, invertebrate remains, scat, etc.) in the shallow areas of both Knapps Creek and the Greenbrier River were identified. The remains of an abandoned beaver dam and bank lodge were observed in Knapps Creek approximately 100 feet (30 m) upstream from the confluence with the Greenbrier River. Two separate active beaver lodges and food caches were found approximately 2 miles further up Knapps Creek. Mink have been reported to utilize the area (USACE 1985), and although no evidence was found during the August 2000 field survey, a single individual was observed on the left descending bank of Stony Creek during a subsequent site visit.

Black bear (*Ursus americanus*) scat was observed at the Waco Stone Quarry off Jericho Road and scat as well as evidence of grubbing and rooting on the saddle of Buckley Mountain. Anecdotal reports from local residents confirmed the regular observations of bears at these locations, including young cubs observed near Jericho Road.

Whitetail deer (*Odocoileus virginianus*) are abundant and were observed at the Waco Stone Quarry and along Knapps Creek. Hoof prints were observed throughout the entire project area and a single individual was observed crossing the Greenbrier River immediately downstream from the WV Route 39 bridge.

A single coyote (*Canis latrans*) was observed approximately 10 miles west of the project area. Given the capacity of coyote to adapt to human-influenced environments, it is reasonable to expect them to occasionally be within the project area.

Other small mammals observed within the project area include Eastern cottontail (*Sylvilagus floridanus*), Eastern chipmunk (*Tamias striatus*), woodchuck (*Marmota monax*), gray squirrel (*Sciurus carolinensis*), southern flying squirrel (*Glaucomys volans*), red squirrel (*Tamiasciurus hudsonicus*), and striped skunk (*Mephitis mephitis*).

Bats were observed at night although not collected for identification. The Hoary Bat (*Lasiurus cinereus*) was confirmed in the area during fieldwork because the animal exhibits a distinctive field mark making collection unnecessary for identification. As discussed below in Section 4.7.4, mist net surveys to ascertain the presence of Indiana bats were conducted in June 2001 resulting in collection of both the little brown bat (Myotis lucifugus) and big brown bat (Eptesicus fuscus).

4.7.4 Threatened and Endangered Species

An “endangered” species is one that is threatened with extinction throughout all or a significant portion of its range, while a “threatened” species is one that is likely to become endangered within the near future. The USFWS lists federally threatened and endangered species. Table 4-10 shows the six federally listed species that historically or potentially could inhabit Pocahontas County, however none are likely to occur within the Marlinton project area. Table 4-10 also shows the corresponding State of West Virginia rank for each of the listed species. The State does not designate species as threatened or endangered at the state level. The West Virginia Non-game Wildlife and Natural Heritage Program, part of the WVDNR’s Wildlife Resources Section, tracks federally listed, proposed and candidate species as well as those

rare on a state (S1, S2, etc.) or global basis using the methodologies employed nationally by the Natural Heritage Network.

Table 4-10. Occurrence of Federally Threatened and Endangered Species in Pocahontas County, WV..

Common Name	**Scientific Name**	*Federal Status*	*WV State Rank*	*Potential for Occurrence Within Project Area*
Eastern cougar	*Felis concolor*	LE	NR	Believed potentially extirpated from the Eastern U.S., it is extremely unlikely that this species would utilize the project area. Suitable habitat may exist within the more remote areas of the Monongahela National Forest.
Indiana bat	*Myotis sodalis*	LE	S1	There are no known caves used by Indiana bat in the project area. Suitable summer roost trees occur within the project area.
Running buffalo clover	*Trifolium stoloniferum*	LE	S2	Never confirmed in Pocahontas county, it is unlikely that this species would occur in the project area.
Virginia northern flying squirrel	*Glaucomys sabrinus fuscus*	LE	S2	This species is unlikely to be present in the project area because suitable high-elevation habitat does not exist in Marlinton.
Bald eagle	*Haliaeetus leucocephalus*	LT	S2B, S2N	The WV Breeding Bird Atlas (Buckelew et al, 1994) has no observations and no confirmed breeding of bald eagles in Pocahontas County.
Cheat mountain salamander	*Plethodon nettingi*	LT	S2	This species would not likely occur within the project area due to the lack of suitable habitat (i.e., high-elevation mountainous, red spruce or mixed deciduous forested areas with substantial leaf litter and ground cover).

Federal Status:
LE = Federally listed endangered
LT = Federally listed threatened
SC = Federal species of concern

WV State Rank:
S1 = extremely rare/critically imperiled in WV
S2 = very rare/imperiled in WV
S3 = somewhat vulnerable to extinction in WV
B = breeding populations in WV
N = non-breeding populations in WV
NR = no WV rank reported

Sources: USFWS 2001a, WVDNR 2001a

Seventeen federally listed Species of Concern[1] (Table 4-11) have been documented in Pocahontas County. Federal "Species of Concern," formerly called "Category 2 Candidates," are those that require further biological research and field study to resolve their conservation status before the USFWS would consider listing them as candidates for threatened or endangered status. Although the Federal *Endangered Species Act* does not mandate the protection of Federal species of concern, the USFWS encourages the consideration of such species in land management planning and natural resource conservation efforts.

[1] Species Of Concern are those species for which the Service has information indicating that protection under the *Endangered Species Act* may be warranted but for which it lacks sufficient information on status and threats to proceed with preparation of a proposed listing. On December 5, 1996 the Service announced their final decision to discontinue efforts to maintain a national list of these species. While species of concern lack formal recognition as candidates for possible future listing under the *Endangered Species Act*, the Service and cooperating State agencies encourage continued consideration of these species in environmental planning.

Table 4-11. Federally Listed Species of Concern in Pocahontas County, W.V.

Common Name	Scientific Name	*Federal Status*	*WV State Rank*
Ammon's tortula	*Tortula ammonsiana*	SC	S1
Appalachian cottontail rabbit	*Sylvilagus obscurus*	SC	S3
Butternut	*Juglans cinerea*	SC	S3
Eastern small-footed myotis	*Myotis leibii*	SC	S1
Eastern woodrat	*Neotoma magister*	SC	S3
Elktoe mussel	*Alasmidonta marginata*	SC	S2
Finescale saddled (Candy) darter	*Etheostoma osburni*	SC	S2
Glade spurge	*Euphorbia purpurea*	SC	S2
Green floater	*Lasmigona subviridis*	SC	S2
Greenbrier Valley cave pseudoscorpian	*Kleptochthonius henroti*	SC	S1
Hellbender	*Cryptobranhus alleganiensis*	SC	S2
Kanawha minnow	*Phenacobius teretulus*	SC	S1
Northern goshawk	*Accipiter gentilis*	SC	S1B, S1N
Pocahontas cave amphipod	*Stygobromus nanus*	SC	S1
Southern rock vole	*Microtus chrotorrhinus*	SC	S2
Southern water shrew	*Sorex palustris punctulatus*	SC	S1
Tapered cavesnail	*Fontigens holsingeri*	SC	NR

Federal Status:
LE = Federally listed endangered
LT = Federally listed threatened
SC = Federal species of concern

WV State Rank:
S1 = extremely rare/critically imperiled in WV
S2 = very rare/imperiled in WV
S3 = somewhat vulnerable to extinction in WV
B = breeding populations in WV
N = non-breeding populations in WV
NR = no WV rank reported

Sources: USFWS 2001a, WVDNR 2001a

The following paragraphs provide additional information about each endangered and threatened species, including current and historical populations, life history, current management plans, areas designated as critical habitat within the project area (if any), recovery plans, and whether the species is known to occur within the Marlinton project area.

Endangered Species

Eastern Cougar

The eastern cougar (*Felis concolor cougar*) once occurred from eastern Canada to Tennessee and South Carolina. The current range for the eastern cougar is limited to a few scattered areas at best and the exact population is not known (USFWS 2001b). The species is active at night and it has been observed to occupy a range of 25 or more square miles (65 sq. km). The eastern cougar prefers large, remote wilderness habitat with an adequate food supply of deer, small mammals, wild turkeys, and occasionally domestic livestock.

A recent joint USFWS and U.S. Forest Service (USFS) 5-year survey did not produce any concrete evidence for the existence of eastern cougar populations in the southern Appalachian Mountains from Virginia to northern Georgia (USFWS 2001b). In the southeast, the most likely location for a small permanent population is the Great Smokey Mountain National Park region. Although very unlikely, some individuals may reside within the Monongahela National Forest.

This species has not been documented within the project area near the town of Marlinton and it is extremely unlikely that any individuals be observed there. In addition, no critical habitat has been designated within or near the project area for this species.

Indiana Bat

The range of the Indiana bat (Myotis sodalis) includes much of the midwestern and eastern United States from the Ozark Mountains to southern Wisconsin and Michigan to central Vermont and south to northwestern Florida (WVDNR 2001b). West Virginia is on the edge of the range for this species. The Indiana bat was first documented in West Virginia in 1995 in Tucker County. It has since been reported from caves in eight counties, including Cass Cave and Martha's Cave in Pocahontas County.

The Indiana bat hibernates during the winter in caves that have stable winter temperatures (37-43 degrees F) and high relative humidity (66-95%). The bats begin to assemble in caves in mid-September, breed in early October, and enter hibernation by late-November. They gather in tightly packed clusters on the cave ceilings. Most bats disperse from caves in late March when the females form small colonies under loose bark in trees, where they raise their young. Males also form small colonies in hollow trees or under loose bark. Indiana bats feed on insects in wooded habitats, preferably along rivers. Since the 1950s, the major wintering bat caves of West Virginia have been destroyed, as the bats are very sensitive to disturbance during their hibernation. Repeated disturbances during hibernation deplete energy and leads to premature mortality. Other factors contributing to their decline may be the loss of summer habitat and contamination of their food supply by pesticides in agricultural areas. Despite these threats, recent studies indicate that bat populations in West Virginia are increasing because of protection efforts. The most recent bat recovery plan (October 1983) identifies major recovery goals including: (1) preserving critical winter habitat by securing primary caves and mines and restricting entry; (2) initiating an information/education program; and, (3) monitoring population levels and habitat (USFWS 2001c).

It is estimated that 94 percent of the West Virginia Indiana bat population winters in 13 caves, and a single cave in Pendleton County harbors over 90 percent of the West Virginia population (WVDNR, 2001b). Eight caves are closed to human traffic from September 1 to May 15 to protect the species. Public acquisition of privately owned caves is being negotiated to provide greater protection in West Virginia. Cass Cave and Martha's Cave, located in Cass and Hillsboro quadrangles (Pocahontas County), respectively, are Priority 3 caves (important for species survival but require further investigations). There are no known caves in the project area. Critical habitat has been designated for the Indiana bat in West Virginia, however none has been designated within Pocahontas County. A recent study sought to more extensively evaluate the Marlinton project area for possible Indiana bat summer habitat (i.e., roost trees near suitable feeding areas) and to assess the potential impacts to this species and its summer habitats from the project alternatives (R.D. Zande & Associates 2000). Quantitative habitat analyses, conducted for five forested transects within the project area, estimated that the density of potential roost trees (PRTs) averages 20.1 PRTs/acre, with a range of 0 PRTs/acre to 64.3 PRTs/acre. Using aerial photography to assess current land cover types, 39,476 PRTs were estimated to exist in the entire project area (average number of PRTs/acre multiplied by the number of forested acres). Of this total, approximately 919 PRTs could be impacted during flood protection construction activities. In addition, a qualitative, subjective habitat assessment of ten additional areas likely to be impacted by the construction of floodwalls and levees was

conducted. Of the ten sites assessed, two were given a moderate suitability rating and eight were given a low suitability rating for Indiana bat summer roosting habitat.

Running Buffalo Clover

Historically, running buffalo clover (*Trifolium stoloniferum*) occurred in Arkansas, Illinois, Indiana, Kentucky, Missouri, Nebraska, Ohio, and West Virginia; today known populations are limited to Indiana, Kentucky, Ohio, West Virginia and Missouri (USFWS 2001d). The plant is a perennial, stolon-forming clover that flowers May through July and then dies off in late summer/early fall. The plant usually grows in small clumps in disturbed, rich, moist soil in lightly wooded areas or on the edge of woods. Running buffalo clover has been found along old roads, old game trails, cemeteries, historical home sites, mowed paths, jeep trails, and old logging roads. It is thought that the plant was once associated with bison trails and the seeds were probably dispersed by these large herbivores. Although it generally grows in areas characterized by periodic mowing, trampling, or grazing, it has also been found on stream banks, floodplains and shoals (MDC 2001). Threats to this species are major disturbances that destroy the clover's habitat, and the maturation of habitat through succession.

As of July 1997, running buffalo clover is known from 25 sites within West Virginia, however three sites are pre-1945 and one hadn't been seen since 1985 (WVNHP 1997). Its mapped range includes Pocahontas County as well as Barbour, Fayette, Pendelton, Randolph and Tucker Counties. It is possible, however extremely unlikely, that this species occurs within the project area. During field reconnaissance (summer 2000), running buffalo clover was not observed at any time. In addition, no critical habitat has been designated within the Project Area for this species.

Virginia Northern Flying Squirrel

The Virginia northern flying squirrel (*Glaucomys sabrinus fuscus*) is a southern Appalachian subspecies of the northern flying squirrel. This subspecies is found only in Virginia and West Virginia. Listed as Federally endangered in 1985, this species is vulnerable due to its limited and discontinuous range. The Virginia northern flying squirrel is typically found in boreal habitat and in West Virginia is usually associated with red spruce and northern hardwoods (sugar maple, black cherry, American beech, black birch, and yellow birch). These habitat types tend to occur in areas over 2,800 feet in elevation, often near streams or rivers. Typical habitat is a moist evergreen or mixed forest with some mature trees, standing snags and downed logs; lichens and mosses are often abundant. Northern flying squirrels are omnivores but a major part of their diet consists of lichens and fungi. The squirrels are active the entire year and usually the peak of their daily activity is between sundown and midnight. They usually nest in tree cavities and woodpecker holes or dense branches in the tops of evergreen trees. Their home range can be 17 acres (6.9 hectares) or more.

The main threat to this subspecies is loss of habitat to timbering and development. Recent surveys have shown the subspecies to be more abundant than once thought. By 1996, there were 779-recorded captures at 84 sites in West Virginia, mostly in protected areas of the Monongahela National Forest (WVDNR 2001c). Under the present forest management plan, all habitats within 0.5 mile of a Virginia northern flying squirrel capture site are protected (WVDNR 2001c). The USFWS is reviewing the status of this subspecies to determine if it should be down-listed from endangered to threatened.

This species is unlikely to be present in the project area because suitable high-elevation habitat does not exist in the Marlinton vicinity. In addition, no critical habitat has been designated for this species in the project area.

Threatened Species

Bald Eagle

The bald eagle's historical range includes all of North America south of the Arctic Circle and their migration routes typically follow river systems or mountain ranges. Nests are characteristically used for many years and constructed in the largest living tree in an open span with an open view of the surrounding area and a clear flight path to the water (USFWS 2001e). Nest sites are protected on Federal lands such as National Forests and Parks.

The bald eagle is currently known to breed at only five sites in West Virginia, all located in the Eastern Panhandle (Grant, Hardy, Hampshire, and Mineral counties). There are records of observations of non-breeding eagles from most areas of the state, including Pocahontas County (Buckelew et al. 1994); no critical habitat has been designated for this species in Pocahontas County.

On July 6, 1999, the USFWS proposed de-listing the bald eagle (64 FR 36453) but a final decision has not yet been made.

Cheat Mountain Salamander

The Cheat Mountain salamander (*Plethodon nettingi*) is one of two species endemic to West Virginia (i.e., they are found only in West Virginia). Habitat is usually found on high mountain peaks (generally above 3,500 feet) where red spruce thrive or previously occurred and where the ground is covered with liverworts, leaf litter, fallen logs, and sticks (WVDNR 2001e). Any degradation to high-elevation red spruce or spruce/northern hardwood forests threatens the survival of this species.

There are approximately 65 known sites for the Cheat Mountain salamander in the mountainous areas of Tucker, Grant, Randolph, Pendleton, and Pocahontas Counties in West Virginia (WVDNR 2001e). The WVDNR is currently conducting surveys (including in the Monongahela National Forest) to monitor the populations and protect the habitat of the salamander. This species would not likely occur within the project area due to the lack of suitable habitat (i.e., high-elevation mountainous, red spruce or mixed deciduous forested areas with substantial leaf litter and ground cover). No critical habitat has been designated for this species in the project area.

4.8 CULTURAL RESOURCES

This section describes the previously recorded cultural resources within the vicinity of Marlinton. The Cultural Resources section includes a brief prehistoric and historical summary of the region, a description of the cultural resource investigations that have been performed in the area, and a description of known archaeological and architectural resources. A summary of an architectural reconnaissance report completed for the Marlinton LPP is also included.

Federal agency responsibilities with regard to cultural resources are addressed by a number of laws, regulations, executive orders, programmatic agreements and other requirements. The principal federal law addressing cultural resources is the *National Historic Preservation Act* (NHPA) of 1966, as amended (16 United States Code [USC] Section 470), and implementing regulations (36 Code of Federal Regulations [CFR] 800), that describe the process for identifying and evaluating historic properties, for assessing the effects of federal actions on historic properties, and for seeking consultation to avoid, reduce, or minimize adverse effects. The term “historic properties” refers to cultural resources that meet specific criteria for eligibility for listing on the National Register of Historic Places (NRHP). Section 106 of the NHPA requires that federal agency decisions affecting these properties consider cultural and historic values and the options available to protect the properties. Identifying, evaluating, and assessing effects of construction and operation of the Marlinton LPP on cultural resources is done in consultation with the State Historic Preservation Officer (SHPO) and other concerned parties.

4.8.1 Prehistoric/Historic Framework

Prehistoric Paleo-Indian artifacts dating back to 12,000 BC have been found within West Virginia, many along major river drainages and in similarly poor archaeological contexts. Primarily due to poor preservation, sites of this period are uncommon (Funk 1978; Harrison 1998; Robertson et al. 1990). Artifacts from the Archaic Period (8000-1000 BC) and the Woodland Period (1000 BC to AD 1000) are likely to have been poorly preserved as well. In West Virginia, the two dominant cultural traditions from AD 1000-1700 were Fort Ancient and Monongahela, followed by the Iroquois nations in the late 1600s (Callender 1978; Robertson et al. 1990; Stathakis 1996b).

The first white settlement west of the Allegheny Mountains consisted of a cabin at the mouth of Knapps Creek in 1749 shared for a time by Stephen Sewell and Jacob Marlin. The area of Marlinton was originally known as Marlin’s Bottom after its first white settlers. Fort construction during the French and Indian War, including one at Marlin’s Bottom did little to quell unrest between the settlers and natives. By the close of the Revolutionary War, most Indian groups had lost their land rights and were forced to leave (Comstock 1976; McBride et al. 1996; Robertson et al. 1990). The Greenbrier River at Marlinton was bridged in 1854-56. The first industries in the region consisted of various water-powered ventures, such as gristmills, sawmills, and tanneries. However, local agriculture was the dominant industry of this period (Comstock 1976; Pocahontas County Historical Society 1981; Robertson et al. 1990). Marlinton saw the passing of both Union and Confederate forces and witnessed the battle of Droop Mountain about 16 miles to the south. A number of Civil War graves can be found in Marlinton, near the NRHP listed Hunter House for example, as a reminder of the military presence.

Marlin's Bottom became Marlinton in 1887, and grew to become the county seat in 1891. County growth boomed with the establishment of Marlinton and the Greenbrier Division of the Chesapeake and Ohio Railroad (Conley 1929). The timber industry contributed heavily to the

development of Marlinton. The Pocahontas Tanning Company located at Marlinton in 1904 that included tannery buildings, workers' houses, and ponds. By the early 1900s, intense lumbering had stripped most of the valuable lumber from the region, leaving the mountains and ridge slopes susceptible to erosion. Agriculture became the dominant local industry (McNeel 1985; Pocahontas County Historical Society 1981). Reforestation, road and infrastructure improvements were enacted in the 1930s because of Civilian Conservation Corps job programs. Rail passenger service on the Greenbrier Division ended in 1958, unable to survive the hard blow of the Great Depression. Tourism and historic preservation have largely characterized the last forty years in the region (McNeel 1985).

4.8.2 Previous Cultural Resource Surveys

Six cultural resource surveys have been conducted in and around Marlinton since 1978 and are listed in Table 4-12. Figure 4-10 illustrates cultural resources identified through the previously conducted surveys. Six properties have been listed on the NRHP, and are identified in Figure 4-10: 1) Frank and Anna Hunter House, 2) IOOF Lodge Building, 3) Marlinton Chesapeake and Ohio Railroad Station, 4) Marlinton Opera House, 5) Pocahontas County Courthouse and Jail, and 6) Pocahontas Times Print Shop.

Archaeological Resources

A listing of the 20 previously recorded archaeological sites located near Marlinton is given in Table 4-13. These sites include both historic and prehistoric resources. Prehistoric site types include: earthworks, artifact scatters, and campsites. Two of 12 prehistoric sites have been determined to be not eligible for the NRHP. However, the 10 remaining prehistoric sites are unevaluated. Of the eight historic sites, most are related to railroad activities or structural remains from the late 19th to early 20th centuries. Two sites date earlier, Site 46PH34, Fort Greenbrier (ca. 1755), and Site 46PH471, Toll House/Store (ca. 1852). The two railway sites (46PH492 and 46PH493) have been determined to be not eligible for the NRHP, while two structural sites (46PH470 and 46PH471) were determined to be eligible, and the County Courthouse has been listed on the NRHP. The remaining four historic sites (46PH34, 46PH452, 46PH453 and 46PH454) remain unevaluated.

Table 4-12. Cultural Resource Investigations in Vicinity of Marlinton, WV

Project Type	Project Size	Fieldwork Date(s)	Survey Type	Report
Cultural Resources Overview (Monongahela Nat'l Forest	N/A	1978	Inventory	Davis Jr., R.P. Stephen, 1978 *A Cultural Resource Overview of the Monongahela National Forest, WV*
Identification, registration, and protection of Pocahontas County Historic Sites	34 Sites (16 Sites in or near Marlinton)	1986	Architectural Survey	Pocahontas County Historic Landmarks Commission, 1986
Land Exchange (Monongahela Nat'l Forest)	12 Sites	November 1989	Phase II NRHP Evaluation	Robertson, James A., 1990 *Cultural Resources Evaluation of Selected Prehistoric and Historic Archaeological Sites, Monongahela National Forest, Randolph and Pocahontas Counties, WV.*
Water Line Extension	N/A	October 1996	Phase I Cultural Resource Survey (Section 106)	Stathakis, Steven, 1996a *Phase I Archaeological Survey for the Campbelltown Addition Water Line Extension Project in Marlinton, Pocahontas County, WV.*
Proposed Sewer Line Extension	4,717 ft.	October 1996	Phase I Cultural Resource Survey (Section 106)	Stathakis, Steven, 1996b *Phase I Archaeological Survey for the Riverside Sewer Line Extension Project in Marlinton, Pocahontas County, WV*
Land Development	70 Acres	February 1998	Phase I Cultural Resource Survey (Section 106)	Harrison III, James G., 1998 *Phase I Archaeological Investigation of Approximately 70 Acres at the Snowshoe/Silver Creek Resorts Pocahontas County, WV*

Figure 4-10. National Register of Historic Places (NRHP) Listed Properties in Marlinton

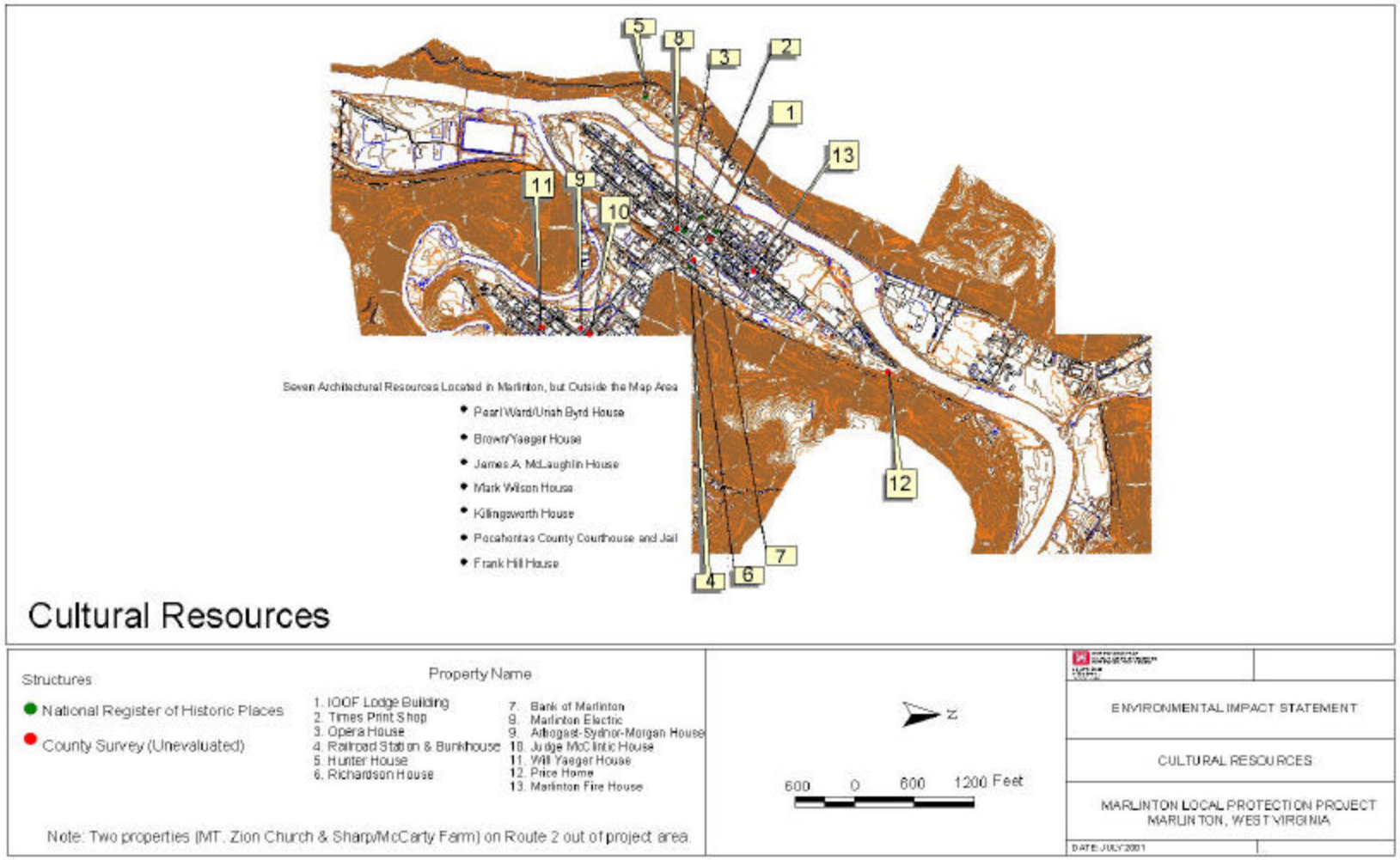


Table 4-13. Recorded Archaeological Resources

State Site No.	FS Site No.	Name/Description	Site Type	Cultural Affiliation	National Register Status	Site Condition
46PH4	-	Earth Mound	Earthwork	Unknown Prehistoric	Unevaluated	Disturbed
46PH5	04-012	Earth Mound	Earthwork	Unknown Prehistoric	Not Eligible	Destroyed
46PH6	-	Earth Mound	Earthwork	Unknown Prehistoric	Unevaluated	Disturbed (Plowing)
46PH7	-	Earth Mound	Earthwork	Unknown Prehistoric	Unevaluated	Disturbed (Road)
46PH8	-	Cairn	Stone Mound	Unknown Prehistoric	Unevaluated	Destroyed ca. 1890
46PH16	04-015	Marlinton/Burial	Campsite/ Burial	Unknown Prehistoric	Not Eligible	Disturbed
46PH17	-	Huntersville	Campsite	Unknown Prehistoric	Unevaluated	Destroyed
46PH34*	04-011	Greenbrier Fort	Military	Historic (circa 1755)	Unevaluated	Unknown
46PH333	-	South Turn North	Artifact Scatter	Unknown Prehistoric	Unevaluated	Disturbed
46PH334	-	South Turn South	Artifact Scatter	Unknown Prehistoric	Unevaluated	Disturbed
46PH452	04-030	Structure	Structure	Historic (circa 1920s)	Unevaluated	Undisturbed
46PH453	04-031	Abandoned Community	Structures	Historic (circa 1920s)	Unevaluated	Undisturbed
46PH454	04-032	Abandoned Community	Structures	Historic (circa 1920s)	Unevaluated	Undisturbed
46PH470*	04-086	County Courthouse	Structure	Historic (1893-1895)	Listed	Sound
46PH471	04-087	Toll House/Store	Structure	Historic (circa 1852)	Eligible	Sound
46PH558	-	Stony Bottom	Artifact Scatter	Unknown Prehistoric, Recent Historic	Unevaluated	Disturbed
46PH559	-	Campbelltown Ridge	Artifact Scatter	Unknown Prehistoric	Unevaluated	Disturbed
46PH560	-	Campbelltown Point	Artifact Scatter	Unknown Prehistoric	Unevaluated	Disturbed
46PH492	04-081	Abandoned Railroad	Railway	Historic (early 1900s)	Not Eligible	Disturbed
46PH493	04-082	Abandoned Railroad	Railway	Historic (early 1900s)	Not Eligible	Undisturbed

*These sites occupy the same location.
Source: Archaeological site files, West Virginia SHPO and USFS, Monongahela National Forest, Elkins District

Table 4-14 presents a summary of potential archaeological resources identified in oral interviews with local historians, conducted specifically for evaluation of the Marlinton LPP. These interviews suggest at least 13 potential archaeological resources may be near Marlinton. All but one of these resources was associated with commercial activities (i.e., tannery and lumber industries). The remaining resource is a cemetery, although it is not listed on current maps of the area. These potential sites date from the mid-19th to early 20th centuries. Much of the information acquired regarding these former building locations was obtained during interviews with local persons. These potential archaeological sites were at one time standing structures, though many are now destroyed. No further archaeological reconnaissance has been conducted to assess these areas. As such, these potential resources have not been evaluated with regard to the NRHP.

Table 4-14. Potential Archaeological Resources Identified in Interviews

Forest Service No.	County Survey No.	Name/Description	Year Built (Period)
04-008	-	Stillwell Mill	Early 1900s
04-107	-	Brown, Depp, & Swanson Mill	-
04-108	-	Limestone Mill	-
04-109	-	Marlinton Mill	-
-	C-0018*	Pocahontas Bank/1st Natl. Bank, Main St.	-
-	-	William & Pfifer Lumber Company	-
-	-	River Ford	1860-1865
-	-	Cemetery	1880s
-	-	Tannery	1904-1970
-	-	Tannery Houses	1904-1970
-	-	Republic Lumber Company	-
-	-	Marlinton Greenbrier River Lumber Co.	1900-1904
-	-	Campbell Lumber Company	1904-1914

* This potential resource had been documented as part of the County Architectural Survey but has since been destroyed. No archaeological evaluation has been conducted to date. Information based on personal interviews, principally with William Price McNeel, Fall 2000.

Architectural Reconnaissance Surveys

An architectural survey of existing buildings in Marlinton was conducted in 1986. This survey was sponsored by the Pocahontas County Historic Landmarks Commission with the intention to identify, register, and protect historic sites in the county. Based upon this survey and previous surveys, Table 4-15 lists the 22 previously recorded architectural resources located in the vicinity of Marlinton. These resources are listed by the USFS site number (FS Site No.), the Pocahontas County Survey No., or the West Virginia structure No. (if applicable). This table also lists the common name and/or description, the address or location of the resource, the year built, or period (if known), and the National Register status of each resource.

Table 4-15. Previously Recorded Architectural/Structural Resources

USFS Site No.	County Survey No.	WV Structure No.	Name/Description	Address/ Location	Year Built	National Register Status
04-089		120	Frank & Anna Hunter House (Pocahontas County Museum)	US Route 219	1903	Listed (5/13/76)
04-088		138	Pocahontas Times Print Shop	810 2nd Ave.	ca. 1900	Listed (9/22/77)
		186	Marlinton Chesapeake & Ohio Railroad Station & Bunkhouse	8th St. & 4th Ave.	1901	Listed (8/29/79)
	C-011	599	Pocahontas County Courthouse and Jail	900C 10th Ave.	1894-1940	Listed (7/15/94)
		727	IOOF Lodge Building (Peacock Building)	8th St. & 2nd Ave.	1905-1930	Listed (3/24/00)
04-091	C-026	728	Marlinton Opera House	800 3rd Ave.	1910	Listed (3/24/00)
	C-001		Bank of Marlinton	Main St.		Unevaluated
	C-003		Will Yaeger House	925 10th St.		Unevaluated
	C-004		Frank Hill House	1008 10th St.		Unevaluated
	C-006		C.W. Price Home	118 2nd Ave.		Unevaluated
	C-008		Marlinton Electric	812 3rd Ave.		Unevaluated
	C-0012		Killingsworth House	Rt. 39 & 10th Street		Unevaluated
	C-0013		Mark Wilson House	10th Ave. & Dead End		Unevaluated
	C-0014		James A. McLaughlin House	900 9th St.		Unevaluated
	C-0015		Brown Yaeger House	1105 10th St.		Unevaluated
	C-0016		Pearl Ward/Uriah Byrd House	707 9th Ave. & Rt. 39		Unevaluated
	C-0019		Ashby Sharp/Dewey S. McCarty Farm	Rt. 2		Unevaluated
	C-0025		C.J. Richardson House	309 8th Street		Unevaluated
	C-0032		Arbogast – Sydnor – Morgan House	812 9th Street		Unevaluated
			Mt. Zion Church*	Rt. 2	1835	Unevaluated
			Marlinton Fire House*	Not Recorded		Unevaluated
			Judge McClintic House*	811 9th St.	1906-1908	Unevaluated

* Resource documented on state inventory forms but not evaluated for NRHP.
Source: Standing structure site files West Virginia State Historic Preservation Office and US Forest Service, Monongahela National Forest, Elkins District.

The architectural resources considered sensitive include residential, civic, and commercial properties from the first half of the 20th century. The six properties listed on the NRHP date back to the early 20th century. Sixteen additional properties remain unevaluated for the NRHP. Of these, 13 were documented during the 1986 county survey and the remaining were documented at various times in the last 25 years. These architectural resources include houses and commercial structures.

In addition to past architectural surveys, an architectural reconnaissance survey and report was completed in June of 2001, in consultation with the SHPO. All properties within the project area of potential effect were viewed. Properties older than 50 years were photographed and classified as either: 1) individually eligible to the NRHP; 2) contributing resources of a potential historic district; 3) non-contributing resources/non-historic resources; or 4) requiring additional research to determine status.

Table 4-16 summarizes the properties identified in the June 2001 architectural reconnaissance as potentially eligible for NRHP listing. Locations of the properties are listed in Table 4-16. While some of the properties identified as potentially NRHP eligible had already been identified in previous studies, additional properties and neighborhoods were also identified through the during the reconnaissance. In the commercial center of Marlinton it was noted that several individual buildings are already NRHP listed, and others appear potentially eligible or require additional research to determine eligibility. No NRHP eligible historic district exists in the commercial area. To the north of the commercial core, the Tannery Row worker housing identified with the former U.S. Leather Company (dating back to 1904) was identified as the best surviving example of worker's housing in the project area. In addition, a limited number of individual residences to the north and south of the commercial core were identified as potentially NRHP eligible. The report states that a NRHP eligible historic district likely exists in the residential area surrounding the Pocahontas County Courthouse. A number of residences in this area also appear to be individually eligible for NRHP listing.

Table 4-16. Potential NRHP Eligible Sites from June 2001 Architectural Report

COE No.	WV HPIF No.[1]	Site Name
Potentially Eligible Ecclesiastical Properties		
C-33-1		Marlinton Presbyterian Church
60131		Marlinton United Methodist Church
60048		Rock Church
C-241		St. John's Episcopal Church
Potentially Eligible Commercial Properties		
C-2		Richardson Building
C-6		Bank of Marlinton
C-48		Marlinton Electric Company
C-68		Marlinton Post Office
C-114		Rambler Showroom
Potentially Eligible Residential Properties that are not located in an Historic District		
C-59		Old Clark Inn Bed and Breakfast
132		2nd Avenue Residence
135.1		2nd Avenue Residence
168		Near intersection of 2nd Avenue and 12th Street[2]
172		Near intersection of 2nd Avenue and 12th Street
173		Near intersection of 2nd Avenue and 12th Street
174		Near intersection of 2nd Avenue and 12th Street
175		Near intersection of 2nd Avenue and 12th Street
176		Near intersection of 2nd Avenue and 12th Street
177		Near intersection of 2nd Avenue and 12th Street
203		3rd Avenue, stone Arts and Crafts bungalow
266		8th Street and 10th Avenue, alleged pre-Marlinton tavern
Potentially Eligible Courthouse Neighborhood Historic District		
252		2 story, brick Arts and Crafts bungalow
254		Judge McClintic House, 811 9th Street
255	10032	Arbogast House, 812 9th Street
256	10014	Yaeger House, 900 9th Street
258		2 story Arts and Crafts bungalow
259		2 story brick foursquare
262		2 story frame Victorian
306		2 story frame Classical Revival
309	1004	Frank Hill House, 1008 10th Avenue
319		Prairie style, brick bungalow
323		2 story brick foursquare
424	10015	Brown Yaeger House, 1105 10th Avenue
429	1003	Captain Smith/Will Yaeger House, 10th Street
435		2 story, brick commercial building
60060		Pocahontas County Courthouse
No #		Mark Wilson House, 10th Avenue
300.1-300.2		Recently built apartment homes, 10th Ave. between 9th and 10th Streets
Potentially Eligible Worker's Housing and Manufacturing Related Buildings		
37-43, 45-57		Worker's houses, Upper Tannery Row (20 residences)
C-41.1		Tannery related building, North 2nd Avenue

[1] West Virginia Historic Properties Inventory Form Number
[2] Potential Historic District may exist at intersection of 2nd Avenue and 12th Street, including structures 168-177.

4.9 SOCIOECONOMIC RESOURCES AND ENVIRONMENTAL JUSTICE

This section describes current socioeconomic conditions within Pocahontas County and the town of Marlinton, which is where the majority of potential Marlinton LPP workforce is expected to reside, based on proximity to the site and historic employment patterns. Pocahontas County, the third largest county in West Virginia, covers an area of 940 square miles (2,444 square kilometers); (U.S. Bureau of the Census 1997b). Marlinton is the county seat and largest commercial center in Pocahontas County. It is also one of four commercial centers on the Greenbrier River, the others being Hinton, Ronceverte, and Alderson.

4.9.1 Population and Housing

The population of Pocahontas County peaked at about 15,000 in 1920 but has since declined with the reduction of the timber and tannery industries in the area and the Federal acquisition of lands for the Monongahela National Forest (USACE 1996). The population of Marlinton peaked at 1,645 in 1950 but has declined since then to a population of 1,204 in 2000. The West Virginia population increased only 0.8 percent from 1990 (1,793,477) to 2000 (1,808,344) (U.S. Department of Commerce 2000). Recent population variations in West Virginia are reflected in the populations shown for Marlinton and Pocahontas County. Younger residents continue to leave the region in search of better employment opportunities. Table 4-17 shows recent population figures for Marlinton, Pocahontas County, and West Virginia.

Table 4-17. Recent Town, County, and State Population Levels

	1970	1980	1990	2000
Marlinton	1,286	1,352	1,148	1,204
Pocahontas County	8,870	9,919	9,008	9,131
West Virginia	1,744,237	1,949,644	1,793,477	1,808,344

The Bureau of the Census classifies Pocahontas County as rural because it has no communities with more than 2,500 residents. Structures are generally older and of lower value than the state or national average. Census 2000 housing data indicates that 84.5 percent, or 552, of the 653 housing units within Marlinton are occupied, while only 50.5 percent, or 3,835, of the 7,594 housing units in Pocahontas County are occupied. Of the occupied houses in Marlinton, 61.2 percent, or 338, are owner-occupied, while the remainder are renter-occupied. Of the 101 vacant houses in Marlinton, 23 are used for seasonal purposes. In Pocahontas County, owner-occupied housing accounts for 80.3 percent, or 3,079 houses and 2,998 of the 3,759 vacant houses are used on a seasonal basis (U.S. Bureau of the Census 2000). Census 1990 data shows that the median value of owner-occupied housing units in Pocahontas County was $42,000 (USACE 1994). As of 1990, approximately 57 percent of Marlinton's owner-occupied homes were valued at less than $50,000. Thirty-five percent were valued from $50,000 to $100,000 (U.S. Bureau of the Census 1990).

4.9.2 Employment

Recent unemployment rates for Pocahontas County, West Virginia, and the nation are shown in Table 4-18. The unemployment rate for Pocahontas County in 1999 was 7.7 percent, which was slightly above West Virginia's 6.7 percent and well above the national rate of 4.2 percent. From 1980-1999 there was a 13 percent increase in the number of people employed in Pocahontas County. During the same time period, employment in West Virginia increased 11 percent and in the United States, 37 percent. Unemployment has increased recently in

Pocahontas County. The April 2000 civilian labor force for Pocahontas County totaled 4,400, of which, 9.8 percent (430) were unemployed (Bureau of Business & Economic Research 2000).

Table 4-18. County, State, and National Unemployment Rates

	1982	1991	1999
Pocahontas County	11.6	14.8	7.7
West Virginia	13.9	10.5	6.0
United States	9.7	6.7	4.2

Source: Bureau of Labor Statistics, 2001

Employment increased in Pocahontas County in the 1980's with a net gain of 700 jobs. Marlinton officials reported that the loss of two major employers in Marlinton in 1995 resulted in a loss of approximately 600 jobs. In 1980, services, construction, and manufacturing represented the major employment sectors of Pocahontas County. By the late 1990s, services, government and manufacturing represented the three largest sectors in the Greenbrier Region (Condon et al. 2000). There were 1,262 persons working in the service industry in Pocahontas County in 1990. By 1999 the number of service industry employees increased to 1,789, which is an increase of 42 percent. The service industry is the highest employing sector in Pocahontas County, with the majority of the employment based on tourism.

Sectors that are associated with tourism, such as retail trade, services, and real estate, offer the most potential for the County. Industrial employment within the county is not expected to grow significantly because of difficulty of access to major transportation routes and major markets and lack of developed industrial sites.

4.9.3 Community Services

The education level attained by residents of Pocahontas County is below that of the State. Based on 1990 statistics, 60.6 percent of the county population held at least a high school diploma (compared to 66.0 percent for the State of West Virginia) and 9.7 percent held at least a bachelor's degree (compared to 12.3 percent for the State of West Virginia). According to the West Virginia Department of Education (1999), within the Pocahontas County school system, 1,480 pupils were enrolled countywide with a pupil to teacher ratio of 13.8:1 (West Virginia Department of Education 1999).

Other community services within Pocahontas County are relatively sparse, due to the small, spread-out population of the county. The Pocahontas Memorial Hospital is located approximately 3 miles (5 kilometers) south of Marlinton. The hospital has 40 beds serviced by four doctors and has an average daily occupancy of 12 patients (AHA 1995, AMA 1996). The Pocahontas Continuous Care Center provides medical services to elderly residents and is located within Marlinton. The county fire and police departments are also located within the town of Marlinton.

4.9.4 Environmental Justice

Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Population and Low-Income Populations*, directs federal agencies to identify and address, as appropriate, disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority population and low-income populations. The Corps incorporates environmental justice considerations into both the technical analyses and

public involvement activities in accordance with EPA and Council on Environmental Quality guidance (CEQ 1997).

The CEQ guidance defines "minority" as individual(s) who are members of the following population groups: American Indian or Alaskan native, Asian or Pacific Islander, Black, not of Hispanic origin, and Hispanic (CEQ 1997). The Council defines these groups as minority populations when either the minority population of the affected area exceeds 50 percent or the percentage of minority population in the affected area is meaningfully greater than the minority population percentage in the general population or other appropriate unit of geographical analysis.

Low-income populations are identified using statistical poverty thresholds from the Bureau of the Census Current Population Reports, Series P-60 on Income and Poverty (U.S. Bureau of the Census 2000). In identifying low income populations, a community may be considered either as a group of individuals living in geographic proximity to one another, or a set of individuals (such as migrant workers or Native Americans), where either type of group experiences common conditions of environmental exposure or effect. The threshold for the 2000 census was an income of $11,531 for a family of two and $17,761 for a family of four. These thresholds are weighted averages based on family size and ages of the family members. The average household size for Marlinton and Pocahontas County is 2.0 and 2.3 respectively (U.S. Bureau of the Census 2000). Per capita income in the county was $20,921 in 1999. Previous census data indicate that Pocahontas County is not an area of extreme poverty but has an unusually high proportion of population with income slightly above poverty, but less than average income. Estimated poverty levels from 1997 indicate that 17.5 percent of the population of Pocahontas County was below the poverty level, which is higher than the statewide level of 16.8 percent and the nation-wide level of 13.8 percent.

The population of Marlinton is comprised of mostly white residents, with 26 members (2.2 percent) of minority populations residing within the town. The largest minority segment is the African American population with 14 members, or 1.2 percent of Marlinton's population (U.S. Bureau of the Census 2000).

4.10 RECREATIONAL AND SCENIC RESOURCES

Pocahontas County, with over 940 square miles (2,400 square kilometers), is the third largest county in the state. The county is rich in natural resources and is an attraction for fishermen, campers, hunters, skiers, and spelunkers. Nearly the entire county lies within the Monongahela National Forest, which encompasses many acres of state forests and parks. The following seven state parks and forests comprising over 35,900 acres (14,400 hectares) are located, at least in part, within Pocahontas County: Beartown State Park; Cass Scenic Railroad State Park; Droop Mountain Battlefield State Park; Greenbrier River Trail State Park; Watoga State Park; Seneca State Forest; and Calvin Price State Forest. Five wildlife management areas (WMA) operated by USFS are partly or completely within Pocahontas County: Cranberry WMA; Little River WMA; Neola WMA; Rimel WMA; and Tea Creek WMA.

Pocahontas County and the surrounding region possess an abundance of natural areas, as indicated by the presence of the sources of eight rivers within county borders. The county is rich in recreation and tourist resources, with the focus on the natural amenities of the Greenbrier River. In its assessment of the river for "Wild and Scenic" classification, the U.S. Forest Service characterized the Greenbrier River as having "outstandingly remarkable" resources. That

assessment identified 199 miles of streams within the river basin that met the criteria for designation as a Wild and Scenic River (USACE 1996), however no sections of any rivers within Pocahontas County have obtained the Wild and Scenic designation.

Recreational resources within Pocahontas County but outside of the project area include the Monongahela National Forest, Highland Scenic Highway, Cranberry Glades Botanical Area, Edray Fish Hatchery, and the Pearl S. Buck Museum, and various major ski resorts, among others. Skiing is a major recreation resource of the county and is in reasonably close proximity for much of the East Coast population. The Monongahela National Forest borders the town approximately 1 mile (1.6 kilometers) to the north and east and is also located approximately 5 miles (8 kilometers) to the west. The Highland National Scenic Highway runs through the Monongahela National Forest to the north and west of Marlinton. The highway is closest to Marlinton at its eastern terminus on U.S. Route 219, approximately 5 miles (8 kilometers) northwest of the town.

Recreational resources within Marlinton and Riverside include the Greenbrier River Trail, Greenbrier River, Knapps Creek, Stony Creek, Marlinton Municipal Park, Marlinton Elementary School Field, and Marlinton Roadside Park. Previous recreational studies concluded that recreation within the Greenbrier River corridor was “light,” despite its high potential to provide recreational opportunities. General isolation of the region and extreme variation in water flow volumes, (i.e., ranging from severe periodic flooding to extremely low flows) were identified as primary constraints to enhanced usage of the corridor for recreational purposes.

The Greenbrier River Trail is estimated to receive approximately 3,200 visits annually or 2,600 recreation visit-days (USACE 1996). The trail passes through numerous small towns and traverses 35 bridges and two tunnels as it winds its way along the valley. Throughout much of its length, the trail is directly adjacent to the Greenbrier River and is surrounded by peaks of the Allegheny Mountains. Most visitors are from local areas and use the trail for relatively short distances and time frames. Restrictions on motorized use, scenic views, presence of wildlife and degree of trail maintenance were cited as the greatest attributes of the trail while the limited number of restrooms and camping facilities, and need for additional law enforcement and better trail surface maintenance were identified as preferences for improvements. Overall, the Greenbrier Trail and its associated activities are seen as important economic development resources of the area as several businesses are in operation for outfitting, equipment rentals, and lodging in support of trail users within Marlinton (USACE 1996).

The landscape surrounding the town of Marlinton and the community of Riverside is comprised of several steep hills, while the landscape of the majority of the town itself is relatively flat. A small section on the east side of Marlinton sits atop a small ridge and is elevated approximately 60 feet (18.3 meters) higher than the rest of the town. The project study area would be located along the banks of the Greenbrier River and Knapps and Stony Creeks. These locations are visible from almost every point within Marlinton and Riverside. However, they are not visible to a great extent beyond the town. The large hills and mountains surrounding the town restrict views of the water bodies from long distances. Buckley Mountain is the part of the project area that is visible from the greatest distance, although the hilly terrain limits views of this mountain from great distances.

4.11 HAZARDOUS, TOXIC, AND RADIOACTIVE WASTES

The Corps has conducted a Phase I Hazardous, Toxic, and Radioactive Waste (HTRW) investigation of 117 tracts of land that would fall within the contractor work limits of the alternatives (USACE 1999). The Phase I Environmental Site Assessment provides a review of the properties to identify conditions that could indicate a potential for materials being present that are regulated under the *Comprehensive Environmental Response, Compensation, and Liability Act* (CERCLA), *Resource Conservation and Recovery Act* (RCRA), and/or other environmental laws and regulations.

For each of the target properties, a research of the ownership history was conducted. The data for the historical property uses were obtained from discussions with owners, occupants, and former occupants of the properties, and chain-of-title information. Six properties within the area of investigation were found to have a history of industrial use. A Federal and state environmental records database search was also conducted for each of the target properties. Of the databases that were searched, two active underground storage tank (UST) sites, one active leaking underground storage tank (LUST) site, and one inactive LUST site were identified for the target properties. The database search did not reveal any other apparent environmental concerns that would affect any of the potential construction activities.

Based on field observations, record review process, interviews, and historical information, there were four properties (Tracts 1-39, 12-6, 7-1 and 7-1.1) within the Marlinton project area where potential HTRW concerns were identified.

Tract 1-39

Currently owned by the Pocahontas Development Corporation, this property is located east of the Greenbrier River and west of 2nd Avenue. The tract is bounded on the north by 3rd street, on the south by 6th street, on the west by the Greenbrier River, and on the east by 2nd Avenue. This tract has historically been the location of several tanneries (Union Tanning Company and International Shoe between 1909 and 1970) that used natural vegetable tanning agents and more recently, the location of two shoe manufacturing facilities (Hanover Shoe, Inc. and West Virginia Shoe Company).

The surface and subsurface soils on the property have potential for being contaminated with chemicals and other materials used in the tanning process and in shoe manufacturing. There exists the possibility that vats, a UST, and other material from the former tanneries are buried on site. Stressed vegetation is evident in two small areas (6 feet x 8 feet [1.8 meters x 2.4 meters] and 2 feet x 2 feet [0.6 meters x 0.6 meters]).

Tracts 7-1 and 7-1.1

Two adjacent properties owned by the Town of Marlinton and the Pocahontas Development Corporation respectively are the location of the Marlinton's wastewater treatment lagoons and the Marlinton Municipal Park. The properties are west of Stillwell Rd (Co. Rt. 39/2) and south of Knapps Creek on the Greenbrier River's left descending bank.

These areas were used historically for land disposal of spent tanning liquor and other wastes generated during leather tanning operations on Tract 1-39. Between 1961 and 1970, wastes were pumped from Tract 1-39 through a series of piping/lift stations southward along the east bank of the Greenbrier River and ultimately into series of settling ponds. The wastes were then sprayed onto a 55-acre (22 hectare) tract of land that is currently the Marlinton Municipal Park.

Interviews with former tannery employees and records at the WVDEP Office of Water Resources indicate that chemicals other than natural vegetable tanning agents were also used at the International Shoe Company. Large volumes of sulfuric acid, dyes, oils, and other chemicals used in trial treatment technologies for spent vegetable tannins were used at the tannery and may have been disposed of at this location.

Tract 12-6

Owned by Burns Properties, this tract is located east of, and adjacent to, US Highway 219 and west of, and adjacent to, along the right descending bank of the Greenbrier River. Extending approximately 1,400 ft along Rt. 219, Burns Motor Freight, Foodland grocery store, and Fast Break Texaco all are currently located on the property. Two oil/water separator sump areas are the main concern on this tract because of the shallow depth of groundwater. Leaks from the sumps of petroleum-products (diesel and oil organics) would be easily adsorbed onto the soils potentially entering the groundwater.

As a result of the findings of the Phase I investigations, Phase II investigations were conducted on the Burns Motor Freight property (Riverside, Tract 12-6) and the former tannery property (Tract 1-39) in Marlinton. Ground penetrating radar (GPR) and additional soil sampling identified no contaminants above regulatory limits at the Burns Motor Freight property (Tract 12-6). At the tannery property (Tract 1-39), a GPR survey identified several small and large anomalies throughout the site. The large anomalies are thought to be USTs or drums, however conclusive identification could not be made with the GPR results. Additional investigations would be necessary to conclusively identify the anomalies on the site. Soil sampling at this property revealed concentrations of total petroleum hydrocarbons – diesel range organics (THP/DRO) which were above the West Virginia Underground Storage Tank regulatory limit of 100 ppm THP. Arsenic concentrations were also detected above regulatory limits at the tannery property.

4.12 HEALTH AND SAFETY

The Greenbrier River has a long history of severe flooding. At Marlinton, in the upper reach of the Greenbrier River, warning times for floods are short, yet floodwater volumes can be significant because of the large drainage area. The most severe floods occurred in 1812, 1877, 1985, and 1996.

The November 1985 flood was the flood of record at Marlinton. Five deaths are attributed to this flood. Additionally, during this event and the Flood of 1996, water service to the town was disrupted for several days. The destruction caused by flooding, and its ongoing threat, has caused businesses to leave town and the Pocahontas County Hospital to relocate from the heart of downtown.

The health and safety impacts to those remaining in flood prone areas associated with flooding can be numerous, and include outbreaks of infectious diseases, injuries from debris and drowning. Chemical hazards from hazardous or industrial chemicals released in a flood event are also possible.

Fortunately, major outbreaks of infectious diseases are uncommon after flooding disasters in the United States. The most common health impacts occurring from floods affect the gastrointestinal system and are caused by contact with contaminated surfaces and subsequent

ingestion of contaminated food or water. The town's sewage treatment lagoons are located in the southern (downstream) part of the project area and in the event of a flood partially treated sewage could be released, contaminating the surface water.

There is also a potential exposure to disease caused by vector-borne insects such as mosquitoes, which tend to multiply to the increase in breeding areas caused by floodwaters. After flooding, there is also an increased risk of getting tetanus from flood-related injuries and exposure to contaminated floodwaters, and the threat of respiratory diseases from the growth of molds and fungi increases. In addition to the physical and chemical hazards that pose potential risks during floods, there is also the potential health impact of stress. Stress associated with displacement and property damage can increase the risk of getting other more serious diseases.

4.13 INFRASTRUCTURE

Numerous roads, including several that are less than 500 feet (152 m) from the Greenbrier River and Knapps Creek shorelines transect the Town of Marlinton. Since the majority of the town itself is located within the 100-year floodplain (424 residential and nonresidential structures) and thus the streets are as well.

The main line of the sewer system in Marlinton parallels the shorelines of the Greenbrier River and Knapps Creek. The Marlinton Water Treatment Plant, owned and operated by the Town of Marlinton, is located on the right descending bank of Knapps Creek. The town's sewage treatment facility is located along the Greenbrier River southeast of the Knapps Creek/Greenbrier confluence.

The Greenbrier River Trail is 75-mile (120.7-kilometer) constructed on abandoned railroad and is used for recreation. The trail follows the Greenbrier River and crosses over Knapps Creek via a bridge approximately 1,200 feet from the confluence of the two streams.

As part of the Marlinton LPP, the existing storm water system within Marlinton was evaluated to determine the adequacy for incorporating the existing system into the proposed interior drainage design. The combined sanitary/storm water system suffers from numerous capacity inefficiencies and environmental concerns (USACE 2001).

4.14 TRAFFIC AND TRANSPORTATION

This section discusses the existing modes of transportation within Marlinton and Riverside and focuses on the areas that would be affected by a flood control project. The most recent traffic level data are also discussed.

Roadways

The major roads through the Marlinton and Riverside area include one U.S. highway, two State roads, and one county road. The main north-south highway through the area is U.S. Route 219, which runs along the west side of the Greenbrier River and Riverside. U.S. Route 219 is also the main north-south crossing of Stony Creek and connects the Riverside area to the Campbelltown neighborhood along the north bank of Stony Creek. Stony Creek is also crossed by Pocahontas County Route 15, which extends east from U.S. Route 219 at an intersection in

Riverside. The main east-west route through Marlinton is West Virginia State Route 39, which enters Marlinton from the east, crosses over the Greenbrier River and joins with U.S. Route 219 and continues south. The other main road, West Virginia Route 39/2, runs south from an intersection with WV Route 39 near the Marlinton Elementary School and crosses Knapps Creek near the Pocahontas Continuous Care Center. From this point, it runs south adjacent to Buckley Mountain and along the east side of the Greenbrier River. All of these major roads are two lane highways.

Other roads in Marlinton and Riverside are primarily paved, two-lane, residential streets. The majority of the roads in Marlinton are numbered with avenues running north-south and streets running east-west. The avenue numbers ascend from 1st Avenue, located along the Greenbrier River, to the east and the street numbers ascend from the north to the south. WV Route 39 is designated as 8th Street and State Route 39/2 is designated as 5th Avenue in Marlinton. There are three traffic lights within Marlinton, all placed along WV Route 39, with one located at the intersection with U.S. Route 219, which is the busiest intersection in the project area. There are also a few streets within Marlinton that do not follow the numbering system. One of these is called Tannery Row, which follows the left descending bank of the Greenbrier River in the north end of Marlinton. Marlinton and Riverside also contain several small, unpaved back roads and some alleys.

Railroads

At one point in time, the railroad was vitally important to the businesses of Marlinton. This time has passed, however, and railroads no longer operate in the area. The railroad has since been converted to the Greenbrier River Trail under a program sponsored by West Virginia's Rails-To-Trails Council. The Greenbrier River Trail runs north-south through Marlinton, crosses Knapps Creek downstream of State Route 39/2, and continues along Buckley Mountain to the west of State Route 39/2. By agreement, the Greenbrier River Trail and its appurtenances (bridges, tunnels, etc.) must be maintained to meet railroad criteria so that the railway could be placed in service again should it become economically feasible.

Traffic

Vehicle traffic on the roads in the project area is relatively light and intermittent. The exceptions to this are the major roads in Marlinton and Riverside, U.S. Route 219 and State Route 39. Table 4-19 provides average daily and peak hourly traffic data for these roads. Peak hourly traffic occurs during the rush hour periods of 7:30 to 9:30 AM and 4:30 to 6:30 PM on weekdays.

Table 4-19. Traffic Counts for Major Routes in Marlinton and Riverside

Route	Location	Average Daily Traffic	Peak Hourly Traffic
U.S. Route 219	North of WV 39	5,500	450-500
U.S. Route 219	South of WV 39	3,300	300-350
WV Route 39	Downtown Marlinton	6,000	500-550
WV Route 39	East of 5th Avenue	2,500	N/A

Source: WVDOT 2000

4.15 FUTURE WITHOUT CONDITIONS

The without project condition is defined as the most likely condition expected to exist in the future in the absence of a flood control project at Marlinton. This section forecasts the without project conditions and is used as a benchmark for comparison to the alternatives considered in this report.

The population of Pocahontas County has slightly increased since 1970 (3 percent), but over this same period the employment has increased considerably (15 percent). The major increase in employment has occurred since 1990 and is attributable to the growing tourist industry. The county has one of the major ski resorts in the Eastern United States, and there also are several state parks and forests in this county. Projected population increase for Pocahontas County is modest over the next several decades (6% by 2040), but employment is projected to significantly increase (40% by 2040). This favorable increase in county employment is related to the tourist industry, and in particular the large ski resort complex north of Marlinton. Employment increases will involve not only workers at the ski resort, but other tourist related development (shops, restaurants, etc.) along the primary access roads, US 219 and WV 39. A proposed industrial park at Edray near Marlinton also should stimulate commercial growth in the county as well as the need for housing and infrastructure. Most development and employment opportunities associated with tourism and the industrial park, however, are expected to be in the surrounding area near the major access roads and not in Marlinton.

In contrast to the optimistic economic outlook for Pocahontas County, the future business climate at Marlinton is more subdued. Marlinton population has generally decreased since 1970 (minus 6 percent), nevertheless population was slightly greater in 2000 than in 1990. Population at Marlinton is projected to decrease slightly over the next decades through 2040 (minus 4 percent). However, the employment situation is bleaker, with projections indicating a decreasing pattern through 2040 (minus 7 percent). This employment trend apparently means that while Pocahontas County will prosper as a result of the flourishing tourist industry, Marlinton will not be a party to the overall growth. This gloomy outlook can be attributed almost entirely to the lack of flood-free development opportunities within the Town of Marlinton. While the service industry related to tourism is the largest employment segment in Marlinton, there appears to be little opportunity for expansion. The most recent development in Marlinton (restaurant, drug store, etc.) were raised above flood level by filling the site. While effective, this type of development is expensive, and future opportunities are limited because of the scarcity of sites and the flood insurance regulations which discourage development in flood prone areas. While total employment in Marlinton shows substantial growth since 1980 (15 percent), projected employment indicates a decreasing pattern through 2040 (minus 7 percent).

The apparent employment trend is that while the county will prosper as a result of the booming tourist industry, the Town of Marlinton will not be a participant in the overall economic growth. This outlook can be attributed almost entirely to the lack of flood-free development opportunities within Marlinton. The service industry directly related to tourism comprises the largest employment segment in Marlinton. However, due to the regulation of floodplain development as part of the flood insurance program, and general public awareness of the hazard associated with major events such as the 1985 flood, any development in the main business district of Marlinton, even with pressures from tourism, will be limited.

Land use in the project area has changed little over the past 30 years and this would be expected to continue for the future without condition. Some properties within Marlinton (i.e. hospital) were abandoned after the 1985 flood. Future flooding, the risk of flooding, and rising cost for insurance could result in more abandonment of properties. Similarly, limited development along the streams in the project area would be expected. Therefore the quality, and perhaps quantity, of riparian habitat could be expected to improve, except for recurring floods that destroy riparian habitat.

5.0 PLAN FORMULATION

This section summarizes the planning process by which project alternatives were developed and analyzed to arrive at a selected plan.

5.1 PROBLEMS, NEEDS, AND OPPORTUNITIES

The Greenbrier Basin has a long history of flooding. The Town of Marlinton, situated in the heart of the Greenbrier Basin, has experienced persistent, devastating floods since it was established. However, the two largest known floods have been recent occurrences. In November 1985, the flood of record at that time occurred throughout the entire basin. It was a devastating flood of 350-year frequency, with five deaths being attributed to the flood event. Damages caused by this flood have been estimated at over $100 million (October 2001 price level) throughout the basin. Since virtually the entire town of Marlinton lies within the flood plain, damaging effects of the 1985 flood were tremendous. An estimated 95% of the residences and businesses in the Town were damaged during the 1985 flood, with inundation depths reaching 8 feet (2.4 m) or more in many structures. Damage estimates for Marlinton from the 1985 flood range from $35 to $40 million. Another major flood occurred in January 1996, with basin wide damages also estimated to exceed $100 million. A second major basin-wide flood occurred later that year in May. During the 1996 events, flood heights were actually greater in some locations than in 1985, but at Marlinton the November 1985 event remained the flood of record.

During these major flood events, homes and businesses in Marlinton received extensive damages and some were completely destroyed causing severe financial losses to the residents and business owners. In addition to the severe financial losses incurred due to the frequent flooding in the area, there is an adverse psychological effect of the population. The prospect of future flooding discourages proper maintenance and repair of structures. This in turn causes a deterioration of dwellings and business structures. Few businesses are willing to locate in the area due to the threat of future flooding. In addition to the financial burden caused by flooding, major floods result in hazards to health and even loss of life. A flood control project for the Town of Marlinton would indirectly increase the quality of the housing stock in the area and increase the development opportunities and retail shopping opportunities for both the residents of Marlinton and Pocahontas County.

5.2 PLANNING OBJECTIVES

Based upon the identified problems, needs, and opportunities within the study area, the desires of local interests, and the intent of the aforementioned authorization, the following planning objectives have been established for this study:

- develop the most cost-effective, implementable plan to provide flood protection for the Town of Marlinton to the level of the 1985 flood as specified in WRDA 96 and all other applicable laws and regulations;
- reduce financial and personal losses to residents and businesses due to flooding;
- maintain the social and cultural resources of the Town of Marlinton;
- minimize the social and economic disruptions within the Town of Marlinton project area; and

- develop the most socially acceptable and environmentally sound flood control plan for the Town of Marlinton.

5.3 PLANNING CONSTRAINTS

- Alternative plans must provide flood protection to the level of the 1985 flood as per WRDA 96;
- Alternative plans must be formulated using Corps' planning guidance;
- Alternative plans should be compatible with provisions of the National Flood Insurance program (NFIP);
- The selected plan should have support from the Town of Marlinton, Pocahontas County and the State of West Virginia; and
- Non-Federal sponsor(s) must have capability of sharing project cost and assuming operation and maintenance responsibilities.

5.4 ALTERNATIVES

This section discusses all concepts and alternatives considered in the planning process for the Marlinton flood control project. Section 5.4 is divided into three main sections which discuss the initial, intermediate, and final screening processes used to determine and define all reasonable alternatives that could meet the Congressional direction to provide flood protection to the level of the 1985 flood of record for the Town of Marlinton. Costs for these alternatives were developed during initial screening without the benefit of detailed engineering studies such as geotechnical investigations, detailed hydrologic and hydraulic information, or HTRW investigations.

5.4.1 Alternatives Considered (Initial Screening)

This section discusses alternatives initially considered in the planning process (See Section 3.0 Prior Studies and Reports).

5.4.1.1. Mainstem Dams and Reservoirs

After the 1985 flood, study efforts focused on mainstem dams and reservoirs, including both wet (multipurpose) and dry dam (flood control only) concepts, on the Greenbrier River upstream from Marlinton. Several dam sites were considered including just upstream from Marlinton at River Mile (RM) 100 and 119, and at RM 132 above Cass. A dam at either the RM 110 or RM 119 sites would control discharge from an event equal to the 1985 flood at Marlinton. However, with no control on Knapps Creek considerable damage would occur at Marlinton from flood discharges of this tributary stream even with a mainstem dam. The drainage area controlled at the Cass site (RM 132) is approximately 50% less than at the other sites. Consequently, the ability to control 1985 flood discharges at Marlinton would be considerably reduced.

The best overall mainstem site for either the multipurpose reservoir or the dry dam was determined to be located at RM 119, about 11 miles (17.7 km) upstream from Marlinton. The Corps'
1994 Evaluation Report indicated that a dry dam with 4 inches (10 cm) of runoff storage was economically feasible, however as mentioned above, would not protect Marlinton from flooding from Knapps Creek. The multipurpose reservoir provides greater overall benefits but the development cost is about one-third more, resulting in an uneconomical project. However, mainstem impoundments were not expressly included within the authorization language in WRDA 1996 under which this report is prepared and were therefore not considered further.

5.4.1.2 Tributary Impoundments

In the 1980's, investigations of impoundments on Greenbrier River tributaries were initiated along with mainstem dams. Two broad schemes have been formulated for tributary streams. One involves small dams (similar to NRCS projects) in headwater streams. The most feasible plan included 13 small tributary impoundments upstream of Marlinton with drainage areas of less than 25 sq. miles (65 sq. km) each. Another scheme involves somewhat larger impoundments (drainage area of 25-50 sq. miles or 65-130 sq. km) located on seven tributaries above Marlinton. Neither of these schemes would result in significant reduction in the 1985 flood levels at Marlinton. Nevertheless, the tributary scheme, with two impoundments on Knapps Creek, which has a drainage area of 67 sq. miles (174 sq. km), would greatly reduce flood discharges on that tributary at Marlinton. Prior studies concluded that neither a mainstem dam nor a tributary impoundment system could independently control 1985 flood levels at Marlinton. However, a mainstem dam at site RM 119 together with two tributary impoundments on Knapps Creek could provide the desired flood control at Marlinton. This plan was eliminated from further consideration because mainstem dams were not expressly included within the congressional authorization of this study.

5.4.1.3 Floodwalls/Levees

The concept of a local protection project at Marlinton was first investigated under Section 205 of the Corps of Engineers Continuing Authorities and documented in a Draft Detailed Project Report (DPR) in September of 1985. That report concluded was that a levee/floodwall plan was not economically feasible and the most feasible local protection project was channel widening. However, after the devastating 1985 flood of record, it became apparent that channel improvement projects would have little effect on major flood events and study efforts were then directed more to large-scale basin-wide solutions.

Following two major flood events in 1996, Congress authorized the Corps in the WRDA 1996 to investigate and implement flood reduction projects at several locations in the Greenbrier Basin, including Alderson, Marlinton and Ronceverte. The results of these investigations were documented in a Limited Evaluation Report, December 1997. The most cost-effective plan was developed for each community, however only the project at Ronceverte was determined to be economically feasible and provided positive net benefits.

A levee/floodwall project at Marlinton would be highly effective in controlling and reducing damages from a major flood event. This alternative includes levee/floodwall combinations to protect the Town of Marlinton and the community of Riverside along the right descending bank. The project at Marlinton would have a total length of about 10,000 feet (3050 m) including 5,000 feet (1500 m) of floodwall along lower Knapps Creek. The Riverside levee/floodwall section would be about 5,800 feet (1,770 m) in length. A possible variation for this alternative is a

diversion of Knapps Creek through Buckley Mountain directly to the Greenbrier River. This alternative with either variation would provide nearly complete protection for Marlinton against a recurrence of the record flood of 1985. Although past studies have indicated that this alternative is not economically feasible, it was retained for further consideration because it was one of the most effective means of reducing flood damages at Marlinton.

5.4.1.4 Channel Improvements

Widening of the Greenbrier River at Marlinton was investigated in the early 1980's and the results presented in the September 1985 draft DPR. Various widths and lengths were investigated, but the most feasible plan consisted of an improved channel 300 feet (91 m) wide and 2,600 feet (790 m) long. This alternative would provide only a 25-year level of flood protection. Most of the Town of Marlinton lies within the 100-year floodplain; therefore, this channel-widening alternative would have a limited effect at Marlinton reducing damages from major floods. To appreciably reduce major flood levels, the channel widening would have to be on the order of 800-1,000 feet (240- 300 m) wide. Such an unrealistic channel size would necessitate acquisition of the majority of the Town of Marlinton and was therefore not considered further

5.4.1.5 Nonstructural Measures

Nonstructural alternatives have been considered for the Town of Marlinton at various times over the last two decades. These measures have included floodproofing, floodplain evacuation, and flood warning and emergency evacuation plans. Floodproofing of residential and non-residential structures means elevating the structure in place or relocating the structure to a flood-safe area. Floodplain evacuation simply means the property is acquired. Properties are acquired when certain criteria isn't met for floodproofing the structure. In a floodproofing/floodplain evacuation program, the property would be acquired if: 1) floodproofing costs would exceed its fair market value, 2) the structure was unsound and could not physically be raised, or 3) the height of raise exceeds 12 feet (3.6 m) above ground elevation. For larger commercial, public or industrial structures, individual protection measures such as ringwalls or veneer walls are often considered. Nonstructural measures have been used extensively in southern West Virginia in areas where development is linear and lies outside of major community centers. However, for densely developed community areas, such as the Town of Marlinton, nonstructural projects have included commercial redevelopment sites and/or housing and community redevelopment sites as well as structural components such as floodwall /levee sections to retail the social, cultural, and economic viability of the project area.

In the 1994 Evaluation Report, nonstructural measures were evaluated and documented for four different levels of protection, up to and including the 100-year event. A complete nonstructural plan for Marlinton was estimated to cost in the range of structural alternatives and was not economically feasible even when formulated for lower-level frequency events. It was also recognized that nonstructural measures that include floodproofing and permanent floodplain acquisition only would cause unacceptable socio-economic impacts. In Marlinton, because of the legislative requirement to raise the structures' first floor above the 1985 flood elevation and the proximity of the non-residential structures to other buildings in town, ringwalls and veneer walls are not practicable. Therefore, approximately 95% of the non-residential structures would have to be acquired in a plan that includes floodproofing and permanent floodplain evacuation. The Town of Marlinton is the county seat and is the commercial hub for county residents. Major loss of the business district in Marlinton would cause a significant socio-economic impact to Pocahontas County.

A river corridor management plan, while largely nonstructural, can involve measures such as a flood warning system of which one has already been installed for Marlinton and the entire Greenbrier River Valley. Another concept is to facilitate the transition of land use from urban to a more open use consistent with flood risk. Severely damaged structures could be demolished or removed and the future use of evacuated lands limited to environmental or recreational purposes. Such a concept provides an incentive for owners of severely damaged properties not to rebuild in flood-prone areas.

Other nonstructural plans that could be developed for the Town of Marlinton would include a commercial redevelopment site in order to preserve the business district or the relocation of all of the structures within Marlinton that received first floor flooding during the 1985 event. These alternatives were recommended for further consideration because of their ability to meet the WRDA 96 direction of providing a 1985 level of protection to the Town of Marlinton.

5.4.1.6 Summary of Alternatives Considered (Initial Screening)

A mainstem impoundment site at RM 119 would provide significant reduction in flood levels at Marlinton. However, the potential for major flood damages would remain because of uncontrolled discharges on Knapps Creek. This alternative is the most costly of all options considered and would not provide Marlinton complete protection against a recurrence of the 1985 flood. Further, this alternative does not meet the congressional authority requirements, which did not allow for consideration of mainstem impoundments. Consequently, the alternative was dropped from further consideration.

Tributary impoundments provide some flood reduction on the Greenbrier River mainstem, but would not make significant reductions for major floods at Marlinton. Two of the tributary impoundments were located on Knapps Creek and these would effectively control major flood discharges from that tributary at Marlinton. However, it would take a combination of these two impoundments and a mainstem dam to provide the desired flood reduction at Marlinton for a recurrence of the 1985 flood. Such a combination plan would be very expensive with the total cost approaching $200 million and mainstem dams were not expressly included within the of authorization for this study. Therefore, tributary impoundments were dropped from further consideration.

Floodwalls and levees are two of the most effective means of limiting the devastating effect of major floods at Marlinton. Such alternatives would protect the downtown business district as well as the Riverside community along the right descending bank of the Greenbrier River. Plans can be developed for a levee/floodwall combination along Knapps Creek or a diversion of Knapps Creek directly to the Greenbrier River eliminating the need for barriers along Knapps Creek. Provided that the levee/floodwall alignment minimizes the impact on existing structures, this alternative is strongly supported by the local interests. This alternative is not only more effective in reducing flood damages at Marlinton than mainstem or tributary impoundments, but also much less costly than those alternatives. A levee/floodwall project was initially estimated to cost $50 to $60 million, less than other alternatives considered. Consequently, a combination levee/floodwall alternative at Marlinton was retained for more detailed investigation.

Widening the channel of the Greenbrier River at Marlinton to 300 feet would provide an estimated 25-year level of protection but would have very little effect on major floods such as occurred in 1985 or 1996. This alternative has a much lower cost than most other options. However, the potential for significant damages during major flooding would continue and not

fulfill the requirements of WRDA 96. Therefore, this alternative was dropped from further consideration.

Nonstructural measures can be effective in reducing flood damages by elevating structures or relocating them away from the flood hazard. These techniques have been used in the Tug Fork Basin of the Huntington District since 1985 and costs for such measures are well established. It should be noted that for densely developed communities or major business centers in the Tug Fork Basin, combinations of floodwalls, flood-safe resettlement and floodproofing are being implemented to avoid unacceptable socio-economic impacts. However, because nonstructural measures are considered to have fewer natural environmental impacts and have proven to be effective for other areas of WV, nonstructural measures including relocating to a flood-safe site and redevelopment of the business district were retained for more detailed investigation. A summary of the initial screening of alternatives is provided in Table 5-1.

Table 5-1
Initial Screening of Alternatives

	Alternative	Description	Flood Reduction Effectiveness [1]	Development Cost	Environmental Impacts	Social Impacts	Local Support	Conclusion
1	Multipurpose Reservoir	Site 119 Greenbrier River	Moderate	Very High ($100 –135M)	Significant	Significant	Strong	Dropped [2]
2	Dry Flood Control Dam	Site 119 Greenbrier River	Moderate	High ($60 –100 M)	Significant	Moderate	Weak	Dropped [2]
3	Upstream Impoundments	7 Tributary Sites	Low	Very High (>$125 M)	Significant	Moderate	Weak	Dropped
4	Levees/Floodwall	Marlinton/ Riverside	High	Moderate ($50 - 60 M)	Moderate	Low	Strong	Retained
5	Channel Improvements	Marlinton/ Riverside	Low	Low (~$10 M)	Significant	Low	Weak	Dropped
6	Floodproofing/ Relocation	Marlinton/ Riverside	High [3]	High ($80 – 100 M)	Low	Significant	Mixed	Retained

[1] Reduction of flood damages at the 1985 design flood at Marlinton
[2] Not within authority of 1996 WRDA
[3] Effectiveness dependent on participation rate

5.4.2 Alternatives Evaluated (Intermediate Screening)

This section discusses the evaluation of those alternatives retained from the initial screening (Section 5.4.1.6). This level of plan formulation required additional technical information, including more detailed design, developing an updated venture level cost estimate, and an initial assessment of social and environmental aspects, to determine which alternatives are reasonable and should be considered in further detail.

5.4.2.1 Levee/Floodwall

This alternative is a levee/floodwall combination that would provide protection to downtown Marlinton and the Riverside community. The Marlinton sections include a levee extending along the Greenbrier River and the right descending bank of Knapps Creek. There also is a section of floodwall along Knapps Creek where residential development limits the construction of a levee. The levee/floodwall plan includes one pump station and seven gate closures for streets and highways. The Riverside section extends downstream along Stony Creek and the right descending bank of the Greenbrier River, crossing Route 219 to high ground. This section includes two portable pumps and two gate closures for Airport Road and Route 219. This alternative would protect about 88% of the structures, both residences and businesses that were flooded in November 1985. The remainder of the structures would be acquired for project construction. Environmental impacts include some loss of riparian, upland and old-field habitat from construction of the levee/floodwall and from soil and rock borrow; some temporary aquatic impacts from placement of stone slope-protection; and other temporary impacts during construction such as noise, dust and other air quality impacts, and traffic. In addition, this alternative has significant impacts to aesthetic and socio-economic resources. The initial estimated cost of this alternative was $50 million (October 2001 price level).

5.4.2.2 Levee/Stream Diversion

This alternative has levee/floodwall components similar to the previous alternative, but includes a diversion channel for Knapps Creek instead of a levee and floodwall bordering Knapps Creek. The protective levee for the Riverside section is the same as previously described. The Marlinton levee section extends downstream along the Greenbrier River, crosses Knapps Creek near the mouth, and ties to high ground at the Greenbrier Trail (old railroad embankment). A diversion channel would be constructed through nearby Buckley Mountain directly to the Greenbrier River to carry floodwaters on Knapps Creek away from Marlinton. The diversion channel would sever the Greenbrier River trail and the Marlinton Municipal Park. A concrete diversion dike would be constructed across from Knapps Creek just downstream of the channel entrance, and when closed it would divert high flows through the channel. A gated conduit through the dam would allow continuation of normal low flows along the lower reaches of Knapps Creek. A large pump station near the mouth of Knapps Creek would be required to pump the “bank full capacity” of Knapps Creek during flood conditions. This plan would protect about 88% of the structures damaged during the 1985 flood, with the remaining structures to be acquired for project construction. Public facilities and highways would be extensively affected by this alternative. A new highway bridge for WV 39/2 (Stilwell Road) as well as a new footbridge for the Greenbrier trail would be constructed across the diversion channel. Access between severed portions of the Marlinton Municipal Park would be provided by construction of a combination vehicular/pedestrian bridge. This alternative requires construction of the levee/floodwall, the diversion channel and borrow/construction areas. Environmental and social impacts from this alternative would be similar to the levee/floodwall alternative discussed above, however impacts to Knapps Creek from diversion of flow would be much greater. In addition,

the diversion channel would impact additional bottomland. The initial estimated cost of this alternative was approximately $50 million (October 2001 price level).

5.4.2.3 Floodproofing/Acquisition

In the initial screening, the floodproofing/floodplain evacuation plan was considered to have significant socio-economic impacts. However, because it met the WRDA 96 level of protection, this plan was developed to a venture level and a cost estimate was prepared. The plan is described in the paragraphs that follow and is included for comparison purposes to the other plans being considered.

This alternative involves floodproofing or floodplain evacuation for residential structures and non-residential structures. This would be a voluntary program and eligible structures would be those with a first-floor elevation at or below the elevation of the 1985 flood of record. Eligible residences that are structurally sound would be raised in place, elevating the first floor above the flood of record, to a maximum of 12 ft (3.6 m) above ground surface. Residential structures would be acquired and removed if: 1) the structures are not structurally sound, 2) the height of raise is greater than 12 ft (3.6 m), or 3) the cost of raising is greater than the acquisition cost. Non-residential structures are evaluated using the same criteria but there is a wider range of floodproofing methods available. Veneer walls can be used to floodproof an individual structure to a maximum of depth of 3 feet (0.9 m), and ringwalls can be used where there is sufficient land to construct. Any structure located in the regulatory floodway, residential or non-residential, would be acquired and removed, if the owner chose to participate.

This plan is based on an estimated 275 residences and over 100 non-residential structures. In developing the plan, structures were evaluated based on the aforementioned criteria for floodproofing. Because of the need to raise the first floor above the 1985 flood elevation (8 feet or 2.4 meters in many structures) and the close proximity of the non-residential structures to other buildings in town, ringwalls and veneer walls are not practicable. Therefore, approximately 95% of the non-residential structures would only be eligible for acquisition. In addition, streets and utilities would continue to receive damages. Because a non-structural program would be voluntary, not all owners would be expected to participate therefore reducing the effectiveness of this alternative. Local replacement housing and developable commercial land within Marlinton is scarce and homeowners and businesses could therefore choose to leave the area. Natural environmental impacts from this alternative would be minimal because project construction would be confined to developed areas. Socio-economic impacts, however, would be expected to be significant due to the expected loss of tax base and much of the Town's main business district. The Town of Marlinton is the county seat and is the commercial hub for county residents. Major loss of the business district in Marlinton would cause a significant impact to Pocahontas County. The cost for comparison purposes of the Marlinton floodproofing/floodplain evacuation plan was estimated to be $84 million (October 2001 price level), assuming 100 percent participation.

5.4.2.4 Commercial Redevelopment/Floodproofing

This nonstructural plan differs from the previous alternative in that a flood-safe site within Marlinton would be developed and non-residential structures would have the opportunity to relocate to the site rather than be acquired. This plan was developed to maintain the viability of the business district in Marlinton. An area of about 15 acres (6 hectares) in the northern part of Marlinton would be elevated on an engineered fill to create a commercial redevelopment site that would be safe from a recurrence of the 1985 flood. A new bridge crossing the Greenbrier

River would provide a direct connection to US 219 through Riverside. Owners of commercial structures would be given the option of relocating to the redevelopment site and the Town of Marlinton would be responsible for site development. Utilities would be provided for the site (sewer, water, electricity, etc.). The plan includes construction of a new municipal building and in-place floodproofing with a ringwall around the elementary school. The eligible residential structures in Marlinton would be floodproofed or evacuated from the floodplain as discussed in Section 5.4.2.3. The Riverside section would be protected by a combination levee/floodwall. Businesses in the downtown section of Marlinton that choose not to relocate would continue to receive flood damage. There would also continue to be residual damage to streets and utilities. Natural environmental impacts from this alternative would be more significant than with the floodproofing and floodplain evacuation plan due to the large amount of fill required for the redevelopment site. Socio-economic impacts would be very high because the community would be disrupted throughout the construction and relocation process, however, the commercial business district would be preserved and the Town would have the opportunity to plan for future expansion. The cost for the commercial/redevelopment plan was estimated to be $124 million (October 2001 price level), assuming 100 percent participation.

5.4.2.5 Town Relocation

A third nonstructural plan involves the relocation of both residential and non-residential structures to a flood-safe site, a “new town” concept. Five sites were evaluated and the most feasible site for new development was in the vicinity of Edray, adjacent to US 219 about 3 miles (4.8 km) north of Marlinton. The plan for a new town included residential site development, roads and streets, and installation of utilities. The owners of eligible residential and non-residential structures would have the option of relocating from their current flood hazard area to the flood-safe site. Institutional structures would be relocated under a relocation contract. The developed site would be adequate in size to accommodate all those who would choose to relocate, as well as provide space for new development. All structures in Marlinton not affected by a recurrence of the 1985 flood would remain in place. The Town of Marlinton would have the responsibility of maintaining services for those structures and the residents that remain in the old town as well as at the new site including fire, ambulance and utilities. Once residences and businesses have been acquired, the owners would have the option to relocate somewhere other than the Edray redevelopment site. Natural environmental impacts would be moderate and primarily associated with development of the new site that is mostly field habitat. Initially, socio-economic impacts would be significant because this alternative would divide the community into two areas and about half of the residents of Marlinton would no longer be near the core of the town. Furthermore, individuals and businesses could choose not to relocate to the “new town” thus further fragmenting the community. The cost of the town relocation plan was estimated to be $132 million (October 2001 price level), assuming 100 percent participation.

5.4.2.6 Summary of Alternatives Evaluated (Intermediate Screening)

<u>The levee/floodwall alternative</u> would protect all of Marlinton, including the Riverside area on the west bank of the Greenbrier River, from flooding to the level of the 1985 flood. The plan would significantly reduce post-flood cleanup and emergency cost. Residents would be relieved of potential flood hazard and the cost of individual flood insurance. Environmental impacts would be moderate. Disruption of the community would occur only during the construction period of a levee/floodwall project. However, the aesthetic environment of the town would be significantly impacted. This is the least costly of all alternatives evaluated and one of the most effective at

reducing flood damages. Therefore, the levee/floodwall alternative was retained for evaluation as one of the final alternatives.

The levee/stream diversion plan would also protect all of Marlinton and Riverside from the record flood of 1985. The levee components along the Greenbrier River are the same as for the previously discussed alternative. The major difference with this alternative is that a diversion channel and diversion dam would replace the levee/floodwall along Knapps Creek. This alternative is more costly because of the diversion structure and the channel to be constructed through Buckley Mountain and the need for greater pumping capacity for Knapps Creek. In addition, the environmental impacts are more significant, thereby requiring more costly mitigation features. This alternative was, however, the second least costly plan evaluated at this level in the study. Because of its effectiveness and cost this plan was retained for evaluation as one of the final alternatives.

Floodplain evacuation and floodproofing of flood prone structures could significantly reduce damages from future floods. However, success of such an alternative is dependent on several factors including the ability to actually floodproof non-residential properties and other large structures such as banks, municipal buildings and churches and the willingness of homeowners to participate in a voluntary program. Residential structures can be floodproofed by raising the structure in place if: 1) the structure is sound, 2) the height of raise is 12 feet (3.6 m) or less (first floor must be above 1985 flood level), 3) the cost is less than that of acquiring the structure and finally, 4) if the owner is willing to participate. The cost of the nonstructural alternatives is based on 100% participation in order to compare it to the other alternatives for effectiveness. Similar programs in other areas of the Huntington District have demonstrated that actual participation is much less, often not more than 75% of eligible structures. Owner participation of businesses and large public buildings is even less because in many instances it is physically impractical or cost prohibitive to floodproof those large structures, for example, building size, building configuration, construction methods, structural condition, and inundation depths. Many large non-residential structures are eligible for acquisition and public buildings eligible for relocations. Further, because the authorization for the Marlinton flood control project requires protection to the flood of record (1985 flood), ringwalls and veneer walls are not possible (excessive height required and close proximity of the buildings). In the Marlinton project area, an initial assessment showed that 95% of the businesses could not be floodproofed in place and would have to be acquired. It is unlikely that those businesses could relocate within Marlinton due to the lack of flood-safe land.

Residences not floodproofed would continue to receive flood damages and many businesses, which cannot be floodproofed, would be acquired. In many instances, the acquired businesses would not re-open. The net result would be considerable less commercial use in the downtown section of Marlinton resulting in loss of employment and tax income for the town. In addition, highways, streets, and utilities would continue to receive residual flood damages and the hazards associated with major flooding would continue even in the areas where homes have been raised and businesses floodproofed. Access during emergencies would be restricted and the potential for loss of life would remain. A floodproofing program with less than 100% participation would have an overall cost less than the estimated $84 million for the considered alternative, but such a program would not be effective in reducing damages from major floods and does not meet the legislative direction set forth in WRDA 96. Such a program does not have wide spread acceptability among the local interests and citizens of Marlinton. Because of the significant socio-economic impacts due to potential elimination of the business district and disruption of the residential community, this alternative has been dropped from further consideration.

The commercial redevelopment/floodproofing alternative would allow the flood prone businesses to relocate to an engineered fill in northern Marlinton that would be raised above the elevation of the 1985 flood. This would allow businesses to remain together in a commercial center rather than be individually floodproofed or scattered by relocation. However, residential structures would not be relocated to this raised area, but either raised in place or acquired as previously described. This alternative would not be as permanently disruptive to the local business community as a floodproofing or acquisition program. However social disruption would be significant and the town would expect the loss of residents and businesses during implementation. Furthermore, at a cost of $124 million, the redevelopment alternative was one of the more costly plans considered at this level. Therefore, commercial redevelopment/floodproofing was dropped from further consideration.

The town relocation alternative allows both businesses and residences to be relocated to a flood-safe site near Edray, maintaining somewhat the character of a small town. Residential and business owners would have the option of relocating to the Edray site, but there is no assurance that enough owners would be interested to make this alternative viable. The plan includes full development of the residential area, but commercial development would be the responsibility of business owners and the Town of Marlinton. All structures in Marlinton not affected by the 1985 flood would remain in place, so the Town would have the responsibility of maintaining services in the existing community as well as the “new town” site. Because this alternative is estimated to cost $132 million, much more than any other plan considered, and the socio-economic impacts were deemed unacceptable, it was dropped from further consideration. A summary of the intermediate screening of alternatives is provided in Table 5-2.

Table 5-2
Intermediate Screening of Alternatives

Alternative	First Cost [1] (Millions)	Residual Damages	Environmental Impacts	Social Impacts/ Community Disruption	Conclusions
Levee/Floodwall	$ 50	Low	Moderate	Minor, Acquisition of some residences & businesses	Low cost. Plan retained
Levee/Stream Diversion	$ 50	Low	Significant impacts to Knapps Creek	Minor, Acquisition of some residences & businesses	Low cost. Plan retained
Floodproofing/Acquisition	$ 84	Moderate [2]	Minor	Major [2], Commercial district decimated. Most businesses cannot be floodproofed.	Unacceptable social impacts. Plan Dropped
Redevelopment/ Floodproofing	$124	Low [2]	Moderate	Major, Temporarily disruptive to businesses	High cost Plan Dropped
Town Relocation	$132	Low [2]	Moderate	Major, Most businesses to relocate. Divided residential community	High cost/high social impacts. Plan dropped

[1] October 2001 price level
[2] Based on participation rates

5.4.3 Final Array of Alternatives (Final Screening)

Based on the previous analysis, only levee/floodwall alternatives were determined to be acceptable and capable of implementation. Two levee/floodwall plans were developed with more detailed information and are discussed below along with No Federal Action, or the "without project" condition. With the development of these plans using more detailed engineering information, the cost estimates for the alternatives in the final array were revised. These two structural plans, Alternative 1 and Alternative 2, and the no action alternative are considered in detail in the remainder of this report.

5.4.3.1 Levee/Floodwall (Alternative 1)

Alternative 1 is a levee/floodwall combination that would protect downtown Marlinton and the Riverside area. The level of protection for Alternative 1 is the design flood, or the 1985 flood of record. The Marlinton levee would begin upstream of Second Avenue and would follow along the left descending bank of the Greenbrier River downstream approximately 6,000 ft. (1,830 m) to the mouth of Knapps Creek, then up the right descending bank of Knapps Creek to high ground near the end of Tenth Avenue, a total length of about 10,400 ft (3,170 m). About 1,500 ft. (457 m) of floodwall would be constructed along Knapps Creek where development would preclude construction of a levee section. Four openings with gate closures for streets and the Greenbrier River Trail would be required on the Marlinton side of the project. In addition, a stoplog closure would be required at 11th Street for access to the water intake for the town's water treatment plant. *(See Figure 5-1)*

The Riverside section would begin upstream on Stony Creek at US 219 and continue along the right descending bank of Stony Creek to the Greenbrier River, then along the right descending bank of the Greenbrier River downstream crossing US 219 to high ground, for a total of about 5,800 ft (1,770 m). The Riverside section would have two openings with gate closures for US 219 and Airport Road.

A pump station located near the mouth of Knapps Creek would handle interior drainage behind the Marlinton section. The pump station would have a total capacity of 31,500 gallons per minute (GPM) or 119,000 liters per minute, or three -10,500 GPM pumps (40,000 liters per minute) with an interceptor system. Interior drainage for the Riverside levee section would be handled by two 20,000 GPM (76,000 liters per minute) portable pumps using a sump and interceptor system.

Alternative 1 would provide protection for Marlinton against a recurrence of the 1985 flood of record. This plan would protect about 88% of the structures (residences and businesses) that were flooded in 1985 and still remain. Acquisition of 93 tracts including both residential and nonresidential improvements would be necessary to construct the levee and floodwall sections. Acquisitions also would be necessary for potential staging and borrow areas and for project induced high water. Construction of the plan would require the relocation of utilities (sewer, water, electric, etc.) and a small roadside park adjacent to the WV 39 bridge at the entrance to town.

The revised first cost of this Alternative based on more detailed engineering is estimated to be $76 million based on October 2001 price levels. The estimated annual cost is $6.1 million, including $80,500 for annual operation and maintenance (O&M). The O&M requirements for this plan include operation, maintenance, and replacement of pumps

for interior drainage and the gated closures, as well as mowing of the levee and maintenance of the floodwall.

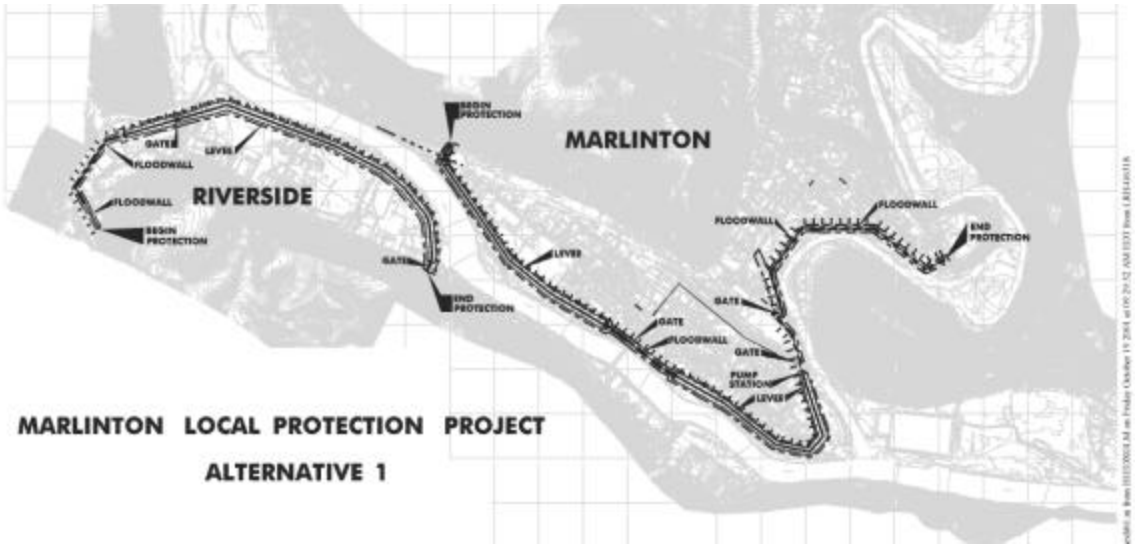


Figure 5-1.

5.4.3.2 Levee/Stream Diversion (Alternative 2)

Alternative 2 includes levee/floodwall components similar to Alternative 1, but provides for the diversion of lower Knapps Creek flood flows in lieu of the levee/floodwall section along Knapps Creek. The Riverside levee section is the same as Alternative 1. The Marlinton levee section would begin upstream of Second Avenue and extends downstream crossing Knapps Creek near the mouth and then to high ground at the Greenbrier River Trail embankment at Buckley Mountain. This levee section is approximately 6,800 feet (2,070 m) long and has two street openings with gate closures. In place of a levee/floodwall along Knapps Creek, floodwaters from the creek would pass through a diversion channel directly to the Greenbrier River. The diversion channel would begin about 1 mile (1.6 km) above the mouth of Knapps Creek, and extend approximately 2,500 feet (760 m) through Buckley Mountain and across the floodplain to the Greenbrier River 0.4 miles (0.6 km) downstream from the mouth of Knapps Creek. The channel would be 100 feet (30 m) wide at base and the deepest cut through the mountain would be 180 feet (51 m). A weir at the diversion channel entrance would prevent the normal flow of Knapps Creek from entering. A stilling basin to dissipate the energy from high flow and reduce the potential for erosion would be constructed where the diversion channel exits the mountain. *(See Figure 5-2)*

A diversion dam would be located approximately 400 feet (122 m) downstream from the channel entrance to direct high flows through the channel. During preliminary analysis this structure was designed as a stone dike which would divert flow up to the level of the 1985 flood through the diversion channel. Following more detailed design analysis, it was determined that to meet State of West Virginia dam safety requirements, the structure would have to safely pass the Probable Maximum Flood (PMF). The resulting

design is a concrete dam and stilling basin, approximately 500 feet wide (152 m) and 26 feet (8 m) high. A 72-inch (183-cm) diameter conduit through the diversion dam would allow passage of the normal low flows of Knapps Creek (up to 150 cubic feet per second [cfs] or 4.5 cubic meters per second) through the lower reaches of the stream channel. An increase of flood levels upstream of the diversion channel would result from the loss of floodplain storage (7.5+ ft. for the 1985 flood). This would require construction of a stoplog structure near 11th Street to prevent floodwaters on Knapps Creek from spilling into Marlinton. Interior drainage for this levee section would be handled by one large pump station located near the mouth of Knapps Creek. The station would consist of four 52,000 GPM (197,000 LPM) pumps for a total capacity of 208,000 GPM (790,000 LPM). Such a large station is required in order to pump the “bank full capacity” of Knapps Creek that could pass through the diversion dam conduit.

Alternative 2 would provide protection to the level of the November 1985 flood of record, including about 88% of the structures that were damaged during that flood. The remaining structures would be acquired for project construction. This plan would result in significant impacts to public/municipal facilities. The diversion channel alignment would cross highway WV 39/2 (Stilwell Road) which runs along the left descending bank of the Greenbrier River. A new concrete highway bridge, about 140 feet (42 m) long, would be constructed across the diversion channel. The old railroad embankment, now the Greenbrier Trail, would be severed by the diversion channel. It was initially planned that a pedestrian bridge would be constructed across the diversion channel to accommodate trail use. However, due to the requirement to maintain the railway ROW for possible future rail service this alternative was revised to include a girder railroad bridge about 110 feet (34 m) long across the diversion channel. The diversion channel would pass through the Marlinton Municipal Park which is located just downstream of the junction of Knapps Creek and the Greenbrier River. Access between severed portions of the park would be provided by the construction of a steel vehicular bridge about 150 feet (46 m) long. The bridge would have a pedestrian walkway and would also provide access to the Marlinton sewage treatment plant. Construction of this plan would also require the relocation of utilities and the roadside park adjacent to the WV 39 bridge.

Real estate requirements for Alternative 2 include acquisition of 93 tracts with residential and nonresidential improvements, all of which would be necessary to construct the levee/floodwall sections and the diversion channel. Included in this alternative is the acquisition of potential staging and borrow areas, and four tracts from induced high water.

Based upon a detailed engineering and design analysis, the cost estimate was revised to be $93 million based on October 2001 price levels. The estimated annual cost is $7.5 million, including $120,000 for annual O&M. The O&M requirements for Alternative 2 are considerably more than Alternative 1 because of the necessity for sedimentation removal from the diversion channel and operation and maintenance of interior drainage pumps and gates associated with the diversion dam.

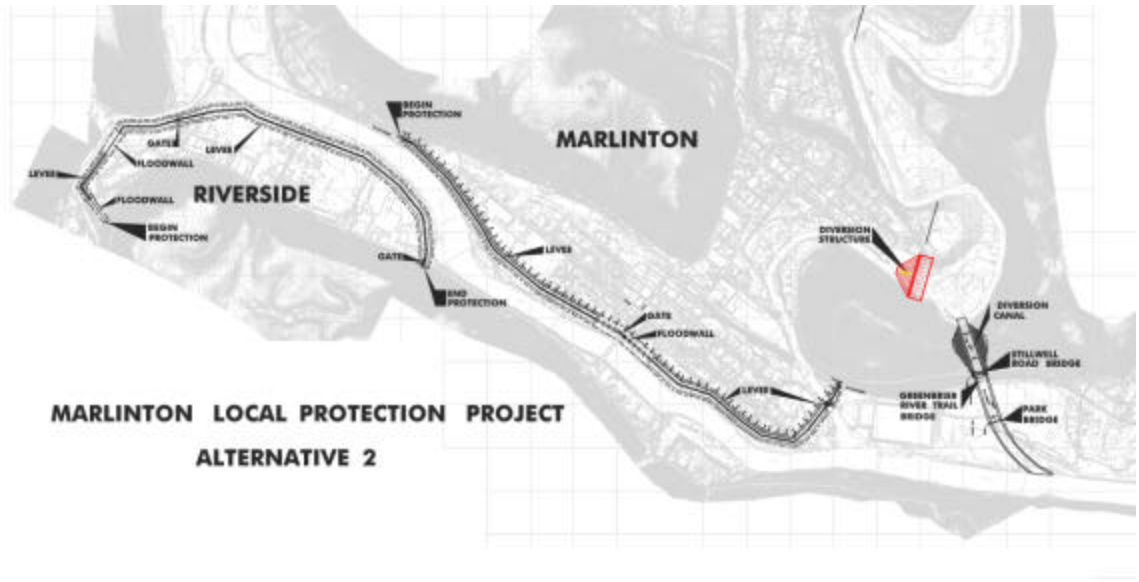


Figure 5-2

5.4.3.3 No Federal Action

The without project condition assumes no action by the Federal government to implement any type of comprehensive flood damage reduction program at Marlinton or for any other portion of the Greenbrier River Basin. It reflects the continuation of existing economic, social, and environmental conditions and trends in the project area. Inherent with this condition would be federally subsidized flood insurance coverage for property owners which is currently available through the National Flood Insurance Program and continued enforcement of the local floodplain zoning ordinances. This condition would result in no expenditure of federal funds to implement a flood damage reduction plan for the Town of Marlinton. However, federal expenditures to subsidize the flood insurance program and to assist in flood emergency and recovery operations would continue.

The potential for future growth and economic development in Marlinton would be limited without the means to reduce damages from major floods. Under this alternative, the projected 40 percent increase in employment within Pocahontas County would not likely occur within Marlinton itself. It can be expected that the residents of Marlinton would continue to be subjected to floods and flood damages similar to what has occurred in previous years. The residential and business district would continue to deteriorate and business owners would be left to cover continually increasing flood losses on an individual basis. Flood insurance now available for floodplain occupants, while providing some economic protection, does not necessarily guarantee a decent, safe and sanitary community environment.

5.5 ENVIRONMENTAL CONSEQUENCES

This section discusses the environmental effects, adverse environmental effects that cannot be avoided, the relationship between short-term uses of the environment and the maintenance and enhancement of long-term productivity, and irreversible and irretrievable commitments of resources from implementation of the alternatives. In addition, measures to mitigate adverse environmental impacts are also discussed.

5.5.1 Land Use/Land Cover

This section discusses the potential effects of the Marlinton flood control project on the land use and land cover of the project area. The methodology for determining impacts is presented, along with a description of the impacts for each alternative.

Methodology

The land use/land cover resource impact analysis consists of an evaluation of the effects caused by the construction and operation of the proposed alternatives on specific land use resources within the Region of Influence (ROI). Construction activities represent the principal means by which an effect to the land use would occur. Impacts to land use are determined relative to the context of the affected environment described in Section 4.1.

To determine if an action may cause a significant impact, both the context of the proposed action and the intensity of the impact are considered. The context for the Marlinton flood control project is the area in and around Marlinton. The intensity of the impact is considered in terms of any unique characteristics of the area (e.g., recreational opportunities) and the degree to which the proposed action may adversely affect such unique resources. The land use evaluation includes both temporary land use impacts during construction and permanent changes to land use resources. Because there are currently no land use plans or local zoning ordinances effective in the Marlinton area, the project impacts cannot be evaluated against existing land use plans.

Land Use/Land Cover Impacts from the No Action Alternative

Under the No Action Alternative, potential impacts to land use/land cover associated with the construction and operation of a Marlinton flood control project would not occur. Land use patterns, as described in Section 4.1, would be expected to remain the same. The continued potential for flooding of residences and commercial establishments within Marlinton could tend to discourage investment in new construction, building maintenance and improvements.

Land Use/Land Cover Impacts from Alternative 1

The land that would be affected under Alternative 1 consists of residential, commercial, forest and open land. A short-term impact would be loss of land use within the construction right-of-way (ROW). A total of 74 acres (183 hectares) of land would be affected during construction, consisting of approximately 14% residential, 12% commercial, 4% forest, and 70% open vegetated land. The land that would become

permanently part of the flood control infrastructure is approximately 28 acres (69 hectares).

The average width of the construction ROW is 125 feet (38 meters), including 25 feet (7.6 meters) of working area on either side of the levee/floodwall footprint. Floodwall sections would be used in several locations to preserve buildings adjacent to the ROW, and the ROW is reduced in these sections as needed. Figure 5-1 shows the levee/floodwall route and ROW for Alternative 1. Figure 5-3 shows the proposed rock borrow area for Alternative 1.

The Riverside portion of the levee/floodwall begins upstream of U.S. Highway 219 over Stony Creek and runs along the right descending bank of Stony Creek to the Greenbrier River, then follows along the right descending bank of the Greenbrier River to the site of Burns Properties Limited, tying into high ground with a gate structure across U.S. Highway 219. The Riverside levee/floodwall ROW passes primarily through open vegetated land. However, a lumber storage shed and two buildings along Stony Creek, and five residences along the Greenbrier River would be acquired as part of the ROW. The ROW also passes through a truck parking area.

The levee/floodwall on the left descending bank of the Greenbrier River begins approximately 200 feet (61 meters) upstream of Tannery Row and runs south to near the mouth of Knapps Creek. Twenty-three houses on Tannery Row and the accompanying access road would be taken in clearing the ROW. South of Tannery Row, the ROW passes through several open fields and runs adjacent to the Hanover Shoe Company building, which would not be taken during construction. In downtown Marlinton, approximately 11 houses and the River Place Restaurant would be taken. A floodwall section would preserve several other commercial establishments.

The Knapps Creek portion of the levee/floodwall would extend about 4300 feet (1290 meters) along the right descending bank of Knapps Creek from the confluence with the Greenbrier River. The ROW passes through open land and the yards of several residences. A portion of the Marlinton Elementary School ball field would be taken for the construction ROW. The 11th Street stoplog gate along Knapps Creek would be located on open land, as would the pump station at the Knapps Creek crossing of the Greenbrier River Trail.

Because of induced backwater from the levee/floodwall along Knapps Creek, the Pocahontas Continuous Care Center would be acquired for flowage easement. Therefore, future use of this land would be restricted, as no structures could be built within the flowage easement limits.

The approximately 9 acre (3.6 hectare) soil borrow area would be located on undeveloped grassland directly north of the confluence of Stony Creek and the Greenbrier River. Staging areas on currently open land include two areas totaling approximately 10 acres (4 hectares) in Riverside and a 4-acre (1.6 hectare) area south of Tannery Row on the left descending bank of the Greenbrier River. Two additional staging areas totaling 3 acres (1.2 hectares) are located to the southeast of Marlinton along Knapps Creek. The land use impacts on staging and borrow areas would be temporary, as these areas would return to open land after construction. The soil borrow area at the confluence of Stony Creek and the Greenbrier River would be used for mitigation of approximately 2 acres (0.8 hectares) of wetland loss under Alternative 1.

The rock borrow area would require approximately 6 acres (2.4 hectares) of forested land in the saddle of Buckley Mountain. Access road to the rock borrow area would require about 3 acres (1.2 hectares) and would ascend the western side of Buckley Mountain from Stillwell Road (WV Highway 39/2). Excavation of the rock borrow area would create a flat area approximately 600 feet (183 meters) in length and 300 feet wide (91 meters), totaling about 4 acres. Highwalls with benches would remain at either end of the borrow area (See Figure 5-3). Future use of this area has not been determined, however the resultant flat land may be desirable for development. The highwall benches would be vegetated to reduce visual impacts.

Upon completion of construction of Alternative 1, 28 acres (11 hectares) of land would be permanently included in the Marlinton flood control infrastructure. The balance of the land affected during construction would return to its pre-construction condition, with the exception of the borrow areas. The recreational use of the Greenbrier River Trail would not be significantly impacted under Alternative 1. Access to streams from the river and creek banks would be hindered by the levees and prevented in the sections of floodwalls. Although not part of Alternative 1, the flat area on top of the levee could be developed as a recreation trail after the construction is complete.

In evaluating the significance of the land use impacts of Alternative 1, both context and intensity are considered. Given the relatively small residential and commercial size of Marlinton, the number of houses and businesses affected may be considered significant. The impacts to the Marlinton Elementary School ball field could also be considered significant, given its frequent utilization and the limited number of open-field sports areas in Marlinton. Although river and creek access would be hindered their use would not be precluded.

Two potentially conflicting results of the levee/floodwall would be: 1) encouragement of development and property upkeep due to flood protection, and 2) reduced desirability of properties in Marlinton that would be in view of the levee/floodwall. An indirect effect of the Marlinton flood control project could be the encouragement of development in the protected area.

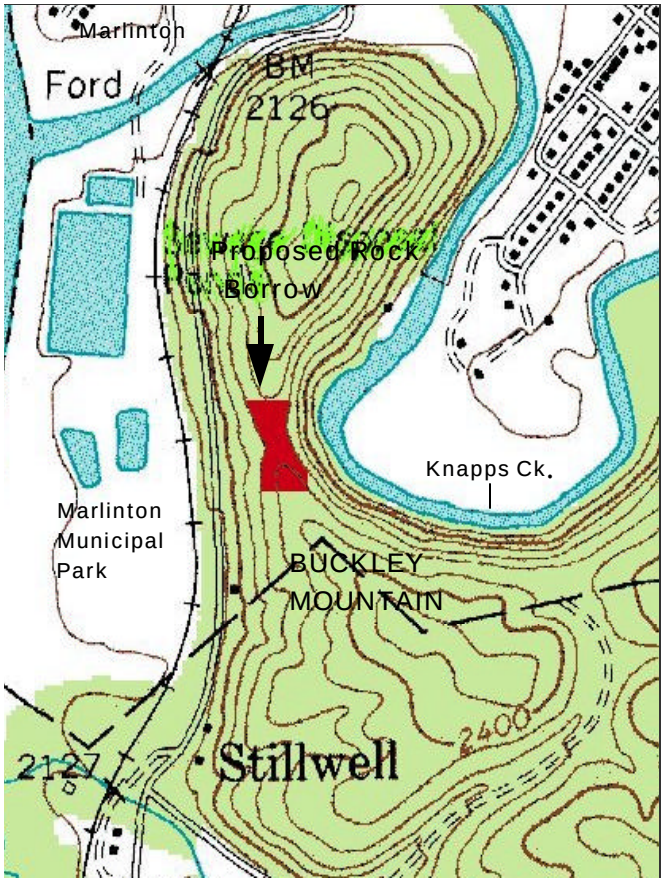


Figure 5-3. Location of proposed rock borrow area.

Land Use/Land Cover Impacts from Alternative 2

The land use/land cover impacts on the Marlinton side of the project (east of the Greenbrier River) from Alternative 2 would be the same as those for Alternative 1, with the following exceptions: Knapps Creek impacts would be limited to the land affected in construction of the diversion dam and the levee extension near the mouth because floodwall/levee would not be constructed along the stream; the cut in the saddle of Buckley Mountain would be deeper than that of the rock borrow area of Alternative 1; and, the Knapps Creek Diversion Channel would cut through Marlinton Municipal Park. A total of 98 acres (40 hectares) of land would be affected temporarily during construction, consisting of approximately 8% residential, 9% commercial, 8% forest, and 75% open vegetated land. The land that would become permanently part of the flood control infrastructure is approximately 35 acres (14 hectares). The average width of the construction ROW for floodwall/levee would be 125 feet (38 meters) as with Alternative 1. Floodwall sections would be used where feasible to preserve buildings adjacent to the ROW. Figure 5-2 shows the levee/floodwall location and ROW for Alternative 2.

The land impacted by Alternative 2 in the Riverside portion of the levee/floodwall would be the same as with Alternative 1. In addition, the staging and soil borrow areas identified for Alternative 1 would also be utilized for Alternative 2.

The Knapps Creek diversion dam would impact about 3.5 acres (1.4 hectares) of land that is currently forested. An additional 26 acres (10.4 hectares) of playing fields in

Marlinton Municipal Park would be affected during the construction of the Knapps Creek Diversion Channel for staging. About 2.8 acres (1.1 hectares) within Marlinton Municipal Park and 6.5 acres (2.7 hectares) of forested land would be used for construction of the Knapps Creek Diversion channel. A bridge would be built on the park road and the balance of the Park would return to its pre-construction state. The covered pavilion would be relocated within the Park.

A new bridge would be built across the diversion channel for the Greenbrier River Trail which would allow continued use of the trail. Access to the Greenbrier River and Stony Creek would be hindered by the levees and prevented in the sections of floodwalls. Although access from the banks of Knapps Creek would not be limited with Alternative 2, access to the Greenbrier River would be greatly hindered by the levee which would cross near the mouth of Knapps Creek and by the diversion dam as well. Further, flows of Knapps Creek would be significantly altered from the current condition and its use as a fishery significantly effected. A walking trail on top of levee sections could be constructed after the levee is completed.

The land use impacts under Alternative 2 would be the same as under Alternative 1 for land adjacent to the Greenbrier River and Stony Creek. In contrast to Alternative 1, there would be no impacts associated with a levee/floodwall along Knapps Creek. The permanent land use impact of the Knapps Creek Diversion channel in Marlinton Municipal Park may be considered significant as it would divide and reduce a primary recreational area in Marlinton. The channel would also permanently impact a significant portion of forested land on Buckley Mountain. Filling at the old stone quarry on Jericho Road would preclude any future quarrying at that site, however the fill material would be available. As with Alternative 1, future development within the flood-protected area would be expected.

5.5.2 Topography/Drainage

This section discusses the potential effects of the Marlinton flood control project on the topography and drainage in the project area. Impacts to the large surface water bodies in the area are discussed primarily in Section 5.5.6, Surface Water/Floodplain Management. The methodology for determining impacts is presented, followed by a description of the impacts for each alternative.

Methodology

The topography/drainage impacts analysis considers a region of influence that includes the areas that would be affected by construction and operation of each alternative. These areas include the levee/floodwall footprint; stream and riverbanks along the levee/floodwall; the soil borrow area; the staging areas; the disposal areas for excess fill; and the rock borrow area in, and diversion channel cut through, Buckley Mountain. Impacts were determined by assessing potential changes in existing topography and drainage patterns that could result from construction activities and operations under each alternative.

Topography/Drainage Impacts from the No Action Alternative

The Greenbrier River is a fairly stable river with few signs of active aggradation or degradation. Bank erosion is almost nonexistent. (WEST 2001). No impacts to topography would occur from No Action and local drainage patterns would remain unchanged. Similarly, the topography/drainage of the soil and rock borrow areas, the staging areas, and the excess fill disposal areas would remain unchanged.

Topography/Drainage Impacts from Alternative 1

Greenbrier River/Stony Creek/Knapps Creek

Detailed sedimentation investigations completed in June 2001 (WEST 2001) show that scouring and sedimentation under Alternative 1 would have only minor effects over current conditions. In general, it is expected that some minor degradation of the channel will occur in the proposed levee/floodwall reaches. Increased sediment deposition would likely occur immediately upstream of the project reaches of the Greenbrier River, Knapps Creek and Stony Creek due to backwater effects. However, increased deposition should only occur during flows greater than bank-full, as the proposed levee only alters the channel hydraulics for flows greater than bank-full. More frequently occurring bank-full flows should help remove the majority of deposition that would occur as the result of a larger flood event helping to maintain the current channel over the long-term.

In levee/floodwall projects, stone slope protection is usually required in order to protect stream banks from erosion and migration that could eventually undermine the structural stability of the constructed levees and floodwalls. For this reason, stone slope protection is often installed for the entire length of the levee/floodwall. However, for that section of the Marlinton flood control project along the Greenbrier River, protection for the levee/floodwall would be a “windrow revetment” constructed along the riverward toe of the levee/floodwall. This feature is a linear structure of stone placed parallel to the levee on the riverward side (See Figure 5-4, following). Windrow revetment would be constructed where erosion protection for the levee/floodwall is required for a total of about 3700 feet (1130 m) on levee sections of the right descending bank and about 1700 feet (518 m) on sections on the left descending bank. Along Knapps Creek, however, conventional stone slope protection would be required because of increased velocities and channel configuration. A total of about 2100 feet (640 m) of stone slope-protection along Knapps Creek would be required which includes about 1460 feet (445 m) on the right descending bank and 640 feet (195 m) on the left descending bank (adjacent to the Pocahontas Continuous Care Center).

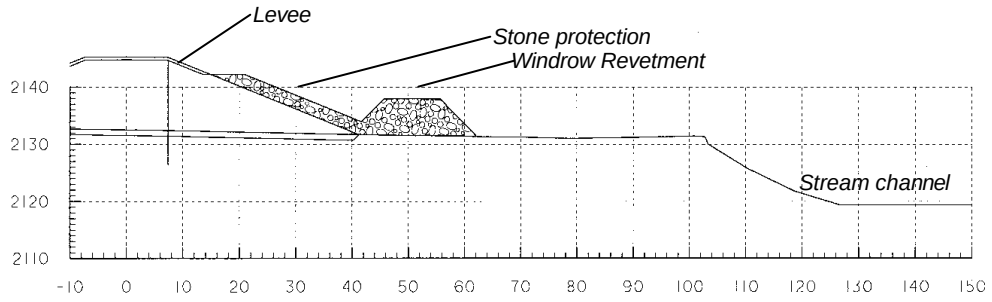


Figure 5-4. Typical cross-section depicting windrow revetment protection for levee sections.

Soil Borrow Area

The topography and drainage characteristics of the soil borrow area would be altered significantly, as up to approximately 6 feet (1.8 m) of soil would be removed. To mitigate for the loss of approximately 2 acres (0.8 hectares) of wetlands from construction of Alternative 1, the soil borrow site would be used to create about 4 acres (1.6 hectares) of functional wetlands. The remaining disturbed area would be graded to drain to the Greenbrier River.

Rock Borrow Area

The rock borrow area would be located atop the saddle in Buckley Mountain causing this area to be further lowered topographically (See Figure 5-3). Drainage patterns from this area would remain essentially the same as current conditions.

Staging Areas

The topography and drainage characteristics of the staging areas would not be altered significantly, and would be restored to the original grade after construction is finished. Soils could be compacted by heavy equipment movement in these areas. However, after construction is complete these areas would be vegetated and therefore some soil preparation would be required.

Interior Drainage

The levee/floodwall structures for Alternative 1 would impact the drainage of surface runoff to adjacent waterways. The levee/floodwall alignment would require interior drainage features to provide a means for interior runoff to be conveyed to be conveyed to pre-determined pump stations using a series of trapezoidal channels and/or closed conduits and then discharged to streams through gravity outlets and/or by pumping. These include a box culvert that would extend from a point along 8th Street (WV Route 39) between 2nd and 3rd Avenues to the west side of Greenbrier River Trail, and from there would parallel the Trail to the pump station at Knapps Creek. An alley would be

temporarily disrupted during construction of this culvert. A lateral collection system would convey interior drainage to an interceptor at the culvert inlet on 8th Street.

About 350 feet (105 m) of Marlin Run would be reconstructed under Alternative 1, from its confluence with Knapps Creek upstream to where it runs under 9th Street through a culvert. The constructed channel would be trapezoidal, grass-lined and about 1380 feet long (414 m). Inasmuch as is possible, natural stream channel restoration principles would be incorporated in the channel. Marlin Run has a drainage area of approximately 0.561square miles (359 acres/109 hectares) and the discharge for a 100-year frequency flood event is estimated to be about 380 cfs. The constructed channel would convey flows from Marlin Run to the pump station where, under normal conditions flows would be discharged through a culvert with a flap-gate to Knapps Creek. Under flood conditions Marlin Run discharges would be pumped to Knapps Creek from a pump station located near the Greenbrier River Trail on Knapps Creek.

Topography/Drainage Impacts from Alternative 2

Greenbrier River/Stony Creek/Knapps Creek

The topography/drainage impacts that would occur to the Greenbrier River and Stony Creek under Alternative 2 are the same as described above for Alternative 1. However, because of the diversion dam and channel under Alternative 2, impacts to Knapps Creek and Marlin Run would differ from those under Alternative 1. The flow of Knapps Creek would be restricted by the diversion dam and this would be expected to result in a change to the stream channel over time. However, because flows of Knapps Creek would be limited, stone slope protection on Knapps Creek would not be required under Alternative 2. Marlin Run would not be affected under Alternative 2.

Soil Borrow Area

The topography and drainage impacts to this area would be the same as described above for Alternative 1.

Rock Borrow Area/Diversion Cut

The diversion cut through Buckley Mountain would cause a significant change in the topography of the mountain. The sides of the cut-through channel would be of uniform slope. During high flows, the diversion channel would carry surface water from Knapps Creek to the Greenbrier River, causing a significant change in the current drainage pattern.

Staging Areas

The impacts to topography and drainage of the staging areas would be the same as described above for Alternative 1.

Excess Fill Disposal Areas

Material excavated from the diversion channel in excess of that required for construction fill would be disposed of in the abandoned Waco Stone Quarry off Jericho Road. The topography of the quarry would be altered significantly, as up to 190,000 cubic yards (144,400 cubic meters) of rock fill would be deposited there.

5.5.3 Geology and Soils

This section discusses the potential effects of the Marlinton flood control project on the geology and soils in the project area. The methodology for determining impacts is presented, followed by a description of the impacts for each alternative.

Methodology

The geology and soils impacts analysis considers a region of influence that includes the areas that would be affected by construction and operation of each alternative. These areas include the levee/floodwall footprint and construction ROW; stream and riverbanks along the levee/floodwall; the soil borrow area; the staging areas; the disposal areas for excess fill; and the rock borrow area in, and diversion channel cut through, Buckley Mountain. Impacts were determined by assessing potential changes in existing geology and soils that could result from construction activities and operations under each alternative. In addition, potential impacts from geologic hazards are evaluated.

Geology and Soils Impacts from the No Action Alternative

With No Action Alternative, areas currently undergoing ongoing erosion, as discussed in Section 5.5.2, would receive no erosion control and would continue to erode. There would be no impacts to the geology and soils of the other potentially affected areas, as no construction would occur under the No Action Alternative. The potential for geologic hazards would remain as described in Section 4.1.3.

Geology and Soils Impacts from Alternative 1

Prime Farmland Soils

Most of the soils in the project area are fertile floodplain soils that are classified as prime farmland soils. However, because of the developed nature of most of the project area, many of these soils have been disturbed or are located adjacent to disturbed, developed areas. A prime farmland determination was made by the NRCS and because the project area has been urbanized these areas were not considered prime farmland.

Mineral Resources

Other than the rock and soil, there are no viable mineral resources in the project area. Therefore, no impacts to mineral resources would be expected.

Erosion

During construction, soil disturbance would occur along the levee/floodwall footprint, at staging areas, at the rock and soil borrow sites, and during construction of the road leading from the rock borrow area on Buckley Mountain to Stilwell Road (WV 2/39). This activity would destroy soil profile, leading to a possible temporary increase in erosion as a result of stormwater runoff and wind action. Standard Corps erosion control methods would limit soil loss and transport of eroded soil.

As discussed in Section 5.5.2, additional impacts from scour under Alternative 2 would be minor.

Potential for Soil Contamination

Many pieces of heavy equipment will be utilized during construction of the levee/floodwall. As with any large construction project, the equipment is refueled on site and there is potential for fuel spills or leaks. Similarly, maintenance such as degreasing could also occur on site. Chemicals used during maintenance activities and fuel (both gasoline and diesel) can spill or leak onto the ground surface and contaminate the soil.

A Spill Prevention, Countermeasure, and Control (SPCC) Plan would be prepared by the contractor and approved by the Corps prior to beginning construction. This plan would identify steps to be taken to prevent spills, and also activities to be conducted if a spill occurs. Examples of preventative measures include refueling and maintenance only allowed in special lined areas that have secondary containment to capture spills should they occur and a requirement to have spill kits at refueling areas. By using these best management practices, potential adverse impacts to soils would be minimized to the extent possible.

Geologic Hazards

No geologic hazards have been identified in the project area that would affect construction or operation of Alternative 1. Seismic risk is considered to be low and ground rupture as a result of an earthquake is unlikely.

Geology and Soils Impacts from Alternative 2

With the exception of the disturbance caused by the construction of the floodwall along Knapps Creek, the impacts to geology and soils from Alternative 2 would be the same as described above for Alternative 1, with the following exceptions.

There would be a greater impact to the geology and soils of Buckley Mountain from Alternative 2 due to the construction of the diversion channel. In order to construct the cut in the mountain, approximately 970,000 cubic yards (742,000 cubic meters) of rock would be removed, or approximately double the volume of rock to be removed for Alternative 1. Similarly, blasting in the bed of Knapps Creek for the foundation of the diversion dam would further impact the geology of this area. Any potentially recoverable geologic resources at the proposed rock disposal area quarry would be buried.

5.5.4 Air Quality and Climate

This section discusses the potential effects of the Marlinton flood control project on the air quality and climate of the project site and other potentially affected areas. The methodology for determining impacts is presented, followed by a description of the impacts for each alternative.

Methodology

The air quality and climate impacts discussion focuses on the construction phase of the project as the primary activity with the potential to impact air quality. This evaluation includes potential air emissions during construction of each alternative from three sources: 1) construction vehicle exhaust, 2) fugitive dust due to site disturbance, and 3) explosives blasting emissions. Quantification of emissions is based upon projected construction progression, equipment use, dust control procedures, and local climate and soil conditions. Mitigation measures to avoid potential nuisance dust conditions and minimize construction equipment impacts to nearby residents are described below.

Air Quality and Climate Impacts from the No Action Alternative

Under the No Action Alternative, potential air quality impacts associated with the construction and operation of the Marlinton flood control project would not occur. The air quality and climate impacts of the No Action Alternative would be the same as the existing Air Quality and Climate affected environment discussed in Section 4.1.4.

Air Quality and Climate Impacts from Alternative 1

The duration of construction for Alternative 1 is projected to last two to three years. The major contributors to potential adverse impacts to air quality would be construction vehicle exhaust and fugitive dust emissions (dust which escapes from a construction site) from construction vehicles and soil and rock handling. Alternative 1 would likely be constructed in two phases with several sites under active construction concurrently. No impact to overall climate would be expected as a result of Alternative 1 given the localized and temporary nature of the potential effects.

Fugitive dust in the air causes a temporary and localized increase in particulate matter, regulated as PM_{10} by EPA to protect public health and welfare. Several factors affect the amount of fugitive dust emissions from an active construction site. The size of the construction site(s), soil type, level of activity, and specific operations being performed affect the generation of fugitive dust. Dust control practices (e.g., watering of construction areas) and prevailing meteorological conditions may help minimize the release of fugitive dust emissions.

The fugitive dust emissions from construction of Alternative 1 would be approximately 1,120 lbs/day (508 kg/day), or 112 tons/year (101 metric tons/year). These calculations assume a typical active area of 50 acres (124 hectares). The calculations account for the mitigation effects of standard Corps procedures (Corps of Engineers Technical Manual TM 5-830-03) to water disturbed surface areas in an amount and frequency to control fugitive dust. The average duration for an active construction area near a

particular residence or business would be 1-2 months. Fugitive dust emissions from active construction areas would result in temporary localized adverse impacts to air quality. While average precipitation in the Marlinton Area was accounted for in the calculations, sole reliance on precipitation as a means of dust control could result in a significantly higher level of fugitive emissions than calculated. Particular attention would need to be given to dust control during construction activities scheduled in the summer and fall when precipitation rates are typically lower (EPA 1995).

The explosives blasting and material handling at the Buckley Mountain rock borrow area would have minor emissions of fugitive dust. As explosives are most efficiently used by containing the blast energy in the ground to fracture the rock, little fugitive dust would be created at the ground surface of the explosion (EPA 1995). Fugitive emissions from the handling of fractured rock and soil at additional soil borrow areas would be controlled with sprayed water as necessary.

The use of construction equipment would result in the emission of air pollutants associated with diesel combustion. The major pollutants emitted would be nitrogen oxides (NO_x), carbon monoxide (CO), sulfur oxides (SO_x), particulate matter (PM_{10}) and hydrocarbon gases (ROG) from the fuel. In addition, the explosives used in blasting would emit NO_x, ROG, and CO. The Corps' estimate of major construction equipment use is as follows: 5 generators, 3 track drills, 2 end loaders, 3 dozers, 2 graders, 2 rollers/compactors, 3 cranes, 2 water trucks, 6 dump trucks, and 3 straight trucks. Based upon construction equipment and explosives blasting estimates, daily construction emissions are shown in Table 5-3.

Table 5-3
Estimate of Daily Construction Emissions for Alternative 1

	Alternative 1 Emissions (pounds per day)				
Emission Source	ROG	NO_x	CO	SO_x	PM_{10}
Construction Equipment	51	711	234	62	53
Fugitive Dust	0	0	0	0	1,120
TOTAL	51	711	234	62	1,173

Source: EPA 1991 and EPA 1995

The construction emissions of Alternative 1 would not be expected to affect EPA's designation of the Marlinton area as in attainment with the NAAQS for criteria pollutants (see explanation in Section 4.4.2). The construction vehicle emissions would generally be localized and temporary in nature. The use of modern and properly maintained construction equipment, and controlled refueling procedures would minimize air quality impacts from construction equipment. A discussion is presented in Section 5.5.13 of potential air quality related health effects.

Upon completion of construction, little or no air impacts are expected from ongoing operation and maintenance of the protection project carried out by the Town of Marlinton. The diesel engines of the pump station would have minor emissions, however these would run only during flood events and therefore impacts would be minor and temporary. Emissions would be expected from an occasional maintenance vehicle required to perform maintenance activities and these would be minor.

Air Quality and Climate Impacts from Alternative 2

Under Alternative 2, the potential sources of air quality impacts would be the same as those under Alternative 1. The two to three year construction period for Alternative 2 is the focus of the air quality impact analyses as the primary activity likely to generate air quality effects. Due to the increased amount of construction activity under Alternative 2 associated with the Knapps Creek Diversion Channel in Buckley Mountain, Alternative 2 projected emissions are slightly higher than those from Alternative 1. The potential adverse impacts to air quality would be primarily from construction vehicle exhaust and fugitive dust emissions from construction vehicles and material handling.

Alternative 2 would likely be constructed in several phases with several sites under active construction concurrently. As construction of the levee/floodwall progresses, the areas impacted by construction would follow the active construction areas. No impact to overall climate would be expected as a result of Alternative 2 given the localized and temporary nature of the potential effects.

The fugitive dust emissions from construction of Alternative 2 would be approximately the same as those for Alternative 1.

The explosives blasting and material handling at the Buckley Mountain rock borrow area would have minor emissions of fugitive dust. As explosives are most efficiently used by containing the blast energy in the ground to fracture the rock, little fugitive dust would be created at the ground surface of the explosion (EPA 1995). Fugitive emissions from the handling of fractured rock and soil at additional soil borrow areas would be controlled with sprayed water as necessary.

The use of construction equipment would result in the emission of air pollutants associated with diesel combustion. The major pollutants emitted would be nitrogen oxides (NO_x), carbon monoxide (CO), sulfur oxides (SO_x), Particulate Matter (PM_{10}) and hydrocarbon gases (ROG) from the fuel. In addition, the explosives used in blasting would emit NO_x, ROG, and CO. Estimated major construction equipment use is as follows: 10 generators, 3 track drills, 2 end loaders, 3 dozers, 2 graders, 2 rollers/compactors, 3 cranes, 2 water trucks, 6 dump trucks, and 3 straight trucks. Based upon construction equipment and blasting estimates, daily construction emissions are shown in Table 5-4.

Table 5-4
Estimate of Daily Construction Emissions for Alternative 2

	Alternative 2 Emissions (pounds per day)				
Emission Source	ROG	NO_x	CO	SO_x	PM_{10}
Construction Equipment	51	788	250	67	58
Fugitive Dust	0	0	0	0	1,120
TOTAL	51	788	250	67	1,178

Source: EPA 1991 and EPA 1995

The construction emissions of Alternative 2 would not be expected to affect EPA's designation of the Marlinton area as in attainment for the NAAQS for criteria pollutants (see explanation in Section 4.4.2). The construction vehicle emissions would generally be localized and temporary in nature. The use of modern and properly maintained construction equipment, and controlled refueling procedures would minimize air quality impacts from construction equipment. A discussion is presented in Section 5.5.13 of potential air quality related health effects.

As under Alternative 1, no air quality impact is expected on any Class I areas. The potential health effects of dust and other pollutants under Alternative 2 would be localized and temporary in nature. Air quality impacts from ongoing operation and maintenance of Alternative 2 would be minor as with Alternative 1.

The increased construction activity of Alternative 2 for the Knapps Creek Diversion Channel would be associated with increased potential for air emissions, particularly in the vicinity of Marlinton Municipal Park. Given the logistical constraints on daily construction operations, construction emissions from Alternative 1 and 2 are projected to be similar on a daily basis. Both alternatives are estimated to be completed within a two to three year timeframe.

5.5.5 Noise

This section discusses the potential noise impacts of the Marlinton flood control project from construction activities and operation in the potentially affected areas. The methodology for determining impacts is presented, followed by a description of the impacts from each alternative.

Methodology

The analysis of noise impacts focuses on the potential effects of the construction and operation of each of the proposed alternatives on the background noise levels in the ROI. The analysis includes quantification of projected noise levels during construction generated by construction activities and by explosives blasting on Buckley Mountain for both alternatives. The post-construction noise impacts of each alternative are also identified.

As discussed in Section 4.5, noise levels are measured as a composite decibel (dB) value. Because human hearing varies in sensitivity for different sound frequencies, decibels may be adjusted to account for this human hearing sensitivity difference. The adjusted decibels (dBA) represent the human hearing response to sound for a single sound event. The average sound level over a complete 24-hour period is represented by the Day-Night Average Sound Level (DNL). The DNL accounts for the increased disturbance potential of sounds that occur during normal sleeping hours by adding a 10-decibel adjustment to those noise events that take place between 10:00 p.m. and 7:00 a.m. The DNL is often used for the evaluation of community noise effects.

In the case of the Marlinton flood control project, both an average noise level (DNL) and a single sound event noise level (dBA) have been evaluated. The single sound event analysis shows the peak noise levels the community will experience, while the DNL measures average community noise levels. For this analysis, the calculation of the DNL assumes that no construction would occur between the hours of 10 p.m. and 7 a.m. The noise levels are calculated for the area immediately adjacent to the ROW as there are several residences within this range along the proposed levee/floodwall. Noise levels would be reduced for receptors at farther distances from the ROW by approximately 6 dBA for each doubling of distance from the source. For example, a 75-dBA noise heard at 50 feet (15.2 meters) from the source would be reduced to 69 dBA at 100 feet (30.4 meters) away from the source (Canter 1977).

In determining the significance of the calculated DNL, results for each alternative are compared to established standards. In 1974, the EPA identified noise levels that could be used to protect public health and welfare, including prevention of hearing damage, sleep disturbance, and communication disruption. Outdoor DNL values of 55 dBA were identified as desirable to protect against activity interference and hearing loss in residential areas and at educational facilities.

The determination as to whether the impact of a single sound event (or series of single events) is significant is a qualitative assessment of the increase in noise level above background as experienced by receptors near the source. A subjective response to changes in sound levels based upon personal judgments of sound presented within a short time span indicate that a change of +/-5 dBA may be quite noticeable, although changes that take place over a long period of time of this magnitude or greater may be "barely perceptible." Changes in sound levels of +/-10 dBA within a short time span may be perceived by humans as "dramatic" and changes in sound levels of +/-20 dBA within a short time span may be perceived as "striking." In qualitative terms, these types of changes in sound level could be considered significant (DOE 2001). In addition, the potential for construction noise to impact wildlife is discussed in the Section 5.1.7, Ecological Resources. Mitigation measures to minimize potential noise impacts are described in Section 5.3.

Noise Impacts from the No Action Alternative

Under the No Action Alternative, potential noise impacts associated with the construction and operation of the Marlinton flood control project would not occur. The local noise conditions would continue as they currently exist. Natural sounds, such as from the streams and wildlife, along with any local traffic or construction sounds would be the dominant sources of noise. Based on the population density and activity of Marlinton

the current background noise level is estimated to be approximately 30 dBA. This level would not change appreciably under the No Action Alternative (Canter 1977).

Noise Impacts from Alternative 1

The acoustical environment would be impacted during construction of Alternative 1. Construction activities would generate noise produced by heavy construction equipment, trucks, and to a lesser extent power tools, used along the levee/floodwall ROW. Explosives blasting at the rock borrow area on Buckley Mountain would generate additional noise. Relatively high peak noise levels in the range of 93-108 dBA would occur on the active construction sites, decreasing with distance from the construction areas. Noise levels would be variable and intermittent, as equipment is operated on an as-needed basis. Construction activities normally would be limited to daytime hours, and thus would not impact existing background noise levels at night.

Alternative 1 would likely be constructed in two phases with several sites under active construction concurrently. As construction of the levee/floodwall progresses, the areas impacted by construction would follow the active construction areas. Construction for Alternative 1 is projected to last two to three years.

Single event exposure. Table 5-5 presents the peak noise levels (dBA) expected from various construction equipment during the proposed construction of Alternative 1.

Table 5-5
Peak Attenuated Noise Levels (dBA) Expected from Construction Equipment

Source	Peak Noise Level	Distance from Source (in feet)						
		50	100	200	400	1,000	1,700	2,500
Heavy Trucks	95	84-89	78-83	72-77	66-71	58-63	54-59	50-55
Dump trucks	108	88	82	76	70	62	58	54
Concrete mixer	108	85	79	73	67	59	55	51
Jack-hammer	108	88	82	76	70	62	58	54
Scraper	93	80-89	74-82	68-77	60-71	54-63	50-59	46-55
Bulldozer	107	87-102	81-96	75-90	69-84	61-76	57-72	53-68
Generator	96	76	70	64	58	50	46	42
Crane	104	75-88	69-82	63-76	55-70	49-62	45-48	41-54
Loader	104	73-86	67-80	61-74	55-68	47-60	43-56	39-52
Grader	108	88-91	82-85	76-79	70-73	62-65	58-61	54-57
Pile driver	105	95	89	83	77	69	65	61
Forklift	100	95	89	83	77	69	65	61

Source: Golden et al. 1980

The potential noise impacts under Alternative 1 would be most severe to residences, businesses, and the school which are located adjacent to the river and creek beds. The

river or creek banks define the boundaries of several properties throughout the communities, while many more properties are located at distances of 50 feet (15.2 meters), 100 feet (30.5 meters), or more. The combined effect of several equipment types operating simultaneously is not represented by the sum of the individual noise levels, but rather is calculated based on the logarithmic scale of decibels (see explanation in Section 4.5). Table 5-6 presents the results of a sample calculation assuming a worst-case scenario of a bulldozer, jackhammer, and scraper operating simultaneously.

Table 5-6
Worst-Case Combined Peak Noise Level from Bulldozer, Jackhammer, and Scraper

	Distance from Source				
	50 feet (15.2 meters)	**100 feet (30.5 meters)**	**200 feet (61 meters)**	**¼ mile (402 meters)**	**½ mile (805 meters)**
Combined Peak Noise Level	103 dBA	97 dBA	91 dBA	74 dBA	34 dBA

The peak noise levels within 50 feet (15.2 meters) would probably be perceived as "striking" or very loud, comparable to peak crowd noise of an indoor sports arena. Beyond 200 feet (61 meters), peak noise levels would be moderate, approximately comparable to a garbage disposal or vacuum cleaner at 10 feet (3 meters). Peak construction noise levels would be considerably higher than existing background noise levels of 30 dBA. These peak noise levels would be localized and intermittent. The average time period a construction site would be active adjacent to a particular residence or business is 1-2 months.

In evaluating the potential for hearing damage (both Temporary Threshold Shift, or TSS and Noise-Induced Permanent Threshold Shift, or NIPTS), the noise level and duration of exposure are considered. For example, NIPTS would be produced by unprotected exposures of 8 hours per day for several years to noise above 105 dBA. Similarly, TSS would be based on exposure to a steady noise level of 80 to 130 dBA, increasing with duration of exposure (Canter 1977). The intermittent peak construction noise levels would not create the steady noise level conditions for an extended duration that could lead to TSS or NIPTS hearing damage.

The levee would extend through the existing ball field of Marlinton Elementary School and the nearest classrooms are located approximately 200 feet (61 meters) from the proposed construction ROW. Construction-related noise levels within the interior of the school building may reach approximately 70 dBA. The estimated duration of construction adjacent to Marlinton Elementary School is 1-2 months.

The projected peak noise levels associated with explosives blasting at the rock borrow area at Buckley Mountain have been calculated based on the rock removal requirements assuming the rock borrow area is located near the center-point of the saddle. This

borrow area is approximately 300 feet (91 meters) from the Greenbrier Trail and 600 feet (183 meters) from the covered pavilion in Marlinton Municipal Park. The corresponding peak noise levels from explosives blasting would be 90 dBA and 84 dBA, respectively. Peak explosives blasting noise at the nearest residence in southeast Marlinton, which is located over 1,200 feet (366 meters) from the explosives blasting area, would be approximately 73 dBA. The explosives blasting noise in the downtown Marlinton area would be of the same magnitude as average levee construction noise (Raspet and Bobak 1988). One to two blasts would occur each day during levee construction.

Day-Night Average Sound Level (DNL). The average community noise effects are typically represented by the DNL. While the DNL can account for the increased potential for disturbance by sounds occurring during normal sleeping hours, the projected construction schedule for Alternative 1 does not include nighttime activity.

Based upon the projected construction activities of Alternative 1, the DNL would be approximately 55 dBA for any residential or business areas within 50 feet (15.2 meters) of an active construction site. Noise at this level is equivalent to a residential air conditioner at 50 feet (15.2 meters). The DNL would decrease as distance from the site increases (e.g., the approximate DNL would be 49 dBA at 100 feet [30.5 meters], 43 dBA at 200 feet [61 meters], and near existing background of 30 dBA at 900 feet [274 meters]). The projected DNL at various distances from construction sites is equal to or below the outdoor DNL value of 55 dBA established by EPA to protect against activity interference and hearing loss in residential areas and at educational facilities (Canter 1977).

The projected DNL at residential and business areas adjacent to construction sites represents a maximum increase of 25 dBA above typical background noise levels in Marlinton. Although an increase in noise levels above current background conditions results during construction of Alternative 1, the resulting noise level of 55 dBA approximates the background noise level of a suburban environment.

Upon completion of construction, the completed levee and floodwall would reduce the natural sounds of the running water audible to residents and businesses adjacent to the Greenbrier River, Stony Creek, and Knapps Creek. The operation of the pump station at the junction of Knapps Creek and the Greenbrier River Trail during high-rain events would generate noise during facility operation. The pump station would contain two 100-horsepower diesel engines and three 11,700-gpm pumps. The noise level during facility operation would be approximately 60 dBA within 50 feet (15.2 meters) of the facility. The noise level at the houses nearest to the pump station (at a distance of 150 feet [46 meters]) would be approximately 50 dBA. Noise at this level would be infrequent and would likely occur during heavy rain events that contribute to background noise levels. Operation of the pumps would not be expected to cause any significant impacts.

Based upon the noise impacts analyses of Alternative 1, no hearing damage would be expected as the combined sound level and duration of exposure is well below those conditions associated with hearing damage. Construction workers who would be located closer to the noise sources and would experience longer exposure durations than the public would follow standard Corps and Federal Occupational Safety and Health Administration (OSHA) procedures for hearing protection.

Noise Impacts from Alternative 2

The noise impacts from Alternative 2 would be the same as under Alternative 1 for the Stony Creek and Greenbrier River portions of the levee/floodwall. The increased volume of material to be removed from Buckley Mountain for the Knapps Creek Diversion Channel construction would result in additional explosives blasting beyond that required for Alternative 1. Furthermore, trucking of spoil from Buckley Mountain to the old stone quarry on Jericho Road would increase noise levels over a wider area. Explosives blasting would also be required for the construction of the flood diversion dam on Knapps Creek. The impacts along Knapps Creek would be from construction of the flood diversion dam, weir and 11th Street stopgap floodwall.

Single Event Exposure. The projected peak noise levels from construction equipment depicted in Table 5-5 and Table 5-6 would be the same for Alternative 2. However, the effects along Knapps Creek would be limited to those construction effects of the flood diversion dam, weir, and 11th Street stopgap floodwall.

Under Alternative 2, no construction would take place at or near the Marlinton Elementary School. The nearest construction site to the school would be the pump station at the confluence of Knapps Creek and the Greenbrier River, approximately 1,500 feet (457 meters) from the school. Construction-related classroom noise levels would reach approximately 50 dBA within the interior of the school building. This peak noise level is unlikely to cause disruption to classroom activities.

The projected peak noise levels associated with explosives blasting for the Knapps Creek Diversion Channel have been calculated based on the rock removal requirements at Buckley Mountain. Alternative 2 requires an increased volume of rock to be removed (970,000 cubic yards or 742,000 cubic meters), approximately double the volume of rock to be removed for Alternative 1). This would require 1-2 blasts each day throughout the duration of the diversion channel construction. The diversion channel explosives blasting would intercept the Greenbrier River Trail and would occur approximately 300 feet (91 meters) from the covered pavilion in Marlinton Municipal Park. The corresponding peak noise levels from explosives blasting at these locations during diversion channel construction would be approximately 104 dBA and 90 dBA, respectively (Raspet and Bobak 1988). The calculated peak noise level from diversion channel explosives blasting at the nearest residence, approximately 1,200 feet (366 meters) away, would be 73 dBA.

The explosives blasting required for construction of the flood diversion dam along Knapps Creek would also consist of 1-2 blasts per day. The peak noise level at the nearest residences, approximately 300 feet (91 meters) away, would be 90 dBA. The explosives blasting noise in the downtown Marlinton area from both the diversion channel and flood diversion dam construction would be of the same magnitude as average levee construction noise.

In evaluating the potential for hearing damage (both Temporary Threshold Shift, or TSS and Noise-induced Permanent Threshold Shift, or NIPTS), the noise level and duration of exposure are considered. For example, NIPTS would be produced by unprotected exposures of 8 hours per day for several years to noise above 105 dBA. Similarly, TSS would be based on exposure to a steady noise level of 80 to 130 dBA, increasing with duration of exposure (Canter 1977). The intermittent peak construction noise levels

would not create the steady noise level conditions for an extended duration that could lead to TSS or NIPTS hearing damage.

Day-Night Average Sound Level (DNL). Based upon the projected construction activities of Alternative 2, the DNL would be approximately 55 dBA for any residential or business areas within 50 feet (15.2 meters) of an active construction site. Noise at this level is equivalent to a residential air conditioner at 50 feet (15.2 meters). The DNL would decrease as distance from the site increases (e.g., the approximate DNL would be 49 dBA at 100 feet or 30.5 m, 43 dBA at 200 feet or 61 m, and near existing background of 30 dBA at 900 feet or 274 m). The projected DNL at various distances from construction sites is equal to or below the outdoor DNL value of 55 dBA established by EPA to protect against activity interference and hearing loss in residential areas and at educational facilities. Given that the daily number of explosive blasts required for Alternative 2 is the same as for Alternative 1, no increase would occur in the overall daily average noise level (DNL) for Alternative 2 versus Alternative 1.

The projected DNL at residential and business areas adjacent to construction sites represents a maximum increase of 25 dBA above typical background noise levels in Marlinton. Although an increase in noise level above current background conditions results from construction of Alternative 2, the resulting noise level of 55 dBA approximates the background noise level of a suburban environment.

Upon completion of construction, the completed levee and floodwall would reduce the natural sounds of the running water audible to residents and businesses adjacent to the Greenbrier River and Stony Creek. In average flow conditions, there would be no interference with the natural sounds of Knapps Creek for adjacent residents as there would be under Alternative 1. The operation of the pump station in the Knapps Creek Channel at the Greenbrier River during storm events would generate noise during facility operation. The pump station would contain four 280-hp diesel engines and 4 pumps. The noise level during facility operation could reach approximately 62 dBA within 50 feet (15.2 meters) of the facility. The distance-attenuated noise level at the houses nearest to the pump station (at a distance of approximately 500 feet or 152.4 meters) would be 42 dBA. This noise level is not a significant increase over background and would be infrequent. No significant impacts would be expected.

As with Alternative 1, impacts from noise are not significant. No hearing damage would be expected as the combined sound levels and duration of exposure is well below those conditions associated with hearing damage. Construction workers who would be located closer to the noise sources and would experience longer exposure durations than the public would follow standard Corps and OSHA procedures for hearing protection.

5.5.6 Water Resources

This section discusses both surface water/floodplain management and groundwater impacts.

Surface Water/Floodplain Management

This subsection discusses the potential effects of the Marlinton flood control project on surface water and floodplain management in the project area. The methodology for

determining impacts is presented, followed by a description of the impacts for each alternative.

Methodology

The surface water/floodplain management impacts discussion is based primarily on information generated by the Corps during their engineering analysis of the feasible alternatives for the Marlinton flood control project. Computer modeling of surface water flow velocities, water elevation profiles, areas of scour and sediment deposition, and induced backwater flooding were performed to evaluate alternatives for the Marlinton flood control project. The analysis of impacts to surface water and floodplain management focuses primarily on the operation phase of the project during times of flooding, since during times of normal flow no changes will occur.

Surface Water/Floodplain Management Impacts from the No Action Alternative

Under the No Action Alternative, potential impacts to surface water/floodplain management associated with the construction and operation of the Marlinton flood control project would not occur. The surface water/floodplain management impacts of the No Action Alternative would be the same as the existing affected environment discussed in Section 4.6.1. Floodwaters would not be restricted and continued flooding of Marlinton would be expected to occur.

Surface Water/Floodplain Management Impacts from Alternative 1

Construction of the levee and floodwall structures under Alternative 1 will effectively contain floodwaters that would otherwise flow out into the floodplain in the project area. The constriction of flow would result in higher water surface elevations (flow depth) and increased velocity of flow during flood events (i.e. events that cause the waterways to overflow their banks) throughout portions of the project reaches. Knapps Creek will also be subject to induced backwater flooding from the Greenbrier River. There are no projected changes in water surface elevations downstream of the confluence of Knapps Creek and the Greenbrier River. Under flow conditions within the banks, the hydrologic regimes (peak flows, flow velocities, water surface elevations) of Stony Creek, Knapps Creek, and the Greenbrier River within the project area will be unaffected by the Alternative 1.

The design height of the levees and floodwalls takes into account the projected increase in water surface elevations plus additional freeboard. Consideration was also given in the design height to the possibility of increased water surface elevations as a result of debris accumulation and blockage at existing bridges, since implementation of the levee/floodwall alignment will occupy overland space normally available for flood water and debris conveyance.

Based on numerical modeling, through implementation of the levee/floodwall protection project, several areas that lie outside of the limits of protection of the levees and floodwalls will be impacted by the projected increase in water surface relative to predicted baseline flood levels. These unprotected areas include:

- Residents and businesses situated across from Marlinton along the right-descending bank of the Greenbrier River immediately upstream of the WV Rt. 39 bridge would have approximately 4.5 feet (1.4 m) of additional flood waters compared to the inundation depth that occurred during the November 1985 flood event.

- Structures and lands situated along the right and left-descending banks of the Greenbrier River immediately upstream of the Stony Creek confluence are projected to experience an increase in inundation of approximately 3.75 feet (1.1 m) of additional inundation relative to the November 1985 flood event as a result of the levee/floodwall installation.

Water Quality

As discussed in Section 4.6.1, an SPCC Plan will be developed that will specify procedures to be followed that will minimize the potential for release of fuels and other liquids that could potentially contaminate soil, surface waters, and groundwater. An example of a method of protecting surface waters is to allow refueling and maintenance of heavy equipment only in areas that have secondary containment and are located away from surface water bodies.

During construction, short-term impacts from clearing land would occur. Exposed soil subjected to precipitation would create increased volumes of storm runoff, accelerated soil erosion and sediment yield. Localized but temporary increases in turbidity of Stony Creek, Knapps Creek, and the Greenbrier River may occur.

Transport of sediment in surface runoff from disturbed areas into water bodies will be minimized through the use of properly designed and installed erosion and sediment control measures, such as silt fence, culvert inlet protection, temporary diversion dikes, and other measures. These measures would be addressed in an Erosion and Sediment Control Plan to be developed for the project. Impacts to water quality from Alternative 1 would be minor and short-term.

Surface Water/Floodplain Management Impacts from Alternative 2

The configuration of the levee/floodwall protection measures along Stony Creek and the Greenbrier River is nearly identical to that of Alternative 1. Under Alternative 2, the portion of the levee/floodwall along Knapps Creek would be replaced with a diversion dike and diversion channel to divert higher flows of Knapps Creek away from Marlinton. In order to reduce flooding associated with backwater from the Greenbrier River, the line of protection around Marlinton would extend across Knapps Creek immediately upstream of the existing confluence. As a result of discharge from the diversion channel, a reach of approximately 0.4 miles (0.6 km) immediately downstream of the confluence of Knapps Creek and the Greenbrier River would experience an increase of approximately 1 foot (0.3 m) of additional inundation relative to the November 1985 flood event. A pump station with gravity outlets would be installed within the existing Knapps Creek streambed to convey water to the Greenbrier (refer to Alternative 2 description).

Energy dissipation of diverted flows in the diversion channel will be facilitated with a stilling basin installed in the channel.

The diversion dike would be equipped with an outlet structure that would be operated to allow passage of no more than 150 cfs (4.5 cubic meters per second or cms) in order to maintain the average discharge under existing conditions in the Marlinton reach of Knapps Creek. The average discharge for Knapps Creek at Marlinton under existing conditions is 149 cfs (4.47 cms). Therefore, natural streamflows for this reach of Knapps Creek would be significantly affected. (*Note: The maximum discharge that would be allowed to maintain water quality is assumed for this analysis to be 150 cfs (4.5 cms). However, the West Virginia Department of Environmental Protection could allow as much as a 500 cfs (15 cms) maximum discharge. Increasing the maximum discharge to 500 cfs (15 cms) would lessen aquatic impacts to the affected section of Knapps Creek but would require substantially larger, and more costly pumps.)*

Impacted areas outside the limits of protection are the same as under Alternative 1 except for a 1-mile (1.6 km) reach of Knapps Creek immediately upstream of the diversion dike would experience on average an increase of approximately 8 feet (2.4 m) relative to the November 1985 flood as a result of the presence of the diversion dike.

Water Quality

The impacts to the water quality of Stony Creek and the Greenbrier River during construction and operation would be the same as described above for Alternative 1. Impacts to Knapps Creek, however, would be greater during the construction phase than for Alternative 1 because of the construction of the diversion dike and outlet structure. During operation under average flow and low-flow conditions, water quality of Knapps Creek would be similar to those of the No Action Alternative.

Groundwater

This subsection discusses the potential effects of the Marlinton flood control project on the groundwater in the project area. The methodology for determining impacts is presented, followed by a description of the impacts for each alternative.

Methodology

The groundwater impacts analysis considers a region of influence that includes the areas that would be affected by construction and operation of each alternative. These areas include the levee/floodwall footprint and construction ROW; the soil borrow area; the staging areas; the disposal areas for excess fill; and the rock borrow area in, and diversion channel cut through, Buckley Mountain. Impacts were determined by assessing potential changes to existing groundwater quality that could result from construction activities and operations under each alternative. Because groundwater will not be used either for project construction or operation, no assessment of impacts to groundwater quantity is necessary.

Groundwater Impacts from the No Action Alternative

Under the No Action Alternative, the Marlinton flood control project would not be constructed and therefore there would be no potential effect on the groundwater quality of the project area. The groundwater would remain as described in Section 4.6.2.

Groundwater Impacts from Alternative 1

Potential effects to groundwater from the implementation of Alternative 1 are primarily associated with the construction phase of the project. As mentioned in Section 5.5.6, during refueling or maintenance of heavy equipment there is potential for spills or leaks. If not immediately cleaned up, these substances can migrate downward through the soil column to the groundwater table.

Because the depth to groundwater is shallow in the area of the levee/floodwall footprint and construction ROW, the potential to contaminate groundwater from spills or leaks of fuel or other petroleum-based fluids is greater in these areas. However, the SPCC Plan will identify steps to be taken to prevent spills, and also activities to be conducted if a spill occurs. Examples of preventative measures include refueling and maintenance only allowed in special lined areas that have secondary containment to capture spills should they occur. By using these best management practices, potential adverse impacts to groundwater would be minimized.

The potential impacts to the other areas affected by Alternative 1 would be the same as described above for the levee/floodwall footprint and construction ROW. However, the potential for groundwater contamination is probably slightly less in the rock borrow area, as the depth to groundwater is likely greater there.

Groundwater Impacts from Alternative 2

The potential impacts to groundwater from Alternative 2 are the same as described above for Alternative 1.

5.5.7 Ecological Resources

This section discusses the potential effects of the construction and operation of the Marlinton flood control project on the ecological resources at the proposed project location and the surrounding area. The methodology for determining impacts is presented, followed by a description of the impacts for each alternative.

Methodology

The biological impact analysis was performed by reviewing site documentation and previously published environmental analysis documentation, and conducting field visits in coordination with the USFWS. Information contained in the Draft Fish and Wildlife Coordination Act Report was used in preparation of this section (Appendix C).

Aquatic Resources

Aquatic Resource Impacts from the No Action Alternative

Under the No Action Alternative, there would be no changes in land use at the proposed site. Therefore, there would be no identified adverse impacts to aquatic resources from the No Action Alternative. Aquatic habitat, structure, and function would be unchanged and would continue as described in Section 4.7.1.

Aquatic Resource Impacts from Alternative 1

Several activities associated with construction of Alternative 1 would have impacts on the aquatic environment. Although no construction would occur in Stony Creek, temporary diversion of some flow would be required in order to keep water away from construction activities. Such diversion would be accomplished using a barrier to water, such as sand bags. Impacts would be temporary and minor. Placement of stone slope protection will encroach on the water's edge along Knapps Creek. This could cause localized increases in turbidity from disrupting river or streambed sediments. Furthermore, a sewer line that crosses the Greenbrier River about 600 feet downstream of the WV Route 39 bridge may have to be relocated because of floodwall construction. This would require some trenching in the river. If possible, however, a new line may be threaded through the existing line, thus eliminating impacts to the stream.

Approximately 350 feet (105 meters) of Marlin Run would have to be relocated. Marlin Run enters Knapps Creek about 2000 feet (600 meters) upstream from the confluence of Knapps Creek and the Greenbrier River. The section that would have to be relocated is from the mouth of Marlin Run upstream to where it exits a culvert at 9th Street. Marlin Run passes through numerous culverts as it winds its way through a section of Marlinton, and as such has been significantly disturbed. The subject section is unstable and exhibits significant headcutting. Further, the section has little or no vegetation lining its banks, other than herbaceous species. A 1380-foot (420 m) long channel would be constructed to replace this section in order to convey flow of Marlin Run through an outlet (flap-gate) in the floodwall and into Knapps Creek. Where possible, natural stream channel design would be incorporated in the design of the constructed channel. In addition, trees would be planted at top of bank of the channel to provide shading of the stream.

Impacts to aquatic species would be minor as construction would not take place within the riverbed and best management plans would be in place to minimize the introduction of sediment within the river course during construction. Post construction, revegetation using native species would minimize erosion and subsequent transport of soils into the river course. Because no maintenance clearing on the streambanks would be required due to the use of windrow revetment for erosion protection of the levee, no long-term adverse impacts to aquatic species would be expected to the Greenbrier River.

Aquatic Resource Impacts from Alternative 2

During construction of the diversion channel and diversion dam increases in stream turbidity and sedimentation could occur. There would be temporary and localized effects to fish and benthic invertebrates in the immediate area; however, no freshwater mussels were identified in Knapps Creek in the area of the diversion dam. A permanent loss of

about 0.6 acres (0.24 hectares) of aquatic environment would occur from the placement of the diversion dam across Knapps Creek. Furthermore, Knapps Creek would undergo some reduction in channel width over time due to restriction of flow to 150 cfs (4.5 cms), respectively reducing the aquatic environment of that reach of stream below the diversion dam (See Section 5.5.6, subsection entitled *Surface Water/Floodplain Management Impacts from Alternative 2* for more discussion of flow restriction of Knapps Creek downstream of the diversion dam).

As described above under Alternative 1, temporary diversion of some flow of Stony Creek would be required for construction of the floodwall. Likewise, the sewer line that crosses the Greenbrier River would have to be replaced or retrofitted as described above.

Best management construction practices would be in place to limit increases in stream turbidity, thus limiting the impacts to aquatic resources. Because of this mitigation and the temporary and localized nature of the impacts, no long-term adverse impacts to aquatic resources are expected.

Terrestrial Resources

Terrestrial Resource Impacts from the No Action Alternative

Under the No Action Alternative, there would be no changes in land use at the proposed site. Within the proposed project area, the riparian vegetation is characterized primarily as bottomland hardwoods, and would continue as such. However, without a flood protection project for the Town of Marlinton, future development to support a growing tourism industry would likely occur in flood-safe areas – and these areas could be currently undeveloped, such as fields or wooded areas. Therefore, impacts could be more significant in comparison to impacts to terrestrial resources within the project area.

Terrestrial Resource Impacts from Alternative 1

Terrestrial impacts from Alternative 1 are directly from the construction of an earthen levee/concrete floodwall combination and the excavation of borrow materials. Vegetation directly in the alignment of the levees and floodwall would be removed and would no longer provide habitat for terrestrial organisms. This habitat would be permanently converted to maintain a treeless environment along the earthen levee and concrete floodwall. A change of species composition would occur in these altered environments.

Acquisition of property to construct the levee/floodwall would extend from the construction work limits on the “protected” side of the levee/floodwall to the edge of the stream along the alignment. Therefore, land between the “wet” side of the levee/floodwall and the stream would be precluded from development. Further, consideration for the potential loss of terrestrial and riparian habitat was appropriately given in determining and refining the alignment of the levee/floodwall. As such, approximately 16 acres of important riparian area would become part of the project, including a substantial area at the mouth of Knapps Creek.

Approximately 10 acres (3.0 hectares) of bottomland hardwood/riparian habitat and approximately 2 acres (0.8 hectares) of wetlands would be lost from construction of

Alternative 1. However, based on a 2:1 mitigation ratio for replacement of the loss of emergent wetlands, approximately 4 acres (1.6 hectares) of the soil borrow area northeast of the confluence of the Greenbrier River and Stony Creek would be converted to wetlands if suitable conditions exist or could be created. Thus, the project area would realize a net gain of 2 acres (0.8 hectares) of wetlands.

During site clearing activities highly mobile wildlife species or wildlife species with large home ranges (such as deer and birds) would be able to relocate to adjacent undeveloped areas. However, successful relocation may not occur due to competition for resources to support the increased population and the carrying capacity limitations of areas outside the proposed development. Species relocation may result in additional pressure to lands already at or near carrying capacity. The impacts could include overgrazing (in the case of herbivores), stress, and over-wintering mortality. For less mobile species (reptiles, amphibians, and small mammals), direct mortality could occur during the actual construction event or ultimately result from habitat alteration.

Some clearing of vegetation will be necessary for installation of stone slope protection along Knapps Creek, but much of the reach requiring stone slope protection is field above the normal high-water line. For sections where windrow revetment will be used, natural succession would be allowed to occur in the riparian area between the stream and revetment because no maintenance clearing is required for this protection treatment. Therefore, habitat value would improve in these areas over time.

The levee sections, especially those with windrow revetment, would inhibit crossing of some wildlife species, and floodwall sections would preclude passage. Because much of the project area is urban, these impacts would not be significant.

There are no impacts expected to the six Federally listed threatened or endangered species that historically or currently have ranges that include part or all of Pocahontas County. None of the species are known or likely to occur within the project area. Mist-net survey for the presence of bats found no occurrence of the Federally endangered Indiana Bat (R.D. Zande 2001).

Seventeen Federally listed species of concern (Table 4-11) have been documented in Pocahontas County. No listed species of concern are expected to be affected by construction and operation of Alternative 1.

Terrestrial Resource Impacts from Alternative 2

The primary impact from Alternative 2 is from the construction of an earthen levee/concrete floodwall combination and the excavation of soil for borrow material. No structures would be placed in the Greenbrier River and direct construction activities would not occur within the riverbed. However, a section of levee would be constructed across the mouth of Knapps Creek. Further, a diversion channel and diversion dam would be constructed that would affect Knapps Creek and the Greenbrier River floodplain. Vegetation directly in the alignment of the levees, floodwall, diversion channel, and diversion dam would be removed and would no longer provide valuable habitat.

Approximately 13 acres (4.0 hectares) of bottomland hardwood/riparian habitat and approximately 3 acres (1.2 hectares) of wetlands would be lost from construction of

Alternative 2. In addition, about 6.5 acres (2 hectares) of upland habitat on Buckley Mountain would be lost from the diversion cut. However, as mitigation for the loss of these wetlands, 6 acres of the soil borrow area northeast of the confluence of the Greenbrier River and Stony Creek will be converted to wetlands if suitable conditions exist or could be created. Thus, the project area could realize a net gain of 4 acres (1.6 hectares) of wetlands.

Impacts on wildlife would be similar to those described above for Alternative 1, however these would be more extensive due to greater area disturbed for construction of the project. Similarly, impacts from the levee/floodwall and windrow revetment are the same as those for Alternative 1. On the other hand, Alternative 2 would not require stone slope protection on Knapps Creek and therefore impacts from that treatment would be avoided.

Impacts to Federally listed threatened or endangered species that historically or currently have ranges that include part or all of Pocahontas County are the same as those described above for Alternative 1. Likewise, of the Seventeen Federally listed species of concern (Table 4-11) documented in Pocahontas County none would be affected by Alternative 2.

5.5.8 Cultural Resources

This section discusses the potential impact on cultural resources of the Marlinton flood control project from construction activities and operation in the potentially affected areas. The methodology for determining impacts is presented, along with a description of the impacts from each alternative on cultural, historical, architectural and archaeological resources.

Methodology

Federal agency responsibilities with regard to cultural resources are addressed by a number of laws, regulations, executive orders, programmatic agreements and other requirements. The principal federal law addressing cultural resources is the *National Historic Preservation Act* (NHPA) of 1966, as amended (16 United States Code [USC] Section 470), and implementing regulations (36 Code of Federal Regulations [CFR] 800), that describe the process for identifying and evaluating historic properties, for assessing the effects of federal actions on historic properties, and for seeking consultation to avoid, reduce, or minimize adverse effects. The term “historic properties” refers to cultural resources that meet specific criteria for eligibility for listing on the National Register of Historic Places (NRHP). This Section 106 process does not require preserving historic properties but does ensure that federal agency decisions affecting these places consider cultural and historic values and the options available to protect the properties.

This investigation includes identifying, evaluating, and assessing effects on cultural resources from construction and operation of the Marlinton flood control project in concurrence with the State Historic Preservation Officer (SHPO). Other agencies, Native American groups, and those with an interest in the undertaking may become consulting parties in this process, as outlined in 36 CFR 800.2(c). The Advisory Council

on Historic Preservation (ACHP), an independent federal agency, administers the provisions of Section 106 regarding cultural resources and has review and oversight responsibilities defined throughout 36 CFR 800. Additional cultural resource management responsibilities of the Corps are addressed in other sections of the NHPA and in other federal laws, regulations, and executive orders.

Potential impacts to cultural resources, in general, are assessed by applying the criteria of adverse effect, as defined in 36 CFR 800.5a. An adverse effect is identified when an action could alter the NRHP-qualifying characteristics of a historic property in a manner that would diminish the integrity of the property's location, design, setting, workmanship, feeling, or association. Adverse effects can include reasonably foreseeable effects caused by the action that could occur later, that could be farther removed in distance, or that could be cumulative. Activities conducted under the Proposed Action and alternatives are measured against the criteria of adverse effect to determine the potential for and intensity of impacts to cultural resources. Consultation with the affected communities is required to identify, assess, and address impacts to Traditional Cultural Properties (TCPs). TCPs are places or activities associated with the cultural heritage or beliefs of a living community and are important in maintaining cultural identity. Potential impacts to TCPs can include physical destruction or disturbance, loss of access or privacy, and alteration of setting.

As discussed in Section 4.8 of this document the Section 106 process in consultation with the West Virginia SHPO has been initiated. A literature review was conducted to compile information on previously recorded cultural resources in the Marlinton area and create an archaeological sensitivity map (Historic Letter Report 2001). An archaeological survey and testing program is in progress to identify archaeological resources that may be impacted by the undertaking. Interim results from an architectural reconnaissance have been obtained. The Section 106 process will be completed prior to any construction activities.

In addition to the listed NRHP resources, the architectural reconnaissance identified several potentially eligible cultural resources in the ROI. These include many residences and commercial establishments associated with the railroad, lumber and tannery industries. Specifically, the historic worker's housing on "Upper Tannery Row" on the left descending bank of the Greenbrier River and several residences and churches near the commercial district of Marlinton are potentially eligible. The entire Courthouse neighborhood has been identified as a potentially eligible historic district. A listing of potentially eligible cultural resources identified to date is included in Table 4-16.

Cultural Resource Impacts from the No Action Alternative

There would be no construction under the No Action Alternative, and thus no known or potential cultural resources would be affected during construction. Visual impacts to the setting of historic structures from prominent levees/floodwalls would not occur. However, the existing potential for flooding would continue and these cultural resources would remain unprotected from any such flooding. The residences of "Upper Tannery Row" would remain particularly susceptible to flooding, given their location immediately adjacent to the Greenbrier River. Residents report these houses were inundated with between three and five feet of water in the floods of 1985 and 1996 (PT 2001b). Renovations following a flood often introduce non-historic materials and designs to

properties, compromising the integrity of the cultural resource (Historic Letter Report 2001). The No Action Alternative could result in the demolition of historic buildings in favor of modern, elevated buildings.

Cultural Resource Impacts from Alternatives 1

The construction and operation of Alternative 1 would not have direct adverse effects through demolition or alteration of any listed NRHP cultural resources. All such properties are located a block or more inland from the levee/floodwall construction ROW and construction staging areas.

However, Alternative 1 would have a direct adverse effect on several potentially eligible cultural resources along the Greenbrier River. The historic worker's housing in "Upper Tannery Row" would be taken during construction. Dating back to 1904, the houses are significant because of their association with the Marlinton tannery industry and their representation of the materials, design and construction of worker's housing in early-twentieth century West Virginia. The architectural integrity of these properties has been compromised but the properties retain building and historical context information that could be documented prior to any demolition or construction.

The Greenbrier River levee may also have a direct adverse effect on the property of potentially eligible residences located near the south end of 2nd Avenue at 12th Street. Levee construction would require the taking of the landscape buffering area associated with these properties. This would detract from the historic setting of the resources. Further, the levee would interfere with the association of these properties with the river, a contributing quality to the properties' historical significance.

Alternative 1 would lead to indirect adverse effects on listed and potentially eligible resources throughout the commercial district of Marlinton. The levees and floodwalls would introduce visual elements incompatible with the historic setting, and would decrease the association of the town and its resources to the Greenbrier River. The levees and floodwalls along Knapps Creek would have similar indirect adverse effects on the potentially eligible Courthouse Neighborhood Historic District.

A beneficial effect of Alternative 1 would be the protection of cultural resources from future floods comparable to the flood of record. Renovations following a flood often introduce non-historic materials and designs to properties, compromising the integrity of the cultural resource.

Potential locations of archaeological resources are listed in Table 4-14. The ROW along the left descending bank of the Greenbrier River passes through portions of the former tannery site (the present day site of Gardner Shoe Company). An inventory of archaeologically sensitive areas was made to identify potentially eligible resources. Because the construction will require ground-disturbing activities, there is potential for discovery of subsurface archaeological resources throughout the project area. An unanticipated discovery plan will be developed and approved prior to construction.

Cultural Resource Impacts from Alternatives 2

The construction and operation of Alternative 2 would not have direct adverse effects on any listed NRHP cultural resources. The effects of the levee/floodwall along the Greenbrier River would have the same direct and indirect effects to significant properties as under Alternative 1.

Alternative 2 would have no effect on the potentially eligible Courthouse Neighborhood Historic District since there would be no levee or floodwall introducing new visual elements or interfering with the association of the area with Knapps Creek. However, construction of the Knapps Creek diversion channel through Buckley Mountain would be visible from portions of this neighborhood. This visual change would alter the setting of these historic properties. The indirect effects of the diversion channel could be mitigated through sensitive terracing and re-vegetation activities adjacent to and within the construction limits of the channel cut.

The potential for unexpected discovery of archaeological resources during construction exists for Alternative 2 as well as Alternative 1. Such discovery would be handled in the same manner as under Alternative 1, in accordance with the unanticipated discovery plan procedures. As under Alternative 1, a beneficial effect of Alternative 2 would be the flood protection provided for cultural resources in the Marlinton area.

5.5.9 Socio-economic Resources and Environmental Justice

Any sudden influx of capital or employment to a region, such as a large construction project, will impact the existing social and economic environment to some degree. Social and economic factors, such as employment, income, population, housing, and community services, are interrelated in their response to the implementation of an action.

This section describes the potential effects of the alternatives on the existing social and economic environment of the communities of Marlinton and Riverside and for the Pocahontas County region of influence (ROI) as a whole. To facilitate the discussion of such complex and interrelated issues, the economic and social resources are addressed separately. Economic impacts, such as changes in income and employment, are discussed first for each alternative. Social impacts, such as changes in population, housing, community services, and community cohesion, follow the discussion of economic impacts. Included with the discussion of social impacts is the analysis of environmental justice issues associated with the project, as required pursuant to Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations (Volume 59, Federal Register, Number 32). The discussion of environmental justice identifies and addresses disproportionately high and adverse human health and environmental effects on minority or low-income populations from activities associated with implementation of the Marlinton flood control project.

Methodology for Determining Economic Impacts

Economic impacts are addressed in terms of both direct and indirect impacts. Direct impacts are those changes that can be directly attributed to the proposed action, such as

changes in employment and expenditures from the construction of the levee/floodwall. Indirect impacts to the ROI occur based on the direct impacts from the proposed action. Two factors, (1) the changes in site purchase and non-payroll expenditures from the construction of the levee/floodwall and (2) the changes in payroll spending by new employees, indirectly lead to changes in employment levels and income in other sectors throughout the ROI. The total economic impact is the sum of the direct and indirect impacts.

The direct impacts estimated in the economic analysis are based on project summary data developed by the Corps. Total employment and earnings impacts were estimated using Regional Input-Output Modeling System multipliers developed specifically for the Marlinton flood control project ROI by the U.S. Bureau of Economic Analysis (BEA). These multipliers are developed from national input-output tables maintained by the BEA and adjusted to reflect regional trading patterns and industrial structure. The tables show the distribution of the inputs purchased and the outputs sold for each industry for every county in the United States. The multipliers for this analysis were developed from the input-output tables for Pocahontas County. The multipliers are applied to data on initial changes in employment levels and earnings associated with the proposed project to estimate the total (direct and indirect) impact of the project on regional earnings and employment levels.

For this analysis, the term “direct jobs” refers to the employment created by the project and direct income refers to project workers’ salaries. The term “indirect jobs” refers to the jobs created in other employment sectors as an indirect result of new employment at the construction site and indirect income refers to the income generated by the new indirect jobs. The multipliers were statistically adjusted to develop a minimum and maximum range for analysis of potential employment and income effects. Employment and income impacts were determined based on the indicated phases of construction occurring in distinct intervals. Consideration was also given to the fate of certain businesses located within the footprint of the levee or outside the area to be protected.

The importance of the actions and their impacts is determined relative to the context of the affected environment, or project baseline, established in Section 4.9.2. The baseline conditions provide the framework for analyzing the importance of potential economic impacts that could result from the project. Impacts would be determined to be significant if the change resulting from the action analyzed would exceed historical fluctuations in the regional economy.

All required project operations personnel are assumed to currently work in a municipal capacity within Marlinton or Pocahontas County. Therefore, the project would not require any new staff to operate and maintain the infrastructure added as a result of the Marlinton flood control project.

Methodology for Determining Social Impacts

The impacts estimated in the social analysis are based on project summary data developed for this investigation. It is assumed that 75 percent of the construction workforce would commute from within a 50-mile (80-kilometer) radius around Marlinton, while the other 25 percent would come from outside of the 50-mile (80-kilometer) radius and rent housing within Marlinton. It is also assumed that the 25 percent of the workforce that would rent housing would do so only to provide housing during the

workweek and would spend weekends at their current housing outside of Marlinton and Pocahontas County. Buildings that would require removal were also identified based on project data developed by the Corps.

Community Cohesion

Community cohesion is a tool for measuring the stability of the community during and after the large disruption associated with a levee/floodwall project. The required taking of several structures currently in the proposed footprint of the levee and the changes to the aesthetic, scenic, and historical environment detailed in other sections of this document would affect the stability of the community both positively and negatively in some fashion.

Environmental Justice

Environmental justice guidance developed by the CEQ defines “minority” as individual(s) who are members of the following population groups: American Indian or Alaskan Native, Asian or Pacific Islander, Black, or Hispanic (CEQ 1997). Minority populations are identified when either the minority population of the affected area exceeds 50 percent or the percentage of minority population in the affected area is meaningfully greater than the minority population percentage in the general population in the surrounding area or other appropriate unit of geographical analysis. Low-income populations are identified using statistical poverty thresholds from the Bureau of Census (defined in 2000 as 1999 income less than $17,463 for a family of four).

Environmental justice impacts become issues of concern if the proposed activities result in disproportionately high and adverse human and environmental effects to minority or low-income populations. Disproportionately high, and adverse human health effects are identified by assessing these three factors to the extent practicable:

- Whether the health effects, which may be measured in risks or rates, are significant (as defined by NEPA) or above generally accepted norms. Adverse health effects may include bodily impairment, infirmity, illness, or death.

- Whether the risk or rate of exposure of a minority population or low-income population to an environmental hazard is significant (as defined by NEPA) and appreciably exceeds or is likely to appreciably exceed the risk or rate to the general population or other appropriate comparison group.

- Whether health effects occur in a minority population or low-income population affected by cumulative or multiple adverse exposures from environmental hazards.

The assessment of environmental justice impacts is limited to individuals directly affected by the project. For this analysis, only residents of Marlinton and Riverside, especially those residents requiring relocation, were considered for potential environmental justice impacts.

Socio-economic and Environmental Justice Impacts from the No Action Alternative

Under the No Action Alternative, a levee/floodwall would not be constructed to protect residents of Marlinton and Riverside from flooding. Future flooding could result in major social and economic impacts to Marlinton, such as residential and business structural damage and relocation, which could otherwise have been avoided by the presence of a levee/floodwall. In addition, without flood protection future business to support the growing tourism of the county would likely locate in flood-safe areas outside of Marlinton.

Socio-economic and Environmental Justice Impacts from Alternative 1

Economic Impacts

The construction of the Alternative 1 levee/floodwall will be conducted in two distinct phases. No overlap would occur between the construction periods of the different phases. Table 5-7 presents the impacts to employment and income within Pocahontas County as a result of each phase of construction. Income figures are determined based on the average annual salary of $16,300 for a construction worker in Pocahontas County for 1999 (CBP 1999). Impacts from each phase of construction would only occur during that particular phase.

Table 5-7 Economic Impacts from Construction Phases of Alternative 1

Phase	Workers Required	Total Direct Income*	Indirect Employment		Indirect Income*	
			Minimum	Maximum	Minimum	Maximum
1	60	$978,000	39	69	$430,320	$919,320
2	110	$1,793,000	72	127	$788,920	$1,685,420

*Figure is presented on an annual basis

With Alternative 1, several businesses would be taken in accordance with the *Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970*, as amended (42 USC §4601 et seq.). Two businesses on the Marlinton side of the project area (left descending bank of Greenbrier River) would be acquired. Four businesses on U.S. Route 219 south of Riverside could have the option of being relocated or compensated for not being protected by the project if real estate procedures determine that compensation is due under the law. Each of the four businesses has indicated to *The Pocahontas Times* that they would not relocate within Marlinton (PT 2001a). The closure of these six businesses could result in the loss of approximately 70 jobs within Marlinton. Additional loss of employment would occur should the owners of the Pocahontas Continuous Care Center choose not to relocate in the Marlinton area. This loss would be mitigated to some degree by the indirect jobs created during construction. However, these jobs would only last for the duration of the construction period and would not necessarily be solely within Marlinton. Pocahontas County would experience a slight increase in employment during construction and would benefit from the extra income generated from the project.

Since no new jobs would be created to operate and maintain the levee/floodwall infrastructure, no economic impacts would occur as a direct effect of a project once the construction was completed. The protection offered by the levee/floodwall would negate

the need for flood insurance within the protected areas of Marlinton and Riverside thus increasing disposal personal income, and may attract new businesses to locate within the protected area thereby potentially creating additional employment.

Social Impacts

During each phase of construction, it is estimated that 25 percent of the workforce would obtain weekly rental housing in Marlinton. For the first phase, 15 workers would relocate, and for the second phase, 28 workers would relocate. There is enough vacant housing within Marlinton to accommodate these workers on a weekly basis.

Further impacts to housing would result from the required relocation of individuals currently residing within the project construction area. In accordance with the *Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970*, as amended landowners of properties that must required to construct a project would be compensated. Displaced persons, including those who rent, would also be compensated for eligible expenses. These individuals could relocate to similar housing within the town as available, however several of the residents have indicated to *The Pocahontas Times* that they would move outside of Marlinton (PT 2001b).

Furthermore, the Pocahontas Continuous Care Center would be acquired because of induced flooding. This 63-bed facility is currently full. The operators of this facility could choose to relocate within Marlinton, however the facility could merely close. Therefore, this potentially could be a significant loss for Marlinton and Pocahontas County.

Impacts to community services would be negligible. It is expected that workers would only take residence in Marlinton during the week and would return to their homes on weekends. They would most likely not relocate their entire families to the project area. No new students would be added to the local school systems and local fire and police services would not be stressed by the addition of a maximum of 28 temporary residents. Medical services would likely experience a slight increase in use due to the minor accidents typically associated with a large construction project located in the area. Barring a major accident however, medical services would not be stressed beyond capacity.

Community Cohesion

A review of local news articles pertaining to the project stated two main factors would influence individuals deciding to remain in Marlinton. These two factors are the change in the scenic and aesthetic resources of the town and the protection offered by the levee/floodwall. Several residents interviewed for these articles have indicated that they would relocate outside of Marlinton should the project proceed. As stated before, many residents whose houses would be taken would prefer to move outside of town rather than remain. In the 10th Avenue neighborhood near the Knapps Creek floodwall, three of the approximately fifteen houses south of 10th Street are currently for sale and other owners have indicated a desire to put their houses on the market (PT 2001c). Much of the Tannery Row neighborhood would be taken due to its presence within the footprint of the levee; the remaining parts of the neighborhood would be negatively impacted.

Other neighborhoods of Marlinton would not receive any flood protection from the project. The neighborhood known as Campbelltown, located across Stony Creek west

of Riverside, and residents along U.S. Route 219 south of the Greenbrier River Bridge would not be protected by levees or floodwalls. The approximately 30 structures comprising Campbelltown and 15 structures along U.S. Route 219 are considered outside the scope of the LPP. Residents of these areas have experienced minor flooding during recent events and are concerned that induced flooding from the project could cause greater damage. They also express concern about being isolated from the rest of Marlinton due to the barriers established and views restricted by the levee/floodwall (PT 2001d). Several residents along U.S. Route 219 stated that they would relocate outside of Marlinton due to the change in the scenic quality of their property should the levee/floodwall be constructed.

The current layout and aesthetic qualities of several neighborhoods in Marlinton would be radically altered. The construction phase of the project has the potential to be damaging to the overall present community cohesion of Marlinton and could potentially drastically change the town itself. The taking of residences for construction of the project will result in significant changes to the communities of Riverside and Tannery Row as well as other communities within Marlinton. Furthermore, the acquisition of the Pocahontas Continuous Care Center would significantly impact Marlinton and Pocahontas County, which it serves.

Environmental Justice

The population of Marlinton is comprised of mostly white residents, with only 26 members of minority populations residing within the town. The total population of Marlinton is 1,204 and members of minority races comprise 2.2 percent of the population. The largest minority segment is the African American population, which consists of 14 members (1.2 percent) of Marlinton's population (Census 2000). The Marlinton flood control project would not adversely or disproportionately affect members of minority populations because the minority population is not meaningfully greater in the project area than in the general county and state populations.

A high percentage of the population of Marlinton has an income level slightly above the established poverty level, yet below the national average. The estimated percentage of individuals below the poverty level in Pocahontas County for 1997 is 17.5 percent, which is higher than the state level of 16.8 percent and national level of 13.3 percent (Census 1997). Thus, any environmental and human health impacts from this project could potentially have a disproportionate effect on members of low-income populations. However, no serious environmental or human health effects are expected to result from this project. The greatest potential effect to members of low-income populations would be the required acquisition of residences and relocation of families within the proposed footprint of the levee/floodwall. All displaced persons, regardless of race or income level, would be compensated for moving expenses and replacement housing. No environmental justice issues are expected from the construction and operation of this alternative.

Socio-economic and Environmental Justice Impacts from Alternative 2

Economic Impacts

The construction of the Alternative 2 levee/floodwall and Knapps Creek diversion would be conducted in two distinct phases. No overlap would occur between the construction periods of the different phases. Table 5-8 presents the impacts to employment and income within Pocahontas County as a result of each phase of construction. Impacts from each phase of construction would only occur during that particular phase.

Table 5-8 Economic Impacts from Construction Phases of Alternative 2

Phase	Workers Required	Total Direct Income*	Indirect Employment		Indirect Income*	
			Minimum	Maximum	Minimum	Maximum
1	90	$1,467,000	59	104	$645,480	$1,378,980
2	120	$1,956,000	78	138	$860,640	$1,838,640

*Figure is presented on an annual basis

Economic impacts under Alternative 2 would be similar to those under Alternative 1, however because the Pocahontas Continuous Care Center would not be acquired employment and income losses would be less than for Alternative 1. The duration of the overall project is similar; however, each phase of construction would last longer than under Alternative 1. Each phase would also employ more workers. Thus, more indirect jobs would be created and the overall income generated by Alternative 2 would be greater. The same businesses would be taken under Alternative 2, resulting in an equivalent loss of employment to Marlinton. Comparatively, since Alternative 2 would employ more workers and create more jobs, it would provide greater benefit to Marlinton and Pocahontas County from an economic standpoint.

Since no new jobs would be created to operate and maintain the levee/floodwall infrastructure, no economic impacts would occur once the construction was completed. The protection offered by the levee/floodwall would reduce insurance rates within Marlinton and Riverside and may assist in attracting new businesses to the town, thus creating more jobs for the residents of Marlinton.

Social Impacts

Social impacts under Alternative 2 would also be similar to those of Alternative 1. During each phase of construction, it is estimated that 25 percent of the workforce would obtain weekly rental housing in Marlinton. For the first phase, 22 workers would relocate and for the second phase, 30 workers would relocate. There is enough vacant housing within Marlinton to accommodate these workers on a weekly basis. The same houses are located within the real estate taking area of the Alternative 2 levee/floodwall as with Alternative 1. Impacts to community services would also be similar to those with Alternative 1.

Community Cohesion

The impacts to community cohesion under Alternative 2 would be the same as those under Alternative 1.

Environmental Justice

There would be no impacts to environmental justice under Alternative 2.

5.5.10 Recreational Resources

This section analyzes the impacts to recreational resources in the Marlinton and Riverside area from each alternative. The methodology for analysis is presented, followed by a description of the impacts from each alternative.

Methodology

The impacts resulting from each alternative were determined through comparison with the existing recreational resources available to the town of Marlinton. Impacts to recreation resources would be focused in this location, however slight changes to region wide recreation resources may be experienced. Impacts to recreational facilities were determined based on changes to the existing condition. The method of quantifying usage impacts to recreation resources usually consists of surveying users of the resources. However, such a survey is beyond the scope of this study, therefore usage impacts have been evaluated qualitatively.

The following recreational resources have been considered for impact analysis: the Greenbrier River, Stony Creek, Knapps Creek, the Greenbrier River Trail, Marlinton Municipal Park, Marlinton Roadside Park and Marlinton Elementary School Field.

Recreational Resource Impacts from the No Action Alternative

Under the No Action Alternative, a flood protection project would not be constructed for Marlinton and Riverside. Therefore, no changes would result to the existing recreational resources. Usage of existing recreational resources would not be affected. However, none of the existing recreational resources would be protected from future flooding.

Recreational Resource Impacts from Alternative 1

Under Alternative 1, approximately 16,300 feet (4,970 m) of levee/floodwall combinations would be built to protect Marlinton and Riverside. The levee/floodwall would pass through the Marlinton Roadside Park on the left descending bank of the Greenbrier River and the Marlinton Elementary School Field and Greenbrier River Trail on the right descending bank of Knapps Creek. A gated structure, consisting of a floodwall and swing gate with a 22-foot-wide (6.7-meter-wide) by 7.5-foot-high (2.3-meter-high) opening, would be constructed at the Greenbrier River Trail crossing to allow for continued use of the trail and easy closure should a flood occur.

The approximately 1-acre (0.4-hectare) Marlinton Roadside Park, located north of 8th Street adjacent to the WV 39 bridge, would be impacted by construction of the levee/floodwall. Construction of this alternative would eliminate the Marlinton Roadside Park because the northern half of the park would be replaced by a 17-foot high (5.2-meter-high) levee and the southern half would be replaced by an 18.5-foot-high (5.6-meter-high) floodwall. The park facilities would be relocated to a site to be determined in cooperation with the town.

The Knapps Creek levee/floodwall would extend through the southern part of the Marlinton Elementary School athletic field. Levee construction would alteration of some facilities at the south end of the field. However, the construction would not otherwise affect the school and usage of the athletic field would not be expected to decline, although it would be reduced in size.

A gated structure would be provided for the Greenbrier River Trail at the point where the trail crosses Knapps Creek. The gate would remain open and the trail would be passable, and only during floods would the gate be closed to protect the town. Therefore, Alternative 1 would have no impact on normal use of the Greenbrier River Trail. The pump station would be constructed to the west of the Greenbrier River Trail near the gate structure. The gate structure, 6-foot (1.8-meter) floodwall, and pump station would obstruct scenic views along part of the trail. In addition, blasting at the rock borrow area on Buckley Mountain may require temporary closures of the trail along the mountain.

Recreational uses of the Greenbrier River include fishing, swimming, and boating (principally canoeing). Recreational use of Knapps Creek is mainly limited to fishing due to the shallow depth. Currently, the open access to these water bodies from Riverside and Marlinton allow for the ease of their use as recreational resources. The construction of a levee/floodwall along the banks would make accessing the water bodies more difficult, however access paths over the levee would be constructed as part of the project. Fishing and swimming usage is not expected to change noticeably as a result of hindered stream access because the equipment required is easier to maneuver around the levee/floodwall structures.

Impacts to regional recreational resources would be minor. No significant change in use of the Greenbrier River Trail in Marlinton would be expected. Boating, principally canoeing in Marlinton, could decline slightly, however regional usage of the river is not expected to change. Boaters in Marlinton would experience a decline in aesthetic and scenic resources, as discussed in Section 5.5.11. However, these impacts would only be temporary, with the duration based on the period of time that the individuals were in Marlinton.

Alternative 1 would not directly impact the Marlinton Municipal Park, although access to the park may be temporarily restricted during periods of blasting on Buckley Mountain. No levee/floodwall structure would be constructed through the park and it would therefore not receive any protection from flooding.

Recreational Resource Impacts from Alternative 2

Alternative 2 differs from Alternative 1 in the type of flood protection constructed for Knapps Creek. Recreational impacts to the Marlinton Roadside Park, Greenbrier River, and Stony Creek would be the same for Alternative 2 as for Alternative 1. No impacts would occur to the Marlinton Elementary School Field. Access to Knapps Creek would not be restricted from the streambanks as with Alternative 1, however direct stream access would be blocked at the by the diversion dam and near the mouth where the levee section crosses Knapps Creek.

Construction of the diversion channel would directly affect the Greenbrier River Trail and Marlinton Municipal Park. The diversion channel would require the removal of a section of the trail adjacent to Buckley Mountain and would run directly through the park. Both recreational resources would have to be closed for an extended period of time while construction of the diversion channel is completed.

The section of the Greenbrier River Trail that would be severed by the diversion channel would be replaced with a bridge crossing the diversion channel. The Greenbrier River Trail is an old rail line converted into a trail under the West Virginia "Rails to Trails" Program. The program requires that all trails should be able to convert back to rail use should it become economically feasible at some point in the future. This requires the diversion channel bridge to be constructed to meet state railroad standards. Usage of the trail near Buckley Mountain may decline due to the aesthetic impacts associated with the diversion channel (see Section 5.5.11). Regional use of the trail would likely not be affected.

The Marlinton Municipal Park would be cut in half by the diversion channel. The park's main shelter lies along the proposed alignment for the channel and would have to be relocated. A vehicle and pedestrian bridge would be installed across the diversion channel in the park to maintain access to the sewage lagoons located to the north. The park itself would not benefit from any flood protection structures under Alternative 2.

5.5.11 Aesthetic and Scenic Resources

This section discusses the potential effects of the Marlinton flood control project on the aesthetic and scenic resources of the project site and other potentially affected areas. The methodology for determining impacts is presented followed by a description of the impacts from each alternative.

Methodology

Changes in the natural environment, impacts on landmarks and cultural resources, and the design quality of the levee or floodwall all affect the aesthetic and scenic qualities of the project area. Direct impacts to landmarks and cultural resources are discussed in Section 5.5.8, Cultural Resources, and Section 5.5.10, Recreational Resources. The effects on aesthetic and scenic resources are evaluated in terms of value, scale, and extent. Value can be defined as benefiting, distracting, or leaving unchanged an individual's sense of visual enjoyment. The scale of the change can be either minor, in that it complements the existing scene, or major, in that it significantly alters of eliminates the existing scene. The extent of the change is a measure of the visibility of the constructed features and the number of people it affects.

This analysis provides a general assessment of aesthetic and scenic impacts to the project area measured in terms of value, scale, and extent. Impacts are discussed on a community-wide (Marlinton and Riverside) and local scale. Mitigation measures for potential impacts, including improvement of levee and floodwall design, are presented in Section 5.2.

Visual Resource Assessment Procedure

The Corps' Visual Resource Assessment Procedure (VRAP) or similar procedure is conducted as a part of Corps planning studies for any project with the potential to significantly impact aesthetic resources. The VRAP process includes identifying the regional landscape, inventorying existing aesthetic resources, assessing visual impacts, obtaining public input, evaluating alternative plans, and forecasting with and without project conditions using visual simulations of design alternatives. This procedure is currently being conducted to provide greater detail on the potential impacts to aesthetic and scenic resources and to assist in providing appropriate aesthetic mitigation features in the design of the final selected plan. Mitigation features could include but would not be limited to landscaping, floodwall graphics, and certain maintenance and design features that would integrate the project into the visual fabric of the community.

Aesthetic and Scenic Resource Impacts from the No Action Alternative

Under the No Action Alternative, no levees or floodwalls would be constructed by the Corps to protect Marlinton and Riverside. Therefore, there would be no impacts to aesthetic and scenic resources from constructed features from construction of a flood control project. Existing views of the water bodies and Buckley Mountain would not be obstructed or altered. Riparian areas would remain in private ownership and could be altered by clearing or construction activities. Further, in the absence on flood protection additional abandonment of businesses and residences is expected.

Aesthetic and Scenic Resource Impacts from Alternative 1

Under Alternative 1, a levee/floodwall combination would be constructed along Stony Creek and the Greenbrier River to protect the Riverside community and along the Greenbrier River and Knapps Creek to protect Marlinton. A stoplog structure would be installed on the right descending bank of Knapps Creek near 11th Street. The levee/floodwall structure would appear to have a uniform top elevation along the length of the structure, however the actual height would vary relative to the topography. The height of the levee/floodwall would gradually increase from the tie-in with existing higher ground to a maximum of 17 feet (5.2 meters) at certain locations. The majority of the structure would range in height from 12 to 16 feet (3.7 to 4.9 meters). Lower sections of levee/floodwall would be built around higher sections of ground, such as the 8th Street/ State Route 39 bridge and the Greenbrier River Trail. The levee would range from 75 to 100 feet (22.9 to 30.5 meters) in width at the base and the floodwall would range from 1 to 3 feet (0.3 to 0.9 meters) in width at the base. Six gated structures would also be constructed, two gates as part of the Riverside levee/floodwall, and four as part of the Marlinton levee/floodwall. A 22-foot (6.7-meter) tall pump station would be installed near the Knapps Creek crossing of the Greenbrier River Trail.

The levee/floodwall structure and the six gates will be the dominant feature throughout Marlinton and Riverside. The flood protection currently utilized throughout the town consists of elevated structures and a small floodwall/retaining wall along the right descending bank of Knapps Creek near the water treatment plant. Presently, the communities have unobstructed views of the Greenbrier River and Stony and Knapps Creek. The levee/floodwall would be visible throughout the majority of the community,

with the exception being the houses atop the 60-foot (18.3-meter) ridge on the east side of town and where houses or buildings already block the view of the streams. The gated structure across the 8th Street/State Route 39 bridge would be directly visible along 8th Street to 4th Avenue, which is the location of the majority of the businesses in Marlinton. It would also be visible from across the river on U.S. Route 219, where several other tourist-oriented businesses are located. Several houses along the left descending bank of the Greenbrier River and the Marlinton Roadside Park would be removed to permit construction of the levee/floodwall. Initially, the structure would be visible from Riverside and to individuals utilizing the Greenbrier River for recreation purposes for approximately 1.5 miles (2.4 kilometers) except where trees and vegetation block the view. Because the riparian corridor would not require maintenance clearing, over time, vegetation would be expected to substantially block the view from the riverside of the levee/floodwall, except of course in winter when leaves have fallen.

The rock borrow area, located on Buckley Mountain, would change the shape and appearance of the mountain by creating a cut with steep, terraced side-slopes and a approximately 4-acre (1.6 hectare) flat area between. The borrow area would be visible from the Marlinton Municipal Park located south of the Greenbrier River/Knapps Creek confluence as well as along a section of US 219 when approaching Marlinton from the south. The benches on the cuts of the borrow area would be vegetated to soften the view.

Alternative 1 would include a levee/floodwall along the right descending bank of Knapps Creek from the Knapps Creek/Greenbrier River confluence upstream about 4300 feet. This includes two gated structures over the Greenbrier River Trail and State Route 39/2 at the points where they cross Knapps Creek. The levee would also be constructed through a portion of the elementary school field along Knapps Creek. These structures would be visible from almost any point south of 8th Street and would be directly visible from the elementary school. The gated structures would also be visible from the elementary school and from south of 8th Street along the respective trail and road.

Local impacts to aesthetic and scenic resources are more severe to property owners along the river and creek banks. The river or creek banks define the boundaries of several properties throughout the communities. The construction of a levee/floodwall would have significant impacts on these properties. Several structures would have to be acquired to accommodate the levee, while others that remain would have a floodwall or levee along part of their property. For some residences on 9th and 10th Avenues, the floodwall would pass directly through the front yard of their homes, completely eliminating the existing scenery of Knapps Creek from their houses. The existing scenery would also be obstructed for approximately 15 neighboring residences. The 11th Street stoplog closure would be visible from, and thus directly affect, only one residential property. The pump station would be visible from many locations throughout town because of its height and location adjacent to the Greenbrier River Trail near the gated closure.

Aesthetic and Scenic Resource Impacts from Alternative 2

The project with Alternative 2 would differ from that of Alternative 1 for flood control measures on Knapps Creek (See Section 5.4.3), as no levee/floodwall would be constructed there under Alternative 2. The diversion channel through Buckley Mountain

is a component also exclusive to Alternative 2. Essentially the same area of the mountain would be cut for rock borrow under Alternative 1, however the size and appearance of the excavation would differ. The diversion channel cut through would look similar to a highway cut, and because of its direction it would only be visible east of 9th Street in Marlinton and from the Marlinton Municipal Park. The size of the cut would enable the feature to be viewed from many locations throughout the area, including several locations that would not be able to view the levee/floodwall structures. The cut would be visible from many locations on the west side of the Greenbrier River to the south of Marlinton.

Alternative 2 also includes the construction of two other large structures, the diversion dam and the Knapps Creek Flow Control (a dike) and Pump Station Structure at the mouth of Knapps Creek. The dam would appear to be of uniform height, however the structure itself would vary in height and width throughout its length and would average approximately 8 to 10 feet (2.4 to 3.1 meters) in height and would be approximately 70 feet (21.3 meters) at the widest point. The structure would be visible to residents living near it and to individuals utilizing Wilson's field and Knapps Creek in the immediate vicinity.

The Knapps Creek Flood Control and Pump Station Structure would be a dominant feature for the western and southern sections of the town. The structure would be over 25 feet (7.6 meters) high and would be visible from as far north as 8th Street and the small business district located just south of Riverside on U.S. Route 219. It would also be visible from along the Greenbrier River and from the Marlinton Municipal Park located to the south of the town.

The diversion channel would extend through the Marlinton Municipal Park. A person looking toward the diversion channel from Knapps Creek would be able to view the area of the Marlinton Municipal Park and the mountains on the other side of the Greenbrier River, as well as the road and rail bridges required for this alternative. Individuals utilizing WV Route 39/2 (Stillwell Road), the Greenbrier River, or the Greenbrier River Trail would be able to see through the Buckley Mountain diversion channel cut to the Knapps Creek diversion structure. The weir would also be visible from both sides of the cut. Because the cut would have to have stable slopes created by pre-split blasting, it is expected that vegetation growth on the cut rock slopes would be minimal.

The Knapps Creek Diversion Channel and Buckley Mountain cut, Knapps Creek Pump Station, and levee/floodwall would be dominant features of Alternative 2. The visual impacts of Alternative 2 would be similar for many Marlinton and Riverside residents, except that for most of those residents along the right descending bank of Knapps Creek in Marlinton the visual impacts would be less. With Alternative 2, the scenery of the locale would be significantly altered, most noticeably from the Buckley Mountain cut/diversion channel and dam, and the levee/floodwall structure; thereby the value of the aesthetic and scenic resources in the immediate area would be greatly diminished. Primarily due to the Buckley Mountain cut/diversion channel and dam, the changes resulting to the existing environment for Alternative 2 are larger and more visible than under Alternative 1. Thus, the scale and extent of visual modification with Alternative 2 is greater than Alternative 1.

5.5.12 Hazardous, Toxic, and Radioactive Waste

This section describes the potential waste management issues resulting from unearthing historic hazardous, toxic, or radiological waste (HTRW) disposal in the project area that would need to be addressed prior to construction of the Marlinton flood control project. The methodology for determining impacts is presented, along with a description of the potential impacts from handling, storage, transportation, and disposal of solid and hazardous waste.

Methodology

The HTRW impacts analysis consists of an evaluation of the potential for HTRW to be disturbed during construction of the Marlinton flood control project, and then considers potential environmental impacts from the handling, storage, transportation, and disposal of such waste.

Hazardous, Toxic, and Radiological Waste Impacts from the No Action Alternative

Under the No Action Alternative, the Marlinton flood control project would not be constructed. Consequently, there would be no potential historical waste management issues to address as a result of this project. However, the areas already identified in this study as potentially contaminated could undergo future remedial investigations under state or local supervision.

Hazardous, Toxic, and Radiological Waste Impacts from Alternative 1

A Phase II(a) HTRW Investigation of Tract 1-39, the “tannery property”, found several small anomalies using ground penetrating radar (possibly rock/fill material, bricks, pipe sections, etc.) and seven large anomalies on the site. In order to identify the large anomalies, a test pit investigation was conducted on the property. This investigation revealed several areas of debris of varying sizes. No potential HTRW concerns (e.g. underground storage tanks, vats, etc.) were uncovered during the test pit investigation. All HTRW Investigation results for this property have been coordinated with Corps of Engineers’ Nashville District, the Great Lakes and Ohio River Division center of expertise for HTRW, and the West Virginia Department of Environmental Protection (WVDEP) in order to provide further recommendations with regard to potential soil contamination, if any, and any required remedial investigations for this site. Both Nashville District and WVDEP have concurred with the recommendation to leave the material on-site for levee construction. Any material that must be removed for levee construction purposes (i.e. stripping) would be stockpiled and evaluated for the appropriate disposal during construction. Removing any waste or contamination present would have a positive impact on the environmental quality of the area.

Subsurface and/or surface soil samples were also collected from 23 locations within Tract 1-39, and samples were also obtained during the test pit investigations. Samples were analyzed for volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), total petroleum hydrocarbons – diesel and gasoline range organics (TPH-DRO/GRO), priority pollutant metals (PPM) and pH. For comparison purposes, samples were also collected from a “background” location.

Soil samples from this property yielded detections of TPH-DRO above the West Virginia Underground Storage Tank (WVUST) level of 100 ppm TPH. Detections of arsenic were also found slightly above background levels and above the Environmental Protection Agency (EPA) Region III Risk Based Concentration table value. However, these levels are only action levels or screening values. Detection above these levels does not necessarily indicate contamination.

A Phase II(a) HTRW Investigation of surface and subsurface soil in Tract 12-6 found no soil contamination in this tract. Consequently, no additional HTWR Investigations are required for this property at this time. Because it appears that no contamination is present in this area, no adverse impacts would be expected here from implementation of Alternative 1.

A Phase I Investigation of the soil borrow area along Stony Creek found small areas of soil staining and the presence of solid waste. Should the Alternative 1 be implemented, these areas could be avoided during design and construction. No adverse impacts would be expected.

Hazardous, Toxic, and Radiological Waste Impacts from Alternative 2

Since Tracts 1-39 and 12-6 are included in the project area for Alternative 2, the waste management issues would be the same as for Alternative 1 for these sites. Tracts 7-1 and 7-1.1 are also included in the project area for Alternative 2. A Phase II Investigation of Tracts 7-1 and 7-1.1 has not been conducted. Should Alternative 2 be selected as the preferred alternative, a Phase II Investigation of these tracts would need to be conducted prior to construction. Any solid and hazardous waste unearthed during site preparation would be handled and disposed of in accordance with applicable Federal, state, and local requirements for solid and hazardous waste material management. Compliance with these requirements would ensure minimal environmental impact. If waste or contamination was discovered and removed, it would result in a positive impact on the environmental quality of the project area.

5.5.13 Health and Safety

This section presents potential health effects of the proposed Marlinton flood control project on both workers and the public. The methodology for determining impacts is presented, along with a description of the impacts of each alternative.

Methodology

Occupational and public health and safety issues have been evaluated in the context of those activities with the potential to affect human health and safety. The areas identified are construction noise and air emissions, as well as flooding. Air quality, noise, and water quality considerations are addressed in other sections.

Health and Safety Impacts from the No Action Alternative

Under the No Action Alternative, the Marlinton flood control project would not be constructed. Consequently, there would be no construction noise or air emission impacts to workers and the public. However, the potential for large flooding events to impact

public health and safety by exposing the citizens of Marlinton to disease, injury and death would still exist.

Health and Safety Impacts from Alternative 1

Alternative 1 involves the construction of an earthen levee/floodwall combination to protect Marlinton, and the earthen levee to protect Riverside. Typical worker impacts present in the construction industry would be expected from the construction of the proposed levee/floodwall. During construction, compliance with Federal Occupational Safety and Health Administration (OSHA) construction safety standards will be the responsibility of the construction contractor selected for the project. Compliance with these standards would provide for basic protection of worker health and safety during both construction and operation.

The noise generated from construction of the levee and the explosive blasting at the rock borrow area on Buckley Mountain could likely be perceived as loud to striking by residents within one-fourth mile of the project site, when compared to background noise levels. As explained in Section 5.5.5, no damage to residents hearing would be expected. Workers, who would be the closest to the noise sources and therefore would be exposed to the highest noise levels, would be required to wear hearing protection under OSHA regulations.

Construction workers would potentially be exposed to dust and airborne emissions from routine activities such as welding, soldering, grinding, and cleaning operations. These exposures would be intermittent, but may be intense and would be evaluated at the time of construction. Appropriate health and safety measures would be implemented for all identified and anticipated hazards to worker health and safety. Therefore, the potential adverse impacts to worker health and safety during construction would be minimized.

While the construction effects of the project are temporary, increased exposure to fugitive dust and NOx levels from the operation of heavy equipment can be associated with potential health effects. For sensitive populations (e.g., elderly in the Pocahontas Care Center) these effects could include aggravated asthma and an increase in respiratory symptoms like coughing and chronic bronchitis. Any effects would be localized and would be reduced to the extent possible using appropriate mitigation measures such as watering of roads and active construction areas as required.

With Alternative 1, construction of the levee/floodwall would greatly reduce the impact of flooding events as large as the flood of record on the town of Marlinton and the Riverside community. Floodwaters would be contained by the levee, but high volumes of storm water runoff from significant storm events within the interior of the protected area could cause some minor, nuisance flooding.

Because the sewage treatment lagoons located in the southern (downstream) section of the project area would not be protected, any partially treated sewage present in these lagoons would be released to the Greenbrier River during a flood event, as is the current condition. Implementation of Alternative 1 would have a significant positive impact on the reduction of flood hazard as well as the potential health and safety impacts associated with the aftermath of floods.

Health and Safety Impacts from Alternative 2

The health and safety impacts from Alternative 2 would be the same as the impacts for Alternative 1 for the Stony Creek and Greenbrier River portions of the levee/floodwall. However, there would be additional noise impacts to residents of Marlinton from the construction of the diversion channel and dam for Knapps Creek due to blasting of Buckley Mountain and Knapps Creek. The frequency of blasting events would be 1-2 blasts each day throughout the construction of the diversion channel. Since Pocahontas County is largely rural and background noise levels are typically low, the peak noise associated with blasting could be perceived as striking, but would not be expected to adversely impact public or worker health. As with Alternative 1, Alternative 2 would have a significant positive impact on the reduction of flood hazard as well as the potential health and safety impacts associated with the aftermath of floods.

5.5.14 Infrastructure

This section analyzes the impacts to the existing infrastructure in the Marlinton and Riverside area from each alternative. The methodology for analysis is presented, followed by a description of the impacts from each alternative.

Methodology

The impacts resulting from each alternative were determined through comparison with the existing infrastructure in Marlinton and Riverside. Impacts to the town infrastructure would only occur in the project area due to construction of the levee/floodwall and associated facilities. Infrastructure affected by the proposed alternatives includes sewer lines and lift stations, water lines, electric transmission and phone cables, and roadways. New infrastructure that would be added as a result of the proposed alternative is also presented.

Infrastructure Impacts from the No Action Alternative

Under the No Action Alternative, a LPP would not be constructed for Marlinton and Riverside. Therefore, no changes would result to the town infrastructure. However, none of the existing infrastructure would be protected from future flooding and the purpose of the project would not be met.

Infrastructure Impacts from Alternative 1

- Under Alternative 1, a levee/floodwall combination, pump station, two sumps and associated portable pumps, and a ring wall would be constructed and installed to protect the town of Marlinton and the Riverside community from flooding. The new levee/floodwall infrastructure under Alternative 1 would consist of the following:

- 16,300 feet (4,970 meters) of levee/floodwall combination, 10,510 feet (3,200 meters) in Marlinton and 5,790 feet (1,770 meters) in Riverside;

- a 34-foot-wide (10.3-meter-wide) by 13.5-foot-high (4.1-meter-high) swing gate on Airport Road/County Road 15 where it crosses Stony Creek in Riverside;

- a 44-foot-wide (13.4-meter-wide) by 13.3-foot-high (4.1-meter-high) trolley gate on U.S. Route 219 on the south side of Riverside;

- a 44-foot-wide (13.4-meter-wide) by 10.9-foot-high (3.3-meter-high) trolley gate at the Greenbrier River Bridge on 8th Street/State Route 39 in Marlinton;

- a 22-foot-wide (6.7-meter-wide) by 7.5-foot-high (2.9-meter-high) swing gate on the Greenbrier River Trail where it crosses Knapps Creek in Marlinton;

- a 34-foot-wide (10.4-meter-wide) by 12.8-foot-high (3.9-meter-high) swing gate on Stillwell Road/State Route 39/2 where it crosses Knapps Creek in Marlinton; and,

- a 10-foot-wide (3-meter-wide) by 3-foot-high (0.9-meter-high) stoplog closure at the eastern end of 11th Street.

The mechanical infrastructure added under Alternative 1 would consist of a pump station and two portable pumps. The pump station would house three pumps and have a total capacity of 35,100 GPM (132,800 liters per minute). Each pump would be capable of pumping 11,700 GPM (44, 300 liters per minute) and would be powered by a 100-horsepower diesel engine. The pump station would be located in Marlinton to the west of the Greenbrier River Trail, near the point where it crosses Knapps Creek. Two sumps, each with a corresponding portable pump, would be located in Riverside. Each portable pump would have a capacity of 20,000 GPM (75,700 liters per minute).

The existing main sewer lines within Marlinton parallel the banks of the Greenbrier River and Knapps Creek, thus requiring extensive relocation work due to levee/floodwall construction. In addition, three lift stations would be relocated. Inasmuch as possible, sewer lines would be relocated to follow town rights-of-way, primarily along town streets. Sewer lines would necessarily be buried about 12-15 feet (3.7-4.6 m); therefore excavation work would be extensive. Furthermore, the sewer line that crosses the Greenbrier River, at a point between 9th and 10th Streets, would have to be relocated because of floodwall construction. This would require some trenching in the river. However, if possible a new line may be threaded through the existing line, thus eliminating impacts to the stream.

Water line relocation work would also be required during construction. It would not be as extensive as sewer line work, however, as only approximately 2,000 feet (610 meters) of water line would require relocation or abandonment. Approximately 5,000 linear feet (1,500 m) of telephone lines and 25,000 linear feet (7,620 linear meters) of power lines would also require relocation or abandonment in the area. Adjustments would also be needed at the three locations where power lines cross the Greenbrier River within the project area (USACE 2001a). Residents of Riverside and Marlinton may experience temporary utility outages while these relocations occur.

U.S. Route 219, WV Routes 39 and 39/2, and County Route 15 would be impacted during construction of the gated structures but would not require abandonment or relocation. Further impacts to these roads are discussed in Section 5.5.15, Traffic and Transportation. Sections of several streets in Marlinton, including the entire length of Tannery Row, would be crossed by the levee/floodwall, thus requiring their

abandonment. Other local roads would access any areas affected by the levee/floodwall structure.

The sewage lagoons located south of the Knapps Creek-Greenbrier River confluence would not be protected from flooding under Alternative 1. During periods of flooding, raw sewage may overflow from the lagoons and briefly contaminate downstream sections of the Greenbrier River as would occur under current conditions (No Action). These issues are further addressed in Section 5.5.13, Public Health and Safety.

Infrastructure Impacts from Alternative 2

Under Alternative 2, a levee/floodwall combination, pump station, two sumps and associated portable pumps, and the Knapps Creek diversion project would be constructed and installed to protect the town of Marlinton and the Riverside community from flooding. The new levee/floodwall infrastructure added under Alternative 2 would consist of the following:

- 12,580 feet (3,835 meters) of levee/floodwall combination, 6,790 feet (2,070 meters) in Marlinton and 5,790 feet (1,765 meters) in Riverside;
- a 34-foot-wide (10.3-meter-wide) by 13.5-foot-high (4.1-meter-high) swing gate on Airport Road/County Road 15 where it crosses Stony Creek in Riverside;
- a 44-foot-wide (13.4-meter-wide) by 13.3-foot-high (4.1-meter-high) trolley gate on U.S. Route 219 on the south side of Riverside;
- a 44-foot-wide (13.4-meter-wide) by 10.9-foot-high (3.3-meter-high) trolley gate at the Greenbrier River Bridge on 8th Street/State Route 39 in Marlinton; and,
- a 10-foot-wide (3-meter-wide) by 3-foot-high (0.9-meter-high) stoplog closure at the eastern end of 11th Street.

The Knapps Creek diversion project would add several new structures to the infrastructure of Marlinton. These are:

- a diversion dam located in Knapps Creek near Wilson's Field;
- an approximately 250-foot-long (76-meter-long) dike along the bend in Knapps Creek near Wilson's Field;
- a 2,090-foot-long (637-meter-long) by 100- to 105-foot-wide (30.5- to 32-meter-wide) diversion channel through Buckley Mountain;
- a concrete weir in the diversion channel;
- a 50-foot-long (15.3-meter-long) stilling basin at the western base of Buckley Mountain;
- a two-lane, single span bridge for Stillwell Road/WV Route 39/2 across the diversion channel;

- a single span bridge designed to railroad specifications for the Greenbrier River Trail across the diversion channel; and,
- a single span bridge for Marlinton Municipal Park across the diversion channel.

The mechanical infrastructure added under Alternative 2 would consist of a pump station and two portable pumps. The pump station on Knapps Creek would house four pumps and have a total capacity of 208,000 GPM (787,000 liters per minute). Each pump would be capable of pumping 52,000 GPM (196,750 liters per minute) and would be powered by a 280-horsepower diesel engine. Two sumps, each with a corresponding portable pump, would be installed in Riverside. Each portable pump would have a capacity of 20,000 GPM (75,700 liters per minute).

The impacts to sewer and water lines, telephone and power lines, and the sewage lagoons from Alternative 2 would be the same as from Alternative 1. Additional impacts to power lines would occur due to the Knapps Creek diversion project, as a 3-phase power line currently located on Buckley Mountain would require relocation. The impacts to the affected roads under Alternative 2 would be the same as Alternative 1 except for WV Route 39/2. This road would not require a gated structure at the Knapps Creek crossing as under Alternative 1, however, a new bridge would be constructed near Buckley Mountain to provide a crossing of the diversion channel.

5.5.15 Traffic and Transportation

This section discusses the road and rail transportation impacts from the construction and operation of the each alternative. The methodology for assessing the impacts is also discussed. Since the railroad is not currently in operation in the project area, no impacts would occur to rail traffic and transportation from any alternative discussed. Impacts to the streets and railroad itself are discussed in Section 5.5.14, Infrastructure.

Methodology

Impacts are analyzed in comparison to the existing traffic conditions presented in Section 4.14. The analysis establishes travel routes for construction vehicles and examines the impacts to existing traffic along these routes. It is expected that the major traffic impacts would occur during construction of the proposed alternatives, as few vehicle trips would be required for operation. Other than occasional maintenance trips during operation, it is expected that less traffic would utilize the local roads during periods of operation requiring vehicular support, as these periods would only occur during flood events.

Impacts on regional commuting traffic levels from construction workers traveling to and from the site are also analyzed. Commuting impacts were determined based on the indicated phases of construction occurring in distinct intervals. Several assumptions were made to conduct this analysis. The first was that 75 percent of the construction workforce would commute from within a 50-mile (80-kilometer) radius around Marlinton, while the other 25 percent would come from outside of the 50-mile (80-kilometer) radius and rent weekly housing within Marlinton. The 75 percent of the workforce that would commute for this project reside throughout the area and travel into Marlinton via U.S.

Route 219 or WV Route 39. Based on the population distribution of the 50-mile (80-kilometer) radius area surrounding Marlinton, it was assumed that the majority of the commuters would enter Marlinton on U.S. Route 219. The assumed distribution of trips to reach Marlinton is as follows: 40 percent traveling north on U.S. Route 219, 40 percent traveling south on U.S. Route 219, and 20 percent traveling west on State Route 39. Each vehicle trip taken by construction workers to the project site is assumed to transport 1-2 individuals.

The period of construction would be from March through November, comprising 200 total days of work each year. To establish commuting periods and operational periods of trucks and assorted heavy equipment, several assumptions were made about the workweek. The workweek was assumed to be a six-day week, with construction occurring Monday to Friday, 8:00 am to 5:00 pm during March and November and Monday to Friday, 7:00 am to 6:00 pm and Saturday, 7:00 am to 4:00 pm during April through October. Commuting periods related to the Marlinton flood control project are established as the two-hour period before and after work occurs on each day.

Traffic and Transportation Impacts from the No Action Alternative

Under the No Action Alternative there would be no impacts to traffic and transportation from construction activities. Vehicle trips would occur at or near the same frequency detailed in Section 4.14 and no excessive delays would be experienced due to heavy truck traffic.

Traffic and Transportation Impacts from Alternative 1

Under Alternative 1, a levee/floodwall combination would be constructed along the Greenbrier River and Knapps and Stony Creeks. To supply the rock and soil required for the construction of the levee, rock borrow would come from Buckley Mountain and soil borrow from an area upstream of Stony Creek between the Greenbrier River and Airport Road, to the north of Riverside. Three possible routes for transporting material from the rock borrow area at Buckley Mountain were considered and are described as follows.

The first route considered uses existing roadways. Trucks leaving the rock borrow area on Buckley Mountain would travel north on WV Route 39/2 (Stillwell Road), cross the bridge over Knapps Creek and continue into Marlinton on 5th Avenue to its intersection with WV Route 39. From this point, construction vehicles would turn west (left) onto WV Route 39 and travel to their destination on the Marlinton portion of the levee/floodwall or cross the Greenbrier River bridge and turn north (right) onto US Route 219 to the Riverside portion of the project. This route would have the greatest impact on traffic because more of the town's streets would be used. In addition, all truck traffic from the rock borrow area would pass directly by the Marlinton Elementary School.

A second route would use the levee/floodwall right-of-way downstream of the WV Route 39/2 (Stillwell Road) Bridge. After crossing the bridge over Knapps Creek, trucks would turn left and follow a temporary road along the levee/floodwall alignment to 1st Avenue, then proceed on 1st Avenue to its intersection with WV Route 39.

A third route considered for hauling material from the rock borrow area would use the CWL for an interior drainage culvert. After crossing Knapps Creek on WV Route 39/2, traffic would turn left onto a temporary road along the levee/floodwall alignment. After crossing over the Greenbrier River Trail, trucks would turn right and follow the CWL of the culvert which would parallel the Trail to its intersection with WV Route 39.

Trucks traveling from the soil borrow area to the northeast of Riverside would head west on County Route 15 and cross the bridge over Stony Creek into Riverside. During construction on the Riverside levee, the trucks would travel along the construction right of way. During construction on the Marlinton levee, the trucks would travel south on U.S. Route 219 to the intersection with State Route 39. They would then cross the Greenbrier River Bridge and travel east into Marlinton along State Route 39. Once the trucks have crossed the bridge, they would travel along the construction right of way to access the current construction area (USACE 2001b).

During construction, it is assumed that 180 semi-trailer dump truck trips per day (one way) would be required to transport rock and soil to the construction sites. Based on a 10-hour workday, during periods of construction from March to November, one truck would leave either the rock or soil borrow area approximately every 3 minutes. Since trucks travel slower than other vehicles, this would significantly impact road traffic along WV Routes 39 and 39/2 and U.S. Route 219 while construction was occurring. Travel times for local vehicle trips would be extended. Brief traffic closures would be required along WV Route 39/2 due to blasting at the rock borrow area, which would cause further delays in traffic. Overall, traffic throughout Marlinton and Riverside would be noticeably affected during the construction phase of the project.

Additional vehicle trips would occur during project commuting periods as workers travel to and from the site. The number of trips would change based on the phase of the construction. Table 5-9 provides the additional number of vehicle trips expected on each of the major roads near and in Marlinton for each of the two phases of construction for Alternative 1.

Table 5-9
Additional Vehicle Trips resulting from Construction Phases of Alternative 1

Construction Phase	Number of Workers		Additional Vehicle Trips		
	Commuting	Moving	US 219 North	US 219 South	SR 39
Phase 1	45	15	15	15	8
Phase 2	82	28	28	28	14

The maximum number of additional trips that would be made on any segment is 28. These would occur along U.S. Route 219 both north and south of Marlinton. Given that existing average and peak traffic levels are comparatively light along these segments (see Section 4.14), the additional vehicle trips required during commuting periods would have little to no impact on traffic within Marlinton. Overall vehicle trips on other roads throughout the 50-mile (80-kilometer) radius area would increase slightly, with the maximum of 5 additional vehicle trips expected to occur on any segment during project commuting periods. Thus, no traffic impacts would be expected due to workers traveling to and from the project site throughout the 50-mile (80-kilometer) radius area.

Operation of the levee/floodwall would close gates on all of the major roads in the area, effectively preventing traffic flow during flooding. Once construction is complete, brief delays may also be experienced on major roads during maintenance of the gate structures during non-flooding periods.

Traffic and Transportation Impacts from Alternative 2

Traffic impacts under Alternative 2 would be similar in nature to those under Alternative 1. Since the levee/floodwall and gate structures would not be constructed along Knapps Creek under Alternative 2, traffic impacts to areas along Knapps Creek would not be as severe under Alternative 2. Greater impacts would be experienced along 10th Avenue, however, as this would be the main route of access to the construction site for the diversion dam and dike. Since more excavated rock would require moving under this alternative, truck traffic would increase in comparison to Alternative 1. All excavated material from the Buckley Mountain/diversion channel cut would need to be moved by truck. The material not used in construction of the levees would be deposited in the abandoned Waco Stone Quarry located about 1/2 mile (0.8 km) up Jericho Road from the intersection with US Route 219.

To access the quarry, trucks would travel north from Buckley Mountain along WV Route 39/2 (Stillwell Road), then west along State Route 39 across the Greenbrier River Bridge, and then south along U.S. Route 219 to Jericho Road. Since approximately 33 percent of the rock taken from the Buckley Mountain Cut would be used to construct the levees and diversion dam, 67 percent would need to be transported to the spoil area. This would require almost three times as many truck trips as Alternative 1, with two of every three truck trips made for the purposes of removing spoil. This equates to one truck passing the Marlinton Elementary School just over every three minutes, on average.

WV Route 39/2 (Stillwell Road) would be closed for an extended period under Alternative 2 while the diversion channel and bridge are under construction. All traffic would be diverted onto U.S. Route 219, which runs along the opposite bank of the Greenbrier River, while the construction proceeds. This diversion, combined with the large number of trucks driving through town on a continual basis, would greatly increase traffic at the U.S. Route 219/State Route 39 intersection, resulting in frequent delays. Traffic throughout Marlinton and Riverside would be affected to a greater degree during construction of Alternative 2 than Alternative 1.

The number of vehicle trips during commuting periods for the construction of Alternative 2 would be different than for Alternative 1 as Alternative 2 would require more workers and only occur in two phases. Table 5.10 provides the additional number of vehicle trips expected on each of the major roads near and in Marlinton for both phases of construction for Alternative 2.

Table 5-10 Additional Vehicle Trips resulting from Construction Phases of Alternative 2

Construction Phase	Number of Workers		Additional Vehicle Trips		
	Commuting	Moving	US 219 North	US 219 South	SR 39
Phase 1	67	23	23	23	12
Phase 2	90	30	30	30	15

Since the maximum number of additional trips that would be made on any segment is 30, the commuting traffic impacts would be similar to those under Alternative 1.

Operation of the levee/floodwall would close gates on all of the major roads in the area except for State Route 39/2, effectively preventing traffic flow during flooding. Once construction is complete, brief delays may also be experienced on major roads during maintenance of the gate structures and bridges during non-flooding periods.

5.5.16 Cumulative Impacts

Evidence is increasing that the most significant environmental effects may not result from the direct effects of a particular action, but from the combination of individually minor effects of multiple actions over time (CEQ 1997). The Council on Environmental Quality (CEQ) regulations implementing the procedural provisions of the National Environmental Policy Act (NEPA) define cumulative effects as “the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such actions” (40 CFR 1508.7). The regulations further explain “cumulative effects can result from individually minor but collectively significant actions taking place over a period of time.”

Methodology

The cumulative impacts analysis qualitatively presented in this document is based on the potential effects of the Marlinton flood control project when added to similar impacts from other projects in the region. The region of influence (ROI) considered for the cumulative impacts analysis is the Greenbrier River Basin, with a drainage area of 1641 square miles (4,250 square km). Marlinton is located in the upper portion of this watershed.

In the previous resource descriptions and impacts analysis, Sections 4.0 and 5.5, the existing environment and potential environmental effects of the No Action Alternative and Alternatives 1 and 2 were evaluated with respect to existing conditions or “background.” This takes into account past and present actions in the vicinity of the Marlinton flood control project. Therefore, discussions in this section center on the potential effects of reasonably foreseeable future actions in the ROI. As the construction of the Marlinton flood control project would be concluded within a period of 2-3 years, the cumulative impacts analysis focuses on the post-construction (operation) period of the project, which coincides with other reasonably foreseeable future actions.

An inherent part of the cumulative effects analysis is the uncertainty surrounding actions that have not yet been fully developed. The CEQ regulations provide for the inclusion of uncertainties in the EIS analysis and states that “when an agency is evaluating

reasonably foreseeable significant adverse effects on the human environment in an EIS and there is incomplete or unavailable information, the agency shall always make clear that such information is lacking" (40 CFR 1502.22). The CEQ regulations do not state that the analysis cannot be performed if the information is lacking. Consequently, the analysis contained in this section includes actions that could be reasonably anticipated to occur during the lifetime of the Marlinton flood control project, likely to have cumulative effects within the ROI.

In evaluating each of the resource areas for cumulative effects, focus is given to those which are likely to be impacted throughout operation of the project and thus could be cumulatively affected by other activities. This narrowing of the scope of analysis supports the intent of the NEPA process which is "to reduce paperwork and the accumulation of extraneous background data; and to emphasize real environmental issues and Alternatives"(40 CFR 1500.2[b]).

Cumulative Impacts

The primary resources that are likely to have cumulative effects from other reasonably foreseeable future projects are water and ecological resources. The cumulative effects to water resources occur primarily during high water events, when hydrologic conditions are altered by the flood control structures. The water resource effects, based on a decrease of the floodplain of the Greenbrier River, are an increase in the floodwater elevation, and an increase in water velocity that can increase scour. The cumulative effects to ecological resources occur both during normal flow and high water events, and are primarily impacts to riparian habitats. The following reasonably foreseeable actions are considered in the Marlinton flood control project cumulative impacts analysis:

1. Flood Control Projects: The Corps has authority to study flood damage reduction measures, similar to those of the Marlinton flood control project, for other communities in the Greenbrier River Basin, including Alderson and Ronceverte. These communities are located over 40 miles (66 km) downstream from Marlinton. Prior Corps studies indicated structural flood control solutions to be infeasible for other more rural areas of the Greenbrier River Basin, including Cass, Renick, and Durbin. Thus, the most likely locations for future flood control projects within the ROI would be Alderson and Ronceverte (USACE 1997). However, no feasible projects have been developed to date at either of these locations.

2. Road Paving and Maintenance Activities: The West Virginia Department of Transportation is responsible for the planning, construction, reconstruction, and maintenance of state roads. State Highway 39 and US Route 219 pass through the vicinity of Marlinton. It is reasonably foreseeable that road construction and maintenance activities would be periodically required throughout the lifetime of the Marlinton flood control project. However, such construction activities would be temporary and thus not expected to contribute significantly to cumulative impacts.

3. Lumber Industry Activities: Lumber is one of the primary industries in Pocahontas County, which overlaps significantly with the ROI. It is reasonably foreseeable that there would be ongoing and/or new lumber industry activities during the lifetime of the Marlinton flood control project.

During high water events, the floodwater elevations would be increased in some locations because the levee/floodwall would effectively contain floodwaters that would otherwise flow out into the floodplain in the project area. As explained in Section 5.5.6, floodwater elevations would be increased in some parts of Marlinton and in the vicinity of Campbelltown, approximately 1 mile (0.6 km) upstream from Marlinton. Downstream of the project, only Alternative 2 is expected to increase floodwater elevations, and this would be limited to a distance of 0.4 miles (0.7 km). Given that the nearest foreseeable flood control projects are over 40 miles (66 km) from Marlinton, no overlap of the increased floodwater elevations from these projects with the Marlinton flood control project effects would be expected.

An additional effect of the Marlinton flood control project would be increased water velocity during flood events. Although additional sedimentation from the Marlinton flood control project would be temporary and minor, sediments transported during flood events that would otherwise be deposited in the floodplain would be carried farther downstream. Other reasonably foreseeable flood control projects could contribute to increased scour and sediment loading of the Greenbrier River during high flood events. The cumulative impacts of these changes could be an adverse impact to aquatic resources during high water events within the ROI.

The potential effects of increased logging by the lumber industry could be periods of increased surface runoff due to removal of vegetation. This increased runoff would cumulatively increase creek and floodwater elevations and velocities within the Greenbrier River Basin, resulting in the cumulative effects described above.

The Marlinton flood control project would result in a direct loss of about 10 acres (0.4 hectares) of bottomland hardwoods from construction of the levee/floodwall that would be permanently converted to a treeless environment along the earthen levee and concrete floodwall. A change of species composition would occur in these altered environments. This overall loss of riparian habitat could be compounded by other reasonably foreseeable flood control projects that could have similar losses. Pressures to find new food sources and habitats would increase as species lose more habitat to development in the ROI (see Section 5.5.7).

5.5.17 Unavoidable Adverse Impacts

The construction of either Alternative 1 or 2 would have some unavoidable adverse impacts in the project area. Traffic will be adversely affected during construction of either alternative, and noise generated from construction activities would be an unavoidable adverse impact.

Lasting unavoidable adverse impacts would occur to the visual resources of the vicinity. Under either alternative, views that currently include the streams in the project area would be unavoidably restricted by the levee/floodwall. Views from the river, typically from recreational use such as canoeing and fishing, would be affected aesthetically The visual impacts associated with the diversion channel through Buckley Mountain under Alternative 2, and the rock borrow area on Buckley Mountain under Alternative 1 may be considered unavoidable.

Implementation of either alternative would cause the unavoidable long-term loss of some ecological habitat. Similarly, the taking of houses and business structures is also

considered an unavoidable adverse impact to the community. In addition, some loss in population could be attributed to the project for any of those whose houses would be taken. Likewise economic and employment losses would be unavoidable for any of those businesses acquired for the project and that choose to not reopen within the town or vicinity.

Fugitive dust emissions generated during construction will be suppressed using standard Corps mitigation measures. However, the dust generated would be an unavoidable adverse impact.

5.5.18 Irreversible and Irretrievable Commitments of Resources

This section describes the major irreversible and irretrievable commitments of resources associated with either Alternative 1 or 2. A commitment of resources is irreversible when its primary or secondary impacts limit the future options for a resource. An irretrievable commitment refers to the use or consumption of a resource that is neither renewable nor recoverable for use by future generations.

The ecological habitat lost because of the levee and floodwall construction would be irreversibly committed, as would any previously undiscovered cultural resources that may be encountered during construction.

The primary irretrievable commitment of resources associated with either Alternative 1 or 2 is the consumption of fossil fuels (gasoline, diesel, hydraulic fluid) by construction equipment, and to a much lesser extent, consumption of fossil fuels by maintenance equipment during operation.

Materials used in the relocation of power, water, and sewer lines would also be irretrievably committed. Similarly, concrete and steel would be required for the floodwalls and gates. However, at the end of its useful life, these materials could be recycled. The stone used for stone slope protection and levee base has an indefinite useful life, however for the purposes of this analysis it would be irreversibly committed to the project.

5.5.19 Relationship Between Short-Term Use of the Environment and the Maintenance and Enhancement of Long-Term Productivity

Because of the disruption caused by construction of either Alternative 1 or 2, there would be significant impacts on short-term uses of the environment in the project area. Implementation of either alternative would cause long-term loss of ecological habitat and associated productivity for those areas where infrastructure is placed and for borrow areas. However, for both Alternative 1 and 2 approximately 16 acres of riparian area riverward of the levee/floodwall included in the proposed property acquisition would not be disturbed and could over the long term revert into more productive habitat. This and the creation of wetlands in the soil borrow area would contribute to the maintenance and enhancement of long-term productivity of the Greenbrier River ecosystem.

5.6 FINAL SCREENING CRITERIA

The final screening of alternatives is based on an assessment of environmental impacts, economic impacts (costs and benefits), and effectiveness (damages prevented by each plan).

5.6.1 Environmental Impacts

The Corps planning principles state that projects must be consistent with protecting the Nation's environment. Therefore, environmental consequences weigh heavily in the final plan selection. Following is a summary of the significant impacts from construction and implementation of the alternatives including No Action. All impacts are summarized in Table 5-12, below.

Those resource categories having significant impacts from Alternative 1 are: ecological resources, cultural resources, and aesthetics. Specifically, with Alternative 1 about 2 acres of wetlands and 10 acres of bottomland hardwoods would be lost from construction of the levee/floodwall, and riparian habitat would be lost along about 2100 feet (640 meters) of lower Knapps Creek from the placement of stone slope protection. Cultural resource impacts from Alternative 1 would be the potentially adverse effect on the integrity of historical districts, specifically the Tannery Row area and the Courthouse District. Significant impacts to the aesthetic qualities of the area would be from the predominant physical features of the project – the floodwall/levee and the rock borrow area on Buckley Mountain. Traffic and transportation impacts would be significant, however, they would occur only during actual construction of the project. No impacts to Federally listed threatened and endangered species would be expected.

Construction and operation of Alternative 2 would result in impacts similar to those of Alternative 1, however overall impacts would be greater. With Alternative 2, about 3 acres of wetlands and about 13 acres (5.2 hectares) of bottomland hardwoods would be lost. The diversion dam would significantly change the aquatic environment of Knapps Creek downstream of the dam, a reach of about 6000 feet (1830 meters), by altering natural flows in the channel. In addition, to the aesthetic impacts of the floodwall/levee, the diversion channel and particularly the cut in Buckley Mountain would significantly alter the visual resources of the area. Traffic impacts would be limited to when construction is occurring, however impacts would be substantially greater than with Alternative 1 due to the approximate 190,000 cubic yards (144,400 cubic meters) of excess rock that would be trucked to the disposal area on Jericho Road. No impacts to Federally listed threatened and endangered species would be expected.

The No Action alternative would have impacts on socio-economic resources of Marlinton. Without flood protection, occupants within the flood plain would continue to maintain flood insurance and disinvestments in real property would be expected to continue. Moreover, the risk to human health and safety from the continued threat of flooding would remain.

Table 5-11. Summary of Environmental Consequences of the Alternatives

Resource Category	No Action	Alternative 1	Alternative 2
Land Use	No change to land use would be expected within the project area. Potential for increased development in undisturbed areas outside of town. Continued potential for flooding would discourage investment and development.	74 acres affected during construction 28 acres permanently used for infrastructure. Additional 22 acres disturbed for CWL. 9 acres converted from meadow by soil borrow. 9 acres upland converted by rock borrow and access road. Increased investment and development in flood-protected area expected	98 acres affected during construction 35 acres permanently used for infrastructure. Additional 20 acres in CWL. 9 acres converted from meadow to soil borrow. 190,000 yd^3 spoil placed in old quarry. Increased investment and development in flood-protected area expected.
Topography/Drainage	No impact.	Soil borrow area drainage/topography changed. Rock borrow a major change in topography. Interior drainage improved.	Soil borrow alters topograpy/drainage. Cut-through major change is topography. Diversion channel major change in drainage pattern. Interior drainage of town improved.
Geology and soils	No impact.	Minor loss of prime farmland soils.	Minor loss of prime farmland soils.
Air Quality	No impact.	Minor impacts from fugitive dust and vehicle/equiment exhaust emissions during construction.	Minor impacts from fugitive dust and vehicle/equiment exhaust emissions during construction.
Noise	No impact.	Moderate impact during construction and blasting.	Moderate impacts during construction. Greater imacts from blasting due to cut.
Water Resources	Flooding potential would continue.	Minor and only during construction	Permanent change in flow of lower Knapps Creek
Ecological Resources	High quality resources continue. Riparian resources could be affected by development/clearing	2 acres of wetlands affected, 2100 feet of Knapps Creek streambank affected from stone slope protection. 10 acres of riparian/bottomland hardwoods affected. 16 acres of riparian area precluded from future development.	3 acres of wetlands affected. Significant changes in aquatic environment of lower Knapps Creek. 10 acres of riparian/bottomland hardwoods affected. 16 acres of riparian area precluded from future development.
Cultural Resources	No impact. Any potential unrecorded resources would not be recorded.	Adverse effect on potentially eligible historic resources along Greenbrier River and Courthouse Neighborhood District.	Adverse effect on potentially eligible historic resources along Greenbrier River.

Table 5-11. Summary of Environmental Consequences of the Alternatives			
Socio-economic	Flooding potential would continue to discourage investment and development in Marlinton.	Major, but temporary boast to economy during construction. Acquisition of 39 residences and 6 businesses, including the Pocahontas Continuous Care Center, could result in permanent loss of residents and/or businesses. Flood insurance would no longer be required with project. Major disruption of the community during construction.	Major, but temporary boast to economy during construction. Acquisition of 37 residences and 5 businesses could result in permanent loss of residents and/or businesses. Flood insurance would no longer be required with project. Major disruption of the community during construction.
Recreation	No impact.	Small park near State Rt. 39 bridge relocated. Portion of Marlinton Elementary athletic field taken for project. Minor impacts during construction to Greenbrier River Trail and Marlinton Municipal Park.	Small park near State Rt. 39 bridge relocated. Minor impacts during construction to Greenbrier River Trail. Major impact to Marlinton Municipal Park.
Aesthetics	No impact.	Major impact to landscape features from levee/floodwall and rock borrow area.	Major impact to landscape features from levee/floodwall, diversion cut and channel.
HTRW	No impact.	No impact.	No impact.
Health & Safety	No impact.	Minor impacts typical of construction activities. Major positive impact on reduced potential for loss of life and property damages in Marlinton.	Minor impacts typical of construction activities. Major positive impact on reduced potential for loss of life and property damages in Marlinton.
Traffic & Transportation	Major impact only during flood events when roads flooded	Major traffic impacts during construction especially from truck transport of levee fill material (Soil and rock). Interior streets protected from flooding with project.	Major traffic impacts during construction especially from truck transport of levee fill material and spoil disposal from diversion. Interior streets protected from flooding with project.
Cumulative Impacts	No impact.	Minor impacts to Greenbrier River watershed from restriction of floodplain and changes to riparian habitat.	Minor impacts to Greenbrier River watershed from restriction of floodplain and changes to riparian habitat.

5.6.2 Economic Impacts

The costs and benefits for the final plans, Alternative 1 and Alternative 2, are summarized in this section. Project first cost represents the total monetary outlay to construct each alternative plan. The base year for economic analysis is 2007, the earliest estimated completion date for either alternative. The construction period is estimated to be five years – 2003 to 2007. Both benefits and costs are expressed in October 2001 prices.

First Cost

First cost for the final alternative plans are summarized in Table 5-12. Costs are given for each feature code of accounts, including contingencies. Details to the sub-feature level are contained in the Baseline Cost Estimate Appendix for the project. The first cost includes project construction, real estate acquisition, environmental mitigation and engineering and design.

Table 5-12
First Cost of Final Alternatives (Millions)

Feature	*Item*	*Alternative 1*	*Alternative 2*
01	Lands & Damages	$11.4	$7.8
02	Relocations	$2.3	$3.7
06	Environmental Mitigation	$1.2	$2.5
11	Levees & Floodwalls	$37.9	$29.9
13	Pump Station	$6.2	$6.9
15	Diversion Channel	N/A	$20.9
30	Planning, Engineering & Design	$13.9	$17.2
31	Construction Management	$3.3	$4.5
	TOTAL PROJECT COST	**$76.3**	**$93.4**

Annual Cost and Benefits

The annual costs for the final alternative plans are the summation of the annualized capital cost and the estimated O&M cost. Annual capital costs include average annual interest and amortization charges on the investment cost and have been computed using an interest rate of 6 3/8 percent and an economic life of 50 years. The estimated O&M costs are based on actual cost experience for similar local flood control projects constructed by the Huntington District. These costs include maintaining the levee and floodwall structures, operating the pump stations and gate closures, and with Alternative 2, periodic removal of sediment from the diversion channel. The O&M costs are provided in Table 5-13.

The benefits attributable to each of the final alternative plans represents flood damages prevented up to the flood of record level expressed in annual values. Benefit categories include: residential, commercial, personal property, utilities, transportation, emergency cost reduction, and construction employment. The benefits were computed over a 50-year period using standard discounting procedures and an interest rate of 6 3/8 percent. A summary of the average annual benefits, average annual costs, net benefits (negative) and benefit-to-cost ratio rates are presented in Table 5-13.

Table 5-13
Summary of Benefits and Costs

	Alternative 1	*Alternative 2*
Annual Benefits	$2,448,207	$2,522,480
Annual First Cost	$6,086,631	$7,473,666
Annual O&M	$80,500	$120,000
Total Annual Cost	$6,89131	$7,593,666
Net Benefits (negative)	$(3,638,425)	$(4,951,185)
Benefit-to-Cost Ratio	0.40	0.34

5.6.3 Effectiveness

Effectiveness describes the physical beneficial attributes of the alternative plans. Both Alternative 1 and Alternative 2 are equally effective in that both protect 88 percent of the structures that were damaged during the 1985 flood. Both plans provide the same level of protection, in the main part of Marlinton and in Riverside. Alternative 1 impacts three structures along Knapps Creek that are not affected by Alternative 2. These structures include two residences and the Pocahontas Continuous Care Center.

5.6.4 Plan Selection

Two local protection alternatives have been carried forward as final plans for providing flood protection at Marlinton. The major features of each alternative plan are similar for Marlinton and Riverside; however, Alternative 1 includes a levee / floodwall combination along Knapps Creek while Alternative 2 includes a diversion channel to carry high flows of Knapps Creek away from Marlinton.

The primary Planning objective was to develop the most cost effective, implementable plan to provide protection for the Town of Marlinton to the level of the 1985 flood; a plan that is environmentally sound and socially acceptable. Both final plans provide the desirable level of flood protection and meet the requirements specified in WRDA 96, however, Alternative 2 is estimated to cost 22% more and has greater environmental impacts.

Corps' planning guidance stipulates that the recommended plan must have incremental benefits in excess of costs (net benefits and a positive benefit-to-cost ratio) and the recommended plan must provide the maximum net benefits unless there is a significant reason otherwise. Neither of the final plans is economically feasible and no feasible plan can be developed for Marlinton that meets the requirements for traditional economic feasibility under the guidance of WRDA 96.

The Congressional authorization (Section 579 of WRDA '96) stipulates that the Corps *"design and implement a flood damage reduction program in the vicinity of …Marlinton"* to a level of protection for the flood that occurred in November 1985. This report documents the investigations that have been undertaken to meet requirements of the authorization. Since traditional economic feasibility as stipulated in P&G could not be achieved, emphasis has been placed on formulating the most cost effective plan to meet the planning objectives and satisfy the authorization. Both final plans provide equal protection against flooding as occurred in 1985, but Alternative 1 is much more efficient in that Alternative 2 has a greater construction

cost resulting in a considerably lower benefit-to-cost ratio. The environmental impacts associated with construction of Alternative 2 are also much greater.

In consideration of the above, it is concluded that Alternative 1, levee / floodwall combination for Marlinton including the Riverside area, is the most cost effective plan to provide protection for Marlinton and therefore is the selected plan. Table 5-14 provides a summary comparison of the final alternative plans in support of the selection of Alternative 1.

Table 5-14. Summary Comparison of Final Alternative Plans

	No Action	Alternative 1	Alternative 2
1. Plan Description	Without project condition/ no flood protection.	Levee/floodwall combination for Marlinton, Knapps Cr. & Riverside area. Flood protection to 1985 level.	Levee/floodwall combination for Marlinton & Riverside area. Diversion channel for Knapps Creek. Flood protection to 1985 level.
2. Economic Analysis			
A. Project cost	$0	$76.3 M	$93.4 M
Federal	NA	$68.7 M	$68.7 M
Non Federal	NA	$ 7.6 M	$24.8 M
B. Real Estate	NA	$11.4 M	$7.8 M
C. Annual Cost	NA	$ 6.1 M	$7.5 M
D. Annual O&M	NA	$80.5 K	$120 K
E. Annual Benefits	$0	$2.45 M	$2.52 M
F. BCR	NA	0.40	0.34
3. Significant Environmental Impacts			
A. Surface Water	Existing quality will continue.	Minor impacts only during construction	Significant, perm-anent change in lower Knapps Creek
B. Aquatic Resources	High quality resources continue.	Significant impact to 2 acres wetlands, 2100 feet of stream from stone slope protection.	Significant impact to 3 acres wetlands, 6000+ ft. of stream from diversion of flows.
C. Terrestrial resources	High quality resources continue.	Significant impacts from loss of about 10 acres bottomland hardwoods.	Significant impacts from loss of about 13 acres bottomland hardwoods.
D. Cultural Resources	No impacts.	Significant adverse effect along Greenbrier R. and in Courthouse District.	Significant adverse effect along Greenbrier River.
E. Recreation Resources	No impacts.	Moderate impacts to small park relocated/school athletic field disturbed	Significant impacts to Marlinton Municipal Park.

F. Aesthetics	No impacts.	Significant impacts from floodwall/levee and rock borrow area.	Significant impacts from floodwall/levee and diversion channel and cut.
G. Traffic & Transportation	Roads and streets will continue to be flooded	Significant impacts during construction.	Very significant impacts during construction.
4. Social Effects			
A. Public Safety	Significant flood hazard continues with threat for loss of life.	Reduced potential for loss of life and property damages in Marlinton.	Reduces potential for loss of life and property damages in Marlinton.
B. Community Cohesion	No change. Continued disinvestments expected from threat of flooding.	Moderate loss of residences and businesses due to construction.	Moderate loss of residences and businesses due to construction.
C. Business Activities	Business activities constrained by repeated flooding, causing loss of income for owners and employees	Improved conditions for businesses inside protection limits	Improved conditions for businesses inside protection limits
D. Recreation Activities	No impacts.	Small park to be relocated.	Diversion channel would divide community park.
5. Evaluation Criteria			
A. Effectiveness (residual damages)	No reduction in annual avg. flood damages of $1.6M.	Residual damages = $29 K, for a reduction of 98%	Residual damages = $29 K, for a reduction of 98%
B. Level of Flood Protection	Significant damages begin at about 20-yr flood level. Doesn't meet objective.	Marlinton protected to the level of the 1985 flood of record. Meets objective.	Marlinton protected to the level of the 1985 flood of record. Meets objective.
C. Minimize Environmental Impacts	Habitats unaffected.	Loss of 2 acres wetland, 10 acres riparian/bottomland hardwoods, and 2100 feet of stream impacted.	Loss of 3 acres wetlands, 10 acres riparian/bottomland hardwoods, and 6000 feet of stream impacted.
D. Acceptability	Not acceptable. Does not meet planning constraints.	Acceptable. Meets planning constraints.	Fairly Acceptable. Meets planning constraints.

6.0 SELECTED PLAN

This section presents details for Alternative 1, which is the selected plan. It also provides information on the mitigation requirements, project economics, and implementation of the plan.

6.1 PLAN DESCRIPTION

Alternative 1, the selected plan, consists of a levee/floodwall combination that would protect the main part of Marlinton and also the Riverside section of Marlinton. (See Fig. 5-1) The main levee section at Marlinton begins upstream of Tannery Row and extends downstream along the left descending bank of the Greenbrier River to the mouth of Knapps Creek. From that point, the levee would extend up the right descending bank of Knapps Creek approximately 4,400 feet (1,341 meters) to high ground. The Knapps Creek section would include approximately 1,500 feet (457 meters) of concrete floodwall in areas where development limits construction of an earthen levee. There are four gate openings in this section, two for the Greenbrier Trail and two for town streets. In addition, a stop-log closure on 11th Street is required. A pump station near the mouth of Knapps Creek with a capacity of 31,500 GPM (120,000 liters per minute) would handle interior drainage.

The Riverside section consists of a levee with two short floodwall sections. It begins on the right descending bank of Stony Creek upstream of US 219, extends down Stony Creek to the Greenbrier River, downstream along the right descending bank of the Greenbrier River, then crossing US 219 to high ground, for a total of about 5,790 feet (1,770 meters). This section contains two gate closures, one for US 219 and one for Airport Road. Interior drainage for the Riverside section would be handled by two 20,000 GPM (76,000 liters per minute) portable pumps using a sump and interceptor system.

The plan requires the acquisition of 39 residences and 6 businesses, a total of 85 acres involving 93 different tracts. Relocations would involve 8,700 feet (2,652 meters) of sewer line along the Greenbrier River and Knapps Creek and a lift station at First Avenue, 2,000 feet (610 meters) of water line, 5,000 feet (1,524 meters) of telephone lines and 25,000 feet (7,620 meters) of power lines.

The levee section for both Marlinton and Riverside would be of rolled rock construction with an impervious soil blanket. Rock would be obtained from a borrow area in the vicinity of Buckley Mountain located south of Knapps Creek and soil from a borrow area directly north of the confluence of Stony Creek and the Greenbrier River.

6.2 MITIGATION PLAN

Corps of Engineers planning policy provides that a mitigation plan be developed for the National Economic Development Plan, and for the selected plan if not the same. The following mitigation plan has been developed for Alternative 1, which is the plan that offers the greatest benefits at the least cost and is the Selected Plan.

6.2.1 Baseline Conditions

The Greenbrier River and Knapps Creek are both listed by the West Virginia Division of Natural Resources as high quality streams. Substrates within the project area are predominately rubble and cobble interspersed with areas of sand. Much of these reaches have bedrock control. Water quality is good to excellent. These factors coupled with low siltation rates allow the area

to support good diversity of macroinvertebrates, including many species of mussels, crayfish, and snails. The Greenbrier River also supports an excellent warm water fishery, particularly for smallmouth bass.

The riparian zone within the project area is comprised predominately of river birch, sycamore, black willow, silky dogwood, and alder. The riparian zone is more consistently of high quality downstream of the WV 39 bridge and along Knapps Creek than through the main part of town. However, some riparian areas within town are of high quality, such as near the old tannery, and others, such as just downstream of the Route 219 Stony Creek bridge, are poor. Most of the high quality riparian areas can be characterized as bottomland hardwood habitat.

Wetland habitats are also scattered throughout the project area. Palustrine scrub - shrub (PSS) habitats are particularly prominent in the downstream portions of the project area near the confluence of Knapps Creek. The dominant species in this habitat type is river birch, sycamore, black willow, silky dogwood, and alder. Herbaceous species include grass-leaved goldenrod, spike-rush, and jewelweed. The interspersion of these wetland habitat types with bottomland hardwoods and the riverine community creates greater habitat diversity and increases the fish and wildlife resource values of the area.

The only Federally listed threatened of endangered species that could potentially be affected from implementation of the selected plan is the Indiana bat. Indiana bats would use the project area for foraging and roosting between April 1 and November 14. Indiana bat summer foraging habitats are generally defined as riparian, bottomland, or upland forest, and old fields or pastures with scattered trees (USFWS 2001f).

6.2.2 Potential Impacts

Without Project Conditions

Based on reviews of aerial photography and maps of the project area from 1969 to present, habitats in the project area have generally increased in quantity and quality over time. An exception to this would be increased development of the Riverside area. Abandonment of other areas, however has allowed for natural succession to old-field habitat. Riparian areas have not been significantly disturbed and are maturing. Conversely, aquatic beds, islands, and bars have decreased, presumably from major flood events and instream work that occurred after the 1985 flood. Generally, land use in the project area has not changed over the past 30 years and this would be expected to continue for the “future without project” scenario (USFWS 2001f).

With Project Conditions

Construction of Alternative 1, the selected plan, would result in adverse impacts to aquatic and terrestrial resources in the project area. Anticipated impacts include direct habitat losses due to construction activities, and socioeconomic and aesthetic impacts. The majority of the impacts are attributable to construction of the levee/floodwall, however excavation for soil and rock borrow would impact wetland, old-field and upland habitats.

Construction of the levee/floodwall would result in some unavoidable impacts to terrestrial and aquatic habitats. All impacts to terrestrial habitats would occur within the Construction Work Limits of the proposed project. Total length of the levee/floodwall is about 16,300 feet (4,968 meters). About 28 acres (11.2 hectares) would be permanently converted to floodwall/levee. The construction work limits to either side of the structure would comprise an additional 22

acres (8.8 hectares) that would be temporarily disturbed. About 10 acres (4 hectares) is in bottomland hardwoods habitat while the remaining acreage is old-field, agricultural and urban. Wetland habitats lost due to direct and indirect impacts from floodwall/levee construction would comprise approximately 1 acre and are located along Knapps Creek An additional 2100 feet (640 meters) of riparian habitat, or about $^{1}/_{2}$-acre (0.2 hectares), would be effected from placement of stone slope protection along Knapps Creek. The rock borrow area and access road would disturb about 9 acres (3.6 hectares) of upland habitat. The soil borrow area would disturb about 9 acres (3.6 hectares) most of which is agricultural (hay meadow), however 1 acre (0.4 hectares) is wetland habitat. Table 6-1 summarizes habitat impacts.

Table 6-1. Habitat Impacts.

Habitat Type	Estimated Acreage (hectares) Lost	Description of Impacts
Riparian	10 (4)	Clearing for floodwall/levee
Wetlands	2 (0.8)	Direct impact for construction of floodwall/levee and indirect impacts to hydrology.
Streams	0.5 (0.2)	Placement of 2100 linear ft. stone slope protection
Old-field	25 (10)	Clearing for floodwall/levee
Upland	9 (3.6)	Clearing, excavation for rock borrow
Agricultural	3 (1.2)	Clearing for floodwall/levee
Urban	12 (4.8)	Clearing for floodwall/levee
Total	61.5 (24.6)	

6.2.3 Impact Assessment

A Modified Habitat Evaluation Procedure (HEP) was conducted in 1985 to assist in determining mitigation requirements for the Section 205 flood study for Marlinton (*See Section 3.0, Prior Study and Reports*). This procedure rated habitats on suitability to support all wildlife that would be expected to use each cover type. Therefore, no evaluation species were used. This Modified HEP, often referred to as the Modified Missouri Method, was based on the species guilding concept where groups of species with similar habitat requirements were discussed, i.e. songbirds or furbearers. A subjective rating from 1 to 10 was assessed on the suitability of the habitat to provide food, cover, and reproduction requirements for wildlife. Although the system is based on subjective value judgments, the final values obtained are useful in comparing alternatives, reflecting losses and gains, and identifying areas where project modification or management can effect a change in habitat potential. For this reason the HEP was used for development of this draft mitigation plan.

Table 6-2. Results of 1985 modified HEP

Terrestrial Habitat Type	***Baseline HSI value***
Urban (U)	15
Palustrine Emergent (PEM)	80
Palustrine Scrub/Shrub & Riverine Emergent (PSS/REM)	78
Bottomland Hardwoods (BH)	50
Open land/Agricultural (EO)	53
Old-field (OF)	55
Aquatic Habitat Type	
Greenbrier River – Riverine Upper Perennial (RUP)	70.7

For the aquatic portion of the modified HEP, field evaluations emphasized physical features of the habitat such as instream and riparian cover, as well as chemical and biological parameters. Resulting Habitat Suitability Index (HSI) values were then multiplied by a factor of ten to aid in calculations and ease in comparisons. A value of 100 reflects optimum habitat suitability. The results are listed in Table 6-2 (USFWS 1985).

A freshwater mussel field survey was conducted in the project area on the Greenbrier River, Knapps Creek, and Stony Creek (Ecological Specialists 2000). An initial search covered the Greenbrier River and the mouths of both tributary creeks, however since no mussels were found in either creek, more intensive surveys were limited to five sites on the Greenbrier River (including two sites upstream of Marlinton that were sampled in an earlier survey). Results of a sedimentation survey conclude that scouring and deposition as a result of the project would be minimal. Further, the use of windrow revetment instead of conventional stone slope protection for reaches along the Greenbrier River will result in no impact to the streams. Therefore, no mussel habitat would be significantly impacted.

Habitat and mist-net surveys were conducted for bats. Although suitable habitat was found for the Federally endangered Indiana Bat, mist-net surveys found none were present. Therefore, the proposed project would not be expected to impact the Indiana Bat. No impacts to Federally listed threatened and endangered species would be expected (R.D. Zande 2001).

Those resource categories having significant impacts from Alternative 1 are: ecological resources including wetlands and streams, cultural resources, and aesthetics. Cultural resource impacts could occur from the potentially adverse effect on the integrity of historic districts, specifically the Tannery Row area and the Courthouse District. Significant impacts to the aesthetic qualities of the area would be from the predominant physical features of the project – the floodwall/levee and the rock borrow area on Buckley Mountain. In addition, traffic and transportation impacts would be significant but would occur only when construction activities are occurring. Significant impacts are summarized in Table 6-3, below.

Table 6-3. Resource impacts and proposed mitigation.

Resource Category	Impacts	Mitigation proposed
Ecological - Wetlands	2 acres (0.8 hectares) of wetland habitats affected.	Creation of wetlands at soil borrow site.
Ecological – Riparian/Stream	10 acres (4 hectares) of riparian/bottomland hardwoods affected. 2100 feet (640 m) of Knapps Creek streambank affected from placing stone slope protection.	Stream bank restoration on Knapps Creek.
Cultural Resources	Adverse effect on potentially eligible historic resources along Greenbrier River and Courthouse Neighborhood District.	Recordation.
Aesthetics	Major impact to landscape features from levee/floodwall and rock borrow area.	Landscaping and design features.
Traffic & Transportation	Major traffic impacts during construction especially from truck transport of levee fill material (Soil and rock).	Use of alternate routes, such as CWL rights-of-way, instead of town streets where possible.

6.2.4 Engineering Design and Construction Specifications Which Avoid or Minimize Effects

Through the planning process consideration has been given to minimizing environmental impacts through good engineering design. Although direct losses of certain habitats from construction are unavoidable, the levee/floodwall alignment has been adjusted to maximize areas between the levee/floodwall and the streams. These “set-aside” areas would be purchased and become part of the project. Some of these set-aside lands currently have good riparian vegetation, while others are in lower value habitats. All of these areas would be expected to mature into valuable bottomland hardwoods.

In addition to refining the project alignment to preserve riparian acreage from future disturbance, the windrow revetment design for erosion protection for the levee/floodwall eliminates the need for clearing of stream banks that would have otherwise been required for placement of stone slope protection. Furthermore, because maintenance mowing and clearing will not be required along streams where windrow revetment is utilized, herbicide use would be greatly reduced. The lower portion of Marlin Run would be relocated as part of the selected plan. This section of Marlin Run is highly disturbed, has little to no cover, and is unstable as evidenced by severe erosion. The proposed 1,380-foot (421 meter) channel would incorporate to the maximum extent possible natural stream restoration principles. Further, tree and shrub plantings would provide shading for this section of stream. Therefore, impacts to Marlin Run can be mitigated in-kind.

To mitigate for potential adverse effects from application of herbicides, an Integrated Pest Management Plan would be developed for the project that would designate appropriate

herbicides and surfactants to be used on applicable levee sections. Application of herbicides including frequency, timing, rate, technique, and extent of application would be specified.

Traffic impacts would be mitigated to the maximum extent possible by utilizing the construction rights-of-way (levee/floodwall alignment) instead of town streets when and where practicable. During future engineering and design studies, should sufficient quantity of soil be found and the Riverside levee constructed completely from soil, trucking of rock from Buckley Mountain to the Riverside area would be eliminated. However, addition disturbance from soil borrow activities may increase mitigation requirements for other impacts.

Aesthetic impacts from the proposed project would be mitigated primarily by use of landscaping. In addition, design features such as floodwall graphics or textured concrete and other decorative features could be used to give the project a more pleasing appearance. The Corps Visual Resource Assessment Procedure is being used to assist in incorporation of appropriate aesthetic mitigation features in the detailed design of the project.

6.2.5 Formulation of Mitigation Alternatives

This section discusses the formulation of necessary mitigation for aquatic and terrestrial impacts associated with the selected plan. Aquatic mitigation requirements are based on replacement ratios typically used for Section 401 water quality certification in West Virginia. Terrestrial mitigation is based on habitat units.

Aquatic Mitigation

Due to technical difficulties associated with wetland and aquatic habitat creation, and the lag time for habitat functions to be reestablished, the following wetland/aquatic mitigation ratios have been established by the West Virginia Division of Environmental Protection (WVDEP) and the WVDNR for use under their Section 401, Water Quality Certification program. The ratios given for wetlands and open water are for mitigation by creation of those habitat types, while the ratio for stream habitats is for mitigation by enhancement. The USFWS and USEPA concur with these ratios (USFWS 2001f). See Table 6-4, below.

Table 6-4. Wetland/Aquatic Habitat Mitigation ratios

Habitat	Mitigation Ratio
Forested wetlands	3:1
Scrub/shrub wetlands	3:1
Emergent wetlands	2:1
Open water (Lacustrine)	1:1
Stream habitats	2:1

Aquatic mitigation was based on these accepted ratios as depicted in Table 6-4. Table 6-5 shows wetland/aquatic impact mitigation requirements for the Marlinton LPP utilizing these ratios.

Table 6-5: Wetland/Aquatic impacts and required mitigation.

Habitat	Impacted acres	Mitigation ratio	Mitigation amount
Emergent wetlands	2.0 (0.8 hectares)	2:1	4.0 acres (1.6 hectares)
Stream	0.5 (0.2 hectares) (2100 linear ft./640 meters)	2:1	1.0 acres/4,200 linear ft. (0.4 hectares/1,280 meters)

Terrestrial Mitigation

Mitigation required for terrestrial impacts was computed by multiplying the acreages for each affected habitat type by the appropriate HSI value from the 1985 Modified HEP to determine the number of habitat units (HU) needed to mitigate impacts. Since HSI values were reported on a scale of 100, they were converted to decimal figures for multiplication. A total of 27.2 HUs are required for mitigation of terrestrial impacts. Table 6-6 shows the computation of habitat units required to mitigate terrestrial impacts.

Table 6-6. Terrestrial impacts and required mitigation in habitat units.

Habitat Type	Estimated Acreage (hectares) Effected	HIS value	Habitat Units
Riparian/Bottomland Hardwoods	10 (4)	50	5.0
Old-field	25 (10)	55	13.8
Upland	9 (3.6)	50*	4.5
Agricultural	3 (1.2)	53	1.6
Urban	12 (4.8)	15	1.8
Total	59(23.6)		**26.7**

**Assumed HSI value –upland habitat was not included in referenced 1985 HEP.*

Impacts to wetlands would be mitigated by creation of wetlands at the soil borrow area proposed for the project. The soil borrow area is in the Greenbrier River floodplain and is bordered by Stony Creek to the west, Airport Road to the north, and the Greenbrier River to the south. About 9 acres (3.6 hectares) of this area would be excavated for soil borrow. To mitigate for wetland losses from the proposed project, 4 acres (1.6 hectares) of wetlands would have to be created. However, the entire area would be available for creation of additional wetlands if required.

Proposed mitigation for impacts to Knapps Creek from placement of 2,100 linear feet (640 meters) of stone slope protection is the restoration of 4,200 linear feet (1,280 meters) of Knapps Creek stream bank. Inasmuch as possible, stream restoration would be within the project area. However, offsite mitigation would be considered to include the upper Knapps Creek watershed.

6.2.6 Mitigation Costs

The following costs are based on previous mitigation from Corps projects with similar impacts.

Table 6-7. Mitigation Costs *

Habitat	Losses	Required Mitigation	Cost per Unit	Cost
Wetlands	2 acres (0.8 hectares)	4 acres (1.6 hectares)	$3,500 per acre ($8,645 per hectare)	$ 14,000
Stream	2,100 linear feet (640 meters)	4,200 linear feet (1,280 meters)	$75 per foot ($246 per meter)	$315,000
Terrestrial	27.2 HU	27.2 HU	Approx.$1800	$490,000
Total				**$819,000**

6.3 ECONOMIC ANALYSIS

The costs, benefits, and effectiveness for the selected plan are summarized in this section. Project first cost represents the total monetary outlay to construct the selected plan. The base year for economic analysis is 2007, the earliest estimated completion date for either alternative. The construction period is estimated to be five years – 2003 to 2007. Both benefits and costs are expressed in October 2001 prices.

6.3.1 First Cost

First cost for the selected plan is summarized in Table 6-8. Costs are given for each feature code of accounts, including contingencies. Details to the sub-feature level are contained in the Baseline Cost Estimate for the project. The first cost includes project construction, real estate acquisition, environmental mitigation and engineering and design.

Table 6-8. Marlinton LPP – First Cost and Fully Funded Cost of Selected Plan

Feature	*Item*	*October 2001 Cost*	*Fully Funded Cost*
01	Lands & Damages	$11,366,000	$11,975,000
02	Relocations	$2,321,000	$2,472,000
06	Environmental	$1,183,000	$1,260,000
11	Levees & Floodwalls	$37,936,000	$42,255,000
13	Pumping Plants	$6,243,000	$7,040,000
30	Planning, Engineering & Design	$13,936,000	$14,668,000
31	Construction Management	$3,338,000	$3,835,000
	TOTAL PROJECT COST	**$76,323,000**	**$83,505,000**

6.3.2 Investment Cost

Investment costs are the sum of construction expenditures for the selected plan plus the accrued interest on those expenditures up to the time the project is complete and begins producing benefits, presently estimated to be the year 2007. The interest has been computed using the estimated sequence of construction for each plan, and a compound interest rate of

6 $^{3}/_{8}$ percent. Investment costs for the selected plan are $85.5 million based on an estimated interest during construction of $13.6 million.

6.3.3 Annual Cost

The annual costs for the selected plan is the summation of the annualized capital cost and the estimated O&M cost. Annual capital costs include average annual interest and amortization charges on the investment cost and have been computed using an interest rate of 6 $^{3}/_{8}$ percent and an economic life of 50 years. The estimated O&M costs are based on actual cost experience for similar local flood control projects constructed by the Huntington District. These costs include maintaining the levee and floodwall structures, operating the pump stations and gate closures, and rehabilitation and replacement of the mechanical features of the project. Table 6-9 provides a summary the annual O&M cost components.

Table 6-9. Summary of Annual O&M

O&M Features	*Alternative 1*
Materials & Equipment*	
Levee & Floodwall	$30,000
Pump stations	$16,000
Quick-close gates	$1,500
Labor Costs	$33,000
Total Annual O&M	$80,500

**includes replacement and rehabilitation costs*

6.3.4 Annual Benefits

The benefits attributable to selected plan represents flood damages prevented up to the flood of record level expressed in annual values. Benefit categories include: residential, commercial, personal property, utilities, transportation, emergency cost reduction, and construction employment. The benefits were computed over a 50-year period using standard discounting procedures and an interest rate of 6 $^{3}/_{8}$ percent. A summary of the average annual benefits, average annual costs, net benefits (negative) and benefit-to-cost ratio rates are presented in Table 6-10.

Table 6-10. Summary of Benefits and Costs

	Alternative 1
Annual Benefits	$2,448,207
Annual First Cost	$6,086,631
Net Benefits	$(3,638,425)
Benefit-to-Cost Ratio	0.40

6.3.5 Effectiveness

Effectiveness describes the physical beneficial attributes of the proposed alternative. There were 433 structures identified within the project area that were flooded during the 1985 and 1996 events. Of these structures, 45 will be acquired for the project and 7 others are located

outside the levee/floodwall alignment. The selected plan protects 118 businesses and 263 residences, both in the main part of Marlinton, along Knapps Creek, and in Riverside. A display of the number, type, and location of structures protected by the selected plan is displayed in Table 6-11.

Table 6-11. Structures Protected by Location

Location of Structures	*Alternative 1*			
	Residential		Non-residential	
	Reach Total	Protected	Reach Total	Protected
Downtown Marlinton	183	155	104	102
Knapps Creek	99	97	1	0
Riverside	22	11	24	16
Totals	304	263	129	118

6.4 PLAN IMPLEMENTATION

6.4.1 Cost Sharing

The Town of Marlinton as a sponsor qualifies for a reduction in the cost sharing percentage based on ability-to-pay provisions. The ability-to-pay legislation also includes a provision to waive the design agreement and the non-Federal share of design cost will be deferred until the first year of construction. The cost share responsibilities for this project will reflect the requirements that existed at the time of original project authorization (WRDA 1996).

The total non-Federal share for the selected levee / floodwall project will be 10 percent of the total project cost or $7.6 million and the estimated cost of the O&M is $80.5 K annually. The non-Federal sponsor will be responsible for all lands, easements, rights of way, relocations, and disposal areas (LERRD). The sponsor must also provide a minimum of 5 percent of the project cost in cash. The details regarding cost share and sponsor responsibilities are discussed in Section 6.4.3, Division of Plan Responsibilities.

6.4.2 Institutional Requirements

Prior to initiation of construction, Congress must appropriate funds for the Federal share of project costs. Requirements for non-Federal participation must also be met prior to initiation of construction. This includes the execution of a Project Cooperation Agreement (PCA) between the local sponsor and the Federal government and the provision of all funds and/or work necessary to satisfy the cost sharing requirements in effect at the time of PCA execution. Upon completion of construction, the project will be turned over to the local sponsor for operation and maintenance.

6.4.3 Division of Plan Responsibilities

The primary local governmental body associated with the selected levee / floodwall project, or the Marlinton Local Project Plan (LPP), is the Town Council of Marlinton. The Town Council has continually shown a high level of interest in the project, and is fully expected to do so throughout the life of the project. In their role as non-Federal sponsor for the project, the Town Council has become familiar with the project formulation and implementation processes and has participated

in preliminary discussions concerning their legal capability to sponsor and ability to acquire real estate. A Project Cooperation Agreement (PCA) specifying the responsibilities of the two parties must be consummated prior to the initiation of construction.

The implementation of the recommended plan of development is the joint responsibility of the Corps of Engineers (representing the Federal government) and the Town of Marlinton, West Virginia (the local sponsor). The Corps of Engineers will complete the plans and specifications, provide funds for project construction, construct the project, and make an annual inspection of the conditions of the project. The estimated Federal cost is $68.7 million. The estimated non-Federal cost is $7.6 million and the estimated cost of operation and maintenance is $80.5 K annually.

The following paragraphs summarize the operation, maintenance, and management responsibilities of the non-Federal sponsor that will be contained in the PCA.

a. Provide 10% of the total project costs allocated to the structural flood control as further specified below:

(1) Provide all lands, easements, and rights-of-way, including suitable borrow and dredged or excavated material disposal areas, and perform or assure the performance of all relocation determined by the Federal Government to be necessary for the construction, operation, and maintenance of the project;

(2) Provide retaining dikes, waste weirs, bulkheads, and embankments, including all monitoring features and stilling basins, that may be required at any dredged or excavated material disposal areas required for the construction, operation, and maintenance of the project; and

(3) Provide, during implementation, any additional costs as necessary to make its total contribution equal to 10 percent of the total project costs allocated to flood control.

b. For so long as the project remains authorized; operate maintain, repair, replace, and rehabilitate the completed project or functional portion of the project, at no cost to the Federal Government, in accordance with applicable Federal and State laws and any specific directions prescribed by the Federal Government.

c. Give the Federal Government a right to enter, at reasonable times and in a reasonable manner, upon land that the non-Federal sponsor owns or controls for access to the project for the purpose of inspection and, if necessary after failure to perform by the non-Federal sponsor, for the purpose of completing, operating, maintaining, repairing, replacing, or rehabilitating the project.

d. Hold and save the United States free from all damages arising from the construction, operation, maintenance, repair, replacement, and rehabilitation of the project and any project-related betterments, except for damages due to the fault or negligence of the United States or its contractors.

e. Keep and maintain books, records, documents, and other evidence pertaining to costs and expenses incurred pursuant to the project in accordance with the standards for financial management systems set forth in the Uniform Administrative Requirements for Grants and

Cooperative Agreements to State and Local Governments at 32 Code of Federal Regulations (CFR), Section 33.20.

f. Perform, or cause to be performed, any investigations for hazardous substances as are determined necessary to identify the existence and extent of any hazardous substances regulated under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 U.S.C. 9601-9675, that may exist in, on, or under lands, easements, or rights-of-way that the Federal Government determines to be required for the operation, maintenance, repair, replacement and rehabilitation of the project. However, for lands that the Federal Government determines to be subject to the navigation servitude, only the Federal Government shall perform such investigations unless the Federal Government provides the non-Federal sponsor with prior specific written direction, in which case the non-Federal sponsor shall perform such investigations in accordance with such written direction.

g. Assume complete financial responsibility, as between the Federal Government and the non-Federal sponsor, for all necessary cleanup and response costs of any CERCLA regulated materials located in, on, or under lands, easements, or rights-of-way that the Federal Government determines to be required for the operation, maintenance, repair, replacement, or rehabilitation of the project.

h. As between the Federal Government and the non-Federal sponsor, the non-Federal sponsor shall be considered the operator of the project for the purpose of CERCLA liability. To the maximum extent practical, operate maintain, repair, replace, and rehabilitate the project in a manner that will not cause liability to arise under CERCLA.

i. Comply with the applicable provisions of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, Public Law 91-646, as amended by Title IV of the Surface Transportation and Uniform Relocation Assistance Act of 1987 (Public Law 100-17), and the Uniform Regulations contained in 49 CFR, Part 24, in acquiring lands, easements, and rights-of-way required for the operation maintenance repair, replacement, and rehabilitation of the project, including those necessary for relocations, borrow materials, and dredged or excavated material disposal, and inform all affected persons of applicable benefits, policies, and procedures in connection with said act.

j. Comply with all applicable Federal and State laws and regulations including, but not limited to, Section 601 of the Civil Rights Act of 1964, Public Law 88-352 (42 U.S.C. 2000d), and Department of Defense Directive 5500.11 issued pursuant thereto, as well as Army Regulation 600-7, entitled Nondiscrimination on the Basis of Handicap in Programs and Activities Assisted or Conducted by the Department of the Army, and Section 402 of the Water Resources Development Act of 1986, as amended (33 U.S.C. 701b-12), requiring non-Federal preparation and implementation of floodplain management plans.

k. Provide 5 percent of that portion of total cultural resources preservation, mitigation and data recovery costs attributed to flood control that are in excess of 1 percent of the total amount authorized to be appropriated for flood control.

l. Participate in and comply with applicable Federal floodplain management and flood insurance programs.

m. Prescribe and enforce regulations to prevent obstruction of or encroachment on the project that would reduce the level of protection it affords or that would hinder operation and maintenance of the project.

n. Not less than once each year, inform affected interests of the extent of the protection afforded by the project.

o. Publicize floodplain information in the area concerned and provide this information to zoning and other regulatory agencies for their use in preventing unwise future development in the floodplain and in adopting such regulations as may be necessary to prevent unwise future development and to ensure compatibility with protection levels provided by the project.

p. Comply with Section 221 of Public law 91-611, as amended, and Section 103 of Public Law 99-662, as amended, which provides that the Secretary of the Army shall not commence the construction of any water resources project or separable element thereof, until the non-Federal sponsor has entered into a written agreement to furnish its required cooperation for the project or separable element.

q. Provide and maintain necessary access roads, parking areas and other public use facilities, open and available to all on equal terms.

r. Not use Federal funds to meet the non-Federal sponsor's share of total project costs unless the Federal granting agency verifies in writing that the expenditure of such funds is expressly authorized by statute.

6.4.4 Views of the Non-Federal Sponsor

During the course of the study, the Town of Marlinton has demonstrated a strong interest in and support for a project that would reduce flood damages in Marlinton. The Town of Marlinton has expressed their interest in a letter of intent dated 12 April 1999 which is included in Appendix A. Representatives of the Town Council have met with county, state and Federal officials and received support for this project.

7.0 NEPA COMPLIANCE

7.1 STATUTES, REGULATIONS, CONSULTATIONS, AND OTHER REQUIREMENTS

This section identifies and summarizes the major Federal, state and local laws, regulations, and requirements that may apply to the alternatives analyzed in this Detailed Project Report and Environmental Impact Statement.

Federal Environmental Statutes and Regulations

***Water Resources Development Act of 1996,* Section 579** The Marlinton Local Protection Project was authorized under this act which mandates the U.S. Army, Corps of Engineers to design and implement a flood damage reduction plan for the Greenbrier Basin. The Act specifically states that the project must be sufficient to afford the communities with protection against flooding such as occurred in November 1985, January 1996, and May 1996.

***National Environmental Policy Act of 1969* (NEPA), as amended (42 United States Code [USC] §4321 et seq.), the Council on Environmental Quality Implementing Regulations (40 Code of Federal Regulations [CFR] § 1500 et seq.)** The environmental impacts are being analyzed in order to comply with NEPA, the Federal law that requires agencies of the Federal government to study the possible environmental impacts of major Federal actions significantly affecting the quality of the human environment.

***Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970*, as amended (42 USC §4601 et seq.)** The Uniform Relocation Assistance and Real Property Acquisition Policies Act establishes guidelines to provide compensation for owners of property and houses affected by Federal projects. Owners of property and houses that must be acquired and removed to construct the levee/floodwall in Marlinton and Riverside will be compensated according to the guidelines established by this Act.

***Clean Air Act* (CAA), as amended (42 USC §7401 et seq.)** The CAA establishes National Ambient Air Quality Standards (NAAQS) set by the U.S. Environmental Protection Agency (EPA) for certain pervasive pollutants; the standards are set at a level designed to protect human health with a conservative margin of safety. The CAA contains emission limiting programs and permit programs to protect the NAAQS and air quality. Regulations implementing the CAA are found in 40 CFR Parts 50-95.

***Comprehensive Environmental Response, Compensation, and Liability Act* (CERCLA) of 1980/*Superfund Amendments and Reauthorization Act* (SARA) of 1986 (42 USC §9601 et seq.)** This statute requires cleanup and notification if there is a release or threatened release of a hazardous substance.

***Occupational Safety and Health Act* of 1970, as amended (29 USC §651 et seq.)** Compliance with the *Occupational Safety and Health Act* would be required according to *Occupational Safety and Health Act* standards. Specifically, the construction and general industry rules in 29 CFR Parts 1910 and 1926 apply. Operational employees would be instructed in worker protection and safety procedures, and would be provided appropriate personal protective equipment.

***Clean Water Act* (CWA) of 1977 as amended (33 USC §§1251 et seq.)** The *Clean Water Act* focuses on improving the quality of water resources by providing a comprehensive framework of standards, technical tools and financial assistance to address the many causes of pollution and poor water quality, including municipal and industrial wastewater discharges, polluted runoff from urban and rural areas, and habitat destruction. Section 404 of the Clean Water Act establishes a program to regulate the discharge of dredged and fill material into waters of the United States, including wetlands. Activities in waters of the United States that are regulated under this program include fills for development, water resource projects (such as dams and levees), infrastructure development (such as highways and airports), and conversion of wetlands to uplands for farming and forestry. A Federal permit is required to discharge dredged or fill material into wetlands and other waters.

Compliance With Floodplain/Wetlands Environmental Review Requirements. Executive Order 11988, Floodplain Management, directs Federal agencies to establish procedures to ensure that they consider and minimize potential effects of flood hazards and floodplain management for any action undertaken. Executive Order 11990, Protection of Wetlands, requires Federal agencies to avoid short- and long- term impacts to wetlands if a practical alternative exists. Where there is no practical alternative to development in floodplain and wetlands, the Corps is required to prepare a floodplain and wetlands assessment discussing the effects on the floodplain and wetlands, and consideration of alternatives. In addition, these regulations require the Corps to design or modify its actions to minimize potential damage in floodplains or harm to wetlands and provide opportunity for public review.

***Endangered Species Act of 1973* (16 USC §§1531 et seq.)** Section 7, "Interagency Cooperation," requires any Federal agency authorizing, funding, or carrying out any action to ensure that the action is not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of critical habitat of such species. Consequently, the USFWS conducts a consultation, in compliance with Subsection (a)(2) of Section 7 of the Act, with regard to the impacts of the proposed project on threatened and endangered species listed by U.S. Fish & Wildlife Service (USFWS) and any critical habitat of such species in the vicinity of the project. A consultation has been conducted with the USFWS for the proposed project.

***Executive Order 12898: Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations* (February 11, 1994)** This Executive Order requires Federal agencies to identify and address, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations.

***Fish and Wildlife Coordination Act* (16 USC §§661 et seq.)** This Federal statute requires consultation on the possible effects on wildlife if there is construction, modification, or control of bodies of water in excess of 10 acres (4 ha) in surface area.

***National Historic Preservation Act of 1966, as amended* (16 §USC 470 et. seq.)** This Federal statute requires the Corps to consult with the State Historic Preservation Officer (SHPO) prior to construction to ensure that no historical properties will be affected by the proposed project.

***Wild and Scenic Rivers Act of 1968* (16 USC §§1271 et seq.)** as amended, protects selected national rivers possessing outstanding scenic, recreational, geological, fish and wildlife, historical, cultural, or other similar values. These rivers are to be preserved in a free-flowing condition to protect water quality and for other vital national conservation purposes. This Act also instituted a National Wild and Scenic Rivers system, designated the initial rivers within the system, and developed standards for the addition of new rivers in the future. The Act requires consultation before construction of any Federal project associated with a river designated as wild and scenic or under study in order to minimize and mitigate any adverse effects on the physical and biological properties of the river.

Rivers and Harbors Act of 1899 (33 U.S.C. 403). Section 9 prohibits the construction of any bridge, dam, dike or causeway over or in navigable waterways of the U.S. without Congressional approval. Administration of Section 9 has been delegated to the Coast Guard. Structures authorized by State legislatures may be built if the affected navigable waters are totally within one State, provided that the plan is approved by the Chief of Engineers and the Secretary of Army (33 U.S.C. 401). Section 10 covers construction, excavation, or deposition of materials in, over, or under such waters, or any work which would affect the course, location, condition, or capacity of those waters.

Federal Water Project Recreation Act of 1965 (16 USC 4601-12 et seq.,) as amended. This act states that Federal agencies must consider the potential outdoor recreational opportunities and potential fish and wildlife enhancement when planning navigation, flood control, reclamation, hydroelectric, or multipurpose water resource projects. If a project can provide either or both of these, it must be constructed, operated and maintained accordingly. Second, planning for a project's recreation potential must be coordinated with existing and planned federal, state or local public recreation developments. Third, project construction agencies must encourage non-federal public bodies to administer project land and water areas for recreation and fish and wildlife enhancement purposes, and to operate, maintain and replace facilities provided for those purposes, unless the areas or facilities are within a national recreation area, the national forest system, the public lands classified for retention in federal ownership or an authorized federal program for the conservation and development of fish and wildlife.

West Virginia Environmental Statutes and Regulations

***West Virginia Air Quality Standards* (45 CSR)** This title establishes ambient air quality standards and the procedures for maintaining air quality and controlling air pollution within West Virginia. Several Series under Title 45 are applicable to the Marlinton LLP. Series 4, 21, and 27 establish guidelines controlling the discharge of pollutants contributing to odors, volatile organic chemicals, and toxic air pollutants respectively. Other Series establish ambient air quality standards for sulfur oxides and particulate matter (Series 8) and nitrogen dioxide (Series 12). Series 13, 14, and 19 establish procedures for granting permits for construction purposes. Series 19 specifically relates to the construction of the pump stations, which would be new air emissions sources constructed by the LLP. Series 15 and 16 establish the emissions standards for hazardous air pollutants pursuant to 40 CFR 61 and standards of performance for stationary sources pursuant to 40 CFR 60 respectively, which are also applicable to the pump stations. Series 30 establishes requirements for operating permits and Series 38 establishes provisions for the determination of compliance with Title 45.

***West Virginia Water Resources Standards* (47 CSR)** This title establishes procedures to promote pollution prevention by encouraging the reduction or elimination of pollutants at the source through process modification, material substitution, in process recycling, reduction of raw material use or other source reduction opportunities. This rule establishes requirements governing the Division of Environmental Protection's in-house mechanisms for encouraging pollution prevention efforts by industries to assist in achieving regulatory compliance; and to further improve compliance with environmental laws by improving advisory and technical assistance features of programs within the Division. Applicable Series under Title 47 include the following: Series 3, Pollution Prevention; Series 10, NPDES Program; Series 11, Special Regulations; Series 33, State Construction Grants Program Rule; Series 34, Dam Safety Rules; Series 58, Groundwater Protection Regulations; and Series 59, Monitoring Well Rules.

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The Environmental Impact Statement parts of the Marlinton LPP Detailed Project Report and Environmental Impact Statement were prepared under the supervision of the U.S. Army Corps of Engineers, Huntington District. The individuals who contributed to the preparation of this document are listed below, accompanied by their organization, education, years of experience, and project role.

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Hillsboro Library
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Durbin Library
P.O. Box 333
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8.0 RECOMMENDATIONS

This DPR/EIS describes the project elements determined to be necessary and advisable to reduce future flood damages in the Town of Marlinton project area. The most cost effective plan was found to be effective in relation to the planning objectives. The cost effective project satisfies the legislative requirements of Section 579 of the 1996 Water Resource Development Act (Public Law 104-303) providing flood protection to the specified level of protection. However, the selected plan does not satisfy the institutional requirements for economics and is not in accordance with current Corps of Engineers policy and budgetary priorities.

The selected plan provides flood protection for the Town of Marlinton against a reoccurrence of the flood of record. This flood control plan for the Town of Marlinton is strongly supported by the State of West Virginia, Pocahontas County, the Town of Marlinton and its residents.

JOHN D. RIVENBURGH
COLONEL, Corp of Engineers
Commanding

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GLOSSARY

GLOSSARY

A-weighted. The A-scale sound level is a quantity, in decibels, read from a standard sound-level meter with A-weighting circuitry. The A-scale weighting discriminates against the lower frequencies according to a relationship approximating the auditory sensitivity of the human ear. The A-scale sound level measures approximately the relative "noisiness" or "annoyance" of many common sounds.

Attainment Area. An area considered to have air quality as good as or better than the National Ambient Air Quality Standards as defined in the Clean Air Act. An area may be in attainment for one pollutant and in non-attainment area for others.

Benthic. Those forms of life that are bottom dwelling in fresh or salt water.

Borrow area. An excavated area where material will be dug for use of fill at another location.

Bottomland. A lowland, usually highly fertile, along a stream.

Chert. A hard, dense rock consisting chiefly of interlocking microcrystals of quarts found as nodules or as layered deposits; flint.

Confluence. A point when two streams meet.

Decibels. The unit of measurement of sound level calculated by taking ten times the common logarithm of the ratio of the magnitude of the particular sound pressure to the stand reference sound pressure of 20 micropascals and its derivatives.

Dendritic drainage. An arrangement of surface drainage in which the streams branch randomly at almost any angle, resembling the branching habit of tress.

Detritus. Any fine particulate debris of organic origin.

Dike. A wall or embankment built around a low-lying area to prevent flooding.

Displaced person. Any person (individual, family, partnership, association, or corporation) who moves from real property as a direct result of acquisition of the real property, a written notice of intent from the government, negotiations for the purchase of the property from the government, or a written notice requiring a person to vacate real property for the purpose of demolition or improvements, provided the displacement is permanent and the property is needed for the Federally assisted project.

Endangered species. A species that is threatened with extinction throughout all or significant portion of its range.

Ecotone. A transition zone between two adjacent ecological communities, such as forest and grassland. It has some of the characteristics of each bordering community and often contains species not found in the overlapping communities. An ecotone may exist along a broad belt or in a small pocket, such as a forest clearing, where two local communities blend together. The influence of the two bordering communities on each other is known as the edge effect. An ecotonal area often has a higher density of organisms and a greater number of species than are found in either flanking community.

Floodplain. The lowland that borders a stream or river and is found outside of the floodway. It is usually dry, but subject to flooding.

Floodproofing. A voluntary program for those people living outside areas protected by floodwalls by raising the houses to a level one-foot above the 1977 flood level.

Floodwall. An artificial embankment made from concrete along a watercourse to protect land from flooding.

Floodway. The channel of a river or stream and the adjacent land that must be reserved to discharge floodwaters.

Fugitive Emissions. Emissions, which could not reasonably pass through a stack, chimney, vent or other functionally equivalent opening.

Habitat. A place where particular plants or animals occur or could occur.

Herbaceous. A plant with no persistent woody stem above ground.

Levee. An artificial embankment made from earthen material along a watercourse to protect land from flooding which is engineered.

Karst. A type of topography that is formed over limestone, dolomite, or gypsum by dissolution and that is characterized by sinkholes, caves and underground drainage.

Macrophytes. A plant large enough to be seen by the naked eye.

Macroinvertebrates. Animals without backbones that are distinctly visible to the unaided eye or with the use of a simple lens.

Meander. One of a series of sinuous curves or loops in the course of a mature stream, produced as the stream swings from side to side in flowing across its floodplain.

Noise. Sound that is perceived by humans as annoying and unwanted.

Nonattainment. Those areas designated as not having attained National Ambient Air Quality Standards for specific air pollutants.

Nonstructural measures. Methods for reduction of flood damages that do not significantly altering the nature or extent of flooding. Damage reduction from nonstructural measures is accomplished by changing the use made of the flood plains or by accommodating existing uses to the flood hazard, including acquisition, raising of structures, veneer walls, ringwalls, and flood warning systems.

Physiographic Province. A region of which all parts are similar in geologic structure and climate.

Pool. A body of impounded water.

Riffle. An expanse of shallow bottom extending across a stream; shallow rapids with comparatively little fall in elevation.

Ringwall. A barrier that protects an individual structure or small group of structures from flooding, depending on the topography of the site.

Riparian Zones. Land areas directly influenced by a body of water. Usually such areas have visible vegetation or physical characteristics showing this water influence. Streamsides, lake borders, and marshes are typical riparian areas.

Riverine. Pertaining to the river bank

Runoff. The non-infiltrating water entering a stream or other conveyance channel shortly after a rainfall.

Sediment. Particles derived from rock or biological sources that have been transported by water.

Significance. A measure of the context and intensity of an impact. Context analysis refers to society as a whole, the affected region (of the impact area), the affected interests, and the locality. Intensity refers to the severity of impact. Intensity can be based on: benefit to the environment; effects to public health or safety; proximity to cultural/historical resources, or other ecologically critical area; public controversy; risk to humans; connection to future project impacts; connection with cumulative impacts; effects to objects listed on the Nation Register of Historic Places; threat to endangered or threatened species; or violation of a State or Federal environmental protection law.

Stilling basin. A basin constructed to dissipate the energy of rapidly flowing water (e.g., from a spillway or outlet) and to protect the riverbed from erosion.

Stoplog closure. Opening in a levee or floodwall system at road, railroad tracks, etc. that can be closed during a flooding event by placing metal “logs” into the closure.

STORET. STOrage and RETrieval is a repository for water quality, biological, and physical data and is used by state environmental agencies, EPA and other federal agencies, universities, private citizens, and many others.

Structural measures. Utilization of methods such as dams, reservoirs, ringwalls, levees, floodwalls or channel improvement to protect an area from flooding.

Terrestrial. Pertaining to the earth’s dry land.

Threatened Species. A species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

Trellis Drainage. An arrangement of surface drainage characterized by parallel main streams that have right-angle tributaries; it resembles the stems of a vine on a trellis.

Upland. A general term for an extensive region of high ground.

Veneer wall. An impervious water barrier integrated with the building structure and used to protect against flood depths of less than 3 feet

Weir. A small dam built across a river or canal so that water flows over it, serving to regulate the flow or to raise the level of water upstream.

Wetlands. Those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and other similar areas.

Windrow revetment. A mound of stone placed along a stream bank landward of the slope crest that will fall onto the slope if excessive erosion occurs, thereby protecting the slope from additional erosion.

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APPENDIX A
CORRESPONDENCE

United States Department of the Interior
FISH AND WILDLIFE SERVICE

West Virginia Field Office
Post Office Box 1278
Elkins, West Virginia 26241

MAR - 1 1999

James S. Everman
Chief, Planning Division
U.S. Army Corps of Engineers
502 Eighth Street
Huntington, West Virginia 25701

Dear Mr. Everman:

The U.S. Fish and Wildlife Service has received your letter dated February 12, 1999 requesting our input on the proposed Marlinton Flood Protection Project. This response is based on the information presented during the November 9, 1998 field visit to the project site.

Two structural alternatives have been retained for detailed analysis. Both alternatives include a floodwall/levee along Stoney Creek and between the town of Marlinton and the Greenbrier River from the upstream end of the city to the mouth of Knapps Creek. One alternative (floodwall only) proposes to extend the floodwall/levee up the north side of Knapps Creek. The other alternative (floodwall with diversion) includes a diversion of flood flows from Knapps Creek to the Greenbrier River through a cut in Buckley Mountain. A nonstructural alternative was evaluated, but is no longer being considered.

Based on the analysis provided so far, both structural alternatives have similar cost-benefit ratios. In addition, both alternatives will have similar impacts to the Greenbrier River and Stoney Creek, however the "floodwall with diversion" alternative will have greater environmental impacts in the Knapps Creek area primarily due to the impacts associated with placement of spoil material from the cut-through. Given the lack of any distinct flood protection or cost advantages between alternatives, and the potential for environmental impacts to the Knapps Creek area under the "floodwall with diversion" alternative, the Service recommends that the "floodwall only" alternative appears to be a preferable option.

However, the current study only evaluates the engineering feasibility of the structural alternatives. Additional factors, such as the source of material used to construct the floodwall, geotechnical factors affecting the cut-through, potential downstream impacts from future flooding, and the ecological impacts and associated mitigation costs of the project, must be

considered. A thorough evaluation of all project impacts should be presented to the public and the resource agencies before selection of a final preferred alternative is made.

We recommend that if the "floodwall with diversion" alternative is retained, the Huntington District evaluate alternate methods and locations for disposal of the excess fill, including completely incorporating it into levee/floodwall construction. Fill should not be placed in high quality habitat areas, or in such a manner that would encourage additional construction in flood prone areas. The Service encourages the District to incorporate avoidance, minimization, and mitigation measures into project design. Insuring that this requirement is included as an essential component of the project will expedite project reviews and allow the project to move forward on a more accelerated schedule.

The Service looks forward to continuing cooperative efforts as you proceed with this project, and will work to support the least damaging practicable alternative that will provide a reasonable level of flood protection to the affected community. Please direct any questions regarding these comments to Barbara Douglas of my staff at (304) 636-6586 or call me directly at the same number.

Sincerely,

Jeffrey K. Towner

Jeffrey K. Towner
Field Supervisor

TOWN OF MARLINTON
709 SECOND AVENUE
MARLINTON, WV 24954
PHONE: 304-799-4315
FAX: 304-799-6159

1998 APR 12 A 8:56

Colonel Dana Robertson
District Engineer
U.S. Army Corps of Engineers, Huntington District
502 Eighth Street
Huntington, WV 25701-2070

Dear Colonel Robertson:

The Town of Marlinton, hereinafter called "Sponsor", is interested in obtaining Corps of Engineers' assistance in addressing flooding problems in Marlinton, West Virginia.

The Sponsor is aware of the cost sharing requirements associated with a flood damage reduction project and is willing to undertake the following non-Federal cost sharing requirements associated with the Corps' flood damage reduction projects. At this time, the locally preferred plan is Option 2 as described in the Greenbrier Limited Evaluation Report dated December 1997. However, the Sponsor is aware that there are some risks in pursuing Option 2 and therefore agrees to have preliminary designs of both Option 1 and Option 2 carried forward through the Detailed Project Report. The Sponsor is also aware that a Construction Project Cooperation Agreement (PCA) cannot be executed and no real estate can be acquired until all necessary environmental studies have been completed.

A. The Corps will complete the design phase of the project, including plans and specifications, prior to execution of a Construction Project Cooperation Agreement (PCA).

B. If the project proceeds to construction, then the Sponsor will contribute the non-Federal share of the design costs at the beginning of the year of construction. The non-Federal cost share is currently estimated to be 14 percent for both design and construction.

C. The non-federal share of construction consists of provision of lands, easements, right-of- way, relocations, and disposal areas necessary for the project (LERRD), plus a cash contribution of 5% of the total project costs; in approximately 14% of the total project cost, the non-Federal sponsor must contribute additional cash to equal 14%, if LERRD plus 5% exceeds 14%, the sponsor will contribute no more than a maximum 50% of the total project costs;

D. The non-Federal sponsor is required to prepare a floodplain management plan within one year after signing a PCA. The plan is to be implemented within one year after completion of the project.

E. The non-federal Sponsor is responsible for operating and maintaining the project upon completion.

The sponsor is aware that this letter constitutes an expression of intent and does not represent either a financial or contractual obligation on the part of the Sponsor or the Federal government. The Sponsor is anticipating using monics supplied by the State of West Virginia to finance the design and construction of any project. The Sponsor or the Corps may opt to discontinue the project development process during the design phase.

Sincerely,

G. Douglas Dunbrack

G. Douglas Dunbrack
Mayor, Town of Marlinton

DIVISION OF NATURAL RESOURCES
Wildlife Resources Section
Capitol Complex, Building 3, Room 812
1900 Kanawha Boulevard, East
Charleston WV 25305-0664
Telephone (304) 558-2771
Fax (304) 558-3147
TDD 1-800-354-6087

Cecil H. Underwood
Governor

John B. Rader
Director

February 11, 1999

Mr. A. Benjamin Borda, Jr.
U.S. Army Corps of Engineers
Huntington District
502 Eighth Street
Huntington, WV 25701

Dear Mr. Borda:

The West Virginia Division of Natural Resources (WVDNR) has completed a preliminary review of the Marlinton Flood Protection Project. Two alternatives were presented. Both alternatives include a flood wall on Stoney Creek and a flood wall between Marlinton and the Greenbrier River from the upstream end of the city to the mouth of Knapps Creek. One alternative (flood wall) proposes to continue the flood wall up the north side of Knapps Creek to high ground. The other alternative (diversion) extends the flood wall across Knapps Creek to high ground. This alternative includes a pumping station to pump water from Knapps Creek to the Greenbrier River and diversion of flood flows of Knapps Creek to the Greenbrier River through a cut in Buckley Mountain. A diversion dam will be constructed in Knapps Creek to permit normal flow to pass through the existing channel. Both alternatives provide equal protection to the residents of Marlinton and preliminary cost estimates indicate approximately equal cost.

Both alternatives have the same impacts to aquatic and riparian habitat in and along Stoney Creek and the Greenbrier River. Evaluation of impacts and development of mitigative measures will be required.

The flood wall alternative will incur impacts to riparian and terrestrial habitat on the north bank of Knapps Creek. The diversion alternative will impose significant impacts to upland habitats to create the diversion channel from Knapps Creek to the Greenbrier River. Construction of the diversion channel will produce an unknown amount of material that will require disposal. The yet to be identified disposal sites will likely impact upland habitat.

Due to the relatively minor impact of the flood wall alternative, it is the WVDNR's opinion that an environmental assessment will meet the requirements of the National Environmental Policy Act. The diversion alternative will likely require an environmental impact statement, because of the excavation, earth moving, disposal of excess material and other construction activities. This will increase the cost of the diversion alternative and increase the time between planning and construction beyond that required for the flood wall alternative.

Environmental impacts of the flood wall alternative are expected to be far less than the diversion alternative. The flood wall alternative will not alter current flushing flows in Knapps Creek and the normal stream flow regime will be maintained in the lower portion of the stream. Since the level of protection and cost of the alternatives are basically identical, the WVDNR recommends that the Huntington District pursue the flood wall alternative and discontinue further examination of the diversion alternative.

Sincerely,

Bernard F. Dowler

Bernard F. Dowler, Chief
Wildlife Resources Section

BFD/jrj

WEST VIRGINIA DIVISION OF
CULTURE AND HISTORY

July 26, 2001

Mr. Anthony Borda, Jr.
Department of the Army
COE
502 Eighth Street
Huntington, West Virginia 25701

RE: Marlinton Local Protection Project
FR#: 01-1211-PH

Dear Mr. Borda:

We have reviewed the letter report for the above mentioned project. As required by Section 106 of the National Historic Preservation Act, as amended, and its implementing regulations, 36 CFR 800: "Protection of Historic Properties," we submit our comments.

The current letter report for the Marlinton Local Protection Project provides information on results and interpretations for use in the interim coordination with our office. The report broadly defines the results of an architectural reconnaissance of Marlinton, identifying those historic resources already listed in the National Register of Historic Places, recommending additional properties eligible either individually or as contributing to a district, and suggesting issues for further research. Additionally, the report provides preliminary effects determinations for the three project alternatives.

In general, we approve of the methodology used in evaluating the architectural resources for their National Register eligibility. Summarized, properties must posses the majority of their physical or associative characteristics of integrity in order to be considered either potentially eligible individually, contributing to an identified historic district, or requiring further investigation. Under this criteria, several individual properties and two historic districts were identified as possibly worthy of inclusion in the National Register. Of those buildings preliminarily recommended as individually eligible, four are ecclesiastical properties. Due to the special consideration for religious properties, an evaluation of the historic integrity for the buildings' interiors would assist us in our determination of eligibility under Criterion C.

From our knowledge of Marlinton we concur that the neighborhood surrounding the courthouse and the dwellings that constitute tannery row probably do constitute historic districts. However, please ensure that your assertions are supported by discussions regarding the historic context of these areas in the final report. Similarly, please defend with more detail your determination

that an historic district does not exist in Marlinton's commercial core. We look forward to reviewing your final eligibility report.

It would be premature for us to comment on the undertaking's impact to historic resources before National Register determinations and boundaries are established. However, from the descriptions presented in the letter report, each project alternative has the potential to adversely impact, either directly or indirectly, architectural resources eligible for the National Register. As such, please include mitigation strategies for affected resources in your final effects assessment report.

If you have questions regarding our comments or the Section 106 process, please call me at (304) 558-0220, Ext. 158.

Sincerely,

Susan M. Pierce

Susan M. Pierce
Deputy State Historic Preservation Officer

SMP: mh

USDA

United States
Department of
Agriculture

Natural
Resources
Conservation
Service

465 Ragland Rd.
Beckley, WV
25801

Phone:
(304) 255-9225

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(304) 255-1250

Scott Truesdale, P.G.
Tetra Tech, Inc.
One Skyline Place, 5205 Leesburg Pike, Suite 1400
Falls Church, VA 22041

RE: Local Protection Project in Marlinton, Pocahontas County, WV

September 10, 2001

Mr. Truesdale:

The above referenced project does not contain Prime or Unique Farmland, Statewide Important Farmland, or Locally Important Farmland, because the area has already been urbanized. The soil types of Ch, Lo, Tg, and Us may be found in your project area, descriptions of these soils may be found in the Pocahontas County Soil Survey.

I have completed a Form AD-1006, please see attached.

If you have any further questions, please contact me anytime.

Sincerely,

Robert N. Pate

Robert N. Pate
Resource Soil Scientist
Robert.Pate@wvbeckley.fsc.usda.gov

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Pocahontas County Important Farmland Map Units

Prime Farmland

AlB	BaB
CeB	Ch
CuB	DuB
LlB	Lo
MaB	MrB
Ph	Se
ShB	Tg

Us

Statewide Important Farmland

AlC	BaC
BaD	BeB
BeC	BeD
BoB	CgC
CeC	CeD
CuC	CuD
DuC	LlC
LlD	LyB
LyC	MaC
MaD	Or
ShC	

Locally Important Farmland

At
Ho
MdC
MdD
Po
Pt
Pu
Sc

Hydric Soils

At
Ho
Mh
Pu
TrC
Uf

WEST VIRGINIA DIVISION OF
CULTURE AND HISTORY

October 17, 2001

Mr. Michael Worley
Department of the Army
502 Eighth Street
Huntington, WV 25701

RE: Marlinton Local Protection Project
FR#: 01-1211-PH-1

Dear Mr. Worley:

We have received the draft report "Architectural Reconnaissance, Marlinton Local Projection Project, Pocahontas County, WV" for review as required by Section 106 of the National Historic Preservation Act of 1966, as amended, and its implementing regulations, 36 CFR 800: "Protection of Historic Properties."

We accept the draft report with the following requests for additional information: that a new map is provided of the area with street names and a label for Buckley Mountain; the potential downtown historic district is outlined; name change for the Second "Street" historic district is changed to Second "Avenue."

Our comments on the recommended alternatives and their effects are as follows:
Alternative 1 - This alternative would be an adverse effect with the demolition of Upper Tannery Row and other potential buildings in the Courthouse Residential District and South Second Avenue Historic Districts. There will be visual effects to Second Avenue and the Courthouse Residential Districts. We concur that mitigation for the demolition would include further documentation of the workers housing on Upper Tannery Row with Historic Property Inventory forms, measured drawings, archival black and white photographs and a history of their connection to the local industry that can be placed for public use in both the local library and with the county historical society. Demolition of other properties in any historic district would also be documented following the steps already outlined above. Mitigation for the visual effects can be further discussed with our office and with property owners, but would likely include appropriate landscaping.

THE CULTURAL CENTER • 1900 KANAWHA BOULEVARD, EAST • CHARLESTON, WEST VIRGINIA 25305-0300
TELEPHONE 304-558-0220 • FAX 304-558-2779 • TDD 304-558-3562
EEO/AA EMPLOYER

Alternative 2 - Our office requests a map detailing where the canal would be located. This alternative appears to have less of a visual impact for the Courthouse Residential District and part of the Second Avenue Historic District. The adverse effect to the historic properties facing the Greenbrier River would be the same for the visual impact near Second Avenue Historic District and the demolition of Upper Tannery Row as well as potential other properties. Mitigation for the visual effects can be further discussed with our office and with property owners, but would likely include appropriate landscaping.

Alternative 3 - This alternative would have a potential adverse effect. Our office would work on a case by case basis to continue consultation with the Core of Engineers and the property owners who may choose this program.

We appreciate the opportunity to be of service. If you have any questions, please contact Katherine Jourdan, Structural Historian at (304) 558-0220, ext. 156.

Sincerely,

Susan M. Pierce

Susan M. Pierce
Deputy State Historic Preservation Officer

SMP:kmj

APPENDIX B
DRAFT FISH AND WILDLIFE COORDINATION ACT REPORT

West Virginia Field Office
694 Beverly Pike
Elkins, West Virginia 26241

July 18, 2001

Mr. Anthony B. Borda
Chief, Planning Division
U.S. Army Corps of Engineers
502 Eighth Street
Huntington, West Virginia 25701

Dear Mr. Borda:

Enclosed is a copy of the U.S. Fish and Wildlife Service, West Virginia Field Office's (Service) Draft Fish and Wildlife Coordination Act Report (Draft CAR) for the Marlinton Flood Control Project. The Corps Planning staff has cooperated with the Service throughout the planning process and has incorporated, or is working on incorporating, many of the conservation recommendations that have been made to date. The Service commends the Corps on that effort. The Service also recognizes that the Corps is in the process of refining project plans in response to obtaining more advanced engineering information.

This draft CAR was based on the information available to the Service as of June 30, 2000. Recent project changes or refinements that have been, or are being, incorporated as a result of advanced engineering or our recent conservation recommendations may not be reflected in this draft, but should be incorporated in the final report. As noted in the draft CAR, the Service will also require some additional information from the Corps before this report can be finalized.

This Draft CAR has been coordinated with and reviewed by the West Virginia Division of Natural Resources. Except as where noted in their forthcoming comment letter, this report should represent joint recommendations from both agencies.

The Service looks forward to continuing our cooperative efforts on this project. If you have any questions regarding this report, please have your staff contact Barbara Douglas of my staff, or contact me directly, at (304) 636-6586, or at the letterhead address.

Sincerely,
/S/
Jeffrey K. Towner
Field Supervisor

DRAFT

FISH AND WILDLIFE COORDINATION ACT REPORT
MARLINTON FLOOD CONTROL PROJECT

June 2001

Prepared by the U.S. Fish and Wildlife Service
West Virginia Field Office

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EXECUTIVE SUMMARY

The town of Marlinton is located almost entirely within the 100-year floodplain of the Greenbrier River, in Pocahontas County, West Virginia, and has been periodically subject to extensive flooding damages. Flood control alternatives are being evaluated that would address floods up to the 1985 flood of record. Three alternatives; a levee/floodwall system, a levee/floodwall system with a diversion dam on Knapps Creek, and a non-structural alternative were retained for full evaluation in the Environmental Impact Statement (EIS). Alternative 1, the levee/floodwall system, has been selected as the preferred alternative.

Numerous studies that document the fish and wildlife resources within the study area have been conducted by the U.S. Fish and Wildlife Service (Service), the West Virginia Division of Natural Resources (WVDNR), and the Corps of Engineers (Corps). The Greenbrier River and Knapps Creek are both listed as high quality streams by the WVDNR, and they support a wide range of fish and wildlife resources such as an excellent pan (Lepomis spp.) and smallmouth bass (Micropterus dolomieu) fishery, and a wide diversity of fish, amphibians, and native freshwater mussel species, including the green floater (Lasmigona subviridis), a Species of Concern (SOC). SOC are those species for which the Service has information indicating that protection under the Endangered Species Act may be warranted but for which it lacks sufficient information on status and threats to proceed with preparation of a proposed listing.

Although much of the project area is developed, bottomland hardwoods and wetland habitats are common along the riparian corridor. These areas support numerous species of mammals, and migratory birds including waterfowl. The federally endangered Indiana bat (Myotis sodalis), could occur within the project area. The Greenbrier River is also a prime recreational resource that contributes to the economy of the region.

Construction of the proposed project would impact an estimated 45.9 acres of terrestrial habitat, consisting mostly of bottomland hardwoods, as well as 1.24 acres of wetlands, cut-off a large amount of floodplain, and require approximately 1,000 feet of stream relocation, and 7,000 feet of stone slope protection along the river bank. Access to the river by recreational users and wildlife would be restricted. As standard practice, the Corps suggests that long-term maintenance of the project would require that vegetation be controlled along the entire length of the levee, which would permanently eliminate much of the riparian habitat within the project area and potentially entail extensive use of herbicides along the river. More information from the Corps is required before potential impacts to the hydrology of the river, both within the project area, and downstream, can be evaluated.

The Service has recommended conservation and mitigation measures that should be incorporated into the project to address these impacts including: adjusting the lay-out and design of the project to allow for preservation of more riparian habitat, incorporating plantings of native vegetation, and construction of recreational access paths into project designs. Terrestrial habitats within the watershed should be created or enhanced to provide mitigation for 23.5 Habitat Units (HU).

Aquatic mitigation for project impacts should include 2.5 acres of Palustrine Emergent (PEM) habitat and restoration or enhancement of 16,000 feet of stream habitat. An Indiana bat survey should be conducted and coordinated with the Service prior to project construction, or clearing of trees within the project area should occur during the Indiana bat hibernation period, between November 15 and March 31. Mitigation for aquatic and terrestrial impacts could be best accomplished within the Upper Knapps Creek Watershed, based on an already existing and locally supported watershed restoration plan.

The non-structural plan, Alternative 3, should have the least impacts to fish and wildlife resources and, therefore, would be our preferred alternative. However, without having detailed project maps for this alternative, impacts have not been quantified, and impacts under Alternative 3 could be greater then currently anticipated. Of the construction alternatives, Alternative 1 is the least damaging, and the Service would not object to this alternative if the mitigation described above is implemented. This draft Coordination Act Report (CAR) is based on the project information that was available as of June 30, 2001. The information presented in this report may be revised for the final CAR due to project alterations or receipt of additional project data. If any part of the described plans change, the Service will need to re-evaluate the impacts and modify our mitigation recommendations accordingly.

INTRODUCTION

The town of Marlinton is located adjacent to the Greenbrier River in Pocahontas County, West Virginia. The town lies almost entirely within the 100-year floodplain of the Greenbrier River and has experienced significant damages and sometimes deaths as a result of periodic flooding. The Water Resource Development Act of 1996 (WRDA 96) authorized the Corps of Engineers to design and implement flood damage measures for the Greenbrier River, including the town of Marlinton.

Flood management projects for this area have been under consideration for some time, and numerous studies and reports have been produced. The Corps' previous studies include the Greenbrier Limited Evaluation Report (December 1997), and the Greenbrier River Basin Study Evaluation Report (July 1994). These reports developed the scope of potential project alternatives, and provided preliminary evaluations of the engineering and economic feasibility of those alternatives. Most of these alternatives were not retained for full analysis in the EIS because they were either technically unfeasible, cost prohibitive, or would not provide the required level of flood protection. Many of the previously rejected alternatives, such as damming or dredging of the Greenbrier River, would have been expected to cause significant adverse impacts to the fish and wildlife resources of the Greenbrier River and the surrounding area. In this sense, the alternatives retained in the EIS, have a reduced potential to incur adverse ecological impacts in comparison to previously rejected plans. None of the alternatives evaluated had positive cost-benefit ratios.

The three alternatives retained for full evaluation in the EIS are;
1) A levee/floodwall system along the Greenbrier River and Knapps Creek.
2) A levee/floodwall alternative along the Greenbrier River, and a diversion dam and cut through for flooding from Knapps Creek.
3) A nonstructural alternative that includes a combination of raising some structures in place, relocation of structures out of the floodplain, and buy-outs of existing properties within the floodplain.

All three retained alternatives would provide protection to over 400 residential and non-residential structures in the Marlinton area from flood levels up to those experienced during the flood of record, which occurred in 1985.

This report is being prepared pursuant to the Fish and Wildlife Coordination Act (l6 U.S.C. 66l-667e) and is consistent with the U.S. Fish and Wildlife Service's authorities under the Migratory Bird Treaty Act (16 U.S.C. 703-712) and the Endangered Species Act (87 Stat. 884, as amended; l6 U.S.C. l53l et seq.) (ESA).

DISCUSSION OF EVALUATION METHODS AND PREVIOUS STUDIES

Service and WVDNR biologists have coordinated with representatives from the Corps throughout the planning process to insure that conservation recommendations were incorporated into the project plan and to evaluate the impacts of the proposed project. The information presented in this report is based on project plans available as of June 30, 2001. Alterations to project plan may occur as planning progresses. For example, the Corps is in the process of refining the plan to slightly alter the location of the proposed levee and the amount of bank stabilization work that must be conducted. Additional engineering work may also alter the current conceptual designs. Additional coordination with the Service and the WVDNR must be conducted prior to finalization of this report, to insure that additional impacts are addressed and conservation efforts are acknowledged.

The Service and the WVDNR have conducted a number of studies that evaluated and documented the fish and wildlife resources that are present within the potential project area. Previous reports include:

Planning Aid Report: Application of the Aquatic and Terrestrial Habitat Evaluation Procedures (HEP) on the Greenbrier River Flood Control Feasibility Study. June 1991.

Planning Aid Reports presenting fish and wildlife resource survey results for bats (May 1987), herpetofauna (September 1987), small mammals (January 1988), and freshwater mussels (January 1985, and August 1987).

Draft Fish and Wildlife Coordination Act Report for the Marlinton Local Flood Protection Project (October 1985) including a Modified HEP.

A survey of freshwater mussels in the Upper Portion of the Greenbrier River Drainage, Pocahontas County, West Virginia. WVDNR (January 1997).

Fishery Resources of the Greenbrier River, Cloverlick Creek, Thorny Creek, and Sitlington Creek, between Cass and Marlinton, West Virginia. WVDNR (June 1988).

In addition, the Corps, under coordination with the Service and the WVDNR, has contracted for a number of additional resource studies to be conducted. These studies served to supplement the information provided in previous studies and insure that the EIS is based on current and accurate information. These studies include an Indiana Bat Summer Habitat Suitability Assessment (R.D. Zande & Associates, Inc., December 2000), a Wetland Inventory and Mapping (David Miller & Associates, Inc., February 2001), and an Unionid Survey on the Greenbrier River and Tributaries (Ecological Specialists, Inc., December 2000), and AVegetation of the Upper Greenbrier River: Marlinton to Cass, West Virginia@ (Dr. Dan Evans of Marshall University, 1988).

The recommendations and information provided in this draft CAR are derived primarily from the reports listed above. Mitigation recommendations are based where possible on HEP and/or the Service's established mitigation policies. Where this is not possible or practicable, best professional judgement, under consultation with the biologists from the WVDNR and the Corps, has been used.

DESCRIPTION OF ALTERNATIVES

The selected plan, Alternative 1, would consist of a combination of a levee and floodwall system to protect Marlinton and the community of Riverside from flooding from the Greenbrier River and Knapps Creek.

The upstream end of the project would begin by tying into high ground just upstream of where Route 219 crosses Stoney Creek. It would then run along the right descending bank (RDB) of Stoney Creek, crossing the Route 15 bridge, to the confluence of Stoney Creek and the Greenbrier River. From there, it would continue down the RDB of the Greenbrier to tie into high ground near the Burns Motor Freight property adjacent to Rt. 219, for a total length of approximately 5,000 feet. A quick closing gate structure which would close off the road during flood situations, would be located on Rt. 219. This portion of the project would protect the community of Riverside from the induced flood heights caused by the Marlinton levee.

Along the left descending bank (LDB) of the Greenbrier, the upstream end of the levee begins near First Ave, and would run adjacent to the river past the Rt. 39 bridge to the confluence of Knapps Creek. From there it would turn and continue up the RDB of Knapps Creek to the Municipal Water Plant. At that point the project would transition into a floodwall for approximately 1,000 feet, and then return to levee and tie into high ground near Wilson's Field. Total length of the project on the LDB would be 14,000 feet. The levee would be an average of 11 feet tall, 100 feet wide at the base, and would consist of a mowed grass face on the landward side, and stone slope protection on the riverward side.

Alternative 2 consists of a levee/floodwall system along the Greenbrier River, and a diversion dam and cut through for flooding from Knapps Creek. Through downtown Marlinton, this alternative is essentially the same as Alternative 1, however, at the point of confluence with Knapps Creek, the levee would not turn and follow Knapps Creek, but would instead cross Knapps Creek and continue 800 feet to tie into high ground. Gated culverts would run through the levee to allow water to pass through. Under flood situations the gates would close and a large pumping station (that would need to be constructed as part of the project) would pump excess flows to the Greenbrier. In addition, a 2,200 foot diversion channel would be cut through a low saddle of Buckley Mountain. This channel would flow from approximately 1 mile upstream of the confluence to approximately 2,000 feet downstream of the confluence. A 25-foot high dam would be built just downstream of the diversion channel to direct flood flows through the cut-through. This dam would also have a culvert that would allow a base flow of up

to 500 cfs to pass through into Knapps Creek. This gate would be closed to activate the dam and divert the flood waters.

Alternative 3 is a nonstructural alternative that includes a combination of raising some structures in place, relocation of structures out of the floodplain, and buy-outs of existing properties within the floodplain. Three sub-alternatives are possible. Alternative 3A consists of either raising structurally sound buildings in place or direct acquisition and removal of other unsound or ineligible buildings. Alternative 3B would involve filling of the floodplain and rebuilding the commercial district in town in place but at a higher elevation. Alternative 3C would consist of relocating structures and infrastructure to the town of Edray, which is 4 miles north of Marlinton and is not subject to flooding due to its higher elevation.

FISH AND WILDLIFE RESOURCES IN THE STUDY AREA

The project area is located in and along the Greenbrier River near the town of Marlinton, in Pocahontas County, West Virginia, and includes approximately 4 miles of the Greenbrier River between the confluences of Stoney Creek and Knapps Creek, and the lower most one mile of both Stoney Creek and Knapps Creek. Pocahontas County is mostly rural, with lumber, tourism and agriculture being the main economic contributors. Pocahontas County is noted for its: outstanding recreational resources, including the presence of the Greenbrier River, the Greenbrier River Trail, and the Monongahela National Forest. The area is widely used for outdoor recreation including fishing, hiking, biking, canoeing, swimming, hunting, and general aesthetic and outdoor enjoyment. Although land-use in the county is primarily forested, the town of Marlinton is mostly residential with some light commercial and industrial areas, and has a population of approximately 1,200 people.

The drainage areas of the affected watersheds are as follows: Knapps Creek: 110 square miles; Stoney Creek: 23 square miles; and the Greenbrier River to Marlinton: 381 square miles. The surrounding topography is characterized by steep slopes and elevations of up to 3,200 feet above mean sea level. Marlinton is located on relatively flat floodplain whose width ranges from approximately 400 to 1,700 feet wide . The widest point of the floodplain is near the mouth of Knapps creek.

The Greenbrier River and Knapps Creek are both listed by the WVDNR as high quality streams. Substrates within the project area are predominately rubble and cobble interspersed with areas of sand. The project area contains some reaches with bedrock controls, mostly within the Knapps Creek area. Water quality is good to excellent. These factors coupled with low siltation rates allow the area to support good diversity of macroinvertebrates, including many species of mussels, crayfish, and snails. The Greenbrier River also supports an excellent warm water fishery particularly for smallmouth bass. Other common species include the flathead catfish (Pylodictis olivaris), redbreasted sunfish (Lepomis auritus), silver shiner (Notropis photogenis), bigmouth chub (Nocomis platyrhynchus), rock bass (Ambloplites rupestris), fantail darter (Etheostoma flabellare), and northern hogsucker (Hypentelium nigricans). In Knapps Creek

other species such as stoneroller (Campostoma anomalum), bluntnose minnows (Pimephales notatus), and striped shiner (Notropis chysocephalus) are also common. This portion of the Greenbrier River tends to be rather shallow, with few deep pools, and most pools being between 2-3 feet deep.

The riparian zone within the project area is predominately river birch (Betula nigra), sycamore (Platanus occidentalis), black willow (Salix nigra), silky dogwood (Cornus obliqua), and alder (Alnus serrulata). The riparian zone is more consistently of high quality downstream of the Route 39 bridge and along Knapps Creek, than through the main part of town, however within town some riparian areas such as near the old tannery are of high quality and some riparian areas, such as just downstream of the Route 219 Stoney Creek bridge, are poor.

Most of the high quality riparian areas can be characterized as bottomland hardwood habitat. This habitat type contains species that generally occur in low lying areas that are subject to soil saturation and repeated flooding. Common overstory species include river birch, sycamore, beech (Fagus grandifolia), sweet buckeye (Aesculus octandra), cucumber magnolia (Magnolia acuminata), tulip popular (Liriodendron tulipifera), ash (Fraxinus pensylvanica), and silver maple (Acer saccharinum). Understory species include flowering dogwood (Cornus florida), silky dogwood (Cornus obliqua), spicebush (Lindera benzoin), ironwood (Ostrya virginiana), and reproduction of the overstory species. The herbaceous layer will commonly contain Virginia creeper (Parthenocissus quinquefolia), jewelweed (Impatiens capensis), honewort (Cryptotaenia canadensis), maiden hair fern (Adiantum pedatum), smartweed (Polygonum pensylvanicum), and Joe-pye weed (Eupatorium perfoliatum).

This habitat type is the climax riparian community within this area and is extremely productive in terms of wildlife use. Bottomland hardwood habitats are used by muskrat (Ondatra zibethicus), raccoon (Procyon lotor), beaver (Castor canadensis), mink (Mustela vison), red fox (Vulpes fulva), gray squirrel (Sciurus carolinensis), and white-tailed deer (Odocoileus virginiana). Birds species noted within the area include mallard (Anas platyrhynchos), wood duck (Aix sponsa), great blue heron (Ardea herodias), green-backed heron (Butorides virescens), belted kingfisher (Megaceryle alcyon), osprey (Pandion haliaetus), common yellow throat (Geothypis trichas), yellow warbler (Dendroica petechia), scarlet tanager (Piranga olivacea), cardinal (Richmondena cardinalis), catbird (Dumetella carolinensis), rough-wing swallow (Stelgidopteryx ruficollis), Louisiana waterthrush (Seiurus motacilla), phoebe (Sayornis phoebe), and parula warbler (Parula americana).

Wetland habitats are also scattered throughout the project area. Palustrine scrub - shrub (PSS) habitats are particularly prominent in the downstream portions of the project area near the confluence of Knapps Creek. The dominant species in this habitat type is river birch, sycamore, black willow, silky dogwood, and alder. Herbaceous species include grass-leaved goldenrod (Solidago graminifolia), spike-rush (Eleocharis spp.), and jewelweed. The interspersion of these wetland habitat types with bottomland hardwoods and the riverine community, creates greater habitat diversity and increases the fish and wildlife resource values of the area. American toad (Bufo americanus), wood frog (Rana sylvatica), green frog (Rana clamitans melanota), snapping

turtle (Chelydra serpentina), box turtle (Terrapene carolina carolina), northern ringneck snake (Diadophis punctatus edwardsi), black rat snake (Elaphe obsoleta), northern water snake (Nerodia sipedon sipedon), and a number of salamanders can be expected to occur within the project area.

Emergent and submergent riverine wetlands are present throughout the project area. Dominant species in the area are water willow (Justicia americana), and waterweed (Elodea canadensis), with the waterweed beds occurring primarily near the confluence of Knapps Creek. These areas provide excellent feeding and nursery areas for fish and macroinvertabrates, including mussels. Five mussel species are known to occur within the project area. These species are elktoe (Alasmidonta marginata), spike (Elliptio dilatata), plain pocket book (Lampsilis cardium), wavyrayed lampmussel (Lampsilis fasciola), and green floater. Two of these species, the elktoe and the green floater are listed by the Service as SOC.

SOC are those species for which the Service has information indicating that protection under the Endangered Species Act may be warranted but for which it lacks sufficient information on status and threats to proceed with preparation of a proposed listing. On December 5, 1996 the Service announced their final decision to discontinue efforts to maintain a national list of these species. While species of concern lack formal recognition as candidates for possible future listing under the Endangered Species Act, the Service and cooperating State agencies encourage continued consideration of these species in environmental planning.

The Service=s Planning Aid Report dated January 2, 1985 reported that 774 individual green floaters were collected within the project area during a mussel survey conducted in 1984, and that this was the largest known bed of this species in West Virginia. Shortly after the flood of 1985, channel Aclean-up@ efforts were conducted in the surveyed reach. These efforts consisted of removing vegetation and substrate materials from the shallow islands and riverine emergent (REM) wetlands that protected the mussels. These efforts destabilized the substrates and removed the ecological and hydrological conditions that allowed the mussel populations to thrive. Subsequent surveys have failed to report substantial mussel populations in this area, with a total of 8 individuals of all species being reported in the WVDNR=s 1997 report, and 34 individuals of all species (including 2 live green floaters) in Ecological Specialist=s 2000 report. Recent observations indicate that the REM wetlands and shallow bars have begun to naturally restore themselves, and in the absence of additional channel disturbance, this may allow for mussel populations to recover to some extent over time.

Except for occasional transient species, the only Federally listed endangered species that could potentially be impacted by the currently proposed project is the Indiana bat. This species may use the project area for foraging and roosting between April 1 and November 14. Indiana bat summer foraging habitats are generally defined as riparian, bottomland, or upland forest, and old fields or pastures with scattered trees. Roosting/maternity habitat consists primarily of live or dead hardwood tree species such as shagbark hickory, which have exfoliating bark that provides space for bats to roost between the bark and the bole of the tree. Tree cavities, crevices, splits, or hollow portions of tree boles and limbs also provide roost sites.

There are 29 known hibernacula for the Indiana bat in the limestone region of eastern West Virginia in Preston, Tucker, Randolph, Pendleton, Pocahontas, Greenbrier, Monroe, and Mercer Counties. The population of the hibernacula in West Virginia range in size from one to 9,000 Indiana bats. The nearest known hibernating populations are near Hillsboro and Cass, WV about 11 and 16 air miles from the project area, respectively. Surveys indicate that the cave near Hillsboro has the larger population of the two caves, with approximately 160 individuals recorded.

Recent data indicate that the area within an approximate 5.0 mile radius of a hibernaculum is important foraging and roosting habitat for the Indiana bat in the fall swarming period, August 15 through November 14. The project area is outside a five mile radius of a known hibernaculum. Therefore, fall-swarming behavior is not expected in the proposed project area.

HABITAT EVALUATION PROCEDURES

As described above, a number of HEPs have been conducted on the Greenbrier River in the vicinity of the project area. Although habitat quality may vary somewhat along the length of the river, the reported HEP values represent an overall (average) value for each habitat type within the system. In addition, when considering riverine systems, alterations or degradation of one reach may adversely affect the overall habitat suitability for that system.

For the Modified HEP, conducted in 1985, habitat was rated on its suitability to support all wildlife which would be expected to use each cover type, and no evaluation species were selected. The evaluation was essentially based on a guilding concept where groups of species with similar habitat requirements, i.e., songbirds or furbearers were discussed. A subjective value of one to ten was assessed on the suitability of the habitat to provide food, cover, and reproduction requirements for wildlife. For the aquatic portion of the modified HEP, field evaluations emphasized physical features of the habitat such as instream and riparian cover, as well as chemical and biological parameters. Resulting Habitat Suitability Index (HSI) values were then multiplied by a factor of ten to aid in calculations and ease in comparisons. A value of 100 reflects optimum habitat suitability. The results are listed in Table 1.

Table 1: Results of 1985 modified HEP

Terrestrial Habitat Type	Baseline HSI value
Urban (U)	15
Palustrine Emergent (PEM)	80
Palustrine Scrub/Shrub & Riverine Emergent (PSS/REM)	78
Bottomland Hardwoods (BH)	50
Openland/Agricultural (EO)	53
Oldfield (OF)	55
Aquatic Habitat Type	
Greenbrier River - Riverine Upper Perennial (RUP)	70.7

In 1991, a full HEP was also conducted. This HEP addressed areas upstream of the currently defined project area because damming of the river was still being considered as an alternative at that time. The results of that HEP are included for reference as Attachment 1, however these results were not used when evaluating project impacts for this CAR, because the results do not reflect the habitat conditions within the current project area.

BASELINE FUTURE WITHOUT PROJECT ASSESSMENT

Aerial photography and maps of the project area from 1969 to present were reviewed to determine how changes in land-use may have affected the accuracy of the HEP results, as well as to determine what types of changes would be expected to occur in the project area in the future. While some development has occurred in the area, such as near Riverside, other primarily industrial areas have been abandoned and have reverted to early oldfield habitat. This may be due in combination to changes in economic conditions, and to losses that occurred during previous floods. Along many reaches, riparian habitats appear to have increased in quantity or quality over time, as trees and shrubs have grown in or been allowed to mature. Photos from 1969 show a greater amount of aquatic beds, islands, and bars than are currently present, with the lowest levels of these features occurring in the 1980's. Instream work and disturbances are most likely the cause of the reductions in these features, and it can be expected that the amount of this habitat type will increase in the future as the river returns to a stable configuration. In general

within the proposed project area, agricultural habitats may have decreased in availability, oldfields may be more abundant, and palustrine forested and scrub-shrub wetlands and bottomland hardwood habitats may have increased in both availability and habitat value. Overall, little change in land-use patterns has occurred over the past 30 years, and under the future without project scenario, it is not anticipated that this trend would change significantly in the future. Based on this review, no reduction in mitigation requirements will occur due to Afuture without project@ projections.

DESCRIPTION OF IMPACTS AND RECOMMENDED CONSERVATION AND MITIGATION MEASURES

Preliminary project maps indicate that the Construction Work Limit (CWL) for the proposed levee will be about 175 feet wide, with the levee being approximately 100 feet wide in most locations. Although portions of the project will be constructed as floodwall, the construction work limits appear to remain the same regardless of construction type. An overlay of the project maps and the vegetation map was conducted to obtain a rough estimate of the acreage of each terrestrial habitat type that will be directly impacted by project construction. The vegetation map was updated slightly to indicate that the riparian area next to the former tannery site has reverted to bottomland hardwoods as opposed to Industrial, as listed on the map. The impacts to urban areas were not calculated. The acreages calculated were then multiplied by the appropriate HSI value from the 1985 modified HEP to determine the number of HUs that would be needed for mitigation. Since HSI values were reported on a scale of 100, they were converted to decimal figures for multiplication. Results are shown in Table 4.

Soil materials for project construction will be derived from a parcel of land close to the project area. Preliminary information from the Corps indicates that the old fairgrounds, currently on open field or agricultural area, will be used. Because no figures on the amount of disturbance that would occur under this portion of the project were available, these impacts have not yet been calculated.

Table 4: Estimate of direct terrestrial impacts of project construction by habitat type and associated mitigation requirements.

Habitat type	Project Length (ft)	Acreage under CWL	HSI value	HU
Agricultural	750	3.0	53	1.6
Oldfield	2150	8.6	55	4.7
Bottomland Hardwoods	8550	34.3	50	17.2
Total		**45.9**		**23.5**

Project maps were also overlayed with wetland delineation and stream maps to determine the amount of aquatic/wetland habitat that would be impacted. Marlin Run, a small tributary of Knapps Creek would be blocked by the proposed levee. The stream would either be ponded and pumped over the levee or re-routed through a box culvert to emerge upstream on Knapps creek past the end of the levee. Even though it is somewhat degraded by surrounding development, numerous small fish were observed in Marlin Run, and this area is functioning as a refugium for young fish from larger fish species and swifter flows of the main channel. Although current plans are unrefined and additional information on this portion of the project is required, up to 1,000 feet of stream could be affected by the re-routing. In addition, the confluence of Marlin Run and Knapps Creek is surrounded by a low bottom containing a former river channel and a series of PEM wetlands (listed as wetlands AA1, AB1, AC1). These areas would be cut off from the river thus losing their source of water, and/or be directly impacted by project construction. These impacted wetlands total 1.24 acres.

Initial project plans called for stone slope protection to be placed along the banks of the Greenbrier River and Knapps Creek for the entire length of the project. However, after an interdisciplinary Corps team conducted a detailed field analysis, this figure was reduced to approximately 7,000 feet of stone slope protection. The Corps has also indicated that although the stone will need to be keyed in at the base, no aquatic beds next to the stone slope protection areas will be disturbed. While this still represents a large loss of riparian habitat, it demonstrates that impact minimization measure have been considered on this project. Riparian vegetation provides cover and food for aquatic species, provides roughness to decrease flooding velocities and stream energy, and contributes nutrients and shade to the river thus improving water quality and buffering fluctuations in water temperatures. The loss of the riparian zone may adversely impact the quality of the aquatic habitat in the project area.

The Service considers the Greenbrier River and its associated aquatic and riparian habitats to be Resource Category 2 Resources in accordance with our Mitigation Policy (Federal Register Volume 46, Number 15, January 23, 1981). Resource Category 2 habitat is of high value for evaluation species and is relatively scarce or becoming scarce on a national basis or in the ecoregion. The Service's corresponding mitigation goal is no net loss of habitat value.

Due to technical difficulties associated with wetland and aquatic habitat creation, and the lag time for habitat functions to be reestablished, the following wetland/aquatic mitigation ratios have been established by the West Virginia Division of Environmental Protection (WVDEP) and the WVDNR for use under their Section 401, Water Quality Certification program. The ratios given for wetlands and open water are for mitigation by creation of those habitat types, while the ratio for stream habitats is for mitigation by enhancement. The Service and the USEPA concur with these ratios. Because use of these ratios will be required for this project to receive State certification, they have been used to calculate mitigation requirements as opposed to the HEP method used for terrestrial impacts.

The mitigation ratios are:

- $ Forested Wetlands: 3 to 1
- $ Scrub/Shrub Wetlands: 3 to 1
- $ Emergent Wetlands: 2 to 1
- $ Open Water (Lacustrine): 1 to 1
- $ Stream Habitats: 2 to 1

Table 5: Estimate of Aquatic impacts and associated mitigation requirements

Habitat type	Amount of impact	Mitigation ratio	Mitigation amount
PEM	1.24 acres	2:1	2.48 acres
Stream (Marlin Run)	1,000 feet	2:1	2,000 feet
Stream (stone slope)	7,000 feet	2:1	14,000 feet

Service biologists have routinely noted people fishing, swimming, and otherwise recreating in and along the river within the project area. Access to the river throughout the town would become more difficult under the Corps' preferred alternative, since people would have to cross up and over the levee. Recreational uses of the river could be expected to be reduced. However, people will still be expected to attempt to access the river to reach prime fishing, swimming, or other recreational areas. Repeated access over the levee in concentrated locations could adversely affect the structure of the levee and necessitate repairs. In order to maintain recreational usage of the river, access trails over the levee should be constructed at intervals along the length of the project. If feasible, river viewpoints or pathways could also be constructed on the top of the levee. These features should be engineered to be low maintenance, and incorporated as part of the design structure of the levee. The Corps should coordinate with the WVDNR on designs for recreational features.

Similarly, the presence of the levee consisting of open grass and stone slope protection will provide very little wildlife cover, and would discourage or restrict wildlife access to the river from habitats landward of the levee. In addition, preliminary plans show the levee closely following the riverbank with the construction work limits often nearing the waters' edge. Placement of the levee close to the existing bank, coupled with the placement of stone slope protection as discussed above, will eliminate much of the riparian corridor along the project length. Bottomland hardwood habitats landward of the levee such as along Knapps Creek will no longer be subject to periodic flooding and therefore may convert to upland forest types over time. These factors will further restrict movement of wildlife species who forage or travel along the river.

In many locations the levee could be moved back away from the river or straightened without requiring that any additional structures be taken. This would allow for more riparian habitat to

be maintained, would reduce the length (and therefore cost) of the levee, while also slightly increasing the flood capacity of the remaining channel. The Corps is currently reviewing this option, and results of their investigation should be reflected in the Final CAR. Where possible, clearing within the CWL should be minimized to those areas absolutely necessary for project construction, and construction methods should be designed to reduce the need for clearing. This is particularly important in areas where stone slope protection will be required near the river's edge and in areas that currently support bottomland hardwood habitats or other large trees (such as the large willows near 11th Street). All trees riverward of the levee should be left intact. The Corps should also consider incorporating plantings of native vegetation along the base of the levee and/or stone slope protection areas. Clusters of native vegetation would provide increased cover and habitat values for wildlife, provide some shading of the river, and improve the aesthetic and recreational values along the river.

The Corps' long term management policy is to recommend that vegetation be controlled on all areas of stone slope protection. This policy would allow for some level of herbaceous vegetation or shrubbery to grow, but woody vegetation would not be permitted. This means that all areas where stone slope protection was placed would be permanently devoid of any significant habitat value and that some type of maintenance treatment would be required for the life of the project. While many herbicides are labeled for use near aquatic systems, spraying over 14,000 feet of levee and 7,000 feet of stone slope protection adjacent to the water surface could cause potential accumulation or acute toxicity problems. Also many products approved for aquatic uses recommend that a surfactant be mixed with the product before it is applied. Any surfactant used should also be screened and approved for use near aquatic systems.

An Integrated Pest Management Plan should be developed by the Corps and the town of Marlinton, under coordination with the Service and the WVDNR that would potentially include some of the following options: designating appropriate herbicides and surfactants to be used on the project, limiting the frequency of vegetation control treatments, treating the project in sections instead of all at once, using selective wicking and wiping instead of spraying, setting threshold levels that would allow vegetation to reach a certain stage or height before treatment was initiated, not applying herbicides when dissolved oxygen was low, and seeding the project with a herbaceous mix that would hinder the growth of other larger vegetation.

The proposed project will have the primary effect of constricting the floodplain within the project boundaries. This will unavoidably affect the hydraulic properties of the river during flood flows including velocity, sediment transport capabilities, and flow patterns. The Service and the WVDNR are concerned that these alterations may cause adverse impacts to the aquatic environment. Potential adverse impacts include significant changes in the width/depth ratio of the stream channel, increased bank instability downstream, or areas of aggradation and degradation. More information on the hydraulic modeling conducted by the Corps is required before an analysis of these potential impacts can be conducted. If, based on our review of that information, it is determined that additional stream impacts may occur, then additional mitigation will be required.

Endangered Species - Indiana bat

The Service has determined that suitable foraging and roosting habitat for the Indiana bat occurs within the project area. One option the Corps may use to address Indiana bat concerns is to assume Indiana bats are present and schedule timber removal operations during the hibernation period, between November 15 and March 31. If that option is chosen, the Corps must then submit a calculation of the percentage of area of suitable summer Indiana bat habitat that would remain within a two-mile radius (from the approximate center point of the proposed project area) after the proposed disturbance. If the Service determines that the extent of disturbance is significant and may affect the Indiana bat, the Corps must request formal Section 7 consultation with the Service or conduct mist net surveys to determine if Indiana bats are present. If Indiana bats are collected during mist netting, the Corps must prepare a Biological Assessment, as described below.

In accordance with that option the Corps submitted R.D. Zande=s 2000 Indiana Bat Summer Habitat Suitability Assessment. However, the project impact area represents only a small portion of the potentially suitable habitat within the study area, and construction activities will impact approximately 2% of the existing potential roost trees within a two-mile radius. Therefore, if tree-clearing construction activities occur outside the summer maternity season, the proposed construction is not anticipated to have significant impacts on foraging and roosting habitat.

Another option the Corps has is to conduct mist nest surveys prior to initiating project construction. The results of these surveys should be submitted to the Service for review and concurrence. The survey should follow the standard Indiana bat mist net protocol from the Draft Indiana Bat Recovery Plan, and be conducted between May 15 and August 15 by a qualified mammalogist with experience in identifying Indiana bats.

If Indiana bats are collected, the data should be incorporated into a Biological Assessment pursuant to Section 7 of the ESA. Biological Assessments are designed to assist Federal agencies in determining if formal consultation is required. The Service recommends that the following steps be taken in preparation of the BA.

1. Conduct recent interviews of recognized experts on the species at issue, including those within the Service, WVDNR, U.S. Forest Service, universities and others who may have data not yet found in scientific literature.

2. Review up to date literature and other scientific data to determine the species distribution, habitat needs, and other biological requirements.

3. Analyze the effects of the action on individuals and populations of the species and its habitat, including indirect and cumulative effects of the action.

4. Analyze alternative actions that may provide conservation measures.

5. Conduct any studies necessary to fulfill the requirements of (1) through (4) above.

6. Review any other relevant information.

If you determine that the proposed action Amay affect@ a federally listed species you must request, in writing, formal consultation with this office, pursuant to Section 7(a) of the ESA. If the determination is Ano effect@, no further consultation is necessary, unless requested by the Service. Regardless of your findings, the Corps should provide this office a copy of the survey results and any other relevant information that assisted you in reaching your conclusion.

COMPARISON OF ALTERNATIVES

Alternative 2

While the impacts to the Greenbrier River would essentially be the same under the two build alternatives, impacts to Knapps Creek and wetlands would be greater under Alternative 2 than under Alternative 1. Because the levee would cross Knapps Creek near its mouth, a portion of the Creek would be permanently eliminated, hydrologic conditions near the confluence would be altered and movement of fish and other organisms between the two systems would be restricted. In addition, construction of the diversion dam upstream of Knapps Creek would permanently alter or eliminate a large reach of the Creek including a number of bars, islands, an oxbow, and a approximately 5.5 acre parcel of bottomland hardwoods with interspersed PEM, and PSS wetlands. Terrestrial impacts would also be greater due to the creation of the cut-through. The cut-through would primarily disturb forested mixed hardwoods as well as some recreation land. Because this alternative was not selected, the amount of disturbance was not quantified for this report. Preliminary information from the Corps indicates that approximately 960,000 cubic yards of material would be removed. Much of this material would need to be deposited in a spoil location, which would disturb an additional, as yet undefined, amount of acreage. However, spoil areas such as old quarries, could be selected that would have limited wildlife resource values.

Alternative 3

Because construction under Alternative 3 is focused on already developed areas, this alternative would have limited impacts to existing fish and wildlife resources. Acquisition and removal of structures would increase the amount of land for natural functioning of the floodplain. Raising structures in place would have a neutral impact. Filling of the floodplain and elevating a portion of the town, as described under Alternative 3B would restrict the floodplain somewhat, but to a lesser degree than Alternatives 1 and 2, and would also concentrate development within the elevated area; once again having an overall neutral to minimal impact. Relocation to Edray, as proposed under Alternative 3C, would disturb a large amount of acreage in the relocation area, which is mostly agricultural and mixed hardwood forest habitat, but would also significantly increase the amount of acreage available for reversion to wetland, old field or bottomland hardwood habitats, would allow natural functioning of the flood plain, and would encourage development of recreational and other features that supported utilization and enjoyment of the river.

The Service considers mixed hardwood forest habitats in this area to be Resource Category 3 Resources in accordance with our Mitigation Policy (Federal Register Volume 46, Number 15, January 23, 1981). Resource Category 3 habitat is of high to medium value for evaluation species and is relatively abundant on a national basis or in the ecoregion. The Service's corresponding mitigation goal is no net loss of habitat value while minimizing loss of in-kind habitat value. Because habitat losses under Alternative 3 would be primarily to Resource Category 3 Resources, while Resource Category 2 Resources would be restored or increased, little to no adverse impacts would be expected under Alternative 3, and limited mitigation would be required. As a result, Alternative 3 would be the least damaging alternative to natural resources. However, this Alternative is not locally supported because it would alter the social and cultural structure of the town.

RECOMMENDED MITIGATION LOCATIONS

The Upper Knapps Creek Watershed Association (UKCWA) is a group of local landowners who have joined together to develop a watershed restoration plan for Upper Knapps Creek and its tributaries. The watershed study area includes a drainage area of approximately 49 square miles, and extends from Paddy Knob on the West Virginia - Virginia border to the confluence of Knapps Creek and Douthat Creek in Minnehaha Springs. The watershed has been subject to severe streambank erosion and loss of riparian vegetation, resulting in increased siltation, reduced water quality, and loss of habitat values. The proposed restoration plan includes improvement of land-use practices, development of conservation easements, replanting and restoration of riparian vegetation, and direct channel restoration efforts. The plan would result in direct increases in riparian and bottomland hardwood habitats and would also improve wildlife utilization and water quality within the area.

Losses of riparian and aquatic habitat types, wildlife corridors, and potential reductions in water quality along the impacted reaches of the Greenbrier and lower Knapps Creek could be mitigated for by contributing to the implementation or maintenance of projects in the UKCWA plan. The approach would have a number of benefits including: no acquisition of additional land would be required, restoration plans have already been initiated, mitigation would occur within the same watershed as the proposed impact, and the project is locally supported. Additionally because the UKCWA would reduce the loss of agricultural land due to stream bank erosion and increase agricultural productivity, it would also offset the loss of agricultural habitat that is expected to occur as a result of the proposed Marlinton project,

As part of project construction, the Corps will utilize a soil borrow area. Preliminary information from the Corps indicates that the Aold fairgrounds@ an area that is currently used as open field or agricultural land, just upstream of the project area will be used. Excavation of borrow material may convert this area to low lying land suitable for wetland mitigation. Because the purchase and

excavation of this land will already be included in the project costs, using this area for wetland mitigation would be cost-effective. However, depending on the amount of hydrologic connectivity

to the river that can be obtained, this area may not be suitable for obtaining all the required types of habitat mitigation.

SUMMARY OF FINDINGS AND SERVICE POSITION

The Corps has selected Alternative 1, the levee/floodwall system, as the preferred project alternative. The Corps coordinated with the Service and the WVDNR during the planning process to develop project features that minimize the potential for adverse impacts to fish and wildlife resources in the project area, and to refine project plans so that conservation recommendations could be incorporated into project design.

The non-structural plan, Alternative 3, should have the least impacts to fish and wildlife resources and, therefore, would be the Service's preferred alternative. However, without having detailed project maps for this alternative, impacts have not been quantified, and damages under Alternative 3 could be greater then currently anticipated. Of the construction alternatives, Alternative 1 is the least damaging, and the Service would not object to this alternative if our mitigation recommendations are agreed to and implemented.

Based on a review of available information, including the results of a modified HEP, the following mitigation and conservation recommendations should be incorporated into the project plan:

1. The levee should be moved away from the river in locations where no additional structures would be taken.

2. To the extent possible, during project construction clearing of vegetation should be minimized and existing vegetation should remain intact.

3. Plantings of native vegetation along the levee should be incorporated into project design.

4. Terrestrial habitats within the watershed should be created to provide mitigation for 23.5 Habitat Units.

5. Aquatic mitigation should include 2.5 acres of PEM habitat and restoration or enhancement of 16,000 feet of stream habitat.

6. An Indiana bat survey should be conducted and coordinated with the Service prior to project construction, or clearing of trees within the project area should occur during the Indiana bat hibernation period, between November 15 and March 31.

7. Additional information on the soil borrow area and on hydrologic modeling and potential impacts to downstream areas should be provided. If modeling determines that impacts would result either upstream or downstream then additional mitigation may be required.

In order to mitigate for loss of recreational access to the river, access paths over the levee should be provided. Design and placement of these paths should be coordinated with the WVDNR. Mitigation for aquatic and terrestrial impacts could best be accomplished within the Upper Knapps Creek Watershed, or for some habitat types within the soil borrow area.

This draft CAR is based on the project information that was available as of June 30, 2001. The information presented in this report may be revised for the final CAR due to project alterations or receipt of additional project data. If any part of the described plans change the Service will re-evaluate the impacts and possibly modify our mitigation recommendations accordingly.

Attachment 1 : Results of 1991 full HEP

		Cover type				
Indicator Species	Forested	Bottomland Hardwood	Palustrine Forested	Oldfield	Agri-cultural	Riverine
Barred Owl	0.63	1.0	1.0	B	B	B
Pileated woodpecker	0.3	0.59	B	B	B	B
Gray squirrel	0.66	0.9	0.71	B	B	B
Meadow lark	B	B	B	B	0.82	B
Brown Thrasher	0.23	0.12	B	0.6	B	B
Beaver	0.5	0.5	0.5	0.5	B	0.5
Smallmouth bass	B	B	B	B	B	0.95
Shiner	B	B	B	B	B	0.68

Suitability indices for the eastern wild turkey by cover type and life requisite, from 1991 full HEP.

Cover type	Summer food/brood	Fall, Winter, Spring food	Cover
Upland Forest	0.0	0.73	0.9
Bottomland hardwoods	0.3	0.73	1.0
Palustrine forested	0.22	0.63	1.0
Agricultural	1.0	B	B
Oldfield	1.0	0.26	B

Attachment 2: List of Scientific and Common Names

Plants

alder (Alnus serrulata)
ash (Fraxinus pensylvanica)
beech (Fagus grandifolia)
black willow (Salix nigra)
cucumber magnolia (Magnolia acuminata)
flowering dogwood (Cornus florida)
grass-leaved goldenrod (Solidago juncea)
honewort (Cryptotaenia canadensis)
ironwood (Ostrya virginiana)
jewel weed (Impatiens capensis)
Joe-pye weed (Eupatorium perfoliatum)
maiden hair fern (Adiantum pedatum)
silky dogwood (Cornus obliqua)
silver maple (Acer saccharinum)
smartweed (Polygonum pensylvanicum)
spicebush (Lindera benzoin)
spike-rush (Eleocharis spp.)
sweet buckeye (Aesculus octandra)
sycamore (Platanus occidentalis)
tulip popular (Liriodendron tulipifera)
river birch (Betula nigra)
Virginia creeper (Parthenocissus quinquefolia)
water weed (Elodea canadensis)
water willow (Justicia americana)

Fish

bigmouth chub (Nocomis platyrhynchus)
bluntnose minnow (Pimephales notatus)
fantail darter (Etheostoma flabellare)
flathead catfish (Pylodictis olivaris)
hogsucker (Hypentelium nigricans)
redbreasted sunfish (Lepomis auritus)
rock bass (Ambloplites rupestris)
silver shiner (Notropis photogenis)
smallmouth bass (Micropterus dolomieu)
stoneroller (Campostoma anomalum)
striped shiner (Notropis chysocephalus)

Mussels

elktoe (Alasmidonta marginata)
spike (Elliptio dilatata)
plain pocket book (Lampsilis cardium)
green floater (Lasmigona subviridis)
wavyrayed lampmussel (Lampsilis fasciola)

Mammals

beaver (Castor canadensis)
gray squirrel (Sciurus carolinensis)
Indiana bat (Myotis sodalis)
mink (Mustela vison)
muskrat (Ondatra zibethicus)
racoon (Procyon lotor)
red fox (Vulpes fulva)
white-tailed deer (Odocoileus virginiana)

Birds

belted kingfisher (Megaceryle alcyon)
cardinal (Richmondena cardinalis)
catbird (Dumetella carolinensis)
common yellow throat (Geothypis trichas)
great blue heron (Ardea herodias)
green-backed heron (Butorides virescens)
Louisiana waterthrush (Seiurus motacilla)
mallard (Anas platyrhynchos)
osprey (Pandion haliaetus)
parula warbler (Parula americana)
phoebe (Sayornis phoebe)
rough-wing swallow (Stelgidopteryx ruficollis)
scarlet tanager (Piranga olivacea)
wood duck (Aix sponsa)
yellow warbler (Dendroica petechia)

Herpetofauna

American toad (Bufo americanus)
black rat snake (Elaphe obsoleta)
box turtle (Terrapene carolina carolina)
green frog (Rana clamitans melanota)
northern ringneck snake (Diadophis punctatus edwardsi)
northern water snake Natrix sipedon sipedon)

snapping turtle (Chelydra serpentina)
wood frog (Rana sylvatica)

Attachment 3: List of Acronyms Used

CAR	Coordination Act Report
CWL	Construction Work Limit
EIS	Environmental Impact Statement
ESA	Endangered Species Act
HEP	Habitat Evaluation Procedures
HSI	Habitat Suitability Index
HU	Habitat Units
LDB	Left Descending Bank
PEM	Palustrine Emergent wetlands
PSS	Palustrine Scrub-Shrub wetlands
RDB	Right Descending Bank
REM	Riverine Emergent wetlands
SOC	Species of Concern
UKCWA	Upper Knapps Creek Watershed Association
USEPA	United States Environmental Protection Agency
WRDA 96	Water Resources Development Act of 1996
WVDEP	West Virginia Division of Environmental Protection
WVDNR	West Virginia Division of Natural Resources