"WE ARE AGAIN IN THE MIDST OF TROUBLE": FLOODING ON THE POTOMAC RIVER AND THE STRUGGLE FOR THE SUSTAINABILITY OF THE CHESAPEAKE AND OHIO CANAL, 1828-1996

By

Donald R. Shaffer

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Prepared By

Donald R. Shaffer, Ph.D.
UNIVERSITY OF MARYLAND, COLLEGE PARK

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We are again in the midst of Trouble, Everything we have been doing the Last 6 weeks have been swept a way; and we may as well & Better have burn [sic], the money we have expended on this portion of the Canal; The whole canal is now under water; This is discouraging; I am discouraged after night & day for the Last 6 weeks to restore the navigation; and Just as it was Ready for the Trade, to entirely be swept away.

W. S. Elgin, maintenance superintendent, to James M. Coale, president of the C&O Canal Company. 25 November 1847.

This letter, written shortly after renewed flooding destroyed just-completed repairs of an earlier flood in October 1847, captures the devastating effect flooding had on the morale of people working on the Chesapeake and Ohio Canal.

Cover Photo: a crowd on the banks of the Potomac River at Williamsport, Md., watches the water rising around the Cushwa Coal Warehouse on March 18, 1936. The warehouse and its adjacent basin served canal traffic until the canal closed in 1924. The building is now the C&O Canal NHP's visitors' center in Williamsport. Note the inundated railroad cars to the left of the warehouse. The canal runs parallel to the trees behind the railroad cars. The March 1936 flood was the greatest ever recorded on the Potomac.

Photo Credit: New American Photo Archives, Marylandia, McKeldin Library, University of Maryland, College Park.

C&O CANAL NATIONAL HISTORICAL PARK
FLOOD RECOVERY TEAM

Park Staff

Douglas Faris, Superintendent
Kevin Brandt, Assistant Superintendent
Keith Whisenant, Chief Ranger
Bob Hartman, Chief of Maintenance
Ken Brodie, Chief of Administration
Doug Stover, Chief, Branch of Cultural Resources
Pat Toops, Chief, Branch of Natural Resources
Gordon Gay, Chief, Branch of Interpretation & Visitor Services
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Ron Bricker, Conococheague District Foreman
Bradley Hofe, Four Locks District Foreman
Glen Gossert, Paw Paw District Foreman
Cyndy Ponce, Program Analyst
John Haynes, Flood Project Manager, Palisades District
Bill Stenson, Flood Project Manager, Western Maryland District
Ron Dorsey, Flood Project Foreman

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ABSTRACT

Recurrent flooding has plagued the Chesapeake and Ohio Canal throughout its history. During its operational era, major floods repeatedly put the waterway out of business, sometimes for months, and were a key factor behind the failure of the C&O Canal Company in 1890 and the final closure of the canal in 1924. Since the purchase of the canal by the federal government in 1938 and its transformation into a park, flooding has continued to be a major problem. Flood damage has made the towpath inaccessible to the public for long periods and required the expenditure of tens of millions of dollars for repairs and the stabilization of canal structures.

The response to flood damage on the C&O Canal changed over time. The shifts reflected the differing priorities of the organizations controlling the canal. For instance, the C&O Canal Company, which built the waterway, wanted to operate it as a profitable business. Consequently, the company promptly repaired flood damage. Every day the canal was closed meant a loss of revenue. As the threat posed by the river to reliable navigation became apparent in the 1840s, the company started trying to protect to the canal and make it sustainable. However, it experienced only limited success in this endeavor and the considerable expense of flood repairs and damage prevention activities contributed to the failure of the canal company in 1890.

The canal fell into the hands of trustees representing the Baltimore and Ohio Railroad. Their main concern was not the canal's sustainability, but preventing its right-of-way from falling into the hands of competitors. To control the C&O Canal's right-of-way, the B&O found it necessary to keep the canal in operation to prevent its sale by the courts. Consequently, they spent only the bare minimum required to maintain the canal and undertook few projects aimed at preventing flood damage. Under the B&O trustees, the condition of the canal declined. The waterway managed to stay in operation for thirty-five more years, however, because the period from 1889 to 1924 was unusually free of major floods on the Potomac River. After the flood of May 1924 finally gave the railroad the justification to close the canal, maintenance on the waterway largely ceased and its rate of deterioration increased markedly.

With the acquisition of the C&O Canal by the federal government in 1938, the National Park Service adapted it to serve the recreational needs of the national capital region and the goal of historic preservation. Both aims gave the federal government an incentive to repair and maintain the C&O Canal, especially after major floods. However, since the canal had to

compete with the rest of the government for federal dollars, maintenance funds were often scarce and money for flood restoration slow in coming. Repairs that would have taken weeks or months under the C&O Canal Company, stretched into years under federal control. Given these circumstances, the canal continued to deteriorate until the 1972 flood finally prompted the federal government to spend millions restoring and stabilizing the waterway. This expenditure improved the flood worthiness of the canal, but failed to make it invulnerable to damage from high water as the floods of 1985 and 1996 have shown.

TABLE OF CONTENTS

ABSTRACT i

TABLE OF CONTENTS iii

LIST OF FIGURES iv

INTRODUCTION 1

CHAPTER 1 THE C&O CANAL COMPANY 6

The Early Years: 1828-36 6
The First Major Flood: 1836 8
The Devastating 1840s 10
Canal Renovations: 1849-52 18
Rebuilding Dams 4 and 5: 1852-60 25
The Civil War Era: the 1860s 36
Prosperity, More Renovations, and More Flooding: The 1870s 39
The Decline of the C&O Canal Company: the 1880s 45
The Failure of the C&O Canal Company: 1889-90 48

CHAPTER 2 THE B&O RAILROAD 53

A New Philosophy: 1890-1924 53
The Railroad Faces Floods: 1924 56
Abandonment and Disintegration: 1924-38 62

CHAPTER 3 THE NATIONAL PARK SERVICE 70

The Canal Revived: 1938-42 70
World War II and the Flood of 1942 72
The Postwar Years: 1945-1972 77
The 1972 Flood 89
The 1985 Flood 99

CHAPTER 4 SUSTAINABILITY: CASE STUDIES 104

Widewater 104
The Harpers Ferry Area 111

CONCLUSION 117

BIBLIOGRAPHY 119

APPENDIX A DAMAGE TO THE C&O CANAL FROM MAJOR FLOODS 124

APPENDIX B DOCUMENTED FLOODS ON THE POTOMAC RIVER, 1828-1996 126

LIST OF FIGURES

Figure		Page
1.	Chain bridge, above Georgetown, with packet steamboat John C. Poor partially submerged. Flood of May 1889	49
2.	Lockhouse 16, below Great Falls, after the flood of May 1889	50
3.	Conococheague aqueduct, at Williamsport, after the flood of May 1924	59
4.	Lock 17, at Great Falls, during the flood of May 1924	60
5.	Lock 52, below Hancock, during the flood of May 1924	61
6.	Lockhouse 6, below Dam 1, during the flood of March 1936	66
7.	Lock 6, below Dam 1, after the flood of March 1936	67
8.	Lock 15, upstream end of Widewater, after the flood of March 1936	68
9.	Eroded towpath near Lock 18, at Great Falls, after the flood of March 1936	69
10.	Break in the towpath embankment at Fletcher's Boathouse, above Georgetown. Flood of October 1942	74
11.	Widewater, looking upstream, after the flood of October 1942	75
12.	Spectators observe flood waters from the Virginia side of Great Falls. Flood of August 1955	85
13.	Break in the towpath, 1/4 a mile above Lock 20 at Great Falls. Flood of August 1955	86

Figure		Page

14. Break in the towpath at Lock 7, near Glen Echo. Flood of August 1955 87

15. Break in the towpath near Glen Echo caused by the flood of June 1972 90

16. Dumps trucks carry clay dirt in November 1973 to repair the canal after the flood of June 1972 92

INTRODUCTION

This report is a historical analysis of responses to flooding on the Chesapeake and Ohio (C&O) Canal from the time construction began on the waterway in 1828 up until (but not including) the flood of January 1996. The January 1996 flood on the Potomac River devastated the Chesapeake and Ohio Canal National Historical Park (hereafter C&O Canal NHP), which follows the Potomac for nearly 185 miles along its northern shore from Washington, D.C., to Cumberland, Md. The flood cut many breaks in the towpath, damaged other canal structures, and scattered garbage and debris over the park. A second flood in September 1996 compounded the devastation left from January. The floods of 1996 were the latest in a long series of ravaging episodes of high water to affect the C&O Canal since 1828. During the years it was a functional waterway, major floods time and again put the canal out of commission, seriously inconveniencing shippers and undermining confidence in the canal company.

However, the greatest problem resulting from flooding was the extraordinary repair expense. In fact, the cost of fixing the canal after floods contributed significantly to the failure of the C&O Canal Company. Each episode of high water increased its already ponderous debts until by the late 1880s the canal company's credit was completely exhausted, allowing the great flood of 1889 to deal the company a fatal blow. The Baltimore and Ohio Railroad, which controlled the canal between 1890 and 1938, largely managed to avoid such catastrophic expenditures because of an unusually flood-free period on the Potomac between 1890 and 1924, but the federal government was not as fortunate. Three major floods on the Potomac River since 1938 (in October 1942, June 1972, and November 1985) and many other smaller floods have cost the National Park Service (NPS) tens of millions of dollars.

The floods of January and September 1996 necessitated another round of costly repairs. Congress and the Department of the Interior have thus far proved generous in funding this work, and the C&O Canal NHP also has benefitted from an unprecedented outpouring of volunteer labor and gifts from private sources. However, the Superintendent of the C&O Canal NHP, Douglas Faris, and his staff have recognized the impracticality in an increasingly austere fiscal climate of obtaining tens of millions of dollars to restore the canal after each major flood. Therefore, they decided after the 1996 floods to rebuild the canal in as sustainable a manner as possible in order to minimize the expense of future flood repairs.

In keeping with the goal of making the canal sustainable, the C&O Canal NHP launched the Flood History Study during the summer of 1996. The project was organized as Cooperative Agreement CA-3040-4-9001 between the C&O Canal NHP and the University of Maryland, College Park. The Flood History Study had two goals: 1) to provide a thorough and detailed description and analysis of the effects of flooding upon the canal throughout its history and; 2) to determine what measures had been made in the past to protect the canal, in the hope it could provide ideas for future flood protection.

Previous scholarship by NPS historian Harlan D. Unrau already has addressed the first question. As a member of the restoration team from the Denver Service Center after the 1972 flood, Unrau wrote a flood history of the C&O Canal in 1976. He provided a detailed discussion of floods affecting the C&O Canal from 1828 to 1936, based primarily on the C&O Canal Company papers at the National Archives in Washington, D.C., the published annual reports of the canal company, and newspaper accounts. His study moved chronologically, describing the causes of each episode of high water (if known), the extent and patterns of damage, repair activity--and in a few cases--flood damage prevention efforts. Unrau's study was intended for publication as part of a series of studies he wrote on the history of the C&O Canal, but funding never materialized and the flood history stayed in manuscript form.

The Flood History Study builds on Harlan Unrau's work. Research began in late August 1996 in the C&O Canal Company papers, which are now located at the new National Archives facility in College Park, Maryland (known as Archives II). These papers are part of Record Group 79, Records of the National Park Service. At Archives II researchers examined sixty-five bound volumes and loose documents, that if piled on top of each other would rise nearly thirty-nine feet in the air. Of these records, the correspondence of the executive and field officers of the C&O Canal Company, the minutes of the directors and stockholders meetings, and the correspondence of B&O Railroad trustees, who managed the canal during the entire period it was controlled by that corporation, proved most useful.

It had been thought prior to the beginning of the project that the records of the Civilian Conservation Corps (CCC), whose personnel did repair work on the C&O Canal in the late 1930s, would prove valuable. However, consultation with archivists revealed that the CCC papers merely documented the operation of their camps, and that the planning and management of the repairs on the canal were the responsibility of the National Park Service. Archives II personnel located four boxes containing NPS correspondence, research reports, plans, and blueprints for the pre-World War II restoration of the canal. These materials were

examined after the investigation of the C&O Canal Company papers was completed.

Work at the National Archives was finished by mid-January 1997. From then until the end of March research continued simultaneously in documentary materials gathered from several sources. Perhaps were the most important were NPS records on the C&O Canal held at the Washington National Records Center in Suitland, Md. As Suitland is merely a storage facility, it was necessary to have the records there shipped out to the headquarters of the C&O Canal NHP in Sharpsburg, Md. Since the Suitland records were not catalogued the author ordered their entire holdings on the C&O Canal (filling over forty standard government storage boxes) to cull them for useful material. The most valuable documents from Suitland consisted of the correspondence on the maintenance of the canal from the 1940s until it became a national monument in 1961. Time also was spent gathering relevant newspaper clippings off microfilm at the University of Maryland, College Park, and examining documents from the library at headquarters of the C&O Canal NHP. The library contained a nearly complete collection of the annual reports of the C&O Canal Company and a file of correspondence dealing with the repair of the canal after the 1972 and 1985 floods, and other miscellaneous materials. However, the disorganized condition of the library meant its resources probably were not fully utilized.

Research notes from the documentary sources were compiled in electronic form as word processing files. They consist primarily of verbatim extracts of original documents from the National Archives, the Washington National Records Center, and other sources. The electronic notes are a chronological, documentary history of flooding and flood damage prevention activities on the C&O Canal from 1828 to 1996. The newspaper clippings and more recent park documents on flooding also were collected in a "C&O Canal Flood File." The clippings and documents in the flood file are referenced and described, although not transcribed, in the electronic notes. The electronic notes and the C&O Canal Flood File are available at the headquarters of the C&O Canal NHP.

Starting in late March, a mini-oral history project began, consisting of interviews with seven men who had played a role in flood repairs in the C&O Canal NHP after the 1972 and 1985 floods. The subjects interviewed were (in alphabetical order): 1) William Failor, superintendent from 1972 to 1981; 2) John Frye, a former member of the C&O Canal Commission (the citizens' advisory panel for the park), a seasonal ranger and canal enthusiast; 3) Gordon Gay, current chief of interpretation for the park; 4) George Hicks, a former maintenance foreman and preservation officer; 5) Richard Huber, who headed the restoration team after the 1972 flood; 6) Dale Sipes, maintenance

chief from 1971 to 1985; and 7) J. D. Young, assistant superintendent from 1977 to 1991. The number of interviews was constrained by time limitations, and the difficulty of locating former park personnel.

A typical interview consisted of questions regarding specific floods that occurred during the subjects' association with the C&O Canal NHP, and their participation in post-flood repairs. For administrative personnel questions related more to administrative and financial issues associated with repairing the canal, while the questions directed to former maintenance personnel concentrated on the actual repair work. All of the interviewees were asked for specific suggestions about how to increase the sustainability of the canal, and most gave many practical suggestions. The interviews were recorded and transcribed, and the tapes and transcripts are available at the headquarters of the C&O Canal NHP.

The following report is an interpretive study of the response of canal authorities to floods. It contains only general descriptions of the floods and flood damage on the C&O Canal, sufficient for readers to understand the actions taken to prevent future flood damage. Persons seeking the most detailed information on flood damage patterns should consult the electronic notes, the C&O Canal Flood File, and Harlan Unrau's flood history.

Users of these sources, however, should understand their limits. The papers of the C&O Canal Company, particularly the correspondence files, get sketchy after 1880. Likewise, the papers of B&O trustees are sparse prior to the 1910s. Hence, the historical record has gaps, and even where records do exist they might not contain the information intelligible or useful to modern readers. Personnel on the canal wrote for their own time. For instance, early in the history of the canal, they often described place locations in terms of canal construction sections, a description for which is not available. They also wrote of place names which have fallen out of use; made statements based on unstated facts known to the recipient of the letter but unknown to modern readers; or were inadvertently or deliberately vague. Certainly the most useful documents in the electronic notes are the letters of the maintenance superintendents. They provide the most detailed information of flood damage patterns. The stockholders and directors proceedings can also be useful, but the data they contain tends to be more summary in nature.

Likewise, the value of the oral histories are limited by the memories of the men interviewed. After many years, most of the subjects do not remember details in any systematic way. Consequently, the interviews are valuable more in terms of the

theory and practice of flood protection, than they are in documenting specific flood damage. Documentary sources are a better source of flood damage information, particularly during the era of the C&O Canal Company. Harlan D. Unrau's study is a fine recapitulation of the information in the electronic notes (prior to 1938) and the C&O Canal Flood File, but it is essentially derivative in nature.

Hence, rather than repeat yet again the information on flood damage patterns available in the aforementioned resources, this report mainly analyzes how canal managers reacted to floods, and how such responses changed over time, particularly as different organizations gained control of the canal. This question has received only minimal attention in the past--an unfortunate oversight. For just as floods were recurring, so were the efforts to protect the canal from the Potomac River. Nineteenth-century engineers described such work as making the canal more "durable" or "permanent," instead of "sustainable," but they clearly aspired after same goal pursued by the C&O Canal NHP today. Hence, their experience is of considerable relevance to the present campaign to protect the park from floods.

The report contains four chapters. The first three chapters consist of a general history of the reaction to flooding on the C&O Canal by the managers that controlled it. The first chapter considers this question during the life of the C&O Canal Company (1828-90). The second chapter examines the response of the B&O Railroad to flooding on the canal (1890-1938). The third chapter looks at the problem of floods under federal control (1938-present). The fourth chapter presents two case studies. These case studies examine, over the entire history of the canal, how authorities coped with floods in two of its most vulnerable areas: the Widewater section between Great Falls and Old Angler's Inn, and the general area of canal opposite of Harpers Ferry, W.Va.--particularly at the junction of the Potomac and Shenandoah Rivers. The report also is illustrated with historic photographs, and contains maps to help readers understand where events being described actually took place.

Donald R. Shaffer, a recent Ph.D. in the History Department at the University of Maryland, College Park, was the principle researcher for the Flood History Study, and the author of this report. Many other people, however, made contributions to the project. Rebecca Stevens organized the cooperative agreement between the C&O Canal NHP and the University of Maryland. Doug Stover and Jill Halchin supervised the project for the park. Judy Collins assisted in the research at the National Archives for short periods. Dwight Stinson, historian for the C&O Canal NHP, also provided occasional research assistance.

CHAPTER 1

THE C&O CANAL COMPANY

The Early Years: 1828-36

The C&O Canal Company labored futilely for sixty years to cope with flooding from the Potomac River. The company failed because it had what ultimately proved a horrendous task: to maintain a functional and profitable canal within the flood plain of an especially flood-prone river.[1] The frequency and severity of high water ultimately proved beyond the resources of the company to pay for repairs.

Promoters of the C&O Canal were aware before its construction that flooding posed a potential threat, but they thought the danger manageable. The Joint Virginia-Maryland Commission that studied the feasibility of a canal along the Potomac in the early 1820s recommended the canal "be generally elevated above the highest floods, except when it is found necessary to take in a supply of water from the river or to pass expensive ground along a rocky shore."[2]

Likewise, the C&O Canal Company also knew early on of the waterway's vulnerability to the Potomac River. Yet they also believed they could cope with the problem. During the early years of construction, Charles Mercer, the first president of the canal, gave orders that engineers ensure that the height of the canal embankments were above the highest known floods in the

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[1]A report by the Army Corps of Engineers to Congress after World War II, indicated that the potential for flooding on the Potomac was greater than on other rivers. The Corps stated:

> The capacity of streams in the Potomac River to translate run-off rapidly downstream results (a) from the mountainous terrain of the larger portion of the basin and (b) from the pattern of the streams in the watershed in which tributaries of nearly equal length converge at several points to synchronize flood crests. Studies indicate that the same amount of flood run-off will produce larger flood flows in the Potomac River Basin than in adjacent Middle Atlantic coastal rivers to the south.

See Congress, House, Committee on Flood Control, Potomac River and Tributaries, Maryland, Virginia, West Virginia, and Pennsylvania, 79th Cong., 2d sess., 1946, House Document No. 622, p. 24.

[2]Message of the Governor of Maryland, Communicating the Report of the Commissioners Appointed to Survey the Potomac River (Annapolis: J. Hughes, 1822), 47.

river.[3] In addition, the construction guidelines for the C&O Canal gave instructions for making the embankments of the canal flood resistant. The company directed:

> In all cases when the outside walls of the canal is liable to be covered by river freshets, the embankments behind the same shall be carried up with spall of the quarries or excavated rock of the Section, one foot in thickness, and if there be no spalls, the contractor may be required to pound or reduce part of the excavated rock of the Section to a size to pass through a three-inch ring.[4]

Therefore, during the earliest years of the C&O Canal, canal officials believed they could successfully deal with high water. They established a dual strategy of minimizing flood damage: 1) to place the canal out of harm's way by constructing it beyond the flood plain whenever possible; 2) to build structures sufficiently strong, elevated, and well drained to withstand freshets within the flood plain. Because of the narrowness of the Potomac Valley, it often was not possible to place the canal outside the flood plain, and the company more often was forced to adopt the second preventive approach.

During the 1830s, contractors, and company engineers and division superintendents proposed various improvements they believed would make the canal safer against freshets. The projects included strengthening weak walls and embankments with masonry or riprap, adding additional culverts, waste weirs, spillways and stop locks. The President and Board of Directors approved many of these proposals. Perhaps the most significant flood damage prevention project, completed by 1835, was "protection walls, embracing fully thirty miles in extent . . . on the line of the canal, varying from ten to twenty feet in height, and, in some places from forty to sixty feet."[5]

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[3]Minutes, 30 August 1828, C&O Directors Proceedings, 1828-90.

[4]Quoted in Harlan D. Unrau, Chesapeake and Ohio Canal National Historic Park Resource Study, Chapter 4, Canal Engineering Technology Employed in the Construction of the Chesapeake and Ohio Canal: 1828 (Seneca, Md.: Chesapeake and Ohio Canal Restoration Team, 1976), 83.

[5]Seventh Annual Report, 1 June 1835, Proceedings of the Stockholders, 1828-90, Chesapeake and Ohio Canal Company, Entry 180, Record Group 79, Records of the National Park Service, National Archives, College Park, Md. [Hereafter C&O Stockholders Proceedings, 1828-90]. G. C. Washington, who made the annual report in 1835, unfortunately did not specify where these walls had been built.

The First Major Flood: 1836

The June 1836 freshet was the first major flood to affect the canal after the beginning of construction. The spring of 1836 was very wet and six days of continuous rain in June raised the water level in the Potomac's tributaries, particularly the Shenandoah. The resulting flood was the greatest on the river since 1810. Company officials initially feared the flood had done considerable damage to the canal. However, the devastation turned out to be less than initially thought and the canal company fully restored navigation within three weeks. "On the completed portion of the canal," wrote NPS historian Harlan Unrau, "the most extensive damage occurred at Dam No. 4 and Harpers Ferry and from Seneca to Little Falls. The flood inflicted considerable damage upon the canal embankments still under construction below Cacapon River."[6] There were six notable breaches from Little Falls to Seneca. There were also some breaks in the canal between Edwards Ferry and Seneca, and a sizable breach and erosion of the guard bank at Dam 4. On the unfinished portion of the canal, the canal company lost 5,800 cubic yards of embankment to the high water. The flood also left sand bars in many places along the prism of the canal, particularly at Harpers Ferry where breaks above the town led to the obstruction of the feeder at Dam 3.

During the flood of 1836, J. Y. Young, superintendent of the Georgetown division, took several steps to reduce damage from the flood once he learned the water in the river was rising. He had the canal emptied between Lock 14 and 15, in the Widewater area, to reduce the pressure on an embankment where a slippage had developed. Young also instructed a foreman to cut a controlled break in an embankment on the Georgetown level to save a high embankment farther downstream, because he found a waste weir there could not sufficiently vent the excess water from the canal.[7]

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[6]Harlan D. Unrau, The Major Floods of the Potomac River and Their Effect on the Chesapeake and Ohio Canal: 1828-1936, Chapter 10, Chesapeake and Ohio National Historical Park Historic Resource Study (Seneca, Md.: Chesapeake and Ohio Canal Restoration Team, 1976), 3.

[7]Ibid., 3-4; J. Y. Young, Superintendent, Canal Line to J. P. Ingle, Clerk, Washington, D.C., 2 June 1836, [6 a.m.]; J. Y. Young, Superintendent, Canal Line [near Lock 21], to J. P. Ingle, Clerk, Washington, D.C., 2 June 1836, [4 p.m.]; J. Y. Young, Superintendent, Canal Line, to "Dear Sir," 3 June 1836, C&O Incoming Correspondence, 1828-90.

Young's letters are a good example of the use of construction sections, in the early decades, to describe locations along the canal. A construction section was a unit of the canal assigned to a particular contractor to build. In his 4:00 p.m. letter on June 2, Young writes, "The only plan I could adopt with the Geo Town level was to cut away through on Sec E to save the high

The success with which the canal withstood the flood of June 1836, made canal officials, particularly the C&O President, G. C. Washington, confident about the canal's sustainability. At the annual company meeting, he asserted that the damage to the waterway had occurred primarily where the canal was too close to the river, and he assured stockholders that the company was trying to move the unfinished portions of the canal farther away from the Potomac's shore. Furthermore, the masonry structures "were fully tested . . . and notwithstanding the immense pressure on the aqueduct and other masonry, none have been injured."[8]

Still, in the wake of the flood, the C&O Canal Company initiated some additional flood control projects. These included a waste weir near Muddy Branch culvert and Lock 28; a stop lock at the abutment of Dam 4; riprapping the embankment above Dam 4; and coping the Rock Creek basin with stone.[9] These improvements made G. C. Washington very confident the canal could withstand future high water. A year after the flood he reported to the C&O stockholders:

> The high freshets of this spring have passed by without injury to the canal, and we have every reason to believe that the great strength of the dams, superior masonry of the aqueducts, locks, culverts, and wastes, with the increasing

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embankment of Sec B." Where exactly these locations were on the canal can only be guessed at, as the author has never come across location descriptions for construction sections on the C&O Canal. Harlan Unrau experienced the same frustration in his study of flooding on the C&O Canal. See Unrau, The Major Floods, 1.

[8]Eight Annual Report, 15 June 1836, C&O Stockholders Proceedings, 1828-90.

[9]Minutes, 12 November 1834, C&O Directors Proceedings, 1828-90; J. Y. Young, Superintendent, Canal Line, to the President and Directors, 12 April 1836, C&O Incoming Correspondence, 1828-90; John P. Ingle, Clerk, Washington, D.C., to G. W. Rodgers, Superintendent, 29 July 1836; John P. Ingle, Clerk, Washington, D.C., to W. S. Elgin, Superintendent, 6 January 1837; John P. Ingle, Clerk, Washington, D.C., to Charles B. Fisk, Chief Engineer, 30 November 1837, Letters Sent by the Office of the President & Directors, 1828-70, Chesapeake and Ohio Canal Company, Entry 194, Record Group 79, Records of the National Park Service [Hereafter C&O Outgoing Correspondence, 1828-70]; W. S. Elgin, Superintendent, Harpers Ferry, to Charles B. Fisk, Resident Engineer, 9 February 1837, Letters Received By The Chief Engineer, 1834-52, Chesapeake and Ohio Canal Company, Entry 207, Record Group 79, Records of the National Park Service, National Archives, College Park, Md. [Hereafter Chief Engineer's Incoming Correspondence, 1834-52].

solidity of the embankments, afford an ample guarantee against future damage.[10]

By June 1838, the flood of 1836 was becoming a distant memory, and Washington felt confident enough to tell stockholders:

> As no breaches of any consequence have occurred on the line, and as the embankments are becoming more solid every day, we have reason to believe such accidents will be of rare occurrence, and that the cost of repairs will consequently decrease every year. Indeed, it is one of the highest recommendations of canals, that, unlike most works of art, their strength increases with their age. The materials of which this canal is constructed are imperishable, with the exception of the lockgates and a few pivot-bridges; and when it is completed, the annual expense of repairs will be inconsiderable, compared with its magnitude and cost, and will abduct but a small amount from its vast receipts.[11]

The Devastating 1840s

The unprecedented floods of the 1840s show Washington's comments were naive. During three years of the decade, major freshets hit the finished portions of the canal (which by 1842 was completed as far as Dam 6, about 134 miles upstream from Georgetown), straining the resources of the company and leaving the canal in need of renovation.

However, even before the 1840s floods, the completed parts of the canal had started to deteriorate, the result of inadequate maintenance. The cost of building the canal greatly overran the initial estimates during the 1830s and the company had trouble raising sufficient capital to continue construction. By the early 1840s, the C&O Canal Company was virtually bankrupt, and had to suspend construction on the canal in the spring of 1842. As the company's position grew ever more tenuous, maintenance suffered. The company could not afford the $40,000 per year the chief engineer estimated was needed to keep up the canal.[12] Division superintendents ran up debts because the company could

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[10]Ninth Annual Report, 12 June 1837, C&O Stockholders Proceedings, 1828-90.

[11]Tenth Annual Report, 4 June 1838, Ibid.

[12]Fourteenth Annual Report, 6 June 1842, Ibid.

not supply them with sufficient funds to pay their expenses.[13] As the financial condition of the C&O Canal grew increasingly desperate, company officials became worried about the possibility of unplanned repair expenses they could not pay for and took extreme steps to avoid them. In the spring of 1841, they ordered superintendents to lower the water level in the canal to three feet, nine inches (less than two-thirds of the canal's designed six-foot depth) as a preventive measure against costly breaches in the canal; although lowering the water to such a low level seriously impeded navigation on the canal.[14]

Such was the condition of the canal when the freshet of April 1843 struck. The flood started from a rapid snow melt in the mountains of western Maryland. The most severe damage was between Edwards Ferry and Georgetown, with a lesser amount between Dam 4 and Dam 6 (then the terminus of the canal). The chief engineer estimated that it would cost $10,000 to restore navigation and $20,000 to repair damage fully. The company turned to banks in the District of Columbia to finance the repairs, pledging future tolls and water rents as security. Under strong financial pressures to resume navigation, repairs progressed quickly. Although, the flood struck on April 15, by May 6, canal boats could again traverse the entire canal.[15]

As in 1836, the division superintendents on the canal worked to minimize damage during the flood. As the water rose, W. S. Elgin, based in Harpers Ferry, had the waste weirs on his section of the canal raised to vent excess water from the canal back into the river.[16] J. Y. Young repeated his tactics of 1836, cutting the embankments of the eastern-most portion of canal where he

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[13]Charles B. Fisk, Chief Engineer, Frederick, to the President and Directors, 1 December 1842, C&O Incoming Correspondence, 1828-90.

[14]Thomas Turner, Clerk, Frederick, to J. Y. Young, Superintendent, 9 April 1841, Letters Received, by President and Directors, 1873-80, Chesapeake and Ohio Canal Company, Entry 191, Record Group 79, Records of the National Park Service, National Archives, College Park, Md. [Hereafter C&O Outgoing Correspondence, 1828-70].

[15]Unrau, The Major Floods, 5-6.

[16]W. S. Elgin, Superintendent, Harpers Ferry, to Charles B. Fisk, Chief Engineer, 15 April 1843, 7:30 a.m., Chief Engineer's Incoming Correspondence, 1834-52.

thought it would relieve pressure on more important embankments and prevent costly uncontrolled breaks.[17]

Before the canal company could fully restore the injuries from the April freshet, an even more serious flood struck the C&O Canal in September 1843. Several days of heavy rain across the Potomac basin resulted in high water from Dam 6 all the way down to Georgetown. Damage was heaviest below Edwards Ferry, but particularly downstream of Seneca, where numerous breaks occurred and one-third of Lockhouse 6 washed away. It took a full month to repair the canal and the September deluge cost an additional $30,000 on top of the injuries still left from April.

As before, the division superintendents worked to minimize damage. J. Y. Young cut the canal embankment at strategic points to allow water to exit the canal before it damaged expensive canal structures. This tactic, however, proved unable to save the Beaver Dam culvert because the flood waters were too high there.[18]

The company again had to borrow money to pay for repairs. This time it tapped the banks in Frederick, Maryland, soliciting loans of $10,500. Milling interests in Georgetown, who were dependent on the canal for water power, also advanced the canal company $3,000 on their water rents to speed the repair of the Georgetown level.[19]

The September 1843 flood convinced the C&O Canal Company that further preventive measures were necessary to protect the canal from flooding. Chief Engineer Charles B. Fisk wrote the president, "with a like rise of the river, we should again suffer the same damages, unless certain precautionary work . . . can be done, that shall keep the river out at points of greatest damage."[20] Top company officers agreed with Fisk's

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[17]J. Y. Young, Superintendent, to Thomas Turner, Frederick, 19 April 1843, C&O Incoming Correspondence, 1828-90.

[18]J. Y. Young, Superintendent, Canal Line, to James M. Coale, President, Frederick, 16 September 1843; J. Y. Young, Superintendent, Lock 26, to James M. Coale, President, 19 September 1843, Ibid.

[19]Minutes, 21 September 1843, C&O Directors Proceedings, 1828-90

[20]Charles B. Fisk, Chief Engineer, Canal Line opposite Harpers Ferry, to James M. Coale, President, Frederick, 17 September 1843, C&O Incoming Correspondence, 1828-90.

recommendation. President James Coale, who had taken over the canal shortly before the September flood, recommended to the stockholders a $60,000 program of repair and preventive activity on the canal, particularly the installation of new waste weirs at strategic points.[21]

The greatest focus of the company's improvement efforts after the 1843 freshets was the Georgetown level, which had flooded in both the April and September freshets, particularly the three-fifths of a mile below Dam 1 at the Little Falls. The flooding had caused breaches as the waters in the canal ran down to the river from the canal. To combat this problem, President Coale recommended:

> . . . to raise the part of the towpath liable to overflow, and also the feeder bank below the guard gates [at Dam 1], at least one foot above the highest water mark hitherto known in the Potomac; or, in other words, about one foot higher than the rise of the last September freshet. This, with a tumbling waste 500 feet long on the tow-path side of the canal, near the fourth mile stone, and some few other repairs of minor importance, it is thought would oppose an effectual barrier against the inroads of the river at all times hereafter.[22]

The tenuous financial condition of the canal company made financing such improvements a tricky proposition. The Georgetown level was the focus of repairs not only because it had suffered two large breaks during the September 1843 flood, but also because the commercial interests in the town were willing in principle to lend the canal company $10,000 for the improvements there. Negotiations for the loan, however, delayed the implementation of the Georgetown project. To make the loan, Georgetown demanded a mortgage, which the canal company refused.[23] In the end, negotiations broke off and the C&O Canal Company paid for a more limited program of improvements in Georgetown from funds originally earmarked to finish construction

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[21]Special Report of James M. Coale, President, 16 November 1843, C&O Stockholders Proceedings, 1828-90.

[22]Appendix to the Sixteenth Annual Report, 3 June 1844, Ibid.

[23]Minutes, 5 September 1844, C&O Directors Proceedings, 1828-90.

of the canal to Cumberland.[24] In November 1844, it contracted for the construction of a 250-foot spillway at Falls Branch. The company completed the tumbling waste by April 1845 at a cost of nearly $2,000. The company also raised the "guard banks of the canal at such points as are most exposed to the overflow of the river."[25]

In addition to the work at Georgetown, the C&O Canal Company engaged in flood damage prevention projects elsewhere on the canal. At the Little Monocacy culvert, the company constructed a new foundation and abutment walls to give the structure additional strength to better withstand floods. It also raised the Shenandoah River lock to prevent overflows that had damaged this area in the past and strengthened weak embankments elsewhere along the canal.[26] While the improvements proved helpful, they were not as extensive as the original $10,000 plan for Georgetown, and nowhere near the $60,000 recommended by Coale to the stockholders.

Despite the disastrous 1843 season, the canal company remained confident of its ability to meet the challenge of the Potomac River. A committee of stockholders that responded to the 1845 Annual Report articulated this attitude. They wrote:

> The excellent condition of the canal in reference to repairs affords the best proof of the gratifying fact that in progress of time and in consequence of the necessary repairs the work has become more perfect and substantial and less liable to accident or injury; and proves conclusively, that in future there will be a diminution of expenses for repairs instead of an increase as in the case of works of a different character.[27]

The floods of 1846 seemed to bear out the belief of the stockholder's committee. Two major freshets occurred that year,

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[24]Eighteenth Annual Report, 2 June 1846, C&O Stockholders Proceedings, 1828-90.

[25]Unrau, The Major Floods, 10.

[26]Ibid., 9.

[27]Report of the Committee on the Seventeenth Annual Report, 3 June 1845, C&O Stockholders Proceedings, 1828-90.

and the damage from them was much less than in 1843, a fact which the canal company attributed to the precautions built since then.

The first flood of 1846 struck in March, as winter snow in the mountains rapidly melted off. The heaviest damage was between Dams 4 and 5. The flood opened an eighty-foot breach in Dam 4, broke the gates of Locks 41 through 44, and washed away about fifty or sixty feet of sheathing on Dam 5. The canal company restored navigation in just over a week. Damage elsewhere on the canal was relatively light, in part because the flood waters at their peak were four feet less than the flood of September 1843. However, the Chief Engineer Fisk also attributed the small amount of damage to the preventive work done since 1843, particularly raising the canal embankments.[28]

Still, the light damage in March 1846 did not discourage the Chief Engineer from looking for additional ways to make the canal more flood proof. Fisk had new gates with cast-iron frames installed on the locks damaged in March. The towpath below Dam 5 was raised and protected with stone.[29] John G. Stone, the superintendent on the western section of the canal reported that he had constructed waste weirs at "Lock No. 43, below lock No. 44 and below Dam No. 5."[30]

The repairs and improvements from the March flood were not completed when a second flood hit the canal in July 1846, the result of heavy rains. The level of this flood was comparable to the September 1843 freshet, although it was slightly lower below Williamsport and somewhat higher above. The amount of damage, however, was much less the 1843 flood. William S. Elgin reported, "this freshet above Harpers Ferry was within 14 inches of the Freshet of Sept 1843. But did not do any thing like the damages of that freshet not 1/4."[31] Elgin and other canal

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[28]Unrau, The Major Floods, 9-10; Charles B. Fisk, Chief Engineer, Washington, D.C., to James M. Coale, President, 19 March 1846, Drafts of Letters Sent By the Chief Engineer, 1836-38, 1846-52, Chesapeake and Ohio Canal Company, Entry 210, Record Group 79, Records of the National Park Service, National Archives, College Park, Md. [Hereafter Drafts of Chief Engineer's Outgoing Correspondence, 1836-38, 1846-52].

[29]Unrau, The Major Floods, 11.

[30]John G. Stone, Superintendent, to Charles B. Fisk, Chief Engineer, Frederick, 25 May 1846, Chief Engineer's Incoming Correspondence, 1834-52.

[31]W. S. Elgin, Superintendent, Point of Rocks, to James M. Coale, President, Frederick, 8 July 1846, C&O Incoming Correspondence, 1828-90.

managers again claimed the reduction in damage was due to improvements they had made on the canal since 1843. Charles Fisk wrote to James Coale that, with exception of the collapse of the Broad Run culvert and a significant breach at the Rock Creek basin, the damage between Georgetown and the Rock Creek basin was not heavy. Fisk attributed the light injuries to the installation of new waste weirs and the raising of the canal embankment above the level of the 1843 floods.[32] Damages west of Harpers Ferry also were less than expected. W. S. Elgin gave higher embankments the credit. He admitted that Dam 4 had suffered $1,000 in damage, but blamed the foreman at that location for failing to install the planks in the stop lock there in time prevent significant erosion in the guard bank and to a widening of the breach in the dam left from the March freshet.[33] Indeed, the stockholders' committee that reviewed the annual report of the president and directors congratulated the company on the success with which it had weathered the 1846 floods compared to canals of Pennsylvania.[34]

Despite the self-congratulations, it was not until a month after the July 1846 flood before the C&O Canal Company managed to restore navigation on the canal, and repairs at Dam 4 were not finished until the autumn of 1847. The company also could not afford $10,000 in preventive work recommended by the chief engineer, or to permanently replace the Broad Run culvert. All told, the floods of 1846 cost the canal company over $21,000 and a significant amount of lost revenue while the canal was closed.[35] In fact, by the end of the year, depression replaced the mood of celebration, as a smaller flood came down the canal in November exacerbating the breach at Dam 4. This damage led the chief engineer to recommend that the canal company raise "the Guard bank, Guard and Stop locks, and abutment of the dam,

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[32]Charles B. Fisk, Chief Engineer, Harpers Ferry, to James M. Coale, President, Frederick, 6 July 1846, Ibid.

[33]W. S. Elgin, Superintendent, Point of Rocks, to James M. Coale, President, Frederick, 8 July 1846, Ibid.

[34]Report of the Committee on the Eighteenth Annual Report, 16 July 1846, C&O Stockholders Proceedings, 1828-90.

[35]Unrau, The Major Floods, 11-12. Note: damage from more minor freshets on the canal in May and November of 1846 are part of the tally of $21,327.76, in addition to major floods of March and July.

entirely above the highest freshets."[36] The board approved this project and authorized the president to borrow money to finance its completion.[37]

Barely had the company completed its improvements at Dam 4 when an unprecedented flood hit the canal in October 1847. Flooding was not limited to the Potomac, but also occurred on other rivers in Maryland, Virginia, Ohio, and Pennsylvania. While there was significant damage on all portions of the finished canal, according to Harlan Unrau, "The most critical damage to the waterway was concentrated in the following area: Lock No. 7 to Widewater; the level above Great Falls; Point of Rocks to Dam No. 4 and the vicinity of Dam No. 5."[38] Despite the preventive work on Dam 4, $5,000 worth of damage occurred there. W. S. Elgin reported, "the whole of the Cross Guard Bank between the Stop Lock & the abutment of the Dam have been carried a way. The river is runing [sic] around the abutment of the Dam also considerable damage done the Guard Bank."[39] As soon as the waters started receding, the chief engineer and division superintendents began repair efforts. The initial damage estimate to repair the canal was $20,000. James Coale quickly wrote letters to banks in major towns near the canal, soliciting loans to mend the waterway.[40]

Repairs proceeded rapidly after the flood of October 1847 and by the middle of November were on the verge of completion. On November 25, however, the Potomac rose again, wiping out much of the completed repairs. The November flood had a depressing

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[36]Charles B. Fisk, Chief Engineer, Cumberland, to the President and Directors, 29 March 1847, C&O Incoming Correspondence, 1828-90.

[37]Minutes, 8 April 1847 and 26 May 1847, C&O Directors Proceedings, 1828-90.

[38]Unrau, The Major Floods, 13.

[39]W. S. Elgin, Superintendent, Dam 4, to James M. Coale, President, Frederick, 10 October 1847, C&O Incoming Correspondence, 1828-90.

[40]James M. Coale, President, Frederick, to the President and Directors of the Farmers and Merchants Bank of Georgetown, 14 October 1847; James M. Coale, President, Frederick, to W. Maury, President of the Bank of the Metropolis, 14 October 1847; James M. Coale, President, Frederick, to John Van Lear, [Cashier, Washington County Bank, Williamsport], 14 October 1847, C&O Outgoing Correspondence, 1828-70.

effect on the morale of company employees out on the line of the canal. W. S. Elgin wrote James Coale from Dam 4:

> We are again in the midst of Trouble, Everything we have been doing the Last 6 weeks have been swept a way; and we may as well & Better have burn [sic], the money we have expended on this portion of the Canal; The whole canal is now under water; This is discouraging; I am discouraged after night & day for the Last 6 weeks to restore the navigation; and Just as it was Ready for the Trade, to entirely be swept away.[41]

The damage from the November 25 flood appears to have affected the middle and upper sections of the canal greatest, although it did significant damage below as well. The November 1847 flood, in combination with a smaller freshet sometime in December, essentially ended navigation on the canal that season above Harpers Ferry. It was not until the middle of February 1848 that boats could travel as far as Dam 6. The total cost of repairs for the October, November, and December floods came to over $48,000.[42]

Canal Renovations: 1849-52

The freshets of 1847 destroyed confidence that the improvements made after the 1843 and 1846 floods were sufficient to protect the canal from the Potomac. Opinion had long existed within the canal company that only a thorough renovation of the canal would properly safeguard it. Charles Fisk, the chief engineer, had advocated a systematic program of flood repair and preventive activity on the finished portion of the canal since 1842.[43] During the mid-1840s, the company had determined which parts of the canal needed refurbishment and improvement, but did not start a restoration program.

The devastating floods of 1847 finally pushed the president and directors to carry out a plan to renovate the entire waterway below Dam 6. The imminent completion of the last section of the

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[41]W. S. Elgin, Superintendent, Dam 4, to James M. Coale, President, Frederick, 25 November 1847, C&O Incoming Correspondence, 1828-90.

[42]Unrau, The Major Floods, 14.

[43]Charles B. Fisk, Chief Engineer, Frederick, to the President and Directors, 1 December 1842, C&O Incoming Correspondence, 1828-90.

canal between Dam 6 and Cumberland provided a further motivation. To run fully loaded coal boats down from Cumberland would require the canal to carry the six feet of water for which it had been designed. Since its opening, however, the waterway often had carried less than six feet because the embankments, weakened by flooding and neglect, had proven incapable of carrying a full load. Outside pressure also played a role in prompting a campaign to repair the canal and safeguard it against future floods. The citizens of Washington, Georgetown, and Alexandria sent a memorial to the canal company in June 1848, requesting that a committee of stockholders be appointed to investigate the condition of the canal below Dam 6 and see that "proper measures are adopted without delay, the necessary means, may be raised among ourselves & other interested parties to forthwith place the Canal between Georgetown & Dam No 6, in a permanently substantial & profitable condition."[44]

The biggest obstacle to the renovation program that began after the 1847 floods was financial. Burdened by staggering debts incurred in completing the canal, it was impossible for the C&O Canal Company to finance restoration efforts internally. Likewise, the amount of money required for the repair and improvement program--$200,000--was beyond the lending capacity of the banks which regularly did business with the canal. Even if they had had sufficient resources, the banks were not eager to make loans to the canal company. Many of these institution still were owed substantial repayments for previous flood repairs. The company had discovered as much in the spring of 1848 when the banks refused to lend it money to pay for further preventive activities at Dam 4.[45]

To get the money to finance the renovation program required government assistance, and the C&O Canal Company turned to the State of Virginia.[46] Virginia had assisted the canal much less

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[44]Memorial of Citizens of Washington, Georgetown, and Alexandria, 17 June 1848, in the Appendix to the Report of the Committee on the Twentieth Annual Report, 2 August 1848, C&O Stockholders Proceedings, 1828-90.

[45]James M. Coale, President, Frederick, to George Schley, Hagerstown Bank, Hagerstown, 28 March 1848; James M. Coale, President, Frederick, to John Van Lear, Cashier, Washington County Bank, Williamsport, 11 July 1848, C&O Outgoing Correspondence, 1828-70. In fact, it was necessary for the canal company to refinance the loans made to repair the 1847 damage. See Minutes, 18 April 1849, C&O Directors Proceedings, 1828-90.

[46]The federal government had been at best indifferent to the canal since the accession of Andrew Jackson to the presidency in 1829. Jackson and his Democratic party successors did not believe the federal government should support internal improvements that were not national in character. Although

than Maryland, even though by the 1840s much of the trade on the canal ended in Alexandria rather than Georgetown (because of a serious silting problem in the Rock Creek basin). Consequently, in the fall of 1848, the C&O Canal Company sent a memorial to the State of Virginia asking for a loan of $200,000 to finance the renovation of the canal from Georgetown to Dam 6. The Virginia legislature declined to lend the money outright, but it did pass a bill on March 15, 1849, that guaranteed an issue of $200,000 in repair bonds to be offered by the canal company.[47]

After the passage of the bond guarantee, preparations for the renovation campaign proceeded quickly. By August 1849, Charles Fisk had submitted his plan for the consideration of the C&O's president and directors and the Virginia Board of Public Works. Fisk foresaw eight separate projects. The company would spend the largest share stemming from the sale of the repair bonds--$80,000--to raise the towpath where it had worn down from erosion or use. With a portion of the aforementioned sum, Fisk also planned to desilt the Rock Creek basin and protect the canal from leakage in the limestone country.[48] The next largest project--$50,000--was the dams. Fisk wanted to repair all the existing dams and protect Dams 4, 5, and 6 from future floods by raising their guard banks. The third largest project--$20,000--was to raise the level of the canal at vulnerable locations to exclude flood waters, and, where this was not possible, to improve drainage from the canal prism by means of new overflow wastes and waste weirs. The remainder of the projects consisted of repairing or, when necessary, rebuilding culverts, building

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the C&O Canal served two states at that time and the District of Columbia, the Democrats were content to leave support for the canal to Maryland, Virginia and the District of Columbia. Maryland had already supplied most of the money to construct the canal, and pledged its credit in the mid-1840s to allow the company to sell construction bonds to finish the waterway.

[47]Minutes, 3 August 1848 and 18 April 1849, C&O Directors Proceedings, 1828-90.

[48]The author was unable to determine precisely where the limestone country was located. However, parts of the canal in Frederick, Washington, and Allegany counties passed through areas dominated by this porous rock. See William E. Davies, Highlights of the Geology and Engineering of the Chesapeake and Ohio Canal (Washington, D.C.: American Geophysical Union, 1989), 11-24.

new bypass flumes around some locks and repairing others, and tightening the aqueducts against leakage.[49]

The company moved quickly to implement Fisk's plan. Within the month, the C&O Canal Company had borrowed $10,000 based on the coming issue of repair bonds and started renovating the dams.[50] The work was carried out by crews under the supervision of the division superintendents, themselves directed by the chief engineer. By April 1850, Fisk submitted a detailed progress report of the work to date, showing that he had spent $60,274.67 of the $200,000 bond issue.[51] The sale of the repair bonds itself proved successful, selling at face value or even slightly above. By June 1851, Samuel Sprigg, James Coale's successor as president, reported to the stockholders:

> The repairs of the canal have been continued with as little interruption to the navigation as practicable; and are now so far advanced, as to give assurance of comparative security against encroachments by high water in the river, at several points, which have heretofore been most exposed; and we trust, by the close of the present year, they will have been so far completed, as to leave but little apprehension for the future safety of the works, and the maintenance of uninterrupted navigation.[52]

While the renovation proceeded smoothly, the C&O Canal Company experienced problems with conditions the State of Virginia had added to the legislation guaranteeing the repair bond issue. The Virginia legislature forced the canal company to promise to build a new outlet lock opposite Berkeley County, Virginia--despite the fact that boats already could exit the canal to Berkeley County in the slackwater above both Dams 4 and 5, and that the added expense of the new outlet lock would divert

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[49]Charles B. Fisk, Chief Engineer, Cumberland, to President and Directors, 2 August 1849, C&O Incoming Correspondence, 1828-90. For a list of specific projects completed with the funds from the repair bonds, see Charles B. Fisk, Chief Engineer, Cumberland, to the President and Directors, 25 April 1850 and 6 May 1850, C&O Incoming Correspondence, 1828-90.

[50]Minutes, 24 August 1849, C&O Directors Proceedings, 1828-90.

[51]Charles B. Fisk, Chief Engineer, Cumberland, to the President and Directors, 25 April 1850, C&O Incoming Correspondence, 1828-90.

[52]Twenty-Third Annual Report, 2 June 1851, C&O Stockholders Proceedings, 1828-90.

at least $30,000 from the restoration of the canal. The canal company later managed to convince the Virginia Board of Public Works to waive building the Berkeley outlet lock.[53] However, it was less successful in deflecting business interests in Alexandria. The Virginia Board of Public Works, responding to pressure from Alexandria merchants, retroactively prohibited the canal company from spending repair bond money east of the C&O Canal's junction with the Alexandria aqueduct. The Alexandria business community feared that if the Rock Creek basin was dredged and navigation on the easternmost section of the canal improved, it would draw traffic away from their city in favor of Georgetown.[54] While the canal company managed to avoid a blanket prohibition against repairs east of the Alexandria aqueduct, it was forced to pledge to use its own funds, and not money from the repair bonds, to desilt the Rock Creek basin (a $15,000 project).[55] Later the canal company got a further exemption from the prohibition, permitting repair bond funds to be used "to the first lock below the aqueduct." However, the company could not afford to dredge the basin from its own resources, and the project was delayed.[56] Still, despite the obstacles to the renovation of the canal imposed by the State of Virginia, by the spring of 1852 the restoration of the canal above the intersection with the Alexandria aqueduct was essentially complete.

The test of the renovation came immediately, when the largest flood on the Potomac to that date hit the canal in April 1852. It also was the first major freshet on the river since the completion of the canal to Cumberland two years earlier. The flood started on April 18 after six days of heavy rain raised the river to levels six feet over October 1847, with the river cresting at sixty-four feet in Great Falls.[57] By April 29, Charles Fisk reported on damage from the flood, which he

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[53]Twenty-Second Annual Report, 3 June 1850, Ibid.

[54]James M. Coale, President, Frederick, to J. Brown Jr., 2nd Auditor and Secretary, Board of Public Works, Richmond, Va., 22 April 1850, C&O Outgoing Correspondence, 1828-70.

[55]Twenty-First Annual Report, 13 June 1849; Twenty-Second Annual Report, 3 June 1850, C&O Stockholders Proceedings, 1828-90.

[56]Twenty-Third Annual Report, 2 June 1851, Ibid.

[57]Twenty-Fourth Annual Report, 7 June 1852, Ibid.

estimated would cost $80,000 to repair. Only the uppermost twenty-one miles of the waterway escaped significant damage. From Town Creek to Seneca there were many small breaches, but the dams suffered the most extensive damage. At Dam 6, a breach of 200 feet had opened in the Virginia abutment of the dam. Fisk wrote of Dam 4, "the river broke over the Guard bank and around the Maryland abutment. The damage, however, at this point . . . does not exceed that of 1847." At Dam 3, according to Fisk, "the river has broken around the Maryland Abutment, and in returning to the river over and through the towpath of the level above Lock No. 34, has done damage exceeding that done in 1847."[58] Below Seneca, the canal was a shambles, especially at Widewater. Outside Widewater, four major breaks occurred on the Georgetown level, and two large blowouts in the towpath between Little Falls and the entrance to Widewater.[59]

The flood of April 1852 dramatically proved that the costly restoration of the canal had utterly failed, in the words of its architect, Charles Fisk, "to guard and protect the canal in all time to come against the floods of the Potomac."[60] Fisk and other C&O Company officials attributed the calamity to the decision to protect the canal against floods of the proportions of October 1847--then the highest on record--but not a larger flood. Fisk claimed that an investigation of crests in the Potomac had revealed no evidence of previous floods greater than 1847 height. "If there are marks of higher water along the river as high as the late fresh, within the last 100 years," he wrote, "I have not met with them."[61]

Later, other officers would suggest the 1852 renovation failed because $200,000 was not enough money to properly protect the canal against high water. William Grason, Samuel Sprigg's successor as president of the canal company, told the stockholders in June 1854:

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[58]Charles B. Fisk, Chief Engineer, Washington, D.C., to President and Directors, 29 April 1852, C&O Incoming Correspondence, 1828-90.

[59]Unrau, The Major Floods, 15.

[60]Charles B. Fisk, Chief Engineer, Cumberland, to C. J. Faulkner, 18 January 1849, C&O Incoming Correspondence, 1828-90.

[61]Charles B. Fisk, Chief Engineer, Washington, D.C., to President and Directors, 29 April 1852, Ibid.

> Indeed, it could hardly have been expected, that one hundred and thirty-four miles of canal . . . requiring the removal of obstructions, and the reconstruction of dams, culverts, and embankments, could have been placed in [adequate] condition . . . without the expenditure of a much larger sum than two hundred thousand dollars.[62]

Even as the top officials from the canal offered excuses for the failure of their costly efforts to protect the canal from the river, they still had the difficult task of rebuilding the waterway yet again. Charles Fisk estimated it would take ten weeks to put the canal back in navigable condition. However, even more challenging than the task of filling in breaks in the canal embankments and rebuilding the guard walls and abutments at the dams, was finding $80,000 to pay for this work. The company was responsible for interest payments on millions of dollars of loans stemming from the construction and renovation of the canal, as well as debts left over from earlier floods, at a time when virtually no revenue was coming in. Fortunately for the C&O Canal Company, the communities and banks near the national capital came to the rescue. Most of the money for the repairs after the 1852 flood came from the cities of Washington, Alexandria, and Georgetown, with banks in these places supplying the remainder, in tandem with advances on water rents from the Georgetown millers and subscriptions from Cumberland. W. W. Corcoran, a leading merchant and financier in Washington, D.C., also pledged a personal loan of $5,000 to the company, should the first $75,000 prove insufficient to make the repairs. As it turned out, the canal company needed Corcoran's money. It was not until the middle of July that navigation was possible along the entire line of the canal, and the final cost of repairing the canal was nearly $100,000.[63]

The overrun in the repair costs resulted from new flood prevention improvements ordered by the C&O directors on the suggestion of Charles Fisk. At Dam 6, the company replaced the embankment washed away with a heavy masonry wall. It built a new guard bank from Dam 3 to Lock 36 at Harpers Ferry, elevated several feet higher than the 1852 flood. The guard banks above Widewater, and the guard banks at Dams 2 and 4 also were raised above the level of the 1852 flood, as well as paved and riprapped

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[62]Twenty-Sixth Annual Report, 5 June 1854, C&O Stockholders Proceedings, 1828-90.

[63]William Grason, President, Washington, D.C., to W. W. Corcoran, Washington, D.C., 19 July 1852, C&O Outgoing Correspondence, 1828-70; Unrau, The Major Floods, 17.

to make them more flood resistant. The company built new waste weirs, and enlarged some of the existing waste weirs to drain more water. Part of the cross-section at Dam 5 was modified to "free it from the effects of reaction during freshets, by which it has heretofore been very much injured." The modifications made it more like Dam 6, which had less steep cascade, helping to preserve the structure from the churning action of the water as it struck the channel below the dam.[64]

The improvements made after the flood of April 1852 show the C&O Canal Company continued to believe it was worth spending large sums to protect the canal from the river. They did not question their ability to make the canal sustainable. In their opinion, the renovation of 1849-51 had failed because the structures the company had built were not high enough, or sufficiently substantial and capacious to be effective against a flood of the level of 1852. With the points most heavily damaged protected against another such flood, they asserted, the canal was safe for some time to come. Thomas L. Patterson, Charles Fisk's successor (with the title of engineer and general superintendent), even went as far to argue that the canal had held up well to the 1852 flood, considering it was only designed to withstand an 1847-level flood. Now that the waterway had gained protection against another flood of the proportions of 1852, he considered the canal safer still.[65]

Rebuilding Dams 4 and 5: 1852-60

Yet continued flooding in the 1850s and 1860s, although not as destructive as the flood of April 1852, further called into question the effectiveness of the company's protective measures, especially at the dams. Weakened by the 1852 flood and earlier water action, the dams increasingly were the canal's weakest points. In his study of canal engineering, Harlan Unrau attributed the vulnerability of the dams on the C&O Canal to their poor design. Dams 1 and 2 (1828-31) were the most flimsy, constructed of "timber cribs, loose rubble stone, and brush." They had to be rebuilt almost each year because high water in the spring regularly washed large portions of them out. Dams 4, 5, and 6 (1833-39) were "heavily reinforced wooden structures firmly

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[64]Quoted in Ibid.; Thomas L. Patterson, Engineer and General Superintendent, Washington, D.C., to the President and Directors, 1 June 1853, in Appendix A, Twenty-Fifth Annual Report, 6 June 1853, C&O Stockholders Proceedings, 1828-90; Unrau, Canal Engineering Technology, 144-45.

[65]Ibid.

secured to the sub-riparian rock and resting at either end against natural rock or rubble masonry abutments."[66] However, this design easily developed leaks and, when subjected to flood waters, breaches occurred. Only Dam 8 (1837-50), constructed of masonry and upstream of the more flood-prone stretches of the Potomac, held up well against the river.[67] Indeed, dam construction for the C&O Canal Company had been a "learning exercise" which taught that although the dams farther downstream had been cheaper to build, they were ruinously expensive to maintain. As construction moved farther up the Potomac, the company proved increasingly willing to build expensive but more substantial dams in the hope they would hold up better against the river and prove cheaper in the long run.[68]

The company struggled during the 1850s and 1860s about what to do with its troublesome dams. The issue became one of paramount importance. The dams were perhaps the most critical structures on the C&O Canal because they supplied the water used in the canal. If the dams leaked or breached, however, the supply of water to the canal often was insufficient to maintain operations, particularly during times of low water on the river. In the wake of the flood of 1852, the problem of leaks and breaches became acute and the company, despite its tenuous financial state, had to deal with the problem.

Of all the dams on the canal, Nos. 4 and 5 proved the most vexing to the C&O Canal Company. The canal's president, William Grason, in a report to a special meeting of the stockholders,

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[66]Unrau, Canal Engineering Technology, 140-41. "Dam No. 6," according to Unrau, "was built with a less steep slope on its downstream side and additional timber facing on its upstream side to give it further stability against the action of the river."

[67]What is truly remarkable about Dam 8 is how little it appears in the records of the C&O Canal Company. While volumes of correspondence passed between officers of the company about Dams 1-6 (no "Dam 7" was ever built), virtually nothing appears about Dam 8, a testament to its sturdiness. Further evidence of its strength was the failure of the Army Corps of Engineers in its attempt to demolish the structure in 1954 to make way for modern flood control improvements to protect Cumberland. Despite the use of the 300 sticks of dynamite, the 100-year-old masonry structure held together. See C. W. Heine, Park Historian, to Chief, Public Use Branch, National Park Service, 13 April 1954, Administration, Protection and Maintenance File 1460/C&O-5, National Capital Parks, National Park Service, Washington National Records Center, Suitland, Md. [Hereafter Administration, Protection and Maintenance File 1460/C&O-5].

[68]Unrau, Canal Engineering Technology, 140-41.

admitted that the structures being "badly constructed at first, and injured by repeated floods, have not been in a proper condition for many years past to supply the levels below with sufficient depth of water in very dry seasons."[69] Dams 4 and 5 had required $40,000 in repairs even before the 1852 flood struck. After the waters receded there had been little money to fix these dams because the company had to devote its limited resources to rebuild Dam 6, which had been more seriously damaged.

It was not until the spring of 1853 that the canal company had sufficient resources to contemplate repairs at Dams 4 and 5. Grason informed the stockholders he had directed the general superintendent, Thomas L. Patterson, to make plans to repair Dams 4 and 5.[70] Patterson first turned his attention to Dam 5. However, the repairs planned for the structure did not take place because, as Grason informed the stockholders the following June, "the difficulty of procuring and deliverying [sic] timber at the proper time, and the probability of a falling off in the revenue, in consequence of the detention of boats, prevented the commencement of the work."[71] That is, the damages at Dam 5 themselves delayed the repairs, by preventing the canal company from earning enough revenue to start them. The company was reduced to dumping gravel and other materials to plug the breaches temporarily in order to open the canal for navigation and obtain funds for more permanent repairs.

Although the condition of Dam 5 was more pressing because of its failure to supply the canal below with enough water to allow laden boats to pass, William Grason was actually more concerned about Dam 4. As of the summer of 1854, Dam 4 could still divert enough water to maintain navigation to Harpers Ferry, but it was closer than Dam 5 to total collapse. The C&O president was so worried about Dam 4 that he told the stockholders he had ordered the company to investigate how much money it would cost to replace the old structure with a masonry dam. As he and the board were coming to the end of their terms as officers of the company, he felt unable to order the replacement dam built. However, Grason was confident that a masonry dam would be durable

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[69]Report of William Grason, President, to Adjourned Stockholders Meeting, 3 August 1853, C&O Stockholders Proceedings, 1828-90.

[70]Minutes, 28 September 1853, C&O Directors Proceedings, 1828-90.

[71]Twenty-Sixth Annual Report, 5 June 1854, C&O Stockholders Proceedings, 1828-90.

enough to withstand freshets and provide a reliable water supply to the canal. No doubt trying to build support for the considerable expense that a masonry dam at No. 4 and other locations would entail, he told the stockholders, "When the contemplated improvements are made in the dams, nothing will be required except ordinary repairs to keep the canal in navigable order."[72]

Yet the C&O Canal Company did not have the resources to finance immediate construction of masonry dams in the summer of 1854. In fact, the company had reached yet another financial crisis. The financial state of the waterway was such that it suspended interest payments on the Virginia repair bonds in June 1854.[73] A committee of directors that inspected the canal in 1854 recommended the company take no specific action at either dam, merely that Patterson and his subordinates keep a close eye on the structures, and take whatever action was needed to keep them sufficiently tight to supply the canal with water. Based on this advice, the full board dropped plans for replacement of the dams, or their systematic repair, instead opting to do nothing until the issue had received further study.[74]

The canal company gave responsibility for examining its options concerning the dams to A. K. Stake, Patterson's successor as general superintendent. In October 1854, Stake reported that the company had three choices for dealing with Dam 4. As suggested earlier by William Grason, Stake thought the most effective solution would be to replace the wooden dam with a masonry structure. However, a masonry dam would cost $65,000 and take two or three years to build. The cheapest plan would be to reinforce the existing dam with "cribs of timber thrown across immediately below the present Dam, and Secured to it." Stake quickly dismissed this option stating:

> . . . there are objections to it which would make it preferable to adopt the third plan, which is to thoroughly overhaul the old dam, replacing the decayed timber, renewing the filling, and remedying the defects known to exist in its original construction, this could be done by means such are now being used at Dam No 5, and at cost which would not exceed 25000$ and might fall short of that amount, the

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[72]Twenty-Sixth Annual Report, 5 June 1854, Ibid.

[73]Ibid.

[74]Minutes, 6 July 1854, C&O Directors Proceedings, 1828-90.

expense would be regulated by the amount of timber and materials necessary to be removed and replaced.[75]

While Stake recommended the replacement of the old structure with a masonry dam, he admitted the complete refurbishment of the old dam was the next best option. The company initially chose refurbishment for both Dams 4 and 5, and spent over $10,000 on such work at Dam 5 in the autumn of 1854.[76] The directors ordered Stake in December 1854 to implement a similar plan at Dam 4, but Stake did not start work until early in the summer of 1855.[77] High water in the river delayed the completion of the repairs at Dam 4.[78]

In the summer of 1856, the C&O Canal Company suddenly and without explanation ended its efforts at refurbishing Dams 4 and 5, and decided to replace them with masonry structures. In late August 1856, the directors ordered the solicitation of bids for a masonry dam at No. 4, using a plan drawn up by Thomas L. Patterson. They also hired Patterson to execute a design for another masonry dam at No. 5, and to supervise the construction of both dams. The firm of John Humbird and Company received the contract to build the new dam to replace the old Dam 4 in October 1856. By November, Patterson had finished his plan for the new Dam 5, and the company solicited bids to build it.[79]

Replacing the dams was a bold move for a company in such dire financial condition. In January 1857, the C&O Canal Company filed a certificate with the State of Virginia stating its inability to pay interest on the 1849 repair bonds. The certificate was essentially an admission that the canal company could not make interest payments on the loan for the foreseeable future. Desperate necessity, however, pushed the company to

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[75]A. K. Stake, General Superintendent, to [President and Directors], 19 October 1854, C&O Incoming Correspondence, 1828-90.

[76]B. F. Hollman, Superintendent, Williamsport, to the President and Directors, 3, 25 November and 11 December 1854, Ibid.

[77]Minutes, 16 December 1854, C&O Directors Proceedings, 1828-90.

[78]Twenty-Eighth Annual Report, 2 June 1856, C&O Stockholders Proceedings, 1828-90.

[79]Minutes, 27 August, 3 October, 7 November 1856, and 7 January 1857, C&O Directors Proceedings, 1828-90.

replace the old dams. Only expensive masonry structures seemed to promise they could withstand the Potomac and provide a sufficient supply of water to the canal in all seasons. Though the company did not have the money to build the dams, it had no choice but to start construction. Without reliable navigation, the company could not hope to attract sufficient traffic to remain in operation and eventually pay off its debts.

High water on the Potomac struck as construction of the masonry dams started. About the same time the canal company signed a contract for the new Dam 5 in February 1857, an ice freshet occurred--the first of a series of four destructive floods in four months. In his report to the stockholders, C&O President William P. Maulsby recounted the disastrous spring of 1857:

> In February the severity of the weather relaxed, and there occurred an Ice Freshet such as had not for very many years, if ever, occurred before. The decaying structures at Dams 4 and 5 gave way, the former being much injured, the latter totally swept off from the Virginia abutment to the repaired portion of the Maryland side--over Five Hundred Feet. Measures were immediately taken to repair the damages thus occasioned, and about the 25th of February a large and efficient force of workmen were engaged in making the repairs. It was proposed to complete them, and reestablish navigation by the 1st of April, if possible, or as soon thereafter as practicable, and the plan of repairs was adopted with that view. Those at No. 4 were completed. Those at No. 5 being much more extensive, and embracing the stoppage of the entire waters of the River for a distance of over Five Hundred feet, were pressed forward with the utmost energy, and on the 12th of April the breach was closed, leaving but a few days to be occupied in completing the filling of the cribs with stone, and sheeting them. On that day a freshet occurred, which aided a few boats, in waiting at that point, to pass but which also carried away a portion of the work, which had been entirely filled, and was deemed most secure of all, but of which foundation proved to be defective. Again was the work entered upon and on the 4th of May had so far progressed as to require but a few days for final completion. On that day another Freshet occurred, which assisted in passing a large number of boats in waiting, but which finally succeeded in sweeping off about one halt [sic] of all the work that had been done, after a struggle between the structure and the flood extending from Saturday until Tuesday, and also in injuring and weakening all that was left. The Work was resumed, in the hope that on this day navigation would be restored. A fourth Freshet occured during the week before last, which had the effect of putting back operations for some days, but caused no other

> material injury at No. 5, and at this time it is the expectation of the Board that navigation will be resumed the 16th instant, at latest. This last freshet carried away a small portion of Dam No. 4, but that too will be repaired by the day named.[80]

In actuality, because of further high water on the Potomac in June and July of 1857, the canal company did not restore navigation on the waterway until August.[81]

The damages of the floods of the spring of 1857 added further to the staggering debt of the C&O Canal Company. To pay for the repairs to Dam 4 and 5, the company negotiated loans from coal companies, who after the completion of the canal to Cumberland in 1850 had become the main users of the waterway. To fix the damages resulting from the February ice freshet, they made loans of $15,750 to the canal.[82] After the second major flood in May, several banks in Washington, D.C., Alexandria, and the Corporation of Georgetown loaned the canal company a further $25,000.[83]

President William P. Maulsby's faith in the sustainability of the canal was unshaken by the floods of 1857. Despite the disaster at Dams 4 and 5, Maulsby stated that the rest of the canal had come through the high water well. He bragged to the Governor of Maryland that the C&O Canal, except for the dams, had fared much better than other canals across the country. Indeed, Maulsby asserted that the dams were the only significant obstacle to the company's prosperity. "The Canal has been nominally, but never really finished," he wrote. "The Chief points of difficulty have been the Dams mentioned. They have never been perfect structures, and so indispensable are perfect Dams at those points that without them the Canal never could have in the past and never can in the future present an inviting aspect to transportation." In short, Maulsby promised that once the

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[80]Twenty-Ninth Annual Report of the President and Directors of the Chesapeake & Ohio Canal Company to the Stockholders, June 1st, 1857 (Frederick, Md.: Johnson, Koontz, & Cole Printers, 1857), 12.

[81]William P. Maulsby, President, to the Governor of Maryland, 7 November 1857, C&O Outgoing Correspondence, 1828-70.

[82]Minutes, 1 May 1857, C&O Directors Proceedings, 1828-90.

[83]Minutes, 29 May 1857, Ibid.

masonry dams were completed, the canal would be sustainable and could finally look forward to a profitable future.[84]

The floods of the spring of 1857, however, hindered the completion of the masonry dams. The canal company had originally contracted for the completion of the new Dam 4 by January 1, 1858. After the floods subsided, the contractors building the dam still claimed this was possible but demanded extra money to hire more men to speed the work. The company agreed to pay, but only if the contractors dropped their compensation claims for damages incurred during the spring floods. The contractors agreed to forego their flood damage claims, but only if the canal company extended the completion deadline, which it refused to do.[85] Stung by the refusal and fearful the canal company could not make payments for work already completed, the contractors slowed progress on Dam 4. The delay in the completion of the dams brought a response from Thomas L. Patterson, the engineer supervising construction of the dams, who recognized the vulnerability of the uncompleted structures, particularly Dam 4, to the river. In November 1857, he recommended preventive action at Dam 4 to safeguard the unfinished masonry dam against high water. Patterson recommended:

> I propose to construct a crib enclosing the end of the masonry and connecting it with the old dam. This crib will be filed with stone and planked so as to be tolerably tight in order that, in case of high water, the space between the old and new dams shall be full of water and the new work not exposed to the shock of a mass of water falling against it.[86]

Patterson believed Dam 5 was more secure than Dam 4. Still, he thought it too could be safeguarded. "It would add to its security. "he wrote, "if about five hundred cubic yards of gravelling were put in so as to fill up the space between the old dam and new."[87]

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[84]Maulsby to Governor, 7 November 1857, C&O Outgoing Correspondence, 1828-70.

[85]Minutes, 1 July and 13 September 1857, C&O Directors Proceedings, 1828-90.

[86]T. L. Patterson, Engineer, to the President and Directors, 1 and 6 November 1857, C&O Incoming Correspondence, 1828-90.

[87]Ibid.

The canal company also sought to speed completion of Dam 5, by offering its contractor more money. Unlike at Dam 4, an agreement was reached, but despite the incentives offered, the new Dam 5 was not completed by its deadline date, June 1858. In fact, by that date both dams were only about one-fifth complete. The poverty of the C&O Canal Company and high water in the Potomac continued to delay their completion.[88]

Although it was unable to repay its outstanding loans, the C&O Canal Company managed to find financing for the new dams. The coal companies, which had a great interest in reliable navigation on the canal, offered in August 1858 to lend the canal company up to $100,000 to complete the masonry dams. The loan was to be in the form of toll certificates, which the canal company would give to the contractors in payment for their work, and which the contractors in turn would sell for cash, principally to the coal companies. Then the coal companies would pay its tolls with certificates. In essence, the toll certificates allowed the canal to finance the masonry dams out of future revenue.[89] Unfortunately, too many toll certificates were already in circulation, and the new issue cut into the cash receipts of the company to an excessive degree. Not enough canal tolls came as cash. As a result, the canal company did not take in enough revenue to pay its current expenses. It was forced to institute a policy where only half of tolls could be paid in the certificates and the remainder had to be paid in cash.[90] By the summer of 1859, the company could no longer afford to redeem toll certificates at all, and appealed to the coal companies for a suspension of their use.[91]

Even more troubling to the canal company than its finances was the fact that as long as the masonry dams remained uncompleted, they had to continue--at ruinous expense--to repair the old Dams 4 and 5. After the floods of 1857, William P. Maulsby had ordered that temporary crib dams be built across the

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[88]Thirtieth Annual Report, 7 June 1858, C&O Stockholders Proceedings, 1828-90.

[89]Minutes, 9 August 1858, C&O Directors Proceedings, 1828-90.

[90]Minutes, 3 and 4 March 1859, Ibid. It is worth noting at the same time it was demanding that canal users pay at least half their tolls in cash, however, the company tried to pay off the contractors at the dams entirely in toll certificates.

[91]Minutes, 14 July 1859, Ibid.

breached portions of the dams in order to restore navigation quickly. The canal company hoped these crib dams would soon be replaced by the masonry dams. However, the slow progress on the masonry dams meant extensive work was necessary to keep what was left of the old dams and the temporary cribs in place. This work diverted men and resources from the new dams. L. J. Brengle, Maulsby's successor as C&O president, estimated in his 1859 report to the stockholders that it had cost $100,000 to maintain the old dams in the past two years, leaving only $58,000 to spend on building the new masonry dams.[92] Inflating repair costs were new freshets in the river. The April 1859 flood damaged Dam 4. John G. Stone, the general superintendent, informed the stockholders, "About 100 feet of the guard bank was washed away by the water getting over the bank just above the abutment where the crib of the old Dam connected with the bank, part also of the crib work put in last Spring was carried away. " The flood also weakened the existing Dam 5, but Stone did not specify how.[93]

In addition, flooding plagued the construction of the masonry dams. High water in the autumn of 1858 prevented the completion of the nearly finished Dam 4 that year. It also ignited great fears that floods would wash away the new dams before they were sufficiently finished to withstand the river. As a stopgap measure, the company built temporary crib dams at the new Dam 4 to provide it some protection. Still, a freshet near Williamsport in April 1859 damaged the uncompleted masonry structure. The new dam was just downstream from the old Dam 4, and timber and other debris coming over the old dam hit the new dam with such force that it dislodged masonry, causing $10,000 in damage.[94] Another flood struck in September 1859, this time washing away 175 feet of masonry at No. 4. The company responded by "building a temporary crib in front of the damaged portion of the dam, and a contract was let to Lewis Stanhope to construct a permanent crib at that point and fill the space between the old

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[92]Thirty-First Annual Report of the President and Directors of the Chesapeake and Ohio Canal Company to the Stockholders, June 6th, 1859 (Frederick, Md.: Schley, Haller & Co., 1859), 3-6; Thirty-Second Annual Report of the President and Directors of the Chesapeake and Ohio Canal Company to the Stockholders, June 4th, 1860 (Frederick, Md.: Schley, Haller & Co., 1860), 6-13.

[93]Minutes, 1 September 1859, C&O Directors Proceedings, 1828-90.

[94]Thirty-First Annual Report, 10-11.

and new dams with stone."[95] To finance these repairs, the canal again appealed to the coal companies. An agreement was reached that the coal companies would pay their tolls in cash for two months to finance repairs from the flood and continued work on the masonry dams.[96]

Further damage occurred to the old dams as a result of an ice freshet in January 1860. Having no other source of assistance, the C&O Canal Company turned once more to the coal companies. The coal companies, however, proved more reluctant to assist the canal than before. In order to finance the repair of the old dams, the coal companies demanded that the canal company surrender to them control of the issuance of toll certificates. This would have essentially allowed the coal companies to cut off the canal company's principle means of obtaining credit if they wished, and the canal company found this condition unacceptable. Instead, the C&O directors authorized the issue of toll certificates to pay for a crib dam to bridge the breach at Dam 4 and to secure the Virginia abutment at Dam 5. The coal companies refused to buy these toll certificates, however, so the company gave them to a director to sell to other parties, but found few buyers. The canal company also explored the possibility of suspending acceptance of toll certificates to increase the cash receipts temporarily, but its attorney advised against this step. Finally, in June 1860, the canal company reached an agreement with the coal companies in which the latter advanced the canal an additional $10,000 in anticipation of future tolls. The money was to be used to repair the old Dam 4 and continue work on the new masonry dam. In October the coal companies agreed until further notice to pay half their tolls in cash.[97] Although the canal and the coal companies came to terms, the president and board decided to stop work on the masonry dam at No. 5, believing the limited resources of the company were better applied at Dam 4, where the old dam was more vulnerable and the masonry dam, begun in early 1857, was closer to completion.[98]

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[95]Unrau, The Major Floods, 19.

[96]Minutes, 6 December 1859, C&O Directors Proceedings, 1828-90.

[97]Minutes, 28 January, 2 March, 5 and 26 April, 15 May, 1 and 9 June, and 5 October 1860, Ibid.

[98]Thirty-Second Annual Report of the President and Directors of the Chesapeake and Ohio Canal Company to the Stockholders, June 4th, 1860 (Frederick, Md.: Schley, Haller & Co., 1860), 6-13.

The Civil War Era: the 1860s

Through the early 1860s, the C&O Canal Company limped along, struggling with its limited resources to preserve the canal, especially Dams 4 and 5, against the river. Rather than being confronted with a big flood, the canal during this period suffered through a long series of smaller freshets. The first of these minor floods struck in the summer of 1860. James Fitzpatrick, then President of the canal company, later remembered:

> The summer of 1860 . . . was indeed remarkable for heavy rains and high waters. Scarcely a month passed without a rise of water, causing serious interference with the progress of the work under contract, and affecting the crib dams so much so, that they needed constant attention to replace the metal carried away by the high waters. It being a matter of necessity to maintain the navigation, in order to be put in receipt of revenue, we were compelled to expend from 4 to 5 thousand dollars at Dam No 4 and about 2800 dollars at 5.[99]

The next flood came in November 1860, causing damage mainly at Dam 5, where the masonry abutment on the Virginia side of the river was swept away (lesser damage also occurred at Dams 4 and 6). The freshet of April 1861 was the highest flood on the upper portion of the river since April 1852. Washes and breaches occurred there, while the canal below Harpers Ferry sustained less damage. The outbreak of the Civil War brought a new impediment to repairs. With the secession of Virginia in April 1861, the Virginia-Maryland border, which the canal followed, became the most important battleground of the war. Both armies, but particularly the Confederate, damaged the canal, and hindered commerce and the activities of C&O maintenance personnel. For instance, after the July 1861 freshet caused further injury to the canal, repairs crews were reluctant to travel to damaged locations for fear of confronting hostile southern troops. It was not until Union army dispatched forces to protect the workers that the pace of repairs quickened and the canal finally reopened in late August 1861.[100]

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[99]James Fitzpatrick, Former President, Cumberland, to W. S. Ringgold, Clerk, 28 January 1862, C&O Incoming Correspondence, 1828-90.

[100]Unrau, The Major Floods, 19-21.

If 1860 and 1861 were difficult years for the C&O Canal Company, 1862 proved even more trying. High water returned in late April 1862, causing heavy damage at Dam 4. A shipper in Williamsport lamented to a C&O Director that the freshet was the "7th high water within the last 18 months." The damage at Dam 4 might have been less, but "the Plank at the Stop Lock Dam No 4 had either not been put in or if put in had gone out."[101] The shipper insisted that this was not the first time negligence had worsened the injury to the canal during a flood. Company records bear his complaint out. Such had been the case during the November 1860 flood as well.[102] The canal was back in operation on May 8, but high water on May 14 damaged the uncompleted repairs made to Dam 5 after Confederate troops had tried to destroy the structure in December 1861. Navigation again resumed at the beginning of June, just in time for heavy rain to cause a significant breach in the canal near the Antietam Ironworks.[103]

The series of small floods between the summers of 1860 and 1862, combined with the obstruction of commerce along the canal by the war, led to renewed financial problems for the C&O Canal Company. Floods and war significantly reduced the company's income at the same time it was forced to increase its expenditures to repair the damage wrought by high water and marauding armies. Making the situation even worse was that many tolls were still being paid in the form of certificates instead of cash. In October 1861, the company took a step it had contemplated for some time and suspended the use of toll certificates, stating "the means of the Company are inadequate to the proper repairs and maintenance of the navigation of the canal."[104] While the company attorney quickly pushed the president and directors to rescind their action (which was illegal), the declaration of suspension demonstrates the company's desperate position. Unable to suspend the use of toll certificates unilaterally, the company raised its transportation

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[101]Charles Embry and Son, Williamsport, to H. W. Dellinger, Director, 26 April 1862, C&O Incoming Correspondence, 1828-90.

[102]Unrau, The Major Floods, 19. Both episodes point out the importance of quick action on the part of canal personnel in minimizing damage along the waterway from floods (although it was not unusual for canal users to unfairly blame maintenance workers for flood damage that was beyond human control).

[103]Ibid., 22-23.

[104]Minutes, 1 October 1861, C&O Directors Proceedings, 1828-90.

rates in an attempt to bring in more revenue.[105] Raising tolls proved only of limited value in increasing revenue, at least initially. Alfred Spates, president of the canal company, confessed to the stockholders in 1863, "The Company have again been greatly restricted in making repairs on the Canal by their limited revenues, and have been obliged to confine them to such as were indispensably requisite to maintain the navigation, leaving others of greater magnitude, where it could be safely done, to be effected when their means or credit will be more ample."[106]

While the company was able to pick up the pace of repair activities early in 1864, by the end of the Civil War the canal was in poor shape. With the end of the conflict in 1865, the president and board of directors determined to refurbish the canal. They ordered Charles P. Manning, the engineer and general superintendent, to examine the entire line of the canal and suggest any repairs and flood improvements that would make the canal "permanent and efficient."[107] Manning, like his predecessors in the 1850s, found the dams of great concern. He recommended that the masonry dam at No. 5, where construction had stopped during the war with the structure only two-thirds complete, be resumed. The gradual accumulation of sediment in the canal from flooding and normal water flow bothered Manning. He recommended a systematic program of dredging, and hinted that the company should end the sale of water for powering manufacturing, which would enable them to run less water down the canal and minimize silting.[108] While the sale of water power continued, the C&O Canal Company resumed work on Dam 5 in July 1866. As before, high water plagued construction of the dam, although not to the extent it had in the 1850s. A freshet in October 1866 carried away a coffer dam and damaged a

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[105]Minutes, 10 April 1863, Ibid.

[106]Thirty-Fifth Annual Report of the President and Directors of the Chesapeake & Ohio Canal Company to the Stockholders, June 1st, 1863 (Washington, D.C.: R. A. Waters, 1863), 4.

[107]Minutes, 14 September 1865, C&O Directors Proceedings, 1828-90.

[108]Charles P. Manning, Engineer and General Superintendent, Cumberland, to the President and Directors, 12 April 1866 and 31 May 1866, C&O Incoming Correspondence, 1828-90.

just-completed sixty-foot section of the masonry dam.[109] The structure was injured one more time by high water in 1867, before it was finally completed in 1869.[110]

Prosperity, More Renovations, and More Flooding: The 1870s

With the end of the Civil War, the Chesapeake and Ohio Canal entered the most prosperous period in its existence. The canal company suffered through a brief depression after the Civil War, but in the late 1860s traffic and revenue for the waterway began to increase, and for five years starting in 1870 the canal even made a profit. Finally in the black, the company resumed interest payments on the Virginia repair bonds and retired this debt in 1871. It also began paying interest on the preferred construction bonds.[111]

The prosperity of the waterway meant the C&O Canal Company finally had money for a new repair and improvement program. In December 1868, President Alfred Spates and the board of directors appropriated $100,000 for that purpose.[112] The repair and improvement program continued under Spates' successors, James C. Clarke and Arthur P. Gorman. The architect behind the repairs was William R. Hutton, the company engineer during this period and designer of the Georgetown incline plane. In the 1870 Annual Report to the stockholders, Hutton outlined his vision for repairing the canal. Of particular concern to Hutton was the vulnerability of the canal embankments to the river at certain locations. While he believed the weakest locations had already been protected, he identified areas that still needed work. They were the guard bank of Dam 4, which needed "rip rap or slope wall" to provide protection from erosion and a sagging fifty-two

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[109]Unrau, The Major Floods, 24.

[110]Fortieth Annual Report of the President and Directors of the Chesapeake & Ohio Canal Company to the Stockholders, June 1st, 1868 (Washington, D.C.: Samuel Polkinhorn, 1868), 4-5; Minutes, 5 and 6 May 1870, C&O Directors Proceedings, 1828-90.

[111]Walter S. Sanderlin, The Great National Project: A History of the Chesapeake and Ohio Canal (Baltimore, Md.: The Johns Hopkins Press, 1946), 228-29; Minutes, 27 July 1870, C&O Directors Proceedings, 1828-90.

[112]Forty-First Annual Report of the President and Directors of the Chesapeake & Ohio Canal Company to the Stockholders, June 7th, 1869 (Georgetown, D.C.: Courier Print, 1869), 4-5.

foot sustaining wall near Great Falls, which he recommended "be protected by an exterior revetment at its foot, and for at least one-third of its height." Hutton also suggested that the Rock Creek basin and the Georgetown level required extensive desilting.[113]

In July 1870, William R. Hutton submitted a comprehensive repair and improvement plan to the president and board of directors. Hutton's $77,620 program consisted of general restoration, rather than building or improving water control structures. Most of the money would go toward desilting the canal and repairing locks and other structures. However, Hutton did plan to riprap embankments, raise the towpath, repair culverts, and work on other flood control projects. Hutton's proposal contemplated spending most of the funds in three of the seven divisions of the canal: Georgetown, Monocacy, and Williamsport. The bulk of the proposed expenditure at Williamsport was for the Conococheague aqueduct, which had been damaged during the Civil War. The board of directors approved Hutton's plan and he started restoration work after the end of the 1870 boating season. Over the winter of 1870-71, Hutton spent about half the $77,620 repairing the Conococheague aqueduct, building a flume at the guard bank at Dam 5, and desilting the canal in and around Georgetown. The repairs continued over the winter of 1871-72, with over $24,000 programmed.[114]

Despite all the restorative and preventive work conducted between 1870 and 1872, William R. Hutton was still not satisfied he had put the canal in first-class condition. In August 1872, he submitted a report to the company describing the progress of the work to date and what still needed to be done. Hutton discussed the desilting of the canal prism, which had just been completed; the need to repair and raise an unspecified twenty miles of the canal towpath; the state of each dam (he recommended that Dam 6 be replaced with a masonry dam, but thought a masonry dam not worth the cost at Dam 1); the condition of the locks, culverts, waste weirs, aqueducts, bridges, and other structures (specifying those that needed work). He also recommended raising, building up, or riprapping canal embankments and reinforcing walls to protect certain structures from the river

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[113]Forty-Second Annual Report of the President and Directors of the Chesapeake & Ohio Canal Company to the Stockholders, June 6th, 1870 (Annapolis, Md.: George Colton & Sons, Printer, 1870) 24-25.

[114]Minutes, 3 and 27 July 1870, and 7 December 1871, C&O Directors Proceedings, 1828-90.

better.[115] The work Hutton suggested started in the autumn of 1872. It included among other projects riprapping the guard banks of Dams 4 and 5, and rebuilding a retaining wall below Lock 15 in Widewater that had been weakened seriously over time.[116]

Restoration work on the canal continued under Hutton's successor, Thomas L. Patterson. Besides keeping up the pace of repairs on the locks, culverts, and aqueducts, and dredging material out of the canal, Patterson recommended replacing Dams 1 and 2 with masonry structures. Patterson's goal in suggesting masonry dams was to insure a reliable supply of water to the lowest part of the canal, particularly in Georgetown where the canal company had water power leases. The company, however, did not pursue Patterson's proposal and opted, as it had in the past, to rebuild the existing stone and brush dams.[117]

Starting in the winter of 1873-74, restoration activity shifted to the aqueducts. Both the Seneca and Big Tonoloway aqueducts received extensive repairs. Crews took down the berm walls of both structures and reconstructed them. The company also continued its dredging activities near Georgetown.[118] By 1876, James C. Clarke's successor as president, Arthur P. Gorman, pronounced the condition of the canal as "excellent," although

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[115]William R. Hutton, Report of W. R. Hutton, Chief Engineer as to the Condition of the Chesapeake and Ohio Canal, With Estimate of Cost of Extraordinary Repairs Required During the Current Year, August 14, 1872 (Annapolis, Md.: Luther F. Colton and Company, Printers, 1872), 1-30.

[116]Minutes, 16 September 1872, C&O Directors Proceedings, 1828-90; Forty-Fifth Annual Report of the President and Directors of the Chesapeake & Ohio Canal Company to the Stockholders, June 2nd, 1873 (Annapolis, Md.: L. F. Colton & Co., Steam Printers, 1873), 29.

[117]I. R. Mans, Superintendent, Georgetown, to the President and Directors, 27 December 1873, C&O Incoming Correspondence, 1828-90.

[118]Forty-Sixth Annual Report of the President and Directors of the Chesapeake & Ohio Canal Company to the Stockholders, June 2nd, 1874 (Annapolis, Md.: L. F. Colton & Co., Steam Printers, 1874), 11-12; Annual Report of the President and Directors, 7 June 1875, Printed Materials, 1816-1907, Chesapeake and Ohio Canal Company, Entry 320, Record Group 79, Records of the National Park Service, National Archives, College Park, Md.

dredging of the canal prism and the rebuilding of retaining walls on the Georgetown level continued into 1877.[119]

During the period of renovation and improvement of the canal in the 1870s, flooding continued to plague the waterway. Two notable floods struck the canal in the early 1870s, as well as a host of smaller, more localized freshets. In September 1870, a record flood on the Shenandoah River slammed into the Potomac, causing an 850-foot breach in the canal embankment at Lock 33 opposite Harpers Ferry and weakening the "sea wall" supporting the towpath there. The 1870 flood severely injured the canal from Harpers Ferry to Sandy Hook, with notable damage below Seneca as well. The flood forced company crews to breach an embankment near Georgetown to safeguard the high banks and walls of the canal. While they succeeded, the force of the water exiting the hastily cut channel caused a 360-foot hole in the waterway. The flood put the canal out of commission from September 30 until mid-October, and cost the company over $22,000 by the end of 1870. The repairs might have cost less had not the canal company been in haste to resume navigation on the canal before the end of 1870 boating season.[120]

An even more expensive flood occurred in August 1873. This freshet showed the vulnerability of the culverts passing mountain streams under the canal and into the Potomac River. A flash flood that followed fourteen days of rain overwhelmed many culverts, particularly in the Antietam and Monocacy divisions of the canal. In the Antietam Division, the limestone formations of the region compounded the damage: flood waters working their way through fissures in the rock caused two breaches in the canal. It cost $25,000 and almost a month to put the canal back into operation.[121]

Still, canal officials believed all the repair and preventive work done on the canal in the 1870s had left the waterway in the best shape it had been in years, and was more resistant to floods. Arthur P. Gorman admitted the damage to the canal from the August 1873 flood was the worst since 1852. However, he asserted, "but for the substantial manner in which

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[119]Forty-Ninth Annual Report of the President and Directors of the Chesapeake and Ohio Canal Company to the Stockholders, June 4th, 1877 (Annapolis, Md.: Maryland Republican Steam Press, 1877), 9.

[120]Unrau, The Major Floods, 25-26; Minutes, 11 January 1871, C&O Directors Proceedings, 1828-90.

[121]Unrau, The Major Floods, 26-27.

[the canal] was constructed possibly its navigation would not be resumed."[122] After the canal came through a flood in April 1874 relatively unscathed, Gorman grew even more optimistic about the sustainability of the canal. "During the greater portion of the past month the Potomac River was so swollen from the heavy rains as to overflow some portions of the Canal," Gorman wrote, "but so solid have become the banks, and so permanent are the repairs, that but little damage has been done the works."[123]

While Gorman was no doubt correct that the canal was more resistant to floods than it had been in years, it could not withstand the flood of November 1877. This flood was the worst ever recorded on the Potomac to that date, easily exceeding the flood of April 1852. The crest of the flood generally exceeded that of April 1852 by two feet, and at the confluence of the North and South branches of the Potomac the river was six feet higher than in 1852. Damage was heavy all along the entire line of the canal, but it was worst in the waterway's middle section because the exceptionally high level of the Antietam and Conococheague during the flood.[124] In the words of the Arthur P. Gorman, the flood of November 1877 "was the greatest ever known in the Potomac river. It damaged . . . every mile of the canal from Cumberland to Georgetown. Large portions of it were swept completely away, and others filled up as completely, as if the canal had never been excavated."[125]

The most notable loss to the canal was at Dam 4. Despite the dam's sturdy masonry construction, 200 feet in the center of the 720-foot span washed away during the 1877 flood, even before the river had reached its crest. The calamity stunned the officers of the C&O Canal Company. The company had spent hundreds of thousands of dollars replacing the old wooden dams

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[122]Minutes, 10 September 1873, C&O Directors Proceedings, 1828-90.

[123]A. P. Gorman, President, Annapolis, to the Directors, 11 May 1874, C&O Incoming Correspondence, 1828-90.

[124]Unrau, The Major Floods, 27-28.

[125]Testimony of A. P. Gorman, President, C&O Canal Company, 31 May 1880, in Testimony for the Respondents, Cumberland, Md., Daniel K. Stewart v. The Chesapeake and Ohio Canal Company, The Chesapeake and Ohio Canal Company Collection, Archives and Manuscripts Department, McKeldin Library, University of Maryland, College Park.

with masonry structures.[126] The 1877 flood showed the masonry dams, while more sustainable than their predecessors, were themselves susceptible to the worst the river could offer. The company temporarily sealed the breach at Dam 4 with crib dams until more permanent repairs could be initiated.

Despite the onset of winter, the C&O Canal Company did not wait until spring to repair the canal. While starting work on the entire line, the initial priority was the canal below the Dam 1. The canal company wanted to resume water supplies to Georgetown. The flood struck the canal on November 24, 1877, and by December 20 water was again on the Georgetown level. A mild winter helped push along the pace of repairs elsewhere and the company restored navigation along the entire line of the canal by April 1878. However, the condition of the canal was abysmal. Isaac R. Mans, superintendent of the canal in Georgetown, wrote that his division, particularly the towpath and culverts, was "in very bad condition."[127] Indeed, restoration work continued through 1878, and it was not until June 1879 that President Gorman declared the repairs essentially complete (except Dam 4, where the company did not finish work until October 1879).[128]

After the 1877 deluge, the canal company engaged in further flood control work. Most of this labor included elevating the towpath and building high retaining walls to protect the canal at vulnerable locations such as opposite Harpers Ferry.[129] However, another improvement was quite novel. In 1879, the canal company installed a telephone system along the line. At the time, it was the longest operating telephone circuit in the world.[130] The telephone constituted a significant advance in

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[126]Minutes, 12 December 1877, C&O Directors Proceedings, 1828-90.

[127]I. R. Mans, Superintendent, to A. P. Gorman, President, Annapolis, 20 May 1878, C&O Incoming Correspondence, 1873-80.

[128]John Humbird, B. B. Crawford, P. Hamill, Directors, Annapolis, to President, A. P. Gorman, 27 September 1979, Ibid.; Fifty-First Annual Report of the President and Directors of the Chesapeake and Ohio Canal Company to the Stockholders, June 2nd, 1879 (Annapolis, Md.: Maryland Republican Steam Press, 1879), 8-9.

[129]Ibid.

[130]In installing a telephone system, the C&O Canal Company was on the cutting edge of technology. Alexander Graham Bell made the first successful of test of the telephone in March 1876. He spent the remainder of the year perfecting the device, and by early 1877 commercialization began. Long

flood damage prevention, giving superintendents along the canal much more time to prepare the canal for high water than in the past. Before, notification had come by a horse back rider reporting from the nearest telegraph office. The telephone also allowed the superintendents to better regulate the water flow in the canal during floods, preventing inadvertent overflows. As Edward Mulvaney, a longtime superintendent, explained:

> By the use of the telephone, the water can be regulated on the levels by the feeder at the upper end of the division. At Cumberland, there is a feeder which feeds 50 miles of the canal, and there are telephone stations at regular distances along the canal, and they regulate the supply by sending word through this telephone as to the amount of water to be let in from this feeder, and therefore, they need not let more on than is necessary. If the water is let on too much after a rain, it is likely to overflow some of the levels and thereby cause a breach in the canal. But if the levels are overflowed now they can be notified immediately by telephone and the water let off, and it will recede immediately.[131]

The Decline of the C&O Canal Company: the 1880s

While the canal recovered physically from the flood of November 1877, it weakened the C&O Canal Company financially. The initial estimate placed the cost of repairs on the canal at just over $200,000. A decline in the coal trade due to the Panic of 1873 and labor unrest along the waterway during the summer of

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distance telephone communications still was in its infancy when the C&O Canal network was built in 1879, as inventors were still looking for the best medium to transmit signals over long distances. It was not until the early 1880s that copper wire became the standard material for transmitting long-distance telephone signals and long-distance lines began to be laid between major cities in the Northeast. The author did not come across any information describing the technology used in the C&O Canal telephone system. See The New Encyclopedia Britannica: Macropedia, 1995 ed., s. v., "Telecommunications Systems."

[131]Testimony of Isaac R. Mans, Former Division Superintendent of the Canal in Georgetown, 16 March 1880, in Report of the Joint Standing Committee Appointed Under Article 3, Section 24, of the Maryland Constitution, in the Chesapeake and Ohio Canal Investigation (Annapolis, Md.: W. T. Iglehalt and Company, State Printers, 1880), 187; Testimony of Edward Mulvaney, Canal Shipping Agent in Cumberland, and a former (and future) Division Superintendent, 18 March 1880, in Ibid., 212-17; Sanderlin, The Great National Project, 246; Fifty-Second Annual Report of the President and Directors of the Chesapeake and Ohio Canal Company to the Stockholders, June 7th, 1880 (Annapolis, Md.: Maryland Republican Steam Press, 1880), 10-11.

1877 had already hurt the canal company even before the flood. Consequently, the company had no alternative but to borrow money to repair the canal. The initial loans to start the repairs came from the coal companies and banks in Maryland and Washington, D.C. The company managed to raise over $110,000 from these sources, and President Gorman even contributed $5,000 of his own money. However, the unprecedented cost of the repairs pushed the canal to seek government assistance. Gorman, who was influential in Maryland politics, convinced the state legislature to guarantee the issuance of up to $500,000 in repair bonds in February 1878. The bonds proved indispensable, because the repair estimate had increased by April 1878 to between $225,000 and $250,000. The flood of 1877 left the canal company with an extra debt of nearly $200,000 on top of already ponderous obligations.[132]

The ill fortune that beset the C&O Canal Company in the mid-1870s continued into the 1880s. Labor troubles plagued the company and the Baltimore and Ohio Railroad forced the canal into a price war for control of the Allegany coal trade. The canal company repeatedly had to reduce tolls on the waterway to retain its share of the coal traffic, which by the 1880s was almost the only commodity shipped on the canal. As toll rates fell, so did revenue, which not only ended the flood improvement program of the 1870s, but also forced the company to slash expenditures for basic repairs. The only maintenance program it continued from before the 1877 flood was the dredging of the Rock Creek basin, which became critical after 1887 when the federal government purchased the Alexandria aqueduct for conversion into a bridge. Consequently, the condition of the C&O Canal deteriorated during the 1880s, leaving it increasingly vulnerable to flooding.[133]

Subsequent flooding took a terrible toll on the canal. A freshet in June 1884 struck the Washington County portion of the waterway, causing a one week closure.[134] A much more destructive series of freshets hit the canal during April and May of 1886. The first flood on April 1 breached Dam 6, the remaining wooden dam on the canal, and resulted in damage elsewhere on the line as well. The gap in Dam 6 was widened by another flood in the river on April 4, and again on May 9. Rather than replace Dam 6 with a masonry dam, the company opted

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[132]Fifty-First Annual Report, 8-9; Unrau, The Major Floods, 27-30.

[133]Sanderlin, The Great National Project, 248-52.

[134]Unrau, The Major Floods, 30.

to rebuild it again as a wooden dam. However, G. W. Smith, the company engineer recommended, "If rebuilt it should be of sawed white oak (and not hewn as in old dam) and filled with broken stone instead of field stone or stone from the river bottom which have been run smooth by the action of the water, which latter fact was the cause of so much leakage in the dam."[135]

The C&O Company financed repairs after the 1886 flood by using its authority to sell repair bonds under the 1878 Maryland legislation. Before 1885, the company had sold only $125,000 of the $500,000 in bonds authorized. The board of directors sold $189,000 in bonds (at a 14 percent discount) in 1886 before the flood to pay off its short-term indebtedness, principally the back wages and salaries of its employees. After the 1886 flood, the company sold the remainder of the 1878 bonds to pay for the repairs and to put off the day of reckoning in its futile price war with the railroad. Investors were willing to buy the bonds because they carried a preferred mortgage on the physical property of the canal company. The majority bondholder would probably take over the canal's assets if it went bankrupt. However, the weak position of the company meant the bonds sold at a deep discount: bonds sold in August 1887 carried a 22 percent discount, and by the end of 1887 the discount had increased to 24 percent.[136] With the sale of the last bonds, the officers of the canal company realized they had no further resources should another calamity befall the canal. Victor Baughman, the president of the canal company, warned the stockholders:

> The situation becomes more embarrassing when it is remembered that all of the assets of the Company have been used--that there are no more repair bonds to fall back upon in the event of another flood. A recurrence of these floods is inevitable. The extent of the destruction they may entail cannot be conjectured. With a steady and gradually increasing indebtedness, and without a dollar of means to repair in the event of a disaster--a destruction of any considerable portion of the works (though not so disastrous as that of the past season) will amount to--for it will

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[135]Report of G. W. Smith, Engineer, to L. Victor Baughman, President, 17 April 1886 in Minutes, 22 April 1886, C&O Directors Proceedings, 1828-90.

[136]Sanderlin, The Great National Project, 254.

essentially produce--a total abandonment of the canal as a water-way carrier.[137]

The Failure of the C&O Canal Company: 1889-90

The scenario Baughman feared was closer at hand than he probably imagined. In late May 1889, the largest flood in the history of the Potomac to that date, eclipsing those of 1852 and 1887 hit the canal. It devastated the entire canal from Cumberland to the Rock Creek basin, causing the greatest injury below Harpers Ferry **(see Figures 2 and 3)**. Initial damage estimates ranged between $500,000 and $1,000,000, although the figure quickly fell to $300,000. Company officials indicated it would take $180,000 alone to restore the canal from Georgetown to Great Falls, while $60,000 would be necessary to rebuild the waterway from Great Falls to Harpers Ferry, and another $60,000 to reconstruct the waterway from there to Cumberland.[138]

Even before the flood waters drained from the C&O Canal, the debate about its future began. The 1889 flood raised the distinct possibility that the waterway would close. It was apparent to all concerned that the canal company could not raise the $300,000 needed for the repairs because in the years leading up to the flood it had trouble meeting operating expenses from its current revenues, let alone making debt payments.[139] Since it was obvious that the canal company probably could not repair the waterway, the debate shifted to whether it was worth restoring the canal at all, and what should be done with the canal if it was not restored. In Georgetown, the millers, dependent on the water power supplied by the canal, pushed for the quick repair of at least the Georgetown level of the C&O Canal, while other business interests, which had transportation needs, believed that a railroad should replace the canal. Railroads, however, were feared greatly in the nineteenth century as monopolistic price gougers, and the majority public opinion

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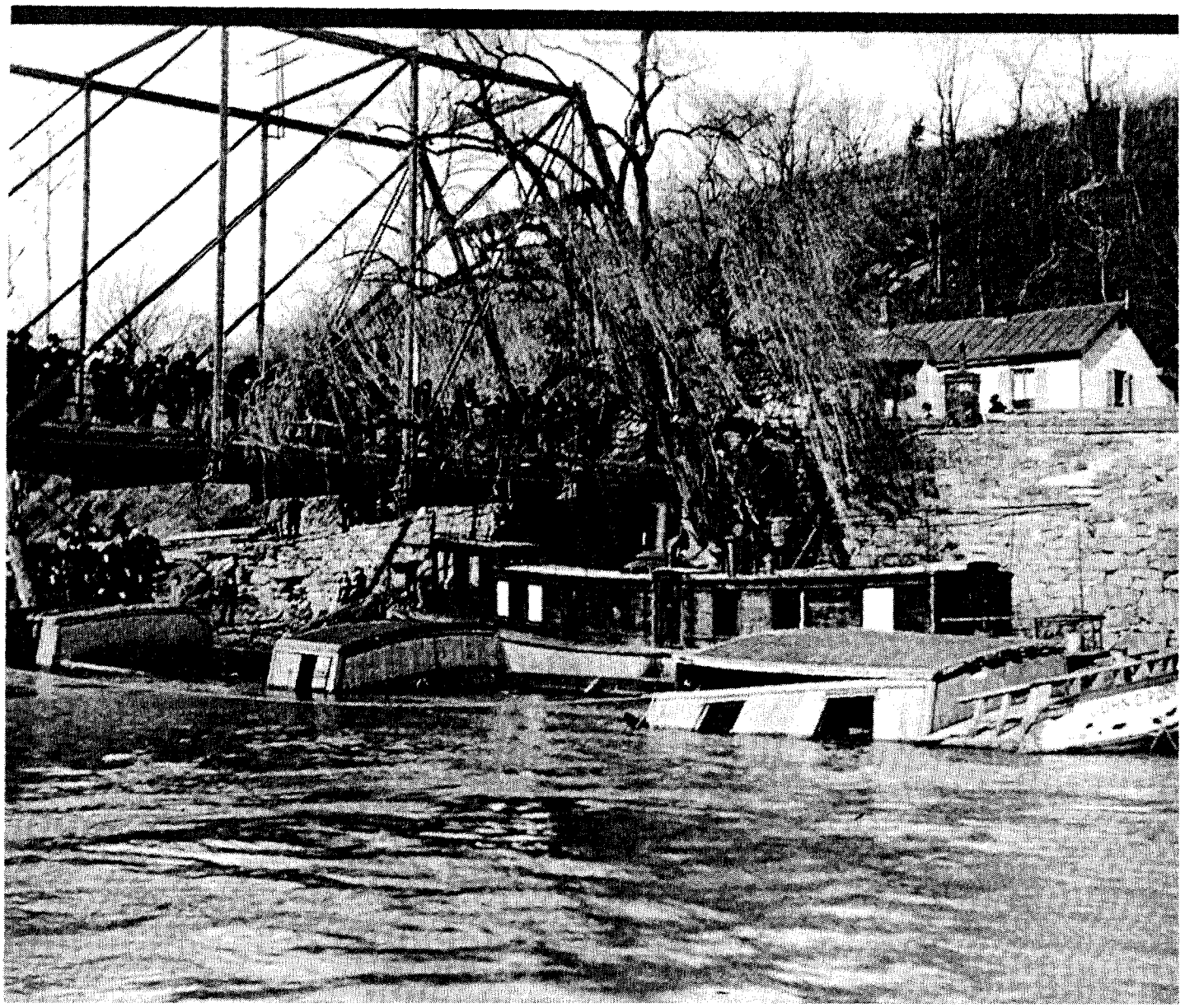
[137]Fifty-Ninth Annual Report of the President and Directors of the Chesapeake and Ohio Canal Co. to the Stockholders, January 5th, 1887 (n.p., [1887]), 8.

[138]Baltimore Sun, 11 June 1889, 1.

[139]Evening Star (Washington, D.C.), 3 June 1889, 5.

FIGURE 2



Chain bridge, above Georgetown, with packet steamboat John C. Poor partially submerged. Flood of 1889

FIGURE 3

Lockhouse 16, below Great Falls, after the flood of May 1889

favored saving the C&O Canal as a competitor that would keep transportation rates lower.[140]

Despite the widespread belief that it was without means to repair the waterway itself, the C&O Canal Company attempted to find money. Stephen Gambrill, president of the canal company, called a meeting of parties interested in saving the waterway on June 19, 1889. The meeting produced an agreement between the company and Georgetown millers to restore the Georgetown level. The millers would advance $16,000 from future water rents for the repairs.[141] Mending the Georgetown level proceeded rapidly, and by the end of the summer water was again flowing from Dam 1 to the Rock Creek basin. However, the June 19 meeting did not determine the means to repair the rest of the canal. The C&O stockholders pushed the Maryland legislature for the authority to issue new repair bonds. Although the State of Maryland granted this authority, the company could find no market for the bonds, because earlier issues already carried a lien on the companies assets, and the company could only pledge future revenues as collateral, which had proved inadequate for even the current expenses of the company. Having failed at selling bonds, the company attempted to find contractors who would take toll certificates in payment for their work but, like the bond issue, this tactic was unsuccessful. The company also appealed to its patrons along the line for assistance but, as elsewhere their efforts met with complete failure.[142]

With the failure of the C&O Canal Company to find money for repairs, its future fell into the hands of the company's old rival, the Baltimore and Ohio Railroad. The B&O was the majority holder of the canal's biggest debt issues, the 1844 construction bonds and 1878 repair bonds. In its capacity as the canal's principal creditor, the B&O petitioned to place the canal in receivership in December 1889. The Washington County Circuit Court approved the receivership petition early in 1890. It must have appeared to most observers that the canal was doomed.

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[140]Ibid., 4 June 1889, 5.

[141]Minutes, 19 June 1889, C&O Directors Proceedings, 1828-90.

[142]President and Directors to the Stockholders of the Chesapeake and Ohio Canal, 2 June 1890, Brown et al. Trustees v. Chesapeake and Ohio Canal Company, Nos. 4191 and 4198 Equity, Circuit Court of Washington County, Hagerstown, Md.

The Potomac River had played a large role in the death of the C&O Canal Company. Competition with the B&O Railroad was the long-term disease that killed the canal company, but the insustainability of the waterway hurried its demise. Despite large and repeated expenditures for restoration and flood control, the river had overwhelmed the C&O Canal time after time, exhausting the financial resources of the canal company. After sixty years, high water had defeated all efforts to operate a profitable canal within the flood plain of the Potomac River.