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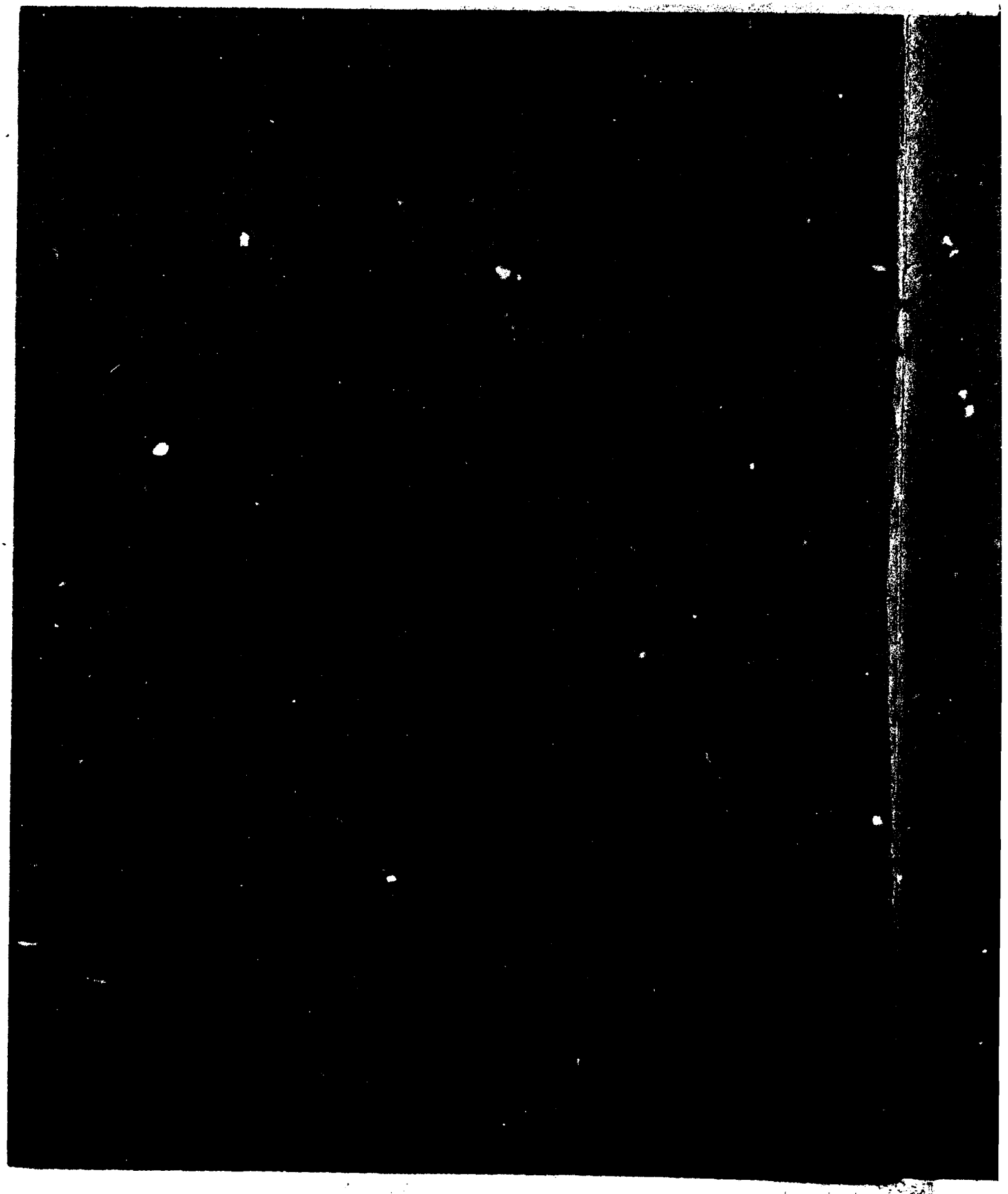

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20. ABSTRACT *(Continue on reverse side if necessary and identify by block number)*

The report, "Engineering Geology and Geomorphology of Streambank Erosion; Report 3, The Applications of Waterborne Geophysical Techniques in Fluvial Environments," was published by the U. S. Army Engineer Waterways Experiment Station (WES) in February 1982. Report 3 presented the results of an investigation conducted in support of the Section 32 Program, "Streambank Erosion Control, Evaluation, and Demonstration Act of 1974."

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20. ABSTRACT (Continued).

A review of Report 3 by U. S. Army Corps of Engineer organizations has identified significant errors in portions of Report 3 that describe the relationship of physical, hydrologic, and environmental processes to streambank erosion occurring along the Ohio River. The errors contained in Part IV, Data Collection and Analysis, Ohio River Survey Sites, are identified in this supplementary report. Paragraphs that contain significant errors are restated and data-based explanations of causation of streambank failure and erosion observed at Ohio River survey sites are provided.

PREFACE

This report is a supplemental update to "The Application of Waterborne Geophysical Techniques in Fluvial Environments," Report 3 of the series "Engineering Geology and Geomorphology of Streambank Erosion." The study was conducted in the Geotechnical Laboratory (GL) of the U. S. Army Engineer Waterways Experiment Station (WES) and was sponsored by the Office, Chief of Engineers, U. S. Army in support of the Section 32 Program, "Streambank Erosion Control, Evaluation, and Demonstration Act of 1974."

The analysis was performed during the period June-August 1982 by Mr. J. R. May, Engineering Geology Applications Group (EGAG), Engineering Geology and Rock Mechanics Division (EGRMD), GL. The report was written by Mr. May. Mr. J. H. Shamburger, Chief, EGAG, provided direct supervision of the analysis. General supervision was provided by Dr. D. C. Banks, Chief, EGRMD, GL, and Dr. W. F. Marcuson III, Chief, GL.

The Commander and Director of the WES during the conduct of the study was COL Tilford C. Creel, CE. The Technical Director was Mr. Fred R. Brown.

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CONVERSION FACTORS, U. S. CUSTOMARY TO METRIC (SI) UNITS OF MEASUREMENT

U. S. customary units of measurement used in this report can be converted to metric (SI) units as follows:

Multiply	By	To Obtain
feet	0.3048	metres
inches	2.54	centimetres
miles (U. S. statute)	1.609347	kilometres

ENGINEERING GEOLOGY AND GEOMORPHOLOGY
OF STREAMBANK EROSION

SUPPLEMENTAL UPDATE TO REPORT 3: THE APPLICATION OF WATERBORNE GEOPHYSICAL TECHNIQUES IN FLUVIAL ENVIRONMENTS

PART I: INTRODUCTION

Background

1. "The Application of Waterborne Geophysical Techniques in Fluvial Environments" is Report 3 of the series "Engineering Geology and Geomorphology of Streambank Erosion" published by the U. S. Army Engineer Waterways Experiment Station (WES). The three reports collectively deal with the engineering geology and geomorphology of streambank erosion. The investigations described in the reports were funded by the Office, Chief of Engineers (OCE), U. S. Army in support of the Section 32 Program, "Streambank Erosion Control, Evaluation, and Demonstration Act of 1974."

2. Waterborne geophysical surveys were performed by WES at survey sites located on selected reaches of the White River, Lower Mississippi River, Middle Mississippi River, Missouri River, and the Ohio River. Geophysical data collected during the field surveys were analyzed and interpretations were presented in Report 3. In addition to geophysical data, personal observations of physical, hydrologic, and environmental conditions observed at the survey sites and data from a number of published documents relevant to the survey areas were included in Report 3.

3. Report 3 was published by WES in February 1982. Subsequent to the publication and distribution of Report 3, a review of the subject report was made by organizational elements of the U. S. Army Corps of Engineers (CE). This review has identified a number of observations and statements that did not agree with the data in previously published

documents concerning the relationship of fluvial, hydrologic, and environmental processes to streambank erosion occurring, in particular, along the Ohio River system.

Purpose and Scope

4. This supplementary report will address that portion of Report 3 that describes the Ohio River survey sites, pages 197-231. The purpose is to restate certain paragraphs that contain significant errors and provide a data-based explanation of causation of streambank failure and erosion observed at Ohio River survey sites. This supplementary action is warranted because the significant data base collected by the CE along the Ohio River describing streambank erosion mechanisms was not considered in Report 3.

PART II: SUPPLEMENTAL DATA ANALYSIS

5. Portions of Report 3, specifically Part IV, "Data Collection and Analysis," Ohio River Survey Sites, paragraphs 235, 236, 241, and 252, contain observations and statements requiring correction. The referenced paragraphs of Report 3 and corrected statements are contained below.

Background of Bank Erosion Problems

6. Paragraph 235, page 200, contains the statement, "The dominant bank erosion mechanisms operating on the Ohio River are believed to be saturation of bank sediments; drawdown; scour of channel sediments at the toe of channel slopes; and other miscellaneous actions such as wind and river traffic-generated waves."

7. Supplemental data resulting from comprehensive studies (U. S. Army Engineer Division, Ohio River 1977) conducted by the CE at numerous sites along the Ohio River indicate that wind-generated wave action has a negligible effect on Ohio River banks due to low wave heights and short fetch lengths. River traffic-generated waves are generally insignificant as a bank erosion mechanism (U. S. Army Engineer Division, Ohio River 1977) when compared to major storm and flood events.

8. The caption of Figure 112, page 207, states that "At some sites wave action generated by heavy commercial boat and barge traffic on the Ohio River has been identified as a mechanism for bank erosion."

9. Supplemental data indicate the principal sites where traffic-generated waves and turbulence may result in bank erosion are limited to areas of the bank line located at locking and docking facilities and fleeting and staging areas where river traffic maneuvers close to the banks. Traffic operating along prescribed navigation sailing lines do not generate wave intensities of the magnitude to be classified as a factor in bank erosion.

10. Paragraph 235, page 200, states that "Active erosion areas recognized and monitored by CE districts along the Ohio River are characterized principally by sloughing banks of several feet in height retreating a distance of a few feet per year in irregular fashion along straight as well as curved reaches of the river channel."*

11. Supplemental data revealed that bank failures of the magnitude described above do occur as stated. However, these failures most often occur within short time periods in response to storms and floods.

12. Paragraph 236, page 201, states that "Available data indicate that prior to the late 1920's the Ohio River channel located in the narrower portions of its valley above Hawesville, Ky., was relatively free of serious bank erosion problems."

13. A review of additional data (Ellet 1852) indicates that bank erosion has been historically persistent along the entire length of the Ohio River.

14. Paragraph 236, page 201, states that "Bank problems now occurring in these reaches above Hawesville may be a response to physical and environmental processes that are associated with changing river regimen, either natural, such as climatic changes, or man-induced, such as forest clearing and cultivation of riparian lands and construction of navigation and flood-control structures."

15. Significant data derived from studies conducted on the Ohio River (Hagerty, Spoor, and Ullrich 1981 and U. S. Army Engineer Division, Ohio River 1977) have proven that bank erosion problems along the Ohio are not caused by the construction or operation of the navigation structures.

Configurations and Characteristics of the Survey Area

16. Paragraph 241, page 203, states that "The ordinary high waterline could be seen clearly on the steep portion of the heavily vegetated banks."

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* A table of factors for converting U. S. customary units of measurement to metric (SI) units is presented on page 3.

17. Visual observation of Ohio River channel banks without careful consideration of an array of physical criteria is not a reliable means for determining the elevations of the ordinary high waterline (OHW). Significant criteria that should be used to determine the OHW elevations include: (a) absence of vegetation, or terrestrial or aquatic vegetation assemblages, (b) benching and shelving, (c) drift or accumulation of debris, (d) changes in soil characteristics, (e) commercial agricultural activities or commercial timber values, and (f) recently deposited sediments.

18. Paragraph 241, page 203, states that "It was apparent in this reach of the river that the banks had been eroded landward, the soil making up the banks stripped away and carried out into the river, and that erosion had occurred within the past few years, as some of the large trees were still upright with their roots exposed."

19. Additional data indicate the soil composing the banks has been eroded (rather than stripped) and carried into the river. This bank erosion has occurred in response to storms and floods over the past few years.

CSRP Data

20. Paragraph 252, pages 217 and 221, states as follows: "The profile in Figure 118 is a cross section of the Ohio River channel from near the Ohio bank to a point close to the Kentucky bank. The right margin of the profile is near the steep bedrock valley wall located on the Ohio shore. The bottom of the channel (C) is composed of rock near the Ohio shore. Note the intense and numerous multiple reflections of the channel bottom. As the profile progresses southward toward the Kentucky shore, it reaches the older position of the Ohio River channel that was occupied by the river prior to construction of the new locks and dams. At this point, the present channel bottom and the bedrock abruptly drops in elevation. The bedrock (D) dips below the channel bottom and continues southward. The top of rock (D) can be traced several hundred feet before it gets too deep to detect. The bench feature

(H) is a common feature along the periphery of the older channel alignment. It is apparently an erosional feature developed over a long period of time by fluctuations in Ohio River stage. The reflector (E) located below the present bottom and restricted generally to the area of the older channel may represent the top of coarse substratum alluvium. The profile continues into a point bar area in the left portion of the record where the smooth bottom is representative of silty and sandy alluvium. The bedrock valley wall bordering the alluvial valley along the Kentucky shore is approximately one-half mile south of the present position of the bank line. The bedrock reflector (D) probably rises abruptly just before reaching the valley wall. The surface of the water is at (A), direct arrival at (B), multiples at (F), and position fix mark at (G). The horizontal scale of the profile is 1 in. = approximately 200 ft."

21. Paragraph 20 above does not imply that two distinct Ohio River channels have been formed over the years. The "older position" and "older channel," as referenced in paragraph 20 above, were intended to note previous navigation pool levels.

PART III: ERRATA

22. The following errors should be corrected in Report 3:

a. Figure 105, page 198. The symbol denoting the former location of a lock and dam at River Mile (RM) 310 (Huntington, W. Va.) should be identified as Lock and Dam (L&D) 28.

b. Figure 105, page 198. The symbol denoting the former location of L&D 28 should be identified as L&D 1 (located on the Big Sandy River).

c. Figure 106, page 199. RM 116 should read RM 336.

d. Paragraph 240, page 203. In the sentence "The only islands . . . and Brush Creek Island located at about RM 389," RM 389 should read RM 388.

e. Paragraph 240, page 203. The sentence "Within the survey area . . . the remains, or locations, of seven old lock and dam facilities . . . replaced by two new lock and dam facilities (Greenup and Gallipolis)," should read: "Within the survey area . . . the remains, or locations, of eight old lock and dam facilities . . . replaced by two new lock and dam facilities (Greenup and Meldahl)."

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Ellet, C., Jr. 1852. "Reports on the Ohio and Mississippi Rivers," Document No. 918, House of Representatives, 63rd Congress, Government Printing Office, Washington, D. C.

Hagerty, D. J., Spoor, M. F., and Ullrich, C. R. 1981. "Bank Failure and Erosion on the Ohio River," Engineering Geology, Vol 17, pp 141-158.

U. S. Army Engineer Division, Ohio River. 1977. "Ohio River Bank Erosion Study," U. S. Army Corps of Engineers, Cincinnati, Ohio.

In accordance with letter from DAEN-RDC, DAEN-ASI dated 22 July 1977, Subject: Facsimile Catalog Cards for Laboratory Technical Publications, a facsimile catalog card in Library of Congress MARC format is reproduced below.

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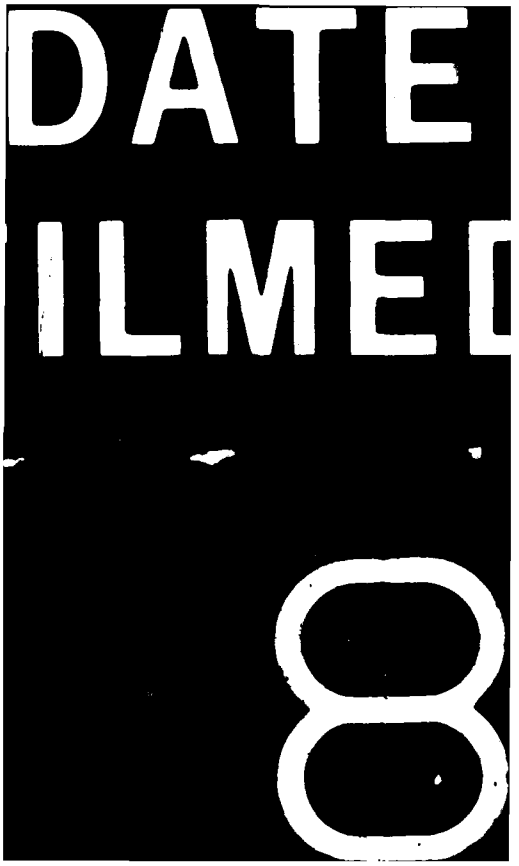
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