UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

ANALYSES OF WATER, CORE MATERIAL, AND ELUTRIATE SAMPLES COLLECTED NEAR YAZOO CITY, MISSISSIPPI (YAZOO HEADWATER PROJECT)

Open-File Report 78-792

Prepared in cooperation with the

U. S. Army Corps of Engineers

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By Harold L. Leone, Jr., and Alton J. Dupuy, 1935-

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FACTORS FOR CONVERTING U.S. CUSTOMARY UNITS TO
INTERNATIONAL SYSTEM (SI) UNITS

The following factors may be used to convert the U.S. customary units of measurement published herein to the International System of units:

Multiply U.S. customary unit	By	To obtain metric unit
inch (in.)	25.40	millimeter (mm)
foot (ft)	.3048	meter (m)
mile (mi)	1.609	kilometer (km)

(To convert temperature in °C to °F, multiply by 1.8 and add 32.)

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ABSTRACT

Five core-material-sampling sites were chosen by the U.S. Army Corps of Engineers to represent areas of proposed dredging activity. Four receiving-water sites also were selected to represent the water that will contact the proposed dredged material. Chemical and physical analyses were performed upon core material and native-water samples from these sites as well as upon elutriate samples of specific sediment-receiving water systems. The results of these analyses are presented without interpretation.

INTRODUCTION

Authorization of flood-control works in the headwater portion of the Yazoo River basin (Yazoo Headwater project) is contained in the Flood Control Act approved June 15, 1936 (Public Law 678, 74th Congress). Under the Yazoo Headwater project the U.S. Army Corps of Engineers has been authorized to enlarge the upper Yazoo River channel. This report deals with Items 1B and 1C of the project and covers a reach of the Yazoo River just north of Yazoo City, Miss. (river mile 85.5 to river mile 107.3).

In December 1977 the U.S. Geological Survey cooperated with the Corps of Engineers, Vicksburg District, in a study to investigate possible environmental consequences of the channel-improvement dredging. It was of interest to the Corps of Engineers, as part of an environmental impact study, to assess the effects that dredging could have upon the quality of the water.

One way to analyze for possible influences of the dredging on water quality is through use of the "standard elutriate test" (Keeley and Engler, 1974). This test was developed by the Corps of Engineers and approved by the U.S. Environmental Protection Agency as a method to assess the effects of dredged material on water with which it comes into contact. This water is referred to as "receiving water." By mixing

4 parts (volume) of receiving water with 1 part (volume) of fill material or dredged material, agitating for 30 minutes, allowing to settle for 1 hour, then centrifuging and filtering, one can prepare a standard elutriate (the final filtrate) for a dredged material-receiving water system. The analysis of this elutriate can be compared to the analysis of the receiving water to estimate the relative effects upon the quality of the receiving water that can occur when the dredged material comes into contact with the water. The "standard elutriate test" was used in this report to simulate the results of possible interactions between the dredged material and the water that it will contact.

Because much of the dredging will be for the purpose of widening the existing channel, elutriate tests were made on four core samples collected from the bank of the stream in areas that were to be widened. An elutriate test was also performed on a bottom-material sample collected from the center of the existing river channel. All sampling sites were selected by the Corps of Engineers. The U.S. Geological Survey assisted in the collection of the core samples, collected the receiving-water samples from the river, and performed all laboratory analyses. This report describes the field and laboratory procedures used and presents the results of the analyses without interpretation.

FIELD PROCEDURE

During the period December 5-9, 1977, samples were collected at the five sites shown on plate 1. Core material was collected at four sites along the bank of the river, one bottom-material sample was collected from the river bottom, and receiving-water samples were collected at four sites. Elutriate tests were performed on five specific sediment-receiving water systems as designated by the Corps of Engineers.

The core material was sampled with a split-spoon sampler on a wire-line hammer drilling rig that was truck mounted. Core sampling was performed on the bank at proposed dredge sites. The metal split-spoon sampler contained a removable plastic cylinder 1.25x18.5 in. (32x470 mm). The shoe of the sampler was constructed of teflon to prevent the core material entering the sampler from contacting any metal. The core material was forced into the shoe and up into the plastic tube by wire-line hammer action. After each 18-inch (460-mm) sample was taken, the hammer and split-spoon assembly was drawn out of the hole, and the shoe was disconnected from the sampler to facilitate removal of the plastic tube containing the core. The core material was pushed from the plastic tube using a rubber-tipped rod and placed in a large plastic container. In this way, core samples were taken in 18-inch (460-mm) increments to a depth of 20 ft (6.1 m). The samples were then sealed in plastic and stored at a temperature of 4°C until preparation for analysis in the laboratory.

The one bottom sample (site 2) was collected from the center of the channel with a pipe dredge sampler.

Native river water (receiving water) was sampled at each of the four sites and stored at 4°C until preparation for analysis.

LABORATORY PROCEDURE

The native-water samples were prepared for analysis of selected dissolved and whole-water constituents (tables 1-3) in a mobile laboratory near the sites.

All core-material samples for each site were combined and thoroughly homogenized using a Hobart model D-300[1/] mixer with a Hobart "B" beater at low speed for 15 minutes to insure complete integration. (The stainless-steel bowl and beater were modified by application of a nylon coating to prevent contamination of samples through contact with the stainless steel). A representative sample was then taken for analysis of selected chemical and physical constituents (tables 1-3). Results of analysis for particle size are presented in figure 1. Core material was analyzed by procedures used to analyze bottom material.

Preparation of an elutriate for a specified sediment-receiving water system required that 2 liters of the core material or bottom material and 8 liters of native water be mixed for 30 minutes, then allowed to settle for 1 hour. The supernatant was then decanted, centrifuged, and filtered in preparation for analysis of selected dissolved constituents (tables 1 and 2).

All samples for laboratory analyses were prepared and analyzed in accordance with the following guidelines:

1. Receiving water and elutriate samples were analyzed for kjeldahl nitrogen, ammonia nitrogen, residues, and oil and grease using methods outlined in "Methods for Chemical Analysis of Water and Wastes" (U.S. Environmental Protection Agency, 1974).

2. Receiving water and elutriate samples were analyzed for cyanides, phenols, chemical oxygen demand, selected pesticides, and other organic compounds using methods outlined by Goerlitz and Brown (1972).

3. Receiving water and elutriate samples were analyzed for dissolved metals using methods outlined by Brown, Skougstad, and Fishman (1970).

4. Core-material and bottom-material samples were analyzed for heavy metals using methods outlined by Wells and Gogel (1975).

1/ The use of the brand name in this report is for identification purposes only and does not imply endorsement by the U.S. Geological Survey.

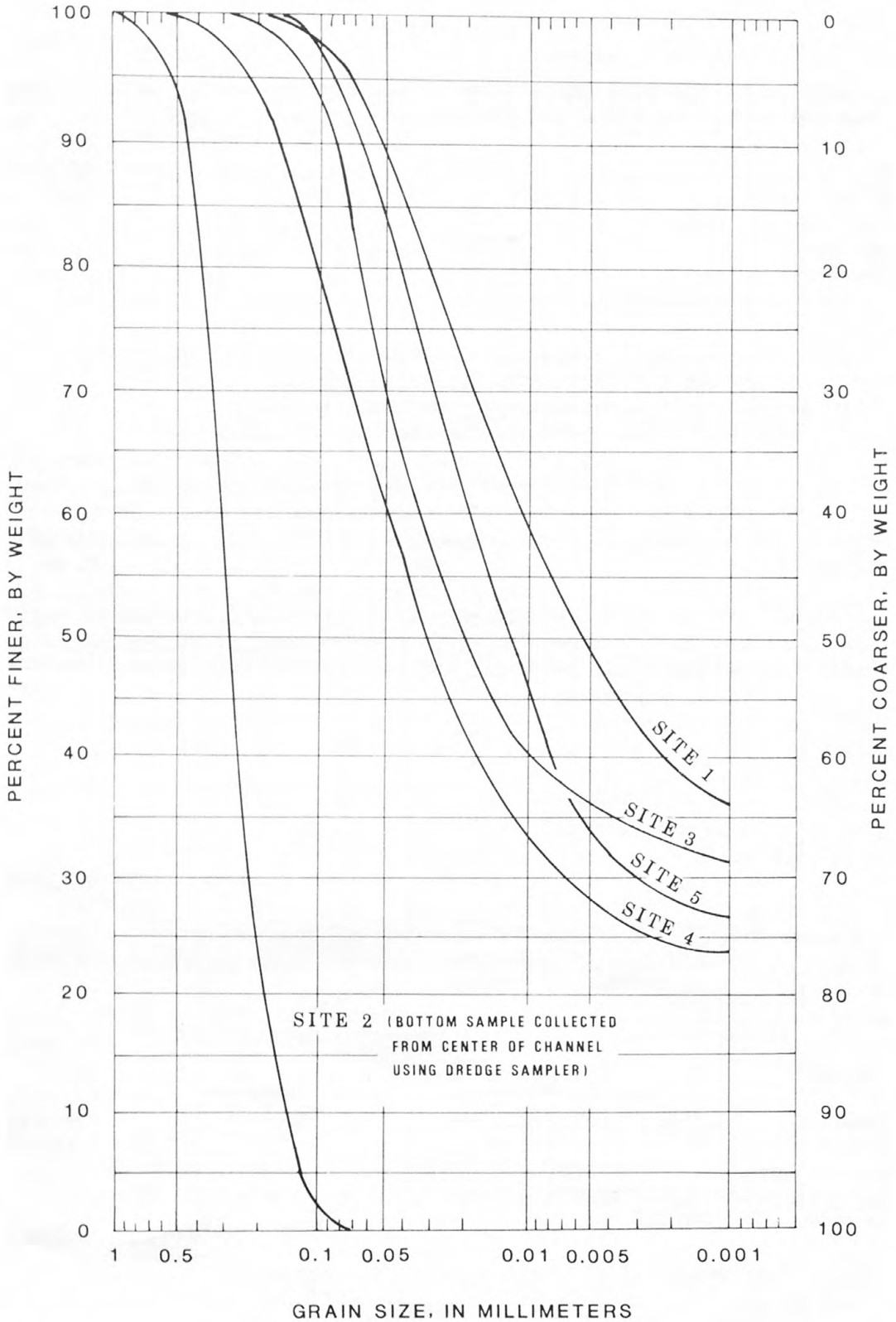

Figure 1.--Results of particle-size analyses of bottom- and core-material samples from sites on the Yazoo River.

5. Other analyses of core material were performed as outlined in "Methods for Chemical Analysis of Water and Wastes" (U.S. Environmental Protection Agency, 1974).

RESULTS

The data are presented in tables 1-4. Sample identification numbers utilize a four-digit system in which the first two digits signify a particular receiving-water site and the last two digits signify a core- or bottom-material site. For example, 0100 indicates the receiving water sampled at site; 0001 indicates indicates the core material sampled at site 1; and 0101 signifies the elutriate sample prepared by mixing the water from site 1 with the core material from site 1.

To facilitate comparison of analyses of core materials, bottom materials, receiving waters, and elutriates, the results are presented as three tables of analytical data (tables 1-3). Latitude and longitude coordinates of each of the sampling sites are given in table 4.

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Brown, Eugene, Skougstad, M. W., and Fishman, M. J., 1970, Methods for collection and analysis of water samples for dissolved minerals and gases: U.S. Geological Survey Techniques of Water-Resources Investigations, book 5, chap. A1, 160 p.

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_____1975, Navigable waters: Discharge of dredged or fill material: Federal Register, September 5, 1975, v. 40, no. 173, pt. 230, p. 41292-41298.

Wells, F. C., and Gogel, A. J., 1975, Analyses of selected constituents in native water and soil in the Bayou Boeuf-Chene-Black area near Morgan City, Louisiana, including a modified standard elutriate test: Baton Rouge, La., U.S. Geological Survey Open-File Report 75-176, 23 p.

HYDROLOGIC DATA

Tables 1-4

Table 1.--Results of analyses of core and bottom materials, receiving waters, and elutriates for selected trace elements and other constituents

Sample type	Sample identification	Chemical oxygen demand	Kjeldahl nitrogen as N	Ammonia nitrogen as N	Organic nitrogen as N	Cyanide	Phenol	Arsenic	Beryllium	Cadmium	Chromium	Copper	Lead	Manganese	Mercury	Nickel	Selenium	Vanadium	Zinc
		Milligrams per kilogram				Micrograms per gram													
Core material	0001	16,000	22	1.0	21	0	-	6	10	0.22	6	14	10	840	0.05	25	1.0	---	36
	0003	9,800	27	1.1	26	0	-	5	0	.09	6	9	10	680	.04	10	3.0	---	29
	0004	9,900	28	4.8	23	0	-	6	0	.15	7	8	10	640	.04	10	1.0	---	29
	0005	8,800	24	1.2	23	0	-	6	10	.15	8	10	10	600	.50	15	2.0	---	29
Bottom material	0002	1,200	4.2	----	-----	0	-	3	0	.05	2	2	<10	5,100	.00	5	.0	---	0
		Milligrams per liter				Micrograms per liter													
Receiving water (whole-water constituents)	0100	38	1.3	0.18	1.1	0.00	1	3	0	0	0	4	6	320	0.0	15	0	---	40
	0300	41	.82	.19	.63	.00	2	4	0	0	30	12	7	340	.0	15	0	---	50
	0400	36	.82	.19	.63	.00	1	4	0	2	20	15	7	320	.0	18	0	---	40
	0500	35	.95	.25	.70	.00	4	4	0	0	20	13	7	340	.0	16	0	---	50
Receiving water (dissolved constituents)	0100	------	1.2	.10	1.1	----	-	1	0	0	0	4	0	60	.0	3	0	0.5	10
	0300	31	.54	.08	.46	----	-	1	0	0	30	5	0	60	.0	2	0	.4	10
	0400	------	.58	.05	.53	----	-	1	0	2	0	6	0	70	.0	4	0	.5	30
	0500	29	.49	.11	.38	----	-	1	0	0	0	5	0	10	.0	2	0	.5	10
Elutriate (dissolved constituents)	0101	22	3.9	3.2	.70	.00	2	1	0	0	30	13	1	40	.0	6	0	2.2	40
	0102	24	.78	.46	.32	.00	2	2	0	0	0	4	1	80	.0	2	0	1.5	10
	0303	50	2.7	.75	2.0	.00	1	2	0	0	0	21	2	160	.0	2	0	8.0	70
	0404	30	.86	.25	.61	.00	2	1	0	0	0	7	1	0	.2	1	0	4.8	20
	0505	41	.32	.25	.07	.00	2	1	0	0	0	2	0	0	.0	1	0	.7	10

Table 2. --Results of analyses of core and bottom materials, receiving waters, and elutriates for selected pesticides and other organic compounds

Sample type	Sample identification	Aldrin	Chlordane	DDD	DDE	DDT	Diazinon	Dieldrin	Endrin	Ethyl parathion	Ethyl trithion	Ethion	Heptachlor epoxide	Heptachlor	Lindane	Malathion	Methyl parathion	Methyl trithion	Mirex	PCB	PCN	Toxaphene	Methoxychlor	Perthane	Silvex	2,4-D	2,4-DP	2,4,5-T	Endosulfan
		Micrograms per kilogram																											
Core material	0001	0.0	0	0.5	0.7	3.6	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0	0	----	----	----	----	----	----	-----
	0003	.0	0	.9	.3	3.3	.3	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	0	0	5	----	----	----	----	----	----	-----
	0004	.1	0	1.3	1.9	2.8	.4	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	0	0	5	----	----	----	----	----	----	-----
	0005	.0	0	7.4	12	26	.5	.5	.1	.0	.0	.0	.0	.0	.0	.0	.0	.3	.0	.0	0	0	48	----	----	----	----	----	----	-----
Bottom material	0002	.0	0	1.2	.9	1.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	0	0	4	----	----	----	----	----	----	-----
		Micrograms per liter																											
Receiving water (whole-water constituents)	0100	0.000	0.0	0.018	0.012	0.033	0.00	0.000	0.004	0.00	0.00	0.00	0.000	0.000	0.006	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.00	0.00	0.00	0.01	0.00	0.01	0.000
	0300	.000	.0	.020	.014	.031	.00	.000	.005	.00	.00	.00	.000	.000	.000	.00	.00	.00	.00	.0	.0	.0	.00	.00	.00	.01	.00	.01	.000
	0400	.000	.0	.014	.009	.021	.00	.000	.003	.00	.00	.00	.000	.000	.000	.00	.00	.00	.00	.0	.0	.0	.00	.00	.00	.01	.00	.01	.000
	0500	.000	.0	.000	.000	.022	.00	.012	.004	.00	.00	.00	.000	.000	.002	.00	.00	.00	.00	.0	.0	.0	.00	.00	.00	.01	.00	.01	.000
Elutriate (dissolved constituents)	0101	.000	.0	.000	.000	.000	.59	.007	.000	.00	.00	.00	.000	.001	.005	.00	.00	.00	.00	.0	.0	.0	.00	.00	.00	.02	.00	.02	.000
	0102	.000	.0	.000	.000	.008	.04	.009	.000	.00	.00	.00	.000	.000	.006	.00	.00	.00	.00	.0	.0	.0	.00	.00	.00	.00	.00	.00	.000
	0303	.000	.0	.000	.000	.000	.26	.010	.000	.00	.00	.00	.000	.000	.004	.00	.00	.00	.00	.0	.0	.0	.00	.00	.00	.00	.00	.01	.000
	0404	.000	.0	.000	.000	.000	.84	.013	.000	.00	.00	.00	.000	.000	.004	.00	.00	.00	.00	.0	.0	.0	.00	.00	.00	.03	.00	.04	.000
	0505	.000	.0	.000	.000	.000	.21	.000	.000	.00	.00	.00	.000	.000	.002	.00	.00	.00	.00	.0	.0	.0	.00	.00	.00	.00	.00	.01	.000

Table 3. --Results of analyses of receiving waters and core and bottom materials for major chemical constituents and selected physical characteristics

Site	Specific conductance	pH	Total alkalinity as $CaCO_3$	Bicarbonate	Dissolved calcium	Carbonate	Dissolved chloride	Noncarbonate hardness	Total hardness	Dissolved iron	Dissolved magnesium	Dissolved potassium	Suspended residue (110°C)	Total nonfilterable residue (105°C)	Volatile suspended residue	Dissolved sodium	Dissolved sulfate	Total organic carbon	Total nitrite as N	Total nitrate as N	Dissolved phosphorus as P	Total phosphorus as P	Oil and grease	Chlorophyll A	Chlorophyll B	Oil and grease in bottom material	Residue loss on ignition in bottom material
	Micromhos	Units	Milligrams per liter																					Micrograms per liter		Milligrams per kilogram	
1	64	6.6	21	26	5.8	0	4.1	1	23	0.13	2.0	3.9	35	35	4	3.3	6.2	18	0.09	0.34	0.05	0.36	0.0	0.000	0.000	0	48,300
2[a]	--	---	--	--	---	-	---	-	--	----	---	---	---	---	--	---	---	----	----	----	----	----	---	-----	-----	0	3,840
3	62	6.8	23	28	5.6	0	3.0	0	23	.13	2.2	3.8	35	35	2	2.5	8.0	----	.09	.33	.05	.30	---	.000	.000	0	41,600
4	58	6.3	20	24	5.0	0	3.7	1	20	.15	1.9	3.7	29	29	1	2.5	7.7	----	.10	.30	.05	.30	.0	.000	.000	0	40,900
5	60	6.6	23	28	4.6	0	2.6	0	19	.04	1.9	3.4	176	176	17	2.4	5.6	9.8	.12	.34	.11	.43	.0	.000	.000	0	48,400

[a] At site 2 the sample was collected with a dredge sampler from center channel and thus is a sample of the bottom material rather than core material.

Table 4.--Latitude and longitude of sampling sites

Sampling site No.	Latitude	Longitude
1	33°05'33"	90°26'43"
2	33°05'31"	90°26'41"
3	33°02'56"	90°24'44"
4	33°00'34"	90°21'15"
5	32°58'25"	90°24'40"

Orthophoto mosaic base by U.S. Geological Survey; aerial photographs taken 1974

PLATE 1. MAP SHOWING LOCATION OF SAMPLING SITES IN THE PROJECT AREA.