UNITED STATES
DEPARTMENT OF INTERIOR
GEOLOGICAL SURVEY

ANALYSES OF WATER, CORE MATERIAL, AND ELUTRIATE SAMPLES COLLECTED NEAR SICILY ISLAND, LOUISIANA (SICILY ISLAND AREA LEVEE PROJECT)

Open-File Report 80-434

Prepared in cooperation with the

U.S. Army Corps of Engineers

Yours truly

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Baton Rouge, Louisiana

April 1980

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FACTORS FOR CONVERTING INCH-POUND UNITS TO INTERNATIONAL SYSTEM (SI) OF METRIC UNITS

The following factors may be used to convert inch-pound units of measurement published herein to the International System (SI) of metric units:

Multiply inch-pound units	By	To obtain metric units
acre	0.4047	hectare (ha)
inch (in.)	25.40	millimeter (mm)
foot (ft)	0.3048	meter (m)
mile (mi)	1.609	kilometer (km)

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

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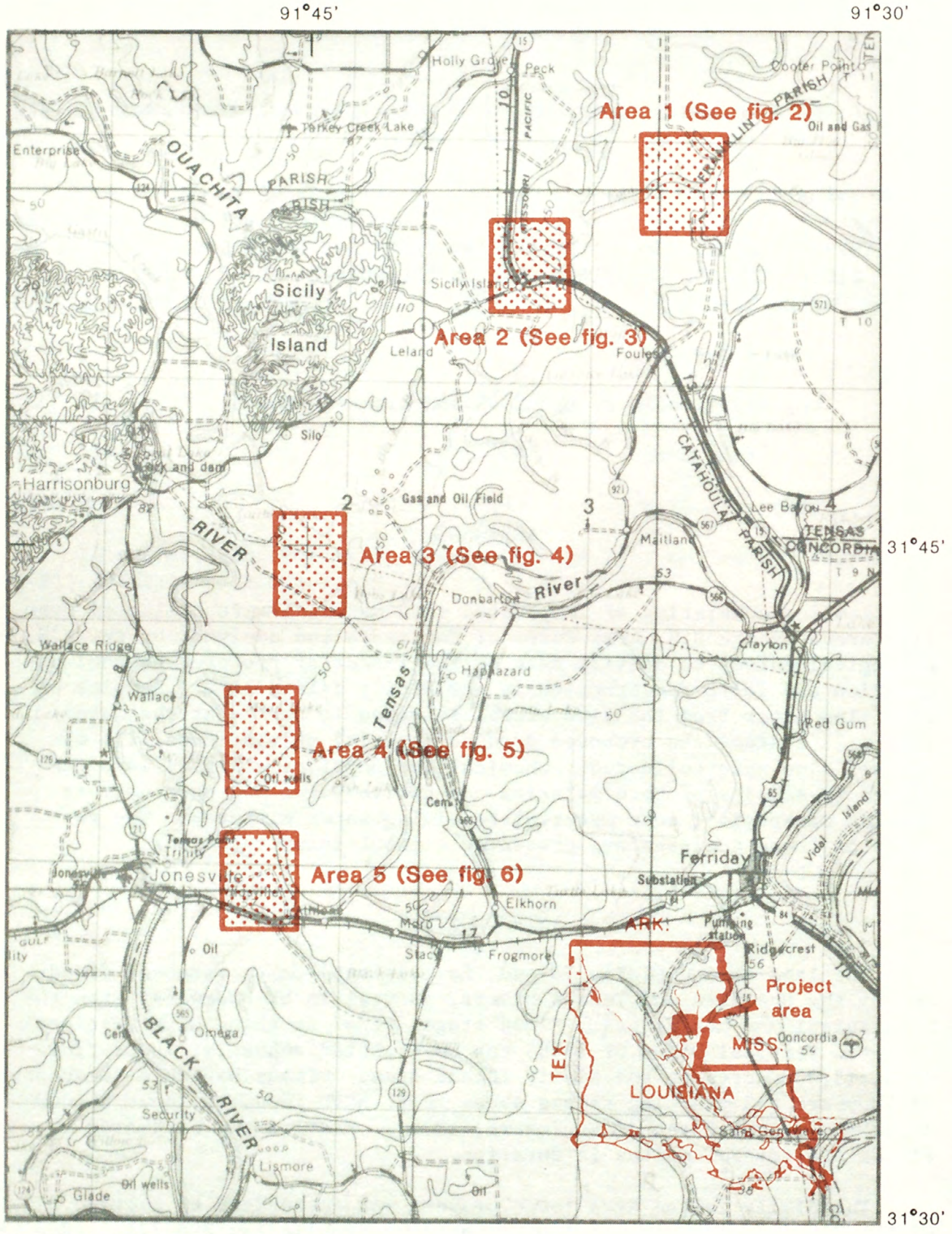
ABSTRACT

Samples consisting of composited core material were collected from five areas by the U.S. Army Corps of Engineers and analyzed by the U.S. Geological Survey to provide data on the impact of proposed channel excavation and levee construction in the Sicily Island area. Samples of receiving water from the five areas, selected to represent the water that will contact the proposed dredged material or the levee fill material, also were collected. Chemical and physical analyses were performed on samples of core material and native water and on elutriate samples of specific core material-receiving water mixtures. The results of these analyses are presented without interpretation.

INTRODUCTION

The land around Sicily Island, La., is subject to frequent flooding by the Ouachita and Tensas Rivers, as well as by backwater from the Mississippi and Red Rivers. Flood stages of 47 ft above NGVD (National Geodetic Vertical Datum of 1929) can be expected annually, inundating about 13,000 acres in the Sicily Island area. Floods having a frequency of 10 years and reaching stages above 58 ft NGVD inundate about 56,000 acres (U.S. Army Corps of Engineers, 1979). Most of the backwater floods are several months in duration.

The Sicily Island area levee project was authorized by Section 3 of the Flood Control Act of August 18, 1941 (Public Law 228-77). (See fig. 1 for location of project area.) It authorized the U.S. Army Corps of Engineers to construct flood-control works consisting of 58.7 mi of levees along the Ouachita and Tensas Rivers, 11.0 mi of channel excavation, 13 mi of channel cleanout, and several drainage structures. The authorized plan would provide reduction of flood damages on about 73,000 acres of land.



Base from U.S. Geological Survey
1:250,000 quadrangle

5 0 5 10 15 Miles

5 0 5 10 15 20 Kilometers

5 0 5 Nautical Miles

Figure 1.--Location of sampling areas near Sicily Island, La.

As a result of detailed planning studies, the Vicksburg District has recommended the plan be modified to 56 mi of levee, 9.9 mi of channel for flood control purposes, 1.1 mi of channel for environmental purposes, 31 small drainage structures, two large drainage structures, and two pumping plants. The revised plan would provide reduction of flood damages to about 75,900 acres of land.

In October 1978 the U.S. Geological Survey cooperated with the Corps of Engineers, Vicksburg District, in a study to investigate the possible environmental effects of this project. One way to analyze for possible influences of the dredging and levee construction 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." A standard elutriate (the final filtrate) for a dredged material-receiving water system is prepared by mixing 4 parts (volume) of receiving water with 1 part (volume) of fill or dredged material, agitating for 30 minutes, allowing to settle for 1 hour, then filtering. This elutriate analysis can be compared to the analysis of the receiving water to estimate the effects of dredging upon the receiving water. The "standard elutriate test" was used in this study to simulate results of the interaction between the dredged material and the water it will contact.

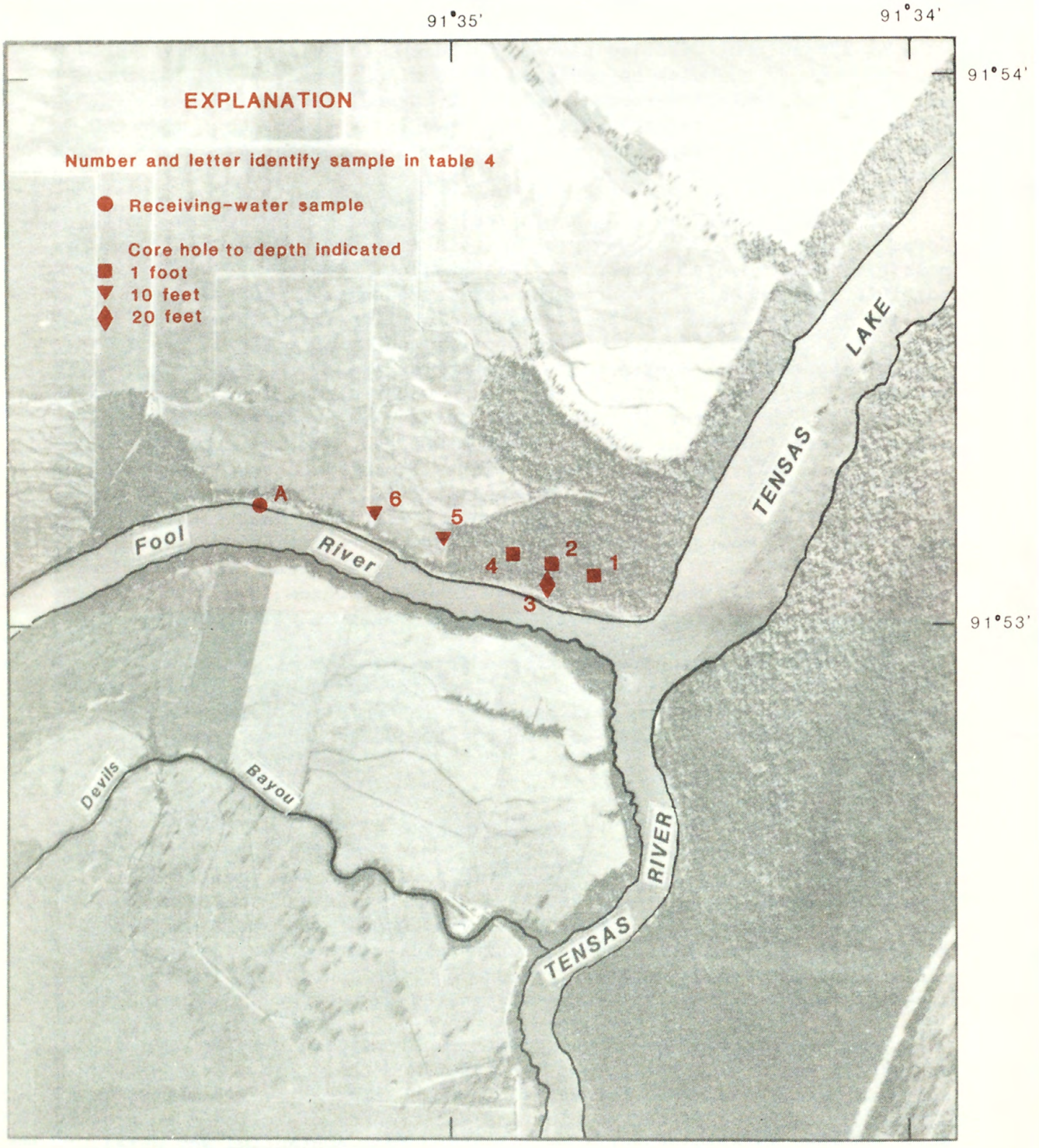
The Corps of Engineers was responsible for site selection and sample collection. The U.S. Geological Survey was responsible for the preparation and analysis of all samples. The purpose of this report is to describe the field and laboratory procedures and to present the analytical data.

FIELD PROCEDURE

During the period October 29-31, 1978, samples were collected in five areas shown in figure 1. Details of each area are shown in figures 2-6. Receiving-water samples were collected from surface water (figs. 2-6) representative of that which will contact the dredged material. Elutriate tests were performed upon five specific sediment-receiving water systems that were designated by the Corps of Engineers.

The core material was sampled with a split-spoon sampler on a hydraulic hammer drilling rig that was truck mounted. The metal split-spoon sampler contained a removable plastic cylinder 1.25x18.5 in., or 32x70 mm. The shoe of the sampler was constructed of Teflon[1/] 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 hydraulic hammer action. After each 18-inch (460-mm) sample was taken, the hammer and split-spoon assembly were drawn out of the hole,

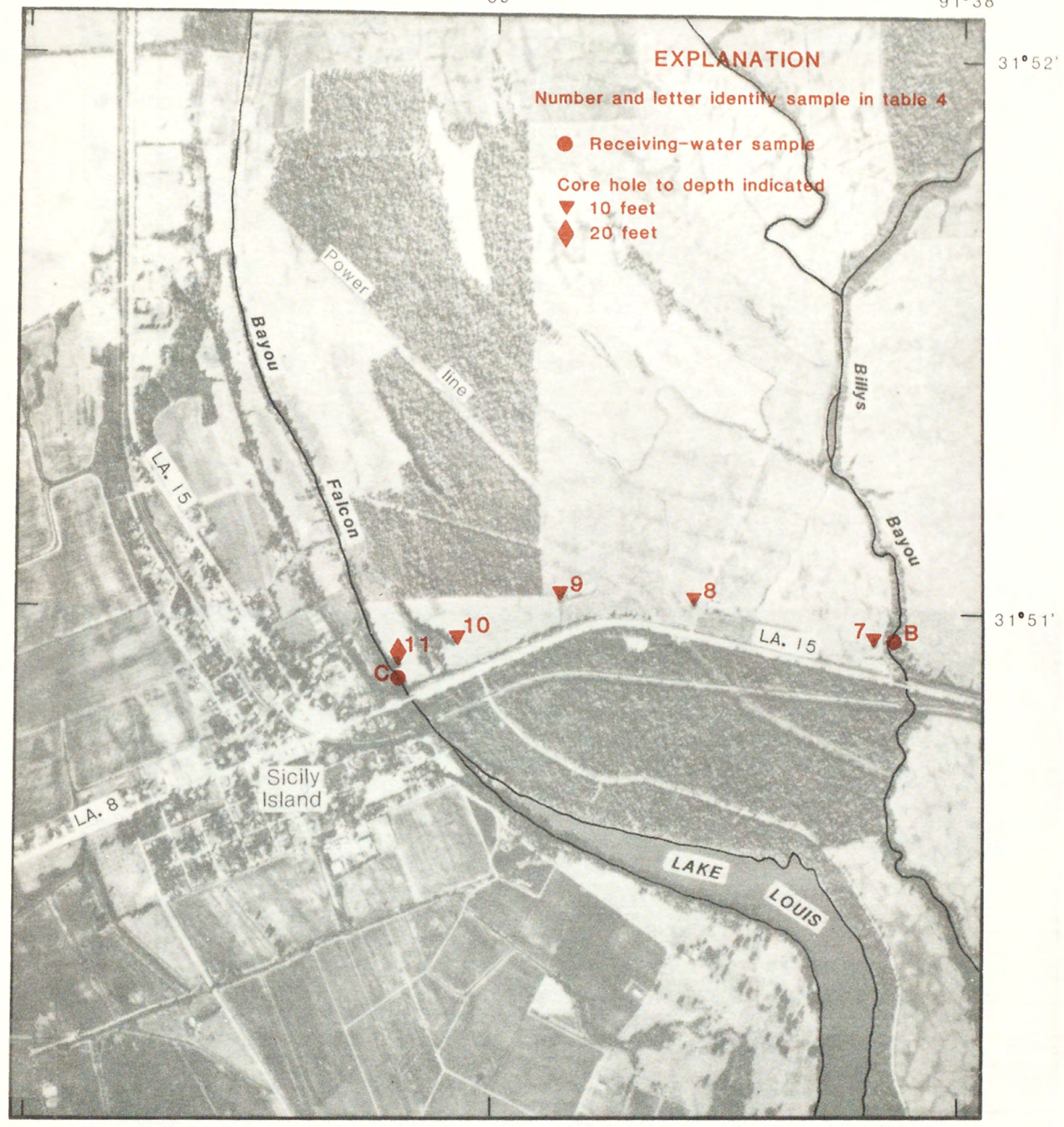
1/ The use of brand names in this report is for identification purposes only and does not imply endorsement by the U.S. Geological Survey.



Aerial photomap by U.S. Corps of Engineers,
November 1977

0 1000 5000 FEET
0 300 600 900 1200 1500 METERS

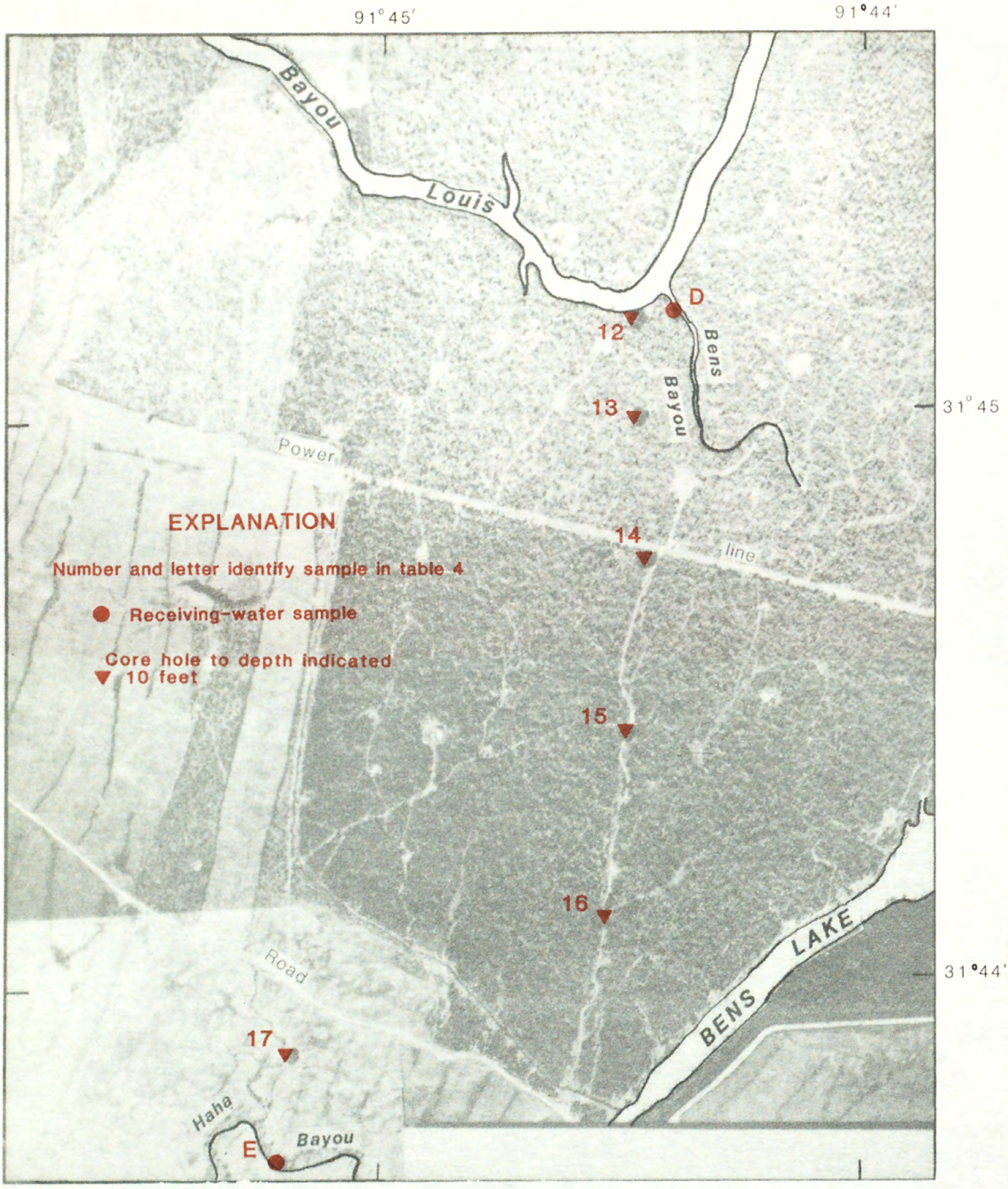
Figure 2.--Location of water- and core-sampling sites in area 1.



Aerial photomap by U.S. Corps of Engineers,
November 1977

0 1000 5000 FEET
0 300 600 900 1200 1500 METERS

Figure 3.--Location of water- and core-sampling sites in area 2.

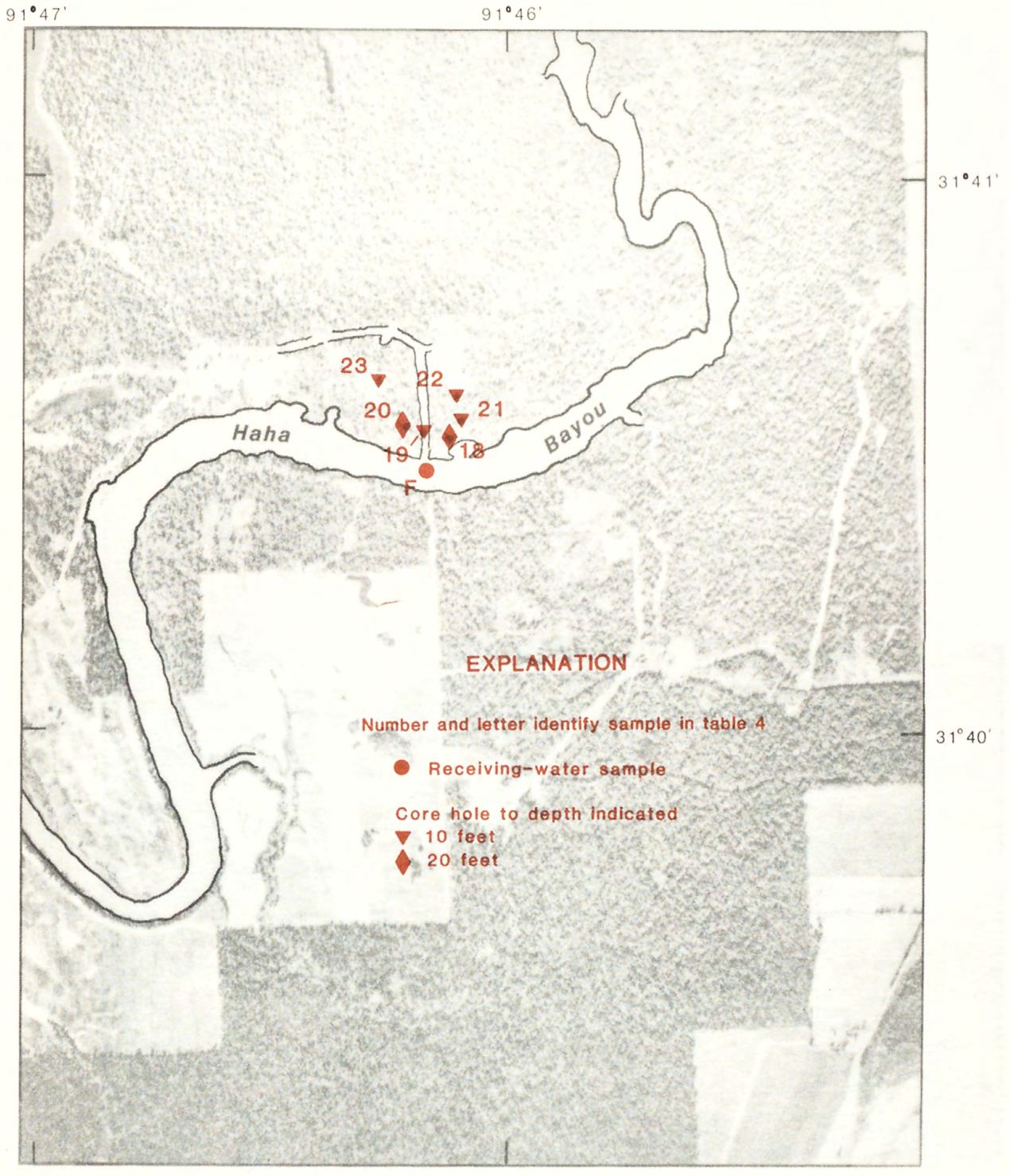


Aerial photomap by U.S. Corps of Engineers,
November 1977

0 1000 5000 FEET

0 300 600 900 1200 1500 METERS

Figure 4.--Location of water- and core-sampling sites in area 3.

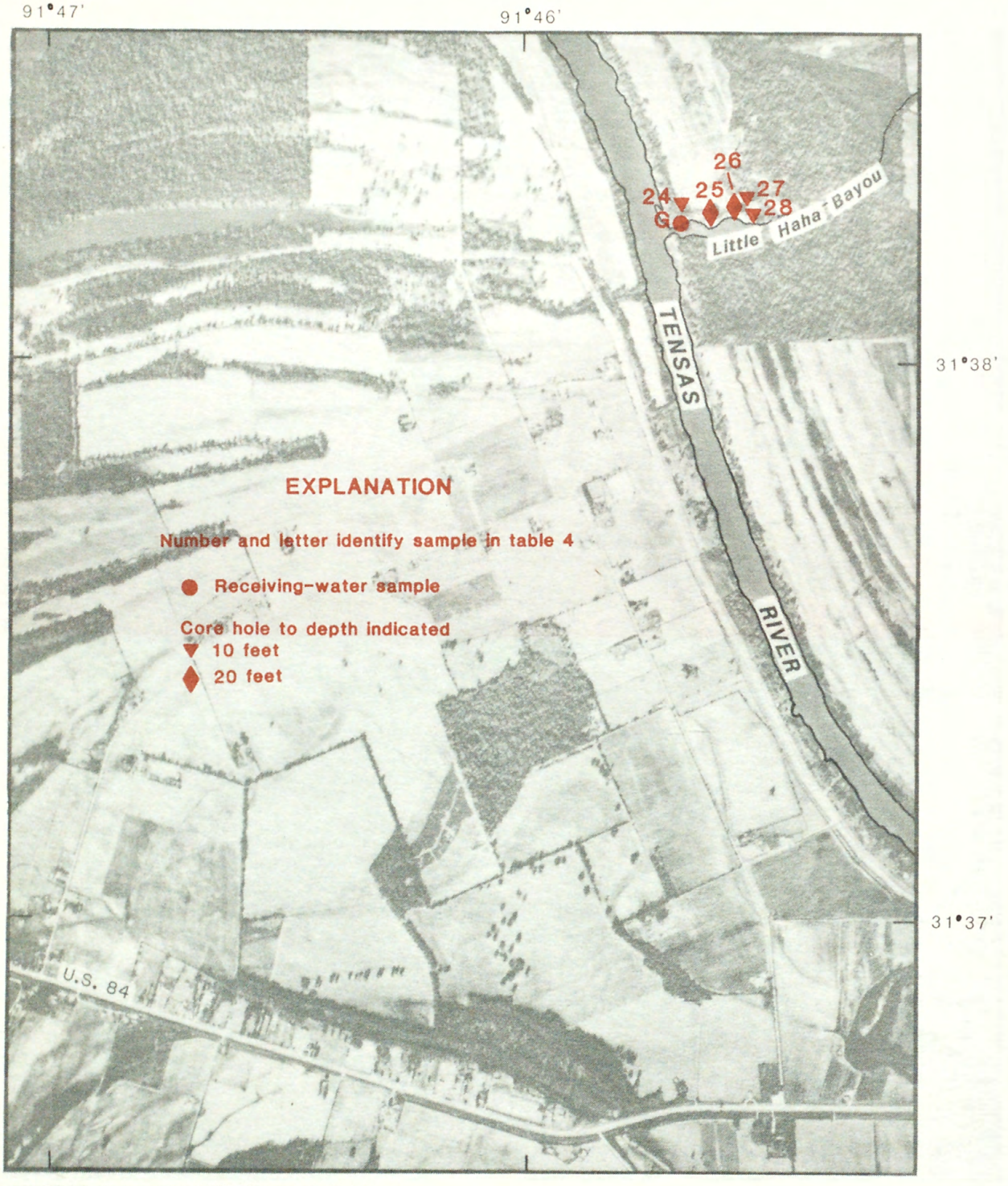


Aerial photomap by U.S. Corps of Engineers,
November 1977

0 1000 5000 FEET

0 300 600 900 1200 1500 METERS

Figure 5.--Location of water- and core-sampling sites in area 4.



Aerial photomap by U.S. Corps of Engineers,
November 1977

0 1000 5000 FEET

0 300 600 900 1200 1500 METERS

Figure 6.--Location of water- and core-sampling sites in area 5.

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 wooden dowel and placed in a large plastic container. In this way, core samples were taken in 18-inch (460-mm) increments. Core materials from each of the sites within a designated area were composited, sealed in plastic, and stored at a temperature of 4°C until preparation for analysis. Native receiving water was sampled in each of the five areas and stored at 4°C until preparation for analysis.

Receiving water from area 2 consisted of a composite of equal volumes of water from Billy's Bayou and Bayou Falcon because water from both of these bayous will contact dredged material from area 2. Similarly, receiving water from area 3 was a composite of samples from Ben's Bayou and Haha Bayou.

LABORATORY PROCEDURE

Core material, native water, and elutriate samples were prepared for analyses for selected dissolved and whole-water constituents (tables 1-3) in a mobile laboratory near the sites.

All core-material samples from a site were combined and thoroughly homogenized using a Hobart model D-300 mixer with a Hobart "B" beater at low speed for 15 minutes to insure complete integration. The steel bowl and beater had been modified by application of a nylon coating to prevent contamination of samples through contact with the steel. A representative sample was then taken for analyses for selected chemical and physical constituents (tables 1-3). Results of particle-size analyses are presented in figure 7.

Preparation of an elutriate for a specified core material-receiving water system required that 2 liters of the core material and 8 liters of native water be mixed for 30 minutes, then allowed to settle for 1 hour. The supernatant was then decanted and filtered in parparation for analyses for 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, 1979).

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).

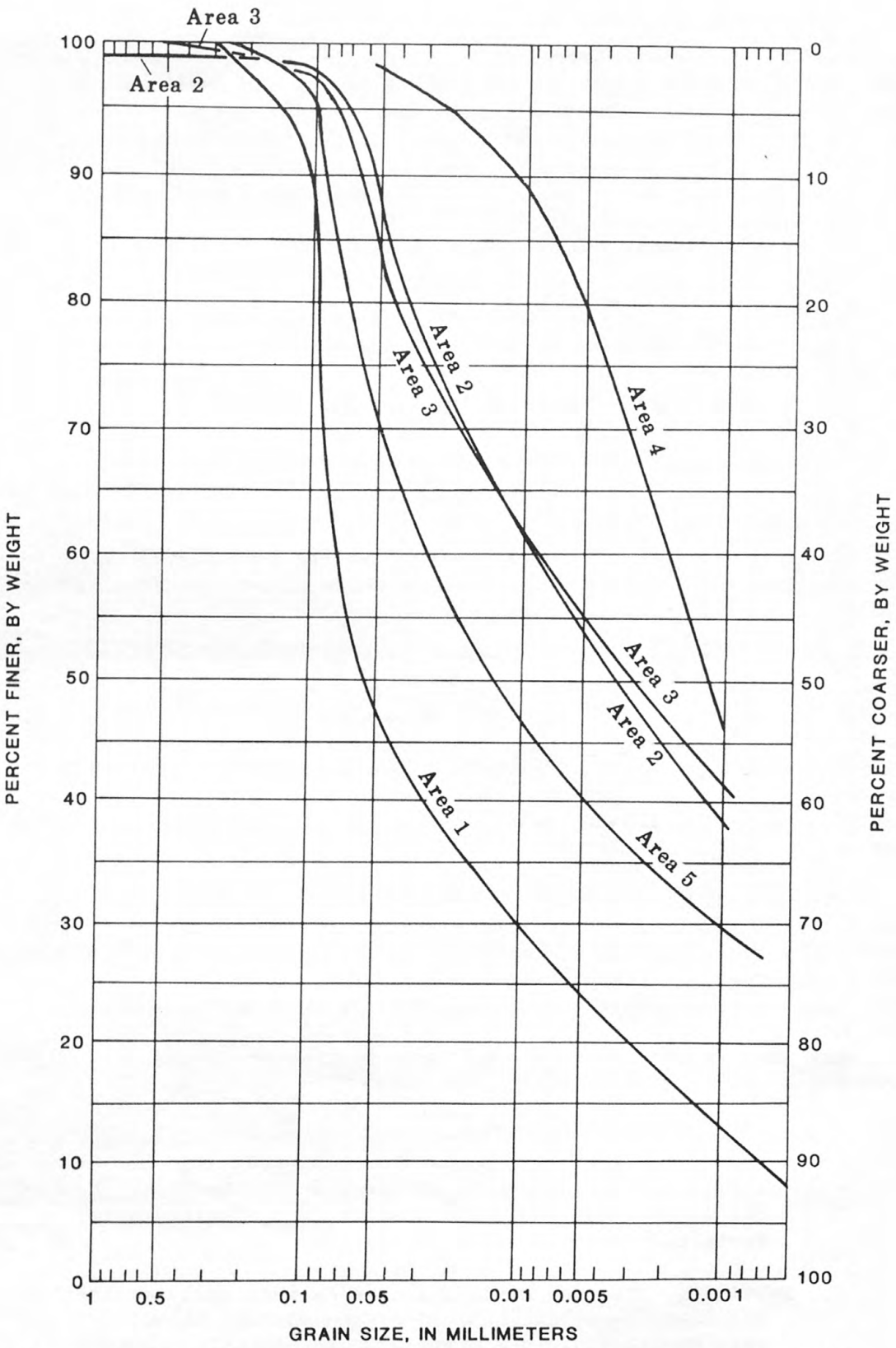


Figure 7.--Results of particle-size analyses of composite samples of core material collected near Sicily Island, La.

3. Receiving water and elutriate samples were analyzed for dissolved metals using methods outlined by Skougstad, Fishman, Friedman, Erdmann, and Duncan (1979).

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

5. Other analyses of core material were performed as outlined in "Methods for Chemical Analysis of Water and Wastes" (U.S. Environmental Protection Agency, 1979).

6. Receiving-water and mixture samples were analyzed for settleable matter as outlined in "Standard Methods for the Examination of Water and Wastewater" (American Public Health Association and others, 1971).

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 area and the last two digits signify a core-material area. For example, 0100 indicates the receiving water sampled for area 1; 0001 indicates the core material sampled from area 1; and 0101 signifies the elutriate sample prepared by mixing the water from area 1 with the core material from area 1.

To facilitate comparison, analyses of core material, receiving waters, and elutriates 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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HYDROLOGIC DATA

Tables 1-4

Table 1.--Results of analyses of core material, 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	20,000	670	14	----	0	--	3	0	0.30	8	14	20	340	0.04	10	3.0	--	40
	0002	17,000	500	11	----	0	--	6	0	.35	7	14	20	500	.04	20	.0	--	40
	0003	17,000	500	14	----	0	--	0	0	.24	7	14	14	340	.0	20	1.0	--	40
	0004	14,000	460	10	----	0	--	2	0	.27	9	19	24	370	.04	20	1.0	--	50
	0005	12,000	290	6.6	----	0	--	0	0	.29	7	15	18	440	.04	20	.0	--	40
		Milligrams per liter				Micrograms per liter													
Receiving water (total constituents)	0100	22	0.68	0.07	0.61	0.00	1	4	0	1	0	5	3	190	0	4	0	0	20
	0200	30	2.4	.06	2.3	.00	0	3	0	1	0	49	7	280	0	4	0	0	40
	0300	42	1.5	.06	1.4	.00	0	2	0	1	0	7	5	200	0	6	0	0	20
	0400	22	1.1	.05	1.1	.00	2	1	0	1	0	4	6	40	0	2	0	0	10
	0500	24	.78	.06	.72	.00	1	4	0	1	0	4	6	80	0	3	1	0	20
Receiving water (dissolved constituents)	0100	11	.68	.02	.66	.00	--	3	0	1	0	5	3	60	0	3	0	0	10
	0200	------	.95	.00	.95	.00	--	2	0	1	0	13	7	200	0	2	0	0	40
	0300	54	1.4	.01	1.4	.00	--	1	0	1	0	3	1	140	0	0	0	0	10
	0400	26	.82	.00	.82	.00	--	1	0	1	0	3	2	10	0	2	0	0	10
	0500	140	.48	.00	.48	.00	--	4	0	1	0	3	2	10	0	3	1	0	10
Elutriate (dissolved constituents)	0101	20	.88	.17	.71	.00	2	1	0	0	0	3	0	280	.0	4	0	0	10
	0202	16	7.5	3.6	4.7	.00	3	1	0	16	10	210	240	120	.0	25	0	0	290
	0303	18	.42	.02	.40	.00	1	1	0	0	0	2	0	140	.0	3	5	0	20
	0404	19	.43	.00	.43	.00	6	0	0	0	0	3	0	30	.0	0	3	0	20
	0505	12	.58	.00	.58	.00	1	1	0	1	0	14	0	80	.0	12	2	0	50

Table 2.--Results of analyses of core material, 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
		Micrograms per kilogram																				
Core material	0001	0.0	0.0	0.1	0.5	0.4	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	0	0
	0002	.0	0	1.2	.7	1.7	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.1	1	0	0
	0003	.0	0	.3	.4	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	0	0	0
	0004	.0	0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	0	0	0
	0005	.0	0	.1	.2	.2	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	0	0	0
		Micrograms per liter																				
Receiving water (total constituents)	0100	0.000	0.0	0.004	0.006	0.001	0.00	0.000	0.000	0.00	0.00	0.00	0.000	0.000	0.001	0.00	0.00	0.00	0.00	0.0	0.0	0.0
	0200	.000	.0	.000	.006	.008	.01	.000	.000	.00	.00	.00	.000	.000	.000	.00	.00	.00	.00	.0	.0	.0
	0300	.000	.0	.001	.002	.000	.00	.000	.000	.00	.00	.00	.000	.000	.000	.00	.00	.00	.00	.0	.0	.0
	0400	.000	.0	.000	.000	.000	.00	.000	.000	.00	.00	.00	.000	.000	.000	.00	.00	.00	.00	.0	.0	.0
	0500	.000	.0	.001	.000	.000	.00	.000	.000	.00	.00	.00	.000	.000	.000	.00	.00	.00	.00	.0	.0	.0
Receiving water (dissolved constituents)	0100	.000	.0	.001	.000	.000	.51	.006	.000	.00	.00	.00	.000	.000	.000	.00	.00	.00	.00	.0	.0	.0
	0200	.000	.0	.000	.000	.000	3.0	.011	.001	.00	.00	.00	.000	.000	.000	.00	.01	.00	.00	.0	.0	.0
	0300	.000	.0	.000	.000	.000	.05	.004	.000	.00	.00	.00	.000	.000	.000	.00	.00	.00	.00	.0	.0	.0
	0400	.000	.0	.000	.000	.000	.01	.002	.000	.00	.00	.00	.000	.000	.001	.00	.00	.00	.00	.0	.0	.0
	0500	.000	.0	.000	.002	.000	.00	.000	.000	.00	.00	.00	.000	.000	.001	.00	.00	.00	.00	.0	.0	.0
Elutriate (dissolved constituents)	0101	.000	.0	.000	.000	.000	.20	.004	.000	.00	.0	.00	.000	.000	.000	.00	.00	.00	.00	.0	.0	.0
	0202	-----	---	-----	-----	-----	---	-----	-----	---	---	---	-----	-----	-----	---	---	---	---	---	---	---
	0303	.000	.0	.000	.000	.000	.15	.000	.000	.00	.0	.00	.000	.000	.000	.00	.00	.00	.00	.0	.0	.0
	0404	.000	.0	.000	.000	.000	.12	.002	.000	.00	.0	.00	.000	.000	.000	.00	.00	.00	.00	.0	.0	.0
	0505	.000	.0	.000	.000	.000	.11	.003	.000	.00	.0	.00	.000	.000	.000	.00	.01	.00	.00	.0	.0	.0

Sample type	Sample identification	Methoxychlor	Perthane	Silvex	2,4-D	2,4-DP	2,4,5-T	Endosulfan
		Micrograms per kilogram						
Core material	0001	----	0.0	----	----	----	----	0.0
	0002	----	.0	----	----	----	----	3.0
	0003	----	.0	----	----	----	----	.0
	0004	----	.0	----	----	----	----	.0
	0005	----	.0	----	----	----	----	.0
		Micrograms per liter						
Receiving water (total constituents)	0100	0.00	0.00	0.00	0.05	0.01	0.23	0.000
	0200	.00	.00	.00	.03	.00	.00	.000
	0300	.00	.00	.00	.01	.00	.00	.000
	0400	.00	.00	.00	.01	.00	.02	.000
	0500	.00	.00	.00	.00	.00	.00	.000
Receiving water (dissolved constituents)	0100	.00	.00	.00	.05	.00	.21	.000
	0200	.00	.00	.00	.07	.00	.01	.000
	0300	.00	.00	.00	.01	.00	.00	.000
	0400	.00	.00	.00	.03	.00	.03	.000
	0500	.00	.00	.00	.07	.00	.38	.000
Elutriate (dissolved constituents)	0101	.00	.00	.00	.07	.01	.13	.000
	0202	----	----	.00	.00	.00	.00	-----
	0303	.00	.00	.00	.04	.00	.01	.000
	0404	.00	.00	.00	.04	.00	.00	.000
	0505	.00	.00	----	----	----	----	.000

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

Area	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 non-filterable residue (105°C)
	Micromhos	Units	Milligrams per liter											
1	586	7.7	210	257	52	0	54	0	200	10	18	4.5	20	22
2	183	6.7	59	72	14	0	15	0	53	50	4.3	5.6	42	45
3	123	7.0	52	63	15	0	8.5	0	51	70	3.2	3.8	105	106
4	358	7.2	40	49	15	0	76	14	54	60	4.0	2.8	4	7
5	556	8.2	220	267	66	0	55	16	230	10	17	4.3	13	21

Area	Volatile suspended residue	Dissolved sodium	Dissolved sulfate	Total organic carbon	Total nitrate as N	Total nitrite 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
	Milligrams per liter									Micrograms per liter		Milligrams per kilogram	
1	19	38	17	7.0	0.01	0.00	0.08	0.12	0.0	9.03	0.000	0	73,300
2	12	11	9.7	7.1	.01	.03	.07	.19	.0	25.7	.000	0	73,600
3	34	7	6.2	17	.01	.04	.12	.24	.0	108	.000	1	87,500
4	--	46	17	7.6	.01	.00	.02	.05	.0	5.05	.000	0	103,000
5	--	40	15	5.8	.01	.10	.06	.11	.0	8.21	.000	1	64,600

Table 4.--Latitude and longitude of sampling areas

	Latitude	Longitude
Area 1		
Core site:		
1----------	31°53'08"	91°34'44"
2----------	31°53"10"	91°34'51"
3----------	31°53'07"	91°34'55"
4----------	31°53'11"	91°35'00"
5----------	31°53'12"	91°35'06"
6----------	31°53'16"	91°35'13"
Receiving water:		
A----------	31°53'13"	91°35'26"
Area 2		
Core site:		
7----------	31°50'55"	91°38'14"
8----------	31°50'59"	91°38'33"
9----------	31°51'01"	91°38'51"
10----------	31°59'58"	91°39'04"
11----------	31°50'57"	91°39'13"
Receiving water:		
B----------	31°50'55"	91°38'11"
C----------	31°50'53"	91°39'15"
Area 3		
Core site:		
12----------	31°45'11"	91°44'34"
13----------	31°44'58"	91°44'32"
14----------	31°44'46"	91°44'30"
15----------	31°44'18"	91°44'32"
16----------	31°44'01"	91°44'33"
Area 3--Continued		
Core site--Con.		
17----------	31°43'53"	91°45'22"
Receiving water:		
D----------	31°45'39"	91°44'27"
E----------	31°43'39"	91°45'22"
Area 4		
Core site:		
18----------	31°40'36"	91°46'07"
19----------	31°40'37"	91°46'09"
20----------	31°40'38"	91°46'11"
21----------	31°40'39"	91°46'03"
22----------	31°40'43"	91°46'05"
23----------	31°40'46"	91°46'20"
Receiving water:		
F----------	31°40'31"	91°46'11"
Area 5		
Core site:		
24----------	31°38'19"	91°45'38"
25----------	31°38'19"	91°45'31"
26----------	31°38'19"	91°45'24"
27----------	31°38'21"	91°45'21"
28----------	31°38'17"	91°45'16"
Receiving water:		
G----------	31°38'14"	91°45'38"