WATER-RESOURCES INVESTIGATIONS REPORT
84-4214

TEST WELL INSTALLATION AND WATER QUALITY, HOLLYWOOD DUMP AREA, MEMPHIS, TENNESSEE

PREPARED BY

U.S. GEOLOGICAL SURVEY

IN COOPERATION WITH THE

CITY OF MEMPHIS

Test Well Installation and Water Quality, Hollywood Dump Area, Memphis, Tennessee

David D. Graham

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1985

UNITED STATES DEPARTMENT OF THE INTERIOR

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CONVERSION FACTORS

Factors for converting inch-pound units to International System of Units (SI) are shown to four significant digits.

Multiply	By	To obtain
inch (in.)	25.40	millimeter (mm)
foot (ft)	0.3048	meter (m)
mile (mi)	1.609	kilometer (km)
square mile (mi^2)	2.590	square kilometer (km^2)
gallon per minute (gal/min)	0.06308	liter per second (L/s)
million gallons per day (Mgal/d)	0.04381	cubic meter per second (m^3/s)

National Geodetic Vertical Datum of 1929 (NGVD of 1929): A geodetic datum derived from a general adjustment of the first-order level nets of both the United States and Canada, formerly called mean sea level. NGVD of 1929 is referred to as sea level in this report.

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ABSTRACT

The Hollywood Dump in north Memphis, Tennessee, is known to contain hazardous wastes. Monitor wells were installed and sampled to determine if contaminants have entered the underlying Wolf River alluvium and concentrated in this unconfined aquifer.

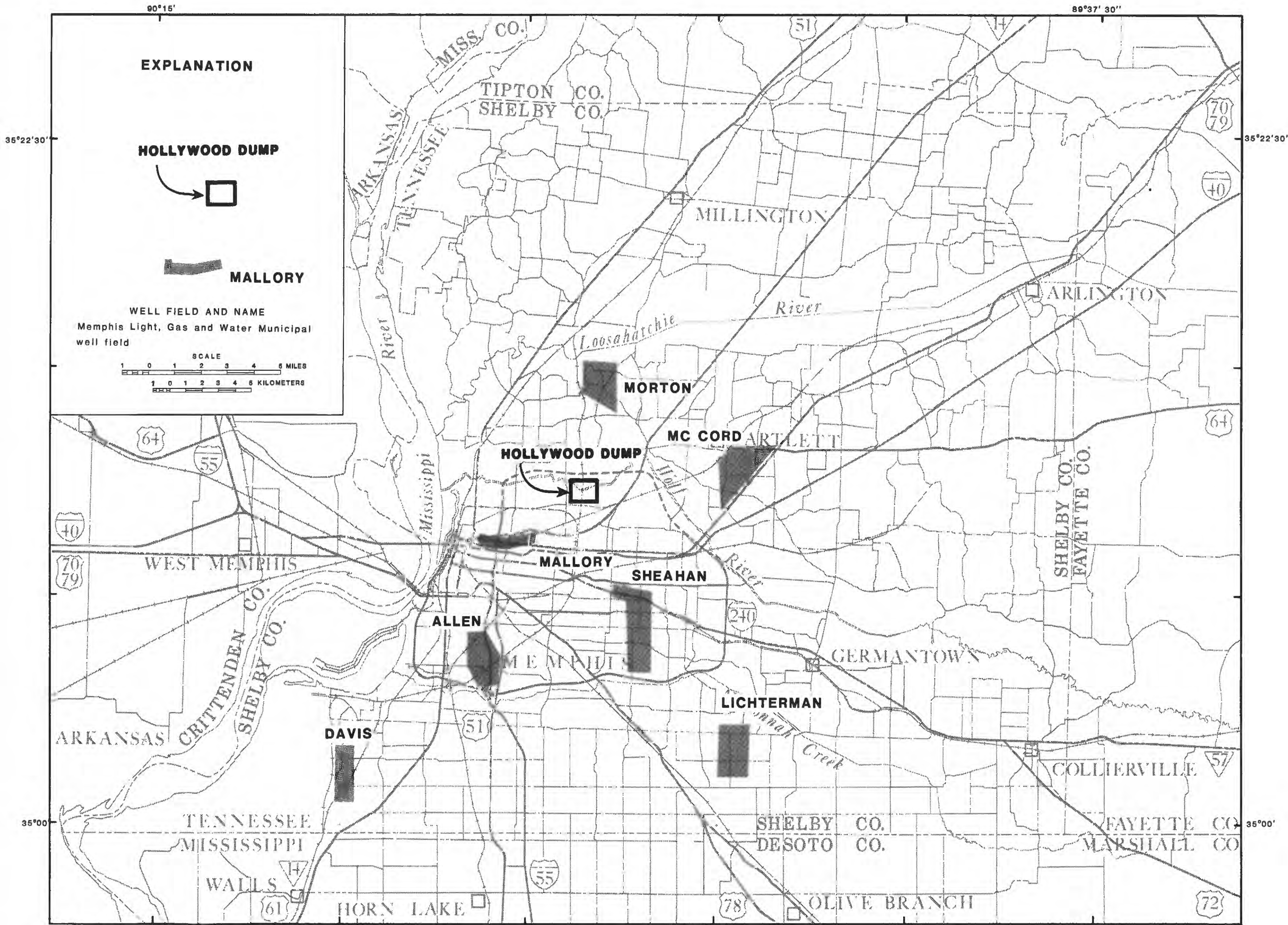
Four water-quality samples were collected from each of nine monitor wells screened in the Wolf River alluvium at the Hollywood Dump between June 1982 and June 1983. Also sampled during this period was one well screened in the fluvial (terrace) deposits, about one-half mile upgradient from the dump, and three nearby wells screened in the artesian aquifer of the Memphis Sand. Concentrations of selected trace inorganic constituents and organic compounds included on the Environmental Protection Agency's list of priority pollutants were determined. Concentrations of several organic compounds including heptachlor (1.1 μg/L), chlordane (2.4 μg/L), and chlordene (1.27 μg/L), were detected in alluvium wells. High concentrations of barium (3,000 μg/L) and arsenic (450 μg/L) were detected in some of the alluvium wells. Samples of water from the fluvial deposits were reported to contain the following organic compounds: diethyl phthalate (8.0 μg/L), dimethyl phthalate (2.0 μg/L), di-n-octyl phthalate (56 μg/L), heptachlor (0.04 μg/L), chlordane (0.12 μg/L), and endrin (0.04 μg/L). Water from the Memphis Sand showed no traces of synthetic organic compounds. Other constituents and properties were found to be at levels that are normal for this aquifer.

Five of the alluvium wells sampled were newly installed. Geophysical logs made of these wells, supplemented by driller's logs and split spoon samples, show that clay underlies the Wolf River alluvium at the well sites.

Monthly water-level measurements made in each of the nine alluvium wells at the site and readings made at a staff gage installed on the nearby Wolf River show that water levels in the monitor wells generally exceed and vary directly with those of the Wolf River.

INTRODUCTION

Ground water is the sole source of potable water currently being used for municipal and industrial supplies in the Memphis area. The possibility that leachates from landfills and dumps known to contain hazardous wastes might threaten this water source is a subject of public concern. Much of this attention has been focused on the Hollywood Dump. Figure 1 shows the Memphis area with locations of the Hollywood Dump and Memphis Light, Gas and Water (MLGW) municipal well fields.



Base from U.S. Geological Survey 1:24,000 and Mississippi River Commission 1:62,500 quadrangles

Figure 1.--Hollywood Dump and Memphis Light, Gas and Water municipal well fields.

As part of a previous study by the U.S. Geological Survey, three shallow monitor wells were installed in the Wolf River alluvium (water-table aquifer) downgradient and close to areas of the Hollywood Dump thought to contain toxic wastes. These wells were sampled twice - once in the early summer of 1980 when water levels were high and again in the fall of 1980 when water levels were low. Two additional monitor wells installed by the Tennessee Valley Authority were included in the fall sampling. The water quality data obtained were published in reports by Parks and others (1981, 1982). These data indicate that leachates are entering the water-table aquifer in the immediate vicinity of the dump (Graham, 1982). Several constituents or properties of water, including chloride, color, iron, manganese, total dissolved solids, barium, cadmium, and endrin, exceed primary or secondary contaminant levels established by the Environmental Protection Agency (EPA) for drinking supplies (U.S. Environmental Protection Agency, 1976 and 1979); and some of the other constituents of EPA's list of priority pollutants such as chlordane, DDT, and heptachlor epoxide are present in trace amounts. This aquifer is not used as a source of drinking water.

Since the completion of the previous study, local, state, and federal agencies have collected and analyzed soil, waste, air, and water samples in an effort to determine what hazards the Hollywood Dump may pose to the environment. Residue from the manufacture of pesticides, principally chlordane isomers, and soil samples containing elevated levels of these and other toxic organic compounds are reported to have been found at the surface of the dump.

Wells previously installed and sampled at the Hollywood Dump are screened in the upper part of the shallow aquifer. Additional wells were needed to provide water and sediment samples from the lower part of the aquifer to determine what contaminants were present near the base of the water-table aquifer. The U.S. Geological Survey undertook an investigation to install additional monitor wells and to collect water-quality data. This investigation consisted of the following elements:

(1) information collected and compiled by the Tennessee Department of Public Health and the Memphis-Shelby County Health Department was reviewed to determine the location and depths of five planned monitor wells in the shallow aquifer;
(2) five new monitor wells were installed and developed in the lower part of the shallow aquifer;
(3) split-spoon samples were taken as the wells were drilled and these samples were delivered to representatives of the North Hollywood Dump Technical Action Group (TAG) for analysis by other agencies;
(4) geophysical logs of each of the newly installed wells were made;
(5) information about the location and feasability of sampling nearby wells in the Memphis Sand was reviewed, three wells were selected and permission to sample them was obtained from the owners;
(6) quarterly water samples from each of the five new monitor wells, the five previously installed monitor wells, and the three production wells in the Memphis Sand were collected;
(7) concentrations of a broad range of organic and inorganic constituents and values of selected physical properties of the water were determined; and

(8) water levels were measured in each of the monitor wells before each sampling and at various times throughout the year.

As the work progressed, the water-quality data were provided, as available, through the City of Memphis to the North Hollywood Dump Technical Action Group (TAG). TAG uses these data as part of a data-base being compiled in a more comprehensive study of the possible environmental hazard posed by the dump.

This report summarizes the work performed by the Geological Survey during this investigation and summarizes the Survey collected water-quality data.

SITE DESCRIPTION

The Hollywood Dump is in north Memphis on both sides of Hollywood Street just south of the Wolf River (fig. 2). This dump, which is about five miles from the confluence of the Wolf and Mississippi Rivers, was made in abandoned channels on the alluvial plain of the Wolf River.

Surface water drains from the dump into several nearby ditches. These ditches in turn discharge into nearby low areas and ponds or into the Wolf River which flows east to west.

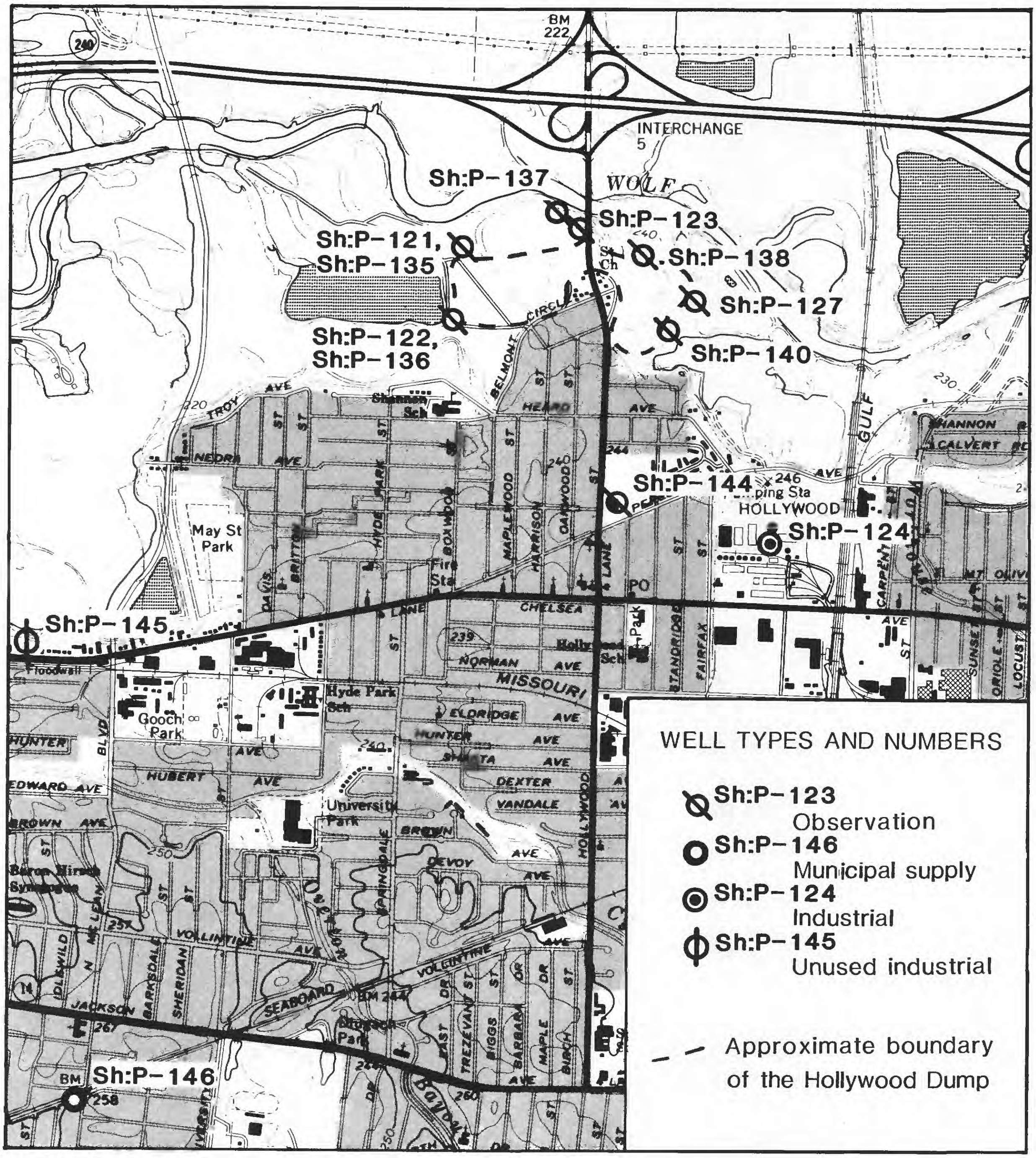
The direction of ground-water flow in the water-table aquifer is presumed to be in two general directions--northward from the original high ground south of the dump towards the Wolf River and westward down the Wolf River valley.

GEOLOGIC SETTING

The Memphis area is located near the axis of the Mississippi Embayment, a large structural trough in the Gulf Coastal Plain containing sediments consisting primarily of unconsolidated clay, silt, sand and gravel (table 1). These sediments are approximately 3,000 feet thick near Memphis and range from Cretaceous to Holocene in age; they rest unconformably on Paleozoic carbonate bedrock. The general hydrology and geology of the Memphis area are described in reports by Schneider and Cushing (1948), Criner and Armstrong (1958), Criner and others (1964), and Bell and Nyman (1968).

The oldest geologic unit of interest to this study is the Claiborne Group of Eocene age (table 1). The Memphis Sand ("500-foot sand") of the Claiborne Group is the principal artesian aquifer in the Memphis area. The Memphis Sand supplies about 98 percent of inventoried pumpage in the area, which totaled 193 Mgal/d in 1980 (Graham, 1982). The municipal water supply for the city of Memphis is derived entirely from this aquifer.

The Memphis Sand is overlain by the upper part of the Claiborne Group and the Jackson Formation (table 1). This sequence of strata consists mainly of low permeability sediments (clay, silt, and fine sand), and areally acts as a confining layer that restricts vertical movement of water into or out of the Memphis Sand. At places in the Memphis area this confining layer may be thin, absent or consist predominantly of sand. Where this occurs water may easily move vertically into or out of the Memphis Sand.



Base from U.S. Geological Survey
Northeast Memphis, 1965,
Photorevision as of 1983

SCALE 1:24 000

½ 0 1 MILE

5 0 1 KILOMETER

CONTOUR INTERVAL 10 FEET

NATIONAL GEODETIC VERTICAL DATUM OF 1929

Figure 2.--Location of the Hollywood Dump and wells installed or sampled.

Table 1.--Geologic and equivalent units underlying
(modified from Criner

System	Series	Group	Stratigraphic unit	Thickness (ft)
Quaternary	Holocene and Pleistocene		Alluvium	0-175
	Pleistocene		Loess	0-65
Quaternary and Tertiary (?)	Pleistocene and Pliocene (?)		Fluvial deposits (terrace deposits)	0-100
Tertiary	Eocene	?	Jackson Formation and upper part of Claiborne Group ("capping clay")	0-350
		Claiborne	Memphis Sand ("500-foot" sand)	500-880
		Wilcox	Flour Island Formation	160-350
	?		Fort Pillow Sand ("1,400-foot" sand)	210-280
	Paleocene		Old Breastworks Formation	200-250

the Memphis area and their hydrologic significance
and Parks, 1976)

Lithology and environmental significance
Sand, gravel, silt, and clay. Underlies the Mississippi River alluvial plain and the flood plains of other streams in the area. Supplies water to a few domestic and industrial wells. Could be an important source of water for irrigation and some industrial uses.
Wind-deposited silt; silty clay and minor sand. Forms a blanket over the fluvial deposits in upland area; topographically higher than alluvium. Thickest on the bluffs that border the Mississippi River alluvial plain; generally thinner towards the east. Not a source of ground water.
Sand and gravel; minor ferruginous sandstone. Underlies the upland areas in a broad, irregular belt east of the Mississippi River alluvial plain; may be locally absent. Supplies water to many shallow, small-capacity wells in suburban and county areas.
Gray, bluish-gray, greenish-gray, and tan clay; subordinate beds of fine-sands and fine-grained lignite. Supplies water to some small-capacity wells. Generally considered to be of low permeability and to confine water in Memphis Sand. Absent in southeastern part of Memphis area.
Fine to coarse sand; subordinate lenses of clay and minor amounts of lignite. Thick clay bed locally in lower part; coarse sand lenses locally at base. Very good aquifer supplying over 98 percent of water used in Memphis area.
Gray, greenish-gray, and brown carbonaceous clay. Locally contains fine-sand lenses and some lignite. Serves as lower confining bed for Memphis Sand and upper confining bed for Fort Pillow Sand.
Fine- to medium-grained sand; minor amounts of lignite and some clay lenses. Second most important aquifer but supplies less than 2 percent of water used in Memphis area.
Gray, greenish-gray, and brown carbonaceous clay. Contains some lignite and is sandy near top. Lower confining bed for water in Fort Pillow Sand.

Pleistocene and Pliocene (?) fluvial (terrace) deposits, consisting primarily of sand and gravel, overlie the Jackson and upper part of the Claiborne (table 1). The fluvial deposits and the Holocene and Pleistocene alluvium which underlies the flood plains of streams, are the unconfined aquifers in the Memphis area.

TEST WELLS

LOCATIONS AND DESCRIPTIONS

The nine monitor wells installed in the alluvium as part of this and previous investigations are located down-gradient and immediately adjacent to fill areas along presumed pathways of ground-water flow toward the Wolf River. Figure 2 shows the locations of all the monitor wells sampled during this investigation. Figure 3 shows the locations of the nine alluvium wells in the Hollywood Dump. Wells Sh:P-121, Sh;P-122, Sh:P-123, and Sh:P-127 (fig. 3) are shallow wells, screened in the upper part of the Wolf River alluvium. A description of each of these wells is given in Parks and others (1982). Wells Sh:P-135, Sh:P-136, Sh:P-137, Sh:P-138, and Sh:P-140 (fig. 3), which were drilled for the present investigation, are screened in the lower part of the Wolf River alluvium. These wells were constructed so that they obtain water from just above a clay layer at the top of the "capping clay" (Jackson Formation and upper part of the Claiborne Group) separating the alluvium from the Memphis Sand (table 1). This water may contain contaminants that have concentrated there because of their density or by selective filtration of water passing into and through the underlying low permeability clay.

Well Sh:P-135 was installed near the northwest corner of the dump in an area where barrels containing pesticide residue had been buried at depths of a few feet. These barrels were removed in early 1980. This well is close (about 10 feet) to well Sh:P-121, but is screened about 15 feet deeper.

Well Sh:P-136 was installed near the southwest corner of the dump, adjacent to the so-called "endrin pit" where pesticide residue is reported to have been buried. This well is close (about 20 feet) to well Sh:P-122, but is screened 30 feet deeper.

Well Sh:P-137 was installed near the north edge of the dump, west of the Hollywood Street bridge, in an old channel of the Wolf River recognized on aerial photographs of the area taken before dumping began. It was thought that the old channel might be filled with coarse sediments that would provide a preferential route for contaminants to move from the fill areas towards the Wolf River.

Well Sh:P-138 was installed near the north edge of the dump, east of the Hollywood Street bridge, between the dump and the Wolf River to intercept water moving from fill areas towards an abandoned sand and gravel dredge pond.

Well Sh:P-140 was installed near the southeast corner of the dump to intercept water moving from fill areas towards an abandoned sand and gravel dredge pond.

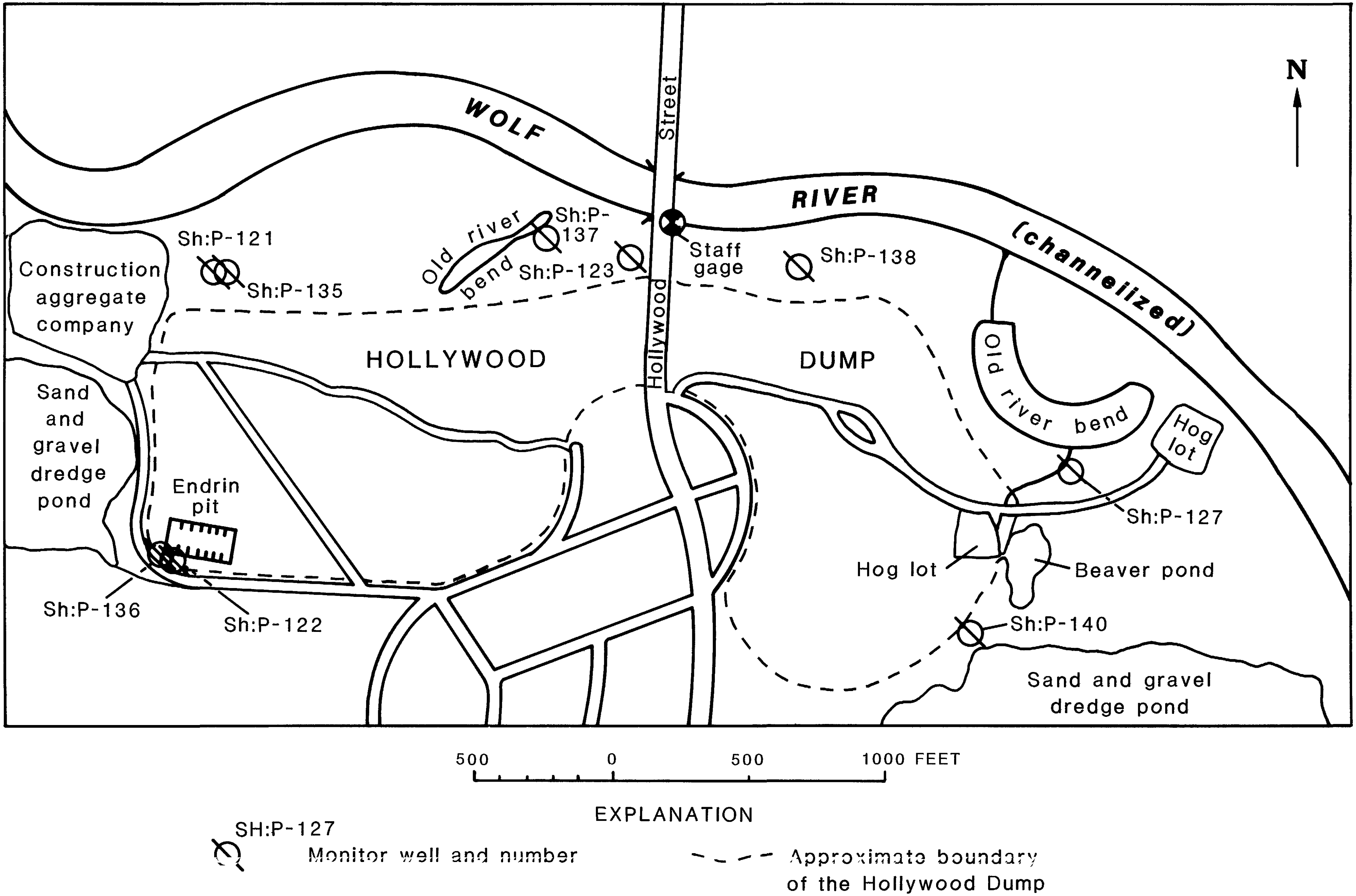


Figure 3.--The Hollywood Dump with locations of Wolf River alluvium monitor wells and the Wolf River staff gage.

Well Sh:P-144 (fig. 2) is located in the upland area south of the dump and screened in the fluvial (terrace) deposits. In the area of the dump, the fluvial deposits are thought to be in hydraulic connection with the Wolf River alluvium. Well Sh:P-144 is upgradient from the Hollywood Dump in the presumed direction of ground-water flow. Wells Sh:P-124, Sh:P-145, and Sh:P-146 (fig. 2) are screened in the artesian aquifer of the Memphis Sand. Table 2 gives information concerning the construction of all of the wells sampled during this investigation.

INSTALLATION

Wells Sh:P-121, Sh:P-122, Sh:P-123, and Sh:P-127 were installed prior to this investigation using a hollow-stem auger (Parks and others, 1982). Drilling fluid was not used. The casing and screen were emplaced through the stem of the auger and the formation was allowed to cave around the screen when the auger was withdrawn. A seal formed from bentonite pellets was emplaced several feet above the screens of each of the shallow-aquifer monitor wells to prevent downward migration of fluids in the annular space around the well pipe. The annular space remaining in each well above the bentonite layer was filled with a mixture of sand and cement (cement grout). To minimize the possibility of contamination between drilling sites, the following precautions were taken when drilling with the hollow stem auger:

(1) The auger was cleaned initially with a wire brush and water;
(2) the auger was steam cleaned inside and outside;
(3) the auger was rinsed with hexane or acetone; and
(4) the stainless steel well points and riser pipe were rinsed with hexane or acetone.

During this investigation, well Sh:P-144 was installed for the City of Memphis by a private firm using these same procedures.

Initial attempts were made to install the five new wells for this investigation by using the hollow-stem auger method of drilling. It was difficult to obtain representative lithologic samples during drilling, and it was impractical to obtain split-spoon samples because the stem of the auger became plugged. Plugging of the hollow auger stem also made emplacement of the casing and screen difficult or impossible.

As a consequence, wells Sh:P-135, Sh:P-136, Sh:P-137, Sh:P-138, and Sh:P-140 were installed using the hydraulic rotary method of drilling. Bentonite mixed with tap water made up the drilling fluid. The use of the hydraulic rotary method of drilling allowed split-spoon samples to be taken every five feet and geophysical logs to be run in the open hole before the casing and screen were installed. During drilling the following precautions were taken:

(1) the drill bit was cleaned initially with a wire brush and water;
(2) the drill bit was rinsed with acetone;
(3) the drilling fluid was sampled periodically during drilling and analyzed later by other agencies to determine if selected organic compounds had contaminated the fluid and had been circulated to greater depths in the borehole; and

Table 2.--Construction details of wells sampled in or near the Hollywood Dump

Well No.	Aquifer	Latitude-longitude	Land surface elevation (feet above NGVD of 1929)	Screened interval (feet below land surface)	Bentonite seal (feet below land surface)	Measuring point (feet above land surface)	Drilling method used for installation	Yield (gallons per minute)
Sh:P-121	Wolf River alluvium.	3511120895851	220.2	19-24	12	0.9	hollow stem auger.	15
SH:P-122	Wolf River alluvium.	3511030895853	217.9	14-19	2 (grout)	0.7	hollow stem auger.	60
Sh:P-123	Wolf River alluvium.	3511150895833	219.4	24-29	10	0.8	hollow stem auger.	50
Sh:P-127	Wolf River alluvium.	3511060895815	218.7	21-26		2.4	hollow stem auger.	50
SH:P-135	Wolf River alluvium.	3511110895851	221.5	35-40	28	1.4	hydraulic rotary.	15
SH:P-136	Wolf River alluvium.	3511030895853	220.6	44-49	20	0.8	hydraulic rotary.	10
Sh:P-137	Wolf River alluvium.	3511160895837	214.1	25-30	13	1.4	hydraulic rotary.	50
Sh:P-138	Wolf River alluvium.	3511110895824	213.5	24-29	18	1.6	hydraulic rotary.	30
Sh:P-140	Wolf River alluvium.	3511010895820	221	35-40	31	1.3	hydraulic rotary.	30
Sh:P-144	fluvial (terrace) deposits.	3510400895828	245	70-75	28	1.5	hollow stem auger.	-
Sh:P-124	Memphis Sand.	3510350895805	245	400-460	-	-	hydraulic rotary.	-
Sh:P-145	Memphis Sand.	3510230895956	235	-540 (screen length not known)	- -	- -	hydraulic rotary.	- -
Sh:P-146	Memphis Sand.	3509260895949	255	429-509	-	-	hydraulic rotary.	-

(4) the stainless steel well points and riser pipe were rinsed with acetone before installation.

All of the shallow monitor wells at the Hollywood Dump are constructed of 2-inch-diameter, 5-foot-long, stainless-steel well points (slot size 0.010 inch) and the required amount of 2-inch diameter stainless steel casing. A schematic diagram of the construction details of the shallow monitor wells is shown in figure 4.

DEVELOPMENT

After the five alluvium monitor wells installed for this investigation (Sh:P-135, Sh:P-136, Sh:P-137, Sh:P-138, and Sh:P-140) were completed they required development to increase yields and to clear the water of drilling fluid and formation sediment. These wells were developed by (1) injecting and surging air through the well screen using an air compressor and (2) surging and pumping the well at the highest rate possible using a centrifugal pump.

All of the wells installed in the Wolf River alluvium had water levels and yields high enough to permit well development by pumping each for several hours with a centrifugal pump, after about 8 hours of injecting and surging air through the well screen. Well Sh:P-144, installed in the fluvial deposits, required about 16 hours of development with air and could not be pumped with a centrifugal pump because of the low water level.

Each well was developed about a week before initial water-quality sampling. No additional development was required for subsequent sampling. A centrifugal pump was used to remove stagnant water from each of the alluvium wells prior to sampling. A small capacity submersible pump was used to remove stagnant water from well Sh:P-144 prior to sampling.

The procedures used to develop wells Sh:P-121, Sh:P-122, Sh:P-123, and Sh:P-127 are described in Parks and others (1982).

DRILLER'S AND GEOPHYSICAL LOGS

The sediments penetrated by the five wells drilled for this phase of the study consisted of sand, gravel, silt and clay. Some fill material (trash) was encountered in the upper parts of the holes drilled for wells Sh:P-135, Sh:P-136 and Sh:P-137. Driller's and geophysical logs were made for each of the holes drilled. These logs and the geologic formations interpreted from them are shown in figures 5-9.

Electric and natural-gamma logs were run in each of the new monitor wells to verify and supplement the sample descriptions provided by the driller and to provide a continuous graphic record of each borehole. Reproduction of the logs run are shown in figures 5-9. These logs were used for qualitative interpretation of the geologic formations penetrated at the site. All of the logs were run in uncased boreholes filled with bentonite drilling fluid. An explanation of the specific types of logs run is given below:

Two types of electric logs were run, SP (spontaneous-potential) and point resistance. SP logs are records of natural electric currents developed between

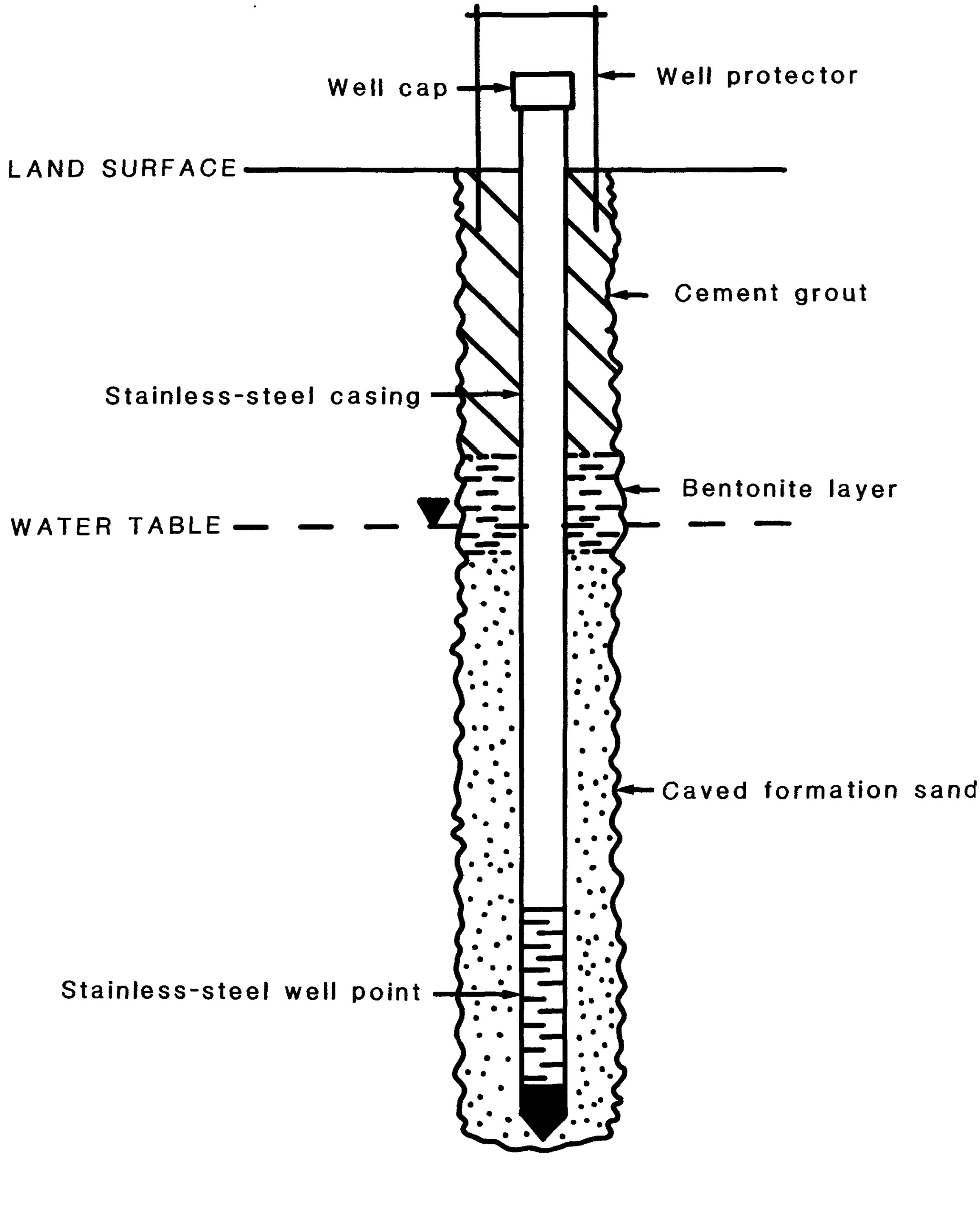


Figure 4.--Schematic diagram showing construction details of the Wolf River alluvium and fluvial (terrace) deposits monitor wells.

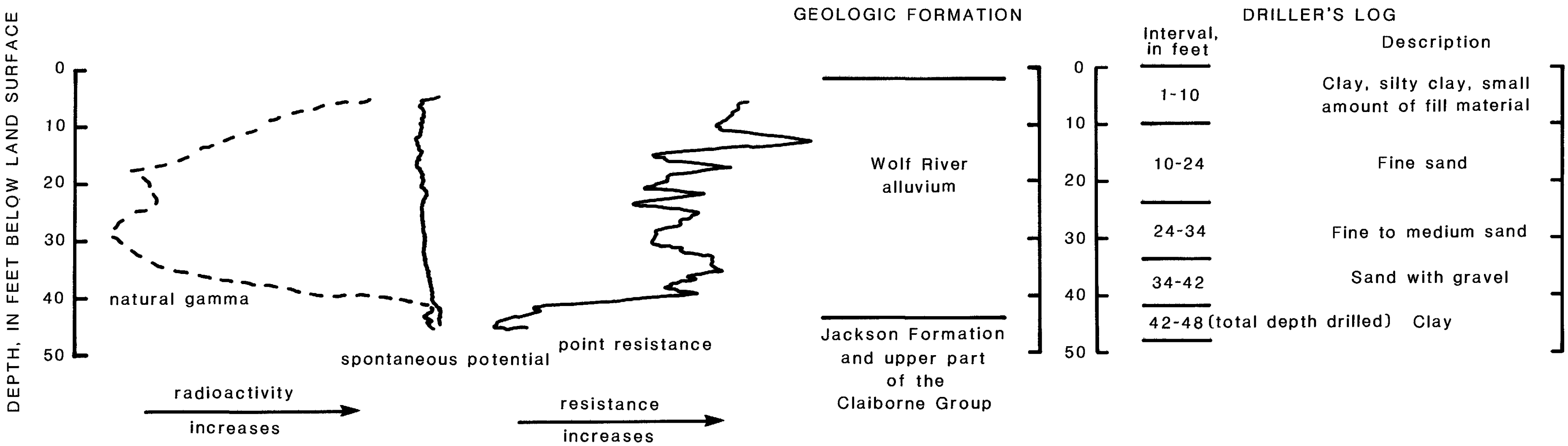


Figure 5.--Geophysical logs and driller's log of well Sh:P-135 and geologic formations penetrated.

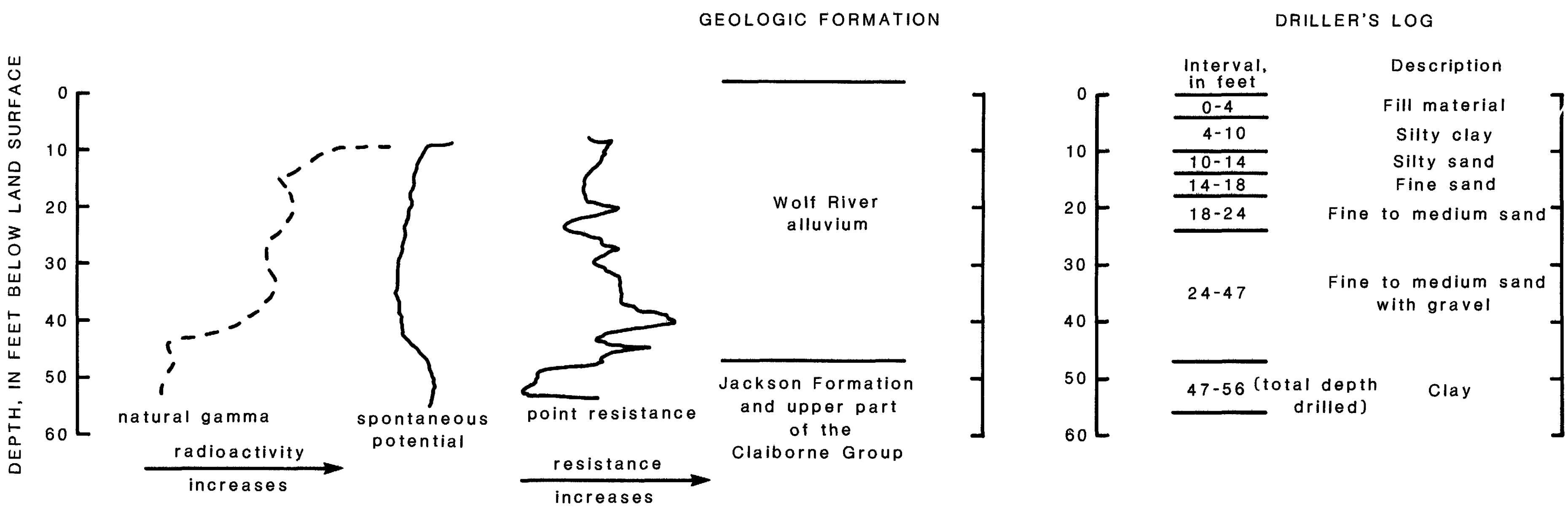


Figure 6.--Geophysical logs and driller's log of well Sh:P-136 and geologic formations penetrated.

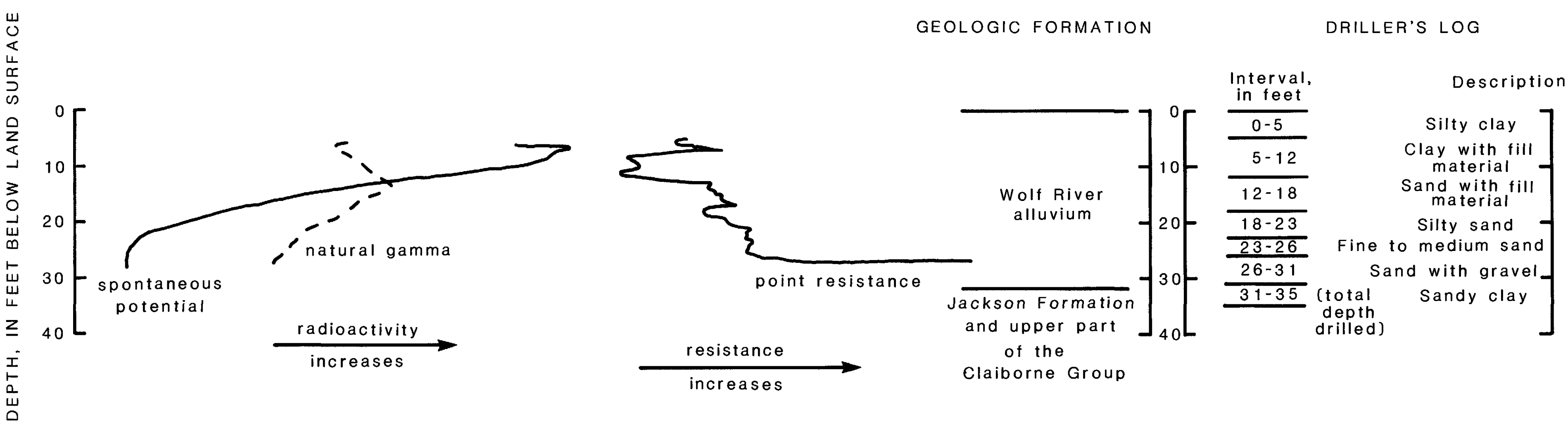


Figure 7.--Geophysical logs and driller's log of well Sh:P-137 and geologic formations penetrated.

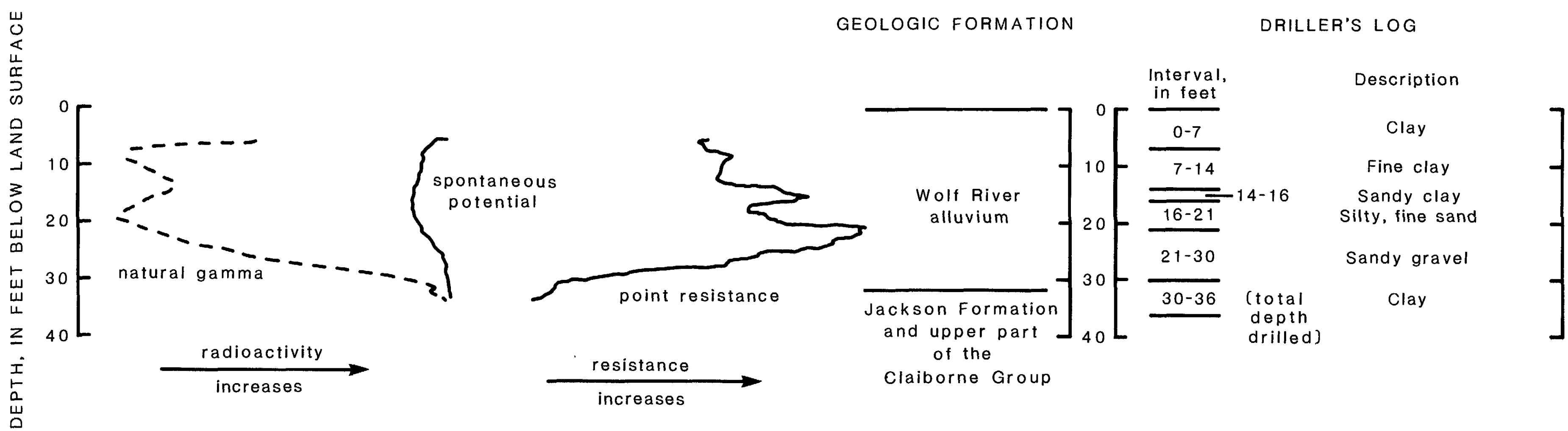


Figure 8.--Geophysical logs and driller's log of well Sh:P-138 and geologic formations penetrated.

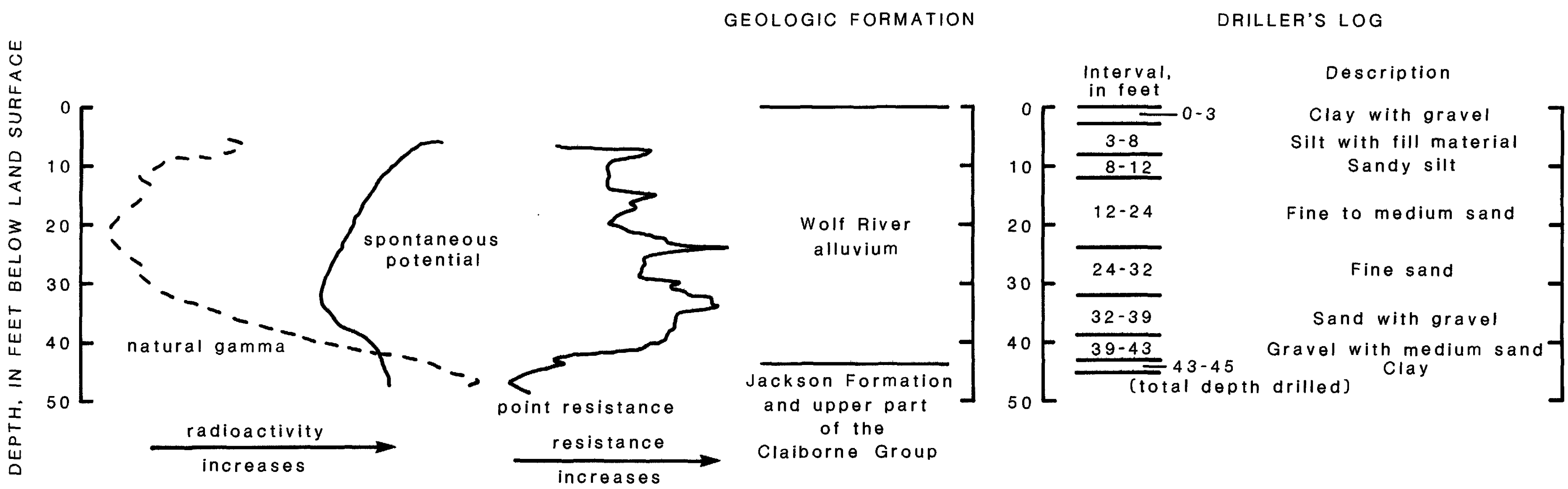


Figure 9.--Geophysical logs and driller's log of well Sh:P-140 and geologic formations penetrated.

the borehole fluid and the surrounding strata. These natural currents occur at the junction of dissimilar materials in the borehole. SP logs can be affected by variation in borehole size, the movement of water in the borehole, the presence of nearby pipelines and interference caused by the operation of drill-rig mud pumps and generators. On the SP logs provided (figs. 5-9) clay shows as a deflection of the trace to the right on the charts; sand shows as a deflection to the left.

Resistance logs are records of the apparent electrical resistance of the earth materials lying between an inhole electrode and a surface electrode. Clay formations show relatively low resistance to the passage of electricity; sand formations saturated with fresh water show relatively high resistance. The interpretation of resistance logs is affected by many conditions, including borehole diameter, type of fluid in the hole, the conductivity of the formation water and the porosity of the formation. On the resistance logs provided (figs. 5-9), clay shows as a deflection of the trace to the left on the charts; sand shows as a deflection to the right.

Natural-gamma logs are records of the amount of naturally occurring gamma radiation that is emitted by all rocks. In general the natural gamma activity of clays is higher than that of quartz sands. On the gamma-ray logs provided (figs. 5-9), clay shows as a deflection of the trace to the right on the charts; sand shows as a deflection to the left.

The geophysical logs of wells Sh:P-135, Sh:P-136, Sh:P-137, Sh:P-138 and Sh:P-140, supplemented by driller's logs of these wells, indicate the presence of thin layers of materials of low hydraulic conductivity--clay and silt--near the surface with layers of materials of higher hydraulic conductivity--fine to medium sand--below them (fig. 5-9). The logs of wells Sh:P-135, Sh:P-136, Sh:P-138 and Sh:P-140 also indicate a clay layer at the bottom of each of these bore holes. The driller's log of well Sh:P-137 (fig. 7) indicates a sandy clay at the bottom of the borehole. The lower part of this hole collapsed before geophysical logging could be completed so the clay is not shown by the electric and gamma-ray logs.

Descriptions of the materials penetrated when wells Sh:P-121, Sh:P-122, Sh:P-123 and Sh:P-127 were drilled are given by Parks and others (1982). Their descriptions are based on cuttings returned to the surface with an auger. No geophysical logs were made of these wells.

WATER LEVELS

Water-level measurements were made in each of the nine wells discussed in the previous section before each sampling. In addition, a staff gage on the Wolf River was read on a monthly basis and monthly water-level measurements were made in each monitor well. Water levels in the monitor wells generally are higher than and vary directly with the stage of the Wolf River. Hydrographs of wells Sh:P-138 and Sh:P-140 and of the Wolf River illustrating this relationship are shown in figure 10. The Wolf River at this location, is subject to extended periods of backwater from the Mississippi River. Several of the monitor wells were submerged by the Wolf River at times during the study. There were no indications that river water entered these wells directly through the well casings. The wells are capped and have protective, removable stainless steel liners which would fill if water entered from the top of the well.

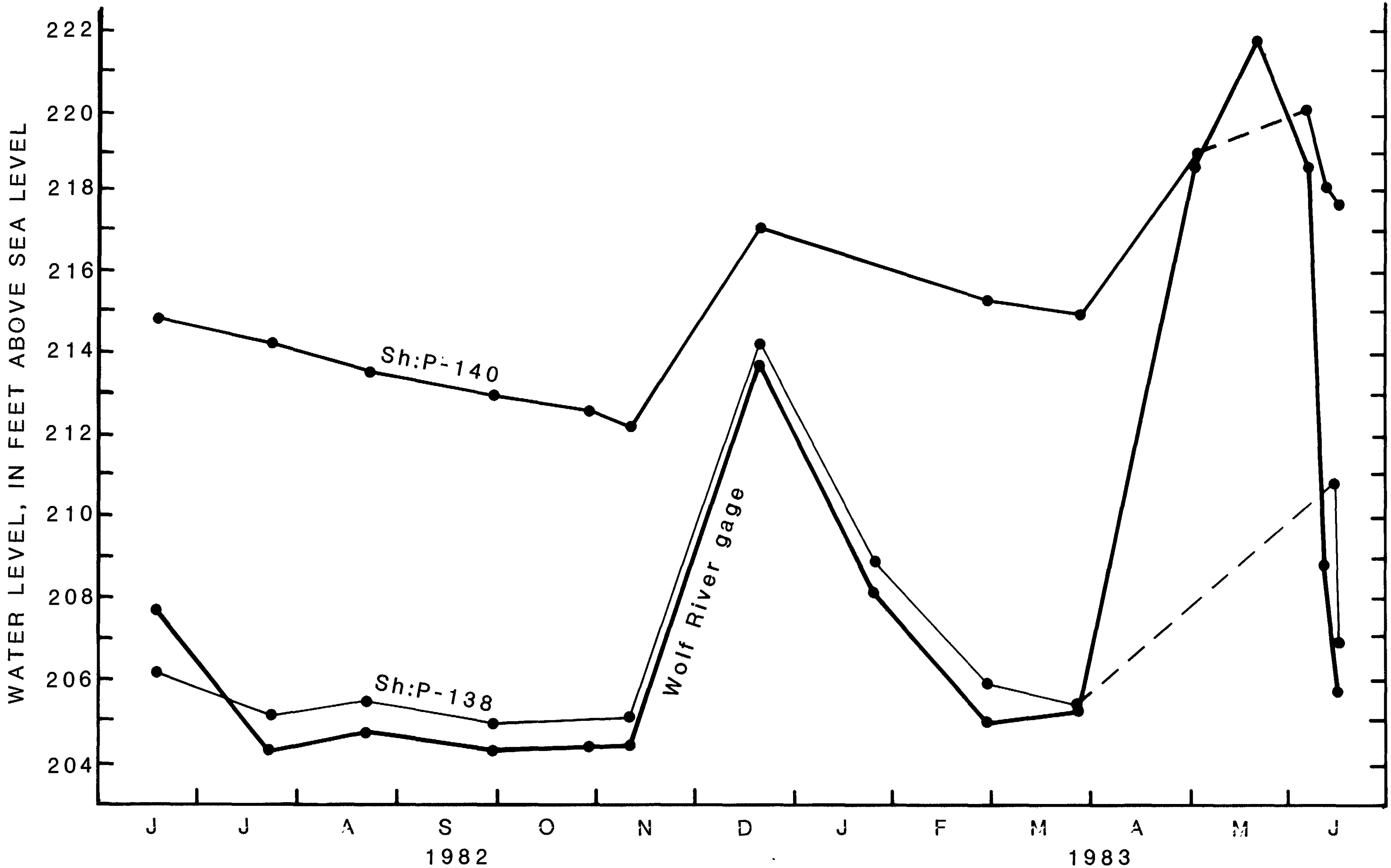


Figure 10.--Hydrographs of Wolf River alluvium wells Sh:P-138 and Sh:P-140 and of the Wolf River.

WATER QUALITY

SAMPLING PROCEDURES

Water samples were collected in June 1982, September 1982, February 1983, and June 1983. All wells except Sh:P-144 were sampled during June and September 1982. Sh:P-144 was vandalized and had to be redrilled before it could be sampled. All wells except Sh:P-124 were sampled in February and June 1983. Sh:P-124, an industrial well screened in the Memphis Sand, was not sampled during June 1983. A maintenance shut-down prevented the well from being pumped for a sufficient length of time to completely evacuate stagnant water.

All shallow monitor wells were pumped for a short period of time before sampling to remove stagnant water from the well casing and from the area around the screen. The intake hose of a centrifugal pump was attached directly to the top of the casing of each well. The pump was primed either with tap water or with deionized water. Little, if any of this priming water flowed into the wells. The pump discharge was directed away from the area of the well. The wells were pumped for about 15 minutes before sampling. Estimates of well yields (table 2) were made by measuring the time it took to fill a 2-gallon container.

Water levels in well Sh:P-144 exceeded the limits of suction lift, making use of a centrifugal pump impossible. This well was pumped using a submersible sampling pump. No realistic estimate of well yield for this well could be made because of the limited capacity of the pump. Three 15-minute pumping periods were used to evacuate the well before samples were taken. The pump intake was first positioned near the top of the water column and then gradually lowered in the well as pumping progressed. Water samples taken from wells Sh:P-122 and Sh:P-136 in February 1983, were also collected using this pumping procedure.

Temperature and specific conductance were measured periodically during the pumping periods to verify that these properties had stabilized before sampling was conducted.

Samples were collected using a stainless steel bailer equipped with a teflon ball check-valve at the lower end. The bailer was cleaned with pesticide-grade acetone and deionized water before each use. Additional equipment rinse was accomplished by discharging the first three bailer fulls of well water before samples were collected.

Water from wells in the Memphis Sand was obtained directly from the discharge lines of production wells equipped with high capacity, turbine pumps. Wells were pumped at rates exceeding 500 gal/min (estimate) for a minimum of several hours before sampling.

Temperature, specific conductance, pH and alkalinity were measured at the wells. Water samples for laboratory analyses were collected in either plastic or glass bottles, as appropriate for the constituents and properties to be determined. All bottles were labeled and treated as required by standard U.S. Geological Survey procedures. These bottles were chilled in ice chests which were then sealed and shipped on the day of sampling to the Survey laboratory in Atlanta.

Concentrations of trace constituents and of the organic compounds included in the EPA's list of priority pollutants were determined. The aroclors (PCB's) and the acid extractable compounds were only determined for samples collected in June and September 1982.

To provide additional quality-assurance measures for the water-quality data, duplicate samples were provided, when requested, to TAG for independent chemical analyses.

WATER-QUALITY DATA

Water-quality data collected during June and September 1982 have been published (Lowery and others, 1983). Water-quality data collected during February and June 1983 are available from the U.S. Geological Survey computer files. The minimum, median and maximum values of selected constituents and properties in water from the Wolf River alluvium, fluvial deposits and Memphis Sand in and near the Hollywood Dump are summarized in table 3.

WOLF RIVER ALLUVIUM

Specific conductance values for water from the nine monitor wells in the Wolf River alluvium ranged from 420 to 2,500 micromhos per centimeter (μmhos/cm). The highest conductance values occurred in water from wells Sh:P-121 and Sh:P-135, ranging from 1,900 to 2,500 μmhos/cm. The specific conductance of water from well Sh:P-137 ranged from 1,100 to 1,600 μmhos. Water from Sh:P-121, Sh:P-135, and Sh:P-137 had higher alkalinity concentrations than water from other Wolf River alluvium wells, ranging from 460 to 910 milligrams per liter (mg/L).

Barium concentrations exceeding 1,000 micrograms per liter (μg/L), the maximum contaminant level specified by EPA (1976), were found in water from wells Sh:P-121 and Sh:P-135. The highest concentration of total barium, 3,000 μg/L, was found in well Sh:P-121. The highest concentration of dissolved barium, 2,000 μg/L, was also found in this well. Arsenic concentrations exceeding 50 μg/L, the maximum contaminant level specified by EPA (1976), were found in water from wells Sh:P-123 and Sh:P-135. The highest concentration of total arsenic, 450 μg/L, was found in water from well Sh:P-135; the concentration of dissolved arsenic was 190 μg/L in water from this well. Concentrations of all other trace inorganic constituents in water from the alluvial wells were below the levels established by EPA (1976 and 1979) for primary or secondary contaminants.

The following organic compounds were found in water from alluvium wells: n-butyl benzyl phthalate, chlorobenzene, 2-nitro phenol, di-n-octyl phthalate, aldrin, DDT, endrin, heptachlor, heptachlor epoxide, chlordane isomers and related compounds (including alpha chlordane, gamma chlordane and transnonochlor), chlordene, isodrin, toluene, 2-ethyl hexyl phthalate, beta BHC and heptachloronorbornene. Concentrations of 2-nitro phenol, aldrin and isodrin, were reported in concentrations that are only slightly above detection levels. Concentrations of chlordane and heptachlor were found in at least one of the samples taken from each of the alluvium wells. Table 4 shows the organic compounds found in water from the Wolf River alluvium wells, along with detection limits and the highest concentration reported for each well in which the compound was found.

Table 3.--Minimum, maximum, and median values observed for selected properties and constituents of water from wells sampled in or near the Hollywood Dump from June 1982 to June 1983

Aquifer		Specific conductance (µmhos)	pH (standard units)	Alkalinity field (mg/L as CaCO3)	Cyanide, total (mg/L as CN)	Hardness (mg/L as CaCO3)	Hardness, noncarbonate (mg/L CaCO3)	Calcium, dissolved (mg/L as Ca)	Magnesium, dissolved (mg/L as Mg)	Arsenic, dissolved (µg/L as As)	Arsenic, total (µg/L as As)
Wolf River alluvium (nine wells sampled four times each).	Min	420	6.1	140	<.01	150	0	32	16	1	2
	Med	740	6.5	260	<.01	250	0	61	26	3	4
	Max	2,500	6.8	910	<.01	480	41	99	55	190	450
Fluvial deposits (one well sampled twice).	Min	350	6.3	140	<.01	-	-	-	-	-	1
	Max	460	6.6	160	<.01	-	-	-	-	-	3
Memphis Sand (two wells sampled four times each and one well sampled three times).	Min	120	5.9	52	<.01	40	0	9.3	4.1	1	<1
	Med	145	6.3	66	<.01	53	0	12	5.5	1	1
	Max	180	6.6	89	.03	74	0	17	6.9	1	1

Aquifer		Barium, dissolved (µg/L as Ba)	Barium, total recoverable (µg/L as Ba)	Beryllium, dissolved (µg/L as Be)	Beryllium, total recoverable (µg/L as Be)	Cadmium, dissolved (µg/L as Cd)	Cadmium, total recoverable (µg/L as Cd)	Chromium, dissolved (µg/L as Cr)	Chromium, total recoverable (µg/L as Cr)	Copper, dissolved (µg/L as Cu)	Copper, total recoverable (µg/L as Cu)
Alluvium	Min	90	100	<1	<10	<1	1	<10	10	<1	7
	Med	180	200	<1	<10	<1	2	10	30	2	28
	Max	2,000	3,000	<10	<10	2	3	30	40	11	52
Fluvial deposits	Min	-	200	-	<10	-	4	-	-	-	17
	Max	-	200	-	<10	-	7	-	-	-	34
Memphis Sand	Min	38	<100	<1	<10	<1	1	10	10	1	4
	Med	75	<100	<1	<10	<1	1	10	10	2	5
	Max	120	200	<1	<10	<1	1	20	20	9	9

Table 3.--Minimum, maximum, and median values observed for selected properties and constituents of water from wells sampled in or near the Hollywood Dump from June 1982 to June 1983--Continued

Aquifer		Lead, dis-solved (µg/L as Pb)	Lead total recov-erable (µg/L as Pb)	Mercury dis-solved (µg/L as Hg)	Mercury, total recov-erable (µg/L as Hg)	Nickel, dis-solved (µg/L as Ni)	Nickel, total recov-erable (µg/L as Ni)	Silver, dis-solved (µg/L as Ag)	Silver, total recov-erable (µg/L as Ag)	Strontium, dis-solved (µg/L as Sr)	Zinc, dis-solved (µg/L as Zn)
Alluvium	Min	<1	6	<.1	<.1	<1	4	<1	<1	160	<4
	Med	3	16	<.1	.1	2	13	<1	<1	195	8
	Max	13	35	.3	1.2	25	24	<1	2	700	45
Fluvial deposits	Min	-	18	-	-	-	17	-	<1	-	-
	Max	-	20	-	-	-	18	-	<1	-	-
Memphis Sand	Min	<1	3	<.1	<.1	<1	1	<1	<1	21	<4
	Med	1	3	<.1	.1	1	2	<1	<1	57	<4
	Max	2	4	<.1	.1	4	4	<1	<1	87	5

Aquifer		Zinc, total recov-erable (µg/L as Zn)	Anti-mony, dis-solved (µg/L as Sb)	Anti-mony, total (µg/L as Sb)	Sele-nium, dis-solved (µg/L as Se)	Sele-nium, total (µg/L as Se)	Di-chloro-bromo-methane, total (µg/L)	Carbon-tetra-chlo-ride, total (µg/L)	1,2-Di-chloro-ethane, total (µg/L)	Bromo-form, total (µg/L)	Chloro-di-bromo-methane, total (µg/L)
Alluvium	Min	40	<1	<1	<1	<1	<1.0	<1.0	<1.0	<1.0	<1.0
	Med	110	<1	<1	<1	<1	<1.0	<1.0	<1.0	<1.0	<1.0
	Max	320	-	<1	7	-	<1.0	<1.0	<1.0	<1.0	<1.0
Fluvial deposits	Min	90	-	<1	-	<1	<1.0	<1.0	<1.0	<1.0	<1.0
	Max	160	-	<1	-	<1	<1.0	<1.0	<1.0	<1.0	<1.0
Memphis Sand	Min	10	<1	<1	<1	<1	<1.0	<1.0	<1.0	<1.0	<1.0
	Med	20	<1	<1	<1	<1	<1.0	<1.0	<1.0	<1.0	<1.0
	Max	30	<1	<1	<1	<1	<1.0	<1.0	<1.0	<1.0	<1.0

Table 3.--Minimum, maximum, and median values observed for selected properties and constituents of water from wells sampled in or near the Hollywood Dump from June 1982 to June 1983--Continued

Aquifer		Chloroform, total (μg/L)	Toluene, total (μg/L)	Benzene, total (μg/L)	Acenaphthylene, total (μg/L)	Acenaphthene, total (μg/L)	Anthracene, total (μg/L)	Benzo B fluoranthene, total (μg/L)	Benzo K fluoranthene, total (μg/L)	Benzo-a-pyrene, total (μg/L)	Bis 2-Chloroethyl ether, total (μg/L)
Alluvium	Min	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
	Med	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
	Max	<1.0	2.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Fluvial deposits	Min	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
	Max	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Memphis Sand	Min	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
	Med	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
	Max	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0

Aquifer		Bis (2-Chloroethoxy) methane, total (μg/L)	Bis (2-Chloroisopropyl) ether, total (μg/L)	n-Butyl benzyl phthalate, total (μg/L)	Chlorobenzene, total (μg/L)	Chloroethane, total (μg/L)	Chrysene total (μg/L)	Diethyl phthalate, total (μg/L)	Dimethyl phthalate total (μg/L)	Ethylbenzene total (μg/L)	Fluoranthene total (μg/L)
Alluvium	Min	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
	Med	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
	Max	<1.0	<1.0	12.0	5.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Fluvial deposits	Min	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
	Max	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	8.0	2.0	<1.0	<1.0
Memphis Sand	Min	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
	Med	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
	Max	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0

Table 3.--Minimum, maximum, and median values observed for selected properties and constituents of water from wells sampled in or near the Hollywood Dump from June 1982 to June 1983--Continued

Aquifer		Fluorene, total (μg/L)	Hexachlorocyclopentadiene, total (μg/L)	Hexachloroethane, total (μg/L)	Indeno (1,2,3-cd) pyrene, total (μg/L)	Isophorone, total (μg/L)	Methylbromide, total (μg/L)	Methylene-chloride, total (μg/L)	N-nitrosodi-n-propylamine, total (μg/L)	N-nitrosodiphenylamine, total (μg/L)	N-nitrosodimethylamine, total (μg/L)
Alluvium	Min	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
	Med	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
	Max	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Fluvial deposits	Min	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
	Max	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Memphis Sand	Min	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
	Med	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
	Max	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0

Aquifer		Nitrobenzene, total (μg/L)	Parachlorometa cresol, total (μg/L)	Phenanthrene, total (μg/L)	Pyrene, total (μg/L)	Tetrachloroethylene, total (μg/L)	Trichloroflouromethane, total (μg/L)	1,1-Dichloroethane, total (μg/L)	1,1-Dichloroethylene total (μg/L)	1,1,1-Trichloroethane, total (μg/L)	1,1,2-Trichloroethane, total (μg/L)
Alluvium	Min	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
	Med	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
	Max	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Fluvial deposits	Min	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
	Max	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Memphis Sand	Min	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
	Med	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
	Max	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0

Table 3.--Minimum, maximum, and median values observed for selected properties and constituents of water from wells sampled in or near the Hollywood Dump from June 1982 to June 1983--Continued

Aquifer		1,1,2,2 Tetra-chloro-ethane, total (μg/L)	Benzo(g,h,i)peryl-ene 1,12 benzo-perylene, total (μg/L)	Benzo(a) anthra-cene 1,2-benzan-thracene, total (μg/L)	1,2-Di-chloro-benzene, total (μg/L)	1,2-Di-chloro-propane, total (μg/L)	Chloro-ethyl-ene, total (μg/L)	1,2,4-Tri-chloro-benzene, total (μg/L)	1,2,5-dibenz-anthra-cene, total (μg/L)	1,3-Di-chloro-propane, total (μg/L)	1,3-Di-chloro-benzene, total (μg/L)
Alluvium	Min	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
	Med	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
	Max	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Fluvial deposits	Min	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
	Max	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Memphis Sand	Min	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
	Med	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
	Max	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0

Aquifer		1,4-Di-chloro-benzene, total (μg/L)	2-Chloro-ethyl-vinyl-ether, total (μg/L)	2-Chloro-naph-thalene, total (μg/L)	2-Chloro-phenol, total (μg/L)	2-Nitro-phenol, total (μg/L)	Di-n-octyl phthal-ate, total (μg/L)	2,4-Di-chloro-phenol, total (μg/L)	2,4-Di-methyl-phenol, total (μg/L)	2,4-Di-nitro-toluene, total (μg/L)	2,4-Di-nitro-phenol, total (μg/L)
Alluvium	Min	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
	Med	<1.0	<1.0	<1.0	<1.0	<1.0	1.0	<1.0	<1.0	<1.0	<1.0
	Max	<1.0	<1.0	<1.0	<1.0	2.0	14	<1.0	<1.0	<1.0	<1.0
Fluvial deposits	Min	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
	Max	<1.0	<1.0	<1.0	<1.0	<1.0	56	<1.0	<1.0	<1.0	<1.0
Memphis Sand	Min	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
	Med	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
	Max	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0

Table 3.--Minimum, maximum, and median values observed for selected properties and constituents of water from wells sampled in or near the Hollywood Dump from June 1982 to June 1983--Continued

Aquifer		2,4,6-Tri-chloro-phenol, total (µg/L)	2,6-Di-nitro-toluene, total (µg/L)	3,3-Di-chloro-benzi-dine, total (µg/L)	4 Bromo-phenyl phenyl ether, total (µg/L)	4 Chloro-phenyl phenyl ether, total (µg/L)	4-Nitro-phenol, total (µg/L)	4,6-Dinitro-ortho-cresol, total (µg/L)	Di-Chloro-di-fluoro-methane, total (µg/L)	Aroclor 1016 PCB, total (µg/L)	2,3,7,8 Tetrachlo-rodi-benzo-P-dioxin, total (µg/L)
Alluvium	Min	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
	Med	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
	Max	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Fluvial deposits	Min	<1.0	<1.0	<1.0	<1.0	<1.0	-	-	<1.0	-	<1.0
	Max	<1.0	<1.0	<1.0	<1.0	<1.0	-	-	<1.0	-	<1.0
Memphis Sand	Min	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
	Med	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
	Max	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0

Aquifer		Phenol, total (µg/L)	Naphth-alene, total (µg/L)	Penta-chloro-phenol, total (µg/L)	Per-thane, total (µg/L)	Bis(2-ethyl hexyl) phthalate, total (µg/L)	Di-n-butyl phthal-ate, total (µg/L)	Benzi-dine, total (µg/L)	Vinyl chlo-ride, total (µg/L)	Tri-chloro-ethyl-ene, total (µg/L)	Naphtha-lenes, poly-chlor, total (µg/L)
Alluvium	Min	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
	Med	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
	Max	<1.0	<1.0	<1.0	<1.0	18	<1.0	<1.0	<1.0	<1.0	<1.0
Fluvial deposits	Min	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
	Max	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Memphis Sand	Min	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
	Med	<1.0	<1.0	<1.0	<1.0	<1.0.	<1.0	<1.0	<1.0	<1.0	<1.0
	Max	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0

Table 3.--Minimum, maximum, and median values observed for selected properties and constituents of water from wells sampled in or near the Hollywood Dump from June 1982 to June 1983--Continued

Aquifer		Aldrin, total (µg/L)	Lindane, total (µg/L)	DDD, total (µg/L)	DDE, total (µg/L)	DDT, total (µg/L)	Di-Eldrin, total (µg/L)	Endo-sulfan, total (µg/L)	Endrin, total (µg/L)	Tox-aphene, total (µg/L)	Hepta-chlor, total (µg/L)
Alluvium	Min	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<1	<.01
	Med	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<1	.04
	Max	.02	<.01	<.01	<.01	.06	<.01	<.01	.12	<1	1.1
Fluvial deposits	Min	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<1	.02
	Max	<.01	<.01	<.01	<.01	<.01	<.01	<.01	.04	<1	.04
Memphis Sand	Min	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<1	<.01
	Med	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<1	<.01
	Max	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<1	<.01

Aquifer		Hepta-chlor epoxide, total (µg/L)	Meth-oxy-chlor, total (µg/L)	Aroclor 1221 PCB, total (µg/L)	Aroclor 1232 PCB, total (µg/L)	Aroclor 1242 PCB, total (µg/L)	Aroclor 1248 PCB, total (µg/L)	Aroclor 1254 PCB, total (µg/L)	Aroclor 1260 PCB, total (µg/L)	PCB, total (µg/L)	Hexa-chloro-benzene, total (µg/L)
Alluvium	Min	<.01	<.01	<.1	<.1	<.1	<.1	<.1	<.1	<.1	<1.0
	Med	<.01	<.01	<.1	<.1	<.1	<.1	<.1	<.1	<.1	<1.0
	Max	.13	<.01	<.1	<.1	<.1	<.1	<.1	<.1	<.1	<1.0
Fluvial deposits	Min	<.01	<.01	-	-	-	-	-	-	<.1	<1.0
	Max	<.01	<.01	-	-	-	-	-	-	<.1	<1.0
Memphis Sand	Min	<.01	<.01	<.1	<.1	<.1	<.1	<.1	<.1	<.1	<1.0
	Med	<.01	<.01	<.1	<.1	<.1	<.1	<.1	<.1	<.1	<1.0
	Max	<.01	<.01	<.1	<.1	<.1	<.1	<.1	<.1	<.1	<1.0

Table 3.--Minimum, maximum, and median values observed for selected properties and constituents of water from wells sampled in or near the Hollywood Dump from June 1982 to June 1983--Continued

Aquifer		Hexa-chloro-but-adiene, total (μg/L)	Mirex, total (μg/L)	Alpha BHC, total (μg/L)	Beta BHC, total (μg/L)	Delta BHC, total (μg/L)	Chlor-dane, total (μg/L)	Alpha chlor-dane, total (μg/L)	Gamma chlor-dane, total (μg/L)	Trans nono-chlor, total (μg/L)	Oxy-chlor-dane, total (μg/L)
Alluvium	Min	<1.0	<.01	<.01	<.01	<.01	<.1	<.01	.01	<.01	<.01
	Med	<1.0	<.01	<.01	<.01	<.01	.2	.02	.16	<.01	<.01
	Max	<1.0	<.01	<.01	.16	<.01	2.4	.34	2.0	<.10	<.01
Fluvial deposits	Min	<1.0	<.01	<.01	<.01	<.01	<.1	<.01	.03	<.01	<.01
	Max	<1.0	<.01	<.01	<.01	<.01	.12	<.01	.12	<.01	<.01
Memphis Sand	Min	<1.0	<.01	<.01	<.01	<.01	<.1	<.01	<.01	<.01	<.01
	Med	<1.0	<.01	<.01	<.01	<.01	<.1	<.01	<.01	<.01	<.01
	Max	<1.0	<.01	<.01	<.01	<.01	<.1	<.01	<.01	<.01	<.01

Aquifer		Chlor-dene, total (μg/L)	1-Hydroxy chlor-dene, total (μg/L)	Endo-sulfan Alpha, total (μg/L)	Endo-sulfan Beta, total (μg/L)	Endo-sulfan sulfate, total (μg/L)	Endrin alde-hyde, total (μg/L)	Isodrin, total (μg/L)	Hexa-chloronor-borna-diene, total (μg/L)	Hepta-chloro-nor-bornene, total (μg/L)	Octa-chloro-cyclo-pentene, total (μg/L)
Alluvium	Min	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01
	Med	.02	<.01	<.01	<.01	<.01	<.01	<.01	<.01	.01	<.01
	Max	1.27	<.01	<.01	<.01	<.01	<.01	.02	<.01	.12	<.01
Fluvial deposits	Min	<.01	<.01	<.01	<.01	<.01	-	<.01	<.01	<.01	<.01
	Max	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01
Memphis Sand	Min	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01
	Med	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01
	Max	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01

Table 4.--Organic compounds found in water from Wolf River alluvium wells in the Hollywood Dump area from June 1982 to June 1983

Compound	Detection limit (micrograms per liter)	Wells in which detected	Highest concentration (micrograms per liter)
n-butyl benzyl phthalate	1.0	Sh:P-123	3
		Sh:P-127	12
		Sh:P-137	2
		Sh:P-138	7
chlorobenzene	1.0	Sh:P-135	5
		Sh:p-137	2
2-nitro phenol	1.0	Sh:P-127	2
di-n-octyl phthalate	1.0	Sh:P-127	14
aldrin	0.01	Sh:P-138	0.02
DDT	0.01	Sh:P-140	0.06
endrin	0.01	Sh:P-123	0.02
		Sh:P-127	0.06
		Sh:P-140	0.12
heptachlor	0.01	Sh:P-121	0.12
		Sh:P-122	0.02
		Sh:P-123	0.09
		Sh:P-127	0.02
		Sh:P-135	0.56
		Sh:P-136	0.85
		Sh:P-137	0.54
		Sh:P-138	1.1
		Sh:P-140	0.87
heptachlor epoxide	0.01	Sh:P-121	0.04
		Sh:P-123	0.01
		Sh:P-135	0.04
		Sh:P-136	0.01
		Sh:P-137	0.03
		Sh:P-140	0.13
chlordane	0.1	Sh:P-121	1.0
		Sh:P-122	0.1
		Sh:P-123	0.4
		Sh:P-127	0.2
		Sh:P-135	1.0
		Sh:p-136	0.5
		Sh:P-137	2.4
		Sh:P-138	1.3
		Sh:P-140	1.5

Table 4.--Organic compounds found in water from Wolf River alluvium wells in the Hollywood Dump area from June 1982 to June 1983--Continued

Compound	Detection limit (micrograms per liter)	Wells in which detected	Highest concentration (micrograms per liter)
Chlordene	0.01	Sh:P-121	0.01
		Sh:P-123	0.01
		Sh:P-127	0.12
		Sh:P-135	0.01
		Sh:P-136	0.01
		Sh:P-137	1.27
		Sh:P-138	0.11
		Sh:P-140	0.06
isodrin	0.01	Sh:P-127	0.02
heptachlornorbornene	0.01	Sh:P-121	0.01
		Sh:P-123	0.12
		Sh:P-127	0.05
		Sh:P-135	0.01
		Sh:P-137	0.10
		Sh:P-140	0.02
toluene	1.0	Sh:P-121	2.0
beta BHC	0.01	Sh:P-140	0.16

FLUVIAL (TERRACE) DEPOSITS

Specific conductance, pH and alkalinity values reported for the two samples taken from Sh:P-144, screened in the fluvial deposits, are all within a range that is normal for this aquifer. Specific conductance ranges from 350 to 460 μmhos/cm; pH ranges from 6.3 to 6.6 units; alkalinity ranges from 140 to 160 mg/L. Concentrations of all constituents were below the levels specified by EPA for primary or secondary contaminants (U.S. Environmental Protection Agency, 1976 and 1979). For comparison purposes, a table listing minimum, median, and maximum values of selected trace and major inorganic constituents and properties of water from the fluvial deposits and other aquifers in the Memphis area is given in Graham (1982). This table was compiled using analyses of water from wells located throughout the Memphis area.

The following organic compounds were found in samples from well Sh:P-144: diethyl phthalate (8.0 μg/L), dimethyl phthalate (2.0 μg/L), di-n-octyl phthalate (56 μg/L), heptachlor (0.02 and 0.04 μg/L), chlordane (0.12 μg/L) and endrin (0.04 μg/L). No other organic compounds were detected.

The presence of diethyl phthalate, dimethyl phthalate and di-n-octyl phthalate is probably related to the use of PVC pipe with freshly cemented joints during well development. The PVC pipe was inserted into the well and used as a conduit for compressed air; about 50-feet of the pipe was submerged in water. Subsequent well development and well evacuation was performed with a low capacity (about 1 gallon per minute) submersible pump which may have been inadequate to insure complete removal of all of the standing water in the well riser pipe.

MEMPHIS SAND

Water from the Memphis Sand showed no traces of organic contaminants. The specific conductance, pH, alkalinity, and hardness values reported are all within a range that is normal for this aquifer. Specific conductance ranges from 120 to 180 μmhos/cm; pH ranges from 5.9 to 6.6 units; and alkalinity ranges from 52 to 89 mg/L. Concentrations of trace and major constituents are also within the normal range (Graham, 1982). A cyanide concentration of 0.03 mg/L was reported for one sample from one of the wells in the Memphis Sand. However, this value is very close to the lower detection limit of the analytical method used, (0.01 mg/L). No other cyanide concentrations higher than the detection limit were found in other samples obtained from this well.

SUMMARY

Geophysical logs, drillers logs and split-spoon samples from five wells drilled at the Hollywood Dump indicate the presence of a clay layer--presumed to be the top of the Jackson Formation and upper part of the Claiborne--beneath the Wolf River alluvium water-table aquifer, separating it from the underlying artesian aquifer in the Memphis Sand.

Near the Hollywood Dump the Wolf River is subject to extended periods of backwater when the Mississippi River is at high stage. Periodic measurements made in nine Wolf River alluvium wells at the Hollywood site show that water-level trends in this aquifer generally exceed and vary directly with those of the Wolf River.

Barium and arsenic concentrations exceeding the maximum contaminant levels specified in the EPA National Interim Primary Drinking Water Regulations were found in samples of ground water from the Wolf River alluvium at the Hollywood Dump. Low concentrations of several organic compounds listed on the EPA's list of priority pollutants were found in water from some of the wells at the Hollywood site. The following compounds were found: n-butyl benzyl phthalate, chlorobenzene, 2-nitro phenol, di-n-octyl phthalate, aldrin, DDT, endrin, heptachlor, heptachlor epoxide, chlordane, chlordene, isodrin, toluene, 2-ethyl hexyl phthalate, beta BHC and heptachloronorbornene.

Water samples taken from a fluvial deposit well situated about one-half mile from the dump indicate the presence of heptachlor, chlordane and endrin at concentrations of less than 0.2 $\mu g/L$. The Hollywood Dump is an unlikely source of these contaminants because the well is upgradient from the dump.

None of the contaminants found in water from the Wolf River alluvium aquifer near the dump were found in water from nearby wells screened in the Memphis Sand. Other constituents and properties are within a range that is normal for water from this aquifer.

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