Reference 1

SOIL SURVEY OF

Forrest County, Mississippi

United States Department of Agriculture
Soil Conservation Service and Forest Service
In cooperation with
Mississippi Agricultural and Forestry Experiment Station

Contents

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Most map units include small, scattered areas of soils other than those that appear in the name of the map unit. Some of these soils have properties that differ substantially from those of the dominant soil or soils and thus could significantly affect use and management of the map unit. These soils are described in the description of each map unit. Some of the more unusual or strongly contrasting soils that are included are identified by a special symbol on the soil map.

Most mapped areas include places that have little or no soil material and support little or no vegetation. Such places are called *miscellaneous areas*; they are delineated on the soil map and given descriptive names. Urban land is an example. Some of these areas are too small to be delineated and are identified by a special symbol on the soil map.

The acreage and proportionate extent of each map unit are given in table 5, and additional information on properties, limitations, capabilities, and potentials for many soil uses is given for each kind of soil in other tables in this survey. (See "Summary of tables.") Many of the terms used in describing soils are defined in the Glossary.

AaA—Alaga loamy sand, 0 to 5 percent slopes. This is a somewhat excessively drained soil in broad, flat areas adjacent to large streams.

Typically the surface layer is very dark grayish brown loamy sand about 8 inches thick. This is underlain by dark yellowish brown loamy sand to a depth of about 24 inches, strong brown loamy sand to a depth of about 52 inches, and yellowish brown sand to a depth of about 90 inches.

This soil is strongly acid or very strongly acid. Permeability is rapid. Available water capacity is low. Runoff is slow. This soil tends to be droughty.

Included with this soil in mapping are small areas of Bassfield and Troup soils.

Most of this soil is used for woodland, and the rest is pasture and row crops. Corn, pasture plants, and pine trees are suited.

This soil has medium potential for row crops and pasture plants and is limited mostly by its tendency to be droughty. Corn and deep-rooted pasture plants such as bahiagrass and improved bermudagrass are suited. This soil has moderately high potential for loblolly pine, slash pine, and longleaf pine.

Potential for most urban uses is high. This soil has medium potential for openland and woodland wildlife habitat because of sandy texture. Potential for recreational uses is medium because of sandy texture. Capability unit IIIs-1; woodland suitability group 3s2.

BaA—Bassfield fine sandy loam, 0 to 2 percent slopes. This is a well drained soil on broad, flat terraces adjacent to large streams.

Typically the surface layer is dark brown fine sandy loam about 10 inches thick. The subsoil is yellowish red sandy loam that extends to a depth of about 41 inches. This is underlain to a depth of about 56 inches by reddish yellow loamy sand that contains common fine to coarse quartz pebbles and to a depth of about 70 inches by very pale brown sand that contains some medium gravel.

This soil is strongly acid or very strongly acid throughout. Permeability is moderately rapid. Available water capacity is medium. Runoff is slow. This soil tends to be slightly droughty.

Included with this soil in mapping are small areas of Prentiss soils and small areas of soils that have a finer textured subsoil. Also included are small areas of soils in which the sandy substratum is less than 40 inches deep.

Most of this soil is in cropland and pasture, and rest is in woodland. The soil has high potential for cultivated crops such as corn and soybeans. The use of adequate fertilization and conservation practices, such as row arrangement and return of crop residues, helps reduce runoff, control erosion, and improve infiltration.

This soil has high potential for pasture plants such as bahiagrass and improved bermudagrass. It also has high potential for loblolly pine, shortleaf pine, cherrybark oak, and sweetgum. There are no significant concerns in woodland use and management.

Potential is high for most urban uses and for woodland and openland wildlife habitat. Capability unit IIs-1; woodland suitability group 2o7.

BbA—Bassfield-Urban land complex, 0 to 2 percent slopes. This is a complex of nearly level, well drained soils on terraces within the city limits of Hattiesburg and Petal. Individual areas range from 60 to 2,000 acres.

This unit consists of an intricate pattern of Bassfield soils and Urban land. It is 40 percent Bassfield soils and 35 percent Urban land.

The well drained Bassfield soils have a surface layer of dark brown fine sandy loam about 10 inches thick. The subsoil is yellowish red sandy loam that extends to a depth of about 41 inches. The underlying material is reddish yellow and very pale brown loamy sand and sand that contains some gravel and that extends to a depth of 70 inches or more.

Bassfield soils are strongly acid or very strongly acid throughout. Permeability is moderately rapid. Available water capacity is medium. Runoff is slow. The soil is slightly droughty.

Urban land is mostly altered or reworked soil material that has no identifiable soil profile. These areas are mostly occupied by house sites and by the adjoining streets. A few light industrial and commercial buildings and paved parking lots are in this map unit.

Included with this unit in mapping are small areas of Bigbee, Latonia, Stough, and Cahaba soils. These are poorly drained soils along drainageways and in depressions.

Potential for most urban uses is high. Not assigned to a capability unit; Bassfield soil in woodland suitability group 2o7, Urban land not assigned to a woodland suitability group.

BcA—Bassfield-Urban land complex, occasionally flooded. This is a complex of nearly level soils on terraces that are occasionally flooded. Slopes are 0 to 2 percent. Most of this complex is within the city limits of Hattiesburg and Petal. Individual areas range from 40 to 1,500 acres.

is mottled in shades of red and brown and that contains plinthite nodules to a depth of about 25 inches; mottled light gray, red, and yellow clay loam to a depth of about 39 inches; and light gray clay mottled in shades of brown and red to a depth of about 62 inches or more.

Saucier soils are strongly acid or very strongly acid. Available water capacity is high. Permeability is slow. Runoff is slow to medium. This soil is subject to erosion if vegetative cover is removed.

Included with these soils in mapping are small areas of McLaurin soils; small areas of moderately well drained, loamy soils underlain by a layer that contains soft, yellowish red nodules; and small areas of poorly drained organic and mineral soils on flood plains.

Most of this association is in pine forest, mostly in the DeSoto National Forest.

This association has medium potential for cultivated crops such as cotton, corn, and soybeans because of slope, the erosion hazard, and the variability of the soils. Such erosion control measures as parallel terraces, strip-cropping, grassed waterways, and crop residue management help prevent excessive soil loss. Potential for pasture plants such as bahiagrass is high. Adequate fertilization, proper stocking rates, and controlled grazing help control erosion. This association has high potential for longleaf pine, loblolly pine, and slash pine. Equipment limitations on the Saucier soil, however, are moderate because of wetness and low strength. Scheduling operations for drier periods helps avoid these limitations.

Potential is medium for most urban uses because of wetness and low strength. Poarch soils have fewer limitations than Saucier soils; permeability is slow in Saucier soils, and the lower part of the subsoil is clayey. Larger septic tank filter fields and specially designed foundations help overcome these limitations. Potential is high for woodland and openland wildlife habitat and for most recreational uses. Capability unit IIIe-1; Poarch soil in woodland suitability group 2o1, Saucier soil in woodland suitability group 2w8.

PtA—Prentiss loam, 0 to 2 percent slopes. This is a moderately well drained soil on broad flats on uplands.

Typically the surface layer is dark brown loam about 7 inches thick. The upper part of the subsoil is yellowish brown loam that extends to a depth of about 26 inches. Below this to a depth of about 30 inches is yellowish brown loam that has strong brown mottles. This layer is underlain to a depth of 60 inches or more by a compact and brittle fragipan of yellowish brown loam mottled with yellowish red and gray.

This soil is strongly acid or very strongly acid. Permeability is moderate in the upper part and moderately slow in the fragipan. Available water capacity is medium. Runoff is slow. A seasonal high water table is at a depth of about 24 to 36 inches.

Included with this soil in mapping are small areas of Bassfield, Benndale, Malbis, and Stough soils.

About half of this soil is in cropland or pasture. The rest is in woodland.

This soil has high potential for cultivated crops such cotton, corn, and soybeans and for pasture plants such bahiagrass, tall fescue, and improved bermudagra Adequate fertilization, return of crop residue, row a rangement, and surface field drains are needed in are used for crops and pasture. Potential is also high f loblolly pine, slash pine, and longleaf pine. There are n significant limitations to use and management f woodland.

Potential is medium for most urban uses because wetness and low strength. Larger septic tank filter field surface drainage, and specially designed foundations ove come these limitations. Potential is high for woodland an openland wildlife habitat and for most recreational uses Capability unit IIw-1; woodland suitability group 2o7.

PtB—Prentiss loam, 2 to 5 percent slopes. This is a moderately well drained soil of the uplands.

Typically the surface layer is dark grayish brown loam about 6 inches thick. The upper part of the subsoil is yellowish brown loam that extends to a depth of about 18 inches. Below this to a depth of about 27 inches is yellowish brown loam mottled with strong brown. This layer is underlain by a compact and brittle fragipan of loam that is mottled in shades of brown and gray in the upper part and is yellowish brown mottled with grayish and brownish colors in the lower part.

The soil is strongly acid or very strongly acid. Permeability is moderate in the upper part and moderately slow in the fragipan. Available water capacity is medium. Runoff is medium, and the erosion hazard is moderate if vegetative cover has been removed. A water table is perched above the fragipan during wet seasons.

Included with this soil in mapping are small areas of Benndale and Pheba soils.

Most of this soil is in woodland, and the rest is in pasture or cropland.

This soil has high potential for cultivated crops such as cotton, corn, and soybeans. When used for crops, it needs adequate fertilization, return of crop residue, contour cultivation, minimum tillage, and terraces. Potential is high for pasture plants such as bahiagrass, tall fescue, and Coastal bermudagrass. Potential is also high for loblolly pine, slash pine, and longleaf pine. There are no significant limitations to use and management for woodland.

This soil has medium potential for most urban uses because of wetness and low strength. Larger septic tank filter fields and specially designed foundations help overcome these limitations. This soil has high potential for woodland and openland wildlife habitat and for most recreational uses. Capability unit IIe-3; woodland suitability group 2o7.

Pu—Prentiss-Urban land complex. This complex consists of gently sloping and sloping, moderately well drained soils and Urban land on uplands in metropolitan Hattiesburg and in the Camp Shelby area. Slopes are 2 to 8 percent. Areas range from 40 to 500 acres.

This unit consists of an intricate pattern of Prentiss soils and Urban land. It is about 40 percent Prentiss loam and about 35 percent Urban land.

The moderately well drained Prentiss soils have a surface layer of dark grayish brown loam about 6 inches thick. The upper part of the subsoil extends to a depth of 29 inches; it is yellowish brown loam that has strong brown mottles in the lower 9 inches. The lower part of the subsoil is a compact and brittle fragipan; to a depth of 37 inches, it is loam that is mottled in shades of brown and gray, and to a depth of 60 inches or more, it is brown loam that is mottled with gray.

Prentiss soils are strongly acid or very strongly acid. Permeability is moderate in the upper part and moderately slow in the fragipan. Available water capacity is medium. Runoff is medium. A water table is perched above the fragipan during wet seasons.

Urban land is mostly altered or reworked soil material that has no identifiable soil profile. These areas are mostly occupied by house sites and the adjoining streets. A few shopping centers and other public service areas that have paved parking lots are also in this map unit.

Included with this unit in mapping are small areas of McLaurin, Susquehanna, and Trebloc soils and small areas of poorly drained soils on narrow flood plains.

This unit has medium potential for most urban uses. Wetness and low strength are the main limitations. These limitations can be overcome through the use of specially designed foundations and by increasing the area of septic tank filter fields. Not assigned to a capability unit; Prentiss soil in woodland suitability group 2o7, Urban land not assigned to a woodland suitability group.

StA—Stough loam, 0 to 2 percent slopes. This is a somewhat poorly drained soil on broad flats.

Typically the surface layer is dark gray loam about 4 inches thick. The subsurface layer is grayish brown loam about 4 inches thick. The upper part of the subsoil is loam that is mottled in shades of brown and gray and that extends to a depth of about 15 inches. The lower part is loam that is mottled in shades of gray, brown, yellow, and red and that is partially compact and brittle; it extends to a depth of about 63 inches or more.

This soil is strongly acid or very strongly acid. Permeability is moderately slow. Available water capacity is medium. Runoff is slow. A water table is perched at a depth of about 12 to 18 inches during the wet season.

Included with this soil in mapping are small areas of Prentiss and Trebloc soils.

Most of this soil is in woodland, and the rest is in pasture and row crops.

Potential for cultivated crops such as cotton, corn, and soybeans and for pasture plants such as bahiagrass, tall fescue, and improved bermudagrass is high. Ditches are needed to remove excess water from the surface. This soil has high potential for loblolly pine and slash pine. Wetness and plant competition are the main limitations to use and management for woodland. These limitations can be partially avoided by scheduling operations for the dry season and through the use of management practices that eliminate plant competition.

This soil has medium potential for most urban uses because of wetness. This limitation can be partially overcome by adequate surface drainage. Septic tank filter fields should be designed larger than normal because of wetness. This soil has high potential for woodland and openland wildlife habitat. Potential is medium for most recreational uses because of wetness. Capability unit IIw-2; woodland suitability group 2w8.

SuB—Susquehanna silt loam, 2 to 5 percent slopes. This is a somewhat poorly drained soil on uplands.

Typically the surface layer is grayish brown silt loam about 4 inches thick. The subsurface layer is brownish yellow silt loam about 5 inches thick. The upper part of the subsoil is clay that is mottled in shades of brown, red, and gray and that extends to a depth of about 16 inches. The middle part is clay that is mottled in shades of red and gray and that extends to a depth of about 38 inches. The lower part is gray and light gray clay that is mottled in shades of brown and gray and that extends to a depth of 68 inches or more.

This soil is strongly acid or very strongly acid except for the surface layer in limed areas. Permeability is very slow. Available water capacity is high. Runoff is medium. The erosion hazard is slight to moderate. This soil has high shrink-swell potential.

Included with this soil in mapping are small areas of nearly level Falkner and Prentiss soils.

Most of this soil is in woodland, and the rest is in pasture.

This soil has low potential for cultivated crops because of the erosion hazard and the clayey texture. Potential for pasture plants such as bahiagrass and tall fescue is medium because of clayey texture. Adequate fertilization, proper stocking rates, and controlled grazing help prevent soil loss. This soil has moderately high potential for loblolly pine and shortleaf pine. Low strength is a moderate limitation to equipment operation, but scheduling operations for drier seasons overcomes this limitation.

This soil has low potential for most urban uses because of low strength, high shrink-swell potential, clayey texture, and wetness. Specially designed foundations, adequate drainage, and larger septic tank filter fields help overcome these limitations. This soil has a high potential for woodland and openland wildlife habitat. Potential is medium for most recreational uses because of wetness. Capability unit IVe-3; woodland suitability group 3c2.

SuD—Susquehanna silt loam, 5 to 12 percent slopes. This is a somewhat poorly drained soil on uplands.

Typically the surface layer is dark gray silt loam about 5 inches thick. The subsurface layer is light yellowish brown silt loam about 3 inches thick. The upper part of the subsoil is yellowish red silty clay that has yellowish mottles. The middle part is silty clay mottled in shades of red, gray, and brown. The lower part of the subsoil is clay mottled in shades of gray and red over gray clay mottled in shades of yellow; it extends to a depth of 65 inches or more.

This complex has low potential for most urban uses because of wetness and flooding. If the soils are used for urban purposes, they must be shaped and graded to remove water from the surface, and larger than normal septic tank filter fields are needed. Trebloc soils have high potential for wetland wildlife habitat, and Escambia soils have high potential for woodland and openland wildlife habitat. Potential is low for most recreational uses because of wetness and flooding. Capability unit Vw-1; Trebloc soil in woodland suitability group 2w9, Escambia soil in woodland suitability group 2w2.

TrB—Troup loamy fine sand, 0 to 8 percent slopes. This is a well drained soil of the uplands.

Typically the surface layer is dark grayish brown loamy fine sand about 3 inches thick. The subsurface layer is yellowish brown loamy fine sand about 23 inches thick. The next layer is yellowish red and red loamy sand that extends to a depth of about 64 inches. The subsoil is red sandy loam that extends to a depth of about 91 inches or more.

This soil is strongly acid or very strongly acid. Permeability is rapid in the thick, sandy surface layer and moderate in the subsoil. Available water capacity is low in the sandy layers and medium in the subsoil. Runoff is slow. The erosion hazard is slight. This soil tends to be droughty.

Included with this soil in mapping are small areas of Alaga, Heidel, and McLaurin soils.

Most of this soil is in woodland.

This soil has medium potential for cultivated crops such as corn and soybeans because of low available water capacity in the sandy layers. Early planting helps to avoid the driest part of the growing season. Potential is medium for pasture plants such as bahiagrass and improved bermudagrass because of sandy texture. Adequate fertilization, proper stocking, and weed control help preserve moisture and maintain a good grass coverage. This soil has moderately high potential for loblolly pine, longleaf pine, and slash pine. Moisture is the limiting factor. Seedling mortality and equipment limitations are concerns because of sandy texture. Equipment operates best on this soil during wetter periods.

This soil has high potential for most urban uses. Potential for woodland and openland wildlife habitat is medium because of droughtiness. Potential is medium for most recreational uses. Capability unit IIIs-1; woodland suitability group 3s2.

Ur—Urban land. Most of this map unit is in Hattiesburg, and a smaller amount is in Camp Shelby (Mississippi National Guard). About 70 to 95 percent of the area is covered with industrial, commercial, military, or residential development, such as railroad yards, buildings, streets, and parking lots. In the Camp Shelby area, warehouses, maintenance shops, parking areas, and vehicle storage areas cover this map unit.

Cuts and fills for the purpose of installing works and structures have altered and obscured soil features to the point that the soil can no longer be identified as a soil series. Most of the original soils were well drained and moderately well drained.

Use and management of the soils

The soil survey is a detailed inventory and evaluation of the most basic resource of the survey area—the soil. It is useful in adjusting land use, including urbanization, to the limitations and potentials of natural resources and the environment. Also, it can help avoid soil-related failures in uses of the land.

While a soil survey is in progress, soil scientists, conservationists, engineers, and others keep extensive notes about the nature of the soils and about unique aspects of behavior of the soils. These notes include data on erosion, drought damage to specific crops, yield estimates, flooding, the functioning of septic tank disposal systems, and other factors affecting the productivity, potential, and limitations of the soils under various uses and management. In this way, field experience and measured data on soil properties and performance are used as a basis for predicting soil behavior.

Information in this section is useful in planning use and management of soils for crops and pasture, rangeland, and woodland, as sites for buildings, highways and other transportation systems, sanitary facilities, and parks and other recreation facilities, and for wildlife habitat. From the data presented, the potential of each soil for specified land uses can be determined, soil limitations to these land uses can be identified, and costly failures in houses and other structures, caused by unfavorable soil properties, can be avoided. A site where soil properties are favorable can be selected, or practices that will overcome the soil limitations can be planned.

Planners and others using the soil survey can evaluate the impact of specific land uses on the overall productivity of the survey area or other broad planning area and on the environment. Productivity and the environment are closely related to the nature of the soil. Plans should maintain or create a land-use pattern in harmony with the natural soil.

Contractors can find information that is useful in locating sources of sand and gravel, roadfill, and topsoil. Other information indicates the presence of bedrock, wetness, or very firm soil horizons that cause difficulty in excavation.

Health officials, highway officials, engineers, and many other specialists also can find useful information in this soil survey. The safe disposal of wastes, for example, is closely related to properties of the soil. Pavements, sidewalks, campsites, playgrounds, lawns, and trees and shrubs are influenced by the nature of the soil.

Crops and pasture

The major management concerns in the use of the soils for crops and pasture are described in this section. In addition, the crops or pasture plants best suited to the soil,

Factors of soil formation

Soil is the product of the interaction of five major factors of soil formation: climate, living organisms, parent material, relief, and time. The kind of soil that formed in one area differs from the kind that formed in another area if there has been a difference between the two areas in any factor of soil formation.

Climate

Forrest County has the warm, humid, subtropical climate characteristic of much of the southeastern United States. This type of climate affects the physical, chemical, and biological relationships in soils, primarily through high temperature and precipitation.

Water dissolves minerals, supports biological activity, and transports minerals and organic residue in the soil profile. The amount of water that percolates through the soil depends mainly on rainfall, relative humidity, and the physiographic position, topography, and permeability of the soil.

Living organisms

Plants, animals, insects, bacteria, and fungi affect the formation of soils. Gains in organic matter and nitrogen, gains or losses in plant nutrients, and alterations in structure and porosity are some of the changes caused by living organisms.

Vegetation, mainly pine trees, has probably affected soil formation in Forrest County more than other living organisms have. The soils on uplands formed under dense forest dominated by pine trees, and the soils on flood plains formed under mixed hardwood and pine forest. The soils that formed under trees have lower organic-matter content than soils that formed under grasses.

Earthworms and other small invertebrates are most active in the upper part of the soil, and they continuously mix the soil. Rodents and other animals burrow in the soil and contribute to mixing. Little is known about fungi and other micro-organisms in the soils of Forrest County, but it is known that micro-organisms aid in weathering, decomposing organic matter, and fixing nitrogen in the soils.

Parent material

Parent material, the unconsolidated mass from which soil forms, has much to do with the chemical and mineral composition of the soil. The parent material of the soils in Forrest County is mainly marine deposits of sandy, loamy, and clayey material.

The clayey soils formed mostly in the Hattiesburg Clay and Pascagoula Clay Formations of Miocene age. The loamy and sandy soils are derived mostly from the Citronelle Formation of Pliocene age. The soils on flood plains are derived from material eroded from the nearby uplands. Organic soils formed in an accumulation of plant debris under saturated conditions. The soils that formed in clayey material are generally less weathered and contain more bases than those derived from the loamy material.

Relief

Relief affects soil formation through its influence on drainage, erosion, plant cover, and soil temperature. The relief in Forrest County ranges from nearly level to steep. Most of the nearly level land is on flood plains or stream terraces. Many of the soils are poorly drained or very poorly drained. Soils on ridgetops are mostly gently sloping or moderately sloping and are better drained than soils on flood plains or stream terraces. The steep soils are generally between the ridgetops and the flood plains. Runoff from them is greater, and as a result they generally show less horizon development than soils on ridgetops.

Time

The length of time required for soil development depends largely on the effects of the other four factors of soil formation. Less time is generally required for a soil to develop in warm, humid regions where the vegetation is luxuriant than in cold, dry regions where the vegetation is scant. Also, other factors being equal, less time is required if the parent material is coarse textured rather than fine textured.

Fairly stable, nearly level soils on interstream divides have more strongly developed horizons than sloping soils in which the rate of geologic erosion approaches that of soil development, and a smaller amount of total rainfall percolates through the profile. Soils on flood plains in Forrest County formed in deposits washed from uplands. Many of these soils, however, are old enough and have received such a small amount of sediment in recent times that they have formed thick, well drained horizons.

Processes of soil formation

The main processes involved in the formation of horizons are the accumlation of organic matter; the leaching of calcium carbonates and bases; the formation and translocation of silicate clay; and the reduction, segregation, and transfer of iron.

Accumulation of organic matter in the upper part of the soil profile contributes to the formation of an A1 horizon. Organic-matter content in the soils of Forrest County ranges from low to very high.

Carbonates and bases have been leached from nearly all the soils, and most are moderately to strongly leached. Leaching of bases from the upper horizons of a soil commonly preceded the translocation of silicate clay.

Translocation of silicate clay has occurred in many of the soils. This contributes to the development of an eluviated A2 horizon that contains less clay and that generally is lighter in color than the B horizon. The B horizon commonly has clay accumulations in films, in

TABLE 18.--SOIL AND WATER FEATURES

[Absence of an entry indicates the feature is not a concern. See text for descriptions of symbols and such terms as "rare," "brief," and "perched." The symbol < means less than; > means greater than]

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Bedrock
		Frequency	Duration	Months	Depth	Kind	Months	Depth
					Ft			In
Alaga: AaA	A	None to rare	Brief	Nov-Apr	>6.0	---	---	>60
Bassfield: BaA, [1]BbA, [1]BcA	B	None to common.	Very brief	Nov-Apr	>6.0	---	---	>60
Benndale: BeB, BeC, BeD	B	None	---	---	>6.0	---	---	>60
Bibb: Bf	C	Common	Brief	Dec-May	0.5-1.5	Apparent	Dec-Apr	>60
[1]BG: Bibb part	C	Common	Brief	Dec-May	0.5-1.5	Apparent	Dec-Apr	>60
Jena part	B	Rare to common.	Very brief to long.	Dec-Apr	>6.0	---	---	>60
Bigbee: Bh	A	Rare to common.	Brief	Jan-Mar	3.5-6.0	Apparent	Jan-Mar	>60
Cadeville Variant: CaF	D	None	---	---	>6.0	---	---	>60
Cahaba: ChA	B	None	---	---	>6.0	---	---	>72
Falkner: FaB	C	None	---	---	1.5-2.5	Perched	Jan-Mar	>60
[1]FsB: Falkner part	C	None	---	---	1.5-2.5	Perched	Jan-Mar	>60
Susquehanna part	D	None	---	---	>6.0	---	---	>60
Harleston: HaA	C	None to occasional.	Very brief	Nov-Apr	2.0-3.0	Apparent	Nov-Mar	>60
Heidel: HeD, HeE	B	None	---	---	>6.0	---	---	>60
Jena: [1]JN: Jena part	B	Rare to common.	Very brief to long.	Dec-Apr	>6.0	---	---	>60
Nugent part	A	Common	Brief to long.	Dec-Mar	>3.5	Apparent	Jan-Apr	>60
Latonia: LaA	B	None to common.	Very brief	Nov-Apr	>6.0	---	---	>60
[1]LT: Latonia part	B	None to common.	Very brief	Nov-Apr	>6.0	---	---	>60

See footnote at end of table.

TABLE 18.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro-logic group	Flooding: Frequency	Flooding: Duration	Flooding: Months	High water table: Depth	High water table: Kind	High water table: Months	Bedrock: Depth
					Ft			In
Latonia: Trebloc part	D	None to common.	Very brief	Jan-Apr	0.5-1.0	Apparent	Jan-Apr	>60
Lucedale: LuA	B	None	---	---	>6.0	---	---	>60
Malbis: MaB	B	None	---	---	2.5-4.0	Perched	Dec-Mar	>60
McLaurin: MbB, MbC, [1]MCB	B	None	---	---	>6.0	---	---	>60
[1]MLD: McLaurin part	B	None	---	---	>6.0	---	---	>60
Benndale part	B	None	---	---	>6.0	---	---	>60
Pamlico: [1]PD: Pamlico part	D	Frequent	Very long	Nov-Jun	(1)-1.0	Apparent	Nov-Jul	>60
Dorovan part	D	Frequent	Very long	Jan-Dec	<0.5	Apparent	Jan-Dec	>60
Petal: [1]PEC: Petal part	C	None	---	---	2.5-3.5	Perched	Jan-Apr	>60
Susquehanna part	D	None	---	---	>6.0	---	---	>60
Benndale part	B	None	---	---	>6.0	---	---	>60
Pheba: PhA	C	None	---	---	1.5-2.0	Perched	Jan-Mar	>60
Pits: Pn.								
Poarch: PoB, PoC	B	None	---	---	2.5-5.0	Apparent	Dec-Mar	>60
[1]PSB: Poarch part	B	None	---	---	2.5-5.0	Apparent	Dec-Mar	>60
Saucier part	C	None	---	---	2.5-4.0	Perched	Jan-Mar	>60
Prentiss: PtA, PtB, [1]Pu	C	None	---	---	2.0-2.5	Perched	Jan-Mar	>60
Stough: StA	C	None	---	---	1.0-1.5	Perched	Jan-Apr	>60
Susquehanna: SuB, SuD	D	None	---	---	>6.0	---	---	>60
Trebloc: Tb	D	None to common.	Very brief	Jan-Apr	0.5-1.0	Apparent	Jan-Apr	>60
[1]TeA: Trebloc part	D	None to common.	Very brief	Jan-Apr	0.5-1.0	Apparent	Jan-Apr	>60
Escambia part	C	None	---	---	1.5-2.5	Apparent	Dec-Mar	>60
Troup: TrB	A	None	---	---	>6.0	---	---	>60

See footnote at end of table.

TABLE 18.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Bedrock
		Frequency	Duration	Months	Depth	Kind	Months	Depth
					Ft			In
Urban land: Ur.								

[1]This map unit is made up of two or more dominant kinds of soil. See map unit description for the composition and behavior of the whole map unit.

SOIL LEGEND

The first letter, always a capital, is the initial letter of the soil name. The second letter is a capital if the mapping unit is broadly defined 1/; otherwise, it is a small letter. The third letter, always a capital, shows the slope. Symbols without slope letters are those of nearly level soils, except for Pits, Prentiss-Urban land complex, and Urban land.

SYMBOL	NAME
AaA	Alaga loamy sand, 0 to 5 percent slopes
BaA	Bassfield fine sandy loam, 0 to 2 percent slopes
BbA	Bassfield-Urban land complex, 0 to 2 percent slopes
BcA	Bassfield-Urban land complex, occasionally flooded
BeB	Benndale fine sandy loam, 2 to 5 percent slopes
BeC	Benndale fine sandy loam, 5 to 8 percent slopes
BeD	Benndale fine sandy loam, 8 to 12 percent slopes
Bf	Bibb silt loam
BG	Bibb and Jena soils, frequently flooded
Bh	Bigbee loamy sand
CaF	Cadeville Variant silt loam, 15 to 60 percent slopes
ChA	Cahaba sandy loam, 0 to 2 percent slopes
FaB	Falkner silt loam, 2 to 5 percent slopes
FsB	Falkner-Susquehanna-Urban land complex, 2 to 5 percent slopes
HaA	Harleston fine sandy loam, 0 to 2 percent slopes
HeD	Heidel sandy loam, 8 to 12 percent slopes
HeE	Heidel sandy loam, 12 to 30 percent slopes
JN	Jena-Nugent association frequently flooded
LaA	Latonia fine sandy loam, 0 to 2 percent slopes
LT	Latonia-Trebloc association, occasionally flooded
LuA	Lucedale loam, 0 to 2 percent slopes
MaB	Malbis loam, 2 to 5 percent slopes
MbB	McLaurin loamy sand, 2 to 5 percent slopes
MbC	McLaurin loamy sand, 5 to 8 percent slopes
MCB	McLaurin association, undulating
MLD	McLaurin-Benndale association, rolling
PD	Pamlico-Dorovan association
PEC	Petal-Susquehanna-Benndale association, rolling
PhA	Pheba silt loam, 0 to 2 percent slopes
Pn	Pits
PoB	Poarch fine sandy loam, 2 to 5 percent slopes
PoC	Poarch fine sandy loam, 5 to 8 percent slopes
PSB	Poarch-Saucier association, undulating
PtA	Prentiss loam, 0 to 2 percent slopes
PtB	Prentiss loam, 2 to 5 percent slopes
Pu	Prentiss-Urban land complex
StA	Stough loam, 0 to 2 percent slopes
SuB	Susquehanna silt loam, 2 to 5 percent slopes
SuD	Susquehanna silt loam, 5 to 12 percent slopes
Tb	Trebloc silt loam
TeA	Trebloc-Escambia complex, 0 to 2 percent slopes
TrB	Troup loamy fine sand, 0 to 8 percent slopes
Ur	Urban land

1/ The composition of these units is more variable than that of others in the survey area, but has been controlled well enough to be interpreted for the expected use of the soils.

CULTURAL

BOUNDARIES

National, state or provinc

County or parish

Minor civil division

Reservation (national for
state forest or park,
and large airport)

Land grant

Limit of soil survey (labe

Field sheet matchline & r

AD HOC BOUNDARY (labe

Small airport, airfield, pa
cemetery, or flood poo

STATE COORDINATE TICK

LAND DIVISION CORNERS
(sections and land grants)

ROADS

Divided (median shown
if scale permits)

Other roads

Trail

ROAD EMBLEMS & DESIG

Interstate

Federal

State

County, farm or ranch

RAILROAD

POWER TRANSMISSION L
(normally not shown)

PIPE LINE
(normally not shown)

FENCE
(normally not shown)

LEVEES

Without road

With road

With railroad

DAMS

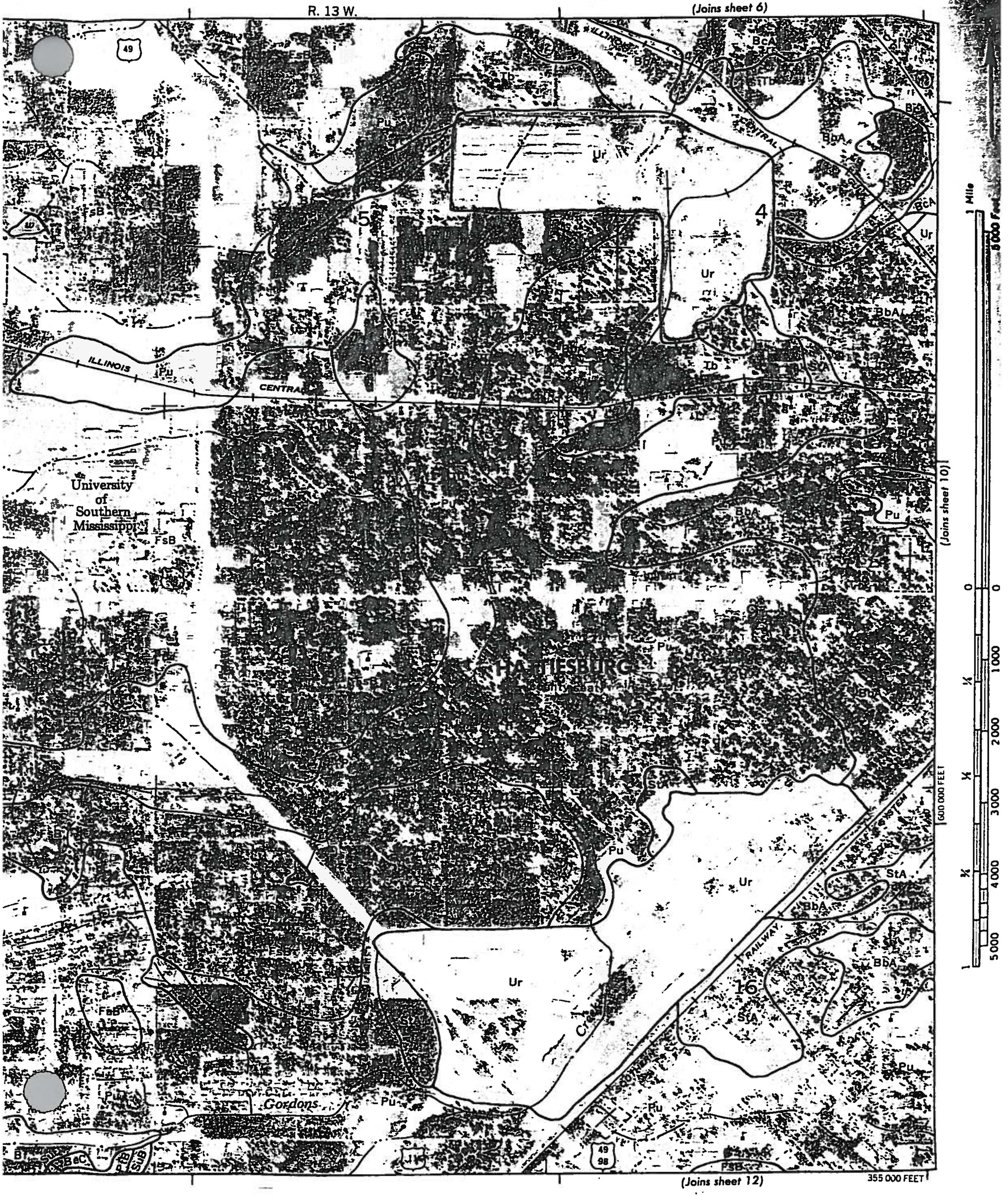
Large (to scale)

Medium or small

PITS

Gravel pit

Mine or quarry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University of Southern Mississippi
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LIMATIC
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TATES

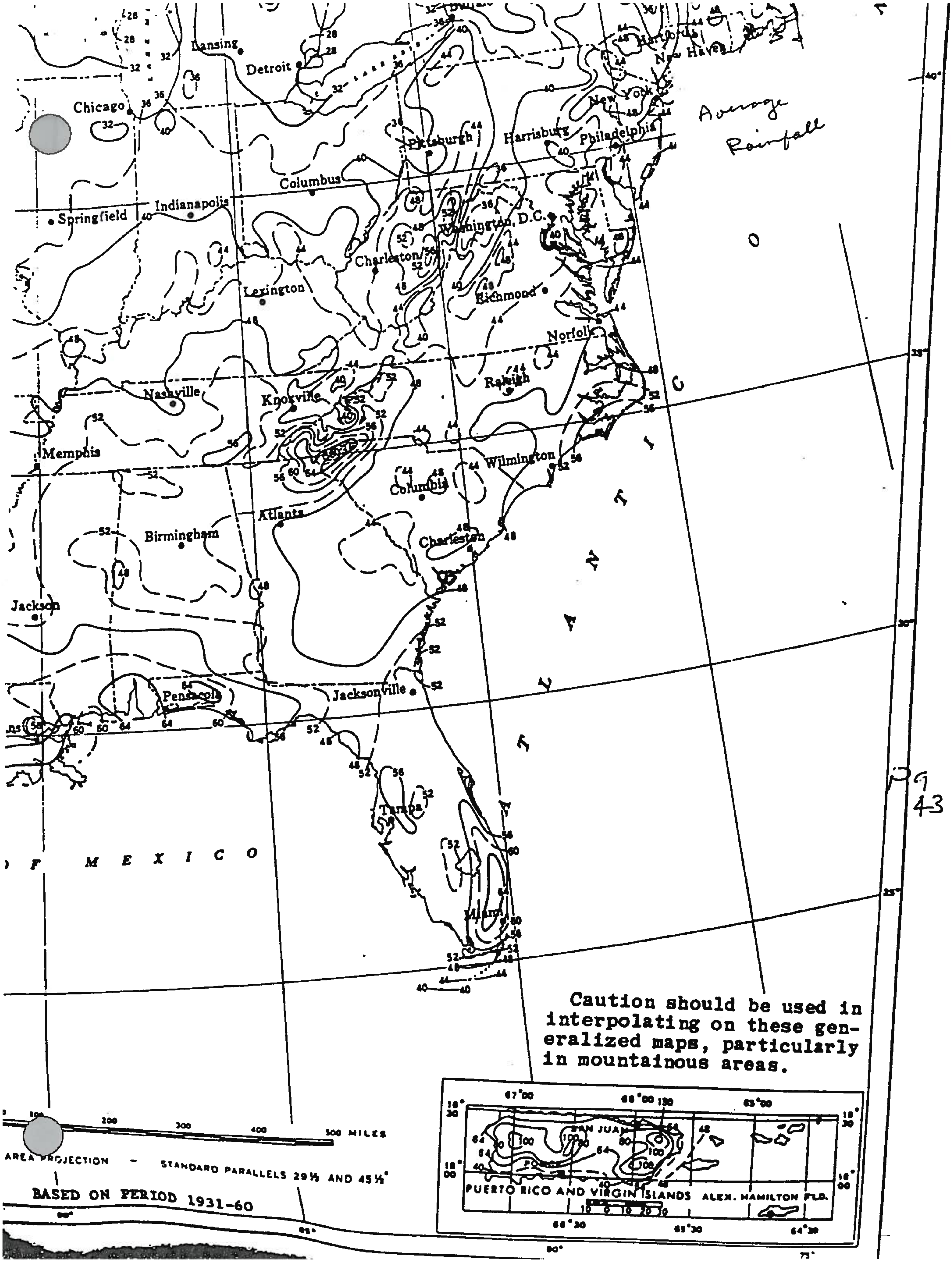
U.S. DEPARTMENT OF COMMI
C. R. Smith, Secretary

ENVIRONMENTAL SCIENCE SERVICES ADMII
Robert M. White, Administrator

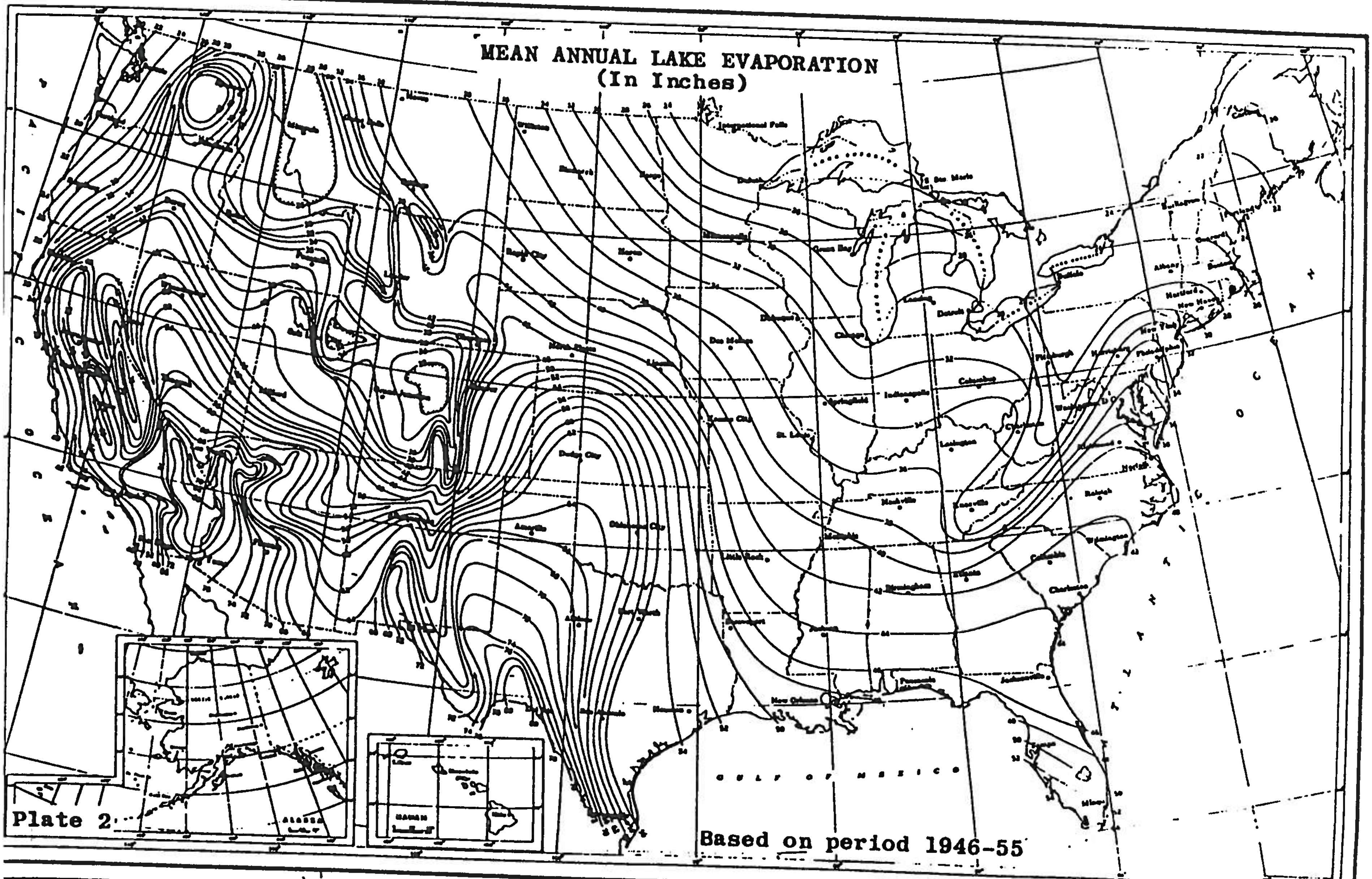
ENVIRONMENTAL DATA SERVICE
Woodrow C. Jacobs, Director

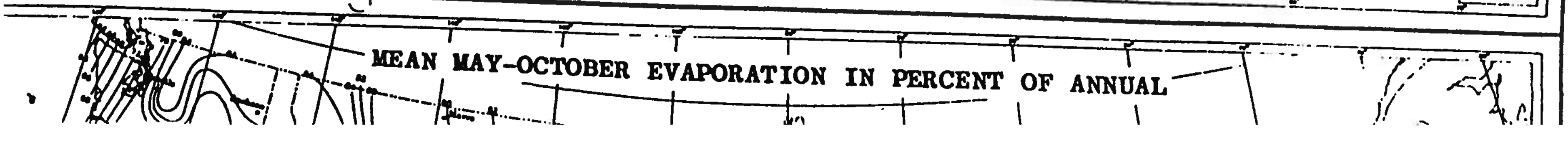
JUNE 1968

REPRINTED BY THE
NATIONAL OCEANIC AND ATMOSPHERIC ADM
1983

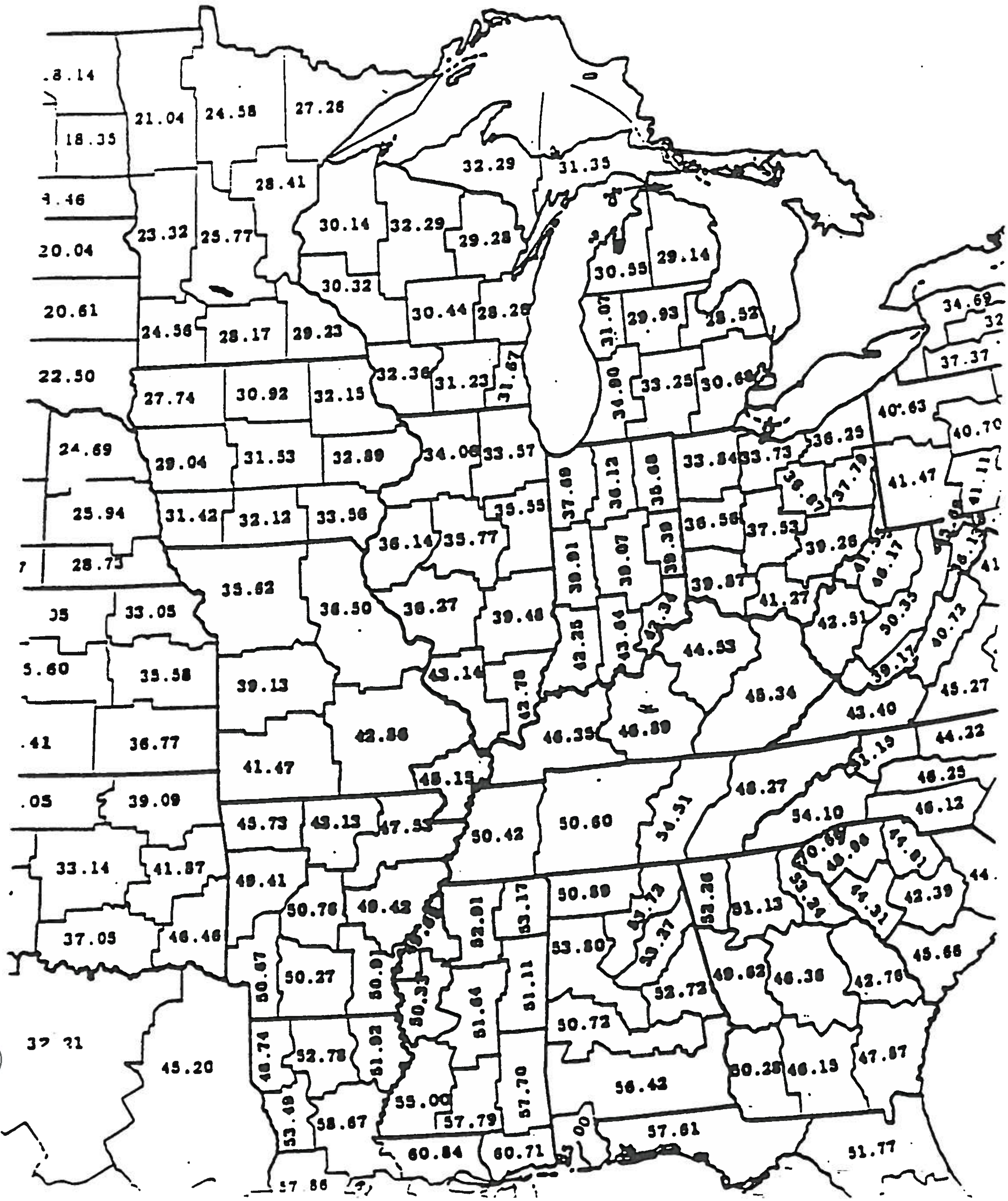


Caution should be used in interpolating on these generalized maps, particularly in mountainous areas.


MEAN ANNUAL LAKE EVAPORATION
(In Inches)
GULF OF MEXICO
Plate 2
Based on period 1946-55


MEAN MAY-OCTOBER EVAPORATION IN PERCENT OF ANNUAL

ON. (inches) B



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Reference 3

ENT OF COMMERCE
Secretary

WEATHER BUREAU
F. W. Reichelderfer, Chief

TECHNICAL PAPER NO. 40

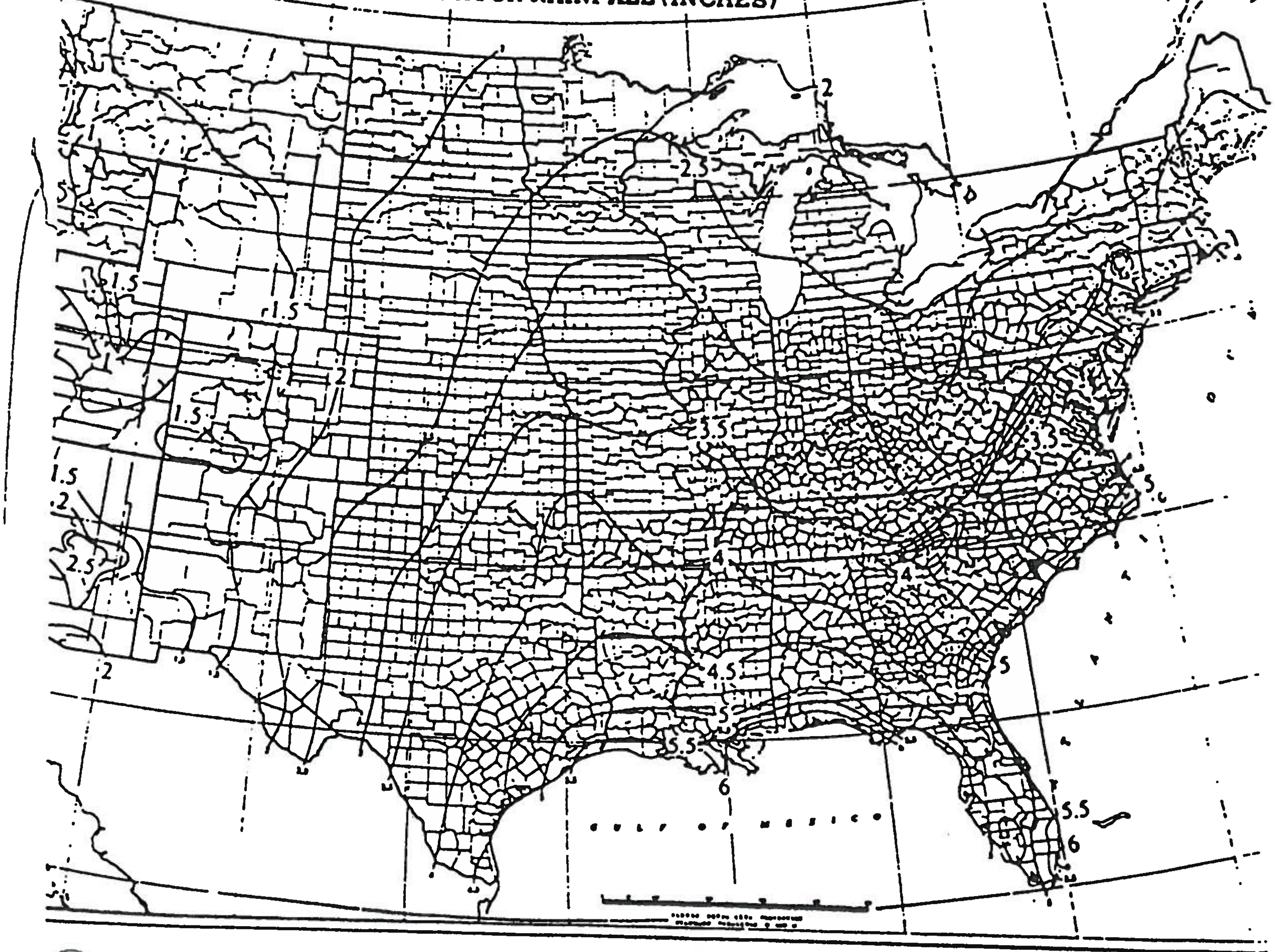
RAINFALL FREQUENCY ATLAS OF THE UNITED STATES

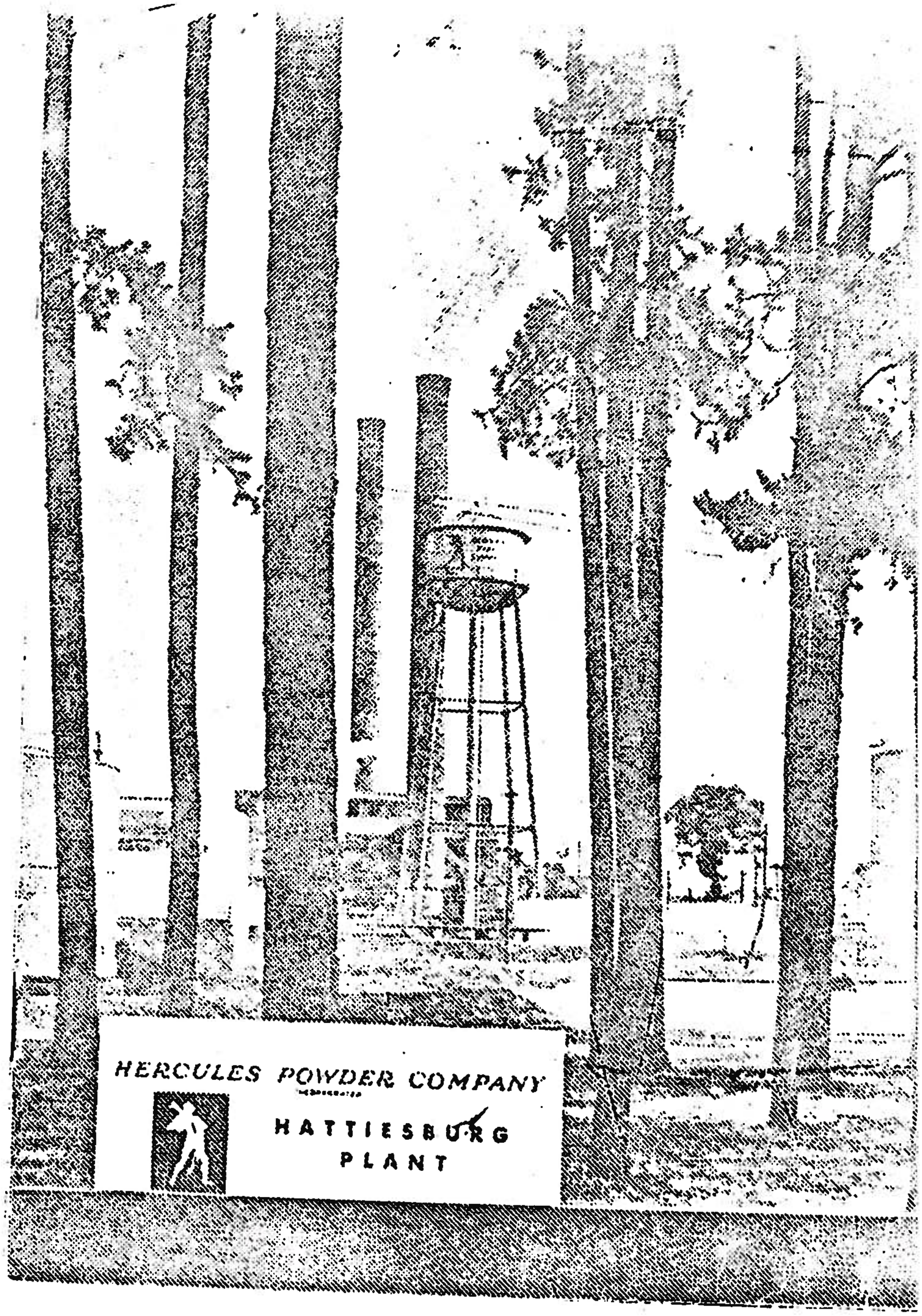
for Durations from 30 Minutes to 24 Hours and Return Periods from 1 to 100 Years

Prepared by
DAVID M. HERSHFIELD
Cooperative Studies Section, Hydrologic Services Division
for
Engineering Division, Soil Conservation Service
U.S. Department of Agriculture

p. 95

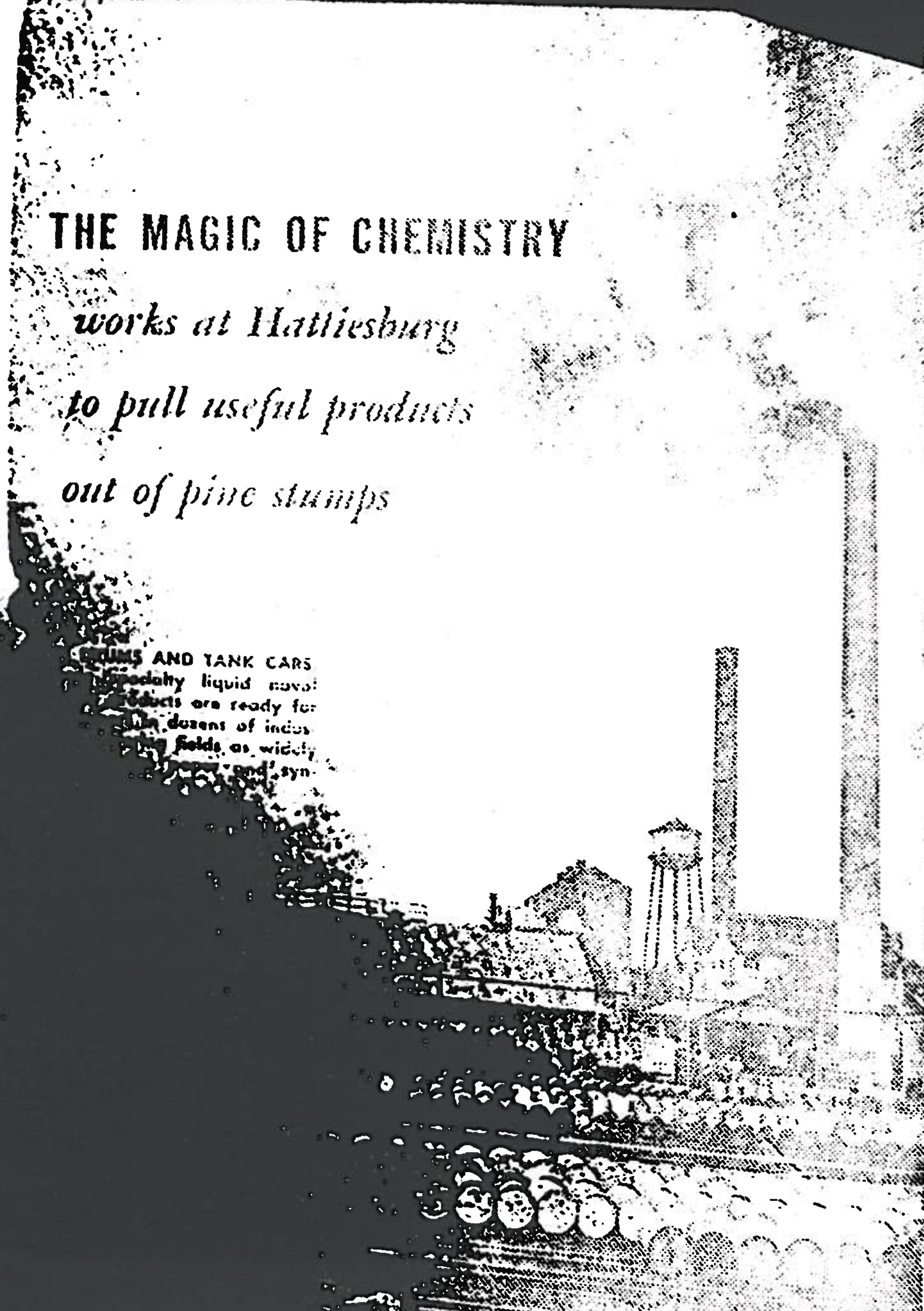
2-YEAR 24-HOUR RAINFALL (INCHES)




HERCULES POWDER COMPANY
HATTIESBURG
PLANT

THE MAGIC OF CHEMISTRY

works at Hattiesburg to pull useful products out of pine stumps



AND TANK CARS ... liquid naval ... are ready for ... dozens of indus... fields as widely ... and syn...

The stumps of the longleaf pine, left in the ground after the trees have been cut down for lumber, contain valuable resins. At its Hattiesburg, Mississippi plant, Hercules extracts turpentine, pine oil, and rosin from these stumps.

The process is complicated, and the manufacturing equipment necessary costs millions of dollars. The chemical knowhow needed to do the job was acquired through Hercules' nearly forty years of experience in the naval stores business.

The operation begins when tractors with big, forklike fingers snake through the fields and forests of the South to find these stumps and tear them from the soil. The stumps and their roots, hauled to the plant in trucks and railroad cars, are stacked in huge piles or taken directly to the mill. From a storage pit an overhead crane lifts them on to a conveyor where they are washed and carried to the "hog."

The hog is a big grinder with knives sharp as razors, which slash and cut the stumps and roots — with a noise like thunder — into pieces of wood five to ten inches long. From there the wood goes to the shredder.

Sharp-edged hammers on the rims of wheels, rotating a mile a minute, sliver and chip the wood until it is almost as fine as shredded wheat.

The purpose of this cutting and slashing is to make it easier to remove the resin from the wood. In giant extractor tanks, solvents extract the resin from the chips in much the same way that coffee is brewed. The resultant oily mixture and the chemicals made from it are the lifeblood of the naval stores industry.

The naval stores industry produces chemicals for many of the things we use in our daily lives . . . insecticides, rosin for varnishes and paints, turpentine in the familiar Hercules orange-and-black cans, pine oils and chemicals that go into textiles, rubber, paper, adhesives, plastics, and a hundred other uses.

Thousands of Hercules men and women work in this industry, obtaining the chemicals from these resinous stumps. At Hattiesburg and its sister plant at Brunswick, Georgia, 1,800 people are employed, and 500 more work in woods camps around the two plants to supply the hungry hogs and shredders with stumps. A steady stream of stumps comes into Hattiesburg from millions of pine-covered acres in the states of Mississippi, Louisiana, and Alabama.

Hattiesburg operations consist of wood gathering and plant operations. The plant operations can be grouped into three classifications:

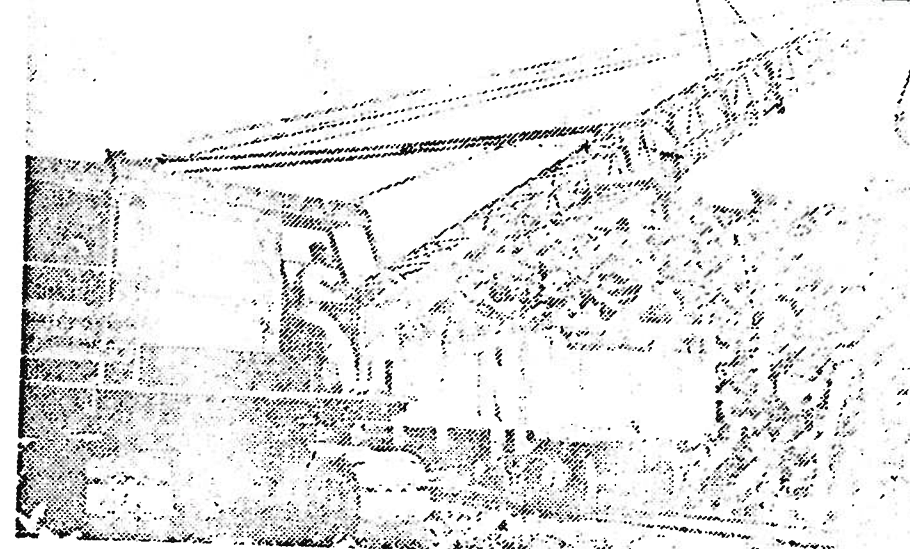
HATTIESBURG naval stores plant where nearly a thousand Herculites work with millions of dollars worth of equipment. Using the magic of chemistry and the know-how acquired by thirty-five years in the business, they turn Southern pine stumps into valuable products for industry.

Primary – all operating units required to produce rosin, pine oil, and turpentine. This covers wood grinding, shredding, extraction, refining, and distillation of the crude resin.

Secondary – those units that produce specialty products, in most cases using as the main raw material one of the materials produced by the primary operations.

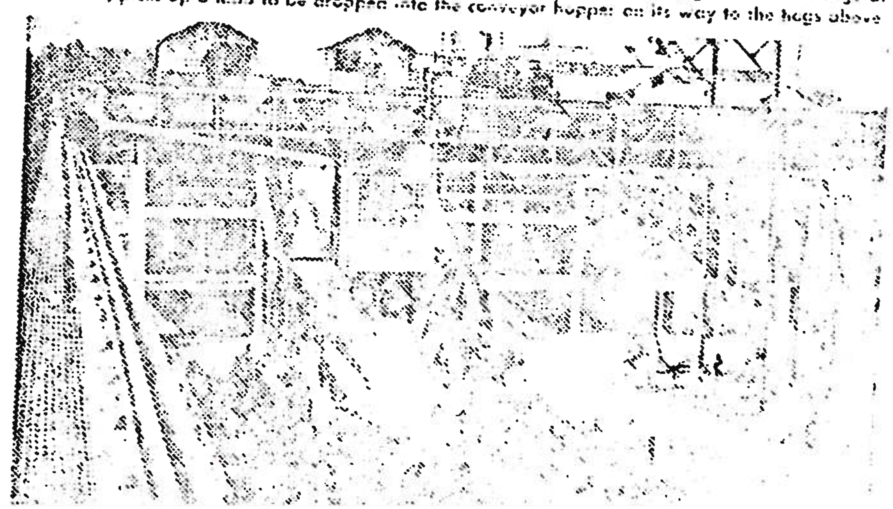
Common facilities – include the office, laboratory, shops, powerhouse, central loading and packaging facilities, and the railroad.

In secondary operations, rosin is processed into special grades; or it is limed, polymerized, hydrogenated, ammoniated, or esterified into chemicals having special properties for industrial uses. Pine oil is the source of anethole and other chemical materials which must meet rigid quality specifications. Turpentine is processed to yield pinene and synthetic pine oil. Dipentene

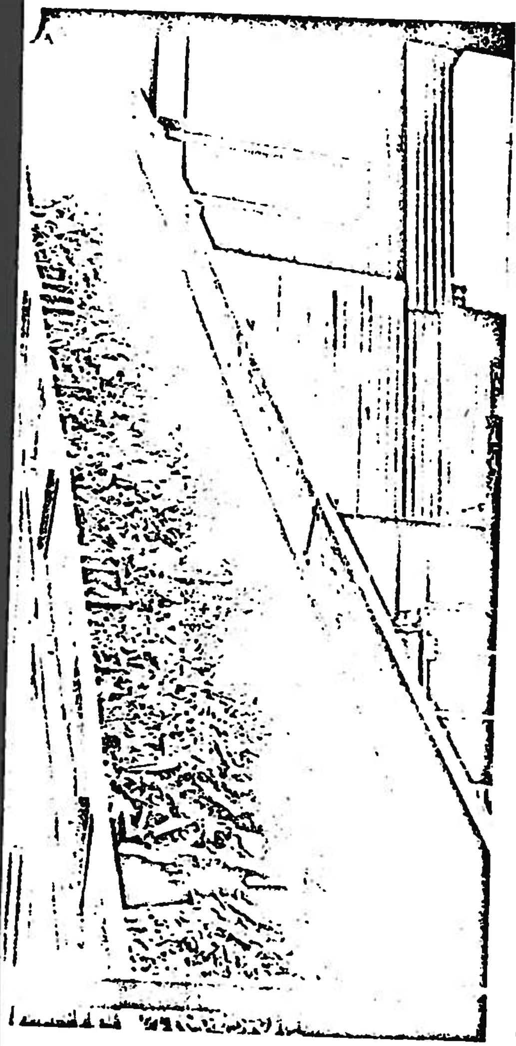


UNLOADING STUMPS from a gondola car to the wood storage pile is the job of this huge crane operated by Barney Sullivan. In addition to the stumps brought in by rail, some 300 tons are trucked in daily, five days a week, for the plant which operates 24 hours a day and to stock this over-size wood pile, covering about 60 acres and holding three to four months' supply.

THE STUMP PIT contains food for the hogs which are huge revolving V-shaped spools covered with rows of heavy knives which tear the stumps apart. The pit, about a quarter full in this picture, holds 600 tons of wood. Here an operator, in the little house slung under the bridge of the crane, picks up a load to be dropped into the conveyor hopper on its way to the hogs above.



THE HOG has ground up the stumps into pieces about five to ten inches long. Here they are carried on the conveyor to the shredder house to be ground still finer. The shredders, a series of wheels with square-cornered hammers, pound and chip the wood.



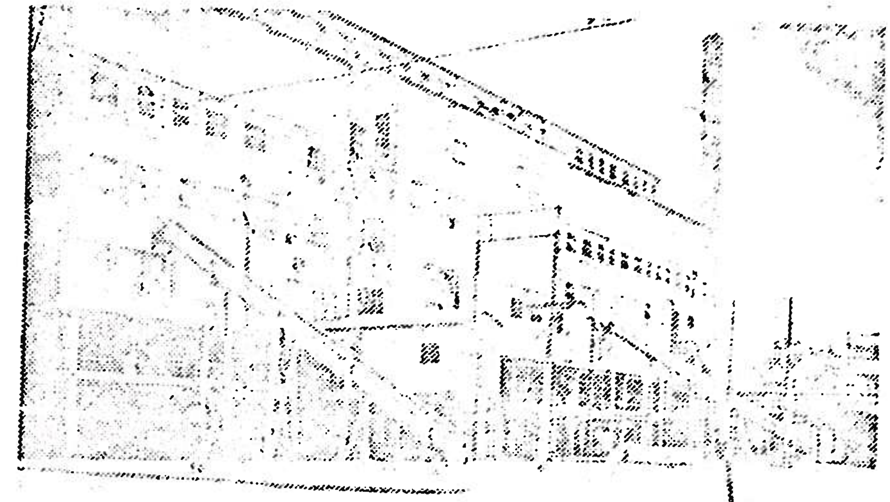
and Solvenol® are processed into para-cymene, para-menthane-hydroperoxide, para-cresol, acetone, and other high-quality products.

The plant operates twenty-four hours a day, with the exception of the railroad, millroom, and Truline® plant, which work sixteen hours a day; the mechanical department and shipping crews work eight hours a day, five days a week.

The cutting and slashing of the giant knives of the hogs and the shredders bring forth a stream of chips for the extractors and stills which remove the resins, separate the resins into many different products, and process them for the industries of the world.

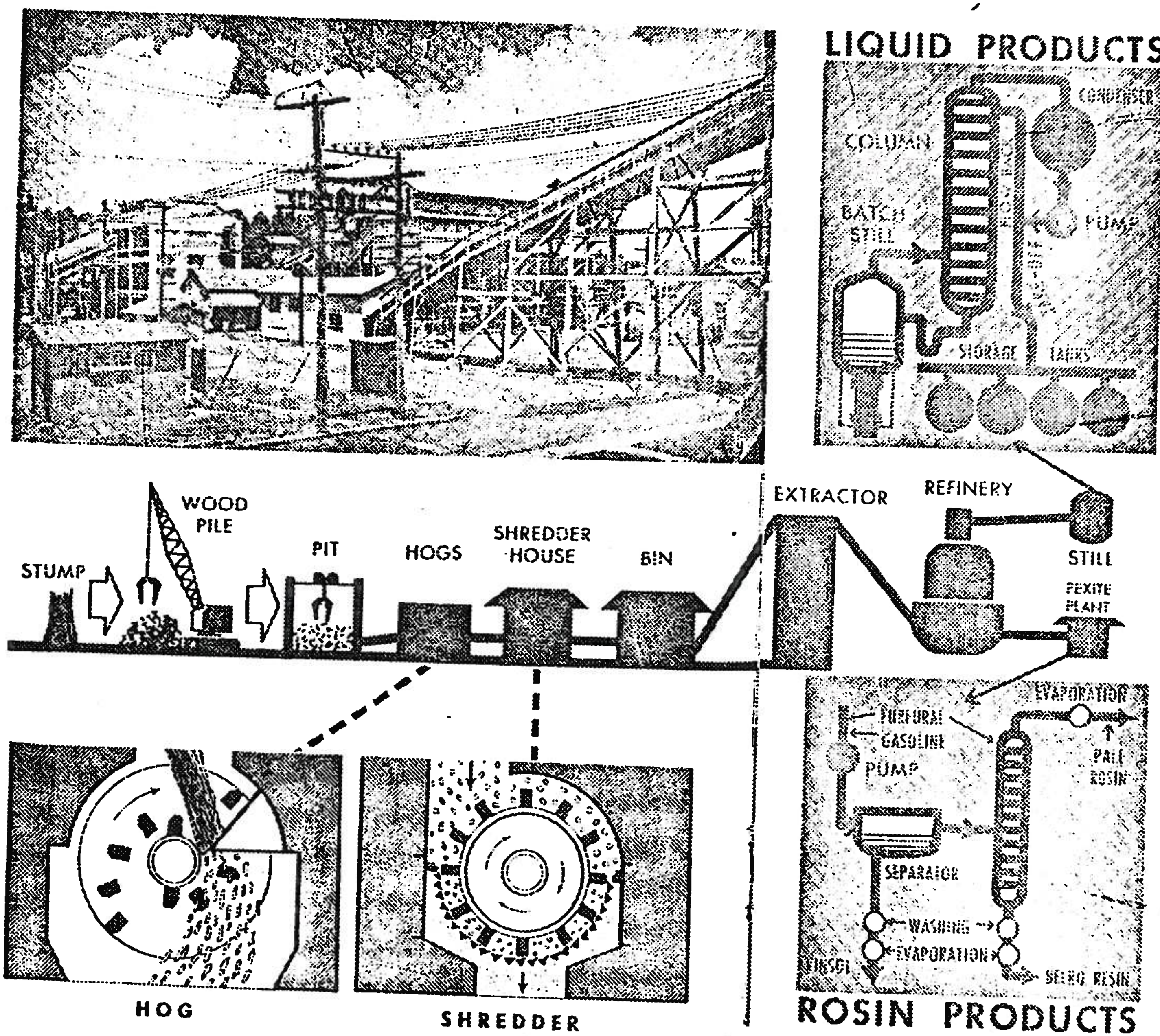
The fine chips go from the chip bin to the extractor house by conveyor. Inside this huge building sixteen steel tanks, each about the size of a farm silo, stand in a row. Into the extractors the conveyor belt dumps about half a carload of chips.

To dissolve the resins, the solvent enters the bottom of the tank and is pumped through the chips – to come off at the top and go on to the bottom of the next tank to repeat the process through ten extractors. The rest of the extractors are needed for solvent recovery, emptying, and refilling. Heat and pressure are used to extract the resin from the chips more thoroughly. The oily mixture of solvent and dissolved resin is drained off to be processed in the refinery. The solvent which remains in the chips is recovered for reuse in the process. Then the spent chips are removed from the extractor



THE EXTRACTOR HOUSE contains a row of sixteen huge steel tanks, called extractors, each about as big as a good size farm silo.

SPENT CHIPS, which have given up their resins in the extracting process, are raked out of the bottom of the extractor to go on their way by conveyor belt to a useful end as fuel for the plant's boilers. Hugh Moore, on the job here, and his fellow extractor pullers work at top speed like this for about an hour in order to empty the extractor. Then the puller has a well-earned rest period before unbolting the huge door of the



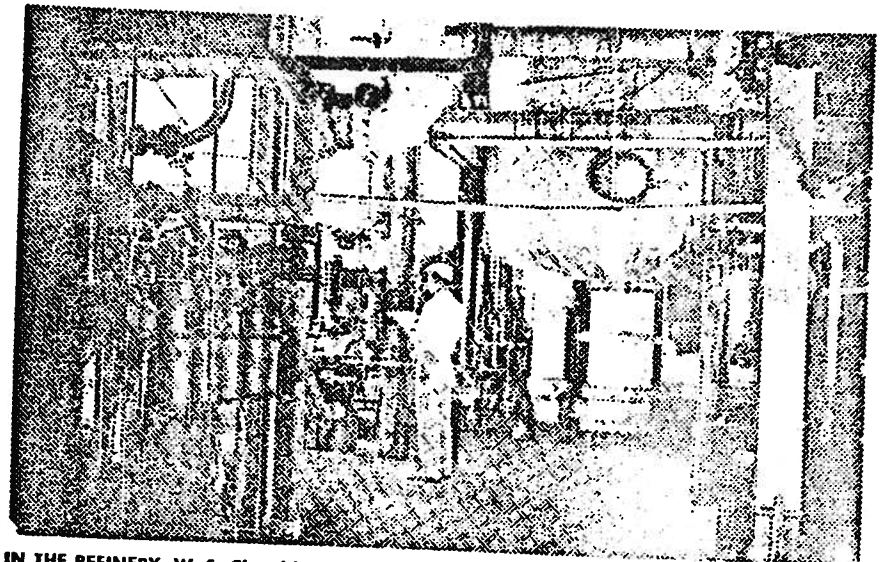
in order to make it ready to repeat the cycle.

In the refinery the solvent content and the turpentine and pine oil are removed by distillation in several evaporators, thus separating them from the crude rosin. This rosin goes to the Pexite plant, where it is refined. The turpentine and pine oil are sent into the stills for further separating ("fractionating" is the term chemists use).

A still is a piece of equipment widely used in chemical operations in which material is placed in a closed tank and heated to boiling. Then the hot vapors that rise are fractionated in a column to obtain a pure vapor, which is condensed into a liquid.

At the Hattiesburg plant and its sister plant at Brunswick, Georgia, are elaborate stills, which are tall towers with an inverted bottlelike tank at the base. The stills fractionate the liquid naval stores products into many different chemical materials, each having properties that fit them to do specific jobs as basic raw materials for industry. The refined liquid naval stores produced in these stills include: turpentine, alpha- and beta-pinene, monocyclic terpenes, pine oil, anethole, and other liquids.

The rosin from the evaporators is refined in the Pexite plant with furfural, a heavy liquid that smells like almonds and is obtained from oat hulls. The rosin, dissolved in gasoline, is washed with the furfural to remove the dark-colored portions, leaving a pale amber-colored rosin in the gasoline. After recovery of the gasoline



IN THE REFINERY, W. S. Chambliss takes a reading at a distillation unit. Here the solvent and liquid naval stores products, which have been separated from the rosin, are fractionated to remove the solvent from the oils. Millions of dollars worth of equipment, know-how acquired by thirty-five years in the business, highly skilled workers, and constant laboratory check on quality and yield have gained Hercules a leading position in the naval stores industry.

the pale rosin is sold in drums and tank cars. Some of it is used in the plant to make other products like Poly-pale,® Staybelite,® and Resin 731.* The dark rosin is used to make Vinsol® and Truline® binder.

Today Hercules' naval stores products are many and varied, tailored to do specific jobs in hundreds of industries. These myriad products have been developed through the years by the ingenuity of chemists from three primary naval stores products — rosin, turpentine, and pine oil, which back in the early twenties were the only products of the industry.

Many skills and many tasks are needed to operate the Hercules naval stores plant at Hattiesburg. Yet this process could not stand by itself, and the operators alone could not make the plant run for long without the help of a large company of men and women who perform the plant services.

The service facilities, such as transportation by railroad and truck, the laboratory, and the office staff are all vital to the efficient operation of the Hattiesburg naval stores plant.

The office performs a variety of services for the plant. All payroll, accounting, purchasing, engineering, stenographic, and personnel work is carried on by eighty-four men and women in this group. They get the orders from our salesmen and pass them on to the plant so that the right products will be produced in the right quantities to fill our customers' demands.

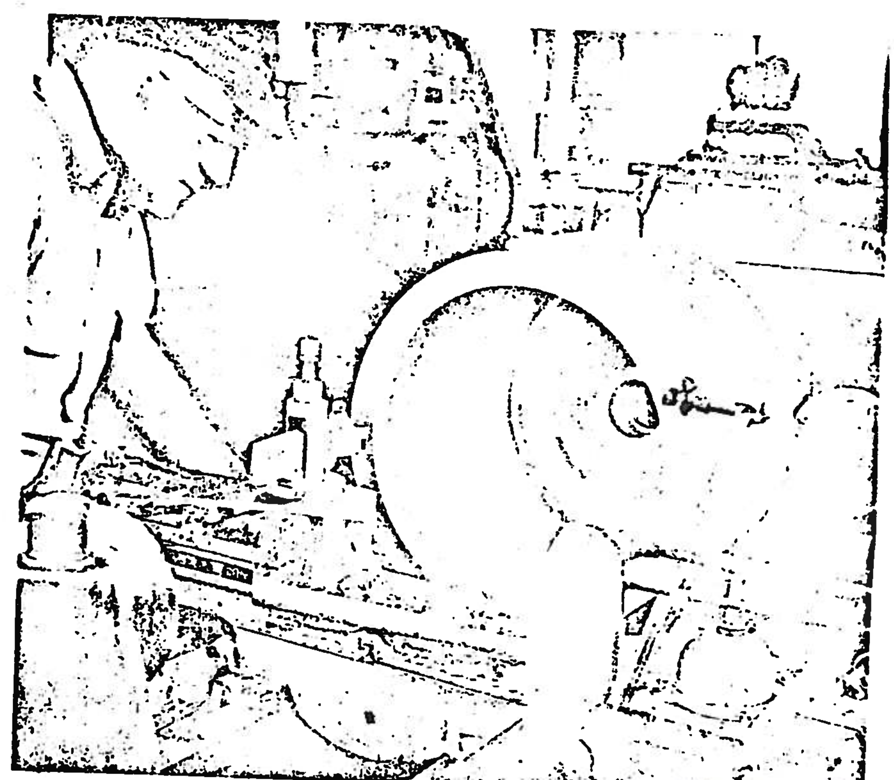
Safety is an important part of this staff's work. A safety committee which meets once a month, a roving safety committee which spots hazardous conditions in the plant and corrects them, and plant foremen who insist on safe methods for their crews all work with the Personnel and Safety Departments located in the plant office.

The machine shop and maintenance crew are the builders and troubleshooters of the plant. These 237 men — carpenters, pipefitters, pipe insulators, electricians, painters, welders, foundrymen, and other skilled workers — build and equip new buildings. They either make the equipment that goes inside or install tanks and reactors that we buy to equip the plant.

When something springs a leak or a pump won't work, it is a maintenance man who puts it back in shape again.

Another specialized group that helps

*Hercules Trademark



IN THE MACHINE SHOP, Dan Blocker faces off the end of a casting for the overhead crane which lifts the stump wood ...

to run the plant is the laboratory. These eighty-nine men and women are the checkers for the operators; they tell the plant men how they are doing. They analyze chemical materials we buy to make sure that they are what we want, and they analyze all finished products to make certain that the quality is up to the standards we guarantee our customers.

Chemical research is carried on to see if better ways of making our products can be found, or if new products can be made from the resins or oils.

The three pilot plants at Hattiesburg are run by the laboratory. One is a hydrogenation high pressure plant; another is a pilot plant for Dresinate,® operated for the Paper Makers Chemical Department; and a third is kept busy on various sorts of research work.

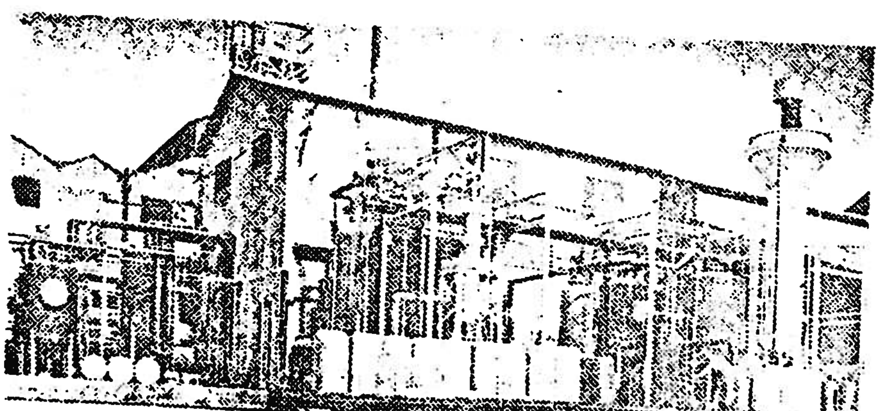
A small railroad with a diesel locomotive and two smaller engines is used to shift nearly a thousand cars from place to place within the plant every month. Almost as many highway trucks enter and leave the plant. Cars and trucks haul stump wood into the plant; and finished drums of rosin, turpentine, and other products start out on their way to the customers.

Four of the yard trucks are equipped with two-way radio, so that they can be dispatched to any point and directed about the plant.

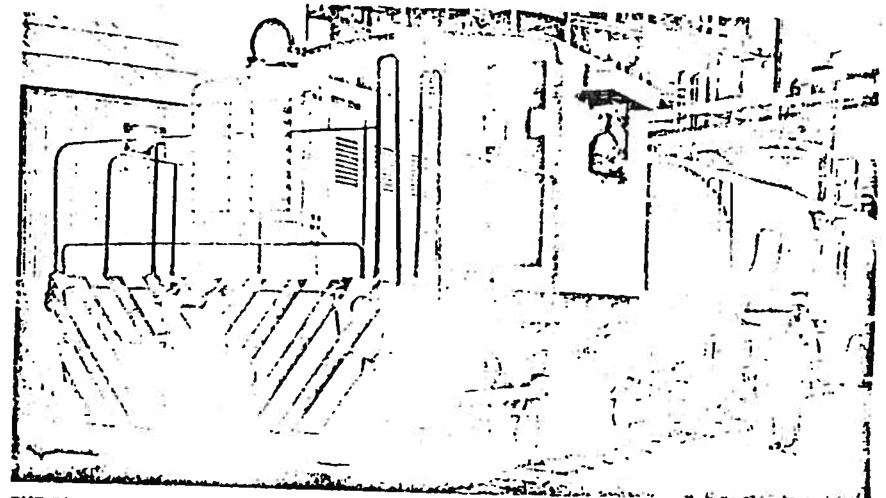
The Hercules Hattiesburg plant is

RECEPTIONIST AND TELEPHONE OPERATOR Mattie J. Odom welcomes plant visitors W. R. Shannon and A. H. Gallagher of the General

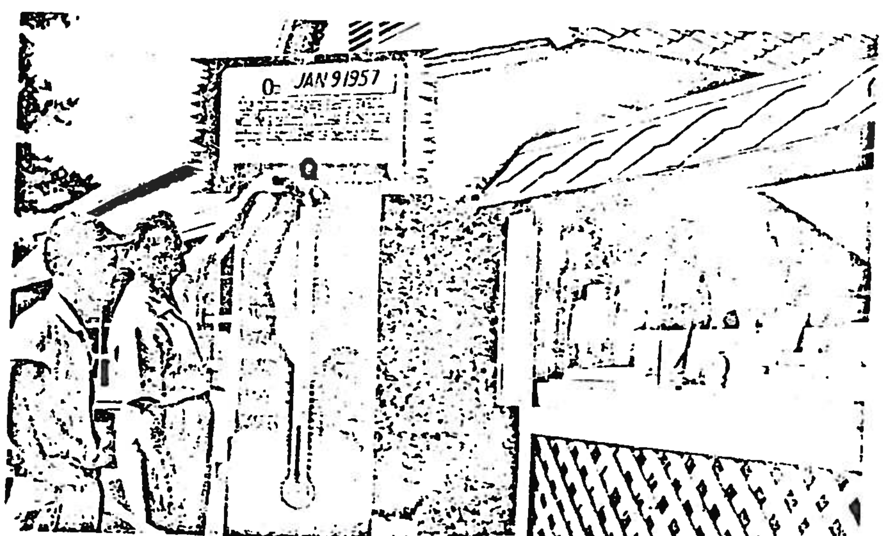
FINISHED PRODUCTS are analyzed in the laboratory. Here Katheryn N. McNease, analyst, uses the thermometer drop method to determine the softening point of rosin. The temperature at which rosin begins to soften is important to users of our products.



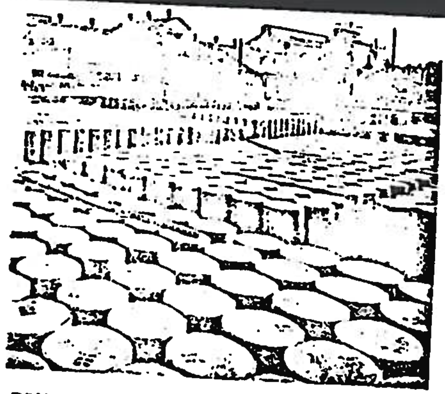
ONE OF THE PILOT PLANTS operated by the Lab to produce PMC rubber chemicals. Charles Walters is shown drawing off a sample of Dresinate.®



THE BIGGEST LOCOMOTIVE on the plant's railroad is this diesel. Here, D. H. Widdon, engineer, as he takes out a string of tank cars pauses to talk with Earlie Hudnall, signalman. Two other locomotives are "fireless cookers" — they get a charge of steam from the powerhouse which keeps them running for about a half day.

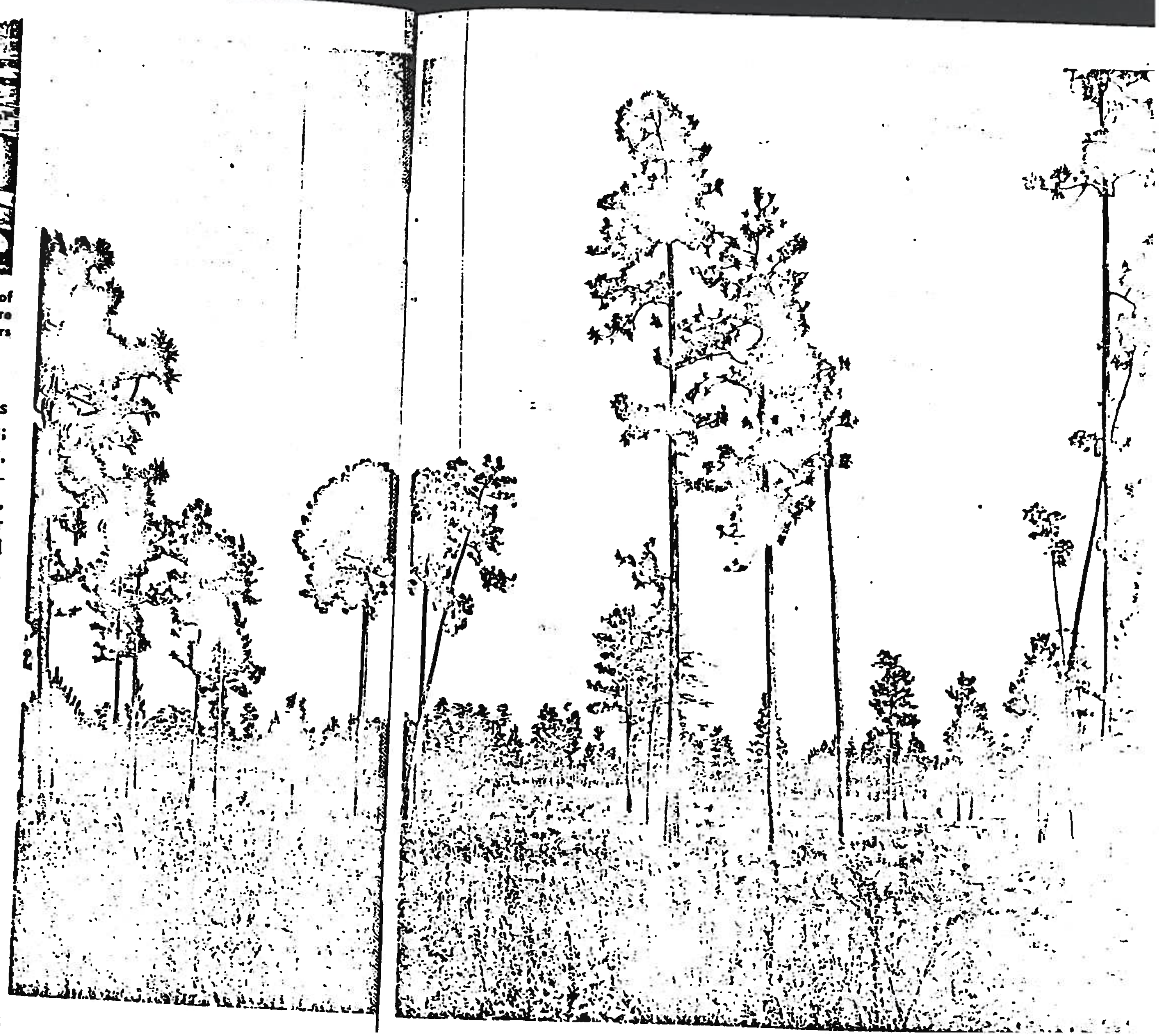


SAFETY THERMOMETER shows how long the plant has gone without a lost-time accident. Each employe has a choice of plant manager's prizes, shown in the window, after 270 accident-free days. E. L. Summers, safety supervisor, puts some red ink in the thermometer to mark another week without an accident. Lawrence O'Flynn, concrete finisher, looks at the prizes.



DRUMS OF ROSIN, made by the magic of chemistry from the resins in stump wood, are ready for shipment to naval stores customers in many industries all over the world.

one of the company's two naval stores plants in southeastern United States; a sister plant is located at Brunswick, Georgia. A Paper Makers Chemical Department plant at Savannah, Georgia, produces paper size and other paper chemicals, tall oil rosin, and tall oil fatty acids. At Bessemer, Alabama, Hercules makes dynamite and acid. Sales offices are located in the South at Atlanta, Georgia; Beaumont, Texas; Birmingham, Alabama; Brownsville, Dallas, and Houston, Texas; Greenville, Mississippi; New Orleans, Louisiana; and Raleigh, North Carolina. A map on the back cover shows the location of all Hercules plants and offices in the United States.



STUMPING OPERATIONS carried on throughout the South yield land values as well as naval stores chemicals. This typical field of stumps is of little value for forestry or agriculture. Stump-gathering operations will clear the land, churn the soil, and leave it suitable for crops, cattle grazing, or much more productive second-growth timber.

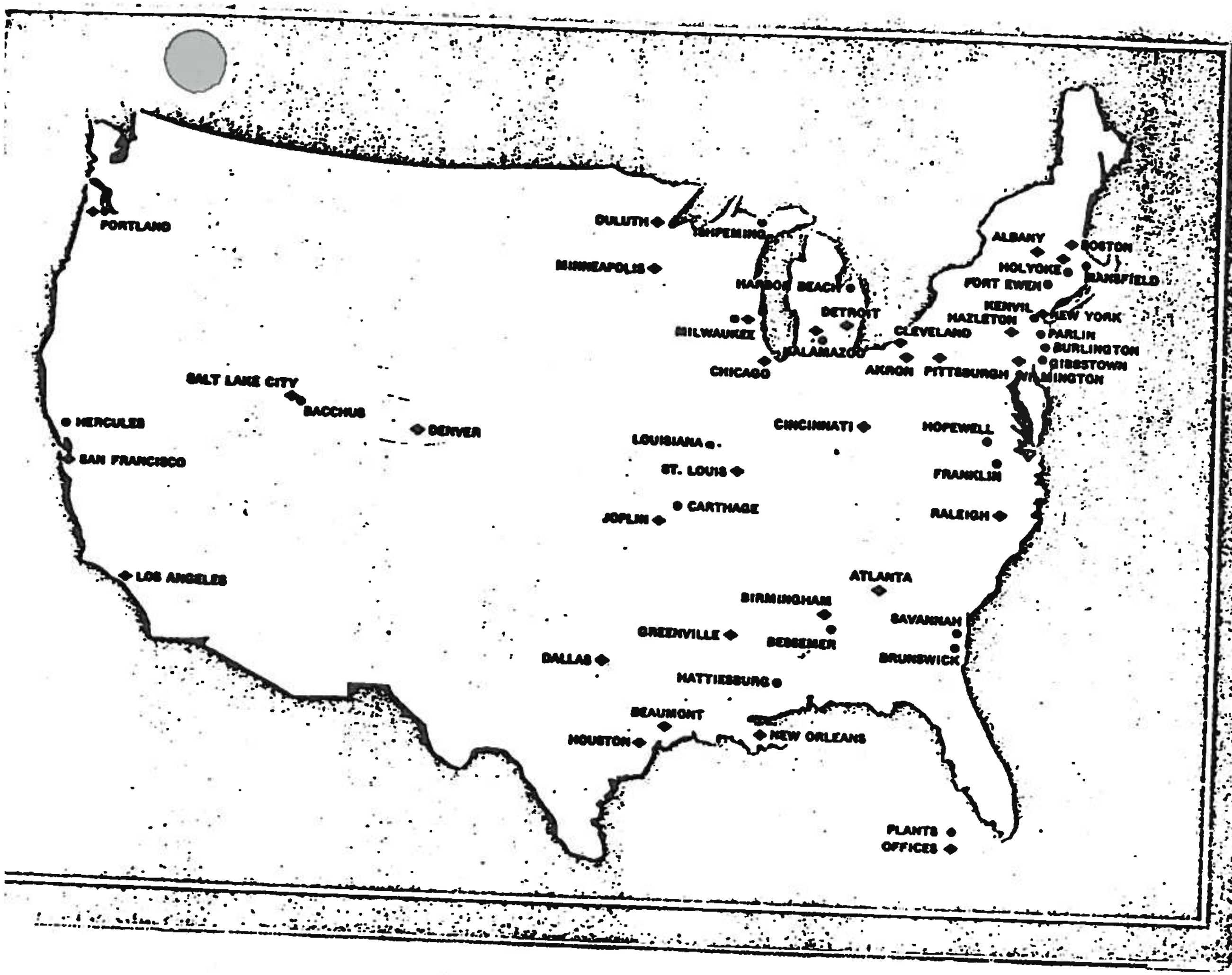
The products derived from the crude extract obtained from the pine stump flow out into a diverse tree of chemicals almost as wondrous as the pine which once grew where the stump was found. The oily crude extract is separated into the three primary products: rosin, turpentine, and pine oil, plus several miscellaneous chemicals. From these, an array of esters, resins, and other specialized chemicals are produced by the plant to meet more precisely the needs of Hercules customers, most of whom are manufacturers of a wealth of consumer products.

The chart below shows: (1) the primary products coming from the crude extract, (2) the products derived from them by Hercules, and (3) the end uses for which the customer buys our products.

1 Primary Products	2 Derivatives	3 Customers' Applications of Hercules Products
Rosin		protective coatings; paint; varnish; floor coverings; linoleum; soap; rubber
	Poly-pale Resin	ink; protective coatings; floor coverings; rubber; adhesives
	Staybelite Resin	rubber; adhesives; paper size
	Resin 731 and Dresinates	emulsifiers for synthetic rubber polymerization
	Dymerex Resin	ink; protective coatings; adhesives; shoe soles
	Resin 861	rubber; soap; adhesives
	Rosin Amines and Derivatives	corrosion inhibitors; flotation reagents; water conditioners; wood preservatives; wetting agents; algicides
	Rosin Esters:	
	— Pentalyn Resins	paint; varnish; traffic paint; printing ink; adhesives
	— Cellolyn Resins	lacquers
	— Staybelite Ester Resins	chewing gum; adhesives; food packaging

1 Primary Products	2 Derivatives	3 Customers'* Applications of Hercules Products
Rosin	Rosin Esters:	
	— Poly-pale Ester	varnishes; adhesives
	— Dymerex Resin Esters	printing inks
	— Vinsol Ester Gum	floor tile
	Rosin Size	paper
Vinsol Resins		phonograph records; Portland cement; floor coverings adhesives; asphalt; foundry; plastics; wallboard
Turpentine		paint thinners and solvents; textile printing anc dyeing
	alpha-Pinene	oil additives; synthetic camphor; insecticides
Pine Oil		flotation of ores; disinfectants; cleaners and polishes textile wetting, cleaning, and scouring agents; paint varnish
Solvenol and Dipentene		paint and varnish; rubber reclaiming; lubricating oi additives
*Miscellaneous Products:		
— Technical Anethole		licorice flavoring
— Terpin Hydrate		cough syrups
— Terpineol 318		odorant in soap and perfumes; disinfectants
— para-Menthane Hydroperoxide		catalyst for synthetic rubber
para-Cymene		heat-exchange medium
	para-Cresol	anisaldehyde for synthetic hormones and dyes
Metalyn (Methyl Ester of Tall Oil)		petroleum oil additives; plasticizers for resins

*Most of these products are in the technical form, and some are further purified or compounded before being ...



PORTLAND
HERCULES
SAN FRANCISCO
LOS ANGELES
SALT LAKE CITY
BACCHUS
DENVER
DULUTH
MINNEAPOLIS
ISHPEMING
MILWAUKEE
CHICAGO
DETROIT
KALAMAZOO
CLEVELAND
AKRON
PITTSBURGH
ALBANY
BOSTON
HOLYOKE
FORT EWEN
MANSFIELD
KENVIL
NEW YORK
HAZLETON
PARLIN
BURLINGTON
GIBBSTOWN
CINCINNATI
HOPEWELL
FRANKLIN
RALEIGH
LOUISIANA
ST. LOUIS
CARTHAGE
JOPLIN
ATLANTA
BIRMINGHAM
GREENVILLE
BESSEMER
SAVANNAH
BRUNSWICK
DALLAS
HATTIESBURG
BEAUMONT
HOUSTON
NEW ORLEANS
PLANTS
OFFICES

INFORMATION

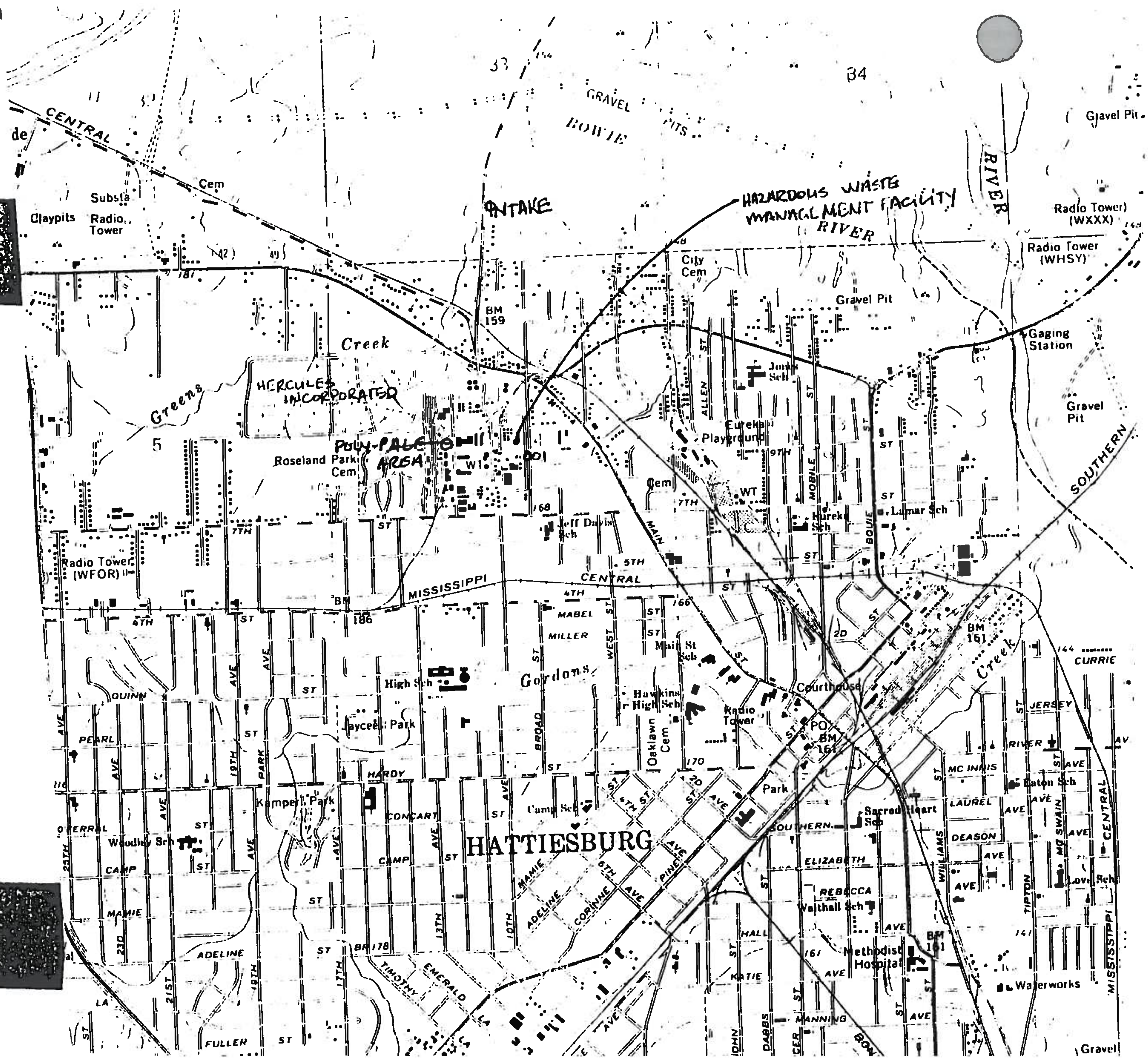
TOUR NOTES

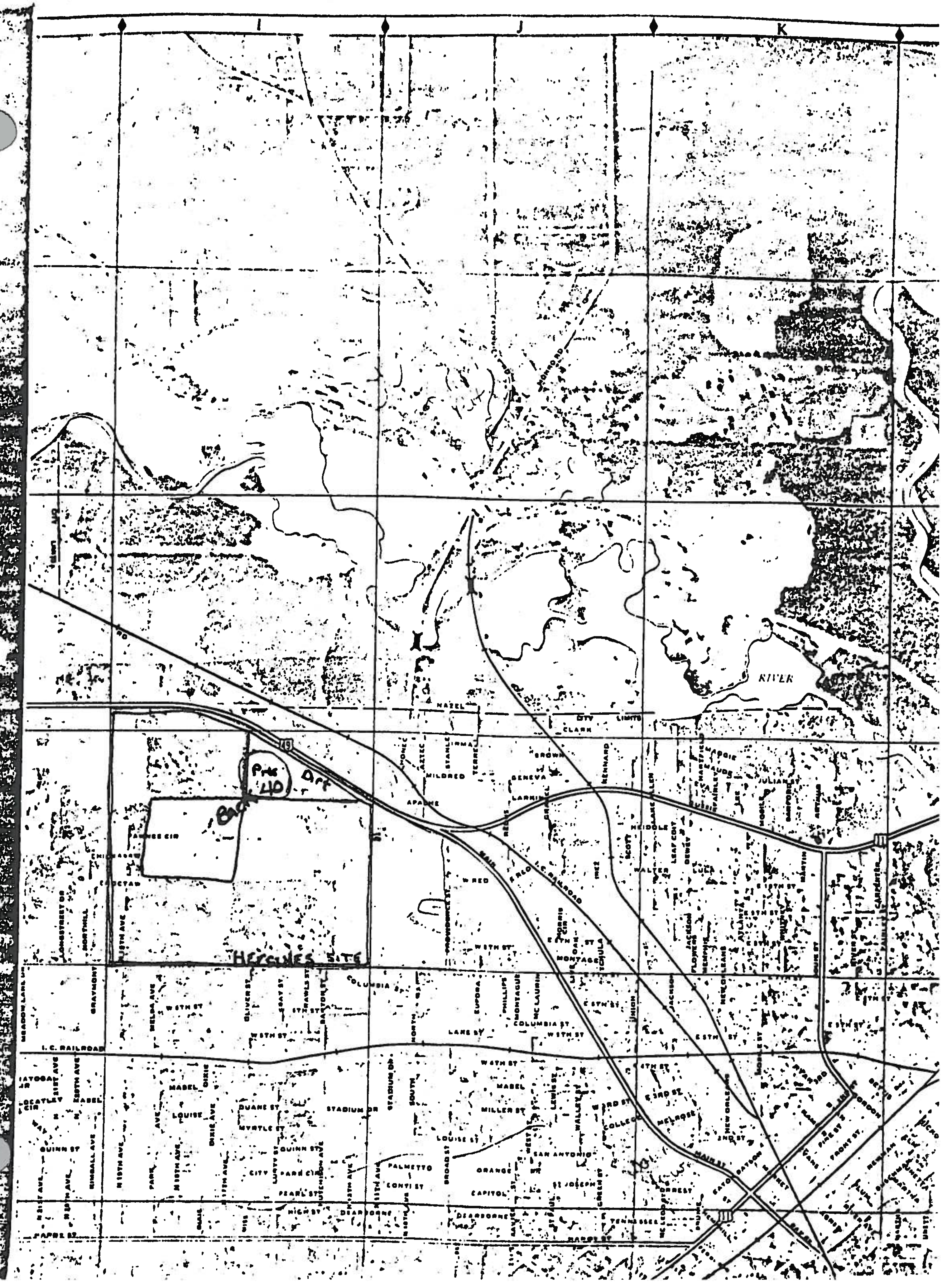
HERCULES INC.

The HATTIESBURG PLANT

Welcomes You!

R. H. HELLER
Plant Manager


HAZARDOUS WASTE MANAGEMENT FACILITY
INTAKE
HERCULES INCORPORATED
POLY-PALE AREA
001
HATTIESBURG
Radio Tower (WXXX)
Radio Tower (WHSY)
Radio Tower (WFOR)
Gaging Station
Gravel Pit
Gravel Pits
Bowie
River
Claypits
Substa
Radio Tower
Cem
City Cem
Roseland Park Cem
Oaklawn Cem
Greens Creek
Gordons Creek
Jones Sch
Eureka Playground
Lamar Sch
Eureka Sch
Jeff Davis Sch
Main St Sch
Hawkins Jr High Sch
High Sch
Jaycee Park
Kamper Park
Camp Sch
Woodley Sch
Courthouse
PO
Park
Sacred Heart Sch
Eaton Sch
Love Sch
Walthall Sch
Methodist Hospital
Waterworks
Central
Mississippi Central
Southern
BM 159
BM 186
BM 161
Mississippi
Main
Mobile
Bouie
Allen
Mabel
Miller
West
Broad
Hardy
Concart
Camp
Quinn
Pearl
O'Ferral
Mamie
Adeline
Corinne
Pine
Emerald
Timothy
Fuller
Currie
Jersey
River
Mc Innis
Laurel
Deason
Williams
Elizabeth
Rebecca
Tipton
Mc Swain
Hall
Katie
Dabbs
John
Manning

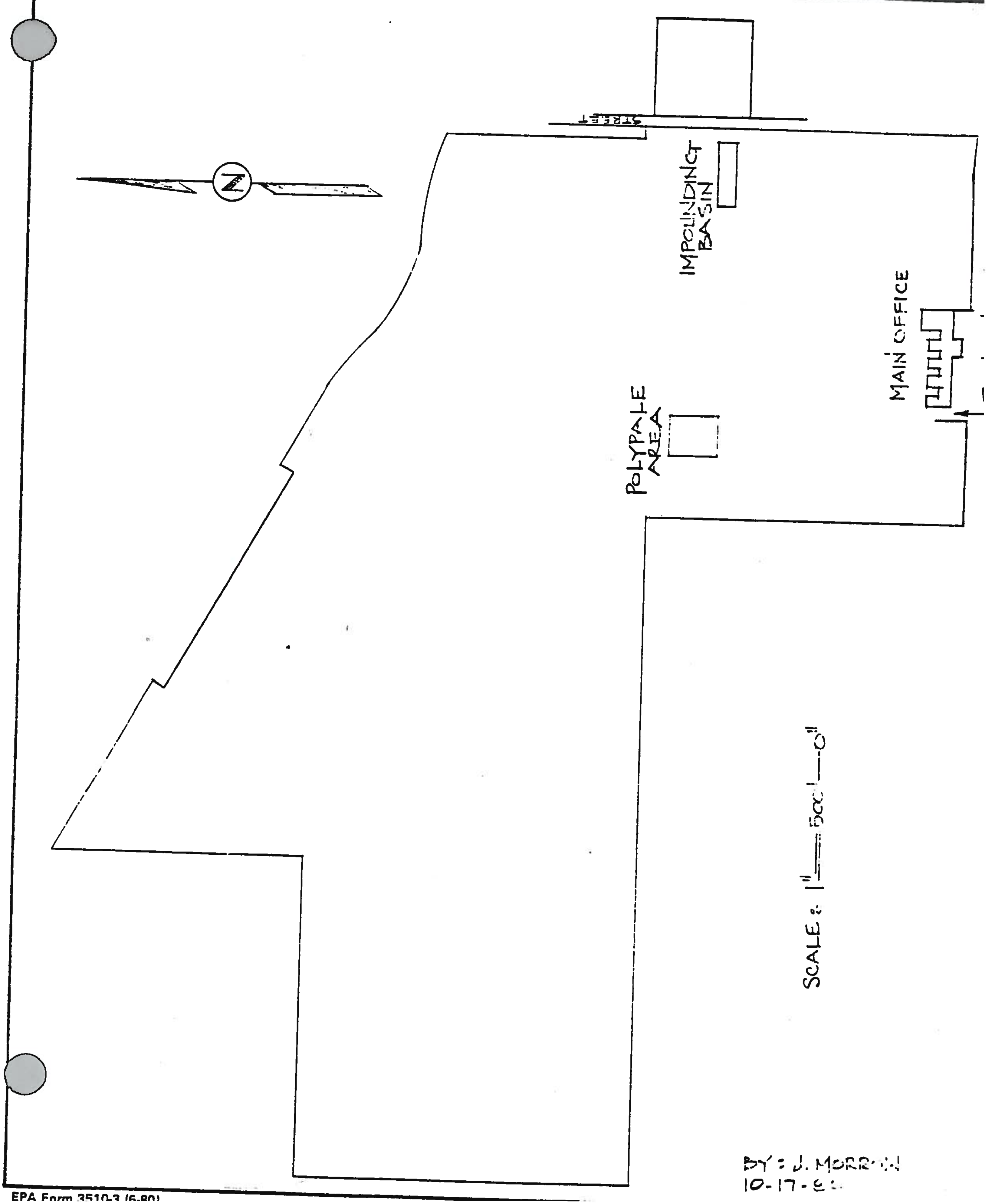


I
J
K
RIVER
HAZEL
CITY LIMITS
CLARK
BROWN
MILDRED
GENEVA
LARKIN
APACHE
KENNARD
SCOTT
WALTER
Off
Back
HERCULES SITE
COLUMBIA ST
I. C. RAILROAD
STADIUM DR
MABEL
LOUISE
DUANE ST
MYRTLE ST
QUINN ST
MILLER ST
SAN ANTONIO
PALMETTO
ORANGE
CAPITOL
DEARBORNE
TENNESSEE
HARDY ST
MELROSE
FORREST
MAIN ST
FRONT ST
GORDON
PHILLIPS
MONTAGUE
MC LAURIN
GRAYMONT
LONGSTREET DR
NORTHILL
CHICKASAW
CHOCTAW
DIXIE AVE
PARK AVE

Continued from page 4.

V. FACILITY DRAWING *(see page 4)*

Form Approved OMB No. 158-S80004



B&V WASTE SCIENCE AND TECHNOLOGY CORP.

Reference 5

TELEPHONE MEMORANDUM

US EPA -- Region IV
Hercules, Inc.
General Site Information

BVWST Project 52011.040
BVWST File
November 2, 1992
15:20

To: Charles Jordan, Environmental Supervisor
Company: Hercules, Inc.
Phone No.: (601) 545-3450

Recorded by: Carter Helm

To fill in same data gaps, Mr. Jordan provided the following information:

- The entire 200-acre facility lies within the 500-year floodplain -- according to the Engineering Department's reference from the Corps of Engineers Map No. 28035C0045C Panel 45 of 200 dated April 2, 1990.

- Currently, Hercules employs 290 people including the clerical staff.

- Operations began in 1923, over 250 products are manufactured.

- The Hercules surface water intake on the Bowie River is used for industrial purposes only.

- Zeon Chemicals of Mississippi, located at 1301 West 7th, is located on land which was originally Hercules property, but this parcel of land was first purchased from Hercules by B. F. Goodrich, who then sold or leased it to Zeon. See Figure 2.

Information about the holding ponds (surface impoundments) located in the back forty, as offered by Mr. Jordan include:

- Three "ponds" are located north of the dirt road and share common dike walls. Their sizes and depths are similar.

- One large "pond" plus two smaller "ponds" exist south of the dirt road. Previously, common dike walls have collapsed and yield a large, but still contained, surface impoundment. Dike walls are four to five feet tall.

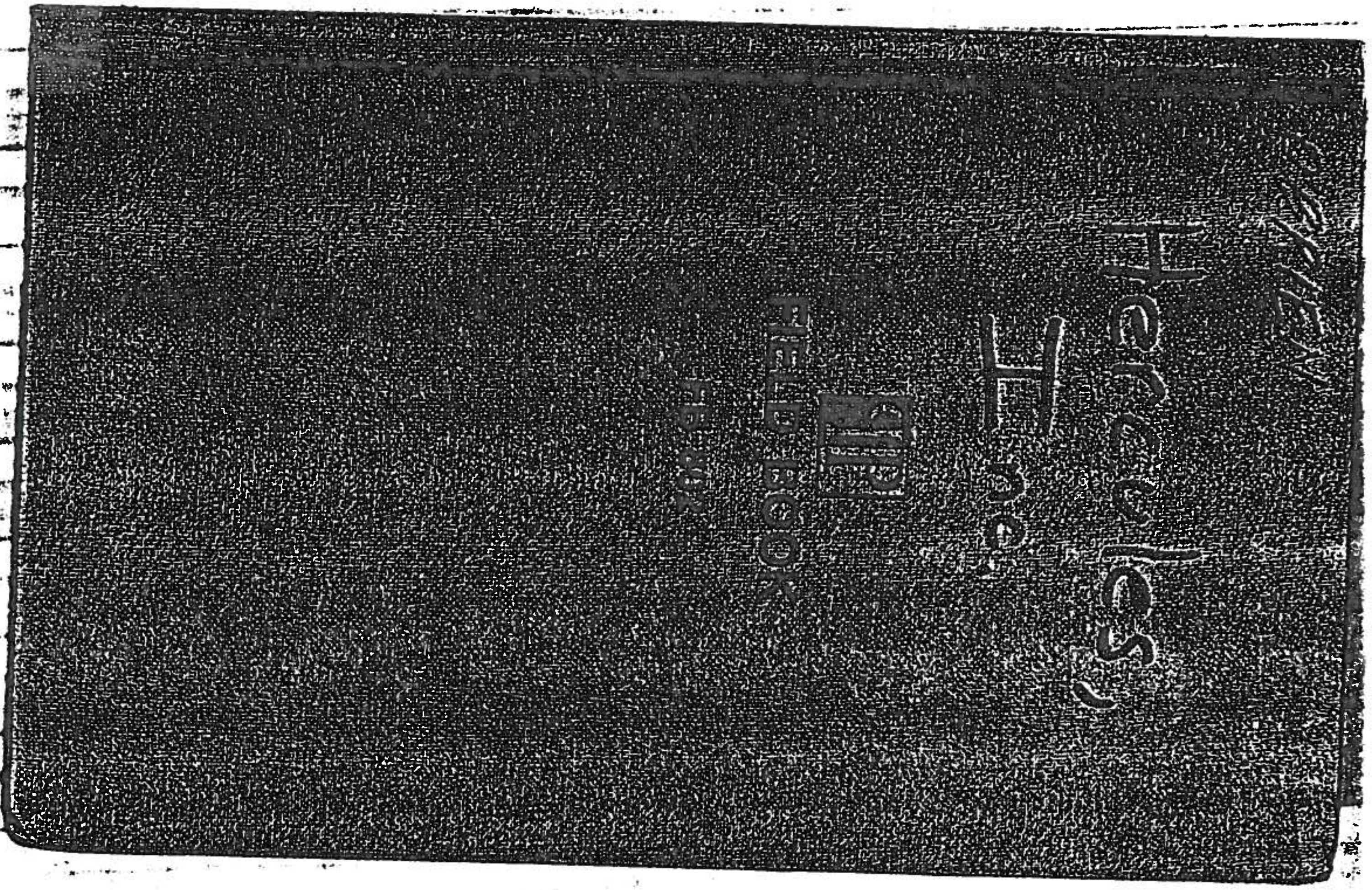
- All impoundment material is of the same composition, but deposition times are all different.

- Using four feet as an average depth, maximum volume of the impoundments is one million cubic feet.

- Mr. Jordan will fax me exact dimensions of these surface impoundments tomorrow.

ms

Reference 6



CONTENTS

PAGE NO.	REFERENCE	DATE

HERCULES, INC. (1)

6-1-92 HATTIESBURG

0730 Arrive at BVWST office
pick up copies of aerial photos.
0750 Leave office for Airport.
0950 Board plane
1015 (CENTRAL) Arrive New Orleans
1251 Arrive at Hercules Inc in
Hattiesburg, Miss.
1300 Meet Charles Jordan
and go get a drink (soda)
1330 Meet Jim Hardage

1340 Begin touring Back Forty
- Sludge Pits - Unlined
- Waste piles all through Back 40 comprised of metals and drums, wood scraps and old equipment!
- Look at Green's creek no discoloration noted.

1430 Go back to Charles

(2)

Jordan's office and discuss our sampling plan and geophysics survey. Jim Hardage brings up to two areas of concern. Both areas reported to (MER). Charles said he was ~~was~~ aware of the areas. Jim will provide BVWST with copies of his maps.

1510 Go to view these two areas. One area on north appears ok, but mounded possible drum burial. The second on the west side can not be accessed easily but will be during investigation.

1630 Jim Hardage leaves as does Charles Jordan and Nikki Carlson. JBO will meet Jim Hardage in Jackson to look over files.

6-2-92 (3)

0600 Leave Hattiesburg for Jackson

0730 Arrive Jackson. Have breakfast

0800 Arrive at Mississippi State Department of Environmental Quality

(4) CPW 6-21-92

Sunday

weather: Sunny, 80°

12:00 ~~Stopped~~ by BVWST Office for field supplies & to copy sampling field sheets for Hercules, Inc.

1400 Depart office for Hattiesburg, MS Holiday Inn

EST → CST time zone change

21:15 Arrive at Holiday Inn

6-22-92 (5) CPW

HERCULES

Hercules Incorporated
P. O. Box 1937
Hattiesburg, MS 39401
(601) 545-3450

Charles S. Jordan
Environmental Supervisor

0740 Meet with Charles Jordan to discuss the week's events

He showed us aerial maps of site circa 1980

location error on the FSP site layout + sampling maps: sludge pits are located at top △≈△ - these Greens Creek plus Xeon Chemical Co has purchased land from Hercules, Inc. - SW corner of site. New site layout maps will indicate this portion.

(6) C/[initials]

6-22-92

Bonner Labs
Joe & Mike Bonner
will split samples
with us

Joe Powers is field tech.
that will join us. - Tee a wash
start. Hercules wants JSA so
we contacted OBrien to set up "OK"
from EPA.
Mr. Curtis Knight
process shift supervisor
will escort us & guide
us around the site - he
is in radio contact with Charles
Jordan if we need assistance

0900 Brian Jones, I, Charles Jordan
& Curtis Knight take my
truck to recon site & get
familiar with layout & safety
rules.

10:00 Set up decon

6-22-92 (7) C/[initials]

10:30 Battery check plus
calibration of G-856
Magnetometer serial 690741.

10 40 Mag at background
for Area 1 - near more Labs:

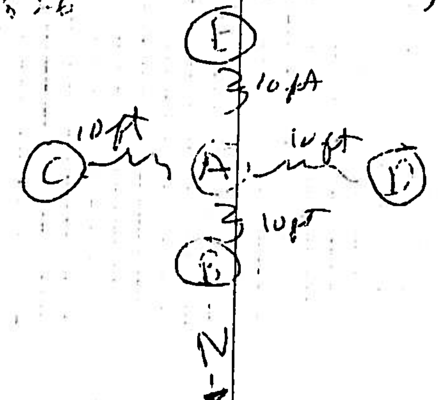
A) 1) 50,832.7
2) " " .7
3) " " .8

B) 1) 50,858.7
2) 50,858.4
3) 50,858.3

C) → 1) 50,830.7
2) " " .8
3) " " .8

D) 50,827
50,827
50,8 [illegible]

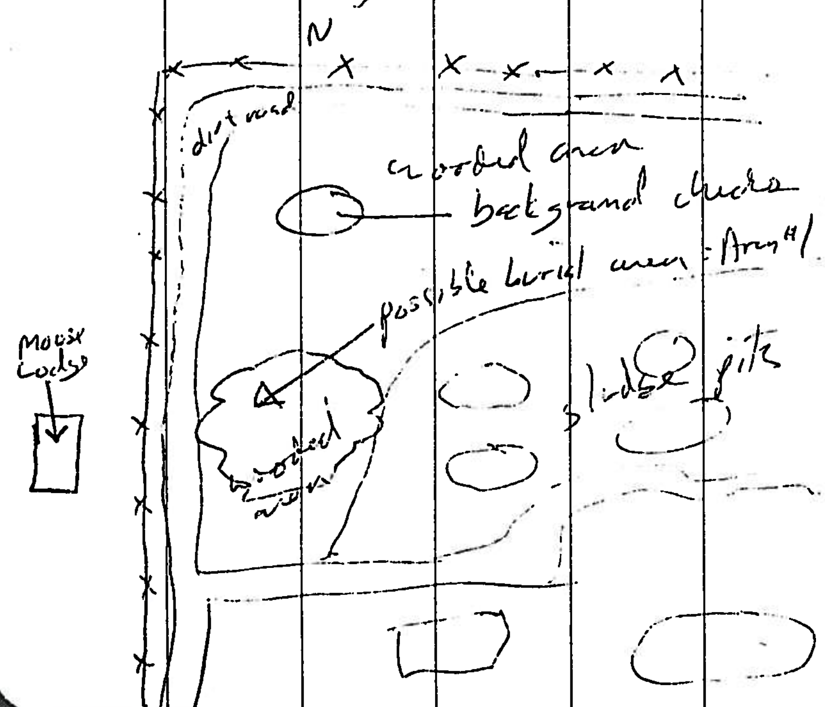
E) 50,826.4
" " .8
" " .8



(8) CJM

6-22-92

Background location is 30 ft South of fence in a wooded area that appears undisturbed by any prior activity.



6-22-92 (9) CJM

13:30 to 14:00 Lunch break

Mr. Jas Poole will replace Mr. Knight at 2:30 every day, however (14:30) as he will be busy to be with us constantly.

16:00 Spot check indicates higher anomalies near the Moose Lodge - otherwise all other areas show background ± 70 gammas

We have found & delineated Area #1 of Geophysical Grid

(10) [initials]

6-22-92

1700 EM-31 spot checks
one meets [illegible] use
serial No. 8305012
decal No 307293 EM-31

Batt check ✓ zero check ✓
phasing ✓ sensitivity ✓

Same background levels as mag.
shows 38 to 42 (C.H.) ~~[illegible]~~
mmhos/m average values.
Some erratic readings in area
near Moose Lodge.

18:15 Set up Base Lines for Area
#1, 10 foot intervals
70' X 100' will be grid

1930 Depart Site

[signature]

6-23-92

(11) [initials]

0715 Arrive on site

07:20 Release SI & Geophysics
FSP to Mr. Jordan - we
have EPA Permission to do so.

07:30 Set up Recon

0735 Calibrate OVA
- Brian & I.
Sent Dave Brown for
ice

Dynamac personell will help
us with the geophysical
surveys

8:00 Back at Area #1

Everyone helps to
cut brush, trees in
~~the~~ 70 x 100 foot
area. - Heavily wooded.

(12) C/

6-23-92

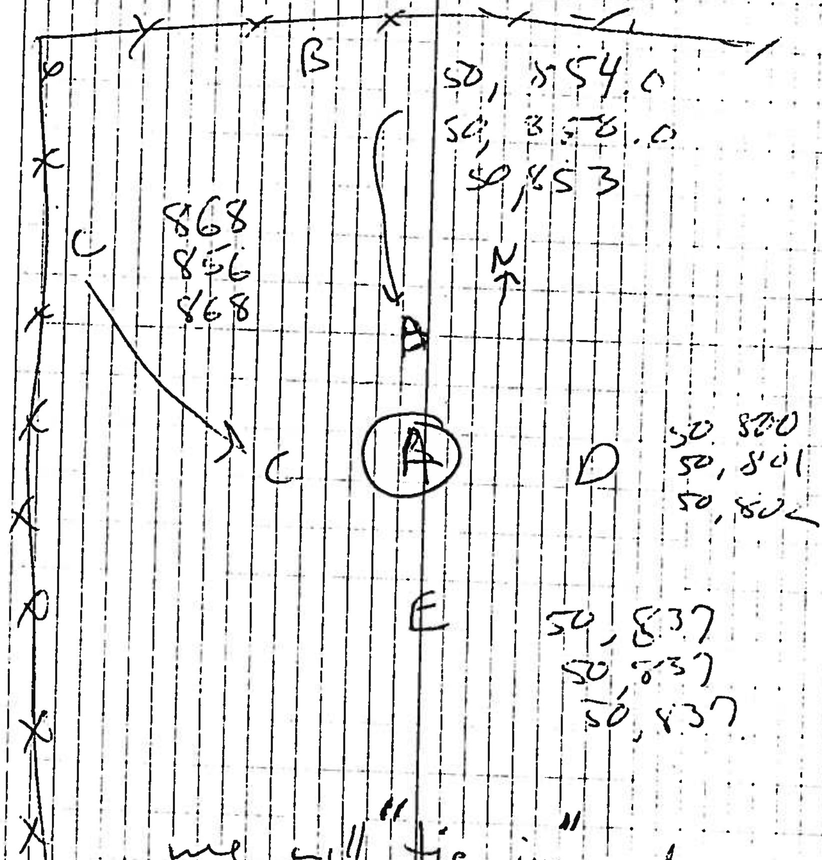
D. Brown & D. Smith
+ Brown & myself set up
grid stations (10 ft x 10 ft
wooden stakes at base line
wire flags at all other
stations = all flags labelled
(x, y) coordinate points

10:40 Low on wire flags
so I depart site for
Lowes to purchase more

11:40 Return - crew just finishing
the grid layout.
& instruct Brown & Smith
on use of Mag G-856.

6-23-92 (13) C/

12:10 Same background area (A) → G22292 : 50,836.6
50,833.8
50,843.0



we will "tie in" grid
at end of field sampling.

12:20 Smith & Brown start w/ G-856 at (0,0)

Helm & Jones start at (0,7) with EM-31

We will not take readings close to each other for fear of interference.

Please see EM field Data sheets + Mag field Data sheets

Note Talked to neighbor, Mo Booth. He said retired employees live near him that might help us locate former burial pits.
- Murphy Payton
& - C.L. Rankin

13:30 Lunch break

14:30 back on site - area #1

15:40 All data collected at area #1, we take our instruments to suspected landfill near E-O tank

Spot checks indicate high anomalies on hill of stressed vegetation. This will be Area #2

16:00 Base Lines marked off w/ wooden stakes

25 X 25 foot spacings

(16) C [initials]

6-23-92

Total grid size:
175 X 250 feet.

Again - Jones/Helm run EM-31
Smith/Brown operating G-856

see EM Gold sheets
" MAG " "

for data.

18:15 Both teams finish up w/ data collection

6-23-92 (17)

C [initials]

18:30 Talked to Mr. Poole, about today's activities & what to expect tomorrow. I told him sampling will start early tomorrow wrap up Recon

19:00 Depart site

19:05 Drive around site to speak to former employees of Hercules. Go to Mixon Street - behind Moose Lodge. C. L. Rankin not home

(18) CJH

6-23-92

19:20 talked to Murphy Payton 5828 Mixon Street, he used to operate heavy machinery that dug & buried ~~empty~~ drums plus some non-toxic full drum at bottoms of many pits - including the pine stump storage area. He states that fly ash was used to cover up burial pits - he said all haz waste was transported off site.

20:00 Brian & I shift data input into Surfer program for both Areas

Area 1
EM "Hot areas" (3,3), (7,7), (5,3), (6,2), (7,3) (6,4)
Mag "Hot areas" (6,2) (6,3) (6,4) (7,4)

Area 2
EM "Hot areas" (1,3) (1,4) (1,5) (3,4) (3,2)
Mag "Hot areas" (1,3) (1,4) (3,6)

22:30 Go To Bed

6-24-92

(19) CJH

6:40 Arrive on site

6:45 set up Recon & paperwork table

7:25 collect TB-01

8:00 Brian Calibrates OVA

Rest [illegible] equipment ~~in dooley~~ for next step background location. We will go south across the street from the gate house. This is the up gradient area.

CQ 6-24-92

I explain paperwork procedures to crew especially David Brown. He is the designated paperwork person but everyone will help.

Bonner Labs employee, Jim Powers joins us to split samples - he has his own vehicle

08:40 I calibrate pH, conductivity temp. meter

6-24-92 CQ

0850 Permission granted from 906 Seventh St (Short Columbia St.) Mrs. Sadie B. Smith 601-583-4487

0855 Collected SS-01 - 6 inches bls back property

0905 - Silt, Clayey Sand soil is coming out of background. By the time we reached 4' we encounter clay

0920 No OVA reading at 5' bls <1 ppm

0925 Hit saturated zone at 7' bls, fine sand, white, tan

0925 Collected SB-01 OVA <1 ppm

(22) CJH 6-24-92

9:45 at 8 feet bls
we notice borehole
collapse occurring

due to plenty of groundwater
in hole so we
install (fast point)
3 foot screen
5 foot casing – all
stainless steel.

Set up peristaltic
pump & wait for recharge

10:00 Problem with pump
– a break in the
tubing within pump head

6-24-92 (23) CJH

Mr Bonner (PRP Lab)
plus
Mr. Jordan arrive
at background locale

Mr. Bonner offers
a "pump head" to use
from his Lab – I said
"OK" – so he radioed
for one.

10:25 Bonner Lab
employee arrives with
new equipment –
we install it

10:30 We now set G-4
to pump out – Problem
Solved

(24) [initials]

6-24-92

		pH	conductivity	temp
10:33				
10:33	1)	5.87	256	87.8
10:40	2)	5.83	254	88.2
10:45	3)	5.81	254	89.2

10:45 Collect TW-01
slow recharge

11:30 I drive back with samples already taken.
Dave Brown is paperwork person,

OTher crew is still collecting TW-01

6-24-92 [initials] (25)

1:30 (13:30) called office
Jim OB - is gone
Talked to Joe about Labs

{ organ: Comp Chem Lab
{ inorgan: AATS Lab

Talked to Bryan Williams,

he says don't do Temporary well cause there are no targets - he said do on site wells & check to see if City

6-24-92

of Hattiesburg municipal wells (600 to 750 feet deep) use the same aquifer. They dont.

Talked to Dynamac's Katherine Siders / Belinda Brock

They said go ahead and collect at least one temporary well sample plus collect from the site's monitoring wells.

14:30 Scouted out the Grass Creek for best sample location. Cut a path through brush to access creek at point of entry onto site

6-24-92

16:10 collected SW-01 * matrix Duplicate

16:20 parameters { Temp 96.1 °F, Cond " 82 u S/cm, 82/ ×100 = 82, pH " 7.91 }

16:40 collected SD-01 matrix Dup.

also at creek's entry onto site property - crew noticed an oily slick sheen on water (non-site related) but otherwise "clean" area.

17:10 Returned samples to
pipeline person

Went to Creek's exit
off site property to
17:20 get SW-02, SD02
v. bronze/black sludge
coming out of creek bed
plus foamy white
Field measurements
of SW-02:

17:40: Temp 97.3° F
cond 415
pH 7.36

OVA <1 ppm

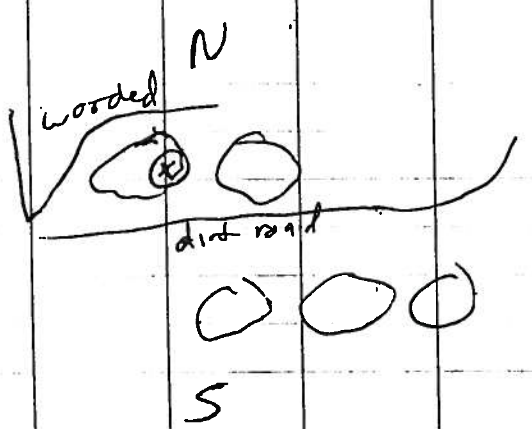
17:30 Collect Sediment
Sample SD-02

17:50 Checked out
sludge pits near
geophysical area #1
They are black, smelly &
semi-viscous - all these
ponds seem to have the
same constituents so
only one sample will be
necessary.

(30) C[initials] 6-29-92

1800 OVA readings are between 5-10 ppm after breaking open the hard top layer of this sludge.

18:15 SD-03 collected from sludge pond furthest NW



6-29-92 C[initials] (31)

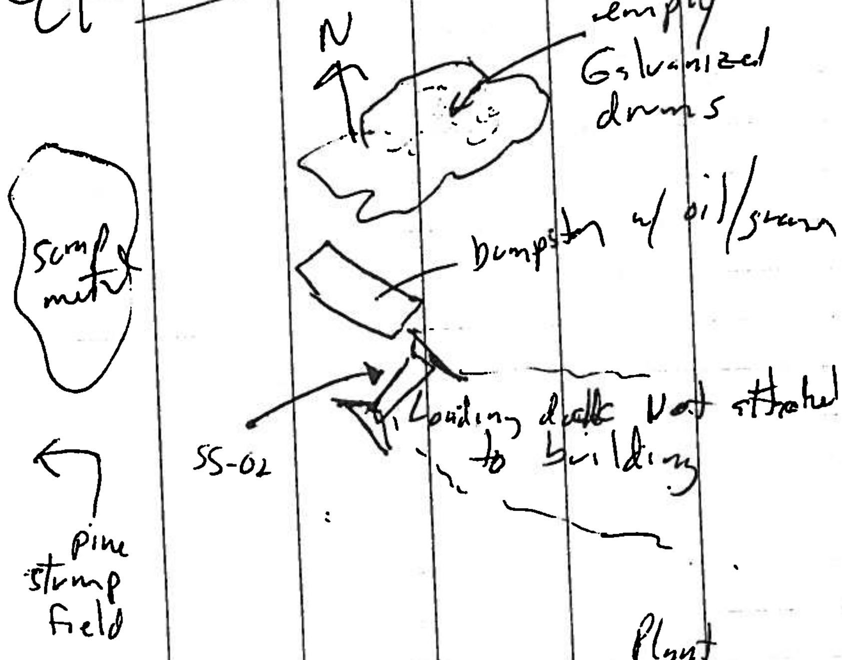
18:45 We move to drum recycler area to a loading dock where stained soil is evident at a dumpster — seems greasy or petroleum-based black smelly

19:00 OVA reading is variable but between 10-13 ppm.

19:15 SS-02 collected from very stained soil 4 inches deep.

32 CW

6-24-92 Crooked Creek



20:00 everyone helped w/ paperwork & sample prep.

20:45 Depart Site

33 CW

6-25-92

0630 Arrive on site

Blanks & Spikes are with us - David Starts to prepare Them to ship

OVA calibrated by Brian

we prepare for sample set #3

weather: 100°F 100% humidity no wind - miserable

7:15 In stump field for SS-03, SB-03, TW-03

near stained soil, tar spots

(34) CJW 6-25-92

7:25 SS-03 collected
OVA <1 ppm
at 6 inches bls

7:45 ~~offset~~ CH Refusal w/ hand auger

7:55 ~~offset~~ Refusal

8:05 offset/Refusal

Too many stumps and scrap metal, Therefore No SB-04, nor TW-04 will be collected here.

6-25-92 (35) CJW

8:15 OVA out of H2

8:22 Calibrate HNu
10.2 eV probe
span = 9.8

8:20 At Area #2
(1,3) (1,4)
area of high anomalies

6 in bls - SS-04
8:45 SS-04 collected
HNu <1 ppm

36 CLW

6-25-92

9:00 1 ft bls

HNu = 55 ppm

w/ background = 10 ppm

in borehole

4 offsets - No luck - roots garbage

SB-04, TW-04

will not be collected

6-25-92

37 CLW

0945 At Area #1

(6,4) (6,7) are

high anomalous areas

/ concern and sample area for SS-05.

0945 - SS05 by Moose Lodge - 5' bls

0955 - H1-SB-05 by Moose Lodge at 3 ft bls

See cond/temp/pH on pg 39

10:40 Peristaltic pump in use

10:50 collect VOA's at 5' bls

(38) CH

6-25-92

11:40 all VOA's filled but recharge is slow

Charles Jordan drops by also Scott Wigley of Bonner Labs, Scott has brought a pulley device that will aid in minimizing well purging (3 volumes)

B-1 well is next.

6-25-92 (39) CH

TW-05 Field Data

pH	cond	temp
7.58	397	82.7
7.56	388	83.8
7.42	392	83.9

PHONE (601) 264-2854

BATCO

Scott Wigley

BONNER ANALYTICAL TESTING COMPANY

AIR, WATER, PETROLEUM, AND HAZARDOUS WASTE

JOE C. POWERS
Analytical Reagents

668 Weathersby
~~ROUTE 14, BOX 509~~
HATTIESBURG, MS 39402

40 CJM

6-25-92

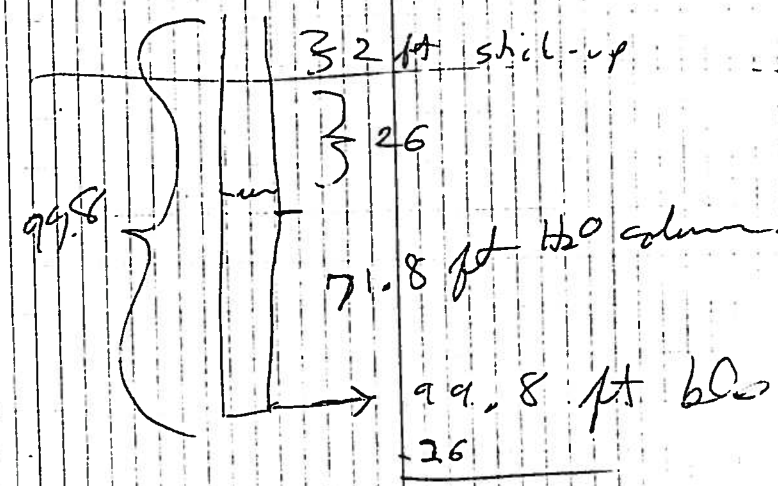
12:00 I leave Brian Jones & Joe Powers at TW-05 to continue to collect GW sample

I return samples to paperwork table and grab water level indicator & mobilize to MW-B1

6-25-92 41 CJM

12:10 at Permanent well B-1

to top of casing (2 ft)



11.75 gallons = 1 well volume

35.25 gallons = 3 well volumes

(42) CJW

6-25-72

I depart B-1 and let D. Smith & Scott Wiggles to continue boiling -

I checked out drainage ditches on east side of plant.

12:35 One well volume purged (initial/base reading)

pH 7.33

cond 241

temp 81.0° F

6-25-12

(43) CJW

2 Volume Purged 12:40

Temp 79.7

PH 7.28

COND 242

3 Volumes Purged 12:55

Temp 81.5

PH 7.02

COND 259

4 volumes Purged 1:10 (13:10)

Temp 84.1

PH 6.88

COND 268

6-25-92

12:45 Joe Powers & I scout out location for a soil or sediment sample on East Side of Plant. Near the Paracel Process Area is stagnant drainage ditch with brown/tan water w/ Thin, hard coating. We sample here.

OVA/HNu indicates <1 ppm.

6-25-92

Drainage ditch

SD-04-E4

12:45 collection time

HI-B-1
collection at 13:30

13:30 all volumes collected for HI-MW-B1

1400 Return to Decon with Samples from MW-B1 and SD-04

14:30 We all help label & package samples into coolers

<u>Note</u>: A red fox was seen by all present roaming South of Greens Creek near decon station

1500. Attempt to collect MW-B2 near Hercules waste water treatment plant. The "cap" has a large open hole on the side plus a long PVC tube extending into well casing - This is for pumping air into well for water extraction We can <u>not</u> sample this well.

(48) C

6-25-92

15:30 Return to decon sampling is complete

all help to ship samples.

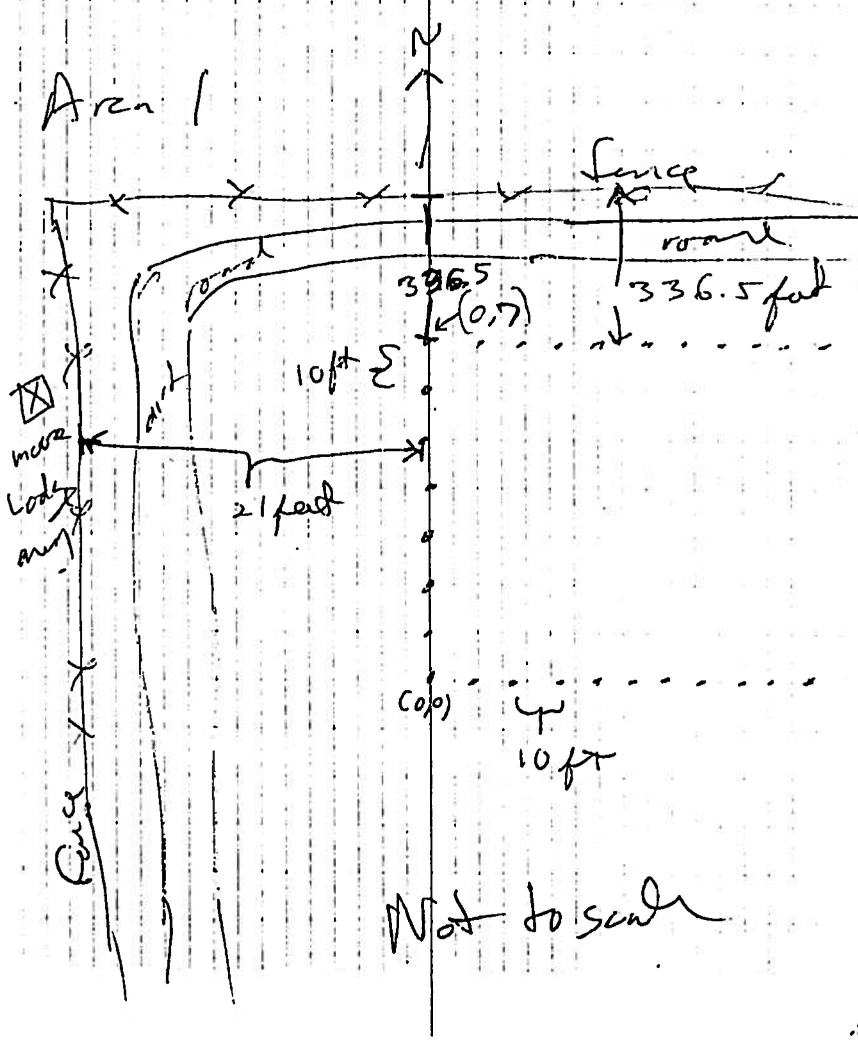
1600 Brian delivers Receipt for sample to Sadie Smith (Background location)

Joe Powers signs his receipt for samples (split samples).

1700 Brian + I measure out the geophysical grids for reproducibility.

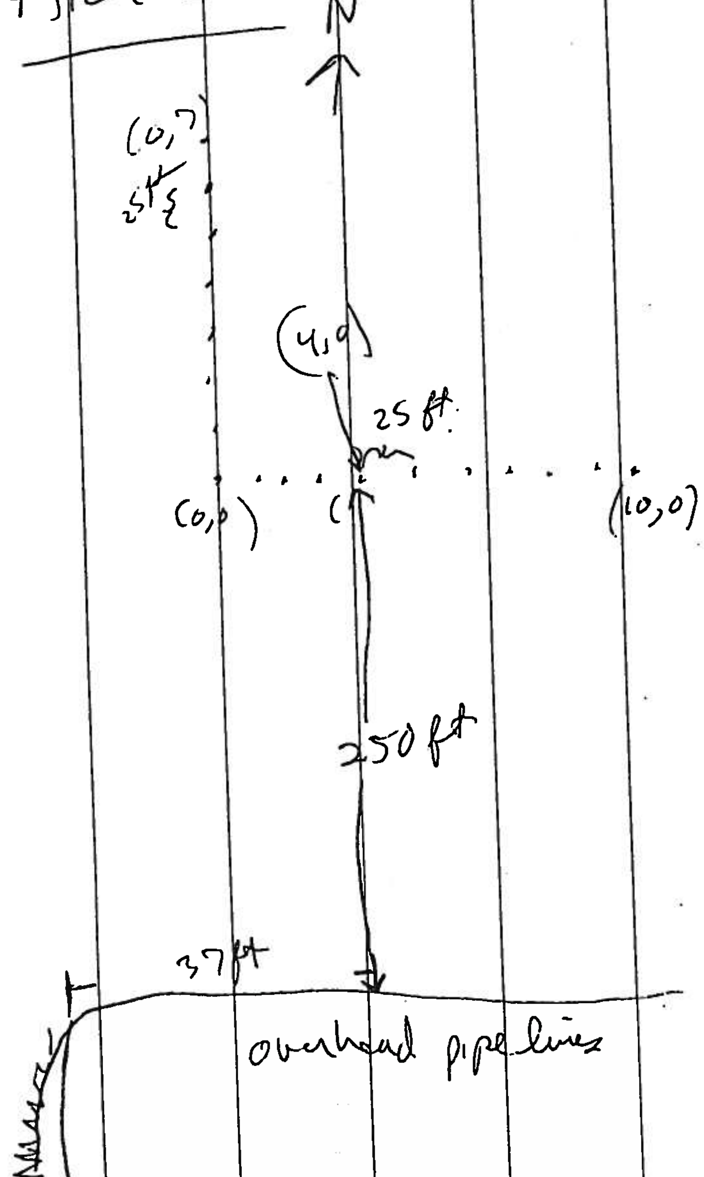
6-25-92 (49) C

Note: Reproducibility of Geophysical Area Grids:



(50) C[crossed out] 6-25-92

Area 2



6-25-92 (51) CJW

18:30
D. Smith & I take
6 coolers — 2 inorgs
— 4 organic
to Hattiesburg Fed Ex.

19:30 Brian & D. Brown
clean up Decon
& put equipment
away

~~18~~ CJW

20:00 Depart Site

[signature]

6-26-92

0900 SMO contacted for report of samples shipped:

SW - 5 + dup = 6
SD - 4 + dup = 5
SS - 6
SB - 3
TW - 2
MW - 1

10:00 Called in hours to BUWST office

6-26-92

10:30 Depart Hattiesburg

17:45 Arrive in Atlanta

(54) CH

8-18-92

0700 Meet w/ Robert Jordan BUWST

0720 Collected
PB-01
TB-01 } blanks

Off-site

Weather today:

70-80° F
clear
low humidity

0735 Meet w/ Charles Jordan for entrance meeting — explained what samples are necessary.

8-18-92

(55) CH

Curtis Knight will escort us on site today.

0745 Set up Decon Station

	Std.	Reading
pH	7.00	= 7.03
	4.00	= 3.98
	10.00	= 10.25

Conduct. 2000 = 2029

Temp. 75°F

Meter # 9976138
Decal # 683 956
Calibrated by Carter Helm 08:42

(56) [initials]

8-18-92

Loc	pH	Cond.	(°F) Temp.	Time
SW-01	7.04	339	71.5	09:04
	7.13	239	71.3	09:05
	7.21	236	71.2	09:05

at 9:10 SW-01 collected
plus matrix dup's
two x volume
at Green's Creek
entrance onto site property
just below fence grating

8-18-92 (57) [initials]

9:30

at SW-02	pH	Cond	Temp
9:30	7.13	435	73.6
9:33	7.19	441	72.3
9:35	7.14	438	71.9

9:40 SW-02 collected

banks are again
oozing w/ rusty-colored
seepage. - No smell.
Note SD-02 contains
this seepage
which was collected
at last field trip.

Note:
SW-02 is at Green's Creek exit
from site property.

10:01 Old Landfill Location
Area #2 of Geophysics
(1,4) coordinate for SS-04
near old location

10:10 - SS-04 collected

3 ft south of (1,4) stake
at 6 inches bls

10:30 SD-04 collected
200 ft South of
original location
since old location has
dried-up.

New location is
30 ft East of ETM M1206 surge tank H2O holding tank
2 inches bls

11:15 - SD-03 collected from bldg 40 holding ponds at 2" bls

Same pond as before was sampled.

11:20 Behind Moore Lodge (6,4) coordinate area #1 of Geophysics

SS-05 is Matrix Duplicate

11:25 - SS-05 collected at 6 in bls

11:45 SB-05 collected

3 ft bls mud → sand tan red

between (7,4) & (7,3)

7½ ft bls (at pt of saturation) is where sample was collected

12:40 Back at Recon station to begin paperwork

15:30 Deliver receipt for samples to Charles Jordan to sign

He wanted me to make a note that SD-04 location was moved 200 ft south & I did not give him an opportunity to split this sample.

16:00 exit meeting with Charles Jordan

1700 Clean up Recon Area

Depart site to Hotel

<u>Note</u>: No Lunch today

64

8-19-92

0900 Set up paperwork table and wait for Fed Ex w/ our blanks & spikes.

1000 Blanks & spikes arrive

10:30 → 14:30
Prepare all samples for shipment

1500 Fed Ex delivery

organics - 2 large coolers
IEA Lab
Airbill# 5125970802

inorgs - 1 large cooler
Keystone - PA Lab
Airbill #: 5125970791

8-19-92

65

15:30 Lunch break

16:00 Depart Hattiesburg, MS

23:30 Arrive Atlanta

6/23/92

page 1 of __

DB

Area 1

MAG FIELD DATA SHEET

STATION X	STATION Y	Reading	Reading	Reading	Average (gammas)	Comments
0	0	50717	717	718	50717	25' from fence
1	0	50804	805	805	50805	
2	0	50854	854	854	50854	
3	0	50902	50903	902	50902	
4	0	50985	985	985	50985	
5	0	51106	108	106	51107	
6	0	51181	179	175	51178	
7	0	51097	091	093	51094	
8	0	50976	976	976	50976	
9	0	50925	925	925	50925	
10	0	50914	914	914	50914	
10	1	50887	887	888	50887	
9	1	50894	894	894	50894	
8	1	50984	987	987	50986	
7	1	51394	400	401	51397	
6	1	51883	882	877	51881	
5	1	51542	537	538	51539	mounded area
4	1	51068	069	066	51068	mounded area
3	1	50893	893	893	50893	
2	1	50841	841	841	50841	
1	1	50804	804	805	50804	
0	1	50733	733	733	50733	
0	2	50716	715	715	50715	25' from fence
1	2	50792	792	792	50792	
2	2	50816	816	816	50816	

* Field data sheet is an extension of Geophysical Logbook ________.

Location ____________

6/23/92

page 2 of __ DB

MAG FIELD DATA SHEET

Area I

STATION X	STATION Y	Reading	Reading	Reading	Average (gammas)	Comments
3	2	50842	842	842	50842	On Mound
4	2	51006	001	005	51004	
* 5	2	52066	081	063	52070	Adjacent to Mounded Area
* 6	2	53380	385	397	53387	mounded Area
7	2	51893	919	902	51905	
8	2	50946	941	937	50941	
9	2	50840	841	841	50 841	
10	2	50864	865	865	50 865	
10	3	50842	842	841	50 842	
9	3	50740	739	739	50,739	
8	3	50521	50526	533	50 526	
7	3	50802	810	807	50 806	
6	3	51471	462	482	51472	
5	3	50867	872	881	50873	
4	3	50712	716	715	50 714	
3	3	50764	766	766	50 765	
2	3	50783	783	783	50783	
1	3	50766	766	766	50766	
0	3	50686	689	688	50 688	25' from fence
0	4	50668	666	666	50667	25' from fence
1	4	50741	741	741	50741	
2	4	50768	767	767	50767	
3	4	50731	730	730	50 730	
4	4	50586	588	588	50,587	
5	4	50173	168	173	50 171	

* Field data sheet is an extension of Geophysical Logbook ______________.

Location ______________________________

6/23/92

DB

MAG FIELD DATA SHEET

Area I

STATION X	STATION Y	Reading	Reading	Reading	Average (gammas)	Comments
* 6	4	49719	718	722	49,720	North Mounded Area
* 7	4	49852	872	872	49 865	
8	4	50460	456	459	50 458	
9	4	50760	759	762	50 760	
10	4	50852	852	852	50852	
10	5	50857	857	856	50857	
9	5	50808	808	807	50 808	
8	5	50703	705	707	50705	
7	5	50549	551	554	50 552	
6	5	50477	493	488	50486	
5	5	50532	532	535	50533	
4	5	50685	686	687	50 686	
3	5	50750	752	752	50 751	
2	5	50765	766	766	50766	
1	5	50727	728	729	50728	
0	5	50637	641	642	50640	25' from fence
0	6	50630	629	630	50630	25' from fence
1	6	50725	726	725	50725	
2	6	50770	770	770	50770	
3	6	50789	789	789	50789	
4	6	50777	775	775	50776	
5	6	50758	756	755	50 756	
6	6	50753	756	755	50 755	Mound
7	6	50770	771	771	50 771	
8	6	50804	804	804	50804	

* Field data sheet is an extension of Geophysical Logbook ______________.

Location ______________________________

6/23/92

page 4 of __

DB

MAG FIELD DATA SHEET

Area I

STATION X	STATION Y	Reading	Reading	Reading	Average (gammas)	Comments
9	6	50854	855	855	50, 855	
10	6	50868	868	868	50868	
10	7	50886	886	886	50886	
9	7	50884	884	884	50884	
8	7	50863	863	862	50863	
7	7	50850	849	849	50849	
6	7	50838	838	838	50838	
5	7	50833	832	832	50832	
4	7	50815	815	815	50815	
3	7	50804	804	805	50804	
2	7	50781	781	781	50781	
1	7	50732	732	732	50732	
0	7	50643	645	645	50644	

* Field data sheet is an extension of Geophysical Logbook ________.

Location ____________________

page 1 of __

AREA 1

EM FIELD DATA SHEET

STATION X	STATION Y	Instrument Reading	SCALE	Conductivity mmho/m	Comments NS / EW	Avg Cond
0	7				N-S 42 E-W 42 Near fence 25'	42
1	7				NS 38 / EW 38	38
2	7				NS 32 / EW 32	32
2	6				NS 35 / EW 35	35
3	7				34 / 34	34
4	7				34 / 34	34
5	7				34 / 34	34
6	7				34 / 34	34
7	7				110 / 120	115
8	7				36 / 34	35
9	7				36 / 36	36
10	7				36 / 36	36
10	6				36 / Not possible	36
9	6				34 / 34	34
8	6				32 / 32	32
7	6				34/34	34
6	6				34 / 34	34
5	6				36 / 36	36
4	6				36 / 36	36
3	6				34 / 34	34
10	6				36 / 36	36
0	6				41 / 43 Near fence	42
0	5				44 / 44 Near fence	44
1	5				38 / 38	38
2	5				36 / 36	36

* Field data sheet is an extension of Geophysical Logbook ____________.

Location ____________________

EM FIELD DATA SHEET

Area 1

(2)

STATION X	STATION Y	Instrument Reading	SCALE	Conductivity mmho/m	NS/EW Comments	Ave. Conduct
3	5				40/40	40
4	5				40/45	43
5	5				42/42	42
0	0				45/45	45
1	0				40/40	40
2	0				38/38	38
3	0				38/38	38
4	0				38/38	38
5	0				38/38	38
6	0				40/40	40
7	0				40/42	41
8	0				40/42	41
9	0				40/40	40
10	0				38/40	39
10	1				39/39	39
9	1				41/41	41
8	1				45/45	45
7	1				49/46	48
6	1				53/51	52
5	1				43/42	43
4	1				40/40	40
3	1				39/39	39
2	1				38/38	39
1	1				32/NP	32
[illegible]	[illegible]				~~46/47~~ [illegible]	46

0 0 — 46/47 final

* Field data sheet is an extension of Geophysical Logbook ______

Location ______

Area 1

(3)

EM FIELD DATA SHEET

STATION X	STATION Y	Instrument Reading	SCALE	Conductivity mmho/m	N-S / E-W Comments	Avg value
0	2				45 / 45 Near River	45
1	2				40 / 40	40
2	2				38 / 38	38
3	2				38 / 38	38
4	2				44 / NP	44
5	2				45 / 22	34
6	2				10 / 0	0
7	2				38 / 50	44
8	2				44 / NP	44
9	2				43 / 43	43
10	2				39 / 39	39
10	3				41 / 41	41
9	3				43 / 41	42
8	3				48 / 45	47
7	3				0 / 0	0
6	3				0 / 0	0
5	3				38 / 48	43
4	3				41 / 22	32
3	3				41 / 113	77
2	3				45 / 45	45
1	3				47 / 46	46
0	3				45 / 43	44
0	4				43 / 41	42
1	4				49 / 49	49
2	4				38 / 38	38

* Field data sheet is an extension of Geophysical Logbook ________.

Location ____________________

Area 1

page __ of __ (2)

EM FIELD DATA SHEET

STATION X	STATION Y	Instrument Reading	SCALE	Conductivity mmho/m	N-S / E-W Comments	Avg. cond.
3	4				40/40	40
4	4				45/43	44
5	4				24/40	32
6	4				25/00	0
7	4				50/44	47
8	4				45/45	45
9	4				40/40	40
10	4				40/40	40
10	5				48/48	48
9	5				38/38	38
8	5				37/39	38
7	5				42/43	42
6	5				40/42	41

* Field data sheet is an extension of Geophysical Logbook ______.

Location ______

6/23/92

page 1 of __ DB

MAG FIELD DATA SHEET

Area 2

STATION X	STATION Y	Reading	Reading	Reading	Average (gammas)	Comments
0	0	52570	568	566	52,568	
1	0	52721	722	723	52,722	
2	0	52262	263	267	52,264	Near pipe rack
3	0	53715	720	722	53,719	Near pipe rack
4	0	53735	733	737	53,735	Near pipe rack
5	0	54342	54340	340	54,341	
6	0	52823	829	835	52 829	
7	0	51849	861	865	51859	
8	0	50283	283	287	50285	
9	0	50065	064	063	50 064	
10	0	49833	828	825	49828	
10	1	50566	578	575	50574	
9	1	50144	145	150	50147	
8	1	50177	177	189	50181	
7	1	49703	713	710	49709	
6	1	50683	692	715	50696	
5	1	53007	011	004	53,007	
4	1	52035	043	059	52 046	
3	1	54083	061	050	54065	
2	1	52477	500	504	52 494	
1	1	52378	380	383	52380	
0	1	53735	735	732	53734	
* 0	2	56301	334	368	56334	
1	2	55358	356	320	55345	
2	2	54732	713	730	54725	

* Field data sheet is an extension of Geophysical Logbook ______________.

Location ______________________

6/23/92 DB

MAG FIELD DATA SHEET

STATION X	STATION Y	Reading	Reading	Reading	Average (gammas)	Comments
3	2	55333	314	388	55345	
4	2	54070	077	085	54077	
5	2	53808	813	812	53811	
6	2	53280	282	294	53285	
7	2	51740	737	727	51735	
8	2	50748	737	741	50.742	Near Drums on Surface
9	2	50027	023	040	50030	Near Drums on Surface
10	2	50342	346	342	50343	
10	3	49782	781	778	49780	
9	3	50496	497	495	50,496	Near Drums
8	3	51366	350	360	51,359	Near Drums
7	3	51902	902	893	51899	
6	3	53101	118	107	53109	
5	3	53121	112	113	53115	
4	3	52946	943	940	52943	
3	3	53941	944	940	53,942	
2	3	55506	535	537	55526	
1	3	22869	23370	24573	23606	From 22869 to 55000
0	3	54888	881	899	54889	
0	4	49191	229	276	49232	
1	4	50751	854	~~097~~	51000	← 50868
2	4	51319	252	186	51252	
3	4	52069	051	049	52056	
4	4	52763	768	759	52763	
5	4	51479	484	484	51481	

* Field data sheet is an extension of Geophysical Logbook ______.

Location ______

page 3 of __

MAG FIELD DATA SHEET

6/23/92

DB

STATION X	STATION Y	Reading	Reading	Reading	Average (gammas)	Comments
6	4	50824	846	855	50842	
7	4	50655	658	659	50659	
8	4	51067	062	060	51063	15' from Steel beam
9	4	49982	986	992	49987	
10	4	49974	975	974	49[illegible]	
10	5	50179	178	180	50179	
9	5	49996	995	998	49997	
8	5	50383	389	386	50386	
7	5	49688	693	693	49691	
6	5	48975	993	998	48989	
5	5	49747	762	769	49759	
4	5	50449	463	470	50461	
3	5	14908	35174	46994	32359	From 14908 to 46994
2	5	13902	27938	38995	26945	From 13902 to 38995
1	5	19429	29210	41857	30265	From 19429 to 41857
0	5	14764	16095	14670	15176	From 14764 to 16095
0	6	13887	15362	15343	14864	From 13887 to 15362
1	6	29182	38977	32806	33655	
2	6	19450	58516	19425	32464	
3	6	10702	12035	11880	11539	
4	6	47575	578	578	47577	Next to telephone guidewire anchor
5	6	47896	897	906	47900	
6	6	48486	496	499	48494	
7	6	49880	875	883	49879	
8	6	50075	084	077	50079	

* Field data sheet is an extension of Geophysical Logbook ________.

Location ____________

MAG FIELD DATA SHEET

6/23/92
DS

STATION X	STATION Y	Reading	Reading	Reading	Average (gammas)	Comments
9	6	50429	428	433	50430	
10	6	50613	605	608	50609	

* Field data sheet is an extension of Geophysical Logbook ________________.

Location ______________________________

Area 2

EM FIELD DATA SHEET

(1)

STATION X	STATION Y	Instrument Reading	SCALE	Conductivity mmho/m	NS/EW Comments	
0	0				52 / 52	52
1	0				82 / 90	86
2	0				84 / 82	83
3	0				120 / 110	115
4	0				150 / 140	145
5	0				90 / 110	100
6	0				62 / 62	62
7	0				150 / 150	150
8	0				140 / 146	143
9	0				100 / 110	105
10	0				80 / 90	85
10	1				64 / 64	64
10	2				53 / 55	54
10	3				56 / 54	55
10	4				42 / 50	46
10	5				45 / 47	46
10	6				52 / 58	55
9	6				50 / 50	50
8	6				45 / 43	44
7	6				56 / 64	60
6	6				75 / 77	76
5	6				70 / 68	69
4	6				91 / 83; Near telephone pole guy wire anchor	87
3	6				105 / 105	105
2	6				140 / 140	140

* Field data sheet is an extension of Geophysical Logbook ______.

Location ______

EM FIELD DATA SHEET

Area 2 (2)

STATION X	STATION Y	Instrument Reading	SCALE	Conductivity mmho/m	NS EW Comments	
1	6				150/160	155
0	6				120/120	120
0	5				170/180	175
1	5				180/170	175
2	5				150/130	140
3	5				125/125	125
4	5				100/106	103
5	5				80/80	80
6	5				75/75	75
7	5				75/75	75
8	5				65/65	65
9	5				55/57	56
9	4				62/64 adjacent to metal pipe	63
8	4				70/60	65
7	4				84/82	83
6	4				95/93	94
5	4				110/110	110
4	4				140/130	135
3	4				220/200	210
2	4				150/200	175
1	4				0/85	0 ✓
0	4				140/130	135
0	3				110/110	110
0	2				50/30	40
0	1				40/42	41

* Field data sheet is an extension of Geophysical Logbook ____________.

Location ____________________

EM FIELD DATA SHEET

Area 2 (3)

STATION X	STATION Y	Instrument Reading	SCALE	Conductivity mmho/m	Comments (VS EH)	
0	1½				0 / 0	0
1	1				65 / 59	62
2	1				130 / 140	135
3	1				110 / 100	105
4	1				160 / 140	150
5	1				130 / 130	130
6	1				92 / 86	89
7	1				145 / 145	145
8	1				170 / 170	170
9	1				88 / 88	88
9	2				94 / 94 } Near Surface	9
8	2				120 / 110 } drums	11
7	2				150 / 165	158
6	2				120 / 140	130
5	2				155 / 151	153
4	2				145 / 140	143
3	2				92 / 60	76
2	2				125 / 121	123
1	2				125 / 110	118
1	3				210 / 140	175
2	3				115 / 135	125
3	3				155 / 235	195
4	3				150 / 140	145
5	3				135 / 131	133
6	3				115 / 125	120

* Field data sheet is an extension of Geophysical Logbook ______.

Location ______

Area 2

page __ of __ (4)

EM FIELD DATA SHEET

STATION		Instrument Reading	SCALE	Conductivity mmho/m	N-S / E-W Comments	
X	Y					
7	3				70 / 90	80
8	3				120 / 140 surface D[illegible]	130
9	3				105 / 110	107

* Field data sheet is an extension of Geophysical Logbook ________.

Location ________________