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16. Abstract

Aggregate material deposits which can be processed economically for construction materials are an important resource for the state and LADOTD. This need, together with the shortage of aggregates in the state, necessitated a thorough study in development of an exploration methodology for mapping the availability, location and extent of aggregate materials. This report describes a comprehensive exploration methodology which involves the integration of terrain analysis techniques, geomorphological, and geotechnical studies to locate aggregates in Louisiana. Landform analysis from aerial photographs along with geomorphic analysis of topographic forms has indicated the areas of promise which required further in-situ investigations. Ground methods, employing both geotechnical and field sampling techniques, have aided stratigraphic analysis and refined the image based expectations. The techniques employed are explained in detail so that they can be readily put into practice. Specific sites were identified, one in each region of Louisiana, and are used as examples to demonstrate the principles of exploration from broad scale mapping to site-specific exploration. In summary, sand and gravel deposits are generally associated with modern river floodplains and valleyflanking Late Pleistocene terraces. In the coastal terraces of south Louisiana, gravel-bearing river trends also occur oblique to present river systems. Older gravel-bearing trends of modern and Late Pleistocene rivers are the most favorable for mining since cost-effective hydraulic mining techniques can be used. The older deposits provide suitable quantities of gravel by dry mining techniques when increased clay fractions and presence of iron oxides are not important considerations.

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EXPLORATION FOR AGGREGATES IN LOUISIANA

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FINAL REPORT

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ABSTRACT

Aggregate material deposits which can be processed economically for construction materials are an important resource for the state and LaDOTD. This need, together with the shortage of aggregates in the state, necessitated a thorough study in development of an exploration methodology for mapping the availability, location and extent of aggregate materials. This report describes a comprehensive exploration methodology which involves the integration of terrain analysis techniques, geomorphological, and geotechnical studies to locate aggregates in Louisiana. Landform analysis from aerial photographs along with geomorphic analysis of topographic forms has indicated the areas of promise which required further in-situ investigations. Ground methods, employing both geotechnical and field sampling techniques, have aided stratigraphic analysis and refined the image based expectations. The techniques employed are explained in detail so that they can be readily put into practice. Specific sites were identified, one in each region of Louisiana, and are used as examples to demonstrate the principles of exploration from broad scale mapping to site-specific exploration. In summary, sand and gravel deposits are generally associated with modern river floodplains and valley-flanking Late Pleistocene terraces. In the coastal terraces of south Louisiana, gravel-bearing river trends also occur oblique to present river systems. Older gravel deposits occur in upland settings in Early Pleistocene terraces. The gravel-bearing trends of modern and Late Pleistocene rivers are the most favorable for mining since cost-effective hydraulic mining techniques can be used. The older deposits provide suitable quantities of gravel by dry mining techniques when increased clay fractions and presence of iron oxides are not important considerations.

IMPLEMENTATION STATEMENT

This report describes a comprehensive exploration methodology which involves the integration of terrain analysis techniques, together with geomorphological, and geotechnical studies to locate aggregates in Louisiana. The approach follows an "establish-refine" methodology: each phase establishes certain criteria for aggregate site selection which leads to the refinement of the selected sites of the previous phase. This involves a conceptual and spatial focusing from regional to site specific evaluation. The process is repeated until the final phase.

The first phase of exploration involved a statewide assessment of mining activities and analysis of small-scale topographic, geologic maps, soil maps and aerial photographs and resulted in the determination of twenty-eight aggregate bearing environments in the state. The second phase involved landform analysis from various scales of aerial photographs and geomorphic analysis of topographic forms and has resulted in selection of twelve, and after further refinement, four potential aggregate trends. The third phase involved field investigations utilizing borings, surface trenches and cone penetrometer soundings to determine the extent, overburden thicknesses and potential value of the aggregate deposits. Within the scope of this study four sites were thoroughly investigated.

All these techniques and steps are explained in sufficient detail so as to facilitate their implementation by LTRC/LaDOTD personnel in future aggregate explorations. The results presented in this report for the statewide assessment are complete. In exploration of new aggregate deposits LaDOTD personnel may select any of the twenty-eight aggregate bearing environments, described in detail in the first phase of this report, collect the appropriate geomorphologic literature, obtain and interpret various scales of aerial images and topographic, geologic and soil maps, and finally conduct field inspection, surface borings and cone penetrometer soundings to locate the deposits in the selected trends. To effectively use the methodology provided in this report for further aggregate exploration efforts, it would be appropriate to employ a team with expertise in geology, photo interpretation and geotechnical engineering.

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METRIC CONVERSION FACTORS*

To Convert from	To	Multiply by
	Length	
foot	meter (m)	0.3048
inch	millimeter (mm)	25.4
yard	meter (m)	0.9144
mile (statute)	kilometer (km)	1.609
	Area	
square foot	square meter (m^2)	0.0929
square inch	square centimeter (cm^2)	6.451
square yard	square meter (m^2)	0.8361
	Volume (capacity)	
cubic foot	cubic meter (m^3)	0.02832
gallon (U.S. liquid)**	cubic meter (m^3)	0.003785
gallon (Can. liquid)**	cubic meter (m^3)	0.004546
ounce (U.S. liquid)	cubic centimeter (cm^3)	29.57
	Mass	
ounce-mass (avdp)	gram (g)	28.35
pound-mass (avdp)	kilogram (kg)	0.4536
ton (metric)	kilogram (kg)	1000
ton (short, 2000 lbs)	kilogram (kg)	907.2
	Mass per Volume	
pound-mass/cubic foot	kilogram/cubic meter (kg/m^3)	16.02
pound-mass/cubic yard	kilogram/cubic meter (kg/m^3)	0.5933
pound-mass/gallon (U.S.)**	kilogram/cubic meter (kg/m^3)	119.8
pound-mass/gallon (Can.)**	kilogram/cubic meter (kg/m^3)	99.78
	Temperature	
deg Celsius (C)	kelvin (K)	$t_K = (t_c + 273.15)$
deg Fahrenheit (F)	kelvin (K)	$t_K = (t_F + 459.67)/1.8$
deg Fahrenheit (F)	deg Celsius (C)	$t_c = (t_F - 32)/1.8)$

*The reference source for information on SI units and more exact conversion factors is "Metric Practice Guide" ASTM E380.

**One U.S. gallon equals 0.8327 Canadian gallon.

INTRODUCTION

GENERAL

Aggregates are rock fragments or naturally-deposited sands and gravels which might be combined to produce a mixture that can be used in construction. The majority of known aggregates in the state are granular materials found as stratified sands and gravel deposits.

Aggregate material deposits which can be processed economically for construction materials are an important resource for the state and LaDOTD. The LaDOTD has a continuous need for aggregates in its construction and reconstruction programs. Because of the increasing demand for construction materials and scarcity of readily available gravel deposits in the state it has become necessary for LaDOTD/LTRC to increase its exploration efforts in locating and mapping new sources of aggregates. This need necessitated a thorough study to establish an exploration methodology for their availability, location and extent.

This report describes a cooperative research effort between Louisiana State University (LSU), Louisiana Geological Survey (LGS) and Louisiana Transportation Research Center (LTRC) that involved the integration of terrain analysis, geomorphological and geotechnical techniques to locate aggregates in Louisiana for use in highway construction. Due to the interdisciplinary nature of this report a glossary of terms familiar only to technical specialists in these fields is included in Appendix G.

Existing geologic and soil maps have only general indications about environments in which aggregates may be found. Image analysis of remotely sensed data coupled with geomorphic and stratigraphic analysis, geotechnical exploration and field sampling have provided a methodology of exploration for aggregates by designating prime areas for detailed study.

LITERATURE SURVEY

A number of investigators have concluded that the most efficient approach to exploring for aggregates is the integration of remote sensing, in-situ soil investigations and soil borings (1), (2), and (3).

Remote sensing-aided terrain analysis plays a vital role in acquiring knowledge of soil types. It provides a wealth of information in the form of relationships existing among climate, geology, soils, vegetation and the culture of a given environment (4) and (5). Image interpretation of remotely sensed images for locating aggregates has been documented by a number of researchers. Highway departments have traditionally used the terrain analysis and geophysical survey approaches to soil identification. The U.S. Army Corps of Engineers has extensively developed and used the terrain analysis approach for aggregate exploration. Appendix A (part 2) contains a current bibliography of image interpretation related research documenting the experience of these institutions. Most investigators concluded that image interpretation of aerial photos of a site prior to field surveys is the most efficient exploration approach because it focuses attention, in a systematic manner, on areas where aggregate deposits are most likely to occur. Thus field surveys can be conducted in those locations having the highest probability of occurrence of aggregates, and hence, exploration costs can be minimized.

In Louisiana, sand and gravel deposits are generally associated with modern river floodplains and valley-flanking Late Pleistocene terraces (6). In the coastal terraces of south Louisiana, gravel-bearing river trends also occur oblique to present river systems (7). Older gravel deposits occur in upland settings in Early Pleistocene terraces (8). The gravel-bearing trends of modern and Late Pleistocene rivers are the most favorable for mining since the deposit can be recovered by the low-cost hydraulic mining techniques. The older deposits provide suitable quantities of gravel by dry mining techniques when increased clay fractions and presence of iron oxides are not important considerations in selection. Knowledge of the distribution, quantity and quality of aggregate trends in Louisiana is essential to both the cost-effective mining of aggregate resources and also the cost of constructing highways in the state. The spatial distribution and lithologic properties of geologic map units in Louisiana are described in numerous publications of the Louisiana Geological Survey and existing open file information. A number of these publications have been included in Appendix A (part 1).

OBJECTIVES

The specific objectives of the study described in this report were:

1. Determination of aggregate bearing environments in the state through literature evaluation and analysis of topographic, geologic and soil maps and small scale aerial photographs
2. Conceptual modeling of the geologic processes that might have contributed to the deposition of aggregate materials
3. Identification of a few potential aggregate trends through interpretation of large scale aerial images, examination of landforms and geomorphic analysis of topographic forms
4. Field investigations, utilizing borings and surface trenches, to determine the extent, overburden thicknesses, and potential value of aggregate deposits
5. Procurement and analysis of cone penetrometer data to define the depth and distribution of the potential aggregate-producing strata
6. Convergence of evidences and final site evaluation for economic aggregate potential

SCOPE

This report describes a comprehensive exploration methodology which involves the integration of terrain analysis techniques, geomorphological, and geotechnical studies to locate aggregates in Louisiana. The approach follows and "establish-refine" methodology: each phase establishes certain criteria for aggregate site selection which leads to the refinement of the selected sites of the previous phase. This involves a conceptual and spatial focusing from regional to site-specific evaluation. This process was repeated until the final phase. The first phase of exploration involved a statewide assessment of mining activities and analysis of small-scale topographic, geologic maps, soil maps and aerial photographs and resulted in the determination of twenty-eight aggregate bearing environments in the state. The second phase involved landform analysis from various scales of aerial photographs and geomorphic analysis of topographic forms. This phase has resulted in the selection of twelve, and after further refinement, four potential aggregate trends. The third phase involved field investigations utilizing borings and cone penetrometer soundings to determine the extent, overburden thicknesses and potential utility of aggregate deposits. Within the scope of this study, four sites were investigated in detail. All the analysis techniques are explained in sufficient detail so that they can be readily implemented and used in practice.

METHOD OF PROCEDURE

In order to accomplish the objectives of this study it was necessary to segment the study in three phases. Figure 1 presents an overview of the phases, tasks, work activities and products of the aggregate exploration process. Phase 1 describes the literature survey and regional evaluation. Phase 2 describes the landform interpretation through terrain analysis, and phase 3 describes the selective field checking, stratigraphic mapping, and cone penetrometer testing. The approach is one of "establish-refine:" each phase will establish certain criteria for aggregate site selection which will lead to the refinement of the selected sites of the previous phase. This process will be repeated until the final phase. This involves a conceptual and spatial focusing from regional to site-specific evaluation.

PHASE I: LITERATURE SURVEY AND REGIONAL EVALUATION

Aggregate deposition follows certain physical laws. Aggregates are expected to be found only under certain geologic conditions and are not likely to be found occurring under others. It is therefore important that relevant geological processes be established and related to patterns of aggregate deposition. To accomplish the above goals a literature survey was conducted of all available topographic, geologic, geomorphic, geotechnical, hydrologic, and pedologic reports and maps to formulate the regional picture. Furthermore, an inventory of the location, origin, morphologic history and composition of previously located deposits was made to provide means for conceptual and spatial interpolation in search of new deposits. Files searched were those of the LaDOTD, the LGS, the USACE and the Soil Conservation Service.

After a thorough perusal and study of the available maps, reports and data regarding the previously located aggregate deposits, a regional concept was formulated. The concept forms a general impression as to the nature of the soil and landform conditions. The state's soils were analyzed with respect to their geologic and geomorphic origin by noting the arrangement of physiographic units and the materials or layered sequences underlying them. As a result of phase I studies, twenty-eight aggregate-bearing trends were identified for further analysis.

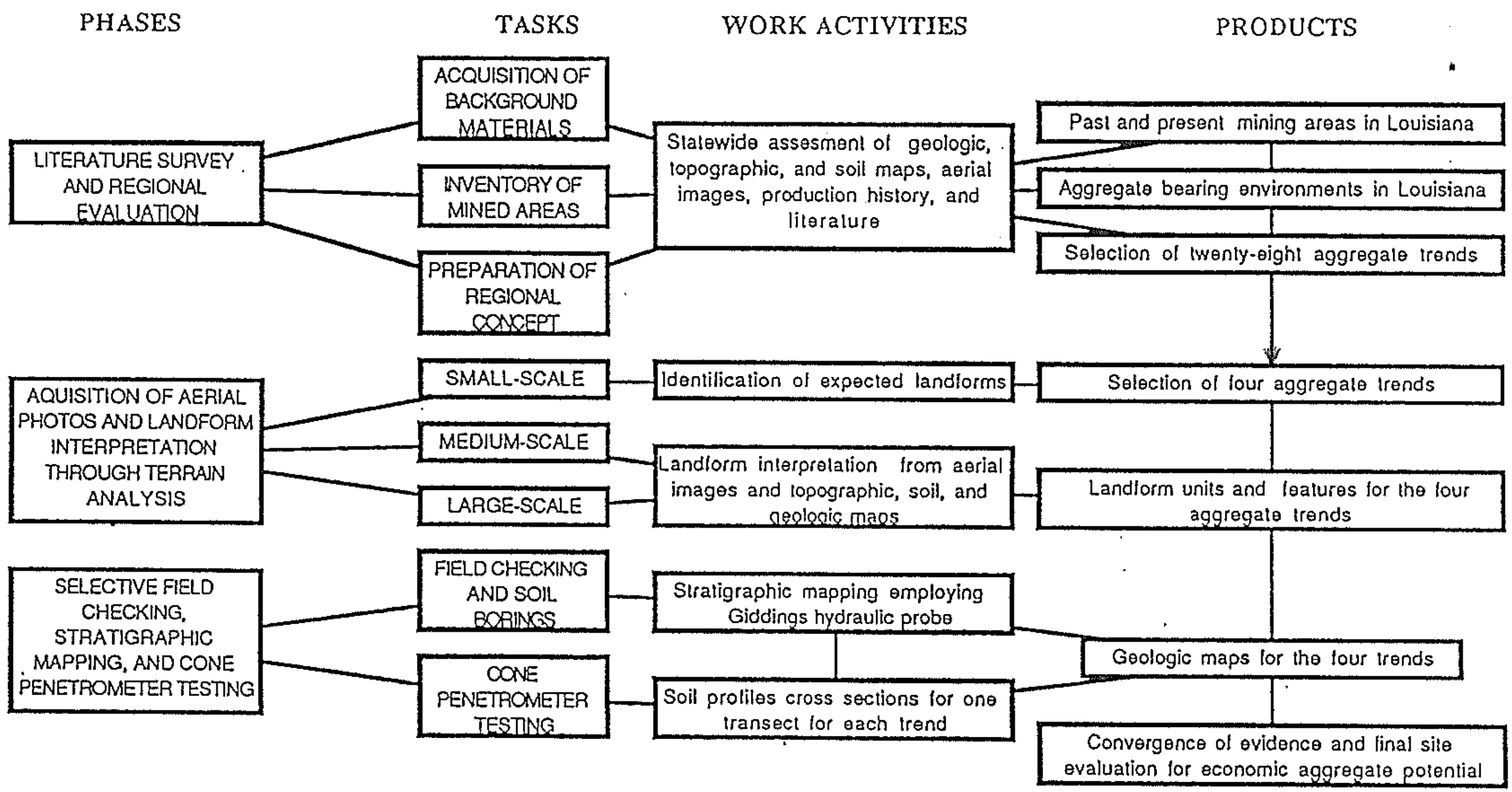


Figure 1. AN OVERVIEW OF THE PHASES, TASKS, ACTIVITIES AND PRODUCTS OF THE AGGREGATE EXPLORATION PROCESS.

PHASE 2: LANDFORM INTERPRETATION THROUGH TERRAIN ANALYSIS

Interpretation of landforms using aerial photographs is achieved in two scales of analysis: regional and detailed. The regional analysis employed small-scale aerial photographs (approximately 1/135,000 scale), and the detailed analysis employed medium (approximately 1/65,000 scale) and large scale aerial photographs (approximately 1/20,000 and larger scales).

The methodology of identifying aggregate materials on aerial photographs is based on the interpretation and mapping of landform units and features such as Pleistocene terraces, valley train deposits and Holocene flood plains. Landforms are the key elements in the exploration of aggregates from aerial photographs because they indicate the development of constructional geologic processes of soil erosion, transportation and deposition. Aggregate deposits are expected to be found in certain landform types and features and are not likely to occur in other types of landforms. The various landforms in which aggregate deposits may occur in Louisiana are of fluvial type and include stream terraces, fluvial outwash, meander belt deposits, point bars, abandoned channels and braided stream channels.

Landforms are studied through the terrain analysis approach. Terrain analysis is the systematic study of visual and physical elements relating to the origin, morphologic history and composition of landforms (9). It is the approach used by photointerpreters in analyzing soil patterns from large scale photography. It is based on the principle that similar environmental, geologic, topographic and climatic conditions create similar landscape patterns.

The visual and physical elements employed during stereoscopic terrain analysis are called pattern elements and include topography, drainage patterns, gully characteristics, vegetation and land use. These pattern elements provide the framework within which the visual impression of landforms is examined and recorded. When the specific landform type is identified, the soil types may subsequently be inferred because most of the landforms exhibit specific range of soil types and textures.

Topographic Form and Position: The topography of a landform is described by its degree of dissection and continuity. The expression of physical relief of the land surface as developed by erosional or depositional processes under given climatic and geologic conditions is referred to as the topographic position.

Terms such as shape, relief and slope are used to describe the topographic position of landforms. The description of topographic form includes a general statement about the topography such as plain, level and gently sloping.

Drainage Pattern: The characteristics of the drainage patterns provide important information about the type of bedrock and soil material. Drainage patterns are classified according to their density of dissection or texture and by their type of pattern form. The three categories of drainage densities commonly used--fine, medium, and coarse--are indicative of the weathering resistance, erosion and/or permeability of the material over which the water flows. For example, a coarse drainage pattern is usually associated with porous granular material, whereas a fine drainage pattern is usually associated with impervious, fine-grained material. The different type of drainage patterns is also indicative of the type of soil materials and bedrock. Among numerous drainage patterns that can be seen from aerial images, six are considered to be most common: dendritic, rectangular, trellis, radial, centripetal, and deranged. The most common patterns in Louisiana are dendritic and anastomotic drainage patterns.

Gully Characteristics: The type of gullies formed are indicative of the types of soils. The gully characteristics can be used with other photo pattern elements to identify an unknown landform. V-shaped gullies with short, steep gradients are usually associated with granular materials such as sand and gravel. Gullies that are U-shaped are usually associated with silty materials such as loess and alluvial silt deposit. Flat-bottomed gullies with sharp, steep-sided slope and low, flat gradient are usually associated with sandy clay materials found in coastal plain landforms. Saucer-shaped gullies with long gradients are usually associated with silty clay, silt and shale materials found in lake beds, and marine terrace landforms.

Color or Photographic Gray Tone: Color or tone observed on aerial images are the result of surface spectral reflectance variations. They are indicative of the surface and near-surface ground condition, such as soil moisture and texture, vegetative cover, and slope and aspect. In areas where the ground surface is not totally obscured by the vegetative cover, light tones are usually indicative of well-drained, coarse-grained soils; dark tones are indicative of poorly-drained, fine-grained soils. In some areas the form of cultivation and vegetation influences the variation of gray tones that can be observed on aerial images.

Landuse: The pattern of landuse can provide valuable information on soil and terrain conditions. Features such as field tiles, orchards, ditches, levees, floodwalls, sand and gravel pits, contour plowing and farming, and strip cropping are helpful in identifying landforms and soil types. For example, the presence of orchards or sand and gravel pits usually indicate well-drained, coarse soils, and the presence of deep furrows and ditches usually indicates fine-grained soils and a high water table.

Vegetation: The vegetation pattern can provide information on the soil conditions, especially soil moisture and textures which can be inferred from the types of vegetation present. For example, jack pine trees are usually found on well-drained, coarse soils such as sand and gravel, whereas spruce, tamarack, sycamore and willow trees are found on poorly drained, fine-drained soils.

Special Features: Some landform features are uniquely associated with specific landform and surface conditions which can provide important clues in the identification of an unknown landform. Features such as meander scars, natural levees and cutoff channels indicate alluvial plain landform, whereas the presence of sinkholes, haystacks, and other karst features indicate a limestone landform.

Besides mapping landforms that could potentially bear aggregate materials, one can also identify landform features that have potential for aggregate materials. Landform features having a high potential for aggregate materials include active and abandoned point bar deposits, stream terrace deposits, abandoned channels and meander belt deposits (11). Point bars are typically composed of distinct layers that have an upward grading sequence. Gravel, the coarsest material, can be found at the base and grades upward through sand, fine sand, clay and other floodplain deposits (6),(10). As a river continues its lateral movement within its meander belt, meander loops may be cut off or abandoned, and therefore act as storage areas for coarse-grained point bar deposits. Figure 2 shows a schematic diagram of a point bar and meander belt deposits, and Figure 3 shows a May 1990 oblique CIR photograph of a point bar deposit in the Amite River area. Other areas with a high potential for aggregate materials are simple valley fill and the confluences of channels and tributaries with high bed load. These areas tend to have no distinctive surface expression and therefore are difficult to identify on aerial images. Valley fill occurs when the coarsest materials are deposited within the deepest parts of the channel, and the channel is subsequently covered by finer floodplain deposits

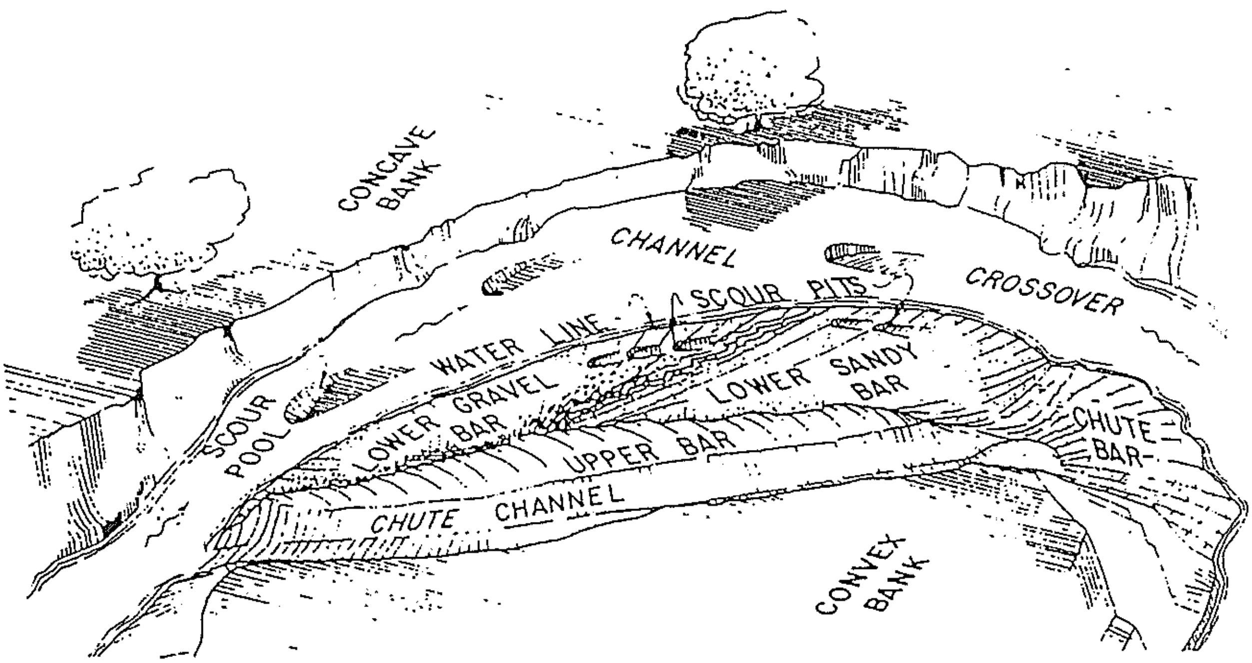


Figure 2. CONCEPTUAL MODEL OF AN AGGREGATE-BEARING POINT BAR IN THE AMITE RIVER (FROM (29); COPYRIGHT GULF COAST ASSOCIATION OF GEOLOGICAL SOCIETIES)

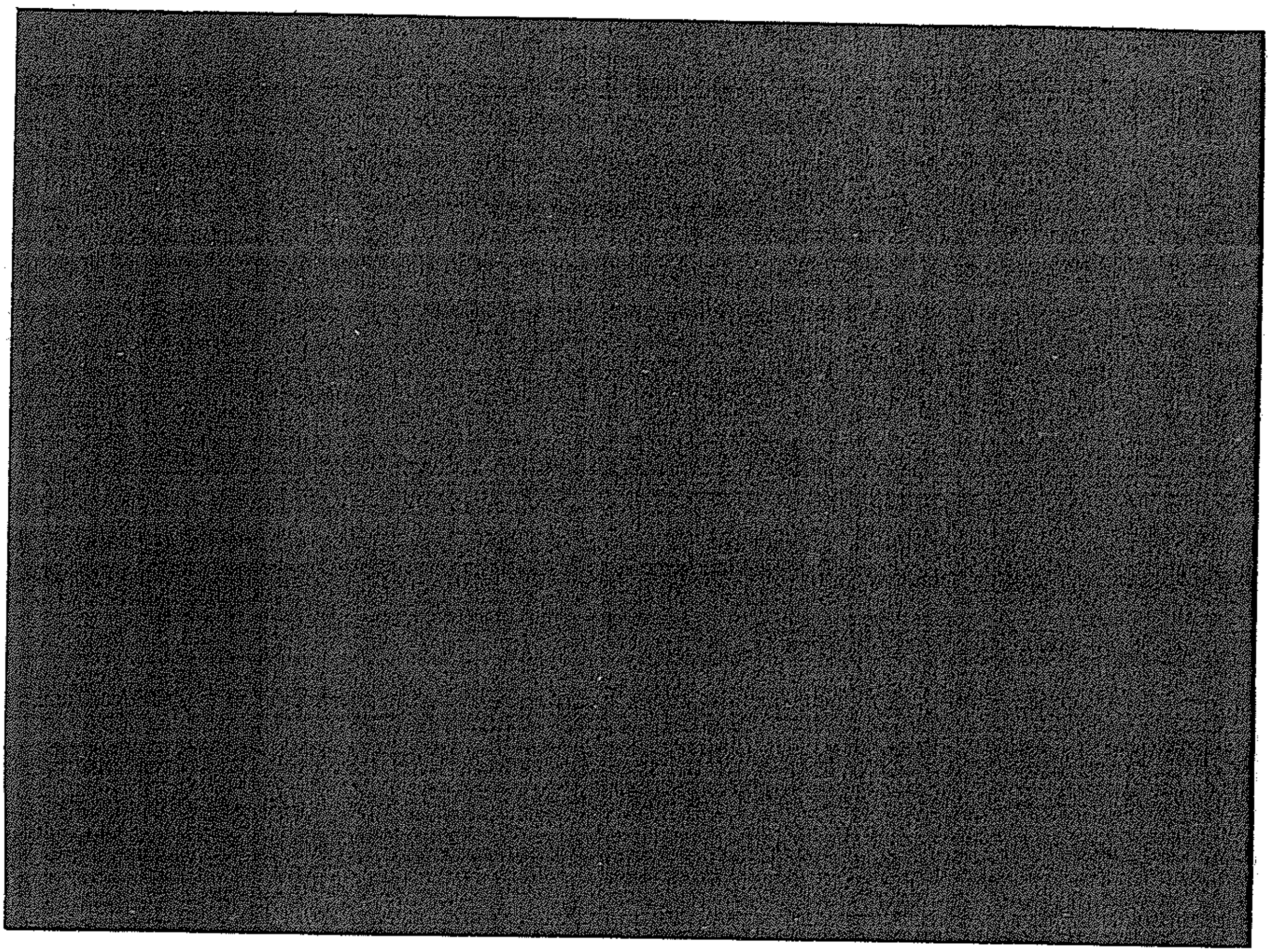


Figure 3. MAY 1990 OBLIQUE CIR PHOTOGRAPH OF A POINT BAR DEPOSIT IN THE AMITE RIVER, GRANGEVILLE TREND

as the channel is abandoned. Deposits at confluences are the result of a high bedload, high velocity stream meeting a low velocity stream. The low velocity stream is unable to transport the material of the high velocity stream. Thus, the bedload material will be deposited at the location where they meet. Areas that separate landform units also have potential for aggregate materials. As streams flow from one landform to another, the gradient between landform changes. As a result of these gradient changes, the competence of the streams are reduced, causing deposition to occur in their channels.

Landform interpretation was performed using the following steps for each trend:

(1) Review and description of the soil composition of the trend using soil survey and other relevant published information

(2) Review and description of the geology of the trend from information found in parish geology bulletins and other relevant journal articles

(3) Review and description of the geomorphic origin and history of the trend from information found in parish geology bulletins, journal articles and other published papers

(4) Stereoscopic analysis of photographs using the terrain analysis approach

(5) Identification and mapping of landforms based on the observed pattern elements

(6) Correlation of observed landform with geologic unit, soil unit, and geomorphic origin and history to determine if any relationships exist: Any correlation would allow further refinement of the aggregate trends.

Mapping of landform boundaries was based on the following criteria:

(1) Identification of any drastic or sharp change in topographic gradient, drainage pattern, vegetation and landuse

(2) Boundary lines between geologic units if available

(3) Boundary line between soil units if available or the soil composition of the aggregate trends

(4) The existence of special landform features such as meander scars and point bars

Landform interpretation and mapping included careful scrutiny of areas where significant changes of the pattern elements take place because these are directly related to locations where changes in landform and soil patterns occur. Often these changes occur at breaks in slope. These slope changes are generally accompanied by change in soils and subsurface sediments. Change in topographic gradient of trends is a good indication where deposition would have occurred. Many of the important gravel-bearing strata in Louisiana occur beneath landforms constructed in aggradational sedimentary environments. The density of drainage patterns generally is related to the relative permeability of surface materials. Distinctive differences in drainage patterns and dissection are associated with the Pleistocene terraces of southeastern Louisiana (7). The boundary line between geologic units usually indicates different geologic material that are suitable or not suitable for aggregate. Similarly, some soils are good indicators of aggregate potential because the soils are the result of weathering of the underlying materials or deposition. Light soil tones on black and white images are indicative of coarse-grained, well-drained soils. In Louisiana, settlement patterns often follow trends of well drained soils associated with sand and gravel extraction. Vegetative cover can be indicative of granular materials, because some tree species prefer well drained soils (e.g., orchards and pine trees). These criteria were used separately or in combination in order to identify locations that may have a potential for aggregate material.

PHASE 3: SELECTIVE FIELD CHECKING, STRATIGRAPHIC MAPPING, AND CONE PENETROMETER TESTING

Selective field checking and stratigraphic mapping is carried out to confirm and/or revise the image interpretation results and to evaluate the surface characteristics of the aggregate trends. The reconnaissance stratigraphic study has employed a Giddings hydraulic probe. It was conducted at four sites to gather information on the geometry of the deposits, general textural trends within the deposits and overburden characteristics (6). Refined aggregate location maps, stratigraphic maps and cross sections were prepared to show the lateral distribution and depth of the aggregate deposits and associated overburden.

To further refine and complement the previous results, electrical resistivity and boring data have been planned for the areas having the highest potential for the occurrence of aggregate materials. However, since both LSU and LTRC/LaDOTD have purchased a cone penetrometer testing vehicle, it was decided to use this equipment for the geotechnical investigations instead of the electrical resistivity survey. The cone penetrometer can be used to classify the different soil strata by employing the recorded data from the field tests. The data recorded from the field test were (1) tip resistance, (2) frictional resistance, and (3) friction ratio. The tip resistance is defined as the resistance offered by the soil to the tip of the penetrating cone. The friction resistance is the resistance measured along the sleeve of the cone. The friction ratio is defined as the ratio between the sleeve friction to the cone resistance. These values vary with the type of soils, like clay or sand or a mixture of both, the consolidation levels, i.e., normally consolidated or over consolidated (in clays), and the relative density (for sands). Several studies were conducted using this equipment in Louisiana, and several classification charts have been developed for identifying the soils based on these data. Some of these charts are used in the present classification study.

Two sites were selected to minimize exploration costs. The sites were selected at locations where confirmatory information or more detailed information was required. The cone penetrometer sounding locations were selected to complement the hydraulic probe data. The data from the cone penetrometer data could confirm or refine the findings of image analysis and stratigraphic mapping.

Data related to location of aggregate materials is obtained through an iterative process involving integration of information extracted during all phases of the study. The convergence of information from the smallest to the largest scale of analysis and from image data to geotechnical data reinforces the interpretation made at each level. All data from image analysis, stratigraphic survey, cone penetrometer borings and field samples was integrated and correlated, leading to the final assessment of the aggregate deposits and their textural composition. Final maps were made to show the location of the four aggregate trends on 7.5 minute topographic base maps. Final profiles were drawn to show the textural composition of the aggregate deposits and their associated overburden.

DISCUSSION OF RESULTS

The results of this study are presented and discussed in three phases that parallel those of the methodology section. Phase 1 describes the literature survey and regional evaluation. Phase 2 describes the landform interpretation through terrain analysis, and phase 3 describes the selective field checking, stratigraphic mapping and cone penetrometer testing.

PHASE 1: LITERATURE SURVEY AND REGIONAL EVALUATION

Acquisition of Background Materials

Aggregate is distributed among various landforms and commercially produced from various regions of Louisiana. Relationships between geologic units, topography, soils patterns and production history provide the background information necessary to develop a statewide aggregate exploration effort. A research approach was followed that established regional-scale criteria for site selection. Subsequent refinement of selected sites provided an exploration methodology. This process identified potential aggregate trends suitable for analysis of their economic potential.

During the initial phase of the investigation, background materials necessary for regional-scale exploration were acquired. Topographic maps, aerial imagery, soil survey data and pertinent technical literature and reports were identified and collected. From this information a statewide assessment and inventory of aggregate deposits was conducted. The suitability of regional-scale geologic units for aggregate production was assessed and mapped. Areas of aggregate mining activity were also identified and mapped. This initial phase of investigation produced a regional concept and identified potential aggregate trends for additional evaluation.

Project investigation was initiated with the acquisition of regional topographic maps. Maps of 1:250,000 scale were used as a base for mapping of mined areas and for defining potential aggregate trends. These data were transferred to 1:500,000 scale maps to evaluate the statewide distribution of data. Aggregate suitability mapping was conducted at a 1:500,000 scale, compatible with the Geologic Map of Louisiana (8).

After maps of aggregate suitability, mined areas and potential aggregate trends were produced, they were drafted at a scale appropriate for inclusion in this report.

The literature review consisted of (1) reports and publications from bibliographies of the geology and mineral resources of Louisiana and the Gulf Coast, (2) file data of LGS researchers pertinent to mineral resources, river processes and landforms of Louisiana, and 3) contact with various State and Federal agencies. Typical citations include articles from technical journals, publications of research efforts at State and Federal agencies, contract reports and data files, and unpublished Masters theses and Ph.D. dissertations. A bibliography is provided in Appendix A.

Inventory of Previously Located Aggregate Deposits

Sources of data that document mining activities in Louisiana were used to map the statewide distribution of sand and gravel mines. Each site was plotted with an identification code on work maps to enable identification by source. Work maps at 1:250,000 scale allowed location to the nearest quarter section, however, sites in irregular sections could not be plotted more precisely than its township. The sources span more than forty years and caused many sites to be identified two or more times. These were plotted to indicate multiple identifications.

Data sources included mineral surveys, high altitude infrared images, U.S. Geological Survey topographic maps and LaDOTD parish road maps. Two of the sources specifically listed sand and gravel operations (12) and (13); two sources mapped "gravel pits" which may include sand or dirt pits (U.S. Geological Survey 1:250,000 topographic quadrangles; Louisiana Department of Transportation and Development parish road maps); one source identified all abandoned mines regardless of the type of mining activity (14). The 1978 color infrared imagery of Louisiana was reviewed, and sites with surface mining activity were located. A total of more than 1,200 locations were plotted on the work maps in the form of "dots."

The resulting "dot" maps illustrate concentrations in and adjacent to several river valleys. Areas with a cluster of mining activity were mapped as envelopes. The statewide distribution of mining activity is illustrated in Figure 4 and in Appendix B. Heaviest concentrations of historic and current mining activity occurs in

(1) the Bayou Dorcheat drainage and adjacent Pleistocene terrace surfaces near Minden, Webster Parish;

(2) the Amite River valley and adjacent terraces in Livingston, St. Helena, and West Feliciana parishes;

(3) the Tangipahoa River valley and adjacent terraces in Tangipahoa Parish;

(4) the Bogue Chitto and lower Pearl River valleys and adjacent terraces in Washington and St. Tammany parishes; and

(5) the Pleistocene terraces flanking the Red River north and south of Alexandria in Grant and Rapides parishes.

Other notable concentrations occur

(6) near West Monroe in Ouachita Parish,

(7) north of Merryville along Bayou Anococo in Vernon and Beauregard parishes. Several isolated large operations are noteworthy,

(8) a site south of Indian Village in Jefferson Davis Parish,

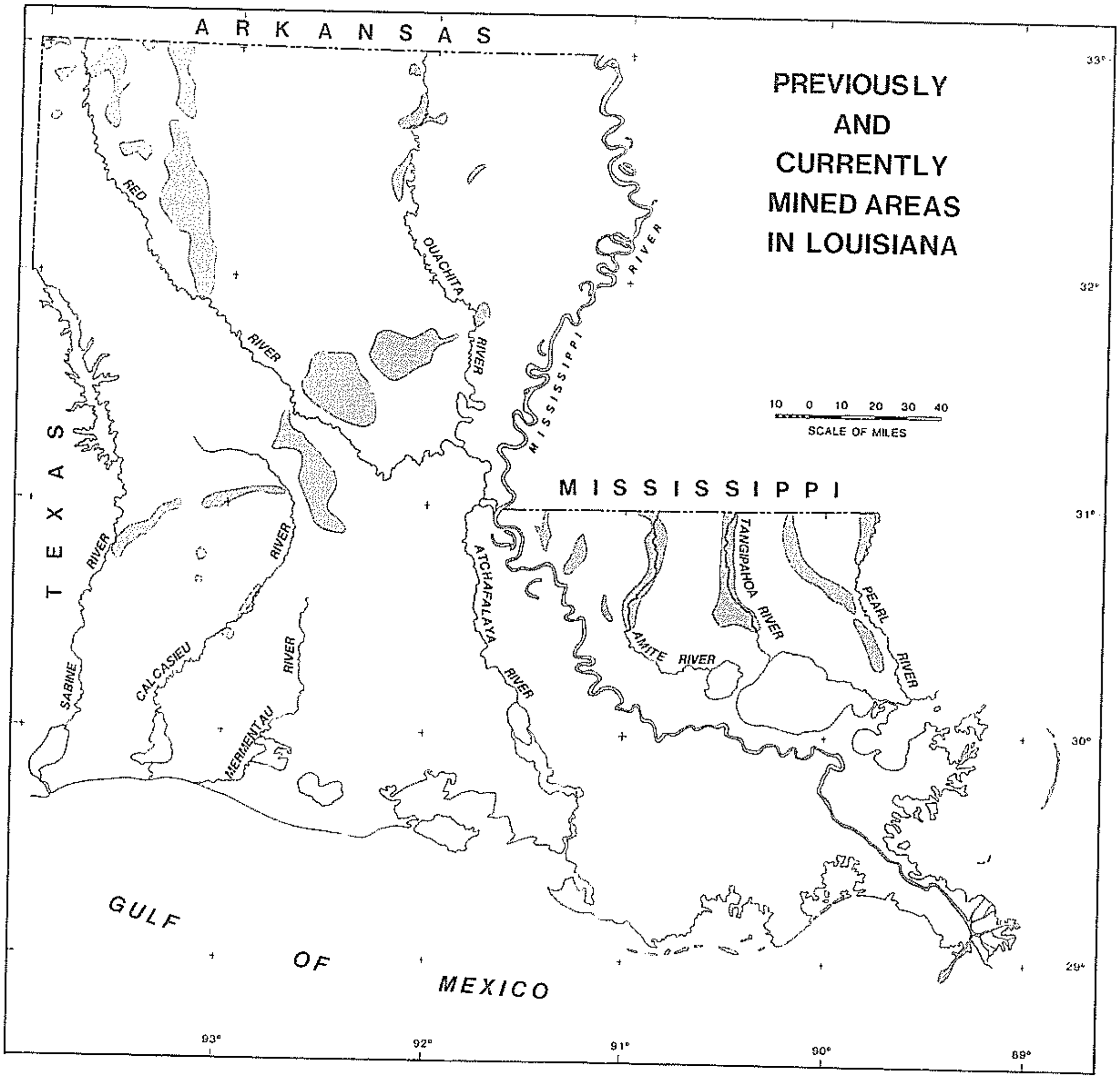
(9) one northeast of Longville in Beauregard parish,

(10) Harrisonburg in Catahoula Parish, and

(11) on Thompson's Creek at US Hwy. 61 in East and West Feliciana parishes.

Preparation of Regional Concept

Regional mapping of aggregate suitability was accomplished by initial evaluation of units on the Geologic Map of Louisiana (8). Aggregates are rock fragments or naturally-deposited sands and gravels which might be combined to produce a mixture that can be used in construction. In Louisiana sand and gravel deposits provide the most widely used source of aggregate. Areas lacking aggregate were excluded in an initial screening, then the remaining areas that contained aggregates were divided into categories: possibly



Shaded areas represent areas that mining has occurred

Figure 4. DISTRIBUTION OF PREVIOUS AND CURRENT MINING AREAS IN LOUISIANA

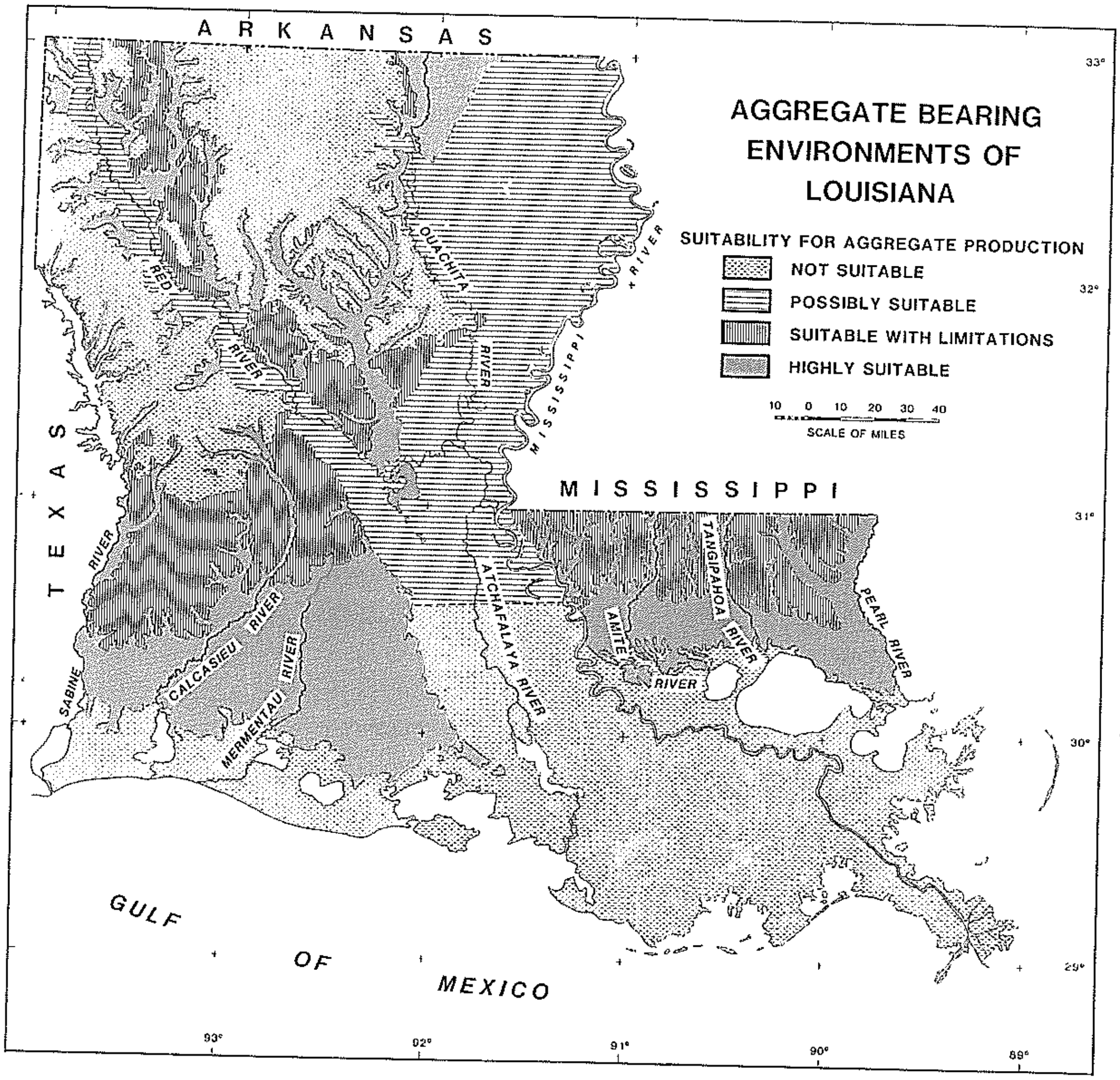
suitable, suitable with limitations, and highly suitable for aggregate exploration. The resulting maps were used to guide the selection and delineation of potential aggregate trends for additional evaluation. Geologic and geomorphic features associated with each suitability category (Figure 5) are discussed below.

Areas not suitable for aggregate exploration. The Tertiary Uplands occur in north Louisiana between the Mississippi and Red River valleys and between the Red and Sabine River valleys. The deposits are largely interbedded sands, silts, clays, limestones, lignites, and volcanic ash (8). Chert gravel has been locally reported in lenses of the Miocene Williamson Creek Member of the Fleming Group. Other local potential sources of aggregate include crushed sandstone from the Oligocene Catahoula Formation, scattered ironstone in the Eocene Claiborne Group and salt dome cap rock. This area of north Louisiana has nearby Quaternary deposits which should prove more favorable than the Tertiary Uplands.

The Deltaic and Chenier Plains are located south of Baton Rouge and between the southern limit of Pleistocene deposits and the Gulf of Mexico. These landforms are Holocene in age and include marshes, swamps, cheniers, natural levees, and alluvium (8), the deposits formed by constructional phases of the Mississippi River delta and subsequent reworking by marine processes. Sand is produced locally from point bars along the Mississippi River and shells have been produced from lakes and bays in coastal Louisiana. The lack of other sources of aggregate in this area requires transport of materials from other areas.

Areas possibly suitable for aggregate exploration. The Mississippi and Red River Alluvium of northeast and northwest Louisiana are associated with natural levees and alluvium of major streams. The deposits consist of coarse-grained alluvium overlain by fine-grained overburden. The deposits were largely produced by floodplain deposition by meandering rivers during the Holocene (15), (16), (17). Thickness of overburden varies and may possibly prohibit aggregate extraction. Gravel occurs in the coarse-grained deposits, but its areas of concentration and distribution are not defined. Possible favorable settings include active and abandoned point bar deposits and alluvial fans where tributary streams merge with these valleys.

The braided stream terraces of northeast Louisiana are associated with Pleistocene-age glacial outwash carried from the Midwestern United States by the Mississippi River. The deposits are known to



Suitability classes were correlated to geological units and areas of previous mining

Figure 5. AGGREGATE-BEARING ENVIRONMENTS OF LOUISIANA

contain gravel (19), (20) and are capped by relatively thin overburden of silty loess deposits. Specific data on the distribution, concentration and depth to gravel in these deposits is unavailable.

Areas suitable for aggregate exploration. Included in this group are areas associated with the Pleistocene High and Intermediate terraces throughout Louisiana (8). These terraces developed during the early to middle Pleistocene as coarse-grained sediment was eroded from the Appalachian Mountains, the Ouachita Mountains and the glacial deposits of the Midwestern United States. The aggregate deposits occur beneath upland terrain with relatively deep water tables and are limited to dry mining. The deposits are usually sandy and contain locally abundant gravel. The overburden is typically loess, silty or clayey soils, or sandy soils without aggregate. Aggregate has been produced from these deposits over the past several decades (12). Production is generally by dry mining since the water table is usually well below the surface of these upland landscapes. The aggregate may locally contain clay or iron oxide in its matrix and usually requires washing before use in construction projects.

Areas highly suitable for aggregate exploration. This area includes Prairie and Deweyville terraces and alluvium of streams draining the High and Intermediate terraces (8). These deposits contain the most abundant gravel-bearing trends in Louisiana. The landscapes are associated with modern valleys and valleys of late Pleistocene age. They developed from the recycling of gravel from the older Pleistocene terraces (21). Recycling has produced sorted and well-washed gravel deposits at elevations near or below the water table. Removal of relatively thin silty or clayey overburden exposes aggregate suitable for extraction by hydraulic mining.

Summary of the distribution of suitability areas. The state of Louisiana can be divided into regional areas of relative suitability for aggregate exploration. The Tertiary Uplands and the Deltaic and Chenier plains are excluded from further consideration based on a lack of aggregate described in geologic investigations and no history of production. Alluvium of the Mississippi and Red rivers and the braided stream terraces of northeast Louisiana are considered possibly suitable based on reports of aggregate in geologic investigations (20). However, production from these areas is sparse, and the depth to aggregate and/or recoverable quantities may prohibit economic extraction. The High and Intermediate terraces have produced large quantities of aggregate, but mining has been exclusively above the water table without the benefit of hydraulic dredging. The Prairie and Deweyville terraces and stream alluvium have the highest suitability, especially in southeast and southwest Louisiana.

Regional exploration concept. The results of the preliminary mapping and literature review guided the preparation of a regional concept and delineation of potential aggregate trends for additional exploration. Selection of aggregate trends was distributed evenly by geographic area. Seven trends were delineated for each region of Northwest, Northeast, Southwest and Southeast Louisiana respectively, and the distribution of individual trends are identified in Figure 6. Each trend was delineated based on the results of aggregate suitability mapping, mapping of historic sand and gravel production, information in technical literature, and previous experience and knowledge of the work group. Pertinent information about each trend such as trend location, associated drainage basins, geologic units, reasons for selection, and important literature references are identified in Appendix B.

PHASE 2: LANDFORM INTERPRETATION THROUGH TERRAIN ANALYSIS

From the twenty-eight aggregate trends previously delineated, twelve (i.e. three from each region) were selected for the small-scale landform evaluation using the terrain analysis approach. These aggregate trends and their corresponding numbers in Figure 6 were Ringgold (5), Colfax (3), Rocky Mount (6), Monroe (12), Harrisonburg (10), Fishville (9), Rosepine (21), Le Blanc (20), Merryville (18), Amite (22), Grangeville (25), and Bogue-Chitto (24). Color infrared (CIR) aerial photography at scales of 1:135,000 was used for this evaluation. All the aerial photographs used in this study as well as information for ordering more aerial photographs are shown in Appendix C. The terrain analysis results of the twelve trends are shown in Appendix D. In summary, the analysis of small-scale (1/135,000) color infrared images of the aggregate trends allowed identification of the possible landforms. The landforms were mainly fluvial terraces and floodplains. However, due to the subtle differences of the topography, delineation of landforms boundaries was not possible at this scale of analysis.

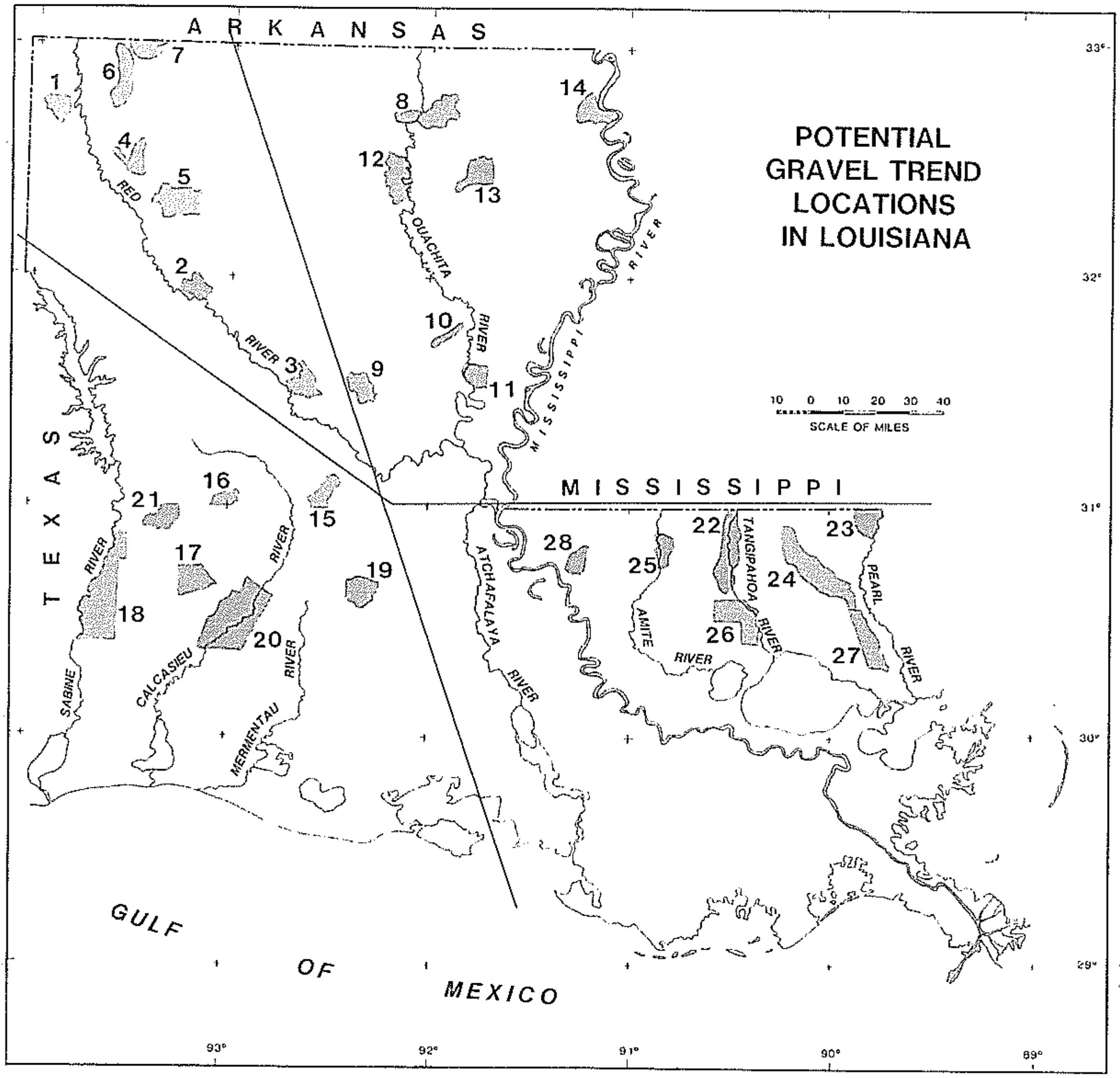


Figure 6. POTENTIAL GRAVEL TREND LOCATIONS IN LOUISIANA.

As a result of the regional (small-scale) landform evaluation, one potential aggregate trend for each region was selected for medium and large-scale landform analysis. The aggregate trends selected were Ringgold in the northwest region, Monroe in the northeast region, Le Blanc in the southwest region and Grangeville in the southeast region.

For the detailed landform analysis a representative site for each of the four aggregate trends was selected. The representative sites within each trend were selected (1) to minimize the cost of acquiring aerial images, (2) to minimize the amount of aerial reconnaissance required, (3) to include an evaluation of all possible landform that were expected in each aggregate trend, and (4) to be accessible to subsequent field and geotechnical investigations. For the medium-scale analysis, CIR aerial photographs at a scale of 1/65,000 were obtained from the USGS. For the large-scale landform interpretation, black and white aerial photographs at a scale of 1/20,000 were obtained from the Agriculture Stabilization and Conservation Service (ASCS) for the representative sites within the four aggregate trends.

Both the CIR and black and white photographs were analyzed in stereo and in mosaic form using the terrain analysis approach. For selected portions of the sites, additional information was obtained by contracting the acquisition of color infrared photographs at a scale of 1/10,000 from an aerial mapping company. In some locations color and color infrared oblique slide photographs were obtained by using a 35mm camera from a low flying aircraft. All the aerial photographs used in this study as well as information for ordering more aerial photographs are shown in Appendix C. In the following, the results of the detailed interpretation are presented for each trend and the potential of the various landforms, and their features for aggregate potential are discussed.

The Ringgold trend is located in Bienville Parish, Louisiana. The trend is located on the Pleistocene High, Intermediate, and Prairie terraces and on the Holocene Alluvium. Tertiary deposits of the Cane River Formation and the Wilcox group are found in some location within the trend.

Medium-scale landform analysis of the representative site selected in Ringgold trend indicated the area to be composed of a floodplain and an undulating to slightly dissected upland with cultivation in the upland and forest in the floodplain. Figure 7 is a CIR photograph of a portion of Ringgold trend showing the general

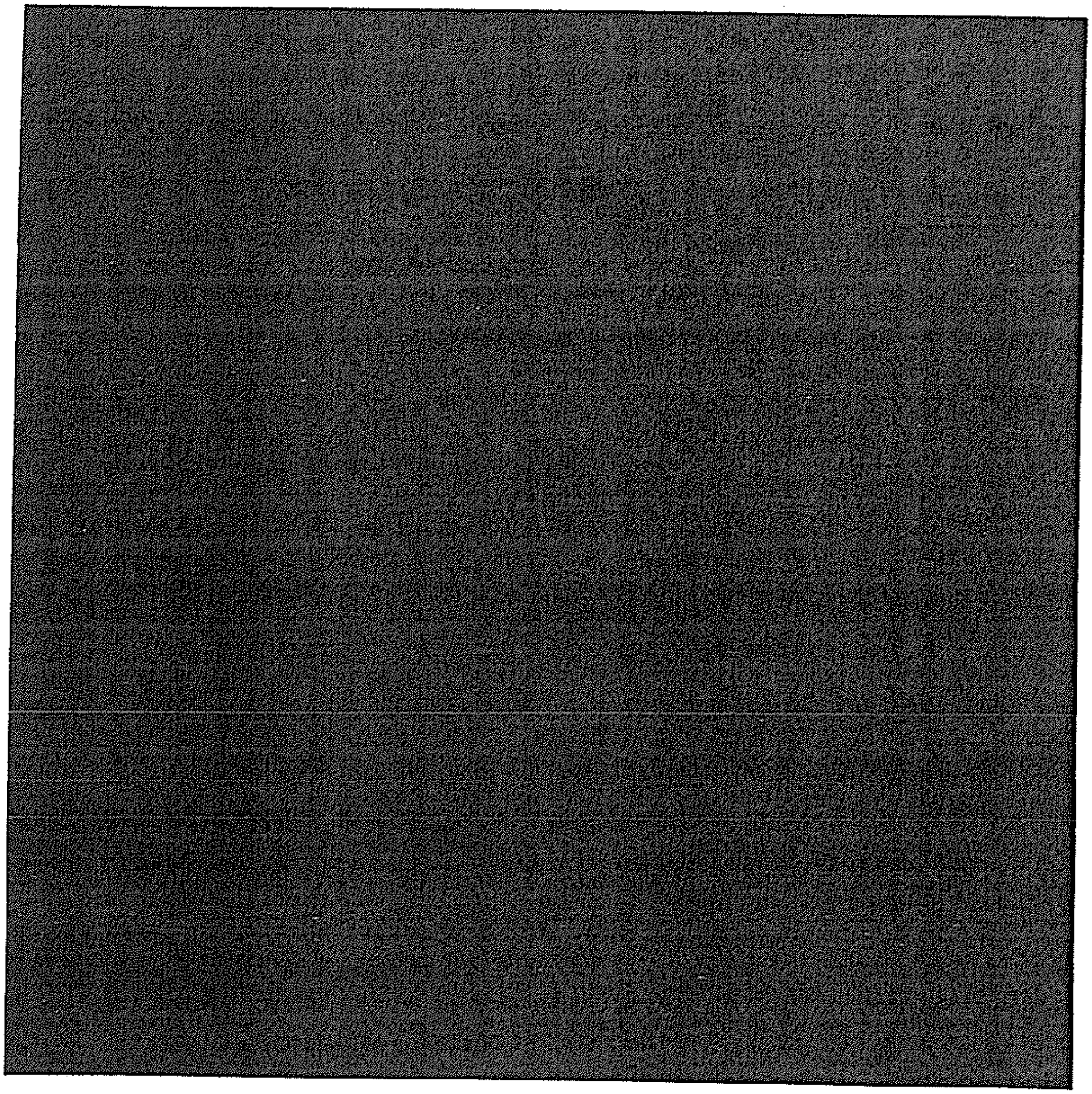


Figure 7. CIR PHOTOGRAPH OF A RINGGOLD TREND AT A SCALE OF 1:65,000 SHOWING GENERAL LOCATION OF LANDFORMS AND GRAVEL PIT.

location of the expected landforms. The heavy forest cover and subtle topography proved to be an obstacle to their delineation.

For large-scale landform interpretation an area west, southwest, and south of the city of Ringgold was selected for detailed analysis. Aerial photography at a scale of 1:20,000 was acquired from U.S. Department of Agriculture ASCS. Large-scale landform analysis shows the area to be predominantly forested with cultivation concentrated in the eastern portion of the trend. The area has a generally flat to undulating surface south of State Highway 154, as indicated by the practice of contour ploughing and farming (Figure 8). However, north of Highway 154 the area is heavily dissected. This is indicated by the dendritic drainage pattern (Figures 8 and 9). The photographs have a dull gray tone in areas that are predominantly forested and a gray tone in areas that are cleared of vegetation. A sand and gravel pit was also observed on the black and white aerial photograph shown in Figure 8. The generally uniform photo tone, which was a result of the area being predominantly forested, prevented the delineation of the terrace and floodplain landforms. Even though the history of aggregate production in Ringgold is largely associated with the geologic occurrence of the High Terraces (8), (22), landform analysis of the selected site failed to identify any specific features with a high potential for aggregate material.

The Monroe trend is located in Ouachita Parish, Louisiana. The trend is located on the Pleistocene Prairie and Deweyville terraces, the Holocene Alluvium and the Eocene Cockfield Formation. The soil composition of the Monroe trend included the poorly to moderately well-drained soils. The maximum terrain elevation of the trend is about 200 feet above mean sea level with a relief of approximately 150 feet. As a result, there is a small topographic change between landforms. A large portion of the area is considered to be a part of a lacustrine lakebed that resulted from the damming of the Ouachita valley, which created a perennial lake called Lake Monroe (23). The ridge identified in Figures 10 and 11 is considered a remnant of the shoreline of the ancestral Lake Monroe.

Medium-scale landform analysis of the representative site selected in the Monroe trend indicated a gently sloping terrace and a floodplain. Figures 10 and 11 are CIR photographs of a portion of Monroe trend showing the terrace and floodplain landforms. The topography can be described as mildly dissected terraces

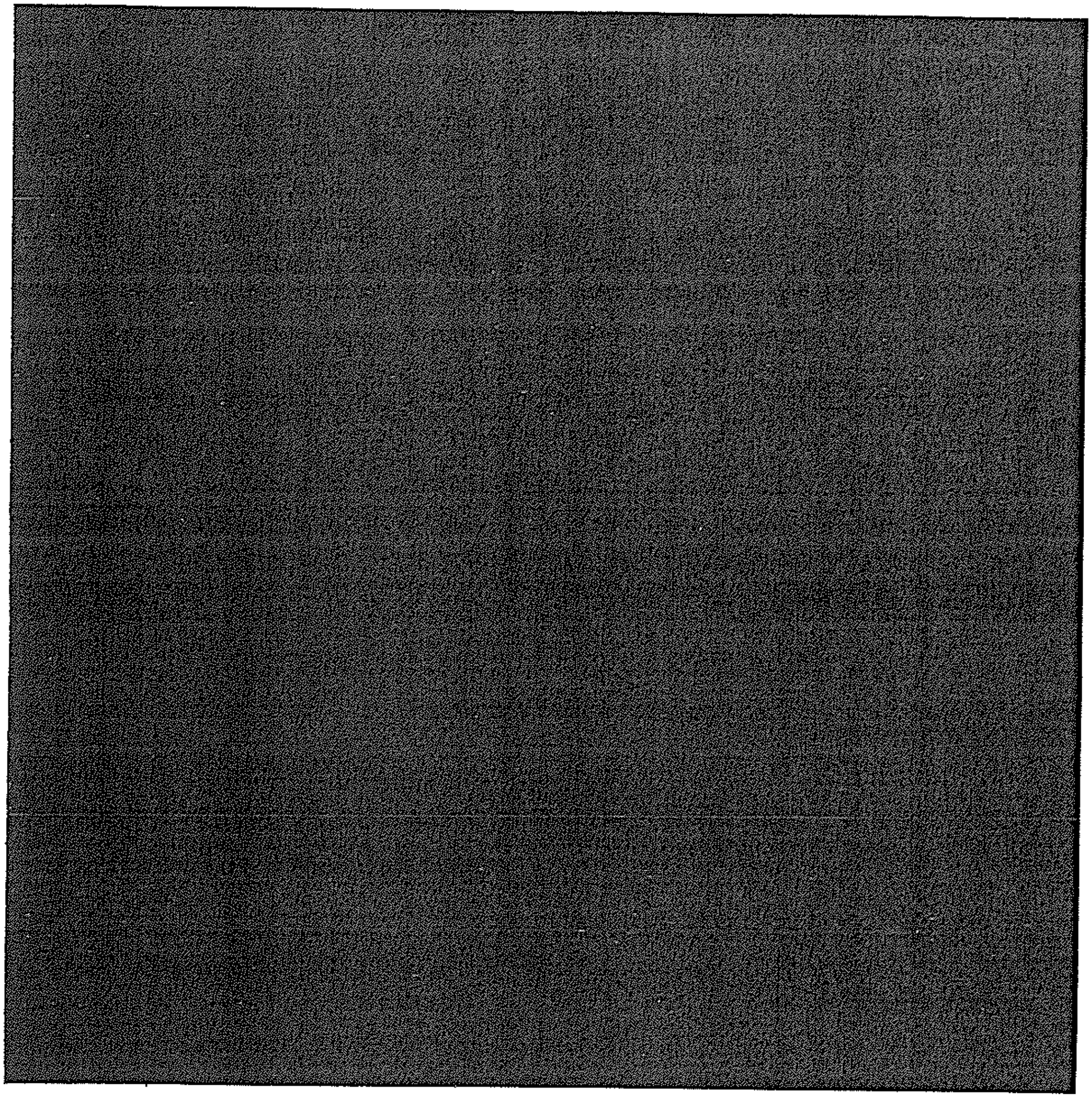


Figure 8. BLACK AND WHITE AERIAL PHOTO OF A PORTION OF RINGGOLD TREND SHOWING GENERAL LOCATION OF LANDFORMS AND GRAVEL PIT.

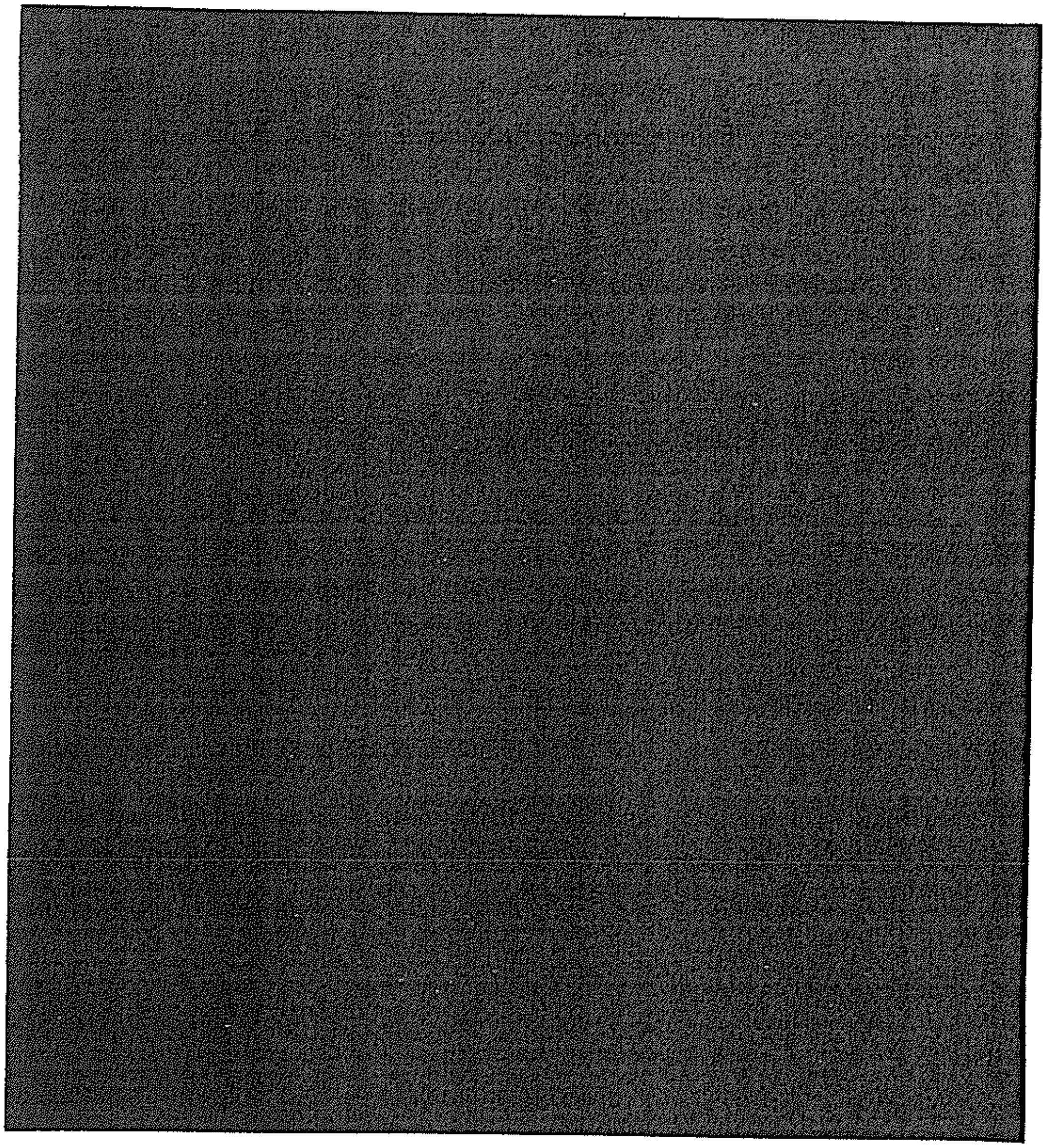


Figure 9. TOPOGRAPHIC MAP OF A PORTION OF RINGGOLD TREND AS SHOWN IN THE BLACK AND WHITE PHOTOGRAPH OF FIGURE 8.

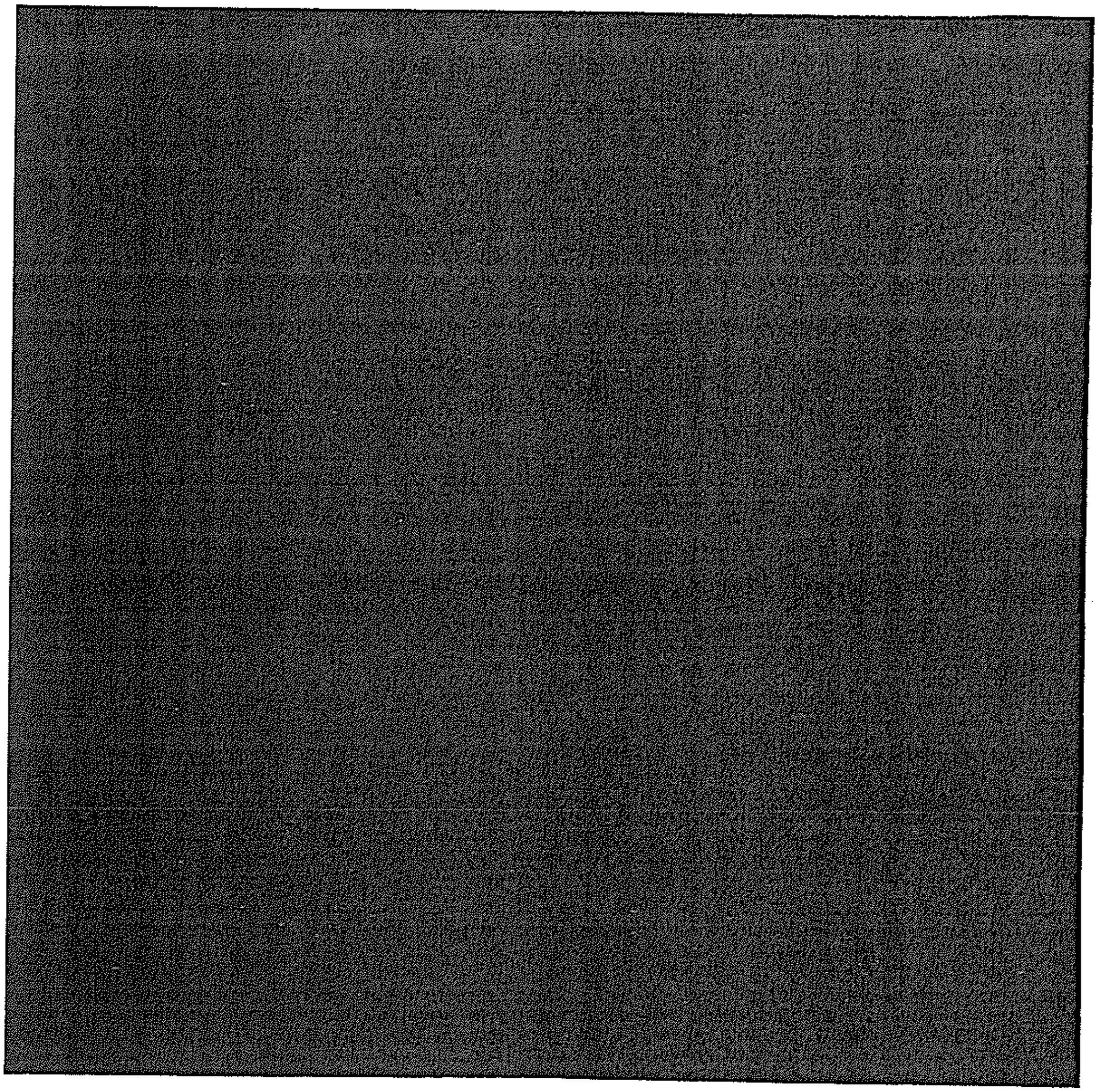


Figure 10. CIR PHOTOGRAPH OF A PORTION OF MONROE TREND AT A SCALE OF 1:65,000 SHOWING TYPICAL LANDFORM BOUNDARIES AND FEATURES RELATING TO THE POTENTIAL FOR AGGREGATE MATERIAL.

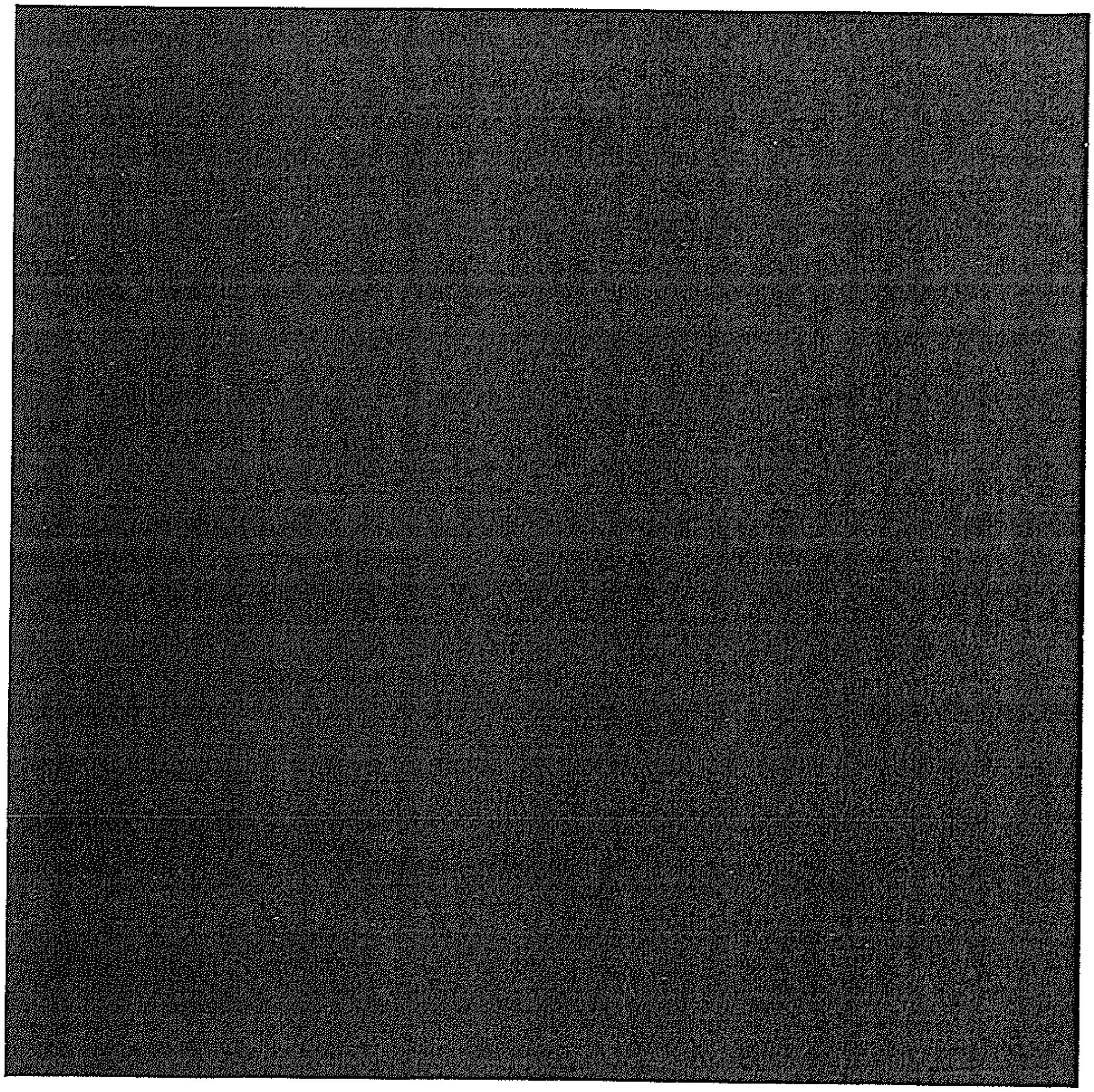


Figure 11. CIR PHOTOGRAPH OF A PORTION OF MONROE TREND AT A SCALE OF 1:65,000 SHOWING TYPICAL LANDFORM BOUNDARIES AND POINT BAR AND OXBOW LAKE WITH POTENTIAL FOR AGGREGATE MATERIAL.

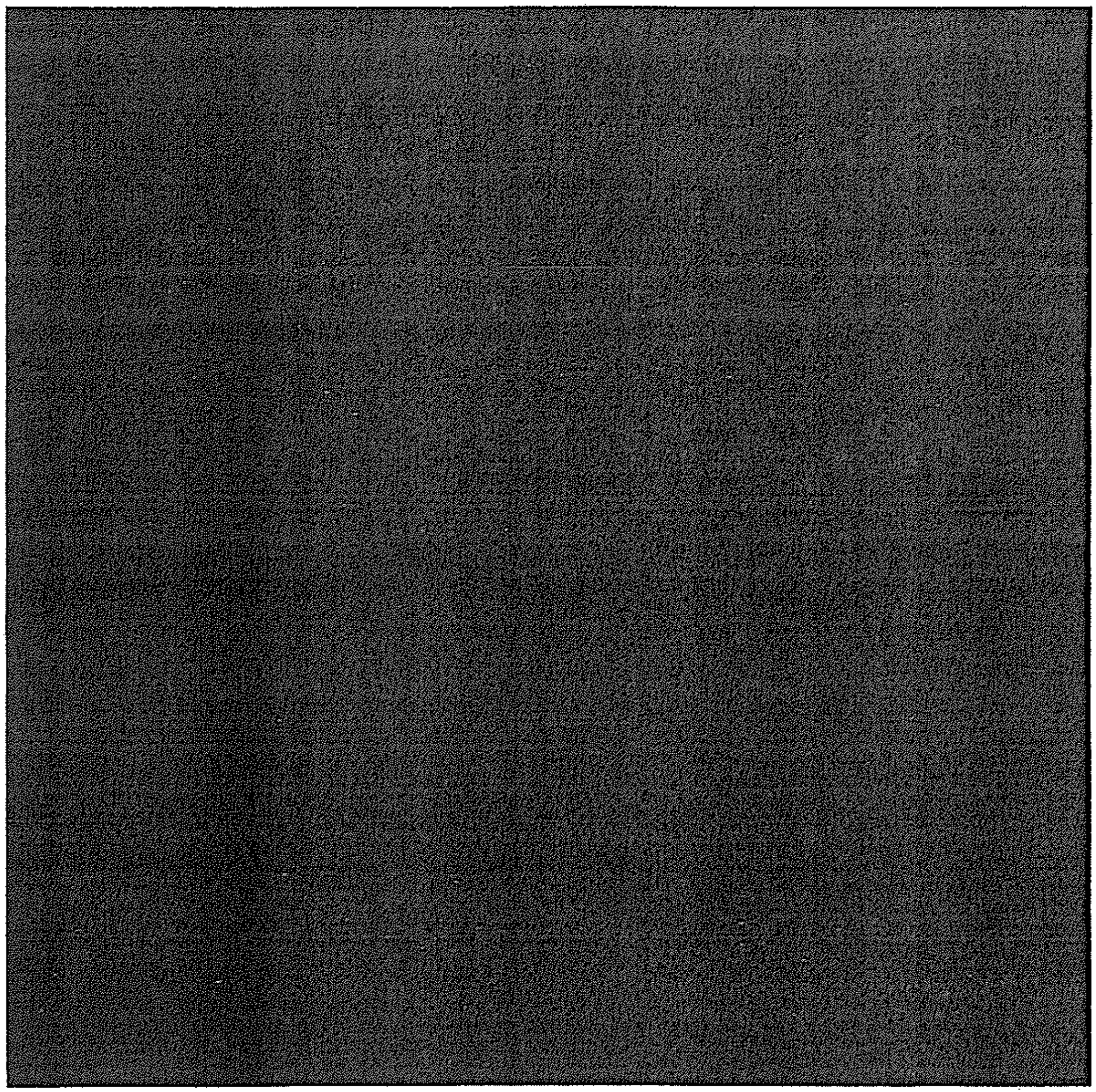


Figure 12. BLACK AND WHITE AERIAL PHOTO OF A PORTION OF MONROE TREND SHOWING LANDFORM BOUNDARIES AND FEATURES RELATING TO THE POTENTIAL FOR AGGREGATE MATERIAL.

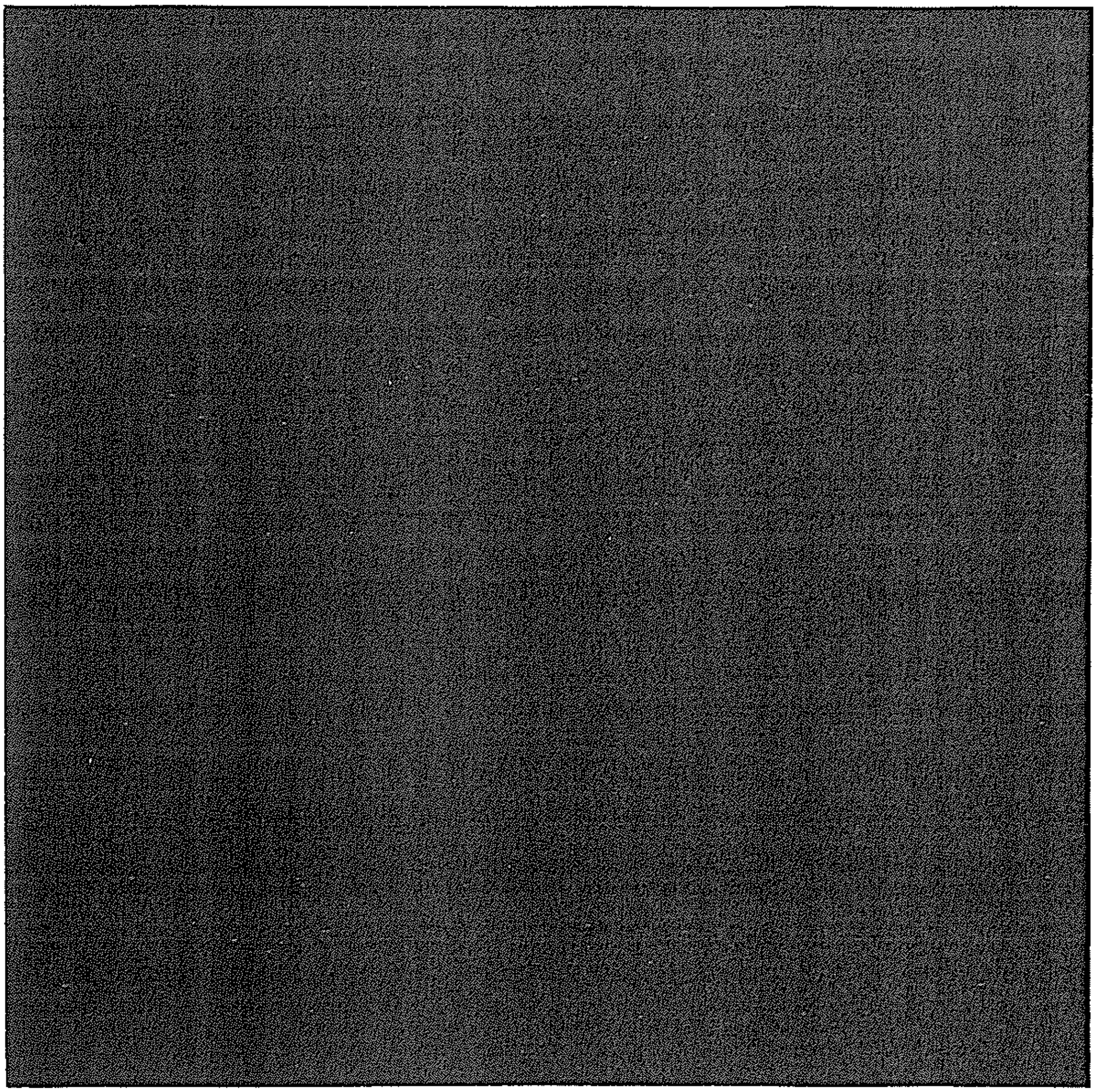


Figure 13. MAY 1990 CIR PHOTOGRAPH OF A PORTION OF MONROE TREND AT A SCALE OF 1:10,000 SHOWING RELIC BEACH RIDGE WITH HIGH POTENTIAL FOR AGGREGATE AND ACTIVE GRAVEL PIT.

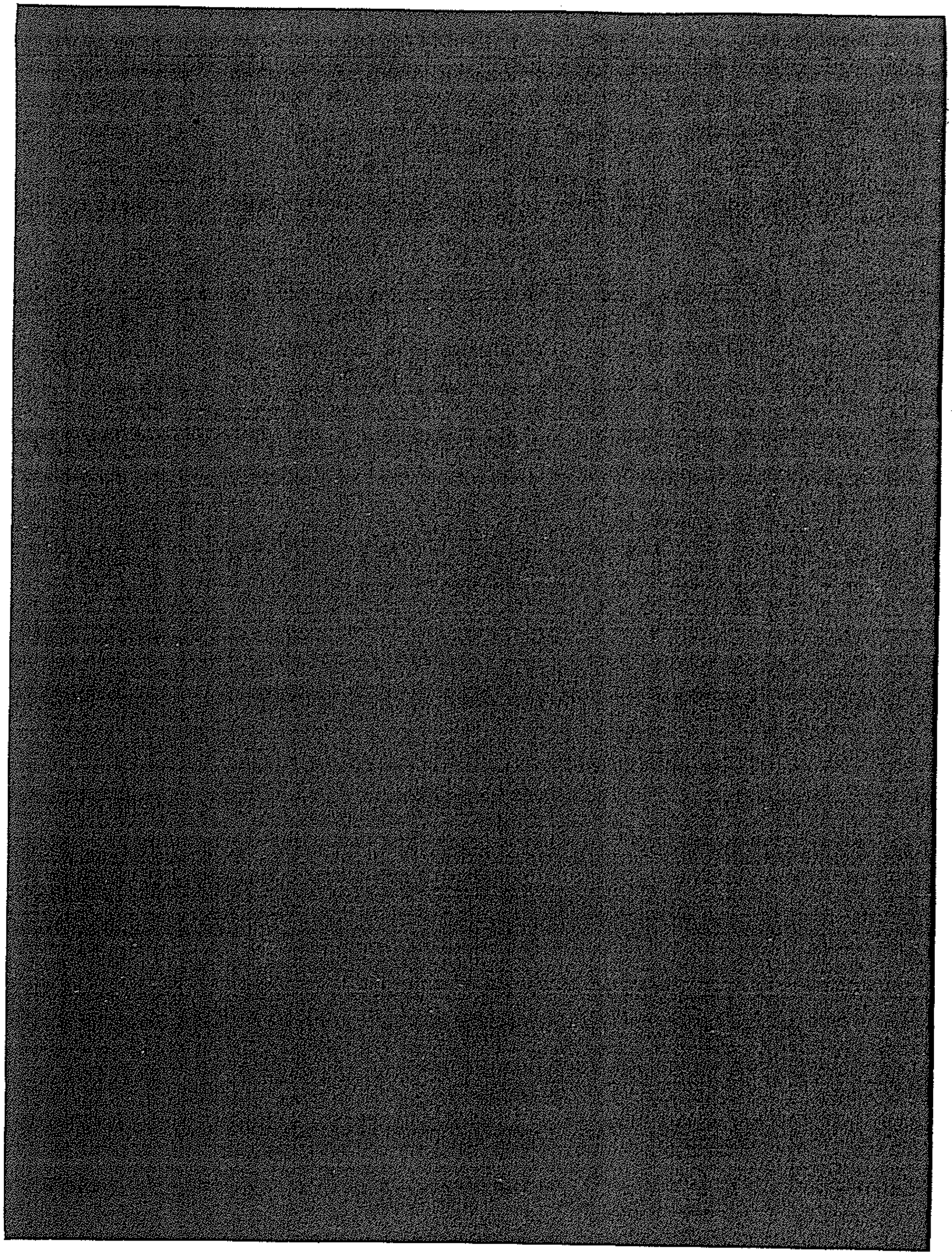


Figure 14. TOPOGRAPHIC MAP OF A PORTION OF MONROE TREND AS SHOWN IN THE BLACK AND WHITE PHOTOGRAPH OF FIGURE 12.

photo tone in those areas. This beach ridge has potential for aggregate material. Additionally, the boundary between landforms are locations having a potential for aggregate deposits.

The Le Blanc Trend is located in Allen and Jefferson Davis Parishes, Louisiana. Le Blanc is a small town located along US 190 west of the city of Baton Rouge, Louisiana. The Le Blanc is located mainly on the Pleistocene Intermediate, Prairie, and Deweyville terraces. Holocene Alluvium is found adjacent to rivers and streams. The soil composition of the Le Blanc Trend consists of well-drained to poorly-drained soils.

Medium-scale landform analysis of the representative site selected for the Le Blanc Trend indicated a flat terrace that is extensively cultivated. The surface is drained by the meandering Calcasieu River and its tributaries. Adjacent to the river system is a floodplain with a number of meander scar and point bars. Meander scars were also observed on the terrace surface. Sand and gravel operations were observed in this area, one of which is very extensive. Figure 15 is a CIR photograph of a portion of Ringgold trend showing landforms delineated and identifying fluvial features.

For large-scale analysis of the representative site, black and white aerial photographs at a scale of 1:20,000 were obtained. The analysis was also supplemented by the acquisition of 35mm color and CIR slides. Large-scale landform interpretation of the site shows three landforms: an upper terrace; a lower terrace; and a floodplain (Figure 16). These landforms correspond, respectively, to the Prairie Terraces, the Deweyville Terraces, and the Holocene Alluvium. The Prairie terrace is characterized by a fairly flat surface (Figure 17) that is cultivated (Figure 16). There are also some abandoned channel scars on this terrace surface (Figures 16 and 17). The Deweyville terrace is somewhat more dissected than the higher Prairie terrace, even though there is only a small relief in this surface, i.e., the surface is generally flat with depressions. The presence of sand and gravel pits in the Deweyville terrace indicates that there are aggregate materials in this terrace (Figure 15 and 16). The Holocene Alluvium floodplain, which is mainly forested, is characterized by meandering streams, meander scar, point bars and cutoff.

The Deweyville terrace is the landform that is most likely to have aggregate materials in economic quantities. However, there is also a likelihood that aggregate materials in limited quantity can be found on the Prairie terrace and in point bars in the floodplain. In addition, there is a possibility for aggregate in areas

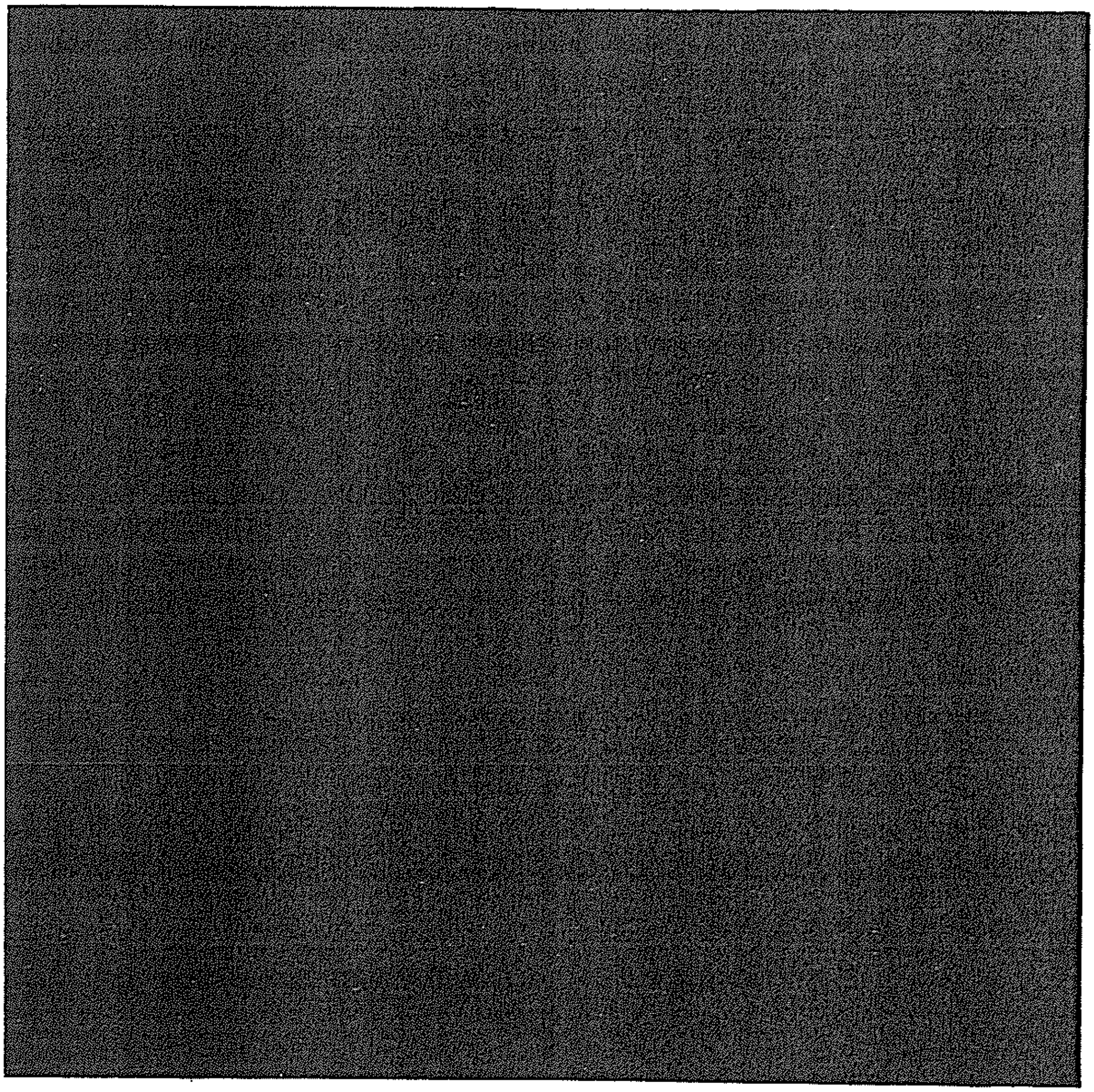


Figure 15. CIR PHOTOGRAPH OF A PORTION OF LE BLANC TREND AT A SCALE OF 1:65,000 SHOWING LANDFORMS AND FEATURES RELATING TO THE POTENTIAL FOR AGGREGATE MATERIAL.

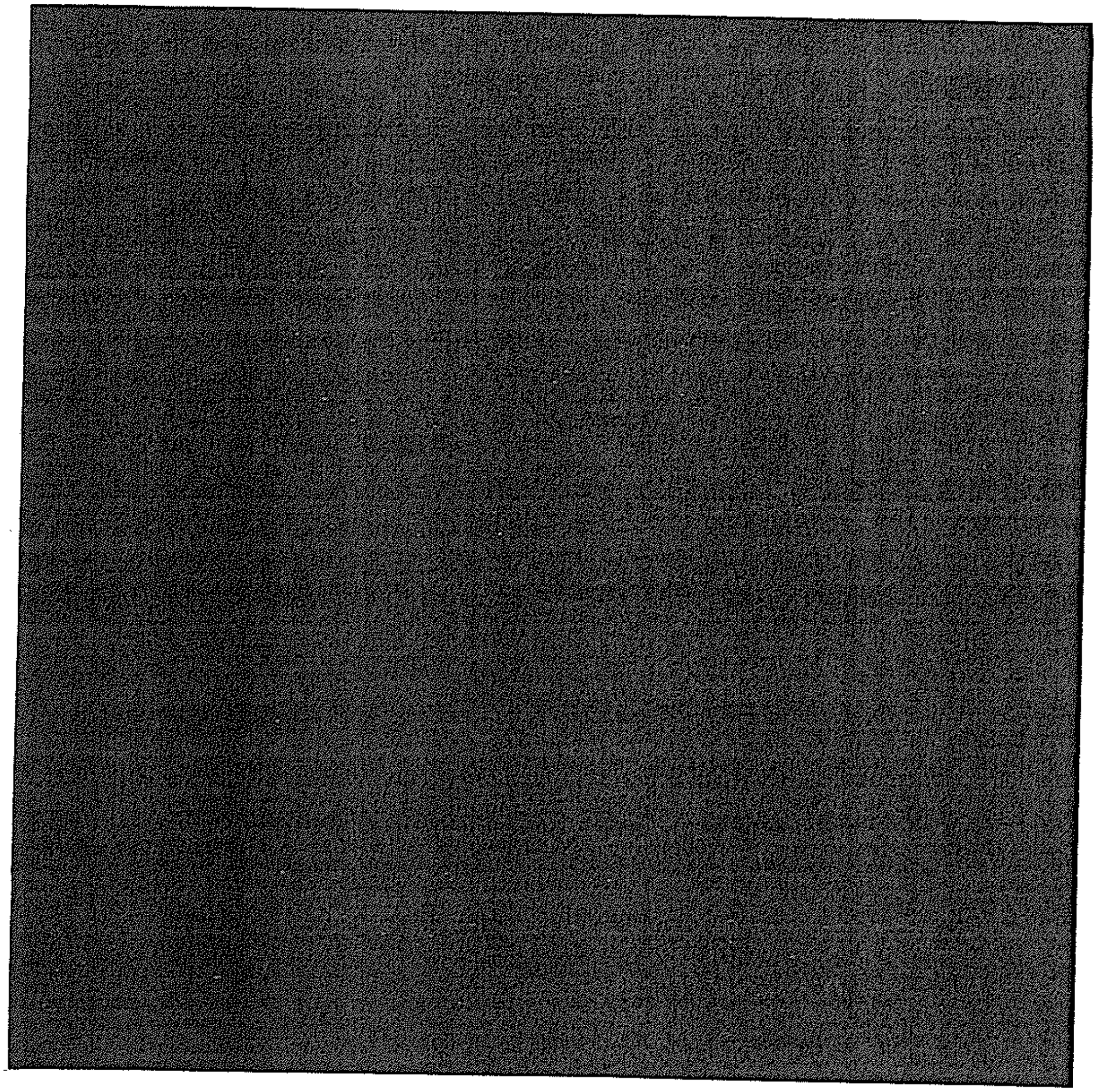


Figure 16. BLACK AND WHITE PHOTO OF A PORTION OF LE BLANC TREND SHOWING LANDFORMS AND FEATURES RELATING TO THE POTENTIAL FOR AGGREGATE MATERIAL.

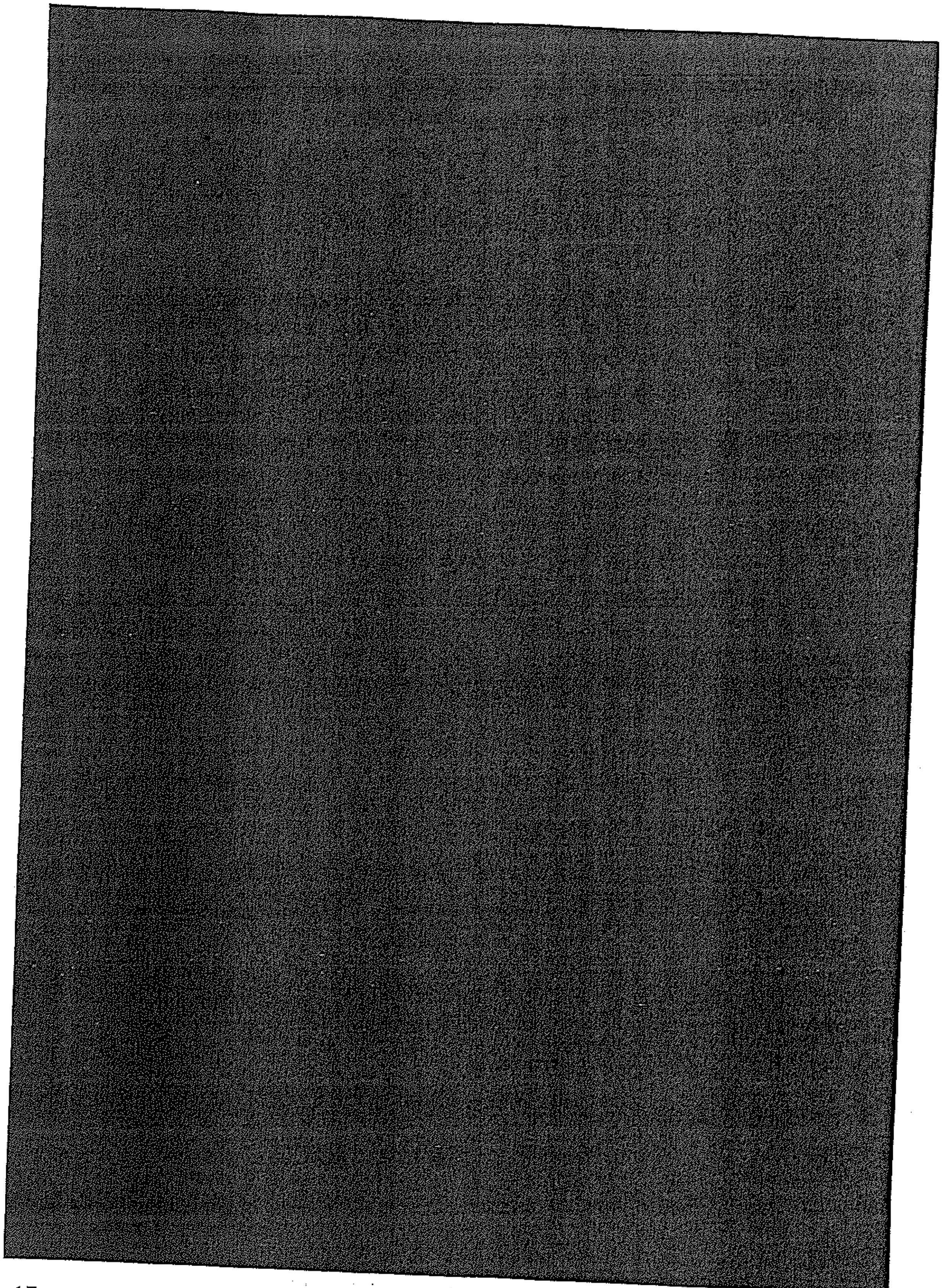


Figure 17. TOPOGRAPHIC MAP OF A PORTION OF LE BLANC TREND AS SHOWN IN THE BLACK AND WHITE PHOTOGRAPH OF FIGURE 16.

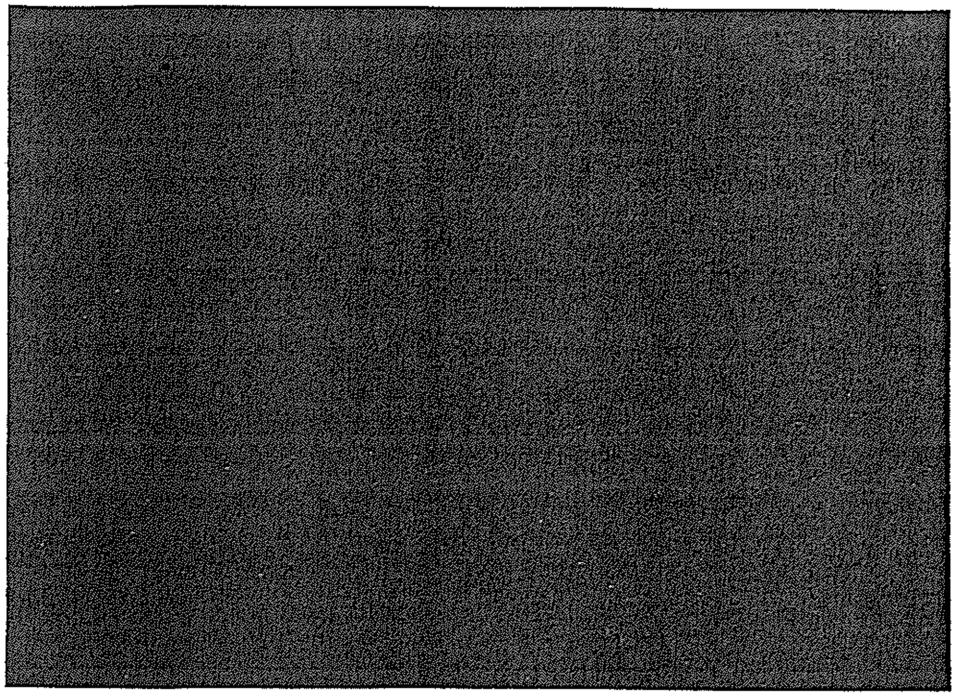
adjacent to the confluence of the Whisky Chitto Creek and the Calcasieu River. The curvilinear features in Figures 16, 18, and 19 are examples of meander scars that can be identified on these surfaces. The area with white tone in Figure 19 is one of the many active point bars along the Whisky Chitto Creek. These meander scars represent relict point bar and channel deposits of an abandoned meandering stream system and therefore have the potential for aggregate material. Other potential areas include the boundaries between landforms.

The Grangeville trend is located in East Feliciana and St. Helena Parishes, Louisiana. The Grangeville trend is located on the Pleistocene High, Intermediate and Prairie Terraces and the Holocene Alluvium. The geomorphic origin and history indicated that the Grangeville trend is part of the Amite River alluvial valley (7).

Medium-scale landform analysis of the representative site selected for Grangeville trend has indicated a gently sloping surface which is drained by the meandering Amite river system. Figure 20 is a CIR photograph showing a portion of the Grangeville trend. The area adjacent to the primary river system is extensively mined as indicated by the numerous active and abandoned sand and gravel pits on its banks. Logging and crop cultivation is the other landuse activity in the area. The site contains a number of meander scars, point bars and oxbow lakes (Figure 20). It is composed of a terrace landform and adjacent floodplain. Delineation of landform boundaries was not possible due to the subtle topography and forest cover.

For the detailed analysis, black and white aerial photographs at a scale of 1:20,000 were obtained from USDA ASCS. The analysis was also supplemented by large scale (1/10,000) CIR photographs and 35mm color and CIR slides.

The representative site exhibits a gently sloping surface with a meandering channel. Figures 21 and 22 are portions of this site showing the landforms and features that can be found within this trend. It is predominantly forested with little cultivation close to residential areas. As a result, the photographs have a dull gray tone. However, in areas that are cultivated and cleared the photographs have a light gray to gray tone. Numerous point bars are identifiable, and where they are free of vegetation they have a distinctive white



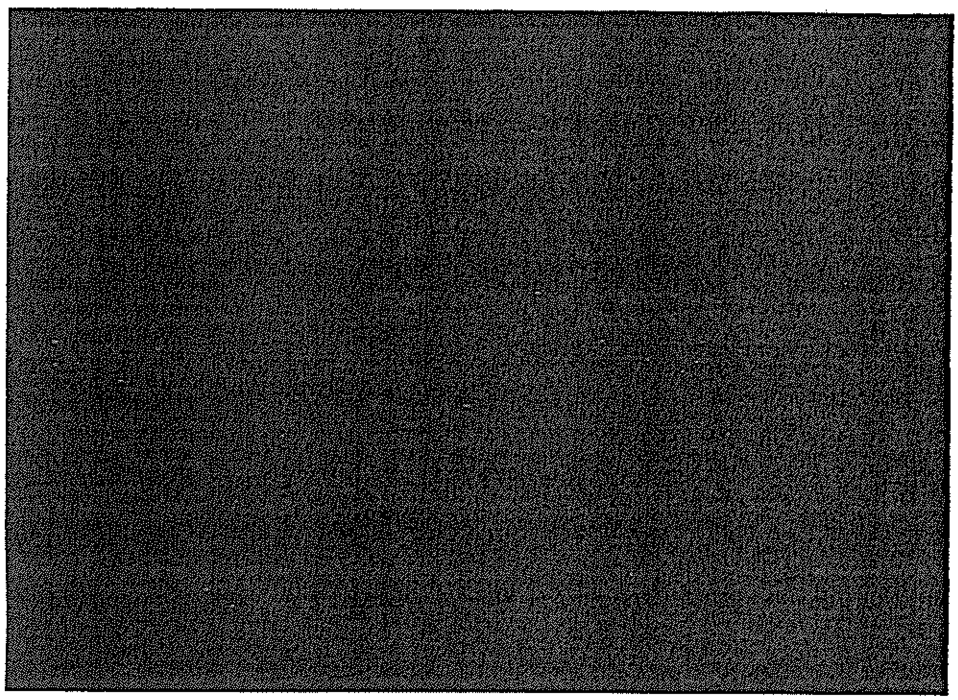


Figure 18. MAY 1990 OBLIQUE COLOR (A) AND CIR PHOTOGRAPH (B) OF MEANDER SCAR IN THE LE BLANC TREND WITH POTENTIAL FOR AGGREGATE.

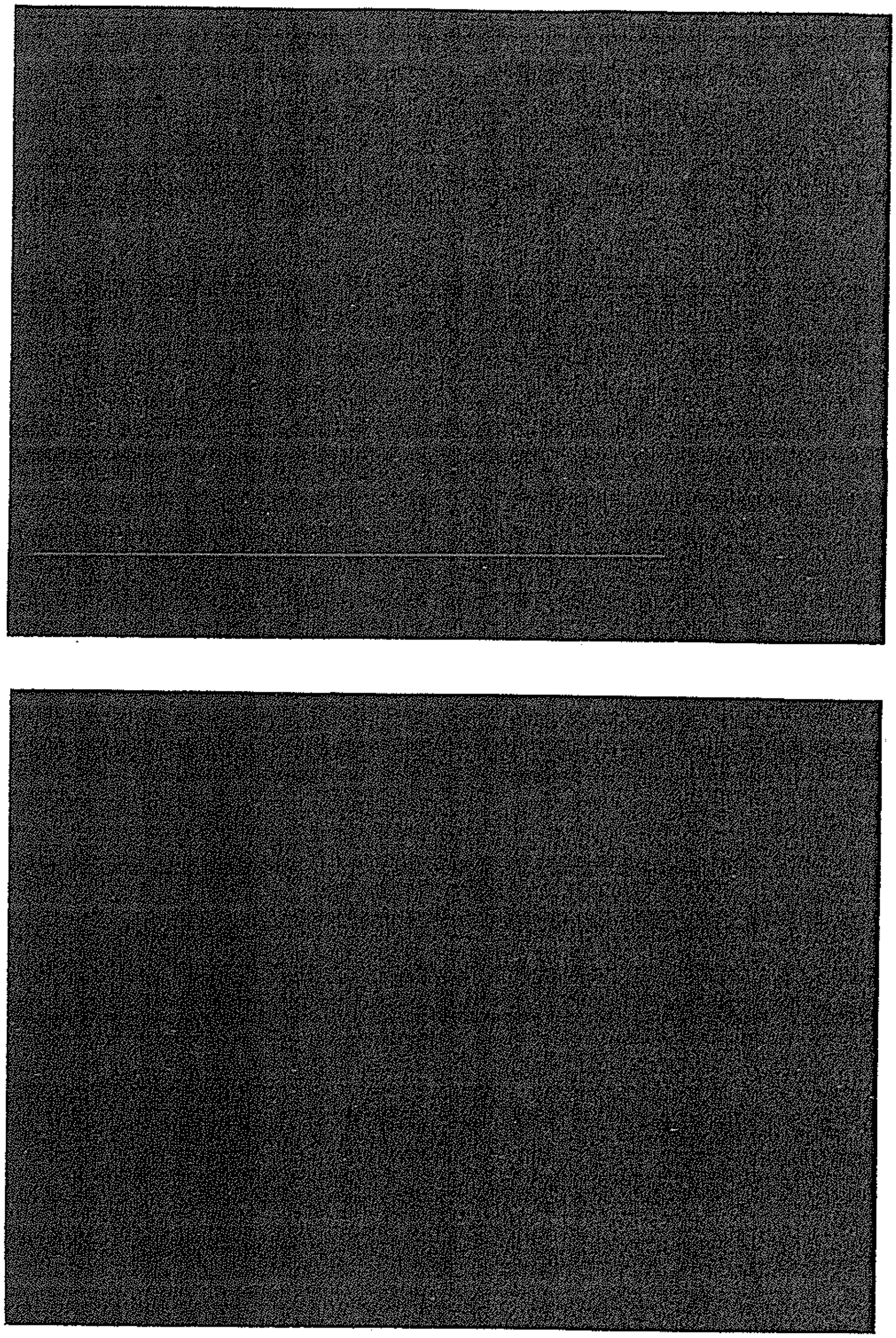


Figure 19. MAY 1990 OBLIQUE COLOR (A) AND CIR PHOTOGRAPH (B) OF MEANDER SCAR AND POINT BAR IN THE LOWER TERRACE OF THE LE BLANC TREND WITH POTENTIAL FOR AGGREGATE.

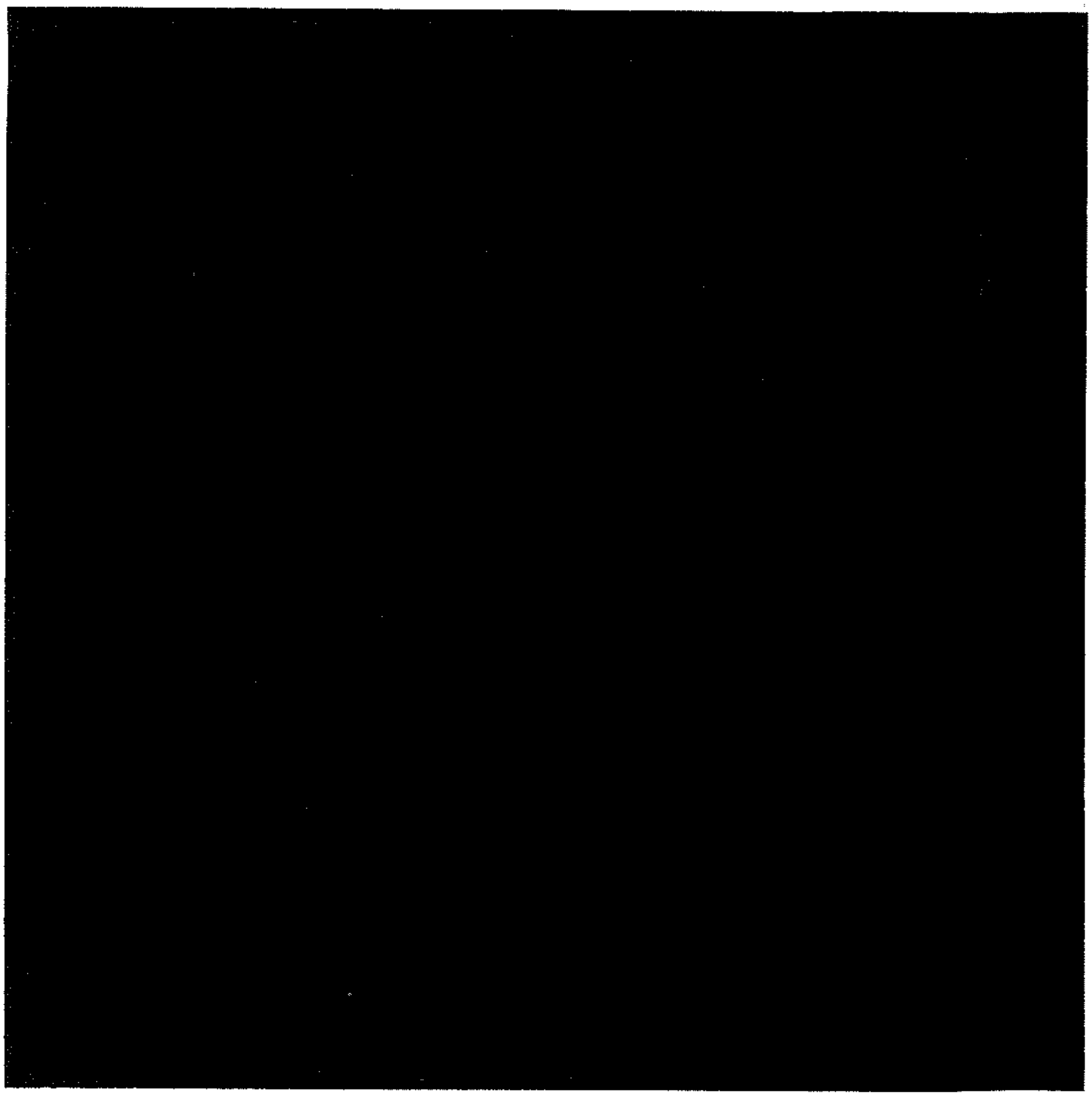


Figure 20. CIR PHOTOGRAPH OF A PORTION OF GRANGEVILLE TREND AT A SCALE OF 1:65,000 SHOWING GENERAL LOCATION OF LANDFORMS AND LANDFORM FEATURES RELATING TO THE POTENTIAL FOR AGGREGATE MATERIAL.

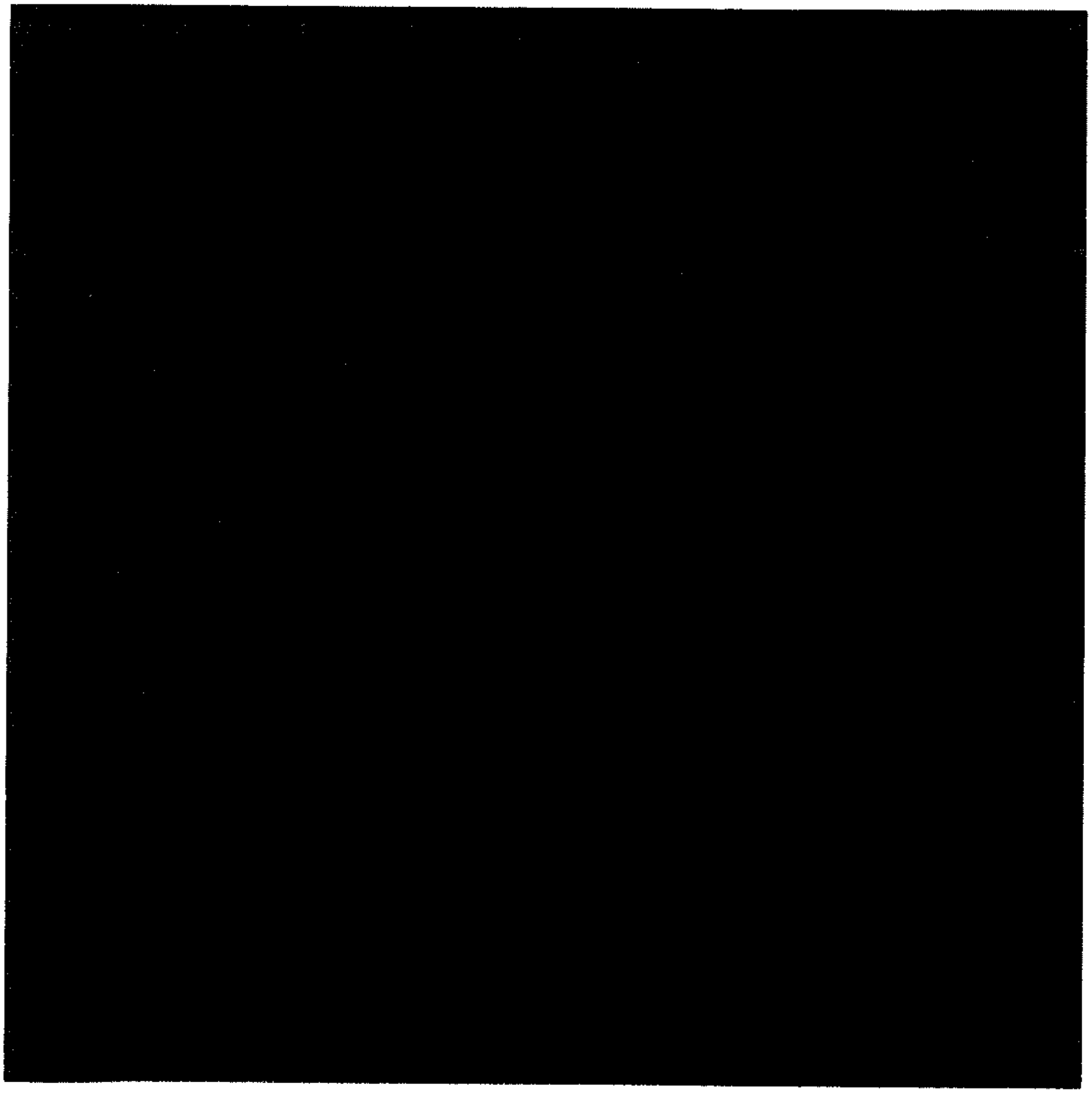


Figure 21. BLACK AND WHITE AERIAL PHOTO OF A PORTION OF GRANGEVILLE TREND SHOWING GENERAL LOCATION OF LANDFORMS AND LANDFORM FEATURES RELATING TO THE POTENTIAL FOR AGGREGATE MATERIAL.

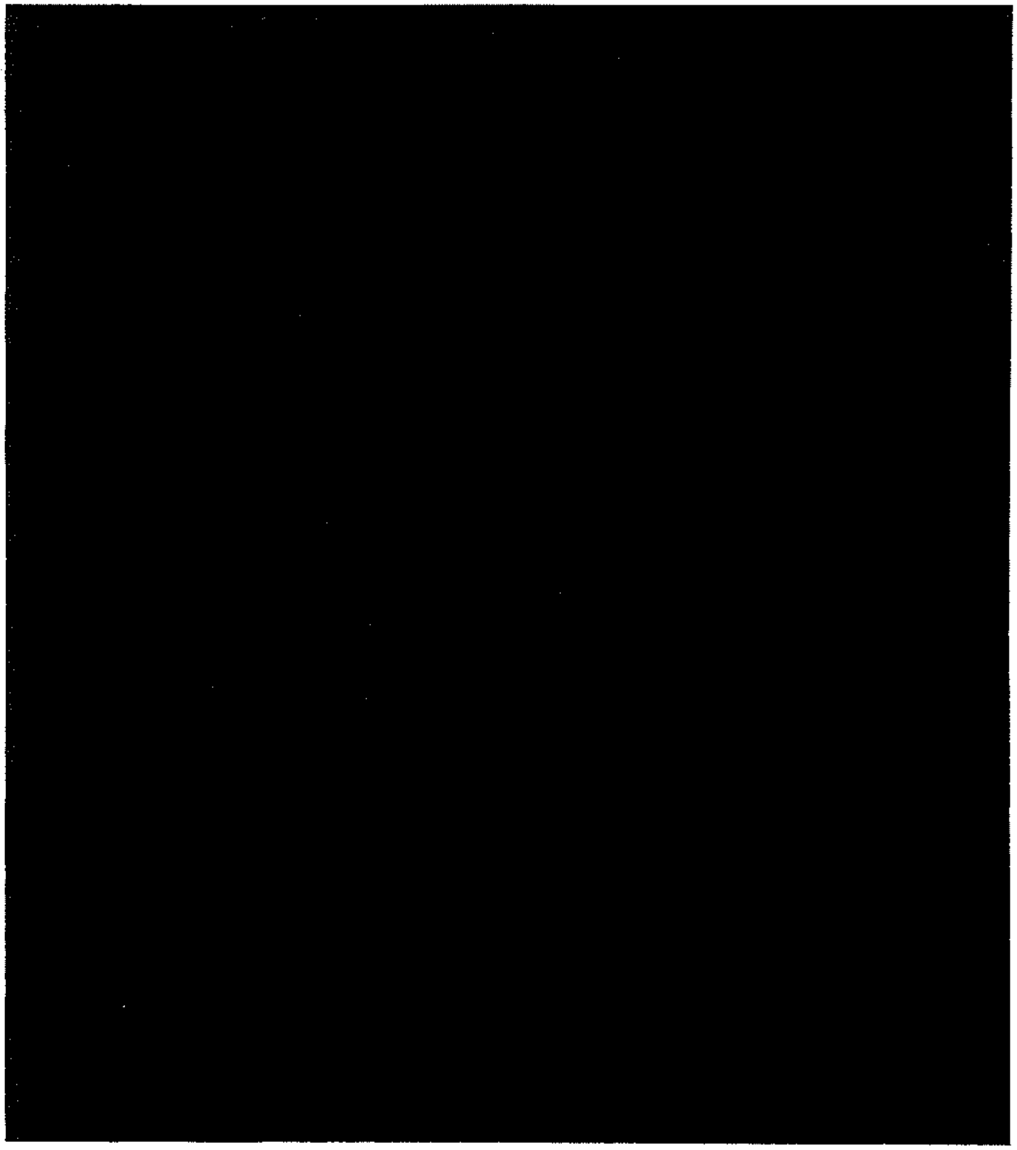


Figure 22. TOPOGRAPH MAP OF A PORTION OF GRANGEVILLE TREND AS SHOWN IN THE BLACK AND WHITE PHOTOGRAPH OF FIGURE 21.

tone (Figure 21). Relic meander scars and cutoff channels are also observable on these photographs. Areas that had been subjected to sand and gravel mining operation are clearly visible by a distinctive white tone on the photographs. The majority of tonal variation observed on the photographs was because of the extensive logging operation that occurs in this region. Due to the uniform dull tone of the photographs as a result of the forest cover and the subtle topography, it was not possible to delineate the terrace and floodplain landform expected in this area.

In the Grangeville trend the potential is high for aggregate material along the Amite River. This potential is evident by the large number of active and abandoned mining areas that can be identified on the aerial photographs. Numerous active point bars can be identified along the Amite River (Figure 20, 23). In some areas relic meander scars are also observed (Figure 24). Boundaries between landforms also have a potential for aggregate material.

PHASE 3: SELECTIVE FIELD CHECKING, STRATIGRAPHIC MAPPING, AND CONE PENETROMETER TESTING

Description of Work Activities

Individual aggregate trends were investigated in each region of Louisiana to refine regional interpretations from previous analysis. Geologic and aggregate resource data were evaluated for four trends using available geologic data, topographic patterns from 7.5-minute quadrangles, soil survey maps, and black and white panchromatic photographs. This data helps to identify the most promising areas for defining a minable aggregate deposit within the selected trends. Areas identified as promising were visited on a field reconnaissance to verify geologic and geomorphic interpretations and establish locations for field stratigraphic and geotechnical investigations.

This phase of the investigation was initiated with the selection of the most promising aggregate trend in each region. The selection process was influenced by logistical considerations such as data availability, degree of aggregate production in a trend, and possibility of accessing a field site for additional data acquisition. Within each aggregate trend geologic units were mapped, modifying the Geologic Map of Louisiana (8) wherever applicable. Soils were correlated to geologic units, and soil textures were used to map

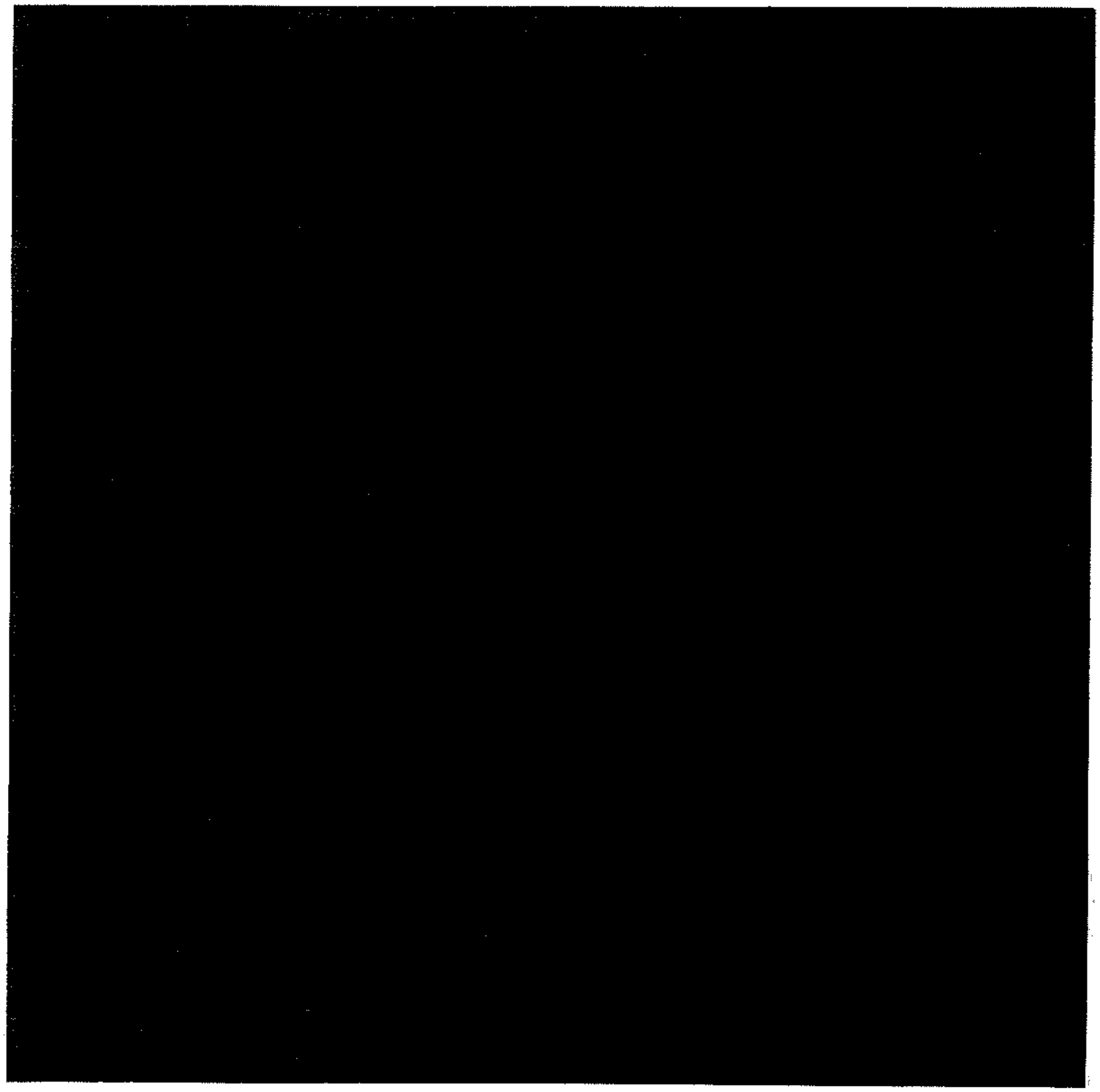


Figure 23. MAY 1990 CIR PHOTOGRAPH OF GRANGEVILLE TREND AT SCALE OF 1:10,000 SHOWING POINT BAR AND MEANDER SCARS WITH HIGH POTENTIAL FOR AGGREGATE AND ACTIVE MINING AREA.

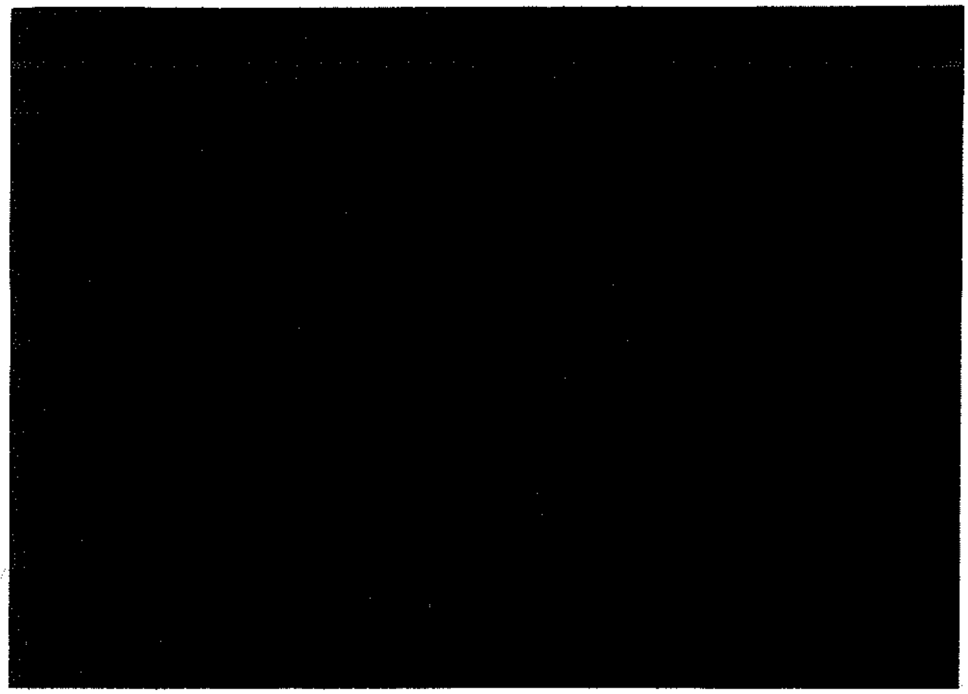


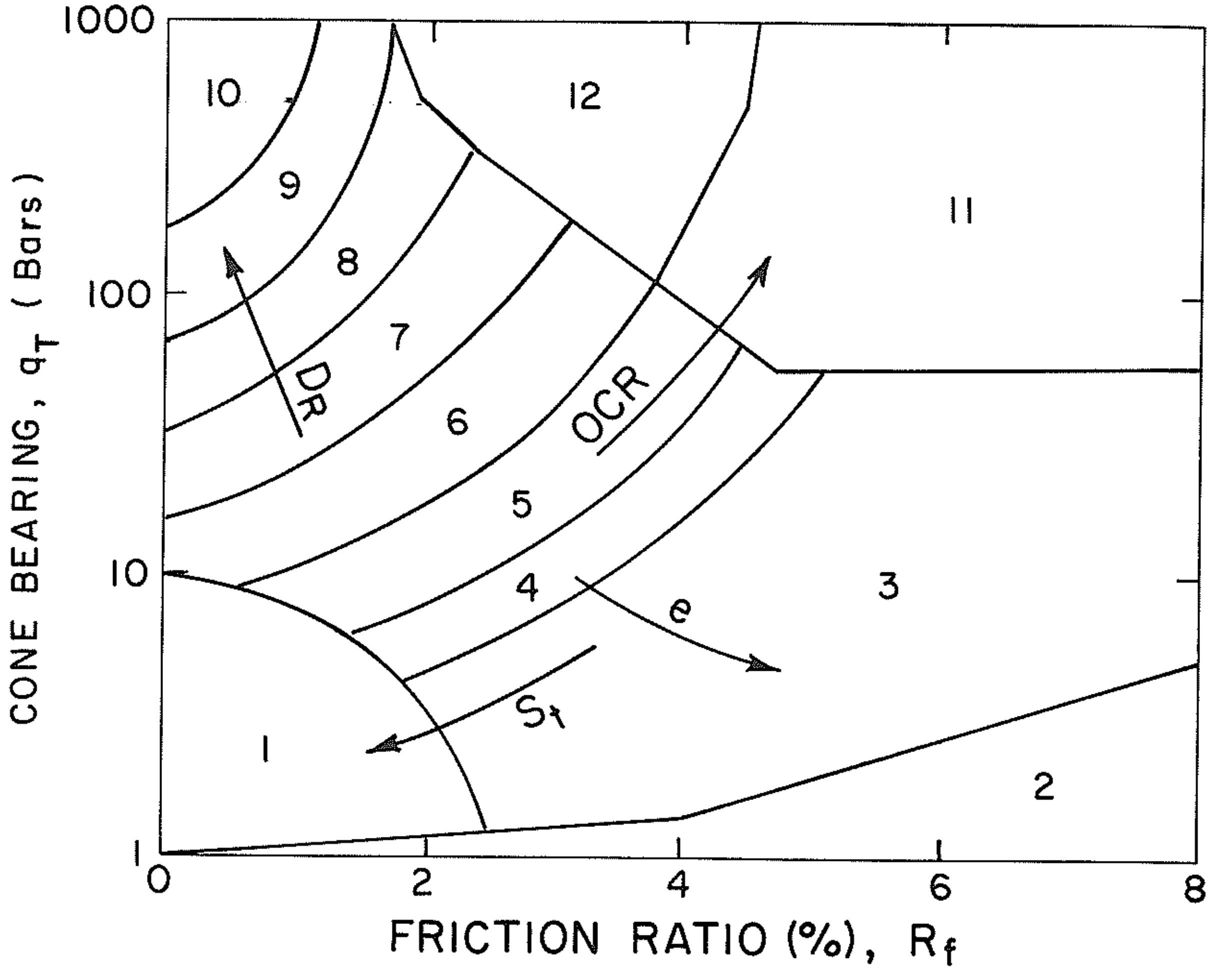
Figure 24. MAY 1990 OBLIQUE CIR PHOTOGRAPH OF MEANDER SCAR AND RELIC POINT BAR CURRENTLY BEING MINED IN AMITE RIVER OF THE GRANGEVILLE TREND.

overburden thickness in promising areas. General soil texture was determined by estimating the texture at the base of the soil profile at 2 meter depth from published Soil Conservation Service soil descriptions. This procedure produced maps illustrating variations in overburden thickness, and the pattern produced by sandy and loamy subsoils reflects remnants of abandoned river channel courses. Soil borings were collected for each of the four aggregate trends (Appendix E) along transects to verify previously published data, refine preliminary interpretations and assess the geometric and physical properties of aggregate deposits and the associated overburden.

Geotechnical investigations were performed by employing a cone penetrometer testing (CPT) device. The objectives of the cone penetrometer study was to provide vertical soil profile for two transects, in the Grangeville and Monroe sites, and to compare these results with the soil borings and image interpretation results. For field testing, two trucks with all facilities for CPT testing were used. The LTRC truck (LECOPS) was used in the first four locations near Grangeville. The LSU truck (REVIGITS) was used for the rest of the study. The advantages of using these trucks for in-situ testing were efficiency, accuracy, and cost effectiveness together with better soil profiling capability.

The field cone penetrometer tests were conducted along the same transects of the hydraulic probe borings. The data was recorded continuously in each sounding. The classification of the cone penetrometer data was done using two approaches. The first method was using a program called "Classify." This program is provided by the manufacturers of the penetrometer truck and gives a classification of the soil data based upon the tip resistance and sleeve friction readings. All the test files that were obtained from the field testing were classified using this program. The second approach used the classification charts reported by: (a) Robertson and Campanella (24) (Figure 25), (b) Douglas and Olsen (25) (Figure 26), (c) Tumay (26) (Figure 27).

The Grangeville location transect consisted of 6 CPT soundings designated as G1, G3, G4, G5, G6, and G7. The Monroe location transect consisted of 6 CPT soundings designated as M1, M2, M3, M4, M6A, and M7. The soil classification results according to the "Classify" program are presented in Appendix F with the sounding plots. The soil classification results according to the three charts are presented in Tables 1 to



ZONE	q_T/N	SOIL BEHAVIOR TYPE
1	2	Sensitive Fine Grain
2	1	Organic Material
3	1	Clay
4	1.5	Silty Clay to Clay
5	2	Clayey Silt to Silty Clay
6	2.5	Sandy Silt to Clayey Silt
7	3	Silty Sand to Sandy Silt
8	4	Sand to Silty Sand
9	5	Sand
10	6	Gravelly Sand to Sand
11	1	Very Stiff Fine Grain
12	2	Sand to Clayey Sand

Figure 25. ROBERTSON AND CAMPANELLA'S CLASSIFICATION CHART (24).

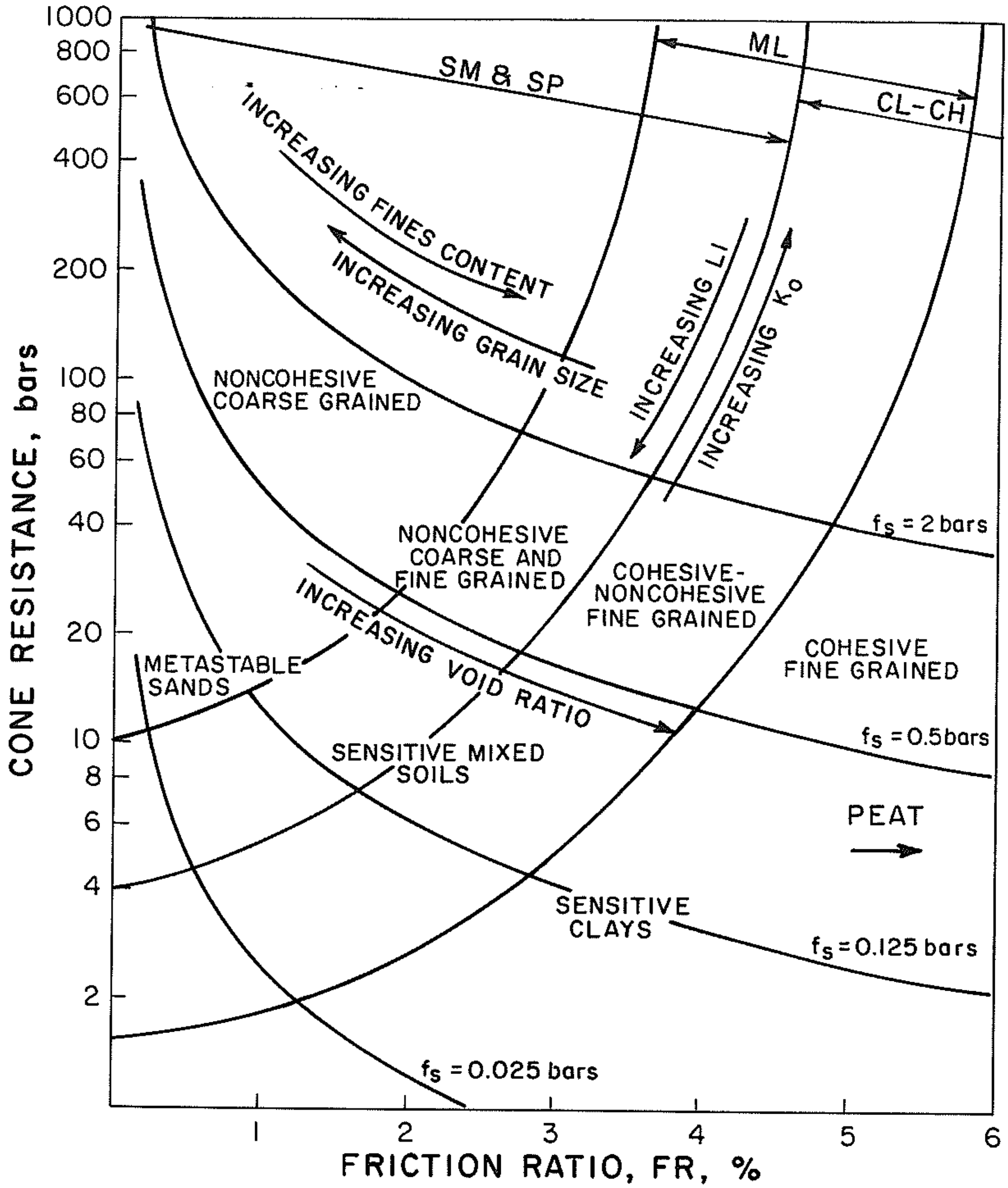


Figure 26. DOUGLAS AND OLSEN CLASSIFICATION CHART (25).

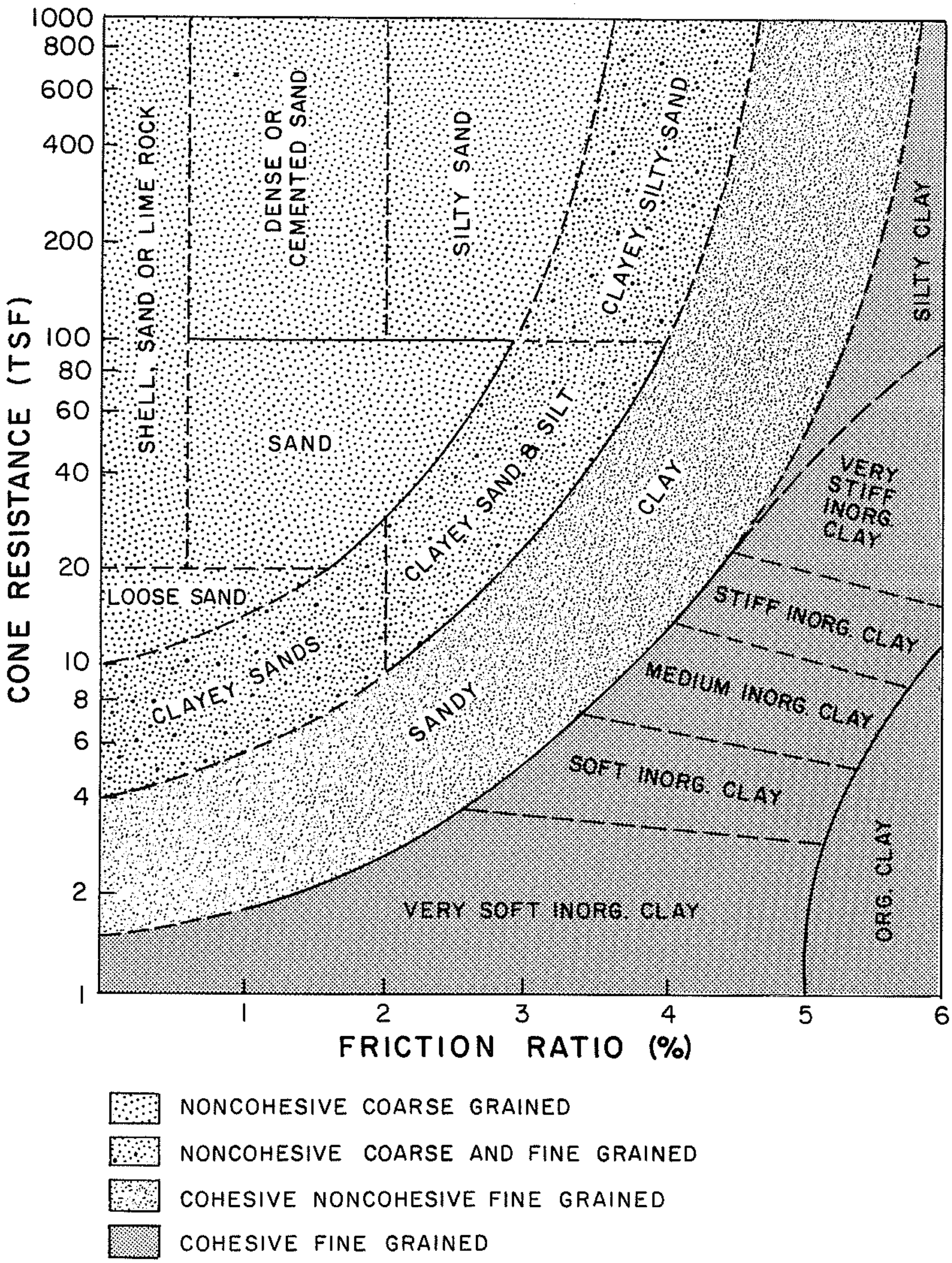


Figure 27. M. T. TUMAY'S CLASSIFICATION CHART (26).

12. The vertical soil profiles indicate that the locations shown on Tables 13 and 14 may have aggregate deposits. It is noted that sleeve friction readings of less than 1 percent and tip resistances of greater than 100 kg/sqcm indicate granular soils. If the friction ratio decreases below 1 percent and the tip resistance increases above 100 kg/sqcm, the grain size increases, relative density increases and/or cementation in the deposit increases. Therefore, cemented deposits will display characteristics similar to the gravelly deposits (tip resistance and friction ratio). It is often difficult to separate the two unless complimented with geological information. In particular, it is to be noticed that at soundings M1 and M7 locations of Table 14, the cone penetrometer data suggest large grain size, gravelly deposits and/or cemented deposits. Geological data, as explained in the following sections, do not support having aggregate deposits in these locations. These strata are possibly cemented deposits of the Tertiary period with iron possibly being the primary cementing agent.

TABLE 1

CONE TESTING PARAMETERS AND SOIL CLASSIFICATION OF BORING G1 (GRANGEVILLE, LA., GROUND SURFACE ELEVATION: 74 M.)

	Penetration Parameters			Classification		
Depth Range (m)	Tip Resistance (kg/cm^2)	Sleeve Friction (kg/cm^2)	Friction Ratio (%)	Robertson & Campanella (24)	Tumay (26)	Douglas & Olsen (25)
0.00-0.96	23.2	0.9	4.0	Silty Clay Clay	Sandy Clay	Cohesive & Non-Cohesive Fine Grained (ML-CL)
0.96-5.56	91.0	6.4	7.2	Very Stiff Clay	Inorganic Clay Very Stiff	Cohesive Fine Grained (CL)
5.56-8.30	87.2	6.5	7.6	Very Stiff Clay	Very Stiff Inorganic Clay	Cohesive Fine Grained (CL)
8.30-16.04	88.8	1.2	1.3	Sand-Silty Sand	Sand	Non-Cohesive Coarse Grained (SM-SP)

TABLE 2

CONE TESTING PARAMETERS AND SOIL CLASSIFICATION OF BORING G3 (GRANGEVILLE, LA., GROUND SURFACE ELEVATION: 52 M.)

Depth Range (m)	Penetration Parameters: Tip Resistance (kg/cm²)	Sleeve Friction (kg/cm²)	Friction Ratio (%)	Classification: Robertson & Campanella (24)	Tumay (26)	Douglas & Olsen (25)
0.02-2.20	34.3	1.6	4.6	Silty Clay Clay	Sandy Clay	Non-Cohesive & Cohesive Fine Grained (ML-CL)
2.20-4.26	41.9	1.7	4.2	Silty Clay Clay	Sandy Clay	Cohesive & Non-Cohesive Fine Grained (ML-CL)
4.26-4.64	356.6	5.7	1.8	Sand Clay	Dense or Cemented	Non-Cohesive Coarse Grained (SM-SP)

TABLE 3

CONE TESTING PARAMETERS AND SOIL CLASSIFICATION OF BORING G4 (GRANGEVILLE, LA., GROUND SURFACE ELEVATION: 46 M.)

Depth Range (m)	Penetration Parameters			Classification		
	Tip Resistance (kg/cm^2)	Sleeve Friction (kg/cm^2)	Friction Ratio (%)	Robertson & Campanella (24)	Tumay (26)	Douglas & Olsen (25)
0.02-0.68	27.8	0.7	2.7	Clayey Silt Silty Clay	Clayey Sand & Silt	Non-Cohesive Coarse Grained (SM-ML)
0.68-0.92	15.2	0.1	1.0	Sandy Silt Clayey Silt	Sand	Metastable Sand (SM-ML)
0.92-3.8	25.8	1.7	6.7	Clay	Very Stiff Inorganic Clay	Cohesive Coarse Grained (CL)
3.80-6.06	338.9	1.5	0.6	Gravelly Sand Sand	Shell Sand-Lime Rock	Non-Cohesive Coarse Grained (SM-SP)
6.06-8.44	27.1	0.7	2.4	Sandy Silt Clayey Silt	Clayey Sand Silt	Non-Cohesive Coarse Grained & Fine Grained (SM-ML)

TABLE 4

CONE TESTING PARAMETERS AND SOIL CLASSIFICATION OF BORING G5 (GRANGEVILLE, LA., GROUND SURFACE ELEVATION: 49 M.)

Depth Range (m)	Penetration Parameters Tip Resistance (kg/cm²)	 Sleeve Friction (kg/cm²)	 Friction Ratio (%)	Classification Robertson & Campanella (24)	 Tumay (26)	 Douglas & Olsen (25)
0.00-0.46	29.8	0.8	2.6	Sandy Silt Clayey Silt	Clayey Sand Silt	Non-Cohesive Coarse Grained (SM-SP)
0.46-1.62	28.0	2.0	7.0	Clay	Inorganic Clay Very Stiff	Sensitive Clays (CL)
1.62-1.94	394.6	8.7	2.2	Sand-Clayey Sand	Silty Sand	Non-Cohesive Coarse Grained (SM-SP)
1.94-2.14	506.7	9.9	2.1	Sand-Clayey Sand	Silty Sand	Non-Cohesive Coarse Grained (SM-SP)

TABLE 5

CONE TESTING PARAMETERS AND SOIL CLASSIFICATION OF BORING G7
(GRANGEVILLE, LA., GROUND SURFACE ELEVATION: 43 M.)

	Penetration Parameters			Classification		
Depth Range (m)	Tip Resistance (kg/cm²)	Sleeve Friction (kg/cm²)	Friction Ratio (%)	Robertson & Campanella (24)	Tumay (26)	Douglas & Olsen (25)
0.00-2.60	26.1	1.1	4.0	Clayey Silt Silty Clay	Sandy Clay	Cohesive & Non-Cohesive Fine Grained (ML-CL)
2.60-3.18	88.7	1.0	1.2	Sand-Silty Sand	Sand	Non-Cohesive Coarse Grained (SM-SP)
3.18-3.34	31.1	1.0	3.1	Clayey Silt Silty Clay	Clayey Sand Silt	Non-Cohesive Coarse Grained & Fine Grained (SM-ML)
3.34-4.84	123.1	0.7	0.7	Sand	Shell Sand Lime Rock	Non-Cohesive Coarse Grained (SM-SP)
4.84-5.34	13.4	0.2	1.3	Sandy Silt Clayey Silt	Clayey Sands	Metastable Sands (SM-ML)
5.34-6.20	54.3	0.3	0.6	Silty Sand	Shell Sand Lime Rock	Non-Cohesive Coarse Grained (SM-SP)
6.20-8.06	188.6	0.9	0.6	Gravelly Sand Sand	Shell Sand Lime Rock	Non-Cohesive Coarse Grained (SM-SP)
8.06-9.68	35.5	0.8	2.4	Sandy Silt Clayey Silt	Clayey Sand Silt	Non-Cohesive Coarse Grained & Fine Grained (SM-ML)
9.68-15.34	78.0	0.9	1.1	Silty Sand	Sand	Non-Cohesive Coarse Grained (SM-SP)
15.34-23.08	146.9	1.6	1.1	Sand	Dense or Cemented Sand	Non-Cohesive Coarse Grained (SM-SP)
23.08-30.46	15.8	0.5	3.0	Clayey Silt Silty Clay	Clayey Sand Silt	Sensitive Mixed Soils (ML-CL)
30.46-33.20	49.3	2.1	4.3	Clayey Silt Silty Clay	Sandy Clay	Cohesive & Non-Cohesive Fine Grained (ML-CL)

TABLE 6

CONE TESTING PARAMETERS AND SOIL CLASSIFICATION OF BORING G6 (GRANGEVILLE, LA., GROUND SURFACE ELEVATION: 43 M.)

	Penetration Parameters			Classification		
Depth Range (m)	Tip Resistance (kg/cm^2)	Sleeve Friction (kg/cm^2)	Friction Ratio (%)	Robertson & Campanella (24)	Tumay (26)	Douglas & Olsen (25)
0.00-1.08	2.8	0.3	12.0	Organic Material	Organic Clay	Sensitive Clays (CL-CH)
1.08-1.62	69.1	2.4	3.5	Clayey Silt	Silty Sand	Non-Cohesive Coarse Grained & Fine Grained (SM-ML)
1.62-8.42	94.3	0.6	0.6	Sand Silty Sand	Shell Sand & Lime Rock	Non-Cohesive Coarse Grained (SM-SP)
8.42-8.90	6.4	0.3	5.3	Clay	Med Inorganic Clay	Cohesive Fine Grained (CL)
8.90-9.60	28.5	0.4	1.4	Sandy Clayey Silt	Sand	Metastable Sand (SM-ML)
9.60-11.18	21.2	0.7	3.2	Silty Clay	Clayey Sand Silt	Cohesive & Non-Cohesive Fine Grained (ML-CL)
11.18-12.00	7.4	0.2	3.3	Silty Clay	Clayey Sand Silt	Sensitive Clays (CL-CH)
12.00-13.50	88.6	0.9	1.1	Sand-Silty Sand	Sand	Non-Cohesive Coarse Grained (SM-SP)
13.50-16.20	85.7	1.1	1.3	Sand-Silty Sand	Sand	Non-Cohesive Coarse Grained (SM-SP)
16.20-20.54	87.5	1.0	1.2	Sand-Silty Sand	Sand	Non-Cohesive Coarse Grained (SM-SP)
20.54-27.92	41.2	1.6	3.8	Clayey Silt Silty Clay	Clayey Sand Silt	Cohesive & Non-Cohesive Fine Grained (ML-CL)

TABLE 7

CONE TESTING PARAMETERS AND SOIL CLASSIFICATION OF BORING M1 (WEST MONROE, LA., GROUND SURFACE ELEVATION: 26 M.)

Depth Range (m)	Tip Resistance (kg/cm²)	Sleeve Friction (kg/cm²)	Friction Ratio (%)	Robertson & Campanella (24)	Tumay (26)	Douglas & Olsen (25)
	Penetration Parameters			Classification		
0.00-0.22	0.6	0.1	9.2	Organic Material	Organic Clay	Sensitive Clays (CL)
0.22-0.54	71.0	1.3	1.9	Silty Sand	Sand	Non-Cohesive Coarse Grained (SM-SP)
0.54-2.90	41.1	1.7	4.3	Clayey Silt Silty Clay	Sandy Clay	Non-Cohesive & Cohesive Fine Grained (ML-CL)
2.90-10.54	137.7	0.7	0.6	Sand	Shell Sand Lime Rock	Non-Cohesive Coarse Grained (SM-SP)
10.54-10.70	31.8	1.4	4.3	Silty Clay Clay	Sandy Clay	Non-Cohesive & Cohesive Fine Grained (ML-CL)
10.70-10.94	36.1	0.6	1.7	Sandy Silt Clayey Silt	Sand	Non-Cohesive Coarse Grained (SM-SP)
10.94-12.96	38.3	1.1	2.8	Sandy Silt Clayey Silt	Clayey Sand Silt	Non-Cohesive Coarse Grained & Fine Grained (SM)
12.96-13.66	125.1	5.2	4.2	Very Stiff Fine Grained	Clayey Silt Sand	Non-Cohesive Coarse Grained & Fine Grained (SM-ML)
13.66-13.86	353.3	3.4	1.2	Gravelly Sand Sand	Cemented Sand	Non-Cohesive Coarse Grained (SP-SM)
13.86-14.56	55.7	1.7	3.1	Sandy Silt Clayey Silt	Clayey Sand Silt	Non-Cohesive Coarse Grained & Fine Grained (SM)

TABLE 8

CONE TESTING PARAMETERS AND SOIL CLASSIFICATION OF BORING M2
(WEST MONROE, LA., GROUND SURFACE ELEVATION: 28 M.)

	Penetration Parameters			Classification		
Depth Range (m)	Tip Resistance (kg/cm^2)	Sleeve Friction (kg/cm^2)	Friction Ratio (%)	Robertson & Campanella (24)	Tumay (26)	Douglas & Olsen (25)
0.00-1.14	25.7	0.6	2.4	Sandy Silt Clayey Silt	Clayey Sand Silt	Non-Cohesive Coarse Grained & Fine Grained (SM)
1.14-4.92	131.7	0.9	0.8	Sand	Dense Sand	Non-Cohesive Coarse Grained (SP)
4.92-5.08	6.7	0.4	5.6	Clay	Organic Clay	Peat (CL)
5.08-5.22	31.7	0.2	0.8	Silty Sand Sandy Silt	Sand	Metastable Sand
5.22-10.20	142.0	0.8	0.6	Gravelly Sand Sand	Dense Cemented Sand	Non-Cohesive Coarse Grained (SP)
10.20-12.52	38.8	1.4	3.6	Sandy Silt Clayey Silt	Sandy Clay	Cohesive & Non-Cohesive Fine Grained (ML-CL)
12.52-12.60	85.1	1.5	1.9	Sand-Silty Sand	Sand	Non-Cohesive Coarse Grained (SP)
12.60-21.82	64.0	1.9	3.0	Sandy/Clayey Silt	Clayey Silty Sand	Non-Cohesive Coarse Grained & Fine Grained (SM-ML)

TABLE 9

CONE TESTING PARAMETERS AND SOIL CLASSIFICATION OF BORING M3 (WEST MONROE, LA., GROUND SURFACE ELEVATION: 33 M.)

	Penetration Parameters			Classification		
Depth Range (m)	Tip Resistance (kg/cm^2)	Sleeve Friction (kg/cm^2)	Friction Ratio (%)	Robertson & Campanella (24)	Tumay (26)	Douglas & Olsen (25)
0.02-0.18	108.2	1.4	1.1	Sand Silty Sand	Dense or Cemented Sand	Non-Cohesive Coarse Grained (SM-SP)
0.18-5.68	74.1	2.9	3.9	Sandy Clayey Silt	Clayey Sand Silt	Non-Cohesive Fine Grained & Coarse Grained (SM-ML)
5.68-5.86	134.2	2.7	2.1	Sandy Silty Sand	Silty Sand	Non-Cohesive Coarse Grained (SM-SP)
5.86-6.02	76.9	3.5	4.6	Very Stiff Fine Grained	Sandy Clay	Cohesive & Non-Cohesive Fine Grained (ML-CL)
6.02-15.86	164.1	1.2	0.8	Sand	Dense or Cemented Sand	Non-Cohesive Coarse Grained (SP)
15.86-16.04	33.3	1.5	4.4	Silty Clay Clay	Sandy Clay	Cohesive & Non-Cohesive Fine Grained (ML-CL)
16.04-16.28	35.9	0.6	1.6	Sandy Silt Clayey Silt	Sand	Non-Cohesive Coarse Grained & Fine Grained (SM-ML)
16.28-19.54	43.7	1.7	3.8	Clayey Silt	Clayey Silt Sand	Non-Cohesive Coarse Grained & Fine Grained (SM-ML)
19.54-19.88	53.9	0.9	1.7	Sandy Silt Clayey Silt	Sand	Non-Cohesive Coarse Grained (SP-SM)
19.88-23.14	47.8	2.0	4.2	Silty Clay Clay	Sandy Clay	Non-Cohesive & Cohesive Fine Grained (ML-CL)

TABLE 10

CONE TESTING PARAMETERS AND SOIL CLASSIFICATION OF BORING M4 (WEST MONROE, LA., GROUND SURFACE ELEVATION: 31 M.)

	Penetration Parameters			Classification		
Depth Range (m)	Tip Resistance (kg/cm²)	Sleeve Friction (kg/cm²)	Friction Ratio (%)	Robertson & Campanella (24)	Tumay (26)	Douglas & Olsen (25)
0.00-0.32	82.0	1.0	1.2	Sand Silty Sand	Sand	Non-Cohesive Coarse Grained (SM-SP)
0.32-1.26	17.4	1.2	6.6	Clay	Clay Organic	Cohesive Fine Grained (CL)
1.26-1.66	41.5	0.9	2.1	Silty Sand Sandy Silty	Sand	Non-Cohesive Coarse Grained (SM-SP)
1.66-2.34	14.6	0.8	5.5	Clay	Stiff Clay	Cohesive Fine Grained (CL)
2.34-4.60	136.6	1.4	1.1	Sand	Dense or Cemented Sand	Non-Cohesive Coarse Grained (SM-SP)
4.60-7.56	15.6	0.3	1.7	Silty Clay Clayey Silt	Sand	Metastable Sand (SM-ML)
7.56-9.18	23.3	0.2	0.8	Silty Sand Sand	Sand	Non-Cohesive Coarse Grained (SM-SP)
9.18-11.76	82.1	0.6	0.8	Silty Sand Clayey Silt	Sand	Non-Cohesive Coarse Grained (SM-SP)
11.76-14.90	135.1	0.9	0.7	Sand	Dense or Cemented Sand	Non-Cohesive Coarse Grained (SM-SP)
14.90-20.06	46.4	1.3	2.8	Silty Sand Clayey Silt	Sand Clay & Silty	Non-Cohesive Coarse Grained & Fine Grained (SM-ML)
20.06-20.22	166.0	2.8	1.7	Sand Silty Sand	Cemented Sand	Non-Cohesive Coarse Grained (SM-SP)
20.22-26.26	73.2	1.1	1.5	Silty Sand Sandy Silt	Sand	Non-Cohesive Coarse Grained (SM-SP)

TABLE 11

CONE TESTING PARAMETERS AND SOIL CLASSIFICATION OF BORING M6A
(WEST MONROE, LA., GROUND SURFACE ELEVATION: 44 M.)

Depth Range (m)	Penetration Parameters: Tip Resistance (kg/cm^2)	Sleeve Friction (kg/cm^2)	Friction Ratio (%)	Classification: Robertson & Campanella (24)	Tumay (26)	Douglas & Olsen (25)
0.00-0.22	56.9	0.6	0.9	Silty Sand Sandy Silt	Sand	Non-Cohesive Coarse Grained (SM-SP)
0.22-0.68	17.4	1.1	6.4	Clay	Organic Clay	Cohesive Fine Grained (CL)
0.68-1.10	56.9	1.0	1.8	Clayey Silt Sandy Silt	Sand	Non-Cohesive Coarse Grained (SM-SP)
1.10-4.12	49.9	3.3	6.7	Clay	Very Stiff Inorganic Clay	Cohesive Fine Grained (CL)
> 4.12	312.0	6.6	2.2	Silty Sand	Sand	Non-Cohesive Coarse Grained (SM-SP)

TABLE 12

CONE TESTING PARAMETERS AND SOIL CLASSIFICATION OF BORING M7 (WEST MONROE, LA., GROUND SURFACE ELEVATION: 46 M.)

Depth Range (m)	Penetration Parameters Tip Resistance (kg/cm^2)	 Sleeve Friction (kg/cm^2)	 Friction Ratio (%)	Classification Robertson & Campanella (24)	 Tumay (26)	 Douglas & Olsen (25)
0.06-0.24	75.9	1.1	1.4	Silty Sand Sandy Silt	Sand	Non-Cohesive Coarse Grained (SM-SP)
0.24-3.08	26.8	1.1	4.0	Silty Clay	Sandy Clay	Cohesive & Non-Cohesive Fine Grained (ML-CL)
3.08-9.68	29.1	1.7	5.7	Clay	Very Stiff Inorganic Clay	Cohesive Fine Grained (CL)
9.68-12.00	28.0	0.8	2.9	Clayey Silt	Clayey Sand Silt	Non-Cohesive Fine Grained & Coarse Grained (SM-ML)
12.00-12.54	102.5	1.8	1.7	Sand Silty Sand	Dense or Cemented Sand	Non-Cohesive Coarse Grained (SM-SP)
12.54-13.06	102.2	1.3	1.3	Sand Silty Sand	Dense or Cemented Sand	Non-Cohesive Coarse Grained (SM-SP)
13.06-17.60	94.3	1.1	1.2	Silty Sand	Sand	Non-Cohesive Coarse Grained (SM-SP)
17.60-18.26	31.8	1.3	4.0	Clayey Silt	Sandy Clay	Non-Cohesive & Cohesive Fine Grained (ML-CL)
18.26-18.60	391.4	4.1	1.0	Gravelly Sand Sand	Dense or Cemented Sand	Non-Cohesive Coarse Grained (SM-SP)
18.68-18.74	130.7	7.1	5.4	Very Stiff Fine Grained	Sandy Clay	Cohesive & Non-Cohesive Fine Grained (ML-CL)

TABLE 13

SUGGESTED AGGREGATE DEPOSITS AT EACH BORING (GRANGEVILLE, LA.)

Boring	Elevation (m)	Possible Aggregate Deposit Locations
G3	52	at a depth of 4.2 meters
G4	46	around 3.8 to 6 meters
G6	125	between 6 and 8 meters
G7	130	between 7 and 8 meters
G5	140	around 1.62 meters

TABLE 14

SUGGESTED AGGREGATE DEPOSITS AT EACH BORING (WEST MONROE, LA.)

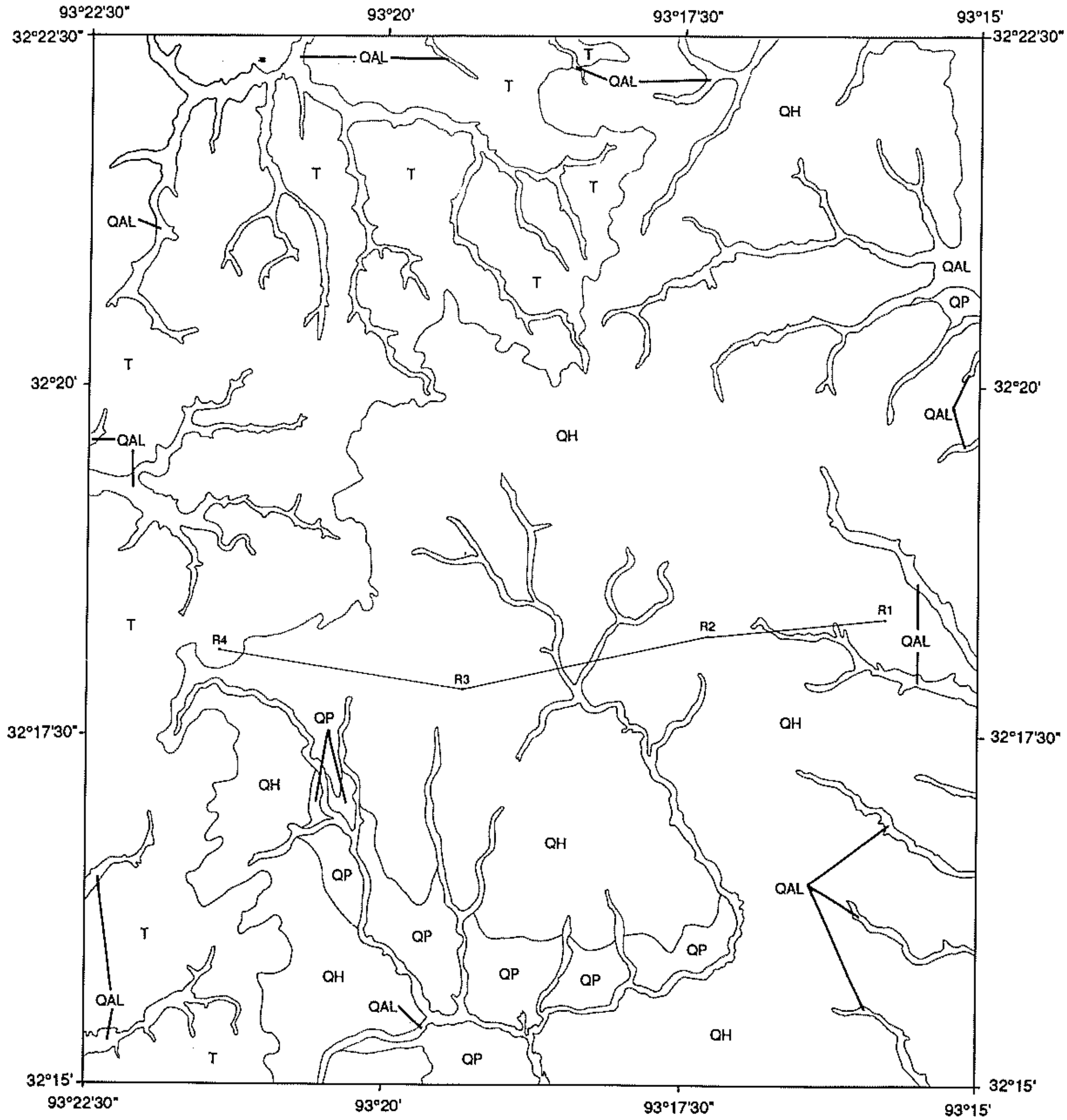
Boring	Elevation (m)	Possible Aggregate Deposit Locations
M1	26	around 13.66-13.86 meters
M2	28	between 5.22-10.20 meters
M3	33	between 6-15 meters
M4	31	between 2.3-4.6 meters
M6A	44	beyond 4 meters
M7	46	between 18.26-18.60 meters

Soil Geomorphic Mapping

Areas included for additional field investigations are located in the Ringgold Trend in the Northwest, the Monroe Trend in the Northeast, the Le Blanc Trend in the Southwest and the Grangeville Trend in the Southeast. A 1:24,000 scale geologic map was made for each of these areas to provide examples of the various aggregate-bearing settings in Louisiana. Differences in the geologic characteristics were related to variations in aggregate potential for each of the areas. Overburden is considered silty or loamy material that covers the aggregate deposit. The relation of overburden to aggregate deposits provides a guide to the distribution of the mineable aggregate.

The Ringgold Trend (Figure 28) in Northwest Louisiana is situated in Bienville Parish on the southern end of an active production trend extending along the drainage divide between Bayou Dorcheat and Black Lake Bayou from Ringgold north to the Minden area. The aggregate production in this area is largely associated with the geologic occurrence of the High Terraces (8), and (22). Published soil survey data is not currently available, and a request for unpublished Bienville Parish soils maps in progress provided coverage of areas near the Ringgold area. Field soil borings indicate that the area transected is covered by overburden thicknesses of three meters or greater (Figure 29). Aggregate was not encountered at the base of any of the borings. Inspection of mined areas near the transect location indicated that most abandoned digs were sand-rich at depths greater than three meters below the land surface, but gravel was isolated in thin, discontinuous stringers. Based on this information the area was not given additional consideration for its aggregate potential.

The Monroe Trend (Figure 30) is bounded by the Ouachita River valley on the east and the Tertiary Uplands on the west. Previous geologic mapping in the area consists of the Eocene Cockfield Formation in the adjacent uplands, the late Pleistocene Prairie and Deweyville terraces, and Alluvium, undifferentiated (8), (27). Geologic features generally agreed with the previous mapping of Fleetwood (27). One significant modification is the reassignment of the Deweyville Terraces (8) to the Prairie Terraces. This was done to be consistent with revisions of the geology of the Ouachita and Red River valleys by the Louisiana Geological



QAL - Alluvium, undifferentiated

QP - Prairie Terraces

QH - High Terraces

T - Tertiary, undifferentiated

R2 R1 LINE OF CROSS SECTION

N

1km

Base: Ringgold, 1:24,000 Quadrangle, U.S.G.S., 1972

Figure 28. GEOLOGIC MAP OF THE RINGGOLD TREND.

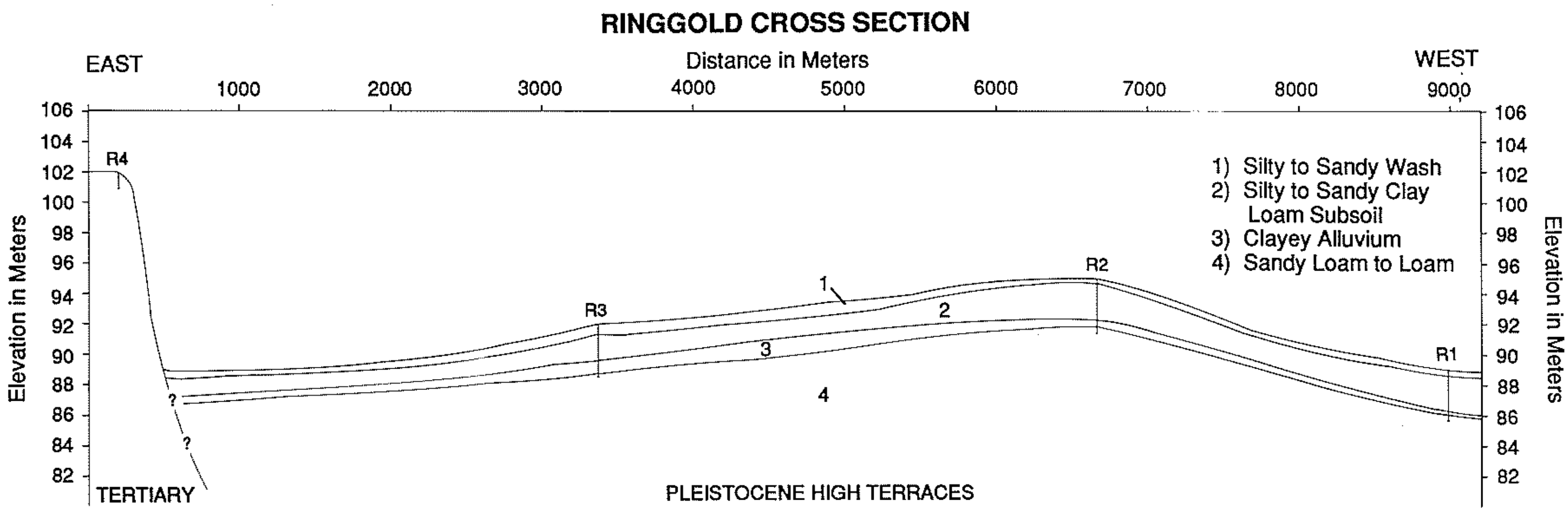


Figure 29. CROSS SECTION OF RINGGOLD TREND.

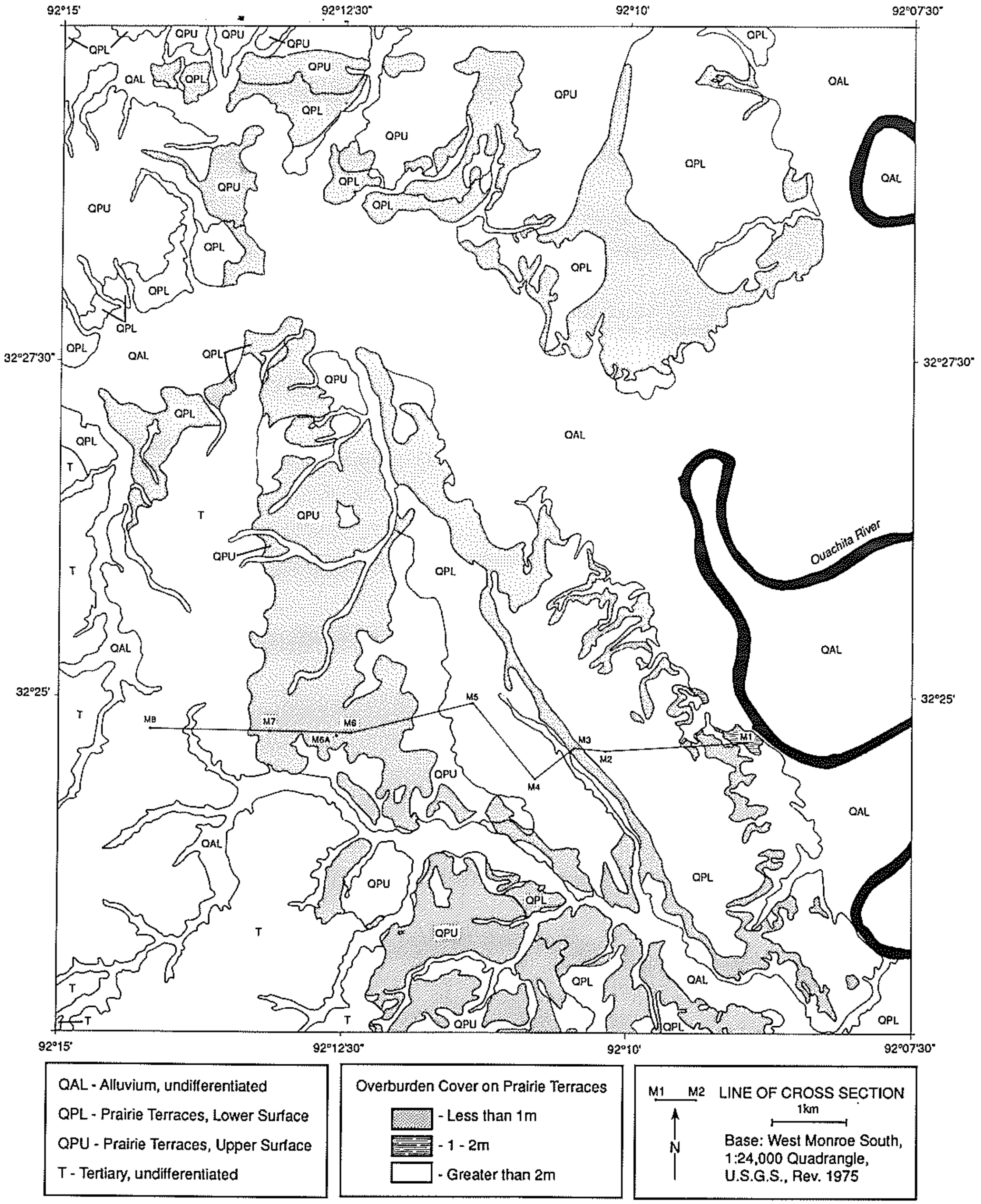


Figure 30. GEOLOGIC MAP OF THE MONROE TREND.

Survey. Refinement of geologic unit boundaries was achieved using 7.5-minute topographic contours, soil survey maps, aerial photographs and field data acquired by this investigation.

The geologic map of the trend (Figure 30) shows four map units: Tertiary, undifferentiated; Prairie Terraces, upper surface (Upper Prairie); Prairie Terraces, lower surface (Lower Prairie); and Holocene, alluvium. The Tertiary crops out at elevations generally greater than 50 meters and has a distinctly greater degree of dissection than younger units. The Upper Prairie is adjacent to the Tertiary, and the Lower Prairie is situated between the Upper Prairie and Holocene alluvium. Elevation differences between Pleistocene and Holocene units are quite minor, and soils data and aerial photograph tonal patterns were used to establish the boundaries between units. The Lower Prairie was commonly associated with constructional geomorphic features, namely beach ridges and relict meander scars (23).

The soils of the Upper and Lower Prairie fell into two textural classes: silt and clay cover less than 2 meters over a loamy sediment, and thick silt and clay sequences with loamy sediments greater than 2 meters deep. The distribution of soils with less than 2 meters overburden reflects the ancestral river patterns associated with each of these units (Figure 30). The Lower Prairie is inferred to be a lacustrine plain associated with drowning of the lower Ouachita River valley. This relict lake is associated with a thicker silt and clay cover except along the berm of the relict lake shoreline, the topographic ridge associated with M3. The Upper Prairie has less area with thick overburden since this unit is associated with a relict river system of higher competence than the present Ouachita River. The silty cover on this unit is a thin reworked loess deposit. Because of the promising preliminary data from this area, a cone penetrometer transect was also conducted to gain additional geologic and geotechnical data. The transect across the Monroe Trend (Figure 31) illustrates the stratigraphic character of the aggregate bearing sedimentary environments. Beneath the Lower Prairie surface is a thin silty unit associated with surface wash of loess from higher landscapes. Beneath this unit is a buried soil developed in the sandy clay deposits of the relict Lake Monroe. The lake deposit grades into fluvial sediments with an upper unit of interbedded sands and clay and a lower unit of sand and gravel. Tertiary sediments comprise the base of the sequence. Beneath the Upper Prairie surface is a thin silty unit associated with local reworking of loess that was deposited on this surface. Beneath this unit

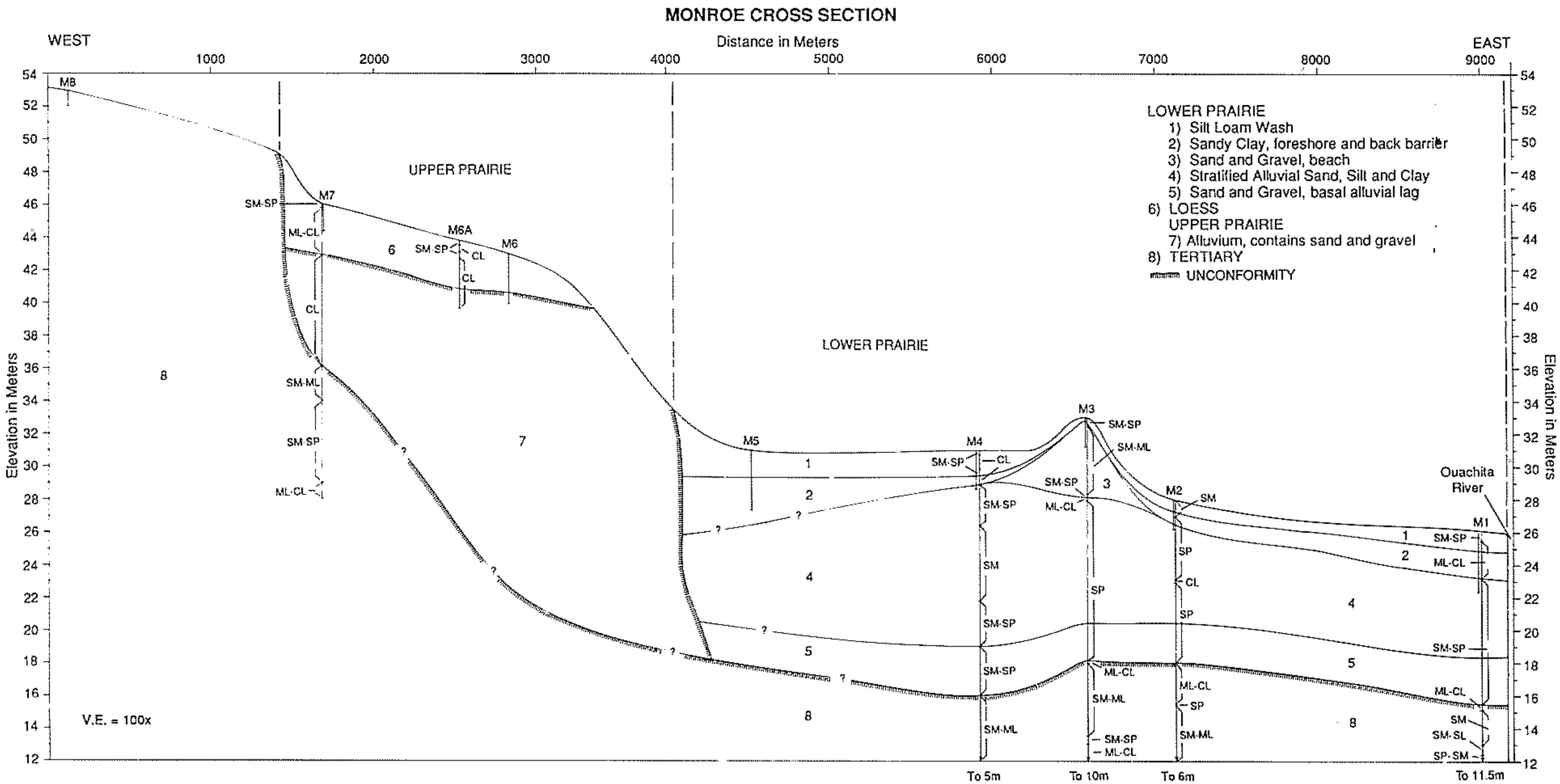


Figure 31. CROSS SECTION OF THE MONROE TREND.

is a buried soil developed in the upper part of the sandy to loamy fluvial sediments. This unit grades down into sand and gravel deposits with significant economic aggregate potential.

The Le Blanc Trend (Figure 32) in Southwest Louisiana is situated in Allen Parish near the junction of the Calcasieu and Whisky Chitto rivers north and south of US Highway 190. Geologic units in the area (8) consist of the Prairie terraces, the Deweyville terraces and Holocene alluvium. Soils with less than 2 meters of overburden were identified on both the Prairie and Deweyville terraces (Figure 32). The distribution of these soils was associated with distinct meander scars identified on aerial photographs that represent relict point bar and channel deposits of abandoned meandering stream systems. A transect of soil borings across the area (Figure 33) verified the distribution of overburden in the area, but only sand was encountered at the base of borings. Quarry operations at a nearby silica sand pit and other local abandoned pits revealed well sorted medium sand beneath the silty overburden. Since aggregate was not identified by the field investigation, this area was not given additional consideration for its economic potential.

The Grangeville Trend (Figure 34) is in St. Helena and East Feliciana parishes along the Amite River. Local gravel roads form the eastern and western boundaries near the local topographic drainage divides. Geologic units mapped in this area (8) consists of High terraces, Prairie terraces, and Alluvium, undifferentiated. Mapping at 1:24,000 scale (Figure 34) revealed the following differences from the Geologic Map. (1) The Intermediate terraces extend up the flanks of the valley and can be identified by their positions distinctly lower than the High terraces, but generally 3 to 5 meters higher than the Prairie terraces. This unit occupies much of the area mapped as Prairie terraces and part of the areas mapped as High terraces on the Geologic Map. (2) The Prairie terraces are fairly continuous through the area and occupy parts of the area previously mapped as Prairie terraces and parts of the area mapped as Alluvium, undifferentiated. Most active mining in this part of the valley is from this unit. (3) Areas of Holocene alluvium are less extensive than depicted on the Geologic Map, but the unit can be identified as a continuous strip flanking the modern channel

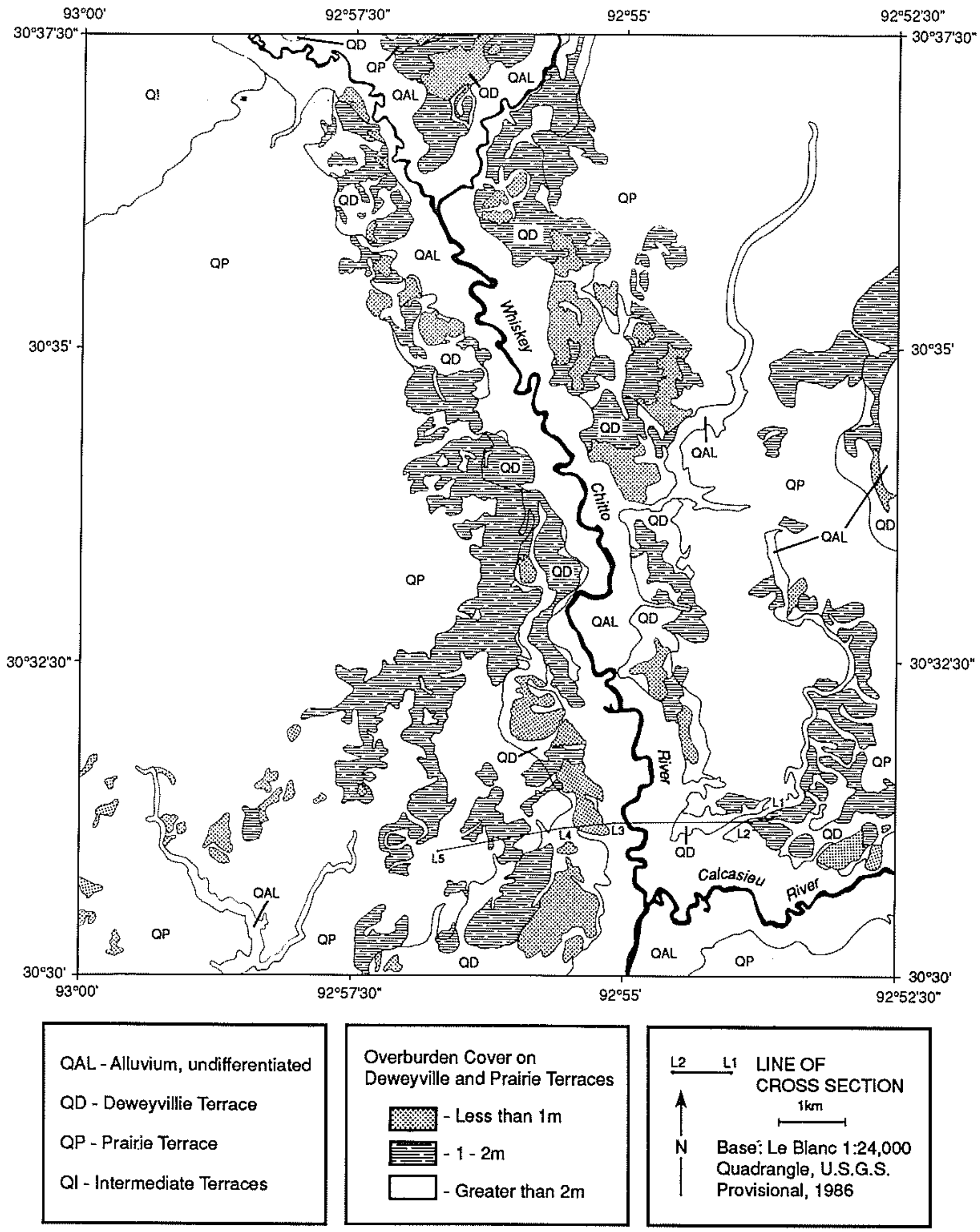


Figure 32. GEOLOGIC MAP OF THE LE BLANC TREND.

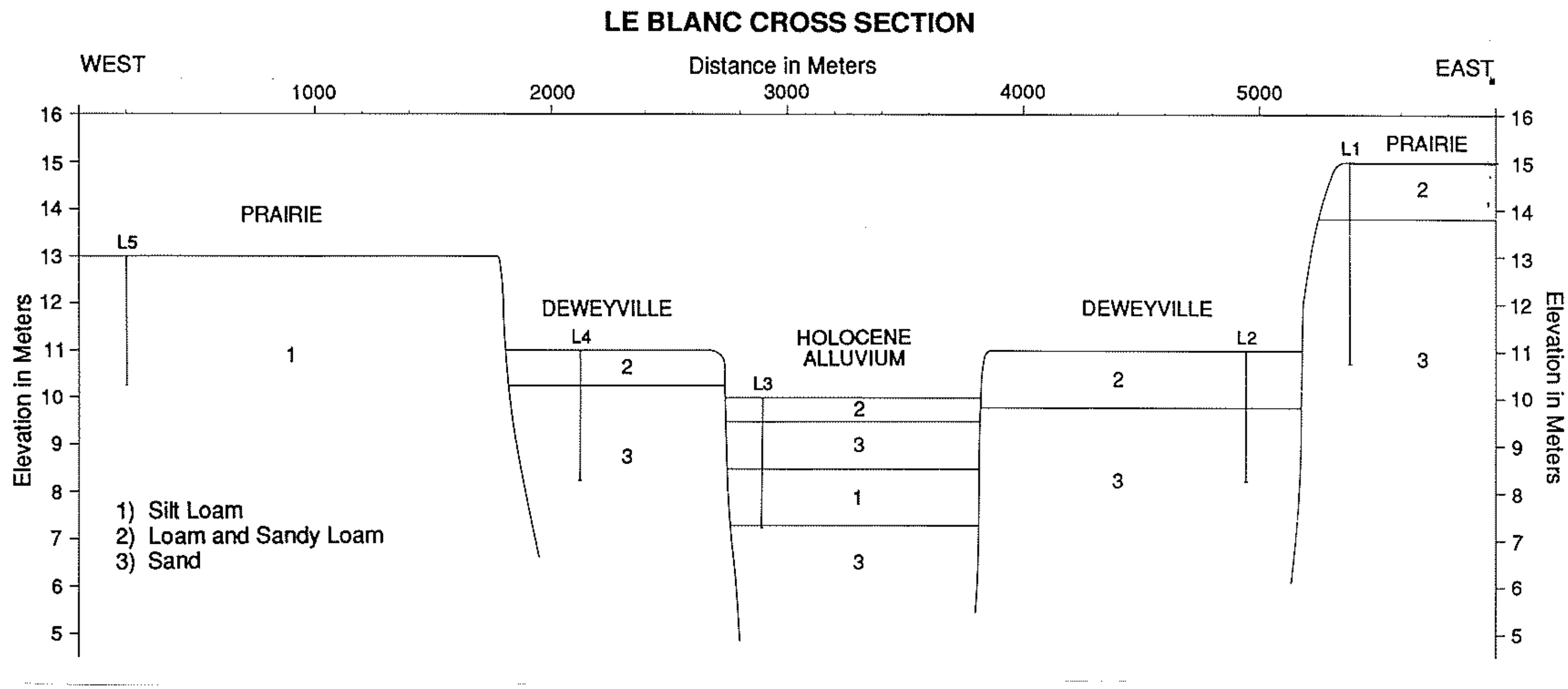


Figure 33. CROSS SECTION OF THE LE BLANC TREND.

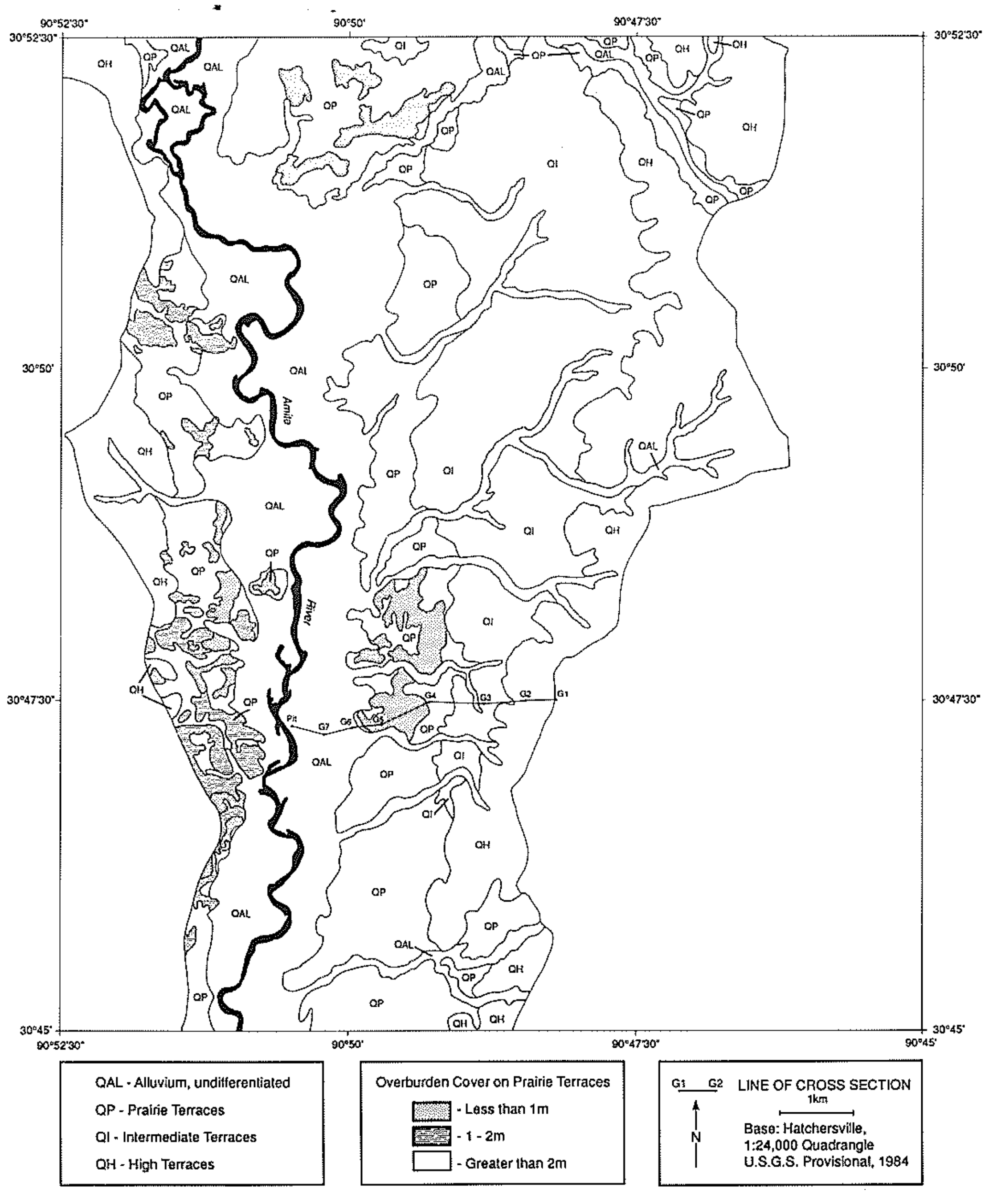


Figure 34. GEOLOGIC MAP OF GRANGEVILLE TREND.

of the Amite River. Some active mining occurs from this unit, but it is generally in large mines whose area encompasses both Prairie terraces and Alluvium.

Unpublished soil survey data (Denham Springs Soil Survey Office, file data) was used to map thickness of fine-grained overburden for the Prairie terraces (Figure 34). These soils have a variable thickness of silty overburden overlying coarser sediment. The Prairie terraces consist of a discontinuous trend of soils with less than 2 meters of silty overburden over sandy sediments. The remaining areas are 2 meters or greater silty overburden. The pattern produced by these soils reflect remnant alluvial ridges delineated by the coarser-textured soils. The Intermediate Terraces are typified by soils which have a silty mantle of less than 5 feet thickness. Beneath this soil are loamy colluvial deposits which overlie an eroded clayey sand soil associated with the High Terraces. The High terraces have soils developed in locally reworked loess opposed soils developed in the coarse-textured Citronelle Formation. The distribution of soils and geomorphic features in the Grangeville Trend is most promising for evaluation of economic aggregate potential. A cone penetrometer transect was conducted to gain additional geologic and geotechnical data.

Cone penetrometer data indicates that aggregate occurs beneath the High Terraces, Prairie Terraces, and Holocene alluvium (Figure 35). Aggregate beneath the High Terraces occurs beneath 2 meters of silty reworked loess overburden, which is underlain by 6 meters of sandy clay that represents the weathered interval at the top of the Citronelle Formation. Beneath the weathered interval (red sand of (28)) is an interbedded sand and gravel unit with economic grade aggregate. Beneath the High Terraces, this unit is above the water table and can be mined by dry mining methods only. The Prairie terraces have a coarse aggregate layer which is at least 2-3 meters thick beneath its silty overburden at G4. The aggregate unit could not be penetrated at G5 by either the hydraulic soil core or cone penetrometer. However, its top was encountered at less than 2 meters depth. The Holocene alluvium contains a coarse aggregate unit beneath a variable thickness of silty overburden. The aggregate unit is continuous beneath G6 and G7 and is exposed in a pit near the stream channel. Observations indicate that this unit is at least 4 meters thick along the transect. The Holocene alluvium is underlain by aggregate units associated with the Prairie Terraces and the Citronelle Formation. The complete aggregate-bearing interval beneath the alluvium is up to 20 meters thick

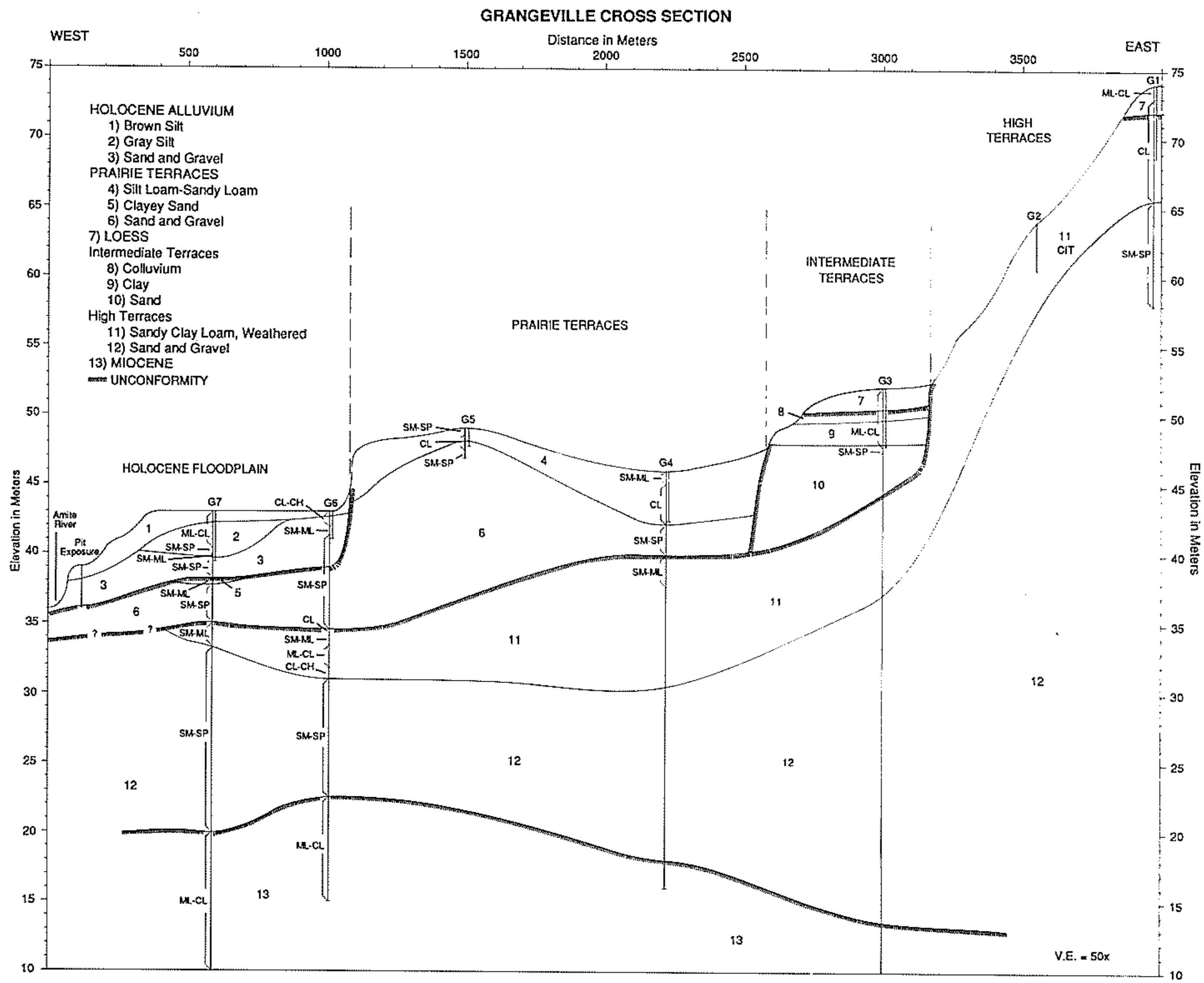


Figure 35. CROSS SECTION OF THE GRANGEVILLE TREND.

when the three units are considered. The top of the Miocene strata represents the base of the aggregate bearing interval in the trend.

CONCLUSIONS AND RECOMMENDATIONS

Based on the combined data collected from the four high potential aggregate trends, each area can be evaluated for its economic aggregate potential (Table 15). When the data collected is compared for each of the geologic settings, the aggregate potential can be described with respect to the geologic factors that control aggregate occurrence.

The Ringgold Trend has proven economic gravel reserves. The historic production is located along the northern part of the trend, and the distribution of mines diminishes towards the part of the trend investigated by this study. It is likely that the quantity of economic grade aggregate may diminish towards the southern end of the trend. Geomorphic techniques are difficult to apply in the terrain of the High Terraces. This results from landscape dissection which modifies the surficial form of the aggregate body that was constructed by fluvial deposition. The lack of available soils data also inhibited estimation of overburden thickness since maps could not be produced with just reconnaissance data. Besides the limited potential of the geologic setting, economic aggregate production is limited by the low water table in the area. Hydraulic mining can be used only under limited situations, possibly after removal of substantial quantities of overburden. In northwest Louisiana, two conclusions can be reached. (1) The Ringgold Trend is not the prime aggregate trend in the region and one of the other trends may provide a more favorable setting. (2) Northwest Louisiana has an aggregate potential that is significantly less than the other regions.

The Monroe Trend has proven economic potential. An active aggregate mining industry exists within the trend investigated. The geologic and geomorphic data on this trend suggests that the Upper and Lower Prairie terraces produced a setting with abundant economic aggregate resources. The class sizes and bedding characteristics of sediments exposed in existing aggregate mines of the Upper Prairie suggest that the streams that formed this unit were more competent than the present Ouachita River. Cone penetrometer data from the Lower Prairie indicates that the fluvial deposits beneath the lake plain are of similar competence. The lake deposition on the Lower Prairie produces a thicker overburden than the Upper Prairie. The

TABLE 15

SUMMARY RESULTS FOR THE FOUR TRENDS

Gravel Trend	Location of Previous Aggregate Production	Landform Types	Features relating to Potential for Aggregate	Subsurface Material via Soil Boring	Aggregate Potential Rank
Ringgold	High Terraces	Dissected Terraces and floodplain	None	Sand below 3 meters; no aggregate encountered	4
Monroe	Upper & Lower Prairie Terraces	Upper & Lower Terraces & Floodplain	Relic point bars, meander scars, oxbow lake, & beach ridge	Sand below 2 meters	2
Le Blanc	Deweyville and Prairie Terraces	Upper & Lower Terraces & Floodplain	Relic meander scars, point bars, abandoned channel scars, & cutoffs	Sand below 2 meters; no aggregate encountered	3
Grangeville	Prairie Terrace & Alluvium	Terraces & Floodplain	Relic meander scars, point bars, & oxbow lakes	Aggregate below 2 meters	1

overburden and planation by the lake masks the floodplain topography that existed soon after fluvial deposition. These reasons explain why more aggregate production occurs on the Upper Prairie. The Lower Prairie is apparently not fully exploited for its aggregate production. Although the flat lake plain inhibits geomorphic evaluation of the underlying fluvial deposits, additional detailed geotechnical investigation could accurately define the specific potential of the aggregate resource for this trend.

The Le Blanc Trend is an area with little previous aggregate production. In the trend is an active silica sand plant and scattered topsoil borrow pits. To the south is the Indian Village Trend, which has the geographically largest single production facility in Southwest Louisiana. The Prairie and Deweyville terraces along the Whisky Chitto and Calcasieu rivers in the Le Blanc Trend have well-preserved meander scars and abandoned fluvial channels. Overburden maps indicate most areas in these ancestral meander belts are sandy within 2 meters beneath the land surface. However, no aggregate was identified during the geologic field investigation. The aggregate is possibly deeper than the depth of the borings, but no significant quantity of aggregate was observed in the sand pit adjacent to the transect. The upper part of the Whisky Chitto River may have a less gravelly headwater area than other rivers of Southwest Louisiana. Other aggregate trends of Southwest Louisiana appear to have greater potential than the Le Blanc Trend.

The Grangeville Trend is probably the most economically significant aggregate trend in Louisiana. Production in this area and to the immediate south has been prolific for the past 50 years. The geologic setting and its geographic location are the primary reasons. The upland areas adjacent to the mined landforms are gravelly fluvial deposits that are reworked into the Prairie Terraces and Holocene alluvium. This process locally concentrates aggregate into deposits below the water table.

The Prairie Terraces and Holocene alluvium are the most aggregate rich landforms in the Grangeville Trend. Both units have remnants of alluvial floodplain topography associated with their ancestral meandering channels. The overburden maps produced for the Prairie terraces illustrate areas with less than 2 meters of overburden, associated with relict point bars and areas with thicker overburden, associated with relict channels and floodplain areas behind point bars. Geotechnical data supplemented this inference and demonstrated that the aggregate body is thick and relatively continuous through the trend. This distribution suggests patterns of aggregate production parallel to the fluvial system in conformity with the models developed for the Holocene alluvium (6), (29), (30). Specific application of these models developed in the middle Amite River were not tested in detail for Holocene alluvium in the Grangeville Trend, but general geomorphic and stratigraphic patterns are similar to those identified in the Denham Springs/Watson area. In summary, the Grangeville Trend is an example of a highly productive aggregate trend in a Gulf Coastal Plain floodplain and low terrace setting. The aggregate pattern is controlled by the stratigraphy and sedimentary processes in both the modern and ancestral fluvial systems of the trend.

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APPENDIX A

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APPENDIX B

Potential Gravel Trends for Additional Exploration

NORTHWEST LOUISIANA GRAVEL TRENDS

Name	Location	Drainage	Geologic Units	Reasons for Selection	References
Caddo Lake (1)	Mooringsport; Caddo Parish	Red River	Alluvium Deweyville Prairie	Possibly suitable Meander scars	Russ, 1975 Smith and Russ, 1974
Campti (2)	Campti-Messick; Natchitoches and Red River Parishes	Black Lake Bayou Red River	Alluvium Prairie Intermediate	High suitability Meander Scars	Anderson, in press Murray, 1948 Newcome and Page, 1963 Newcome, Page, and Sloss, 1963
Colfax (3)	Colfax; Grant Parish	Iatt Creek Red River	Alluvium High	Active production Suitable for dry mining	Fisk, 1938 Maher, 1941 Russ, 1975
Haughton (4)	Haughton-Oakland; Bossier Parish	Clarke Bayou Foxskin Bayou	Alluvium Prairie Intermediate High	Historic production Suitable for dry mining Possibly suitable	Jones, 1961 Russ, 1975
Ringgold (5)	Ringgold; Bienville Parish	Bayou Dorcheat Black Lake Bayou	Alluvium Prairie Intermediate High	Active production Suitable for dry mining	Echols, 1970 Kolb, Holmes, and Alford, 1983 Robertson, 1981
Rocky Mount (6)	Rocky Mount; Bossier Parish	Bayou Bodcau Coney Creek	Alluvium Intermediate	Active production High suitability	Jones, 1961 Russ, 1975
Springhill (7)	Springhill-Midway; Bossier and Webster Parishes	Bayou Dorcheat	Alluvium Intermediate High	Active production Suitable for dry mining	Echols, 1970 Martin, Hough, Raggio, and Sandberg, 1954 Robertson, 1981

NORTHEAST LOUISIANA GRAVEL TRENDS

Name	Location	Drainage	Geologic Units	Reasons for Selection	References
Bastrop (8)	Bastrop-Sterling-ton; Union, Morehouse, and Ouachita Parishes	B. Bartholomew Ouachita River	Alluvium Deweyville Prairie Intermediate	Active production High suitability	Krinitzsky, 1949 McGowan, 1967
Fishville (9)	Fishville; Grant Parish	Little River	Alluvium Prairie High	Active production High suitability	Fisk, 1938 Maher, 1941
Harrison-burg (10)	Harrisonburg - Manifest; Catahoula Parish	Ouachita River	High	Active production Suitable for dry mining	Chawner, 1936 Saucier, 1967
Jonesville (11)	Jonesville; Concordia Parish	Black River Tensas River	Alluvium Natural levees	Possibly suitable Meander scars	Chawner, 1936 Saucier, 1967, 1974, 1986
Monroe (12)	West Monroe; Ouachita Parish	Ouachita River	Alluvium Deweyville Prairie	Active production High suitability	Bender, 1971 Holaway, 1967 McGowan, 1967 Rogers, Calandro, and Gaydos, 1972 Wang, 1952
Rayville (13)	Rayville-Girard; Richland Parish	Boeuf River	Alluvium Braided Stream	Possibly suitable Braided-stream morphology	Krinitzsky, 1949 Saucier, 1967, 1968 Smith and Saucier, 1971
Transyl-vania (14)	Lake Providence - Transylvania; East Carroll Parish	Mississippi River	Alluvium Natural levees	Possibly suitable Meander scars	Krinitzsky, 1949 Poole, 1961 Saucier, 1974

SOUTHWEST LOUISIANA GRAVEL TRENDS

Name	Location	Drainage	Geologic Units	Reasons for Selection	References
Forest Hill (15)	Forest Hill; Rapides Parish	Bayou Boeuf - Spring Creek divide	Intermediate High	Active production Suitable for dry mining	Jones, Turcan, and Skibitzke, 1954 Maher, 1940 Whitfield, 1975
Fullerton (16)	Fullerton; Vernon Parish	West Fork Sixmile Creek	High	Active production Suitable for dry mining	Jones, Turcan, and Skibitzke, 1954 Whitfield, 1975
Longville (17)	Longville; Beauregard Parish	Barnes Creek - Bundick Creek divide	Intermediate	Active production Suitable for dry mining	Holland, Hough, and Murray 1952; Jones, Turcan, and Skibitzke, 1954; Whitfield, 1975
Merryville (18)	Merryville-Starks; Beauregard Parish	Sabine River	Alluvium Deweyville Prairie Intermediate	Active production High suitability Meander scars	Alford and Holmes, 1985; Aronow, 1968, 1970, 1978; Bernard, 1950; Holland, Hough, and Murray, 1952; Jones, Turcan, and Skibitzke, 1954
Point Blue (19)	Ville Platte Evangeline Parish	Bayou des Cannes	Prairie	High suitability Meander scars	Jones, Turcan, and Skibitzke, 1954 Varvaro, 1957 Whitfield, 1975
Le Blanc (20)	Oberlin-Indian Village; Allen and Jefferson Davis Parishes	Calcasieu River	Alluvium Deweyville Prairie Intermediate	Active production High suitability	Holland, Hough, and Murray, 1952; Jones, Turcan, and Skibitzke, 1954; Whitfield, 1975
Rosepine (21)	DeRidder Vernon Parish	Bayou Anacoco	Alluvium Prairie Int., High	Active production High suitability Suitable for dry mining	Jones, Turcan, and Skibitzke, 1954 Whitfield, 1975

SOUTHEAST LOUISIANA GRAVEL TRENDS

Name	Location	Drainage	Geologic Units	Reasons for Selection	References
Amite (22)	Amite-Kentwood; Tangipahoa Parish	Tangipahoa River	Alluvium Prairie High	Active production High suitability	Campbell, 1971 Mossa and Autin, 1989 Nyman and Fayard, 1978; Self, 1979, 1982, 1983, 1984, 1986
Angie (23)	Angie-Varnado; Washington Parish	Pearl River	Alluvium Prairie High	High suitability Ridge and swale topography	Case, 1979 Cullinan, 1969 Self, 1979, 1982, 1983, 1984, 1986 Smith and Meylan, 1983
Bogue Chitto (24)	Franklinton; Washington and St. Tammany Parishes	Bogue Chitto River	Alluvium Prairie High	High suitability Active production	Case, 1979 Cullinan, 1969 Self, 1979, 1982, 1983, 1984, 1986 Smith and Meylan, 1983
Grangeville (25)	Grangeville - Darlington; East Feliciana and St. Helena Parishes	Amite River	Alluvium Prairie High	High suitability Active production	Autin, 1985, 1989 Campbell, 1971 Mossa and Autin, 1989 Parsons, 1967 Self, 1979, 1982, 1983, 1984, 1986

SOUTHEAST LOUISIANA GRAVEL TRENDS -- CONTINUED

Name	Location	Drainage	Geologic Units	Reasons for Selection	References
Hammond (26)	Hammond; Tangipahoa Parish	Tangipahoa and Natalbany Rivers	Alluvium Prairie	High suitability Active production Sand hills	Campbell, 1971 Mossa and Autin, 1989 Nyman and Fayard, 1978; Otvos, 1978 Self, 1979, 1982, 1983, 1984, 1986
Pearl River (27)	Slidell - Talisheek; St. Tammany Parish	Pearl River	Alluvium Deweyville Prairie	High suitability Active production Meander scars	Cullinan, 1969 Gagliano and Thom, 1967; Nyman and Fayard, 1978 Self, 1979, 1982, 1983, 1984, 1986
Thompsons Creek (28)	Jackson; West Feliciana and East Feliciana Parishes	Thompsons Creek	Alluvium Prairie High	High suitability Active production	Alford, Kolb, and Holmes, 1983 Delcourt, 1974 Fisk, 1938 Mossa and Autin, 1989 Self, 1979, 1982, 1983, 1984, 1986

APPENDIX C

B&W and Color Infrared Aerial Photographs Employed in this Study

ASCS Black and White Photographs at scale of 1:20,000

SITE	DATE	PHOTO CODE
Ringgold, Bienville Parish	10/25/1966	CEW-3HH-(63-67) CEW-3HH-(83-86) CEW-3HH-(142-145) CEW-3HH-(160-163)
Monroe, Ouachita Parish	11/18/1967	CQK-2JJ-(90-91) CQK-2JJ-(133-138) CQK-3JJ-(32-37) CQK-3JJ-(71-76)
Grangeville, St. Helena Parish	11/16/1967	CPX-4JJ-(25-31) CPX-4JJ-(52-58)
Le Blanc, Allen Parish	11/19/1968	CJV-3KK-(73-74) CJV-3KK-(127-128) CJV-3KK-(141-142) CJV-3KK-(189-190) CJV-3KK-(203-204) CJV-3KK-(257-258) CJV-3KK-(272-274) CJV-2KK-(204-205)

USGS Color Infrared Photographs at scale of 1:65,000

SITE	DATE	PROJECT	PHOTO ROLL/FRAME #
Ringgold, Bienville Parish	3/6/1983	NHAP 82	311-(8-10)
Monroe, Ouachita Parish	2/17/1983	NHAP 82	297-(144-147)
Grangeville, St. Helena Parish	December 1985	585	3551-(2423-2425) 3551-(2453-2455)
Le Blanc, Allen Parish	November 1988	588	3809-(5527-5529)
	December 1985	585	3551-(2217-2218)

NASA Color Infrared Photographs at Scale of 1:135,000

SITE	DATE	Flight #	PHOTO CODE/FRAME
Ringgold, Bienville Parish	11/12&16/1979	79-164	1183-1185 1336-1338
Colfax, Grant Parish	11/12/1979	79-164	1107-1109
Rocky Mount, Bossier Parish	11/12/1979	79-164	1354-1356 1363-1364
Monroe, Ouachita Parish	11/12/1979	79-164	1216-1217
Harrisonburg, Catoula Parish	11/12/1979	79-164	1139-1142
Fishville, Grant Parish	11/12/79	79-164	1104-1106
Rosepine, Vernon Parish	11/12/1988	79-164	1012-1015

NASA Color Infrared Photographs at Scale of 1:65,000

SITE	DATE	FLIGHT #	PHOTO CODE/FRAME
Le Blanc, Allen Parish	10/10/1978	78-145	365-369 474-478 506-511
Merryville, Beauregard Parish	10/10/1978	78-145	441-443 487-491 495-498
Amite, Tangipahoa Parish	10/10/1978	78-143	9641-9644 9670-9673 9823-9826 9852-9854
Bogue Chitto, Franklinton, Washington and ST. Tammany Parishes	10/08/1978	78-143	3141-3143 9828-9831 9841-9847 9666-9668
Grangeville, East Feliciana and ST. Helena Parishes	10/8/1978	78-143	9637-9639 9818-9820

Sources for information on Color Infrared and Black and White photographs can be obtained from:

National Headquarters
National Cartographic Information Center
U.S. Geological Survey
507 National Center
Reston, VA 22092
(703) 860-6045
FTS: 959-6045

National Space Technology Laboratories
National Cartographic Information Center
U.S. Geological Survey
Building 3101
NSTL Station, MS 39529
(601) 688-3544
FTS: 494-3544

USDA-ASCS, Aerial Photography Field Office
P.O. Box 30010
2222 West 2300 South
Salt Lake City, UT 84130-0010
(801)-524-5856
FTS: 588-5856

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

Airborne Instrumentation Research Project
Ames Research Center
Moffett Field, California 94035

APPENDIX D

Small-Scale Landform Analysis for Twelve Aggregate Trends

RINGGOLD TREND

The Ringgold trend is located in Bienville Parish, Louisiana. The trend is located on the Pleistocene High, Intermediate, and Prairie terraces and on the Holocene Alluvium. Tertiary deposits of the Cane River Formation and the Wilcox group are found in some location within the trend. Terrain analysis of this trend has indicated the following. Terrain position: Upland areas and adjacent floodplain. Topography: Undulating, slightly dissected upland with steep slopes. Drainage Pattern and Texture: Coarse dendritic. Gully Characteristic: V-shaped. Soil Tone: Light tone where soil surface is visible. Land Use and Vegetation: Partially cultivated upland and forested floodplains. Possible Landform: Dissected terrace and floodplain.

COLFAX TREND

The Colfax trend is located in Grant Parish, Louisiana. It is located on the Pleistocene High, Intermediate and Prairie terraces, and partially on the Holocene Alluvium, and the Catahoula Formation of the Miocene. The soil composition of the trend include the somewhat poorly-drained soils of the Moreland-Armistead-Latanier unit and the moderately to well-drained soils of the Roxana-Gallion-Norwood, Guyton-Cascilla, Malbis-Glenmora, Gore-Kolin, Smithdale-Ruston, and Cadeville-Ruston units (Kilpatrick et al., 1986). The geomorphic origin and history of the trend indicated it to be dominated by the fluvial process. According to Fisk (1938), tilting had separated similar material into distinct depositional stages. In addition, the main streams having been so close to the Gulf of Mexico reflect changes in sea level, and the land mass having been sufficiently removed, reflects regional uplift by diverging terrace slopes. The lowering and rising of sea level resulted in erosion and alluviation of stream valleys as their base level fall and rose accordingly. The effects of continual tilting resulted in the diverging of longitudinal profiles of the different terraces (Fisk, 1938). Terrain analysis of this trend has indicated the following. Terrain position: Upland terrace and adjacent floodplain. Topography: Level to gently sloping floodplain and slightly dissected upland with steep slopes. Drainage Pattern and Texture: Dendritic drainage pattern with a medium texture. Gully Characteristic: V-shaped. Soil Tone: Bare soil have a light tone. Land Use and Vegetation: Densely forested terrace and cultivated floodplain. Possible Landform: Fluvial terrace and floodplain.

ROCKY MOUNT TREND

The Rocky Mount trend is located in Bossier Parish, Louisiana. It is located on the Pleistocene High and Prairie terraces and on the Eocene Cook Mountain and Sparta Formations. The soil composition of Rocky Mount trend consists of the well-drained soils of the Shubuta-Ruston, Kirvin-Shubuta-Susquehanna, Prentiss-Cahaba-Tilden associations and the poorly-drained soils of Wrightsville-Acadia and Gore-Mckamie-Morse association (Chappin et al., 1962). The geomorphic origin and history of the trend indicated it to be located on an extensive Pleistocene Prairie Terrace that was laid down by the ancestral Red River. Over the centuries, the Red River actively widened its valley and built up its floodplains by shifting laterally across the alluvial valleys (Kolb, 1949). As a result of glaciation and the consequent lowering of sea level, the gradient of the Red River increased greatly and caused a rapid downcutting of the Red River to its present floodplain. The increase in gradient also caused excavation of deep V-shaped valleys in the Tertiary sediments. Terrain analysis of this trend has indicated the following: Terrain Position: Pleistocene Prairie terraces adjacent to floodplain of Red River; Topography: Level to gently sloping terraces. Terraces closer to the Red River are more dissected; Drainage Pattern and Texture: Coarse dendritic pattern; Gully Characteristic: Few to none on terrace, V-shaped gully along the edge of the terraces; Soil Tone: Light tone on bare soil; Land Use and Vegetation: Mainly forested with few areas under cultivation; Possible Landform: Fluvial terrace.

MONROE TREND

The Monroe trend is located in Ouachita Parish, Louisiana. The trend is located on the Pleistocene Prairie and Deweyville Terraces, the Holocene Alluvium, and the Eocene Cockfield Formation. The soil composition of the Monroe trend included the poorly to moderately well-drained soil of the Frizzell-Providence-Guyton, Waller-Guyton, Hebert-Sterlington-Rilla, and Perry-Portland associations, and the well-drained soil of the Ruston-Lucy-Alaga, Ruston-Lucy,and Ora-Savannah associations (Matthews et al., 1974). The geomorphic origin and history of Monroe trend indicated that a close relationship existed between terraces and major episodes of aggradation and degradation in the Mississippi alluvial valley (Saucier and Fleetwood, 1970). During the Pleistocene period, alternate lowering and raising of sea level resulted in valley deposition and erosion due to the fluctuation of the base level of the streams (Wang, 1952). The rapid deposition of glacial outwash in the Mississippi Valley and the development of an alluvial cone by the Arkansas River created a dam that resulted in the creation of a 500 to 700 square mile perennial lake called Lake Monroe (Saucier and Fleetwood, 1970). The shoreline features and lacustrine plain remnants of the Lake Monroe is now recognized as the highest and intermediate Deweyville terraces. Saucier and Fleetwood (1970) associated the creation of the lowest Deweyville terrace as a period of waxing glaciation and valley entrenchment under the influence of a pluvial climate. Terrain analysis of this trend has indicated the following: Terrain Position: Upland terraces and adjacent floodplain; Topography: Mildly dissected terraces with gentle to steep slopes and gradually sloping and undulating landscape toward the river; Drainage Pattern and Texture: Coarse dendritic with one dominant river channel and large lake; Gully Characteristic: V-shaped; Soil Tone: Light tone where the soil surface is visible; Land Use and Vegetation: Densely forested with few cultivated areas at scattered locations on the terrace and floodplain; Possible Landform: Fluvial Terrace and floodplain.

HARRISONBURG TREND

The Harrisonburg trend is located in Catahoula Parish, Louisiana. The Harrisonburg trend is located on the Pleistocene High and Intermediate terraces and the Miocene Catahoula Formation and on the Holocene Alluvium. The soil composition of Harrisonburg trend included the moderately well-drained to well-drained soils of the Providence-Oula-Smithdale, and Smithdale-Oula-Sweatman units and the poorly drained soil of the Guyton unit (Boyd, 1986). The geomorphic origin and history of Harrisonburg trend indicated it to be portion of the Catahoula formation that was deposited on a broad alluvial plain extending from southern Alabama westward into Mexico (Chawner, 1936). The climate was tropical and subtropical during the deposition of the Catahoula Formation. Special conditions also existed during the Pleistocene for the production of the Citronelle Formation (Chawner, 1936). Great gravel deposits in the upper Mississippi valley were produced when heavier rainfall and the melting of glacier fed torrential amount of water into the drainage channels. It is possible that similar influence of these torrents was felt down in the lower valley of the Mississippi. Terrain analysis of this trend has indicated the following: Terrain Position: A major portion of the trend is located on the upland areas known as the High Terraces and the Catahoula Formation; Topography: The upland is highly dissected with steep slope. The floodplain is relatively level; Drainage Pattern and Texture: Medium to fine dendritic; Gully Characteristic: V-shaped; Soil Tone: Visible soil surface have a light tone; Land Use and Vegetation: Mainly forested with cultivation little to none in valley; Possible Landform: Terrace and adjacent floodplain.

FISHVILLE TREND

The Fishville trend is located in Grant Parish, Louisiana. The Fishville trend is located on the Pleistocene High and Prairie terraces, the Holocene Alluvium, and the Miocene Catahoula Formation. The soil composition of Fishville trend included the well-drained to moderately well-drained soils of the Smithdale-Ruston, Cadeville-Ruston, and Malbis-Glenmora units and the poorly to moderately well-drained soils of the Una-Urbo-Variant, Guyton-Cascilla, and Caddo-Glenmora-Guyton units (Kilpatrick et al., 1986). The geomorphic origin and history of the Fishville trend indicated it to be dominated by the fluvial process. According to Fisk (1938), tilting had separated similar material into distinct depositional stages. The lowering and rising of sea level has resulted in the erosion and alluviation of stream valleys as their base level changes. Eustatic change was the most likely explanation for the oscillation of the continent in relation to ocean level, while tilting probably represented regional compensation for continued overloading at the deltas (Fisk, 1938). The effects of continual tilting resulted in the diverging longitudinal profiles of the different terraces. Terrain analysis of this trend has indicated the following: Terrain Position: Strongly sloping terrace uplands and level to gently undulating floodplain of Little River; Topography: Level to gently sloping floodplain with meander scars. Flat dissected upland terrace with steep slopes and narrow ridges; Drainage Pattern and Texture: Coarse dendritic with a main meandering channel; Gully Characteristic: V-shaped; Soil Tone: Light where terrain surface visible; Land Use and Vegetation: Densely forested with some cultivation; Possible Landform: Fluvial terrace and floodplain.

ROSEPINE TREND

The Rosepine Trend is located in Vernon Parish, Louisiana. The Rosepine trend is located on the Pleistocene High, Intermediate, and Prairie terraces and on the Holocene Alluvium. The geomorphic origin and history of the trend is typical of the region of southwest Louisiana. Geosynclinal subsidence is the dominant feature of the region (Jones et al., 1954). The subsidence and repeated periods of accelerated deposition that accompanied it, have resulted in the alternative gulfward and landward movement of the shoreline for several hundred miles. The deposits of southwestern Louisiana are mainly Pleistocene deposits. The deposits are mainly channel fill materials deposited by the Mississippi River and its tributaries in a broad scour trench cut into a terrain of Tertiary rocks. The lowering of base levels, as a result of lowered sea levels, caused streams to deepen their channel by scouring. The rising of sea level caused a reduction in stream competence, which resulted in the deposition of the transported material in their channel. The materials deposited further reduced the carrying capacity of streams by reducing the stream gradient. Terrain analysis of this trend has indicated the following: Terrain Position: Higher terraces with adjacent floodplain; Topography: Gently sloping dissected landscape with steep slopes and narrow valleys; Drainage Pattern and Texture: Medium dendritic; Gully Characteristic: V-shaped; Soil Tone: Bare soils have a light tone; Land Use and Vegetation: Upland terrace partially cultivated with forest area adjacent to streams and rivers; Possible Landform: Dissected terrace with floodplain along major stream.

LE BLANC TREND

The Le Blanc Trend is located in Allen and Jefferson Davis Parishes, Louisiana. The Le Blanc is located mainly on the Pleistocene Intermediate, Prairie, and Deweyville terraces. Holocene Alluvium is found adjacent to rivers and streams. The soil composition of Le Blanc Trend consist of well-drained to moderately well-drained soils of the Malbis-Ruston, Beauregard-Malbis, Kinder-Glenmora, and Cahaba-Bienville units to the well-drained and poorly-drained soils of the Glenmora-Caddo, Guyton-Caddo, Frost-Crowley, and Guyton-Cascilla units (Kilpatrick et al., 1980). The geomorphic origin and history of Le Blanc trend is typical of the region of southwest Louisiana. Geosynclinal subsidence is the dominant feature of the region (Jones et al., 1954). The subsidence and repeated periods of accelerated deposition that accompanied it, have resulted in the alternative gulfward and landward movement of the shoreline for several hundred miles. The lowering of base levels, as a result of lowered sea levels, caused streams to deepen their channel by scouring. The rising of sea level caused a reduction in stream competence, which resulted in the deposition of the transported material in their channel. The deposits of southwestern Louisiana are mainly Pleistocene deposits. The deposits are mainly channel fill materials deposited by the Mississippi River and its tributaries in a broad scour trench cut into a terrain of Tertiary rocks (Jones et al., 1954). Terrain analysis of this trend has indicated the following: Terrain Position: Dissected Pleistocene upland terrace deposits; Topography: Gentle sloping upland with a slightly dissected landscape; Drainage Pattern and Texture: Coarse dendritic with one dominant river system; Gully Characteristic: V-shaped; Soil Tone: Light tone where bare soil is visible; Land Use and Vegetation: Uplands are partially cultivated while areas adjacent to stream are forested; Special Feature: The area is dominated with relic meander scars, oxbow lakes, and abundant stream channels; Possible Landform: Terraces.

MERRYVILLE TREND

The Merryville trend is located in Beauregard Parish, Louisiana. The Merryville trend is located on the Pleistocene Intermediate, Prairie and Deweyville terraces and on the Holocene Alluvium. The geomorphic origin and history of Merryville trend is typical of the region of southwest Louisiana. Geosynclinal subsidence is the dominant feature of the region (Jones et al., 1954). The subsidence and repeated periods of accelerated deposition that accompanied it have resulted in the alternative gulfward and landward movement of the shoreline for several hundred miles. In order to keep up with the shoreline movement that causes changes in the base level of streams, the characteristics of streams changed correspondingly with every shoreline movement. The lowering of base levels, as a result of lowered sea levels, caused streams to deepen their channel by scouring. The rising of sea level caused a reduction in stream competence, which resulted in the deposition of the transported material in their channel (Jones et al., 1954). The deposits of southwestern Louisiana are mainly Pleistocene deposits. The deposits are mainly channel fill materials deposited by the Mississippi River and its tributaries in a broad scour trench cut into a terrain of tertiary rocks (Jones et al., 1954). Terrain analysis of this trend has indicated the following: Terrain Position: Upland terraces adjacent to floodplain; Topography: Flat floodplain and undulating upland terrace; Drainage Pattern and Texture: Coarse dendritic with a dominant river forming the western boundary; Gully Type: V-shaped; Soil Tone: Light tone where soil surface is visible; Land Use and Vegetation: Densely forested with very little cultivation on the upland areas; Special Feature: Relic meander scars, oxbow lakes, and abundant streams dominate the floodplain; Possible Landform: Upland terraces with adjacent floodplain.

AMITE TREND

The Amite trend is located in Tangipahoa Parish, Louisiana. The Amite trend is located on the Pleistocene High and Prairie terraces and the Holocene Alluvium. The geomorphic origin and history indicated this trend to have a predominantly fluvial origin. The resulting fluvial terrace deposit is considered to form as a result of the Pleistocene sea level changes (Fisk, 1940), alluvial apron deposited by braided stream (Doering, 1935; Doering, 1956; Self, 1986), aggregating stream deposits and small fans (Woodward and Gueno, 194l) and point bar deposits (Campbell, 197l). Terrain analysis of this trend has indicated the following: Terrain Position: River floodplain flanked by higher terraces; Topography: Gently-sloping floodplain; Drainage Pattern and Texture: Coarse dendritic with one dominant main channel; Gully Characteristic: V-shaped at edge of terrace at tributary to the main channel; Soil Tone: Bare soils have a light tone; Land Use and Vegetation: This site is partially cultivated and partially under natural vegetation; Special Feature: Meander scar and oxbow lakes; Possible Landform: River floodplain flanked by terraces.

GRANGEVILLE TREND

The Grangeville trend is located in East Feliciana and St. Helena parishes, Louisiana. The Grangeville trend is located on the Pleistocene High, Intermediate and Prairie Terraces and the Holocene Alluvium. The geomorphic origin and history indicated that the Grangeville trend is in Amite River valley. According to Autin (1985), the Amite River alluvial valley developed a meandering channel system with a coarse-grained bedload. This conclusion was also supported by Self (1986) who considered the Citronelle formation to be braided streams and alluvial fan deposits. The river morphologic and stratigraphic characteristic reflects its floodplain development by lateral accretion and chute cutoff processes. The development of the Amite River was the result of entrenchment, which was followed by lateral planation while base level rose during the drainage basin aggradation. The gravel deposits of Amite area concentrated in large fan shaped trends at the northern ends of paleo valleys and are regarded as large alluvial fan deposits (Self, 1986). Terrain analysis of this trend has indicated the following: Terrain Position: Floodplain flanked by higher terrace; Topography: Gently sloping surface; Drainage Pattern and Texture: A coarse dendritic pattern with one dominant drainage channel; Gully Characteristic: V-shaped; Soil Tone: Bare soils have light tone; Land Use and Vegetation: Heavily forested; Special Feature: Meander scars, point bars and oxbow lakes; Possible Landform: A terrace landform and adjacent floodplain.

BOGUE CHITTO TREND

The Bogue Chitto trend is located in Washington and St. Tammany parishes, Louisiana. The Bogue Chitto trend is located on the Pleistocene High, Prairie, Deweyville terraces and the Holocene Alluvium. The geomorphic origin and history indicated terraces of southeastern Louisiana have a fluvial origin. The resulting fluvial terrace deposit is considered to form as a result of the Pleistocene sea level changes (Fisk, 1940), alluvial apron deposited by braided streams (Doering, 1935; Doering, 1936; Self, 1986), aggregating stream deposits and small fans (Woodward and Gueno, 194l) and point bar deposit (Campbell, 197l). Terrain analysis of this trend has indicated the following: Terrain Position: High terrace and adjacent floodplain; Topography: Gently sloping terraces and floodplain; Drainage Pattern and Texture: Coarse dendritic with one dominant main channel; Gully Characteristic: V-shaped at edge of terrace; Soil Tone: Soil surface have a light tone; Land Use and Vegetation: Cultivated terrace and forested floodplain; Possible Landform: Terrace and floodplain.

APPENDIX E

Description of Soil Borings from Four Aggregate Trends

BORINGS FROM THE RINGGOLD AREA, NORTHWEST LOUISIANA

CORE R1 -- Ringgold, LA 7.5-minute quadrangle; from High Terraces, 89 m elevation, 3-5% slope, pasture; described by W. J. Autin and D. J. McCraw on February 1, 1990.

Ap -- 0 - 15 cm -- Pale brown (10YR 6/3) loamy sand; weak, fine, granular structure; loose consistence; grass roots; clear boundary.

E -- 15 - 30 cm -- Very pale brown (10YR 7/4) loamy sand; weak, fine, granular structure; loose consistence; grass roots; gradual boundary.

2Bt1 -- 30 - 100 cm -- Yellowish red (5YR 5/8) sandy clay loam; moderate, medium, subangular blocky structure; friable consistence; grass roots; occasional clay films; clear boundary.

2Bt2 -- 100 - 240 cm -- Strong brown (7.5YR 5/8) sandy clay loam with common, medium, distinct red (10R 4/8) and light gray (10YR 7/1) mottles; moderate, medium, subangular blocky structure; friable consistence; common clay films; red (10R 4/8) plinthite; gradual boundary.

2BC -- 240 - 270 cm -- Strong brown (7.5YR 5/8) sandy clay loam with common, medium, distinct red (10R 4/8) and light gray (10YR 7/1) mottles; moderate, medium, subangular blocky structure; friable consistence; clear boundary.

2C1 -- 270 - 290 cm -- Light gray (10YR 7/1) clay with common, fine, distinct strong brown (7.5YR 5/8) and red (2.5YR 4/8) mottles; plastic consistence; sedimentary interbeds; abrupt boundary.

2C2 -- 290 - 330 cm -- Red (2.5YR 4/8) sandy loam; very friable.

CORE R2 -- Ringgold, LA 7.5-minute quadrangle; from High Terraces, 95 m elevation, 0-1% slope, plowed field; described by W. J. Autin and D. J. McCraw on February 1, 1990.

Ap -- 0 - 15 cm -- Pale brown (10YR 6/3) loamy sand; weak, fine, granular structure; loose consistence; grass roots; clear boundary.

E -- 15 - 30 cm -- Yellowish brown (10YR 5/6) sandy loam; weak, fine, granular structure; loose consistence; grass roots; gradual boundary.

2Bt1 -- 30 - 90 cm -- Reddish yellow (5YR 6/8) sandy clay loam; moderate, medium, subangular blocky structure; friable consistence; common clay films; gradual boundary.

2Bt2 -- 90 - 135 cm -- Strong brown (7.5YR 5/8) sandy clay loam with common, medium, distinct red (2.5YR 4/6) mottles; moderate, medium, subangular blocky structure; friable consistence; common clay films; gradual boundary.

2BC -- 135 - 270 cm -- Strong brown (7.5YR 5/8) sandy clay loam with common, medium, distinct white (5YR 8/1) mottles; moderate, coarse, platy structure; friable consistence; abrupt boundary.

2C1 -- 270 - 310 cm -- Strong brown (7.5YR 5/8) clay with common, fine, distinct red (2.5YR 4/8) and white (5YR 8/1) mottles; plastic consistence; sedimentary interbeds; abrupt boundary.

2C2 -- 310 - 360 cm -- Red (2.5YR 5/8) sandy clay loam; loose consistence.

CORE R3 -- Ringgold, LA 7.5-minute quadrangle; from High Terraces, 92 m elevation, 0-1% slope, churchyard; described by W. J. Autin and D. J. McCraw on February 1, 1990.

Ap -- 0 - 25 cm -- Pale brown (10YR 6/3) silt loam; weak, fine, granular structure; fraible consistence; grass roots; clear boundary.

Bw -- 25 - 70 cm -- Yellowish brown (10YR 5/6) silt loam; weak, fine, subangular blocky structure; grass roots; friable consistence.

Btx -- 70 - 240 cm -- Brownish yellow (10YR 6/6) silt loam with common, fine, faint pale brown (10YR 6/3) mottles; moderate, medium, subangular blocky structure; hard consistence; occasional clay films; lower 40 cm of unit is mixed with underlying material; gradual boundary.

2BC -- 240 -330 cm -- Red (2.5YR 4/8) silty clay loam; friable consistence; gradual boundary.

2C -- 330 - 350 cm -- Red (2.5YR 4/8) sandy loam; very friable; becomes coarser grained towards base.

CORE R4 -- Ringgold, LA 7.5-minute quadrangle; from Tertiary Wilcox Group, 102 m elevation, 5-8% slope, abandoned home; described by W. J. Autin and D. J. McCraw on February 1, 1990.

Ap -- 0-10 cm -- Yellowish brown (10YR 5/4) sand; loose consistence; grass roots; gradual boundary.

E -- 10 - 60 cm -- Brownish yellow (10YR 6/6) loamy sand; loose consistence; clear boundary.

2Bt -- 60 - 110 cm -- Red (2.5YR 4/6) sandy clay loam with common, coarse, distinct brownish yellow (10YR 6/6) and white (10YR 8/2) mottles; moderate, medium, platy structure; hard consistence.

BORINGS FROM THE MONROE AREA, NORTHEAST LOUISIANA

CORE M1 -- West Monroe South, LA 7.5-minute quadrangle; from Prairie Terraces, lower surface, 26 m elevation, 0-1% slope; clearcut forest; described by W. J. Autin and R. Green on November 1, 1989.

Ap -- 0 - 60 cm -- Pale brown (10YR 6/3) silt loam; weak, medium, platy structure; firm consistence; scattered roots; clear boundary (augered from 35 to 60 cm).

B/E -- 60 - 110 cm -- Pale brown (10YR 6/3) silt loam with common, medium, distinct white (10YR 8/2) mottles; weak, fine, subangular blocky structure; friable consistence; scattered roots; scattered gravel; common pores; strong brown (7.5YR 5/8) stains; clear boundary.

2Bt1 -- 110 - 165 cm -- Brownish yellow (10YR 6/8) sandy clay with common, medium, prominent yellowish red (5YR 5/8) mottles; moderate, medium, subangular blocky structure; friable consistence; reddish brown (5YR 5/3) clay films; scattered gravel; distinct boundary.

2Btg -- 165 - 275 cm -- Brownish yellow (10YR 6/8) sandy clay with common, medium, prominent gray (7.5YR 6/0) mottles; weak, medium, subangular blocky structure; friable consistence; clayey interbeds; gradual boundary.

3C -- 275 - 365 cm -- Light brownish gray (10YR 6/2) sandy loam; loose consistence; water saturated at base.

CORE M2 -- West Monroe South, LA 7.5-minute quadrangle; from Prairie Terraces, lower surface, 28 m elevation, 0-1% slope; forest; described by W. J. Autin and R. Green on November 1, 1989.

Ap -- 0 - 30 cm -- Pale brown (10YR 6/3) silt loam with common, coarse, distinct light gray (10YR 7/2) mottles; weak, fine, subangular blocky structure; friable consistence; common roots; abrupt boundary.

E -- 30 - 70 cm -- Pale brown (10YR 6/3) sandy loam; weak, medium, platy structure; friable consistence; common roots; gradual boundary.

2Bt -- 70 - 150 cm -- Brownish yellow (10YR 6/8) sandy clay loam with common, coarse, distinct light gray (10YR 7/2) mottles; weak, fine, subangular blocky structure; friable consistence; interbedded at base; gradual boundary.

3C -- 150 - 185 cm -- Light gray (10YR 7/2) sand; loose consistence; brownish yellow (10YR 6/8) stains; water saturated at base.

CORE M3 -- West Monroe South, LA 7.5-minute quadrangle; from Prairie Terraces, lower surface, 33 m elevation, 3-5% slope; forest; described by W. J. Autin and R. Green on November 1, 1989.

Ap -- 0 - 20 cm -- Yellowish brown (10YR 5/4) silt loam; weak, fine, granular structure; friable consistence; common roots; clear boundary.

Bt -- 20 - 125 cm -- Reddish yellow (5YR 6/8) sandy loam; weak, fine, subangular blocky structure; friable; common clay films; common roots; scattered gravel; gradual boundary.

C -- 125 - 185 cm -- Reddish yellow (7.5YR 6/6) sand; loose; scattered gravel.

CORE M4 -- West Monroe South, LA 7.5-minute quadrangle; from Prairie Terraces, lower surface, 31 m elevation, 0-1% slope; forest; described by W. J. Autin and R. Green on November 1, 1989.

A&E -- 0 - 55 cm -- White (10YR 8/2) silt loam with common, fine, distinct brownish yellow (10YR 6/8) mottles; weak, fine, subangular blocky structure; firm consistence; common roots; clear boundary.

Bt -- 55 - 155 cm -- Brown (10YR 4/3) silt loam with common, fine, distinct brownish yellow (10YR 6/8) mottles; moderate, fine, subangular blocky structure; hard consistence; common dark yellowish brown (10YR 4/4) clay films; brownish yellow (10YR 6/8) stains; scattered gravel; abrupt boundary.

2Bt -- 155 - 215 cm -- Pale brown (10YR 6/3) sandy clay loam with common, medium, distinct yellowish brown (10YR 5/6) mottles; weak, medium, subangular blocky structure; fraible consistence; common yellowish brown (10YR 5/4) clay films; brownish yellow (10YR 6/8) stains; scattered gravel; gradual boundary.

3C -- 215 - 240 cm -- White (10YR 8/2) sand; loose consistence; scattered gravel.

CORE M5 -- West Monroe South, LA 7.5-minute quadrangle; from Prairie Terraces, lower surface, 31 m elevation, 0-1% slope; power line right of way; described by W. J. Autin and R. Green on November 1, 1989.

A&Bt -- 0 - 165 cm -- Light gray (10YR 7/2) silt loam with common, medium, distinct reddish yellow (7.5YR 6/8) mottles; moderate, medium, subangular blocky structure; friable consistence; reddish yellow (7.5YR 6/8) stains; scattered gravel; clear boundary.

2Bt -- 165 - 250 cm -- Dark grayish brown (10YR 4/2) clay loam with common, medium, distinct reddish yellow (7.5YR 6/8) mottles; weak, fine, subangular blocky structure; plastic consistence; reddish yellow (7.5YR 6/8) stains; scattered gravel; gradual boundary.

2BC -- 250 - 280 cm -- Dark grayish brown (10YR 4/2) sandy clay with common, medium, distinct reddish yellow (7.5YR 6/8) mottles; weak, fine, subangular blocky structure; friable consistence; scattered gravel; gradual boundary.

2C -- 280 365 cm -- Dark grayish brown (10YR 4/2) sandy clay loam; friable consistence; olive yellow (2.5Y 6/6) stains; abundant gravel.

CORE M6 -- West Monroe South, LA 7.5-minute quadrangle; from Prairie Terraces, upper surface, 43 m elevation, 1-3% slope; power line right of way; described by W. J. Autin and R. Green on November 1, 1989.

Ap -- 0 - 20 cm -- Light brownish gray (10YR 6/2) silt loam with few, fine, faint brownish yellow (10YR 6/8) mottles; weak, fine, platy structure; friable consistence; common roots; brownish yellow (10YR 6/8) stains; clear boundary.

Bt1 -- 20 - 110 cm -- Pale brown (10YR 6/3) silt loam with common, medium, faint yellowish brown (10YR 5/6) mottles; moderate, medium, subangular blocky structure; friable consistence; few roots: very dark brown (10YR 2/2) concretions; few pores; gradual boundary.

Bt2 -- 110 - 165 cm -- Pale brown (10YR 6/3) silt loam with common, coarse, distinct brownish yellow (10YR 6/8) mottles; moderate, medium, subangular blocky structure; friable consistence; very dark brown (10YR 2/2) concretions; gradual boundary.

Bw -- 165 - 245 cm -- Pale brown (10YR 6/3) silt loam with common, coarse, distinct brownish yellow (10YR 6/8) mottles; weak, fine, subangular blocky structure; friable consistence; gradual boundary.

BC -- 245 - 310 cm -- Brownish yellow (10YR 6/8) loam; friable consistence.

CORE M7 -- West Monroe South, LA 7.5-minute quadrangle; from Prairie Terraces, upper surface, 46 m elevation, 1-3% slope; power line right of way; described by W. J. Autin and R. Green on November 1, 1989.

Ap -- 0 - 10 cm -- Light brownish gray (10YR 6/2) silt loam; weak, fine, platy structure; friable consistence; common roots; brownish yellow (10YR 6/8) stains; gradual boundary.

Bt1 -- 10 - 110 cm -- Light gray (10YR 7/2) silt loam with common, medium, distinct brownish yellow (10YR 6/8) mottles; moderate, medium, subangular blocky structure; friable consistence; few very dark brown (10YR 2/2) concretions; gradual boundary.

Bt2 -- 110 -160 cm -- Light brownish gray (10YR 6/2) silt loam with common, medium, distinct brownish yellow (10YR 6/8) mottles; moderate, medium, subangular blocky structure; friable consistence; very dark brown (10YR 2/2) concretions.

CORE M8 -- West Monroe South, LA 7.5-minute quadrangle; from Eocene Cockfield Formation, 53 m elevation, 3-8% slope; abandoned home site; described by W. J. Autin and R. Green on November 1, 1989.

A & E -- 0 - 25 cm -- Very pale brown (10YR 8/3) sandy loam; very friable consistence; common roots; clear boundary.

Bt -- 25 - 70 cm -- Yellowish red (5YR 5/6) silt loam; moderate, coarse, subangular blocky structure; friable consistence; few roots; red (2.5YR 5/6) clay films; gradual boundary.

BC -- 70 - 100 cm -- Strong brown (7.5YR 5/6) sandy loam; friable consistence.

BORINGS FROM THE LE BLANC AREA, SOUTHWEST LOUISIANA

CORE L1 -- Le Blanc, LA 7.5-minute quadrangle; from Prairie Terraces, 15 m elevation, 0-1% slope, forest; described by W. J. Autin and R. Green on March 21, 1990.

A -- 0 - 10 cm -- Dark grayish brown (10YR 4/2) sandy loam; weak, fine, granular structure; friable consistence; common plant roots and charcoal; clear boundary.

E -- 10 - 20 cm -- Very pale brown (10YR 7/3) sandy loam; weak, fine, granular structure; friable consistence; scattered plant roots and charcoal; gradual boundary.

Bt1 -- 20 -55 cm -- Red (2.5YR 5/8) clay loam; moderate, medium, subangular blocky structure; friable consistence; common clay films; scattered plant roots; clear boundary.

Btg -- 55 - 85 cm -- Red (2.5YR 5/8) clay loam with common, medium, distinct light gray (5Y 7/1) mottles; moderate, medium, subangular blocky structure; friable consistence; common clay films; scattered plant roots; gradual boundary.

BC -- 85 - 120 cm -- Reddish yellow (5YR 6/8) loam; weak, medium, subangular blocky structure; friable consistence; gradual boundary.

C1 -- 120 - 170 cm -- Reddish yellow (5YR 6/8) loamy sand; loose consistence; sedimentary interbeds; diffuse boundary.

C2 -- 170 - 425 cm -- Very pale brown (10YR 8/3) fine to medium sand; loose consistence; sedimentary interbeds; yellow (10YR 7/6) stains.

CORE L2 -- Le Blanc, LA 7.5-minute quadrangle; from Deweyville Terraces, 11 m elevation, 0-1% slope, forest; described by W. J. Autin and R. Green on March 21, 1990.

A -- 0 - 10 cm -- Dark grayish brown (10YR 4/2) sandy loam; weak, fine, granular structure; friable consistence; common plant roots and charcoal; clear boundary.

E -- 10 - 20 cm -- Very pale brown (10YR 7/3) sandy loam with common, fine, distinct dark grayish brown (10YR 4/2) mottles; weak, fine, granular structure; friable consistence; scattered plant roots; clear boundary.

Bt1 -- 20 -50 cm -- Red (2.5YR 5/8) clay loam; moderate, medium, subangular blocky structure; friable consistence; common clay films; scattered plant roots; gradual boundary.

Bt2 -- 50 -80 cm -- Red (2.5YR 5/8) clay loam with few, fine, distinct very pale brown (10YR 7/4) mottles; moderate, medium, subangular blocky structure; friable consistence; common clay films; gradual boundary.

BC -- 80 - 120 cm -- Yellowish red (5YR 5/8) sandy loam; weak, fine, granular structure; friable consistence; gradual boundary.

C1 -- 120 - 140 cm -- Reddish yellow (7.5YR 6/8) loamy sand; loose consistence; sedimentary interbeds; yellowish red (5YR 5/8) stains; gradual boundary.

C2 -- 140 - 275 cm -- Light gray (10YR 7/2) fine to medium sand; loose consistence; sedimentary interbeds; reddish yellow (7.5YR 7/8) stains.

CORE L3 -- Le Blanc, LA 7.5-minute quadrangle; from Holocene Alluvium, 10 m elevation, 0-1% slope, forest; described by W. J. Autin and R. Green on March 21, 1990.

A -- 0 - 5 cm -- Brown (10YR 5/3) loamy sand; weak, fine, granular structure; very friable consistence; grass and wood roots; sedimentary bedding; abrupt boundary.

Bw -- 5 - 30 cm -- Dark yellowish brown (10YR 4/4) sandy loam; weak, fine, crumb structure; friable consistence; clear boundary.

BC -- 30 - 50 cm -- Light yellowish brown (10YR 6/4) loamy sand; loose consistence; gradual boundary.

C -- 50 - 150 cm -- Brownish yellow (10YR 6/6) fine to coarse sand; loose consistence; reddish yellow (7.5YR 6/8) stains towards base; clear boundary.

2Cg1 -- 150 - 265 -- Gray (10YR 6/1) silt loam; plastic consistence; brownish yellow (10YR 6/8) stains; dense compact layer at base; abrupt boundary.

2Cg2 -- 265 - 275 cm -- Light gray (10YR 7/1) fine sand; loose consistence; brownish yellow (10YR 6/8) stains; water saturated.

CORE L4 -- Le Blanc, LA 7.5-minute quadrangle; from Deweyville Terraces, 11 m elevation, 0-1% slope, clearcut forest; described by W. J. Autin and R. Green on March 21, 1990.

APPROXIMATELY 15 CM OF THIS PROFILE HAS BEEN STRIPPED BY EROSION.

A -- 0 - 5 cm -- Brown (10YR 5/3) sandy loam; weak, fine, granular structure; friable consistence; common plant roots and charcoal; clear boundary.

Bt -- 5 - 50 cm -- Red (2.5YR 5/8) clay loam; moderate, medium, subangular blocky structure; friable consistence; common clay films; occasional plant roots; gradual boundary.

BC -- 50 - 75 cm -- Yellowish red (5YR 5/8) sandy loam; weak, medium subangular blocky structure; friable consistence; gradual boundary.

C1 -- 75 - 165 cm -- Reddish yellow (7.5YR 6/8) loamy sand; loose consistence; sedimentary interbeds; gradual boundary.

C2 -- 165 - 275 cm -- White (10YR 8/2) medium sand; loose consistence; sedimentary interbeds.

CORE L5 -- Le Blanc, LA 7.5-minute quadrangle; from Prairie Terraces, 13 m elevation, 0-1% slope, open field; described by W. J. Autin and R. Green on March 21, 1990.

A -- 0 - 15 cm -- Dark grayish brown (10YR 4/2) silt loam; weak, fine, granular structure; friable consistence; common plant roots and charcoal; clear boundary.

Btg1 -- 15 - 65 cm -- Light brownish gray (10YR 6/2) silt loam with common, medium, distinct brownish yellow (10YR 6/8) mottles; moderate, medium, subangular blocky structure; friable consistence; common clay films; few plant roots; gradual boundary.

Btg2 -- 65 - 120 cm -- Light brownish gray (10YR 6/2) silty clay loam with common, medium, distinct brownish yellow (10YR 6/8) mottles; moderate, medium, subangular blocky structure; friable consistence; common clay films; red (2.5YR 5/8) stains; gradual boundary.

BC -- 120 275 cm -- Light brownish gray (10YR 6/2) silty clay loam with common, medium, distinct brownish yellow (10YR 6/8) mottles; weak, medium, subangular blocky structure; firm consistence; faint sedimentary bedding.

BORINGS FROM THE GRANGEVILLE AREA, SOUTHEAST LOUISIANA

CORE G1 -- Hatchersville, LA 7.5-minute quadrangle; from High Terraces, 74 m elevation, 0-1% slope, clearcut forest; described by W. J. Autin and R. Green on September 20, 1989.

Ap -- 0 - 15 cm -- Brown (10YR 4/3) silt loam; weak, fine, granular structure; very friable consistence; wood roots; clear boundary.

Bt -- 15 - 90 cm -- Yellowish brown (10YR 5/6) silt loam with common, medium, distinct light brownish gray (10YR 6/2) mottles; moderate, coarse, prismatic structure; firm consistence; scattered very dark brown (10YR 2/2) concretions; red (7.5R 4/6) plinthite at base; gradual boundary.

Btx -- 90 - 205 cm -- Yellowish brown (10YR 5/6) clay loam with many, coarse, distinct red (2.5YR 4/6) mottles; weak, very thick, platy structure; firm consistence; clear boundary.

2Btx -- 205 - 270 cm -- Red (10R 4/6) clay loam; weak, thick, platy structure; firm consistence; light gray (10YR 7/1) tongues of silt loam and sand-sized clay particles; gradual boundary.

2Bt -- 270 - 460 cm -- Red (10R 4/6) sandy loam; weak, medium, subangular blocky structure; friable consistence; light gray (10YR 7/1) tongues of silt loam; gradual boundary.

2BC -- 460 - 530 cm -- Red (10R 4/6) sandy loam; weak, medium, subangular blocky structure; friable consistence.

CORE G2 -- Hatchersville, LA 7.5-minute quadrangle; from High Terraces, 64 m elevation, 20% slope, clearcut forest; described by W. J. Autin and R. Green on September 20, 1989.

Ap -- 0 - 15 cm -- Brown (10YR 4/3) sandy loam; weak, fine, granular structure; very friable consistence; wood roots; clear boundary.

Bt1 -- 15 - 55 cm -- Yellowish red (5YR 5/6) sandy clay loam; moderate, medium, subangular blocky structure; friable consistence; common clay films; gradual boundary.

Bt2 -- 55 - 160 cm -- Yellowish red (5YR 5/6) sandy clay loam with common, coarse, distinct strong brown (7.5YR 4/6) mottles; moderate, medium, subangular blocky structure; friable consistence; common clay films; diffuse boundary.

BC -- 160 - 355 cm -- Red (10R 4/6) sandy loam; weak, medium, subangular blocky structure; friable consistence; scattered granule gravel.

CORE G3 -- Hatchersville, LA 7.5-minute quadrangle; from Intermediate Terraces, 52 m elevation, 1-3% slope, clearcut forest; described by W. J. Autin and R. Green on September 20, 1989.

Ap -- 0 - 10 cm -- Dark grayish brown (10YR 4/2) silt loam; weak, fine granular structure; very friable consistence; wood roots; clear boundary.

Bt -- 10 - 55 cm -- Strong brown (7.5YR 5/6) silty clay loam; moderate, medium, subangular blocky structure; friable consistence; very dark brown (10YR 2/2) concretions; gradual boundary.

Btx -- 55 - 150 cm -- Strong brown (7.5YR 5/6) clay loam with common, coarse, distinct yellowish red (5YR 4/6) mottles; moderate, coarse, prismatic structure; firm consistence; tongues of light brownish gray (10YR 6/2) silt loam; gradual boundary.

2Bt -- 150 - 225 cm -- Yellowish brown (10YR 5/6) sandy clay loam with many, coarse, distinct yellowish red (5YR 4/6) mottles; moderate, medium, subangular blocky structure; firm consistence; tongues of light brownish gray (10YR 6/2) silt loam; gradual boundary.

3Bt1 -- 225 - 260 cm -- Yellowish brown (10YR 5/6) clay; moderate, medium, subangular blocky structure; firm consistence; tongues of light brownish gray (10YR 6/2) silt loam; gradual boundary.

3Bt2 -- 260 - 400 cm -- Light gray (10YR 7/2) clay with common, coarse, distinct red (10R 4/6) mottles; moderate, medium, subangular blocky structure; firm consistence; sand interbeds; clear boundary.

4C -- 400 - 420 cm -- White (10YR 8/1) sand; loose consistence.

CORE G4 -- Hatchersville, LA 7.5-minute quadrangle; from Prairie Terraces, 46 m elevation, 0-1% slope, clearcut forest; described by W. J. Autin and R. Green on September 20, 1989.

Ap -- 0 - 5 cm -- Gray (10YR 6/1) silt loam; weak, fine, granular structure; friable consistence; wood and grass roots; clear boundary.

B&E -- 5 - 35 cm -- Light gray (10YR 7/2) silt loam with common, coarse, distinct brownish yellow (10YR 6/8) mottles; weak, medium, subangular blocky structure; friable consistence; very dark brown (10YR 2/2) stains; tongues of light gray (10YR 7/2) silt loam; gradual boundary.

Btg1 -- 35 - 70 cm -- Light gray (10YR 7/2) silt loam with common, coarse, distinct brownish yellow (10YR 6/8) mottles; weak, medium, subangular blocky structure; friable consistence; very dark brown (10YR 2/2) stains; gradual boundary.

Btg2 -- 70 - 180 cm -- Gray (10YR 6/1) silt loam; weak, medium, subangular blocky structure; friable consistence; very dark brown (10YR 2/2) and brownish yellow (10YR 6/8) stains; gradual boundary.

Cg1 -- 180 - 295 cm -- Light gray (10YR 7/1) silt loam; friable consistence; brownish yellow (10YR 6/8) stains; sandy loam and loam interbeds; clear boundary.

Cg2 -- 295 - 360 cm -- Gray (10YR 6/1) silty clay loam; friable consistence; scattered wood and organic material; clear boundary.

Cg3 -- 360 - 370 cm -- Light gray (10YR 7/2) loamy sand; friable consistence; yellow (10YR 7/6) stains.

CORE G5 -- Hatchersville, LA 7.5-minute quadrangle; from Prairie Terraces, 49 m elevation, 1-3% slope, pasture; described by W. J. Autin and R. Green on September 20, 1989.

Ap -- 0 - 25 cm -- Brown (10YR 5/3) sandy loam; weak, fine, granular structure; friable consistence; common roots; yellowish brown (10YR 5/6) stains; scattered granule gravel; clear boundary.

Bt -- 25 - 95 cm -- Yellowish brown (10YR 5/4) loam with common, medium distinct brownish yellow (10YR 6/8) mottles; moderate, medium, subangular blocky structure; friable consistence; common roots; clay films; scattered granule gravel; gradual boundary.

C -- 95 - 125 cm -- Light brownish gray (10YR 6/2) sandy loam; friable consistence; brownish yellow (10YR 6/8) stains; abundant granule gravel.

CORE G6 -- Hatchersville, LA 7.5-minute quadrangle; from Holocene Alluvium, 43 m elevation, 0-1% slope, pasture; described by W. J. Autin and R. Green on September 20, 1989.

Ap -- 0 - 10 cm -- Light brownish gray (10YR 6/2) silt loam; weak, fine, granular structure; friable consistence; grass roots; scattered granule gravel; clear boundary.

Bw -- 10 - 30 cm -- Brown (7.5YR 4/4) loam; weak, fine, subangular blocky structure; friable consistence; grass roots; scattered granule gravel;
gradual boundary.

C1 -- 30 - 75 cm -- Yellowish brown (10YR 5/6) sand; loose consistence; granule gravel; gradual boundary.

C2 -- 75 - 200 cm -- Pale brown (10YR 6/3) sand; loose consistence; abundant granule gravel.

CORE G7 -- Hatchersville, LA 7.5-minute quadrangle; from Holocene Alluvium, 43 m elevation, 0-1% slope, pasture; described by W. J. Autin and R. Green on September 20, 1989.

Ap -- 0 - 15 cm -- Grayish brown (10YR 5/2) silt loam; weak, fine, granular structure; friable consistence; common roots; very dark brown (10YR 2/2) and yellowish brown (10YR 5/8) stains; gradual boundary.

Bw -- 15 - 85 cm -- Brown (7.5YR 4/4) silt loam; weak, medium, crumb structure; friable consistence; few roots; clear boundary.

2Btg -- 85 - 295 cm -- Light brownish gray (10YR 6/2) silt loam with common, coarse, distinct yellowish brown (10YR 5/6) mottles; friable consistence; very dark brown (10YR 2/2) and brownish yellow (10YR 6/8) stains; tongues of gray (10YR 6/1) silt loam; gradual boundary.

BC -- 295 - 340 cm -- Gray (10YR 6/1) silt loam; friable consistence; few very dark brown (10YR 2/2) and brownish yellow (10YR 6/8) stains; clear boundary.

C -- 340 -345 cm -- Gray (10YR 6/1) sandy loam; friable consistence.

APPENDIX F

Sounding Plots and Computer Soil Classification Results from All Cone Penetrometer Borings

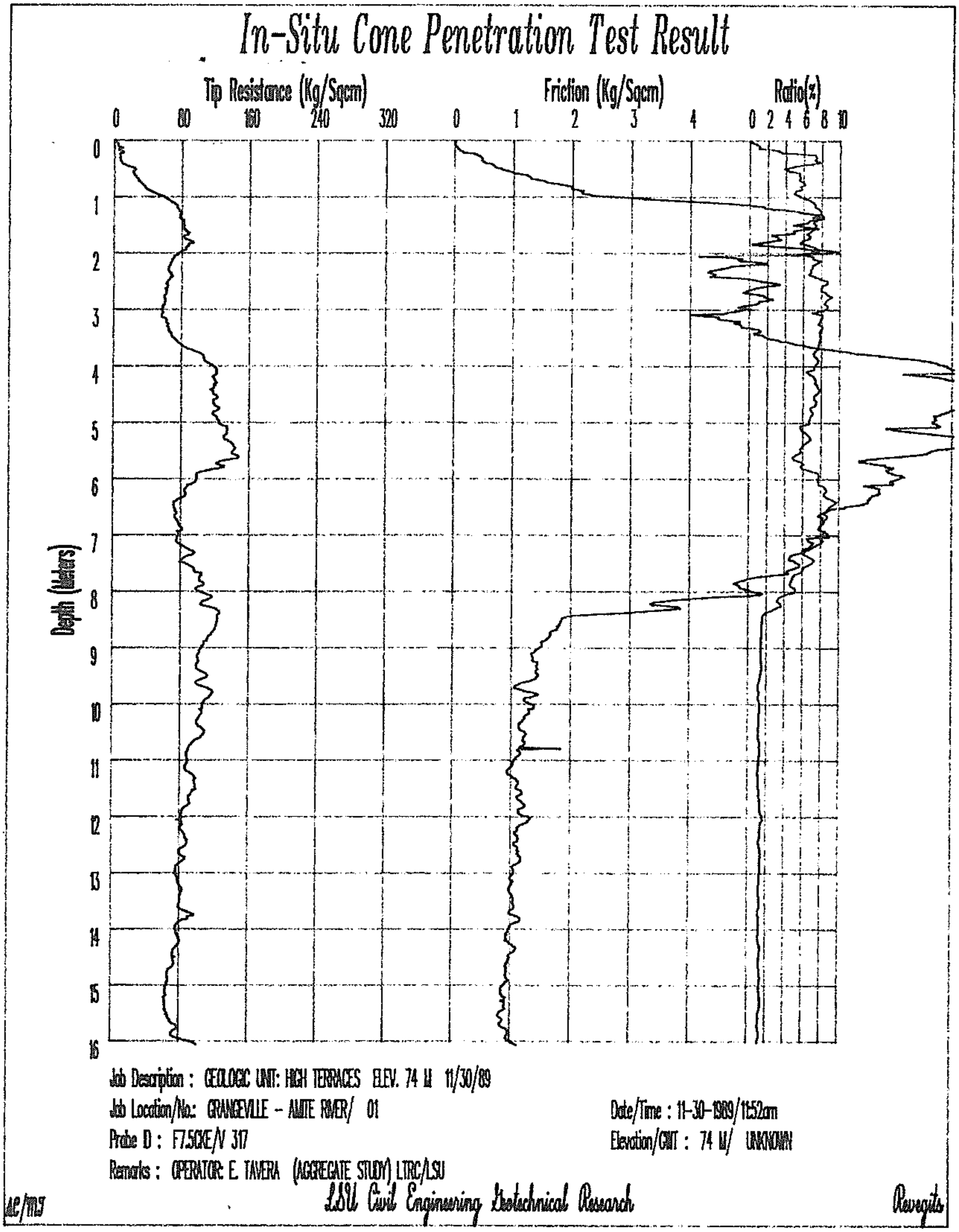

Figure 36. SOUNDING PLOT OF BORING G1

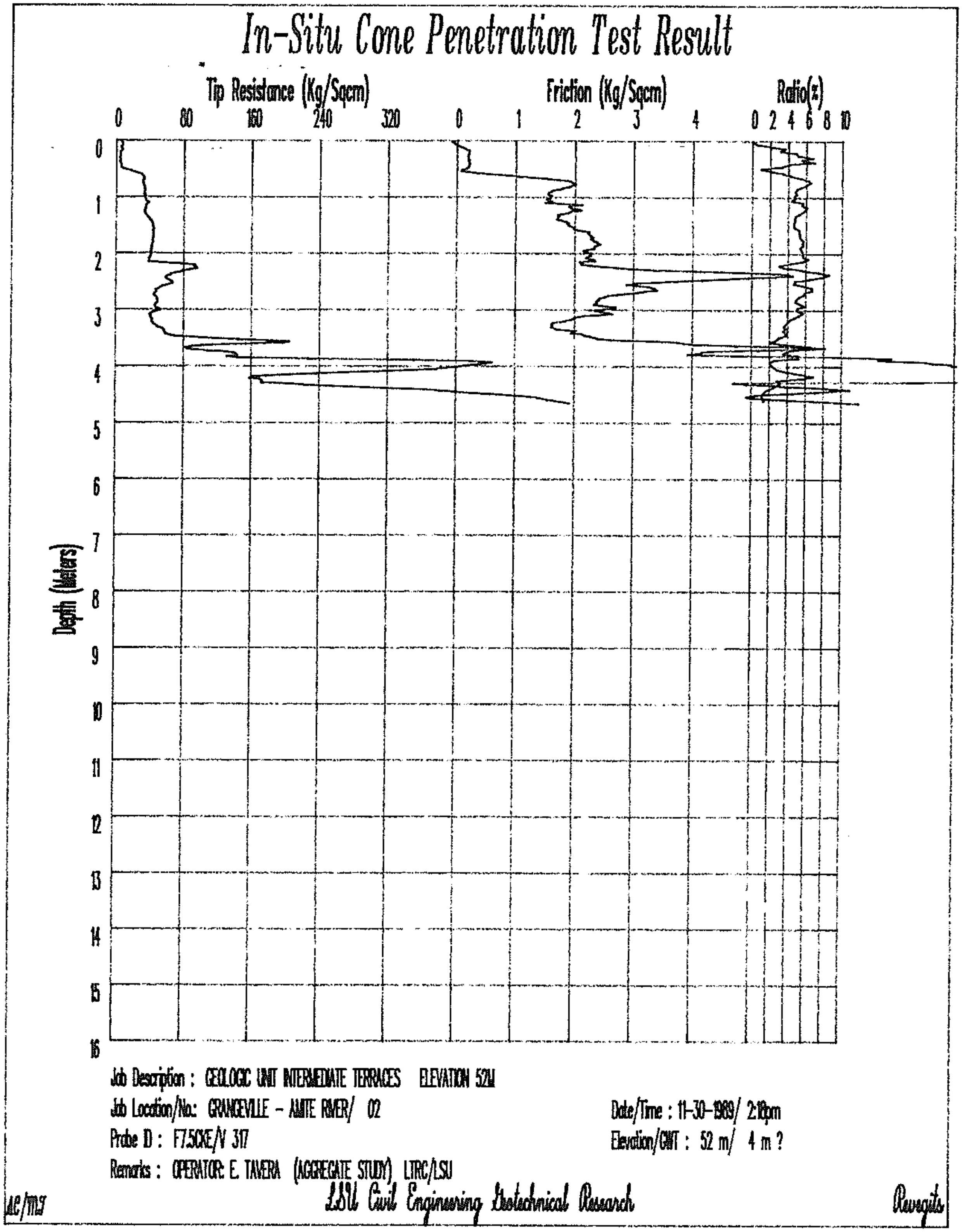

Figure 37. SOUNDING PLOT OF BORING G3

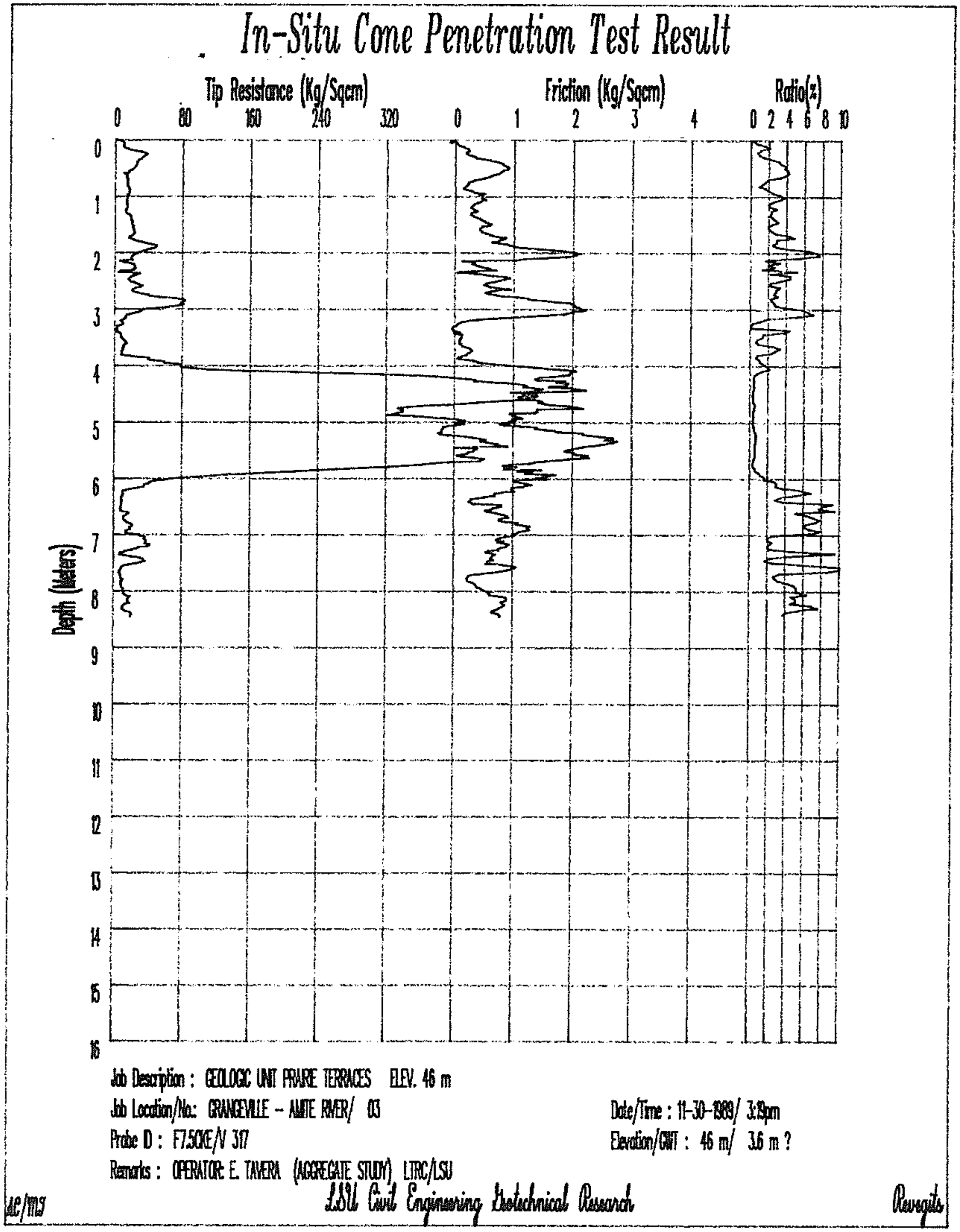

Figure 38. SOUNDING PLOT OF BORING G4

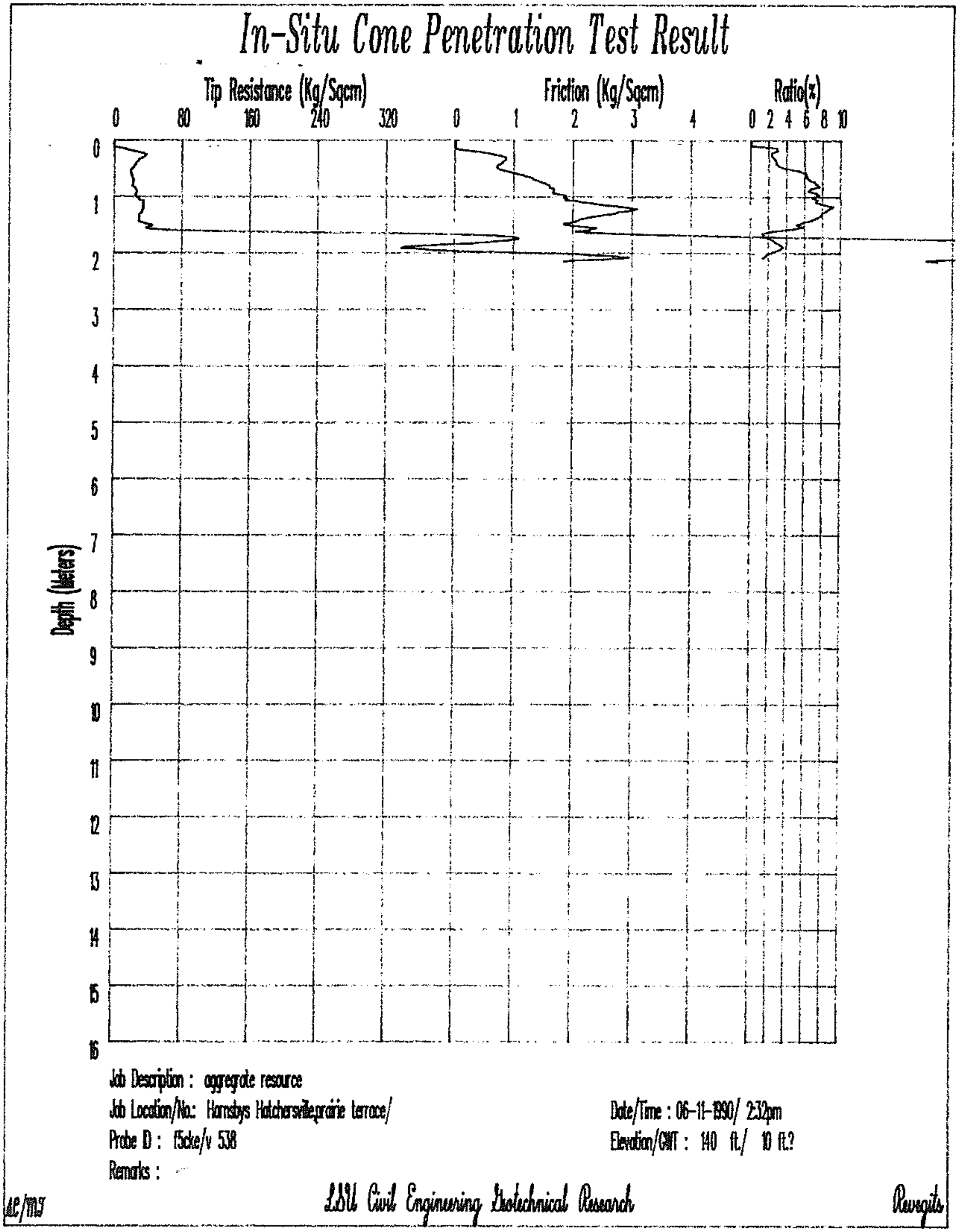

Figure 39. SOUNDING PLOT OF BORING G5

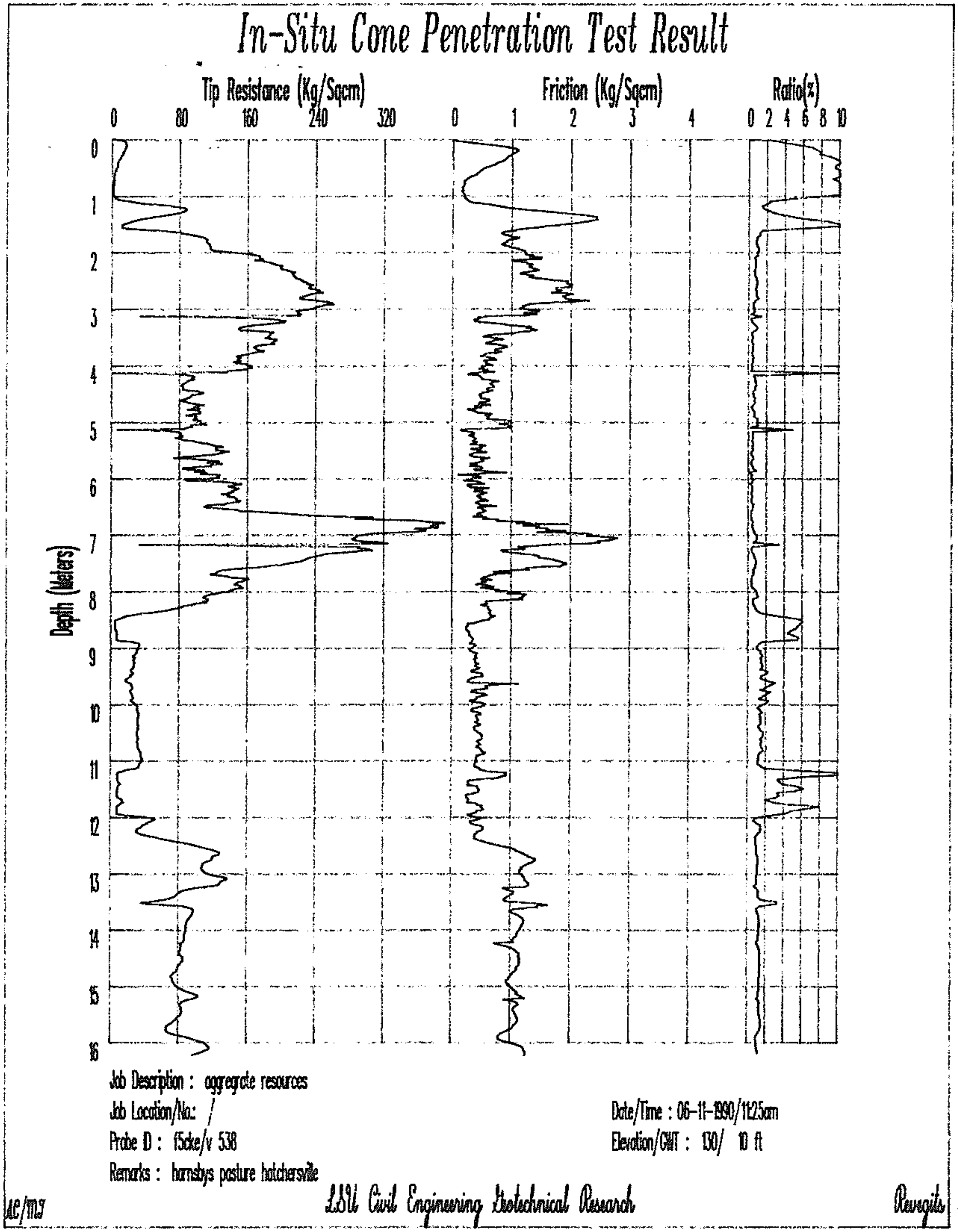

Figure 40. SOUNDING PLOT OF BORING G7

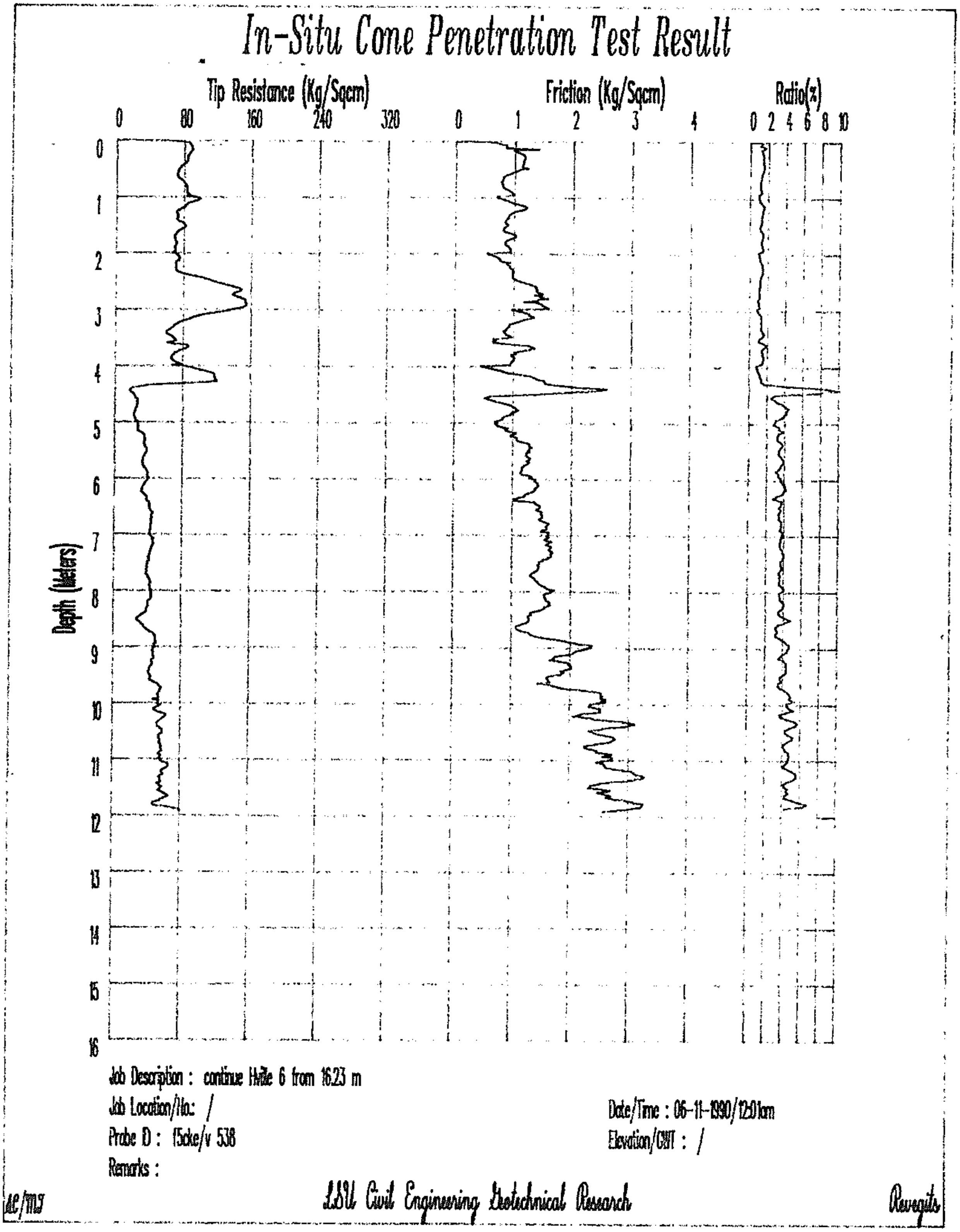

Figure 40. (Continued)

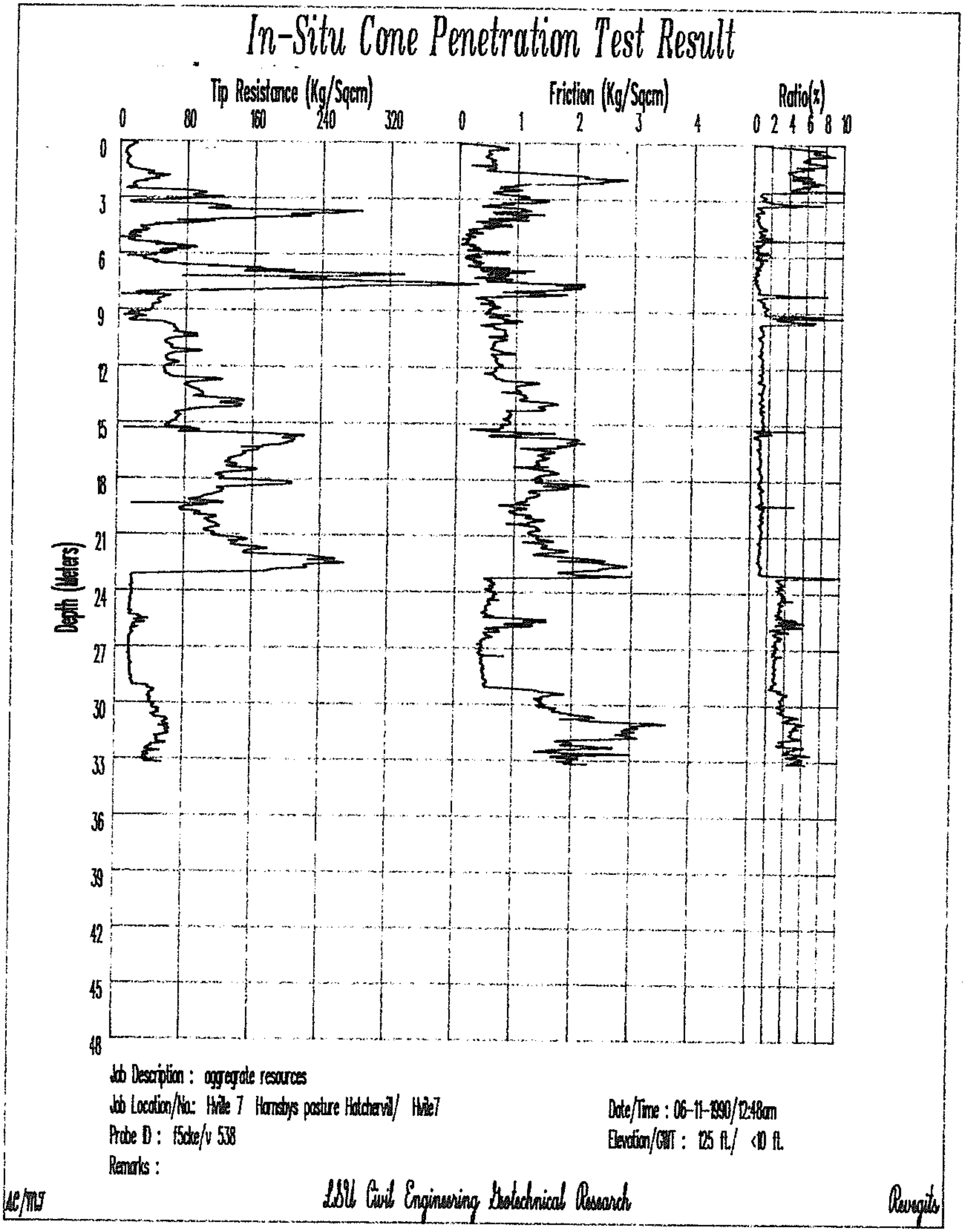

Figure 41. SOUNDING PLOT OF BORING G6

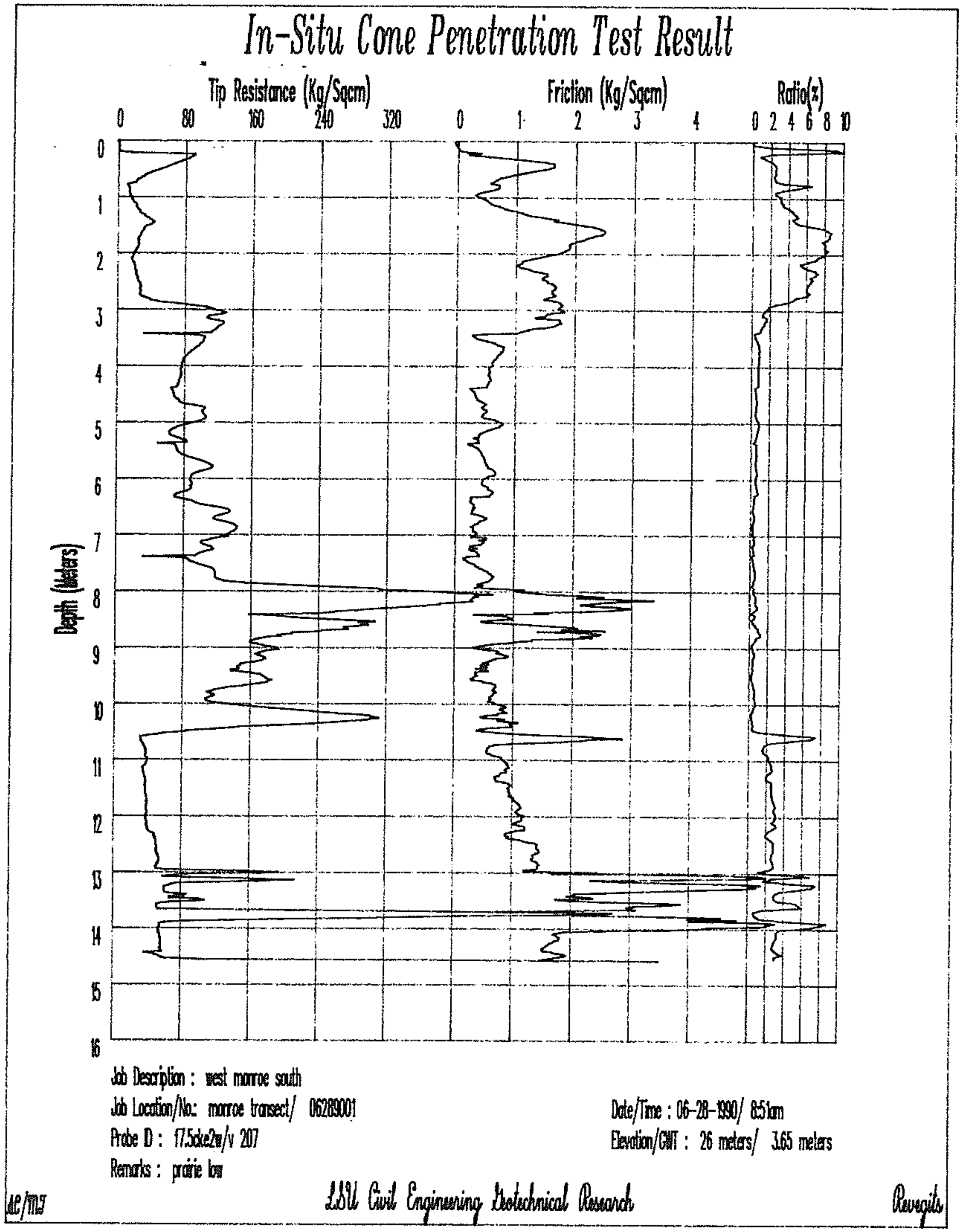

Figure 42. SOUNDING PLOT OF BORING M1

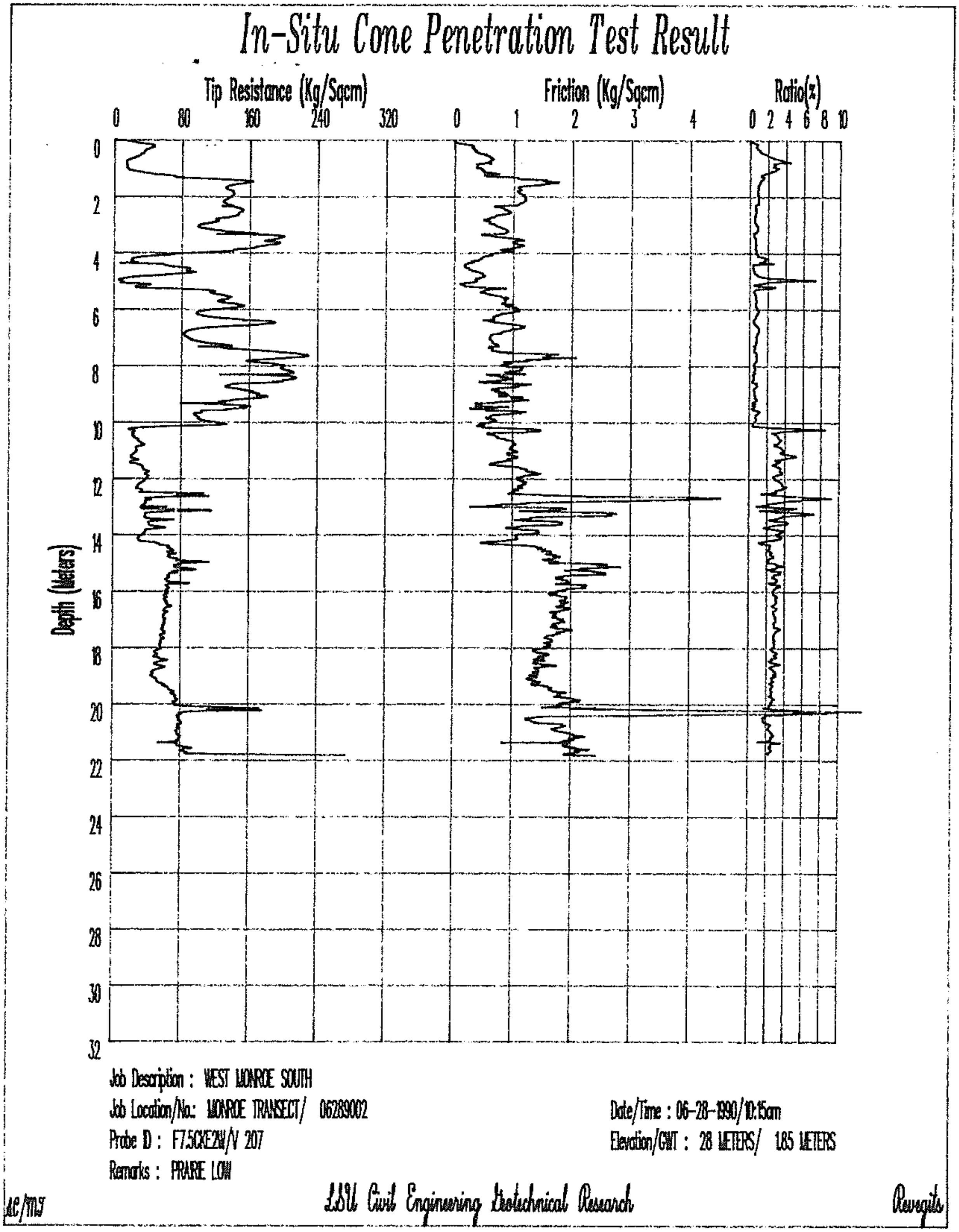

Figure 43. SOUNDING PLOT OF BORING M2

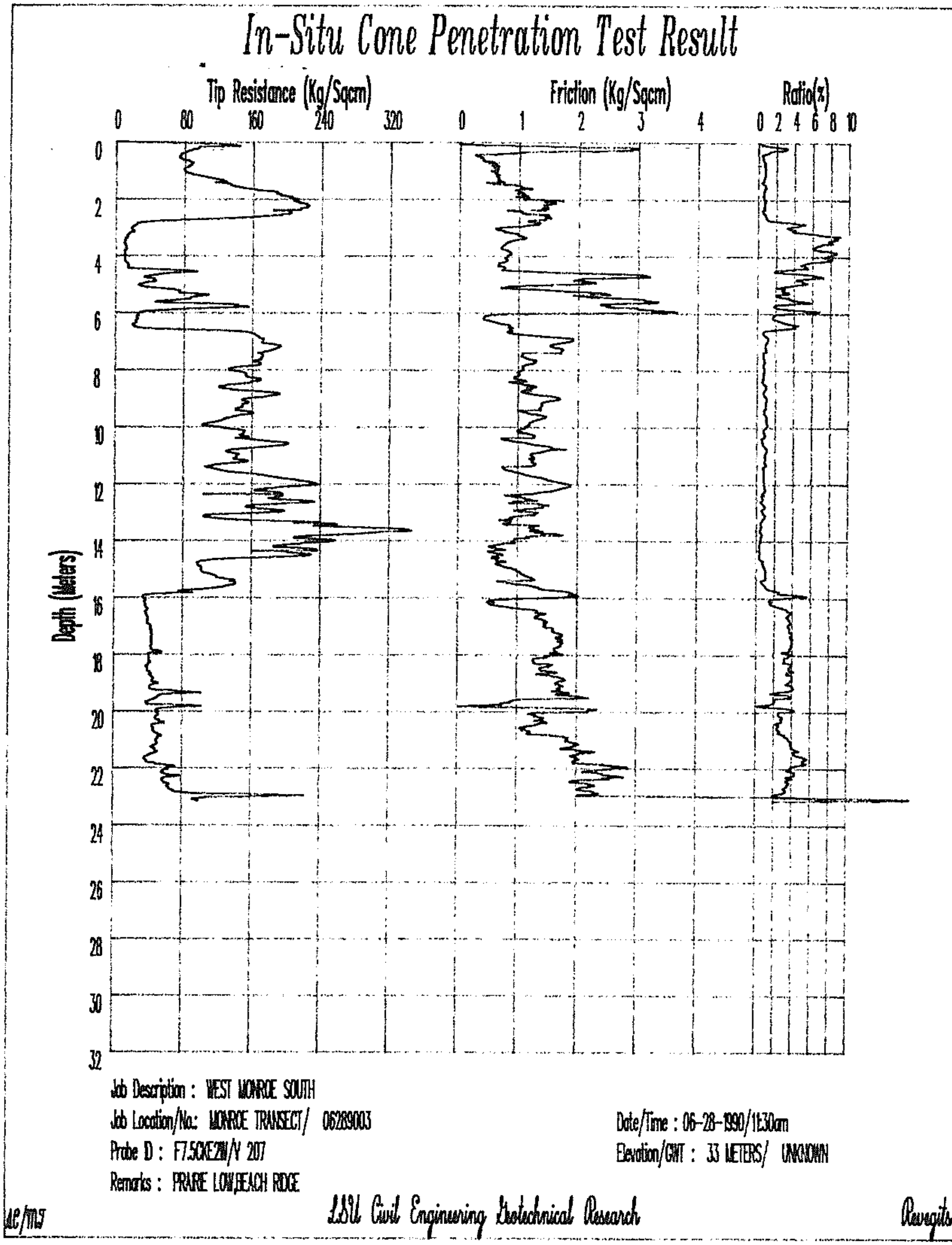

Figure 44. SOUNDING PLOT OF BORING M3

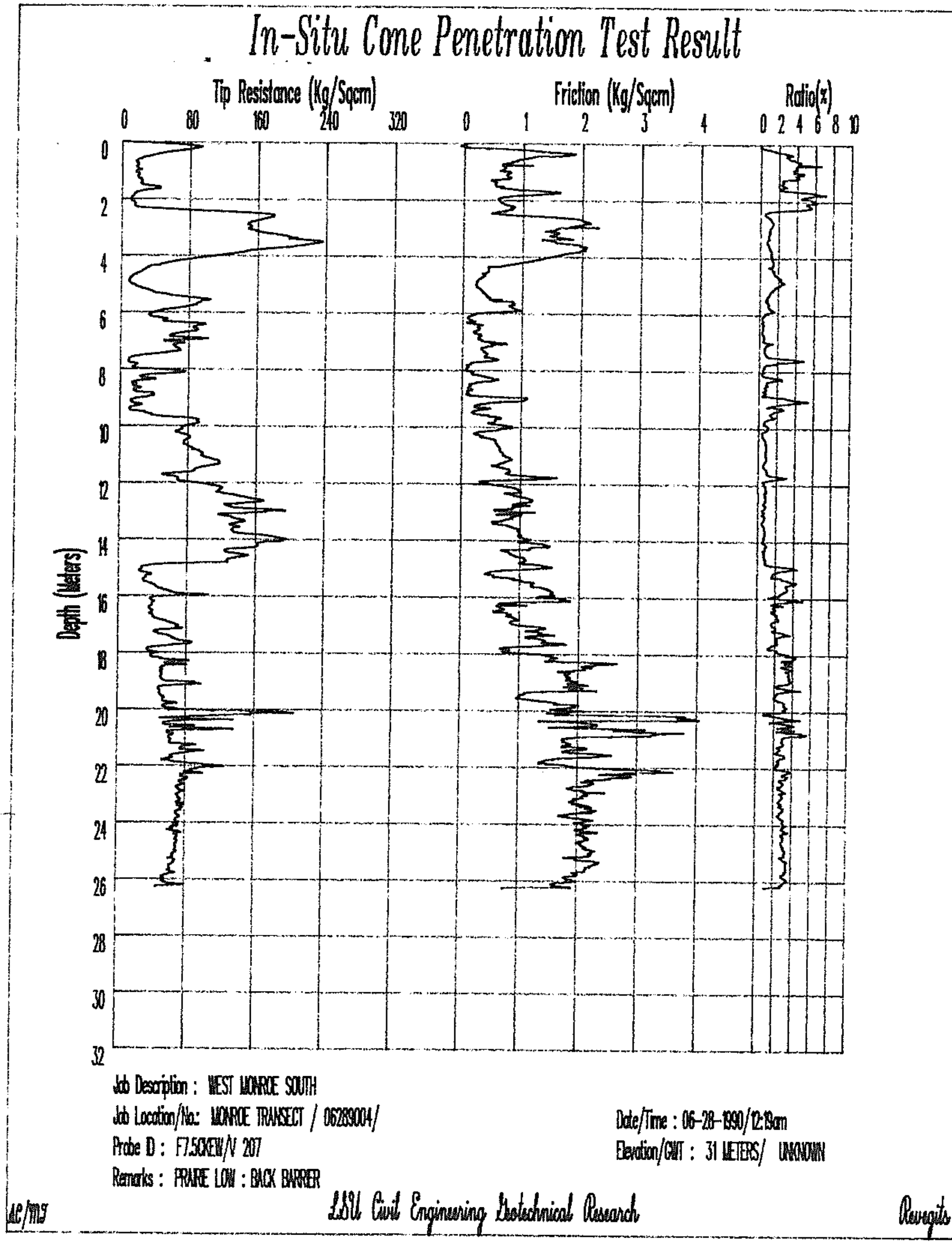

Figure 45. SOUNDING PLOT OF BORING M4

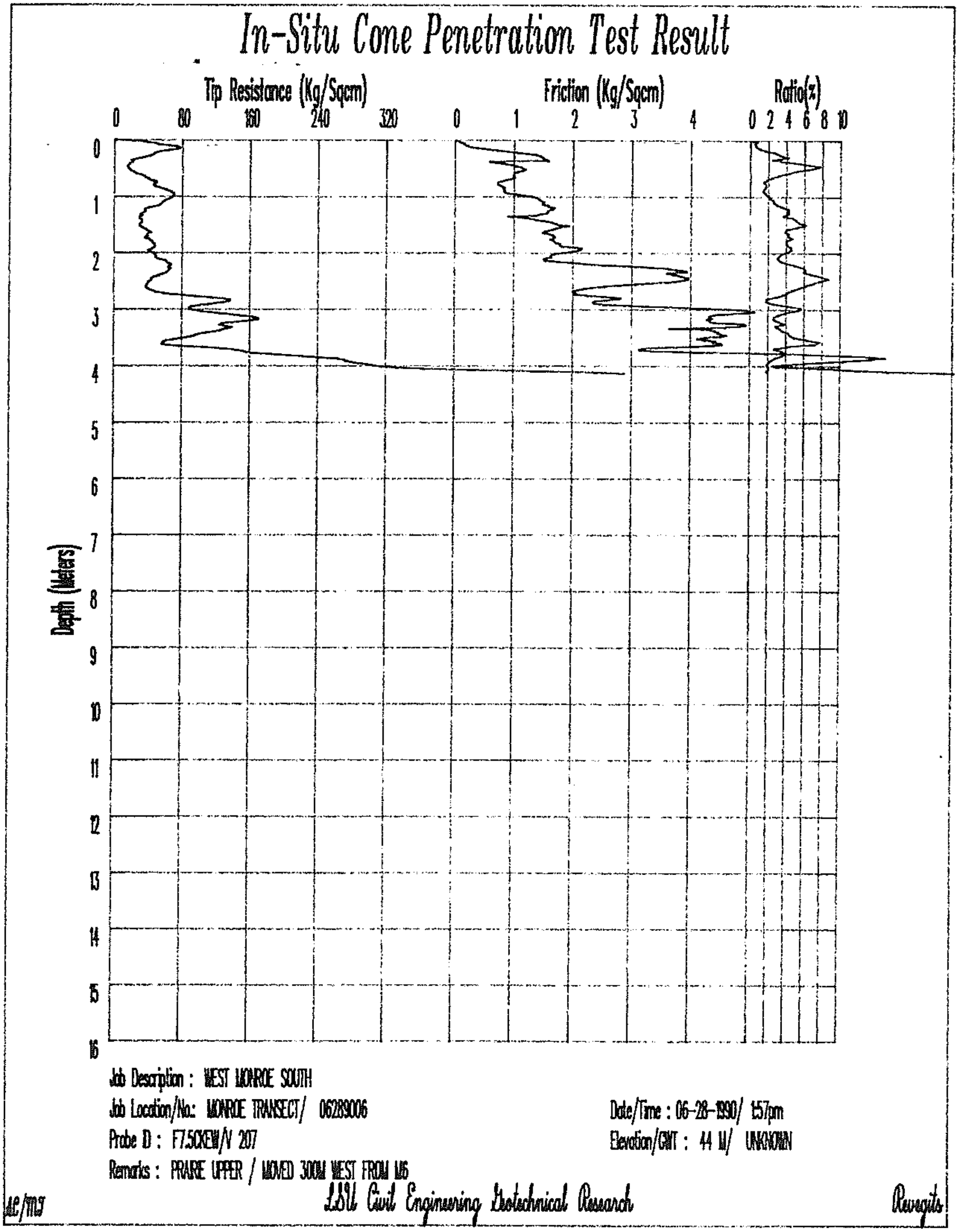

Figure 46. SOUNDING PLOT OF BORING M6A

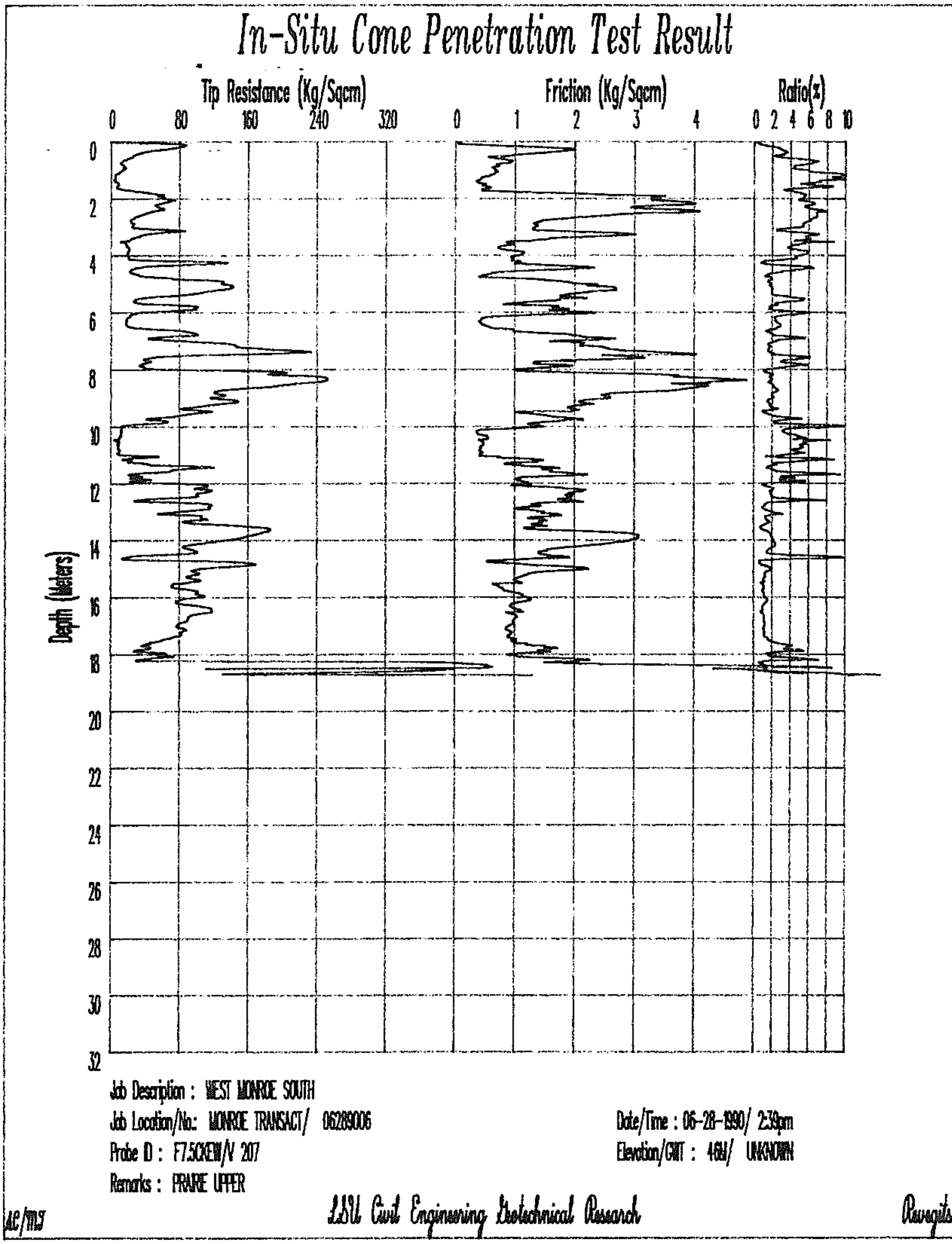

Figure 47. SOUNDING PLOT OF BORING M7

A1. COMPUTER SOIL CLASSIFICATION FROM CPT DATA OF G1

Date/Time : 11-30-1989/11:52am
Job Description :
GEOLOGIC UNIT: HIGH TERRACES ELEV. 74 M 11/30/89
Site Information : GRANGEVILLE - AMITE RIVER
Job Number : 01
Probe I.D. : F7.5CKE/V 317

LEGEND: fn = fine
Grn = grained

DEPTH (M)	CONE AVE	FRICT AVE	RATIO AVE(%)	CLASSIFICATION
0.02- 0.06	0.61	-0.006	-0.25	Undefined / Undefined
0.06- 0.14	4.35	0.043	0.97	Coh.-noncoh. fn grained/ Sandy clay
0.14- 0.16	9.33	0.093	1.00	Noncoh. coarse & fn Grn/ Clayey sand
0.16- 0.18	5.00	0.137	2.74	Coh.-noncoh. fn grained/ Sandy clay
0.18- 0.20	5.00	0.156	3.11	Cohesive fine grained / Soft inorg. clay
0.20- 0.24	10.27	0.361	3.51	Coh.-noncoh. fn grained/ Sandy clay
0.24- 0.48	8.50	0.559	6.83	Cohesive fine grained / Organic clay
0.48- 0.56	23.19	0.915	3.95	Coh.-noncoh. fn grained/ Sandy clay
0.56- 0.90	29.76	1.667	5.58	Cohesive fine grained /Very stiff inorg. clay
0.90- 0.92	43.54	2.166	4.97	Coh.-noncoh. fn grained/ Sandy clay
0.92- 0.94	44.82	2.284	5.10	Cohesive fine grained / Silty clay
0.94- 0.96	48.54	2.352	4.85	Coh.-noncoh. fn grained/ Sandy clay
0.96- 5.56	91.01	6.433	7.20	Cohesive fine grained /Very stiff inorg. clay
5.56- 5.68	143.77	7.128	4.96	Coh.-noncoh. fn grained/ Sandy clay
5.68- 7.68	87.21	6.506	7.60	Cohesive fine grained /Very stiff inorg. clay
7.68- 8.06	102.96	4.991	4.85	Coh.-noncoh. fn grained/ Sandy clay
8.06- 8.30	110.05	3.749	3.41	Noncoh. coarse & fn Grn/ Clayey silty sand
8.30-16.04	88.76	1.159	1.30	Noncoh. coarse grained / Sand

A2. COMPUTER SOIL CLASSIFICATION FROM CPT DATA OF G3

Date/Time : 11-30-1989/ 2:18pm
Job Description :
GEOLOGIC UNIT INTERMEDIATE TERRACES ELEVATION 52M
Site Information : GRANGEVILLE - AMITE RIVER
Job Number : 02
Probe I.D. : F7.5CKE/V 317

LEGEND: fn = fine
Grn = grained

DEPTH (M)	CONE AVE	FRICT AVE	RATIO AVE(%)	CLASSIFICATION
0.02- 0.06	5.91	-0.031	-0.54	Undefined / Undefined
0.06- 0.10	6.83	0.053	0.78	Noncoh. coarse & fn Grn/ Clayey sand
0.10- 0.12	6.22	0.124	2.00	Coh.-noncoh. fn grained/ Sandy clay
0.12- 0.16	4.97	0.174	3.50	Cohesive fine grained / Soft inorg. clay
0.16- 0.20	6.22	0.193	3.10	Coh.-noncoh. fn grained/ Sandy clay
0.20- 0.48	3.95	0.187	4.89	Cohesive fine grained / Soft inorg. clay
0.48- 0.50	5.61	0.074	1.33	Coh.-noncoh. fn grained/ Sandy clay
0.50- 0.58	14.01	0.271	1.70	Noncoh. coarse & fn Grn/ Clayey sand
0.58- 0.64	27.80	1.033	3.69	Coh.-noncoh. fn grained/ Sandy clay
0.64- 0.86	31.86	1.820	5.72	Cohesive fine grained /Very stiff inorg. clay
0.86- 0.94	32.99	1.548	4.69	Coh.-noncoh. fn grained/ Sandy clay
0.94- 0.98	32.38	1.581	4.88	Cohesive fine grained / Silty clay
0.98- 1.10	34.33	1.570	4.57	Coh.-noncoh. fn grained/ Sandy clay
1.10- 1.34	34.44	1.890	5.49	Cohesive fine grained /Very stiff inorg. clay
1.34- 1.58	40.92	1.886	4.61	Coh.-noncoh. fn grained/ Sandy clay
1.58- 2.18	41.42	2.258	5.46	Cohesive fine grained /Very stiff inorg. clay
2.18- 2.20	54.76	2.259	4.13	Coh.-noncoh. fn grained/ Sandy clay
2.20- 2.22	78.42	2.440	3.11	Noncoh. coarse & fn Grn/Clayey sands and silts
2.22- 2.24	93.35	2.695	2.89	Noncoh. coarse grained / Sand
2.24- 2.28	93.05	3.140	3.37	Noncoh. coarse & fn Grn/Clayey sands and silts
2.28- 2.30	95.24	4.046	4.25	Coh.-noncoh. fn grained/ Sandy clay
2.30- 2.50	67.21	4.746	7.10	Cohesive fine grained /Very stiff inorg. clay
2.50- 2.56	65.55	2.969	4.53	Coh.-noncoh. fn grained/ Sandy clay
2.56- 2.80	49.64	2.916	5.88	Cohesive fine grained /Very stiff inorg. clay
2.80- 2.90	48.54	2.352	4.85	Coh.-noncoh. fn grained/ Sandy clay
2.90- 2.98	45.90	2.575	5.61	Cohesive fine grained /Very stiff inorg. clay
2.98- 3.04	50.00	2.440	4.88	Coh.-noncoh. fn grained/ Sandy clay
3.04- 3.12	42.32	2.298	5.42	Cohesive fine grained /Very stiff inorg. clay
3.12- 3.28	41.85	1.745	4.18	Coh.-noncoh. fn grained/ Sandy clay
3.28- 3.34	47.71	1.660	3.48	Noncoh. coarse & fn Grn/Clayey sands and silts
3.34- 3.36	54.15	2.016	3.72	Coh.-noncoh. fn grained/ Sandy clay
3.36- 3.40	56.01	1.948	3.48	Noncoh. coarse & fn Grn/Clayey sands and silts
3.40- 3.42	56.65	2.123	3.75	Coh.-noncoh. fn grained/ Sandy clay
3.42- 3.44	58.48	2.166	3.70	Noncoh. coarse & fn Grn/Clayey sands and silts
3.44- 3.46	58.48	2.253	3.85	Coh.-noncoh. fn grained/ Sandy clay
3.46- 3.50	66.59	2.362	3.55	Noncoh. coarse & fn Grn/Clayey sands and silts
3.50- 3.62	154.15	3.693	2.48	Noncoh. coarse grained / Silty sand
3.62- 3.64	152.50	5.707	3.74	Noncoh. coarse & fn Grn/ Clayey silty sand
3.64- 3.70	94.80	5.747	6.11	Cohesive fine grained / Silty clay
3.70- 3.74	87.44	4.232	4.85	Coh.-noncoh. fn grained/ Sandy clay
3.74- 3.76	107.07	4.114	3.84	Noncoh. coarse & fn Grn/ Clayey silty sand
3.76- 3.78	131.34	3.909	2.98	Noncoh. coarse grained / Silty sand
3.78- 3.80	140.67	4.799	3.41	Noncoh. coarse & fn Grn/ Clayey silty sand
3.80- 3.84	142.22	6.955	4.89	Coh.-noncoh. fn grained/ Sandy clay
3.84- 3.86	130.68	7.132	5.46	Cohesive fine grained / Silty clay
3.86- 3.88	143.17	7.301	5.10	Coh.-noncoh. fn grained/ Sandy clay
3.88- 3.90	226.53	7.935	3.50	Noncoh. coarse & fn Grn/ Clayey silty sand

A2. (Continued)

DEPTH (M)	CONE AVE	FRICT AVE	RATIO AVE(%)	CLASSIFICATION
3.90- 4.10	398.51	9.394	2.38	Noncoh. coarse grained / Silty sand
4.10- 4.12	308.72	11.838	3.83	Noncoh. coarse & fn Grn/ Clayey silty sand
4.12- 4.16	253.02	12.724	5.05	Coh.-noncoh. fn grained/ Sandy clay
4.16- 4.24	174.58	11.027	6.31	Cohesive fine grained / Silty clay
4.24- 4.26	169.94	7.792	4.58	Coh.-noncoh. fn grained/ Sandy clay
4.26- 4.64	356.59	5.684	1.83	Noncoh. coarse grained /Dense or cemented sand

A3. COMPUTER SOIL CLASSIFICATION FROM CPT DATA OF G4

Date/Time : 11-30-1989/ 3:19pm
Job Description :
GEOLOGIC UNIT PRAIRIE TERRACES ELEV. 46 m
Site Information : GRANGEVILLE - AMITE RIVER
Job Number : 03
Probe I.D. : F7.5CKE/V 317

LEGEND: fn = fine
Grn = grained

DEPTH (M)	CONE AVE	FRICT AVE	RATIO AVE(%)	CLASSIFICATION
0.02- 0.12	9.08	0.081	0.85	Noncoh. coarse & fn Grn/ Clayey sand
0.12- 0.16	9.97	0.211	2.13	Coh.-noncoh. fn grained/ Sandy clay
0.16- 0.18	13.71	0.230	1.68	Noncoh. coarse & fn Grn/ Clayey sand
0.18- 0.34	30.42	0.314	1.03	Noncoh. coarse grained / Sand
0.34- 0.40	27.80	0.735	2.66	Noncoh. coarse & fn Grn/Clayey sands and silts
0.40- 0.56	22.87	0.829	3.65	Coh.-noncoh. fn grained/ Sandy clay
0.56- 0.58	15.55	0.722	4.64	Cohesive fine grained / Stiff inorg. clay
0.58- 0.60	15.55	0.648	4.16	Coh.-noncoh. fn grained/ Sandy clay
0.60- 0.62	9.94	0.598	6.01	Cohesive fine grained / Organic clay
0.62- 0.68	13.27	0.485	3.64	Coh.-noncoh. fn grained/ Sandy clay
0.68- 0.82	14.06	0.216	1.54	Noncoh. coarse & fn Grn/ Clayey sand
0.82- 0.86	15.24	0.149	0.98	Noncoh. coarse grained / Loose sand
0.86- 0.92	16.60	0.295	1.77	Noncoh. coarse & fn Grn/ Clayey sand
0.92- 0.94	16.16	0.498	3.08	Coh.-noncoh. fn grained/ Sandy clay
0.94- 0.96	16.16	0.386	2.39	Noncoh. coarse & fn Grn/Clayey sands and silts
0.96- 1.10	13.97	0.436	3.13	Coh.-noncoh. fn grained/ Sandy clay
1.10- 1.22	13.81	0.290	2.10	Noncoh. coarse & fn Grn/Clayey sands and silts
1.22- 1.26	12.75	0.349	2.73	Coh.-noncoh. fn grained/ Sandy clay
1.26- 1.44	16.04	0.367	2.26	Noncoh. coarse & fn Grn/Clayey sands and silts
1.44- 1.50	19.49	0.579	2.97	Coh.-noncoh. fn grained/ Sandy clay
1.50- 1.68	21.65	0.479	2.20	Noncoh. coarse & fn Grn/Clayey sands and silts
1.68- 1.72	20.55	0.787	3.84	Coh.-noncoh. fn grained/ Sandy clay
1.72- 1.76	16.19	0.784	4.84	Cohesive fine grained / Stiff inorg. clay
1.76- 1.78	19.27	0.722	3.75	Coh.-noncoh. fn grained/ Sandy clay
1.78- 1.88	31.73	0.838	2.68	Noncoh. coarse & fn Grn/Clayey sands and silts
1.88- 1.90	49.15	1.139	2.32	Noncoh. coarse grained / Sand
1.90- 1.94	47.93	1.519	3.18	Noncoh. coarse & fn Grn/Clayey sands and silts
1.94- 1.96	41.71	1.855	4.45	Coh.-noncoh. fn grained/ Sandy clay
1.96- 2.12	25.83	1.717	6.69	Cohesive fine grained /Very stiff inorg. clay
2.12- 2.14	18.66	0.112	0.60	Noncoh. coarse grained / Loose sand
2.14- 2.16	20.55	0.336	1.64	Noncoh. coarse & fn Grn/ Clayey sand
2.16- 2.18	5.61	0.280	4.99	Cohesive fine grained / Medium inorg. clay
2.18- 2.20	10.60	0.342	3.23	Coh.-noncoh. fn grained/ Sandy clay
2.20- 2.30	22.28	0.530	2.36	Noncoh. coarse & fn Grn/Clayey sands and silts
2.30- 2.34	21.77	0.149	0.69	Noncoh. coarse grained / Sand
2.34- 2.36	6.22	0.318	5.11	Cohesive fine grained / Medium inorg. clay
2.36- 2.38	3.72	0.504	13.55	Undefined / Undefined
2.38- 2.40	29.27	0.641	2.19	Noncoh. coarse & fn Grn/Clayey sands and silts
2.40- 2.44	23.33	0.883	3.84	Coh.-noncoh. fn grained/ Sandy clay
2.44- 2.46	18.66	0.840	4.50	Cohesive fine grained / Stiff inorg. clay
2.46- 2.48	17.44	0.753	4.32	Coh.-noncoh. fn grained/ Sandy clay
2.48- 2.50	15.55	0.691	4.44	Cohesive fine grained / Stiff inorg. clay
2.50- 2.54	17.44	0.544	3.13	Coh.-noncoh. fn grained/ Sandy clay
2.54- 2.62	27.38	0.593	2.16	Noncoh. coarse & fn Grn/Clayey sands and silts
2.62- 2.64	29.27	0.946	3.23	Coh.-noncoh. fn grained/ Sandy clay
2.64- 2.80	28.09	0.762	2.70	Noncoh. coarse & fn Grn/Clayey sands and silts
2.80- 2.96	75.23	1.823	2.43	Noncoh. coarse grained / Sand

A3. (Continued)

DEPTH (M)	CONE AVE	FRICT AVE	RATIO AVE(%)	CLASSIFICATION
2.96- 3.00	64.11	2.169	3.40	Noncoh. coarse & fn Grn/Clayey sands and silts
3.00- 3.02	47.93	2.129	4.44	Coh.-noncoh. fn grained/ Sandy clay
3.02- 3.16	22.86	1.441	6.31	Cohesive fine grained /Very stiff inorg. clay
3.16- 3.18	12.44	0.386	3.10	Coh.-noncoh. fn grained/ Sandy clay
3.18- 3.28	8.84	0.083	0.90	Noncoh. coarse & fn Grn/ Clayey sand
3.28- 3.38	4.36	-0.037	-1.29	Undefined / Undefined
3.38- 3.40	1.89	0.081	4.30	Cohesive fine grained /Very soft inorg. clay
3.40- 3.42	2.50	-0.019	-0.76	Undefined / Undefined
3.42- 3.44	3.11	0.118	3.80	Cohesive fine grained /Very soft inorg. clay
3.44- 3.46	6.83	0.106	1.55	Coh.-noncoh. fn grained/ Sandy clay
3.46- 3.56	7.95	0.084	1.08	Noncoh. coarse & fn Grn/ Clayey sand
3.56- 3.64	12.76	0.093	0.72	Noncoh. coarse grained / Loose sand
3.64- 3.66	11.22	0.187	1.66	Noncoh. coarse & fn Grn/ Clayey sand
3.66- 3.80	9.07	0.240	2.64	Coh.-noncoh. fn grained/ Sandy clay
3.80- 3.84	7.78	0.087	1.11	Noncoh. coarse & fn Grn/ Clayey sand
3.84- 6.06	338.85	1.543	0.60	Noncoh. coarse grained /Shell sand or limerock
6.06- 6.18	38.18	1.132	2.97	Noncoh. coarse & fn Grn/Clayey sands and silts
6.18- 6.20	27.38	0.996	3.64	Coh.-noncoh. fn grained/ Sandy clay
6.20- 6.34	11.73	0.679	5.85	Cohesive fine grained / Stiff inorg. clay
6.34- 6.42	8.41	0.269	3.21	Coh.-noncoh. fn grained/ Sandy clay
6.42- 7.00	13.06	0.897	7.12	Cohesive fine grained / Organic clay
7.00- 7.02	21.77	0.877	4.03	Coh.-noncoh. fn grained/ Sandy clay
7.02- 7.04	29.88	0.790	2.65	Noncoh. coarse & fn Grn/Clayey sands and silts
7.04- 7.08	36.10	0.722	2.00	Noncoh. coarse grained / Sand
7.08- 7.10	34.87	0.834	2.39	Noncoh. coarse & fn Grn/Clayey sands and silts
7.10- 7.12	36.71	0.734	2.00	Noncoh. coarse grained / Sand
7.12- 7.18	37.36	0.892	2.39	Noncoh. coarse & fn Grn/Clayey sands and silts
7.18- 7.24	40.87	0.803	1.96	Noncoh. coarse grained / Sand
7.24- 7.28	27.07	0.663	2.44	Noncoh. coarse & fn Grn/Clayey sands and silts
7.28- 7.30	19.27	0.535	2.78	Coh.-noncoh. fn grained/ Sandy clay
7.30- 7.36	10.79	0.666	6.75	Cohesive fine grained / Organic clay
7.36- 7.38	6.22	0.635	10.21	Undefined / Undefined
7.38- 7.40	12.44	0.629	5.05	Cohesive fine grained / Stiff inorg. clay
7.40- 7.42	19.27	0.604	3.13	Coh.-noncoh. fn grained/ Sandy clay
7.42- 7.44	29.88	0.666	2.23	Noncoh. coarse & fn Grn/Clayey sands and silts
7.44- 7.50	35.26	0.558	1.59	Noncoh. coarse grained / Sand
7.50- 7.52	32.38	0.809	2.50	Noncoh. coarse & fn Grn/Clayey sands and silts
7.52- 7.54	25.49	0.959	3.76	Coh.-noncoh. fn grained/ Sandy clay
7.54- 7.58	14.63	1.033	7.30	Cohesive fine grained / Organic clay
7.58- 7.64	8.29	0.869	10.50	Undefined / Undefined
7.64- 7.70	6.02	0.473	7.74	Cohesive fine grained / Organic clay
7.70- 7.84	8.35	0.246	2.96	Coh.-noncoh. fn grained/ Sandy clay
7.84- 8.38	12.27	0.667	5.47	Cohesive fine grained / Stiff inorg. clay
8.38- 8.44	20.12	0.776	3.86	Coh.-noncoh. fn grained/ Sandy clay

A4. COMPUTER SOIL CLASSIFICATION FROM CPT DATA OF G5

Date/Time : 06-11-1990/ 2:32pm
Job Description :
aggregate resource
Site Information : Hornsbys Hatchersville,prairie terrace
Job Number :
Probe I.D. : f5cke/v 538

LEGEND: fn = fine
Grn = grained

DEPTH (M)	CONE AVE	FRICT AVE	RATIO AVE(%)	CLASSIFICATION
0.02- 0.04	0.00	0.006	0.00	Undefined / Undefined
0.04- 0.06	-0.61	-0.006	1.00	Cohesive fine grained / Organic clay
0.06- 0.14	-0.61	0.015	-0.63	Undefined / Undefined
0.14- 0.20	11.81	0.326	2.77	Coh.-noncoh. fn grained/ Sandy clay
0.20- 0.46	29.83	0.769	2.61	Noncoh. coarse & fn Grn/Clayey sands and silts
0.46- 0.52	22.20	0.770	3.48	Coh.-noncoh. fn grained/ Sandy clay
0.52- 1.58	27.99	1.960	6.97	Cohesive fine grained /Very stiff inorg. clay
1.58- 1.60	43.54	2.041	4.69	Coh.-noncoh. fn grained/ Sandy clay
1.60- 1.62	61.59	2.234	3.63	Noncoh. coarse & fn Grn/Clayey sands and silts
1.62- 1.88	394.59	8.725	2.18	Noncoh. coarse grained / Silty sand
1.88- 1.94	346.87	12.284	3.54	Noncoh. coarse & fn Grn/ Clayey silty sand
1.94- 2.14	506.68	9.894	2.07	Noncoh. coarse grained / Silty sand

A5. COMPUTER SOIL CLASSIFICATION FROM CPT DATA OF G6A

Date/Time : 06-11-1990/11:25am
Job Description :
aggregate resources
Site Information :
Job Number :
Probe I.D. : f5cke/v 538

LEGEND: fn = fine
Grn = grained

DEPTH (M)	CONE AVE	FRICT AVE	RATIO AVE(%)	CLASSIFICATION
0.02- 0.08	14.11	0.475	3.32	Coh.-noncoh. fn grained/ Sandy clay
0.08- 0.36	13.11	0.956	7.52	Cohesive fine grained / Organic clay
0.36- 0.46	6.46	0.688	10.66	Undefined / Undefined
0.46- 0.52	5.61	0.502	9.01	Cohesive fine grained / Organic clay
0.52- 0.70	2.77	0.326	12.01	Undefined / Undefined
0.70- 0.76	1.89	0.180	9.57	Cohesive fine grained / Organic clay
0.76- 0.80	1.22	0.171	14.00	Undefined / Undefined
0.80- 0.82	1.89	0.149	7.92	Cohesive fine grained / Organic clay
0.82- 1.00	0.95	0.167	19.83	Undefined / Undefined
1.00- 1.08	4.04	0.238	6.53	Cohesive fine grained / Organic clay
1.08- 1.10	12.44	0.336	2.70	Coh.-noncoh. fn grained/ Sandy clay
1.10- 1.14	25.82	0.572	2.22	Noncoh. coarse & fn Grn/Clayey sands and silts
1.14- 1.32	73.93	1.398	1.88	Noncoh. coarse grained / Sand
1.32- 1.36	69.09	2.380	3.46	Noncoh. coarse & fn Grn/Clayey sands and silts
1.36- 1.38	56.65	2.415	4.26	Coh.-noncoh. fn grained/ Sandy clay
1.38- 1.50	31.02	2.123	7.34	Cohesive fine grained /Very stiff inorg. clay
1.50- 1.56	12.05	1.403	11.66	Undefined / Undefined
1.56- 1.60	14.33	1.036	7.49	Cohesive fine grained / Organic clay
1.60- 1.62	34.87	0.852	2.44	Noncoh. coarse & fn Grn/Clayey sands and silts
1.62- 4.14	178.93	1.101	0.64	Noncoh. coarse grained /Dense or cemented sand
4.14- 4.16	1.22	0.442	36.13	Undefined / Undefined
4.16- 5.14	94.33	0.590	0.63	Noncoh. coarse grained / Sand
5.14- 5.16	6.83	0.330	4.83	Cohesive fine grained / Medium inorg. clay
5.16- 7.18	173.66	0.771	0.42	Noncoh. coarse grained /Shell sand or limerock
7.18- 7.20	32.99	1.114	3.38	Coh.-noncoh. fn grained/ Sandy clay
7.20- 8.42	157.54	0.962	0.67	Noncoh. coarse grained /Dense or cemented sand
8.42- 8.44	26.16	0.660	2.52	Noncoh. coarse & fn Grn/Clayey sands and silts
8.44- 8.46	17.44	0.629	3.60	Coh.-noncoh. fn grained/ Sandy clay
8.46- 8.88	6.37	0.330	5.34	Cohesive fine grained / Medium inorg. clay
8.88- 8.90	12.44	0.299	2.40	Coh.-noncoh. fn grained/ Sandy clay
8.90- 9.40	28.46	0.384	1.37	Noncoh. coarse grained / Sand
9.40- 9.50	24.15	0.474	1.96	Noncoh. coarse & fn Grn/ Clayey sand
9.50- 9.56	21.36	0.301	1.41	Noncoh. coarse grained / Sand
9.56- 9.60	17.13	0.305	1.79	Noncoh. coarse & fn Grn/ Clayey sand
9.60- 9.62	18.66	1.114	5.97	Cohesive fine grained /Very stiff inorg. clay
9.62- 9.64	21.77	0.660	3.03	Coh.-noncoh. fn grained/ Sandy clay
9.64- 9.72	24.42	0.566	2.32	Noncoh. coarse & fn Grn/Clayey sands and silts
9.72- 9.76	24.57	0.336	1.37	Noncoh. coarse grained / Sand
9.76- 9.84	23.17	0.519	2.24	Noncoh. coarse & fn Grn/Clayey sands and silts
9.84- 9.94	25.26	0.375	1.48	Noncoh. coarse grained / Sand
9.94-10.00	25.73	0.546	2.13	Noncoh. coarse & fn Grn/Clayey sands and silts
10.00-11.16	32.39	0.446	1.38	Noncoh. coarse grained / Sand
11.16-11.18	21.16	0.672	3.18	Coh.-noncoh. fn grained/ Sandy clay
11.18-11.22	13.69	0.914	6.89	Cohesive fine grained / Organic clay
11.22-11.28	7.67	0.859	11.20	Undefined / Undefined
11.28-11.34	7.89	0.477	5.99	Cohesive fine grained / Organic clay

A5. (Continued)

DEPTH (M)	CONE AVE	FRICT AVE	RATIO AVE(%)	CLASSIFICATION
11.34-11.38	8.41	0.277	3.29	Coh.-noncoh. fn grained/ Sandy clay
11.38-11.40	8.11	0.293	3.61	Cohesive fine grained / Medium inorg. clay
11.40-11.44	10.91	0.351	3.20	Coh.-noncoh. fn grained/ Sandy clay
11.44-11.58	8.00	0.420	5.25	Cohesive fine grained / Medium inorg. clay
11.58-11.62	7.44	0.249	3.34	Coh.-noncoh. fn grained/ Sandy clay
11.62-11.64	7.44	0.262	3.51	Cohesive fine grained / Medium inorg. clay
11.64-11.70	9.96	0.285	2.95	Coh.-noncoh. fn grained/ Sandy clay
11.70-11.72	13.71	0.268	1.95	Noncoh. coarse & fn Grn/ Clayey sand
11.72-11.76	14.33	0.426	2.98	Coh.-noncoh. fn grained/ Sandy clay
11.76-11.96	8.02	0.434	5.55	Cohesive fine grained / Organic clay
11.96-11.98	10.60	0.386	3.64	Coh.-noncoh. fn grained/ Sandy clay
11.98-12.00	24.27	0.510	2.10	Noncoh. coarse & fn Grn/Clayey sands and silts
12.00-13.50	88.64	0.939	1.08	Noncoh. coarse grained / Sand
13.50-13.52	46.70	1.519	3.25	Noncoh. coarse & fn Grn/Clayey sands and silts
13.52-13.54	36.10	1.624	4.50	Coh.-noncoh. fn grained/ Sandy clay
13.54-13.56	44.21	1.444	3.27	Noncoh. coarse & fn Grn/Clayey sands and silts
13.56-16.20	85.67	1.076	1.27	Noncoh. coarse grained / Sand

A6. COMPUTER SOIL CLASSIFICATION FROM CPT DATA OF G6B

Date/Time : 06-11-1990/12:01am
Job Description :
continue Hville 6 from 16.23 m
Site Information :
Job Number :
Probe I.D. : f5cke/v 538

LEGEND: fn = fine
Grn = grained

DEPTH (M)	CONE AVE	FRICT AVE	RATIO AVE(%)	CLASSIFICATION
0.02- 4.34	87.53	1.017	1.19	Noncoh. coarse grained / Sand
4.34- 4.36	53.53	2.216	4.14	Coh.-noncoh. fn grained/ Sandy clay
4.36- 4.40	32.38	2.527	7.89	Cohesive fine grained / Organic clay
4.40- 4.44	18.99	2.103	11.06	Undefined / Undefined
4.44- 4.50	18.05	1.315	7.40	Cohesive fine grained / Organic clay
4.50- 4.64	23.92	0.648	2.69	Noncoh. coarse & fn Grn/Clayey sands and silts
4.64- 4.94	24.02	0.936	3.90	Coh.-noncoh. fn grained/ Sandy clay
4.94- 5.06	25.62	0.730	2.85	Noncoh. coarse & fn Grn/Clayey sands and silts
5.06- 5.08	26.77	0.902	3.37	Coh.-noncoh. fn grained/ Sandy clay
5.08- 5.10	27.38	0.852	3.11	Noncoh. coarse & fn Grn/Clayey sands and silts
5.10- 5.20	27.27	0.966	3.55	Coh.-noncoh. fn grained/ Sandy clay
5.20- 5.32	34.24	1.054	3.08	Noncoh. coarse & fn Grn/Clayey sands and silts
5.32- 5.46	34.94	1.271	3.64	Coh.-noncoh. fn grained/ Sandy clay
5.46- 5.56	37.33	1.238	3.32	Noncoh. coarse & fn Grn/Clayey sands and silts
5.56- 5.80	33.61	1.221	3.63	Coh.-noncoh. fn grained/ Sandy clay
5.80- 5.96	37.43	1.191	3.18	Noncoh. coarse & fn Grn/Clayey sands and silts
5.96- 6.00	38.29	1.357	3.54	Coh.-noncoh. fn grained/ Sandy clay
6.00- 6.02	40.43	1.363	3.37	Noncoh. coarse & fn Grn/Clayey sands and silts
6.02- 6.30	34.41	1.335	3.89	Coh.-noncoh. fn grained/ Sandy clay
6.30- 6.38	37.19	1.063	2.86	Noncoh. coarse & fn Grn/Clayey sands and silts
6.38- 6.50	39.63	1.424	3.60	Coh.-noncoh. fn grained/ Sandy clay
6.50- 6.54	41.40	1.401	3.38	Noncoh. coarse & fn Grn/Clayey sands and silts
6.54- 6.58	41.40	1.481	3.58	Coh.-noncoh. fn grained/ Sandy clay
6.58- 6.74	44.10	1.487	3.37	Noncoh. coarse & fn Grn/Clayey sands and silts
6.74- 6.88	42.93	1.578	3.68	Coh.-noncoh. fn grained/ Sandy clay
6.88- 6.92	42.93	1.490	3.47	Noncoh. coarse & fn Grn/Clayey sands and silts
6.92- 7.06	42.14	1.588	3.77	Coh.-noncoh. fn grained/ Sandy clay
7.06- 7.10	45.76	1.624	3.55	Noncoh. coarse & fn Grn/Clayey sands and silts
7.10- 7.12	44.82	1.612	3.60	Coh.-noncoh. fn grained/ Sandy clay
7.12- 7.20	45.90	1.613	3.51	Noncoh. coarse & fn Grn/Clayey sands and silts
7.20- 7.66	41.05	1.525	3.71	Coh.-noncoh. fn grained/ Sandy clay
7.66- 7.70	38.60	1.304	3.38	Noncoh. coarse & fn Grn/Clayey sands and silts
7.70- 7.74	37.65	1.344	3.57	Coh.-noncoh. fn grained/ Sandy clay
7.74- 7.78	40.13	1.385	3.45	Noncoh. coarse & fn Grn/Clayey sands and silts
7.78- 7.80	40.43	1.438	3.56	Coh.-noncoh. fn grained/ Sandy clay
7.80- 7.88	42.78	1.462	3.42	Noncoh. coarse & fn Grn/Clayey sands and silts
7.88- 8.02	42.76	1.620	3.79	Coh.-noncoh. fn grained/ Sandy clay
8.02- 8.10	44.20	1.551	3.51	Noncoh. coarse & fn Grn/Clayey sands and silts
8.10- 8.34	41.23	1.562	3.79	Coh.-noncoh. fn grained/ Sandy clay
8.34- 8.36	38.60	1.307	3.39	Noncoh. coarse & fn Grn/Clayey sands and silts
8.36- 8.50	34.15	1.290	3.82	Coh.-noncoh. fn grained/ Sandy clay
8.50- 8.52	26.77	1.270	4.74	Cohesive fine grained / Silty clay
8.52- 8.60	29.42	1.156	3.96	Coh.-noncoh. fn grained/ Sandy clay
8.60- 8.84	41.29	1.323	3.20	Noncoh. coarse & fn Grn/Clayey sands and silts
8.84- 9.18	48.04	2.044	4.25	Coh.-noncoh. fn grained/ Sandy clay
9.18- 9.20	47.93	1.649	3.44	Noncoh. coarse & fn Grn/Clayey sands and silts

A6. (Continued)

DEPTH (M)	CONE AVE	FRICT AVE	RATIO AVE(%)	CLASSIFICATION
9.20- 9.60	44.10	1.818	4.12	Coh.-noncoh. fn grained/ Sandy clay
9.60- 9.70	49.28	1.687	3.42	Noncoh. coarse & fn Grn/Clayey sands and silts
9.70- 9.94	54.41	2.457	4.52	Coh.-noncoh. fn grained/ Sandy clay
9.94- 9.96	47.32	2.484	5.25	Cohesive fine grained / Silty clay
9.96-10.10	53.53	2.417	4.52	Coh.-noncoh. fn grained/ Sandy clay
10.10-10.12	48.54	2.515	5.18	Cohesive fine grained / Silty clay
10.12-10.18	50.63	2.247	4.45	Coh.-noncoh. fn grained/ Sandy clay
10.18-10.22	59.42	2.132	3.59	Noncoh. coarse & fn Grn/Clayey sands and silts
10.22-10.30	60.67	2.609	4.31	Coh.-noncoh. fn grained/ Sandy clay
10.30-10.40	53.89	2.970	5.51	Cohesive fine grained / Silty clay
10.40-10.58	56.15	2.521	4.50	Coh.-noncoh. fn grained/ Sandy clay
10.58-10.60	54.15	2.776	5.13	Cohesive fine grained / Silty clay
10.60-11.20	57.82	2.602	4.51	Coh.-noncoh. fn grained/ Sandy clay
11.20-11.36	57.49	3.129	5.44	Cohesive fine grained / Silty clay
11.36-11.72	58.19	2.615	4.50	Coh.-noncoh. fn grained/ Sandy clay
11.72-11.86	51.66	3.148	6.13	Cohesive fine grained /Very stiff inorg. clay
11.86-11.88	65.36	2.782	4.26	Coh.-noncoh. fn grained/ Sandy clay
11.88-11.90	72.81	2.577	3.54	Noncoh. coarse & fn Grn/Clayey sands and silts

A7. COMPUTER SOIL CLASSIFICATION FROM CPT DATA G7

Date/Time : 06-11-1990/12:48am
Job Description :
aggregate resources
Site Information : Hville 7 Hornsbys pasture Hatcherville
Job Number : Hvile7
Probe I.D. : f5cke/v 538

LEGEND: fn = fine
Grn = grained

DEPTH (M)	CONE AVE	FRICT AVE	RATIO AVE(%)	CLASSIFICATION
0.02- 0.06	0.00	0.078	8.63	Undefined / Undefined
0.06- 0.14	16.95	0.331	1.92	Noncoh. coarse & fn Grn/ Clayey sand
0.14- 0.22	16.65	0.602	3.66	Coh.-noncoh. fn grained/ Sandy clay
0.22- 1.20	8.53	0.567	6.78	Cohesive fine grained / Organic clay
1.20- 1.22	8.11	0.199	2.46	Coh.-noncoh. fn grained/ Sandy clay
1.22- 1.44	9.85	0.527	5.37	Cohesive fine grained / Stiff inorg. clay
1.44- 1.70	26.10	1.075	4.03	Coh.-noncoh. fn grained/ Sandy clay
1.70- 1.82	36.00	2.102	5.87	Cohesive fine grained /Very stiff inorg. clay
1.82- 1.90	54.16	2.312	4.28	Coh.-noncoh. fn grained/ Sandy clay
1.90- 2.42	28.97	1.760	5.94	Cohesive fine grained /Very stiff inorg. clay
2.42- 2.46	18.05	0.719	3.99	Coh.-noncoh. fn grained/ Sandy clay
2.46- 2.52	14.53	0.986	7.26	Cohesive fine grained / Organic clay
2.52- 2.56	8.08	0.962	11.95	Undefined / Undefined
2.56- 2.58	11.83	0.815	6.89	Cohesive fine grained / Organic clay
2.58- 2.60	21.77	0.728	3.34	Coh.-noncoh. fn grained/ Sandy clay
2.60- 3.18	88.68	1.049	1.24	Noncoh. coarse grained / Sand
3.18- 3.22	31.13	0.970	3.10	Noncoh. coarse & fn Grn/Clayey sands and silts
3.22- 3.24	19.27	0.859	4.46	Coh.-noncoh. fn grained/ Sandy clay
3.24- 3.32	13.54	0.815	6.16	Cohesive fine grained / Stiff inorg. clay
3.32- 3.34	17.44	0.516	2.96	Coh.-noncoh. fn grained/ Sandy clay
3.34- 4.84	123.14	0.690	0.71	Noncoh. coarse grained /Dense or cemented sand
4.84- 4.86	16.16	0.218	1.35	Noncoh. coarse & fn Grn/ Clayey sand
4.86- 4.92	18.25	0.133	0.73	Noncoh. coarse grained / Loose sand
4.92- 4.94	12.44	0.156	1.25	Noncoh. coarse & fn Grn/ Clayey sand
4.94- 5.00	20.53	0.174	0.88	Noncoh. coarse grained / Sand
5.00- 5.06	12.46	0.226	1.79	Noncoh. coarse & fn Grn/ Clayey sand
5.06- 5.08	15.55	0.156	1.00	Noncoh. coarse grained / Loose sand
5.08- 5.12	13.38	0.168	1.26	Noncoh. coarse & fn Grn/ Clayey sand
5.12- 5.18	20.73	0.118	0.61	Noncoh. coarse grained / Sand
5.18- 5.20	1.22	0.124	10.17	Undefined / Undefined
5.20- 5.26	16.20	0.139	0.86	Noncoh. coarse grained / Loose sand
5.26- 5.34	10.90	0.115	1.06	Noncoh. coarse & fn Grn/ Clayey sand
5.34- 6.18	54.25	0.321	0.62	Noncoh. coarse grained / Sand
6.18- 6.20	9.33	0.137	1.47	Noncoh. coarse & fn Grn/ Clayey sand
6.20- 8.06	188.57	0.878	0.56	Noncoh. coarse grained /Shell sand or limerock
8.06- 8.08	46.04	1.220	2.65	Noncoh. coarse & fn Grn/Clayey sands and silts
8.08- 8.10	24.27	1.313	5.41	Cohesive fine grained /Very stiff inorg. clay
8.10- 8.12	37.98	1.836	4.83	Coh.-noncoh. fn grained/ Sandy clay
8.12- 8.16	23.96	1.693	7.23	Cohesive fine grained /Very stiff inorg. clay
8.16- 8.20	32.99	1.391	4.21	Coh.-noncoh. fn grained/ Sandy clay
8.20- 8.22	35.49	0.846	2.38	Noncoh. coarse & fn Grn/Clayey sands and silts
8.22- 8.24	52.26	0.654	1.25	Noncoh. coarse grained / Sand
8.24- 8.26	2.50	0.741	29.65	Undefined / Undefined
8.26- 9.16	43.87	0.526	1.23	Noncoh. coarse grained / Sand
9.16- 9.18	23.66	0.604	2.55	Noncoh. coarse & fn Grn/Clayey sands and silts
9.18- 9.26	13.70	0.832	6.23	Cohesive fine grained / Stiff inorg. clay
9.26- 9.30	20.55	0.756	3.74	Coh.-noncoh. fn grained/ Sandy clay

A7. (Continued)

DEPTH (M)	CONE AVE	FRICT AVE	RATIO AVE(%)*	CLASSIFICATION
9.30- 9.32	23.66	0.529	2.24	Noncoh. coarse & fn Grn/Clayey sands and silts
9.32- 9.34	20.55	0.598	2.91	Coh.-noncoh. fn grained/ Sandy clay
9.34- 9.36	6.22	0.679	10.91	Undefined / Undefined
9.36- 9.38	22.38	0.741	3.31	Coh.-noncoh. fn grained/ Sandy clay
9.38- 9.44	29.06	0.778	2.70	Noncoh. coarse & fn Grn/Clayey sands and silts
9.44- 9.52	20.06	0.838	4.18	Coh.-noncoh. fn grained/ Sandy clay
9.52- 9.66	15.38	0.944	6.23	Cohesive fine grained /Very stiff inorg. clay
9.66- 9.68	32.99	0.703	2.13	Noncoh. coarse & fn Grn/Clayey sands and silts
9.68-15.34	78.00	0.854	1.10	Noncoh. coarse grained / Sand
15.34-15.36	7.44	0.442	5.94	Cohesive fine grained / Organic clay
15.36-19.38	145.18	1.461	1.04	Noncoh. coarse grained /Dense or cemented sand
19.38-19.40	17.44	0.834	4.78	Cohesive fine grained / Stiff inorg. clay
19.40-23.08	146.94	1.598	1.12	Noncoh. coarse grained /Dense or cemented sand
23.08-23.10	79.69	2.552	3.20	Noncoh. coarse & fn Grn/Clayey sands and silts
23.10-23.12	65.36	2.763	4.23	Coh.-noncoh. fn grained/ Sandy clay
23.12-23.16	41.71	2.844	7.03	Cohesive fine grained /Very stiff inorg. clay
23.16-23.22	19.09	2.168	11.38	Undefined / Undefined
23.22-23.26	17.44	1.288	7.39	Cohesive fine grained / Organic clay
23.26-24.42	17.81	0.616	3.46	Coh.-noncoh. fn grained/ Sandy clay
24.42-24.44	15.55	0.741	4.76	Cohesive fine grained / Stiff inorg. clay
24.44-25.28	16.10	0.537	3.34	Coh.-noncoh. fn grained/ Sandy clay
25.28-25.30	14.94	0.660	4.42	Cohesive fine grained / Stiff inorg. clay
25.30-25.36	16.79	0.517	3.08	Coh.-noncoh. fn grained/ Sandy clay
25.36-25.38	24.27	0.703	2.90	Noncoh. coarse & fn Grn/Clayey sands and silts
25.38-25.42	25.82	1.052	4.09	Coh.-noncoh. fn grained/ Sandy clay
25.42-25.44	24.88	1.238	4.98	Cohesive fine grained /Very stiff inorg. clay
25.44-25.46	28.65	1.344	4.69	Coh.-noncoh. fn grained/ Sandy clay
25.46-25.50	28.32	1.450	5.11	Cohesive fine grained /Very stiff inorg. clay
25.50-25.52	26.77	1.176	4.39	Coh.-noncoh. fn grained/ Sandy clay
25.52-25.56	36.71	1.198	3.26	Noncoh. coarse & fn Grn/Clayey sands and silts
25.56-25.66	25.01	1.379	5.56	Cohesive fine grained /Very stiff inorg. clay
25.66-25.70	25.82	1.005	3.89	Coh.-noncoh. fn grained/ Sandy clay
25.70-25.74	31.13	0.936	3.01	Noncoh. coarse & fn Grn/Clayey sands and silts
25.74-25.78	29.88	1.219	4.11	Coh.-noncoh. fn grained/ Sandy clay
25.78-25.86	21.17	1.232	5.83	Cohesive fine grained /Very stiff inorg. clay
25.86-25.94	19.76	0.706	3.56	Coh.-noncoh. fn grained/ Sandy clay
25.94-26.00	22.60	0.562	2.50	Noncoh. coarse & fn Grn/Clayey sands and silts
26.00-26.18	18.88	0.680	3.63	Coh.-noncoh. fn grained/ Sandy clay
26.18-26.20	19.27	0.510	2.65	Noncoh. coarse & fn Grn/Clayey sands and silts
26.20-26.24	18.35	0.532	2.90	Coh.-noncoh. fn grained/ Sandy clay
26.24-26.26	19.93	0.541	2.72	Noncoh. coarse & fn Grn/Clayey sands and silts
26.26-27.40	15.75	0.467	2.96	Coh.-noncoh. fn grained/ Sandy clay
27.40-27.42	16.16	0.834	5.16	Cohesive fine grained / Stiff inorg. clay
27.42-27.90	16.12	0.458	2.85	Coh.-noncoh. fn grained/ Sandy clay
27.90-27.94	18.35	0.485	2.64	Noncoh. coarse & fn Grn/Clayey sands and silts
27.94-28.54	17.02	0.486	2.86	Coh.-noncoh. fn grained/ Sandy clay
28.54-28.56	18.05	0.485	2.69	Noncoh. coarse & fn Grn/Clayey sands and silts
28.56-28.58	16.83	0.479	2.85	Coh.-noncoh. fn grained/ Sandy clay
28.58-28.68	18.66	0.499	2.67	Noncoh. coarse & fn Grn/Clayey sands and silts
28.68-28.86	18.59	0.539	2.90	Coh.-noncoh. fn grained/ Sandy clay
28.86-29.00	19.29	0.506	2.63	Noncoh. coarse & fn Grn/Clayey sands and silts
29.00-29.02	19.27	0.535	2.78	Coh.-noncoh. fn grained/ Sandy clay
29.02-29.22	31.00	0.834	2.66	Noncoh. coarse & fn Grn/Clayey sands and silts
29.22-29.28	39.41	1.398	3.55	Coh.-noncoh. fn grained/ Sandy clay
29.28-29.36	44.65	1.501	3.36	Noncoh. coarse & fn Grn/Clayey sands and silts
29.36-29.74	40.75	1.584	3.88	Coh.-noncoh. fn grained/ Sandy clay
29.74-29.76	41.09	1.407	3.42	Noncoh. coarse & fn Grn/Clayey sands and silts
29.76-29.80	41.40	1.462	3.53	Coh.-noncoh. fn grained/ Sandy clay

A7. (Continued)

DEPTH (M)	CONE AVE	FRICT AVE	RATIO AVE(%)	CLASSIFICATION
29.80-29.82	41.71	1.432	3.43	Noncoh. coarse & fn Grn/Clayey sands and silts
29.82-30.02	40.32	1.479	3.67	Coh.-noncoh. fn grained/ Sandy clay
30.02-30.16	45.33	1.474	3.25	Noncoh. coarse & fn Grn/Clayey sands and silts
30.16-30.32	44.26	1.693	3.83	Coh.-noncoh. fn grained/ Sandy clay
30.32-30.40	50.26	1.733	3.45	Noncoh. coarse & fn Grn/Clayey sands and silts
30.40-30.42	49.15	1.824	3.71	Coh.-noncoh. fn grained/ Sandy clay
30.42-30.46	51.04	1.830	3.58	Noncoh. coarse & fn Grn/Clayey sands and silts
30.46-30.60	49.70	2.042	4.11	Coh.-noncoh. fn grained/ Sandy clay
30.60-30.70	44.18	2.335	5.29	Cohesive fine grained / Silty clay
30.70-30.94	53.16	2.301	4.35	Coh.-noncoh. fn grained/ Sandy clay
30.94-31.16	58.50	3.316	5.67	Cohesive fine grained / Silty clay
31.16-31.26	61.49	3.082	5.01	Coh.-noncoh. fn grained/ Sandy clay
31.26-31.28	52.26	2.938	5.62	Cohesive fine grained /Very stiff inorg. clay
31.28-31.32	58.17	2.944	5.06	Coh.-noncoh. fn grained/ Sandy clay
31.32-31.34	58.48	3.000	5.13	Cohesive fine grained / Silty clay
31.34-31.72	61.45	2.923	4.76	Coh.-noncoh. fn grained/ Sandy clay
31.72-31.84	51.88	2.935	5.67	Cohesive fine grained /Very stiff inorg. clay
31.84-31.94	49.30	2.095	4.25	Coh.-noncoh. fn grained/ Sandy clay
31.94-31.98	50.42	1.749	3.47	Noncoh. coarse & fn Grn/Clayey sands and silts
31.98-32.12	49.34	1.967	3.99	Coh.-noncoh. fn grained/ Sandy clay
32.12-32.20	57.58	1.918	3.33	Noncoh. coarse & fn Grn/Clayey sands and silts
32.20-32.24	54.76	2.296	4.20	Coh.-noncoh. fn grained/ Sandy clay
32.24-32.40	43.17	2.419	5.60	Cohesive fine grained /Very stiff inorg. clay
32.40-32.62	40.74	1.682	4.14	Coh.-noncoh. fn grained/ Sandy clay
32.62-32.76	38.14	2.398	6.29	Cohesive fine grained /Very stiff inorg. clay
32.76-32.86	37.72	1.738	4.61	Coh.-noncoh. fn grained/ Sandy clay
32.86-33.12	35.04	1.953	5.59	Cohesive fine grained /Very stiff inorg. clay
33.12-33.16	43.87	1.936	4.41	Coh.-noncoh. fn grained/ Sandy clay
33.16-33.20	37.65	2.150	5.75	Cohesive fine grained /Very stiff inorg. clay

B1. COMPUTER SOIL CLASSIFICATION FROM CPT DATA OF M1

Date/Time : 06-28-1990/ 8:51am
Job Description :
west monroe south
Site Information : monroe transect
Job Number : 06289001
Probe I.D. : f7.5cke2w/v 207

LEGEND: fn = fine
Grn = grained

DEPTH (M)	CONE AVE	FRICT AVE	RATIO AVE(%)	CLASSIFICATION
0.02- 0.04	-1.22	-0.037	3.04	Cohesive fine grained / Organic clay
0.04- 0.10	0.20	-0.016	-0.33	Undefined / Undefined
0.10- 0.12	0.61	0.012	2.00	Cohesive fine grained /Very soft inorg. clay
0.12- 0.14	0.00	0.006	0.00	Undefined / Undefined
0.14- 0.16	0.61	0.056	9.17	Cohesive fine grained / Organic clay
0.16- 0.22	1.02	0.240	23.74	Undefined / Undefined
0.22- 0.24	15.55	0.299	1.92	Noncoh. coarse & fn Grn/ Clayey sand
0.24- 0.54	71.04	1.296	1.94	Noncoh. coarse grained / Sand
0.54- 0.74	30.62	0.746	2.45	Noncoh. coarse & fn Grn/Clayey sands and silts
0.74- 0.78	18.35	0.697	3.85	Coh.-noncoh. fn grained/ Sandy clay
0.78- 0.86	11.83	0.640	5.48	Cohesive fine grained / Stiff inorg. clay
0.86- 1.30	18.38	0.648	3.38	Coh.-noncoh. fn grained/ Sandy clay
1.30- 1.32	27.99	1.344	4.80	Cohesive fine grained / Silty clay
1.32- 1.34	31.10	1.475	4.74	Coh.-noncoh. fn grained/ Sandy clay
1.34- 1.38	32.68	1.643	5.03	Cohesive fine grained / Silty clay
1.38- 1.46	39.36	1.838	4.66	Coh.-noncoh. fn grained/ Sandy clay
1.46- 2.82	24.42	1.698	6.99	Cohesive fine grained /Very stiff inorg. clay
2.82- 2.88	41.08	1.734	4.25	Coh.-noncoh. fn grained/ Sandy clay
2.88- 2.90	54.76	1.786	3.26	Noncoh. coarse & fn Grn/Clayey sands and silts
2.90-10.54	137.71	0.741	0.57	Noncoh. coarse grained /Shell sand or limerock
10.54-10.58	53.53	2.313	4.34	Coh.-noncoh. fn grained/ Sandy clay
10.58-10.66	32.82	2.262	6.87	Cohesive fine grained /Very stiff inorg. clay
10.66-10.68	31.76	1.369	4.31	Coh.-noncoh. fn grained/ Sandy clay
10.68-10.70	31.76	0.977	3.08	Noncoh. coarse & fn Grn/Clayey sands and silts
10.70-10.94	36.09	0.628	1.74	Noncoh. coarse grained / Sand
10.94-10.98	36.71	0.824	2.25	Noncoh. coarse & fn Grn/Clayey sands and silts
10.98-11.00	39.21	0.859	2.19	Noncoh. coarse grained / Sand
11.00-11.26	36.00	0.878	2.44	Noncoh. coarse & fn Grn/Clayey sands and silts
11.26-11.36	36.10	0.715	1.98	Noncoh. coarse grained / Sand
11.36-12.26	38.31	1.061	2.77	Noncoh. coarse & fn Grn/Clayey sands and silts
12.26-12.42	46.30	0.984	2.12	Noncoh. coarse grained / Sand
12.42-12.72	50.71	1.402	2.76	Noncoh. coarse & fn Grn/Clayey sands and silts
12.72-12.76	53.23	1.335	2.51	Noncoh. coarse grained / Sand
12.76-12.92	52.45	1.432	2.73	Noncoh. coarse & fn Grn/Clayey sands and silts
12.92-12.96	50.73	1.207	2.38	Noncoh. coarse grained / Sand
12.96-12.98	60.98	2.446	4.01	Coh.-noncoh. fn grained/ Sandy clay
12.98-13.04	171.79	3.765	2.13	Noncoh. coarse grained / Silty sand
13.04-13.10	73.01	4.707	6.47	Cohesive fine grained /Very stiff inorg. clay
13.10-13.18	159.96	3.462	2.24	Noncoh. coarse grained / Silty sand
13.18-13.20	125.12	5.215	4.17	Coh.-noncoh. fn grained/ Sandy clay
13.20-13.32	64.52	4.380	6.76	Cohesive fine grained /Very stiff inorg. clay
13.32-13.34	59.76	2.583	4.32	Coh.-noncoh. fn grained/ Sandy clay
13.34-13.40	62.24	2.018	3.25	Noncoh. coarse & fn Grn/Clayey sands and silts
13.40-13.46	78.64	2.147	2.72	Noncoh. coarse grained / Sand
13.46-13.48	65.98	1.967	2.98	Noncoh. coarse & fn Grn/Clayey sands and silts
13.48-13.50	100.85	2.508	2.49	Noncoh. coarse grained / Silty sand
13.50-13.52	107.68	3.560	3.31	Noncoh. coarse & fn Grn/ Clayey silty sand

B1. (Continued)

DEPTH (M)	CONE AVE	FRICT AVE	RATIO AVE(%)	CLASSIFICATION
13.52-13.54	96.46	3.865	4.01	Coh.-noncoh. fn grained/ Sandy clay
13.54-13.64	55.14	3.132	5.70	Cohesive fine grained /Very stiff inorg. clay
13.64-13.66	51.65	1.973	3.82	Coh.-noncoh. fn grained/ Sandy clay
13.66-13.86	353.27	3.401	1.16	Noncoh. coarse grained /Dense or cemented sand
13.86-13.88	138.17	5.465	3.96	Noncoh. coarse & fn Grn/ Clayey silty sand
13.88-14.00	60.78	4.669	7.78	Cohesive fine grained / Organic clay
14.00-14.02	52.92	2.539	4.80	Coh.-noncoh. fn grained/ Sandy clay
14.02-14.44	55.66	1.696	3.05	Noncoh. coarse & fn Grn/Clayey sands and silts
14.44-14.46	36.71	1.923	5.24	Cohesive fine grained /Very stiff inorg. clay
14.46-14.48	47.93	1.848	3.86	Coh.-noncoh. fn grained/ Sandy clay
14.48-14.52	53.51	1.683	3.15	Noncoh. coarse & fn Grn/Clayey sands and silts
14.52-14.54	57.26	1.487	2.60	Noncoh. coarse grained / Sand
14.54-14.56	60.98	1.805	2.96	Noncoh. coarse & fn Grn/Clayey sands and silts

B2. COMPUTER SOIL CLASSIFICATION FROM CPT DATA OF M2

Date/Time : 06-28-1990/10:15am

Job Description :

WEST MONROE SOUTH

Site Information : MONROE TRANSECT

Job Number : 06289002

Probe I.D. : F7.5CKE2W/V 207

LEGEND: fn = fine
Grn = grained

DEPTH (M)	CONE AVE	FRICT AVE	RATIO AVE(%)	CLASSIFICATION
0.02- 0.04	6.22	0.000	0.00	Undefined / Undefined
0.04- 0.56	35.69	0.333	0.93	Noncoh. coarse grained / Sand
0.56- 0.66	25.65	0.614	2.42	Noncoh. coarse & fn Grn/Clayey sands and silts
0.66- 0.78	16.40	0.578	3.56	Coh.-noncoh. fn grained/ Sandy clay
0.78- 0.80	13.71	0.604	4.40	Cohesive fine grained / Stiff inorg. clay
0.80- 0.92	14.12	0.376	2.67	Coh.-noncoh. fn grained/ Sandy clay
0.92- 0.94	14.94	0.361	2.42	Noncoh. coarse & fn Grn/Clayey sands and silts
0.94- 1.08	15.74	0.448	2.85	Coh.-noncoh. fn grained/ Sandy clay
1.08- 1.14	24.06	0.539	2.26	Noncoh. coarse & fn Grn/Clayey sands and silts
1.14- 4.20	131.65	0.923	0.76	Noncoh. coarse grained /Dense or cemented sand
4.20- 4.26	21.58	0.400	1.86	Noncoh. coarse & fn Grn/ Clayey sand
4.26- 4.30	21.46	0.302	1.41	Noncoh. coarse grained / Sand
4.30- 4.32	19.93	0.324	1.62	Noncoh. coarse & fn Grn/ Clayey sand
4.32- 4.38	24.27	0.243	1.01	Noncoh. coarse grained / Sand
4.38- 4.40	6.83	0.174	2.55	Coh.-noncoh. fn grained/ Sandy clay
4.40- 4.88	72.09	0.345	0.52	Noncoh. coarse grained /Shell sand or limerock
4.88- 4.92	19.27	0.365	1.93	Noncoh. coarse & fn Grn/ Clayey sand
4.92- 4.94	11.22	0.342	3.05	Coh.-noncoh. fn grained/ Sandy clay
4.94- 5.02	6.69	0.361	5.59	Cohesive fine grained / Organic clay
5.02- 5.08	9.76	0.245	2.48	Coh.-noncoh. fn grained/ Sandy clay
5.08- 5.10	7.44	0.093	1.25	Noncoh. coarse & fn Grn/ Clayey sand
5.10- 5.22	31.74	0.232	0.81	Noncoh. coarse grained / Sand
5.22- 5.24	24.88	0.685	2.75	Noncoh. coarse & fn Grn/Clayey sands and silts
5.24- 5.26	26.16	0.865	3.31	Coh.-noncoh. fn grained/ Sandy clay
5.26- 5.28	31.76	0.728	2.29	Noncoh. coarse & fn Grn/Clayey sands and silts
5.28-10.20	141.96	0.835	0.61	Noncoh. coarse grained /Dense or cemented sand
10.20-10.22	34.87	1.232	3.53	Coh.-noncoh. fn grained/ Sandy clay
10.22-10.34	22.41	1.362	6.24	Cohesive fine grained /Very stiff inorg. clay
10.34-10.36	24.88	0.821	3.30	Coh.-noncoh. fn grained/ Sandy clay
10.36-10.40	23.35	0.572	2.45	Noncoh. coarse & fn Grn/Clayey sands and silts
10.40-10.42	21.77	0.635	2.92	Coh.-noncoh. fn grained/ Sandy clay
10.42-10.46	23.66	0.694	2.93	Noncoh. coarse & fn Grn/Clayey sands and silts
10.46-10.60	24.36	0.792	3.25	Coh.-noncoh. fn grained/ Sandy clay
10.60-10.62	29.27	0.902	3.08	Noncoh. coarse & fn Grn/Clayey sands and silts
10.62-10.70	29.25	1.002	3.43	Coh.-noncoh. fn grained/ Sandy clay
10.70-10.86	33.84	1.003	2.97	Noncoh. coarse & fn Grn/Clayey sands and silts
10.86-11.16	26.39	0.980	3.72	Coh.-noncoh. fn grained/ Sandy clay
11.16-11.26	21.04	1.057	5.03	Cohesive fine grained /Very stiff inorg. clay
11.26-11.34	24.27	0.924	3.85	Coh.-noncoh. fn grained/ Sandy clay
11.34-11.36	29.88	0.865	2.90	Noncoh. coarse & fn Grn/Clayey sands and silts
11.36-11.48	21.37	0.687	3.21	Coh.-noncoh. fn grained/ Sandy clay
11.48-11.60	31.85	0.916	2.85	Noncoh. coarse & fn Grn/Clayey sands and silts
11.60-11.72	35.58	1.219	3.43	Coh.-noncoh. fn grained/ Sandy clay
11.72-11.78	40.87	1.361	3.33	Noncoh. coarse & fn Grn/Clayey sands and silts
11.78-11.84	38.78	1.413	3.64	Coh.-noncoh. fn grained/ Sandy clay
11.84-12.10	38.92	1.138	2.93	Noncoh. coarse & fn Grn/Clayey sands and silts
12.10-12.40	30.34	1.134	3.76	Coh.-noncoh. fn grained/ Sandy clay

B2. (Continued)

DEPTH (M)	CONE AVE	FRICT AVE	RATIO AVE(%)	CLASSIFICATION
12.40-12.52	33.50	0.994	2.97	Noncoh. coarse & fn Grn/Clayey sands and silts
12.52-12.60	85.11	1.535	1.87	Noncoh. coarse grained / Sand
12.60-12.62	77.80	2.259	2.90	Noncoh. coarse & fn Grn/Clayey sands and silts
12.62-12.64	100.85	4.139	4.10	Coh.-noncoh. fn grained/ Sandy clay
12.64-12.66	112.63	4.101	3.64	Noncoh. coarse & fn Grn/ Clayey silty sand
12.66-12.82	47.53	3.355	7.13	Cohesive fine grained /Very stiff inorg. clay
12.82-12.84	37.98	1.456	3.83	Coh.-noncoh. fn grained/ Sandy clay
12.84-12.90	38.39	1.157	3.01	Noncoh. coarse & fn Grn/Clayey sands and silts
12.90-13.00	35.72	0.600	1.66	Noncoh. coarse grained / Sand
13.00-13.02	37.32	1.730	4.64	Coh.-noncoh. fn grained/ Sandy clay
13.02-13.04	62.86	1.824	2.90	Noncoh. coarse & fn Grn/Clayey sands and silts
13.04-13.10	33.82	1.828	5.41	Cohesive fine grained /Very stiff inorg. clay
13.10-13.12	36.71	1.599	4.36	Coh.-noncoh. fn grained/ Sandy clay
13.12-13.18	106.44	1.560	1.45	Noncoh. coarse grained /Dense or cemented sand
13.18-13.20	91.47	2.695	2.95	Noncoh. coarse & fn Grn/Clayey sands and silts
13.20-13.22	57.87	2.757	4.76	Coh.-noncoh. fn grained/ Sandy clay
13.22-13.32	39.22	2.576	6.59	Cohesive fine grained /Very stiff inorg. clay
13.32-13.40	37.33	1.419	3.80	Coh.-noncoh. fn grained/ Sandy clay
13.40-13.46	40.65	1.168	2.89	Noncoh. coarse & fn Grn/Clayey sands and silts
13.46-13.50	63.81	1.391	2.18	Noncoh. coarse grained / Sand
13.50-13.54	57.56	1.796	3.15	Noncoh. coarse & fn Grn/Clayey sands and silts
13.54-13.64	42.33	1.801	4.26	Coh.-noncoh. fn grained/ Sandy clay
13.64-13.70	43.15	1.205	2.80	Noncoh. coarse & fn Grn/Clayey sands and silts
13.70-13.80	54.51	1.013	1.87	Noncoh. coarse grained / Sand
13.80-13.84	46.68	1.381	2.97	Noncoh. coarse & fn Grn/Clayey sands and silts
13.84-13.94	37.70	1.415	3.75	Coh.-noncoh. fn grained/ Sandy clay
13.94-14.06	34.65	1.092	3.15	Noncoh. coarse & fn Grn/Clayey sands and silts
14.06-14.16	30.12	1.058	3.51	Coh.-noncoh. fn grained/ Sandy clay
14.16-14.22	30.08	0.836	2.78	Noncoh. coarse & fn Grn/Clayey sands and silts
14.22-14.72	60.82	1.311	2.10	Noncoh. coarse grained / Sand
14.72-14.76	65.98	1.802	2.73	Noncoh. coarse & fn Grn/Clayey sands and silts
14.76-15.02	80.20	1.786	2.26	Noncoh. coarse grained / Sand
15.02-15.10	79.35	2.500	3.15	Noncoh. coarse & fn Grn/Clayey sands and silts
15.10-15.12	72.20	2.832	3.92	Coh.-noncoh. fn grained/ Sandy clay
15.12-15.20	74.38	2.318	3.12	Noncoh. coarse & fn Grn/Clayey sands and silts
15.20-15.28	92.44	2.178	2.36	Noncoh. coarse grained / Sand
15.28-15.50	69.19	2.189	3.15	Noncoh. coarse & fn Grn/Clayey sands and silts
15.50-15.54	66.28	1.737	2.62	Noncoh. coarse grained / Sand
15.54-15.70	64.02	1.908	2.98	Noncoh. coarse & fn Grn/Clayey sands and silts
15.70-15.76	85.88	1.994	2.32	Noncoh. coarse grained / Sand
15.76-15.98	65.18	2.036	3.13	Noncoh. coarse & fn Grn/Clayey sands and silts
15.98-16.06	64.59	1.698	2.63	Noncoh. coarse grained / Sand
16.06-16.08	61.59	1.693	2.75	Noncoh. coarse & fn Grn/Clayey sands and silts
16.08-16.10	64.75	1.643	2.54	Noncoh. coarse grained / Sand
16.10-16.50	62.52	1.861	2.98	Noncoh. coarse & fn Grn/Clayey sands and silts
16.50-16.54	68.47	1.767	2.58	Noncoh. coarse grained / Sand
16.54-18.00	59.50	1.732	2.91	Noncoh. coarse & fn Grn/Clayey sands and silts
18.00-18.08	56.33	1.397	2.48	Noncoh. coarse grained / Sand
18.08-18.36	50.86	1.510	2.97	Noncoh. coarse & fn Grn/Clayey sands and silts
18.36-18.40	55.07	1.395	2.53	Noncoh. coarse grained / Sand
18.40-18.44	57.59	1.515	2.63	Noncoh. coarse & fn Grn/Clayey sands and silts
18.44-18.52	60.99	1.395	2.29	Noncoh. coarse grained / Sand
18.52-18.66	51.75	1.580	3.07	Noncoh. coarse & fn Grn/Clayey sands and silts
18.66-18.74	60.04	1.427	2.38	Noncoh. coarse grained / Sand
18.74-19.24	49.52	1.380	2.79	Noncoh. coarse & fn Grn/Clayey sands and silts
19.24-19.34	57.88	1.435	2.48	Noncoh. coarse grained / Sand
19.34-19.36	59.14	1.618	2.74	Noncoh. coarse & fn Grn/Clayey sands and silts
19.36-19.76	69.30	1.757	2.54	Noncoh. coarse grained / Sand
19.76-19.78	73.42	2.041	2.78	Noncoh. coarse & fn Grn/Clayey sands and silts

B2. (Continued)

DEPTH (M)	CONE AVE	FRICT AVE	RATIO AVE(%)	CLASSIFICATION
19.78-19.80	74.69	2.060	2.76	Noncoh. coarse grained / Sand
19.80-19.84	74.08	2.123	2.86	Noncoh. coarse & fn Grn/Clayey sands and silts
19.84-19.88	76.56	2.019	2.64	Noncoh. coarse grained / Sand
19.88-19.90	75.31	2.141	2.84	Noncoh. coarse & fn Grn/Clayey sands and silts
19.90-20.20	95.23	2.150	2.31	Noncoh. coarse grained / Sand
20.20-20.22	112.02	5.434	4.85	Coh.-noncoh. fn grained/ Sandy clay
20.22-20.24	122.01	6.915	5.67	Cohesive fine grained / Silty clay
20.24-20.26	176.16	6.523	3.70	Noncoh. coarse & fn Grn/ Clayey silty sand
20.26-20.28	124.46	6.342	5.10	Coh.-noncoh. fn grained/ Sandy clay
20.28-20.36	84.33	5.500	6.50	Cohesive fine grained /Very stiff inorg. clay
20.36-20.38	81.53	3.417	4.19	Coh.-noncoh. fn grained/ Sandy clay
20.38-20.40	80.30	2.975	3.71	Noncoh. coarse & fn Grn/Clayey sands and silts
20.40-21.10	77.70	1.684	2.17	Noncoh. coarse grained / Sand
21.10-21.14	78.42	2.222	2.83	Noncoh. coarse & fn Grn/Clayey sands and silts
21.14-21.38	78.22	1.904	2.43	Noncoh. coarse grained / Sand
21.38-21.40	54.15	1.954	3.61	Noncoh. coarse & fn Grn/Clayey sands and silts
21.40-21.82	85.21	2.055	2.43	Noncoh. coarse grained / Sand

B3. COMPUTER SOIL CLASSIFICATION FROM CPT DATA OF M3

Date/Time : 06-28-1990/11:30am
Job Description :
WEST MONROE SOUTH
Site Information : MONROE TRANSECT
Job Number : 06289003
Probe I.D. : F7.5CKE2W/V 207

LEGEND: fn = fine
Grn = grained

DEPTH (M)	CONE AVE	FRICT AVE	RATIO AVE(%)	CLASSIFICATION
0.02- 0.18	108.22	1.404	1.12	Noncoh. coarse grained /Dense or cemented sand
0.18- 0.24	95.85	2.896	3.02	Noncoh. coarse & fn Grn/Clayey sands and silts
0.24- 2.80	137.54	0.958	0.73	Noncoh. coarse grained /Dense or cemented sand
2.80- 2.82	42.32	1.276	3.01	Noncoh. coarse & fn Grn/Clayey sands and silts
2.82- 2.86	31.10	1.319	4.28	Coh.-noncoh. fn grained/ Sandy clay
2.86- 2.90	23.96	1.189	4.96	Cohesive fine grained /Very stiff inorg. clay
2.90- 3.16	20.10	0.768	3.80	Coh.-noncoh. fn grained/ Sandy clay
3.16- 4.46	11.82	0.813	7.02	Cohesive fine grained / Organic clay
4.46- 4.48	18.66	0.703	3.77	Coh.-noncoh. fn grained/ Sandy clay
4.48- 4.50	32.99	0.834	2.53	Noncoh. coarse & fn Grn/Clayey sands and silts
4.50- 4.60	81.89	1.712	2.07	Noncoh. coarse grained / Sand
4.60- 4.62	74.08	2.857	3.86	Noncoh. coarse & fn Grn/Clayey sands and silts
4.62- 4.64	61.59	3.081	5.00	Coh.-noncoh. fn grained/ Sandy clay
4.64- 4.80	42.55	2.710	6.41	Cohesive fine grained /Very stiff inorg. clay
4.80- 4.88	43.40	2.016	4.65	Coh.-noncoh. fn grained/ Sandy clay
4.88- 4.90	44.82	2.278	5.08	Cohesive fine grained / Silty clay
4.90- 4.94	45.12	2.222	4.93	Coh.-noncoh. fn grained/ Sandy clay
4.94- 5.00	34.65	1.805	5.19	Cohesive fine grained /Very stiff inorg. clay
5.00- 5.06	27.40	1.041	3.78	Coh.-noncoh. fn grained/ Sandy clay
5.06- 5.10	29.27	0.765	2.62	Noncoh. coarse & fn Grn/Clayey sands and silts
5.10- 5.12	34.21	0.710	2.08	Noncoh. coarse grained / Sand
5.12- 5.18	44.39	1.226	2.76	Noncoh. coarse & fn Grn/Clayey sands and silts
5.18- 5.24	67.62	1.784	2.64	Noncoh. coarse grained / Sand
5.24- 5.34	75.19	2.424	3.22	Noncoh. coarse & fn Grn/Clayey sands and silts
5.34- 5.46	100.41	2.232	2.23	Noncoh. coarse grained / Silty sand
5.46- 5.56	85.88	3.093	3.61	Noncoh. coarse & fn Grn/Clayey sands and silts
5.56- 5.60	68.47	3.317	4.85	Coh.-noncoh. fn grained/ Sandy clay
5.60- 5.66	50.41	2.788	5.53	Cohesive fine grained / Silty clay
5.66- 5.68	59.14	2.359	3.99	Coh.-noncoh. fn grained/ Sandy clay
5.68- 5.86	134.23	2.733	2.07	Noncoh. coarse grained / Silty sand
5.86- 5.88	98.96	3.255	3.29	Noncoh. coarse & fn Grn/Clayey sands and silts
5.88- 5.92	76.89	3.501	4.59	Coh.-noncoh. fn grained/ Sandy clay
5.92- 6.00	45.43	2.944	6.52	Cohesive fine grained /Very stiff inorg. clay
6.00- 6.02	27.99	1.133	4.05	Coh.-noncoh. fn grained/ Sandy clay
6.02- 6.08	25.93	0.612	2.36	Noncoh. coarse & fn Grn/Clayey sands and silts
6.08- 6.20	25.42	0.415	1.63	Noncoh. coarse grained / Sand
6.20- 6.34	24.18	0.542	2.25	Noncoh. coarse & fn Grn/Clayey sands and silts
6.34- 6.56	22.23	0.825	3.74	Coh.-noncoh. fn grained/ Sandy clay
6.56- 6.58	33.60	0.852	2.54	Noncoh. coarse & fn Grn/Clayey sands and silts
6.58-15.86	164.12	1.188	0.77	Noncoh. coarse grained /Dense or cemented sand
15.86-15.90	62.87	1.904	3.04	Noncoh. coarse & fn Grn/Clayey sands and silts
15.90-15.92	45.43	2.023	4.45	Coh.-noncoh. fn grained/ Sandy clay
15.92-15.96	36.40	1.914	5.28	Cohesive fine grained /Very stiff inorg. clay
15.96-16.00	33.29	1.475	4.43	Coh.-noncoh. fn grained/ Sandy clay
16.00-16.04	33.60	0.952	2.83	Noncoh. coarse & fn Grn/Clayey sands and silts
16.04-16.28	35.94	0.574	1.60	Noncoh. coarse grained / Sand
16.28-16.46	37.76	1.112	2.93	Noncoh. coarse & fn Grn/Clayey sands and silts

B3. (Continued)

DEPTH (M)	CONE AVE	FRICT AVE	RATIO AVE(%)	CLASSIFICATION
16.46-16.60	37.16	1.379	3.71	Coh.-noncoh. fn grained/ Sandy clay
16.60-16.62	37.98	1.301	3.42	Noncoh. coarse & fn Grn/Clayey sands and silts
16.62-16.66	38.29	1.335	3.49	Coh.-noncoh. fn grained/ Sandy clay
16.66-16.70	39.21	1.300	3.32	Noncoh. coarse & fn Grn/Clayey sands and silts
16.70-16.96	39.40	1.453	3.69	Coh.-noncoh. fn grained/ Sandy clay
16.96-17.02	42.73	1.469	3.44	Noncoh. coarse & fn Grn/Clayey sands and silts
17.02-17.88	43.70	1.676	3.84	Coh.-noncoh. fn grained/ Sandy clay
17.88-17.96	53.52	1.670	3.13	Noncoh. coarse & fn Grn/Clayey sands and silts
17.96-18.08	41.07	1.534	3.74	Coh.-noncoh. fn grained/ Sandy clay
18.08-18.30	41.36	1.289	3.12	Noncoh. coarse & fn Grn/Clayey sands and silts
18.30-18.62	39.44	1.497	3.79	Coh.-noncoh. fn grained/ Sandy clay
18.62-18.70	42.62	1.413	3.31	Noncoh. coarse & fn Grn/Clayey sands and silts
18.70-18.98	44.28	1.708	3.86	Coh.-noncoh. fn grained/ Sandy clay
18.98-19.04	50.41	1.691	3.36	Noncoh. coarse & fn Grn/Clayey sands and silts
19.04-19.24	43.13	1.709	3.97	Coh.-noncoh. fn grained/ Sandy clay
19.24-19.30	53.52	1.724	3.27	Noncoh. coarse & fn Grn/Clayey sands and silts
19.30-19.40	87.63	1.752	2.05	Noncoh. coarse grained / Sand
19.40-19.44	61.00	1.966	3.25	Noncoh. coarse & fn Grn/Clayey sands and silts
19.44-19.52	52.59	2.083	3.96	Coh.-noncoh. fn grained/ Sandy clay
19.52-19.54	50.42	1.401	2.78	Noncoh. coarse & fn Grn/Clayey sands and silts
19.54-19.88	53.93	0.863	1.66	Noncoh. coarse grained / Sand
19.88-19.90	67.20	2.334	3.47	Noncoh. coarse & fn Grn/Clayey sands and silts
19.90-20.00	51.66	2.152	4.17	Coh.-noncoh. fn grained/ Sandy clay
20.00-20.04	48.84	1.347	2.76	Noncoh. coarse & fn Grn/Clayey sands and silts
20.04-20.08	50.42	1.226	2.43	Noncoh. coarse grained / Sand
20.08-20.10	51.65	1.320	2.56	Noncoh. coarse & fn Grn/Clayey sands and silts
20.10-20.14	52.26	1.297	2.48	Noncoh. coarse grained / Sand
20.14-20.38	50.62	1.417	2.80	Noncoh. coarse & fn Grn/Clayey sands and silts
20.38-20.46	56.80	1.334	2.35	Noncoh. coarse grained / Sand
20.46-20.52	46.26	1.172	2.53	Noncoh. coarse & fn Grn/Clayey sands and silts
20.52-20.56	45.12	1.055	2.34	Noncoh. coarse grained / Sand
20.56-20.58	45.43	1.133	2.49	Noncoh. coarse & fn Grn/Clayey sands and silts
20.58-20.64	46.69	1.085	2.32	Noncoh. coarse grained / Sand
20.64-20.74	46.55	1.204	2.59	Noncoh. coarse & fn Grn/Clayey sands and silts
20.74-20.76	47.93	1.170	2.44	Noncoh. coarse grained / Sand
20.76-21.00	52.23	1.707	3.26	Noncoh. coarse & fn Grn/Clayey sands and silts
21.00-21.58	47.84	1.979	4.15	Coh.-noncoh. fn grained/ Sandy clay
21.58-21.84	38.06	2.033	5.34	Cohesive fine grained /Very stiff inorg. clay
21.84-21.86	48.54	2.409	4.96	Coh.-noncoh. fn grained/ Sandy clay
21.86-21.88	49.15	2.589	5.27	Cohesive fine grained / Silty clay
21.88-21.96	62.07	2.760	4.48	Coh.-noncoh. fn grained/ Sandy clay
21.96-22.00	70.03	2.583	3.69	Noncoh. coarse & fn Grn/Clayey sands and silts
22.00-22.04	62.87	2.396	3.81	Coh.-noncoh. fn grained/ Sandy clay
22.04-22.10	61.61	2.168	3.52	Noncoh. coarse & fn Grn/Clayey sands and silts
22.10-22.28	60.02	2.518	4.20	Coh.-noncoh. fn grained/ Sandy clay
22.28-22.34	72.20	2.521	3.50	Noncoh. coarse & fn Grn/Clayey sands and silts
22.34-22.38	59.45	2.324	3.91	Coh.-noncoh. fn grained/ Sandy clay
22.38-22.52	57.61	2.020	3.50	Noncoh. coarse & fn Grn/Clayey sands and silts
22.52-22.54	59.76	2.247	3.76	Coh.-noncoh. fn grained/ Sandy clay
22.54-22.88	66.67	2.201	3.31	Noncoh. coarse & fn Grn/Clayey sands and silts
22.88-23.00	149.48	3.240	2.18	Noncoh. coarse grained / Silty sand
23.00-23.02	179.27	6.118	3.41	Noncoh. coarse & fn Grn/ Clayey silty sand
23.02-23.04	150.00	6.940	4.63	Coh.-noncoh. fn grained/ Sandy clay
23.04-23.14	98.96	6.730	6.79	Cohesive fine grained /Very stiff inorg. clay

B4. COMPUTER SOIL CLASSIFICATION FROM CPT DATA OF M4

Date/Time : 06-28-1990/12:19am
Job Description :
WEST MONROE SOUTH
Site Information : MONROE TRANSECT / 06289004
Job Number :
Probe I.D. : F7.5CKEW/V 207

LEGEND: fn = fine
Grn = grained

DEPTH (M)	CONE AVE	FRICT AVE	RATIO AVE(%)	CLASSIFICATION
0.02- 0.10	41.85	-0.032	-0.09	Undefined / Undefined
0.10- 0.32	82.03	0.962	1.22	Noncoh. coarse grained / Sand
0.32- 0.52	45.24	1.423	3.14	Noncoh. coarse & fn Grn/Clayey sands and silts
0.52- 0.64	22.92	0.868	3.83	Coh.-noncoh. fn grained/ Sandy clay
0.64- 0.66	17.44	0.790	4.53	Cohesive fine grained / Stiff inorg. clay
0.66- 0.74	16.34	0.666	4.08	Coh.-noncoh. fn grained/ Sandy clay
0.74- 0.76	17.44	1.151	6.60	Cohesive fine grained /Very stiff inorg. clay
0.76- 1.02	18.38	0.687	3.75	Coh.-noncoh. fn grained/ Sandy clay
1.02- 1.08	15.96	0.728	4.56	Cohesive fine grained / Stiff inorg. clay
1.08- 1.26	18.66	0.725	3.89	Coh.-noncoh. fn grained/ Sandy clay
1.26- 1.56	23.07	0.545	2.38	Noncoh. coarse & fn Grn/Clayey sands and silts
1.56- 1.62	41.49	0.859	2.07	Noncoh. coarse grained / Sand
1.62- 1.66	43.87	1.257	2.87	Noncoh. coarse & fn Grn/Clayey sands and silts
1.66- 1.70	37.32	1.584	4.28	Coh.-noncoh. fn grained/ Sandy clay
1.70- 2.30	14.63	0.818	5.54	Cohesive fine grained / Stiff inorg. clay
2.30- 2.34	20.22	0.744	3.74	Coh.-noncoh. fn grained/ Sandy clay
2.34- 4.60	136.58	1.393	1.10	Noncoh. coarse grained /Dense or cemented sand
4.60- 4.74	17.52	0.331	1.91	Noncoh. coarse & fn Grn/ Clayey sand
4.74- 5.00	10.01	0.235	2.36	Coh.-noncoh. fn grained/ Sandy clay
5.00- 5.14	15.56	0.254	1.66	Noncoh. coarse & fn Grn/ Clayey sand
5.14- 7.54	64.36	0.404	0.66	Noncoh. coarse grained / Sand
7.54- 7.56	23.05	0.498	2.16	Noncoh. coarse & fn Grn/Clayey sands and silts
7.56- 7.60	16.49	0.563	3.46	Coh.-noncoh. fn grained/ Sandy clay
7.60- 7.68	10.73	0.510	4.74	Cohesive fine grained / Stiff inorg. clay
7.68- 7.72	9.33	0.221	2.35	Coh.-noncoh. fn grained/ Sandy clay
7.72- 7.80	9.33	0.118	1.28	Noncoh. coarse & fn Grn/ Clayey sand
7.80- 8.26	36.80	0.182	0.56	Noncoh. coarse grained /Shell sand or limerock
8.26- 8.34	23.80	0.577	2.43	Noncoh. coarse & fn Grn/Clayey sands and silts
8.34- 8.94	23.30	0.194	0.77	Noncoh. coarse grained / Sand
8.94- 8.98	36.10	1.095	3.05	Noncoh. coarse & fn Grn/Clayey sands and silts
8.98- 9.04	29.45	1.048	3.59	Coh.-noncoh. fn grained/ Sandy clay
9.04- 9.12	15.72	0.775	4.86	Cohesive fine grained / Stiff inorg. clay
9.12- 9.18	12.03	0.371	3.10	Coh.-noncoh. fn grained/ Sandy clay
9.18- 9.22	14.33	0.274	1.91	Noncoh. coarse & fn Grn/ Clayey sand
9.22- 9.30	21.77	0.227	1.06	Noncoh. coarse grained / Sand
9.30- 9.32	19.27	0.473	2.46	Noncoh. coarse & fn Grn/Clayey sands and silts
9.32- 9.40	13.07	0.322	2.45	Coh.-noncoh. fn grained/ Sandy clay
9.40- 9.50	11.96	0.178	1.52	Noncoh. coarse & fn Grn/ Clayey sand
9.50-11.72	82.13	0.623	0.80	Noncoh. coarse grained / Sand
11.72-11.76	50.73	1.466	2.88	Noncoh. coarse & fn Grn/Clayey sands and silts
11.76-14.90	135.11	0.944	0.73	Noncoh. coarse grained /Dense or cemented sand
14.90-14.92	50.42	1.506	2.99	Noncoh. coarse & fn Grn/Clayey sands and silts
14.92-15.04	31.95	1.237	3.88	Coh.-noncoh. fn grained/ Sandy clay
15.04-15.14	25.27	0.543	2.14	Noncoh. coarse & fn Grn/Clayey sands and silts
15.14-15.30	31.98	0.525	1.65	Noncoh. coarse grained / Sand
15.30-15.38	31.60	0.880	2.79	Noncoh. coarse & fn Grn/Clayey sands and silts
15.38-15.56	29.95	1.144	3.83	Coh.-noncoh. fn grained/ Sandy clay
15.56-15.84	45.30	1.422	3.16	Noncoh. coarse & fn Grn/Clayey sands and silts

B4. (Continued)

DEPTH (M)	CONE AVE	FRICT AVE	RATIO AVE(%)	CLASSIFICATION
15.84-16.04	75.43	1.520	2.11	Noncoh. coarse grained / Sand
16.04-16.08	49.48	1.730	3.50	Noncoh. coarse & fn Grn/Clayey sands and silts
16.08-16.10	39.21	1.848	4.71	Coh.-noncoh. fn grained/ Sandy clay
16.10-16.12	36.71	1.842	5.02	Cohesive fine grained / Silty clay
16.12-16.14	36.71	1.656	4.51	Coh.-noncoh. fn grained/ Sandy clay
16.14-16.18	38.29	1.089	2.85	Noncoh. coarse & fn Grn/Clayey sands and silts
16.18-16.26	40.46	0.682	1.69	Noncoh. coarse grained / Sand
16.26-16.28	39.21	1.120	2.86	Noncoh. coarse & fn Grn/Clayey sands and silts
16.28-16.64	37.86	0.707	1.87	Noncoh. coarse grained / Sand
16.64-16.66	36.10	0.809	2.24	Noncoh. coarse & fn Grn/Clayey sands and silts
16.66-16.72	40.02	0.892	2.23	Noncoh. coarse grained / Sand
16.72-16.78	40.65	0.952	2.34	Noncoh. coarse & fn Grn/Clayey sands and silts
16.78-17.22	60.62	1.116	1.85	Noncoh. coarse grained / Sand
17.22-17.30	43.57	1.369	3.15	Noncoh. coarse & fn Grn/Clayey sands and silts
17.30-17.32	43.54	1.593	3.66	Coh.-noncoh. fn grained/ Sandy clay
17.32-17.36	46.37	1.310	2.83	Noncoh. coarse & fn Grn/Clayey sands and silts
17.36-17.84	65.66	1.248	1.91	Noncoh. coarse grained / Sand
17.84-17.88	34.85	0.771	2.22	Noncoh. coarse & fn Grn/Clayey sands and silts
17.88-17.90	33.60	0.710	2.11	Noncoh. coarse grained / Sand
17.90-17.98	35.17	0.919	2.60	Noncoh. coarse & fn Grn/Clayey sands and silts
17.98-18.00	39.21	1.382	3.52	Coh.-noncoh. fn grained/ Sandy clay
18.00-18.04	45.73	1.459	3.19	Noncoh. coarse & fn Grn/Clayey sands and silts
18.04-18.20	39.14	1.573	4.02	Coh.-noncoh. fn grained/ Sandy clay
18.20-18.26	49.80	1.571	3.16	Noncoh. coarse & fn Grn/Clayey sands and silts
18.26-18.28	56.03	2.216	3.96	Coh.-noncoh. fn grained/ Sandy clay
18.28-18.36	74.07	2.483	3.37	Noncoh. coarse & fn Grn/Clayey sands and silts
18.36-18.40	56.62	2.194	3.88	Coh.-noncoh. fn grained/ Sandy clay
18.40-18.42	63.48	2.054	3.24	Noncoh. coarse & fn Grn/Clayey sands and silts
18.42-18.46	78.75	2.166	2.75	Noncoh. coarse grained / Sand
18.46-18.48	65.36	2.085	3.19	Noncoh. coarse & fn Grn/Clayey sands and silts
18.48-18.58	51.91	2.012	3.88	Coh.-noncoh. fn grained/ Sandy clay
18.58-18.64	51.65	1.735	3.36	Noncoh. coarse & fn Grn/Clayey sands and silts
18.64-18.66	50.42	1.861	3.69	Coh.-noncoh. fn grained/ Sandy clay
18.66-18.82	50.96	1.816	3.56	Noncoh. coarse & fn Grn/Clayey sands and silts
18.82-18.84	50.42	1.848	3.67	Coh.-noncoh. fn grained/ Sandy clay
18.84-18.90	50.42	1.805	3.58	Noncoh. coarse & fn Grn/Clayey sands and silts
18.90-18.98	51.34	1.937	3.77	Coh.-noncoh. fn grained/ Sandy clay
18.98-19.04	55.18	1.892	3.43	Noncoh. coarse & fn Grn/Clayey sands and silts
19.04-19.18	86.16	1.993	2.34	Noncoh. coarse grained / Sand
19.18-19.22	57.59	1.919	3.35	Noncoh. coarse & fn Grn/Clayey sands and silts
19.22-19.30	47.77	1.949	4.08	Coh.-noncoh. fn grained/ Sandy clay
19.30-19.32	46.70	1.394	2.99	Noncoh. coarse & fn Grn/Clayey sands and silts
19.32-19.64	50.52	1.079	2.13	Noncoh. coarse grained / Sand
19.64-20.00	56.74	1.763	3.11	Noncoh. coarse & fn Grn/Clayey sands and silts
20.00-20.04	65.64	1.755	2.67	Noncoh. coarse grained / Sand
20.04-20.06	59.76	1.842	3.08	Noncoh. coarse & fn Grn/Clayey sands and silts
20.06-20.22	165.96	2.773	1.69	Noncoh. coarse grained /Dense or cemented sand
20.22-20.28	112.03	3.865	3.48	Noncoh. coarse & fn Grn/ Clayey silty sand
20.28-20.34	71.99	3.363	4.63	Coh.-noncoh. fn grained/ Sandy clay
20.34-20.36	49.81	1.338	2.69	Noncoh. coarse & fn Grn/Clayey sands and silts
20.36-20.42	107.05	2.027	1.96	Noncoh. coarse grained /Dense or cemented sand
20.42-20.46	70.64	2.287	3.25	Noncoh. coarse & fn Grn/Clayey sands and silts
20.46-20.54	55.70	2.246	4.04	Coh.-noncoh. fn grained/ Sandy clay
20.54-20.58	55.09	1.696	3.09	Noncoh. coarse & fn Grn/Clayey sands and silts
20.58-20.62	87.13	2.293	2.62	Noncoh. coarse grained / Sand
20.62-20.64	84.03	3.137	3.73	Noncoh. coarse & fn Grn/Clayey sands and silts
20.64-20.68	65.64	2.853	4.34	Coh.-noncoh. fn grained/ Sandy clay
20.68-20.70	79.03	2.944	3.72	Noncoh. coarse & fn Grn/Clayey sands and silts
20.70-20.74	134.12	3.012	2.25	Noncoh. coarse grained / Silty sand

B4. (Continued)

DEPTH (M)	CONE AVE	FRICT AVE	RATIO AVE(%)	CLASSIFICATION
20.74-20.76	110.79	3.784	3.42	Noncoh. coarse & fn Grn/ Clayey silty sand
20.76-20.80	76.25	3.389	4.51	Coh.-noncoh. fn grained/ Sandy clay
20.80-20.86	58.07	3.251	5.60	Cohesive fine grained / Silty clay
20.86-20.90	62.56	2.791	4.49	Coh.-noncoh. fn grained/ Sandy clay
20.90-21.24	61.83	1.811	2.93	Noncoh. coarse & fn Grn/Clayey sands and silts
21.24-21.54	83.40	2.018	2.43	Noncoh. coarse grained / Sand
21.54-21.68	70.51	2.183	3.09	Noncoh. coarse & fn Grn/Clayey sands and silts
21.68-21.80	60.89	1.481	2.44	Noncoh. coarse grained / Sand
21.80-21.82	52.26	1.344	2.57	Noncoh. coarse & fn Grn/Clayey sands and silts
21.82-22.06	87.85	1.971	2.28	Noncoh. coarse grained / Sand
22.06-22.20	93.44	3.270	3.51	Noncoh. coarse & fn Grn/Clayey sands and silts
22.20-22.22	87.14	2.484	2.85	Noncoh. coarse grained / Sand
22.22-22.26	84.33	2.539	3.01	Noncoh. coarse & fn Grn/Clayey sands and silts
22.26-22.30	98.96	2.875	2.90	Noncoh. coarse grained / Sand
22.30-22.42	75.93	2.597	3.42	Noncoh. coarse & fn Grn/Clayey sands and silts
22.42-22.50	82.15	2.150	2.62	Noncoh. coarse grained / Sand
22.50-22.64	75.40	2.216	2.94	Noncoh. coarse & fn Grn/Clayey sands and silts
22.64-22.76	74.58	1.913	2.57	Noncoh. coarse grained / Sand
22.76-22.90	71.93	2.138	2.97	Noncoh. coarse & fn Grn/Clayey sands and silts
22.90-22.92	79.03	2.123	2.69	Noncoh. coarse grained / Sand
22.92-23.08	72.35	2.099	2.90	Noncoh. coarse & fn Grn/Clayey sands and silts
23.08-23.12	71.89	1.951	2.71	Noncoh. coarse grained / Sand
23.12-23.14	71.58	1.979	2.76	Noncoh. coarse & fn Grn/Clayey sands and silts
23.14-23.26	73.75	1.912	2.59	Noncoh. coarse grained / Sand
23.26-23.34	70.79	2.082	2.94	Noncoh. coarse & fn Grn/Clayey sands and silts
23.34-23.36	79.03	2.048	2.59	Noncoh. coarse grained / Sand
23.36-23.58	74.86	2.218	2.96	Noncoh. coarse & fn Grn/Clayey sands and silts
23.58-23.76	70.46	1.841	2.61	Noncoh. coarse grained / Sand
23.76-24.28	69.13	2.128	3.08	Noncoh. coarse & fn Grn/Clayey sands and silts
24.28-24.30	59.14	2.222	3.76	Coh.-noncoh. fn grained/ Sandy clay
24.30-24.36	68.46	2.041	2.99	Noncoh. coarse & fn Grn/Clayey sands and silts
24.36-24.38	75.92	2.054	2.71	Noncoh. coarse grained / Sand
24.38-25.28	68.79	2.127	3.09	Noncoh. coarse & fn Grn/Clayey sands and silts
25.28-25.30	60.37	2.309	3.83	Coh.-noncoh. fn grained/ Sandy clay
25.30-26.20	61.29	1.987	3.24	Noncoh. coarse & fn Grn/Clayey sands and silts
26.20-26.26	73.23	1.143	1.53	Noncoh. coarse grained / Sand

B5. COMPUTER SOIL CLASSIFICATION FROM CPT DATA OF M6A

Date/Time : 06-28-1990/ 1:57pm
Job Description :
WEST MONROE SOUTH
Site Information : MONROE TRANSECT
Job Number : 06289006A
Probe I.D. : F7.5CKEW/V 207

LEGEND: fn = fine
Grn = grained

DEPTH (M)	CONE AVE	FRICT AVE	RATIO AVE(%)	CLASSIFICATION
0.02- 0.22	56.94	0.557	0.93	Noncoh. coarse grained / Sand
0.22- 0.28	46.67	1.434	3.08	Noncoh. coarse & fn Grn/Clayey sands and silts
0.28- 0.32	38.90	1.515	3.91	Coh.-noncoh. fn grained/ Sandy clay
0.32- 0.34	30.49	1.581	5.19	Cohesive fine grained /Very stiff inorg. clay
0.34- 0.36	24.27	0.585	2.41	Noncoh. coarse & fn Grn/Clayey sands and silts
0.36- 0.40	20.52	0.778	3.78	Coh.-noncoh. fn grained/ Sandy clay
0.40- 0.56	17.35	1.088	6.37	Cohesive fine grained /Very stiff inorg. clay
0.56- 0.62	24.27	0.988	4.09	Coh.-noncoh. fn grained/ Sandy clay
0.62- 0.68	34.86	0.952	2.75	Noncoh. coarse & fn Grn/Clayey sands and silts
0.68- 1.10	56.87	1.037	1.81	Noncoh. coarse grained / Sand
1.10- 1.20	52.90	1.601	3.04	Noncoh. coarse & fn Grn/Clayey sands and silts
1.20- 1.32	36.00	1.507	4.19	Coh.-noncoh. fn grained/ Sandy clay
1.32- 1.34	30.49	0.890	2.92	Noncoh. coarse & fn Grn/Clayey sands and silts
1.34- 1.38	31.13	1.254	4.06	Coh.-noncoh. fn grained/ Sandy clay
1.38- 1.56	30.92	1.685	5.46	Cohesive fine grained /Very stiff inorg. clay
1.56- 2.02	41.83	1.753	4.20	Coh.-noncoh. fn grained/ Sandy clay
2.02- 2.18	52.59	1.717	3.26	Noncoh. coarse & fn Grn/Clayey sands and silts
2.18- 2.24	65.55	2.938	4.47	Coh.-noncoh. fn grained/ Sandy clay
2.24- 2.66	49.93	3.316	6.71	Cohesive fine grained /Very stiff inorg. clay
2.66- 2.74	48.69	2.079	4.30	Coh.-noncoh. fn grained/ Sandy clay
2.74- 2.78	73.44	2.651	3.63	Noncoh. coarse & fn Grn/Clayey sands and silts
2.78- 2.92	122.70	2.559	2.13	Noncoh. coarse grained / Silty sand
2.92- 2.94	110.18	3.573	3.24	Noncoh. coarse & fn Grn/ Clayey silty sand
2.94- 2.98	95.22	4.344	4.59	Coh.-noncoh. fn grained/ Sandy clay
2.98- 3.02	88.05	5.013	5.69	Cohesive fine grained / Silty clay
3.02- 3.06	98.02	4.823	4.94	Coh.-noncoh. fn grained/ Sandy clay
3.06- 3.12	124.47	4.336	3.51	Noncoh. coarse & fn Grn/ Clayey silty sand
3.12- 3.22	162.95	4.353	2.68	Noncoh. coarse grained / Silty sand
3.22- 3.30	135.67	4.809	3.56	Noncoh. coarse & fn Grn/ Clayey silty sand
3.30- 3.32	129.45	3.629	2.80	Noncoh. coarse grained / Silty sand
3.32- 3.42	128.84	4.435	3.46	Noncoh. coarse & fn Grn/ Clayey silty sand
3.42- 3.52	96.60	4.340	4.51	Coh.-noncoh. fn grained/ Sandy clay
3.52- 3.66	62.95	4.241	6.81	Cohesive fine grained /Very stiff inorg. clay
3.66- 3.68	76.53	3.162	4.13	Coh.-noncoh. fn grained/ Sandy clay
3.68- 3.70	103.96	3.118	3.00	Noncoh. coarse & fn Grn/ Clayey silty sand
3.70- 3.74	132.89	3.688	2.77	Noncoh. coarse grained / Silty sand
3.74- 3.84	171.16	6.412	3.75	Noncoh. coarse & fn Grn/ Clayey silty sand
3.84- 4.12	312.04	6.629	2.18	Noncoh. coarse grained / Silty sand

B6. COMPUTER SOIL CLASSIFICATION FROM CPT DATA OF M7

Date/Time : 06-28-1990/ 2:39pm
Job Description :
WEST MONROE SOUTH
Site Information : MONROE TRANSACT
Job Number : 06289006
Probe I.D. : F7.5CKEW/V 207

LEGEND: fn = fine
Grn = grained

DEPTH (M)	CONE AVE	FRICT AVE	RATIO AVE(%)	CLASSIFICATION
0.02- 0.04	-1.22	0.031	-2.54	Undefined / Undefined
0.04- 0.06	5.00	0.050	1.00	Noncoh. coarse & fn Grn/ Clayey sand
0.06- 0.24	75.93	1.104	1.40	Noncoh. coarse grained / Sand
0.24- 0.36	59.02	1.793	3.08	Noncoh. coarse & fn Grn/Clayey sands and silts
0.36- 0.42	37.97	1.342	3.53	Coh.-noncoh. fn grained/ Sandy clay
0.42- 0.56	27.91	0.800	2.83	Noncoh. coarse & fn Grn/Clayey sands and silts
0.56- 0.62	21.99	0.794	3.65	Coh.-noncoh. fn grained/ Sandy clay
0.62- 0.92	13.86	0.774	5.65	Cohesive fine grained / Stiff inorg. clay
0.92- 0.96	16.19	0.654	4.04	Coh.-noncoh. fn grained/ Sandy clay
0.96- 1.16	10.90	0.652	6.32	Cohesive fine grained / Organic clay
1.16- 1.24	4.67	0.507	10.85	Undefined / Undefined
1.24- 1.34	4.73	0.411	8.71	Cohesive fine grained / Organic clay
1.34- 1.38	3.11	0.352	11.31	Undefined / Undefined
1.38- 1.68	7.30	0.475	6.74	Cohesive fine grained / Organic clay
1.68- 1.82	26.76	1.132	4.03	Coh.-noncoh. fn grained/ Sandy clay
1.82- 1.84	46.04	2.352	5.11	Cohesive fine grained / Silty clay
1.84- 1.86	51.04	2.564	5.02	Coh.-noncoh. fn grained/ Sandy clay
1.86- 2.02	59.74	3.318	5.56	Cohesive fine grained / Silty clay
2.02- 2.08	70.75	3.461	4.89	Coh.-noncoh. fn grained/ Sandy clay
2.08- 3.06	40.62	2.528	6.15	Cohesive fine grained /Very stiff inorg. clay
3.06- 3.08	34.21	1.307	3.82	Coh.-noncoh. fn grained/ Sandy clay
3.08- 3.10	46.04	1.369	2.97	Noncoh. coarse & fn Grn/Clayey sands and silts
3.10- 3.16	76.99	1.824	2.37	Noncoh. coarse grained / Sand
3.16- 3.18	79.03	2.471	3.13	Noncoh. coarse & fn Grn/Clayey sands and silts
3.18- 3.22	63.50	2.794	4.43	Coh.-noncoh. fn grained/ Sandy clay
3.22- 3.48	32.89	2.024	6.10	Cohesive fine grained /Very stiff inorg. clay
3.48- 3.52	20.22	0.889	4.40	Coh.-noncoh. fn grained/ Sandy clay
3.52- 3.64	15.26	0.913	6.23	Cohesive fine grained /Very stiff inorg. clay
3.64- 3.82	19.57	0.780	3.99	Coh.-noncoh. fn grained/ Sandy clay
3.82- 4.06	19.60	1.058	5.40	Cohesive fine grained /Very stiff inorg. clay
4.06- 4.08	21.16	0.940	4.44	Coh.-noncoh. fn grained/ Sandy clay
4.08- 4.14	20.55	0.956	4.65	Cohesive fine grained / Stiff inorg. clay
4.14- 4.18	23.63	0.943	4.01	Coh.-noncoh. fn grained/ Sandy clay
4.18- 4.20	37.32	1.083	2.90	Noncoh. coarse & fn Grn/Clayey sands and silts
4.20- 4.36	109.15	1.261	1.23	Noncoh. coarse grained /Dense or cemented sand
4.36- 4.38	71.58	2.029	2.83	Noncoh. coarse & fn Grn/Clayey sands and silts
4.38- 4.40	54.15	2.209	4.08	Coh.-noncoh. fn grained/ Sandy clay
4.40- 4.54	30.23	1.781	5.87	Cohesive fine grained /Very stiff inorg. clay
4.54- 4.60	21.97	0.805	3.66	Coh.-noncoh. fn grained/ Sandy clay
4.60- 4.66	24.27	0.575	2.38	Noncoh. coarse & fn Grn/Clayey sands and silts
4.66- 5.44	101.15	1.820	1.77	Noncoh. coarse grained /Dense or cemented sand
5.44- 5.48	63.48	2.029	3.23	Noncoh. coarse & fn Grn/Clayey sands and silts
5.48- 5.52	43.57	1.967	4.50	Coh.-noncoh. fn grained/ Sandy clay
5.52- 5.62	30.00	1.595	5.33	Cohesive fine grained /Very stiff inorg. clay
5.62- 5.68	27.60	1.068	3.90	Coh.-noncoh. fn grained/ Sandy clay
5.68- 5.74	35.89	0.925	2.57	Noncoh. coarse & fn Grn/Clayey sands and silts
5.74- 5.98	89.83	1.724	1.96	Noncoh. coarse grained / Sand

B6. (Continued)

DEPTH (M)	CONE AVE	FRICT AVE	RATIO AVE(%)	CLASSIFICATION
5.98- 6.00	62.25	2.284	3.67	Noncoh. coarse & fn Grn/Clayey sands and silts
6.00- 6.02	47.32	2.328	4.92	Coh.-noncoh. fn grained/ Sandy clay
6.02- 6.10	29.10	1.665	5.66	Cohesive fine grained /Very stiff inorg. clay
6.10- 6.14	22.41	0.868	3.86	Coh.-noncoh. fn grained/ Sandy clay
6.14- 6.42	18.58	0.446	2.40	Noncoh. coarse & fn Grn/Clayey sands and silts
6.42- 6.50	18.20	0.521	2.86	Coh.-noncoh. fn grained/ Sandy clay
6.50- 6.60	27.39	0.733	2.72	Noncoh. coarse & fn Grn/Clayey sands and silts
6.60- 6.86	86.03	1.575	1.82	Noncoh. coarse grained / Sand
6.86- 6.88	69.09	2.384	3.45	Noncoh. coarse & fn Grn/Clayey sands and silts
6.88- 6.90	57.26	2.552	4.46	Coh.-noncoh. fn grained/ Sandy clay
6.90- 6.96	45.22	2.531	5.60	Cohesive fine grained /Very stiff inorg. clay
6.96- 6.98	50.42	1.960	3.89	Coh.-noncoh. fn grained/ Sandy clay
6.98- 7.54	153.31	2.669	1.81	Noncoh. coarse grained /Dense or cemented sand
7.54- 7.56	78.42	3.099	3.95	Coh.-noncoh. fn grained/ Sandy clay
7.56- 7.66	48.66	2.801	5.77	Cohesive fine grained /Very stiff inorg. clay
7.66- 7.68	37.98	1.768	4.65	Coh.-noncoh. fn grained/ Sandy clay
7.68- 7.70	38.60	2.010	5.21	Cohesive fine grained / Silty clay
7.70- 7.80	43.44	1.335	3.08	Noncoh. coarse & fn Grn/Clayey sands and silts
7.80- 7.82	37.32	1.599	4.29	Coh.-noncoh. fn grained/ Sandy clay
7.82- 7.90	34.39	1.854	5.40	Cohesive fine grained /Very stiff inorg. clay
7.90- 7.94	37.65	1.506	4.01	Coh.-noncoh. fn grained/ Sandy clay
7.94- 7.98	39.21	1.223	3.12	Noncoh. coarse & fn Grn/Clayey sands and silts
7.98- 9.68	149.89	2.732	1.84	Noncoh. coarse grained /Dense or cemented sand
9.68- 9.72	61.31	1.995	3.29	Noncoh. coarse & fn Grn/Clayey sands and silts
9.72- 9.74	45.43	2.141	4.71	Coh.-noncoh. fn grained/ Sandy clay
9.74- 9.76	41.09	2.129	5.18	Cohesive fine grained / Silty clay
9.76- 9.78	46.70	1.824	3.90	Coh.-noncoh. fn grained/ Sandy clay
9.78- 9.80	56.65	1.737	3.07	Noncoh. coarse & fn Grn/Clayey sands and silts
9.80- 9.92	62.02	1.370	2.21	Noncoh. coarse grained / Sand
9.92- 9.94	37.98	1.357	3.57	Coh.-noncoh. fn grained/ Sandy clay
9.94-10.00	20.75	1.438	7.47	Cohesive fine grained / Organic clay
10.00-10.02	11.83	1.332	11.26	Undefined / Undefined
10.02-10.10	11.83	0.895	7.56	Cohesive fine grained / Organic clay
10.10-10.30	11.77	0.391	3.32	Coh.-noncoh. fn grained/ Sandy clay
10.30-10.48	10.51	0.509	4.87	Cohesive fine grained / Stiff inorg. clay
10.48-10.50	3.72	0.442	11.88	Undefined / Undefined
10.50-11.00	8.59	0.437	5.18	Cohesive fine grained / Medium inorg. clay
11.00-11.04	14.02	0.463	3.40	Coh.-noncoh. fn grained/ Sandy clay
11.04-11.10	49.58	0.751	1.54	Noncoh. coarse grained / Sand
11.10-11.12	37.98	1.077	2.83	Noncoh. coarse & fn Grn/Clayey sands and silts
11.12-11.16	21.77	1.335	6.29	Cohesive fine grained /Very stiff inorg. clay
11.16-11.18	13.71	1.475	10.76	Undefined / Undefined
11.18-11.26	21.31	1.298	6.31	Cohesive fine grained /Very stiff inorg. clay
11.26-11.28	19.93	0.865	4.34	Coh.-noncoh. fn grained/ Sandy clay
11.28-11.30	27.99	0.821	2.93	Noncoh. coarse & fn Grn/Clayey sands and silts
11.30-11.34	40.76	0.899	2.20	Noncoh. coarse grained / Sand
11.34-11.36	44.82	1.108	2.47	Noncoh. coarse & fn Grn/Clayey sands and silts
11.36-11.60	85.58	1.542	1.89	Noncoh. coarse grained / Sand
11.60-11.64	59.45	1.926	3.28	Noncoh. coarse & fn Grn/Clayey sands and silts
11.64-11.74	27.02	1.990	7.70	Cohesive fine grained / Organic clay
11.74-11.76	32.38	1.382	4.27	Coh.-noncoh. fn grained/ Sandy clay
11.76-11.80	36.40	1.073	2.95	Noncoh. coarse & fn Grn/Clayey sands and silts
11.80-11.86	25.51	1.052	4.14	Coh.-noncoh. fn grained/ Sandy clay
11.86-11.88	39.21	1.102	2.81	Noncoh. coarse & fn Grn/Clayey sands and silts
11.88-11.90	46.70	1.040	2.23	Noncoh. coarse grained / Sand
11.90-11.92	39.82	1.114	2.80	Noncoh. coarse & fn Grn/Clayey sands and silts
11.92-11.94	30.49	1.158	3.80	Coh.-noncoh. fn grained/ Sandy clay
11.94-11.98	22.08	1.182	5.36	Cohesive fine grained /Very stiff inorg. clay
11.98-12.00	32.99	1.245	3.77	Coh.-noncoh. fn grained/ Sandy clay

B6. (Continued)

DEPTH (M)	CONE AVE	FRICT AVE	RATIO AVE(%)	CLASSIFICATION
12.00-12.54	102.54	1.770	1.74	Noncoh. coarse grained /Dense or cemented sand
12.54-12.58	56.95	1.767	3.15	Noncoh. coarse & fn Grn/Clayey sands and silts
12.58-12.66	32.04	2.009	6.40	Cohesive fine grained /Very stiff inorg. clay
12.66-12.68	45.43	1.525	3.36	Noncoh. coarse & fn Grn/Clayey sands and silts
12.68-13.06	102.21	1.310	1.34	Noncoh. coarse grained /Dense or cemented sand
13.06-13.12	57.46	1.751	3.05	Noncoh. coarse & fn Grn/Clayey sands and silts
13.12-14.54	123.78	1.964	1.64	Noncoh. coarse grained /Dense or cemented sand
14.54-14.56	47.93	1.780	3.71	Coh.-noncoh. fn grained/ Sandy clay
14.56-14.70	18.94	1.439	7.82	Cohesive fine grained / Organic clay
14.70-14.72	26.16	0.541	2.07	Noncoh. coarse & fn Grn/Clayey sands and silts
14.72-17.60	94.32	1.061	1.15	Noncoh. coarse grained / Sand
17.60-17.68	43.72	1.229	2.82	Noncoh. coarse & fn Grn/Clayey sands and silts
17.68-17.78	40.94	1.587	3.89	Coh.-noncoh. fn grained/ Sandy clay
17.78-17.84	44.39	1.519	3.42	Noncoh. coarse & fn Grn/Clayey sands and silts
17.84-17.86	36.10	1.388	3.85	Coh.-noncoh. fn grained/ Sandy clay
17.86-17.92	27.80	1.525	5.49	Cohesive fine grained /Very stiff inorg. clay
17.92-17.94	31.76	1.263	3.98	Coh.-noncoh. fn grained/ Sandy clay
17.94-18.12	62.24	1.085	1.75	Noncoh. coarse grained / Sand
18.12-18.14	60.37	1.811	3.00	Noncoh. coarse & fn Grn/Clayey sands and silts
18.14-18.18	46.98	2.157	4.60	Coh.-noncoh. fn grained/ Sandy clay
18.18-18.26	33.61	2.012	6.03	Cohesive fine grained /Very stiff inorg. clay
18.26-18.52	391.39	4.076	1.02	Noncoh. coarse grained /Dense or cemented sand
18.52-18.54	110.79	4.935	4.46	Coh.-noncoh. fn grained/ Sandy clay
18.54-18.68	345.42	5.669	1.71	Noncoh. coarse grained /Dense or cemented sand
18.68-18.70	166.16	6.479	3.90	Noncoh. coarse & fn Grn/ Clayey silty sand
18.70-18.72	130.68	7.114	5.44	Coh.-noncoh. fn grained/ Sandy clay
18.72-18.74	164.33	6.585	4.01	Noncoh. coarse & fn Grn/ Clayey silty sand

APPENDIX G

GLOSSARY OF TECHNICAL TERMS USED IN THIS REPORT

AGGRADATION - The building up of the Earth's surface by deposition. Specifically the upbuilding performed by a stream in order to establish or maintain uniformity of grade or slope.

AGGREGATE - (a) A mass or body of rock particles, mineral grains, or mixture of both. (b) Any of several hard inert materials, such as sand, gravel, slag, or crushed stone, used for mixing with a cementing or bituminous material to form concrete, mortar, or plaster; or used alone, as in railroad ballast or graded fill.

ALLUVIAL FAN - A sloping, fan-shaped mass of loose rock material deposited by a stream at the place where it emerges from an upland into a broad valley or plain.

ALLUVIUM - A general term for all detrital material deposited permanently or in transit by streams. It includes gravel, sand, silt and clay, and all variations and mixtures of these.

BASE LEVEL - The theoretical limit toward which erosion constantly tends to reduce the land. Sea level is the general base level, but in the reduction of the land there may be many temporary and/or local base levels below which, for the time being, streams cannot reduce the land.

BRAIDED STREAM - A stream that divides into or follow an interlacing or tangled network of several small branching and reuniting shallow channels separated from each other by branch islands and channel bars, resembling in plan the strands of a complex braid. Such a stream is generally believed to indicate an inability to carry all its load.

CUTOFF CHANNEL - The new and relatively short channel formed when a stream cuts through a narrow strip of land and thereby shortens the length of its channel.

CHENIER - A long narrow wooded beach ridge or sandy hummock, three to six meters high, forming roughly parallel to a prograding shoreline seaward of marsh and mudflat deposits, enclosed on the seaward side by fine-grained sediments, and resting on foreshore or mudflat deposits.

CITRONELLE FORMATION - An upland sand and gravel deposit of the Gulf Coastal Plain. In Louisiana it is generally equivalent to the High terraces.

CONSTRUCTIONAL LANDFORM - A land form created by accumulation of material; examples are deltas and flood plains.

DEGRADATION - The wearing down or away, and the general lowering or reduction, of the Earth's surface by the natural processes of weathering and erosion; e.g. the deepening by a stream of its channel.

DELTA - Deltas are formed when a stream system encounters a large body of water, either an ocean or lake; this immediately decreases both the gradient and the flow velocity and allows the sediments and debris to settle.

DEWEYVILLE TERRACES - Louisiana geologic map unit described as gray mixed with brown to red clay and silty clay; some sand and gravel locally. Topographically higher than Holocene alluvium and lower than Prairie terraces. Found along streams of intermediate size.

DRAINAGE PATTERNS

DENDRITIC - Drainage pattern characterized by a tree-like branching system in which the tributaries join the gently curving mainstream at acute angles.

RECTANGULAR - A variation of the dendritic system where the tributaries join the mainstream at right angles and form rectangular shapes controlled by bedrock jointing, foliations or fracturing.

TRELLIS - A modified dendritic forms with parallel tributaries and short parallel gullies occurring at right angles.

RADIAL - A circular network of almost parallel channels flowing away from a central high point characterizes this pattern.

CENTRIPETAL - A variation of the radial system in which the drainage is directed downward toward a central point.

DERANGED - Non-integrated drainage systems resulting from a relatively young landform having flat or undulating topographic surface and a high water table.

EOCENE - The epoch of the Tertiary between the Paleocene and Oligocene epochs.

EOCENE COCKFIELD FORMATION - Louisiana geologic map unit described as brown lignitic clays, silts, and sands; some sideritic glauconite may weather to brown ironstone in lower part.

EPOCH - (a) A geologic time unit longer than age and shorter than a period, during which the rocks of the corresponding series were formed. (b) A term used informally to designate a length (usually short) of geologic time.

GEOMORPHIC - Pertaining to the form of the Earth or its surface features.

GEOMORPHOLOGY - The science that treats the general configuration of the Earth's surface; specifically the study of the classification, description, nature, origin, and development of present landforms, and of the history of geologic changes as recorded by these surface features.

HIGH TERRACES - Louisiana geologic map unit described as tan to orange clay, silt and sand with large amount of basal gravel. Surfaces are highly dissected and less continuous than lower terraces.

HOLOCENE - An epoch of the Quaternary period, from the end of the Pleistocene, approximately 10,000 years ago, to present time; also, the corresponding series of rocks and deposits.

HOLOCENE FLOODPLAIN - A floodplain deposited during the Holocene period. It is generally the surface of modern overflow.

IMAGE INTERPRETATION - Comprises at least three mental acts, which may or may not be performed simultaneously; (1) measurement of objects on the imagery, (2) identification of the objects imaged, and (3) appropriate use of this information in the solution of problem on hand.

INTERMEDIATE TERRACES - Louisiana geologic map unit described as light gray to orange-brown clay, sandy clay and silt; much sand and gravel locally. Surfaces show more dissection and are topographically higher than the Prairie.

LACUSTRINE - Pertaining to, produced by, or formed in a lake or lakes; e.g. " lacustrine plain" the relic bottom of an ancestral lake, or a "lacustrine terrace" formed along its margin.

LANDFORM - A terrain feature formed by natural processes, which has a definable composition and range of characteristics that occur wherever that landform is found.

LEVEE - An embankment along the shore of a river or arm of the sea to prevent overflow.

LOESS DEPOSITS - An unconsolidated or weakly consolidated sedimentary deposit composed dominantly of silt-sized rock and mineral particles deposited by wind. Loess may contain appreciable amounts of fine sand or clay, or both, but most of the particles are generally within the size range 0.01 to 0.05 mm.

MEANDER BELT - The zone along a valley floor across which a meandering stream shifts its channel from time to time; specifically the area of the floodplain included between two lines drawn tangentially to the extreme limits of all fully developed meanders.

MEANDER CUTOFF - A cutoff formed when a stream cuts through a meander neck.

MEANDER SCAR - A crescentic, concave mark on the face of a bluff or valley wall, produced by the lateral planation of a meandering stream which undercuts the bluff, and indicating the abandoned route of the stream.

MIOCENE - The epoch of the Tertiary period between the Oligocene and the Pliocene epochs.

NATURAL LEVEE - A levee built by a river in times of flood by deposition of material upon the banks. Natural levees are relatively low and wide.

OLIGOCENE - The epoch of the tertiary period between the Eocene and Miocene epochs.

OLIGOCENE CATAHOULA FORMATION - Louisiana geologic map unit described as gray to white sandstones, loose quartz sand, tuffaceous sandstone, volcanic ash, and brown sandy clays; petrified wood locally.

OVERBURDEN - Term used to designate material of any nature, consolidated or unconsolidated, that overlies deposits of useful materials, ores, or coal, especially those deposits that are mined from surface by open cuts.

OXBOW LAKE - Meander loops lend themselves by the erosion of their outer banks, which gradually narrows the neck between successive loops. In time of flood the neck may be breached and the ends of the loop become silted up and the river taking a new, "preferred," straighter course. The cut-off loop is called an oxbow lake.

PANCHROMATIC - The film normally used for making black and white aerial photographs. Panchromatic film has a black and white emulsion with a spectral sensitivity from 0.36 to 0.72 micrometer.

PLEISTOCENE - An epoch of the Quaternary period, after the Pliocene of the Tertiary and before the Holocene; also, the corresponding worldwide series of rocks. It began two to three million years ago and lasted until the start of the Holocene some 10,000 years ago.

POINT BAR - One of a series of low, arcuate ridges of sand and gravel developed on the inside of a growing meander by slow addition of individual accretions accompanying migration of the channel toward the outer bank.

PRAIRIE TERRACES - Louisiana geologic map unit described as light gray to light brown clay, sandy clay, silt, sand and some gravel. Surfaces generally show little dissection and are topographically higher than the Deweyville. Three levels are recognized: two along alluvial valleys, the lower coalescing with its broad coastwise expression; the third, still lower, found intermittently gulfward.

QUATERNARY - The second period of the Cenozoic era, following the Tertiary; also, the corresponding system of rocks. It began two to three million years ago and extends to the present. It is consists of two grossly unequal epochs: The Pleistocene, up to about 10,000 years ago, and the Holocene since that time.

REMOTE SENSING - The science and art of obtaining information about an object, area, or phenomenon through the analysis of data acquired by a device that is not in contact with the object, area, or phenomenon under investigation.

SEDIMENTS - Solid fragmental material that originates from weathering of rocks and is transported or deposited by air, water, or ice, or that accumulates by other natural agents ,such as chemical precipitation from solution or secretion from organisms, and that forms in layers on the Earth's surface at ordinary temperatures in a loose, unconsolidated form; e.g. sand, gravel, silt, mud, till, loess and alluvium.

STREAM FLOODPLAIN - A flat tract of land bordering a river, mainly in its lower reaches, and consisting of alluvium deposited by the river. It is formed when sediments carried by rivers and streams are deposited during floods in slack-water areas where velocities are low.

STRATIGRAPHIC CLASSIFICATION - The systematic arrangement, zonation or partitioning of the sequence of rock strata of the Earth's crust into units with reference to any or all of the many different characters, properties, or attributes which the strata may possess. Louisiana stratigraphic units are classified primarily on the physical properties of earth materials.

STREAM TERRACES - Abandoned floodplains and/or coastal landforms that were formed in the geologic past are commonly preserved at a higher topographic level than adjacent landforms that are presently active.

TERRAIN ANALYSIS -Terrain analysis is the systematic study of visual and physical elements relating the origin, morphologic history and composition of landforms.

TERTIARY - The first period of the Cenozoic era (after the Mesozoic era and before the Quaternary), thought to cover the span of time between 65 and approximately two millions years ago. It is divided into five epochs: the Paleocene, Eocene, Oligocene, Miocene, and Pliocene.