FINAL REPORT

PALYNOLOGY OF THE UPPERMOST LARAMIE AND ARAPAHOE FORMATIONS AT THE ROCKY FLATS PLANT NEAR GOLDEN, COLORADO

U.S. DEPARTMENT OF ENERGY

Rocky Flats Plant

Golden, Colorado

ENVIRONMENTAL RESTORATION PROGRAM

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PALYNOLOGY OF THE UPPER LARAMIE AND ARAPAHOE FORMATIONS AT THE ROCKY FLATS PLANT NEAR GOLDEN, COLORADO

1.0 STUDY OBJECTIVES

The current geologic characterization model for the Rocky Flats Plant (RFP) establishes an environment of deposition that is based upon interpretation of stratigraphic data obtained from numerous boreholes and wells installed throughout the plant site. The current interpretation at the RFP for the Late Cretaceous age Arapahoe Formation is a meandering system of fluvial or lower deltaic sandstone-filled distributary channels surrounded by interdistributary claystone, mudstone, siltstone, or argillaceous sandstone. Difficulties in identifying and recognizing correlative units or continuous lithologies has confounded stratigraphic interpretations. It was initially thought that a biostratigraphic study might aid in defining and resolving the issue of depositional architecture through interpretation of the depositional environments. However, during the course of this study, it became apparent that a palynology study would not provide the stratigraphic resolution necessary to accomplish this. Therefore, EG&G modified the objectives of the study to address several other relevant issues.

1. The first objective of this study was to evaluate the environments of deposition of the Laramie and Arapahoe Formations in the subsurface at the RFP. The determination of sedimentary environments can be a useful tool for defining subsurface sandstone aquifer geometries.

2. The second objective of this study was to evaluate the location of the contact

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between the Laramie and Arapahoe Formations. In the Geologic Characterization Report (1991) the Arapahoe Formation underlying the RFP is described as consisting of 150 feet of claystone, siltstone, and sandstone. According to the Surface Mapping Report (1992), the Arapahoe Formation is significantly thinner. In the surface mapping report, the sandstone defined as Arapahoe Sandstone No. 1 in the Geologic Characterization is termed the basal Arapahoe Sandstone.

3. The third objective was to establish basic stratigraphic correlation. Correlations in the Phase I Geologic Characterization (July 31, 1991) were based on the assumption that the subsurface units are laterally continuous and relatively flat lying with a regional dip of 1.5 degrees to the east. In a recent field mapping project (Phase II Geologic Characterization Data Acquisition - - Surface Geologic Mapping of the RFP and Vicinity, Jefferson and Boulder Counties, Colorado, 1992), it was suggested that faulting in the area could account for difficulties with stratigraphic correlation. Evidence for faulting was presented on core logs from the 1991-1992 site-wide drilling program (i.e.. Borehole 40291). In addition, one or more potential marker beds (see attachments in Appendix 1) were identified in the 1991-1992 site-wide drilling program. One of the issues addressed by this biostratigraphic study was to determine if any of the potential marker beds were truly correlative.

2.0 INTRODUCTION

The Upper Cretaceous (Maastrichtian) Laramie and Arapahoe Formations occur in the subsurface at the Rocky Flats Plant located north of Golden, Colorado. The Laramie Formation consists of sandstone, siltstone, claystone, and thin coal beds (See Generalized Stratigraphic Section). According to Weimer and Land (1975), the Laramie Formation was deposited in a delta plain environment along the western edge of the Western Interior Seaway. Within the delta plain complex, sub-environments include channel, channel-levee, swamp, crevasse splay, and bay or lake settings. The Arapahoe Formation consists of conglomeratic sandstone, sandstone, siltstone, mudstone, and claystone (see Generalized Stratigraphic Section) and was deposited in a fluvial-deltaic environment.

The palynology of the Laramie and Arapahoe Formations was studied to: 1) document the depositional environments represented by the plant microfossil assemblages; and to 2) determine if the two formations could be distinguished by their plant microfossil assemblages; and finally to 3) determine if several thin calcareous siltstone beds within the Laramie Formation could be used as stratigraphic correlation markers in the subsurface.

GENERALIZED STRATIGRAPHIC SECTION

Golden-Morrison Area

JEFFERSON COUNTY, COLORADO

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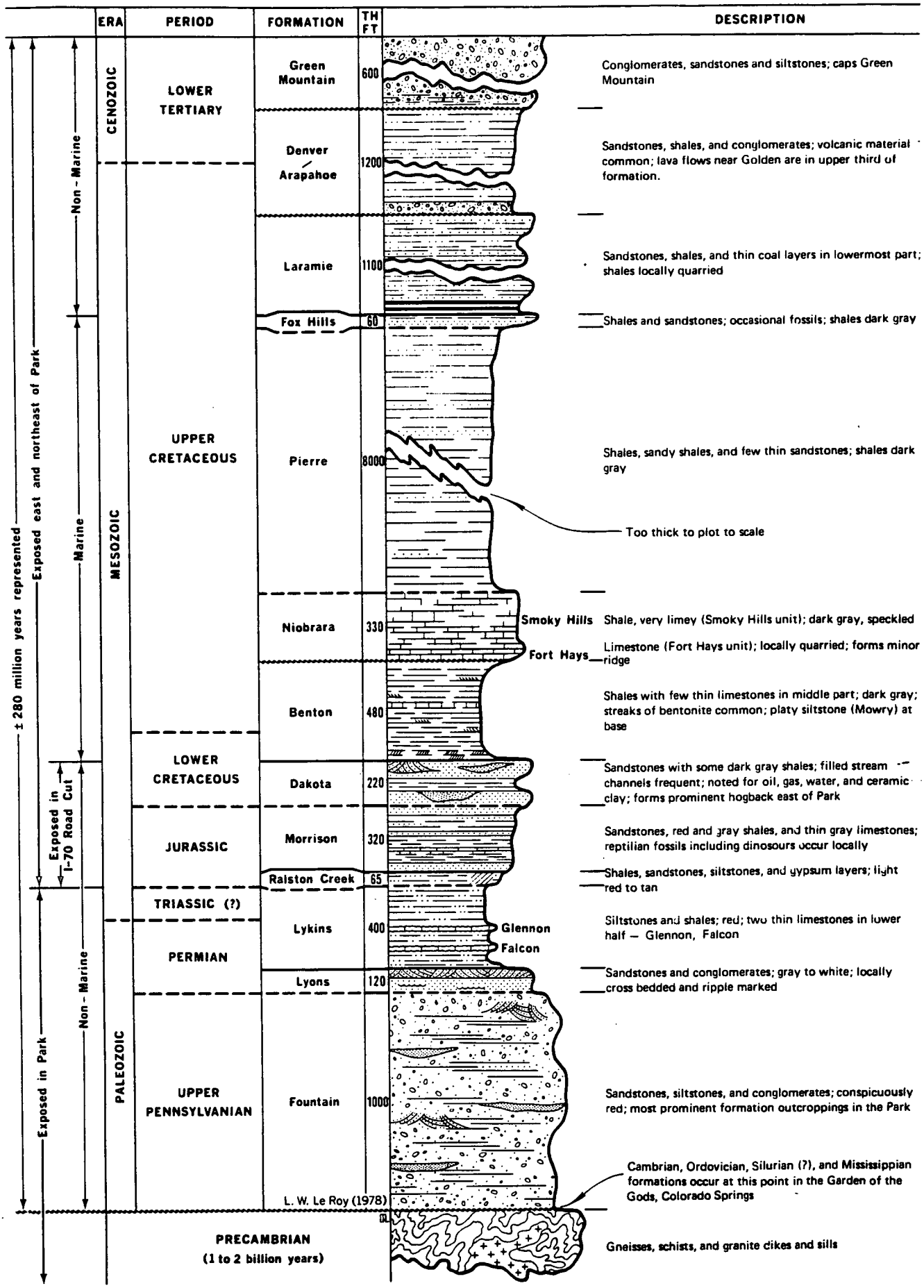

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3.0 METHODS

Thirty core samples were collected from five wells on 8 September 1992. Four additional core samples from two different wells were collected on 25 September 1992. After initial analysis of the 34 samples, 15 additional samples were collected on 5 January 1993. The 49 core samples were from the following wells: #00191, #00291, #40591, #40891, #41191, #42892, #B217489, #B217689, #B217789, #B218589, and #B315289. (see Appendix 2). The 49 core samples were processed to extract the plant microfossils used in the study. The processed samples were then examined to characterize the plant microfossil assemblages. Plant microfossils found in the samples include dinoflagellates and acritarchs (marine plankton), fern spores, and gymnosperm and angiosperm pollen. Plant microfossil specimens were counted in eight samples to determine the relative percentages of each plant type (i.e. gymnosperm, fern spore, angiosperm, acritarch, and dinoflagellate) present in each sample (see Appendix 3). The vegetational composition and likely depositional environment were then inferred from the percentages of the plant types (see Conclusions section).

4.0 RESULTS

Tables 1 and 2 show the occurrences of 52 pollen and spore taxa and 19 dinoflagellate taxa in the eleven wells. Fourteen samples were taken from well #B217489. Samples from this well contain pollen, spores, dinoflagellates, and acritarchs. The uppermost sample at 45.1' -45.5' yielded only 23 specimens. For a statistically accurate evaluation, a minimum of 200 specimens is necessary. Except for the samples from 45.1', 75.9', 130.7', 198.3', and 214.3', the entire sampled interval contains both marine and terrestrial plant microfossils. The five samples listed above contain only terrestrial plant microfossils. The marine algae are represented by the dinoflagellates and acritarchs. The terrestrial vegetation is represented by pollen from both the gymnosperms and angiosperms and by fern spores. The marine component of the plant microfossil assemblage from well B217489 ranges from three to ten percent (see Appendix 3). Under normal marine conditions, the dinoflagellates would make up most of the assemblage.

In well #00291, the samples from 33.9' and 35.0' yielded five and seventeen specimens, respectively. The sample from 33.9' yielded primarily gymnosperm pollen and no dinoflagellates. The sample from 35.0' yielded several acritarch specimens, which are indicative of marine influence. Well #00191 was barren and yielded no significant specimens.

Under normal circumstances, the presence of dinoflagellates and acritarchs would indicate a marine or brackish-water depositional environment. One potential pitfall in interpreting depositional environments from relative percentages of marine and terrestrial taxa

is the possibility that some of the taxa are derived from reworked older material. In this study, the presence of *Ovoidinium verrucosum* is an example of older material occurring in younger strata. *Ovoidinium verrucosum* last appears in place in the Cenomanian (Nichols and Jacobson, 1982). There are three possible explanations for its occurrence in the Laramie Formation. The first option is a localized extension of its stratigraphic range into the Maastrichtian. The second option is that it is reworked from older strata. The third option is that it is contamination from the drilling mud manufactured with bentonites containing *Ovoidinium verrucosum*. Without knowing the source of the drilling mud used to drill these wells, it is not possible to speculate on the third option. However, there are other clues to rule out the first option. Reported occurrences of *Ovoidinium verrucosum* in strata younger than Cenomanian or possibly Turonian, are interpreted to be out of place (Nichols and Jacobson, 1982). It is highly unlikely that the top of the stratigraphic range should be extended all the way from Cenomanian to the Maastrichtian. The second option is a more realistic possibility. If other older taxa were present in the wells, then it is more likely that there is reworked older material in the plant microfossil assemblage. In fact, there are several other taxa that have not been reported from strata as young as Maastrichtian. These taxa include: *Palaeohystricophora_infusorioides*, *Quadripollis krempii*, and *Umbosporites callosus*. These taxa were previously reported from strata as young as Campanian, but not Maastrichtian. It is possible that the occurrence of these additional taxa in the Laramie Formation represent local geographic extensions of their stratigraphic ranges. However, the presence of *Ovoidinium verrucosum* along with these taxa, makes reworking an option.

The implications of reworked material occurring within the assemblages makes

recreating a realistic picture of the vegetation and depositional environments more difficult. If there is reworked material present, it may not be appropriate to interpret the low percentages of dinoflagellates in the Laramie Formation as indicative of marine conditions. However, in this case, it may be appropriate to infer a marine influence within the Laramie Formation, even though there is evidence of reworked material. Within the dinoflagellate assemblage there are several species of *Dinogymnium*. Because the species of *Dinogymnium* that occur in the Laramie Formation are known to occur in Maastrichtian age strata, it is likely that they occur in place.

Additional evidence for marine conditions comes from Weimer and Land (1975) and Spencer (1961). Weimer and Land (1975) reported the occurrence of the marine foraminifer, *Haplophragmoides* sp. and Spencer (1961) reported the occurrence of marine mollusks within the lower Laramie Formation. Although the occurrence of *Haplophragmoides* sp. was above the sandstone beds of the Fox Hills Formation, Weimer and Land (1975) placed the strata containing *Haplophragmoides* sp. into the Fox Hills Formation because its presence indicated marine to brackish-water conditions. Taking this information into account, the portion of the Laramie Formation in this study most likely represents at least brackish-water conditions. The high percentages of fern spore taxa in the study samples (see Appendix 2) indicate that the depositional site was close to shore. Therefore, the portion of the Laramie Formation encountered in this study probably represents a lagoonal, brackish-water environment.

The results of the palynological study indicate that only the uppermost Arapahoe Sandstone identified in the Geologic Characterization report is fluvial. The other sandstone units were probably deposited in a shallow marine or brackish water environment.

The second objective of this study was to determine if the Laramie and Arapahoe Formations could be differentiated on the basis of their respective plant microfossil assemblages. All of the samples from well B217489 are probably within the Laramie Formation. The shallowest sample (45.1'-45.5') does contain a slightly different plant microfossil assemblage from the samples below. Unfortunately, there were only 23 specimens in that sample which makes a conclusive interpretation difficult. Unless there is lithologic evidence in this well for the Laramie/Arapahoe boundary between 45.5' and 67.2', the plant microfossil evidence is not strong enough by itself to indicate a boundary in this interval.

The samples from well #00291 provide some information for interpreting the Laramie/Arapahoe boundary. The deepest sample (57.6') contains a plant microfossil assemblage that is similar to the assemblage in well #B217489. This indicates that the deepest sample from well #00291 is within the Laramie Formation. The two shallower samples (33.9' and 35.0') are more difficult to interpret because of the poor recovery of plant microfossils. Six specimens were recovered from the sample at 33.9' and 17 specimens were recovered from the sample at 35.0'. The sample at 35.0' does contain several acritarchs which may indicate brackish-water conditions. It is possible that the acritarchs are reworked from older material. Because the sample from 57.6' is within the Laramie Formation, the Laramie/Arapahoe boundary is above 57.6' in well #00291.

The single sample from well #B315289 contained only one pollen specimen and therefore, cannot provide any reliable information. The single sample from well #00191 was barren and therefore, cannot provide any additional information.

The results of this biostratigraphic study suggest that if the Arapahoe Formation is present in the studied wells, it is relatively thin. Rock units identified in the Geologic Characterization report as Arapahoe Formation have similar plant microfossil assemblages as the Laramie Formation. Subsequent efforts to identify the shallowest bedrock units as either Laramie or Arapahoe were inconclusive because core samples from these shallow units were too oxidized to yield satisfactory results.

The third objective was to use the plant microfossils to determine if any of several calcareous siltstone beds identified by the well logger from core could be useful for stratigraphic correlation of the wells. Wells #40591, #40891, #41191, #42892, #B217489, #B217689, #B217789 and #B218589 contain one or more of these beds. Tables 1 and 2 show the occurrences of various pollen, spores, and dinoflagellates along with the calcareous siltstone beds in each well. Selected pollen, spore, and dinoflagellate taxa from these eight wells suggests that the calcareous siltstone beds may not make good stratigraphic markers. The palynological data suggest the following correlations. In well #B217489 the calcareous siltstone bed at 69.8' is designated as marker A. In the nearby well, #B218589, there are three similar beds. The upper unit at 72.7' is designated as bed A, the one at 170.0' as bed B, and the one at 255.4' as bed C. Table 3 shows a composite section formed by correlating and combining the palynological data and depth information from these two wells. In Table 3, sample depths from well #B218589 are accompanied by the suffix (b). This composite section serves as a reference section for trying to correlate the calcareous siltstone beds in the other wells. In well #B217689, the palynological data suggest that the calcareous siltstone bed at 82.6' correlates with bed B in the composite section. Many of the taxa that occur

above the calcareous siltstone bed in this well do not occur above bed A in the composite section, but do occur above bed B in the composite section. Similarly, the calcareous siltstone bed at 114.8' in well #B217689 correlates better with calcarous siltstone bed C in the composite section. Unfortunately, the lithostratigraphic data (see Appendix 1) suggest that the upper calcareous siltstone bed at 82.6' correlates with bed A in the composite section, rather than bed B as the palynological data suggest. Similar discrepancies between the lithostratigraphic data and biostratigraphic data are evident in several of the other wells (see Table 3). If these calcareous siltstone beds are to be used as stratigraphic markers, it will be necessary to resolve the discrepancies between the lithostratigraphic and biostratigraphic data. In reality, neither of these methods can stand alone to provide the necessary stratigraphic resolution to solve these discrepancies. Therefore, the calcareous siltstone beds should not be used as stratigraphic markers in the well cores until these discrepancies are resolved.

One of the most common uses for palynology is relative age dating. Several of the taxa found during this study have reported occurrences in the literature that range from Campanian to Maastrichtian. These taxa include *Integricorpus rigidus* and *Liburnisporis adnacus*. Other taxa, such as *Thomsonipollis magnificus* and *Tripunctisporis maastrichtiensis*, first appear in the Maastrichtian and range on up into younger strata. Some of the other taxa have longer stratigraphic ranges and are less useful for estimating the age of the rocks in these wells. By their overlapping stratigraphic ranges, the above mentioned taxa indicate that the age of the rocks in these wells is at least Maastrichtian. This estimate can be refined even more by noting the absence of significant upper Maastrichtian taxa (Nichols and Jacobson, 1982), such as *Aquilapollenites delicatus* var. *collaris* and *Wodehouseia spinata*.

The lack of upper Maastrichtian taxa suggests that the rocks sampled from the seven wells in this study are most likely lower to middle Maastrichtian in age.

5.0 CONCLUSIONS

Based on a combination of lithologic and palynological data the following conclusions are made in this study:

1) Most of the Laramie Formation core sampled in this study represent brackish-water, lagoonal conditions. The notable exceptions are the two deepest samples in well #B217489 which contain no dinoflagellates. However, when this well is correlated with #B218589 to form a composite section (Table 3), there are dinoflagellates present below the two deepest samples from well #B217489.

2) The Laramie/Arapahoe contact probably does not occur within well #B217489. The contact probably does occur within well #00291 somewhere above 57.6' and perhaps deeper than 35.0'. Otherwise, the biostratigraphic data from the wells studied, suggest that the Arapahoe Formation is thinner than previously thought.

3) The calcareous siltstone beds in wells #40591, #40891, #41191, #42892, #B217489, #B217689, #B217789, and #B218589 have questionable utility as stratigraphic markers because of the different stratigraphic occurrences of selected plant microfossils relative to these units. Exception to this recommendation could be justified for wells that occur in close proximity to each other, such as wells #B217489 and #B218589. These calcareous siltstone beds may represent several fluvial horizons with limited lateral extent that were deposited at different stratigraphic levels within the Laramie Formation. It is likely that the calcareous cement is secondary and was precipitated from carbonate saturated groundwater.

4) The Laramie Formation represented in this study is lower to middle Maastrichtian in age.

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PALYNOLOGY PLATES

FERN SPORES

PHOTO #:	NAME:
1.	*Cibotiidites bettianus*
2.	*Cicatricosisporites australiensis*
3.	*Deltoidospora mesozoica*
4.	*Gleicheniidites senonicus*
5.	*Ghoshispora bella*
6.	*Kuylisporites scutatus*
7.	*Laevigatosporites* sp.
8.	*Liburnisporis adnacus*
9.	*Retitriletes mirabilis*
10.	*Triporoletes novomexicanus*

11. *Triporoletes reticulatus*

12. *Tripunctisporis maastrichtiensis*

13. *Trisolissporites montanensis*

14. *Umbosporites callosus*

PALYNOLOGY PLATES (cont.)

GYMNOSPERM POLLEN

PHOTO #:	NAME:
15.	*Callialasporites dampieri*
16.	*Corollina torosa*
17.	*Gnetaceaepollenites eocenipites*
18.	*Equisetosporites volutus*
19.	*Rugubivesiculites* sp.
20.	*Taxodiaceaepollenites* sp.

ANGIOSPERM POLLEN

PHOTO #:	NAME:
21.	*Aquilapollenites aptus*
22.	*Aquilapollenites bertillonites*

23. *Aquilapollenites striatus*

24. *Aquilapollenites trialatus* var. *variabilis*

25. *Aquilapollenites turbidus*

26. *Integricorpus rigidus*

27. *Mancicorpus calvus*

28. *Pseudointegricorpus clarireticulatus*

29. *Erdtmanipollis procumbentiformis*

30. *Plicapollis serta*

31. *Proteacidites thalmanni*

32. *Thomsonipollis magnificus*

33. *Margocolporites* sp.

PALYNOLOGY PLATES (cont.)

ANGIOSPERM POLLEN

34. *Rhoipites globosus*

35. *Cupaniedites* sp.

36. *Retitrescolpites anguloluminosus*

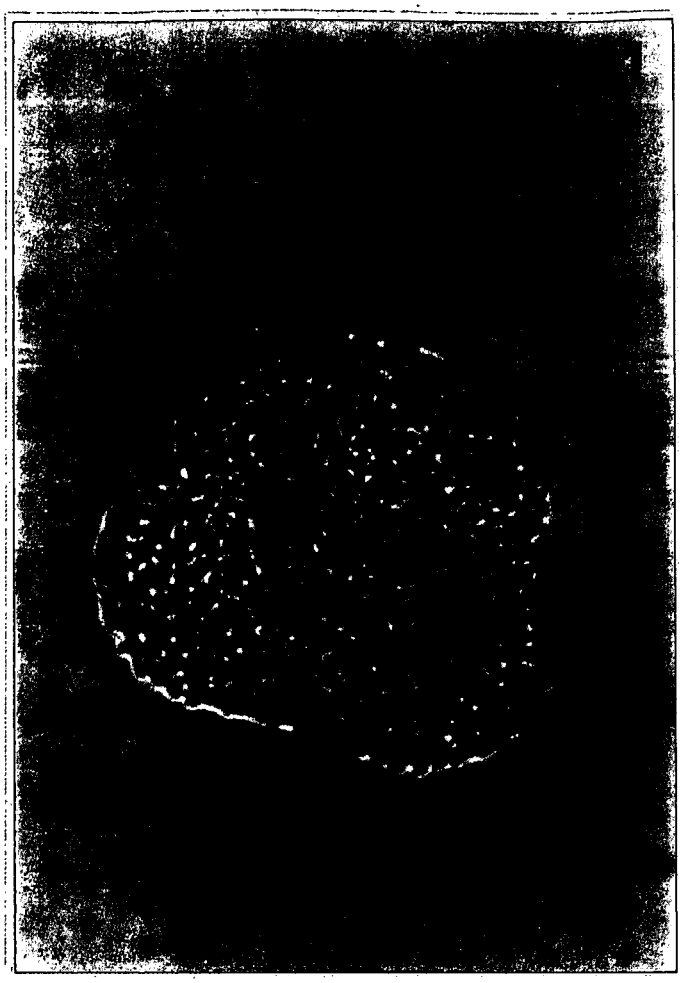
37. *Liliacidites leei*

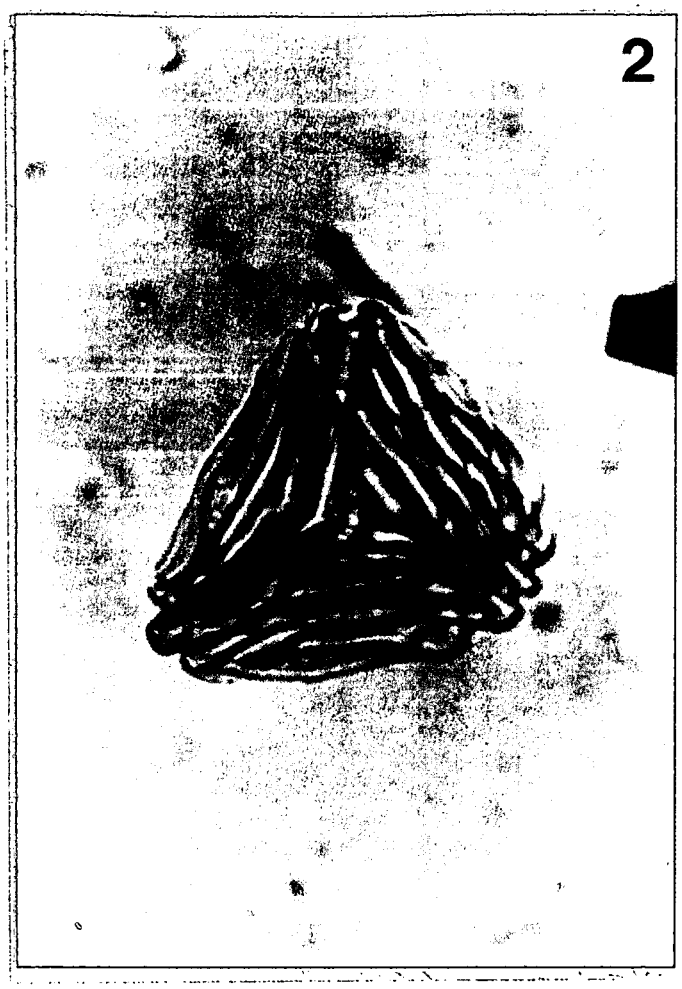
38. *Quadripollis krempii*

PALYNOLOGY PLATES (cont.)

DINOFLAGELLATES

PHOTO #:	NAME:
39.	*Chatangiella* sp.
40.	*Cyclonephelium distinctum*
41.	*Dinogymnium acuminatum*
42.	*Dinogymnium digitus*
43.	*Dinogymnium euclaense*
44.	*Isabelidinium* sp.

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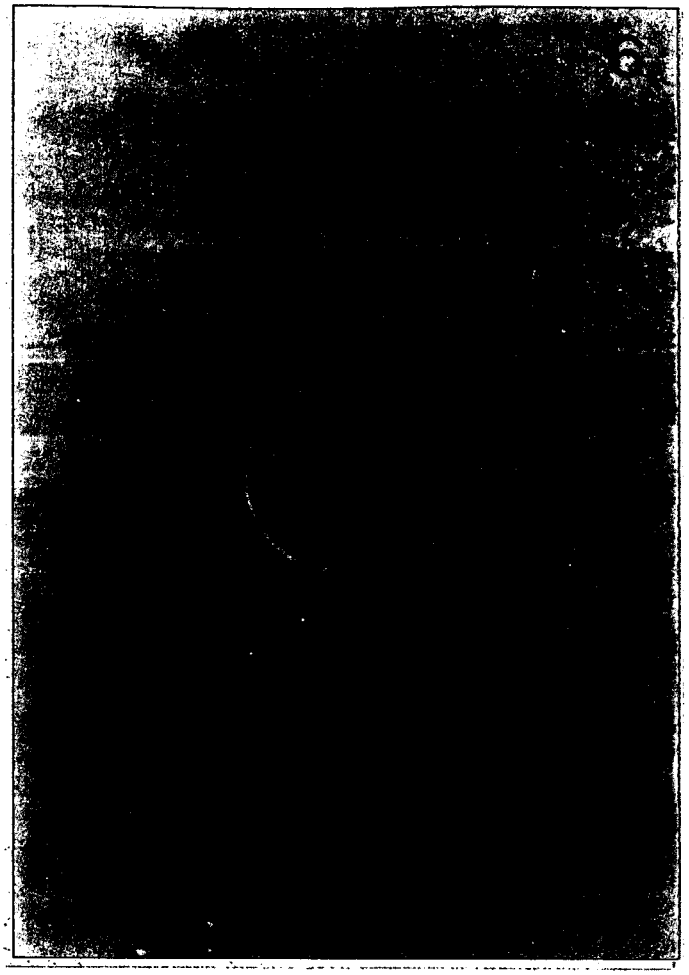

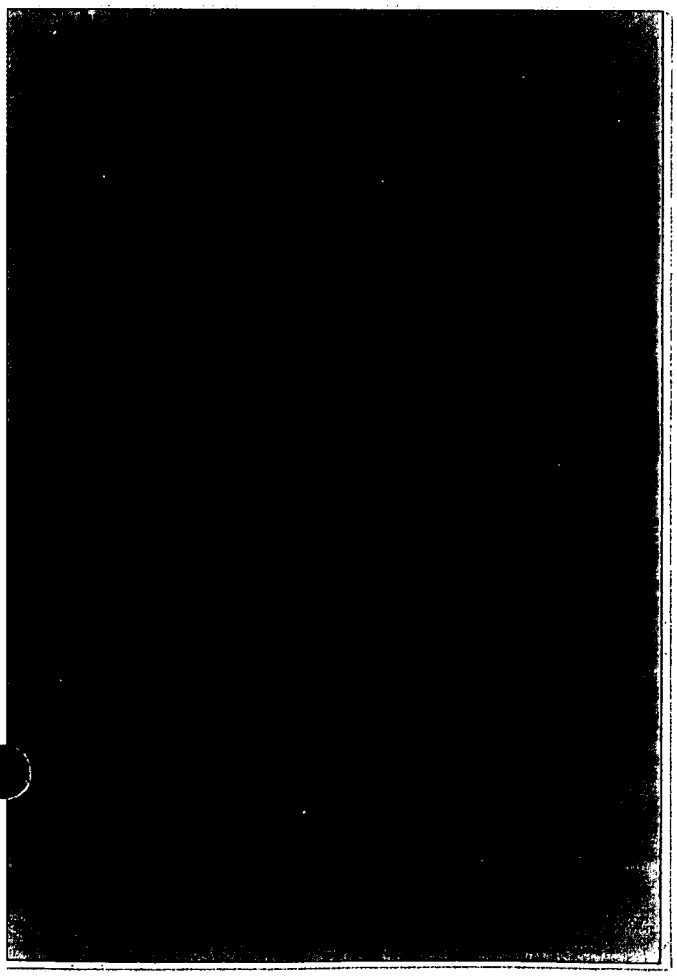

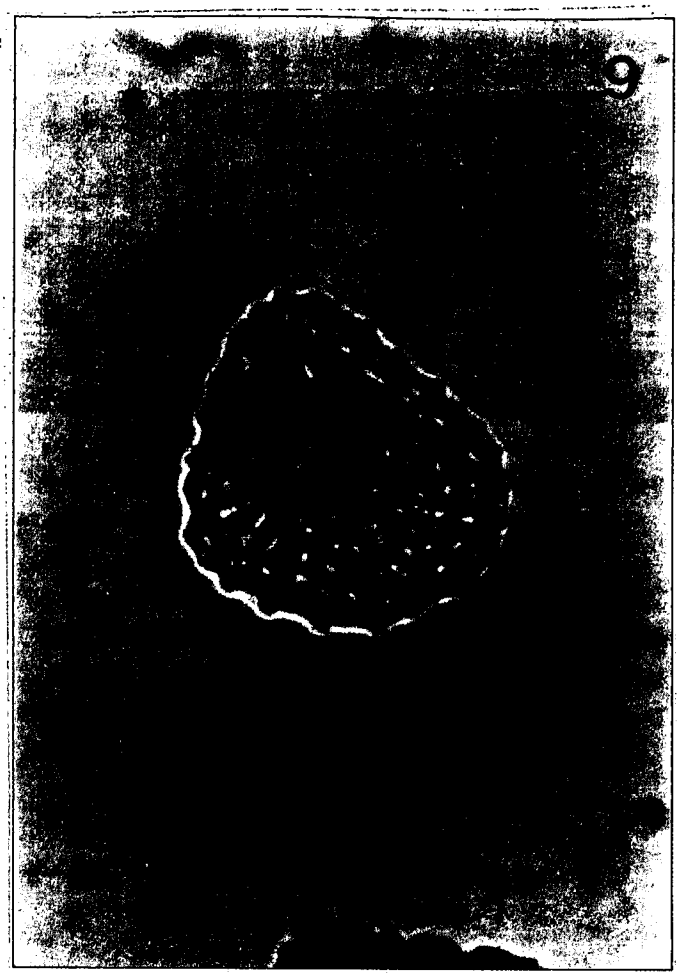
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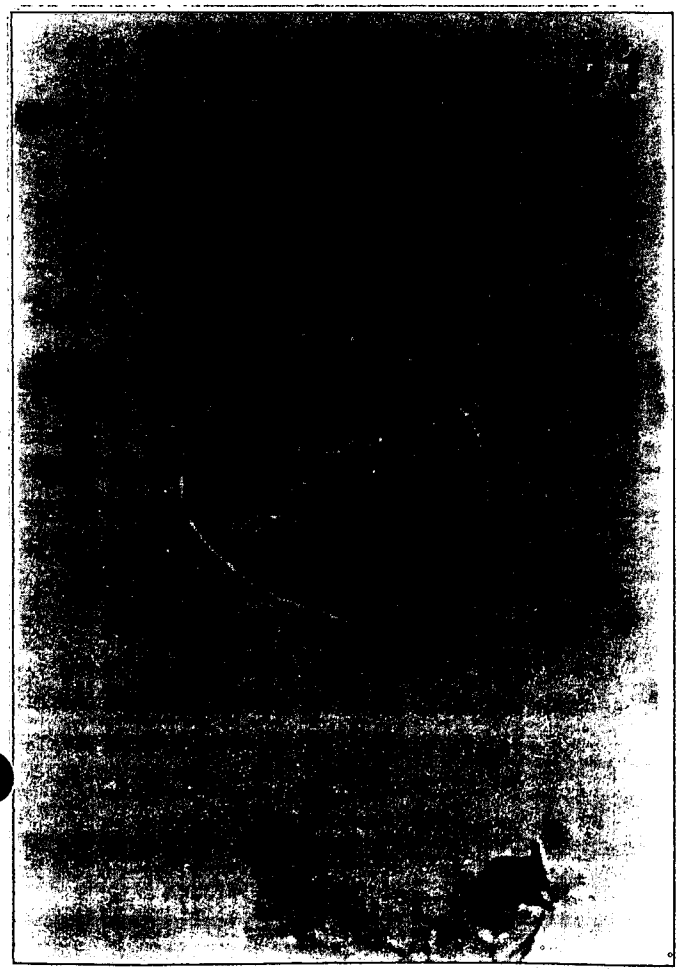

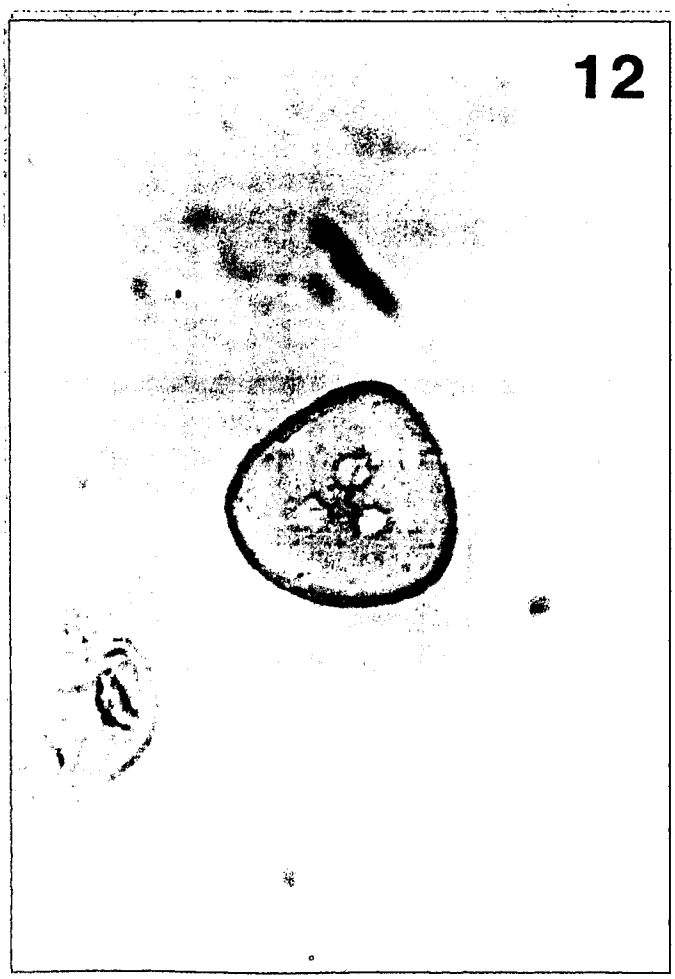
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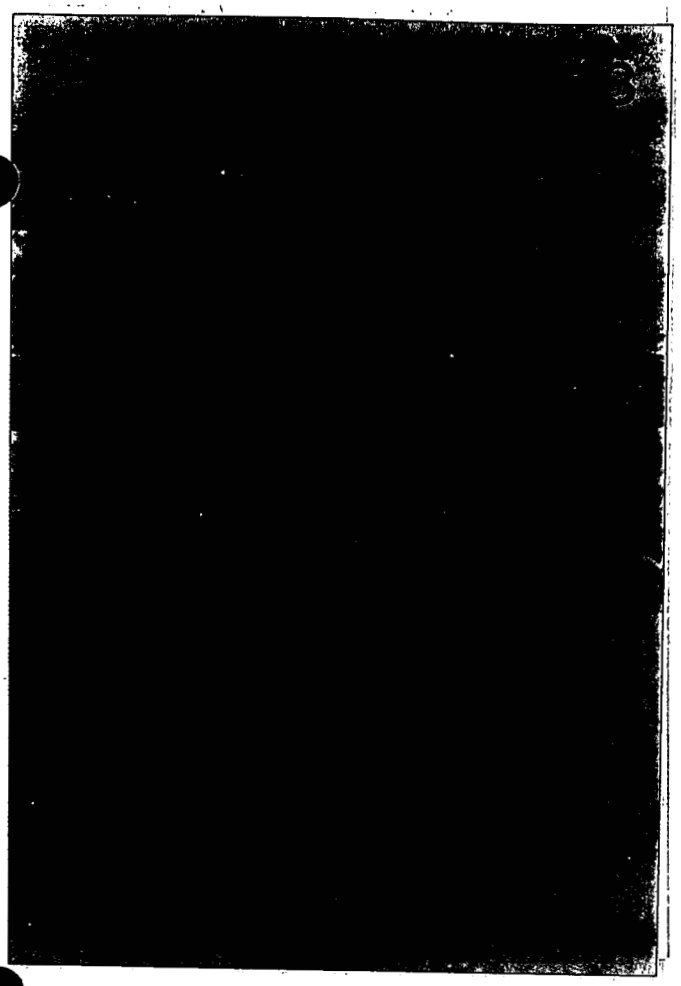

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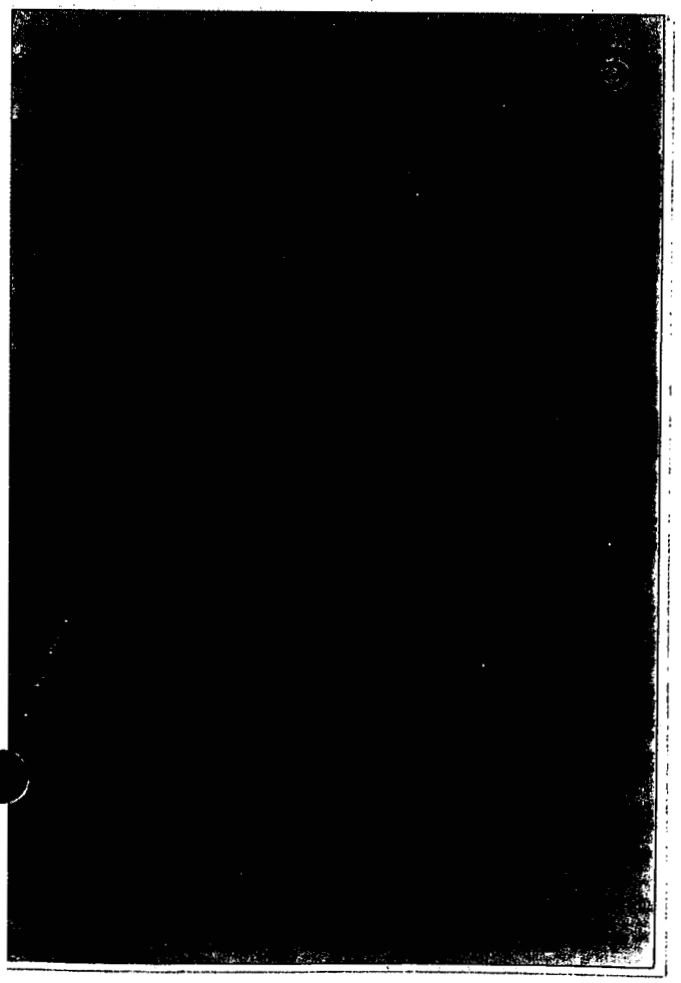

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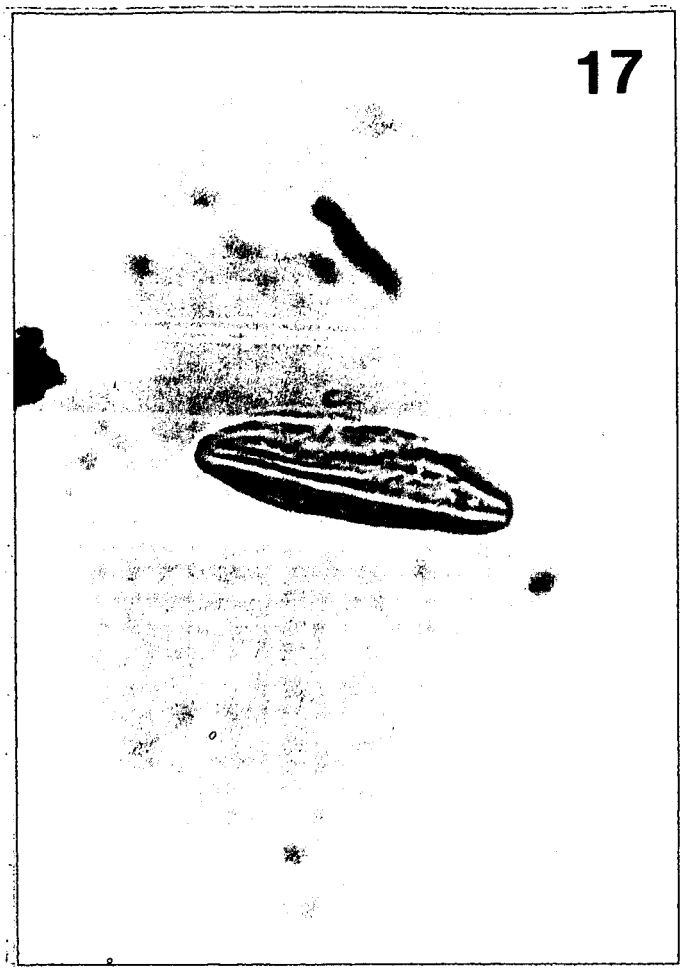
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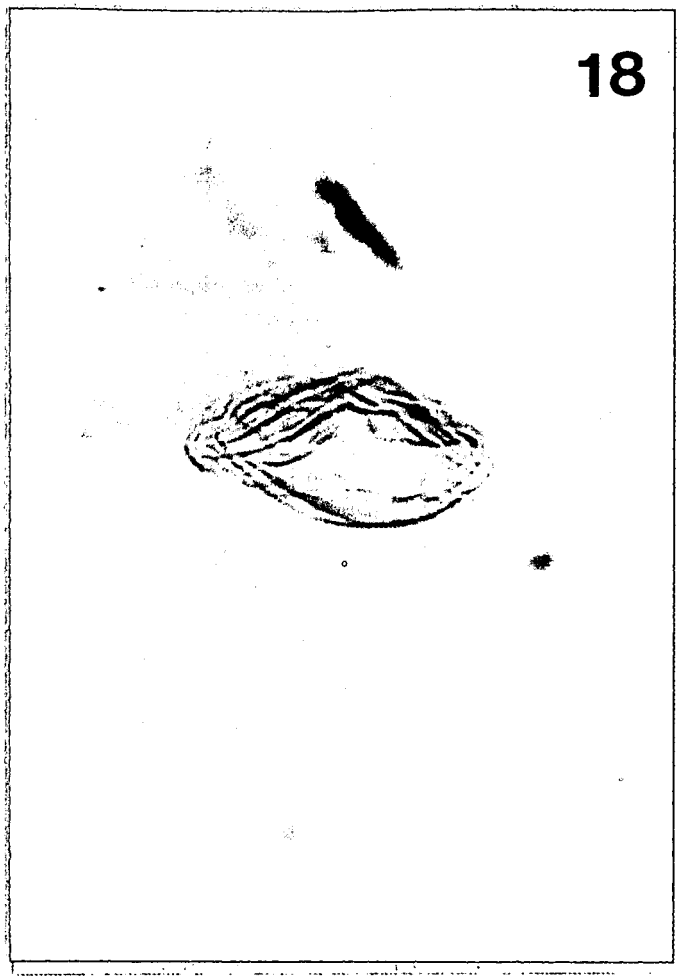
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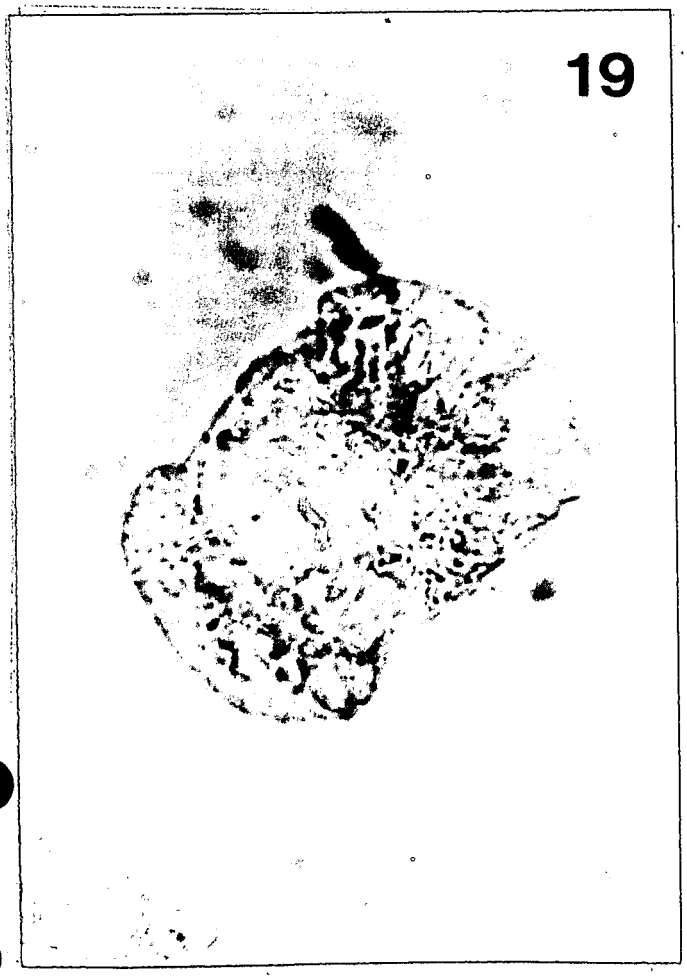
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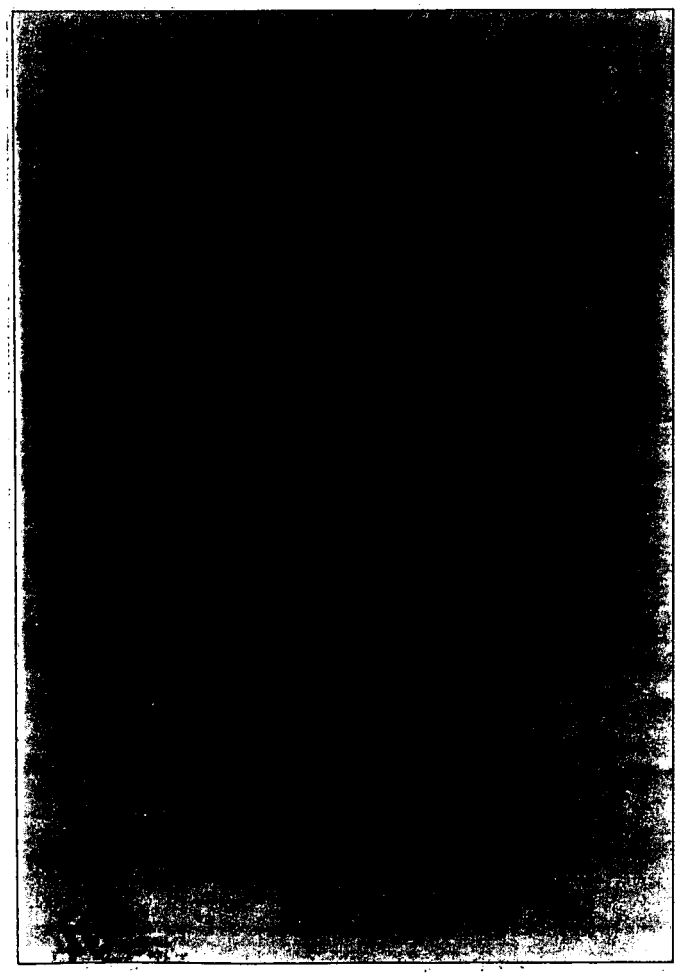

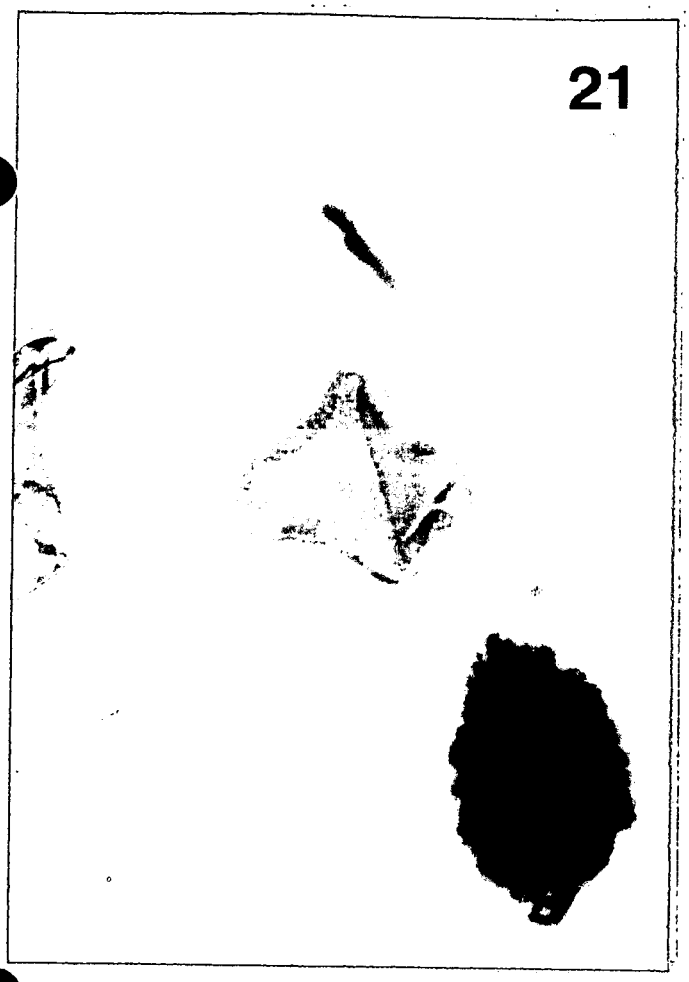
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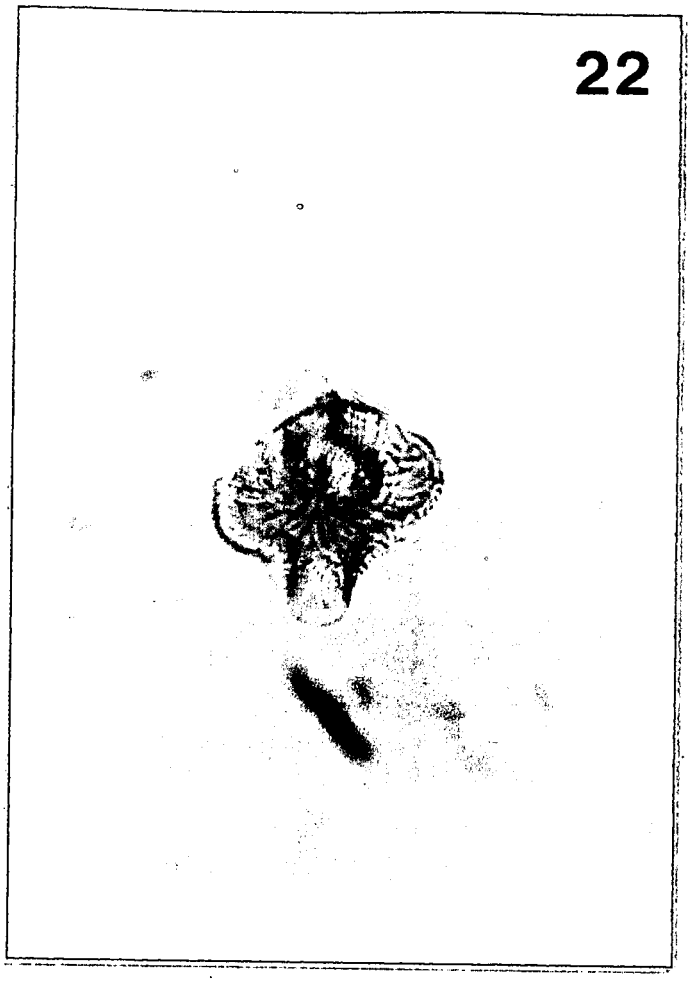
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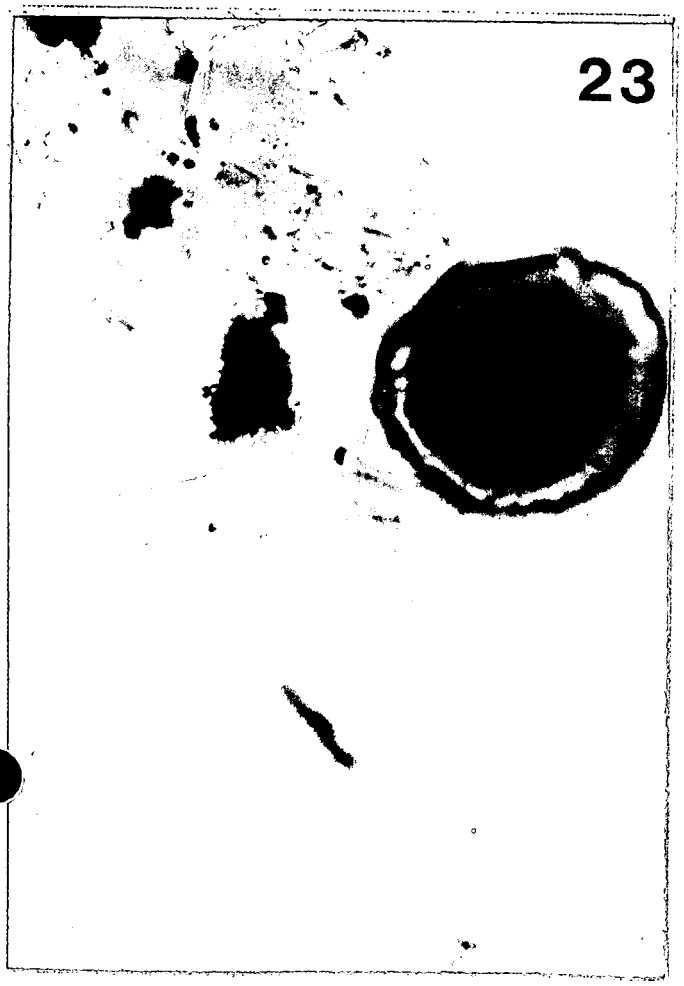
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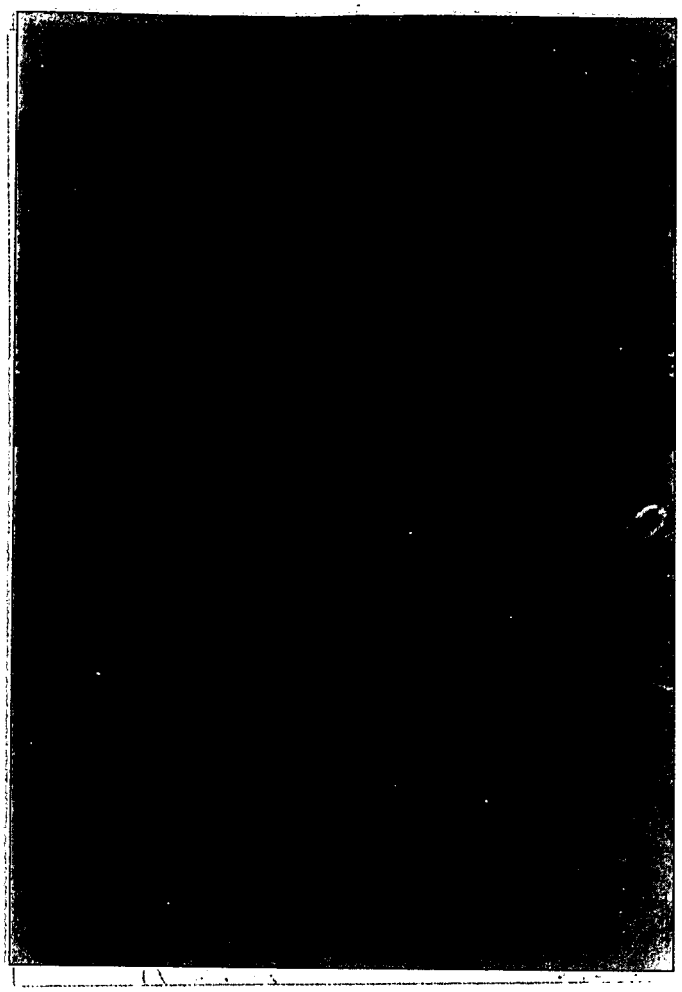

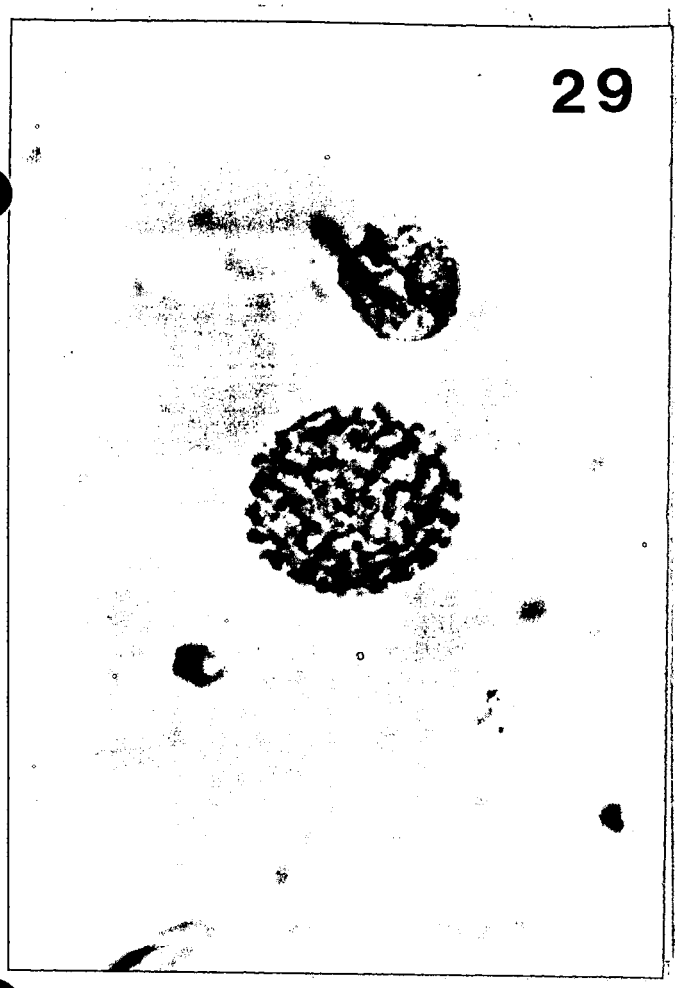

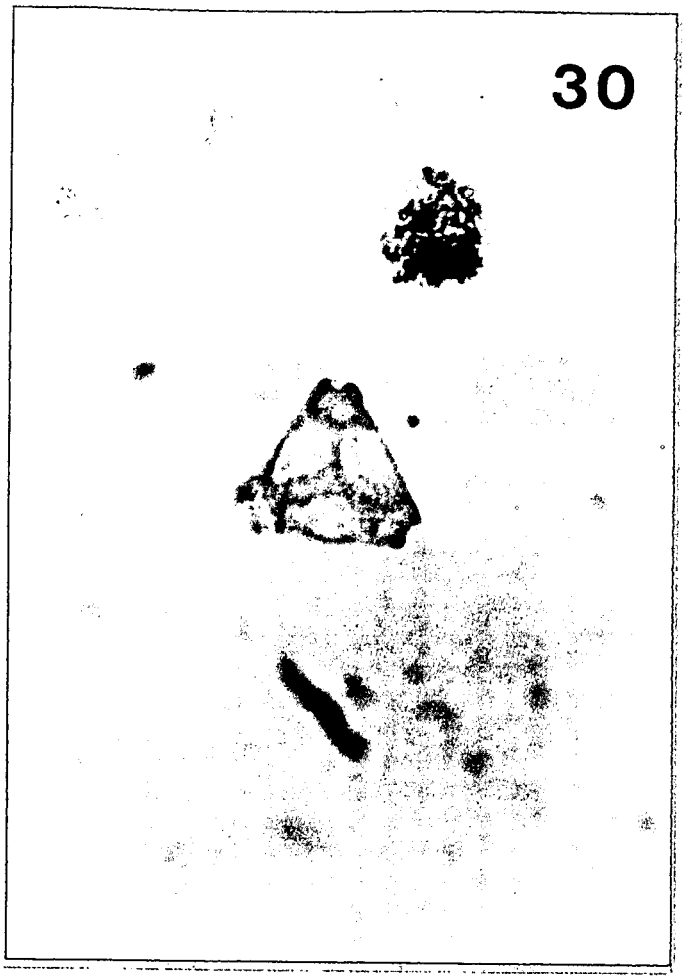

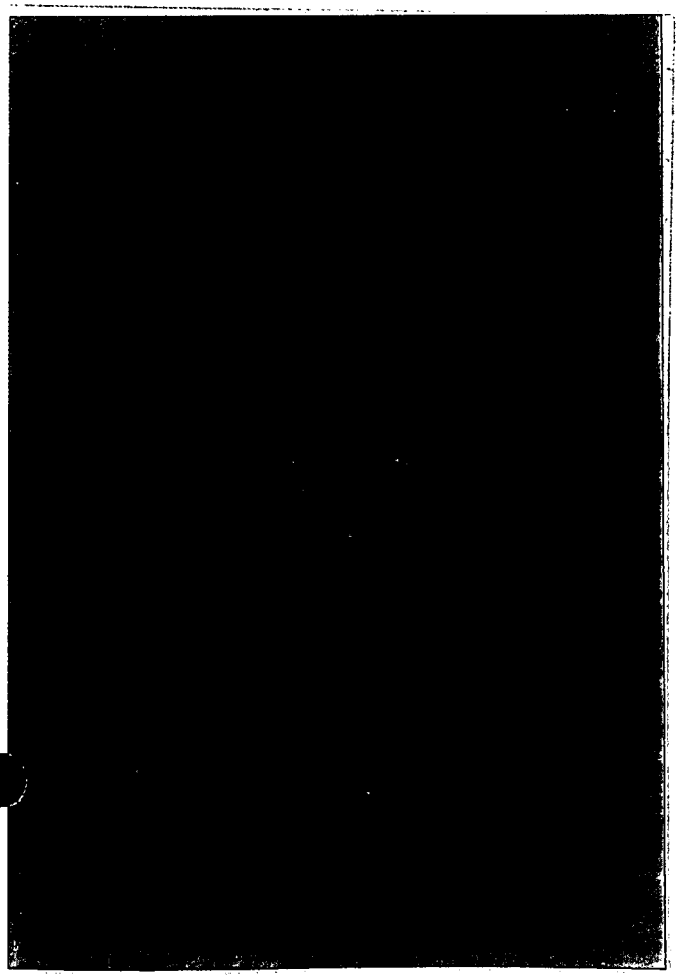

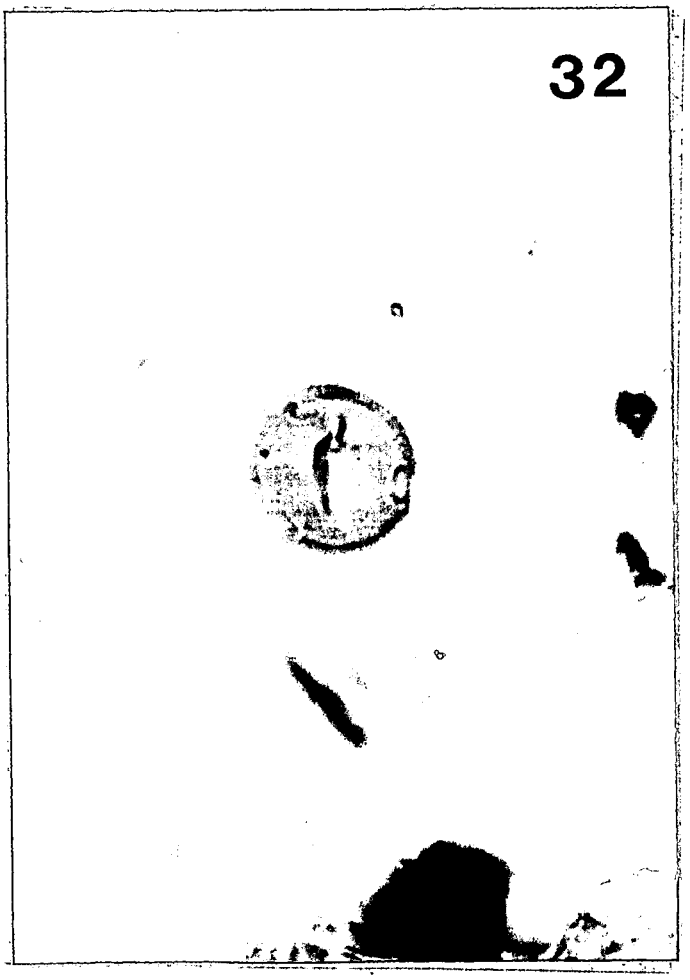

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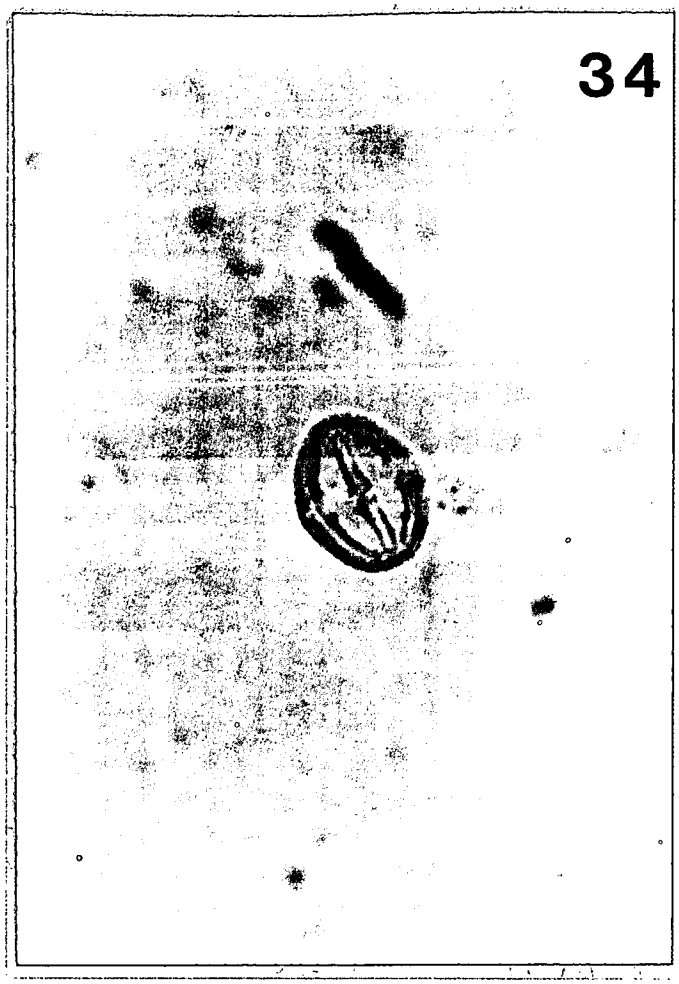
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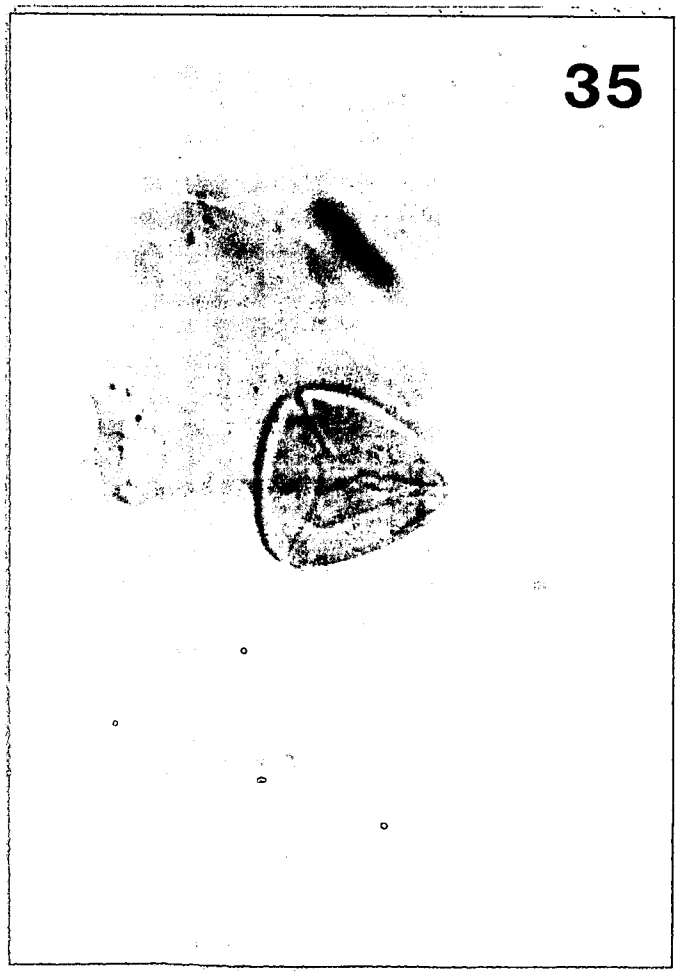
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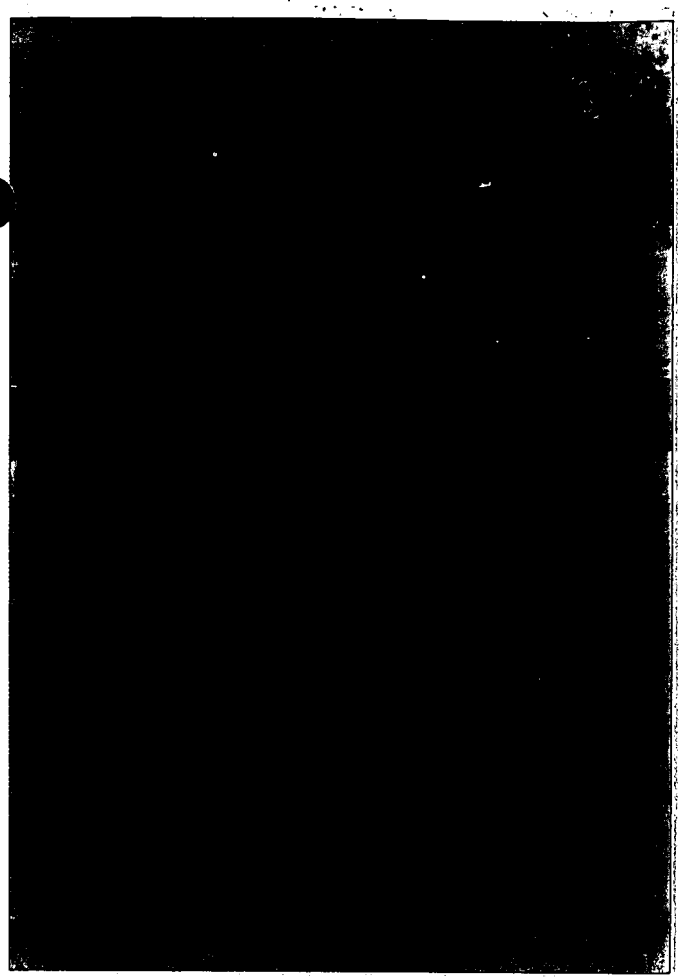

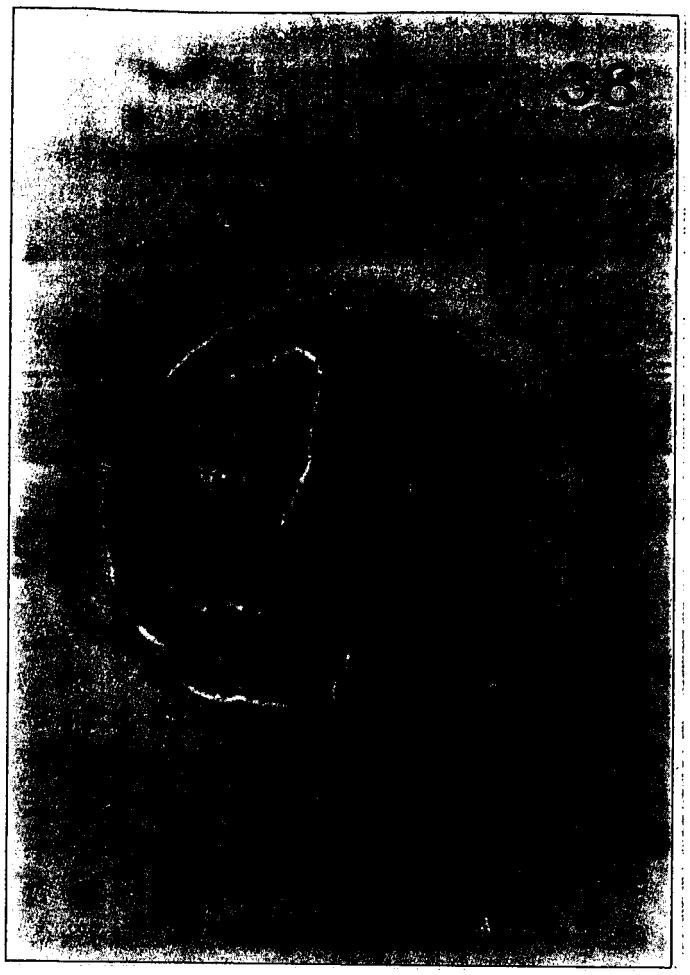

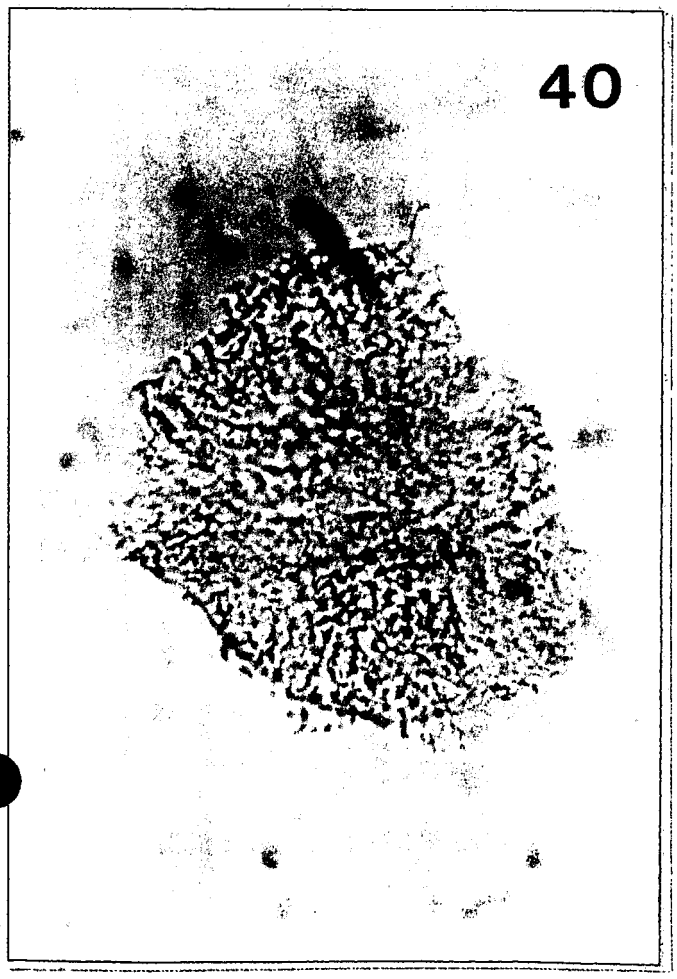
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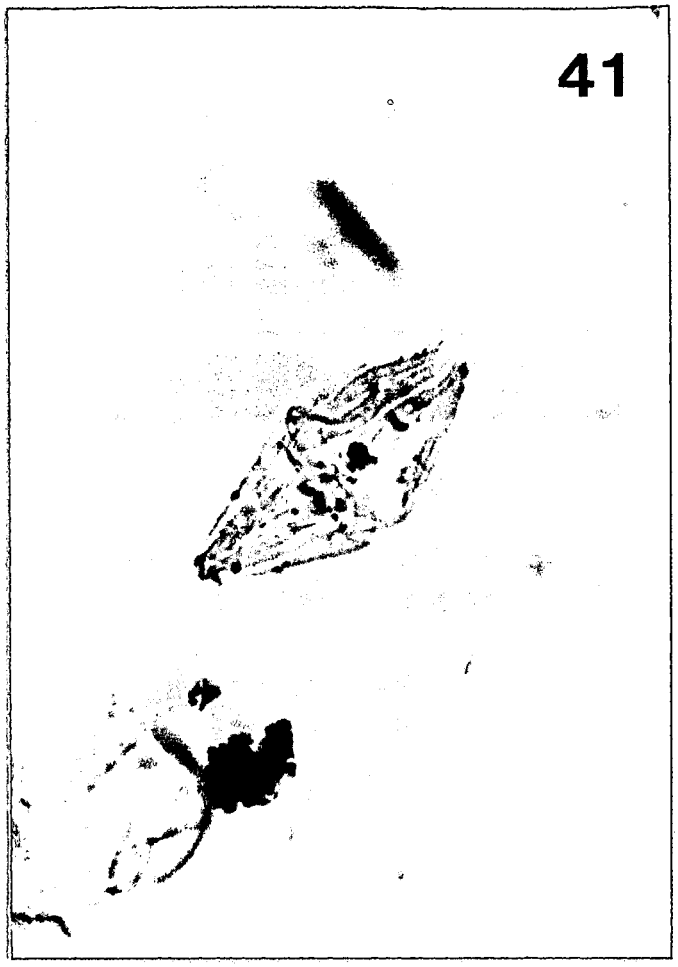
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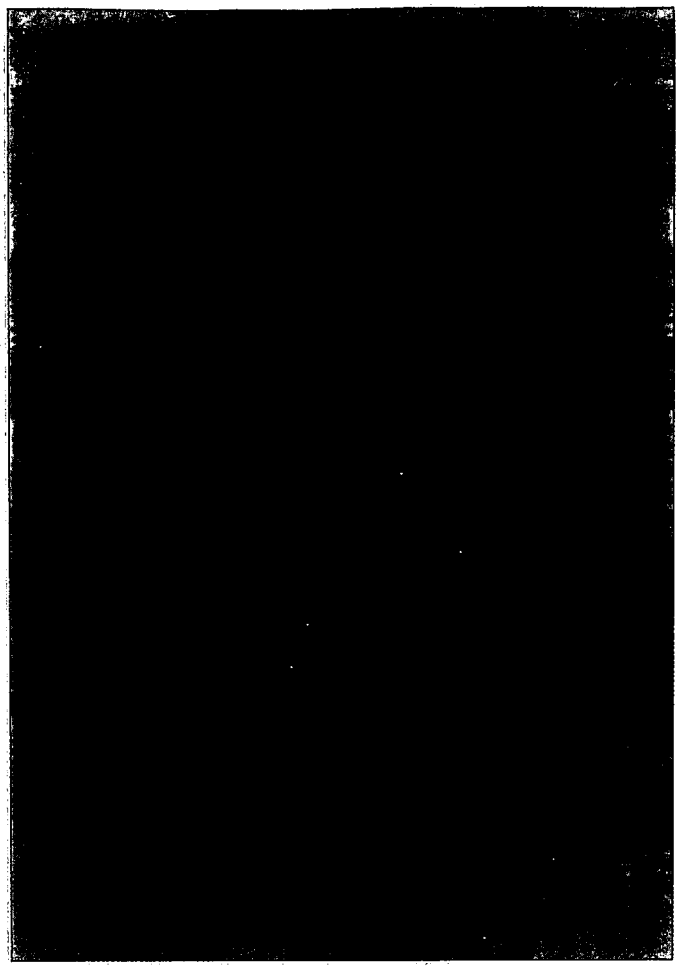

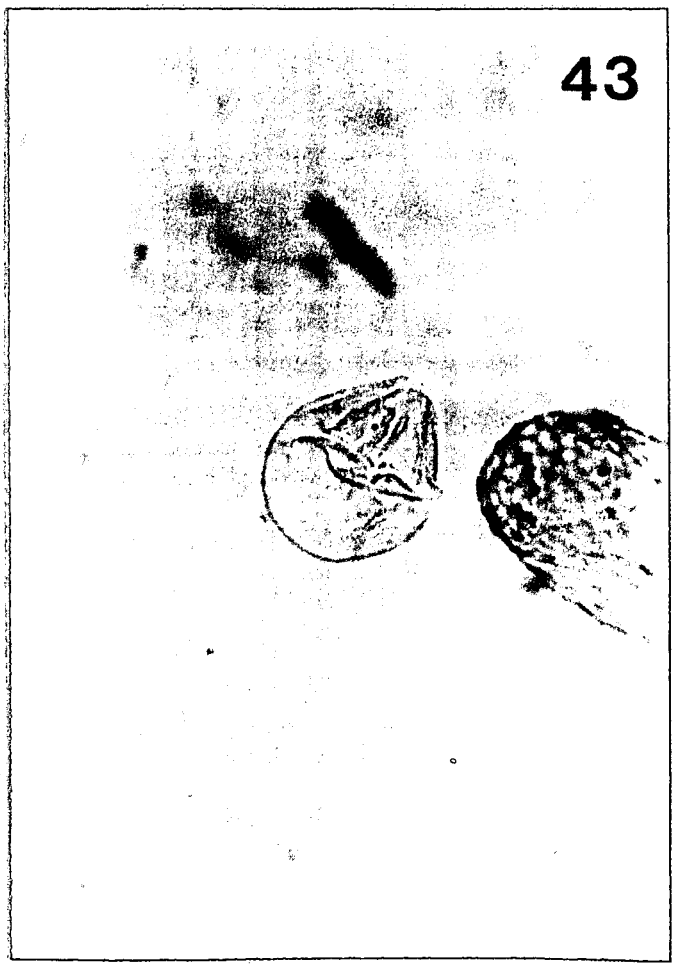
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APPENDIX 1

TWO ATTACHMENTS FROM FRED GRIGSBY RE: POTENTIAL SUBSURFACE STRATIGRAPHIC MARKER BEDS

ATTACHMENT 1

MEMORANDUM

DATE: June 24, 1992
TO: Laurie Host
FROM: Fred Grigsby
RE: Potential Marker Bed, Rocky Flats Site

Core logging has resulted in the identification of a calcareous siltstone bed that has been found in boreholes site-wide. This bed, although relatively thin, appears to be consistent in lithology and inferred lateral extent and may be a mappable unit that could be helpful in defining the structure of the upper Laramie Formation underlying the Rocky Flats Plant.

This unit appears to be the uppermost calcareous siltstone of three nearly identical beds. The consistency and lateral continuity of the lower two beds has not been established, primarily due to their depths. The second bed has been found in at least twelve holes, while only four boreholes were deep enough to intercept the third bed.

The thickness of the top bed varies from a current maximum of 2.7 feet in hole 40392 to a minimum of only 0.2 feet in holes 43892 and 44192. While these thickness are not especially favorable, it should be noted that in hole 43892, which was completed this week, the bed was intercepted at approximately the depth expected. Also of interest is the fact that an identical bed was found in an obvious fault at a depth of 13 feet below the top bed. This hole is located in the PA at Rocky Flats.

The calcareous siltstone marker bed has been recognized in 19 boreholes at depth ranging from 45.8 to 199.0 feet. A list of boreholes containing the potential marker bed is enclosed. When the ground level survey is completed for these boreholes a structure contour map of the calcareous siltstone bed could be constructed. Such map may reveal that the siltstones' present configuration is a result of: original depositional relief, folding of the western flank of the Denver Basin, or possibly fault offset beneath Rocky Flats Plant.

This represents only a preliminary evaluation of the logging program. Connie Dodge has been aware of the progress of this program, and has requested a copy of this memo.

cc:	Connie Dodge	EG&G
	Rose Zeiler	ASI
	Darrel Dunn	ASI

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Potential Calcareous Siltstone Marker Bed

Borehole Number	EG&G Number	Bed Depth	Bed Thickness
40392	BHZ-43	53.0'	2.7'
40592	BHZ-1	123.0'	1.5'
40892	BHZ-3	198.3'	2.5'
41192	BHZ-45	45.8'	1.0'
41392	BHZ-17	129.9'	0.4'
41792	BHZ-50	60.1'	2.0'
41892	BHZ-51	152.2'	1.8'
41992	BHZ-49	160.3'	1.0'
42092	BHZ-48	98.9'	1.1'
42192	BHZ-47	156.8'	0.7'
42392	BHZ-6	199.0'	0.8'
42592	BHZ-9	122.2'	0.8'
42692	BHZ-12	106.3'*	1.4'
42892	BHZ-54	121.2'	0.9'
43292	BHZ-53	103.6'	0.5'
43892	BHZ-40	59.1'	0.2'
43992	BHZ-41	80.9'	0.6'
44092	BHZ-42	91.0'	1.4'
44192	BHZ-52	70.1'	0.2'*

* Best correlation

Well No.	Elevation	Depth Marker	Elevation Marker	Thickness
B217589	5952.9'	188.7'	5764.2	0.3'
B217689	5960.5'	82.6'*	5877.9	0.3'
		114.8'	5845.7'	0.5'
B217789	5954.9'	77.0'*	5877.9'	0.15'
		146.6'	5808.3'	1.6'
		191.6'	5763.3'	0.5'
B218589	5946.8'	72.7'*	5874.1'	0.15'
		170.0'	5776.8'	0.45'
		255.4'	5691.4'	1.0'
2887BR	5947.2'	NONE		
4686	6081.7'	126.7'	5955.0'	0.5'
		162.6'	5919.1'	0.2'
4886	6096.7'	115.5'	5981.2'	1/2"
		120.3'	5976.4'	0.15'
0887BR	5919.7'	100.5'	5819.2'	2.0'
3987BR	5947.1	NONE		
B203789	5946.2	NONE		
B203889	5935.8'	151.2'	5784.6'	0.6'
B203989	5920.9'	NONE		
B204089	5877.6'	205.8	5671.8'	0.2'
B204189	5828.9'	80.9'	5748.0'	0.2'
B304289	5833.0'	64.5'*	5768.5'	1.4'
		106.8'	5726.2'	1.45'
B404689	5901.4'	57.4'*	5844.0'	0.1'
B304989	5729.4'	73.2'*	5656.2'	2.6'

Collected
76.8' - 177-59
78.7' - 177-49

Well No.	Elevation	Depth Marker	Elevation Marker	Thickness
B405289	5965.7'	72.4'	5893.3'	2.6'
P208889	5947.3'	NONE		
P416989	6045.2	100.8'	5944.4'	1.3'
B217089	5919.0	214.7*	5704.3	2.25'
		232.9'	5686.1'	0.5'
		243.4'	5675.6'	0.95'
		271.8'	5647.2'	1.0'
		287.6'	5631.4'	2.0'
B317189	5725.0'	77.5'	5647.5'	0.8'
		173.5'*	5551.5'	1.55'
		184.6'	5540.4'	0.6'
B217289	5777.5'	109.2'**	5668.3'	0.4'
		172.3'	5605.2'	0.3'
		210.8'	5566.7'	1.6'
B217489	5961.2'	69.8*	5891.4'	0.2'

* Indicated marker bed with overlying claystone

** Possible repeated section of marker bed with upper claystone at 109.2' and 210.8'. Possible fault indicated at 172.3'. One half of core calcareous siltstone and one half claystone (70° + fracture).

APPENDIX 2

LITHOLOGIC WELL LOGS

Best Available Copy

STATE PLANE COORDINATE:	TOTAL DEPTH (FT): 100.0	GROUND ELEVATION (FT): 5958.68	PROJECT NUMBER: SITEWIDE	LOG OF BORING NUMBER:
NORTH: 750732	AREA: SITEWIDE	CASING DIAMETER (IN):	GEOLOGIST: DIO, FG	40291
EAST: 2066298	LOCATOR NUMBER: N10	BOREHOLE DIAMETER (IN): 10.0/3.75	DATE DRILLED: 10/03/91	

REMARKS: Hollow Stem Auger to 13.4', then conventional coring to T.D. ASI Log: ASI Geologists: Doug Dennison, Fred Grigsby. EGASCO Rig Geologist: R T Canon. Borehole filled with bentonite grout and abandoned on 10/4/91.

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE (0% 50% 100%)	PERCENT RECOVERY (0% 100%)	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
						20				
					5938	21			NO SAMPLE:	No recovery.
				0.40 /3.40	5937	22				
					5936	23				
					5935	24			SILTY CLAYSTONE:	Silty Claystone with some Sand. Sand percentage varies. Grayish orange (10 YR 7/4) to mod. yellowish brown (10 YR 5/4). Some pale yellowish brown mottling (10 YR 6/2). Uncansol., wet and sticky. Contains scattered Siltstone pebbles/hematite stains (to 1.25 in.). Sand well sorted. Sub-angular to sub-rounded. Quartz. 10% sand, 72% clay, 18% silt.
					5934	25			CLAYSTONE:	Claystone with some Silt. Med. light gray (N6), mod. yellowish brown (10 YR 5/4) with dark yellowish orange (10 YR 6/6) mottling. Grades to olive gray (5 Y 4/1) with mod. yellowish brown (10 YR 5/4) mottling. Numerous fracture faces (pred. vertical) with Fe and Mn staining. Some slickensides. Some drilling fractures, pred. in lower part of interval. Some slightly silty intervals. Trace sand. Clay mod. indurated. Slightly to mod. friable. +/-10% silt, +/-90% clay.
					5933	26				
				6.60 /6.60	5932	27				
					5931	28				
					5930	29				
					5929	30				

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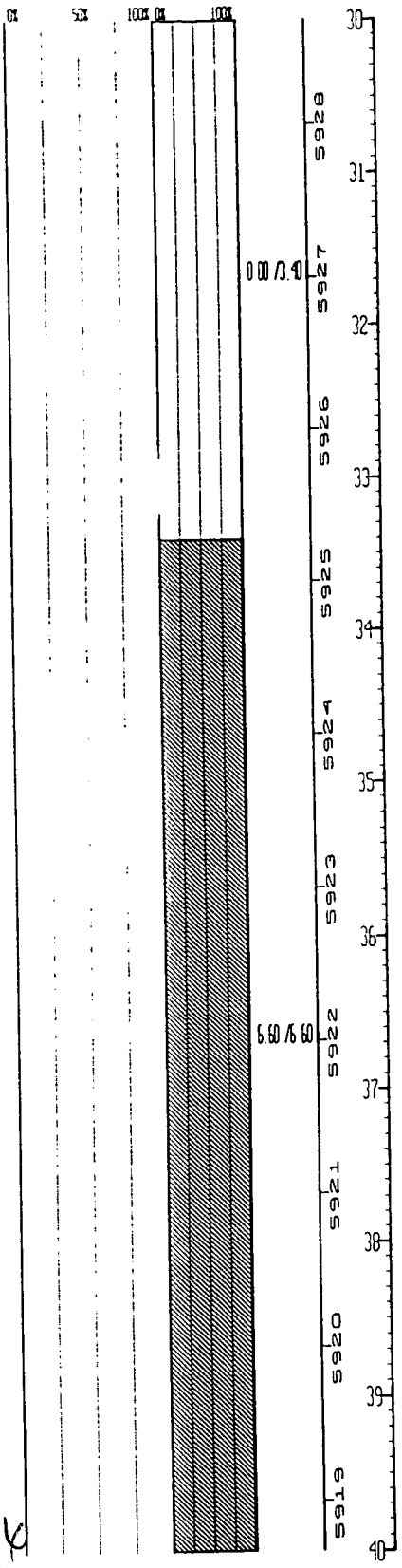
STATE PLANE COORDINATE:	TOTAL DEPTH (FT): 100.0	GROUND ELEVATION (FT): 5958.68	PROJECT NUMBER: SITEWIDE	LOG OF BORING NUMBER:
NORTH: 750732	AREA: SITEWIDE	CASING DIAMETER (IN):	GEOLOGIST: DID, FG	40291
EAST: 2086298	LOCATOR NUMBER: N10	BOREHOLE DIAMETER (IN): 10.0/3.75	DATE DRILLED: 10/03/91	

REMARKS: Hollow Stem Auger to 13.4', then conventional coring to T.D. ASI Log; ASI Geologists: Doug Dennison, Fred Gri gsby.
EBASCO Rig Geologist: R.T Canon. Borehole filled with bentonite grout and abandoned on 10/4/91.

CRITICAL GEOTECHNICAL DEPTH | SAMPLE DEPTH | SAMPLE NUMBER | SAMPLE GRAIN SIZE (0% 50%) | PERCENT RECOVERY (100% 0% 100%) | RECOVERY/INTERVAL | DATUM (FT) | DEPTH (FT) | WELL OR PIEZOMETER CONSTRUCTION | LITHOLOGY | UNIFIED SOILS CLASSIFICATION OR ROCK TYPE | DESCRIPTION



NO SAMPLE: No recovery.

SILTY CLAYSTONE: POSSIBLE FAULT ZONE.
Silty Claystone and Silty Claystone with some Sand. One side of vertical fracture Silty Claystone with Sand (approx. 15%). Dark yellowish brown (10 YR 4/2) with dark yellowish orange (10 YR 6/6) mottling and staining. Opposite side Silty Claystone with only a trace of sand. Brownish gray (5 YR 4/1) with dark yellowish orange (10 YR 6/6) and some grayish black (N2) carbonaceous material. Fracture extends full length of interval. Fracture angle 80 to 90 degrees and 70 degrees. Heavy Fe and Mn mineralization along fracture planes. Well developed slickensides, slightly oblique to vertical. Clays mod. indurated and mod. friable. Sand in sandy intervals pred. quartz. Sub-angular, v.f.g., well sorted. Sandy side 15% sand, 25% silt, 60% clay. Non-sandy side 20% silt, 80% clay.

SILTY CLAYSTONE: Silty Claystone. Light brownish gray (5 YR 6/1) in upper half of interval and dark yellowish brown (10 YR 4/2) in lower half. PROMINENT FRACTURE with heavy Fe mineralization (mod. brown (5 YR 4/4) and dark yellowish orange (10 YR 6/6)) on lower fracture planes. Fracture angle approx. 60 degrees.
+/-20% silt, +/-80% clay.

CLAYSTONE: POSSIBLE FAULT GOUGE AND/OR BRECCIA ZONE
Claystone with some Silt and trace Sand. Pred. Claystone. Light brownish gray (5 YR 6/1) to brownish gray (5 YR 4/1) with mod. yellowish brown (10 YR 5/4) and dark yellowish orange (10 YR 6/6) mottling and staining. Several healed and mineralized fractures. Some occasional carbon material. Fe stained nodule at approx. 36.5' (small).
Trace of sand, +/-10% silt, +/-90% clay.

CLAYSTONE: Claystone with some Silt and trace Sand. Dark yellowish brown (10 YR 4/2) to brownish gray (5 YR 4/1) with mod. yellowish brown (10 YR 5/4) and dark yellowish orange (10 YR 6/6) mottling and as staining on healed fracture faces. (Fe and some Mn staining on fracture planes). No apparent bedding planes, numerous healed fractures. Some slickensides. Fracture angle approx. 45 degrees. Clay mod. indurated. "Rotational" feature at 38.4' to 38.9'. Circular structure or feature possibly "biogenic". Offset from center of core and therefore does not appear to be drilling related.
Trace sand, <10% silt, >90% clay.

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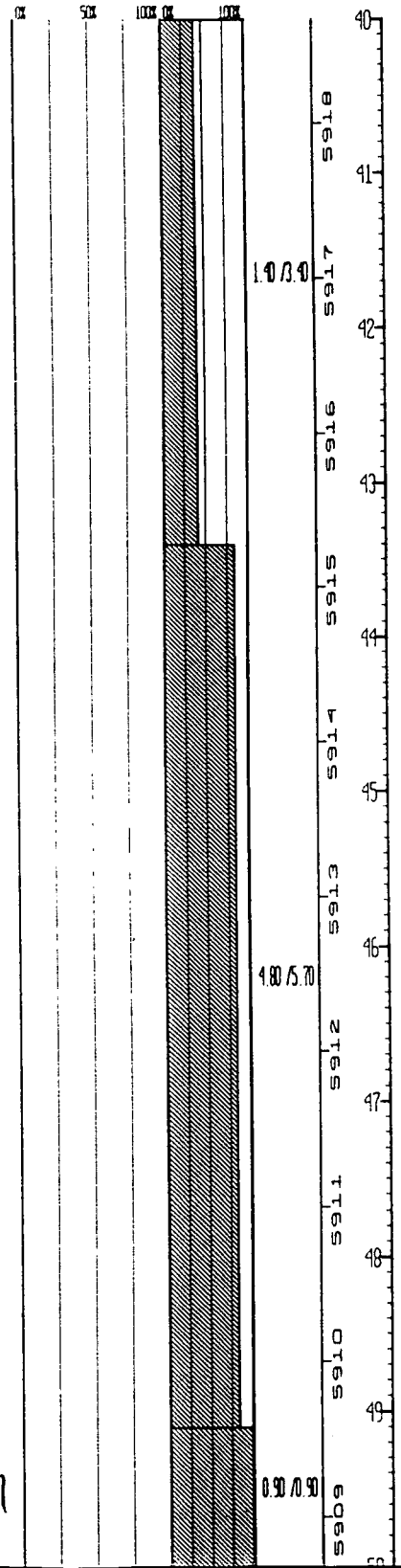
STATE PLANE COORDINATE:		TOTAL DEPTH (FT): 100.0	GROUND ELEVATION (FT): 5958.68	PROJECT NUMBER: SITEWIDE	LOG OF BORING NUMBER:
NORTH:	750732	AREA: SITEWIDE	CASING DIAMETER (IN):	GEOLOGIST: DIO, FG	40291
EAST:	2086298	LOCATOR NUMBER: N10	BOREHOLE DIAMETER (IN): 10.0/3.75	DATE DRILLED: 10/03/91	

REMARKS: Hollow Stem Auger to 13.4', then conventional coring to T.D. ASI Log; ASI Geologists: Doug Dennison, Fred Gri gsby.
EBASCO Rig Geologist: R.T. Conon. Borehole filled with bentonite grout and abandoned on 10/4/91.

CHEMICAL SAMPLE DEPTH
GEOTECHNICAL SAMPLE DEPTH
SAMPLE NUMBER
SAMPLE GRAIN SIZE (0% 50% 100%)
PERCENT RECOVERY (0% 100%)
RECOVERY/INTERVAL
DATUM (FT)
DEPTH (FT)
WELL OR PIEZOMETER CONSTRUCTION
LITHOLOGY



UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
NO SAMPLE:	No recovery.
SILTY CLAYSTONE:	Silty Claystone with trace Sand. Dark yellowish brown (10 YR 4/2) pred. unconsol., very moist, sticky. Consol. Claystone mod. indurated. Evidence of torque shearing during drilling. Sand fraction pred. quartz, v.f.g., sub-angular to angular. <5% sand, 28% silt, 67% clay.
CLAYSTONE:	Claystone with some Silt and trace Sand. Dark yellowish brown (10 YR 4/2) to olive gray (5 Y 4/1). Extensively fractured by drilling. Clay indurated but mod. friable when damp. Shearing probably occurs along silty intervals. Trace of sand, <15% silt, >85% clay.
NO SAMPLE:	No recovery.
CLAYSTONE:	Claystone. Dark gray (N3) with dark yellowish orange (10 YR 6/6) staining on fracture surface. Fracture angles approx. 30 degrees.
CLAYSTONE:	Claystone with some Silt. Pale yellowish brown (10 YR 6/2) to dark yellowish brown (10 YR 4/2) and grayish black (N2). Heavy mineralization (Fe and Mn) along fracture planes (mod. yellowish brown (10 YR 5/4)). Prominent fractures in lower 1' of interval. Fracture angles 80 degrees and 35 degrees. <20% silt, >80% clay.

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STATE PLANE COORDINATE:		TOTAL DEPTH (FT): 100.0	GROUND ELEVATION (FT):	5958.68	PROJECT NUMBER:	SITEWIDE	LOG OF BORING NUMBER:
NORTH:	750732	AREA: SITEWIDE	CASING DIAMETER (IN):		GEOLOGIST:	DID, FG	40291
EAST:	2086298	LOCATOR NUMBER: N10	BOREHOLE DIAMETER (IN):	10.0/3.75	DATE DRILLED:	10/03/91	

REMARKS: Hollow Stem Auger to 13.4', then conventional coring to T.D. ASI Log; ASI Geologists: Doug Dennison, Fred Gri gsby. EBASCO Rig Geologist; R.T. Canon. Borehole filled with bentonite grout and abandoned on 10/4/91.

DEPTH (FT)	GEOTECHNICAL SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
			GR SAND	100% OR 100%	3.40/3.40	5908	50				
						5907	51			SILTY CLAYSTONE	Silty Claystone with trace Sand. Siltier than above. Pale yellowish brown (10 YR 6/2) to dark yellowish brown (10 YR 4/2). Numerous mineralized fractures coated with Fe and some Mn material which varies from dark yellowish orange (10 YR 6/6) to pale yellowish orange (10 YR 8/6) and dusky yellowish brown (10 YR 2/2). Core varies from very clayey in some intervals to slightly sandy (>10%) at approx. 54.7' to to approx. 55.6'. Clays mod. indurated but mod. friable when damp. Trace carbon below approx. 56.0' and mod. abundt. at bottom of interval. Fracture angles vary from approx. 80 degrees to approx. 30 degrees. Trace sand, 38% silt, 57% silt.
						5906	52				
						5905	53				
						5904	54				
						5903	55				
					6.60/6.60	5902	56				
						5901	57				
						5900	58				
						5899	59				
							60				

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STATE PLANE COORDINATE:	TOTAL DEPTH (FT): 100.0	GROUND ELEVATION (FT): 5958.68	PROJECT NUMBER: SITEWIDE	LOG OF BORING NUMBER:
NORTH: 750732	AREA: SITEWIDE	CASING DIAMETER (IN):	GEOLOGIST: DID, FG	40291
EAST: 2086298	LOCATOR NUMBER: N10	BOREHOLE DIAMETER (IN): 10.0/3.75	DATE DRILLED: 10/03/91	

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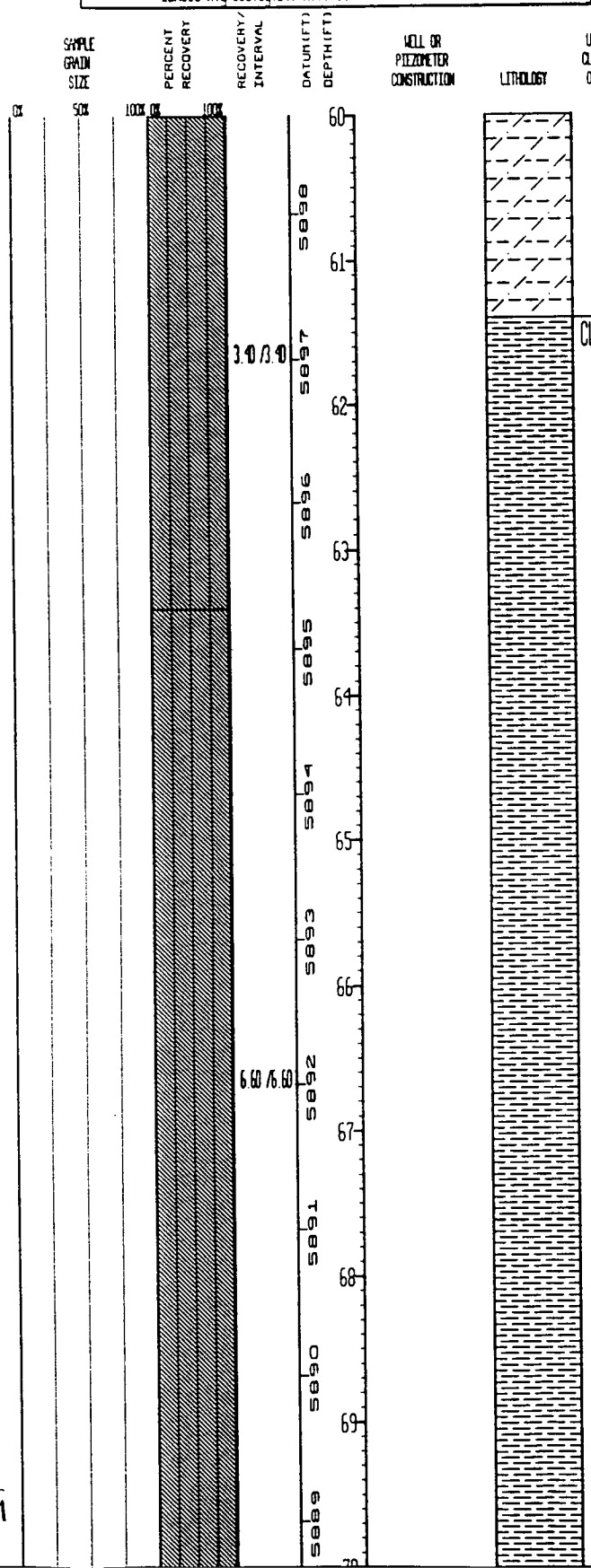
CHEMICAL SAMPLE DEPTH
GEOTECHNICAL SAMPLE DEPTH
SAMPLE NUMBER



UNIFIED SOILS CLASSIFICATION OR ROCK TYPE

DESCRIPTION

CLAYSTONE: Carbonaceous Claystone. Brownish black (5 YR 2/1) to grayish black (N2). Some lignitic intervals (thin beds). "Drilling induced fractures throughout. Fractures at approx. 63.8' and 64.0' at approx. 20 degrees with slickensides. Appear to be natural". All other fractures appear to be drilling induced with some slickensides caused by drilling. Light brown (5 YR 5/6) silty Clay bed (approx. 1 in. thick at 62.4'). Interval generally massive but with some possible poorly developed planes in more carbonaceous intervals.

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STATE PLANE COORDINATE:	TOTAL DEPTH (FT): 100.0	GROUND ELEVATION (FT):	5958.68	PROJECT NUMBER:	SITEWIDE	LOG OF BORING NUMBER:
NORTH: 750732	AREA: SITEWIDE	CASING DIAMETER (IN):		GEOLOGIST:	DID, FG	40291
EAST: 2086298	LOCATOR NUMBER: N10	BOREHOLE DIAMETER (IN):	10.0/3.75	DATE DRILLED:	10/03/91	

REMARKS: Hollow Stem Auger to 13.4', then conventional coring to T.D. ASI Log; ASI Geologists: Doug Dennison, Fred Grigsby.
EBASCO Rig Geologist: R.T. Canon. Borehole filled with bentonite grout and abandoned on 10/4/91.

DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
				3.40/3.40	70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80			CLAYSTONE:	Carbonaceous Claystone with trace to some Sand. Brownish black (5 YR 2/1) with lignite stringers. Claystone silty to slightly sandy. Friable. Trace of sand, 90% clay.
								SILTY CLAYSTONE:	Silty Claystone with some Sand. Brownish black (5 YR 2/1). Unconsol., wet. Carbonaceous sand fraction pred. v.f.g., angular to sub-angular quartz. Also contains carbon fragments and consol. clay particles. Lower 2-3 in. consists of sticky clay balls and clasts and some light olive gray (5 Y 6/1) nodules (unidentified). 6% sand, 28% silt, 66% clay.
								CLAYSTONE:	Carbonaceous Claystone with some Silt. Brownish black (5 YR 2/2). Mod. indurated, slightly friable when damp. +/-10% silt, +/-90% clay.
								SILTY CLAYSTONE:	Silty Claystone with some Sand. Brownish black (5 YR 2/1) to olive black (5 Y 2/1) and olive gray (5 Y 4/1). Abundt. carbon. No apparent bedding. Mod. indurated, slightly friable when damp. Sand fraction pred. quartz, v.f.g., angular to sub-angular. Well sorted. Some thinly laminated intervals. <15% sand, 17% silt, 68% clay.
				6.60/6.60				CLAYSTONE:	Claystone. Olive black (5 Y 2/1). Massive. >95% clay.
								CLAYSTONE:	Claystone with some Silt. Interbedded silty intervals. Olive black (5 Y 2/1) with olive gray (5 Y 4/1) and light olive gray (5 Y 6/1). Silty at approx. 77.6' and thin laminations or varves from 77.7' to 78.0' showing [illegible] motion or drag features. Some possible very poorly developed [illegible] planes. Some to mod. abundt. carbon. Mod. friable when damp. <10% silt, >90% clay.
								SILTY CLAYSTONE:	Silty Claystone with trace Sand. Dusky yellowish brown (10 YR 2/2) to light olive gray (5 Y 6/1). Mod. abundt. carbon. Vertical fracture in middle of interval. Generally massive unit. Indurated but slightly friable when damp. Fracture angle 90 degrees. +/-3% sand, <19% silt, >78% clay.

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STATE PLANE COORDINATE:		TOTAL DEPTH (FT): 100.0	GROUND ELEVATION (FT):	5958.68	PROJECT NUMBER:	SITEWIDE	LOG OF BORING NUMBER:
NORTH:	750732	AREA: SITEWIDE	CASING DIAMETER (IN):		GEOLOGIST:	DID, FG	40291
EAST:	2086298	LOCATOR NUMBER: N10	BOREHOLE DIAMETER (IN):	10.0/3.75	DATE DRILLED:	10/03/91	

REMARKS: Hollow Stem Auger to 13.4', then conventional coring to T.D. ASI Log: ASI Geologists: Doug Dennison, Fred Gri gsby.
EBASCO Rig Geologist: R T. Conon. Borehole filled withbentonite grout and abandoned on 10/4/91.

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
						80				
					5878	81			CLAYSTONE:	Claystone with trace Silt. Olive gray (5 Y 4/1). Some silty intervals. Massive, dense, indurated. Slightly friable when damp. >95% clay.
				1.00 /3.40	5877	82			NO SAMPLE:	No recovery.
					5876	83				
					5875	84			CLAYSTONE:	Claystone. Olive black (5 Y 2/1). Drilling induced fractures (horiz.). Friable, sticky when wet. Some carbonaceous material.
					5874	85				
					5873	86			CLAYSTONE:	Carbonaceous Claystone. Brownish black (5 YR 2/1). Friable and unconsol. Consol. Claystone beds(?) at 86.6' (3 in.) and 87.5' (approx. 4 in.). Friability may be due to fragmented carbon particles. Interval damp. >95% clay.
				6.60 /6.60	5872	87				
					5871	88			CLAYSTONE:	Claystone with some Silt. Brownish black (5 YR 2/1). Slightly silty. Trace carbon. Massive, dense, indurated, slightly friable. +/-10% silt, +/-90% clay.
					5870	89				
					5869	90			CLAYSTONE:	Claystone with trace Carbon. Olive black (5 Y 2/1). Massive, dense, sticky when damp. +/-98% clay.

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STATE PLANE COORDINATE:	TOTAL DEPTH (FT): 100.0	GROUND ELEVATION (FT): 5958.68	PROJECT NUMBER: SITEWIDE	LOG OF BORING NUMBER:	
NORTH: 750732	AREA: SITEWIDE	CASING DIAMETER (IN):	GEOLOGIST: DID, FG	40291	
EAST: 2086298	LOCATOR NUMBER: N10	BOREHOLE DIAMETER (IN): 10 0/3.75	DATE DRILLED: 10/03/91		

REMARKS: Hollow Stem Auger to 13.4', then conventional coring to T.D. ASI Log; ASI Geologists: Doug Dennison, Fred Grigsby.
EBASCO Rig Geologist: R T Canon Borehole filled with bentonite grout and abandoned on 10/4/91.

SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
					90			CLAYSTONE:	Claystone with some Silt. Same as above. +/-15% silt, +/-85% clay.
				5868	91			CLAYSTONE:	Claystone with trace Silt. Brownish black (5 YR 2/1). Badly broken, some fragments with slickensides. Trace carbon. <5% silt, >95% clay.
			1.00/3.40	5867	92			NO SAMPLE:	No recovery.
				5866	93				
				5865	94			CLAYSTONE:	Claystone. Brownish black (5 YR 2/1). Mod. abundt. carbon, broken, friable, damp. >95% clay.
				5864	95			SILTY CLAYSTONE:	Silty Claystone. Olive gray (5 Y 4/1). Dense, mod. indurated, massive. Trace carbon. +/-20% silt, +/-80% clay.
				5863	95			CLAYSTONE:	Claystone with some Silt. Olive gray (5 YR 4/1). Trace to mod. carbon. Coarsely bedded. Slightly silty <10% silt, >90% clay.
								SILTY CLAYSTONE:	Silty Claystone. Same as above (reference interval 94.2' to 95.1'). +/-20% silt, +/-80% clay.
			6.00/6.60	5862	97			CLAYSTONE:	Claystone. Same as above (reference interval 95.1' to 95.4')
				5861	98			SILTY CLAYSTONE:	Silty Claystone. Same as above (reference interval 94.2' to 95.1').
								CLAYSTONE:	Claystone. Same as above (reference interval 95.1' to 95.4')
				5860	99			SILTY CLAYSTONE:	Silty Claystone. Same as above (reference interval 94.2' to 95.1').
				5859	100			NO SAMPLE:	No recovery. Total drilled depth = 100.0'.

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STATE PLANE COORDINATE		TOTAL DEPTH (FT): 186.0	GROUND ELEVATION (FT): 5795.66	PROJECT NUMBER: SITEWIDE	LOG OF BORING NUMBER:
NORTH: 7-72926		AREA: SITEWIDE	CASING DIAMETER (IN):	GEOLOGIST: F.G.	40591
EAST: 2093876		LOCATOR NUMBER: U7	BOREHOLE DIAMETER (IN): 10.0/3.75	DATE DRILLED: 11/27/91	

REMARKS: ASI Geologist: Fred Grigsby, Laurie Hoist. EBASCO Rig Geologist: R.T. Canon. Borehole filled with bentonite grout and abandoned on 12/10/91.

GEOTECHNICAL SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY INTERVAL	ELEVATION (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
		0% 50% 100%	0% 100%						SM:	Gravelly Sand with some Silt and Clay (topsoil). Brownish gray (5 YR 4/1). Abundt. roots. Gravel quartz and quartzite, poorly graded, sub-angular. Sand and silt, poorly graded, pred. quartz and weathered feldspar, sub-rounded to sub-angular. Mod. abundt. mica in f.g. fraction. Non-calcareous, med. plasticity, mod. weathered. 22% gravel, 60% sand, 12% silt, 6% clay.
	B0002RB			1.30/2.00	5795 / 5794	1 / 2			SM:	Sandy Silt with some Gravel and trace Clay. Yellowish gray (5 Y 7/2) with some very pale orange (10 YR 8/2). Very calcareous, possible caliche bed (pieces only). Gravel poorly graded, pred. quartz and quartzite, sub-rounded. Sand, poorly graded, sub-angular to sub-rounded quartz and weathered feldspar, trace quartzite. Mod. abundt. mica in f.g. fraction. Low to med. plasticity, mod. weathered. 23% gravel, 37% sand, >38% silt, <2% clay.
	B0003RB				5793	3			NO SAMPLE:	No recovery.
				1.50/4.00	5792	4			SM:	Sandy Silt. Same as above (reference interval 0.6' to 1.3') except color change to pred. very pale orange (10 YR 8/2) and interval more calcareous (caliche cemented). 23% gravel, 37% sand, >38% silt, <2% clay.
					5791	5			CALICHE:	Caliche bed with gravel and clay clasts. White (N9) with light olive gray (5 Y 6/1) clay clasts.
	B0004RB				5790	6			NO SAMPLE:	No Recovery.
					5789	7			CL:	Sandy Clay with some Silt and trace Gravel. Pale yellowish brown (10 YR 6/2) to light olive gray (5 Y 6/1) with abundt. very pale orange (10 YR 8/2) calcareous (caliche) intervals. Med. plasticity (-200 fraction). Sand pred. sub-rounded, quartz, poorly graded. Trace quartzite pebbles (approx. 1/2 in.). Clays mod. indurated. Pred. badly broken. Very highly calcareous with several caliche cemented/enriched intervals. Possible Claystone clast or boulder at approx. 8'. Trace gravel, 30% sand, <10% silt, >60% clay.
				3.50/4.00	5788	8				
	B0005RB				5787	9				
	B0006RB				5786	10			NO SAMPLE:	No recovery.

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STATE PLANE COORDINATE:	TOTAL DEPTH (FT): 186.0	GROUND ELEVATION (FT):	5795.66	PROJECT NUMBER:	SITEWIDE	LOG OF BORING NUMBER:
NORTH: 747926	AREA SITEWIDE	CASING DIAMETER (IN):		GEOLOGIST:	F.G.	40591
EAST: 2093876	LOCATOR NUMBER: U7	BOREHOLE DIAMETER (IN):	10.0/3.75	DATE DRILLED:	11/27/91	

REMARKS: ASI Geologist: Fred Grigsby, Laurie Hast. EBASCO Rig Geologist: R.T. Canon. Borehole filled with bentonite grout and abandoned on 12/10/91.

SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
			1.80 /2.00	5795	10			CL	Sandy Clay with some Silt and trace Gravel. Same as above (reference interval 6.0' to 9.5') except intermixed with clasts of med. gray (N5) clay and one large quartzite pebble (approx. 1.75 in.). Also some grayish orange (10 YR 7/4) mottling (Fe) on clast surfaces and on some small fractures. Top of interval less calcareous than interval from 6.0' to 9.5'. Amount of calcareous cementing decreases towards bottom of interval.
				5794	11			CLAYSTONE:	Top of Bedrock at 11.6'. Claystone with trace Silt. Light olive gray (5 Y 6/1) to olive gray (5 Y 6/1) with med. dark gray (N4) clasts throughout interval. Non-calcareous. Some grayish orange (10 YR 7/4) zoning and mottling. Clay indurated, dense, mod. friable when damp. (The lithology of this interval is similar to that of above interval). >95% clay.
				5793	12				
B0000068			1.60 /2.00		13				
				5792				NO SAMPLE:	No recovery.
B0000058					14			CLAYSTONE:	Claystone. Same as above (reference interval 11.6' to 11.8') except less gray clasts and trace of carbon. Upper part of interval broken, lower half intact. >95% clay.
					15			NO SAMPLE:	No recovery.
				5790				CLAYSTONE:	Claystone. Grayish orange (10 YR 7/4) to pale yellowish brown (10 YR 6/2) with dark yellowish orange (10 YR 6/6) (Fe) mottling. Upper 0.6' sticky and pliable. Lower interval crinkly texture, mod. indurated, fractured (drilling induced). Core damp to slightly damp. >95% clay.
				5789	16				
			6.00 /6.00		17			CLAYSTONE:	Claystone. Color change to med. dark gray (N4). Heavily fractured with Fe Oxide mineralized fractures. Multiple fracture dips. Core has crinkly texture, mod. indurated, slightly friable. Multiple drilling induced fractures. Trace of Mn staining. Trace carbon. >90% clay. NOTE: 0.1' extra core recovery from 14.0' to 23.0'.
				5788	18				
				5787	19				
				5786	20				

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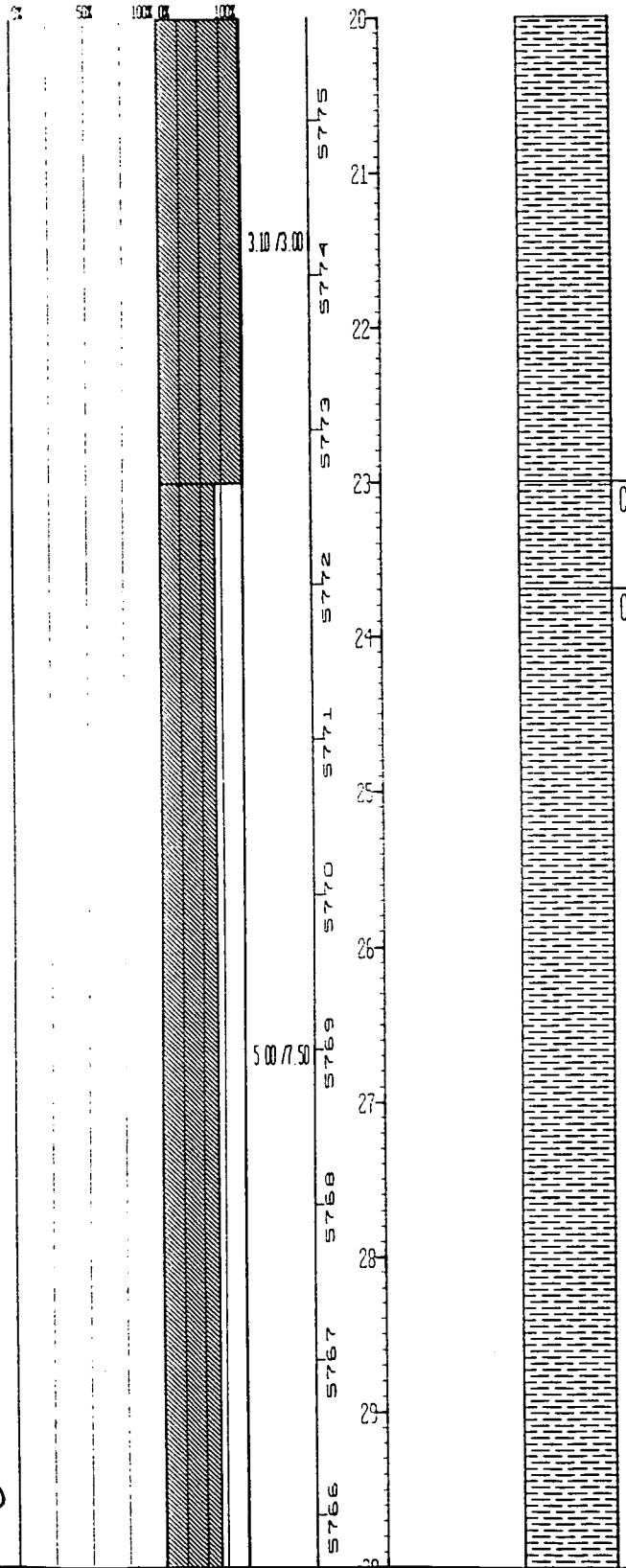
STATE PLANE COORDINATE:		TOTAL DEPTH (FT) 186.0	GROUND ELEVATION (FT):	5795.66	PROJECT NUMBER:	SITEWIDE	LOG OF BORING NUMBER:
NORTH:	717926	AREA: SITEWIDE	CASING DIAMETER (IN):		GEOLOGIST:	F.G.	40591
EAST:	2093876	LOCATOR NUMBER: U7	BOREHOLE DIAMETER (IN):	10.0/3.75	DATE DRILLED:	11/27/91	

REMARKS: ASI Geologist: Fred Grigsby, Laurie Hast. EBASCO Rig Geologist: R.T. Canon. Borehole filled with bentonite grout and abandoned on 12/10/91.

CHEMICAL SAMPLE DEPTH
GEOTECHNICAL SAMPLE DEPTH
SAMPLE NUMBER

SAMPLE GRAIN SIZE | PERCENT RECOVERY | RECOVERY/INTERVAL | DATUM (FT) | DEPTH (FT) | WELL OR PIEZOMETER CONSTRUCTION | LITHOLOGY | UNIFIED SOILS CLASSIFICATION OR ROCK TYPE | DESCRIPTION



UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
CLAYSTONE:	Claystone. Light olive gray (5 Y 6/1), sticky, damp, pliable. >95% clay.
CLAYSTONE:	Claystone. Same as above (reference interval 15.5' to 23.0') except increase in amount of carbon with depth. Fractures become less random (approx. 30 degrees). Multiple healed fractures, some mineralized. Fracture angle 30 degrees.

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NORTH: 747926	AREA: SITEWIDE	CASING DIAMETER (IN):	GEOLOGIST: F.G.	40591	
EAST: 2093876	LOCATOR NUMBER: U7	BOREHOLE DIAMETER (IN): 10.0/3.75	DATE DRILLED: 11/27/91		

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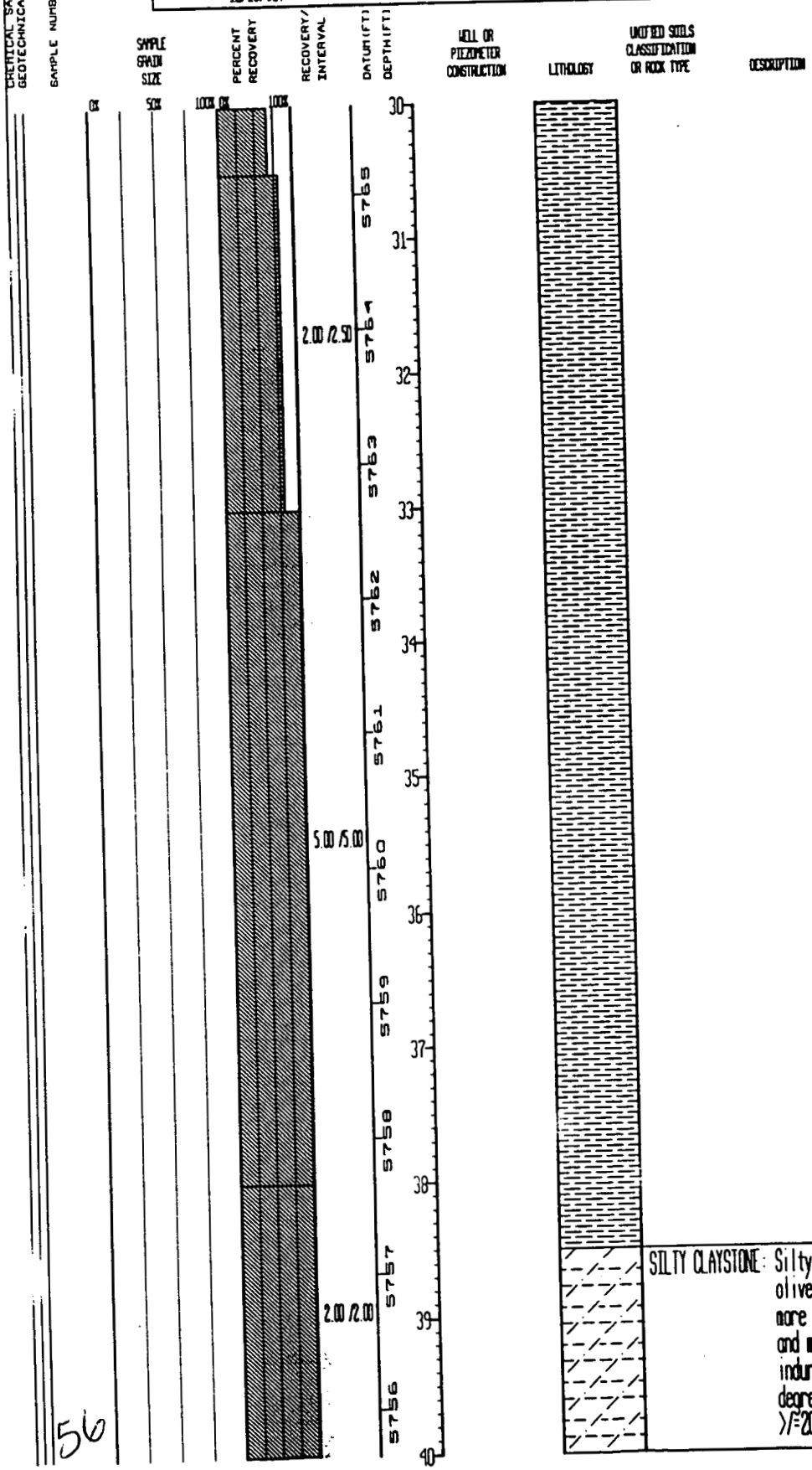

SILTY CLAYSTONE: Silty Claystone. Pred. olive grav (5 Y 4/1) with light olive gray mottling. Massive, more clayey at top becoming more silty with depth. Some to mod. abundt. carbon. Healed and mineralized fractures (Fe). Core slightly damp, mod. indurated, mod. friable. Fracture angles 20 degrees and 45 degrees.
>/=20% silt, </=80% clay.

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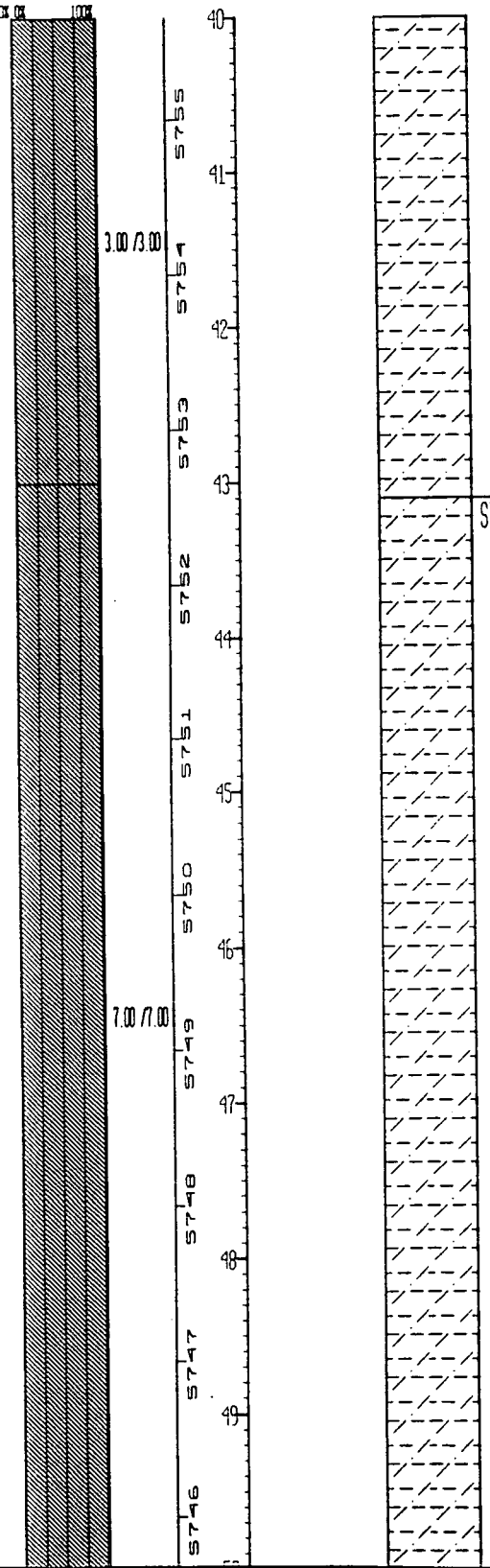
STATE PLANE COORDINATE:	TOTAL DEPTH (FT): 186.0	GROUND ELEVATION (FT): 5795.66	PROJECT NUMBER: SITEWIDE	LOG OF BORING NUMBER:
NORTH: 747926	AREA: SITEWIDE	CASING DIAMETER (IN):	GEOLOGIST: F.G.	40591
EAST: 2093876	LOCATOR NUMBER: U7	BOREHOLE DIAMETER (IN): 10.0/3.75	DATE DRILLED: 11/27/91	

REMARKS: AST Geologist; Fred Grigsby, Laurie Hoat. EBASCO Rig Geologist; R.T. Canon. Borehole filled with bentonite grout and abandoned on 12/10/91.

CHEMICAL SAMPLE DEPTH
GEOTECHNICAL SAMPLE DEPTH
SAMPLE NUMBER
SAMPLE GRAIN SIZE (0% 50% 100%)
PERCENT RECOVERY (0% 100%)
RECOVERY/INTERVAL
DATUM (FT)
DEPTH (FT)
WELL OR PIEZOMETER CONSTRUCTION
LITHOLOGY
UNIFIED SOILS CLASSIFICATION OR ROCK TYPE
DESCRIPTION



SILTY CLAYSTONE: Silty Claystone with trace Sand. Extensive Fe Oxide mineralization. Pale yellowish brown (10 YR 6/2), very pale orange (10 YR 8/2) and light olive gray (5 Y 6/1) with heavy dark yellowish orange (10 YR 6/6) Fe coating and staining throughout interval. Extensively disturbed and fractured bedding indicated. Some lenses of discontinuous v.f.g. Sandstone. Sand is quartz, sub-angular to sub-rounded, well sorted. Thickest interval (0.4') at 50.6' to 51.0'. Fractures extensive. No evidence of slickensides. Most consistent measurable fracture angle is 30 degrees. Core slightly damp. Varies from mod. well cemented to friable. Lithology varies considerably but becomes more consistent below 51.0' depth. Carbon varies from some to abundt. Woody fragments fairly common. Possibly some burrow casts. Trace of sand, >20% silt, <80% clay.

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NORTH: 747926	AREA: SITEWIDE	CASING DIAMETER (IN):	GEOLOGIST: F.G.	40591
EAST: 2093876	LOCATOR NUMBER: U7	BOREHOLE DIAMETER (IN): 10.0/3.75	DATE DRILLED: 11/27/91	

REMARKS: ASI Geologist: Fred Grigsby, Laurie Hoist. EG&GCO Rig Geologist: R.T. Canon. Borehole filled with bentonite grout and abandoned on 12/10/91.

CHEMICAL SAMPLE DEPTH
GEOTECHNICAL SAMPLE DEPTH
SAMPLE NUMBER

SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
CL SCK	100% CR 100%	2.50 /2.50	5745 5744 5743	50 51 52			CLAYSTONE:	Claystone. Dark yellowish brown (10 YR 4/2) in top 0.2' and dusky yellowish brown in lower 0.2'. Sticky and pliable in top 0.2'. Mod. indurated in lower 0.2' of interval. >95% clay.
		5.50 /5.50	5742 5741 5740 5739 5738	53 54 55 56 57 58			CLAYSTONE:	Claystone. Brownish gray (5 YR 4/1) in upper half of interval grading to olive gray in lower half. Abundt. mod. brown (5 YR 4/4) and dark yellowish orange (10 YR 6/6) Fe Oxide coatings on fractures and planes. Interval dry, generally brittle, indurated, slightly friable to non-friable. Core surface texture generally crinkly. Fractures common, most prevelant fracture dip approx. 30 degrees. Many fractures at various angles. Possible Breccia zone in top 0.4' of interval. No distinct bedding. No slickensides. Some to mod. abundt carbon. Trace of Mn staining on fractures (some). >90% clay.
		2.00 /2.00	5737 5736	59 60			CLAYSTONE:	Claystone. Olive gray (5 Y 4/1) with dark yellowish orange (10 YR 6/6) Fe Oxide coatings and nodules. Alternating beds of sticky pliable Claystone with beds of brittle Claystone (see above interval). Interval extensively fractured (drilling induced). Natural fractures common at varying dips. Some vertical fractures with Fe mineralization. Interval damp to slightly damp. Slightly to nonfriable. Some carbon, trace Mn staining. Some 90 degree fracture angles. >90% clay.

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STATE PLANE COORDINATE:		TOTAL DEPTH (FT) 186.0	GROUND ELEVATION (FT)	5795.66	PROJECT NUMBER:	SITEWIDE	LOG OF BORING NUMBER:
NORTH:	747926	AREA SITEWIDE	CASING DIAMETER (IN):		GEOLOGIST:	F.G.	40591
EAST:	2093876	LOCATOR NUMBER: U7	BOREHOLE DIAMETER (IN):	10.0/3.75	DATE DRILLED:	11/27/91	

REMARKS: AST Geologist: Fred Grigsby, Laurie Hoist. EGASCO Rig Geologist: R.T. Canon. Borehole filled with bentonite grout and abandoned on 12/10/91.

SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
		2.00/3.00	5755	60				
			5754	61				
			5753	62			NO SAMPLE	No recovery
			5752	63			CLAYSTONE:	Claystone. Pred. brownish gray (5 YR 4/1) with some dark yellowish orange (10 YR 6/6). Consistency of sticky pliable clay with clasts of indurated Claystone (Possible Breccia Zone). Random mineralized fractures in some intervals. Interval damp, broken, sticky. Some carbon dispersed throughout interval. >95% clay.
		3.20/4.00	5751	64				
			5750	65			CLAYSTONE:	Claystone. Brownish gray (5 YR 4/1) with light olive gray (5 Y 6/1) mottling. Some dark yellowish orange (10 YR 6/6) Fe Oxide fracture filling. Claystone dense, slightly damp. Mod. indurated, slightly friable. Possible horiz. fracturing (with Fe Oxide mineralization.) 1/2" layer of dark yellowish brown (10 YR 4/2) clay (pliable) at bottom of interval. Origin questionable.
			5749	66				
							NO SAMPLE:	No recovery.
		1.30/1.00	5748	67			CLAYSTONE:	Claystone with trace Silt. Olive gray (5 Y 4/1), some dark yellowish orange (10 YR 6/6) iron staining. Core is damp. Bedding appears massive. Core slightly to mod. friable. Some to trace silt and v.f.g. sand. Trace black minerals. 5% silt, 95% clay.
				68				
		2.00/2.00	5747	69			CLAYSTONE:	Claystone with some Silt. Olive gray (5 Y 4/1) to brownish gray (5 YR 4/1) in middle of interval. Some silt, becomes siltier at bottom of interval. Some dark yellowish orange (10 YR 6/6) iron staining as mottles and in some fractures. Several 30 degree fractures, one healed fracture 50 degrees. Bedding not apparent. Interval slightly damp (less sticky/wet than above). Slightly friable. Trace carbonaceous material. Fracture angle at 70 degrees. <10% silt, >90% clay.
			5746	70				

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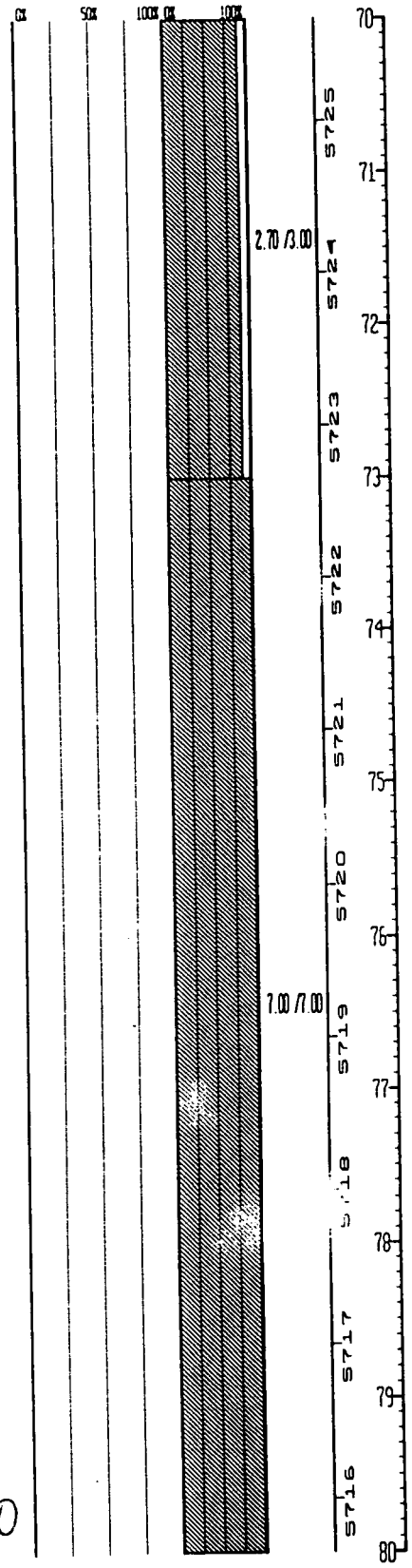
STATE PLANE COORDINATE:	TOTAL DEPTH (FT): 186.0	GROUND ELEVATION (FT): 5795.66	PROJECT NUMBER: SITEWIDE	LOG OF BORING NUMBER:
NORTH: 747926	AREA: SITEWIDE	CASING DIAMETER (IN):	GEOLOGIST: F.G.	40591
EAST: 2093876	LOCATOR NUMBER: U7	BOREHOLE DIAMETER (IN): 10.0/3.75	DATE DRILLED: 11/27/91	

REMARKS: ASI Geologist; Fred Grigsby, Laurie Hoat. EBASCO Rig Geologist; R.T. Canon. Borehole filled with bentonite grout and abandoned on 12/10/91.

CHEMICAL SAMPLE DEPTH
GEOTECHNICAL SAMPLE DEPTH
SAMPLE NUMBER
SAMPLE GRAIN SIZE
PERCENT RECOVERY
RECOVERY/INTERVAL
DATUM (FT)
DEPTH (FT)
WELL OR PIEZOMETER CONSTRUCTION
LITHOLOGY
UNIFIED SOILS CLASSIFICATION OR ROCK TYPE
DESCRIPTION



NO SAMPLE:	No recovery.
CLAYSTONE:	Claystone with some Silt. Olive gray (5 Y 4/1) to brownish gray (5 YR 4/1). Slightly porous, mod. to slightly friable. Bedding appears massive. Slightly damp. Trace carbonaceous material. High angle fractures (60 and 58 degrees) have dark yellowish orange (10 YR 6/6) iron staining. <10% silt, >90% clay.
CLAYSTONE:	Claystone with some Silt. Brownish gray (5 YR 4/1). Mod. friable. Bedding appears massive. Interval damp. Some carbonaceous material (approx. 5%). Dark reddish brown (10 R 3/4) area at approx. 77.2' and approx. 77.7' conjunction with more abundt. carbonaceous (coal) material. May be wood remains. Trace to some v.f.g. sand in localized area at approx. 77.2'. Some dark yellowish orange iron staining (10 YR 6/6). Becomes less silty toward approx. 80.0', grades to Claystone. Localized carbonaceous (coal?) area at approx. 78.6'. +/- 15% silt, +/-80% clay.

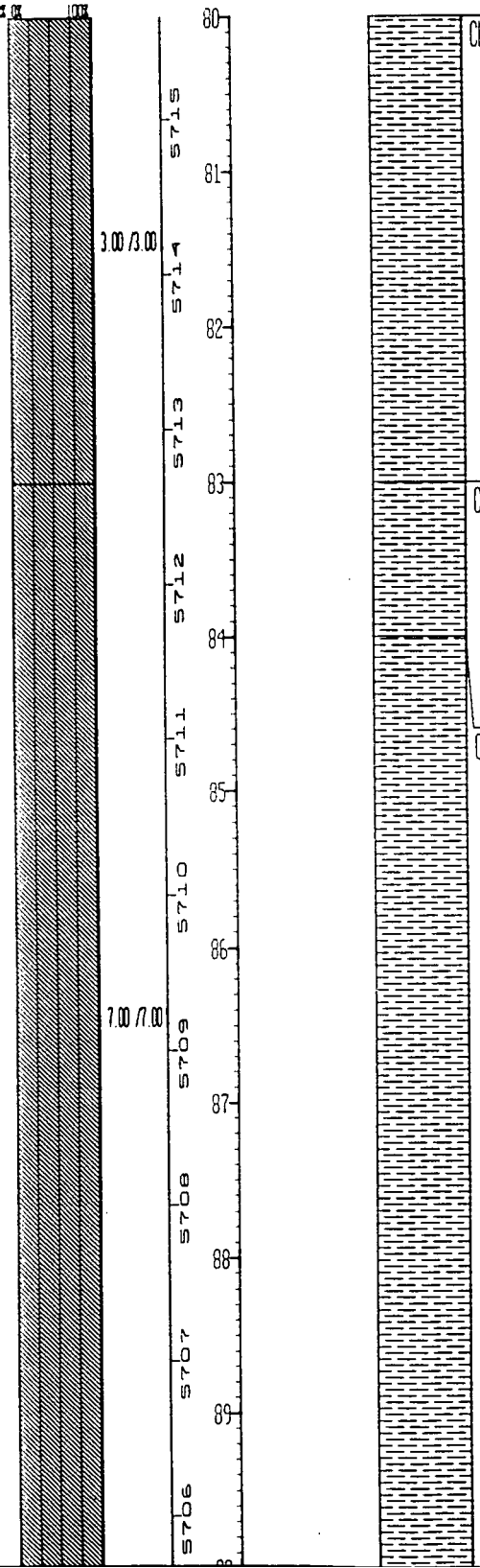
60

STATE PLANE COORDINATE:	TOTAL DEPTH (FT) 186.0	GROUND ELEVATION (FT) 5795.66	PROJECT NUMBER: SITEWIDE	LOG OF BORING NUMBER:
NORTH: 747926	AREA: SITEWIDE	CASING DIAMETER (IN):	GEOLOGIST: F.G.	40591
EAST: 2093876	LOCATOR NUMBER: U7	BOREHOLE DIAMETER (IN): 10.0/3.75	DATE DRILLED: 11/27/91	

REMARKS: ASI Geologist: Fred Grigsby, Laurie Host. EBASCO Rig Geologist, R.T. Canon. Borehole filled with bentonite grout and abandoned on 12/10/91.

CHEMICAL SAMPLE DEPTH
GEOTECHNICAL SAMPLE DEPTH
SAMPLE NUMBER

SAMPLE GRAIN SIZE (0% 50% 100%) | PERCENT RECOVERY (0% 100%) | RECOVERY/INTERVAL | DATUM (FT) | DEPTH (FT) | WELL OR PIEZOMETER CONSTRUCTION | LITHOLOGY | UNIFIED SOILS CLASSIFICATION OR ROCK TYPE | DESCRIPTION



CLAYSTONE: Claystone with some Silt. Brownish gray (5 YR 4/1) at top (80.0') grading to more olive gray (5 Y 4/1) at bottom of interval. Bedding massive. Trace to some dark yellowish orange (10 YR 6/6) staining (iron). Trace black mineralization. Slightly friable. Trace to some silt.
+/-10% silt, +/-90% clay.

CLAYSTONE: Claystone with trace Silt. Olive gray (5 Y 4/1). Same as above except slightly more damp. Slightly more plastic consistency. Mod. to slightly friable. Dark yellowish orange (10 YR 6/6) iron staining and possible slickensides on a high angle, irreg. fracture (unable to measure). Iron staining also in numerous micro fractures. Trace silt.
+/-5% silt, +/-95% clay.

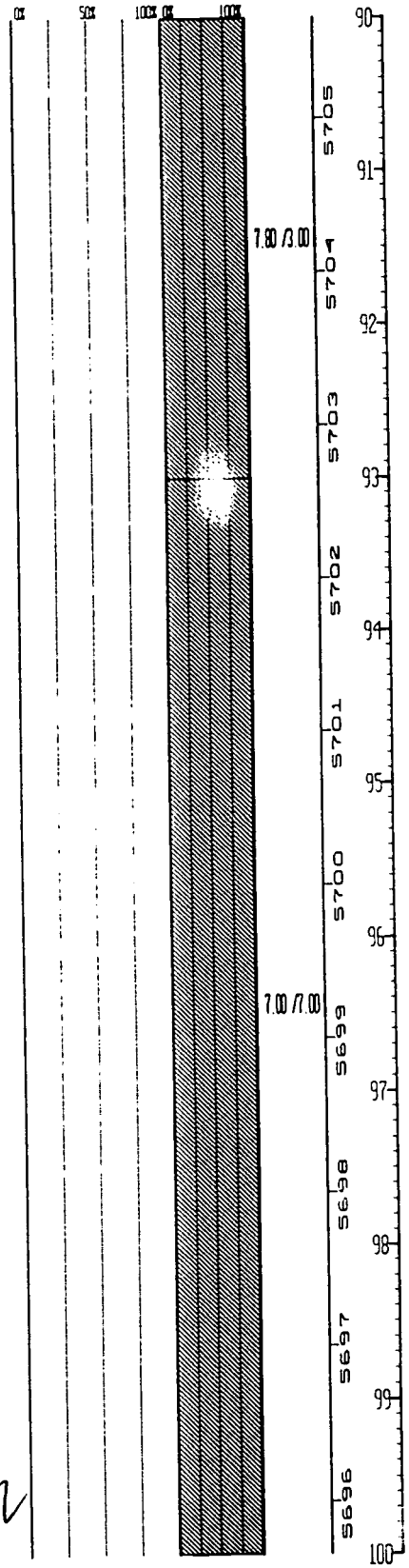
CLAYSTONE: Claystone with trace Silt. Grades from olive gray (5 Y 4/1) at very top of interval to olive black (5 Y 2/1) to brownish black (5 YR 2/1) last 3.5' (approx.) of interval. Entire interval is damp, massively bedded, slightly to mod. friable. Dark yellowish orange (10 YR 6/6) iron staining in irregular fractures and infrequent mottles in top approx. 3.9' of interval. Some possible slickensides in the irreg. fractures (approx. 84.0'). At approx. 87.0' interval becomes more carbonaceous. Localized coal seam at approx. 87.4'. At approx. 90', interval is brownish black. Some to abundt. carbonaceous material and coal. No apparent iron staining or bedding.
+/-5% silt, +/-95% clay.

61

STATE PLANE COORDINATE:	TOTAL DEPTH (FT): 186.0	GROUND ELEVATION (FT): 5795.66	PROJECT NUMBER: SITEWIDE	LOG OF BORING NUMBER:
NORTH: 747926	AREA: SITEWIDE	CASING DIAMETER (IN):	GEOLOGIST: F.G.	40591
EAST: 2093876	LOCATOR NUMBER: U7	BOREHOLE DIAMETER (IN): 10.0/3.75	DATE DRILLED: 11/27/91	

REMARKS: ASI Geologist: Fred Grigsby, Laurie Hast. EBASCO Rig Geologist: R.T. Canon. Borehole filled with bentonite grout and abandoned on 12/10/91.

CHEMICAL SAMPLE DEPTH
GEOTECHNICAL SAMPLE DEPTH
SAMPLE NUMBER



LITHOLOGY

UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
NO SAMPLE:	No recovery.
CLAYSTONE:	Claystone with some Silt. Olive black (5 Y 2/1) grading to olive gray (5 Y 4/1) bottom half of interval. Mod. friable (damp, slightly plastic consistency). Bedding not evident (appears massive). Some carbonaceous material (coal?). Some irreg. fractures appear to have slickensides (in top 1/2 of interval). Trace to some silt 15% silt, 85% clay.
CLAYSTONE:	Same as above (reference interval 93.0' to 97.0'). Olive gray (5 Y 4/1). Little to no carbonaceous material or fractures. <10% silt, >90% clay.

62

STATE PLANE COORDINATE:	TOTAL DEPTH (FT): 186.0	GROUND ELEVATION (FT):	5795.66	PROJECT NUMBER:	SITEWIDE
NORTH: 747926	AREA: SITEWIDE	CASING DIAMETER (IN):		GEOLOGIST:	F.G.
EAST: 2093876	LOCATOR NUMBER: U7	BOREHOLE DIAMETER (IN):	10.0/3.75	DATE DRILLED:	11/27/91

LOG OF BORING NUMBER: 40591

REMARKS: AST Geologist; Fred Grigsby, Laurie Hoot. EBASCO Rig Geologist; R.T. Canon. Borehole filled with bentonite grout and abandoned on 12/10/91.

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
		0% 50%	100% 0% 100%	1.90 /2.30	5695	100 101				
				0.00 /0.70	5694 5693	102			NO SAMPLE:	No recovery.
					5692	103			CLAYSTONE:	Claystone with trace Silt. Olive gray (5 Y 4/1). Mod. friable (plastic consistency). Bedding not evident, appears massive. Wet. Trace silt and v.f.g. sand. Fracture angles: 65 and 55 degrees. Trace of silt, >95% clay.
					5691	104			CLAYSTONE:	Claystone with trace Silt. Olive gray (5 Y 4/1) to olive black (5 Y 2/1). Some to abundt. carbonaceous material appearing as thin (1 mm.) coal seams. Common fractures (some irreg., some high angle) showing slickensides. Visual porosity low, mod. friable. Bedding appears massive. Slightly damp. Trace of silt, +/-5% carbonaceous material, +/-95% clay.
				5.00 /5.00	5690	105				
					5689	106				
					5688	107				
					5687	108			CLAYSTONE:	Claystone. Same as above (reference interval 104.0' to 108.0') except less carbonaceous material and fractures more irreg. Trace to some carbonaceous material. >95% clay, 2-5% carbonaceous material.
				2.00 /2.00	5686	109				

63

STATE PLANE COORDINATE:		TOTAL DEPTH (FT): 186.0	GROUND ELEVATION (FT): 5795.66	PROJECT NUMBER: SITEWIDE	LOG OF BORING NUMBER:
NORTH:	747926	AREA: SITEWIDE	CASING DIAMETER (IN):	GEOLOGIST: F.G.	40591
EAST:	2093876	LOCATOR NUMBER: U7	BOREHOLE DIAMETER (IN): 10.0/3.75	DATE DRILLED: 11/27/91	

REMARKS: ASI Geologist: Fred Grigsby, Laurie Host. EBASCO Rig Geologist: R.T. Canon. Borehole filled with bentonite grout and abandoned on 12/10/91.

CHEMICAL/BAUGH/GEOTECHNICAL SAMPLE DEPTH | SAMPLE NUMBER | SAMPLE GRAIN SIZE | PERCENT RECOVERY | RECOVERY/INTERVAL | DATUM (FT) | DEPTH (FT) | WELL OR PIEZOMETER CONSTRUCTION | LITHOLOGY | UNIFIED SOILS CLASSIFICATION OR ROCK TYPE | DESCRIPTION

0% 50% 100% 0% 100%

3.00 /3.00

7.00 /7.00

Depth (ft)	Datum (ft)
110	5685
111	
112	5684
113	5683
114	5682
115	5681
116	5680
117	5679
118	5678
119	5677
120	5676

SILTY CLAYSTONE: Silty Claystone with trace Sand. Olive black (5 Y 2/1). Mod. friable to friable. Bedding appears massive. Slightly damp. Slickensides on irreg. fractures. Trace carbonaceous material. Some silt, trace v.f.g. sand.
+/-5% sand, +/-20% silt, +/-75% clay.

CLAYSTONE: Same as above (reference interval 113.0' to 117.5'). Top 1' of interval wet. Numerous fractures with slickensides. One regular fracture with slickensides (60 degrees). Interval becomes sandy (v.f.g.) at very bottom, sub-angular to sub-rounded. Core surface has a crinkly texture in this interval.
+/-25% sand, +/-5% silt, +/-70% clay.

SANDY CLAYSTONE: Sandy Claystone with abundt. Silt. Olive black (5 Y 2/1). Bedding not evident, appears massive. Sand v.f.g., mod. to well sorted, sub-angular to sub-rounded quartzite grains (pred.). Trace to some carbonaceous material. Mod. to slightly friable. Low angle fractures. Some faint low angle bedding visible at approx. 120.5'. Bedding angle approx. 20 degrees. Fracture angles 30 degrees and 20 degrees.
36% sand, 26% silt, 38% clay.

SANDY CLAYSTONE: Interbedded Sandy Claystone as above and Clayey Sandstone with some Silt. Olive gray (5 Y 4/1) to light olive gray (5 Y 6/1). Sand v.f.g., mod. to well sorted, sub-angular to sub-rounded. Visual porosity low (in clay), to mod. in Sandstone. Mod. to slightly friable. Faint bedding laminations visible, horiz., thin (<1 mm. thick). Damp. Trace to some carbonaceous material in fragments and thin coal seams (<1 mm. thick).
46% sand, +/-6% silt, +/-48% clay.

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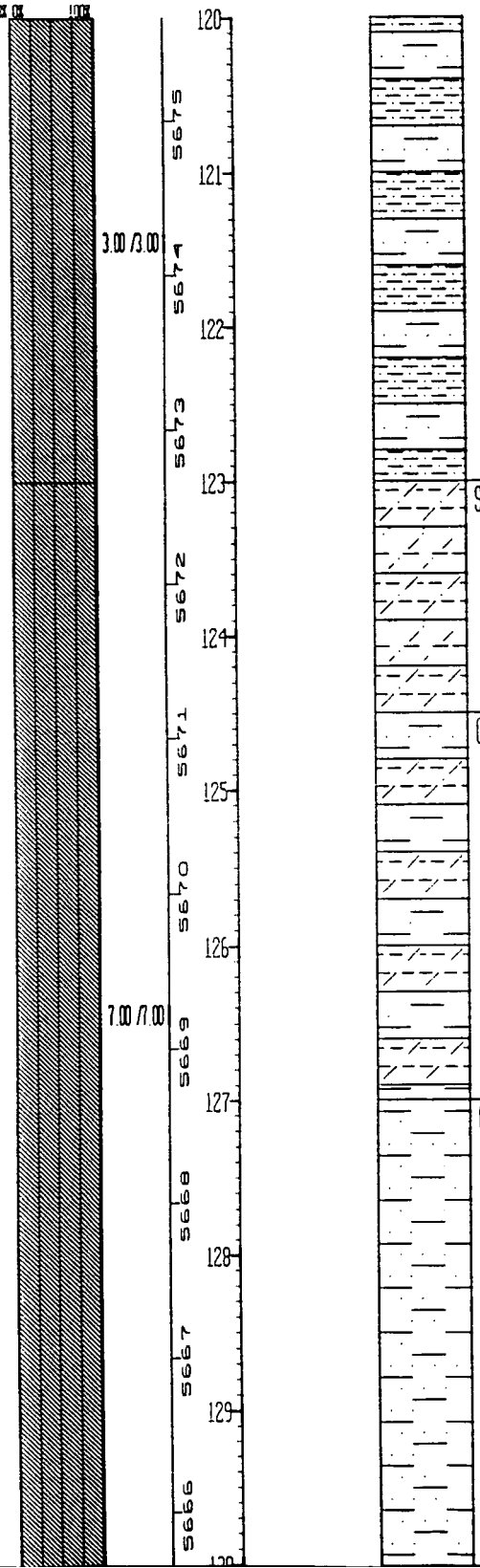
STATE PLANE COORDINATE:	TOTAL DEPTH (FT): 186.0	GROUND ELEVATION (FT): 5795.66	PROJECT NUMBER: SITEWIDE	LOG OF BORING NUMBER:
NORTH: 747926	AREA: SITEWIDE	CASING DIAMETER (IN):	GEOLOGIST: F.G.	40591
EAST: 2093876	LOCATOR NUMBER: U7	BOREHOLE DIAMETER (IN): 10.0/3.75	DATE DRILLED: 11/27/91	

REMARKS: ASI Geologist; Fred Grigsby, Laurie Hast. EBASCO Rig Geologist; R.T. Canon. Borehole filled with bentonite grout and abandoned on 12/10/91.

CHEMICAL SAMPLE DEPTH
GEOTECHNICAL SAMPLE
SAMPLE NUMBER
SAMPLE GRAIN SIZE (0% 50% 100%)
PERCENT RECOVERY (0% 100%)
RECOVERY/INTERVAL
DATUM (FT)
DEPTH (FT)
WELL OR PIEZOMETER CONSTRUCTION
LITHOLOGY
UNIFIED SOILS CLASSIFICATION OR ROCK TYPE
DESCRIPTION



SILTY CLAYSTONE: Interbedded Silty Claystone and Clayey Siltstone with some Sand. Light olive gray (5 Y 6/1) to olive gray (5 Y 4/1). Distinct calcareous zone. Thinly laminated (<1 mm.), small scale cross lamination (ripples?). Trace carbonaceous material.
+/-22% sand, +/-30% silt, +/-48% clay.

CLAYEY SANDSTONE: Interbedded Clayey Sandstone and Silty Claystone (Pred. Clayey Sandstone). Light olive gray (5 Y 6/1) to olive black (5 Y 2/1). Sand v.f.g., mod. to well sorted, sub-rounded to sub-angular. Laminations as above. Abundt. carbonaceous material in last 0.2' of interval.
26% sand, 30% silt, 44% clay.

CLAYEY SANDSTONE: Clayey Sandstone with some Silt. Light olive gray (5 Y 6/1). Sand v.f.g. to f.g., mod. sorted, sub-angular. Faint laminations visible. Near horiz., more angled laminations from center to bottom (bedding angle 10 to 20 degrees). Trace to some carbonaceous material in bedding laminations. Visual porosity low, 10-30%. Becomes more carbonaceous from center to bottom. Faint possible cross bedding at approx. 30 degrees.
74% sand, +/-6% silt, +/-20% clay.

45

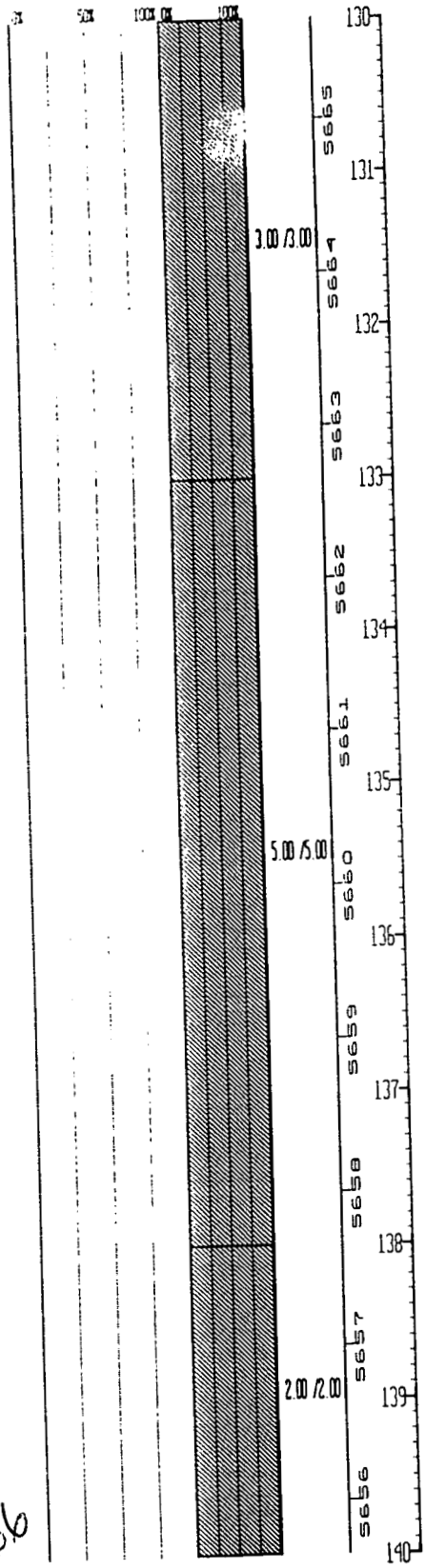
STATE PLANE COORDINATE:	TOTAL DEPTH (FT) 186.0	GROUND ELEVATION (FT): 5795.66	PROJECT NUMBER: SITEWIDE	LOG OF BORING NUMBER:
NORTH: 747926	AREA: SITEWIDE	CASING DIAMETER (IN):	GEOLOGIST: F.G.	40591
EAST: 2093876	LOCATOR NUMBER: 07	BOREHOLE DIAMETER (IN): 10.0/3.75	DATE DRILLED: 11/27/91	

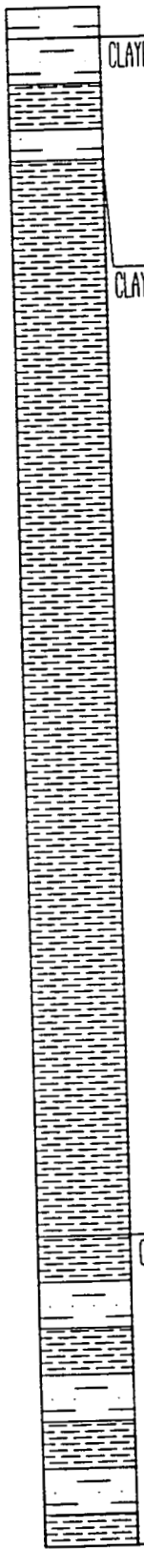
REMARKS: [illegible] Geologist: Fred Grigsby, Laurie Host. EBASCO Rig Geologist: R.T. Canon. Borehole filled with bentonite grout and abandoned on [illegible]10/91.

CONTRACT SAMPLE / GEOTECHNICAL SAMPLE DEPTH

SAMPLE NUMBER

SAMPLE GRAIN SIZE | PERCENT RECOVERY | RECOVERY/INTERVAL | DATUM (FT) | DEPTH (FT) | WELL OR PIEZOMETER CONSTRUCTION | LITHOLOGY | UNIFIED SOILS CLASSIFICATION OR ROCK TYPE | DESCRIPTION





CLAYEY SANDSTONE: Interbedded Clayey Sandstone and Claystone w[illegible]ne Silt. Sandstones light olive gray (5 Y 6/1), abunc[illegible]lay, v.f.g. to f.g., mod. sorted, sub-angular. Claystor[illegible] olive gray (5 Y 4/1) to olive black (5 Y 2/1), thinly to thickly laminated (<1 mm. to 20 mm.). Sandstone layer at top of interval has small scale cross laminations.
35% sand, 20% silt, 45% clay.

CLAYSTONE: Claystone with abundt. Silt (at bottom) and some Sand. Olive gray (5 Y 4/1) to olive black (5 Y 2/1). Mod. friable, well indurated. Some thin laminated bedding visible near top of interval (approx. 131.2'), and at (approx. 136.2'). Rest of interval appears to be massively bedded. Trace to some carbonaceous material. Interval becomes silty toward bottom (last 2' approx.). Thin layer of clayey sand (approx. 0.5 in.) thick. Sand v.f.g., mod. sorted. Other area of thin laminated bedding appears to have thin layers of silt. Entire in[illegible]val damp.
+/-12% sand, +/-26% silt, +/-62% clay.

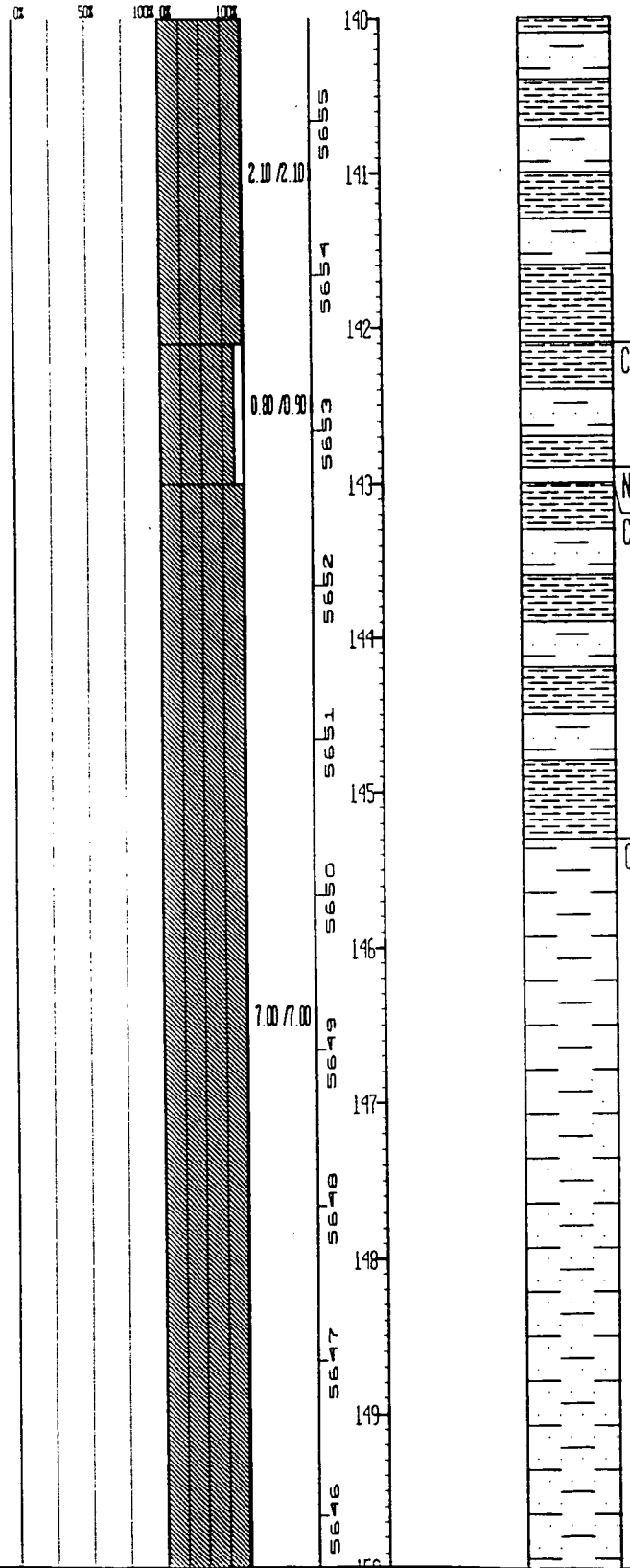
CLAYSTONE: Interbedded [illegible]ystone and Clayey Sandstone wi[illegible] Silt. Claystone olive gray (5 Y 4/1) to olive black [illegible]1). Silt content varies from trace in some laminat[illegible] to some in others. Sandstone intervals same as interval from 127.0' to 130.2', except no carbonaceous material noted. Thinly (<1mm.) to thickly laminated, near horiz. Mod. friable.
30% sand, 10% silt, 60% clay.

66

STATE PLANE COORDINATE:	TOTAL DEPTH (FT): 186.0	GROUND ELEVATION (FT): 5795.66	PROJECT NUMBER: SITEWIDE	LOG OF BORING NUMBER:
NORTH: 747926	AREA: SITEWIDE	CASING DIAMETER (IN):	GEOLOGIST: F.G.	40591
EAST: 2093876	LOCATOR NUMBER: U7	BOREHOLE DIAMETER (IN): 10.0/3.75	DATE DRILLED: 11/27/91	

REMARKS: ASI Geologist; Fred Grigsby, Laurie Hoist. EBASCO Rig Geologist; R.T. Canon. Borehole filled with bentonite grout and abandoned on 12/10/91.

CHEMICAL SAMPLE DEPTH
GEOTECHNICAL SAMPLE DEPTH
SAMPLE NUMBER
SAMPLE GRAIN SIZE
PERCENT RECOVERY
RECOVERY/INTERVAL
DATUM (FT)
DEPTH (FT)
WELL OR PIEZOMETER CONSTRUCTION
LITHOLOGY
UNIFIED SOILS CLASSIFICATION OR ROCK TYPE
DESCRIPTION



CLAYSTONE:	Same as above (reference interval 142.0' to 142.9'). Trace iron staining at very top of interval.
NO SAMPLE:	No recovery.
CLAYSTONE:	Interbedded Claystone with some Silt and Clayey Sandstone. Claystone ranges from trace silt to silty. Majority of interval Claystone. Claystones olive gray (5 Y 4/1) to olive black (5 Y 2/1), slightly to mod. friable. Sandstone light olive gray (5 Y 6/1), friable to mod. friable, bedding thinly laminated, v.f.g. to f.g., sub-angular to sub-rounded. +/-30% sand, +/-10% silt, +/-60% clay.
CLAYEY SANDSTONE:	Clayey Sandstone with abundt. Silt. Light olive gray (5 Y 6/1) to olive gray (5 Y 4/1). Well indurated, slightly friable. Bedding appears massive in first 0.5', then shows laminations that are soft sediment deformed. Some silt nodules. Angled bedding visible from approx. 149.3' to 150.5'. More soft sediment deformation and silt nodules. In last 1.5' sand grades to silt. Sand v.f.g., angular to sub-rounded, poorly sorted. Bedding angle approx. 55 degrees at approx. 149.3'. 41% sand, 29% silt, 30% clay.

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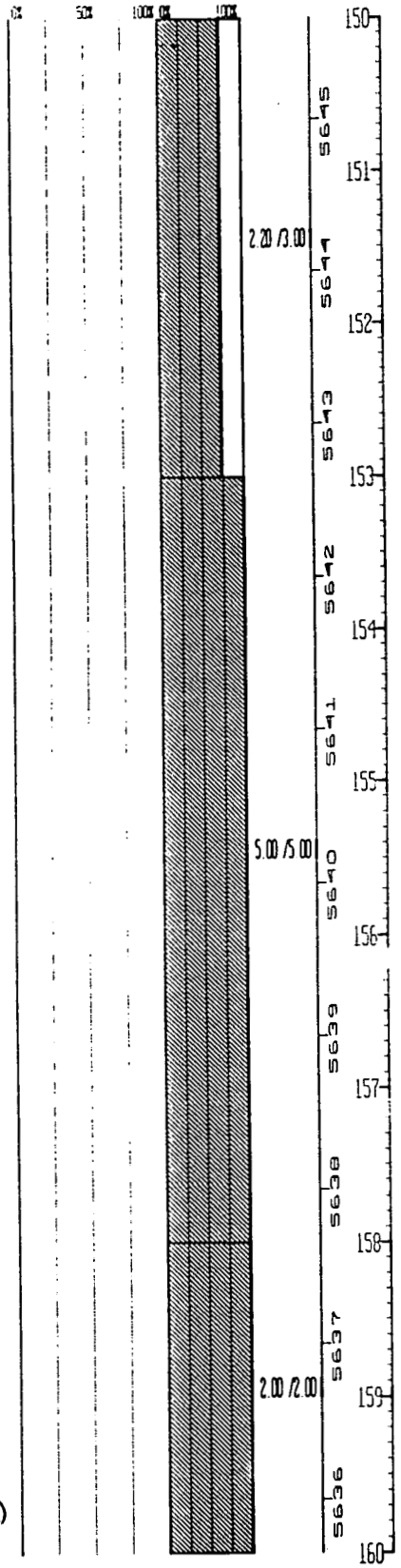
STATE PLANE COORDINATE:		TOTAL DEPTH (FT): 186.0	GROUND ELEVATION (FT):	5795.66	PROJECT NUMBER:	SITEWIDE	LOG OF BORING NUMBER:
NORTH:	747926	AREA: SITEWIDE	CASING DIAMETER (IN):		GEOLOGIST:	F.G.	40591
EAST:	2993876	LOCATOR NUMBER: U7	BOREHOLE DIAMETER (IN):	10.0/3.75	DATE DRILLED:	11/27/91	

REMARKS: ASI Geologist: Fred Grigsby, Laurie Hast. EBASCO Rig Geologist: R.T. Canon. Borehole filled with bentonite grout and abandoned on 12/10/91.

CHEMICAL SAMPLE DEPTH
GEOTECHNICAL SAMPLE DEPTH
SAMPLE NUMBER



LITHOLOGY | UNIFIED SOILS CLASSIFICATION OR ROCK TYPE | DESCRIPTION

NO SAMPLE: No recovery.

SILTY CLAYSTONE: Silty Claystone with trace Sand. Olive gray (5 Y 4/1) to olive black (5 Y 2/1). Visual porosity low, <5%. Slightly friable, well indurated. Bedding irreg. Some areas of very thinly laminated (<1 mm.), slanted to approx. 40 degrees. May be soft sediment deformation and/or rip-up clasts. Some areas less silty, more Claystone than Silty Claystone. Trace carbonaceous material in very thin (<1mm.) coal seams. Trace to some sand in first 0.8' of interval. Fractures mostly drilling induced. One high angle fracture, very smooth surface (may be slickensides), some near bottom, approx. 30 degrees. Fracture angle 70 degrees.
Trace v.f.g. sand, +/-40% silt, +/-60% clay.

/SILTY CLAYSTONE: Silty Claystone with trace Sand. Olive black . /1). Bedding appears massive though some irreg./distu bedding (soft sediment deformations) can be seen. Numero: rac-tures both open and healed. Fracture at approx. 156.2' has slickensides. Healed fracture at 160.3' (approx.). Slabbed approx. 161.3' to 161.7'. Slab shows micro fractures, trace carbonaceous material. Irreg. siltier zone lighter in color, very pale orange (10 YR 8/2). Trace v.f.g. sand. Fracture angles 50 degrees and 45 degrees. Healed fracture 60 degrees.
+/-5% v.f.g. sand, +/-20% silt, +/-75% clay.

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STATE PLANE COORDINATE:	TOTAL DEPTH (FT): 186.0	GROUND ELEVATION (FT): 5795.66	PROJECT NUMBER: SITEWIDE	LOG OF BORING NUMBER:
NORTH: 747926	AREA: SITEWIDE	CASING DIAMETER (IN):	GEOLOGIST: F.G.	40591
EAST: 2093876	LOCATOR NUMBER: U7	BOREHOLE DIAMETER (IN): 10.0/3.75	DATE DRILLED: 11/27/91	

REMARKS: ASI Geologist; Fred Grigsby, Laurie Hast. EBASCO Rig Geologist; R.T. Canon. Borehole Filled with bentonite grout and abandoned on 12/10/91.

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY / INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
		0% 50% 100%	0% 100%	3.00 /3.00	5635 5634 5633	160 161 162				
				7.00 /7.00	5632 5631 5630 5629 5628 5627 5626	163 164 165 166 167 168 169 170			SILTY CLAYSTONE	Silty Claystone with trace Sand. Olive black (5 Y 2/1). Some areas contain some silt, to silty. Bedding not evident, may be massive. Interval mod. friable to friable, more damp than previous. "Sticky" consistency in some zones. Trace to some carbonaceous material. Thin coal zone at approx 166.0'-166.4'. Core becomes slightly less friable below approx. 164.5' (with exception of lignite coal zone). Numerous fractures below 166.4'. Some showing slickensides. Slickensides oblique (not vertical) on some faces. Angle approx. 30 degrees from vertical. Very thin (<0.5 mm.) laminations (irreg. of v.f.g. sand and silt in last 0.5' of interval). Fracture angles at 30 degrees, 40 degrees and 50 degrees. +/-5% sand, +/-20% silt, 75-80% clay.

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STATE PLANE COORDINATE:	TOTAL DEPTH (FT) 186.0	GROUND ELEVATION (FT): 5795.66	PROJECT NUMBER: SITEWIDE	LOG OF BORING NUMBER:
NORTH: 747926	AREA: SITEWIDE	CASING DIAMETER (IN):	GEOLOGIST: F G.	40591
EAST: 2093876	LOCATOR NUMBER: U7	BOREHOLE DIAMETER (IN): 10.0/3.75	DATE DRILLED: 11/27/91	

REMARKS: ASI Geologist; Fred Grigsby, Laurie Hast. EBASCO Rig Geologist; R.T. Canon. Borehole filled with bentonite grout and abandoned on 12/10/91.

DIAGRAM OF SAMPLE DEPTH
GEOTECHNICAL SAMPLE DEPTH
SAMPLE NUMBER

SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
0% 50%	100% 0% 100%	2.50 /3.00	5625 5624 5623 5622 5621 5620 5619 5618 5617 5616	170 171 172 173 174 175 176 177 178 179 180			CLAYSTONE:	Claystone. Olive black (5 Y 2/1) with some olive gray (5 Y 4/1). Dense, mod. indurated. Slightly friable, slightly damp. Varies from mod. laminated to well laminated. (Slightly Silty Claystone with Claystone) - some intervals bioturbated. Laminae dip from approx. 10 degrees to 25 degrees. Fractures from approx. 173.5' to 174.6' with oblique slickensides at 45 degrees off of vertical. Fractures at 70 degrees, 35 degrees and 45 degrees. Similar fractures (35 to 45 degrees) at approx. 176.6' to 177.3'. Fracture planes for 35 degree and 45 degree sets approx. offset by 45 degrees. Possible breccia at approx. 177.0' No apparent slickensides on lower fracture set. Some carbon. >90% clay.
		7.00 /7.00					CLAYSTONE:	Claystone. Olive black (5 Y 2/1). Extensively fractured with some breccia. Pred. fracture angle 45 degrees. >95% clay.
							CLAYSTONE:	Claystone. Breccia - olive black (5 Y 2/1), characterized by randomly oriented Claystone fragments and clasts in clay matrix. Micro fractures found using microscope. Some intact core fractured at 45 degrees. Interval extensively broken. Slightly damp, friable to mod. friable, some carbon. >95% clay. NOTE: 0.5' extra core recovery 173.0' to 182.5'.

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STATE PLANE COORDINATE:	TOTAL DEPTH (FT): 186.0	GROUND ELEVATION (FT): 5795.66	PROJECT NUMBER: SITEWIDE	LOG OF BORING NUMBER:
NORTH: 747926	AREA: SITEWIDE	CASING DIAMETER (IN):	GEOLOGIST: F.G.	40591
EAST: 2093876	LOCATOR NUMBER: U7	BOREHOLE DIAMETER (IN): 10.0/3.75	DATE DRILLED: 11/27/91	

REMARKS: ASI Geologist: Fred Grigsby, Laurie Hoot. EBASCO Rig Geologist: R.T. Canon. Borehole filled with bentonite grout and abandoned on 12/10/91.

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE (0% 50% 100%)	PERCENT RECOVERY (0% 100%)	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
				3.00 /2.50	5615, 5614	180, 181, 182				
				3.50 /3.50	5613, 5612, 5611, 5610	183, 184, 185, 186			CLAYSTONE:	Claystone. Olive black (5 Y 2/1). Consists of both dense Claystone and damp, sticky intervals that appear brecciated. Fractures present in competent Claystone with oblique slickensides (30 degrees off vertical). Fracture at 45 degrees and approx. 30 degrees. Indications of fracture planes offset by approx. 45 degrees. Solid Claystone mod. indurated. Slightly friable, some carbon. >95% clay.
					5609, 5608, 5607, 5606	187, 188, 189				Total Drilled Depth = 186.0'.

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STATE PLANE COORDINATE:		TOTAL DEPTH (FT) 223.3	GROUND ELEVATION (FT):	5647.92	PROJECT NUMBER:	SITEWIDE	LOG OF BORING NUMBER:
NORTH:	745086	AREA: SITEWIDE	CASING DIAMETER (IN):		GEOLOGIST:	F.G.	40891
EAST:	2093927	LOCATOR NUMBER: U5	BOREHOLE DIAMETER (IN):	10.0/3.75	DATE DRILLED:	10/25/91	

REMARKS: Hollow Stem Auger, rotary drill ASI Geologist: Fred Grigsby; EBASCO Geologist: R.T. Conon. Borehole filled with bentonite grout and abandoned on 11/01/91.

SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY INTERVAL	ELEVATION (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
			2.00 /2.00	5647	1			SM:	Silty Sand with some Gravel and trace Clay. Brownish gray (5 YR 4/1) and dusky brown (5 YR 2/2). Gravel pred. consists of two large pebbles (1.5 in. and 2.0 in.) and smaller pebbles in top 6 in. Pred. quartzite, sub-angular. Sand poorly graded, quartz, feldspar, some quartzite. Mod. root development to bottom of interval. Med. plasticity, non-calcareous. 65% sand, >18% silt, and <2% clay.
B-00004LB				5646	2			CL:	Silty Clay with abundt. Sand. Mod. yellowish brown (10 YR 5/4) with very pale orange (10 YR 8/2) calcareous (caliche) zones, med. plasticity. Sand poorly graded, f.g., pred. with trace of feldspar, grains sub-angular to angular, mod. weathered. 27% sand, 29% silt, 44% clay
B-00004TLB				5645	3			GW:	Sandy Gravel with trace Silt and Sand. Matrix grayish orange (10 YR 7/4). Gravel well graded, pred. lithology quartzite with some granite pebbles, size from 0.25 in. to 2.0+ in. Sub-rounded to sub-angular. Sand well graded; coarser fraction quartzite and quartz with some feldspar, pred. sub-angular; finer fraction pred. quartz, trace feldspar and mica, sub-angular to sub-rounded. Non-calcareous. Interval appears very permeable. Sieved entire sample, 0.5 in. claystone at bottom of interval 51% gravel, 43% sand, +/-4% silt, +/-2% clay.
			2.50 /4.00	5644	4				
				5643	5			NO SAMPLE	Top of Bedrock at 3.9'. No Recovery
B-00004RLB				5642	6			CLAYEY SANDSTONE	Clayey Sandstone with some Silt. Grayish orange (10 YR 7/4) with yellowish gray (5 Y 7/2) and some dark yellowish orange (10 YR 6/6) mottling (some Fe staining). Sand v.f.g., sub-angular, approx. 95% quartz, some dark mineralization. Trace mica, friable. Visual estimated porosity approx. 15%. No apparent bedding or fracturing. 46% sand, 22% silt, 32% clay.
				5641	7				
			4.60 /4.00	5640	8			CLAYSTONE:	Claystone. Mod. yellowish brown (10 YR 5/4) with pale yellowish brown (10 YR 6/2) and very pale orange (10 YR 8/2). Pale orange zones calcareous. Silty interval. >95% clay.
B-00005DLB				5639	9			SANDY CLAYSTONE:	Sandy Claystone with some Silt. Very pale orange (10 YR 6/6) grading to dark yellowish orange (10 YR 6/6) at bottom of interval. Some mod. yellowish brown (10 YR 5/4) mottling. Calcareous from 8.9' to 9.3'. Interval more sandy in top 0.2'. Interbedded claystone at approx. 9.5' to 9.7'. Most of interval friable (damp). Some laminations, no apparent bedding. Some drilling fracturing (horiz.). 31% sand, 17% silt, 52% clay.
B-00005ELB									
B-00004RLB				38					

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STATE PLANE COORDINATE:	TOTAL DEPTH (FT): 223.3	GROUND ELEVATION (FT):	5647.92	PROJECT NUMBER:	SITEWIDE	LOG OF BORING NUMBER:
NORTH: 745086	AREA: SITEWIDE	CASING DIAMETER (IN):		GEOLOGIST:	F.G.	40891
EAST: 2093927	LOCATOR NUMBER: U5	BOREHOLE DIAMETER (IN):	10.0/3.75	DATE DRILLED:	10/25/91	

REMARKS: Hollow Stem Auger, rotary drill. ASI Geologist: Fred Grigsby; EBASCO Geologist: R.T. Canon. Borehole filled with bentonite grout and abandoned on 11/01/91.

CHEMICAL SAMPLE / GEOTECHNICAL SAMPLE	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
		0% 50% 100%	0% 100%			10			CLAYSTONE:	Claystone. Dark yellowish orange (10 YR 6/6) and pale yellowish brown (10 YR 6/2), mottled. Clay dense, mod. indurated but mod. friable when damp. >95% clay.
				1.20 /2.00	5637	11			SANDY CLAYSTONE:	Sandy Claystone with some Silt. Intermixed (not interbedded) with clay clasts. Color varies from dark yellowish orange (10 YR 6/6) to pale yellowish brown (10 YR 6/2) and mod. yellowish brown (10 YR 5/4), with some med. gray (N5) clay clasts. Sandy claystone same as 8.6' to 10.6' interval. 31% sand, 17% silt, 52% clay.
					5636	12			CLAYSTONE:	Claystone. Same as above (reference interval from 10.6' to 11.0') >95% clay.
					5635	13			CLAYEY SILTSTONE:	Clayey Siltstone with some Sand. Grayish orange (10 YR 7/4) with dark yellowish orange (10 YR 6/6) and pale yellowish brown (10 YR 6/2) mottling. Subtlely stratified. Sand is v.f.g., sub-rounded to sub-angular quartz, trace amount mica, friable. 10% sand, 60% silt, 30% clay.
	B0001528			2.70 /2.60						
	B0001538				5634	14				
					5633	15			CLAYSTONE:	Claystone with some Silt. Very pale orange (10 YR 8/2) to pale yellowish brown (10 YR 6/2), mod. yellowish brown (10 YR 5/4) zones (Fe oxide stained). Mod. friable. 25% silt, 80% clay.
					5632	16			CLAYSTONE:	Claystone with some Silt. Dark yellowish brown (10 YR 4/2), pale yellowish brown (10 YR 6/2) to grayish orange (10 YR 7/4) and very pale orange (10 YR 8/2). Extensively broken. Clay clasts. Some sandy intervals. Bottom 0.2' of interval intact core. Indurated dense. 20% silt, 80% clay.
				4.00 /5.40	5631	17			SILTY CLAYSTONE:	Silty Claystone with some Sand. Overall, same as above (reference interval from 13.1' to 14.6'). Sand to 10-15%, v.f.g., sub-angular quartz, well sorted. 11% sand, 25% silt, 64% clay.
					5630	18				
					5629	19				
					5628	20				

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STATE PLANE COORDINATE:	TOTAL DEPTH (FT): 223.3	GROUND ELEVATION (FT): 5547.92	PROJECT NUMBER: SITEWIDE	LOG OF BORING NUMBER:
NORTH: 7-5086	AREA: SITEWIDE	CASING DIAMETER (IN):	GEOLOGIST: F.G.	40891
EAST: 2093927	LOCATOR NUMBER: U5	BOREHOLE DIAMETER (IN): 10.0/3.75	DATE DRILLED: 10/25/91	

REMARKS: Hollow Stem Auger, rotary drill ASI Geologist: Fred Grigsby; EBASCO Geologist: R.T. Canon. Borehole filledwith bentonite grout and abandoned on 11/01/91.

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
						20			CLAYSTONE:	Claystone. Olive gray (5 Y 4/1) with some dusky yellow (5 Y 6/4). Dense, mod. indurated, slightly friable when damp. Fresh break mottled with dark yellowish orange (10 YR 6/6) and med. gray (N5). >90% clay.
					5627	21				
				0.00/3.00					NO SAMPLE:	No Recovery.
					5626	22				
					5625	23			CLAYSTONE:	Claystone. Same as above (reference interval from 20.2' to 20.6'). Numerous mineralized, healed fractures with some trace of obscured slickensides. Fracture angle approx. 30 degrees.
					5624	24				
					5623	25			SILTY CLAYSTONE:	Silty Claystone with trace Sand. Med. gray (N5), yellowish gray (5 Y 8/1) with grayish orange (10 YR 7/4) laminations. Entire interval cross-laminated. Soft sediment deformation, laminations dip at approx. 10 degrees. Several healed fractures. Lower part of interval gray claystone. Core mod. friable. Fracture angles approx. 30 degrees and approx. 60 degrees. Trace of sand, +/-40% silt, +/-60% clay.
					5622	26				
				4.60/7.00						
					5621	27			CLAYSTONE:	Claystone. Dusky yellowish brown (10 YR 2/2) with some light olive gray (5 Y 6/1) mottling; (slightly silty lenses) and dark yellowish orange (10 YR 6/6) coating and staining (Fe oxide). Trace to mod. abundt. carbon, core extensively broken. Evidence of healed fractures, mod. indurated, mod. friable when fresh (damp). >90% clay.
					5620	28				
					5619	29			NO SAMPLE:	No Recovery.
					18					

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STATE PLANE COORDINATE:	TOTAL DEPTH (FT): 223.3	GROUND ELEVATION (FT): 5647.92	PROJECT NUMBER: SITEWIDE	LOG OF BORING NUMBER:
NORTH: 745086	AREA: SITEWIDE	CASING DIAMETER (IN):	GEOLOGIST: F G.	40891
EAST: 2093927	LOCATOR NUMBER: U5	BOREHOLE DIAMETER (IN): 10.0/3.75	DATE DRILLED: 10/25/91	

REMARKS: Hollow Stem Auger, rotary drill. ASI Geologist: Fred Grigsby; EBASCO Geologist: R.T. Canon. Borehole filled with bentonite grout and abandoned on 11/01/91.

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE (0% 50% 100%)	PERCENT RECOVERY (0% 100%)	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
				0.00 /0.60		30				
					5617	31				
				3.10 /2.40	5616	32				
					5615	33				
					5614	34				
					5613	35				
					5612	36				
				7.00 /7.00						
					5611	37				
					5610	38				
					5609	39				
					5608	40			CLAYSTONE:	Claystone. Dusky yellowish brown (10 YR 2/2) with a trace of pale yellowish brown (10 YR 6/2) mottling. Abundt. carbon throughout. Lignite seam at approx. 41.2'. Some indications of healed fracture (angle undetermined) on fracture with slickensides at approx. 39.4'. Fracture angle approx. 45 degrees. Core varies from sticky when damp to mod. wet. Indurated and slightly friable (fresh). Some dessication cracks forming along possible laminar planes approx. horiz.) Interval (lithology) appears generally consistent throughout, with some minor, slightly silty intervals, and variations in amounts of carbon. >95% clay.

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STATE PLANE COORDINATE:	TOTAL DEPTH (FT) 223 3	GROUND ELEVATION (FT): 5547 92	PROJECT NUMBER: SITEWIDE	LOG OF BORING NUMBER:
NORTH: 74-5086	AREA: SITEWIDE	CASING DIAMETER (IN):	GEOLOGIST F G.	40891
EAST: 2093927	LOCATOR NUMBER: 05	BOREHOLE DIAMETER (IN): 10 9/3.75	DATE DRILLED: 10/25/91	

REMARKS: Hollow Stem Auger, rotary drill ASI Geologist Fred Grigsby; EBASCO Geologist: R T Canon. Borehole filled with bentonite grout and abandoned on 11/01/91.

CHEMICAL SAMPLE DEPTH
GEOTECHNICAL SAMPLE
SAMPLE NUMBER

SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
		3.00 /3.00	5607	40			CLAYSTONE:	Claystone with some Silt Olive gray (5 Y 4/1) and light olive gray (5 Y 6/1) slightly friable. +/-20% silt, +/-80% clay.
			5606	41			CLAYSTONE:	Claystone with some Silt, olive gray (5 Y 4/1) with some yellowish gray (5 Y 8/1) and med. dark gray (N4) mottling. Trace to mod. abundt. carbon. Core varies from sticky to mod. well indurated and mod. friable >90% clay.
			5605	42				
			5604	43				
			5603	44			SILTY CLAYSTONE:	Silty Claystone with some Sand. Med. dark gray (N4) with light gray (N7) sandy lenses or interbedded silty sandstone. Varies from mod friable to friable Sand is v f g., well sorted, sub-angular quartz Trace dark minerals and mica, some laminar structure with some cross laminations. Some disseminated carbons, becomes more clayey at bottom with some clay clasts. 11% sand, 29% silt, 60% clay.
			5602	45				
		7.00 /7.00	5601	46			CLAYSTONE:	Claystone. Some slightly silty intervals and interbedded claystone with some silt Olive gray (5 Y 4/1) to olive black (5 Y 2/1) with some light olive gray (5 Y 6/1) silty zones. Core surface texture varies from smooth to crinkly. Carbon generally mod. abundt. Some laminations and indicated soft sediment deformation. Core mod. indurated, slightly friable to mod. friable in silty intervals. No defined bedding, no apparent fractures. 90% to 95% clay
			5600	47				
			5599	48				
			5598	49				

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STATE PLANE COORDINATE:	TOTAL DEPTH (FT): 223.3	GROUND ELEVATION (FT): 5647.92	PROJECT NUMBER: SITEWIDE	LOG OF BORING NUMBER:
NORTH: 745086	AREA: SITEWIDE	CASING DIAMETER (IN):	GEOLOGIST: F.G.	40891
EAST: 2093927	LOCATOR NUMBER: U5	BOREHOLE DIAMETER (IN): 10.0/3.75	DATE DRILLED: 10/25/91	

REMARKS: Hollow Stem Auger, rotary drill. ASI Geologist: Fred Grigsby; EBASCO Geologist: R.T. Canon. Borehole filled with bentonite grout and abandoned on 11/01/91.

CHEMICAL SAMPLE DEPTH
GEOTECHNICAL SAMPLE DEPTH
SAMPLE NUMBER

SAMPLE GRAIN SIZE: 0% 50% 100%
PERCENT RECOVERY: 0% 100%
RECOVERY/INTERVAL: 3.00 /3.00; 7.00 /7.00
DATUM (FT): 5597, 5596, 5595, 5594, 5593, 5592, 5591, 5590, 5589, 5588
DEPTH (FT): 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60
WELL OR PIEZOMETER CONSTRUCTION
LITHOLOGY

UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
CLAYSTONE:	Claystone. Brownish black (5 YR 2/1), carbonaceous, with some yellowish gray (5 Y 8/1) siltstone lenses (isolated). Mod. indurated and mod. friable, becomes laminar at bottom of interval. >90% clay.
CLAYSTONE:	Claystone with some Silt. Slightly silty to approx. 15% silt. Pred. olive gray (5 Y 4/1) with light olive gray (5 Y 6/1) mottling, laminations, and silty lenses. Mod. abundt. carbon, core surface texture varies from smooth to crinkly. Laminar structure common with soft sediment deformation. Some interbedding silty claystones with massive, non-laminar structure. Lower 2.0' of interval contains fractures with slickensides (approx. 55 degrees), also some drilling induced fracturing. Lower 2.0' of interval pred. claystone, no silt. Entire interval mod. indurated, slightly friable when damp. No apparent bedding planes. >90% clay.

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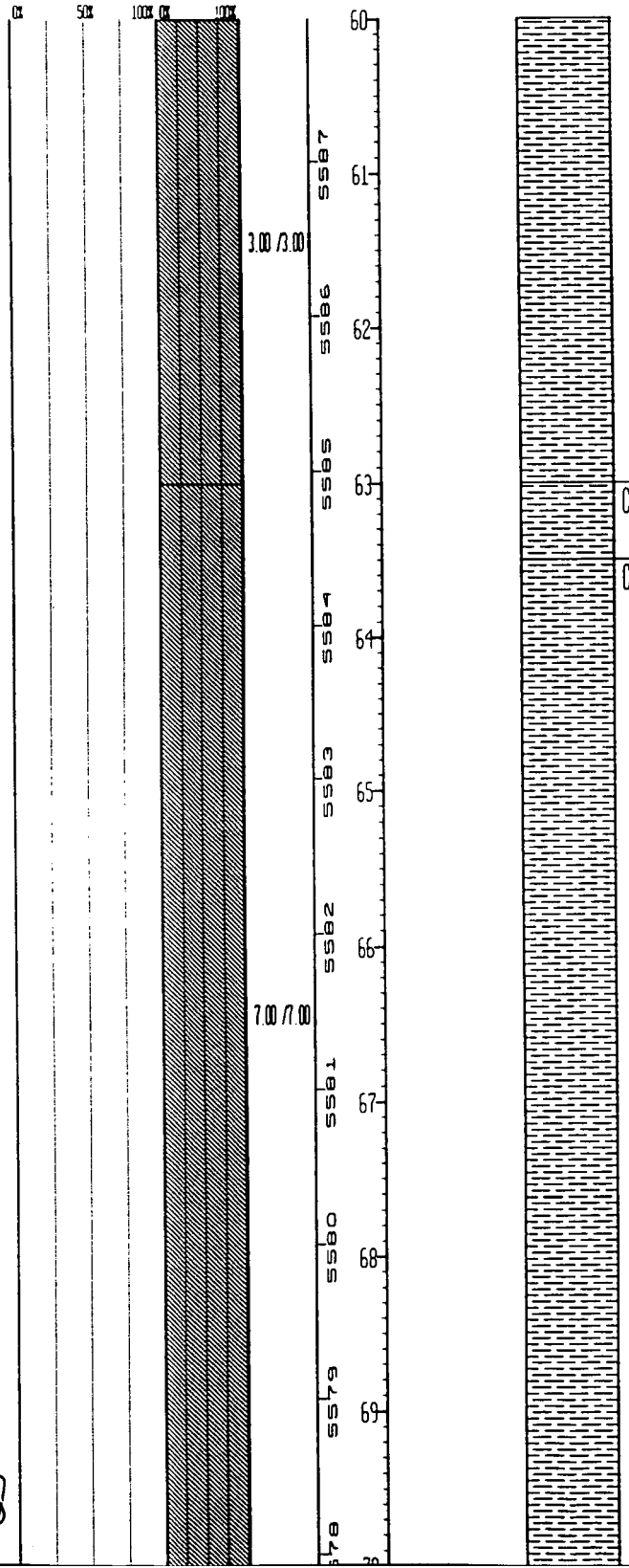
STATE PLANE COORDINATE:	TOTAL DEPTH (FT): 223.3	GROUND ELEVATION (FT): 5647.92	PROJECT NUMBER: SITEWIDE	LOG OF BORING NUMBER:
NORTH: 745086	AREA: SITEWIDE	CASING DIAMETER (IN):	GEOLOGIST: F.G.	40891
EAST: 2093927	LOCATOR NUMBER: U5	BOREHOLE DIAMETER (IN): 10.0/3.75	DATE DRILLED: 10/25/91	

REMARKS: Hollow Stem Auger, rotary drill. ASI Geologist: Fred Grigsby; EBASCO Geologist: R.T. Canon. Borehole filled with bentonite grout and abandoned on 11/01/91.

CHEMICAL SAMPLE DEPTH
GEOTECHNICAL SAMPLE DEPTH
SAMPLE NUMBER
SAMPLE GRAIN SIZE
PERCENT RECOVERY
RECOVERY/INTERVAL
DATUM (FT)
DEPTH (FT)
WELL OR PIEZOMETER CONSTRUCTION
LITHOLOGY
UNIFIED SOILS CLASSIFICATION OR ROCK TYPE
DESCRIPTION



UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
CLAYSTONE:	Claystone. Brownish black (5 YR 2/1), carbonaceous. >90% clay.
CLAYSTONE:	Claystone. Some slightly silty intervals, pred. dusky yellowish brown (10 YR 2/2) grading to olive gray (5 Y 4/1) in lower 2.0' of interval. Some light olive gray (5 Y 6/1) silty or siltstone lenses (sporadic). Core mod. indurated throughout, varies from sticky (damp) to mod. friable in slightly silty intervals. Dessication cracks forming as core dries. Carbon varies from trace to mod. abundt. Fractures not apparent in upper half of interval, some fractures (healed) at approx. 60 degrees in lower half (below approx. 71.0'). No apparent bedding. >95% clay.

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STATE PLANE COORDINATE:	TOTAL DEPTH (FT): 223.3	GROUND ELEVATION (FT): 5647.92	PROJECT NUMBER: SITEWIDE	LOG OF BORING NUMBER:
NORTH: 745086	AREA: SITEWIDE	CASING DIAMETER (IN):	GEOLOGIST: F.G.	40891
EAST: 2093927	LOCATOR NUMBER: U5	BOREHOLE DIAMETER (IN): 10.0/3.75	DATE DRILLED: 10/25/91	

REMARKS: Hollow Stem Auger, rotary drill. ASI Geologist: Fred Grigsby; EBASCO Geologist: R.T. Canon. Borehole filled with bentonite grout and abandoned on 11/01/91.

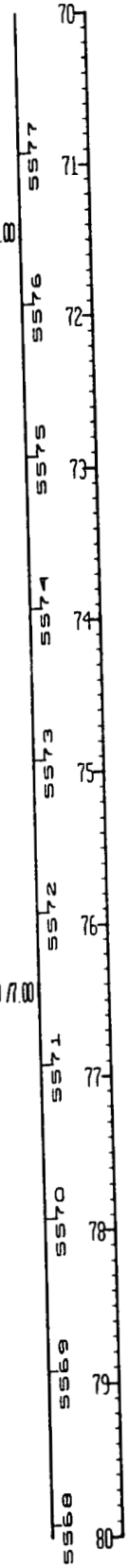
CHEMICAL SAMPLE DEPTH
GEOTECHNICAL SAMPLE DEPTH
SAMPLE NUMBER

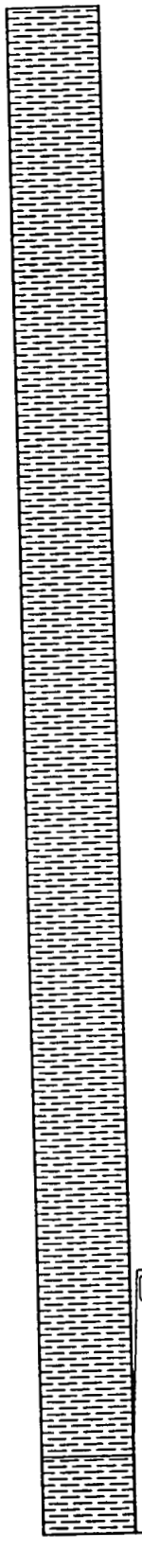
SAMPLE GRAIN SIZE | PERCENT RECOVERY | RECOVERY/INTERVAL | DATUM (FT) | DEPTH (FT) | WELL OR PIEZOMETER CONSTRUCTION | LITHOLOGY | UNIFIED SOILS CLASSIFICATION OR ROCK TYPE | DESCRIPTION

0% 50% 100% 100%

3.00 /3.00

7.00 /7.00





CLAYSTONE: Claystone with some Silt. Med. gray (N5) with light gray (N7) grading to olive gray in lower claystone at bottom of interval. Core mod. well indurated to mod. friable, core surface varies from smooth to crinkly. Some laminar structure and soft sediment deformation at bottom of interval. Fractures drilling induced with possible healed fracture at bottom of core (60 degrees).
+/-20% silt, +/-80% clay.

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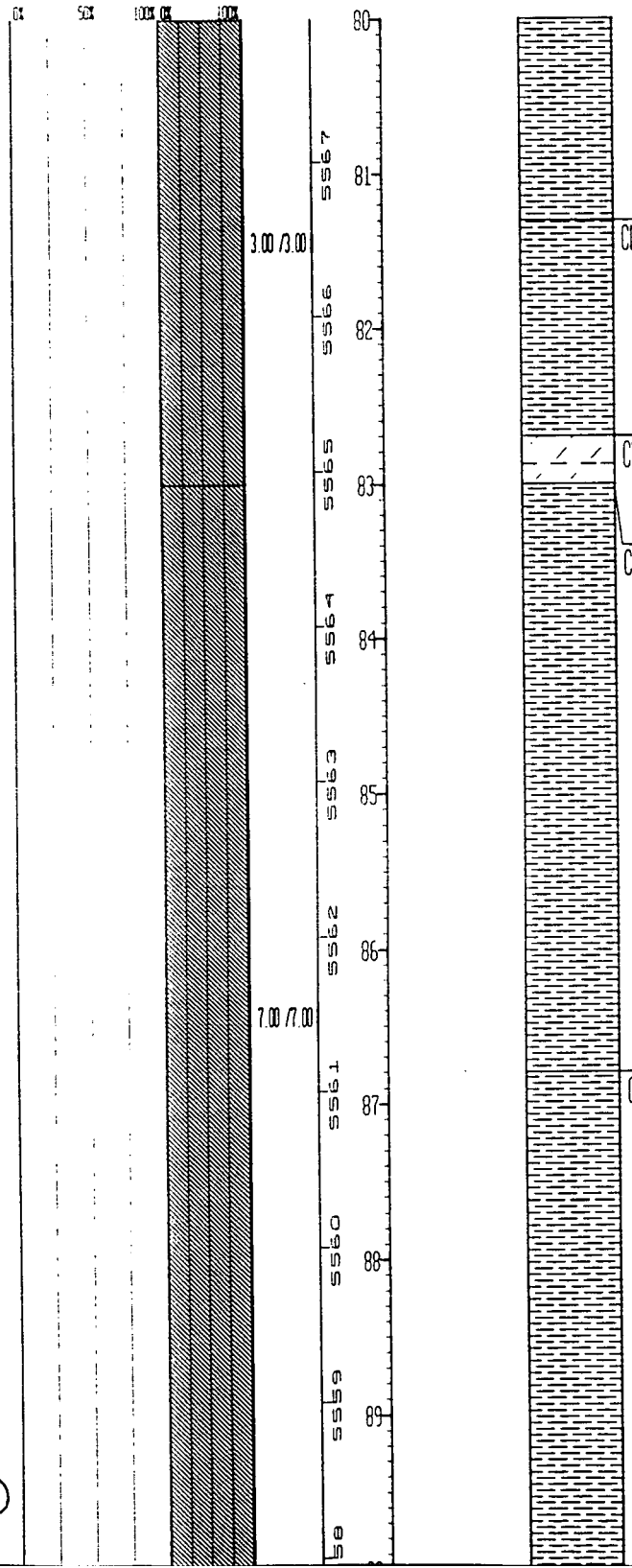
STATE PLANE COORDINATE:	TOTAL DEPTH (FT): 223.3	GROUND ELEVATION (FT): 5647.92	PROJECT NUMBER: SITEWIDE	LOG OF BORING NUMBER:
NORTH: 7-5086	AREA: SITEWIDE	CASING DIAMETER (IN):	GEOLOGIST: F G	40891
EAST: 2093927	LOCATOR NUMBER: U5	BOREHOLE DIAMETER (IN): 10 0/3.75	DATE DRILLED: 10/25/91	

REMARKS: Hollow Stem Auger, rotary drill. AGI Geologist: Fred Grigsby; EBASCO Geologist: R T. Canon. Borehole filled with bentonite grout and abandoned on 11/01/91.

CHEMICAL SAMPLE DEPTH
GEOTECHNICAL SAMPLE DEPTH
SAMPLE NUMBER
SAMPLE GRAIN SIZE
PERCENT RECOVERY
RECOVERY/INTERVAL
DATUM (FT)
DEPTH (FT)
WELL OR PIEZOMETER CONSTRUCTION
LITHOLOGY
UNIFIED SOILS CLASSIFICATION OR ROCK TYPE
DESCRIPTION



CLAYSTONE:	Claystone. Same as above except less silt and more laminar structure. >90% clay.
CLAYEY SILTSTONE:	Clayey Siltstone. Light gray (N7) with some med. dark gray (N5). Well cemented, non-friable. +/-60% silt, +/-40% clay.
CLAYSTONE:	Claystone. Olive black (5 Y 2/1) and brownish black (5 YR 2/1) with some traces of yellowish gray (5 Y 8/1) mottling. Some abundt. carbonaceous intervals. Some carbon throughout interval. Possible laminar structure in some intervals. Core surface texture ranges from smooth (all claystone) to crinkly (laminations ?). Core broken during drilling and logging. No positive identification of fractures. Core dense, mod. indurated, damp, slightly friable (when fresh). No apparent bedding. >95% clay.
CLAYSTONE:	Claystone with some Silt and trace of Sand. Varies from brownish gray (5 YR 4/1), to brownish black (5 YR 2/1) to olive gray (5 Y 4/1), with light olive gray (5 Y 6/1) silty lenses, laminations and mottling. Overall crinkly surface texture. Laminations common, soft sediment deformation. Mod. abundt. carbon. No apparent bedding. Core mod. indurated, slightly friable when fresh (slightly damp). Trace of sand, +/-15% silt, +/-85% clay.

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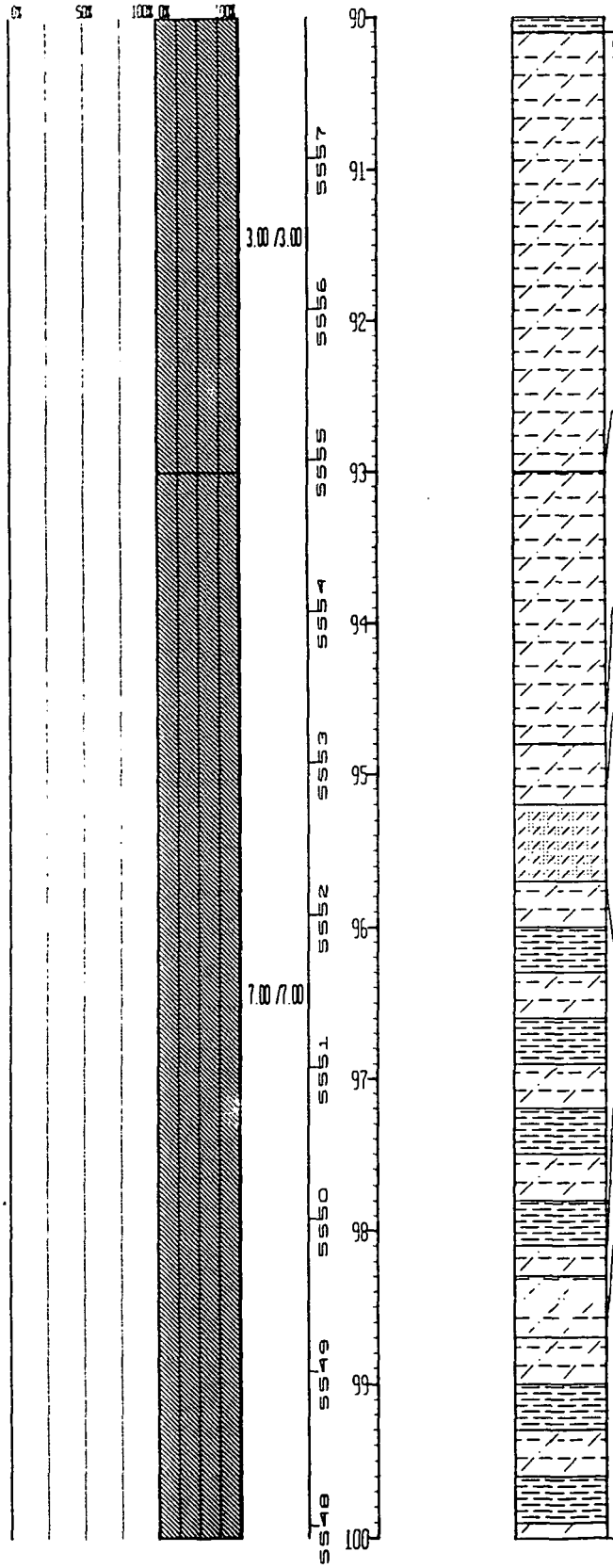
STATE PLANE COORDINATE:	TOTAL DEPTH (FT): 223.3	GROUND ELEVATION (FT): 5647.92	PROJECT NUMBER: SITEWIDE	LOG OF BORING NUMBER:
NORTH: 745086	AREA: SITEWIDE	CASING DIAMETER (IN):	GEOLOGIST: F G	40891
EAST: 2093927	LOCATOR NUMBER: U5	BOREHOLE DIAMETER (IN): 10.0/3.75	DATE DRILLED: 10/25/91	

REMARKS: Hollow Stem Auger, rotary drill. ASI Geologist: Fred Grigsby; EBASCO Geologist: R.T. Canon. Borehole filled with bentonite grout and abandoned on 11/01/91.

CHEMICAL SAMPLE
GEOTECHNICAL SAMPLE
DEPTH
SAMPLE NUMBER

SAMPLE GRAIN SIZE | PERCENT RECOVERY | RECOVERY/INTERVAL | DATUM (FT) | DEPTH (FT) | WELL OR PIEZOMETER CONSTRUCTION | LITHOLOGY | UNIFIED SOILS CLASSIFICATION OR ROCK TYPE | DESCRIPTION



SILTY CLAYSTONE: Silty Claystone. Med. dark gray (N4). Pred. claystones with interbedded or laminar light olive gray (5 Y 6/1) silty claystone. Both thicker interbedded units and thin laminations. Interval extensively broken in lower half. Some indications of breccia. Overall core mod. indurated and cemented. Mod. friable in more silty intervals, slightly friable in more clayey beds. No apparent well defined bedding planes. Some to mod. abundt. carbon.
>30% silt, <70% clay.

SILTY CLAYSTONE: Silty Claystone. Same as above except well developed ripple marked cross laminations in upper part of core, with well defined contact with claystone grading downward to pred. claystone at bottom of interval. Some to mod. abundt. carbon.
>30% silt, <70% clay.

SILTY CLAYSTONE: Silty Claystone. Very similar to above except for siltstone. Some to mod. abundt. carbon.
50% silt, 50% clay.

SANDY SILTSTONE: Sandy Siltstone with some Clay. Clay cemented, light olive gray (5 Y 6/1) with some olive gray (5 Y 4/1) clay laminations (not well defined). No apparent bedding planes. Core mod. friable, visible porosity to approx. 20% in sandier portion of interval. Sand v.f.g., sub-angular quartz, trace of mica. Some to mod. abundt. carbon.
38% sand, 42% silt, 20% clay.

SILTY CLAYSTONE: Silty Claystone. Light olive gray (5 Y 6/1) with some interbedded med. dark gray (N4) claystone laminations and beds. Some ripple mark cross laminations. Core mod. indurated, mod. to slightly friable. Some to mod. carbon.
>20% silt, <80% clay.

CLAYEY SILTSTONE: Clayey Siltstone. Light olive gray (5 Y 6/1) wi[illegible] some med. dark gray (N4) clayey intervals. Well cemented, [illegible] friable. Some to mod. abundt. carbon.
>50% silt, <50% clay.

SILTY CLAYSTONE: Silty Claystone. Light olive gray (5 Y 6/1) to oli[illegible] gray (5 Y 4/1). Varies from very silty to slightly silty. Some well developed ripple mark cross laminations. Interbedded claystone at 103.0' to 103.2'. Most lithology variations gradational. Overall core mod. indurated, siltier intervals well cemented. Core damp, mod. to slightly friable. No apparent bedding or identifiable fracturing. Trace to mod. abundt. carbon throughout.
<=40% silt, >=60% clay.

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STATE PLANE COORDINATE:	TOTAL DEPTH (FT): 223.3	GROUND ELEVATION (FT): 5647.92	PROJECT NUMBER: SITEWIDE	LOG OF BORING NUMBER:
NORTH: 745086	AREA: SITEWIDE	CASING DIAMETER (IN):	GEOLOGIST: F.G.	40891
EAST: 2093927	LOCATOR NUMBER: U5	BOREHOLE DIAMETER (IN): 10.0/3.75	DATE DRILLED: 10/25/91	

REMARKS: Hollow Stem Auger, rotary drill. ASI Geologist: Fred Grigsby; EBASCO Geologist: R.T. Canon. Borehole filled with bentonite grout and abandoned on 11/01/91.

CHEMICAL SAMPLE DEPTH
GEOTECHNICAL SAMPLE DEPTH
SAMPLE NUMBER

SAMPLE GRAIN SIZE: 0% 50% 100%

PERCENT RECOVERY: 0% 100%

RECOVERY/INTERVAL: 3.00/3.00; 7.00/7.00

DATUM (FT): 5547, 5546, 5545, 5544, 5543, 5542, 5541, 5540, 5539, 5538

DEPTH (FT): 100, 101, 102, 103, 104, 105, 106, 107, 108, 109

WELL OR PIEZOMETER CONSTRUCTION

LITHOLOGY

UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
CLAYSTONE:	Claystone. Pred. olive gray (5 Y 4/1) with some light olive gray (5 Y 6/1) lenses and as mottling. Clay varies in consistency from sticky and pliable to mod. indurated and slightly friable. Lower 2/3 of core extensively broken. Assumed to be drilling induced. Some silty lenses (sparse), some poorly developed laminar structure. No apparent bedding. Some to mod. abundt. carbon. >90% clay.
SILTY CLAYSTONE:	Silty Claystone. Olive gray (5 Y 4/1) to light olive gray (5 Y 6/1). Percent Silt content varies. Some interbedded claystone beds. Healed 45 degree fracture at approx. 110.8'. Interval mod. indurated, slightly friable (when fresh). All lithological changes gradational. Trace carbon, no apparent bedding. Some poorly developed or defined laminar structure. Core surface texture crinkly appearance. +/-15% silt, +/-85% clay.

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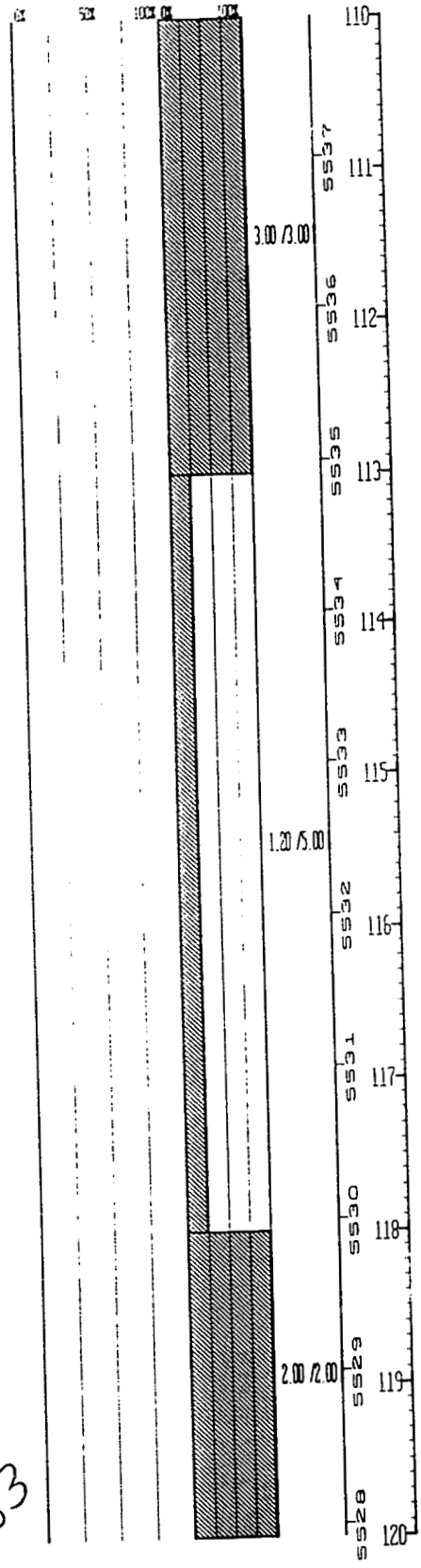
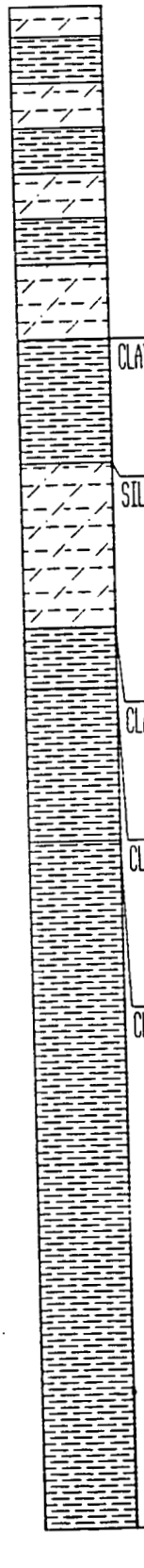
STATE PLANE COORDINATE:	TOTAL DEPTH (FT): 223.3	GROUND ELEVATION (FT): 5647.92	PROJECT NUMBER: SITEWIDE	LOG OF BORING NUMBER:	
NORTH: 745086	AREA: SITEWIDE	CASING DIAMETER (IN):	GEOLOGIST: F.G.	40891	
EAST: 2093927	LOCATOR NUMBER: U5	BOREHOLE DIAMETER (IN): 10.0/3.75	DATE DRILLED: 10/25/91		

REMARKS: Hollow Stem Auger, rotary drill. AGI Geologist: Fred Grigsby; EBASCO Geologist: R.T. Canon. Borehole filled with bentonite grout and abandoned on 11/01/91.

GEOTECHNICAL SAMPLE DEPTH | SAMPLE NUMBER | SAMPLE GRAIN SIZE | PERCENT RECOVERY | RECOVERY INTERVAL | DATUM (FT) | DEPTH (FT) | WELL OR PIEZOMETER CONSTRUCTION | LITHOLOGY | UNIFIED SOILS CLASSIFICATION OR ROCK TYPE | DESCRIPTION





CLAYSTONE: Claystone with some Silt. Olive gray (5 Y 4/1), massive, no apparent bedding. No apparent fractures. Dense, indurated, slightly friable.
>90% clay.

SILTY CLAYSTONE: Silty Claystone with some Sand (matrix) with claystone clasts. Olive gray (5 Y 4/1) with some dark yellowish orange (10 YR 6/6) and olive gray claystone clasts. Recovered as moist granular unconsol. material with claystone clasts. Sand pred. quartz, v f.g., sub-angular, some dark minerals (<5%).
12% sand, 35% silt, 53% clay.

CLAYSTONE: Claystone with some Silt. Same as above except more consol. and little or no sand. Damp to moist. Overall silt content questionable.
>85% clay.

CLAYSTONE: Claystone with some Silt. Light olive gray (5 Y 6/1) with some olive gray (5 Y 4/1) as claystone lenses or laminae. Generally massive, indurated. Most of interval extensively broken.
+/-20% silt, +/-80% clay.

CLAYSTONE: Claystone. Olive gray (5 Y 4/1) to c[illegible]ck (5 Y 2/1) with sparse light olive gray (5 Y 6/1, [illegible]nd as mottling. Varies from sticky and pliable [illegible]ell indurated and slightly friable (when fresh) [illegible] interval damp. Trace to some carbon. Massive, no bc[illegible] or laminations. Possible fracture with slickensides [illegible]o of interval (approx. 30 degrees).
>95% [illegible]
NOTE: 1.7' extra core recovery 118.0' to 123.0'.

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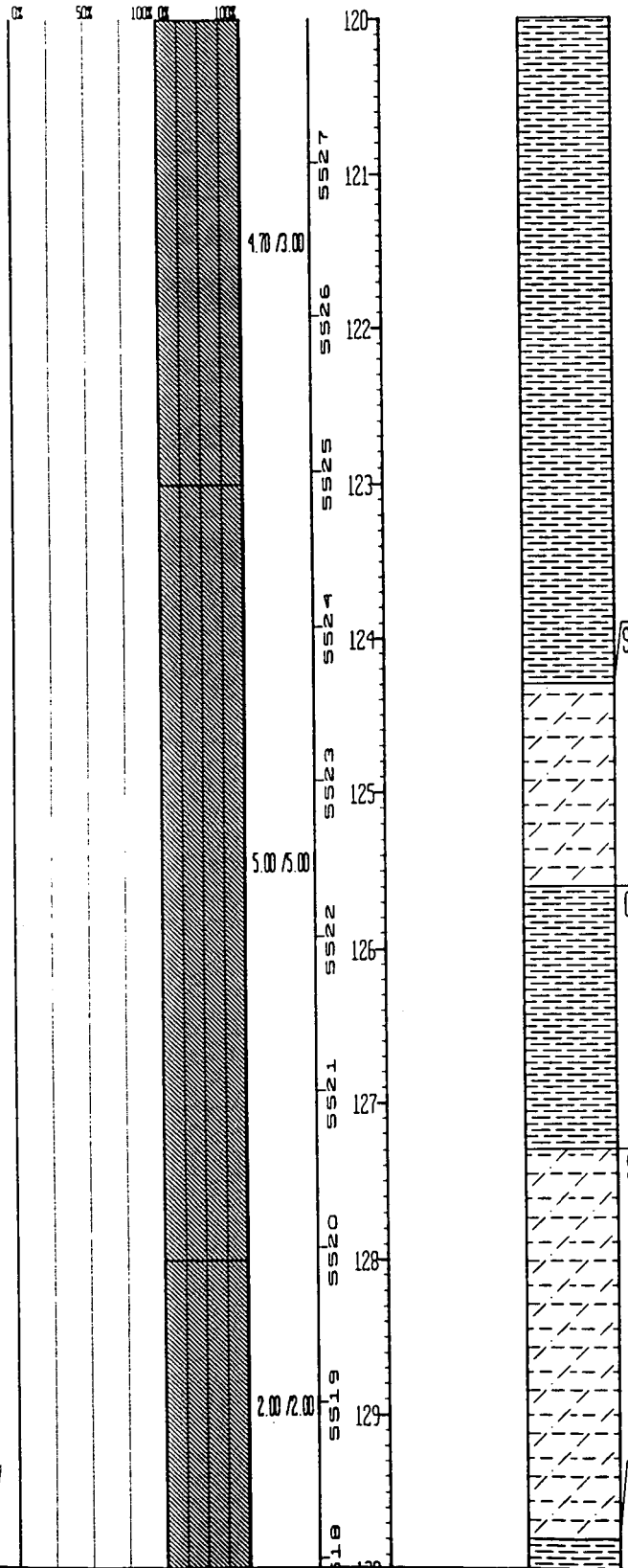
STATE PLANE COORDINATE:	TOTAL DEPTH (FT): 223.3	GROUND ELEVATION (FT): 5647.92	PROJECT NUMBER: SITEWIDE	LOG OF BORING NUMBER:
NORTH: 745086	AREA: SITEWIDE	CASING DIAMETER (IN):	GEOLOGIST: F.G.	40891
EAST: 2093927	LOCATOR NUMBER: U5	BOREHOLE DIAMETER (IN): 10.0/3.75	DATE DRILLED: 10/25/91	

REMARKS: Hollow Stem Auger, rotary drill. ASI Geologist: Fred Grigsby; EBASCO Geologist: R.T. Canon. Borehole filled with bentonite grout and abandoned on 11/01/91.

CHEMICAL SAMPLE DEPTH
GEOTECHNICAL SAMPLE DEPTH
SAMPLE NUMBER

SAMPLE GRAIN SIZE | PERCENT RECOVERY | RECOVERY/INTERVAL | DATUM (FT) | DEPTH (FT) | WELL OR PIEZOMETER CONSTRUCTION | LITHOLOGY | UNIFIED SOILS CLASSIFICATION OR ROCK TYPE | DESCRIPTION



UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
SILTY CLAYSTONE:	Silty Claystone. Olive gray (5 Y 4/1) and olive black (5 Y 2/1) with light olive gray (5 Y 6/1) lenses and mottling. Mod. abundt. carbon throughout. Indications of some possible laminar structure. Pred. horiz. orientation, no indications of fracturing. No distinct bedding. Core mod. indurated, slightly damp, slightly friable. Silt content variable throughout interval. >20% silt, +/-80% clay.
CLAYSTONE:	Claystone. Olive black (5 Y 2/1) with light olive gray (5 Y 6/1) small silty lense. Interval pred. sticky, slightly pliable, damp, mod. abundt. carbon. >95% clay.
SILTY CLAYSTONE:	Silty Claystone. Same as above (reference interval 124.3' to 125.6'). >20% silt, +/-80% clay.
CLAYSTONE:	Claystone. Same as above (reference interval 125.6' to 127.3'). >95% clay.

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STATE PLANE COORDINATE:	TOTAL DEPTH (FT): 223.3	GROUND ELEVATION (FT): 5647.92	PROJECT NUMBER: SITEWIDE	LOG OF BORING NUMBER:
NORTH: 745086	AREA: SITEWIDE	CASING DIAMETER (IN):	GEOLOGIST: F.G.	40891
EAST: 2093927	LOCATOR NUMBER: U5	BOREHOLE DIAMETER (IN): 10.0/3.75	DATE DRILLED: 10/25/91	

REMARKS: Hollow Stem Auger, rotary drill. ASI Geologist: Fred Grigsby; EBASCO Geologist: R.T. Canon. Borehole filled with bentonite grout and abandoned on 11/01/91.

CHEMICAL SAMPLE DEPTH
GEOTECHNICAL SAMPLE DEPTH
SAMPLE NUMBER

SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
0% 50%	100% 0% 100%			130			SILTY CLAYSTONE:	Silty Claystone. Same as above (reference interv .3' to 125.6'). >20% silt, +/-80% clay.
		3.70 /3.00	SS17 SS16	131 132			CLAYSTONE:	Claystone. Same as above (reference interval 125.6' to 127.3'). >95% clay.
			SS15	133			SILTY CLAYSTONE:	Silty Claystone. Same as above (reference interval 124.3' to 125.6'). >20% silt, +/-80% clay. NOTE: 0.7' extra core recovery.
			SS14	134			CLAYSTONE:	Claystone. Olive black (5 Y 2/1), very damp in upper half. Entire interval sticky and pliable. Some carbon. >95% clay.
		6.30 /5.00	SS13 SS12	135 136			SILTY CLAYSTONE:	Silty Claystone with trace Sand. Olive gray (5 Y 4/1) and olive black (5 Y 2/1) with light olive gray (5 Y 6/1) lenses and laminae. Some intervals with trace of sandstone. Interval grades from pred. massive in upper approx. 3.0' (some laminar structure) to very laminar in lower portion of core. Very well developed ripple marked laminations from 136.8' to 141.5'. Some possible sediment deformation also indicated throughout core. Core mod. indurated, slightly friable when fresh (slightly damp). Core tends to break along horiz. lamination planes. No definite fractures. No well defined bedding planes. Some to mod. abundt. carbon. Trace sand, >20% silt, +/-80% clay. NOTE: 0.25' extra core recovery.
			SS11	137				
			SS10	138				
		2.00 /2.00	SS09	139				
			SS08	140				

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STATE PLANE COORDINATE:	TOTAL DEPTH (FT): 223.3	GROUND ELEVATION (FT): 5647.92	PROJECT NUMBER: SITEWIDE	LOG OF BORING NUMBER:
NORTH: 74086	AREA: SITEWIDE	CASING DIAMETER (IN):	GEOLOGIST: F.G.	40891
EAST: 2093927	LOCATOR NUMBER: U5	BOREHOLE DIAMETER (IN): 10.0/3.75	DATE DRILLED: 10/25/91	

REMARKS: Hollow Stem Auger, rotary drill ASI Geologist: Fred Grigsby; EBASCO Geologist: R.T. Canon. Borehole filled with bentonite grout and abandoned on 11/01/91.

CHEMICAL SAMPLE DEPTH
GEOTECHNICAL SAMPLE DEPTH
SAMPLE NUMBER

SAMPLE GRAIN SIZE: GR SOIL

PERCENT RECOVERY: 100% GR 100%

RECOVERY/INTERVAL: 3.25 /3.00; 7.00 /7.00

DATUM (FT) / DEPTH (FT): 140, 141, 142, 143, 144, 145, 146, 147, 148, 149

SS07, SS06, SS05, SS04, SS03, SS02, SS01, SS00, S499, S98

WELL OR PIEZOMETER CONSTRUCTION

LITHOLOGY

UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
CLAYSTONE:	Claystone. Olive black (5 Y 2/1) to brownish black (5 YR 2/1) with some light olive gray (5 Y 6/1) mottling. Core varies from sticky and pliable (mod. damp) to mod. indurated and slightly friable (when fresh - damp). Reopened healed fractures at approx. 145.4' (60 degrees) and approx. 148.1' 45 degrees). Interval between 150.0' (from marker in box - actual interval of broken core is approx. 4.0'.) to 151.7' very broken, indications of healed fractures at approx. 45 degrees. Some slickensides at 145.4' and 148.1'. Some laminar structure (poorly developed) throughout entire interval. Core tends to break along horiz. laminae planes except in fractured intervals. Some to abundt. carbon. >90% clay. NOTE: 1.3' extra core recovery.

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STATE PLANE COORDINATE:	TOTAL DEPTH (FT): 223.3	GROUND ELEVATION (FT): 5647.92	PROJECT NUMBER: SITEWIDE	LOG OF BORING NUMBER:
NORTH: 745086	AREA: SITEWIDE	CASING DIAMETER (IN):	GEOLOGIST: F.G.	40891
EAST: 2093927	LOCATOR NUMBER: U5	BOREHOLE DIAMETER (IN): 10.0/3.75	DATE DRILLED: 10/25/91	

REMARKS: Hollow Stem Auger, rotary drill. ASI Geologist: Fred Grigsby; EBASCO Geologist: R.T. Canon. Borehole filled with bentonite grout and abandoned on 11/01/91.

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
		0% 50% 100%	0% 100%	3.00 /1.70	5497	150				
					5496	151				
					5495	152				
					5494	153				
				5.60 /6.30	5493	154				
					5492	155			CLAYEY SILTSTONE	Clayey Siltstone. Light olive gray (5 Y 6/1) with olive gray (5 Y 4/1) in fresh breaks and as mottling. Also white (N9) coating on some fresh breaks (non-calcareous). Entire interval well cemented, hard, non-friable. Carbon (some woody textured) mod. abundt. No bedding, healed fractures. Disturbed bedding. >/=55% silt, </=45% clay.
					5491	156			SILTY CLAYSTONE	Silty Claystone with trace Sand. Light olive gray (5 Y 6/1) and olive gray (5 Y 4/1) with olive black (5 Y 2/1) carbonaceous coating and laminae. Very clayey in upper 1.0' of interval, grades to laminar structure with some very silty laminae, some with sand. Indicated laminar planes of approx. 5 degrees. Some soft sediment deformation. Healed fracture at approx. 160.7', fracture angle approx. 60 degrees. Entire interval mod. indurated and mod. friable when fresh (slightly damp) Some to mod. abundt. carbon. Probably bioturbated 4.4' to 162.0'. Trace sand, >/=20% silt, </=80% clay.
					5490	157				
				2.00 /2.00	5489	158				
					5488	159				
						160				

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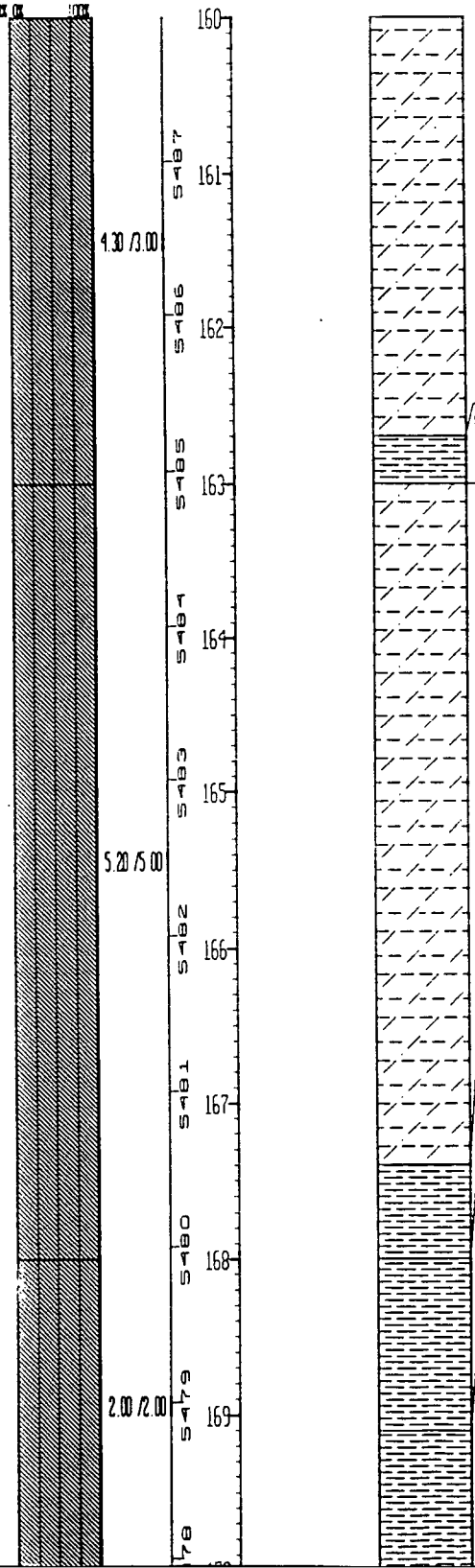
STATE PLANE COORDINATE:	TOTAL DEPTH (FT): 223.3	GROUND ELEVATION (FT): 5647.92	PROJECT NUMBER: SITEWIDE	LOG OF BORING NUMBER:
NORTH: 745086	AREA: SITEWIDE	CASING DIAMETER (IN):	GEOLOGIST: F.G.	40891
EAST: 2093927	LOCATOR NUMBER: U5	BOREHOLE DIAMETER (IN): 10.0/3.75	DATE DRILLED: 10/25/91	

REMARKS: Hollow Stem Auger, rotary drill ASI Geologist: Fred Grigsby; EBASCO Geologist: R.T. Canon. Borehole filledwith bentonite grout and abandoned on 11/01/91.

CHEMICAL SAMPLE DEPTH
GEOTECHNICAL SAMPLE D
SAMPLE NUMBER

SAMPLE GRAIN SIZE (0% – 50%) | PERCENT RECOVERY (100% 0% 100%) | RECOVERY/INTERVAL | DATUM (FT) | DEPTH (FT) | WELL OR PIEZOMETER CONSTRUCTION | LITHOLOGY



UNIFIED SOILS CLASSIFICATION OR ROCK TYPE | DESCRIPTION

CLAYSTONE: Claystone. Olive gray (5 Y 4/1). Sticky and pliable (damp). >95% clay.

SILTY CLAYSTONE: Silty Claystone with some Sand. Light olive gray (5 Y 6/1) with olive gray (5 Y 4/1) laminae and brownish black (5 YR 2/1) carbonaceous coatings and zones. Entire interval ripple marked, cross laminated, and some soft sediment deformation. Dom. laminar planes horiz. to approx. 10 degrees. Core dry, mod. to slightly friable, no fractures. Distinct contact between overlying and underlying claystones. Lower contact appears undulating. Porosity (visual) <10% (interval well cemented, mod. indurated). Some to mod. abundt. carbon. Sand v.f.g., well sorted, sub-angular quartz, trace mica and dark minerals.
11% sand, 40% silt, 49% clay.

CLAYSTONE: Claystone. Olive black (5 Y 2/1), slickensides on one break, mod. indurated, non-friable, dry.
>95% clay.

CLAYSTONE: Claystone with some Silt. Olive gray (5 Y 4/1) to olive black (5 Y 2/1). Fractured, some carbon on fracture faces, Core indurated, dry, non-friable. Fracture angles approx. 45 degrees to 90 degrees.
>90% clay.

CLAYSTONE: Claystone. Olive black (5 Y 2/1) and olive gray (5 Y 4/1). Top 3.0 in. possibly brecciated (claystone clasts in clay matrix). Core extensively broken. Some fragments with slickensides. Dessication cracks forming. Core mod. indurated, slightly damp, some sticky and pliable when damp. Non-friable. Bottom 0.2' becoming silty.
>95% clay.

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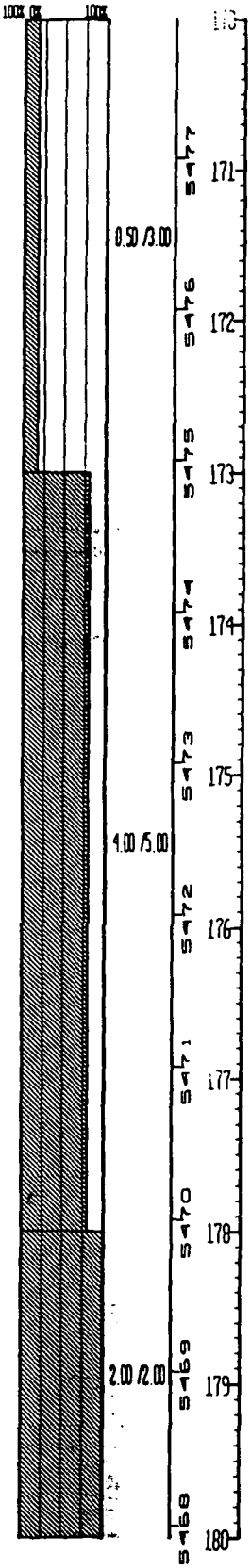
STATE PLANE COORDINATE:	TOTAL DEPTH (FT): 223.3	GROUND ELEVATION (FT): 5647.92	PROJECT NUMBER: SITEWIDE	LOG OF BORING NUMBER:
NORTH: 745086	AREA: SITEWIDE	CASING DIAMETER (IN):	GEOLOGIST: F.G.	40891
EAST: 2093927	LOCATOR NUMBER: U5	BOREHOLE DIAMETER (IN): 10.0/3.75	DATE DRILLED: 10/25/91	

REMARKS: Hollow Stem Auger, rotary drill. ASI Geologist: Fred Grigsby; EBASCO Geologist: R.T. Canon. Borehole filled with bentonite grout and abandoned on 11/01/91.

CHEMICAL SAMPLE DEPTH
GEOTECHNICAL SAMPLE DEPTH
SAMPLE NUMBER
SAMPLE GRAIN SIZE (0% 50% 100%)
PERCENT RECOVERY (0% 100%)
RECOVERY/INTERVAL
DATUM (FT)
DEPTH (FT)
WELL OR PIEZOMETER CONSTRUCTION
LITHOLOGY



UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
NO SAMPLE:	No Recovery.
CLAYSTONE:	Claystone. Olive gray (5 Y 4/1) with light olive gray (5 Y 6/1) mottling in upper 6 in. of interval and grayish orange (10 YR 7/4) dispersed stains in lower portion of core. Silt in top 6 in. of interval, becomes sticky and pliable in lower portion of interval (upper 6 in. slightly damp; lower portion damp). No apparent bedding or fractures. Some carbon. >90% clay.
SILTY CLAYSTONE:	Silty Claystone with trace to some Sand. Pred. laminar structure. Light olive gray (5 Y 6/1), olive gray (5 Y 4/1) and some olive black (5 Y 2/1) laminae. Some sandy laminae, composition (lith.) varies. Carbon varies from some to abundt. Fracture with carbonaceous material filling at approx. 176.5' (measured up from 183.0' marker in box)*. No other apparent fractures. No apparent bedding, laminar structure varies from possible ripple marks, to soft sediment deformation. Bioturbation possible in some intervals. Possible convoluted structure, entire interval mod. well indurated. Well to mod. well cemented, mod. to slightly friable, only slightly damp. Fracture angles approx. 45 degress to 50 degrees. 0-10% sand, >/=20% silt, </=80% clay. *NOTE: Lithology tops from 171.8' to 183.0' adjusted for non-recovery and extra core (2.5') recovered for that interval.

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STATE PLANE COORDINATE:	TOTAL DEPTH (FT): 223.3	GROUND ELEVATION (FT): 5647.92	PROJECT NUMBER: SITEWIDE	LOG OF BORING NUMBER:
NORTH: 745086	AREA: SITEWIDE	CASING DIAMETER (IN):	GEOLOGIST: F G.	40891
EAST: 2093927	LOCATOR NUMBER: U5	BOREHOLE DIAMETER (IN): 10.0/3.75	DATE DRILLED: 10/25/91	

REMARKS: Hollow Stem Auger, rotary drill. ASI Geologist: Fred Grigsby; EBASCO Geologist: R.T. Canon. Borehole filled with bentonite grout and abandoned on 11/01/91.

CHEMICAL SAMPLE DEPTH
GEOTECHNICAL SAMPLE DEPTH
SAMPLE NUMBER

SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
0% 50%	100% 0% 100%			180				
			5467	181				
		5.50 /3.00						
			5466	182				
			5465	183			CLAYSTONE:	Claystone. Olive gray (5 Y 4/1), sticky, pliable, appears out of place. Possibly from further up hole. >95% clay.
			5464	184			SILTY CLAYSTONE:	Silty Claystone. Same as above (reference interval 173.9' to 183.0'). >/=20% silt, </=80% clay.
			5463	185				
		5.00 /5.00						
			5462	186				
			5461	187				
			5460	188				
		2.00 /2.00	5459	189				
			5458	190				

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STATE PLANE COORDINATE:	TOTAL DEPTH (FT): 223.3	GROUND ELEVATION (FT): 5647.92	PROJECT NUMBER: SITEWIDE	LOG OF BORING NUMBER:
NORTH: 7-5086	AREA: SITEWIDE	CASING DIAMETER (IN):	GEOLOGIST: F.G.	40891
EAST: 2093927	LOCATOR NUMBER: U5	BOREHOLE DIAMETER (IN): 10.0/3.75	DATE DRILLED: 10/25/91	

REMARKS: Hollow Stem Auger, rotary drill. ASI Geologist: Fred Grigsby; EBASCO Geologist: R.T. Canon. Borehole filled with bentonite grout and abandoned on 11/01/91.

CHEMICAL SAMPLE NO.
GEOTECHNICAL SAMPLE NO.
SAMPLE NUMBER

SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
0% 50%	100% 0% 100%	3.00 /3.00	190 191 192 193 194 195 196 197 198 199 200			SILTY CLAYSTONE	Silty Claystone with some Sand. Light olive gray (5 Y 6/1) with some olive gray (5 Y 4/1) mottling. Well to mod. well cemented, mod. friable, interval generally massive with gradational contact with overlying and underlying lithologic units. Visual porosity <10%, sand v.f.g., well sorted, sub-angular quartz. Trace of carbon. +/-19% sand, +/-24% silt, +/-57% clay.
						SILTY CLAYSTONE	Silty Claystone. Light olive gray (5 Y 6/1) with olive gray (5 Y 4/1) clayey laminations. Generally same as above (reference interval form 193.2' to 193.4') with only trace of sand. >/=20% silt, </=80% clay.
		6.80 /7.00				SILTY CLAYSTONE	Silty Claystone with some Sand. Same as above (reference interval 192.3' to 193.4') except sandier and more friable. Visual porosity approx. 20%. Gradational contact with overlying and underlying lithology units. Trace of carbon. +/-23% sand, +/-31% silt, +/- 46% clay
						SILTY CLAYSTONE	Silty Claystone. Light olive gray (5 Y 6/1) with olive gray (5 Y 4/1) laminae. Gradational contact with overlying sediments. Becomes laminar, well cemented, dry, slightly friable. Soft sediment deformation prevalent. Trace grayish orange (10 YR 7/4) mottling in lower 0.5' of interval. Surfaces of core become clay coated and sticky when wet. Trace of carbon, some with woody texture. >/=20% silt, </=80% clay.
						CLAYEY SILTSTONE	Clayey Siltstone. Very calcareous. Med. gray (N5) with some olive gray (5 Y 4/1) laminae, and some very light gray (N8) mottling. Well cemented (calcareous), hard, non-friable, well defined contacts between overlying and underlying sediments. (Based on lithology and calcareous cement). Both contacts undulating. No apparent fracture, bedding flat(?). >55% silt, <45% clay.

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STATE PLANE COORDINATE:	TOTAL DEPTH (FT) 223.3	GROUND ELEVATION (FT): 5647.92	PROJECT NUMBER: SITEWIDE	LOG OF BORING NUMBER:
NORTH: 7-5086	AREA: SITEWIDE	CASING DIAMETER (IN):	GEOLOGIST: F.G.	40891
EAST: 2093927	LOCATOR NUMBER: 05	BOREHOLE DIAMETER (IN): 10.0/3.75	DATE DRILLED: 10/25/91	

REMARKS: Hollow Stem Auger, rotary drill. ASI Geologist: Fred Grigsby; EBASCO Geologist: R.T. Canon. Borehole filled with bentonite grout and abandoned on 11/01/91.

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE (0% 50%)	PERCENT RECOVERY (100% 0% 100%)	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
						200				
					5447	201			SILTY CLAYSTONE	Silty Claystone. Light olive gray (5 Y 6/1) with olive gray (5Y 4/1) laminae. Laminar structure indicating soft sediment deformation. Interval dry, mod. indurated, slightly friable. No fractures, no apparent bedding, core tends to break along laminae planes (flat). Some carbon, some slightly sandy laminae. >/=20% silt, </=80% clay.
					5446	202				
					5445	203				
				8.00 /8.00	5444	204			SANDY CLAYSTONE	Sandy Claystone with some to abundt. Silt. Interbedded lithologic unit. Gradational contact with overlying and underlying sediments. Light olive gray (5 Y 6/1) with some olive gray (5 Y 4/1) laminae. Well cemented, mod. friable, dry. Sand v.f.g., well sorted, sub-angular quartz. 30% sand, >25% silt, <45% clay.
					5443	205			SANDY CLAYSTONE	Sandy Claystone with abundt. Silt. Same as above (reference interval 203.7' to 204.3') except becomes more laminar with depth. Breaks along laminae common, pred. horiz. Sand v.f.g., well sorted, sub-angular quartz, with trace of dark minerals. Some carbon throughout with occassional mod. abundt. amounts. Core well cemented, dry and mod. friable. No apparent bedding. No apparent fractures except healed fractures at 212.0' to 212.5'. Soft sediment deformation apparent in places. Fractures angle 60 degrees. 31% sand, 28% silt, 41% clay.
					5442	206				
					5441	207				
					5440	208				
				2.00 /2.00	5439	209				
					38					

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STATE PLANE COORDINATE:	TOTAL DEPTH (FT): 223.3	GROUND ELEVATION (FT): 5647.92	PROJECT NUMBER: SITEWIDE	LOG OF BORING NUMBER:
NORTH: 745086	AREA: SITEWIDE	CASING DIAMETER (IN):	GEOLOGIST: F.G.	40891
EAST: 2093927	LOCATOR NUMBER: U5	BOREHOLE DIAMETER (IN): 10.0/3.75	DATE DRILLED: 10/25/91	

REMARKS: Hollow Stem Auger, rotary drill. ASI Geologist: Fred Grigsby; EBASCO Geologist: R.T. Canon. Borehole filled with bentonite grout and abandoned on 11/01/91.

CHEMICAL SAMPLE DEPTH
GEOTECHNICAL SAMPLE DEPTH
SAMPLE NUMBER

SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
0% 50%	100% 0% 100%	2.50 /3.00	5437 5436 5435 5434 5433 5432 5431 5430 5429 5428	210 211 212 213 214 215 216 217 218 219 220				
							NO SAMPLE:	No Recovery.
		7.00 /7.00					SILTY CLAYSTONE:	Silty Claystone. Olive black (5 Y 2/1) and olive gray (5 Y 4/1) with some light olive gray (5 Y 6/1) laminae and mottling. Silt content varies considerably. Core dry, well cemented, non-friable to slightly friable, well to mod. indurated. Carbon varies from some to mod. abundt. Possible well healed fracture at approx. 216.6' (fracture angle approx. 45 degress). No other fractures apparent. Core tends to break along lamination surfaces, pred. horiz. Laminar structure pred. consists of silty claystone laminae with some silty to slightly sandy laminae. Contact with lower sediments is gradational. No apparent dom. bedding planes, some soft sediment deformation indicated. >20% silt, <80% clay.
							SILTY CLAYSTONE:	Silty Claystone with some Sand. Light olive gray (5 Y 6/1) and olive gray (5 Y 4/1) laminae. Upper approx. 1.0' of interval consists of very evenly spaced thin laminae dipping at approx. 10 degrees, underlain by more irregular laminar structure. Some possible ripple marked cross laminations and soft sediment deformation. Fractures from 220.1' to 220.8' at approx. 45 degrees. Fracture shows normal fault movment (no indication of notable displacement). Interval dry, mod. friable to friable in places, mod. well to well cemented. Sand v.f.g., well sorted, sub-angular quartz. some dark mineral grains (<10%), mox. visual porosity (sandy intervals). 24% sand, 34% silt, 42% clay.

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STATE PLANE COORDINATE:	TOTAL DEPTH (FT): 223.3	GROUND ELEVATION (FT): 5647.92	PROJECT NUMBER: SITEWIDE	LOG OF BORING NUMBER:
NORTH: 745086	AREA: SITEWIDE	CASING DIAMETER (IN):	GEOLOGIST: F.G.	40891
EAST: 2093927	LOCATOR NUMBER: U5	BOREHOLE DIAMETER (IN): 10.0/3.75	DATE DRILLED: 10/25/91	

REMARKS: Hollow Stem Auger, rotary drill ASI Geologist: Fred Grigsby; EBASCO Geologist: R.T. Canon. Borehole filled with bentonite grout and abandoned on 11/01/91.

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE (0% 50% 100%)	PERCENT RECOVERY (0% 100%)	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
				2.30/2.30	5427	221				
					5426	222				
					5425	223				
										Total Drilled Depth = 223.3'.
					5424	224				
					5423	225				
					5422	226				
					5421	227				
					5420	228				
					5419	229				
					5418	230				

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STATE PLANE COORDINATE:	TOTAL DEPTH (FT): 223.0	GROUND ELEVATION (FT): 5955.03	PROJECT NUMBER: SITEWIDE	LOG OF BORING NUMBER:
NORTH: 746761	AREA: SITEWIDE	CASING DIAMETER (IN):	GEOLOGIST: F Grigsby	41191
EAST: 2087141	LOCATOR NUMBER: 06	BOREHOLE DIAMETER (IN): 10.0/3.75	DATE DRILLED: 01/09/92	

REMARKS: Hollow Stem Auger, Rotary Core Drill. ASI Geologist F Grigsby. Borehole filled with bentonite grout and abandoned on 1/17/92.

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE	SAMPLE NUMBER	SAMPLE GRAIN SIZE (0% 50%)	PERCENT RECOVERY (100% 0% 100%)	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
	B00012SEB			1.60 /2.30	5954	1			GW:	Sandy Gravel with trace Silt and Clay. Light brown (5 YR 6/4 to 5 YR 5/6) matrix. Max. pebble size to 3 in. Pred. lithology quartzite, sub-angular, well graded. Sand well graded, pred. quartz and feldspar in coarser fraction. More feldspar and some mica in finer fraction. All sand sizes pred. sub-angular. Interval well oxidized and Fe stained (well weathered). Roots in upper 4 in. Non-calcareous, damp. 58% gravel, 39% sand, 2% silt, 1% clay.
	B00013IEB				5953	2			NO SAMPLE:	No recovery.
	[illegible]EB				5952	3			GW:	Sandy Gravel with trace Silt and Clay. Same as above (reference interval 0.0' to 1.6') with color change to pred. grayish orange (10 YR 7/2) and increase in clay content. One large 3 in. pebble. 58% gravel, 39% sand, 2% silt, 1% clay.
				1.80 /4.10	5951	4			NO SAMPLE:	No recovery.
					5950	5				
					5949	6				
					5948	7			SW:	Gravelly Sand with trace Silt and Clay. Pred. mod. yellowish brown (10 YR 5/4). Gravel pred. approx. 0.5 in. with some pebbles to plus 1 in. Pred. lithology quartzite, sub-angular. Sand well graded, sub-angular, pred. quartz with some feldspar. Interval well oxidized (well weathered), non-calcareous. Low plasticity, no prevelent Fe staining. 43% gravel, 49% sand, 5% silt, 3% clay.
	B00013SEB			1.90 /3.70	5947	8				
					5946	9			NO SAMPLE:	No recovery.
	B00013[illegible]EB									

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STATE PLANE COORDINATE:	TOTAL DEPTH (FT): 223.0	GROUND ELEVATION (FT): 5955.03	PROJECT NUMBER: SITEWIDE	LOG OF BORING NUMBER:
NORTH: 746761	AREA: SITEWIDE	CASING DIAMETER (IN):	GEOLOGIST: F Grigsby	41191
EAST: 2087141	LOCATOR NUMBER: 06	BOREHOLE DIAMETER (IN): 10.0/3.75	DATE DRILLED: 01/09/92	

REMARKS: Hollow Stem Auger, Rotary Core Drill. ASI Geologist F Grigsby. Borehole filled with bentonite grout and abandoned on 1/17/92.

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE (0% – 50% – 100%)	PERCENT RECOVERY (0% – 100%)	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
				2.00 /2.40	5944	10–11			SW:	Gravelly Sand with trace Silt and Clay. Light brown (5 YR 5/6) with some clayey intervals with very pale orange (10 YR 8/2) mottling. Gravel pred. approx. 3/8 in. with pebbles to 1.75 in., sub-angular quartzite. Sand well graded. Angular to sub-angular quartz with some feldspar and quartzite in coarser fraction and sub-angular quartz and feldspar in finer fraction. Interval well oxidized (weathered), non-calcareous, unconsol. Appears very permeable. Slightly damp. 33% gravel, 63% sand, +/-4% silt, trace clay.
					5943	12			NO SAMPLE:	No Recovery.
				1.50 /1.50	5942	13			SW:	Gravelly Sand with trace Silt and Clay. Same as above (reference interval 10.1' to 12.1') except higher percentage of gravel, and pebbles to 2.5 in. Slightly damp. 45% gravel, 51% sand, +/- 4% silt, trace clay.
	BH00135CB				5941	14				
	BH00137CB									
	BH00138CB				5940	15				
				2.90 /4.00	5936	16			SM:	Silty Sand with some clay. Light brown (5 YR 5/6) Low plasticity, friable. Sand poorly graded, pred. sub-angular quartz and felspar. Trace mica, well weathered, slightly damp. 70% sand, 20% silt, 10% clay.
	BH00136CB				5938	17			GW:	Sandy Gravel Matrix mod. brown (5 Y 4/4). Gravel well-graded with one large pebble (3.5 in.). Lithology pred. dark gray quartzite, sub-angular to angular. Interval dry, low plasticity (matrix), well weathered. >75% gravel, <25% sand.
									NO SAMPLE:	No Recovery.
				2.00 /2.00	5936	19			SW:	Gravelly Sand. Same as above (reference interval 10.1' to 12.1' and interval 12.[illegible] 2') except bottom 0.3' of interval very carbonaceous and color changes to mod. orange pink (5 YR 8/4) and very pale orange (10 YR 8/2) with black (N1) carbon. No sieve analysis.
						20				

Gb

STATE PLANE COORDINATE:	TOTAL DEPTH (FT): 223.0	GROUND ELEVATION (FT): 5955.03	PROJECT NUMBER: SITEWIDE	LOG OF BORING NUMBER:
NORTH: 746761	AREA: SITEWIDE	CASING DIAMETER (IN):	GEOLOGIST: F Grigsby	41191
EAST: 2087141	LOCATOR NUMBER: 06	BOREHOLE DIAMETER (IN): 10.0/3.75	DATE DRILLED: 01/09/92	

REMARKS: Hollow Stem Auger, Rotary Core Drill. ASI Geologist F Grigsby. Borehole filled with bentonite grout and abandoned on 1/17/92.

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY / INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
					5935	20				
	B-00013EB			1.20 /2.20	5934	21			CL:	Clay with some Sand. Pred. pale yellowish brown (10 YR 6/2) with trace dark yellowish orange (10 YR 6/6) mottling (Fe staining). Med. plasticity, dense, non-friable, slightly damp. <10% sand, >90% clay.
					5933	22			SM:	Silty Sand with some Clay. Pale yellowish brown (10 YR 6/2) sand, poorly graded, sub-angular, quartz, some feldspar. Friable, slightly damp, weathered, non-calcareous, low plasticity. 60% sand, >25% silt, <15% clay
				2.00 /1.80	5932	23			NO SAMPLE:	No Recovery.
					5931	24			SM:	Silty Sand with some Clay. Same as above (reference interval 20.9' to 21.2') but with more sand in top 0.4' of interval, and trace Fe staining and carbon in lower approx. 0.3' of interval. Non-calcareous. 70% sand, >20% silt, <10% clay.
					5930	25			SW:	Gravelly Sand with trace Silt and Clay. Same as above (reference intervals 10.1' to 12.1' and 12.5' to 15.2') with color change to pred. grayish orange (10 YR 7/4). Interval damp, well weathered, non-calcareous. >40% gravel, >50% sand, +/- 5% silt, +/- 5% clay. NOTE: Extra 0.2' of recovery from 22.2' to 24.0'.
				2.50 /3.00						
	B-00014EB				5929	26			GP:	Sandy Gravel with trace Clay and Silt. Matrix mod. brown (5 YR 4/4) to pale yellowish brown (10 YR 6/2). Percentages questionable because of size of sample. Gravel poorly graded, sub-angular quartzite with one pebble at 2.0 in.+. One hematitic concretion. Interval slightly damp, unconsol., well weathered. 60% gravel, 35% sand, +/-2% silt, +/-3% clay.
	B-00014EB				5928	27				
									NO SAMPLE:	No Recovery.
					5927	28			GW:	Sandy Gravel with trace Silt and Clay. Similar to above (reference interval 25.9' to 26.5') except gravel becomes well graded, and some clay clasts throughout interval. Also some carbonaceous material in lower part of interval. Matrix low to med. plasticity, interval well weathered. Non-calcareous, unconsol. >50% gravel, 40% sand, +/-5% silt, +/-5% clay.
				2.50 /2.80						
	B-00014GEB				5926	29				
				0.20 /0.20					NO SAMPLE:	No Recovery.

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STATE PLANE COORDINATE:		TOTAL DEPTH (FT): 223.0	GROUND ELEVATION (FT): 5955.03	PROJECT NUMBER: SITEWIDE	LOG OF BORING NUMBER:
NORTH:	7-6761	AREA: SITEWIDE	CASING DIAMETER (IN):	GEOLOGIST: F.Grigsby	41191
EAST:	2087141	LOCATOR NUMBER: 06	BOREHOLE DIAMETER (IN): 10.0/3.75	DATE DRILLED: 01/09/92	

REMARKS: Hollow Stem Auger, Rotary Core Drill ASI Geologist F. Grigsby. Borehole filled with bentonite grout and abandoned on 1/17/92.

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH / SAMPLE NUMBER / SAMPLE GRAIN SIZE (0% 50% 100%) / PERCENT RECOVERY (0% 100%) / RECOVERY/INTERVAL / DATUM (FT) / DEPTH (FT) / WELL OR PIEZOMETER CONSTRUCTION / LITHOLOGY / UNIFIED SOILS CLASSIFICATION OR ROCK TYPE / DESCRIPTION

Sample number	Recovery/Interval	Datum (ft)	Depth (ft)	Unified Soils Classification or Rock Type	Description
		5925	30	GW:	Sandy Gravel with trace Silt and Clay [illegible] as above (reference interval 27.0' to 29.5') except [illegible] large pebbles and one 2.5 in. hematite concretion. [illegible] vol unconsol., slightly damp. >50% gravel, 40% sand, +/-5% silt, +/-5% clay.
		5924	31		
	3.50 /4.30	5923	32	CLAYSTONE:	Top of Bedrock at 31.3' Claystone. Yellowish gray (5 Y 7/2) with light olive gray (5 Y 5/2) in top 0.4' of interval. Some dark yellowish orange (10 YR 6/6) mottling. Fairly sharp color change to dark yellowish orange (10 YR 6/6) to 33.2' Some Mn staining in this interval. Color change to brownish gray (5 YR 4/1) from 33.2' to 33.5'. Some carbon in this interval. Zone between orange and brownish gray Claystones consists of intermixed clasts of both. Claystone mod. well indurated, dense, non-friable. Drilling induced fractures. >95% clay.
B0001-5EB					
B0001-4EB		5922	33		
		5921	34	NO SAMPLE:	No Recovery
	1.40 /1.30	5920	35	CLAYSTONE:	Claystone. Pale yellowish brown (10 YR 6/2) with mod. abundt. dark yellowish orange (10 YR 6/6) mottling. Core extensively drilling fractured. Dense, mod. indurated, non-friable, slightly damp. Mod. abundt. carbon, with well preserved leaf in lower part of interval Bedding not apparent. >95% clay. NOTE: Extra 0.1' of core recovery 34.3' to 35.6'
		5919	36		
	4.30 /3.30	5918	37	CLAYSTONE:	Claystone Color change to pred. dusky yellowish brown (10 YR 2/2) with dark yellowish orange (10 YR 6/6) mottling. Heavily drilling fractured, tends to break along horiz. planes (bedding?). Abundt. to some carbon. Core mod. well indurated, non-friable, slightly damp. No sieve analysis.
		5917	38	CLAYSTONE:	Claystone with some Silt Dark gray (N3) with some light olive gray (5 Y 6/1) mottling Silt content varies from slightly silty to some silt. Entire interval extensively broken and drilling fractured. Claystone fragments well to mod. well indurated. Bedding and fracturing cannot be determined. Carbon varies from abundt. (lignite fragments) to some. Core varied from non-friable to mod. friable. Entire interval slightly damp. 10-15% silt, 85-90% clay.
		5916	39		
	1.10 /1.10		40		

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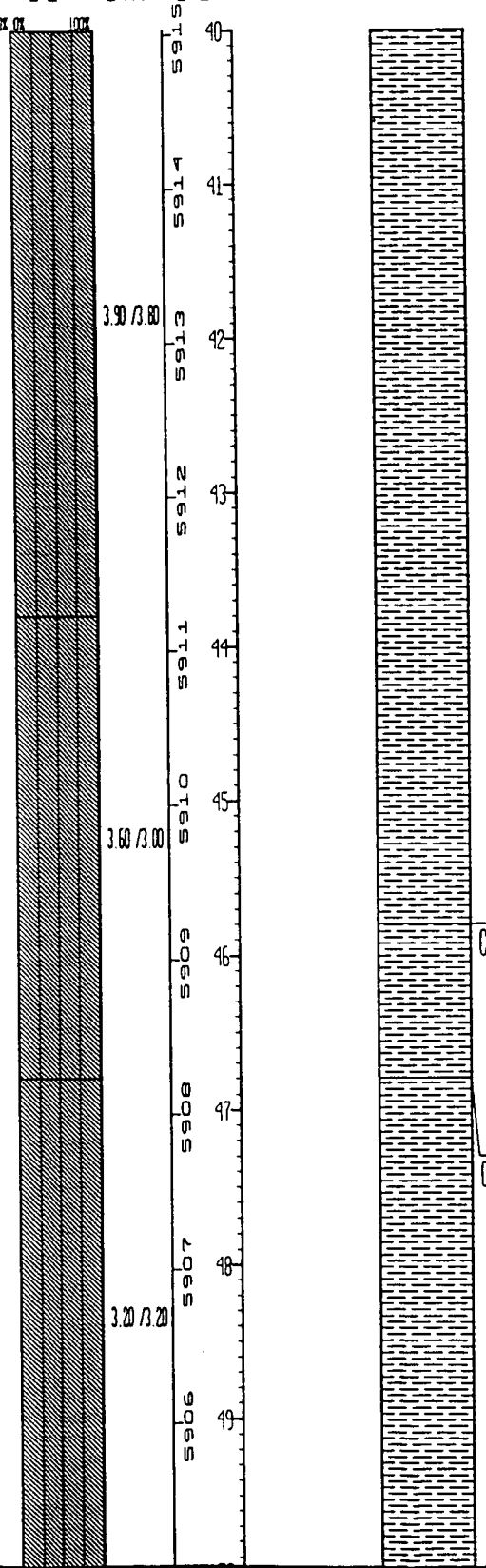
STATE PLANE COORDINATE:	TOTAL DEPTH (FT): 223.0	GROUND ELEVATION (FT): 5955.03	PROJECT NUMBER: SITEWIDE	LOG OF BORING NUMBER:
NORTH: 7-6761	AREA: SITEWIDE	CASING DIAMETER (IN):	GEOLOGIST: F.Grigsby	41191
EAST: 2087141	LOCATOR NUMBER: 06	BOREHOLE DIAMETER (IN): 10.0/3.75	DATE DRILLED: 01/09/92	

REMARKS: Hollow Stem Auger, Rotary Core Drill. ASI Geologist F Grigsby. Borehole filled with bentonite grout and abandoned on 1/17/92.

CHEMICAL SAMPLE DEPTH
GEOTECHNICAL SAMPLE
SAMPLE NUMBER
SAMPLE GRAIN SIZE (0% 50% 100%)
PERCENT RECOVERY (0% 100%)
RECOVERY/INTERVAL
DATUM (FT)
DEPTH (FT)
WELL OR PIEZOMETER CONSTRUCTION
LITHOLOGY
UNIFIED SOILS CLASSIFICATION OR ROCK TYPE
DESCRIPTION



CLAYSTONE:-	Claystone with some Silt. Med. light gray (N6) with some very light gray (N8). Calcareous, no apparent bedding. Slightly damp, varies from friable to mod. friable. Varying amounts of carbon. Indistinct contacts with overylying and underlying sediments because of extensively broken core (drilling induced). +/-20% silt, +/-80% clay.
CLAYSTONE:	Claystone with some Silt. Olive gray (5 Y 4/1). Non-calcareous, slightly to non-porous. Friable to mod. friable. No apparent bedding. Core extensively broken as above. Trace carbonaceous material (<1%). Slightly damp, trace v.f.g. sand. +/-20% silt, +/-80% clay.

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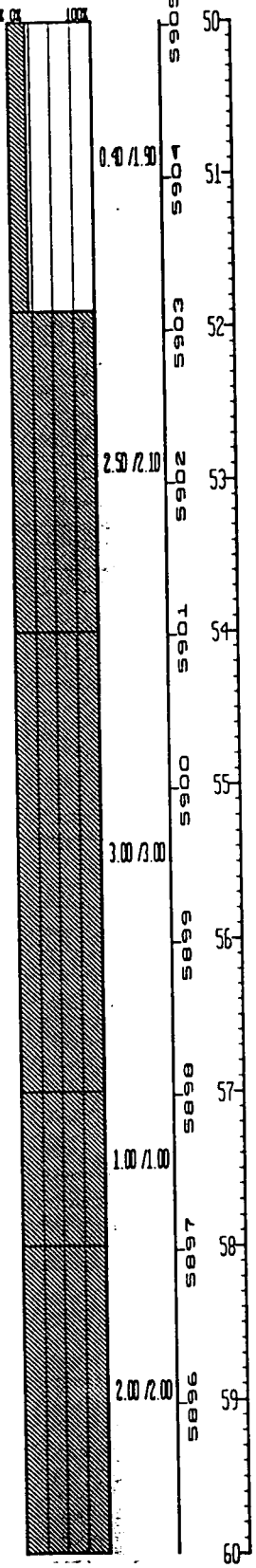
STATE PLANE COORDINATE:	TOTAL DEPTH (FT): 223.0	GROUND ELEVATION (FT): 5955.03	PROJECT NUMBER: SITEWIDE	LOG OF BORING NUMBER:
NORTH: 746761	AREA: SITEWIDE	CASING DIAMETER (IN):	GEOLOGIST: F.Grigsby	41191
EAST: 2087141	LOCATOR NUMBER: 06	BOREHOLE DIAMETER (IN): 10.0/3.75	DATE DRILLED: 01/09/92	

REMARKS: Hollow Stem Auger, Rotary Core Drill. ASI Geologist F. Grigsby. Borehole filled with bentonite grout and abandoned on 1/17/92.

CHEMICAL SAMPLE DEPTH
GEOTECHNICAL SAMPLE DEPTH
SAMPLE NUMBER
SAMPLE GRAIN SIZE (0% 50% 100%)
PERCENT RECOVERY (0% 100%)
RECOVERY/INTERVAL
DATUM (FT)
DEPTH (FT)
WELL OR PIEZOMETER CONSTRUCTION
LITHOLOGY
UNIFIED SOILS CLASSIFICATION OR ROCK TYPE
DESCRIPTION



NO SAMPLE: No Recovery.

CLAYSTONE: Claystone with some Silt. Olive gray (5 Y 4/1) to olive black (5 Y 2/1). All else same as above (reference interval 46.8' to 50.4').
+/-20% silt, +/-80% clay.

SILTY CLAYSTONE: Silty Claystone with some Sand. Light olive gray (5 Y 6/1) to olive gray (5 Y 4/1). Some v.f.g. sand, well sorted, fissile, friable. No apparent bedding. Slightly damp. Trace carbonaceous material. Slightly less sandy in bottom half of interval.
19% sand, 24% silt, 57% clay.
NOTE: 0.4' extra core recovery from 51.9' to 54.0'.

CLAYEY SILTSTONE: Clayey Siltstone with some Sand. Olive gray (5 Y 4/1) to light olive gray (5 Y 6/1). V.f.g. sand, mod. sorted, sub-rounded. Trace carbonaceous material. No apparent bedding except some faint laminations in top 6 in. Core friable/fissile. Mid-interval is sandier with more f.g. to m.g. sand and less clay. Mod. porous. Plug at 57.0'.
25% sand, 40% silt, 35% clay.

SILTY CLAYSTONE: Silty Claystone with trace Sand. Light olive gray (5 Y 6/1) to olive gray (5 Y 4/1), mottled appearance. Top 0.2' calcareous. Interval (whole) appears bioturbated, some mod. brown (5 YR 3/4) hematite nodules. Possibly some soft sediment deformation. Core mod. well cemented (argillaceous). Mod. friable to non-friable in calcareous interval. Core slightly damp. Some carbon, some very silty lenses.
+/-40% silt, +/-60% clay, trace sand.

SANDY CLAYSTONE: Sandy Claystone with some Silt to Silty Claystone with sandy lenses. Light olive gray (5 Y 6/1) to olive gray (5 Y 4/1). Abundt. carbon, pred. woody fragments and some leaf imprints. Core slig..., damp, friable sandier lenses, to mod. friable. Pred. mod. well cemented (argillaceous). Trace hematitic nodules and staining. Some laminar structure. Some soft sediment deformation. Drilling induced fracturing along sandier lenses and laminae. Sand pred. quartz, some dark minerals, v.f.g., well sorted, pred. sub-angular. One fracture at approx. 58.45' at an angle of approx. 30 degrees.
29% sand, +/-29% silt, +/-42% clay.

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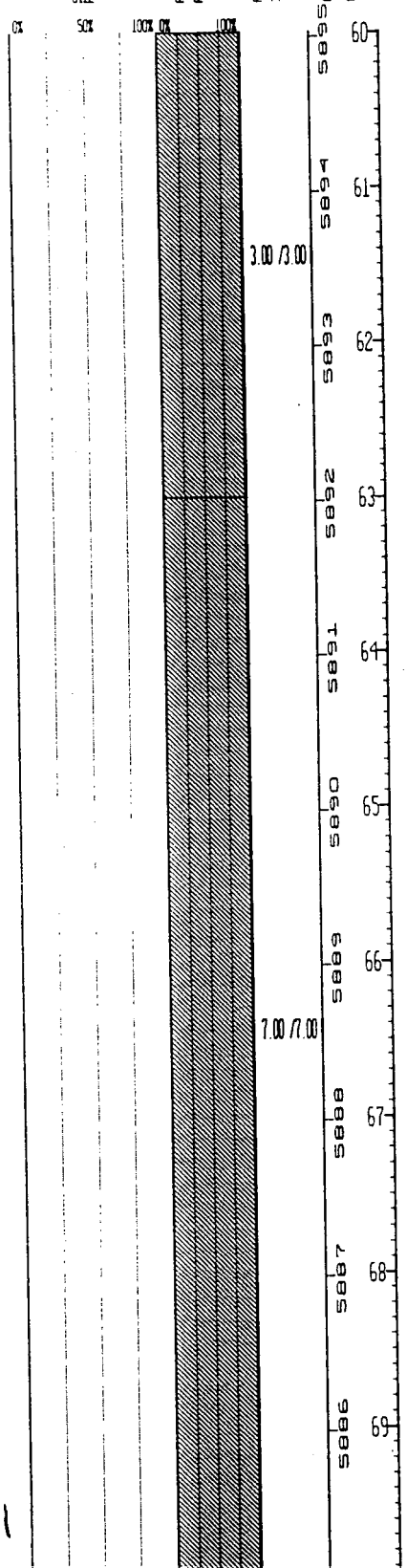
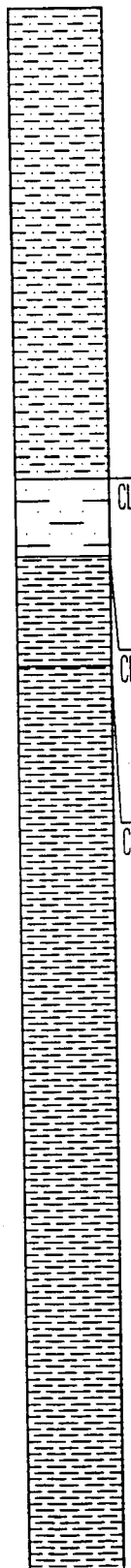
STATE PLANE COORDINATE:	TOTAL DEPTH (FT): 223.0	GROUND ELEVATION (FT): 5955.03	PROJECT NUMBER: SITEWIDE	LOG OF BORING NUMBER:
NORTH: 746761	AREA: SITEWIDE	CASING DIAMETER (IN):	GEOLOGIST: F.Grigsby	41191
EAST: 2087141	LOCATOR NUMBER: 06	BOREHOLE DIAMETER (IN): 10.0/3.75	DATE DRILLED: 01/09/92	

REMARKS: Hollow Stem Auger, Rotary Core Drill. ASI Geologist F Grigsby. Borehole filled with bentonite grout and abandoned on 1/17/92.

CHEMICAL SAMPLE DEPTH
GEOTECHNICAL SAMPLE D
SAMPLE NUMBER
SAMPLE GRAIN SIZE
PERCENT RECOVERY
RECOVERY/INTERVAL
DATUM(FT)
DEPTH(FT)
WELL OR PIEZOMETER CONSTRUCTION
LITHOLOGY
UNIFIED SOILS CLASSIFICATION OR ROCK TYPE
DESCRIPTION





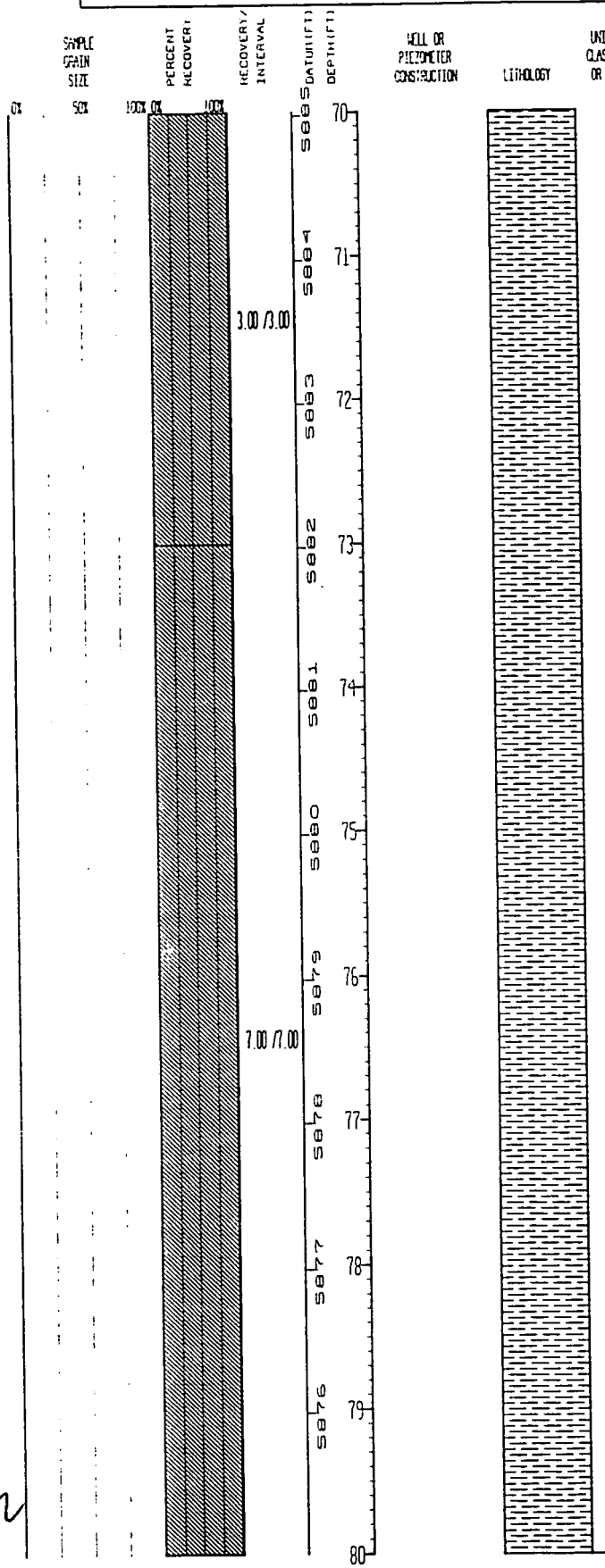
UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
CLAYEY SANDSTONE:	Clayey Sandstone with some Silt. Olive gray (5 Y 4/1), friable, slightly damp. Mod. well cemented (argilloceous). Healed fracture at bottom of interval (angle approx. 45 degrees). 60% sand, 10% silt, 24% clay.
CLAYSTONE:	Claystone with some Silt. Olive gray (5 Y 4/1). Healed fracture at 60 degrees and possibly at 30 degrees. Possibly some re-cemented claystone clasts in localized breccia zone (thin). +/-20% silt, 80% clay.
CLAYSTONE:	Claystone with some Silt. Pred. olive gray (5 Y 4/1) with some light olive gray (5 Y 6/1) mottling. Pred. crinkly surface texture. Interval generally consistent lithology with trace to some carbon throughout. Possible thin breccia at approx. 65.4' to 65.5'. Fractures at 68.5' (30 degrees), 69.5' (30 degrees), 69.7' (70 degrees), 71.4' (60 degrees), 71.8' (60 degrees with slickensides), 73.5' (60 degrees with slickensides), 80.3' (60 degrees with questionable slickensides), 82.0' to 83.0' (30 degrees). Fracture plane at bottom of interval. Core extensively broken at 71.8' to 73.0'. Possible disturbed bedding from 73.0' to 76.3' and 78.0' to 78.7'. Crinkly texture possibly caused by laminar or poorly developed bedding (generally flat to 3 to 5 degrees). Some core breaks with consol. surface. Core generally slightly damp, mod. indurated to indurated. Very slightly friable when fresh. <=15% silt, >=895% clay.

101

STATE PLANE COORDINATE:	TOTAL DEPTH (FT): 223.0	GROUND ELEVATION (FT): 5955.03	PROJECT NUMBER: SITEWIDE	LOG OF BORING NUMBER:
NORTH: 746761	AREA: SITEWIDE	CASING DIAMETER (IN):	GEOLOGIST F Grigsby	41191
EAST: 2087141	LOCATOR NUMBER: 06	BOREHOLE DIAMETER (IN): 10 0/3.75	DATE DRILLED 91/09/92	

REMARKS: Hollow Stem Auger, Rotary Core Drill. ASI Geologist F Grigsby. Borehole Filled with bentonite grout and abandoned on 1/17/92

CHEMICAL SAMPLE DEPTH
GEOTECHNICAL SAMPLE DEPTH
SAMPLE NUMBER



102

STATE PLANE COORDINATE:	TOTAL DEPTH (FT): 223.0	GROUND ELEVATION (FT): 5955.03	PROJECT NUMBER: SITEWIDE	LOG OF BORING NUMBER:
NORTH: 745761	AREA: SITEWIDE	CASING DIAMETER (IN):	GEOLOGIST: F Grigsby	4191
EAST: 2087141	LOCATOR NUMBER: 06	BOREHOLE DIAMETER (IN): 10.0/3.75	DATE DRILLED: 01/09/92	

REMARKS: Hollow Stem Auger, Rotary Core Drill ASI Geologist F Grigsby. Borehole filled with bentonite grout and abandoned on 1/17/92

CHEMICAL SAMPLE DEPTH
GEOTECHNICAL SAMPLE D
SAMPLE NUMBER

SAMPLE GRAIN SIZE: CL 50% 100%

PERCENT RECOVERY: 100% 0% 100%

RECOVERY/INTERVAL: 3.00 /3.00; 7.00 /7.00

DATUM (FT): 5965, 5964, 5963, 5962, 5961, 5960, 5959, 5958, 5957, 5956

DEPTH (FT): 80, 81, 82, 83, 84, 85, 86, 87, 88, 89

WELL OR PIEZOMETER CONSTRUCTION

LITHOLOGY

UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
CLAYSTONE:	Claystone. Olive gray (5 Y 4/1) to olive black (5 Y 2/1). Top 0.5' indurated, possible 10 degree fracture from 83.5' to 83.9'. Sticky clay 83.9' to 85.6'. Both indurated claystones, and claystone clasts in sticky clay (breccia?). Interval damp to slightly damp, non-friable to sticky clay. No sieve analysis.
SILTSTONE:	Siltstone. Siliceous cemented (boulder). Fragments of similar rock imbedded in clay above and below. Color pred. light gray (N7) when dry, light brownish gray (5 Y 6/1) when damp. Some carbon. Boulder fractured and recemented. Non-calcareous white coating on old surfaces. Top and bottom of rock appears weathered. Rock very hard, cannot scratch with a knife. Possible old channel or paleo surface. >90% clay.
CLAYSTONE:	Claystone. Dusky yellowish brown (10 YR 2/2) with light olive gray (5 Y 6/1) mottling. Crinkly surface texture in upper 3.0'+. Some indicated disturbed bedding in upper 3.0' interval (claystone clasts in clay and silty clay). Top 0.1' of interval contains pebbles and fragments of siliceous Siltstone (same as boulder at 85.6' to 86.2'). Fracture at 88.5' (approx. 45 degrees) and 89.0' (approx. 45 degrees). No definite slickensides. Core slightly damp. Mod. well indurated, no apparent bedding, some carbon. >90% clay.

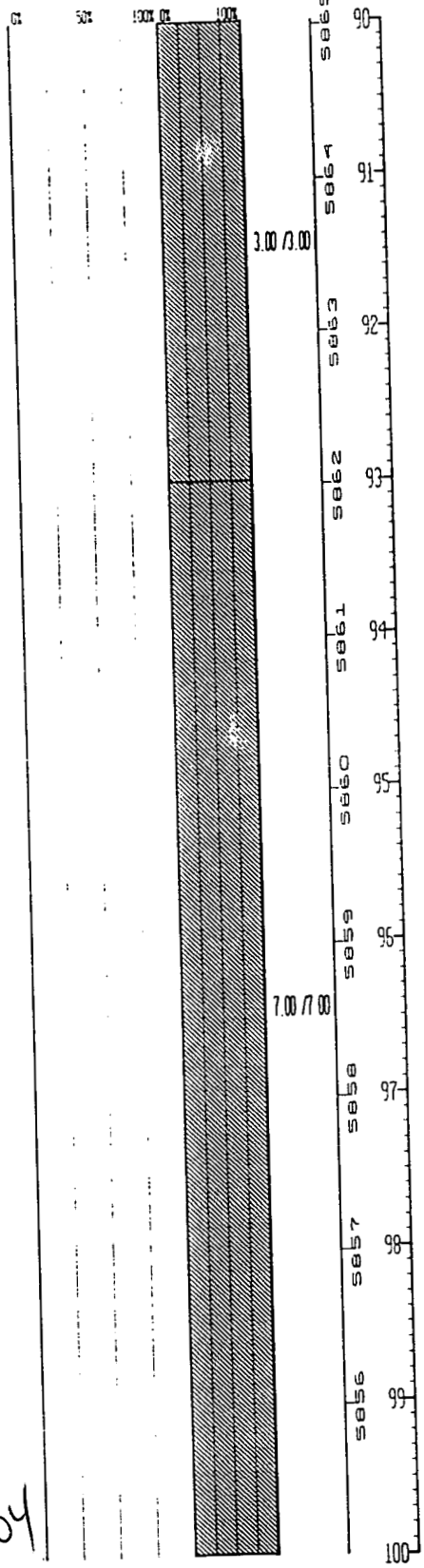
103

STATE PLANE COORDINATE:	TOTAL DEPTH (FT): 223.0	GROUND ELEVATION (FT): 5955.03	PROJECT NUMBER: SITEWIDE	LOG OF BORING NUMBER:
NORTH: 745761	AREA: SITEWIDE	CASING DIAMETER (IN):	GEOLOGIST: F Grigsby	41191
EAST: 2087141	LOCATOR NUMBER: 06	BOREHOLE DIAMETER (IN): 10.0/3.75	DATE DRILLED: 01/09/92	

REMARKS: Hollow Stem Auger, Rotary Core Drill. ASI Geologist F Grigsby. Borehole filled with bentonite grout and abandoned on 1/17/92.

CHEMICAL SAMPLE DEPTH
GEOTECHNICAL SAMPLE DEPTH
SAMPLE NUMBER

SAMPLE GRAIN SIZE (0% 50% 100%) | PERCENT RECOVERY (0% 100%) | RECOVERY/INTERVAL | DATUM (FT) | DEPTH (FT) | WELL OR PIEZOMETER CONSTRUCTION | LITHOLOGY | UNIFIED SOILS CLASSIFICATION OR ROCK TYPE | DESCRIPTION



CLAYSTONE: Claystone with some Silt Med. dark gray (N4) to light gray (N7) Massive, but tends to break along possible bedding planes at approx. 5 degrees. Vertical fracture at 92.8' 60 degree fracture at approx. 93.3'. Core mod. well indurated, slightly damp. Slightly friable, some carbon. Lower half of core grades to crinkly suface texture. Less indicated bedding.
>90% clay.

CLAYSTONE: Claystone with some Silt Olive gray (5 Y 4/1) to olive black (5 Y 2/1) with light olive gray (5 Y 6/1) mottling (silty lenses). Surface textures and silt contents vary. Core tends to break along essentially horiz. laminae or poorly defined bedding planes. Core slightly damp, slightly friable, mod. indurated. Some carbon (woody fragments) throughout. Contact with upper sediments gradational. No apparent fractures (natural).
+/-15-20% silt, +/-80-85% clay.

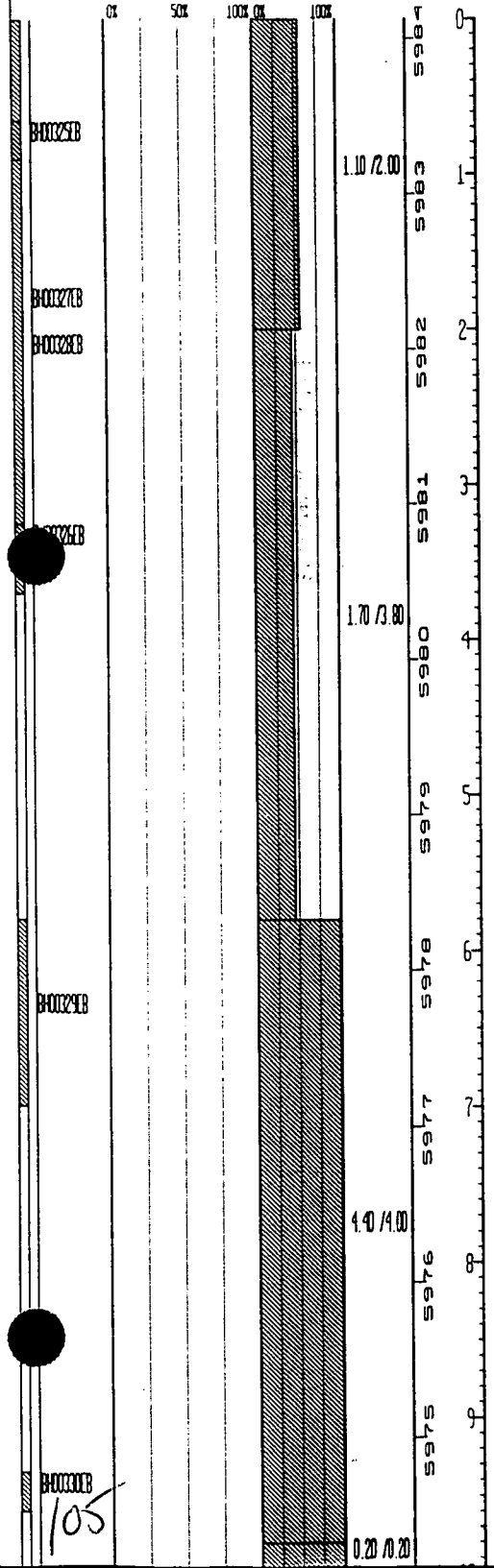
104

STATE PLANE COORDINATE:		TOTAL DEPTH (FT): 159.6	GROUND ELEVATION (FT):	5984.13	PROJECT NUMBER:	SITEWIDE	LOG OF BORING NUMBER:
NORTH:	748876	AREA: SITEWIDE	CASING DIAMETER (IN):		GEOLOGIST:	F. GRIGSBY	42892
EAST:	2085012	LOCATOR NUMBER: L9	BOREHOLE DIAMETER (IN):	10.0/3.75	DATE DRILLED:	05/12/92	

REMARKS: Drilling Equipment: CME 750 ATV, SIMCO 2800. ASI Geololgist: Fred Grigsby. EBASCO Geologist: J. Boylan. Borehole filled with bentonite grout and abandoned on 05/14/92.

CHEMICAL SAMPLE DEPTH
GEOTECHNICAL SAMPLE

SAMPLE NUMBER | SAMPLE GRAIN SIZE (0% – 50% – 100%) | PERCENT RECOVERY (0% – 100%) | RECOVERY/INTERVAL | DATUM (FT) | DEPTH (FT) | WELL OR PIEZOMETER CONSTRUCTION | LITHOLOGY | UNIFIED SOILS CLASSIFICATION OR ROCK TYPE | DESCRIPTION



UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
SC:	Gravelly Sand with some Clay and Silt. Grayish brown (5 YR 3/2). Sample dry, low plasticity. Sand well graded, pred. quartz and quartzite in c.g. fraction; and quartz and feldspar in m.g. to f.g. fraction, pred. sub-angular to sub-rounded. Slightly calcareous at bottom of interval. 25% gravel, 40% sand, 14% silt, 20% clay.
GC:	Sandy Gravel with some Clay and Silt. Grayish brown (5 YR 3/2). Caliche cemented. Gravel poorly graded, dom. lithology quartzite, max. pebble size 2.0", sub-angular. Sand lithology same as above (reference interval 0.0' to 0.7'). 50% gravel, 27% sand, 7% silt, 16% clay.
NO SAMPLE:	No recovery.
ML:	Caliche, composed of calcareous cement and clayey Silt with some Sand and Gravel. Pred. very pale orange (10 YR 8/2). Unconsol. Gravel pred. at bottom of interval with one 3.0" cobble, and one 2.0" pebble. Some smaller gravel throughout interval. 12% gravel, 17% sand, 43% silt, 28% clay.
NO SAMPLE:	No recovery.
CLAYSTONE:	Claystone boulder or slab. Yellowish gray (5 Y 7/2), some grayish orange (10 YR 7/2) streaks (Fe staining). Some hematite nodules. Core coated with caliche (or smeared). 95% clay.
CALICHE:	Caliche with Claystone fragments and quartzite gravel at contact with bedrock. 95% clay.
CLAYSTONE:	Top of Bedrock at 7.0'. Claystone with some Silt and trace Sand. Yellowish gray (5 Y 7/2) with dark yellowish orange (10 YR 6/6). Heavy Fe staining. Silt and sand occur in silty or sandy claystone lenses. Layer of hematite nodules (lenses) occuring at approx. 1.2' from top of interval. Numerous caliche lenses in upper 1.5' of interval. Claystone is dense and indurated, non-friable. Core breaks along silty or sandy zones. Core dry. No well defined bedding. <5% sand, 15% silt, 80% clay.
CLAYSTONE:	Claystone. Yellowish gray (5 Y 7/2). Slightly damp and pliable. Non-friable. Hematite nodules and mineralization at approx. 11.4'. Some caliche lenses below 11.7'. No apparent bedding. 95% clay.

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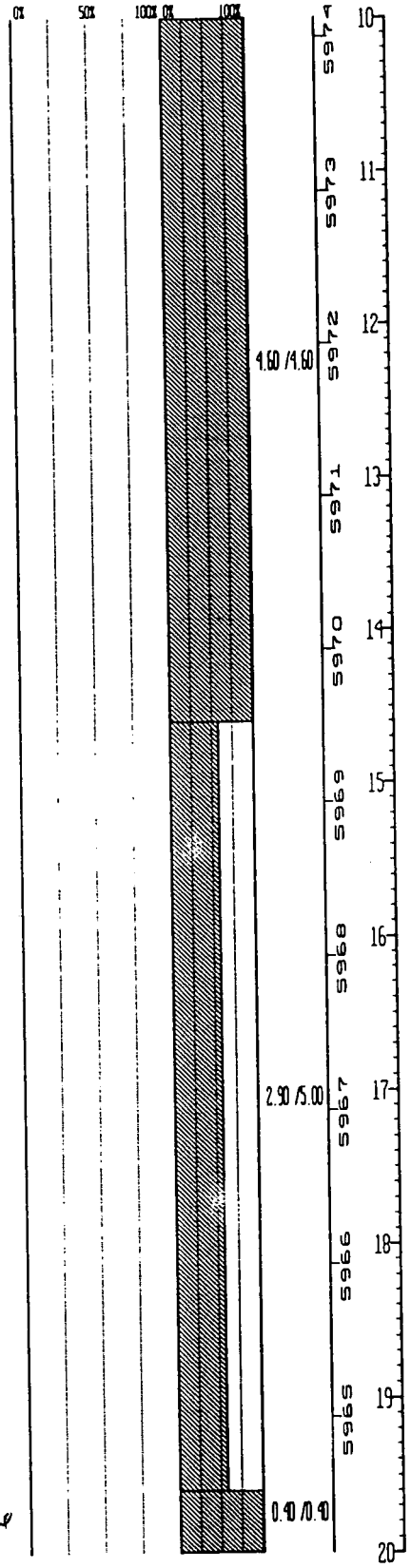
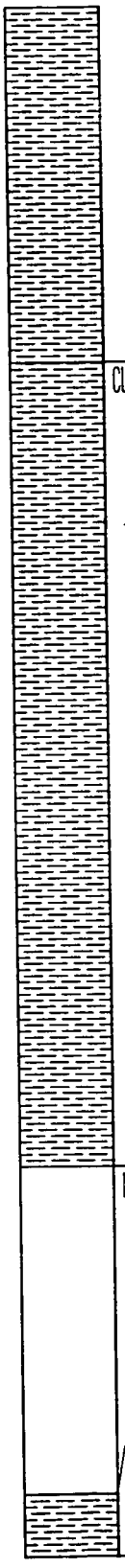
STATE PLANE COORDINATE:	TOTAL DEPTH (FT): 159.6	GROUND ELEVATION (FT): 5984.13	PROJECT NUMBER: SITEWIDE	LOG OF BORING NUMBER:
NORTH: 748876	AREA: SITEWIDE	CASING DIAMETER (IN):	GEOLOGIST: F. GRIGSBY	42892
EAST: 2085012	LOCATOR NUMBER: L9	BOREHOLE DIAMETER (IN): 10.0/3.75	DATE DRILLED: 05/12/92	

REMARKS: Drilling Equipment: CME 750 ATV, SIMCO 2800. ASI Geololgist: Fred Grigsby. EG&SCO Geologist: J. Boylan. Borehole filled with bentonite grout and abandoned on 05/14/92.

CHEMICAL SAMPLE DEPTH
GEOTECHNICAL SAMPLE DEPTH
SAMPLE NUMBER
SAMPLE GRAIN SIZE (0% 50% 100%)
PERCENT RECOVERY (0% 100%)
RECOVERY/INTERVAL
DATUM (FT)
DEPTH (FT)
WELL OR PIEZOMETER CONSTRUCTION
LITHOLOGY
UNIFIED SOILS CLASSIFICATION OR ROCK TYPE
DESCRIPTION





UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
CLAYSTONE:	Claystone. Color change to light olive gray (5 Y 5/2) grading to brownish gray (5 YR 4/1). Core slightly damp and friable at top, becomes very dense and indurated with depth. Some slightly silty intervals. Core pred. non-friable. Trace to some FeO staining, trace Mn staining. Core extensively fractured (drilling induced) in some intervals. No apparent natural fractures. No apparent bedding. >95% clay.
NO SAMPLE:	No recovery.
/CLAYSTONE:	Claystone. Same as lower half of interval from 12.3' to 17.5'. 95% clay.

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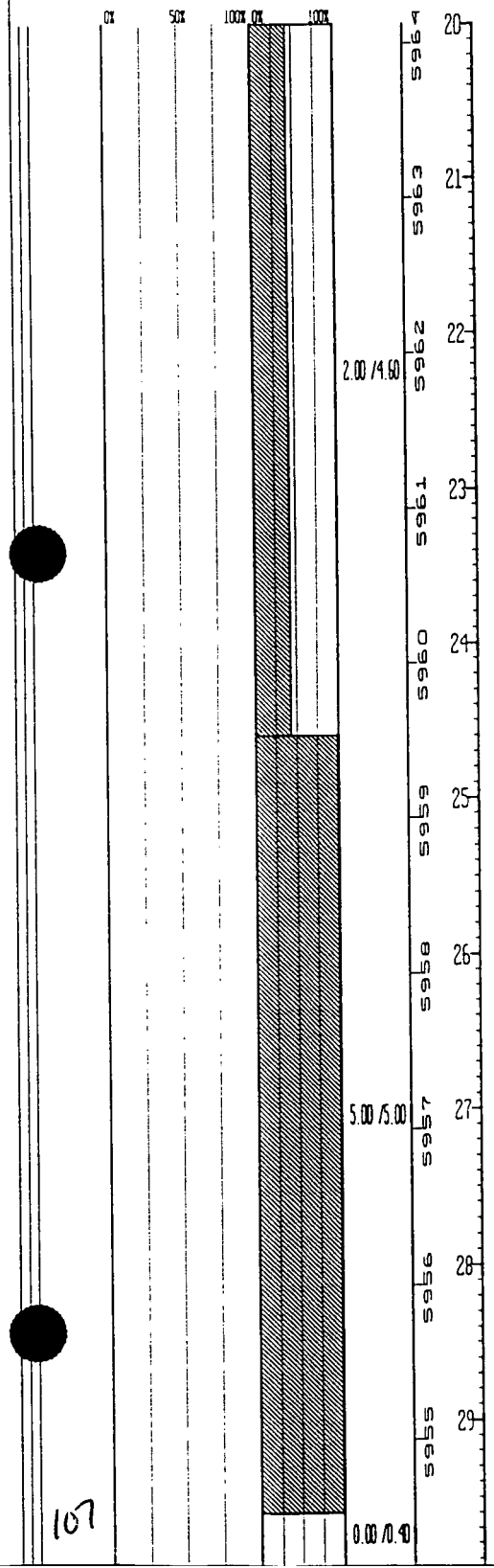
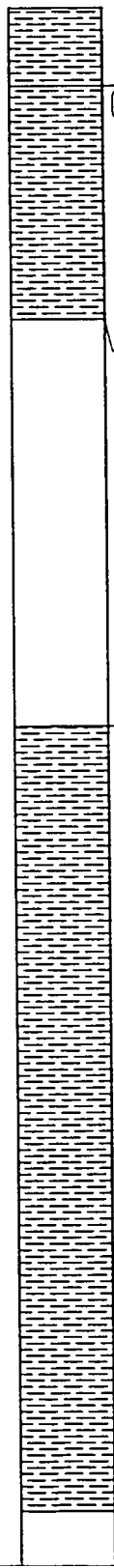
STATE PLANE COORDINATE:	TOTAL DEPTH (FT): 159.6	GROUND ELEVATION (FT): 5984.13	PROJECT NUMBER: SITEWIDE	LOG OF BORING NUMBER:
NORTH: 749876	AREA: SITEWIDE	CASING DIAMETER (IN):	GEOLOGIST: F GRIGSBY	42892
EAST: 2085012	LOCATOR NUMBER: L9	BOREHOLE DIAMETER (IN): 10.0/3.75	DATE DRILLED: 05/12/92	

REMARKS: Drilling Equipment: CME 750 ATV, SIMCO 2800. ASI Geololgist: Fred Grigsby. EBASCO Geologist: J Boylan. Borehole filled with bentonite grout and abandoned on 05/14/92.

CHEMICAL SAMPLE DEPTH
GEOTECHNICAL SAMPLE D
SAMPLE NUMBER
SAMPLE GRAIN SIZE (0% 50% 100%)
PERCENT RECOVERY (0% 100%)
RECOVERY/INTERVAL
DATUM (FT)
DEPTH (FT)
WELL OR PIEZOMETER CONSTRUCTION
LITHOLOGY
UNIFIED SOILS CLASSIFICATION OR ROCK TYPE
DESCRIPTION





CLAYSTONE: Claystone with some Silt. Brownish gray (5 YR 4/1) with mod. abundt. dark yellowish orange (10 YR 6/6) FeO staining and mineralized fractures. Interval extensively fractured with disturbed sediments and/or breccia. Longitudinal section of core reveals numerous mineralized and healed fractures (no distinct fracture angle). Fracture angles from horiz. to approx. 45 degrees.
10% silt, 90% clay.

NO SAMPLE: No recovery.

CLAYSTONE: Claystone with some silt. Same as above (reference interval from 20.5' to 22.0') except color change to pred. light olive gray (5 Y 6/1). Heavy dark yellowish orange (10 YR 6/6) FeO mineralization and staining in some intervals. Core extensively fractured. Intact core is very dense and indurated. Dry and non-friable to slightly friable. Some silty zones. Some Mn staining occuring with Fe mineralization. 60 degree fractures occurring in lower foot of interval. Numerous fractures indicated throughout interval with disturbed sediments or some breccia zones.
10% silt, 90% clay.

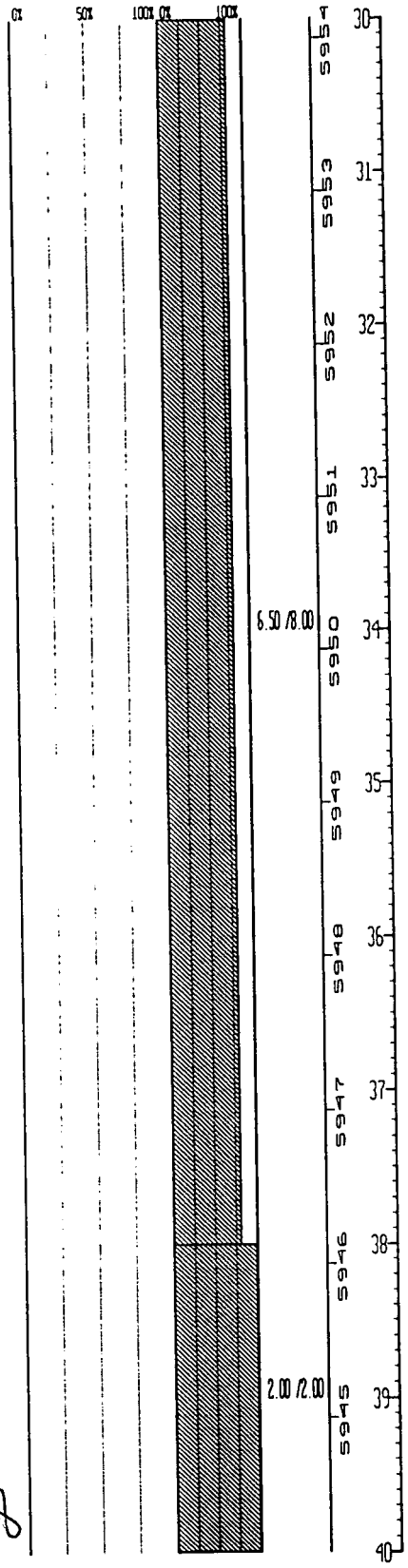
NO SAMPLE: Expansion Plug at top of run.

107

STATE PLANE COORDINATE:	TOTAL DEPTH (FT): 159.6	GROUND ELEVATION (FT): 5984.13	PROJECT NUMBER: SITEWIDE	LOG OF BORING NUMBER:
NORTH: 748876	AREA: SITEWIDE	CASING DIAMETER (IN):	GEOLOGIST F GRIGSBY	42892
EAST: 2085012	LOCATOR NUMBER: L9	BOREHOLE DIAMETER (IN): 10 0/3.75	DATE DRILLED: 05/12/92	

REMARKS: Drilling Equipment: CME 750 ATV, SIMCO 2800. ASI Geololgist: Fred Grigsby. EBASCO Geologist: J. Boylan. Borehole filled with bentonite grout and abandoned on 05/14/92.

CHEMICAL SAMPLE DEPTH
GEOTECHNICAL SAMPLE DEPTH
SAMPLE NUMBER
SAMPLE GRAIN SIZE
PERCENT RECOVERY
RECOVERY/INTERVAL
DATUM(FT)
DEPTH(FT)
WELL OR PIEZOMETER CONSTRUCTION
LITHOLOGY
UNIFIED SOILS CLASSIFICATION OR ROCK TYPE
DESCRIPTION



CLAYSTONE:	Claystone. Light olive gray (5 Y 6/1) grading to brownish gray (5 YR 4/1), abundt. dark yellowish orange (10 YR 6/6) and grayish orange (10 YR 7/4) FeO staining at top of interval. Decreases with depth. Top 5" of interval consists of soft, slightly damp and pliable clay with 2.5" quartzite pebble imbedded in middle of core (sluff). Remainder of interval consists of slightly damp, dense claystone. Non-friable, some slightly pliable. Vertical sections reveal laminated claystone layers. Some showing deformation or disturbed bedding. Laminations indicate possible horiz. bedding. Trace Mn staining. Most of interval washed and undersize. 95% clay.
NO SAMPLE:	No recovery.
CLAYSTONE:	Claystone. Olive gray (5 Y 4/1). Very distorted by drilling. Varies from slightly damp and dense, to damp, and pliable. Not representative of interval. 95% clay.

108

STATE PLANE COORDINATE:	TOTAL DEPTH (FT): 159.6	GROUND ELEVATION (FT): 5984.13	PROJECT NUMBER: SITEWIDE	LOG OF BORING NUMBER:
NORTH: 748876	AREA: SITEWIDE	CASING DIAMETER (IN):	GEOLOGIST: F. GRIGSBY	42892
EAST: 2085012	LOCATOR NUMBER: L9	BOREHOLE DIAMETER (IN): 10.0/3.75	DATE DRILLED: 05/12/92	

REMARKS: Drilling Equipment: CME 750 ATV, SIMCO 2800. ASI Geolologist: Fred Grigsby. EBASCO Geologist: J. Boylan. Borehole filled with bentonite grout and abandoned on 05/14/92.

CHEMICAL SAMPLE DEPTH
GEOTECHNICAL SAMPLE DE
SAMPLE NUMBER

SAMPLE GRAIN SIZE (0% 50% 100%)	PERCENT RECOVERY (0% 100%)	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
			5944	40				
			5943	41				
		3.20 /4.30	5942	42				
			5941	43				
							NO SAMPLE:	No recovery.
			5940	44				
							CLAYSTONE:	Claystone. Olive gray (5 Y 4/1) to brownish gray (5 YR 4/1). Highly distorted by drilling. Pred. damp and pliable. 95% clay.
			5939	45				
		2.00 /3.70	5938	46				
							NO SAMPLE:	No recovery.
			5937	47				
			5936	48				
							CLAYSTONE:	Claystone. Same as above (reference interval 44.3' to 46.3'). 95% clay.
		2.00 /2.00	5935	49				

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STATE PLANE COORDINATE:	TOTAL DEPTH (FT): 159.6	GROUND ELEVATION (FT): 5984.13	PROJECT NUMBER: SITEWIDE	LOG OF BORING NUMBER:
NORTH: 748876	AREA: SITEWIDE	CASING DIAMETER (IN):	GEOLOGIST: F. GRIGSBY	42892
EAST: 2085012	LOCATOR NUMBER: L9	BOREHOLE DIAMETER (IN): 10.0/3.75	DATE DRILLED: 05/12/92	

REMARKS: Drilling Equipment: CME 750 ATV, SIMCO 2800. ASI Geologist: Fred Grigsby. EBASCO Geologist: J. Boylan. Borehole filled with bentonite grout and abandoned on 05/14/92

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE (0% 50% 100%)	PERCENT RECOVERY (0% 100%)	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
					5965	50			NO SAMPLE:	No recovery.
					5963	51				
					5952	52				
					5951	53				
				0.00 /8.00	5950	54				
					5929	55				
					5928	56				
					5927	57				
					5926	58				
				0.00 /2.00	5925	59				
						60				

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STATE PLANE COORDINATE:	TOTAL DEPTH (FT): 159.6	GROUND ELEVATION (FT): 5984.13	PROJECT NUMBER: SITEWIDE	LOG OF BORING NUMBER:
NORTH: 748876	AREA: SITEWIDE	CASING DIAMETER (IN):	GEOLOGIST F GRIGSBY	42892
EAST: 2085012	LOCATOR NUMBER: L9	BOREHOLE DIAMETER (IN): 10.0/3.75	DATE DRILLED 05/12/92	

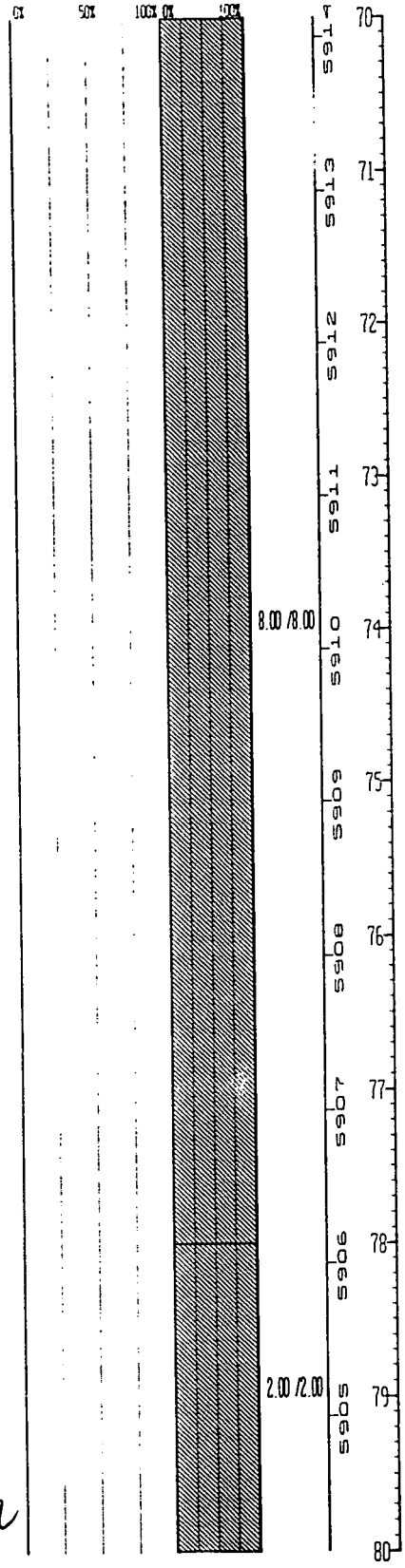
REMARKS: Drilling Equipment: CME 750 ATV, SIMCO 2800. ASI Geologist: Fred Grigsby. EBASCO Geologist: J. Boylan. Borehole filled with bentonite grout and abandoned on 05/14/92.

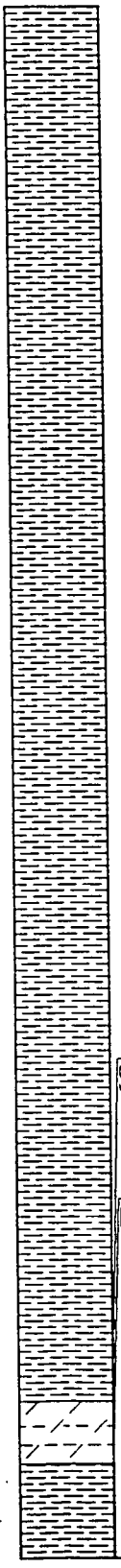
CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE D	SAMPLE NUMBER	SAMPLE GRAIN SIZE (0% 50% 100%)	PERCENT RECOVERY (0% 100%)	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
					5924	60				
					5923	61				
				0.00 /3.00						
					5922	62				
					5921	63			NO SAMPLE:	No recovery, rotary drilled.
				0.00 /2.60	5920	64				
					5919	65			CLAYSTONE:	Claystone. Olive gray (5 Y 4/1). Damp, soft and pliable, possibly sluff 95% clay.
					5918	66			SANDY CLAYSTONE:	Sandy Claystone with some Silt. Light olive gray (5 Y 6/1) with olive gray (5 Y 4/1) claystone lenses and brownish black (5 YR 2/1) carbonaceous laminae. Sand v f g. well sorted, sub-angular quartz. Core slightly damp, well cemented, mod. friable. No bedding, min. visual porosity. 36% sand, 19% silt, 45% clay
				2.00 /2.40	5917	67			CLAYSTONE:	Claystone. Olive gray (5 Y 4/1). Core dry to slightly damp, dense and indurated. Slightly friable. >90% clay.
					5916	68			NO SAMPLE:	No recovery.
				2.00 /2.00	5915	69			CLAYSTONE:	Claystone with some Silt. Med. gray (N5) to dark gray (N3) and brownish gray (5 YR 4/1). Some brownish black (5 YR 2/1) carbonaceous laminae. Core slightly damp, generally dense and mod. indurated. Non-friable to slightly friable. Some to mod. abundt. carbon. Core breaks with coincoidal surface. Bedding questionable. May be roughly horiz. to slightly dipping. No distinct fractures. Indications of possible approx. 30 degree healed fractures. 10% silt, 90% clay.

STATE PLANE COORDINATE:	TOTAL DEPTH (FT): 159.6	GROUND ELEVATION (FT): 5984.13	PROJECT NUMBER: SITEWIDE	LOG OF BORING NUMBER:
NORTH: 748876	AREA: SITEWIDE	CASING DIAMETER (IN):	GEOLOGIST: F GRIGSBY	42892
EAST: 2085012	LOCATOR NUMBER: L9	BOREHOLE DIAMETER (IN): 10.0/3.75	DATE DRILLED: 05/12/92	

REMARKS: Drilling Equipment: CME 750 ATV, SIMCO 2800. ASI Geolotgist: Fred Grigsby. EBASCO Geologist: J. Boylan. Borehole filled with bentonite grout and abandoned on 05/14/92.

CHEMICAL SAMPLE DEPTH
GEOTECHNICAL SAMPLE DEPTH
SAMPLE NUMBER
SAMPLE GRAIN SIZE
PERCENT RECOVERY
RECOVERY/INTERVAL
DATUM (FT)
DEPTH (FT)
WELL OR PIEZOMETER CONSTRUCTION
LITHOLOGY
UNIFIED SOILS CLASSIFICATION OR ROCK TYPE
DESCRIPTION





SILTY CLAYSTONE:	Silty Claystone with trace Sand. Light olive gray (5 Y 6/1). Some olive b' (5 Y 2/1) mottling. Core dry, well cemented, slightly i. ble, some carbon. <2% sand, 25% silt, 73% clay.
CLAYSTONE:	Claystone with some Silt. Olive gray (5 Y 4/1) to olive black (5 Y 2/1) in top half of interval. Grades to dusky yellowish brown (10 YR 2/2) in lower half of interval. Bottom foot of core becomes more silty with some yellowish gray (5 Y 8/1) silty lenses. Core broken in top foot of interval with indications of vertical fractures. Interval is damp, intact core slightly friable. Core generally slightly damp, dense, and indurated, non-friable. Some carbon throughout. Indications of possible healed fractures (30 degrees at 81.9'). Bedding varying from horiz. to 5 degrees on avg. 5-10% silt, 90-95% clay.

112

STATE PLANE COORDINATE:	TOTAL DEPTH (FT): 159.6	GROUND ELEVATION (FT): 5994.13	PROJECT NUMBER: SITEWIDE	LOG OF BORING NUMBER:
NORTH: 748876	AREA: SITEWIDE	CASING DIAMETER (IN):	GEOLOGIST: F. GRIGSBY	42892
EAST: 2085012	LOCATOR NUMBER: L9	BOREHOLE DIAMETER (IN): 10.0/3.75	DATE DRILLED: 05/12/92	

REMARKS: Drilling Equipment: CME 750 ATV, SIMCO 2800. ASI Geolologist: Fred Grigsby. EBASCO Geologist: J. Boylan. Borehole filled with bentonite grout and abandoned on 05/14/92.

CHEMICAL SAMPLE DEPTH
GEOTECHNICAL SAMPLE D
SAMPLE NUMBER

SAMPLE GRAIN SIZE (0% – 50% – 100%)	PERCENT RECOVERY (0% – 100%)	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
			5904	80				
			5903	81				
			5902	82				
			5901	83				
		7.00 /8.00	5900	84				
			5899	85				
			5898	86				
			5897	87			NO SAMPLE:	No recovery.
			5896	88			CLAYSTONE:	Claystone with some Silt. Dusky yellowish brown (10 YR 2/2) to brownish black (5 YR 2/1). Core consists of damp, unconsol. intervals and slightly damp to dry intact core. Intact core is dense and indurated. Pred. non-friable. Unconsol. core consists of disturbed or brecciated sediment fragments. Some to mod. abundt. carbon. Indicated possible horiz. to slightly dipping (5 degrees) bedding. Indicated 30 degree and 45 degree fractures. 10% silt, 90% clay.
		2.00 /2.00	5895	89				

113

STATE PLANE COORDINATE:	TOTAL DEPTH (FT) 159.6	GROUND ELEVATION (FT) 5384.13	PROJECT NUMBER	SITEWIDE	LOG OF BORING NUMBER:
NORTH: 7[illegible]8376	AREA: SITEWIDE	CASING DIAMETER (IN):	GEOLOGIST	F. GRIGSBY	42892
EAST: 1285012	LOCATOR NUMBER: L9	BOREHOLE DIAMETER (IN): 10.0/3.75	DATE DRILLED	05/12/92	

REMARKS: Drilling Equipment: CME 750 ATV, SIMCO 2800. ASI Geologist: Fred Grigsby. EG&GCO Geologist: J. Boylan. Borehole filled with bentonite grout and abandoned on 05/14/92.

SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
	100%		5891	90				
			5890	91				
			5889	92				
			5888	93				
		8.00 /8.00	5887	94				
			5886	95				
			5885	96				
			5884	97			SILTY CLAYSTONE:	Silty Claystone. Light gray (N7) with dark gray (N3) to olive gray (5 Y 4/1) claystone lenses. Interval extensively fractured. Core fragments dry, indurated, and slightly friable. 30% silt, 70% clay
			5883	98			CLAYSTONE:	Claystone. Olive black (5 Y 2/1). Some light olive gray (5 Y 6/1) silty lenses in top 2.0' of interval. Some to mod. abundt. carbon. Some siltstone nodules. Some fragments with slickensides. Overall core dry, dense, and indurated. Non-friable. Core breaks indicate horiz. to approx. 7 degree bedding. 95% clay.
		2.00 /2.00	5882	99				
				100				

114

APPENDIX 3

PLANT MICROFOSSIL COUNT DATA FROM

WELL #B217489 AND WELL #00291

POLLEN, SPORE, & DINO COUNTS

SAMPLE# B217489-1 45.1-45.5'	DATE: 28 OCTOBER 1992	%
COUNTS		
1. Gymnosperms		
Monocolpate	0	0%
Bisaccates	1	4%
Corollina	0	0%
TCT	2	9%
Other	0	0%
2. Spores		
Trilete	5	22%
Monolete	3	13%
Schizosporis	1	4%
3. Angiosperms		
Triprojectate	0	0%
Tricolpate	5	22%
Triporate	0	0%
Tricolporate	1	4%
Periporate	5	22%
4. Dinoflagellates		
Cyclonephelium	0	0%
Spiniferites	0	0%
Oligosphaeridium	0	0%
Dinogymnium	0	0%
Chatangiella/Isabelidinium	0	0%
Other	0	0%
Acritarchs	0	0%
TOTAL	23	100%

116

POLLEN, SPORE, & DINO COUNTS

SAMPLE# B217489-2 67.2'	DATE: 28 OCTOBER 1992	%
COUNTS		
1. Gymnosperms		
Monocolpate	2	1%
Bisaccates	16	5%
Corollina	2	1%
TCT	50	17%
Other	1	0%
2. Spores		
Trilete	117	39%
Monolete	24	8%
Schizosporis	14	5%
3. Angiosperms		
Triprojectate	7	2%
Tricolpate	9	3%
Triporate	23	8%
Tricolporate	2	1%
Periporate	1	0%
4. Dinoflagellates		
Cyclonephelium	4	1%
Spiniferites	4	1%
Oligosphaeridium	0	0%
Dinogymnium	3	1%
Chatangiella/Isabelidinium	0	0%
Other	16	5%
Acritarchs	5	2%
TOTAL	300	100%

117

POLLEN, SPORE, & DINO COUNTS

SAMPLE# B217489-3 75.9'	DATE: 28 OCTOBER 1992	%
COUNTS		
1. Gymnosperms		
Monocolpate	21	11%
Bisaccates	2	1%
Corollina	0	0%
TCT	29	15%
Other	1	1%
2. Spores		
Trilete	102	53%
Monolete	26	13%
Schizosporis	3	2%
3. Angiosperms		
Triprojectate	1	1%
Tricolpate	7	4%
Triporate	1	1%
Tricolporate	0	0%
Periporate	1	1%
4. Dinoflagellates		
Cyclonephelium	0	0%
Spiniferites	0	0%
Oligosphaeridium	0	0%
Dinogymnium	0	0%
Chatangiella/Isabelidinium	0	0%
Other	0	0%
Acritarchs	0	0%
TOTAL	194	100%

118

POLLEN, SPORE, & DINO COUNTS

SAMPLE# B217489-4 84.3'	DATE: 28 OCTOBER 1992	%
COUNTS		
1. Gymnosperms		
Monocolpate	2	1%
Bisaccates	13	6%
Corollina	0	0%
TCT	51	25%
Other	0	0%
2. Spores		
Trilete	78	38%
Monolete	18	9%
Schizosporis	5	2%
3. Angiosperms		
Triprojectate	3	1%
Tricolpate	5	2%
Triporate	14	7%
Tricolporate	2	1%
Periporate	0	0%
4. Dinoflagellates		
Cyclonephelium	1	0%
Spiniferites	3	1%
Oligosphaeridium	1	0%
Dinogymnium	1	0%
Chatangiella/Isabelidinium	1	0%
Other	5	2%
Acritarchs	1	0%
TOTAL	204	100%

POLLEN, SPORE, & DINO COUNTS

SAMPLE# B217489-5 86.1'	DATE: 28 OCTOBER 1992	%
COUNTS		
1. Gymnosperms		
Monocolpate	2	1%
Bisaccates	9	4%
Corollina	0	0%
TCT	13	6%
Other	1	0%
2. Spores		
Trilete	121	60%
Monolete	14	7%
Schizosporis	0	0%
3. Angiosperms		
Triprojectate	8	4%
Tricolpate	3	1%
Triporate	13	6%
Tricolporate	1	0%
Periporate	0	0%
4. Dinoflagellates		
Cyclonephelium	1	0%
Spiniferites	2	1%
Oligosphaeridium	0	0%
Dinogymnium	3	1%
Chatangiella/Isabelidinium	3	1%
Other	6	3%
Acritarchs	3	1%
TOTAL	203	100%

120

POLLEN, SPORE, & DINO COUNTS

SAMPLE# B217489-6 91.5'	DATE: 28 OCTOBER 1992	%
COUNTS		
1. Gymnosperms		
Monocolpate	4	2%
Bisaccates	10	5%
Corollina	0	0%
TCT	26	13%
Other	0	0%
2. Spores		
Trilete	102	51%
Monolete	27	14%
Schizosporis	2	1%
3. Angiosperms		
Triprojectate	3	2%
Tricolpate	1	1%
Triporate	15	8%
Tricolporate	2	1%
Periporate	1	1%
4. Dinoflagellates		
Cyclonephelium	0	0%
Spiniferites	0	0%
Oligosphaeridium	0	0%
Dinogymnium	5	3%
Chatangiella/Isabelidinium	0	0%
Other	1	1%
Acritarchs	1	1%
TOTAL	200	100%

121

POLLEN, SPORE, & DINO COUNTS

SAMPLE# B217489-14 214.3'	DATE: 28 OCTOBER 1992	%
COUNTS		
1. Gymnosperms		
Monocolpate	9	4%
Bisaccates	0	0%
Corollina	0	0%
TCT	19	9%
Other	0	0%
2. Spores		
Trilete	65	32%
Monolete	35	17%
Schizosporis	1	0%
3. Angiosperms		
Triprojectate	3	1%
Tricolpate	6	3%
Triporate	29	14%
Tricolporate	35	17%
Periporate	0	0%
4. Dinoflagellates		
Cyclonephelium	0	0%
Spiniferites	0	0%
Oligosphaeridium	0	0%
Dinogymnium	0	0%
Chatangiella/Isabelidinium	0	0%
Other	0	0%
Acritarchs	0	0%
TOTAL	202	100%

122

POLLEN, SPORE, & DINO COUNTS

SAMPLE# 00291-4 57.6'	DATE: 28 OCTOBER 1992	%
COUNTS		
1. Gymnosperms		
Monocolpate	2	1%
Bisaccates	9	4%
Corollina	0	0%
TCT	14	7%
Other	0	0%
2. Spores		
Trilete	109	53%
Monolete	20	10%
Schizosporis	1	0%
3. Angiosperms		
Triprojectate	10	5%
Tricolpate	1	0%
Triporate	4	2%
Tricolporate	0	0%
Periporate	0	0%
4. Dinoflagellates		
Cyclonephelium	7	3%
Spiniferites	2	1%
Oligosphaeridium	1	0%
Dinogymnium	2	1%
Chatangiella/Isabelidinium	2	1%
Other	15	7%
Acritarchs	5	2%
TOTAL	204	100%

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TABLE 1

TABLE 2

TABLE 3

TABLE 3

ROCKY FLATS POLLEN, SPORE, AND DINOFLAGELLATE OCCURRENCES

			POLLEN AND SPORE TAXA																																								
TAXA			A at	A bt	A de	A qu	A se	A st	A tu	Atvu	Atvv	C au	C be	C da	C mi	C to	Ch s	Cu s	E mi	E pr	E vo	G eo	Gh s	I re	I ri	K sc	L ad	Li s	M ca	M un	Ma s	Mo s	P cl	P in	P ma	P no	P re	P se	Pr s	Ps s	Q kr	R an	R gl	R mi	S mo
WELLS B217489 and	Lithostrat ID	Biostrat ID	25	1	34	32	42	23	24	22	37	18	43	49	58	14	48	7	15	35	40	6	29	53	41	8	16	11	12	44	3	56	45	27	26	36	55	17	10	28	46	5	2	19	9
B218589 Composite																																													
45.1'																	X																												
67.2'						X								X		X	X		X							X		X											X					X	
69.8' MARKER?	A	A																																											
75.9'														X			X											X						X	X				X						
84.3'				X			X			X			X			X			X				X		X	X	X		X	X	X		X					X	X		X	X		X	X
86.1'						X				X		X										X	X					X	X						X			X	X			X		X	
91.5'								X	X	X	X									X									X						X			X							
110.0'												X																							X										
120.5'			X	X		X				X										X		X				X		X			X					X			X			X			
130.7'			X	X		X		X				X											X					X			X								X	X		X			
149.0'			X					X	X	X		X				X										X	X		X					X	X				X					X	
162.0' (b)						X		X	X	X		X		X		X	X					X	X		X	X	X		X		X		X			X	X	X	X			X		X	
162.1'																										X	X		X										X					X	
170.0' MARKER?(b)	B	B																																											
178.9'																X			X							X	X	X	X		X							X	X			X			
182.0'(b)						X			X																X	X	X		X							X	X		X			X		X	
198.3'																										X		X											X			X			X
202.6'(b)						X		X	X	X		X		X		X		X		X			X			X	X	X	X	X	X	X	X			X	X	X	X			X		X	X
214.3'				X														X				X									X											X	X		
222.0'(b)			X	X	X			X	X						X	X				X			X					X			X							X				X	X		
243.2'(b)							X		X			X				X			X				X			X	X	X	X	X	X						X		X		X	X	X	X	
255.4' MARKER?(b)	C	C																																											
257.7'(b)							X	X	X	X	X		X	X		X							X	X		X	X		X	X	X					X	X	X	X			X		X	
272.4'(b)					X	X																						X														X			
289.8'(b)					X	X		X	X					X		X			X			X	X		X	X		X	X	X		X				X	X	X	X					X	

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TABLE 3 Cont'd

ROCKY FLATS POLLEN, SPORE, AND DINOFLAGELLATE OCCURRENCES

TAXA																		DINOFLAGELLATE TAXA															
			T co	T ma	T ma	T mi	Ta s	Tr b	Tr s	Tr t	U ca			C di	C fi	C oc	Cht	Cr s	D ac	D di	D cu	Din	Ex s	Flo	I ma	I mi	Isa	O co	O ve	Oli	Spf	Spn
WELLS B217489 and	Lithostrat ID	Biostrat ID	39	4	31	57	33	20	30	21	13			G	Q	K	C	U	I	J	M	E	S	P	T	R	L	D	H	F	A	B
B218589 Composite																																	
45.1'																																	
67.2'									X					X					X	X		X									X		
69.8' MARKER?	A	A																															
75.9'																																	
84.3'			X				X	X	X					X					X	X	X						X		X	X	X	X	
86.1'			X						X					X			X				X								X		X		
91.5'					X			X	X		X								X	X	X						X						
110.0'																				X													
120.5'					X		X									X			X														
130.7'					X			X	X																								
149.0'										X							X		X	X													
162.0' (b)			X					X			X			X			X		X	X	X					X			X		X		
162.1'								X											X														
170.0' MARKER?(b)	B	B																															
178.9'									X		X			X			X					X						X	X	X	X	X	
182.0'(b)			X								X							X	X												X		
198.3'																																	
202.6'(b)			X	X			X		X	X	X			X				X	X	X					X			X		X		
214.3'				X																													
222.0'(b)			X	X	X		X		X											X													
243.2'(b)				X			X		X		X			X					X	X	X		X							X	X		
255.4' MARKER?(b)	C	C																															
257.7'(b)							X		X	X	X			X			X		X	X			X								X		
272.4'(b)				X															X	X													
289.8'(b)			X	X		X	X		X										X	X						X					X		

TAXA (Pollen and Spores)
Aquilapollenites attenuatus (25)
Aquilapollenites bertillonites (1)
Aquilapollenites delicatus (34)
Aquilapollenites quadrilobus (32)
Aquilapollenites senonicus (42)
Aquilapollenites striatus (23)
Aquilapollenites trialatus var. uniformis (22)
Aquilapollenites trialatus var. variabilis (37)
Aquilapollenites turbidus (24)
Callialasporites dampieri (49)
Chenopodipollis sp. (48)
Chomotriletes minor (58)
Cibotiidites bettianus (43)
Cicatricosisporites australiensis (18)
Corollina torosa (14)
Cupanieidites spp. (7)
Equisetosporites volutus (40)
Erdtmanipollis procumbentiformis (35)
Eucommiidites minor (15)
Ghoshispora spp. (29)
Gnetaceaepollenites eocenipites (6)
Integricorpus reticulatus (53)
Integricorpus rigidus (41)
Kuylisporites scutatus (8)
Liburnisporis adnacus (16)
Liliacidites spp. (11)
Mancicorpus calvus (12)
Margocolporites sp. (3)
Microreticulatisporites uniformis (44)
Montanapollis sp. (56)
Plicapollis retusus (55)
Plicapollis serta (17)
Polypodiaceoisporites macrospeciosus (26)
Polypodiisporites inangahuensis (27)
Proteacidites spp. (10)
Pseudointegricorpus clarireticulatus (45)
Pseudointegricorpus novacolpites (36)
Pseudoplicapollis sp. (28)
Quadripollis krempii (46)
Retitrescolpites angulolumnosus (5)
Retitriletes mirabilis (19)
Rhoipites globosus (2)
Siberiapollis montanensis (9)
Taxodiaceaepollenites sp. (33)
Thomsonipollis magnificus (31)
Tricolpites microreticulatus (57)
Triporoletes spp. (30)
Triporopollenites coryloides (39)
Triporopollenites sp. "baculate" (20)
Triporopollenites sp. "triangular" (21)
Tripunctisporis maastrichtiensis (4)
Umbosporites callosus (13)

TAXA (Dinoflagellates)
Chatangiella spp. (C)
Cordosphaeridium fibrospinosum (Q)
Coronifera oceanica (K)
Cribroperidinium spp. (U)
Cyclonephelium distinctum (G)
Dinogymnium acuminatum (I)
Dinogymnium digitus (J)
Dinogymnium euclaense (M)
Dinogymnium sp. (E)
Exochosphaeridium spp. (S)
Florentinia sp. (P)
Isabelidinium magnum (T)
Isabelidinium microarmum (R)
Isabelidinium spp. (L)
Odontochitina costata (D)
Oligosphaeridium sp. (F)
Ovoidinium verrucosum (H)
Spinidinium spp. (B)
Spiniferites spp. (A)
RAC 1993

LEGEND

X = Plant microfossil occurrence

= Range of fossil occurrences

= Calcareous siltstone bed A

= Calcareous siltstone bed B

= Calcareous siltstone bed C

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TABLE 1

ROCKY FLATS POLLEN, SPORE, AND DINOFLAGELLATE OCCURRENCES

TAXA	Lithostrat ID	Biostrat ID	A at	A bt	A de	A qu	A se	A st	A tu	Atvu	Atvv	C au	C be	C da	C mi	C to	Ch s	Cu s	E mi	E pr	E vo	G eo	Gh s	I re	I ri	K sc	L ad	Li s	M ca	M un	Ma s	Mo s	P cl	P in	P ma	P no	P re	P sc	Pr s	Ps s	Q kr	R an	R gl	R mi
			POLLEN AND SPORE TAXA																																									
			25	1	34	32	42	23	24	22	37	18	43	49	58	14	48	7	15	35	40	6	29	53	41	8	16	11	12	44	3	56	45	27	26	36	55	17	10	28	46	5	2	19
WELL B217489																																												
45.1'																	X																											
67.2'						X								X		X	X		X							X		X											X					X
69.8' MARKER?	A	A																																										
75.9'														X			X											X						X	X				X					
84.3'				X			X			X			X			X			X				X		X	X	X		X	X	X		X					X	X		X	X		X
86.1'						X				X		X									X	X	X					X	X						X			X	X			X		X
91.5'								X	X	X	X									X									X						X			X						
110.0'												X																							X									
120.5'				X	X	X				X										X		X				X		X			X					X			X			X		
130.7'			X	X		X		X				X											X					X			X								X	X		X		
149.0'			X					X	X	X		X				X										X	X		X					X	X				X					X
162.1'																										X	X		X										X					X
178.9'																X			X							X	X	X	X		X							X	X			X		
198.3'																										X		X											X			X		
214.3'				X														X				X									X											X	X	
WELL B218589																																												
72.7' MARKER?	A	A																																										
162.0'						X		X	X	X		X		X		X	X					X	X		X	X	X		X		X		X			X	X	X	X			X		X
170.0' MARKER?	B	B																																										
182.0'						X			X																X	X	X		X							X	X		X			X		X
202.6'						X		X	X	X		X		X		X		X		X			X			X	X	X	X	X	X	X	X			X	X	X	X			X		X
222.0'			X	X	X			X	X						X	X				X			X					X			X								X			X	X	
243.2'							X		X			X				X			X		X		X			X	X	X	X	X	X						X		X		X	X	X	X
255.4' MARKER?	C	C																																										
257.7'							X	X	X	X	X		X	X		X							X	X		X	X		X	X	X					X	X	X	X			X		X
272.4'					X	X																						X														X		
289.8'					X	X		X	X					X		X			X			X	X		X	X		X	X	X		X				X	X	X	X					X
WELL 00291																																												
33.9'																																												
35.0'																																												
57.6'			X					X		X	X									X			X		X	X	X	X	X									X	X					X
WELL 00191																																												
28.4'			BARREN																																									
WELL B315289			NEARLY BARREN																																									
19.7'																																												

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TABLE 1 Cont'd

ROCKY FLATS POLLEN, SPORE, AND DINOFLAGELLATE OCCURRENCES

TAXA	Lithostrat ID	Biostrat ID	S mo	T co	T ma	T ma	T mi	Ta s	Tr b	Tr s	Tr t	U ca			C di	C fi	C oc	Cht	Cr s	D ac	D di	D eu	Din	Ex s	Flo	I ma	I mi	Isa	O co	O ve	Oli	Spf	Spn
															DINOFLAGELLATE TAXA																		
			9	39	4	31	57	33	20	30	21	13			G	Q	K	C	U	I	J	M	E	S	P	T	R	L	D	H	F	A	B
WELL B217489																																	
45.1'																																	
67.2'										X					X					X	X		X									X	
69.8' MARKER?	A	A																															
75.9'																																	
84.3'			X	X				X	X	X					X					X	X	X						X		X	X	X	X
86.1'				X						X					X			X				X								X		X	
91.5'						X			X	X		X								X	X	X						X					
110.0'																					X												
120.5'						X		X									X			X													
130.7'						X			X	X																							
149.0'											X							X		X	X												
162.1'									X											X													
178.9'										X		X			X			X					X										
198.3'			X																										X	X	X	X	X
214.3'					X																												
WELL B218589																																	
72.7' MARKER?	A	A																															
162.0'				X					X			X			X			X		X	X	X					X			X		X	
170.0' MARKER?	B	B																															
182.0'				X								X							X	X												X	
202.6'			X	X	X			X		X	X	X			X				X	X	X					X				X		X	
222.0'				X	X	X		X		X											X												
243.2'					X			X		X		X			X					X	X	X		X							X	X	
255.4' MARKER?	C	C																															
257.7'								X		X	X	X			X			X		X	X			X								X	
272.4'					X															X	X												
289.8'				X	X		X	X		X										X	X						X					X	
WELL 00291																																	
33.9'								X																									
35.0'								X																									
57.6'				X											X		X	X		X									X	X	X		X
WELL 00191																																	
28.4'																																	
WELL B315289																																	
19.7'				X																													

TAXA (Pollen and Spores)
Aquilapollenites attenuatus (25)
Aquilapollenites bertillonites (1)
Aquilapollenites delicatus (34)
Aquilapollenites quadrilobus (32)
Aquilapollenites senonicus (42)
Aquilapollenites striatus (23)
Aquilapollenites trialatus var. uniformis (22)
Aquilapollenites trialatus var. variabilis (37)
Aquilapollenites turbidus (24)
Callaliasporites dampieri (49)
Chenopodipollis sp. (48)
Chomotriletes minor (58)
Cibotiidites bettianus (43)
Cicatricosisporites australiensis (18)
Corollina torosa (14)
Cupanieidites spp. (7)
Equisetosporites volutus (40)
Erdtmanipollis procumbentiformis (35)
Eucommiidites minor (15)
Ghoshispora spp. (29)
Gnetaceaepollenites eocenipites (6)
Integricorpus reticulatus (53)
Integricorpus rigidus (41)
Kuylisporites scutatus (8)
Liburnisporis adnacus (16)
Liliacidites spp. (11)
Mancicorpus calvus (12)
Margocolporites sp. (3)
Microreticulatisporites uniformis (44)
Montanapollis sp. (56)
Plicapollis retusus (55)
Plicapollis serta (17)
Polypodiaceoisporites macrospeciosus (26)
Polypodiisporites inangahuensis (27)
Proteacidites spp. (10)
Pseudointegricorpus clarireticulatus (45)
Pseudointegricorpus novacolpites (36)
Pseudoplicapollis sp. (28)
Quadripollis krempii (46)
Retitrescolpites angulofluminosus (5)
Retitriletes mirabilis (19)
Rhoipites globosus (2)
Siberiapollis montanensis (9)
Taxodiaceaepollenites sp. (33)
Thomsonipollis magnificus (31)
Tricolpites microreticulatus (57)
Triporoletes spp. (30)
Triporopollenites coryloides (39)
Triporopollenites sp. "baculate" (20)
Triporopollenites sp. "triangular" (21)
Tripunctisporis maastrichtiensis (4)
Umbosporites callosus (13)

TAXA (Dinoflagellates)
Chatangiella spp. (C)
Cordosphaeridium fibrospinosum (Q)
Coronifera oceanica (K)
Cribroperidinium spp. (U)
Cyclonephelium distinctum (G)
Dinogymnium acuminatum (I)
Dinogymnium digitus (J)
Dinogymnium euclaense (M)
Dinogymnium sp. (E)
Exochosphaeridium spp. (S)
Florentinia sp. (P)
Isabelidinium magnum (T)
Isabelidinium microarmum (R)
Isabelidinium spp. (L)
Odontochitina costata (D)
Oligosphaeridium sp. (F)
Ovoidinium verrucosum (H)
Spinidinium spp. (B)
Spiniferites spp. (A)

LEGEND

X = Plant microfossil occurrence

= Range of fossil occurrences

= Calcareous siltstone bed A

= Calcareous siltstone bed B

= Calcareous siltstone bed C

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TABLE 2

ROCKY FLATS POLLEN, SPORE, AND DINOFLAGELLATE OCCURRENCES

TAXA	Lithostrat ID	Biostrat ID	A at	A bt	A de	A qu	A se	A st	A tu	Atvu	Atvv	C au	C be	C da	C mi	C to	Ch s	Cu s	E mi	E jr	E vo	G eo	Gh s	I re	I ri	K sc	L ad	Li s	M ca	M un	Ma s	Mo s	P cl	P in	P ma	P no	P re	P se	Pr s	Ps s	Q kr	R an	R gl	R mi
			POLLEN AND SPORE TAXA																																									
			25	1	34	32	42	23	24	22	37	18	43	49	58	14	48	7	15	35	40	6	29	53	41	8	16	11	12	44	3	56	45	27	26	36	55	17	10	28	46	5	2	19
WELL 40891																																												
23.5'							X																	X																				
178.9'																																			X				X					
198.3' MARKER?	A	A																																					X					
201.0'									X					X		X					X					X		X	XX										X			X		X
WELL 40591																																												
114.0'					X	X																																						
123.0' MARKER?	A	A																																					X					
126.5'																																				X								
132.1'						X			X	X		X				X		X			X				X	X	X		X		X				X			X	X					X
141.1'			X			X		X		X				X						X					X	X	X		XX				X		X			X	X			X		X
WELL 42892																																												
102.5'																								X		X	X		X		X		X		X							X		X
121.2' MARKER?	A	B																																										
122.1'						X																	X																					
139.8'																													X										X	X				
WELL 41191																																							X					
41.4'								X				X													X			X																
44.8'			X									X		X								X	X								X								X	X				
45.8' MARKER?	A	B																																										
52.0'								X												X			X					X			X								X					
85.1'						X		X	X	X			X	X								X	X			X			X		X							X	X					X
91.3'												X																X											X					
120.0'								XX							X																								X					
WELL B217689																																												
82.3'				X		X	X	X	X	X						X			X				X		X	X	X		X	X		X	X			X		X	X				X	X
82.6' MARKER?	A	B																																										
87.3'					X	X	X	X	X	X	X	X	X	X		X					X		X		X	X	X	X	X	X						X	X	X	X	X	X	X	X	X
104.8'				X		X		X				X		X	X								X								X								X					
114.8' MARKER?	B	C																																										
116.9'												X								X											X								X			X	X	
WELL B217789																																												
76.8'								X		X	X	X				X			X				X	X		X	X		X	X	X					X		X	X		X		X	X
77.0' MARKER?	A	B																																										
78.7						X			X	X	X	X		X		X					X		X	X	X	X	X	X	X	X			X			X	X	X	X		X			X

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TABLE 2 Cont'd

ROCKY FLATS POLLEN, SPORE, AND DINOFLAGELLATE OCCURRENCES

TAXA	Lithostrat ID	Biostrat ID	S mo 9	T co 39	T ma 4	T ma 31	T mi 57	Ta s 33	Tr b 20	Tr s 30	Tr t 21	U ca 13			C di G	C fi Q	C oc K	Cht C	Cr s U	D sc I	D di J	D eu M	Din E	Ex s S	Flo P	I ma T	I mi R	Isa L	O co D	O ve H	Oli F	Spf A	Spn B
															DINOFLAGELLATE TAXA																		
WELL 40891																																	
23.5'																		X			X							X					
178.9'																	X																
198.3' MARKER?	A	A																															
201.0'					X																							X				X	
WELL 40591																																	
114.0'																																	
123.0' MARKER?	A	A																															
126.5'																					X												
132.1'			X	X		X		X			X						X			X	X							X				X	X
141.1'				X				X	X		X	X			X			X		X	X								X	X		X	
WELL 42892																																	
102.5'											X	X						X		X	X												
121.2' MARKER?	A	B																															
122.1'				X																X												X	
WELL 41191																																	
41.4'										X																				X			
44.8'								X								X									X								
45.8' MARKER?	A	B																															
52.0'						X			X																								
85.1'				X	X			X		X	X									X		X						X		X		X	
91.3'																														X			
120.0'																					X												
WELL B217689																																	
82.3'				X				X	X	X		X			X			X		X	X			X	X	X			X	X		X	
82.6' MARKER?	A	B																															
87.3'				X	X		X	X	X	X	X	X			X			X	X	X	X	X		X		X							
104.8'						X			X																								
114.8' MARKER?	B	C																															
116.9'				X	X																												
WELL B217789																																	
76.8'				X				X	X		X				X			X	X	X	X	X		X	X	X			X	X	X	
77.0' MARKER?	A	B																															
78.7'			X	X	X			X	X	X		X						X		X	X	X		X		X	X			X		X	

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Dinogymnium digitus (J)
Dinogymnium euclaense (M)
Dinogymnium sp. (E)
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Isabelidinium microarmum (R)
Isabelidinium spp. (L)
Odontochitina costata (D)
Oligosphaeridium sp. (F)
Ovoidinium verrucosum (H)
Spinidinium spp. (B)
Spiniferites spp. (A)

LEGEND

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= Calcareous siltstone bed A

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= Calcareous siltstone bed C

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