APPENDIX 2A

ENGINEERING GEOLOGY AND FOUNDATION CONSIDERATIONS

1 INTRODUCTION

1.1 LOCATION

Three Mile Island is located approximately 2-1/2 miles south of Middletown, Pennsylvania at longitude 76° 43'-30" West and at latitude 40° 8' North. It is one of the largest of a group of several islands in the Susquehanna River and is situated about 900 ft from the east bank. It is elongated parallel to the flow of the river, with its longer axis oriented approximately due north and south. The island is about 11,000 feet long and 1700 feet wide. The proposed generating components will be in the northern one-third of the island.

The southeasterly flowing Susquehanna River makes a sharp change in direction to nearly due South in the vicinity of Middletown. After this directional change just north of Three Mile Island, the channel widens to approximately 1.5 miles.

1.2 FIELD INVESTIGATION

Supplemented by a ground surface survey team, aerial photographs, and a geologic surface investigation; a subsurface exploration program, consisting of 21 borings in conjunction with a seismic refraction survey was initiated in August and September of 1966 to establish the general range of soil depths, types, and engineering properties, and to examine and evaluate the condition of the bedrock and depth of weathering. This work was done to ascertain the capabilities of the site to safely and economically support a nuclear-powered generating station.

The borings and seismic profiles covered the entire length of the island. From the initial interpretation of the longitudinal seismic line and accompanying borings, the general area of the island appearing to offer the best subsurface conditions was selected, and the seismic cross lines and additional borings were concentrated in that area.

In January 1967, 20 borings were added in the proposed plant site area for further soil investigation and to obtain reliable water table information.

All of the Phase I drilling program consisted of continuous sampling of overburden using the Standard Penetration Method and coring (NX core) a minimum of ten feet into sound rock. Phase II drilling, in all but a few holes, consisted of continuous split-barrel soil sampling of overburden to bedrock and the installation of 3 in. slotted standpipes in drilled holes, comprising a system of groundwater observation points.

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The seismic survey was conducted by Weston Geophysical Engineers, Inc. of Weston, Mass. A teelve trace seismic refraction system with a recording oscillograph was used. Seismic energy was generated with explosives. All data were collected using two hundred-foot long geophone spreads, with twenty-foot geophone intervals and with three ten-foot intervals on both ends of the geophone spreads. The standard continuous profiling technique was used. In addition to end shots, two intermediate shop point determinations were made on each spread.

Seismic results were interpreted by Weston and incorporated in the text of this report and on the soils profile, Figure 2A-2. The location of the seismic lines and borings are shown on the boring location plan, Figure 2A-1. The remainder of this text presents the evaluation and interpretation of the raw field data. Test Boring Logs are attached at the end of this Appendix.

2 GEOLOGY

2.1 GEOGRAPHIC SETTING

The site lies within the Gettysburg Basin section of the physiographic division known as the Piedmont Province. The topography of the area immediately surrounding Three Mile Island is of a slightly undulating nature with maximum relief of about 200 ft and highest elevation seldom above 500 feet. From the east, drainage is largely represented by the southwesterly flowing Swatara Creek which has its mouth near Middletown and by the more westerly flowing Conewago Creek which empties into the Susquehanna River at the south end of Three Mile Island. Fishing Creek flows into the Susquehanna west of the site, and the northwesterly flowing Conewago Creek terminates at York Haven. Three Mile Island has very little relief, with elevations ranging from about 280 feet at the water's edge to slightly more than 300 feet in the north-central portion.

2.2 REGIONAL GEOLOGIC HISTORY

"After the late Paleozoic mountain making during which compression had been relieved by folding and overthrusting, large blocks of the region settled along nearly vertical joint planes, resulting in formal faulting and tilting of blocks, which formed a vast sunken basin or trough with a northeast trend and a highland to the southeast. In the following Triassic period torrential rains washed the waste from the disintegrated crystalline rocks of this highland into the trough and arkosic sand, argillaceous sand and fine sandy mud accumulated. Much of this sediment was of a pronounced red color, owing to the fact that the iron content of the rocks was highly oxidized when they disintegrated, apparently under acid conditions. After the accumulation of a thickness of many thousands of feet of these red rocks, which now form the Newark group, further adjustment of earth blocks by tilting and normal faulting took place on a still larger scale than before and in places mountains were formed on the northwest side of the basin by differential uplift of several thousand feet. Catoctin Mountain in Southern Pennsylvania, is an example". Stose and Jonas (1933).

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The Newark group is believed to have a thickness of approximately 16,000 feet and tilts toward the northwest due to subsidence and faulting along the northwest border.

Later, intrusion of Triassic diabase dikes and sills cut through the Newark group and metamorphism took place along the edges of these intrusions. Since Triassic times an erosional period has been prevalent except for glacio-fluvial deposition from Pleistocene glacial advances. The furthest advance occurred during the Illinoian stage when a lobe of the glacier extended down the Susquehanna Valley to near Fisher's Ferry, approximately 45 miles north of Three Mile Island. Glacial meltwater was responsible for the deposition of some alluvial terrace deposits now present in the region.

The tectonic history of thearea as related in Appendix 2D indicates that the region has been extremely stable for at least the last 10,000 to one million years.

2.3 DEPOSITIONAL HISTORY OF THREE MILE ISLAND

Three Mile Island, along with Shelly Island and other small islands in the vicinity, were formed as a result of fluvial deposition by the Susquehanna River. The carrying capacity of the river sharply decreases as the channel width increases after the stream crosses an east-west trending very resistant diabase dike just downstream from Middletown. At this point the channel has been incised into the more easily erodable Gettysburg shale, resulting in a conspicuously wider channel. In addition a change of flow direction occurs after the stream cuts through the diabase dike which crosses the river at that point (represented by Hill Island) and is directed along N 10 E striking vertical joints until it is again restricted and deflected by a second diabase dike just south of Three Mile Island.

Boulders carried by the glacial meltwater or transported downstream by ice-rafts were first deposited in this wide-channel, low velocity section of the river and became the nuclei for subsequent deposition of smaller materials. This gradual accretion of river sediment resulted in the growth of most of the islands in this area. Three Mile Island is made up of two such nuclei which eventually merged. The area between the two nuclei is presently represented by fine-grained deposits which were deposited in a low energy fluvial environment between the two growing depositional islands.

2.4 BED ROCK GEOLOGY

The site is underlain by the sedimentary rocks of the Gettysburg shale, a part of the Newark group of Triassic Age. Two easterly trending diabase intrusions cut through the Gettysburg shale, one approximately 1 mile upstream from Three Mile Island and a second one about 0.2 miles downstream from the island. These more erosion resistant diabase dikes and metamorphosed shales along their edge have caused restrictions in the river at Hill Island, north of the site and at Conewago Falls, downstream from the site.

The bedrock surface, at the site, is essentially flat and lies at approximately 277 ft elevation. Lithologic types vary from red to brown, interbedded, fine to medium-grained sandstone, shaly siltstone, and

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shaly claystone which range from medium-hard to hard possessing seismic velocities in a range of from 8,500 to 11,500 ft/sec. One to three feet of weathered rock occurs at the overburden-bedrock interface.

The regional dip of the Gettysburg shale is to the northwest at 10 to 50 degrees. Near the proposed site, the attitude of these beds as measured in surface outcrop varies from N65 - 80°E with 35° to 70° northerly dips. This variation in inclination of strata was not apparent from drill cores, as a fairly consistent dip of 45 degrees was observed in the subsurface of Three Mile Island.

Well-developed, near vertical jointing is conspicuous along a N 10 E trend. Drill hole data substantiates surface observations regarding jointing, and revealed that healing of some joints has occurred, while others were altered by oxidation.

2.5 FAULTING

No evidence of faulting which transects the island was seen in the field from available rock exposures along the east bank of the river, or along the western periphery of the island. Aerial photographs as well give no suggestion of faulting through the island.

Stose and Jonas, (1933) mapped a hypothetical NE tranding fault which they projected through Three Mile Island approximately 0.5 miles south of the site area as shown on Addendum 1 of Appendix 2D. The substance for their structural geology was obtained by large scale surface mapping which was completed in 1929. Based on the data collected in this investigation (summarized by Addendum 1 of this Appendix), it has been concluded that such a hypothetical fault does not exist. Likewise, these studies show no evidenc to substantiate the projections of other hypothetical faults across the river immediately north and south of the island. The Triassic depositional basins were subjected to an appreciable degree of diastrophism during the Palisades disturbance. Most significant, however, is the fact that structural features resulting from such diastrophism are as much as 185 million years old, and that the area has been extremely stable for the last 10,000 to 1 million year In addition, rock velocities obtained from the seismic survey are normal to Triassic Gettysburg Formation rock types and indicate that the bedrock is not in a state of stress, thereby eliminating any latent threat of future strain.

A comprehensive evaluation of major tectonic elements in south central Pennsylvania was prepared by Kauffman (1967) and is included in Appendix 2D. It is concluded that the proposed site is not deleteriously affected by faulting, and further, that regional tectonic elements are inactive and present no threat to the structural integrity of the local geology.

2.6 SOILS

The island, as a whole, is composed of fluvially stratified sub-rounded to rounded sand and gravel containing varying amounts of silt, clay, and occasional lenses of clean sand. Density values range from loose to very dense, as established by Standard Penetration Tests. Boulders are present at depth and are mainly confined to the lower portions of the soil zone on the north end of the island. Soil depths vary from approximately 6 feet at the south end of the island to a maximum of 30.0 feet

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near the axial intersection of the island Depth of soil is relatively constant at about 20 feet in the vicinity of the proposed plant site.

The overburden is made up primarily of two units. Directly overlying the sedimentary rocks is a layer of coarse sand and gravel which, at the north end of the island, contains numerous boulders and cobbles and ranges from medium-dense to very dense. This layer thins from about 15.5 feet at Boring No. 4 to zero at Boring No. 8 to the south.

Above the coarse sand and gravel is a layer of loose to medium-dense, fine-grained granular material which varies from a fine silty sand and gravel, north of Station 13 + 00 north to a very stiff, clayey silt on the south end of the island.

Local variations do occur, and in some drill holes at the plant site, the amount of Fines appeared slightly greater below a depth of about 10.5 feet. This variation is believed to be a function of a mechanical breakdown of individual shale and siltstone pebbles contained in the soil.

As a result from one-half to one-foot of topsoil, composed of sandy silt with much organic material, covers the island. The island has been cultivated and planted into corn fields for the past several years.

3 FOUNDATION CONSIDERATIONS

As set forth in the section on Depositional History, the sub surface of Three Mile Island indicates that it formed first as two islands which were later joined as a result of the fluvial cycle of the Susquehanna River. Both nuclei have sub-surface conditions which are favorable for safe, economic foundation design; however, the larger thickness of the uniformly dense to very dense sand and gravel layer at the north end of the island provides a better opportunity to utilize these dense soils as bearing materials and a greater opportunity to remain above the groundwater table. A plant built on the south end of the island would involve expensive rock excavations and definite dewatering costs. Also, a greater variation in the bedrock surface was detected by the seismic survey on the south end of the island, and inferences of greater variations in intensity of weathering were also noted in this area.

3.2 SOILS

There is a high degree of uniformity of density and of soil types at the selected plant location, within the upper silty sand layer and the lower sand and gravel layer.

Both layers are capable of supporting foundation loads which will greatly increase with increasing depth. The actual bearing capacity of each soil layer is dependent upon the depth, size, and spacing of footings, and is greatly influenced by the elevation of the ground water table. The bearing capacity of footings placed in the lower sand and gravel layer can conservatively be permitted within a range of 5 to 8 kips per square foot, but can be considerably increased depending upon the above variables. For instance, a square footing 10 ft wide at a depth of 10 ft can be considered to safely support 14 kips per square foot if it remains a sufficient distance above the water table, and half of that value at the water table.

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3.3 ROCK

The fact that the bedrock surface is differentially weathered necessitates a variation in the surface bearing capacity and points out the need for assuring that any structure supported by rock be firmly established on sound rock. For preliminary planning and estimating purposes, the sound rock surface can be assumed to be represented by the seismic top of rock line, defined by a velocity of 10,000 ft/sec, shown on Figure 2A-1, and the bearing capacity of rock to support any given foundation at a constant elevation be assumed to be equal to a maximum of 30 kips per square foot.

Since bedding dips at approximately 45° to the horizontal, it is recommended that heavily loaded foundations (those in excess of 10 kips/sq ft) not be placed up dip from sides of excavations. The shearing strength of rock parallel to unconfined bedding planes is significantly smaller than the compressive strength of the rock perpendicular to bedding planes. Also, due to the combination of vertical jointing and moderately dipping bedding planes which afford potential shear surfaces, it is not recommended that high differential loading be placed at shallow depths.

Under conditions of even loading at constant elevation, the unweathered rock at Three Mile Island is capable of safely sustaining maximum loading of 30 kips per square foot.

3.4 GROUNDWATER

Groundwater levels were recorded in detail around the proposed plant site and vary from 279.0 to 282.0 with elevation and distance from the river. Assuming that the river is maintained at elevation 277 feet, the groundwater levels should vary little from those presently observed. However, flood studies indicate a mean annual flood at elevation 286 with 5, 10, 25, and 50 year flood predicted at 287.6, 289.0, 290.6, and 292.0 feet, respectively.

Dewatering of deep excavations must be considered, and foundation design must include hydrostatic considerations. Based on field observations it appears that a permanent deep well system can accomplish both the necessary dewatering during construction and serve as a controlling mechanism for rising ground water during flood stage, as well as be used as a potable water supply.

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GEOLOGIC GLOSSARY

Alluvial	Stream transported
Aquifer	A water producing geologic unit
Artesian Water	Groundwater that rises above the level at which it is encountered
Bedrock	Rock underlying soil, sand, clay, boulders, etc.
Diastrophism	The process of deformation of the earth's crust
Dike	A tabular body of igneous rock that cuts across the structure of adjacent rocks or cuts massive rocks
Decomposition	Breakdown and decay of rock to soils condition
Dip	The angle at which a stratum or any planar feature is inclined from the horizontal
Fault	A break in rock along which there has been displacement of the two sides relative to one another parallel to the break
Fluvial	Produced by river action
Folds	Bends in the strata
Footwall	Rock below a fault plane
Fractures	Breaks in rock due to folding or faulting
Groundwater	Subsurface water in the zone of saturation
Hanging Wall	Rock above a fault plane
Ice-Raft	Floating ice which transports rock particles and other materials
Intrusion	An invasion of older rock by igneous rock
Joint	A fracture or parting along which little or no movement has occurred parallel to the fracture
Lithology	Composition and texture of rock
NX	Core size - 2.155 inches
Overburden	Soil, sand, gravel, boulders, etc., that overlies bedrock

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GEOLOGIC GLOSSARY (con't)

Overthrust	In faulting, the process of thrusting the hanging wall (relatively) over the foot wall
Sandstone	Sandstones are composed of cemented grains of sand size material
Shale	A laminated sediment, composed predominantly of particles of clay size
Siltstone	A very fine grained clastic rock composed predominantly of particles of silt size
Tectonics	The study of the structure of the earth in response to earth movements
Water Table	The upper surface of a zone of saturation
Weathering	Mechanical and chemical action on rocks which eventually reduces them to a soil state

Hardness Criteria

Rock hardness as indicated on the boring logs is a qualitative property determined by field classification, and is used as an aid to analyzing general subsurface conditions. Actual rock hardness is difficult to define, therefore an arbitrary method of hardness determination was defined by the following criteria:

Very soft	Rock disintegrates to touch; exhibits destructive alteration; can be considered as hard to very hard soil.
Soft	Rock is coherent but is broken very easily by thumb pressure at sharp edges and crumbles with firm hand pressure. Exhibits partial alteration.
Medium hard	Rock appears to be relatively hard but small pieces can be broken by considerable hand pressure. Usually exhibits high degree of oxidation.
Hard	Rock cannot be broken by thumb pressure. May exhibit minor oxidation (i.e. some oxide staining or discoloration, etc.).
Very hard	Rock broken with difficulty by hammer. Exhibits no effects from weathering.

0002 081

REFERENCES

(1) Meisler, H. and Longwill, S. M. Ground-Water Resources of Olmstead Air Force Base, Middletown, Pennsylvania, U. S. Geol. Survey Water-Supply Paper 1539-H, 1961, U. S. Govt. Printing Office, Washington, D.C., 34 pp.

(2) Stose, G. W. and Jonas, A. E. Geology and Mineral Resources of the Middletown Quadrangle, Pennsylvlania, U. S. Printing Office, Washington, D. C., 86 pp.

(3) Hall, G. M. Ground Water in Southeastern Pennsylvania, Pennsylvania Geological Survey Bulletin W-2; 1934, 255 pp.

(4) Gray, C. Geologic Map of Pennsylvania, Pennsylvania Geoligical Survey Map #1, 1960

(5) Sexton, T. F. Seismic Survey, Three Mile Island, Pennsylvania Weston Geophysical Engineers, Inc., Weston, Mass., September 9, 1966

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TEST BORINGS

The following SOIL CLASSIFICATION SHEETS and ROCK CLASSIFICATION SHEETS are attached and are a part of Appendix 2A. They are listed in numerical sequence by Drill Hole Number.

Sheet	Drill Hole No.	Sheet	Drill Hole No.
1	1	42	CT-1
2	2	44	CT-2
3	3	46	CT-3
4	4	48	CT-4
5	5	50	CT-5
6	6	52	CT-6
7	7	54	CT-7
8	8	56	CT-8
9	9	58	CT-9
10	10	60	CT-10
11	11	62	CT-11
12	12	64	CT-12
13	13	66	CT-13
14	14	68	CT-14
15	15	70	CT-15
16	16	72	DH-100
17	17	74	DH-101
18	18	76	DH-102
19	19	78	DH-103
20	20	80	DH-104
21	21	82	DH-105
22	A-1	84	DH-106
23	A-2	86	DH-107
24	A-3	88	DH-108
25	B-1	90	DH-109
26	B-1A	92	DH-110
27	B-2	94	DH-111
28	BL-1	96	DH-112
29	BL-2	98	DH-113
30	C-1	100	DH-114
31	C-2	102	DH-115
32	C-5	104	DH-117
33	C-6	106	DH-118
34	C-7	108	DH-119
35	D-1	110	DH-120
36	D-2	113	RB-1 (NX)
37	D-3	115	RB-1 (BX)
38	D-4	117	RB-2 (BX)
39	OW-1	118	RB-2 (NX)
40	OW-2	121	RB-3 (BX)
41	OW-3	122	RB-3
		125	RB-4 (BX)
		126	RB-4 (NX)
		129	RB-5 (BX)
		131	RB-5 (NX)
		133	RB-6
		136	RB-7

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GILBERT ASSOCIATES, INC.

SOIL CLASSIFICATION SHEET

SHEET 1 OF

PROJECT: MET. ED W.O. 4115-05 SITE AREA 3 Mile Island DRILL HOLE NO

CONTRACTOR: F. T. Kitlinski COORDINATES 0+08S ELEVATION 2

DRILLER: W. Carson GWL 0 HRS

CLASSIFIED BY: R. Boyd DATE: 9-6-66 24 HRS

Depth Ft.	Sample No.	SPT Blows/6 In. 6	12	18	In. Rec.	Profile	SOIL DESCRIPTION Density (or Consistency), Color Soil Type - Accessories	U.S.C.S.	qu	Coarse Granular Soils: Range Size / Core Run	Grain Shape / Rec. Core	REMARKS Chemical Comp, Geologic Data, Ground Water, Construction Problems,
1.5	1	1	1	6			Topsoil 0.7					
3.0	2	11	18	23			Med. dense, fine silty sand - tr. gravel	SP		1MM - ½"	Ang.	Dry
4.5	3	8	9	10								
6.0	4	10	9	11								
							6.7					
7.5	5	12	14	18			Dense to very dense, fine to coarse grained silty sand & gravel	SW GP		1MM - 1"	Sub. ang. to sub. rnd.	Moist
9.0	6	21	22	30								
10.5	7	27	29	22								
12.0	8	31	21	26								
13.5	9	28	41	32								
15.0	10	18	29	45								
16.5	11	36	29	35								
18.0	12	29	36	41								
							19.5					Top of Rock
							Med. hard to hard interbedded shaley claystone & shaley siltstone - moderately broken			4.0	3.4	Dip ≈ 45°
										23.5	85%	several 45° bedd slips
										6.0	5.5	few nearly verti joints
										29.5	92%	
							Total Depth 29.5'					

0002 084

GILBERT ASSOCIATES, INC.

SOIL CLASSIFICATION SHEET

ECT: MET. ED W.O. 4115-05 SITE AREA 3 Mile Island

'RACTOR: F. T. Kitlinski COORDINATES 10 + 14 N

LER: W. Carson

SIFIED BY: R. Boyd DATE: 9-6-66

SHEET 1 OF 1

DRILL HOLE NO. 2

ELEVATION 298.8

GWL 0 HRS 19.7

24 HRS

SPT Blows/6 In. 6	12	18	In Rec.	Profile	SOIL DESCRIPTION Density (or Consistency), Color Soil Type - Accessories	U.S.C.S.	gb	Coarse Granular Soils: Range Size / Core Run	Grain Shape / Rec. Core	REMARKS Chemical Comp, Geologic Data, Ground Water, Construction Problems, etc.
					Topsoil 0.8					
1	6	7			Med. dense, fine to med. grained			1MM-	Sub.	
9	6	5			silty sand - some gravel			1"	ang	
7	7	8							to	
8	7	6							sub.	
5	6	7							rnd.	
18	18	31			8.8					
35	32	36			Very dense, fine to coarse, silty	SW		1MM-	Ang. to	
42/.3'					sand & gravel - some boulders	GW		>2"	rnd	
18	36	35								
28	40/.4'							14.4		
O	R	E	D					16.5	0%	Cored Boulders
20	28	36						18.2		
40/.2'										
O	R	E	D					21.0	0%	" "
50/.3'								21.2		
O	R	E	D		23.7			23.7	0%	" " Top of Rock
					Med. hard to hard, interbedded			4.2	4.2	Dip ≃ 45°
O					shaley siltstone & shaley med.					
	R				grained sandstone, moderately			27.9	95%	
		E			broken					
			D					5.8	5.2	
								33.7	89%	
					Total Depth 33.7					

0002 085

GILBERT ASSOCIATES, INC.

SOIL CLASSIFICATION SHEET

SHEET 1 OF

PROJECT: MET. ED W.O. 4115-05 SITE AREA 3 Mile Island DRILL HOLE NO

CONTRACTOR: F. T. Kitlinski COORDINATES 20 + 00 N ELEVATION 29

DRILLER: W. Carson GWL 0 HRS 1

CLASSIFIED BY: R. Boyd DATE: 9-2-66 24 HRS

Depth Ft.	Sample No.	SPT Blows/6 in. 6	12	18	In. Rec.	Profile	SOIL DESCRIPTION Density (or Consistency), Color Soil Type - Accessories	U.S.C.S.	%	Coarse Granular Soils: Range Size / Core Run	Grain Shape / Rec. Core	REMARKS Chemical Comp, Geologic Data, Ground Water, Construction Problems,
							Topsoil 0.7					
1.5	1	1	3	6								
3.0	2	12	14	25			Med. dense, fine silty sand - some gravel	SP GP		1MM - 1"	Sub ang	Dry
4.5	3	31	17	11								
6.0	4	10	11	11								
7.5	5	8	10	9								
9.0	6	14	29	35			8.5					
10.5	7	46	48	40/.2"			Med. dense to dense, fine to coarse grained, silty sand & gravel- some boulders	SW GW		1MM - >2"	Ang to Rnd	Moist samples
12.0	8	37	50/.1"									
13.5	9	14	12	18								
15.0	10	10	16	21								
16.5	11	9	10	11								
18.0	12	10	11	12								
19.5	NO SAMPLE						19.5					
19.6	14	40/.1					Very dense sand & gravel No sample recovered	--		----	----	Cored Boulders
22.9	C	O	R	E	D		22.9			22.4	0%	Top of Rock
	C	O	R	E	D		Medium hard to hard, interbedded shaley claystone & shaley siltstone, moderately broken			2.1 / 25.0	2.0 / 96%	Dip 45°
										7.9	7.4	Few Joints
										32.9	93%	
							Total Depth 32.9					

0002 086

GILBERT ASSOCIATES, INC.

SOIL CLASSIFICATION SHEET

SHEET 1 OF 1

DRILL HOLE NO. 4

ELEVATION 299.9

GWL 0 HRS 19.6 Ft.

24 HRS Hole Caved

ECT: MET. ED W.O. 4115-05 SITE AREA 3 Mile Island

RACTOR: F. T. Kitlinski COORDINATES 30 + 00 N - B 0 + 00

ER: W. Carson

IFIED BY: R. Boyd DATE: 8-30-66

SPT Blows/6 in. (6 12 18)	In. Rec.	Profile	SOIL DESCRIPTION Density (or Consistency), Color Soil Type - Accessories	U.S.C.S.	gr	Coarse Granular Soils: Range Size / Core Run	Grain Shape / Rec. Core	REMARKS Chemical Comp, Geologic Data, Ground Water, Construction Problems, etc.
			Topsoil 0.7					
1 1 2 / 2 3 5 / 6 7 8			Loose to medium dense fine silty sand & gravel - trace clay seams 4.0	SP GP		1MM - 1"		Dry
10 10 17 / 22 25 27 / SAMPLE			Dense to very dense, fine to coarse, silty sand & gravel - some cobbles	SW SP		1" - >2"	Ang Rnd	
16 17 13 / 16 28 44 / SAMPLE / 18 36 39 / SAMPLE / 50 .47			21.4					Samples wet at bottom layer (samples 7 & 8) more coarse material with increasing depth
0 R E	D		Medium hard to hard clayey siltstone, moderately broken (red)			2.4 23.8' / 7.6 / 31.4	2.2 92% / 7.5 / 98%	Few vertical joints pieces up to 1 ft. in length massive unit, no apparent bedding
			Total Depth 31.4'					

0002 087

GILBERT ASSOCIATES, INC.

SOIL CLASSIFICATION SHEET

PROJECT: MET. ED W.O. 4115-05 SITE AREA 3 Mile Island

CONTRACTOR: F. T. Kitlinski COORDINATES 40 + 00 N

DRILLER: W. Carson

CLASSIFIED BY: R. Boyd DATE: 8-31-66

SHEET 1 O

DRILL HOLE NO

ELEVATION

GWL 0 HRS 16.

24 HRS 19.

Depth Ft.	Sample No.	SPT Blows/6 in. 6	12	18	In. Rec.	Profile	SOIL DESCRIPTION Density (or Consistency), Color Soil Type - Accessories	U.S.C.S.	g	Coarse Granular Soils: Range Size / Core Run	Grain Shape / Rec. Core	REMARKS Chemical Comp, Geologic Data, Ground Water, Construction Problems,
							Topsoil 0.7					
1.5	1	1	2	2			Loose sandy silt & gravel, trace organic material 3.0	ML GP		<1MM-½"	Ang	Loam
3.0	2	3	4	3								
4.5	3	8	10	11			Medium dense to dense silty sand & gravel (sand fine to medium - dry) 7.5	GM		1MM - 3MM	Sub Ang	
6.0	4	15	12	18								
7.5	5	23	25	27								
9.0	6	9	8	10			Med. dense silty sand & gravel - wet - sand med. to coarse grained 12.5	SP GP		2MM - 1"	Ang to Sub Rnd	Pebbles covered FeO stains
10.5	7	10	11	10								
12.0	8	10	9	10								
13.5	9	14	25	27			Very dense clayey sand (med.) & gravel - some boulders-some silt	SP GP		2MM 22"	Ang to Rnd	Desiccated
15.3	10	26	40	.3'						14.3		
16.5	C	O	R	E	D					16.5	0%	Cored Boulders
17.1	11	40	30	.2'						17.1		
	C	O	R	E	D		20.4'			--- 20.4	0%	" " Top of Rock
	C	O	R	E	D		Medium hard to hard, red shaley claystone, broken to very broken			2.1	1.2	Dip 45°
										22.5	57%	Vertical jointin quite extensive joints cemented
25										3.6	3.6	
										26.1'	100%	
										4.3	4.3	
30										30.4'	100%	
							Total Depth 30.4'					

0002 088

GILBERT ASSOCIATES, INC.

SOIL CLASSIFICATION SHEET

ECT: MET. ED W.O. 4115-05 SITE AREA 3 Mile Island

RACTOR: F. T. Kitlinski COORDINATES 50 + 00 N

.ER: W. Carson

SIFIED BY: R. Boyd DATE: 9-1-66

SHEET 1 OF 1
DRILL HOLE NO. 6
ELEVATION 295.4
GWL 0 HRS 15.5
24 HRS 16.1

SPT Blows/6 in. (6 / 12 / 18)	In. Rec.	Profile	SOIL DESCRIPTION Density (or Consistency), Color Soil Type - Accessories	U.S.C.S.	Depth	Coarse Granular Soils: Range Size / Core Run	Grain Shape / Rec. Core	REMARKS Chemical Comp, Geologic Data, Ground Water, Construction Problems, etc.
			Topsoil 0.8					
1 3 4 / 5 4 3 / 3 5 5			Loose sandy silt - trace clay & roots 5.0	ML				
17 25 27 / 29 21 28 / 40/.2'			Dense, fine sand & rock frags 7.7	SP GP		1MM - 1" 7.7	Ang	Red sandstone rock fra
0 R E	D		Dense to very dense - silty sand & gravel - some boulders - sand med to coarse contains both gravel & ang. rock frags.	SP GP		1" - >2" 12.2	Sub Rnd Ang 0%	Boulders cored no recovery
19 38 44 / 30/.1'						13.7		
0 R E	D					16.5	0%	Cored boulders
25 19 35 / 50/.4'						18.4		Samples wet
0 R E	D		20.1			20.1'	0%	Cored boulders top of rock
0 R E	D		Medium soft (red) shaley siltstone very broken			5.0 / 25.1'	3.2 / 64%	Mica flecks on parting: rock poorly consolidat can break frags. with fingers
						5.0 / 30.1'	3.3 / 66%	Dip 45°
			Total Depth 30.1'					

0002 089

GILBERT ASSOCIATES, INC.

SOIL CLASSIFICATION SHEET

PROJECT: MET. ED W.O. 4115-05 SITE AREA 3 Mile Island

CONTRACTOR: F. T. Kitlinski COORDINATES 10 + 00 S

DRILLER Smolewicz

CLASSIFIED BY: R. Boyd DATE: 8-30-66

SHEET 1 OF

DRILL HOLE NO

ELEVATION 2

GWL 0 HRS

24 HRS

Depth Ft.	Sample No.	SPT Blows/6 In. 6	12	18	In. Rec.	Profile	SOIL DESCRIPTION Density (or Consistency), Color Soil Type - Accessories	U.S.C.S.	qu	Coarse Granular Soils: Range Size / Core Run	Grain Shape / Rec. Core	REMARKS Chemical Comp, Geologic Date, Ground Water, Construction Problems,
							Topsoil 0.7					
2.0	1	2	5	7			V. stiff clayey silt - some fine sand 2.3	ML				
4.0	2	8	8	8			M. dense fine silty sand-trace organic material 4.4	SP		1MM	Ang	Damp
4.4	3	50/.4'								---	---	
	C						Dense, sand, gravel & sandstone boulders	--		4.6	0.9	Cored from 4.4' 9.0' - no soil recoverei
		O	R	E	D							
9.0							9.0			9.0	19%	
1.0	4	32	38	47			V. dense silty sand & Gravel - some decomposed red shale, trace clay	SW GP		1MM - 2"	Sub rnd to ang	Damp
	NO	SAMPLE										
4.0												
5.2	5	46	59	80/.2'			15.2					
	C						Medium hard (red) shaley clay-stone, broken			5.3	3.5	Dip 45°
		O	R	E	D					20.5	66%	Moderate vertica jointing
										5.0	4.5	
										25.5	90%	
							Total Depth 25.5'					

0002 090

GILBERT ASSOCIATES, INC.

SOIL CLASSIFICATION SHEET

SHEET 1 OF 1

:CT: MET. ED W.O. 4115-05 SITE AREA 3 Mile Island

DRILL HOLE NO. 8

RACTOR: F. T. Kitlinski COORDINATES 20 + 00 S

ELEVATION 287.4

ER: Smolewicz

GWL 0 HRS 4.71

IFIED BY: R. Boyd DATE: 9-1-66

24 HRS

SPT Blows/6 In. 6	12	18	In. Rec.	Profile	SOIL DESCRIPTION Density (or Consistency), Color Soil Name - Accessories		U.S.C.S.	ϕ	Coarse Granular Soils: Range Size / Core Run	Grain Shape / Rec. Core	REMARKS Chemical Comp, Geologic Data, Ground Water, Construction Problems, etc.
					Topsoil	0.7					
2	3	7			Loose sandy silt	1.8	ML				Dry
7	8	8			Very stiff clayey silt - some fine sand - trace rock fragments		ML				Dry to moist
8	7	8				6.5					
8	7	8			Med. Dense - silt - trace sand & rock frags		ML				Damp
7	6	6									
6	5	6									
5	5	7				13.5					
48	85	-			Soft decomposed claystone	15.0	CL		---	---	Top of Rock
0	R	E	D		Medium hard to hard (red) interbedded shaley claystone & shaley siltstone, very broken				5.0	4.4	Extensive vertical jointing
									20.0	88%	
									5.0	5.0	
									25.0	100%	
					Total Depth 25.0						

0002 091

GILBERT ASSOCIATES, INC.

SOIL CLASSIFICATION SHEET

SHEET 1 O

PROJECT: MET. ED W.O. 4115-05 SITE AREA 3 Mile Island DRILL HOLE NO

CONTRACTOR: F. T. Kitlinski COORDINATES 30 + 00 S ELEVATION

DRILLER: W. Carson GWL 0 HRS

CLASSIFIED BY: R. Boyd DATE: 8-26-66 24 HRS

Depth Ft.	Sample No.	SPT Blows/6 In. 6	12	18	In. Rec.	Profile	SOIL DESCRIPTION Density (or Consistency), Color Soil Type - Accessories	U.S.C.S.	gb	Coarse Granular Soils: Range Size / Core Run	Grain Shape / Rec. Core	REMARKS Chemical Comp, Geologic Data, Ground Water, Construction Problems,
							Topsoil 0.6					
1.5	1	1	1	3			Very stiff clayey silt - tr. fine sand & roots	ML				1% - 2% - finely disseminated coal dry
3.0	2	4	5	5								
4.5	3	7	6	11								
6.0	4	12	14	16			6.5					
7.5	5	20	35	44			V. dense silty sand & gravel	SP		1MM - 1"	Ang sub rnd	
9.0	6	20	29	60			9.0	GP				
9.7							Soft decomposed shale 9.7	CL				Samples wet
	7	40/.2'										
	C	O	R	E	D		Medium hard (red) - interbedded silty shale & clayey shale Broken to very broken			7.2	7.2	Fractures irregu some nearly vert ≈ 45° shear face in clayey shale (45° Bedding sl
										16.9	100%	
										2.6	2.6	
										19.7	100%	
							Total Depth 19.7					

0002 092

GILBERT ASSOCIATES, INC.

SOIL CLASSIFICATION SHEET

ECT: MET. ED W.O. 4115-05 SITE AREA 3 Mile Island

RACTOR: F. T. Kitlinski COORDINATES 40 + 00 S

ER: W. Carson

SIFIED BY: R. Boyd DATE: 8-26-66

SHEET 1 OF 1

DRILL HOLE NO. 10

ELEVATION 285.3

GWL 0 HRS 10.3

24 HRS Hole cave

SPT Blows/6 in. (6 12 18)	In. Rec.	Profile	SOIL DESCRIPTION Density (or Consistency), Color Soil Type - Accessories	USCS	ab	Coarse Granular Soils: Range Size (Core Run)	Grain Shape (Rec. Core)	REMARKS Chemical Comp, Geologic Data, Ground Water, Construction Problems, etc.
			Topsoil 0.6					
1 2 7 / 11 15 17 / 20 21 22 / 21 28 25			Very stiff clayey silt - trace of fine sand - trace roots & organic material	ML				
			5.9					
18 31 40 / 40 R E	D		Very dense silty sand & rock fragments 8.7'	SP GP		1MM-2" / 7.6 / 8.7	Sub.rnd to ang / 0%	Coarse sand & boulder fragments - cored Top of Rock
			Medium hard to hard interbedded clayey shale & silty shale			3.5	3.0	
0 R E	D					12.2	86%	Bedding 45°
						6.5	6.5	
						18.7	100%	
			Total Depth 18.7'					

0002 093

GILBERT ASSOCIATES, INC.

SOIL CLASSIFICATION SHEET

PROJECT: MET. ED W.O. 4115-05 SITE AREA 3 Mile Island

CONTRACTOR: F. T. Kitlinski COORDINATES 50 + 00 S

DRILLER: W. Carson

CLASSIFIED BY: R. Boyd DATE: 8-26-66

SHEET 1 O

DRILL HOLE N

ELEVATION

GWL 0 HRS

24 HRS

Depth Ft.	Sample No.	SPT Blows/6 In. 6	12	18	In. Rec.	Profile	SOIL DESCRIPTION Density (or Consistency), Color Soil Type - Accessories	U.S.C.S.	qu	Coarse Granular Soils: Range Size / Core Run	Grain Shape / Rec. Core	REMARKS Chemical Comp, Geologic Data, Ground Water, Construction Problems
							Topsoil 0.8					
1.5	1	1	2	8			Very stiff clayey silt - trace very					
3.0	2	13	10	12			fine sand & organic material	ML				Damp
4.5	3	15	11	14			5.6					
6.0	4	17	18	21			Dense clayey sand & gravel 6.5	SP GP		2MM -	Sub Ang	V. soft clay (r small gravel & rock frags Top
7.5	5	26	16	25								
8.7	6	27	40	.2			Soft decomposed shale 8.2	CL				
	C						Interbedded med. hard claystone &			3.0	1.9	
		O					hard siltstone (red)			11.2	63%	
			R				Claystone - v. broken			2.6	2.3	Siltstone
				E			Siltstone - moderately broken			13.8	89%	fairly massive
					D		(3" 18" pieces)					with ≈45
										4.4	4.4	bedding
										18.2	100%	
							Total Depth 18.2'					

0002 094

GILBERT ASSOCIATES, INC.

SOIL CLASSIFICATION SHEET

ECT: MET. ED W.O. 4115-05 SITE AREA 3 Mile Island

RACTOR: F. T. Kitlinski COORDINATES D 2 + 00 W

.ER: Smolewicz

SIFIED BY: R. Boyd DATE: 9-6-66

SHEET 1 OF 1

DRILL HOLE NO. 12

ELEVATION 299.1

GWL 0 HRS 11.2

24 HRS 15.6

SPT Blows/6 In. 6	12	18	In. Rec.	Profile	SOIL DESCRIPTION Density (or Consistency), Color Soil Type - Accessories	U.S.C.S.	g	Coarse Granular Soils Range Size / Core Run	Grain Shape / Rec. Core	REMARKS Chemical Comp, Geologic Data, Ground Water, Construction Problems, etc.
					Topsoil 0.6					
2	5	6			Med. dense, fine grained, silty sand, some gravel	SP GP		<1MM ½"	Ang	Dry
12	10	14			5.0					
11	13	10			Dense, silty, fine to coarse grained, sand & gravel - trace coal	SW GP		1MM - 2"	Sub ang to Sub rnd	Moist
18	17	24								
21	19	23								
16	19	23			12.5					
21	27	23			Very dense fine to coarse grained sand & gravel - some cobbles - trace silt	SW GP		1MM - 2"	Sub ang - Sub rnd	Moist
26	41	37								
37	46	43								
0 SAMPLE										
85	.3				Soft decomposed siltstone 20.6 21.3					Top of Rock
0	R	E	D		Med. hard to hard, interbedded shaley claystone & shaley siltstone, broke			5.2	2.6	≈ 1" to 3" pieces moderate high angle jointing
								26.5'	50%	
								5.0	3.0	Bedding dips 45°
								31.5	60%	
					Total Depth 31.5'					

0002 095

GILBERT ASSOCIATES, INC.

SOIL CLASSIFICATION SHEET

PROJECT: MET. ED W.O. 4115-05 SITE AREA 3 Mile Island

CONTRACTOR: F. T. Kitlinski COORDINATES C 6 + 00 W = F 8 + 00 N

DRILLER: Smolewicz

CLASSIFIED BY: R. Boyd DATE: 8-31-66

SHEET 1 C

DRILL HOLE N

ELEVATION

GWL 0 HRS

24 HRS

Depth Ft.	Sample No.	SPT Blows/6 In. 6	12	18	In. Rec.	Profile	SOIL DESCRIPTION Density (or Consistency), Color Soil Type - Accessories	U.S.C.S.	gs	Coarse Granular Soils: Range Size / Core Run	Grain Shape / Rec. Core	REMARKS Chemical Comp, Geologic Data, Ground Water, Construction Problems
							Topsoil 0.6					
2.0	1	2	5	5			Med. dense sandy silt - some gravel 3.4'	ML		---	---	
4.0	2	9	8	9			Med. dense fine silty sand & gravel 6.2'	SP GP		1MM-2"	Sub ang Sub rnd	Dry
6.0	3	7	7	5								
8.0	4	17	13	9			Medium dense to very dense, fine to coarse, silty sand & gravel - some cobbles, trace clay	SW GP		1MM-72"	Sub rnd - ang	Damp to moist
10.0	5	18	23	27								
12.0	6	23	28	28								
	NO SAMPLE											
15.0												
15.7	7	56	90/.2'				15.7					
	C	O	R	E	D		V. dense, sand, gravel, cobbles & boulders 21.0	--		5.3 / 21.0'	0.5 / 9%	Cored 15.7' 21. poor recovery no soil recovere Top of Rock
							Medium hard to hard interbedded shaley claystone & siltstone - moderately broken			5.0 / 26.0'	2.4 / 48%	Dip ≈ 45° Few vertical joi
										5.0 / 31.0'	4.7 / 94%	
							Total Depth 31.0					

0002 096

GILBERT ASSOCIATES, INC.

SOIL CLASSIFICATION SHEET

ECT: MET. ED W.O. 4115-05 SITE AREA 3 Mile Island

RACTOR: F. T. Kitlinski COORDINATES B 6 + 00 W = F 4 + 00 N

ER: Smolewicz

IFIED BY: R. Boyd DATE: 8-30-66

SHEET 1 OF 1

DRILL HOLE NO. 14

ELEVATION 299.8

GWL 0 HRS 7.0

24 HRS 15.3

SPT Blows/6 in. 6	12	18	In. Rec.	Profile	SOIL DESCRIPTION Density (or Consistency), Color Soil Type - Accessories	U.S.C.S.	g	Coarse Granular Soils: Range Size / Core Run	Grain Shape / Rec. Core	REMARKS Chemical Comp, Geologic Data, Ground Water, Construction Problems, etc.
					Topsoil 0.7					
1	2	2			Med. dense, fine to medium, silty sand & gravel	SP		1MM	Sub	
5	6	11			4.2	SP		2"	Ang Sub	Dry
11	16	15			Dense to very dense, fine to coarse grained silty sand & gravel - some cobbles & boulders - trace of clay	SW GP		1MM-2"	Ang.-rnd	All samples moist
17	15	18								
12	15	9								
20	18	23								
18	13	16								
16	24	26								
37	34	39								
SAMPLE					20.6					
54	85	.2'			Soft decomposed claystone 21.7	CL				Top of Rock
0	R	E	D		Medium hard to hard interbedded shaley siltstone & shaley claystone, broken to 24.5			2.8 / 24.5'	1.9 / 68%	Dip 45° Little vertical jointi
					Moderately broken below			2.5 / 27.0'	2.3 / 92%	
								5.0 / 32.0'	4.0 / 80%	
					Total Depth 32'					

0002 097

GILBERT ASSOCIATES, INC.

SOIL CLASSIFICATION SHEET

SHEET 1 OF

PROJECT: MET. ED W.O. 4115-05 SITE AREA 3 Mile Island

CONTRACTOR: F. T. Kitlinski COORDINATES A G + 00 W = F 0 + 00

DRILLER: Smolewicz

CLASSIFIED BY: R. Boyd DATE: 8-31-66

DRILL HOLE NO

ELEVATION 3

GWL 0 HRS 1

24 HRS

Depth Ft.	Sample No.	SPT Blows/6 in. 6	12	18	In. Rec.	Profile	SOIL DESCRIPTION Density (or Consistency), Color Soil Type - Accessories	U.S.C.S.	qu	Coarse Granular Soils: Range Size / Core Run	Grain Shape / Rec. Core	REMARKS Chemical Comp, Geologic Data, Ground Water, Construction Problems,
							Topsoil 0.7					
2.0	1	2	5	13			Med. dense, sandy silt - some gravel 4.5'	ML		1"	Rnd	Dry
4.0	2	10	16	18								
6.0	3	18	23	27			Medium dense to v. dense, fine to coarse grained silty sand & gravel, some cobbles, tr. clay	SW GP				Moist to Damp
8.0	4	20	22	26								
10.0	5	23	20	17								
12.0	6	14	11	7								
14.0	7	7	8	7								
16.0	8	9	8	16						1" - >2"	Sub rnd to ang	
18.0	9	31	27	35								Samples wet at b unit
	NO SAMPLE											
21.0							21.4					
23.3	10	40	47	75/.3'			Soft decomposed siltstone 22.3	CL				Top of Rock
	C	O	R	E	D		Medium hard to hard (red) siltstone, broken to moderately broken			2.9 / 25.2'	1.5 / 52%	Massive unit - n bedding - appare recemented irre jointing
										2.8 / 28.0'	1.5 / 54%	
										4.5	3.5	
										32.5'	78%	
							Total Depth 32.5'					

0002 098

GILBERT ASSOCIATES, INC.

SOIL CLASSIFICATION SHEET

ECT: MET. ED W.O. 4115-05 SITE AREA 3 Mile Island

RACTOR: F. T. Kitlinski COORDINATES D 6 + 00 E

ER: Smolewicz

IFIED BY: R. Boyd DATE: 9-6-66

SHEET 1 OF 1

DRILL HOLE NO. 16

ELEVATION 295.0

GWL 0 HRS 8

24 HRS 12.4

SPT Blows/6 In. 6	12	18	In Rec.	Profile	SOIL DESCRIPTION Density (or Consistency), Color Soil Type - Accessories	U.S.C.S.	qu	Coarse Granular Soils: Range Size / Core Run	Grain Shape / Rec. Core	REMARKS Chemical Comp, Geologic Data, Ground Water, Construction Problems, etc.
					Topsoil 0.7					
2	5	5			Med. dense, fine silty sand - tr. organic	SP		1-2	Sub	
8	8	8			4.3			MM	Ang	Stratified
13	19	22			Very dense, med to coarse sand & gravel, some boulders	SP GW		1MM - 2"	Ang to Rnd	
31	46	38								
28	36	34						10.2		
O	R	E	D					3.3	2.1	Hard sandstone boulder 10.2 to 13.5' - blasted with dynamite
								13.5	63%	
O	R	E	D					3.0	0.2	Cored boulders
								16.0	6%	
37	34	42								
SAMPLE										
					20.3					Top of Rock
O	R	E	D		Soft to medium hard shaley claystone, very broken			3.7	0.6	Max. size of core 2"
								24.0	16%	
								3.5	0.7	
								27.5	20%	
								3.0	1.2	
								30.5	40%	
					Total Depth 30.5'					

0002 099

GILBERT ASSOCIATES, INC.

SOIL CLASSIFICATION SHEET

PROJECT: MET. ED W.O. 4115-05 SITE AREA 3 Mile Island

CONTRACTOR: F. T. Kitlinski COORDINATES C 4 + 00 E = J 0 + 00

DRILLER: W. Carson

CLASSIFIED BY: R. Boyd DATE: 9-1-66

SHEET 1 OF

DRILL HOLE NO

ELEVATION

GWL 0 HRS

24 HRS

Depth Ft.	Sample No.	SPT Blows/6 in. 6	12	18	In. Rec.	Profile	SOIL DESCRIPTION Density (or Consistency), Color Soil Type - Accessories	U.S.C.S.	qu	Coarse Granular Soils: Range Size / Core Run	Grain Shape / Rec. Core	REMARKS Chemical Comp, Geologic Data, Ground Water, Construction Problems,
							Topsoil 0.7					
1.5	1	1	2	8			Dense to very dense silty sand & gravel - some cobbles	SW GP		1MM - >2"	Ang to Rnd	
3.0	2	12	18	14								
4.5	3	14	16	17								
6.0	4	14	12	18								
7.5	5	18	19	31								
9.0	6	14	16	21			9.1			9.1		
9.1	7	40/.1'					Very dense, fine to medium grained sand, gravel, & boulders	SP GW		1MM - >2"	Ang to Rnd	Cored boulders - recovery
13.0	C	O	R	E	D					13.0	0%	
13.9	8	20	60/.4'							13.9		
17.0	C	O	R	E	D					---	---	" "
17.8	9	39	39/.1'							17.0	0%	
19.6	C	O	R	E	D		19.6			--- 19.6	--- 0%	" " Top of Rock
	C	O	R	E	D		Medium hard to hard interbedded shaley siltstone & claystone - very broken to moderately broken			6.0	5.2	
										25.6'	87%	
										4.0	3.4	
										29.6'	97%	
							Total Depth 29.6'					

0002 100

GILBERT ASSOCIATES, INC.

SOIL CLASSIFICATION SHEET

SHEET 1 OF 1

ECT: MET. ED W.O. 4115-05 SITE AREA 3 Mile Island

DRILL HOLE NO. 18

RACTOR: F. T. Kitlinski COORDINATES B 4 + 00 E

ELEVATION 297.4

ER: W.Carson

GWL 0 HRS 11.7

IFIED BY: R. Boyd DATE: 9-1-66

24 HRS Hole Cave

SPT Blows/6 in. 6	12	18	In. Rec.	Profile	SOIL DESCRIPTION Density (or Consistency), Color Soil Type - Accessories	U.S.C.S.	q	Coarse Granular Soils: Range Size / Core Run	Grain Shape / Rec. Core	REMARKS Chemical Comp, Geologic Data, Ground Water, Construction Problems, etc.
					Topsoil 0.5					
2	10	9			Dense to very dense, fine silty	SP		1MM-	Ang	
10	25	24			sand & gravel	GP		1"	to	Dry
12	18	27							Sub	
14	26	31							Rnd	
					6.0					
26	20	28			Dense to very dense, fine to	SW		1MM -	Ang	
39	18	26			coarse grained silty sand &	--		>2"	to	
27	31	38			gravel - some cobbles & boulders	GW			Rnd	Moist
					trace of clay					
40	44	46								
30	38	43								
18	31	29								
20	36	41								
					16.9			16.9		
60	.4'							--		Cored boulders
0	R	E	D		Sand, gravel & boulders (no			19.0	0%	no recovery
40	.2'				samples recovered)			19.2		" "
0	R	E	D					20.7	0%	Top of Rock
					20.7					
					Medium hard to hard interbedded					
0					shaley claystone & shaley silt-					
	R				stone			8.1	8.0	
		E			moderately broken					
			D							
								28.8'	98%	
								1.9	1.6	
								30.7'	84%	
					Total Depth 30.7					

0002 101

GAI - 227 12/5

GILBERT ASSOCIATES, INC.

SOIL CLASSIFICATION SHEET

PROJECT: MET. ED W.O. 4115-05 SITE AREA 3 Mile Island

CONTRACTOR: F. T. Kitlinski COORDINATES A 4 + 00 E

DRILLER: W. Carson

CLASSIFIED BY: R. Boyd DATE: 9-6-66

SHEET 1 C

DRILL HOLE N

ELEVATION

GWL 0 HRS

24 HRS

Depth Ft.	Sample No.	SPT Blows/6 In. 6	12	18	In. Rec.	Profile	SOIL DESCRIPTION Density (or Consistency), Color Soil Type - Accessories	U.S.C.S.	g	Coarse Granular Soils Range Size / Core Run	Grain Shape / Rec. Core	REMARKS Chemical Comp, Geologic Data, Ground Water, Construction Problems
							Topsoil 0.6					
1.5	1	1	3	6			Med. dense to dense fine silty sand & gravel - some cobbles	SP GP				Dry
3.0	2	7	9	14								
4.5	3	14	20	17								
6.0	4	16	21	18								
7.5	5	17	12	16								
9.0	6	14	12	7			8.3					
10.5	7	5	5	4			Loose, fine to med. grained silty sand & gravel	SP GP		1MM - >2"	Sub ang to sub rnd	
12.0	8	5	6	7								
13.5	9	7	20	31			12.5					Moist
15.0	10	50/.4'					Very dense, fine to med. grained silty sand & gravel - some boulders	SP GW		13.9 1"-2"	Ang-Rnd	Cored Boulders
16.5	C	O	R	E	D					16.5	0%	
17.4	11	20	30	/.1'						17.4	0%	
18.0	C	O	R	E	D					18.0		" "
18.6	12	36	40	/.1'						18.6		
	C	O	R	E	D					---	---	" "
23.7							23.7			23.7	0%	Top of Rock
	C	O	R	E	D		Medium hard to hard, interbedded shaley siltstone & shaley fine grained sandstone - broken			5.0	1.4	Ax core
										28.7	28%	
										2.0	1.8	
										30.6	90%	
										3.0	2.9	
										33.7	97%	

0002 102

GILBERT ASSOCIATES, INC.

SOIL CLASSIFICATION SHEET

SHEET 1 OF 1

:CT: MET. ED W.O. 4115-05 SITE AREA 3 Mile Island DRILL HOLE NO. 20

RACTOR: F. T. Kitlinski COORDINATES E 6 + 00 E ELEVATION 284.6

:ER: W. Carson GWL 0 HRS 12.6

:IFIED BY: R. Boyd DATE: 8-31-66 24 HRS Hole Caved

SPT Blows/6 In. 6	12	18	In. Rec.	Profile	SOIL DESCRIPTION Density (or Consistency), Color Soil Type - Accessories	U.S.C.S.	g	Coarse Granular Soils Range Size / Core Run	Grain Shape / Rec. Core	REMARKS Chemical Comp, Geologic Data, Ground Water, Construction Problems, etc.
					Topsoil 0.5					
1	2	3			Loose to med. dense sandy silt -					
5	7	11			tr. clay & roots - dry	ML				
15	16	17			5.0					
10	7	6			Med. dense sandy silt - trace					
4	5	8			organic material & gravel moist	ML		----	----	
3	5	12								
18	25	60			10.5					Top of Rock
								4.0	3.8	
					Soft to hard interbedded siltstone					
0					& claystone - very broken &			14.5'	95%	
	R				weathered to 16.0' - competant &			1.2	1.2	
		E			unbroken to 18.0' - very broken			15.7'	100%	
			D		below 18.0'					
								4.8	4.8	
								20.5'	100%	
					Total Depth 20.5'					

0002 103

GILBERT ASSOCIATES, INC.

SOIL CLASSIFICATION SHEET

PROJECT: MET. ED W.O. 4115-05 SITE AREA 3 Mile Island

CONTRACTOR: F. T. Kitlinski COORDINATES B 8 + 93

DRILLER: W. Carson

CLASSIFIED BY: R. Boyd DATE: 9-6-66

SHEET 1 OF

DRILL HOLE NO

ELEVATION 2

GWL 0 HRS 13

24 HRS

Depth Ft.	Sample No.	SPT Blows/6 in. 6	12	18	In. Rec.	Profile	SOIL DESCRIPTION Density (or Consistency), Color Soil Type - Accessories	U.S.C.S.		Coarse Granular Soils Range Size / Core Run	Grain Shape / Rec. Core	REMARKS Chemical Comp, Geologic Data, Ground Water, Construction Problems.
							Topsoil 0.5					
2.5	1	1	7	7			Medium dense, sandy silt - tr.					
3.0	2	8	10	8			clay seams	ML		1MM <	Ang	Dry
4.5	3	10	9	9								
6.0	4	13	14	20								
7.5	5	10	14	13			7.5					
9.0	6	8	7	5			Loose to med. dense, fine silty					
							sand-tr. organic mat.					
9.5	7	4	4	4			10.5	SP		1MM	Ang	Moist
12.0	8	14	21	20			Dense to very dense fine to coarse	SW		1MM -	Sub	
13.5	9	18	21	19			silty sand - some gravel - tr.	GW		>2"	ang	
15.0	10	29	36	19			boulders & cobbles				to	Samples Wet
16.5	11	20	38	41							Sub	
											Rnd	
17.5	NO	SAMPLE					17.5					
18.2	12	20	30	7.2'			Soft decomposed siltstone 18.2			---	---	Top of Rock
20										3.3	3.0	
							Medium hard to hard interbedded					
							shaley claystone & shaley silt=			21.5	91%	Bedding ≈ 45°
							stone, broken to moderately			2.7	2.7	Well developed ve
							broken			24.2	100%	stained surfaces
25.0												
										6.6	6.6	
30.0												
										30.8	100%	
										4.6	4.6	
35.0												
										35.4	100%	
										2.6	2.4	
										38.0	92%	
40.0										5.2	5.2	
										43.2	100%	
							Total Depth 43.2'					

0002 104

GILBERT ASSOCIATES, INC.

SOIL CLASSIFICATION SHEET

PROJECT: 3 Mile Island W.O. 4192.00 SITE AREA Plant

CONTRACTOR: Kitlinski COORDINATES A-5+85 W

DRILLER: Kubitsky

CLASSIFIED BY: Kubitsky DATE: 1-26-67

SHEET 1 O

DRILL HOLE N

ELEVATION

GWL 0 HRS

24 HRS

Depth Ft.	Sample No.	SPT Blows/ 6 In. (6 12 18)	In. Rec.	Profile	SOIL DESCRIPTION Density (or Consistency), Color Soil Type - Accessories	U.S.C.S.	g	Coarse Granular Soils: Range Size / Grain Shape	Core / Rec.	Run / Core	REMARKS Chemical Comp, Geologic Date, Ground Water, Construction Problems,
0.0					0.0						
					0.8 Brown Top soil						
					Brown Silty Sand w/ multi-colored Gravel & Rock Frags.						No Sampling Drillers Classification
5.0											
10.0											
					14.5						
15.0					Brn. Silty Sand w/ multi-colored Rock Frags & Gravel & w/ some Bldrs.						
20.0											
					21.0						
					Red Shale						
					21.5 T. D.						

GAI-

0002 105

GILBERT ASSOCIATES, INC.

SOIL CLASSIFICATION SHEET

ECT: 3 Mile Island W.O. 4192.00 SITE AREA Plant

RACTOR: Kitlinski COORDINATES 26+00 N

.ER: Kubitsky

SIFIED BY: W. S. DATE: 1-31-67

SHEET 1 OF 1

DRILL HOLE NO. A-2

ELEVATION 300.6

GWL 0 HRS 7.3

72 HRS 17.9

SPT Blows/6 in. 6	12	18	In. Rec.	Profile	SOIL DESCRIPTION Density (or Consistency), Color Soil Type - Accessories	U.S.C.S.	%	Coarse Granular Soils: Range Size / Core Run	Grain Shape / Rec. Core	REMARKS Chemical Comp, Geologic Date, Ground Water, Construction Problems, etc.
					0.0					
					0.8 Top soil very loose					
1	1	2			Med. Dense Brown, Sand & Gravel Silt, TR Organic Particles moist to dry	GM		3/4"	Sub Ang to Rdd	½ Sand & Gravel 10% - Silt
2	2	3								
4	4	5								
4	6	5			6.0					
5	7	9			Med Dense Brown Sand & Gravel, TR Silt, TR decomposed coaly particles. dry	GP		1"	Sub Ang to Rdd	Silt less than 5% Relatively clean 7.5. Gravel composed of Red Shale, Siltstone Sandstone, Grey dolomitic, occassional Qtz & chert pebbles
5	5	8								
5	7	6								
6	9	9								
9	11	13			13.5					
10	10	14			Brown Sand & Gravel; Some to TR Silt & Clay med Dense to Dense Dry	GM to GP				15% + Silt & Clay - 13.5 to 14.0 Clay mostly from decomposed shale pebbles
11	15	20			16.5 chgs. to wet at 15.0					
1L	LE	D			Boulders & Cobbles 18.0					less permeable.
14	18	25								less than 5% Silt & Clay 14.0 to 15.0
35	50				No Recovery 19.5-20.5					5% + Silt & Clay below 15.0'
					22.0					
1L	LE	D			Red Shale					
					22.5 T. D.					

0002 106

GAI - 227 12/6

GILBERT ASSOCIATES, INC.

SOIL CLASSIFICATION SHEET

SHEET 1 C

PROJECT: 3 Mile Island W.O. 4192.00 SITE AREA Plant Site

DRILL HOLE N

CONTRACTOR: Kitlinski COORDINATES A 7+00sE

ELEVATION

DRILLER: Kubitsky

GWL 0 HRS

CLASSIFIED BY: W.S. DATE: 1-31-67

24 HRS

Depth Ft.	Sample No.	SPT Blows/6 in. 6	12	18	In. Rec.	Profile	SOIL DESCRIPTION Density (or Consistency), Color Soil Type - Accessories	U.S.C.S.	φ	Coarse Granular Soils: Range Size / Core Run	Grain Shape / Rec. Core	REMARKS Chemical Comp, Geologic Data, Ground Water, Construction Problems
0.0							0.0					
							0.9 Top Soil					
	1	1	3	3								
	2	2	2	3			Brown, silt, tr. clay Some fine sand moist	ML				
	3	4	7	10			4.5					
5.0							M. Dense Brown silt & fine sand					
	4	10	8	8			6.0 moist	ML				
							Dense Brown fine to cse. sand & gravel, tr. silt -dry tr. clay, tr. organic			Max. 1/2"	Sub Ang to Rdd.	Less than 10%
	5	12	17	28								
	6	16	17	20				GM				Silt & clay in to 10%+ below
10.0	7	21	18	16			10.5					
	8	16	14	15			Dense Brown fine to cse. sand & gravel tr. of silt & clay 11.5 wet	GP				High % of qtz. & sand grains
	9	14	13	9			Brown fine to cse. sand & gravel, tr. silt & clay - wet	GP				Lenses of clea sand
15.0	10	6	5	12			Med. dense to 15.0 - Dense below 15.0					
	11	20	20	20								
	12	17	23	90			Much decomposed red shale 18.0 16.5 to 18.0					
	DR	IL	LE	D			Red Shale					
20.0							20.5					
							T. D.					

0002 107

GAI

GILBERT ASSOCIATES, INC.

SOIL CLASSIFICATION SHEET

PROJECT: 3 mile island W.O. 4192.00 SITE AREA Plant

CONTRACTOR: Kitlinski COORDINATES B-3+ 00W

DRILLER: Kubitski

CLASSIFIED BY: W.S. DATE: 1-18-67

SHEET 1 C

DRILL HOLE N

ELEVATION

GWL 0 HRS

24 HRS

Depth Ft.	Sample No.	SPT Blows/6 In. 6	12	18	In. Rec.	Profile	SOIL DESCRIPTION Density (or Consistency), Color Soil Type - Accessories	U.S.C.S.	qu	Coarse Granular Soils: Range Size / Core Run	Grain Shape / Rec. Core	REMARKS Chemical Comp, Geologic Data, Ground Water, Construction Problems
00							Loose, Brown, Silt, Sand & Gravel 1.0 Topsoil Moist					
	1	1	2	3			Med. Dense, Brown Fine to Med. Sand & Gravel, Tr. Silt	SP & GP		3/4"	Sub Ang to Rdd	Less Than 2% to 4.5
	2	3	4	5								5% silt to 7. Fairly Clean Permeable
	3	10	5	6								
5.0	4	5	7	7								
	5	9	7	5			7.5					
	6	4	5	5			Med. Dense - Fine to Coarse Sand, Some Gravel, TR Coal ptcles.	SP		"	"	70% Sand Fairly Clean & Permeable
10.0	7	5	5	6			10.5 Moist to Dry					
	8	7	5	7			Med. Dense, Fine to CSE Sand & Gravel 12.0 Dry	SP & GP				1/2 1/2 Sand &
	9	5	8	10			Med. Dense, Fine to CSE Sand & Gravel, Tr. Silt; Tr. Decomposed coal 13.5 Moist	SP & GP				2% ± Silt
15.0	10	12	14	30			Dense - Fine to CSE Sand & Gravel TR. Silt & Clay 15.0 10% Moist	GM		"	"	Less permeable below 13.5
	D R I L L E D						16.0 Boulder & Cobble					
	11	8	10	15			Med. Dense, Fine to CSE. Sand & Gravel, Some Silt & Clay	GM				10 to 20% Silt & Total
	12	30	25	21			19.0 Moist					
20.0	13	15	21	30			V. Dense, Fine to CSE Sand & Gravel (1" Layer of fine sand-clean) Tr. Coal TR. Silt 5%± 21.1 Moist	GM		"	"	
	D R I L L E D						Red Shale 21.3					

0002 108

GAI-

GILBERT ASSOCIATES, INC.

SOIL CLASSIFICATION SHEET

ECT: 3 Mile Isle W.O. 4192.00 SITE AREA Plant Site

RACTOR: Kitlinski COORDINATES

.ER: Kubitsky

SIFIED BY: DATE: 1-19-67

SHEET 1 OF 1

DRILL HOLE NO. B-1A

ELEVATION 300.3

GWL 0 HRS 16.5

24 HRS 18.2

SPT Blows/6 in. (6 12 18)	In. Rec.	Profile	SOIL DESCRIPTION Density (or Consistency), Color Soil Type - Accessories	U.S.C.S.	qu	Coarse Granular Soils: Range Size / Grain Shape	Core / Rec.	Run / Core	REMARKS Chemical Comp, Geologic Data, Ground Water, Construction Problems, etc.
			0.0						
			0.8 Top Soil						
			Fine & Med. Sand & Gravel						No Sampling in hole. Classification from drillers logs.
			13.0						
			Fine & Med. Sand & Gravel, Cobbles & Bldrs.						
			21.6						
			22.0 Red Shale						

0002 109

GAI - 227 12/6

GILBERT ASSOCIATES, INC.

SOIL CLASSIFICATION SHEET

PROJECT: 3 Mile Isle W.O. 4102.0 SITE AREA Plant Site

CONTRACTOR: Kitlinski COORDINATES B-3+85 E

DRILLER: Kubitski

CLASSIFIED BY: DATE: 1-20-67

SHEET A O

DRILL HOLE N

ELEVATION

GWL 0 HRS

24 HRS

Depth Ft.	Sample No.	SPT Blows/6 in. 6	12	18	In. Rec.	Profile	SOIL DESCRIPTION Density (or Consistency), Color Soil Type - Accessories	U.S.C.S.	ø	Coarse Granular Soils: Range Size / Core Run	Grain Shape / Rec. Core	REMARKS Chemical Comp, Geologic Data, Ground Water, Construction Problems
0.0							0.0					
							0.7 Top soil					
							Multi-colored Silty Sand, Gravel, and Cobbles					No Sampling hole. Classification fr Drillers Lo
							8.0					
10.0							Brown Silty Sand w/multi colored Gravel, Cobbles & Bldrs.					
15.0												
20.0							20.5					
							21.0 Red Shale					

0002 110

GAI-

GILBERT ASSOCIATES, INC.

SOIL CLASSIFICATION SHEET

PROJECT: 3 Mile Island W.O. 4192 SITE AREA Plant Site

CONTRACTOR: Kitlinski COORDINATES 37+00 N

DRILLER: Boyer

CLASSIFIED BY: W.S. DATE: 1-11-67

SHEET 1 O

DRILL HOLE NO

ELEVATION

GWL 0 HRS

192 14 HRS

Depth Ft.	Sample No.	SPT Blows/6 in. 6	12	18	In. Rec.	Profile	SOIL DESCRIPTION Density (or Consistency), Color Soil Type - Accessories	U.S.C.S.	ρd	Coarse Granular Soils Range Size / Core Run	Grain Shape / Rec. Core	REMARKS Chemical Comp, Geologic Date, Ground Water, Construction Problems,
0.0							0.0 V. loose brown silty sand & gravel 0.8 Topsoil wet					Started 1-10-67
	1	1	1	1			Loose gravel & sand (fine to med.) some silt & clay - moist	CC		Max. 1"	Sub.Ang to Round & Flat	Fluvial Moder Permc 40% Gravel 40% Sand 20% Silt & clay
	2	1	3	6								
	3	3	4	6			4.5					
5.0	4	11	13	16			Med. dense-brown, fine to CGE sand, some gravel, Tr. silt - dry 6.0	GM		Max. 3/4"	Sub.Rd to Rdd	75% Sand 20% Gravel 5% Silt
	5	12	9	10			Med. dense - brown, fine to CGE sand & gravel - dry					½ Sand ½ Gravel less than 2% si
	6	9	13	15			9.0					
10.0	7	21	20	16			Dense - brown, fine to CGE sand & gravel, TR silt - some black organic dry 10.5					½ & ½ sand & gr 10% silt
	8	18	23	43			V. dense, brown, fine to CGE sand some gravel, some silt, moist					less per below 10 60% sand 30% gravel 10% silt
	9	20	40	100			13.2					
15.0	C	O	R	E	D		Red J.J. Bldr. & cobbles 15.5					
	10	40	51	47			V. dense, brown, fine to CGE sand & gravel, some silt, moist Chgs. to wet at 17.0'					60% sand 30% gravel 10% silt
	11	47	43	48								
	12	48	50	56								
20.0	13	100	02				20.8					
	DR	IL	LE	D			21.8 Boulder Top of rock 21.8					
	DR	IL	LE	D			22.5 Red silty shale T.O.					

GAI -

0002 111

GILBERT ASSOCIATES, INC.

SOIL CLASSIFICATION SHEET

ECT: 3 Mile Island W.O. 4192.0 SITE AREA Plant Site

RACTOR: Kitlinski COORDINATES 35+50 N

ER: Boyer

IFIED BY: W.S. DATE: 1-12-67

SHEET 1 OF 1

DRILL HOLE NO. BL-2

ELEVATION 298.70

GWL 0 HRS 17.3

72 ~~24~~ HRS 16.9

SPT Blows/6 in. (6 / 12 / 18)	In. Rec.	Profile	SOIL DESCRIPTION Density (or Consistency), Color Soil Type - Accessories	U.S.C.S.	∇	Coarse Granular Soils: Range Size / Core Run	Grain Shape / Rec. Core	REMARKS Chemical Comp, Geologic Data, Ground Water, Construction Problems, etc.
			0.0					
1 2 2			0.8 Loose-Brn. Silty Sandy Top-soil - Some Gravel Wet					Started 1-12-67
7 9 13			Med. Dense-Fine to Coarse Sand & Gravel - Tr. of Silt - Dry - Brown			to	Sub.	1/2 and 1/2 Sand & Gravel Less Than 5% Silt. Fairly Clean and Permeabl
12 9 7			Tr. Organic	GW		3/4"	Ang. to Rd.	
12 14 17			6.0					Fluvial
21 19 19			Dense, Brown, Fine to Cse. Sand & Gravel, Tr. Silt Moist			to	Sub. Ang.	Less than 10% Silt
			Tr.Coaly Ptcles. 7.5 to 9.0'	GM		3/4"	to Rdd.	
			9.0					
19 14 13			9.5 Med. Dense, Med. Sand w/Tr. Organic	SP				(100% Med.) Clean Sa
11 10 10			10.5 Dense, Fine to Cse. Sand, Some Gravel, Tr.Silt, Tr.Organic Moist	SM				70% Sand, 28% Grav 2% Silt, Est.
9 14 26			Dense to V.Dense, Sand and Gravel, Some Silt, Tr. of Clay, Much Decomposed Red Shale Some Organic Ptcles., Moist					Less Permeable Below 10.5' 1/2 & 1/2 Sand and Gravel, 10% + Silt and Clay. (Below 13. 10 to 20% Clay and Silt)
20 28 32								
27 31 .02/7S			14.7					
O R E D			15.5 Boulder					
15 49 120			17.0 V. Dense, Lt.Brn., Silty F. to Med. Sand., Interstratified Sand and Gravel	SP & GP				Fluvial Strat. of Sand Lenses w/Sand & Gravel - K is lo
O R E D			Recovered 26' Boulders and Cobbles					
			20.0					
R I L L			21.3 Brown Sand w/Gravel Cobbles	GM				No Recovery
R I L L			21.7 Red Silty Shale - Bedrock					
			T.D.					

GAI - 227 12/

0002 112

GILBERT ASSOCIATES, INC.

SOIL CLASSIFICATION SHEET

PROJECT: 3 Mile Island W.O. 4192.0 SITE AREA Plant

CONTRACTOR: Kitlinski COORDINATES C-5+85W

DRILLER: Kubitsky

CLASSIFIED BY: W.S. DATE: 1-17-67

SHEET 1 O

DRILL HOLE N

ELEVATION 2

GWL 1 HRS 1

24 HRS 1

Depth Ft.	Sample No.	SPT Blows/6 In. 6	12	18	In. Rec.	Profile	SOIL DESCRIPTION Density (or Consistency), Color Soil Type - Accessories	U.C.S.		Coarse Granular Soils Range Size / Core Run	Grain Shape / Rec. Core	REMARKS Chemical Comp, Geologic Data, Ground Water, Construction Problems.
10.0							0.8' frozen - topsoil					
	1	1	2	2			Loose, fine to Cse. sand & gravel - dry	gp & sp		3/4"	Sub-Ang. to Rdd.	High permeabil 1-1/2" sand & 1/2 gravel
	2	2	3	4								
	3	13	16	26			Some blk. coaly ptcles. 3.0' to 4.5' & Dense 4.5 much Red SS Rock Frags.					
5.0												
	4	17	19	15			Dense, fine to cse. sand & gravel, tr. silt - dry					Less than 5% S
	5	14	17	15				gp & sp		3/4"	Sub-Ang. to Rdd.	
	6	16	15	18								
10.0	7	14	19	20			10.5					
	8	18	31	.4/50			Dense to v. dense - Brown sand & gravel w/some silt & tr. clay - Moist.					Low permeabili below 10.5
	Dr	il	le	d							Sub-Ang. to Rdd.	10 to 20% si clay
	9	50					Drilled through many cobbles & boulders below 12.0'	gm		3/4"		
	Dr 10	il 50	le	d								
	Dr	il	le	d								
	Dr	il	le	d			20.3					
							21.5 Weathered Red Shale					
							T.D.					

GAI -

0002 113

GILBERT ASSOCIATES, INC.

SOIL CLASSIFICATION SHEET

SHEET 1 OF 1

:CT: 3 Mile Island W.O. 4192.00 SITE AREA Plant DRILL HOLE NO. C-2

RACTOR: Kitlinski COORDINATES C-3+00 W ELEVATION 299.05

E: Kibitsky GWL 0 HRS 15.5

IFIED BY: W.S. DATE: 1-12-67 144~~4~~ HRS 18.6

SPT Blows/ 6 in. 6	12	18	In. Rec.	Profile	SOIL DESCRIPTION Density (or Consistency), Color Soil Type - Accessories	U.S.C.S.	ø	Coarse Granular Soils: Range Size / Core Run	Grain Shape / Rec. Core	REMARKS Chemical Comp, Geologic Data, Ground Water, Construction Problems, etc.
					0.0					
1	2	4			Topsoil 1.5					
3	4	5			Loose fine to CSE sand & gravel, TR. silt. moist			to 1-1/4"	Sub ang. to Rdd.	
7	4	5			med. dense below 4.5'	GM		to 1/2"		1/2 sand 1/2 gravel 2% silt to 4.5' 5 to 10% silt below 4.5'
7	8	11								Fairly permeable
9	10	10			Wet 6.0 to 7.5 7.5					
11	9	10			Med. Dense-fine to med grained brown sand & gravel TR. silt TR. organic-moist	GM		1/2"		70% sand 30% gravel less than 2% silt
9	10	14			Med. dense to dense- brown, silty, fine to med grained sand & gravel TR. clay TR. shaly particles moist	GM		1/2	Sub ang. to Rdd.	less permeable below 9.0' Some w'ed shale 1/2" sand & gravel 5 to 15% silt & clay
15	17	30								
25	26	29			V. dense, brn. sand & gravel TR. silt & clay - moist					clean sand in samll (0.2') lenses
26	31	40			15.0					
2	1	11	3		16.0 Boulders					
39	50	50			V. dense, brn. sand & gravel some silt & clay - moist			3/4"	Sub-ang to Rdd.	1/2 & 1/2 sand & gravel 10% silt & clay
12	31	37			(some sand lenses)					
31	37	35			20.5					
21	44	65			Red-sandy, silty, shale 22.0					
					T.D.					

GAI - 227 12/6

0002 114

GILBERT ASSOCIATES, INC.

SOIL CLASSIFICATION SHEET

PROJECT: 3-Mile Island W.O. 4192 SITE AREA Plant

CONTRACTOR: Kitlinski COORDINATES 34+00 N

DRILLER: Kubitsky

CLASSIFIED BY: REW DATE: 1-10-67

SHEET 1 (

DRILL HOLE N

ELEVATION 2

GWL 0 HRS

192 ½ HRS

Depth Ft.	Sample No.	SPT Blows/6 In. 6	12	18	In. Rec.	Profile	SOIL DESCRIPTION Density (or Consistency), Color Soil Type - Accessories	U.S.C.S.	%	Coarse Granular Soils: Range Size / Core Run	Grain Shape / Rec. Core	REMARKS Chemical Comp, Geologic Data, Ground Water, Construction Problems
							0.0					
							0.1 Soft brn sdy silt-some	sm				Topsoil
	1	1	1	2			Fine gravel-tr clay loose red brn sand & gravel-some sdy silt binder	GW		1mm +2"	subang rdd	dirty; ss. qtz.r gravel
	2	2	3	4			3.0					
	3	5	7	9			med. dense brn med. sand & gravel- sl. tr. silt	GW		1mm +0 2"	subrdd	+50% gravel -50% red gr sand K moderate
5.0	4	7	8	10			med. dense brn. gravel & med. sand tr. silt as above	GW		1mm to +2"		60% gravel 1, K- moderate t: coal silt
	5	10	12	14			7.5					
	6	17	24	20			dense brn med sand & gravel- trace silt 9.0	GW		1mm to +2"		50% gravel, 50% K - moderate
10.0	7	32	21	25	1"		dense to v. dense (?) recovered one 2" dia - weathered → 10.5	ss	cobble, blocked			spoon, no sample
	8	32	38	45	6"		v. dense silty med. sand & gravel	GW				v. dirty; contai decomp. sh. fra 50% gravel 15% CSE sand 35% med sand
	No Rec	48	56	21	0		13.5					
15.0	9	35	48	69	0.5		v. dense Red-brn silty f. to med. sand & gravel - trace clay	GW		1mm to +2"		v. dirty w/ much rock (shale) mak pasty mtx. dirty poor K
	10	41	65	73	0.7							
	11	47	59	71	1.0		18.0 Below 16.5' Intermittent traces clay					
	12	26	35	41	0.5		v. dense silty f. to med sand-some gravel					
20.0	13	70	125 / 0.2		0.5		20.2					
	21.2						21.2 Boulder					Drilled boulder
	14	170			0.5		21.7 Sand & gravel as above					
							Brick red w/ su siltstone					
25.0												

0002 115

GAI

GILBERT ASSOCIATES, INC.

SOIL CLASSIFICATION SHEET

:CT: 3 Mile Island W.O. 4192.0 SITE AREA Plant

RACTOR: COORDINATES C-3+85 E

.ER:

:IFIED BY: W S DATE: 1-17-67

SHEET 1 OF 1

DRILL HOLE NO. C-6

ELEVATION 296.20

GWL 0 HRS 13.4

24 HRS 14.8

SPT Blows/6 in. 6	12	18	In. Rec.	Profile	SOIL DESCRIPTION Density (or Consistency), Color Soil Type - Accessories	U.S.C.S.	ab	Coarse Granular Soils: Range Size / Core Run	Grain Shape / Rec. Core	REMARKS Chemical Comp, Geologic Data, Ground Water, Construction Problems, etc.
					0.0					
1	1	5			Loose-Brn. Silt & Fine Sand Some Gravel - Topsoil Wet 1.0					
4	5	10			Med. Dense, Fine to Cse., Brown, Sand & Gravel, Some Rock Frags. Dry					10% Silt to 3.0' 2% ± Below 3.0'
14	14	15			Tr. Coal (Decomposed) 4.5 to 6.0'					Moderately Permeable
14	10	12								
19	16	13								
10	10	14			9.0					
20	25	27			V. Dense, Fine to Cse., Brown Sand & Gravel, Some Rock Frags. Dry 10.5					
27	35	92			V. Dense, Fine to Cse. Sand & Gravel, Some Silt and Clay - Moist, Bldr. 12.2 to 13.0'					Less Permeable Below 10.5
37										15% Silt and Clay to 13.0'
ILLED										
68	54	60			Wet - Below 14.5'					10% Silt and Clay Below 13.0'
42	.03	/53								
29	41	39			Much Weathered Red Shale 16.0 to 17.5'					
49	59	58			19.4					Up to 20% Silt Below 17.5'
ILLED					Red Weathered Shale 21.0					
					T.D.					

0002 116

GAI - 227 12/

GILBERT ASSOCIATES, INC.
SOIL CLASSIFICATION SHEET

PROJECT: 2 Mil. Isle W.O. 4122.0 SITE AREA Plant
CONTRACTOR: Mitlinski COORDINATES C-7+00E
DRILLER: Bower
CLASSIFIED BY: W.G. DATE: 1-17-57

SHEET 1 O
DRILL HOLE N
ELEVATION 2
GWL 0 HRS 1
24 HRS 1

Depth Ft.	Sample No.	SPT Blows/6 In. 6	12	18	In. Rec.	Profile	SOIL DESCRIPTION Density (or Consistency), Color Soil Type - Accessories	U.S.C.S.	φ	Coarse Granular Soils: Range Size / Core Run	Grain Shape / Rec. Core	REMARKS Chemical Comp, Geologic Data, Ground Water, Construction Problems,
0.0							V. Loose Brown or Silt & Sand (Damp) Wet					
	1	0	1	1			1.0					
							V. Loose Brown Fine to med. Sand & Silt					
	2	2	1	2			3.0 V. Moist					
							Med. Dense to 4.5' Brown Fine to CSE. Sand & Gravel Tr. of Silt Less Than 5%	GP		Max. 3/4"	Sub Ang. to Rdd.	1/2 & 1/2 Sand & Quite Clean
5.0	3	8	14	15								
	4	14	1	22			Dense 4.5 to 6.0' Tr. Organic 4.5 to 5.0' V. Dense 6.0' to 9.0'					
	5	12	22	24			Dense to 12.5'					
	6	32	24	2			Preponderance of Fine Sand 7.5 to 9.0'					60% of Sample 10 11.0' is Med. Sa
10.0		22	24	21			1" Silty Layer 10.3 to 10.4 dry to 9.0' moist 9.0' to 12.5'					
	7	1	31	21			12.5					
							Very Dense Fine to CSE Sand & Gravel tr. Silt (up to 10%) Some organic 12.5 to 15.0'					Less permeable 12.5'
	8	40	35	36								
15.0	10	30	33	32								
	11	1	22	1								
							Dense & Med. Dense below 15.0'					
	13	7	12	7			Moist to 13.5 Wet below 13.5					
20.0												
	14	11	17	30								
							21.0					
							Red Shale 30.0					
							T.D.					

GAI -

0002 117

GILBERT ASSOCIATES, INC.

SOIL CLASSIFICATION SHEET

SHEET 1

PROJECT: 3 Mile Island W.O. 4192.00 SITE AREA Plant Site

CONTRACTOR: Kitlinski COORDINATES D-6+00 W

DRILLER: Kubitsky

CLASSIFIED BY: W. S. DATE: 1-31-67

DRILL HOLE

ELEVATION

GWL 0 HRS

24 HRS

Depth Ft.	Sample No.	SPT Blows/6 In. 6	12	18	In. Rec.	Profile	SOIL DESCRIPTION Density (or Consistency), Color Soil Type - Accessories	U.S.C.S.	φ	Coarse Granular Soils: Range Size / Core Run	Grain Shape / Rec. Core	REMARKS Chemical Comp, Geologic Data, Ground Water, Construction Problems
0.0							0.0					
							0.7 Top soil					
	1	1	2	3			Loose Brown Silt, Sand & Gravel, moist					
	2	2	3	3			3.0	GM				
	3	4	5	9			Med.Dense Brown, Sand & Gravel, Some Organic particles (black) dry				Sub	Moderately pert Relatively cle ½ & ½ Sand & Gr
5.0	4	6	11	8			changes to TR. Silt below 5.0	GP		3/4"	ang to rdd	5% Silt Pebbles-are s. stone & shale p antly w/ severa chert pebbles.
	5	10	5	9			7.5					
10.0	6	13	17	10			Dense to v. Dense Brown Sand & Gravel TR Organic particles, TR silt Dry					10% Silt
	7	9	13	17								Slightly la permeable
	8	10	15	13				GM to GP				
	9	11	18	21			Changes to wet @ 12.0 & with a TR of clay -					
15.0	10	19	41	29			15.0					
	DR	1L	LE	D			16.0 Boulders					
	11	25	36	47			V. Dense Brown Sand & Gravel TR. Silt Wet 17.5	GP				
	DR	1L	LE	D			Boulders 19.5					
20.0							Red Shale 21.5					

0002 118

GAI

GILBERT ASSOCIATES, INC.

SOIL CLASSIFICATION SHEET

ECT: 3 Mile Isle W.O. 4192.00 SITE AREA Plant Site

RACTOR: Kitlinski COORDINATES D 3+00 W

LER: Kubitski

SIFIED BY: DATE: 1-20-67

SHEET 1 OF 1

DRILL HOLE NO. D-2

ELEVATION 298.8

GWL 0 HRS 5.5

24 HRS 17.3

SPT Blows/ 6 in. (6 12 18)	In. Rec.	Profile	SOIL DESCRIPTION Density (or Consistency), Color Soil Type - Accessories	U.S.C.S.	%	Coarse Granular Soils: Range Size / Grain Shape	Core Run / Rec. Core	REMARKS Chemical Comp, Geologic Date, Ground Water, Construction Problems, etc.
			0.0					
			0.7 Top Soil					
			Brn. Silty Sand w/multi. colored gravel					No Sampling in hole. Classification from drillers logs.
			15.0					
			Brown Silty Sand & Gravel w/multi-colored rock fragments & boulders					
			19.6					
			20.5 Red Shale					
			T-D					

0002 119

GAI - 227 12/1

GILBERT ASSOCIATES, INC.

SOIL CLASSIFICATION SHEET

PROJECT: 3 Mile Island W.O. 4192.00 SITE AREA Plant Site

CONTRACTOR: Kitlinski COORDINATES D 4+00 E

DRILLER: Rover

CLASSIFIED BY: W. S. DATE: 1-31-66

SHEET 1 C

DRILL HOLE N

ELEVATION 2

GWL 0 HRS 1

24 HRS 1

Depth Ft.	Sample No.	SPT Blows/6 In. 6	12	18	In. Rec.	Profile	SOIL DESCRIPTION Density (or Consistency), Color Soil Type - Accessories	U.S.C.S.	γd	Coarse Granular Soils: Range Size / Core Run	Grain Shape / Rec. Core	REMARKS Chemical Comp, Geologic Data, Ground Water, Construction Problems
0.0							0.0					
							0.7 Brown Silty Top Soil					
	1	1	2	1								
	2	3	6	8			Brown med. to cse. sand w/ gravel dry 3.0	GP		1/2"	Sub ang to Rdd	moderately, pe: clean sand & g:
	3	27	40	28			V. Dense Brown fine to cse sand & gravel, TR. silt, dry Some red siltstone rock frags.	GP				Less than 5% :
5.0	4	30	25	25								
	5	30	18	16								
	6	22	60	60 0.3								
10.0	D	RI	LL	ED			Boulders 8.7 to 10.0 10.0					
	7	52	75	77			V. dense - Brown fine loose sand & gravel, tr. silt, moist lense of fine clean sand 11.7 to 11.9. BLDRS. 12.6 to 14.0 Some decomposed Red Shale Adding to clay contents, Tr. of organic particles Fewer fines below 14.0' - more permeable	GM to CP				5% + Silt
	8	47	58	50 0.1								Less per
	DR	IL	LE	D								
15.0	9	21	27	46								
	10	50	46	44								
	11	54	23				18.0					
20.0	D	RI	LL	ED			Red Shale 21.0					

0002 120

GAI-

GILBERT ASSOCIATES, INC.

SOIL CLASSIFICATION SHEET

ECT: 3 Mile Island W.O. 4192.0 SITE AREA Plant

RACTOR: Kitl. COORDINATES D 7+00 E

.ER: Boyer

SIFIED BY: W.S. DATE: 1-20-67

SHEET 1 OF 1

DRILL HOLE NO. D-4

ELEVATION 293.8

GWL 0 HRS 10.8

24 HRS 14.7

SPT Blows/6 in. 6	12	18	In. Rec.	Profile	SOIL DESCRIPTION Density (or Consistency), Color Soil Type - Accessories	U.S.C.S.	%	Coarse Granular Soils Range Size / Core Run	Grain Shape / Rec. Core	REMARKS Chemical Comp, Geologic Data, Ground Water, Construction Problems, etc.
					0.3 Brown silt fine sand wet topsoil					
5	3	4			loose brown fine sand some silt					80% fine sand 18% silt 2% ± gravel
3	2	2			Tr. gravel moist	SM				
2	2	2			4.5					
2	4	15			Med dense fine to cse sand some gravel tr silt dry 6.0	SP		1/2"		70% sand 30% ± gravel 2% ± silt
27	37	23			Dense fine to cse sand & gravel S.S & shale rock frags TR silt dry	OP				1/2 sand & gravel 2% ± silt
33	24	30			TR coaly particles 4.5 to 5.0			3/4"	"	Moderately Permeable
25	24	26								
29	21	20								
42	73	35			13.5					
16	19	17			Dense fine to cse sand & gravel TR organic, TR silt & dry moist					1/2 sand & gravel 5% ± silt
13	10	8			TR coaly particles much shale wet					slightly less permeable
12	9	13			Med. dense 15.0 to 18.0					
25	19	24			Dense below 18'-0"					
26	26	61/0.3			20.7					
					Red sandstone 21.5					

0002 121

GAI - 227 12/

GILBERT ASSOCIATES, INC.

SOIL CLASSIFICATION SHEET

PROJECT: 3 MILE ISLE W.O. 4192.00 SITE AREA PLANT SITE

CONTRACTOR: Kitlinski COORDINATES

DRILLER: Boyer

CLASSIFIED BY: DATE: 1-24-67

SHEET 1 O

DRILL HOLE NO

ELEVATION 2

GWL 0 HRS

24 HRS

Depth Ft.	Sample No.	SPT Blows/6 in. (6 / 12 / 18)	In. Rec.	Profile	SOIL DESCRIPTION Density (or Consistency), Color Soil Type - Accessories	U.S.C.S.	qu	Coarse Granular Soils: Range Size / Grain Shape / Core / Rec. / Run / Core	REMARKS Chemical Comp, Geologic Data, Ground Water, Construction Problems,
0.0					0.0				
					0.7 Top Soil				
					Lt. Brn. Fine Sandy Silt w/ Few Rock Frags.				No Sampling in Hole
5.0					5.0				Classification From Drillers Logs
					Brn. Sand & Gravel Trace of Silt				
10.0									
15.0									
					19.7				
20.0					Red Shale				
					21.0				
					T.D.				

0002 122

GAI

GILBERT ASSOCIATES, INC.

SOIL CLASSIFICATION SHEET

ECT: 3 Mile Island W.O. 4192.00 SITE AREA Plant

RACTOR: Kitlinski COORDINATES

ER: Boyer

IFIED BY: DATE: 1-25-67

SHEET 1 OF 1

DRILL HOLE NO. 002

ELEVATION 294.1

GWL 0 HRS 14.5

24 HRS 14.5

SPT Blows/ 6 In. 6 12 18	In. Rec.	Profile	SOIL DESCRIPTION Density (or Consistency), Color Soil Type - Accessories	U.S.C.S.	Ø	Coarse Granular Soils: Range Size / Core Run	Grain Shape / Rec. Core	REMARKS Chemical Comp, Geologic Data, Ground Water, Construction Problems, etc.
			0.0					
			0.8 Top soil-V. Loose moist					
			lt. Brown Fine Silty Sand w/ Rock Frags.					
			3.0 Loose - moist					
			Multi Colored Fine to CSE. Sand w/ Gravel, Cobbles & Boulders. moist					No Sampling - Classification from Drillers Logs.
			Lost & Regained Wash Water between 12.0 & 18.0' -					
			20.8					
			Red Shale 20.8 to 21.3 soft Red S.S. 21.3 to 22.0 Hard					
			22.0 T. D.					

0002 123

GAI - 227 12/

GILBERT ASSOCIATES, INC.

SOIL CLASSIFICATION SHEET

PROJECT: 3 Mile Island W.O. 4192.00 SITE AREA Plant

CONTRACTOR: Kitlinski COORDINATES

DRILLER: Boyer

CLASSIFIED BY: Boyer DATE: 1-26-67

SHEET 1 OF

DRILL HOLE NO

ELEVATION

GWL 0 HRS

24 HRS

Depth Ft.	Sample No.	SPT Blows/ 6 In. (6 12 18)	In. Rec.	Profile	SOIL DESCRIPTION Density (or Consistency), Color Soil Type - Accessories	U.S.C.S.	φ	Coarse Granular Soils: Range Size / Grain Shape	Core Run / Rec. Core	REMARKS Chemical Comp, Geologic Data, Ground Water, Construction Problems,
0.0					0.7 v. Loose - Sand Silty topsoil					
					Lt. Brn. v. Fine Sandy Silt w/ few Rock Frag. Loose - moist					
					4.0					
5.0					Mult-colored fine to CSE. Sand w/ Gravel, Cobbles & Bldrs. Moist - Med. to V. Dense					No Sampling Drillers Classification
10.0										
15.0										
20.0					20.8					
					22.0 Red Shale - Med. Hd.					
					T. D.					

0002 124

GAI-

GILBERT ASSOCIATES, INC.

SOIL CLASSIFICATION SHEET

SHEET 1

PROJECT: Three Mile Island W.O. 4192-51 SITE AREA Cooling Tower DRILL HOLE

CONTRACTOR: Fdn. Services COORDINATES ELEVATION

DRILLER: Boyer GWL 0 HRS.

CLASSIFIED BY: REW DATE: 7-24-67 24 HRS.

Sample No.	SPT Blows/6 in. 6	12	18	In. Rec.	Profile	SOIL DESCRIPTION Density (or Consistency), Color Soil Type - Accessories	U.S.C.S.	qu	Coarse Granular Soils: Range Size / Core Run	Grain Shape / Rec. Core	REMARKS Chemical Comp, Geologic Data, Ground Water, Construction Proble
1	2	2	3			0.0 Loose, brown sandy silt; trace gravel; 0.5 dry topsoil					
2	12	24	25			V. dense brown, f. sand & gravel; trace silt dry			.25 mm to .5 mm sand	Sub. ang. to rdd.	+ 2" size for
3	17	24	36				SP & GP				
4	35	38	38			sample #4 - slightly gray					
5	24	20	24			7.5 Dense, fine to med. brown sand &					
6	27	15	19			gravel; slightly moist			.5 m to 1 mm	Sub. rdd.	trace of coal
7	23	25	26			9.5 sam. #7 same but wet & w/trace silt					
8	46	52	36			V. dense, brown gravel & sand, trace 12.4 silt, trace clay					till-like text
9	25	31	43			V. dense brown gravel & silty sand;					
10	54	50	51			trace to some clay				Ang.	till-like text
11	38	45	64								
12	41	44	38			no clay in sample #12					
13	61	54	47			18.0 light brown, v. dense gravel & 19.6 sand	SP GP			Sub. rdd.	Add:-
14	40	71				20.7 V. dense, brick red, silty clay					weathered shal
						Top of rock					started co
						(see attached rock classification sheet)					

0002 125

Sheet 42 Amend-2 (10-2-67)

GILBERT ASSOCIATES, INC.

ROCK CLASSIFICATION, SHEET

SHEET 2 OF 2

DATE 7-10-67

T Three Mile Island NO. 4192-51 DRILL HOLE NO. GT-1

CTOR Fdn Services SITE AREA Cooling Tower ELEV. 295.7

ZE NX COORDINATES ANGLE vertical

4" BEARING

D BY: R.E.W. GWL DEPTH 5.0'

Core Rec. Run	Core Rec. Core	Profile	Interval	DESCRIPTION: Rock type, color, grain size & shape, bedding (angle thickness), fractures, faults, joints (angle, filling, etc.), permeability, alteration, weathering, chemical composition	REMARKS: Condition of core. Excavating evaluat etc.
0/0				Top of rock	
20.7			20.7		
77%			22.7	Sandstone, brick red, f, to med. grnd., bedding indistinct, ~~45° cross joints, soft in 1" to 6" pieces~~	
26.2	3.5			silty shale, brick red, bedding indistinct, 45° cross joints, irregular 60-70° jointing, soft clay zone @ 24.6', clay seam ¼" at 28.0', soft zone 28.0-28.4', core ± 6" pieces throughout except at 29.2' & 30.4'.	some blk. Mn/ staining on 45 white zin veinlet along joints, stair along all cro joints w/Mn/
100 29.4	4.0				
100 35.0	5.6		35.0		
				T. D. to top of brick zone	Sound rock at 22.7.

0002 126

GAI-228 1/66

GILBERT ASSOCIATES, INC.

SOIL CLASSIFICATION SHEET

SHEET 1

ROJECT: Three Mile Island W.O. 4192-51 SITE AREA Cooling Tower

ONTRACTOR: Edn. Services COORDINATES

RILLER: Boyer

LASSIFIED BY: WS DATE: 7-17-67

DRILL HOLE

ELEVATION

GWL 0 HRS

24 HRS

Sample No.	SPT Blows/6 In. 6	12	18	In. Rec.	Profile	SOIL DESCRIPTION Density (or Consistency), Color Soil Type - Accessories	U.S.C.S.	qu	Coarse Granular Soils: Range Size / Core Run	Grain Shape / Rec. Core	REMARKS Chemical Comp, Geologic Data, Ground Water, Construction Proble
						0.8 Drk. brn. sandy silty topsoil					
1	3	5	8			Med. dense to dense, brown sand and gravel, trace silt, some rock fragments dry	CP		up to 3/4"		
2	11	9	9				CP				
3	9	17	26								
4	25	22	20								
5	11	10	5			7.0-10.0' trace of organic					
6	12	11	5								
7	21	21	27			10.5					
8	25	20	29			Multi-colored sand & gravel, trace silt, some rock fragments- moist					
9	36	30	44			V. dense, some decomposed coal pieces					
10	47	44	47				GM				
No recovery						wet below 16.5'	SM				
11	40	35	22								
No recovery						19.2 started coring					
						see sheet #2 for rock classification					

0002 127

GILBERT ASSOCIATES, INC.

ROCK CLASSIFICATION, SHEET

SHEET 2 OF 2

DATE 7-17-67

· Three Mile Island NO. 4192-51 DRILL HOLE NO. CT-2

CTOR Fdn. Services SITE AREA Cooling Tower ELEV. 294.2

E NX COORDINATES ANGLE vertical

BEARING

BY: GWL DEPTH 30.0'

Core Rec. Run	Core Rec. Core	Profile	Interval	DESCRIPTION (Rock type, color, grain size & shape, bedding (angle thickness), fractures, faults, joints (angle, filling, etc.), permeability, alteration, weathering, chemical composition)	REMARKS (Condition of core. Excavating evaluat etc.)
				Started coring	
19.2			19.2		top of rock
90 28.2 100 44.5	3.6 1.3		26.5	Med. hard, red, fine to med. grained sandstone, vertical joint mineralized 19.2-21.6', core pieces up to 0.5', good core	no loss of dr Water
100 300	2.5		30.0	red, med. hard shale, silty and sandy, good core, vertical mineralized joint 29.0-30.0'	
				T. D. No loss of drill water	Sound rock below 19.6

0002 128

GILBERT ASSOCIATES, INC.

SOIL CLASSIFICATION SHEET

SHEET 1

PROJECT: Met Ed Co. W.O. 4192-51 SITE AREA Three Mile Island

CONTRACTOR: Fdn. Services COORDINATES

DRILLER: Boyer

CLASSIFIED BY: WS DATE: 7-27-67

DRILL HOLE

ELEVATION

GWL 0 HRS

24 HRS

Sample No.	SPT Blows/6 in. 6	12	18	In. Rec.	Profile	SOIL DESCRIPTION Density (or Consistency), Color Soil Type - Accessories	U.S.C.S.	qu	Coarse Granular Soils: Range Size / Core Run	Grain Shape / Rec. Core	REMARKS Chemical Comp, Geologic Data, Ground Water, Construction Proble
						0.0					
1	1	3	3			loose brn sandy silt, trace of gravel					topsoil moist
2	6	9	9			Med. dense, brown sand, silt & gravel	GM SM		± 3/4"	Sub rdd. to rdd.	moist
3	10	9	25			Dense, brown sand & gravel, trace of coal, many sandstone & quartzite fragments					
4	30	30	25								
5	17	30	21						½"	Sub. rdd. to rdd.	
6	17	18	41			7.3-7.4' lense of f. sand					moist
7	26	39	32								
8	12	12	14			10.5-12.0' M. dense, brown sand, med. grained					
9	21	22	26			12-16.0' as two above, wet					wet
10	39	24	20								
11	20	18	25			16.2-17.8' V. dense, brown sand, med. grained					
12	24	34	26								
13	22	55	102			V. dense, multi-colored sand & gravel, trace of silt, coal, clay, some decomposed shale @ base	SM GM		½"	Sub. ang. Sub. rdd.	till li
	58										
						Begin coring @ 20.1					

0002 129

GILBERT ASSOCIATES, INC.

ROCK CLASSIFICATION, SHEET

SHEET 2 OF 2

DATE 7-27-67

r Metropolitan Edison Co. NO. 4192-51 DRILL HOLE NO. [illegible]

CTOR Fdn. Services SITE AREA Three Mile Island ELEV. 293.6

ZE NX COORDINATES ANGLE vertical

4" BEARING

BY: GWL 14.4 DEPTH 43.0'

Core Rec. Run	Core Rec. Core	Profile	Interval	DESCRIPTION: Rock type, color, grain size & shape, bedding (angle thickness), fractures, faults, joints (angle, filling, etc.), permeability, alteration, weathering, chemical composition	REMARKS: Condition of core. Excavating evaluat etc.
20.1			20.1	Begin coring @ 20.1'	
89% 23.8	3.3		24.4	Sandstone, gray, med. grained, med, hard, 22° bedding, water course at 21.0', 60° cross joint @ 21.5', brn. staining along partings, soft sandstone seam @ 24.2	
100% 29.5	6.0			Shale, brick red, extremely broken, much MnOx staining 24.7-40° slickensides, 24.8 another slickenside, some weathering, 27.0-29.5' sandy zone, high angle jointing 29-29.5', brown stains, 45° bedding, brown stain & white mineralization along most partings,	
96% 30.0	6.3			33.9-34.7' extremely broken 34.6-34.7' weathered decomposed shale seam	
92% 37.5	6.8			35.7-37.5' extremely broken, some 50° cross jointing 39.2-43.0' extremely broken, vertical slickensides @ 39.7'	
94% 43.0	5.2		43.0	41.7' high angle slickensides 42.2' 30 slickensides 42.5-42.7' clay seam	
				T. D. 43.0' No loss of drill water	Sound rock below 24.4?

0002 130

GAI-328 1/66

GILBERT ASSOCIATES, INC.

SOIL CLASSIFICATION SHEET

SHEET ___

PROJECT: Three Mile Island W.O. 4192-51 SITE AREA Cooling Tower DRILL HOLE

CONTRACTOR: Gen. Services COORDINATES ___ ELEVATION

DRILLER: Boyer GWL 0 HRS.

CLASSIFIED BY: WS DATE: 7-17-67 24 HRS.

Sample No.	SPT Blows/6 In. 6	12	18	In. Rec.	Profile	SOIL DESCRIPTION Density (or Consistency), Color Soil Type - Accessories	U.S.C.S.	qu	Coarse Granular Soils: Range Size / Core Run	Grain Shape / Rec. Core	REMARKS Chemical Comp, Geologic Data, Ground Water, Construction Probl
						0.0					
1	1	1	2			Loose, drk. brn., silty, sandy topsoil			moist		
2	2	2	4			Loose, brown, fine sandy silt moist	ML				
3	13	23	37			Multi-colored gravel & sand, trace silt			UP TO 3/4"	Sub. rnd. to rnd.	
4	23	43	48			V. dense, some rock fragments, dry					
5	27	19	17			trace decomposed coal	GP				
6	13	28	23			from 7.5-9.0', becomes some decom-	SP				
7	23	19	24			posed coal					
8	28	29	26								
9	15	17	21			changes to wet at 12.0'- may be drill water					
10	72	59	49			changes to moist at 13.5'					
						18.5					
11	35	26	25			nearly all v. dense, poorly graded, medium sand, some organic, trace					
12	20	28	67			gravel	SP				
13	47	90				19.1 ~~dark brown, moist~~					
						started coring - top of rock					
						see sheet #2 for rock classification					

0002 131

GILBERT ASSOCIATES, INC.

ROCK CLASSIFICATION, SHEET

SHEET 2 OF 2

DATE 7-17-67

T Three Mile Island — NO. 4192-51 — DRILL HOLE NO. CT 4

CTOR Fdn. Services — SITE AREA Cooling Tower — ELEV. 294.2'

ZE NX — COORDINATES — ANGLE vertical

BEARING

) BY: W.S. — GWL — DEPTH 36.5'

Core Rec. Run	Core Rec. Core	Profile	Interval	DESCRIPTION (Rock type, color, grain size & shape, bedding (angle thickness), fractures, faults, joints (angle, filling, etc.), permeability, alteration, weathering, chemical composition)	REMARKS (Condition of core. Excavating evaluat etc.)
				Top of rock	
19.1			19.1		
82.7	2.7		21.6	Red, hard, broken, med. grnd. sandstone, white mineralization along fractures	
28.7			22.4	Olive green shale, extensively broken, possible slickensides on some ccs	
100	4.2		24.0	gray, med. hard, broken s.s, hi-ang. joints in several directions.	pc
68.9				Red shaley sandstone, broken to extensively broken, much white mineralization	clay gravel s
98	6.0		30.7		
32.0				Red, med. hard, silty shale, slickensides at 60° at 30.7 & 31.0'- across core along 50° btg., many incipient fractures rehealed, slickensides along many cartings	
100	4.5				
36.5			36.5		good core
				T. D.	
				core recovery shown between 19.1 & 32.0'- questionable due to broken condition of core	no loss of dr water

0002 132

GAI-226 1/66

GILBERT ASSOCIATES, INC.

SOIL CLASSIFICATION SHEET

SHEET 1

PROJECT: Met Ed Co. W.O. 4192-51 SITE AREA Three Mile Island DRILL HOLE

CONTRACTOR: Fdn. Services COORDINATES ELEVATION

DRILLER: Boyer GWL 0 HRS

CLASSIFIED BY: WS DATE: 7-27-67 24 HRS

Sample No.	SPT Blows/6 in. 6	12	18	In. Rec.	Profile	SOIL DESCRIPTION Density (or Consistency), Color Soil Type - Accessories	U.S.C.S.	q	Coarse Granular Soils: Range Size / Core Run	Grain Shape / Rec. Core	REMARKS Chemical Comp, Geologic Data, Ground Water, Construction Proble
						0.0					
1	1	2	3			Loose, dark brown sandy silt, trace of gravel					moist - top
2	3	5	6			Med. dense, brown sand, trace of gravel			± ½"	Sub. to rdd.	rdd. moist
3	10	18	26			Dense, brown med. to coarse sand & gravel, trace of coal			± 3/4"	Sub. to rdd.	rdd.
4	22	25	26								
5	18	20	17								dry
6	25	26	30			- as above -					
7	52	18	22								
8	80	118	89			V. dense, multi-colored sand & gravel, trace of clay, much decomposed moist sandy shale, trace of coal, v. dense below 12.0' MOIST			± ½"	Sub. ang. to Sub. rdd. to rdd.	12-13.5' wash till-like cons
9	104	107	84								
10	69	84	96								
11	71	83	116								
12	85	109	97								
13	121	93	109								
						No recovery					
						Begin coring 19.9'					

0002 133

GILBERT ASSOCIATES, INC.

ROCK CLASSIFICATION, SHEET

SHEET 2 OF 2

DATE 7-27-67

r Metropolitan Edison Co. NO. 4192-51 DRILL HOLE NO. CT-5

CTOR Eqn. Services SITE AREA ~~Three Mile Island~~ ELEV. 294.0'

E NX COORDINATES ANGLE vertical

4" BEARING

BY: GWL 13.5' DEPTH 35.0'

Core Rec. Run	Core Rec. Core	Profile	Interval	DESCRIPTION: Rock type, color, grain size & shape, bedding (angle thickness), fractures, faults, joints (angle, filling, etc.), permeability, alteration, weathering, chemical composition	REMARKS: Condition of core. Excavating evaluat etc.
19.9			19.9	Begin coring 19.9'	
			21.0	Shale- brick red, extremely broken, weathered	
79% 27	57			Sandstone and shale, interbedded, brick red, gray @ 28-29', badly broken to 31.5', good core below 31.5', bedding @ 23-32°, high angle joints, white mineralization along some joints, extremely broken 30.8-31.0', small shale seam (green) 31.0'	recovery ques able due to b state of rock
106	14			31.3-31.6' extremely broken	
100	68			32.7' white mineral filled incipient fractures, v. small	
350			35.0	32.8-33.2' broken core	
				T. D. 35.0' No loss of drill water	

0002 134

GILBERT ASSOCIATES, INC.

SOIL CLASSIFICATION SHEET

SHEET 1

PROJECT: Met Ed Co. W.O. 4192-51 SITE AREA Three Mile Island DRILL HOLE

CONTRACTOR: Fdn. Services COORDINATES ELEVATION

DRILLER: Boyer GWL 0 HRS.

CLASSIFIED BY: WS DATE: 7-27-67 24 HRS.

Sample No.	SPT Blows/6 In. 6	12	18	In. Rec.	Profile	SOIL DESCRIPTION Density (or Consistency), Color Soil Type - Accessories	U.S.C.S.	qu	Coarse Granular Soils: Range Size / Core Run	Grain Shape / Rec. Core	REMARKS Chemical Comp, Geologic Data, Ground Water, Construction Proble
1	1	2	3			Loose, brown silty sand					Topsoil
2	4	10	16			Med. dense, brown silty sand, trace of gravel					moist
3	8	12	10			Med. dense, brown sand & gravel, trace of silt			± ½"	Sub. rd. to rd.	
4	15	15	18			trace of coal					
5	18	12	11			6.0-7.5' dry					
6	15	17	15			7.5' dense, as above					
7	25	23	29			V. dense, as above					
8	65	72	70			V. dense, multi-colored, sand, silt and gravel, trace of coal			± ½"	Sub. ang. to rd.	moist
9	47	53	60								
10	60	53	48			15.0-17.0' wet (wash sample)					
11	37	42	59			16.5-18.0' V. dense sand, silt and gravel					
12	57	100	85			18.0-18.6' red weathered shale					
						20.4					
						Begin coring @ 20.4'					

0002 135

GILBERT ASSOCIATES, INC.

ROCK CLASSIFICATION, SHEET

SHEET 2 OF 2

DATE 7-27-67

r Metropolitan Edison Co. NO. 4192-51 DRILL HOLE NO. 37e6

CTOR Eqn. Services SITE AREA Three Mile Island ELEV. 296.6

ZE NX COORDINATES ANGLE vertical

4" BEARING

BY: GWL 15.6' DEPTH 39.0'

Core Rec. Run	Core Rec. Core	Profile	Interval	DESCRIPTION: Rock type, color, grain size & shape, bedding (angle thickness), fractures, faults, joints (angle, filling, etc.), permeability, alteration, weathering, chemical composition	REMARKS: Condition of core. Excavating evaluat etc.
204			20.4	Begin coring @ 20.4'	
72 240	2.6			Shale, Brick red, med. hard, badly broken to 24.5', silty, slickensides along bedding @ 24.0', small vertical joint 24- 24.4', white mineralized joint @ 26.5', vertical mineralized joint 28.2-28.6'	Black MnOx st ing along som partings thro cut hole
98 288	4.7		28.6		
			29.6	Sandstone, gray, med. grnd., vert. min. fract., bdng. @ 22°	
100 350	6.2			Silty shale, brick red, broken to 30.7', 31.3-31.7' extremely broken, ¼" decomposed green shale seam @ 31.7' hard green shale seam @ 31.4' (1"), 85° vertical mineralized fracture @ 31.9-32.7', small slickensides at 34' & 34.1' & 34.3', calcite filled slick @ 34.3', horizontal slickensides @ 35', 50° cross joint @ 37', 37.7', 38.7', rock badly broken	becomes very sandy below 3
100 390	4.0		39.0		
				T. D. 39.0'	Sound rock below 24.5
				No loss of drill water	

0002 136

GILBERT ASSOCIATES, INC.

SOIL CLASSIFICATION SHEET

SHEET 1

ROJECT: Met. Ed Co. W.O. 4192-51 SITE AREA Three Mile I land DRILL HOLE

ONTRACTOR: Fdn. Services COORDINATES ELEVATION

RILLER: Boyer GWL 0 HRS

LASSIFIED BY: WS DATE: 7-27-67 24 HRS

Sample No.	SPT Blows/6 in. 6	12	18	In. Rec.	Profile	SOIL DESCRIPTION Density (or Consistency), Color Soil Type - Accessories	U.S.C.S.	qu	Coarse Granular Soils: Range Size / Core Run	Grain Shape / Rec. Core	REMARKS Chemical Comp, Geologic Data, Ground Water, Construction Proble
1	2	3	3			Loose, sand, silt, trace of gravel			< ¼"	rdd.-sub. rdd.	t
2	3	4	7			loose, brown sand, trace of silt, trace of coal				Sub. rdd.	
3	11	18	23			- 4.5' dense, as above			< 3/4"	to rdd.	moist
4	39	24	17			6.0					
5	12	7	8			Med. dense, multi-colored sand & gravel, trace of silt, much decomposed coal					
6	8	15	21						< ¼"	Sub. ang. to rdd.	
7	25	33	31			9.0-10.3' as above (dry)					moist
8	17	18	84			10.5-12.0' V. dense, as above (wet)					
9	37	42	49			12.0-13.5' as above, 13.2-13.5' brown sand lense					
10	55	60	59			13.5' V. dense, brown sand, trace of silt & clay, till like, trace of coal					
11	118	101	93								
12	60	51	43								
13	26	30	15			18.0' as above (wet)					wet
14	14	22	30			20.0 Red weathered shale					
						Begin coring @ 21.5'					

0002 137

GILBERT ASSOCIATES, INC.

ROCK CLASSIFICATION, SHEET

SHEET 2 OF 2

DATE 7-27-67

r Metropolitan Edison Co. NO. 4192-51 DRILL HOLE NO. CT-2

CTOR Edn. Services SITE AREA Three Mile Island ELEV. 297.3'

ZE NY COORDINATES ANGLE vertical

4" BEARING

) BY: GWL 15.1' DEPTH 40.0

Core Rec. Run	Core Rec. Core	Profile	Interval	DESCRIPTION: Rock type, color, grain size & shape, bedding (angle thickness), fractures, faults, joints (angle, filling, etc.), permeability, alteration, weathering, chemical composition	REMARKS: Condition of core. Excavating evaluat etc.
21.5			21.5	Begin coring @ 21.5'	
100 24.4	2.7			Sandstone, brick red, fine grnd., med. hard, evidence of H_2O course @ 22', decomposed sandstone @ 24-24.2', bedding @ 30°, H_2O course @ 24.6', soft sandstone-½"seam, small ¼" soft seam@ 26.3', soft shale seam @ 26.6-26.8', some cross jointing, vertical curved joint @ 28.2-28.5'	
95	5.5		28.5		
300				Silty shale, brick red, 40° bedding, 28.5-29.3' v. broken, v. sandy 29.3-30', some white mineral coating and MnOx staining along partings, 32-32.4' badly broken, small clay seam; 34-35' broken zone, some clay seams, some pieces show possible slick; 34-37' soft shale, evidence of slick, white mineral staining, high angle slick @ 36.6', some grinding of core, some small limy inclusions below 37.0'	
90	4.5				
250					
100	5.0				
400			40.0		
				T. D. 40.0' No loss of drill water	Sound rock below 27.0

0002 138

GILBERT ASSOCIATES, INC.

SOIL CLASSIFICATION SHEET

SHEET 1

ROJECT: Three Mile Island W.O. 4192-51 SITE AREA Cooling Tower DRILL HOLE

ONTRACTOR: Fdn. Services COORDINATES ELEVATION

RILLER: Boyer GWL 0 HRS

LASSIFIED BY: REW DATE: 7-20-67 24 HRS

Sample No.	SPT Blows/6 in. 6	12	18	In. Rec.	Profile	SOIL DESCRIPTION Density (or Consistency), Color Soil Type - Accessories	U.S.C.S.	φ	Coarse Granular Soils: Range Size / Core Run	Grain Shape / Rec. Core	REMARKS Chemical Comp, Geologic Data, Ground Water, Construction Proble
						o.c Topsoil					
1	1	3	2			Loose, brown sandy silt, trace of gravel					
2	2	12	16			Dense brown sand & gravel, trace to some silt			.25 mm to +2"	Ang. to sub. rdd.	cobbles
3	19	15	22				SW				
4	11	15	14				GW				
5	12	9	9			Med. dense, brown fine sand & gravel, trace-to-some coal silt, trace silt	SP		.25 to .50	Sub. rdd.	
6	9	11	16								
7	16	12	37			V. dense, brown fine sand & gravel, trace silt, trace to some coal silt					
8	25	19	26								
9	28	64	38			V. dense, red-brown gravel and silty sand, trace clay					Pasty till-lik Rock bit on bo 14.3-15.0', oc (SP) lenses, k this zone but from 18.0' to
Boulder											
11	39	60	89								
12	44	57	71								
13	36	56	86								
14	51	79				Begin coring					
No recovery											
											Rock bit on bo 20.8-21.5', 79 21.5-21.9' wi recovery

0002 139

GILBERT ASSOCIATES, INC.

ROCK CLASSIFICATION, SHEET

SHEET 2 OF 2

DATE 7-20-67

T Three Mile Island NO. 4192-51 DRILL HOLE NO. CT-8

CTOR Fdtn. Services SITE AREA Cooling Towers ELEV. 296.9'

ZE NX COORDINATES ANGLE vertical

4" BEARING

D BY: REW GWL 16.7' DEPTH 35.0'

Core Rec. Run	Core Rec. Core	Profile	Interval	DESCRIPTION: Rock type, color, grain size & shape, bedding (angle thickness), fractures, faults, joints (angle, filling, etc.), permeability, alteration, weathering, chemical composition	REMARKS: Condition of core. Excavating evaluat etc.
21.9			21.9	Begin coring @ 21.9'	
25.3	3.4			Silty shale; brick red; slightly v. finely sandy 25-28.0'; bedding ~ 40°; 40-45° and irregular 60-70° jointing; core broken with max size 6"	v. broken and intense weat ing to 25'
30.2	4.7		30.2		
35.1	5.0			Sandstone, silty; brick red; very fine grained; bedding ~40°; 40-45° cross joints; irregular vertical slippage from 33.5 to base of core; max. 4" breccia along zone; healed with white mineral (thomsonite); slippage oriented ~parallel to direction of dip T. D. 35.0'	core in ± 6" to 33.5', then ± 1" lengths

0002 140

GAI-228 1/66

GILBERT ASSOCIATES, INC.

SOIL CLASSIFICATION SHEET

SHEET 1

ROJECT: Met Ed Co. W.O. 4192-51 SITE AREA Three Mile Island DRILL HOLE

ONTRACTOR: Fdtn. Services COORDINATES ELEVATION

RILLER: GWL 0 HRS

LASSIFIED BY: DJS DATE: 8-11-67 24 HRS

Sample No.	SPT Blows/6 In. 6	12	18	In. Rec.	Profile	SOIL DESCRIPTION Density (or Consistency), Color Soil Type - Accessories	U.S.C.S.	qu	Coarse Granular Soils: Range Size / Core Run	Grain Shape / Rec. Core	REMARKS Chemical Comp, Geologic Data, Ground Water, Construction Proble
1	1	1	2			Loose to med. dense; brown silt; trace of coal					moist
2	3	11	11			1.5-3.0' trace of gravel					
3	11	11	8			Med. dense; brown sand & gravel; trace of silt; trace of clay; till like				sub ang-	dry
4	13	11	14						1"	rdd	
5	12	12	15			7.5-9.0' trace of coal; moist, dense					
6	17	16	26			9.0-10.5' light brown; very dry					moist
7	41	38	35			10.5					dry
8	35	46	46			V. dense; multi-colored silty sand & gravel				sub rdd-	
9	35	31	74			13.5 No recovery			2"	grg	moist
10	23	29	25			As next above; trace of coal					
11	27	20	33			17.0					moist
12	44	47	56			V. dense; brown sand; some gravel			4"	rdd	wet
13						18.5 V. dense; red decomposed shale					
						Begin coring @ 18.8'					

0002 141

GILBERT ASSOCIATES, INC.

ROCK CLASSIFICATION, SHEET

SHEET 2 OF 2

DATE ~~8-11-67~~

r Met Ed Co. NO. 4192-51 DRILL HOLE NO. CT-9

CTOR Fdtn. Services SITE AREA Three Mile Island ELEV.

ZE NX COORDINATES ANGLE vertical

4" BEARING

) BY: GWL DEPTH 33.0'

Core Rec. Run	Core Rec. Core	Profile	Interval	DESCRIPTION (Rock type, color, grain size & shape, bedding (angle thickness), fractures, faults, joints (angle, filling, etc.), permeability, alteration, weathering, chemical composition)	REMARKS (Condition of core. Excavating evaluat etc.)
18.8			18.8	Begin coring @ 18.8'	
100	5.4		24.2	Shale (silty); brick red; broken w/no pieces .2'; weathered 18.8-19.9'; MnOx staining along some partings; vertical joint @ 20.3'	
27.2					
75	5.1			Sandstone; reddish gray; hard; fine grained; core broken due to near vertical fracturing; bedding is @ 35°; several ¼" diameter limy inclusions @ 27.8' & 29.4'; MnOx staining throughout; slight amount of mineralization along several bedding planes	becomes shaly with depth
32.2					
100	5.4				
33.0			33.0		
				T. D. No loss of drill w ater	

0002 142

GAI-328 1/66

GILBERT ASSOCIATES, INC.

SOIL CLASSIFICATION SHEET

SHEET 1

ROJECT: Three Mile Island W.O. 4192-51 SITE AREA Colling Tower DRILL HOLE

ONTRACTOR: Edn. Services COORDINATES ELEVATION

RILLER: Boyer GWL 0 HRS

LASSIFIED BY: HEW DATE: 7-5-67 24 HRS

Sample No.	SPT Blows/6 In. 6	12	18	In. Rec.	Profile	SOIL DESCRIPTION Density (or Consistency), Color Soil Type - Accessories	U.S.C.S.	φ	Coarse Granular Soils: Range Size / Core Run	Grain Shape / Rec. Core	REMARKS Chemical Comp, Geologic Data, Ground Water, Construction Proble
1	1	1	1			Loose; dark to orange brown; sandy					
2	2	4	4			silt; trace gravel & roots			4 2"	Rdd.	Topsoil
3	3	5	11			Med. dense; brown silty f. sand & gravel			± 2"		
4	21	24	20			Dense; brown silty f. sand & gravel					
5	24	20	25			trace of clay					samples slight from 6.0' down gravel of all Paleozoic sec river, includ
6	24	25	28			v. dense					
7	30	30	31								
8	53	41	67								
9	63	59	50			clay increases to some from 13.5'					K- 10^{-4} cm/sec
10	31	40	36								
11	21	30	36			clay to trace from 16.5' to bottom					K- 10^{-3} cm/sec
12	25	32	40								
13	39	51	57								Martin
14	50/4"					v. dense; brown clayey silt; no H_2O loss			19.9		weathered shal
						Begin coring 19.9'					

0002 143

GILBERT ASSOCIATES, INC.

ROCK CLASSIFICATION, SHEET

SHEET 2 OF 2

DATE 7-5-67

T Met. Ed. Co. NO. 4192-57 DRILL HOLE NO. GT 10

CTOR E. T. Kitlinski & Asso. SITE AREA Three Mile Island ELEV. 293.1

ZE NX COORDINATES ANGLE vertical

4" BEARING

) BY: GWL 13.0 DEPTH 35.0'

Core Rec. Run	Core Rec. Core	Profile	Interval	DESCRIPTION (Rock type, color, grain size & shape, bedding (angle thickness), fractures, faults, joints (angle, filling, etc.), permeability, alteration, weathering, chemical composition)	REMARKS (Condition of core. Excavating evaluat etc.)
19				Begin coring @ 19.9'	
100	62			Shale- brick red, silty; bedding 45°, irregular fractures @ 30° & steep ± 80° ∠s; core intensely broken to 29.0' with core 1" pieces @ 25 & 29' for 1.0' intervals.	upper 1.0' we ed & very bro rippable
26					
100	49				top comp. roc
28.0				Sandstone- red, very fine grained, light gray speckled texture; some zones are better called sandy shale; broken zone 0.3' @ 29.7'; core hard & unbroken except by bdng. & occasional 30° cross fractures.	good rock sly. conglomer 30-32'
100	50				
35.0				T. D. 35.0'	
				No loss of drill water	

0002 144

Sheet 61 Amend-2 (10-2-67)

GAI-228 1/66

GILBERT ASSOCIATES, INC.

SOIL CLASSIFICATION SHEET

SHEET 1

PROJECT: Three Mile Island W.O. 4192-51 SITE AREA Cooling Tower DRILL HOLE

CONTRACTOR: Fdn. Services COORDINATES ELEVATION

DRILLER: Boyer GWL 0 HRS

CLASSIFIED BY: DJS DATE: 7-5-67 24 HRS

Sample No.	SPT Blows/6 in. 6	12	18	In. Rec.	Profile	SOIL DESCRIPTION Density (or Consistency), Color Soil Type - Accessories	U.S.C.S.	qu	Coarse Granular Soils: Range Size / Core Run	Grain Shape / Rec. Core	REMARKS Chemical Comp, Geologic Data, Ground Water, Construction Proble
						0.0					
1	1	3	4			Loose, light brown silt, v. f. grnd.					silt
						2.0					
2	8	9	14			Med. dense, sand & gravel, light brown					
3	12	25	21			Dense, as above, clay traces					sand & gravel
4	18	17	19			coal fragments					
						6.0					
5	57	58	48			V. dense, sand & gravel w/abundant clay traces (brown)					
6	44	52	61			- clay traces more abundant -					wet
7	57	62	74								
8	24	29	37								
9	59	60	59			- as above -					clay conten increasing wit
10	53	49	73								
11	44	59	70								
12	63	70	63								
						18.0					
13	34	40	43			V. dense, brick red weathered shale					
14	28	35	53								
						21.0					
						Begin coring @ 21.0'					

0002 145

GILBERT ASSOCIATES, INC.

ROCK CLASSIFICATION, SHEET

SHEET 2 OF 2

DATE 7-5-67

T Metropolitan Edison Co. NO. 4192-51 DRILL HOLE NO. CT.11

CTOR F. T. Kitlinski & Assoc. SITE AREA Three Mile Island ELEV. 291.5'

ZE NX COORDINATES ANGLE vertical

4" BEARING

) BY: GWL 11.8 DEPTH 38.0'

Core Rec. Run	Core Rec. Core	Profile	Interval	DESCRIPTION: Rock type, color, grain size & shape, bedding (angle thickness), fractures, faults, joints (angle, filling, etc.), permeability, alteration, weathering, chemical composition	REMARKS: Condition of core. Excavating evaluat etc.
				Begin coring 21.0'	
				Sandstone, brick red, v.f. grnd., slightly micaceous, bedding @ 35°-40°, 45° cross-fra ctures, 70° fractures, intensely broken throughout, MnOx staining, core 1" pcs.	rippable to 3
				Sandstone, brick red and light gray, f. laminated @ 45°, 60° & 45° cross fractures w/MnOx staining, vertical joint coated w/$CaCO_3$, open, weathering apparent to 31.0', solid rock from 31'-on, core in ± 1" pcs. to 31', 60° to 70° vertical joints, ~~thomsonite~~ coated-conspicuous to bottom of hole, broken rock to 34.5', 45° cross fractures, 2" shaley zone @ 37.3'	
				T. D. 38.0' 50% loss of drill water	

0002 146

GILBERT ASSOCIATES, INC.

SOIL CLASSIFICATION SHEET

SHEET 1

ROJECT: Three Mile Island W.O. 4192-51 SITE AREA Cooling Tower DRILL HOLE

ONTRACTOR: Fdn. Services COORDINATES ELEVATION

RILLER: Boyer GWL 0 HRS

LASSIFIED BY: DEW DATE: 7-5-67 24 HRS

Sample No.	SPT Blows/6 In. 6	12	18	In. Rec.	Profile	SOIL DESCRIPTION Density (or Consistency), Color Soil Type - Accessories	U.S.C.S.	qu	Coarse Granular Soils: Range Size / Core Run	Grain Shape / Rec. Core	REMARKS Chemical Comp, Geologic Data, Ground Water, Construction Proble
						loose, dk -orange brn. silty sand					
1	1	2	3			loose, lgt. brn. sandy silt, tr. sm. gravel				1"	topsoil- some
2	8	9	12			m.d. dense lgt. brn. sand & gravel,			± 2"	to 7	moist
						trace of some clay					
3	50	13	14			Dense to v. dense brown sand & gravel					
4	21	34	27			trace of some clay					k= 10^{-3} 10^{-4}
5	21	46	54			- trace clay 6.0-7.5'					
6	32	41	52			- sand med. to cse. 7.5-9.0'					
7	41	45	60			- trace of clay 9.0-10.5'- more gravel					
8	46	42	32								
9	44	70	64			- 12-13.5' silty sand, some gravel					12.0 dirtier a gravel to rock
10	39	57	61								
11	29	43	50								
12	51		-			weathered red siltstone					top of rock ?
						Begin coring 17.4'					

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GILBERT ASSOCIATES, INC.

ROCK CLASSIFICATION, SHEET

SHEET 2 OF 2

DATE 7-5-67

Metropolitan Edison Co. NO. 4192-51 DRILL HOLE NO. CT-12

CTOR F. T. Kitlinski and Assoc SITE AREA Three Mile Island ELEV. 292.5'

E NX COORDINATES ANGLE vertical

4" BEARING

BY: GWL 12.0 DEPTH 31.0'

Core Rec. Run	Core	Profile	Interval	DESCRIPTION (Rock type, color, grain size & shape, bedding (angle thickness), fractures, faults, joints (angle, filling, etc.), permeability, alteration, weathering, chemical composition)	REMARKS (Condition of core. Excavating evaluat etc.)
124				Begin coring @ 17.4'	
100% 220	4.5			Sandstone, red & light gray, v. finely laminated @ 45°, prominent vertical joint healed w/white $CaCO_3$ (?), core badly broken to 24.0' 1"-2" pieces, many micro fractures, vertical jointing prominent, 1" granule size, light gray	weathered to
100% 140	2.8				
100%	3.8		25.5	conglomerate red @ 24.7' & 25.5'	top sound roc
27.5				Shale- red silty, bedding in 2"-6" beds, dipping 45°, core +2" pieces, light gray conglomerate ½" thick @ 27.5', occasional sandy inclusions, 45° cross fractures, broken zone 29.7-30.0'	solid unbroke core except a noted
100% 31.7	3.2				

T. D. 31.0' No losss of drill water

0002 148

GILBERT ASSOCIATES, INC.

SOIL CLASSIFICATION SHEET

SHEET 1

ROJECT: Three Mile Island W.O. 4192-51 SITE AREA Cooling Tower DRILL HOLE

ONTRACTOR: Fdn. Services COORDINATES ELEVATION

RILLER: Boyer GWL 0 HRS

LASSIFIED BY: D.S. DATE: 7-5-67 24 HRS

possible hol

Sample No.	SPT Blows/6 in. 6	12	18	In. Rec.	Profile	SOIL DESCRIPTION Density (or Consistency), Color Soil Type - Accessories	U.S.C.S.	qu	Coarse Granular Soils: Range Size / Core Run	Grain Shape / Rec. Core	REMARKS Chemical Comp, Geologic Data, Ground Water, Construction Proble
						0.0 Brown silty, sandy topsoil					
1	1	1	2			V. loose, tan, sandy silt, trace					
2	1	1	2			gravel, f. grnd.	SM				
3	6	14	18			3.5 Med. dense, sar. & gravel, brown,					
4	10	15	20			Dense 4.5-6.0'					high quartz co
5	20	19	26			7.5					
6	30	30	42			V. dense. brown sand & gravel, 9.0 trace of clay	GD SP				
7	38	52	61			V. dense brown silty sand & gravel,					
8	31	12	16			trace of clay					
9	11	23	26			Dense 10.5-12.0'					
10	47	61	63								
11	49	52	56								
12	41	54	60			Coal fragments Begin coring					
No	recovery					13.5					

0002 149

GILBERT ASSOCIATES, INC.

ROCK CLASSIFICATION, SHEET

SHEET 2 OF 2

DATE 7-5-67

T Three Mile Island NO. 4192-51 DRILL HOLE NO. 67-1

CTOR Eng. Services SITE AREA Cooling Tower ELEV. 314.7'

ZE NX COORDINATES ANGLE vertical

BEARING

) BY: GWL DEPTH 30.0'

Core Rec. Run	Core Rec. Core	Profile	Interval	DESCRIPTION: Rock type, color, grain size & shape, bedding (angle thickness), fractures, faults, joints (angle, filling, etc.), permeability, alteration, weathering, chemical composition	REMARKS: Condition of core. Excavating evaluat etc.
19.5			19.5		
100	8.2			Sandstone, brick red, v.f. grnd., v. broken 19.3-23.0', med. broken 23.0-30.0', bedding at approx. 45°, jointing at 60°w/vertical joint at 21.7-22.2', white mineraliza-tion on vertical joints throughout, MnOx stain @ 28.0'	weathered app ance at 19.5- white mottled in lens sandy 25.0' to base
26.5					
100					
27.2	4.7				
100	2.8				
30.0			30.0		
				T. D.	no loss of wa

PA1 S2H1

0002 150

GILBERT ASSOCIATES, INC.

SOIL CLASSIFICATION SHEET

SHEET 1

PROJECT: Three Mile Island W.O. 4192-51 SITE AREA Cooling Tower DRILL HOLE

CONTRACTOR: Fdn. Services COORDINATES ELEVATION

DRILLER: Bower GWL 0 HRS

CLASSIFIED BY: REW DATE: 7-5-67 24 HRS

Sample No.	SPT Blows/6 In. 6	12	18	In. Rec.	Profile	SOIL DESCRIPTION Density (or Consistency), Color Soil Type - Accessories	U.S.C.S.	qu	Coarse Granular Soils: Range Size / Core Run	Grain Shape / Rec. Core	REMARKS Chemical Comp, Geologic Data, Ground Water, Construction Problem
						0.0					
1	1	2	3			Loose brown sandy silt, trace gravel trace clay					Topsoil
2	6	9	12			4.0 Med. dense orange-brn sdy silt, trace gravel					trace roots
3	9	13	18			Dense brown sand & gravel, some silt. trace clay			± 2"	Sub. ang. to rdd.	f. to med. grn coal frags., p lithologic type paleozoic in p K- 10-3 cm/s
4	15	17	20			As above					
5	22	25	27			V. dense, as above					
6	21	2[illegible]	27			As above, but no clay					
7	38	57	64			10.5					
8	23	60	68			V. dense brown silty sand & gravel, trace to some clay.					
9	49	68	75								first damp sam
10	39	41	53			V. dense brown gravel & silty sand			± 2"		wet sample
11	41	56	61								
12	41	43	75								K- 10-2 cm/sec
No Recovery						19.1 Begin coring @ 19.1'					

0002 151

GILBERT ASSOCIATES, INC.

ROCK CLASSIFICATION, SHEET

SHEET 2 OF 2

DATE 7-5-67

r Three Mile Island NO. 4192-51 DRILL HOLE NO. CT-14

CTOR Fdn. Services SITE AREA Cooling Towers ELEV. 294.9

E NX COORDINATES ANGLE vertical

4" BEARING

BY: GWL DEPTH 32.0

Core Rec. Run	Core Rec. Core	Profile	Interval	DESCRIPTION: Rock type, color, grain size & shape, bedding (angle thickness), fractures, faults, joints (angle, filling, etc.), permeability, alteration, weathering, chemical composition	REMARKS: Condition of core. Excavating evaluat etc.
19.1			19.1	Begin coring	
100	69			sandstone, brick red, v.f. grnd., bedding 40°, v. broken to 23.0' w/core 2" pieces, fractures at 30° & 60°, vertical white mineral coated joint 26.0-29.0'; blk. Mn/Ox staining on all fracture surfaces, some 3" beds of silty shale	weathered to & rock is friable, sli weathering be 23'
26.0					
100	60		29.0	Shale, brick red, silty, 45° bedding, intensely broken, 60° cross fracturing, MnOx & FeOx staining	rock max. 2" rock weather
32.0			32.0	T. D. No loss of drill water	to bottom of h rippable to 3

0002 152

Sheet 69 Amend-2 (10-2-67) GAI-228 1/66

GILBERT ASSOCIATES, INC.

SOIL CLASSIFICATION SHEET

SHEET 1

ROJECT: Three Mile Island W.O. 4192-51 SITE AREA Colling Tower DRILL HOLE

ONTRACTOR: Fdn. Services COORDINATES ELEVATION

RILLER: Boyer GWL 0 HRS

LASSIFIED BY: WS DATE: 7-17-67 24 HRS possible

Sample No.	SPT Blows/6 in. 6	12	18	In. Rec.	Profile	SOIL DESCRIPTION Density (or Consistency), Color Soil Type - Accessories	U.S.C.S.	qu	Coarse Granular Soils: Range Size / Core Run	Grain Shape / Rec. Core	REMARKS Chemical Comp, Geologic Data, Ground Water, Construction Problem
						0.0 0.8 Topsoil, loose, moist					
1	1	3	2			Loose, brown, sandy silt, some gravel moist			up to 1"	Sub. rd. to rd.	
2	2	3	2								
3	9	12	10			Brown, sand & gravel, trace silt med. dense dry	SP GP		up to 3/4"	"	
4	10	16	18			Dense, brown sand & gravel, trace silt dry	SP GP		to 3/4"	"	
5	25	19	12								
6	15	13	17			9.0					
7	33	61	57			V. dense, brown sand & gravel, trace silt dry	SP GP				
8	50	63	61			12.0					
9	62	57	40			V. dense, multi-colored, sand & gravel, trace silt, trace clay moist	GM SM				
10	47	53	57								
11	37	57	70			some coal pieces and decomposed red shale					
12	38	40	71								
13	52	55				19.0					
						Started coring					

0002 153

Sheet 70 Amend-2 (10-2-67)

GILBERT ASSOCIATES, INC.

ROCK CLASSIFICATION, SHEET

SHEET 2 OF 2

DATE 7-17-67

T Three Mile Island NO. 4192-57 DRILL HOLE NO. CT-15

CTOR Fdn. Services SITE AREA Cooling Tower ELEV. 294.8

ZE NX COORDINATES ANGLE vertical

BEARING

) BY: GWL DEPTH 37.5

Core Rec. Run	Core Rec. Core	Profile	Interval	DESCRIPTION (Rock type, color, grain size & shape, bedding (angle thickness), fractures, faults, joints (angle, filling, etc.), permeability, alteration, weathering, chemical composition)	REMARKS (Condition of core. Excavating evaluat etc.)
% Rec.				Started coring	
19.1			19.1		
90 21.4	21'			Red silty shale, extremely broken by many vertical joints (filled with white mineral), slickensides on small pieces 26.8-27.0', not noticed above.	possible slip planes
100 26.8	5.4			Bedding slips along partings of most pieces between 27.0 & 28.0'	
100 32.0	6.2			Core again broken by jointing (vertical and mineralized) at 29.2-29.6' & 30.4-32.4', slickensides at about 33.0'	
			34.5		
90 37.5	5.0		37.5	Red, hard, fine grained sandstone, high angle mineralized jointing 36.0 to 37.0'	
				T. D.	
				Black stain along partings throughout hole- no loss of drill water	core may be sound throug but badly br in core box to jointing. Sound below

0002 154

GILBERT ASSOCIATES, INC.

SOIL CLASSIFICATION SHEET

SHEET 1

PROJECT: Met Ed Co. W.O. 4192-51 SITE AREA Three Mile Island DRILL HOLE

CONTRACTOR: Edtn. Services COORDINATES ELEVATION

DRILLER: GWL 0 HRS

CLASSIFIED BY: DJS DATE: 8-11-67 24 HRS

Sample No.	SPT Blows/6 In. 6	12	18	In. Rec.	Profile	SOIL DESCRIPTION Density (or Consistency), Color Soil Type - Accessories	U.S.C.S.	qu	Coarse Granular Soils: Range Size / Core Run	Grain Shape / Rec. Core	REMARKS Chemical Comp, Geologic Data, Ground Water, Construction Problem
1	2	5	12			Loose; brown silt w/some gravel 2.0					moist
2	16	14	13			Med. dense; brown sand & gravel; 4.0 trace of silt			± 1"	sub rdd-	rdd dry
3	15	15	11			Med. dense to dense; multi-colored sand & gravel; trace of coal	silty		<½"	ang-sub rdd	dry - moist
4	12	18	15			4.5-6.0' gray shale fragments					
5	16	12	14								
6	10	9	8			9.0					
7	18	14	12			Dense; brown sand & gravel 10.5-12.0' some coal					moist
8	13	11	16			12.0-13.5' trace of silt			<½"		
9	15	20	22			13.5					wet
10	NO SAMPLE					No recovery 16.5					
11	23	39	50/.08			V. dense; as next above 17.8					wet
NO	SAMPLE					No recovery 19.5					
12	25	46	50/.04			V. dense; multi-colored silty sand 20.9 gravel; trace of clay			<3/4"	sub ang-	dry
NO	SAMPLE					No recovery 22.7					
						Begin coring @ 22.7'					

0002 155

GILBERT ASSOCIATES, INC.

ROCK CLASSIFICATION, SHEET

SHEET 2 OF 2

DATE 8-11-67

T Met Ed Co. NO. 4192-51 DRILL HOLE NO. DH-100

CTOR Fdtn. Services SITE AREA Three Mile Island ELEV. 299.0'

ZE NX COORDINATES ANGLE vertical

4" BEARING

) BY: GWL DEPTH 40.0'

Core Rec. Run	Core Rec. Core	Profile	Interval	DESCRIPTION: Rock type, color, grain size & shape, bedding (angle thickness), fractures, faults, joints (angle, filling, etc.), permeability, alteration, weathering, chemical composition	REMARKS: Condition of core. Excavating evaluation etc.
22.7			22.7	Begin coring @ 22.7'	
76	2.6			Sandy Shale; brick red; badly broken; good core below 34.8'; possible water course @ 30.0' & 32.7-33.2'; much high angle fracturing; bedding @ 37° or 38°; MnOx staining along some partings; green mineralization along joint plane @ 31.2'; gradational change into below sandstone; micaceous @ 36-37.0'; slickersides @ 29.2'	top of sound @ 34.8'
26.3					
98	3.8				
32.1					
100	5.0				
36.0					
96	4.8		37.6		
40.0			40.0	Sandstone; reddish gray; moderately broken w/pieces up to .6'; small limy inclusions @ 39.1'; vertical joints @ 37.9-39.1'; bedding @ 32°	micaceous
				T. D. No loss of drill water	

0002 156

GILBERT ASSOCIATES, INC.

SOIL CLASSIFICATION SHEET

SHEET 1

ROJECT: Met Ed Co. W.O. 1192-51 SITE AREA Three Mile Island DRILL HOLE

ONTRACTOR: Fdtr. Services COORDINATES ELEVATION.

RILLER: GWL 0 HRS

LASSIFIED BY: DJS DATE: 8-14-67 24 HRS

Sample No.	SPT Blows/6 In. 6	12	18	In. Rec.	Profile	SOIL DESCRIPTION Density (or Consistency), Color Soil Type - Accessories	U.S.C.S.	qu	Coarse Granular Soils: Range Size / Core Run	Grain Shape / Rec. Core	REMARKS Chemical Comp, Geologic Data, Ground Water, Construction Problem
1	2	5	6			Loose; brown silt & gravel; trace			±2"	sub rdd-	
2	6	8	10			of sand & coal				rdd	moist
3	7	11	9			Med. dense; brown sand, silty gravel;			±1"	sub ang-	moist
4	9	14	12			trace of coal; trace of red decomposed				rdd	
5	10	9	9			shale					
6	12	8	13			4.5-9.0' dry					
7	10	9	11			10.5-12.0' wet					dry
8	8	11	16			12.0-15.0' dense					
9	10	29	31								moist
10	30	20	28			15.0					
11											
No Sample						No recovery					
						18.0					
12	24	31	20			V. dense; as next above; trace of			< 2"	sub ang-	moist - wet
13	31	45	70			red decomposed shale				sub rdd	
						22.9					
No Sample						No recovery					
						27.2					
						Begin coring @ 27.2'					

0002 157

GILBERT ASSOCIATES, INC.

ROCK CLASSIFICATION, SHEET

SHEET 2 OF 2

DATE 8-14-67

T Met. Ed. Co. NO. 4192-5 DRILL HOLE NO. DH-101

CTOR Edtn. Services SITE AREA Three Mile Island ELEV. 299.3'

ZE NX COORDINATES ANGLE vertical

4" BEARING

D BY: GWL DEPTH 40.0'

GPM	Core Rec. Run	Core Rec. Core	Profile	Interval	DESCRIPTION: Rock type, color, grain size & shape, bedding (angle thickness), fractures, faults, joints (angle, filling, etc.), permeability, alteration, weathering, chemical composition	REMARKS: Condition of core. Excavating evalua etc.
						top of sound 27.5'
22.2				22.2	Begin coring @ 22.2'	
70	5.0				Limy shale; brick red; broken; fine grained; highly fractured; some thomsonite mineral coating on partings	
25.5				25.4		
				26.0	Shale; as above; fine laminations (¼"); bedding @ 30°; coarse grained	
100	5.0				Limy shale; brick red; small limy inclusions throughout up to ½" in diameter; moderately broken w/pieces up to .8' in length; bedding @ 28°; some fractures are rehealed; some MnOx & thomsonite mineralization along partings; slight amount of FeOx staining @ 39.9'	slickensides throughout w/ apparent direc
30.5						
39	4.0					
35.0						
140	5.0					
40.0				40.0		
					T. D. No loss of drill water	

0002 158

GILBERT ASSOCIATES, INC.

SOIL CLASSIFICATION SHEET

SHEET 1

ROJECT Met Ed Co. W.O. 4192-51 SITE AREA Three Mile Island DRILL HOLE

ONTRACTOR Fdtn. Services COORDINATES ELEVATION

RILLER: GWL 0 HRS

LASSIFIED BY: WJS DATE: 8-16-67 24 HRS

Sample No.	SPT Blows/6 in. 6	12	18	In. Rec.	Profile	SOIL DESCRIPTION Density (or Consistency), Color Soil Type - Accessories	U.S.C.S.	qu	Coarse Granular Soils: Range Size / Core Run	Grain Shape / Rec. Core	REMARKS Chemical Comp, Geologic Data, Ground Water, Construction Proble
						Very loose; brown topsoil					
1	1	1	2			med. dense; brown sand & gravel;					
2	4	6	8			some silt					
3	10	15	16			Dense; brown sand & gravel; trace of silt;			± ½"	sub rnd-rnd	
4	16	15	14			sample #3 - wash sample; below 6.0'					
						trace of decomposed coal					some rock from dry- moist
5	8	7	9								
6	7	8	8								
7	12	9	14			17.5' (½" fine sand lense)					
8	20	14	26								
9	16	18	20								
10	19	26	31								
11	27	43	30								
12	31	22	49			18.2					
No Sample						No recovery					
14	20					20.0 no next above					
No Sample						No recovery					
						24.3					
						Begin coring @ 24.3'					

0002 159

GILBERT ASSOCIATES, INC.

ROCK CLASSIFICATION, SHEET

SHEET 2 OF 2

DATE 8-16-67

T Met. Ed. Co. NO. 4192-51 DRILL HOLE NO. ~~DH 102~~

CTOR Fdnt. Services SITE AREA Three Mile Island ELEV. 299.0'

ZE NX COORDINATES ANGLE vertical

4" BEARING

D BY: GWL ~~2483.~~ -18.2 DEPTH 43.0'

Core Rec. Run	Core Rec. Core	Profile	Interval	DESCRIPTION (Rock type, color, grain size & shape, bedding (angle thickness), fractures, faults, joints (angle, filling, etc.), permeability, alteration, weathering, chemical composition)	REMARKS (Condition of core. Excavating evaluat etc.)
					top of sound probably 24.3 but definitel @ 29'
24.5			24.5	Begin coring @ 24.3'	
22.6				Limestone conglomerate; gray; short pieces of core	core loss duc extensive gri
49	2.2		28.8		
29.1			29.1	Shale; gray; short pieces of core	
100	2.5		30.8	~~Sandstone; red; fine grained~~	
31.6				Sandstone; reddish gray; medium grained; hard; good core	
100	4.4				
36.0			36.0		
100	7.0			Silty shale; brick red; med. hard; good core; pieces up to 1.0' in length; 40-42' mamy limy inclusions giving conglomeratic appearance	
43.0			43.0		
				T. D. No loss of drill water	

0002 160

GILBERT ASSOCIATES, INC.

SOIL CLASSIFICATION SHEET

SHEET 1

PROJECT: Met Ed Co. W.O. 4192-51 SITE AREA Three Mile Island DRILL HOLE

CONTRACTOR: Fdtn. Services COORDINATES ELEVATION

DRILLER: GWL 0 HRS

CLASSIFIED BY: DJS DATE: 8-10-67 24 HRS

Sample No.	SPT Blows/6 In. 6	12	18	In. Rec.	Profile	SOIL DESCRIPTION Density (or Consistency), Color Soil Type - Accessories	U.S.C.S.	qu	Coarse Granular Soils: Range Size / Core Run	Grain Shape / Rec. Core	REMARKS Chemical Comp, Geologic Data, Ground Water, Construction Problem
1	2	4	5			Loose to med. dense; orange brown silt and gravel			< 3/4"	sub rnd-rnd	moist
2	6	6	16			1.5-3.0' some sand					
3	16	26	29			Dense to v. dense; brown sand & gravel; trace of coal; trace of silt			< 1"	sub ang-rnd	dry
4	24	26	21								
5	40	24	22			7.5					
No Sample						No recovery					
						9.0					
6	7	5	7			As next above; wet; some organic material					wet
						10.5					
No Sample						No recovery					
						12.0					
7	13	26	37			V. dense; multi-colored silty sand & gravel; trace of coal			< 1"	ang-rnd	moist
8	57	46	38			15.0					
No Sample						No recovery					
9	53	60	79			As next above (V. dense)					moist
						No recovery					moist
10	49	103				V. dense; red decomposed shale					
						Begin coring @ 23.0'					

0002 161

GILBERT ASSOCIATES, INC.

ROCK CLASSIFICATION, SHEET

SHEET 2 OF 2

DATE 8-10-67

T Met Ed Co. NO. 4192-51 DRILL HOLE NO. DM-103

CTOR Fdtn. Services SITE AREA Three Mile Island ELEV. 298.7'

ZE NX COORDINATES ANGLE vertical

4" BEARING

D BY: GWL DEPTH 38.0'

Core Rec. Run	Core Rec. Core	Profile	Interval	DESCRIPTION: Rock type, color, grain size & shape, bedding (angle thickness), fractures, faults, joints (angle, filling, etc.), permeability, alteration, weathering, chemical composition	REMARKS: Condition of core. Excavating evalua etc.
23.0			23.0	Begin coring @ 23.0'	
92	46			Silty shale; brick red; fine grained; good core; moderately broken with pieces up to .6' in length; many limy 1/8" diameter inclusions 31.5-38'; weathered zones @ 23-23.9', 30.5-31', 37.7-38'; bedding at 37°; MnOx staining along some partings; small vertical fractures @ 24.6' & 25'; high angle slickensides @ 27'	
28.0					
90	45				
33.0					top of sound @ 24.6'
96	48				
38.0			38.0		
				T. D. No loss of drill water	

0002 162

Sheet 79 Amend-2 (10-2-67)

GAI-228 1/66

GILBERT ASSOCIATES, INC.

SOIL CLASSIFICATION SHEET

SHEET 1

ROJECT: Met Ed Co. W.O. 4192-51 SITE AREA Three Mile Island DRILL HOLE

ONTRACTOR: Fdtn. Services COORDINATES ELEVATION

RILLER: Boyer GWL 0 HRS

LASSIFIED BY: DJS DATE: 8-10-67 24 HRS

Sample No.	SPT Blows/6 in. 6	12	18	In. Rec.	Profile	SOIL DESCRIPTION Density (or Consistency), Color Soil Type - Accessories	U.S.C.S.	qu	Coarse Granular Soils: Range Size / Core Run	Grain Shape / Rec. Core	REMARKS Chemical Comp, Geologic Data, Ground Water, Construction Proble.
1	2	4	6			Loose to med. dense; silt & gravel;			± ½"	sub	
2	8	10	11			trace of sand				rdd-rdd	moist
3	15	26	26			Dense to v. dense; silty sand &				sub	moist
4	30	21	38			gravel (brown); trace of coal			± 1"	ang-sub	
5	16	18	16			6.0-7.5' as above; wet				rdd	wet
6	13	13	19								moist
7	15	16	14								
8	16	20	19			Dense; brown sand; some gravel			< ½"	rdd	moist
9	16	13	19			As next above					moist
10	28	30	30			v. dense; multi-colored silty sand				sub	
11	22	38	39			& gravel; some coal				ang-	
12	42	67	100			13.5-15' some coal			± 1"	rdd	dry
13	50	52	53			19.5-21.0' trace of red decomposed shale					
14	52	49	54								
No Sample						NO RECOVERY					
						Begin coring @ 23.0'					

0002 163

GILBERT ASSOCIATES, INC.

ROCK CLASSIFICATION, SHEET

SHEET 2 OF 2

DATE 3-10-67

r Met Ed Co. NO. 4192-51 DRILL HOLE NO. DH-104

CTOR Fdtn. Services SITE AREA Three Mile Island ELEV. 299.7

ZE NX COORDINATES ANGLE vertical

4" BEARING

BY: GWL DEPTH 41.0'

Core Rec. Run	Core Rec. Core	Profile	Interval	DESCRIPTION: Rock type, color, grain size & shape, bedding (angle thickness), fractures, faults, joints (angle, filling, etc.), permeability, alteration, weathering, chemical composition	REMARKS: Condition of core. Excavating evaluat etc.
					top of sound at 27.0'
23.0			23.0	Begin coring @ 23.0'	
89	96			Sandy shale; brick red; broken w/no pieces >.3';vert.	
25.9			25.9	~~jointing @ 23-25.9';slight amount of MnOx staining~~	
94	4.8			Silty shale; brick red; excellent core with core pieces up to .8' in length; bedding @ 35°; badly broken zone @ 38-38.2'; weathering @ 25.9-26.9'; cross jointing @ 34.2'	
31.0					
96	4.8				
36.0					
100	5.0		38.2		
41.0			41.0	Shale; brick red; mottled with small 1/6" limy inclusions; badly broken @ 39-39.4'; some MnOx staining along partings	
				T. D.. No loss of drill water	

0002 1<4

Sheet 81 Amend-2 (10-2-67)

GAI-228 1/66

GILBERT ASSOCIATES, INC.

SOIL CLASSIFICATION SHEET

SHEET 1

ROJECT: Met Ed Co. W.O. 4192-51 SITE AREA Three Mile Island DRILL HOLE

ONTRACTOR: Edtn. Services COORDINATES ELEVATION

RILLER: GWL 0 HRS

LASSIFIED BY: DWS DATE: 5-11-67 24 HRS

Sample No.	SPT Blows/6 In. 6	12	18	In. Rec.	Profile	SOIL DESCRIPTION Density (or Consistency), Color Soil Type - Accessories	U.S.C.S.	qu	Coarse Granular Soils Range Size Core Run	Grain Shape Rec. Core	REMARKS Chemical Comp, Geologic Data, Ground Water, Construction Proble
1	2	4	6			Loose to med. dense; orange-brown silt & gravel; trace of coal			<1"	sub rdd-rdd	moist
2	9	10	16			3.0					
3	24	23	21			Dense; brown silt, sand & gravel; trace of coal			<1"	ang-sub rdd.	dry
4	26	18	15			6.0					
5	22	30	25			V. dense; multi-colored silty sand & ~~gravel; some coal~~					moist - wet
6	31	16	14			Med. dense to dense: brown sand & gravel; trace of silt; trace of coal			<2"	and-rdd.	dry
7	13	13	14								
8	17	22	26			9.0					
9	24	23	35			V. dense; multi-colored silty sand & gravel; trace of coal; trace of red decomposed shale			<2"		moist
10	49	28	24								
11	38	23	20								
12	41	59	62			12.0					
13	37	42	62			V. dense; brown sand & gravel; trace of silt; trace of coal; trace of red decomposed shale					moist
14	49	72	91								wet
15	43	66	102			22.5					
No Sample						No recovery					
						24.6					
						Begin coring @24.5'					

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Sheet 82 Amend-2 (10-2-67)

GILBERT ASSOCIATES, INC.

ROCK CLASSIFICATION, SHEET

SHEET 2 OF 2

DATE 8-11-67

r Met Ed Co. NO. 4192-51 DRILL HOLE NO. DH 105

CTOR Fdtn. Services SITE AREA Three Mile Island ELEV. 299.9

ZE NX COORDINATES ANGLE vertical

4" BEARING

) BY: GWL DEPTH 42.0'

Core Rec. Run	Core Rec. Core	Profile	Interval	DESCRIPTION: Rock type, color, grain size & shape, bedding (angle thickness), fractures, faults, joints (angle, filling, etc.), permeability, alteration, weathering, chemical composition	REMARKS: Condition of core. Excavating evaluat etc.
24.5			24.5	Begin coring @ 24.5'	top of sound : questionable (to broken conc in box, maybe :
86	4.3			Silty shale; brick red; v. broken with no pieces >.2'; possible water courses @ 29.4' & 33' with some decomposed shale; weathered rock @ 24.5-25.5'; high amount of joint ing is responsible for broken core; MnOx & thomsonite coated partings throughout; rehealed vertical joint @ 34.5-34.8'; possible slickensides @ 26.3 & 27'	much minerali: along broken (
29.5					
100	5.0				
34.5					
			37.2		
77	3.9			Shaly sandstone; brick red; broken 37.2-38.6'; good core below 38.6'; high amount of limy inclusions @ 39.8-40.6' gives a conglomerate appearance; several rehealed partings below 40.6'	
40.0			42.0	T. D. No loss of drill water	

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Sheet 83 Amend-2 (10-2-67)

GAI-228 1/66

GILBERT ASSOCIATES, INC.

SOIL CLASSIFICATION SHEET

SHEET 1

PROJECT: Met Ed Co. W.O. 4192-51 SITE AREA Three Mile Island DRILL HOLE

CONTRACTOR: Fdtn. Services COORDINATES ELEVATION

DRILLER: GWL 0 HRS

CLASSIFIED BY: DJS DATE: 8-11-67 24 HRS

Sample No.	SPT Blows/6 In. 6	12	18	In. Rec.	Profile	SOIL DESCRIPTION Density (or Consistency), Color Soil Type - Accessories	U.S.C.S.	qu	Coarse Granular Soils: Range Size / Core Run	Grain Shape / Rec. Core	REMARKS Chemical Comp, Geologic Data, Ground Water, Construction Proble
1	1	3	3			Loose, brown silt; trace of coal; ~~trace of gravel~~ 2.5					moist
2	6	7	20			Med. dense to v. dense; light brown silty sand & gravel; trace of coal 4.5-6.0' sample is very dry 6.0			± 1"	sub arg-rdd	dry
3	27	27	30								
4	40	37	29								
5	13	11	17			Med. dense; multi-colored sand & gravel; trace of silt; trace of coal 7.5			± 1"	sub rdd-rdd	moist
6	11	14	14								dry
7	10	7	15								
8	17	30	21			V. dense; tan sand & gravel; v. dry 10.0					dry
9	23	27	30			V. dense; multi-colored silty sand & gravel; trace of red decomposed shale; trace of coal 13.9			< ½"	sub rdd-rdd	moist
10	27	34	35								
11	38	18/4									
No Sample						NO RECOVERY					
12	31	39	52			V. dense as next above					moist
13	49	67	91			V. dense; brown sand & gravel			< ½"	arg-rdd	wet
No Sample						No recovery					
						Begin coring @ 23.9'					

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Sheet 84 Amend-2 (10-2-67)

GILBERT ASSOCIATES, INC.

ROCK CLASSIFICATION, SHEET

SHEET 2 OF 2

DATE 8-11-67

r Met Ed Co. NO. 4192-51 DRILL HOLE NO. DH-106

CTOR Fdtn. Services SITE AREA Three Mile Island ELEV. 300.2'

E NX COORDINATES ANGLE vertical

4" BEARING 40.0'

BY: GWL DEPTH

Core Rec. Run	Core Rec. Core	Profile	Interval	DESCRIPTION: Rock type, color, grain size & shape, bedding (angle thickness), fractures, faults, joints (angle, filling, etc.), permeability, alteration, weathering, chemical composition	REMARKS: Condition of core. Excavating evaluat etc.
23.9			23.9	Begin coring @ 23.9'	
27.6	2.4			Sandstone; brick red to reddish gray; good core; pieces up to 1.2' in length; weathered 23.9-25.3'; water course with soft shale @ 32.3-32.6'; cross jointing @ 28.8-29.6'; vertical jointing 29.6-30.2'; fine grained; bedding @ 35-40°.	top of sound r @ 27.6'
32.0	4.8		32.6		
34.5	1.8			Silty shale; brick red; fine grained: med. hard; small 1/16" diameter; limy inclusions throughout; good core with pieces up to .6"; bedding at 34°; vertical jointing 35.4-36'; thomsonite coated bedding plane @ 37.6"; several ~~rehealed joints @ 39.5'~~	
40.0	.50		40.0		
			T.	D. 40.0' No loss of drill water	

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Sheet 55 Amend-2 (10-2-67)

GAI-228 1/66

GILBERT ASSOCIATES, INC.

SOIL CLASSIFICATION SHEET

SHEET 1

PROJECT: Met Ed Co. W.O. 4192-51 SITE AREA Three Mile Island DRILL HOLE

CONTRACTOR: Fdtn. Services COORDINATES ELEVATION

DRILLER: GWL 0 HRS

CLASSIFIED BY: DWS DATE: 8-3-67 24 HRS

Sample No.	SPT Blows/6 in. 6	12	18	In. Rec.	Profile	SOIL DESCRIPTION Density (or Consistency), Color Soil Type - Accessories	U.S.C.S.	qu	Coarse Granular Soils: Range Size / Core Run	Grain Shape / Rec. Core	REMARKS Chemical Comp, Geologic Data, Ground Water, Construction Proble
1	2	3	4			Loose; orange brown silt & gravel 4.5			<3/4"	sub rdd-rdd	moist
2	7	15	12			Med. dense to dense; brown sand & gravel; trace of silt; trace of coal			< 2"	ang-rdd	dry
3	18	18	15			4.5					
4	10	9	15			Med. dense; multi-colored sand & gravel; some silt; some coal			±1"	sub rdd-rdd	moist
5	16	13	13			7.5					
6	10	12	11			Med. dense; brown sand & gravel; some coal throughout			±½"	sub rdd-rdd	moist
7	11	10	11								
8	13	16	17								
9	13	13	50			13.6					
						Gray shale boulder; v. hard 15.0					(cored)
10	39	52	69			V. dense; multi-colored; sand & gravel; trace of silt & clay; trace of coal			< 2"	sub ang-rdd	moist
11	31	34	26								
12	36	30	29								
13	46	71	99			19.5-21.0' slight amount of decomposed brick red shale 21.6					wet
						Begin coring @ 21.6'					

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GILBERT ASSOCIATES, INC.

ROCK CLASSIFICATION, SHEET

SHEET 2 OF 2

DATE 8-3-67

Met Ed Co. NO. 4192-51 DRILL HOLE NO. DH-107

:TOR Fdtn. Services SITE AREA Three Mile Island ELEV. 298.6'

E NX COORDINATES ANGLE vertical

4" BEARING

BY: GWL 15.6' - 0 hrs. 17.4' - 24hrs. DEPTH 37.0'

Core Rec. Run	Core Rec. Core	Profile	Interval	DESCRIPTION (Rock type, color, grain size & shape, bedding (angle thickness), fractures, faults, joints (angle, filling, etc.), permeability, alteration, weathering, chemical composition)	REMARKS (Condition of core. Excavating evaluat etc.)
					top of sound r @ 21.6'
21.6			21.6		
92	3.0			Shale; brick red; broken w/pieces 3"; fine grained; broken @ 23.2', 24.2' & 26.5'-27.3'; bedding @ 35-40°; MnOx staining along some partings; cross joints @ 24.5'	
24.9					
81	1.3				
26.3			28.2		
97	5.1			Shaly sandstone; brick red & slightly gray; fine grained; good core with pieces up to .8'; some limy inclusions throughout; bedding @ 30-35°; slightly micaceous @ 30.4'; vertical fractures 33.6-34.0';slight amount of mineralization along parting @ 35.6'	
32.0					
100	5.2				
37.0			37.0		
				T. D. 37.0' No loss of drill water	

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Sheet 87 Amend-2 (10-2-67)

GAI-228 1/66

GILBERT ASSOCIATES, INC.

SOIL CLASSIFICATION SHEET

SHEET 1

ROJECT: Met. Ed. Co. W.O. 4192-51 SITE AREA Three Mile Island DRILL HOLE

ONTRACTOR: Edtn. Services COORDINATES ELEVATION

RILLER: GWL 0 HRS

LASSIFIED BY: DJS DATE: 8-3-67 24 HRS

Sample No.	SPT Blows/ 6 in. 6	12	18	In. Rec.	Profile	SOIL DESCRIPTION Density (or Consistency), Color Soil Type - Accessories	U.S.C.S.	qu	Coarse Granular Soils: Range Size / Core Run	Grain Shape / Rec. Core	REMARKS Chemical Comp, Geologic Data, Ground Water, Construction Proble
1	3	5	8			Loose; brown silt; trace of gravel					moist
2	15	18	21			Dense to v. dense; brown sand & gravel; trace of silt; trace of coal 4.5-6.0' trace of decomposed shale			±1"	sub ang-sub rdd	moist
3	29	30	20								
4	19	20	28								
5	12	15	18			Dense to med. dense; multi-colored; silty sand & gravel; trace of coal			±1"	sub ang-rdd	moist
6	15	11	12								
7	9	8	11			Med. dense; sand & gravel; trace of silt			±½"	sub rdd-rdd	moist
8	18	29	21			Dense; brown sand; trace of gravel; some organic material					dry - moist
9	27	38	46			V. dense; multi-colored; sand, silt & gravel; trace of coal; some decomposed shale			<½"	sub ang-rdd	moist
10	45	52	41								wet
11	29	34									
12	32	37	36			V. dense; brown silty sand & gravel; very wet @ 19.5-21.0'; trace of coal and decomposed shale			<1"	sub rdd-rdd	moist
13	40	62	65								
14	42	33	28								
15	28	23	53			21.5-22.5' decomposed brown- red shale					wet
						Begin coring @ 23.0'					

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GILBERT ASSOCIATES, INC.

ROCK CLASSIFICATION, SHEET

SHEET 2 OF 2

DATE 8-3-67

T Met Ed Co. NO. 4192-51 DRILL HOLE NO. DH-108

CTOR Edtn. Services SITE AREA Three Mile Island ELEV. 298.9'

ZE NX COORDINATES ANGLE vertical

4" BEARING

D BY: GWL DEPTH 39.0'

GPM	Core Rec. Run	Core Rec. Core	Profile	Interval	DESCRIPTION: Rock type, color, grain size & shape, bedding (angle thickness), fractures, faults, joints (angle, filling, etc.), permeability, alteration, weathering, chemical composition	REMARKS: Condition of core. Excavating evalua etc.
23.0				23.0	Begin coring @ 23.0'	
23	8.0				Shale and sandstone; interbedded; brick red; slightly limy in shaly areas; good core; pieces up to .8' in length; moderately broken with very broken zone @ 33.0-34.0' (possible water course); bedding @ 37; MnOx staining along partings throughout; jointing @ high angles with thomsonite minerlization along joint planes @ 37.0' & 38.5'	top of sound @ 23.5'
24.4						
24	1.6					
24.3						
25	8.3					
26.0						
34	4.7					
39.0				39.0		
					T. D. No loss of drill water	

DDD2 172

Sheet 89 Amend-2 (10-2-67)

GAI-226 1/66

GILBERT ASSOCIATES, INC.

SOIL CLASSIFICATION SHEET

SHEET 1

ROJECT: Met Ed Co. W.O. 4192-51 SITE AREA Three Mile Island DRILL HOLE

ONTRACTOR: Fdtn. Services COORDINATES ELEVATION

RILLER: GWL 0 HRS

LASSIFIED BY: DJS DATE: 8-3-67 24 HRS

Sample No.	SPT Blows/6 In. 6	12	18	In. Rec.	Profile	SOIL DESCRIPTION Density (or Consistency), Color Soil Type - Accessories	U.S.C.S.	qu	Coarse Granular Soils Range Size / Core Run	Grain Shape / Rec. Core	REMARKS Chemical Comp, Geologic Data, Ground Water, Construction Proble
1	2	6	8			Loose to med. dense; orange brown; silt & gravel; trace of coal			< ½"	sub rdd-rdd	moist
2	9	8	10			9.0					
3	16	13	15			Med. dense; brown sand & gravel; some silt; trace of coal; less gravel with depth			<1"	sub ang-rdd	dry
4	17	9	11								
5	12	17	20								
6	21	16	14								moist
7	14	8	15			Dense as above					
8	13	11	10			12.0					
9	14	28	37			L. dense; multi-colored sand, silty; & gravel; trace of coal & some decomposed shale			< 2"	rdd-rdd	moist
10	21	30	33								
11	[illegible]	[illegible]	[illegible]								
	No Sample										
12	34	46	57								
13	41	50	67			19.5					
14	44	57	68			L. dense; brown sand & gravel; trace of silt; trace of coal			< ½"	sub rdd-rdd	wet
15	51	69	85			22.8					
						Begin coring @ 22.8'					

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GILBERT ASSOCIATES, INC.

ROCK CLASSIFICATION, SHEET

SHEET 2 OF 2

DATE 8-3-67

T Met Ed Co. NO. 4192-51 DRILL HOLE NO. DH-109

CTOR Fdtn. Services SITE AREA Three Mile Island ELEV. 299.0'

ZE NX COORDINATES ANGLE vertical

4" BEARING

D BY: GWL 16.9' caved @ 16.5' @ 24 hrs. DEPTH 40.0'

Core Rec. Run	Core Rec. Core	Profile	Interval	DESCRIPTION: Rock type, color, grain size & shape, bedding (angle thickness), fractures, faults, joints (angle, filling, etc.), permeability, alteration, weathering, chemical composition	REMARKS: Condition of core. Excavating evaluat etc.
22.8			22.8		
98	5.0		Shale 27.9	Shale; brick red; badly broken w/no pieces 1"; organic seams @ 25.3 & 27.8'; MnOx staining throughout; slightly micaceous @ 24.2'; vertical joint @ 23.6 & 27.2'; breakage due to joint	sound rock @ 2
100	5.1		31.2	Shale; red & green mottled; broken w/pieces 4"; several small organic seams @ 28.9', 29.3' & 30.4' (green Clay); ~~bedding @ 35°; badly broken w/ clay seams~~	limy
33.0			34.1	Shale; (green limy); good core w/pcs. <.4'; small 1" thick clay; sly. or ~~seam @ 32.9-33"; bedding @ 36; mineralization along some partings~~	
84	4.2			Shale; brick red; good core; weathered @ 36.2-37.2'; MnOx staining along some partings; calcite coated high angle joint @ 40.0'; bedding @ 30-35°	
38.0					
70	1.6				
40.0			40.0	T. D. No loss of drill water	

0002 174

GAI-228 1/66

GILBERT ASSOCIATES, INC.

SOIL CLASSIFICATION SHEET

SHEET 1

PROJECT: Met Ed Co. W.O. 4192-51 SITE AREA Three Mile Island DRILL HOLE

CONTRACTOR: Fdtn. Services COORDINATES ELEVATION

DRILLER: GWL 0 HRS

CLASSIFIED BY: DJS DATE: 8-11-67 24 HRS

Sample No.	SPT Blows/6 In. 6	12	18	In. Rec.	Profile	SOIL DESCRIPTION Density (or Consistency), Color Soil Type - Accessories	U.S.C.S.	qu	Coarse Granular Soils Range Size Core Run	Grain Shape Rec. Core	REMARKS Chemical Comp, Geologic Data, Ground Water, Construction Proble
1	2	5	6			Loose; brown silt w/some gravel 2.8					moist
2	7	19	18			Med. dense; brown sand and gravel; some silt; trace of coal; goes from dry @ 3.0' to moist at about 10.5'			< 1"	sub arg-rdd	dry
3	12	14	11								
4	10	8	7								
5	12	14	9								
6	9	7	11								
7	5	8	5			10.5					moist
8	6	6	6			Loose; brown sand; some coal; trace of gravel 12.8					moist
9	10	12	18			Dense; multi-colored sand, silty; gravel; trace of coal			< ½"	sub rdd-rdd	moist
10	19	25	42			15.0					
11	2/3					No recovery					
No Sample						16.5					
12	15	18	28			Dense; brown sand and gravel; trace ~~of silt and coal~~					moist
13	35	31	38			V. dense; multi-colored sand, silt gravel; trace of red decomposed shale 22.5			±½"	arg-rdd	moist - wet
14	40	75									
						Begin coring @ 22.5'					

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GILBERT ASSOCIATES, INC.

ROCK CLASSIFICATION, SHEET

SHEET 2 OF 2

DATE 8-11-67

r Met Ed Co. NO. 4192-51 DRILL HOLE NO. DH-110

CTOR Edtn. Services SITE AREA Three Mile Island ELEV. 300.1'

ZE NX COORDINATES ANGLE vertical

4" BEARING

BY: GWL DEPTH 37.0'

Core Rec. Run	Core Rec. Core	Profile	Interval	DESCRIPTION: Rock type, color, grain size & shape, bedding (angle thickness), fractures, faults, joints (angle, filling, etc.), permeability, alteration, weathering, chemical composition	REMARKS: Condition of core. Excavating evaluat etc.
22.5			22.5		
26	3.4		26.5	Shaly sandstone; brick red; fine grained; badly broken; highly fractured; possible water course @ 26.5'; coarse grained @ 23.5-23.9'	top of sound r 29.4'
27.0					
96	4.5			Shale; brick red; broken from 26.5-29.8'; moderately broken 29.8-32.0'; broken due to vertical jointing 32-35.4'; good core 35.4-37.0'; vertical, thomsonite coated joint @ 32.0-35.4'; bedding @ 34°; small limy 1/8" diameter inclusions below 30.0'; rock becomes sandy with depth	much grinding run 27.0-32.0'
32.0					
94	4.7				
37.0			37.0		
				T. D. No loss of drill water	

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GILBERT ASSOCIATES, INC.

SOIL CLASSIFICATION SHEET

SHEET 1

PROJECT: Met Ed Co. W.O. 4192-51 SITE AREA Three Mile Island DRILL HOLE

CONTRACTOR: Fdtn. Services COORDINATES ELEVATION

DRILLER: GWL 0 HRS

CLASSIFIED BY: DJC DATE: 8-2-67 24 HRS

Sample No.	SPT Blows/6 In. 6	12	18	In. Rec.	Profile	SOIL DESCRIPTION Density (or Consistency), Color Soil Type - Accessories	U.S.C.S.	qu	Coarse Granular Soils: Range Size / Core Run	Grain Shape / Rec. Core	REMARKS Chemical Comp, Geologic Data, Ground Water, Construction Proble
1	2	5	5			Loose; orange brown silt; some gravel			< 1/2"		
2	9	11	17			Med. dense to dense; brown sand & gravel; some silt; trace of coal					
3	21	16	19								
4	18	17	8			Loose to med. dense; as above			<1"		
5	5	6	3								
6	6	8	12			9.0					
7	12	4	5			Med. dense; brown sand with some gravel					
8	6	11	13			12.0					
9	13	18	35			Dense; brown silty sand & gravel; 15.5 trace of coal			1"		
10	70	88	55			13.5-15.0' very wet; wash sample					
11	58	63	48			V. dense; multi-colored silty sand			<		
12	53	45	47			18.0 gravel; trace of coal, clay					
	43	47	43								
	27	30	41			No recovery					
13	40	99				24.0 V. dense; as next above					
						Begin coring @ 21.0'					

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GILBERT ASSOCIATES, INC.

ROCK CLASSIFICATION, SHEET

SHEET 2 OF 2

DATE 8-3-67

T Met Ed Co. NO. 4192-51 DRILL HOLE NO. DH-111

CTOR Fdtn. Services SITE AREA Three Mile Island ELEV. 299.1'

ZE NX COORDINATES ANGLE vertical

4" BEARING

) BY: GWL 17.1 @ 0 hrs. 17.9' @ 24 hrs. DEPTH 40.0'

Core Rec. Run	Core Rec. Core	Profile	Interval	DESCRIPTION: Rock type, color, grain size & shape, bedding (angle thickness), fractures, faults, joints (angle, filling, etc.), permeability, alteration, weathering, chemical composition	REMARKS: Condition of core. Excavating evaluat etc.
					sound rock @
21.9			21.9		
97 24.2	2.0			Shale; brick red; good core; pieces up to .5'; broken zones @ 27-28.3', 30.5-33.5' & 37.7'; MnOx staining along some partings; bedding @ 37°; becomes sandy from 28.2-34.0'; vertical joints @ 26.1' & 39.0'-39.5'; cross joints @ 29.5' & 31.8'; fine grained; med. hard to hard	
99 28.2	4.0				
	2.7				
90 36.1	1.9				
98 40.0	3.8		40.0		
				T. D. 40.0' No loss of drill water	

0002 178

Sheet 95 Amend-2 (10-2-67)

GAI-226 1/66

GILBERT ASSOCIATES, INC.

SOIL CLASSIFICATION SHEET

SHEET 1

PROJECT: Met Ed Co. W.O. 4192-51 SITE AREA Three Mile Island DRILL HOLE

CONTRACTOR: Fdtn. Services COORDINATES ELEVATION

DRILLER: GWL 0 HRS

CLASSIFIED BY: DJS DATE: 8-3-67 24 HRS

Sample No.	SPT Blows/6 In. 6	12	18	In. Rec.	Profile	SOIL DESCRIPTION Density (or Consistency), Color Soil Type - Accessories	U.S.C.S.	qu	Coarse Granular Soils: Range Size / Core Run	Grain Shape / Rec. Core	REMARKS Chemical Comp, Geologic Data, Ground Water, Construction Problems
1	4	6	8			Loose; brown; silt and sand			± ½"	sub rnd-rdd	moist
2	12	16	18			Med. dense; multi-colored silty sand & gravel; trace of coal			<1	sub ang-rdd	dry
3	9	12	8								
4	12	13	13								moist
5	8	13	16								
6	11	12	10			Med. dense; brown sand & gravel; some silt; trace of coal					
7	11	14	12								
8	15	15	16								moist
9	27	35	40			V. dense; multicolored silty sand & gravel; trace of coal			± ½"		dry
10	44	63	57								
11	32					V. dense; brown sand & gravel 16.5-18.0 some silt			±1"		wet
	No Sample										
12	31	65	66								
13	53	35	30			18.0-19.0' trace of coal					moist
14	29	41	87								
	91.4					19.5-21.0' very coarse sand & gravel					wet
						Begin coring @ 21.4'					

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GILBERT ASSOCIATES, INC.

ROCK CLASSIFICATION, SHEET

SHEET 1 OF 2

DATE 8-3-67

T Met. Ed Co. NO. 4192-51 DRILL HOLE NO. DH-112

CTOR Fdtn. Services SITE AREA Three Mile Island ELEV. 299.3'

ZE NX COORDINATES ANGLE vertical

4" BEARING

) BY: GWL 18.2' - 0 hrs. caved @ 17.7' 24 hrs. DEPTH 38.0'

Core Rec. Run	Core Rec. Core	Profile	Interval	DESCRIPTION: Rock type, color, grain size & shape, bedding (angle thickness), fractures, faults, joints (angle, filling, etc.), permeability, alteration, weathering, chemical composition	REMARKS: Condition of core. Excavating evaluat etc.
21.4			21.4	Begin coring @ 21.4'	
85	6.1			Sandstone; reddish gray; broken with pieces .6'; bedding @ 33°; fine grained; med. hard; vertical joint 22.4-24.3'; white mineral filled vertical joint @ 24.5-25.5'; soft zone @ 24.6-25.7' - possible water course; MnOx staining @ 25.6'; becoming med. grained 28.5-33.0'; 29.3-30.3' soft zone; 30.3-30.8' hard zone; 30.8-31.7' & 32.7-33.0' softer zones	top of sound 28.6'
96	4.2		33.0		
100	5.6			Shale; brick red; moderately broken; pieces up to 1.5'; very fine grained; bedding @ 30°; Mn Ox staining throughout	becomes sand with depth
38.0			38.0		
				T. D. 38.0' No loss of drill water	

0002 180

Sheet 97 Amend-2 (10-2-67)

GAI-228 1/66

GILBERT ASSOCIATES, INC.

SOIL CLASSIFICATION SHEET

SHEET 1

PROJECT: Met. Ed Co. W.O. 4192-51 SITE AREA Three Mile Island DRILL HOLE

CONTRACTOR: Edtn. Services COORDINATES ELEVATION

DRILLER: GWL 0 HRS

CLASSIFIED BY: WJS DATE: 8-3-67 24 HRS

Sample No.	SPT Blows/6 In. 6	12	18	In. Rec.	Profile	SOIL DESCRIPTION Density (or Consistency), Color Soil Type - Accessories	U.S.C.S.	qu	Coarse Granular Soils: Range Size / Core Run	Grain Shape / Rec. Core	REMARKS Chemical Comp, Geologic Data, Ground Water, Construction Proble
1	5	10	8			Med. dense; brown silt; trace of gravel			½"	sub rdd-rdd	moist
2	10	10	15			3.0					
3	15	12	14			Med. dense to dense; Brown; silty sand & gravel; trace of decomposed coal			½"	sub ang-rdd	dry 4.5-6.0'
4	15	14	15			6.0-9.0' some coal					moist
5	16	11	9			9.0-10.5' trace of coal					
6	10	12	10								
7	11	10	10								
8	14	17	16								
9	21	25	33			13.5-15.0' trace of decomposed shale; v. dense					
10	31	25	35			15.0					
11	23	30	46			V. dense; multi-colored silty sand & gravel; trace of decomposed shale			1"	ang-sub rdd	moist
12	55	94	—								
	No Samples										
13	22	39	38			18.0-19.5' trace of coal					
14	60	59	89								
15	37	43	88			21.0-22.5' some decomposed shale					wet
	47	93/4									
						Begin coring @ 23.4'					

0002 181

GILBERT ASSOCIATES, INC.

ROCK CLASSIFICATION, SHEET

SHEET 2 OF 2

DATE 8-3-67

T Met Ed Co. NO. 4192-51 DRILL HOLE NO. DH-113

CTOR Fdtn. Services SITE AREA Three Mile Island ELEV. 299.5'

ZE NX COORDINATES ANGLE vertical

4" BEARING

BY: GWL 7.1' cayed @ 12.9' @ 24 hrs. DEPTH 39.0'

Core Rec. Run	Core Rec. Core	Profile	Interval	DESCRIPTION: Rock type, color, grain size & shape, bedding (angle thickness), fractures, faults, joints (angle, filling, etc.), permeability, alteration, weathering, chemical composition	REMARKS: Condition of core. Excavating evaluat etc.
23.4			23.4	Begin coring @ 23.4'	
90	4.6		28.0	Shale; brick red; badly broken with pieces 2"; very broken @ 24.9' & 27.2'; fine grained; fracturing at high angles; MnOx staining along partings; weathered to 29.0'	top of sound r @ 29.0'
33.2 / 98 / 34.2	3.9			Shaly sandstone; reddish gray; good core; fine grained; hard; bedding @ 40°-45°; some fracturing throughout; two small limy inclusions @ 38.5'; slight amount of mineralization along bedding plane @ 33.5'; pieces up to .7'; slickensides @ 26.0' fragments	becomes sandie with depth
96 / 39.0	4.8		39.0		
				T. D. No loss of drill water	

0002 182

GAI-2 B 1/66

GILBERT ASSOCIATES, INC.

SOIL CLASSIFICATION SHEET

SHEET 1

ROJECT: Met Ed Co. W.O. 4192-51 SITE AREA Three Mile Island DRILL HOLE

ONTRACTOR: Fdtn. Services COORDINATES ELEVATION

RILLER: GWL 0 HRS

LASSIFIED BY: WJS DATE: 8-14-67 24 HRS

Sample No.	SPT Blows/6 In. 6	12	18	In. Rec.	Profile	SOIL DESCRIPTION Density (or Consistency), Color Soil Type - Accessories	U.S.C.S.	qu	Coarse Granular Soils: Range Size / Core Run	Grain Shape / Rec. Core	REMARKS Chemical Comp, Geologic Data, Ground Water, Construction Problems
1	1	3	4			Loose; brown topsoil					moist
2	6	8	10			Med. dense; brown sand & gravel; trace of decomposed coal below 3.5-6.0' slightly cohesive					
3	9	13	16								
4	13	16	23								
5	17	15	12								dry - moist
6	19	13	21			10.5-12.0' wash sample					
7	12	14	19			12.0-13.5' wash sample					
8	13	14	13								
9	8	19	14			15.5					
10	13	9	18			Dense; multi-colored sand & gravel; trace of clay, silt, coal; till like texture					
11	23	28	44/2			16.2					
No Sample						19.5 No recovery					
12	27	33	44			As next above					
13						20.0					
No Sample						24.6 Dense sand & gravel; brown					
						25.5 No recovery					
14	30	44	50/3			As next above					
						Begin coring @ 21.8'					

0002 183

GILBERT ASSOCIATES, INC.

ROCK CLASSIFICATION, SHEET

SHEET 2 OF 2

DATE 8-14-67

· Met Ed Co. NO. 4192-51 DRILL HOLE NO. DH-114

CTOR Edtn. Services SITE AREA Three Mile Island ELEV. 300.0'

E NX COORDINATES ANGLE vertical

4" BEARING

BY: GWL DEPTH 30.0'

Core Rec. Run	Core Rec. Core	Profile	Interval	DESCRIPTION: Rock type, color, grain size & shape, bedding (angle thickness), fractures, faults, joints (angle, filling, etc.), permeability, alteration, weathering, chemical composition	REMARKS: Condition of core. Excavating evaluat etc.
21.8			21.8	Begin coring	top of sound r @ probably 24. possibly @ 27.
24.5	2.0		24.5	Sandstone; reddish gray; fine grained; hard	
30.0	4.1		30.0	Shaly sandstone; red; good core but short pieces maximum .4'; fine grained	core loss due grinding of co
				T. D. No loss of drill water	

0002 184

Sheet 101 Amend-2 (10-2-67)

GAI-225 1/66

GILBERT ASSOCIATES, INC.

SOIL CLASSIFICATION SHEET

SHEET 1

ROJECT: Met Ed Co. W.O. 4192-51 SITE AREA Three Mile Island DRILL HOLE

ONTRACTOR: Fdtn. Services COORDINATES ELEVATION

RILLER: GWL 0 HRS

LASSIFIED BY: DJS DATE: 8-14-67 24 HRS

Sample No.	SPT Blows/6 In. 6	12	18	In. Rec.	Profile	SOIL DESCRIPTION Density (or Consistency), Color Soil Type - Accessories	U.S.C.S.	qu	Coarse Granular Soils: Range Size / Core Run	Grain Shape / Rec. Core	REMARKS Chemical Comp, Geologic Data, Ground Water, Construction Proble
1	1	2	3			V. loose; dark brown silt w/ trace of gravel					moist
2	4	6	5			Loose to med. dense; brow silty sand & gravel; 1.5-3.0' trace of coal; 6;0-7.5' trace of red decomposed shale			±1"	sub rdd-rdd	dry - moist
3	4	8	9								
4	10	9	13								
5	7	10	12								
6	11	9	12			Med. dense; multi-colored silty sand & gravel; trace of coal & red decomposed shale			<1"	sub rdd-rdd	dry
7	6	8	9								
8	8	10	11								
9	10	12	15			Med. dense; brown sand & gravel; some organic material			<½"	sub rdd-rdd	moist
10	14	13	9								
11	20	28	35			V. dense; brown sand, silt & gravel; trace of coal; 15-16.5' dry			<1"	sub ang-rdd	dry moist
12	14	16	20								
13	18	23	28			Dense to v. dense; multi-colored sand, silt & gravel; trace of clay; trace of coal; trace of red shale			±1"	sub rdd-rdd	moist
14	20	28	33								
15	22	21	45								
16	40	35/6				23.2					
2						Begin coring @ 23.2'					

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GILBERT ASSOCIATES, INC.

ROCK CLASSIFICATION, SHEET

SHEET 2 OF 2

DATE 8-14-67

T Met Ed Co. NO. 4192-51 DRILL HOLE NO. DH-115

CTOR Fdtn. Services SITE AREA Three Mile Island ELEV. 299.7"

ZE NX COORDINATES ANGLE vertical

4" BEARING

) BY: GWL DEPTH 37.0'

Core Rec. Run	Core Rec. Core	Profile	Interval	DESCRIPTION (Rock type, color, grain size & shape, bedding (angle thickness), fractures, faults, joints (angle, filling, etc.), permeability, alteration, weathering, chemical composition)	REMARKS (Condition of core. Excavating evalua etc.)
23.2			23.2	Begin coring @ 23.2'	
97 / 27.0	5.6		31.9	Shale; brick red; badly broken w/no pieces > 3"; 27.5-29.0' v. broken rock; decomposed; bedding @ 30-35°; some mineralization along partings	top of sound 29.0'
91 / 37.0	7.9		37.0	Sandstone; reddish gray; fine grained; hard; good core w/ core pieces up to .9'; bedding @ 35°; shaly in some areas; jointing @ high angles @ 75°	
				T. D. No loss of drill water	

0002 186

Sheet 103 Amend-2 (10-2-67) GAI-228 1/66

GILBERT ASSOCIATES, INC.

SOIL CLASSIFICATION SHEET

SHEET 1

ROJECT: Met Ed Co. W.O. 4192-51 SITE AREA Three Mile Island DRILL HOLE

ONTRACTOR: Fdtn. Services COORDINATES ELEVATION

RILLER: GWL 0 HRS

LASSIFIED BY: DJS DATE: 8-11-67 24 HRS

Sample No.	SPT Blows/6 In. 6	12	18	In. Rec.	Profile	SOIL DESCRIPTION Density (or Consistency), Color Soil Type - Accessories	U.S.C.S.	qu	Coarse Granular Soils: Range Size / Core Run	Grain Shape / Rec. Core	REMARKS Chemical Comp, Geologic Data, Ground Water, Construction Problem
1	2	6	8			Loose; brown silt w/some gravel			< ½"	sub rdd	moist
2	8	9	11			Med. dense; brown silty sand & gravel; trace of clay			< 1"	ang-rdd	dry
3	12	9	14								
4	10	12	10								moist
5	9	8	7			Med. dense; brown sand & gravel; trace of coal			<½"	ang-sub rdd	
6	5	6	6			7.5-9.0' trace of silt					
7	12	11	8								
8	10	9	6								
9	7	18	21			Dense; as above; sand & gravel; trace of coal					moist - dry
No Sample						No recovery					
11	41	70				Dense; brown sand & gravel			<½"		dry
No Sample						No recovery					
12	28	41	58			Dense; multi-colored sand, silty gravel; trace of coal			<½"	ang-sub rdd	wet
						Begin coring @ 21.9'					

0002 187

GILBERT ASSOCIATES, INC.

ROCK CLASSIFICATION, SHEET

SHEET 2 OF 2

DATE 8-11-67

T Met. Ed. Co. NO. 4192-51 DRILL HOLE NO. DH-117

CTOR Edtn. Services SITE AREA Three Mile Island ELEV. 299.3'

ZE NX COORDINATES ANGLE vertical

4" BEARING

D BY: GWL DEPTH 33.5'

GPM	Core Rec. Run	Core Rec. Core	Profile	Interval	DESCRIPTION: Rock type, color, grain size & shape, bedding (angle thickness), fractures, faults, joints (angle, filling, etc.), permeability, alteration, weathering, chemical composition	REMARKS: Condition of core. Excavating evalua etc.
21.9				21.9	Begin coring @ 21.9'	
70	5.2				Shale; brick red; mottled w/small 1/16" diameter limy inclusions; sandy 21.9-22.5'; excellent core w/core pieces up to .8" in length; bedding @ 36; 60 joint @ 23.4'; Thomsonite coated bedding planes @ 26.5', 27.5', 28.5' & 29.3'; fine grained and hard	top of sound @ 22.3'
26.5						
73	5.1					slightly limy throughout
33.5				33.5		
					T. D. No loss of drill water	

0002 188

Sheet 105 Amend-2 (10-2-67)

GAI-228 1/66

GILBERT ASSOCIATES, INC.

SOIL CLASSIFICATION SHEET

SHEET 1

ROJECT: Met Ed Co. W.O. 4192-51 SITE AREA Three Mile Island DRILL HOLE

ONTRACTOR: Fdtn. Services COORDINATES ELEVATION

RILLER: GWL 0 HRS

LASSIFIED BY: WJS DATE: 8-16-67 24 HRS 0

Sample No.	SPT Blows/6 in. 6	12	18	In. Rec.	Profile	SOIL DESCRIPTION Density (or Consistency), Color Soil Type - Accessories	U.S.C.S.	φ	Coarse Granular Soils: Range Size / Core Run	Grain Shape / Rec. Core	REMARKS Chemical Comp, Geologic Date, Ground Water, Construction Problem
1	1	4	6			Loose; brown silt; some gravel					topsoil moist
2	8	14	12			Med. dense; brown sand & gravel; trace of silt; some rock fragments			±½'	sub rdd-rdd	dry - moist
3	17	16	12								
4	9	5	8								
5	12	8	9								
6	12	14	13								
7	12	12	13			9.0' traced of decomposed coal					
8	7	8	8								
9	7	11	9			10.5' becomes dark brown					
10	40	31	18								
No Sample						No recovery					
12	20	70				Vd. dense; decomposed siltstone; red					dry
No Sample						No recovery					
						Begin coring @ 22.7'					

0002 189

GILBERT ASSOCIATES, INC.

ROCK CLASSIFICATION, SHEET

SHEET 2 OF 2

DATE 8-16-67

T Met Ed Co. NO. 4192-51 DRILL HOLE NO. DH-118

CTOR Edtn. Services SITE AREA Three Mile Island ELEV. 299.9'

ZE NX COORDINATES ANGLE vertical

4" BEARING

) BY: GWL DEPTH 40.0'

Core Rec. Run	Core Rec. Core	Profile	Interval	DESCRIPTION: Rock type, color, grain size & shape, bedding (angle thickness), fractures, faults, joints (angle, filling, etc.), permeability, alteration, weathering, chemical composition	REMARKS: Condition of core. Excavating evalua etc.
22.7			22.7	Begin coring @ 22.7'	
7.5	5.5			Shale; brick red; silty; med. hard; fine grained; much grinding of core	top of sound 28.0'
30.0			30.0		
5.0	4.5			Sandstone; brick red; fine grained; broken 35.0-37.0' due to jointing & 39.0-40.0'; 60° joints 32.0-33.0'	
35.0					
5.0	5.0				
40.0			40.0		
				T. D. No loss of drill water	

0002 190

Sheet 107 Amend-2 (10-2-67)

GAI-228 1/66

GILBERT ASSOCIATES, INC.

SOIL CLASSIFICATION SHEET

SHEET 1

PROJECT Met Ed Co. W.O. 4192-51 SITE AREA Three Mile Island

CONTRACTOR: Edtn. Services COORDINATES

DRILLER:

CLASSIFIED BY: MWS DATE: 8-17-67

DRILL HOLE

ELEVATION

GWL 0 HRS

24 HRS

Sample No.	SPT Blows/6 In. 6	12	18	In. Rec.	Profile	SOIL DESCRIPTION Density (or Consistency), Color Soil Type - Accessories	U.S.C.S.	qu	Coarse Granular Soils: Range Size / Core Run	Grain Shape / Rec. Core	REMARKS Chemical Comp, Geologic Data, Ground Water, Construction Proble
1	2	4	8			Loose; topsoil (brown)					
2	13	9	9			Med. dense to dense; brown sand & gravel; trace of silt			3/4"	[illegible]	dry - [illegible]
3	15	23	20			below 7.5' trace of coal				[illegible]	
4	12	12	16								
5	11	15	19								
6	12	10	16								
7	8	11	18			below 10.5' slightly cohesive					
8	10	11	10								
9	14	23	18								
10	25	16	18								
11	14	23	31								
12	41	35	30			18.0					
13	36	34	40			19.5 dense; multi-colored sand & gravel;			3/4"	[illegible]	[illegible]
14	35	44	2			20.2 trace of silt & gravel, 20.8				[illegible]	
	No Sample					dense; brown sand & gravel				[illegible]	
						22.4 No recovery					
						Begin coring @ 22.4'					

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GILBERT ASSOCIATES, INC.

ROCK CLASSIFICATION, SHEET

SHEET 2 OF 2

DATE 8-17-67

r Met Ed Co. NO. 4192-51 DRILL HOLE NO. DH-119

CTOR Fdtn. Services SITE AREA Three Mile Island ELEV. 300.0'

ZE NX COORDINATES ANGLE vertical

4" BEARING

BY: GWL DEPTH 36.0'

Core Rec. Run	Core Rec. Core	Profile	Interval	DESCRIPTION: Rock type, color, grain size & shape, bedding (angle thickness), fractures, faults, joints (angle, filling, etc.), permeability, alteration, weathering, chemical composition	REMARKS: Condition of core. Excavating evaluat etc.
22.4			22.4	Begin coring @ 22.4'	
98	8.0			Silty shale; brick red; med. hard; moderately broken to 27.3', 32.4'-33.0'; many limy inclusions; bedding indistinct	top of sound : 22.4'
100	4.9		33.0	Sandstone; brick red; med. to coarse grained; good core; some grinding; broke 35.6-36.6' due to drilling	
36.0			36.0	T. D. No loss of drill water	

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Sheet 109 Amend-2 (10-2-67)

GAI-228 1/66

GILBERT ASSOCIATES, INC.

SOIL CLASSIFICATION SHEET

SHEET 1

PROJECT: Met Ed. Co. W.O. 4192-51 SITE AREA Three Mile Island DRILL HOLE

CONTRACTOR: Fdn. Services COORDINATES ELEVATION

DRILLER: GWL 0 HRS

CLASSIFIED BY: WS DATE: 7-25-67 24 HRS

Sample No.	SPT Blows/6 In. 6	12	18	In. Rec.	Profile	SOIL DESCRIPTION Density (or Consistency), Color Soil Type - Accessories	U.S.C.S.	qu	Coarse Granular Soils Range Size / Core Run	Grain Shape / Rec. Core	REMARKS Chemical Comp, Geologic Data, Ground Water, Construction Proble
1	4	3	3			Loose brown f. sand & silt, trace 2.5 of gravel					topsoil (sand)
2	4	5	6			Loose to med. dense, brown f. to					some rock fra
3	7	11	14			coarse sand & gravel, trace of silt	SP				
4	8	11	13				SF		½"	Sub. angl. to rnd.	
5	12	10	16								
6	9	11	12								
7	12	17	20								
8	11	16	19			Med. dense, coarse sand & gravel,					
9	7	11	15			multi-colored, wash sample 10.5					wet
10	8	10	14			Med. dense to dense, dark brown,					
11	9	31	29			med. sand & gravel, trace of silt 16.5					moist
12	11	41	40			V. dense, multi-colored sand &					
13	20	60	-			gravel, trace of silt, clay & coal					moist
No recovery											
14	19	26	38			Dense to v. dense, coarse sand & gravel, wash sample					wet
No sample						24.6					
						Begin coring @ 24.6'					

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GILBERT ASSOCIATES, INC.

ROCK CLASSIFICATION, SHEET

SHEET 2 OF 3

DATE 7-25-67

Metropolitan Edison Co. NO. 4192-51 DRILL HOLE NO. DH-120

CTOR Fdn. Services SITE AREA Three Mile Island ELEV. 300.01

E NX COORDINATES ANGLE vertical

4" BEARING

BY: GWL DEPTH 200.01

Core Rec. Run	Core Rec. Core	Profile	Interval	DESCRIPTION: Rock type, color, grain size & shape, bedding (angle thickness), fractures, faults, joints (angle, filling, etc.), permeability, alteration, weathering, chemical composition	REMARKS: Condition of core. Excavating evaluat etc.
			24.6	Begin coring @ 24.6'	
3.0			27.0	Shale & sandstone, interbedded, some limy inclusions, bedding @ 40°-45°, broken & weathered @ 26-28', MnOx staining throughout	brick red
6.0			33.0	Sandstone, brick red w/gray streaks, f. to med. grnd., shaly in spots, some 30°-35° cross joints, med. hard, some red shale interbeds, bedding @ 30°-35° below 34', small slickensides surfaces @ 36.5', good core pieces 0.1-.5'	
			36.5	some MnOx staining along joints	
1.0			36.8	Shale, red & green, broken and soft	
			38.0	Shale, brick red, hard, few small limy inclusions @ 38' high angle slickensides 25° diagonal to core, broken	calcite along slickensides across core
			42.0	Shale, red & green mottled, hard, appears to be dessicated, some possible horiz. slickensides-@ 40.1'-10° slickensides	
7.6			46.7	Sandy shale, brick red w/gray sandstone, interfingering, some limy inclusions, bedding 35-40, good core	
7.5			53.8	Limy shale, green-@ 47.2' to 47.4', broken green shale w/organic mat'l,) red decomposed shale 47.8-48.1', wet, clay consistency, rock broken 49-49.5' w/brown stain, weathered 49.5-49.8'	
7.0				Shaley sandstone, red, hard, fine grained, bedding 30°-40° some cross joints @ 45°, good core-pieces to 1.5', MnOx staining along some fractures, calcite along others, 60° joint @ 71.0'-72' w/calcite, excellent rock below 54'	
7.4					

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Sheet 111 Amend-2 (10-2-67)

GAI-228 1/66

GILBERT ASSOCIATES, INC.

ROCK CLASSIFICATION, SHEET

SHEET 3 OF 3

DATE 7-25-62

PROJECT Metropolitan Edison Co. NO. 4192-51 DRILL HOLE NO.

CONTRACTOR Fdn. Services SITE AREA Three Mile Island ELEV. 300.

CORE SIZE NX COORDINATES ANGLE vertical

CASING 4" BEARING

LOGGED BY: GWL DEPTH 100.

Press. Test PSI	Take GPM	Core Rec. Run	Core	Profile	Interval	DESCRIPTION: Rock type, color, grain size & shape, bedding (angle thickness), fractures, faults, joints (angle, filling, etc.), permeability, alteration, weathering, chemical composition	REM: Condition Excavatin
	100	9.3					
	91.2					As above	
	100	7.8			87.0		
	89.0					Shale, brick red, some calcite filled joints, two small 0.1' broken zones 89.4-90.4'	med. ha
	100	8.5			91.5	Sandy shale, brick red, med. hard, excellent core pieces 3.2', fine grained	
	97.4						
	100	8.0					
	100.0				100.0		
						T. D.	
						No loss of drill water	

0002 195

Sheet 112 Amend-2 (10-2-67)

GAI-2

GILBERT ASSOCIATES, INC.

ROCK CLASSIFICATION, SHEET

SHEET 1 OF 2

DATE 7-19-67

r Three Mile Island NO. 4192-51 DRILL HOLE NO. BB-1 (

CTOR Fdn. Services SITE AREA Reactor Building ELEV. 299.8'

ZE NX COORDINATES ANGLE vertical

4" BEARING

) BY: GWL DEPTH 120.0'

Core Rec. Run	Core Rec. Core	Profile	Interval	DESCRIPTION (Rock type, color, grain size & shape, bedding (angle thickness), fractures, faults, joints (angle, filling, etc.), permeability, alteration, weathering, chemical composition)	REMARKS (Condition of core. Excavating evaluat etc.)
% Rec.				Overburden not sampled	
246			246	Started coring	
259	1.1		259	Red & green, many limy inclusions, shaly & sandy, bedng ∠ 35, some writ	
268	0.0		268	Sand & gravel-(driller's notes- no recovery) mineralization; appear	
96	2.7		288	Green limy shale, badly broken, brown stain throughout of L. S. cogl.	
296				Red med. hard shale, badly broken 28.8-29.6', occasional high angle slickensides, greenish color at 28.8-29.6', limy ½" max, limy inclusions 31.6-31.8', some small 50° calcite filled fractures	good rock belc 29.6', core pi 0.15-0.9'
90	6.9		329		
322				Red, med. hard, v.f. grnd., shaly sandstone & sandy shale, varies from nearly all sandstone to nearly all shale, bedding approx. 35°, few incipient calcite filled fractures, occasional limy inclusions, core broken a t end of runs- probably due to drill blocking. 52.8-53.3' softer shale.	much grindir of core good sound roc core pieces up 0.9-57.9'
72	5.5				
349					
87	2.1			some marbling at 56.0-57.0' core pieces increase in length below 57.0' up to 3.4' in length	
370					
92	3.7				
370					
85	6.0				
440					
98	4.1				
482			489		
98	2.6			Grayish red, fine to med. grained sandstone, med. hard to hard, calcite along some partings	some grinding core good rock
500				see sheet #2	

Sheet 113 Amend-2 (10-2-67)

GAI-228 1/66

GILBERT ASSOCIATES, INC.

ROCK CLASSIFICATION, SHEET

SHEET 2 OF ___

DATE 7-17-

PROJECT Three Mile Island NO. 4192-51 DRILL HOLE NO. 2

CONTRACTOR Fdn. Services SITE AREA Reactor Building ELEV. [illegible]

CORE SIZE NQ COORDINATES ___ ANGLE [illegible]

CASING 4" BEARING ___

LOGGED BY: ___ GWL ___ DEPTH ___

Press. Test PSI	Take GPM	Core Rec. Run	Core	Profile	Interval	DESCRIPTION: Rock type, color, grain size & shape, bedding (angle thickness), fractures, faults, joints (angle, filling, etc.), permeability, alteration, weathering, chemical composition	REA: Condition Excavatin
		76.0				High angle 80° joint at 61.7-62.7', calcite along plane, bedding 20°-35°	drillers small. [illegible] out cure indicate may be chuck [illegible]
		93	7.4			some small limy inclusions 76.6-79' 82.7-83.5' 86.7-89.5' high angle (nearly vertical filled fractures filled w/white mineral) rock broken in box due to fractures and joints	
		100	5.5			from 94-96' ; 81° calcite and thomsonite healed old fault showing 2-3" offset between layers of limy inclusions- movement probably occured early in lithification as a result of readjustment of beds due to superimposed loading.	orientec at rt/a strike
		100	5.0			from 7/16" to max. ½"	
					96.0		
		98	7.8		97.0	Rock becomes shale 96-97' w/some small slickensided surfaces, 96.7-97'-broken-w/green surfaces and calcite, brown staining	
		100	7.0			Grayish red, med. hard to hard, fine grained sandstone, core pieces 0.8-3.5' in length, excellent rock, becomes gray, fine to med. grained sandstone at 105.5', some incipient mineral-filled fractures, rock reddish - gray along fresh breaks across core	incipier thomson fill. d to
		100	5.1			minor broken shaly zone - 110.3-110.4'	
		100	7.4		117.4		
					120.0	117.4-117.7' many limy inclusions giving conglomerate appearance, 117.7-120' shaly sandstone	gry, fine [illegible] lost wri at 79'- indicate

0002 197

GILBERT ASSOCIATES, INC.

SOIL CLASSIFICATION SHEET

SHEET 1 OF 2

: Three Mile Island W.O. 4192-51 SITE AREA Reactor Building DRILL HOLE NO. RBI

TOR: Edn. Services COORDINATES ELEVATION 299.8

Kubitsky GWL 0 HRS 17.5

ED BY: REW DATE: 6-30-67 24 HRS 18.1

SPT Blows/6 In. 12	18	In. Rec.	Profile	SOIL DESCRIPTION Density (or Consistency), Color Soil Type - Accessories	U.S.C.S.	qu	Coarse Granular Soils: Range Size / Core Run	Grain Shape / Rec. Core	REMARKS Chemical Comp, Geologic Data, Ground Water, Construction Problems, etc.
				0.0					
2	3			Loose, dark brown, sandy silt, some gravel					topsoil
5	5			1.5 Loose, dark brown, silty sand, trace clay					lower topsoil zone
10	9			3.0 Med. dense, brown silty fine sand					± 10^{-3} cm/sec perm.
14	17			% gravel, very slight trace of clay			1 mm 2"	Sub ang to rdd.	coeff. estimate
7	23								
10	20								
10	28								
26	30			12.0					
35	47			V. dense, dark brown, gravel					* multi-colored grav
21	20			clayey sand matrix				ang to rdd.	and rock fragments in wet slightly cohe matrix
29	33			17.5					
19	31			V. dense, brown sand gravel,					
21	40			trace of silt			½ mm to 2 cm		relatively clean est. k- 10^{-2} cm/sec
17	35			22.7					
				Gray weathered shale					
				24.7 Red weathered shale					
									No loss of drill wat

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Sheet 115 Amend-2 (10-2-67 GAI - 227

GILBERT ASSOCIATES, INC.

ROCK CLASSIFICATION, SHEET

SHEET 2 OF ___

DATE 6-30-

ROJECT Three Mile Island NO. 4190-51 DRILL HOLE NO. RE

ONTRACTOR Fdn. Services SITE AREA Reactor Building ELEV. 290

ORE SIZE BX COORDINATES ___ ANGLE vertical

ASING 4" ___ BEARING ___

OGGED BY ___ GWL ___ DEPTH 50

Press. Test PSI	Take GPM	Core Rec. Run	Core	Profile	Interval	DESCRIPTION: Rock type, color, grain size & shape, bedding (angle thickness), fractures, faults, joints (angle, filling, etc.), permeability, alteration, weathering, chemical composition	REM: Condition Excavating
		24.7			24.7		
		70	40		27.0	Shale, brick red, slightly silty, bedding indistinct but ~40° irregular fractures @ 30° & 50° angles breaking core into 3" pieces, rock broken to 29'	slippage 50° plane slipe
		31.0				Sandstone, brick red and very light gray, v.f. grnd., speckled, v.f. grnd. - almost siltstone, bedding @ 30°, core broken at bedding planes in 4-10" pieces, occasional cross fractures @ 30°, bedding planes slicked w/some coated by 1mm thick $CaCO_3$ (?), occasional ± 1' shaly bed, incipient 70°-80°, very tight joints, slight vuggy appearance at 39', 1-2 mm vugs, core broken into ± 1" pieces to 39-40', open vertical fracture 42-43', broken $Ca\ CO_3$ coated, becomes shaly @ 43-44', conspicuous vertical fracturing 45-50', oxidized surfaces, rock broken in max. 3" pieces to 50'	
34.7		100	56				good ro
34.7		36.0					
		98	49				
		40.0					no loss water rock,
			50				
44.0		46.0					
46.0			47				
		50.0			50.0		
							some lat slippage fracture

Note: Throughout sandy portion of core, the rock has subtle mottled appearance resembling diagenetic congl. Believe much fractures and slippage was penecontemporaneous w/diagenesis.

Samples taken and sent for testing from 30-30.7', 33.4-34.1' & 44.6-45'.
TX tests

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GILBERT ASSOCIATES, INC.

ROCK CLASSIFICATION, SHEET

SHEET 1 OF 1

DATE 7-14-67

T Three Mile Island NO. 4192-51 DRILL HOLE NO. BB-2 (E

CTOR Fdn. Services SITE AREA Reactor Building ELEV.

ZE BX COORDINATES ANGLE vertical

4" BEARING

D BY: GWL DEPTH 53.0'

GPM	Core Rec. Run	Core Rec. Core	Profile	Interval	DESCRIPTION: Rock type, color, grain size & shape, bedding (angle thickness), fractures, faults, joints (angle, filling, etc.), permeability, alteration, weathering, chemical composition	REMARKS: Condition of core. Excavating evalua etc.
					No sampling in overburden	
110				18.0		
110		39			Brick red, med. hard, silty shale, some black staining, some vertical fractures, many irregular limy inclusions to ¼", slickensides across core @ 28.2', short pieces of core, max. 0.2', but good rock	rock appears sound below ? definitely be 28'
110		48		36.5	Shale, red & green limy, mottled, slickensides along 45° parting w/CaCO3 along plane	lateral desic appearance
110		39		38.0	Silty shale, brick red, some CaCO3 along partings, some 1/8" limy inclusions, good core, hard, black staining along some partings, core pieces from .1-.7', some grinding of core	
110		50		41.3	Sandstone. med. grnd., red & gray. vertical jointing 43.3-43.5', good core	
110		47		44.3	Silty shale, brick red, sandy @ 44-45', much grinding of core, some 1/8" limy inclusions, broken 47.8-48', 45° slickensides @ 48.5' w/CaCO3, some incipient fractures across core @ 48'-49', some black staining throughout	broken 47.8-4 appears to be to drilling
110		47		53.0		
					T. D.	
					No loss of drill water	
					* Note: Samples taken for tests are #5 (28-28.5'), #6 (33.3-33.9'), #7 (38-38.7'), #8 (40.5-41.3'), & #9 (52.1-52.5')	

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Sheet 117 Amend-2 (10-2-67) GAI-228 1/66

GILBERT ASSOCIATES, INC.

SOIL CLASSIFICATION SHEET

SHEET 1

PROJECT: Three Mile Island W.O. 4192-51 SITE AREA Reactor Building DRILL HOLE

CONTRACTOR: Fdn. Services COORDINATES ELEVATION

DRILLER: Kubitsky GWL 0 HRS

CLASSIFIED BY: WS DATE: 6-20-67 24 HRS

Sample No.	SPT Blows/6 in. 6	12	18	In. Rec.	Profile	SOIL DESCRIPTION Density (or Consistency), Color Soil Type - Accessories	U.S.C.S.	qu	Coarse Granular Soils: Range Size / Core Run	Grain Shape / Rec. Core	REMARKS Chemical Comp, Geologic Data, Ground Water, Construction Proble
						0.0					
1	1	2	6			Brown sandy topsoil wet			to ½"	sub.rdd.- rdd.	sub a fragmen
2	11	17	9			Med. dense to dense, brown f. to coarse sand & gravel					
3	16	15	10			Some angular rock fragments			to ½"	sub. rdd. to rdd.	
4	7	10	9								
5	15	21	6								
6	8	11	21			dry					
						9.0					
7	10	8	11			Coarse sand & gravel wet					appears to be
8	14	7	16			Coarse, med. dense to dense sand & gravel					
9	12	15	17								believe blow c good due to no cobbles & boul encountered
10	14	15	8								
11	17	40				16.5					
	Rock pit					Boulders					
						19.5					
12	10	12	13			Boulders					
Rock pit						21.0					
						22.5					
						Started coring					

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GILBERT ASSOCIATES, INC.

ROCK CLASSIFICATION, SHEET

SHEET 2 OF 3

DATE 6-20-67

r Three Mile Island NO. 4192-51 DRILL HOLE NO. RB-2 (N

CTOR Edn. Services SITE AREA Reactor Building ELEV. 299.6'

E NY COORDINATES ANGLE vertical

BEARING

BY: GWL DEPTH 120.0'

Core Rec. Run	Core	Profile	Interval	DESCRIPTION (Rock type, color, grain size & shape, bedding (angle thickness), fractures, faults, joints (angle, filling, etc.), permeability, alteration, weathering, chemical composition)	REMARKS (Condition of core. Excavating evaluat etc.)
% Rec.					
23.5			23.5	Started coring	
23.7	1.0			Red hard silty shale, broken to 24.4', rest of core is good, up to o.8' core pieces, slightly limy to 29', changes to very limy, red & green to 34.4', slightly limy 43.3', slickensides at 23.6, 33.2 & 34', along bedding much grinding of core at bottom of run 38-42'	
94 28.8	4.8				
93 34.4	5.2				
96 41.0	6.4				
			43.3		
96 46.6	4.2		47.4	Red, med. grained, hard sandsatone, some broken core 45-45.5'	Black stain or partings
100 52.7	6.3			Red silty shale, hard, good core but some short pieces, some healed joints, vertical, and near vertical, becomes grayish red & more sandy at 58', slightly limy, slickensides across core along 45° bedding plane at 48.4-48.8', some mineralization along partings	
97 58.7	5.1				
			60.5		
98 64.7	5.9			Interfingering sandstone & shale, hard - no partings at interfingerings, slightly marbled, vertical mineralized joint 64- 64.7'	40° bedding- bl stain on parti good core
90 66.6	1.7				
100 70.6	4.0				
			73.6		
100 75.0	3.4		75.9	Red hard, silty shale, short pieces of core, green color along parting at 73 & 75.7'	60° angle slick side at 75.6'

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GILBERT ASSOCIATES, INC.

ROCK CLASSIFICATION, SHEET

SHEET 3 OF ___

DATE 6-20-

ROJECT Three Mile Island NO. 4192-51 DRILL HOLE NO. B

ONTRACTOR Edn. Services SITE AREA ~~Reactor Building~~ ELEV. 299.

ORE SIZE NX COORDINATES ANGLE vertic

ASING BEARING

OGGED BY: GWL DEPTH 120.

Press. Test PSI	Take GPM	Core Rec. Run	Core	Profile	Interval	DESCRIPTION: Rock type, color, grain size & shape, bedding (angle thickness), fractures, faults, joints (angle, filling, etc.), permeability, alteration, weathering, chemical composition	REA Condition Excavatin
		26.0			75.9		
					77.8	Red & green mottled shale w/limy inclusions up to 4"	core pcs
		100	5.7			Interlaminated, hard. fine grained sandstone & shale, red & reddish gray, occasional limy inclusions, broken rock w/small clay seam at 79.4-79.6'	some mic stone
		81.7			81.7		
		97	6.6			Shale, hard, red & green mottled on top & changes to green, green shale is limy, 83.5-83.8' red mottled shale w/ black organic pieces, broken, some casting & desiccated appearance green grades to red at 91'	core p 1.8
		88.5					
					91.0		
		97	7.9			Red shale, hard, sandy, changes to sandstone between 96.6-97.8' & back to shale at 97.8' nearly vertical healed joint 101.5 to 102.2' changes to shaley sandstone 101.4-102.2' & 103.6-110.1' limy inclusions below 112'	core pie 2' excellen
		96.6					
		95	7.0				
		104.0					
		97	7.9				
		112.1					
		100	7.9				
		120.0			120.0		
						T.D.	

0002 203

GILBERT ASSOCIATES, INC.

ROCK CLASSIFICATION, SHEET

SHEET 1 OF 1

DATE 7-12-67

Metropolitan Edison Co. NO. 4192-51 DRILL HOLE NO. ~~RB-3 (B~~

CTOR Eng. Services SITE AREA ~~Three Mile Island~~ ELEV.

E BX COORDINATES ANGLE vertical

4" 18.0' BEARING

BY: GWL DEPTH 53'

Core Rec. Run	Core Rec. Core	Profile	Interval	DESCRIPTION: Rock type, color, grain size & shape, bedding (angle thickness), fractures, faults, joints (angle, filling, etc.), permeability, alteration, weathering, chemical composition	REMARKS: Condition of core. Excavating evaluat etc.
4/0 28.0				No sampling in overburden	
32.8			22.8		
58 28.0	3.0		~28.0	Shaly sandstone, brick red, v. f. grnd., bedding 35°-45°, short pieces of core .1" max., loss of core due to grinding	
50 33.0	2.5			Sandy shale, brick red, v. f. grnd., short pieces of core broken, 45° slickensides @ 32.7', 45° slickensides @ 33½ 34', core loss due to excessive grinding, MxOx staining along several partings 32-43.7' much incipient fracturing & vuggy appearance 34-53' many limy inclusions 1/32" in diameter much $CaCO_3$ mineralization along fractures 43.7-53' core improves, pieces max. of .4"	
80 38.0	4.0				
50 43.0	2.5				
72 48.0	4.1				
94 53.0	4.7		53.0		
				T. D. No loss of drill water	

0002 204

GILBERT ASSOCIATES, INC.

SOIL CLASSIFICATION SHEET

SHEET 1

PROJECT: Met Ed Co. W.O. A192-51 SITE AREA Three Mile Island DRILL HOLE

CONTRACTOR: Fdn. Services COORDINATES ELEVATION

DRILLER: GWL 0 HRS

CLASSIFIED BY: REW DATE: 6-13-67 24 HRS

Sample No.	SPT Blows/6 in. 6	12	18	In. Rec.	Profile	SOIL DESCRIPTION Density (or Consistency), Color Soil Type - Accessories	U.S.C.S.	q	Coarse Granular Soils: Range Size / Core Run	Grain Shape / Rec. Core	REMARKS Chemical Comp, Geologic Data, Ground Water, Construction Proble
1	1	3	4			Loose, brown very fine sand, some gravel, trace of clay	SM		< ½"	Rdd.	Topsoil, black 1.5-3.0'
2	3	4	5			3.0					
3	10	8	13			Med. dense, brown, fine to med. silty sand & gravel			± 2"	Ang. to rdd.	K= 10^{-4} - 10^{-3} sand slightly & gravel conte toward base
4	9	11	14								
5	10	10	13			7.5					
6	6	9	12			Med. dense, brown fine sand, some gravel			± ½".	Ang - rdd	
7	13	8	10			10.5					
8	9	17	11			Med dense, multi-colored gravel, some med. brown clayey silt matrix			+ 2"	Ang.	Some holds cor to clayey silt
9	21	15	20			13.5 Dense, multi-colored gravel & med. coarse sand			+ 2"	Sub ang	30-40% weath. sand
10	7	21	27			Dense to very dense, brown sand & gravel, trace of silt			< 2"	Rdd.	wet
11	15	45	25							Sub ang.	suspects cobbl
12	35	70	—								suspect cobble
No Sample						19.0					
13	17	32	70/3			V. dense, brown silty sand & gravel				Sub ang	
No Sample						No recovery					
						24.5					
						Begin coring @ 24.5'					

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GILBERT ASSOCIATES, INC.

ROCK CLASSIFICATION, SHEET

SHEET 2 OF 3

DATE 6-13-67

r Metropolitan Edison Co. NO. 4192-51 DRILL HOLE NO. RB-3

CTOR Edn. Services SITE AREA Three Mile Island ELEV. 299.8'

E NX COORDINATES ANGLE vertical

4" BEARING

BY: GWL 16.9 @ 1.5 hrs. DEPTH 120.0'

Core Rec. Run	Core Rec. Core	Profile	Interval	DESCRIPTION (Rock type, color, grain size & shape, bedding (angle thickness), fractures, faults, joints (angle, filling, etc.), permeability, alteration, weathering, chemical composition)	REMARKS (Condition of core. Excavating evaluat etc.)
24.5			24.5	Begin coring @ 24.5'	
93 22.2	2.6		28.1	Sandstone, brick red, med, hard, badly broken	
100 31.5	4.2			Sandy silty shale, brick red, hard, 45° bedding @ right angles to joints, slickensides diagonal to bedding @ 33.8, 34.1, 36.3, 37.0, 42.0', 45° slickensides @ 38.5' & 44.5', soft weathered seam 43.1-43.3', core broken to 31.5' & 34-37.5'. 40.6-42.4', 44.3-44.5' many vertical fractures, very good rock below 44'.	Lost H_2O (50%) @ 38.5-44.5'
100 38.5	7.0				
100 44.5	11.0				
100 51.8	2.3		57.8		
97 58.5	6.5		58.0	Some rehealed joints 60° to 70°	
100 64.2	7.7		64.5	58-64.5' Shale, red & green mottled, desiccated appearance, hard, good core	
100 71.8	5.6			64.5-71.8' silty shale, brick red, hard, 40° bedding w/some $CaCO_3$ along joints, good rock, some healed high angle jointing	
100	5.4				

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GILBERT ASSOCIATES, INC.

ROCK CLASSIFICATION, SHEET

SHEET 3 OF ___

DATE 6-13

RCJECT Met Ed Co. NO. 4192-51 DRILL HOLE NO. ___

ONTRACTOR Fdn. Services SITE AREA Three Mile Island ELEV. 2

ORE SIZE NX COORDINATES ___ ANGLE vertica

ASING 4" ___ BEARING ___

OGGED BY: ___ GWL 16.9 @ 1.5 hrs. DEPTH 1

Press. Test PSI	Take GPM	Core Rec. Run	Core	Profile	Interval	DESCRIPTION: Rock type, color, grain size & shape, bedding (angle thickness), fractures, faults, joints (angle, filling, etc.), permeability, alteration, weathering, chemical composition	REA: Condition Excavatin
		73.3			77.2	71.8-77.2' Sandstone, med. grnd., brick red, shaley in spots, broken 76.8-77.2' due to drilling	
		100 84.4	7.2		86.6	Silty shale, brick red, hard, good core, pieces up to 1.[illegible] some rehealed joints, vertical, high angle joints, broken core 84.2- 84.8'	
		96 91.5	6.8			Sandstone, red & gray, fine grained, med. hard, some rehealed bedding joints & planes, broken 91.6-93.1' due to jointing (mineralized), some shale interfingering 92.5-97.2'	
		100 97.2	5.7		97.2		
		100 100.7	7.1		98.7	Shale, brick red, hard, some limy 1" inclusions, incipient vertic	
					100.7	Sandstone, gray, hard, med. grnd., good core-pcs. 0.5-1.[illegible] irregul bedding 35°	
					103.3	Shale, brick red, hard; 100.9-110'- sandstone w/mineralized fract	
		94 113.8	8.0			102.9-103.3' slickensides @ 45° angles w/calcite mineralization along them 103.3-105.4' shale, red & green mottled, hard w/much limy 1/8" inclusions 105.4-109' Sandstone, red & gray, f. grnd., micaceous, some shale interfingering	
		90 120.0	6.5		120.0	109-119.3' limy shale, red & green, hard, some marbling, broken 114.1-114.8' 119.3-120' Shale, brick red, broken @ end of run, probably due to drilling or blocking	
						T. D. 120'	

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Sheet 124 Amend-2 (10-2-67)

GILBERT ASSOCIATES, INC.

ROCK CLASSIFICATION, SHEET

SHEET 1 OF 1

DATE

Metropolitan Edison Co. NO. 4192-51 DRILL HOLE NO. RB-4(BX

CTOR Fdn. Services SITE AREA Three Mile Island ELEV.

E BX COORDINATES ANGLE vertical

4" BEARING

Y: GWL 17.0' @ 3 hrs 18.9' @ 7 hrs DEPTH 54.0'

Core Rec. Run	Core Rec. Core	Profile	Interval	DESCRIPTION: Rock type, color, grain size & shape, bedding (angle thickness), fractures, faults, joints (angle, filling, etc.), permeability, alteration, weathering, chemical composition	REMARKS: Condition of core. Excavating evaluat etc.
% Rec 23.5			23.5	No sampling in overburden	
18 39.0				Shale & sandstone, interbedded, some vertical jointing, some marbling, broken, short pieces of core, some limy inclusions, bedding @ 40°, some MnOx staining along fractures, core loss due to grinding, very poor recovery	
46 54.0					
52 39.0			39.6		
42 44.0			43.0	Shale, red & green mottled, hard, some grinding, slickenside @ 39.5', 55° joint 41.5', slickenside diagonal across core @ 42'	desicated loo
40 49.0			48.5	Sandstone, red and gray, cross bedded, shale interfingering micaceous, some Calc, along partings, poor recovery	
30 54.0			54.0	Shale, red & green, short pieces of core, poor recovery, possible slippage plane @ 53'	
				T. D. No loss of drill water	

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GILBERT ASSOCIATES, INC.

SOIL CLASSIFICATION SHEET

SHEET 1

ROJECT: Three Mile Island W.O. 4192-51 SITE AREA Reactor Building DRILL HOLE

ONTRACTOR: Fdr. Services COORDINATES ELEVATION

RILLER: Kubitsky GWL 0 HRS

LASSIFIED BY: WS DATE: 6-26-67 24 HRS

Sample No.	SPT Blows/6 in. 6	12	18	In. Rec.	Profile	SOIL DESCRIPTION Density (or Consistency), Color Soil Type - Accessories	U.S.C.S.	qu	Coarse Granular Soils: Range Size / Core Run	Grain Shape / Rec. Core	REMARKS Chemical Comp, Geologic Data, Ground Water, Construction Proble
						0.0					
1	1	2	3			Topsoil & gravel & sand, some silt, dark brown moist	GM		4"	Sub. ang. to sub. rnd.	
2	3	6	5			Brown sand and gravel, trace of silt	GM		up to 1"	Sub rnd. to rnd.	
3	9	10	7								
4	25	50				5.5					
Rock Bit						Boulder dry					
5	7	11	14			Multi-colored dense to v. dense sand & gravel, trace of silt, trace coal moist					
6	17	12	14								
7	15	21	20			trace of clay below 11'					
8	13	17	25								
9	17	15	20			dry 14-15.5'					
10	8	13	19			wash sample 15.5-17'					
11	15	21	31								
12	22	26	35			8.5 Cobble 17-18.5' moist					
13	14	36	60			19.0 19-20.5' wet 20.5					
Rock Bit						Boulders 23.5					

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Sheet 126 Amend-2 (10-2-67)

GILBERT ASSOCIATES, INC.

ROCK CLASSIFICATION, SHEET

SHEET 2 OF 3

DATE 6-26-67

DRILL HOLE NO. BB-4 (

ELEV. 299.5'

ANGLE vertical

BEARING

DEPTH 120.0'

Three Mile Island NO. 4192-51

CTOR Edn. Services SITE AREA Reactor Building

E NY COORDINATES

4"

BY: GWL

Core Rec. Run	Core Rec. Core	Profile	Interval	DESCRIPTION: Rock type, color, grain size & shape, bedding (angle thickness), fractures, faults, joints (angle, filling, etc.), permeability, alteration, weathering, chemical composition	REMARKS: Condition of core. Excavating evaluati etc.
% Rec.				Sample from 36.2-36.7' sent for unconfined test	
23.5			23.5	Started coring	
72 27.5	90			Rec & gray, f. grnd., micaeous, sandstone, interlayered, w/red shale, broken to 28.2' w/soft shaley zone 27.1-27.3', bedding broken 312.-31.8', may be due to drill blocking; ¼" limy inclusions 33-33.5'	bedding planes 35° to 45° some marbling
93 31.3	40				
33.5	1.5		33.9		
90 39.9	5.5			Red & green mottled, hard shale, some limy inclusions 36.2-36.4', badly broken zone. greenish color, desiccated looking	slickersides c some pcs.-60° s @ 37.4 & 37.8'
			40.5		
98 44.7	5.6			Reddish gray, hard sandstone, w/interfingering of shale, some marbling, broken 44-44.2', some high angle to vertical jointing, bedding 30°-40°	core pcs. 0.1-0.5'
			45.7		
94 52.2	7.6			Red shale and green limy shale, interbedded, some broken pieces at 52-52.2'	some grinding core
			53.3		
100 56.1	3.3			Red hard silty shale, some broken core, may be due to drilling	
			56.7		
70 60.5	3.0		57.8	Rec. 0.2-broken greenish shale w/clay & f. sand, organic looking.	Poor recovery
100 64.5	4.0			Brick red silty shale, bedding at 40°-50°, 60° fractures @ 60', slightly sandy 60.5-62', 70-71', 79-82', tight cross-fractures @ 70° angles @ 63.5' $CaCO_3$ filling 1mm thick, tight cross-fracture @ 70° angles @ 67', $CaCO_3$ filling 1mm thick, also a third set @ 55-60° which is open & along which core breaks, 0.2 broken zone @ 71' due to drilling vibration on 70° $CaCO_3$ filled joints, 60° thomsonite coated joint @ 82, 85, 85', very tight, unbroken	Excellent r unfract. or br free 71-82', y loss of water 78'-obvious going out at but elsewhere hole
100 68.0	3.5				
97 76.0	7.8				

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GILBERT ASSOCIATES, INC.

ROCK CLASSIFICATION, SHEET

SHEET 3 OF

DATE 6-26-67

ROJECT Three Mile Island NO. 4192-51 DRILL HOLE NO. 26

ONTRACTOR Edr. Services SITE AREA Reactor Building ELEV. 289.

ORE SIZE X COORDINATES ANGLE vertical

ASING 4" BEARING

OGGED BY: GWL DEPTH 20.

Press. Test PSI	Take GPM	Core Rec. Run	Core	Profile	Interval	DESCRIPTION: Rock type, color, grain size & shape, bedding (angle thickness), fractures, faults, joints (angle, filling, etc.), permeability, alteration, weathering, chemical composition	REM: Condition Excavating
		76.0					
		100	8.0				
		84.0					
		100	8.0		90.0	See sheet #1	
		92.0				Brick red sandy siltstone, sandy portions have v.f. grnd. light gray speckled appearance, rock is occasionally mottled w/light black, green, gray @ 90.5, 92, 93, 99, 100, 104.5'	excellen
		100	7.2			bedding inconspicuous ~40°	CORE len to 2.0'
		99.2				occasional steep ± 70° $CaCO_3$ and/or **Thomsonite** coated, very tight joint	
		100	8.0			102.5' open vuggy bedding plane ~40° w/ $CaCO_3$ & SiO_2 crystals .5 mm size	
		107.2				similar bedding plane vug @ 115' w/0.2mm crystals & at 118'	
		100	7.0			slightly broken 110-120' but due to drilling 115-116' - .5mm size limy inclusion giving cgl. appearance	
		114.2				rock spring slipped, some core left in hole or last run	
		75	4.3				
		120.0			120.0	T.D.	

0002 211

GILBERT ASSOCIATES, INC.

ROCK CLASSIFICATION, SHEET

SHEET 1 OF 2

DATE 7-12-67

r Met Ed Co. NO. 4192-51 DRILL HOLE NO. RB-5(BX

CTOR Edtn. Services SITE AREA Three Mile Island ELEV. 299.6'

ZE Bx COORDINATES ANGLE vertical

4" BEARING

BY: GWL 17.6' - 0 HRS. DEPTH 79.5'

Core Rec. Run	Core Rec. Core	Profile	Interval	DESCRIPTION: Rock type, color, grain size & shape, bedding (angl. thickness), fractures, faults, joints (angle, filling, etc.), permeability, alteration, weathering, chemical composition	REMARKS: Condition of core. Excavating evaluat etc.
				No sampling in overburder	
24.5			24.5		
80 27.5	4.0			Sandstone; brick red; fine grained; very broken to broken with no pieces >3"; MnOx staining @ 24.0'; white mineral on bedding plane @ 31.0'; bedding @ 45°; jointing near vertical	
70 33.5	3.5			32.0' above becomes more shaly; gradually grading into a sandy shale	
76 38.5	3.8				
92 40.5	4.6			Shale; brick red; fine grained; very broken with no pieces >3"; blue-green mineral staining @ 43.0'; jointing @ 75° with bedding @ 40-50°	
90 42.5	4.5			43.5-50.0' more sandy than above	
			50.0		
90 53.5	4.5			Shale; red & green mottled; broken with no pieces 3" 54.0-55.0' med.stiff brown clay; silty texture	
66 57.5	3.3		56.5		
			58.5	Limy shale; green; broken with no pieces > 3"; hard	depths approx to core loss
100 63.5	5.0		63.5	Shale; brick red; moderately broken; many small limy inclusions throughout	
99 66.5	4.9			Shaly sandstone; reddish gray; fine grained; good core with pieces up to .8'; some grinding due to drilling; mineralization (white) along some bedding planes; bedding @ 35-40°; becomes more shaly with depth	
100 68.5	5.0				

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GILBERT ASSOCIATES, INC.

ROCK CLASSIFICATION, SHEET

SHEET 2 OF ___

DATE 7-12-

PROJECT Met. Ed. Co. NO. 4192-51 DRILL HOLE NO. [illegible]

CONTRACTOR Fdtn. Services SITE AREA Three Mile Island ELEV. [illegible]

CORE SIZE BX COORDINATES ___ ANGLE Vertical

CASING 4" ___ BEARING ___

LOGGED BY: ___ GWL 17.6' DEPTH [illegible]

Press. Test PSI	Take GPM	Core Rec. Run	Core	Profile	Interval	DESCRIPTION: Rock type, color, grain size & shape, bedding (angle thickness), fractures, faults, joints (angle, filling, etc.), permeability, alteration, weathering, chemical composition	REM: Condition Excavating
		85	5.1			As above	
		79%				T. D. No loss of drill water	

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GILBERT ASSOCIATES, INC.

ROCK CLASSIFICATION, SHEET

SHEET 1 OF 2

DATE 7-14-67

Three Mile Island — NO. 4192-51 — DRILL HOLE NO. RB-5(

CTOR Fdn. Services — SITE AREA Reactor Building — ELEV. 299.61

E NX — COORDINATES — ANGLE vertical

4" — BEARING

BY: — GWL 18.2 — DEPTH 120.01

Core Rec. Run	Core Rec. Core	Profile	Interval	DESCRIPTION (Rock type, color, grain size & shape, bedding (angle thickness), fractures, faults, joints (angle, filling, etc.), permeability, alteration, weathering, chemical composition)	REMARKS (Condition of core. Excavating evaluati etc.)
% Rec.				Overburden not sampled	
23.9			23.9	Started coring	
100 26.5	2.6			Sandstone, brick red, shaly, v. f. grnd., slightly micaceous @ 26.5', v. broken w/pieces<.3, vertical joint 25-26', bedding @ 45° w/fracturing at 60°, slightly vuggy @ 27.5-28'	
100 32.0	5.5		28.5	Sandy shale, slight grayish red, v. f. grnd., interbedded w/ sandstone, moderately broken to broken, FeOx staining @ 29.7', small greenish-brown soft seam 31-31.5', organic appearance	
100 38.0	6.0		32.0	Red & green mottled, badly broken, shale, 60° angle slickensides at 36.4' (diagonal)	
100 39.5	1.5		38.0	Red-grsy sandstone, med. hard, micaceous, some vertical jointing, some black stain, 35° bedding	
100 44.5	5.0		40.5	Red & green mottled, dessicated looking, limy shale, hard, slickensides at 42.5', diagonal across core-44-44.5'- broken- may be due to blocking	
100 49.5	5.0		46.3	Green limy shale, much calcite filled incipient fractures 45.3-46.1', badly broken green shale w/much black organic matl, approx.	35 slickensid
100 54.0	4.5		49.5	Shale, brick red, mottled, good core, moderately broken, bedding 25°-35°, jointing at 60°- $CaCO_3$ on bedding planes	some black st ing on partin
100 67.0	13.0		54.0	Shaly sandstone, grayish red, v. f. grnd., good core, hard, max. length of pieces 2.5', smallest pieces 0.2', bedding 40° ±, jointing at 60°-75°, abundant $CaCO_3$ filled fractured 63-77', broken zone @ 77-78', small limy inclusions at 78.5', some black staining	interfingerin sandstone & s
99 77.0	9.4				
99 77.0	9.4				

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GILBERT ASSOCIATES, INC.

ROCK CLASSIFICATION, SHEET

SHEET 2 OF ___

DATE 7-11-

PROJECT Three Mile Island NO. 4192-51 DRILL HOLE NO. ___

CONTRACTOR Fnd. Services SITE AREA Reactor Building ELEV. 200

CORE SIZE NX COORDINATES ___ ANGLE vert

CASING ___ BEARING ___

LOGGED BY: ___ GWL ___ DEPTH 12

Press. Test PSI	Take GPM	Core Rec. Run	Core	Profile	Interval	DESCRIPTION: Rock type, color, grain size & shape, bedding (angle thickness), fractures, faults, joints (angle, filling, etc.), permeability, alteration, weathering, chemical composition	REA Condition Excavatin
		77.0					
			4.0				
		81.5				81.5	
			7.7			Sandy shale, brick red, hard. max. length of core 3.0', slightly mottled throughout w/limy inclusions @ ¼" diam., slight amount of black staining at 88.4' &93', several joints healed w/ $CaCO_3$ (?), bedding at 40° ± w/jointing @ 60°-70°	
		89.2					
			7.9				
		97.0					
			9.1			Below 97'- max. core length 4.0', core broken 103-104', several mineralized fractures, bedding at 40° w/jointing at high angles	
		105.0			105.0		
			7.0			Grayish red sandstone, hard. med. to f. grnd., shaly 105-106', v. numerous mineralized fractures filled w/ white mineral, main fracture ¼" wide at 60° dip, apparent old plane of movement, displacement not possible to measure but probably v. minor	109.7- v. num. clusion gi" ance conrl
		112.3			112.3		
					115.6	Red, hard, sandy shale, core pieces up to 0.5', good core	
			6.4			Red-gray, fine grained, sandstone, good core-max. pieces 2.0'	
		120.0			120.0		
						T. D.	

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GILBERT ASSOCIATES, INC.

ROCK CLASSIFICATION, SHEET

SHEET 1 OF 3

DATE 8-2-67

T Met Ed Co. NO. 4192-51 DRILL HOLE NO. RB-6

CTOR Fdn. Services SITE AREA Three Mile Island ELEV. 320.0 approx

ZE NX COORDINATES ANGLE vertical

4" BEARING

) BY: GWL 18.5' DEPTH 103.7'

Core Rec. Run	Core Rec. Core	Profile	Interval	DESCRIPTION: Rock type, color, grain size & shape, bedding (angle thickness), fractures, faults, joints (angle, filling, etc.), permeability, alteration, weathering, chemical composition	REMARKS: Condition of core. Excavating evaluat etc.
			24.6	Begin coring @ 24.6'	
100 23.9	63		32.3	Sandy shale, brick red, broken throughout, coarse sandstone, seam @ 26.2-26.5', organic shale 26.6 & 27.2', micaceous throughout the organic seams, MnOx staining along some partings, bedding @ 35,° green shaley layer @ 30.2'	sound rock @
100 32.4	3.8		35.5	Sandstone w / shale interfingering, brick red & gray, fine grnd., bedding @ 40°, hard, near vertical joint @ 34.3-34.4	
100 40.3	50			Shale, red & green mottled, v. broken @ 37.4 - 37.7', 39-39.6', 47.3-47.6', seam organic shale layer @ 37.6', greenish black material, bedding @ 40°	
100 42.8	1.8		43.8		
100 48.0	60		48.5	Limy shale, green, small seam organic shale seam @ 42.5', high angle jointing @ 43', 45-45.5' broken zone, unlithified	
			48.5	Shale, red & green mottled, broken 48-48.5'	
100 54.5	66			Sandstone, brick red, fine grnd., 55-55.6', med. grnd., some calcite along partings, 65°cross jointing @ 60.8' becomes more shaley w/depth, core relatively urfractured below 48.5'	
100 58.8	44				
98 66.5	76		63.8		
			66.5	Shale, brick red, good core, max. pcs. 1FT.	
97 79.0	72		71.6	Shaley sandstone, brick red, few scattered limy inclusions, some concentration of limy inclusions @ 71.6', med. hard hard, 32°bedding	pieces up to
				Sandy shale, med. hard to hard, brick red, soft shale 74-74.4', limy inclusions throughout	pieces up to 2

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GILBERT ASSOCIATES, INC.

ROCK CLASSIFICATION, SHEET

SHEET 2 OF ___

DATE 8-2-

PROJECT Met Ed Co. NO. 1092-51 DRILL HOLE NO. I

CONTRACTOR Fdn. Services SITE AREA Three Mile Island ELEV. 300.0 ar

CORE SIZE Nx COORDINATES ___ ANGLE vertic

CASING 4" ___ BEARING ___

LOGGED BY: ___ GWL 18.5' DEPTH 107

Press. Test PSI	Take GPM	Run	Core Rec. Core	Profile	Interval	DESCRIPTION: Rock type, color, grain size & shape, bedding (angle thickness), fractures, faults, joints (angle, filling, etc.), permeability, alteration, weathering, chemical composition	REA: Condition Excavatin
		96	7.7		80.0	As above	
		820				Shaley sandstone, brick red, fine grnd., excellent core, some calcite along partings, some limy nodules throughout, bedding @ 35°, becomes less shaley @ 94'	
		100	7.0				
		890					
		97	7.7			As above	
		97.0					
		97	6.8				
		104					
		98	7.8		109.7	109.7-110.7' concentration of limy nodules, conglomerate like appearance, core recovery in 4-6' pcs.- below 93'	
		112.0			112.7		
					114.5	Shale, brick red, med. hard, 30° slickensides @ 111.3', good core, pcs. .7'	
		99	6.5			Sandstone, brick red & grayish, f. grnd., excellent core, max. core length 6.5', med. grnd. 131-134', shaley conglom. 133.8-134', bedding @ 35, gray from 127' on.	
		126.0					
		97	7.3				
		134.0					
		99	7.9				
		134.0			134.7		
		100	8.0			Silty shale, brick red becoming sandier w/ depth grading into shaley sandstone @ 140', good hard rock	pcs. 2.0
		142.0			140.0		
		100	7.2			Sandstone, reddish gray, f. grnd., few limy inclusions, good solid core	
		149.2			149.0		

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Sheet 134 Amend-2 (10-2-67)

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GILBERT ASSOCIATES, INC.

ROCK CLASSIFICATION, SHEET

SHEET 3 OF 3

DATE 8-2-67

Met Ed Co. NO. 4192-57 DRILL HOLE NO. RB-6

TOR Fdn. Services SITE AREA Three Mile Island ELEV. 300.0 approx

E NX COORDINATES ANGLE vertical

4" BEARING

BY: GWL 18.5' DEPTH 197.3'

Core Rec. Run	Core Rec. Core	Profile	Interval	DESCRIPTION (Rock type, color, grain size & shape, bedding (angle thickness), fractures, faults, joints (angle, filling, etc.), permeability, alteration, weathering, chemical composition)	REMARKS (Condition of core. Excavating evaluati etc.)
100 / 197.3	8.1		197.3	Silty shale, brick red, many limy inclusions 149-150'	solid 8.1' pc. of core
100 / 165.2	8.0			Shaley sandstone, reddish gray, f. grnd., coarse grnd., 157.3-159'. 60° jointing @ 163.7', vertical jointing @ 163.7-168.7', ¼" wide, excellent core (mineral FILLED)	max. core pcs. 8.0'
99 / 173.3	7.9				
99 / 181.3	7.9			181-182' some load casting (marbling)	
100 / 189.3	8.0		189.3	187.3-189.1' vertical incipient fracturing, (mineral	
100 / 197.3	8.1		197.3	Shale, brick red, 190.2' low angle slickensides across core, excellent core; max. length of pcs. 2.5'; 197' 25° bedding slip & 30° bedding slip.	becomes sandy w/depth
				T. D. 197.3'	

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GILBERT ASSOCIATES, INC.

ROCK CLASSIFICATION, SHEET

SHEET 1 OF 1

DATE [illegible]

PROJECT Met Ed Co. NO. 4192-51 DRILL HOLE NO. ___

CONTRACTOR Fdn. Services SITE AREA Three Mile Island ELEV. approx. 30

CORE SIZE NX COORDINATES ___ ANGLE vertic

CASING 4" ___ BEARING ___

LOGGED BY: W.S. GWL ___ DEPTH 151.3

Press. Test PSI	Take GPM	Core Rec. Run	Core Rec. Core	Profile	Interval	DESCRIPTION: Rock type, color, grain size & shape, bedding (angle thickness), fractures, faults, joints (angle, filling, etc.), permeability, alteration, weathering, chemical composition	REM: Condition Excavatin
						No sampling in the overburden	
		25			22.8	Begin coring @ 22.8'	
		247	1.8		26.6	Silty shale, brick red, broken, med. hard, good rock	top of s 24.7'
		100 304	5.7		29.4	Shale, red & green mottled, good core, med. hard to hard, some fracturing	
		100 365	6.0		34.5	Shale, brick red, broken to 34.4', several slickensides 29.4-30.4', 60° slickensides (across core) 29.4-29.6', some grinding of core, some cross fracturing	few calc clusions .2-.6'
		90 405	4.5			Shaley sandstone, brick red, fine grnd., bedding @ 30°-35°, becomes med. grnd. @ 39.5-40.5', broken zone 40-40.5', some MnOx staining	
		92 465	6.5		46.1		
		100 540	7.7		51.0	Silty shale, brick red, small zone decomposed shale @ 44.8' (½" seam), along H_2O course, pieces .1-.8'	
		100 640	6.0			Sandstone, reddish gray, f. grnd., good core, med. hard to hard, small H_2O course @ 51', 53.2', 53.6', broken zone due to drilling, bedding @ 30°-35°, some calcite along parting, interfingering & marbling of sandstone & shale 66.4-66.6' badly broken red & green mottled shale	good cor .7'
		100 680	8.0		66.4		
					70.4	Shale, red & green mottled	
		100 780	7.0		74.8	Sandstone & shale, interfingering, red & gray, micaceous, bedding @ 35', 70.7-70.9' & 71.5-71.7' broken decomposed zones along H_2O courses	

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Sheet 136 Amend-2 (10-2-67) GAI-1

GILBERT ASSOCIATES, INC.

ROCK CLASSIFICATION, SHEET

SHEET 2 OF 2

DATE 8-4-67

~~Met Ed Co.~~ NO. 4192.91 DRILL HOLE NO. RB-7

CTOR Fdn. Services SITE AREA Three Mile Island ELEV. 300.0±

E NX COORDINATES ANGLE vertical

4" BEARING

BY: GWL DEPTH 151.9

Core Rec. Run	Core Rec. Core	Profile	Interval	DESCRIPTION (Rock type, color, grain size & shape, bedding (angle thickness), fractures, faults, joints (angle, filling, etc.), permeability, alteration, weathering, chemical composition)	REMARKS (Condition of core. Excavating evaluat etc.)
98 304	5.8			Shale - red,& green limy shale, med, hard to hard, 79.2-81.2' broken zone, some oxidation 79.2-79.4', bedding @ 37°, good core	
			83.8	83.8' bottom of greer limy shale	
100 88.5	2.1		88.5	Silty shale, brick red, good core, some fractures, few small limy inclusions	
98 96.5	7.9			Sandstone, red, some gray bedding, fine grnd., excellent core, few incipient vertical mineralized healed joints, max. length of pieces <2', few limy inclusions	
100 103.6	7.8		103.5		
111.6	8.1			Silty shale; brick red; excelllent core; fine grained; hard; relatively unbroken with core pieces up to 2.1'	
119.1	7.6		115.0	Sandstone; reddish gray; excelllent core; fine to med. grained; course grained @ 118.4' to 120.0'; hard core - pieces up to 3.0' in length	
127.1	8.0		122.2	Shale & sandstone; interbedded; brick red to reddish gray; excellent core; pieces up to 2.0' in length; slight amount of limy inclusions throughout; bedding @ 32°	
	8.0		131.5		
			138.6	Sandstone; gray; fine grained; hard	
135.1	8.2			Shale (sandy); brick red; excellent core; pieces up to 2.0'; slightly mottled with small limy inclusions; bedding @ 17° 140.1'-140.6' takes the appearance of conglomerate due to a high amount of limy inclusions As next above; thomsonite coated joint faces @ 143.2' & 146.7'; joints near vertical	gradational ch from sandstone shale
143.3					
151.3	7.9		146.3	T. D.	

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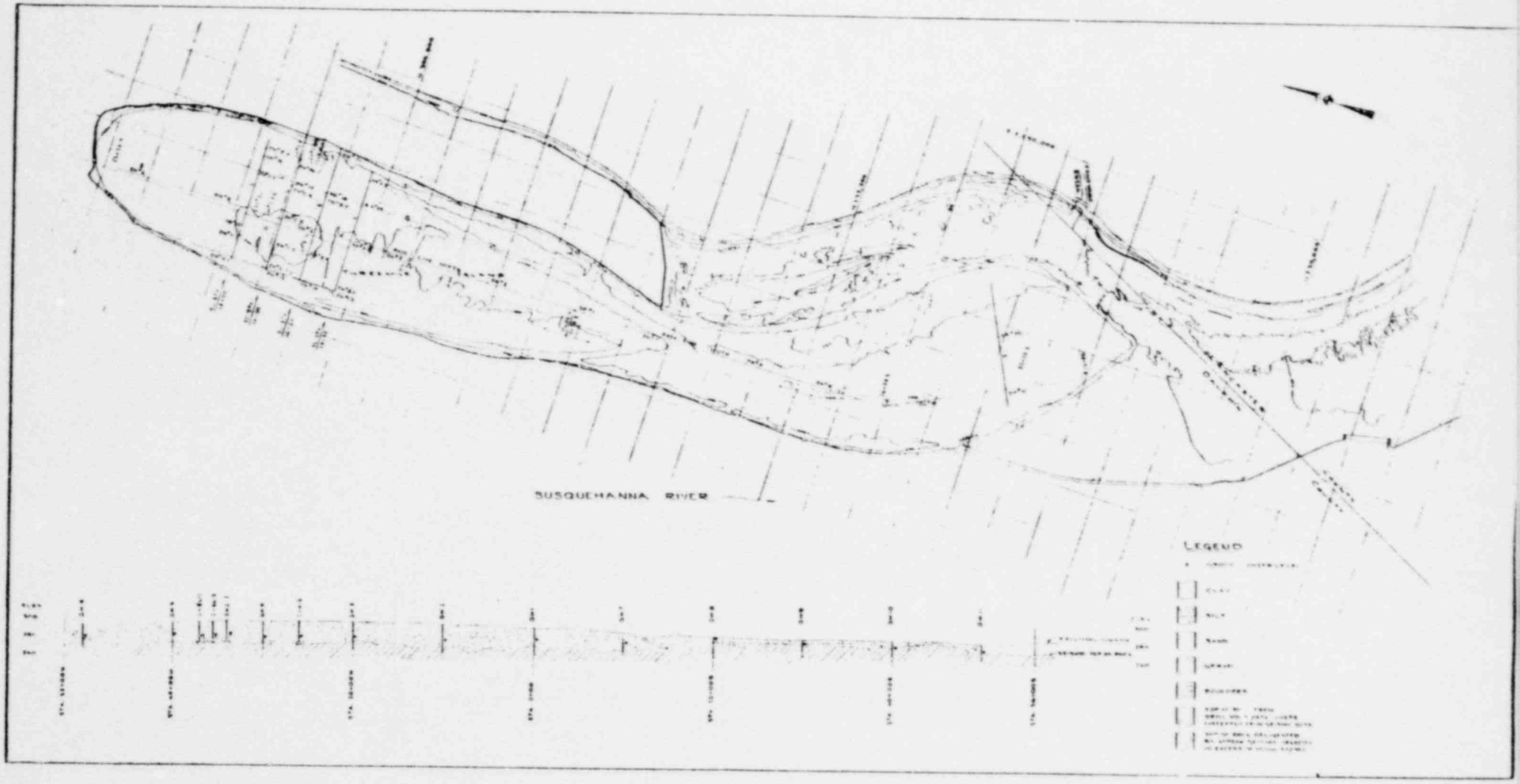
Sheet 137 Amend-2 (10-2-67) GAI-228 1/66



SEISMIC REFRACTION TEST BORING PLAN

FIGURE 2A-1

THREE MILE ISLAND NUCLEAR STATION

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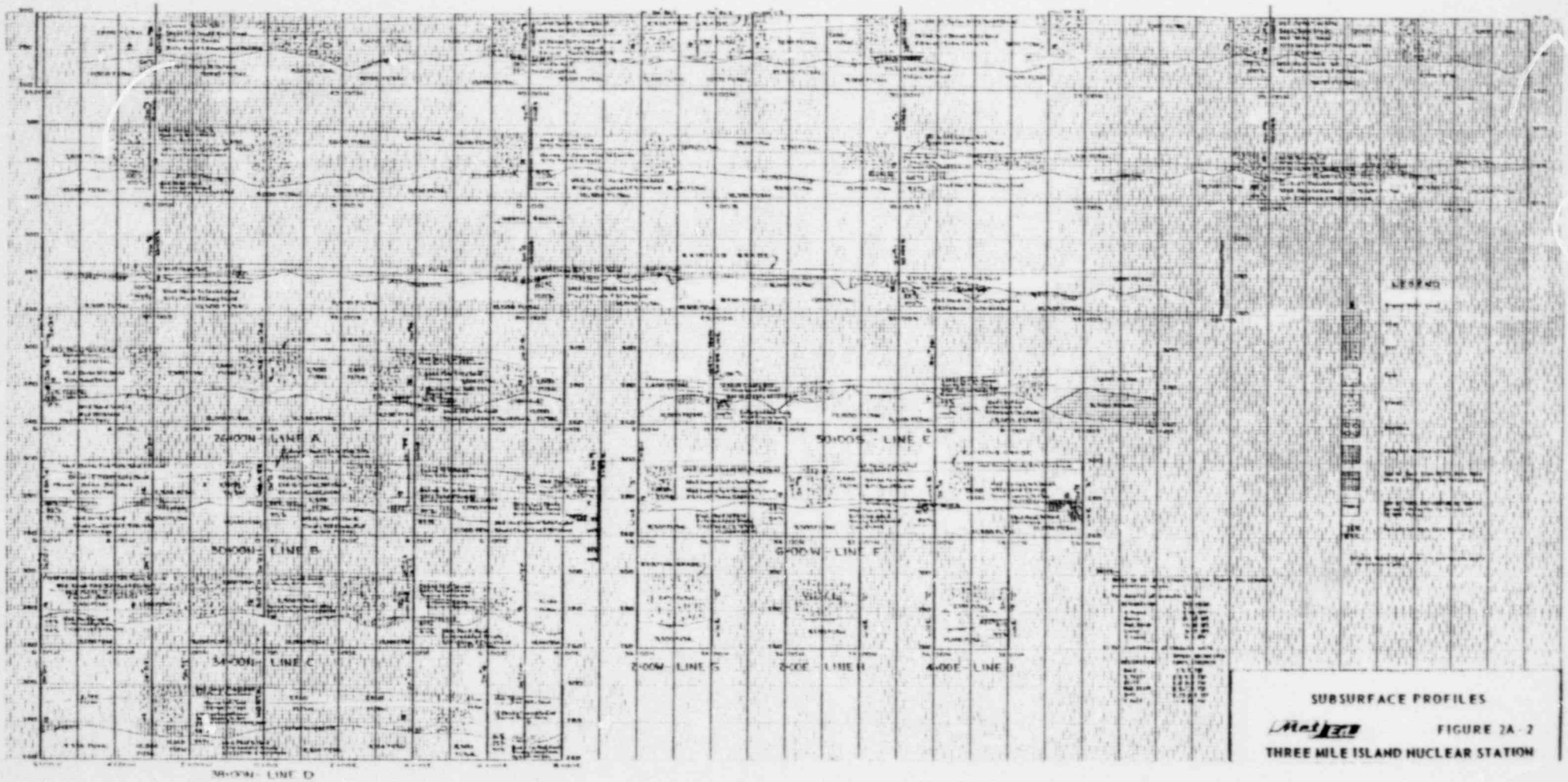

SUBSURFACE PROFILES

FIGURE 2A - 2

THREE MILE ISLAND NUCLEAR STATION

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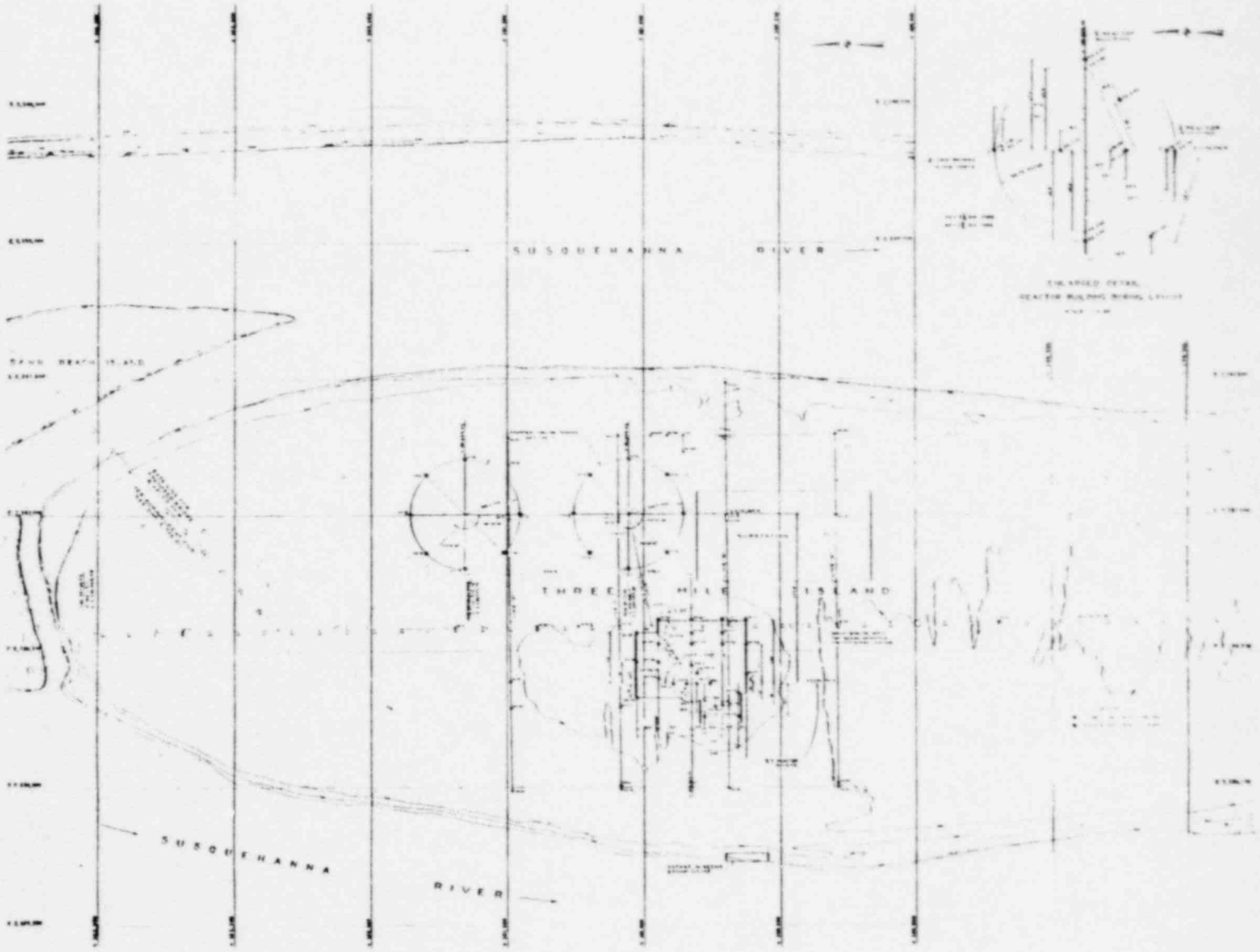

PLOT PLAN - TEST BORING LOCATIONS

FIGURE 2A-3

THREE MILE ISLAND NUCLEAR STATION

AMEND. 2 (10-2-67)

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ADDENDUM I

APPENDIX 2A

Fault traces as shown on Addendum 1 of Appendix 2D are taken directly from Stose and Jonas' (1933). The substance for their structural geology was obtained by large scale surface mapping which was completed in 1929.

Speculation as to the existence of the faults results from their interpretation of:

1. The topography of the area.

2. The spatial relationships of rock types which were determined by examination of scattered outcrops of rock throughout the mapped quadrangle.

It is important to note that the Stose and Jonas' mapping was accomplished without the aid of:

1. High quality (from the standpoint of scale and contour interval) topographic base maps.

2. Stereographic aerial photographs.

3. Any reliable subsurface data.

4. High quality geologic research conducted from 1929 to the present.

Under the circumstances described above, and in view of the fact that they were required to map large areas in a relatively short time, their work was of a high quality nature for its vintage. However, from the standpoint of an engineering geology investigation, Stose and Jonas' work constitutes little more than a geologic reconnaissance.

Since Stose and Jonas' report is a longstanding government publication its contents can not be overlooked, but rather evaluated by means of newer tools and techniques.

The present study, tailored to obtain the necessary data to satisfy the requirements of a PSAR was purely objective, and as such was directed along the lines of a multiple working hypothesis. Our conclusions have been drawn and recommendations made with the aid of:

1. A seismic refraction survey designed to establish:

   a. the depth to and configuration of the bedrock surface

   b. the seismic velocity of the overburden and rock

   c. if anomolous velocities were present

2. A detailed test boring program to:

   a. verify seismic results

   b. obtain subsurface data from which structural design criteria could be established

3. A set of high quality stereographic aerial photographs.

4. A high quality topographic map.

5. An intensive literature study, utilizing published and available unpublished data made prior to, and following Stose and Jonas' work.

6. A field study made by competent geologists with extensive experience in local geology.

7. An aeromagnetic survey prescribed by the United States Geological Survey.

Based upon these studies, we have not been able to substantiate the existence of the tenuous fault which Stose and Jonas speculate across Three Mile Island. All of the information is presented in Appendices 2A, 2B, 2C and 2D of the current draft of the PSAR.

In conclusion, departing from the multiple working hypothesis approach, we set out to substantiate the existence of the hypothetical faulting of Stose and Jonas. In doing so we have concluded that such faulting does not exist for the following reasons:

1. Seismic refraction profules of the bedrock surface do not indicate abrupt topographic chages characteristic of fault zones.

2. The small variation of seismic velocities is appropriately attributed to variations of rock types perpendicular to the strike of the strata

3. Seismic velocities obtained are those common to sedimentary rocks of the lithologies present at Three Mile Island. Values of higher magnitude should be expected from the same rocks in a state of natural stress.

4. Surface field studies of available rock outcrops and of the residual and alluvial soils do not present data suggestive of faulting.

5. Photogeologic studies negate the inference of faulting.

6. No discordant slippage planes or brecciated zones were observed in rock cores.

7. Aeromagnetics do not substantiate the existence of such a fault.

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