Appendix F

Bedrock Core Logs

CORE LOG

Boring CH-1 (MW-14) Project/No. NC0239.001 Page 1 of 7

Site Location University of North Carolina - Airport Road Waste Disposal Area, Chapel Hill, North Carolina

Total Depth Drilled 174 ft Hole Diameter _____ in Coring Started ~14-15'bls Coring Completed _____

Coring Method Wire-line Drilling Fluid _____

Land-Surface Elev. _____ ft [X] Estimated [ ] Estimated Datum Land Surface

Drilling Contractor Graham & Currie Driller/Helper Rick Morrison/Paul Chauez/Vince Moore

Prepared By P. Maner

Comments Coring stated inside 8" surface casing (set at 29' bls)

RUN #	DEPTH	CORE REC.%	TIME ft/min.	CORE LITHOLOGY	COMMENTS
	0-5.5	NA		Fill - Mixture of clay and trash (plastic bags).	Drilled with 10¼" HSA on 7/18/95
	5.5-14.5	NA		Clay, 90 to 100 percent, greenish to gray; sand, 0 to 10 percent.	As above.
	14.5-23	NA		Clay, 80 percent, light olive green; sandy, 20 percent, quartz, medium size.	As above, water table ~20'.
	23-27	NA		Clay, 70 percent, light orange brown to pale organic; sand, quartz, 20 percent, medium.	As above.
	27-30	NA		Bedrock.	Air hammer, no returns.
0	17-27	~50 percent	~4 min/ft	Grout for 8" surface casing.	Begin coring.
1	27-30	~26 percent	~4 min/ft	Grout for 8" surface casing.	
1	30-35	95 - 100 %	~ 7 min/ft	Granite - Granodiorite, greenish steel gray (slate and pepper appearance), even granular, finely crystalline, moderately hard, dark gray to rust colored where fractures occur, some fractures filed with carbonate (calcite) minerals. Darker mineralization (green to black) noted from 34 to 35'.	n-shaped vertical fracture (filled) Fractures
			~7 min/ft		More K-feldspar Fracture
			8 min/ft		Fractures Fine fracture 11 to bedding fractures
			6 min/ft		Fractures
2	35-45	~90 to 95 percent	4.5 min/ft	Granodiorite, greenish to gray, less quartz than above, fractures infilled.	"Hairline" fractures at ~45°, very small cavities. Fractures Fractures
			4 min/ft	*NOTE: Below fracture at 41-42' bls fracture pattern resembles n-shape; below this depth fractures are mainly v-shaped.*	Rust colored dendrite Fracture
			6 min/ft		Highly fractured, possible fault.
			~3 min/ft	Hydrothermally altered granite-granodiorite, white to light gray, soft. Slick to greasy, texture, possible mylonite.	Fracture

CORE LOG (continued)

Boring CH-1 (MW-14) Project/No. NC0239.001 Page 2 of 7

Prepared by P. Maner

RUN #	DEPTH	CORE REC. %	TIME ft/min	CORE LITHOLOGY	COMMENTS
2		~90 to 95 percent	5-7 min/ft	Granite - Granodiorite, greenish to gray, abundant K-feldspar (pink crystals), even granular, vertical fracture infilled with light olive green mineral.	Quartz crystals
					Carbonate infilled fractures darker minerals -amphibole
					Plugging up. Reduce rotary speed.
3	45-54	90 to 95 percent	10 min/ft		Fracture aphanitic
					Fracture coarsely - K-feldspar crystalline
			14 min/ft		Fracture infilled vertical fracture silt olive color
			25 min/ft		Fracture
			~7min/ft		Fracture
				Grandiorite, gray to dark gray, aphanitic texture, less quartz.	Fracture
				Granite - Granodiorite	
			26 min/ft		Fracture Change Bit
4	54-64	~90%	~17 min/ft	As above.	"Salt and Pepper"
				Granite - Granodiorite gray to greenish-gray, porphyritic texture, abundant feldspar, crystals, filled hairline fractures at ~45° to bedding (possible calcite lined)	Pyrite crystals Fractures
					Fracture
			~7 min/ft		Fracture
					Fracture
					Fracture
					Fracture
				Lost Recovery	

RUN #	DEPTH	CORE REC. %	TIME ft/min	CORE LITHOLOGY	COMMENTS
5	64.5-74.5	~95%	4 min/ft	Granodiorite, greenish-gray to dark gray, finely crystalline to aphanitic texture, light yellowish, olive green intrusives, frequent pyrite.	Fractures Fracture
			8 to 9 min/ft		"Fracture-free" Potassium feldspar intrusive Aphanitic
			9 min/ft		Melanboratic
			2 to 3 min/ft		Pink cakite fracture Light yellowish and green intrusive fracture
6	74.5-83.5	~95% to 100 %	~7-8 min/ft	Granodiorite, dark gray, mainly aphantic, numerous hairline fractures filled with pyrite and other minerals.	"fracture-free" small fractures have been filled.
				Granodiorite - granite gray to dark greenish gray, porphyritic texture, metamorphosed, vertical hairline fractures have been filled - some with carbonate minerals.	"fracture-free" (fractures slicken side filled) possible fault slicken side
					Fractures
7	83.5-93.5	98% (includes portion of Run #8 which appears to have broken from Run #7)	~7 min/ft	As above but with larger multiple fractures at approximately 86 to 87 ft/bls	Rust-colored layers 1-2" fractures
			~4-5 min/ft	Granodiorite - Granite gray to dark greenish gray porphyritic texture to aphanitic, salt and pepper appearance, vertical to 45° hairline fractures filled.	"fracture-free" small fractures have been filled with carbonate minerals.

CORE LOG (continued)

RUN #	DEPTH	CORE REC. %	TIME ft/min.	CORE LITHOLOGY	COMMENTS
7	83.5-93.5	98%	4 min/ft		
			4-5 min/ft		
			6 ft/min		
8	93.5-98.5	100%	6 ft/min	As above.	"Fracture - free"
				No recovery.	
9	100-108.5	99%	10 min/ft	Granite -granodiorite - gray to dark greenish gray, even granular, biotifte and pyrite present, metamorphosed.	"Fracture-free" small fractures filled with carbonate minerals
					Fracture
			12-13 min/ft	Granodiorite, gray to dark gray to yellowish green gray, aphanitic to even gradner, numerous small infilled fractures with calcite, more feldspar crystals from 106 to 108 ft/bls.	Fracture
					Calcite vein
					Fracture
					Fracture
				No recovery.	Remove core bit and shoe from open hole
10	110-115.5'	90%	14 min/ft	Granodiorite, gray to dark greenish-gray, even granular.	Fractures
					Smaller fractures
			5-6 min/ft		
					Fracture

CORE LOG (continued)

RUN #	DEPTH	CORE REC. %	TIME ft/min.	CORE LITHOLOGY	COMMENTS
11	115.5-120.05	100%	5-6 min/ft		(large) highly fractured
					Quartz vein
				Granite, light gray to greenish-gray, coarsely crystalline. Granite, light gray to greenish-gray, coarsely crystalline, "splotchy" appearance, rust colored fractures.	Fracture
12	120.5-125.5'	100%	4-5 min/ft		Fracture
					Fracture
					Fracture
					Fracture
13	125.5-130.5	98 %	4 min/ft		Fracture
					Fracture
				Granite, light gray to light greenish gray, mainly. fine-crystalline, even granular, leucocratic, calcite-lined fractures highly fractured	Fracture
14	130.5-135.5	100 %	3-4 min/ft		Small fractures
15	135.5-140.5	77 %	3-4 min/ft	As above.	Multiple fractures
				No recovery	

CORE LOG (continued)

Boring CH-1 (MW-14) Project/No. NC0239.001 Page 6 of 7

Prepared by P. Maner

RUN #	DEPTH	CORE REC. %	TIME ft/min.	CORE LITHOLOGY	COMMENTS
16	141.5-	100 %	8 min/ft	Granodiorite - Granite gray to light to olive gray to dark gray, mainly aphanitic, multiple fractures filled with carbonate minerals, several vertical fractures.	Possible fault Fractures Quartz vein
	145				
17	145-150	98%	~6 min/ft		Carbonate-lined fractures Fracture Pyrite
				Granite, greenish-gray to dark gray, even granular, coarsely crystalline.	
18	150-155	98 %	5-7 min/ft	Granodiorite -granite gray to dark greenish-gray, mainly asphalt to finely-crystalline, less fractured than above.	Fractures
19	155-158	100%	9 min/ft		
		95%		Granite-granodiorite light gray to greenish-dark gray, mainly porphyrite, even granular, multiple fractures with calcite and carbonate filing, some potassium, feldspar, numerous infilled vertical fractures, some pyrite sulfide minerals, leucocratic (more quartz).	Quartz vein Vertical fracture change bit Fractures with black to greenish white coatings
20	158-163		5 min/ft		Fractures
21	163-168	99%	5-6 min/ft		

CORE LOG (continued)

Boring CH-1 (MW-14) Project/No. NC0239.001 Page 7 of 7

Prepared by P. Maner

	RUN #	DEPTH	CORE REC. %	TIME ft/min.	CORE LITHOLOGY	COMMENTS
168	22	168-169.25	99%	10 min/ft	Granite-Granodiorite light gray to light olive gray.	Calcite vein Fractures
169	23	169.25-174	76%	3-4 min/ft	to dark gray, finely crystalline to aphauitic highly fractured (particularly between 168-169' bls - fault breccia) but fractures are filled with carbonate minerals. Mylonite present.	
170						Mylonite-fault brecciaed
						Multiple fractures
171						
172						
173				6 min/ft		Left in the hole.
174						
175						

CORE LOG

Boring CH-2 Project/No. NC0239.001 Page 1 of 2

Site Location University of North Carolina - Airport Road Waste Disposal Area, Chapel Hill, North Carolina

Total Depth Drilled 60 ft Hole Diameter _____ in Coring Started ~14-15'bls Coring Completed _____

Coring Method Wire-line Drilling Fluid _____

Land-Surface Elev. _____ [X] Estimated [ ] Estimated Datum Land Surface

Drilling Contractor Graham & Currie Driller/Helper Rick Morrison/Paul Chauez/Vince Moore

Prepared By P. Maner

Comments Coring stated inside 8" surface casing (set at 29' bls)

RUN #	DEPTH	CORE REC.%	TIME ft/min.	CORE LITHOLOGY	COMMENTS
1	20-30'	94%	.14 ft/min	Granite - granodiorite, steel gray - gray, mainly asphanitic texture with occasional feldspar crystals, fractures numerous and filled.	Gravel
			.2 ft/min		1" thick quartz vein Fracture
			0.25 ft/min		Fracture
			~ 0.14 ft/min		Pyrite Fracture
					Fracture
				Granite, light gray to pinkish gray, phaneritic, coarsely crystalline, highly fractured, fractures partially filled with dissolved quartz, frequent pyrite, hydrothermal alteration (sulfur-rich). Fractures are coated rust-colored, black or light yellow green.	Fracture
			0.09 ft/min		Fracture Fracture
			0.14 ft/min		Fracture Light olive green intrusive fracture
			0.14 ft/min		
			~0.14 ft/min		Fracture
			0.09 ft/min		Fracture Fracture
2	30-33.5'	97%	0.06 ft/min	As above, slightly less k-spar.	Fracture Fracture Fracture
3	33.5-43.5'	91%	~0.35 ft/min	Granite, light gray to greenish gray, coarsely crystalline, numerous fractures, metamorphosed.	Fractures Quartz filled Fracture Fracture

CORE LOG (continued)

Boring CH-2 Project/No. NC0239.001

Prepared by P. Maner

RUN #	DEPTH	CORE REC. %	TIME ft/min	CORE LITHOLOGY	COMMENTS
				Granodiorite, greenish gray to dark gray, mainly aphanitic, fractures filled with yellowish green minerals, some pyrite.	
			0.22 ft/min		Fracture
					Fracture Feldspar crystals
					Fracture
					Fracture
4	43.5-53	100%	~0.2 ft/min	As above.	Fracture
				Granite - granodiorite greenish gray to dark gray, more abundant feldspar crystals than above, porphyritic, fractures filled.	Fracture
					Fracture
				Granodiorite greenish gray to dark gray, asphanitic texture, pyrite, fractures filled with calcite and carbonate minerals.	Fractures
5		99%	0.3 ft/min	As above, highly fractured at 59-60' bls. Fracture filled with calcite. Large fracture at 53.5' bls.	Fractures
					Fractures
					Fractures
					Fractures
		0.2 ft/min			Fractures
					Vertical fracture

CORE LOG

Boring CH-3 (MW-23) Project/No. NC0239.001 Page 1 of 4

Site Location University of North Carolina - Airport Road Waste Disposal Area, Chapel Hill, North Carolina

Total Depth Drilled 88 Hole Diameter _____ in Coring Started ~14-15'bls Coring Completed _____

Coring Method Wire-line Drilling Fluid _____

Land-Surface Elev. _____ [X] Estimated [ ] Estimated Datum Land Surface

Drilling Contractor Graham & Currie Driller/Helper Rick Morrison/Paul Chauez/Vince Moore

Prepared By P. Maner

Comments Coring stated inside 8" surface casing (set at 29' bls)

	RUN #	DEPTH	CORE REC.%	TIME ft/min.	CORE LITHOLOGY	COMMENTS
		0-17			See Calvin Whitfield 8-8-95	8-inch diameter stainless steel surface casing
17	1	17-18.5	81%	18 min/ft	Granite - granodiorite gray to greenish-gray, phaneritic, finely to coarsely crystalline, highly fractured (fractures are rust-colored), hydrothermally altered (abundant chlorite-biotic), micro-joints, "salt and pepper" appearance.	Gravel
18						
19	2	18.5-23	87%	4 min/ft		
20						
21						
22						Fractures
23						Highly fragmented
24	3	23-28	58%	~5 min/ft		
25						
26						Lost recovery
27						
28						Multiple fractures
	4	28-29	58%	~9 min/ft		Fragmented
29	5	29-34	88%			
30						
31						Fractures siliceous filling
				8-10 min/ft		
32					Granite, greenish gray to pinkish gray, coarsely crystalline, highly fractured, jointed in herring bone pattern at 38-40', fractures rust-colored, greenish to yellow mineral filling many fractures (possibly diopside),	Aphanitic
33						

CORE LOG (continued)

Boring CH-3 (MW-23) Project/No. NC0239.001 Page 2 of 4

Prepared by P. Maner

RUN #	DEPTH	CORE REC. %	TIME ft/min	CORE LITHOLOGY	COMMENTS
6	34-38.5	100%	6-8 min/ft		Fragmented Vertical fracture Quartz? pink intrusive
7	38.5-43.5	99%	4 min/ft	Granite as above but less potassium feldspar, numerous fractures and filled fractures (light green to white filled fractures).	Drusy-crystals filling vugs
8	43.5-48.5	93%	5-7 min/ft		
9	48.5-52	91%	12 min/ft 12 min/ft	Meta-volcanic (slate) dark grayish-green, glassy texture, mainly aphanitic with occasional fine-sized white crystals.	Fractures
	52-53	--		No recovery.	
10	53-58	92%	7 min/ft	Granodiorite - diorite dark gray, mainly aphanitic to very finely crystalline, fractured, less albite and visible potassium feldspar than above granites, rust-colored fractures.	Fractures

CORE LOG (continued)

Boring CH-3 (MW-23) Project/No. NC0239.001 Page 3 of 4

Prepared by P. Maner

RUN #	DEPTH	CORE REC. %	TIME ft/min	CORE LITHOLOGY	COMMENTS
11	58-62	86%	9 min/ft		
			6 min/ft		
			4 min/ft		
12	62-67	76%	4-6 min/ft	Granodiorite - diorite as above.	
					Multiple fractures
					No recovery
13	67-72	100%	4 min/ft.		Highly fractured vertical fracture fault
				Granite - granodiorite greenish gray to very pale pinkish-orange, highly fractured, rust colored fractures, fault breccia.	
				Granite - granodiorate greenish to pinkish gray, coarsely crystalline, mottled appearance, phaneritic, numerous vertical micro-fractures/joints.	
14	72-77	91%	4.5 min/ft		
					Fragments
					"Fracture-free"
			7 min/ft		
15	77-82	89%	3-4 min/ft		Fragments highly fractured.
				Quartz vein - white to grayish white.	
			4 min/ft	Granite gray to pinkish gray to greenish gray, coarsely crystalline, abundant feldspars, multiple iron-rich fractures, silt (mylonite?) filling some fractures.	Highly fractured
			~ 5 min/ft		
				As above but with light yellowish-olive green vertical filled fracture (chlorite - diopside minerals?)	
16	82-87	100%	4-6 min/ft		Vertical filled fracture

CORE LOG (continued)

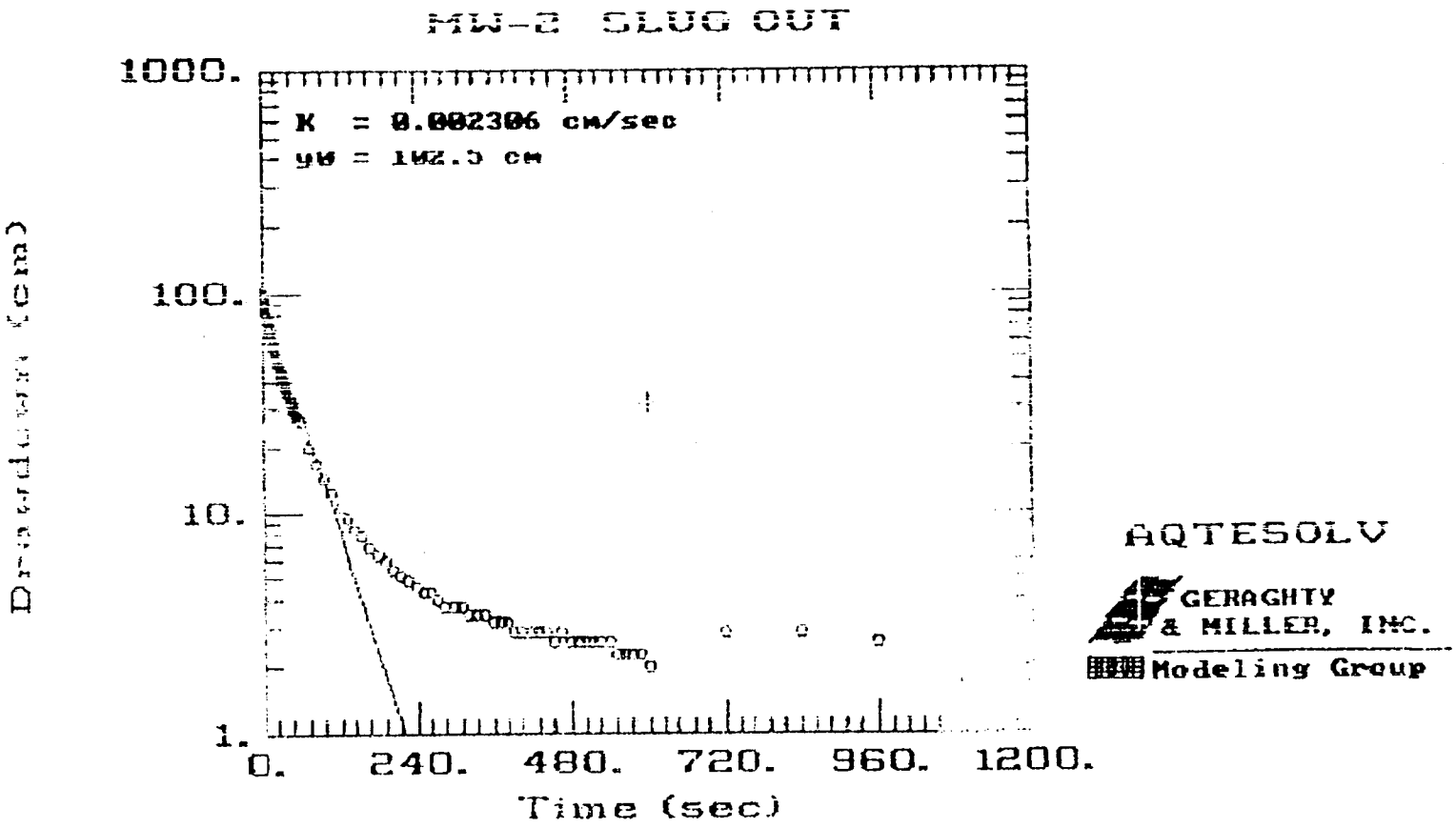
Boring CH-3 (MW-23) Project/No. NC0239.001 Page 4 of 4

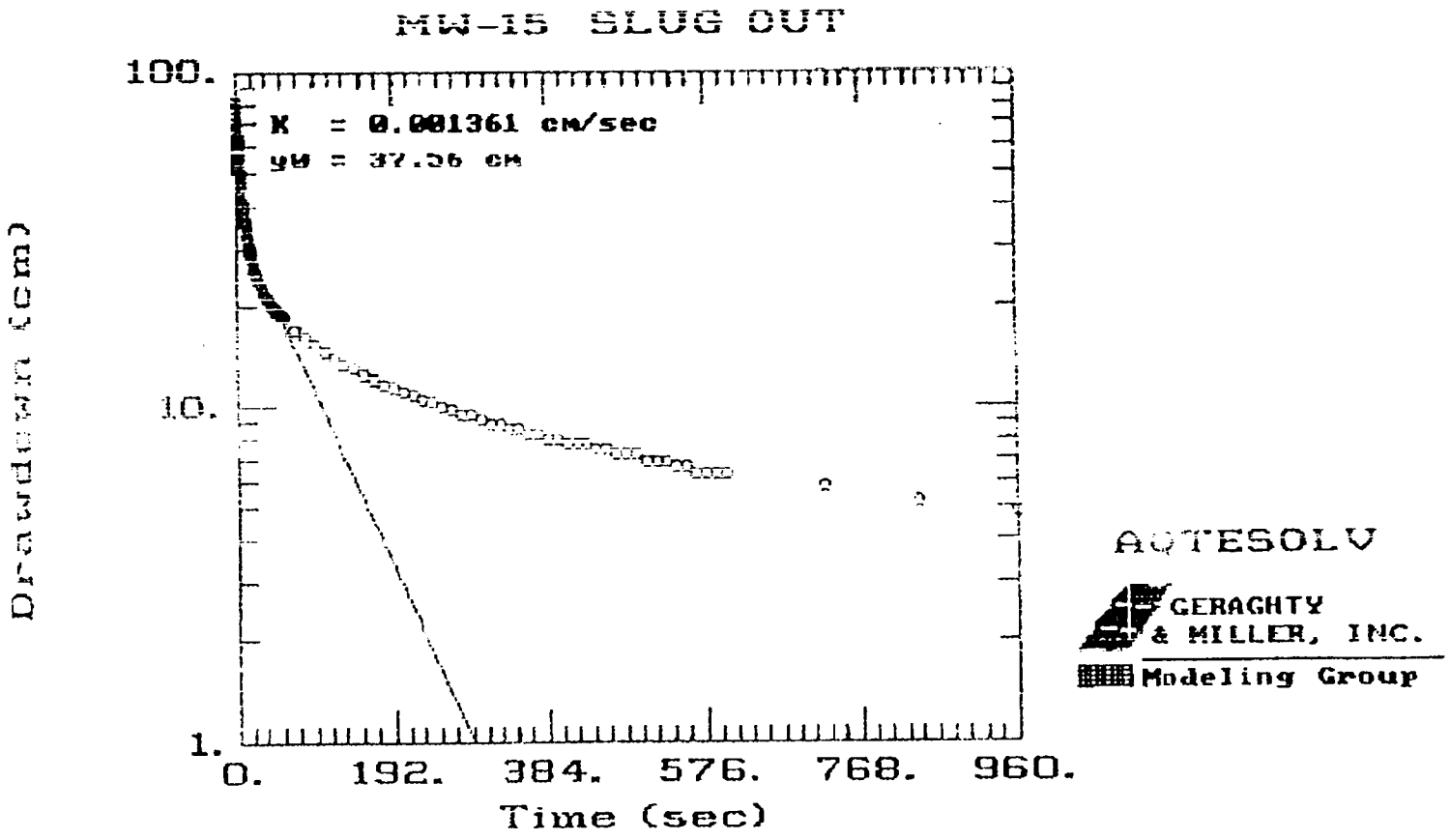
Prepared by P. Maner

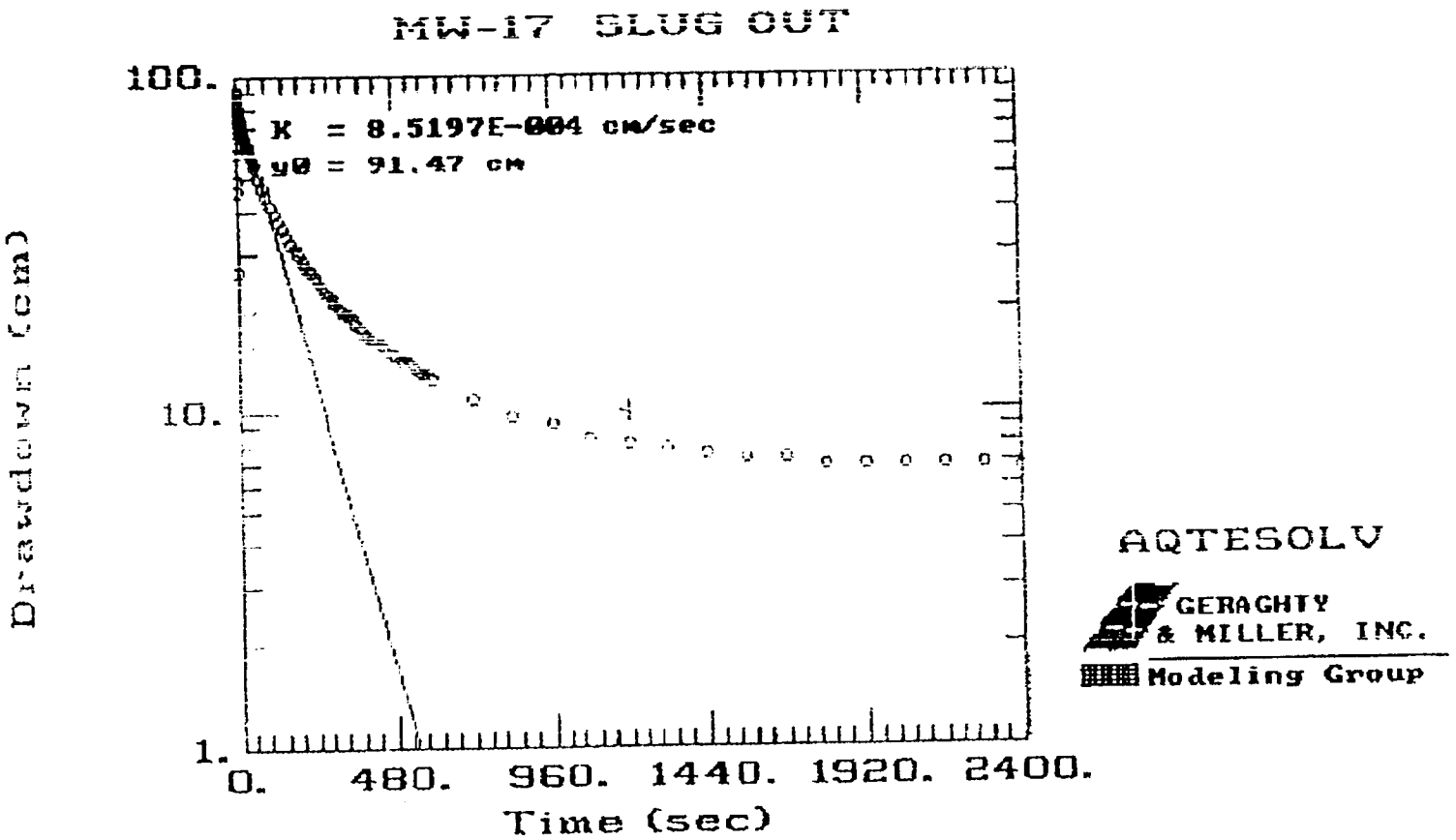
RUN #	DEPTH	CORE REC. %	TIME ft/min	CORE LITHOLOGY	COMMENTS
83				Granite (hydrothermally altered) light yellowish olive green to light olive gray, soft, brittle, associated with pinkish-orange quartz.	
84					Vertical fracture
85					
86				Granite gray to greenish gray, finely crystalline.	
87	17	87-88	100%	4-6 min/ft	

Appendix G

Slug-Test Results


MW-2 SLUG OUT
K = 0.002306 cm/sec
y0 = 102.5 cm
1000.
100.
10.
1.
0.
240.
480.
720.
960.
1200.
Time (sec)
AQTESOLV
GERAGHTY & MILLER, INC.
Modeling Group


MW-15 SLUG OUT
K = 0.001361 cm/sec
y0 = 37.56 cm
100.
10.
1.
0.
192.
384.
576.
768.
960.
Drawdown (cm)
Time (sec)
AQTESOLV
GERAGHTY & MILLER, INC.
Modeling Group


MW-17 SLUG OUT
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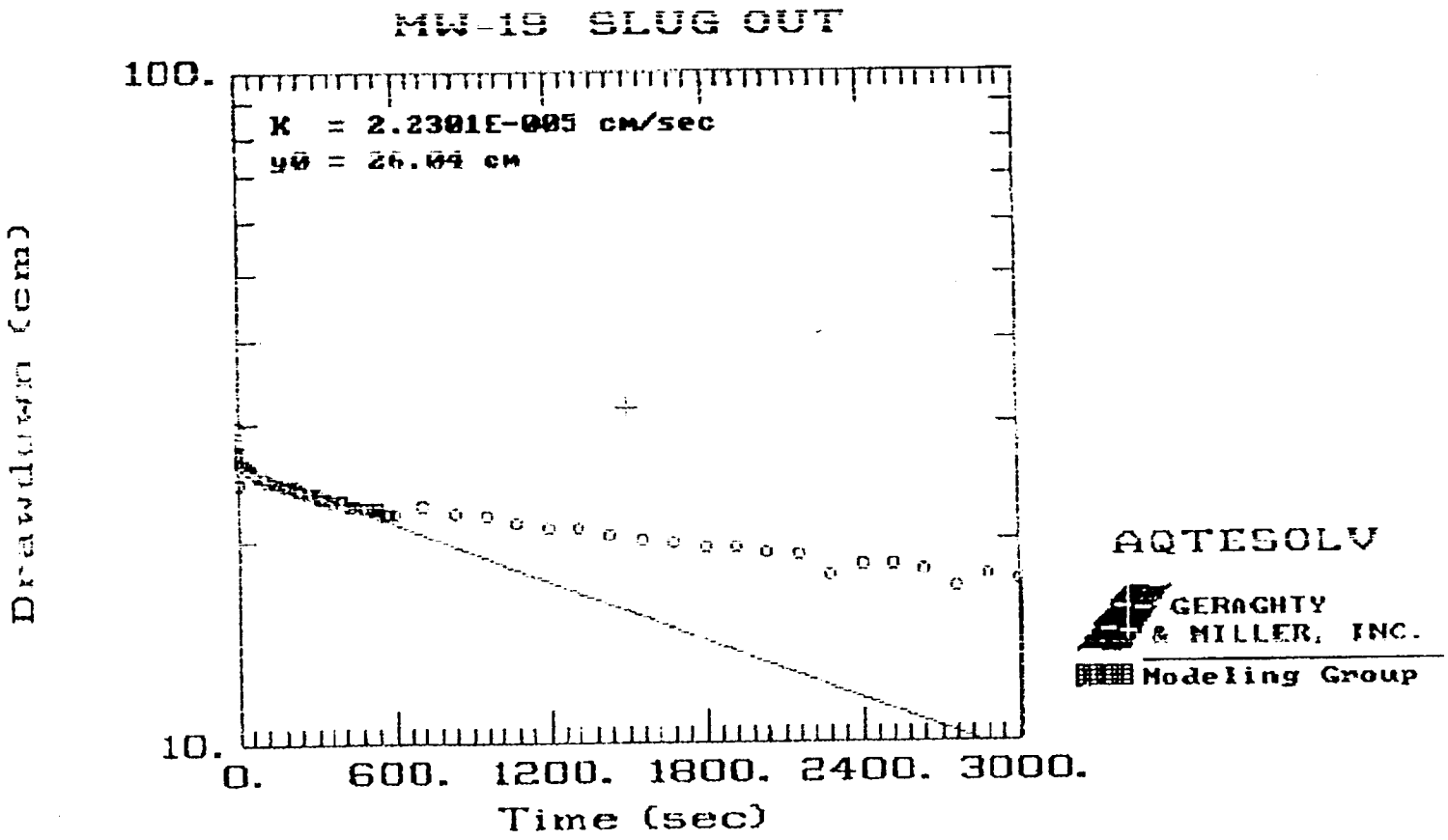
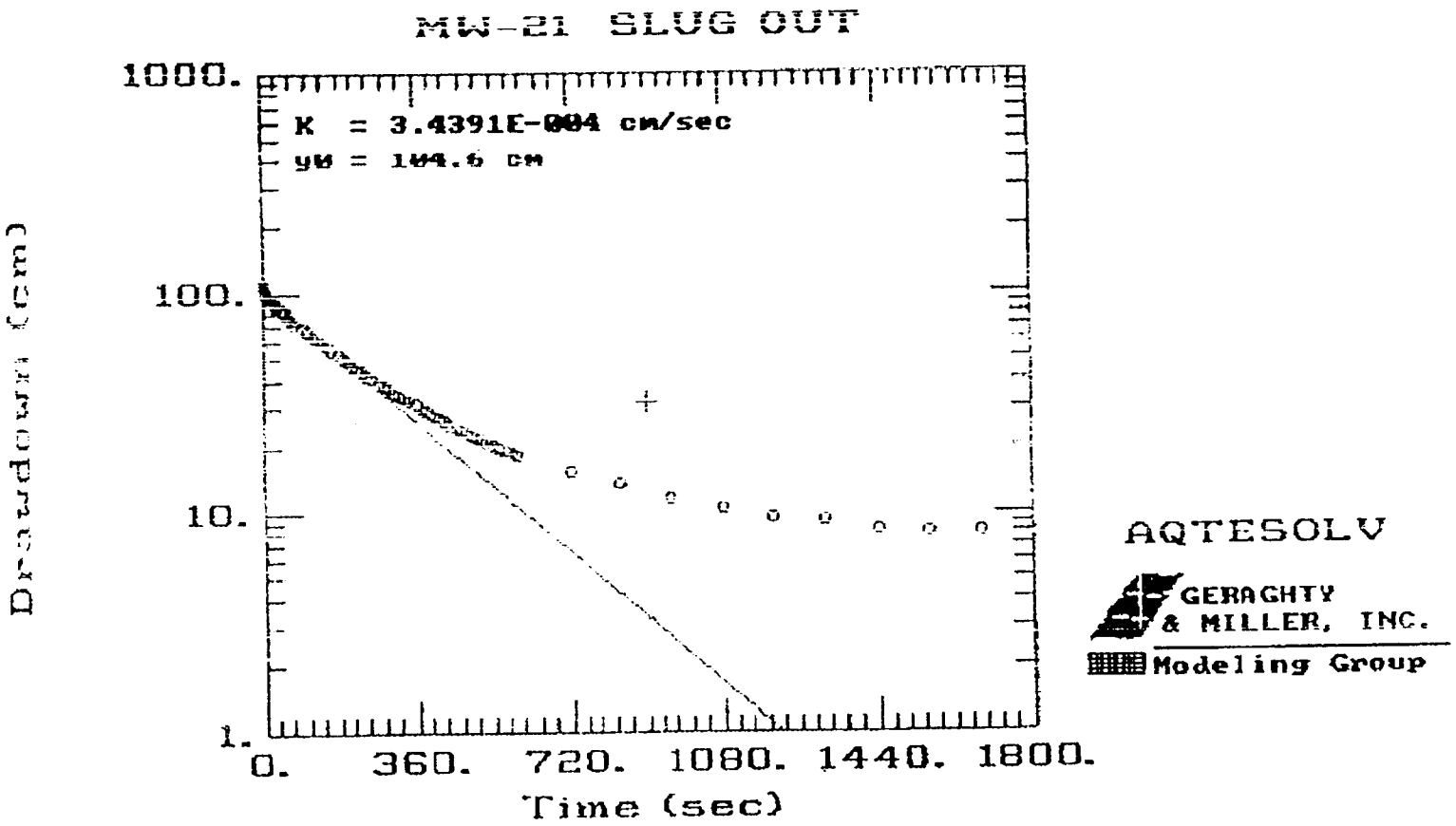
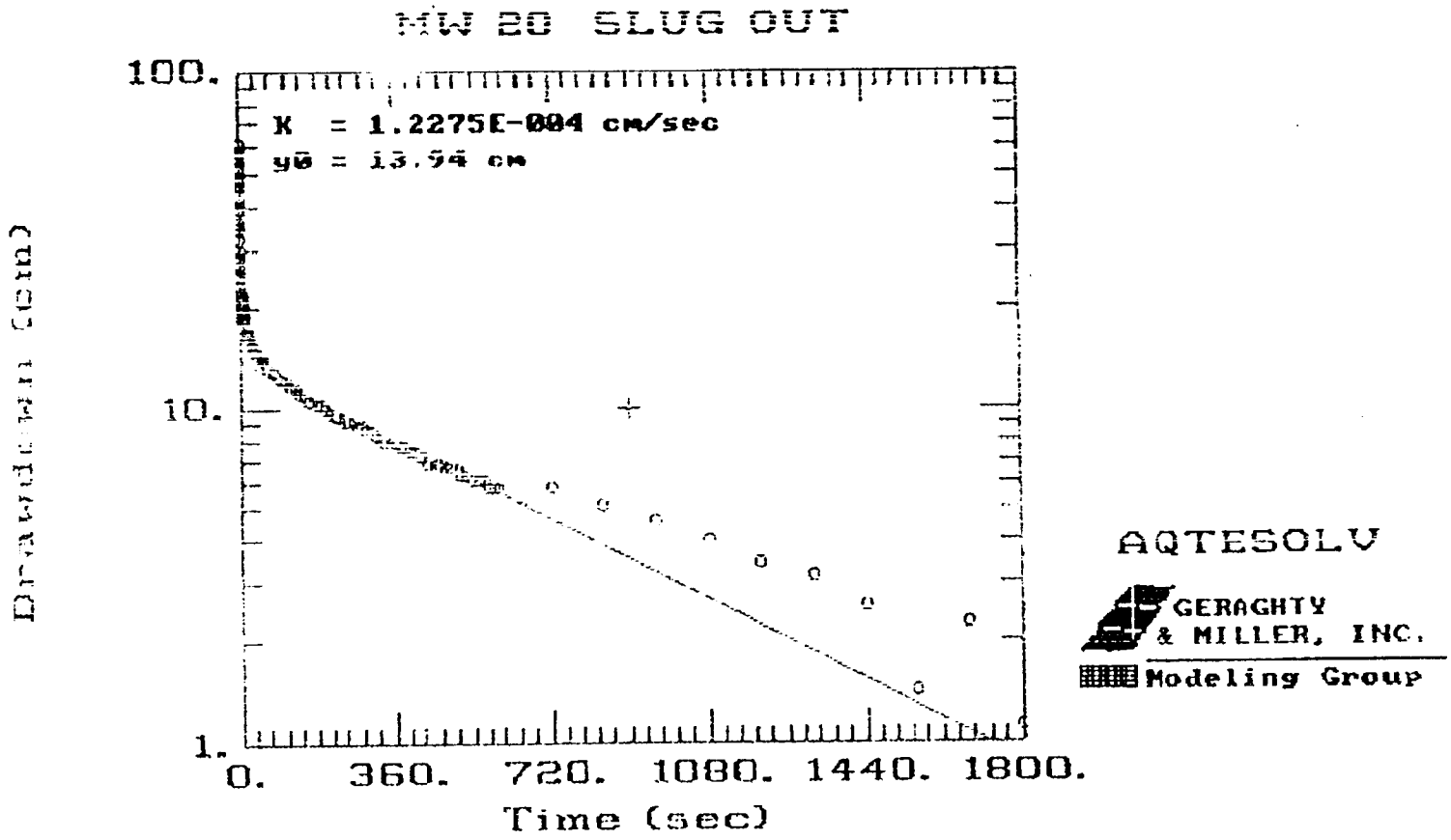
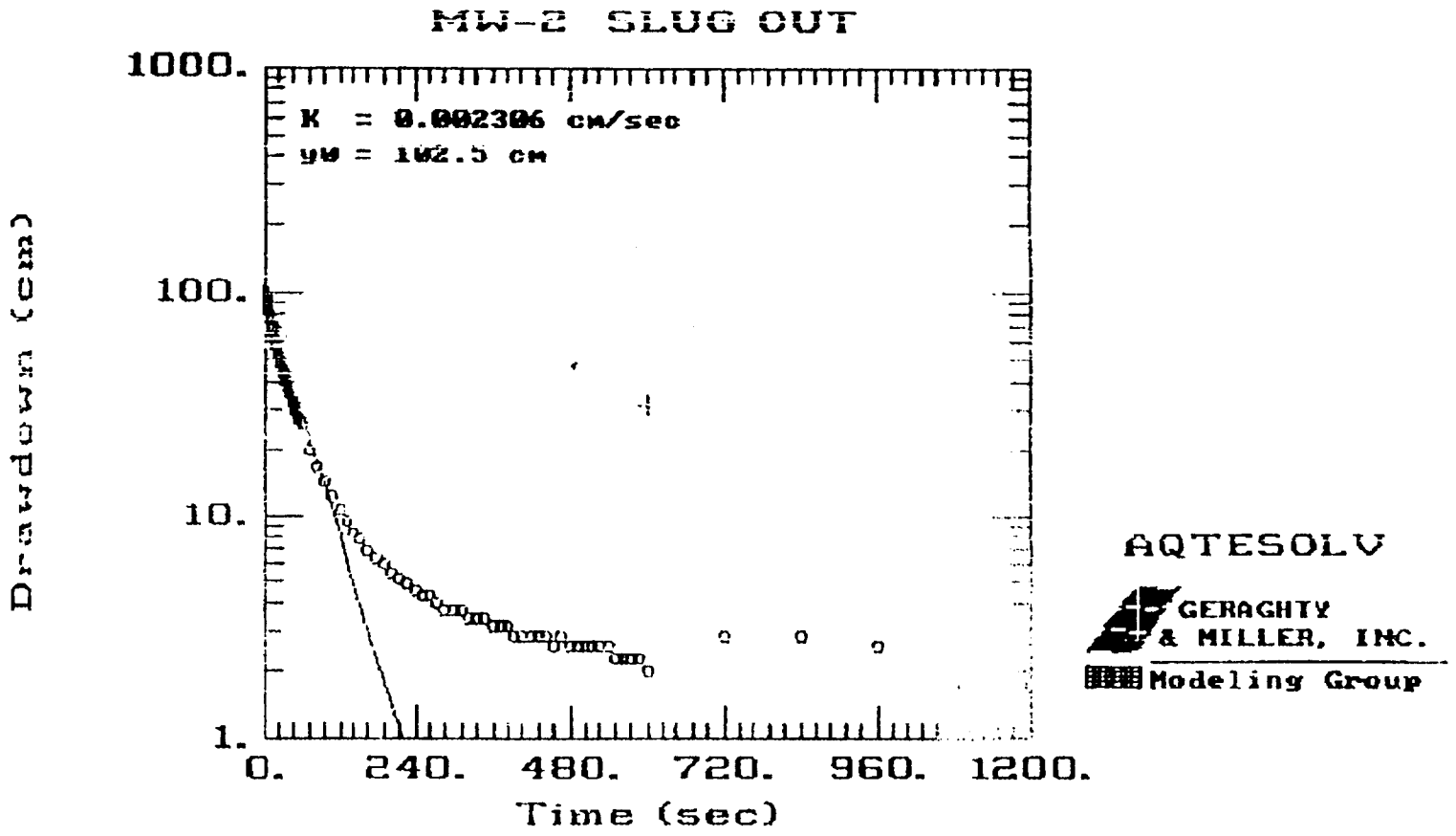
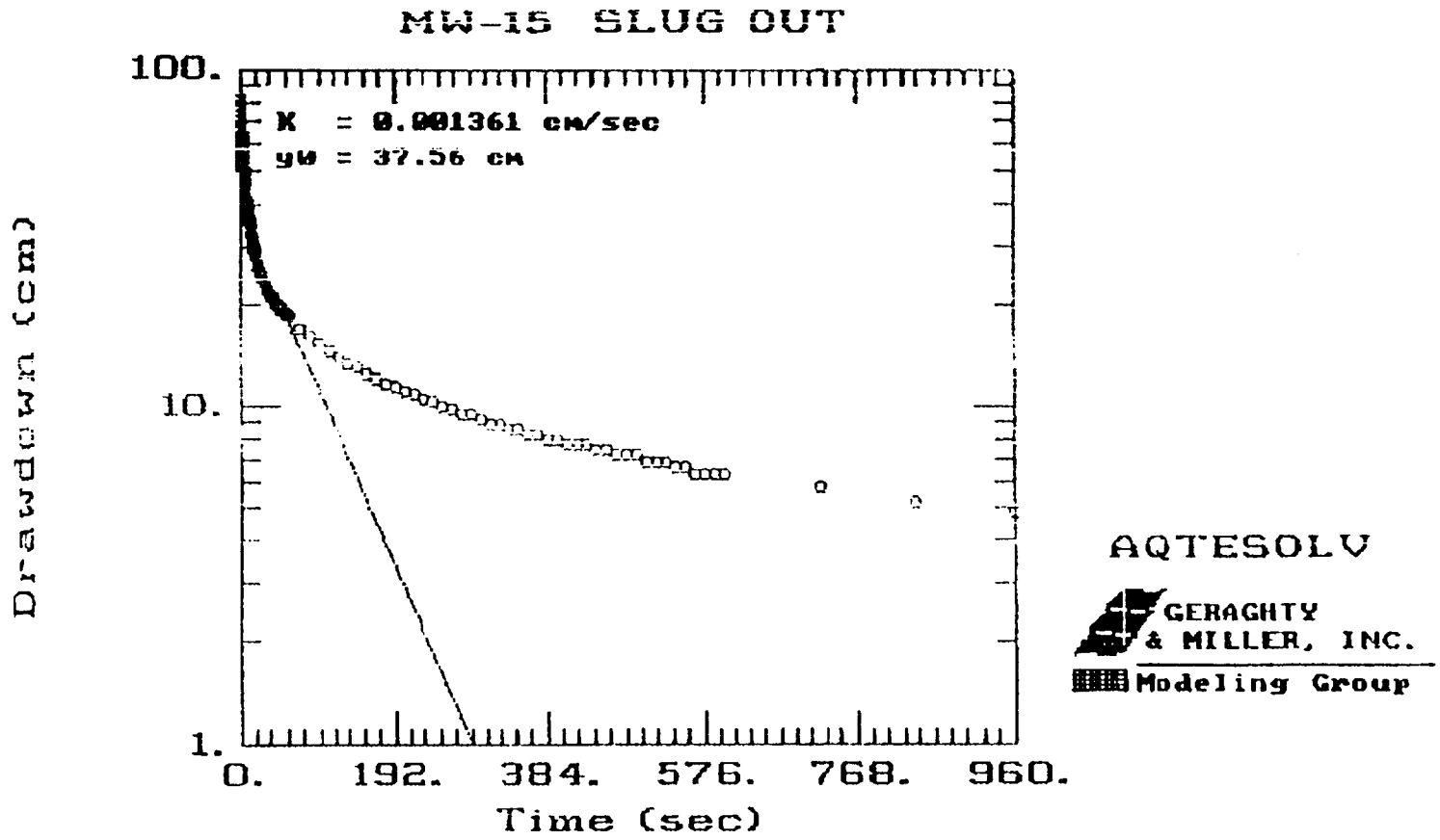
10.
1.
K = 8.5197E-004 cm/sec
y0 = 91.47 cm
Drawdown (cm)
0.
480.
960.
1440.
1920.
2400.
Time (sec)
AQTESOLV
GERAGHTY
& MILLER, INC.
Modeling Group

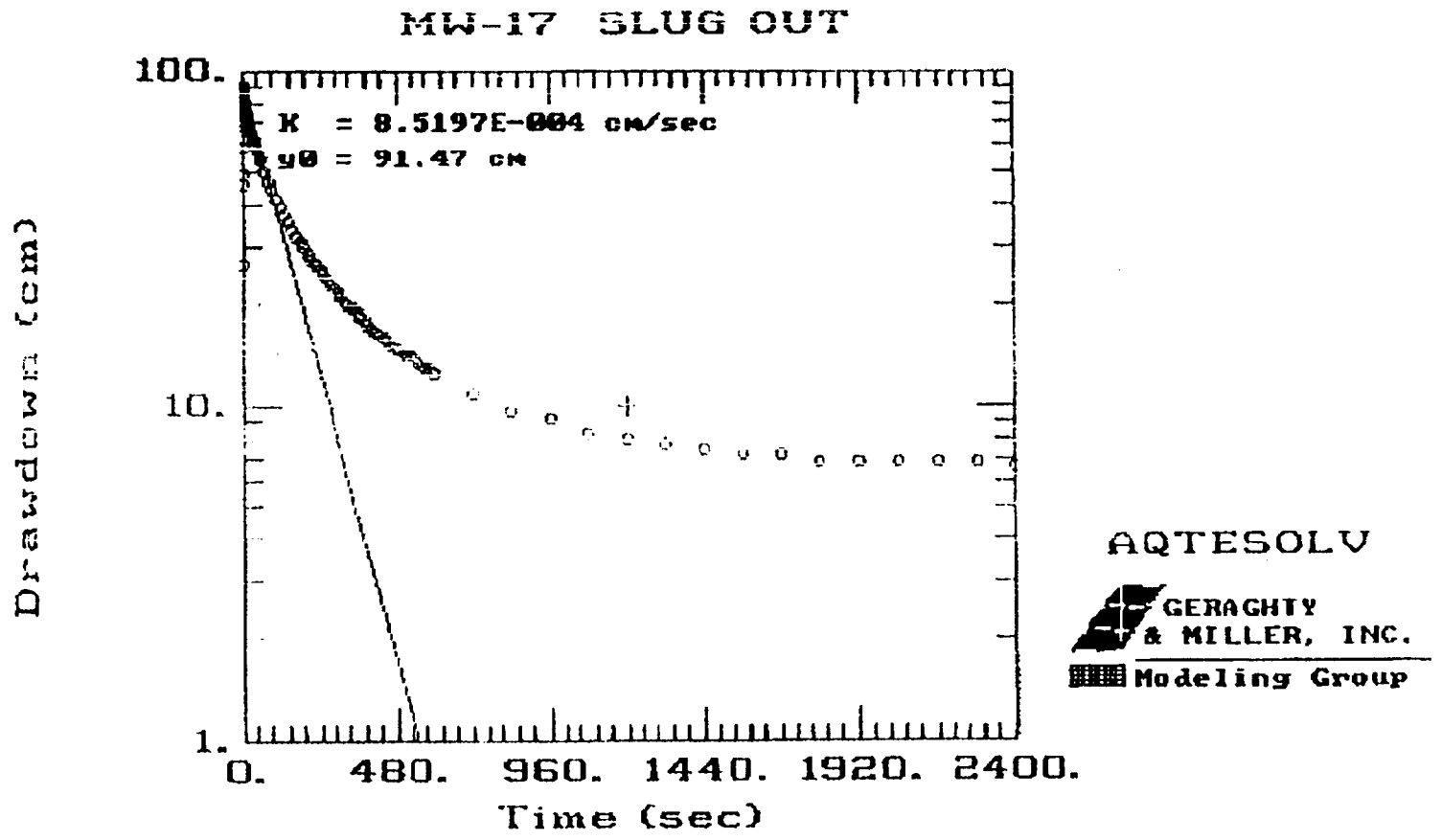

MW-19 SLUG OUT
K = 2.2301E-005 cm/sec
y0 = 26.04 cm
100.
10.
0.
600.
1200.
1800.
2400.
3000.
Drawdown (cm)
Time (sec)
AQTESOLV
GERAGHTY & MILLER, INC.
Modeling Group

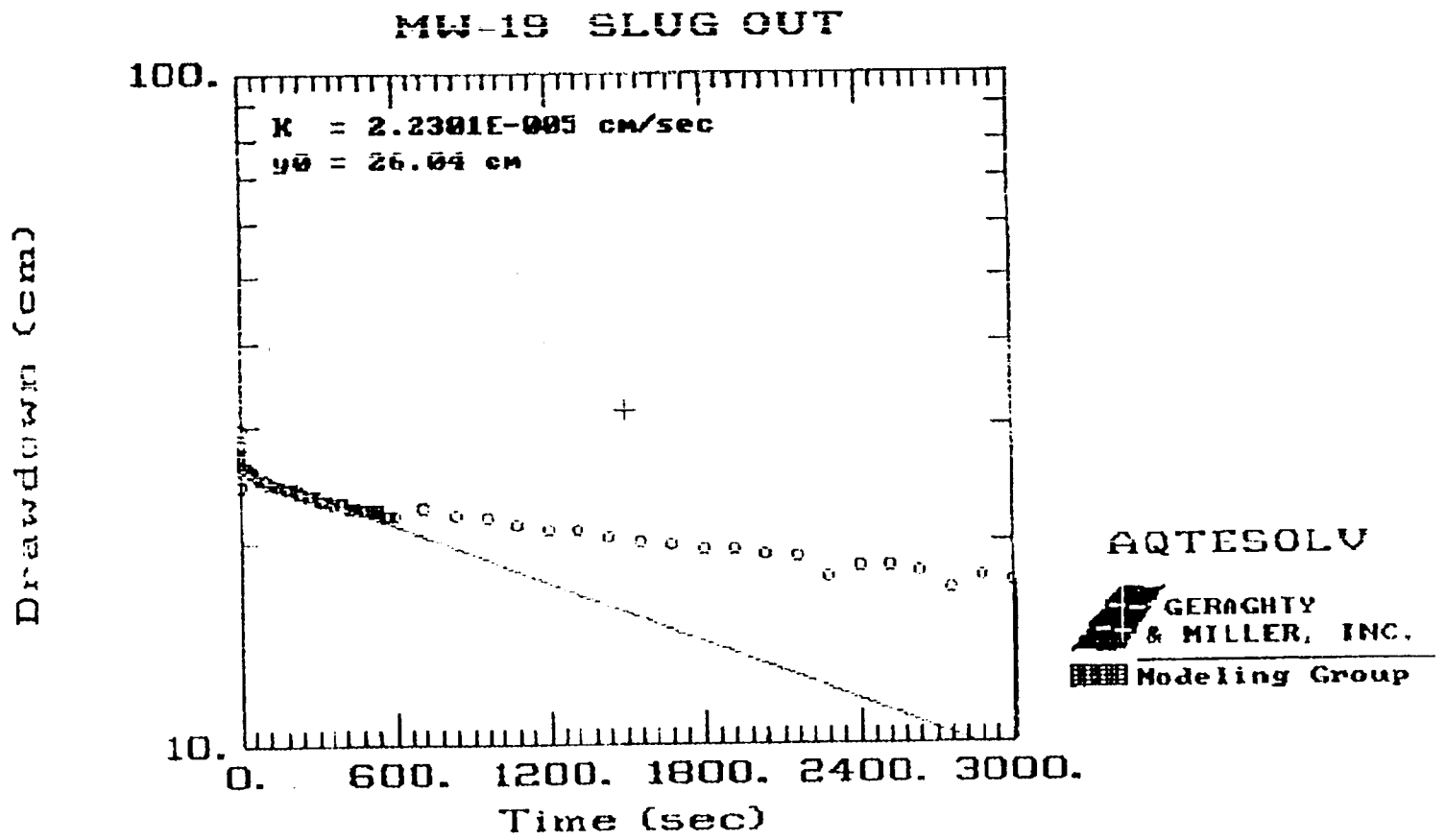

MW-21 SLUG OUT
K = 3.4391E-004 cm/sec
y0 = 144.6 cm
1000.
100.
10.
1.
0.
360.
720.
1080.
1440.
1800.
Time (sec)
AQTESOLV
GERAGHTY & MILLER, INC.
Modeling Group

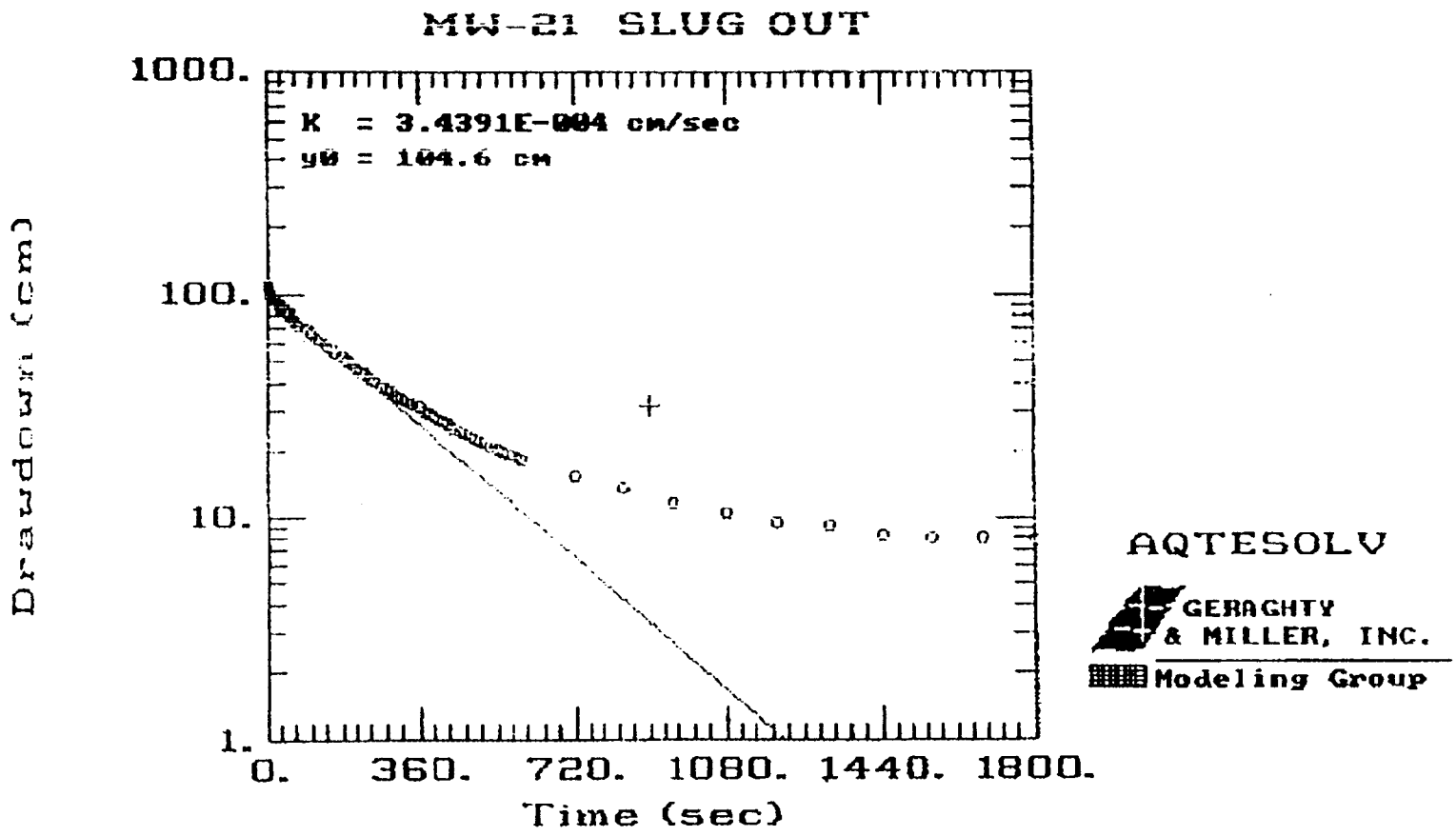

MW 20 SLUG OUT
K = 1.2275E-004 cm/sec
y0 = 13.94 cm
100.
10.
1.
0.
360.
720.
1080.
1440.
1800.
Time (sec)
AQTESOLV
GERAGHTY & MILLER, INC.
Modeling Group

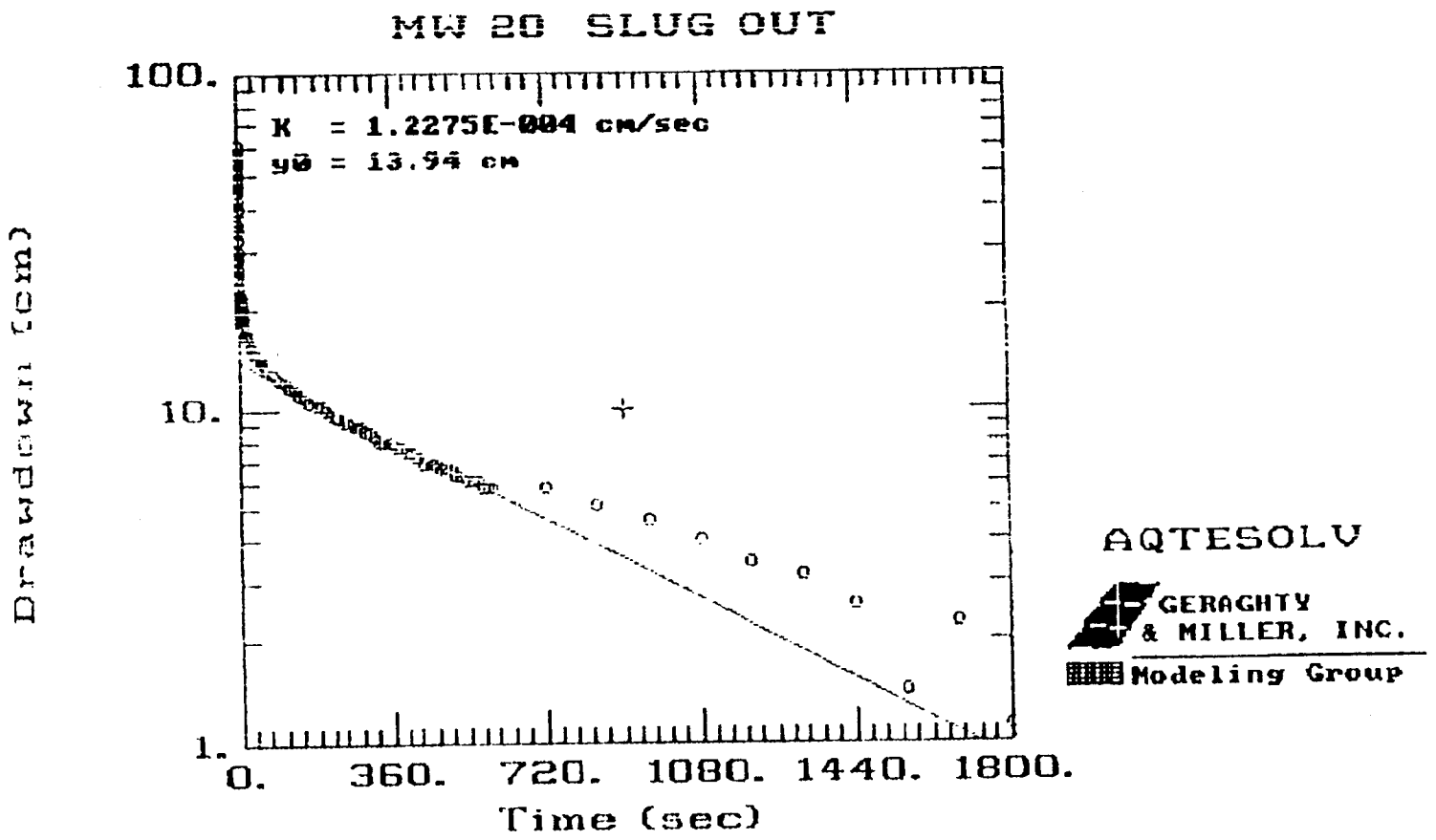

MW-2 SLUG OUT
K = 0.002306 cm/sec
y0 = 162.5 cm
1000.
100.
10.
1.
Drawdown (cm)
0.
240.
480.
720.
960.
1200.
Time (sec)
AQTESOLV
GERAGHTY
& MILLER, INC.
Modeling Group


MW-15 SLUG OUT
K = 0.001361 cm/sec
y0 = 37.56 cm
100.
10.
1.
Drawdown (cm)
0.
192.
384.
576.
768.
960.
Time (sec)
AQTESOLV
GERAGHTY
& MILLER, INC.
Modeling Group


MW-17 SLUG OUT
100.
10.
1.
K = 8.5197E-004 cm/sec
y0 = 91.47 cm
Drawdown (cm)
0.
480.
960.
1440.
1920.
2400.
Time (sec)
AQTESOLV
GERAGHTY
& MILLER, INC.
Modeling Group


MW-19 SLUG OUT
100.
10.
K = 2.2301E-005 cm/sec
y0 = 26.04 cm
Drawdown (cm)
0.
600.
1200.
1800.
2400.
3000.
Time (sec)
AQTESOLV
GERAGHTY & MILLER, INC.
Modeling Group


MW-21 SLUG OUT
K = 3.4391E-004 cm/sec
y0 = 104.6 cm
1000.
100.
10.
1.
0.
360.
720.
1080.
1440.
1800.
Drawdown (cm)
Time (sec)
AQTESOLV
GERAGHTY & MILLER, INC.
Modeling Group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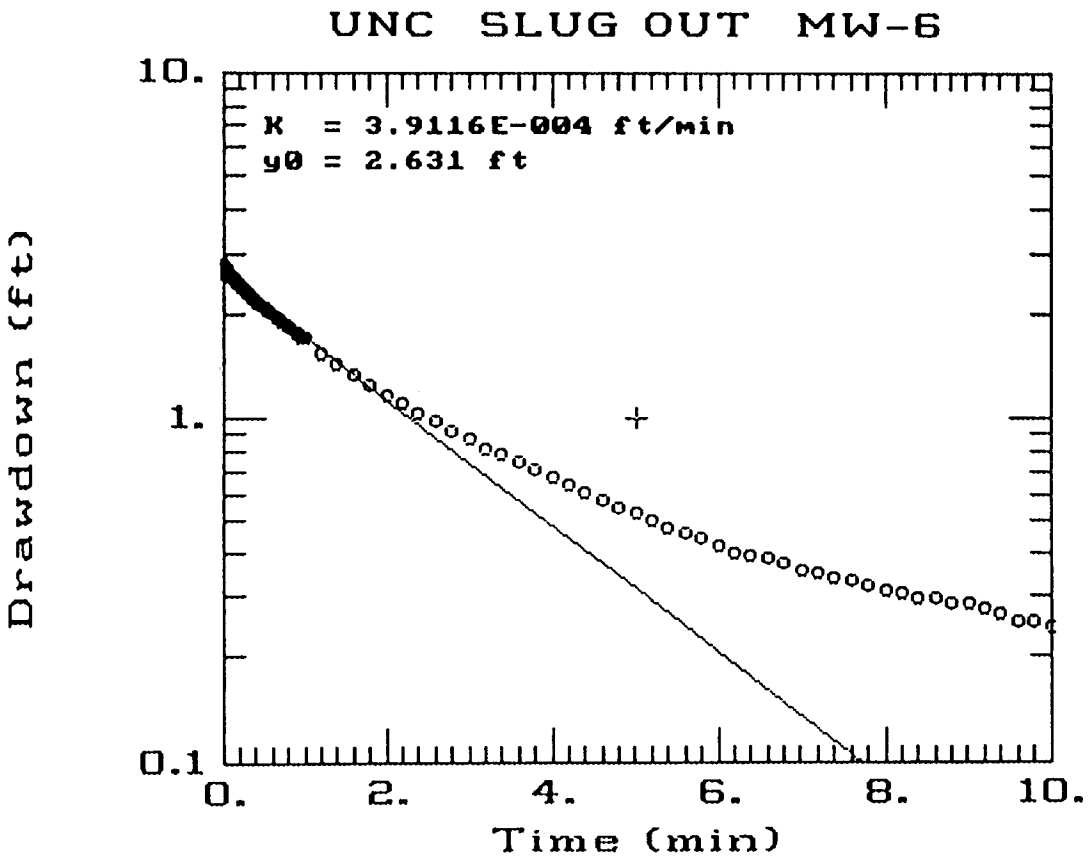
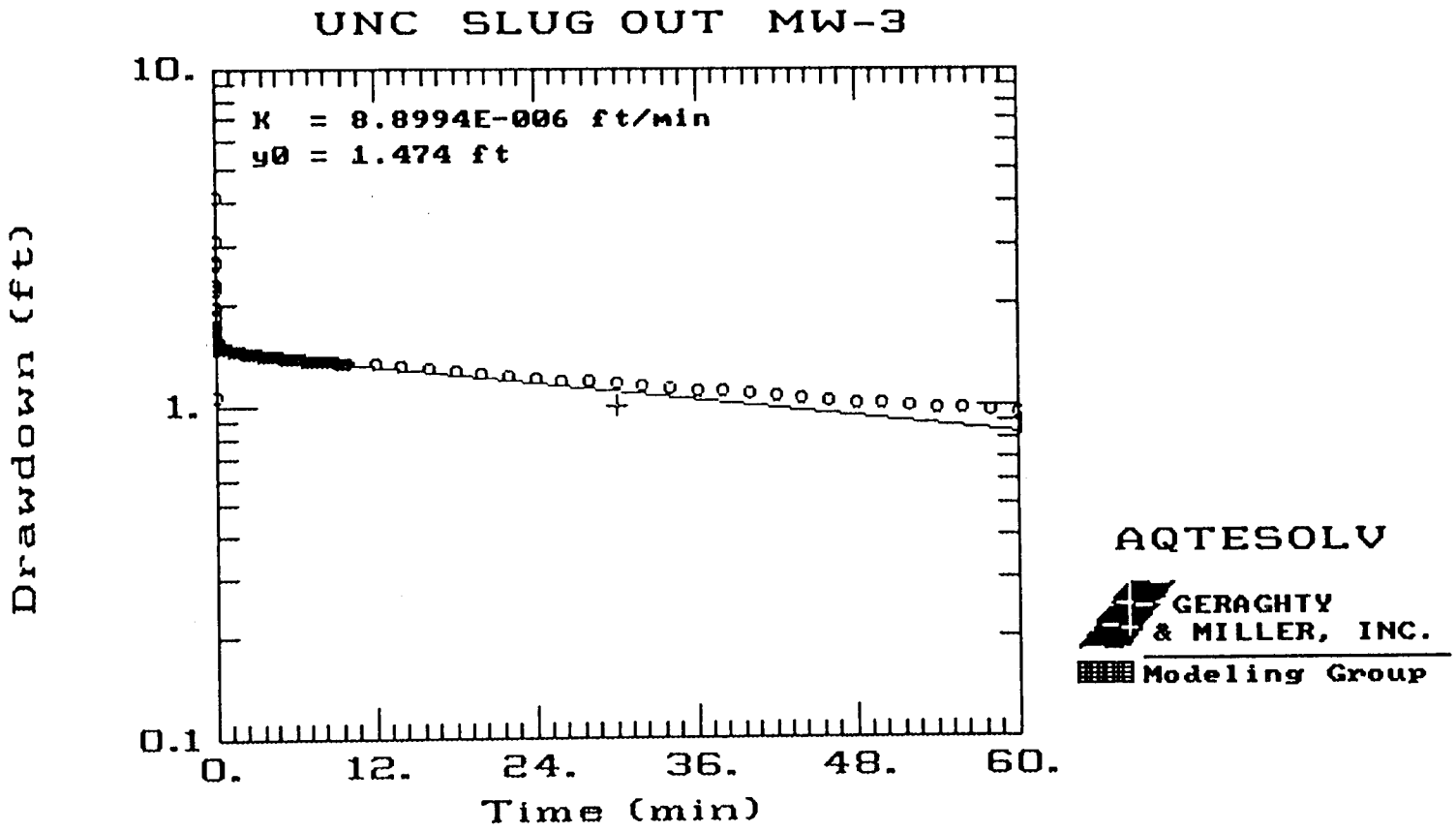
K = 1.2275E-004 cm/sec
y0 = 13.94 cm
100.
10.
1.
Drawdown (cm)
0.
360.
720.
1080.
1440.
1800.
Time (sec)
AQTESOLV
GERAGHTY & MILLER, INC.
Modeling Group

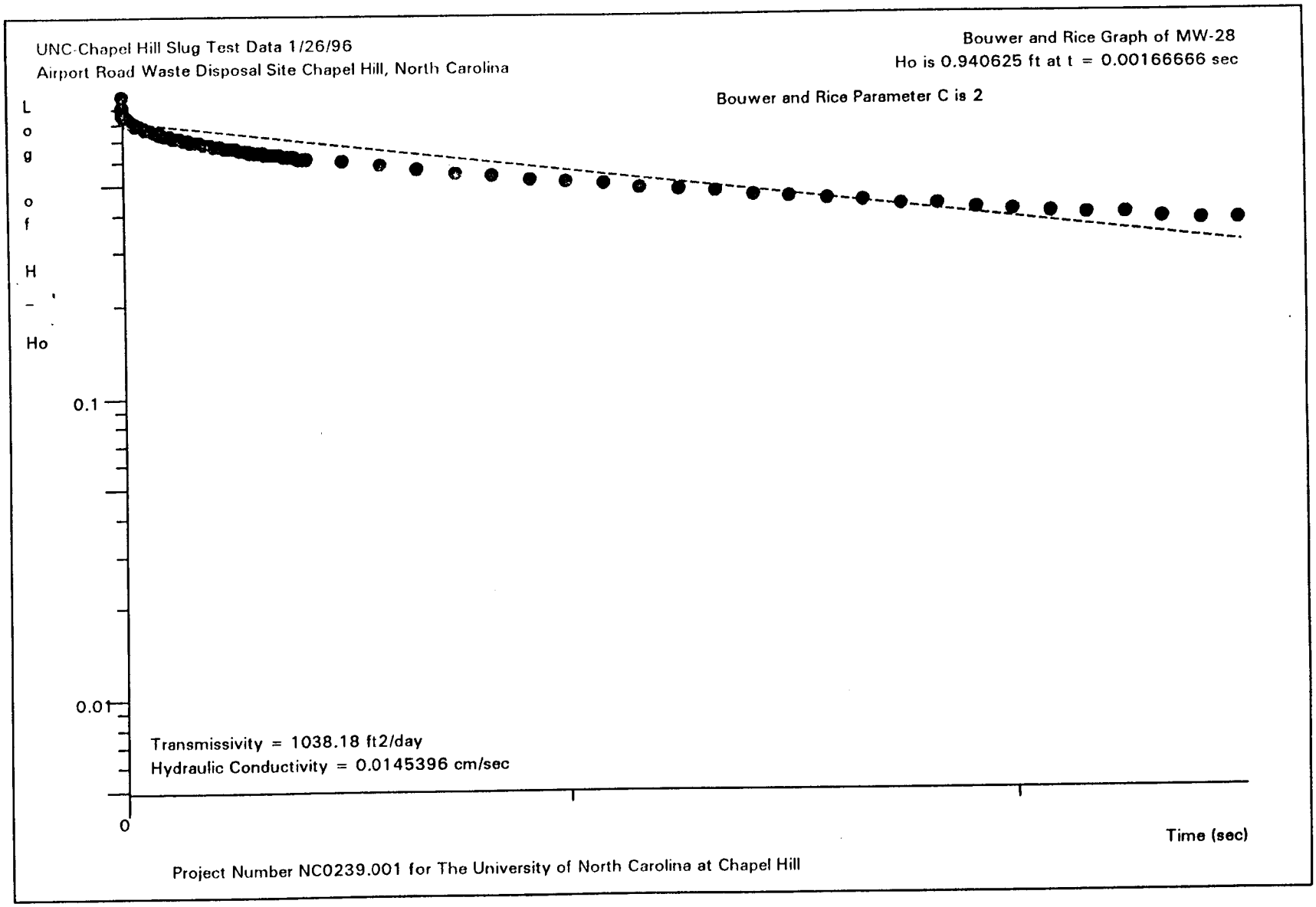


AQTESOLV

GERAGHTY & MILLER, INC.

Modeling Group


UNC SLUG OUT MW-3
K = 8.8994E-006 ft/min
y0 = 1.474 ft
10.
1.
0.1
Drawdown (ft)
0.
12.
24.
36.
48.
60.
Time (min)
AQTESOLV
GERAGHTY
& MILLER, INC.
Modeling Group


UNC-Chapel Hill Slug Test Data 1/26/96
Airport Road Waste Disposal Site Chapel Hill, North Carolina
Bouwer and Rice Graph of MW-28
Ho is 0.940625 ft at t = 0.00166666 sec
Bouwer and Rice Parameter C is 2
Log of H - Ho
0.1
0.01
0
Transmissivity = 1038.18 ft2/day
Hydraulic Conductivity = 0.0145396 cm/sec
Time (sec)
Project Number NC0239.001 for The University of North Carolina at Chapel Hill

Appendix H

Air Dispersion Model Documentation

MEMORANDUM

TO: Chris Lovdahl - Raleigh
Nanjun Shetty - Raleigh

FROM: Patti Beer - Pittsburgh PAB
Rob Frey - Pittsburgh

cc: Robert Sauer - Pittsburgh

DATE: June 26, 1996

SUBJECT: University of North Carolina Waste Disposal Area Air Modeling Discussion

---

Per your request, we have evaluated the air quality impact of the University of North Carolina (UNC) Airport Road Waste Disposal Area operation on ambient air quality. The SCREEN3 air quality dispersion model (Version 95250) was used to predict the maximum ambient 1-hour average concentration resulting from source operation.

All modeling was performed using an arbitrary mass emission rate of 1 gram per second (g/sec). The waste disposal area was modeled as an area source with a total area of 738 square meters. Based on this information, the model calculates an emission flux rate of 1.35E-03 grams per second per square meter ($g/sec/m^2$). Table 1 shows the relationship between emission flux rate ($g/sec/m^2$) and mass emission rate (g/sec) for the compounds of concern.

An Auer land use analysis was performed for an area out to 3 kilometers (km) from the site. The results of this analysis show that the area is 72 percent rural. The model was run using dispersion coefficients applicable for flat rural terrain. The SCREEN3 model utilizes assumed worst-case meteorology and assumes a direct downwind receptor alignment.

The maximum 1-hour average concentration predicted by SCREEN3 using the 1 g/sec mass emission rate was 105,100 microgram per cubic meter ($\mu g/m^3$) occurring at a downwind receptor distance of 21 meters. Due to the linear relationship between source emission strength and ambient concentration, using an arbitrary 1 g/sec source emission rate allows the modeling results to be easily scaled for each compound of concern from a single modeling run. Therefore, compound specific predicted ambient concentrations were derived by multiplying the arbitrary predicted ambient concentration by the compound specific mass emission rate.

For area sources, the maximum predicted 1-hour average ambient concentration can conservatively be assumed for other averaging periods. The predicted 1-hour average concentrations were used in comparison with North Carolina Toxic Air Pollutant ambient air guideline concentrations and a screening risk analysis. Annual average ambient air guideline concentrations are given for the compounds of concern in Title 15A Subchapter 2D.1104 of the North Carolina Administrative Code. The screening risk analysis was performed using unit risk factors (based upon a 70-year exposure duration) from the U.S. Environmental Protection Agency (USEPA) Region III Risk-Based Concentrations Table dated April 30, 1996.

A summary of the modeling results are reported in Table 1 along with comparisons with the North Carolina guideline concentrations and the screening risk analysis. Model predicted concentrations were well below both guideline values. The modeling output file and project correspondence are attached to document the work performed.

If you have any questions or require any additional information, please do not hesitate to call.

PAB\RNF:sls

Attachments

RSAUER\UNC\UNCMEMO.DOC

Table 1. Model Input Emission Rates, University of North Carolina Airport Road Waste Disposal Area, University of North Carolina at Chapel Hill, Chapel Hill, North Carolina.

Compound	Flux Rate ($ng/m^2/min$)	Flux Rate ($g/sec/m^2$)	Area of Site (m^2)	Mass Emission Rate (g/sec)
{1 g/sec emission rate}	81,300,813	1.36E-03	738	1
Benzene	1.7	2.83E-11	738	2.09E-08
Chloroform	19.3	3.22E-10	738	2.37E-07
Carbon Tetrachloride	7.8	1.30E-10	738	9.59E-08
Tetrachloroethene	52.8	8.80E-10	738	6.49E-07

$ng/m^2/min$	Nanograms per square meter per minute.
$g/sec/m^2$	Grams per second per square meter.
m^2	Square meters.
g/sec	Grams per second.

Table 2. Summary of SCREEN3 Predicted Concentrations. University of North Carolina Airport Road Waste Disposal Area, University of North Carolina at Chapel Hill, Chapel Hill, North Carolina.

Compound	Mass Emission Rate (g/sec)	Maximum 1-Hour Average Concentration [1] ($\mu g/m^3$)	Distance to Max. Conc. (meters)	North Carolina Guideline Concentration [2] ($\mu g/m^3$)	Modeled Concentration as Percent of NC Guideline Concentration	USEPA Region III Risk-Based Concentration [3] ($\mu g/m^3$)	Modeled Concentration as Percent of Risk-Based Concentration
{ 1gram/sec emission rate }	1	105,100	21	N/A	N/A	N/A	N/A
Benzene	2.09E-08	2.2E-03	21	0.12	1.83%	2.2E-01	1.0%
Chloroform	2.37E-07	2.5E-02	21	4.3	0.58%	7.8E-02	32.0%
Carbon Tetrachloride	9.59E-08	1.0E-02	21	6.7	0.15%	1.2E-01	8.4%
Tetrachloroethene	6.49E-07	6.8E-02	21	190	0.04%	3.1E+00	2.2%

Note: For area sources, the maximum predicted 1-hour average concentration can conservatively be assumed to apply other averaging periods.

1 Compound ambient concentrations were calculated by multiplying the compound mass emission rate by the 1 g/sec predicted ambient concentration.

2 Guideline concentrations as given in Title 15A, Subchapter 2D, Section .1104 of the North Carolina Administrative Code.

3 USEPA Region III Risk-Based Concentration Table, January-June 1996, Roy L. Smith, Ph.D.

g/sec Grams per second.

$\mu g/m^3$ Micrograms per cubic meter.

SUMMARY OF MODELING RESULTS

BEE-Line SCREEN3 Version 3.00 06/26/96
11:22:19

Input File: UNC.DTA
Output File: UNC.LST

*** SCREEN3 MODEL RUN ***
*** VERSION DATED 95250 ***

UNC Chapel Hill Waste Disposal Area - Arbitrary Model Run

SIMPLE TERRAIN INPUTS:
SOURCE TYPE = AREA
EMISSION RATE (G/(S-M**2)) = .135463E-02
SOURCE HEIGHT (M) = .0000
LENGTH OF LARGER SIDE (M) = 35.3568
LENGTH OF SMALLER SIDE (M) = 20.8788
RECEPTOR HEIGHT (M) = .0000
URBAN/RURAL OPTION = RURAL
MODEL ESTIMATES DIRECTION TO MAX CONCENTRATION

BUOY. FLUX = .000 M**4/S**3; MOM. FLUX = .000 M**4/S**2.

*** FULL METEOROLOGY ***

****
*** SCREEN AUTOMATED DISTANCES ***
****

*** TERRAIN HEIGHT OF 0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

DIST (M)	CONC (UG/M**3)	STAB	U10M (M/S)	USTK (M/S)	MIX HT (M)	PLUME HT (M)	MAX DIR (DEG)
1.	.8084E+05	6	1.0	1.0	10000.0	.00	29.
100.	.1655E+05	6	1.0	1.0	10000.0	.00	19.
200.	7711.	6	1.0	1.0	10000.0	.00	0.
300.	4403.	6	1.0	1.0	10000.0	.00	0.
400.	2844.	6	1.0	1.0	10000.0	.00	0.
500.	1998.	6	1.0	1.0	10000.0	.00	0.
600.	1488.	6	1.0	1.0	10000.0	.00	0.
700.	1156.	6	1.0	1.0	10000.0	.00	0.
800.	939.3	6	1.0	1.0	10000.0	.00	0.
900.	781.1	6	1.0	1.0	10000.0	.00	0.
1000.	662.8	6	1.0	1.0	10000.0	.00	0.
1100.	573.2	6	1.0	1.0	10000.0	.00	0.
1200.	501.9	6	1.0	1.0	10000.0	.00	0.
1300.	444.2	6	1.0	1.0	10000.0	.00	0.
1400.	396.8	6	1.0	1.0	10000.0	.00	0.
1500.	357.3	6	1.0	1.0	10000.0	.00	0.
1600.	324.0	6	1.0	1.0	10000.0	.00	0.
1700.	295.1	6	1.0	1.0	10000.0	.00	0.
1800.	270.3	6	1.0	1.0	10000.0	.00	0.

1900.	248.8	6	1.0	1.0	10000.0	.00	0.
2000.	230.0	6	1.0	1.0	10000.0	.00	0.
2100.	214.2	6	1.0	1.0	10000.0	.00	0.
2200.	200.3	6	1.0	1.0	10000.0	.00	0.
2300.	187.8	6	1.0	1.0	10000.0	.00	0.
2400.	176.6	6	1.0	1.0	10000.0	.00	0.
2500.	166.5	6	1.0	1.0	10000.0	.00	0.
2600.	157.3	6	1.0	1.0	10000.0	.00	0.
2700.	149.0	6	1.0	1.0	10000.0	.00	0.
2800.	141.3	6	1.0	1.0	10000.0	.00	0.
2900.	134.4	6	1.0	1.0	10000.0	.00	0.
3000.	128.0	6	1.0	1.0	10000.0	.00	0.

MAXIMUM 1-HR CONCENTRATION AT OR BEYOND 0. M:

21.	.1051E+06	6	1.0	1.0	10000.0	.00	27.

****
*** SCREEN DISCRETE DISTANCES ***
****

DIST (M)	CONC (UG/M**3)	STAB	U10M (M/S)	USTK (M/S)	MIX HT (M)	PLUME HT (M)	MAX DIR (DEG)
110.	.1507E+05	6	1.0	1.0	10000.0	.00	14.
120.	.1380E+05	6	1.0	1.0	10000.0	.00	14.
130.	.1274E+05	6	1.0	1.0	10000.0	.00	3.
140.	.1178E+05	6	1.0	1.0	10000.0	.00	2.
150.	.1092E+05	6	1.0	1.0	10000.0	.00	0.
160.	.1015E+05	6	1.0	1.0	10000.0	.00	0.
170.	9449.	6	1.0	1.0	10000.0	.00	0.
180.	8812.	6	1.0	1.0	10000.0	.00	0.
190.	8234.	6	1.0	1.0	10000.0	.00	0.
200.	7711.	6	1.0	1.0	10000.0	.00	0.
210.	7238.	6	1.0	1.0	10000.0	.00	0.
220.	6807.	6	1.0	1.0	10000.0	.00	0.
230.	6413.	6	1.0	1.0	10000.0	.00	1.
240.	6052.	6	1.0	1.0	10000.0	.00	0.
250.	5719.	6	1.0	1.0	10000.0	.00	1.

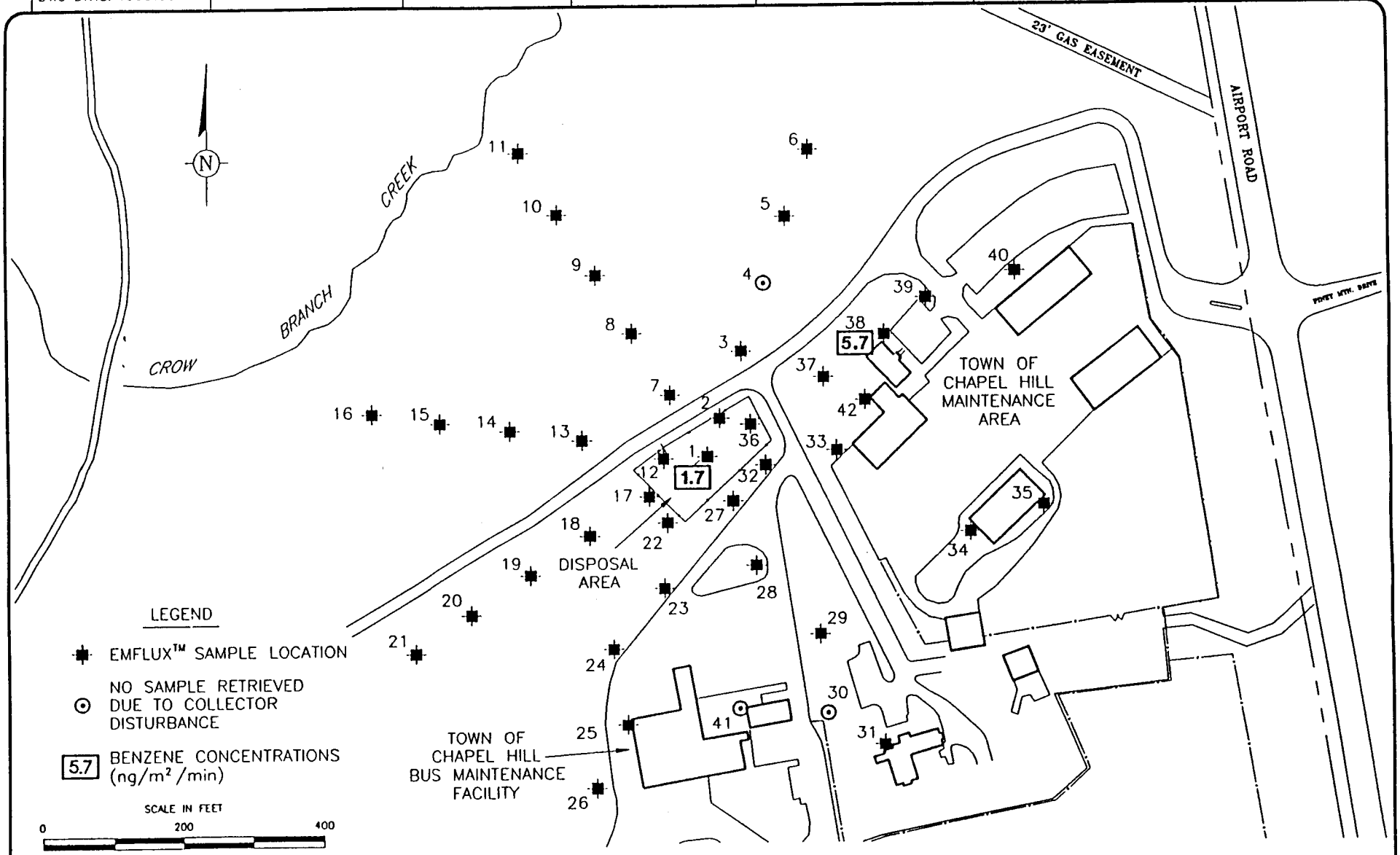
****
*** SUMMARY OF SCREEN MODEL RESULTS ***
****

CALCULATION PROCEDURE	MAX CONC (UG/M**3)	DIST TO MAX (M)	TERRAIN HT (M)
SIMPLE TERRAIN	.1051E+06	21.	0.

****
** REMEMBER TO INCLUDE BACKGROUND CONCENTRATIONS **
****

MODELING INPUT

DWG DATE: 10OCT96	PRJCT NO.: NC0239.004	FILE NO.: UNC-CHAP	DRAWING: SITE7	CHECKED:	APPROVED: J. SHILLIDAY	DRAFTER: A. WARREN



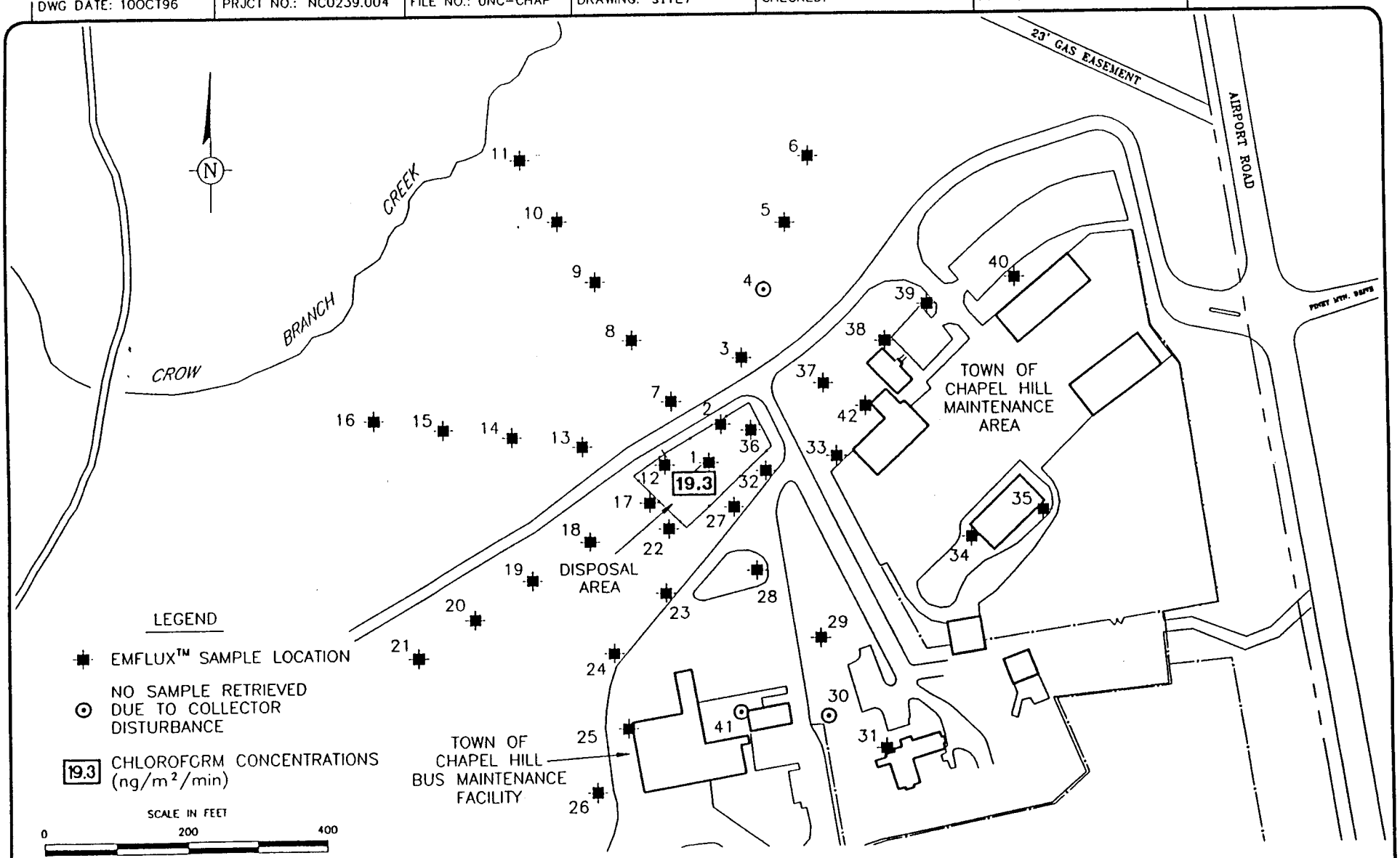
GERAGHTY & MILLER, INC.
Environmental Services

EMFLUX™ BENZENE CONCENTRATIONS (ng/m²/min)

UNC AIRPORT ROAD WASTE DISPOSAL AREA
THE UNIVERSITY OF NORTH CAROLINA AT CHAPEL HILL
CHAPEL HILL, NORTH CAROLINA

FIGURE
4-11

DWG DATE: 10OCT96	PRJCT NO.: NC0239.004	FILE NO.: UNC-CHAP	DRAWING: SITE7	CHECKED:	APPROVED: J. SHILLIDAY	DRAFTER: A. WARREN



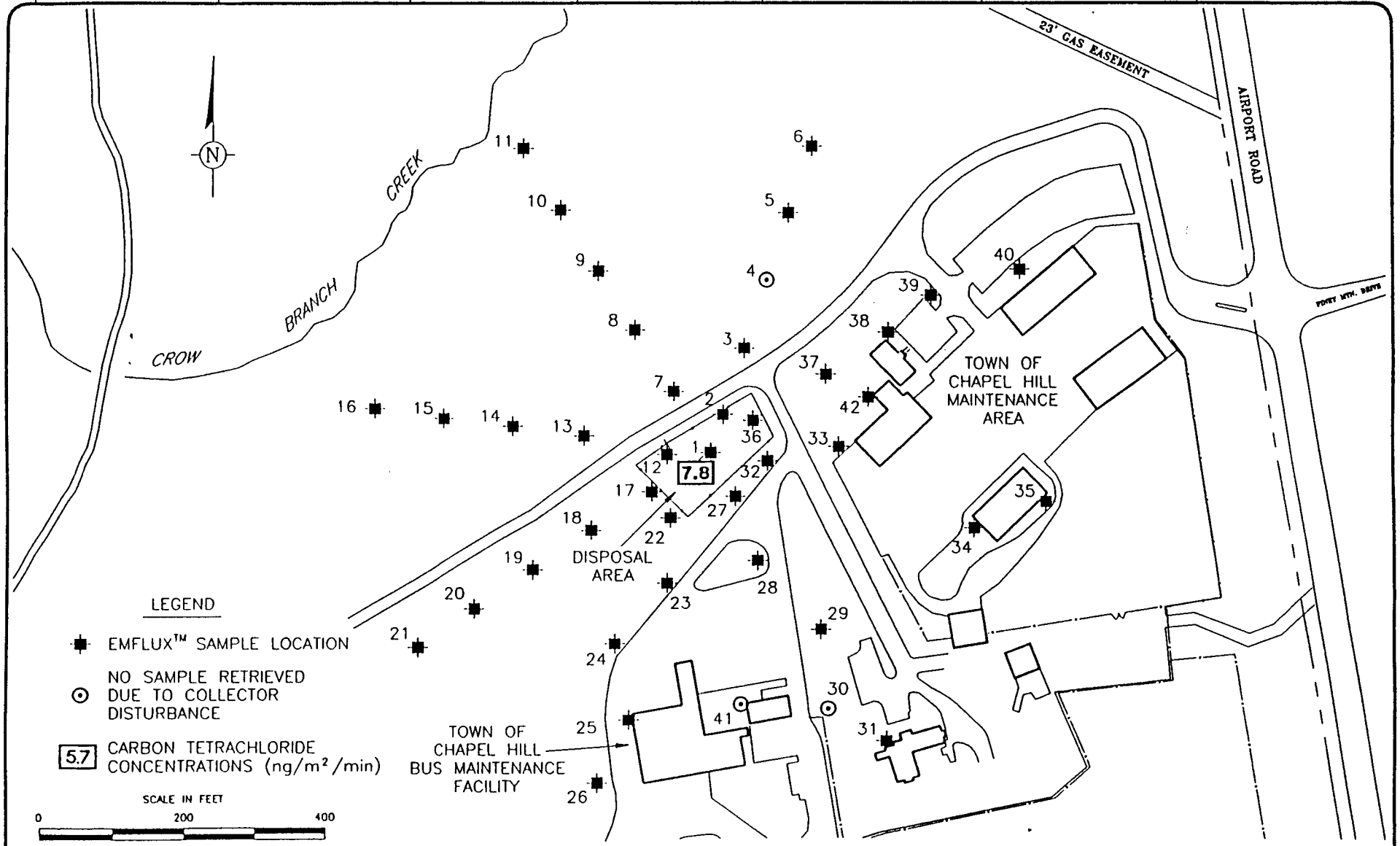
GERAGHTY & MILLER, INC.
Environmental Services

EMFLUX™ CHLOROFORM CONCENTRATIONS (ng/m²/min)

UNC AIRPORT ROAD WASTE DISPOSAL AREA
THE UNIVERSITY OF NORTH CAROLINA AT CHAPEL HILL
CHAPEL HILL, NORTH CAROLINA

FIGURE
4-12

DWG DATE: 10OCT96	PRJCT NO.: NC0239.004	FILE NO.: UNC-CHAP	DRAWING: SITE7	CHECKED:	APPROVED: J. SHILLIDAY	DRAFTER: A. WARREN



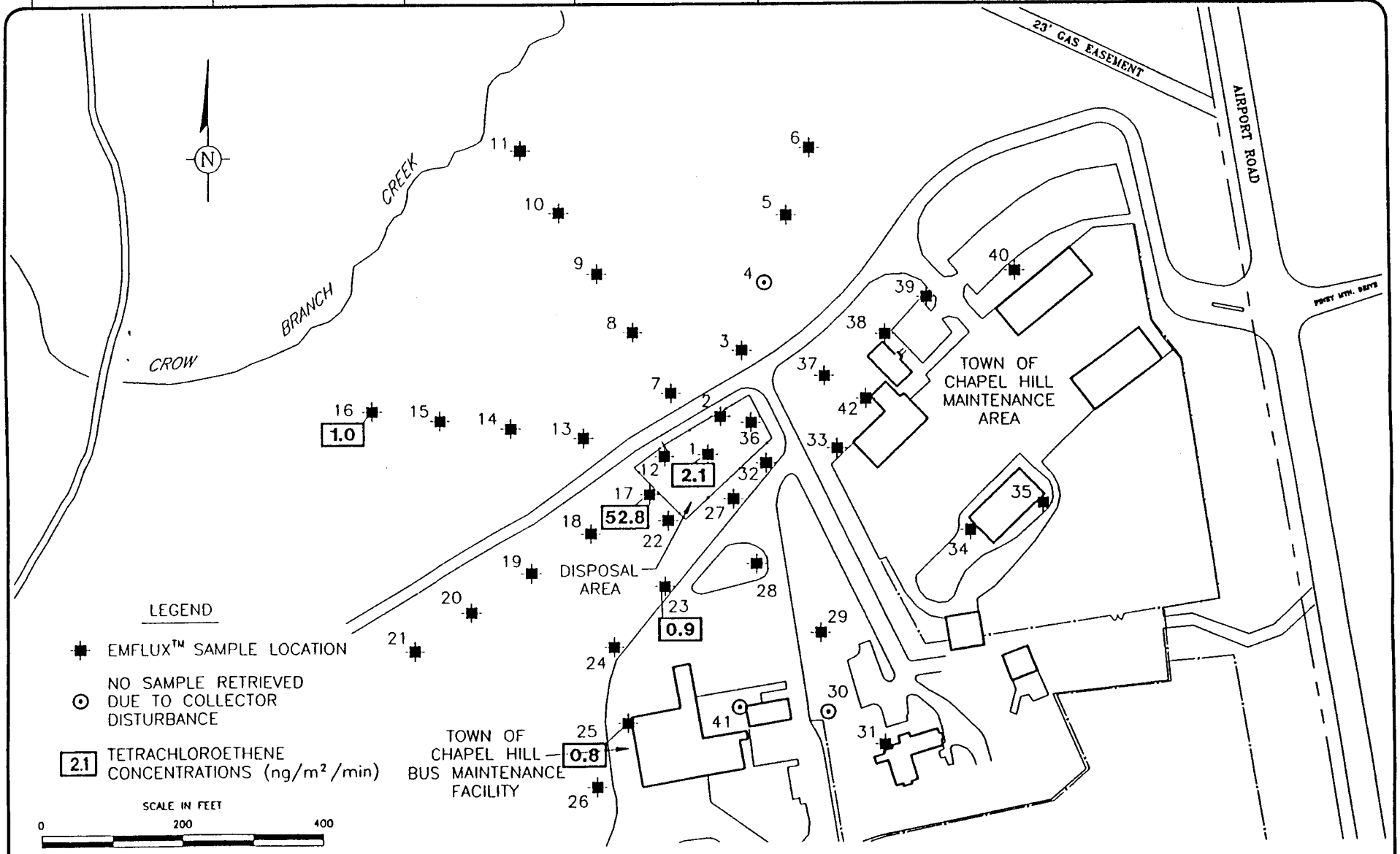
GERAGHTY & MILLER, INC.
Environmental Services

EMFLUX™ CARBON TETRACHLORIDE CONCENTRATIONS (ng/m²/min)

UNC AIRPORT ROAD WASTE DISPOSAL AREA
THE UNIVERSITY OF NORTH CAROLINA AT CHAPEL HILL
CHAPEL HILL, NORTH CAROLINA

FIGURE
4-13

DWG DATE: 10OCT96	PRJCT NO.: NC0239.004	FILE NO.: UNC-CHAP	DRAWNG: SITE7	CHECKED:	APPROVED: J. SHILLIDAY	DRAFTER: A. WARREN



GERAGHTY & MILLER, INC.
Environmental Services

EMFLUX™ TETRACHLOROETHENE CONCENTRATIONS (ng/m²/min)

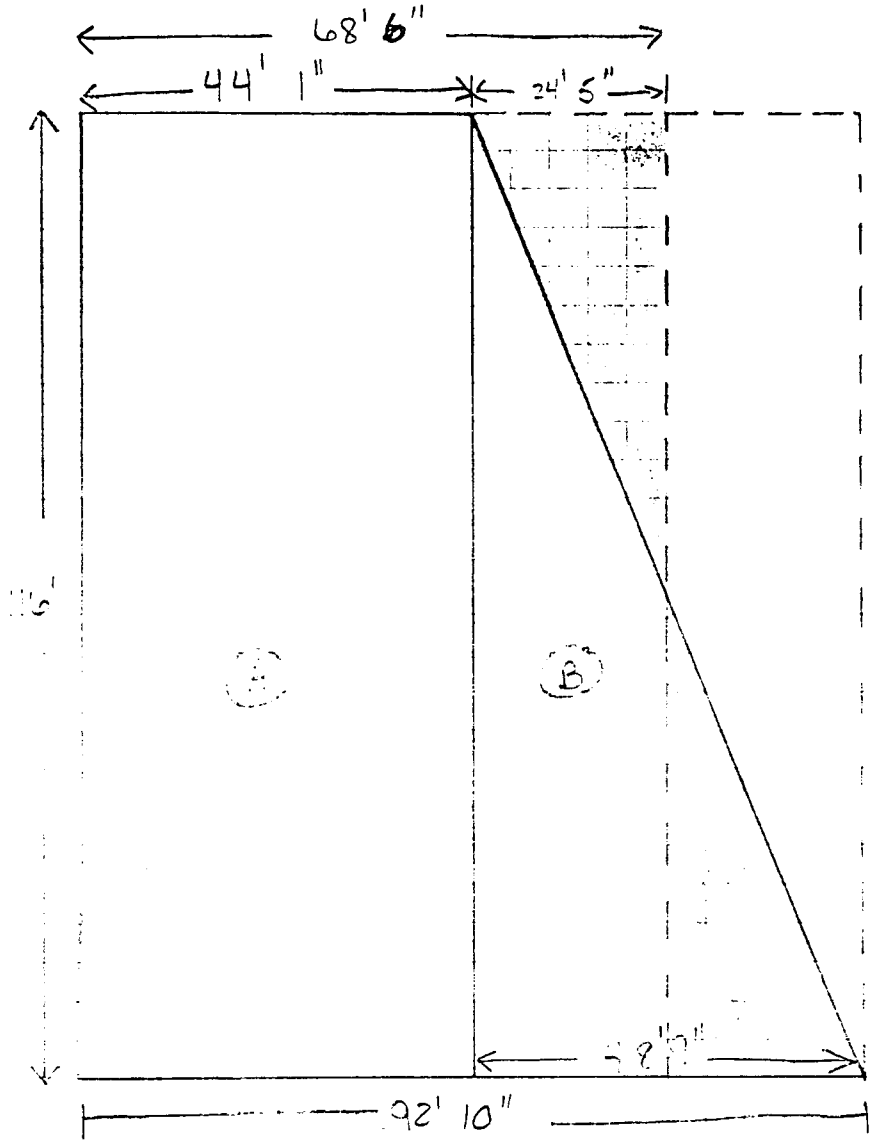
UNC AIRPORT ROAD WASTE DISPOSAL AREA
THE UNIVERSITY OF NORTH CAROLINA AT CHAPEL HILL
CHAPEL HILL, NORTH CAROLINA

FIGURE
4-14

UNC- Chapel Hill
Modeled Area

NOT TO SCALE

6/26/96 1 1
PAB
NC0[illegible].004

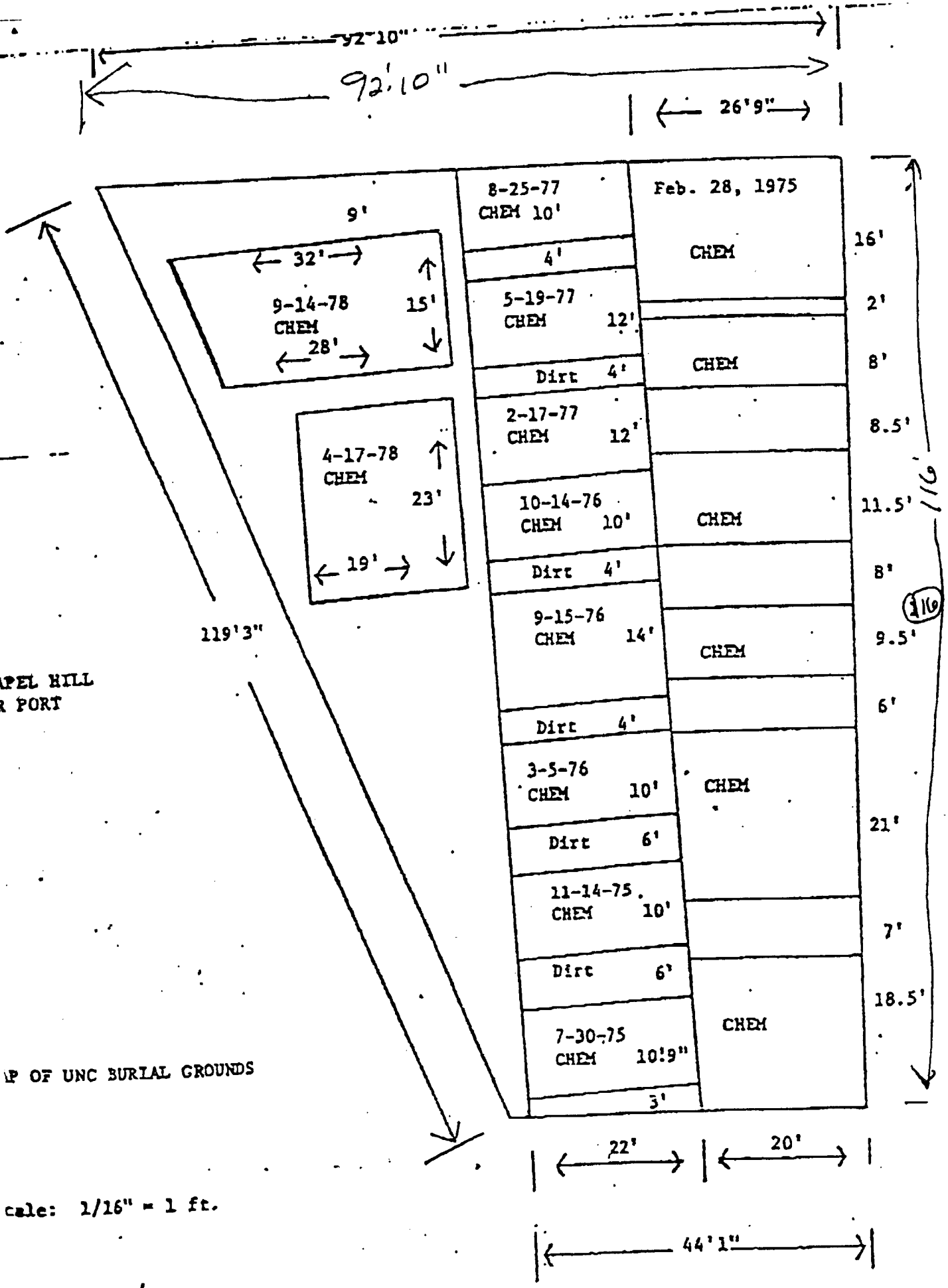


A = 116' x 44' 1" = [illegible]

B = 116' x ½ 48' 9" = 2827.5 ft²

7,941.17 ft²

[illegible] 68' 6" [illegible]



PEL HILL
R PORT

P OF UNC BURIAL GROUNDS

cale: 1/16" = 1 ft.

GERAGHTY & MILLER, INC. file: unc.xls
PITTSBURGH, PENNSYLVANIA

LAND USE CLASSIFICATION
AS PER AUER METHODOLOGY
PROJECT: University of North Carolina, Airport Road Waste Disposal Area
PROJECT NO: NC 0239.004.001
DATE: June 18, 1996

To decide which land use option to use for SCREEN and ISC air dispersion models, the land use classification of the area surrounding the source must be determined.

AUER METHODOLOGY

According to the August Auer, Jr. methodology, as published in the Journal of Applied Meteorology, May 1978, the classification of an area as rural or urban is based on 12 land use types as determined by the author.
As per his methodology, the percentage of each land use type within a 3-kilometer (km) radius of the source is determined. The land use types percentages are then summed, and the urban option is used if more than 50 percent of the area falls under one or more of the urban land uses.

DETERMINATION OF LAND USE TYPE

Geraghty & Miller uses the following procedure to determine land use type as per the Auer Methodology:

Step 1: The latest available USGS 7.5 minute or 1:24,000 scale topographic map of the area is obtained.

Step 2: The position of the site is determined and the site's center of mass is marked.

Step 3: A 3-km radius circle is drawn on the map, using the site's center of mass as the origin. On a 7.5 minute series map, the circle will have a 12.5-centimeter (cm) radius.

Step 4: A 1/4 inch grid is then overlaid onto the 3-km area. On the 7.5 minute series topographic map, this size grid divides the 3-km area into 1,200 squares. Each square of the grid is equal to 0.1 percent of the total area.

Step 5: A working copy of the map is then made, with the grid superimposed over the site and the 3-km area.

Step 6: The 3-km radius area is studied and then divided into different land uses. Land use boundaries are drawn onto the map.

Step 7: The number of grid squares representing the different land use types are then counted. Some grid squares will be divided between two land use types. Best judgment is used to assign land use types to these squares.

GERAGHTY & MILLER, INC. file: unc.xls
PITTSBURGH, PENNSYLVANIA

LAND USE CLASSIFICATION
AS PER AUER METHODOLOGY
PROJECT: University of North Carolina, Airport Road Waste Disposal Area
PROJECT NO: NC 0239.004.001
DATE: June 18, 1996

Step 8: Enter the number of grid squares assigned to each land use type to the attached table. The total number of grid squares should be within +/- 100 of 1,200. If the total does not fall within this range, the grid squares will need to be recounted.

Step 9: The percentage of grid squares assigned to the land use type is calculated by the table. Each land use type is designated as either rural or urban.
If 50 percent or more of the area is classified Urban, then the Urban option will be used in the modeling.

There are many incidents where it may be difficult to assign a land use type to an area, using only a topographic map as a basis. To ease this situation and provide consistency in our procedures, the following guidelines have been established.

- The major difference between the Heavy and Light Industrial classification is the height of the site buildings. Only major refineries, steel mills, cement kilns, etc. have buildings five stories or greater in height. Over 90 percent of industrial areas should be assigned to I2 type.

- Most residential areas will not have the individual houses marked on the map. However, build-up areas with compact housing are usually shaded. Shaded residential areas will be assigned to the R2 or R3 group, non-shaded areas to the R1 group.

- The commercial land use type was designed with downtown city areas in mind. It should be only assigned to areas where nearly all buildings are above five stories. This includes large urban renewal apartment complexes.

- Suburban shopping malls and industrial/office parks will be assigned to the light industrial land use type (I2).

- Ponds or lakes which are less than 2-grid squares in size will be assigned to the land use type bordering them. Rivers less than 1/4 of a grid square in width should also be ignored.

- Major highways and interchanges are considered to be urban. For our purposes they will be assigned to the I2, or light industrial type. An area 1 grid square wide along the length of the roadway will be assigned to the I2 land use type.

- The heavily wooded classification, A4, will be assigned only to areas larger than 2-grid squares.

GERAGHTY & MILLER, INC.
PITTSBURGH, PENNSYLVANIA

file: unc.xls

LAND USE CLASSIFICATION
AS PER AUER METHODOLOGY

PROJECT: University of North Carolina, Airport Road Waste Disposal Area
PROJECT NO: NC 0239.004.001
DATE: June 18, 1996

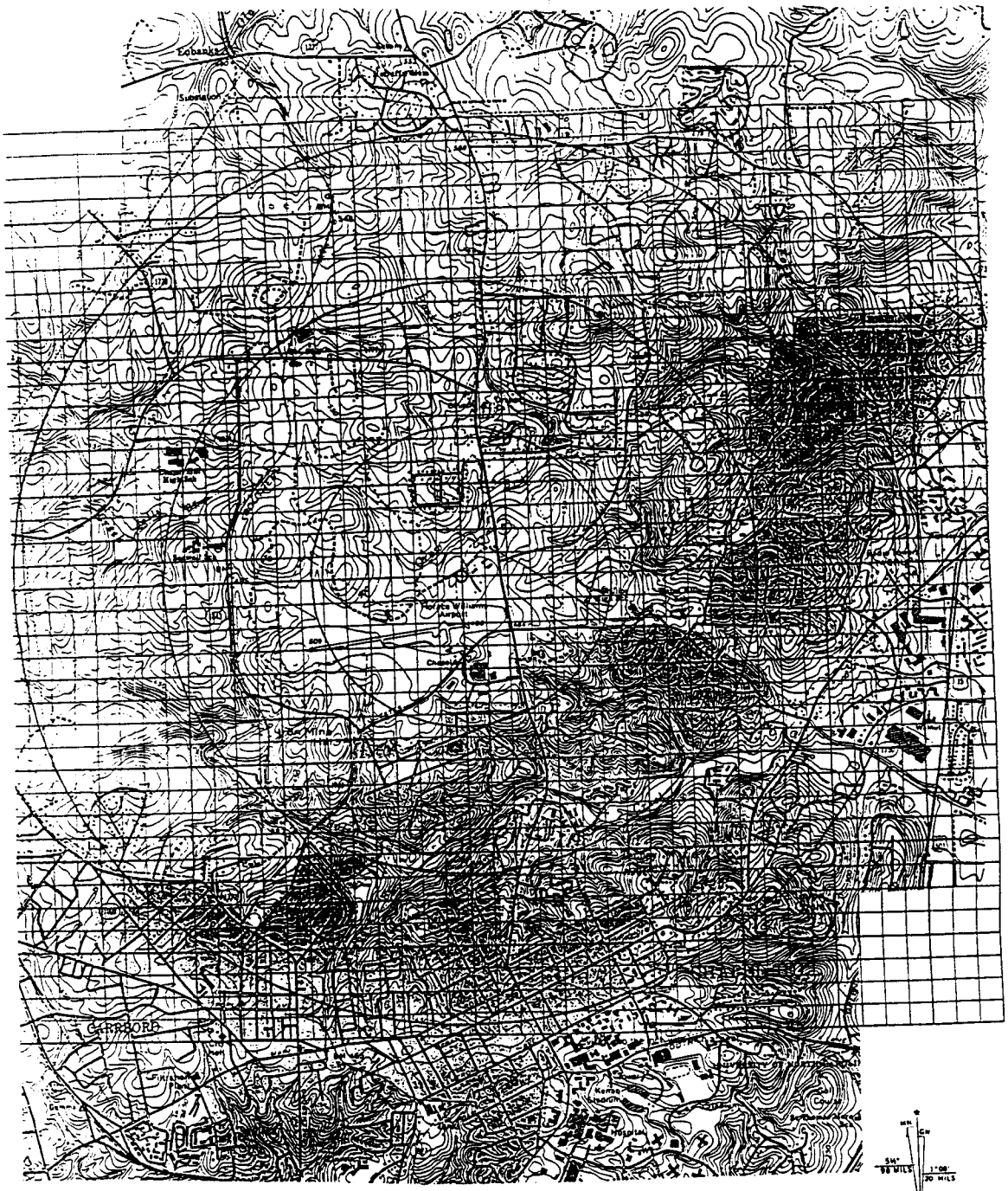
- Many sites are near the shore of a ocean, large river, or lake. Even a heavily urban area may be classified as rural land use if a large percentage of the 3-km radius circle is open water (A5). In cases where this situation exists, temporally remove the open water grid count from the table. If the percentages then changes in favor of an urban situation, use the urban option in the model. The state agency should be involved when this situation arises, to gain their approval of this method.

GERAGHTY & MILLER, INC. file: unc.xls
PITTSBURGH, PENNSYLVANIA

LAND USE CLASSIFICATION
AS PER AUER METHODOLOGY
PROJECT: University of North Carolina, Airport Road Waste Disposal Area
PROJECT NO: NC 0239.004.001
DATE: June 18, 1996

Land Use ID.	Land Use Type	Land Use Description	Number of Grid Squares	Land Use Percentage
I1	Heavy Industrial	major chemical, steel industries, building 3 to 5 stories, < 5% vegetation	0	0.0
I2	Light Industrial	rail yards, truck depots, warehouses, buildings 1 to 3 stories, < 5% vegetation	60	5.0
C1	Commercial	office and apartment buildings 10 > stories, < 15% vegetation	46	3.8
R1	Common Residential	single family homes, medium to large yards > 70 % vegetation	201	16.8
R2	Compact Residential	single family homes, small yards < 30% vegetation	226	18.8
R3	Compact Residential	multiple family homes, no to small yards, row houses, < 35% vegetation	0	0.0
R4	Estate Residential	multi-acre tract housing > 80% vegetation	41	3.4
A1	Metropolitan Natural	parks, golf courses, cemeteries, certain college campuses	8	0.7
A2	Agricultural	farmland	0	0.0
A3	Undeveloped	unused grasslands, marshes, thin woods, shore lines, and tidal flats	600	50.0
A4	Undeveloped Rural	thickly wooded areas	6	0.5
A5	Open Water	rivers, lakes, reservoirs, etc.	12	1.0
		Total Number of Grid Squares:	1200	

Percentage of Land Use assigned to Urban classification:	27.7	%
Percentage of Land Use assigned to Rural classification:	72.3	%



DRAFTER: –
APPROVED: –
CHECKED: –
DRAWING: –
FILE NO.: –
PROJCT NO.: –
DWG DATE: –

GERAGHTY & MILLER, INC.
Environmental Services

FIGURE

Appendix I

Geotechnical Assessment Report

CTL Engineering, Inc.
6301-A Angus Drive, Raleigh, North Carolina 27613
Phone: 919/782-9895 · Fax: 919/782-1558

March 26, 1996

Geraghty & Miller, Inc.
Cross Pointe III
2840 Plaza, Suite 350
Raleigh, North Carolina 27612

Attention: **Mr. Nanjun V. Shetty, P.E.**
Senior Engineer

Reference: **Laboratory Testing Services**
CTL Project No. 96-050014R

Dear Mr. Shetty:

As requested by Mr. Nanjun Shetty with Geraghty & Miller, Inc., CTL Engineering has completed laboratory testing services on various soil samples delivered to our laboratory. The laboratory tests include moisture content, bulk density, specific gravity, Atterberg Limits, sieve analysis with hydrometer and moisture-density relationship (Standard Proctor) in accordance with ASTM standards and policies. The results of our laboratory tests are attached to this letter.

CTL appreciates the opportunity to provide laboratory testing services. If you have any questions or need further information, please do not hesitate to contact us.

Respectfully submitted,

CTL ENGINEERING, INC.

Don Dewey

Don Dewey, P.E.
Manager, Geotechnical Services

Miguel R. Frisco
Project Engineer

DD/MRF/cpn

TABLE OF LABORATORY TEST RESULTS
CTL Project No. 96-050014R

SOIL SAMPLE	ATTERBERG LIMITS			NATURAL MOISTURE	SPECIFIC GRAVITY	DENSITY (pcf)	
	LL	PL	PI			WET	DRY
SB-2	27	17	10	15.6			
SB-3	34	18	16	26.1			
SB-4	23	18	5.0	11.4	2.63	107.5	96.5
GP-4	-	*NP	-	5.4			
GP-5	27	17	10	11.7			

*NP = NON-PLASTIC

CTL ENGINEERING

CTL ENGINEERING of CONSTRUCTION SERVICES DEPT.

6301-A ANGUS DRIVE
RALEIGH, NC 27613

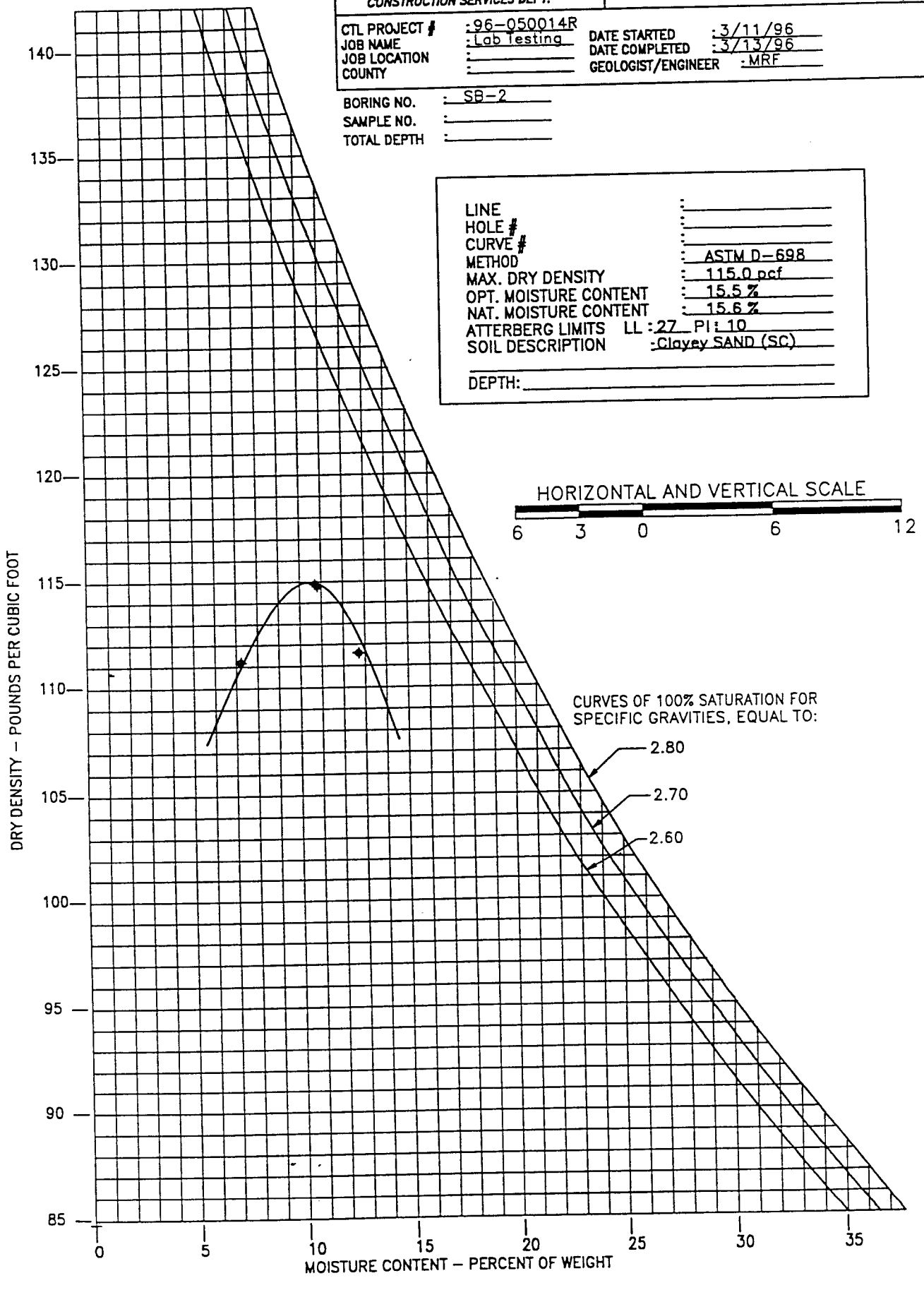
MOISTURE– DENSITY RELATIONSHIP

CTL PROJECT #	:96-050014R	DATE STARTED	:3/11/96
JOB NAME	:Lab Testing	DATE COMPLETED	:3/13/96
JOB LOCATION	:	GEOLOGIST/ENGINEER	:MRF
COUNTY	:		

BORING NO. : SB-2
SAMPLE NO. :
TOTAL DEPTH :

LINE :
HOLE # :
CURVE # :
METHOD : ASTM D-698
MAX. DRY DENSITY : 115.0 pcf
OPT. MOISTURE CONTENT : 15.5 %
NAT. MOISTURE CONTENT : 15.6 %
ATTERBERG LIMITS LL : 27 PI : 10
SOIL DESCRIPTION : Clayey SAND (SC)

DEPTH:



CTL JOB # 95-050014R Lab Code 359 DATE 3/22/96

CTL PROJECT

TEST LOCATION SB-2

DESCRIPTION Clayey SAND

DRY WT. BEFORE WASH	1142.90	DRY WT. AFTER WASH	162.40
WT. IN HYDROMETER	103.50	DRY WT. AFTER WASH	49.40
CORRECTED WEIGHT	112.61		

SIEVE	Wt. Ret	Percent Retained Partial	Total	% Finer
3 in		0.00	0.00	100.00
2 in		0.00	0.00	100.00
1-1/2 in		0.00	0.00	100.00
1 in		0.00	0.00	100.00
3/4 in		0.00	0.00	100.00
1/2 in	17.30	1.51	1.51	98.49
3/8 in	7	0.00	2.13	97.87
No. 3		1.90	4.02	95.98
No. 4	21.70	1.90	4.02	95.98
No. 8	38.70	3.39	7.41	92.59
No. 10	7.80	0.68	8.09	91.91
PAN 69.90	1050.40	91.91	100.00	0.00
No. 10	9.11	8.09	8.09	91.91
No. 16		0.00	8.09	91.91
No. 20		0.00	8.09	91.91
No. 30		0.00	8.09	91.91
No. 40	11.80	0.10	18.57	81.43
No. 50	6.30	0.06	24.17	75.83
No. 70		0.00	24.17	75.83
No. 100	17.60	0.16	39.79	60.21
No. 140		0.00	39.79	60.21
No. 200	13.30	0.12	51.60	48.40
PAN 0.40	54.50	48.40	100.00	0.00

CTL JOB # 95-050014R Lab Code 359 DATE 3/22/96

CTL PROJECT 0

TEST LOCATION SB-2

DESCRIPTION Clayey SAND

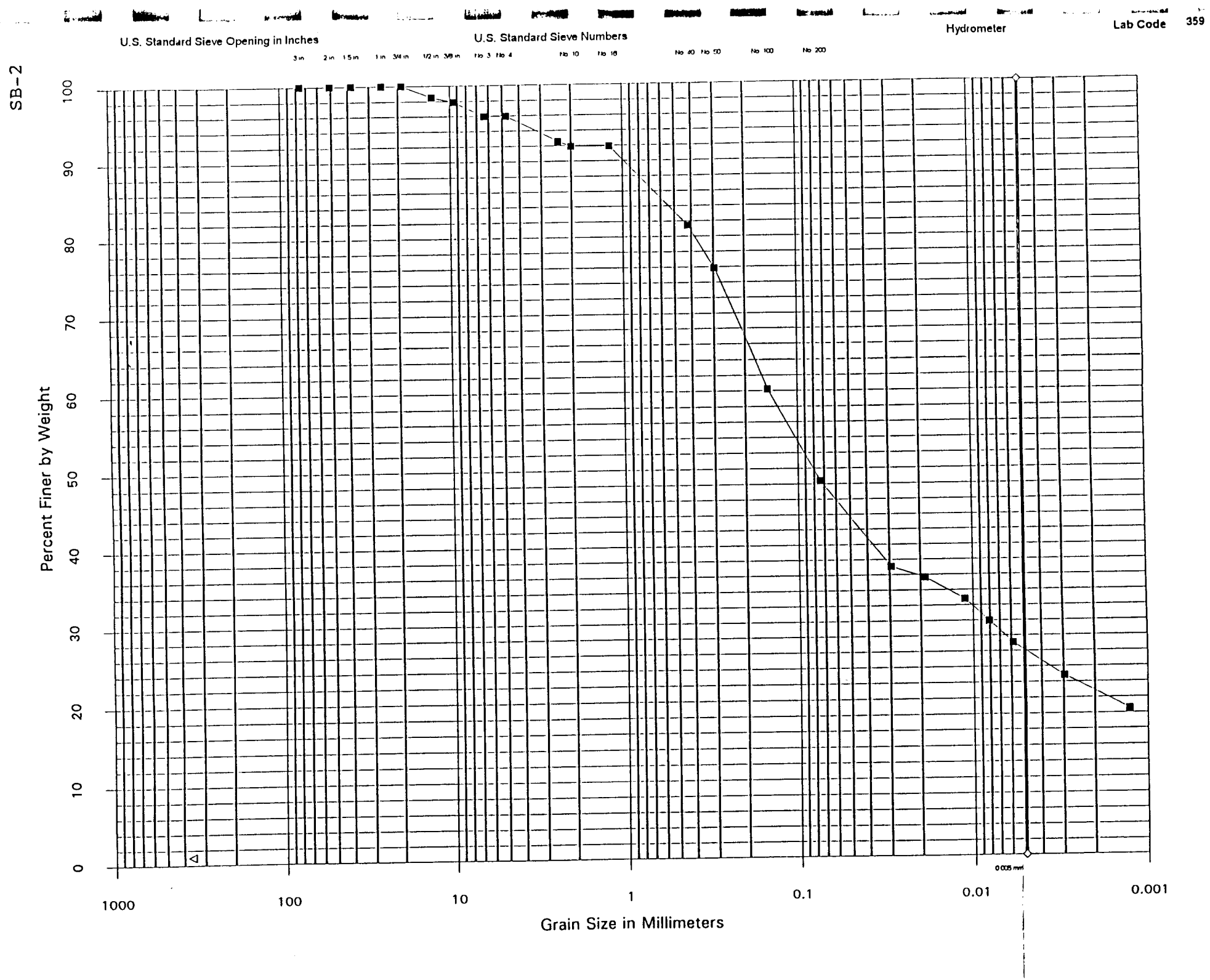
HYDROMETER DATA

K= 0.01365

S.G.= 2.65

PERCENT FINER

TIME	TEMP	ACTUAL	L	CORR.	actual	adjusted	L/t	K	D(mm)
2	20	1.027	9.2	1.026	40.34548382	37.08014368	4.6	0.01365	0.029276
5	20	1.026	9.4	1.025	38.79373445	35.6539843	1.88	0.01365	0.0187159
15	20	1.024	10	1.023	35.69023569	32.80166556	0.666667	0.01365	0.0111452
30	20	1.022	10.5	1.021	32.58673693	29.94934682	0.35	0.01365	0.0080754
60	20	1.02	11	1.019	29.48323818	27.09702807	0.183333	0.01365	0.0058446
250	20	1.017	11.8	1.016	24.82799005	22.81854996	0.0472	0.01365	0.0029655
1440	20	1.014	12.6	1.013	20.17274191	18.54007184	0.00875	0.01365	0.0012768


U.S. Standard Sieve Opening in Inches
U.S. Standard Sieve Numbers
Hydrometer
Lab Code 359
SB-2
Percent Finer by Weight
Grain Size in Millimeters
1000
100
10
1
0.1
0.01
0.001
0
10
20
30
40
50
60
70
80
90
100

CTL JOB # 96-020014R Lab Code 356 DATE 3/22/96

CTL PROJECT

TEST LOCATION SB-4

DESCRIPTION Silty Clayey SAND (SC-SM)

DRY WT. BEFORE WASH	938.20	DRY WT. AFTER WASH	178.00
WT. IN HYDROMETER	100.20	DRY WT. AFTER WASH	65.40
CORRECTED WEIGHT	110.08		

Percent Retained

SIEVE	Wt. Ret	Partial	Total	% Finer
3 in		0.00	0.00	100.00
2 in		0.00	0.00	100.00
1-1/2 in		0.00	0.00	100.00
1 in		0.00	0.00	100.00
3/4 in		0.00	0.00	100.00
1/2 in		0.00	0.00	100.00
3/8 in		0.00	0.00	100.00
No. 3		1.43	1.43	98.57
No. 4	13.40	1.43	1.43	98.57
No. 8	56.40	6.01	7.44	92.56
No. 10	14.40	1.53	8.97	91.03
PAN 93.80	854.00	91.03	100.00	0.00
No. 10	9.88	8.97	8.97	91.03
No. 16		0.00	8.97	91.03
No. 20		0.00	8.97	91.03
No. 30		0.00	8.97	91.03
No. 40	26.00	0.24	32.59	67.41
No. 50	9.40	0.09	41.13	58.87
No. 70		0.00	41.13	58.87
No. 100	18.10	0.16	57.58	42.42
No. 140		0.00	57.58	42.42
No. 200	11.60	0.11	68.11	31.89
PAN 0.30	35.10	31.89	100.00	0.00

CTL JOB # 96-020014R Lab Code 356 DATE 3/22/96

CTL PROJECT 0

TEST LOCATION SB-4

DESCRIPTION Silty Clayey SAND (SC-SM)

HYDROMETER DATA

K = 0.01365

S.G. = 2.65

PERCENT FINER

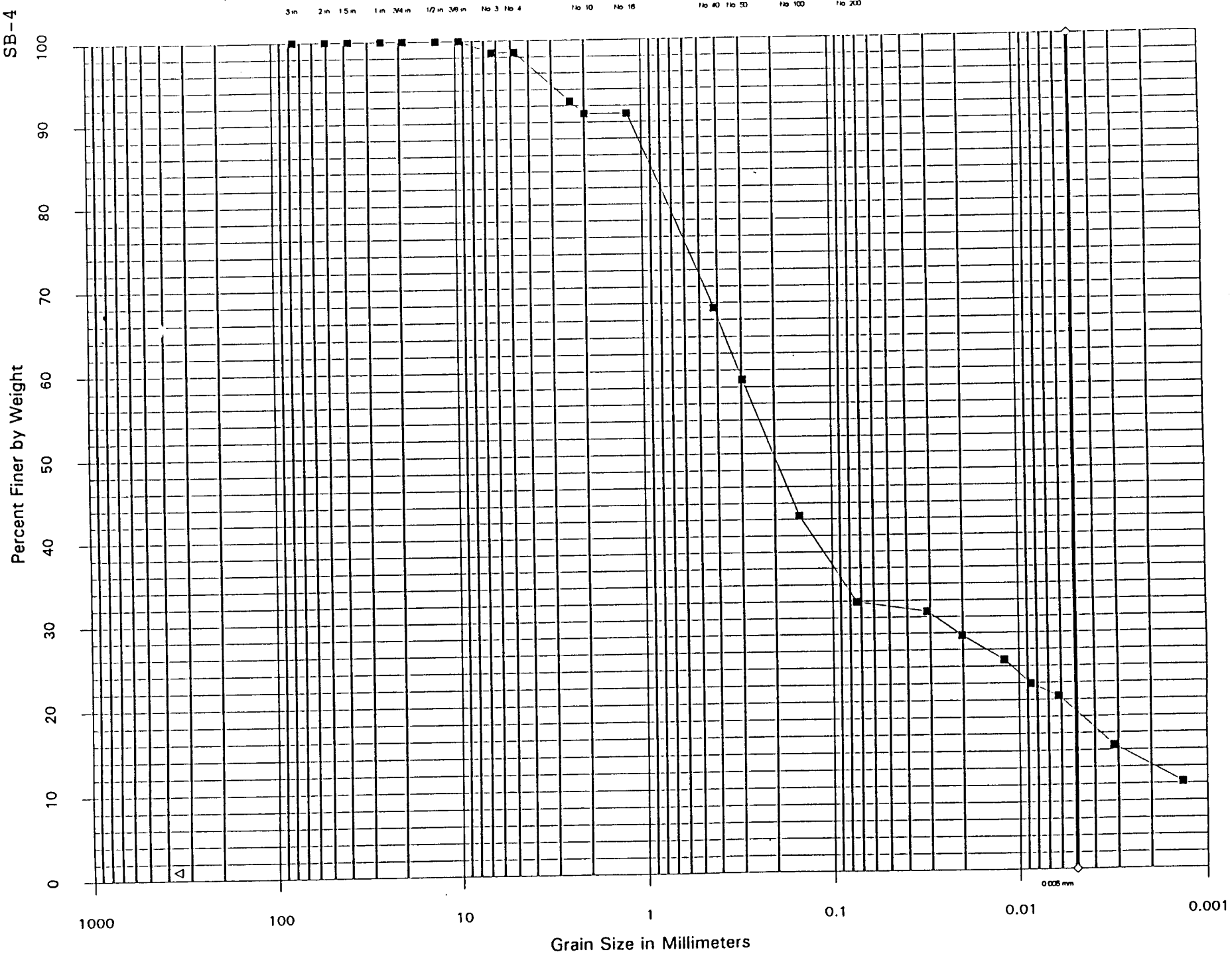
TIME	TEMP	ACTUAL	L	CORR.	actual	adjusted	L/t	K	D(mm)
2	20	1.022	10.5	1.021	33.65995282	30.63909583	5.25	0.01365	0.0312761
5	20	1.02	11	1.019	30.45424303	27.72108671	2.2	0.01365	0.0202462
15	20	1.018	11.5	1.017	27.24853324	24.80307758	0.766667	0.01365	0.0119519
30	20	1.016	12.1	1.015	24.04282344	21.88506845	0.403333	0.01365	0.0086689
60	20	1.015	12.3	1.014	22.43996855	20.42606389	0.205	0.01365	0.0061803
250	20	1.011	13.4	1.010	16.02854896	14.59004563	0.0536	0.01365	0.0031602
1440	20	1.008	14.2	1.007	11.21998427	10.21303194	0.009861	0.01365	0.0013555

U.S. Standard Sieve Opening in Inches

U.S. Standard Sieve Numbers

Hydrometer

Lab Code 356



CTL JOB # 96-020014R Lab Code 357 DATE 3/22/96

CTL PROJECT

TEST LOCATION GP-4 (2' to 4')

DESCRIPTION Well Graded SAND

DRY WT. BEFORE WASH	1260.00	DRY WT. AFTER WASH	557.20
WT. IN HYDROMETER	102.50	DRY WT. AFTER WASH	86.20
CORRECTED WEIGHT	166.13		

Percent Retained

	SIEVE	Wt. Ret	Partial	Total	% Finer
	3 in		0.00	0.00	100.00
	2 in		0.00	0.00	100.00
	1-1/2 in		0.00	0.00	100.00
	1 in		0.00	0.00	100.00
	3/4 in		0.00	0.00	100.00
	1/2 in		0.00	0.00	100.00
	3/8 in	12.3	0.00	0.98	99.02
	No. 3		10.10	11.08	88.92
	No. 4	127.30	10.10	11.08	88.92
	No. 8	278.00	22.06	33.14	66.86
	No. 10	65.00	5.16	38.30	61.70
PAN	74.60	777.40	61.70	100.00	0.00
	No. 10	63.63	38.30	38.30	61.70
	No. 16		0.00	38.30	61.70
	No. 20		0.00	38.30	61.70
	No. 30		0.00	38.30	61.70
	No. 40	62.70	0.38	76.04	23.96
	No. 50	7.60	0.05	80.62	19.38
	No. 70		0.00	80.62	19.38
	No. 100	10.50	0.06	86.94	13.06
	No. 140		0.00	86.94	13.06
	No. 200	5.10	0.03	90.01	9.99
PAN	0.30	16.60	9.99	100.00	0.00

CTL JOB # 96-020014R Lab Code 357 DATE 3/22/96

CTL PROJECT 0

TEST LOCATION GP-4 (2' to 4')

DESCRIPTION Well Graded SAND

HYDROMETER DATA

K = 0.01365

S.G. = 2.65

PERCENT FINER

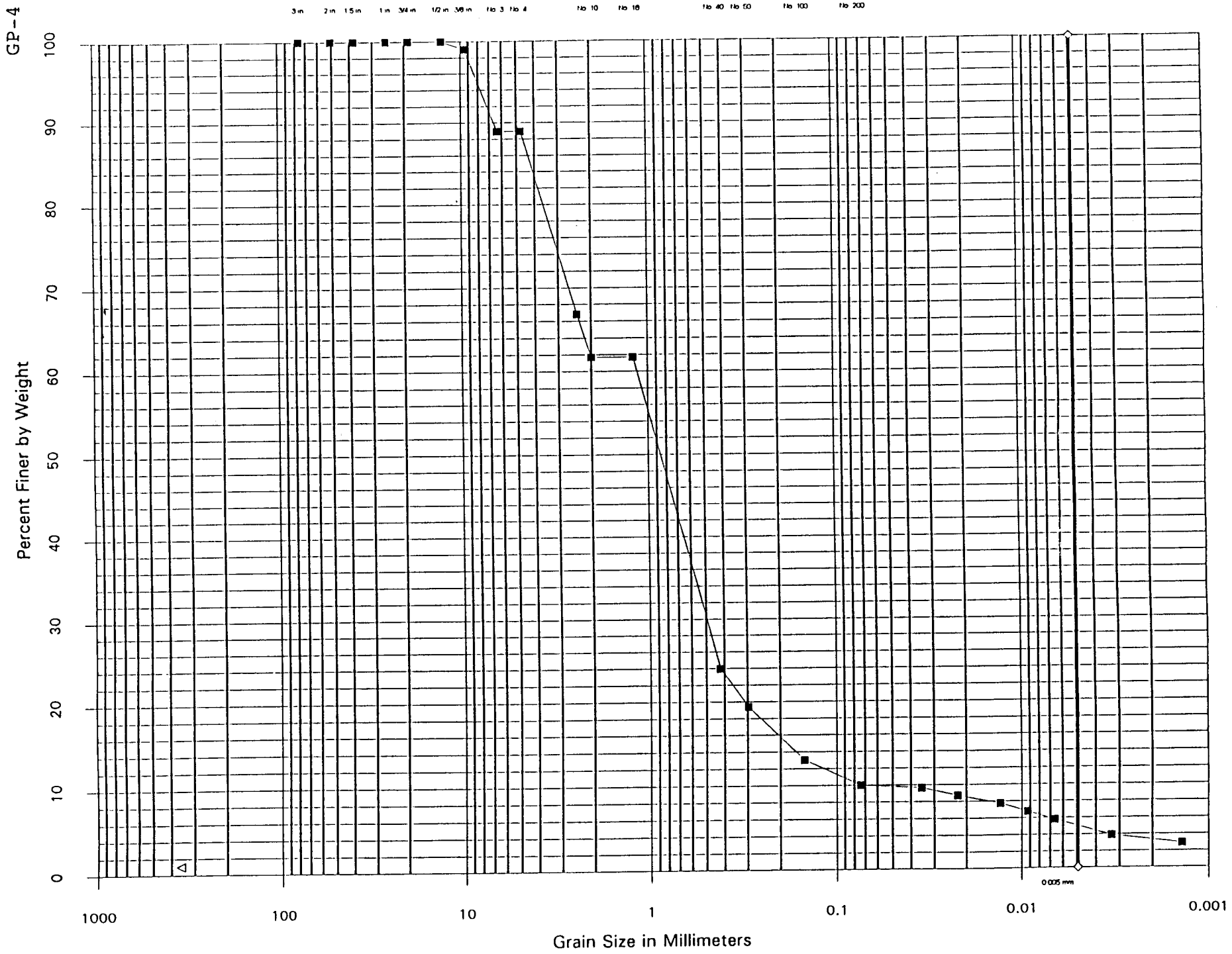
TIME	TEMP	ACTUAL	L	CORR.	actual	adjusted	L/t	K	D(mm)
2	20	1.012	13.1	1.01	15.66888396	9.667452692	6.55	0.01365	0.0349344
5	20	1.011	13.4	1.009	14.10199557	8.700707423	2.68	0.01365	0.022346
15	20	1.01	13.7	1.008	12.53510717	7.733962153	0.913333	0.01365	0.0130451
30	20	1.009	13.9	1.007	10.96821877	6.767216884	0.463333	0.01365	0.0092914
60	20	1.008	14.2	1.006	9.401330377	5.800471615	0.236667	0.01365	0.0066405
250	20	1.006	14.7	1.004	6.267553585	3.866981077	0.0588	0.01365	0.0033099
1440	20	1.005	15	1.003	4.700665188	2.900235808	0.010417	0.01365	0.0013931

U.S. Standard Sieve Opening in Inches

U.S. Standard Sieve Numbers

Hydrometer

Lab Code 357



CTL JOB # 96-050014R Lab Code 358 DATE 3/22/96

CTL PROJECT

TEST LOCATION GP-5

DESCRIPTION Clayey SAND (SC)

DRY WT. BEFORE WASH	1085.20	DRY WT. AFTER WASH	375.50
WT. IN HYDROMETER	103.00	DRY WT. AFTER WASH	66.00
CORRECTED WEIGHT	142.77		

		Percent Retained		
SIEVE	Wt. Ret	Partial	Total	% Finer
3 in		0.00	0.00	100.00
2 in		0.00	0.00	100.00
1-1/2 in		0.00	0.00	100.00
1 in		0.00	0.00	100.00
3/4 in		0.00	0.00	100.00
1/2 in	6.20	0.57	0.57	99.43
3/8 in	26.1	0.00	2.98	97.02
No. 3		11.09	14.06	85.94
No. 4	120.30	11.09	14.06	85.94
No. 8	127.90	11.79	25.85	74.15
No. 10	21.80	2.01	27.86	72.14
PAN 73.20	782.90	72.14	100.00	0.00
No. 10	39.77	27.86	27.86	72.14
No. 16		0.00	27.86	72.14
No. 20		0.00	27.86	72.14
No. 30		0.00	27.86	72.14
No. 40	29.00	0.20	48.17	51.83
No. 50	8.00	0.06	53.77	46.23
No. 70		0.00	53.77	46.23
No. 100	17.70	0.12	66.17	33.83
No. 140		0.00	66.17	33.83
No. 200	10.50	0.07	73.52	26.48
PAN 0.80	37.80	26.48	100.00	0.00

CTL JOB # 96-050014R Lab Code 358 DATE 3/22/96

CTL PROJECT 0

TEST LOCATION GP-5

DESCRIPTION Clayey SAND (SC)

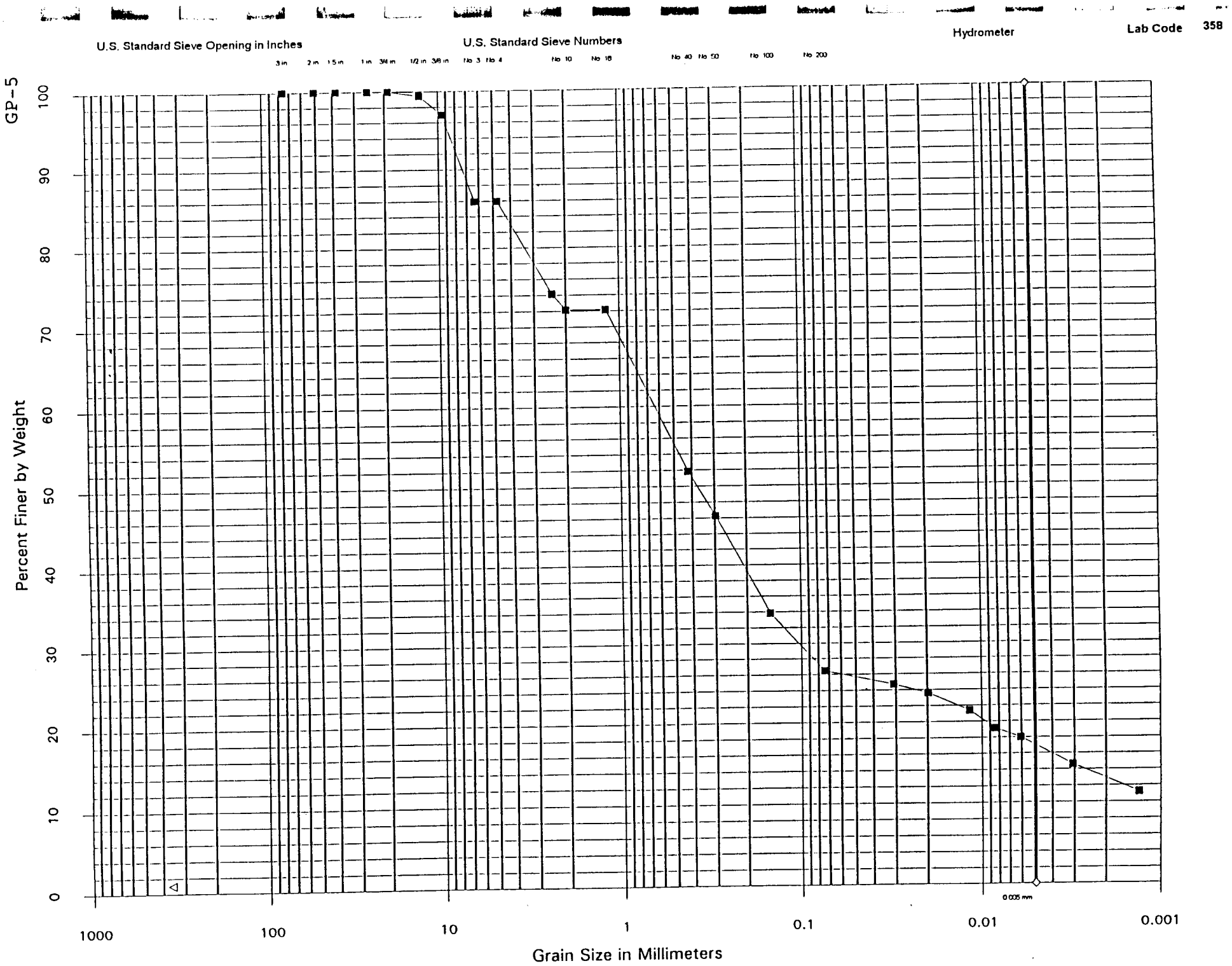
HYDROMETER DATA

K = 0.01365

S.G. = 2.65

PERCENT FINER

TIME	TEMP	ACTUAL	L	CORR.	actual	adjusted	L/t	K	D(mm)
2	20	1.023	10.2	1.022	34.30420712	24.74821577	5.1	0.01365	0.030826
5	20	1.022	10.5	1.021	32.74492498	23.62329687	2.1	0.01365	0.0197807
15	20	1.02	11	1.019	29.62636069	21.37345907	0.733333	0.01365	0.0116892
30	20	1.018	11.5	1.017	26.50779641	19.12362128	0.383333	0.01365	0.0084512
60	20	1.017	11.8	1.016	24.94851427	17.99870238	0.196667	0.01365	0.0060534
250	20	1.014	12.6	1.013	20.27066784	14.62394568	0.0504	0.01365	0.0030644
1440	20	1.011	13.4	1.010	15.59282142	11.24918899	0.009306	0.01365	0.0013168


U.S. Standard Sieve Opening in Inches
U.S. Standard Sieve Numbers
Hydrometer
Lab Code 358
3 in
2 in
1.5 in
1 in
3/4 in
1/2 in
3/8 in
No 3
No 4
No 10
No 16
No 40
No 50
No 100
No 200
GP-5
Percent Finer by Weight
100
90
80
70
60
50
40
30
20
10
0
0.005 mm
1000
100
10
1
0.1
0.01
0.001
Grain Size in Millimeters

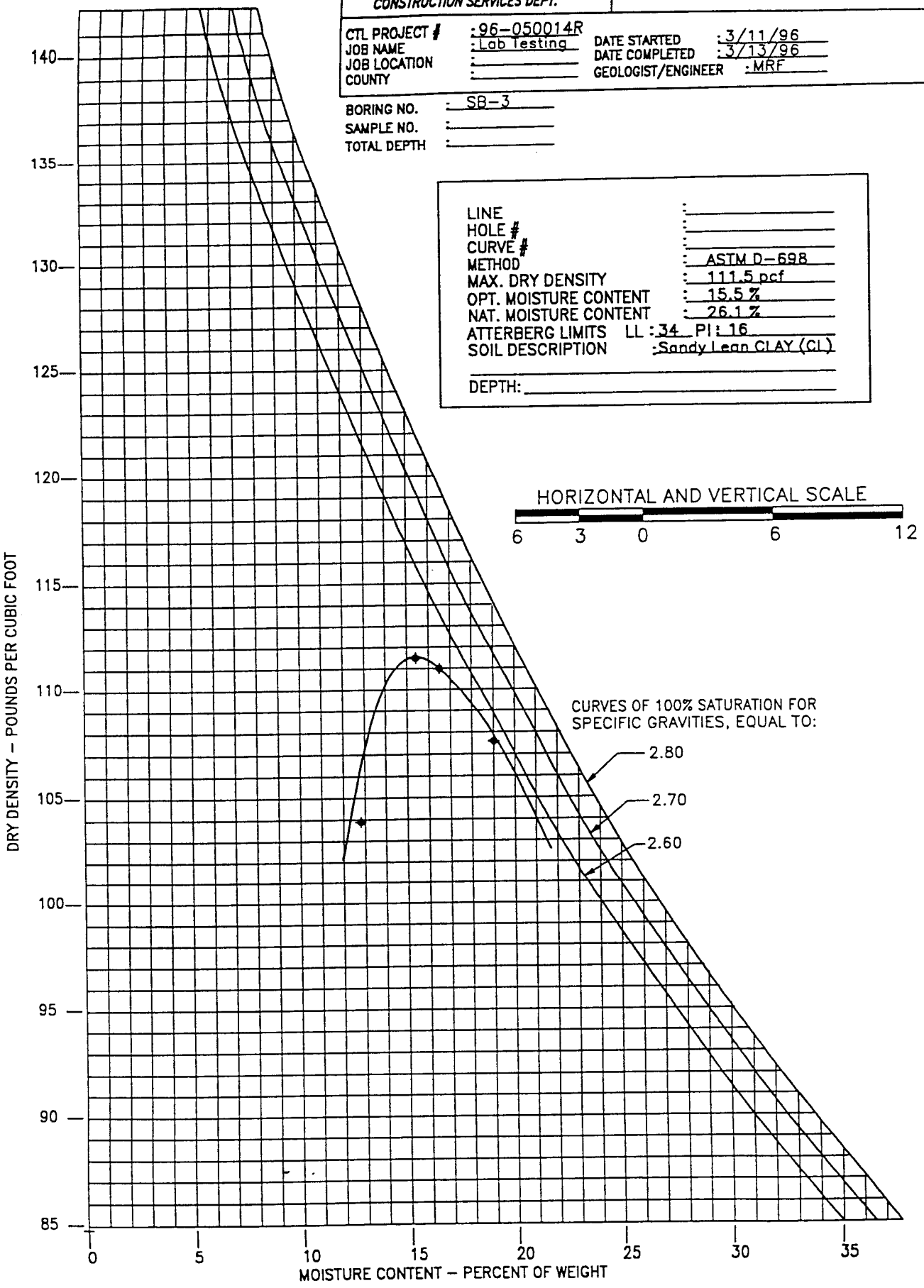
CTL ENGINEERING of CONSTRUCTION SERVICES DEPT.
6301-A ANGUS DRIVE
RALEIGH, NC 27613

MOISTURE- DENSITY RELATIONSHIP

CTL PROJECT #	: 96-050014R	DATE STARTED	: 3/11/96
JOB NAME	: Lab Testing	DATE COMPLETED	: 3/13/96
JOB LOCATION	:	GEOLOGIST/ENGINEER	: MRF
COUNTY	:		

BORING NO. : SB-3
SAMPLE NO. :
TOTAL DEPTH :

LINE :
HOLE # :
CURVE # :
METHOD : ASTM D-698
MAX. DRY DENSITY : 111.5 pcf
OPT. MOISTURE CONTENT : 15.5 %
NAT. MOISTURE CONTENT : 26.1 %
ATTERBERG LIMITS LL : 34 PI : 16
SOIL DESCRIPTION : Sandy Lean CLAY (CL)
DEPTH:



CTL JOB # 96-050014R Lab Code 360 DATE 3/22/96

CTL PROJECT

TEST LOCATION SB-3

DESCRIPTION Sandy Lean CLAY (CL)

DRY WT. BEFORE WASH	1052.10	DRY WT. AFTER WASH	198.00
WT. IN HYDROMETER	101.30	DRY WT. AFTER WASH	44.20
CORRECTED WEIGHT	106.13		

			Percent Retained		
	SIEVE	Wt. Ret	Partial	Total	% Finer
	3 in		0.00	0.00	100.00
	2 in		0.00	0.00	100.00
	1-1/2 in		0.00	0.00	100.00
	1 in		0.00	0.00	100.00
	3/4 in		0.00	0.00	100.00
	1/2 in		0.00	0.00	100.00
	3/8 in	1.8	0.00	0.17	99.83
	No. 3		1.65	1.82	98.18
	No. 4	17.40	1.65	1.82	98.18
	No. 8	24.10	2.29	4.12	95.88
	No. 10	4.60	0.44	4.55	95.45
PAN	150.10	1004.20	95.45	100.00	0.00
	No. 10	4.83	4.55	4.55	95.45
	No. 16		0.00	4.55	95.45
	No. 20		0.00	4.55	95.45
	No. 30		0.00	4.55	95.45
	No. 40	8.50	0.08	12.56	87.44
	No. 50	4.90	0.05	17.18	82.82
	No. 70		0.00	17.18	82.82
	No. 100	15.30	0.14	31.59	68.41
	No. 140		0.00	31.59	68.41
	No. 200	14.70	0.14	45.45	54.55
PAN	0.80	57.90	54.55	100.00	0.00

CTL JOB # 96-050014R Lab Code 360 DATE 3/22/96

CTL PROJECT 0

TEST LOCATION SB-3

DESCRIPTION Sandy Lean CLAY (CL)

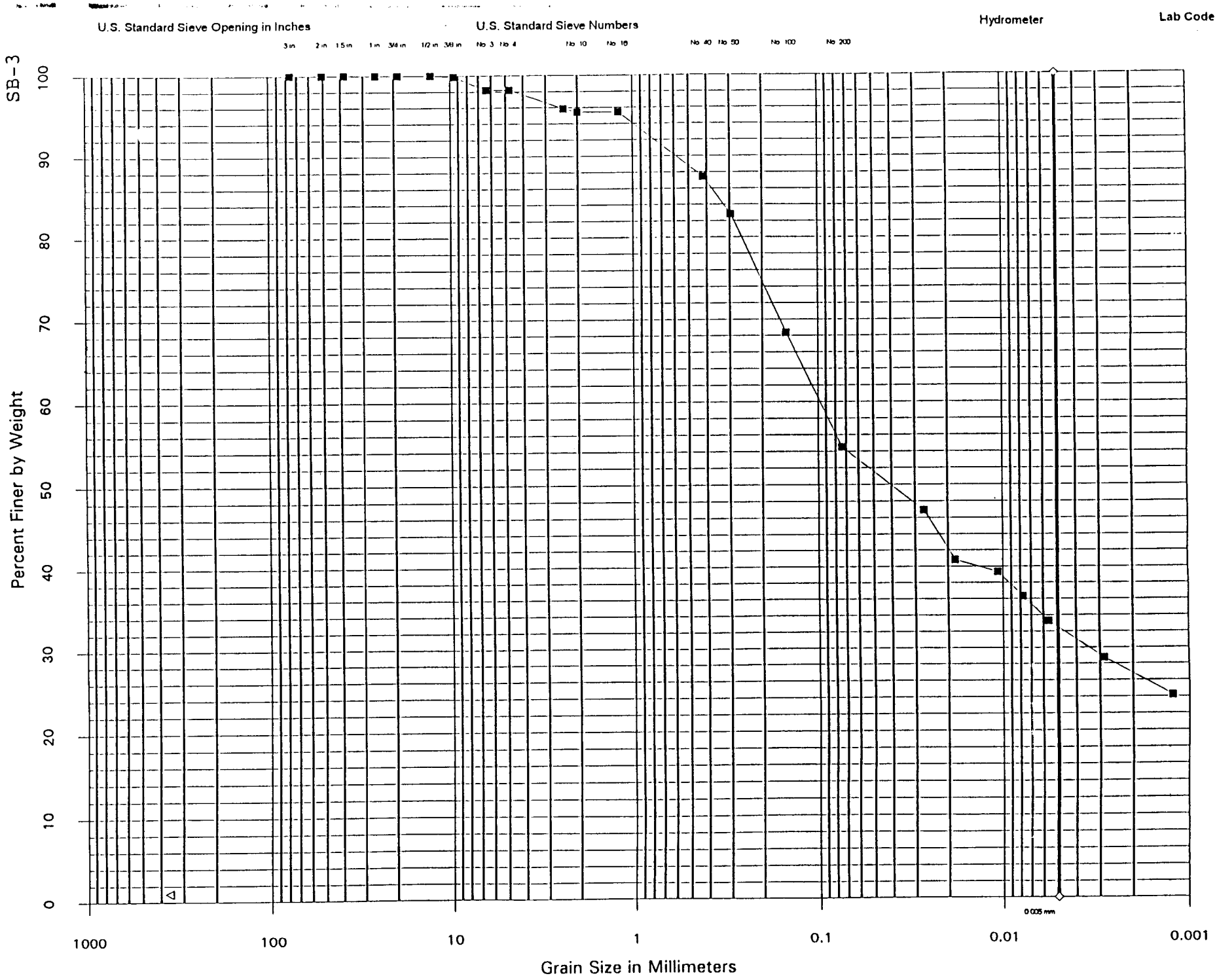
HYDROMETER DATA

K = 0.01365

S.G. = 2.65

PERCENT FINER

TIME	TEMP	ACTUAL	L	CORR.	actual	adjusted	L/t	K	D(mm)
2	20	1.032	7.8	1.031	49.14894253	46.91128989	3.9	0.01365	0.0269566
5	20	1.028	8.9	1.027	42.8071435	40.85822023	1.78	0.01365	0.0182114
15	20	1.027	9.2	1.026	41.22169374	39.34495281	0.613333	0.01365	0.0106901
30	20	1.025	9.7	1.024	38.05079422	36.31841798	0.323333	0.01365	0.0077617
60	20	1.023	10.2	1.022	34.8798947	33.29188315	0.17	0.01365	0.005628
250	20	1.02	11	1.019	30.12354542	28.7520809	0.044	0.01365	0.0028632
1440	20	1.017	11.8	1.016	25.36719615	24.21227865	0.008194	0.01365	0.0012356


U.S. Standard Sieve Opening in Inches
U.S. Standard Sieve Numbers
Hydrometer
Lab Code 360
3 in
2 in
1.5 in
1 in
3/4 in
1/2 in
3/8 in
No 3
No 4
No 10
No 16
No 40
No 50
No 100
No 200
SB-3
Percent Finer by Weight
100
90
80
70
60
50
40
30
20
10
0
1000
100
10
1
0.1
0.01
0.001
0.005 mm
Grain Size in Millimeters