Golder Associates, Inc.
CONSULTING GEOTECHNICAL AND MINING ENGINEERS

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FINAL REPORT ON

Piedmont MSWLF 34-06

A PHASE II HYDROGEOLOGIC INVESTIGATION AT THE PROPOSED KERNERSVILLE, NC SANITARY LANDFILL SITE

VOLUME 2 OF 2

MAIN REPORT

Carmen Johnson
Fac/Perm/Co ID # 34-06 | Date 8/12/13 | Doc ID# | DIN

Submitted to:

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June 1988 863-3407

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APPENDIX A

FIELD BORING AND PIEZOMETER INSTALLATION LOGS

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Field Boring Log

DEPTH HOLE 87ft	JOB NO. 863-3407.4	PROJECT WMI/Hydro/Kernersville				BORING NO. P100, D.S	
DEPTH SOIL DRILL	GA INSP. Greg Richardson	DRILLING METHOD Hollow stem Augers, Roller Cone, Coring				SHEET ' OF '	
DEPTH ROCK CORE	WEATHER PC	DRILLING COMPANY ATEC				SURFACE ELEV.	
NO. DIST. SA. UD. SA.	TEMP. 75-95	DRILL RIG B61		DRILLER DonS		DATUM	
DEPTH WL.	HRS. PROD.	WT. SAMPLER HAMMER 140lbs		DROP 30"		STARTED / (TIME / DATE)	
TIME WL.	HRS. DELAYED	WT. CASING HAMMER		DROP		COMPLETED /	

SAMPLE TYPES

A.S.	AUGER SAMPLE	BL	BLACK	M	MEDIUM	SA	SAMPLE
C.S.	CHUNK SAMPLE	BR	BROWN	MIC	MICACEOUS	SAT	SATURATED
D.O.	DRIVE OPEN	C	COARSE	MOT	MOTTLED	SD	SAND
D.S.	DENISON SAMPLE	CA	CASING	NP	NON-PLASTIC	SI	SILT
P.S.	PITCHER SAMPLE	CL	CLAY	OG	ORANGE	SIY	SILTY
R.C.	ROCK CORE	CLY	CLAYEY	ORG	ORGANIC	SM	SOME
S.T.	SLOTTED TUBE	F	FINE	PH	PRESSURE-HYDRAULIC	TR	TRACE
T.O.	THIN-WALLED, OPEN	FRAG	FRAGMENTS	PM	PRESSURE-MANUAL	WL	WATER LEVEL
T.P.	THIN-WALLED, PISTON	GL	GRAVEL	R	RED	WH	WEIGHT OF HAMMER
W.S.	WASH SAMPLE	LYD	LAYERED	RES	RESIDUAL	Y	YELLOW
		LI	LITTLE	RX	ROCK		

SOIL DESCRIPTION - RANGE OF PROPORTION

"TRACE" - 0 - 5% "SOME" - 12 - 30%
"LITTLE" - 5 - 12% "AND" - 30-50%

RELATIVE DENSITY		BLOWS	CONSISTENCY		FINGER PRESSURE
VERY LOOSE	VLS	0-4	VERY SOFT	VS	EXTRUDES
LOOSE	LS	4-10	SOFT	S	MOLDS EASILY
COMPACT	CP	10-30	FIRM	FM	MOLDS
DENSE	DN	30-50	STIFF	ST	THUMB INDENTS
VERY DENSE	VDN	50	VERY STIFF	VST	THUMBNAIL INDENT
			HARD	H	RESISTS THUMBNAIL

ELEV. / DEPTH	DESCRIPTION	BLOWS / FT	SAMPLES NO.	TYPE	(HAMM. BLOWS PER 6 IN (FORCE))	REC / ATT	DEPTH
	Tan clayey silt, Some fine and Mic. F to C Sand, firm to stiff, Dry to moist (unit 3)	115	1A, 1B	Do	7·15·100	22/24	0·2
5	839.47	68	2A	Do	23·35·33 50/1"	17/24	3.5-5.5
10	Multi-colored Brown Mic. F to C Sand, Some Silt Dense to V. Dense, Dry to moist (unit 4)	149	3A	Do	50·67·81	19/24	8.5-10.5
15		>100	4A	Do	100/4"	5/24	13.5-15.5
20		>100	5A	Do	35·100/4"	13/24	18.5-20.5
25	26						
30	815.47						
35	Alternating Layers of Rock & Partially Weathered Rock (unit 7)						
40							
45							
50							
55							
60	60 / 781.47						
65							
70	Competent Rock (See Rock Core Logs) (unit 8)						
75							
80							
85							
90	87 End of Boring						

SAMPLE DESCRIPTION AND BORING NOTES

4/21/87, 3:40PM, Hollow stem Auger 3¼ ID
(1A) Br. Silty Clay Mixed Micaceous F to C Sand, Stiff ft
V. Stiff, moist, Plant Material Topsoil 18"
(1B) Tan Micaceous F to C Sand, little Silt trace Clay
Dry to Moist, Hard, Organic Matter
(2A) Dk Br. Mica F to C Sand, little Silt, trace Clay
Moist, Hard
(3A) Tan Mic. F to C Sand, little to Some Silt,
mixed white (weathered Rock) moist, Hard
(4A) Greenish Brown Mic. F to C Sand, little to Some
Silt (Black specks) Hard, moist
(5A) 4" Same as sample 4A No Sample Kept
8" White tan F to C Sand (weathered
Rock) little silt, Fragments of Rock little Mica
V Dense, moist
4/21/87, 5:10 stop Augering 22ft BGS
4/22/87, 7:50 started Roller Cone
4/22/87, 8:30 stopped Roller Cone 24ft tried to take split
Spoon unable to obtain sample 100 blows no recovery
4/22/87, 9:30 started Coring
4/22/87, 9:54 stopped Coring 25.5ft (No sample in Core barrel)
4/22/87, 10:15 started Roller Cone again
Roller cone to depth of 34'2"
27-28 Hard, 32-34 Hard
4/22/87, 3:30 started Coring
P100 *1st Run 5'9" (34'7" to 40'4") Return 2.5'
*2nd Run 5' (40'4" to 45'4") Return 1'5"
*3rd Run 5' (45'4" to 50'4") Return 0
4/23/87 set casing to 40.5' unable to Continue
due to lack of Equipment. Need to telescope
a smaller casing to continue sampling

P100
*1 Run 59'-67 White & Black
Granitic Gneiss
*2 Run 67'-72' White & Black
Granitic Gneiss

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Field Boring Log

DEPTH HOLE 70ft	JOB NO. 863-3407.4	PROJECT WMI / Hydro / Kernersville N.C.				BORING NO. P2D & P2S	
DEPTH SOIL DRILL 70ft	GA INSP. Greg Richardson	DRILLING METHOD Hollowstem Augers, Roller Cone				SHEET 1 OF 1	
DEPTH ROCK CORE	WEATHER Sunny, Clear	DRILLING COMPANY ATEC				SURFACE ELEV. 821.40	
NO. DIST. SA. UD. SA.	TEMP. 80's	DRILL RIG B61		DRILLER Don S.		DATUM	
DEPTH WL.	HRS. PROD.	WT. SAMPLER HAMMER 140lbs		DROP 30"		STARTED 8:30 / 4/30/87 (TIME / DATE)	
TIME WL.	HRS. DELAYED	WT. CASING HAMMER		DROP		COMPLETED 11:00 / 5/1/87	

SAMPLE TYPES

A.S.	AUGER SAMPLE	BL	BLACK
C.S.	CHUNK SAMPLE	BR	BROWN
D.O.	DRIVE OPEN	C	COARSE
D.S.	DENISON SAMPLE	CA	CASING
P.S.	PITCHER SAMPLE	CL	CLAY
R.C.	ROCK CORE	CLY	CLAYEY
S.T.	SLOTTED TUBE	F	FINE
T.O.	THIN-WALLED, OPEN	FRAG	FRAGMENTS
T.P.	THIN-WALLED, PISTON	GL	GRAVEL
W.S.	WASH SAMPLE	LYD	LAYERED
		LI	LITTLE

ABBREVIATIONS

M	MEDIUM	SA	SAMPLE
MIC	MICACEOUS	SAT	SATURATED
MOT	MOTTLED	SD	SAND
NP	NON-PLASTIC	SI	SILT
OG	ORANGE	SIY	SILTY
ORG	ORGANIC	SM	SOME
PH	PRESSURE-HYDRAULIC	TR	TRACE
PM	PRESSURE-MANUAL	WL	WATER LEVEL
R	RED	WH	WEIGHT OF HAMMER
RES	RESIDUAL	Y	YELLOW
RX	ROCK		

SOIL DESCRIPTION - RANGE OF PROPORTION

"TRACE" - 0 - 5% "SOME" - 12 - 30%
"LITTLE" - 5 - 12% "AND" - 30-50%

RELATIVE DENSITY		BLOWS	CONSISTENCY		FINGER PRESSURE
VERY LOOSE	VLS	0-4	VERY SOFT	VS	EXTRUDES
LOOSE	LS	4-10	SOFT	S	MOLDS EASILY
COMPACT	CP	10-30	FIRM	FM	MOLDS
DENSE	DN	30-50	STIFF	ST	THUMB INDENTS
VERY DENSE	VDN	50	VERY STIFF	VST	THUMBNAIL INDENT
			HARD	H	RESISTS THUMBNAIL

ELEV. DEPTH	DESCRIPTION	BLOWS / FT	SAMPLES NO.	TYPE	HAMM. BLOWS PER 6 IN (FORCE)	REC / ATT	DEPTH
821.40	Topsoil	14	1A,1B	DO	4·6·8·10	24/24	0-2
816.40 5	820.2 Red Clayey Silt some to and Mic. F to M Sand, trace Clay, moist, firm (unit 2)	31	2A,2B	DO	8·13·18·21	23/24	3.5-5.5
811.40 10		17	3A	DO	6·7·10·11	23/24	8.5-10.5
806.40 15		16	4A	DO	5·7·9·11	21/24	13.5-15.5
801.40 20	20 801.40	16	5A,5B	DO	6·7·9·10	23/24	18.5-20.5
796.40 25	Brown, Black, white Silt and Mic F. sand, moist firm. (unit 4)	22	6A	DO	6·10·12·13	20/24	23.5-25.5
791.40 30		19	7A	DO	7·9·10·15	21/24	28.5-30.5
786.40 35	35 786.40	24	8A,8B	DO	11·13·11·17	20/24	33.5-35.5
781.40 40		48	9A	DO	20·21·27·31	23/24	38.5-40.5
776.40 45		103	10A	DO	18·32·71·56	22/24	43.5-45.5
771.40 50	White, tan Mic F to C Sand, Some to and Silt, moist to Sat, Dense (unit 4)	52	11A	DO	22·30·32·68	16/24	48.5-50.5
766.40 55		152	12A	DO	13·52·100	12/18	54-56
761.40 60		59	13A	DO	17·23·36·70	22/24	58-60
756.40 65		75	14A	DO	21·32·43·98	14/24	64-66
751.40 70			15A	DO	78 109/3"	9/12	69-71
	70ft (751.40) End of Boring						

SAMPLE DESCRIPTION AND BORING NOTES

(1A) 14" TOPSoil - Reddish Brown Clayey silt, Silty Clay, little to Some f Sand, moist, firm, Organic Matter (8:35)

(1B) 10" Red Silty Clay / Clayey Silt Some f to C Sand, Moist, Firm, little Organic Matter, little Mica.

(2A) 18" Red Clayey Silt mixed f to M Sand Moist, firm.

(2B) 5" Red Purple Clayey Silt mixed f to M Sand, Moist, Firm

(3A) Reddish Orange Silt mixed Micaceous f Sand, Moist, firm (little Clay) 9:05

(4A) Orange Tan mixed Gray, Black Silt mixed Mica f. Sand, trace Clay Moist, Soft

(5A) 17" Same as Sample 4A

(5B) 5" Brown, Red, Black & White Silt and Micaceous f Sand, moist, Soft to firm (Weathered Rock)

(6A) Brown, Black & White Micaceous f to C Sand and Silt moist, firm, (Weathered Rock)

(7A) Same as Sample 6A 10:29

(8A) 9" Same as Sample 6A (Had 1" Quartz Lens)

(8B) Brown, Black, White Micaceous f to C Sand mixed Silt, moist, Soft (Wet)

(9A) White, Red f to C Micaceous Sand and Silt, Dense, Wet, Fragments Rock, Weathered Rock - 6" from TOP 1" Quartz Lens, 6" Rose Quartz mixed with Silt

(10A) Same as Sample 9A (11:25)

(11A) Same as Sample 10A 5:10 Weathered Rock

(12A) Same as Sample 10A 7:30 5/1/87

(13A) Brown Black, White Weathered Rock (9:34)

(14A) 5" Same as Sample 13A
2" Pink Silt Some f Sand
3" Brown Silt and f Sand
4" Pink Silt Some f Sand Moist Firm

(15A) Weathered Rock

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Field Boring Log

DEPTH HOLE 58ft	JOB NO. 863-3407.4	PROJECT WMI/Hydro/Kernersville N.C.				BORING NO. P3D&P3S	
DEPTH SOIL DRILL 48'	GA INSP. Greg Richardson	DRILLING METHOD Hollowstem Augers, Roller Cone, Coring				SHEET 1 OF 1	
DEPTH ROCK CORE 10'	WEATHER Sunny Hot	DRILLING COMPANY ATEC				SURFACE ELEV. 759.37	
NO. DIST. SA. ___ UD. SA. ___	TEMP. 80's	DRILL RIG B61		DRILLER Don S.		DATUM	
DEPTH WL. 7ftBGS	HRS. PROD.	WT. SAMPLER HAMMER 140lbs		DROP 30"		STARTED 1:50 (TIME) 5/2/87 (DATE)	
TIME WL.	HRS. DELAYED	WT. CASING HAMMER		DROP		COMPLETED /	

SAMPLE TYPES

A.S.	AUGER SAMPLE	BL	BLACK
C.S.	CHUNK SAMPLE	BR	BROWN
D.O.	DRIVE OPEN	C	COARSE
D.S.	DENISON SAMPLE	CA	CASING
P.S.	PITCHER SAMPLE	CL	CLAY
R.C.	ROCK CORE	CLY	CLAYEY
S.T.	SLOTTED TUBE	F	FINE
T.O.	THIN-WALLED, OPEN	FRAG	FRAGMENTS
T.P.	THIN-WALLED, PISTON	GL	GRAVEL
W.S.	WASH SAMPLE	LYD	LAYERED
		LI	LITTLE

ABBREVIATIONS

M	MEDIUM	SA	SAMPLE
MIC	MICACEOUS	SAT	SATURATED
MOT	MOTTLED	SD	SAND
NP	NON-PLASTIC	SI	SILT
OG	ORANGE	SIY	SILTY
ORG	ORGANIC	SM	SOME
PH	PRESSURE-HYDRAULIC	TR	TRACE
PM	PRESSURE-MANUAL	WL	WATER LEVEL
R	RED	WH	WEIGHT OF HAMMER
RES	RESIDUAL	Y	YELLOW
RX	ROCK		

SOIL DESCRIPTION - RANGE OF PROPORTION

"TRACE" - 0 - 8% "SOME" - 12 - 30%
"LITTLE" - 8 - 12% "AND" - 30-50%

RELATIVE DENSITY		BLOWS	CONSISTENCY		FINGER PRESSURE
VERY LOOSE	VLS	0-4	VERY SOFT	VS	EXTRUDES
LOOSE	LS	4-10	SOFT	S	MOLDS EASILY
COMPACT	CP	10-30	FIRM	FM	MOLDS
DENSE	DN	30-50	STIFF	ST	THUMB INDENTS
VERY DENSE	VDN	50	VERY STIFF	VST	THUMBNAIL INDENT
			HARD	H	RESISTS THUMBNAIL

ELEV. DEPTH	DESCRIPTION	BLOWS/FT		SAMPLES NO.	TYPE	HAMM. BLOWS PER 6 IN (FORCE)	REC/ATT	DEPTH	SAMPLE DESCRIPTION AND BORING NOTES
759.37	0.25 TOPSoil	5		1A	Do	3·3·2·2	22/24	0-2	(1A) 3" TOPSoil Tan Brown Silt mixed Micaceous f to M Sand trace clay, moist, Soft (last 3" had more Clay)
754.37 5	Red, Brown Silt, Some to and M.c., f to C Sand, firm to Stiff, moist (unit 3)	16		2A	Do	4·8·8·11	18/24	3.5-5.5	(2A) Top 6" same as sample 1A (wetter) Brown f to C Sand mixed Clayey Silt Firm, Wet, (Gravel & Quartz Lense 6" & 10" from top of Sample, last part of Sample had Gray Clay
749.37 10	11 748.37 Black, Brown, white M.c. f to C Sand some silt, firm to stiff moist (unit 4)	50		3A,3B	Do	25·23·27·25	17/24	8.5-10.5	(3A) 13" Reddish Brown Silt Mixed Mica f to M Sand Dry, Firm
744.37 15	17 742.37	42		4A	Do	12·17·25·35	22/24	13.5-15.5	(3B) 4" Brown Silt and Sand
739.37 20	Reddish Brown M.c. f to C Sand, Some Silt, V. Dense, moist (unit 4)	56		5A	Do	20·25·31·15	22/24	18.5-20.5	(4A) Black White Brown Micaceous f to C Sand mixed Silt, Weathered Rock, Moist, firm to stiff, Spoon was wet
734.37 25		61		6A	Do	15·35·26·74	22/24	23.5-25.5	(5A) Reddish Brown f to C Micaceous Sand Some Silt, Very stiff, Sat, Weathered Rose Quartes & Lenses of Rose Quarts
729.37 30		116		7A	Do	95·28·88	18/18	28.5-30.5	(6A) Reddish Brown Micaceous f to M Sand Some Silt Dry V. stiff, (Top portion of Sample was Tan)
724.37 35		48		8A	Do	17·27·21·25	17/24	33.5-35.5	(7A) Tan Brown Micaceous f to C Sand Some Silt, moist, stiff to Very stiff
719.37 40				9A	Do	60·50/11"	6/12	38.5-40.5	(8A) Brown Mica f to M Sand Some to And Silt, moist, stiff
714.37 45				10A	Do	11·50/11"	6/6	43.5-45.5	(9A) Reddish Brown Micaceous f to C Sand Some Silt moist, Compact Weathered Rock
709.37 50	47 712.37 Black & White Granitic Schist & Gneiss (See Core Log)								5/8/87 Rig Broke down 5/4/87 7:48
704.37 55									(10A) Reddish Brown Micaceous f to C Sand Some Silt moist Compact Weathered Rock
699.37 60	58ft (701.37) End of Boring								see Core sample

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Field Boring Log

DEPTH HOLE 61 ft	JOB NO. 863-3407.4	PROJECT WMI/Hydro/Kernersville N.C				BORING NO. P4D	
DEPTH SOIL DRILL 61 ft	GA INSP. Greg Richardson	DRILLING METHOD Hollowstem Augers, Roller Cone				SHEET 1 OF 1	
DEPTH ROCK CORE ___	WEATHER Clear, Sunny	DRILLING COMPANY ATEC				SURFACE ELEV. 782.48	
NO. DIST. SA. ___ UD. SA. ___	TEMP. 70's	DRILL RIG B61		DRILLER Don S.		DATUM 785.78	
DEPTH WL. 32 ft BGS	HRS. PROD. ___	WT. SAMPLER HAMMER 140 lbs		DROP 30"		STARTED 3:10 (TIME) 5/6/87 (DATE)	
TIME WL. 7:30 5/12/87	HRS. DELAYED ___	WT. CASING HAMMER ___		DROP ___		COMPLETED 1:30 (TIME) 5/12/87 (DATE)	

SAMPLE TYPES

A.S.	AUGER SAMPLE
C.S.	CHUNK SAMPLE
D.O.	DRIVE OPEN
D.S.	DENISON SAMPLE
P.S.	PITCHER SAMPLE
R.C.	ROCK CORE
S.T.	SLOTTED TUBE
T.O.	THIN-WALLED, OPEN
T.P.	THIN-WALLED, PISTON
W.S.	WASH SAMPLE

ABBREVIATIONS

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C	COARSE	MOT	MOTTLED	SD	SAND
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CLY	CLAYEY	ORG	ORGANIC	SM	SOME
F	FINE	PH	PRESSURE-HYDRAULIC	TR	TRACE
FRAG	FRAGMENTS	PM	PRESSURE-MANUAL	WL	WATER LEVEL
GL	GRAVEL	R	RED	WH	WEIGHT OF HAMMER
LYD	LAYERED	RES	RESIDUAL	Y	YELLOW
LI	LITTLE	RX	ROCK		

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VERY DENSE	VDN	50	VERY STIFF	VST	THUMBNAIL INDENT
			HARD	H	RESISTS THUMBNAIL

ELEV. / DEPTH	DESCRIPTION	BLOWS / FT	SAMPLES NO.	TYPE	HAMM. BLOWS PER 6 IN (FORCE)	REC / ATT	DEPTH
777.48 / 5	0.7 Topsoil Red Silty Clay, trace f Sand moist, firm, Organic Matter (Unit 2) 7	14	1A	Do	4·6·8·10	22/24	0-2
		17	2A	Do	4·7·10·12	22/24	3.5-5.5
772.48 / 10	775.48	13	3A	Do	4·5·8·12	23/24	8.5-10.5
767.48 / 15	White, tan Silt little f to M Sand, moist, firm (unit 3)	17	4A	Do	6·8·9·11	24/24	13.5-15.5
762.48 / 20		14	5A	Do	5·7·7·9	24/24	18.5-20.5
757.48 / 25		34	6A	Do	17·19·15·18	16.5/24	23.5-25.5
752.48 / 30		31	7A	Do	11·13·18·22	24/24	28.5-30.5
747.48 / 35		17	8A/B	Do	4·7·10·27	23/24	33.5-35.5
742.48 / 40		32	9A	Do	9·14·18·19	17/24	38.5-40.5
737.48 / 45		36	10A	Do	12·14·22·16	23/24	43.5-45.5
732.48 / 50	49 733.48	55	11A/11B	Do	21·26·29·16	24/24	48.5-50.5
727.48 / 55	Brown, tan Micaceous f to C Sand Some Silt, moist, stiff. (unit 4)	28	12A	Do	13·13·15·25	23/24	53.5-55.5
722.48 / 60	59 (723.48) End of Boring	44	13A	Do	15·19·25·26	22/24	59-61
717.48 / 65							

SAMPLE DESCRIPTION AND BORING NOTES

8" Topsoil (Dark reddish Brown Silty Clay OM)

(1A) Red Silty Clay mixed little mottled Gray Clay 4.00 trace f Sand moist, firm, little Organic Matter

(2A) Reddish White Silty clay trace f Sand moist, firm, little Organic Matter

(3A) White silt, trace to little f sand moist firm, mottled tan streaks Saprolite

(4A) White (tan + Purple streaks) Silt, little to Some f sand, moist, firm

(5A) White tan Silt, little f sand, moist, firm

(6A) 4.5" Same as Sample 5A
12" Brown Micaceous f to C Sand Some Silt, moist, stiff

(7A) Alternating Layers Brown Black Silt, mixed Mica f to M sand moist, stiff (5:25)

(8A) 16" White Tan purple Silt, little f to C Sand, moist, firm (TOP 1" Rock Fragments)

(8B) 7" Reddish Brown Micaceous f to M Sand mixed Silt moist, stiff (5:43)

(9A) Reddish Brown Silt, trace fine Micaceous Sand moist, stiff (5:57)

(10A) Reddish Brown Silt Some Micaceous f to M Sand moist, stiff

(11A) 6" Tan Silt some Micaceous f to M Sand moist, stiff

(11B) Brown Micaceous f to C Sand Some Silt wet

(12A) Tan Brown Silt some Sand dry stiff
1" Lense white Weathered Rock middle of Sample

(13A) White f to C Sand Some to and Silt moist stiff (Above was a coarse Sand)

End of Sampling 61 ft
End of Well 59 ft

Golder Associates

Field Boring Log

DEPTH HOLE 36 ft	JOB NO. 863-3407.4	PROJECT WMI / Hydro / Kernersville N.C.		BORING NO. P5D & S	
DEPTH SOIL DRILL 21 ft	GA INSP. Greg Richardson	DRILLING METHOD Hollow Stem Auger, Roller Cone, Coring		SHEET 1 OF 1	
DEPTH ROCK CORE 15 ft	WEATHER PC, Windy, Rain	DRILLING COMPANY Atec		SURFACE ELEV. 755.96	
NO. DIST. SA. ___ UD. SA. ___	TEMP. 70's	DRILL RIG B61	DRILLER Don S.	DATUM	
DEPTH WL. 12 ft BGS	HRS. PROD.	WT. SAMPLER HAMMER 140 lbs	DROP 30"	STARTED 4.00, 5/12/87	
TIME WL. 4:30 5/12/87	HRS. DELAYED	WT. CASING HAMMER	DROP	COMPLETED 6:15, 5/12/87 (TIME, DATE)	

SAMPLE TYPES

A.S.	AUGER SAMPLE
C.S.	CHUNK SAMPLE
D.O.	DRIVE OPEN
D.S.	DENISON SAMPLE
P.S.	PITCHER SAMPLE
R.C.	ROCK CORE
S.T.	SLOTTED TUBE
T.O.	THIN-WALLED, OPEN
T.P.	THIN-WALLED, PISTON
W.S.	WASH SAMPLE

ABBREVIATIONS

BL	BLACK	M	MEDIUM	SA	SAMPLE
BR	BROWN	MIC	MICACEOUS	SAT	SATURATED
C	COARSE	MOT	MOTTLED	SD	SAND
CA	CASING	NP	NON-PLASTIC	SI	SILT
CL	CLAY	OG	ORANGE	SIY	SILTY
CLY	CLAYEY	ORG	ORGANIC	SM	SOME
F	FINE	PH	PRESSURE-HYDRAULIC	TR	TRACE,
FRAG	FRAGMENTS	PM	PRESSURE-MANUAL	WL	WATER LEVEL
GL	GRAVEL	R	RED	WH	WEIGHT OF HAMMER
LYD	LAYERED	RES	RESIDUAL	Y	YELLOW
LI	LITTLE	RX	ROCK		

SOIL DESCRIPTION - RANGE OF PROPORTION

"TRACE" - 0 - 5% "SOME" - 12 - 30%
"LITTLE" - 5 - 12% "AND" - 30-50%

RELATIVE DENSITY		BLOWS	CONSISTENCY		FINGER PRESSURE
VERY LOOSE	VLS	0-4	VERY SOFT	VS	EXTRUDES
LOOSE	LS	4-10	SOFT	S	MOLDS EASILY
COMPACT	CP	10-30	FIRM	FM	MOLDS
DENSE	DN	30-50	STIFF	ST	THUMB INDENTS
VERY DENSE	VDN	50	VERY STIFF	VST	THUMBNAIL INDENT
			HARD	H	RESISTS THUMBNAIL

ELEV. DEPTH	DESCRIPTION	BLOWS / FT	SAMPLES NO.	TYPE	HAMM. BLOWS PER 6 IN (FORCE)	REC / ATT	DEPTH
755.96	Tan Clayey Silt and Mic. f to C Sand, firm, dry (con. #2)	12	1A	Do	5·6·6·8	18/24	0-2
750.96 / 5							
	751.96 Brown, Black, white Mic. f to C Sand, some silt, moist, compact (con. #4)	17	2A	Do	6·7·10·12	24/24	3.5-5.5
745.96 / 10	748.96 White, Black, Green Mic. f to C Sand, little silt, v. Dense, moist. (con. #4)	>166	3A	Do	25·66·100/4"	18/18	8.5-10.5
740.96 / 15		>100	4A	Do	100/5"	6"/6"	13.5-15.5
735.96 / 20	20 735.96	>114	5A	Do	64·50/2	8"/8"	18.5-20.5
730.96 / 25	Black Kollinite Granitic Gneiss + Schist (see core log)						
725.96 / 30							
720.96 / 35							
715.96 / 40	36 ft (719.96) End of Boring						

SAMPLE DESCRIPTION AND BORING NOTES

Topsoil had been removed with Bulldozer

(1A) Tan Clayey Silt mixed with Micaceous f to C Sand, firm, dry

(2A) 4" same as sample 1A Brown, White, Black Micaceous f to C Sand little to Some Silt, moist, firm

(3A) White Green Mica f to C Sand, little Silt, moist, v. stiff, Weathered Rock, Quartz lens

12-13' soft, Hard, Soft 4:30

(4A) Same as sample 3A

Auger Refusal at 15ft 4:50

(5A) Black, white, Green Micaceous f to C Sand Some Silt mixed Weathered Rock Fragments, V. Dense, SAT.

Stop Roller Cone 21'
Change to Coring 5:53
Advance Rate 5ft 8min

Run #1 21-31 Attempt 10ft Return 7'1"

Run #2 31-36 Attempt 5ft Return

TD 36ft

Golder Associates

Field Boring Log

DEPTH HOLE 71ft	JOB NO. 863-3407.4	PROJECT WMI/Hydro/Kernersville N.C.		BORING NO. P6D	
DEPTH SOIL DRILL 67	GA INSP. Greg Richardson	DRILLING METHOD Hollowstem Augers, Rollercone, Coring		SHEET 1 OF 1	
DEPTH ROCK CORE 4	WEATHER Cloudy, Rain	DRILLING COMPANY ATEC		SURFACE ELEV. 807.71	
NO. DIST. SA. ___ UD. SA. ___	TEMP. 60-70's	DRILL RIG B61	DRILLER Don S.	DATUM 811.71	
DEPTH WL. 60	HRS. PROD. ___	WT. SAMPLER HAMMER 140lbs	DROP 30"	STARTED 4.00 5/13/87 (TIME / DATE)	
TIME WL. ___	HRS. DELAYED ___	WT. CASING HAMMER ___	DROP ___	COMPLETED 5:30 5/14/87 (TIME / DATE)	

SAMPLE TYPES

A.S.	AUGER SAMPLE	BL	BLACK	M	MEDIUM	SA	SAMPLE
C.S.	CHUNK SAMPLE	BR	BROWN	MIC	MICACEOUS	SAT	SATURATED
D.O.	DRIVE OPEN	C	COARSE	MOT	MOTTLED	SD	SAND
D.S.	DENISON SAMPLE	CA	CASING	NP	NON-PLASTIC	SI	SILT
P.S.	PITCHER SAMPLE	CL	CLAY	OG	ORANGE	SIY	SILTY
R.C.	ROCK CORE	CLY	CLAYEY	ORG	ORGANIC	SM	SOME
S.T.	SLOTTED TUBE	F	FINE	PH	PRESSURE-HYDRAULIC	TR	TRACE,
T.O.	THIN-WALLED, OPEN	FRAG	FRAGMENTS	PM	PRESSURE-MANUAL	WL	WATER LEVEL
T.P.	THIN-WALLED, PISTON	GL	GRAVEL	R	RED	WH	WEIGHT OF HAMMER
W.S.	WASH SAMPLE	LYD	LAYERED	RES	RESIDUAL	Y	YELLOW
		LI	LITTLE	RX	ROCK		

SOIL DESCRIPTION - RANGE OF PROPORTION

"TRACE" - 0 - 5% "SOME" - 12 - 30%
"LITTLE" - 5 - 12% "AND" - 30-50%

RELATIVE DENSITY	BLOWS	CONSISTENCY	FINGER PRESSURE
VERY LOOSE VLS	0-4	VERY SOFT VS	EXTRUDES
LOOSE LS	4-10	SOFT S	MOLDS EASILY
COMPACT CP	10-30	FIRM FM	MOLDS
DENSE DN	30-50	STIFF ST	THUMB INDENTS
VERY DENSE VDN	50	VERY STIFF VST	THUMBNAIL INDENT
		HARD H	RESISTS THUMBNAIL

ELEV. / DEPTH	DESCRIPTION	BLOWS / FT	SAMPLES NO.	TYPE	HAMM. BLOWS PER 6 IN (FORCE)	REC / ATT	DEPTH
807.71	C.S. TopSoil	16	1A	Do	5·6·10·1	24/24	0-2
802.71 5	Orange Brown Mic. FtoC Sand, Some silt, Dense, Dry. (unit 4)	113	2A	Do	25·38·75·90	24/24	3.5-5.5
797.71 10	12 795.71			Do	too hard	0/24	8.5-10.5
792.71 15	Brown Mic. FtoM Sand, some silt, Dense, dry (unit 4)	>100	3A	Do	100/6"	6"/6"	13.5-15.5
787.71 20	20 787.71	>50	4A	Do	50/1"	0/24	18.5-20.5
782.71 25	Black, Brown, white Mic FtoC sand, some silt Dense, dry	>100	5A	Do	100/2"	2"/24	23.5-25.5
777.71 30		>100	6A	Do	100/2"	2"/24	28.5-30.5
772.71 35	(unit 4)	>50	7A	Do	50/0"	0/24	33.5-35.5
767.71 40	39 768.71						
762.71 45	Alternating Layers of Rock & partially weathered Rock (Unit 7)						
757.71 50		>50	8A	Do	50/0"	0/24	48.5-50.5
752.71 55							
747.71 60							
742.71 65	65 742.71						
737.71 70	Black & white Granite Schist (see Core log) (unit 8)						
732.71 75	71ft (736.71) End of Boring						

SAMPLE DESCRIPTION AND BORING NOTES

TopSoil < 6"

(1A) Brown Silt Some to and FtoM sand, firm dry, Organic Matter

(2A) Orange Brown FtoC Sand Some Silt Dense dry (last 6" had Sand & Silt more than the upper part of sample)

(3A) Brown Gray Micaceous FtoM Sand Some Silt Dense dry

(4A) No Sample Kept fall in was all thing in Sample - Black white weathered Rock Sand & Silt

(5A) Brown, Black, white Micaceous FtoC Sand some silt Dense Dry Weathered Rock,

(6A) Same as Sample 5A

11:40 Rig Broke
12:30 fixed Rig 5/14/87

Hollowstem Auger to 48.5'
50ft Casing
Roller Cone 67
Cored 71

Run #1

Golder Associates

Field Boring Log

DEPTH HOLE	41ft	JOB NO.	863-3407.41	PROJECT	WMI/Hydro/Kernersville N.C.	BORING NO.	P7D & 7S
DEPTH SOIL DRILL	26.5	GA INSP.	Greg Richardson	DRILLING METHOD	Hollow stem Augers, Roller Cone, Coring	SHEET	1 OF 1
DEPTH ROCK CORE	15	WEATHER	Clear	DRILLING COMPANY	ATEC	SURFACE ELEV.	767.79
NO. DIST. SA. ___ UD. SA. ___		TEMP.	70's	DRILL RIG	B61	DRILLER Dow S.	DATUM 769.50/769.77
DEPTH WL.	20' 3"	HRS. PROD.		WT. SAMPLER HAMMER	140lbs	DROP 30"	STARTED TIME 1:00 DATE 5/15/87
TIME WL.		HRS. DELAYED		WT. CASING HAMMER		DROP	COMPLETED TIME ' DATE 5/14/87

SAMPLE TYPES

A.S.	AUGER SAMPLE	BL	BLACK	M	MEDIUM	SA	SAMPLE
C.S.	CHUNK SAMPLE	BR	BROWN	MIC	MICACEOUS	SAT	SATURATED
D.O.	DRIVE OPEN	C	COARSE	MOT	MOTTLED	SD	SAND
D.S.	DENISON SAMPLE	CA	CASING	NP	NON-PLASTIC	SI	SILT
P.S.	PITCHER SAMPLE	CL	CLAY	OG	ORANGE	SIY	SILTY
R.C.	ROCK CORE	CLY	CLAYEY	ORG	ORGANIC	SM	SOME
S.T.	SLOTTED TUBE	F	FINE	PH	PRESSURE-HYDRAULIC	TR	TRACE,
T.O.	THIN-WALLED, OPEN	FRAG	FRAGMENTS	PM	PRESSURE-MANUAL	WL	WATER LEVEL
T.P.	THIN-WALLED, PISTON	GL	GRAVEL	R	RED	WH	WEIGHT OF HAMMER
W.S.	WASH SAMPLE	LYD	LAYERED	RES	RESIDUAL	Y	YELLOW
		LI	LITTLE	RX	ROCK		

SOIL DESCRIPTION - RANGE OF PROPORTION

"TRACE" - 0 - 5% "SOME" - 12 - 30%
"LITTLE" - 5 - 12% "AND" - 30-50%

RELATIVE DENSITY		BLOWS	CONSISTENCY		FINGER PRESSURE
VERY LOOSE	VLS	0-4	VERY SOFT	VS	EXTRUDES
LOOSE	LS	4-10	SOFT	S	MOLDS EASILY
COMPACT	CP	10-30	FIRM	FM	MOLDS
DENSE	DN	30-50	STIFF	ST	THUMB INDENTS
VERY DENSE	VDN	50	VERY STIFF	VST	THUMBNAIL INDENT
			HARD	H	RESISTS THUMBNAIL

ELEV. DEPTH	DESCRIPTION	BLOWS/FT	SAMPLES NO.	TYPE	HAMM. BLOWS PER 6 IN (FORCE)	REC/ATT	DEPTH	SAMPLE DESCRIPTION AND BORING NOTES
767.79	Tan clayey silt and Mic f to C Sand Firm to St. ff, moist to dry. (unit 1)	26	1A	Do	8·12·14·18	24/24	0-2	(1A) Tan Silt mixed f to C Sand with Clay Layers Firm, dry, 17" from top had 1" Quartz Lense Topsoil has been removed
762.79 5	6.5	44	2A	Do	21·24·20·43	24/24	3.5-5.5	
757.79 10	761.29 Black, white Mic f to C Sand, Some to and Silt, Dense to V. Dense, moist (unit 4)	24	3A	Do	10·10·14·19	8"/24	8.5-10.5	(2A) Tan and White Silt and Micaceous f to C Sand stiff, dry, 1" of Micaceous silt and sand that was damp 20" from Top of spoon
752.79 15		49	4A	Do	15·19·30·26	20/24	13.5-15.5	
747.79 20			5A	Do	23·50/2"	8"/24	18.5-20.5	(3A) Black & White Micaceous f to M Sand Some to and Sand, Firm, moist, bottom of sample had Tan streaks of silt
742.79 25	25		6A	Do	12·79	9/24	23.5-25.5	
	742.79 Black & white Granitic Gneiss and micaceous schist (See Core Log) (Unit 8)							(4A) Most of Sample same as sample 3A 17" From top of Spoon 1/2" Lense of Brown Mica f to C Sand some silt then went back into 3A material
737.79 30								
732.79 35								
727.79 40								(5A) Black & white Micaceous f to M Sand some to and silt moist, stiff to V. stiff, V Dense
722.79 45	41ft (726.79) End of Boring							Took water Level reading GS = 20:3"
								(6A) White tan Mica f to C Sand some silt Little f Gravel Weathered Rock, Sat Dense to V. Dense
								25ft Auger Refusal Change to Roller Cone from Bottom of Auger - Red Micaceous f to C Sand some to little silt with fragments of Quartz WATER Level from Ground Surface = 19.31 Set 27ft Casing Roller Cone 25 - 26.5 Cored 26.5 to 41

Golder Associates

Field Boring Log

DEPTH HOLE 79'	JOB NO. 863-3407.4	PROJECT WMI / Hydro / Kernersville N.C.				BORING NO. P8D, M, S	
DEPTH SOIL DRILL 79'	GA INSP. Greg Richardson	DRILLING METHOD Hollow stem Augers, Roller Cone				SHEET 1 OF 1	
DEPTH ROCK CORE	WEATHER Clear	DRILLING COMPANY ATEC				SURFACE ELEV. 747.84	
NO. DIST. SA. UD. SA.	TEMP. 70's	DRILL RIG B61		DRILLER Don S.		DATUM 749.57/750.35/750.86	
DEPTH WL. 6ft	HRS. PROD.	WT. SAMPLER HAMMER 140		DROP 30"		STARTED 1.00 (TIME) 5/16/87 (DATE)	
TIME WL. 1:50	HRS. DELAYED	WT. CASING HAMMER		DROP		COMPLETED 5:19 (TIME) 5/20/87 (DATE)	

SAMPLE TYPES

A.S.	AUGER SAMPLE	BL	BLACK
C.S.	CHUNK SAMPLE	BR	BROWN
D.O.	DRIVE OPEN	C	COARSE
D.S.	DENISON SAMPLE	CA	CASING
P.S.	PITCHER SAMPLE	CL	CLAY
R.C.	ROCK CORE	CLY	CLAYEY
S.T.	SLOTTED TUBE	F	FINE
T.O.	THIN-WALLED, OPEN	FRAG	FRAGMENTS
T.P.	THIN-WALLED, PISTON	GL	GRAVEL
W.S.	WASH SAMPLE	LYO	LAYERED
		LI	LITTLE

ABBREVIATIONS

M	MEDIUM	SA	SAMPLE
MIC	MICACEOUS	SAT	SATURATED
MOT	MOTTLED	SD	SAND
NP	NON-PLASTIC	SI	SILT
OG	ORANGE	SIY	SILTY
ORG	ORGANIC	SM	SOME
PH	PRESSURE-HYDRAULIC	TR	TRACE
PM	PRESSURE-MANUAL	WL	WATER LEVEL
R	RED	WH	WEIGHT OF HAMMER
RES	RESIDUAL	Y	YELLOW
RX	ROCK		

SOIL DESCRIPTION - RANGE OF PROPORTION

"TRACE" - 0 - 5% "SOME" - 12 - 30%
"LITTLE" - 5 - 12% "AND" - 30-50%

RELATIVE DENSITY		BLOWS	CONSISTENCY		FINGER PRESSURE
VERY LOOSE	VLS	0-4	VERY SOFT	VS	EXTRUDES
LOOSE	LS	4-10	SOFT	S	MOLDS EASILY
COMPACT	CP	10-30	FIRM	FM	MOLDS
DENSE	DN	30-50	STIFF	ST	THUMB INDENTS
VERY DENSE	VDN	50	VERY STIFF	VST	THUMBNAIL INDENT
			HARD	H	RESISTS THUMBNAIL

ELEV. DEPTH	DESCRIPTION	BLOWS/FT	SAMPLES NO.	TYPE	HAMM. BLOWS PER 6 IN (FORCE)	REC/ATT	DEPTH
747.84	0.6 TOPSOIL	11	1A	Do	13·6·5·5	24/24	0-2
742.84 5	Tan Clayey silt some to and Mic. f to M Sand, firm to stiff, moist to dry (unit 2) 8	4	2A	Do	3·2·2·2	8/24	3.5-5.5
737.84 10	739.84	14	3A	Do	5·7·7·10	15/24	8.5-10.5
732.84 15	White, tan, Mic. f to C Sand, Some to and silt, Dense, moist (Unit 4)	27	4A	Do	9·11·16·20	18/24	13.5-15.5
727.84 20		36	5A	Do	14·14·22·26	24/24	18.5-20.5
722.84 25		58	6A	Do	12·22·36·32	13/24	23.5-25.5
717.84 30	27 / 720.84	44	7A	Do	13·19·25·50/4"	15/24	28.5-30.5
712.84 35	Tan, pink Mic. f to C Sand and silt, V. dense, dry (unit 4)	81	8A	Do	20·24·57	13/18	33.5-35
707.84 40		127	9A	Do	29·47·80/4"	12/18	38.5-40
702.84 45		113	10A	Do	36·47·66	6"/18	43.5-45
697.84 50		>100	11A	Do	37·100/6"	6/12	48.5-50
692.84 55		>100	12A	Do	6"/6"	4"/6	55-57
687.84 60	61 / 686.84	38	13A	Do	17·16·22·23	18/24	60-62
682.84 65	Brown Silt Some f Sand Dense, dry, (Pink & Purple Streaks and Green Specks) (Unit 5)	40	14A	Do	13·17·23·24	24/24	65-67
677.84 70	74						
672.84 75	673.84 White, pink f to C Sand, Some Silt, Dense, Dry to moist, Fragmented Rock	>100	15A	Do	23·50/2"	6/6"	74-76
667.84 80	79ft End of Boring 668.84						

SAMPLE DESCRIPTION AND BORING NOTES

TOPSoil - Dark Br. Clayey Silt Some f to M Sand moist, Organic matter (5")
(1A) Tan Clayey Silt Some to And f to M Sand, little to trace clay, Firm dry (19")
(2A) Tan Br. Clayey Silt and f to M Sand, Soft, moist, little organic matter
(3A) White, Gray, Tan f to C Sand Some to and silt, moist, firm to Compact, weathered Rock Fragments
(4A) White Gray Tan f to C Micaceous Sand Some to And Silt moist, stiff, Rose Quartz Lense scattered throughout sample (weathered Rock) water (1.41)
(5A) Same as sample 4A last 2" Pink Saprolite
2.00 Rig broke down Augered Depth 23.5
5/26/87 3:04
(6A) White tan f to C Micaceous Sand, Some to and Silt, dense, moist to Sat, Rose Quartz Lense
(7A) Tan, pink, f to C Micaceous Sand and Silt, V. Dense, moist, had streaks of pink Clayey silt
(8A) Tan, Pink, f to C Micaceous Sand and Silt, Fragmented Rock, Quartz throughout the sample, V. Dense, Moist, (first 4" of sample was white fragmented Rock)
(9A) Same as sample #8A (Fragmented Quartz)
(10A) Tan Pink white f to C sand and Silt Pink silt streaks, V. Dense, dry
(11A) Tan silt and f to M Micaceous sand Dense to Hard, dry
4/27/87 set 52ft Casing started Roller Cone at 1.00
(12A) Reddish Brown Tan f to M Sand and to some silt Dense to V. Dense, Dry Soft 58ft
(13A) Tan Pink Micaceous f to C Sand and Silt Compact, dry to moist 4"
(13B) Orange Silt Some f Sand purple & Pink streaks, Compact, Dry to Moist (14")
(14A) Same as sample 13B but with Green specks
74ft Hard
(15A) Same as sample 13A, White Pink f to C Sand, Some Silt Fragments Quartz Dense, dry to Moist

TEMPORARY PIEZOMETER INSTALLATION LOG

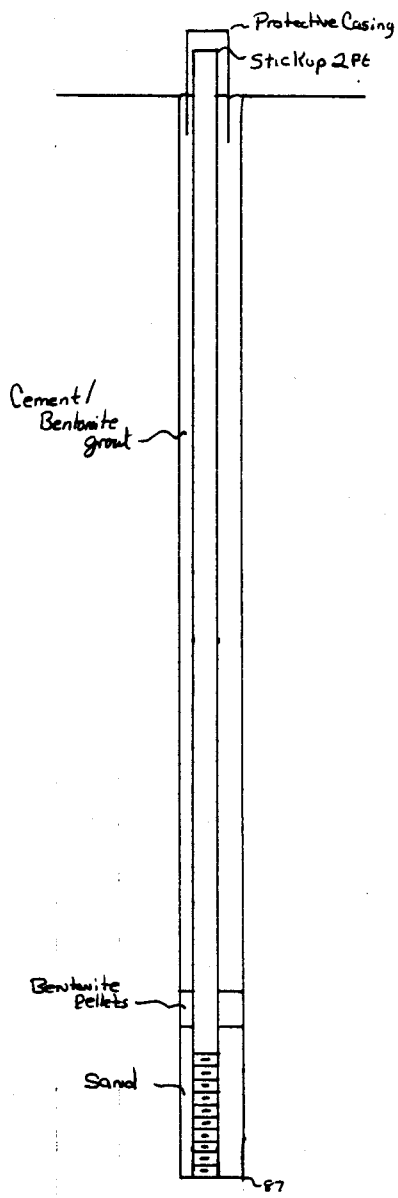
JOB NO. 863-3407.4	PROJECT WMI / Hydro / Kernersville N.C.	WELL NO. PIDD	SHEET 1 OF 1
GA INSP. Greg Richardson	DRILLING METHOD Roller Cone, Coring	GROUND ELEV. 841.55	WATER DEPTH
WEATHER P.C.	DRILLING COMPANY ATEC	COLLAR ELEV. 843.55	DATE/TIME
TEMP. 80	DRILL RIG B61 / DRILLER Dan S.	STARTED 1:00 (TIME) / 5/28/87 (DATE)	COMPLETED 3:30 (TIME) / 5/31/87 (DATE)

MATERIALS INVENTORY

WELL CASING 3/4" in. dia. ___ l.f.	WELL SCREEN 3/4" in. dia. 10' l.f.	BENTONITE SEAL 1 bucket
CASING TYPE	SCREEN TYPE Machine slot	INSTALLATION METHOD Poured from top
JOINT TYPE Flush Threaded	SLOT SIZE	FILTER PACK QTY 2 bags
GROUT QUANTITY	CENTRALIZERS NA	FILTER PACK TYPE Coarse Sand
GROUT TYPE Cement / Bentonite	DRILLING MUD TYPE Bentonite	INSTALLATION METHOD Poured from top

ELEV./DEPTH	SOIL/ROCK DESCRIPTION
841.55	GROUND SURFACE
0.0	Tan Clayey Silt, Some to and Mic. FtoC Sand, Firm to stiff, Dry to moist (unit 3)
839.47	
836.55/5	
831.55/10	Multi-Colored Brown Mic FtoC Sand, Some Silt, Dense to V. Dense, Dry to moist (unit 4)
826.55/15	
821.55/20	
816.55/25	26
815.47	
811.55/30	
806.55/35	Alternating Layers of Rock & Partially Weathered Rock (unit 7)
801.55/40	
796.55/45	
791.55/50	
786.55/55	
781.55/60	60
781.47	
776.55/65	
771.55/70	Competent Rock (see Core Logs) (unit 8)
766.55/75	
761.55/80	
756.55/85	87
754.55	
751.55/90	END of Boring

WELL SKETCH



INSTALLATION NOTES

PIDD

Screen	10
Casing	
8 X 9.9	79.2
total Length of Pipe	89.2
Stickup	

WELL DEVELOPMENT NOTES

Unable to air lift water From piezometer

TEMPORARY PIEZOMETER INSTALLATION LOG

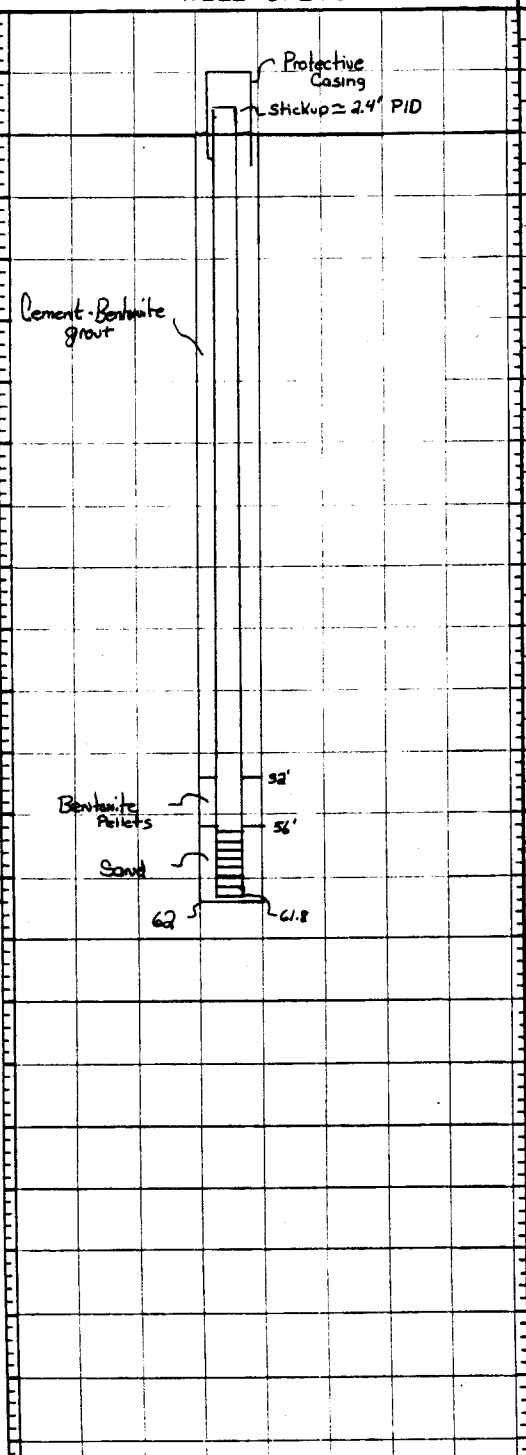
JOB NO. 863-3407.4	PROJECT WMI / Hydro / Kernersville N.C	WELL NO. PID	SHEET 1 OF 1
GA INSP. Greg Richardson	DRILLING METHOD Hollow stem Augers, Roller Cone, Coring	GROUND ELEV. 841.47	WATER DEPTH
WEATHER PC Sunny	DRILLING COMPANY ATEC	COLLAR ELEV. 843.87	DATE/TIME
TEMP. 60-70	DRILL RIG B61 / DRILLER Jim Mann	STARTED 1.00 PM 4/28/87 (TIME / DATE)	COMPLETED 4:30 4/28/87 (TIME / DATE)

MATERIALS INVENTORY

WELL CASING 3/4 in. dia. 59.5' l.f.	WELL SCREEN 3/4 in. dia. 5.1' l.f.	BENTONITE SEAL 1/4 Bucket Bentonite Pellets
CASING TYPE PVC	SCREEN TYPE Machine slot	INSTALLATION METHOD Poured from Top
JOINT TYPE Flush Threaded	SLOT SIZE	FILTER PACK QTY 1/2 bag Sand
GROUT QUANTITY 4 bag Cement, 1/2 bag Bentonite	CENTRALIZERS N/A	FILTER PACK TYPE Coarse Sand
GROUT TYPE Cement, Bentonite	DRILLING MUD TYPE None	INSTALLATION METHOD Poured from Top

ELEV./DEPTH	SOIL/ROCK DESCRIPTION
841.47	GROUND SURFACE
0.0	Tan clayey silt, some fine and Mic. Fine Sand, trace of AF Organics (unit 2)
3 / 839.47	
836.47/5	
831.47/10	Multi-colored, Brown Micaceous F to C Sand, Some Silt, Dense to V. Dense Dry to moist.
826.47/15	
821.47/20	
816.47/25	26 (unit 4)
815.47	
811.47/30	
806.47/35	Alternating Layers of Rock and Partially Weathered Rock
801.47/40	
796.47/45	
791.47/50	
786.47/55	
781.47/60	60 (unit 7)
781.47	Competent Rock (unit 8)
62	END of Boring
776.47/65	

WELL SKETCH



INSTALLATION NOTES

Had to set 2 casings to keep borehole open, The 4" casing was set to 41 ft and the 3" casing was set to 52 ft. Before work started Water Level was 39'4".

PID

Screen	5.1'
Casing 6 - 9.9	59.4
Total length of Pipe	64.5
Cutoff	.3
stickup	2.4

WELL DEVELOPMENT NOTES

After well was installed the Piezometer went dry. The water Levels that had been read earlier were tropped drilling water that had not moved thru the materials.

TEMPORARY PIEZOMETER INSTALLATION LOG

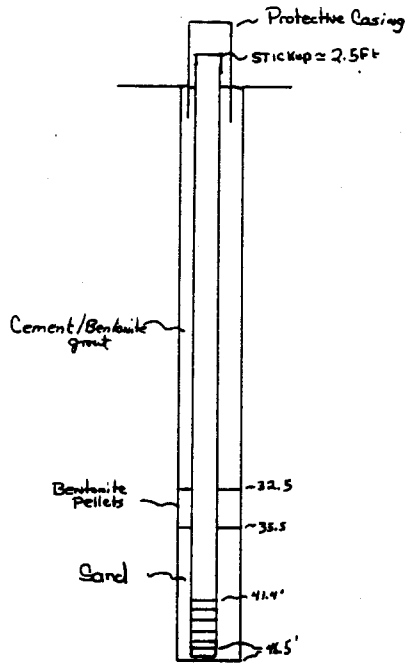
JOB NO. 863-3407.4	PROJECT WMI / Hydro / Kernersville N.C.	WELL NO. PIS	SHEET 1 OF 1
GA INSP. Greg Richardson	DRILLING METHOD Roller Cone, Cored	GROUND ELEV. 841.37	WATER DEPTH
WEATHER Clear, Sunny, Windy	DRILLING COMPANY ATEC	COLLAR ELEV. 843.87	DATE/TIME
TEMP. 60-70°	DRILL RIG B61 / DRILLER Don S.	STARTED 11:00 (TIME) / 4/28/87 (DATE)	COMPLETED (TIME) / 4/29/87 (DATE)

MATERIALS INVENTORY

WELL CASING 3/4" in. dia. 44.8' l.f.	WELL SCREEN 3/4" in. dia. 5.1' l.f.	BENTONITE SEAL 1 bucket
CASING TYPE PVC	SCREEN TYPE Machine Slot	INSTALLATION METHOD Pour from top
JOINT TYPE Flush threaded	SLOT SIZE	FILTER PACK QTY 2 bags
GROUT QUANTITY	CENTRALIZERS NA	FILTER PACK TYPE Coarse Sand
GROUT TYPE Cement / Bentonite	DRILLING MUD TYPE Light Bentonite mud (only used above screened area)	INSTALLATION METHOD Poured from top

ELEV./DEPTH	SOIL / ROCK DESCRIPTION
841.37	GROUND SURFACE
0.0	Tan Clayey silt, some fine and med. Black Sand, from top 0-3 Dry to moist (unit 2)
836.37/5	3 / 839.47
831.37/10	multi-colored Brown Med. f to C Sand, Some Silt, Dense to V. Dense, Dry to moist. (unit 4)
826.37/15	
821.37/20	
816.37/25	26 / 815.47
811.37/30	Alternating Layers of Rock + Partially Weathered Rock (unit 7)
806.37/35	
801.37/40	
796.37/45	46.5 / 794.87
791.37/50	End of Boring 46.5'

WELL SKETCH



INSTALLATION NOTES

Calculation mistake lead to a 11ft sandpack instead of 7ft.

PIS

screen	5.1'
Casing	
4 - 9.9	39.6'
1 - 5.9	4.9'
total Length of Pipe	49.6
stickup	2.5
cutoff	.6

WELL DEVELOPMENT NOTES

Piezometer Dry

TEMPORARY PIEZOMETER INSTALLATION LOG

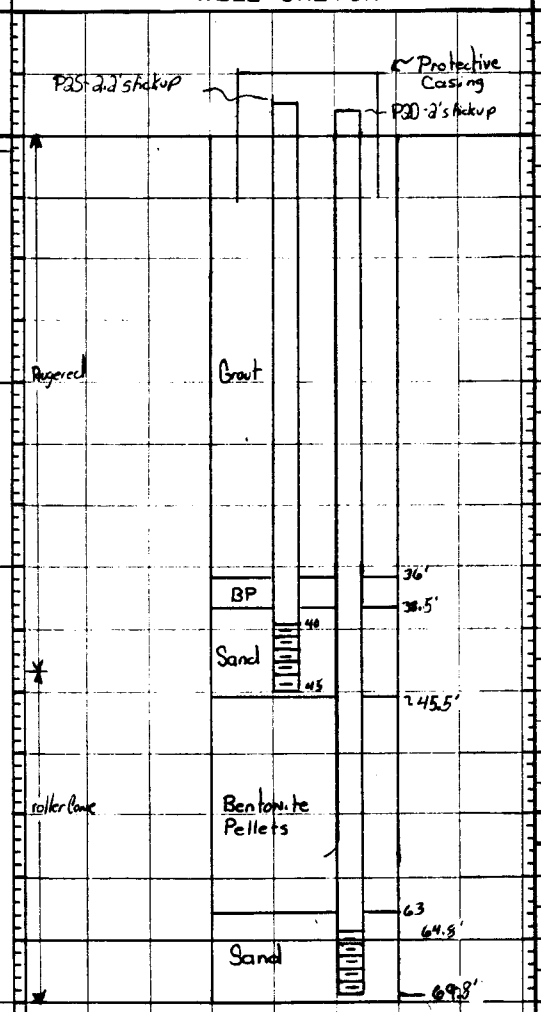
JOB NO. 863-3407.4	PROJECT WMI / Hydro / Kernersville N.C.	WELL NO. P2D & P2S	SHEET 1 OF 1
GA INSP. Greg Richardson	DRILLING METHOD Hollow Stem Augers, Roller Cone	GROUND ELEV. 821.40	WATER DEPTH
WEATHER Clear, Sunny	DRILLING COMPANY ATEC	COLLAR ELEV. 823.35/823.66	DATE/TIME
TEMP. 80's	DRILL RIG B61	DRILLER Don S.	STARTED 11:00 (TIME) 5/1/87 (DATE) COMPLETED 5:00 (TIME) 5/1/87 (DATE)

MATERIALS INVENTORY

WELL CASING	3/4 in. dia. 69'5" / 44'7" l.f.	WELL SCREEN	3/4 in. dia. 5'1" / 5'1" l.f.	BENTONITE SEAL	2.5 buckets of Bentonite Pellets
CASING TYPE	PVC	SCREEN TYPE	Machine Slot	INSTALLATION METHOD	Poured from TOP
JOINT TYPE	Flush Threaded	SLOT SIZE		FILTER PACK QTY	1 bag Sand
GROUT QUANTITY	5 bags Cement, ½ bag Bentonite	CENTRALIZERS	NA	FILTER PACK TYPE	Coarse Sand
GROUT TYPE	Cement, bentonite	DRILLING MUD TYPE	Bentonite	INSTALLATION METHOD	Poured from Top

ELEV./DEPTH	SOIL/ROCK DESCRIPTION
	GROUND SURFACE
0.0 821.40	1.2 TOPSOIL 820.2
5 / 816.40	Red Clayey, silt some to and M.c. f to M Sand, trace clay, moist, firm (unit 2)
10 / 811.40	
15 / 806.40	
20 801.4	20 801.40
25 / 796.4	Brown, Black, white Silt and M.c. f Sand, moist, firm. (unit 4)
30 / 791.4	
35 / 786.4	35 786.40
40 / 781.40	
45 / 776.40	White tan M.c. f to C Sand, Some to and s. lt, moist to Sat, Dense (unit 4)
50 / 771.40	
55 / 766.40	
60 / 761.40	
65 / 756.40	
70 / 751.40	70 ft (751.40) End of Boring

WELL SKETCH



INSTALLATION NOTES

P2D

5'1" Screen	5'1"
7 - 9'11" Casing	69'5"
Total Length Pipe =	74'6"
Cutoff =	2'9"
Stickup =	2'

P2S

5'1" Screen	5'1"
4 - 9'11" Casing	39'8"
1 - 4'11" Casing	4'11"
Total length Pipe =	49'8"
Cutoff	2'6"
Stickup =	2'3"

Set 60 ft Temporary Casing

WELL DEVELOPMENT NOTES

Piezometers were developed using a oilless air compressor to air lift the water from the Piezometer

P2D

Date	WLtoc	WLGS	PH	Cond
5/12/87	37.5	35.5		
5/14/87	37.2	35.2		
5/15/87	37.3	35.3		
5/17/87	37.1	35.1		
5/17/87 PM	37.1	35.1		
5/18/87	37.1	35.1		
5/19/87	37.3	35.3		

P2S

Date	WLtoc	WLGS	PH	Cond
5/12/87	36'	33.8		
5/14/87	38.2'	36.0		
5/15/87	38'	37.8		
5/16/87	37.4	35.2		
5/17/87	37.5	35.3		
5/18/87	37.7	35.5		

TEMPORARY PIEZOMETER INSTALLATION LOG

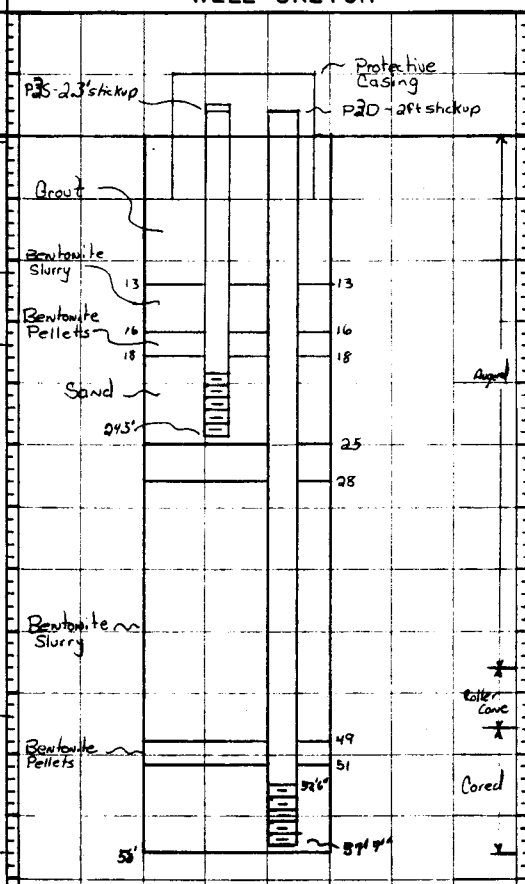
JOB NO. 863-3407.4	PROJECT WMI/Hydro/Kernersville N.C.	WELL NO. P3D&S	SHEET 1 OF 1
GA INSP. Greg Richardson	DRILLING METHOD Hollow stem Augers, Roller Cone, Coring	GROUND ELEV. 759.27	WATER DEPTH
WEATHER Rain	DRILLING COMPANY ATEC	COLLAR ELEV. 761.26/761.59	DATE/TIME
TEMP. 50's	DRILL RIG B61 DRILLER Don S.	STARTED 4:00 (TIME) / 5/4/87 (DATE)	COMPLETED 2:00 (TIME) / 5/6/87 (DATE)

MATERIALS INVENTORY

WELL CASING 3/4" in. dia. 54' 6" 19' 10" l.f.	WELL SCREEN 3/4 in. dia. 5'1" 5'1" l.f.	BENTONITE SEAL 1½ Buckets
CASING TYPE PVC	SCREEN TYPE Machine Slot	INSTALLATION METHOD Poured from top
JOINT TYPE Flush Threaded	SLOT SIZE	FILTER PACK QTY 1 Bag Sand
GROUT QUANTITY 2.5 Bags Cement ½ Bentonite	CENTRALIZERS NA	FILTER PACK TYPE Coarse Sand
GROUT TYPE Cement, Bentonite	DRILLING MUD TYPE NONE	INSTALLATION METHOD Poured from top

ELEV./DEPTH	SOIL/ROCK DESCRIPTION
	GROUND SURFACE
0.0 759.27	0.25 TOPSOIL
5/754.27	Red Brown Silt, Some to and M.c. f to C Sand, Firm to stiff, moist (unit 3)
10/749.27	11
	748.27 Black Brown, wh to M.c. f to C Sand, Some S. lt, firm to stiff moist (unit 4)
15/744.27	17
	742.27
20/739.27	
25/734.27	Reddish Brown M.c. f to C Sand, Some S. lt, V. Dense moist (unit 4)
30/729.27	
35/724.27	
40/719.27	
45/714.27	47
	712.27
50/709.27	Black & White Granitic Schist & Gneiss (see core log)
55/704.27	
60/699.27	58 ft (701.27) End of Boring

WELL SKETCH



INSTALLATION NOTES

Water Swivel Broke and there is a chance some grease got into the Well. Lost 10 ft of Casing and Casing Bit. Between 49 - 34 ft

P3D

5'1" Screen	5'1"
1 - 4'11" Casing	4'11"
5 - 9'11" Casing	49' 7"
Total Length Pipe	59' 7"
stickup	2'

P3S

5'1" Screen	5'1"
2 - 9'11" Casing	19'10"
Total Length Pipe	24' 11"
Stickup	2' 4"

Set 50 ft of Temporary Casing

WELL DEVELOPMENT NOTES

Piezometers were Developed using a oilless air compressor to air lift the water from the Piezometers.

P3D

WL TOC	WL GS	PH	Cond	Date
10'1"	8'1"			5/14
10'1"	8'1"	8.07		5/17
10'1.5"	8'1.5"			5/18

P3S

Date	WL TOC	WL GS	PH	Cond
5/14/87	11'	8'8"		
5/17/87	11'	8'8"	9.43	
5/18/87	11'	8'8"		

TEMPORARY PIEZOMETER INSTALLATION LOG

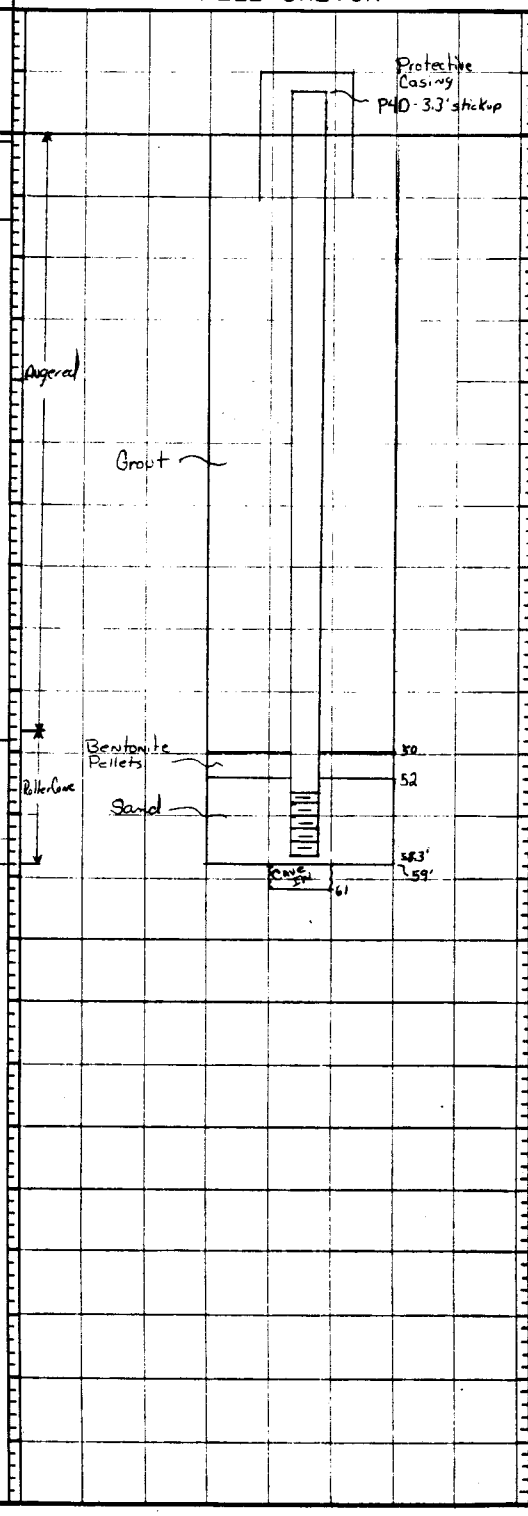
JOB NO. 863-3407.4	PROJECT WMI/Hydro/Kernersville N.C.	WELL NO. P4D	SHEET 1 OF 1
GA INSP. Greg Richardson	DRILLING METHOD Hollow stem Augers, Roller Cone, Coring	GROUND ELEV. 782.48	WATER DEPTH 32'
WEATHER Clear, Windy	DRILLING COMPANY ATEC	COLLAR ELEV. 785.78	DATE/TIME 8:00 5/12/87
TEMP. 70's	DRILL RIG B61 DRILLER Don S.	STARTED 12:45 5/12/87 (TIME / DATE)	COMPLETED 3:00 5/12/87 (TIME / DATE)

MATERIALS INVENTORY

WELL CASING 3/4 in. dia. 54.5' l.f.	WELL SCREEN 3/4 in. dia. 5'1" l.f.	BENTONITE SEAL ½ bucket Bentonite Pellets
CASING TYPE PVC	SCREEN TYPE Machine Slot	INSTALLATION METHOD Poured from top
JOINT TYPE flush threaded	SLOT SIZE	FILTER PACK QTY ½ bag Sand
GROUT QUANTITY	CENTRALIZERS NA	FILTER PACK TYPE Coarse Sand
GROUT TYPE Cement Bentonite	DRILLING MUD TYPE None	INSTALLATION METHOD Poured from Top

ELEV./DEPTH	SOIL/ROCK DESCRIPTION
	GROUND SURFACE
0.0 782.48	.7 topsoil
	Red Silty Clay, trace f Sand firm, moist, Organic Matter (unit 2)
5/777.48	7
	775.48
10/772.48	
15/767.48	White, tan Silt, little f to M Sand, moist, firm. (unit 3)
20/762.48	
25/757.48	
30/752.48	
35/747.48	
40/742.48	
45/737.48	
	49
	733.48
50/732.48	Brown, tan Micaceous f to C Sand, some silt, moist stiff. (unit 4)
55/727.48	
	59 ft (723.48) End of Boring
60/722.48	

WELL SKETCH



INSTALLATION NOTES

P4D

Screen	5.1'
Casing	
5 - 9.9'	49.5
2 - 4.9'	9.8
Total Length	64.4'
cutoff	2.8'
	61.6'
stickup	3.3'

Set 50 ft Temporary Casing

WELL DEVELOPMENT NOTES

Piezometers were developed using a oilless air compressor to air lift the water from the piezometer

P4D

Date	WL TOC	WL GS	PH	Cond
5/14/87				
5/14/87 PM	30.5'	29.3		} change stickup
5/16/87	30.5'	29.3		
5/17/87	32.7'	29.4		
5/18/87	32.7	29.4		

TEMPORARY PIEZOMETER INSTALLATION LOG

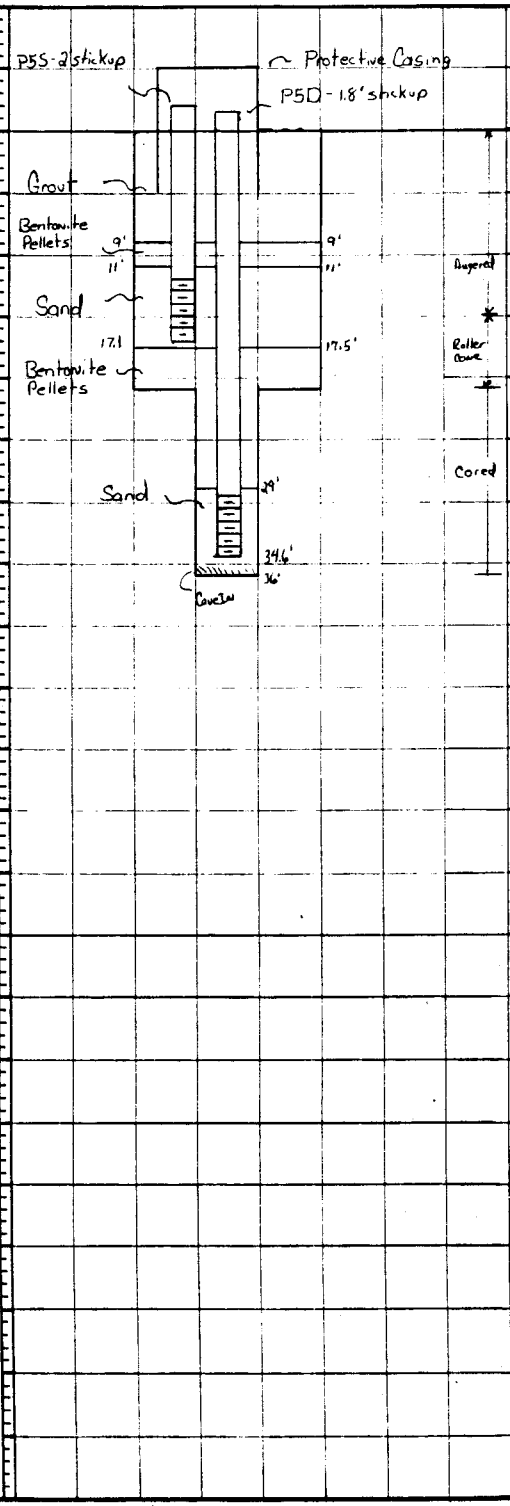
JOB NO. 863-3407.4	PROJECT WMI / Hydro / Kernersville N.C.			WELL NO. P5D & P5S		SHEET 1 OF 1	
GA INSP. Greg Richardson	DRILLING METHOD Hollow stem Auger, Roller Cone, Coring			GROUND ELEV. 755.96		WATER DEPTH 12ft	
WEATHER Cloudy, Rain	DRILLING COMPANY ATEC			COLLAR ELEV. 757.75/757.92		DATE/TIME 5/12/87 8:00	
TEMP. 60-70	DRILL RIG B61	DRILLER Don S.		STARTED 6:40 (TIME) / 5/12/87 (DATE)		COMPLETED 7:40 (TIME) / 5/12/87 (DATE)	

MATERIALS INVENTORY

WELL CASING 3/4 in. dia. 31.3'/14' l.f.	WELL SCREEN 3/4 in. dia. 5.1'/5.1' l.f.	BENTONITE SEAL 1/4 bucket Bentonite Pellets
CASING TYPE PVC	SCREEN TYPE Machine Slot	INSTALLATION METHOD Poured from Top
JOINT TYPE Flush threaded	SLOT SIZE	FILTER PACK QTY. 1 bag of Sand
GROUT QUANTITY 3 Bags Cement 1/4 bag Bentonite	CENTRALIZERS NA	FILTER PACK TYPE Coarse Sand
GROUT TYPE Cement Bentonite	DRILLING MUD TYPE NA	INSTALLATION METHOD Poured from top

ELEV./DEPTH	SOIL/ROCK DESCRIPTION
	GROUND SURFACE
0.0/755.96	Tan Clayey Silt and M.c. f to C Sand, firm, dry (unit 2)
	4
5/750.96	751.96 Brown, Black, white Mic. f to C Sand, some silt, moist, compact (unit 4)
	7
	748.96
10/745.96	white, Black, Green Mic. f to C Sand little silt, moist V. Dense (unit 4)
15/740.96	
	20
20/735.96	735.96
25/730.96	Black, white Granitic Gneiss & Schist
30/725.96	
35/720.96	36ft (719.96) End of Boring
40/715.96	

WELL SKETCH



INSTALLATION NOTES

P5D	
Screen	5.1'
Casing	
3 - 9.9'	29.7
1 - 4.9'	4.9
Total length pipe	39.7'
Cutoff	3.3'
stickup	1.8'
P5S	
Screen	5.1'
Casing	
1 - 9.9'	9.9
1 - 4.9	4.9
Total Length pipe	19.9'
Cutoff	.8
stickup	2ft

Set Temporary Casing 15ft

WELL DEVELOPMENT NOTES

Piezometers were developed using a oilless air compressor to air lift the water from the piezometers

P5D

Date	WLtoc	WLgs	PH	Cond
5/14/87	4.3'	2.5'		
5/17/87	4.3'	2.5'		
5/17/87 PM	4.3'	2.5'	6.84	
5/18/87	4.3'	2.5'		

P5S

Date	WLtoc	WLgs	PH	Cond
5/14/87	5.8'	3.8		
5/17/87	5.8'	3.8		
5/17/87	5.8'	3.8	7.14	
5/18/87	5.7	3.7		

TEMPORARY PIEZOMETER INSTALLATION LOG

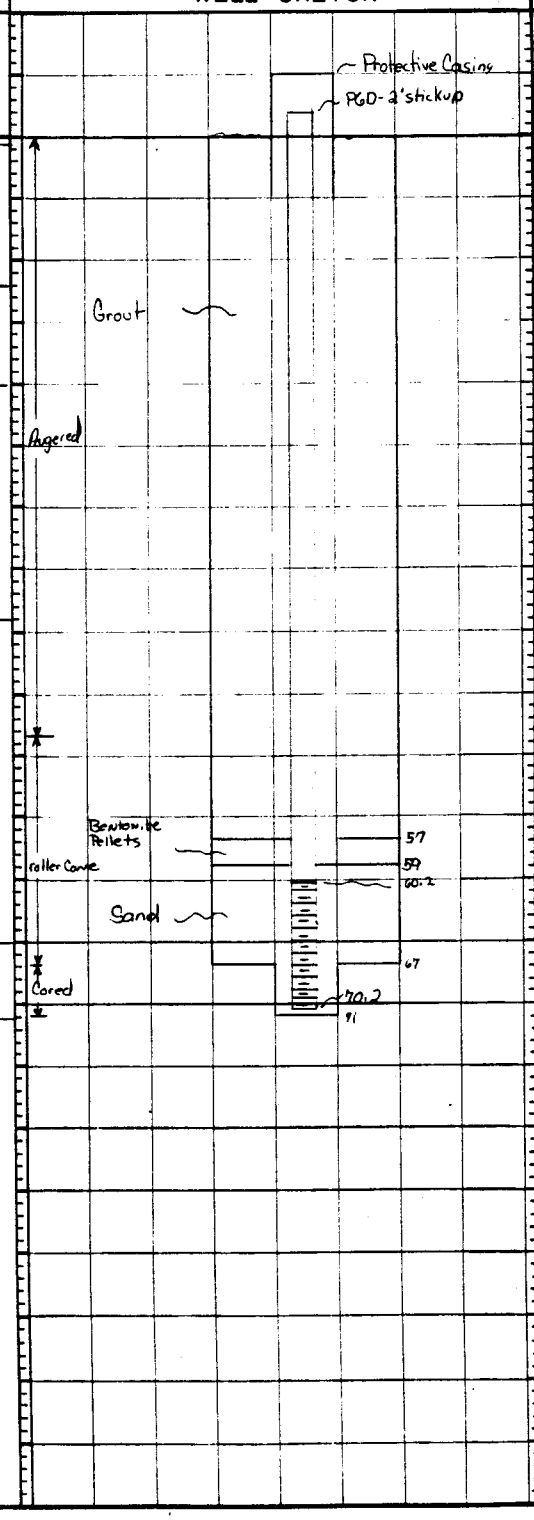
JOB NO. 863-3407.4	PROJECT WMI / Hydro / Kernersville N.C.	WELL NO. P6D	SHEET 1 OF 1
GA INSP. Greg Richardson	DRILLING METHOD Hollow stem Augers, Roller Cone, Coring	GROUND ELEV. 807.71	WATER DEPTH 60 ft
WEATHER PC Cool	DRILLING COMPANY ATEC	COLLAR ELEV. 811.71	DATE/TIME 5/15/87 8:30
TEMP. 60's	DRILL RIG B61 / DRILLER Don S.	STARTED 8:40 (TIME) / 5/5/87 (DATE)	COMPLETED 12:00 (TIME) / 5/15/87 (DATE)

MATERIALS INVENTORY

WELL CASING 3/4 in. dia. ___ l.f.	WELL SCREEN 3/4" in. dia. 10' l.f.	BENTONITE SEAL 1/2 bucket Bentonite Pellets
CASING TYPE PVC	SCREEN TYPE Machine slot	INSTALLATION METHOD Poured from top
JOINT TYPE Flush threaded	SLOT SIZE ___	FILTER PACK QTY 3/4 bag of Sand
GROUT QUANTITY 8 bags Cement / bag bentonite	CENTRALIZERS NA	FILTER PACK TYPE Coarse Sand
GROUT TYPE Cement, bentonite	DRILLING MUD TYPE None	INSTALLATION METHOD Poured from top

ELEV./DEPTH	SOIL/ROCK DESCRIPTION
	GROUND SURFACE
0.0 807.71	0.5 Topsoil
5/802.71	Orange Brown Mic. F to C Sand, Some Silt, Dense Dry. (unit 4)
10/797.71	12 795.71
15/792.71	Brown Mic. F to M Sand, Some silt, Dense, dry. (unit 4)
20/787.71	20 787.71
25/782.71	Black, Brown, white Mic. F to C sand, some silt Dense, dry (unit 4)
30/777.71	
35/772.71	
	39 768.71
40/767.71	
45/762.71	Alternating Layers of Rock & partially weathered Rock (unit 7)
50/757.71	
55/752.71	
60/747.71	
	65 742.71
65/742.71	Black, white Granitic Schist (see core log) (unit 8)
70/737.71	71ft (73.71) End of Boring
75/732.71	

WELL SKETCH



INSTALLATION NOTES

Finished Coring 5/14/87 TD 71
Let well set overnight before setting Piezometer. After terminating Coring the water Level drop to 44ft from Top of Casing. Decided to use a bailer to Lower Water Level to make sure well was making water. Bailed down to 56ft before going home for the night. The next morning 5/15/87 the water Level was 60ft from top of Casing well was bailed twice to 61 ft and each time the water level rose back to 60ft. To prevent dry well a 10ft screen and a 12ft sand pack was used.

P6D
Screen 10'
Casing 9.9
total Length Pipe 74.
Cutoff 2.2'
Stickup 2'

WELL DEVELOPMENT NOTES

Set 50ft Temporary Casing

Piezometer Could not be Developed due to lack of Water to air lift from Piezometer.

TEMPORARY PIEZOMETER INSTALLATION LOG

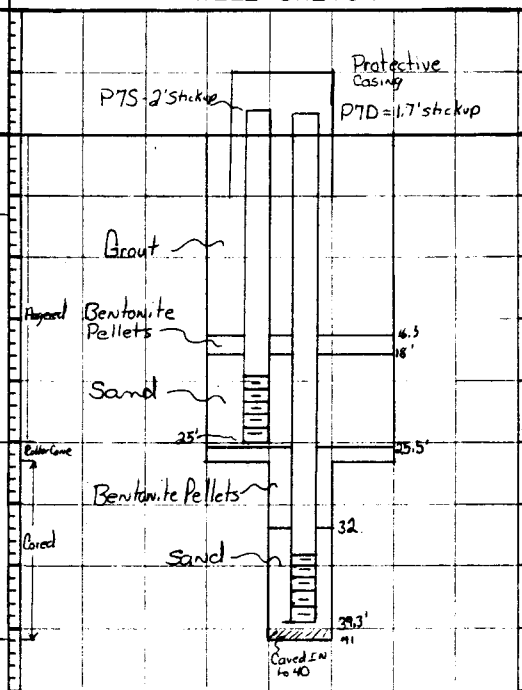
JOB NO. 863-3407.4	PROJECT WMI / Hydro / Kernersville N.C.	WELL NO. P7D, P7S	SHEET 1 OF 1
GA INSP. Greg Richardson	DRILLING METHOD Hollowstem Augers, Roller Cone, Coring	GROUND ELEV. 767.79	WATER DEPTH
WEATHER Clear	DRILLING COMPANY ATEC	COLLAR ELEV. 769.50/769.77	DATE/TIME
TEMP. 70's	DRILL RIG B61	DRILLER Dan S.	STARTED 10:00 (TIME) 5/16/87 (DATE) COMPLETED 10:55 (TIME) 5/16/87 (DATE)

MATERIALS INVENTORY

WELL CASING 3/4 in. dia. 35.9/21.9 l.f.	WELL SCREEN 3/4 in. dia. 5.1'/5.1' l.f.	BENTONITE SEAL 2 Buckets Bentonite Pellets
CASING TYPE PVC	SCREEN TYPE Machine slot	INSTALLATION METHOD Poured from Top
JOINT TYPE Flush threaded	SLOT SIZE	FILTER PACK QTY. 2 bag
GROUT QUANTITY 4 Bags Cement ½ bag Bentonite	CENTRALIZERS NA	FILTER PACK TYPE Coarse Sand
GROUT TYPE Cement, Bentonite	DRILLING MUD TYPE None	INSTALLATION METHOD Poured from Top

ELEV./DEPTH	SOIL/ROCK DESCRIPTION
	GROUND SURFACE
0.0/767.79	Tan Clayey Silt and Mic f to C Sand, Firm to stiff moist to dry. (Unit 1)
5/762.79	6.5 / 761.29
10/757.79	Black, white Mic f to C Sand, Some to and Silt, Dense to V. Dense, moist. (Unit 4)
15/752.79	
20/747.79	25
25/742.79	742.79
30/737.79	Black & white Granitic Gneiss, and micaceous schist (See Core Logs) (Unit 8)
35/732.79	
40/727.79	41 ft (726.79) End of Boring
45/722.79	

WELL SKETCH



INSTALLATION NOTES

P7D

Screen	5.1'
Casing	
4 - 9.9'	39.6'
Total Length	44.7'
Cutoff 3.7'	
Stickup 1.7	

P7S

Screen	5.1'
Casing	
2 - 9.9'	19.8'
1 - 4.9'	4.9'
Total length	29.8'
Cutoff	2.8'
Stickup	2 ft

Set Temporary Casing 27 ft

WELL DEVELOPMENT NOTES

Piezometers were developed using a oilless air compressor to air lift the water from the piezometers.

P7D

Date	WLTOC	WLGS	PH	Cond
5/17/87 AM	20.1'	18.4		
5/17/87 AM	20.4'	19.7		
5/17/87 PM	20.1'	19.4		
5/18/87	21.1'	19.4		

P7S

Date	WLTOC	WLGS	PH	Cond
5/17/87	19.9'	17.9'		
5/17/87	19.9'	17.9'		
5/17/87 AM	19.9'	17.9'		
5/18/87	20.2'	18.2'		

TEMPORARY PIEZOMETER INSTALLATION LOG

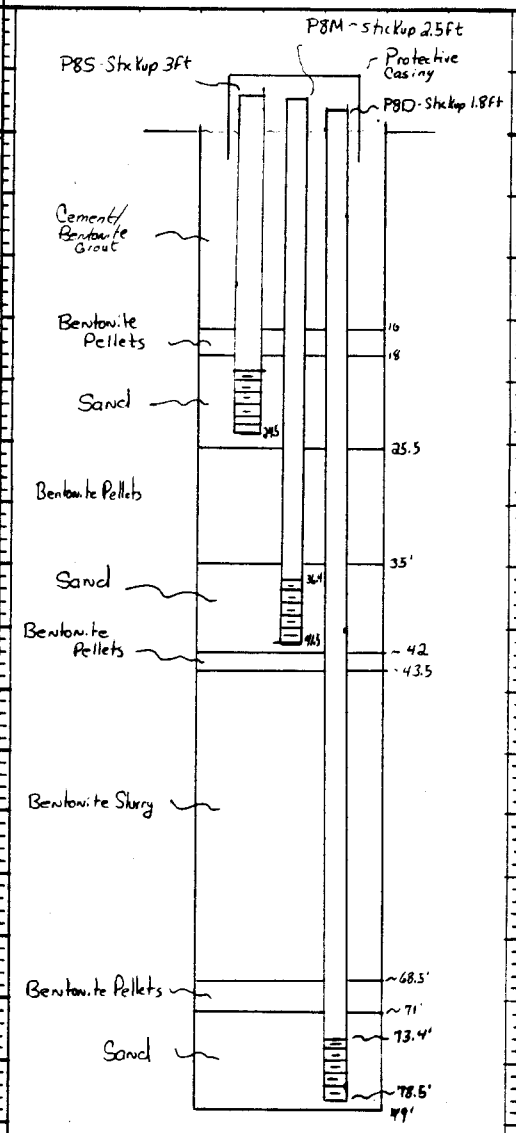
JOB NO. 863-3407.4	PROJECT WMI / Hydro / Kernersville N.C	WELL NO. P8D,M,S	SHEET 1 OF 1
GA INSP. Greg Richardson	DRILLING METHOD Hollowstem Augers, Roller Cone	GROUND ELEV. 747.84	WATER DEPTH
WEATHER Mod. Humid, P.C.	DRILLING COMPANY ATEC	COLLAR ELEV. 749.57/750.35/750.86	DATE/TIME
TEMP. 90's	DRILL RIG B61 DRILLER Don S.	STARTED 5.30 / 5/27/87 (TIME / DATE)	COMPLETED 3.30 / 6/1/87 (TIME / DATE)

MATERIALS INVENTORY

WELL CASING 3/4 in. dia. 79.1/39.6 l.f.	WELL SCREEN 3/4 in. dia. 5.1 l.f.	BENTONITE SEAL Bentonite Pellets & Slurry
CASING TYPE PVC	SCREEN TYPE Machine slot	INSTALLATION METHOD Poured from top
JOINT TYPE Flush Threaded	SLOT SIZE	FILTER PACK QTY
GROUT QUANTITY 3 bags Cement, ½ Bentonite	CENTRALIZERS NA	FILTER PACK TYPE Coarse Sand
GROUT TYPE Cement, Bentonite	DRILLING MUD TYPE None	INSTALLATION METHOD Poured from top

ELEV./DEPTH	SOIL/ROCK DESCRIPTION
	GROUND SURFACE
0.0 747.84	2.6 TOPSOIL
5/742.84	Tan Clayey Silt some to and Mic. F to M Sand, firm to stiff, moist to dry. (Unit 2)
	8 / 739.84
10/737.84	White, tan, Mic. F to C Sand, Some to and Silt, Dense moist. (unit 4)
15/732.84	
20/727.84	
25/722.84	
	27 / 720.84
30/717.84	
35/712.84	Tan, pink, Mic. F to C Sand and Silt, V. dense, dry. (Unit 4)
40/707.84	
45/702.84	
50/697.84	
55/692.84	
	61 / 686.84
60/687.84	
65/682.84	Brown Silt Some F Sand Dense, Dry (Pink & Purple streaks and Green Specks) (Unit 5)
70/677.84	
	74 / 673.84
75/672.84	White, pink F to C Sand, Some Silt, Dense, Dry to moist, Fragmented Rock
80/667.84	79 ft (668.84) End of Boring

WELL SKETCH



INSTALLATION NOTES

Flushed well before installing Piezometers.

P8D

Screen	5.1
Casing	
7 - 9.9'	69.3'
2 - 4.9'	9.8'
total Length	84.2
stickup	1.8
cutoff	3.9

P8M

Screen	5.1
Casing	
4 - 9.9'	39.6
Total Length	44.7
stickup	2.5
cutoff	1.7

Before installation of P8M too much Bentonite slurry was placed in hole which had to be washed out back down to 43.5'

P8S

Screen	5.1
Casing	24.9
Total Length	30.0
stickup 3ft	cutoff 2.5ft

WELL DEVELOPMENT NOTES

Piezometers were developed using a oilless air compressor to air lift the water from the piezometer

P8D

Date	WLTOC	WLGS	PH	
5/30/87	6.8	5.0		Before Development
5/31/87	6.34	4.54	5.5	
6/1/87	6.2	4.4		

P8M

Date	WLTOC	WLGS	PH
5/30/87	6.4	4.4	
5/31/87		3.71	5
6/1/87		3.76	

P8S

Date	WLTOC	WLGS	PH
5/31/87	8.3	3.8	
6/1/87	6.88	3.88	
6/1/87	7.1	4.1	

TEMPORARY PIEZOMETER INSTALLATION LOG

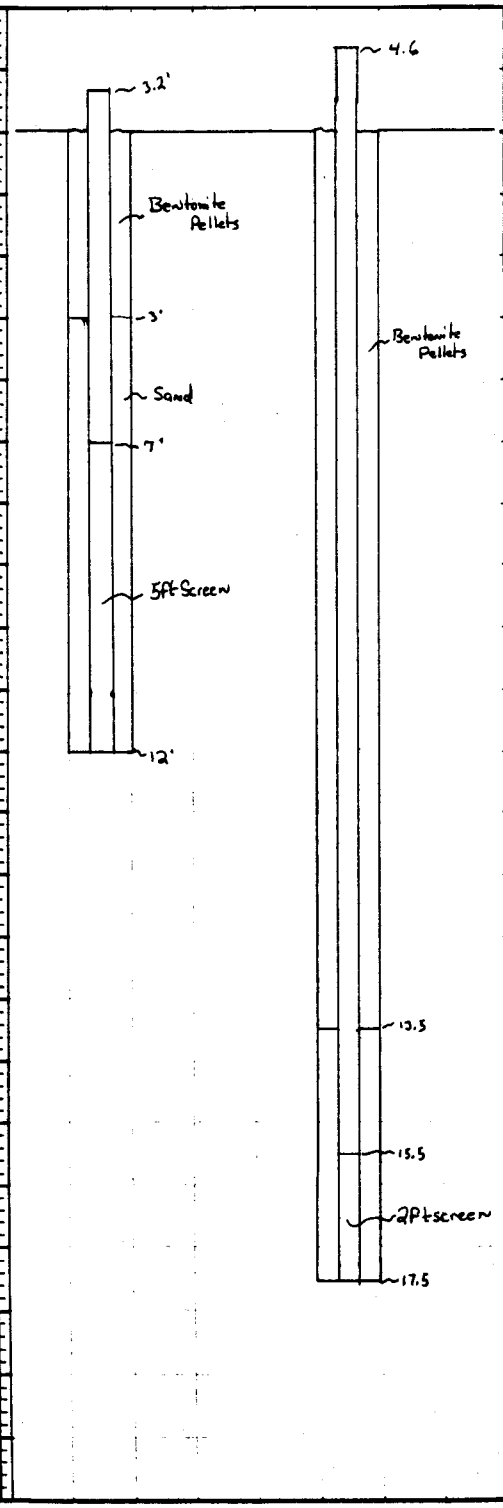
JOB NO. 863-3407.4 PROJECT WMI / Hydro / Kernersville N.C. WELL NO. HAID, S SHEET 1 OF 1
GA INSP. Greg Richardson DRILLING METHOD Hand Auger GROUND ELEV. 739 WATER DEPTH
WEATHER DRILLING COMPANY — COLLAR ELEV. 743.68/742.28 DATE/TIME
TEMP. DRILL RIG — DRILLER — STARTED TIME / DATE COMPLETED TIME / DATE

MATERIALS INVENTORY

WELL CASING 3/4" in. dia. 20'/10 l.f. WELL SCREEN 3/4" in. dia. 2'/5.1' l.f. BENTONITE SEAL Bentonite Pellets
CASING TYPE PVC SCREEN TYPE Machine slot INSTALLATION METHOD Poured from top
JOINT TYPE Flush threaded SLOT SIZE FILTER PACK QTY
GROUT QUANTITY NA CENTRALIZERS NA FILTER PACK TYPE Coarse Sand
GROUT TYPE NA DRILLING MUD TYPE NA INSTALLATION METHOD Poured from top

ELEV./DEPTH	SOIL/ROCK DESCRIPTION
739 / 0.0	GROUND SURFACE
738	Brown Gray Silty Clay
737	
736	
735	Gray Clay Some to little Sand, (Organic Matter)
734	
733	
732	
731	
730	Gray White C. Sand
729	
728	
727	
726	Gray Clay
725	
724	
723	Graywhite C Sand
722	
721	
77.5' / 721.5	END of Boring 17.5'
720	

WELL SKETCH



INSTALLATION NOTES

WELL DEVELOPMENT NOTES

PROJECT WMI / Hydro / Kernersville N.C.	JOB NO. 863-3407	BORING NO. P1D DATE	SHEET 1 OF 2
BORING BEGAN	BORING COMPLETED	CORE HOLE LOCATION	
METHOD OF CORING	DRILLING FLUID	GR.ELEV. WEATHER PC.	
CASING USED Steel SIZE 4"		INSPECT. GR OPERAT. Jim Nood	WATER LEVEL, TIME, DATE

DEPTH (FT.)	RUN NUMBER	RECOVERY	RQD	DISCONTINUITIES: DEPTH	TYPE	INFILLING	ANGLE W/AXIS	FREQUENCY	LITHOLOGY	COLOR	TEXTURE	WEATHERING	DESCRIPTION	POINT LOAD TEST	HARDNESS	SAMPLES-LABORATORY TESTS	DRILLING RATE MIN./FT.
34													(Sample was broken up to much to destinguish Fractures, due to weathering) Granitic Schist				
34.6																	
35																	
36																	
37	1	2.5/6.3	.7/6.3										Highly Weathered to Partially Weathered Rock				
38		39.7	11%														
39																	
40																	
40.3																	
41																	
42	2	1.4/5	0/5														
43		28%	0														
44																	
45																	
46																	
47	3	0/5	0														
48																	
49																	
50																	
51																	
52																	
53																	
54													Quartes Rich, Feldspar Granitic Gneiss				
55																	
56	4	3.7/9	0/9														
57		41.1%	0														

NOTES: Sample was broken up due to Method + weathering, to many ~~fracture~~ breaks to identify.

SCALE: 1 DIVISION = FEET

DATE LOGGED BY

Golder Associates

PROJECT WMI / Hydro / Kernersville N.C	JOB NO. 863-3407	BORING NO. P10 DATE	SHEET 2 OF 2
BORING BEGAN 4/28/87	BORING COMPLETED	CORE HOLE LOCATION	
METHOD OF CORING	DRILLING FLUID	GR.ELEV. WEATHER Sunny	
CASING USED Steel SIZE 4"	NONE	INSPECT. RC OPERAT. Don S.	WATER LEVEL, TIME, DATE

DEPTH (FT.)	RUN NUMBER	RECOVERY	RQD	DISCONTINUITIES DEPTH	TYPE	INFILLING	ANGLE W/AXIS	FREQUENCY	LITHOLOGY	COLOR	TEXTURE	WEATHERING	DESCRIPTION	POINT LOAD TEST	HARDNESS	SAMPLES-LABORATORY TESTS	DRILLING RATE MIN./FT.
58													Granitic Gneiss Quartzes & Feldspar Rich				
59																	
60																	
61																	
62																	

NOTES:

SCALE: 1 DIVISION= FEET

DATE LOGGED BY

Golder Associates

PROJECT WMI / Hydro / Kernersville N.C.	JOB NO. 863-3407	BORING NO. P15 DATE 4/29/87 SHEET 1 OF 1	CORE HOLE LOCATION
BORING BEGAN 10:35 4/29/87	BORING COMPLETED 11:15 4/29/87		
METHOD OF CORING	DRILLING FLUID	GR.ELEV. WEATHER Sunny	
CASING USED steel SIZE 4"	NONE	INSPECT. SR OPERAT. Don S.	WATER LEVEL, TIME, DATE

DEPTH (FT.)	RUN NUMBER	RECOVERY	RQD	DISCONTINUITIES DEPTH	TYPE	INFILLING	ANGLE W/AXIS	FREQUENCY	LITHOLOGY	COLOR	TEXTURE	WEATHERING	DESCRIPTION	POINT LOAD TEST	HARDNESS	SAMPLES-LABORATORY TESTS	DRILLING RATE MIN./FT.
38													Black & White Granitic Gneiss				
				38.5	JSIR	A	25			B&W	C	MW					
39				39	FIR	AQ	30°			B&W	C	MW					
				39.4	FIR	AQ	40°			B&W	C	MW					
40																	
				40.85	FIR	A	0			B&W	C	MW					
41				41.1	FIR	AQ	10	17		B&W	C	MW					
	1	5.3	2	41.8	JSIR	A	90	8.5		B&W	C	MW					
42		8.5	8.5	42	FIR	A	30	2		B&W	C	MW					
		62.4%	23.5%	42.6	FIR	AQ	30			B&W	C	MW					
43				42.8	FIR	A	40			W	C	MW					
				43.4	FIR	A	40			B&W	C	MW					
44																	
45																	
46																	
47																	

NOTES:

SCALE: 1 DIVISION= FEET

DATE LOGGED BY

Golder Associates

PROJECT WMI / Hydro / Kernersville N.C. JOB NO. 863-3407.4 BORING NO. P100 DATE 5/29/87 SHEET 1 OF 1

BORING BEGAN 11:36 5/29/87 BORING COMPLETED CORE HOLE LOCATION

METHOD OF CORING DRILLING FLUID None GR.ELEV. WEATHER Hot Humid

CASING USED 60' SIZE 3" INSPECT. RR OPERAT. Dan S. WATER LEVEL, TIME, DATE

DEPTH (FT.)	RUN NUMBER	RECOVERY	RQD	DISCONTINUITIES DEPTH	TYPE	INFILLING	ANGLE W/AXIS	FREQUENCY	LITHOLOGY	COLOR	TEXTURE	WEATHERING	DESCRIPTION	POINT LOAD TEST	HARDNESS	SAMPLES-LABORATORY TESTS	DRILLING RATE MIN./FT.
59				.22	M								(Water loss 56-57) 58 Soft				
				.7	JSIR	C	20										
60				.9	M							MW	White & Brown, Black Granitic Gneiss				
				1	FISR	A,S	30										
				1.1	M												
61				1.8	FISR	A,S	30										
				2.25	M												
62	1	5.9/8	3.7/5.9	3.0	M			15/5.4		B&W	C	SW					
				3.3	M												
		(67.5%)	(68.5%)	3.4	M												
63				3.6	M			2.8					Loss water				
				4.4	M												
				4.55	M												
64				4.95	F&PR	AS	0										
				5.2	M												
65													Lost circulation				
66																	
67																	
				.6	M												
				.75	M												
68				1.1	F&PR	C	40										
				1.75	M			13/4.3									
69				1.9	M												
	2	4.3/5	1.6/4.3	2.15	PR					B&W	C	MW					
				2.3	M			3.0									
70		86%	37.2%	3.0	M								Lost water				
				3.25	M												
				3.6	M												
71				3.7	M												
				3.8	M												
				4.05	M												
72													Changed to Roller Cone				4min
73																	6.5min
74																	
75													Lost water				
76																	15min
													Soft				
77																	
78																	
													Soft				6min
79																	
													Soft				
80													Drilling water turns to reddish brown Rock				
81																VH	
82													Crack				

NOTES: End of Boring 87 ft From 80 down the Rock was very hard and there was only to cracks 82 & 84 ft
The Depth numbers are measurements from the top of the sample.

SCALE: 1 DIVISION = FEET

DATE 5/31/87 LOGGED BY RR

Golder Associates

PROJECT WMI/Hydro/Kernersville N.C. JOB NO. 863-3407.4 BORING NO. P30 DATE 5/4/87 SHEET 1 OF 1

BORING BEGAN 2:20 5/4/87 BORING COMPLETED CORE HOLE LOCATION

METHOD OF CORING NXM Double tube DRILLING FLUID GR.ELEV. WEATHER Rain

CASING USED SIZE INSPECT. [illegible] OPERAT. Don S. WATER LEVEL, TIME, DATE

DEPTH (FT.)	RUN NUMBER	RECOVERY	RQD	DISCONTINUITIES: DEPTH	TYPE	INFILLING	ANGLE W/AXIS	FREQUENCY	LITHOLOGY	COLOR	TEXTURE	WEATHERING	DESCRIPTION	POINT LOAD TEST	HARDNESS	SAMPLES-LABORATORY TESTS	DRILLING RATE MIN./FT.
48																	
49				.4	M								Black White Granitic Schist				
49				1.1	M												
50				1.72	M												
51				3	M					BW	FGM	SW					
				3.2	M												
				3.3	M												
52	1	9.7'/10' 97%	8.7'/10 87%	3.54	F5PR	4	0	16/9.7 1.6									
53				4.25	C1PR	C	35										
54				5.9	M												
				6.3	M												
				6.7	M												
55				7.8	M								54.8 Black White Granitic Gneiss				
										BW	MGC	SW					
56				8.5	C1PR								56.2 [redacted]				
57				9.1	C1PR								56.9 Black White Granitic Schist				
				9.3	F5PR	C	25			BW	FGM	SW					
58																	
59																	
60																	
61																	
62																	
63																	

NOTES: The Depth numbers are measurements from the top of the sample

SCALE: 1 DIVISION = FEET

DATE LOGGED BY

Golder Associates

PROJECT WMI / Hydro / Kernersville N.C. JOB NO. 862-3940-24 BORING NO. P5 DATE SHEET 1 OF 1

BORING BEGAN 5/12/87 BORING COMPLETED CORE HOLE LOCATION

METHOD OF CORING DRILLING FLUID None GR.ELEV. WEATHER

CASING USED SIZE 6" INSPECT. Guy R. OPERAT. Don S. WATER LEVEL, TIME, DATE

DEPTH (FT.)	RUN NUMBER	RECOVERY	RQD	DISCONTINUITIES DEPTH	TYPE	INFILLING	ANGLE W/AXIS	FREQUENCY	LITHOLOGY	COLOR	TEXTURE	WEATHERING	DESCRIPTION	POINT LOAD TEST	HARDNESS	SAMPLES-LABORATORY TESTS	DRILLING RATE MIN./FT.
21				.2	F1PS	C	40			Gray	M	MW	21 Gray with Black Granitic Schist, Moderately Weathered 21.5				
				.6	M												
				.85	M												
22				1	M												
				1.1	M												
				1.3	M												
				1.5	M												
23				1.75	M								Black & White Granitic Gneiss mixed with Mica Quartz Rich				
				2.0	M												
				2.26	M												
				2.55	M												
				2.8	M												
24				3.0	M			24/10		BOW	C	AVOW					
	1	7.1/10' 71%	2.3'/10 23%	3.25	M												
				3.4	M												
25				3.75	F5UR	C	80	2.4					Loss of Sample MW to HW				
				4.0	M												
				4.2	M												
				4.7	M												
26				4.9	F2UR	C	0						Loss of Sample HW				
				5.2	M												
				5.3	M												
27																	
				6													
28																	
29				6.2	C1PR	C	70						29.5'				
				6.9	C1PR	C	0						29.5' Black & White Granitic Schist				
30																	
													Black & White Granitic Gneiss				
31				.1	M												
				.4	M												
				.5	M												
32				1.15	M					BOW	C	SW MW					
		4.8/5 96%	3.2/5 64%					10/5									
33	2			2	M												
				2.25	F1PR	C	80						3 inch in Biotite				
				2.55	F1PR	C	80	2									
34																	
				3.95	M												
35				4.1	M												
				4.35	M												
				4.7	M												
36																	

NOTES: The Depth numbers are measurements from the top of the sample.

SCALE: 1 DIVISION = FEET

DATE LOGGED BY

Golder Associates

PROJECT WMI/Hydro/Kerversville N.C		JOB NO. 863-3407.4	BORING NO. P6D DATE SHEET 1 OF 1
BORING BEGAN	BORING COMPLETED		CORE HOLE LOCATION
METHOD OF CORING	DRILLING FLUID	GR.ELEV. WEATHER	
CASING USED SIZE	None	INSPECT. JR OPERAT. Dow S	WATER LEVEL,TIME,DATE

DEPTH (FT.)	RUN NUMBER	RECOVERY	RQD	DISCONTINUITIES: DEPTH	TYPE	INFILLING	ANGLE W/AXIS	FREQUENCY	LITHOLOGY	COLOR	TEXTURE	WEATHERING	DESCRIPTION	POINT LOAD TEST	HARDNESS	SAMPLES-LABORATORY TESTS	DRILLING RATE MIN./FT.
67													Black & White Granitic Schist				
				67.4	E2IIR												
				67.6	E2IIR												
68	1	2.7'/4	2.6'/4	68.2	E2IIR					WaB	M	SW					
				68.6	E2IIR												
69		67.5%	65%	69.3	E2IIR												
70																	
71																	

NOTES:

SCALE: 1 DIVISION= FEET

DATE LOGGED BY

Golder Associates

PROJECT WMI / Hydro / Kernersville N.C.	JOB NO. 863-3407.4	BORING NO. PD05 DATE 5/15/87 SHEET 1 OF 1	
BORING BEGAN 5:00	BORING COMPLETED	CORE HOLE LOCATION	
METHOD OF CORING	DRILLING FLUID	GR.ELEV.	WEATHER PC
CASING USED 27' SIZE	None	INSPECT. SR	OPERAT. DonS
WATER LEVEL, TIME, DATE			

DEPTH (FT.)	RUN NUMBER	RECOVERY	RQD	DISCONTINUITIES DEPTH	TYPE	INFILLING	ANGLE W/AXIS	FREQUENCY	LITHOLOGY	COLOR	TEXTURE	WEATHERING	DESCRIPTION	POINT LOAD TEST	HARDNESS	SAMPLES-LABORATORY TESTS	DRILLING RATE MIN./FT.
26																	
				.2	M					R&W	C&M	MW	26.5 white Red, Granitic Gneiss mixed Rare Quartz				
				.5	M								26.9				
27				.65	M					B&B	C	FW&HD	M. cacous Highly weathered Granite Gneiss				
				.7	M								27.2' Black&White Granitic Gneiss (2" Schist)				
				.9	M					B&W	C	MW	27.8'				
28				1.05	M					Brown	M	HW	28.2' Weathered Micaceous Gneiss				
				1.15	C1PR	C	40										
				1.35	J5PR	A	40						Blacked White Granitic Gneiss				
29				1.7	M					B&W	C	SW					
				1.8	M												
				2.2	M												
30				2.4	M												
				2.8	M			16/6									
	1	6/10	2.4'/10	3.5	M					B&W	M	SW	30.5' ~~Black&White Granitic Schist~~				
				3.7	M								30.8'				
31				3.9	F1CR	A	25	27		B&W	M	HW	30.9' ~~weathered Micaceous Schist~~				
		60%	24%	4.1	C1PR	C	40						31.5' Black white Granitic Gneiss				
				4.5						Brown & Green	C	HW					
32				4.8	M(HW)												
				5.1	J1SR	C	40						Weather Micaceous Schist Black, Brown Green.				
33				5.6	F1PR	A	0										
34																	
35																	
36										B&W	C	SW	Black & White Granitic Gneiss Band of				
36.5										White	C	MW	white Quartz				
				.15	M												
37				.5	M								Homogeneous Gneiss				
				1.1	M												
				1.8	M												
38				2.3	M			7/5									
	2	5/5	5/5							B&W	C	SW					
39		100%	100%	3.4	M			1.4									
40				4.3	M												
41																	
					41.5												

NOTES: The Depth numbers are measurements from the Top of the Sample

SCALE: 1 DIVISION = FEET

DATE LOGGED BY

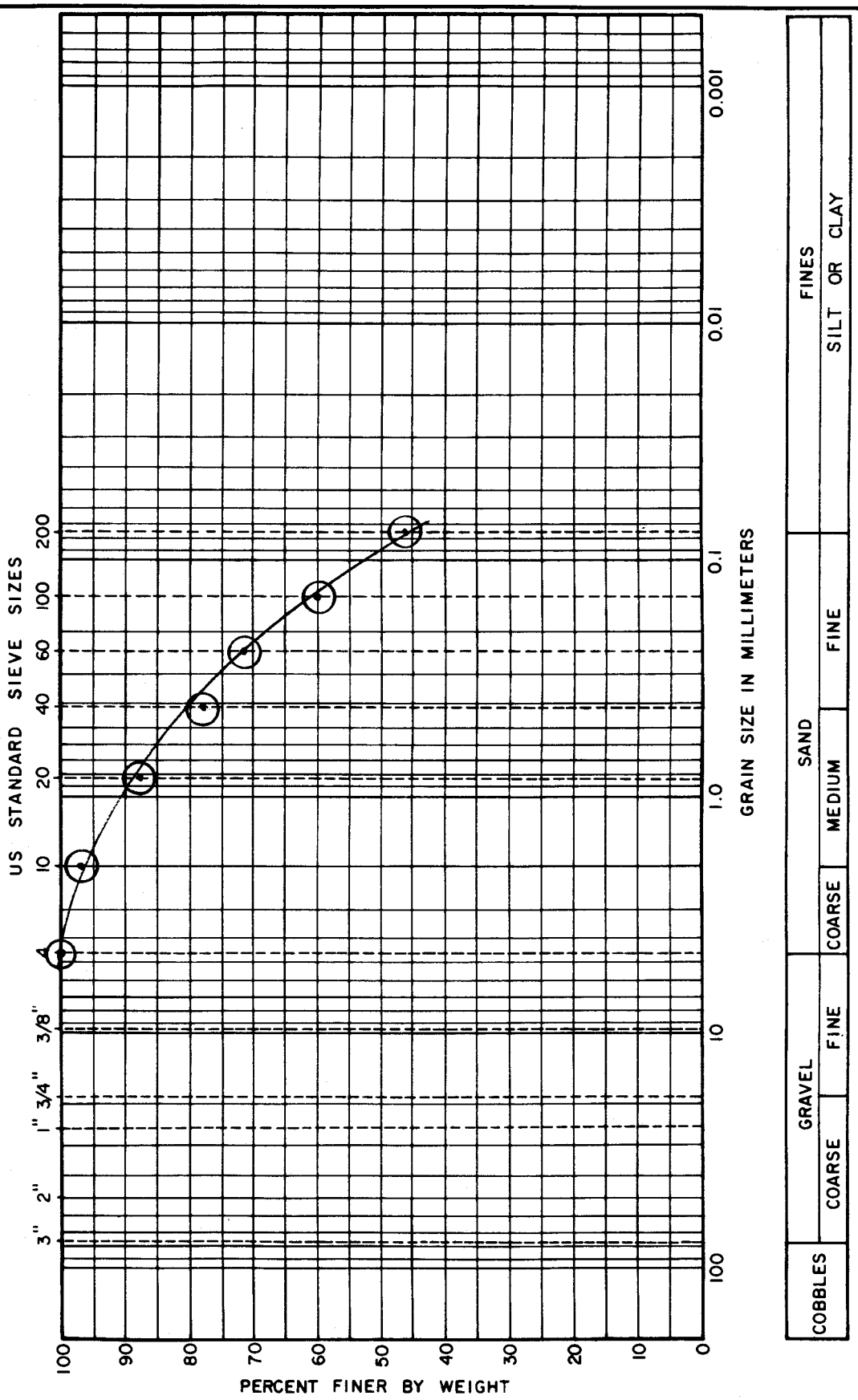
Golder Associates

APPENDIX B

GRAIN SIZE DISTRIBUTION ANALYSES

GRA SIZE DISTRIBUTION

FIGURE



BORING NO.	ELEV. OR DEPTH	W_n	W_L	W_p	I_p	DESCRIPTION OR CLASSIFICATION
24	—	—	—	—	—	White and Tan, Coarse to Fine Sand and Silt (SM) (trace mica)
1 3A						

Date 6-17-87

Job No. 863-3407

Golder Associates

Drawn BobB

Checked

Reviewed

SIEVE ANALYSIS (D422-63)

VISUAL CLASSIFICATION: _____

INITIAL WEIGHT OF SAMPLE: _____ gms. ☐ AIR DRY ☒ OVEN DRY

(1) MOISTURE CONTENT DETERMINATION

WET WEIGHT (SOIL + CONTAINER) = _____ gms.

DRY WEIGHT (SOIL + CONTAINER) = _____ gms.

WEIGHT OF WATER = _____ gms.

CONTAINER NO. _____, WEIGHT = _____ gms.

WEIGHT OF DRY SOIL = _____ gms.

WATER CONTENT = _____ %

(2) DRY WEIGHT OF SAMPLE = 141.81 gms.

(3) SAMPLE PREPARATION

☐ CRUSHED ☐ QUARTERED

☐ SEPARATED ON #10 SIEVE

☐ + 10 MATERIAL WASHED

☒ WASHED ON #200 SIEVE

(4) SAMPLE WEIGHT

	TOTAL SAMPLE	PORTION RETAINED #10/#200	PORTION PASSING #10/#200
CONTAINER NO.			
DRY SOIL + CONTAINER			
CONTAINER WT.			
WT. DRY SOIL	141.81	77.0	64.81

(5) SIEVE ANALYSIS

U.S. STD. SIEVE NO.	CONTAINER WEIGHT	WT. RETAINED + CONTAINER	WT. RETAINED gms.	% RETAINED (1)	HYDROMETER BACKSIEVING WT. RETAINED gms.	% RETAINED (2)	CORRECTED % RETAINED (3)	% PASSING (4)
#4	9.31	0	0	0				100.0
#10	9.31	13.9	4.59	3.24				96.76
#20		27.06	17.75	12.52				87.48
#40		39.52	30.21	21.30				78.70
#60		50.03	40.72	28.71				71.29
#100		66.41	57.10	40.27				59.73
#200		86.31	77.00	54.30				45.70
PAN								
TOTAL								

(1) % RETAINED = WEIGHT RETAINED / DRY WT. OF SAMPLE

(2) % RETAINED = WEIGHT RETAINED / TOTAL HYDRO. SAMPLE WT. (WS)

(3) CORRECTED % RETAINED = (2) X % PASSING 10 SIEVE

(4) % PASSING = 100 % - % RETAINED (1 OR 3)

REMARKS: _____

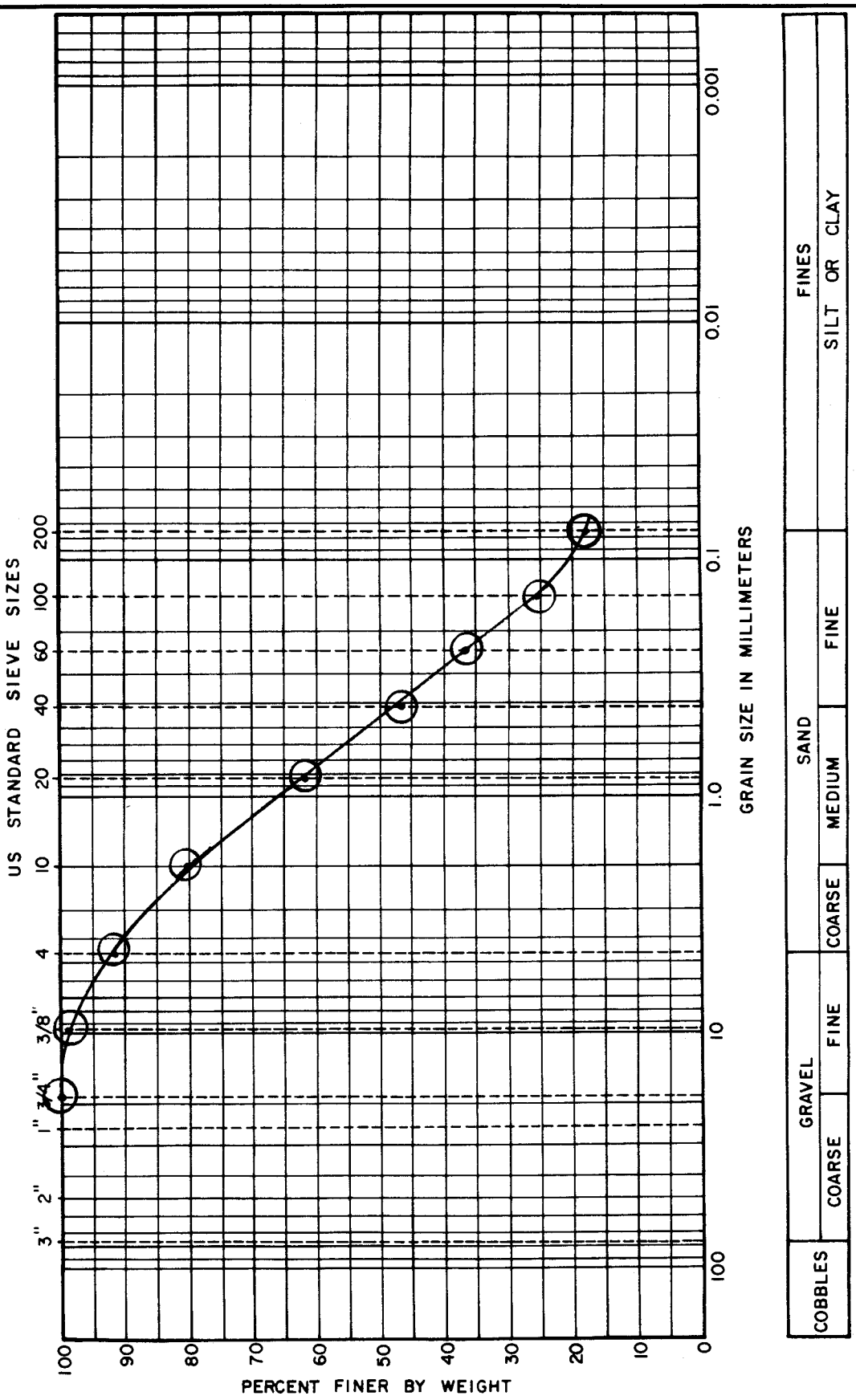
DATE OF TESTING: 6-16-87 BORING NO. Q4 SAMPLE DEPTH: _____ CALCULATED BY: B&B

PROJECT NO. 863-3407 SAMPLE NO. 13 TESTED BY: B&B CHECKED BY: _____

Golder Associates

GRA SIZE DISTRIBUTION

FIGURE



BORING NO.	ELEV. OR DEPTH	W_n	W_L	W_p	I_p	DESCRIPTION OR CLASSIFICATION
P7	23.5-25.5	-	-	-	-	Tan brown, Coarse to Fine Sand, Some silt, little fine gravel, (SM) (Micaceous)
6A						

Date 6-18-87

Job No. 863-3407

Golder Associates

Drawn Bdis

Checked

Reviewed

SIEVE ANALYSIS (D422-63)

VISUAL CLASSIFICATION: _____

INITIAL WEIGHT OF SAMPLE: _____ gms. ☐ AIR DRY ☒ OVEN DRY

(1) MOISTURE CONTENT DETERMINATION

WET WEIGHT (SOIL + CONTAINER) = _____ gms.

DRY WEIGHT (SOIL + CONTAINER) = _____ gms.

WEIGHT OF WATER = _____ gms.

CONTAINER NO. _____, WEIGHT = _____ gms.

WEIGHT OF DRY SOIL = _____ gms.

WATER CONTENT = _____ %

(2) DRY WEIGHT OF SAMPLE = 197.18 gms.

(3) SAMPLE PREPARATION

☐ CRUSHED ☐ QUARTERED

☐ SEPARATED ON # 10 SIEVE

☐ + 10 MATERIAL WASHED

☒ WASHED ON # 200 SIEVE

(4) SAMPLE WEIGHT

	TOTAL SAMPLE	PORTION RETAINED #10/#200	PORTION PASSING #10/#200
CONTAINER NO.			
DRY SOIL + CONTAINER			
CONTAINER WT.			
WT. DRY SOIL	197.18	163.53	33.65

(5) SIEVE ANALYSIS

U.S. STD. SIEVE NO.	CONTAINER WEIGHT	WT. RETAINED + CONTAINER	WT. RETAINED gms.	% RETAINED (1)	HYDROMETER BACKSIEVING WT. RETAINED gms.	% RETAINED (2)	CORRECTED % RETAINED (3)	% PASSING (4)
3/4	0	0	0	0				100.0
3/8	9.28	11.57	2.29	1.16				98.84
#4		24.18	14.90	7.56				92.43
#10		47.80	38.52	19.54				80.46
#20		83.85	74.57	37.82				62.18
#40		114.59	105.31	53.41				46.59
#60		135.54	126.26	64.03				35.97
#100		155.92	146.64	74.37				25.63
#200		172.80	163.53	82.93				17.07
PAN								
TOTAL								

(1) % RETAINED = WEIGHT RETAINED / DRY WT. OF SAMPLE

(2) % RETAINED = WEIGHT RETAINED / TOTAL HYDRO. SAMPLE WT. (WS)

(3) CORRECTED % RETAINED = (2) X % PASSING 10 SIEVE

(4) % PASSING = 100 % - % RETAINED (1 OR 3)

REMARKS: _____

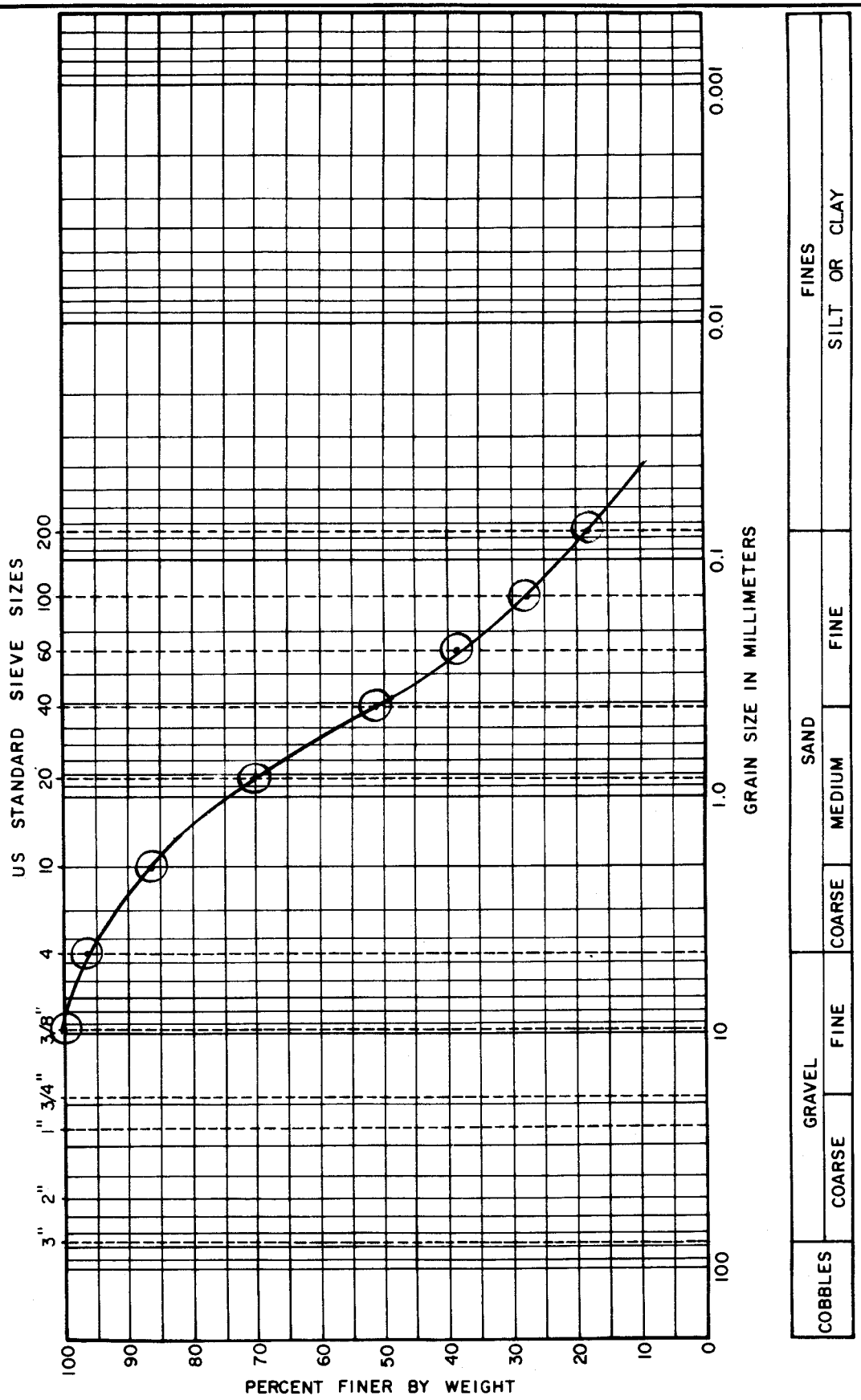
DATE OF TESTING: 10-16-87 BORING NO. R7 SAMPLE DEPTH: 23.5 - 25.5 CALCULATED BY: BdB

PROJECT NO. 863-3407 SAMPLE NO. 6A TESTED BY: BdB CHECKED BY: _____

Golder Associates

GRA. SIZE DISTRIBUTION

FIGURE



BORING NO.	ELEV. OR DEPTH	W_n	W_L	W_P	I_P	DESCRIPTION OR CLASSIFICATION
P5 4A	—	—	—	—	—	Gravel Tan, Fine to Fine Sand, trace Micaceous fine grained

Date 6-17-87

Job No. 863-3407

Golder Associates

Drawn BdB

Checked

Reviewed

SIEVE ANALYSIS (D422-63)

VISUAL CLASSIFICATION: Grey Tan

INITIAL WEIGHT OF SAMPLE: _____ gms. ☐ AIR DRY ☒ OVEN DRY

(1) MOISTURE CONTENT DETERMINATION

WET WEIGHT (SOIL + CONTAINER) = _____ gms.

DRY WEIGHT (SOIL + CONTAINER) = _____ gms.

WEIGHT OF WATER = _____ gms.

CONTAINER NO. _____, WEIGHT = _____ gms.

WEIGHT OF DRY SOIL = _____ gms.

WATER CONTENT = _____ %

(2) DRY WEIGHT OF SAMPLE = 158.09 gms.

(3) SAMPLE PREPARATION

☐ CRUSHED ☐ QUARTERED

☐ SEPARATED ON # 10 SIEVE

☐ + 10 MATERIAL WASHED

☒ WASHED ON # 200 SIEVE

(4) SAMPLE WEIGHT

	TOTAL SAMPLE	PORTION RETAINED #10 #200	PORTION PASSING #10 #200
CONTAINER NO.			
DRY SOIL + CONTAINER			
CONTAINER WT.			
WT. DRY SOIL	158.09	130.35	27.74

(5) SIEVE ANALYSIS

U.S. STD. SIEVE NO.	CONTAINER WEIGHT	WT. RETAINED + CONTAINER	WT. RETAINED gms.	% RETAINED (1)	HYDROMETER BACKSIEVING WT. RETAINED gms.	% RETAINED (2)	CORRECTED % RETAINED (3)	% PASSING (4)
3/8		0	0	0				100.0
#4	8.12	14.43	6.31	3.99				96.01
#10		30.29	22.17	14.02				85.98
#20		54.88	46.76	29.58				70.42
#40		85.29	77.17	48.81				51.19
#60		104.55	96.43	61.00				39.00
#100		123.41	115.29	72.93				27.07
#200		138.47	130.35	82.45				17.55
PAN								
TOTAL								

(1) % RETAINED = WEIGHT RETAINED / DRY WT. OF SAMPLE

(2) % RETAINED = WEIGHT RETAINED / TOTAL HYDRO. SAMPLE WT. (WS)

(3) CORRECTED % RETAINED = (2) X % PASSING 10 SIEVE

(4) % PASSING = 100 % - % RETAINED (1 OR 3)

REMARKS: _____

DATE OF TESTING: 6-16-87 BORING NO. P5 SAMPLE DEPTH: —

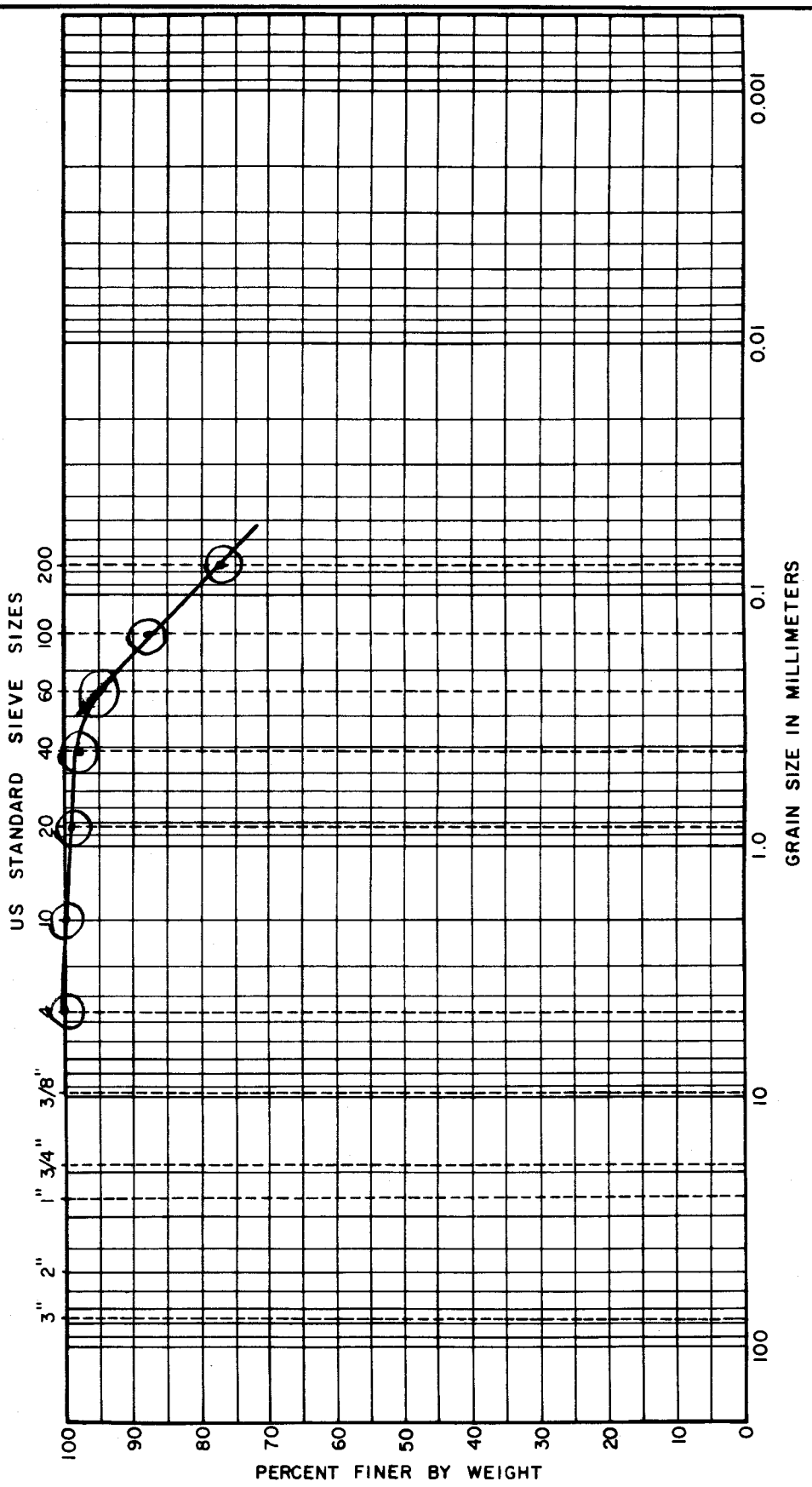
PROJECT NO. 863-3407 SAMPLE NO. 4A TESTED BY: BdB CALCULATED BY: BdB

CHECKED BY: _____

Golder Associates

GRA SIZE DISTRIBUTION

FIGURE



BORING NO.	ELEV. OR DEPTH	W_n	W_L	W_P	I_P	DESCRIPTION OR CLASSIFICATION
P4 11A	—	—	—	—	—	Brown, silt, some medium to fine sand, (M-) Micaceous

Date 6-18-87

Job No. 863-3407

Golder Associates

Drawn BoB3

Checked

Reviewed

SIEVE ANALYSIS (D422-63)

VISUAL CLASSIFICATION: _____

INITIAL WEIGHT OF SAMPLE: _____ gms. ☐ AIR DRY ☒ OVEN DRY

(1) MOISTURE CONTENT DETERMINATION

WET WEIGHT (SOIL + CONTAINER) = _____ gms.

DRY WEIGHT (SOIL + CONTAINER) = _____ gms.

WEIGHT OF WATER = _____ gms.

CONTAINER NO. _____, WEIGHT = _____ gms.

WEIGHT OF DRY SOIL = _____ gms.

WATER CONTENT = _____ %

(2) DRY WEIGHT OF SAMPLE = 132.55 gms.

(3) SAMPLE PREPARATION

☐ CRUSHED ☐ QUARTERED

☐ SEPARATED ON #10 SIEVE

☐ + 10 MATERIAL WASHED

☒ WASHED ON #200 SIEVE

(4) SAMPLE WEIGHT

	TOTAL SAMPLE	PORTION RETAINED #10 / #200	PORTION PASSING #10 / #200
CONTAINER NO.			
DRY SOIL + CONTAINER			
CONTAINER WT.			
WT. DRY SOIL	132.55	31.21	

(5) SIEVE ANALYSIS

U.S. STD. SIEVE NO.	CONTAINER WEIGHT	WT. RETAINED + CONTAINER	WT. RETAINED gms.	% RETAINED (1)	HYDROMETER BACKSIEVING WT. RETAINED gms.	% RETAINED (2)	CORRECTED % RETAINED (3)	% PASSING (4)
#4	0	0	0	0				100.00
#10	7.9	8.27	.37	0.28				99.72
#20		9.33	1.43	1.08				98.92
#40		11.00	3.10	2.34				97.66
#60		14.38	6.48	4.89				95.11
#100		24.62	16.72	12.61				87.39
#200		39.11	31.21	23.55				76.45
PAN								
TOTAL								

(1) % RETAINED = WEIGHT RETAINED / DRY WT. OF SAMPLE

(2) % RETAINED = WEIGHT RETAINED / TOTAL HYDRO. SAMPLE WT. (WS)

(3) CORRECTED % RETAINED = (2) X % PASSING 10 SIEVE

(4) % PASSING = 100 % - % RETAINED (1 OR 3)

REMARKS: _____

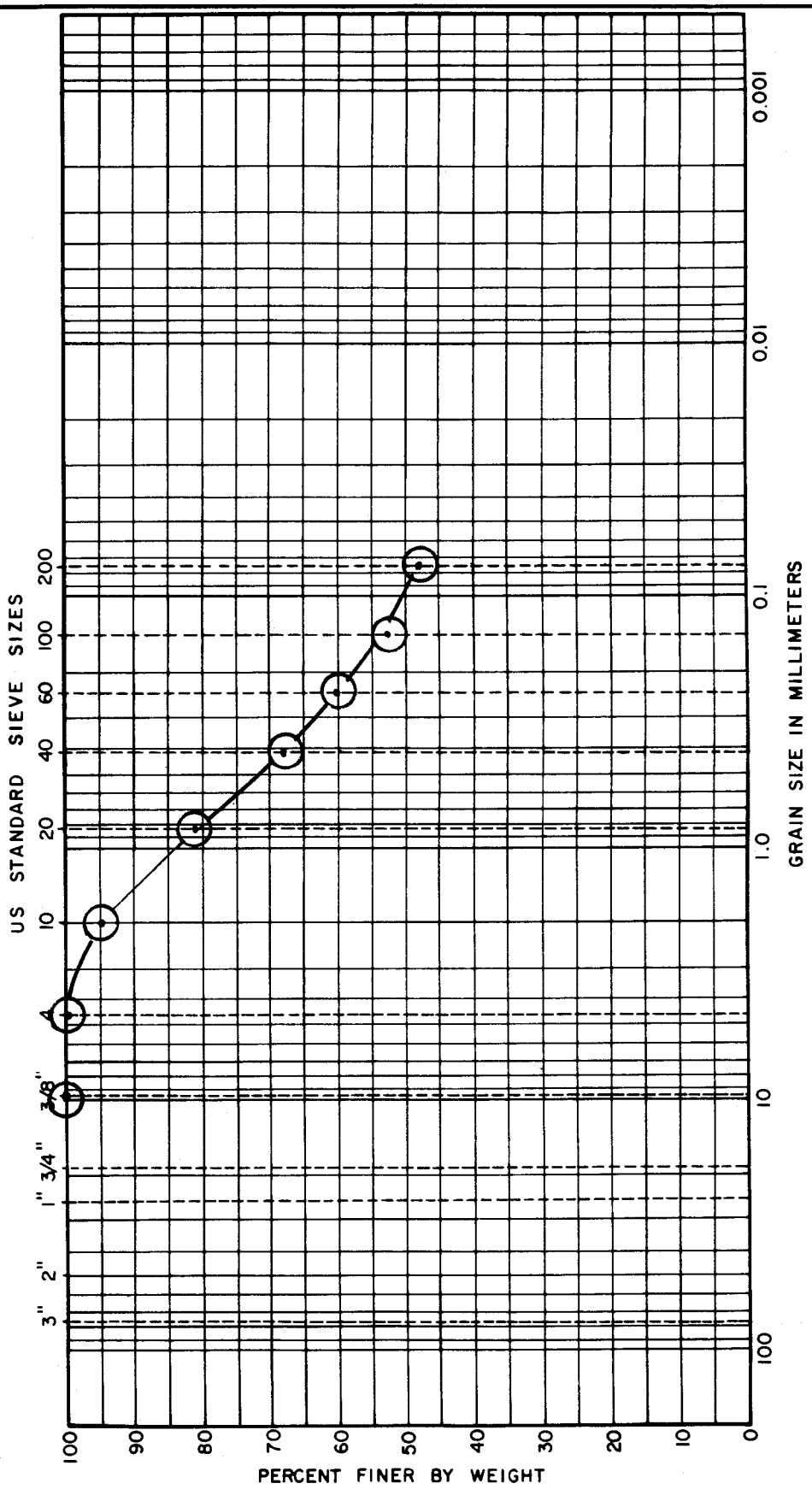
DATE OF TESTING: 6-16-87 BORING NO. P4 SAMPLE DEPTH: — CALCULATED BY: BobB

PROJECT NO. 863-3407 SAMPLE NO. 11 A TESTED BY: BobB CHECKED BY: _____

Golder Associates

GRAIN SIZE DISTRIBUTION

FIGURE



BORING NO.	ELEV. OR DEPTH	W_n	W_L	W_P	I_P	DESCRIPTION OR CLASSIFICATION
PS	—	—	—	—	—	Light Brown, Graded to Fine Sand, and Silt + clay, (SC) (Micaceous)
1A						

Date 6-18-87

Job No. 863-3407

Golder Associates

Drawn BBB

Checked

Reviewed

SIEVE ANALYSIS (D422-63)

VISUAL CLASSIFICATION: _____

INITIAL WEIGHT OF SAMPLE: _____ gms. ☐ AIR DRY ☒ OVEN DRY

(1) MOISTURE CONTENT DETERMINATION

WET WEIGHT (SOIL + CONTAINER) = _____ gms.

DRY WEIGHT (SOIL + CONTAINER) = _____ gms.

WEIGHT OF WATER = _____ gms.

CONTAINER NO. _____, WEIGHT = _____ gms.

WEIGHT OF DRY SOIL = _____ gms.

WATER CONTENT = _____ %

(2) DRY WEIGHT OF SAMPLE = 204.66 gms.

(3) SAMPLE PREPARATION

☐ CRUSHED ☐ QUARTERED

☐ SEPARATED ON # 10 SIEVE

☐ + 10 MATERIAL WASHED

☒ WASHED ON # 200 SIEVE

(4) SAMPLE WEIGHT

	TOTAL SAMPLE	PORTION RETAINED #10 / #200	PORTION PASSING #10 / #200
CONTAINER NO.			
DRY SOIL + CONTAINER			
CONTAINER WT.			
WT. DRY SOIL	204.66	106.34	98.32

(5) SIEVE ANALYSIS

U.S. STD. SIEVE NO.	CONTAINER WEIGHT	WT. RETAINED + CONTAINER	WT. RETAINED gms.	% RETAINED (1)	HYDROMETER BACKSIEVING WT. RETAINED gms.	% RETAINED (2)	CORRECTED % RETAINED (3)	% PASSING (4)
3/8	0	0	0	0				100.0
#4	7.93	8.5	.57	.28				99.72
#10		18.51	10.58	5.17				94.83
#20		47.14	39.21	19.16				80.84
#40		73.75	65.82	32.16				67.84
#60		88.91	80.98	39.57				60.43
#100		102.73	94.80	46.32				53.68
#200		114.27	106.34	51.96				48.04
PAN								
TOTAL								

(1) % RETAINED = WEIGHT RETAINED / DRY WT. OF SAMPLE

(2) % RETAINED = WEIGHT RETAINED / TOTAL HYDRO. SAMPLE WT. (WS)

(3) CORRECTED % RETAINED = (2) X % PASSING 10 SIEVE

(4) % PASSING = 100 % - % RETAINED (1 OR 3)

REMARKS: _____

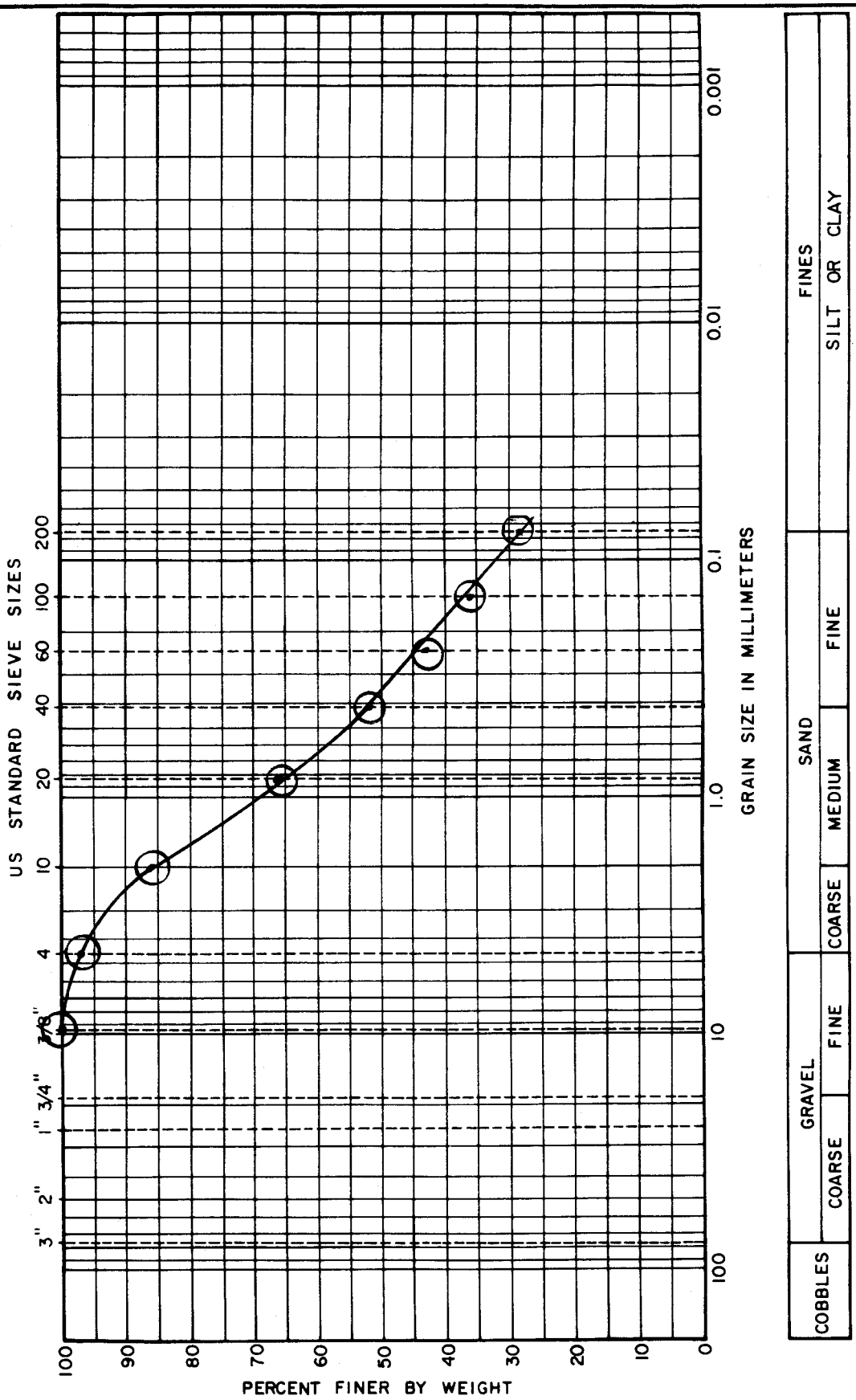
DATE OF TESTING: 6-16-87 BORING NO. P5 SAMPLE DEPTH: _____ CALCULATED BY: BdB

PROJECT NO. 863-3407 SAMPLE NO. 1A TESTED BY: BdB CHECKED BY: _____

Golder Associates

GRA SIZE DISTRIBUTION

FIGURE



BORING NO.	ELEV. OR DEPTH	W_n	W_L	W_P	I_P	DESCRIPTION OR CLASSIFICATION
P8 4A	13.5-15.5	-	-	-	-	Brown, Fine, Coarse to Fine Sand, Some Silt (SM) (Micaceous)

Date 6-17-87

Job No. 863-3407

Golder Associates

Drawn BJB

Checked

Reviewed

SIEVE ANALYSIS (D422-63)

VISUAL CLASSIFICATION: _____

INITIAL WEIGHT OF SAMPLE: _____ gms. ☐ AIR DRY ☒ OVEN DRY

(1) MOISTURE CONTENT DETERMINATION

WET WEIGHT (SOIL + CONTAINER) = _____ gms.

DRY WEIGHT (SOIL + CONTAINER) = _____ gms.

WEIGHT OF WATER = _____ gms.

CONTAINER NO. _____, WEIGHT = _____ gms.

WEIGHT OF DRY SOIL = _____ gms.

WATER CONTENT = _____ %

(2) DRY WEIGHT OF SAMPLE = 199.15 gms.

(3) SAMPLE PREPARATION

☐ CRUSHED ☐ QUARTERED

☐ SEPARATED ON #10 SIEVE

☐ + 10 MATERIAL WASHED

☒ WASHED ON #200 SIEVE

(4) SAMPLE WEIGHT

	TOTAL SAMPLE	PORTION RETAINED #10 #200	PORTION PASSING #10 #200
CONTAINER NO.			
DRY SOIL + CONTAINER			
CONTAINER WT.			
WT. DRY SOIL	199.15	143.83	55.32

(5) SIEVE ANALYSIS

U.S. STD. SIEVE NO.	CONTAINER WEIGHT	WT. RETAINED + CONTAINER	WT. RETAINED gms.	% RETAINED (1)	HYDROMETER BACKSIEVING WT. RETAINED gms.	% RETAINED (2)	CORRECTED % RETAINED (3)	% PASSING (4)
3/8		0	0	0				100.0
#4	9.68	16.29	6.61	3.32				96.68
#10		37.18	27.5	13.81				86.19
#20		77.17	67.49	33.89				66.11
#40		105.47	95.79	48.10				51.90
#60		121.6	111.92	56.20				43.80
#100		137.94	128.26	64.40				35.60
#200		153.51	143.83	72.22				27.78
PAN								
TOTAL								

(1) % RETAINED = WEIGHT RETAINED / DRY WT. OF SAMPLE

(2) % RETAINED = WEIGHT RETAINED / TOTAL HYDRO. SAMPLE WT. (WS)

(3) CORRECTED % RETAINED = (2) X % PASSING 10 SIEVE

(4) % PASSING = 100 % - % RETAINED (1 OR 3)

REMARKS: _____

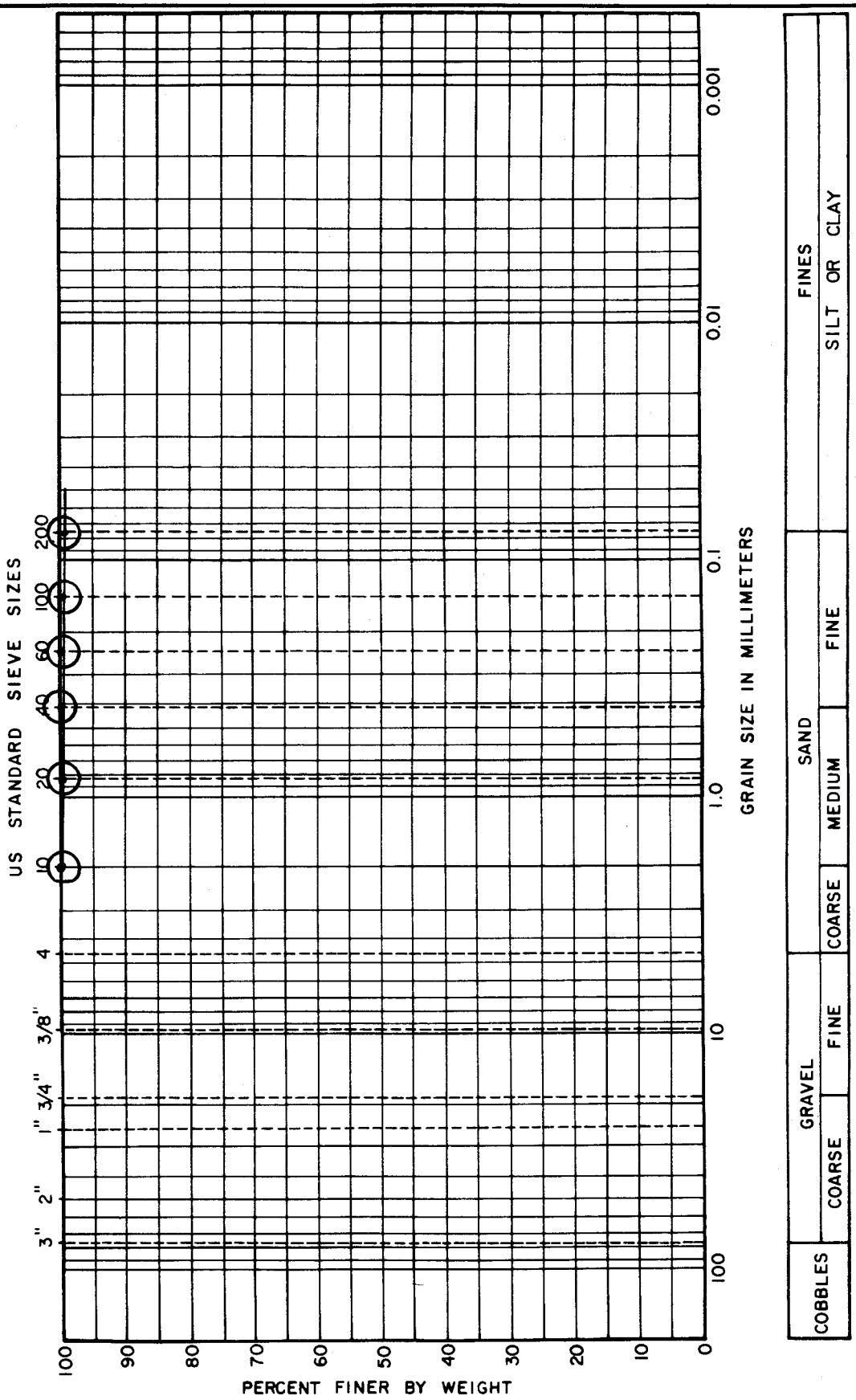
DATE OF TESTING: 6-16-87 BORING NO. P8 SAMPLE DEPTH: 13.5 - 15.5 CALCULATED BY: BdB

PROJECT NO. 863-3407 SAMPLE NO. 4A TESTED BY: BdB CHECKED BY: _____

Gintlar Associates

GRA SIZE DISTRIBUTION

FIGURE



BORING NO.	ELEV. OR DEPTH	W_n	W_L	W_P	I_P	DESCRIPTION OR CLASSIFICATION
P4	3.5-5.5	-	-	-	-	Red and White, Sandy Silt (ML) trace fine sand
24						

Date 6-18-87

Job No. 863-3407

Golder Associates

Drawn BdB

Checked

Reviewed

SIEVE ANALYSIS (D422-63)

VISUAL CLASSIFICATION: _____

INITIAL WEIGHT OF SAMPLE: _____ gms. ☐ AIR DRY ☒ OVEN DRY

(1) MOISTURE CONTENT DETERMINATION

WET WEIGHT (SOIL + CONTAINER) = _____ gms.

DRY WEIGHT (SOIL + CONTAINER) = _____ gms.

WEIGHT OF WATER = _____ gms.

CONTAINER NO. _____, WEIGHT = _____ gms.

WEIGHT OF DRY SOIL = _____ gms.

WATER CONTENT = _____ %

(2) DRY WEIGHT OF SAMPLE = 118.18 gms.

(3) SAMPLE PREPARATION

☐ CRUSHED ☐ QUARTERED

☐ SEPARATED ON # 10 SIEVE

☐ + 10 MATERIAL WASHED

☒ WASHED ON # 200 SIEVE

(4) SAMPLE WEIGHT

	TOTAL SAMPLE	PORTION RETAINED #10 / #200	PORTION PASSING #10 / #200
CONTAINER NO.			
DRY SOIL + CONTAINER			
CONTAINER WT			
WT. DRY SOIL	118.18	.90	117.28

(5) SIEVE ANALYSIS

U.S STD. SIEVE NO.	CONTAINER WEIGHT	WT. RETAINED + CONTAINER	WT. RETAINED gms.	% RETAINED (1)	HYDROMETER BACKSIEVING WT. RETAINED gms.	% RETAINED (2)	CORRECTED % RETAINED (3)	% PASSING (4)
#4								
#10	0	0	0	0				100.00
#20	7.91	7.96	.05	0.04				99.96
#40		8.14	.23	0.19				99.81
#60		8.23	.32	0.27				99.73
#100		8.49	.58	0.49				99.51
#200		8.81	.90	0.76				99.24
PAN								
TOTAL								

(1) % RETAINED = WEIGHT RETAINED / DRY WT. OF SAMPLE

(2) % RETAINED = WEIGHT RETAINED / TOTAL HYDRO. SAMPLE WT. (WS)

(3) CORRECTED % RETAINED = (2) X % PASSING 10 SIEVE

(4) % PASSING = 100 % - % RETAINED (1 OR 3)

REMARKS: _____

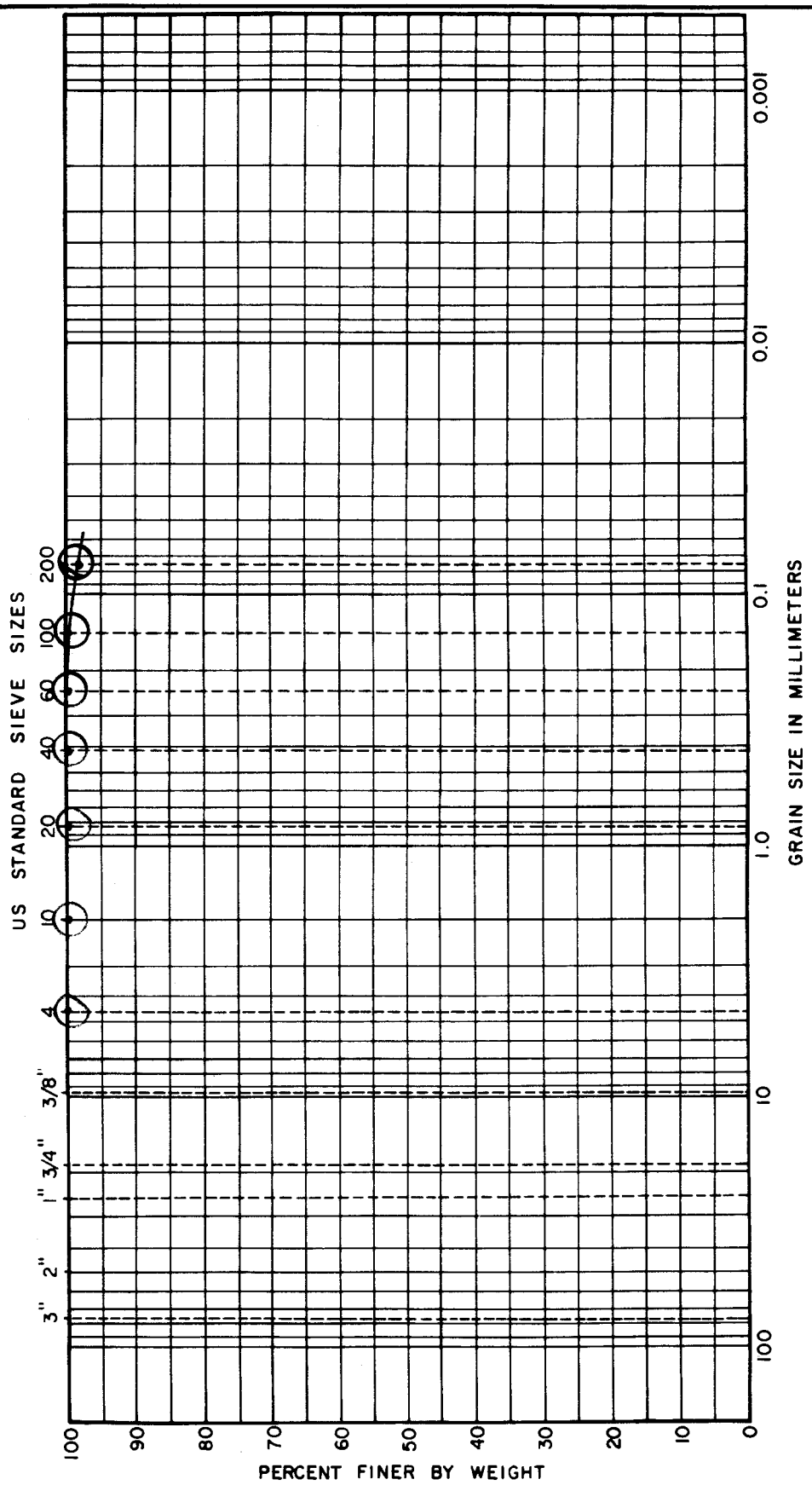
DATE OF TESTING: 6-16-87 BORING NO. P4 SAMPLE DEPTH: 3.5 - 5.5 CALCULATED BY: BoB

PROJECT NO. 863-3407 SAMPLE NO. 24 TESTED BY: BoB CHECKED BY: _____

Golder Associates

GRA SIZE DISTRIBUTION

FIGURE



BORING NO.	ELEV. OR DEPTH	W_n	W_L	W_P	I_P	DESCRIPTION OR CLASSIFICATION
P4 9A	38.5-40.5	—	—	—	—	Brown, silt, trace fine sand, (ML) (trace mica)

Date 6-18-87

Job No. 863-3407

Golder Associates

Drawn BDB

Checked

Reviewed

SIEVE ANALYSIS (D422-63)

VISUAL CLASSIFICATION: _____

INITIAL WEIGHT OF SAMPLE: _____ gms. ☐ AIR DRY ☒ OVEN DRY

(1) MOISTURE CONTENT DETERMINATION

WET WEIGHT (SOIL + CONTAINER) = _____ gms.

DRY WEIGHT (SOIL + CONTAINER) = _____ gms.

WEIGHT OF WATER = _____ gms.

CONTAINER NO. _____, WEIGHT = _____ gms.

WEIGHT OF DRY SOIL = _____ gms.

WATER CONTENT = _____ %

(2) DRY WEIGHT OF SAMPLE = 156.77 gms.

(3) SAMPLE PREPARATION

☐ CRUSHED ☐ QUARTERED

☐ SEPARATED ON # 10 SIEVE

☐ + 10 MATERIAL WASHED

☒ WASHED ON # 200 SIEVE

(4) SAMPLE WEIGHT

	TOTAL SAMPLE	PORTION RETAINED #10 / #200	PORTION PASSING #10 / #200
CONTAINER NO.			
DRY SOIL + CONTAINER			
CONTAINER WT.			
WT. DRY SOIL	156.77	2.51	154.26

(5) SIEVE ANALYSIS

U.S. STD. SIEVE NO.	CONTAINER WEIGHT	WT. RETAINED + CONTAINER	WT. RETAINED gms.	% RETAINED (1)	HYDROMETER BACKSIEVING WT. RETAINED gms.	% RETAINED (2)	CORRECTED % RETAINED (3)	% PASSING (4)
#4		0	0	0				100.0
#10	9.1	9.11	.01	0.01				99.99
#20		9.16	.06	0.04				99.96
#40		9.21	.11	0.07				99.93
#60		9.32	.22	0.14				99.86
#100		9.80	.70	0.45				99.55
#200		11.61	2.51	1.60				98.40
PAN								
TOTAL								

(1) % RETAINED = WEIGHT RETAINED / DRY WT. OF SAMPLE

(2) % RETAINED = WEIGHT RETAINED / TOTAL HYDRO. SAMPLE WT. (WS)

(3) CORRECTED % RETAINED = (2) X % PASSING 10 SIEVE

(4) % PASSING = 100 % - % RETAINED (1 OR 3)

REMARKS: _____

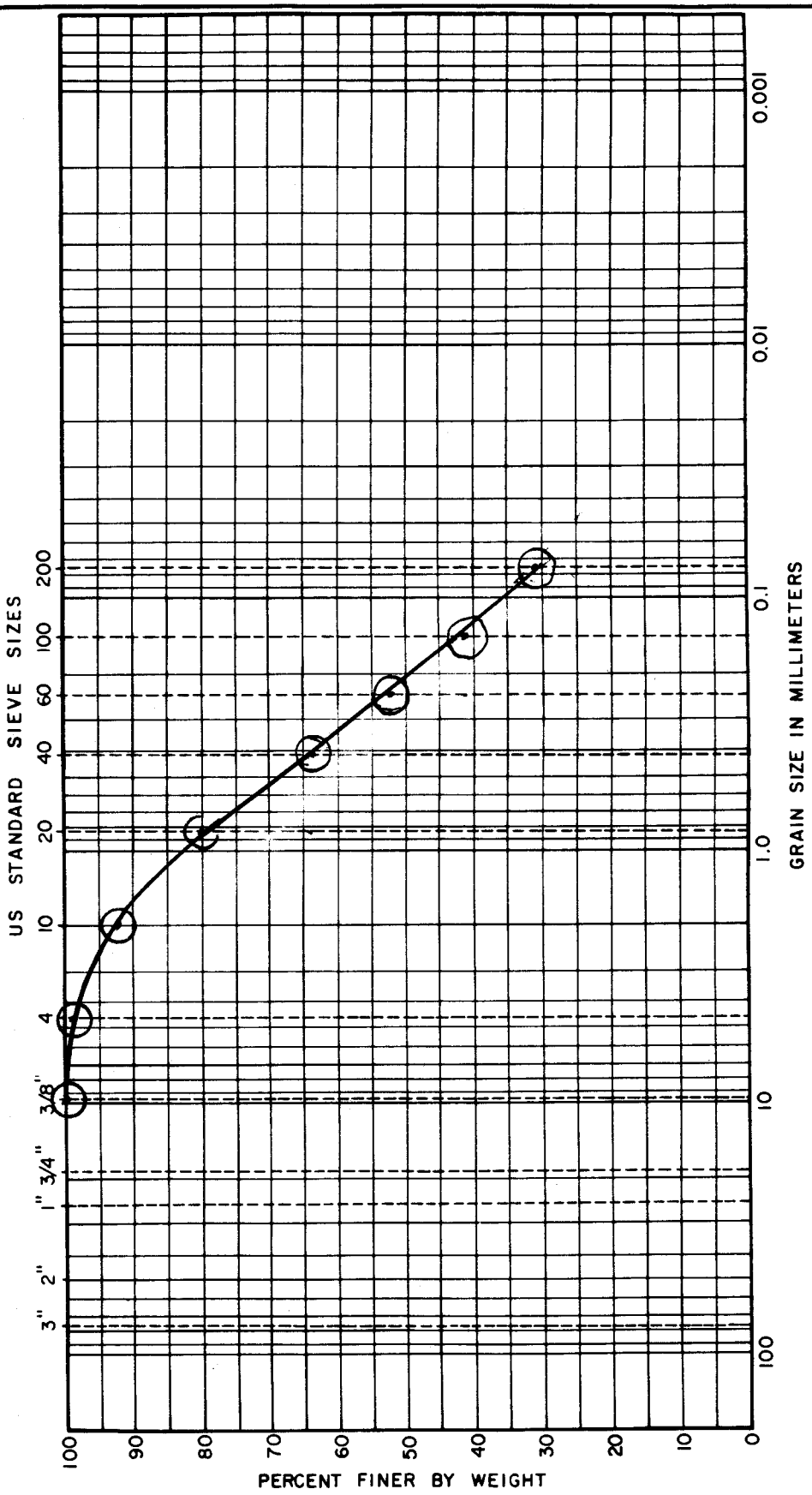
DATE OF TESTING: 6-17-87 BORING NO. D4 SAMPLE DEPTH: 38.5 - 40.5 CALCULATED BY: BdB

PROJECT NO. 863-3407 SAMPLE NO. 9A TESTED BY: BdB CHECKED BY: _____

Geotechnical Associates

GRA SIZE DISTRIBUTION

FIGURE



BORING NO.	ELEV. OR DEPTH	W_n	W_L	W_P	I_P	DESCRIPTION OR CLASSIFICATION
P2	465-505	-	-	-	-	White and Tan, Coarse to Fine Sand, and silt (SM) (Micaceous)
114						

Date 6-17-87

Job No. 863-3407

Golder Associates

Drawn BdB

Checked

Reviewed

SIEVE ANALYSIS (D422-63)

VISUAL CLASSIFICATION: _____

INITIAL WEIGHT OF SAMPLE: _____ gms. ☐ AIR DRY ☒ OVEN DRY

(1) MOISTURE CONTENT DETERMINATION

WET WEIGHT (SOIL + CONTAINER) = _____ gms.

DRY WEIGHT (SOIL + CONTAINER) = _____ gms.

WEIGHT OF WATER = _____ gms.

CONTAINER NO. _____, WEIGHT = _____ gms.

WEIGHT OF DRY SOIL = _____ gms.

WATER CONTENT = _____ %

(2) DRY WEIGHT OF SAMPLE = 167.7 gms.

(3) SAMPLE PREPARATION

☐ CRUSHED ☐ QUARTERED

☐ SEPARATED ON # 10 SIEVE

☐ + 10 MATERIAL WASHED

☒ WASHED ON # 200 SIEVE

(4) SAMPLE WEIGHT

	TOTAL SAMPLE	PORTION RETAINED #10 / #200	PORTION PASSING #10 / #200
CONTAINER NO			
DRY SOIL + CONTAINER			
CONTAINER WT.			
WT. DRY SOIL	167.7	115.98	51.72

(5) SIEVE ANALYSIS

U.S. STD. SIEVE NO.	CONTAINER WEIGHT	WT. RETAINED + CONTAINER	WT. RETAINED gms.	% RETAINED (1)	HYDROMETER BACKSIEVING WT. RETAINED gms.	% RETAINED (2)	CORRECTED % RETAINED (3)	% PASSING (4)
3/8		0	0	0				100.0
#4	7.9	9.14	1.24	0.74				99.26
#10		19.60	11.70	6.98				93.02
#20		41.70	33.8	20.16				79.84
#40		67.82	59.92	35.73				64.27
#60		86.85	78.95	47.08				52.92
#100		106.50	98.60	58.80				41.20
#200		123.88	115.98	69.16				30.84
PAN								
TOTAL								

(1) % RETAINED = WEIGHT RETAINED / DRY WT. OF SAMPLE

(2) % RETAINED = WEIGHT RETAINED / TOTAL HYDRO. SAMPLE WT. (WS)

(3) CORRECTED % RETAINED = (2) X % PASSING 10 SIEVE

(4) % PASSING = 100 % - % RETAINED (1 OR 3)

REMARKS: _____

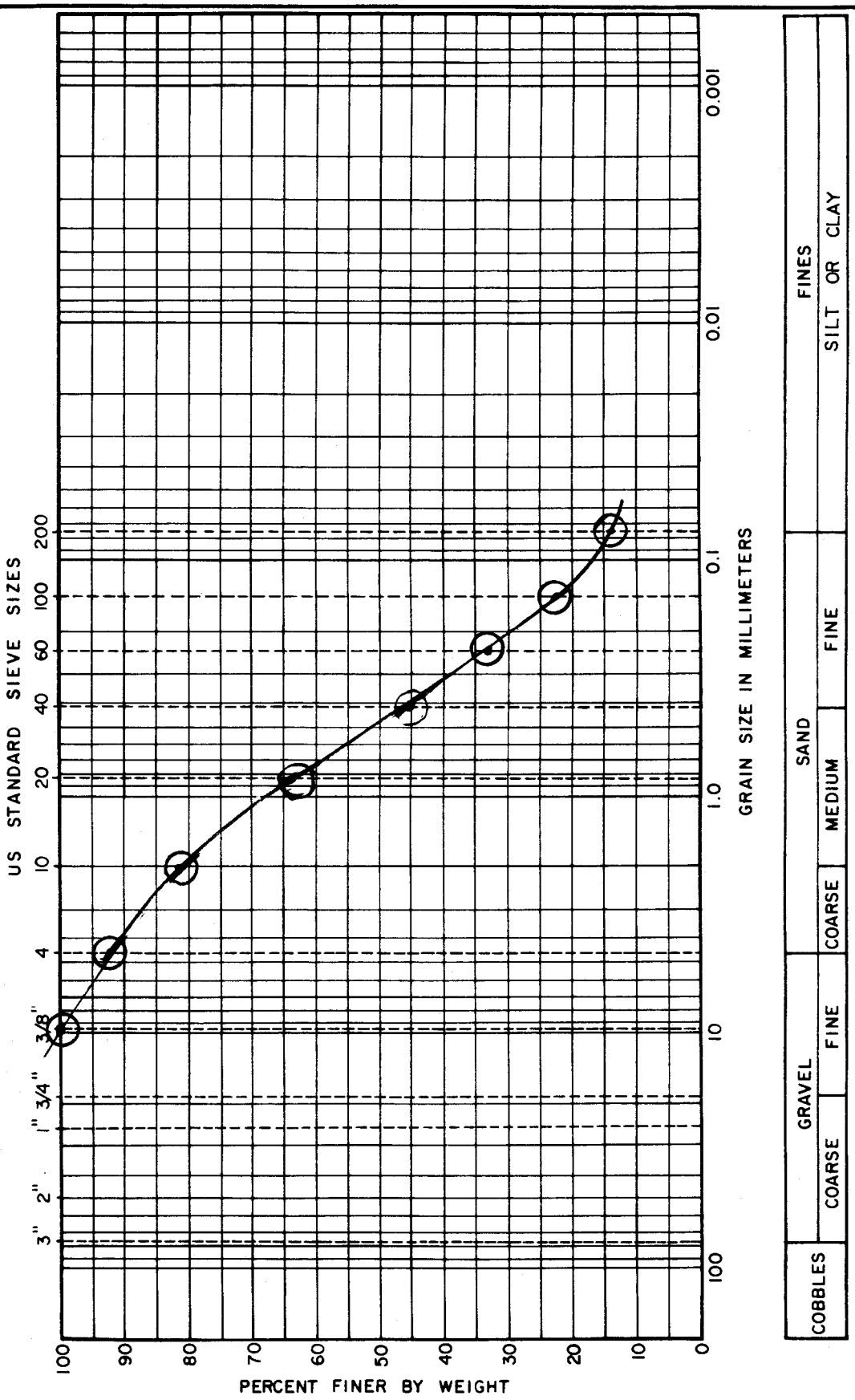
DATE OF TESTING: 6-16-87 BORING NO. B 2 SAMPLE DEPTH: 48.5 - 50.5 CALCULATED BY: B&B

PROJECT NO. 463-3407 SAMPLE NO. 11A TESTED BY: B&B CHECKED BY: _____

Gulular Associates

GRAIN SIZE DISTRIBUTION

FIGURE



BORING NO.	ELEV. OR DEPTH	W_n	W_L	W_p	I_p	DESCRIPTION OR CLASSIFICATION
PS	—	—	—	—	—	Grey and Tan, Coarse to Fine Sand, some silt, little fine gravel, (Micaceous)
SA						

Date 6-18-87

Job No. 863-3407

Golder Associates

Drawn BOB13

Checked

Reviewed

SIEVE ANALYSIS (D422-63)

VISUAL CLASSIFICATION: _____

INITIAL WEIGHT OF SAMPLE: _____ gms. ☐ AIR DRY ☒ OVEN DRY

(1) MOISTURE CONTENT DETERMINATION

WET WEIGHT (SOIL + CONTAINER) = _____ gms.

DRY WEIGHT (SOIL + CONTAINER) = _____ gms.

WEIGHT OF WATER = _____ gms.

CONTAINER NO. _____, WEIGHT = _____ gms.

WEIGHT OF DRY SOIL = _____ gms.

WATER CONTENT = _____ %

(2) DRY WEIGHT OF SAMPLE = 179.66 gms.

(3) SAMPLE PREPARATION

☐ CRUSHED ☐ QUARTERED

☐ SEPARATED ON # 10 SIEVE

☐ + 10 MATERIAL WASHED

☒ WASHED ON # 200 SIEVE

(4) SAMPLE WEIGHT

	TOTAL SAMPLE	PORTION RETAINED #10 / #200	PORTION PASSING #10 / #200
CONTAINER NO.			
DRY SOIL + CONTAINER			
CONTAINER WT.			
WT. DRY SOIL	179.66	153.92	25.74

(5) SIEVE ANALYSIS

U.S. STD. SIEVE NO.	CONTAINER WEIGHT	WT. RETAINED + CONTAINER	WT. RETAINED gms.	% RETAINED (1)	HYDROMETER BACKSIEVING WT. RETAINED gms.	% RETAINED (2)	CORRECTED % RETAINED (3)	% PASSING (4)
3/8	0	0	0	0				100.0
#4	8.13	20.15	12.02	6.69				93.31
#10		40.66	32.53	18.11				81.89
#20		72.02	63.89	35.56				64.44
#40		105.68	97.55	54.30				45.70
#60		127.09	118.96	66.21				33.79
#100		146.79	138.66	77.18				22.82
#200		162.05	153.92	85.67				14.33
PAN								
TOTAL								

(1) % RETAINED = WEIGHT RETAINED / DRY WT. OF SAMPLE

(2) % RETAINED = WEIGHT RETAINED / TOTAL HYDRO. SAMPLE WT. (WS)

(3) CORRECTED % RETAINED = (2) X % PASSING 10 SIEVE

(4) % PASSING = 100 % - % RETAINED (1 OR 3)

REMARKS: _____

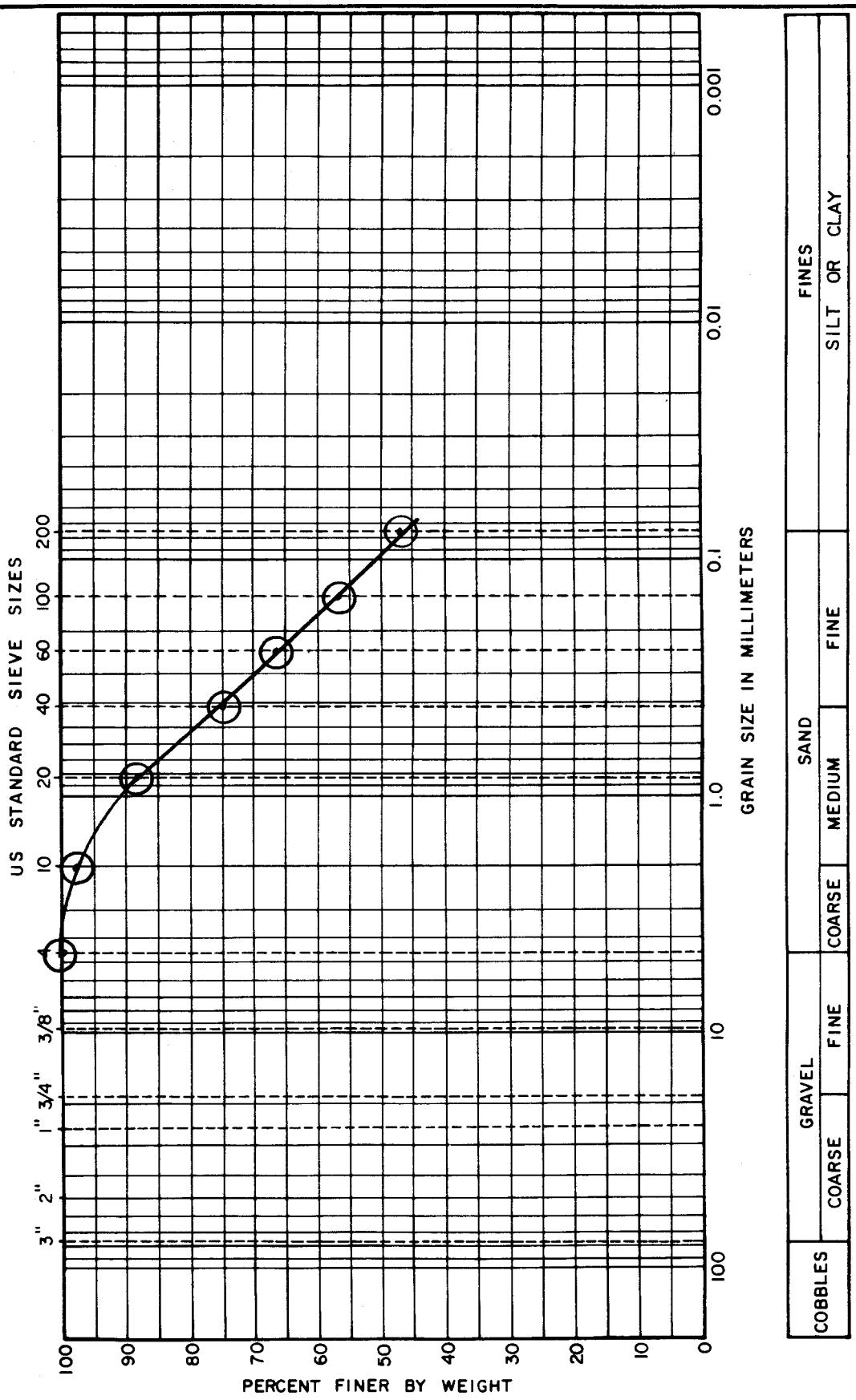
DATE OF TESTING: 6-16-87 BORING NO. 95 SAMPLE DEPTH: _____ CALCULATED BY: BdB

PROJECT NO. 863-3407 SAMPLE NO. 5A TESTED BY: BdB CHECKED BY: _____

Golder Associates

GRA SIZE DISTRIBUTION

FIGURE



BORING NO.	ELEV. OR DEPTH	W_n	W_L	W_p	I_p	DESCRIPTION OR CLASSIFICATION
P8 154	—	—	—	—	—	Reddish Brown, Coarse to Fine Sand, and silty clay, (SC)

Date 6-17-87

Job No. 863-3407

Golder Associates

Drawn Bob B

Checked

Reviewed

SIEVE ANALYSIS (D422-63)

VISUAL CLASSIFICATION: _____

INITIAL WEIGHT OF SAMPLE: _____ gms. ☐ AIR DRY ☒ OVEN DRY

(1) MOISTURE CONTENT DETERMINATION

WET WEIGHT (SOIL + CONTAINER) = _____ gms.

DRY WEIGHT (SOIL + CONTAINER) = _____ gms.

WEIGHT OF WATER = _____ gms.

CONTAINER NO. _____, WEIGHT = _____ gms.

WEIGHT OF DRY SOIL = _____ gms.

WATER CONTENT = _____ %

(2) DRY WEIGHT OF SAMPLE = 204.31 gms.

(3) SAMPLE PREPARATION

☐ CRUSHED ☐ QUARTERED

☐ SEPARATED ON # 10 SIEVE

☐ + 10 MATERIAL WASHED

☒ WASHED ON # 200 SIEVE

(4) SAMPLE WEIGHT

	TOTAL SAMPLE	PORTION RETAINED #10 (#200)	PORTION PASSING #10 (#200)
CONTAINER NO			
DRY SOIL + CONTAINER			
CONTAINER WT			
WT. DRY SOIL	204.31	108.97	95.34

(5) SIEVE ANALYSIS

U.S. STD. SIEVE NO.	CONTAINER WEIGHT	WT. RETAINED + CONTAINER	WT. RETAINED gms.	% RETAINED (1)	HYDROMETER BACKSIEVING WT. RETAINED gms.	% RETAINED (2)	CORRECTED % RETAINED (3)	% PASSING (4)
#4		0	0	0				100.00
#10	7.89	11.31	3.42	1.67				98.33
#20		32.79	24.90	12.19				87.81
#40		59.74	51.85	25.38				74.62
#60		77.65	69.76	34.14				65.86
#100		96.80	88.91	43.52				56.48
#200		116.86	108.97	53.34				46.66
PAN								
TOTAL								

(1) % RETAINED = WEIGHT RETAINED / DRY WT. OF SAMPLE

(2) % RETAINED = WEIGHT RETAINED / TOTAL HYDRO. SAMPLE WT. (WS)

(3) CORRECTED % RETAINED = (2) X % PASSING 10 SIEVE

(4) % PASSING = 100 % - % RETAINED (1 OR 3)

REMARKS: _____

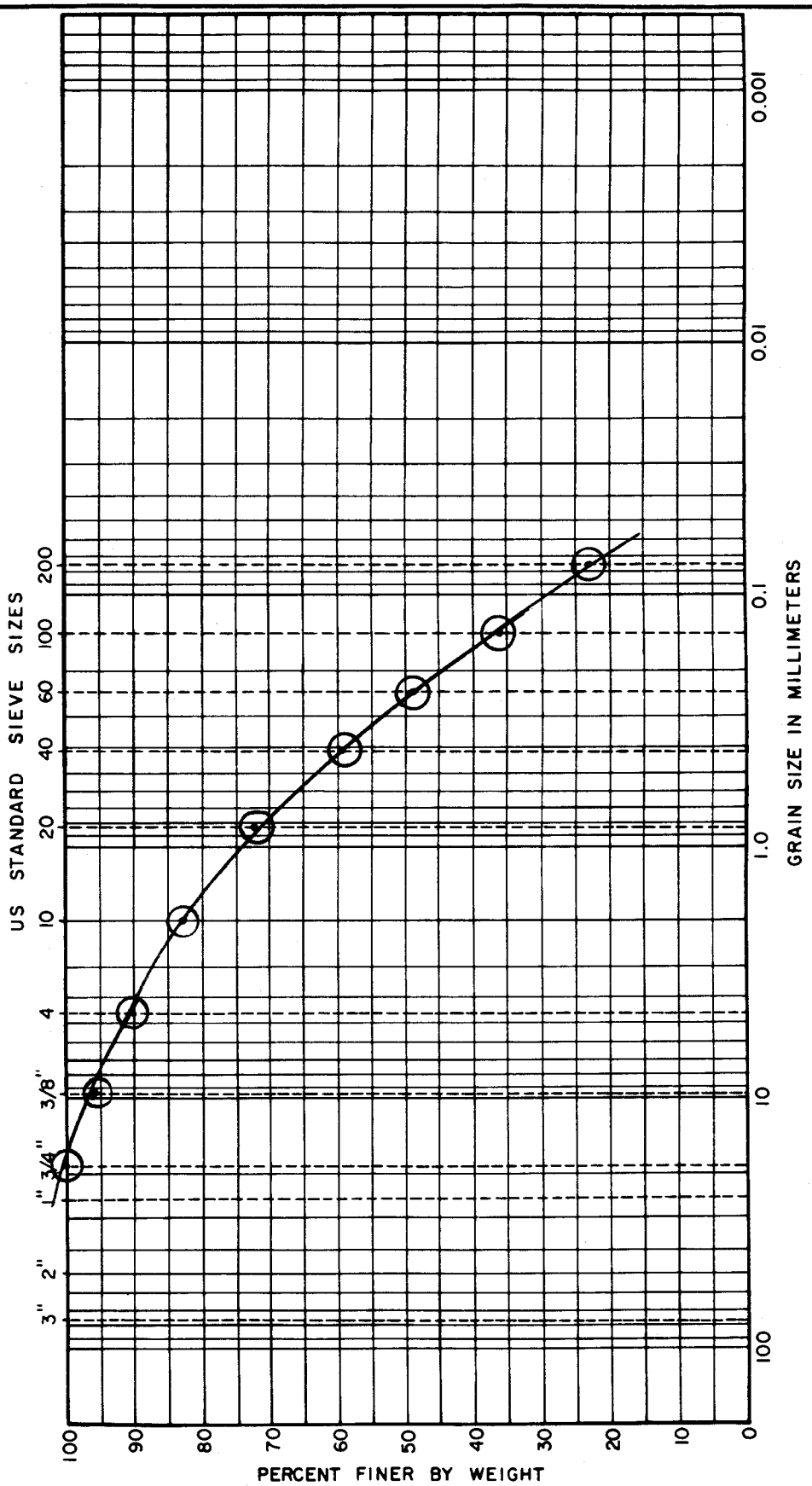
DATE OF TESTING: 6-16-87 BORING NO. 98 SAMPLE DEPTH: — CALCULATED BY: B&B

PROJECT NO. 863-3407 SAMPLE NO. 15 A TESTED BY: B&B CHECKED BY: _____

Geotar Associates

GRA SIZE DISTRIBUTION

FIGURE



BORING NO.	ELEV. OR DEPTH	W_n	W_L	W_P	I_P	DESCRIPTION OR CLASSIFICATION
27	3.5-5.5	-	-	-	-	light brown, coarse to fine sand, some silt, trace fine gravel, (SM)
2A						

Date 6-17-87

Job No. 863-3407

Golder Associates

Drawn

Checked

Reviewed

SIEVE ANALYSIS (D422-63)

VISUAL CLASSIFICATION: _____

INITIAL WEIGHT OF SAMPLE: _____ gms. ☐ AIR DRY ☒ OVEN DRY

(1) MOISTURE CONTENT DETERMINATION

WET WEIGHT (SOIL + CONTAINER) = _____ gms.

DRY WEIGHT (SOIL + CONTAINER) = _____ gms.

WEIGHT OF WATER = _____ gms.

CONTAINER NO. _____, WEIGHT = _____ gms.

WEIGHT OF DRY SOIL = _____ gms.

WATER CONTENT = _____ %

(2) DRY WEIGHT OF SAMPLE = 242.08 gms.

(3) SAMPLE PREPARATION

☐ CRUSHED ☐ QUARTERED

☐ SEPARATED ON # 10 SIEVE

☐ + 10 MATERIAL WASHED

☒ WASHED ON # 200 SIEVE

(4) SAMPLE WEIGHT

	TOTAL SAMPLE	PORTION RETAINED #10 / #200	PORTION PASSING #10 / #200
CONTAINER NO.			
DRY SOIL + CONTAINER			
CONTAINER WT			
WT. DRY SOIL	242.08	185.28	56.8

(5) SIEVE ANALYSIS

U.S STD. SIEVE NO.	CONTAINER WEIGHT	WT. RETAINED + CONTAINER	WT. RETAINED gms.	% RETAINED (1)	HYDROMETER BACKSIEVING WT. RETAINED gms.	% RETAINED (2)	CORRECTED % RETAINED (3)	% PASSING (4)
3/4	0	0	0	0				100.0
3/8	9.4	20.18	10.78	4.45				95.55
#4	9.4	32.58	23.18	9.58				90.42
#10		49.17	39.77	16.23				83.57
#20		73.98	64.58	26.68				73.32
#40		106.95	97.55	40.30				59.70
#60		133.05	123.65	51.08				48.92
#100		165.13	155.23	64.33				35.67
#200		194.68	185.28	76.54				23.46
PAN								
TOTAL								

(1) % RETAINED = WEIGHT RETAINED / DRY WT. OF SAMPLE

(2) % RETAINED = WEIGHT RETAINED / TOTAL HYDRO. SAMPLE WT. (WS)

(3) CORRECTED % RETAINED = (2) X % PASSING 10 SIEVE

(4) % PASSING = 100 % - % RETAINED (1 OR 3)

REMARKS: _____

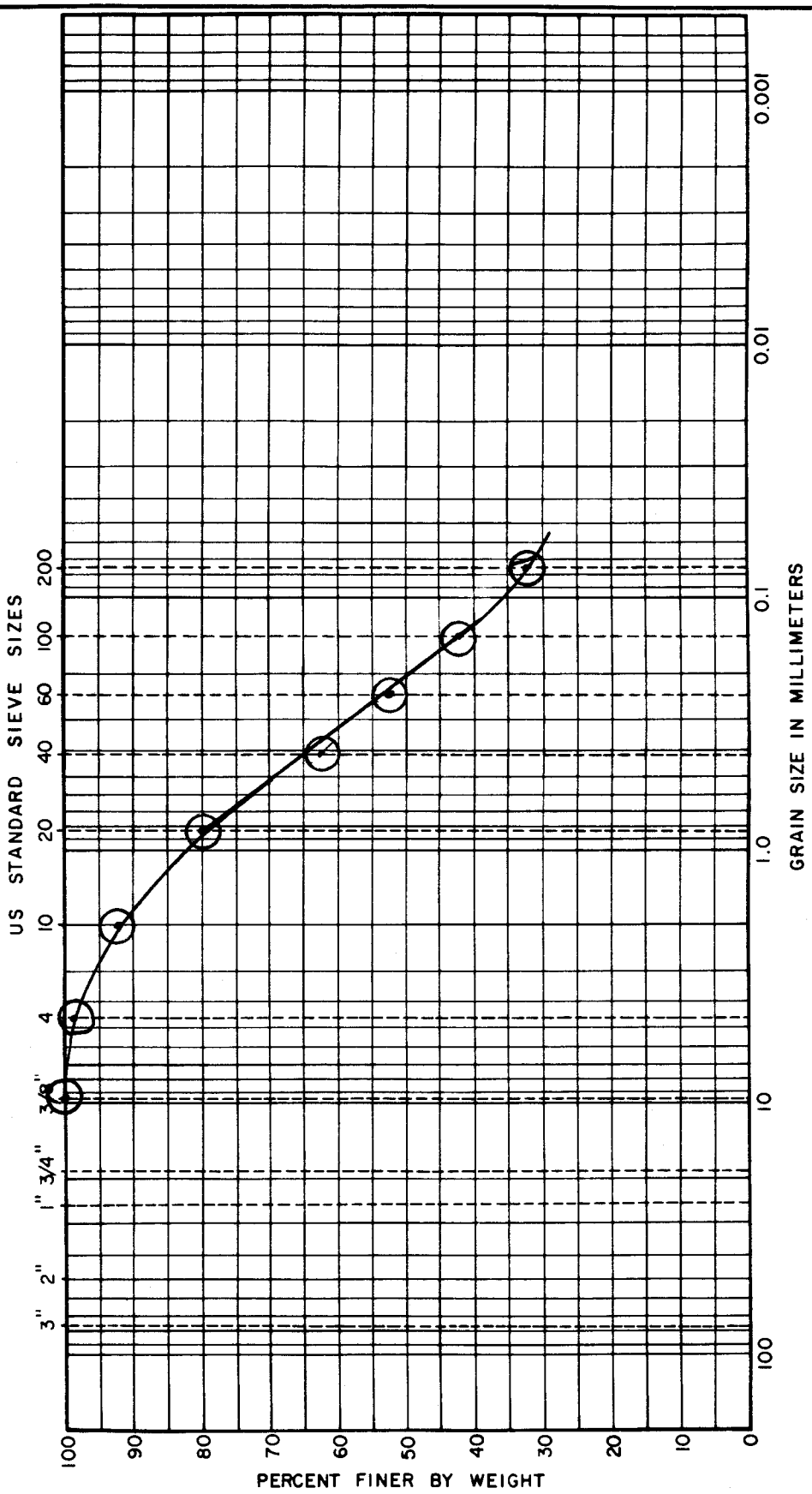
DATE OF TESTING: 6-16-87 BORING NO. B7 SAMPLE DEPTH: 3.5 - 5.5 CALCULATED BY: BobB

PROJECT NO. 863-3407 SAMPLE NO. 21 TESTED BY: BobB CHECKED BY: _____

Golder Associates

GRA SIZE DISTRIBUTION

FIGURE



BORING NO.	ELEV. OR DEPTH	W_n	W_L	W_p	I_p	DESCRIPTION OR CLASSIFICATION
P8	43.5-45.5	—	—	—	—	Tan, brown, Coarse to fine Sand and silt, (SM)
10A						

Date 6-17-87

Job No. 863-3407

Golder Associates

Drawn BBB

Checked

Reviewed

SIEVE ANALYSIS (D422-63)

VISUAL CLASSIFICATION: _____

INITIAL WEIGHT OF SAMPLE: _____ gms. ☐ AIR DRY ☒ OVEN DRY

(1) MOISTURE CONTENT DETERMINATION

WET WEIGHT (SOIL + CONTAINER) = _____ gms.

DRY WEIGHT (SOIL + CONTAINER) = _____ gms.

WEIGHT OF WATER = _____ gms.

CONTAINER NO. _____, WEIGHT = _____ gms.

WEIGHT OF DRY SOIL = _____ gms.

WATER CONTENT = _____ %

(2) DRY WEIGHT OF SAMPLE = 112.65 gms.

(3) SAMPLE PREPARATION

☐ CRUSHED ☐ QUARTERED

☐ SEPARATED ON # 10 SIEVE

☐ + 10 MATERIAL WASHED

☒ WASHED ON # 200 SIEVE

(4) SAMPLE WEIGHT

	TOTAL SAMPLE	PORTION RETAINED #10/#200	PORTION PASSING #10/#200
CONTAINER NO.			
DRY SOIL + CONTAINER			
CONTAINER WT.			
WT. DRY SOIL	112.65	75.31	37.34

(5) SIEVE ANALYSIS

U.S. STD. SIEVE NO.	CONTAINER WEIGHT	WT. RETAINED + CONTAINER	WT. RETAINED gms.	% RETAINED (1)	HYDROMETER BACKSIEVING WT. RETAINED gms.	% RETAINED (2)	CORRECTED % RETAINED (3)	% PASSING (4)
3/8	0	0	0	0				100.0
#4	7.8	9.25	1.45	1.29				98.71
#10		16.15	8.35	7.41				92.59
#20		30.43	22.63	20.09				79.91
#40		48.71	40.91	36.32				63.68
#60		61.03	53.23	47.25				52.75
#100		72.58	64.78	57.51				42.49
#200		83.11	75.31	66.85				33.15
PAN								
TOTAL								

(1) % RETAINED = WEIGHT RETAINED / DRY WT. OF SAMPLE

(2) % RETAINED = WEIGHT RETAINED / TOTAL HYDRO. SAMPLE WT. (WS)

(3) CORRECTED % RETAINED = (2) X % PASSING 10 SIEVE

(4) % PASSING = 100 % - % RETAINED (1 OR 3)

REMARKS: _____

DATE OF TESTING: 6-16-87

PROJECT NO. 863-3407

BORING NO. P8

SAMPLE NO. 10 A

SAMPLE DEPTH: 43 - 45.5

TESTED BY: BobB

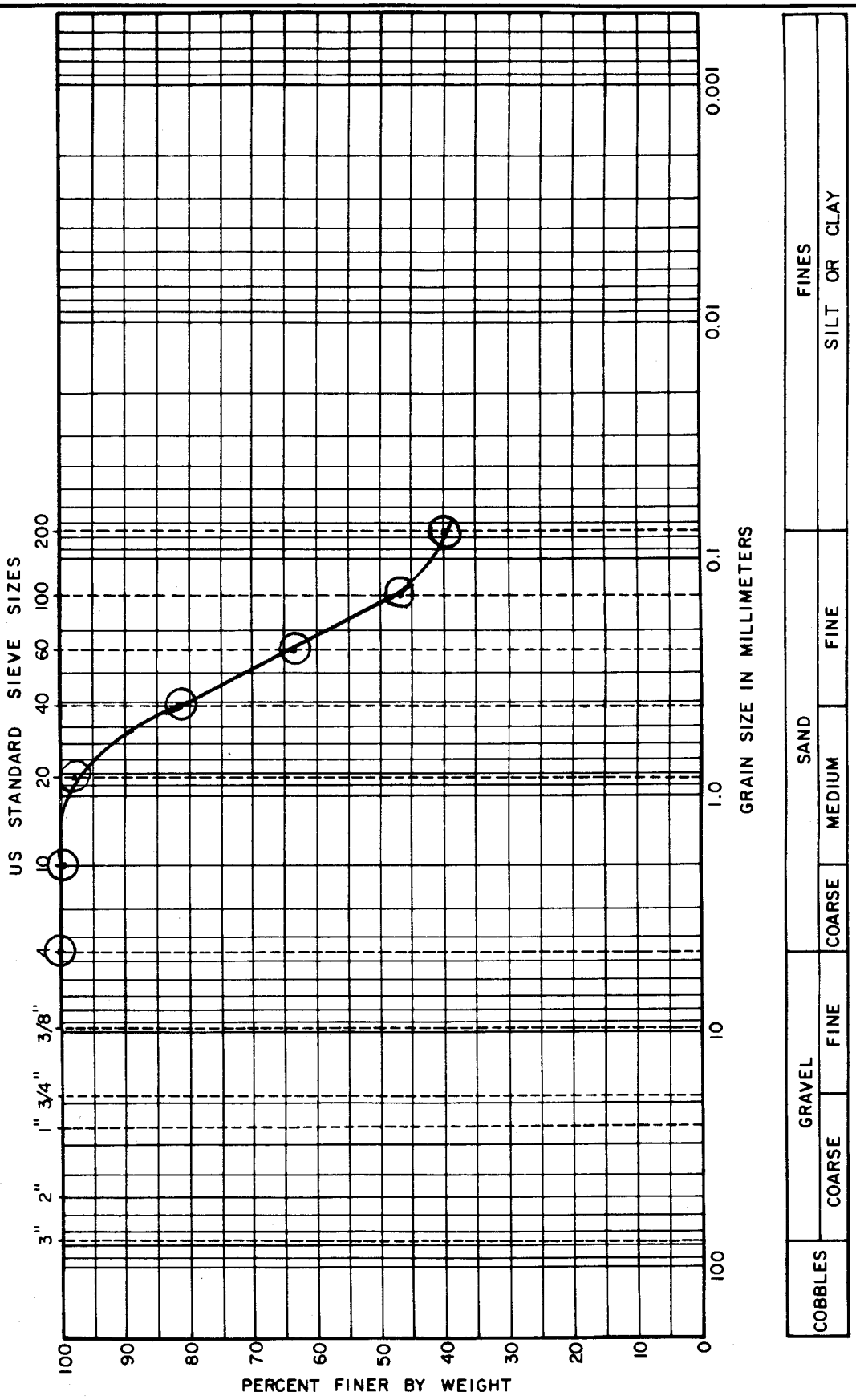
CALCULATED BY: BobB

CHECKED BY: _____

Golder Associates

GRA SIZE DISTRIBUTION

FIGURE



BORING NO.	ELEV. OR DEPTH	W_n	W_L	W_p	I_p	DESCRIPTION OR CLASSIFICATION
P7 5A	10.5-19.5	-	-	-	-	Black, Gray Silty, Medium to Fine Sand and silt, (SM) (Micaceous)

Date 6-18-87

Job No. 863-3407

Golder Associates

Drawn BDB

Checked

Reviewed

SIEVE ANALYSIS (D422-63)

VISUAL CLASSIFICATION: _____

INITIAL WEIGHT OF SAMPLE: _____ gms. ☐ AIR DRY ☒ OVEN DRY

(1) MOISTURE CONTENT DETERMINATION

WET WEIGHT (SOIL + CONTAINER) = _____ gms.

DRY WEIGHT (SOIL + CONTAINER) = _____ gms.

WEIGHT OF WATER = _____ gms.

CONTAINER NO. _____, WEIGHT = _____ gms.

WEIGHT OF DRY SOIL = _____ gms.

WATER CONTENT = _____ %

(2) DRY WEIGHT OF SAMPLE = 216.71 gms.

(3) SAMPLE PREPARATION

☐ CRUSHED ☐ QUARTERED

☐ SEPARATED ON # 10 SIEVE

☐ + 10 MATERIAL WASHED

☒ WASHED ON # 200 SIEVE

(4) SAMPLE WEIGHT

	TOTAL SAMPLE	PORTION RETAINED #10 #200	PORTION PASSING #10 #200
CONTAINER NO.			
DRY SOIL + CONTAINER			
CONTAINER WT.			
WT. DRY SOIL	216.71	149.59	67.12

(5) SIEVE ANALYSIS

U.S. STD. SIEVE NO.	CONTAINER WEIGHT	WT. RETAINED + CONTAINER	WT. RETAINED gms.	% RETAINED (1)	HYDROMETER BACKSIEVING WT. RETAINED gms.	% RETAINED (2)	CORRECTED % RETAINED (3)	% PASSING (4)
#4		0	0	0				100.0
#10	7.9	8.04	1.02	0.47				99.53
#20		12.72	4.82	2.22				97.78
#40		48.49	40.59	18.73				81.27
#60		85.70	77.80	35.90				64.10
#100		124.58	116.68	53.84				46.16
#200		157.49	149.59	69.03				30.97
PAN								
TOTAL								

(1) % RETAINED = WEIGHT RETAINED / DRY WT. OF SAMPLE

(2) % RETAINED = WEIGHT RETAINED / TOTAL HYDRO. SAMPLE WT. (WS)

(3) CORRECTED % RETAINED = (2) X % PASSING 10 SIEVE

(4) % PASSING = 100 % - % RETAINED (1 OR 3)

REMARKS: _____

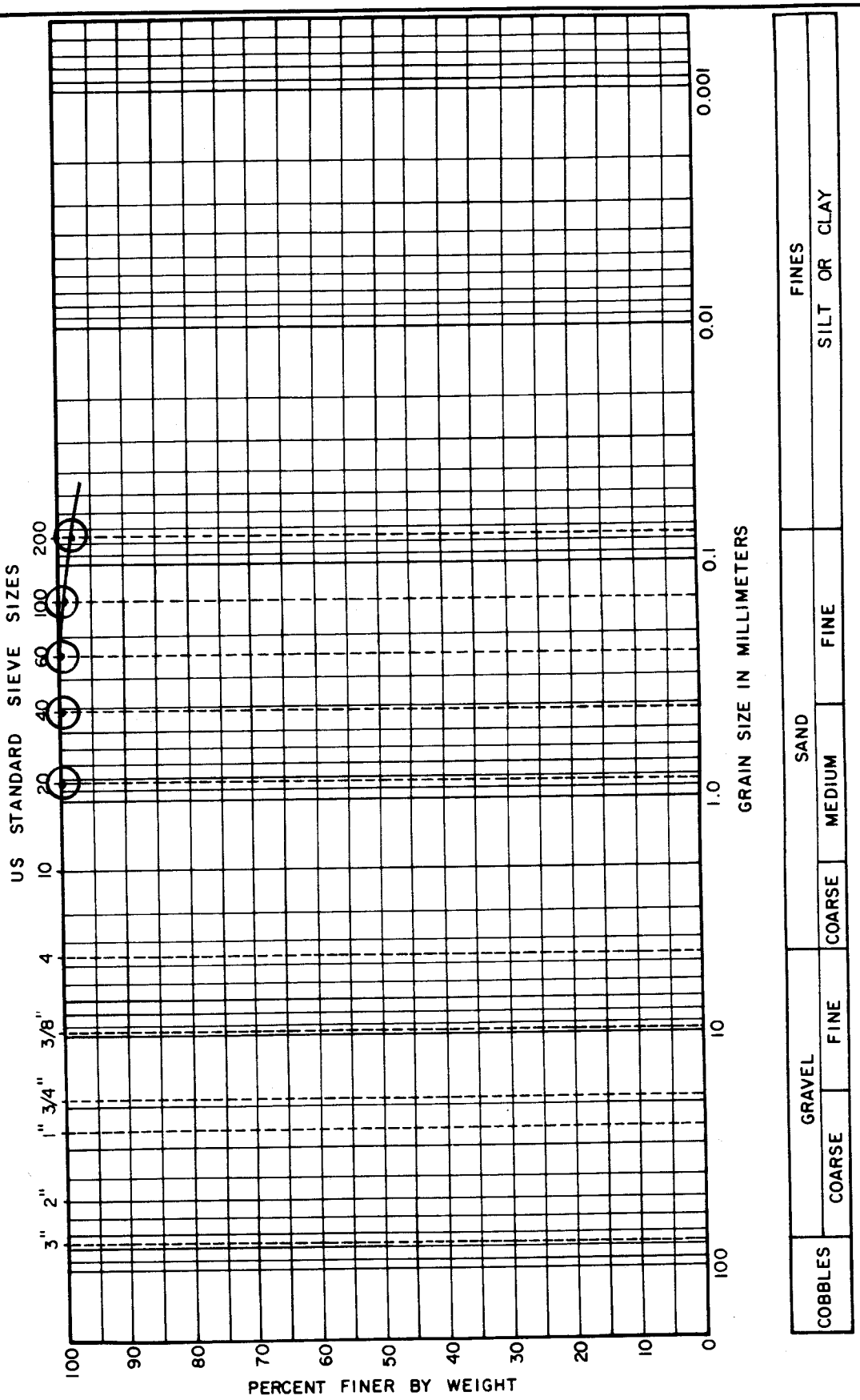
DATE OF TESTING: 6-17-87 BORING NO. P7 SAMPLE DEPTH: 10.5 - 19.5 CALCULATED BY: BdB

PROJECT NO. 863-3407 SAMPLE NO. S4 TESTED BY: BdB CHECKED BY: _____

Golder Associates

GRAIN SIZE DISTRIBUTION

FIGURE



BORING NO.	ELEV. OR DEPTH	W_n	W_L	W_p	I_p	DESCRIPTION OR CLASSIFICATION
P4	8.5-10.5	-	-	-	-	white and Tan, Sandy silt (trace fine sand) (trace mica) ML
3A						

Date 6-18-87

Job No. 863-3407

Golder Associates

Drawn BB

Checked

Reviewed

SIEVE ANALYSIS (D422-63)

VISUAL CLASSIFICATION: _____

INITIAL WEIGHT OF SAMPLE: _____ gms. ☐ AIR DRY ☒ OVEN DRY

(1) MOISTURE CONTENT DETERMINATION

WET WEIGHT (SOIL + CONTAINER) = _____ gms.

DRY WEIGHT (SOIL + CONTAINER) = _____ gms.

WEIGHT OF WATER = _____ gms.

CONTAINER NO. _____, WEIGHT = _____ gms.

WEIGHT OF DRY SOIL = _____ gms.

WATER CONTENT = _____ %

(2) DRY WEIGHT OF SAMPLE = 126.01 gms.

(3) SAMPLE PREPARATION

☐ CRUSHED ☐ QUARTERED

☐ SEPARATED ON # 10 SIEVE

☐ + 10 MATERIAL WASHED

☒ WASHED ON # 200 SIEVE

(4) SAMPLE WEIGHT

	TOTAL SAMPLE	PORTION RETAINED #10 / #200	PORTION PASSING #10 / #200
CONTAINER NO.			
DRY SOIL + CONTAINER			
CONTAINER WT			
WT. DRY SOIL	126.01	2.28	123.73

(5) SIEVE ANALYSIS

U.S. STD. SIEVE NO.	CONTAINER WEIGHT	WT. RETAINED + CONTAINER	WT. RETAINED gms.	% RETAINED (1)	HYDROMETER BACKSIEVING WT. RETAINED gms.	% RETAINED (2)	CORRECTED % RETAINED (3)	% PASSING (4)
#4								
#10								
#20	8.0	8	0	0				100.0
#40	8.0	8.05	.05	0.04				99.96
#60		8.36	.36	0.29				99.71
#100		9.05	1.05	0.83				99.17
#200		10.28	2.28	1.81				98.19
PAN								
TOTAL								

(1) % RETAINED = WEIGHT RETAINED / DRY WT. OF SAMPLE

(2) % RETAINED = WEIGHT RETAINED / TOTAL HYDRO. SAMPLE WT. (WS)

(3) CORRECTED % RETAINED = (2) X % PASSING 10 SIEVE

(4) % PASSING = 100 % - % RETAINED (1 OR 3)

REMARKS: _____

DATE OF TESTING: 6-16-87 BORING NO. P4 SAMPLE DEPTH: 8.5 -10.5'

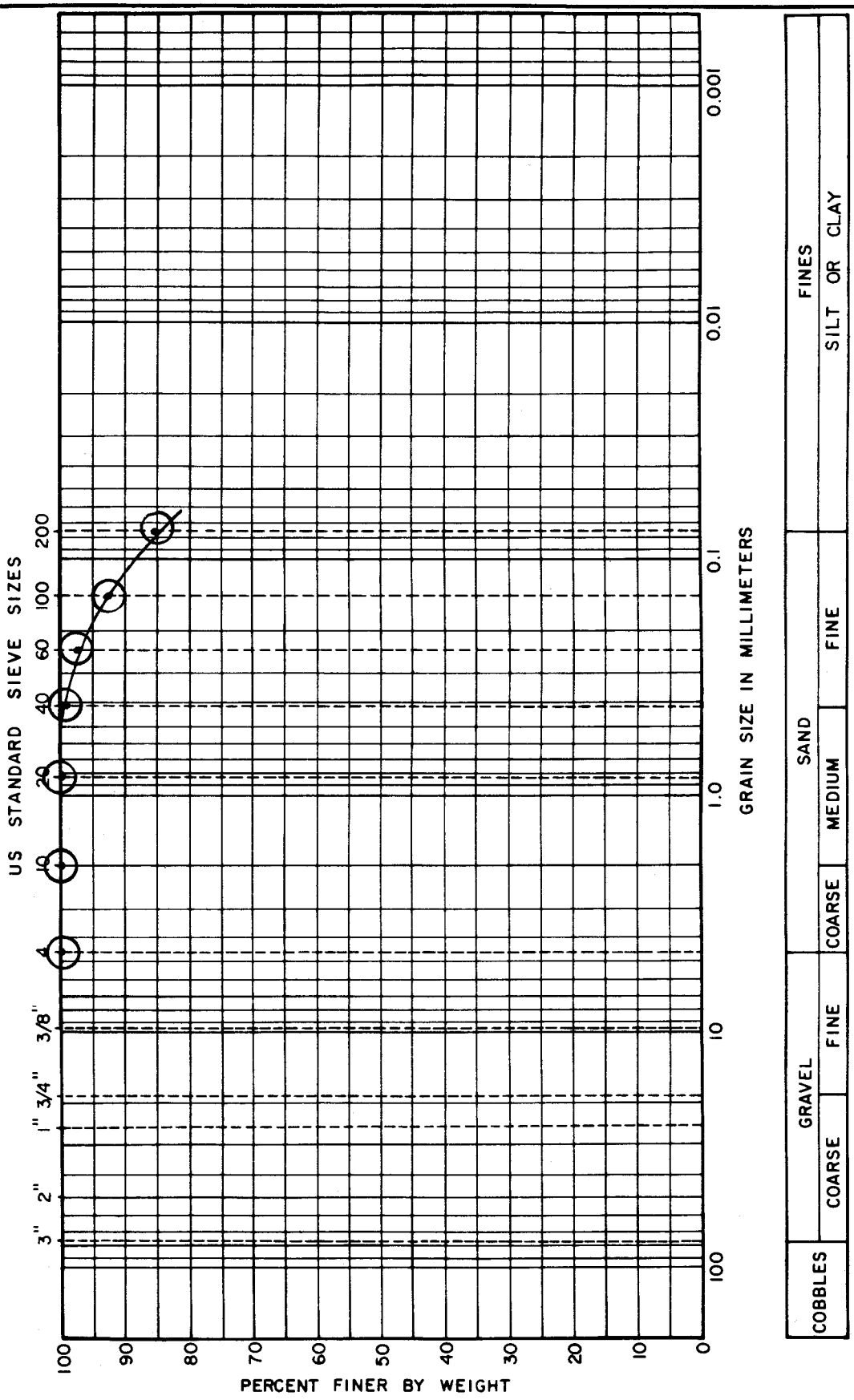
PROJECT NO. 863-3407 SAMPLE NO. 3A TESTED BY: BobB CALCULATED BY: BobB

CHECKED BY: _____

Golder Associates

GRA SIZE DISTRIBUTION

FIGURE



BORING NO.	ELEV. OR DEPTH	W_n	W_L	W_P	I_P	DESCRIPTION OR CLASSIFICATION
P8	65-67'	—	—	—	—	Brown, Silt, Some Fine Sand (SM)
14A						

Date 6-18-87

Job No. 863-3407

Golder Associates

Drawn BobB

Checked

Reviewed

SIEVE ANALYSIS (D422-63)

VISUAL CLASSIFICATION: _____

INITIAL WEIGHT OF SAMPLE: _____ gms. ☐ AIR DRY ☒ OVEN DRY

(1) MOISTURE CONTENT DETERMINATION

WET WEIGHT (SOIL + CONTAINER) = _____ gms.

DRY WEIGHT (SOIL + CONTAINER) = _____ gms.

WEIGHT OF WATER = _____ gms.

CONTAINER NO. _____, WEIGHT = _____ gms.

WEIGHT OF DRY SOIL = _____ gms.

WATER CONTENT = _____ %

(2) DRY WEIGHT OF SAMPLE = 150.78 gms.

(3) SAMPLE PREPARATION

☐ CRUSHED ☐ QUARTERED

☐ SEPARATED ON # 10 SIEVE

☐ + 10 MATERIAL WASHED

☒ WASHED ON # 200 SIEVE

(4) SAMPLE WEIGHT

	TOTAL SAMPLE	PORTION RETAINED #10/#200	PORTION PASSING #10/#200
CONTAINER NO.			
DRY SOIL + CONTAINER			
CONTAINER WT.			
WT. DRY SOIL	150.78	14.89	135.89

(5) SIEVE ANALYSIS

U.S. STD. SIEVE NO.	CONTAINER WEIGHT	WT. RETAINED + CONTAINER	WT. RETAINED gms.	% RETAINED (1)	HYDROMETER BACKSIEVING WT. RETAINED gms.	% RETAINED (2)	CORRECTED % RETAINED (3)	% PASSING (4)
#4		0	0	0				100.0
#10	8.12	8.13	0.01	0.01				99.99
#20		8.28	0.16	0.11				99.89
#40		9.31	1.19	0.79				99.21
#60		12.32	4.2	2.79				97.21
#100		17.19	9.07	6.02				93.98
#200		23.01	14.89	9.88				90.12
PAN								
TOTAL								

(1) % RETAINED = WEIGHT RETAINED / DRY WT. OF SAMPLE

(2) % RETAINED = WEIGHT RETAINED / TOTAL HYDRO. SAMPLE WT. (WS)

(3) CORRECTED % RETAINED = (2) X % PASSING 10 SIEVE

(4) % PASSING = 100 % - % RETAINED (1 OR 3)

REMARKS: _____

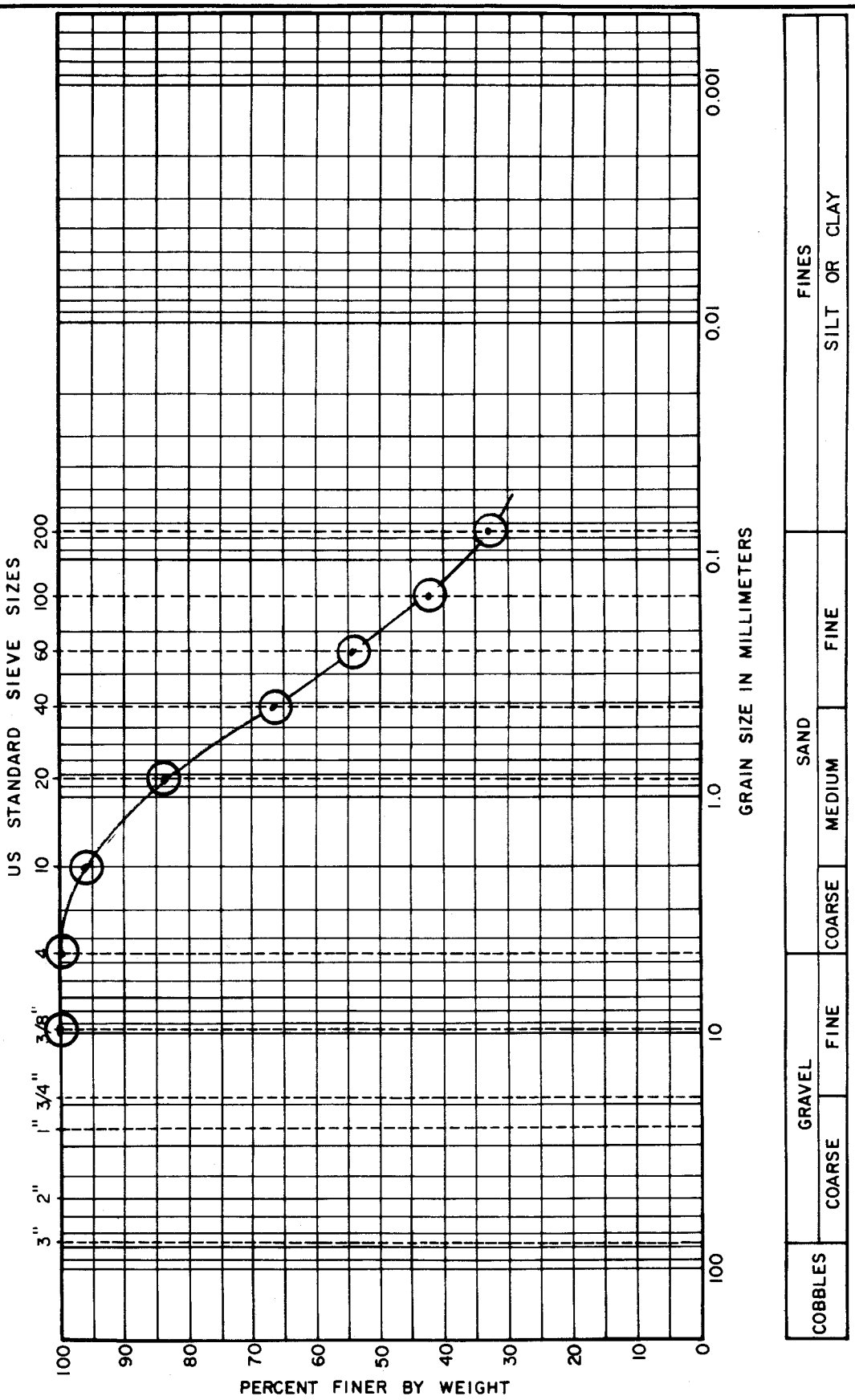
DATE OF TESTING: 6-17-87 BORING NO. P8 SAMPLE DEPTH: 65-67' CALCULATED BY: BobB

PROJECT NO. 863-3407 SAMPLE NO. 14 TESTED BY: BobB CHECKED BY: _____

Gutdar Associates

GRAIN SIZE DISTRIBUTION

FIGURE



BORING NO.	ELEV. OR DEPTH	W_n	W_L	W_p	I_p	DESCRIPTION OR CLASSIFICATION
28	3.5-5.5	—	—	—	—	Brown, Coarse to fine Sand, and silty clay, (SC) (trace mica)
24						

Date _____

Job No. _____

Golder Associates

Drawn _____

Checked _____

Reviewed _____

SIEVE ANALYSIS (D422-63)

VISUAL CLASSIFICATION: _____

INITIAL WEIGHT OF SAMPLE: _____ gms. ☐ AIR DRY ☒ OVEN DRY

(1) MOISTURE CONTENT DETERMINATION

WET WEIGHT (SOIL + CONTAINER) = _____ gms.

DRY WEIGHT (SOIL + CONTAINER) = _____ gms.

WEIGHT OF WATER = _____ gms.

CONTAINER NO. _____, WEIGHT = _____ gms.

WEIGHT OF DRY SOIL = _____ gms.

WATER CONTENT = _____ %

(2) DRY WEIGHT OF SAMPLE = 191.55 gms.

(3) SAMPLE PREPARATION

☐ CRUSHED ☐ QUARTERED

☐ SEPARATED ON # 10 SIEVE

☐ + 10 MATERIAL WASHED

☒ WASHED ON # 200 SIEVE

(4) SAMPLE WEIGHT

	TOTAL SAMPLE	PORTION RETAINED #10 #200	PORTION PASSING #10 #200
CONTAINER NO.			
DRY SOIL + CONTAINER			
CONTAINER WT.			
WT. DRY SOIL	191.55	126.96	64.59

(5) SIEVE ANALYSIS

U.S. STD. SIEVE NO.	CONTAINER WEIGHT	WT. RETAINED + CONTAINER	WT. RETAINED gms.	% RETAINED (1)	HYDROMETER BACKSIEVING WT. RETAINED gms.	% RETAINED (2)	CORRECTED % RETAINED (3)	% PASSING (4)
3/8		0	0	0				100.0
#4	7.63	8.21	.58	0.30				99.70
#10		14.59	6.96	3.63				96.37
#20		38.24	30.61	15.98				84.02
#40		72.51	64.88	33.87				66.13
#60		94.78	87.15	45.50				54.50
#100		117.18	109.55	57.19				42.81
#200		134.59	126.96	66.28				33.72
PAN								
TOTAL								

(1) % RETAINED = WEIGHT RETAINED / DRY WT. OF SAMPLE

(2) % RETAINED = WEIGHT RETAINED / TOTAL HYDRO. SAMPLE WT. (WS)

(3) CORRECTED % RETAINED = (2) X % PASSING 10 SIEVE

(4) % PASSING = 100 % - % RETAINED (1 OR 3)

REMARKS: _____

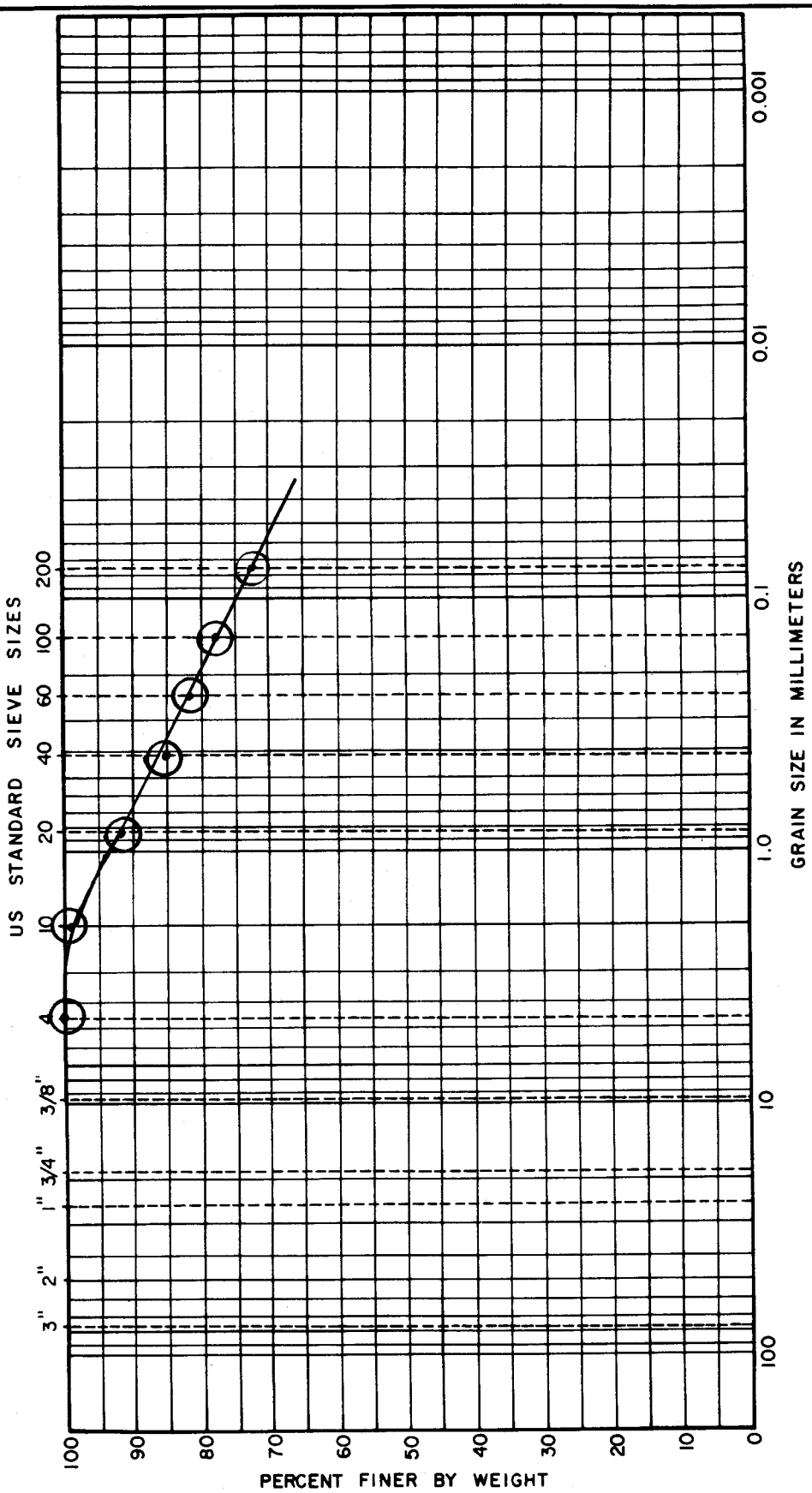
DATE OF TESTING: 6-18-87 BORING NO. P8 SAMPLE DEPTH: 3.5 - 5.5 CALCULATED BY: BdB

PROJECT NO. 863-3407 SAMPLE NO. 2A TESTED BY: BdB CHECKED BY: _____

Golder Associates

GRA SIZE DISTRIBUTION

FIGURE



BORING NO.	ELEV. OR DEPTH	W_n	W_L	W_p	I_p	DESCRIPTION OR CLASSIFICATION
2A	—	—	—	—	—	Red, Silty Clay, Some coarse to fine sand, (CL) (trace mica)
1B						

Date 6-17-87

Job No. 863-3407

Golder Associates

Drawn BoB B

Checked

Reviewed

SIEVE ANALYSIS (D422-63)

VISUAL CLASSIFICATION: _____

INITIAL WEIGHT OF SAMPLE: _____ gms. ☐ AIR DRY ☒ OVEN DRY

(1) MOISTURE CONTENT DETERMINATION

WET WEIGHT (SOIL + CONTAINER) = _____ gms.

DRY WEIGHT (SOIL + CONTAINER) = _____ gms.

WEIGHT OF WATER = _____ gms.

CONTAINER NO. _____, WEIGHT = _____ gms.

WEIGHT OF DRY SOIL = _____ gms.

WATER CONTENT = _____ %

(2) DRY WEIGHT OF SAMPLE = 110.76 gms.

(3) SAMPLE PREPARATION

☐ CRUSHED ☐ QUARTERED

☐ SEPARATED ON # 10 SIEVE

☐ + 10 MATERIAL WASHED

☒ WASHED ON # 200 SIEVE

(4) SAMPLE WEIGHT

	TOTAL SAMPLE	PORTION RETAINED #10 / #200	PORTION PASSING #10 / #200
CONTAINER NO.			
DRY SOIL + CONTAINER			
CONTAINER WT.			
WT. DRY SOIL	110.76	29.87	80.89

(5) SIEVE ANALYSIS

U.S. STD. SIEVE NO.	CONTAINER WEIGHT	WT. RETAINED + CONTAINER	WT. RETAINED gms.	% RETAINED (1)	HYDROMETER BACKSIEVING WT. RETAINED gms.	% RETAINED (2)	CORRECTED % RETAINED (3)	% PASSING (4)
#4		0	0	0				100.0
#10	10.12	11.34	1.22	1.10				98.90
#20		19.13	9.01	8.13				91.87
#40		26.38	16.26	14.68				85.32
#60		30.48	20.36	18.38				81.62
#100		35.05	24.93	22.51				77.49
#200		39.99	29.87	26.97				73.03
PAN								
TOTAL								

(1) % RETAINED = WEIGHT RETAINED / DRY WT. OF SAMPLE

(2) % RETAINED = WEIGHT RETAINED / TOTAL HYDRO. SAMPLE WT. (WS)

(3) CORRECTED % RETAINED = (2) X % PASSING 10 SIEVE

(4) % PASSING = 100 % - % RETAINED (1 OR 3)

REMARKS: _____

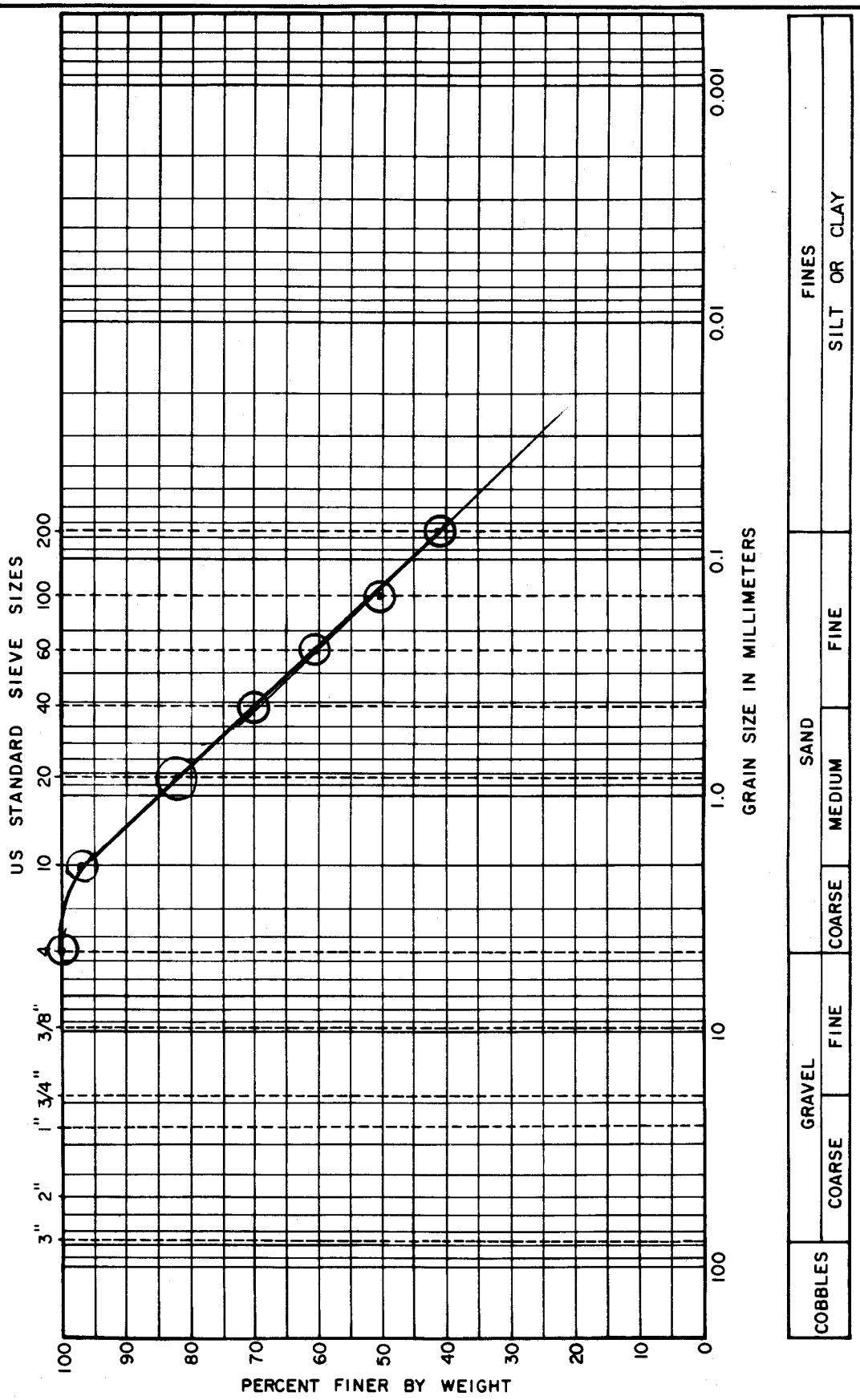
DATE OF TESTING: 6-17-87 BORING NO. P2 SAMPLE DEPTH: — CALCULATED BY: BobB

PROJECT NO. 863-3407 SAMPLE NO. 13 TESTED BY: BobB CHECKED BY: _____

Golder Associates

GRAIN SIZE DISTRIBUTION

FIGURE



BORING NO.	ELEV. OR DEPTH	W_n	W_L	W_p	I_p	DESCRIPTION OR CLASSIFICATION
P2	23.5-25.5	-	-	-	-	White and Tan, Coarse to Fine Sand, and silt (SM) (Micaceous)
6A						

Date 6-18-87

Job No. 863-3407

Golder Associates

Drawn BGB

Checked

Reviewed

SIEVE ANALYSIS (D422-63)

VISUAL CLASSIFICATION: _____

INITIAL WEIGHT OF SAMPLE: _____ gms. ☐ AIR DRY ☒ OVEN DRY

(1) MOISTURE CONTENT DETERMINATION

WET WEIGHT (SOIL + CONTAINER) = _____ gms.

DRY WEIGHT (SOIL + CONTAINER) = _____ gms.

WEIGHT OF WATER = _____ gms.

CONTAINER NO. _____, WEIGHT = _____ gms.

WEIGHT OF DRY SOIL = _____ gms.

WATER CONTENT = _____ %

(2) DRY WEIGHT OF SAMPLE = 167.38 gms.

(3) SAMPLE PREPARATION

☐ CRUSHED ☐ QUARTERED

☐ SEPARATED ON #10 SIEVE

☐ + 10 MATERIAL WASHED

☒ WASHED ON #200 SIEVE

(4) SAMPLE WEIGHT

	TOTAL SAMPLE	PORTION RETAINED #10 #200	PORTION PASSING #10 #200
CONTAINER NO			
DRY SOIL + CONTAINER			
CONTAINER WT.			
WT. DRY SOIL	167.38	98.6	68.78

(5) SIEVE ANALYSIS

U.S STD. SIEVE NO.	CONTAINER WEIGHT	WT. RETAINED + CONTAINER	WT. RETAINED gms.	% RETAINED (1)	HYDROMETER BACKSIEVING WT. RETAINED gms.	% RETAINED (2)	CORRECTED % RETAINED (3)	% PASSING (4)
#4		0	0	0				100.00
#10	7.8	12.81	5.01	2.99				97.01
#20		36.15	28.35	16.94				83.06
#40		58.92	51.12	30.54				69.46
#60		73.53	65.73	39.27				60.73
#100		90.40	82.6	49.35				50.65
#200		106.4	98.6	58.91				41.09
PAN								
TOTAL								

(1) % RETAINED = WEIGHT RETAINED / DRY WT. OF SAMPLE

(2) % RETAINED = WEIGHT RETAINED / TOTAL HYDRO. SAMPLE WT. (WS)

(3) CORRECTED % RETAINED = (2) X % PASSING 10 SIEVE

(4) % PASSING = 100 % - % RETAINED (1 OR 3)

REMARKS: _____

DATE OF TESTING: 6-16-87 BORING NO. P2 SAMPLE DEPTH: 23.5 - 25.5 CALCULATED BY: BobB

PROJECT NO. 863-3407 SAMPLE NO. 6A TESTED BY: BobB CHECKED BY: _____

Golder Associates

APPENDIX C

WATER QUALITY ANALYTICAL RESULTS FOR BARROW'S WELL

SPECIAL WASTE ANALYSIS REPORT

This Report is intended for the sole use and benefit of Waste Management and its companies. No representation concerning significance of the reported data is made to any other person or entity.

WASTE PROFILE SHEET CODE

Project #863-34

FROM SAMPLE CONTAINER

LABORATORY NAME: ADVANCED CHEMISTRY LABS, INC.

ADDRESS: 204 Marray Drive, Chamblee, GA 30341 LAB MGR PHONE: (404) 455-1266

DATE SAMPLE RECEIVED AT LAB: 4/22/87 DATE SAME TAKEN:

LAB SAMPLE NUMBER ASSIGNED: ACL #4114 (ACL Proj. #0930) CERTIFICATION OF REP. SAMPLE OBTAINED? ☐ YES ☐ NO

CERTIFICATION: Except as explicitly noted, all analytical data reported below were obtained under my direction and supervision, using sample preparation and analytical methods and analytical equipment specified or approved in the most recent "Test Methods for the Evaluation of Solid Waste, Physical/Chemical Methods," SW 846, USEPA Office of Solid Waste. This laboratory follows a quality assurance control program, including a sample chain of custody procedure.

DATE OF REPORT: 5/6/87 SIGNATURE: Steven N. Tsoukalas

BARROW Well Kernersville NC

LAB MANAGER NAME: Dr. Steve N. Tsoukalas

PHYSICAL CHARACTERISTICS OF WASTE

SAMPLE VOLUME	COLOR	ODOR: ☐ NONE ☐ MILD ☐ STRONG DESCRIBE	PHYSICAL STATE @ 70°F ☐ SOLID ☐ SEMI-SOLID ☐ LIQUID ☐ POWDER	LAYERS ☐ MULTILAYERED ☐ BI-LAYERED ☐ SINGLE PHASED	FREE LIQUIDS ☐ YES ☐ NO VOLUME ___ %

Test	As Received	Extraction Procedure	Date of Analysis	Test	As Received	Extraction Procedure	Date of Analysis
Specific Gravity							
pH s.u.							
Acidity % as							
Alkalinity % as				Phenols, mg/l	< 0.05		4/24/87
C.O.D. mg/l				Cyanides, as CN Total mg/l	< 0.02		4/24/87
B.O.D. mg/l				Cyanides, as CN Free mg/l			
Total Solids @ 105°C							
Total Dissolved Solids mg/l				Nitrogen Ammonia, as N mg/l			
Residue on Evaporation @ 180°C				Total Kjeldahl Nitrogen as N mg/l			
Flash Point F° (closed cup)				Total Alkalinity, P as $CaCO_3$ mg/l			
Ash Content, on ignition (%)				Total Alkalinity M as $CaCO_3$, mg/l			
Heating Value, BTU/lb				Total Hardness as $CaCO_3$, mg/l			
"Acid Scrub," gNaOH/g				Calcium Hardness, as CaCO mg/l			
Antimony, as Sb, mg/l	< 0.02		4/24/87	Magnesium Hardness, as $CaCO_3$ mg/l			
Arsenic, as As, mg/l	< 0.02		4/24/87				
Barium, as Ba, mg/l							
Bromium as Br, mg/l				Oil and Grease, mg/l			
Cadmium, as Cd, mg/l	< 0.005		4/24/87				
Chromium, Total as Cr, mg/l	0.03		4/24/87				
Hexavalent Chromium as Cr, mg/l				Aldrin, mg/l			
Copper, as Cu, mg/l	< 0.02		4/24/87	Chlorides, mg/l			
Iron, Total as Fe, mg/l				DDT, mg/l			
Iron, dissolved, as Fe, mg/l				Dieldrin, mg/l			
Lead, as Pb, mg/l	< 0.02		4/24/87	Endrin, mg/l			
Manganese, as Mn, mg/l				Heptachlor, mg/l			
Magnesium, as Mg, mg/l				Lindane, mg/l			
Mercury, as Hg, mg/l	< 0.001		4/24/87	Methoxychlor, mg/l			
Nickel, as Ni, mg/l	< 0.02		4/24/87	Toxaphene, mg/l			
Selenium, as Se, mg/l	0.02		4/24/87	Parathion, mg/l			
Silver as Ag, mg/l	< 0.02		4/24/87	2,4, D, mg/l			
Zinc, as Zn, mg/l	< 0.02		4/24/87	2, 4, 5 TP (Silvex), mg/l			
Beryllium, as Be, mg/l	< 0.005		4/24/87	PCB's, mg/l			
Thallium, as Tl, mg/l	< 0.02		4/24/87	2, 3, 7, 8, TCDD, ug/l			
Bicarbonates, as HCO_3, mg/l							
Carbonates, as CO_3, mg/l							
Chlorides, as Cl, mg/l							
Flourides, as F, mg/l							
Nitrates, as NO_3, mg/l							
Nitrite, as NO, mg/l							
Phosphate, as P, mg/l							
Sulfate, as SO_4, mg/l							
Sulfides, as S, mg/l							

ACL

ADVANCED CHEMISTRY LABS, INC.

DR. STEVE N. TSOUKALAS
CHIEF CHEMIST

P.O. BOX 88610 • ATLANTA, GEORGIA 30356
TELEPHONE (404) 455-1266

Client: WASTE MGMT. OF N. AMERICA, INC.
2600 Delk Road
Delk Place, Suite 200
Marietta, GA 30067

Attention: Ed Gibson

Client Project No.: #863-3407 (WMI/HydroGeo/ N. Carolina, ~~Carnesville~~) Kernersville

ACL Project No.: #0930

Date Received: 4/22/87

Report Date: 5/6/87

TEST REQUIRED	Sample Type : ____ Station # : BW-1 Sample #ACL : 4114 Results (ppb)	Sample Type : ____ Station # : ____ Sample #ACL : ____ Results ( )	Sample Type : ____ Station # : ____ Sample #ACL : ____ Results ( )
GC/MS FRACTION - VOLATILE COMPOUNDS			
Acrolein	---		
Acrylonitrile	---		
Benzene	< 10		
Bis (Chloromethyl) ether	< 10		
Bromoform	< 10		
Carbon tetrachloride	< 10		
Chlorobenzene	< 10		
Chlorodi-bromomethane	< 10		
Chloroethane	< 10		
2-Chloroethylvinyl ether	< 10		
Chloroform	< 10		
Dichlorobromomethane	< 10		
Dichlorodifluoromethane	< 10		
1,1-Dichloroethane	< 10		
1,2-Dichloroethane	< 10		
1,1-Dichloroethylene	< 10		
1,2-Dichloropropane	< 10		
1,2-Dichloropropylene	< 10		
Ethylbenzene	< 10		
Methyl bromide	< 10		
Methyl chloride	< 10		
Methylene chloride	< 10		
1,1,2,2-Tetrachloroethane	< 10		
Tetrachloroethylene	< 10		
Toluene	< 10		
1,2-Trans-Dichloroethylene	< 10		
1,1,1-Trichloroethane	< 10		
1,1,2-Trichloroethane	< 10		
Trichloroethylene	< 10		
Trichlorofluoromethane	< 10		
Vinyl chloride	< 10		

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ACL Project No.: #0930

Date Received: 4/22/87

Report Date: 5/6/87

TEST REQUIRED	Sample Type : ____ Station # : BW-1 Sample #ACL : 4114 Results (ppb)	Sample Type : ____ Station # : ____ Sample #ACL : ____ Results ( )	Sample Type : ____ Station # : ____ Sample #ACL : ____ Results ( )
GC/MS FRACTION - ACID COMPOUNDS			
2-Chlorophenol	< 10		
2,4-Dichlorophenol	< 10		
2,4-Dimethylphenol	< 10		
4,6-Dinitro-O-cresol	< 10		
2,4-Dinitrophenol	< 10		
2-Nitrophenol	< 10		
4-Nitrophenol	< 10		
P-chloro-M-cresol	< 10		
Pentachlorophenol	< 10		
Phenol	< 10		
2,4,6-Trichlorophenol	< 10		

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Report Date: 5/6/87

TEST REQUIRED	Sample Type : ____ Station # : BW-1 Sample #ACL : 4114 Results (ppb)	Sample Type : ____ Station # : ____ Sample #ACL : ____ Results ( )	Sample Type : ____ Station # : ____ Sample #ACL : ____ Results ( )
GC/MS FRACTION - BASE/ NEUTRAL COMPOUNDS			
Acenaphthene	< 10		
Acenaphthylene	< 10		
Anthracene	< 10		
Benzidine	< 10		
Benzo (a) anthracene	< 10		
Benzo (a) pyrene	< 10		
3,4- Benzo-fluoranthene	< 10		
Benzo (ghi) perylene	< 10		
Benzo (k) fluoranthene	< 10		
Bis (2-chloroethoxy) methane	< 10		
Bis (2-chloroethyl) ether	< 10		
Bis (2-chloroisopropyl) ether	< 10		
Bis (2-ethyl-hexyl) phthalate	< 10		
4-Bromophenyl phenyl ether	< 10		
Butyl benzyl phthalate	< 10		
2-Chloronaphthalene	< 10		
4-Chlorophenyl phenyl ether	< 10		
Chrysene	< 10		
Dibenzo (a,h) anthracene	< 10		
1,2-Dichlorobenzene	< 10		
1,3-Dichlorobenzene	< 10		
1,4-Dichlorobenzene	< 10		
3,3'-Dichlorobenzidine	< 10		
Diethyl phthalate	< 10		
Dimethyl phthalate	< 10		
Di-N-Butyl phthalate	< 10		
2.4-Dinitrotoluene	< 10		
2.6-Dinitrotoluene	< 10		
Di-N-Octyl phthalate	< 10		
1.2-Diphenylhydrazine	< 10		

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ACL Project No.: #0930
Date Received: 4/22/87
Report Date: 5/6/87

TEST REQUIRED	Sample Type : ____ Station # : BW-1 Sample #ACL : 4114 Results (ppb)	Sample Type : ____ Station # : ____ Sample #ACL : ____ Results ( )	Sample Type : ____ Station # : ____ Sample #ACL : ____ Results ( )
GC/MS FRACTION - BASE/ NEUTRAL COMPOUNDS (CONT'D)			
Fluoranthene	< 10		
Fluorene	< 10		
Hexachlorobenzene	< 10		
Hexachlorobutadiene	< 10		
Hexachlorocyclopentadiene	< 10		
Hexachloroethane	< 10		
Indeno (1,2,3,-cd) pyrene	< 10		
Isophorone	< 10		
Naphthalene	< 10		
Nitrobenzene	< 10		
N-Nitrosodi-methylamine	< 10		
N-Nitrosodi-N-propylamine	< 10		
N-Nitro-sodiphenylamine	< 10		
Phenanthrene	< 10		
Pyrene	< 10		
1,2,4-Trichlorobenzene	< 10		

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ACL Project No.: #0930
Date Received: 4/22/87
Report Date: 5/6/87

TEST REQUIRED	Sample Type : ____ Station # : BW-1 Sample #ACL : 4114 Results (ppb)	Sample Type : ____ Station # : ____ Sample #ACL : ____ Results ( )	Sample Type : ____ Station # : ____ Sample #ACL : ____ Results ( )
GC/MS FRACTION-PESTICIDES			
Aldrin	< 0.01		
BHC-alpha	< 0.01		
BHC-beta	< 0.01		
BHC-delta	< 0.01		
BHC-gamma	< 0.01		
Chlordane	< 0.01		
4,4'-DDT	< 0.01		
4,4'-DDE	< 0.01		
4,4'-DDD	< 0.01		
Dieldrin	< 0.01		
Endosulfan-alpha	< 0.01		
Endosulfan-beta	< 0.01		
Endosulfan sulfate	< 0.01		
Endrin	< 0.01		
Endrin aldehyde	< 0.01		
Heptachlor	< 0.01		
Heptachlor epoxide	< 0.01		
Toxaphene	< 0.01		
PCB-1242	< 0.01		
PCB-1254	< 0.01		
PCB-1221	< 0.01		
PCB-1232	< 0.01		
PCB-1248	< 0.01		
PCB-1260	< 0.01		
PCB-1016	< 0.01		

S. ENVIRONMENTAL PROTECTION AGENCY
GION 4

CHAIN OF CUSTODY RECORD

ENVIRON
COLLEG
ATHENS

PROJ. NO. 63-3407

PROJECT NAME: WMI / HydroGeo / North Carolina (Garnesville)

MPLERS (Signature)

A. NO.	DATE	TIME	COMP.	GRAB	STATION LOCATION	NO. OF CONTAINERS	Water/Wastewater																	Soil/Sed		Sldg/Waste
							Gal G (ext org)	Gal G (EP)	40 ml vial (VOA)	Gal P (BOD, COD, TSS)	Pt G (phenol)	Pt G (metals, Hg)	Pt P (metals)	Pt P (S⁻⁻)	Pt P (TOC, COD)	Qt G (O&G or Pest.)	½ gal P (CN)	½ gal P (Cl, Fl, SO₄)	Qt G (ext org, EP)	8 oz G (VOA)	Pt P (met, Hg, CN, S⁻⁻)	8 oz G (ext org, VOA, met, Hg, CN)	8 oz G (EP, S⁻⁻, FP)	2 liters		
W-1	4.21.87	10:43				4			2																	

Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Robert Benzelle	4.22.87 4:15pm	S. Tsoukalas			
Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received by: (Signature)

Remarks
Run all Priority Pollutants
V.O
A, B/N,
Pest/PCB,
Tot CN
Tot. phenols
13- Metals.

RIBUTION: Original and Pink copies accompany sample shipment to laboratory; Pink copy retained by laboratory;
Yellow copy retained by samplers, Blue copy extra copy as needed.

Golder Associates	SUBJECT WATER SAMPLE (Drilling water supply		
	Job No. 86?-3407 Ref.	Made by WLG. Checked Reviewed	Date 5-21-87 Sheet 1 of 1

Sample No. - BW-1 Sampled 5-21-87 10:43 am

Description - sample from garden hose discharging from Barrows well.

Sample Appearance: Clear

Field Measurements: #1) T = 17°C pH = 4.5 ± 0.5 paper
spec. cond = 90 umhos

#2) T = 17°C pH = 4.5 ± 0.5
spec. cond. = 90 umhos

Remarks - Sample clear, purged ~ 500 gallons prior to taking sample. Water tank (drilling tank) currently being filled

Shuttle sealed by: William M. Gierke

Date: 5-21-87 Time: 13:05

APPENDIX D

IN SITU HYDRAULIC CONDUCTIVITY DATA AND PLOTS

FALLING HEAD TEST

WELL NO. P2S
UNIT 4 - WHITE TAN MIC. F TO C SAND,SOME SILT
MOIST TO SAT.,DENSE.(C TO F SAND AND SILT)
DATE= 6/1/87
DEPTH TO WATER= 37.15 FEET
DEPTH TO TOP OF SCREEN= 47.20 FEET
CASING DIAMETER= 0.75 INCHES
SAND DIAMETER= 6.00 INCHES
OPEN INTERVAL= 7.50 FEET

24-HR CLOCK TIME			ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD	LOG HEAD
HOURS	MINUTES	SECONDS	(SEC)	(FEET)	(FEET)	RATIO	RATIO
10	27	0	0	7.50	-29.65	1.00	0
10	28	0	60	11.00	-26.15	0.88	-0.05455
10	29	0	120	13.00	-24.15	0.81	-0.08910
10	30	0	180	15.00	-22.15	0.75	-0.12665
10	31	0	240	16.50	-20.65	0.70	-0.15710
10	32	0	300	17.80	-19.35	0.65	-0.18534
10	33	0	360	19.20	-17.95	0.61	-0.21796
10	34	0	420	20.50	-16.65	0.56	-0.25061
10	35	0	480	21.50	-15.65	0.53	-0.27751
10	36	0	540	22.70	-14.45	0.49	-0.31215
10	37	0	600	23.70	-13.45	0.45	-0.34330
10	38	0	660	24.50	-12.65	0.43	-0.36993
10	39	0	720	25.20	-11.95	0.40	-0.39465
10	40	0	780	25.70	-11.45	0.39	-0.41321
10	41	0	840	26.50	-10.65	0.36	-0.44467
10	41	0	840	27.00	-10.15	0.34	-0.46555
10	43	0	960	27.60	-9.55	0.32	-0.49202
10	44	0	1020	28.10	-9.05	0.31 *	-0.51537
10	45	0	1080	28.70	-8.45	0.28	-0.54516
10	46	0	1140	29.00	-8.15	0.27	-0.56086
10	47	0	1200	29.40	-7.75	0.26	-0.58272
10	48	0	1260	29.80	-7.35	0.25	-0.60573
10	49	0	1320	30.10	-7.05	0.24	-0.62383
10	50	0	1380	30.40	-6.75	0.23	-0.64272
10	51	0	1440	30.80	-6.35	0.21	-0.66925
10	52	0	1500	31.00	-6.15	0.21	-0.68314
10	53	30	1590	31.50	-5.65	0.19	-0.71997
10	54	0	1620	31.80	-5.35	0.18	-0.74367
10	55	40	1720	32.00	-5.15	0.17	-0.76021
10	56	0	1740	32.30	-4.85	0.16	-0.78628
10	57	40	1840	32.50	-4.65	0.16 *	-0.80457
11	0	20	2000	33.00	-4.15	0.14	-0.85397

NOTES:
1) * INDICATES THAT BEST FIT LINE PASSES THROUGH THESE POINTS
2) ALL DEPTHS MEASURED FROM TOP OF CASING

K= 5.48E-06 CM/SEC

ALTERNATE METHODS OF CALCULATING HYDRAULIC CONDUCTIVITY.
HVORSLEV - CONDITIONS WELLPOINT-FILTER IN UNIFORM SOIL (UNCONFINED)
(1) VARIABLE HEAD - 5.6E-06 CM/SEC
(2) BASIC TIME LAG - 8.6E-06 CM/SEC
HAZEN'S APPROXIMATION FROM LABORATORY RESULTS
(3) HAZEN'S - 4.0E-04 CM/SEC

RISING HEAD TEST

WELL NO. P2D
UNIT 4 - WHITE TAN MIC. F TO C SAND,SOME SILT,
MOIST TO SAT.,DENSE.
DATE= 5/18/87
DEPTH TO WATER= 36.80 FEET
DEPTH TO TOP OF SCREEN= 65.00 FEET
CASING DIAMETER= 0.75 INCHES
SAND DIAMETER= 6.00 INCHES
OPEN INTERVAL= 6.80 FEET

24-HR CLOCK TIME			ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD	LOG HEAD
HOURS	MINUTES	SECONDS	(SEC)	(FEET)	(FEET)	RATIO	RATIO
2	22	0	0	45.00	8.20	1.00 *	0
2	23	0	60	39.00	2.20	0.27	-0.57139
2	24	0	120	38.00	1.20	0.15	-0.83463
2	24	30	150	37.50	0.70	0.09 *	-1.06871
2	27	0	300	37.30	0.50	0.06	-1.21484

NOTES:
1) * INDICATES THAT BEST FIT LINE PASSES THROUGH THESE POINTS
2) ALL DEPTHS MEASURED FROM TOP OF CASING

K= 1.19E-04 CM/SEC

ALTERNATE METHODS OF CALCULATING HYDRAULIC CONDUCTIVITIES
CONDITIONS - WELL POINT-FILTER IN UNIFORM SOILS (UNCONFINED)
(1) VARIABLE HEAD - 9.2E-05 CM/SEC
(2) BASIC TIME LAG - 1.4E-04 CM/SEC
HAZEN'S APPROXIMATION FROM LABORATORY RESULTS
(3) HAZEN'S NO LAB TEST RAN

RISING HEAD TEST

WELL NO. P3S
UNIT 4 - REDDISH BROWN MIC. F TO C SAND,
SOME SILT, V. DENSE, MOIST.
DATE= 5/19/87
DEPTH TO WATER= 11.00 FEET
DEPTH TO TOP OF SCREEN= 20.30 FEET
CASING DIAMETER= 0.75 INCHES
SAND DIAMETER= 6.00 INCHES
OPEN INTERVAL= 6.50 FEET

24-HR CLOCK TIME			ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD	LOG HEAD
HOURS	MINUTES	SECONDS	(SEC)	(FEET)	(FEET)	RATIO	RATIO
12	35	0	0	20.00	9.00	1.00	0
12	36	0	60	16.00	5.00	0.56 *	-0.25527
12	36	30	90	15.00	4.00	0.44	-0.35218
12	36	50	110	14.00	3.00	0.33	-0.47712
12	37	30	150	13.00	2.00	0.22	-0.65321
12	39	10	250	12.00	1.00	0.11	-0.95424
12	41	0	360	11.50	0.50	0.06 *	-1.25527
12	45	0	600	11.25	0.25	0.03	-1.55630

NOTES:
1) * INDICATES THAT BEST FIT LINE PASSES THROUGH THESE POINTS
2) ALL DEPTHS MEASURED FROM TOP OF CASING

K= 5.73E-05 CM/SEC

ALTERNATE METHODS OF CALCULATING HYDRAULIC CONDUCTIVITY
HVORSLEV - CONDITIONS WELLPOINT-FILTER IN UNIFORM SOIL (UNCONFINED)
(1) VARIABLE HEAD - 5.35E-05 CM/SEC
(2) BASIC TIME LAG - 1.11E-04 CM/SEC
HAZEN'S APPROXIMATION - NO LAB TEST RAN

RISING HEAD TEST

WELL NO. P3D
UNIT 8 - BLACK AND WHITE GRANITIC GNEISS
AND SCHIST
DATE= 5/19/87
DEPTH TO WATER= 10.10 FEET
DEPTH TO TOP OF SCREEN= 53.00 FEET
CASING DIAMETER= 0.75 INCHES
SAND DIAMETER= 3.50 INCHES
OPEN INTERVAL= 6.50 FEET

24-HR CLOCK TIME			ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD	LOG HEAD
HOURS	MINUTES	SECONDS	(SEC)	(FEET)	(FEET)	RATIO	RATIO
12	47	0	0	34.00	23.90	1.00	0
12	48	0	60	29.00	18.90	0.79	-0.10193
12	49	0	120	26.00	15.90	0.67	-0.17700
12	50	0	180	23.00	12.90	0.54	-0.26780
12	51	0	240	22.29	12.19	0.51	-0.29239
12	51	30	270	22.00	11.90	0.50	-0.30285
12	52	0	300	21.29	11.19	0.47 *	-0.32956
12	52	30	330	21.00	10.90	0.46	-0.34097
12	53	0	360	20.58	10.48	0.44	-0.35803
12	54	0	420	19.83	9.73	0.41	-0.39028
12	55	0	480	19.25	9.15	0.38	-0.41697
12	56	0	540	18.70	8.60	0.36	-0.44389
12	57	0	600	18.21	8.11	0.34	-0.46937
12	58	0	660	17.75	7.65	0.32	-0.49473
12	59	0	720	17.33	7.23	0.30	-0.51925
13	0	0	780	17.00	6.90	0.29	-0.53954
13	1	0	840	16.58	6.48	0.27	-0.56682
13	2	0	900	16.22	6.12	0.26	-0.59164
13	3	0	960	15.92	5.82	0.24	-0.61347
13	4	0	1020	15.67	5.57	0.23	-0.63254
13	5	0	1080	15.33	5.23	0.22	-0.65989
13	6	0	1140	15.10	5.00	0.21	-0.67942
13	8	0	1260	14.58	4.48	0.19	-0.72711
13	10	0	1380	14.19	4.09	0.17 *	-0.76667
13	15	0	1680	13.33	3.23	0.14	-0.86919
13	20	0	1980	12.67	2.57	0.11	-0.96846
13	25	0	2280	12.17	2.07	0.09	-1.06242
13	30	0	2580	11.73	1.63	0.07	-1.16621
13	43	0	3360	11.00	0.90	0.04	-1.42415

NOTES:

1) * INDICATES THAT BEST FIT LINE PASSES THROUGH THESE POINTS
2) ALL DEPTHS MEASURED FROM TOP OF CASING

K= 8.10E-06 CM/SEC

ALTERNATE METHODS OF CALCULATING HYDRAULIC CONDUCTIVITY

HVORSLEV - CONDITIONS WELLPOINT-FILTER AT IMPERVIOUS BOUNDARY (CONFINED)
(1) VARIABLE HEAD - 9.6E-06 CM/SEC
(2) BASIC TIME LAG - 1.9E-05 CM/SEC
HAZEN'S APPROXIMATION - NO LAB TEST RAN

RISING HEAD TEST

WELL NO. P4D
UNIT 4 - BROWN MIC. F TO C SAND, SOME SILT,
DENSE,MOIST.(C TO F SAND AND SILT)
DATE= 5/19/87
DEPTH TO WATER= 32.67 FEET
DEPTH TO TOP OF SCREEN= 55.30 FEET
CASING DIAMETER= 0.75 INCHES
SAND DIAMETER= 6.00 INCHES
OPEN INTERVAL= 6.30 FEET

24-HR CLOCK TIME			ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD	LOG HEAD
HOURS	MINUTES	SECONDS	(SEC)	(FEET)	(FEET)	RATIO	RATIO
11	44	0	0	47.50	14.83	1.00	0
11	46	0	120	42.00	9.33	0.63	-0.20125
11	46	30	150	41.50	8.83	0.60	-0.22518
11	47	0	180	41.00	8.33	0.56 *	-0.25049
11	47	20	200	40.50	7.83	0.53	-0.27737
11	47	40	220	40.00	7.33	0.49	-0.30603
11	48	0	240	39.50	6.83	0.46	-0.33672
11	48	20	260	39.00	6.33	0.43	-0.36973
11	48	40	280	38.50	5.83	0.39	-0.40547
11	49	0	300	38.00	5.33	0.36	-0.44441
11	50	0	360	37.00	4.33	0.29	-0.53465
11	51	0	420	36.50	3.83	0.26	-0.58794
11	51	40	460	36.00	3.33	0.22	-0.64869
11	52	40	520	35.50	2.83	0.19	-0.71935
11	54	0	600	35.00	2.33	0.16 *	-0.80378
11	55	30	690	34.50	1.83	0.12	-0.90869
11	57	30	810	34.00	1.33	0.09	-1.04728
12	1	0	1020	33.50	0.83	0.06	-1.25206
12	9	0	1500	33.00	0.33	0.02	-1.65262

NOTES:
1) * INDICATES THAT BEST FIT LINE PASSES THROUGH THESE POINTS
2) ALL DEPTHS MEASURED FROM TOP OF CASING

K= 2.31E-05 CM/SEC

ALTERNATE METHODS OF CALCULATING HYDRAULIC CONDUCTIVITY
HVORSLEV - CONDITIONS WELLPOINT-FILTER IN UNIFORM SOIL (UNCONFINED)
(1) VARIABLE HEAD - 1.9E-05 CM/SEC
(2) BASIC TIME LAG - 2.3E-05 CM/SEC
HAZEN'S APPROXIMATION FROM LABORATORY RESULTS
(3) HAZEN'S - 4.0E-04 CM/SEC

RISING HEAD TEST

WELL NO. P5S

UNIT 4 - WHITE BLACK MIC. F TO C SAND,LITTLE SILT,
MOIST,V.DENSE. (C TO F SAND,SOME SILT,TRACE F GRAVEL)

DATE= 5/18/87

DEPTH TO WATER= 5.70 FEET

DEPTH TO TOP OF SCREEN= 19.10 FEET

CASING DIAMETER= 0.75 INCHES

SAND DIAMETER= 6.00 INCHES

OPEN INTERVAL= 6.10 FEET

24-HR CLOCK TIME			ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD	LOG HEAD
HOURS	MINUTES	SECONDS	(SEC)	(FEET)	(FEET)	RATIO	RATIO
9	39	0	0	8.50	2.80	1.00	0
9	40	0	60	7.83	2.13	0.76 *	-0.11877
9	40	30	90	7.00	1.30	0.46	-0.33321
9	41	0	120	6.50	0.80	0.29	-0.54406
9	42	0	180	6.00	0.30	0.11	-0.97003
9	43	0	240	5.85	0.15	0.05 *	-1.27106
9	44	0	300	5.75	0.05	0.02	-1.74818

NOTES:

1) * INDICATES THAT BEST FIT LINE PASSES THROUGH THESE POINTS
2) ALL DEPTHS MEASURED FROM TOP OF CASING

K= 1.15E-04 CM/SEC

ALTERNATE METHODS OF CALCULATING HYDRAULIC CONDUCTIVITY

HVORSLEV - CONDITIONS WELLPOINT-FILTER IN UNIFORM SOIL (UNCONFINED)

(1) VARIABLE HEAD - 1.2E-04 CM/SEC

(2) BASIC TIME LAG - 7.1E-05 CM/SEC

HAZEN'S APPROXIMATION FROM LABORATORY RESULTS

(3) HAZEN'S - 1.6E-03 CM/SEC

FALLING HEAD TEST

WELL NO. P7S

UNIT 4 - BLACK WHITE MIC. F TO C SAND,SOME TO AND SILT,
DENSE TO V. DENSE, MOIST. (M TO F SAND AND SILT)

DATE= 6/1/87

DEPTH TO WATER= 21.62 FEET
DEPTH TO TOP OF SCREEN= 20.00 FEET
CASING DIAMETER= 0.75 INCHES
SAND DIAMETER= 6.00 INCHES
OPEN INTERVAL= 7.00 FEET

24-HR CLOCK TIME			ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD	LOG HEAD
HOURS	MINUTES	SECONDS	(SEC)	(FEET)	(FEET)	RATIO	RATIO
11	11	0	0	20.50	-1.12	1.00	0
11	13	0	120	20.70	-0.92	0.82 *	-0.08543
11	14	0	180	20.80	-0.82	0.73	-0.13540
11	15	0	240	20.90	-0.72	0.64 *	-0.19188
11	18	30	450	21.00	-0.62	0.55	-0.25682
11	25	0	840	21.20	-0.42	0.38	-0.42596

NOTES:

1) * INDICATES THAT BEST FIT LINE PASSES THROUGH THESE POINTS
2) ALL DEPTHS MEASURED FROM TOP OF CASING

K= 1.45E-05 CM/SEC

ALTERNATE METHODS OF CALCULATING HYDRAULIC CONDUCTIVITY

HVORSLEV - CONDITIONS WELLPOINT-FILTER IN UNIFORM SOIL (UNCONFINED)

(1) VARIABLE HEAD - 1.4E-05 CM/SEC
(2) BASIC TIME LAG - 1.3E-05 CM/SEC

HAZEN'S APPROXIMATION FROM LABORATORY RESULTS

(3A) HAZEN'S - 1.6E-05 CM/SEC
(3B) HAZEN'S - 4.0E-04 CM/SEC

RISING HEAD TEST

WELL NO. P7D
UNIT 8 - BLACK ANO WHITE GRANITIC GNEISS
ANO SCHIST
DATE= 5/18/87
DEPTH TO WATER= 21.10 FEET
DEPTH TO TOP OF SCREEN= 33.70 FEET
CASING DIAMETER= 0.75 INCHES
SAND DIAMETER= 3.50 INCHES
OPEN INTERVAL= 7.30 FEET

24-HR CLOCK TIME HOURS	MINUTES	SECONDS	ELAPSED TIME (SEC)	DEPTH TO WATER (FEET)	HEAD (FEET)	HEAD RATIO	LOG HEAD RATIO
8	9	0	0	36.33	15.23	1.00	0
8	10	0	60	36.05	14.95	0.98	-0.00805
8	10	30	90	36.00	14.90	0.98	-0.00951
8	11	0	120	35.75	14.65	0.96	-0.01686
8	12	0	180	35.36	14.26	0.94	-0.02858
8	12	30	210	35.00	13.90	0.91	-0.03968
8	13	0	240	34.92	13.82	0.91	-0.04219
8	14	0	300	34.58	13.48	0.89	-0.05301
8	14	30	330	34.50	13.40	0.88	-0.05559
8	15	0	360	34.21	13.11	0.86	-0.06509
8	15	30	390	34.00	12.90	0.85	-0.07211
8	16	0	420	33.92	12.82	0.84	-0.07481
8	17	0	480	33.58	12.48	0.82	-0.08648
8	18	0	540	33.25	12.15	0.80	-0.09812
8	18	30	570	33.00	11.90	0.78 *	-0.10715
8	19	0	600	32.92	11.82	0.78	-0.11008
8	20	0	660	32.63	11.53	0.76	-0.12087
8	21	0	720	32.29	11.19	0.73	-0.13386
8	22	0	780	32.00	10.90	0.72	-0.14527
8	23	0	840	31.75	10.65	0.70	-0.15535
8	24	0	900	31.46	10.36	0.68	-0.16734
8	25	0	960	31.17	10.07	0.66	-0.17967
8	26	0	1020	30.92	9.82	0.64	-0.19058
8	27	0	1080	30.63	9.53	0.63	-0.20360
8	28	0	1140	30.42	9.32	0.61	-0.21328
8	29	0	1200	30.17	9.07	0.60	-0.22509
8	30	0	1260	29.92	8.82	0.58	-0.23723
8	31	0	1320	29.67	8.57	0.56	-0.24971
8	32	0	1380	29.44	8.34	0.55	-0.26153
8	33	0	1440	29.25	8.15	0.54	-0.27154
8	34	0	1500	29.00	7.90	0.52	-0.28507
8	35	0	1560	28.83	7.73	0.51	-0.29452
8	36	0	1620	28.58	7.48	0.49	-0.30879
8	37	0	1680	28.38	7.28	0.48	-0.32056
8	38	0	1740	28.19	7.09	0.47	-0.33205
8	40	0	1860	27.83	6.73	0.44	-0.35468
8	42	0	1980	27.42	6.32	0.41	-0.38198
8	44	0	2100	27.13	6.03	0.40	-0.40238
8	46	0	2220	26.83	5.73	0.38	-0.42454
8	48	0	2340	26.48	5.38	0.35 *	-0.45191
8	50	0	2460	26.22	5.12	0.34	-0.47342
8	55	0	2760	25.57	4.47	0.29	-0.53239
9	0	0	3060	25.00	3.90	0.26	-0.59163
9	5	0	3360	24.50	3.40	0.22	-0.65122
9	10	0	3660	24.08	2.98	0.20	-0.70848
9	15	0	3960	23.71	2.61	0.17	-0.76605
9	28	0	4740	23.00	1.30	0.12	-0.90394

NOTES:
1) * INDICATES THAT BEST FIT LINE PASSES THROUGH THESE POINTS
2) ALL DEPTHS MEASURED FROM TOP OF CASING

K= 3.58E-06 CM/SEC

ALTERNATE METHODS OF CALCULATING HYDRAULIC CONDUCTIVITY
HVORSLEV - CONDITIONS WELLPOINT-FILTER AT IMPERVIOUS BOUNDARY (CONFINED)
(1) VARIABLE HEAD - 4.2E-06 CM/SEC
(2) BASIC TIME LAG - 5.2E-06 CM/SEC
HAZEN'S APPROXIMATION - NO LAB TEST RAN

RISING HEAD TEST

WELL NO. P8S
UNIT 4 - WHITE TAND MIC. F TO C SAND, SOME TO AND
SILT,DENSE,MOIST.(C TO F SAND AND SILT)
DATE= 6/1/87
DEPTH TO WATER= 6.25 FEET
DEPTH TO TOP OF SCREEN= 21.00 FEET
CASING DIAMETER= 0.75 INCHES
SAND DIAMETER= 6.00 INCHES
OPEN INTERVAL= 7.50 FEET

24-HR CLOCK TIME			ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD	LOG HEAD
HOURS	MINUTES	SECONDS	(SEC)	(FEET)	(FEET)	RATIO	RATIO
1	1	0	0	13.00	6.75	1.00	0
1	2	0	60	10.00	3.75	0.56	-0.25527
1	3	0	120	9.00	2.75	0.41 *	-0.38997
1	4	0	180	8.60	2.35	0.35	-0.45823
1	5	0	240	8.10	1.85	0.27	-0.56213
1	6	0	300	7.80	1.55	0.23	-0.63897
1	7	0	360	7.50	1.25	0.19 *	-0.73239
1	8	0	420	7.40	1.15	0.17	-0.76860

NOTES:
1) * INDICATES THAT BEST FIT LINE PASSES THROUGH THESE POINTS
2) ALL DEPTHS MEASURED FROM TOP OF CASING

K= 2.22E-05 CM/SEC

ALTERNATE METHODS OF CALCULATING HYDRAULIC CONDUCTIVITY
HVORSLEV - CONDITIONS WELLPOINT-FILTER IN UNIFORM SOIL (UNCONFINED)
(1) VARIABLE HEAD - 2.1E-05 CM/SEC
(2) BASIC TIME LAG - 4.5E-05 CM/SEC
HAZEN'S APPROXIMATION FROM LABORATORY RESULTS
(3) HAZEN'S - 4.0E-04 CM/SEC

RISING HEAD TEST

WELL NO. P8M
UNIT 4 - TAN MIC.F TO C SAND AND SILT
V. DENSE,DRY. (C TO F SAND AND SILT)
DATE= 6/1/87
DEPTH TO WATER= 6.25 FEET
DEPTH TO TOP OF SCREEN= 37.50 FEET
CASING DIAMETER= 0.75 INCHES
SAND DIAMETER= 6.00 INCHES
OPEN INTERVAL= 7.00 FEET

24-HR CLOCK TIME			ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD	LOG HEAD
HOURS	MINUTES	SECONDS	(SEC)	(FEET)	(FEET)	RATIO	RATIO
1	31	0	0	13.00	6.75	1.00	0
1	32	0	60	10.00	3.75	0.56 *	-0.25527
1	33	0	120	9.00	2.75	0.41	-0.38997
1	34	0	180	8.60	2.35	0.35	-0.45823
1	35	0	240	8.10	1.85	0.27	-0.56213
1	36	0	300	7.80	1.55	0.23 *	-0.63897
1	40	0	540	7.50	1.25	0.19	-0.73239

NOTES:
1) * INDICATES THAT BEST FIT LINE PASSES THROUGH THESE POINTS
2) ALL DEPTHS MEASURED FROM TOP OF CASING

K= 2.61E-05 CM/SEC

ALTERNATE METHODS TO CALCULATE HYDRAULIC CONDUCTIVITY
HVORSLEV - CONDITIONS WELLPOINT-FILTER IN UNIFORM SOIL (UNCONFINED)
(1) VARIABLE HEAD - 2.6E-05 CM/SEC
(2) BASIC TIME LAG - 3.8E-05 CM/SEC
HAZEN'S APPROXIMATION FROM LABORATORY RESULTS
(3) HAZEN'S - 2.5E-05 CM/SEC

RISING HEAD TEST

WELL NO. P8D
UNIT 6 & 7 - ORANGE SILT,SOME F SAND,DENSE,DRY.
PARTIALLY WEATHERED ROCK.(C TO F SAND AND SILTY CLAY)
DATE= 6/1/87
DEPTH TO WATER= 6.20 FEET
DEPTH TO TOP OF SCREEN= 72.80 FEET
CASING DIAMETER= 0.75 INCHES
SAND DIAMETER= 6.00 INCHES
OPEN INTERVAL= 8.00 FEET

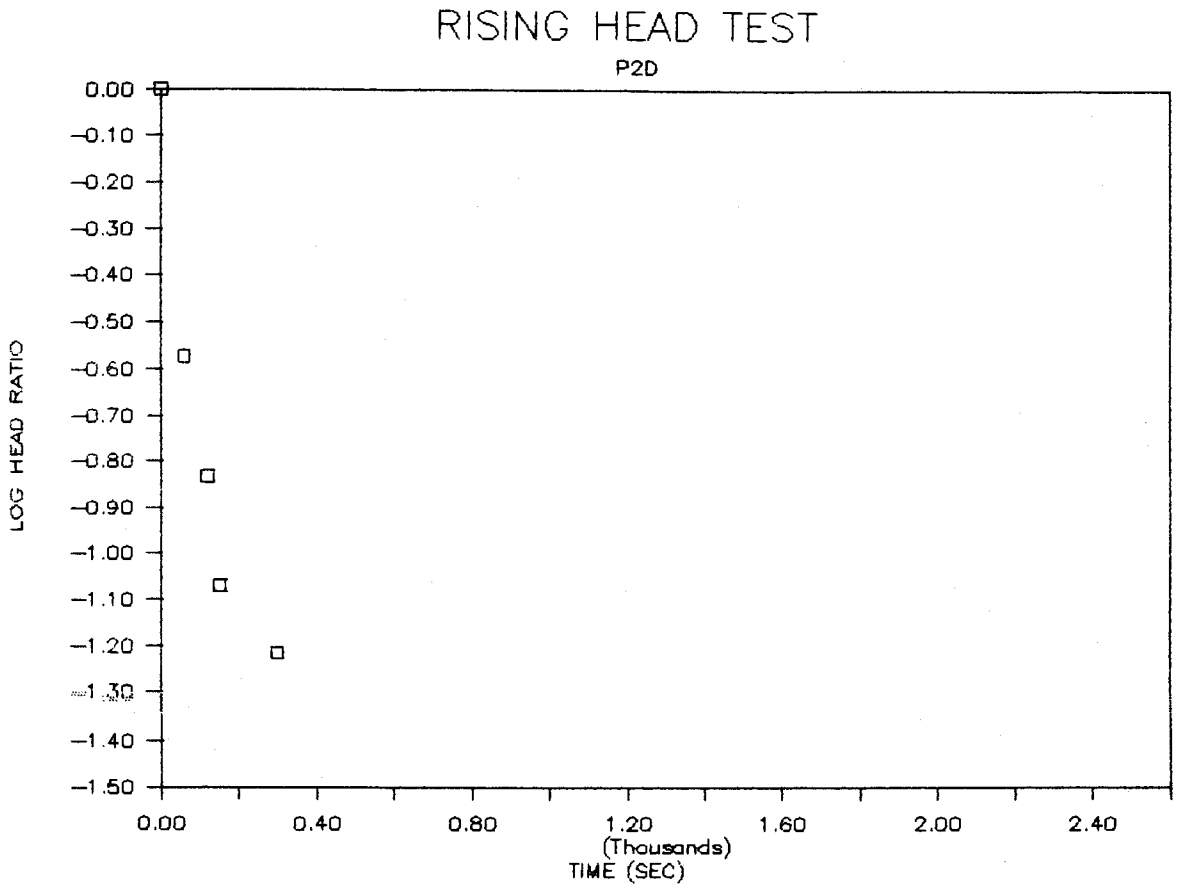
24-HR CLOCK TIME			ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD	LOG HEAD
HOURS	MINUTES	SECONDS	(SEC)	(FEET)	(FEET)	RATIO	RATIO
1	15	0	0	47.00	40.80	1.00	0
1	16	0	60	34.00	27.80	0.68	-0.16661
1	17	0	120	24.40	18.20	0.45	-0.35058
1	18	0	180	18.30	12.10	0.30 *	-0.52787
1	19	0	240	14.60	8.40	0.21	-0.68638
1	20	0	300	12.30	6.10	0.15	-0.82533
1	21	0	360	11.00	4.80	0.12	-0.92941
1	22	0	420	10.30	4.10	0.10	-0.99787
1	23	0	480	9.70	3.50	0.09	-1.06659
1	24	0	540	9.40	3.20	0.08 *	-1.10551
1	25	0	600	9.20	3.00	0.07	-1.13353
1	27	0	720	9.00	2.80	0.07	-1.16350

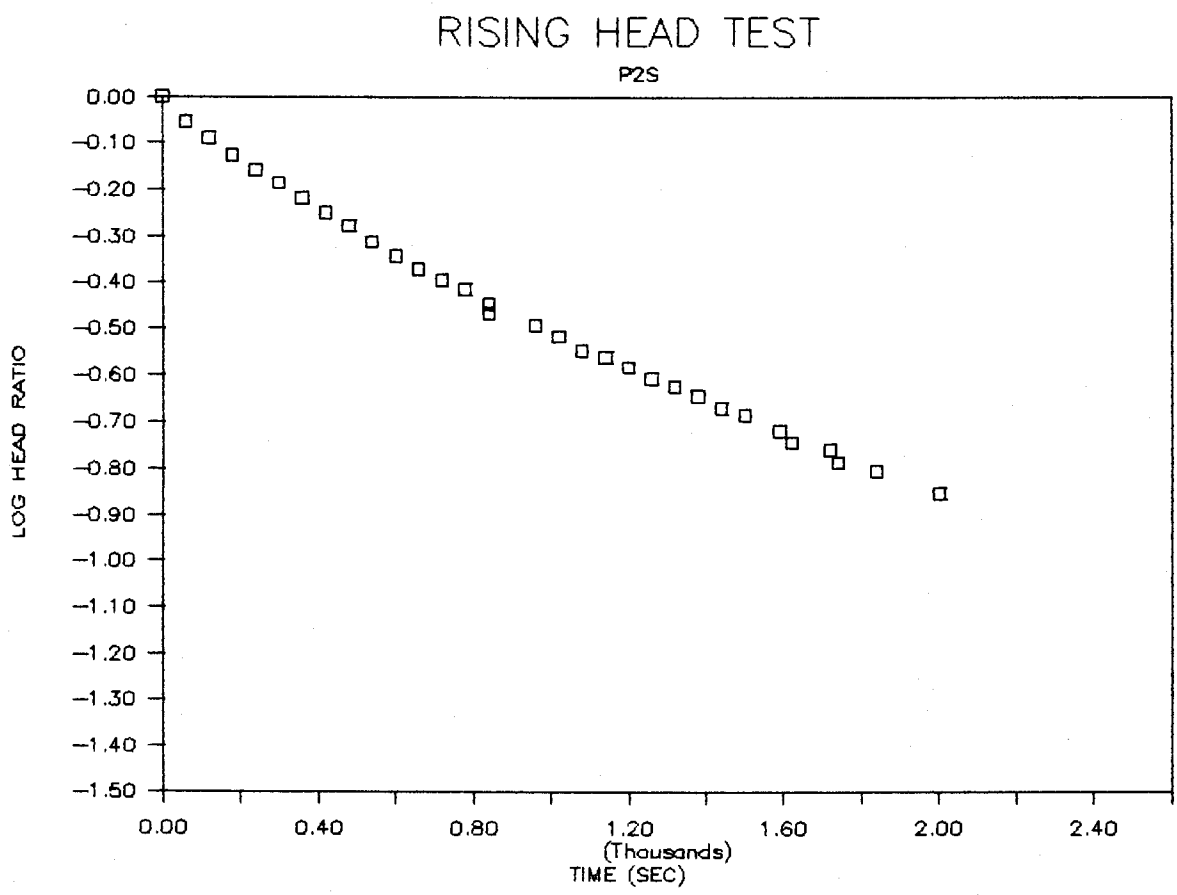
NOTES:

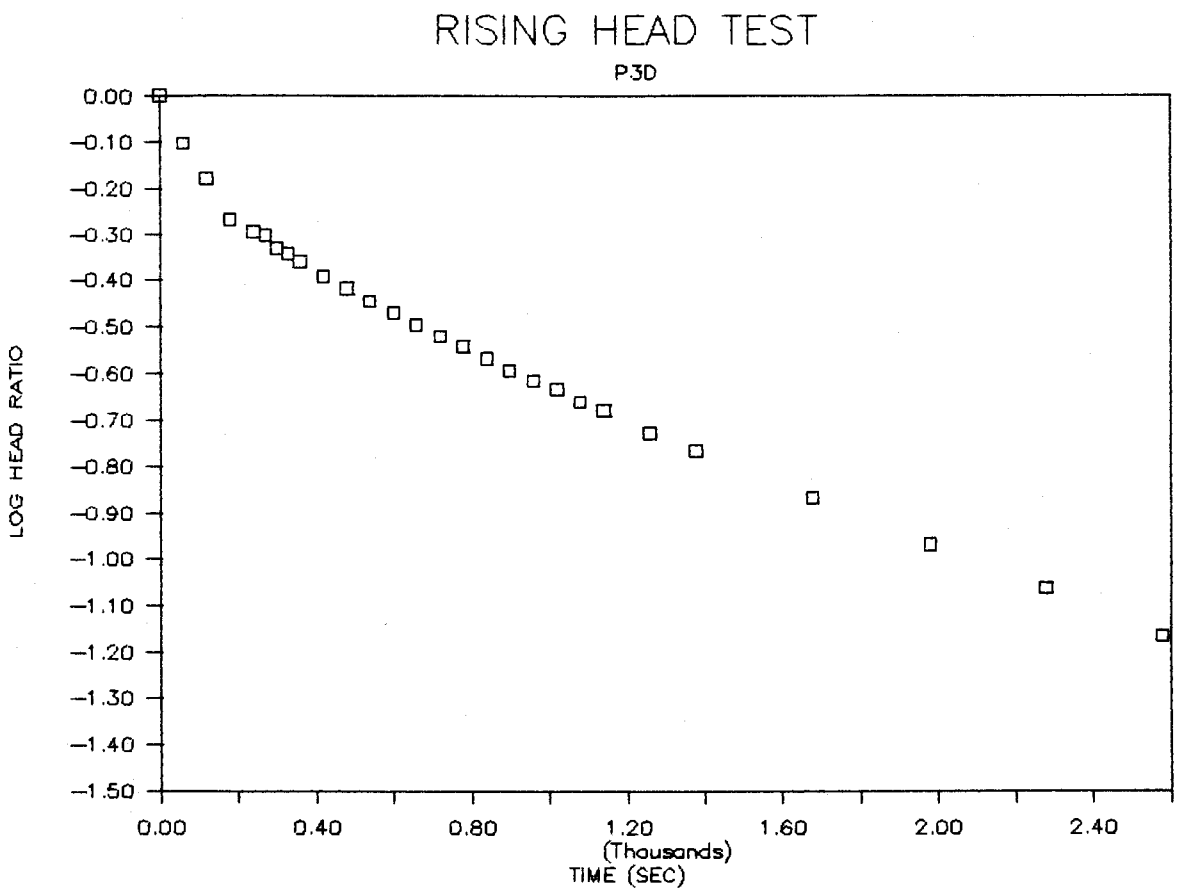
1) * INDICATES THAT BEST FIT LINE PASSES THROUGH THESE POINTS
2) ALL DEPTHS MEASURED FROM TOP OF CASING

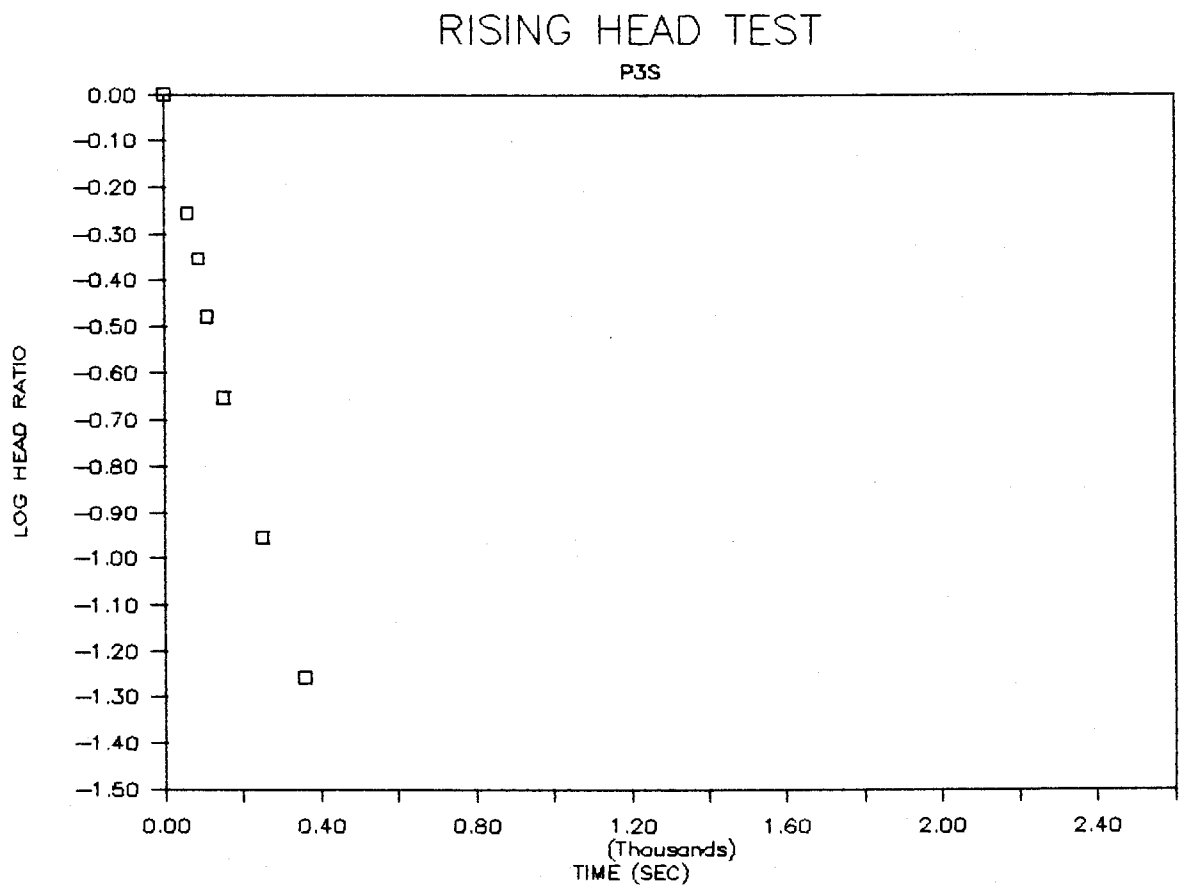
K= 2.38E-05 CM/SEC

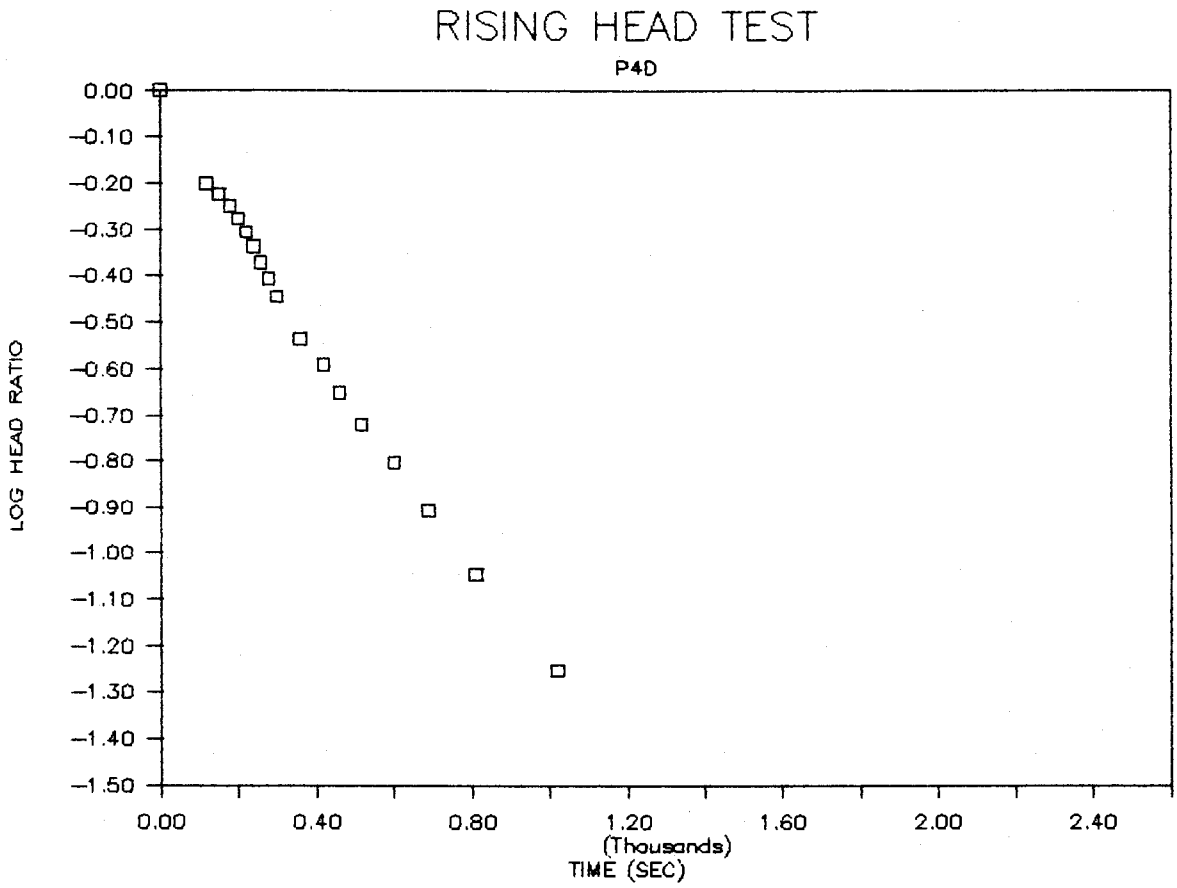
ALTERNATE METHODS OF CALCULATING HYDRAULIC CONDUCTIVITY
HVORSLEV - CONDITIONS WELLPOINT-FILTER IN UNIFORM SOIL (UNCONFINED)
(1) VARIABLE HEAD - 2.4E-05 CM/SEC
(2) BASIC TIME LAG - 5.8E-05 CM/SEC
HAZEN'S APPROXIMATION FROM LABORATORY RESULTS
(3) HAZEN'S - 4.9E-05 CM/SEC


RISING HEAD TEST
P2D
LOG HEAD RATIO
0.00
-0.10
-0.20
-0.30
-0.40
-0.50
-0.60
-0.70
-0.80
-0.90
-1.00
-1.10
-1.20
-1.30
-1.40
-1.50
0.00
0.40
0.80
1.20
1.60
2.00
2.40
(Thousands)
TIME (SEC)


RISING HEAD TEST
P2S
LOG HEAD RATIO
0.00
-0.10
-0.20
-0.30
-0.40
-0.50
-0.60
-0.70
-0.80
-0.90
-1.00
-1.10
-1.20
-1.30
-1.40
-1.50
0.00
0.40
0.80
1.20
1.60
2.00
2.40
(Thousands)
TIME (SEC)


RISING HEAD TEST
P3D
LOG HEAD RATIO
0.00
-0.10
-0.20
-0.30
-0.40
-0.50
-0.60
-0.70
-0.80
-0.90
-1.00
-1.10
-1.20
-1.30
-1.40
-1.50
0.00
0.40
0.80
1.20
1.60
2.00
2.40
(Thousands)
TIME (SEC)


RISING HEAD TEST
P3S
LOG HEAD RATIO
0.00
-0.10
-0.20
-0.30
-0.40
-0.50
-0.60
-0.70
-0.80
-0.90
-1.00
-1.10
-1.20
-1.30
-1.40
-1.50
0.00
0.40
0.80
1.20
1.60
2.00
2.40
(Thousands)
TIME (SEC)


RISING HEAD TEST
P4D
LOG HEAD RATIO
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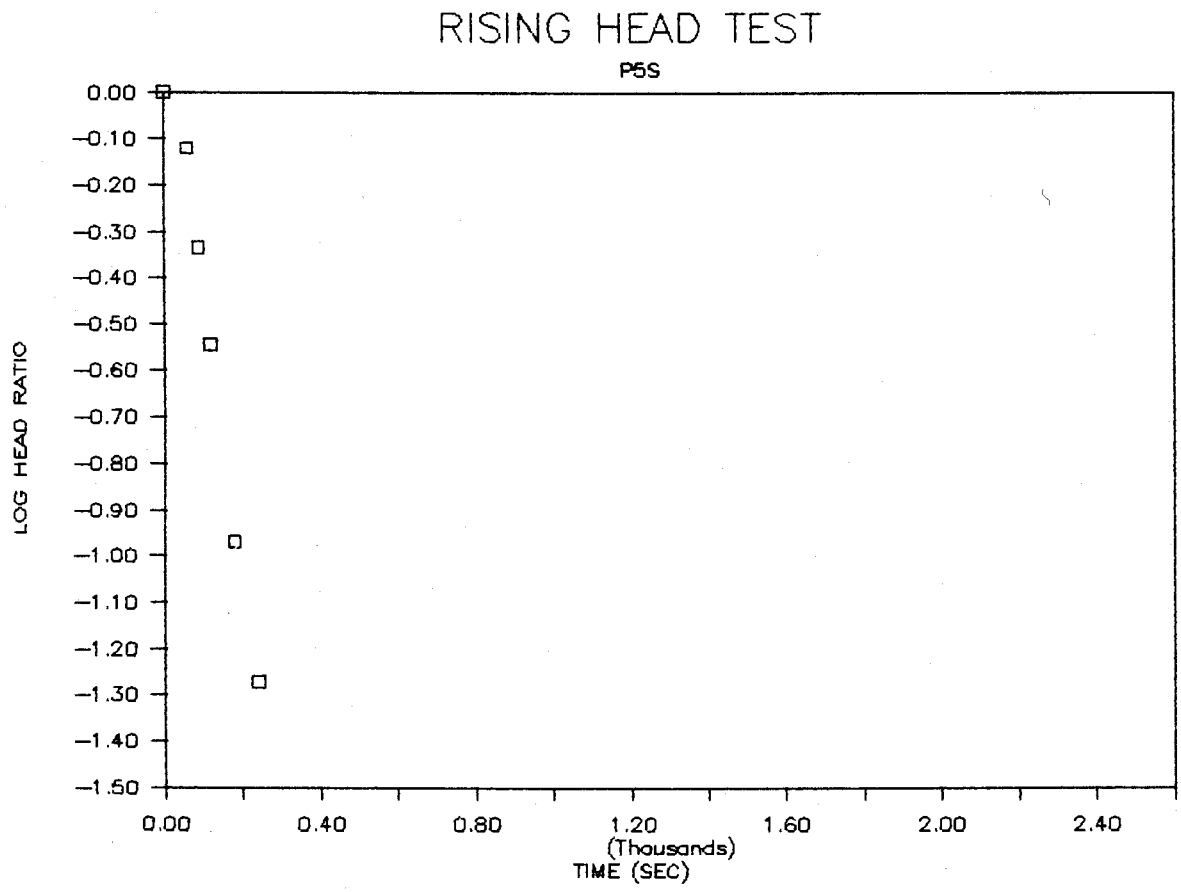
-0.10
-0.20
-0.30
-0.40
-0.50
-0.60
-0.70
-0.80
-0.90
-1.00
-1.10
-1.20
-1.30
-1.40
-1.50
0.00
0.40
0.80
1.20
1.60
2.00
2.40
(Thousands)
TIME (SEC)


RISING HEAD TEST
P5S
LOG HEAD RATIO
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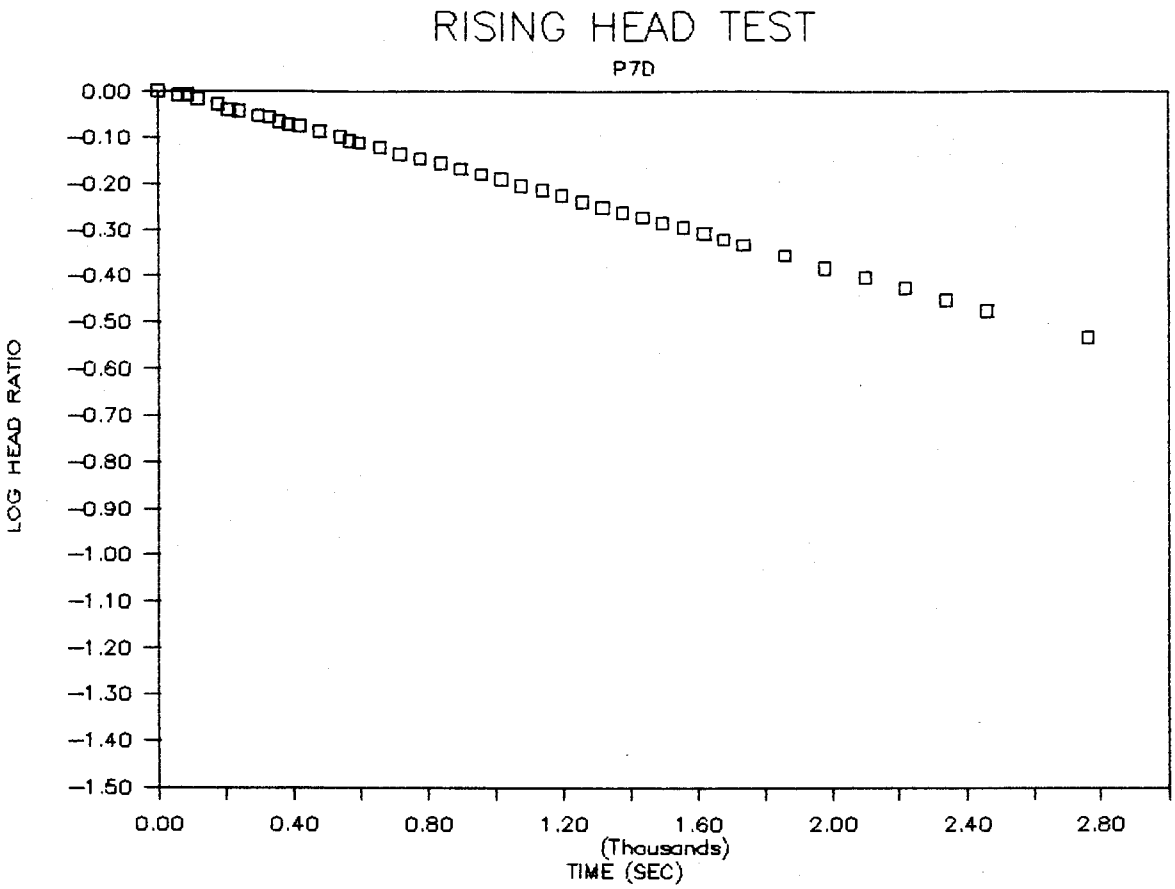
-0.10
-0.20
-0.30
-0.40
-0.50
-0.60
-0.70
-0.80
-0.90
-1.00
-1.10
-1.20
-1.30
-1.40
-1.50
0.00
0.40
0.80
1.20
1.60
2.00
2.40
(Thousands)
TIME (SEC)


RISING HEAD TEST
P7D
LOG HEAD RATIO
0.00
-0.10
-0.20
-0.30
-0.40
-0.50
-0.60
-0.70
-0.80
-0.90
-1.00
-1.10
-1.20
-1.30
-1.40
-1.50
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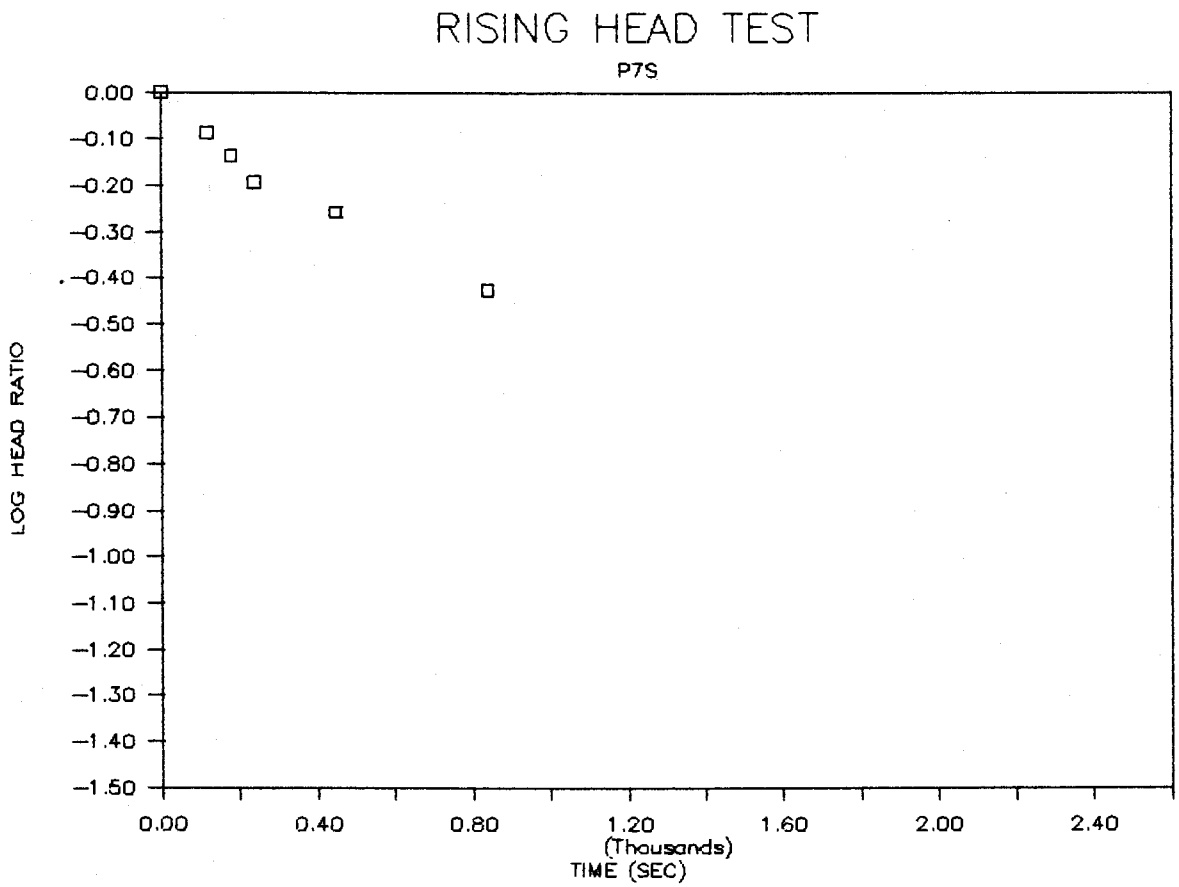
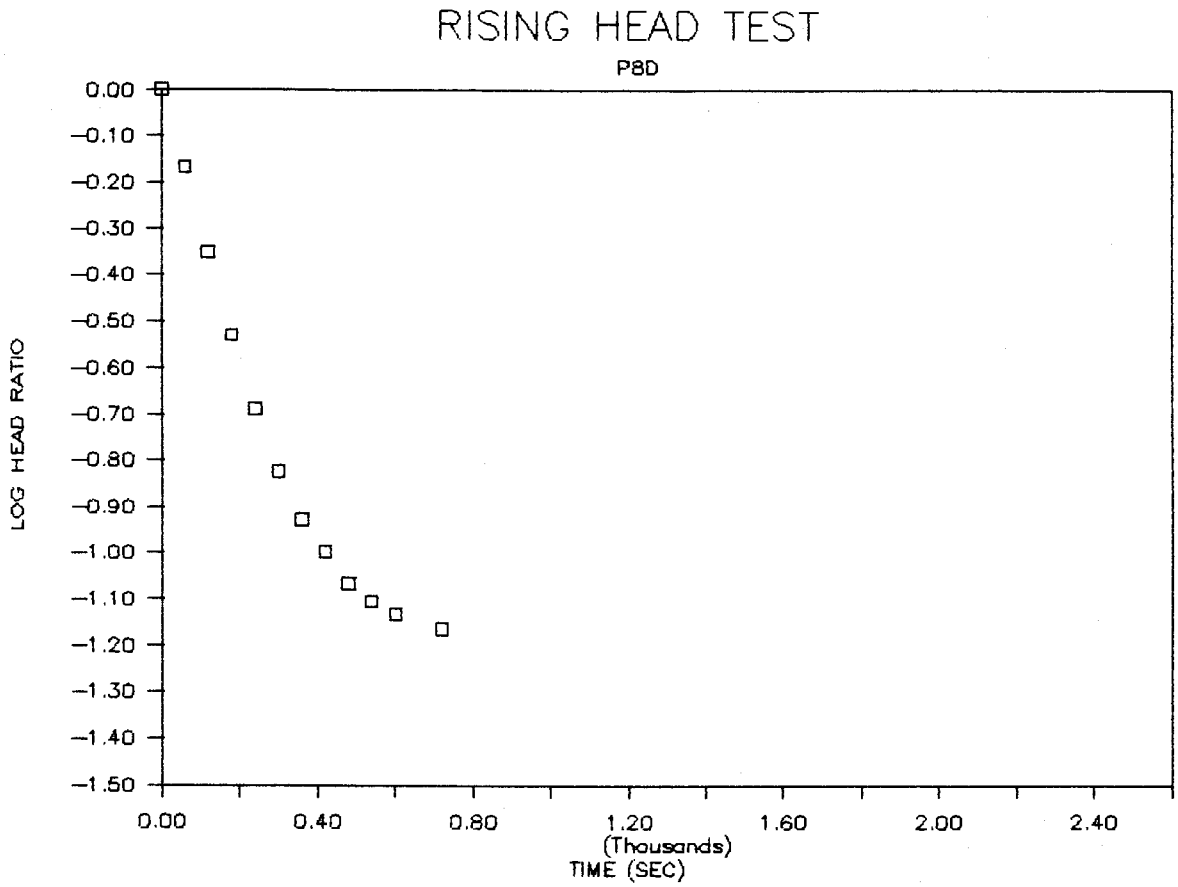
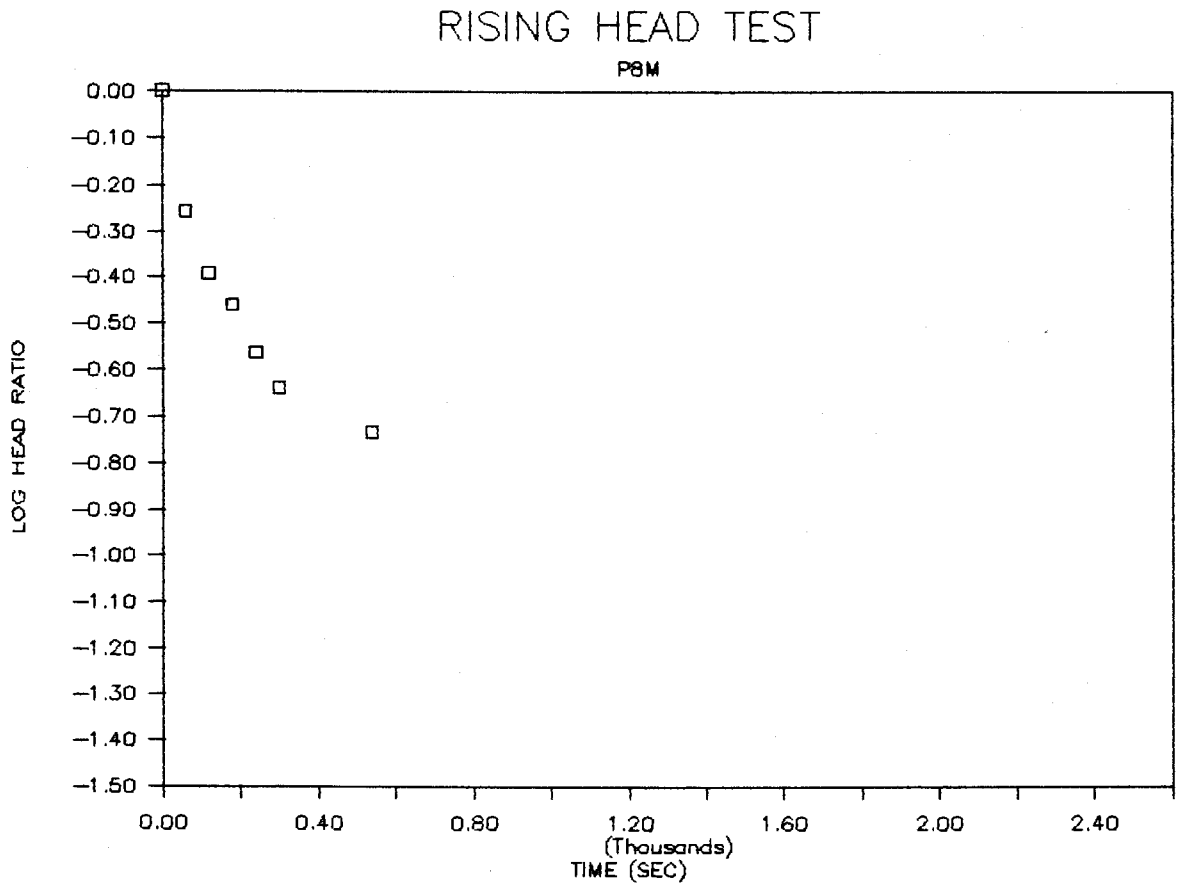
0.40
0.80
1.20
1.60
2.00
2.40
2.80
(Thousands)
TIME (SEC)

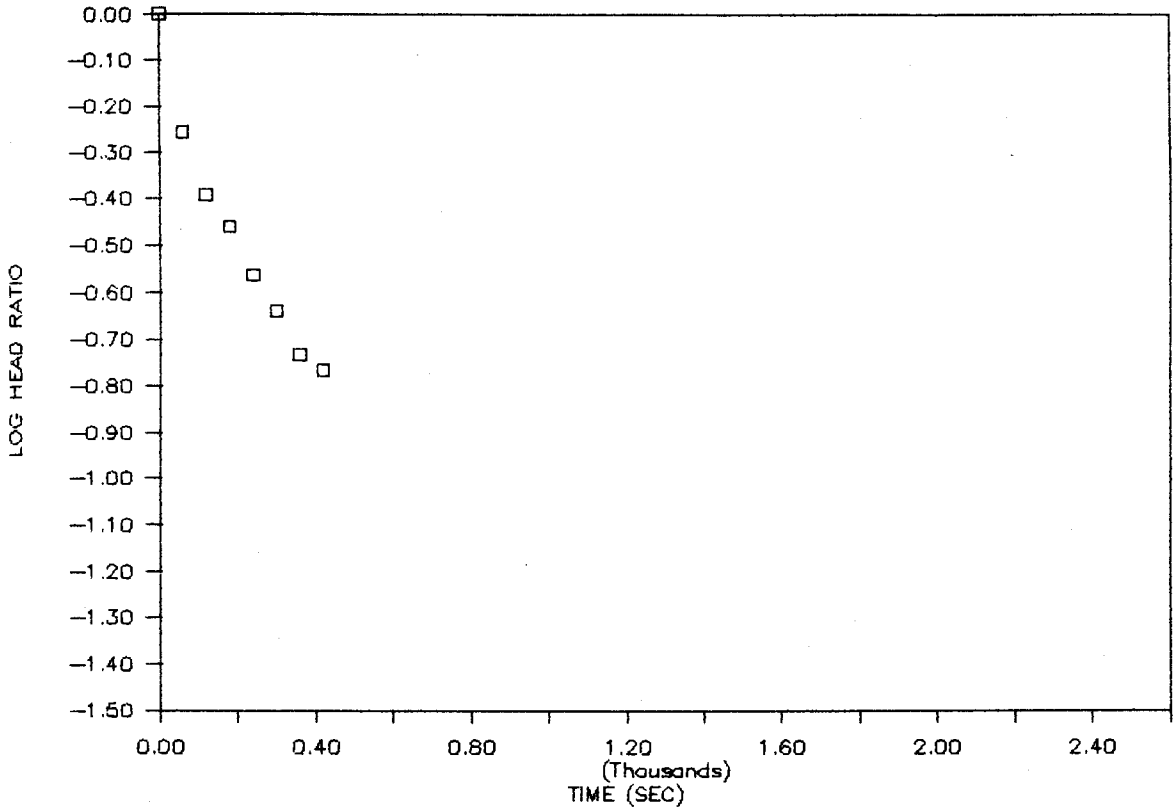

RISING HEAD TEST
P7S
LOG HEAD RATIO
0.00
-0.10
-0.20
-0.30
-0.40
-0.50
-0.60
-0.70
-0.80
-0.90
-1.00
-1.10
-1.20
-1.30
-1.40
-1.50
0.00
0.40
0.80
1.20
1.60
2.00
2.40
(Thousands)
TIME (SEC)


RISING HEAD TEST
P8D
LOG HEAD RATIO
0.00
-0.10
-0.20
-0.30
-0.40
-0.50
-0.60
-0.70
-0.80
-0.90
-1.00
-1.10
-1.20
-1.30
-1.40
-1.50
0.00
0.40
0.80
1.20
1.60
2.00
2.40
(Thousands)
TIME (SEC)


RISING HEAD TEST
P8M
LOG HEAD RATIO
0.00
-0.10
-0.20
-0.30
-0.40
-0.50
-0.60
-0.70
-0.80
-0.90
-1.00
-1.10
-1.20
-1.30
-1.40
-1.50
0.00
0.40
0.80
1.20
1.60
2.00
2.40
(Thousands)
TIME (SEC)

RISING HEAD TEST

P8S



Golder Associates	SUBJECT Permeability Calc. for Kernersville, N.C.		
	Job No. 863-3407	Made by MEO	Date 6-17-87
	Ref.	Checked	Sheet 1 of 12
		Reviewed	

Objective: To calculate permeability from rising head tests

Formulas: Confined (Variable Head)

$$K_h = \frac{d^2 \cdot \ln\left(\frac{4mL}{D}\right)}{8 \cdot L\,(t_2 - t_1)} \ln \frac{h_1}{h_2} \quad \text{for } \frac{2mL}{D} > 4$$

Confined (Basic Time Lag)

$$K_h = \frac{d^2 \cdot \ln\left(\frac{4mL}{D}\right)}{8 \cdot L \cdot T} \quad \text{for } \frac{2mL}{D} > 4$$

Unconfined (Variable Head)

$$K_h = \frac{d^2 \cdot \ln\left(\frac{2mL}{D}\right)}{8 \cdot L \cdot (t_2 - t_1)} \ln \frac{h_1}{h_2} \quad \text{for } \frac{mL}{D} > 4$$

Unconfined (Basic Time Lag)

$$K_h = \frac{d^2 \cdot \ln\left(\frac{2mL}{D}\right)}{8 \cdot L \cdot T} \quad \text{for } \frac{mL}{D} > 4$$

where:

d = diameter, standpipe, [cm]
D = diameter, intake, sample, [cm]
L = length, intake, sample, [cm]
h_1 = piez, head for $t = t_1$ [cm]
h_2 = piez, head for $t = t_2$ [cm]
t = time, sec
T = basic time lag, [sec]
m = transformation ratio $= 1$; $K_h = K_0$

(CEDERGREN, 1977)

Golder Associates	SUBJECT Permeability Calc. for Kernersville, N.C.		
	Job No. 863-3407 Ref.	Made by MED Checked Reviewed	Date 6-17-87 Sheet 2 of 12

Rising Head Test

Well # P7D

Condition - Well point - filter at impervious boundary (confined)

Rock Unit - (Unit 8) Black + White Granitic Gneiss

Formulas 1) Variable Head
2) Basic Time Lag

1) $$K_h = \frac{d^2 \cdot \ln\left(\frac{4mL}{D}\right)}{8 \cdot L\,(t_2 - t_1)} \ln \frac{h_1}{h_2} \qquad \text{for } \frac{2mL}{D} > 4$$

$$K_h = \frac{\left[(0.75\text{ in})(2.54\ \tfrac{\text{cm}}{\text{in}})\right]^2 \cdot \ln\left(\frac{(4)(1)(7.3\text{ ft})(30.48\text{ cm/ft})}{(3.50\text{ in})(2.54\text{ cm/in})}\right)}{8 \cdot (7.3\text{ ft})(30.48\text{ cm/ft})(540 - 2100)} \ln \frac{6.03}{12.15}$$

$$K_h = 4.2175 \times 10^{-6}\ \text{cm/sec}$$

2) $$K_h = \frac{d^2 \cdot \ln\left(\frac{4mL}{D}\right)}{8 \cdot L \cdot T}$$

$$K_h = \frac{\left[(0.75\text{ in})(2.54\text{ cm/in})\right]^2 \cdot \ln\left(\frac{(4)(1)(7.3\text{ ft})(30.48\text{ cm/ft})}{(3.50\text{ in})(2.54\text{ cm/in})}\right)}{8 \cdot (7.3\text{ ft})(30.48\text{ cm/ft})(1799\text{ sec})}$$

$$K_h = 5.2202 \times 10^{-6}\ \text{cm/sec}$$

Golder Associates	SUBJECT Permeability Calc. for Kernersville, N.C.		
	Job No. 863-3407 Ref.	Made by MED Checked Reviewed	Date 6-17-87 Sheet 3 of 12

Rising Head Test

Well # P2S

Conditions - Well point - filter in uniform soil - unconfined

Soil Type - (Unit 4) White tan Mf to C Sand, some silt, moist to Sat, Dense)

Formulas - 1) Variable Head
2) Basic Time Lag

1) $$K_h = \frac{d^2 \cdot \ln\left(\frac{2mL}{D}\right)}{8 \cdot L \cdot (t_2 - t_1)} \ln \frac{h_1}{h_2}$$

$$K_h = \frac{[(0.75\ in)(2.54\ cm/in)]^2 \cdot \ln\left(\frac{(2)(1)(7.0\ ft)(30.48\ cm/ft)}{(6\ in)(2.54\ cm/in)}\right)}{8 \cdot (7.0\ ft)(30.48\ cm/ft)(1080\ sec - 1840)} \cdot \ln \frac{-4.65}{-8.45}$$

$$K_h = 5.5680 \times 10^{-6}\ cm/sec$$

2) $$K_h = \frac{d^2 \cdot \ln\left(\frac{2mL}{D}\right)}{8 \cdot L \cdot T}$$

$$K_h = \frac{[(0.75\ in)(2.54\ cm/ft)]^2 \cdot \ln\left(\frac{(2)(1)(7.0\ ft)(30.48\ cm/ft)}{(6\ in)(2.54\ cm/in)}\right)}{8 \cdot (7.0\ ft)(30.48\ cm/ft)(820\ sec)}$$

$$K_h = 8.6398 \times 10^{-6}\ cm/sec$$

Golder Associates	SUBJECT Permeability Calc for Kernersville, N.C.		
	Job No. 863-3407 Ref.	Made by MEB Checked Reviewed	Date 6-17-87 Sheet 4 of 12

Rising Head Test

Well # P2D

Condition - Well point - Filter in uniform soil (Unconfined soil)

Soil Type - (Unit 4) (white tan Mf to c Sand, some silt, moist to sat, Dense)

Formulas - 1) Variable Head
2) Basic Time Lag

1) $$K_h = \frac{[(0.75\ in)(2.54\ cm/in)]^2 \cdot \ln\left(\frac{(2)(1)(6.8\ ft)(30.48\ cm/ft)}{(6.0\ in)(2.54\ cm/in)}\right)}{8 \cdot (6.8\ ft)(30.48\ cm/ft)(60 - 150\ sec)} \cdot \ln \frac{0.70}{2.20}$$

$$K_h = 9.198 \times 10^{-5}\ cm/sec$$

2) $$K_h = \frac{[(0.75)(2.54\ cm/in)]^2 \cdot \ln\left(\frac{(2)(1)(6.8\ ft)(30.48\ cm/ft)}{(6.0)(2.54)}\right)}{8(6.8\ ft)(30.48\ cm/ft)(50\ sec)}$$

$$K_h = 1.445 \times 10^{-4}\ cm/sec$$

Golder Associates	SUBJECT Permeability Calc for Kernersville, N.C.		
	Job No. 863-3407 Ref.	Made by MEA Checked Reviewed	Date 6-17-87 Sheet 6 of 12

Rising Head Test

Well # P33

Conditions - Well point - filter in uniform soil (unconfined)

Soil type - (Unit 4)(Reddish Brown Mic. f to c Sand, Some Silt, V. dense, moist)

Formulas - 1) Variable Head
2) Basic Time Lag

1) $$K_h = \frac{d^2 \cdot \ln\left(\frac{2mL}{D}\right)}{8 \cdot L \cdot (t_2 - t_1)} \ln \frac{h_1}{h_2}$$

$$K_h = \frac{[(0.75\,in)(2.54\,cm/ft)]^2 \cdot \ln\left(\frac{(2)(1)(6.5\,ft)(30.48\,cm/ft)}{(6.0\,in)(2.54\,cm/in)}\right)}{(8)(6.5\,ft)(30.48\,cm/ft)(110-360)} \cdot \ln \frac{0.5}{3.00}$$

$$K_h = 5.3465 \times 10^{-5}\ cm/sec$$

2) $$K_h = \frac{d^2 \cdot \ln\left(\frac{2mL}{D}\right)}{8 \cdot L \cdot T}$$

$$K_h = \frac{[(0.75\,in)(2.54\,cm/in)]^2 \cdot \ln\left(\frac{(2)(1)(6.5\,ft)(30.48\,cm/ft)}{(6.0\,in)(2.54\,cm/in)}\right)}{(8)(6.5\,ft)(30.48\,cm/ft)(66\,sec)}$$

$$K_h = 1.1130 \times 10^{-4}$$

Golder Associates	SUBJECT Permeability Calc. for Kernersville, N.C.		
	Job No. 863-3407 Ref.	Made by M.E.D Checked GR Reviewed	Date 6-17-87 Sheet 5 of 12

Rising Head Test

Well # P3D

Conditions - Well Point - Filter at impervious boundary - (confined)

Rock Unit - Black and White Granitic Schist and Gneiss

Formulas - 1) Variable Head
2) Basic Time Lag

1)
$$K_h = \frac{d^2 \cdot \ln\left(\frac{4mL}{D}\right)}{8 \cdot L \cdot (t_2 - t_1)} \ln \frac{h_1}{h_2}$$

$$K_h = \frac{[(0.75\ in)(2.54\ cm/in)]^2 \cdot \ln\left(\frac{(4)(1)(6.5\ ft)(30.48\ cm/ft)}{(3.5\ in)(2.54\ cm/in)}\right)}{(8)(6.5)(30.48)(300-1380)} \cdot \ln \frac{(4.09\ ft)(30.48\ cm)}{(11.19\ ft)(30.48\ cm)}$$

$$K_h = 9.5812 \times 10^{-6}\ cm/sec$$

2)
$$K_h = \frac{d^2 \cdot \ln\left(\frac{4mL}{D}\right)}{8 \cdot L \cdot T}$$

$$K_h = \frac{[(0.75\ in)(2.54\ cm/in)]^2 \cdot \ln\left(\frac{(4)(1)(6.5\ ft)(30.48\ cm/ft)}{(3.5\ in)(2.54\ cm/in)}\right)}{8 \cdot (6.5\ ft)(30.48\ cm/ft)(520\ sec)}$$

$$K_h = 1.9930 \times 10^{-5}\ cm/sec$$

Golder Associates	SUBJECT Permeability Calc. for Kernersville, N.C.		
	Job No. 863-3467 Ref.	Made by MEAD Checked GR Reviewed	Date 6-17-87 Sheet 8 of 12

Rising Head Test

Well # P4D

Condition - Well Point - filter in uniform soil (unconfined)

Soil Type - (Unit 4) (Reddish Brown, Tan Mic. f to c Sand, Some Silt, Dense, moist, — Last 2 ft. White f to c sand, Some to and silt, Stiff, moist, Rock Fragments)

Formulas 1) Variable Head
2) Basic Time Lag

1)
$$K_h = \frac{d^2 \cdot \ln\left(\frac{2mL}{D}\right)}{8 \cdot L \cdot (t_2 - t_1)} \ln \frac{h_1}{h_2}$$

$$K_h = \frac{[(0.75\text{ in})(2.54\text{ cm/in})]^2 \cdot \ln\left(\frac{(2)(1)(7\text{ ft})(30.48\text{ cm/ft})}{(6\text{ in})(2.54\text{ cm/in})}\right)}{(8)(7\text{ ft})(30.48\text{ cm/ft})(420 - 810\text{ sec})} \cdot \ln \frac{1.33}{3.83}$$

$$K_h = 1.9214 \times 10^{-5}\text{ cm/sec}$$

2)
$$K_h = \frac{d^2 \cdot \ln\left(\frac{2mL}{D}\right)}{8 \cdot L \cdot T}$$

$$K_h = \frac{[(0.75\text{ in})(2.54\text{ cm/in})]^2 \cdot \ln\left(\frac{(2)(1)(7\text{ ft})(30.48\text{ cm/ft})}{(6\text{ in})(2.54\text{ cm/in})}\right)}{(8)(7\text{ ft})(30.48\text{ cm/ft})(310\text{ sec})}$$

$$K_h = 2.2854 \times 10^{-5}\text{ cm/sec}$$

Golder Associates	SUBJECT Permeability Calc. for Kernersville, N.C.		
	Job No. 863-3407	Made by MEA	Date 6-17-87
	Ref.	Checked JR	Sheet 7 of 12
		Reviewed	

Rising Head Test

Well # P55

Condition - Well Point - Filter in uniform soil (unconfined)

Soil Type - (Unit 4)(White Black Green Mic f to c Sand little, silt, moist, V. dense)

Formula - 1) Variable Head
2) Basic Time Lag

1)
$$K_h = \frac{d^2 \cdot \ln\left(\frac{2mL}{D}\right)}{8 \cdot L \cdot (t_2 - t_1)} \ln \frac{h_1}{h_2}$$

$$K_h = \frac{[(0.75\ in)(2.54\ cm/in)]^2 \cdot \ln\left(\frac{(2)(1)(6.1\ ft)(30.48\ cm/ft)}{(6.0\ in)(2.54\ cm/in)}\right)}{(8)(6.1\ ft)(30.48\ cm/ft)(60 - 240)} \cdot \ln \frac{0.15}{2.13}$$

$$K_h = 1.148 \times 10^{-4}\ cm/sec$$

2)
$$K_h = \frac{d^2 \cdot \ln\left(\frac{2mL}{D}\right)}{8 \cdot L \cdot T}$$

$$K_h = \frac{[0.75\ in)(2.54\ cm/in)]^2 \cdot \ln\left(\frac{(2)(1)(6.1\ ft)(30.48\ cm/ft)}{(6.0\ in)(2.54\ cm/in)}\right)}{(8)(6.1\ ft)(30.48\ cm/ft)(110\ sec)}$$

$$K_h = 7.085 \times 10^{-5}\ cm/sec$$

Golder Associates	SUBJECT Permeability Calc. for Kernersville, N.C.		
	Job No. 863-3407	Made by MEO	Date 6-17-87
	Ref.	Checked	Sheet 9 of 12
		Reviewed	

Rising Head Test

Well # P7S

Condition - Well Point - filter at uniform soil (unconfined)

Soil Type - (Unit 4) (Black, white Mic., f-c Sand, Some to and Silt, Dense to v. dense, moist. - close to unit 7)

Formulas 1) Variable Head
2) Basic Time Lag

1) $$K_h = \frac{d^2 \cdot \ln\left(\frac{2mL}{D}\right)}{8 \cdot L \cdot (t_2 - t_1)} \cdot \ln \frac{h_1}{h_2}$$

$$K_h = \frac{[(0.75\text{ in})(2.54\text{ cm/in})]^2 \cdot \ln\left(\frac{(2)(1)(7.5\text{ ft})(30.48\text{ cm/ft})}{(6.0\text{ in})(2.54\text{ cm/in})}\right)}{(8)(7.5\text{ ft})(30.48\text{ cm/ft})(120-240\text{ sec})} \cdot \ln \frac{-0.92}{-0.72}$$

$$K_h = 1.3787 \times 10^{-5}\text{ cm/sec}$$

2) $$K_h = \frac{d^2 \cdot \ln\left(\frac{2mL}{D}\right)}{8 \cdot L \cdot T}$$

$$K_h = \frac{[(0.75\text{ in})(2.54\text{ cm/in})]^2 \cdot \ln\left(\frac{(2)(1)(7.5\text{ ft})(30.48\text{ cm/ft})}{(6.0\text{ in})(2.54\text{ cm/in})}\right)}{(8)(7.5\text{ ft})(30.48\text{ cm/ft})(500\text{ sec})}$$

$$K_h = 1.3499 \times 10^{-5}\text{ cm/sec}$$

Golder Associates	SUBJECT Permeability Calc. for Kernersville, N.C.		
	Job No. 863-3407	Made by MEA.	Date 6-17-87
	Ref.	Checked SR	Sheet 12 of 12
		Reviewed	

Rising Head Test

Well # P8S

Conditions - Well Point - filter in uniform soil (unconfined)

Soil Type - (Unit 4) (White tan Mic. f-c Sand, some to and Silt, Dense moist)

Formulas - 1) Variable Head
2) Basic Time Lag

1) $$K_h = \frac{d^2 \cdot \ln\left(\frac{2mL}{D}\right)}{8 \cdot L \cdot (t_2 - t_1)} \cdot \ln \frac{h_1}{h_2}$$

$$K_h = \frac{[(0.75\,in)(2.54\,cm/in)]^2 \cdot \ln\left(\frac{(2)(1)(7.5\,ft)(30.48\,cm/ft)}{(6\,in)(2.54\,cm/in)}\right)}{(8)(7.5\,ft)(30.48\,cm/ft)(120-300)} \ln \frac{1.55}{2.75}$$

$$K_h = 2.149 \times 10^{-5}\ cm/sec$$

2) $$K_h = \frac{d^2 \cdot \ln\left(\frac{2mL}{D}\right)}{8 \cdot L \cdot T}$$

$$K_h = \frac{[(0.75\,in)(2.54\,cm/in)]^2 \cdot \ln\left(\frac{(2)(1)(7.5\,ft)(30.48\,cm/ft)}{(6\,in)(2.54\,cm/in)}\right)}{(8)(7.5)(30.48\,cm/ft)(150\,sec)}$$

$$K_h = 4.4995 \times 10^{-5}$$

Golder Associates	SUBJECT Permeability Calc for Kernersville, N.C.		
	Job No. 863-3407	Made by MEO	Date 6-17-87
	Ref.	Checked	Sheet 11 of 12
		Reviewed	

Rising Head Test

Well # P8M

Conditions - Well Point - filter in uniform soil (unconfined)

Soil Type - (Unit 5) (Tan Pink, Mic. f-c Sand and Silt, V. dense, dry)

Formulas - 1) Variable Head
2) Basic Time Lag

1) $$K_h = \frac{d^2 \cdot \ln\left(\frac{2mL}{D}\right)}{8 \cdot L \cdot (t_2 - t_1)} \cdot \ln \frac{h_1}{h_2}$$

$$K_h = \frac{[(0.75\,in)(2.54\,cm/in)]^2 \cdot \ln\left(\frac{(2)(1)(7\,ft)(30.48\,cm/ft)}{(6.0\,in)(2.54\,cm/in)}\right)}{(8)(7.0\,ft)(30.48\,cm/ft)(60 - 300)} \cdot \ln \frac{1.55}{3.75}$$

$$K_h = 2.6080 \times 10^{-5}\ cm/sec$$

2) $$K_h = \frac{d^2 \cdot \ln\left(\frac{2mL}{D}\right)}{8 \cdot L \cdot T}$$

$$K_h = \frac{[(0.75)(2.54)]^2 \cdot \ln\left(\frac{(2)(1)(7\,ft)(30.48\,cm/ft)}{(6.0)(2.54\,cm/in)}\right)}{(8)(7.0)(30.48)(185\,sec)}$$

$$K_h = 3.8295 \times 10^{-5}\ cm/sec$$

Golder Associates	SUBJECT Permeability Calc for Kernersville, N.C.		
	Job No. 863-3407	Made by MEW	Date 6-17-87
	Ref.	Checked SR	Sheet 10 of 12
		Reviewed	

Rising Head Test

Well # P8D

Conditions - Well Point - filter in uniform soil (unconfined)

Soil Type - (Unit 6)(Orange Silt, Some f Sand Dense, Dry (Pink + Purple specks and Green specks)
(Unit 7)(White pink f-c Sand Some Silt Dense Dry to moist, Fragmented Rock)

Formulas 1) Variable Head
2) Basic Time Lag

$$1)\ K_h = \frac{d^2 \cdot \ln\left(\frac{2mL}{D}\right)}{8 \cdot L \cdot (t_2 - t_1)} \cdot \ln \frac{h_1}{h_2}$$

$$K_h = \frac{[(0.75\ in)(2.54\ cm/in)]^2 \cdot \ln\left(\frac{(2)(1)(8.0\ ft)(30.48\ cm/ft)}{(6.0\ in)(2.54\ cm/in)}\right)}{(8)(8.0\ ft)(30.48\ ft)(180 - 540\ sec)} \cdot \ln \frac{3.20}{12.10}$$

$$K_h = 2.3821 \times 10^{-5}\ cm/sec$$

$$2)\ K_h = \frac{d^2 \cdot \ln\left(\frac{2mL}{D}\right)}{8 \cdot L \cdot T}$$

$$K_h = \frac{[(0.75\ in)(2.54\ cm/in)]^2 \cdot \ln\left(\frac{(2)(1)(8.0\ ft)(30.48\ cm/ft)}{(6.0\ in)(2.54\ cm/in)}\right)}{(8)(8.0\ ft)(30.48\ cm/ft)(110\ sec)}$$

$$K_h = 5.861 \times 10^{-5}\ cm/sec$$

Golder Associates	SUBJECT Permeability Calc. for Kernersville N.C		
	Job No. 863-3407	Made by SRA ED	Date 6-17-87
	Ref.	Checked SC	Sheet 12 of 12
		Reviewed	

Reference:

Cedergren, Harry R., "Seepage, Drainage, and Flow Nets", Second edition, John Wiley & Sons, 1967, pg 72-77.

APPENDIX E

HAZEN'S APPROXIMATIONS- DESCRIPTION AND CALCULATIONS

HAZEN'S APPROXIMATION OF HYDRAULIC CONDUCTIVITIES

The flow of ground water through sand and silts depends upon the size and shape of the voids in the soil. Hazen (Hazen, 1893) found from numerous tests with loose filter sands that the hydraulic conductivity of these sands depends upon the effective particle size and the uniformity coefficients; thereby relating hydraulic conductivity to grain size distribution. For loose sands having a uniformity coefficient between 2 and 5, the Hazen empirical equation is:

$$K = C(D_{10})^2$$

Where K is the coefficient of hydraulic conductivity in centimeters per second and D_{10} is the effective size (10 percent of the sample, by weight, being smaller than this size) in centimeters. C is a constant whose value ranges from 90 to 120, and a value of 100 is usually used. For soils other than loose uniform sands, hydraulic conductivity values computed from the Hazen equation should be considered only approximate.

Estimated coefficients of hydraulic conductivity for the materials have been made using Hazen's approximation and the D_{10} particle sizes from the grain size curves. These estimates have been made using a value of 100 for the constant term 'C' in Hazen's equation. The grain size distribution curves give the particle diameters in millimeters. Therefore, with C=100, and grain sizes in millimeters (not centimeters), Hazen's equation may be rewritten as:

$$K = \frac{(D_{10})^2}{100}$$

with the result in meters per second.

Recognizing that 100 cm = 1m allows us to reduce Hazen's equation to:

$$K = (D_{10})^2$$

The table below presents results of hydraulic conductivity estimates using the above formula. The table also gives the D_{10} size in millimeters and the uniformity coefficient (D_{60}/D_{10}). The table is arranged with the data categorized by material type, boring number, and sample number.

These results are not precise determinations of soil hydraulic conductivity but do provide an indication of the variability of hydraulic conductivity which may be expected for the various materials. Where hydraulic conductivity measurements have been made by laboratory tests or from pump tests, their data fall with in the range estimated by the Hazen approximations.

APPENDIX F

HYDRAULIC GRADIENT CALCULATIONS

Golder Associates	SUBJECT Lateral & Vertical Hydraulic Gradients, GW. Velocity		
	Job No. 863-3401	Made by GC	Date 6/23/87
	Ref.	Checked	Sheet 1 of
		Reviewed	

Objective: 1) Compute Vertical Gradients at multi-piezometer Locations. To Calculate both magnitude and direction for water Level measurements on June 1st and 20th, 1987

2) Compute Lateral Gradients between piezometer Locations. To Calculate both magnitude and direction for water Level measurements on June 1, 1987.

3) Compute Groundwater Flow velocity in upper aquifer.

Formulas:

Vertical Gradients:

$$\frac{h_1 - h_2}{L}$$

h_1 = Water Level Elevation in upper piezometer
h_2 = Water Level Elevation in Lower piezometer
L = distance between aquifers will be the distance between the centers of each screened interval.

Lateral Gradient:

$$\frac{h_1 - h_2}{L}$$

h_1 = Water Level Elevation in upgradient piezometer
h_2 = Water Level Elevation in downgradient piezometer
L = distance between piezometer Locations.

Ground Water Velocity:

Darcy's Law $$V = \frac{Ki}{ne}$$

V = Velocity (distance / time)
K = hydraulic conductivity (distance/time)
i = hydraulic gradient; and
ne = effective porosity (dimensionless)

Golder Associates	SUBJECT Lateral & Vertical Hydraulic Gradients & GW Velocities		
	Job No. 863-3407	Made by SC	Date 6/22/87
	Ref.	Checked	Sheet 2 of
		Reviewed	

Given:

Water Level Elevations: see table ____
Piezometer Installation Logs: see Appendix ____
Piezometer Location: see Figure ____
ne = effective porosity (for Sand) = .35

Calculations: (Distance in feet)

P2S & P2D

June 1, 1987 P2S = 786.5
P2D = 786.6
Water Level measurements too close together to calculate a significant Gradient. (upward)

June 20, 1987 P2S = 786.33 (upward)
P2D = 786.47

P3S & P3D

June 20, 1987 P3S = 749.58 upward
P3D = 750.09
distance = 33 ft

Vertical gradient = $\frac{750.09 - 749.58}{33} = .015 \uparrow$

June 1, 1987 P3S = 750.3 upward
P3D = 750.9
distance = 33 ft

Vertical gradient = $\frac{750.9 - 750.3}{33} = .02 \uparrow$

P5S & P5D

June 1, 1987 P5S = 752.1 upward
P5D = 753.2
distance = 18.5

Vertical gradient = $\frac{753.2 - 752.1}{18.5} = .06 \uparrow$

June 20, 1987 P5S = 751.05 distance = 18.5
P5D = 752.25

Vertical gradient = $\frac{752.25 - 751.05}{18.5} = .065 \uparrow$

Golder Associates	SUBJECT Lateral & Vertical Hydraulic Gradient & GW Velocity		
	Job No. 803-3403 Ref.	Made by SR Checked Reviewed	Date [illegible] Sheet 3 of

Calc. Cont

P7S & P7D

June 1, 1987 — P7S = 749.3 downward
P7D = 748.1
distance = 15 ft

Vertical gradient = $\frac{749.3 - 748.1}{15} = .08 \downarrow$

June 20, 1987 — P7S = 748.38 downward
P7D = 747.03
distance = 15

Vertical gradient = $\frac{748.38 - 747.03}{15} = .09 \downarrow$

P8S & P8M

June 1, 1987 — P8S = 744.0 0.0095
P8M = 744.1

June 20, 1987 — P8S = 743.64
P8M = 742.53 downward
distance = 10.5

Vertical gradient = $\frac{743.64 - 742.53}{10.5} = .105 \downarrow$

P8S & P8D

June 1, 1987 — P8S = 744.0 downward
P8D = 743.4
distance = 53.5

Vertical gradient = $\frac{744.0 - 743.4}{53.5} = .01 \downarrow$

June 20, 1987 — P8S = 743.64 downward.
P8D = 742.26
distance = 53.5

Vertical gradient = $\frac{743.64 - 742.26}{53.5} = .026 \downarrow$

Golder Associates	SUBJECT Lateral - Vertical [illegible] Velocity		
	Job No. [illegible] Ref.	Made by SR Checked Reviewed	Date [illegible] Sheet 4 of

Calc. Cont.

P8M & P8D

June 1, 1987

P8M = 744.1
P8D = 743.4
distance = 36.5

Vertical Gradient = $\frac{744.1 - 743.4}{36.5} = .02$ ↓ Downward

June 20, 1987

P8M = 742.53
P8D = 742.26
distance = 36.5

Vertical Gradient = $\frac{742.53 - 742.26}{36.5} = .007$ ↓ Downward

(2) Lateral Gradient Calculations

P2 & P3

P2 = 786.6 , P3 = 750.9 , distance = 1350 ft

Lateral Gradient = $\frac{786.6 - 750.9}{1350} = .026$

P3 & P8

P3 = 750.9 , P8 = 743.4 , distance = 1050 ft

Lateral Gradient = $\frac{750.9 - 743.4}{1050} = .007$

P2 & P1

P2 = 786.6, P1 = 771.0 , distance = 770 ft

Lateral Gradient = $\frac{786.6 - 771.0}{770} = .02$

P1 & P5

P1 = 771.0, P5 = 753.2 , distance = 650 ft

Lateral Gradient = $\frac{771.0 - 753.2}{650} = .027$

Golder Associates	SUBJECT Lateral Vertical Hydraulic Gradient, GW Velocity		
	Job No. 863-3407	Made by [illegible]	Date [illegible]
	Ref.	Checked	Sheet 5 of
		Reviewed	

Calc. Cont.

(2)

P2 & P5

P2 = 786.6, P5 = 753.2, distance = 1240 ft

Lateral Gradient = $\frac{786.6 - 753.2}{1240}$ = .027

P2 & P8

P2 = 786.6, P8 = 743.4, distance = 2320 ft

Lateral Gradient = $\frac{786.6 - 743.4}{2320}$ = .019

P1 & P4

P1 = 771.0, P4 = 753.2, distance = 1180 ft

Lateral Gradient = $\frac{771.0 - 753.2}{1180}$ = .015

P4 & HA1

P4 = 753.2, HA1 = 737.2, distance = 960 ft

Lateral Gradient = $\frac{753.2 - 737.2}{960}$ = .017

P1 & HA1

P1 = 771.0, HA1 = 737.2, distance = 1800 ft

Lateral Gradient = $\frac{771.0 - 737.2}{1800}$ = .019

P6 & HA1

P6 = 750.5, HA1 = 737.2, distance = 540 ft

Lateral Gradient = $\frac{750.5 - 737.2}{540}$ = .025

Golder Associates	SUBJECT Lateral & Vertical Hydraulic Gradient & GW. Velocity		
	Job No. 863-3407	Made by SZ	Date 6/22/87
	Ref.	Checked	Sheet 6 of
		Reviewed	

Calc. Cont.
(2)

P6 & P4

P6 = 750.5, P4 = 753.2, distance = 710 ft

Lateral Gradient = $\frac{753.2 - 750.5}{710} = \underline{\underline{.003}}$ .0038

P2 & HA1

P2 = 786.6, HA1 = 737.2, distance = 2500 ft

Lateral Gradient = $\frac{786.6 - 737.2}{2500} = \underline{\underline{.02}}$

P6 & P7

P6 = 750.5, P7 = 748.1, distance = 890 ft

Lateral Gradient = $\frac{750.5 - 748.1}{890} = \underline{\underline{.003}}$

P6 & P8

P6 = 750.5, P8 = 743.4, distance = 1060 ft

Lateral Gradient = $\frac{750.5 - 743.4}{1060} = \underline{\underline{.007}}$

P2 & P7

P2 = 786.6, P7 = 748.1, distance = 3130 ft

Lateral Gradient = $\frac{786.6 - 748.1}{3130} = \underline{\underline{.012}}$

Golder Associates	SUBJECT Lateral & Vertical Gradients, GW Velocities		
	Job No. 863-3407	Made by GR	Date 6/22/87
	Ref.	Checked	Sheet 7 of
		Reviewed	

Calc. Cont.

(3) Calculation of Groundwater Flow Velocity

typical

P2D & P5S – Water producing unit = (Unit 4)

Lateral Hydraulic gradient = .027

Distance between P2D & P5 = 1240 ft

ne = (for Sands) = .35

K = hydraulic Conductivity from Variable Head Test Insitu
= 1.2×10^{-4} cm/sec

$$V = \frac{Ki}{ne} = \frac{(1.2 \times 10^{-4} \text{ cm/sec})(.027)}{.35}$$

$$V = 9.26 \times 10^{-6} \text{ cm/sec}$$

9.58 $V = 9.64 \approx$ <u>10 Ft/year</u>

Summaries of Calculations Tables __ & __

APPENDIX G

LEGAL DESCRIPTION OF LAND PARCELS

Legal Description
Parcels A, B, C, D

All that piece, parcel or tract of land lying and being in counties of Forsyth, Belews Creek Township and Guilford, Oak Ridge Township, state of North Carolina, the same being shown and delineated as Parcels A, B, C, and D, having a total of 108.81 acres on a plat for Waste Management of Carolinas, Inc. by Survey and Mapping Services of South Carolina, Inc. dated June 5, 1987, and according to said plat having the following courses and distances to-wit: From a stone located at the original southwest corner of the Barrows tract being common to lands formerly of Dwiggins, now Duke Power Co., and lands formerly of Peeples, now Duke Power Co., thence N 89-35 E for a distance of 173.99 ft. to an iron pipe at the point of beginning thence turning and running N 32-29 W along lands now of Duke Power Co. formerly Barrows for a distance of 44.85 ft. to an iron thence continuing along lands of Duke Power the following courses and distances: N 26-53 W for a distance of 295.00 ft. to an iron thence N 5-01 W for a distance of 171.10 ft. to an iron then N 00-30 W for a distance of 23.71 ft. to an iron thence N 24-30 E for a distance of 93.03 ft. to an iron thence N 9-25 W for a distance of 62.06 ft. to an iron thence N 51-02 W for a distance of 38.20 ft. to an iron thence N 02-34 W for a distance of 91.18 ft. along lands now of Duke Power Co. formerly Cole to an iron thence N 0-10 E for a distance of 301.94 to an iron located along lands now or formerly of J. H. Reynold thence continuing along lands of Reynolds N 0-14 W for a distance of 225.09 ft. to an old stone being the northwest corner of the Barrows tract thence S 85-52 E for a distance of 869.11 ft. to a stone thence N 03-36 W for a distance of 200.04 ft. to an iron located along lands now of Duke Power Co., formerly C. H. Russell thence along lands of Duke Power Co. S 85-46 E for a distance of 295.61 ft. to an iron thence N 01-41 W for a distance of 265.19 ft. to an iron thence S 85-12 E for a distance of 131.56 ft. to an iron thence S 85-01 E for a distance of 8.19 ft. to an iron located along lands of Carl H. Russell and Florrie S. Russell thence continuing along lands of Russell S 85-06 E for a distance of 175.99 ft. to an iron thence S 3-29 W for a distance of 506.30 ft. to an iron thence S 87-34 E for a distance of 1670.61 ft. to a stone at the original northeast corner of Barrows tract thence S 05-19 E for a total distance of 462.29 ft. to a point thence S 40-07 E for a distance of 113.50 ft. to an iron thence S 01-56 E for a distance of 232.00 ft. to a monument located along land of the town of Kernersville thence continuing along land of the town of Kernersville S 02-06 W for a distance of 831.15 ft. to a monument at the original southeast corner of the Barrows tract thence N 84-39 W for a distance of 210.63 ft. to an iron located at the Forsyth-Guilford County line thence N 85-15 W for a distance of 592.34 ft. to an axle thence N 84-36 W for a distance of 378.36 ft. to a monument located at lands of Denver B. and Minnie A. Cottingham thence N 87-28 W for a distance of 550.08 ft. to a stone located along lands of Alexander J. and Bertha P. Cottingham thence along lands

of Cottingham N 44-08 W for a distance of 627.86 to an iron thence N 86-28 W for a distance of 307.19 ft. to an iron located at lands of Duke Power Co., formerly W. V. Dwiggins, thence N 86-27 W for a distance of 302.48 ft. to a stone thence continuing along lands of Duke Power Co. S 01-30 W for a distance of 70.60 ft. to a stone thence S 89-35 W for a distance of 134.53 ft. to an iron pipe at the point of beginning.

Also included is a ±3.0 area shown as Freeman Road (SR 2140) and Goodwill Church Road (SR 2027).

Legal Description
Parcel A

All that piece, parcel or tract of land lying and being in counties of Forsyth, Belews Creek Township and Guilford, Oak Ridge Township, state of North Carolina, the same being shown and delineated as Parcel A, having a total of 100.81 acres on a plat for Waste Management of Carolinas, Inc. by Survey and Mapping Services of South Carolina, Inc. dated June 5, 1987, and according to said plat having the following courses and distances to-wit: From a stone located at the original southwest corner of the Barrows tract being common to lands formerly of Dwiggins, now Duke Power Co., and lands formerly of Peeples, now Duke Power Co., thence N 89-35 E for a distance of 173.99 ft. to an iron pipe at the point of beginning thence turning and running N 32-29 W along lands now of Duke Power Co. formerly Barrows for a distance of 44.85 ft. to an iron thence continuing along lands of Duke Power the following courses and distances: N 26-53 W for a distance of 295.00 ft. to an iron thence N 5-01 W for a distance of 171.10 ft. to an iron then N 00-30 W for a distance of 23.71 ft. to an iron thence N 24-30 E for a distance of 93.03 ft. to an iron thence N 9-25 W for a distance of 62.06 ft. to an iron thence N 51-02 W for a distance of 38.20 ft. to an iron thence N 02-34 W for a distance of 91.18 ft. to an iron located on the North side of Freeman Road then turning and running along the northern side of said road the following courses and distances: S 56-37 E for a distance of 99.95 ft. to a point thence S 44-08 E for a distance of 100.00 ft. to a point thence S 42-46 E for a distance of 100.00 ft. to an iron thence S 60-55 E for a distance of 150.08 ft. to an iron thence S 77-43 E for a distance of 119.71 ft. to an iron thence S 89-49 E for a distance of 80.33 ft. to an iron thence N 5-44 E for a distance of 666.14 ft. to an iron thence S 81-19 W for a distance of 214.49 ft. to an iron thence S 81-15 W for a distance of 183.66 ft. to an iron thence S 89-34 W for a distance of 221.59 ft. to an iron located along lands of Reynolds thence turning and continuing along lands of Reynolds N 0-14 W for a distance of 225.09 ft. to an old stone being the northwest corner of the Barrows tract thence S 85-52 E for a distance of 869.11 ft. to a stone thence N 03-36 W for a distance of 200.04 ft. to an iron located along lands now of Duke Power Co., formerly C. H. Russell thence along lands of Duke Power Co. S 85-46 E for a distance of 295.61 ft. to an iron thence N 01-41 W for a distance of 265.19 ft. to an iron thence S 85-12 E for a distance of 131.56 ft. to an iron thence S 85-01 E for a distance of 8.19 ft. to an iron located along lands of Carl H. Russell and Florrie S. Russell thence continuing along lands of Russell S 85-06 E for a distance of 175.99 ft. to an iron thence S 3-29 W for a distance of 506.30 ft. to an iron thence S 87-34 E for a distance of 1670.61 ft. to a stone at the original northeast corner of Barrows tract thence S 05-19 E for a total distance of 462.29 ft. to a point thence S 40-07 E for a distance of 113.50 ft. to an iron thence S 01-56 E for a distance of 232.00 ft. to a monument located along land of the town of

Kernersville thence continuing along land of the town of Kernersville S 02-06 W for a distance of 831.15 ft. to a monument at the original southeast corner of the Barrows tract thence N 84-39 W for a distance of 210.63 ft. to an iron located at the Forsyth-Guilford County line thence N 85-15 W for a distance of 592.34 ft. to an axle thence N 84-36 W for a distance of 378.36 ft. to a monument located at lands of Denver B. and Minnie A. Cottingham thence N 87-28 W for a distance of 650.08 ft. to a stone located along lands of Alexander J. and Bertha P. Cottingham thence along lands of Cottingham N 44-08 W for a distance of 627.86 to an iron thence N 86-28 W for a distance of 307.19 ft. to an iron located at lands of Duke Power Co., formerly W. V. Dwiggins, thence N 86-27 W for a distance of 302.48 ft. to a stone thence continuing along lands of Duke Power Co. S 01-30 W for a distance of 70.60 ft. to a stone thence S 89-35 W for a distance of 134.53 ft. to an iron pipe at the point of beginning.

Also included is a ±3.0 area shown as Freeman Road (SR 2140) and Goodwill Church Road (SR 2027).

Excluded from this is a parcel of land containing 1.01 acres show as Parcel D on said plat being more fully described as follows: "Beginning at an iron located on the south side of Freeman Road thence N 83-41 E for a distance of 209.97 ft. to an iron thence S 6-19 E for a distance of 209.80 ft. to an iron thence S 83-35 W for a distance of 209.97 ft. to an iron thence N 6-19 W for a distance of 209.98 ft. to an iron at the point of beginning." Being bounded on the north by Freeman Rd. and on the east, south and west by lands now or formerly of Barrow.

Legal Description

Parcel B

All that certain piece, parcel or tract of land lying situate and being in the Belews Creek Township, Forsyth County, State of North Carolina containing 1.99 acres as shown on a plat for Waste Management of Carolinas, Inc. by Survey and Mapping Services of South Carolina, Inc. dated June 12, 1987 and according to said plat having the following courses and distances, to wit:

Beginning at an iron located on the north side of Freeman Road (SR 2140) along lands of Duke Power Co., formerly Robert Cole, thence N00°10'E for a distance of 301.94 feet to an iron located along lands of J. H. Reynolds and lands now or formerly Barrow; thence turning and running along lands of Barrow N89°34'E for a distance of 221.59 feet to an iron located along lands now or formerly of Stephenson; thence turning and running along lands of Stephenson S00°-10'W for a distance of 503.81 feet to an iron located on the north side of Freeman Road; thence turning and running along the north side of said road the following courses and distances: N42°46'W for 100.00 feet to a point; thence N44°08'W for 100.00 feet to a point; thence N56°37'W for 99.95 feet to an iron at the point of beginning.

Legal Description

Parcel C

All that certain piece, parcel or tract of land lying situate and being in the Belews Creek Township, Forsyth County, State of North Carolina containing 5.00 acres as shown on a plat for Waste Management of Carolinas, Inc. by Survey and Mapping Services of South Carolina, Inc. dated June 12, 1987 and according to said plat having the following courses and distances, to wit:

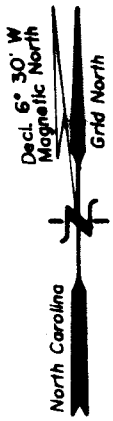
Beginning at an iron located on the north side of Freeman Road (SR 2140) along lands now or formerly of Ballard, thence along and with lands of Ballard N00°-10'E for a distance of 503.81 feet to an iron located along lands now or formerly of Barrow; thence along and with lands of Barrow N81°15'E for a distance of 183.66 feet to an iron; thence N81°19'E for a distance of 214.49 feet to an iron; thence turning and continuing along lands of Barrow S05°44'W for a distance of 666.14 feet to an iron located on the north side of Freeman Road (SR 2140); thence turning and running along the north side of said road N89°49'W for a distance of 80.33 feet to an iron; thence N77°-43'W for a distance of 119.71 feet to an iron; thence N60°55'W for a distance of 150.08 feet to an iron at the point of beginning.

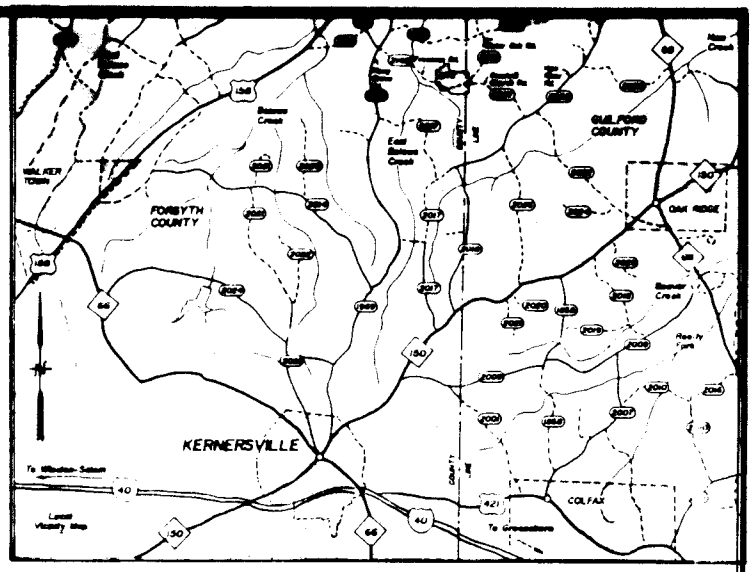
Legal Description

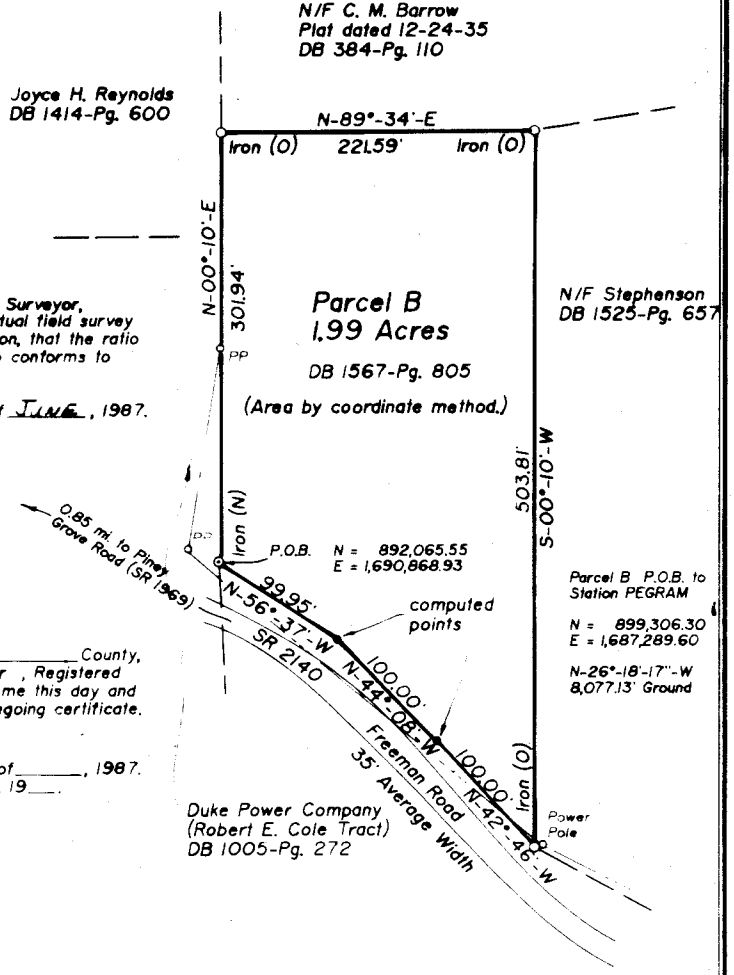
Parcel D

All that certain piece, parcel or tract of land lying situate and being in the Belews Creek Township, Forsyth County, State of North Carolina containing 1.01 acres as shown on a plat for Waste Management of Carolinas, Inc. by Survey and Mapping Services of South Carolina, Inc. dated June 12, 1987 and according to said plat having the following courses and distances, to wit:

Beginning at an iron located on the south side of Freeman Road (SR 2140) along lands now or formerly of Barrow, thence along the south side of said road N83°41'E for a distance of 209.97 feet to an iron located along lands now or formerly of Barrow; thence turning and continuing alongs lands of Barrow S06°-19'E for a distance of 209.80 feet to an iron; thence S83°35'W for a distance of 209.97 feet to an iron; thence N06°19'W for a distance of 209.88 feet to an iron at the point of beginning.







I, David R. Winchester, Registered Land Surveyor, certify that this map was drawn from an actual field survey performed under my direction and supervision, that the ratio of precision is 1 : 10,000, and that this map conforms to GS 47-30 as amended.

Witness my hand and seal this 19 th day of JUNE, 1987.

Registered Land Surveyor

L-2574

North Carolina
_____ County

I, _____, a Notary Public of _____ County, do hereby certify that David R. Winchester, Registered Land Surveyor, personally appeared before me this day and acknowledged the due execution of the foregoing certificate.

Witness my hand and seal this ____ th day of _____, 1987.
My commission expires _____, 19___.

Notary Public

Boundary Survey and Plat For

WASTE MANAGEMENT OF CAROLINAS, INC.

Belews Creek Township, Forsyth County, North Carolina

Survey & Mapping Services
of South Carolina, Inc.

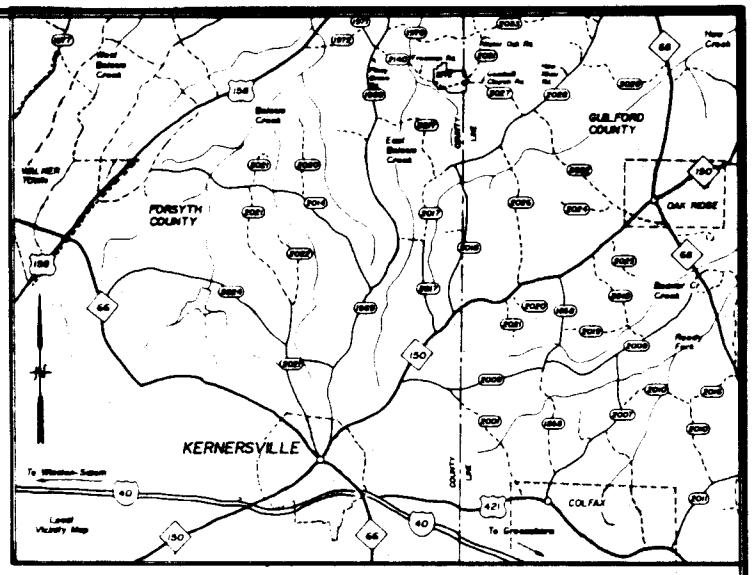
P. O. Box 3263
2028 Platt Springs Road
West Columbia, SC 29171
(803) 796 - 8214

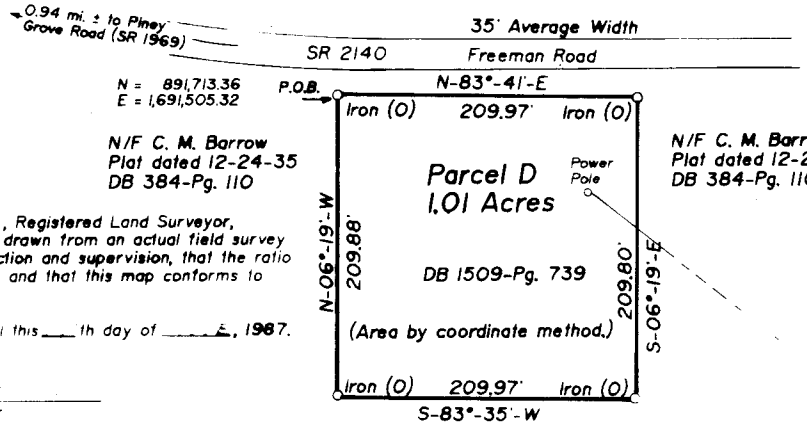
100 50 0 100

Scale : 1" = 100'

Date : 12 June 1987

79310





I, David R. Winchester, Registered Land Surveyor, certify that this map was drawn from an actual field survey performed under my direction and supervision, that the ratio of precision is 1 : 10,000, and that this map conforms to GS 47-30 as amended.

Witness my hand and seal this ___ th day of _____, 1987.

_____
Registered Land Surveyor

L-2574

North Carolina
_____County

I, _____, a Notary Public of _____County, do hereby certify that David R. Winchester, Registered Land Surveyor, personally appeared before me this day and acknowledged the due execution of the foregoing certificate.

Witness my hand and seal this ___ th day of _____, 1987.
My commission expires _____, 19___.

_____
Notary Public

Parcel D P.O.B. to Station PEGRAM

N = 899,306.30
E = 1,687,289.60

N-29°-02'-23"-W
8,684.76' Ground

Boundary Survey and Plat For

WASTE MANAGEMENT OF CAROLINAS, INC.

Belews Creek Township, Forsyth County, North Carolina

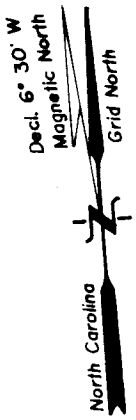
Survey & Mapping Services
of South Carolina, Inc.

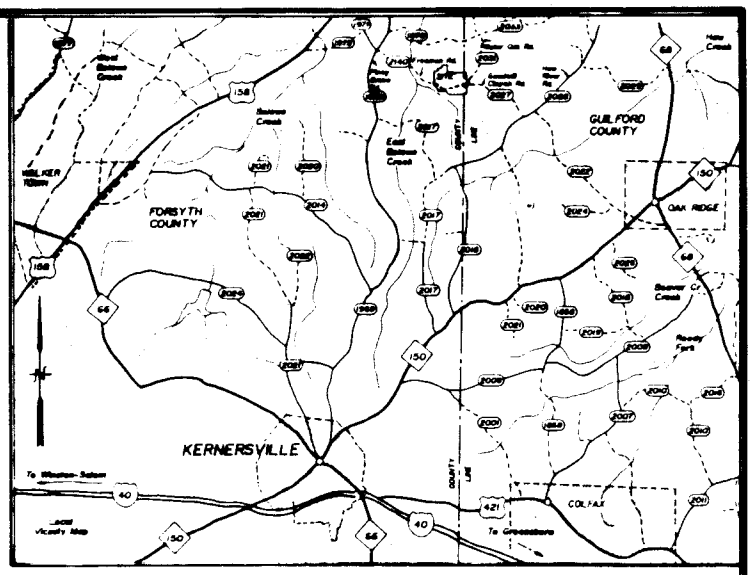
P. O. Box 3263
2028 Platt Springs Road
West Columbia, SC 29171
(803) 796 - 8214

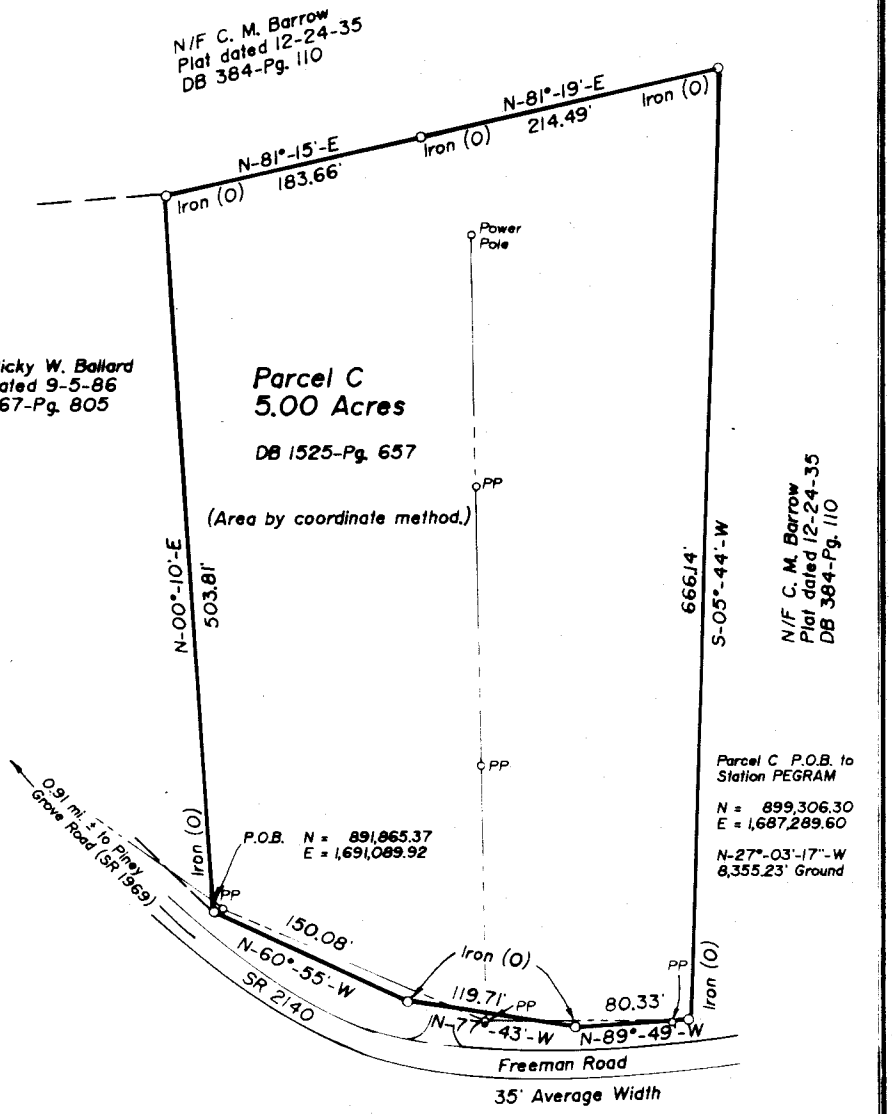
100 50 0 100

Scale : 1" = 100'

Date : 12 June 1987







I, David R. Winchester, Registered Land Surveyor, certify that this map was drawn from an actual field survey performed under my direction and supervision, that the ratio of precision is 1 : 10,000, and that this map conforms to GS 47-30 as amended.

Witness my hand and seal this ___th day of _____, 1987.

_____
Registered Land Surveyor

L-2574

North Carolina
_____County

I, _____, a Notary Public of _____County, do hereby certify that David R. Winchester, Registered Land Surveyor, personally appeared before me this day and acknowledged the due execution of the foregoing certificate.

Witness my hand and seal this ____th day of _____, 1987.
My commission expires _____, 19___.

_____
Notary Public

Boundary Survey and Plat For

WASTE MANAGEMENT OF CAROLINAS, INC.

Belews Creek Township, Forsyth County, North Carolina

APPENDIX H

SEISMIC REFRACTION SURVEY

REPORT ON

PROPOSED KERNERSVILLE SANITARY LANDFILL
FORSYTH COUNTY, NORTH CAROLINA
SEISMIC REFRACTION SURVEY

Submitted to:

Waste Management of North America, Inc.
2600 Delk Rd., Suite 200
Marietta, GA 30067

DISTRIBUTION:

2 Copies - Waste Management of North America, Inc.
2 Copies - Golder Associates, Inc.

April 1987 863-3407

April 14, 1987 863-3407

Waste Management of North America, Inc.
2600 Delk Rd., Suite 200
Marietta, GA 30067

Attn: Mr. Ed Gibson

RE: PROPOSED KERNERSVILLE SANITARY LANDFILL
FORSYTH COUNTY, NORTH CAROLINA
SEISMIC REFRACTION SURVEY

Dear Sir:

Golder Associate, Inc. has completed a seismic refraction survey at the proposed Kernersville Landfill site, Forsyth County, North Carolina. The attached report presents the results of the survey for your review.

We are presently using the survey results to plan the drilling program at the site.

Should you have questions about this addendum report, please call.

Very truly yours,

GOLDER ASSOCIATES

Ray Pearson, P.Eng.
Associate

RP:cee

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Cover Letter

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FIGURE 1 - Site Location Plan — In Order Following Page 10
FIGURE 2 - Seismic Data, Analysis and Interpretation
FIGURE 3 - Approximate Locations of Seismic Refraction
FIGURE 4 thru FIGURE 10 - Seismic Velocity Profile

APPENDIX A - Seismic Velocity Calculations

ADDENDUM 1. RESULTS OF A SEISMIC REFRACTION SURVEY PERFORMED AT THE PROPOSED KERNERSVILLE SANITARY LANDFILL SITE.

1.0 INTRODUCTION

Golder Associates has recently submitted a report to Waste Management of North America, Inc. (WMNA) entitled Phase I Hydrogeologic Desk Study, Proposed Kernersville, North Carolina, Sanitary Landfill. This document is an addendum to that report and describes the methods, findings, and interpretation of a seismic refraction survey recently completed at the site. It is assumed that the reader is familiar with the above report, and in particular with the physiographic, soils and hydrogeologic conditions at the site.

2.0 THE SEISMIC REFRACTION METHOD

The seismic refraction method detects differing materials according to the velocity with which a seismic (compressional) wave passes through the materials. The seismic velocity increases with the rigidity and incompressibility of the material and ranges from about 500 to 4,000 feet per second for soils, and from about 5,000 to 20,000 feet per second for rock Reference 1.

When a seismic wave is started in a low velocity material (such as soil) which overlies a high velocity material (such as rock) some of the waves (direct waves) pass along the surface of the low velocity layer. Other waves (refracted waves) pass down through the low velocity layer, are refracted along the high velocity layer, and return to the surface through the low velocity layer. Discussions of the principles and methods of the seismic refraction method can be found in Dobrin (Reference 2) and Redpath (Reference 3).

3.0 METHODS

3.1 Field Survey

The seismic survey was performed by a two-man crew, using a twelve geophone (detector) seismograph and generating the seismic waves by striking a steel plate on the ground with a sledge hammer. The site location is shown as Figure 1. Geophones were located ten feet apart along a straight line; the ground was struck at both ends of the line. Two or more lines were set up next to each other to form a continuous profile. Locations of seismic refraction profiles are presented in Figure 3. Profile locations were selected to cover as much as possible of the site in the time available. The southwestern portion of the site was excluded from the survey because the many surface water features render that area difficult to work in. The extreme northeastern portion of the site was excluded because the very dense underbrush in that area made access very difficult or impossible.

3.2 Analysis Method

After completing each line, a printout was produced which showed the time that the seismic wave arrived at each geophone. Two or more straight line segments were then fitted to the arrival times. Since these lines represent the time that the shock waves took to travel from one geophone to the next, the slope of the lines is a function of the seismic velocity of the material through which the wave passed. Arrival times at geophones close to the source indicate the velocity of the direct wave passing through the upper layer, while arrival times at farther geophones reflect the velocity of the refracted wave passing through the lower and higher velocity layers. Once the seismic velocities of the two materials are determined, the depth to the higher velocity stratum can be calculated.

3.3 Sample Problem

A sample seismogram, with its analysis and interpretation, is presented in Figure 2. This figure shows the method of analyzing a two-layer case with a horizontal surface. Analytical methods are available for more complicated methods, including three or more layers and tilted or irregular surfaces, and have been applied where appropriate.

4.0 DATA INTERPRETATION

4.1 General

The data obtained in seismic refraction surveys can be interpreted to yield information on the seismic velocity and depth of discrete layers of the subsurface. Seismic velocity data can be used to estimate the nature, consistency, and depth of occurrence of various soil and rock materials in the subsurface. The data cannot, however, be used to absolutely define the continuity, depth and properties of materials and must be substantiated by test borings.

4.2 Site Specific Data

Figure 3 shows the locations of the various seismic lines run at the Kernersville site. Figures 4 through 10 illustrate the seismic profiles in terms of the estimated seismic velocities with depth. The calculations for these velocities are included in Appendix A.

It should be noted that the depths indicated on Figures 3 through 10 do not relate to one another, as yet. These depths are relative to an arbitrary datum point established at or close to each line station. The depths can only be related by a complete survey of the lines relative to a common benchmark. Similarly, the bearings indicated on Figures 3 through 10 are those obtained by Bruntan compass at the time of performance of the seismic survey. The actual orientation of the lines can only be accurately mapped by a full survey.

Despite the above, however, the data as shown in the profiles can be extrapolated to give indications of depth to bedrock.

4.3 Interpretation Problems

Our experience correlating boring and seismic refraction data indicates that depths determined by seismic refraction survey are generally accurate to within about ten to twenty percent. Additional errors may, however, be unavoidably introduced into interpretation of seismic data by the presence of low velocity zones or blind zones. Low velocity zones occur when a stratum has a lower seismic velocity than an overlying stratum. Such a low velocity stratum cannot be detected by seismic refraction; moreover, the increased travel time through the low velocity stratum will cause the depth to all underlying layers to be overestimated Reference 2. Low velocity layers do not normally occur in residual soils such as those at the Kernersville site, but their absence cannot be taken for granted without information from test borings.

Blind zones occur where a relatively thin stratum overlies a stratum at much higher seismic velocity (Reference 3). Blind zones can best be detected and interpreted with test drilling, but their presence may be suggested by changes in the depth and velocity of a stratum in adjacent profiles. Profiles in which a blind zone appears to be present include lines 23, 27 and 32. In line 24, for instance, a stratum of 3,000 fps material appears to thin and dips to the south. In line 23, the thin stratum of 3,000 fps material is masked by the underlying 7,800 fps stratum.

4.4 Interpretation

The lithology of a stratum cannot be determined by seismic velocity without test drilling. However, based on the available literature and our experience with similar

sites, we feel that the following range of velocities is probably typical of the types of soils and rock found at the Kernersville site:

Seismic Velocity	Material
<1200 feet per second	loose soil, such as topsoil
1200 - 3000 fps	dense soils such as residuum and saprolite, probably excavatable without ripping
3000 - 5000 fps	weathered rock, possibly requiring ripping--can be ripped with D8L bulldozer
5000 - 8000 fps	fractured rock--difficult or impossible to rip with D8L bulldozer, depending on spacing and orientation of fractures
>8000 fps	intact rock, non-rippable

Note: Rippability data taken from Caterpillar Performance Handbook, Edition 17, with rippability estimates made somewhat more conservative based on local experience.

Again, the type and consistency of soils can only be determined by borings or test pits in conjunction with refraction surveys. However, based only on the seismic data, the following preliminary inferences can be made:

1. Soil Profile

   Seismic data are consistent with the soil profile consisting of topsoil -- residuum/saprolite --partially weathered rock which is typical of piedmont soils and observed in borrow pits at the site.

2. Soil Depth

Most of the site appears to be underlain by at least 20 feet of soil with a seismic velocity of 3000 fps or less. The exception is line 21 (near Goodwill-Freeman Road), where 5200 fps material (probably fractured rock) lies within about five feet of the surface.

Irregular seismic traces are found in profiles 6, 33 and 34. These traces may indicate the presence of boulders within the soil strata.

The lowest seismic velocity in soils other than topsoil (about 1400 fps) are found in profiles D, E and F, in the southeast corner of the site, and I and J near the center of the site. Low velocity in soils may indicate increased chemical weathering; this is a contrast to low velocity in rock which is often due to fractures. These soils may be better suited for seepage barriers than higher velocity soils; this possibility should be investigated by borings and/or test pits.

3. Groundwater

Groundwater conditions at the site cannot be inferred from seismic data alone. Once piezometer data are available, the seismic data should be reevaluated to determine if a correlation exists between seismic and piezometer data.

5.0 CONCLUSION

In conclusion, the seismic data tend to confirm the description of residual soils at the site presented in Golder Associates' Desk Study of the site. The data indicate that shallow rock is not common at the site and that the most suitable area for initial borrow investigations may be the southeast and central areas of the site. As data from the borrow investigation and piezometer installation programs become available, the seismic data should be reinterpreted to confirm or modify the initial findings, to interpolate data between borings, and to determine if additional inferences can be drawn.

GOLDER ASSOCIATES

Ray Pearson, P.Eng.
Associate

RP:maa

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1. Telford, W.M., L.P. Goldart, R.E. Sheriff, and D.A. Keys: Applied Geophysics, Cambridge University Press, 1976.

2. Dobrin, M.B.: Introduction to Geophysical Prospecting, 3rd Ed., McGraw Hill, N.Y., 1976.

3. Redpath, Bruce B: Seismic Refraction Exploration for Engineering Site Investigations, Explosive Investigation Research Laboratory, Livermore, California, 1973.

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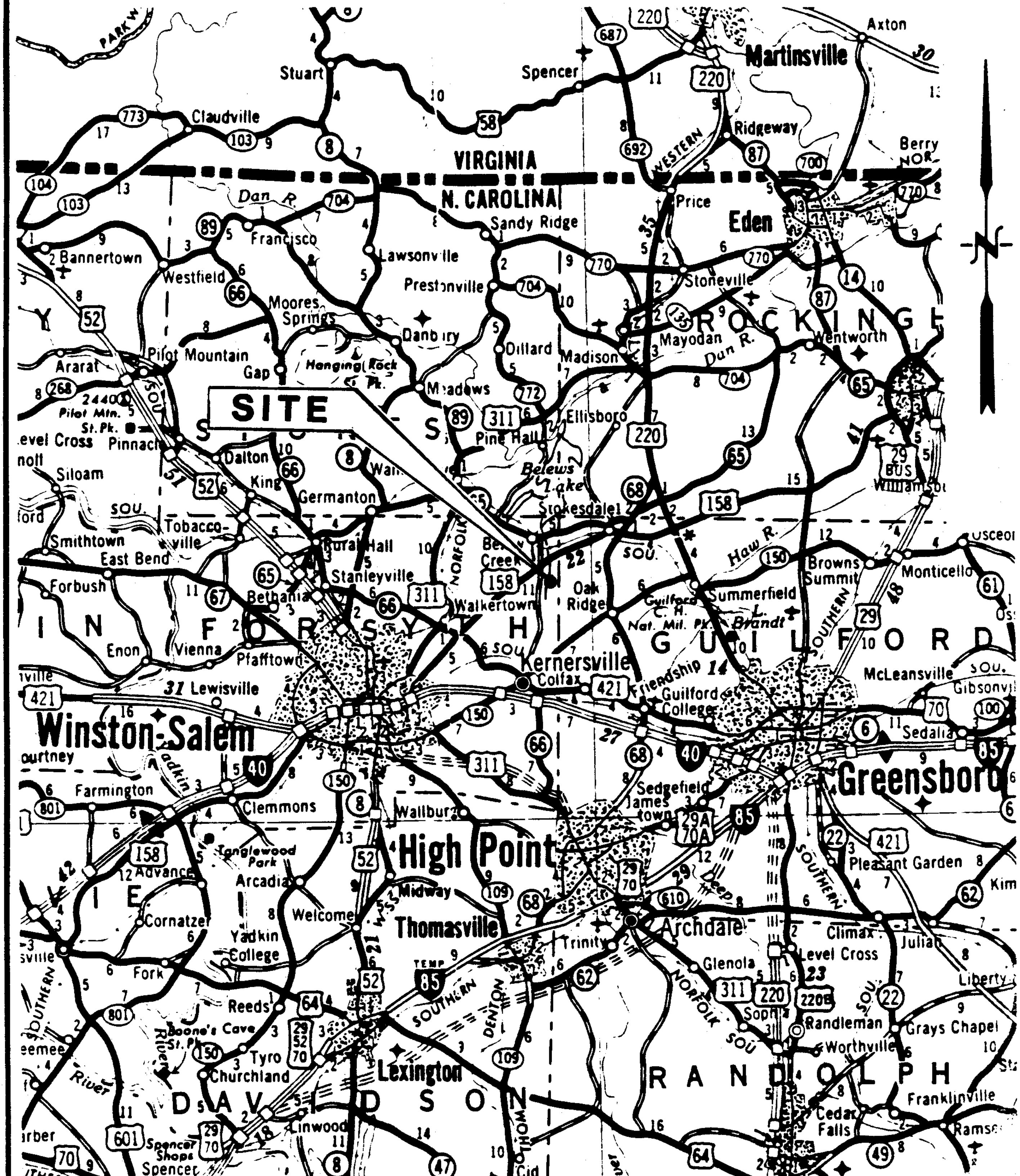

JOB NO.	863-3407	SCALE	N.T.S.	SITE LOCATION PLAN
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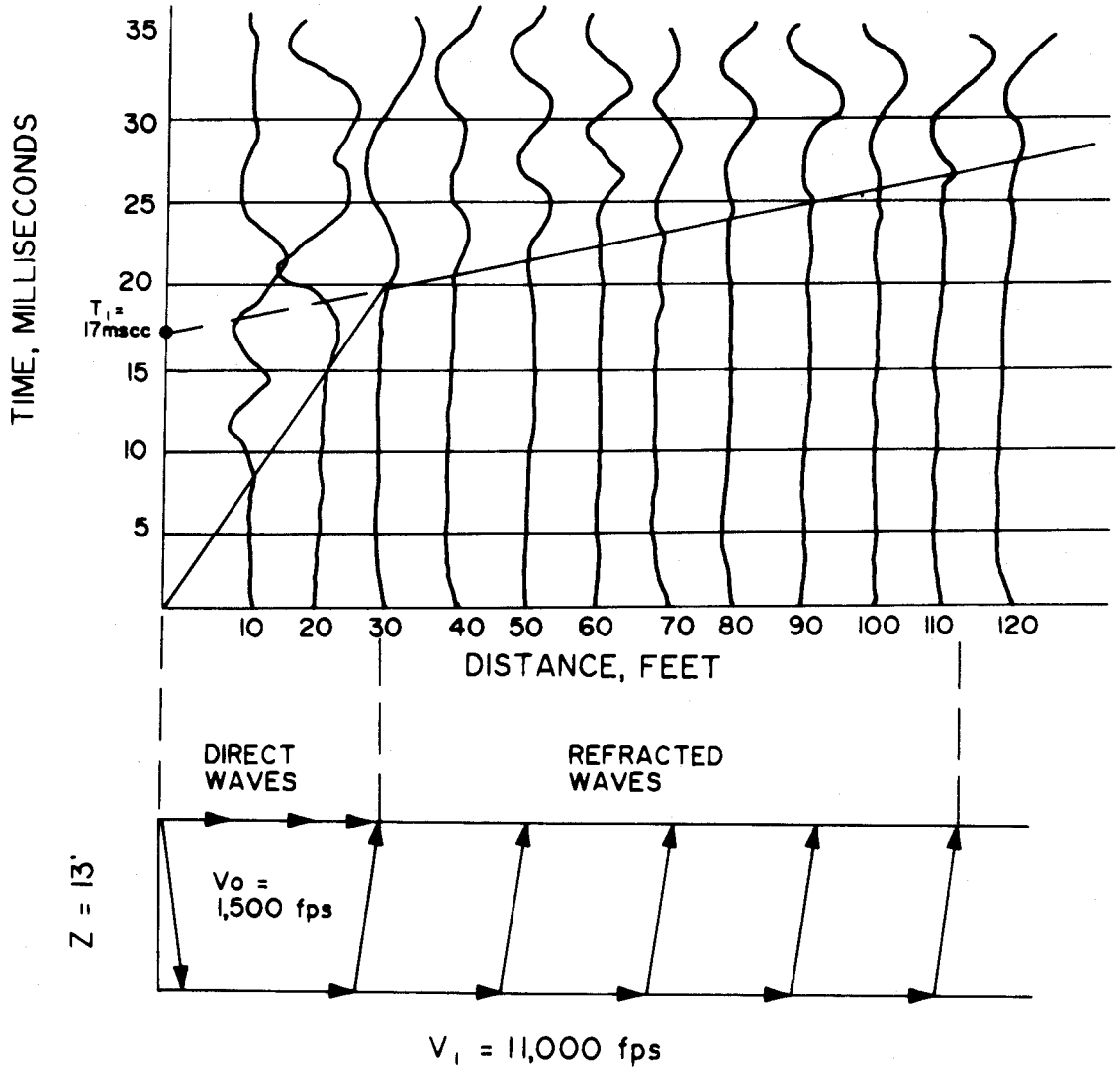
CHECKED	HES	DWG NO.	1	
Golder Associates				WASTE MANAGEMENT, INC. — FIGURE 1



SLOPE OF FIRST LINE SEGMENT = $1/V_o$ = 20 msec/30 FEET V_o = 1,500 fps

SLOPE OF SECOND LINE SEGMENT = $1/V_1$ = (28-17) msec/120 FEET V_1 = 11,000 fps

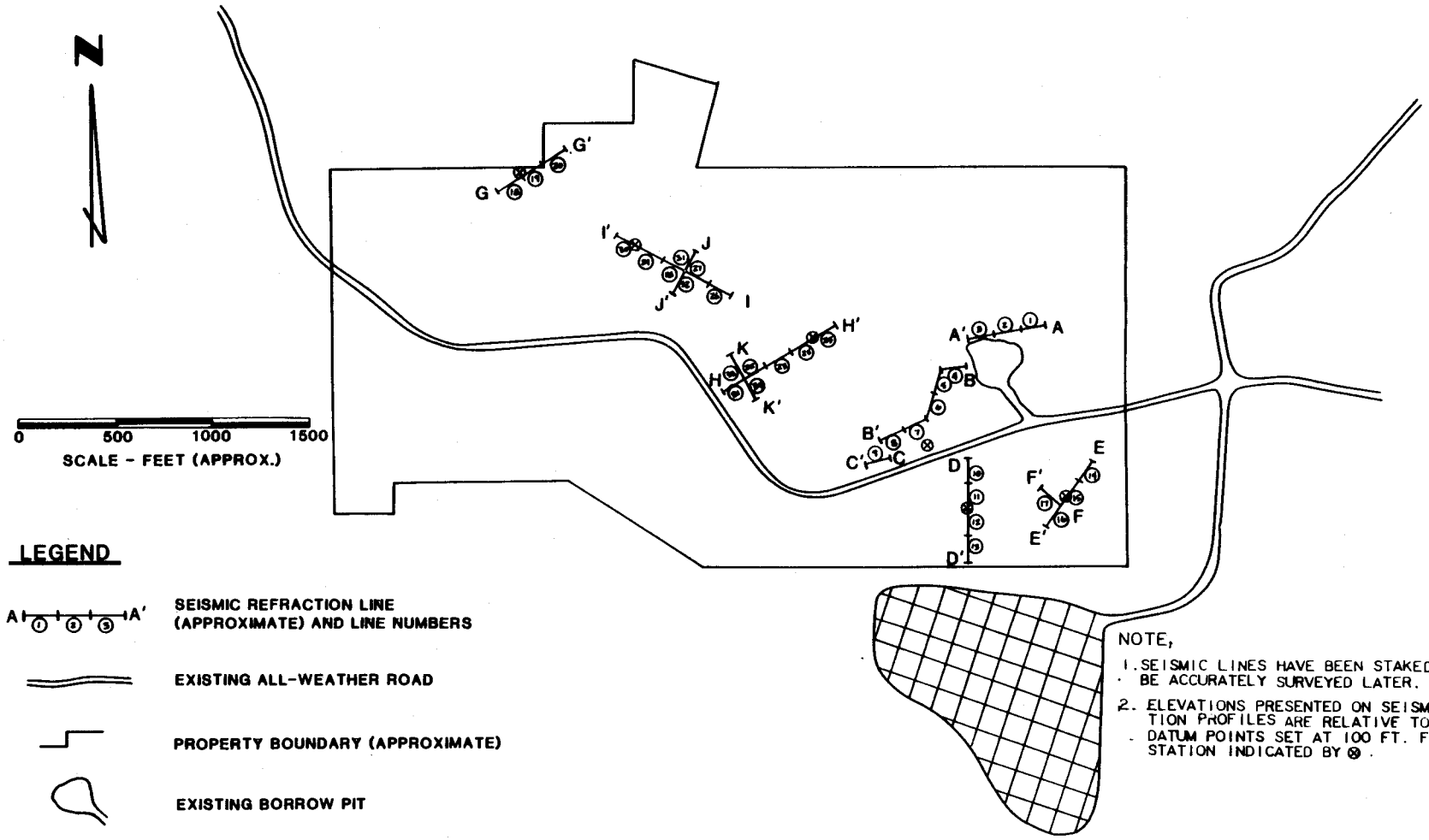
T_1 = (EXTRAPOLATION OF SECOND LINE SEGMENT TO DISTANCE 0) = 17 msec

DEPTH TO REFRACTING LAYER =

$$\frac{T_1}{2} \quad \frac{V_o V_1}{\sqrt{V_1^2 - V_o^2}} = \underline{13 \text{ FEET}}$$

JOB NO 863-3407	SCALE N.T.S.	SEISMIC DATA, ANALYSIS, AND INTERPRETATION	
DRAWN LJW	DATE 4/14/87		
CHECKED RP	DWG NO 42		
Golder Associates		WASTE MANAGEMENT, INC.	FIGURE 2

AF 45148B



LEGEND

A 1 2 3 A' — SEISMIC REFRACTION LINE (APPROXIMATE) AND LINE NUMBERS

EXISTING ALL-WEATHER ROAD

PROPERTY BOUNDARY (APPROXIMATE)

EXISTING BORROW PIT

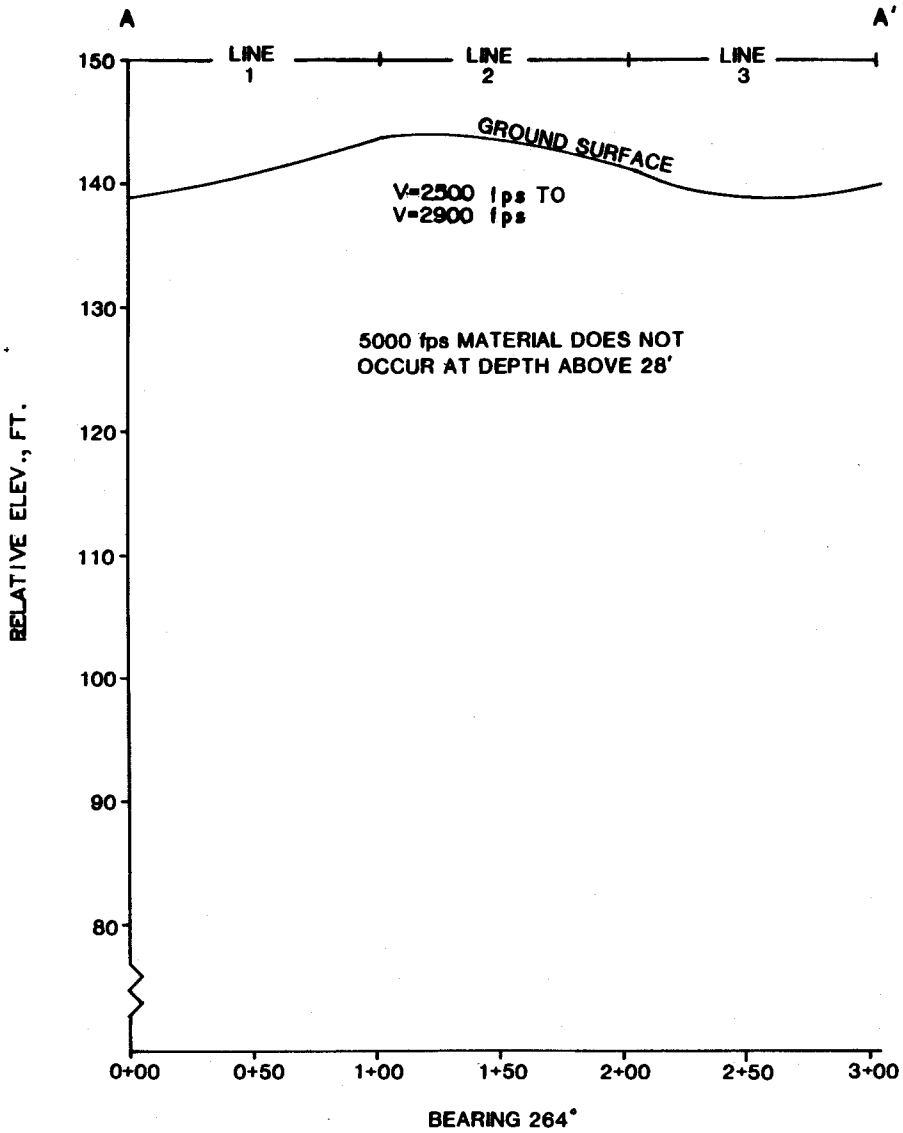
EXISTING LANDFILL

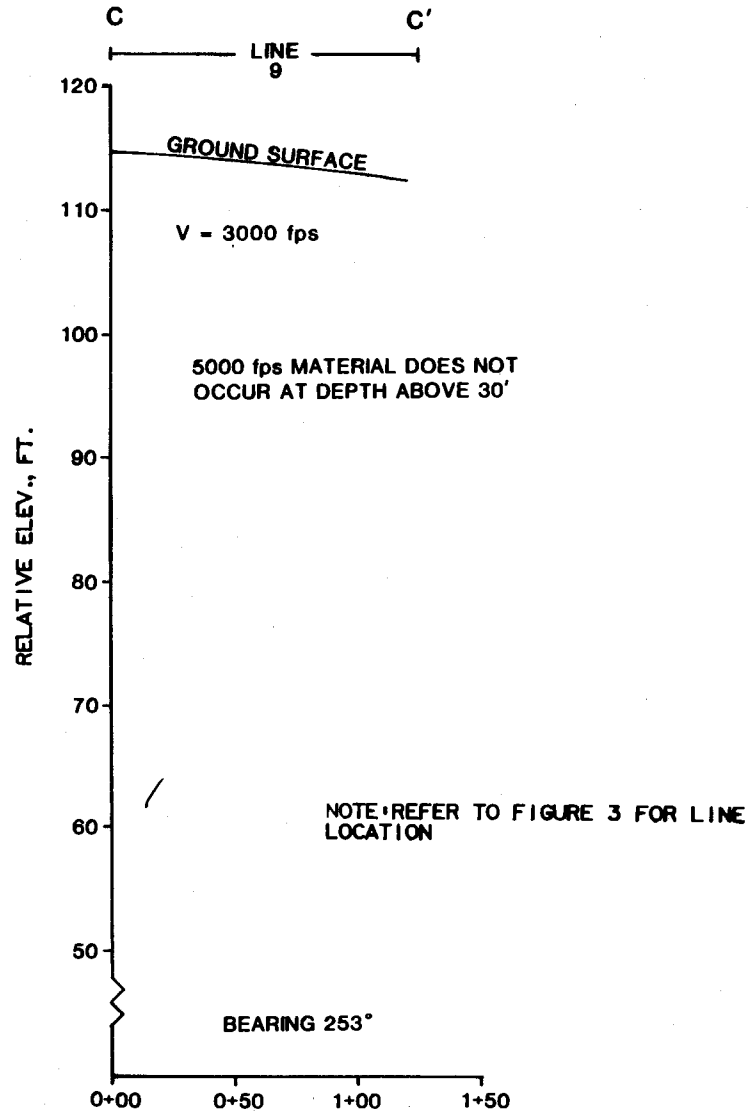
NOTE,

1. SEISMIC LINES HAVE BEEN STAKED AND ARE TO BE ACCURATELY SURVEYED LATER.
2. ELEVATIONS PRESENTED ON SEISMIC REFRACTION PROFILES ARE RELATIVE TO ARBITRARY DATUM POINTS SET AT 100 FT. FOR EACH STATION INDICATED BY ⊗.

JOB NO. 863-3407	SCALE AS SHOWN	APPROXIMATE LOCATIONS OF SEISMIC REFRACTION SURVEY LINES	
DRAWN JLW	DATE 1/28/87		
CHECKED	DWG. NO. 1		
Golder Associates		WASTE MANAGEMENT INC.	FIGURE 3

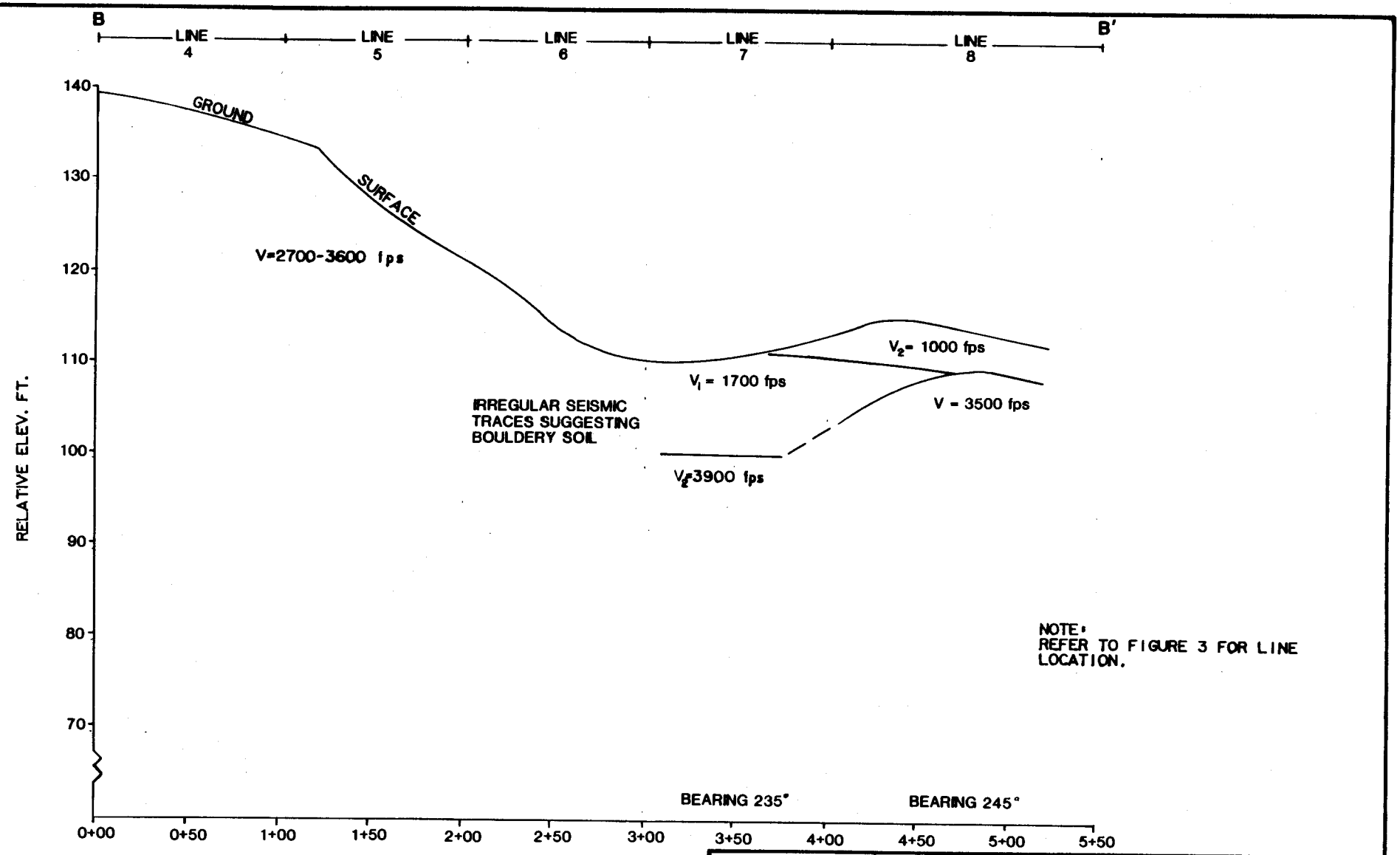
AF 451488





JOB NO. 863-3407	SCALE AS SHOWN	SEISMIC REFRACTION PROFILE	
DRAWN JLW	DATE 1/30/87		
CHECKED	DWG. NO. 7		
Golder Associates		WASTE MANAGEMENT, INC.	FIGURE 4

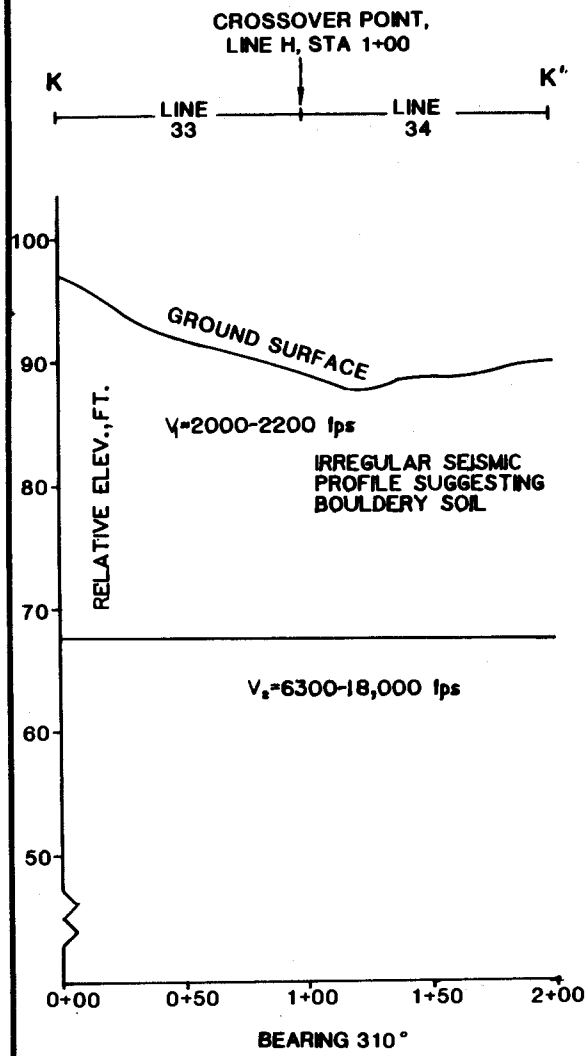
AF 45148B

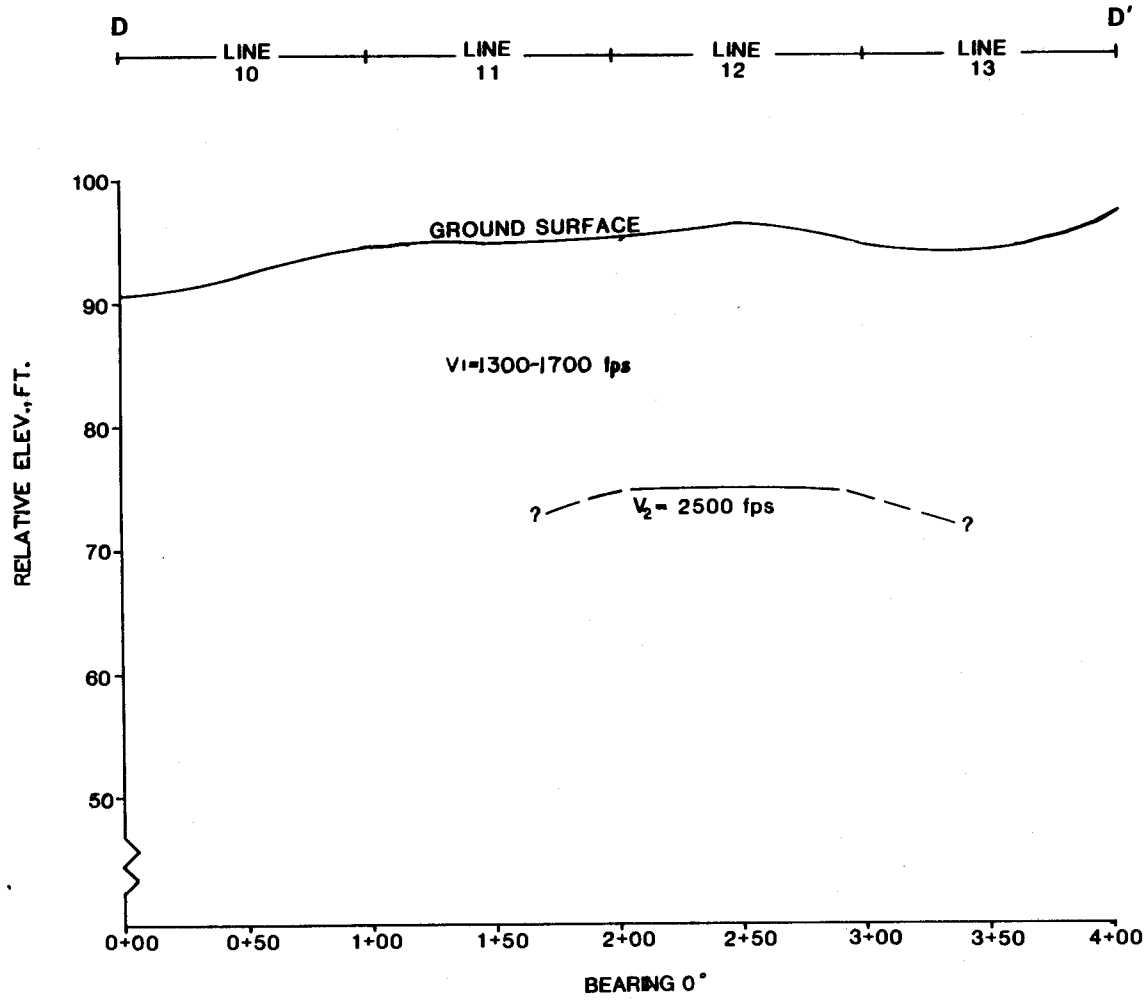


NOTE:
REFER TO FIGURE 3 FOR LINE LOCATION.

JOB NO. 863-3407	SCALE AS SHOWN	SEISMIC REFRACTION PROFILE	
DRAWN JLW	DATE 1/30/87		
CHECKED	DWG. NO. 5		
Golder Associates		WASTE MANAGEMENT, INC.	FIGURE 5

AF 451488

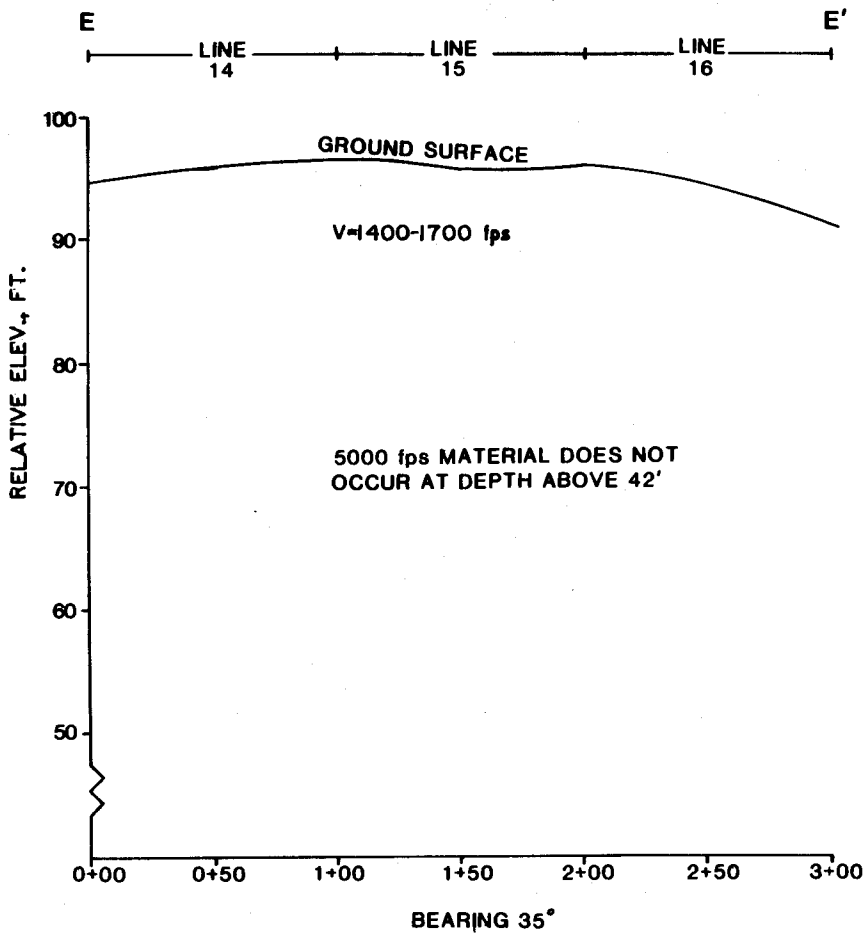


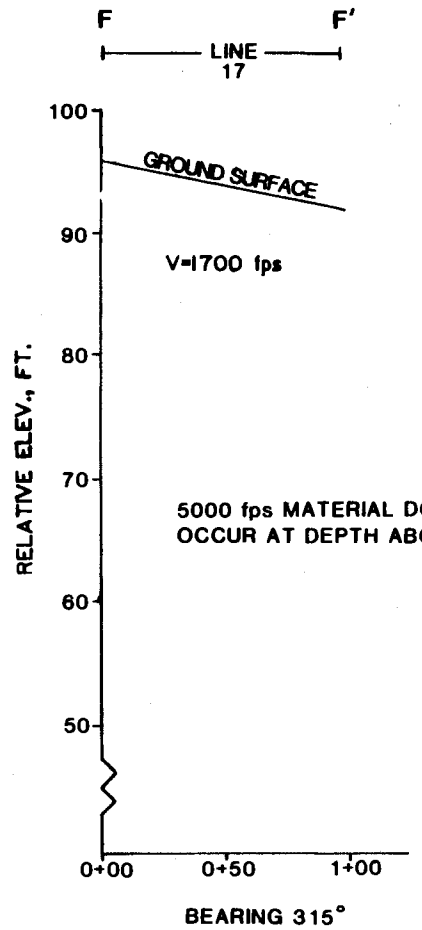


NOTE:
REFER TO FIGURE 3 FOR LINE LOCATION.

JOB NO. 863-3407	SCALE AS SHOWN	SEISMIC REFRACTION PROFILE	
DRAWN JLW	DATE 1/30/87		
CHECKED	DWG. NO. 6		
Golder Associates		WASTE MANAGEMENT, INC.	FIGURE 6

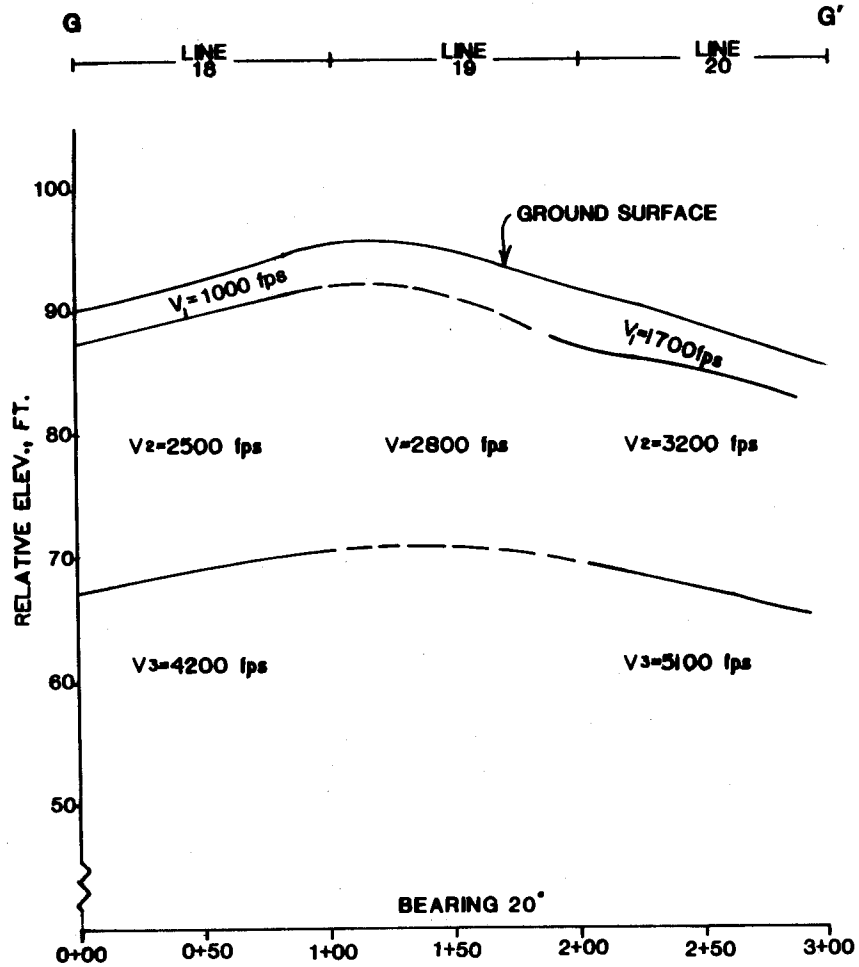
AF 45148B

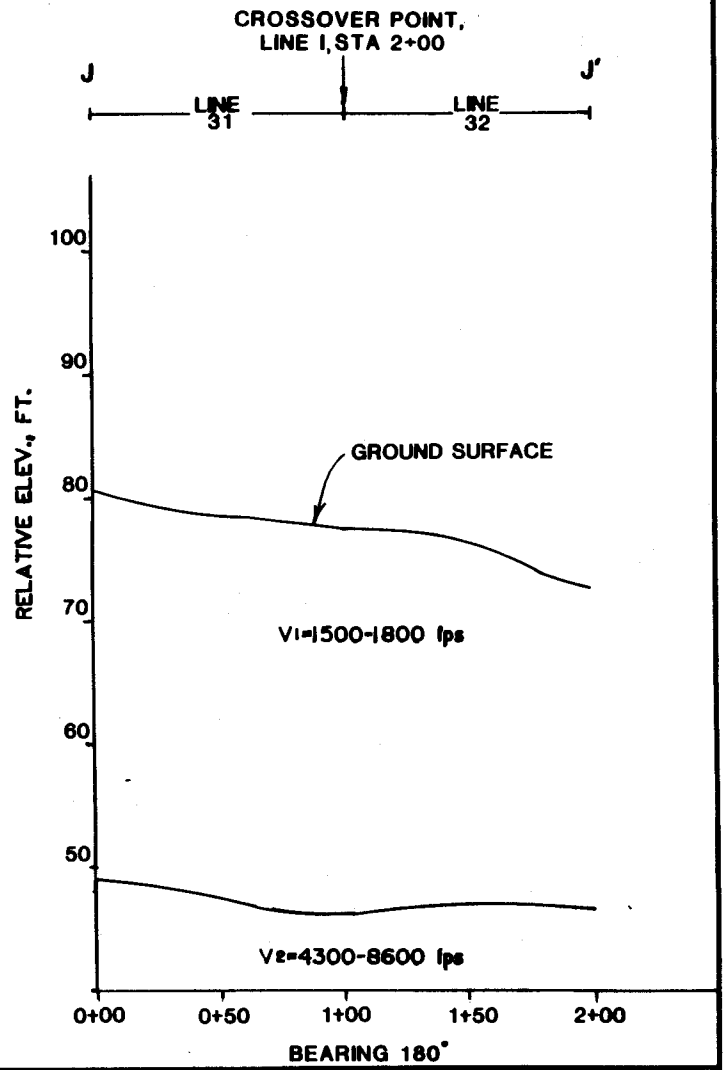




NOTE:
REFER TO FIGURE 3 FOR LINE LOCATION.

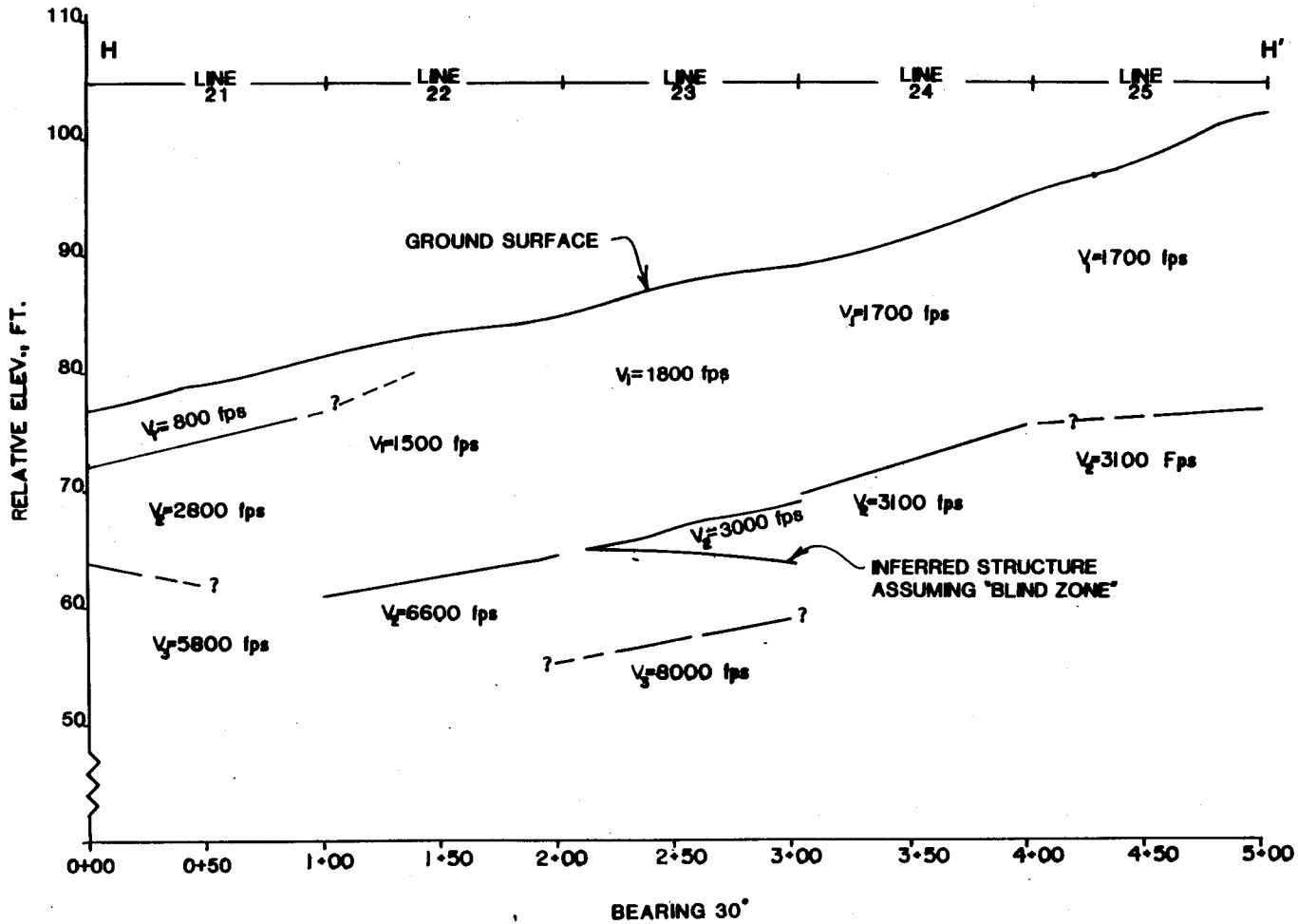
JOB NO. 863-3407	SCALE AS SHOWN	SEISMIC REFRACTION PROFILE	
DRAWN JLW	DATE 1/30/87		
CHECKED	DWG. NO. 8		
Golder Associates		WASTE MANAGEMENT, INC.	FIGURE 7





NOTE:
REFER TO FIGURE 3 FOR LINE LOCATION.

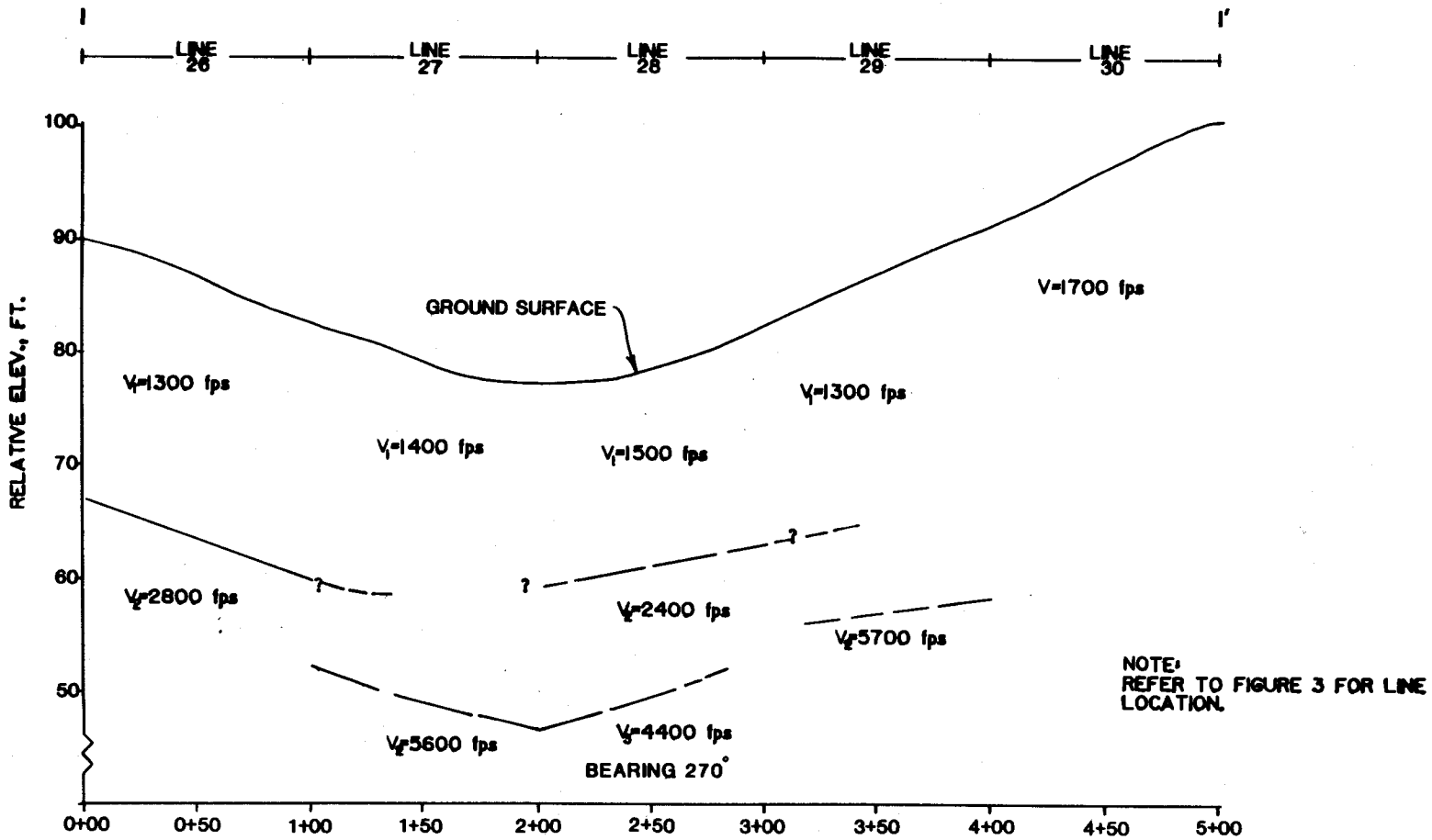
JOB NO. 863-3407	SCALE AS SHOWN	SEISMIC REFRACTION PROFILE	
DRAWN LJW	DATE 1/30/87		
CHECKED	DWG. NO. 2		
Golder Associates		WASTE MANAGEMENT, INC.	FIGURE 8



NOTE:
REFER TO FIGURE 3 FOR LINE LOCATION.

JOB NO. 863-3407	SCALE AS SHOWN	SEISMIC REFRACTION PROFILE
DRAWN LJW	DATE 1/30/87	
CHECKED	DWG. NO. 3	
Golder Associates		WASTE MANAGEMENT, INC. FIGURE 9

AF 451488



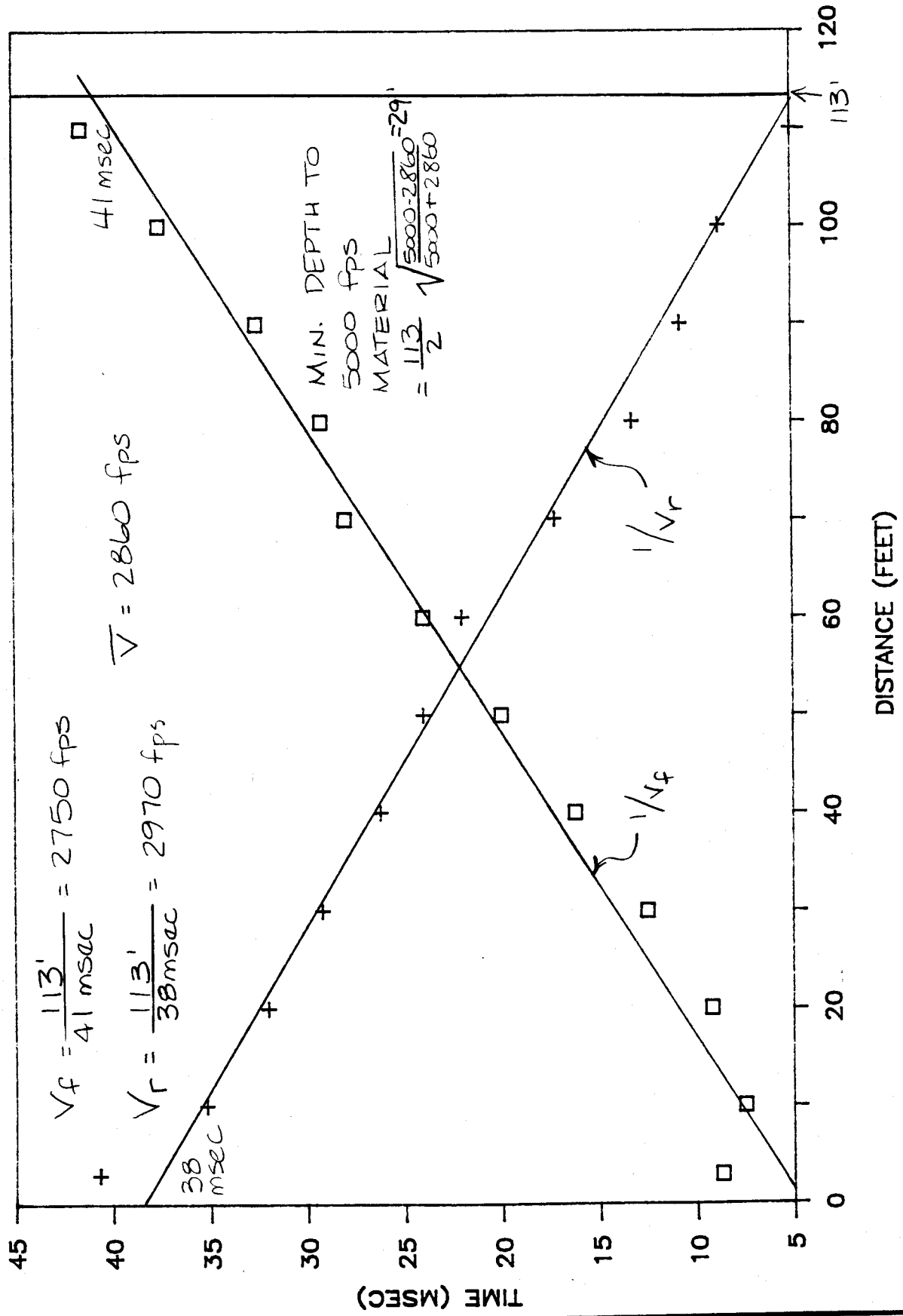
NOTE:
REFER TO FIGURE 3 FOR LINE LOCATION.

JOB NO. 863-3407	SCALE AS SHOWN	SEISMIC REFRACTION PROFILE	
DRAWN LJW	DATE 1/30/87		
CHECKED	DWG. NO. 4		
Golder Associates		WASTE MANAGEMENT, INC.	FIGURE 10

APPENDIX A

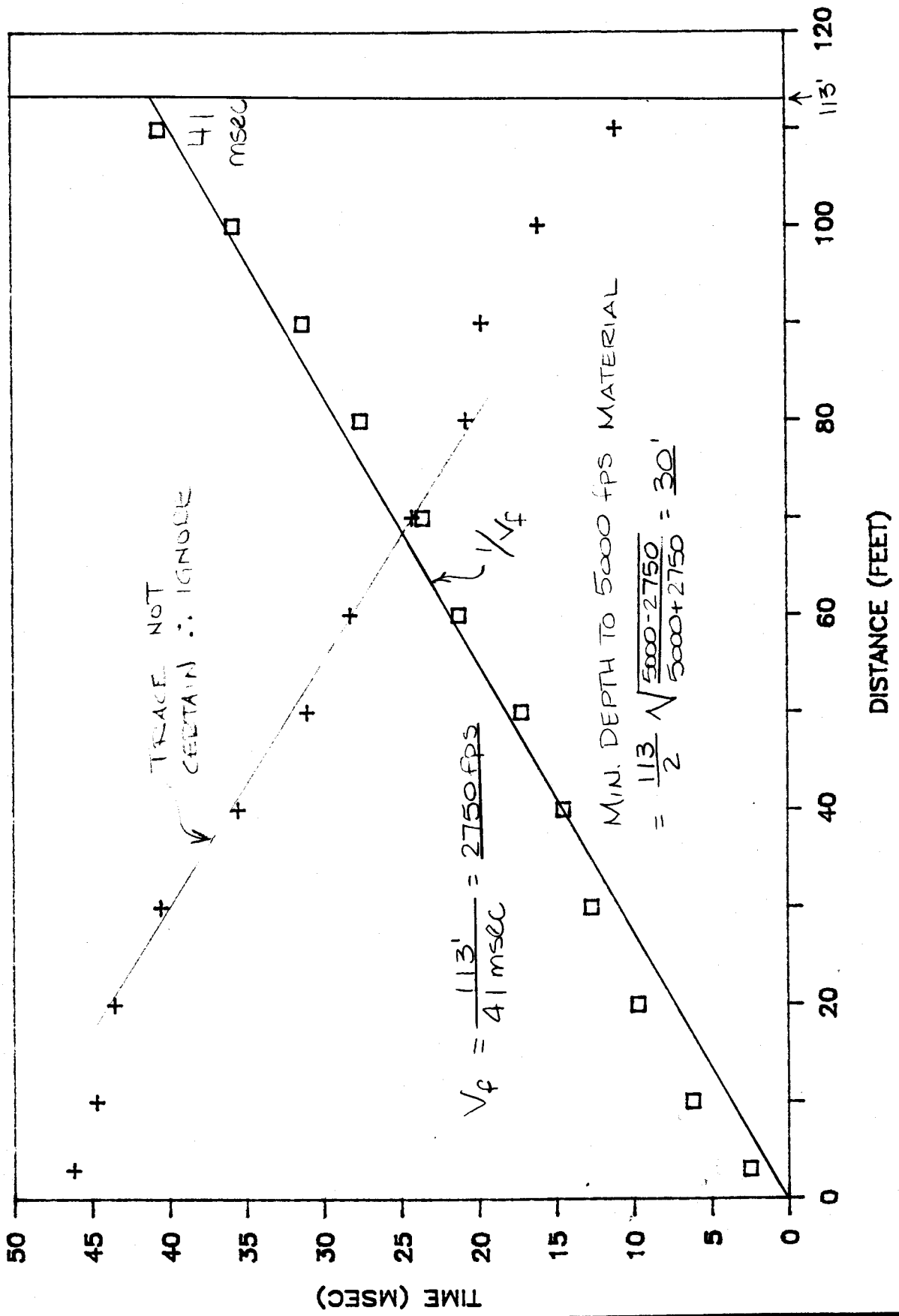
SEISMIC VELOCITY CALCULATIONS

AF 45148A



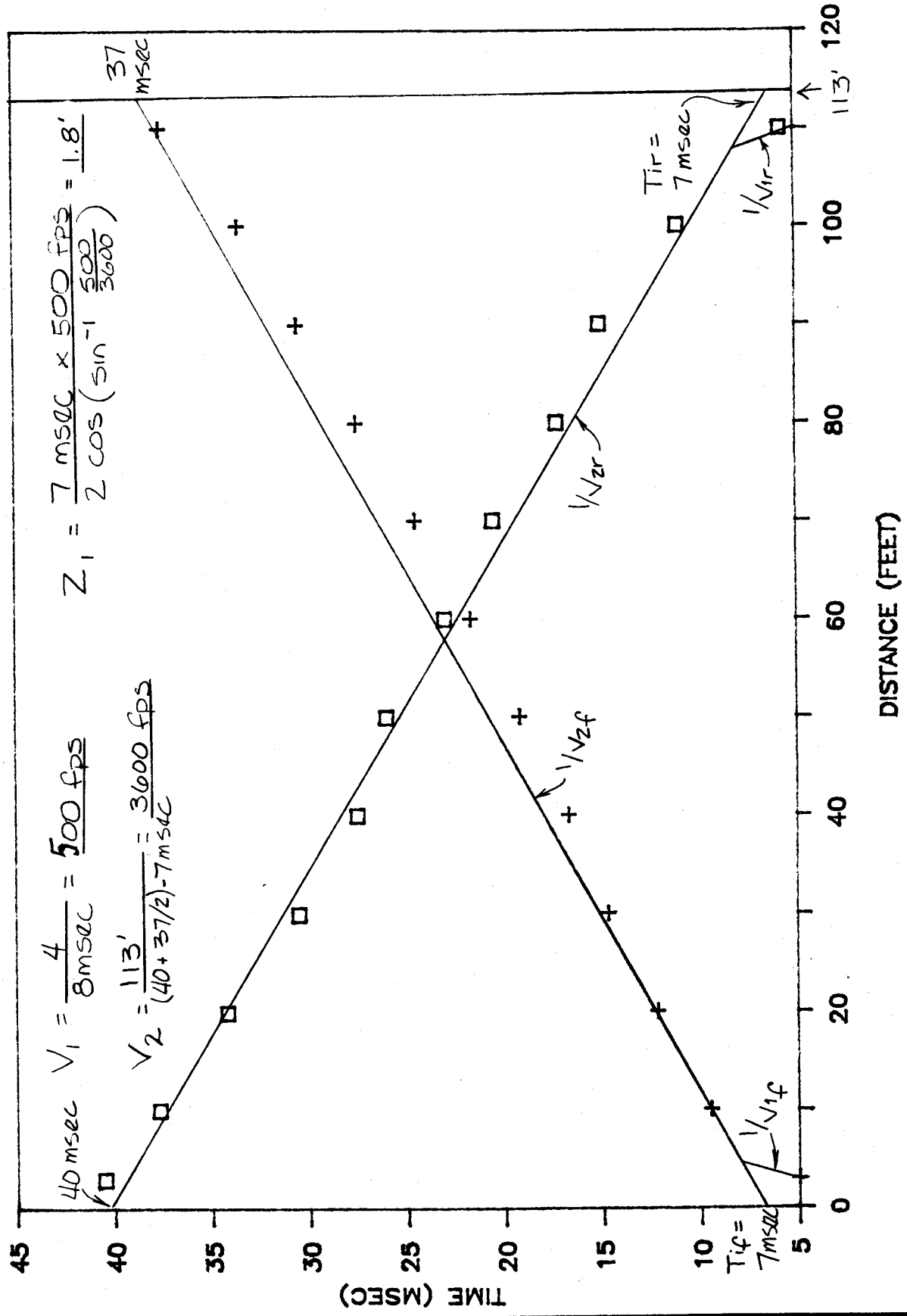
JOB NO. 863-3407	SCALE AS SHOWN	TIME DISTANCE PLOT LINE #2	
DRAWN LJW	DATE 2/3/87		
CHECKED	DWG. NO. 9		
Golder Associates		WASTE MANAGEMENT, INC.	FIGURE A2

AF 45148A



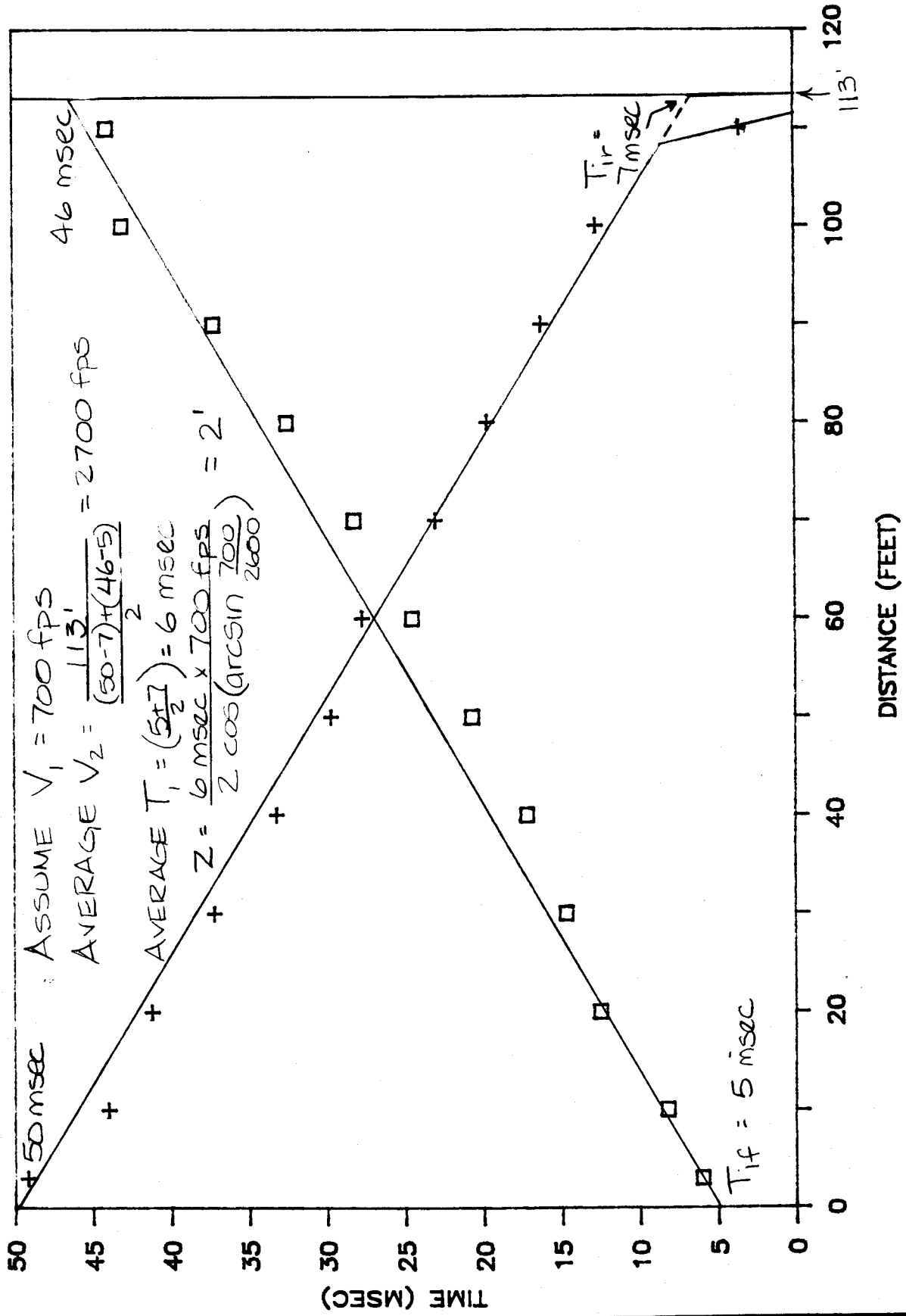
JOB NO. 863-3407	SCALE AS SHOWN	TIME DISTANCE PLOT LINE #3		
DRAWN LJW	DATE 2/3/87			
CHECKED	DWG. NO. 10			
Golder Associates		WASTE MANAGEMENT, INC.	FIGURE A3	

AF 45148A



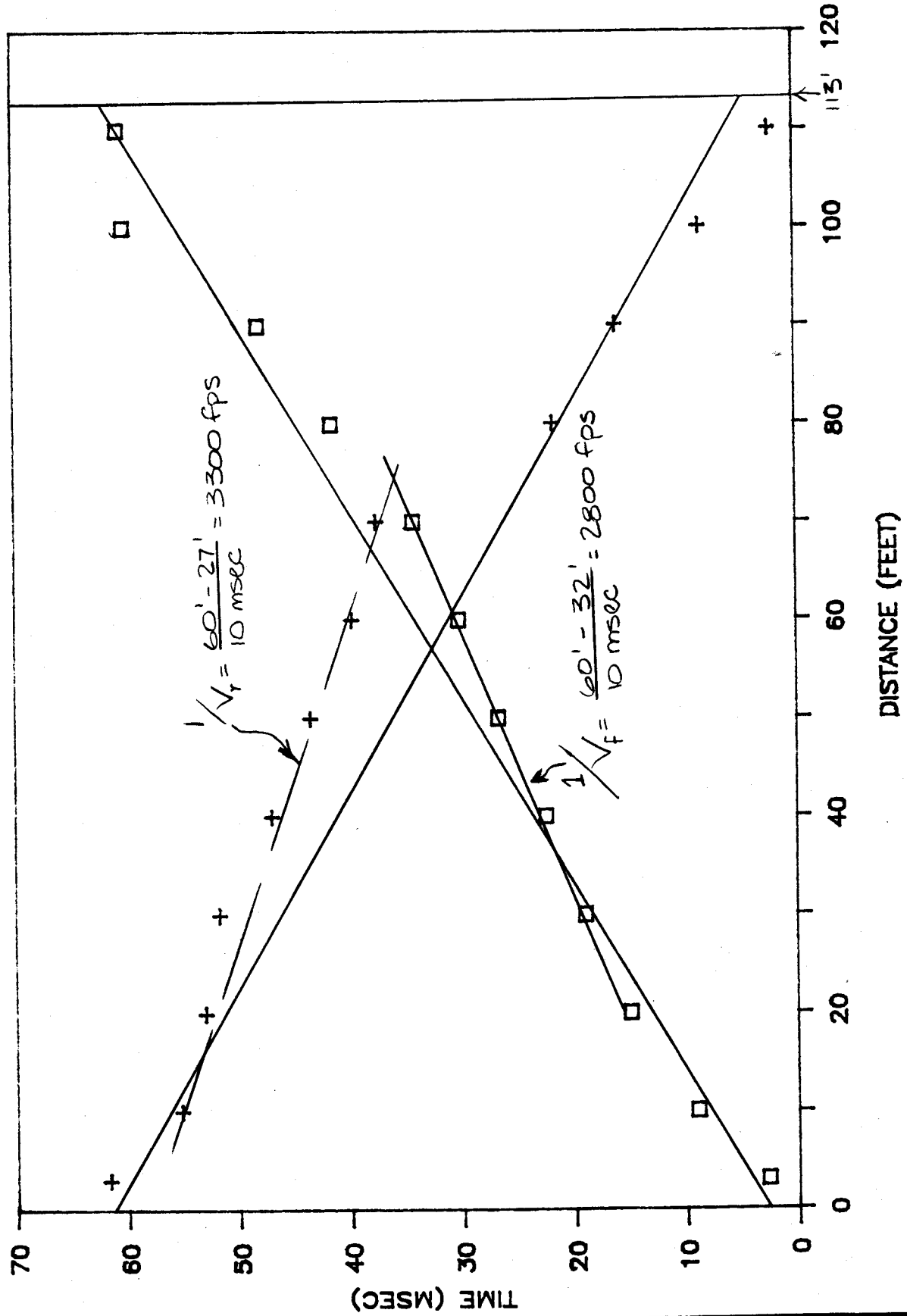
JOB NO. 863-3407	SCALE AS SHOWN	TIME DISTANCE PLOT LINE #4	
DRAWN LJW	DATE 2/3/87		
CHECKED	DWG. NO. 11		
Golder Associates		WASTE MANAGEMENT, INC.	FIGURE A4

AF 45148A



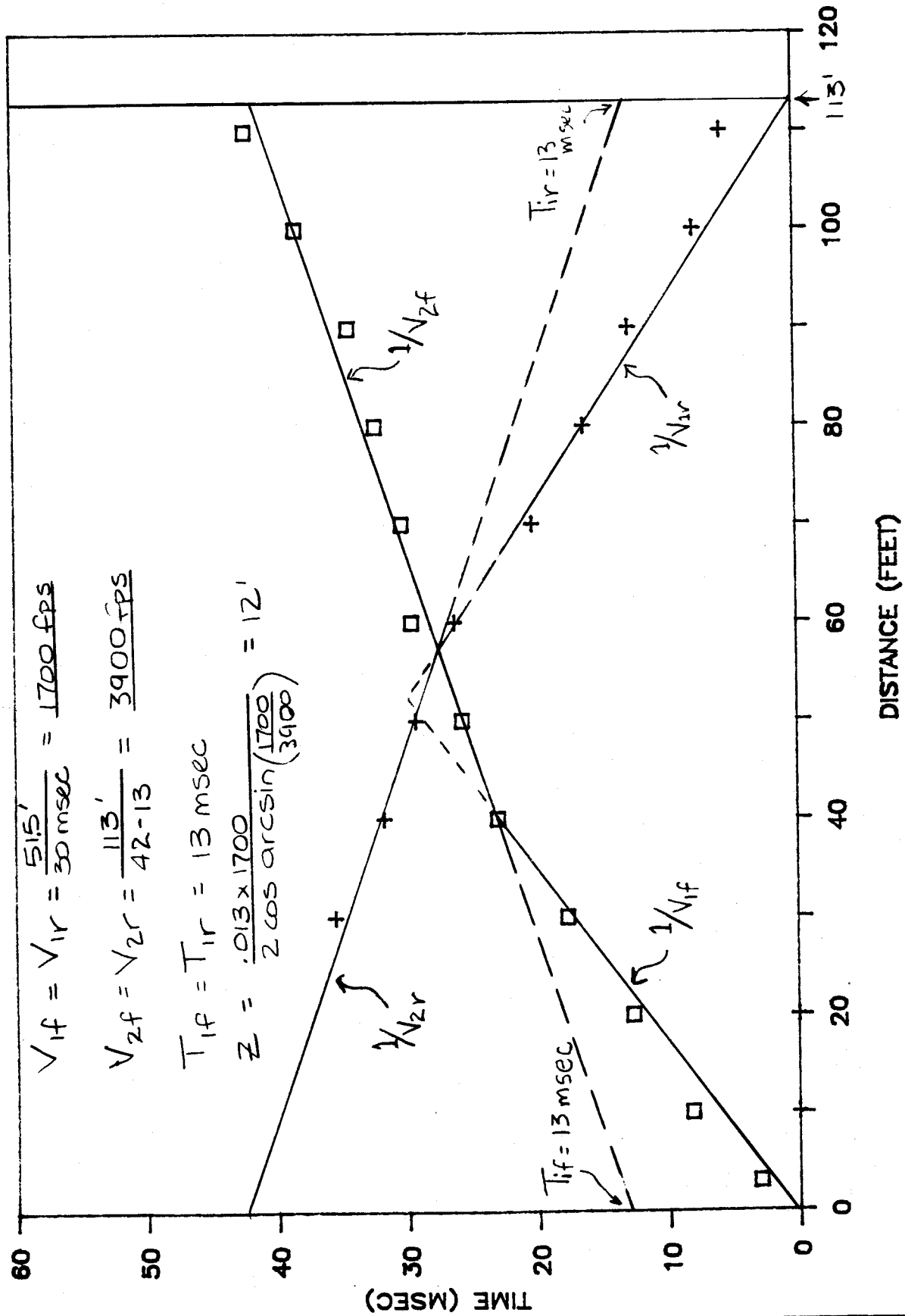
JOB NO. 863-3407	SCALE AS SHOWN	TIME DISTANCE PLOT LINE #5	
DRAWN LJW	DATE 2/3/87		
CHECKED	DWG. NO. 12		
Golder Associates		WASTE MANAGEMENT, INC.	FIGURE A5

AF 45148A



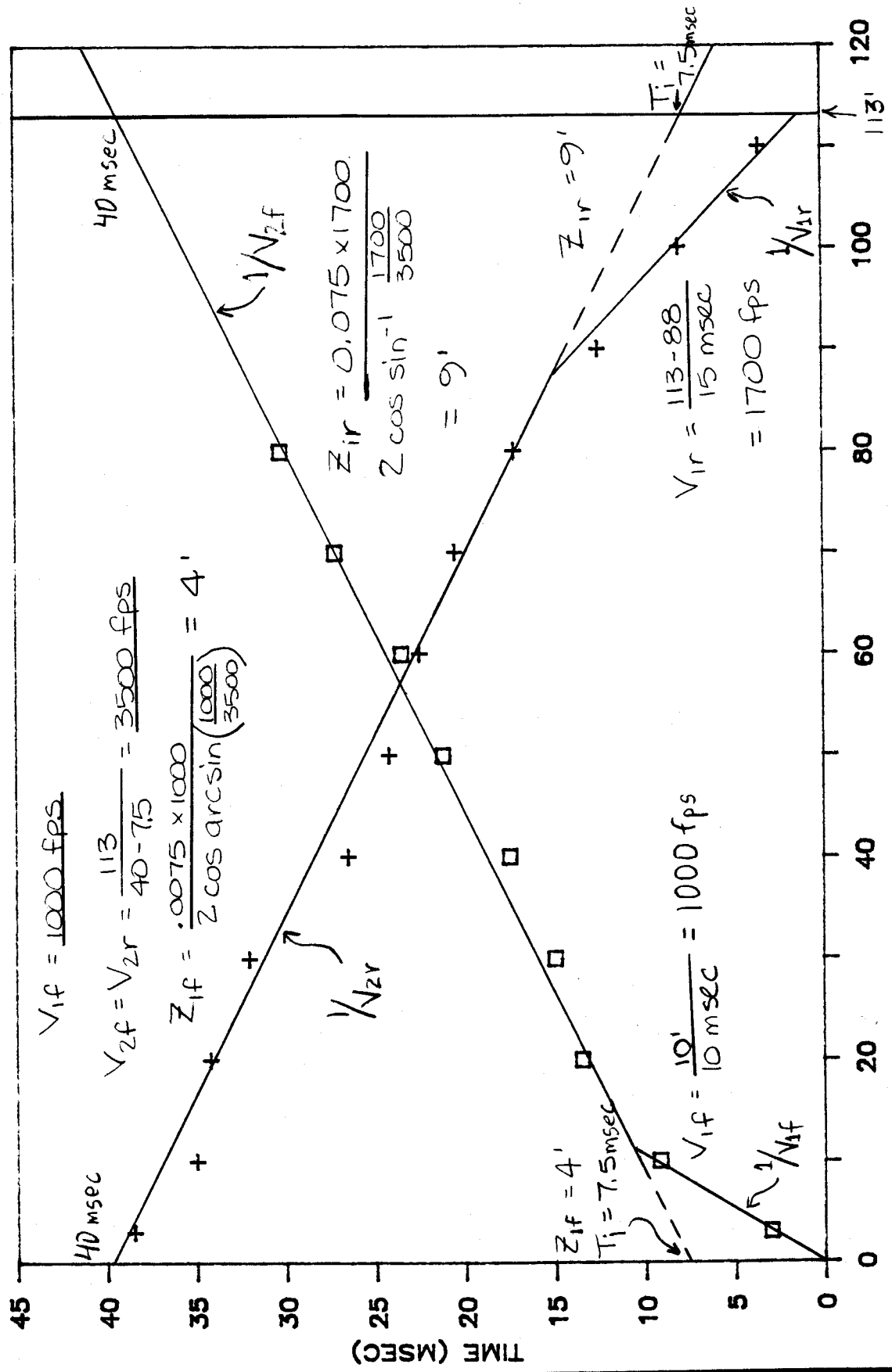
JOB NO. 863-3407	SCALE AS SHOWN	TIME DISTANCE PLOT LINE #6	
DRAWN LJW	DATE 2/3/87		
CHECKED	DWG. NO. 13		
Golder Associates		WASTE MANAGEMENT, INC.	FIGURE A6

AF 45148A



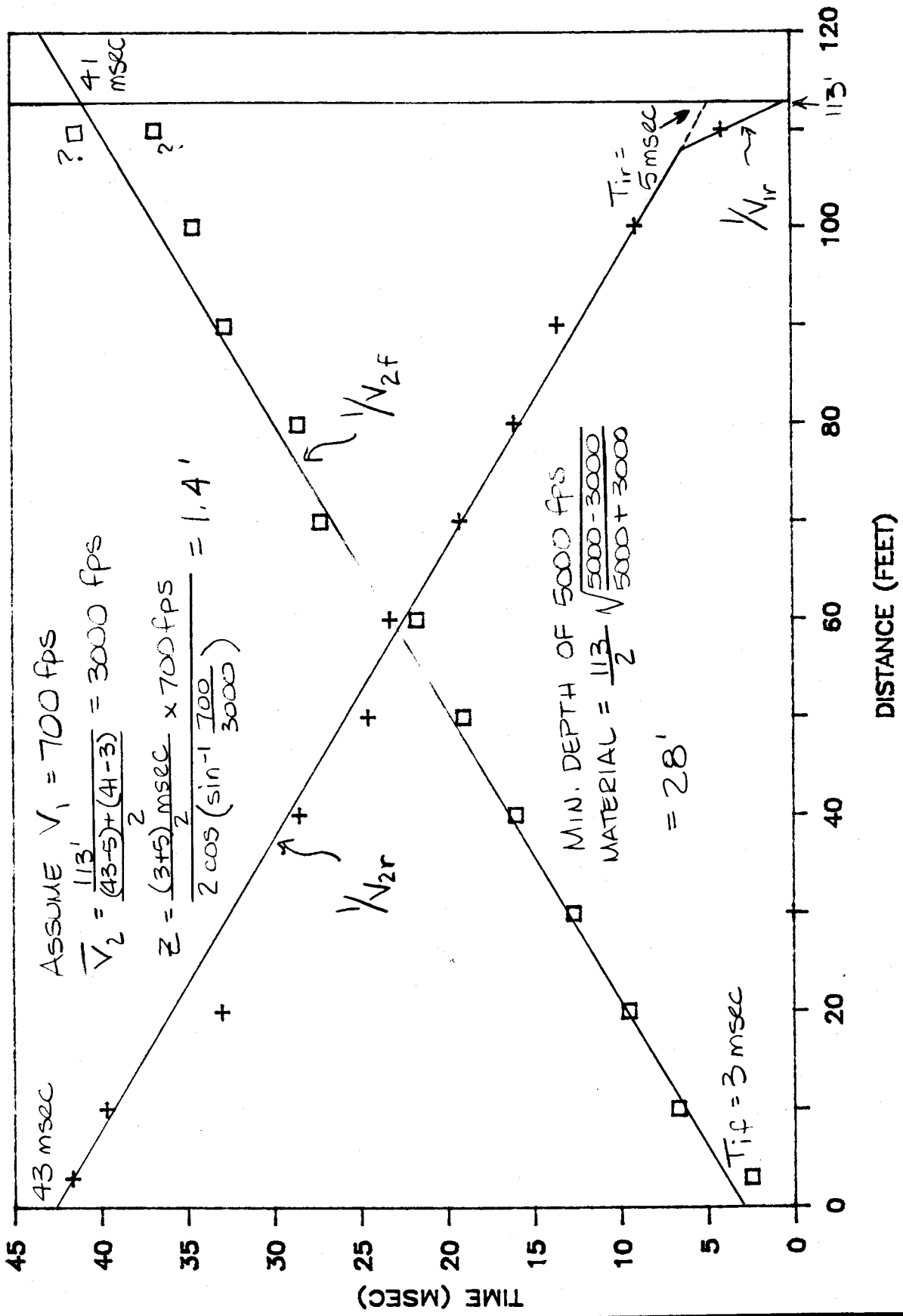
JOB NO. 863-3407	SCALE AS SHOWN	TIME DISTANCE PLOT LINE #7	
DRAWN LJW	DATE 2/3/87		
CHECKED	DWG. NO. 14		
Golder Associates		WASTE MANAGEMENT, INC.	FIGURE A7

AF 45148A



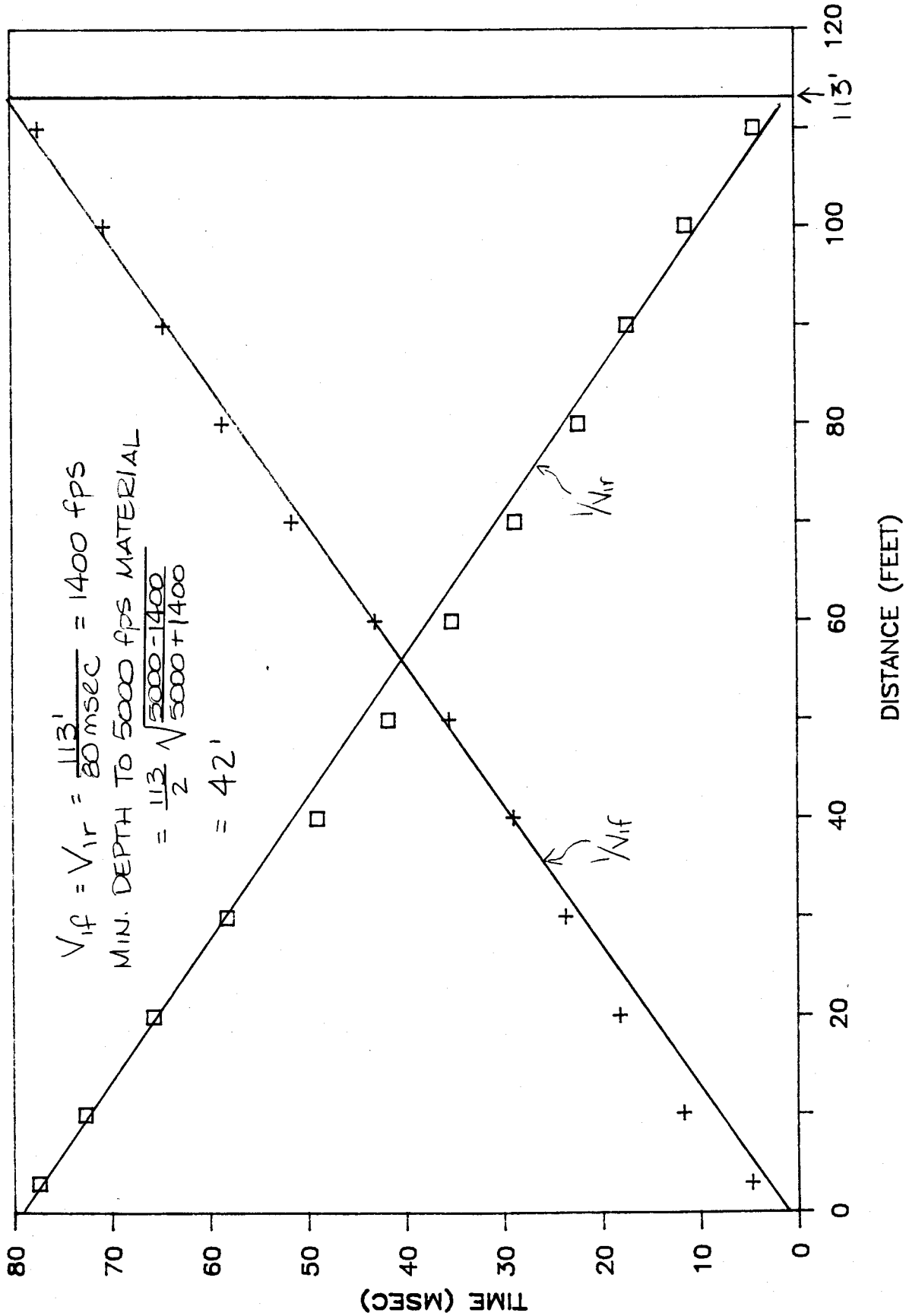
JOB NO. 863-3407	SCALE AS SHOWN	TIME DISTANCE PLOT LINE #8	
DRAWN LJW	DATE 2/3/87		
CHECKED	DWG. NO. 15		
Golder Associates		WASTE MANAGEMENT, INC.	FIGURE A8

AF 45148A



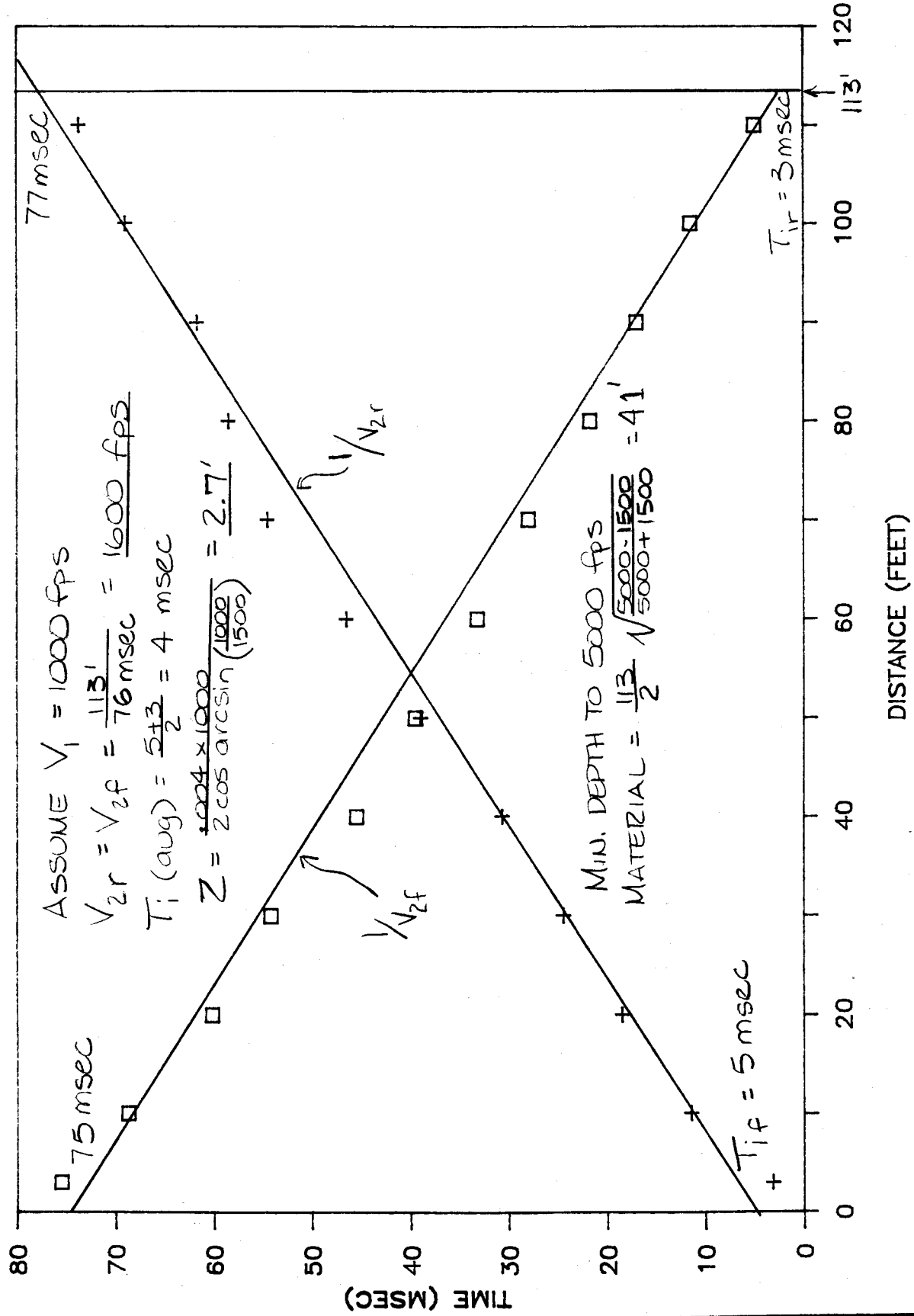
JOB NO. 863-3407	SCALE AS SHOWN	TIME DISTANCE PLOT LINE #9	
DRAWN LJW	DATE 2/3/87		
CHECKED	DWG. NO. 16		
Golder Associates		WASTE MANAGEMENT, INC.	FIGURE A9

AF 45148A



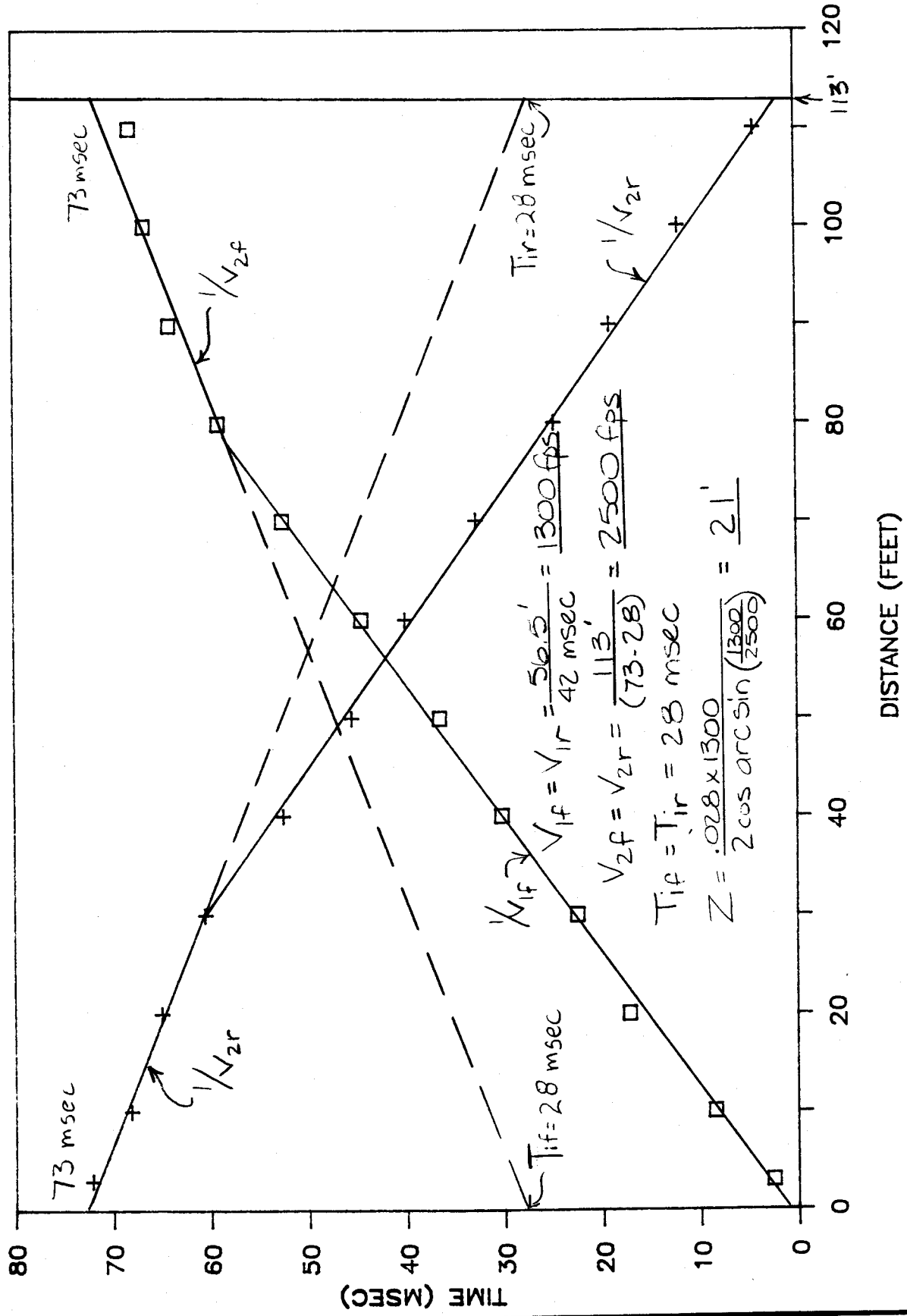
JOB NO. 863-3407	SCALE AS SHOWN	TIME DISTANCE PLOT LINE #10	
DRAWN LJW	DATE 2/3/87		
CHECKED	DWG. NO. 17		
Golder Associates		WASTE MANAGEMENT, INC.	FIGURE A10

AF 45148A



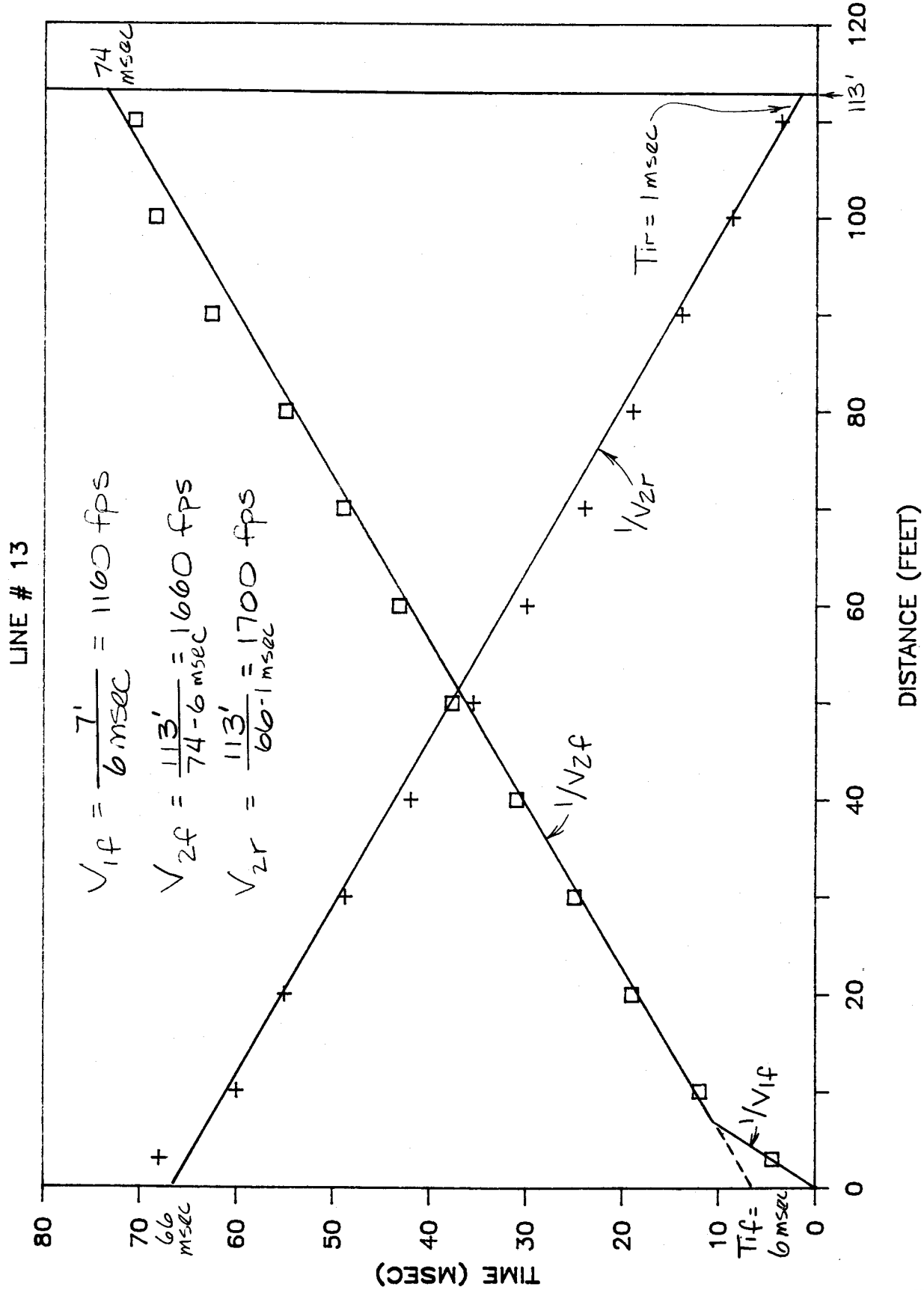
JOB NO. 863-3407	SCALE AS SHOWN	TIME DISTANCE PLOT LINE #11	
DRAWN LJW	DATE 2/3/87		
CHECKED	DWG. NO. 18		
Golder Associates		WASTE MANAGEMENT, INC.	FIGURE A 11

AF 45148A



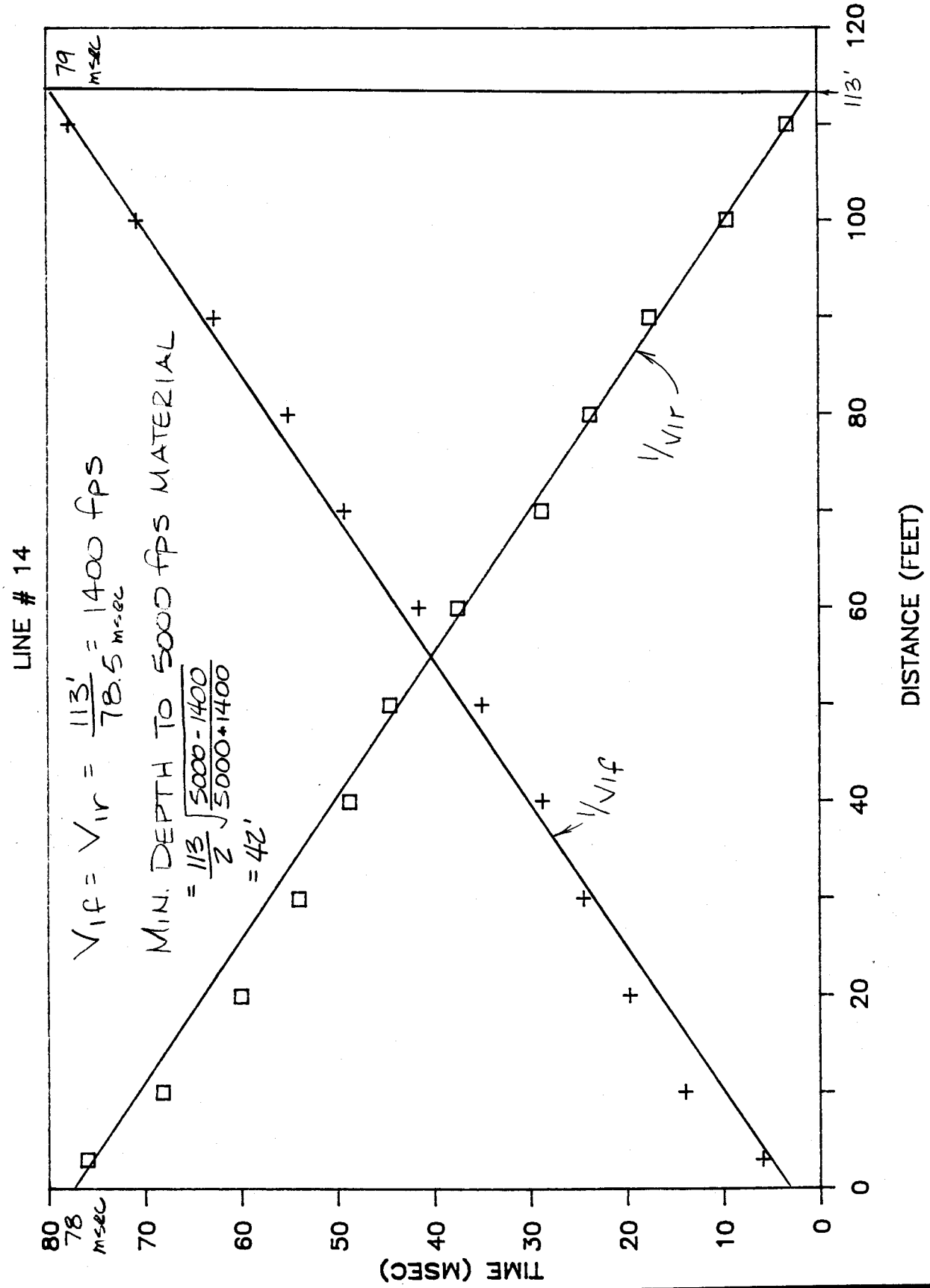
JOB NO. 863-3407	SCALE AS SHOWN	TIME DISTANCE PLOT LINE #12	
DRAWN LJW	DATE 2/3/87		
CHECKED	DWG. NO. 19		
Golder Associates		WASTE MANAGEMENT, INC.	FIGURE A12

AF 45148A



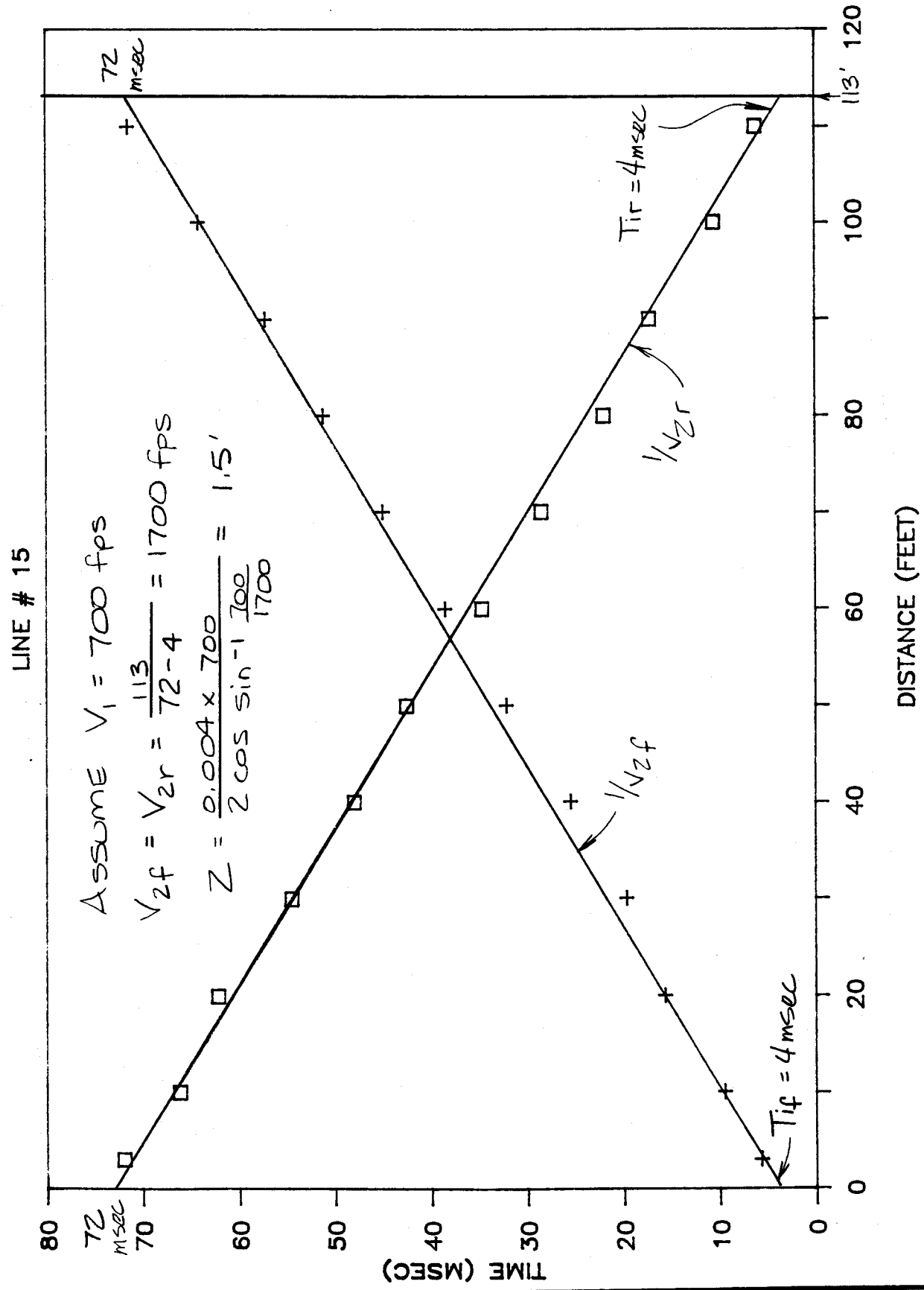
JOB NO. 863-3407	SCALE AS SHOWN	TIME DISTANCE PLOT LINE #13	
DRAWN LJW	DATE 2/3/87		
CHECKED	DWG. NO. 20		
Golder Associates		WASTE MANAGEMENT, INC.	FIGURE A13

AF 45148A



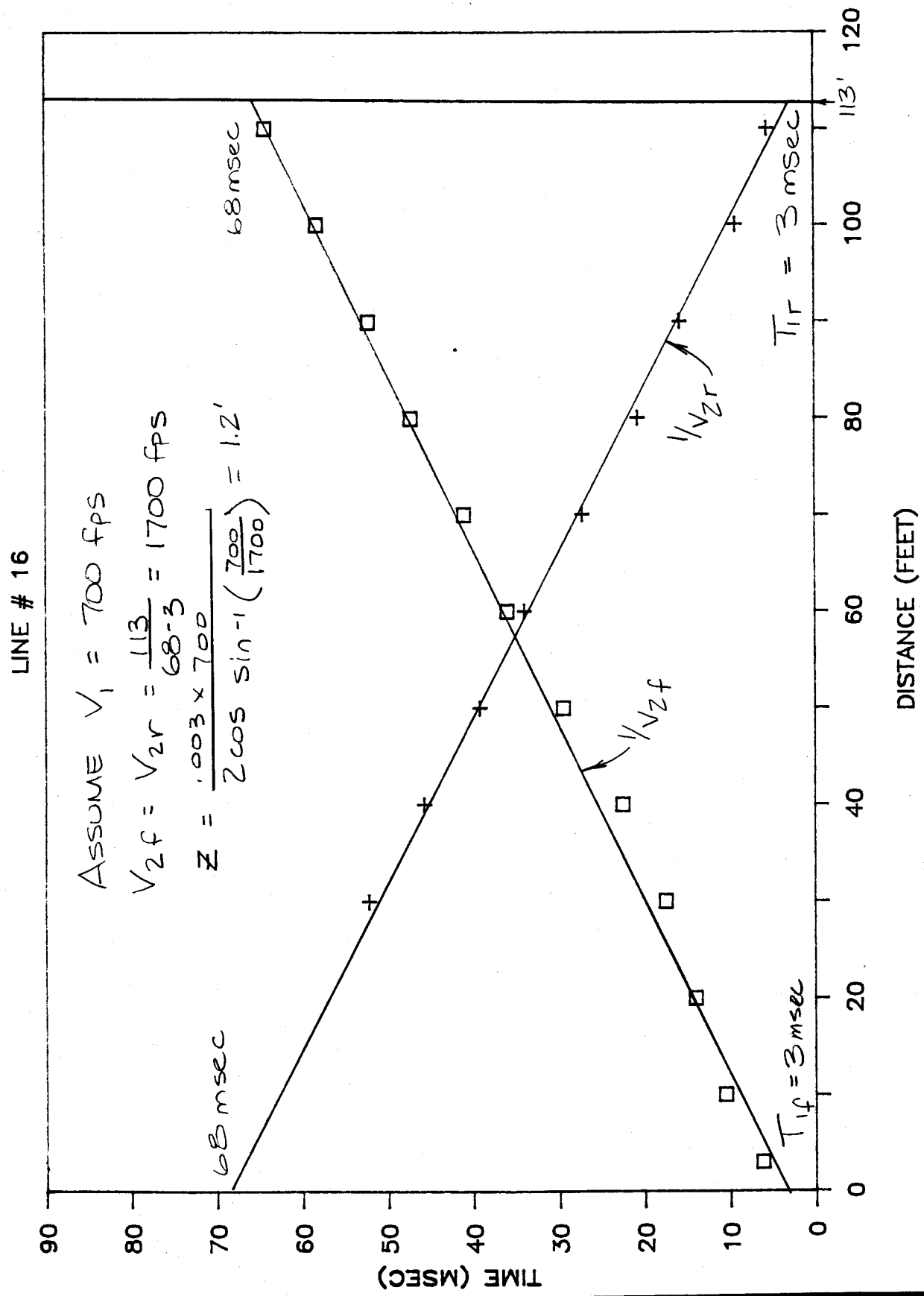
JOB NO. 863-3407	SCALE AS SHOWN	TIME DISTANCE PLOT LINE #14	
DRAWN LJW	DATE 2/3/87		
CHECKED	DWG. NO. 21		
Golder Associates		WASTE MANAGEMENT, INC.	FIGURE A14

AF 45148A



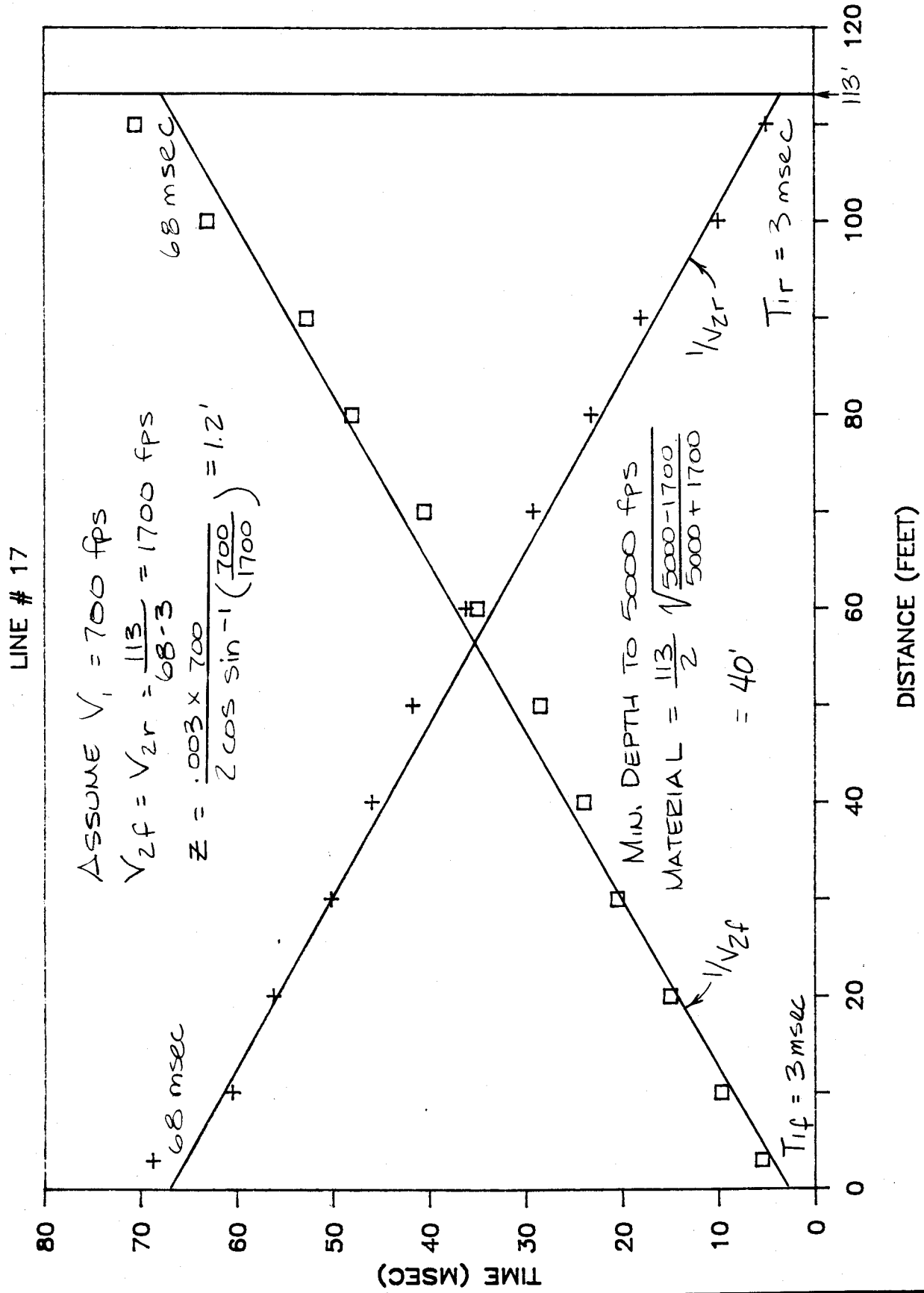
JOB NO. 863-3407	SCALE AS SHOWN	TIME DISTANCE PLOT LINE #15	
DRAWN LJW	DATE 2/3/87		
CHECKED	DWG. NO. 22		
Golder Associates		WASTE MANAGEMENT, INC.	FIGURE A15

AF 45148A



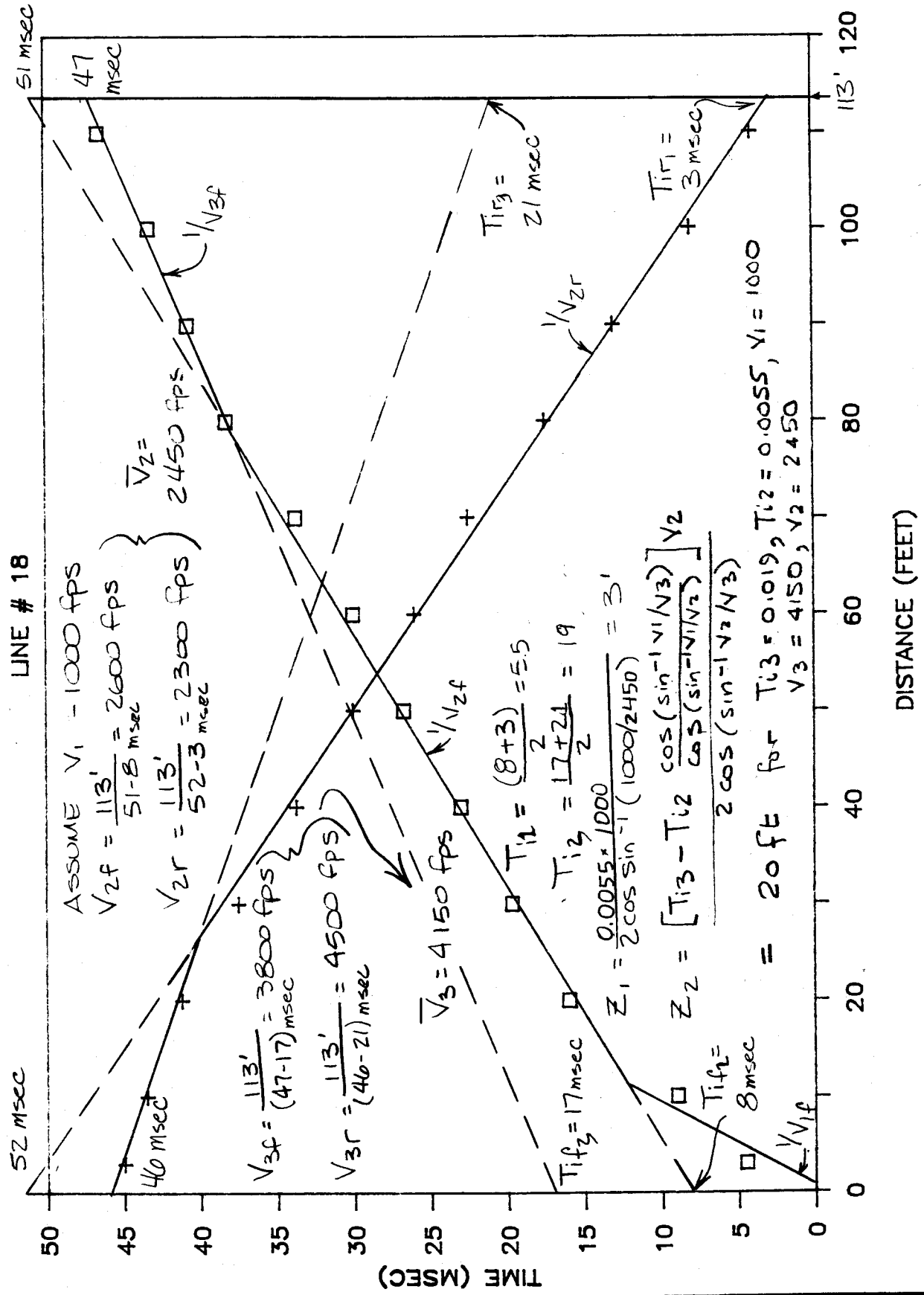
JOB NO. 863-3407	SCALE AS SHOWN	TIME DISTANCE PLOT LINE #16	
DRAWN LJW	DATE 2/3/87		
CHECKED	DWG. NO. 23		
Golder Associates		WASTE MANAGEMENT, INC.	FIGURE A16

AF 45148A



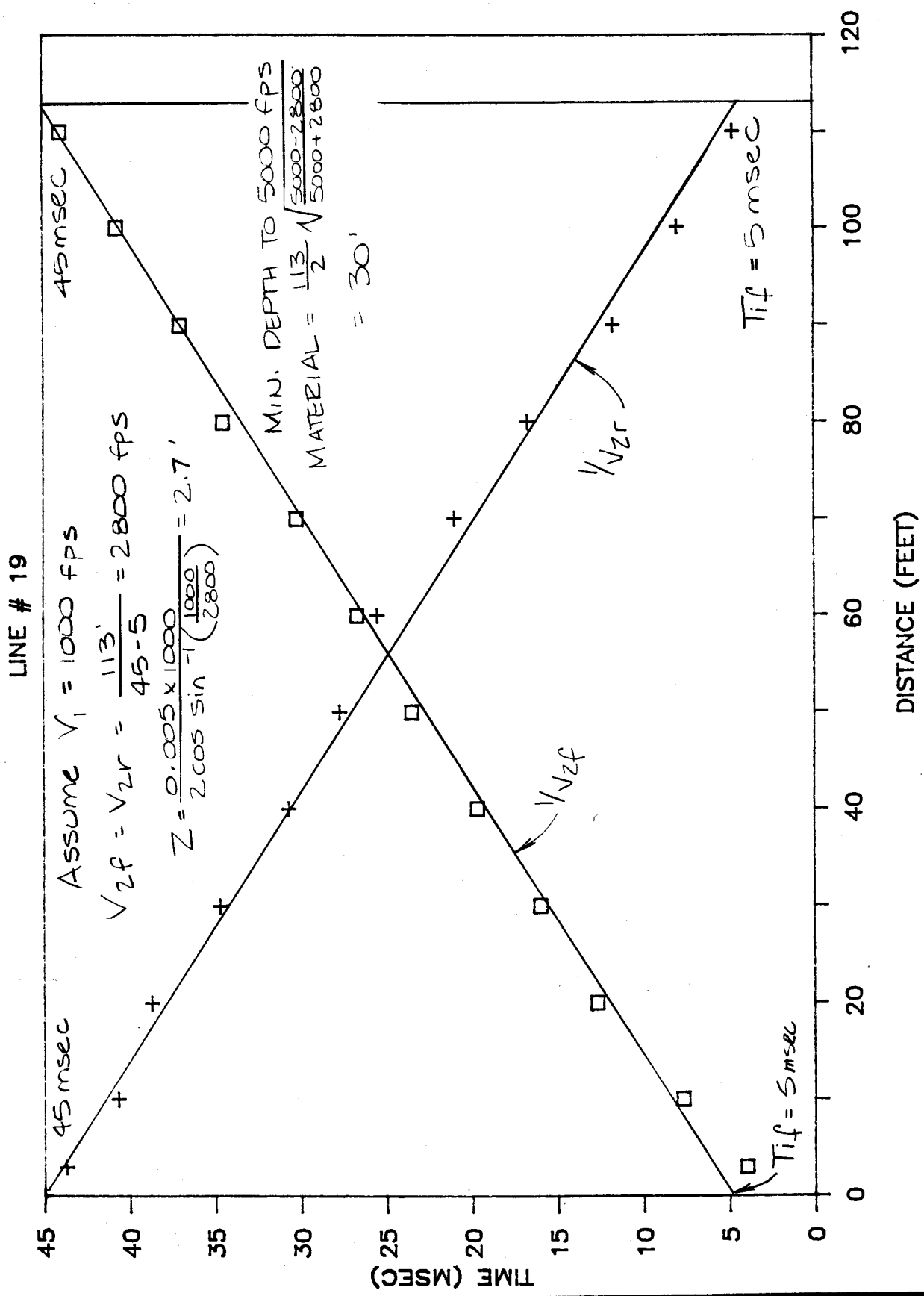
JOB NO. 863-3407	SCALE AS SHOWN	TIME DISTANCE PLOT LINE # 17	
DRAWN LJW	DATE 2/3/87		
CHECKED	DWG. NO. 24		
Golder Associates		WASTE MANAGEMENT, INC.	FIGURE A17

AF 45148A



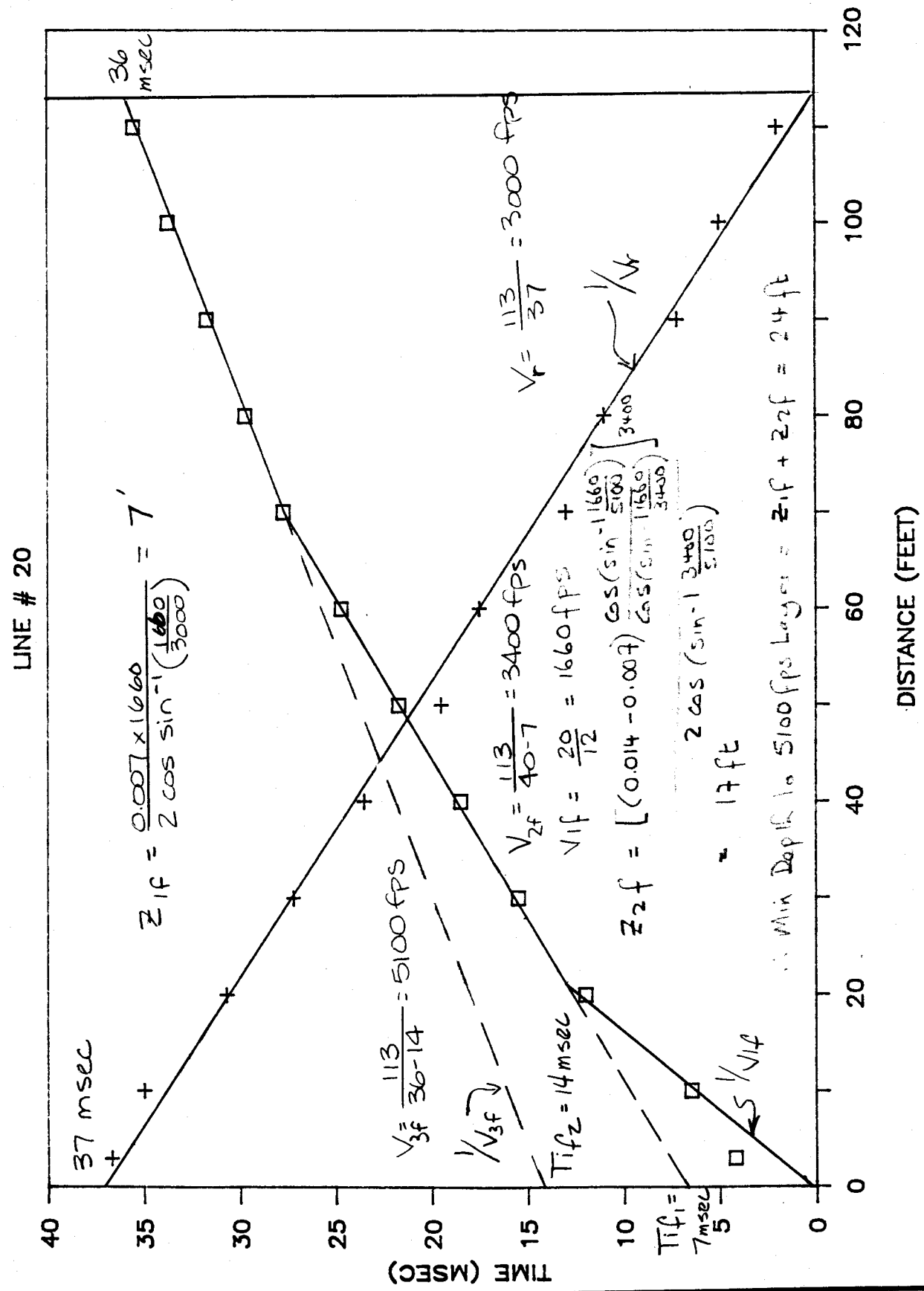
JOB NO. 863-3407	SCALE AS SHOWN	TIME DISTANCE PLOT LINE #18	
DRAWN LJW	DATE 2/3/87		
CHECKED	DWG. NO. 25		
Golder Associates		WASTE MANAGEMENT, INC.	FIGURE A18

AF 45148A



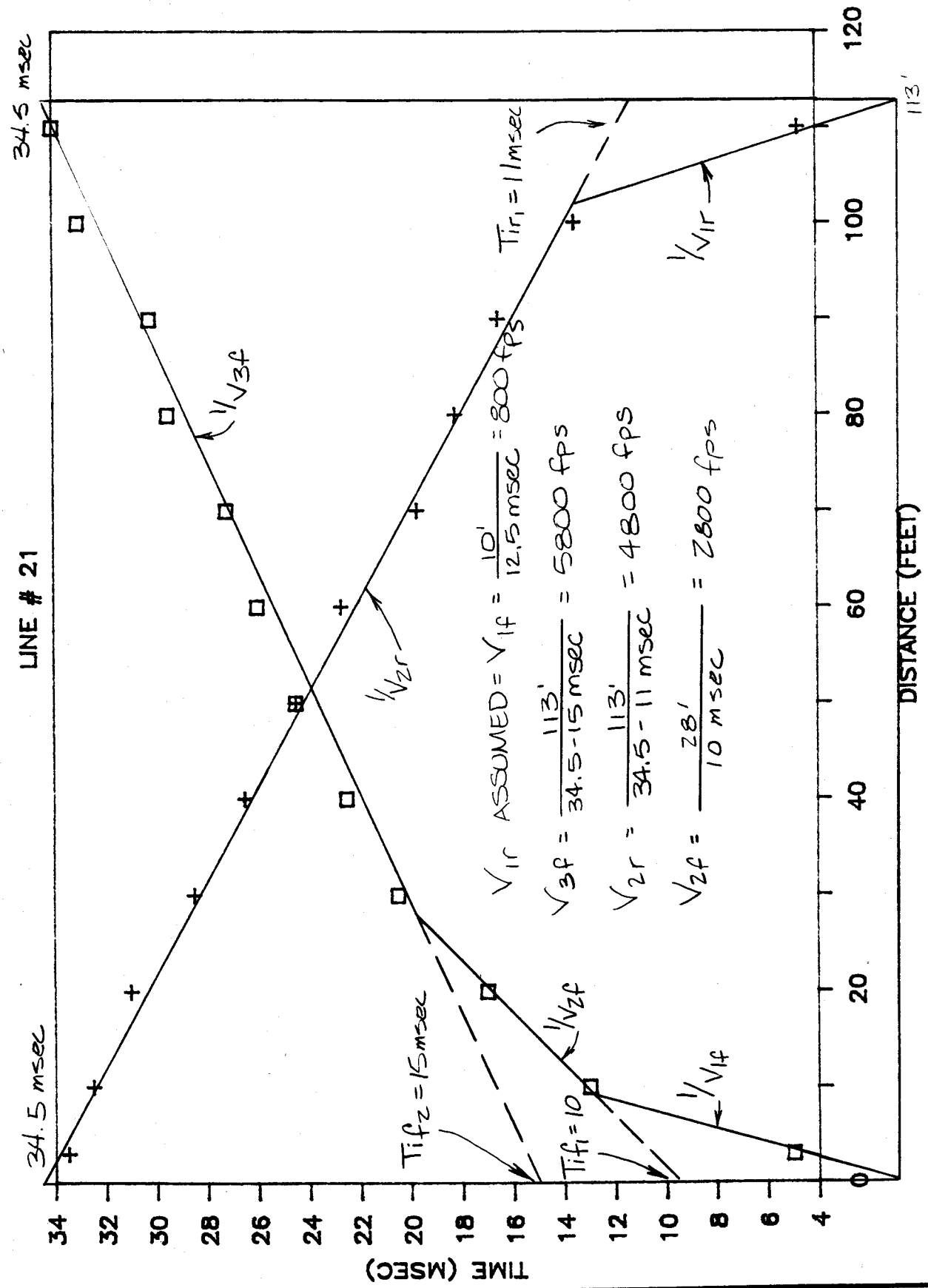
JOB NO. 863-3407	SCALE AS SHOWN	TIME DISTANCE PLOT LINE #19	
DRAWN LJW	DATE 2/3/87		
CHECKED	DWG. NO. 26		
Golder Associates		WASTE MANAGEMENT, INC.	FIGURE A19

AF 45148A



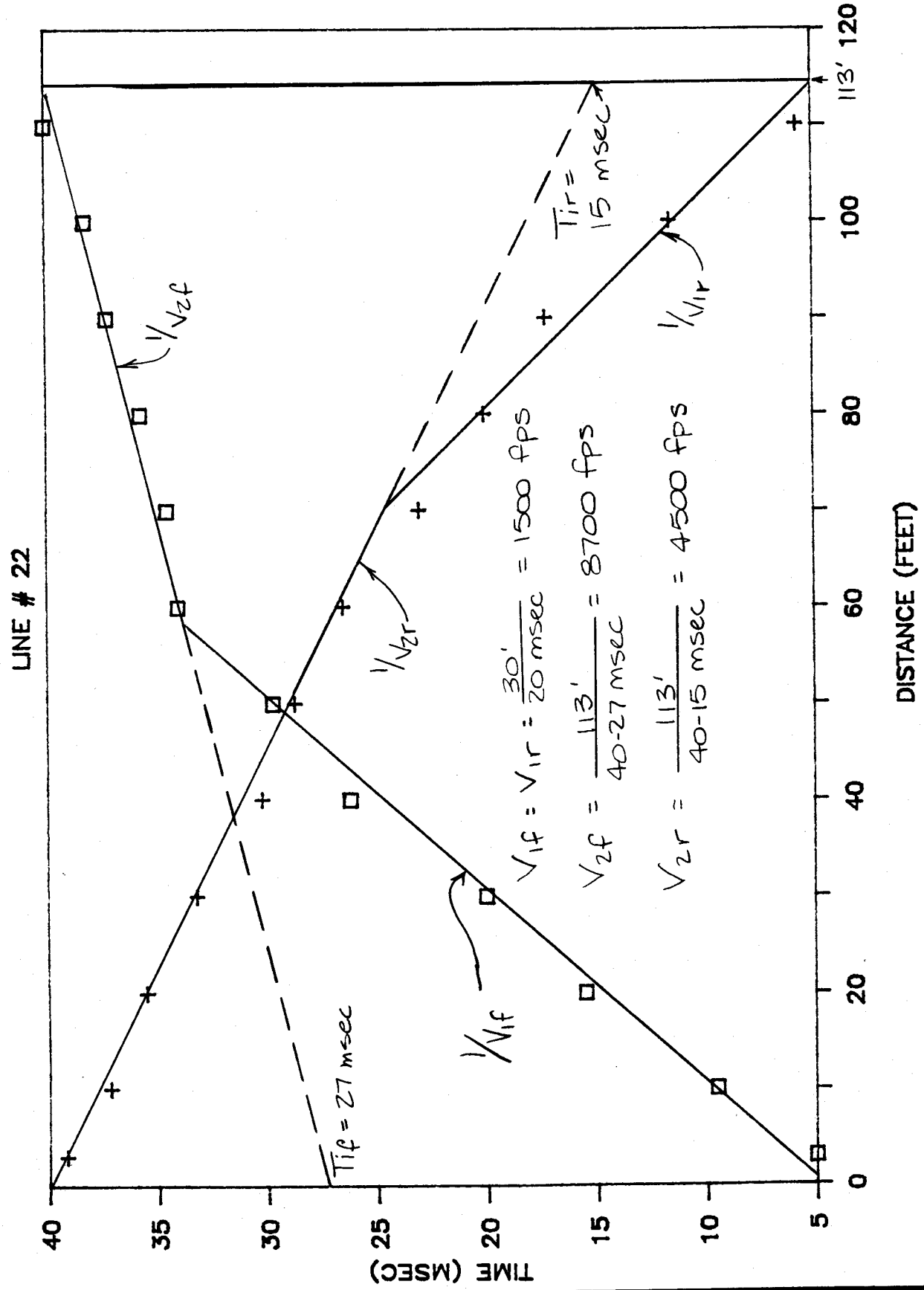
JOB NO. 863-3407	SCALE AS SHOWN	TIME DISTANCE PLOT LINE #20	
DRAWN LJW	DATE 2/3/87		
CHECKED	DWG. NO. 27		
Golder Associates		WASTE MANAGEMENT, INC.	FIGURE A20

AF 45148A



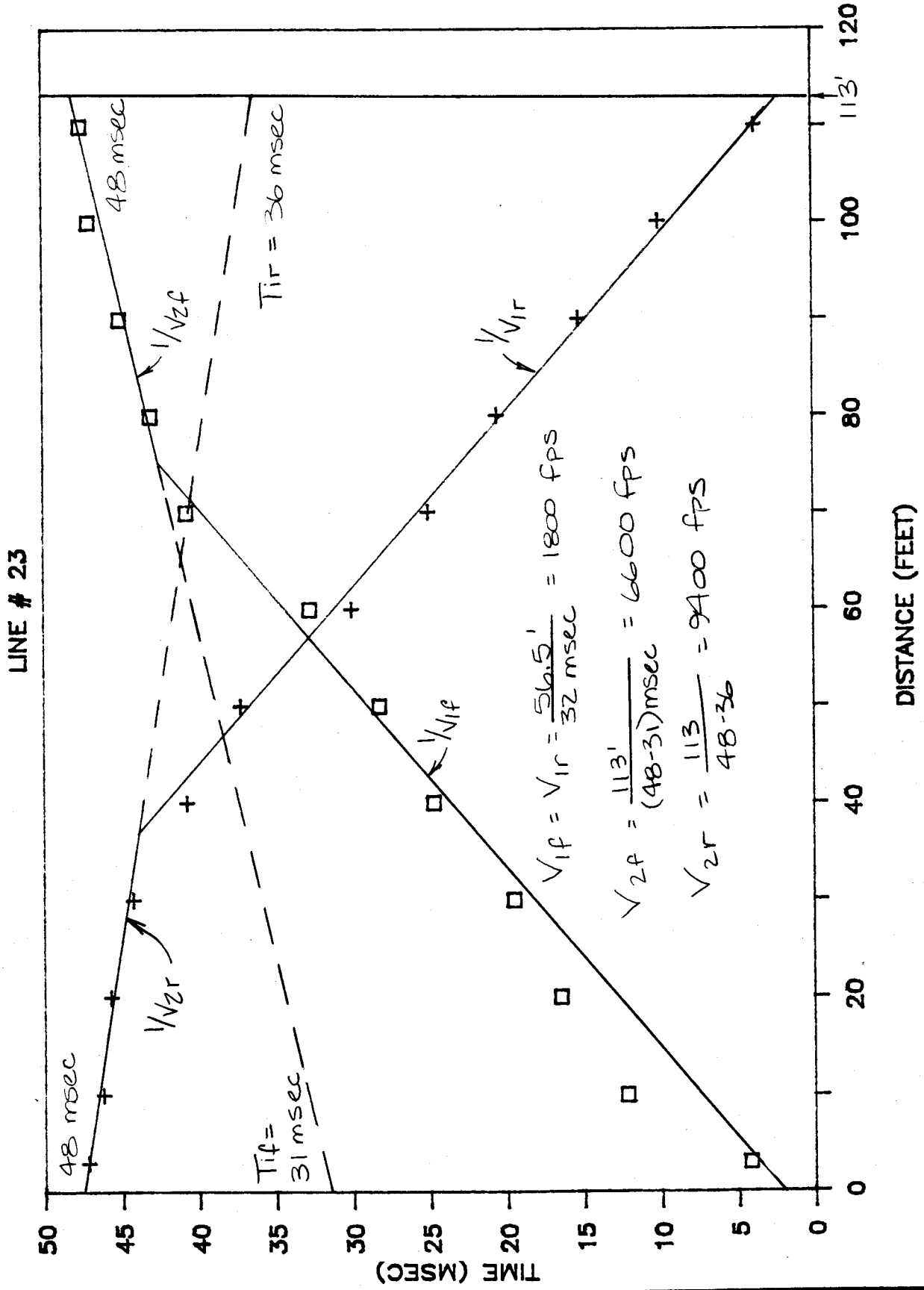
JOB NO. 863-3407	SCALE AS SHOWN	TIME DISTANCE PLOT LINE # 21	
DRAWN LJW	DATE 2/3/87		
CHECKED	DWG. NO. 28		
Golder Associates		WASTE MANAGEMENT, INC.	FIGURE A21

AF 45148A



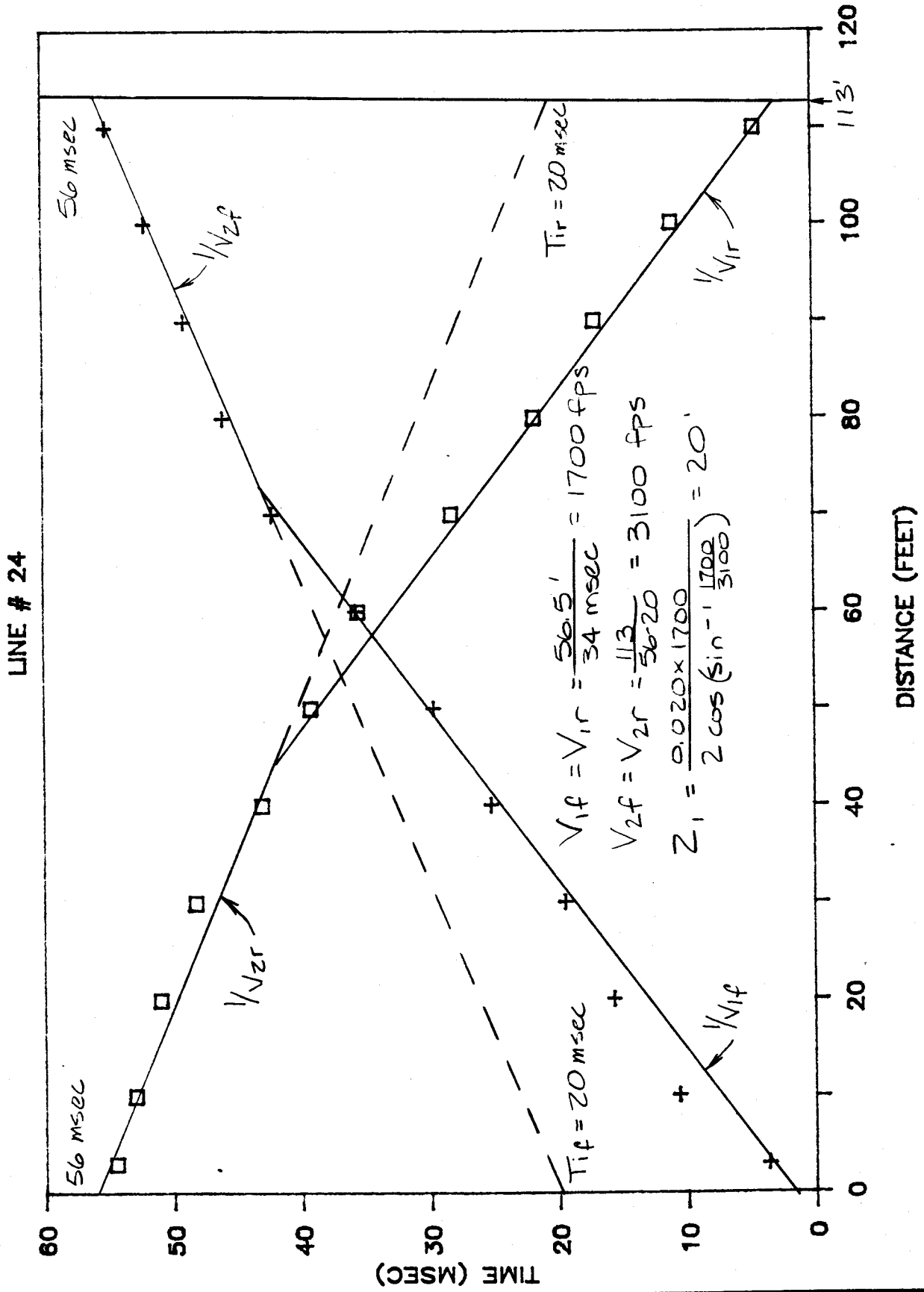
JOB NO. 863-3407	SCALE AS SHOWN	TIME DISTANCE PLOT LINE #22	
DRAWN LJW	DATE 2/3/87		
CHECKED	DWG. NO. 29		
Golder Associates		WASTE MANAGEMENT, INC.	FIGURE A22

AF 45148A



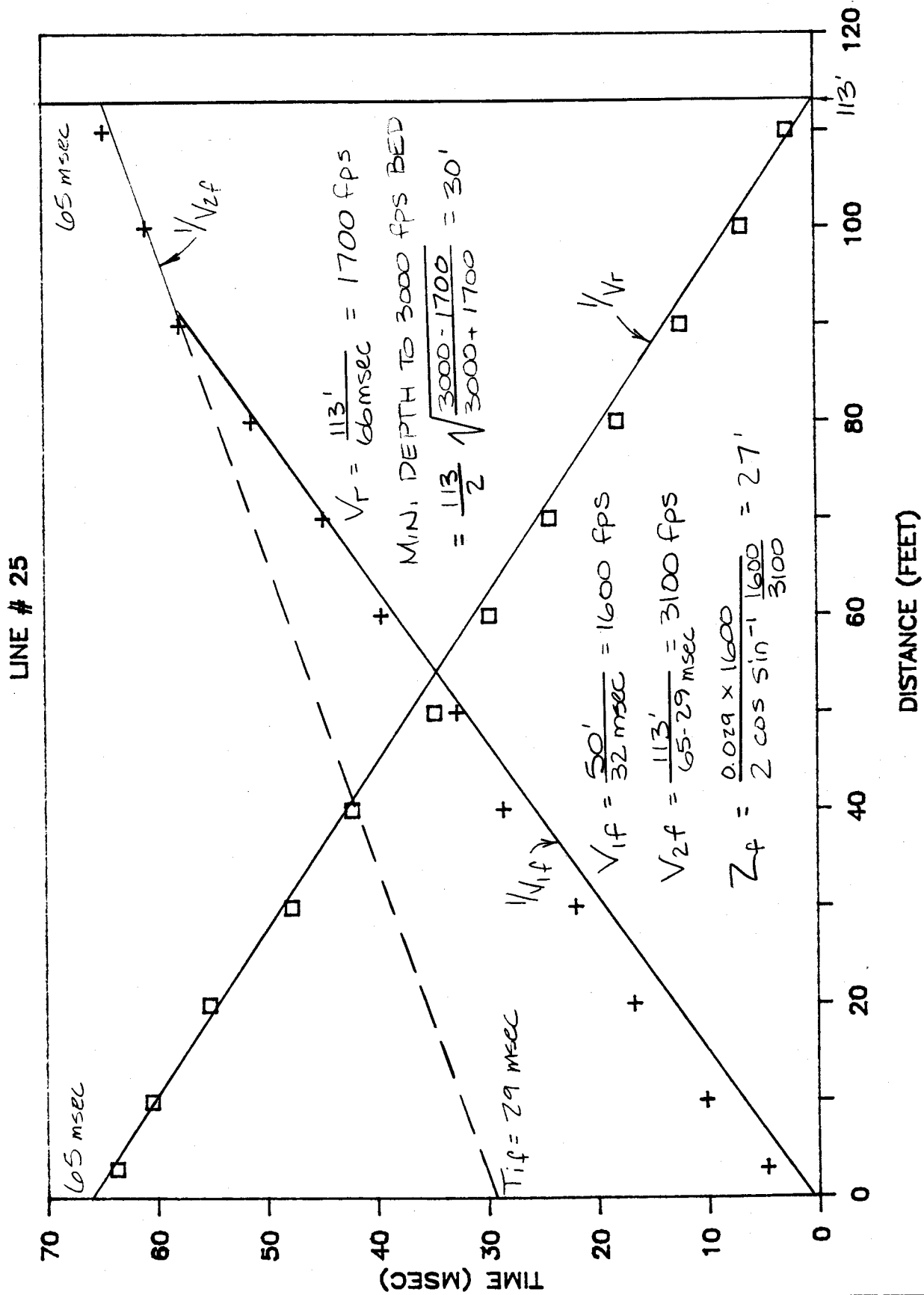
JOB NO. 863-3407	SCALE AS SHOWN	TIME DISTANCE PLOT LINE #23	
DRAWN LJW	DATE 2/3/87		
CHECKED	DWG. NO. 30		
Golder Associates		WASTE MANAGEMENT, INC.	FIGURE A23

AF 45148A



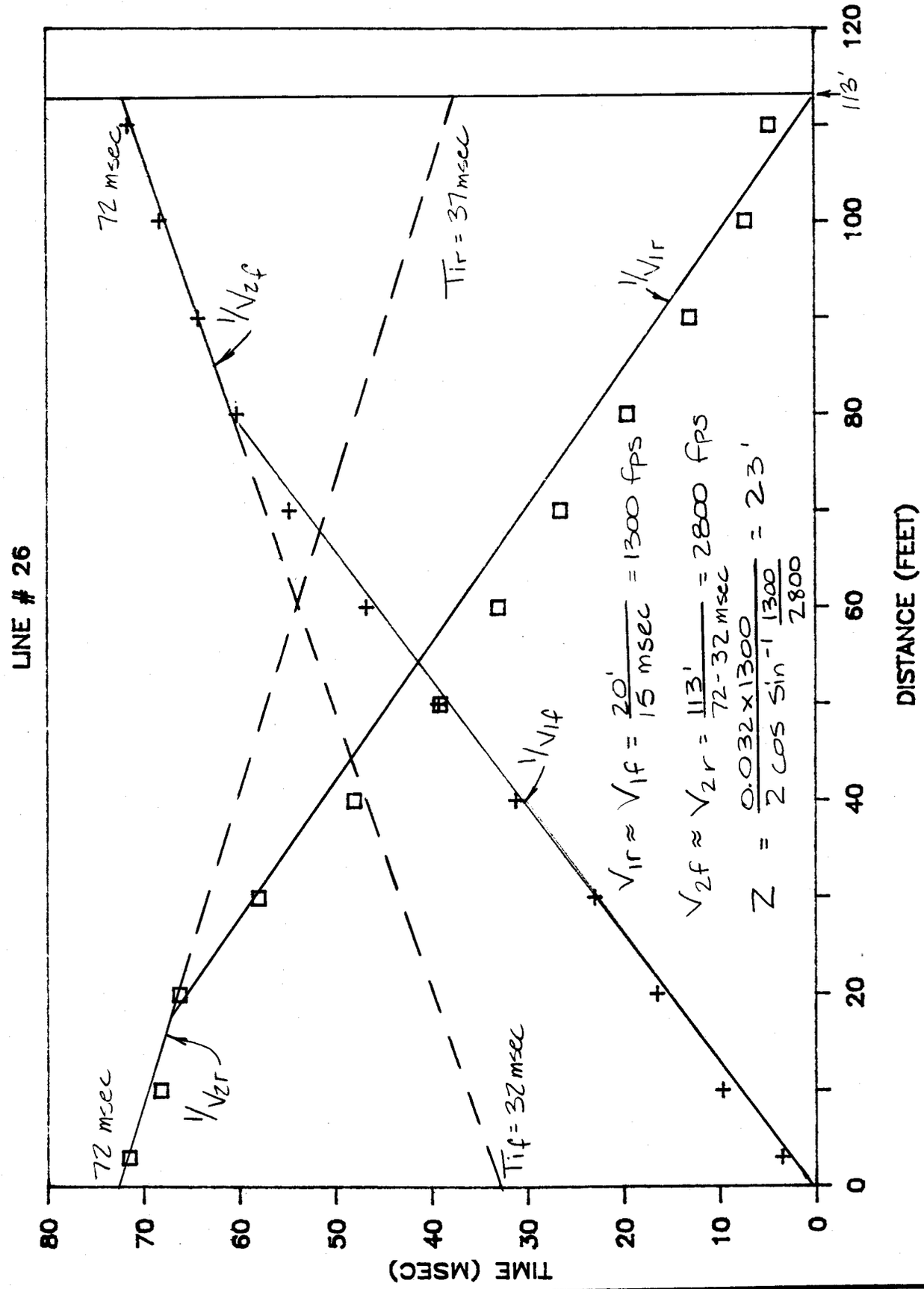
JOB NO. 863-3407	SCALE AS SHOWN	TIME DISTANCE PLOT LINE #24	
DRAWN LJW	DATE 2/3/87		
CHECKED	DWG. NO. 31		
Golder Associates		WASTE MANAGEMENT, INC.	FIGURE A24

AF 45148A



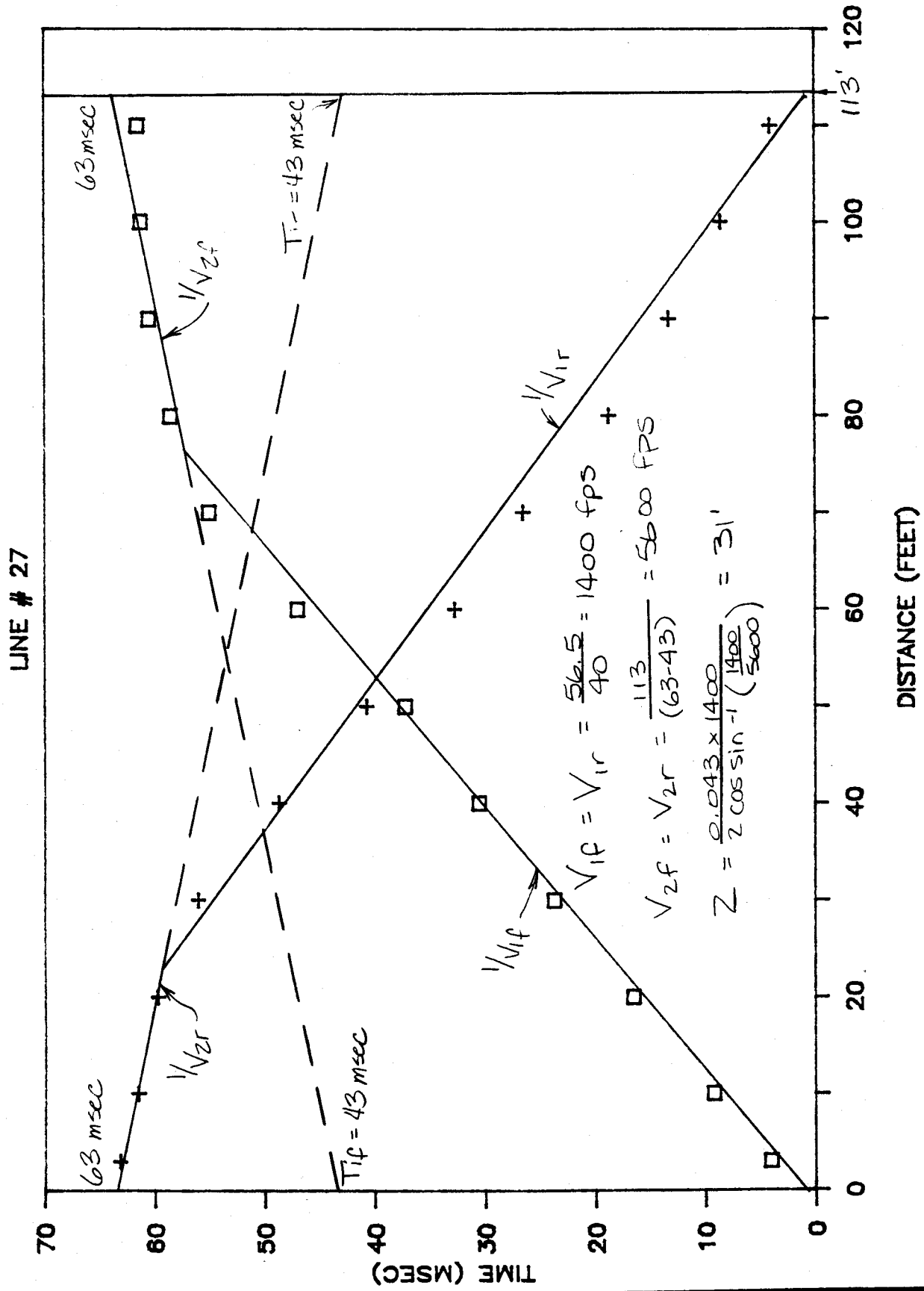
JOB NO. 863-3407	SCALE AS SHOWN	TIME DISTANCE PLOT LINE #25	
DRAWN LJW	DATE 2/3/87		
CHECKED	DWG. NO. 32		
Golder Associates		WASTE MANAGEMENT, INC.	FIGURE A25

AF 45148A



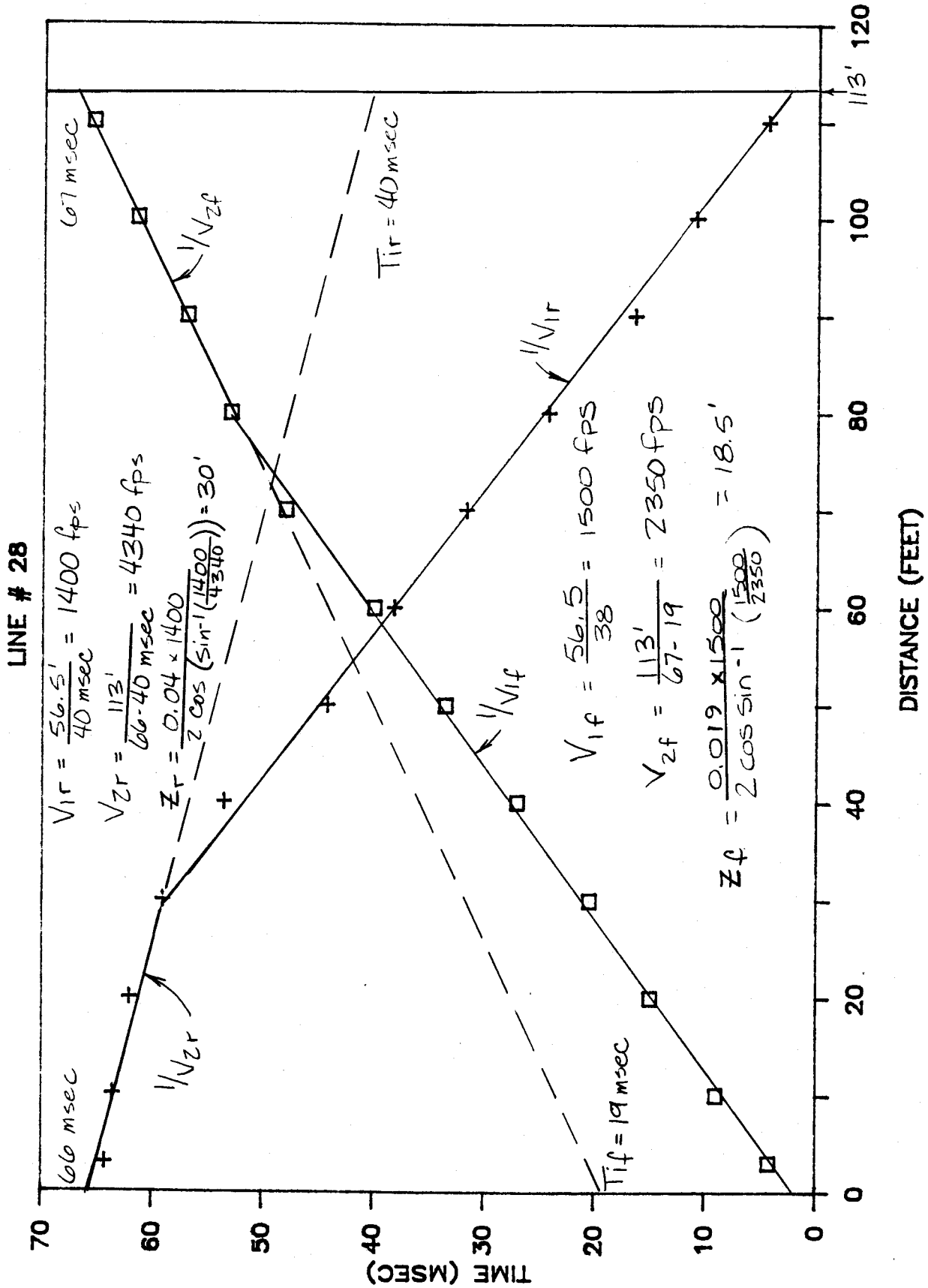
JOB NO. 863-3407	SCALE AS SHOWN	TIME DISTANCE PLOT LINE #26	
DRAWN LJW	DATE 2/3/87		
CHECKED	DWG. NO. 33		
Golder Associates		WASTE MANAGEMENT, INC.	FIGURE A26

AF 45148A



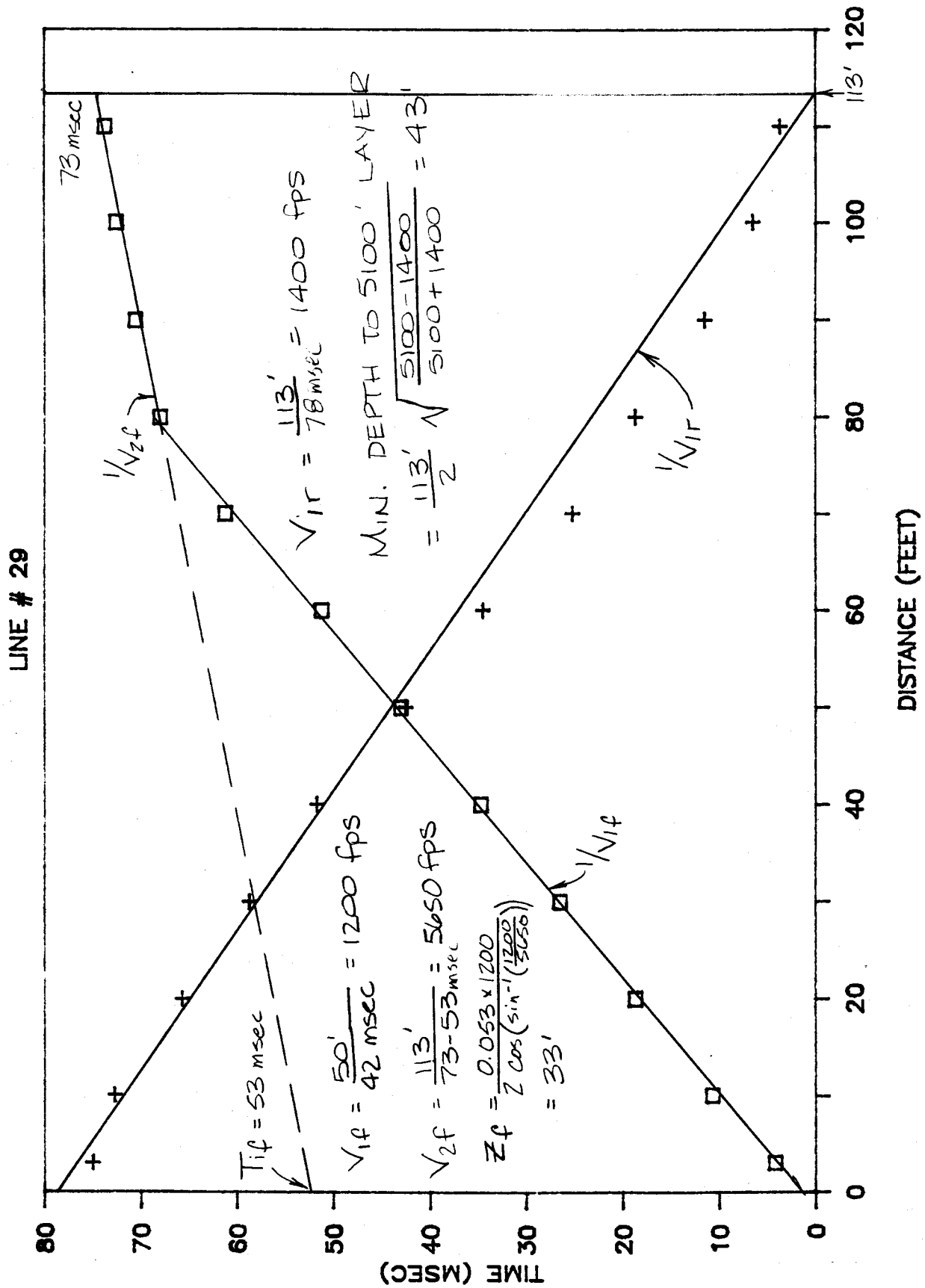
JOB NO. 863-3407	SCALE AS SHOWN	TIME DISTANCE PLOT LINE #27	
DRAWN LJW	DATE 2/3/87		
CHECKED	DWG. NO. 34		
Golder Associates		WASTE MANAGEMENT, INC.	FIGURE A27

AF 45148A



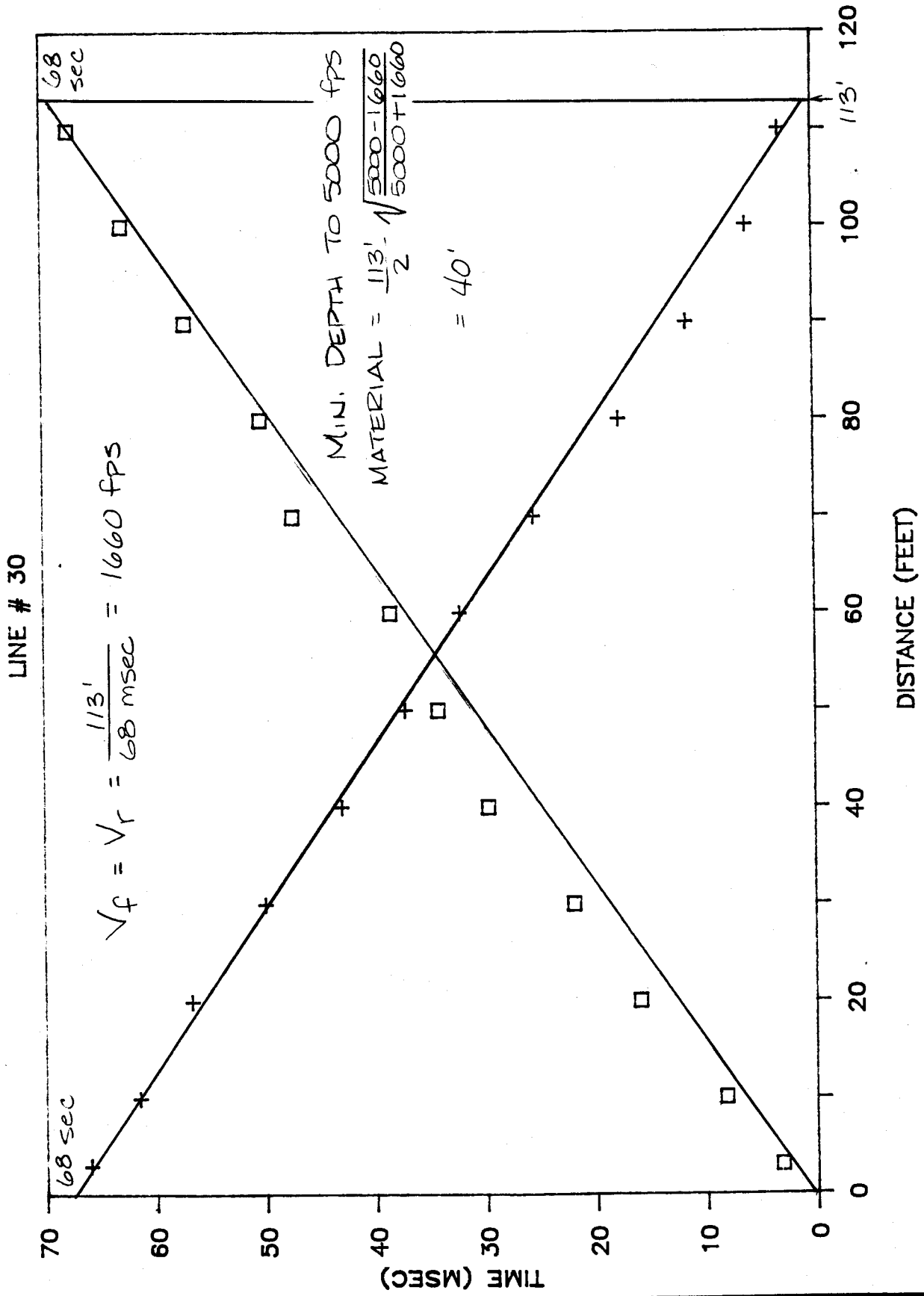
JOB NO. 863-3407	SCALE AS SHOWN	TIME DISTANCE PLOT LINE #28	
DRAWN LJW	DATE 2/3/87		
CHECKED	DWG. NO. 35		
Golder Associates		WASTE MANAGEMENT, INC.	FIGURE A28

AF 45148A



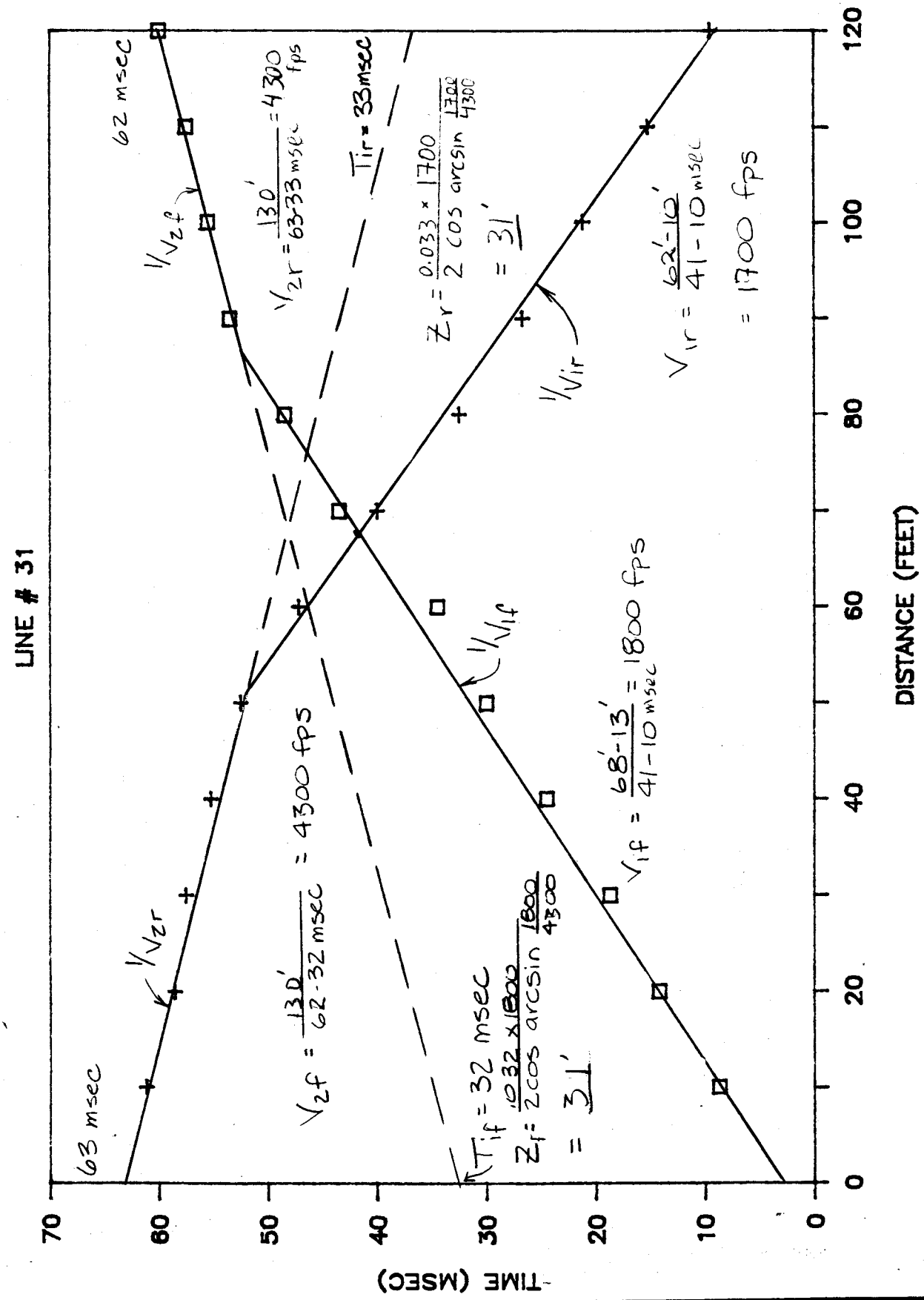
JOB NO. 863-3407	SCALE AS SHOWN	TIME DISTANCE PLOT LINE #29	
DRAWN LJW	DATE 2/3/87		
CHECKED	DWG. NO. 36		
Golder Associates		WASTE MANAGEMENT, INC.	FIGURE A29

AF 45148A



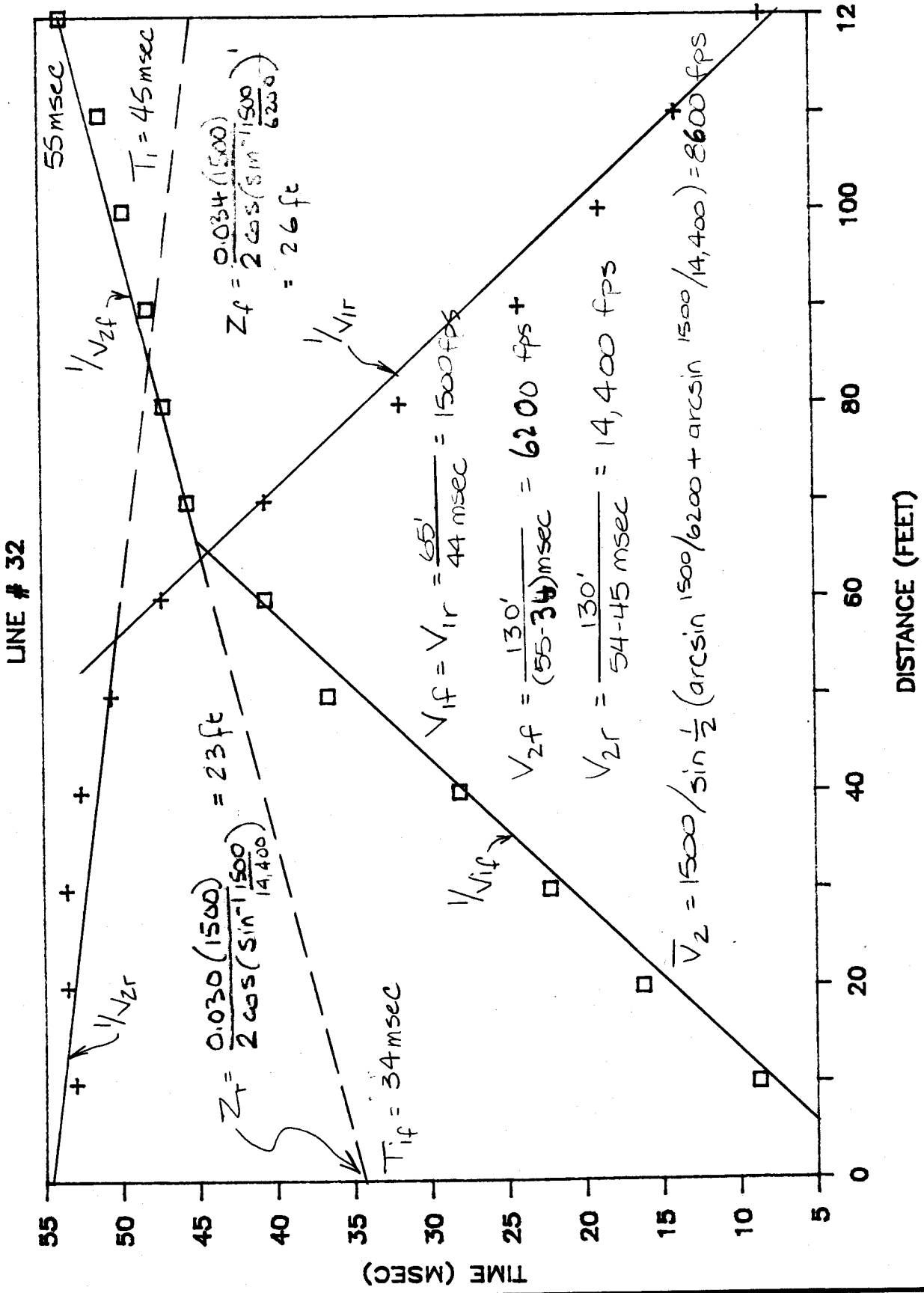
JOB NO. 863-3407	SCALE AS SHOWN	TIME DISTANCE PLOT LINE #30	
DRAWN LJW	DATE 2/3/87		
CHECKED	DWG. NO. 37		
Golder Associates		WASTE MANAGEMENT, INC.	FIGURE A30

AF 45148A



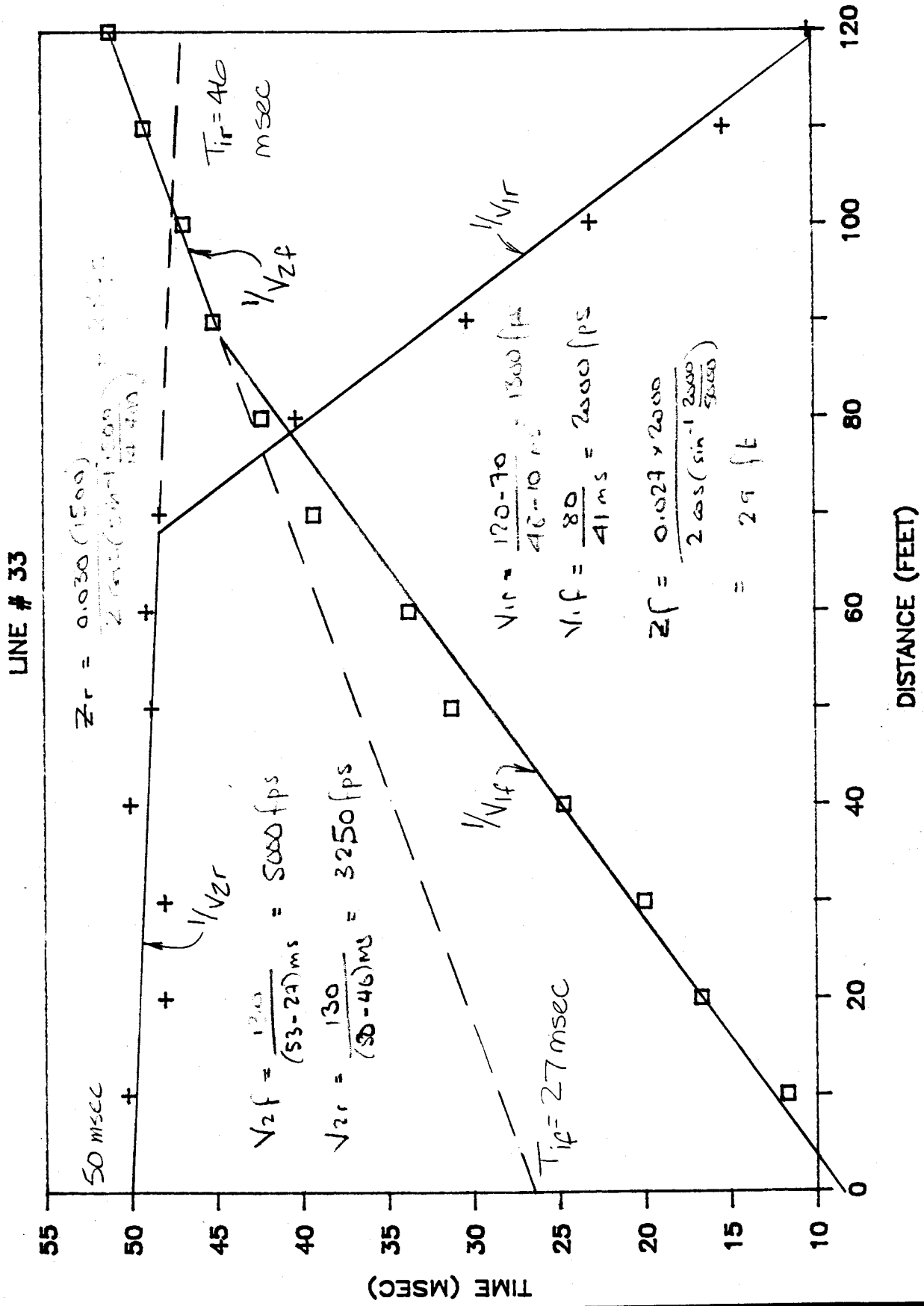
JOB NO. 863-3407	SCALE AS SHOWN	TIME DISTANCE PLOT LINE # 31	
DRAWN LJW	DATE 2/3/87		
CHECKED	DWG. NO.		
Golder Associates		WASTE MANAGEMENT, INC.	FIGURE A31

AF 45148A



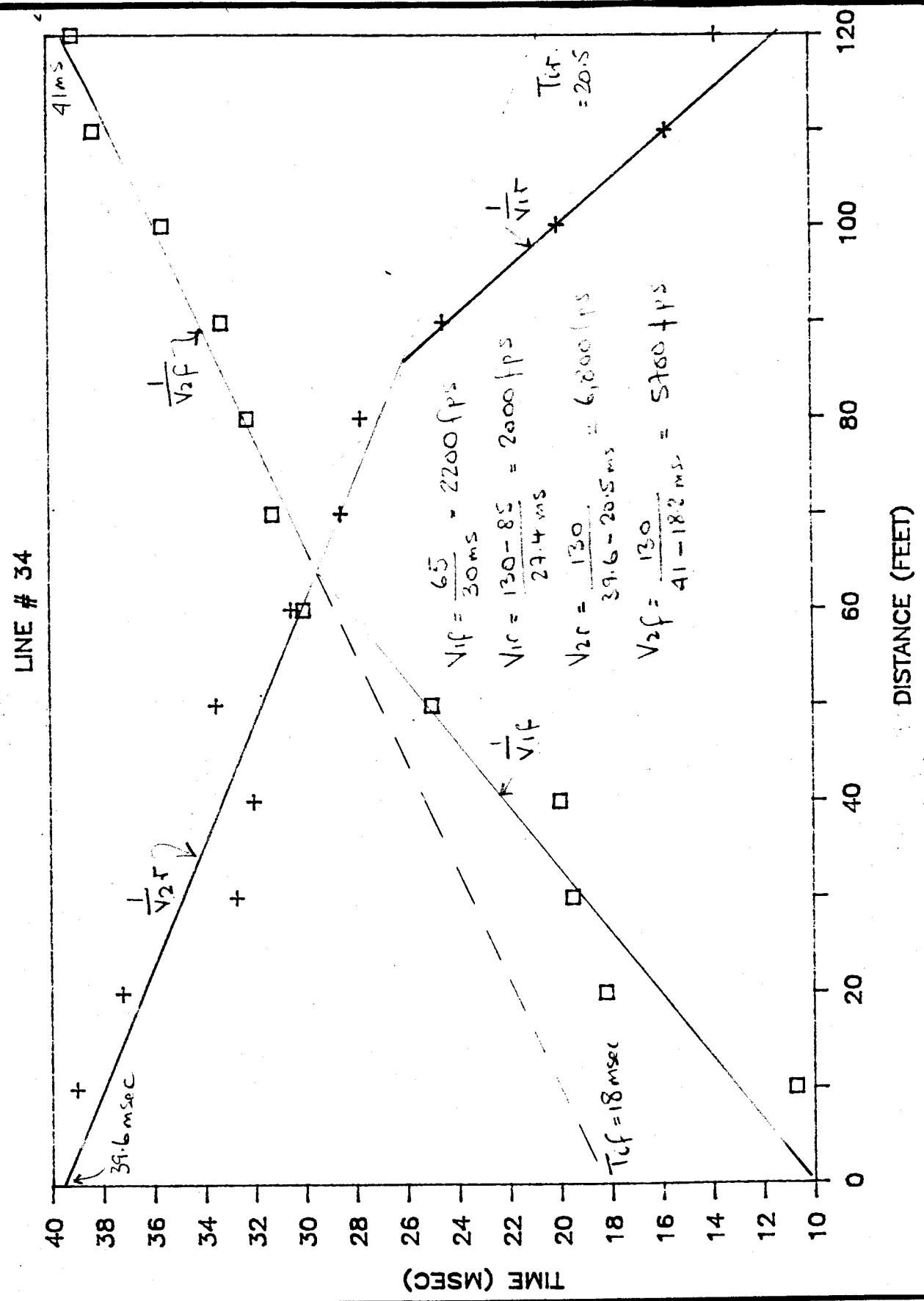
JOB NO. 863-3407	SCALE AS SHOWN	TIME DISTANCE PLOT LINE # 32	
DRAWN LJW	DATE 2/3/87		
CHECKED	DWG. NO.		
Golder Associates		WASTE MANAGEMENT, INC.	FIGURE A32

AF 45148A



JOB NO. 863-3407	SCALE AS SHOWN	TIME DISTANCE PLOT LINE # 33	
DRAWN LJW	DATE 2/3/87		
CHECKED	DWG. NO.		
Golder Associates		WASTE MANAGEMENT, INC.	FIGURE A33

AF 45148A



JOB NO. 863-3407	SCALE AS SHOWN	TIME DISTANCE PLOT LINE # 34	
DRAWN LJW	DATE 2/3/87		
CHECKED	DWG. NO.		
Golder Associates		WASTE MANAGEMENT, INC.	FIGURE A34