WARZYN

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Report
Project No. 13160

Volume 2 of 2
Remedial Investigation
Winnebago Reclamation Landfill
Rockford, Illinois

Prepared for:
Pagel's Pit Landfill
Potentially Responsible Parties
Rockford, Illinois

Prepared by:
Warzyn Inc.
Chicago, Illinois

March 1991

APPENDICES

A

APPENDIX A

BORING LOGS

KEY TO BORING LOGS

Sample Type

- Unsampled interval
- Auger cuttings sample
- Drilled by hollow stem augers; not sampled; logged by cuttings
- Hand sample from surface
- 4" outside diameter core barrel sampler
- Drilled by rotary wash bore; not sampled; logged by cuttings
- 5' continuous sampler
- 3" outside diameter split spoon sampler
- 3" shelby tube
- 2" outside diameter split spoon sampler

Lithologic Description

- Unknown lithology
- Lean clay
- Silty clay or clayey silt
- Sandy clay
- Concrete
- Construction debris-laden fill material
- Gravel
- Clayey gravel
- Silty gravel
- Sandy gravel
- Limestone or dolomitic limestone
- Silt
- Gravelly silt
- Silty sand
- Peat
- Sand
- Gravelly sand
- Sandy silt
- Topsoil

Borehole Material Graphics

- Concrete around flush-mounted protective casing
- Concrete surface seal around well casing
- Bentonite slurry or cement-bentonite grout around well casing
- Bentonite pellet seal around well casing
- Bentonite pellet seal around well screen
- Sand backfill around well casing
- Sand filter pack around well screen
- Sand backfill or natural soil collapse in borehole
- Concrete surface seal over borehole
- Bentonite slurry or bentonite-cement grout backfill in borehole
- Cuttings backfill in borehole
- Bentonite seal in borehole

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Description of Boring Log Headings

No. = Sample number within the boring

Rec. = Amount of sample recovery

Moist = Visual estimate of the amount of moisture in the sample.

Type = Sampler type and sample interval

N Value = The penetration resistance, N, is the summation of the number of blows required to effect two successive 6" penetrations of the 2" split-spoon sampler. The sampler is driven with a 140 lb. weight falling 30" and is seated to a depth of 6" before commencing the standard penetration test.

Depth = Depth below ground surface

Visual Classification = Lithology symbol of stratigraphy; Description of stratigraphy; Borehole material graphics

qu(qa) = Unconfined compressive strength of the sample

PID = Photoionization detector reading

Description of Soil Samples

General Terminology

Relative Density (of noncohesive soils) or consistency (of cohesive soils)
Color
Grain Size (of noncohesive soils)
Major soil constituent
Minor proportions
Other characteristics or features
Unified Soil Classification System (USCS) Symbol

Descriptive Terms

NM = Not measured
ND = Not detected
M = Moist
F = Frozen
D = Dry
W = Wet
-- = Measurement not possible

Relative Density

Term	"N" Value
Very Loose	0-4
Loose	4-10
Medium Dense	10-30
Dense	30-50
Very Dense	Over 50

Consistency

Term	qa.-tons/sq.ft
Very Soft	0.0 to 0.25
Soft	0.25 to 0.50
Medium	0.50 to 1.0
Stiff	1.0 to 2.0
Very Stiff	2.0 to 4.0
Hard	Over 40

Grain Size Terminology

Soil Fraction		Particle Size	U.S. Standard Sieve Size
Boulders		Larger than 12"	Larger than 12"
Cobbles		3" to 12"	3" to 12"
Gravel:	Coarse	3/4" to 3"	3/4" to 3"
	Fine	4.76 mm to 3/4"	#4 to 3/4"
Sand:	Coarse	2.00 mm to 4.76 mm	#10 to #4
	Medium	0.42 mm to 2.00 mm	#40 to #10
	Fine	0.074 mm to 0.42 mm	#200 to #40
Silt		0.005 mm to 0.074 mm	Smaller than #200
Clay		Smaller than 0.005 mm	Smaller than #200

Plasticity characteristics differentiate between silt and clay.

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LOG OF TEST BORING

General Notes

Descriptive Soil Classification

GRAIN SIZE TERMINOLOGY

Soil Fraction	Particle Size	U.S. Standard Sieve Size
Boulders	Larger than 12"	Larger than 12"
Cobbles	3" to 12"	3" to 12"
Gravel: Coarse	¾" to 3"	¾" to 3"
Fine	4.76 mm to ¾"	#4 to ¾"
Sand: Coarse	2.00 mm to 4.76 mm	#10 to #4
Medium	0.42 mm to 2.00 mm	#40 to #10
Fine	0.074 mm to 0.42 mm	#200 to #40
Silt	0.005 mm to 0.074 mm	Smaller than #200
Clay	Smaller than 0.005 mm	Smaller than #200

Plasticity characteristics differentiate between silt and clay.

GENERAL TERMINOLOGY

Physical Characteristics
Color, moisture, grain shape, fineness, etc.

Major Constituents
Clay, silt, sand, gravel

Structure
Laminated, varved, fibrous, stratified, *cemented, fissured, etc.*

Geologic Origin
Glacial, alluvial, aeolian, residual, etc.

RELATIVE DENSITY

Term	"N" Value
Very Loose	0-4
Loose	4-10
Medium Dense	10-30
Dense	30-50
Very Dense	Over 50

RELATIVE PROPORTIONS OF COHESIONLESS SOILS

Proportional Term	Defining Range By Percentage of Weight
Trace	0%- 5%
Little	5%-12%
Some	12%-35%
And	35%-50%

CONSISTENCY

Term	q_u-tons/sq. ft.
Very Soft	0.0 to 0.25
Soft	0.25 to 0.50
Medium	0.50 to 1.0
Stiff	1.0 to 2.0
Very Stiff	2.0 to 4.0
Hard	Over 4.0

ORGANIC CONTENT BY COMBUSTION METHOD

Soil Description	Loss on Ignition
Non Organic	Less than 4%
Organic Silt/Clay	4-12%
Sedimentary Peat	12-50%
Fibrous and Woody Peat	More than 50%

PLASTICITY

Term	Plastic Index
None to Slight	0-4
Slight	5-7
Medium	8-22
High to Very High	Over 22

The penetration resistance, N, is the summation of the number of blows required to effect two successive 6" pentrations of the 2" split-barrel sampler. The sampler is driven with a 140 lb. weight falling 30" and is seated to a depth of 6" before commencing the standard penetration test.

Symbols

DRILLING AND SAMPLING

CS—Continuous Sampling
RC—Rock Coring: Size AW, BW, NW, 2" W
RQD—Rock Quality Designator
RB—Rock Bit
FT—Fish Tail
DC—Drove Casing
C—Casing: Size 2½", NW, 4", HW
CW—Clear Water
DM—Drilling Mud
HSA—Hollow Stem Auger
FA—Flight Auger
HA—Hand Auger
COA—Clean-Out Auger
SS—2" Diameter Split-Barrel Sample
2ST—2" Diameter Thin-Walled Tube Sample
3ST—3" Diameter Thin-Walled Tube Sample
PT—3" Diameter Piston Tube Sample
AS—Auger Sample
WS—Wash Sample
PTS—Peat Sample
PS—Pitcher Sample
NR—No Recovery
S—Sounding
PMT—Borehole Pressuremeter Test
VS—Vane Shear Test
WPT—Water Pressure Test

LABORATORY TESTS

q_p—Penetrometer Reading, tons/sq. ft.
q_u—Unconfined Strength, tons/sq. ft.
W—Moisture Content, %
LL—Liquid Limit, %
PL—Plastic Limit, %
SL—Shrinkage Limit, %
LI—Loss on Ignition, %
D—Dry Unit Weight, lbs./cu. ft.
pH—Measure of Soil Alkalinity or Acidity
FS—Free Swell, %

WATER LEVEL MEASUREMENT

▽—Water Level at time shown
NW—No Water Encountered
WD—While Drilling
BCR—Before Casing Removal
ACR—After Casing Removal
CW—Caved and Wet
CM—Caved and Moist

Note: Water level measurements shown on *the boring logs represent conditions at the* time indicated and may not reflect static levels, especially in cohesive soils.

UNIFIED SOIL CLASSIFICATION SYSTEM

COARSE-GRAINED SOILS

(More than half of material is larger than No. 200 seive size.)

GRAVELS More than half of coarse fraction larger than No. 4 sieve size	**Clean Gravels** (Little or no fines)	
	GW	Well-graded gravels, gravel-sand mixtures, little or no fines
	GP	Poorly graded gravels, gravel-sand mixtures, little or no fines
	Gravels with Fines (Appreciable amount of fines)	
	GM^d_u	Silty gravels, gravel-sand-silt mixtures
	GC	Clayey gravels, gravel-sand-clay mixtures
SANDS More than half of coarse fraction smaller than No. 4 sieve size	**Clean Sands** (Little or no fines)	
	SW	Well-graded sands, gravelly sands, little or no fines
	SP	Poorly graded sands, gravelly sands, little or no fines
	Sands with Fines (Appreciable amount of fines)	
	SM^d_u	Silty sands, sand-silt mixtures
	SC	Clayey sands, sand-clay mixtures

FINE-GRAINED SOILS

(More than half of material is smaller than No. 200 sieve.)

SILTS AND CLAYS Liquid limit less than 50%	ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity
	CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
	OL	Organic silts and organic silty clays of low plasticity
SILTS AND CLAYS Liquid limit greater than 50%	MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts
	CH	Inorganic clays of high plasticity, fat clays
	OH	Organic clays of medium to high plasticity, organic silts
HIGHLY ORGANIC SOILS	PT	Peat and other highly organic soils

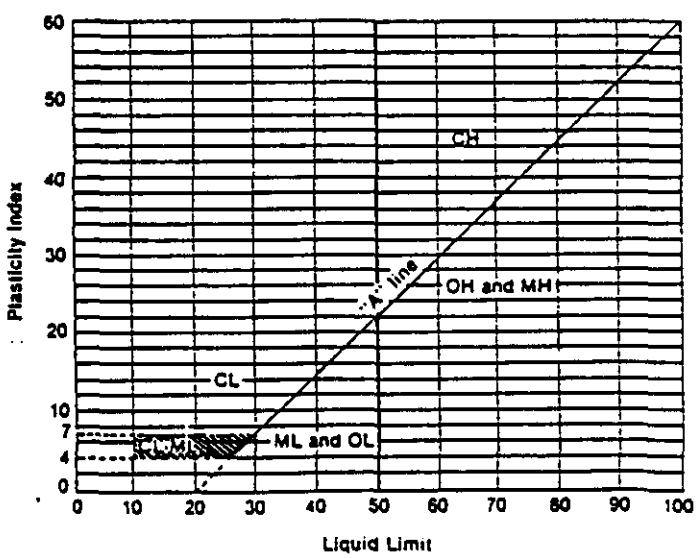
LABORATORY CLASSIFICATION CRITERIA

GW	$C_u = \frac{D_{60}}{D_{10}}$ greater than 4; $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3	
GP	Not meeting all gradation requirements for GW	
GM	Atterberg limits below "A" line or P.I. less than 4	Above "A" line with P.I. between 4 and 7 are borderline cases requiring use of dual symbols
GC	Atterberg limits above "A" line with P.I. greater than 7	
SW	$C_u = \frac{D_{60}}{D_{10}}$ greater than 6; $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3	
SP	Not meeting all gradation requirements for SW	
SM	Atterberg limits below "A" line or P.I. less than 4	Limits plotting in hatched zone with P.I. between 4 and 7 are borderline cases requiring use of dual symbols.
SC	Atterberg limits above "A" line with P.I. greater than 7	

Determine percentages of sand and gravel from grain-size curve. Depending on percentage of fines (fraction smaller than No. 200 sieve size), coarse-grained soils are classified as follows:

Less than 5 per cent ..... GW, GP, SW, SP
More than 12 per cent ..... GM, GC, SM, SC
5 to 12 per cent ..... Borderline cases requiring dual symbols

PLASTICITY CHART



For classification of fine-grained soils and fine fraction of coarse-grained soils.

Atterberg Limits plotting in hatched area are borderline classifications requiring use of dual symbols.

Equation of A-line: PI = 0.73 (LL - 20)

Winnebago Reclamation Landfill
Rockford, Illinois
Field PID Readings

Boring No: P3R

Depth (ft)	Field PID (ppm)
Background - 0.2	
3 1/2-5	0.2
8 1/2-10	0.2
13 1/2-15	0.2
18 1/2-20	0.2
23 1/2-25	0.2
28 1/2-30	0.2
33 1/2-35	0.2
38 1/2-40	0.2
43 1/2-45	0.2
48 1/2-50	0.2

Boring No: G112

Depth (ft)	Field PID (ppm)
Background = 0.2	
3 1/2-5	0.2
8 1/2-10	0.2
13 1/2-15	0.2

Boring No: G113A

Depth (ft)	Field PID (ppm)
Background = 0.2	
3 1/2-5	0.2
8 1/2-10	0.2
13 1/2-15	0.2
18 1/2-20	0.2
23 1/2-25	0.2
28 1/2-30	0.2

Boring No: G115

Depth (ft)	Field PID (ppm)
Background - 0.2	
3 1/2-5	0.3
8 1/2-10	0.3
13 1/2-15	0.3
18 1/2-20	0.2

Boring No: G116A

Depth (ft)	Field PID (ppm)
Background = 0.2	
3 1/2-5	0.2
8 1/2-10	0.2
13 1/2-15	0.2
18 1/2-20	0.2
23 1/2-25	0.2
28 1/2-30	0.2
33 1/2-35	0.2
38 1/2-40	0.2
43 1/2-45	0.2

Boring No: G118

Depth (ft)	Field PID (ppm)
Background = 0.2	
3 1/2-5	0.2
8 1/2-10	0.4
13 1/2-15	0.2
18 1/2-20	0.2
23 1/2-25	0.2
28 1/2-30	0.2

Boring No: P4R

Depth (ft)	Field PID (ppm)
Background = 0.2	
53 1/2-55	0.2
58 1/2-60	0.2
63 1/2-65	0.2
68 1/2-70	0.2

Boring No: G114

Depth (ft)	Field PID (ppm)
Background = 0.2	
3 1/2-5	0.2
8 1/2-10	0.2
13 1/2-15	0.2

Boring No: G118A

Depth (ft)	Field PID (ppm)
Background = 0.2	
33 1/2-35	0.2
38 1/2-40	0.2
43 1/2-45	0.2

(ppm) = parts per billion of benzene equivalent.

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LOG OF TEST BORING

Project Winnebago Reclamation Landfill

Location Rockford, Illinois

Boring No. G112
Surface Elevation 761.3
Job No. 13160
Sheet 1 of 2

ONE PIERCE PLACE · SUITE 1110, ITASCA, ILL. 60143 · TEL(312) 773-8484

SAMPLE No.	Type	Rec (in.)	Moist	N	Depth	VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES qu (qa) (tsf)	W	LL	PL	D
						Thin Black SILT Topsoil (ML)					
1		18	M	11	5	Loose, Red Brown Fine to Medium SAND, Some Silt (SM)					
2		18	M	51	10	Very Dense, Light Red Brown Fine SAND, Little Silt (SP)					
3		14	M	29	15	Medium Dense, Light Red Brown Fine to Medium SAND, Some Silt (SM)					
4		0		100/0"	20	Light Brown Weathered DOLOMITE BEDROCK					
R1					25	Run 1: 24-34', 96% Recovery of Light Brown, Medium Hard, Fractured Vuggy DOLOMITE, Vugs Range from Pinhole to 1.5" dia., Hard White Chert Layers at 25' (1.5") & 28.5 (1.0"), Little if any Water Loss, RQD=78.3%					
					30	Run 2: 34-44'; 98% Recovery of Light Yellow Brown, Medium Hard, Fractured Vuggy DOLOMITE, Vugs Ranged from Pinhole to 0.25", No water Loss; RQD = 71.6%					
R2					35						
					40	(Continued)					

WATER LEVEL OBSERVATIONS

While Drilling ▽ _____ Upon Completion of Drilling _____
Time After Drilling _____ _____ _____ _____
Depth to Water _____ _____ _____ _____ ▼
Depth to Cave in _____ _____ _____ _____

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

GENERAL NOTES

Start 11/4/87 End 11/4/87
Driller _____ Chief MG Rig CME 550
Logger _____ Editor _____
Drill Method RB w/ DM-RC

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LOG OF TEST BORING

Project Winnebago Reclamation Landfill

Location Rockford, Illinois

Boring No. G112
Surface Elevation 761.3
Job No. 13160
Sheet 2 of 2

ONE PIERCE PLACE · SUITE 1110, ITASCA, ILL. 60143 · TEL(312) 773-8484

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
No.	TYPE	Rec (in.)	Moist	N	Depth		qu (qa) (tsf)	W	LL	PL	D
					45	End Boring at 44' Install Well G112 at 44'					
					50						
					55						
					60						
					65						
					70						
					75						
					80						
					85						

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LOG OF TEST BORING

Project Winnebago Reclamation Landfill

Location Rockford, Illinois

Boring No. G113
Surface Elevation 759.9
Job No. 13160
Sheet 1 of 2

ONE PIERCE PLACE · SUITE 1110, ITASCA, ILL. 60143 · TEL(312) 773-8484

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
No.	TYPE	Rec (in.)	Moist	N	Depth		qu (qa) (tsf)	W	LL	PL	D
						See Boring Log G113A for 0-49'					
					5						
					10						
					15						
					20						
					25						
					30						
					35	(Continued)					
					40						

WATER LEVEL OBSERVATIONS

While Drilling ▽ _____ Upon Completion of Drilling _____
Time After Drilling _____ _____ _____ _____
Depth to Water _____ _____ _____ _____ ▼
Depth to Cave in _____ _____ _____ _____

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

GENERAL NOTES

Start 11/2/87 End 11/2/87
Driller _____ Chief MG Rig CME
Logger _____ Editor _____ 550
Drill Method RB w/ DM

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LOG OF TEST BORING

Project Winnebago Reclamation Landfill

Location Rockford, Illinois

Boring No. G113
Surface Elevation 759.9
Job No. 13160
Sheet 2 of 2

ONE PIERCE PLACE · SUITE 1110, ITASCA, ILL. 60143 · TEL(312) 773-8484

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
No.	TYPE	Rec (in.)	Moist	N	Depth		qu (qa) (tsf)	W	LL	PL	D
					45						
					50	End boring at 49' Install Well G113 at 48.5'					
					55						
					60						
					65						
					70						
					75						
					80						
					85						

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LOG OF TEST BORING

Project Winnebago Reclamation Landfill

Location Rockford, Illinois

Boring No. G113A
Surface Elevation 760.0
Job No. 13160
Sheet 1 of 2

ONE PIERCE PLACE · SUITE 1110, ITASCA, ILL. 60143 · TEL(312) 773-8484

SAMPLE No.	Type	Rec (in.)	Moist	N	Depth	VISUAL CLASSIFICATION and Remarks	qu (qa) (tsf)	W	LL	PL	D
						Soft, Black SILT Topsoil, Some Fine Sand (ML)					
						Soft, Brown Black SILT, Some Sand, Some Clay (ML)					
1		18	D	8	5	Loose, Brown Fine to Medium SAND, Little Silt (Possible Fill) (SP)					
						Medium Dense, Yellow Brown Fine to Medium SAND, Some Silt (Possible Fill) (SP)					
2		18	D	27	10						
						Dense, Brown Fine to Coarse SAND, Some Fine Gravel (SW)					
3		10	M	37	15						
4		8	M	100/12"	20	Granite Chip in Spoon Tip					
5		10	M	82	25						
6		8	M	100/8"	30	Brown Silty Clay with Coarse Sand in Tip					
7		0		50/0"	35	Light Yellow Brown DOLOMITE Bedrock Run 1: 35-42'; 94% Recovery of Light Yellow Brown, Medium Hard Fractured, Vuggy DOLOMITE; Vertically Fractured 36.1-38.3'; Vugs Range from Pinhole to 0.5" dia., No Water Loss; RQD = 100%					
R1					40	Run 2: 42-50'; 83% Recovery of Light					

WATER LEVEL OBSERVATIONS

While Drilling ▽ _____ Upon Completion of Drilling _____
Time After Drilling _____ _____ _____ _____
Depth to Water _____ _____ _____ _____ ▼
Depth to Cave in _____ _____ _____ _____

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

GENERAL NOTES

Start 10/28/87 End 10/28/87
Driller _____ Chief MG Rig CME 550
Logger _____ Editor _____
Drill Method RB w/ DM-RC

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LOG OF TEST BORING

Project Winnebago Reclamation Landfill

Location Rockford, Illinois

Boring No. G113A
Surface Elevation 760.0
Job No. 13160
Sheet 2 of 2

ONE PIERCE PLACE · SUITE 1110, ITASCA, ILL. 60143 · TEL(312) 773-8484

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
No.	TYPE	Rec (in.)	Moist	N	Depth		qu (qa) (tsf)	W	LL	PL	D
						Yellow Brown Medium Hard, Fractured, Vuggy DOLOMITE; Vugs Range from Pinhole to 0.25" dia.; Little if any Water Loss, RQD = 93.7%					
R2					45	Run 3: 50-54'; 100% Recovery of Light Yellow Brown, Medium Hard, Fractured Vuggy DOLOMITE; Vertically Fractured 50-7-51.5', hard White Chert Layers at 50.5' (2") and 52' (1.5") Vugs range from Pinhole to 1.0"; Water Loss of 200 gals, RQD = 16.6%					
R3					50	Run 4: 54-64', 80% Recovery of Light Brown Medium Hard Fractured Very Vuggy DOLOMITE; Vugs Range from Pinhole to 1.0"; Water Loss of 400 gal; RQD = 87.5					
R4					55	Run 5: 64-74' 100% Recovery of Light Yellow Brown Medium Hard, Fractured, Vuggy DOLOMITE, Vugs Range from Pinhole to 0.25"; Water Loss of 250 gal; RQD = 58.3%					
R5					60						
					65						
					70						
					75	End Boring at 75' Install Well G113A at 75'					
					80						
					85						

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LOG OF TEST BORING

Project Winnebago Reclamation Landfill

Location Rockford, Illinois

Boring No. G114
Surface Elevation 755.4
Job No. 13160
Sheet 1 of 2

ONE PIERCE PLACE · SUITE 1110, ITASCA, ILL. 60143 · TEL(312) 773-8484

SAMPLE No.	Type	Rec (in.)	Moist	N	Depth	VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES qu (qa) (tsf)	W	LL	PL	D
						Soft Black Sandy SILT Topsoil (SM)					
						Loose, Dark Brown SILT, Some Fine to Medium Sand, Some Clay (ML)					
1		14	M	11							
					5	Medium Dense, Red Brown Fine to Medium SAND, Some Silt, Trace Fine Gravel (SP)					
2		16	M	68							
					10	Very Dense, Yellow Brown Fine to Coarse SAND, Some Fine to Coarse Gravel, Trace Silt (SW)					
3		5	M	75/5"							
					15	Weathered DOLOMITE Bedrock, Some Chert Chips in Mud Return					
R1					20	Run 1: 19-29'; 100% Recovery of Light Yellow Brown, Medium Hard, Fractured Slightly Vuggy DOLOMITE; Chert Layer @ 19.5' (1"); Thin Interbedded Chert Seams from 21.5-22.5'; Vugs Range from Pinhole to 1.0"; No Water Loss; RQD = 78.3%					
					25	Run 2: 29-39'; 100% Recovery of Light Yellow Brown, Medium Hard, Fractured, Slightly Vuggy DOLOMITE; Vertically Fractured 33.4-34.4'; Gravel Size Pieces 35.9-36.8', Water Loss 200 gals; RQD = 58.3%					
R2					30						
					35	Run 3: 39-46'; 93% Recovery of Yellow Brown, medium Hard, Fractured Slightly Vuggy DOLOMITE; Chert Layer at 40.5' (2.5"); Gravel Size Pieces at 41.3-42.0'; Water Loss of 150 gals; RQD = 42.8%					
						(Continued)					
					40						

WATER LEVEL OBSERVATIONS

While Drilling ▽ 36.0 Upon Completion of Drilling 36.2
Time After Drilling
Depth to Water ▼
Depth to Cave in

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

GENERAL NOTES

Start 11/3/87 End 11/3/87
Driller Chief MG Rig CME
Logger Editor 550
Drill Method RB w/ DM-RC

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LOG OF TEST BORING

Project Winnebago Reclamation Landfill

Location Rockford, Illinois

Boring No. G114
Surface Elevation 755.4
Job No. 13160
Sheet 2 of 2

ONE PIERCE PLACE · SUITE 1110, ITASCA, ILL. 60143 · TEL(312) 773-8484

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
No.	TYPE	Rec (in.)	Moist	N	Depth		qu (qa) (tsf)	W	LL	PL	D
					45						
						End Boring at 46' Install Well G114 at 46'					
					50						
					55						
					60						
					65						
					70						
					75						
					80						
					85						

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LOG OF TEST BORING

Project Winnebago Reclamation Landfill

Location Rockford, Illinois

Boring No. G115
Surface Elevation 726.9
Job No. 13160
Sheet 1 of 1

ONE PIERCE PLACE · SUITE 1110, ITASCA, ILL. 60143 · TEL(312) 773-8484

SAMPLE No.	Type	Rec (in.)	Moist	N	Depth	VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES qu (qa) (tsf)	W	LL	PL	D
						Soft, Brown Sandy SILT Topsoil, Little Vegetation, Possible Leachate Seep (SM)					
						Loose, Black Silty SAND & Pea GRAVEL (GM)					
1		15	M	10	5						
						Loose, Light Brown SILT, Some Clay (ML)					
						Interbedded Depositional Very Fine SAND, SILT and Fat CLAY Lenses (CH-MH)					
2		16	M	16	10						
3		12	W	7	15						
						Dense, Gray Black Mottled Fine to Medium SAND, Some Silt, Trace Clay (SM)					
4		18	W	46	20						
						End Boring at 20'					
						Install Well G115 at 21'					
					25						
					30						
					35						
					40						

WATER LEVEL OBSERVATIONS

While Drilling ▽ 14.0 Upon Completion of Drilling 16.4
Time After Drilling
Depth to Water ▼
Depth to Cave in

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

GENERAL NOTES

Start 10/23/87 End 10/23/87
Driller Chief MG Rig CME
Logger Editor 550
Drill Method 4.25" ID HSA

WARZYN

LOG OF TEST BORING

Project Winnebago Reclamation Landfill

Location Rockford, Illinois

Boring No. G116
Surface Elevation 711.4
Job No. 13160
Sheet 1 of 1

ONE PIERCE PLACE · SUITE 1110, ITASCA, ILL. 60143 · TEL(312) 773-8484

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
No.	TYPE	Rec (in.)	Moist	N	Depth		qu (qa) (tsf)	W	LL	PL	D
						See Boring Log G116A for 0-14'					
						Blind HSA Drilling					
					5						
					10						
					15	End Boring at 14'					
						Install Well G116 at 13.5'					
					20						
					25						
					30						
					35						
					40						

WATER LEVEL OBSERVATIONS

While Drilling ▽ 5.0 Upon Completion of Drilling 4.6
Time After Drilling
Depth to Water ▼
Depth to Cave in

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

GENERAL NOTES

Start 10/27/87 End 10/27/87
Driller Chief MG Rig CME
Logger Editor 550
Drill Method 4.25" ID HSA

WARZYN

LOG OF TEST BORING

Project Winnebago Reclamation Landfill

Location Rockford, Illinois

Boring No. G116A
Surface Elevation 711.4
Job No. 13160
Sheet 1 of 2

ONE PIERCE PLACE · SUITE 1110, ITASCA, ILL. 60143 · TEL(312) 773-8484

SAMPLE No.	Type	Rec (in.)	Moist	N	Depth	VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES qu (qa) (tsf)	W	LL	PL	D
						Soft, Dark Black Mollic SILT Topsoil (ML)					
1		18	W	13	5	Loose, Gray Black Fine to Medium SAND, Some SILT (SM)					
2		15	W	21	10	Medium Dense, Yellow Brown Fine to Coarse SAND, Some Fine to Coarse Gravel, Little Silt (SW)					
3		18	W	30	15						
4		18	W	70	20	Very Dense, Light Brown Fine to Coarse SAND, Some Silt, Some Fine to Coarse Gravel (SW)					
5		18	W	58	25						
6		7	W	100 /9"	30						
7		15	W	40	35						
8		14	W	60	40	(Continued)					

WATER LEVEL OBSERVATIONS

While Drilling ▽ 5.0 Upon Completion of Drilling 3.6
Time After Drilling
Depth to Water ▼
Depth to Cave in

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

GENERAL NOTES

Start 10/27/87 End 10/27/87
Driller Chief MG Rig CME
Logger Editor 550
Drill Method 4.25" ID HSA

WARZYN

LOG OF TEST BORING

Project Winnebago Reclamation Landfill

Location Rockford, Illinois

Boring No. G116A
Surface Elevation 711.4
Job No. 13160
Sheet 2 of 2

ONE PIERCE PLACE • SUITE 1110, ITASCA, ILL. 60143 • TEL(312) 773-8484

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
No.	TYPE	Rec (in.)	Moist	N	Depth		qu (qa) (tsf)	W	LL	PL	D
9		18	W	75							
					45	End boring at 45'					
						Install well G116A at 43'					
					50						
					55						
					60						
					65						
					70						
					75						
					80						
					85						

WARZYN

LOG OF TEST BORING

Project Winnebago Reclamation Landfill

Location Rockford, Illinois

Boring No. G117
Surface Elevation 721.9
Job No. 13160
Sheet 1 of 1

ONE PIERCE PLACE · SUITE 1110, ITASCA, ILL. 60143 · TEL(312) 773-8484

SAMPLE No.	TYPE	Rec (in.)	Moist	N	Depth	VISUAL CLASSIFICATION and Remarks	qu (qa) (tsf)	W	LL	PL	D
1						Thin Dark Brown Silty SAND Topsoil (SM)					
						Dense, Light Brown Fine to Coarse SAND & Coarse GRAVEL (GW)					
2		18	D	44	5						
3		18	M	32	10	Dense, Light Brown Fine to Coarse SAND, Trace Fine Gravel (SW)					
4		12	W	32	15	Dense, Brown Fine to Coarse SAND, Little to Some Fine to Coarse Gravel, Little Silt (SW)					
5		18	W	43	20						
6			W		25						
						End Boring at 25'					
						Install Well G117 at 23.5'					
					30						
					35						
					40						

WATER LEVEL OBSERVATIONS

While Drilling ▽ 14.5 Upon Completion of Drilling 14.5
Time After Drilling 10 min.
Depth to Water 17' ▼
Depth to Cave in

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

GENERAL NOTES

Start 10/13/87 End 10/13/87
Driller Chief CB Rig CME
Logger Editor 550
Drill Method 4.25" ID HSA

WARZYN

LOG OF TEST BORING

Project Winnebago Reclamation Landfill

Location Rockford, Illinois

Boring No. G118
Surface Elevation 715.5
Job No. 13160
Sheet 1 of 1

ONE PIERCE PLACE · SUITE 1110, ITASCA, ILL. 60143 · TEL(312) 773-8484

SAMPLE No.	Type	Rec (in.)	Moist	N	Depth	VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES qu (qe) (tsf)	W	LL	PL	D
						Black Silty Sand Topsoil (SM)					
1		3	M	13	5	Light Brown Fine to Coarse SAND, Some Fine to Coarse Gravel (SW)					
2		18	M	28	10	Very Stiff, Brown Lean CLAY, Some Silt (CL)					
3		15	W	45	15	Dense, Light Brown Fine to Coarse GRAVEL, Some Fine to Coarse Sand, Trace Silt (GW)					
4		12	W	40	20						
5			W	26	25	Medium Dense, Light Brown Medium to Coarse SAND, Trace Silt, Little Fine Gravel (SP)					
6			W	29	30						
					35	End Boring at 30' Install well G118 at 13.5'					
					40						

WATER LEVEL OBSERVATIONS

While Drilling ▽ 5.0 Upon Completion of Drilling 7.8
Time After Drilling 14 hrs
Depth to Water 6.5' ▼
Depth to Cave in

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

GENERAL NOTES

Start 10/13/87 End 10/13/87
Driller Chief CB Rig CME
Logger Editor 550
Drill Method 4.25" ID HSA

WARZYN

LOG OF TEST BORING

Project Winnebago Reclamation Landfill

Location Rockford, Illinois

Boring No. G118A
Surface Elevation 715.5
Job No. 13160
Sheet 1 of 2

ONE PIERCE PLACE · SUITE 1110, ITASCA, ILL. 60143 · TEL(312) 773-8484

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
No.	TYPE	Rec (in.)	Moist	N	Depth		qu (qa) (tsf)	W	LL	PL	D
						See Boring Log G118 for 0-30'					
					5						
					10						
					15						
					20						
					25						
					30						
1		10	W	42	35	Dense, Reddish Light Brown Medium to Coarse SAND, Some Fine Gravel, Trace Silt (SP)					
						(Continued)					
2		14	W	68	40						

WATER LEVEL OBSERVATIONS

While Drilling ▽ 6.5 Upon Completion of Drilling 7.8
Time After Drilling
Depth to Water ▼
Depth to Cave in

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

GENERAL NOTES

Start 10/14/87 End 10/14/87
Driller Chief CB Rig CME
Logger Editor 550
Drill Method RB w/ DM

WARZYN

LOG OF TEST BORING

Project Winnebago Reclamation Landfill

Location Rockford, Illinois

Boring No. G118A
Surface Elevation 715.5
Job No. 13160
Sheet 2 of 2

ONE PIERCE PLACE · SUITE 1110, ITASCA, ILL. 60143 · TEL(312) 773-8484

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
No.	TYPE	Rec (in.)	Moist	N	Depth		qu (qs) (tsf)	W	LL	PL	D
3		8	W	32	45	End Boring at 45' Install Well G118A at 43'					
					50						
					55						
					60						
					65						
					70						
					75						
					80						
					85						

WARZYN

LOG OF TEST BORING

Project Winnebago Reclamation Landfill

Location Rockford, Illinois

Boring No. G118R
Surface Elevation
Job No. 13160
Sheet 1 of 1

ONE PIERCE PLACE · SUITE 1110, ITASCA, ILL. 60143 · TEL(312) 773-8484

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
No.	TYPE	Rec (in.)	Moist	N	Depth		qu (qa) (tsf)	W	LL	PL	D
						Hollow Stem Augered to 15', No Samples. Refer to Log G118 for Detailed Subsurface Information					
					5						
					10						
					15	End Boring at 15'					
					20						
					25						
					30						
					35						
					40						

WATER LEVEL OBSERVATIONS

While Drilling ▽ _____ Upon Completion of Drilling _____
Time After Drilling _____ _____ _____ _____
Depth to Water _____ _____ _____ _____ ▼
Depth to Cave in _____ _____ _____ _____

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

GENERAL NOTES

Start 6/9/88 End 6/9/88
Driller ETI Chief LS Rig 9130
Logger Editor
Drill Method HSA

WARZYN

LOG OF TEST BORING

Project Winnebago Reclamation Landfill

Location Rockford, Illinois

Boring No. G119
Surface Elevation 717.5
Job No. 13160
Sheet 1 of 1

ONE PIERCE PLACE · SUITE 1110, ITASCA, ILL. 60143 · TEL(312) 773-8484

SAMPLE No.	Type	Rec (in.)	Moist	N	Depth	VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES qu (qa) (tsf)	W	LL	PL	D
						Dark Brown Silty SAND Topsoil (SM)					
						Medium Dense, Light Brown to Brown Fine to Coarse SAND and Fine to Coarse GRAVEL (GW)					
1		4	D	19	5						
						Dense, Light Brown Fine to Coarse SAND and Fine to Coarse GRAVEL, Some Silt (GM)					
2		10	M	49	10						
3		12		26	15						
						Very Dense, Medium to Coarse SAND, Trace Fine Gravel, Some Silt (SM)					
4				52	20						
						End Boring at 20'					
						Install Well G119 at 18'					
					25						
					30						
					35						
					40						

WATER LEVEL OBSERVATIONS

While Drilling ▽ 11.0 Upon Completion of Drilling 10.3
Time After Drilling
Depth to Water ▼
Depth to Cave in

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

GENERAL NOTES

Start 10/21/87 End 10/21/87
Driller Chief JG Rig CME 550
Logger Editor
Drill Method 4.25" ID HSA

WARZYN

LOG OF TEST BORING

Project Winnebago Reclamation Landfill

Location Rockford, Illinois

Boring No. G119A
Surface Elevation 717.5
Job No. 13160
Sheet 1 of 2

ONE PIERCE PLACE · SUITE 1110, ITASCA, ILL. 60143 · TEL(312) 773-8484

SAMPLE No.	Type	Rec (in.)	Moist	N	Depth	VISUAL CLASSIFICATION and Remarks	qu (qa) (tsf)	W	LL	PL	D
						See Boring Log G119 for 0-20'					
					5						
					10						
					15						
					20	Very Dense, Medium to Coarse SAND, Some Fine Gravel, Trace Silt (SP)					
1		8	W	100/14"	25						
2		0	W	51	30						
						Dense, Fine to Coarse SAND, Some Fine to Coarse Gravel, Some Silt (SW)					
3		10	W	39	35						
						(Continued)					
4		8	W	30/	40						

WATER LEVEL OBSERVATIONS

While Drilling ▽ 11.0 Upon Completion of Drilling 10.4
Time After Drilling
Depth to Water
Depth to Cave in

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

GENERAL NOTES

Start 10/22/87 End 10/22/87
Driller Chief MG Rig CME
Logger Editor 550
Drill Method RB w/ DM

WARZYN

LOG OF TEST BORING

Project Winnebago Reclamation Landfill

Location Rockford, Illinois

Boring No. G119A
Surface Elevation 717.5
Job No. 13160
Sheet 2 of 2

ONE PIERCE PLACE · SUITE 1110, ITASCA, ILL. 60143 · TEL(312) 773-8484

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
No.	TYPE	Rec (in.)	Moist	N	Depth		qu (qa) (tsf)	W	LL	PL	D
				3"							
					45						
					50	End Boring at 49' Install Well G119A at 48'					
					55						
					60						
					65						
					70						
					75						
					80						
					85						

WARZYN

LOG OF TEST BORING

Project Winnebago Reclamation Landfill

Location Rockford, Illinois

Boring No. P3R
Surface Elevation 747.6
Job No. 13160
Sheet 1 of 2

ONE PIERCE PLACE · SUITE 1110, ITASCA, ILL. 60143 · TEL(312) 773-8484

SAMPLE / VISUAL CLASSIFICATION and Remarks / SOIL PROPERTIES

No.	Type	Rec (in.)	Moist	N	Depth	Visual Classification and Remarks	qu (qa) (tsf)	W	LL	PL	D
						Loose, Yellow SAND & GRAVEL (Fill) (GP)					
1		10	D	19	5						
						Medium Dense, Dark Brown to Black Lean CLAY, Some Silt (CL)					
2		15	D	45	10	Dense, Yellow Fine to Coarse SAND and Fine to Coarse GRAVEL, Trace Silt (GW)					
3		18	M	37	15						
						Coarse Rounded GRAVEL, Some Cobbles (GP)					
4		0	M	100 /0"	20						
						Very Dense, Yellow Brown Fine to Coarse SAND, Some Fine to Coarse Gravel, Trace Silt (SW)					
5		8	M	64	25						
6		5	D	57	30						
7		2	D	100 /2"	35	Dolomite Chip in Tip					
						(Continued)					
8		10	D	100	40						

WATER LEVEL OBSERVATIONS

While Drilling ▽ 41.0 Upon Completion of Drilling 40.9
Time After Drilling
Depth to Water
Depth to Cave in

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

GENERAL NOTES

Start 10/16/87 End 10/16/87
Driller Chief LN Rig CME
Logger Editor 550
Drill Method 4.25" ID HSA

WARZYN

LOG OF TEST BORING

Project Winnebago Reclamation Landfill

Location Rockford, Illinois

Boring No. P3R
Surface Elevation 747.6
Job No. 13160
Sheet 2 of 2

ONE PIERCE PLACE · SUITE 1110, ITASCA, ILL. 60143 · TEL(312) 773-8484

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
No.	TYPE	Rec (in.)	Moist	N	Depth		qu (qa) (tsf)	W	LL	PL	D
				/11"							
						Very Dense, Yellow Brown Fine to Coarse SAND, Some Fine to Coarse Gravel, Some Silt (GM)					
9	■	6	W	100 /8"	45						
10	■	0	W	100 /6"	50						
						End Boring at 50' Install Well P3R at 48'					
					55						
					60						
					65						
					70						
					75						
					80						
					85						

WARZYN

LOG OF TEST BORING

Project Winnebago Reclamation Landfill

Location Rockford, Illinois

Boring No. P4R
Surface Elevation 748.0
Job No. 13160
Sheet 1 of 2

ONE PIERCE PLACE · SUITE 1110, ITASCA, ILL. 60143 · TEL(312) 773-8484

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
No.	TYPE	Rec (in.)	Moist	N	Depth		qu (qa) (tsf)	W	LL	PL	D
						See P3R Boring Log for 0-50'					
					5						
					10						
					15						
					20						
					25						
					30						
					35						
					40	(Continued)					

WATER LEVEL OBSERVATIONS

While Drilling ▽ 41.0 Upon Completion of Drilling 40.9
Time After Drilling
Depth to Water ▼
Depth to Cave in

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

GENERAL NOTES

Start 10/19/87 End 10/19/87
Driller Chief MG Rig CME
Logger Editor 550
Drill Method RB w/ DM

WARZYN

LOG OF TEST BORING

Project Winnebago Reclamation Landfill

Location Rockford, Illinois

Boring No. P4R
Surface Elevation 748.0
Job No. 13160
Sheet 2 of 2

ONE PIERCE PLACE · SUITE 1110, ITASCA, ILL. 60143 · TEL(312) 773-8484

SAMPLE No.	Type	Rec (in.)	Moist	N	Depth	VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES qu (qa) (tsf)	W	LL	PL	D
					45						
					50	Very Dense, Yellow Brown Fine to Coarse SAND, Some Fine to Coarse Gravel, Some Silt (GM)					
1		10	W	67	55						
2		12	W	100 /14"	60						
3		6	W	100 /10"	65						
4		12	W	100 /15"	70	End Boring at 70' Install well P4R at 68'					
					75						
					80						
					85						

WARZYN

LOG OF TEST BORING

Project Winnebago Reclamation Landfill

Location Rockford, Illinois

Boring No. B15P
Surface Elevation 741.1
Job No. 13160
Sheet 1 of 2

ONE PIERCE PLACE · SUITE 1110, ITASCA, ILL. 60143 · TEL(312) 773-8484

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
No.	TYPE	Rec (in.)	Moist	N	Depth		qu (qa) (tsf)	W	LL	PL	D
						Blind Mud Rotary Wash Boring to 48.5'					
					5						
					10						
					15						
					20						
					25						
					30						
					35	(Continued)					
					40						

WATER LEVEL OBSERVATIONS

While Drilling ▽ 33.0 Upon Completion of Drilling 33.0
Time After Drilling
Depth to Water ▼
Depth to Cave in

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

GENERAL NOTES

Start 10/15/87 End 10/15/87
Driller Chief CB Rig CME
Logger Editor 55
Drill Method RB w/ DM

WARZYN

LOG OF TEST BORING

Project Winnebago Reclamation Landfill

Location Rockford, Illinois

Boring No. B15P
Surface Elevation 741.1
Job No. 13160
Sheet 2 of 2

ONE PIERCE PLACE · SUITE 1110, ITASCA, ILL. 60143 · TEL(312) 773-8484

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
No.	Type	Rec (in.)	Moist	N	Depth		qu (qa) (tsf)	W	LL	PL	D
					45						
1		6	W	75	50	Very Dense, Brown SILT, Some Fine to Coarse SAND, Trace Fine Gravel (ML)					
						Very Dense Yellow Weathered DOLOMITE Bedrock					
2		2	W	80	55	Dolomite Chip in Spoon Tip					
					60						
					65	End Boring at 63' Install well B15P at 63'					
					70						
					75						
					80						
					85						

APPENDIX B

WELL CONSTRUCTION DETAILS

Winnebago Reclamation Landfill

Elevations are in feet referenced to mean sea level (MSL)

These elevations supercede those reported on well construction logs in Appendix B

Boring No.	Drilled By	Year Drilled	Illinois State Plane Coordinates (West Zone) Northing	Easting	Total Well Depth(ft)	Total Screen Length(ft)	Length of sand Pack (ft)	Ground Elevation (ft,MSL) 8/89	Top of Outer Casing Elevation (ft,MSL) 8/89	Top of Inner Casing Elevation (ft,MSL) 8/89	Water Tab Piezo or clay well=B
B1	E&E	1982	2002143.6	804385.1	51.7	5	16	770.5	773.19	772.87	W
B2	E&E	1982	2002143.4	803629.6	73.5	5	21	790.2	792.66	792.40	W
B3	E&E	1982	2000515.7	802526.1	40	5	17	742.3	745.14	745.00	B
B4	E&E	1982	2001666.9	803477.2	35.5	5	21	755.1	757.97	757.66	W
B5	E&E	1982	2001037.3	803545.8	35	5	15	750.1	752.94	752.85	W
B6S	E&E	1982	2001583.8	803020.1	48.5	5	13	751.7	754.34	754.02	B
B6D	E&E	1982	2001583.7	803015.4	100	5	60	751.7	754.53	754.21	B
B7	E&E	1982	2001929.8	802855.0	30.5	5	21.5	749.0	752.15	751.85	W
B8	E&E	1982	2001001.5	802311.8	35	5	10	747.5	750.55	750.22	W
B9	E&E	1982	2001565.9	802380.9	42.5	5	28.5	755.3	758.79	758.58	W
B10	E&E	1982	2002503.4	801516.1	40	5	23	741.9	744.65	744.34	W
B10A	WEI	1984	2002499.9	801520.5	61.8	5	9	742.0	743.93	743.94	B
B11	E&E	1982	2002085.5	801929.8	47.3	5	28.3	757.8	761.04	760.74	W
B11A	WEI	1984	2002085.9	801924.5	75.4	5	10	756.6	759.23	759.09	B
B12	E&E	1982	2001588.8	801767.1	48.9	5	21	758.4	760.85	760.52	W
B13	E&E	1982	2001316.6	800990.1	32.5	5	12.5	736.6	739.69	739.46	W
B14	E&E	1982	2000728.0	800694.2	15	5	10	714.3	717.62	717.30	W
B15	E&E	1982	2002373.8	800415.1	40	5	24	743.1	744.88	744.55	W
B15R	WEI	1984	2002384.0	800534.4	43.2	5	7	742.9	746.16	746.29	W
B15P	WEI	1987	2002387.2	800417.4	63	5	9	741.5	743.68	743.52	B
B16	E&E	1982	2002103.7	802389.7	45.4	5	23	760.7	763.23	762.87	W
B16A	E&E	1984	2002103.4	802384.3	69.9	5	9	760.4	762.84	762.72	B
G107	WEI	1984	2002777.8	800994.8	36.2	10	11	737.5	739.74	739.58	W
G108	WEI	1984	2002292.1	801724.0	44.2	10	17	749.1	751.37	751.29	W
G109	WEI	1984	2001645.2	801760.5	51.7	10	16	759.0	760.8	760.79	W
G109A	WEI	1984	2001650.4	801762.2	79.5	5	9.5	759.1	761.26	761.03	B
G110	WEI	1984	2001485.2	801237.1	43.1	10	13	745.0	748.22	748.08	W
G111	WEI	1984	2000990.7	801788.2	36.2	10	13	738.9	741.24	741.04	W
G112	WEI	1987	2001743.3	801853.9	44	10	12	760.4	763.48	763.29	W

Winnebago Reclamation Landfill

Elevations are in feet referenced to mean sea level (MSL)

These elevations supercede those reported on well construction logs in Appendix B

Boring No.	Drilled By	Year Drilled	Illinois State Plane Coordinates (West Zone) Northing	Easting	Total Well Depth(ft)	Total Screen Length(ft)	Length of sand Pack (ft)	Ground Elevation (ft,MSL) 8/89	Top of Outer Casing Elevation (ft,MSL) 8/89	Top of Inner Casing Elevation (ft,MSL) 8/89	Water Tab Piezo or clay well=B
G113	WEI	1987	2001424.2	801720.9	48.5	10	12	759.9	762.29	762.22	W
G113A	WEI	1987	2001430.9	801714.8	75	5	12	760.0	762.85	762.89	B
G114	WEI	1987	2001576.1	801486.1	45.5	10	12	755.5	758.25	758.11	W
G115	WEI	1987	2001246.0	800020.5	21	10	13	727.1	729.3	729.03	W
G116	WEI	1987	2002021.0	798812.1	13.5	10	11.5	711.4	713.92	713.76	W
G116A	WEI	1987	2002021.5	798806.7	43	5	15	711.4	714.23	714.06	B
G117	WEI	1987	2002550.2	799202.4	24.5	10	16	722.2	723.61	723.25	W
G118A	WEI	1987	2002786.7	799607.4	43	5	9	715.8	718.39	718.21	B
G118R	WEI	1988	2002790.5	799604.1	14	10	12	715.3	717.93	717.61	W
G119	WEI	1987	2003118.7	799226.0	18	10	14.5	717.6	720.44	720.22	W
G119A	WEI	1987	2003126.2	799230.3	48	5	13	717.6	720.19	720.04	B
P1	ECJ	1984	2002055.9	799343.5	35	5	7	725.5	728.06	727.69	B
P3R	WEI	1987	2001897.3	799552.5	49.2	10	14	747.7	749.74	749.58	W
P4R	WEI	1987	2001885.1	799555.9	69.3	5	14	748.2	749.98	749.80	B
P6	ECJ	1984	2001315.9	801016.8	50	5	6.5	737.2	740.31	739.71	B
P7	ECJ	1984			31						W
P8	ECJ	1984	2001247.4	803790.9	36			746.0	748.77	748.18	B
P9	ECJ	1984	2001239.5	803766.6	51			745.8	749.12	748.67	B
MW-101	ECJ	1984			100						B
MW-102	ECJ	1984			54						B
MW-103	ECJ	1984	2001600.2	804573.4	59.5			748.6	751.65	751.17	B
MW-104	ECJ	1984	2000842.5	803563.5	135			754.4	757.16	756.72	B
MW-105	ECJ	1984	2001584.6	803041.1	76	10	12.5	750.6	753.47	752.82	B
MW-106	ECJ	1984	2002065.6	799325.6	60	10	13	724.9	727.47	725.89	B
MW-107	ECJ	1984	2002727.9	802233.5	150			746.7	750.62	749.78	B
SG-1			2002008.9	799274.0						708.51	
SG-2			2001640.2	799492.0						708.50	
SG-3			2000909.6	799765.3						709.41	

Winnebago Reclamation Landfill
Summary of Well Construction Details

Boring Number	Installed by	Year Installed	Illinois State Plane Coordinates (West Zone) North	East	Depth of Well (ft. below TOIC)	Base of Screen Elevation (ft,MSL)	Screened Interval Length (feet)	Length of Sand Pack (feet)	Ground Surface Elevation (ft,MSL)	TOOC Elevation (ft,MSL)	TOIC Elevation (ft,MSL)	Well Type
B1	E&E	1982	2002143.6	804385.1	48.4	724.47	5	15.7	770.5	773.19	772.87	W
B2	E&E	1982	2002143.4	803629.6	75.7	716.70	5	20.5	790.2	792.66	792.40	W
B3	E&E	1982	2000515.7	802526.1	34.8	710.20	5	17.0	742.3	745.14	745.00	B
B4	E&E	1982	2001666.9	803477.2	37.5	720.16	5	21.0	755.1	757.97	757.66	W
B5	E&E	1982	2001037.3	803545.8	36.6	716.25	5	14.0	750.1	752.94	752.85	W
B6S	E&E	1982	2001583.8	803020.1	51.2	702.82	5	16.5	751.7	754.34	754.02	B
B6D	E&E	1982	2001583.7	803015.4	102.3	651.91	5	60.0	751.7	754.53	754.21	B
B7	E&E	1982	2001929.8	802855.0	33.5	718.35	5	21.5	749.0	752.15	751.85	W
B8	E&E	1982	2001001.5	802311.8	37.4	712.82	5	10.0	747.5	750.55	750.22	B
B9	E&E	1982	2001565.9	802380.9	45.6	712.98	5	28.0	755.3	758.79	758.58	W
B10	E&E	1982	2002503.4	801516.1	42.7	701.64	5	23.0	741.9	744.65	744.34	W
B10A	WI	1984	2002499.9	801520.5	63.7	680.24	5	9.6	742.0	743.93	743.94	B
B11	E&E	1982	2002085.5	801929.8	50.4	710.34	5	18.3	757.8	761.04	760.74	W
B11A	WI	1984	2002085.9	801924.5	77.1	681.99	5	9.4	756.6	759.23	759.09	B
B12	E&E	1982	2001588.8	801767.1	51.3	709.22	5	20.9	758.4	760.85	760.52	W
B13	E&E	1982	2001316.6	800990.1	35.6	703.86	5	12.5	736.6	739.69	739.46	W
B14	E&E	1982	2000728.0	800694.2	17.2	700.10	5	9.0	714.3	717.62	717.30	W
B15	E&E	1982	2002373.8	800415.1	42.1	702.45	5	24.0	743.1	744.88	744.55	W
B15R	WI	1984	2002384.0	800534.4	47.5	698.79	5	7.5	742.9	746.16	746.29	W
B15P	WI	1987	2002387.2	800417.4	65.2	678.32	5	9.0	741.5	743.68	743.52	B
B16	E&E	1982	2002103.7	802389.7	49.0	713.87	5	22.4	760.7	763.23	762.87	W
B16A	WI	1984	2002103.4	802384.3	72.0	690.72	5	9.4	760.4	762.84	762.72	B
G107	WI	1984	2002777.8	800994.8	40.5	699.08	10.1	15.0	737.5	739.74	739.58	W
G108	WI	1984	2002292.1	801724.0	46.4	704.89	10.1	17.0	749.1	751.37	751.29	W
G109	WI	1984	2001645.2	801760.5	53.8	706.99	10.1	17.0	759.0	760.80	760.79	W
G109A	WI	1984	2001650.4	801762.2	81.7	679.33	5	10.0	759.1	761.26	761.03	B
G110	WI	1984	2001485.2	801237.1	45.7	702.38	10.1	13.6	745.0	748.22	748.08	W
G111	WI	1984	2000990.7	801788.2	37.9	703.14	10.1	13.7	738.9	741.24	741.04	W
G112	WI	1987	2001743.3	801853.9	47.0	716.29	10	NA	760.4	763.48	763.29	W
G113	WI	1987	2001424.2	801720.9	51.0	711.22	10	14.0	759.9	762.29	762.22	W
G113A	WI	1987	2001430.9	801714.8	78.0	684.89	5	12.0	760.0	762.85	762.89	B

Table continued on the following page.

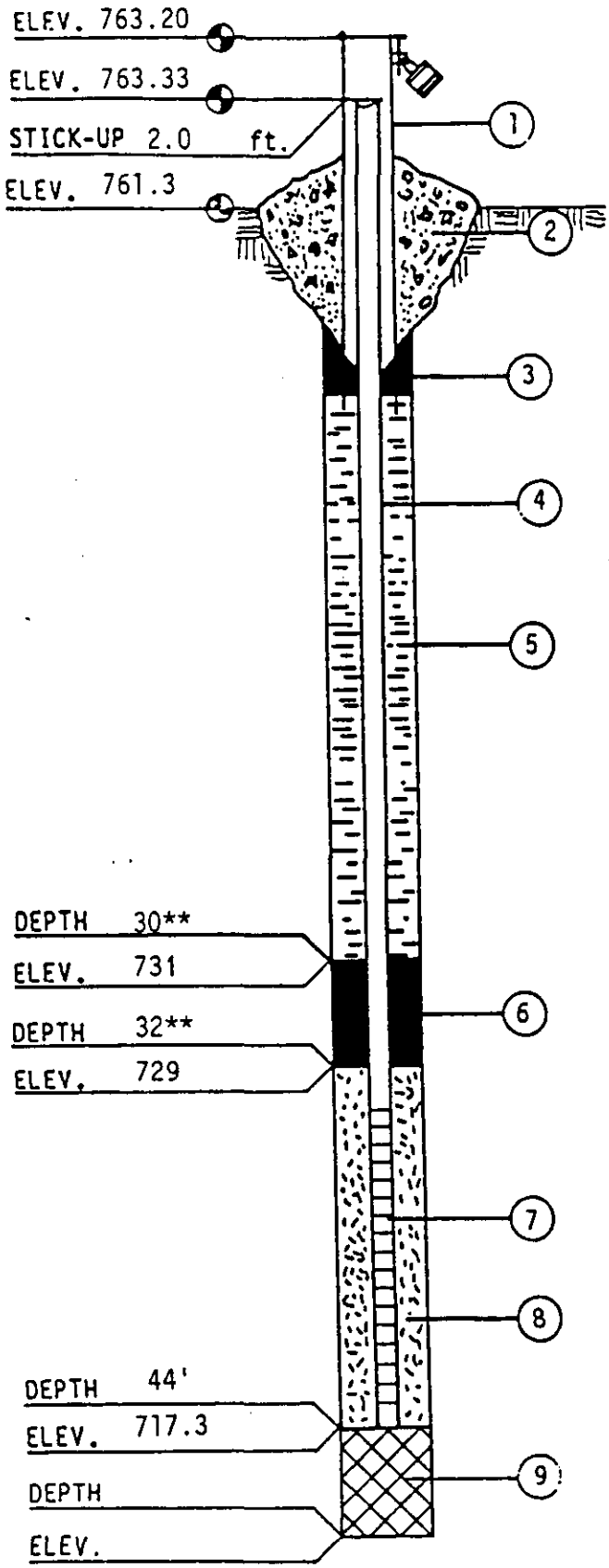
PAGLCOOR.wk1/MJH//DSP

Winnebago Reclamation Landfill
Summary of Well Construction Details

Boring Number	Installed by	Year Installed	Illinois State Plane Coordinates (West Zone) North	East	Total Depth of Well (feet)	Base of Screen Elevation (ft,MSL)	Screened Interval Length (feet)	Length of Sand Pack (feet)	Ground Surface Elevation (ft,MSL)	TOOC Elevation (ft,MSL)	TOIC Elevation (ft,MSL)	Well Type
G114	WI	1987	2001576.1	801486.1	48.0	710.11	10	NA	755.5	758.25	758.11	W
G115	WI	1987	2001246.0	800020.5	23.0	706.03	10	13.0	727.1	729.30	729.03	W
G116	WI	1987	2002021.0	798812.1	15.8	697.96	10	12.0	711.4	713.92	713.76	W
G116A	WI	1987	2002021.5	798806.7	45.6	668.46	5	17.0	711.4	714.23	714.06	B
G117	WI	1987	2002550.2	799202.4	26.0	697.25	10	16.5	722.2	723.61	723.25	W
G118A	WI	1987	2002786.7	799607.4	45.7	672.51	5	11.0	715.8	718.39	718.21	B
G118R	WI	1988	2002790.5	799604.1	16.5	701.11	9.5	13.0	715.3	717.93	717.61	W
G119	WI	1987	2003118.7	799226.0	20.6	699.62	10	14.5	717.6	720.44	720.22	W
G119A	WI	1987	2003126.2	799230.3	50.5	669.54	5	13.0	717.6	720.19	720.04	B
P1	ECJ	1984	2002055.9	799343.5	38.0	689.69	5	7.0	725.5	728.06	727.69	B
P3R	WI	1987	2001897.3	799552.5	50.4	699.18	10	13.7	747.7	749.74	749.58	W
P4R	WI	1987	2001885.1	799555.9	70.0	679.80	5	14.3	748.2	749.98	749.80	B
P6	ECJ	1984	2001315.9	801016.8	52.5	687.21	5	6.5	737.2	740.31	739.71	B
P7	ECJ	1984	NS	NS	31.9	NS	NA	NA	NS	NS	NS	W
P8	ECJ	1984	2001247.4	803790.9	38.6	709.58	NA	NA	746.0	748.77	748.18	B
P9	ECJ	1984	2001239.5	803766.6	53.3	695.37	NA	NA	745.8	749.12	748.67	B
MW-101	ECJ	1984	NS	NS	NM	NS	NA	NA	NS	NS	NS	B
MW-102	ECJ	1984	NS	NS	55.5	NS	NA	NA	NS	NS	NS	B
MW-103	ECJ	1984	2001600.2	804573.4	61.5	689.67	NA	NA	748.6	751.65	751.17	B
MW-104	ECJ	1984	2000842.5	803563.5	136.2	620.52	NA	NA	754.4	757.16	756.72	B
MW-105	ECJ	1984	2001584.6	803041.1	78.3	674.52	10	12.5	750.6	753.47	752.82	B
MW-106	ECJ	1984	2002065.6	799325.6	61.5	664.39	10	13.0	724.9	727.47	725.89	B
MW-107	ECJ	1984	2002727.9	802233.5	NM	NM	NA	NA	746.7	750.62	749.78	B
SG-1	WI	1990	2002008.9	799274.0	--	--	--	--	--	--	708.51	--
SG-2	WI	1990	2001640.2	799492.0	--	--	--	--	--	--	708.50	--
SG-3	WI	1990	2000909.6	799765.3	--	--	--	--	--	--	709.41	--

PAGLCOOR.wk1/MJH/DSP

Notes:
TOIC = The top of the inner well casing.
TOOC = The top of the outer protective casing.
B = Denotes a well screened below the surface of the water table (piezometer) or a well screened in clay soils.
W = Denotes a well screened at or near the surface of the water table.
NS = The well was not surveyed.
NA = The information was not available to Warzyn Inc.
NM = Not measured.
E&E = Ecology and Environment, Inc.
WE = Warzyn Inc.
ECJ = E.C. Jordan Co.
All elevations are expressed in feet above mean sea level (ft,MSL).
The TOIC and TOOC elevations reported in this table suprecede those reported on the well construction diagrams contained in Appendix B.
The wells were resurveyed for elevation and location during August 1989.
The total depths of the wells were measured during groundwater sampling events by Warzyn Inc.



MONITORING WELL CONSTRUCTION INFORMATION

JOB NO. 13160.11

BORING/WELL NO. G112

DATE 11/4/87

CHIEF/UNIT MG/CME 550

1. PROTECTIVE CASING (YES) NO

   LOCKING (YES) NO

2. CONCRETE SEAL (YES) NO

3. TYPE OF SURFACE SEAL (IF INSTALLED)
   Granular & Powder Bentonite

4. SOLID PIPE TYPE Stainless Steel - 10'
   ~~Galvanized Steel - 26'~~

   SOLID PIPE LENGTH 36 ft.

   JOINT TYPE SLIP/GLUED (THREADED) w/Teflon Tape

5. TYPE OF BACKFILL Quick Gel, Bentonite ~~Grout~~

   HOW INSTALLED (TREMIE) FROM SURFACE

6. TYPE OF LOWER SEAL (IF INSTALLED)
   Bentonite Pellets

7. SCREEN TYPE Continous Wrap Stainless Steel

   SCREEN LENGTH 10.8'

   SLOT-SIZE 0.010" LENGTH 10.0 ft.

   SCREEN DIAMETER 2" in.

8. TYPE OF BACKFILL AROUND SCREEN
   #30 Flint Sand

9. TYPE OF BACKFILL None

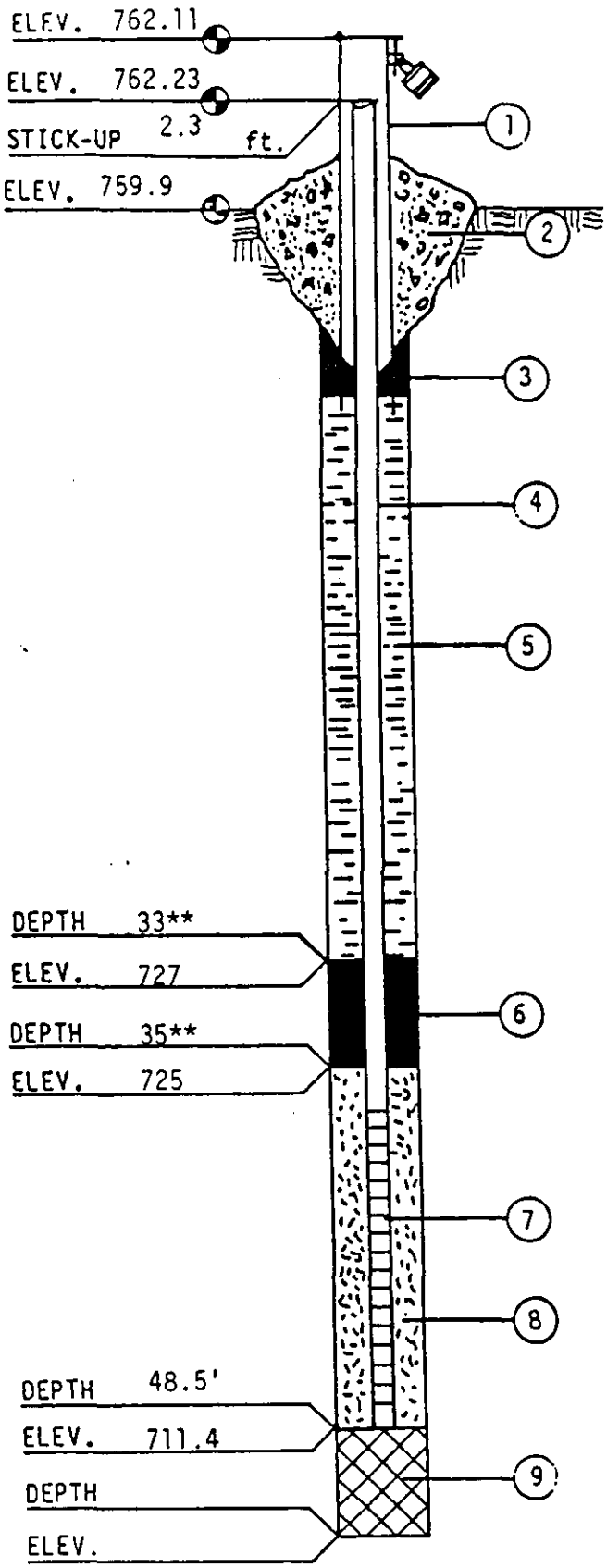
10. DRILLING METHOD 3 7/8" Wash Bore 0-24'
    HQ Core 24-44'

11. ADDITIVES USED (IF ANY)
    Drilling Mud 0-24'

WATER LEVEL _____ DATE _____

*ALL DEPTHS MEASURED FROM GROUND SURFACE.
** UNCERTAIN, MEASUREMENT DIFFICULTIES.

WARZYN ENGINEERING INC



MONITORING WELL CONSTRUCTION INFORMATION

JOB NO. 13160.11

BORING/WELL NO. G113

DATE 11/2/87

CHIEF/UNIT MG/CME 550

1. PROTECTIVE CASING (YES) NO

   LOCKING (YES) NO

2. CONCRETE SEAL (YES) NO

3. TYPE OF SURFACE SEAL (IF INSTALLED)
   Granular Bentonite

4. SOLID PIPE TYPE Stainless Steel - 10'
   ~~Galvanized Steel - 30'~~

   SOLID PIPE LENGTH 40 ft.

   JOINT TYPE SLIP/GLUED (THREADED)

5. TYPE OF BACKFILL Quick Gel Bentonite Grout

   HOW INSTALLED (TREMIE) FROM SURFACE

6. TYPE OF LOWER SEAL (IF INSTALLED)
   Bentonite Pellets

7. SCREEN TYPE Continuous Wrap Stainless Steel

   SCREEN LENGTH 10.8'

   SLOT-SIZE 0.010" LENGTH 10 ft.

   SCREEN DIAMETER 2 in.

8. TYPE OF BACKFILL AROUND SCREEN
   #30 Flint Sand

9. TYPE OF BACKFILL None

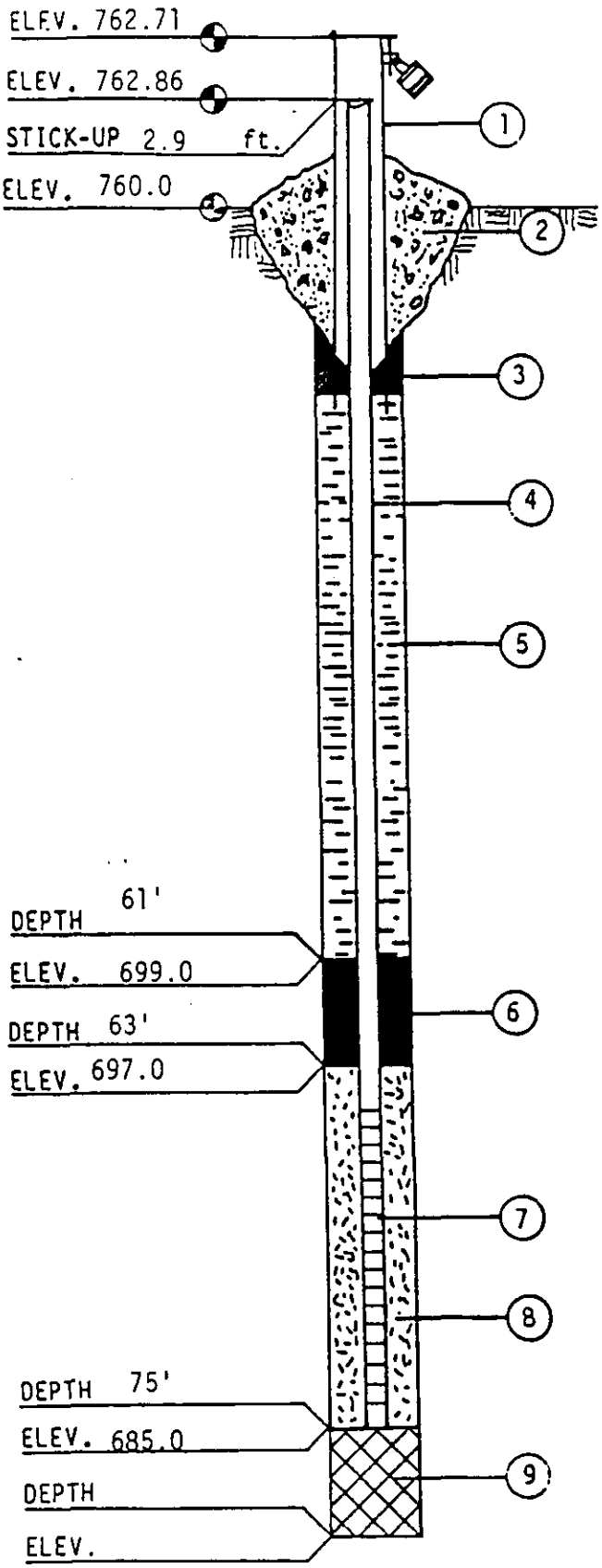
10. DRILLING METHOD 3 7/8" Wash Bore

11. ADDITIVES USED (IF ANY)
    Drilling Mud

WATER LEVEL 41.1' DATE 11/3/87

*ALL DEPTHS MEASURED FROM GROUND SURFACE.
** UNCERTAIN, MEASUREMENT DIFFICULTIES.

WARZYN ENGINEERING INC



MONITORING WELL CONSTRUCTION INFORMATION

JOB NO. 13160.11

BORING/WELL NO. G113A

DATE 10/30/87

CHIEF/UNIT MG/CME 550

1. PROTECTIVE CASING (YES) NO

   LOCKING (YES) NO

2. CONCRETE SEAL (YES) NO

3. TYPE OF SURFACE SEAL (IF INSTALLED)
   Granular Bentonite

4. SOLID PIPE TYPE Stainless Steel - 40' ~~Galvanized Steel - 32'~~

   SOLID PIPE LENGTH 72 ft.

   JOINT TYPE SLIP/GLUED (THREADED)

5. TYPE OF BACKFILL Quick Gel Bentonite ~~Grout~~

   HOW INSTALLED (TREMIE) FROM SURFACE

6. TYPE OF LOWER SEAL (IF INSTALLED)
   Bentonite Pellets

7. SCREEN TYPE Continous Wrap Stainless Steel

   SCREEN LENGTH 5.4'

   SLOT-SIZE 0.010" LENGTH 5 ft.

   SCREEN DIAMETER 2 in.

8. TYPE OF BACKFILL AROUND SCREEN
   #30 Flint Sand

9. TYPE OF BACKFILL None

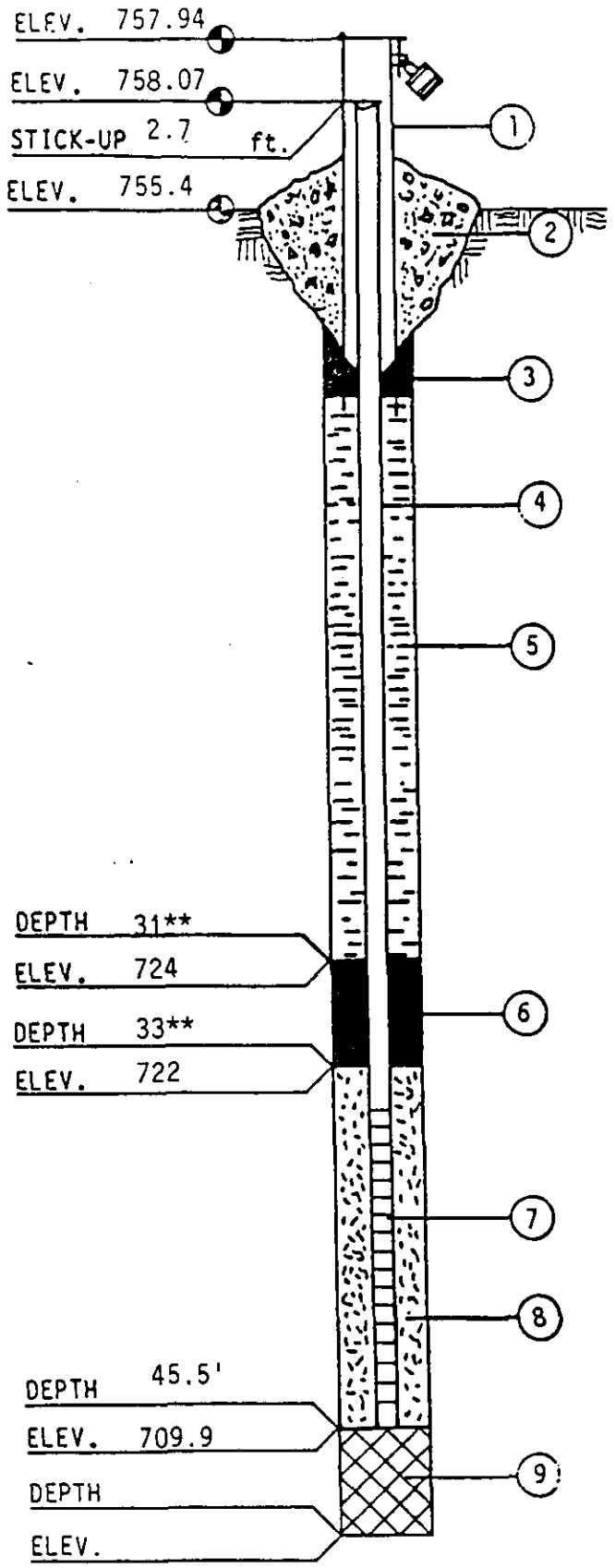
10. DRILLING METHOD Wash Bore w/Mud Cased ~~Rock Coring~~

11. ADDITIVES USED (IF ANY)
    Drilling Mud 0-33'

WATER LEVEL 41.3' DATE 11/2/87

*ALL DEPTHS MEASURED FROM GROUND SURFACE.

WARZYN ENGINEERING INC



WARZYN ENGINEERING INC

MONITORING WELL CONSTRUCTION INFORMATION

JOB NO. 13160.11

BORING/WELL NO. G114

DATE 11/3/87

CHIEF/UNIT MG

1. PROTECTIVE CASING (YES) NO

   LOCKING (YES) NO

2. CONCRETE SEAL (YES) NO

3. TYPE OF SURFACE SEAL (IF INSTALLED)
   Granular Bentonite

4. SOLID PIPE TYPE Stainless Steel - 10'
   Galvanized Steel - 27'

   SOLID PIPE LENGTH 37 ft.

   JOINT TYPE SLIP/GLUED (THREADED)

5. TYPE OF BACKFILL Quick Gel
   Bentonite Grout

   HOW INSTALLED (TREMIE) FROM SURFACE

6. TYPE OF LOWER SEAL (IF INSTALLED)
   Bentonite Pellets

7. SCREEN TYPE Continous Wrap
   Stainless Steel

   SCREEN LENGTH 10.8'

   SLOT-SIZE 0.010" LENGTH 10 ft.

   SCREEN DIAMETER 2 in.

8. TYPE OF BACKFILL AROUND SCREEN
   #30 Flint Sand

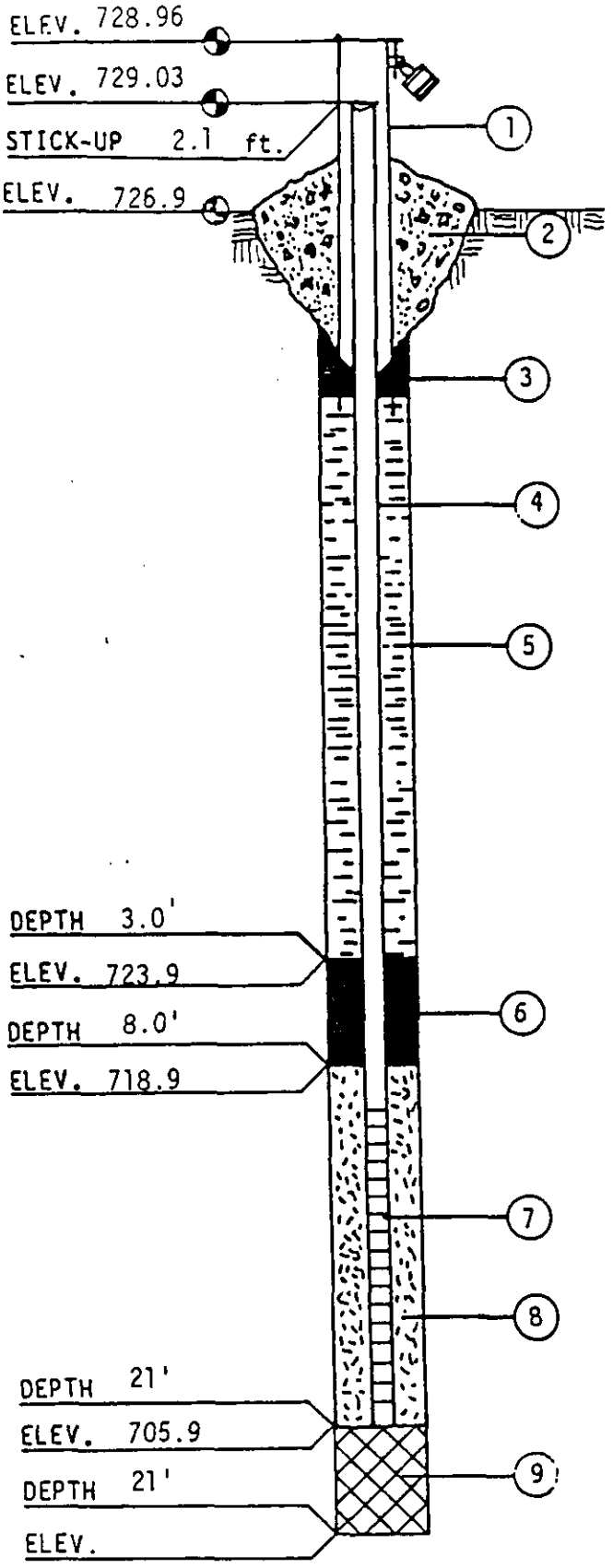
9. TYPE OF BACKFILL None

10. DRILLING METHOD Wash Bore to 19'
    ~~Rock Coring 19-46'~~

11. ADDITIVES USED (IF ANY)
    Drilling Mud to 19'

WATER LEVEL 36.2' DATE 11/4/87

*ALL DEPTHS MEASURED FROM GROUND SURFACE.
** UNCERTAIN, MEASUREMENT DIFFICULTIES.



WARZYN ENGINEERING INC

MONITORING WELL CONSTRUCTION INFORMATION

JOB NO. 13160.11

BORING/WELL NO. G115

DATE 10/26/87

CHIEF/UNIT MG/CME 550

1. PROTECTIVE CASING (YES) NO

   LOCKING (YES) NO

2. CONCRETE SEAL (YES) NO

3. TYPE OF SURFACE SEAL (IF INSTALLED)
   Powder Bentonite

4. SOLID PIPE TYPE Stainless Steel - 10' ~~Galvanized Steel - 2'~~

   SOLID PIPE LENGTH 12 ft.

   JOINT TYPE SLIP/GLUED (THREADED)

5. TYPE OF BACKFILL Cuttings

   HOW INSTALLED (TREMIE) FROM SURFACE

6. TYPE OF LOWER SEAL (IF INSTALLED)
   Granular & Powder Bentonite

7. SCREEN TYPE Continous Wrap Stainless Steel

   SCREEN LENGTH 10.8'

   SLOT-SIZE 0.010" LENGTH 10 ft.

   SCREEN DIAMETER 2 in.

8. TYPE OF BACKFILL AROUND SCREEN
   Natural Cave-in & #30 Flint Sand

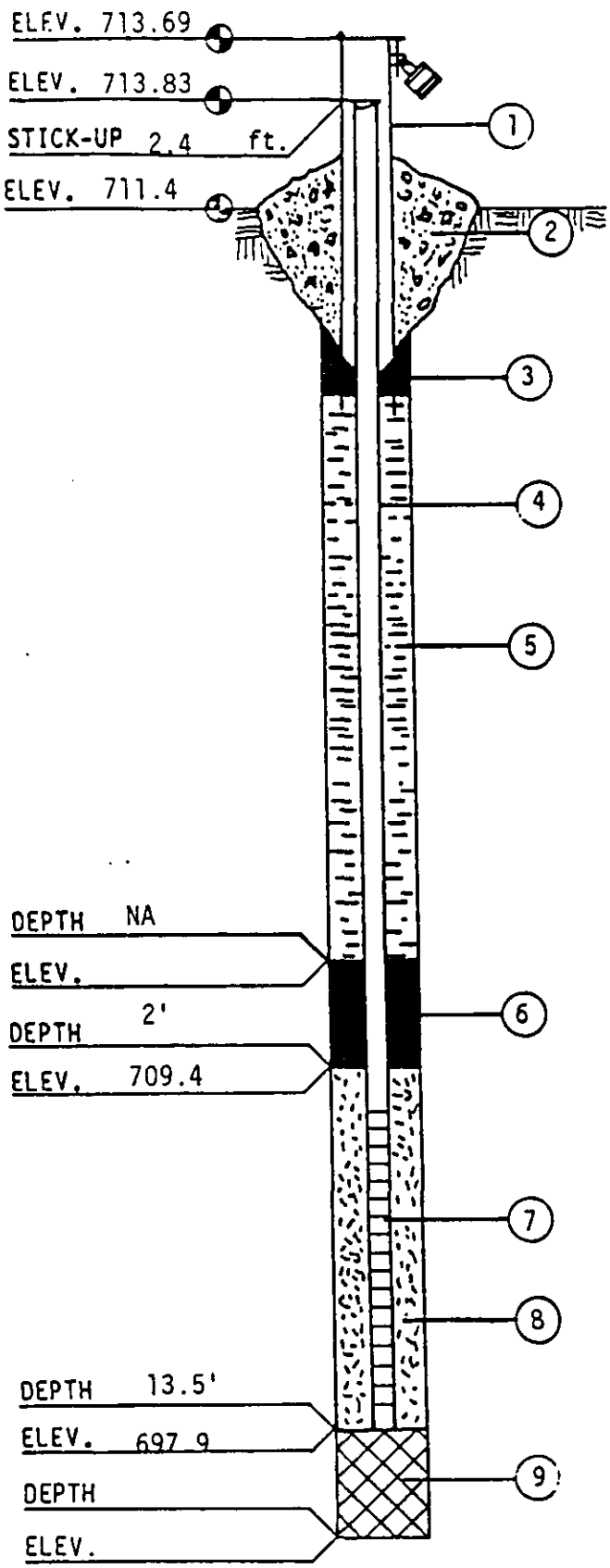
9. TYPE OF BACKFILL None

10. DRILLING METHOD 4¼" HSA

11. ADDITIVES USED (IF ANY)
    None

WATER LEVEL - DATE

*ALL DEPTHS MEASURED FROM GROUND SURFACE.



MONITORING WELL CONSTRUCTION INFORMATION

JOB NO. 13160.11

BORING/WELL NO. G116

DATE 10/27/87

CHIEF/UNIT MG/CME 550

1. PROTECTIVE CASING (YES) NO

   LOCKING (YES) NO

2. CONCRETE SEAL (YES) NO

3. TYPE OF SURFACE SEAL (IF INSTALLED)
   Granular Bentonite

4. SOLID PIPE TYPE Galvanized Steel

   SOLID PIPE LENGTH 5 ft.

   JOINT TYPE SLIP/GLUED (THREADED)

5. TYPE OF BACKFILL None

   HOW INSTALLED (TREMIE) FROM SURFACE

6. TYPE OF LOWER SEAL (IF INSTALLED)
   Granular Bentonite

7. SCREEN TYPE Continous Wrap Stainless Steel

   SCREEN LENGTH 10.8'

   SLOT-SIZE 0.010" LENGTH 10 ft.

   SCREEN DIAMETER 2 in.

8. TYPE OF BACKFILL AROUND SCREEN
   Natural Cave in & #30 Flint Sand

9. TYPE OF BACKFILL None

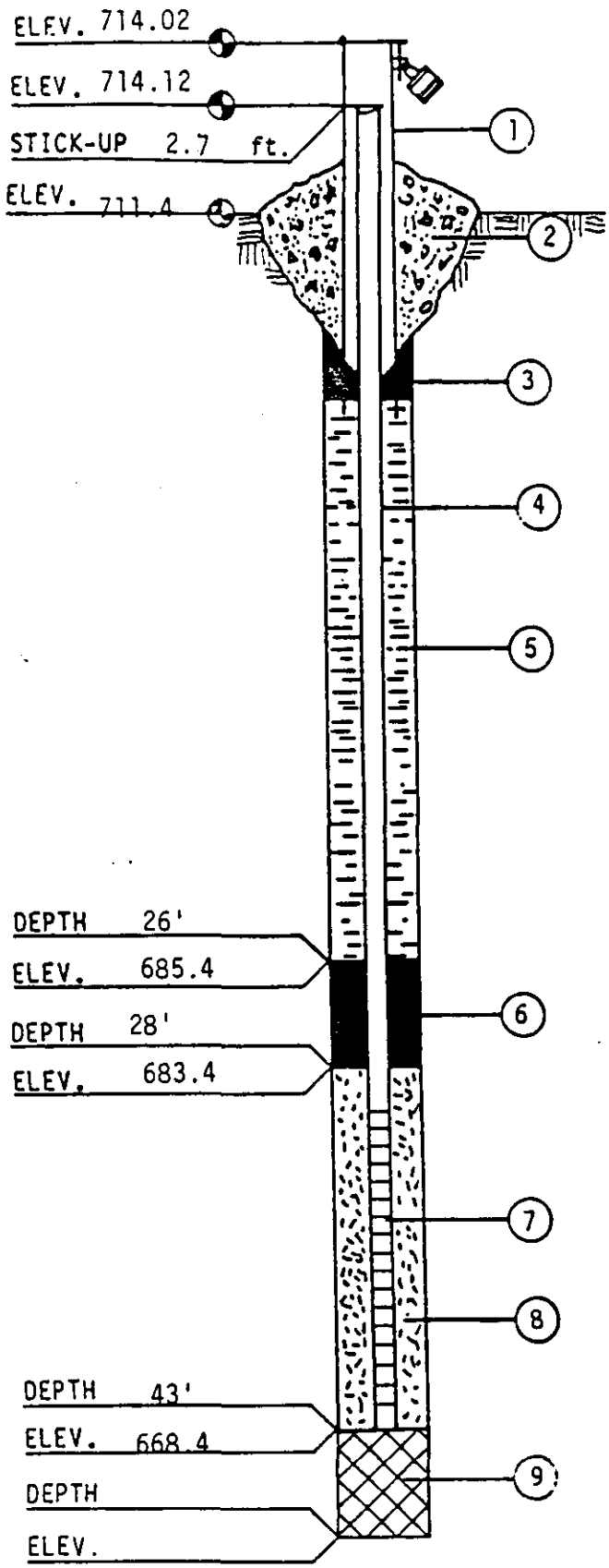
10. DRILLING METHOD 4¼" HSA

11. ADDITIVES USED (IF ANY)
    None

WATER LEVEL 4.7' DATE 10/30/87

*ALL DEPTHS MEASURED FROM GROUND SURFACE.

WARZYN ENGINEERING INC



MONITORING WELL CONSTRUCTION INFORMATION

JOB NO. 13160.11

BORING/WELL NO. G116A

DATE 10/27/87

CHIEF/UNIT MG/CME 550

1. PROTECTIVE CASING (YES) NO

   LOCKING (YES) NO

2. CONCRETE SEAL (YES) NO

3. TYPE OF SURFACE SEAL (IF INSTALLED)
   Granular Bentonite

4. SOLID PIPE TYPE Stainless Steel

   SOLID PIPE LENGTH 40 ft.

   JOINT TYPE SLIP/GLUED (THREADED) w/Teflon Tap

5. TYPE OF BACKFILL Quick Gel ~~Bentonite Grout~~

   HOW INSTALLED (TREMIE) FROM SURFACE

6. TYPE OF LOWER SEAL (IF INSTALLED)
   Bentonite Pellets

7. SCREEN TYPE Continuous Wrap Stainless ~~Steel~~

   SCREEN LENGTH 5.4'

   SLOT-SIZE 0.010" LENGTH 5 ft.

   SCREEN DIAMETER 2 in.

8. TYPE OF BACKFILL AROUND SCREEN
   Natural Cave-in & #30 Flint Sand

9. TYPE OF BACKFILL None

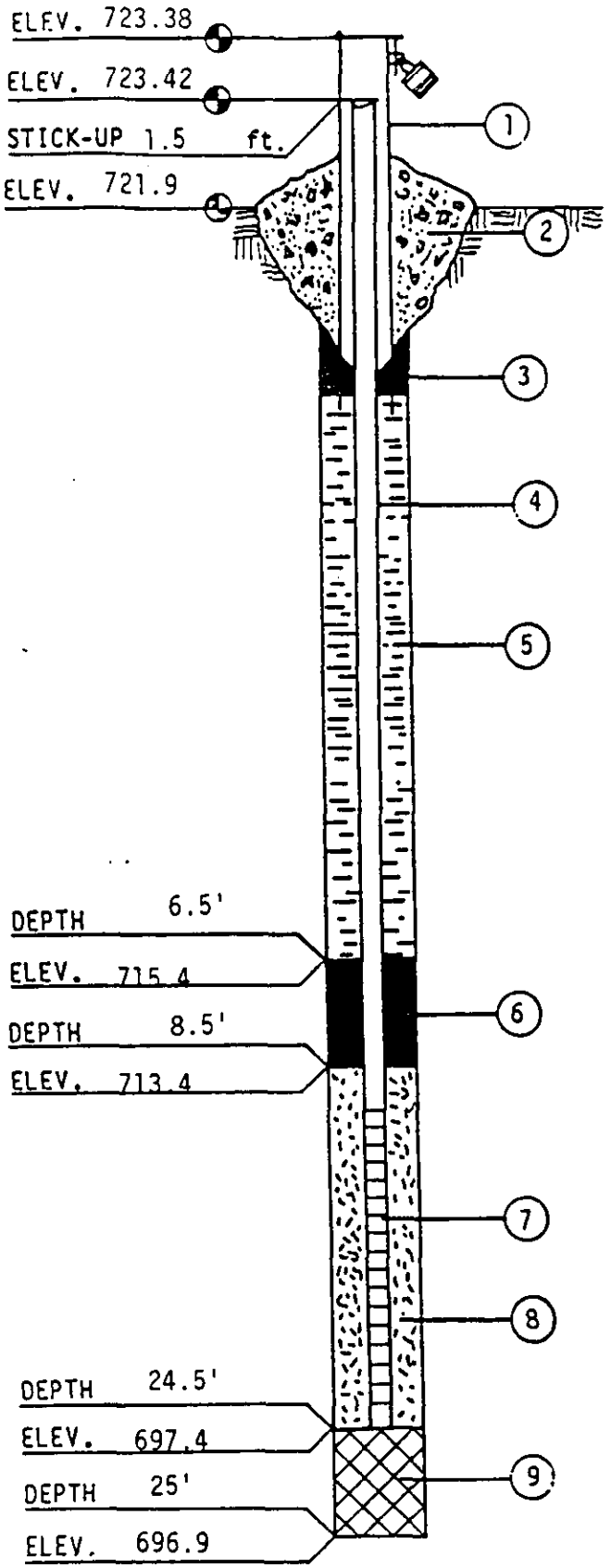
10. DRILLING METHOD 4¼" HSA

11. ADDITIVES USED (IF ANY)
    None

WATER LEVEL 4.8' DATE 10/30/87

*ALL DEPTHS MEASURED FROM GROUND SURFACE.

WARZYN ENGINEERING INC



MONITORING WELL CONSTRUCTION INFORMATION

JOB NO. 13160.11

BORING/WELL NO. G117

DATE 10/13/87

CHIEF/UNIT CB/CME 55

1. PROTECTIVE CASING (YES) NO

   LOCKING (YES) NO

2. CONCRETE SEAL (YES) NO

3. TYPE OF SURFACE SEAL (IF INSTALLED)
   Granular Bentonite

4. SOLID PIPE TYPE Galvanized Steel - 10'
   Stainless Steel - 5'

   SOLID PIPE LENGTH 15 ft.

   JOINT TYPE SLIP/GLUED (THREADED)

5. TYPE OF BACKFILL Quick Gel
   Bentonite Grout

   HOW INSTALLED (TREMIE)
   FROM SURFACE

6. TYPE OF LOWER SEAL (IF INSTALLED)
   Bentonite Pellets

7. SCREEN TYPE Continous Wrap
   Stainless Steel

   SCREEN LENGTH 10.4'

   SLOT-SIZE 0.010" LENGTH 10 ft.

   SCREEN DIAMETER 2 in.

8. TYPE OF BACKFILL AROUND SCREEN
   #30 Washed Flint Sand & Cave-in

9. TYPE OF BACKFILL Cave-in

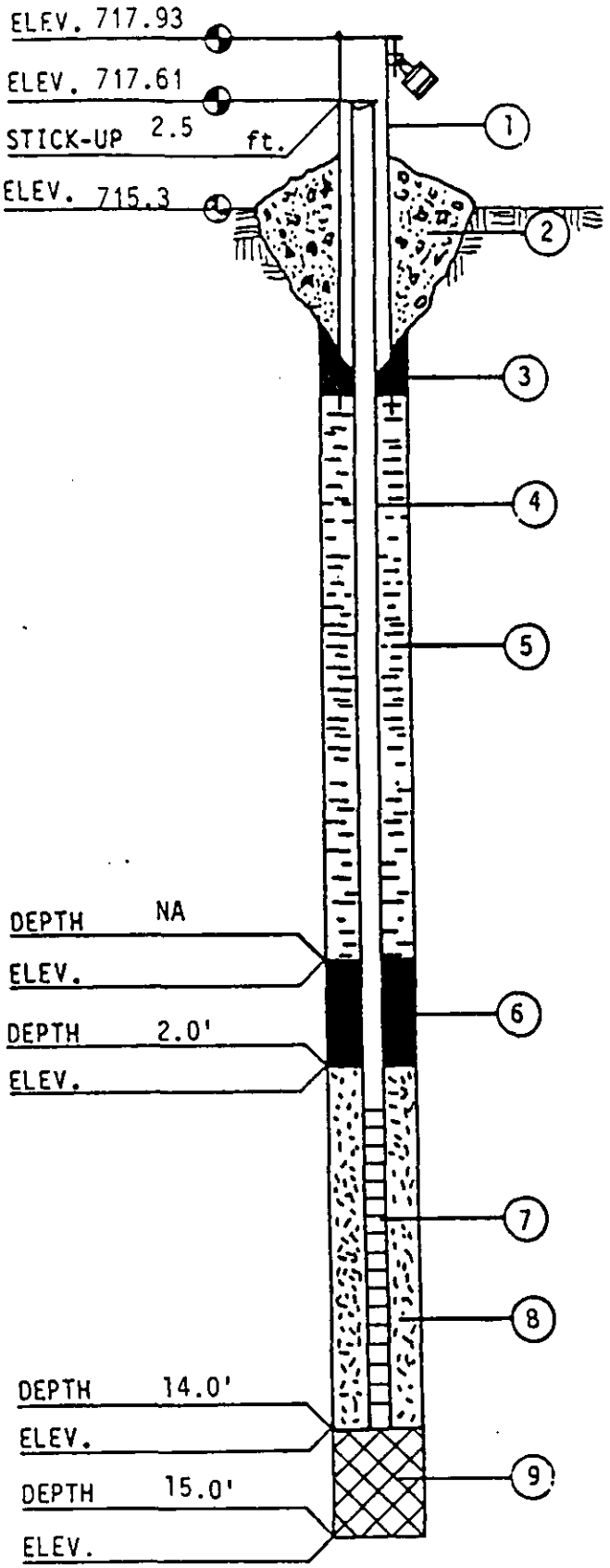
10. DRILLING METHOD 4¼ HSA

11. ADDITIVES USED (IF ANY)
    None

WATER LEVEL _____ DATE _____

*ALL DEPTHS MEASURED FROM GROUND SURFACE.

WARZYN ENGINEERING INC



MONITORING WELL CONSTRUCTION INFORMATION

JOB NO. 13160

BORING/WELL NO. G118R

DATE 6/9/88

CHIEF/UNIT LS/9130

1. PROTECTIVE CASING (YES) NO

   LOCKING (YES) NO

2. CONCRETE SEAL (YES) NO

3. TYPE OF SURFACE SEAL (IF INSTALLED)
   Bentonite Pellets

4. SOLID PIPE TYPE Stainless Steel

   SOLID PIPE LENGTH 6.0 ft.

   JOINT TYPE SLIP/GLUED (THREADED)

5. TYPE OF BACKFILL Flint Sand

   HOW INSTALLED - ~~TREMIE~~ (FROM SURFACE)

6. TYPE OF LOWER SEAL (IF INSTALLED)
   NA

7. SCREEN TYPE Stainless Steel

   SCREEN LENGTH 10.0'

   SLOT-SIZE 0.010" LENGTH 9.5 ft.

   SCREEN DIAMETER 2.0 in.

8. TYPE OF BACKFILL AROUND SCREEN
   #30 Flint Sand

9. TYPE OF BACKFILL Cave-in

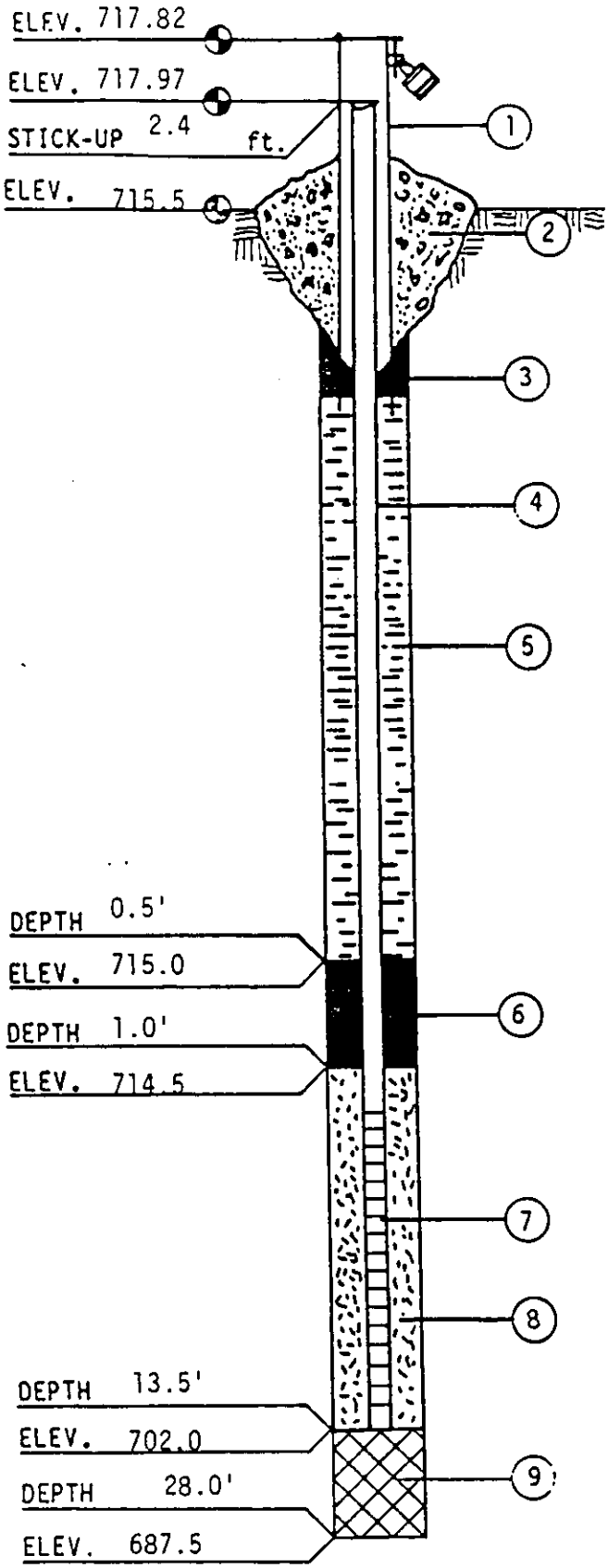
10. DRILLING METHOD HSA

11. ADDITIVES USED (IF ANY)
    None

WATER LEVEL 5' DATE 6/9/88

*ALL DEPTHS MEASURED FROM GROUND SURFACE.

WARZYN ENGINEERING INC



MONITORING WELL CONSTRUCTION INFORMATION

JOB NO. 13160.11

BORING/WELL NO. G118

DATE 10/14/87

CHIEF/UNIT CB/CME 55

1. PROTECTIVE CASING (YES) NO

   LOCKING (YES) NO

2. CONCRETE SEAL (YES) NO

3. TYPE OF SURFACE SEAL (IF INSTALLED)
   Granular Bentonite

4. SOLID PIPE TYPE Stainless Steel

   SOLID PIPE LENGTH 5 ft.

   JOINT TYPE SLIP/GLUED (THREADED) w/Teflon Tape

5. TYPE OF BACKFILL None

   HOW INSTALLED (TREMIE) FROM SURFACE

6. TYPE OF LOWER SEAL (IF INSTALLED)
   Bentonite Pellets

7. SCREEN TYPE Continous Wrap Stainless Steel

   SCREEN LENGTH 10.8'

   SLOT-SIZE 0.010" LENGTH 10 ft.

   SCREEN DIAMETER 2 in.

8. TYPE OF BACKFILL AROUND SCREEN
   #30 Flint Sand

9. TYPE OF BACKFILL Cave-in

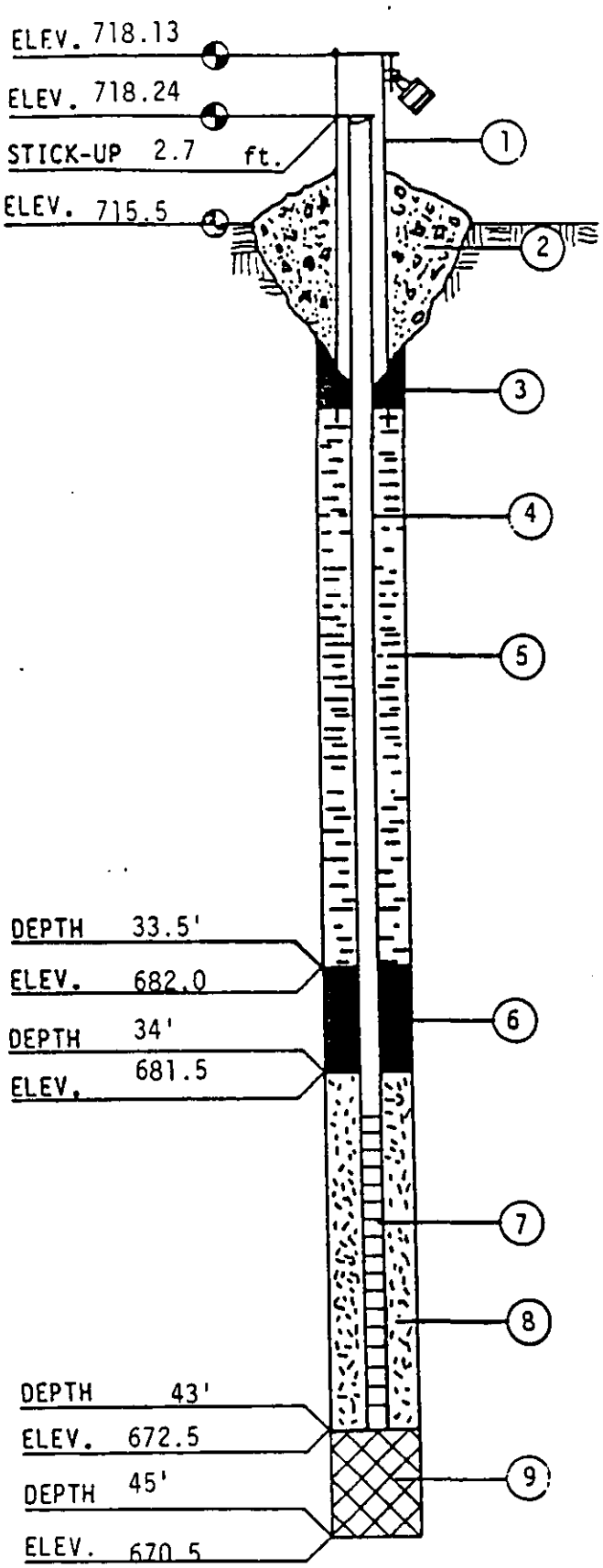
10. DRILLING METHOD 4¼" HSA

11. ADDITIVES USED (IF ANY)
    None

WATER LEVEL 7.9' DATE 10/26/87

*ALL DEPTHS MEASURED FROM GROUND SURFACE.

WARZYN ENGINEERING INC



WARZYN ENGINEERING INC

MONITORING WELL CONSTRUCTION INFORMATION

JOB NO. 13160.11

BORING/WELL NO. G118A

DATE 10/14/87

CHIEF/UNIT CB/CME 55

1. PROTECTIVE CASING (YES) NO

   LOCKING (YES) NO

2. CONCRETE SEAL (YES) NO

3. TYPE OF SURFACE SEAL (IF INSTALLED)
   Granular Bentonite

4. SOLID PIPE TYPE Stainless Steel

   SOLID PIPE LENGTH 40 ft.

   JOINT TYPE SLIP/GLUED (THREADED) w/Teflon Tape

5. TYPE OF BACKFILL Bentonite Grout

   HOW INSTALLED (TREMIE) FROM SURFACE

6. TYPE OF LOWER SEAL (IF INSTALLED)
   Bentonite Pellets

7. SCREEN TYPE Continous Wrap Stainless Steel

   SCREEN LENGTH 5.4'

   SLOT-SIZE 0.010" LENGTH 5 ft.

   SCREEN DIAMETER 2 in.

8. TYPE OF BACKFILL AROUND SCREEN
   Natural Sand & Gravel Cave-in #50 Flint Sand

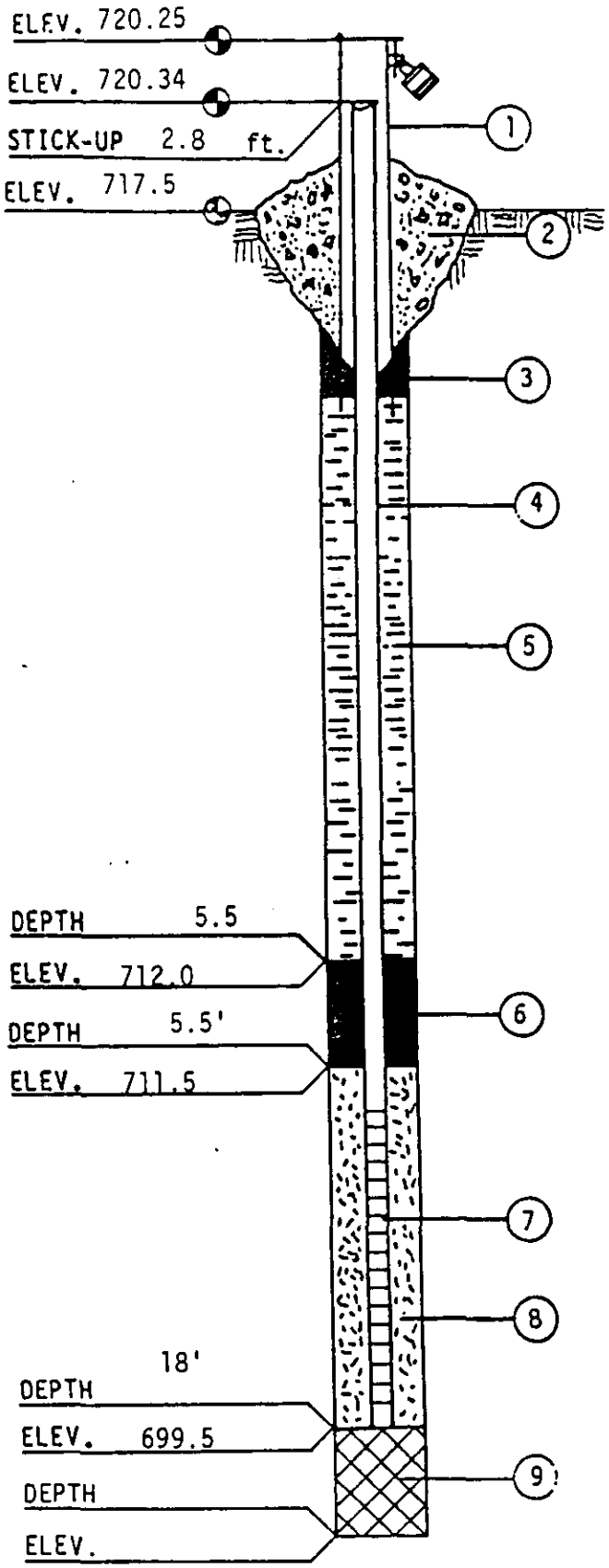
9. TYPE OF BACKFILL Natural Cave-in

10. DRILLING METHOD 3 7/8" Roller Bit 4"Casing Wash Bore

11. ADDITIVES USED (IF ANY)
    Drilling Mud - Quick Gel

WATER LEVEL _____ DATE _____

*ALL DEPTHS MEASURED FROM GROUND SURFACE.



MONITORING WELL CONSTRUCTION INFORMATION

JOB NO. 13160.11

BORING/WELL NO. G119

DATE 10/21/87

CHIEF/UNIT JG/CME 550

1. PROTECTIVE CASING (YES) NO

   LOCKING (YES) NO

2. CONCRETE SEAL (YES) NO

3. TYPE OF SURFACE SEAL (IF INSTALLED)
   Granular Bentonite

4. SOLID PIPE TYPE Stainless Steel

   SOLID PIPE LENGTH 10 ft.

   JOINT TYPE SLIP/GLUED (THREADED) w/Teflon Tape

5. TYPE OF BACKFILL Natural Sand & Grave

   HOW INSTALLED (TREMIE) FROM SURFACE

6. TYPE OF LOWER SEAL (IF INSTALLED)
   Bentonite Pellets

7. SCREEN TYPE Continous Wrap Stainless Steel

   SCREEN LENGTH 10.8'

   SLOT-SIZE 0.010" LENGTH 10 ft.

   SCREEN DIAMETER 2 in.

8. TYPE OF BACKFILL AROUND SCREEN
   Natural Cave in & 50# #30 Flint Sand

9. TYPE OF BACKFILL None

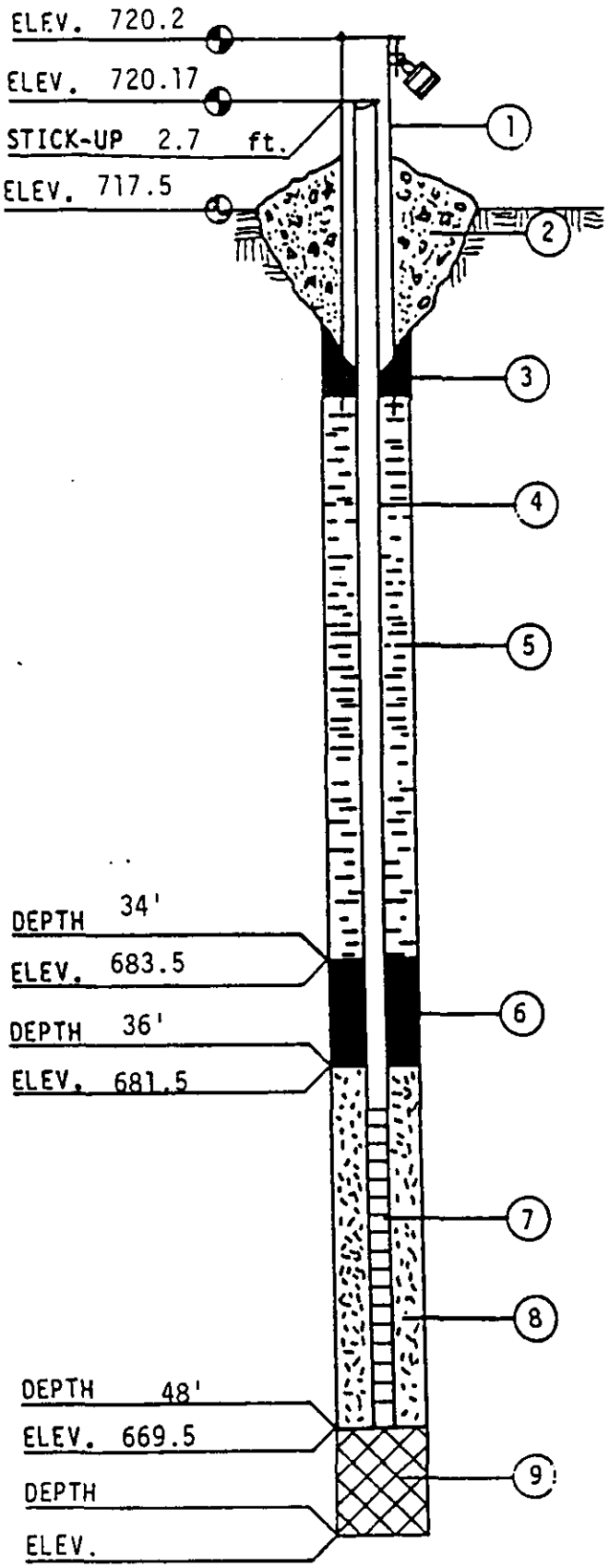
10. DRILLING METHOD 4¼" HSA

11. ADDITIVES USED (IF ANY)
    None

WATER LEVEL 10.3' DATE 10/26/87

*ALL DEPTHS MEASURED FROM GROUND SURFACE.

WARZYN ENGINEERING INC



MONITORING WELL CONSTRUCTION INFORMATION

JOB NO. 13160.11

BORING/WELL NO. G119A

DATE 10/22/87

CHIEF/UNIT MG/CME 550

1. PROTECTIVE CASING (YES) NO

   LOCKING (YES) NO

2. CONCRETE SEAL (YES) NO

3. TYPE OF SURFACE SEAL (IF INSTALLED)
   Granular Bentonite

4. SOLID PIPE TYPE Stainless Steel - 40'
   Galvanized Steel - 5'

   SOLID PIPE LENGTH 45 ft.

   JOINT TYPE SLIP/GLUED (THREADED) w/Teflon Tape

5. TYPE OF BACKFILL Quick Gel Bentonite Grout

   HOW INSTALLED (TREMIE) FROM SURFACE

6. TYPE OF LOWER SEAL (IF INSTALLED)
   Bentonite Pellets

7. SCREEN TYPE Continous Wrap Stainless Steel

   SCREEN LENGTH 5.4'

   SLOT-SIZE 0.010" LENGTH 5 ft.

   SCREEN DIAMETER 2 in.

8. TYPE OF BACKFILL AROUND SCREEN
   Natural Cave-in & #30 Flint Sand

9. TYPE OF BACKFILL None

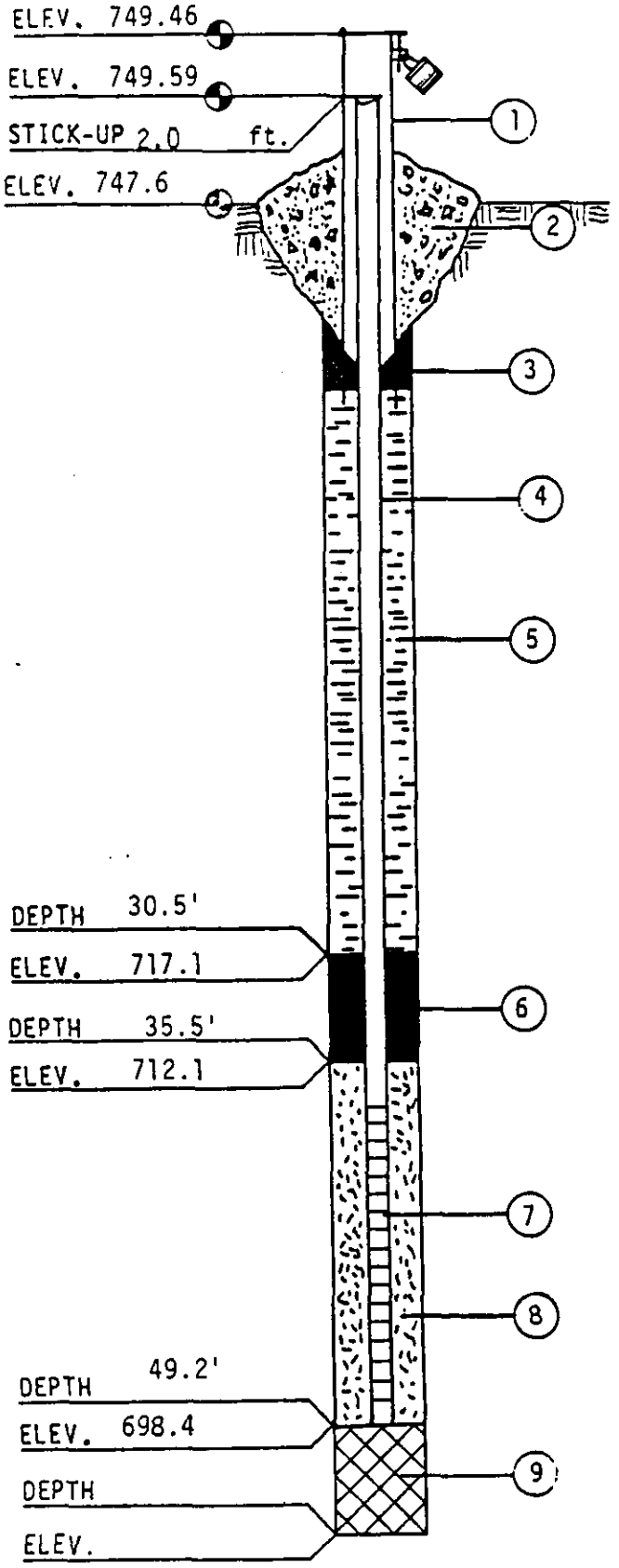
10. DRILLING METHOD 3 7/8" Wash Boring

11. ADDITIVES USED (IF ANY)
    Drilling Mud

WATER LEVEL 10.5' DATE 10/26/87

*ALL DEPTHS MEASURED FROM GROUND SURFACE.

WARZYN ENGINEERING INC



MONITORING WELL CONSTRUCTION INFORMATION

JOB NO. 13160.11

BORING/WELL NO. P3R

DATE 10/19/87

CHIEF/UNIT MG/CME 550

1. PROTECTIVE CASING (YES) NO

   LOCKING (YES) NO

2. CONCRETE SEAL (YES) NO

3. TYPE OF SURFACE SEAL (IF INSTALLED)
   Granular Bentonite

4. SOLID PIPE TYPE Stainless Steel - 10' Galvanized Steel - 30'

   SOLID PIPE LENGTH 40 ft.

   JOINT TYPE SLIP/GLUED (THREADED) w/ Teflon Tape

5. TYPE OF BACKFILL Quick-Gel, Bentonite Grout

   HOW INSTALLED (TREMIE) FROM SURFACE

6. TYPE OF LOWER SEAL (IF INSTALLED)
   Bentonite Pellets

7. SCREEN TYPE Continuous Wrap Stainles Steel

   SCREEN LENGTH 10.8'

   SLOT-SIZE 0.010" LENGTH 10 ft.

   SCREEN DIAMETER 2" in.

8. TYPE OF BACKFILL AROUND SCREEN
   Natural Cave-in & #30 Flint Sand

9. TYPE OF BACKFILL None

10. DRILLING METHOD 4¼" HSA

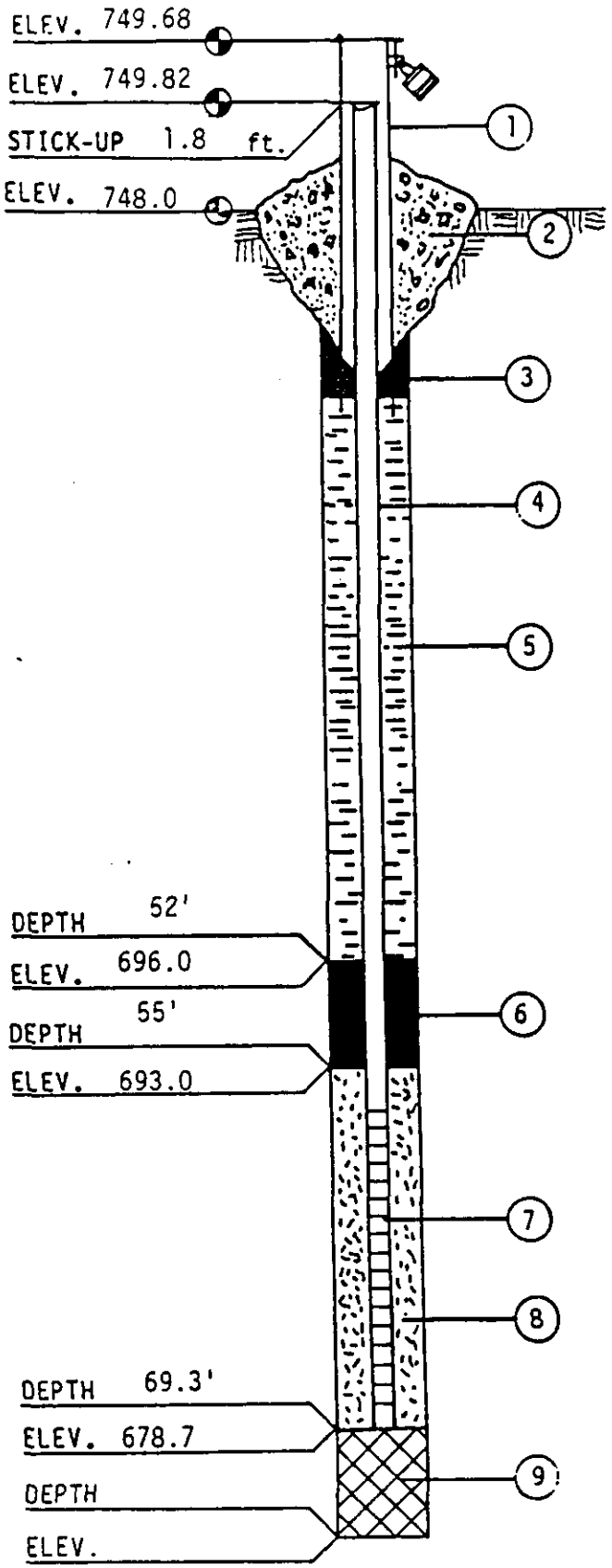
11. ADDITIVES USED (IF ANY)

    None

WATER LEVEL 40.9' DATE 10/29/87

*ALL DEPTHS MEASURED FROM GROUND SURFACE.

WARZYN ENGINEERING INC



MONITORING WELL CONSTRUCTION INFORMATION

JOB NO. 13160.11

BORING/WELL NO. P4R

DATE 10/20/87

CHIEF/UNIT JG/CME 550

1. PROTECTIVE CASING (YES) NO

   LOCKING (YES) NO

2. CONCRETE SEAL (YES) NO

3. TYPE OF SURFACE SEAL (IF INSTALLED)
   Granular Bentonite

4. SOLID PIPE TYPE Stainless Steel - 30'
   ~~Galvanized Steel - 3~~

   SOLID PIPE LENGTH 65' ft.

   JOINT TYPE SLIP/GLUED (THREADED) w/Teflon ~~tape~~

5. TYPE OF BACKFILL Quick Gel, Bentonite ~~Grout~~

   HOW INSTALLED (TREMIE) FROM SURFACE

6. TYPE OF LOWER SEAL (IF INSTALLED)
   #25 Bentonite Pellets

7. SCREEN TYPE Continuous Wrap ~~Stainless Steel~~

   SCREEN LENGTH 5.4'

   SLOT-SIZE 0.010" LENGTH 5 ft.

   SCREEN DIAMETER 2" in.

8. TYPE OF BACKFILL AROUND SCREEN
   Natural Cave-in & #30 Flint Sand

9. TYPE OF BACKFILL None

10. DRILLING METHOD 3 7/8" Wash Bore w/ Mud

11. ADDITIVES USED (IF ANY)
    Quick Gel Drilling Mud

WATER LEVEL _____ DATE _____

*ALL DEPTHS MEASURED FROM GROUND SURFACE.

WARZYN ENGINEERING INC

C

APPENDIX C

ANALYTICAL LABORATORY RESULTS

INDEX

	Tab
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Ambient Air Data	8

Appendix C lists validated results of analyses performed on samples collected at the Winnebago Reclamation Landfill Site. Analytical results are organized by matrix and sampling round. All non-aqueous sample values are reported on a dry weight basis. Qualifiers are reported (Data Validation Qualifier/Laboratory Qualifier) to the right of the concentration. Blank spaces generally mean the analyte was not detected but refer to compound list for round to confirm.

Due to a change in the data reporting system, early rounds of metals data list only positive detects while later data sets include the detection limit qualified by a U for non-detects. This reporting change in no way affects the quality of the data.

TARGET COMPOUND LISTS

APPENDIX C

GC/MS METHOD
CLP TARGET COMPOUND LIST AND DETECTION LIMITS*

	Volatiles	CAS Number	Detection Limits(1) Low Water(2) ug/l	Low Soil/ Sediment(3) ug/kg
1.	Chloromethane	74-87-3	10	10
2.	Bromomethane	74-83-9	10	10
3.	Vinyl Chloride	75-01-4	10	10
4.	Chloroethane	75-00-3	10	10
5.	Methylene Chloride	75-09-2	5	5
6.	Acetone	67-64-1	10	10
7.	Carbon Disulfide	75-15-0	5	5
8.	1,1-Dichloroethene	75-35-4	5	5
9.	1,1-Dichloroethane	75-34-3	5	5
10.	trans 1,2-Dichloroethene	540-59-0	5	5
11.	Chloroform	67-66-3	5	5
12.	1,2-Dichloroethane	107-06-2	5	5
13.	2-Butanone	78-93-3	10	10
14.	1,1,1-Trichloroethane	71-55-6	5	5
15.	Carbon Tetrachloride	56-23-5	5	5
16.	Vinyl Acetate	108-05-4	10	10
17.	Bromodichloromethane	75-27-4	5	5
18.	1,1,2,2-Tetrachloroethane	79-34-5	5	5
19.	1,2 - Dichloropropane	78-87-5	5	5
20.	trans-1,3-Dichloropropene	10061-01-5	5	5
21.	Trichloroethene	79-01-6	5	5
22.	Dibromocloromethane	124-48-1	5	5
23.	1,1,2-Trichloroethane	79-00-5	5	5
24.	Benzene	71-43-2	5	5
25.	cis-1,3-Dichloropropene	10061-01-5	5	5
26.	2-Chloroethyl Vinyl Ether	110-75-8	10	10
27.	Bromoform	75-25-2	5	5
28.	2-Hexanone	591-78-6	10	10
29.	4-Methyl-2-pentanone	108-10-1	10	10
30.	Tetrachloroethene	127-18-4	5	5
31.	Toluene	108-88-3	5	5
32.	Chlorobenzene	108-90-7	5	5
33.	Ethyl Benzene	100-41-4	5	5
34.	Styrene	100-42-5	5	5
35.	Total Xylenes		5	5

GC/MS METHOD

CLP TARGET COMPOUND LIST
AND DETECTION LIMITS*

Volatiles	CAS Number	Detection Limits(1) Low Water(2) ug/l	Detection Limits(1) Low Soil Sediment(3) ug/kg
1. Chloromethane	74-87-3	10	10
2. Bromomethane	74-83-9	10	10
3. Vinyl Chloride	75-01-4	10	10
4. Chloroethane	75-00-3	10	10
5. Methylene Chloride	75-09-2	5	5
6. Acetone	67-64-1	10	10
7. Carbon Disulfide	75-15-0	5	5
8. 1,1-Dichloroethene	75-35-4	5	5
9. 1,1-Dichloroethane	75-35-3	5	5
10. trans-1,2-Dichloroethene	156-60-5	5	5
11. Chloroform	67-66-3	5	5
12. 1,2-Dichloroethane	107-06-2	5	5
13. 2-Butanone	78-93-3	10	10
14. 1,1,1-Trichloroethane	71-55-6	5	5
15. Carbon Tetrachloride	56-23-5	5	5
16. Vinyl Acetate	108-05-4	10	10
17. Bromodichloromethane	75-27-4	5	5
18. 1,1,2,2-Tetrachloroethane	79-34-5	5	5
19. 1,2-Dichloropropane	78-87-5	5	5
20. trans-1,3-Dichloropropene	10061-02-6	5	5
21. Trichloroethene	79-01-6	5	5
22. Dibromocloromethane	124-48-1	5	5
23. 1,1,2-Trichloroethane	79-00-5	5	5
24. Benzene	71-43-2	5	5
25. cis-1,3-Dichloropropene	10061-01-5	5	5
26. 2-Chloroethyl Vinyl Ether	110-75-8	10	10
27. Bromoform	75-25-2	5	5
28. 2-Hexanone	591-78-6	10	10
29. 4-Methyl-2-pentanone	108-10-1	10	10
30. Tetrachloroethene	127-18-4	5	5
31. Toluene	108-88-3	5	5
32. Chlorobenzene	108-90-7	5	5
33. Ethyl Benzene	100-41-4	5	5
34. Styrene	100-42-5	5	5
35. Total Xylenes		5	5

Semi-Volatiles	CAS Number	Detection Limits(1) Low Water(4) ug/l	Low Soil Sediment(5) ug/kg
36. Phenol	108-95-2	10	330
37. bis(2-Chloroethyl)ether	111-44-4	10	300
38. 2-Chlorophenol	95-57-8	10	330
39. 1,3-Dichlorobenzene	541-73-1	10	330
40. 1,4-Dichlorobenzene	106-46-7	10	330
41. Benzyl Alcohol	100-51-6	10	330
42. 1,2-Dichlorobenzene	95-50-1	10	330
43. 2-Methylphenol	95-48-7	10	330
44. bis(2-Chloroisopropyl)ether	39638-32-9	10	330
45. 4-Methylphenol	106-44-5	10	330
46. N-Nitroso-Dipropylamine	621-64-7	10	330
47. Hexachloroethane	67-72-1	10	330
48. Nitrobenzene	98-95-3	10	330
49. Isophorone	78-59-1	10	330
50. 2-Nitrophenol	88-75-5	10	330
51. 2,4-Dimethylphenol	105-67-9	10	330
52. Benzoic Acid	65-85-0	50	1600
53. bis(2-Chloroethoxy)methane	111-91-1	10	330
54. 2,4-Dichlorophenol	120-83-2	10	330
55. 1,2,4-Trichlorobenzene	120-82-1	10	330
56. Naphthalene	91-20-3	10	330
57. 4-Chloroaniline	106-47-8	10	330
58. Hexachlorobutadiene	87-68-3	10	330
59. 4-Chloro-3-methylphenol (para-chloro-meta-cresol)	59-50-7	10	330
60. 2-Methylnaphthalene	91-57-6	10	330
61. Hexachlorocyclopentadiene	77-47-4	10	330
62. 2,4,6-Trichlorophenol	88-06-2	10	330
63. 2,4,5-Trichlorophenol	95-95-4	50	1600
64. 2-Chloronaphthalene	91-58-7	10	330
65. 2-Nitroaniline	88-74-4	50	1600
66. Dimethyl Phthalate	131-11-3	10	330
67. Acenaphthylene	208-96-8	10	330
68. 3-Nitroaniline	99-09-2	50	1600
69. Acenaphthene	83-32-9	10	330
70. 2,4-Dinitrophenol	51-28-5	50	1600
71. 4-Nitrophenol	100-02-7	50	1600
72. Dibenzofuran	132-64-9	10	330
73. 2,4-Dinitrotoluene	121-14-2	10	330
74. 2,6-Dinitrotoluene	606-20-2	10	330
75. Diethylphthalate	84-66-2	10	330

Semi-Volatiles	CAS Number	Detection Limits(1) Low Water(4) ug/l	Low Soil Sediment(5) ug/kg
76. 4-Chlorophenyl Phenyl ether	7005-72-3	10	330
77. Fluorene	86-73-7	10	330
78. 4-Nitroaniline	100-01-6	50	1600
79. 4,6-Dinitro-2-methylphenol	534-52-1	50	1600
80. N-nitrosodiphenylamine	86-30-6	10	330
81. 4-Bromophenyl Phenyl ether	101-55-3	10	330
82. Hexachlorobenzene	118-74-1	10	330
83. Pentachlorophenol	87-86-5	50	1600
84. Phenanthrene	85-01-8	10	330
85. Anthracene	120-12-7	10	330
86. Di-n-Butylphthalate	84-74-2	10	330
87. Fluoranthene	206-44-0	10	330
88. Pyrene	129-00-0	10	330
89. Butyl Benzyl Phthalate	85-68-7	10	330
90. 3,3'-Dichlorobenzidine	91-94-1	20	660
91. Benzo(a)anthracene	56-55-3	10	330
92. bis(2-ethylhexyl)phthalate	117-81-7	10	330
93. Chrysene	218-01-9	10	330
94. Di-n-octyl Phthalate	117-84-0	10	330
95. Benzo(b)fluoranthene	205-99-2	10	330
96. Benzo(k)fluoranthene	207-08-9	10	330
97. Benzo(a)pyrene	50-32-8	10	330
98. Indeno(1,2,3-cd)pyrene	193-39-5	10	330
99. Dibenz(a,h)anthracene	53-70-3	10	330
100. Benzo(g,h,i)perylene	191-24-2	10	330

Pesticides	CAS Number	Detection Limits(1) Low Water(6) ug/l	Low Soil Sediment(7) ug/kg
101. alpha-BHC	319-84-6	0.05	8.0
102. beta-BHC	319-85-7	0.05	8.0
103. delta-BHC	319-86-8	0.05	8.0
104. gamma-BHC (Lindane)	58-89-9	0.05	8.0
105. Heptachlor	76-44-8	0.05	8.0
106. Aldrin	309-00-2	0.05	8.0
107. Heptachlor Epoxide	1024-57-3	0.05	8.0
108. Endosulfan I	959-98-8	0.05	8.0
109. Dieldrin	60-57-1	0.10	16.0
110. 4,4'-DDE	72-55-9	0.10	16.0
111. Endrin	72-20-8	0.10	16.0
112. Endosulfan II	33213-65-9	0.10	16.0
113. 4,4-DDD	72-54-8	0.10	16.0
114. Endosulfan Sulfate	1031-07-8	0.10	16.0
115. 4,4'-DDT	50-29-3	0.10	16.0
116. Endrin Ketone	53494-70-5	0.10	16.0
117. Methoxychlor	72-43-5	0.5	80.0
118. Chlordane	57-74-9	0.5	80.0
119. Toxaphene	8001-35-2	1.0	160.0
120. AROCLOR-1016	12674-11-2	0.5	80.0
121. AROCLOR-1221	11104-28-2	0.5	80.0
122. AROCLOR-1232	11141-16-5	0.5	80.0
123. AROCLOR-1242	53469-21-9	0.5	80.0
124. AROCLOR-1248	12672-29-6	0.5	80.0
125. AROCLOR-1254	11097-69-1	1.0	160.0
126. AROCLOR-1260	11096-82-5	1.0	160.0

Notes:

(1) Detection limits listed for soil/sediment are based on wet weight. The detection limits calculated by the laboratory for soil/sediment will be on dry weight basis and will be higher.

(2) Medium Water Detection Limits (DL) for Volatile CLP Target Compounds are 100 times the individual Low Water RDL.

(3) Medium Soil/Sediment DL for Volatile CLP Target Compounds are 100 times the individual Low Water DL.

(4) Medium Water DL for Semi-Volatile CLP Target Compounds are 100 times the individual Low Water DL.

(5) Medium Soil/Sediment DL for Semi-Volatile CLP Target Compounds are 60 times the individual Low Soil/Sediment DL.

(6) Medium Water DL for Pesticide CLP Target Compounds are 100 times the individual Low Water DL.

(7) Medium Soil/Sediment DL for Pesticide CLP Target Compounds are 15 times the individual Low Soil/Sediment DL.

* Specific detection limits are highly matrix dependent. The detection limits listed herein are provided for guidance and may not always be achievable.

[cac-79-13]

Hazelton
GC Method
Parameter List

Chloromethane
Vinyl Chloride
Chloroethane
Bromomethane
1,1-Dichloroethene
Dichloromethane
trans-1,2-Dichloroethene
1,1-Dichloroethane
cis-1,2-Dichloroethene
Chloroform
1,1,1-Trichloroethane
Carbon tetrachloride
1,2-Dichloroethane
Trichloroethene
1,2-Dichloropropane
Bromodichloromethane
2-Chloroethylvinyl ether
cis-1,3-Dichloropropene
trans-1,2-Dichloropropene
1,1,2-Trichloroethane
Tetrachloroethene
Dibromochloromethane
Chlorobenzene
Bromoform
1,1,2,2-Tetrachloroethane
1,3-Dichlorobenzene
1,4-Dichlorobenzene
1,2-Dichlorobenzene
Benzene
Toluene
Ethylbenzene
m and p-Xylene
o-Xylene
Styrene

ELEMENTS DETERMINED BY INDUCTIVELY COUPLED PLASMA EMISSION
OR ATOMIC ABSORPTION (AA) SPECTROSCOPY

Metal:	Required Detection Level (ug/l)
Alumium	200
Antimony	60
Arsenic	10
Barium	200
Beryllium	5
Cadmium	5
Calcium	5000
Chromium	10
Cobalt	50
Copper	25
Iron	100
Lead	5
Magnesium	5000
Manganese	15
Mercury	0.2
Nickel	40
Potassium	5000
Selenium	5
Silver	10
Sodium	5000
Thallium	10
Vanadium	50
Zinc	20

[cac-79-14]

Attachment 1

QUALITY CONTROL REQUIREMENTS FOR ANALYSES PERFORMED
BY WARZYN AT PAGEL'S PIT LANDFILL

PARAMETER	AUDIT	FREQUENCY*	LIMITS
Arsenic	Lab blank	1 per set	<0.005 mg/L
	Duplicate	1 per 10	10% or <0.005 mg/L
	Calibration check STD	1 per 10 and end of run	90-110% recovery
	Matrix spike	1 per 10	85-115% recovery
	EPA QC Reference STD	1 per set	95% confidence interval
Barium	Lab blank	1 per set	<0.010 mg/L
	Duplicate	1 per 10	10% or <0.005 mg/L
	Calibration check STD	1 per 10 and end of run	90-110% recovery
	Matrix spike	1 per 10	85-115% recovery
	EPA QC Reference STD	1 per set	85-115% recovery
Cadmium	Lab blank	1 per set	<0.0005 mg/L
	Duplicate	1 per 10	10% or <0.005 mg/L
	Calibration check STD	1 per 10 and end of run	90-110% recovery
	Matrix spike	1 per 10	85-115% recovery
	EPA QC Reference STD	1 per 10	95% confidence interval

QUALITY CONTROL REQUIREMENTS FOR ANALYSES PERFORMED BY WARZYN AT PAGEL'S PIT LANDFILL

Chloride	Indicator blank	1 per set	<0.25 ml titrant
	Titrant standardization	2 per titrant solution	<5% RPD
	Check standard	1 per 10 and end of run	90-110% recovery
	Duplicate	1 per 10	<10% or 1 mg/L
	Matrix spike	1 per 10	85-115% recovery
	EPA QC Reference Standard	1 per set	95% confidence interval
Total Alkalinity	Titrant standardization	Daily - 2 per titrant solution	<5% RPD
	Lab Blank	1 per set	<5 mg/L
	Check standard	1 per 10 and end of run	90-110% recovery
	Duplicate	1 per 10	10% or <10 mg/L
	Matrix spike	1 per 10	85-115% recovery
	EPA QC Reference STD	1 per set	95% confidence interval
Total Phenolics	Lab blank	1 per set	<0.005 mg/L
	Duplicate	1 per 10	10% or <0.005 mg/L
	Calibration check STD	1 per 10 and end of run	90-110% recovery
	Matrix spike	1 per 10	85-115% recovery
	EPA QC Reference STD	1 per set	95% confidence interval

QUALITY CONTROL REQUIREMENTS FOR ANALYSES PERFORMED
BY WARZYN AT PAGEL'S PIT LANDFILL

Total Cyanide	Lab blank	1 per set	< 0.005 mg/L
	Duplicate	1 per 10	10% or <0.005 mg/L
	Calibration check STD	1 per 10 and end of set	85-115% recovery
	Matrix spike	1 per 10	85-115% recovery
	EPA QC Reference STD	1 per set	95% confidence interval

*Frequencies apply to each matrix individually.

RCW/mml/KDF
[mml-108-88a]
12660.08

DATA QUALIFIER DEFINITIONS

Data qualifiers are located to the left of the slash (/) in the data tables.

The following data qualifiers may be used in Appendix C.

Compound Group Designations

The following group designations are used within tables in this appendix.

VOC = Volatile Organic Compounds
SVOC = Semi-Volatile Organic Compounds
P/PCB = Pesticides and PCBs
MTL = Metals and Cyanide
IND = Indicator Parameters
TVOA = Tentatively Identified Volatile Organic Compounds
TBNA = Tentatively Identified Semi-Volatile Organic Compounds

Lists of target compounds making up the VOC, SVOC, P/PCB and MTL groupings are attached.

The following qualifier are used by data validation personnel. The code letters are listed below with associated definitions.

Inorganic

U = The material was analyzed for, but was not detected.

J = The associated numerical value is an estimated quantity because quality control criteria were not met.

R = Quality control indicates that the data are unusable (compound may or may not be present). Resampling and/or reanalysis is necessary for verification.

Z = No analytical result.

UJ = Sample was analyzed, but not detected. The associated numeric value is an estimated quantity because quality control criteria were not met.

B = Found in blank.

Organic

U = The material was analyzed for, but was not detected.

J = The associated numerical value is an estimated quantity.

R = The data are unusable (compound may or may not be present). Resampling and reanalysis is necessary for verification.

N = Presumptive evidence of presence of material.

NJ = Presumptive evidence of the presence of the material at an estimated quantity.

UJ = The material was analyzed for, but was not detected. The associated numeric value is an estimated quantity because quality control criteria were not met.

LABORATORY QUALIFIER DEFINITIONS

Lab qualifiers are located to the right of the slash (/) in the data tables.

The following laboratory qualifiers may be used in Appendix C.

Inorganic

[] = * If the result is a value greater than or equal to the instrument detection limit but less than the contract-required detection limit, report the value in brackets (i.e. [10]). This symbol has been replaced by "B" in Round 1 data and "K" in later rounds.

U = Indicates element was analyzed for but not detected. Report with the instrument detection limit value (e.g., 10U).

E = Indicates a value estimated or not reported due to the presence of interference. Explanatory note included on cover page.

S = Indicates value determined by Method of Standard Addition.

N = Indicates spike sample recovery is not within control limits.

* = Indicates duplicate analysis is not within control limits.

+ = Indicates the correlation coefficient for method of standard addition is less than 0.995.

M = Indicates duplicate injection results exceeded control limits.

W = Post-digestion spike for Furnace AA analysis is out of control limits (85-115%), while sample absorbance is less then 50% of spike absorbance.

Method Qualifier (Enter):

- "P" for ICP
- "A" for Flame AA
- "F" for Furnace AA
- "CV" for Manual Cold Vapor AA
- "AV" for Automated Cold Vapor AA
- "AS" for Semi-Automated Spectrophotometric
- "C" for Manual Spectrophotometric
- "T" for Titrimetric
- "NR" if the analyte is not required to be analyzed

Organics

U = Indicates compound was analyzed for but not detected. The sample quantitation limit must be corrected for dilution and for percent moisture. For example, 10U for phenol in water if the sample final volume is the protocol-specified final volume. If a 1 to 10 dilution of extract is necessary, the reported limit is 100U. For a soil sampling, the value must also be adjusted for percent moisture.

J = Indicates an estimated value. This flag is used either when estimating a concentration for tentatively identified compounds where a 1:1 response is assumed, or when the mass spectral data indicate the presence of a compound that meets the identification criteria but the result is less than the sample quantitation limit but greater than zero.

C = This flag applies to pesticide results where the GC identification has been confirmed by GC/MS. Single component pesticides $\geq$ 10 ng/ul in the final extract shall be confirmed by GC/MS.

B = This flag is used when the analyte is found in the associated blank as well as in the sample. It indicates possible/probable blank contamination and warns the data user to take appropriate action. This flag must be used for a TIC as well as for a positively identified TCL compound.

E = This flag identifies compounds whose concentrations exceed the calibration range of the instrument for that specific analysis. If one or more compounds have a response greater than full scale, the sample or extract must be diluted and reanalyzed according to the specifications in Exhibit D. All such compounds with a response greater than full scale should have the concentration flagged with an "E" on the Form I for the original analysis. IF the dilution of the extract causes any compounds identified in the first analysis to be below the calibration range in the second analysis, then the results of both analyses shall be reported on separate Forms I. The Form I for the diluted sample shall have the "DL" suffix appended to the sample number.

D = This flag identifies all compounds identified in an analysis at a secondary dilution factor. If a sample or extract is reanalyzed at a higher dilution factor, as in the "E" flag above, the "DL" suffix is appended to the sample number on the Form I for the diluted sample, and all concentration values reported on that Form I are flagged with the "D" flag.

A = This flag indicates that a TIC is a suspected aldol-condensation product.

X = This flag is manually qualified. Other specific flags and foot notes may be required to properly define the results. If used, they must be fully described and sub description attached to the Sample Data Summary Package and the Case Narrative. If more than one is required, use "Y" and "Z", as needed. If more than five qualifiers are required for a sample result, use the "X" flag to combine several flags, as needed. For instance, the "X" flag might combine the "A", "B", and "D" flags for some sample.

V13160.41-1CWB/gmg/MJH

ROUND 1

SURFACE WATER RESULTS

Results of pH and Specific Conductance Measurements
Round 1 Surface Water Samples

Sample	Conductivity umho/cm	pH
SW1	570	7.86
SW2	620	7.75
SW3	610	7.88
SW4	600	7.81
SW5	610	7.89

APPENDIX C
WINNEBAGO RECLAMATION LANDFILL ROUND 1 SURFACE WATER DATA
ANALYSIS TYPE: GW Indicators MATRIX: Surface Water

SAMPLE ID:		PP-SW01-01	PP-SW02-01	PP-SW03-01	PP-SW03-91	PP-SW04-01	PP-SW05-01
SAMPLE DATE:		4/07/88	4/08/88	4/08/88	4/08/88	4/08/88	4/08/88
COMPOUNDS	UNIT						
Alkalinity	mg/l	186.00	214.00	210.00	212.00	212.00	217.00
Chloride	mg/l	25.00	27.00	26.00	26.00	26.00	26.00
Phenol	ug/l				9.00		7.00

(1) Results are reported with qualifiers (Data Validation Qualifier/Laboratory Qualifier) to the right of the value.

APPENDIX C
WINNEBAGO RECLAMATION LANDFILL ROUND 1 SURFACE WATER DATA
ANALYSIS TYPE: Metals MATRIX: Surface Water

SAMPLE ID:		PP-SW01-01	PP-SW02-01	PP-SW03-01	PP-SW03-91	PP-SW04-01	PP-SW05-01
SAMPLE DATE:		4/07/88	4/08/88	4/08/88	4/08/88	4/08/88	4/08/88
COMPOUNDS	UNIT						
Barium	ug/l	70.00	80.00	73.00	80.00	76.00	76.00
Cadmium	ug/l	0.80 U/					

(1) Results are reported with qualifiers (Data Validation Qualifier/Laboratory Qualifier) to the right of the value.

APPENDIX C
WINNEBAGO RECLAMATION LANDFILL ROUND 1 SURFACE WATER DATA
ANALYSIS TYPE: Volatiles MATRIX: Surface Water

SAMPLE ID:		PP-SW01-01	PP-SW02-01	PP-SW03-01	PP-SW03-91	PP-SW04-01	PP-SW05-01
SAMPLE DATE:		4/07/88	4/08/88	4/08/88	4/08/88	4/08/88	4/08/88
COMPOUNDS	UNIT						
Chloroethane	ug/l			2.25 U/			
Methylene Chloride	ug/l	19.10					
1,1,1-Trichloroethane	ug/l			0.70			
Trichloroethene	ug/l			1.06			
Benzene	ug/l			1.74			
No Compounds Detected	ug/l		0.00		0.00	0.00	0.00
cis-1,2-Dichloroethene	ug/l			0.67			

(1) Results are reported with qualifiers (Data Validation Qualifier/Laboratory Qualifier) to the right of the value.

ROUND 2

SURFACE WATER RESULTS

Results of pH and Specific Conductance Measurements
Round 2 Surface Water Samples

Well	Conductivity umho/cm	pH
SW1	685	7.94
SW2	685	8.17
SW3	685	8.18
SW4	685	8.18
SW5	685	8.13

APPENDIX C
WINNEBAGO RECLAMATION LANDFILL ROUND 2 SURFACE WATER DATA
ANALYSIS TYPE: GW Indicators MATRIX: Surface Water

SAMPLE ID:		PP-SW01-02	PP-SW02-02	PP-SW03-02	PP-SW04-02	PP-SW05-02	PP-SW05-92
SAMPLE DATE:		2/08/90	2/08/90	2/08/90	2/08/90	2/08/90	2/08/90
COMPOUNDS	UNIT						
Alkalinity	mg/l	236.00 /N	234.00 /N	238.00 /N	233.00 /N	227.00 /N	235.00 /N
Chloride	mg/l	43.00	43.00	43.00	42.00	42.00	42.00
Phenol	ug/l	5.00 /U	5.00 /U	5.00 /U	5.00 /U	5.00 /U	5.00 /U

(1) Results are reported with qualifiers (Data Validation Qualifier/Laboratory Qualifier) to the right of the value.

APPENDIX C
WINNEBAGO RECLAMATION LANDFILL ROUND 2 SURFACE WATER DATA
ANALYSIS TYPE: Volatiles MATRIX: Surface Water

SAMPLE ID:		PP-SW01-02	PP-SW02-02	PP-SW03-02	PP-SW04-02	PP-SW05-02	PP-SW05-92
SAMPLE DATE:		2/08/90	2/08/90	2/08/90	2/08/90	2/08/90	2/08/90
COMPOUNDS	UNIT						
2-Butanone	ug/l	10.00 R/U	10.00 R/U	10.00 R/U	10.00 R/U	10.00 R/U	10.00 R/U
Toluene	ug/l					0.70 UJ/BJ	

(1) Results are reported with qualifiers (Data Validation Qualifier/Laboratory Qualifier) to the right of the value.

APPENDIX C
WINNEBAGO RECLAMATION LANDFILL ROUND 2 SURFACE WATER DATA
ANALYSIS TYPE: Metals MATRIX: Surface Water

SAMPLE ID:		PP-SW01-02	PP-SW02-02	PP-SW03-02	PP-SW04-02	PP-SW05-02	PP-SW05-92
SAMPLE DATE:		2/08/90	2/08/90	2/08/90	2/08/90	2/08/90	2/08/90
COMPOUNDS	UNIT						
Arsenic	ug/l	2.00 /U	2.00 /U	2.00 /U	2.00 /U	2.00 /U	3.40 /K
Barium	ug/l	93.50 /K	100.00 /K	86.00 /K	83.00 /K	74.20 /KS	81.40 /KS
Cadmium	ug/l	0.20 /U	0.20 /U	0.20 /U	0.20 /U	0.20 /U	0.20 /U
Chromium, Total	ug/l	1.00 U/KN	0.98 U/KN	0.77 U/KNS	0.83 U/KN	1.10 U/KN	1.20 U/KN
Cyanide, Total	ug/l	10.00 UJ/UN	10.00 UJ/UN	10.00 R/UN	17.00 J/N	10.00 UJ/UN	10.00 UJ/UN
Chromium, Hexavalent	ug/l	50.00 /U	50.00 /U	50.00 /U	50.00 /U	50.00 /U	50.00 /U

(1) Results are reported with qualifiers (Data Validation Qualifier/Laboratory Qualifier) to the right of the value.

2

GROUNDWATER RESULTS

ROUND 1

GROUNDWATER RESULTS

WRL Groundwater Sampling
Round 1

	B4	B6S	B6D	B7	B9	B10	B11	B11A	B12	B13	B14	B15	B15R	B15P	B16	B16A	G107	G108	G109	G109A	G110	G111	G112
VOCS (GC with GC/MS conf.)	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X
SVOCs												X	X	X					X	X			
Pesticide/PCB												X	X	X					X	X			
23 Metals (dissolved)												X	X	X					X	X			
Arsenic (dissolved)	X	X	X	X	X	X	X	X	X	X	X				X	X	X	X			X		X
Barium (dissolved)	X	X	X	X	X	X	X	X	X	X	X				X	X	X	X			X		X
Cadmium (dissolved)	X	X	X	X	X	X	X	X	X	X	X				X	X	X	X			X		X
Cyanide, Total												X	X	X					X	X			
Chloride	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X
Phenolics, Total	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X
Alkalinity, Total	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X
Field pH	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X
Field Spec. Cond.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X

WRL Groundwater Sampling
Round 1
(Continued)

	G113	G113A	G114	G115	D116	G116A	G117	G118R	G118A	G119	G119A	P1	P3R	P4R	P6	P7	MW105	MW106	PRIVATE WELL (PN1/PWD
VOCs (GC with GC/MS conf.)	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X
SVOCs				X	X	X	X		X			X	X	X				X	
Pesticide/PCB				X	X	X	X		X			X	X	X				X	
23 Metals (dissolved)[1]				X	X	X	X		X			X	X	X				X	
Arsenic (dissolved)	X	X	X							X	X				X	X	X		X
Barium (dissolved)	X	X	X							X	X				X	X	X		X
Cadmium (dissolved)	X	X	X							X	X				X	X	X		X
Cyanide, Total				X	X	X	X		X			X	X	X				X	
Chloride	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X
Phenolics, Total	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X
Alkalinity, Total	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X
Field pH	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X
Field Spec. Cond.	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X

1 Arsenic, barium, cadmium and chromium are included in the 23 metals category.

V13160.41-Tables-SJB/lms

Results of pH and Specific Conductance Measurements
Round 1 Groundwater Samples

Sample	Conductivity umho/cm	pH	Sample	Conductivity umho/cm	pH
B4	860	7.27	G113	1,680	6.87
B6S	650	7.56	G113A	1,430	6.89
B6D	570	7.59	G114	1,550	6.57
B7	730	7.46	G115	1,510	6.68
B9	600	7.73	G116	530	7.06
B10	1,230	7.14	G116A	780	6.95
B11	680	7.07	G117	780	7.04
B11A	840	7.15	G118	--	--
B12	1,550	6.69	G118A	410	7.37
B13	1,180	6.84	G119	460	7.43
B14	630	7.63	G119A	600	7.10
B15	4,390	6.99	MW105	640	7.64
B15P	660	7.52	MW106	3,310	6.45
B15R	4,130	7.10	P1	2,200	6.41
B16	660	7.50	P3R	1,010	7.04
B16A	590	7.73	P4R	1,380	7.57
G107	690	7.31	P6	640	7.47
G108	1,010	6.70	P7	900	7.15
G109	1,410	6.67	PW1	660	7.25
G109A	1,640	7.08			
G110	1,420	6.95			
G111	--	--			
G112	1,310	7.04			

APPENDIX C
WINNEBAGO RECLAMATION LANDFILL ROUND 1 GROUNDWATER DATA
ANALYSIS TYPE: GW Indicators MATRIX: Ground Water

SAMPLE ID:		PP-B04-01	PP-B06D-01	PP-B06S-01	PP-B07-01	PP-B09-01	PP-B10-01
SAMPLE DATE:		4/05/88	4/07/88	4/07/88	4/07/88	4/05/88	4/06/88
COMPOUNDS	UNIT						
Alkalinity	mg/l	553.00	273.00	287.00	321.00	294.00	438.00
Chloride	mg/l	9.00	10.00	23.00	23.00	4.00	15.00
Phenol	ug/l					9.00 U/	

APPENDIX C
WINNEBAGO RECLAMATION LANDFILL ROUND 1 GROUNDWATER DATA
ANALYSIS TYPE: GW Indicators MATRIX: Ground Water

SAMPLE ID:		PP-B11-01	PP-B11A-01	PP-B11A-91	PP-B12-01	PP-B13-01	PP-B14-01
SAMPLE DATE:		4/07/88	4/07/88	4/07/88	4/06/88	4/06/88	4/05/88
COMPOUNDS	UNIT						
Alkalinity	mg/l	379.00	463.00	460.00	910.00	647.00	289.00
Chloride	mg/l	5.00	9.00	9.00	22.00	28.00	10.00
Phenol	ug/l				12.00 U/		

APPENDIX C
WINNEBAGO RECLAMATION LANDFILL ROUND 1 GROUNDWATER DATA
ANALYSIS TYPE: GW Indicators MATRIX: Ground Water

SAMPLE ID:		PP-B15-01	PP-B15P-01	PP-B15R-01	PP-B16-01	PP-B16A-01	PP-G107-01
SAMPLE DATE:		4/08/88	4/05/88	4/05/88	4/07/88	4/07/88	4/06/88
COMPOUNDS	UNIT						
Alkalinity	mg/l	1270.00	297.00	1130.00	311.00	245.00	377.00
Chloride	mg/l	609.00	14.00	477.00	19.00	16.00	20.00
Phenol	ug/l	25.00 U/		6.00 U/			5.00 UJ/

APPENDIX C
WINNEBAGO RECLAMATION LANDFILL ROUND 1 GROUNDWATER DATA
ANALYSIS TYPE: GW Indicators MATRIX: Ground Water

SAMPLE ID:		PP-G107-91	PP-G108-01	PP-G109-01	PP-G109A-01	PP-G110-01	PP-G112-01
SAMPLE DATE:		4/06/88	4/07/88	4/06/88	4/06/88	4/06/88	4/06/88
COMPOUNDS	UNIT						
Alkalinity	mg/l	364.00	609.00	848.00	844.00	533.00	569.00
Chloride	mg/l	20.00	9.00	28.00	62.00	166.00	29.00
Phenol	ug/l					10.00 U/	

APPENDIX C
WINNEBAGO RECLAMATION LANDFILL ROUND 1 GROUNDWATER DATA
ANALYSIS TYPE: GW Indicators MATRIX: Ground Water

SAMPLE ID:		PP-G113-01	PP-G113A-01	PP-G114-01	PP-G115-01	PP-G116-01	PP-G116A-01
SAMPLE DATE:		4/06/88	4/06/88	4/06/88	4/05/88	4/05/88	4/05/88
COMPOUNDS	UNIT						
Alkalinity	mg/l	881.00	800.00	855.00	816.00	253.00	313.00
Chloride	mg/l	30.00	30.00	42.00	40.00	7.00	41.00
Phenol	ug/l	9.00 UJ/		6.00 UJ/			

APPENDIX C
WINNEBAGO RECLAMATION LANDFILL ROUND 1 GROUNDWATER DATA
ANALYSIS TYPE: GW Indicators *MATRIX: Ground Water*

SAMPLE ID:		PP-G116A-91	PP-G117-01	PP-G118A-01	PP-G119-01	PP-G119A-01	PP-MW105-01
SAMPLE DATE:		4/05/88	4/05/88	4/05/88	4/04/88	4/04/88	4/07/88
COMPOUNDS	UNIT						
Alkalinity	mg/l	303.00	395.00	273.00	282.00	272.00	260.00
Chloride	mg/l	40.00	28.00	12.00	3.00	12.00	17.00
Phenol	ug/l						

APPENDIX C
WINNEBAGO RECLAMATION LANDFILL ROUND 1 GROUNDWATER DATA
ANALYSIS TYPE: GW Indicators MATRIX: Ground Water

SAMPLE ID:		PP-MW106-01	PP-P1-01	PP-P3R-01	PP-P4R-01	PP-P4R-91	PP-P6-01
SAMPLE DATE:		4/05/88	4/05/88	4/05/88	4/05/88	4/05/88	4/06/88
COMPOUNDS	UNIT						
Alkalinity	mg/l	1030.00	668.00	494.00	559.00	531.00	273.00
Chloride	mg/l	430.00	252.00	47.00	149.00	152.00	16.00
Phenol	ug/l	8.00 U/		6.00 U/	6.00 U/		

APPENDIX C
WINNEBAGO RECLAMATION LANDFILL ROUND 1 GROUNDWATER DATA
ANALYSIS TYPE: GW Indicators MATRIX: Ground Water

SAMPLE ID:		PP-P7-01	PP-PW1-01	PP-PW1-91
SAMPLE DATE:		4/05/88	4/08/88	4/08/88
COMPOUNDS	UNIT			
Alkalinity	mg/l	444.00	270.00	282.00
Chloride	mg/l	44.00	11.00	11.00
Phenol	ug/l			

(1) Results are reported with qualifiers (Data Validation Qualifier/Laboratory Qualifier) to the right of the value.

APPENDIX C
WINNEBAGO RECLAMATION LANDFILL ROUND 3 GROUNDWATER DATA
ANALYSIS TYPE: Semi-Volatiles MATRIX: Ground Water

SAMPLE ID:		PP-G110-03	PP-G111-03	PP-G114-03	PP-G115-03	PP-G116-03	PP-G116A-03
SAMPLE DATE:		2/07/90	2/07/90	2/07/90	2/07/90	2/06/90	2/06/90
COMPOUNDS	UNIT						
1,4-Dichlorobenzene	ug/l	6.00 /J		36.00	3.00 /J		
1,2-Dichlorobenzene	ug/l			4.00 /J			
Diethylphthalate	ug/l	4.00 /J					
bis(2-Ethylhexyl)phthalate	ug/l			7.00 /J			
No Compounds Detected	ug/l		0.00			0.00	0.00

APPENDIX C
WINNEBAGO RECLAMATION LANDFILL ROUND 3 GROUNDWATER DATA
ANALYSIS TYPE: Semi-Volatiles MATRIX: Ground Water

SAMPLE ID:		PP-P1-03	PP-P3R-03	PP-P4R-03	PP-P4R-93	PP-P6-03
SAMPLE DATE:		2/08/90	2/07/90	2/07/90	2/07/90	2/08/90
COMPOUNDS	UNIT					
1,4-Dichlorobenzene	ug/l					
1,2-Dichlorobenzene	ug/l					
Diethylphthalate	ug/l					
bis(2-Ethylhexyl)phthalate	ug/l			9.00 /J	13.00	
No Compounds Detected	ug/l	0.00	0.00			0.00

(1) Results are reported with qualifiers (Data Validation Qualifier/Laboratory Qualifier) to the right of the value.

APPENDIX C
WINNEBAGO RECLAMATION LANDFILL ROUND 3 GROUNDWATER DATA
ANALYSIS TYPE: Metals MATRIX: Ground Water

SAMPLE ID:		PP-B13-03	PP-B15P-03	PP-B15R-03	PP-B15R-93	PP-G109-03	PP-G109A-03
SAMPLE DATE:		2/08/90	2/06/90	2/07/90	2/07/90	2/08/90	2/08/90
COMPOUNDS	UNIT						
Arsenic	ug/l	2.00 /U	2.00 /U	4.10 /K	3.30 /K	2.00 /U	2.00 /U
Barium	ug/l	176.00 /K	45.00 /K	698.00	585.00	141.00 /KS	300.00 /S
Cadmium	ug/l	0.20 /U	0.22 /K	0.20 /U	0.20 /U	0.20 /U	0.20 /U
Chromium, Total	ug/l	1.00 U/KN	1.40 J/KNS	3.00 /KN	2.60 /KN	0.33 U/KN	3.50 /KNS
Cyanide, Total	ug/l	10.00 /UN	10.00 /UN	238.00 /N	158.00 /N	10.00 /UN	10.00 /UN
Chromium, Hexavalent	ug/l	50.00 /U	50.00 /U	50.00 /U	50.00 /U	50.00 /U	50.00 /U

APPENDIX C
WINNEBAGO RECLAMATION LANDFILL ROUND 3 GROUNDWATER DATA
ANALYSIS TYPE: Metals MATRIX: Ground Water

SAMPLE ID:		PP-G110-03	PP-G111-03	PP-G114-03	PP-G115-03	PP-G116-03	PP-G116A-03
SAMPLE DATE:		2/07/90	2/07/90	2/07/90	2/07/90	2/06/90	2/06/90
COMPOUNDS	UNIT						
Arsenic	ug/l	30.10 /S	2.70 /K	16.40	24.30	2.00 /U	2.00 /U
Barium	ug/l	772.00	64.80 /KS	980.00	562.00	50.60 /K	25.30 /K
Cadmium	ug/l	0.20 /U	0.82 /K	0.20 /U	0.20 /U	0.20 /U	0.20 /U
Chromium, Total	ug/l	2.40 /KN	0.53 U/KN	0.64 U/KNS	0.20 U/UNS	0.35 U/KN	0.64 U/KNS
Cyanide, Total	ug/l	10.00 /UN	10.00 /UN	25.00 /N	10.00 /UN	37.00 /N	10.00 /UN
Chromium, Hexavalent	ug/l	50.00 /U	50.00 /U	50.00 /U	50.00 /U	50.00 /U	50.00 /U

APPENDIX C
WINNEBAGO RECLAMATION LANDFILL ROUND 3 GROUNDWATER DATA
ANALYSIS TYPE: Metals MATRIX: Ground Water

SAMPLE ID:		PP-P1-03	PP-P3R-03	PP-P4R-03	PP-P4R-93	PP-P6-03
SAMPLE DATE:		2/08/90	2/07/90	2/07/90	2/07/90	2/08/90
COMPOUNDS	UNIT					
Arsenic	ug/l	12.20	15.80	2.00 /U	2.00 /U	2.00 /U
Barium	ug/l	698.00	555.00	124.00 /KS	148.00 /K	82.00 /K
Cadmium	ug/l	0.20 /U	0.20 /U	2.20 /K	2.20 /K	0.20 /U
Chromium, Total	ug/l	0.64 U/KN	0.40 U/KNS	0.30 U/KN	0.33 U/KN	0.36 U/KN
Cyanide, Total	ug/l	10.00 /UN	12.00 /N	10.00 /UN	10.00 /UN	10.00 /UN
Chromium, Hexavalent	ug/l	50.00 /U	50.00 /U	50.00 /U	50.00 /U	50.00 /U

(1) Results are reported with qualifiers (Data Validation Qualifier/Laboratory Qualifier) to the right of the value.

PROJECT NAME: WINNEBAGO RECLAMATION LANDFILL
PROJECT NUMBER: 13160.00

MATRIX: Ground Water

SAMPLE ID	ANAL. TYPE	COMPOUND	CONC.	UNITS	DVQ	LQ
PP-B13-03						
	TBNA	9-Octadecenamide, (Z)-	13.000	ug/l		J
	TVOA	Ethyl ether	11.000	ug/l		JX
PP-B15P-03						
	TVOA	Unknown fluorocarbon	5.100	ug/l		J
PP-B15R-03						
	TBNA	Sulfur, Mol. (S8)	95.000	ug/l		J
	TBNA	Benzamide, n,n-diethyl-3-methyl-	10.000	ug/l		J
	TBNA	2(3H)-Benzothiazolone	23.000	ug/l		J
	TBNA	Phenol, 2,3-dimethyl-	9.300	ug/l		J
	TBNA	Benzenesulfonamide, n-butyl-...	10.000	ug/l		J
	TBNA	Benzoic acid, 4-(1,1-dimethyl)-	14.000	ug/l		J
	TVOA	Furan, tetrahydro-	9.800	ug/l		JX
	TVOA	Ethyl ether	14.000	ug/l		J
	TVOA	Methane, dichlorofluoro-	8.100	ug/l		J
PP-B15R-93						
	TBNA	Benzoic acid, 4-(1,1-Dimethylethyl)-	10.000	ug/l		J
	TBNA	Sulfur, Mol. (S8)	80.000	ug/l		J
	TBNA	2(3H)-Benzothiazolone	20.000	ug/l		J
	TBNA	Benzenesulfonamide, n-butyl-...	9.500	ug/l		J
	TBNA	3,6-Dioxa-2,4,5,7-Tetrasilao.. .	17.000	ug/l		J
	TVOA	Ethyl ether	12.000	ug/l		J
	TVOA	Methane, chlorofluoro-	9.000	ug/l		J
	TVOA	Methane, dichlorofluoro-	9.000	ug/l		J
PP-G109A-03						
	TBNA	1,2-Benzenedicarboxylic Acid	16.000	ug/l		J
	TBNA	1,2-Benzenedicarboxylic Acid	21.000	ug/l		J
	TBNA	1,2-Benzenedicarboxylic Acid	19.000	ug/l		J
	TBNA	1,2-Benzenedicarboxylic Acid	47.000	ug/l		J
	TBNA	1,2-Benzenedicarboxylic Acid	10.000	ug/l		J

PROJECT NAME: WINNEBAGO RECLAMATION LANDFILL
PROJECT NUMBER: 13160.00

MATRIX: Ground Water

SAMPLE ID	ANAL. TYPE	COMPOUND	CONC.	UNITS	DVQ	LQ
	TBNA	Sulfur, Mol. (S8)	11.000	ug/l		J
	TBNA	Benzamide, n-propyl-	29.000	ug/l		J
	TBNA	Benzamide, n-propyl-	23.000	ug/l		J
	TBNA	Hexanedioic acid, mono(2-eth...	23.000	ug/l		J
PP-G110-03						
	TBNA	Sulfur, Mol. (S8)	650.000	ug/l		J
	TBNA	Benzamide, n,n-diethyl-3-methyl-	9.400	ug/l		J
	TBNA	2(3H)-Benzothiazolone	11.000	ug/l		J
	TBNA	Benzenesulfonamide, n-ethyl-4-methyl-	14.000	ug/l		J
	TBNA	Bicyclo[2.2.1]heptan-2-one,	26.000	ug/l		J
	TBNA	Ethane, 1,1'-Oxybis[2-ethoxy...	8.400	ug/l		J
	TBNA	1,3-Pentanediol, 2,2,4-trime...	15.000	ug/l		J
	TBNA	1-Propanol, 2-(2-methoxy-1-m...	17.000	ug/l		J
	TBNA	1-Hexene, 3,4,5-trimethyl-	9.800	ug/l		J
	TBNA	Benzenesulfonamide, n-ethyl-	31.000	ug/l		J
	TBNA	Pentanamide, 4-methyl-	30.000	ug/l		J
	TVOA	Ethyl ether	98.000	ug/l		J
	TVOA	Methane, chlorofluoro-	52.000	ug/l		J
	TVOA	Methane, dichlorofluoro-	31.000	ug/l		J
PP-G114-03						
	TBNA	Sulfur, Mol. (S8)	12.000	ug/l		J
	TVOA	Ethyl ether	41.000	ug/l		J
	TVOA	Methane, chlorofluoro-	5.000	ug/l		J
PP-G115-03						
	TBNA	Sulfur, Mol. (S8)	38.000	ug/l		J
	TVOA	Ethyl ether	22.000	ug/l		J
	TVOA	Methane, chlorodifluoro-	16.000	ug/l		JX
PP-P3R-03						
	TBNA	Sulfur, Mol. (S8)	71.000	ug/l		J

PROJECT NAME: WINNEBAGO RECLAMATION LANDFILL
PROJECT NUMBER: 13160.00

MATRIX: Ground Water

SAMPLE ID	ANAL. TYPE	COMPOUND	CONC.	UNITS	DVQ	LQ
PP-P4R-03						
	TBNA	Unknown	23.000	ug/l		J
	TBNA	1,2-Benzenedicarboxylic Acid	9.300	ug/l		J
	TBNA	1,2-Benzenedicarboxylic Acid	15.000	ug/l		J
	TBNA	Hexanedioic acid, bis (2-ethyl...)	8.400	ug/l		J
PP-P4R-93						
	TBNA	1,2-Benzenedicarboxylic Acid	18.000	ug/l		J
	TBNA	1,2-Benzenedicarboxylic Acid	9.500	ug/l		J
	TBNA	Hexanedioic acid, bis (2-ethyl...)	13.000	ug/l		J

	TCL ORG	TAL METALS	CN	TS	TOC	CEC	PH	GRAIN SIZE	ATTB.	DISP. FEE	TRACK FEE	TOTAL COST
	1525	475	80.00		100.00	150	25	125		10	10	
LORD												
LO-SSB10-02	x	x	x	x								
LO-SSB10-04					x		x	x		x		
LO-SSB10-06								x	x			
LO-SSB10-36								x	x			
LO-SSW07D-18								x				
LO-SSW07D-26								x				
TOTAL LO SAMPLES	1	1	1	1	1	0	1	5	2	1	0	
LO SS COST	$1,525	$475	$80	$0	$100	$0	$25	$625	$0	$10	$0	$2,840
SAEGERTOWN OFF-SITE (COMMON)												
SA(SM)-SSB18-06	x	x	x	x	x		x	x		x		
SA(SM)-SSB18-10	x	x	x	x	x		x	x		x		
SA-SSB11-04	x	x	x	x	x		x	x		x		
SA-SSB11-10	x	x	x	x	x		x	x		x		
SA-SSB17-04	x	x	x	x	x		x	x		x		
SA-SSB17-10	x	x	x	x	x		x	x		x		
TOTAL SA SAMPLES	6	6	6	6	6	0	6	6	0	6	0	
SA SS COST	$9,150	$2,850	$480	$0	$600	$0	$150	$750	$0	$60	$0	$14,040

SAGERTOWN INDUSTRIAL AREA SITE
Soil Borings Samples

	TCL ORG	TAL METALS	CN	TS	TOC	CEC	PH	GRAIN SIZE	ATTB.	DISP. FEE	TRACK FEE	TOTAL COST
	1525	475	80.00		100.00	150	25	125		10	10	
INVESTIGATIVE SAMPLES												
GATX												
GA-SSB03-06	x	x	x	x	x	x	x	x		x		
GA-SSB03-08						x						
GA-SSB03-10	x	x	x	x	x	x	x	x		x		
GA-SSB04-04	x	x	x	x								
GA-SSB04-06												
GA-SSB04-08	x	x	x	x	x	x	x	x		x		
GA-SSB04-10						x						
GA-SSB07-02	x	x	x	x	x	x	x	x		x		
GA-SSB07-04	x	x	x	x	x		x	x		x		
GA-SSB08-04	x	x	x	x		x						
GA-SSB08-06					x		x	x		x		
GA-SSB08-10	x	x	x	x	x		x					
GA-SSB08-12								x				
GA-SSB09-04	x	x	x	x	x	x	x	x		x		
GA-SSB09-08	x	x	x	x	x	x	x	x		x		
GA-SSB12-04	x	x	x	x	x	x	x	x		x		
GA-SSB12-08	x	x	x	x	x	x	x	x		x		
GA-SSB13-04	x	x	x	x	x	x	x	x		x		
GA-SSB13-12	x	x	x	x	x	x	x	x		x		
GA-SSB14-02	x	x	x	x	x	x	x	x		x		
GA-SSB14-06	x	x	x	x	x	x	x	x		x		
GA-SSB15-04	x	x	x	x	x	x	x	x		x		
GA-SSB15-06	x	x	x	x	x	x	x	x		x		
GA-SSBO5-04	x	x	x	x	x		x	x	x			
GA-SSB06-02	x	x	x	x	x		x	x	x			
GA-SSB06-04	x	x	x	x	x		x	x	x			
GA-SSW04D-04								x	x			
GA-SSW04D-34								x	x			
GA-SSW09D-46								x	x			
GA-SSW05D-40								x	x			
GA-SSW09D-14								x	x			
GA-SSW05D-16								x	x			
TOTAL SAMPLES	21	21	21	21	20	17	20	26	9	16	0	
GA SS COST	$32,025	$9,975	$1,680	$0	$2,000	$2,550	$500	$3,250	$0	$160	$0	$52,140

	TCL ORG	TAL METALS	CN	TS	TOC	CEC	PH	GRAIN SIZE	ATTB.	DISP. FEE	TRACK FEE	TOTAL COST
	1525	475	80.00		100.00	150	25	125		10	10	
SAEGERTOWN MANUFACTURING CORP												
SM-SSB01-14	x	x	x	x	x		x	x		x		
SM-SSB01-06		x	x	x	x		x	x		x		
SM-SSB01-04	x											
SM-SSW01D-04								x	x			
TOTAL SM SAMPLES	2	2	2	2	2	0	2	3	1	2	0	
SM SS COST	$3,050	$950	$160	$0	$200	$0	$50	$375	$0	$20	$0	$4,805
SPECTRIUM CONTROL												
SC-SSB02-06	x	x	x	x	x		x	x		x		
SC-SSB02-18	x	x	x	x	x		x	x		x		
SC-SSB16-04	x	x	x	x	x		x	x		x		
SC-SSB16-08	x	x	x	x	x		x	x		x		
TOTAL SC SAMPLES	4	4	4	4	4	0	4	4	0	4	0	
SC SS COST	$6,100	$1,900	$320	$0	$400	$0	$100	$500	$0	$40	$0	$9,360
TOTAL INVEST SS AMPL COST	$51,850	$16,150	$2,720	$0	$3,300	$2,550	$825	$5,500	$0	$290	$0	$83,185
QUALITY CONTROL SAMPLES												
GA-SSB08-10D	x	x	x	x	x		x	x		x		
GA-SSB08-12D								x				
SA-SSB11-04D	x	x	x	x	x		x	x		x		
SC-SSB16-04D	x	x	x	x	x		x	x		x		
GA-SSB05-04MS	x											
GA-SSB05-04MSD	x											
GA-SSB06-02MS	x											
GA-SSB06-02MSD	x											
GA-SSBO6-04MS	x											
GA-SSBO6-04MSD	x											
TOT QC SS SAMPLE	9	3	3	3	3	0	3	4	0	3	0	
TOTAL QC SS SAMPLE COST	$13,725	$1,425	$240	$0	$300	$0	$75	$500	$0	$30	$0	$16,295
TOTAL SS ANALYTICAL COST	$65,575	$17,575	$2,960	$0	$3,600	$2,550	$900	$6,000	$0	$320	$0	$99,480

	TCL ORG	TAL METALS	CN	TS	TOC	CEC	PH	GRAIN SIZE	ATTB.	DISP. FEE	TRACK FEE	TOTAL COST
	1525	475	80.00		100.00	150	25	125		10	10	
LORD												
LO-SSB10-02	x	x	x	x								
LO-SSB10-04					x		x	x		x		
LO-SSB10-06								x	x			
LO-SSB10-36								x	x			
LO-SSW07D-18								x				
LO-SSW07D-26								x				
TOTAL LO SAMPLES	1	1	1	1	1	0	1	5	2	1	0	
LO SS COST	$1,525	$475	$80	$0	$100	$0	$25	$625	$0	$10	$0	$2,840
SAEGERTOWN OFF-SITE (COMMON)												
SA(SM)-SSB18-06	x	x	x	x	x		x	x		x		
SA(SM)-SSB18-10	x	x	x	x	x		x	x		x		
SA-SSB11-04	x	x	x	x	x		x	x		x		
SA-SSB11-10	x	x	x	x	x		x	x		x		
SA-SSB17-04	x	x	x	x	x		x	x		x		
SA-SSB17-10	x	x	x	x	x		x	x		x		
TOTAL SA SAMPLES	6	6	6	6	6	0	6	6	0	6	0	
SA SS COST	$9,150	$2,850	$480	$0	$600	$0	$150	$750	$0	$60	$0	$14,040

SHEFFIELD INDUSTRIAL AREA SITE
Soil Borings Samples

	TCL ORG	TAL METALS	CN	TS	TOC	CEC	PH	GRAIN SIZE	ATTB.	DISP. FEE	TRACK FEE	TOTAL COST
	1525	475	80.00		100.00	150	25	125		10	10	
INVESTIGATIVE SAMPLES												
GATX												
GA-SSB03-06	x	x	x	x	x	x	x	x		x		
GA-SSB03-08						x						
GA-SSB03-10	x	x	x	x	x	x	x	x		x		
GA-SSB04-04	x	x	x	x								
GA-SSB04-06												
GA-SSB04-08	x	x	x	x	x	x	x	x		x		
GA-SSB04-10						x						
GA-SSB07-02	x	x	x	x	x	x	x	x		x		
GA-SSB07-04	x	x	x	x	x		x	x		x		
GA-SSB08-04	x	x	x	x		x						
GA-SSB08-06					x		x	x		x		
GA-SSB08-10	x	x	x	x	x		x					
GA-SSB08-12								x				
GA-SSB09-04	x	x	x	x	x	x	x	x		x		
GA-SSB09-08	x	x	x	x	x	x	x	x		x		
GA-SSB12-04	x	x	x	x	x	x	x	x		x		
GA-SSB12-08	x	x	x	x	x	x	x	x		x		
GA-SSB13-04	x	x	x	x	x	x	x	x		x		
GA-SSB13-12	x	x	x	x	x	x	x	x		x		
GA-SSB14-02	x	x	x	x	x	x	x	x		x		
GA-SSB14-06	x	x	x	x	x	x	x	x		x		
GA-SSB15-04	x	x	x	x	x	x	x	x		x		
GA-SSB15-06	x	x	x	x	x	x	x	x		x		
GA-SSBO5-04	x	x	x	x	x		x	x	x			
GA-SSB06-02	x	x	x	x	x		x	x	x			
GA-SSB06-04	x	x	x	x	x		x	x	x			
GA-SSW04D-04								x	x			
GA-SSW04D-34								x	x			
GA-SSW09D-46								x	x			
GA-SSW05D-40								x	x			
GA-SSW09D-14								x	x			
GA-SSW05D-16								x	x			
TOTAL SAMPLES	21	21	21	21	20	17	20	26	9	16	0	
GA SS COST	$32,025	$9,975	$1,680	$0	$2,000	$2,550	$500	$3,250	$0	$160	$0	$52,140

	TCL ORG	TAL METALS	CN	TS	TOC	CEC	PH	GRAIN SIZE	ATTB.	DISP. FEE	TRACK FEE	TOTAL COST
	1525	475	80.00		100.00	150	25	125		10	10	
SAEGERTOWN MANUFACTURING CORP												
SM-SSB01-14	x	x	x	x	x		x	x		x		
SM-SSB01-06		x	x	x	x		x	x		x		
SM-SSB01-04	x											
SM-SSW01D-04								x	x			
TOTAL SM SAMPLES	2	2	2	2	2	0	2	3	1	2	0	
SM SS COST	$3,050	$950	$160	$0	$200	$0	$50	$375	$0	$20	$0	$4,805
SPECTRIUM CONTROL												
SC-SSB02-06	x	x	x	x	x		x	x		x		
SC-SSB02-18	x	x	x	x	x		x	x		x		
SC-SSB16-04	x	x	x	x	x		x	x		x		
SC-SSB16-08	x	x	x	x	x		x	x		x		
TOTAL SC SAMPLES	4	4	4	4	4	0	4	4	0	4	0	
SC SS COST	$6,100	$1,900	$320	$0	$400	$0	$100	$500	$0	$40	$0	$9,360
TOTAL INVEST SS AMPL COST	$51,850	$16,150	$2,720	$0	$3,300	$2,550	$825	$5,500	$0	$290	$0	$83,185
QUALITY CONTROL SAMPLES												
GA-SSB08-10D	x	x	x	x	x		x	x		x		
GA-SSB08-12D								x				
SA-SSB11-04D	x	x	x	x	x		x	x		x		
SC-SSB16-04D	x	x	x	x	x		x	x		x		
GA-SSB05-04MS	x											
GA-SSB05-04MSD	x											
GA-SSB06-02MS	x											
GA-SSB06-02MSD	x											
GA-SSBO6-04MS	x											
GA-SSBO6-04MSD	x											
TOT QC SS SAMPLE	9	3	3	3	3	0	3	4	0	3	0	
TOTAL QC SS SAMPLE COST	$13,725	$1,425	$240	$0	$300	$0	$75	$500	$0	$30	$0	$16,295
TOTAL SS ANALYTICAL COST	$65,575	$17,575	$2,960	$0	$3,600	$2,550	$900	$6,000	$0	$320	$0	$99,480

ROUND 4

GROUNDWATER RESULTS

Results of pH and Specific Conductance Measurements for Round 4 Samples

Well	Conductivity	pH
Groundwater	umho/cm	
B13	1220	6.67
B15R	3365	6.37
B15P	610	6.89
G109	1260	6.70
G109A	1450	6.81
G110	3590	7.04
G111	685	6.42
G114	1910	6.57
G115	1840	6.30
G116	645	6.92
G116A	950	7.30
P1	1255	6.75
P3R	1240	6.14
P4R	790	6.66
P6	655	7.14

V160R09JAH ROUND 3

WRL Groundwater Sampling
Round 4

	B4	B6S	B6D	B7	B9	B10	B11	B11A	B12	B13	B14	B15	B15R	B15P	B16	B16A	G107	G108	G109	G109A	G110	G111	G112	G113
VOCS (GC/MS)										X			X	X					X	X	X	X		
Arsenic (dissolved)										X			X	X					X	X	X	X		
Barium (dissolved)										X			X	X					X	X	X	X		
Cadmium (dissolved)										X			X	X					X	X	X	X		
Cyanide, Total										X			X	X					X	X	X	X		
Chloride										X			X	X					X	X	X	X		
Sulfate										X			X	X					X	X	X	X		
Phenolics, Total										X			X	X					X	X	X	X		
Alkalinity, Total										X			X	X					X	X	X	X		
Field pH										X			X	X					X	X	X	X		
Field Spec. Cond.										X			X	X					X	X	X	X		

WRL Groundwater Sampling
Round 4
(Continued)

	G113A	G114	G115	G116	G116A	G117	G118R	G118A	G119	G119A	P1	P3R	P4R	P6	P7	MW105	MW106	PRIVATE WELL (PW1/PW0)
VOCs (GC/MS)		X	X	X	X						X	X	X	X				
Arsenic (dissolved)		X	X	X	X						X	X	X	X				
Barium (dissolved)		X	X	X	X						X	X	X	X				
Cadmium (dissolved)		X	X	X	X						X	X	X	X				
Cyanide, Total		X	X	X	X						X	X	X	X				
Chloride		X	X	X	X						X	X	X	X				
Sulfate		X	X	X	X						X	X	X	X				
Phenolics, Total		X	X	X	X						X	X	X	X				
Alkalinity, Total		X	X	X	X						X	X	X	X				
Field pH		X	X	X	X						X	X	X	X				
Field Spec. Cond.		X	X	X	X						X	X	X	X				

V13160.41-Tables-SJB/lms

APPENDIX C
WINNEBAGO RECLAMATION LANDFILL ROUND 4 GROUNDWATER DATA
ANALYSIS TYPE: GW Indicators MATRIX: Ground Water

SAMPLE ID:		PP-B13-04	PP-B15P-04	PP-B15P-94	PP-B15R-04	PP-G109-04	PP-G109A-04
SAMPLE DATE:		4/24/90	4/25/90	4/25/90	4/25/90	4/24/90	4/24/90
COMPOUNDS	UNIT						
Alkalinity	mg/l	604.00	269.00	271.00	1060.00	729.00	780.00
Chloride	mg/l	34.00	10.00	12.00	459.00	10.00	70.00
Phenol	ug/l	5.00 /U	6.00 U/	5.00 U/	19.00 U/	5.00 /U	5.00 U/
Sulfate	mg/l	40.00	29.00	29.00	41.00	19.00	24.00

APPENDIX C
WINNEBAGO RECLAMATION LANDFILL ROUND 4 GROUNDWATER DATA
ANALYSIS TYPE: GW Indicators MATRIX: Ground Water

SAMPLE ID:		PP-G110-04	PP-G111-04	PP-G114-04	PP-G115-04	PP-G116-04	PP-G116A-04
SAMPLE DATE:		4/24/90	4/23/90	4/24/90	4/24/90	4/23/90	4/23/90
COMPOUNDS	UNIT						
Alkalinity	mg/l	1300.00	255.00	911.00	937.00	273.00	322.00
Chloride	mg/l	523.00	26.00	134.00	191.00	7.00	38.00
Phenol	ug/l	17.00 U/	5.00 /U	9.00 U/	8.00 U/	9.00 U/	5.00 /U
Sulfate	mg/l	26.00	32.00	56.00	73.00	50.00	34.00

APPENDIX C
WINNEBAGO RECLAMATION LANDFILL ROUND 4 GROUNDWATER DATA
ANALYSIS TYPE: GW Indicators MATRIX: Ground Water

SAMPLE ID:		PP-G116A-94	PP-P1-04	PP-P3R-04	PP-P4R-04	PP-P6-04
SAMPLE DATE:		4/23/90	4/24/90	4/23/90	4/23/90	4/24/90
COMPOUNDS	UNIT					
Alkalinity	mg/l	323.00	541.00	537.00	304.00	260.00
Chloride	mg/l	38.00	80.00	77.00	28.00	20.00
Phenol	ug/l	5.00 U/	5.00 U/	10.00 U/	7.00 U/	5.00 /U
Sulfate	mg/l	34.00	50.00	54.00	34.00	35.00

(1) Results are reported with qualifiers (Data Validation Qualifier/Laboratory Qualifier) to the right of the value.

APPENDIX C
WINNEBAGO RECLAMATION LANDFILL ROUND 4 GROUNDWATER DATA
ANALYSIS TYPE: Volatiles MATRIX: Ground Water

SAMPLE ID:		PP-B13-04	PP-B15P-04	PP-B15P-94	PP-B15R-04	PP-G109-04	PP-G109A-04
SAMPLE DATE:		4/24/90	4/25/90	4/25/90	4/25/90	4/24/90	4/24/90
COMPOUNDS	UNIT						
Chloromethane	ug/l	10.00 UJ/U	10.00 UJ/U	10.00 UJ/U	10.00 UJ/U	10.00 UJ/U	10.00 UJ/U
Bromomethane	ug/l	10.00 UJ/U	10.00 UJ/U	10.00 UJ/U	10.00 UJ/U	10.00 UJ/U	10.00 UJ/U
Vinyl Chloride	ug/l	23.00			3.00 /J		4.00 /J
Chloroethane	ug/l	10.00 UJ/U	10.00 UJ/U	10.00 UJ/U	4.00 J/J	10.00 UJ/U	10.00 UJ/U
Methylene Chloride	ug/l	5.00 UJ/U	5.00 UJ/U	5.00 UJ/U	3.00 J/J	5.00 UJ/U	1.00 J/J
Acetone	ug/l	6.00 /J			11.00		
1,1-Dichloroethene	ug/l						
1,1-Dichloroethane	ug/l	15.00	1.00 /J		14.00	1.00 /J	11.00
Total 1,2-Dichloroethene	ug/l	150.00	11.00	9.00	5.00	3.00 /J	47.00
1,2-Dichloroethane	ug/l	3.00 /J					
2-Butanone	ug/l	10.00 R/U	10.00 R/U	10.00 R/U	10.00 R/U	10.00 R/U	10.00 R/U
1,1,1-Trichloroethane	ug/l	2.00 /J	3.00 /J	2.00 /J			
1,2-Dichloropropane	ug/l	6.00			2.00 /J		3.00 /J
Trichloroethene	ug/l	26.00	4.00 /J	3.00 /J	2.00 /J		17.00
Benzene	ug/l	1.00 /J			2.00 /J		1.00 /J
4-Methyl-2-Pentanone	ug/l						
2-Hexanone	ug/l						
Tetrachloroethene	ug/l	16.00	3.00 /J	3.00 /J		1.00 /J	5.00
Toluene	ug/l	5.00 U/U	5.00 U/U	5.00 U/U	5.00 U/U	5.00 U/U	5.00 U/U
Chlorobenzene	ug/l	0.70 /J			1.00 /J		0.80 J/J
Ethylbenzene	ug/l						
Total Xylenes	ug/l						

APPENDIX C
WINNEBAGO RECLAMATION LANDFILL ROUND 4 GROUNDWATER DATA
ANALYSIS TYPE: Volatiles MATRIX: Ground Water

SAMPLE ID:		PP-G110-04	PP-G111-04	PP-G114-04	PP-G115-04	PP-G116-04	PP-G116A-04
SAMPLE DATE:		4/24/90	4/23/90	4/24/90	4/24/90	4/23/90	4/23/90
COMPOUNDS	UNIT						
Chloromethane	ug/l	10.00 UJ/U		10.00 UJ/U	10.00 UJ/U		
Bromomethane	ug/l	10.00 UJ/U	10.00 UJ/U	10.00 UJ/U	10.00 UJ/U	10.00 UJ/U	10.00 UJ/U
Vinyl Chloride	ug/l	11.00	10.00 UJ/U		5.00 /J	10.00 UJ/U	10.00 UJ/U
Chloroethane	ug/l	26.00 J/		10.00 UJ/U	15.00 J/		
Methylene Chloride	ug/l	3.00 J/J		5.00 UJ/U	5.00 UJ/U	5.00 U/U	5.00 U/U
Acetone	ug/l			8.00 /J			
1,1-Dichloroethene	ug/l						
1,1-Dichloroethane	ug/l	32.00	4.00 /J	6.00	20.00		4.00 /J
Total 1,2-Dichloroethene	ug/l	9.00	37.00	1.00 /J	3.00 /J		15.00
1,2-Dichloroethane	ug/l	4.00 /J					
2-Butanone	ug/l	10.00 R/U	10.00 R/U	10.00 R/U	10.00 R/U	10.00 R/U	10.00 R/U
1,1,1-Trichloroethane	ug/l		4.00 /J				3.00 /J
1,2-Dichloropropane	ug/l	6.00		7.00			
Trichloroethene	ug/l	5.00	4.00 /J				2.00 /J
Benzene	ug/l	11.00		1.00 /J	1.00 /J		
4-Methyl-2-Pentanone	ug/l	10.00 U/U					
2-Hexanone	ug/l				10.00 U/U		
Tetrachloroethene	ug/l	0.60 /J	9.00				5.00
Toluene	ug/l	16.00 U/B	5.00 U/U	5.00 U/U	5.00 U/U	5.00 U/U	5.00 U/U
Chlorobenzene	ug/l	4.00 /J		5.00			
Ethylbenzene	ug/l	2.00 /J					
Total Xylenes	ug/l	50.00 /X					

APPENDIX C
WINNEBAGO RECLAMATION LANDFILL ROUND 4 GROUNDWATER DATA
ANALYSIS TYPE: Volatiles MATRIX: Ground Water

SAMPLE ID:		PP-G116A-94	PP-P1-04	PP-P3R-04	PP-P4R-04	PP-P6-04
SAMPLE DATE:		4/23/90	4/24/90	4/23/90	4/23/90	4/24/90
COMPOUNDS	UNIT					
Chloromethane	ug/l		10.00 UJ/U			10.00 UJ/U
Bromomethane	ug/l	10.00 UJ/U	10.00 UJ/U	10.00 UJ/U	10.00 UJ/U	10.00 UJ/U
Vinyl Chloride	ug/l	10.00 UJ/U	6.00 /J	2.00 J/J	10.00 UJ/U	
Chloroethane	ug/l		1.00 J/J	2.00 /J		10.00 UJ/U
Methylene Chloride	ug/l	5.00 U/U	5.00 UJ/U	5.00 U/U	5.00 U/U	5.00 UJ/U
Acetone	ug/l				10.00 U/U	
1,1-Dichloroethene	ug/l					2.00 /J
1,1-Dichloroethane	ug/l	3.00 /J	10.00	8.00	3.00 /J	5.00
Total 1,2-Dichloroethene	ug/l	10.00	3.00 /J	4.00 /J	20.00	45.00
1,2-Dichloroethane	ug/l					
2-Butanone	ug/l	10.00 R/U	10.00 R/U	10.00 R/U	10.00 R/U	10.00 R/U
1,1,1-Trichloroethane	ug/l	3.00 /J			3.00 /J	11.00
1,2-Dichloropropane	ug/l					
Trichloroethene	ug/l	2.00 /J		1.00 /J	3.00 /J	14.00
Benzene	ug/l					
4-Methyl-2-Pentanone	ug/l					
2-Hexanone	ug/l					
Tetrachloroethene	ug/l	5.00			7.00	19.00
Toluene	ug/l	5.00 U/U	5.00 U/U	5.00 U/U	5.00 U/U	5.00 U/U
Chlorobenzene	ug/l					
Ethylbenzene	ug/l					
Total Xylenes	ug/l					

(1) Results are reported with qualifiers (Data Validation Qualifier/Laboratory Qualifier) to the right of the value.

APPENDIX C
WINNEBAGO RECLAMATION LANDFILL ROUND 4 GROUNDWATER DATA
ANALYSIS TYPE: Metals MATRIX: Ground Water

SAMPLE ID:		PP-B13-04	PP-B15P-04	PP-B15P-94	PP-B15R-04	PP-G109-04	PP-G109A-04
SAMPLE DATE:		4/24/90	4/25/90	4/25/90	4/25/90	4/24/90	4/24/90
COMPOUNDS	UNIT						
Arsenic	ug/l	2.00 /U	2.00 /U	2.00 /U	6.50 /K	2.00 /U	2.00 /U
Barium	ug/l	155.00 /K	36.00 /K	34.50 /K	490.00	131.00 /K	230.00 /S
Cadmium	ug/l	0.20 /U	0.20 /U	0.35 U/KS	0.20 /U	0.28 U/K	0.26 U/K
Cyanide, Total	ug/l	10.00 /U	10.00 /U	10.00 /U	10.00 /U	10.00 /U	13.00

APPENDIX C
WINNEBAGO RECLAMATION LANDFILL ROUND 4 GROUNDWATER DATA
ANALYSIS TYPE: Metals MATRIX: Ground Water

SAMPLE ID:		PP-G110-04	PP-G111-04	PP-G114-04	PP-G115-04	PP-G116-04	PP-G116A-04
SAMPLE DATE:		4/24/90	4/23/90	4/24/90	4/24/90	4/23/90	4/23/90
COMPOUNDS	UNIT						
Arsenic	ug/l	31.70	2.00 /U	12.20	16.20	2.00 /U	2.00 /U
Barium	ug/l	1090.00	63.00 /K	870.00	370.00 /K	40.00 /K	191.00 /KS
Cadmium	ug/l	0.57 U/K	0.87 U/K	0.20 /U	0.24 U/K	0.21 U/K	0.27 U/K
Cyanide, Total	ug/l	23.00	10.00 /U	27.00	147.00	10.00 /U	10.00 /U

APPENDIX C
WINNEBAGO RECLAMATION LANDFILL ROUND 4 GROUNDWATER DATA
ANALYSIS TYPE: Metals MATRIX: Ground Water

SAMPLE ID:		PP-G116A-94	PP-P1-04	PP-P3R-04	PP-P4R-04	PP-P6-04
SAMPLE DATE:		4/23/90	4/24/90	4/23/90	4/23/90	4/24/90
COMPOUNDS	UNIT					
Arsenic	ug/l	2.00 /U	11.80	14.50	2.00 /U	2.00 /U
Barium	ug/l	220.00	675.00	510.00 /K	130.00 /K	67.00 /K
Cadmium	ug/l	0.27 U/K	0.59 U/KS	0.29 U/K	1.70 U/K	0.20 /U
Cyanide, Total	ug/l	10.00 /U	16.00	32.00	10.00 /U	10.00 /U

(1) Results are reported with qualifiers (Data Validation Qualifier/Laboratory Qualifier) to the right of the value.

APPENDIX C
ROUND 4 GROUNDWATER
SUMMARY OF TENTATIVELY IDENTIFIED COMPOUNDS

PROJECT NAME: WINNEBAGO RECLAMATION LANDFILL
PROJECT NUMBER: 13160.00

MATRIX: Ground Water

SAMPLE ID	ANAL. TYPE	COMPOUND	CONC.	UNITS	DVQ	LQ
PP-B13-04						
	TVOA	Ethyl ether	15.000	ug/l	JN	J
	TVOA	Methane, dichlorofluoro-	6.600	ug/l	JN	J
PP-B15P-04						
	TVOA	Benzene, 1,4-dichloro-	5.500	ug/l	JN	J
PP-B15R-04						
	TVOA	Silanol, trimethyl	5.500	ug/l	JN	J
	TVOA	Furan, tetrahydro-	23.000	ug/l	JN	J
	TVOA	Ethyl ether	15.000	ug/l	JN	J
	TVOA	Methane, dichlorofluoro-	6.300	ug/l	JN	J
PP-G109A-04						
	TVOA	Methane, dichlorofluoro-	5.300	ug/l	JN	J
PP-G110-04						
	TVOA	Silanol, trimethyl	13.000	ug/l	JN	J
	TVOA	3-Pentanone, 2,4-dimethyl-	5.500	ug/l	JN	J
	TVOA	Bicyclo[2.2.1]heptan-2-one, 1,7,7-trimethyl-,(+-)-	9.800	ug/l	JN	J
	TVOA	Ethyl ether	130.000	ug/l	JN	J
	TVOA	Methane, chlorofluoro-	35.000	ug/l	JN	J
	TVOA	Methane, dichlorofluoro-	44.000	ug/l	JN	J
	TVOA	Ethane, 1,1'-thiobis	8.500	ug/l	JN	J
	TVOA	Ethane, 1,1'-[methylenebis(o...	8.900	ug/l	JN	J
PP-G114-04						
	TVOA	Ethyl ether	29.000	ug/l	JN	J
	TVOA	Methane, thiobis-	7.200	ug/l	JN	J
	TVOA	Benzene, 1,2-dichloro-	16.000	ug/l	JN	J
PP-G115-04						
	TVOA	Ethyl ether	24.000	ug/l	JN	J
	TVOA	Methane, chlorofluoro-	11.000	ug/l	JN	J

PROJECT NAME: WINNEBAGO RECLAMATION LANDFILL
PROJECT NUMBER: 13160.00

MATRIX: Ground Water

SAMPLE ID	ANAL. TYPE	COMPOUND	CONC.	UNITS	DVQ	LQ
PP-P1-04						
	TVOA	Ethyl ether	5.600	ug/l	JN	J

STI SAMPLE RESULTS

WINNEBAGO RECLAMATION LANDFILL
SUMMARY OF ANALYTICAL DATA FOR STI WELLS

MATRIX: Ground Water

SAMPLE ID	DATE SAMPLED	ANAL. TYPE	COMPOUND	CONC.	UNITS	DVQ	LQ
PP-GWSTI-5D	11/12/88						
		IND	Phenol	19.000	ug/l	U	B
		MTL	Arsenic	13.000	ug/l		
		MTL	Barium	63.000	ug/l		K
		MTL	Iron	219.000	ug/l		
		MTL	Magnesium	53300.000	ug/l		
		MTL	Zinc	763.000	ug/l		
		MTL	Cyanide, Total	10.000	ug/l		U
PP-GWSTI-5I	11/14/88						
		IND	Phenol	22.000	ug/l	U	B
		MTL	Arsenic	2.000	ug/l		K
		MTL	Calcium	52000.000	ug/l		
		MTL	Magnesium	35600.000	ug/l		
		MTL	Zinc	246.000	ug/l		
PP-GWSTI-5I-01	8/10/88						
		IND	Phenol	7.000	ug/l	J	
		MTL	Arsenic	1.800	ug/l		K
		MTL	Calcium	52200.000	ug/l	J	E
		MTL	Magnesium	40800.000	ug/l		
		MTL	Manganese	16.000	ug/l		
		MTL	Sodium	18300.000	ug/l		
		MTL	Zinc	318.000	ug/l		
		MTL	Cyanide, Total	10.000	ug/l	J	
PP-GWSTI-5I-91	8/10/88						
		IND	Phenol	13.000	ug/l	J	
		MTL	Arsenic	1.000	ug/l		K
		MTL	Cadmium	5.000	ug/l	R	
		MTL	Calcium	50700.000	ug/l	J	E
		MTL	Magnesium	39700.000	ug/l		
		MTL	Manganese	15.000	ug/l		
		MTL	Zinc	312.000	ug/l		
		MTL	Cyanide, Total	6.000	ug/l	J	

SURFACE WATER RESULTS

Appendix C

WRL
Surface Water and Sediment Sampling
Table

	Surface Water		Sediments
	Round 1	Round 2	Round 1
VOCs (GC with GC/MS confirm)	X		
VOCs (GC/MS)		X	X
SVOCs			X
Pesticides/PCBs			X
23 Metals (Total)			X
Arsenic (Total)	X	X	
Barium (Total)	X	X	
Cadmium (Total)	X	X	
Chromium (Total)		X	
Chromium (hexavalent)		X	
Cyanide (Total)		X	X
Chloride	X	X	
Phenolics (Total)	X	X	
Alkalinity (Total)	X	X	
Field pH	X	X	
Field Spec. Conductivity	X	X	

4

SEDIMENT RESULTS

ROUND 1

SEDIMENT RESULTS

APPENDIX C
WINNEBAGO RECLAMATION LANDFILL GC/MS CONFIRMATION DATA RD 1
ANALYSIS TYPE: Volatiles MATRIX: Sediment

SAMPLE ID:		PP-SD01-01	PP-SD02-01	PP-SD03-01	PP-SD03-91	PP-SD04-01	PP-SD05-01
SAMPLE DATE:		4/08/88	4/08/88	4/08/88	4/08/88	4/08/88	4/08/88
COMPOUNDS	UNIT						
Chloroform	ug/kg		2.00 /J			2.00 /J	
Methylene Chloride	ug/kg						11.00 UJ/B
Acetone	ug/kg						65.00 UJ/B
Benzene	ug/kg						7.00 UJ/U
Toluene	ug/kg						2.00 UJ/JB
No Compounds Detected	ug/kg	0.00		0.00	0.00		

(1) Results are reported with qualifiers (Data Validation Qualifier/Laboratory Qualifier) to the right of the value.

APPENDIX C
WINNEBAGO RECLAMATION LANDFILL ROUND 1 SEDIMENT DATA
ANALYSIS TYPE: Semi-Volatiles MATRIX: Sediment

SAMPLE ID:		PP-SD01-01	PP-SD02-01	PP-SD03-01	PP-SD03-91	PP-SD04-01	PP-SD05-01
SAMPLE DATE:		4/08/88	4/08/88	4/08/88	4/08/88	4/08/88	4/08/88
COMPOUNDS	UNIT						
Di-n-butylphthalate	ug/kg		4400.00	3900.00			
Fluoranthene	ug/kg						160.00 /J
Pyrene	ug/kg						160.00 /J
Benzo(a)anthracene	ug/kg						84.00 /J
Chrysene	ug/kg						95.00 /J
bis(2-Ethylhexyl)phthalate	ug/kg	63.00 /J					
Benzo(b)fluoranthene	ug/kg						95.00 /J
Benzo(k)fluoranthene	ug/kg						85.00 /J
Benzo(a)pyrene	ug/kg						95.00 /J
No Compounds Detected	ug/kg				0.00	0.00	

(1) Results are reported with qualifiers (Data Validation Qualifier/Laboratory Qualifier) to the right of the value.

APPENDIX C
WINNEBAGO RECLAMATION LANDFILL ROUND 1 SEDIMENT DATA
ANALYSIS TYPE: Pesticides/PCBs MATRIX: Sediment

SAMPLE ID:		PP-SD01-01	PP-SD02-01	PP-SD03-01	PP-SD03-91	PP-SD04-01	PP-SD05-01
SAMPLE DATE:		4/08/88	4/08/88	4/08/88	4/08/88	4/08/88	4/08/88
COMPOUNDS	UNIT						
No Compounds Detected	ug/kg	0.00	0.00	0.00	0.00	0.00	0.00

(1) Results are reported with qualifiers (Data Validation Qualifier/Laboratory Qualifier) to the right of the value.

APPENDIX C
WINNEBAGO RECLAMATION LANDFILL ROUND 1 SEDIMENT DATA
ANALYSIS TYPE: Metals MATRIX: Sediment

SAMPLE ID:		PP-SD01-01	PP-SD02-01	PP-SD03-01	PP-SD03-91	PP-SD04-01	PP-SD05-01
SAMPLE DATE:		4/08/88	4/08/88	4/08/88	4/08/88	4/08/88	4/08/88
COMPOUNDS	UNIT						
Aluminum	mg/kg	5980.00 R/	2310.00 R/	5130.00 R/	4570.00 R/	1350.00 R/	5820.00 R/
Arsenic	mg/kg		1.30 J/*N	2.00 J/*N	5.90 J/*N	0.70 J/B*N	2.20 J/*N
Barium	mg/kg	81.90	19.50 /B	53.90	54.70	15.20 /B	73.40
Cadmium	mg/kg		1.00 J/N	0.80 J/N			
Calcium	mg/kg	20400.00	27500.00	43000.00	54800.00	22500.00	26300.00
Chromium, Total	mg/kg	8.80 /*	2.60 /*	5.60 /*	7.30 /*	3.50 /*	5.80 /*
Copper	mg/kg	5.50 /*		7.60 /*			6.90 /*
Iron	mg/kg	9560.00 J/*	4800.00 J/*	9130.00 J/*	10800.00 J/*	2740.00 J/*	9550.00 J/*
Lead	mg/kg	4.80 J/+*N	6.70 J/*N	4.30 J/*N	7.40 J/*N	1.60 J/*N	8.40 J/*N
Magnesium	mg/kg	10100.00	16400.00	23700.00		13600.00	11600.00
Manganese	mg/kg	239.00 J/	211.00 J/	169.00 J/	185.00 J/	75.20 J/	282.00 J/
Nickel	mg/kg	9.10 J/*		9.80 J/*	9.60 J/*		
Potassium	mg/kg	631.00 R/	621.00 R/	1000.00 R/	1180.00 R/		
Silver	mg/kg		0.10 /B	0.10 /B		0.10 /B	0.10 /B
Thallium	mg/kg	0.20 B/B	0.20 B/B	0.20 B/B	0.60 B/B		0.20 B/B
Vanadium	mg/kg	16.70	6.60	9.70	15.40		8.80
Zinc	mg/kg	26.90	13.60	20.30	27.20	8.90	34.50
Cyanide, Total	mg/kg	16.10	3.71	7.94 J/	17.50 J/	3.42	28.60

(1) Results are reported with qualifiers (Data Validation Qualifier/Laboratory Qualifier) to the right of the value.

APPENDIX C
ROUND 1 GROUNDWATER GCMS CONFIRMATION DATA
SUMMARY OF TENTATIVELY IDENTIFIED COMPOUNDS

PROJECT NAME: WINNEBAGO RECLAMATION LANDFILL
PROJECT NUMBER: 13160.00

MATRIX: Sediment

SAMPLE ID	ANAL. TYPE	COMPOUND	CONC.	UNITS	DVQ	LQ
PP-SD05-01	TVOA	Hexane	7.000	ug/kg		J

APPENDIX C
ROUND 1 SEDIMENTS
SUMMARY OF TENTATIVELY IDENTIFIED COMPOUNDS

PROJECT NAME: WINNEBAGO RECLAMATION LANDFILL
PROJECT NUMBER: 13160.00

MATRIX: Sediment

SAMPLE ID	ANAL. TYPE	COMPOUND	CONC.	UNITS	DVQ	LQ
PP-SD02-01						
	TBNA	Unknown	280.000	ug/kg		J
	TBNA	Octacosane	270.000	ug/kg		J
	TBNA	Octacosane	170.000	ug/kg		J
	TBNA	Eicosane, 10-methyl-	160.000	ug/kg		J
	TBNA	Unknown Phthalate	4400.000	ug/kg		J
	TBNA	Hexanedioic acid, dioctyl ester	230.000	ug/kg		J
	TBNA	Phosphoric acid, 2-ethylhexyl diphenyl ester	1100.000	ug/kg		J
PP-SD05-01						
	TBNA	Unknown	310.000	ug/kg		J
	TBNA	Unknown	220.000	ug/kg		J
	TBNA	Tetratetracontane	280.000	ug/kg		J

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LEACHATE RESULTS

Appendix C

WRL
Leachate Sampling
Table

	Round 1	Round 2	Round 3	Round 4	Round 5
VOCs (GC with GC/MS confirm)	X	X			
VOCs (GC/MS)				X	X
SVOCs	X				X
Pesticide/PCBs	X				X
23 metals (Total)	X				X
Arsenic (Total)		X	X	X	
Barium (Total)		X	X	X	
Cadium (Total)		X	X	X	
Chromium (Hexavalent)					X
Cyanide (Total)	X				X
Chloride	X	X	X	X	X
Phenolics (Total)	X	X	X	X	X
Alkalinity (Total)	X	X	X	X	X
Sulfate					X
Nitrate & Nitrite Nitrogen					X
Field pH	X	X	X	X	X
Field Specific Conductivity	X	X	X	X	X

Rounds 1 and 5 "23 metals" includes arsenic, barium and cadmium.

"X" indicates parameter(s) were analyzed for in that round.

ROUND 1

LEACHATE RESULTS

Results of pH and Specific Conductance Measurements
Round 1 Leachate Samples

Sample	Conductivity umho/cm	pH
LLA1	>50,000	7.27
LLE7	27,100	7.54
LLF1	26,200	7.75
LLK2	24,200	7.66
LLMHWEST	19,900	7.54

APPENDIX C
WINNEBAGO RECLAMATION LANDFILL ROUND 1 LEACHATE DATA
ANALYSIS TYPE: GW Indicators MATRIX: Leachate

SAMPLE ID:		PP-LLA1-01	PP-LLE7-01	PP-LLE7-91	PP-LLF1-01	PP-LLK2-01	PP-LLMNW-01
SAMPLE DATE:		4/08/88	4/08/88	4/08/88	4/08/88	4/08/88	4/08/88
COMPOUNDS	UNIT						
Alkalinity	mg/l	11200.00	9090.00	9870.00	8520.00	7860.00	6060.00
Chloride	mg/l	17300.00	3740.00	4070.00	3630.00	2720.00	2490.00
Phenol	ug/l	3250.00 J/	560.00	550.00	1350.00	348.00	262.00

(1) Results are reported with qualifiers (Data Validation Qualifier/Laboratory Qualifier) to the right of the value.

APPENDIX C
WINNEBAGO RECLAMATION LANDFILL ROUND 1 LEACHATE DATA
ANALYSIS TYPE: Volatiles MATRIX: Leachate

SAMPLE ID:		PP-LLA1-01	PP-LLE7-01	PP-LLE7-91	PP-LLF1-01	PP-LLK2-01	PP-LLMHW-01
SAMPLE DATE:		4/08/88	4/08/88	4/08/88	4/08/88	4/08/88	4/08/88
COMPOUNDS	UNIT						
Vinyl Chloride	ug/l						10.50 J/
Chloroethane	ug/l			0.83 R/			
1,1-Dichloroethane	ug/l				22.00 R/	0.60 R/	
Benzene	ug/l		8.90 R/		1.40 UJ/	4.10 R/	2.97 J/
Toluene	ug/l	730.00 J/	106.10 R/		57.00 J/	165.60 R/	112.60 J/
Chlorobenzene	ug/l				5.10 R/		
Ethylbenzene	ug/l		33.00 R/		5.70 J/	16.00 R/	36.60 J/
Styrene	ug/l		2.84 R/			8.65 R/	5.11 J/
cis-1,2-Dichloroethene	ug/l		15.20 R/	43.10 R/			5.40 J/
1,4-Dichlorobenzene	ug/l		2.54 R/	9.45 R/	7.80 R/		8.47 J/
m and p-Xylene	ug/l		27.40 R/			25.10 R/	46.90 J/
o-Xylene	ug/l		33.70 R/		2.70 J/	28.40 R/	39.90 J/
1,2-Dichlorobenzene	ug/l				0.53 R/		0.32 J/

(1) Results are reported with qualifiers (Data Validation Qualifier/Laboratory Qualifier) to the right of the value.

APPENDIX C
WINNEBAGO RECLAMATION LANDFILL ROUND 1 LEACHATE DATA
ANALYSIS TYPE: Semi-Volatiles MATRIX: Leachate

SAMPLE ID:		PP-LLA1-01	PP-LLE7-01	PP-LLE7-91	PP-LLF1-01	PP-LLK2-01	PP-LLMHW-01
SAMPLE DATE:		4/08/88	4/08/88	4/08/88	4/08/88	4/08/88	4/08/88
COMPOUNDS	UNIT						
2-Methylphenol	ug/l					85.00	27.00
2,4-Dimethylphenol	ug/l				160.00		
No Compounds Detected	ug/l	0.00	0.00	0.00			

(1) Results are reported with qualifiers (Data Validation Qualifier/Laboratory Qualifier) to the right of the value.

APPENDIX C
WINNEBAGO RECLAMATION LANDFILL ROUND 1 LEACHATE DATA
ANALYSIS TYPE: Pesticides/PCBs MATRIX: Leachate

SAMPLE ID:		PP-LLA1-01	PP-LLE7-01	PP-LLE7-91	PP-LLF1-01	PP-LLK2-01	PP-LLMHW-01
SAMPLE DATE:		4/08/88	4/08/88	4/08/88	4/08/88	4/08/88	4/08/88
COMPOUNDS	UNIT						
AROCLOR-1242	ug/l		6.90 J/	5.00 J/		3.30 J/	
No Compounds Detected	ug/l	0.00			0.00		0.00

(1) Results are reported with qualifiers (Data Validation Qualifier/Laboratory Qualifier) to the right of the value.

APPENDIX C
WINNEBAGO RECLAMATION LANDFILL ROUND 1 LEACHATE DATA
ANALYSIS TYPE: Metals MATRIX: Leachate

SAMPLE ID:		PP-LLA1-01	PP-LLE7-01	PP-LLE7-91	PP-LLF1-01	PP-LLK2-01	PP-LLMHW-01
SAMPLE DATE:		4/08/88	4/08/88	4/08/88	4/08/88	4/08/88	4/08/88
COMPOUNDS	UNIT						
Aluminum	ug/l	1600.00	494.00	376.00	915.00	470.00	848.00
Antimony	ug/l				18.00 J/BN	11.00 /BN	40.00 /BN
Arsenic	ug/l	22.00 J/*	39.00 /*	37.00 /*	16.00 /*	32.00 /*	27.00 /*
Barium	ug/l	78.00 /B	636.00	493.00	239.00	254.00	426.00
Cadmium	ug/l	266.00	5.00				
Calcium	ug/l	241000.00	40300.00	31200.00	37000.00	29900.00	93100.00
Chromium, Total	ug/l	333.00	590.00	459.00	601.00	599.00	278.00
Cobalt	ug/l		57.00			56.00	59.00
Copper	ug/l	144.00			5720.00		25.00
Iron	ug/l	93100.00	6030.00	4820.00	6960.00	5470.00	11200.00
Lead	ug/l	180.00 /*	40.00 /*	38.00 /*	258.00 /*	140.00 /*	26.00 /*
Magnesium	ug/l	812000.00	136000.00	106000.00	70800.00	57100.00	110000.00
Manganese	ug/l	1960.00	48.00	37.00	72.00	46.00	558.00
Mercury	ug/l					0.80	
Nickel	ug/l	510.00	629.00	560.00	726.00	782.00	323.00
Potassium	ug/l	1750000.00	1220000.00	1320000.00	1300000.00	710000.00	608000.00
Silver	ug/l	1.00 J/B			2.00 /B	1.00 /B	21.00 J/
Sodium	ug/l	10200000.00	1620000.00	1720000.00	1440000.00	1090000.00	968000.00
Vanadium	ug/l					62.00	
Zinc	ug/l	6690.00	284.00	232.00	1280.00	394.00	268.00
Cyanide, Total	ug/l	38.00	6000.00 J/*	46.00 J/	40.00	124.00	423.00

(1) Results are reported with qualifiers (Data Validation Qualifier/Laboratory Qualifier) to the right of the value.

PROJECT NAME: WINNEBAGO RECLAMATION LANDFILL
PROJECT NUMBER: 13160.00

MATRIX: Leachate

SAMPLE ID	ANAL. TYPE	COMPOUND	CONC.	UNITS	DVQ	LQ
PP-LLA1-01						
	TBNA	Unknown	1100.000	ug/l		J
	TBNA	Unknown	2000.000	ug/l		J
	TBNA	Unknown	200.000	ug/l		J
	TBNA	Unknown	1800.000	ug/l		J
	TBNA	Unknown	4000.000	ug/l		J
	TBNA	Unknown	140.000	ug/l		J
	TBNA	Unknown	1900.000	ug/l		J
	TBNA	Unknown	150.000	ug/l		J
	TBNA	Unknown	1500.000	ug/l		J
	TBNA	Unknown	290.000	ug/l		J
	TBNA	Unknown	150.000	ug/l		J
	TBNA	Unknown	140.000	ug/l		J
	TBNA	Cis-Terpin Hydrate	160.000	ug/l		J
	TBNA	2-hexen-1-ol, (Z)-	250.000	ug/l		J
	TBNA	Pentanoic acid, 4-methyl-	1500.000	ug/l		J
	TBNA	Hexanoic acid, 2-methyl-	240.000	ug/l		J
	TBNA	Heptanoic acid	850.000	ug/l		J
	TBNA	Benzeneacetic acid	2900.000	ug/l		J
	TBNA	Benzenepropanoic acid	2800.000	ug/l		J
	TBNA	2-Naphthalenemethanol, decahydro-.alpha, ., .alpha., 4A,8-tetramethyl-,	200.000	ug/l		J
PP-LLE7-01						
	TBNA	Unknown	200.000	ug/l		J
	TBNA	Unknown	330.000	ug/l		J
	TBNA	Unknown	100.000	ug/l		J
	TBNA	Unknown	140.000	ug/l		J
	TBNA	Unknown	120.000	ug/l		J
	TBNA	Unknown	130.000	ug/l		J
	TBNA	Unknown	240.000	ug/l		J
	TBNA	2-Propanol, 1-[2-(2-Methoxy-1-Methylethoxy)-1-Methylethoxy]	130.000	ug/l		J
	TBNA	Benzoic Acid, 4-(1,1-Dimethylethyl)-	190.000	ug/l		J
	TBNA	Camphor (ACN)	330.000	ug/l		J
	TBNA	3-Cyclohexene-1-methanol, .alpha., .alpha.,4-trimethyl-, (S)-	230.000	ug/l		J
	TBNA	Benzoic Acid, 4-methyl-	170.000	ug/l		J

PROJECT NAME: WINNEBAGO RECLAMATION LANDFILL
PROJECT NUMBER: 13160.00

MATRIX: Leachate

SAMPLE ID	ANAL. TYPE	COMPOUND	CONC.	UNITS	DVQ	LQ
	TBNA	Benzamide, n,n-diethyl-3-methyl-	160.000	ug/l		J
	TBNA	2(3H)-Benzothiazolone	210.000	ug/l		J
	TBNA	Phenol, 3,4-dimethyl-	110.000	ug/l		J
	TBNA	Bicyclo[2.2.1]heptan-2-one,	130.000	ug/l		J
	TBNA	Phenol, 2,3-dimethyl-	110.000	ug/l		J
	TBNA	Phenol, 2,3-dimethyl-	250.000	ug/l		J
	TBNA	Phenol, 2-(1-methylethyl)-	280.000	ug/l		J
	TBNA	Propanedioic acid, phenyl-	100.000	ug/l		J
PP-LLE7-91						
	TBNA	Unknown	100.000	ug/l		J
	TBNA	Unknown	59.000	ug/l		J
	TBNA	Unknown	49.000	ug/l		J
	TBNA	Unknown	110.000	ug/l		J
	TBNA	Unknown	45.000	ug/l		J
	TBNA	Unknown	81.000	ug/l		J
	TBNA	Unknown	56.000	ug/l		J
	TBNA	Unknown	130.000	ug/l		J
	TBNA	Unknown	180.000	ug/l		J
	TBNA	Unknown	45.000	ug/l		J
	TBNA	Unknown	46.000	ug/l		J
	TBNA	Unknown	67.000	ug/l		J
	TBNA	Unknown	74.000	ug/l		J
	TBNA	Unknown	56.000	ug/l		J
	TBNA	Unknown	68.000	ug/l		J
	TBNA	Unknown	63.000	ug/l		J
	TBNA	Unknown	44.000	ug/l		J
	TBNA	3-Cyclohexene-1-methanol, .alpha., .alpha.,4-trimethyl-, (S)-	88.000	ug/l		J
	TBNA	Cis-Terpin Hydrate	49.000	ug/l		J
	TBNA	Benzamide, n,n-diethyl-3-methyl-	88.000	ug/l		J
PP-LLF1-01						
	TBNA	Unknown	220.000	ug/l		J
	TBNA	Unknown	150.000	ug/l		J
	TBNA	Unknown	140.000	ug/l		J
	TBNA	Unknown	92.000	ug/l		J
	TBNA	Unknown	140.000	ug/l		J
	TBNA	Unknown	260.000	ug/l		J

PROJECT NAME: WINNEBAGO RECLAMATION LANDFILL
PROJECT NUMBER: 13160.00

MATRIX: Leachate

SAMPLE ID	ANAL. TYPE	COMPOUND	CONC.	UNITS	DVQ	LQ
	TBNA	Unknown	280.000	ug/l		J
	TBNA	Unknown	96.000	ug/l		J
	TBNA	Unknown	230.000	ug/l		J
	TBNA	Unknown	110.000	ug/l		J
	TBNA	Unknown	150.000	ug/l		J
	TBNA	Unknown	530.000	ug/l		J
	TBNA	Benzoic Acid, 4-(1,1-Dimethylethyl)-	130.000	ug/l		J
	TBNA	Sulfur, Mol. (S8)	140.000	ug/l		J
	TBNA	Camphor (ACN)	700.000	ug/l		J
	TBNA	3-Cyclohexene-1-methanol, .alpha., .alpha.,4-trimethyl-, (S)-	580.000	ug/l		J
	TBNA	Benzoic Acid, 4-methyl-	1200.000	ug/l		J
	TBNA	2(3H)-Benzothiazolone	140.000	ug/l		J
	TBNA	Phenol, 2,3-dimethyl-	260.000	ug/l		J
	TBNA	Phenol, 3,5-dimethyl-	130.000	ug/l		J
PP-LLK2-01						
	TBNA	Unknown	560.000	ug/l		J
	TBNA	Unknown	490.000	ug/l		J
	TBNA	Unknown	260.000	ug/l		J
	TBNA	Unknown	710.000	ug/l		J
	TBNA	Unknown	480.000	ug/l		J
	TBNA	Unknown	350.000	ug/l		J
	TBNA	Unknown	200.000	ug/l		J
	TBNA	Unknown	500.000	ug/l		J
	TBNA	Unknown	350.000	ug/l		J
	TBNA	Unknown	220.000	ug/l		J
	TBNA	Unknown	290.000	ug/l		J
	TBNA	Camphor (ACN)	800.000	ug/l		J
	TBNA	3-Cyclohexene-1-methanol, .alpha., .alpha.,4-trimethyl-, (S)-	560.000	ug/l		J
	TBNA	Benzene, (1-nitropropyl)-	230.000	ug/l		J
	TBNA	Benzamide, n,n-diethyl-3-methyl-	260.000	ug/l		J
	TBNA	2(3H)-Benzothiazolone	160.000	ug/l		J
	TBNA	Phenol, 2-[1-(4-hydroxyphenyl)-1-methy lethyl]-	250.000	ug/l		J
	TBNA	Phenol, 3,4-dimethyl-	220.000	ug/l		J
	TBNA	Bicyclo[3.1.1]heptan-2-one,	210.000	ug/l		J

PROJECT NAME: WINNEBAGO RECLAMATION LANDFILL
PROJECT NUMBER: 13160.00

MATRIX: Leachate

SAMPLE ID	ANAL. TYPE	COMPOUND	CONC.	UNITS	DVQ	LQ
	TBNA	Benzoic acid, 3,4-dimethyl-	150.000	ug/l		J
PP-LLMHW-01						
	TBNA	Unknown	51.000	ug/l		J
	TBNA	Unknown	54.000	ug/l		J
	TBNA	Unknown	38.000	ug/l		J
	TBNA	Unknown	30.000	ug/l		J
	TBNA	Unknown	51.000	ug/l		J
	TBNA	Unknown	29.000	ug/l		J
	TBNA	Unknown	32.000	ug/l		J
	TBNA	Unknown	38.000	ug/l		J
	TBNA	Unknown	130.000	ug/l		J
	TBNA	Benzoic Acid, 4-(1,1-Dimethylethyl)-	43.000	ug/l		J
	TBNA	Cyclohexanone, 3,3,5-trimethyl-	60.000	ug/l		J
	TBNA	Camphor (ACN)	61.000	ug/l		J
	TBNA	3-Cyclohexene-1-methanol, .alpha., .alpha.,4-trimethyl-, (S)-	55.000	ug/l		J
	TBNA	Cis-Terpin Hydrate	130.000	ug/l		J
	TBNA	Benzoic Acid, 4-methyl-	120.000	ug/l		J
	TBNA	Benzene, (1-nitropropyl)-	74.000	ug/l		J
	TBNA	Benzamide, n,n-diethyl-3-methyl-	79.000	ug/l		J
	TBNA	2(3H)-Benzothiazolone	110.000	ug/l		J
	TBNA	Benzenesulfonamide, n-ethyl-4-methyl-	28.000	ug/l		J
	TBNA	Phenol, 2-[1-(4-hydroxyphenyl)-1-methy lethyl]-	220.000	ug/l		J

ROUND 2

LEACHATE RESULTS

Results of pH and Specific Conductance Measurements
Round 2 Leachate Samples

Sample	Conductivity umho/cm	pH
LLA3	34,200	7.66
LLB1	33,600	6.90
LLG3	25,700	7.75
LLG7	30,500	7.67
LLMHWEST	28,900	7.79
LLMHEAST	24,500	7.73

APPENDIX C
WINNEBAGO RECLAMATION LANDFILL ROUND 2 LEACHATE DATA
ANALYSIS TYPE: GW Indicators MATRIX: Leachate

SAMPLE ID:		PP-LLA3-02	PP-LLA3-92	PP-LLB1-02	PP-LLG3-02	PP-LLG7-02	PP-LLMHE-02
SAMPLE DATE:		6/15/88	6/15/88	6/15/88	6/16/88	6/16/88	6/16/88
COMPOUNDS	UNIT						
Alkalinity	mg/l	9480.00	9360.00	13100.00	9540.00	11500.00	8230.00
Chloride	mg/l	7360.00	7310.00	6700.00	3430.00	3820.00	3710.00
Phenol	ug/l	410.00	405.00	12000.00	450.00	850.00	295.00

APPENDIX C
WINNEBAGO RECLAMATION LANDFILL ROUND 2 LEACHATE DATA
ANALYSIS TYPE: GW Indicators MATRIX: Leachate

SAMPLE ID: PP-LLMHW-02
SAMPLE DATE: 6/16/88

COMPOUNDS	UNIT	
Alkalinity	mg/l	10600.00
Chloride	mg/l	3840.00
Phenol	ug/l	380.00

(1) Results are reported with qualifiers (Data Validation Qualifier/Laboratory Qualifier) to the right of the value.

APPENDIX C
WINNEBAGO RECLAMATION LANDFILL ROUND 2 LEACHATE DATA
ANALYSIS TYPE: Volatiles MATRIX: Leachate

SAMPLE ID:		PP-LLA3-02	PP-LLA3-92	PP-LLB1-02	PP-LLG3-02	PP-LLG7-02	PP-LLMHE-02	PP-LLMHW-02
SAMPLE DATE:		6/15/88	6/15/88	6/15/88	6/16/88	6/16/88	6/16/88	6/16/88
COMPOUNDS	UNIT							
Vinyl Chloride	ug/l				6.60 J/			
1,1-Dichloroethene	ug/l				38.00 J/			
1,1-Dichloroethane	ug/l				27.00 J/			
Chloroform	ug/l				12.00 J/			
1,1,1-Trichloroethane	ug/l				1.10 J/			
1,2-Dichloropropane	ug/l	0.65 J/						
Benzene	ug/l	2.40 J/	1.00 J/	7.60 J/	4.30 J/	2.00 J/		
Toluene	ug/l	65.00 J/	55.00 J/	190.00 J/		170.00 J/	20.00 J/	
Chlorobenzene	ug/l	0.78 J/	0.27 J/			5.00 J/		
Ethylbenzene	ug/l	2.30 J/	2.00 J/	1.00 J/				
Styrene	ug/l	0.61 J/		2.60 J/				
No Compounds Detected	ug/l							0.00
trans-1,2-Dichloroethene	ug/l				49.00 J/			
cis-1,2-Dichloroethene	ug/l				12.00 J/			
1,4-Dichlorobenzene	ug/l	16.00 J/	12.00 J/	17.00 J/				
m and p-Xylene	ug/l	20.00 J/	17.00 J/	51.00 J/	1.60 J/	18.00 J/	22.00 J/	
o-Xylene	ug/l	21.00 J/	18.00 J/	62.00 J/		31.00 J/	18.00 J/	
1,2-Dichlorobenzene	ug/l	0.96 J/	0.51 J/	2.60 J/				

(1) Results are reported with qualifiers (Data Validation Qualifier/Laboratory Qualifier) to the right of the value.

APPENDIX C
WINNEBAGO RECLAMATION LANDFILL ROUND 2 LEACHATE DATA
ANALYSIS TYPE: Metals MATRIX: Leachate

SAMPLE ID:		PP-LLA3-02	PP-LLA3-92	PP-LLB1-02	PP-LLG3-02	PP-LLG7-02	PP-LLMHE-02
SAMPLE DATE:		6/15/88	6/15/88	6/15/88	6/16/88	6/16/88	6/16/88
COMPOUNDS	UNIT						
Arsenic	ug/l	76.00 J/	149.00 J/	8.00	34.00	15.00	24.00
Barium	ug/l	520.00 J/	2200.00 J/	350.00	260.00	200.00	330.00
Cadmium	ug/l	80.00 J/	170.00 J/	7.40	1.10	3.00	

APPENDIX C
WINNEBAGO RECLAMATION LANDFILL ROUND 2 LEACHATE DATA
ANALYSIS TYPE: Metals MATRIX: Leachate

SAMPLE ID: PP-LLMW-02
SAMPLE DATE: 6/16/88

COMPOUNDS	UNIT	
Arsenic	ug/l	67.00
Barium	ug/l	720.00
Cadmium	ug/l	30.00

(1) Results are reported with qualifiers (Data Validation Qualifier/Laboratory Qualifier) to the right of the value.

ROUND 3

LEACHATE RESULTS

APPENDIX C
WINNEBAGO RECLAMATION LANDFILL ROUND 3 LEACHATE DATA
ANALYSIS TYPE: GW Indicators MATRIX: Leachate

SAMPLE ID:		PP-LLC3-03	PP-LLC3-93	PP-LLC6-03	PP-LLH2-03	PP-LL15-03
SAMPLE DATE:		8/03/88	8/03/88	8/03/88	8/03/88	8/03/88
COMPOUNDS	UNIT					
Alkalinity	mg/l	3480.00	3560.00	2600.00	10900.00	9220.00
Chloride	mg/l	2460.00	2440.00	1160.00	4090.00	3810.00
Phenol	ug/l	210.00	201.00	920.00	780.00 /*	1200.00
Field pH	s.u.	6.98	7.01	6.63	7.85	7.95
Field Conductivity	umho/cm	12500.00	12500.00	6520.00	27200.00	23400.00

(1) Results are reported with qualifiers (Data Validation Qualifier/Laboratory Qualifier) to the right of the value.

APPENDIX C
WINNEBAGO RECLAMATION LANDFILL ROUND 3 LEACHATE DATA
ANALYSIS TYPE: Volatiles MATRIX: Leachate

SAMPLE ID:		PP-LLC3-03	PP-LLC3-93	PP-LLC6-03	PP-LLH2-03	PP-LLI5-03
SAMPLE DATE:		8/03/88	8/03/88	8/03/88	8/03/88	8/03/88
COMPOUNDS	UNIT					
1,2-Dichloropropane	ug/l	0.38 J/	2.00 J/	0.23 J/		
Benzene	ug/l	7.00 J/	6.80 J/	6.50 J/		
Toluene	ug/l	24.00 J/	20.00 J/	35.00 J/	119.00 J/	125.00 J/
Chlorobenzene	ug/l	0.34 UJ/	1.00 UJ/	1.20 UJ/		
Ethylbenzene	ug/l	2.40 J/	2.30 J/	5.00 J/		
Styrene	ug/l	2.50 J/	2.40 J/	2.20 J/	3.90 J/	10.00 J/
cis-1,2-Dichloroethene	ug/l		0.32 UJ/		6.90 UJ/	68.00 J/
1,4-Dichlorobenzene	ug/l	26.00 UJ/	30.00 UJ/	25.00 UJ/	5.40 UJ/	17.00 UJ/
m and p-Xylene	ug/l	53.00 J/	45.00 J/	103.00 J/	55.00 J/	34.00 J/
o-Xylene	ug/l	43.00 J/	40.00 J/	61.00 J/	30.00 J/	28.00 J/
1,2-Dichlorobenzene	ug/l		0.36 UJ/			

(1) Results are reported with qualifiers (Data Validation Qualifier/Laboratory Qualifier) to the right of the value.

APPENDIX C
WINNEBAGO RECLAMATION LANDFILL ROUND 3 LEACHATE DATA
ANALYSIS TYPE: Metals MATRIX: Leachate

SAMPLE ID:		PP-LLC3-03	PP-LLC3-93	PP-LLC6-03	PP-LLH2-03	PP-LLI5-03
SAMPLE DATE:		8/03/88	8/03/88	8/03/88	8/03/88	8/03/88
COMPOUNDS	UNIT					
Arsenic	ug/l	24.00	16.00 /S	138.00	10.00	14.00
Barium	ug/l	1130.00	1040.00	1030.00	147.00	240.00 /S
Cadmium	ug/l	1.00	1.00	170.00	1.00 J/+S	1.00

(1) Results are reported with qualifiers (Data Validation Qualifier/Laboratory Qualifier) to the right of the value.

ROUND 4

LEACHATE RESULTS

APPENDIX C
WINNEBAGO RECLAMATION LANDFILL ROUND 4 LEACHATE DATA
ANALYSIS TYPE: GW Indicators MATRIX: Leachate

SAMPLE ID:		PP-LLD1-04	PP-LLD1-94	PP-LLF7-04	PP-LLG4-04	PP-LLMHE-04	PP-SB01-04
SAMPLE DATE:		6/08/89	6/08/89	6/08/89	6/08/89	6/08/89	6/08/89
COMPOUNDS	UNIT						
Alkalinity	mg/l	10300.00 J/	9890.00 J/	5630.00 J/	10800.00 J/	6920.00 J/	5.00 UJ/U
Chloride	mg/l	5000.00 J/	5000.00 J/	2200.00 J/	4300.00 J/	3250.00 J/	7.00 J/
Phenol	ug/l	460.00 J/	490.00 J/	240.00 J/	1200.00 J/	230.00 J/	20.00 J/
Field pH	s.u.	7.65	7.68	7.71	7.99	7.95	8.30
Field Conductivity	umho/cm	28000.00	28000.00	15200.00	30700.00	19500.00	10.00 /U

(1) Results are reported with qualifiers (Data Validation Qualifier/Laboratory Qualifier) to the right of the value.

APPENDIX C
WINNEBAGO RECLAMATION LANDFILL ROUND 4 LEACHATE DATA
ANALYSIS TYPE: Volatiles MATRIX: Leachate

SAMPLE ID:		PP-LLD1-04	PP-LLD1-94	PP-LLF7-04	PP-LLG4-04	PP-LLMHE-04
SAMPLE DATE:		6/08/89	6/08/89	6/08/89	6/08/89	6/08/89
COMPOUNDS	UNIT					
Chloromethane	ug/l	2.00 /J	3.00 /J			
Vinyl Chloride	ug/l	54.00	55.00	12.00		3.00 /J
Chloroethane	ug/l	10.00	11.00			
Methylene Chloride	ug/l	13.00 /B	10.00 /B	5.00 UJ/BJ	5.00 UJ/BJ	5.00 UJ/BJ
Acetone	ug/l	14000.00 J/BD	18000.00 J/BD	76.00 J/	310.00 UJ/BD	28.00 UJ/B
1,1-Dichloroethane	ug/l	53.00	57.00			
Total 1,2-Dichloroethene	ug/l	21.00	22.00		220.00 /D	6.00
2-Butanone	ug/l	22000.00 J/D	20000.00 J/D	26.00 J/	22.00 J/DJ	10.00 R/U
1,2-Dichloropropane	ug/l	3.00 /J	3.00 /J			
4-Methyl-2-Pentanone	ug/l	1600.00 /DJ	1400.00 /DJ			
2-Hexanone	ug/l	240.00 J/E	260.00 J/E		65.00	
Tetrachloroethene	ug/l				17.00	
Toluene	ug/l	320.00 J/E	310.00 J/E	47.00 J/	150.00 J/	18.00 J/
Chlorobenzene	ug/l	5.00 UJ/U	5.00 UJ/U	5.00 UJ/U	5.00 UJ/U	5.00 UJ/U
Ethylbenzene	ug/l	49.00 J/	49.00 J/	65.00 J/	77.00 J/	5.00 UJ/U
Styrene	ug/l	5.00 UJ/U	5.00 UJ/U	5.00 UJ/U	5.00 UJ/U	5.00 UJ/U
Total Xylenes	ug/l	190.00 J/X	170.00 J/X	230.00 J/X	300.00 J/X	80.00 J/X

(1) Results are reported with qualifiers (Data Validation Qualifier/Laboratory Qualifier) to the right of the value.

APPENDIX C
WINNEBAGO RECLAMATION LANDFILL ROUND 4 LEACHATE DATA
ANALYSIS TYPE: Metals MATRIX: Leachate

SAMPLE ID:		PP-LLD1-04	PP-LLD1-94	PP-LLF7-04	PP-LLG4-04	PP-LLMHE-04
SAMPLE DATE:		6/08/89	6/08/89	6/08/89	6/08/89	6/08/89
COMPOUNDS	UNIT					
Arsenic	ug/l	17.40 J/NS	16.70 J/NS	23.50 J/NS	31.00 J/N+	240.00 J/NS
Barium	ug/l	265.00 U/*	246.00 U/*	2450.00 /S*	468.00 /*	4710.00 /S*
Cadmium	ug/l	22.90 /S*	19.50 /S*	1.70 /S*	2.60 /S*	117.00 /S*

(1) Results are reported with qualifiers (Data Validation Qualifier/Laboratory Qualifier) to the right of the value.

PROJECT NAME: WINNEBAGO RECLAMATION LANDFILL
PROJECT NUMBER: 13160.00

MATRIX: Leachate

SAMPLE ID	ANAL. TYPE	COMPOUND	CONC.	UNITS	DVQ	LQ
PP-LLD1-04						
	TVOA	Silanol, trimethyl	62.000	ug/l		JX
	TVOA	4-Penten-2-ol	51.000	ug/l		J
	TVOA	Furan, tetrahydro-	220.000	ug/l		J
	TVOA	2-Butanol, 3-methyl-	160.000	ug/l		J
	TVOA	2-Butanone, 3-methyl-	100.000	ug/l		JX
	TVOA	2-Pentanol, 4-methyl-	25.000	ug/l		J
	TVOA	3-Pentanone, 2,4-dimethyl-	14.000	ug/l		J
	TVOA	2-Hexanone, 5-methyl-	24.000	ug/l		J
	TVOA	Cineole (van)	23.000	ug/l		J
	TVOA	Bicyclo[2.2.1]heptan-2-one, 1,7,7-trimethyl-,(+-)-	47.000	ug/l		J
PP-LLD1-94						
	TVOA	Unknown	12.000	ug/l		J
	TVOA	Silanol, trimethyl	72.000	ug/l		JX
	TVOA	4-Penten-2-ol	44.000	ug/l		J
	TVOA	Furan, tetrahydro-	230.000	ug/l		J
	TVOA	2-Butanol, 3-methyl-	140.000	ug/l		J
	TVOA	2-Butanone, 3-methyl-	110.000	ug/l		JX
	TVOA	2-Pentanol, 4-methyl-	24.000	ug/l		J
	TVOA	2-Hexanone, 5-methyl-	23.000	ug/l		J
	TVOA	Cineole (van)	15.000	ug/l		J
	TVOA	Bicyclo[2.2.1]heptan-2-one, 1,7,7-trimethyl-,(+-)-	33.000	ug/l		J
PP-LLF7-04						
	TVOA	Unknown	21.000	ug/l		JX
	TVOA	Unknown	120.000	ug/l		JX
	TVOA	Silanol, trimethyl	74.000	ug/l		JX
	TVOA	Furan, tetrahydro-	32.000	ug/l		J
	TVOA	3-Pentanone, 2,4-dimethyl-	28.000	ug/l		JX
	TVOA	Cineole (van)	32.000	ug/l		JX
	TVOA	Bicyclo[2.2.1]heptan-2-one, 1,7,7-trimethyl-,(+-)-	140.000	ug/l		JX
	TVOA	2-Butanol, 2-methyl-	15.000	ug/l		J
	TVOA	.Alpha.-pinene (ACN)	42.000	ug/l		JX
	TVOA	7-Oxabicyclo[2.2.1]heptane, 1-methl-4-(1-methylethyl)-	14.000	ug/l		JX
PP-LLG4-04						

PROJECT NAME: WINNEBAGO RECLAMATION LANDFILL
PROJECT NUMBER: 13160.00

MATRIX: Leachate

SAMPLE ID	ANAL. TYPE	COMPOUND	CONC.	UNITS	DVQ	LQ
	TVOA	Unknown	27.000	ug/l		J
	TVOA	Silanol, trimethyl	71.000	ug/l		JX
	TVOA	Furan, tetrahydro-	30.000	ug/l		J
	TVOA	2-Butanone, 3-methyl-	6.900	ug/l		JX
	TVOA	3-Pentanone, 2,4-dimethyl-	5.600	ug/l		J
	TVOA	Cineole (van)	6.800	ug/l		J
	TVOA	Bicyclo[2.2.1]heptan-2-one, 1,7,7-trimethyl-,(+-)-	44.000	ug/l		J
	TVOA	3-Carene	27.000	ug/l		J
PP-LLMHE-04						
	TVOA	Silanol, trimethyl	20.000	ug/l		JX
	TVOA	Furan, tetrahydro-	11.000	ug/l		J
	TVOA	3-Pentanone, 2,4-dimethyl-	7.300	ug/l		J
	TVOA	Bicyclo[2.2.1]heptan-2-one, 1,7,7-trimethyl-,(+-)-	9.300	ug/l		J
	TVOA	Ethyl ether	7.700	ug/l		J

ROUND 5

LEACHATE RESULTS

Results of pH and Specific Conductance Measurements
Round 5 Leachate Samples

Well	Conductivity	pH
	umho/cm	
LLDI	25,900	7.61
LLE3	31,600	7.91
LLL2	24,800	7.69
LLN8	24,800	7.69
LLMH East	20,000	7.84
LLMH West	23,500	7.83

APPENDIX C
WINNEBAGO RECLAMATION LANDFILL ROUND 5 LEACHATE DATA
ANALYSIS TYPE: GW Indicators MATRIX: Leachate

SAMPLE ID:		PP-LLD1-05	PP-LLE3-05	PP-LLL2-05	PP-LLL2-95	PP-LLMHE-05	PP-LLMHW-05
SAMPLE DATE:		2/09/90	2/09/90	2/09/90	2/09/90	2/09/90	2/09/90
COMPOUNDS	UNIT						
Alkalinity	mg/l	8520.00	14400.00	8900.00	8930.00	6550.00	8190.00
Chloride	mg/l	4710.00	3790.00	4120.00	4150.00	3230.00	3880.00
Phenol	ug/l	598.00	396.00	530.00	523.00	293.00	238.00
Sulfate	mg/l	86.00 /N	164.00 /N	106.00 /N	105.00 /N	82.00 /N	121.00 /N
Nitrate + Nitrite Nitrogen	mg/l	0.81	0.58	0.45	0.62	0.22	0.67

APPENDIX C
WINNEBAGO RECLAMATION LANDFILL ROUND 5 LEACHATE DATA
ANALYSIS TYPE: GW Indicators MATRIX: Leachate

SAMPLE ID: PP-LLN8-05
SAMPLE DATE: 2/09/90

COMPOUNDS	UNIT	
Alkalinity	mg/l	8980.00
Chloride	mg/l	3710.00
Phenol	ug/l	258.00
Sulfate	mg/l	101.00 /N
Nitrate + Nitrite Nitrogen	mg/l	0.54

(1) Results are reported with qualifiers (Data Validation Qualifier/Laboratory Qualifier) to the right of the value.

APPENDIX C
WINNEBAGO RECLAMATION LANDFILL ROUND 1 GROUNDWATER DATA
ANALYSIS TYPE: Volatiles MATRIX: Ground Water

SAMPLE ID:		PP-B04-01	PP-B06D-01	PP-B06S-01	PP-B07-01	PP-B09-01	PP-B10-01
SAMPLE DATE:		4/05/88	4/07/88	4/07/88	4/07/88	4/05/88	4/06/88
COMPOUNDS	UNIT						
Chloromethane	ug/l	5.00					
Vinyl Chloride	ug/l	3.00					
Chloroethane	ug/l						
Methylene Chloride	ug/l		5.20 U/	5.21 U/	9.81 R/		
1,1-Dichloroethene	ug/l						
1,1-Dichloroethane	ug/l	190.00 J/					0.91 J/
Chloroform	ug/l						
1,2-Dichloroethane	ug/l	3.20					
1,1,1-Trichloroethane	ug/l	310.00 J/		0.59	0.50		1.80 J/
Carbon Tetrachloride	ug/l						
Bromodichloromethane	ug/l						
1,2-Dichloropropane	ug/l	5.70					0.32 J/
Trichloroethene	ug/l	380.00 J/					3.10 J/
Dibromochloromethane	ug/l						
1,1,2-Trichloroethane	ug/l	0.78					
Benzene	ug/l	3.60 J/					
trans-1,3-Dichloropropene	ug/l						0.52 J/
Bromoform	ug/l						
Tetrachloroethene	ug/l	550.00 J/					2.50 J/
1,1,2,2-Tetrachloroethane	ug/l			0.28			
Toluene	ug/l	3.00 UJ/					
Chlorobenzene	ug/l						
Ethylbenzene	ug/l	11.00 J/					
No Compounds Detected	ug/l					0.00	
trans-1,2-Dichloroethene	ug/l						
cis-1,2-Dichloroethene	ug/l	1200.00 J/	6.60		0.40 U/		18.00 J/
1,4-Dichlorobenzene	ug/l						
m and p-Xylene	ug/l	9.70 J/					
o-Xylene	ug/l	24.00 J/					
1,2-Dichlorobenzene	ug/l						

APPENDIX C
WINNEBAGO RECLAMATION LANDFILL ROUND 1 GROUNDWATER DATA
ANALYSIS TYPE: Volatiles MATRIX: Ground Water

SAMPLE ID:		PP-B11-01	PP-B11A-01	PP-B11A-91	PP-B12-01	PP-B13-01	PP-B14-01
SAMPLE DATE:		4/07/88	4/07/88	4/07/88	4/06/88	4/06/88	4/15/88
COMPOUNDS	UNIT						
Chloromethane	ug/l						
Vinyl Chloride	ug/l				28.20 J/	33.00 J/	
Chloroethane	ug/l		3.00 U/	2.90 U/	11.00 J/	19.00 J/	
Methylene Chloride	ug/l		4.36 U/	4.93 U/			
1,1-Dichloroethene	ug/l					0.22 J/	
1,1-Dichloroethane	ug/l		1.95	2.40	12.70 J/	17.00 J/	
Chloroform	ug/l						
1,2-Dichloroethane	ug/l				1.87 J/	2.00 J/	
1,1,1-Trichloroethane	ug/l	0.38	1.38	1.37		4.90 J/	
Carbon Tetrachloride	ug/l						
Bromodichloromethane	ug/l						
1,2-Dichloropropane	ug/l				9.89 J/	7.10 J/	
Trichloroethene	ug/l		3.00	2.99	7.30 J/	30.00 J/	
Dibromochloromethane	ug/l						
1,1,2-Trichloroethane	ug/l						
Benzene	ug/l				1.97 J/	2.40 J/	
trans-1,3-Dichloropropene	ug/l				0.44 J/	0.48 J/	
Bromoform	ug/l						
Tetrachloroethene	ug/l	1.06			5.56 J/	17.00 J/	
1,1,2,2-Tetrachloroethane	ug/l		5.68	5.49			
Toluene	ug/l					1.60 UJ/	
Chlorobenzene	ug/l				3.79 J/	2.40 J/	
Ethylbenzene	ug/l						
No Compounds Detected	ug/l						0.00
trans-1,2-Dichloroethene	ug/l				2.75 J/	2.30 J/	
cis-1,2-Dichloroethene	ug/l	0.59 U/	11.10	10.00	93.60 J/	160.00 J/	
1,4-Dichlorobenzene	ug/l				17.60 J/	7.60 J/	
m and p-Xylene	ug/l						
o-Xylene	ug/l					2.10 J/	
1,2-Dichlorobenzene	ug/l				2.35 J/		

APPENDIX C
WINNEBAGO RECLAMATION LANDFILL ROUND 1 GROUNDWATER DATA
ANALYSIS TYPE: Volatiles MATRIX: Ground Water

SAMPLE ID:		PP-B15-01	PP-B15P-01	PP-B15R-01	PP-B16-01	PP-B16A-01	PP-G107-01
SAMPLE DATE:		4/08/88	4/05/88	4/05/88	4/07/88	4/07/88	4/06/88
COMPOUNDS	UNIT						
Chloromethane	ug/l						
Vinyl Chloride	ug/l			5.00 J/			
Chloroethane	ug/l	7.30		11.00 J/			
Methylene Chloride	ug/l					9.44 U/	
1,1-Dichloroethene	ug/l						
1,1-Dichloroethane	ug/l	1.94	1.31	6.37 J/	1.10	0.92	
Chloroform	ug/l				0.37		
1,2-Dichloroethane	ug/l	0.23					
1,1,1-Trichloroethane	ug/l		3.57		2.70	2.02	0.45 J/
Carbon Tetrachloride	ug/l						
Bromodichloromethane	ug/l						
1,2-Dichloropropane	ug/l	3.14		4.71 J/			
Trichloroethene	ug/l	0.58	4.68	4.88 J/	2.50	1.77	0.27 J/
Dibromochloromethane	ug/l						
1,1,2-Trichloroethane	ug/l						
Benzene	ug/l	3.93 J/		3.34 J/			
trans-1,3-Dichloropropene	ug/l				0.66		
Bromoform	ug/l						
Tetrachloroethene	ug/l		2.50	1.30 J/	2.10		
1,1,2,2-Tetrachloroethane	ug/l					1.24	
Toluene	ug/l	1.62 UJ/					
Chlorobenzene	ug/l	2.63					
Ethylbenzene	ug/l	2.84 J/					
No Compounds Detected	ug/l						
trans-1,2-Dichloroethene	ug/l						
cis-1,2-Dichloroethene	ug/l		10.10	11.60 J/	25.30	31.50	1.94 J/
1,4-Dichlorobenzene	ug/l	13.30 J/		3.75 J/			
m and p-Xylene	ug/l	1.39 UJ/		1.29 UJ/			
o-Xylene	ug/l	2.00 J/		1.67 J/			
1,2-Dichlorobenzene	ug/l	2.52 J/		0.14 J/			

APPENDIX C
WINNEBAGO RECLAMATION LANDFILL ROUND 1 GROUNDWATER DATA
ANALYSIS TYPE: Volatiles MATRIX: Ground Water

SAMPLE ID:		PP-G107-91	PP-G108-01	PP-G109-01	PP-G109A-01	PP-G110-01	PP-G112-01
SAMPLE DATE:		4/06/88	4/07/88	4/06/88	4/06/88	4/06/88	4/06/88
COMPOUNDS	UNIT						
Chloromethane	ug/l						
Vinyl Chloride	ug/l		0.98	6.50	14.40	0.20 NR/E	0.40 J/
Chloroethane	ug/l		2.10 U/	3.70 U/	16.50	0.20 NR/E	0.80 UJ/
Methylene Chloride	ug/l	15.40 U/		10.50 U/	4.62 U/		
1,1-Dichloroethene	ug/l						
1,1-Dichloroethane	ug/l		1.75	4.96	22.40	42.50 J/	
Chloroform	ug/l						
1,2-Dichloroethane	ug/l				0.46	4.07 J/	
1,1,1-Trichloroethane	ug/l	0.24	2.57		0.55		
Carbon Tetrachloride	ug/l						
Bromodichloromethane	ug/l						
1,2-Dichloropropane	ug/l		0.75	3.67	5.12	8.99 J/	
Trichloroethene	ug/l	0.50	5.14	1.51	27.60	8.20 J/	
Dibromochloromethane	ug/l						
1,1,2-Trichloroethane	ug/l						
Benzene	ug/l				2.98 J/	15.10 J/	
trans-1,3-Dichloropropene	ug/l						
Bromoform	ug/l						
Tetrachloroethene	ug/l	0.27	5.63	3.30		0.72 J/	0.65 J/
1,1,2,2-Tetrachloroethane	ug/l				18.90		
Toluene	ug/l					2.15 UJ/	
Chlorobenzene	ug/l			0.73	1.82 J/	2.54 J/	
Ethylbenzene	ug/l					4.07 J/	
No Compounds Detected	ug/l						
trans-1,2-Dichloroethene	ug/l				3.75	3.81 J/	
cis-1,2-Dichloroethene	ug/l	2.22	15.90	12.80	53.20 J/	10.30 J/	
1,4-Dichlorobenzene	ug/l			7.24	3.98 J/		
m and p-Xylene	ug/l					2.35 UJ/	
o-Xylene	ug/l				1.68 J/	3.03 J/	
1,2-Dichlorobenzene	ug/l			0.49	0.23 J/	0.66 J/	

APPENDIX C
WINNEBAGO RECLAMATION LANDFILL ROUND 1 GROUNDWATER DATA
ANALYSIS TYPE: Volatiles MATRIX: Ground Water

SAMPLE ID:		PP-G113-01	PP-G113A-01	PP-G114-01	PP-G115-01	PP-G116-01	PP-G116A-01
SAMPLE DATE:		4/06/88	4/06/88	4/06/88	4/05/88	4/04/88	4/04/88
COMPOUNDS	UNIT						
Chloromethane	ug/l						
Vinyl Chloride	ug/l	3.50 J/	0.00 NR/	8.60 J/	16.00		
Chloroethane	ug/l	3.10 UJ/	0.00 NR/	11.00 J/	19.00		1.36 U/
Methylene Chloride	ug/l	20.00 UJ/			19.10 U/		
1,1-Dichloroethene	ug/l		0.53 J/				
1,1-Dichloroethane	ug/l	0.93 J/	43.80 J/	8.33 J/	2.75		1.90
Chloroform	ug/l						
1,2-Dichloroethane	ug/l		1.85 J/	1.37 J/			
1,1,1-Trichloroethane	ug/l		3.16 J/				3.71
Carbon Tetrachloride	ug/l						
Bromodichloromethane	ug/l						
1,2-Dichloropropane	ug/l	1.47 J/	8.41 J/	7.90 J/	0.51		
Trichloroethene	ug/l	2.30 J/	80.30 J/	1.06 J/			2.50
Dibromochloromethane	ug/l		0.41 J/	0.44 J/			
1,1,2-Trichloroethane	ug/l						
Benzene	ug/l	1.88 J/	4.69 J/	3.70 J/	2.80 J/		
trans-1,3-Dichloropropene	ug/l		1.49 J/				
Bromoform	ug/l						
Tetrachloroethene	ug/l	4.80 J/	36.10 J/				
1,1,2,2-Tetrachloroethane	ug/l						4.52
Toluene	ug/l			1.78 UJ/			
Chlorobenzene	ug/l		2.23 J/	6.10 J/			
Ethylbenzene	ug/l			2.09 J/	2.13 J/		
No Compounds Detected	ug/l					0.00	
trans-1,2-Dichloroethene	ug/l	0.97 J/	4.99 J/	2.42 J/			
cis-1,2-Dichloroethene	ug/l	22.80 J/	188.00 J/	2.67 J/	5.36		9.84
1,4-Dichlorobenzene	ug/l	1.09 J/	5.87 J/	44.50 J/	4.50 J/		
m and p-Xylene	ug/l			1.51 UJ/			
o-Xylene	ug/l	1.71 J/	1.95 J/	2.31 J/			
1,2-Dichlorobenzene	ug/l			4.72 J/			

APPENDIX C
WINNEBAGO RECLAMATION LANDFILL ROUND 1 GROUNDWATER DATA
ANALYSIS TYPE: Volatiles MATRIX: Ground Water

SAMPLE ID:		PP-G116A-91	PP-G117-01	PP-G118A-01	PP-G119-01	PP-G119A-01	PP-MW105-01
SAMPLE DATE:		4/04/88	4/04/88	4/05/88	4/04/88	4/04/88	4/07/88
COMPOUNDS	UNIT						
Chloromethane	ug/l						
Vinyl Chloride	ug/l						
Chloroethane	ug/l						
Methylene Chloride	ug/l						14.90 R/
1,1-Dichloroethene	ug/l						
1,1-Dichloroethane	ug/l						
Chloroform	ug/l						
1,2-Dichloroethane	ug/l						
1,1,1-Trichloroethane	ug/l	4.28				0.36	1.29 J/
Carbon Tetrachloride	ug/l						
Bromodichloromethane	ug/l						
1,2-Dichloropropane	ug/l						
Trichloroethene	ug/l	2.73				0.65	0.37 J/
Dibromochloromethane	ug/l						
1,1,2-Trichloroethane	ug/l						
Benzene	ug/l						
trans-1,3-Dichloropropene	ug/l						
Bromoform	ug/l						
Tetrachloroethene	ug/l						
1,1,2,2-Tetrachloroethane	ug/l	4.95					
Toluene	ug/l						
Chlorobenzene	ug/l						
Ethylbenzene	ug/l						
No Compounds Detected	ug/l		0.00		0.00		
trans-1,2-Dichloroethene	ug/l						
cis-1,2-Dichloroethene	ug/l	11.50		0.20 UJ/		1.60	0.72 UJ/
1,4-Dichlorobenzene	ug/l						
m and p-Xylene	ug/l						
o-Xylene	ug/l						
1,2-Dichlorobenzene	ug/l						

APPENDIX C
WINNEBAGO RECLAMATION LANDFILL ROUND 1 GROUNDWATER DATA
ANALYSIS TYPE: Volatiles *MATRIX: Ground Water*

SAMPLE ID:		PP-MW106-01	PP-P1-01	PP-P3R-01	PP-P4R-01	PP-P4R-91	PP-P6-01
SAMPLE DATE:		4/04/88	4/04/88	4/05/88	4/05/88	4/05/88	4/06/88
COMPOUNDS	UNIT						
Chloromethane	ug/l			4.00	4.00	4.00	
Vinyl Chloride	ug/l	5.20	6.00	4.00	2.00	2.00	
Chloroethane	ug/l	6.80 U/	6.00 U/				
Methylene Chloride	ug/l			18.80 U/		15.00 U/	
1,1-Dichloroethene	ug/l				0.33	0.22	2.10
1,1-Dichloroethane	ug/l	2.40	6.90	10.70	6.80	7.00	4.80
Chloroform	ug/l						
1,2-Dichloroethane	ug/l		0.53	0.38	0.43	0.39	0.39
1,1,1-Trichloroethane	ug/l	0.65			7.90	7.70	12.60
Carbon Tetrachloride	ug/l						0.23
Bromodichloromethane	ug/l						
1,2-Dichloropropane	ug/l	2.10	3.10	1.19	0.78	0.72	
Trichloroethene	ug/l	5.20	0.44	2.55	7.90	7.90	14.90
Dibromochloromethane	ug/l						
1,1,2-Trichloroethane	ug/l						
Benzene	ug/l	2.60 J/	2.08 J/	1.46 J/	1.40 J/	1.40 J/	
trans-1,3-Dichloropropene	ug/l						
Bromoform	ug/l		0.49				
Tetrachloroethene	ug/l				8.70	8.10	10.00
1,1,2,2-Tetrachloroethane	ug/l						
Toluene	ug/l						
Chlorobenzene	ug/l		1.30 J/				
Ethylbenzene	ug/l						
No Compounds Detected	ug/l						
trans-1,2-Dichloroethene	ug/l						
cis-1,2-Dichloroethene	ug/l	8.50	5.60	9.69	35.00	39.00	62.20
1,4-Dichlorobenzene	ug/l	7.30 J/	5.20 J/		1.00 J/	0.97 J/	
m and p-Xylene	ug/l	1.20 UJ/					
o-Xylene	ug/l						
1,2-Dichlorobenzene	ug/l	0.48 J/	1.00 J/				

APPENDIX C
WINNEBAGO RECLAMATION LANDFILL ROUND 1 GROUNDWATER DATA
ANALYSIS TYPE: Volatiles MATRIX: Ground Water

SAMPLE ID:		PP-P7-01	PP-PW1-01	PP-PW1-91
SAMPLE DATE:		4/05/88	4/08/88	4/08/88
COMPOUNDS	UNIT			
Chloromethane	ug/l			
Vinyl Chloride	ug/l			
Chloroethane	ug/l	1.40 U/		
Methylene Chloride	ug/l			
1,1-Dichloroethene	ug/l			
1,1-Dichloroethane	ug/l			
Chloroform	ug/l			
1,2-Dichloroethane	ug/l			
1,1,1-Trichloroethane	ug/l	1.64		
Carbon Tetrachloride	ug/l			
Bromodichloromethane	ug/l			0.21 J/
1,2-Dichloropropane	ug/l			
Trichloroethene	ug/l			
Dibromochloromethane	ug/l			
1,1,2-Trichloroethane	ug/l			
Benzene	ug/l			
trans-1,3-Dichloropropene	ug/l			
Bromoform	ug/l			
Tetrachloroethene	ug/l			
1,1,2,2-Tetrachloroethane	ug/l			
Toluene	ug/l			
Chlorobenzene	ug/l			
Ethylbenzene	ug/l			
No Compounds Detected	ug/l		0.00	
trans-1,2-Dichloroethene	ug/l			
cis-1,2-Dichloroethene	ug/l	0.58 U/		
1,4-Dichlorobenzene	ug/l			
m and p-Xylene	ug/l			
o-Xylene	ug/l			
1,2-Dichlorobenzene	ug/l			

(1) Results are reported with qualifiers (Data Validation Qualifier/Laboratory Qualifier) to the right of the value.

APPENDIX C
WINNEBAGO RECLAMATION LANDFILL ROUND 1 GROUNDWATER DATA
ANALYSIS TYPE: Semi-Volatiles MATRIX: Ground Water

SAMPLE ID:		PP-B15-01	PP-B15P-01	PP-B15R-01	PP-G109-01	PP-G109A-01	PP-G115-01
SAMPLE DATE:		4/08/88	4/05/88	4/05/88	4/06/88	4/06/88	4/05/88
COMPOUNDS	UNIT						
1,4-Dichlorobenzene	ug/l	11.00		6.00 /J	9.00 /J	3.00 /J	4.00 /J
1,2-Dichlorobenzene	ug/l	3.00 /J					
Acenaphthene	ug/l	0.60 /J					
Dibenzofuran	ug/l	0.30 /J					
bis(2-Ethylhexyl)phthalate	ug/l						
No Compounds Detected	ug/l		0.00				

APPENDIX C
WINNEBAGO RECLAMATION LANDFILL ROUND 1 GROUNDWATER DATA
ANALYSIS TYPE: Semi-Volatiles MATRIX: Ground Water

SAMPLE ID:		PP-G116-01	PP-G116A-01	PP-G116A-91	PP-G117-01	PP-G118A-01	PP-MW106-01
SAMPLE DATE:		4/04/88	4/04/88	4/04/88	4/04/88	4/05/88	4/04/88
COMPOUNDS	UNIT						
1,4-Dichlorobenzene	ug/l						12.00
1,2-Dichlorobenzene	ug/l						
Acenaphthene	ug/l						
Dibenzofuran	ug/l						
bis(2-Ethylhexyl)phthalate	ug/l						7.00 /J
No Compounds Detected	ug/l	0.00	0.00	0.00	0.00	0.00	

APPENDIX C
WINNEBAGO RECLAMATION LANDFILL ROUND 1 GROUNDWATER DATA
ANALYSIS TYPE: Semi-Volatiles MATRIX: Ground Water

SAMPLE ID:		PP-P1-01	PP-P3R-01	PP-P4R-01	PP-P4R-91
SAMPLE DATE:		4/04/88	4/05/88	4/05/88	4/05/88
COMPOUNDS	UNIT				
1,4-Dichlorobenzene	ug/l	5.00 /J			
1,2-Dichlorobenzene	ug/l				
Acenaphthene	ug/l				
Dibenzofuran	ug/l				
bis(2-Ethylhexyl)phthalate	ug/l	5.00 /J			
No Compounds Detected	ug/l		0.00	0.00	0.00

(1) Results are reported with qualifiers (Data Validation Qualifier/Laboratory Qualifier) to the right of the value.

APPENDIX C
WINNEBAGO RECLAMATION LANDFILL ROUND 1 GROUNDWATER DATA
ANALYSIS TYPE: Pesticides/PCBs MATRIX: Ground Water

SAMPLE ID:		PP-B15-01	PP-B15P-01	PP-B15R-01	PP-G109-01	PP-G109A-01	PP-G115-01
SAMPLE DATE:		4/08/88	4/05/88	4/05/88	4/06/88	4/06/88	4/05/88
COMPOUNDS	**UNIT**						
No Compounds Detected	ug/l	0.00	0.00	0.00	0.00	0.00	0.00

APPENDIX C
WINNEBAGO RECLAMATION LANDFILL ROUND 1 GROUNDWATER DATA
ANALYSIS TYPE: Pesticides/PCBs MATRIX: Ground Water

SAMPLE ID:		PP-G116-01	PP-G116A-01	PP-G116A-91	PP-G117-01	PP-G118A-01	PP-MW106-01
SAMPLE DATE:		4/04/88	4/04/88	4/04/88	4/04/88	4/05/88	4/04/88
COMPOUNDS	UNIT						
No Compounds Detected	ug/l	0.00	0.00	0.00	0.00	0.00	0.00

APPENDIX C
WINNEBAGO RECLAMATION LANDFILL ROUND 1 GROUNDWATER DATA
ANALYSIS TYPE: Pesticides/PCBs MATRIX: Ground Water

SAMPLE ID:		PP-P1-01	PP-P3R-01	PP-P4R-01	PP-P4R-91
SAMPLE DATE:		4/04/88	4/05/88	4/05/88	4/05/88
COMPOUNDS	UNIT				
No Compounds Detected	ug/l	0.00	0.00	0.00	0.00

(1) Results are reported with qualifiers (Data Validation Qualifier/Laboratory Qualifier) to the right of the value.

APPENDIX C
WINNEBAGO RECLAMATION LANDFILL ROUND 1 GROUNDWATER DATA
ANALYSIS TYPE: Metals MATRIX: Ground Water

SAMPLE ID:		PP-B04-01	PP-B06D-01	PP-B06S-01	PP-B07-01	PP-B09-01	PP-B10-01
SAMPLE DATE:		4/05/88	4/07/88	4/07/88	4/07/88	4/05/88	4/06/88
COMPOUNDS	UNIT						
Arsenic	ug/l	10.00					
Barium	ug/l	1570.00	17.00	29.00	58.00	24.00	30.00
Cadmium	ug/l	0.70 U/	0.90 U/	0.70 U/	0.50 U/	1.00 U/	0.30 U/
Calcium	ug/l						
Cobalt	ug/l						
Copper	ug/l						
Iron	ug/l						
Lead	ug/l						
Magnesium	ug/l						
Manganese	ug/l						
Nickel	ug/l						
Potassium	ug/l						
Silver	ug/l						
Sodium	ug/l						
Thallium	ug/l						
Vanadium	ug/l						
Zinc	ug/l						
Cyanide, Total	ug/l						

APPENDIX C
WINNEBAGO RECLAMATION LANDFILL ROUND 1 GROUNDWATER DATA
ANALYSIS TYPE: Metals MATRIX: Ground Water

SAMPLE ID:		PP-B11-01	PP-B11A-01	PP-B11A-91	PP-B12-01	PP-B13-01	PP-B14-01
SAMPLE DATE:		4/07/88	4/07/88	4/07/88	4/06/88	4/06/88	4/05/88
COMPOUNDS	UNIT						
Arsenic	ug/l						
Barium	ug/l	29.00	47.00	37.00	156.00	102.00	30.00
Cadmium	ug/l	1.30	2.00	1.60			0.30 U/
Calcium	ug/l						
Cobalt	ug/l						
Copper	ug/l						
Iron	ug/l						
Lead	ug/l						
Magnesium	ug/l						
Manganese	ug/l						
Nickel	ug/l						
Potassium	ug/l						
Silver	ug/l						
Sodium	ug/l						
Thallium	ug/l						
Vanadium	ug/l						
Zinc	ug/l						
Cyanide, Total	ug/l						

APPENDIX C
WINNEBAGO RECLAMATION LANDFILL ROUND 1 GROUNDWATER DATA
ANALYSIS TYPE: Metals MATRIX: Ground Water

SAMPLE ID:		PP-B15-01	PP-B15P-01	PP-B15R-01	PP-B16-01	PP-B16A-01	PP-G107-01
SAMPLE DATE:		4/08/88	4/05/88	4/05/88	4/06/88	4/07/88	4/06/88
COMPOUNDS	UNIT						
Arsenic	ug/l	46.00 /N		3.00 /BN			
Barium	ug/l	362.00		835.00	51.00	21.00	30.00 /N
Cadmium	ug/l			8.00 /*	1.00 U/	1.20	0.20 U/
Calcium	ug/l	46200.00	72400.00	122000.00			
Cobalt	ug/l						
Copper	ug/l						
Iron	ug/l	3530.00		497.00 /*			
Lead	ug/l						
Magnesium	ug/l	66100.00	41000.00	96600.00			
Manganese	ug/l	41.00	59.00 /*	1230.00 /*			
Nickel	ug/l	224.00		186.00 U/			
Potassium	ug/l	141000.00		78800.00			
Silver	ug/l						
Sodium	ug/l	280000.00	6700.00	194000.00			
Thallium	ug/l	3.00 /B	3.00 /B	5.00 J/B+			
Vanadium	ug/l						
Zinc	ug/l	967.00	1450.00	1970.00			
Cyanide, Total	ug/l	6.00		165.00			

APPENDIX C
WINNEBAGO RECLAMATION LANDFILL ROUND 1 GROUNDWATER DATA
ANALYSIS TYPE: Metals MATRIX: Ground Water

SAMPLE ID:		PP-G108-01	PP-G109-01	PP-G109A-01	PP-G110-01	PP-G112-01	PP-G113-01
SAMPLE DATE:		4/06/88	4/06/88	4/06/88	4/06/88	4/06/88	4/06/88
COMPOUNDS	UNIT						
Arsenic	ug/l			2.00 /BN	11.00		
Barium	ug/l	30.00	172.00 /B	265.00	560.00	104.00	114.00
Cadmium	ug/l	0.50 U/	16.00 /*			0.70 U/	0.70 U/
Calcium	ug/l		225000.00	193000.00			
Cobalt	ug/l						
Copper	ug/l						
Iron	ug/l		191.00 /*	109.00 /*			
Lead	ug/l		7.00				
Magnesium	ug/l		72900.00	107000.00			
Manganese	ug/l		191.00 /*	188.00 /*			
Nickel	ug/l			87.00 U/			
Potassium	ug/l						
Silver	ug/l			2.00			
Sodium	ug/l		14300.00	27300.00			
Thallium	ug/l		2.00 J/B+	3.00 /B			
Vanadium	ug/l		50.00				
Zinc	ug/l		5340.00	6340.00			
Cyanide, Total	ug/l		15.00	8.00			

APPENDIX C
WINNEBAGO RECLAMATION LANDFILL ROUND 1 GROUNDWATER DATA
ANALYSIS TYPE: Metals MATRIX: Ground Water

SAMPLE ID:		PP-G113A-01	PP-G114-01	PP-G115-01	PP-G116-01	PP-G116A-01	PP-G116A-91
SAMPLE DATE:		4/06/88	4/06/88	4/05/88	4/05/88	4/05/88	4/05/88
COMPOUNDS	UNIT						
Arsenic	ug/l			19.00 /N			
Barium	ug/l	120.00	742.00	298.00		170.00 /B	160.00 /B
Cadmium	ug/l	0.60 U/					
Calcium	ug/l			194000.00	75900.00	81900.00	80800.00
Cobalt	ug/l						
Copper	ug/l				122.00 /N		
Iron	ug/l			11000.00 /*			
Lead	ug/l					6.00	
Magnesium	ug/l			90700.00	25800.00	44000.00	43100.00
Manganese	ug/l			2010.00 /*			
Nickel	ug/l			162.00 U/	79.00 U/		44.00 U/
Potassium	ug/l						
Silver	ug/l						
Sodium	ug/l					11400.00	11100.00
Thallium	ug/l			2.00 /B	2.00 /B	3.00 J/B+	2.00 J/B+
Vanadium	ug/l			60.00			
Zinc	ug/l			211.00	37.00		
Cyanide, Total	ug/l			158.00	494.00		6.00

APPENDIX C
WINNEBAGO RECLAMATION LANDFILL ROUND 1 GROUNDWATER DATA
ANALYSIS TYPE: Metals MATRIX: Ground Water

SAMPLE ID:		PP-G117-01	PP-G118A-01	PP-G119-01	PP-G119A-01	PP-MW105-01	PP-MW106-01
SAMPLE DATE:		4/05/88	4/05/88	4/04/88	4/04/88	4/07/88	4/05/88
COMPOUNDS	UNIT						
Arsenic	ug/l						
Barium	ug/l			19.00	28.00	26.00	1030.00
Cadmium	ug/l				0.60 U/		
Calcium	ug/l	75500.00	73100.00				84900.00
Cobalt	ug/l						
Copper	ug/l						
Iron	ug/l						375.00 /*
Lead	ug/l						
Magnesium	ug/l	41100.00	38500.00				74100.00
Manganese	ug/l	65.00					981.00 /*
Nickel	ug/l		46.00 U/				213.00
Potassium	ug/l						83700.00
Silver	ug/l						
Sodium	ug/l	8400.00	21600.00				182000.00
Thallium	ug/l	3.00 /B	3.00 /B				6.00 /B
Vanadium	ug/l						
Zinc	ug/l	657.00	48.00				4720.00
Cyanide, Total	ug/l	14.00					193.00

APPENDIX C
WINNEBAGO RECLAMATION LANDFILL ROUND 1 GROUNDWATER DATA
ANALYSIS TYPE: Metals MATRIX: Ground Water

SAMPLE ID:		PP-P1-01	PP-P3R-01	PP-P4R-01	PP-P4R-91	PP-P6-01	PP-P7-01
SAMPLE DATE:		4/05/88	4/05/88	4/05/88	4/05/88	4/06/88	4/05/88
COMPOUNDS	UNIT						
Arsenic	ug/l	10.00 /N	4.00 /BN				
Barium	ug/l		434.00	440.00	464.00	48.00	33.00
Cadmium	ug/l		9.00 /*				0.80 U/
Calcium	ug/l	113000.00	125000.00	120000.00	126000.00		
Cobalt	ug/l	84.00			63.00		
Copper	ug/l						
Iron	ug/l	6230.00 /*	3830.00 /*		253.00 /*		
Lead	ug/l			32.00	37.00		
Magnesium	ug/l	73300.00	49500.00	58700.00	61300.00		
Manganese	ug/l	219.00 /*	780.00 /*	1160.00 /*	1230.00 /*		
Nickel	ug/l			48.00 U/			
Potassium	ug/l	38000.00	9000.00	10000.00	10500.00		
Silver	ug/l	3.00	3.00 /B				
Sodium	ug/l	93600.00	39200.00	65100.00	62200.00		
Thallium	ug/l	3.00 J/B+	4.00 /B	5.00 /B	4.00 /B		
Vanadium	ug/l						
Zinc	ug/l		587.00	5660.00	5490.00		
Cyanide, Total	ug/l	101.00	28.00	62.00	52.00		

APPENDIX C
WINNEBAGO RECLAMATION LANDFILL ROUND 1 GROUNDWATER DATA
ANALYSIS TYPE: Metals MATRIX: Ground Water

SAMPLE ID:		PP-PW1-01	PP-PW1-91
SAMPLE DATE:		4/08/88	4/08/88
COMPOUNDS	UNIT		
Arsenic	ug/l		
Barium	ug/l	49.00	38.00
Cadmium	ug/l		
Calcium	ug/l		
Cobalt	ug/l		
Copper	ug/l		
Iron	ug/l		
Lead	ug/l		
Magnesium	ug/l		
Manganese	ug/l		
Nickel	ug/l		
Potassium	ug/l		
Silver	ug/l		
Sodium	ug/l		
Thallium	ug/l		
Vanadium	ug/l		
Zinc	ug/l		
Cyanide, Total	ug/l		

(1) Results are reported with qualifiers (Data Validation Qualifier/Laboratory Qualifier) to the right of the value.

PROJECT NAME: WINNEBAGO RECLAMATION LANDFILL
PROJECT NUMBER: 13160.00

MATRIX: Ground Water

SAMPLE ID	ANAL. TYPE	COMPOUND	CONC.	UNITS	DVQ	LQ
PP-B15-01						
	TBNA	Unknown	6.100	ug/l		J
	TBNA	Unknown	5.900	ug/l		J
	TBNA	Unknown	6.900	ug/l		J
	TBNA	Unknown	13.000	ug/l		J
	TBNA	Unknown	9.900	ug/l		J
	TBNA	Unknown	18.000	ug/l		J
	TBNA	Unknown	13.000	ug/l		J
	TBNA	Unknown	14.000	ug/l		J
	TBNA	Unknown	9.200	ug/l		J
	TBNA	Unknown	6.400	ug/l		J
	TBNA	Unknown	8.600	ug/l		J
	TBNA	Hexadecanoic Acid	10.000	ug/l		J
	TBNA	Benzoic Acid, 4-(1,1-Dimethylethyl)-	17.000	ug/l		J
	TBNA	Sulfur, Mol. (S8)	8.200	ug/l		J
	TBNA	Camphor (ACN)	14.000	ug/l		J
	TBNA	Benzamide, n,n-diethyl-3-methyl-	10.000	ug/l		J
	TBNA	2(3H)-Benzothiazolone	30.000	ug/l		J
	TBNA	Benzenesulfonamide, n-ethyl-4-methyl-	11.000	ug/l		J
	TBNA	Phenol, 2,3-dimethyl-	18.000	ug/l		J
	TBNA	Phenol, 4-(1-methylethyl)-	9.300	ug/l		J
PP-B15R-01						
	TBNA	Unknown	14.000	ug/l		J
	TBNA	Benzoic Acid, 4-(1,1-Dimethylethyl)-	11.000	ug/l		J
	TBNA	Sulfur, Mol. (S8)	48.000	ug/l		J
	TBNA	2(3H)-Benzothiazolone	15.000	ug/l		J
	TBNA	Benzamide, n-(1,1-dimethylethyl)-4 methyl-	20.000	ug/l		J
PP-G109A-01						
	TBNA	Sulfur, Mol. (S8)	21.000	ug/l		J
PP-MW106-01						
	TBNA	Unknown	16.000	ug/l		J
	TBNA	Unknown	14.000	ug/l		J

PROJECT NAME: WINNEBAGO RECLAMATION LANDFILL
PROJECT NUMBER: 13160.00

MATRIX: Ground Water

SAMPLE ID	ANAL. TYPE	COMPOUND	CONC.	UNITS	DVQ	LQ
	TBNA	Sulfur, Mol. (S8)	52.000	ug/l		J
	TBNA	2(3H)-Benzothiazolone	15.000	ug/l		J
PP-P4R-01						
	TBNA	Unknown	12.000	ug/l		J
PP-P4R-91						
	TBNA	Unknown	13.000	ug/l		J

ROUND 2

GROUNDWATER RESULTS

WRL Groundwater Sampling
Round 2

	B4	B6S	B6D	B7	B9	B10	B11	B11A	B12	B13	B14	B15	B15R	B15P	B16	B16A	G107	G108	G109	G109A	G110	G111	G112	G113
VOCS (GC with GC/MS conf.)	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Arsenic (dissolved)	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Barium (dissolved)	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Cadmium (dissolved)	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Chloride	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Phenolics, Total	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Alkalinity, Total	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Field pH	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Field Spec. Cond.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

WRL Groundwater Sampling
Round 2
(Continued)

	G113A	G114	G115	G116	G116A	G117	G118R	G118A	G119	G119A	P1	P3R	P4R	P6	P7	MW105	MW106	PRIVATE WELL (PW0/PW1)
VOCs (GC With GC/MS Conf)	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Arsenic (dissolved)	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Barium (dissolved)	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Cadmium (dissolved)	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Chloride	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Phenolics, Total	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Alkalinity, Total	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Field pH	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Spec. Cond.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

V13160.41-Tables-SJB/lms

Results of pH and Specific Conductance Measurements
Round 2 Groundwater Samples

Sample	Conductivity umho/cm	pH
B4	1,040	7.05
B6S	660	7.60
B6D	550	7.40
B7	680	7.15
B9	600	7.39
B10	815	7.16
B11	760	7.18
B11A	840	7.02
B12	1,510	6.57
B13	1,400	6.60
B14	660	7.48
B15	5,620	6.87
B15P	630	7.39
B15R	3,300	6.84
B16	700	7.39
B16A	570	7.44
G107	620	7.12
G108	1,080	6.72
G109	1,390	6.78
G109A	1,520	6.76
G110	1,820	7.05
G111	670	7.41
G112	1,430	7.18
G113	1,620	6.62
G113A	1,480	6.84
G114	1,540	6.51
G115	1,410	6.60
G116	625	7.43
G116A	1,030	7.27
G117	770	7.42
G118R	730	7.09
G118A	617	7.43
G119	590	7.25
G119A	635	7.30
MW105	650	7.47
MW106	2,980	7.00
P1	1,610	6.99
P3R	1,090	6.79
P4R	1,360	7.12
P6	665	7.51
P7	865	7.18
PW1	630	7.51

APPENDIX C
WINNEBAGO RECLAMATION LANDFILL ROUND 2 GROUNDWATER DATA
ANALYSIS TYPE: GW Indicators MATRIX: Ground Water

SAMPLE ID:		PP-B04-02	PP-B06D-02	PP-B06D-92	PP-B06S-02	PP-B07-02	PP-B09-02
SAMPLE DATE:		6/15/88	6/15/88	6/15/88	6/15/88	6/15/88	6/15/88
COMPOUNDS	UNIT						
Alkalinity	mg/l	565.00	277.00	268.00	270.00	302.00	292.00
Chloride	mg/l	9.00	11.00	10.00	27.00	26.00	6.00
Phenol	ug/l	9.00 UJ/	14.00 UJ/	11.00 UJ/	16.00 UJ/	8.00 UJ/	14.00 UJ/

APPENDIX C
WINNEBAGO RECLAMATION LANDFILL ROUND 2 GROUNDWATER DATA
ANALYSIS TYPE: GW Indicators MATRIX: Ground Water

SAMPLE ID:		PP-B10-02	PP-B11-02	PP-B11A-02	PP-B12-02	PP-B13-02	PP-B14-02
SAMPLE DATE:		6/14/88	6/14/88	6/14/88	6/14/88	6/14/88	6/14/88
COMPOUNDS	UNIT						
Alkalinity	mg/l	424.00	392.00	476.00	953.00	781.00	279.00
Chloride	mg/l	17.00	6.00	11.00	25.00	32.00	12.00
Phenol	ug/l	22.00 UJ/	5.00 UJ/	9.00 UJ/	5.00 UJ/		9.00 UJ/

APPENDIX C
WINNEBAGO RECLAMATION LANDFILL ROUND 2 GROUNDWATER DATA
ANALYSIS TYPE: GW Indicators MATRIX: Ground Water

SAMPLE ID:		PP-B15-02	PP-B15P-02	PP-B15R-02	PP-B16-02	PP-B16A-02	PP-G107-02
SAMPLE DATE:		6/20/88	6/20/88	6/20/88	6/14/88	6/14/88	6/14/88
COMPOUNDS	UNIT						
Alkalinity	mg/l	1640.00	283.00	1180.00	313.00	238.00	295.00
Chloride	mg/l	860.00	15.00	348.00	17.00	18.00	16.00
Phenol	ug/l	145.00	11.00 UJ/	14.00 UJ/	10.00 UJ/	12.00 UJ/	7.00 UJ/

APPENDIX C
WINNEBAGO RECLAMATION LANDFILL ROUND 2 GROUNDWATER DATA
ANALYSIS TYPE: GW Indicators MATRIX: Ground Water

SAMPLE ID:		PP-G108-02	PP-G108-92	PP-G109-02	PP-G109A-02	PP-G110-02	PP-G111-02
SAMPLE DATE:		6/14/88	6/14/88	6/14/88	6/14/88	6/14/88	6/15/88
COMPOUNDS	UNIT						
Alkalinity	mg/l	608.00	611.00	829.00	870.00	680.00	268.00
Chloride	mg/l	11.00	11.00	27.00	60.00	234.00	22.00
Phenol	ug/l	11.00 UJ/	8.00 UJ/		5.00 UJ/	170.00	8.00 UJ/

APPENDIX C
WINNEBAGO RECLAMATION LANDFILL ROUND 2 GROUNDWATER DATA
ANALYSIS TYPE: GW Indicators MATRIX: Ground Water

SAMPLE ID:		PP-G112-02	PP-G113-02	PP-G113A-02	PP-G114-02	PP-G115-02	PP-G116-02
SAMPLE DATE:		6/14/88	6/14/88	6/14/88	6/14/88	6/14/88	6/20/88
COMPOUNDS	UNIT						
Alkalinity	mg/l	615.00	840.00	842.00	847.00	816.00	292.00
Chloride	mg/l	34.00	29.00	28.00	44.00	48.00	7.00
Phenol	ug/l	9.00 UJ/	17.00 UJ/	12.00 UJ/	19.00 UJ/	8.00 UJ/	14.00 UJ/

APPENDIX C
WINNEBAGO RECLAMATION LANDFILL ROUND 2 GROUNDWATER DATA
ANALYSIS TYPE: GW Indicators MATRIX: Ground Water

SAMPLE ID:		PP-G116A-02	PP-G116A-92	PP-G117-02	PP-G118A-02	PP-G118R-02	PP-G119-02
SAMPLE DATE:		6/20/88	6/20/88	6/20/88	6/20/88	6/20/88	6/20/88
COMPOUNDS	UNIT						
Alkalinity	mg/l	399.00	395.00	387.00	272.00	338.00	295.00
Chloride	mg/l	99.00	101.00	26.00	14.00	33.00	8.00
Phenol	ug/l	13.00 UJ/	9.00 UJ/	7.00 UJ/	13.00 UJ/	8.00 UJ/	11.00 UJ/

APPENDIX C
WINNEBAGO RECLAMATION LANDFILL ROUND 2 GROUNDWATER DATA
ANALYSIS TYPE: GW Indicators MATRIX: Ground Water

SAMPLE ID:		PP-G119A-02	PP-MW105-02	PP-MW105-92	PP-MW106-02	PP-P1-02	PP-P3R-02
SAMPLE DATE:		6/20/88	6/15/88	6/15/88	6/20/88	6/20/88	6/20/88
COMPOUNDS	UNIT						
Alkalinity	mg/l	270.00	258.00	257.00	949.00	626.00	479.00
Chloride	mg/l	13.00	19.00	19.00	378.00	176.00	46.00
Phenol	ug/l	8.00 UJ/	11.00 UJ/	18.00 UJ/	12.00 UJ/	11.00 UJ/	8.00 UJ/

APPENDIX C
WINNEBAGO RECLAMATION LANDFILL ROUND 2 GROUNDWATER DATA
ANALYSIS TYPE: GW Indicators MATRIX: Ground Water

SAMPLE ID:		PP-P4R-02	PP-P6-02	PP-P6-92	PP-P7-02	PP-PWO-02
SAMPLE DATE:		6/20/88	6/14/88	6/14/88	6/20/88	6/15/88
COMPOUNDS	UNIT					
Alkalinity	mg/l	622.00	277.00	274.00	410.00	272.00
Chloride	mg/l	188.00	18.00	18.00	40.00	13.00
Phenol	ug/l	14.00 UJ/			8.00 UJ/	13.00 UJ/

(1) Results are reported with qualifiers (Data Validation Qualifier/Laboratory Qualifier) to the right of the value.

APPENDIX C
WINNEBAGO RECLAMATION LANDFILL ROUND 2 GROUNWATER DATA
ANALYSIS TYPE: Volatiles MATRIX: Ground Water

SAMPLE ID:		PP-B04-02	PP-B06D-02	PP-B06D-92	PP-B06S-02	PP-B07-02	PP-B09-02
SAMPLE DATE:		6/15/88	6/15/88	6/15/88	6/15/88	6/15/88	6/15/88
COMPOUNDS	UNIT						
Vinyl Chloride	ug/l	1.80 J/					
Chloroethane	ug/l	4.30 J/					
1,1-Dichloroethene	ug/l	6.00 J/	0.56	0.54			
1,1-Dichloroethane	ug/l	170.00	8.20	8.10			
Chloroform	ug/l						
1,2-Dichloroethane	ug/l	13.00 J/	2.00	2.00			
1,1,1-Trichloroethane	ug/l	350.00	1.20	0.94	0.78		
Carbon Tetrachloride	ug/l						
Bromodichloromethane	ug/l						
1,2-Dichloropropane	ug/l	8.90 J/		0.22			
Trichloroethene	ug/l	350.00	0.58	0.37			
Dibromochloromethane	ug/l						
1,1,2-Trichloroethane	ug/l	4.00 J/					
Benzene	ug/l	1.90 J/					
trans-1,3-Dichloropropene	ug/l						
Tetrachloroethene	ug/l	810.00			0.51 U/		
Toluene	ug/l	1.70 J/					
Chlorobenzene	ug/l						
Ethylbenzene	ug/l						
No Compounds Detected	ug/l					0.00	0.00
trans-1,2-Dichloroethene	ug/l	0.68 J/					
cis-1,2-Dichloroethene	ug/l	750.00	88.00	86.00			
1,4-Dichlorobenzene	ug/l						
m and p-Xylene	ug/l	3.90 J/					
o-Xylene	ug/l	9.20 J/					
1,2-Dichlorobenzene	ug/l						
1,3-Dichlorobenzene	ug/l						

APPENDIX C
WINNEBAGO RECLAMATION LANDFILL ROUND 2 GROUNWATER DATA
ANALYSIS TYPE: Volatiles MATRIX: Ground Water

SAMPLE ID:		PP-B10-02	PP-B11-02	PP-B11A-02	PP-B12-02	PP-B13-02	PP-B14-02
SAMPLE DATE:		6/14/88	6/14/88	6/14/88	6/14/88	6/14/88	6/14/88
COMPOUNDS	UNIT						
Vinyl Chloride	ug/l				8.70	12.00 J/	
Chloroethane	ug/l	0.29		1.50 J/	7.00	14.00 J/	
1,1-Dichloroethene	ug/l						
1,1-Dichloroethane	ug/l	1.30		2.00 J/	13.00	21.00 J/	
Chloroform	ug/l					11.00 J/	
1,2-Dichloroethane	ug/l				1.80	3.50 J/	
1,1,1-Trichloroethane	ug/l	4.00		0.70 J/		3.80 J/	
Carbon Tetrachloride	ug/l					0.42 J/	
Bromodichloromethane	ug/l						
1,2-Dichloropropane	ug/l	1.00			11.00	10.00 J/	
Trichloroethene	ug/l	4.60		2.60 J/	7.60	41.00 J/	
Dibromochloromethane	ug/l						
1,1,2-Trichloroethane	ug/l						
Benzene	ug/l				0.67	2.50	
trans-1,3-Dichloropropene	ug/l						
Tetrachloroethene	ug/l	3.10	0.76 U/	5.60 J/	6.60	22.00 J/	
Toluene	ug/l						
Chlorobenzene	ug/l				4.80	1.30 J/	
Ethylbenzene	ug/l				3.30	2.10	
No Compounds Detected	ug/l						0.00
trans-1,2-Dichloroethene	ug/l				2.90	3.10 J/	
cis-1,2-Dichloroethene	ug/l	20.00		8.20 J/	90.00	190.00 J/	
1,4-Dichlorobenzene	ug/l	0.33			22.00	11.00 J/	
m and p-Xylene	ug/l						
o-Xylene	ug/l						
1,2-Dichlorobenzene	ug/l				3.20	0.47 J/	
1,3-Dichlorobenzene	ug/l						

APPENDIX C
WINNEBAGO RECLAMATION LANDFILL ROUND 2 GROUNWATER DATA
ANALYSIS TYPE: Volatiles MATRIX: Ground Water

SAMPLE ID:		PP-B15-02	PP-B15P-02	PP-B15R-02	PP-B16-02	PP-B16A-02	PP-G107-02
SAMPLE DATE:		6/20/88	6/20/88	6/20/88	6/14/88	6/14/88	6/14/88
COMPOUNDS	UNIT						
Vinyl Chloride	ug/l	3.00 J/		3.20			
Chloroethane	ug/l	1.50 J/		7.50			
1,1-Dichloroethene	ug/l						
1,1-Dichloroethane	ug/l		0.80	8.90	0.67	0.96	0.29
Chloroform	ug/l						
1,2-Dichloroethane	ug/l	0.24 J/		1.10			
1,1,1-Trichloroethane	ug/l		2.50	0.29	4.70	4.20	1.30
Carbon Tetrachloride	ug/l		0.20				
Bromodichloromethane	ug/l	0.24 J/					
1,2-Dichloropropane	ug/l	0.86 J/		5.70			
Trichloroethene	ug/l		4.10	4.60	3.10	2.10	1.00
Dibromochloromethane	ug/l	0.24 UJ/					
1,1,2-Trichloroethane	ug/l						
Benzene	ug/l	5.20		2.80			
trans-1,3-Dichloropropene	ug/l						
Tetrachloroethene	ug/l		1.90	1.60	2.60	1.90	0.45 U/
Toluene	ug/l	0.24					
Chlorobenzene	ug/l	0.59 J/		0.94			
Ethylbenzene	ug/l	2.30					
No Compounds Detected	ug/l						
trans-1,2-Dichloroethene	ug/l			0.83			
cis-1,2-Dichloroethene	ug/l		9.20	9.60	16.00	34.00	8.70
1,4-Dichlorobenzene	ug/l	16.00 J/					
m and p-Xylene	ug/l	1.00					
o-Xylene	ug/l	1.80					
1,2-Dichlorobenzene	ug/l	2.70 J/					
1,3-Dichlorobenzene	ug/l						

APPENDIX C
WINNEBAGO RECLAMATION LANDFILL ROUND 2 GROUNWATER DATA
ANALYSIS TYPE: Volatiles MATRIX: Ground Water

SAMPLE ID:		PP-G108-02	PP-G108-92	PP-G109-02	PP-G109A-02	PP-G110-02	PP-G111-02
SAMPLE DATE:		6/14/88	6/14/88	6/14/88	6/14/88	6/14/88	6/15/88
COMPOUNDS	UNIT						
Vinyl Chloride	ug/l	0.20		3.70	9.50	98.00	
Chloroethane	ug/l	1.00	0.85	4.70	11.00	150.00	
1,1-Dichloroethene	ug/l				0.21	0.41	
1,1-Dichloroethane	ug/l	0.48	1.20	4.20	18.00	68.00	6.80
Chloroform	ug/l						
1,2-Dichloroethane	ug/l					4.10	
1,1,1-Trichloroethane	ug/l	0.40	0.81			0.21	8.70
Carbon Tetrachloride	ug/l						
Bromodichloromethane	ug/l						
1,2-Dichloropropane	ug/l	1.10	0.84	3.00	5.90	9.60	
Trichloroethene	ug/l	3.70	4.30	1.10	30.00	9.60	6.60
Dibromochloromethane	ug/l						
1,1,2-Trichloroethane	ug/l						
Benzene	ug/l				3.30	17.00	
trans-1,3-Dichloropropene	ug/l						
Tetrachloroethene	ug/l	5.20	5.90 J/	3.40	7.60	2.50	9.50
Toluene	ug/l					3.00	
Chlorobenzene	ug/l			0.52		2.50	
Ethylbenzene	ug/l			0.24	1.20	1.30	
No Compounds Detected	ug/l						
trans-1,2-Dichloroethene	ug/l			1.00	4.00	6.50	
cis-1,2-Dichloroethene	ug/l	6.90	7.80	9.40	64.00	10.00	41.00
1,4-Dichlorobenzene	ug/l	0.57	0.63	7.00	4.20	9.90	
m and p-Xylene	ug/l					4.40	
o-Xylene	ug/l					6.10	
1,2-Dichlorobenzene	ug/l			0.48	0.30	1.40	
1,3-Dichlorobenzene	ug/l					0.44	

APPENDIX C
WINNEBAGO RECLAMATION LANDFILL ROUND 2 GROUNWATER DATA
ANALYSIS TYPE: Volatiles MATRIX: Ground Water

SAMPLE ID:		PP-G112-02	PP-G113-02	PP-G113A-02	PP-G114-02	PP-G115-02	PP-G116-02
SAMPLE DATE:		6/14/88	6/14/88	6/14/88	6/14/88	6/14/88	6/20/88
COMPOUNDS	UNIT						
Vinyl Chloride	ug/l		2.40 J/	13.00	5.80	16.00	
Chloroethane	ug/l		1.80 J/	92.00	9.00	30.00	
1,1-Dichloroethene	ug/l			1.40		0.39	
1,1-Dichloroethane	ug/l		2.50 J/	110.00	12.00	2.60	
Chloroform	ug/l						
1,2-Dichloroethane	ug/l			1.90	1.80		
1,1,1-Trichloroethane	ug/l			2.20			
Carbon Tetrachloride	ug/l				0.33	8.00	
Bromodichloromethane	ug/l						
1,2-Dichloropropane	ug/l		0.77 J/	7.80	11.00	0.67	
Trichloroethene	ug/l		1.10 J/	160.00	0.85		
Dibromochloromethane	ug/l						
1,1,2-Trichloroethane	ug/l						
Benzene	ug/l		0.96	4.50	3.50	0.51	
trans-1,3-Dichloropropene	ug/l			2.80	0.63		
Tetrachloroethene	ug/l	1.00 U/	5.30 J/	75.00			
Toluene	ug/l				0.37		
Chlorobenzene	ug/l			1.20	8.30		
Ethylbenzene	ug/l		0.38	1.00		0.28	
No Compounds Detected	ug/l						*0.00*
trans-1,2-Dichloroethene	ug/l		0.23 J/	4.60	3.40		
cis-1,2-Dichloroethene	ug/l		15.00 J/	280.00	1.50	6.60	
1,4-Dichlorobenzene	ug/l		1.40 J/	5.50	63.00	3.10	
m and p-Xylene	ug/l				2.40		
o-Xylene	ug/l		0.45		0.71		
1,2-Dichlorobenzene	ug/l			0.36	7.40		
1,3-Dichlorobenzene	ug/l						

APPENDIX C
WINNEBAGO RECLAMATION LANDFILL ROUND 2 GROUNWATER DATA
ANALYSIS TYPE: Volatiles MATRIX: Ground Water

SAMPLE ID:		PP-G116A-02	PP-G116A-92	PP-G117-02	PP-G118A-02	PP-G118R-02	PP-G119-02
SAMPLE DATE:		6/20/88	6/20/88	6/20/88	6/20/88	6/20/88	6/20/88
COMPOUNDS	UNIT						
Vinyl Chloride	ug/l						
Chloroethane	ug/l	0.53	0.53				
1,1-Dichloroethene	ug/l						
1,1-Dichloroethane	ug/l	3.50	3.60				
Chloroform	ug/l						
1,2-Dichloroethane	ug/l						
1,1,1-Trichloroethane	ug/l	4.90	4.80				
Carbon Tetrachloride	ug/l			2.10 J/			
Bromodichloromethane	ug/l						
1,2-Dichloropropane	ug/l						
Trichloroethene	ug/l	4.10	4.20				
Dibromochloromethane	ug/l						
1,1,2-Trichloroethane	ug/l						
Benzene	ug/l						
trans-1,3-Dichloropropene	ug/l						
Tetrachloroethene	ug/l	5.40	5.50				
Toluene	ug/l						
Chlorobenzene	ug/l						
Ethylbenzene	ug/l						
No Compounds Detected	ug/l				0.00	0.00	0.00
trans-1,2-Dichloroethene	ug/l						
cis-1,2-Dichloroethene	ug/l	18.00	18.00				
1,4-Dichlorobenzene	ug/l						
m and p-Xylene	ug/l						
o-Xylene	ug/l						
1,2-Dichlorobenzene	ug/l						
1,3-Dichlorobenzene	ug/l						

APPENDIX C
WINNEBAGO RECLAMATION LANDFILL ROUND 2 GROUNWATER DATA
ANALYSIS TYPE: Volatiles MATRIX: Ground Water

SAMPLE ID:		PP-G119A-02	PP-MW105-02	PP-MW105-92	PP-MW106-02	PP-P1-02	PP-P3R-02
SAMPLE DATE:		6/20/88	6/15/88	6/15/88	6/20/88	6/20/88	6/20/88
COMPOUNDS	UNIT						
Vinyl Chloride	ug/l				3.10 J/	4.40 J/	1.90
Chloroethane	ug/l				5.40 J/	5.40 J/	1.90
1,1-Dichloroethene	ug/l						
1,1-Dichloroethane	ug/l				6.00 J/	7.10 J/	10.00
Chloroform	ug/l						
1,2-Dichloroethane	ug/l				0.48 J/	0.52 J/	0.38
1,1,1-Trichloroethane	ug/l	0.37	1.50	1.40	3.10 J/		0.47
Carbon Tetrachloride	ug/l						
Bromodichloromethane	ug/l						
1,2-Dichloropropane	ug/l				3.00 J/	2.50 J/	1.10
Trichloroethene	ug/l	0.47			6.70 J/	3.60 J/	1.60
Dibromochloromethane	ug/l						
1,1,2-Trichloroethane	ug/l						
Benzene	ug/l				2.30	0.93	0.68
trans-1,3-Dichloropropene	ug/l						
Tetrachloroethene	ug/l				0.76 UJ/		
Toluene	ug/l						
Chlorobenzene	ug/l				0.60 J/		
Ethylbenzene	ug/l				0.79		0.75
No Compounds Detected	ug/l						
trans-1,2-Dichloroethene	ug/l				0.63 J/	0.56 J/	0.34
cis-1,2-Dichloroethene	ug/l	1.10	0.37	0.34	10.00 J/	13.00 J/	8.30
1,4-Dichlorobenzene	ug/l				7.10 J/	0.93 J/	1.40
m and p-Xylene	ug/l						
o-Xylene	ug/l						
1,2-Dichlorobenzene	ug/l				0.55 J/		
1,3-Dichlorobenzene	ug/l						

APPENDIX C
WINNEBAGO RECLAMATION LANDFILL ROUND 2 GROUNWATER DATA
ANALYSIS TYPE: Volatiles MATRIX: Ground Water

SAMPLE ID:		PP-P4R-02	PP-P6-02	PP-P6-92	PP-P7-02	PP-PWO-02
SAMPLE DATE:		6/20/88	6/14/88	6/14/88	6/20/88	6/15/88
COMPOUNDS	UNIT					
Vinyl Chloride	ug/l	0.95				
Chloroethane	ug/l	2.70				
1,1-Dichloroethene	ug/l		3.50	3.10		
1,1-Dichloroethane	ug/l	6.70	10.00	10.00		
Chloroform	ug/l					
1,2-Dichloroethane	ug/l	0.45	1.50	1.50		
1,1,1-Trichloroethane	ug/l	6.80	33.00	37.00	1.30 J/	
Carbon Tetrachloride	ug/l		1.00	1.20		
Bromodichloromethane	ug/l					
1,2-Dichloropropane	ug/l	0.47				
Trichloroethene	ug/l	7.40	36.00	36.00		
Dibromochloromethane	ug/l					
1,1,2-Trichloroethane	ug/l					
Benzene	ug/l	0.83				
trans-1,3-Dichloropropene	ug/l					
Tetrachloroethene	ug/l	7.40	31.00	31.00	0.27 UJ/	
Toluene	ug/l					
Chlorobenzene	ug/l	0.34				
Ethylbenzene	ug/l	0.44				
No Compounds Detected	ug/l					0.00
trans-1,2-Dichloroethene	ug/l	0.32				
cis-1,2-Dichloroethene	ug/l	31.00	93.00 J/	78.00		
1,4-Dichlorobenzene	ug/l	1.40				
m and p-Xylene	ug/l					
o-Xylene	ug/l					
1,2-Dichlorobenzene	ug/l					
1,3-Dichlorobenzene	ug/l					

(1) Results are reported with qualifiers (Data Validation Qualifier/Laboratory Qualifier) to the right of the value.

APPENDIX C
WINNEBAGO RECLAMATION LANDFILL ROUND 2 GROUNDWATER DATA
ANALYSIS TYPE: Metals MATRIX: Ground Water

SAMPLE ID:		PP-804-02	PP-806D-02	PP-806D-92	PP-806S-02	PP-807-02	PP-809-02
SAMPLE DATE:		6/15/88	6/15/88	6/15/88	6/15/88	6/15/88	6/15/88
COMPOUNDS	UNIT						
Arsenic	ug/l	11.00					
Barium	ug/l	1640.00 J/*+	34.00	39.00	45.00	54.00	49.00
Cadmium	ug/l					0.20	

APPENDIX C
WINNEBAGO RECLAMATION LANDFILL ROUND 2 GROUNDWATER DATA
ANALYSIS TYPE: Metals MATRIX: Ground Water

SAMPLE ID:		PP-B10-02	PP-B11-02	PP-B11A-02	PP-B12-02	PP-B13-02	PP-B14-02
SAMPLE DATE:		6/14/88	6/14/88	6/14/88	6/14/88	6/14/88	6/14/88
COMPOUNDS	UNIT						
Arsenic	ug/l						
Barium	ug/l	41.00	34.00	43.00	227.00	263.00	51.00
Cadmium	ug/l	0.50	0.30	1.40			0.30

APPENDIX C
WINNEBAGO RECLAMATION LANDFILL ROUND 2 GROUNDWATER DATA
ANALYSIS TYPE: Metals MATRIX: Ground Water

SAMPLE ID:		PP-B15-02	PP-B15P-02	PP-B15R-02	PP-B16-02	PP-B16A-02	PP-G107-02
SAMPLE DATE:		6/20/88	6/20/88	6/20/88	6/14/88	6/14/88	6/14/88
COMPOUNDS	UNIT						
Arsenic	ug/l	33.00					
Barium	ug/l	693.00	52.00	1110.00	70.00	36.00	37.00
Cadmium	ug/l					1.00	0.30

APPENDIX C
WINNEBAGO RECLAMATION LANDFILL ROUND 2 GROUNDWATER DATA
ANALYSIS TYPE: Metals MATRIX: Ground Water

SAMPLE ID:		PP-G108-02	PP-G108-92	PP-G109-02	PP-G109A-02	PP-G110-02	PP-G111-02
SAMPLE DATE:		6/14/88	6/14/88	6/14/88	6/14/88	6/14/88	6/15/88
COMPOUNDS	UNIT						
Arsenic	ug/l					14.00	
Barium	ug/l	79.00 J/	55.00 J/	188.00	207.00	952.00	218.00
Cadmium	ug/l		0.50			0.60 J/	0.40

APPENDIX C
WINNEBAGO RECLAMATION LANDFILL ROUND 2 GROUNDWATER DATA
ANALYSIS TYPE: Metals MATRIX: Ground Water

SAMPLE ID:		PP-G112-02	PP-G113-02	PP-G113A-02	PP-G114-02	PP-G115-02	PP-G116-02
SAMPLE DATE:		6/14/88	6/14/88	6/14/88	6/14/88	6/14/88	6/20/88
COMPOUNDS	UNIT						
Arsenic	ug/l				20.00	40.00	
Barium	ug/l	105.00	174.00	175.00	1145.00	366.00 J/*+	50.00
Cadmium	ug/l	0.20	1.10	0.70			

APPENDIX C
WINNEBAGO RECLAMATION LANDFILL ROUND 2 GROUNDWATER DATA
ANALYSIS TYPE: Metals MATRIX: Ground Water

SAMPLE ID:		PP-G116A-02	PP-G116A-92	PP-G117-02	PP-G118A-02	PP-G118R-02	PP-G119-02
SAMPLE DATE:		6/20/88	6/20/88	6/20/88	6/20/88	6/20/88	6/20/88
COMPOUNDS	UNIT						
Arsenic	ug/l						
Barium	ug/l	280.00	288.00	68.00	32.00	467.00	33.00
Cadmium	ug/l					0.40	

APPENDIX C
WINNEBAGO RECLAMATION LANDFILL ROUND 2 GROUNDWATER DATA
ANALYSIS TYPE: Metals MATRIX: Ground Water

SAMPLE ID:		PP-G119A-02	PP-MW105-02	PP-MW105-92	PP-MW106-02	PP-P1-02	PP-P3R-02
SAMPLE DATE:		6/20/88	6/15/88	6/15/88	6/20/88	6/20/88	6/20/88
COMPOUNDS	UNIT						
Arsenic	ug/l					8.00	11.00
Barium	ug/l	39.00	29.00	30.00	1050.00	1070.00	400.00
Cadmium	ug/l						0.40

APPENDIX C
WINNEBAGO RECLAMATION LANDFILL ROUND 2 GROUNDWATER DATA
ANALYSIS TYPE: Metals MATRIX: Ground Water

SAMPLE ID:		PP-P4R-02	PP-P6-02	PP-P6-92	PP-P7-02	PP-PWO-02
SAMPLE DATE:		6/20/88	6/14/88	6/14/88	6/20/88	6/15/88
COMPOUNDS	UNIT					
Arsenic	ug/l					
Barium	ug/l	771.00	48.00 J/	82.00 J/	40.00	63.00
Cadmium	ug/l	0.90	0.50			

(1) Results are reported with qualifiers (Data Validation Qualifier/Laboratory Qualifier) to the right of the value.

ROUND 3

GROUNDWATER RESULTS

WRL Groundwater Sampling
Round 3

	B4	B6S	B6D	B7	B9	B10	B11	B11A	B12	B13	B14	B15	B15R	B15P	B16	B16A	G107	G108	G109	G109A	G110	G111
VOCS (GC/MS)										X			X	X					X	X	X	X
SVOCs										X			X	X					X	X	X	X
Arsenic (dissolved)										X			X	X					X	X	X	X
Barium (dissolved)										X			X	X					X	X	X	X
Cadmium (dissolved)										X			X	X					X	X	X	X
Cyanide, Total										X			X	X					X	X	X	X
Chromium, Total (dissolved)										X			X	X					X	X	X	X
Chromium, hexavalent										X			X	X					X	X	X	X
Chloride										X			X	X					X	X	X	X
Nitrate & Nitrite										X			X	X					X	X	X	X
Sulfate										X			X	X					X	X	X	X
Phenolics, Total										X			X	X					X	X	X	X
Alkalinity, Total										X			X	X					X	X	X	X
Field pH										X			X	X					X	X	X	X
Field Spec. Cond.										X			X	X					X	X	X	X

WRL Groundwater Sampling
Round 3
(Continued)

	G112	G113	G113A	G114	G115	G116	G116A	G117	G118R	G118A	G119	G119A	P1	P3R	P4R	P6	P7	MW105	MW106	PRIVATE (PWI/PWO)
VOCs				X	X	X	X						X	X	X	X				
SVOCs				X	X	X	X						X	X	X	X				
Arsenic (dissolved)				X	X	X	X						X	X	X	X				
Barium (dissolved)				X	X	X	X						X	X	X	X				
Cadmium (dissolved)				X	X	X	X						X	X	X	X				
Cyanide, Total				X	X	X	X						X	X	X	X				
Chromium, Total				X	X	X	X						X	X	X	X				
Chromium, hexavalent				X	X	X	X						X	X	X	X				
Chloride				X	X	X	X						X	X	X	X				
Nitrate & Nitrite				X	X	X	X						X	X	X	X				
Sulfate				X	X	X	X						X	X	X	X				
Phenols, Total				X	X	X	X						X	X	X	X				
Alkalinity, Total				X	X	X	X						X	X	X	X				
Field pH				X	X	X	X						X	X	X	X				
Field Spec. Cond.				X	X	X	X						X	X	X	X				

Results of pH and Specific Conductance Measurements
Round 3 Groundwater Samples

Well	Conductivity	pH
	umho/cm	
B13	1260	6.85
B15R	3840	7.06
B15P	585	7.52
G109	1470	6.79
G109A	1590	6.84
G110	2380	7.30
G111	755	7.53
G114	2080	6.82
G115	1620	6.53
G116	645	7.34
G116A	875	7.25
P1	1220	7.03
P3R	535	6.79
P4R	680	7.41
P6	615	7.48

APPENDIX C
WINNEBAGO RECLAMATION LANDFILL ROUND 3 GROUNDWATER DATA
ANALYSIS TYPE: GW Indicators MATRIX: Ground Water

SAMPLE ID:		PP-B13-03	PP-B15P-03	PP-B15R-03	PP-B15R-93	PP-G109-03	PP-G109A-03
SAMPLE DATE:		2/08/90	2/06/90	2/07/90	2/07/90	2/08/90	2/08/90
COMPOUNDS	UNIT						
Alkalinity	mg/l	595.00 /N	261.00 /N	1170.00 /N	1160.00 /N	841.00 /N	807.00 /N
Chloride	mg/l	33.00	13.00	529.00	530.00	20.00	73.00
Phenol	ug/l	6.00 U/	5.00 /U	19.00 U/	26.00 U/	5.00 /U	5.00 /U
Sulfate	mg/l	39.00	28.00	20.00	21.00	16.00	26.00
Nitrate + Nitrite Nitrogen	mg/l	6.94	6.30	0.03	0.02 /U	0.30	1.18

APPENDIX C
WINNEBAGO RECLAMATION LANDFILL ROUND 3 GROUNDWATER DATA
ANALYSIS TYPE: GW Indicators MATRIX: Ground Water

SAMPLE ID:		PP-G110-03	PP-G111-03	PP-G114-03	PP-G115-03	PP-G116-03	PP-G116A-03
SAMPLE DATE:		2/07/90	2/07/90	2/07/90	2/07/90	2/06/90	2/06/90
COMPOUNDS	UNIT						
Alkalinity	mg/l	714.00 /N	246.00 /N	929.00 /N	743.00 /N	291.00 /N	333.00 /N
Chloride	mg/l	379.00	22.00	176.00	178.00	7.00	39.00
Phenol	ug/l	13.00 U/	5.00 U/	6.00 U/	8.00 U/	5.00 U/	5.00 U/
Sulfate	mg/l	5.00	31.00	60.00	6.00	56.00	33.00
Nitrate + Nitrite Nitrogen	mg/l	0.04	11.60	0.04	0.11	4.39	8.09

APPENDIX C
WINNEBAGO RECLAMATION LANDFILL ROUND 3 GROUNDWATER DATA
ANALYSIS TYPE: GW Indicators MATRIX: Ground Water

SAMPLE ID:		PP-P1-03	PP-P3R-03	PP-P4R-03	PP-P4R-93	PP-P6-03
SAMPLE DATE:		2/08/90	2/07/90	2/07/90	2/07/90	2/08/90
COMPOUNDS	UNIT					
Alkalinity	mg/l	485.00 /N	522.00 /N	287.00 /N	288.00 /N	254.00 /N
Chloride	mg/l	65.00	72.00	25.00	24.00	16.00
Phenol	ug/l	5.00 U/	7.00 U/	12.00 U/	6.00 U/	5.00 /U
Sulfate	mg/l	38.00	39.00	32.00	32.00	36.00
Nitrate + Nitrite Nitrogen	mg/l	0.04	0.08	9.84	11.00	8.32

(1) Results are reported with qualifiers (Data Validation Qualifier/Laboratory Qualifier) to the right of the value.

APPENDIX C
WINNEBAGO RECLAMATION LANDFILL ROUND 3 GROUNDWATER DATA
ANALYSIS TYPE: Volatiles MATRIX: Ground Water

SAMPLE ID:		PP-B13-03	PP-B15P-03	PP-B15R-03	PP-B15R-93	PP-G109-03	PP-G109A-03
SAMPLE DATE:		2/08/90	2/06/90	2/07/90	2/07/90	2/08/90	2/08/90
COMPOUNDS	UNIT						
Vinyl Chloride	ug/l	11.00			1.00 J/J	6.00 /J	13.00
Chloroethane	ug/l			4.00 /J	4.00 J/J		
Methylene Chloride	ug/l			6.00 U/B			
Acetone	ug/l				24.00 U/B		
1,1-Dichloroethane	ug/l	15.00		15.00	14.00 J/	5.00	14.00
Total 1,2-Dichloroethene	ug/l	160.00	9.00	3.00 /J	3.00 /J	23.00	56.00
1,2-Dichloroethane	ug/l	2.00 /J					
2-Butanone	ug/l	10.00 R/U	10.00 R/U	10.00 R/U	10.00 R/U	10.00 R/U	10.00 R/U
1,1,1-Trichloroethane	ug/l	4.00 /J	2.00 /J				
1,2-Dichloropropane	ug/l	5.00				3.00 /J	3.00 /J
Trichloroethene	ug/l	28.00	3.00 /J	3.00 /J	2.00 /J	1.00 /J	19.00
Benzene	ug/l	1.00 /J		3.00 /J	2.00 J/J	0.50 /J	2.00 /J
Tetrachloroethene	ug/l	20.00	3.00 J/J	0.60 /J	0.50 J/J	3.00 /J	19.00
Chlorobenzene	ug/l	1.00 /J		2.00 /J	1.00 J/J	2.00 /J	1.00 /J
Ethylbenzene	ug/l			0.80 /J	0.70 J/J		
Total Xylenes	ug/l			1.00 /JX			

APPENDIX C
WINNEBAGO RECLAMATION LANDFILL ROUND 3 GROUNDWATER DATA
ANALYSIS TYPE: Volatiles MATRIX: Ground Water

SAMPLE ID:		PP-G110-03	PP-G111-03	PP-G114-03	PP-G115-03	PP-G116-03	PP-G116A-03
SAMPLE DATE:		2/07/90	2/07/90	2/07/90	2/07/90	2/06/90	2/06/90
COMPOUNDS	UNIT						
Vinyl Chloride	ug/l	2.00 /J					
Chloroethane	ug/l	37.00			13.00		
Methylene Chloride	ug/l						
Acetone	ug/l				37.00 U/B		
1,1-Dichloroethane	ug/l	19.00	5.00	11.00	24.00		3.00 /J
Total 1,2-Dichloroethene	ug/l	4.00 /J	41.00	3.00 /J	1.00 /J		8.00
1,2-Dichloroethane	ug/l	2.00 /J		3.00 /J			
2-Butanone	ug/l	10.00 R/U	10.00 R/U	10.00 R/U	10.00 R/U	10.00 R/U	10.00 R/U
1,1,1-Trichloroethane	ug/l		6.00				2.00 /J
1,2-Dichloropropane	ug/l	3.00 /J		8.00			
Trichloroethene	ug/l	2.00 /J	5.00				
Benzene	ug/l	17.00		2.00 /J	2.00 /J		
Tetrachloroethene	ug/l		13.00				4.00 /J
Chlorobenzene	ug/l	3.00 /J		8.00	1.00 /J		
Ethylbenzene	ug/l	9.00					
Total Xylenes	ug/l	13.00 /X					

APPENDIX C
WINNEBAGO RECLAMATION LANDFILL ROUND 3 GROUNDWATER DATA
ANALYSIS TYPE: Volatiles MATRIX: Ground Water

SAMPLE ID:		PP-P1-03	PP-P3R-03	PP-P4R-03	PP-P4R-93	PP-P6-03
SAMPLE DATE:		2/08/90	2/07/90	2/07/90	2/07/90	2/08/90
COMPOUNDS	UNIT					
Vinyl Chloride	ug/l	2.00 /J	1.00 /J			
Chloroethane	ug/l					
Methylene Chloride	ug/l					
Acetone	ug/l					
1,1-Dichloroethane	ug/l	10.00	8.00	3.00 /J	3.00 /J	3.00 /J
Total 1,2-Dichloroethene	ug/l	4.00 /J	5.00	20.00	22.00	30.00
1,2-Dichloroethane	ug/l					
2-Butanone	ug/l	10.00 R/U	10.00 R/U	10.00 R/U	10.00 R/U	10.00 R/U
1,1,1-Trichloroethane	ug/l			3.00 /J	4.00 /J	6.00
1,2-Dichloropropane	ug/l					
Trichloroethene	ug/l			3.00 /J	3.00 /J	8.00
Benzene	ug/l	0.80 /J	0.60 /J			
Tetrachloroethene	ug/l	1.00 /J		7.00	7.00	13.00
Chlorobenzene	ug/l					
Ethylbenzene	ug/l					
Total Xylenes	ug/l					

(1) Results are reported with qualifiers (Data Validation Qualifier/Laboratory Qualifier) to the right of the value.

APPENDIX C
WINNEBAGO RECLAMATION LANDFILL ROUND 3 GROUNDWATER DATA
ANALYSIS TYPE: Semi-Volatiles MATRIX: Ground Water

SAMPLE ID:		PP-B13-03	PP-B15P-03	PP-B15R-03	PP-B15R-93	PP-G109-03	PP-G109A-03
SAMPLE DATE:		2/08/90	2/06/90	2/07/90	2/07/90	2/08/90	2/08/90
COMPOUNDS	UNIT						
1,4-Dichlorobenzene	ug/l	5.00 /J		8.00 /J	8.00 /J		2.00 /J
1,2-Dichlorobenzene	ug/l						
Diethylphthalate	ug/l						
bis(2-Ethylhexyl)phthalate	ug/l						36.00
No Compounds Detected	ug/l		0.00			0.00	

APPENDIX C
WINNEBAGO RECLAMATION LANDFILL ROUND 5 LEACHATE DATA
ANALYSIS TYPE: Volatiles MATRIX: Leachate

SAMPLE ID:		PP-LLD1-05	PP-LLE3-05	PP-LLL2-05	PP-LLL2-95	PP-LLMHE-05	PP-LLMHW-05
SAMPLE DATE:		2/09/90	2/09/90	2/09/90	2/09/90	2/09/90	2/09/90
COMPOUNDS	UNIT						
Chloromethane	ug/l	15.00					
Vinyl Chloride	ug/l	31.00	270.00 /D	3.00 J/J	3.00 J/J	2.00 J/J	
Chloroethane	ug/l	9.00 J/J					
Methylene Chloride	ug/l	100.00 J/B	5.00 U/BJ	5.00 U/BJ		5.00 U/BJ	17.00 U/BJ
Acetone	ug/l	5100.00 U/BD	1100.00 U/BD	96.00 U/B	100.00 U/B	76.00 U/B	250.00 U/B
Carbon Disulfide	ug/l	1.00 J/J					
1,1-Dichloroethene	ug/l		1.00 J/J				
1,1-Dichloroethane	ug/l	55.00					
Total 1,2-Dichloroethene	ug/l	11.00	2100.00 /D	19.00	19.00	5.00	
2-Butanone	ug/l	7900.00 J/D	200.00 U/U	31.00 UJ/	32.00 UJ/	11.00 UJ/	31.00 UJ/J
1,2-Dichloropropane	ug/l	3.00 J/J	34.00				
Trichloroethene	ug/l	1.00 J/J	29.00				
Benzene	ug/l	4.00 J/J	3.00 J/J	3.00 J/J	3.00 J/J	2.00 J/J	3.00 J/J
4-Methyl-2-Pentanone	ug/l	1000.00 U/U					43.00 J/
2-Hexanone	ug/l	39.00 J/X					
Tetrachloroethene	ug/l	0.70 J/J					
Toluene	ug/l	380.00 J/DJ	99.00 /B	190.00 /B	190.00 /B	25.00 /B	100.00 /B
Chlorobenzene	ug/l	2.00 J/J	4.00 J/J			3.00 J/J	
Ethylbenzene	ug/l	49.00	59.00	29.00	29.00	5.00	49.00
Styrene	ug/l	7.00	7.00	4.00 J/J	4.00 J/J		
Total Xylenes	ug/l	170.00 /X	180.00 /X	70.00 /X	69.00 /X	98.00 /X	160.00 /X

APPENDIX C
WINNEBAGO RECLAMATION LANDFILL ROUND 5 LEACHATE DATA
ANALYSIS TYPE: Volatiles MATRIX: Leachate

SAMPLE ID: PP-LLN8-05
SAMPLE DATE: 2/09/90

COMPOUNDS	UNIT	
Chloromethane	ug/l	
Vinyl Chloride	ug/l	
Chloroethane	ug/l	
Methylene Chloride	ug/l	25.00 U/BJ
Acetone	ug/l	500.00 U/B
Carbon Disulfide	ug/l	
1,1-Dichloroethene	ug/l	
1,1-Dichloroethane	ug/l	
Total 1,2-Dichloroethene	ug/l	
2-Butanone	ug/l	88.00 UJ/
1,2-Dichloropropane	ug/l	
Trichloroethene	ug/l	
Benzene	ug/l	
4-Methyl-2-Pentanone	ug/l	
2-Hexanone	ug/l	
Tetrachloroethene	ug/l	
Toluene	ug/l	120.00 /B
Chlorobenzene	ug/l	
Ethylbenzene	ug/l	38.00
Styrene	ug/l	
Total Xylenes	ug/l	110.00 /X

(1) Results are reported with qualifiers (Data Validation Qualifier/Laboratory Qualifier) to the right of the value.

APPENDIX C
WINNEBAGO RECLAMATION LANDFILL ROUND 5 LEACHATE DATA
ANALYSIS TYPE: Semi-Volatiles MATRIX: Leachate

SAMPLE ID:		PP-LLD1-05	PP-LLE3-05	PP-LLL2-05	PP-LLL2-95	PP-LLMHE-05	PP-LLMHW-05
SAMPLE DATE:		2/09/90	2/09/90	2/09/90	2/09/90	2/09/90	2/09/90
COMPOUNDS	UNIT						
Phenol	ug/l	140.00					
1,3-Dichlorobenzene	ug/l	19.00					
1,4-Dichlorobenzene	ug/l			27.00	27.00		22.00
2-Methylphenol	ug/l				140.00		39.00
4-Methylphenol	ug/l			55.00	200.00		
2,4-Dimethylphenol	ug/l		94.00	67.00	310.00	33.00	33.00
Benzoic acid	ug/l	1200.00 /D					
Naphthalene	ug/l	19.00	18.00	15.00	17.00	6.00 J/J	50.00
2-Methylnaphthalene	ug/l						23.00
Dibenzofuran	ug/l						11.00
Fluorene	ug/l						17.00
Phenanthrene	ug/l					10.00	53.00
Anthracene	ug/l					2.00 J/J	
Fluoranthene	ug/l					12.00	22.00
Pyrene	ug/l					9.00 J/J	
bis(2-Ethylhexyl)phthalate	ug/l	170.00	120.00	80.00	94.00	720.00 J/E	1200.00 /D
Di-n-octylphthalate	ug/l			13.00		72.00	170.00

APPENDIX C
WINNEBAGO RECLAMATION LANDFILL ROUND 5 LEACHATE DATA
ANALYSIS TYPE: Semi-Volatiles MATRIX: Leachate

SAMPLE ID: PP-LLN8-05
SAMPLE DATE: 2/09/90

COMPOUNDS	UNIT	
Phenol	ug/l	
1,3-Dichlorobenzene	ug/l	
1,4-Dichlorobenzene	ug/l	
2-Methylphenol	ug/l	
4-Methylphenol	ug/l	30.00
2,4-Dimethylphenol	ug/l	35.00
Benzoic acid	ug/l	
Naphthalene	ug/l	41.00
2-Methylnaphthalene	ug/l	8.00 J/J
Dibenzofuran	ug/l	
Fluorene	ug/l	
Phenanthrene	ug/l	6.00 J/J
Anthracene	ug/l	
Fluoranthene	ug/l	
Pyrene	ug/l	
bis(2-Ethylhexyl)phthalate	ug/l	97.00
Di-n-octylphthalate	ug/l	23.00

(1) Results are reported with qualifiers (Data Validation Qualifier/Laboratory Qualifier) to the right of the value.

APPENDIX C
WINNEBAGO RECLAMATION LANDFILL ROUND 5 LEACHATE DATA
ANALYSIS TYPE: Pesticides/PCBs MATRIX: Leachate

SAMPLE ID:		PP-LHMHW-05	PP-LLD1-05	PP-LLE3-05	PP-LLL2-05	PP-LLL2-95	PP-LLMHE-05
SAMPLE DATE:		2/09/90	2/09/90	2/09/90	2/09/90	2/09/90	2/09/90
COMPOUNDS	UNIT						
Alpha-BHC	ug/l	0.05 UJ/U	0.05 UJ/U	0.05 UJ/U	0.05 UJ/U	0.05 UJ/U	
Beta-BHC	ug/l		0.05 UJ/	0.05 UJ/U	0.05 UJ/U	0.05 UJ/U	
Delta-BHC	ug/l		0.05 UJ/U	0.05 UJ/U	0.05 UJ/U	0.05 UJ/U	
Gamma-BHC (Lindane)	ug/l	0.05 UJ/U	0.05 UJ/U	0.05 UJ/U	0.05 UJ/U	0.05 UJ/U	
Heptachlor	ug/l	0.05 UJ/U	0.05 UJ/U	0.05 UJ/U	0.05 UJ/U	0.05 UJ/U	
Aldrin	ug/l		0.08 J/	0.05 UJ/U	0.05 UJ/U	0.05 UJ/U	
Heptachlor Epoxide	ug/l	0.05 UJ/U	0.16 J/	0.05 UJ/U	0.05 UJ/U	0.05 UJ/U	
Endosulfan 1	ug/l	0.05 UJ/U	0.05 UJ/U	0.05 UJ/U	0.05 UJ/U	0.05 UJ/U	
Dieldrin	ug/l	0.10 UJ/U	0.10 UJ/U	0.05 UJ/U	0.10 UJ/U	0.10 UJ/U	
4,4-DDE	ug/l	0.10 UJ/U	0.10 UJ/U	0.10 UJ/U	0.10 UJ/U	0.10 UJ/U	
Endrin	ug/l	0.10 UJ/U	0.10 UJ/U	0.10 UJ/U	0.10 UJ/U	0.10 UJ/U	0.13
Endosulfan 11	ug/l	0.10 UJ/U	0.10 UJ/U	0.10 UJ/U	0.10 UJ/U	0.10 UJ/U	
4,4-DDD	ug/l	0.10 UJ/U	0.10 UJ/U	0.10 UJ/U	0.10 UJ/U	0.10 UJ/U	
Endosulfan Sulfate	ug/l	0.10 UJ/U	0.12 J/	0.10 UJ/U	0.10 UJ/U	0.10 UJ/U	0.38
4,4-DDT	ug/l	0.10 UJ/U	0.10 UJ/U	0.10 UJ/U	0.10 UJ/U	0.10 UJ/U	
Methoxychlor	ug/l	0.51 UJ/U	0.50 UJ/U	0.50 UJ/U	0.50 UJ/U	0.50 UJ/U	
Endrin Ketone	ug/l	0.10 UJ/U	0.10 UJ/U	0.10 UJ/U	0.10 UJ/U	0.10 UJ/U	
Alpha-Chlordane	ug/l	0.05 UJ/U	0.05 UJ/U	0.05 UJ/U	0.05 UJ/U	0.05 UJ/U	
Gamma-Chlordane	ug/l	0.05 UJ/U	0.06 J/	0.05 UJ/U	0.05 UJ/U	0.05 UJ/U	0.09 J/
Toxaphene	ug/l	1.00 UJ/U	1.00 UJ/U	1.00 UJ/U	1.00 UJ/U	1.00 UJ/U	
AROCLOR-1016	ug/l	0.51 UJ/U	0.50 UJ/U	0.50 UJ/U	0.50 UJ/U	0.50 UJ/U	
AROCLOR-1221	ug/l	0.51 UJ/U	0.50 UJ/U	0.50 UJ/U	0.50 UJ/U	0.50 UJ/U	
AROCLOR-1232	ug/l	0.51 UJ/U	0.50 UJ/U	0.50 UJ/U	0.50 UJ/U	0.50 UJ/U	
AROCLOR-1242	ug/l		0.50 UJ/U	0.50 UJ/U	3.70 J/	3.00 J/	2.70
AROCLOR-1248	ug/l	0.51 UJ/U	7.20 J/	0.50 UJ/U	0.50 UJ/U	0.50 UJ/U	
AROCLOR-1254	ug/l		1.90 J/	1.00 UJ/U	1.00 UJ/U	1.00 UJ/U	3.80
AROCLOR-1260	ug/l	1.00 UJ/U	1.00 UJ/U	1.00 UJ/U	1.80 J/	1.00 UJ/U	

APPENDIX C
WINNEBAGO RECLAMATION LANDFILL ROUND 5 LEACHATE DATA
ANALYSIS TYPE: Pesticides/PCBs MATRIX: Leachate

SAMPLE ID:		PP-LLMHW-05	PP-LLN8-05
SAMPLE DATE:		2/09/90	2/09/90
COMPOUNDS	UNIT		
Alpha-BHC	ug/l		0.05
Beta-BHC	ug/l	0.11 J/	0.06
Delta-BHC	ug/l	0.05 J/	
Gamma-BHC (Lindane)	ug/l		0.08
Heptachlor	ug/l		
Aldrin	ug/l	0.72 J/	
Heptachlor Epoxide	ug/l		
Endosulfan 1	ug/l		
Dieldrin	ug/l		
4,4-DDE	ug/l		
Endrin	ug/l		
Endosulfan 11	ug/l		
4,4-DDD	ug/l		
Endosulfan Sulfate	ug/l		
4,4-DDT	ug/l		
Methoxychlor	ug/l		
Endrin Ketone	ug/l		
Alpha-Chlordane	ug/l		
Gamma-Chlordane	ug/l		
Toxaphene	ug/l		
AROCLOR-1016	ug/l		
AROCLOR-1221	ug/l		
AROCLOR-1232	ug/l		
AROCLOR-1242	ug/l	3.50 J/	3.20
AROCLOR-1248	ug/l		
AROCLOR-1254	ug/l	1.80 J/	
AROCLOR-1260	ug/l		1.50

(1) Results are reported with qualifiers (Data Validation Qualifier/Laboratory Qualifier) to the right of the value.

APPENDIX C
WINNEBAGO RECLAMATION LANDFILL ROUND 5 LEACHATE DATA
ANALYSIS TYPE: Metals MATRIX: Leachate

SAMPLE ID:		PP-LLD1-05		PP-LLE3-05		PP-LLL2-05		PP-LLL2-95		PP-LLMHE-05		PP-LLMHW-05	
SAMPLE DATE:		2/09/90		2/09/90		2/09/90		2/09/90		2/09/90		2/09/90	
COMPOUNDS	UNIT												
Aluminum	ug/l	6840.00	J/N*	590.00	J/N*	320.00	J/N*	370.00	J/N*	123000.00	J/N*	7530.00	J/N*
Antimony	ug/l	25.00	/UNS	25.00	/UNS	25.00	/UNS	25.00	/UNS	47.20	J/KNS	25.00	/UNS
Arsenic	ug/l	45.70	J/NS*	35.60	J/NS*	30.00	J/NS*	45.50	J/NS*	318.00	J/NS*	62.50	J/NS*
Barium	ug/l	1340.00		442.00		412.00		448.00		3070.00	/S	595.00	
Beryllium	ug/l	0.20	/UNS	0.20	/UNS	0.20	/UN	0.20	/UN	7.70	J/NS	0.20	/UNS
Cadmium	ug/l	33.20		8.30	/S	2.60	/K	2.70	/K	87.00		14.80	
Calcium	ug/l	120000.00		33800.00		43300.00		43600.00		212000.00		139000.00	J/
Chromium, Total	ug/l	143.00		933.00		258.00		271.00		639.00		375.00	
Cobalt	ug/l	81.00		146.00		104.00		106.00		154.00		97.00	
Copper	ug/l	61.00		85.00		253.00		253.00		1390.00		328.00	
Iron	ug/l	24800.00		5730.00		7030.00		7280.00		263000.00		167000.00	
Lead	ug/l	300.00	J/*	72.50	J/*	93.00	J/*	59.50	J/S*	1450.00	J/S*	490.00	J/*
Magnesium	ug/l	246000.00	J/N	32500.00	J/N	76800.00	J/N	72200.00	J/N	86500.00	J/N	30800.00	J/N
Manganese	ug/l	445.00	J/N	39.00	J/N	44.00	J/N	45.00	J/N	4110.00	J/N	619.00	J/N
Mercury	ug/l	5.90	/N	0.50	U/N	0.53	U/N	0.49	U/N	3.40	/N	5.30	/N
Nickel	ug/l	636.00	/N	875.00	/N	867.00	/N	874.00	/N	821.00	/N	846.00	/N
Potassium	ug/l	1080000.00		1350000.00		751000.00		758000.00		637000.00		954000.00	
Selenium	ug/l	12.00	J/KNS	10.00	UJ/UNS	10.00	UJ/UNS	10.00	UJ/UNS	11.10	J/NS	10.00	UJ/UNS
Silver	ug/l	10.00	/U	10.00	/U	10.00	/U	10.00	/U	12.00		10.00	/U
Sodium	ug/l	3100000.00		1330000.00		1550000.00		1520000.00		1110000.00		1550000.00	
Thallium	ug/l	25.00	/UNS	25.00	/UNS	25.00	/UNS	25.00	/UNS	45.40	J/NS	25.00	/UNS
Vanadium	ug/l	13.50	/K	42.60	/KS	35.30	/K	32.80	/K	303.00		74.50	
Zinc	ug/l	8720.00		539.00		191.00		193.00		15400.00		7540.00	
Cyanide, Total	ug/l	160.00	J/N*	254.00	J/N*	265.00	J/N*	176.00	J/N*	70.00	J/N*	389.00	J/N*
Chromium, Hexavalent	ug/l	5000.00	/U	5000.00	/U	5000.00	/U	5000.00	/U	5000.00	/U	5000.00	/U

APPENDIX C
WINNEBAGO RECLAMATION LANDFILL ROUND 5 LEACHATE DATA
ANALYSIS TYPE: Metals MATRIX: Leachate

SAMPLE ID: PP-LLN8-05
SAMPLE DATE: 2/09/90

COMPOUNDS	UNIT		
Aluminum	ug/l	4900.00	J/N*
Antimony	ug/l	25.00	/UNS
Arsenic	ug/l	125.00	J/NS*
Barium	ug/l	205.00	
Beryllium	ug/l	0.26	J/KN
Cadmium	ug/l	10.90	
Calcium	ug/l	82200.00	
Chromium, Total	ug/l	348.00	
Cobalt	ug/l	96.00	
Copper	ug/l	149.00	
Iron	ug/l	14900.00	
Lead	ug/l	99.10	J/S*
Magnesium	ug/l	78900.00	J/N
Manganese	ug/l	267.00	J/N
Mercury	ug/l	1.60	/N
Nickel	ug/l	1130.00	/N
Potassium	ug/l	762000.00	
Selenium	ug/l	10.00	UJ/UNS
Silver	ug/l	10.00	/U
Sodium	ug/l	1350000.00	
Thallium	ug/l	25.00	/UNS
Vanadium	ug/l	50.40	
Zinc	ug/l	1010.00	
Cyanide, Total	ug/l	328.00	J/N*
Chromium, Hexavalent	ug/l	5000.00	/U

(1) Results are reported with qualifiers (Data Validation Qualifier/Laboratory Qualifier) to the right of the value.

PROJECT NAME: WINNEBAGO RECLAMATION LANDFILL
PROJECT NUMBER: 13160.00

MATRIX: Leachate

SAMPLE ID	ANAL. TYPE	COMPOUND	CONC.	UNITS	DVQ	LQ
PP-LLD1-05						
	TBNA	Unknown	130.000	ug/l	JN	J
	TBNA	Undecane	280.000	ug/l	JN	J
	TBNA	2-Propanol, 1-[2-(2-Methoxy-1-Methylethoxy)-1-Methylethoxy]	1000.000	ug/l	JN	J
	TBNA	Cis-Terpin Hydrate	270.000	ug/l	JN	J
	TBNA	Pentanoic acid, 4-methyl-	35.000	ug/l	JN	J
	TBNA	Benzeneacetic acid	590.000	ug/l	JN	J
	TBNA	Benzenepropanoic acid	490.000	ug/l	JN	J
	TBNA	Benzenepropanoic acid	130.000	ug/l	JN	J
	TBNA	Bicyclo[3.1.1]heptan-2-one,	890.000	ug/l	JN	J
	TBNA	Bicyclo[2.2.1]heptan-2-one,	720.000	ug/l	JN	J
	TBNA	3-Cyclohexene-1-methanol, .a...	1000.000	ug/l	JN	J
	TBNA	Bicyclo[2.2.1]heptane, 2,5-di...	270.000	ug/l	JN	J
	TBNA	Propanedioic acid, dimethyl-	26.000	ug/l	JN	J
	TBNA	Cyclohexanol, 1,1'-dioxybis-	49.000	ug/l	JN	J
	TBNA	Butanoic acid	86.000	ug/l	JN	J
	TBNA	Butanoic acid, 2-methyl-	48.000	ug/l	JN	J
	TBNA	Hexanoic acid, (DOT)	94.000	ug/l	JN	J
	TBNA	2-Pyrrolidininone, 1-methyl-	71.000	ug/l	JN	J
	TBNA	2-Propanol, 1-[2-2(2-methoxy-...	270.000	ug/l	JN	J
	TBNA	Benzeneacetic acid, .alpha.-	140.000	ug/l	JN	J
	TVOA	Unknown	14.000	ug/l	JN	J
	TVOA	Silanol, trimethyl	68.000	ug/l	JN	J
	TVOA	Furan, tetrahydro-	200.000	ug/l	JN	J
	TVOA	3-Pentanone, 2,4-dimethyl-	20.000	ug/l	JN	J
	TVOA	Cineole (van)	43.000	ug/l	JN	J
	TVOA	Bicyclo[2.2.1]heptan-2-one, 1,7,7-trimethyl-,(+-)-	82.000	ug/l	JN	J
	TVOA	4-Carene, (1S,3R,6R)-(-)-	40.000	ug/l	JN	J
	TVOA	1,6-Octadien-3-ol, 3,7-dimet...	28.000	ug/l	JN	J
	TVOA	2-Butanol	47.000	ug/l	JN	J
	TVOA	2-Pentanone	54.000	ug/l	JN	JX
PP-LLE3-05						
	TBNA	Unknown	130.000	ug/l	JN	J
	TBNA	Unknown	180.000	ug/l	JN	J
	TBNA	Unknown	140.000	ug/l	JN	J

PROJECT NAME: WINNEBAGO RECLAMATION LANDFILL
PROJECT NUMBER: 13160.00

MATRIX: Leachate

SAMPLE ID	ANAL. TYPE	COMPOUND	CONC.	UNITS	DVQ	LQ
	TBNA	Unknown	130.000	ug/l	JN	J
	TBNA	Unknown	200.000	ug/l	JN	J
	TBNA	Unknown	180.000	ug/l	JN	J
	TBNA	Unknown	160.000	ug/l	JN	J
	TBNA	Tetracontane, 3,5,24-trimethyl-	250.000	ug/l	JN	J
	TBNA	Benzamide, n,n-diethyl-3-methyl-	250.000	ug/l	JN	J
	TBNA	Bicyclo[2.2.1]heptan-2-one,	310.000	ug/l	JN	J
	TBNA	Bicyclo[2.2.1]heptan-2-one,	120.000	ug/l	JN	J
	TBNA	Phenol, 2-(1-methylethyl)-	380.000	ug/l	JN	J
	TBNA	Benzenemethanol, .alpha.,.al...	180.000	ug/l	JN	J
	TBNA	Phenol, 3-propyl-	200.000	ug/l	JN	J
	TBNA	.Alpha.-santalol	390.000	ug/l	JN	J
	TBNA	Decane, 4-methyl-	170.000	ug/l	JN	J
	TBNA	6-Octen-1-ol, 3,7-dimethyl-	150.000	ug/l	JN	J
	TBNA	4-Nonenal, (E)-	160.000	ug/l	JN	J
	TBNA	Undecane, 5-ethyl-	140.000	ug/l	JN	J
	TBNA	Oxirane, tetradecyl-	460.000	ug/l	JN	J
	TVOA	Unknown	23.000	ug/l	JN	J
	TVOA	Silanol, trimethyl	65.000	ug/l	JN	J
	TVOA	Furan, tetrahydro-	36.000	ug/l	JN	J
	TVOA	3-Pentanone, 2,4-dimethyl-	26.000	ug/l	JN	J
	TVOA	2-Hexanone, 5-methyl-	30.000	ug/l	JN	J
	TVOA	Bicyclo[2.2.1]heptan-2-one, 1,7,7-trimethyl-,(+-)-	64.000	ug/l	JN	J
	TVOA	Ethyl ether	32.000	ug/l	JN	J
	TVOA	2-Pentanone, 3-methyl-	16.000	ug/l	JN	J
	TVOA	1,1'-Bicyclopentyl	18.000	ug/l	JN	J
	TVOA	1,6-Octadien-3-ol, 3,7-dimet...	17.000	ug/l	JN	J
PP-LLL2-05						
	TBNA	Unknown	190.000	ug/l	JN	J
	TBNA	Unknown	320.000	ug/l	JN	J
	TBNA	Unknown	260.000	ug/l	JN	J
	TBNA	Unknown	200.000	ug/l	JN	J
	TBNA	Unknown	140.000	ug/l	JN	J
	TBNA	Benzoic acid, 4-methyl-	830.000	ug/l	JN	J
	TBNA	Benzene, (1-nitropropyl)-	460.000	ug/l	JN	J
	TBNA	2(3H)-Benzothiazolone	240.000	ug/l	JN	J
	TBNA	Bicyclo[2.2.1]heptan-2-one,	110.000	ug/l	JN	J

PROJECT NAME: WINNEBAGO RECLAMATION LANDFILL
PROJECT NUMBER: 13160.00

MATRIX: Leachate

SAMPLE ID	ANAL. TYPE	COMPOUND	CONC.	UNITS	DVQ	LQ
	TBNA	3-Pentanol, 2,3,4-trimethyl-	240.000	ug/l	JN	J
	TBNA	Hexanoic acid, 3,5,5-trimethyl-	160.000	ug/l	JN	J
	TBNA	Benzoic acid, 3-methyl-	660.000	ug/l	JN	J
	TBNA	Butanoic acid, 2-methylcyclo...	250.000	ug/l	JN	J
	TBNA	Benzenebutanoic acid, 2,5-di...	210.000	ug/l	JN	J
	TBNA	1,4-Dioxane, 2-ethyl-5-methyl-	440.000	ug/l	JN	J
	TBNA	13-Tetradecynoic acid, methy...	250.000	ug/l	JN	J
	TBNA	Cyclohexane, [2-[(2-ethylhex...	450.000	ug/l	JN	J
	TBNA	4-Octadecenal	270.000	ug/l	JN	J
	TBNA	Ethanone, 1-(1-cyclohexen-1-...	560.000	ug/l	JN	J
	TBNA	1(2H)-Naphthalenone, octahyd...	220.000	ug/l	JN	J
	TVOA	Silanol, trimethyl	22.000	ug/l	JN	J
	TVOA	Furan, tetrahydro-	47.000	ug/l	JN	J
	TVOA	2-Butanone, 3-methyl-	13.000	ug/l	JN	J
	TVOA	3-Pentanone, 2,4-dimethyl-	19.000	ug/l	JN	J
	TVOA	2-Hexanone, 5-methyl-	9.800	ug/l	JN	J
	TVOA	Bicyclo[2.2.1]heptan-2-one, 1,7,7-trimethyl-,(+-)-	21.000	ug/l	JN	J
	TVOA	Bicyclo[2.2.1]heptan-2-one, 1,7,7-trimethyl-,(+-)-	47.000	ug/l	JN	J
	TVOA	3-Carene	10.000	ug/l	JN	J
	TVOA	1,3-Oxathiolane	18.000	ug/l	JN	J
	TVOA	2-Pentanone, 3-methyl-	46.000	ug/l	JN	J
PP-LLL2-95						
	TBNA	Unknown	570.000	ug/l	JN	J
	TBNA	Unknown	190.000	ug/l	JN	J
	TBNA	Unknown	720.000	ug/l	JN	J
	TBNA	Unknown	660.000	ug/l	JN	J
	TBNA	Benzoic acid, 4-methyl-	850.000	ug/l	JN	J
	TBNA	2(3H)-Benzothiazolone	390.000	ug/l	JN	J
	TBNA	Benzoic acid, 3,4-dimethyl-	220.000	ug/l	JN	J
	TBNA	Bicyclo[2.2.1]heptan-2-one,	470.000	ug/l	JN	J
	TBNA	3-Cyclohexene-1-methanol, .a...	690.000	ug/l	JN	J
	TBNA	Cyclohexanol, 3,3,5-trimethyl-	240.000	ug/l	JN	J

PROJECT NAME: WINNEBAGO RECLAMATION LANDFILL
PROJECT NUMBER: 13160.00

MATRIX: Leachate

SAMPLE ID	ANAL. TYPE	COMPOUND	CONC.	UNITS	DVQ	LQ
	TBNA	Hexanoic acid, 3,5,5-trimethyl-	1300.000	ug/l	JN	J
	TBNA	Butanoic acid, 2-ethyl-,1,2...	690.000	ug/l	JN	J
	TBNA	Butanoic acid, 3,3-dimethyl-	400.000	ug/l	JN	J
	TBNA	2,7-Nonadien-5-one, 4,6-dime...	1800.000	ug/l	JN	J
	TBNA	Hexane, 2-(hexyloxy)-5-methy...	540.000	ug/l	JN	J
	TBNA	.beta.-d-glucopyranoside, me...	1100.000	ug/l	JN	J
	TBNA	Cyclohexanol, 4-(1-methyleth...	500.000	ug/l	JN	J
	TBNA	4-Heptanol, 3,4-dimethyl-	570.000	ug/l	JN	J
	TBNA	14-Pentadecynoic acid, methy...	180.000	ug/l	JN	J
	TBNA	3-Benzofurancarboxylic acid,...	230.000	ug/l	JN	J
	TVOA	Silanol, trimethyl	25.000	ug/l	JN	JX
	TVOA	Furan, tetrahydro-	49.000	ug/l	JN	J
	TVOA	2-Butanone, 3-methyl-	14.000	ug/l	JN	J
	TVOA	3-Pentanone, 2,4-dimethyl-	25.000	ug/l	JN	JX
	TVOA	Cineole (van)	11.000	ug/l	JN	J
	TVOA	Bicyclo[2.2.1]heptan-2-one, 1,7,7-trimethyl-,(+-)-	49.000	ug/l	JN	J
	TVOA	Bicyclo[2.2.1]heptan-2-one, 1,7,7-trimethyl-,(+-)-	21.000	ug/l	JN	J
	TVOA	3-Carene	17.000	ug/l	JN	J
	TVOA	1,3-Oxathiolane	19.000	ug/l	JN	J
	TVOA	2-Pentanone, 3-methyl-	47.000	ug/l	JN	J
PP-LLMHE-05						
	TBNA	Heptadecane	100.000	ug/l	JN	J
	TBNA	Undecane	240.000	ug/l	JN	J
	TBNA	Decane	140.000	ug/l	JN	J
	TBNA	1,2-Benzenedicarboxylic Acid	190.000	ug/l	JN	J
	TBNA	Pentatriacontane	150.000	ug/l	JN	J
	TBNA	Iron, tricarbonyl[N-(phenyl-...	170.000	ug/l	JN	J
	TBNA	Octacosane	140.000	ug/l	JN	J
	TBNA	Octane, 2,3,6-trimethyl-	210.000	ug/l	JN	J
	TBNA	Eicosane, 10-methyl-	170.000	ug/l	JN	J
	TBNA	Eicosane, 10-methyl-	150.000	ug/l	JN	J
	TBNA	Heptadecane, 2,6-dimethyl-	150.000	ug/l	JN	J

PROJECT NAME: WINNEBAGO RECLAMATION LANDFILL
PROJECT NUMBER: 13160.00

MATRIX: Leachate

SAMPLE ID	ANAL. TYPE	COMPOUND	CONC.	UNITS	DVQ	LQ
	TBNA	Heptadecane, 2,6-dimethyl-	130.000	ug/l	JN	J
	TBNA	Heptadecane, 2,6-dimethyl-	170.000	ug/l	JN	J
	TBNA	Heptadecane, 2,6-dimethyl-	160.000	ug/l	JN	J
	TBNA	Cyclopentasiloxane, decameth...	240.000	ug/l	JN	J
	TBNA	Hexadecane, 7-methyl-	110.000	ug/l	JN	J
	TBNA	Heptadecane, 2-methyl-	100.000	ug/l	JN	J
	TBNA	4-Hexenoic acid, 3-methyl-2,...	150.000	ug/l	JN	J
	TBNA	Cholestane, 4,5-epoxy-, (4.A...	160.000	ug/l	JN	J
	TBNA	Cholestan-3-one, 4,4-dimethy...	160.000	ug/l	JN	J
	TVOA	Silanol, trimethyl	19.000	ug/l	JN	JX
	TVOA	Furan, tetrahydro-	18.000	ug/l	JN	J
	TVOA	3-Pentanone, 2,4-dimethyl-	17.000	ug/l	JN	JX
	TVOA	2-Hexanone, 5-methyl-	6.800	ug/l	JN	J
	TVOA	Cineole (van)	7.600	ug/l	JN	J
	TVOA	Bicyclo[2.2.1]heptan-2-one, 1,7,7-trimethyl-,(+-)-	12.000	ug/l	JN	J
	TVOA	Ethyl ether	8.700	ug/l	JN	J
	TVOA	2-Pentanone, 3-methyl-	8.900	ug/l	JN	J
	TVOA	Camphor (ACN)	19.000	ug/l	JN	J
PP-LLMHW-05						
	TBNA	Unknown	710.000	ug/l	JN	J
	TBNA	Unknown	540.000	ug/l	JN	J
	TBNA	Docosane	600.000	ug/l	JN	J
	TBNA	Dodecane, 2,7,10-Trimethyl-	570.000	ug/l	JN	J
	TBNA	1,2-Benzenedicarboxylic Acid	740.000	ug/l	JN	J
	TBNA	Octacosane	720.000	ug/l	JN	J
	TBNA	Octacosane	610.000	ug/l	JN	J
	TBNA	Sulfur, Mol. (S8)	1700.000	ug/l	JN	J
	TBNA	1-Decanol, 2-ethyl-	480.000	ug/l	JN	J
	TBNA	6,10,14-Hexadecatrien-1-ol	460.000	ug/l	JN	J
	TBNA	Bicyclo[2.2.1]heptan-2-one,	590.000	ug/l	JN	J
	TBNA	1,6-Octadien-3-ol, 3,7-dimethyl...	570.000	ug/l	JN	J
	TBNA	3-Cyclohexene-1-methanol, .a...	540.000	ug/l	JN	J
	TBNA	Decane, 2,5,6-trimethyl-	650.000	ug/l	JN	J
	TBNA	3-Heptene, 7-ethoxy-	500.000	ug/l	JN	J
	TBNA	Cyclohexanol, 3,3,5-trimethyl-	700.000	ug/l	JN	J

PROJECT NAME: WINNEBAGO RECLAMATION LANDFILL
PROJECT NUMBER: 13160.00

MATRIX: Leachate

SAMPLE ID	ANAL. TYPE	COMPOUND	CONC.	UNITS	DVQ	LQ
	TBNA	Octadecane, 3-methyl-	470.000	ug/l	JN	J
	TBNA	Hexadecane, 3-methyl-	480.000	ug/l	JN	J
	TBNA	Silane, trichlorooctadecyl-	470.000	ug/l	JN	J
	TBNA	Decane, 3-bromo-	670.000	ug/l	JN	J
	TVOA	Furan, tetrahydro-	50.000	ug/l	JN	J
	TVOA	4-Carene, (1S,3R,6R)-(-)-	65.000	ug/l	JN	J
	TVOA	Bicyclo[3.1.1]heptane, 6,6-d...	49.000	ug/l	JN	J
PP-LLN8-05						
	TBNA	Unknown	190.000	ug/l	JN	J
	TBNA	Unknown	100.000	ug/l	JN	J
	TBNA	Unknown	150.000	ug/l	JN	J
	TBNA	Sulfur, Mol. (S8)	160.000	ug/l	JN	J
	TBNA	Dodecane, 3-methyl-	160.000	ug/l	JN	J
	TBNA	Cyclohexanone, 3,3,5-trimethyl-	93.000	ug/l	JN	J
	TBNA	Cis-Terpin Hydrate	120.000	ug/l	JN	J
	TBNA	Benzoic acid, 4-methyl-	170.000	ug/l	JN	J
	TBNA	Bicyclo[3.1.1]heptan-2-one,	95.000	ug/l	JN	J
	TBNA	Bicyclo[2.2.1]heptan-2-one,	170.000	ug/l	JN	J
	TBNA	3-Cyclohexene-1-methanol, .a...	360.000	ug/l	JN	J
	TBNA	1-Heptanol, 2-propyl-	180.000	ug/l	JN	J
	TBNA	Phenol, 3-(1-methylethyl)-	76.000	ug/l	JN	J
	TBNA	Bicyclo[2.2.1]heptane, 2,5-di...	77.000	ug/l	JN	J
	TBNA	Cyclohexane, (1,1-dimethylpr...	80.000	ug/l	JN	J
	TBNA	Bycyclo[3.1.1]heptane-2-carb.. .	100.000	ug/l	JN	J
	TBNA	Benzene, 2-methoxy-1,3,4-tri...	77.000	ug/l	JN	J
	TBNA	3-Heptyne, 5,5-diethyl-...	130.000	ug/l	JN	J
	TBNA	Methanone, [4-(1,1-dimethyle...	100.000	ug/l	JN	J
	TBNA	Nonadecane, 2,3-dimethyl-	87.000	ug/l	JN	J
	TVOA	Silanol, trimethyl	35.000	ug/l	JN	J
	TVOA	Furan, tetrahydro-	43.000	ug/l	JN	J
	TVOA	2,3-Hexanedione	27.000	ug/l	JN	JX

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RESULTS FOR BLANKS

APPENDIX C
WINNEBAGO RECLAMATION LANDFILL BLANK DATA SUMMARY
ANALYSIS TYPE: GW Indicators MATRIX: Blank

SAMPLE ID:		PP-FB01-01	PP-FB01-03	PP-FB01-04	PP-FB02-01	PP-FB02-03	PP-FB02-04
SAMPLE DATE:		4/05/88	2/06/90	4/23/90	4/06/88	2/08/90	4/25/90
COMPOUNDS	UNIT						
Alkalinity	mg/l	6.00	5.00 /UN	10.00	8.00	5.00 /UN	5.00 /U
Chloride	mg/l		1.00 /U	1.00 /U		1.00 /U	1.00
Phenol	ug/l		6.00	10.00	7.00	5.00 /U	6.00
Sulfate	mg/l		5.00 /U	5.00 /U		5.00 /U	5.00 /U
Nitrate + Nitrite Nitrogen	mg/l		0.02 /U			0.02 /U	
Field pH	s.u.						
Field Conductivity	umho/cm						

APPENDIX C
WINNEBAGO RECLAMATION LANDFILL BLANK DATA SUMMARY
ANALYSIS TYPE: GW Indicators MATRIX: Blank

SAMPLE ID:		PP-FB03-01	PP-FB03-02	PP-FB04-01	PP-FB04-05	PP-LLFB01-01	PP-LLSB04-02
SAMPLE DATE:		4/07/88	2/08/90	4/08/88	2/09/90	4/08/88	6/16/88
COMPOUNDS	UNIT						
Alkalinity	mg/l	5.00 /U	5.00 /UW	5.00 /U	5.00 /U	5.00 /U	
Chloride	mg/l	1.00 /U	1.00 /U	1.00 /U	1.00 /U	1.00 /U	
Phenol	ug/l	5.00 /U	5.00 /U	5.00 /U	5.00 /U	5.00 /U	12.00
Sulfate	mg/l				5.00 /UW		
Nitrate + Nitrite Nitrogen	mg/l				0.02 /U		
Field pH	s.u.						
Field Conductivity	umho/cm						

APPENDIX C
WINNEBAGO RECLAMATION LANDFILL BLANK DATA SUMMARY
ANALYSIS TYPE: GW Indicators MATRIX: Blank

SAMPLE ID:		PP-SB01-02	PP-SB01-03	PP-SB01-04	PP-SB02-02	PP-SB03-02
SAMPLE DATE:		6/20/88	8/03/88	6/08/89	6/14/88	6/15/88
COMPOUNDS	UNIT					
Alkalinity	mg/l	6.00		5.00 UJ/U	6.00	
Chloride	mg/l	1.00		7.00 J/	1.00	1.00
Phenol	ug/l	5.00	5.00	20.00 J/	6.00	14.00
Sulfate	mg/l					
Nitrate + Nitrite Nitrogen	mg/l					
Field pH	s.u.			8.30		
Field Conductivity	umho/cm			10.00 /U		

(1) Results are reported with qualifiers (Data Validation Qualifier/Laboratory Qualifier) to the right of the value.

APPENDIX C
WINNEBAGO RECLAMATION LANDFILL BLANK DATA SUMMARY
ANALYSIS TYPE: Volatiles MATRIX: Blank

SAMPLE ID:		PP-FB01-01	PP-FB01-03	PP-FB01-04	PP-FB02-01	PP-FB02-03	PP-FB02-04
SAMPLE DATE:		4/04/88	2/06/90	4/23/90	4/06/88	2/08/90	4/25/90
COMPOUNDS	UNIT						
Chloromethane	ug/l						10.00 UJ/U
Bromomethane	ug/l			10.00 UJ/U			10.00 UJ/U
Vinyl Chloride	ug/l			10.00 UJ/U			
Chloroethane	ug/l						10.00 UJ/U
Methylene Chloride	ug/l	20.00		5.00 U/U			5.00 UJ/U
Acetone	ug/l			10.00 U/U			
1,1-Dichloroethane	ug/l						
Chloroform	ug/l						
1,2-Dichloroethane	ug/l						
2-Butanone	ug/l		10.00 R/U	10.00 R/U		10.00 R/U	10.00 R/U
1,1,1-Trichloroethane	ug/l						
Trichloroethene	ug/l						
Dibromochloromethane	ug/l						
Benzene	ug/l						
trans-1,3-Dichloropropene	ug/l						
4-Methyl-2-Pentanone	ug/l						
Tetrachloroethene	ug/l						
1,1,2,2-Tetrachloroethane	ug/l						
Toluene	ug/l		0.50 /J	5.00 U/U		0.40 /J	5.00 U/U
Chlorobenzene	ug/l						
Ethylbenzene	ug/l						
Styrene	ug/l						
Total Xylenes	ug/l						
trans-1,2-Dichloroethene	ug/l						
cis-1,2-Dichloroethene	ug/l				0.37 J/		
1,4-Dichlorobenzene	ug/l						
m and p-Xylene	ug/l						
1,2-Dichlorobenzene	ug/l						

APPENDIX C
WINNEBAGO RECLAMATION LANDFILL BLANK DATA SUMMARY
ANALYSIS TYPE: Volatiles MATRIX: Blank

SAMPLE ID:		PP-FB03-01	PP-FB03-02	PP-FB04-01	PP-FB04-05	PP-LLFB01-01	PP-LLSB04-02
SAMPLE DATE:		4/07/88	2/08/90	4/08/88	2/09/90	4/08/88	6/16/88
COMPOUNDS	UNIT						
Chloromethane	ug/l						
Bromomethane	ug/l						
Vinyl Chloride	ug/l						
Chloroethane	ug/l			1.40		2.25 J/	
Methylene Chloride	ug/l	18.20	1.00 UJ/BJ		5.00 U/BJ		
Acetone	ug/l		22.00 J/		33.00 U/B		
1,1-Dichloroethane	ug/l					0.39 J/	
Chloroform	ug/l						0.27 J/
1,2-Dichloroethane	ug/l						
2-Butanone	ug/l		13.00 J/				
1,1,1-Trichloroethane	ug/l					0.91 J/	
Trichloroethene	ug/l					0.48 J/	
Dibromochloromethane	ug/l						
Benzene	ug/l					0.39 J/	
trans-1,3-Dichloropropene	ug/l						
4-Methyl-2-Pentanone	ug/l						
Tetrachloroethene	ug/l						
1,1,2,2-Tetrachloroethane	ug/l						
Toluene	ug/l		0.70 UJ/BJ	1.70	5.00 U/BJ		
Chlorobenzene	ug/l						
Ethylbenzene	ug/l						
Styrene	ug/l						
Total Xylenes	ug/l						
trans-1,2-Dichloroethene	ug/l						
cis-1,2-Dichloroethene	ug/l					0.32 J/	
1,4-Dichlorobenzene	ug/l						
m and p-Xylene	ug/l	1.25				1.42 J/	
1,2-Dichlorobenzene	ug/l						

APPENDIX C
WINNEBAGO RECLAMATION LANDFILL BLANK DATA SUMMARY
ANALYSIS TYPE: Volatiles MATRIX: Blank

SAMPLE ID:		PP-SB01-02	PP-SB01-03	PP-SB01-04	PP-SB02-02	PP-SB03-02	PP-TB01-02
SAMPLE DATE:		6/20/88	8/03/88	6/08/89	6/14/88	6/15/88	6/20/88
COMPOUNDS	UNIT						
Chloromethane	ug/l						
Bromomethane	ug/l						
Vinyl Chloride	ug/l						
Chloroethane	ug/l						
Methylene Chloride	ug/l			5.00 UJ/BJ			
Acetone	ug/l						
1,1-Dichloroethane	ug/l						
Chloroform	ug/l						
1,2-Dichloroethane	ug/l						
2-Butanone	ug/l			10.00 R/U			
1,1,1-Trichloroethane	ug/l						
Trichloroethene	ug/l						
Dibromochloromethane	ug/l						
Benzene	ug/l						
trans-1,3-Dichloropropene	ug/l						
4-Methyl-2-Pentanone	ug/l						
Tetrachloroethene	ug/l						
1,1,2,2-Tetrachloroethane	ug/l						
Toluene	ug/l			5.00 UJ/U			
Chlorobenzene	ug/l			5.00 UJ/U			
Ethylbenzene	ug/l			5.00 UJ/U			
Styrene	ug/l			5.00 UJ/U			
Total Xylenes	ug/l			5.00 UJ/U			
trans-1,2-Dichloroethene	ug/l						
cis-1,2-Dichloroethene	ug/l						
1,4-Dichlorobenzene	ug/l						
m and p-Xylene	ug/l						
1,2-Dichlorobenzene	ug/l						

APPENDIX C
WINNEBAGO RECLAMATION LANDFILL BLANK DATA SUMMARY
ANALYSIS TYPE: Volatiles MATRIX: Blank

SAMPLE ID:		PP-TB01-03	PP-TB01-03	PP-TB01-04	PP-TB01-04	PP-TB02-02	PP-TB02-03
SAMPLE DATE:		8/03/88	2/05/90	6/08/89	4/23/90	6/14/88	2/05/90
COMPOUNDS	UNIT						
Chloromethane	ug/l						
Bromomethane	ug/l				10.00 UJ/U		
Vinyl Chloride	ug/l				10.00 UJ/U		
Chloroethane	ug/l						
Methylene Chloride	ug/l			5.00 UJ/BJ	5.00 U/U		
Acetone	ug/l			37.00 UJ/B	10.00 U/U		
1,1-Dichloroethane	ug/l						
Chloroform	ug/l						
1,2-Dichloroethane	ug/l						
2-Butanone	ug/l		10.00 R/U	10.00 R/U	10.00 R/U		10.00 R/U
1,1,1-Trichloroethane	ug/l						
Trichloroethene	ug/l						
Dibromochloromethane	ug/l						
Benzene	ug/l						
trans-1,3-Dichloropropene	ug/l	0.23 J/					
4-Methyl-2-Pentanone	ug/l						
Tetrachloroethene	ug/l						
1,1,2,2-Tetrachloroethane	ug/l						
Toluene	ug/l			5.00 UJ/U	5.00 U/U		0.50 /J
Chlorobenzene	ug/l	0.75 J/		5.00 UJ/U			
Ethylbenzene	ug/l			5.00 UJ/U			
Styrene	ug/l			5.00 UJ/U			
Total Xylenes	ug/l			5.00 UJ/U			
trans-1,2-Dichloroethene	ug/l	0.36					
cis-1,2-Dichloroethene	ug/l	2.80					
1,4-Dichlorobenzene	ug/l	39.00 J/					
m and p-Xylene	ug/l						
1,2-Dichlorobenzene	ug/l	3.00 J/					

APPENDIX C
WINNEBAGO RECLAMATION LANDFILL BLANK DATA SUMMARY
ANALYSIS TYPE: Volatiles MATRIX: Blank

SAMPLE ID:		PP-TB03-03	PP-TB02-04	PP-TB03-02	PP-TB04-02	PP-TB04-03
SAMPLE DATE:		2/08/90	4/25/90	6/15/88	6/15/88	2/05/90
COMPOUNDS	UNIT					
Chloromethane	ug/l		10.00 UJ/U			
Bromomethane	ug/l		10.00 UJ/U			
Vinyl Chloride	ug/l					
Chloroethane	ug/l		10.00 UJ/U			
Methylene Chloride	ug/l		5.00 UJ/U			5.00 U/BJ
Acetone	ug/l	48.00 J/	10.00 UJ/U			51.00 U/B
1,1-Dichloroethane	ug/l					
Chloroform	ug/l					
1,2-Dichloroethane	ug/l		5.00 UJ/U			
2-Butanone	ug/l	10.00 R/U	10.00 R/U			19.00 J/
1,1,1-Trichloroethane	ug/l					
Trichloroethene	ug/l					
Dibromochloromethane	ug/l				0.31	
Benzene	ug/l					
trans-1,3-Dichloropropene	ug/l					
4-Methyl-2-Pentanone	ug/l		10.00 UJ/U			
Tetrachloroethene	ug/l				0.22	
1,1,2,2-Tetrachloroethane	ug/l		5.00 UJ/U			
Toluene	ug/l	0.90 UJ/BJ	5.00 U/U			5.00 U/BJ
Chlorobenzene	ug/l					
Ethylbenzene	ug/l					
Styrene	ug/l					
Total Xylenes	ug/l					
trans-1,2-Dichloroethene	ug/l					
cis-1,2-Dichloroethene	ug/l					
1,4-Dichlorobenzene	ug/l					
m and p-Xylene	ug/l					
1,2-Dichlorobenzene	ug/l					

(1) Results are reported with qualifiers (Data Validation Qualifier/Laboratory Qualifier) to the right of the value.

APPENDIX C
WINNEBAGO RECLAMATION LANDFILL BLANK DATA SUMMARY
ANALYSIS TYPE: Semi-Volatiles MATRIX: Blank

SAMPLE ID:		PP-FB01-01	PP-FB01-03	PP-FB02-03	PP-FB04-05	PP-LLFB01-01
SAMPLE DATE:		4/04/88	2/06/90	2/08/90	2/09/90	4/08/88
COMPOUNDS	UNIT					
No Compounds Detected	ug/l					

(1) No semi-volatile compounds were detected in any samples.

APPENDIX C
WINNEBAGO RECLAMATION LANDFILL BLANK DATA SUMMARY
ANALYSIS TYPE: Pesticides/PCBs MATRIX: Blank

SAMPLE ID:	PP-FB01-01	PP-FB04-05	PP-LLFB01-01
SAMPLE DATE:	4/04/88	2/09/90	4/08/88
COMPOUNDS	UNIT		
No Compounds Detected	ug/l		

(1) No pesticides/PCBs were detected in any of the samples.

APPENDIX C
WINNEBAGO RECLAMATION LANDFILL BLANK DATA SUMMARY
ANALYSIS TYPE: Metals MATRIX: Blank

SAMPLE ID:		PP-FB01-01	PP-FB01-03	PP-FB01-04	PP-FB02-01	PP-FB02-03	PP-FB02-04
SAMPLE DATE:		4/05/88	2/06/90	4/23/90	4/06/88	2/08/90	4/25/90
COMPOUNDS	UNIT						
Aluminum	ug/l						
Antimony	ug/l						
Arsenic	ug/l		2.00 /U	2.00 /U		2.00 /U	2.00 /U
Barium	ug/l		5.00 /U	5.00 /U		5.00 /U	5.00 /U
Beryllium	ug/l						
Cadmium	ug/l		0.20 /U	0.23 /K		0.20 /U	0.20 /U
Calcium	ug/l						
Chromium, Total	ug/l		0.27 /KN			0.26 /KN	
Cobalt	ug/l						
Copper	ug/l						
Iron	ug/l						
Lead	ug/l						
Magnesium	ug/l						
Manganese	ug/l						
Mercury	ug/l						
Nickel	ug/l	43.00					
Potassium	ug/l						
Selenium	ug/l						
Silver	ug/l						
Sodium	ug/l						
Thallium	ug/l						
Vanadium	ug/l						
Zinc	ug/l						
Cyanide, Total	ug/l		10.00 /UN	10.00 /U		10.00 /UN	10.00 /U
Chromium, Hexavalent	ug/l		50.00 /U			50.00 /U	

APPENDIX C
WINNEBAGO RECLAMATION LANDFILL BLANK DATA SUMMARY
ANALYSIS TYPE: Metals MATRIX: Blank

SAMPLE ID:		PP-FB03-01	PP-FB03-02	PP-FB04-01	PP-FB04-05	PP-LLFB01-01	PP-LLSB04-02
SAMPLE DATE:		4/07/88	2/08/90	4/08/88	2/09/90	4/08/88	6/16/88
COMPOUNDS	UNIT						
Aluminum	ug/l				200.00 UJ/UN*		
Antimony	ug/l				5.00 /UNS		
Arsenic	ug/l		2.00 /U		2.00 /UNS*		2.00 /U
Barium	ug/l		5.00 /U		5.00 /U		5.00 /U
Beryllium	ug/l				0.20 /UN		
Cadmium	ug/l		0.20 /U	0.20	0.20 /US		0.20 /U
Calcium	ug/l				500.00 /U		
Chromium, Total	ug/l		0.25 /KN		0.20 /U		
Cobalt	ug/l				50.00 /U		
Copper	ug/l				20.00 /U		
Iron	ug/l				50.00 /U		
Lead	ug/l				3.00 UJ/U*		
Magnesium	ug/l				50.00 UJ/UN		
Manganese	ug/l				15.00 UJ/UN		
Mercury	ug/l				0.26 /N		
Nickel	ug/l				40.00 /UN	42.00	
Potassium	ug/l				100.00 /U		
Selenium	ug/l				2.00 UJ/UNS		
Silver	ug/l				10.00 /U		
Sodium	ug/l				1000.00 /U		
Thallium	ug/l				5.00 /UNS		
Vanadium	ug/l				2.00 /U		
Zinc	ug/l				10.00 /U		
Cyanide, Total	ug/l		10.00 UJ/UN		10.00 UJ/UN*		
Chromium, Hexavalent	ug/l		50.00 /U		50.00 /U		

APPENDIX C
WINNEBAGO RECLAMATION LANDFILL BLANK DATA SUMMARY
ANALYSIS TYPE: Metals MATRIX: Blank

SAMPLE ID:		PP-SB01-02	PP-SB01-03	PP-SB01-04	PP-SB02-02	PP-SB03-02
SAMPLE DATE:		6/20/88	8/03/88	6/08/89	6/14/88	6/15/88
COMPOUNDS	UNIT					
Aluminum	ug/l					
Antimony	ug/l					
Arsenic	ug/l	2.00 /U	2.00 /U	2.00 UJ/UN+	2.00 /U	2.00 /U
Barium	ug/l	5.00 /U	5.00 /U	86.00 /*	5.00 /U	5.00 /U
Beryllium	ug/l					
Cadmium	ug/l	0.20 /U	0.20 /U	0.20 /US*	0.20 /U	0.20 /U
Calcium	ug/l					
Chromium, Total	ug/l					
Cobalt	ug/l					
Copper	ug/l					
Iron	ug/l					
Lead	ug/l					
Magnesium	ug/l					
Manganese	ug/l					
Mercury	ug/l					
Nickel	ug/l					
Potassium	ug/l					
Selenium	ug/l					
Silver	ug/l					
Sodium	ug/l					
Thallium	ug/l					
Vanadium	ug/l					
Zinc	ug/l					
Cyanide, Total	ug/l					
Chromium, Hexavalent	ug/l					

(1) Results are reported with qualifiers (Data Validation Qualifier/Laboratory Qualifier) to the right of the value.

APPENDIX C
BLANKS
SUMMARY OF TENTATIVELY IDENTIFIED COMPOUNDS

PROJECT NAME: WINNEBAGO RECLAMATION LANDFILL
PROJECT NUMBER: 13160.00

MATRIX: Leachate

SAMPLE ID	ANAL. TYPE	COMPOUND	CONC.	UNITS	DVQ	LQ
PP-SB01-04	TVOA	Acetaldehyde (DOT)	17.000	ug/l		J

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GC/MS CONFIRMATION RESULTS

APPENDIX C
WINNEBAGO RECLAMATION LANDFILL GC/MS CONFIRMATION DATA RD 1
ANALYSIS TYPE: Volatiles MATRIX: Ground Water

SAMPLE ID:		PP-B11-01	PP-B16-01	PP-G107-01	PP-G119-01	PP-PW1-01
SAMPLE DATE:		4/07/88	4/07/88	4/06/88	4/04/88	4/05/88
COMPOUNDS	UNIT					
1,1-Dichloroethane	ug/l		0.87 J/			
Total 1,2-Dichloroethene	ug/l	0.47	23.00	1.50		
1,1,1-Trichloroethane	ug/l		3.25	0.42 /J		
Trichloroethene	ug/l	0.27	2.76	0.42		
Tetrachloroethene	ug/l	1.00	1.78	0.46		
No Compounds Detected	ug/l				0.00	0.00

(1) Results are reported with qualifiers (Data Validation Qualifier/Laboratory Qualifier) to the right of the value.

APPENDIX C
WINNEBAGO RECLAMATION LANDFILL GC/MS CONFIRMATION DATA RD 1
ANALYSIS TYPE: Volatiles MATRIX: Surface Water

SAMPLE ID:	PP-SW02-01
SAMPLE DATE:	4/8/88

COMPOUNDS	UNIT	
Chloroform	ug/l	0.29

(1) Results are reported with qualifiers (Data Validation Qualifier/Laboratory Qualifier) to the right of the value.

APPENDIX C
WINNEBAGO RECLAMATION LANDFILL GC/MS CONFIRMATION DATA RD 1
ANALYSIS TYPE: Volatiles MATRIX: Leachate

SAMPLE ID: PP-LLMHW-01
SAMPLE DATE: 4/08/88

COMPOUNDS	UNIT	
Vinyl Chloride	ug/l	12.00
Total 1,2-Dichloroethene	ug/l	4.30
Chloroform	ug/l	16.00
Toluene	ug/l	67.00 /B
Ethylbenzene	ug/l	21.00
Total Xylenes	ug/l	89.00

(1) Results are reported with qualifiers (Data Validation Qualifier/Laboratory Qualifier) to the right of the value.

APPENDIX C
WINNEBAGO RECLAMATION LANDFILL GC/MS CONFIRMATION DATA RD 2
ANALYSIS TYPE: Volatiles MATRIX: Ground Water

SAMPLE ID:		PP-PWO-02	PP-B09-02	PP-B11A-02	PP-G115-02	PP-G119A-02
SAMPLE DATE:		6/15/88	6/15/88	6/14/88	6/14/88	6/20/88
COMPOUNDS	UNIT					
Vinyl Chloride	ug/l				2.40	
Chloroethane	ug/l				6.70	
1,1-Dichloroethene	ug/l					0.11 /J
1,1-Dichloroethane	ug/l			1.80	1.70	0.14 /J
Total 1,2-Dichloroethene	ug/l			5.60	2.60	1.20
1,1,1-Trichloroethane	ug/l			0.94		0.57 /J
1,2-Dichloropropane	ug/l				0.65	
Trichloroethene	ug/l			1.80	0.16 /J	0.76
Benzene	ug/l				1.10	
Tetrachloroethene	ug/l			4.50 /B		0.48 /B
Chlorobenzene	ug/l				0.68	
Methylene Chloride	ug/l	1.40 U/B	0.94 U/B			
Acetone	ug/l	3.60 U/B	27.00 U/B			
Chloroform	ug/l	0.62 U/BJ				
Toluene	ug/l	0.17 U/B	0.10 U/BJ			

(1) Results are reported with qualifiers (Data Validation Qualifier/Laboratory Qualifier) to the right of the value.

APPENDIX C
WINNEBAGO RECLAMATION LANDFILL GC/MS CONFIRMATION DATA RD 2
ANALYSIS TYPE: Volatiles MATRIX: Leachate

SAMPLE ID: PP-LLG7-02
SAMPLE DATE: 6/16/88

COMPOUNDS	UNIT	
Vinyl Chloride	ug/l	90.00
Total 1,2-Dichloroethene	ug/l	24.00
Benzene	ug/l	6.20 /B
Toluene	ug/l	270.00 /B
Ethylbenzene	ug/l	56.00 /B
Total Xylenes	ug/l	130.00 /B

(1) Results are reported with qualifiers (Data Validation Qualifier/Laboratory Qualifier) to the right of the value.

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AMBIENT AIR DATA

Ambient Air Sampling
Calibration Summary
Winnebago Reclamation Landfill
October 24-25, 1988

Sample Location	Sample Tube Number	Sample Description	Initial Calibration (cc/minute)	Final Calibration (cc/minute)	Average (cc/minute)	Time Pump Set Up	Pump Duration (minutes)	Total Volume (cc)
Downwind Location #1 FLow of 20 cc/min	2507	PP-AADW01-01	24.63	26.46*	25.55	1253	720	18,396
Downwind Location #2 Flow of 10 cc/min	2511	PP-AADW02-01	13.00	17.36	15.18	1400	720	10,930
Downwind Location #2 Flow of 20 cc/min	2512	PP-AADW02-01	19.16	18.60	18.88	1345	720	13,594
Downwind Location #2 Flow of 33 cc/min	2510	PP-AADW02-01	29.35	38.57	33.96	1345	720	24,251
Downwind Location #2 Flow of 40 cc/min	2516	PP-AADW02-01	45.44	44.90	45.17	1400	720	32,522
Downwind Location #3 Flow of 20 cc/min	2515	PP-AADW03-01	22.66	22.91	22.79	1414	720	16,405
Upwind Location #4 Flow of 20 cc/min	2509	PP-AAUW04-01	22.16	22.71	22.44	1435	720	16.153
Trip Blank	2513	PP-AATB01-01	--	--	--	--	--	--

BJH/JPL/BJH
*Alpha II pump was calibrated without sorbent tube attached.

PAGEL PIT ---VALIDATED AIR DATA---

COMPOUND (1)	DETECTION LIMIT (Total ng)	mol wt	24.45/ mol wt	2511 PP-AADW02-01 Volume = 10,930 CC Total ng	mg/M3	LQ	2512 PP-AADW02-01 Volume = 13,594 CC Total ng	mg/M3	LQ	2510 PP-AAW02-01 Volume = 24,451 CC Total ng	mg/M3	LQ
Acetone	26	58.08	0.42097			UJ/			UJ/			UJ/
Benzene	19	78.12	0.31298	25	7.16e-04	UJ/	40	9.21e-04	UJ/	32	4.10e-04	UJ/
Bromodichloromethane	17	163.83	0.14924			UJ/			UJ/			UJ/
Bromoform	21	252.75	0.09674			UJ/			UJ/			UJ/
Bromomethane	28	94.94	0.25753			UJ/			UJ/			UJ/
2-Butanone	20	72.12	0.33902			R/			R/			R/
Carbon Tetrachloride	14	153.82	0.15895	9	1.31e-04	J/J	17	1.99e-04	J/	22	1.43e-04	J/
Chlorobenzene	16	112.56	0.21722			UJ/			UJ/			UJ/
Dibromochloromethane	28	208.29	0.11738			UJ/			UJ/			UJ/
Chloroethane	19	64.52	0.37895			UJ/			UJ/			UJ/
Chloroform	16	119.38	0.20481			UJ/	5	7.53e-05	J/J	8	6.70e-05	J/J
Chloromethane	15	50.49	0.48425	80	3.54e-03	UJ/	94	3.35e-03	UJ/	32	6.34e-04	UJ/
Hexane	21	86.18	0.28371	2300	5.97e-02	J/E	92	1.92e-03	UJ/	280	3.25e-03	J/E
Heptane	19	100.21	0.24399			UJ/			UJ/J			UJ/J
1,1-Dichloroethane	18	98.96	0.24707			UJ/			UJ/			UJ/
1,2-Dichloroethane	18	98.96	0.24707			UJ/			UJ/			UJ/
1,1-Dichloroethene	16	96.94	0.25222			UJ/			UJ/			UJ/
Total 1,2-Dichloroethene	18	96.94	0.25222			UJ/			UJ/			UJ/
1,2-Dichloropropane	15	112.99	0.21639	90	1.78e-03	J/			UJ/			UJ/
cis-1,3-Dichloropropene	16	110.97	0.22033			UJ/			UJ/			UJ/
trans-1,3-Dichloropropene	17	110.97	0.22033			UJ/			UJ/			UJ/
Ethylbenzene	20	106.17	0.23029	100	2.11e-03	J/	83	1.41e-03	J/	92	8.66e-04	J/
m-Dichlorobenzene	22	147.01	0.16632			UJ/			UJ/			UJ/
p-Dichlorobenzene	19	147.01	0.16632	17	2.59e-04	J/J	8	9.79e-05	J/J	9	6.12e-05	J/J
o-Dichlorobenzene	20	147.01	0.16632			UJ/			UJ/			UJ/
Methylene Chloride	19	84.93	0.28788	1000	2.63e-02	BJ/E	1700	3.60e-02	J/E	3300	3.89e-02	J/E
Styrene	21	104.16	0.23474			UJ/	10	1.73e-04	J/J	6	5.76e-05	J/J
1,1,2,2-Tetrachloroethane	13	167.85	0.14567			UJ/			UJ/			UJ/
Tetrachloroethene	12	165.83	0.14744	8	1.08e-04	J/J	6	6.51e-05	J/J	6	3.62e-05	J/J
Toluene	12	92.15	0.26533	560	1.36e-02	J/E	170	3.32e-03	J/E	160	1.74e-03	J/E
1,1,1-Trichloroethane	15	133.41	0.18327	16	2.68e-04	UJ/	64	8.63e-04	UJ/	52	3.90e-04	UJ/
1,1,2-Trichloroethane	18	133.41	0.18327			UJ/			UJ/			UJ/
Trichloroethene	12	131.39	0.18609	12	2.04e-04	J/	9	1.23e-04	J/J	12	9.13e-05	J/
Trichlorofluoromethane	16	137.37	0.17799	100	1.63e-03	UJ/	110	1.44e-03	UJ/	110	8.01e-04	UJ/
o-Xylene	22	106.17	0.23029	56	1.18e-03	J/	42	7.12e-04	J/	46	4.33e-04	J/
m,p-Xylenes	47	106.17	0.23029	150	3.16e-03	J/	94	1.59e-03	J/	100	9.42e-04	J/
Vinyl Chloride	16	62.5	0.3912			UJ/			UJ/			UJ/
Isopropylbenzene	20	120.2	0.20341	25	4.65e-04	BJ/	6	8.98e-05	J/J	6	4.99e-05	J/J

(1) All of the samples were analyzed for the list above.
If no value reported, the compound was not detected.

mg/M3 = ((24.45/MOL WT) * NG) / VOL IN CC

JAH/jah/CAW 8-23-90

PAGEL PIT ---VALIDATED AIR DATA---

upwind

COMPOUND (1)	DETECTION LIMIT (Total ng)	mol wt	24.45/ mol wt	2516 PP-AAW02-01 Volume = 32,522 CC Total ng	mg/M3	LQ	2515 PP-AADW03-01 Volume = 16,405 CC Total ng	mg/M3	LQ	2509 PP-AAUW04-01 Volume = 16,153 CC Total ng	mg/M3	LQ
Acetone	26	58.08	0.42097			UJ/			UJ/			UJ/
Benzene	19	78.12	0.31298	44	4.23e-04	UJ/	26	4.96e-04	UJ/	22	4.26e-04	UJ/
Bromodichloromethane	17	163.83	0.14924			UJ/			UJ/			UJ/
Bromoform	21	252.75	0.09674			UJ/			UJ/			UJ/
Bromomethane	28	94.94	0.25753			UJ/			UJ/			UJ/
2-Butanone	20	72.12	0.33902			R/			R/			R/
Carbon Tetrachloride	14	153.82	0.15895	27	1.32e-04	J/	10	9.69e-05	J/J	12	1.18e-04	J/J
Chlorobenzene	16	112.56	0.21722			UJ/			UJ/			UJ/
Dibromochloromethane	28	208.29	0.11738			UJ/			UJ/			UJ/
Chloroethane	19	64.52	0.37895			UJ/			UJ/			UJ/
Chloroform	16	119.38	0.20481	7	4.41e-05	J/J	2	2.50e-05	J/J	4	5.07e-05	J/J
Chloromethane	15	50.49	0.48425	37	5.51e-04	UJ/	150	4.43e-03	UJ/	45	1.35e-03	UJ/
Hexane	21	86.18	0.28371	70	6.11e-04	UJ/	39	6.74e-04	UJ/	48	8.43e-04	UJ/
Heptane	19	100.21	0.24399	21	1.58e-04	UJ/	12	1.78e-04	UJ/J			UJ/
1,1-Dichloroethane	18	98.96	0.24707			UJ/	8	1.20e-04	J/J			UJ/
1,2-Dichloroethane	18	98.96	0.24707			UJ/			UJ/			UJ/
1,1-Dichloroethene	16	96.94	0.25222			UJ/			UJ/			UJ/
Total 1,2-Dichloroethene	18	96.94	0.25222			UJ/			UJ/			UJ/
1,2-Dichloropropane	15	112.99	0.21639			UJ/			UJ/			UJ/
cis-1,3-Dichloropropene	16	110.97	0.22033			UJ/			UJ/			UJ/
trans-1,3-Dichloropropene	17	110.97	0.22033			UJ/			UJ/			UJ/
Ethylbenzene	20	106.17	0.23029	120	8.50e-04	J/	68	9.55e-04	J/	9	1.28e-04	J/J
m-Dichlorobenzene	22	147.01	0.16632			UJ/			UJ/			UJ/
p-Dichlorobenzene	19	147.01	0.16632	12	6.14e-05	J/J	7	7.10e-05	J/J	3	3.09e-05	J/J
o-Dichlorobenzene	20	147.01	0.16632			UJ/			UJ/			UJ/
Methylene Chloride	19	84.93	0.28788	1700	1.50e-02	J/E	840	1.47e-02	J/E	1400	2.50e-02	J/E
Styrene	21	104.16	0.23474	5	3.61e-05	J/J	4	5.72e-05	J/J	7	1.02e-04	J/J
1,1,2,2-Tetrachloroethane	13	167.85	0.14567			UJ/			UJ/			UJ/
Tetrachloroethene	12	165.83	0.14744	7	3.17e-05	J/J	10	8.99e-05	J/J	3	2.74e-05	J/J
Toluene	12	92.15	0.26533	190	1.55e-03	J/E	130	2.10e-03	UJ/	51	8.38e-04	J/
1,1,1-Trichloroethane	15	133.41	0.18327	59	3.32e-04	UJ/	39	4.36e-04	UJ/	33	3.74e-04	UJ/
1,1,2-Trichloroethane	18	133.41	0.18327			UJ/			UJ/			UJ/
Trichloroethene	12	131.39	0.18609	17	9.73e-05	J/	8	9.07e-05	J/J	3	3.46e-05	J/J
Trichlorofluoromethane	16	137.37	0.17799	120	6.57e-04	UJ/	120	1.30e-03	UJ/	54	5.95e-04	UJ/
o-Xylene	22	106.17	0.23029	60	4.25e-04	J/	37	5.19e-04	J/	11	1.57e-04	J/J
m,p-Xylenes	47	106.17	0.23029	130	9.21e-04	J/	78	1.09e-03	UJ/	19	2.71e-04	UJ/J
Vinyl Chloride	16	62.5	0.3912			UJ/			UJ/			UJ/
Isopropylbenzene	20	120.2	0.20341	7	4.38e-05	J/J			UJ/	1	1.26e-05	J/J

(1) All of the samples were analyzed for the list above.
If no value reported, the compound was not detected.

mg/M3 = ((24.45/MOL WT) * NG) / VOL IN CC

JAH/jah/CAW 8-23-90

PAGEL PIT ---VALIDATED AIR DATA---

COMPOUND (1)	DETECTION LIMIT (Total ng)	mol wt	24.45/ mol wt	TRIP BLANK 2513 PP-AATB01-01 Volume = NA Total ng	mg/M3	LQ	(12-7-88) 554 METHOD BLANK Volume = NA Total ng	mg/M3	LQ	(12-8-88) 563 METHOD BLANK Volume = NA Total ng	mg/M3	LQ
Acetone	26	58.08	0.42097			UJ/			UJ/			UJ/
Benzene	19	78.12	0.31298	5		J/J			UJ/			UJ/
Bromodichloromethane	17	163.83	0.14924			UJ/			UJ/			UJ/
Bromoform	21	252.75	0.09674			UJ/			UJ/			UJ/
Bromomethane	28	94.94	0.25753			UJ/			UJ/			UJ/
2-Butanone	20	72.12	0.33902			R/			R/			R/
Carbon Tetrachloride	14	153.82	0.15895			UJ/			UJ/			UJ/
Chlorobenzene	16	112.56	0.21722			UJ/			UJ/			UJ/
Dibromochloromethane	28	208.29	0.11738			UJ/			UJ/			UJ/
Chloroethane	19	64.52	0.37895			UJ/			UJ/			UJ/
Chloroform	16	119.38	0.20481			UJ/			UJ/			UJ/
Chloromethane	15	50.49	0.48425	59		J/			UJ/			UJ/
Hexane	21	86.18	0.28371	72		UJ/			UJ/	17		J/
Heptane	19	100.21	0.24399			UJ/			UJ/			UJ/
1,1-Dichloroethane	18	98.96	0.24707			UJ/			UJ/			UJ/
1,2-Dichloroethane	18	98.96	0.24707			UJ/			UJ/			UJ/
1,1-Dichloroethene	16	96.94	0.25222			UJ/			UJ/			UJ/
Total 1,2-Dichloroethene	18	96.94	0.25222			UJ/			UJ/			UJ/
1,2-Dichloropropane	15	112.99	0.21639			UJ/			UJ/			UJ/
cis-1,3-Dichloropropene	16	110.97	0.22033			UJ/			UJ/			UJ/
trans-1,3-Dichloropropene	17	110.97	0.22033			UJ/			UJ/			UJ/
Ethylbenzene	20	106.17	0.23029			UJ/			UJ/			UJ/
m-Dichlorobenzene	22	147.01	0.16632			UJ/			UJ/			UJ/
p-Dichlorobenzene	19	147.01	0.16632			UJ/			UJ/			UJ/
o-Dichlorobenzene	20	147.01	0.16632			UJ/			UJ/			UJ/
Methylene Chloride	19	84.93	0.28788			UJ/	8		J/J			UJ/
Styrene	21	104.16	0.23474			UJ/			UJ/			UJ/
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Tetrachloroethene	12	165.83	0.14744			UJ/			UJ/			UJ/
Toluene	12	92.15	0.26533	17		UJ/			UJ/	13		J/
1,1,1-Trichloroethane	15	133.41	0.18327	10		J/J			UJ/			UJ/
1,1,2-Trichloroethane	18	133.41	0.18327			UJ/			UJ/			UJ/
Trichloroethene	12	131.39	0.18609			UJ/			UJ/			UJ/
Trichlorofluoromethane	16	137.37	0.17799	240		J/E			UJ/			UJ/
o-Xylene	22	106.17	0.23029			UJ/			UJ/			UJ/
m,p-Xylenes	47	106.17	0.23029	5		UJ/J			UJ/	4		J/J
Vinyl Chloride	16	62.5	0.3912			UJ/			UJ/			UJ/
Isopropylbenzene	20	120.2	0.20341			UJ/	2		J/J			UJ/

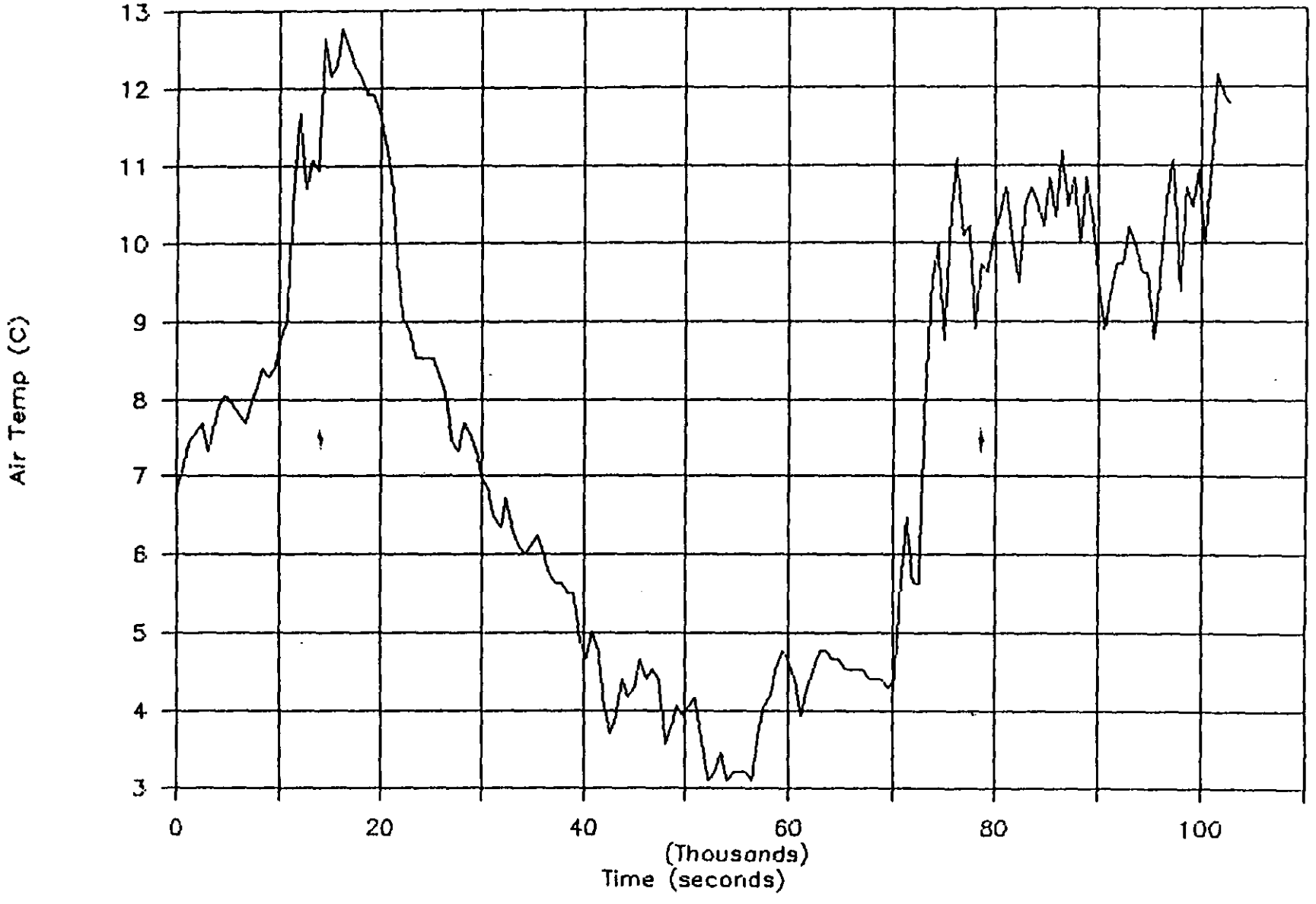
(1) All of the samples were analyzed for the list above.
If no value reported, the compound was not detected.

mg/M3 = ((24.45/MOL WT) * NG) / VOL IN CC

JAH/jah/CAW 8-23-90

Met Data for Pagel Pit Air Sampling Run

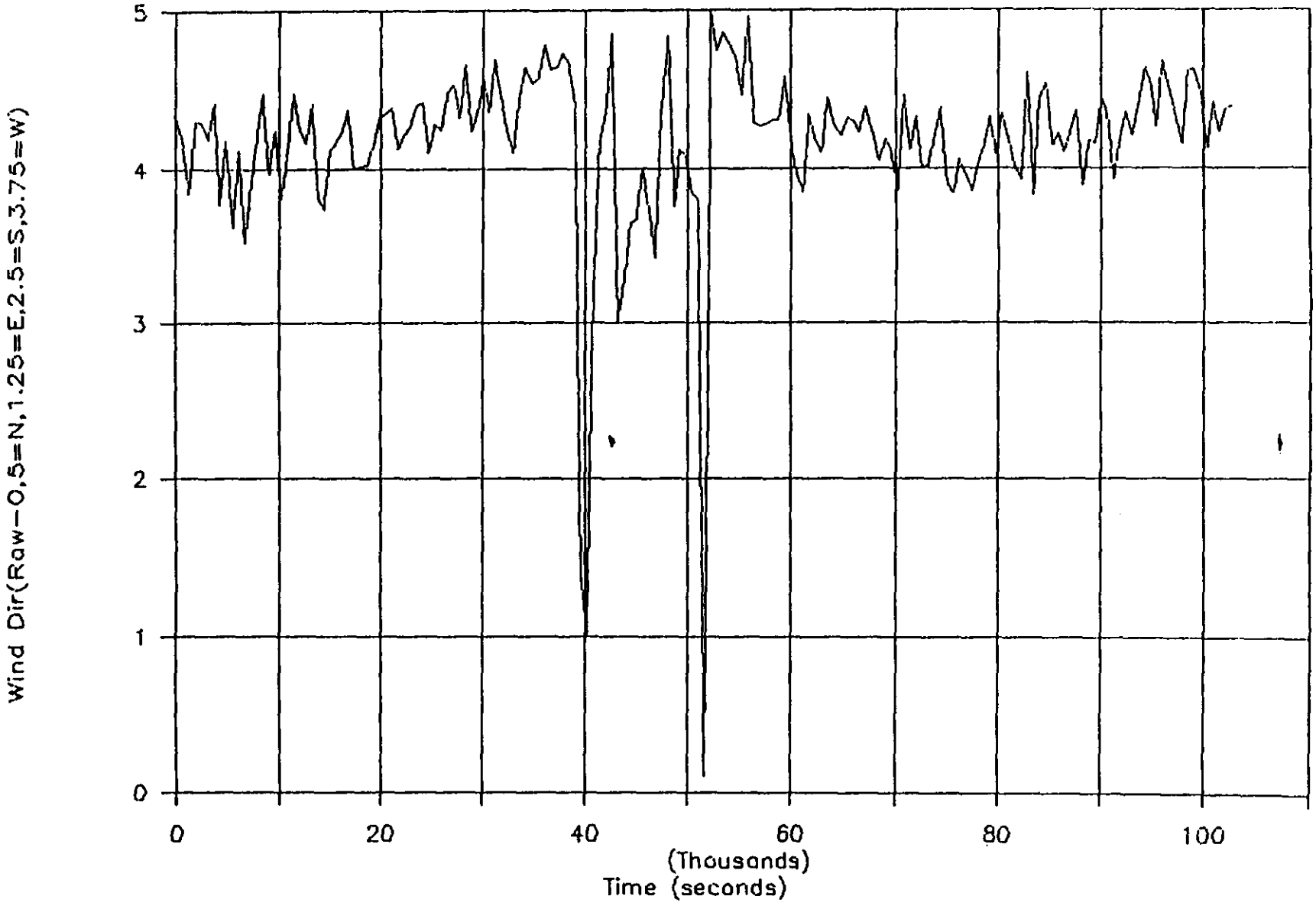
10-minute Data Collected 10/25-26/88



Raw Data

Met Data for Pagel Pit Air Sampling Run

10-minute Data Collected 10/25-26/88



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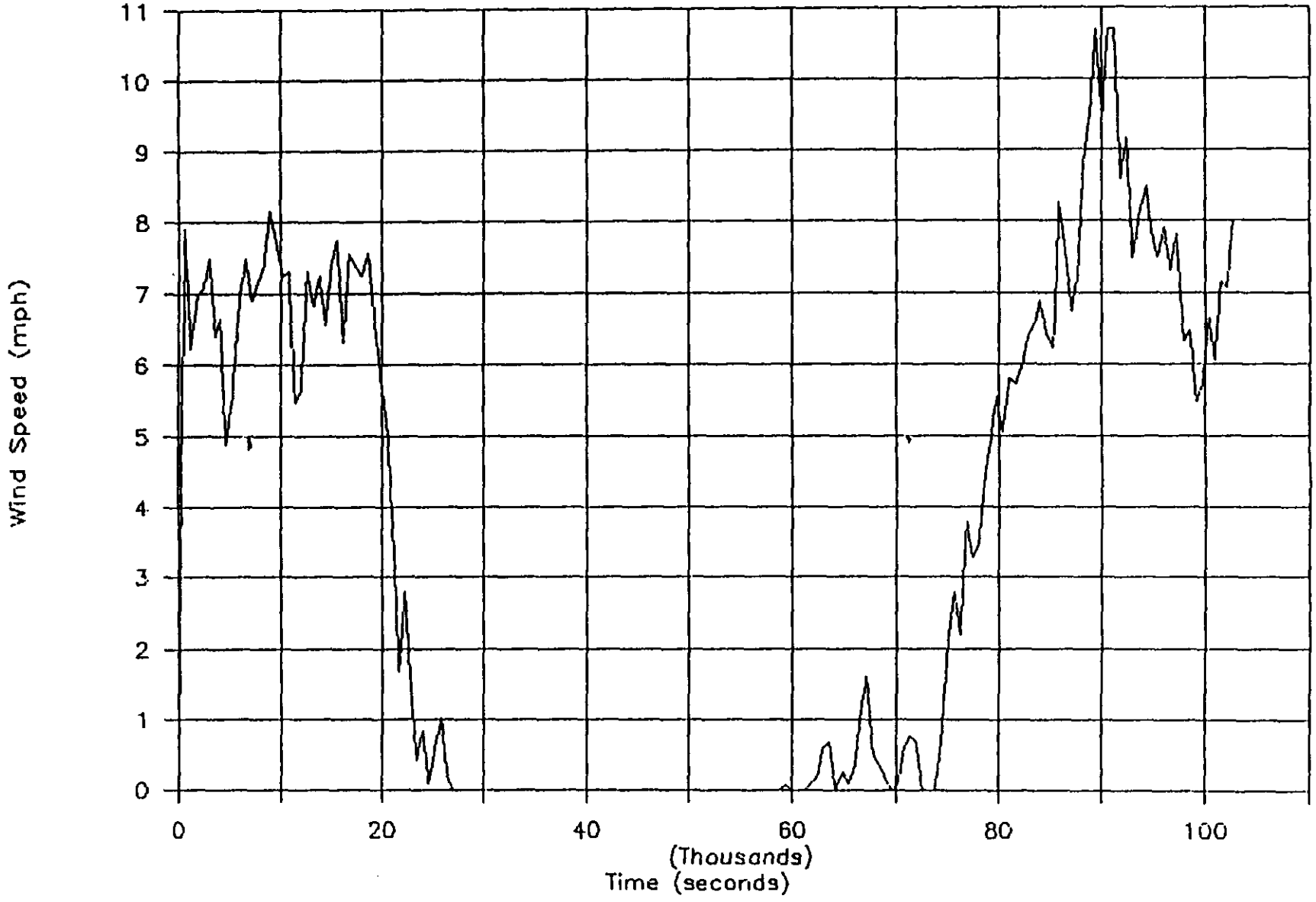

D

APPENDIX D

PERMEABILITY TEST RESULTS

A Slug Test for Determining Hydraulic Conductivity of Unconfined Aquifers With Completely or Partially Penetrating Wells

HERMAN BOUWER AND R. C. RICE

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A procedure is presented for calculating the hydraulic conductivity of an aquifer near a well from the rate of rise of the water level in the well after a certain volume of water is suddenly removed. The calculation is based on the Thiem equation of steady state flow to a well. The effective radius R_e over which the head difference between the equilibrium water table in the aquifer and the water level in the well is dissipated was evaluated with a resistance network analog for a wide range of system geometries. An empirical equation relating R_e to the geometry of the well and aquifer was derived. The technique is applicable to completely or partially penetrating wells in unconfined aquifers. It can also be used for confined aquifers that receive water from the upper confining layer. The method's results are compatible with those obtained by other techniques for overlapping geometries.

With the slug test the hydraulic conductivity or transmissibility of an aquifer is determined from the rate of rise of the water level in a well after a certain volume or 'slug' of water is suddenly removed from the well. The slug test is simpler and quicker than the Theis pumping test because observation wells and pumping the well are not needed. With the slug test the portion of the aquifer 'sampled' for hydraulic conductivity is smaller than that for the pumping test even though with the latter, most of the head loss also occurs within a relatively small distance of the pumped well and the resulting transmissibility primarily reflects the aquifer conditions near the pumped well.

Essentially instantaneous lowering of the water level in a well can be achieved by quickly removing water with a bailer or by partially or completely submerging an object in the water, letting the water level reach equilibrium, and then quickly removing the object. If the aquifer is very permeable, the water level in the well may rise very rapidly. Such rapid rises can be measured with sensitive pressure transducers and fast-response strip chart recorders or x-y plotters. Also it may be possible to isolate portions of the perforated or screened section of the well with special packers for the slug test. This not only reduces the inflow and hence the rate of rise of the water level in the well, but it also makes it possible to determine the vertical distribution of the hydraulic conductivity. Special packer techniques may have to be developed to obtain a good seal, especially for rough casings or perforations. Effective sealing may be achieved with relatively long sections of inflatable stoppers or tubing. The use of long sections of these materials would also reduce leakage flow from the rest of the well to the isolated section between packers. This flow can occur through gravel envelopes or other permeable zones surrounding the casing. Sections of inflatable tubing may have to be long enough to block off the entire part of the well not used for the slug test. High inflation pressures should be used to minimize volume changes in the tubing due to changing water pressures in the isolated section when the head is lowered.

So far, solutions for the slug test have been developed only for completely penetrating wells in confined aquifers. *Cooper et al.* [1967] derived an equation for the rise or fall of the water level in a well after sudden lowering or raising, respectively. Their equation was based on nonsteady flow to a pumped, completely penetrating well, and the solution was expressed as a series of 'type curves' against which observed rates of water level rises were matched. Values for the transmissibility and storage coefficient were then evaluated from the curve parameter and horizontal-scale position of the type curve showing the best fit with the experimental data. *Skibitzke* [1958] developed an equation for calculating transmissibility from the recovery of the water level in a well that was repeatedly bailed. The technique is limited to wells in confined aquifers with sufficiently shallow water levels to permit short time intervals between bailing cycles [*Lohman*, 1972].

To use the slug test for partially penetrating or partially perforated wells in confined or unconfined aquifers, some solutions developed for the auger hole and piezometer techniques to measure soil hydraulic conductivity [*Bouwer and Jackson*, 1974] may be employed. However, the geometry of most groundwater wells is outside the range in geometry covered by the existing equations or tables for the auger hole or piezometer methods. For this reason, theory and equations are presented in this paper for slug tests on partially or completely penetrating wells in unconfined aquifers for a wide range of geometry conditions. The wells may be partially or completely perforated, screened, or otherwise open along their periphery. While the solutions are developed for unconfined aquifers, they may also be used for slug tests on wells in confined aquifers if water enters the aquifer from the upper confining layer through compression or leakage.

THEORY

Geometry and symbols of a well in an unconfined aquifer are shown in Figure 1. For the slug test the water level in the well is suddenly lowered, and the rate of rise of the water level is measured. The flow into the well at a particular value of y can be calculated by modifying the Thiem equation to

$$Q = 2\pi KL \frac{y}{\ln (R_e/r_w)} \qquad (1)$$

where Q is the flow into the well (length³/time), K is the hydraulic conductivity of the aquifer (length/time), L is the height of the portion of well through which water enters (height of screen or perforated zone or of uncased portion of well), y is the vertical distance between water level in well and equilibrium water table in aquifer, R_e is the effective radius over which y is dissipated, and r_w is the horizontal distance

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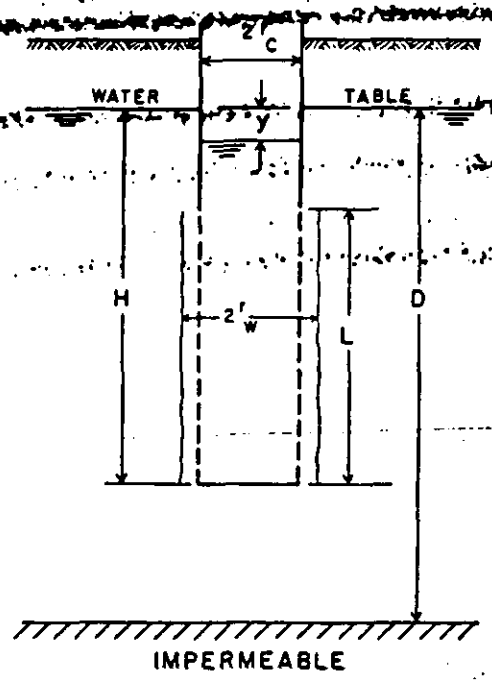

Fig. 1. Geometry and symbols of a partially penetrating, partially perforated well in unconfined aquifer with gravel pack or developed zone around perforated section.

from well center to original aquifer (well radius or radius of casing plus thickness of gravel envelope or developed zone).

The terms L, y, R_e, and r_w are all expressed in units of length. The effective radius R_e is the equivalent radial distance over which the head loss y is dissipated in the flow system. The value of R_e depends on the geometry of the flow system, and it was determined for different values of H, L, D, and r_w (Figure 1) with a resistance network analog, as will be discussed in the next section. Equation (1) is based on the assumptions that (1) drawdown of the water table around the well is negligible, (2) flow above the water table (in the capillary fringe) can be ignored, (3) head losses as water enters the well (well losses) are negligible, and (4) the aquifer is homogeneous and isotropic. These are the usual assumptions in the development of equations for pumped hole techniques [*Bouwer and Jackson*, 1974, and references therein].

The value of r_w in (1) represents the radial distance between the undisturbed aquifer and the well center. Thus r_w should include gravel envelopes or 'developed' zones if they are much more permeable than the aquifer itself (Figure 1).

The rate of rise, dy/dt, of the water level in the well after suddenly removing a slug of water can be related to the inflow Q by the equation

$$dy/dt = -Q/\pi r_c^2 \tag{2}$$

where πr_c^2 is the cross-sectional area of the well where the water level is rising. The minus sign in (2) is introduced because y decreases as t increases.

The term r_c is the inside radius of the casing if the water level is above the perforated or otherwise open portion of the well. If the water level is rising in the perforated section of the well, allowance should be made for the porosity outside the well casing if the hydraulic conductivity of the gravel envelope or developed zone is much higher than that of the aquifer. In that case the (open) porosity in the permeable zone must be included in the cross-sectional area of the well. For example, if the radius of the perforated casing is 20 cm and the casing is surrounded by a 10-cm permeable gravel envelope with a porosity of 30%, r_c should be taken as $[20^2 + 0.30(30^2 - 20^2)]^{1/2} = 23.5$ cm to obtain the cross-sectional area of the well that relates Q to dy/dt. The value of r_w for this well section is 30 cm.

Combining (1) and (2) yields

$$\frac{1}{y}\,dy = -\frac{2KL}{r_c^2 \ln (R_e/r_w)}\,dt \tag{3}$$

which can be integrated to

$$\ln y = -\frac{2KLt}{r_c^2 \ln (R_e/r_w)} + \text{constant} \tag{4}$$

Applying this equation between limits y_0 at $t = 0$ and y_t at t and solving for K yield

$$K = \frac{r_c^2 \ln (R_e/r_w)}{2L}\,\frac{1}{t}\,\ln \frac{y_0}{y_t} \tag{5}$$

This equation enables K to be calculated from the rise of the water level in the well after suddenly removing a slug of water from the well. Since K, r_c, r_w, R_e, and L in (5) are constants, $(1/t)\ln y_0/y_t$ must also be constant. Thus field data should yield a straight line when they are plotted as $\ln y_t$ versus t. The term $(1/t)\ln y_0/y_t$ in (5) is then obtained from the best-fitting straight line in a plot of $\ln y$ versus t (see the example). The value of $\ln R_e/r_w$ is dependent on H, D, L, and r_w and can be evaluated from the analog results presented in the next section. The transmissibility T of the aquifer is calculated by multiplying (5) by the thickness D of the aquifer or

$$T = \frac{Dr_c^2 \ln (R_e/r_w)}{2L}\,\frac{1}{t}\,\ln \frac{y_0}{y_t} \tag{6}$$

This equation is based on the assumption that the aquifer is uniform with depth.

Equations (5) and (6) are dimensionally correct. Thus K and T are expressed in the same units as the length and time parameters in the equations.

EVALUATION OF R_e

Values of R_e, expressed as $\ln R_e/r_w$, were determined with an electrical resistance network analog for different values of r_w, L, H, and D (Figure 1), using the same assumptions as those for (1). An axisymmetric sector of 1 rad was simulated by a network of electrical resistors. The vertical distance between the nodes was constant, but the radial distance between nodes increased with increasing distance from the center line (Figure 2). This yielded a network with the highest node density near the well, where the head loss was greatest, and a decreasing node density toward the outer reaches of the system. For a more detailed discussion of graded networks for representing axisymmetric flow systems, see *Liebmann* [1950] and *Bouwer* [1960].

The radial extent of the medium represented on the analog was more than 60,000 times the largest r_w value used in the analyses. Thus the radial extent of the analog system was essentially infinite, as evidenced by the fact that a reduction in radial extent by several nodes did not have a measurable effect on the observed value of R_e.

The value of R_e for an infinitely deep aquifer ($D = \infty$) was determined by simulating an impermeable and then an infinitely permeable layer at a certain value of D. If this value of D is taken to be sufficiently large, the flow in the system when the layer at D is taken as being impermeable is only slightly

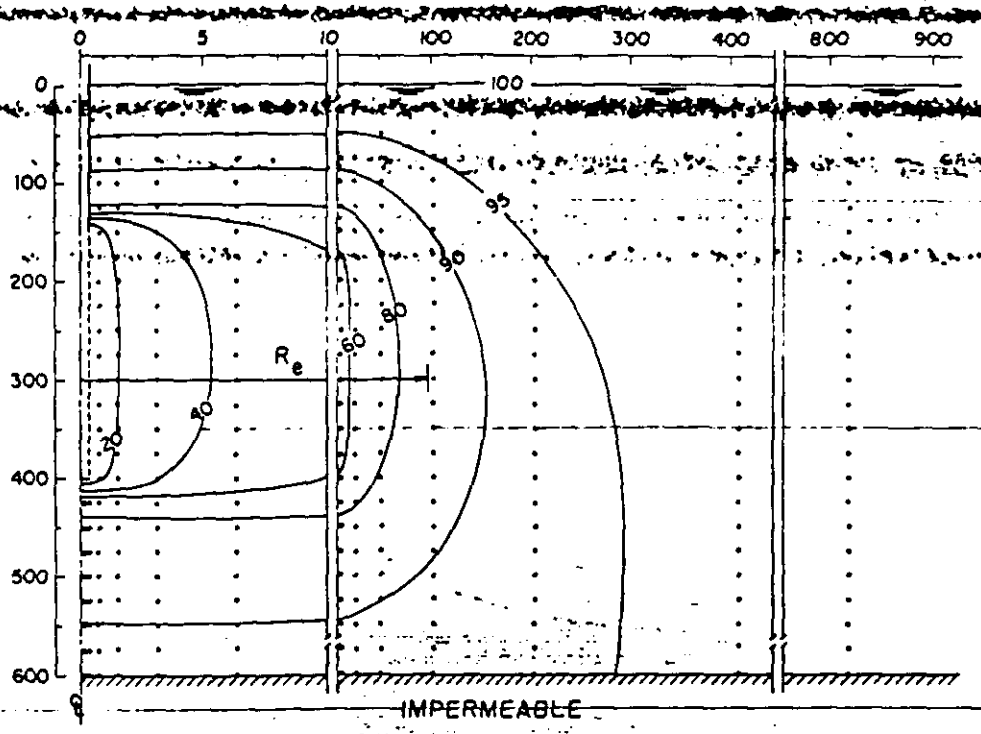

Fig. 2. Node arrangement (dots) for resistance network analog and potential distribution (indicated as percentages on equipotentials) for system with $L/r_w = 625$, $H/r_w = 1000$, and $D/r_w = 1500$. The numbers on the left and at the top of the figure are arbitrary length units (note breaks in horizontal scale).

less than the flow when the layer is taken as being infinitely permeable. The average of the two flows can then be taken as a good estimate of the flow that would occur if the aquifer were represented on the analog as being uniform to infinite depth [*Bouwer*, 1967]. This average flow was used to calculate R_e for $D = \infty$.

The analog analyses were performed by simulating a system with certain values of r_w, H, and D. The electrical current entering the 'well' was then measured for different values of L ranging from near H to near 0. This was repeated for other values of r_w, H, and D. The condition where $L = H$ could not be simulated on the analog because it would mean a short between the water table as the source and the well as the sink. The electrical current flow in the analog was converted to volume per day, and $\ln R_e/r_w$ was evaluated with (1) for each combination of r_w, H, L, and D used in the analog.

For a given geometry described by r_w, H, and D, the current flow Q_i into the simulated well varied essentially linearly with L and could be described by the equation

$$Q_i = mL + n \tag{7}$$

Because of the linearity between Q_i and L the results of the analyses could be extrapolated to the condition $L = H$. The values of m in (7) appeared to vary inversely with $\ln H/r_w$. The values of n varied approximately linearly with $\ln [(D - H)/r_w]$, the slope A and intercept B in these relations being a function of L/r_w. This enabled the derivation of the following empirical equation relating $\ln R_e/r_w$ to the geometry of the system:

$$\ln \frac{R_e}{r_w} = \left[\frac{1.1}{\ln (H/r_w)} + \frac{A + B \ln [(D - H)/r_w]}{L/r_w}\right]^{-1} \tag{8}$$

In this equation, A and B are dimensionless coefficients that are functions of L/r_w, as shown in Figure 3. If $D \gg H$, an increase in D has no measurable effect on $\ln R_e/r_w$. The analog results indicated that the effective upper limit of $\ln [(D - H)/r_w]$ is 6. Thus if D is considered infinity or $(D - H)/r_w$ is so large that $\ln [(D - H)/r_w]$ is greater than 6, a value of 6 should still be used for the term $\ln [(D - H)/r_w]$ in (8). If $D = H$, the term $\ln [(D - H)/r_w]$ in (8) cannot be used. The analog results indicated that for this condition, which is the case of a fully penetrating well, (8) should be modified to

$$\ln R_e/r_w = \left(\frac{1.1}{\ln (H/r_w)} + \frac{C}{L/r_w}\right)^{-1} \tag{9}$$

where C is a dimensionless parameter that is a function of L/r_w as shown in Figure 3.

Equations (8) and (9) yield values of $\ln R_e/r_w$ that are within 10% of the actual value as evaluated by analog if $L > 0.4H$ and within 25% if $L \ll H$ (for example, $L = 0.1H$).

The analog analyses were performed for wells that were closed at the bottom. Occasionally, however, wells with open bottoms were also simulated. The flow through the bottom appeared to be negligible for all values of r_w and L used in the analyses. If L is not much greater than r_w (for example, $L/r_w \ll 4$), the system geometry approaches that of a piezometer cavity [*Bouwer and Jackson*, 1974], in which case the bottom flow can be significant. Equations (8) and (9) can also be used to evaluate $\ln R_e/r_w$ if a portion of the perforated or otherwise open part of the well is isolated with packers for the slug test.

Equipotentials for the flow system around a partially penetrating, partially perforated well in an unconfined aquifer after lowering the water level in the well are shown in Figure 2. The numbers along the symmetry axis and the water table represent arbitrary length units. The numbers on the equipotentials indicate the potential as a percentage of the total head difference between the water table (100%) and the open portion of the well (0%) shown as a dashed line.

The value of R_e for the case in Figure 2 is 96.7 length units. As shown in the figure, this corresponds approximately to the

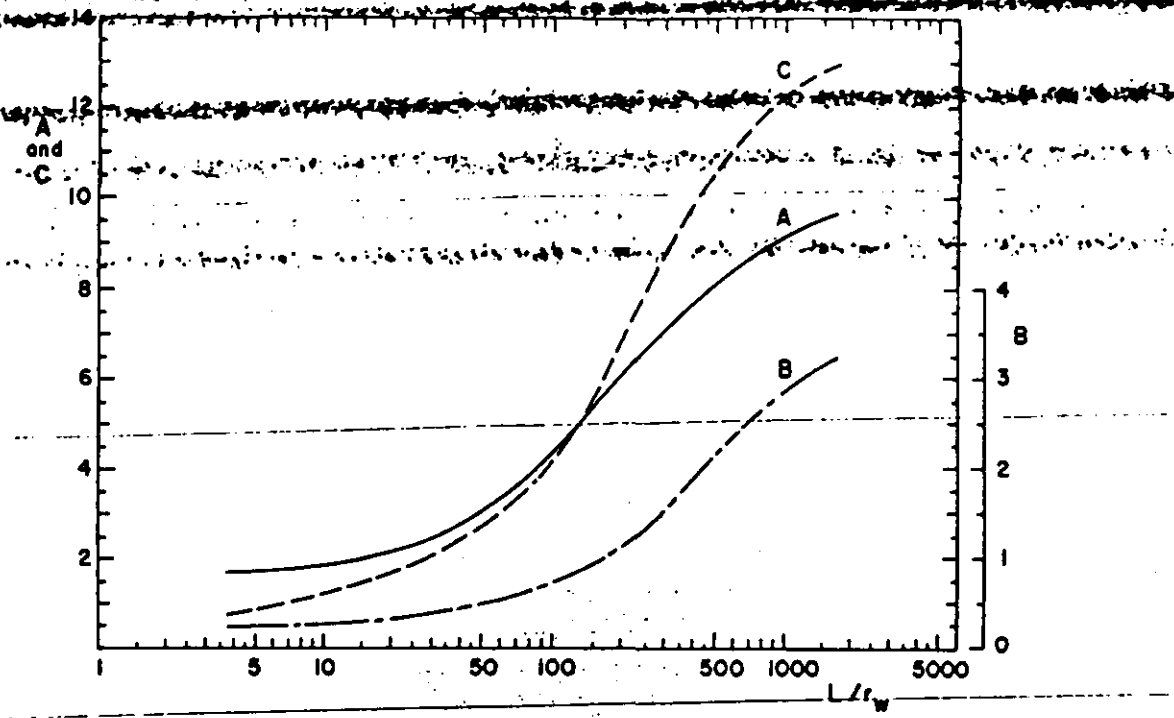

Fig. 3. Curves relating coefficients A, B, and C to L/r_w.

85% equipotential when R_e is laterally extended from the center of the open portion of the well. Thus most of the head loss in the flow system occurs in a cylinder with radius R_e, which is indicative of the horizontal extent of the portion of the aquifer sampled for K or T. The vertical extent is somewhat greater than L, as indicated by, for example, the 80% equipotential in Figure 2.

To estimate the rate of rise of the water level in a well after it is suddenly lowered, (5) can be written as

$$t = \frac{r_c^2}{2KL} \ln \frac{R_e}{r_w} \ln \frac{y_0}{y_t} \tag{10}$$

By taking $y_t = 0.9y_0$, (10) reduces to

$$t_{90\%} = 0.0527 \frac{r_c^2}{KL} \ln \frac{R_e}{r_w} \tag{11}$$

where $t_{90\%}$ is the time that it takes for the water level to rise 90% of the distance to the equilibrium level. By assuming a permeable aquifer with $K = 30$ m/day, a well with $r_c = 0.2$ m and $L = 10$ m, and $\ln (R_e/r_w) = 3$, (11) yields $t_{90\%} = 1.82$ s. Thus if y_0 is taken as 30 cm, it takes 1.8 s for the water level to rise 27 cm, another 1.8 s for the next 2.7 cm (90% of the remaining 3 cm), and another 1.8 s for the next 0.27 cm, or a total of 5.4 s for a rise of 29.97 cm. Measurement of this fast rise requires a sensitive and accurate transducer and a fast-response recorder. The rate of rise can be reduced by allowing groundwater to enter through only a portion of the open section of the well, as can be accomplished with packers.

For a moderately permeable aquifer with, for example, $K = 1$ m/day, a well with $r_c = 0.1$ m and $L = 20$ m, and $\ln (R_e/r_w) = 5$, (11) yields $t = 11.4$ s. In this case, it would take the water level 22.8 s to rise from 30 cm to 0.3 cm below static level.

EXAMPLE

A slug test was performed on a cased well in the alluvial deposits of the Salt River bed west of Phoenix, Arizona. The well, known as the east well, is located about 20 m east of six rapid infiltration basins for groundwater recharge with sewage effluent [*Bouwer*, 1970]. The static water table was at a depth of 3m, $D = 80$ m, $H = 5.5$ m, $L = 4.56$ m, $r_c = 0.076$ m, and r_w was taken as 0.12 m to allow for development of the aquifer around the perforated portion of the casing. A Statham PM131TC pressure transducer was suspended about 1 m below the static water level in the well (when trade names and company names are included, they are for the convenience of the reader and do not imply preferential endorsement of a particular product or company over others by the U.S. Department of Agriculture). A solid cylinder with a volume equivalent to a 0.32-m change in water level in the well was also placed below the water level. When the water level had returned to equilibrium, the cylinder was quickly removed. The transducer output, recorded on a Sargent millivolt recorder, yielded the y-t relationship shown in Figure 4 with y plotted on a logarithmic scale. The straight-line portion is the valid part of the readings. The actual y_0 value of 0.29 m indicated by the straight line is close to the theoretical value of 0.32 m calculated from the displacement of the submerged cylinder.

Extending the straight line in Figure 4 shows that for the arbitrarily selected t value of 20 s, $y = 0.0025$ m. Thus $(1/t) \ln y_0/y_t = 0.238$ s^{-1}. The value of $L/r_w = 38$, for which Figure 3 yields $A = 2.6$ and $B = 0.42$. Substituting these values into (8) and using the maximum value of 6 for $\ln [(D - H)/r_w]$ (since $\ln [(D - H)/r_w]$ for the well exceeds 6) yield $\ln (R_e/r_w) = 2.37$. Equation (5) then gives $K = 0.00036$ m/s $= 31$ m/day. This value agrees with K values of 10 and 53 m/day obtained previously with the tube method on two nearby observation wells [*Bouwer*, 1970]. These K values were essentially point measurements on the aquifer immediately around the well bottoms, which were at depths of 9.1 and 6.1 m, respectively.

COMPARISONS

Piezometer method. The geometry to which (8) and (9) and the coefficients in Figure 3 apply overlaps the geometry of the

piezometer method at the lower values of L/r_w. With the piezometer method a cavity is augered out in the soil below a piezometer tube. The water level in the tube is abruptly lowered, and K of the soil around the cavity is calculated from the rate of rise of the water level in the tube [*Bouwer and Jackson*, 1974]. The equation for K is

$$K = \frac{\pi r_w^2}{A_Y} \frac{1}{t} \ln \frac{y_0}{y_t} \qquad (12)$$

where A_Y is a geometry factor with dimension of length. Values of A_Y were evaluated with an electrolytic tank analog by *Youngs* [1968], whose results were expressed in tabular form as A_Y/r_w for different values of L/r_w (ranging between 0 and 8), $(H - L)/r_w$, and $(D - H)/r_w$.

Taking a hypothetical case where $L/r_w = 8$, $H/r_w = 12$, and $D/r_w = 16$, K calculated with (5) is 18% below K calculated with (12). This is more than the 10% error normally expected with (8) and (9) for the L/H value of 0.67 in this case. The larger discrepancy may be due to the difference in methodology, or to the fact that the L/r_w value is close to the lower limit of the range covered on the resistance network analog.

An approximate equation for calculating K with the piezometer method was presented by *Hvorslev* [1951]. The equation, which is based on the assumptions of an ellipsoidal cavity or well screen and infinite vertical extent (upward and downward) of the flow system, contains a term $[1 + (L/2r_w)^2]^{1/2}$. For most well-slug-test geometries, $L/2r_w$ will be sufficiently large to permit replacement of this term by $L/2r_w$. In that case, however, Hvorslev's equation for Q yields $R_e = L$, which is not true. In reality, R_e is considerably less than L. For example, if $L = 40$ m, $r_w = 0.4$ m, $H = 80$ m, and $D = \infty$, (8) shows that $R_e = 11.9$ m, which is much less than the value of 40 m indicated by Hvorslev's equation. However, since the calculation of K is based on $\ln (R_e/r_w)$ as shown by (5), the error in K is less than the error in R_e (i.e., 36 and 236%, respectively, in this case).

If, for the above example, the top of the well screen or cavity had been taken at the same level as the water table ($H = 40$ m), R_e would have been 8.6 m and Hvorslev's equation would have yielded a K value that is 50% higher than K given by (5). The larger error is probably due to Hvorslev's assumption of infinite vertical (upward) extent of the flow system, which is not met when the cavity is immediately below the water table. Using Hvorslev's equation for cavities immediately below a confining layer would increase the error to 73%, but this, of course, is due to the fact that a water table is not a solid boundary. Hvorslev's equation for the confining layer case can be shown to yield $R_e = 2L$.

Auger hole method. The analog analyses for (8) and (9) and Figure 3 were performed for $L < H$, because short circuiting between the water table and the well prevented simulation of the case where $L = H$. If the analog results are extrapolated to $L = H$, however, the geometry of the system in Figure 1 becomes similar to that of the auger hole technique, for which a number of equations and graphs have been developed to calculate K from the rise of the water level in the well [*Bouwer and Jackson*, 1974]. *Boast and Kirkham* [1971], for example, developed the equation

$$K = C_{BK} \frac{\Delta y}{\Delta t} \qquad (13)$$

where C_{BK} was determined mathematically and expressed in tabular form for various values of L/r_w, $(D - H)/r_w$, and y_0/H. Since the rate of rise of the water level in the hole after

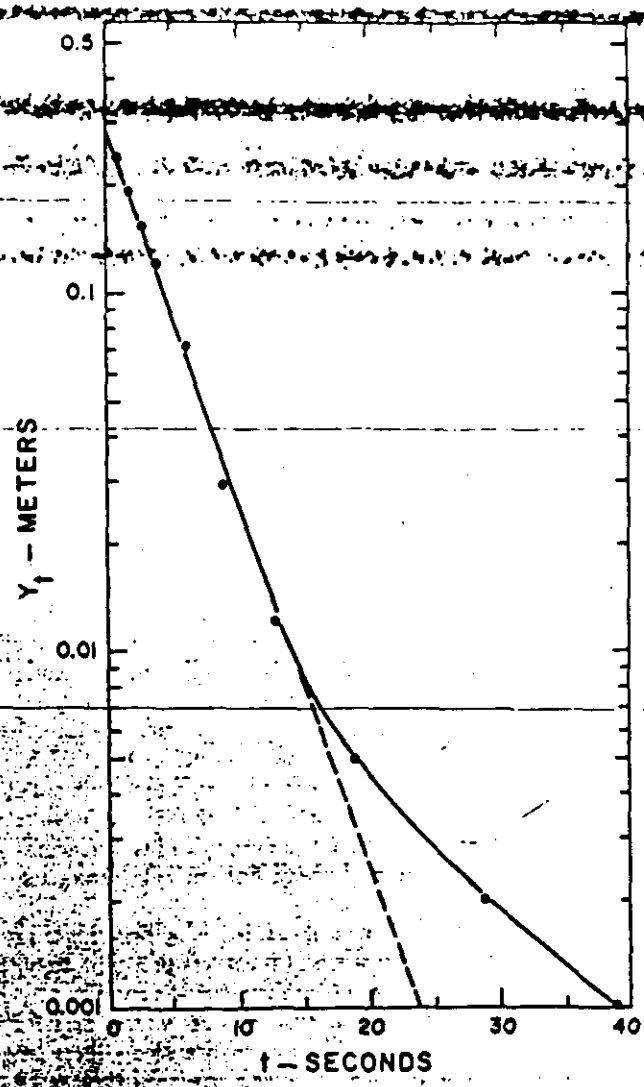

Fig. 4. Plot of y versus t for slug test on east well.

the removal of a slug of water decreases with decreasing y, $\Delta y/\Delta t$ is not a constant and the value of K obtained with this procedure depends on the magnitude of Δy used in the field measurements. The general rule is that Δy should be relatively small.

Taking a hypothetical case where $y_0 = 2.5$ m, $y_t = 2.4$ m, $\Delta t = 10$ s, $L = H = 5$ m, $D = 6$ m, and $r_w = 0.1$ m, (5) yields a K value that is 36% lower than K calculated with (13). However, if y_t is taken as 0.5 m, which should give $\Delta t = 394$ s according to the theory that $(1/t) \ln y_0/y_t$ is constant, the K value yielded by (5) is 26% higher than K obtained with (13). If y_t is taken as 0.9 m, (5) and (13) give identical results.

Slug test on wells in confined aquifers. The confined aquifer for which the slug test by *Cooper et al.* [1967] was developed is an aquifer with an internal water source, for example, recharge through aquitards or compression of confining layers or other material. This situation is similar to that of the unconfined aquifer presented in this paper because the water table is considered horizontal, like the upper boundary of a confined aquifer, and the water table is a plane source. Thus K or T calculated with (5) or (6) should be of the same order as K calculated with the procedure of *Cooper et al.* [1967], which involves plotting the rise of the water level in the well and finding the best fit on a family of type curves. *Cooper et al.* [1967] presented an example of the calculation of T for a well

with $r_c = 0.076$ and $r_w = 0.10$ m. The resulting value of T was 45.8 m²/day. Values of D and H for this well were not given. However, since the well was 122 m deep and completely penetrating (at least theoretically), D and H must have been between 98 and 122 m. Assuming that both D and H were 100 m, (6) yields $T = 62.8$ m²/day, which is compatible with T obtained by Cooper et al.

CONCLUSIONS

The hydraulic conductivity of an aquifer near a well can be calculated from the rise of the water level in the well after a slug of water is suddenly removed. The calculation is based on the Thiem equation, using an effective radius R_e for the distance over which the head difference between the equilibrium water table in the aquifer and the water level in the well is dissipated. Values of R_e were evaluated by electrical resistance network analog. An empirical equation was then developed to relate R_e to the geometry of the system. This equation is accurate to within 10–25%, depending on how much of the well below the water table is perforated or otherwise open. The technique is applicable to partially or completely penetrating wells in unconfined aquifers. It can also be used to estimate the hydraulic conductivity of confined aquifers that receive water from the upper confining layer through recharge or compression.

The vertical distance between the rising water level in the well and the equilibrium water table in the aquifer must yield a straight line when it is plotted on a logarithmic scale against time. This can be used to check the validity of field measurements and to obtain the best-fitting line for calculating the hydraulic conductivity. Permeable aquifers produce rapidly rising water levels that can be measured with fast-response pressure transducers and strip chart recorders or x-y plotters. The portion of the aquifer sampled for hydraulic conductivity with the slug test is approximately a cylinder with radius R_e and a height somewhat larger than the perforated or otherwise open section of the well.

Hydraulic conductivity values obtained with the proposed slug test are compatible with those yielded by the auger hole and piezometer techniques where the geometries of the systems overlap, and by a slug test for completely penetrating wells in confined aquifers.

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The Bouwer and Rice Slug Test — An Update[a]

by Herman Bouwer[b]

ABSTRACT

The Bouwer and Rice slug test was developed to measure aquifer hydraulic conductivity around boreholes (production, monitoring, or test wells). The wells can be partially penetrating and partially screened, perforated, or otherwise open. The slug test can be based on quickly withdrawing a volume of water from the well and measuring the subsequent rate of rise of the water level in the well, or by adding a slug of water and measuring the subsequent rate of fall of the water level in the well. While originally developed for unconfined aquifers, the method can also be used for confined or stratified aquifers if the top of the screen or perforated section is some distance below the upper confining layer. Anomalies ("double straight line effect") sometimes observed in the measured rate of rise of the water level in the well are attributed to drainage of a gravel pack or developed zone around the well following lowering of the water level. The effect of this drainage can be eliminated by ignoring the early data points and using the second straight line portion in the data plot for calculation of hydraulic conductivity. The method is applicable to any diameter and depth of the borehole, provided that the dimensions of the system are covered by the ranges for which the geometry factor R_e has been worked out. The smaller the diameter of the hole, however, the more vulnerable the results will be to aquifer heterogeneities and to inaccuracies in estimating effective well diameters. Computer programs for rapid processing of the field data have been developed.

INTRODUCTION

The slug test developed by Bouwer and Rice (1976) permits the measurement of saturated hydraulic conductivity (K) of aquifer materials with a single well. The method consists of quickly lowering or raising the water level in a well or borehole from equilibrium and measuring its subsequent rate of rise or fall, respectively. The method was designed to measure K of the aquifer around the screen or otherwise open portion of the well for fully or partially penetrating wells in unconfined aquifers. Because of its simplicity, the Bouwer and Rice slug test has become a frequently used tool in ground-water investigations. This paper addresses some of the experiences obtained with the method, including the validity of falling level tests, use of the method in confined aquifers, effect of draining gravel packs on the rise of the water level, effect of hole diameter, and computer processing of field data.

METHODOLOGY

Geometry and symbols of a slug tested well are shown in Figure 1. The rate of flow of ground water into the well when the water level in the well is a distance y lower than the static ground-water table around the well is calculated with the Thiem equation as

$$Q = 2\pi K L_e \frac{y}{\ln(R_e/r_w)} \qquad (1)$$

where Q = volume rate of flow into well;
K = hydraulic conductivity of aquifer around well;
L_e = length of screened, perforated, or otherwise open section of well; y = vertical difference between water level inside well and static water table outside

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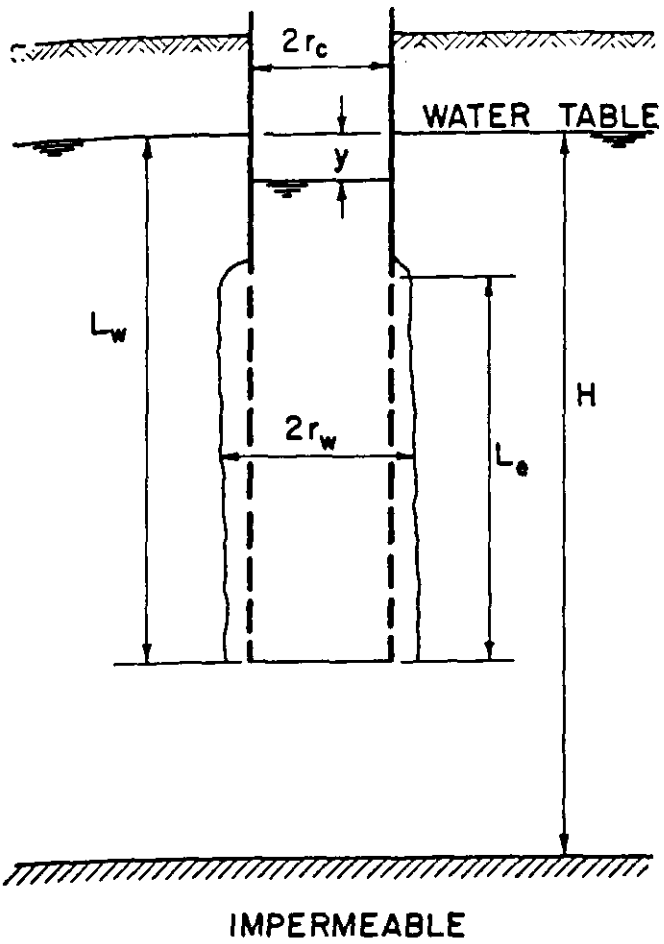

Fig. 1. Geometry and symbols for slug test on partially penetrating, partially screened well in unconfined aquifer with gravel pack and/or developed zone around screen.

well; R_e = effective radial distance over which y is dissipated; and r_w = radial distance of undisturbed portion of aquifer from centerline.

Values of R_e were determined with an electrical resistance network analog for different values of r_w, L_e, L_w, and H (see Figure 1 for meaning of geometry symbols). The value of r_w is the radius of the screened or open section of the well plus the thickness of a sand or gravel pack and/or of the developed zone around the well. Thus, r_w is the radial distance from the center of the well to normal K of the aquifer. Because the thickness of the developed zone is almost never known, the tendency is to ignore it and take only gravel or sand packs into account.

The rate of rise dy/dt of the water level in the well after the water level has been quickly lowered some distance is

$$\frac{dy}{dt} = -\frac{Q}{\pi r_c^2} \qquad (2)$$

where r_c is the radius of the casing or other section of the well where the rise of the water level is measured. If the water level rises in the screened or open section of the well with a gravel pack around it, the thickness and porosity of the gravel envelope should be taken into account when calculating the equivalent value of r_c for the rising water level. This calculation is based on the total free-water surface area in the well and sand or gravel pack, calculated as $\pi r_c^2 + \pi(r_w^2 - r_c^2)n$, where n is the porosity, and $r_w - r_c$ is the thickness of the envelope. The equivalent radius of a circle giving this total area is then calculated as $[(1-n)r_c^2 + nr_w^2]^{1/2}$. For example, if the radius of the screen or perforated casing is 20 cm and there is 8 cm gravel pack with a porosity of 30 percent, r_c should be taken as 25.9 cm, while r_w is 28 cm.

Solving equation (2) for Q, equating the resulting expression to equation (1), integrating, and solving for K yields

$$K = \frac{r_c^2 \ln(R_e/r_w)}{2L_e} \frac{1}{t} \ln \frac{y_0}{y_t} \qquad (3)$$

where y_0 = y at time zero; and y_t = y at time t.

The results of the analog analyses to evaluate R_e for various system geometries were expressed in terms of the dimensionless ratio $\ln(R_e/r_w)$. The data could be fitted into two equations, one for the case where $L_w < H$, and one where $L_w = H$. The resulting equations were, respectively,

$$\ln \frac{R_e}{r_w} = \left[\frac{1.1}{\ln(L_w/r_w)} + \frac{A + B\ln[(H-L_w)/r_w]}{L_e/r_w}\right]^{-1} \qquad (4)$$

and

$$\ln \frac{R_e}{r_w} = \left[\frac{1.1}{\ln(L_w/r_w)} + \frac{C}{L_e/r_w}\right]^{-1} \qquad (5)$$

where A, B, and C are dimensionless numbers plotted in Figure 2 as a function of L_e/r_w.

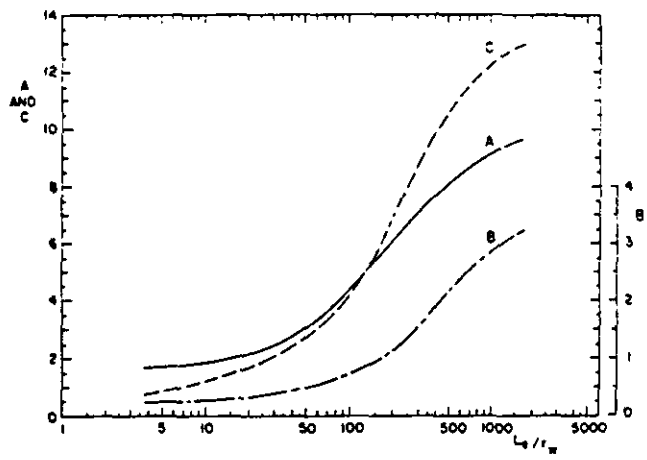

Fig. 2. Dimensionless parameters A, B, and C as a function of L_e/r_w for calculation of $\ln(R_e/r_w)$.

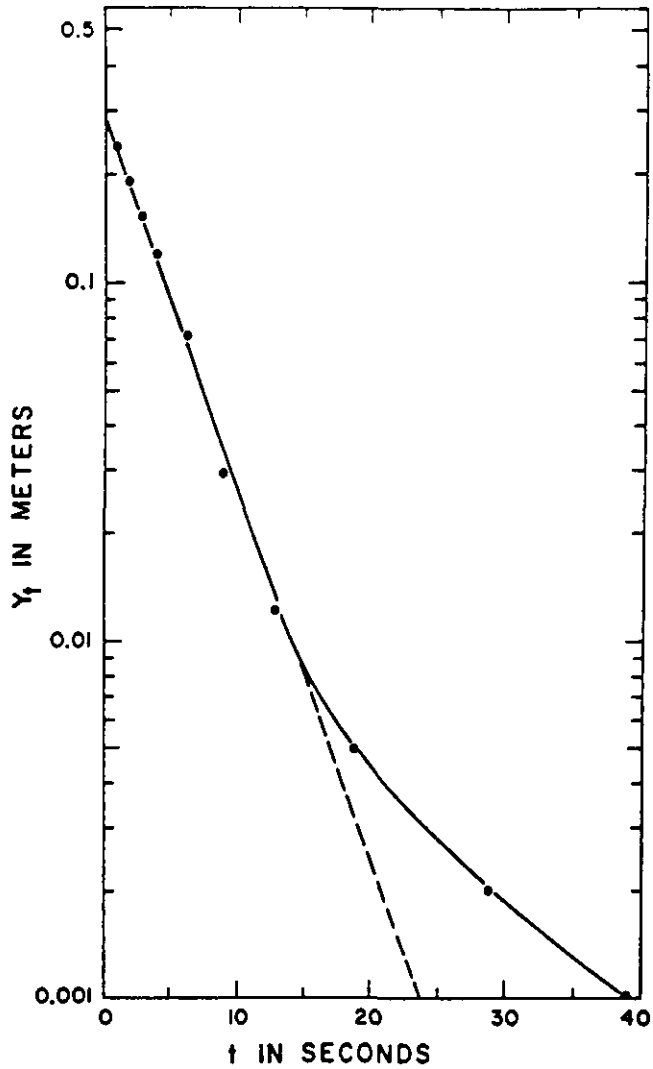

Fig. 3. Graph of log y_t versus t for slug test on well in Salt River Bed, 27th Avenue, Phoenix, Arizona.

Because y and t are the only variables in equation (3), a plot of ln y_t versus t must show a straight line. Thus, instead of calculating K on the basis of two measurements of y and t (y_0 at t = 0 and y_t at t), a number of y and t measurements can be taken and $[\ln(y_0/y_t)]/t$ determined as the slope of the best-fitting line through the y versus t points on semilogarithmic paper (Figure 3). The straight line through the data points can also be used to select two values of y, namely, y_0 and y_t, along with the time interval t between them for substitution into equation (3). Because drawdown of the ground-water table around the well becomes increasingly significant as the test progresses, the points as in Figure 3 begin to deviate from the straight line for large t and small y. Thus, only the straight line portion of the data points should be used to evaluate $[\ln(y_0/y_t)]/t$ for calculation of K with equation (3).

The slug test can be used on production wells, test wells, observation wells, and monitoring wells. Objectives for the measurements include characterization of aquifer hydraulic conductivity for modeling, ground-water recharge studies, and ground-water pollution studies. The method is particularly useful in ground-water contamination studies because the slug test can be carried out on the same wells used for ground-water quality monitoring. Also, combining the resulting values of hydraulic conductivity with the porosity of the aquifer and slopes of the ground-water table or piezometric surface permits the prediction of pore-water velocities and, hence, the rate of movement of pollution plumes and transport of contaminants. The slug test can also be useful in determining vertical distribution of hydraulic conductivities in an aquifer system and other spatial variability of hydraulic conductivity in studies of macrodispersion and movement of contaminants.

Over the years, a number of questions and comments about the slug test have been received. These questions and comments are addressed in the following sections.

DOUBLE STRAIGHT LINE EFFECT

Users of the slug test have observed that when plotting log y_t versus t as in Figure 3, they sometimes get a double straight line as shown schematically in Figure 4. The first part (AB) is straight and steep, whereas the next part (BC) is straight and less steep. Then, at point C, the points begin their expected deviation from the straight line as

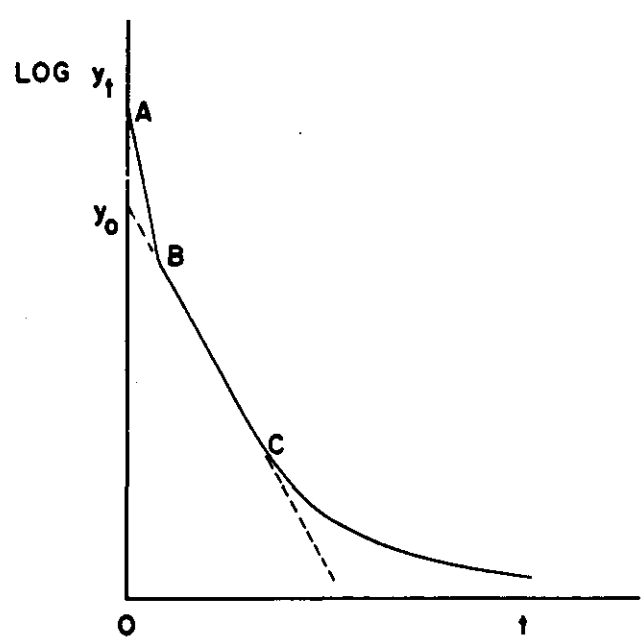

Fig. 4. Schematic of double straight line effect.

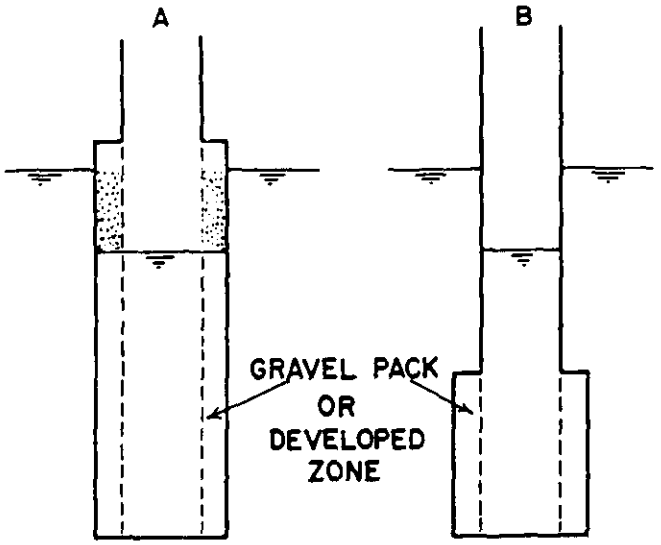

Fig. 5. Slug test for borehole with ground-water level below (A), and above (B) top of screen or perforated section.

the drawdown around the hole becomes significant relative to y_t. The first straight line portion in Figure 4 is probably due to a highly permeable zone around the well (gravel pack or developed zone), which quickly sends water into the well immediately after the water level in the well has been lowered (Figure 5A). Then, when the water level in the permeable zone around the well has drained to the water level in the well itself, the flow into the well slows down and the points begin to form a second, less steep, straight line (BC in Figure 4). This second straight line is more indicative of the flow from the undisturbed aquifer into the well. Hence, segment BC should be used in calculating K of the aquifer with equation (3). In the original 1976 article, gravel envelopes or developed zones were assumed to drain at the same rate as the water level in the borehole when it is lowered for the slug test, i.e., essentially instantaneously. However, some gravel packs or developed zones apparently are not permeable enough to give such instantaneous drainage.

If the ground-water table is above the screened or open section of the borehole, and the water level in the hole is not lowered so far that it drops below the top of the open section (Figure 5B), the gravel envelope or developed zone around the open section cannot drain. The inflow into the hole then is immediately controlled by the aquifer, and the double straight line effect should not occur. If it still occurs, it could indicate leakage around the casing or grouting above the gravel pack.

Where the double straight line is due to a gravel pack around the well, the effective well radius r_w should be taken as the radial distance from the center of the well to the outer surface of the gravel pack. Where the double straight line is due to a naturally developed zone around the well, r_w is harder to evaluate and an "intelligent" estimate must be made. It may also be possible to estimate r_w from the value of y at point B in Figure 4. Considering the volume of water in the well between y_A and y_B in Figure 4 to be due to the drainage of the gravel pack or developed zone, and knowing or estimating the drainable porosity of the gravel pack or developed zone, the radial extent of this zone can be calculated for evaluation of r_w. Capillary fringe effects do not have to be considered, since the capillary fringe was also present in the pack or in the developed zone before the water level was lowered. Because the rising water level in the hole during the slug test will also fill up the drained pore space of the gravel pack or developed zone, the value of r_c in the equation for calculation of K should be adjusted to take this effect into account, as discussed earlier in this article.

Conceivably, a well could have a gravel pack surrounded by a less permeable developed zone before the original aquifer material is reached. This could lead to a triple straight line effect, with an intermediate straight line portion at point B, or a curved transition zone at B if the hydraulic conductivity of the developed zone gradually decreases until K of the original aquifer material is reached. By the same token, portion AB in Figure 4 could also be curved if the hydraulic conductivity of the gravel pack or developed zone immediately around the well decreases with radial distance from the well.

FALLING WATER LEVEL TEST

The slug test was developed for a rising water level in the borehole, as obtained by quick removal of a certain volume or slug of water. This can be achieved by bailing, (quick) pumping, or by immersing a section of pipe filled with sand or other ballast and closed with caps on both ends, or other submersible object, in the borehole, letting the water level in the borehole return to equilibrium, and quickly removing the submerged object. The question is often raised: can the method also be used when a volume of water is quickly added to the hole and the subsequent rate of fall of the water level in the hole is measured for calculation of K? The answer is yes, provided that the equilibrium water level is above the screened or open section of the borehole (Figures 1 and 5B). In this

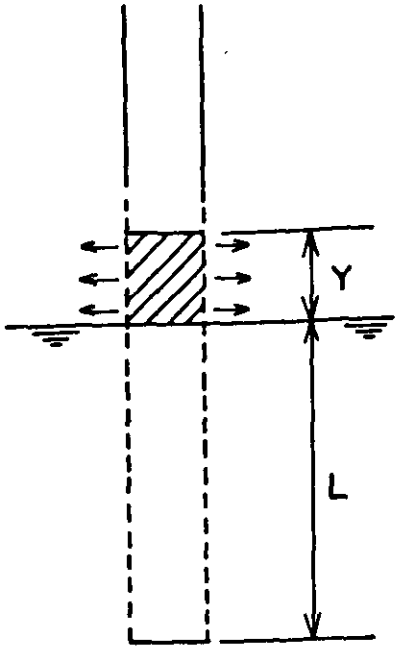

Fig. 5. Schematic of addition of water (hatched section) to borehole with equilibrium water level below top of screen or perforated section, with outflow of water into vadose zone (horizontal arrows).

case, the outflow from the well due to the falling water level occurs only through the screened or open section of the well, and the flow system in the aquifer is a true reverse of the flow system for the rising water level after a slug of water has been removed (ignoring, of course, eventual rises and drawdowns of the ground-water table immediately around the borehole if the aquifer is unconfined). Thus, equations (3), (4), and (5) are also applicable to the addition of a slug of water and measuring the subsequent rate of fall of the water level in the borehole for calculation of K of the aquifer around the hole.

If the equilibrium water level in the borehole is below the top of the screen or open section (Figure 6), and water is added (hatched section in Figure 6), the subsequent flow of water into the aquifer due to the falling water level not only takes place through the screen or perforations below the original water table, but also through the vadose zone above the original water table (arrows in Figure 6). This increases the rate of fall of the water level in the borehole beyond that caused by inflow into the aquifer and leads to an overestimation of K. The greater the ratio of y/L (Figure 6) in this case, the more the slug test will overestimate K if the measurement is based on adding water to the hole and measuring the subsequent rate of fall of the water level.

APPLICATION OF SLUG TEST TO CONFINED AQUIFERS

Theoretically, the slug test (Bouwer and Rice, 1976) applies to aquifers where the upper boundary is a plane source (rising water-level test) or sink (falling water-level test), as in an unconfined aquifer. However, because most of the head difference y between the static water table and the water level in the well is dissipated in the vicinity of the well around the screen or perforated section, the method should also be applicable to situations where the upper boundary of the aquifer is an impermeable or semipermeable plane, i.e., an impermeable or semipermeable upper confining layer. Thus the slug test should also give reasonable values for K in confined, semiconfined, or stratified aquifers. Theoretically, the larger the distance between the top of the screened or open section of the well and the upper confining layer (like $L_w - L_e$ in Figure 1), the more accurate the resulting values of K will be. In actuality, however, source boundaries of ground water flowing into the well in response to lowering the water level are hard to define because of elastic deformation of aquifer material and confining and interbedded fine-textured layers, and because of leakage through semiconfining layers.

EFFECT OF WELL DIAMETER

Theoretically, the Bouwer and Rice slug test applies to any diameter of the borehole. Practically, the hole dimensions should be selected so that the geometry parameters are covered by Figure 2. The larger r_w and L_e (Figure 1), the larger the portion of the aquifer on which K is determined. For layered aquifers, smaller values of L_e may sometimes be preferable because they give more resolution and more information about the vertical distribution of K when the slug test is carried out at different depths. Very small hole diameters (for example 2 in. or 5 cm) should still give accurate values for K, but the values apply to only a small region around the well and, hence, are more sensitive to spatial variability. Also, inaccuracies in the estimates of the thickness of gravel envelopes and developed zones have a greater effect on the calculated values of K where r_c is small than where r_c is large.

PROCESSING OF y VERSUS t MEASUREMENTS

To calculate $1/t \ln(y_0/y_t)$ for the appropriate straight line portion of curves as in Figure 3 or 4, two values of y on the straight line and their

corresponding values of t are read from the graph. The natural logarithm of the ratio y_0/y_t is then taken and divided by the difference between the two values of t. For example, Figure 3 shows that at y is 0.28 m and 0.001 m, t is 0 and 24 seconds, respectively. This yields

$$1/t \ln(y_0/y_t) = 1/24 \ln(0.28/0.001) = 0.23 \text{ m/sec.}$$

If $1/t \ln(y_0/y_t)$ is calculated from the slope of the curve, the number of log cycles on the vertical scale between the two points is divided by the time increment and multiplied by 2.3 to convert to natural logarithm. For example, Figure 3 shows that the straight line from $y_0 = 0.28$ m to $y_t = 0.001$ m covers 2.4 log cycles. The time increment between the two points is again 24 seconds, yielding $1/t \ln(y_0/y_t) = 2.3 \times 2.4/24 = 0.23$ m/sec, which is the same as calculated earlier. Because of different coordinate scales in plots of log y versus t, the value of $1/t \ln(y_0/y_t)$ cannot be taken as the actual slope of the straight line portion!

ESTIMATING RATE OF RISE OR FALL OF WATER LEVEL IN WELL

If the water level in a slug-tested well rises or falls at a relatively slow rate, simple water-level measuring devices and a stop watch may be all that is needed to do the test. Fast-moving water levels, however, require the use of a pressure transducer and a fast-acting x-y plotter. To get some idea about the rate of water-level movement that can be expected in a slug-tested well and what equipment to use, equation (3) can be solved for t and $\ln(y_0/y_t)$ can be taken as ln 10 to calculate the time $t_{90\%}$ required for the water level in the well to rise or fall 90% of the initial lowering or raising, respectively, of the water level in the well. This yields the equation

$$t_{90\%} = 1.15 \frac{r_c^2}{KL_e} \ln \frac{h_0}{h_t} \qquad (6)$$

where K must be taken as the estimated or expected value of K of the aquifer. Equation (6) yields values of t that are 22 times greater than the t values calculated by the $t_{90\%}$ equation in the original article (Bouwer and Rice, 1976), where $\ln(y_0/y_t)$ was erroneously taken as ln 0.9, thus yielding the time required for only 10% of the water-level rise or fall to occur.

COMPUTER PROGRAMS

Where the Bouwer and Rice slug test is routinely used, time for calculating K with equation (3) is saved by developing a computer program in which values of L_e/r_w are stored for direct calculation of $\ln(R_e/r_w)$ and K from the field data. Such programs have been developed by several users (see, for example, Pandit and Miner, 1986; and Kemblowski and Klein, 1988). Also, a number of users have designed forms for easy and systematic recording of field data.

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Kemblowski, M. W. and C. L. Klein. 1988. An automated numerical evaluation of slug test data. Ground Water. v. 26, pp. 435-438.

Pandit, N. S. and R. F. Miner. 1986. Interpretation of slug test data. Ground Water. v. 24, pp. 743-749.

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Herman Bouwer received B.S. and M.S. degrees in 1949 and 1952 in Drainage, Reclamation, and Irrigation from the National Agricultural University at Wageningen, The Netherlands, and a Ph.D. degree in 1955 in Soil and Water Management from Cornell University, New York. He was associated with the Agricultural Engineering Department of Auburn University, Alabama, from 1955 to 1959, before joining the U.S. Water Conservation Laboratory in Phoenix, Arizona, where he became Director in 1972. In 1970, he also was appointed Adjunct Professor at Arizona State University in Tempe where he taught Ground-Water Hydrology in the Geology and Civil Engineering Departments. He is also an Adjunct Professor at the University of Arizona in Tucson.

PHASE I

SLUG TEST RESULTS FOR: B11
Winnebago Reclamation Landfill

WELL INFORMATION

Casing Diameter (in)	2
Effective Casing RADIUS (in)(rc)	1.28
Screen Diameter (in)	2.0
Effective RADIUS (in)(rw)	1.89
Screen Length (ft)(L)	5.0
Aquifer Thickness (ft)(D)	200.0
Well Penetration (ft)(H)	8.75

CALCULATED PARAMETERS

L / rw	31.7
A	2.45
	0.40
C	NA
ln ((D-h)/rw)	7.10
ln (Re / rw) Fully Penetrating	NA
ln (Re / rw)Partially Penetrating	2.27
ln (Re / rw)Partially Penetrating(>6)	2.34
1/t * ln (Yo /Yt)	0.77

RESULTS	FT/MIN	FT/DAY	GPD/SQ.FT	CM/SEC
Hydraulic Conductivity Fully-P	NA	NA	NA	NA
Hydraulic Conductivity Partial-P	1.98E-03	2.85E+00	2.13E+01	1.00E-03
Hydraulic Conductivity Partial-P (>6)	2.04E-03	2.94E+00	2.20E+01	1.04E-03

	SQ.FT/MIN	SQ.FT/DAY	GPD/FT	SQ.M/SEC
Transmissivity Fully-P	NA	NA	NA	NA
Transmissivity Partial-P	3.95E-01	569.2	4257.4	6.12E-04
nsmissivity Partial-P (>6)	4.08E-01	587.8	4396.0	6.32E-04

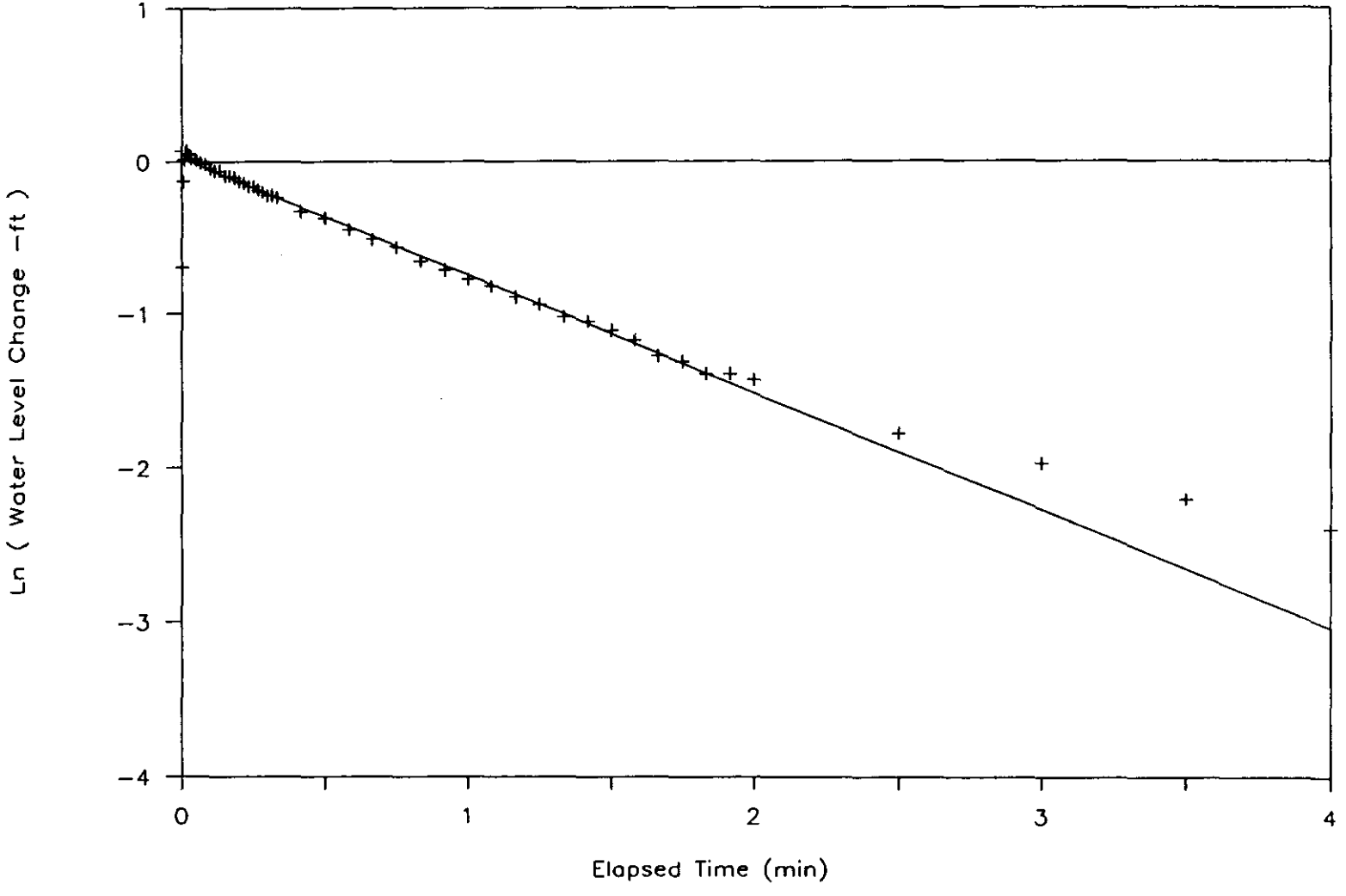
		Time (min)	Well B11 Depth to Water	Water level Change	Natural Log of Water Level Change	REGR LINE CALC.
Regression Output:		0.0000	42.37	1.07	0.068	0.019
Constant	0.019	0.0033	41.80	0.50	-0.693	0.017
Std Err of Y Est	0.020	0.0066	42.18	0.88	-0.128	0.014
R Squared	0.998	0.0099	42.31	1.01	0.010	0.012
No. of Observations	36	0.0133	42.37	1.07	0.068	0.009
Degrees of Freedom	34	0.0166	42.37	1.07	0.068 *	0.007
		0.0200	42.35	1.05	0.049 *	0.004
X Coefficient(s)	-0.7652	0.0233	42.35	1.05	0.049 *	0.001
Std Err of Coef.	0.0057	0.0266	42.34	1.04	0.039 *	-0.001
		0.0300	42.34	1.04	0.039 *	-0.004
		0.0333	42.32	1.02	0.020 *	-0.006
		0.0500	42.31	1.01	0.010 *	-0.019
		0.0666	42.29	0.99	-0.010 *	-0.032
		0.0833	42.28	0.98	-0.020 *	-0.045

Well B11

Time (min)	Depth to Water	Water level Change	Natural Log of Water Level Change	REGR LINE CALC.
0.1000	42.26	0.96	-0.041 *	-0.057
0.1166	42.24	0.94	-0.062 *	-0.070
0.1333	42.24	0.94	-0.062 *	-0.083
0.1500	42.21	0.91	-0.094 *	-0.096
0.1666	42.21	0.91	-0.094 *	-0.108
0.1833	42.20	0.90	-0.105 *	-0.121
0.2000	42.18	0.88	-0.128 *	-0.134
0.2166	42.17	0.87	-0.139 *	-0.147
0.2333	42.15	0.85	-0.163 *	-0.159
0.2500	42.15	0.85	-0.163 *	-0.172
0.2666	42.13	0.83	-0.186 *	-0.185
0.2833	42.12	0.82	-0.198 *	-0.198
0.3000	42.10	0.80	-0.223 *	-0.210
0.3166	42.10	0.80	-0.223 *	-0.223
0.3333	42.09	0.79	-0.236 *	-0.236
0.4167	42.02	0.72	-0.329 *	-0.300
0.5000	41.99	0.69	-0.371 *	-0.363
0.5833	41.94	0.64	-0.446 *	-0.427
0.6667	41.90	0.60	-0.511 *	-0.491
0.7500	41.87	0.57	-0.562 *	-0.555
0.8333	41.82	0.52	-0.654 *	-0.618
0.9167	41.79	0.49	-0.713 *	-0.682
1.0000	41.76	0.46	-0.777 *	-0.746
1.0833	41.74	0.44	-0.821 *	-0.810
1.1670	41.71	0.41	-0.892 *	-0.874
1.2500	41.69	0.39	-0.942 *	-0.937
1.3333	41.66	0.36	-1.022 *	-1.001
1.4166	41.65	0.35	-1.050 *	-1.065
1.5000	41.63	0.33	-1.109 *	-1.129
1.5833	41.61	0.31	-1.171 *	-1.192
1.6667	41.58	0.28	-1.273 *	-1.256
1.7500	41.57	0.27	-1.309 *	-1.320
1.8333	41.55	0.25	-1.386 *	-1.384
1.9167	41.55	0.25	-1.386 *	-1.447
2.0000	41.54	0.24	-1.427	-1.511
2.5000	41.47	0.17	-1.772	-1.894
3.0000	41.44	0.14	-1.966	-2.276
3.5000	41.41	0.11	-2.207	-2.659
4.0000	41.39	0.09	-2.408	-3.041
4.5000	41.38	0.08	-2.526	-3.424
5.0000	41.36	0.06	-2.813	-3.807
5.5000	41.36	0.06	-2.813	-4.189
6.0000	41.35	0.05	-2.996	-4.572
6.5000	41.35	0.05	-2.996	-4.954
7.0000	41.35	0.05	-2.996	-5.337
7.5000	41.35	0.05	-2.996	-5.720
8.0000	41.35	0.05	-2.996	-6.102
8.5000	41.33	0.03	-3.507	-6.485
9.0000	41.33	0.03	-3.507	-6.867
9.5000	41.33	0.03	-3.507	-7.250
10.0000	41.33	0.03	-3.507	-7.632
12.0000	41.32	0.02	-3.912	-9.163
14.0000	41.30	0.00	ERR	
Maximum =	42.37			
Minimum =	41.30			

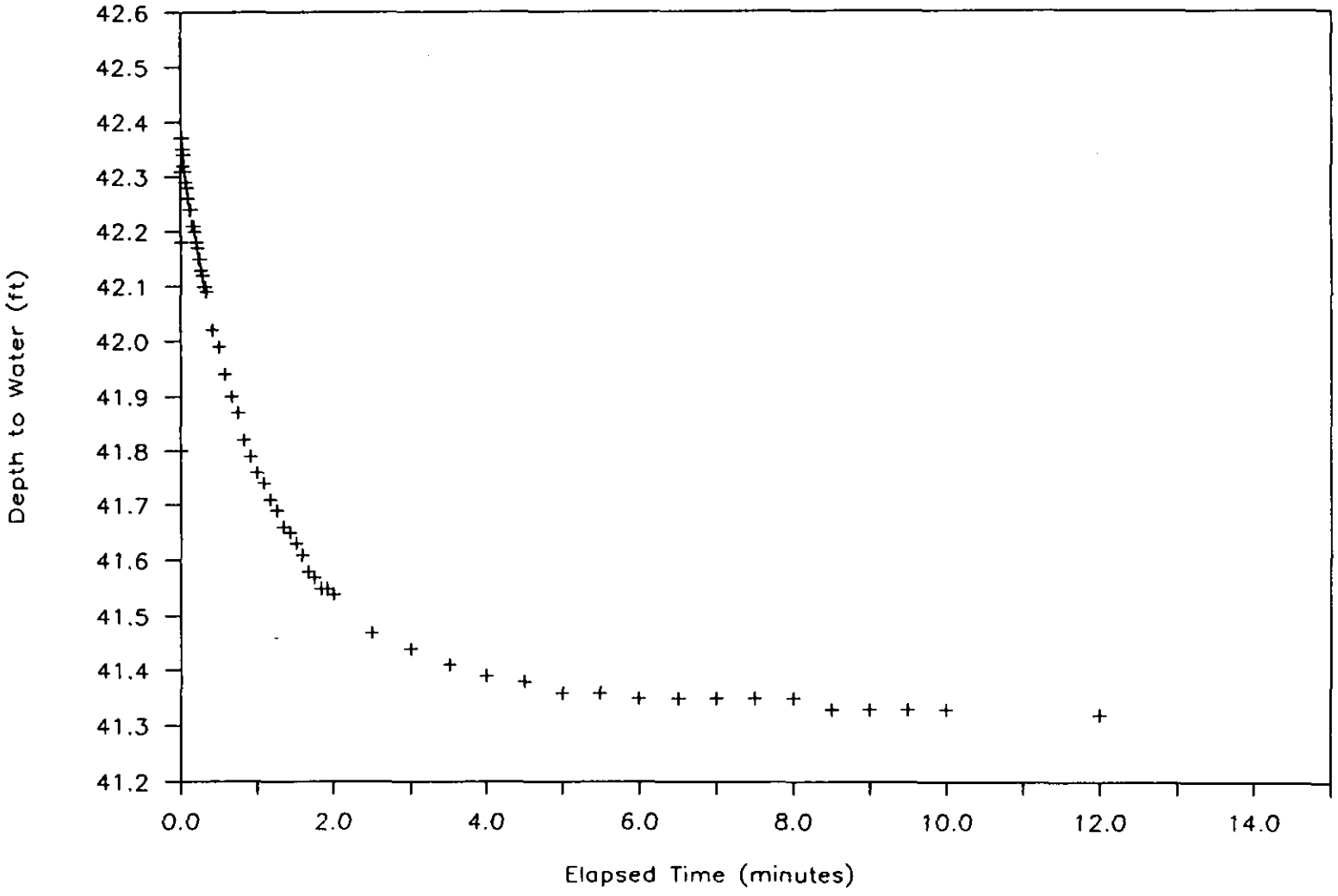
Slug Test for B11

Ln of Recovery vs Elasped Time



Slug Test at B11

Raw Data: Slug Test



SLUG TEST RESULTS FOR: B11A
Winnebago Reclamation Landfill

WELL INFORMATION

Casing Diameter (in)	2
Effective Casing RADIUS (in)(rc)	1.00
Screen Diameter (in)	2.0
Effective RADIUS (in)(rw)	1.89
Screen Length (ft)(L)	5.0
Aquifer Thickness (ft)(D)	200.0
Well Penetration (ft)(H)	36.22

CALCULATED PARAMETERS

L / rw	31.7
A	2.45
B	0.40
C	NA
ln ((D-h)/rw)	6.95
ln (Re / rw) Fully Penetrating	NA
ln (Re / rw)Partially Penetrating	2.72
ln (Re / rw)Partially Penetrating(>6)	2.82
1/t * ln (Yo /Yt)	0.12

RESULTS	FT/MIN	FT/DAY	GPD/SQ.FT	CM/SEC
Hydraulic Conductivity Fully-P	NA	NA	NA	NA
Hydraulic Conductivity Partial-P	2.28E-04	3.28E-01	2.45E+00	1.16E-04
Hydraulic Conductivity Partial-P (>6)	2.35E-04	3.39E-01	2.53E+00	1.20E-04
	SQ.FT/MIN	SQ.FT/DAY	GPD/FT	SQ.M/SEC
Transmissivity Fully-P	NA	NA	NA	NA
Transmissivity Partial-P	4.55E-02	65.5	490.2	7.05E-05
Transmissivity Partial-P (>6)	4.70E-02	67.8	506.7	7.28E-05

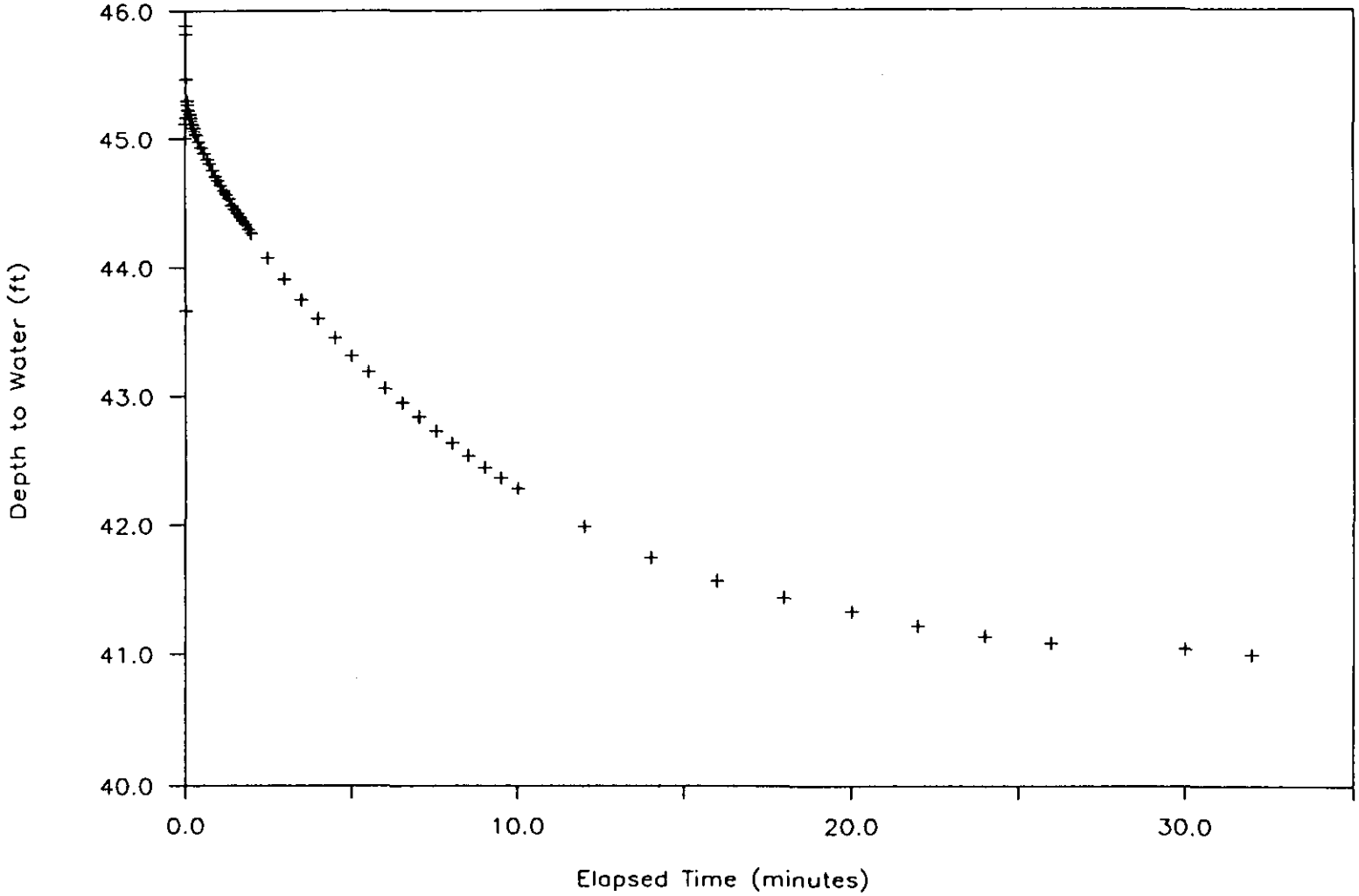
		Time (min)	Depth to Water	Water level Change	Natural Log of Water Level Change	REGR LINE CALC.
Regression Output:		0.0000	5.15	-35.85	ERR	1.444
Constant	1.444	0.0033	5.36	-35.64	ERR	1.444
Std Err of Y Est	0.038	0.0066	49.19	8.19	2.103	1.444
R Squared	0.988	0.0099	43.66	2.66	0.978	1.443
No. of Observations	58	0.0133	43.66	2.66	0.978	1.443
Degrees of Freedom	56	0.0166	45.01	4.01	1.389	1.442
		0.0200	45.82	4.82	1.573	1.442
X Coefficient(s)	-0.1203	0.0233	45.89	4.89	1.587 *	1.442
Std Err of Coef.	0.0018	0.0266	45.47	4.47	1.497 *	1.441
		0.0300	45.17	4.17	1.428 *	1.441
		0.0333	45.12	4.12	1.416 *	1.440
		0.0500	45.30	4.30	1.459 *	1.438
		0.0666	45.27	4.27	1.452 *	1.436
		0.0833	45.23	4.23	1.442 *	1.434

Well B11A Time (min)	Depth to Water	Water level Change	Natural Log of Water Level Change	REGR LINE CALC.
0.1000	45.22	4.22	1.440 *	1.432
0.1166	45.20	4.20	1.435 *	1.430
0.1333	45.19	4.19	1.433 *	1.428
0.1500	45.17	4.17	1.428 *	1.426
0.1666	45.16	4.16	1.426 *	1.424
0.1833	45.14	4.14	1.421 *	1.422
0.2000	45.12	4.12	1.416 *	1.420
0.2166	45.11	4.11	1.413 *	1.418
0.2333	45.11	4.11	1.413 *	1.416
0.2500	45.09	4.09	1.409 *	1.414
0.2666	45.08	4.08	1.406 *	1.412
0.2833	45.06	4.06	1.401 *	1.410
0.3000	46.06	5.06	1.621 *	1.408
0.3166	45.04	4.04	1.396 *	1.406
0.3333	45.03	4.03	1.394 *	1.404
0.4167	44.98	3.98	1.381 *	1.394
0.5000	44.93	3.93	1.369 *	1.384
0.5833	44.89	3.89	1.358 *	1.374
0.6667	44.84	3.84	1.345 *	1.364
0.7500	44.81	3.81	1.338 *	1.354
0.8333	44.76	3.76	1.324 *	1.344
0.9167	44.71	3.71	1.311 *	1.334
1.0000	44.68	3.68	1.303 *	1.324
1.0833	44.64	3.64	1.292 *	1.314
1.1670	44.60	3.60	1.281 *	1.304
1.2500	44.57	3.57	1.273 *	1.294
1.3333	44.54	3.54	1.264 *	1.284
1.4166	44.49	3.49	1.250 *	1.274
1.5000	44.46	3.46	1.241 *	1.264
1.5833	44.43	3.43	1.233 *	1.254
1.6667	44.40	3.40	1.224 *	1.244
1.7500	44.37	3.37	1.215 *	1.234
1.8333	44.34	3.34	1.206 *	1.224
1.9167	44.30	3.30	1.194 *	1.214
2.0000	44.27	3.27	1.185 *	1.204
2.5000	44.08	3.08	1.125 *	1.144
3.0000	43.91	2.91	1.068 *	1.084
3.5000	43.75	2.75	1.012 *	1.023
4.0000	43.60	2.60	0.956 *	0.963
4.5000	43.45	2.45	0.896 *	0.903
5.0000	43.31	2.31	0.837 *	0.843
5.5000	43.19	2.19	0.784 *	0.783
6.0000	43.06	2.06	0.723 *	0.723
6.5000	42.95	1.95	0.668 *	0.663
7.0000	42.84	1.84	0.610 *	0.602
7.5000	42.73	1.73	0.548 *	0.542
8.0000	42.64	1.64	0.495 *	0.482
8.5000	42.54	1.54	0.432 *	0.422
9.0000	42.45	1.45	0.372 *	0.362
9.5000	42.37	1.37	0.315 *	0.302
10.0000	42.29	1.29	0.255 *	0.242
12.0000	41.99	0.99	-0.010	0.001
14.0000	41.75	0.75	-0.288	-0.239
16.0000	41.57	0.57	-0.562	-0.480
18.0000	41.44	0.44	-0.821	-0.721
20.0000	41.33	0.33	-1.109	-0.961
22.0000	41.22	0.22	-1.514	-1.202
24.0000	41.14	0.14	-1.966	-1.442

Well B11A Time (min)	Depth to Water	Water level Change	Natural Log of Water Level Change	REGR LINE CALC.
26.0000	41.09	0.09	-2.408	-1.683
30.0000	41.05	0.05	-2.996	-2.164
32.0000	41.00	0.00	ERR	
Maximum =	49.19			
Minimum =	41			

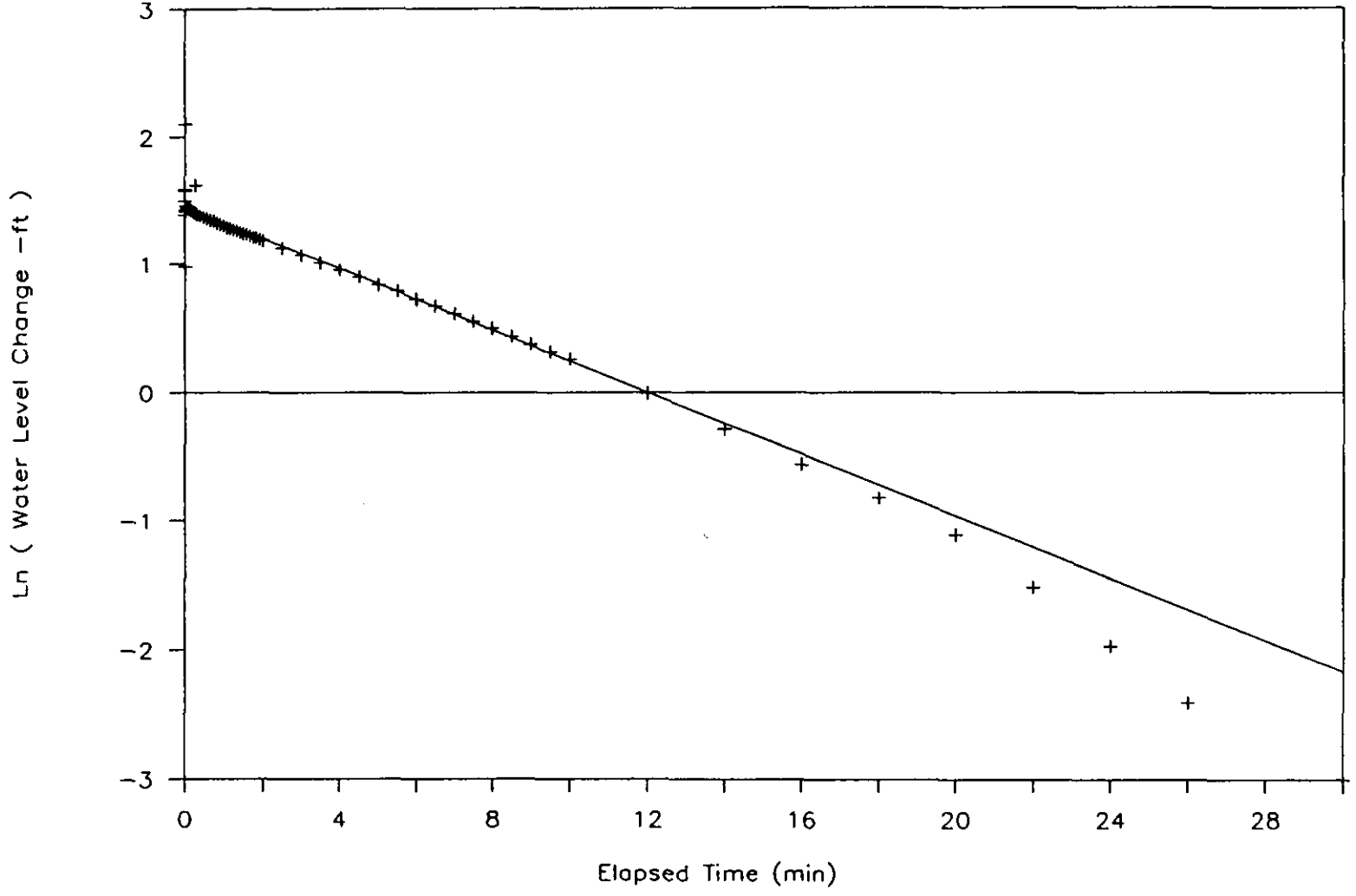
Slug Test at B11A

Raw Data: Slug Test



Slug Test for B11A

Ln of Recovery vs Elasped Time



BAILDOWN TEST RESULTS FOR: B15
Winnebago Reclamation Landfill

WELL INFORMATION

Casing Diameter (in)	2
Effective Casing RADIUS (in)(rc)	1.28
Screen Diameter (in)	2.0
Effective RADIUS (in)(rw)	1.89
Screen Length (ft)(L)	3.1
Aquifer Thickness (ft)(D)	200.0
Well Penetration (ft)(H)	3.14

CALCULATED PARAMETERS

L / rw	19.9
A	2.1
B	0.35
C	NA
ln ((D-h)/rw)	7.13
ln (Re / rw) Fully Penetrating	NA
ln (Re / rw)Partially Penetrating	1.67
ln (Re / rw)Partially Penetrating(>6)	1.73
1/t * ln (Yo /Yt)	231.89

RESULTS	FT/MIN	FT/DAY	GPD/SQ.FT	CM/SEC
Hydraulic Conductivity Fully-P	NA	NA	NA	NA
Hydraulic Conductivity Partial-P	7.02E-01	1.01E+03	7.57E+03	3.57E-01
Hydraulic Conductivity Partial-P (>6)	7.27E-01	1.05E+03	7.83E+03	3.69E-01

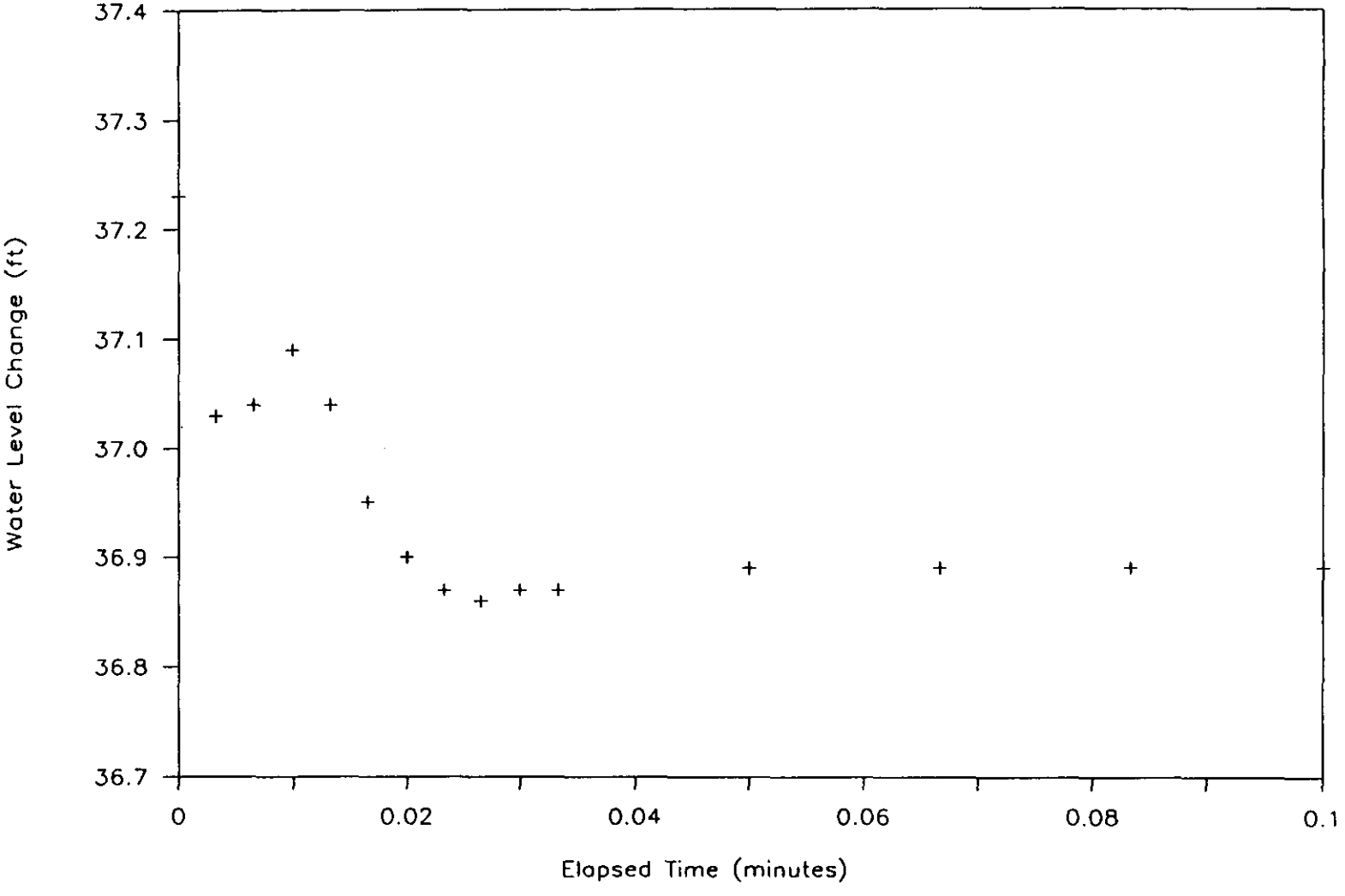
	SQ.FT/MIN	SQ.FT/DAY	GPD/FT	SQ.M/SEC
Transmissivity Fully-P	NA	NA	NA	NA
Transmissivity Partial-P	1.40E+02	202303.2	1513059.5	2.17E-01
Transmissivity Partial-P (>6)	1.45E+02	209248.7	1565005.9	2.25E-01

		Well B15 Time (min)	Depth to Water	Water level Change	Natural Log of Water Level Change	REGR LINE CALC.
Regression Output:		0.0000	37.23	0.37	-0.994	1.171
Constant	1.171	0.0033	37.03	0.17	-1.772	0.406
Std Err of Y Est	0.380	0.0066	37.04	0.18	-1.715	-0.360
R Squared	0.933	0.0099	37.09	0.23	-1.470 *	-1.125
No. of Observations	5	0.0133	37.04	0.18	-1.715 *	-1.913
Degrees of Freedom	3	0.0166	36.95	0.09	-2.408 *	-2.679
		0.0200	36.90	0.04	-3.219 *	-3.467
X Coefficient(s)	-231.8924	0.0233	36.87	0.01	-4.605 *	-4.232
Std Err of Coef.	35.8273	0.0266	36.86	0.00	-4.605	-4.998
		0.0300	36.87	0.01	-4.605	-5.786
		0.0333	36.87	0.01	-4.605	-6.551
		0.0500	36.89	0.03	-3.507	-10.424
		0.0666	36.89	0.03	-3.507	-14.273
		0.0833	36.89	0.03	-3.507	-18.146

Well B15 Time (min)	Depth to Water	Water level Change	Natural Log of Water Level Change	REGR LINE CALC.
0.1000	36.89	0.03	-3.507	-22.018
0.1166	36.89	0.03	-3.507	-25.868
0.1333	36.89	0.03	-3.507	-29.741
0.1500	36.89	0.03	-3.507	-33.613
0.1666	36.89	0.03	-3.507	-37.463
0.1833	36.89	0.03	-3.507	-41.335
0.2000	36.89	0.03	-3.507	-45.208
0.2166	36.89	0.03	-3.507	-49.057
0.2333	36.89	0.03	-3.507	-52.930
0.2500	36.89	0.03	-3.507	-56.802
0.2666	36.89	0.03	-3.507	-60.652
0.2833	36.89	0.03	-3.507	-64.524
0.3000	36.89	0.03	-3.507	-68.397
0.3166	36.89	0.03	-3.507	-72.246
0.3333	36.89	0.03	-3.507	-76.119
0.4167	36.89	0.03	-3.507	-95.459
0.5000	36.89	0.03	-3.507	-114.775
0.5833	36.89	0.03	-3.507	-134.092
0.6667	36.89	0.03	-3.507	-153.432
0.7500	36.89	0.03	-3.507	-172.749
0.8333	36.90	0.04	-3.219	-192.065
0.9167	36.90	0.04	-3.219	-211.405
1.0000	36.90	0.04	-3.219	-230.722
1.0833	36.90	0.04	-3.219	-250.038
1.1670	36.90	0.04	-3.219	-269.448
1.2500	36.90	0.04	-3.219	-288.695
1.3333	36.90	0.04	-3.219	-308.011
1.4166	36.90	0.04	-3.219	-327.328
1.5000	36.90	0.04	-3.219	-346.668
1.5833	36.90	0.04	-3.219	-365.985
1.6667	36.90	0.04	-3.219	-385.324
1.7500	36.90	0.04	-3.219	-404.641
1.8333	36.90	0.04	-3.219	-423.958
1.9167	36.90	0.04	-3.219	-443.297
2.0000	36.90	0.04	-3.219	-462.614
2.5000	36.89	0.03	-3.507	-578.560
3.0000	36.89	0.03	-3.507	-694.507
3.5000	36.89	0.03	-3.507	-810.453
4.0000	36.89	0.03	-3.507	-926.399
4.5000	36.90	0.04	-3.219	
5.0000	36.89	0.03	-3.507	
5.5000	36.89	0.03	-3.507	
6.0000	36.89	0.03	-3.507	
6.5000	36.90	0.04	-3.219	
7.0000	36.90	0.04	-3.219	
7.5000	36.90	0.04	-3.219	
8.0000	36.89	0.03	-3.507	
8.5000	36.90	0.04	-3.219	
9.0000	36.90	0.04	-3.219	
9.5000	36.90	0.04	-3.219	
10.0000	36.90	0.04	-3.219	

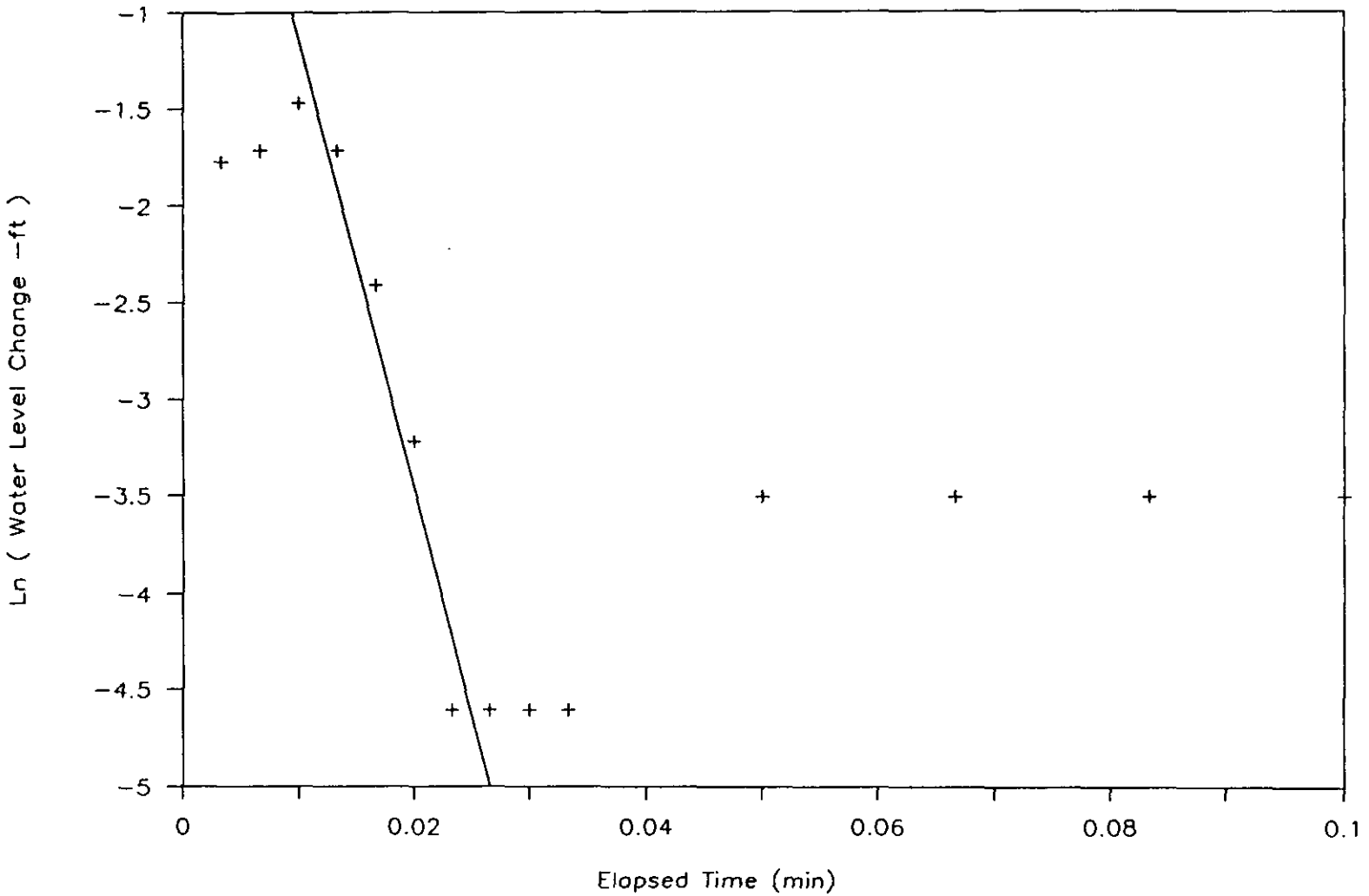
Slug Test at B15

Raw Data: Slug Test



Slug Test for B15

Ln of Recovery vs Elasped Time



SLUG TEST RESULTS FOR: 815P
Winnebago Reclamation Landfill

WELL INFORMATION

Casing Diameter (in)	2
Effective Casing RADIUS (in)(rc)	1.00
Screen Diameter (in)	2.0
Effective RADIUS (in)(rw)	1.89
Screen Length (ft)(L)	5.0
Aquifer Thickness (ft)(D)	200.0
Well Penetration (ft)(H)	29.71

CALCULATED PARAMETERS

L / rw	31.7
A	2.45
B	0.40
C	NA
ln ((D-h)/rw)	6.99
ln (Re / rw) Fully Penetrating	NA
ln (Re / rw)Partially Penetrating	2.67
ln (Re / rw)Partially Penetrating(>6)	2.76
1/t * ln (Yo /Yt)	0.56

RESULTS	FT/MIN	FT/DAY	GPD/SQ.FT	CM/SEC
Hydraulic Conductivity Fully-P	NA	NA	NA	NA
Hydraulic Conductivity Partial-P	1.03E-03	1.49E+00	1.11E+01	5.25E-04
Hydraulic Conductivity Partial-P (>6)	1.07E-03	1.54E+00	1.15E+01	5.43E-04

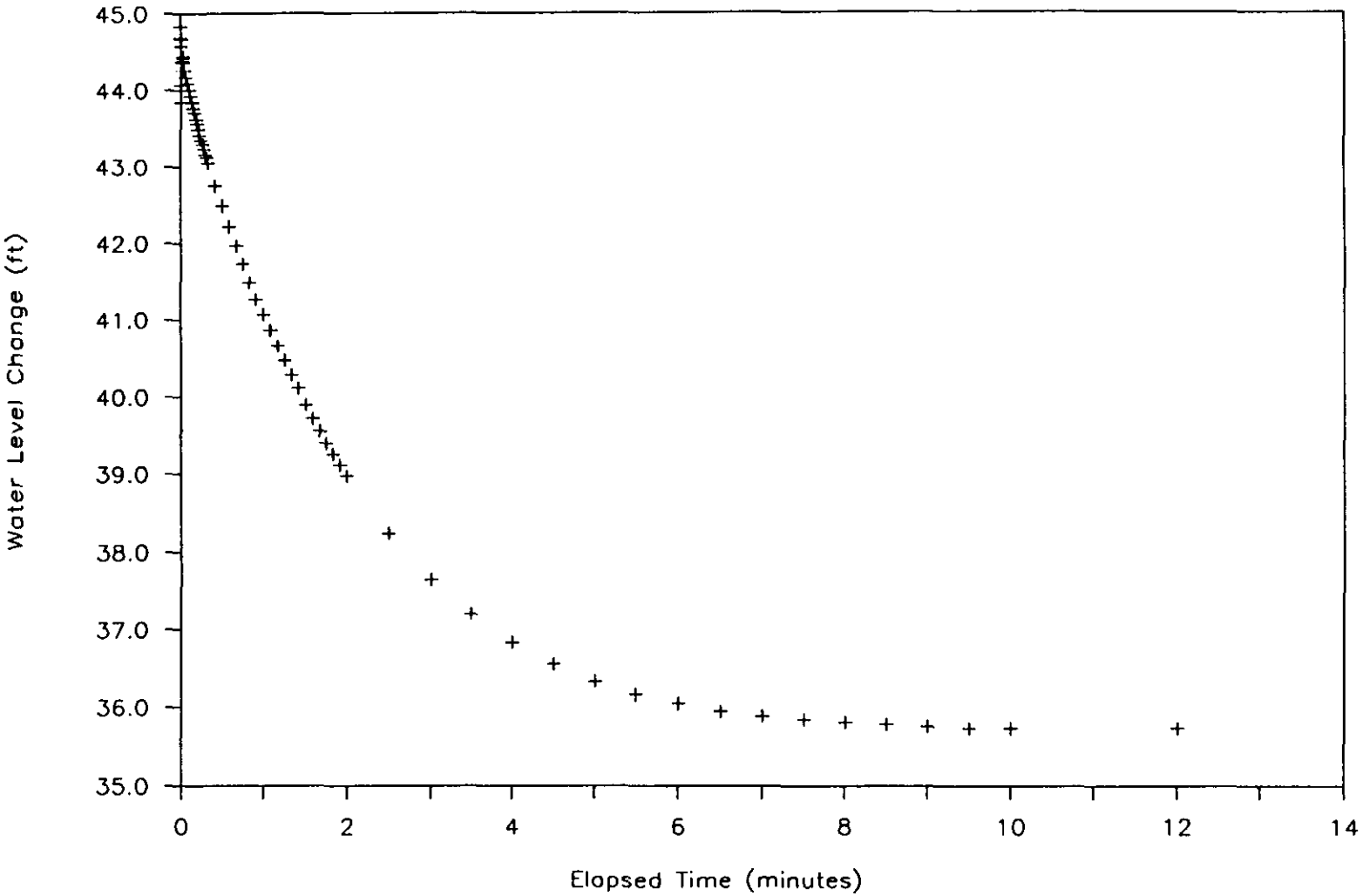
	SQ.FT/MIN	SQ.FT/DAY	GPD/FT	SQ.M/SEC
Transmissivity Fully-P	NA	NA	NA	NA
Transmissivity Partial-P	2.07E-01	297.8	2227.2	3.20E-04
Transmissivity Partial-P (>6)	2.14E-01	308.0	2303.4	3.31E-04

Regression Output:		Time (min)	Depth to Water	Water level Change	Natural Log of Water Level Change	REGR LINE CALC.
		0.0000	44.69	8.99	2.196	2.220
Constant	2.220	0.0033	43.84	8.14	2.097	2.218
Std Err of Y Est	0.083	0.0066	44.06	8.36	2.123	2.216
R Squared	0.997	0.0099	44.58	8.88	2.184	2.215
No. of Observations	61	0.0133	44.83	9.13	2.212 *	2.213
Degrees of Freedom	59	0.0166	44.67	8.97	2.194 *	2.211
		0.0200	44.39	8.69	2.162 *	2.209
X Coefficient(s)	-0.5585	0.0233	44.26	8.56	2.147 *	2.207
Std Err of Coef.	0.0038	0.0266	44.36	8.66	2.159 *	2.205
		0.0300	44.42	8.72	2.166 *	2.203
		0.0333	44.45	8.75	2.169 *	2.202
		0.0500	44.26	8.56	2.147 *	2.192
		0.0666	44.17	8.47	2.137 *	2.183
		0.0833	44.09	8.39	2.127 *	2.174

WELL B15P Time (min)	Depth to Water	Water level Change	Natural Log of Water Level Change	REGR LINE CALC.
0.1000	44.00	8.30	2.116 *	2.164
0.1166	43.92	8.22	2.107 *	2.155
0.1333	43.84	8.14	2.097 *	2.146
0.1500	43.76	8.06	2.087 *	2.136
0.1666	43.70	8.00	2.079 *	2.127
0.1833	43.62	7.92	2.069 *	2.118
0.2000	43.56	7.86	2.062 *	2.108
0.2166	43.49	7.79	2.053 *	2.099
0.2333	43.41	7.71	2.043 *	2.090
0.2500	43.35	7.65	2.035 *	2.081
0.2666	43.30	7.60	2.028 *	2.071
0.2833	43.23	7.53	2.019 *	2.062
0.3000	43.16	7.46	2.010 *	2.053
0.3166	43.12	7.42	2.004 *	2.043
0.3333	43.05	7.35	1.995 *	2.034
0.4167	42.75	7.05	1.953 *	1.987
0.5000	42.49	6.79	1.915 *	1.941
0.5833	42.22	6.52	1.875 *	1.894
0.6667	41.97	6.27	1.836 *	1.848
0.7500	41.73	6.03	1.797 *	1.801
0.8333	41.49	5.79	1.756 *	1.755
0.9167	41.27	5.57	1.717 *	1.708
1.0000	41.07	5.37	1.681 *	1.662
1.0833	40.86	5.16	1.641 *	1.615
1.1670	40.66	4.96	1.601 *	1.568
1.2500	40.47	4.77	1.562 *	1.522
1.3333	40.28	4.58	1.522 *	1.475
1.4166	40.11	4.41	1.484 *	1.429
1.5000	39.90	4.20	1.435 *	1.382
1.5833	39.72	4.02	1.391 *	1.336
1.6667	39.56	3.86	1.351 *	1.289
1.7500	39.40	3.70	1.308 *	1.243
1.8333	39.26	3.56	1.270 *	1.196
1.9167	39.12	3.42	1.230 *	1.150
2.0000	38.98	3.28	1.188 *	1.103
2.5000	38.24	2.54	0.932	0.824
3.0000	37.65	1.95	0.668	0.545
3.5000	37.20	1.50	0.405	0.265
4.0000	36.83	1.13	0.122	-0.014
4.5000	36.55	0.85	-0.163	-0.293
5.0000	36.33	0.63	-0.462	-0.573
5.5000	36.17	0.47	-0.755	-0.852
6.0000	36.05	0.35	-1.050	-1.131
6.5000	35.95	0.25	-1.386	-1.410
7.0000	35.89	0.19	-1.661	-1.690
7.5000	35.84	0.14	-1.966	-1.969
8.0000	35.81	0.11	-2.207	-2.248
8.5000	35.78	0.08	-2.526	-2.527
9.0000	35.76	0.06	-2.813	-2.807
9.5000	35.73	0.03	-3.507	-3.086
10.0000	35.73	0.03	-3.507	-3.365
12.0000	35.73	0.03	-3.507	-4.482

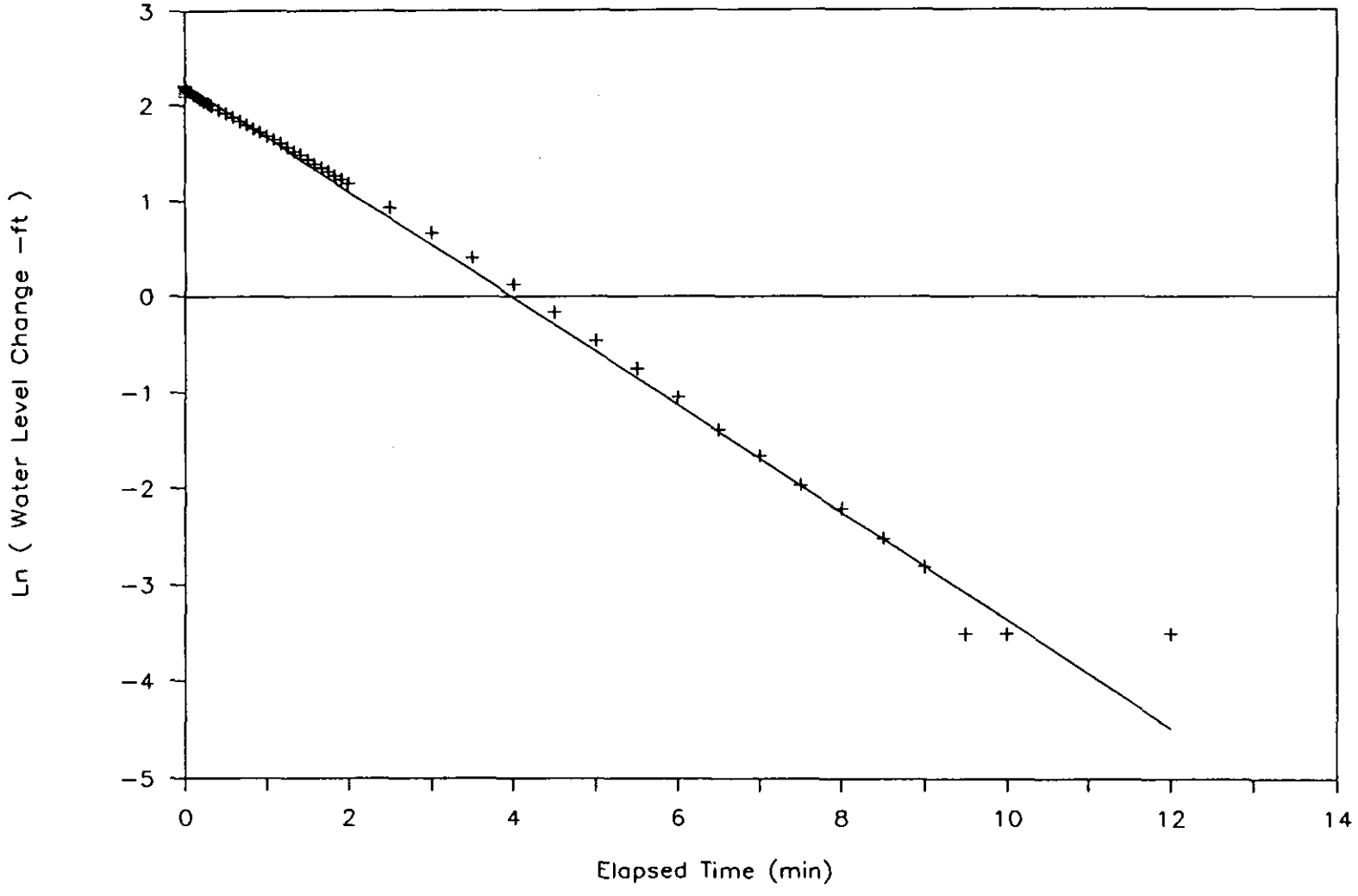
Slug Test at B15P

Raw Data: Slug Test



Slug Test for B15P

Ln of Recovery vs Elasped Time



SLUG TEST RESULTS FOR: B16
Winnebago Reclamation Landfill

WELL INFORMATION

Casing Diameter (in)	2
Effective Casing RADIUS (in)(rc)	1.28
Screen Diameter (in)	2.0
Effective RADIUS (in)(rw)	1.89
Screen Length (ft)(L)	5.0
Aquifer Thickness (ft)(D)	200.0
Well Penetration (ft)(H)	6.61

CALCULATED PARAMETERS

L / rw	31.7
A	2.45
B	0.40
C	NA
ln ((D-h)/rw)	7.34
ln (Re / rw) Fully Penetrating	NA
ln (Re / rw)Partially Penetrating	2.15
ln (Re / rw)Partially Penetrating(>6)	2.24
1/t * ln (Yo /Yt)	0.64

RESULTS	FT/MIN	FT/DAY	GPD/SQ.FT	CM/SEC
Hydraulic Conductivity Fully-P	NA	NA	NA	NA
Hydraulic Conductivity Partial-P	1.56E-03	2.25E+00	1.68E+01	7.93E-04
Hydraulic Conductivity Partial-P (>6)	1.62E-03	2.33E+00	1.74E+01	8.23E-04

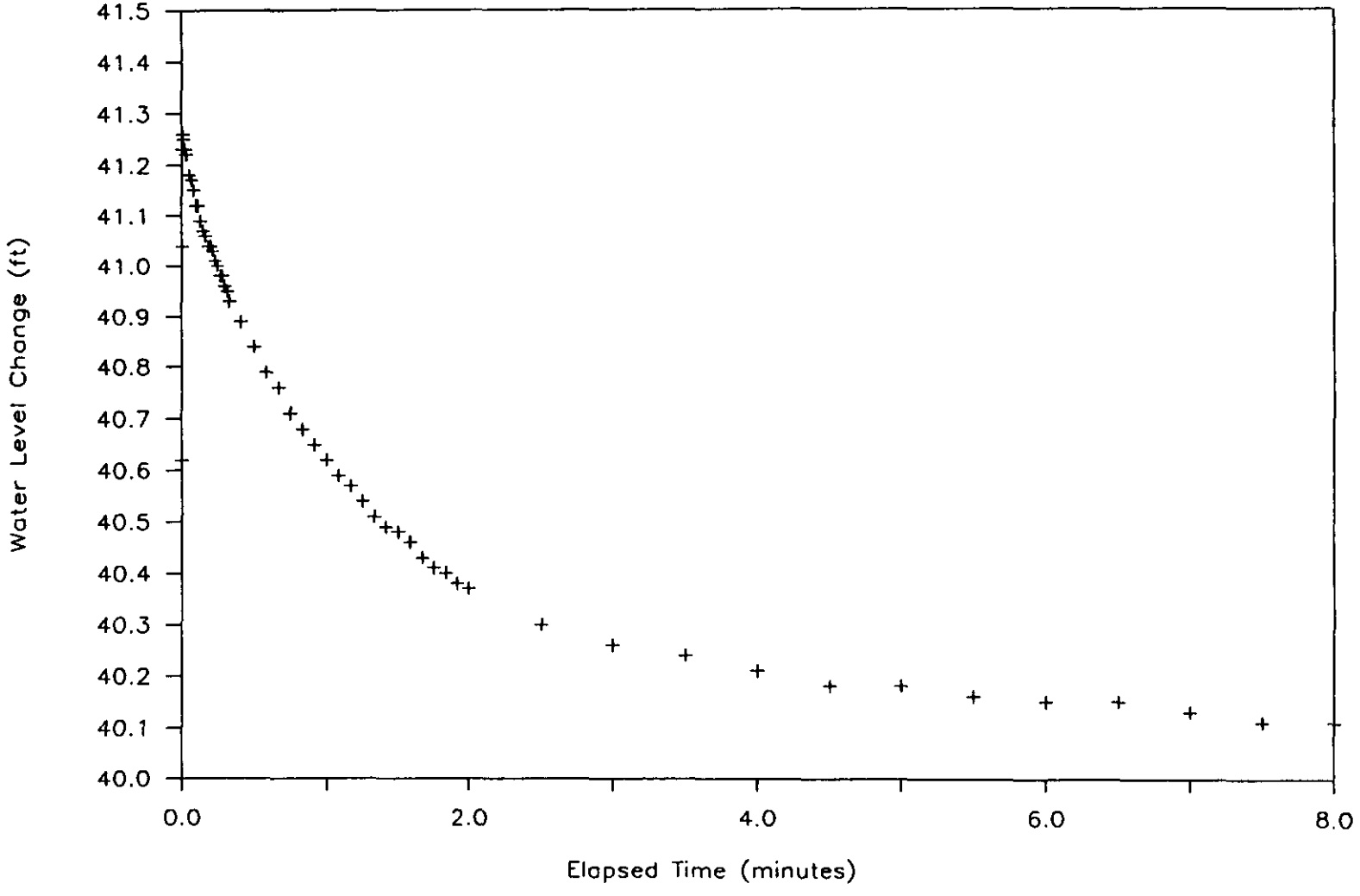
	SQ.FT/MIN	SQ.FT/DAY	GPD/FT	SQ.M/SEC
Transmissivity Fully-P	NA	NA	NA	NA
Transmissivity Partial-P	3.90E-01	561.8	4201.8	6.04E-04
Transmissivity Partial-P (>6)	4.05E-01	583.1	4360.8	6.27E-04

		Time (min)	Depth to Water	Water level Change	Natural Log of Water Level Change	REGR LINE CALC.
Regression Output:		0.0000	40.62	0.52	-0.654	0.049
Constant	0.049	0.0033	41.04	0.94	-0.062	0.047
Std Err of Y Est	0.081	0.0066	41.23	1.13	0.122	0.045
R Squared	0.983	0.0099	41.26	1.16	0.148	0.043
No. of Observations	49	0.0133	41.25	1.15	0.140 *	0.040
Degrees of Freedom	47	0.0166	41.23	1.13	0.122 *	0.038
		0.0200	41.23	1.13	0.122 *	0.036
X Coefficient(s)	-0.6365	0.0233	41.23	1.13	0.122 *	0.034
Std Err of Coef.	0.0122	0.0266	41.22	1.12	0.113 *	0.032
		0.0300	41.22	1.12	0.113 *	0.030
		0.0333	41.22	1.12	0.113 *	0.028
		0.0500	41.18	1.08	0.077 *	0.017
		0.0666	41.17	1.07	0.068 *	0.006
		0.0833	41.15	1.05	0.049 *	-0.004

WELL B16 Time (min)	Depth to Water	Water level Change	Natural Log of Water Level Change	REGR LINE CALC.
0.1000	41.12	1.02	0.020 *	-0.015
0.1166	41.12	1.02	0.020 *	-0.025
0.1333	41.09	0.99	-0.010 *	-0.036
0.1500	41.07	0.97	-0.030 *	-0.047
0.1666	41.06	0.96	-0.041 *	-0.057
0.1833	41.04	0.94	-0.062 *	-0.068
0.2000	41.04	0.94	-0.062 *	-0.078
0.2166	41.03	0.93	-0.073 *	-0.089
0.2333	41.01	0.91	-0.094 *	-0.100
0.2500	41.00	0.90	-0.105 *	-0.110
0.2666	40.98	0.88	-0.128 *	-0.121
0.2833	40.98	0.88	-0.128 *	-0.131
0.3000	40.96	0.86	-0.151 *	-0.142
0.3166	40.95	0.85	-0.163 *	-0.153
0.3333	40.93	0.83	-0.186 *	-0.163
0.4167	40.89	0.79	-0.236 *	-0.216
0.5000	40.84	0.74	-0.301 *	-0.269
0.5833	40.79	0.69	-0.371 *	-0.322
0.6667	40.76	0.66	-0.416 *	-0.375
0.7500	40.71	0.61	-0.494 *	-0.428
0.8333	40.68	0.58	-0.545 *	-0.482
0.9167	40.65	0.55	-0.598 *	-0.535
1.0000	40.62	0.52	-0.654 *	-0.588
1.0833	40.59	0.49	-0.713 *	-0.641
1.1670	40.57	0.47	-0.755 *	-0.694
1.2500	40.54	0.44	-0.821 *	-0.747
1.3333	40.51	0.41	-0.892 *	-0.800
1.4166	40.49	0.39	-0.942 *	-0.853
1.5000	40.48	0.38	-0.968 *	-0.906
1.5833	40.46	0.36	-1.022 *	-0.959
1.6667	40.43	0.33	-1.109 *	-1.012
1.7500	40.41	0.31	-1.171 *	-1.065
1.8333	40.40	0.30	-1.204 *	-1.118
1.9167	40.38	0.28	-1.273 *	-1.171
2.0000	40.37	0.27	-1.309 *	-1.224
2.5000	40.30	0.20	-1.609 *	-1.542
3.0000	40.26	0.16	-1.833 *	-1.861
3.5000	40.24	0.14	-1.966 *	-2.179
4.0000	40.21	0.11	-2.207 *	-2.497
4.5000	40.18	0.08	-2.526	-2.815
5.0000	40.18	0.08	-2.526	-3.134
5.5000	40.16	0.06	-2.813	-3.452
6.0000	40.15	0.05	-2.996	-3.770
6.5000	40.15	0.05	-2.996	-4.088
7.0000	40.13	0.03	-3.507	-4.407
7.5000	40.11	0.01	-4.605	-4.725
8.0000	40.11	0.01	-4.605	-5.043

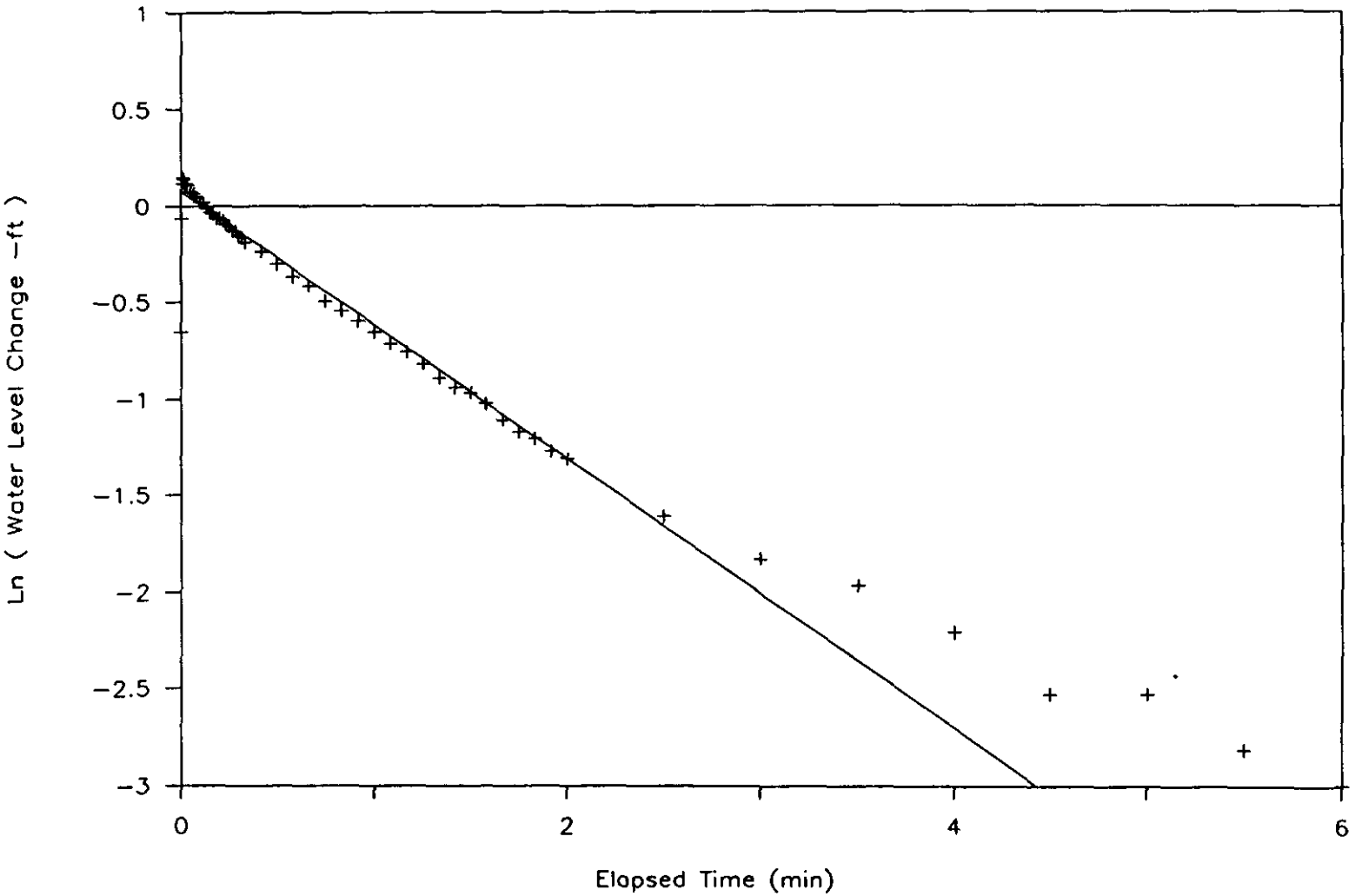
Slug Test at B16

Raw Data: Slug Test



Slug Test for B16

Ln of Recovery vs Elasped Time



SLUG TEST RESULTS FOR: B16A
Winnebago Reclamation Landfill

WELL INFORMATION

Casing Diameter (in)	2
Effective Casing RADIUS (in)(rc)	1.00
Screen Diameter (in)	2.0
Effective RADIUS (in)(rw)	1.89
Screen Length (ft)(L)	5.0
Aquifer Thickness (ft)(D)	200.0
Well Penetration (ft)(H)	29.10

CALCULATED PARAMETERS

L / rw	31.7
A	2.45
B	0.40
C	NA
ln ((D-h)/rw)	6.99
ln (Re / rw) Fully Penetrating	NA
ln (Re / rw)Partially Penetrating	2.66
ln (Re / rw)Partially Penetrating(>6)	2.75
1/t * ln (Yo /Yt)	0.17

RESULTS	FT/MIN	FT/DAY	GPD/SQ.FT	CM/SEC
Hydraulic Conductivity Fully-P	NA	NA	NA	NA
Hydraulic Conductivity Partial-P	3.06E-04	4.41E-01	3.30E+00	1.56E-04
Hydraulic Conductivity Partial-P (>6)	3.17E-04	4.56E-01	3.41E+00	1.61E-04

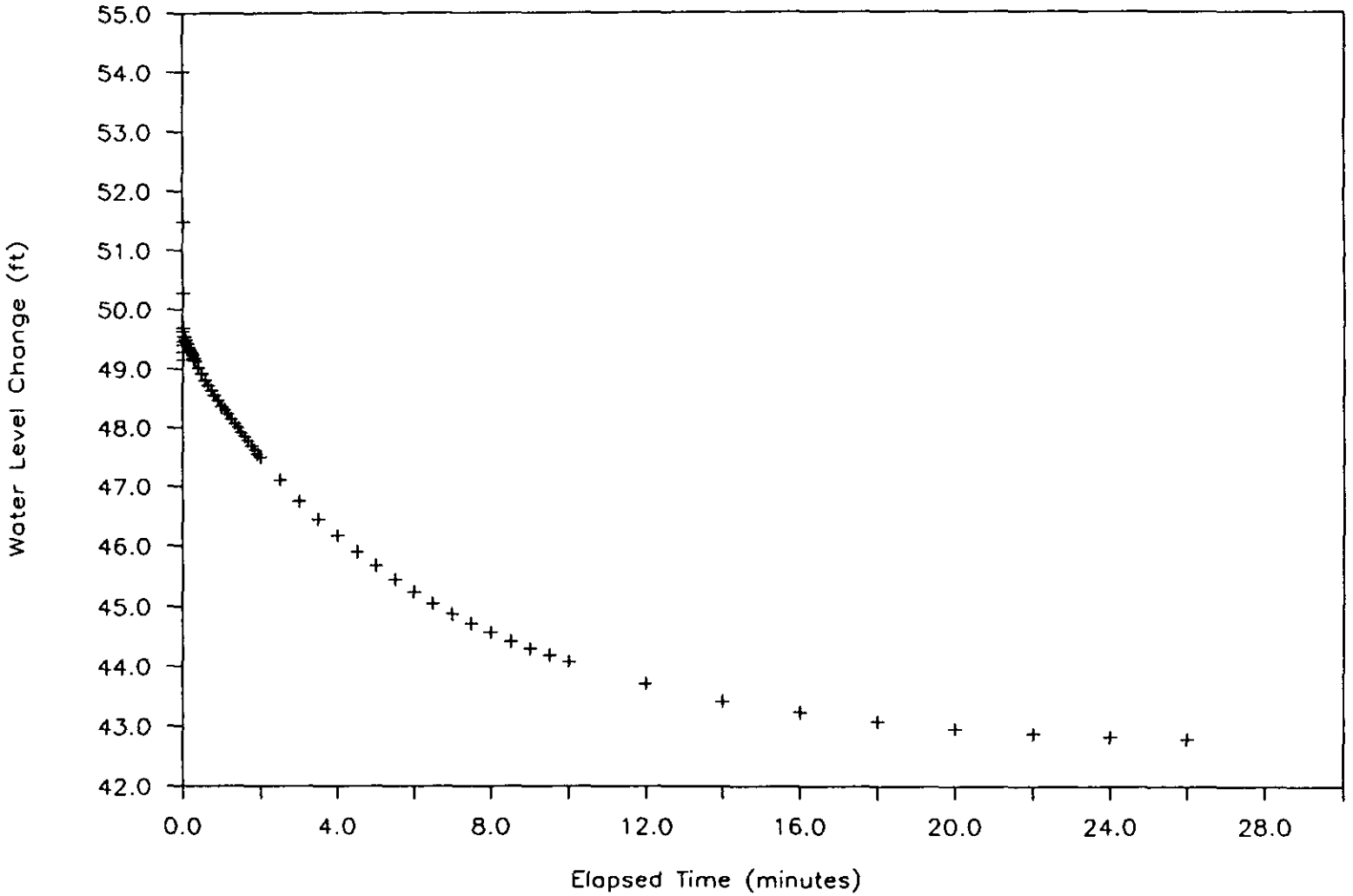
	SQ.FT/MIN	SQ.FT/DAY	GPD/FT	SQ.M/SEC
Transmissivity Fully-P	NA	NA	NA	NA
Transmissivity Partial-P	6.13E-02	88.2	660.0	9.49E-05
Transmissivity Partial-P (>6)	6.34E-02	91.3	682.6	9.81E-05

Regression Output:		Time (min)	Depth to Water	Water level Change	Natural Log of Water Level Change	REGR LINE CALC.
		0.0000	19.72	-23.06	ERR	1.899
Constant	1.899	0.0033	54.02	11.24	2.419	1.899
Std Err of Y Est	0.016	0.0066	51.49	8.71	2.164	1.898
R Squared	0.999	0.0099	50.28	7.50	2.015	1.898
No. of Observations	61	0.0133	49.40	6.62	1.890 *	1.897
Degrees of Freedom	59	0.0166	49.16	6.38	1.853 *	1.897
		0.0200	49.29	6.51	1.873 *	1.896
X Coefficient(s)	-0.1659	0.0233	49.46	6.68	1.899 *	1.896
Std Err of Coef.	0.0007	0.0266	49.63	6.85	1.924 *	1.895
		0.0300	49.70	6.92	1.934 *	1.894
		0.0333	49.68	6.90	1.932 *	1.894
		0.0500	49.55	6.77	1.913 *	1.891
		0.0666	49.54	6.76	1.911 *	1.888
		0.0833	49.49	6.71	1.904 *	1.886

WELL B16A Time (min)	Depth to Water	Water level Change	Natural Log of Water Level Change	REGR LINE CALC.
0.1000	49.48	6.70	1.902 *	1.883
0.1166	49.44	6.66	1.896 *	1.880
0.1333	49.41	6.63	1.892 *	1.877
0.1500	49.38	6.60	1.887 *	1.875
0.1666	49.37	6.59	1.886 *	1.872
0.1833	49.33	6.55	1.879 *	1.869
0.2000	49.32	6.54	1.878 *	1.866
0.2166	49.29	6.51	1.873 *	1.864
0.2333	49.27	6.49	1.870 *	1.861
0.2500	49.24	6.46	1.866 *	1.858
0.2666	49.22	6.44	1.863 *	1.855
0.2833	49.19	6.41	1.858 *	1.852
0.3000	49.18	6.40	1.856 *	1.850
0.3166	49.14	6.36	1.850 *	1.847
0.3333	49.13	6.35	1.848 *	1.844
0.4167	49.02	6.24	1.831 *	1.830
0.5000	48.92	6.14	1.815 *	1.817
0.5833	48.81	6.03	1.797 *	1.803
0.6667	48.72	5.94	1.782 *	1.789
0.7500	48.64	5.86	1.768 *	1.775
0.8333	48.55	5.77	1.753 *	1.761
0.9167	48.47	5.69	1.739 *	1.747
1.0000	48.37	5.59	1.721 *	1.734
1.0833	48.31	5.53	1.710 *	1.720
1.1670	48.23	5.45	1.696 *	1.706
1.2500	48.15	5.37	1.681 *	1.692
1.3333	48.07	5.29	1.666 *	1.678
1.4166	48.00	5.22	1.652 *	1.664
1.5000	47.92	5.14	1.637 *	1.651
1.5833	47.85	5.07	1.623 *	1.637
1.6667	47.78	5.00	1.609 *	1.623
1.7500	47.70	4.92	1.593 *	1.609
1.8333	47.63	4.85	1.579 *	1.595
1.9167	47.55	4.77	1.562 *	1.581
2.0000	47.49	4.71	1.550 *	1.568
2.5000	47.11	4.33	1.466	1.485
3.0000	46.75	3.97	1.379	1.402
3.5000	46.45	3.67	1.300	1.319
4.0000	46.17	3.39	1.221	1.236
4.5000	45.90	3.12	1.138	1.153
5.0000	45.67	2.89	1.061	1.070
5.5000	45.45	2.67	0.982	0.987
6.0000	45.24	2.46	0.900	0.904
6.5000	45.05	2.27	0.820	0.821
7.0000	44.88	2.10	0.742	0.738
7.5000	44.72	1.94	0.663	0.655
8.0000	44.56	1.78	0.577	0.572
8.5000	44.42	1.64	0.495	0.489
9.0000	44.30	1.52	0.419	0.406
9.5000	44.19	1.41	0.344	0.323
10.0000	44.08	1.30	0.262	0.240
12.0000	43.70	0.92	-0.083	-0.091
14.0000	43.41			-0.423
16.0000	43.23			-0.755
18.0000	43.07			-1.087
20.0000	42.96			-1.418
22.0000	42.88			-1.750
24.0000	42.82			-2.082

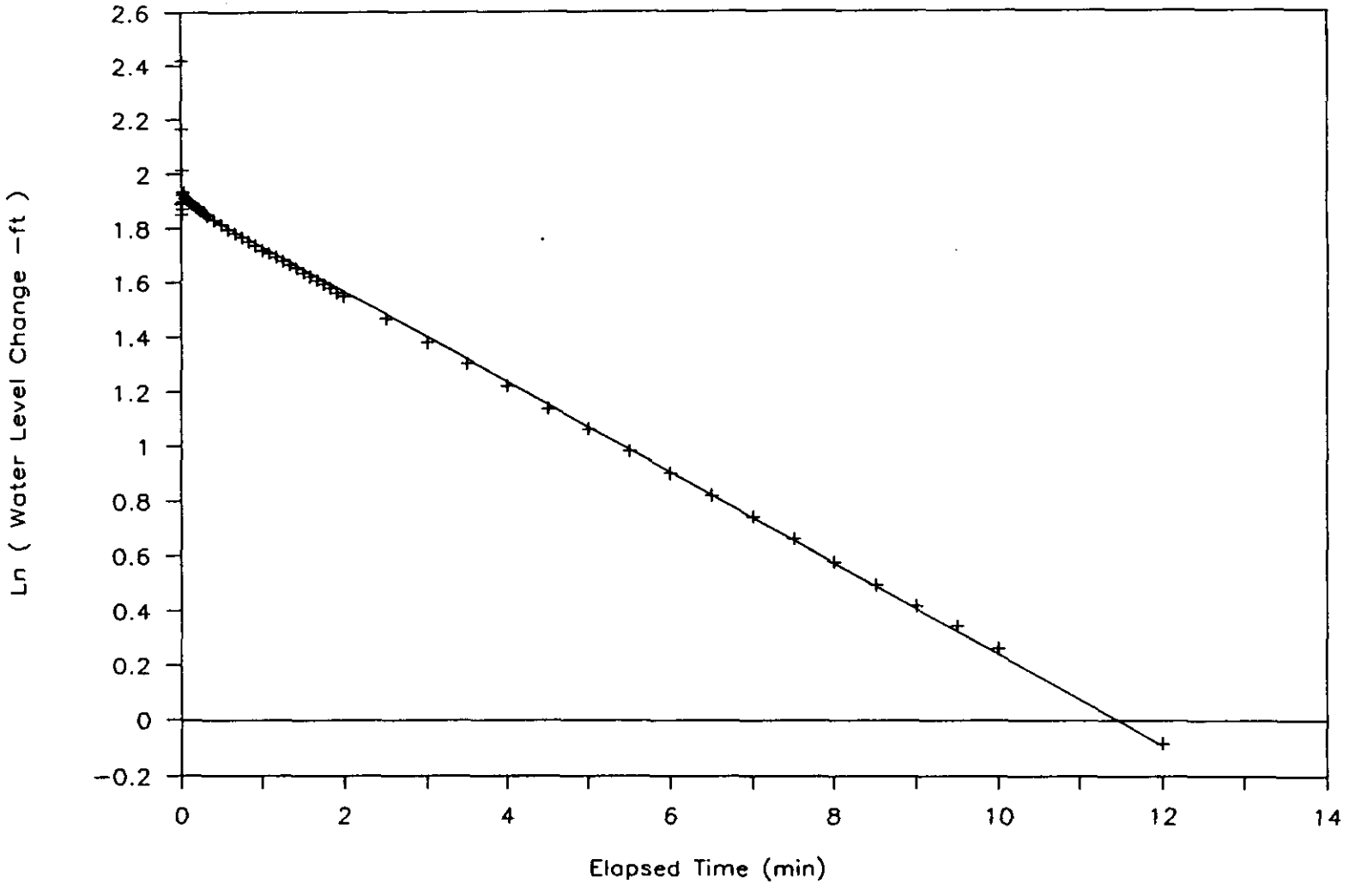
Slug Test at B16A

Raw Data: Slug Test



Slug Test for B16A

Ln of Recovery vs Elasped Time



SLUG TEST RESULTS FOR: G109
Winnebago Reclamation Landfill

WELL INFORMATION

Casing Diameter (in)	2
Effective Casing RADIUS (in)(rc)	1.28
Screen Diameter (in)	2.0
Effective RADIUS (in)(rw)	1.89
Screen Length (ft)(L)	10.0
Aquifer Thickness (ft)(D)	200.0
Well Penetration (ft)(H)	11.58

CALCULATED PARAMETERS

L / rw	63.5
A	3.4
B	0.55
C	NA
ln ((D-h)/rw)	7.09
ln (Re / rw) Fully Penetrating	NA
ln (Re / rw)Partially Penetrating	2.70
ln (Re / rw)Partially Penetrating(>6)	2.77
1/t * ln (Yo /Yt)	0.40

RESULTS	FT/MIN	FT/DAY	GPD/SQ.FT	CM/SEC
Hydraulic Conductivity Fully-P	NA	NA	NA	NA
Hydraulic Conductivity Partial-P	6.07E-04	8.74E-01	6.54E+00	3.08E-04
Hydraulic Conductivity Partial-P (>6)	6.23E-04	8.97E-01	6.71E+00	3.16E-04

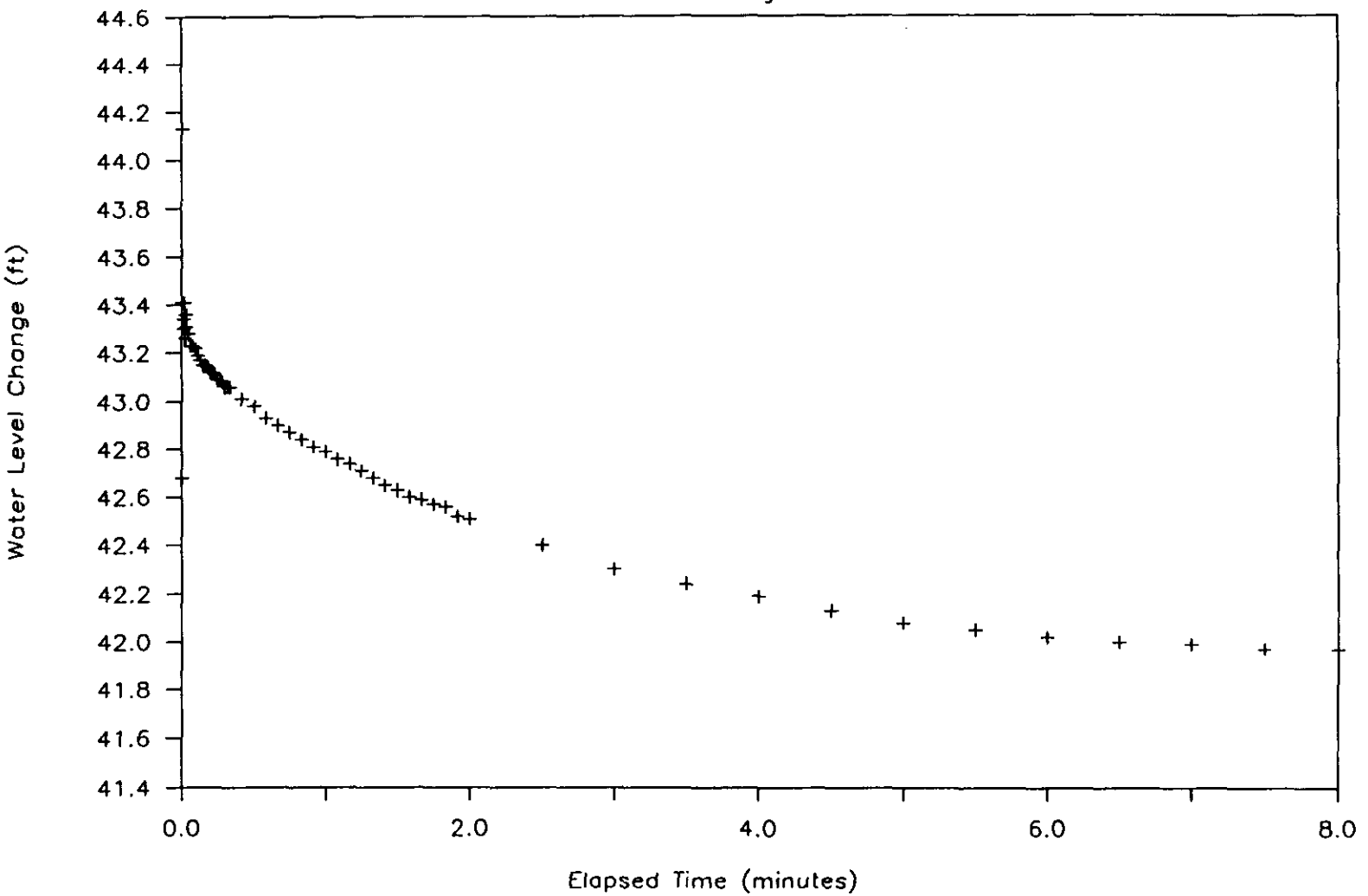
	SQ.FT/MIN	SQ.FT/DAY	GPD/FT	SQ.M/SEC
Transmissivity Fully-P	NA	NA	NA	NA
Transmissivity Partial-P	1.21E-01	174.7	1307.0	1.88E-04
Transmissivity Partial-P (>6)	1.25E-01	179.3	1341.0	1.93E-04

Regression Output:		Time (min)	Depth to Water	Water level Change	Natural Log of Water Level Change	REGR LINE CALC.
		0.0000	45.74	3.85	1.348	0.295
Constant	0.295	0.0033	42.68	0.79	-0.236	0.293
Std Err of Y Est	0.017	0.0066	43.41	1.52	0.419	0.292
R Squared	0.995	0.0099	44.13	2.24	0.806	0.291
No. of Observations	38	0.0133	43.30	1.41	0.344	0.289
Degrees of Freedom	36	0.0166	43.34	1.45	0.372	0.288
		0.0200	43.41	1.52	0.419	0.287
X Coefficient(s)	-0.3956	0.0233	43.36	1.47	0.385	0.285
Std Err of Coef.	0.0045	0.0266	43.26	1.37	0.315	0.284
		0.0300	43.31	1.42	0.351	0.283
		0.0333	43.36	1.47	0.385	0.281
		0.0500	43.28	1.39	0.329 *	0.275
		0.0666	43.23	1.34	0.293 *	0.268
		0.0833	43.23	1.34	0.293 *	0.262

WELL G109 Time (min)	Depth to Water	Water level Change	Natural Log of Water Level Change	REGR LINE CALC.
0.1000	43.22	1.33	0.285 *	0.255
0.1166	43.19	1.30	0.262 *	0.248
0.1333	43.17	1.28	0.247 *	0.242
0.1500	43.15	1.26	0.231 *	0.235
0.1666	43.15	1.26	0.231 *	0.229
0.1833	43.14	1.25	0.223 *	0.222
0.2000	43.12	1.23	0.207 *	0.215
0.2166	43.12	1.23	0.207 *	0.209
0.2333	43.11	1.22	0.199 *	0.202
0.2500	43.09	1.20	0.182 *	0.196
0.2666	43.09	1.20	0.182 *	0.189
0.2833	43.08	1.19	0.174 *	0.182
0.3000	43.06	1.17	0.157 *	0.176
0.3166	43.06	1.17	0.157 *	0.169
0.3333	43.06	1.17	0.157 *	0.163
0.4167	43.01	1.12	0.113 *	0.130
0.5000	42.98	1.09	0.086 *	0.097
0.5833	42.93	1.04	0.039 *	0.064
0.6667	42.90	1.01	0.010 *	0.031
0.7500	42.87	0.98	-0.020 *	-0.002
0.8333	42.84	0.95	-0.051 *	-0.035
0.9167	42.81	0.92	-0.083 *	-0.068
1.0000	42.79	0.90	-0.105 *	-0.101
1.0833	42.76	0.87	-0.139 *	-0.134
1.1670	42.74	0.85	-0.163 *	-0.167
1.2500	42.71	0.82	-0.198 *	-0.200
1.3333	42.68	0.79	-0.236 *	-0.233
1.4166	42.65	0.76	-0.274 *	-0.266
1.5000	42.63	0.74	-0.301 *	-0.299
1.5833	42.60	0.71	-0.342 *	-0.332
1.6667	42.59	0.70	-0.357 *	-0.365
1.7500	42.57	0.68	-0.386 *	-0.398
1.8333	42.56	0.67	-0.400 *	-0.431
1.9167	42.52	0.63	-0.462 *	-0.464
2.0000	42.51	0.62	-0.478 *	-0.497
2.5000	42.40	0.51	-0.673	-0.694
3.0000	42.30	0.41	-0.892	-0.892
3.5000	42.24	0.35	-1.050	-1.090
4.0000	42.19	0.30	-1.204	-1.288
4.5000	42.13	0.24	-1.427	-1.486
5.0000	42.08	0.19	-1.661	-1.683
5.5000	42.05	0.16	-1.833	-1.881
6.0000	42.02	0.13	-2.040	-2.079
6.5000	42.00	0.11	-2.207	-2.277
7.0000	41.99	0.10	-2.303	-2.475
7.5000	41.97	0.08	-2.526	-2.672
8.0000	41.97	0.08	-2.526	-2.870
8.5000	41.96	0.07	-2.659	-3.068
9.0000	41.94	0.05	-2.996	-3.266
9.5000	41.93	0.04	-3.219	-3.464
10.0000	41.93	0.04	-3.219	-3.661

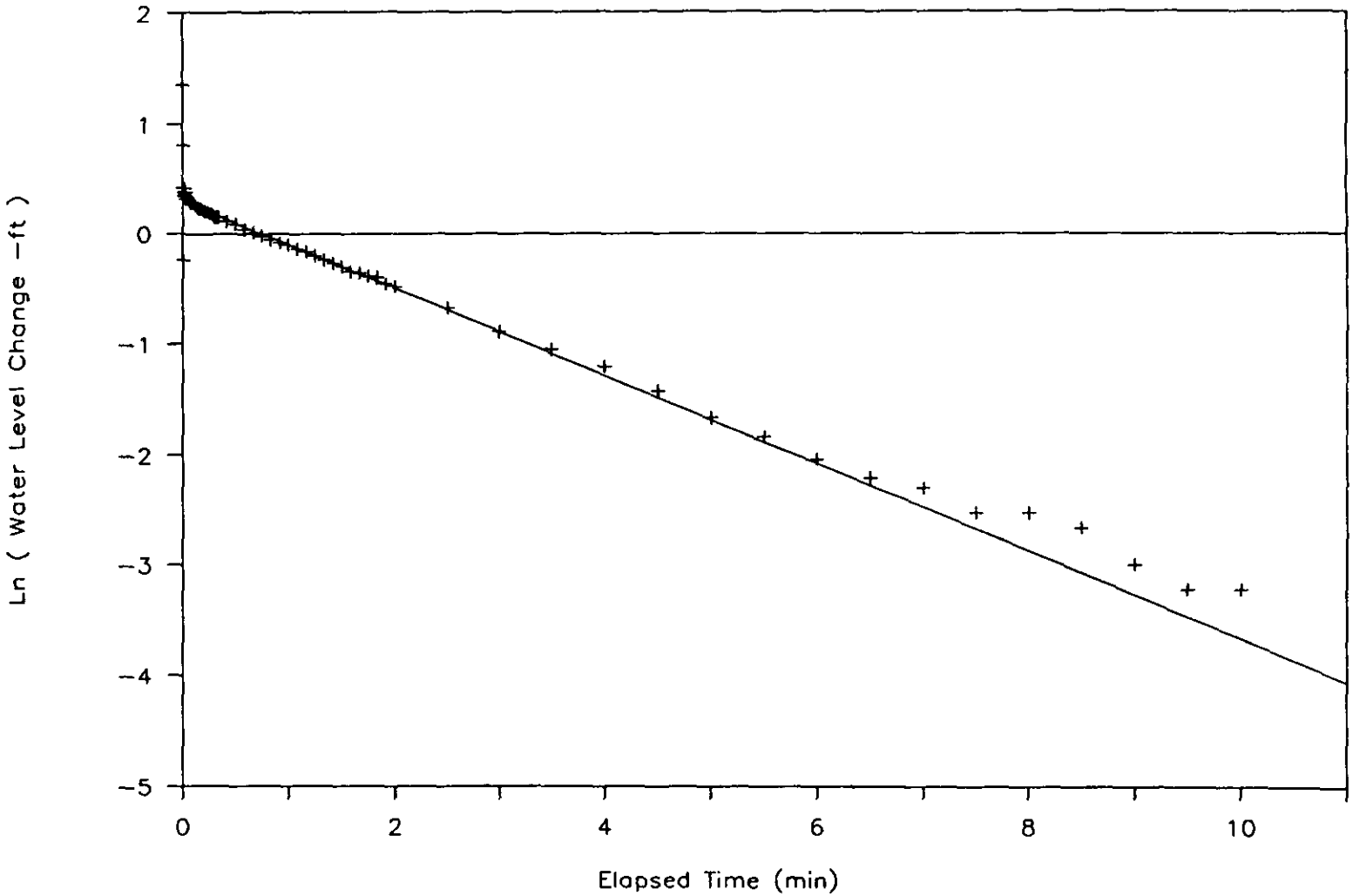
Slug Test at G109

Raw Data: Slug Test



Slug Test for G109

Ln of Recovery vs Elasped Time



BAILDOWN TEST RESULTS FOR: G109A
Winnebago Reclamation Landfill

WELL INFORMATION

Casing Diameter (in)	2
Effective Casing RADIUS (in)(rc)	1.00
Screen Diameter (in)	2.0
Effective RADIUS (in)(rw)	1.89
Screen Length (ft)(L)	5.0
Aquifer Thickness (ft)(D)	200.0
Well Penetration (ft)(H)	39.26

CALCULATED PARAMETERS

L / rw	31.7
A	2.5
B	0.40
C	NA
ln ((D-h)/rw)	6.93
ln (Re / rw) Fully Penetrating	NA
ln (Re / rw)Partially Penetrating	2.75
ln (Re / rw)Partially Penetrating(>6)	2.84
1/t * ln (Yo /Yt)	0.00

RESULTS	FT/MIN	FT/DAY	GPD/SQ.FT	CM/SEC
Hydraulic Conductivity Fully-P	NA	NA	NA	NA
Hydraulic Conductivity Partial-P	7.62E-06	1.10E-02	8.20E-02	3.87E-06
Hydraulic Conductivity Partial-P (>6)	7.87E-06	1.13E-02	8.48E-02	4.00E-06

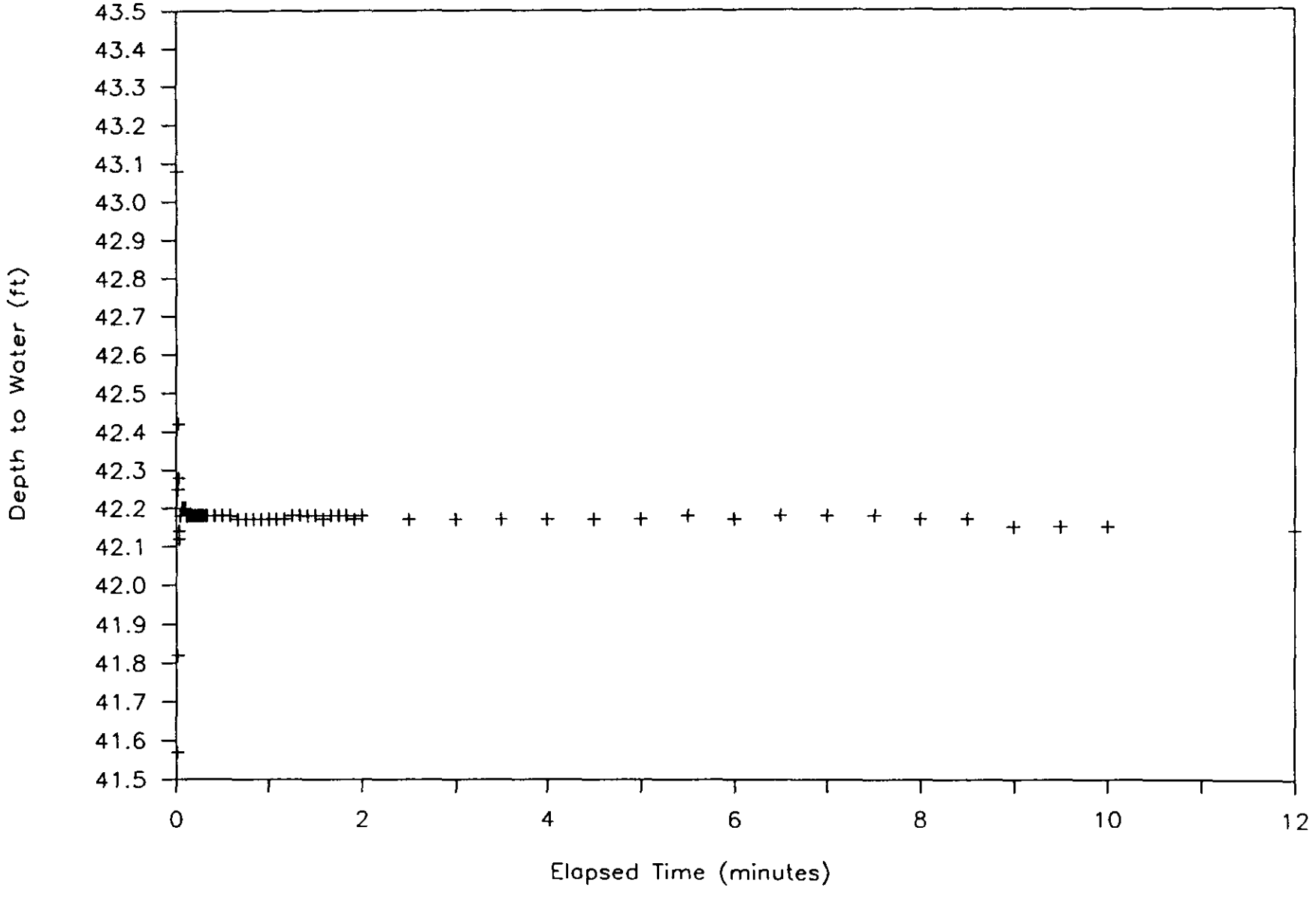
	SQ.FT/MIN	SQ.FT/DAY	GPD/FT	SQ.M/SEC
Transmissivity Fully-P	NA	NA	NA	NA
Transmissivity Partial-P	1.52E-03	2.2	16.4	2.36E-06
Transmissivity Partial-P (>6)	1.57E-03	2.3	16.9	2.44E-06

Regression Output:		Well G109A Time (min)	Depth to Water	Water level Change	Natural Log of Water Level Change	REGR LINE CALC.
		0.0000	9.42	-32.28	ERR	-0.737
Constant	-0.737	0.0033	10.98	-30.72	ERR	-0.737
Std Err of Y Est	0.027	0.0066	44.25	2.55	0.936	-0.738
R Squared	0.180	0.0099	43.08	1.38	0.322	-0.738
No. of Observations	57	0.0133	41.57	-0.13	ERR	-0.738
Degrees of Freedom	55	0.0166	41.82	0.12	-2.120	-0.738
		0.0200	42.25	0.55	-0.598	-0.738
X Coefficient(s)	-0.0040	0.0233	42.42	0.72	-0.329	-0.738
Std Err of Coef.	0.0011	0.0266	42.28	0.58	-0.545	-0.738
		0.0300	42.12	0.42	-0.868 *	-0.738
		0.0333	42.14	0.44	-0.821 *	-0.738
		0.0500	42.18	0.48	-0.734 *	-0.738
		0.0666	42.2	0.50	-0.693 *	-0.738
		0.0833	42.2	0.50	-0.693 *	-0.738

Well G109A Time (min)	Depth to Water	Water level Change	Natural Log of Water Level Change	REGR LINE CALC.
0.1000	42.2	0.50	-0.693 *	-0.738
0.1166	42.18	0.48	-0.734 *	-0.738
0.1333	42.18	0.48	-0.734 *	-0.738
0.1500	42.18	0.48	-0.734 *	-0.738
0.1666	42.18	0.48	-0.734 *	-0.738
0.1833	42.18	0.48	-0.734 *	-0.738
0.2000	42.18	0.48	-0.734 *	-0.738
0.2166	42.18	0.48	-0.734 *	-0.738
0.2333	42.18	0.48	-0.734 *	-0.738
0.2500	42.18	0.48	-0.734 *	-0.738
0.2666	42.18	0.48	-0.734 *	-0.739
0.2833	42.18	0.48	-0.734 *	-0.739
0.3000	42.18	0.48	-0.734 *	-0.739
0.3166	42.18	0.48	-0.734 *	-0.739
0.3333	42.18	0.48	-0.734 *	-0.739
0.4167	42.18	0.48	-0.734 *	-0.739
0.5000	42.18	0.48	-0.734 *	-0.739
0.5833	42.18	0.48	-0.734 *	-0.740
0.6667	42.17	0.47	-0.755 *	-0.740
0.7500	42.17	0.47	-0.755 *	-0.740
0.8333	42.17	0.47	-0.755 *	-0.741
0.9167	42.17	0.47	-0.755 *	-0.741
1.0000	42.17	0.47	-0.755 *	-0.741
1.0833	42.17	0.47	-0.755 *	-0.742
1.1670	42.17	0.47	-0.755 *	-0.742
1.2500	42.18	0.48	-0.734 *	-0.742
1.3333	42.18	0.48	-0.734 *	-0.743
1.4166	42.18	0.48	-0.734 *	-0.743
1.5000	42.18	0.48	-0.734 *	-0.743
1.5833	42.17	0.47	-0.755 *	-0.744
1.6667	42.18	0.48	-0.734 *	-0.744
1.7500	42.18	0.48	-0.734 *	-0.744
1.8333	42.18	0.48	-0.734 *	-0.745
1.9167	42.17	0.47	-0.755 *	-0.745
2.0000	42.18	0.48	-0.734 *	-0.745
2.5000	42.17	0.47	-0.755 *	-0.747
3.0000	42.17	0.47	-0.755 *	-0.749
3.5000	42.17	0.47	-0.755 *	-0.751
4.0000	42.17	0.47	-0.755 *	-0.753
4.5000	42.17	0.47	-0.755 *	-0.755
5.0000	42.17	0.47	-0.755 *	-0.757
5.5000	42.18	0.48	-0.734 *	-0.759
6.0000	42.17	0.47	-0.755 *	-0.761
6.5000	42.18	0.48	-0.734 *	-0.763
7.0000	42.18	0.48	-0.734 *	-0.765
7.5000	42.18	0.48	-0.734 *	-0.767
8.0000	42.17	0.47	-0.755 *	-0.769
8.5000	42.17	0.47	-0.755 *	-0.771
9.0000	42.15	0.45	-0.799 *	-0.773
9.5000	42.15	0.45	-0.799 *	-0.775
10.0000	42.15	0.45	-0.799 *	-0.777
12.0000	42.14	0.44	-0.821 *	-0.785

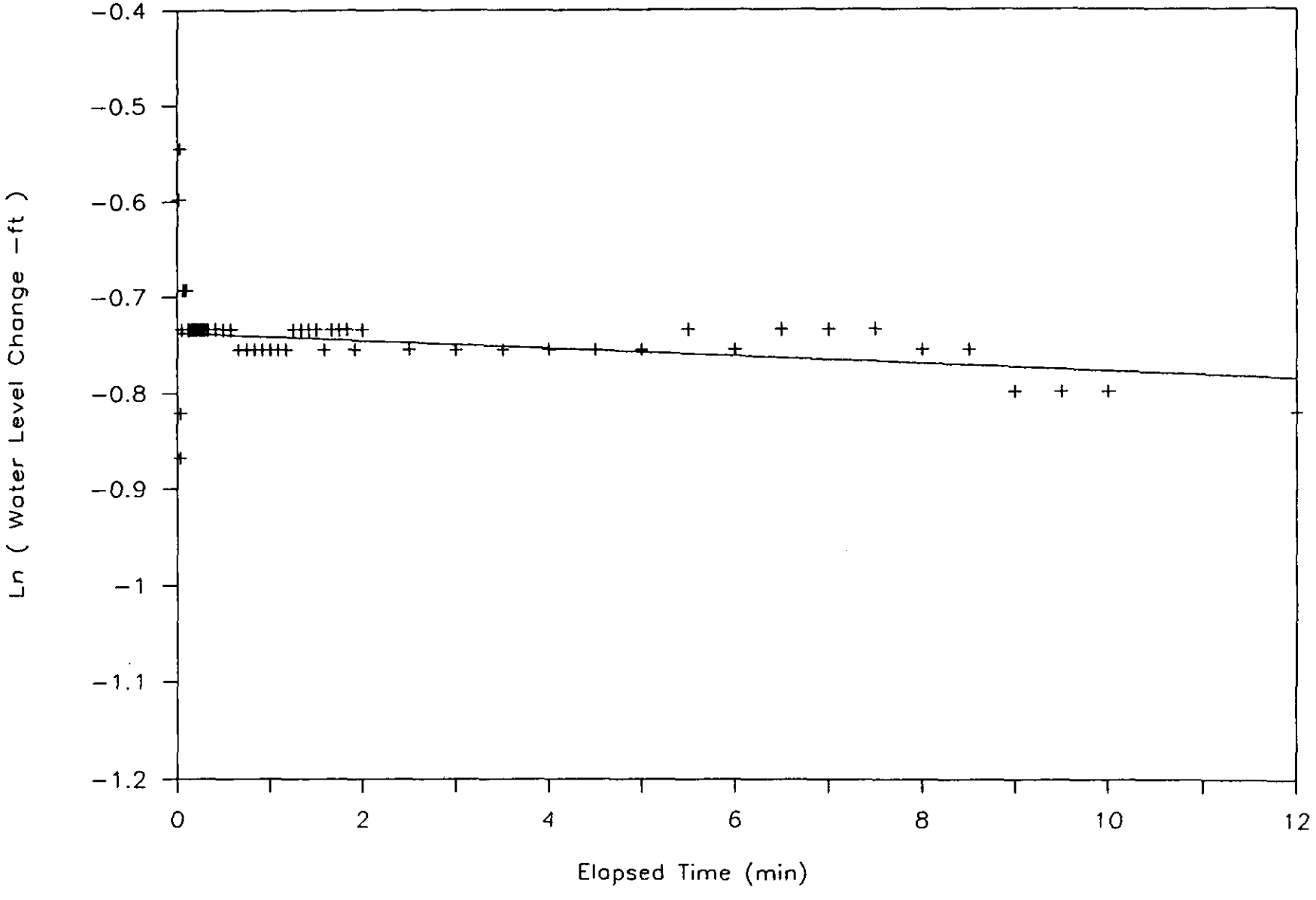
Slug Test at G109A

Raw Data: Slug Test



Slug Test for G109A

Natural Log of Recovery vs Elasped Time



SLUG TEST RESULTS FOR: G111
Winnebago Reclamation Landfill

WELL INFORMATION

Casing Diameter (in)	2
Effective Casing RADIUS (in)(rc)	1.00
Screen Diameter (in)	2.0
Effective RADIUS (in)(rw)	1.89
Screen Length (ft)(L)	10.00
Aquifer Thickness (ft)(D)	200.0
Well Penetration (ft)(H)	13.66

CALCULATED PARAMETERS

L / rw	63.5
A	3.40
B	0.60
C	NA
ln ((D-h)/rw)	7.08
ln (Re / rw) Fully Penetrating	NA
ln (Re / rw)Partially Penetrating	2.73
ln (Re / rw)Partially Penetrating(>6)	2.80
1/t * ln (Yo /Yt)	48.40

RESULTS	FT/MIN	FT/DAY	GPD/SQ.FT	CM/SEC
Hydraulic Conductivity Fully-P	NA	NA	NA	NA
Hydraulic Conductivity Partial-P	4.58E-02	6.60E+01	4.93E+02	2.33E-02
Hydraulic Conductivity Partial-P (>6)	4.71E-02	6.78E+01	5.07E+02	2.39E-02

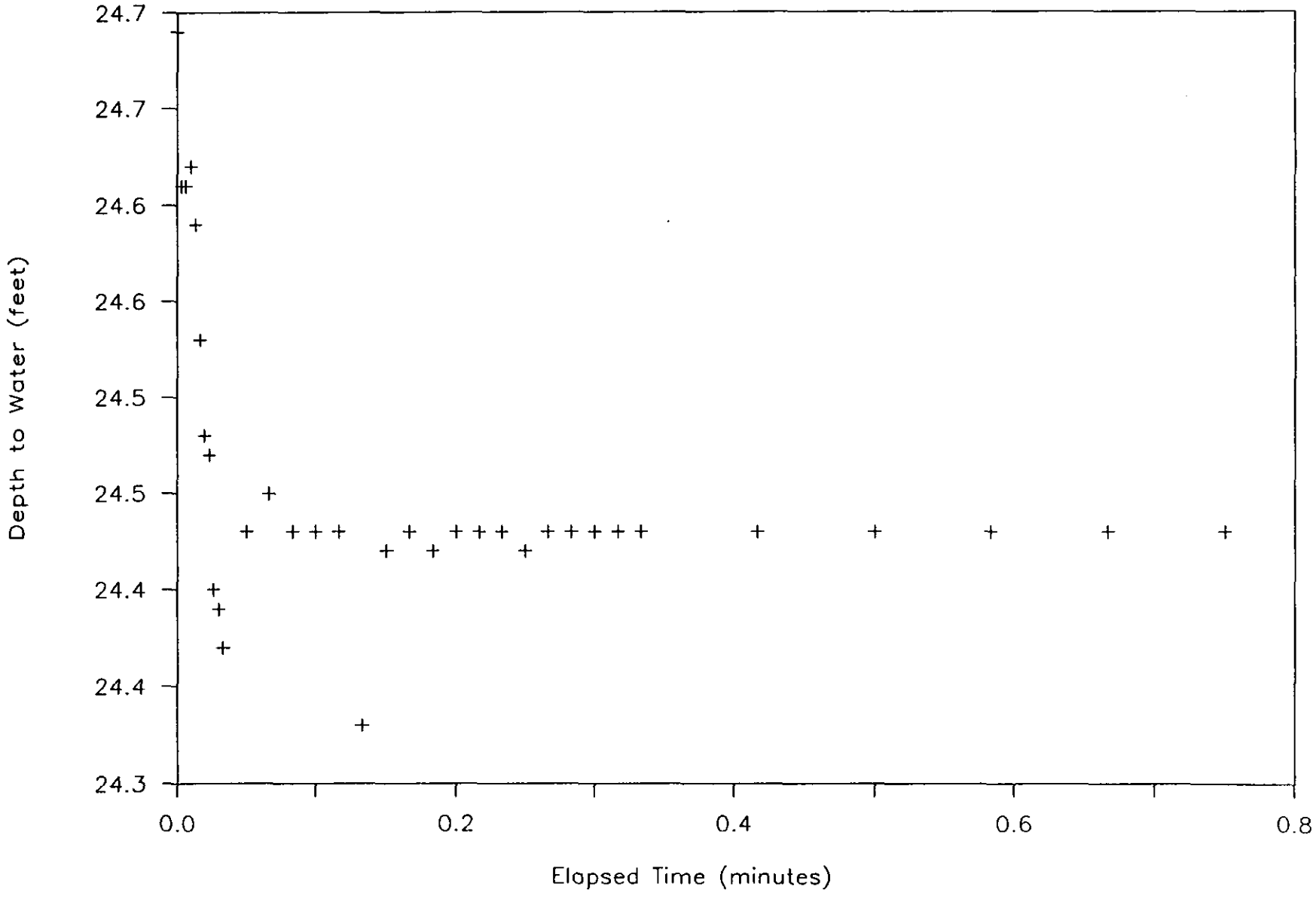
	SQ.FT/MIN	SQ.FT/DAY	GPD/FT	SQ.M/SEC
Transmissivity Fully-P	NA	NA	NA	NA
Transmissivity Partial-P	9.16E+00	13190.8	98656.3	1.42E-02
Transmissivity Partial-P (>6)	9.42E+00	13566.8	101468.1	1.46E-02

Regression Output:		Time (min)	Depth to Water	Water level Change	Natural Log of Water Level Change	REGR LINE CALC.
		0.0000	24.69	0.36	-1.022	-0.830
Constant	-0.830	0.0033	24.61	0.28	-1.273	-0.990
Std Err of Y Est	0.125	0.0066	24.61	0.28	-1.273	-1.150
R Squared	0.849	0.0099	24.62	0.29	-1.238 *	-1.309
No. of Observations	5	0.0133	24.59	0.26	-1.347 *	-1.474
Degrees of Freedom	3	0.0166	24.53	0.20	-1.609 *	-1.634
		0.0200	24.48	0.15	-1.897 *	-1.798
X Coefficient(s)	-48.3970	0.0233	24.47	0.14	-1.966 *	-1.958
Std Err of Coef.	11.7875	0.0266	24.40	0.07	-2.659 *	-2.118
		0.0300	24.39	0.06	-2.813 *	-2.282
		0.0333	24.37	0.04	-3.219	-2.442
		0.0500	24.43	0.10	-2.303	-3.250
		0.0666	24.45	0.12	-2.120	-4.053
		0.0833	24.43	0.10	-2.303	-4.862

Well G111 Time (min)	Depth to Water	Water level Change	Natural Log of Water Level Change	REGR LINE CALC.
0.1000	24.43	0.10	-2.303	-5.670
0.1166	24.43	0.10	-2.303	-6.473
0.1333	24.33	0.00	ERR	
0.1500	24.42	0.09	-2.408	
0.1666	24.43	0.10	-2.303	
0.1833	24.42	0.09	-2.408	
0.2000	24.43	0.10	-2.303	
0.2166	24.43	0.10	-2.303	
0.2333	24.43	0.10	-2.303	
0.2500	24.42	0.09	-2.408	
0.2666	24.43	0.10	-2.303	
0.2833	24.43	0.10	-2.303	
0.3000	24.43	0.10	-2.303	
0.3166	24.43	0.10	-2.303	
0.3333	24.43	0.10	-2.303	
0.4167	24.43	0.10	-2.303	
0.5000	24.43	0.10	-2.303	
0.5833	24.43	0.10	-2.303	
0.6667	24.43	0.10	-2.303	
0.7500	24.43	0.10	-2.303	
0.8333	24.45	0.12	-2.120	
0.9167	24.45	0.12	-2.120	
1.0000	24.45	0.12	-2.120	
1.0833	24.45	0.12	-2.120	
1.1670	24.45	0.12	-2.120	
1.2500	24.45	0.12	-2.120	
1.3333	24.45	0.12	-2.120	
1.4166	24.45	0.12	-2.120	
1.5000	24.45	0.12	-2.120	
1.5833	24.45	0.12	-2.120	
1.6667	24.45	0.12	-2.120	
1.7500	24.45	0.12	-2.120	
1.8333	24.45	0.12	-2.120	
1.9167	24.45	0.12	-2.120	
2.0000	24.45	0.12	-2.120	
2.5000	24.45	0.12	-2.120	
3.0000	24.47	0.14	-1.966	
3.5000	24.47	0.14	-1.966	
4.0000	24.45	0.12	-2.120	
4.5000	24.45	0.12	-2.120	
5.0000	24.45	0.12	-2.120	
5.5000	24.47	0.14	-1.966	
6.0000	24.47	0.14	-1.966	
6.5000	24.47	0.14	-1.966	

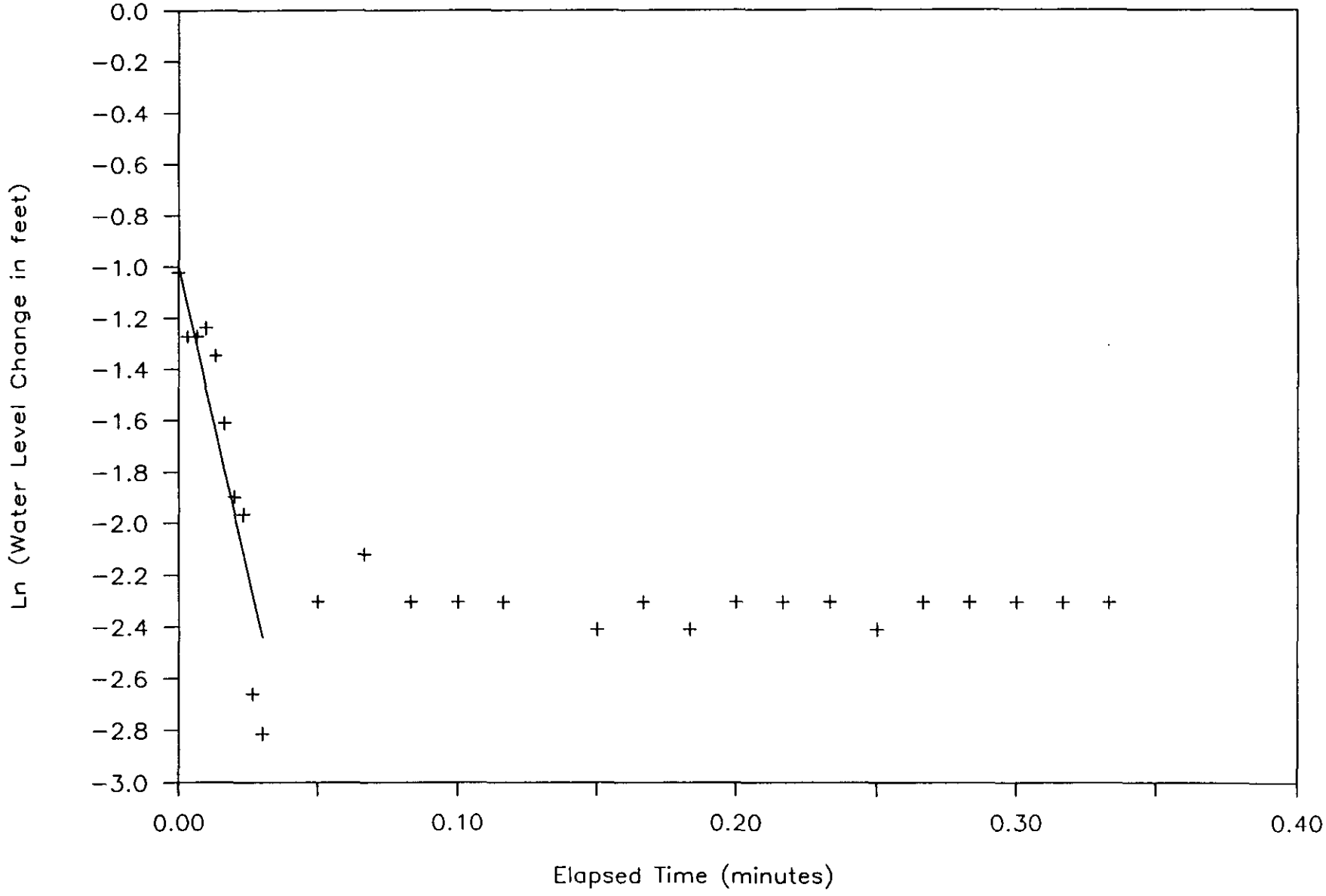
Slug Test at G111

Raw Data: Slug Test



Slug Test at G111

Natural Log of Recovery vs Time



BAILDOWN TEST RESULTS FOR: G115
Winnebago Reclamation Landfill

WELL INFORMATION

Casing Diameter (in)	2
Effective Casing RADIUS (in)(rc)	1.28
Screen Diameter (in)	2.0
Effective RADIUS (in)(rw)	1.89
Screen Length (ft)(L)	3.04
Aquifer Thickness (ft)(D)	200.0
Well Penetration (ft)(H)	3.04

CALCULATED PARAMETERS

L / rw	19.3
A	2.10
B	0.35
C	NA
ln ((D-h)/rw)	7.13
ln (Re / rw) Fully Penetrating	NA
ln (Re / rw)Partially Penetrating	1.64
ln (Re / rw)Partially Penetrating(>6)	1.70
1/t * ln (Yo /Yt)	7.08

RESULTS	FT/MIN	FT/DAY	GPD/SQ.FT	CM/SEC
Hydraulic Conductivity Fully-P	NA	NA	NA	NA
Hydraulic Conductivity Partial-P	2.17E-02	3.13E+01	2.34E+02	1.10E-02
Hydraulic Conductivity Partial-P (>6)	2.25E-02	3.24E+01	2.42E+02	1.14E-02

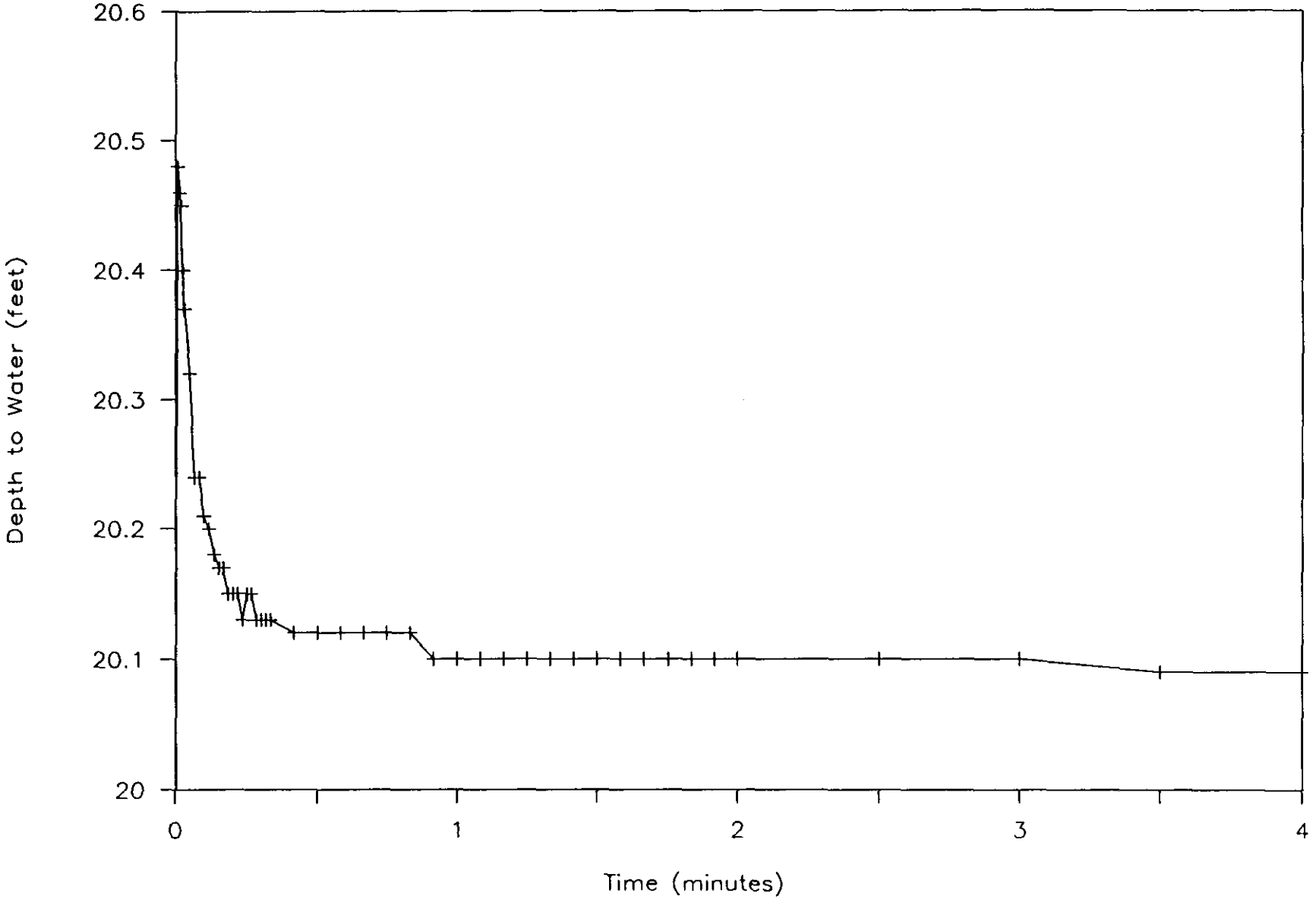
	SQ.FT/MIN	SQ.FT/DAY	GPD/FT	SQ.M/SEC
Transmissivity Fully-P	NA	NA	NA	NA
Transmissivity Partial-P	4.34E+00	6256.8	46795.5	6.73E-03
Transmissivity Partial-P (>6)	4.50E+00	6474.6	48424.8	6.96E-03

Regression Output:		Time (min)	Depth to Water	Water level Change	Natural Log of Water Level Change	REGR LINE CALC.
		0.0000	20.94	0.99	-0.010	-0.611
Constant	-0.611	0.0033	19.44	-0.51	ERR	-0.635
Std Err of Y Est	0.061	0.0066	20.48	0.53	-0.635 *	-0.658
R Squared	0.961	0.0099	20.48	0.53	-0.635 *	-0.682
No. of Observations	15	0.0133	20.46	0.51	-0.673 *	-0.706
Degrees of Freedom	13	0.0166	20.45	0.50	-0.693 *	-0.729
		0.0200	20.45	0.50	-0.693 *	-0.753
X Coefficient(s)	-7.0783	0.0233	20.40	0.45	-0.799 *	-0.776
Std Err of Coef.	0.3931	0.0266	20.40	0.45	-0.799 *	-0.800
		0.0300	20.37	0.42	-0.868 *	-0.824
		0.0333	20.37	0.42	-0.868 *	-0.847
		0.0500	20.32	0.37	-0.994 *	-0.965
		0.0666	20.24	0.29	-1.238 *	-1.083
		0.0833	20.24	0.29	-1.238 *	-1.201

Time (min)	Depth to Water	Water level Change	Natural Log of Water Level Change	REGR LINE CALC.
0.1000	20.21	0.26	-1.347 *	-1.319
0.1166	20.20	0.25	-1.386 *	-1.437
0.1333	20.18	0.23	-1.470 *	-1.555
0.1500	20.17	0.22	-1.514 *	-1.673
0.1666	20.17	0.22	-1.514 *	-1.791
0.1833	20.15	0.20	-1.609 *	-1.909
0.2000	20.15	0.20	-1.609	-2.027
0.2166	20.15	0.20	-1.609	-2.145
0.2333	20.13	0.18	-1.715	-2.263
0.2500	20.15	0.20	-1.609	-2.381
0.2666	20.15	0.20	-1.609	-2.499
0.2833	20.13	0.18	-1.715	-2.617
0.3000	20.13	0.18	-1.715	-2.735
0.3166	20.13	0.18	-1.715	-2.852
0.3333	20.13	0.18	-1.715	-2.971
0.4167	20.12	0.17	-1.772	-3.561
0.5000	20.12	0.17	-1.772	-4.151
0.5833	20.12	0.17	-1.772	-4.740
0.6667	20.12	0.17	-1.772	-5.331
0.7500	20.12	0.17	-1.772	-5.920
0.8333	20.12	0.17	-1.772	-6.510
0.9167	20.10	0.15	-1.897	-7.100
1.0000	20.10	0.15	-1.897	-7.690
1.0833	20.10	0.15	-1.897	-8.279
1.1670	20.10	0.15	-1.897	-8.872
1.2500	20.10	0.15	-1.897	-9.459
1.3333	20.10	0.15	-1.897	-10.049
1.4166	20.10	0.15	-1.897	-10.639
1.5000	20.10	0.15	-1.897	-11.229
1.5833	20.10	0.15	-1.897	-11.818
1.6667	20.10	0.15	-1.897	-12.409
1.7500	20.10	0.15	-1.897	-12.998
1.8333	20.10	0.15	-1.897	-13.588
1.9167	20.10	0.15	-1.897	-14.178
2.0000	20.10	0.15	-1.897	-14.768
2.5000	20.10	0.15	-1.897	-18.307
3.0000	20.10	0.15	-1.897	-21.846
3.5000	20.09	0.14	-1.966	-25.385
4.0000	20.09	0.14	-1.966	-28.925
4.5000	20.09	0.14	-1.966	-32.464
5.0000	20.09	0.14	-1.966	-36.003
5.5000	20.09	0.14	-1.966	-39.542
6.0000	20.09	0.14	-1.966	-43.081
6.5000	20.09	0.14	-1.966	-46.620
7.0000	20.10	0.15	-1.897	-50.159
7.5000	20.09	0.14	-1.966	-53.699
8.0000	20.10	0.15	-1.897	-57.238
8.5000	20.10	0.15	-1.897	-60.777
9.0000	20.09	0.14	-1.966	-64.316
9.5000	20.09	0.14	-1.966	-67.855
10.0000	20.09	0.14	-1.966	-71.394

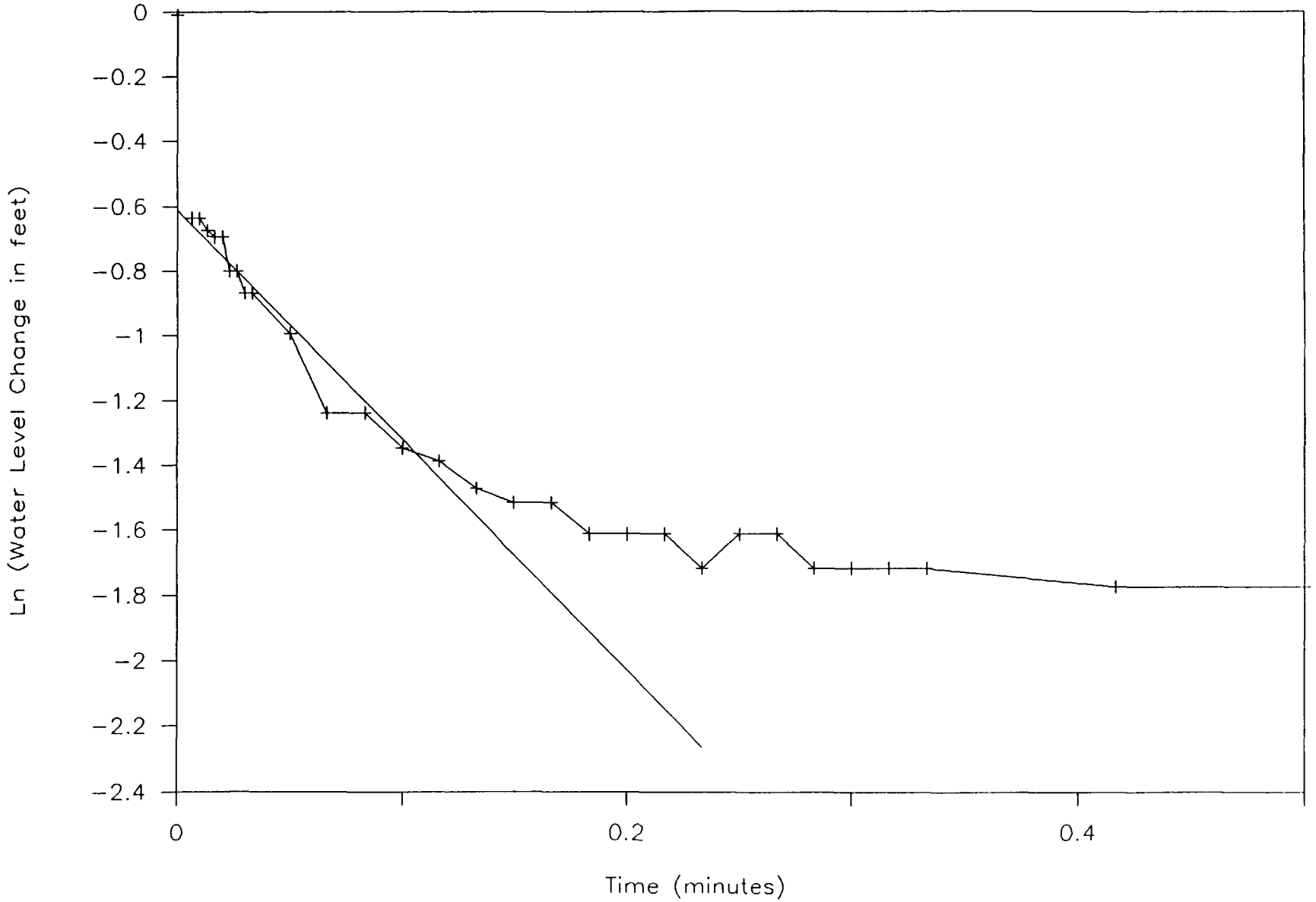
Slug Test at G115

Row Data: Slug Test



Slug Test for G115

Natural Log of Recovery vs. Time



SLUG TEST RESULTS FOR: G116
Winnebago Reclamation Landfill

WELL INFORMATION

Casing Diameter (in)	2
Effective Casing RADIUS (in)(rc)	1.28
Screen Diameter (in)	2.0
Effective RADIUS (in)(rw)	1.89
Screen Length (ft)(L)	8.58
Aquifer Thickness (ft)(D)	200.0
Well Penetration (ft)(H)	8.58

CALCULATED PARAMETERS

L / rw	54.5
A	3.15
B	0.50
C	NA
ln ((D-h)/rw)	7.10
ln (Re / rw) Fully Penetrating	NA
ln (Re / rw)Partially Penetrating	2.51
ln (Re / rw)Partially Penetrating(>6)	2.58
1/t * ln (Yo /Yt)	8.63

RESULTS	FT/MIN	FT/DAY	GPD/SQ.FT	CM/SEC
Hydraulic Conductivity Fully-P	NA	NA	NA	NA
Hydraulic Conductivity Partial-P	1.44E-02	2.07E+01	1.55E+02	7.30E-03
Hydraulic Conductivity Partial-P (>6)	1.47E-02	2.12E+01	1.59E+02	7.49E-03

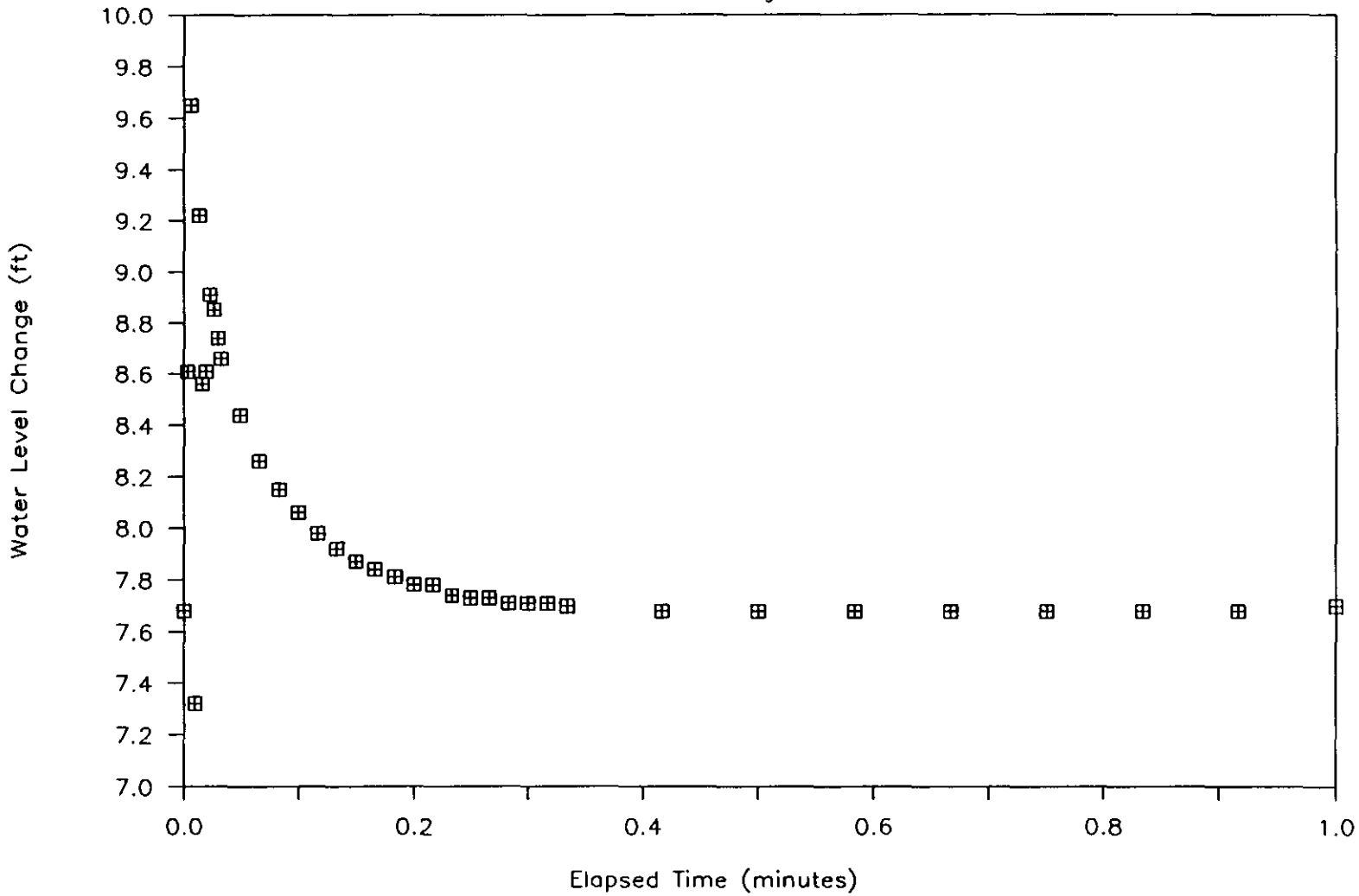
	SQ.FT/MIN	SQ.FT/DAY	GPD/FT	SQ.M/SEC
Transmissivity Fully-P	NA	NA	NA	NA
Transmissivity Partial-P	2.87E+00	4138.0	30948.8	4.45E-03
Transmissivity Partial-P (>6)	2.95E+00	4245.9	31756.1	4.56E-03

		WELL G116 Time (min)	Depth to Water	Water level Change	Natural Log of Water Level Change		REGR LINE CALC.
Regression Output:		0.0000	7.68	0.36	-1.022		0.580
Constant	0.580	0.0033	8.61	1.29	0.255		0.552
Std Err of Y Est	0.098	0.0066	9.65	2.33	0.846		0.523
R Squared	0.524	0.0099	7.32	0.00	ERR		0.495
No. of Observations	6	0.0133	9.22	1.90	0.642		0.465
Degrees of Freedom	4	0.0166	8.56	1.24	0.215	*	0.437
		0.0200	8.61	1.29	0.255	*	0.408
X Coefficient(s)	-8.6283	0.0233	8.91	1.59	0.464	*	0.379
Std Err of Coef.	4.1110	0.0266	8.85	1.53	0.425	*	0.351
		0.0300	8.74	1.42	0.351	*	0.321
		0.0333	8.66	1.34	0.293	*	0.293
		0.0500	8.44	1.12	0.113	*	0.149
		0.0666	8.26	0.94	-0.062		0.006
		0.0833	8.15	0.83	-0.186		-0.139

WELL G116 Time (min)	Depth to Water	Water level Change	Natural Log of Water Level Change	REGR LINE CALC.
0.1000	8.06	0.74	-0.301	-0.283
0.1166	7.98	0.66	-0.416	-0.426
0.1333	7.92	0.60	-0.511	-0.570
0.1500	7.87	0.55	-0.598	-0.714
0.1666	7.84	0.52	-0.654	-0.857
0.1833	7.81	0.49	-0.713	-1.001
0.2000	7.78	0.46	-0.777	-1.145
0.2166	7.78	0.46	-0.777	-1.289
0.2333	7.74	0.42	-0.868	-1.433
0.2500	7.73	0.41	-0.892	-1.577
0.2666	7.73	0.41	-0.892	-1.720
0.2833	7.71	0.39	-0.942	-1.864
0.3000	7.71	0.39	-0.942	-2.008
0.3166	7.71	0.39	-0.942	-2.152
0.3333	7.7	0.38	-0.968	-2.296
0.4167	7.68	0.36	-1.022	-3.015
0.5000	7.68	0.36	-1.022	-3.734
0.5833	7.68	0.36	-1.022	-4.453
0.6667	7.68	0.36	-1.022	-5.172
0.7500	7.68	0.36	-1.022	-5.891
0.8333	7.68	0.36	-1.022	-6.610
0.9167	7.68	0.36	-1.022	-7.329
1.0000	7.7	0.38	-0.968	-8.048
1.0833	7.7	0.38	-0.968	-8.767
1.1670	7.7	0.38	-0.968	-9.489
1.2500	7.7	0.38	-0.968	-10.205
1.3333	7.7	0.38	-0.968	-10.924
1.4166	7.7	0.38	-0.968	-11.643
1.5000	7.7	0.38	-0.968	-12.362
1.5833	7.7	0.38	-0.968	-13.081
1.6667	7.7	0.38	-0.968	-13.801
1.7500	7.7	0.38	-0.968	-14.519
1.8333	7.7	0.38	-0.968	-15.238
1.9167	7.7	0.38	-0.968	-15.958
2.0000	7.68	0.36	-1.022	-16.676
2.5000	7.68	0.36	-1.022	-20.991
3.0000	7.68	0.36	-1.022	-25.305
3.5000	7.68	0.36	-1.022	-29.619
4.0000	7.68	0.36	-1.022	-33.933

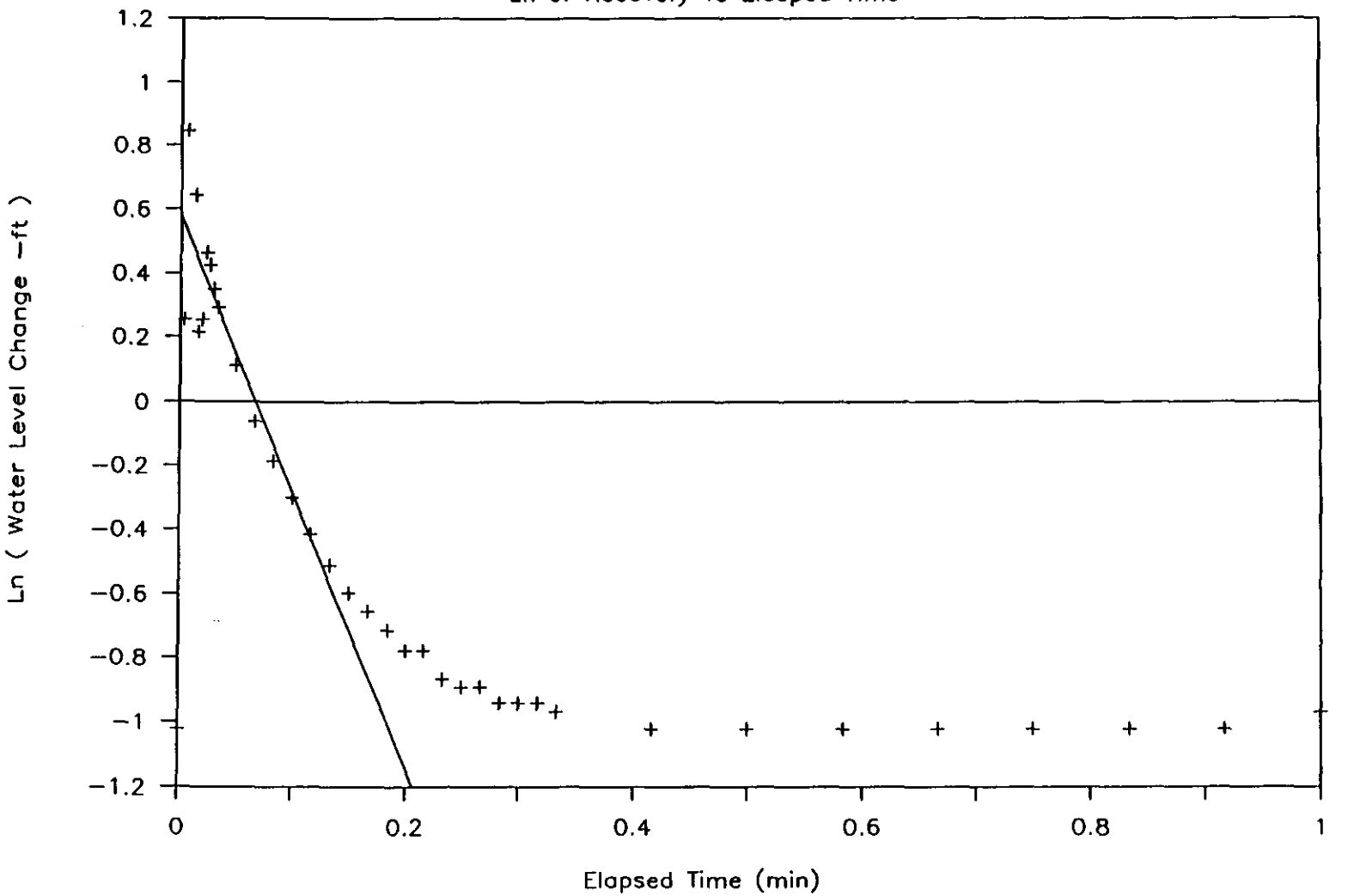
Slug Test at G116

Raw Data: Slug Test



Slug Test for G116

Ln of Recovery vs Elasped Time



SLUG TEST RESULTS FOR: G116A
Winnebago Reclamation Landfill

WELL INFORMATION

Casing Diameter (in)	2
Effective Casing RADIUS (in)(rc)	1.00
Screen Diameter (in)	2.0
Effective RADIUS (in)(rw)	1.89
Screen Length (ft)(L)	5.00
Aquifer Thickness (ft)(D)	200.0
Well Penetration (ft)(H)	37.40

CALCULATED PARAMETERS

L / rw	31.7
A	2.45
B	0.40
C	NA
ln ((D-h)/rw)	6.94
ln (Re / rw) Fully Penetrating	NA
ln (Re / rw)Partially Penetrating	2.73
ln (Re / rw)Partially Penetrating(>6)	2.83
1/t * ln (Yo /Yt)	0.80

RESULTS	FT/MIN	FT/DAY	GPD/SQ.FT	CM/SEC
Hydraulic Conductivity Fully-P	NA	NA	NA	NA
Hydraulic Conductivity Partial-P	1.51E-03	2.18E+00	1.63E+01	7.69E-04
Hydraulic Conductivity Partial-P (>6)	1.56E-03	2.25E+00	1.68E+01	7.95E-04

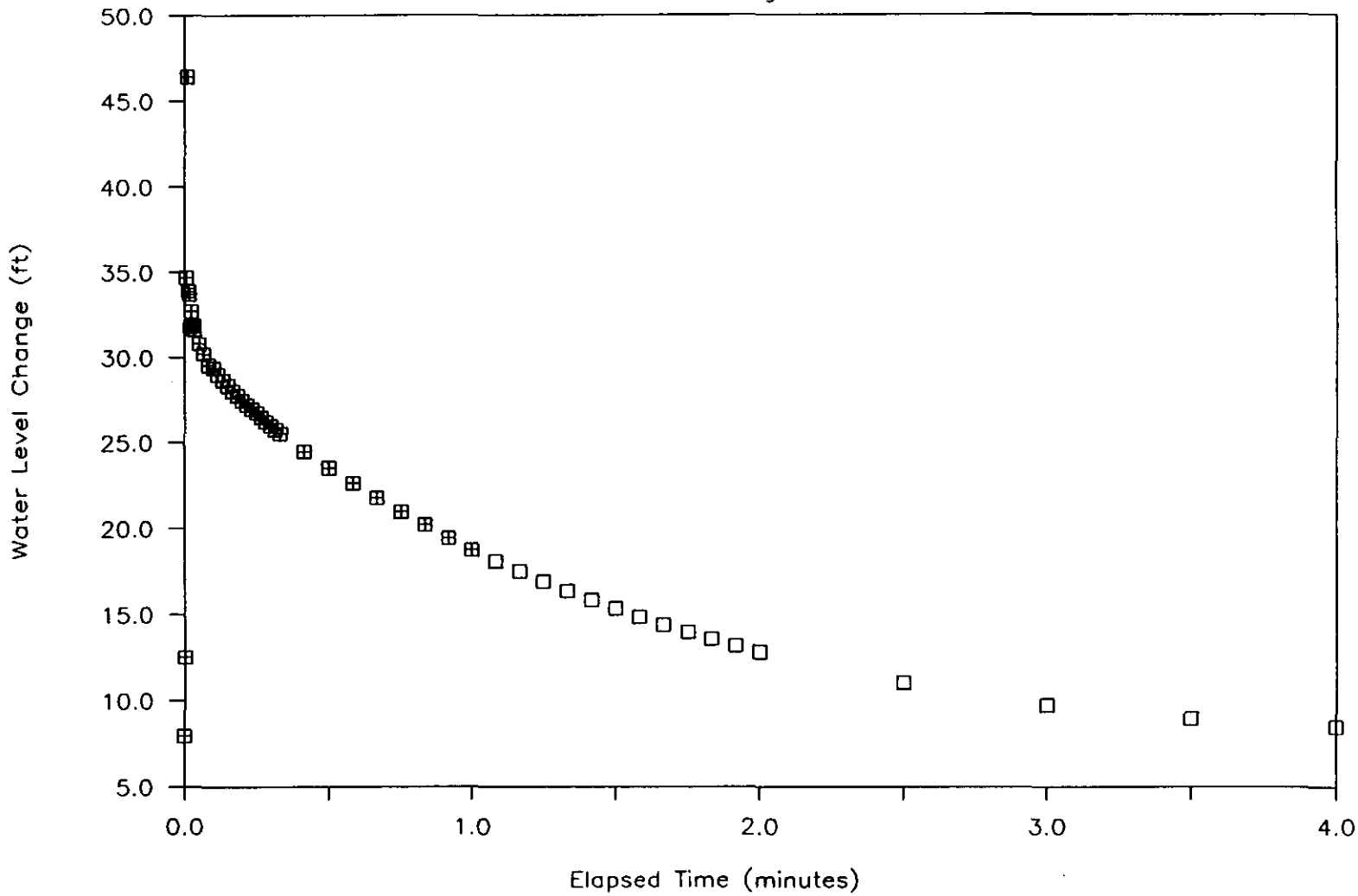
	SQ.FT/MIN	SQ.FT/DAY	GPD/FT	SQ.M/SEC
Transmissivity Fully-P	NA	NA	NA	NA
Transmissivity Partial-P	3.03E-01	435.9	3260.4	4.69E-04
Transmissivity Partial-P (>6)	3.13E-01	450.5	3369.5	4.84E-04

Regression Output:		Time (min)	Depth to Water	Water level Change	Natural Log of Water Level Change	REGR LINE CALC.
		0.0000	7.92	0.00	ERR	3.181
Constant	3.181	0.0033	12.50	4.58	1.522	3.178
Std Err of Y Est	0.080	0.0066	34.69	26.77	3.287	3.175
R Squared	0.975	0.0099	46.41	38.49	3.650	3.173
No. of Observations	46	0.0133	33.86	25.94	3.256 *	3.170
Degrees of Freedom	44	0.0166	33.69	25.77	3.249 *	3.167
		0.0200	31.80	23.88	3.173 *	3.165
X Coefficient(s)	-0.7971	0.0233	32.71	24.79	3.210 *	3.162
Std Err of Coef.	0.0191	0.0266	31.86	23.94	3.176 *	3.159
		0.0300	31.88	23.96	3.176 *	3.157
		0.0333	31.61	23.69	3.165 *	3.154
		0.0500	30.82	22.90	3.131 *	3.141
		0.0666	30.21	22.29	3.104 *	3.127
		0.0833	29.56	21.64	3.075 *	3.114

WELL G116A Time (min)	Depth to Water	Water level Change	Natural Log of Water Level Change	REGR LINE CALC.
0.1000	29.36	21.44	3.065 *	3.101
0.1166	29.00	21.08	3.048 *	3.088
0.1333	28.65	20.73	3.032 *	3.074
0.1500	28.33	20.41	3.016 *	3.061
0.1666	28.02	20.10	3.001 *	3.048
0.1833	27.75	19.83	2.987 *	3.034
0.2000	27.48	19.56	2.973 *	3.021
0.2166	27.22	19.30	2.960 *	3.008
0.2333	26.97	19.05	2.947 *	2.995
0.2500	26.73	18.81	2.934 *	2.981
0.2666	26.48	18.56	2.921 *	2.968
0.2833	26.24	18.32	2.908 *	2.955
0.3000	26.00	18.08	2.895 *	2.941
0.3166	25.77	17.85	2.882 *	2.928
0.3333	25.56	17.64	2.870 *	2.915
0.4167	24.49	16.57	2.808 *	2.848
0.5000	23.53	15.61	2.748 *	2.782
0.5833	22.64	14.72	2.689 *	2.716
0.6667	21.79	13.87	2.630 *	2.649
0.7500	20.98	13.06	2.570 *	2.583
0.8333	20.23	12.31	2.510 *	2.516
0.9167	19.44	11.52	2.444 *	2.450
1.0000	18.76	10.84	2.383 *	2.383
1.0833	18.10	10.18	2.320 *	2.317
1.1670	17.49	9.57	2.259 *	2.250
1.2500	16.91	8.99	2.196 *	2.184
1.3333	16.35	8.43	2.132 *	2.118
1.4166	15.84	7.92	2.069 *	2.051
1.5000	15.33	7.41	2.003 *	1.985
1.5833	14.86	6.94	1.937 *	1.919
1.6667	14.40	6.48	1.869 *	1.852
1.7500	13.98	6.06	1.802 *	1.786
1.8333	13.57	5.65	1.732 *	1.719
1.9167	13.19	5.27	1.662 *	1.653
2.0000	12.81	4.89	1.587 *	1.586
2.5000	11.02	3.10	1.131	1.188
3.0000	9.74	1.82	0.599	0.789
3.5000	8.94	1.02	0.020	0.391
4.0000	8.47	0.55	-0.598	-0.008
4.5000	8.20	0.28	-1.273	-0.406
5.0000	8.04	0.12	-2.120	-0.805
5.5000	7.98	0.06	-2.813	-1.204
6.0000	7.93	0.01	-4.605	-1.602

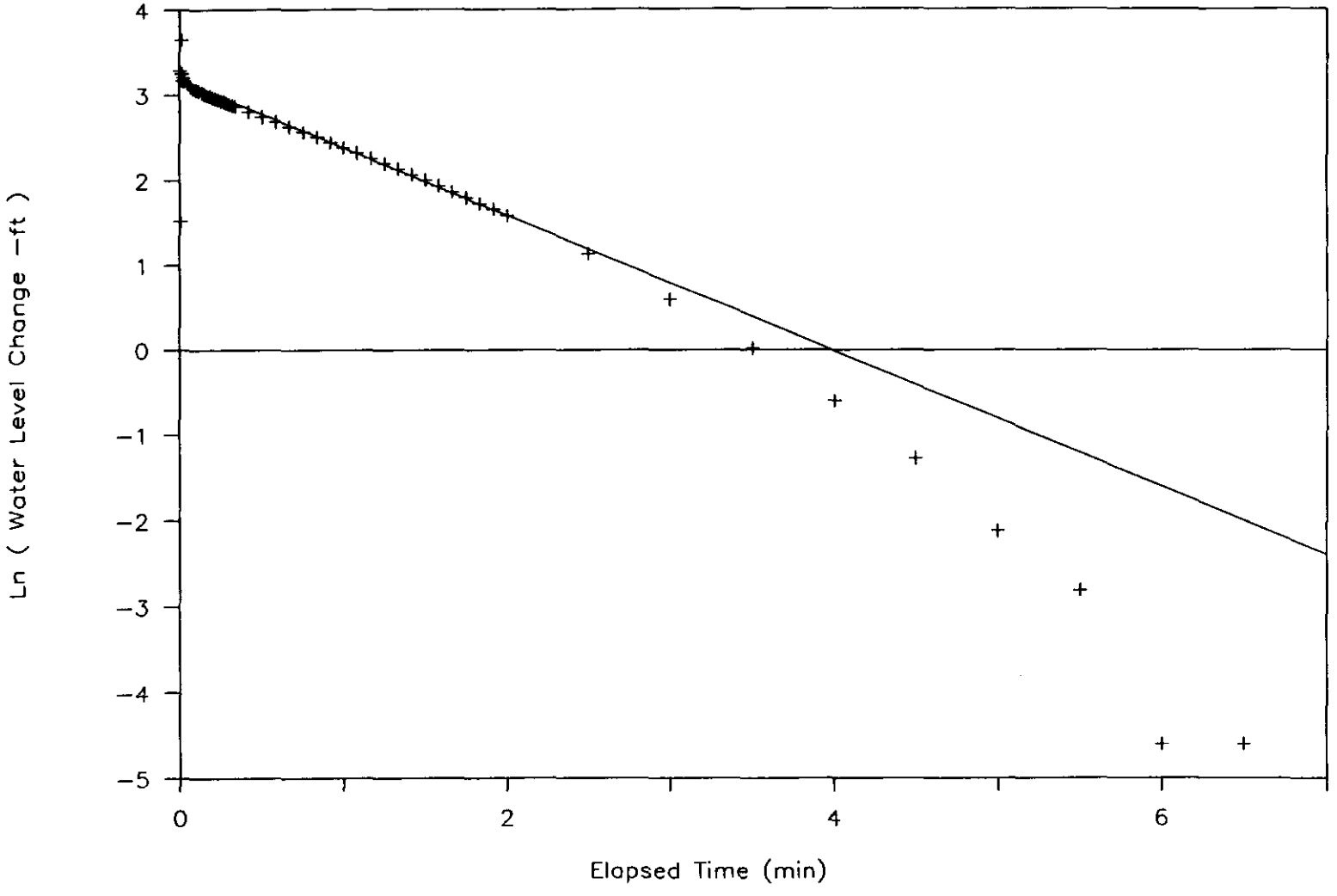
Slug Test at G116A

Raw Data: Slug Test



Slug Test for G116A

Ln of Recovery vs Elasped Time



SLUG TEST RESULTS FOR: G117
Winnebago Reclamation Landfill

WELL INFORMATION

Casing Diameter (in)	2
Effective Casing RADIUS (in)(rc)	1.00
Screen Diameter (in)	2.0
Effective RADIUS (in)(rw)	1.89
Screen Length (ft)(L)	10.00
Aquifer Thickness (ft)(D)	200.0
Well Penetration (ft)(H)	19.00

CALCULATED PARAMETERS

L / rw	63.5
A	3.40
B	0.60
C	NA
ln ((D-h)/rw)	7.05
ln (Re / rw) Fully Penetrating	NA
ln (Re / rw)Partially Penetrating	2.86
ln (Re / rw)Partially Penetrating(>6)	2.94
1/t * ln (Yo /Yt)	0.38

RESULTS	FT/MIN	FT/DAY	GPD/SQ.FT	CM/SEC
Hydraulic Conductivity Fully-P	NA	NA	NA	NA
Hydraulic Conductivity Partial-P	3.74E-04	5.39E-01	4.03E+00	1.90E-04
Hydraulic Conductivity Partial-P (>6)	3.85E-04	5.55E-01	4.15E+00	1.96E-04

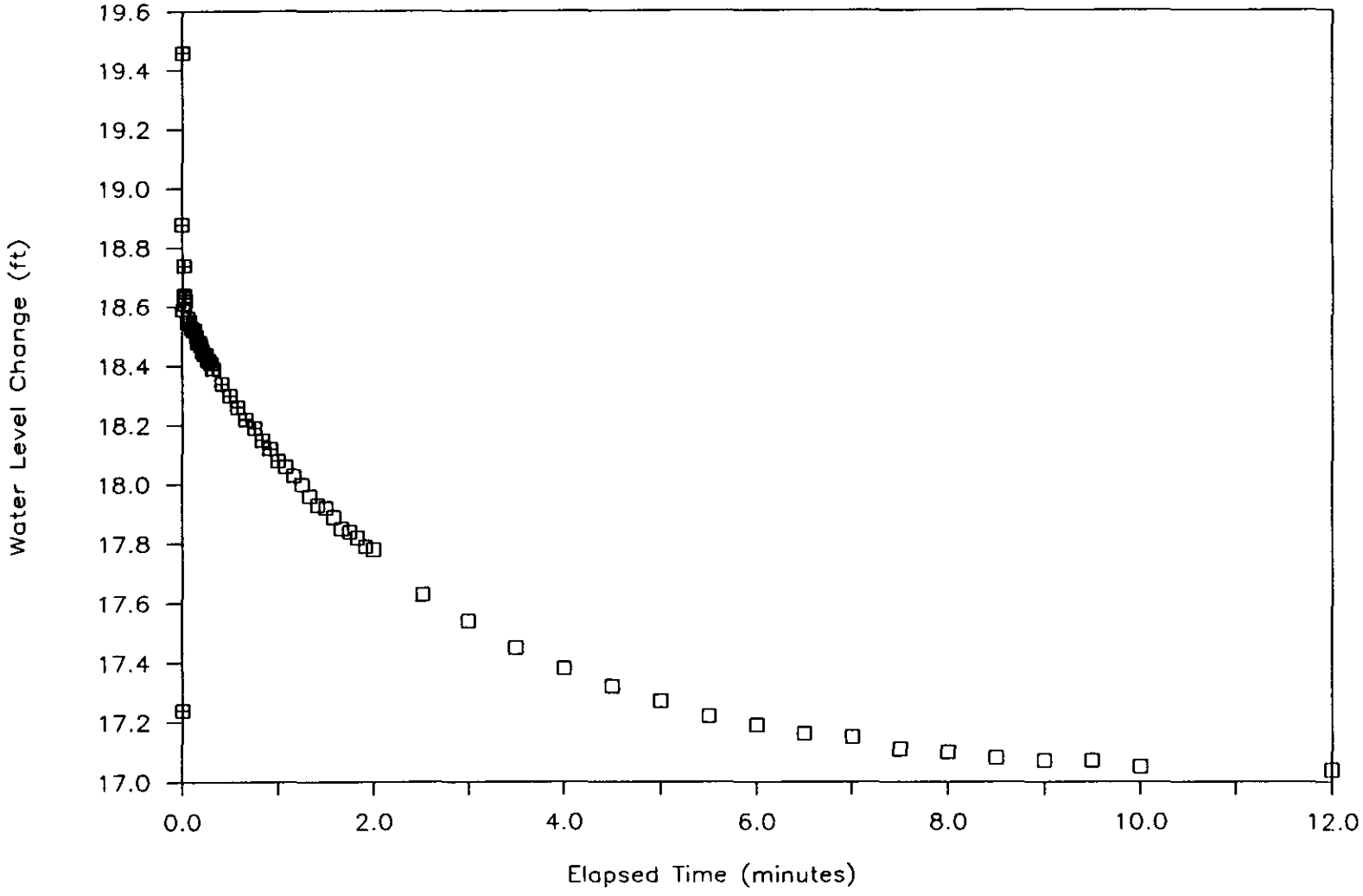
	SQ.FT/MIN	SQ.FT/DAY	GPD/FT	SQ.M/SEC
Transmissivity Fully-P	NA	NA	NA	NA
Transmissivity Partial-P	7.48E-02	107.8	806.1	1.16E-04
Transmissivity Partial-P (>6)	7.70E-02	110.9	829.6	1.19E-04

		Time (min)]	Depth to	Water level Change	Natural Log of Water Level Change		REGR LINE CALC.
Regression Output:		0.0000	18.88	1.86	0.621		0.456
Constant	0.456	0.0033	19.46	2.44	0.892		0.455
Std Err of Y Est	0.043	0.0066	17.24	0.22	-1.514		0.454
R Squared	0.998	0.0099	18.59	1.57	0.451		0.452
No. of Observations	61	0.0133	18.59	1.57	0.451	*	0.451
Degrees of Freedom	59	0.0166	18.74	1.72	0.542	*	0.450
		0.0200	18.64	1.62	0.482	*	0.449
X Coefficient(s)	-0.3769	0.0233	18.63	1.61	0.476	*	0.447
Std Err of Coef.	0.0020	0.0266	18.63	1.61	0.476	*	0.446
		0.0300	18.61	1.59	0.464	*	0.445
		0.0333	18.61	1.59	0.464	*	0.444
		0.0500	18.55	1.53	0.425	*	0.437
		0.0666	18.56	1.54	0.432	*	0.431
		0.0833	18.55	1.53	0.425	*	0.425

WELL G117 Time (min)]	Depth to	Water level Change	Natural Log of Water Level Change	REGR LINE CALC.
0.1000	18.53	1.51	0.412 *	0.419
0.1166	18.52	1.50	0.405 *	0.412
0.1333	18.52	1.50	0.405 *	0.406
0.1500	18.50	1.48	0.392 *	0.400
0.1666	18.48	1.46	0.378 *	0.393
0.1833	18.48	1.46	0.378 *	0.387
0.2000	18.47	1.45	0.372 *	0.381
0.2166	18.45	1.43	0.358 *	0.375
0.2333	18.44	1.42	0.351 *	0.368
0.2500	18.44	1.42	0.351 *	0.362
0.2666	18.42	1.40	0.336 *	0.356
0.2833	18.42	1.40	0.336 *	0.349
0.3000	18.41	1.39	0.329 *	0.343
0.3166	18.39	1.37	0.315 *	0.337
0.3333	18.39	1.37	0.315 *	0.331
0.4167	18.34	1.32	0.278 *	0.299
0.5000	18.30	1.28	0.247 *	0.268
0.5833	18.26	1.24	0.215 *	0.236
0.6667	18.22	1.20	0.182 *	0.205
0.7500	18.19	1.17	0.157 *	0.174
0.8333	18.15	1.13	0.122 *	0.142
0.9167	18.12	1.10	0.095 *	0.111
1.0000	18.08	1.06	0.058 *	0.079
1.0833	18.06	1.04	0.039 *	0.048
1.1670	18.03	1.01	0.010 *	0.016
1.2500	18.00	0.98	-0.020 *	-0.015
1.3333	17.96	0.94	-0.062 *	-0.046
1.4166	17.93	0.91	-0.094 *	-0.078
1.5000	17.92	0.90	-0.105 *	-0.109
1.5833	17.89	0.87	-0.139 *	-0.140
1.6667	17.85	0.83	-0.186 *	-0.172
1.7500	17.84	0.82	-0.198 *	-0.203
1.8333	17.82	0.80	-0.223 *	-0.235
1.9167	17.79	0.77	-0.261 *	-0.266
2.0000	17.78	0.76	-0.274 *	-0.297
2.5000	17.63	0.61	-0.494 *	-0.486
3.0000	17.54	0.52	-0.654 *	-0.674
3.5000	17.45	0.43	-0.844 *	-0.863
4.0000	17.38	0.36	-1.022 *	-1.051
4.5000	17.32	0.30	-1.204 *	-1.240
5.0000	17.27	0.25	-1.386 *	-1.428
5.5000	17.22	0.20	-1.609 *	-1.617
6.0000	17.19	0.17	-1.772 *	-1.805
6.5000	17.16	0.14	-1.966 *	-1.993
7.0000	17.15	0.13	-2.040 *	-2.182
7.5000	17.11	0.09	-2.408 *	-2.370
8.0000	17.10	0.08	-2.526 *	-2.559
8.5000	17.08	0.06	-2.813 *	-2.747
9.0000	17.07	0.05	-2.996 *	-2.936
9.5000	17.07	0.05	-2.996 *	-3.124
10.0000	17.05	0.03	-3.507 *	-3.312
12.0000	17.04	0.02	-3.912	-4.066
14.0000	17.02			-4.820

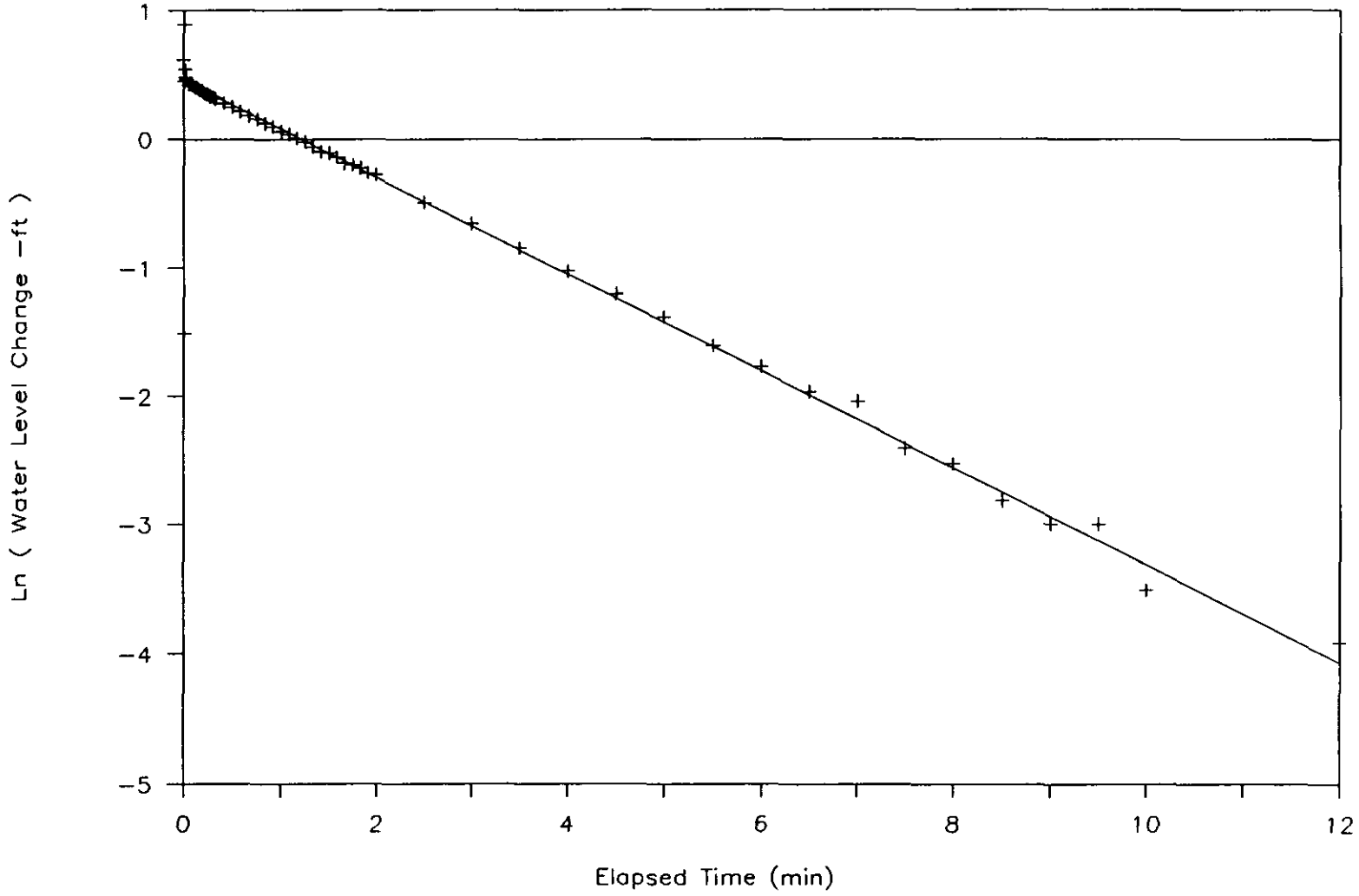
Slug Test at G117

Raw Data: Slug Test



Slug Test for G117

Ln of Recovery vs Elasped Time



SLUG TEST RESULTS FOR: G119
Winnebago Reclamation Landfill

WELL INFORMATION

Casing Diameter (in)	2
Effective Casing RADIUS (in)(rc)	1.28
Screen Diameter (in)	2.0
Effective RADIUS (in)(rw)	1.89
Screen Length (ft)(L)	7.26
Aquifer Thickness (ft)(D)	200.0
Well Penetration (ft)(H)	7.26

CALCULATED PARAMETERS

L / rw	46.1
A	2.90
B	0.45
C	NA
ln ((D-h)/rw)	7.11
ln (Re / rw) Fully Penetrating	NA
ln (Re / rw)Partially Penetrating	2.38
ln (Re / rw)Partially Penetrating(>6)	2.45
1/t * ln (Yo /Yt)	58.11

RESULTS	FT/MIN	FT/DAY	GPD/SQ.FT	CM/SEC
Hydraulic Conductivity Fully-P	NA	NA	NA	NA
Hydraulic Conductivity Partial-P	1.09E-01	1.56E+02	1.17E+03	5.51E-02
Hydraulic Conductivity Partial-P (>6)	1.11E-01	1.60E+02	1.20E+03	5.66E-02

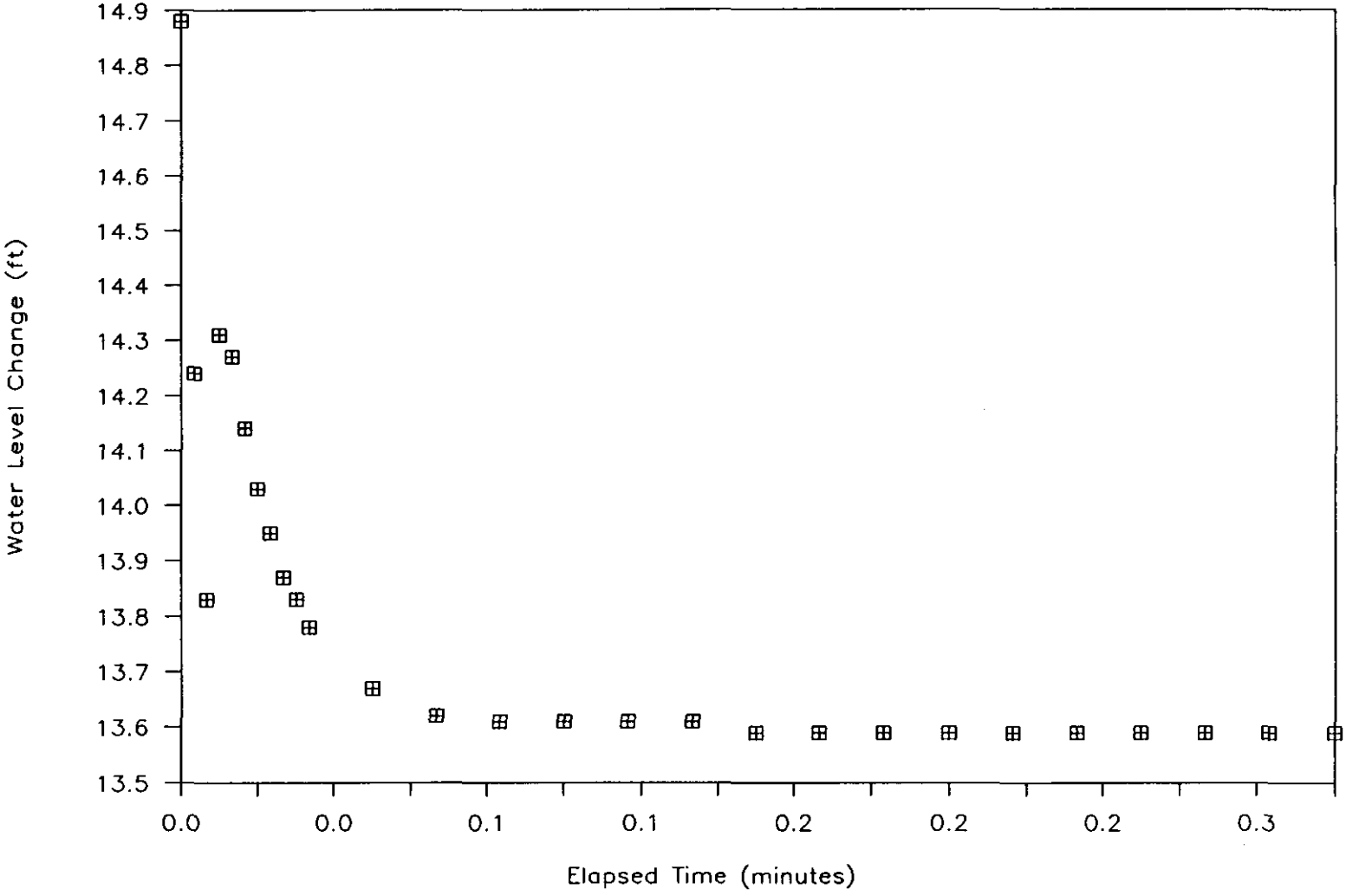
	SQ.FT/MIN	SQ.FT/DAY	GPD/FT	SQ.M/SEC
Transmissivity Fully-P	NA	NA	NA	NA
Transmissivity Partial-P	2.17E+01	31262.0	233814.0	3.36E-02
Transmissivity Partial-P (>6)	2.23E+01	32090.8	240012.5	3.45E-02

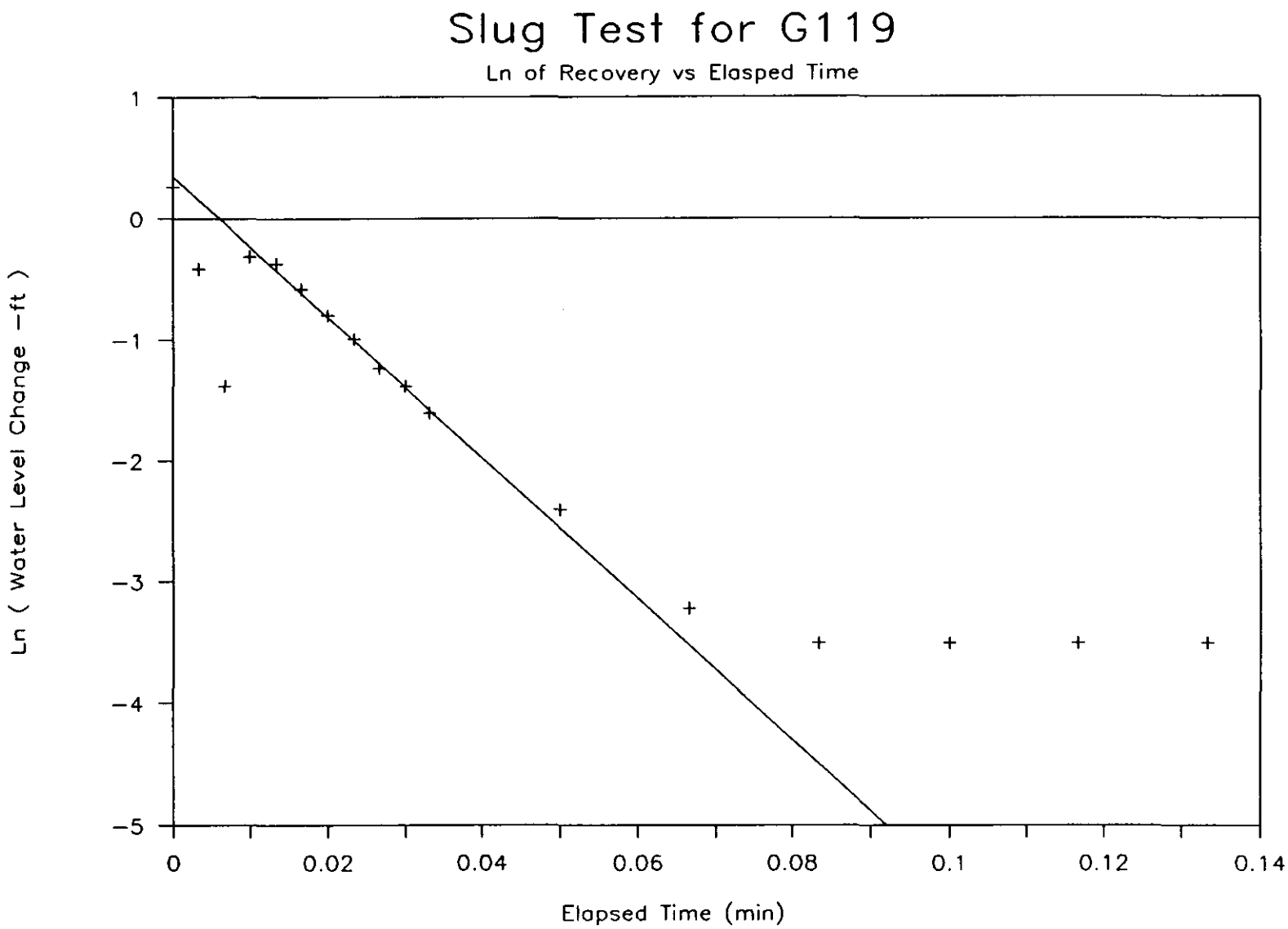
		WELL G119 Time (min)	Depth to Water	Water level Change	Natural Log of Water Level Change		REGR LINE CALC.
Regression Output:		0.0000	14.88	1.30	0.262		0.345
Constant	0.345	0.0033	14.24	0.66	-0.416		0.153
Std Err of Y Est	0.049	0.0066	13.83	0.25	-1.386		-0.038
R Squared	0.991	0.0099	14.31	0.73	-0.315	*	-0.230
No. of Observations	8	0.0133	14.27	0.69	-0.371	*	-0.428
Degrees of Freedom	6	0.0166	14.14	0.56	-0.580	*	-0.620
		0.0200	14.03	0.45	-0.799	*	-0.817
X Coefficient(s)	-58.1084	0.0233	13.95	0.37	-0.994	*	-1.009
Std Err of Coef.	2.2632	0.0266	13.87	0.29	-1.238	*	-1.201
		0.0300	13.83	0.25	-1.386	*	-1.398
		0.0333	13.78	0.20	-1.609		-1.590
		0.0500	13.67	0.09	-2.408		-2.560
		0.0666	13.62	0.04	-3.219		-3.525
		0.0833	13.61	0.03	-3.507		-4.495

WELL G119 Time (min)	Depth to Water	Water level Change	Natural Log of Water Level Change	REGR LINE CALC.
0.1000	13.61	0.03	-3.507	-5.466
0.1166	13.61	0.03	-3.507	-6.430
0.1333	13.61	0.03	-3.507	-7.401
0.1500	13.59	0.01	-4.605	-8.371
0.1666	13.59	0.01	-4.605	-9.336
0.1833	13.59	0.01	-4.605	-10.306
0.2000	13.59	0.01	-4.605	-11.277
0.2166	13.59	0.01	-4.605	-12.241
0.2333	13.59	0.01	-4.605	-13.212
0.2500	13.59	0.01	-4.605	-14.182
0.2666	13.59	0.01	-4.605	-15.147
0.2833	13.59	0.01	-4.605	-16.117
0.3000	13.59	0.01	-4.605	-17.087
0.3166	13.59	0.01	-4.605	-18.052
0.3333	13.59	0.01	-4.605	-19.022
0.4167	13.59	0.01	-4.605	-23.869
0.5000	13.59	0.01	-4.605	-28.709
0.5833	13.59	0.01	-4.605	-33.550
0.6667	13.59	0.01	-4.605	-38.396
0.7500	13.59	0.01	-4.605	-43.236
0.8333	13.59	0.01	-4.605	-48.077
0.9167	13.59	0.01	-4.605	-52.923
1.0000	13.59	0.01	-4.605	-57.763
1.0833	13.59	0.01	-4.605	-62.604
1.1670	13.59	0.01	-4.605	-67.467
1.2500	13.59	0.01	-4.605	-72.290
1.3333	13.59	0.01	-4.605	-77.131
1.4166	13.59	0.01	-4.605	-81.971
1.5000	13.59	0.01	-4.605	-86.817
1.5833	13.59	0.01	-4.605	-91.658
1.6667	13.59	0.01	-4.605	-96.504
1.7500	13.59	0.01	-4.605	-101.345
1.8333	13.59	0.01	-4.605	-106.185
1.9167	13.59	0.01	-4.605	-111.031
2.0000	13.59	0.01	-4.605	-115.872
2.5000	13.59	0.01	-4.605	-144.926
3.0000	13.59	0.01	-4.605	-173.980

Slug Test at G119

Raw Data: Slug Test




Slug Test for G119
Ln of Recovery vs Elasped Time
Ln (Water Level Change -ft)
1
0
-1
-2
-3
-4
-5
0
0.02
0.04
0.06
0.08
0.1
0.12
0.14
Elapsed Time (min)

SLUG TEST RESULTS FOR: G119A
Winnebago Reclamation Landfill

WELL INFORMATION

Casing Diameter (in)	2
Effective Casing RADIUS (in)(rc)	1.00
Screen Diameter (in)	2.0
Effective RADIUS (in)(rw)	1.89
Screen Length (ft)(L)	5.00
Aquifer Thickness (ft)(D)	200.0
Well Penetration (ft)(H)	43.08

CALCULATED PARAMETERS

L / rw	31.7
A	2.45
B	0.40
C	NA
ln ((D-h)/rw)	7.18
ln (Re / rw) Fully Penetrating	NA
ln (Re / rw)Partially Penetrating	2.75
ln (Re / rw)Partially Penetrating(>6)	2.87
1/t * ln (Yo /Yt)	1.66

RESULTS	FT/MIN	FT/DAY	GPD/SQ.FT	CM/SEC
Hydraulic Conductivity Fully-P	NA	NA	NA	NA
Hydraulic Conductivity Partial-P	5.20E-03	7.48E+00	5.60E+01	2.64E-03
Hydraulic Conductivity Partial-P (>6)	5.42E-03	7.80E+00	5.84E+01	2.75E-03

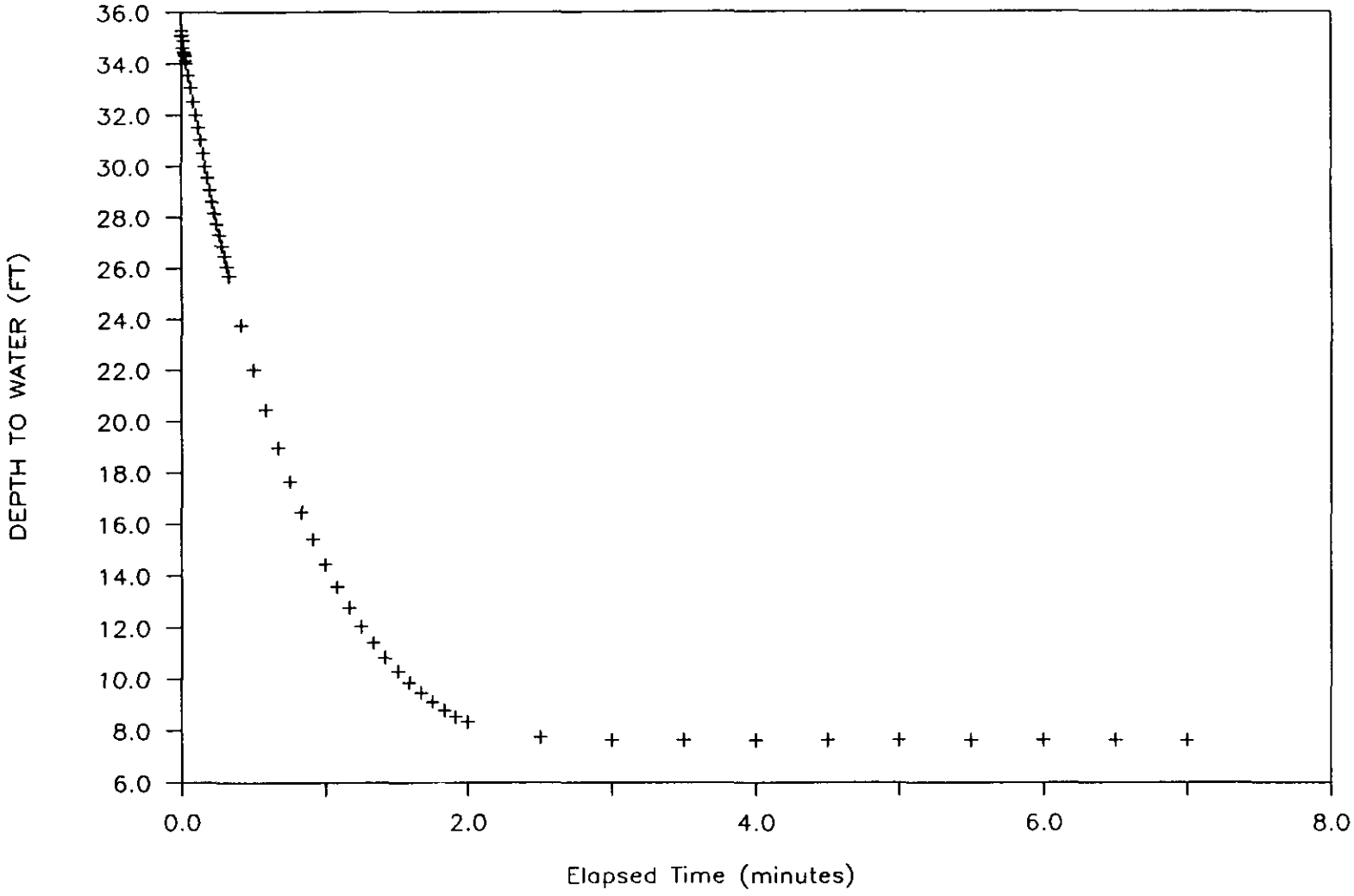
	SQ.FT/MIN	SQ.FT/DAY	GPD/FT	SQ.M/SEC
Transmissivity Fully-P	NA	NA	NA	NA
Transmissivity Partial-P	1.30E+00	1870.9	13992.6	2.01E-03
Transmissivity Partial-P (>6)	1.35E+00	1950.7	14589.4	2.10E-03

		WELL G119A Time (min)	Depth to WATER	Water level Change	Natural Log of Water Level Change		REGR LINE CALC.
Regression Output:		0.0000	35.08	27.49	3.314		3.416
Constant	3.416	0.0033	35.29	27.70	3.321		3.411
Std Err of Y Est	0.117	0.0066	35.10	27.51	3.315		3.406
R Squared	0.988	0.0099	35.11	27.52	3.315	*	3.400
No. of Observations	44	0.0133	34.61	27.02	3.297	*	3.394
Degrees of Freedom	42	0.0166	34.89	27.30	3.307	*	3.389
		0.0200	34.45	26.86	3.291	*	3.383
X Coefficient(s)	-1.6611	0.0233	34.39	26.80	3.288	*	3.378
Std Err of Coef.	0.0283	0.0266	34.29	26.70	3.285	*	3.372
		0.0300	34.12	26.53	3.278	*	3.367
		0.0333	34.01	26.42	3.274		3.361
		0.0500	33.54	25.95	3.256		3.333
		0.0666	33.07	25.48	3.238		3.306
		0.0833	32.53	24.94	3.216		3.278

WELL G119A Time (min)	Depth to WATER	Water level Change	Natural Log of Water Level Change	REGR LINE CALC.
0.1000	32.00	24.41	3.195	3.250
0.1166	31.52	23.93	3.175	3.223
0.1333	31.02	23.43	3.154	3.195
0.1500	30.50	22.91	3.132	3.167
0.1666	29.98	22.39	3.109	3.140
0.1833	29.57	21.98	3.090	3.112
0.2000	29.07	21.48	3.067	3.084
0.2166	28.61	21.02	3.045	3.057
0.2333	28.17	20.58	3.024	3.029
0.2500	27.74	20.15	3.003	3.001
0.2666	27.32	19.73	2.982	2.974
0.2833	26.89	19.30	2.960	2.946
0.3000	26.47	18.88	2.938	2.918
0.3166	26.08	18.49	2.917	2.891
0.3333	25.71	18.12	2.897	2.863
0.4167	23.76	16.17	2.783	2.724
0.5000	22.03	14.44	2.670	2.586
0.5833	20.46	12.87	2.555	2.448
0.6667	18.98	11.39	2.433	2.309
0.7500	17.67	10.08	2.311	2.171
0.8333	16.47	8.88	2.184	2.032
0.9167	15.40	7.81	2.055	1.894
1.0000	14.43	6.84	1.923	1.755
1.0833	13.55	5.96	1.785	1.617
1.1670	12.76	5.17	1.643	1.478
1.2500	12.03	4.44	1.491	1.340
1.3333	11.39	3.80	1.335	1.202
1.4166	10.82	3.23	1.172	1.063
1.5000	10.30	2.71	0.997	0.925
1.5833	9.86	2.27	0.820	0.786
1.6667	9.47	1.88	0.631	0.648
1.7500	9.12	1.53	0.425	0.510
1.8333	8.79	1.20	0.182	0.371
1.9167	8.55	0.96	-0.041	0.233
2.0000	8.35	0.76	-0.274	0.094
2.5000	7.75	0.16	-1.833	-0.736
3.0000	7.64	0.05	-2.996	-1.567
3.5000	7.63	0.04	-3.219	-2.397
4.0000	7.63	0.04	-3.219	-3.228
4.5000	7.63	0.04	-3.219	-4.059
5.0000	7.63	0.04	-3.219	-4.889
5.5000	7.63	0.04	-3.219	-5.720
6.0000	7.63	0.04	-3.219	-6.550
6.5000	7.63	0.04	-3.219	-7.381
7.0000	7.61			-8.211
7.5000	7.61			-9.042

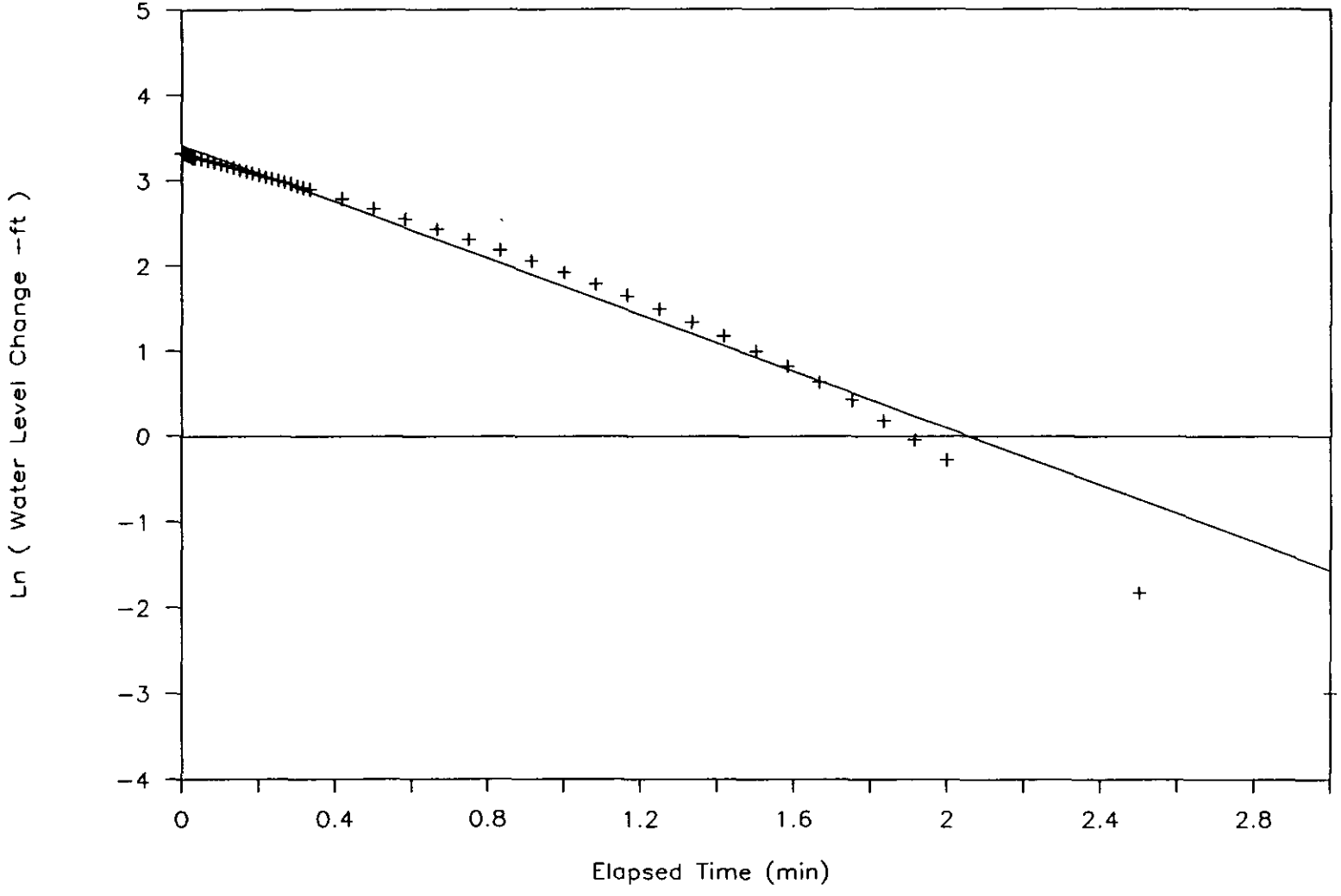
Slug Test at G119A

Raw Data: Slug Test



Slug Test for G119A

Ln of Recovery vs Elasped Time



PHASE II

SLUG TEST RESULTS FOR: G113

SITE: Winnebago Reclamation Landfill

Based on " A Slug Test for Determining Hydraulic Conductivity of Unconfined Aquifers with Completely or Patially Penetrating Wells" by H. Bouwer and R. C. Rice, Water Resources Research, June 1976,p423-428

WELL INFORMATION		TEST DATA	
Casing Diameter (inches)	2	Depth to Water (TOIC, feet)	46.63
Screen Diameter (inches)	2	Beginning Water Level Elevation (ft, MSL)	715.59
Borehole Diameter (inches)	4	Reference from Data Logger (ft)	46.63
Sand Pack Porosity(decimal)	0.2	Last Data Point (ft)	47.70
Screen Length (feet)	10	Final Water Level Elevation (ft)	NT
Top of Inner Casing (feet, MSL)	762.22		
Total Well Depth (TOIC, feet)	50.8		
Stick-UP (feet)	2.3		
Bottom of Screen Elevation (ft, MSL)	711.42		

VARIABLES		AQUIFER PARAMETERS / OTHER WELL DATA
RC---Effective Casing Radius	1.26	Soil or Rock Type: Dolomite
------CHOOSE ONE---------		Confined or Unconfined Conditions? : Unconfined
Water Level Above Screen (inches) OR	1	Est. Aquifer Thickness: 200.0 Feet
in Disturbed Zone (inches)	1.26	Percent Well Penetration: 2.085 %
RW---Radial Distance to Undisturbed Aquifer	2.00	Filter Pack Type: #30 flint sand
------CHOOSE ONE---------		
Filter Pack Permeabilty = Aquifer , OR	1	
Disturbed Zone Permeability >>> Aquifer	2	
L---Effective Screen Length (feet)	4.17	
H---Depth of Well Penetration	4.17	

CALCULATED PARAMETERS		REGRESSION RESULTS	
L / RW	25.0	Regression Output:	
Dimensionless Coefficients (Fig. 3 Bouwer and Rice, 1976)		Constant	-0.91076
Partially Penetrating Well		Std Err of Y Est	0.030942
--- A ----	2.3	R Squared	0.986973
--- B---	0.40	No. of Observations	25
ln (Re / rw)Partially Penetrating	1.83	Degrees of Freedom	23
ln ((D-h)/rw)--If > 6, Use results so marked	7.07		
ln (Re / rw)Partially Penetrating (>6)	1.89	X Coefficient(s)	-0.10754
Or, Fully Pentrating Well		Std Err of Coef.	0.002576
--- C---	NA		
ln (Re / rw) Fully Penetrating	NA		
SLOPE OF BEST FIT LINE:			
1/t * ln (Yo /Yt)	0.1075		

RESULTS	FT/MIN	FT/DAY	GPD/SQ.FT	CM/SEC
Hydraulic Conductivity Fully-P	NA	NA	NA	NA
Hydraulic Conductivity Partial-P	2.60E-04	3.75E-01	2.80E+00	1.32E-04
Hydraulic Conductivity Partial-P (>6)	2.68E-04	3.87E-01	2.89E+00	1.36E-04
	SQ.FT/MIN	SQ.FT/DAY	GPD/FT	SQ.M/SEC
Transmissivity Fully-P	NA	NA	NA	NA
Transmissivity Partial-P	5.20E-02	7.49E+01	5.60E+02	8.05E-05
Transmissivity Partial-P (>6)	5.37E-02	7.73E+01	5.78E+02	8.31E-05

Tested by: DSP

Evaluated by: MJH

Checked by: DSP

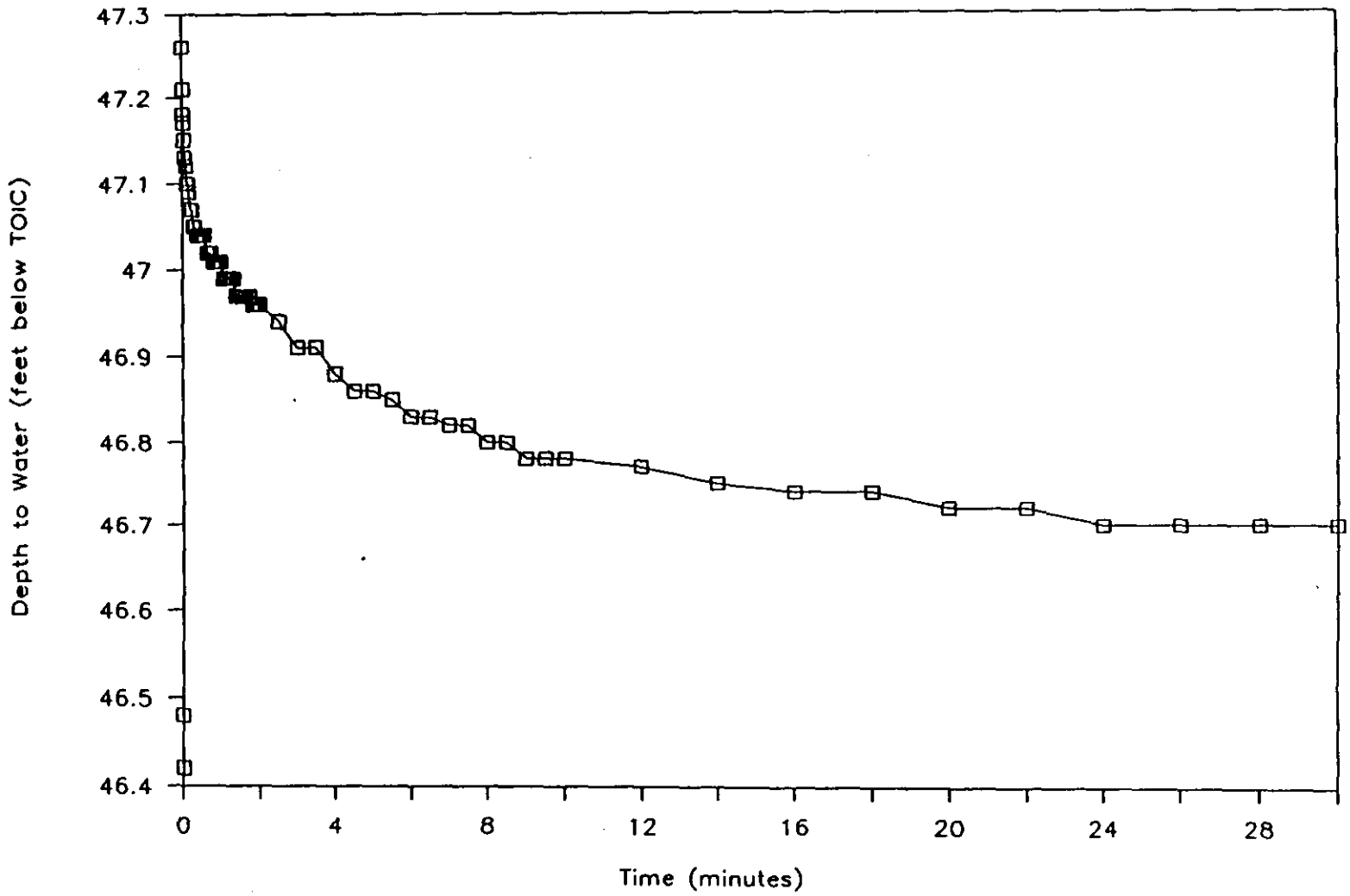
Data for G113

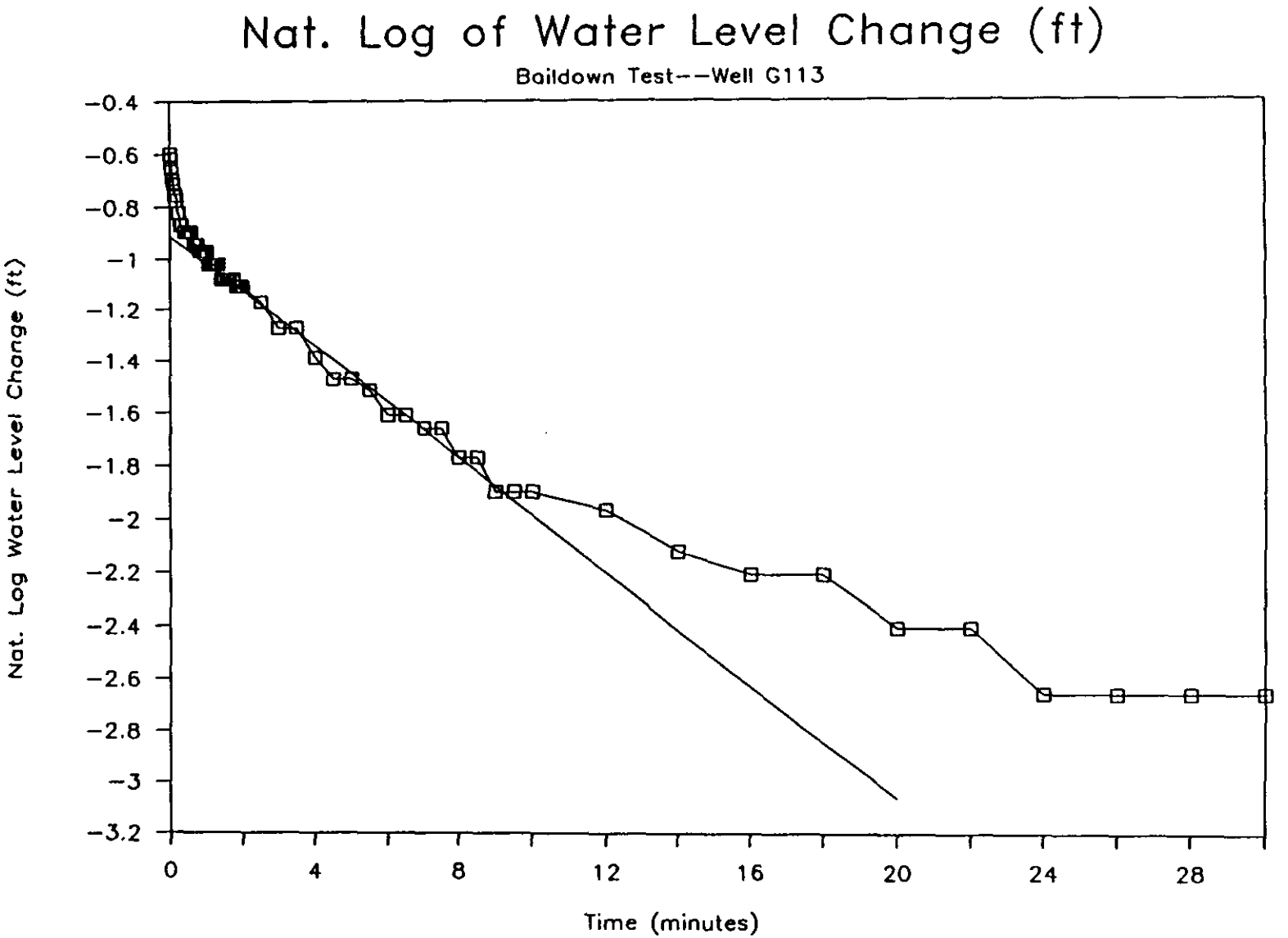
Time (min	Depth to Water	Water level Change	Natural Log of Water Level Change	REGR LINE CALC.
0.0000	46.48	-0.15	ERR	-0.911
0.0033	47.26	0.63	-0.462	-0.911
0.0066	46.42	-0.21	ERR	-0.911
0.0099	47.18	0.55	-0.598	-0.912
0.0133	47.18	0.55	-0.598	-0.912
0.0166	47.21	0.58	-0.545	-0.913
0.0200	47.18	0.55	-0.598	-0.913
0.0233	47.18	0.55	-0.598	-0.913
0.0266	47.18	0.55	-0.598	-0.914
0.0300	47.18	0.55	-0.598	-0.914
0.0333	47.17	0.54	-0.616	-0.914
0.0500	47.15	0.52	-0.654	-0.916
0.0666	47.13	0.50	-0.693	-0.918
0.0833	47.13	0.50	-0.693	-0.920
0.1000	47.12	0.49	-0.713	-0.922
0.1166	47.10	0.47	-0.755	-0.923
0.1333	47.10	0.47	-0.755	-0.925
0.1500	47.10	0.47	-0.755	-0.927
0.1666	47.10	0.47	-0.755	-0.929
0.1833	47.09	0.46	-0.777	-0.930
0.2000	47.09	0.46	-0.777	-0.932
0.2166	47.07	0.44	-0.821	-0.934
0.2333	47.07	0.44	-0.821	-0.936
0.2500	47.07	0.44	-0.821	-0.938
0.2666	47.07	0.44	-0.821	-0.939
0.2833	47.05	0.42	-0.868	-0.941
0.3000	47.05	0.42	-0.868	-0.943
0.3166	47.05	0.42	-0.868	-0.945
0.3333	47.05	0.42	-0.868	-0.947
0.4167	47.04	0.41	-0.892	-0.956
0.5000	47.04	0.41	-0.892	-0.965
0.5833	47.04	0.41	-0.892	-0.973
0.6667	47.02	0.39	-0.942	-0.982
0.7500	47.02	0.39	-0.942	-0.991
0.8333	47.01	0.38	-0.968	-1.000
0.9167	47.01	0.38	-0.968	-1.009
1.0000	47.01	0.38	-0.968	-1.018
1.0833	46.99	0.36	-1.022 *	-1.027
1.1667	46.99	0.36	-1.022 *	-1.036
1.2500	46.99	0.36	-1.022 *	-1.045
1.3333	46.99	0.36	-1.022 *	-1.054
1.4166	46.97	0.34	-1.079 *	-1.063
1.5000	46.97	0.34	-1.079 *	-1.072
1.5833	46.97	0.34	-1.079 *	-1.081
1.6667	46.97	0.34	-1.079 *	-1.090
1.7500	46.97	0.34	-1.079 *	-1.099
1.8333	46.96	0.33	-1.109 *	-1.108
1.9167	46.96	0.33	-1.109 *	-1.117
2.0000	46.96	0.33	-1.109 *	-1.126
2.5	46.94	0.31	-1.171 *	-1.180
3	46.91	0.28	-1.273 *	-1.233
3.5	46.91	0.28	-1.273 *	-1.287
4	46.88	0.25	-1.386 *	-1.341
4.5	46.86	0.23	-1.470 *	-1.395

5	46.86	0.23	-1.470 *	-1.448
5.5	46.85	0.22	-1.514 *	-1.502
6	46.83	0.20	-1.609 *	-1.556
6.5	46.83	0.20	-1.609 *	-1.610
7	46.82	0.19	-1.661 *	-1.664
7.5	46.82	0.19	-1.661 *	-1.717
8	46.80	0.17	-1.772 *	-1.771
8.5	46.80	0.17	-1.772 *	-1.825
9	46.78	0.15	-1.897	-1.879
9.5	46.78	0.15	-1.897	-1.932
10	46.78	0.15	-1.897	-1.986
12	46.77	0.14	-1.966	-2.201
14	46.75	0.12	-2.120	-2.416
16	46.74	0.11	-2.207	-2.631
18	46.74	0.11	-2.207	-2.846
20	46.72	0.09	-2.408	-3.062
22	46.72	0.09	-2.408	-3.277
24	46.70	0.07	-2.659	-3.492
26	46.70	0.07	-2.659	-3.707
28	46.70	0.07	-2.659	-3.922
30	46.70	0.07	-2.659	-4.137

Recovery of Water Level

Baildown Test--G113




Nat. Log of Water Level Change (ft)
Baildown Test--Well G113
Nat. Log Water Level Change (ft)
-0.4
-0.6
-0.8
-1
-1.2
-1.4
-1.6
-1.8
-2
-2.2
-2.4
-2.6
-2.8
-3
-3.2
0
4
8
12
16
20
24
28
Time (minutes)

SLUG TEST RESULTS FOR: G113A

SITE: Winnebago Reclamation Landfill

Based on " A Slug Test for Determining Hydraulic Conductivity of Unconfined Aquifers with Completely or Patially Penetrating Wells" by H. Bouwer and R. C. Rice, Water Resources Research, June 1976,p423-428

WELL INFORMATION		TEST DATA	
Casing Diameter (inches)	2	Depth to Water (TOIC, feet)	47.35
Screen Diameter (inches)	2	Beginning Water Level Elevation (ft, MSL)	715.54
Borehole Diameter (inches)	4	Reference from Data Logger (ft)	47.35
Sand Pack Porosity(decimal)	0.2	Last Data Point (ft)	47.64
Screen Length (feet)	5	Final Water Level Elevation (ft)	NT
Top of Inner Casing (feet, MSL)	762.89		
Total Well Depth (TOIC, feet)	77.9		
Stick-UP (feet)	2.9		
Bottom of Screen Elevation (ft, MSL)	685.00		

VARIABLES		AQUIFER PARAMETERS / OTHER WELL DATA
RC---Effective Casing Radius	1.00	Soil or Rock Type: Dolomite
------CHOOSE ONE---------		Confined or Unconfined Conditions? : Unconfined
Water Level Above Screen (inches) OR	1	Est. Aquifer Thickness: 200.0 Feet
in Disturbed Zone (inches)	1.26	Percent Well Penetration: 15.275 %
RW---Radial Distance to Undisturbed Aquifer	2.00	Filter Pack Type: #30 flint sand
------CHOOSE ONE---------		
Filter Pack Permeabilty = Aquifer , OR	1	
Disturbed Zone Permeability >>> Aquifer	2	
L---Effective Screen Length (feet)	5	
H---Depth of Well Penetration	30.55	

CALCULATED PARAMETERS		REGRESSION RESULTS	
L / RW	30.0	Regression Output:	
Dimensionless Coefficients (Fig. 3 Bouwer and Rice, 1976)		Constant	0.233901
Partially Penetrating Well		Std Err of Y Est	0.011809
--- A ----	2.5	R Squared	0.995142
--- B---	0.40	No. of Observations	48
ln (Re / rw)Partially Penetrating	2.59	Degrees of Freedom	46
ln ((D-h)/rw)--If > 6, Use results so marked	6.92		
ln (Re / rw)Partially Penetrating (>6)	2.67	X Coefficient(s)	-0.05674
Or, Fully Pentrating Well		Std Err of Coef.	0.000584
--- C---	NA		
ln (Re / rw) Fully Penetrating	NA		
SLOPE OF BEST FIT LINE:			
1/t * ln (Yo /Yt)	0.0567		

RESULTS	FT/MIN	FT/DAY	GPD/SQ.FT	CM/SEC
Hydraulic Conductivity Fully-P	NA	NA	NA	NA
Hydraulic Conductivity Partial-P	1.02E-04	1.47E-01	1.10E+00	5.18E-05
Hydraulic Conductivity Partial-P (>6)	1.05E-04	1.52E-01	1.13E+00	5.35E-05
	SQ.FT/MIN	SQ.FT/DAY	GPD/FT	SQ.M/SEC
Transmissivity Fully-P	NA	NA	NA	NA
Transmissivity Partial-P	2.04E-02	2.93E+01	2.19E+02	3.15E-05
Transmissivity Partial-P (>6)	2.10E-02	3.03E+01	2.27E+02	3.26E-05

Tested by: DSP

Evaluated by: MJH

Checked by: DSP

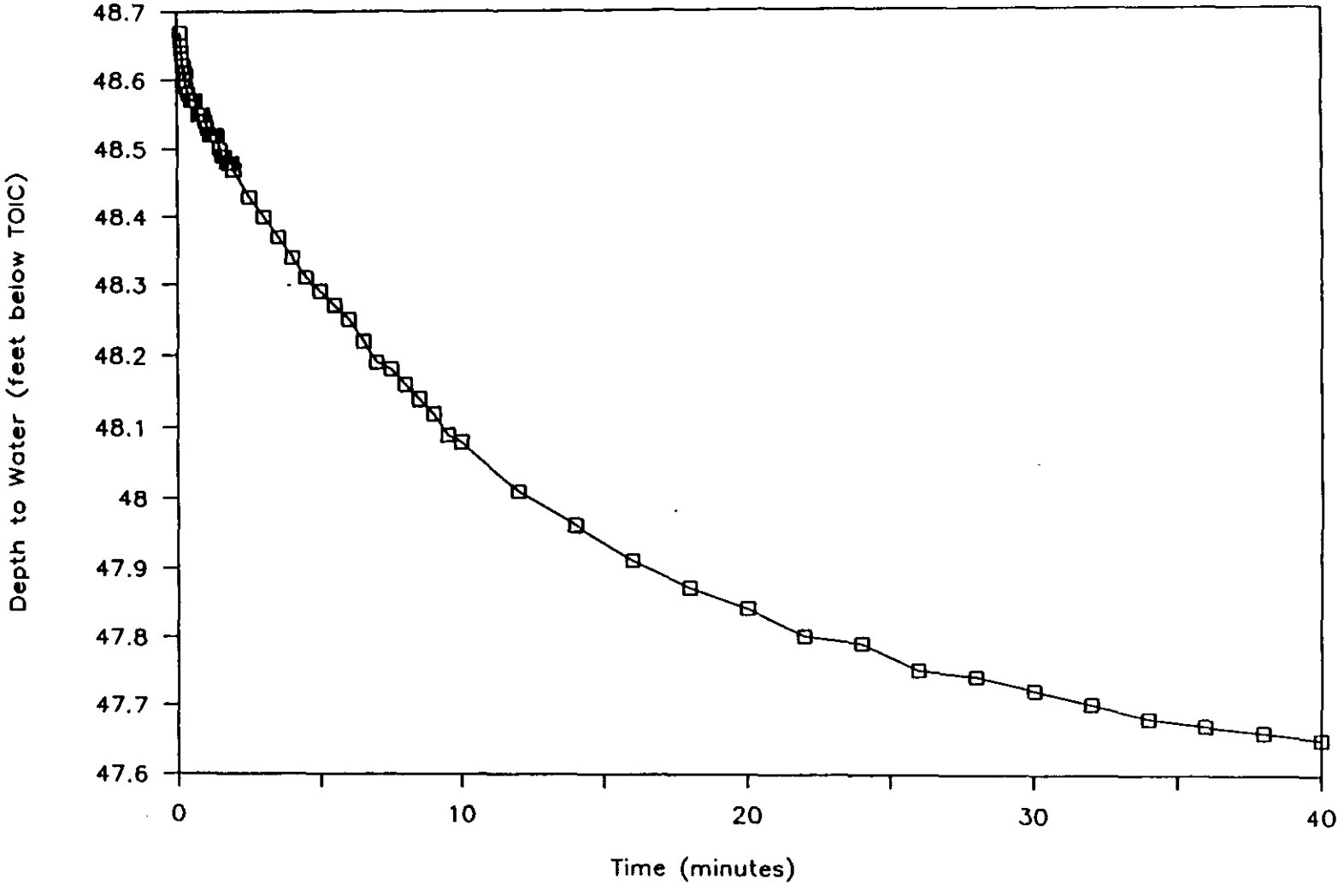
Data for G113A

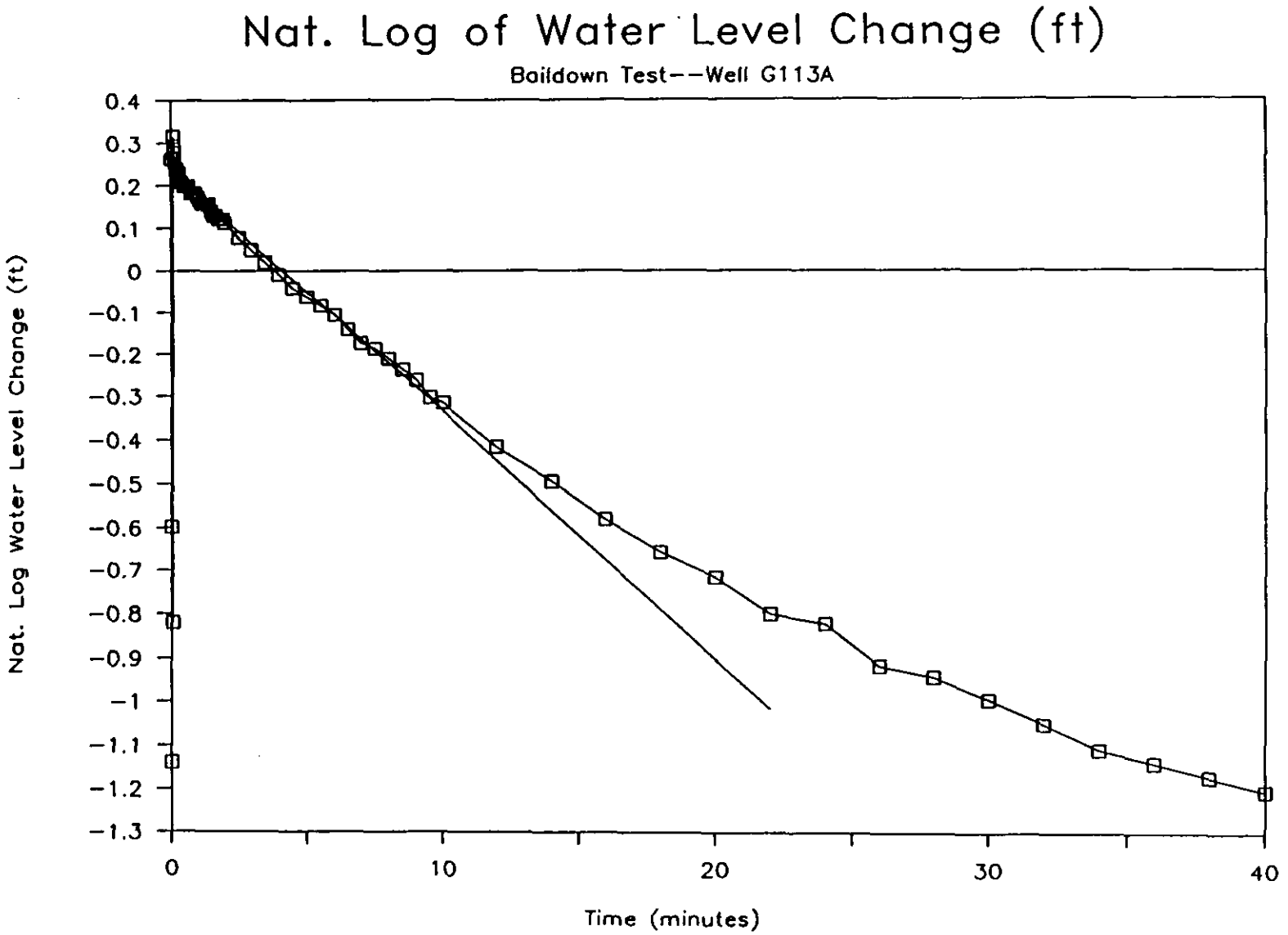
Time (min	Depth to Water	Water level Change	Natural Log of Water Level Change	REGR LINE CALC.
0.0000	46.56	-0.79	ERR	0.234
0.0033	47.19	-0.16	ERR	0.234
0.0066	48.45	1.10	0.095	0.234
0.0099	47.97	0.62	-0.478	0.233
0.0133	48.00	0.65	-0.431	0.233
0.0166	46.60	-0.75	ERR	0.233
0.0200	47.67	0.32	-1.139	0.233
0.0233	46.55	-0.80	ERR	0.233
0.0266	48.65	1.30	0.262	0.232
0.0300	46.77	-0.58	ERR	0.232
0.0333	47.90	0.55	-0.598	0.232
0.0500	47.23	-0.12	ERR	0.231
0.0666	47.79	0.44	-0.821	0.230
0.0833	48.72	1.37	0.315	0.229
0.1000	48.69	1.34	0.293	0.228
0.1166	48.67	1.32	0.278	0.227
0.1333	48.65	1.30	0.262	0.226
0.1500	48.64	1.29	0.255 *	0.225
0.1666	48.63	1.28	0.247 *	0.224
0.1833	48.62	1.27	0.239 *	0.224
0.2000	48.62	1.27	0.239 *	0.223
0.2166	48.60	1.25	0.223 *	0.222
0.2333	48.62	1.27	0.239 *	0.221
0.2500	48.62	1.27	0.239 *	0.220
0.2666	48.60	1.25	0.223 *	0.219
0.2833	48.60	1.25	0.223 *	0.218
0.3000	48.61	1.26	0.231 *	0.217
0.3166	48.60	1.25	0.223 *	0.216
0.3333	48.59	1.24	0.215 *	0.215
0.4167	48.58	1.23	0.207 *	0.210
0.5000	48.57	1.22	0.199 *	0.206
0.5833	48.57	1.22	0.199 *	0.201
0.6667	48.57	1.22	0.199 *	0.196
0.7500	48.55	1.20	0.182 *	0.191
0.8333	48.55	1.20	0.182 *	0.187
0.9167	48.55	1.20	0.182 *	0.182
1.0000	48.54	1.19	0.174 *	0.177
1.0833	48.53	1.18	0.166 *	0.172
1.1667	48.52	1.17	0.157 *	0.168
1.2500	48.52	1.17	0.157 *	0.163
1.3333	48.52	1.17	0.157 *	0.158
1.4166	48.52	1.17	0.157 *	0.154
1.5000	48.50	1.15	0.140 *	0.149
1.5833	48.49	1.14	0.131 *	0.144
1.6667	48.49	1.14	0.131 *	0.139
1.7500	48.48	1.13	0.122 *	0.135
1.8333	48.48	1.13	0.122 *	0.130
1.9167	48.48	1.13	0.122 *	0.125
2.0000	48.47	1.12	0.113 *	0.120
2.5	48.43	1.08	0.077 *	0.092
3	48.40	1.05	0.049 *	0.064
3.5	48.37	1.02	0.020 *	0.035
4	48.34	0.99	-0.010 *	0.007
4.5	48.31	0.96	-0.041 *	-0.021

5	48.29	0.94	-0.062	*	-0.050
5.5	48.27	0.92	-0.083	*	-0.078
6	48.25	0.90	-0.105	*	-0.107
6.5	48.22	0.87	-0.139	*	-0.135
7	48.19	0.84	-0.174	*	-0.163
7.5	48.18	0.83	-0.186	*	-0.192
8	48.16	0.81	-0.211	*	-0.220
8.5	48.14	0.79	-0.236	*	-0.248
9	48.12	0.77	-0.261	*	-0.277
9.5	48.09	0.74	-0.301	*	-0.305
10	48.08	0.73	-0.315	*	-0.334
12	48.01	0.66	-0.416		-0.447
14	47.96	0.61	-0.494		-0.561
16	47.91	0.56	-0.580		-0.674
18	47.87	0.52	-0.654		-0.788
20	47.84	0.49	-0.713		-0.901
22	47.80	0.45	-0.799		-1.015
24	47.79	0.44	-0.821		-1.128
26	47.75	0.40	-0.916		-1.242
28	47.74	0.39	-0.942		-1.355
30	47.72	0.37	-0.994		-1.469
32	47.70	0.35	-1.050		-1.582
34	47.68	0.33	-1.109		-1.695
36	47.67	0.32	-1.139		-1.809
38	47.66	0.31	-1.171		-1.922
40	47.65	0.30	-1.204		-2.036
42	47.64	0.29	-1.238		-2.149

Recovery of Water Level

Baildown Test--G113A




Nat. Log of Water Level Change (ft)
Baildown Test--Well G113A
Nat. Log Water Level Change (ft)
0.4
0.3
0.2
0.1
0
-0.1
-0.2
-0.3
-0.4
-0.5
-0.6
-0.7
-0.8
-0.9
-1
-1.1
-1.2
-1.3
0
10
20
30
40
Time (minutes)

SLUG TEST RESULTS FOR: B10
SITE: Winnebago Reclamation Landfill

Based on " A Slug Test for Determining Hydraulic Conductivity of Unconfined Aquifers with Completely or Patially Penetrating Wells" by H. Bouwer and R. C. Rice, Water Resources Research, June 1976, p423-428

WELL INFORMATION		TEST DATA	
Casing Diameter (inches)	2	Depth to Water (TOIC, feet)	33.87
Screen Diameter (inches)	2	Beginning Water Level Elevation (ft, MSL)	710.47
Borehole Diameter (inches)	4	Reference from Data Logger (ft)	33.87
Sand Pack Porosity(decimal)	0.2	Last Data Point (ft)	33.97
Screen Length (feet)	5	Final Water Level Elevation (ft)	NT
Top of Inner Casing (feet, MSL)	744.34		
Total Well Depth (TOIC, feet)	42.5		
Stick-UP (feet)	2.5		
Bottom of Screen Elevation (ft, MSL)	701.80		

VARIABLES		AQUIFER PARAMETERS / OTHER WELL DATA	
RC---Effective Casing Radius	1.00	Soil or Rock Type: Dolomite	
------CHOOSE ONE---------		Confined or Unconfined Conditions? : Unconfined	
Water Level Above Screen (inches) OR	1	Est. Aquifer Thickness:	200.0 Feet
in Disturbed Zone (inches)	1.26	Percent Well Penetration:	4.315 %
RW---Radial Distance to Undisturbed Aquifer	2.00	Filter Pack Type:	sand
------CHOOSE ONE---------			
Filter Pack Permeabilty = Aquifer , OR	1		
Disturbed Zone Permeability >>> Aquifer	2		
L---Effective Screen Length (feet)	5		
H---Depth of Well Penetration	8.63		

CALCULATED PARAMETERS		REGRESSION RESULTS	
L / RW	30.0	Regression Output:	
Dimensionless Coefficients (Fig. 3 Bouwer and Rice, 1976)		Constant	0.410601
Partially Penetrating Well		Std Err of Y Est	0.017739
--- A ----	2.5	R Squared	0.995311
--- B---	0.40	No. of Observations	57
ln (Re / rw)Partially Penetrating	2.19	Degrees of Freedom	55
ln ((D-h)/rw)--If > 6, Use results so marked	7.05		
ln (Re / rw)Partially Penetrating (>6)	2.26	X Coefficient(s)	-0.08952
Or, Fully Pentrating Well		Std Err of Coef.	0.000828
--- C---	NA		
ln (Re / rw) Fully Penetrating	NA		
SLOPE OF BEST FIT LINE:			
1/t * ln (Yo /Yt)	0.0895		

RESULTS	FT/MIN	FT/DAY	GPD/SQ.FT	CM/SEC
Hydraulic Conductivity Fully-P	NA	NA	NA	NA
Hydraulic Conductivity Partial-P	1.36E-04	1.96E-01	1.47E+00	6.93E-05
Hydraulic Conductivity Partial-P (>6)	1.41E-04	2.03E-01	1.51E+00	7.15E-05
	SQ.FT/MIN	SQ.FT/DAY	GPD/FT	SQ.M/SEC
Transmissivity Fully-P	NA	NA	NA	NA
Transmissivity Partial-P	2.73E-02	3.93E+01	2.94E+02	4.22E-05
Transmissivity Partial-P (>6)	2.81E-02	4.05E+01	3.03E+02	4.35E-05

Tested by: DSP

Evaluated by: MJH

Checked by: DSP

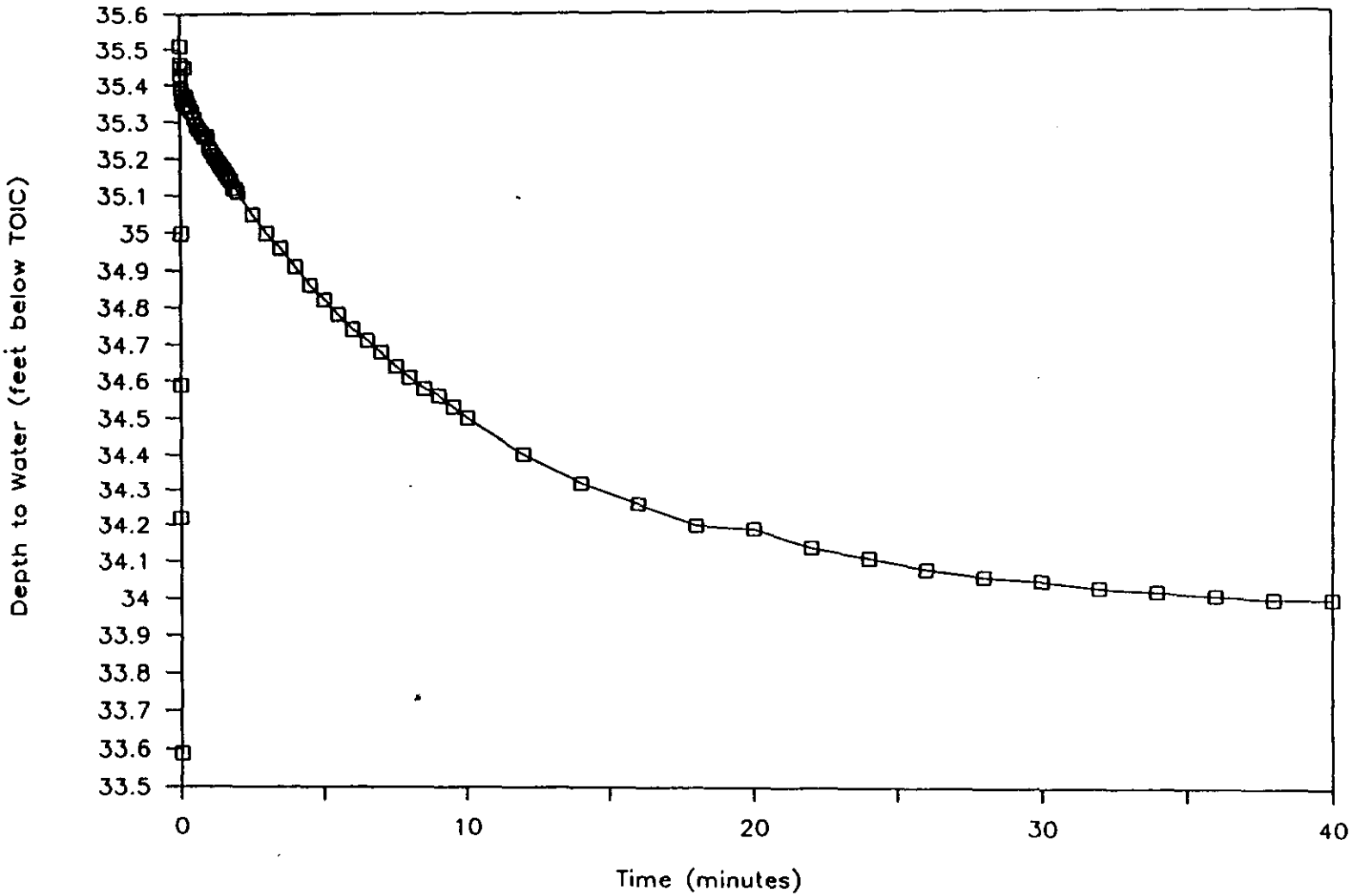
Data for 810

Time (min	Depth to Water	Water level Change	Natural Log of Water Level Change	REGR LINE CALC.
0.0000	33.87	0.00	ERR	0.411
0.0033	37.67	3.80	1.335	0.410
0.0066	34.22	0.35	-1.050	0.410
0.0099	33.59	-0.28	ERR	0.410
0.0133	34.59	0.72	-0.329	0.409
0.0166	35.00	1.13	0.122	0.409
0.0200	35.51	1.64	0.495	0.409
0.0233	35.45	1.58	0.457	0.409
0.0266	35.46	1.59	0.464 *	0.408
0.0300	35.43	1.56	0.445 *	0.408
0.0333	35.43	1.56	0.445 *	0.408
0.0500	35.39	1.52	0.419 *	0.406
0.0666	35.38	1.51	0.412 *	0.405
0.0833	35.37	1.50	0.405 *	0.403
0.1000	35.36	1.49	0.399 *	0.402
0.1166	35.36	1.49	0.399 *	0.400
0.1333	35.35	1.48	0.392 *	0.399
0.1500	35.36	1.49	0.399 *	0.397
0.1666	35.45	1.58	0.457 *	0.396
0.1833	35.36	1.49	0.399 *	0.394
0.2000	35.37	1.50	0.405 *	0.393
0.2166	35.35	1.48	0.392 *	0.391
0.2333	35.36	1.49	0.399 *	0.390
0.2500	35.35	1.48	0.392 *	0.388
0.2666	35.35	1.48	0.392 *	0.387
0.2833	35.35	1.48	0.392 *	0.385
0.3000	35.34	1.47	0.385 *	0.384
0.3166	35.34	1.47	0.385 *	0.382
0.3333	35.34	1.47	0.385 *	0.381
0.4167	35.33	1.46	0.378 *	0.373
0.5000	35.31	1.44	0.365 *	0.366
0.5833	35.29	1.42	0.351 *	0.358
0.6667	35.28	1.41	0.344 *	0.351
0.7500	35.27	1.40	0.336 *	0.343
0.8333	35.26	1.39	0.329 *	0.336
0.9167	35.26	1.39	0.329 *	0.329
1.0000	35.23	1.36	0.307 *	0.321
1.0833	35.22	1.35	0.300 *	0.314
1.1667	35.21	1.34	0.293 *	0.306
1.2500	35.20	1.33	0.285 *	0.299
1.3333	35.19	1.32	0.278 *	0.291
1.4166	35.18	1.31	0.270 *	0.284
1.5000	35.17	1.30	0.262 *	0.276
1.5833	35.16	1.29	0.255 *	0.269
1.6667	35.15	1.28	0.247 *	0.261
1.7500	35.14	1.27	0.239 *	0.254
1.8333	35.12	1.25	0.223 *	0.246
1.9167	35.12	1.25	0.223 *	0.239
2.0000	35.11	1.24	0.215 *	0.232
2.5	35.05	1.18	0.166 *	0.187
3	35.00	1.13	0.122 *	0.142
3.5	34.96	1.09	0.086 *	0.097
4	34.91	1.04	0.039 *	0.053
4.5	34.86	0.99	-0.010 *	0.008

5	34.82	0.95	-0.051 *	-0.037
5.5	34.78	0.91	-0.094 *	-0.082
6	34.74	0.87	-0.139 *	-0.127
6.5	34.71	0.84	-0.174 *	-0.171
7	34.68	0.81	-0.211 *	-0.216
7.5	34.64	0.77	-0.261 *	-0.261
8	34.61	0.74	-0.301 *	-0.306
8.5	34.58	0.71	-0.342 *	-0.350
9	34.56	0.69	-0.371 *	-0.395
9.5	34.53	0.66	-0.416 *	-0.440
10	34.50	0.63	-0.462 *	-0.485
12	34.40	0.53	-0.635	-0.664
14	34.32	0.45	-0.799	-0.843
16	34.26	0.39	-0.942	-1.022
18	34.20	0.33	-1.109	-1.201
20	34.19	0.32	-1.139	-1.380
22	34.14	0.27	-1.309	-1.559
24	34.11	0.24	-1.427	-1.738
26	34.08	0.21	-1.561	-1.917
28	34.06	0.19	-1.661	-2.096
30	34.05	0.18	-1.715	-2.275
32	34.03	0.16	-1.833	-2.454
34	34.02	0.15	-1.897	-2.633
36	34.01	0.14	-1.966	-2.812
38	34.00	0.13	-2.040	-2.991
40	34.00	0.13	-2.040	-3.170
42	33.99	0.12	-2.120	-3.349
44	33.98	0.11	-2.207	-3.528
46	33.99	0.12	-2.120	-3.708
48	33.98	0.11	-2.207	-3.887
50	33.98	0.11	-2.207	-4.066
52	33.98	0.11	-2.207	-4.245
54	33.98	0.11	-2.207	-4.424
56	33.97	0.10	-2.303	-4.603
58	33.97	0.10	-2.303	-4.782

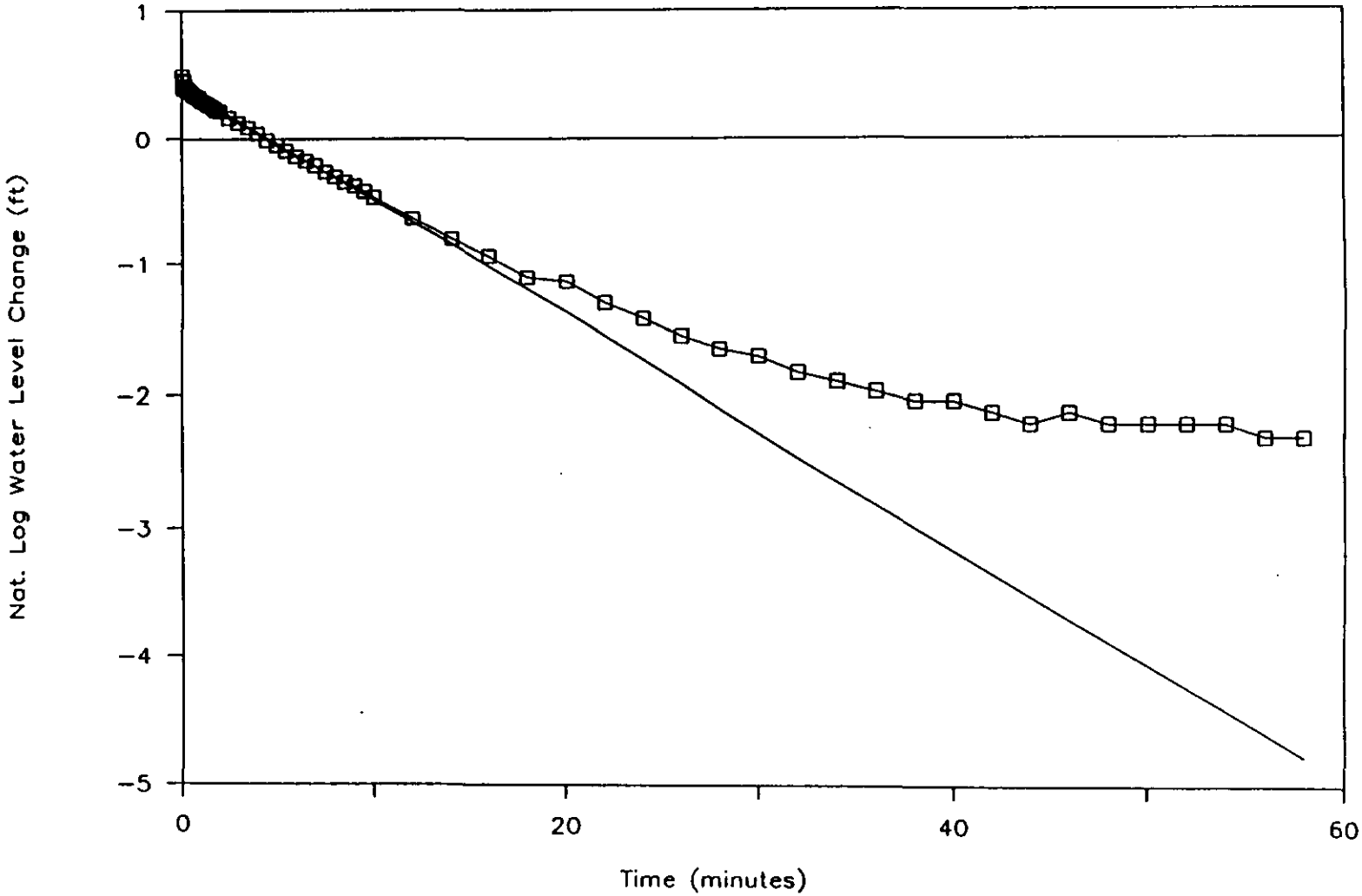
Recovery of Water Level

Baildown Test--B10



Nat. Log of Water Level Change (ft)

Baildown Test--Well B10



SLUG TEST RESULTS FOR: B10A

SITE: Winnebago Reclamation Landfill

Based on " A Slug Test for Determining Hydraulic Conductivity of Unconfined Aquifers with Completely or Patially Penetrating Wells" by H. Bouwer and R. C. Rice, Water Resources Research, June 1976,p423-428

WELL INFORMATION		TEST DATA	
Casing Diameter (inches)	2	Depth to Water (TOIC, feet)	33.1
Screen Diameter (inches)	2	Beginning Water Level Elevation (ft, MSL)	710.84
Borehole Diameter (inches)	4	Reference from Data Logger (ft)	33.10
Sand Pack Porosity(decimal)	0.2	Last Data Point (ft)	33.02
Screen Length (feet)	5	Final Water Level Elevation (ft)	NT
Top of Inner Casing (feet, MSL)	743.94		
Total Well Depth (TOIC, feet)	63.5		
Stick-UP (feet)	1.7		
Bottom of Screen Elevation (ft, MSL)	680.44		

VARIABLES		AQUIFER PARAMETERS / OTHER WELL DATA
RC---Effective Casing Radius	1.00	Soil or Rock Type: Dolomite
------CHOOSE ONE---------		Confined or Unconfined Conditions? : Unconfined
Water Level Above Screen (inches) OR	1	Est. Aquifer Thickness: 200.0 Feet
in Disturbed Zone (inches)	1.26	Percent Well Penetration: 15.2 %
RW---Radial Distance to Undisturbed Aquifer	2.00	Filter Pack Type: flint sand
------CHOOSE ONE---------		
Filter Pack Permeabilty = Aquifer , OR	1	
Disturbed Zone Permeability >>> Aquifer	2	
L---Effective Screen Length (feet)	5	
H---Depth of Well Penetration	30.40	

CALCULATED PARAMETERS		REGRESSION RESULTS	
L / RW	30.0	Regression Output:	
Dimensionless Coefficients (Fig. 3 Bouwer and Rice, 1976)		Constant	0.884828
Partially Penetrating Well		Std Err of Y Est	0.013016
--- A ----	2.5	R Squared	0.995636
--- B---	0.40	No. of Observations	20
ln (Re / rw)Partially Penetrating	2.58	Degrees of Freedom	18
ln ((D-h)/rw)--If > 6, Use results so marked	6.93		
ln (Re / rw)Partially Penetrating (>6)	2.67	X Coefficient(s)	-1.96274
Or, Fully Pentrating Well		Std Err of Coef.	0.030625
--- C---	NA		
ln (Re / rw) Fully Penetrating	NA		
SLOPE OF BEST FIT LINE:			
1/t * ln (Yo /Yt)	1.9627		

RESULTS	FT/MIN	FT/DAY	GPD/SQ.FT	CM/SEC
Hydraulic Conductivity Fully-P	NA	NA	NA	NA
Hydraulic Conductivity Partial-P	3.52E-03	5.07E+00	3.79E+01	1.79E-03
Hydraulic Conductivity Partial-P (>6)	3.64E-03	5.24E+00	3.92E+01	1.85E-03
	SQ.FT/MIN	SQ.FT/DAY	GPD/FT	SQ.M/SEC
Transmissivity Fully-P	NA	NA	NA	NA
Transmissivity Partial-P	7.04E-01	1.01E+03	7.59E+03	1.09E-03
Transmissivity Partial-P (>6)	7.28E-01	1.05E+03	7.84E+03	1.13E-03

Tested by: DSP

Evaluated by: MJH

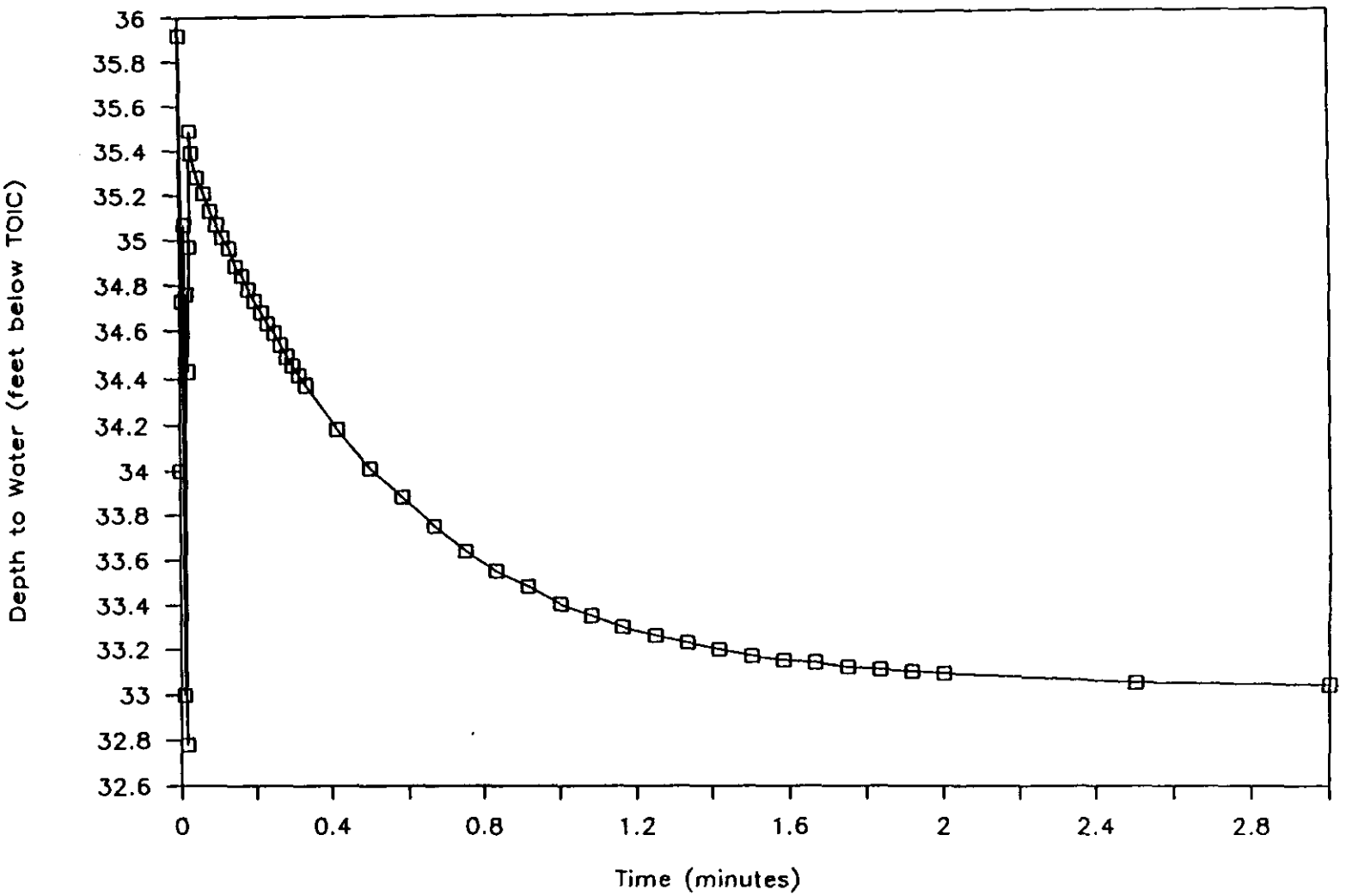
Checked by: DSP

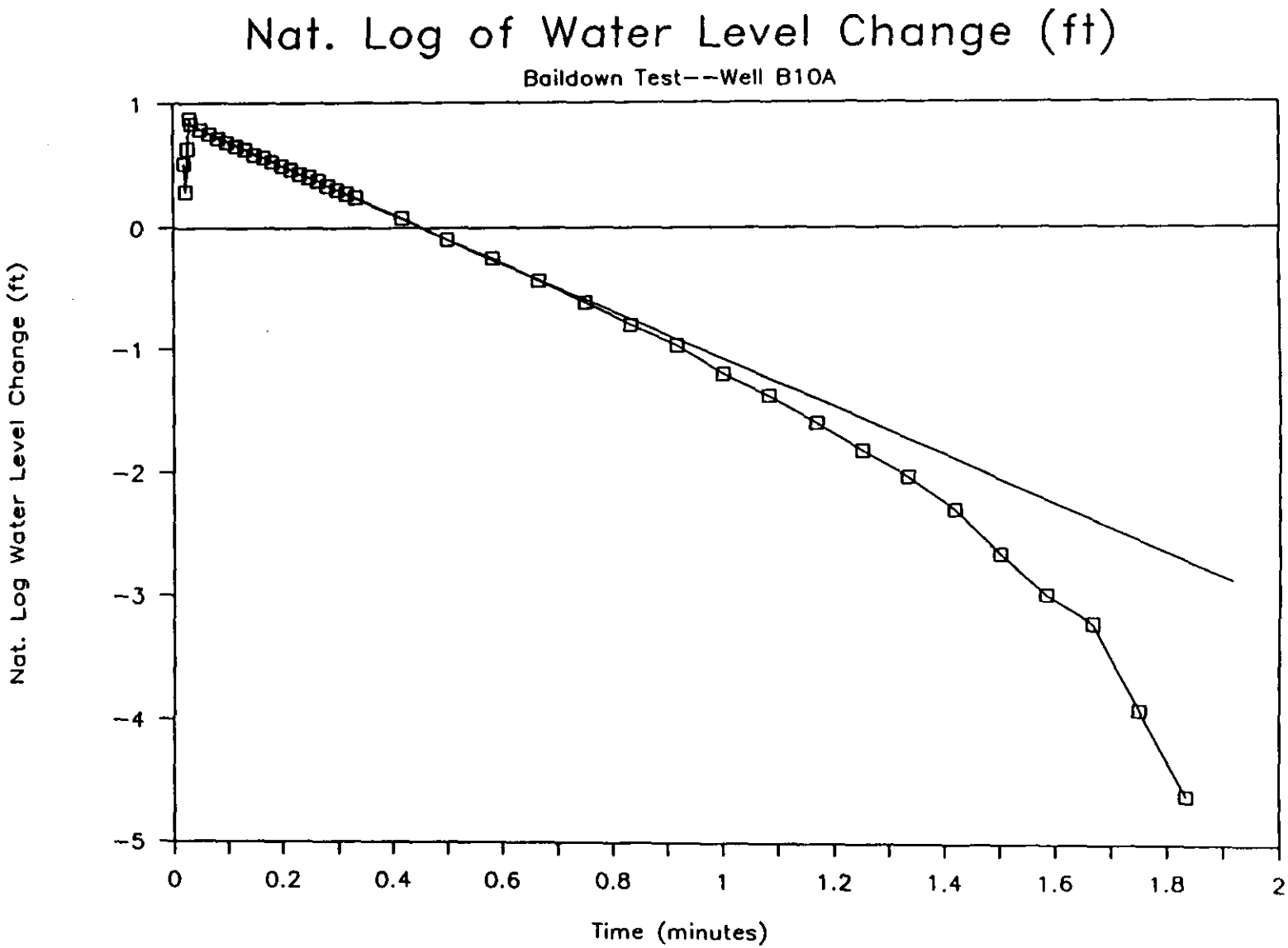
Data for B10A

Time (min	Depth to Water	Water level Change	Natural Log of Water Level Change	REGR LINE CALC.
0.0000	34.00	0.90	-0.105	0.885
0.0033	35.92	2.82	1.037	0.878
0.0066	34.73	1.63	0.489	0.872
0.0099	33.00	-0.10	ERR	0.865
0.0133	35.07	1.97	0.678	0.859
0.0166	32.78	-0.32	ERR	0.852
0.0200	34.76	1.66	0.507	0.846
0.0233	34.43	1.33	0.285	0.839
0.0266	34.97	1.87	0.626	0.833
0.0300	35.49	2.39	0.871 *	0.826
0.0333	35.39	2.29	0.829 *	0.819
0.0500	35.28	2.18	0.779 *	0.787
0.0666	35.21	2.11	0.747 *	0.754
0.0833	35.13	2.03	0.708 *	0.721
0.1000	35.07	1.97	0.678 *	0.689
0.1166	35.01	1.91	0.647 *	0.656
0.1333	34.96	1.86	0.621 *	0.623
0.1500	34.88	1.78	0.577 *	0.590
0.1666	34.84	1.74	0.554 *	0.558
0.1833	34.78	1.68	0.519 *	0.525
0.2000	34.73	1.63	0.489 *	0.492
0.2166	34.68	1.58	0.457 *	0.460
0.2333	34.63	1.53	0.425 *	0.427
0.2500	34.59	1.49	0.399 *	0.394
0.2666	34.54	1.44	0.365 *	0.362
0.2833	34.49	1.39	0.329 *	0.329
0.3000	34.45	1.35	0.300 *	0.296
0.3166	34.41	1.31	0.270 *	0.263
0.3333	34.37	1.27	0.239 *	0.231
0.4167	34.18	1.08	0.077	0.067
0.5000	34.01	0.91	-0.094	-0.097
0.5833	33.88	0.78	-0.248	-0.260
0.6667	33.75	0.65	-0.431	-0.424
0.7500	33.64	0.54	-0.616	-0.587
0.8333	33.55	0.45	-0.799	-0.751
0.9167	33.48	0.38	-0.968	-0.914
1.0000	33.40	0.30	-1.204	-1.078
1.0833	33.35	0.25	-1.386	-1.241
1.1667	33.30	0.20	-1.609	-1.405
1.2500	33.26	0.16	-1.833	-1.569
1.3333	33.23	0.13	-2.040	-1.732
1.4166	33.20	0.10	-2.303	-1.896
1.5000	33.17	0.07	-2.659	-2.059
1.5833	33.15	0.05	-2.996	-2.223
1.6667	33.14	0.04	-3.219	-2.386
1.7500	33.12	0.02	-3.912	-2.550
1.8333	33.11	0.01	-4.605	-2.713

Recovery of Water Level

Baildown Test--B10A




Nat. Log of Water Level Change (ft)
Baildown Test--Well B10A
Nat. Log Water Level Change (ft)
1
0
-1
-2
-3
-4
-5
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
2
Time (minutes)

SLUG TEST RESULTS FOR: B13
SITE: Winnebago Reclamation Landfill

Based on " A Slug Test for Determining Hydraulic Conductivity of Unconfined Aquifers with Completely or Patially Penetrating Wells" by H. Bouwer and R. C. Rice, Water Resources Research, June 1976, p423-428

WELL INFORMATION		TEST DATA	
Casing Diameter (inches)	2	Depth to Water (TOIC, feet)	27.27
Screen Diameter (inches)	2	Beginning Water Level Elevation (ft, MSL)	712.19
Borehole Diameter (inches)	4	Reference from Data Logger (ft)	27.27
Sand Pack Porosity(decimal)	0.2	Last Data Point (ft)	27.27
Screen Length (feet)	5	Final Water Level Elevation (ft)	NT
Top of Inner Casing (feet, MSL)	739.46		
Total Well Depth (TOIC, feet)	35.4		
Stick-UP (feet)	2.9		
Bottom of Screen Elevation (ft, MSL)	704.06		

VARIABLES		AQUIFER PARAMETERS / OTHER WELL DATA	
RC---Effective Casing Radius	1.00	Soil or Rock Type: Dolomite	
------CHOOSE ONE---------		Confined or Unconfined Conditions? : Unconfined	
Water Level Above Screen (inches) OR	1	Est. Aquifer Thickness:	200.0 Feet
in Disturbed Zone (inches)	1.26	Percent Well Penetration:	4.065 %
RW---Radial Distance to Undisturbed Aquifer	2.00	Filter Pack Type: sand	
------CHOOSE ONE---------			
Filter Pack Permeabilty = Aquifer , OR	1		
Disturbed Zone Permeability >>> Aquifer	2		
L---Effective Screen Length (feet)	5		
H---Depth of Well Penetration	8.13		

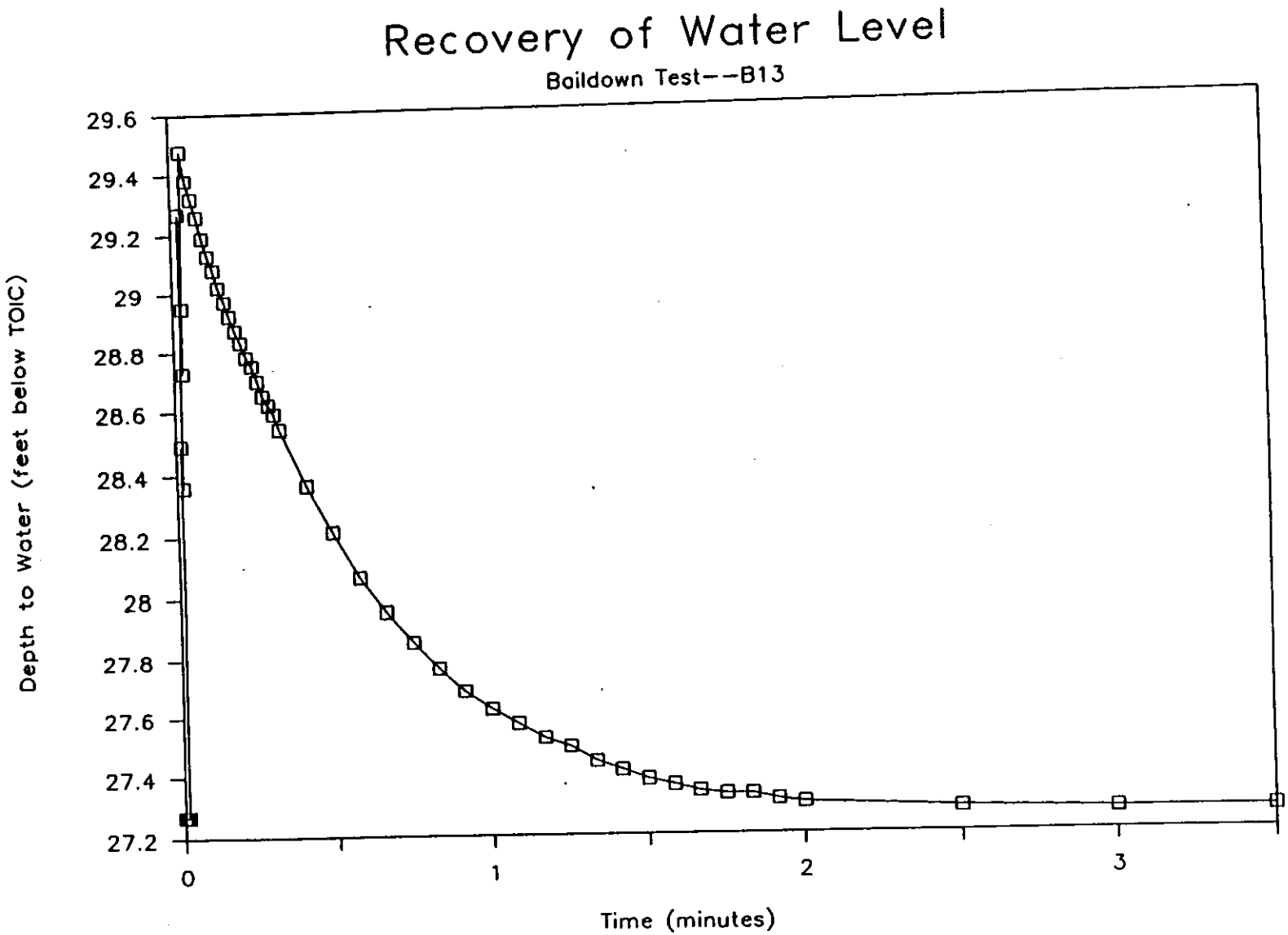
CALCULATED PARAMETERS		REGRESSION RESULTS	
L / RW	30.0	Regression Output:	
Dimensionless Coefficients (Fig. 3 Bouwer and Rice, 1976)		Constant	0.835789
Partially Penetrating Well		Std Err of Y Est	0.006463
--- A ----	2.5	R Squared	0.998614
--- B---	0.40	No. of Observations	19
ln (Re / rw)Partially Penetrating	2.17	Degrees of Freedom	17
ln ((D-h)/rw)--If > 6, Use results so marked	7.05		
ln (Re / rw)Partially Penetrating (>6)	2.24	X Coefficient(s)	-1.79795
Or, Fully Pentrating Well		Std Err of Coef.	0.016244
--- C---	NA		
ln (Re / rw) Fully Penetrating	NA		
SLOPE OF BEST FIT LINE:			
1/t * ln (Yo /Yt)	1.7980		

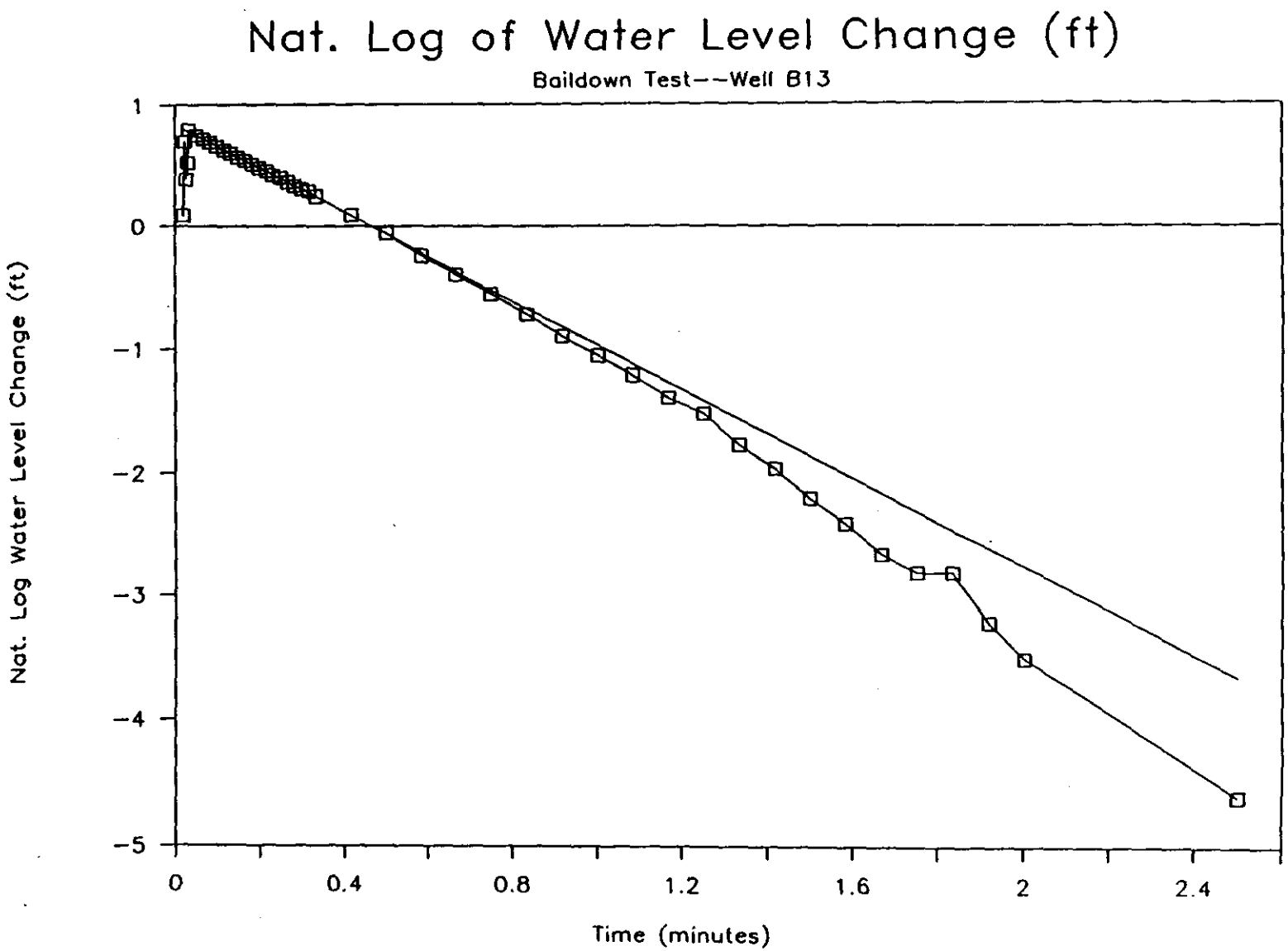
RESULTS	FT/MIN	FT/DAY	GPD/SQ.FT	CM/SEC
Hydraulic Conductivity Fully-P	NA	NA	NA	NA
Hydraulic Conductivity Partial-P	2.71E-03	3.91E+00	2.92E+01	1.38E-03
Hydraulic Conductivity Partial-P (>6)	2.80E-03	4.03E+00	3.01E+01	1.42E-03
	SQ.FT/MIN	SQ.FT/DAY	GPD/FT	SQ.M/SEC
Transmissivity Fully-P	NA	NA	NA	NA
Transmissivity Partial-P	5.43E-01	7.81E+02	5.84E+03	8.40E-04
Transmissivity Partial-P (>6)	5.60E-01	8.06E+02	6.03E+03	8.66E-04

Tested by: DSP
Evaluated by: MJH
Checked by: DSP

Data for B13

Time (min	Depth to Water	Water level Change	Natural Log of Water Level Change	REGR LINE CALC.
0.0000	27.27	0.00	ERR	0.836
0.0033	27.27	0.00	ERR	0.830
0.0066	27.27	0.00	ERR	0.824
0.0099	27.27	0.00	ERR	0.818
0.0133	27.27	0.00	ERR	0.812
0.0166	28.49	1.22	0.199	0.806
0.0200	28.36	1.09	0.086	0.800
0.0233	29.27	2.00	0.693	0.794
0.0266	28.73	1.46	0.378	0.788
0.0300	28.95	1.68	0.519	0.782
0.0333	29.48	2.21	0.793 *	0.776
0.0500	29.38	2.11	0.747 *	0.746
0.0666	29.32	2.05	0.718 *	0.716
0.0833	29.26	1.99	0.688 *	0.686
0.1000	29.19	1.92	0.652 *	0.656
0.1166	29.13	1.86	0.621 *	0.626
0.1333	29.08	1.81	0.593 *	0.596
0.1500	29.02	1.75	0.560 *	0.566
0.1666	28.97	1.70	0.531 *	0.536
0.1833	28.92	1.65	0.501 *	0.506
0.2000	28.87	1.60	0.470 *	0.476
0.2166	28.83	1.56	0.445 *	0.446
0.2333	28.78	1.51	0.412 *	0.416
0.2500	28.75	1.48	0.392 *	0.386
0.2666	28.70	1.43	0.358 *	0.356
0.2833	28.65	1.38	0.322 *	0.326
0.3000	28.62	1.35	0.300 *	0.296
0.3166	28.59	1.32	0.278 *	0.267
0.3333	28.54	1.27	0.239 *	0.237
0.4167	28.36	1.09	0.086	0.087
0.5000	28.21	0.94	-0.062	-0.063
0.5833	28.06	0.79	-0.236	-0.213
0.6667	27.95	0.68	-0.386	-0.363
0.7500	27.85	0.58	-0.545	-0.513
0.8333	27.76	0.49	-0.713	-0.662
0.9167	27.68	0.41	-0.892	-0.812
1.0000	27.62	0.35	-1.050	-0.962
1.0833	27.57	0.30	-1.204	-1.112
1.1667	27.52	0.25	-1.386	-1.262
1.2500	27.49	0.22	-1.514	-1.412
1.3333	27.44	0.17	-1.772	-1.561
1.4166	27.41	0.14	-1.966	-1.711
1.5000	27.38	0.11	-2.207	-1.861
1.5833	27.36	0.09	-2.408	-2.011
1.6667	27.34	0.07	-2.659	-2.161
1.7500	27.33	0.06	-2.813	-2.311
1.8333	27.33	0.06	-2.813	-2.460
1.9167	27.31	0.04	-3.219	-2.610
2.0000	27.30	0.03	-3.507	-2.760
2.5	27.28	0.01	-4.605	-3.659


Recovery of Water Level
Baildown Test--B13
Depth to Water (feet below TOIC)
29.6
29.4
29.2
29
28.8
28.6
28.4
28.2
28
27.8
27.6
27.4
27.2
0
1
2
3
Time (minutes)


Nat. Log of Water Level Change (ft)
Baildown Test--Well B13
Nat. Log Water Level Change (ft)
1
0
-1
-2
-3
-4
-5
0
0.4
0.8
1.2
1.6
2
2.4
Time (minutes)

SLUG TEST RESULTS FOR: P6

SITE: Winnebago Reclamation Landfill

Based on " A Slug Test for Determining Hydraulic Conductivity of Unconfined Aquifers with Completely or Patially Penetrating Wells" by H. Bouwer and R. C. Rice, Water Resources Research, June 1976, p423-428

WELL INFORMATION		TEST DATA	
Casing Diameter (inches)	2	Depth to Water (TOIC, feet)	27.86
Screen Diameter (inches)	2	Beginning Water Level Elevation (ft, MSL)	711.85
Borehole Diameter (inches)	4	Reference from Data Logger (ft)	27.78
Sand Pack Porosity(decimal)	0.2	Last Data Point (ft)	27.78
Screen Length (feet)	5	Final Water Level Elevation (ft)	NT
Top of Inner Casing (feet, MSL)	739.71		
Total Well Depth (TOIC, feet)	52.8		
Stick-UP (feet)	2.8		
Bottom of Screen Elevation (ft, MSL)	686.90		

VARIABLES		AQUIFER PARAMETERS / OTHER WELL DATA	
RC---Effective Casing Radius	1.00	Soil or Rock Type: Dolomite	
------CHOOSE ONE---------		Confined or Unconfined Conditions? : Unconfined	
Water Level Above Screen (inches) OR	1	Est. Aquifer Thickness:	200.0 Feet
in Disturbed Zone (inches)	1.26	Percent Well Penetration:	12.47 %
RW---Radial Distance to Undisturbed Aquifer	2.00	Filter Pack Type: sand	
------CHOOSE ONE---------			
Filter Pack Permeability = Aquifer , OR	1		
Disturbed Zone Permeability >>> Aquifer	2		
L---Effective Screen Length (feet)	5		
H---Depth of Well Penetration	24.94		

CALCULATED PARAMETERS		REGRESSION RESULTS	
L / RW	30.0	Regression Output:	
Dimensionless Coefficients (Fig. 3 Bouwer and Rice, 1976)		Constant	1.038651
Partially Penetrating Well		Std Err of Y Est	0.053128
--- A ----	2.5	R Squared	0.992442
--- B---	0.40	No. of Observations	26
ln (Re / rw)Partially Penetrating	2.53	Degrees of Freedom	24
ln ((D-h)/rw)--If > 6, Use results so marked	6.96		
ln (Re / rw)Partially Penetrating (>6)	2.61	X Coefficient(s)	-2.16105
Or, Fully Pentrating Well		Std Err of Coef.	0.038494
--- C---	NA		
ln (Re / rw) Fully Penetrating	NA		
SLOPE OF BEST FIT LINE:			
1/t * ln (Yo /Yt)	2.1611		

RESULTS	FT/MIN	FT/DAY	GPD/SQ.FT	CM/SEC
Hydraulic Conductivity Fully-P	NA	NA	NA	NA
Hydraulic Conductivity Partial-P	3.79E-03	5.46E+00	4.08E+01	1.93E-03
Hydraulic Conductivity Partial-P (>6)	3.92E-03	5.64E+00	4.22E+01	1.99E-03
	SQ.FT/MIN	SQ.FT/DAY	GPD/FT	SQ.M/SEC
Transmissivity Fully-P	NA	NA	NA	NA
Transmissivity Partial-P	7.58E-01	1.09E+03	8.17E+03	1.17E-03
Transmissivity Partial-P (>6)	7.84E-01	1.13E+03	8.44E+03	1.21E-03

Tested by: DSP

Evaluated by: MJH

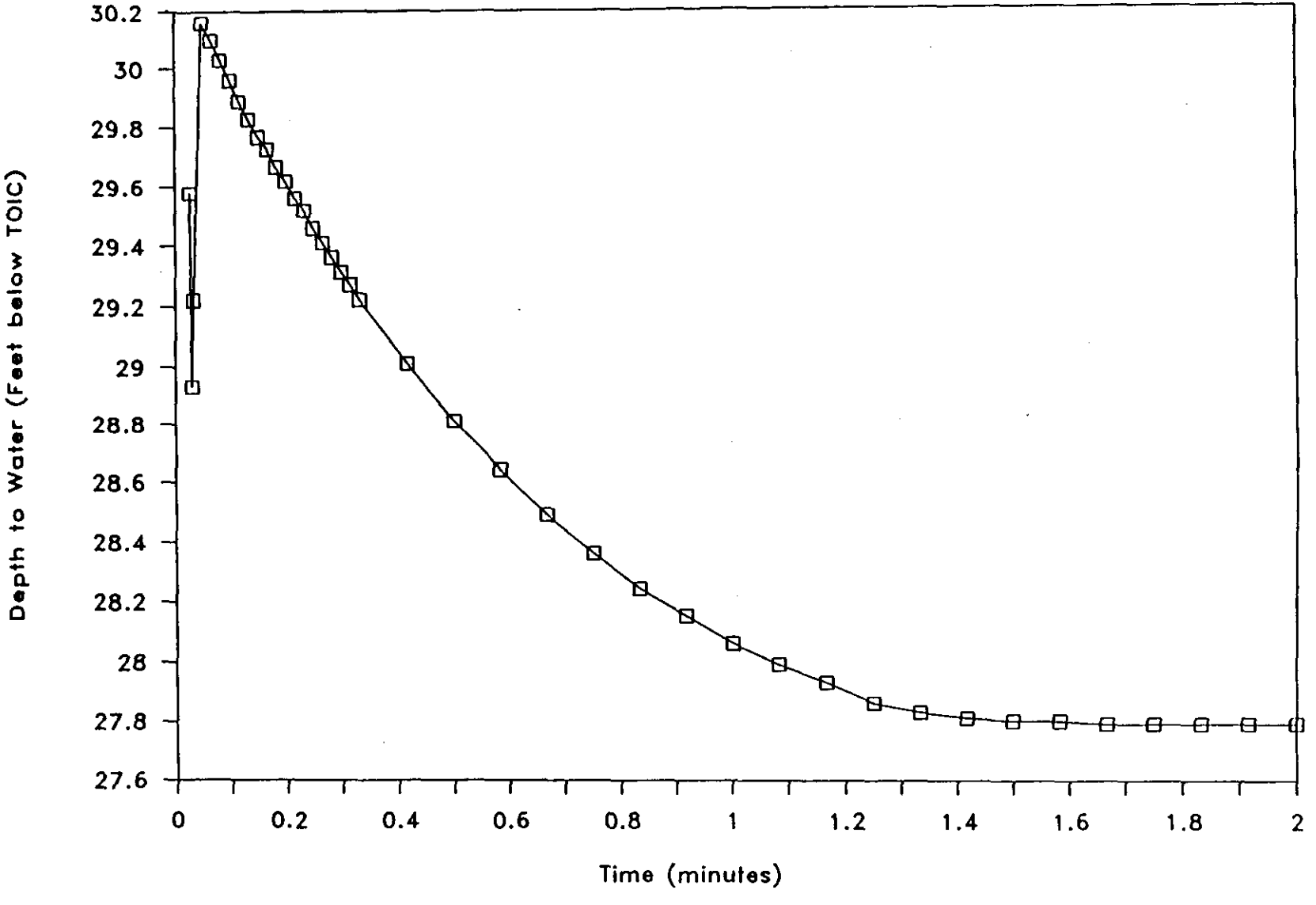
Checked by: DSP

Data for P6

Time (min	Depth to Water	Water level Change	Natural Log of Water Level Change	REGR LINE CALC.
0.0000	27.77	-0.01	ERR	1.039
0.0033	27.82	0.04	-3.219	1.032
0.0066	31.07	3.29	1.191	1.024
0.0099	29.91	2.13	0.756	1.017
0.0133	29.67	1.89	0.637	1.010
0.0166	28.58	0.80	-0.223	1.003
0.0200	29.66	1.88	0.631	0.995
0.0233	29.74	1.96	0.673	0.988
0.0266	29.58	1.80	0.588	0.981
0.0300	28.93	1.15	0.140	0.974
0.0333	29.22	1.44	0.365	0.967
0.0500	30.16	2.38	0.867 *	0.931
0.0666	30.10	2.32	0.842 *	0.895
0.0833	30.03	2.25	0.811 *	0.859
0.1000	29.96	2.18	0.779 *	0.823
0.1166	29.89	2.11	0.747 *	0.787
0.1333	29.83	2.05	0.718 *	0.751
0.1500	29.77	1.99	0.688 *	0.714
0.1666	29.73	1.95	0.668 *	0.679
0.1833	29.67	1.89	0.637 *	0.643
0.2000	29.62	1.84	0.610 *	0.606
0.2166	29.56	1.78	0.577 *	0.571
0.2333	29.52	1.74	0.554 *	0.534
0.2500	29.46	1.68	0.519 *	0.498
0.2666	29.41	1.63	0.489 *	0.463
0.2833	29.36	1.58	0.457 *	0.426
0.3000	29.31	1.53	0.425 *	0.390
0.3166	29.27	1.49	0.399 *	0.354
0.3333	29.22	1.44	0.365 *	0.318
0.4167	29.01	1.23	0.207 *	0.138
0.5000	28.81	1.03	0.030 *	-0.042
0.5833	28.64	0.86	-0.151 *	-0.222
0.6667	28.49	0.71	-0.342 *	-0.402
0.7500	28.36	0.58	-0.545 *	-0.582
0.8333	28.24	0.46	-0.777 *	-0.762
0.9167	28.15	0.37	-0.994 *	-0.942
1.0000	28.06	0.28	-1.273 *	-1.122
1.0833	27.99	0.21	-1.561	-1.302
1.1667	27.93	0.15	-1.897	-1.483
1.2500	27.86	0.08	-2.526	-1.663
1.3333	27.83	0.05	-2.996	-1.843
1.4166	27.81	0.03	-3.507	-2.023
1.5000	27.80	0.02	-3.912	-2.203
1.5833	27.80	0.02	-3.912	-2.383
1.6667	27.79	0.01	-4.605	-2.563
1.7500	27.79	0.01	-4.605	-2.743
1.8333	27.79	0.01	-4.605	-2.923
1.9167	27.79	0.01	-4.605	-3.103
2	27.79	0.01	-4.605	-3.283
2.5	27.79	0.01	-4.605	-4.364
3	27.79	0.01	-4.605	-5.445
3.5	27.79	0.01	-4.605	-6.525

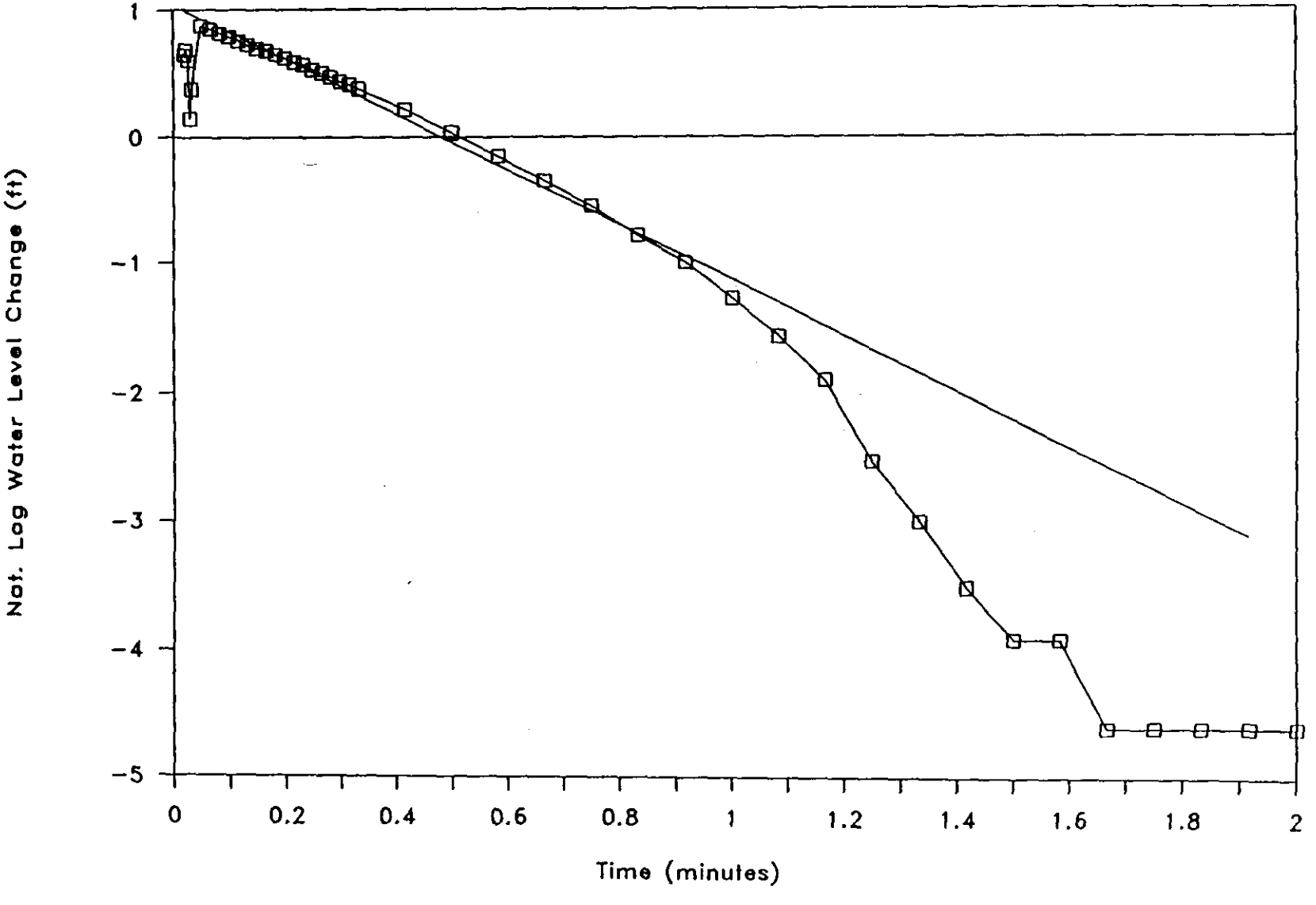
Recovery of Water Level

Baildown Test-- Well P6



Nat. Log of Water Level Change (ft)

Baildown Test--Well P6



SLUG TEST RESULTS FOR: G114

SITE: Winnebago Reclamation Landfill

Based on " A Slug Test for Determining Hydraulic Conductivity of Unconfined Aquifers with Completely or Patially Penetrating Wells" by H. Bouwer and R. C. Rice, Water Resources Research, June 1976, p423-428

WELL INFORMATION		TEST DATA	
Casing Diameter (inches)	2	Depth to Water (TOIC, feet)	42.94
Screen Diameter (inches)	2.0	Beginning Water Level Elevation (ft, MSL)	715.17
Borehole Diameter (inches)	4	Reference from Data Logger (ft)	42.94
Sand Pack Porosity(decimal)	0.2	Last Data Point (ft)	43.07
Screen Length (feet)	10	Final Water Level Elevation (ft)	NT
Top of Inner Casing (feet, MSL)	758.11		
Total Well Depth (TOIC, feet)	48.2		
Stick-UP (feet)	2.7		
Bottom of Screen Elevation (ft, MSL)	709.91		

VARIABLES		AQUIFER PARAMETERS / OTHER WELL DATA
RC---Effective Casing Radius	1.26	Soil or Rock Type: Dolomite
------CHOOSE ONE---------		Confined or Unconfined Conditions? : Unconfined
Water Level Above Screen (inches) OR	1	Est. Aquifer Thickness: 200.0 Feet
in Disturbed Zone (inches)	1.26	Percent Well Penetration: 2.63 %
RW---Radial Distance to Undisturbed Aquifer	2.00	Filter Pack Type: #30 flint sand
------CHOOSE ONE---------		
Filter Pack Permeabilty = Aquifer , OR	1	
Disturbed Zone Permeability >>> Aquifer	2	
L---Effective Screen Length (feet)	5.26	
H---Depth of Well Penetration	5.26	

CALCULATED PARAMETERS		REGRESSION RESULTS	
L / RW	31.6	Regression Output:	
Dimensionless Coefficients (Fig. 3 Bouwer and Rice, 1976)		Constant	-0.38308
Partially Penetrating Well		Std Err of Y Est	0.034070
--- A ----	2.5	R Squared	0.988054
--- B---	0.40	No. of Observations	34
ln (Re / rw)Partially Penetrating	2.05	Degrees of Freedom	32
ln ((D-h)/rw)--If > 6, Use results so marked	7.06		
ln (Re / rw)Partially Penetrating (>6)	2.11	X Coefficient(s)	-0.05875
Or, Fully Pentrating Well		Std Err of Coef.	0.001142
--- C---	NA		
ln (Re / rw) Fully Penetrating	NA		
SLOPE OF BEST FIT LINE:			
1/t * ln (Yo /Yt)	0.0588		

RESULTS	FT/MIN	FT/DAY	GPD/SQ.FT	CM/SEC
Hydraulic Conductivity Fully-P	NA	NA	NA	NA
Hydraulic Conductivity Partial-P	1.26E-04	1.82E-01	1.36E+00	6.42E-05
Hydraulic Conductivity Partial-P (>6)	1.30E-04	1.87E-01	1.40E+00	6.60E-05
	SQ.FT/MIN	SQ.FT/DAY	GPD/FT	SQ.M/SEC
Transmissivity Fully-P	NA	NA	NA	NA
Transmissivity Partial-P	2.53E-02	3.64E+01	2.72E+02	3.91E-05
Transmissivity Partial-P (>6)	2.60E-02	3.74E+01	2.80E+02	4.02E-05

Tested by: DSP

Evaluated by: MJH

Checked by: DSP

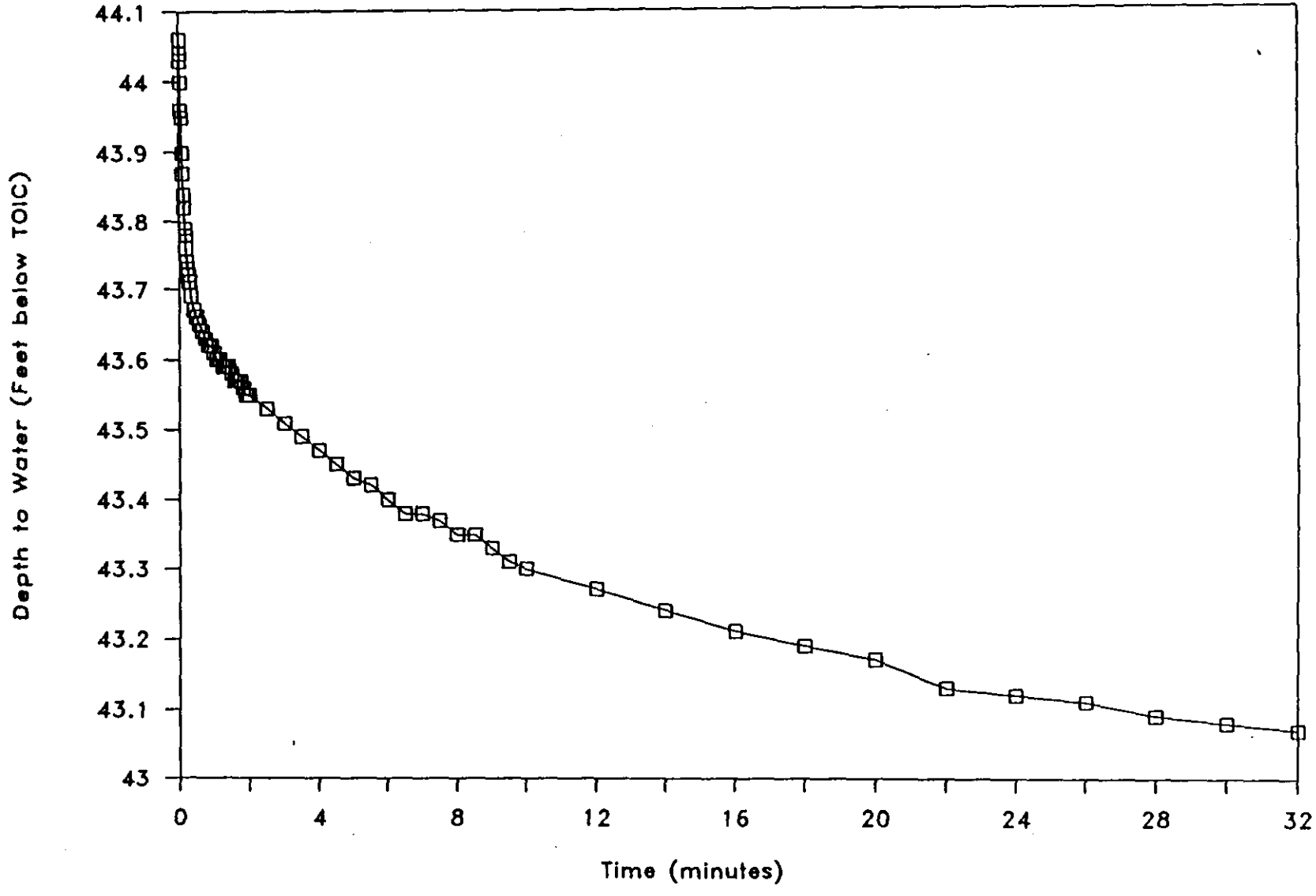
Data for G114

Time (min	Depth to Water	Water level Change	Natural Log of Water Level Change	REGR LINE CALC.
0	42.85	-0.09	ERR	-0.383
0.0033	43.06	0.12	-2.120	-0.383
0.0066	43.23	0.29	-1.238	-0.383
0.0099	43	0.06	-2.813	-0.384
0.0133	44.01	1.07	0.068	-0.384
0.0166	43.93	0.99	-0.010	-0.384
0.02	44.17	1.23	0.207	-0.384
0.0233	44	1.06	0.058	-0.384
0.0266	44.06	1.12	0.113	-0.385
0.03	44.04	1.10	0.095	-0.385
0.0333	44.03	1.09	0.086	-0.385
0.05	44	1.06	0.058	-0.386
0.0666	43.96	1.02	0.020	-0.387
0.0833	43.95	1.01	0.010	-0.388
0.1	43.9	0.96	-0.041	-0.389
0.1166	43.87	0.93	-0.073	-0.390
0.1333	43.84	0.90	-0.105	-0.391
0.15	43.82	0.88	-0.128	-0.392
0.1666	43.79	0.85	-0.163	-0.393
0.1833	43.78	0.84	-0.174	-0.394
0.2	43.76	0.82	-0.198	-0.395
0.2166	43.74	0.80	-0.223	-0.396
0.2333	43.73	0.79	-0.236	-0.397
0.25	43.73	0.79	-0.236	-0.398
0.2666	43.72	0.78	-0.248	-0.399
0.2833	43.71	0.77	-0.261	-0.400
0.3	43.71	0.77	-0.261	-0.401
0.3166	43.71	0.77	-0.261	-0.402
0.3333	43.69	0.75	-0.288	-0.403
0.4167	43.67	0.73	-0.315	-0.408
0.5	43.66	0.72	-0.329	-0.412
0.5833	43.65	0.71	-0.342	-0.417
0.6667	43.64	0.70	-0.357	-0.422
0.75	43.63	0.69	-0.371	-0.427
0.8333	43.62	0.68	-0.386	-0.432
0.9167	43.62	0.68	-0.386	-0.437
1	43.61	0.67	-0.400 *	-0.442
1.0833	43.6	0.66	-0.416 *	-0.447
1.1667	43.6	0.66	-0.416 *	-0.452
1.25	43.59	0.65	-0.431 *	-0.457
1.3333	43.59	0.65	-0.431 *	-0.461
1.4166	43.59	0.65	-0.431 *	-0.466
1.5	43.58	0.64	-0.446 *	-0.471
1.5833	43.57	0.63	-0.462 *	-0.476
1.6667	43.57	0.63	-0.462 *	-0.481
1.75	43.57	0.63	-0.462 *	-0.486
1.8333	43.56	0.62	-0.478 *	-0.491
1.9167	43.55	0.61	-0.494 *	-0.496
2	43.55	0.61	-0.494 *	-0.501
2.5	43.53	0.59	-0.528 *	-0.530
3	43.51	0.57	-0.562 *	-0.559
3.5	43.49	0.55	-0.598 *	-0.589
4	43.47	0.53	-0.635 *	-0.618
4.5	43.45	0.51	-0.673 *	-0.647
5	43.43	0.49	-0.713 *	-0.677

5.5	43.42	0.48	-0.734 *	-0.706
6	43.4	0.46	-0.777 *	-0.736
6.5	43.38	0.44	-0.821 *	-0.765
7	43.38	0.44	-0.821 *	-0.794
7.5	43.37	0.43	-0.844 *	-0.824
8	43.35	0.41	-0.892 *	-0.853
8.5	43.35	0.41	-0.892 *	-0.883
9	43.33	0.39	-0.942 *	-0.912
9.5	43.31	0.37	-0.994 *	-0.941
10	43.3	0.36	-1.022 *	-0.971
12	43.27	0.33	-1.109 *	-1.088
14	43.24	0.30	-1.204 *	-1.206
16	43.21	0.27	-1.309 *	-1.323
18	43.19	0.25	-1.386 *	-1.441
20	43.17	0.23	-1.470 *	-1.558
22	43.13	0.19	-1.661	-1.676
24	43.12	0.18	-1.715	-1.793
26	43.11	0.17	-1.772	-1.911
28	43.09	0.15	-1.897	-2.028
30	43.08	0.14	-1.966	-2.146
32	43.07	0.13	-2.040	-2.263

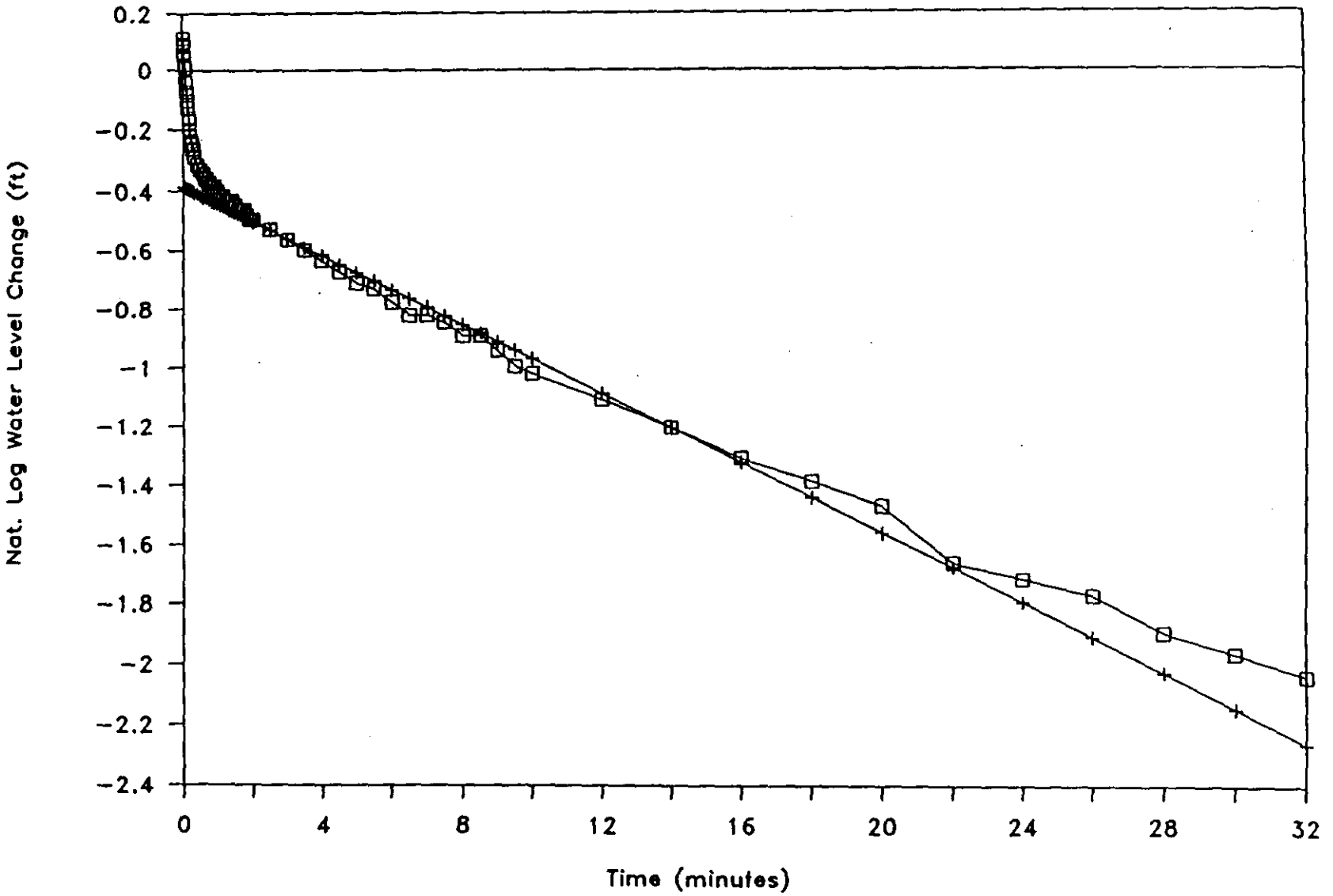
Recovery of Water Level

Baildown Test-- Well G114



Nat. Log of Water Level Change (ft)

Baildown Test--Well G114



SLUG TEST RESULTS FOR: B12

SITE: Winnebago Reclamation Landfill

Based on " A Slug Test for Determining Hydraulic Conductivity of Unconfined Aquifers with Completely or Patially Penetrating Wells" by H. Bouwer and R. C. Rice, Water Resources Research, June 1976, p423-428

WELL INFORMATION		TEST DATA	
Casing Diameter (inches)	2	Depth to Water (TOIC, feet)	44.72
Screen Diameter (inches)	2.0	Beginning Water Level Elevation (ft, MSL)	715.80
Borehole Diameter (inches)	4	Reference from Data Logger (ft)	44.72
Sand Pack Porosity(decimal)	0.2	Last Data Point (ft)	44.81
Screen Length (feet)	5	Final Water Level Elevation (ft)	NT
Top of Inner Casing (feet, MSL)	760.52		
Total Well Depth (TOIC, feet)	51.2		
Stick-UP (feet)	2.3		
Bottom of Screen Elevation (ft, MSL)	709.30		

VARIABLES		AQUIFER PARAMETERS / OTHER WELL DATA
RC---Effective Casing Radius	1.00	Soil or Rock Type: Dolomite
------CHOOSE ONE---------		Confined or Unconfined Conditions? : Unconfined
Water Level Above Screen (inches) OR	1	Est. Aquifer Thickness: 200.0 Feet
in Disturbed Zone (inches)	1.26	Percent Well Penetration: 3.24 %
RW---Radial Distance to Undisturbed Aquifer	2.00	Filter Pack Type: sand
------CHOOSE ONE---------		
Filter Pack Permeabilty = Aquifer , OR	1	
Disturbed Zone Permeability >>> Aquifer	2	
L---Effective Screen Length (feet)	5	
H---Depth of Well Penetration	6.48	

CALCULATED PARAMETERS		REGRESSION RESULTS	
L / RW	30.0	Regression Output:	
Dimensionless Coefficients (Fig. 3 Bouwer and Rice, 1976)		Constant	0.101190
Partially Penetrating Well		Std Err of Y Est	0.035114
--- A ----	2.5	R Squared	0.991379
--- B---	0.40	No. of Observations	22
ln (Re / rw)Partially Penetrating	2.09	Degrees of Freedom	20
ln ((D-h)/rw)--If > 6, Use results so marked	7.06		
ln (Re / rw)Partially Penetrating (>6)	2.16	X Coefficient(s)	-0.07326
Or, Fully Pentrating Well		Std Err of Coef.	0.001527
--- C---	NA		
ln (Re / rw) Fully Penetrating	NA		
SLOPE OF BEST FIT LINE:			
1/t * ln (Yo /Yt)	0.0733		

RESULTS	FT/MIN	FT/DAY	GPD/SQ.FT	CM/SEC
Hydraulic Conductivity Fully-P	NA	NA	NA	NA
Hydraulic Conductivity Partial-P	1.06E-04	1.53E-01	1.15E+00	5.41E-05
Hydraulic Conductivity Partial-P (>6)	1.10E-04	1.58E-01	1.18E+00	5.57E-05
	SQ.FT/MIN	SQ.FT/DAY	GPD/FT	SQ.M/SEC
Transmissivity Fully-P	NA	NA	NA	NA
Transmissivity Partial-P	2.13E-02	3.07E+01	2.29E+02	3.30E-05
Transmissivity Partial-P (>6)	2.19E-02	3.16E+01	2.36E+02	3.40E-05

Tested by: DSP

Evaluated by: MJH

Checked by: DSP

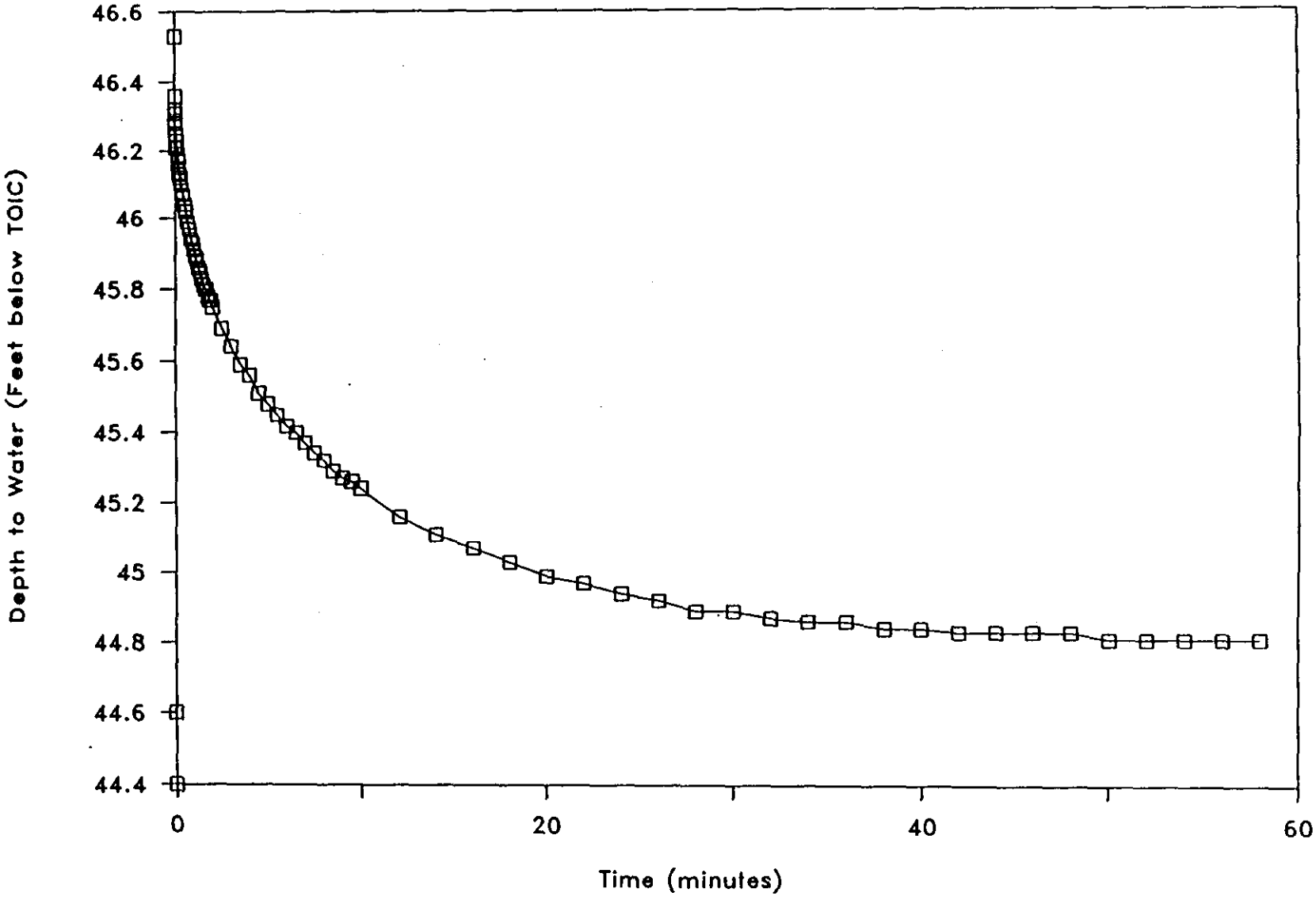
Data for B12

Time (min	Depth to Water	Water level Change	Natural Log of Water Level Change	REGR LINE CALC.
0	44.4	-0.32	ERR	0.101
0.0033	46.31	1.59	0.464	0.101
0.0066	46.32	1.60	0.470	0.101
0.0099	44.6	-0.12	ERR	0.100
0.0133	46.21	1.49	0.399	0.100
0.0166	46.53	1.81	0.593	0.100
0.02	46.36	1.64	0.495	0.100
0.0233	46.31	1.59	0.464	0.099
0.0266	46.28	1.56	0.445	0.099
0.03	46.29	1.57	0.451	0.099
0.0333	46.31	1.59	0.464	0.099
0.05	46.28	1.56	0.445	0.098
0.0666	46.25	1.53	0.425	0.096
0.0833	46.23	1.51	0.412	0.095
0.1	46.21	1.49	0.399	0.094
0.1166	46.21	1.49	0.399	0.093
0.1333	46.21	1.49	0.399	0.091
0.15	46.18	1.46	0.378	0.090
0.1666	46.18	1.46	0.378	0.089
0.1833	46.17	1.45	0.372	0.088
0.2	46.15	1.43	0.358	0.087
0.2166	46.15	1.43	0.358	0.085
0.2333	46.13	1.41	0.344	0.084
0.25	46.13	1.41	0.344	0.083
0.2666	46.13	1.41	0.344	0.082
0.2833	46.12	1.40	0.336	0.080
0.3	46.12	1.40	0.336	0.079
0.3166	46.12	1.40	0.336	0.078
0.3333	46.1	1.38	0.322	0.077
0.4167	46.07	1.35	0.300	0.071
0.5	46.04	1.32	0.278	0.065
0.5833	46.02	1.30	0.262	0.058
0.6667	45.99	1.27	0.239	0.052
0.75	45.97	1.25	0.223	0.046
0.8333	45.94	1.22	0.199	0.040
0.9167	45.93	1.21	0.191	0.034
1	45.91	1.19	0.174	0.028
1.0833	45.89	1.17	0.157	0.022
1.1667	45.88	1.16	0.148	0.016
1.25	45.86	1.14	0.131	0.010
1.3333	45.85	1.13	0.122	0.004
1.4166	45.83	1.11	0.104	-0.003
1.5	45.81	1.09	0.086	-0.009
1.5833	45.8	1.08	0.077	-0.015
1.6667	45.8	1.08	0.077	-0.021
1.75	45.78	1.06	0.058	-0.027
1.8333	45.77	1.05	0.049	-0.033
1.9167	45.77	1.05	0.049	-0.039
2	45.75	1.03	0.030 *	-0.045
2.5	45.69	0.97	-0.030 *	-0.082
3	45.64	0.92	-0.083 *	-0.119
3.5	45.59	0.87	-0.139 *	-0.155
4	45.56	0.84	-0.174 *	-0.192
4.5	45.51	0.79	-0.236 *	-0.228
5	45.48	0.76	-0.274 *	-0.265

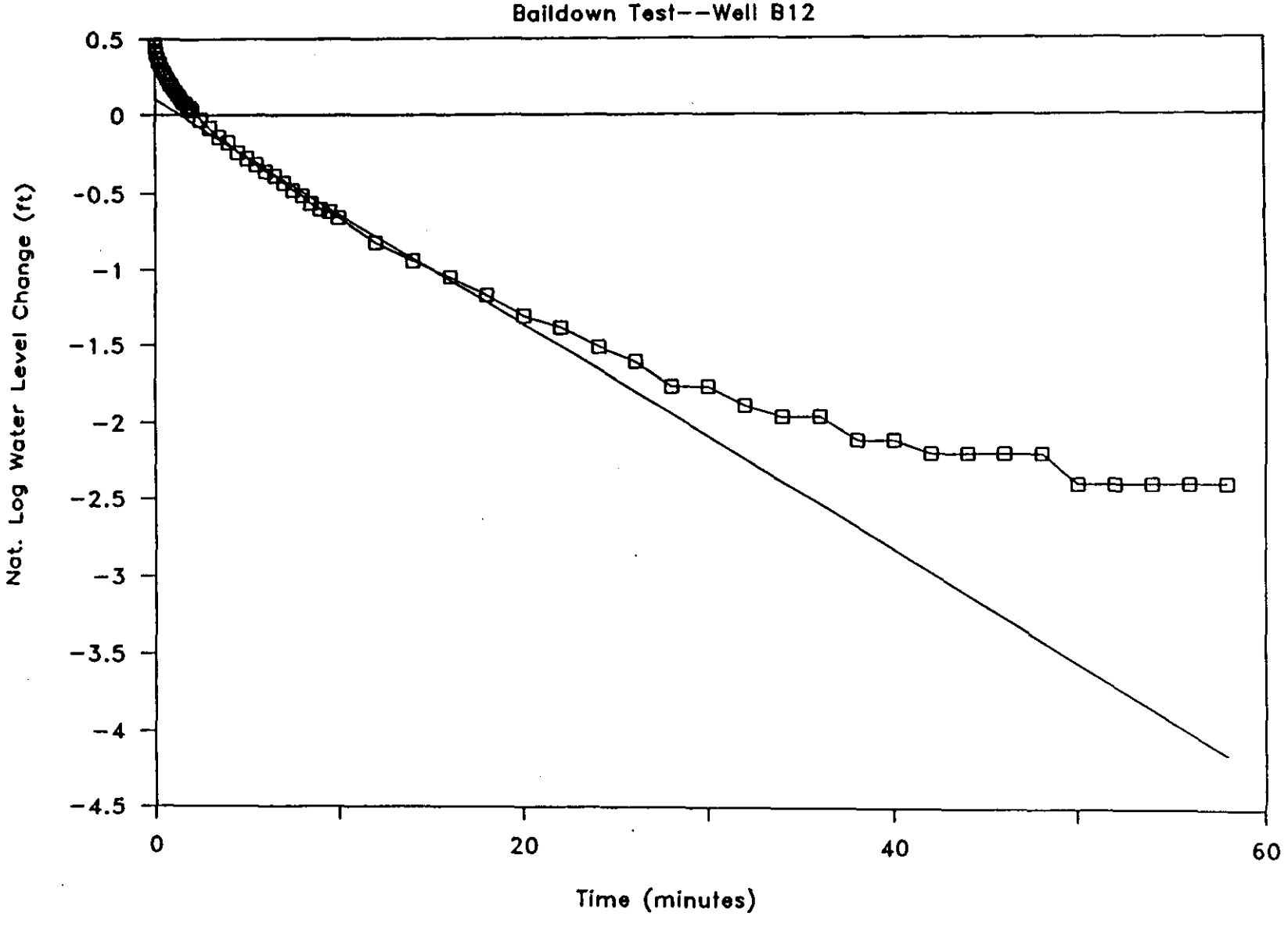
5.5	45.45	0.73	-0.315 *	-0.302
6	45.42	0.70	-0.357 *	-0.338
6.5	45.4	0.68	-0.386 *	-0.375
7	45.37	0.65	-0.431 *	-0.412
7.5	45.34	0.62	-0.478 *	-0.448
8	45.32	0.60	-0.511 *	-0.485
8.5	45.29	0.57	-0.562 *	-0.522
9	45.27	0.55	-0.598 *	-0.558
9.5	45.26	0.54	-0.616 *	-0.595
10	45.24	0.52	-0.654 *	-0.631
12	45.16	0.44	-0.821 *	-0.778
14	45.11	0.39	-0.942 *	-0.924
16	45.07	0.35	-1.050 *	-1.071
18	45.03	0.31	-1.171 *	-1.218
20	44.99	0.27	-1.309 *	-1.364
22	44.97	0.25	-1.386	-1.511
24	44.94	0.22	-1.514	-1.657
26	44.92	0.20	-1.609	-1.804
28	44.89	0.17	-1.772	-1.950
30	44.89	0.17	-1.772	-2.097
32	44.87	0.15	-1.897	-2.243
34	44.86	0.14	-1.966	-2.390
36	44.86	0.14	-1.966	-2.536
38	44.84	0.12	-2.120	-2.683
40	44.84	0.12	-2.120	-2.829
42	44.83	0.11	-2.207	-2.976
44	44.83	0.11	-2.207	-3.122
46	44.83	0.11	-2.207	-3.269
48	44.83	0.11	-2.207	-3.415
50	44.81	0.09	-2.408	-3.562
52	44.81	0.09	-2.408	-3.709
54	44.81	0.09	-2.408	-3.855
56	44.81	0.09	-2.408	-4.002
58	44.81	0.09	-2.408	-4.148
60	44.81	0.09	-2.408	-4.295
62	44.81	0.09	-2.408	-4.441

Recovery of Water Level

Baildown Test-- Well B12



Nat. Log of Water Level Change (ft)



SLUG TEST RESULTS FOR: G109A

SITE: Winnebago Reclamation Landfill

Based on " A Slug Test for Determining Hydraulic Conductivity of Unconfined Aquifers with Completely or Patially Penetrating Wells" by H. Bouwer and R. C. Rice, Water Resources Research, June 1976,p423-428

WELL INFORMATION		TEST DATA	
Casing Diameter (inches)	2	Depth to Water (TOIC, feet)	45.49
Screen Diameter (inches)	2.0	Beginning Water Level Elevation (ft, MSL)	715.54
Borehole Diameter (inches)	4	Reference from Data Logger (ft)	45.49
Sand Pack Porosity(decimal)	0.2	Last Data Point (ft)	46.44
Screen Length (feet)	5	Final Water Level Elevation (ft)	NT
Top of Inner Casing (feet, MSL)	761.03		
Total Well Depth (TOIC, feet)	81.5		
Stick-UP (feet)	2		
Bottom of Screen Elevation (ft, MSL)	679.50		

VARIABLES		AQUIFER PARAMETERS / OTHER WELL DATA
RC---Effective Casing Radius	1.00	Soil or Rock Type: Dolomite
------CHOOSE ONE---------		Confined or Unconfined Conditions? : Unconfined
Water Level Above Screen (inches) OR	1	Est. Aquifer Thickness: 200.0 Feet
in Disturbed Zone (inches)	1.26	Percent Well Penetration: 18.005 %
RW---Radial Distance to Undisturbed Aquifer	2.00	Filter Pack Type: #30 Flint sand
------CHOOSE ONE---------		
Filter Pack Permeability = Aquifer , OR	1	
Disturbed Zone Permeability >>> Aquifer	2	
L---Effective Screen Length (feet)	5	
H---Depth of Well Penetration	36.01	

CALCULATED PARAMETERS		REGRESSION RESULTS	
L / RW	30.0	Regression Output:	
Dimensionless Coefficients (Fig. 3 Bouwer and Rice, 1976)		Constant	0.268446
Partially Penetrating Well		Std Err of Y Est	0.010769
--- A ----	2.5	R Squared	0.989533
--- B---	0.40	No. of Observations	53
ln (Re / rw)Partially Penetrating	2.63	Degrees of Freedom	51
ln ((D-h)/rw)--If > 6, Use results so marked	6.89		
ln (Re / rw)Partially Penetrating (>6)	2.72	X Coefficient(s) -0.00567	
Or, Fully Pentrating Well		Std Err of Coef. 0.000081	
--- C---	NA		
ln (Re / rw) Fully Penetrating	NA		
SLOPE OF BEST FIT LINE:			
1/t * ln (Yo /Yt)	0.0057		

RESULTS	FT/MIN	FT/DAY	GPD/SQ.FT	CM/SEC
Hydraulic Conductivity Fully-P	NA	NA	NA	NA
Hydraulic Conductivity Partial-P	1.04E-05	1.49E-02	1.12E-01	5.27E-06
Hydraulic Conductivity Partial-P (>6)	1.07E-05	1.54E-02	1.15E-01	5.44E-06
	SQ.FT/MIN	SQ.FT/DAY	GPD/FT	SQ.M/SEC
Transmissivity Fully-P	NA	NA	NA	NA
Transmissivity Partial-P	2.07E-03	2.99E+00	2.23E+01	3.21E-06
Transmissivity Partial-P (>6)	2.14E-03	3.08E+00	2.31E+01	3.32E-06

Tested by: DSP

Evaluated by: MJH

Checked by: DSP

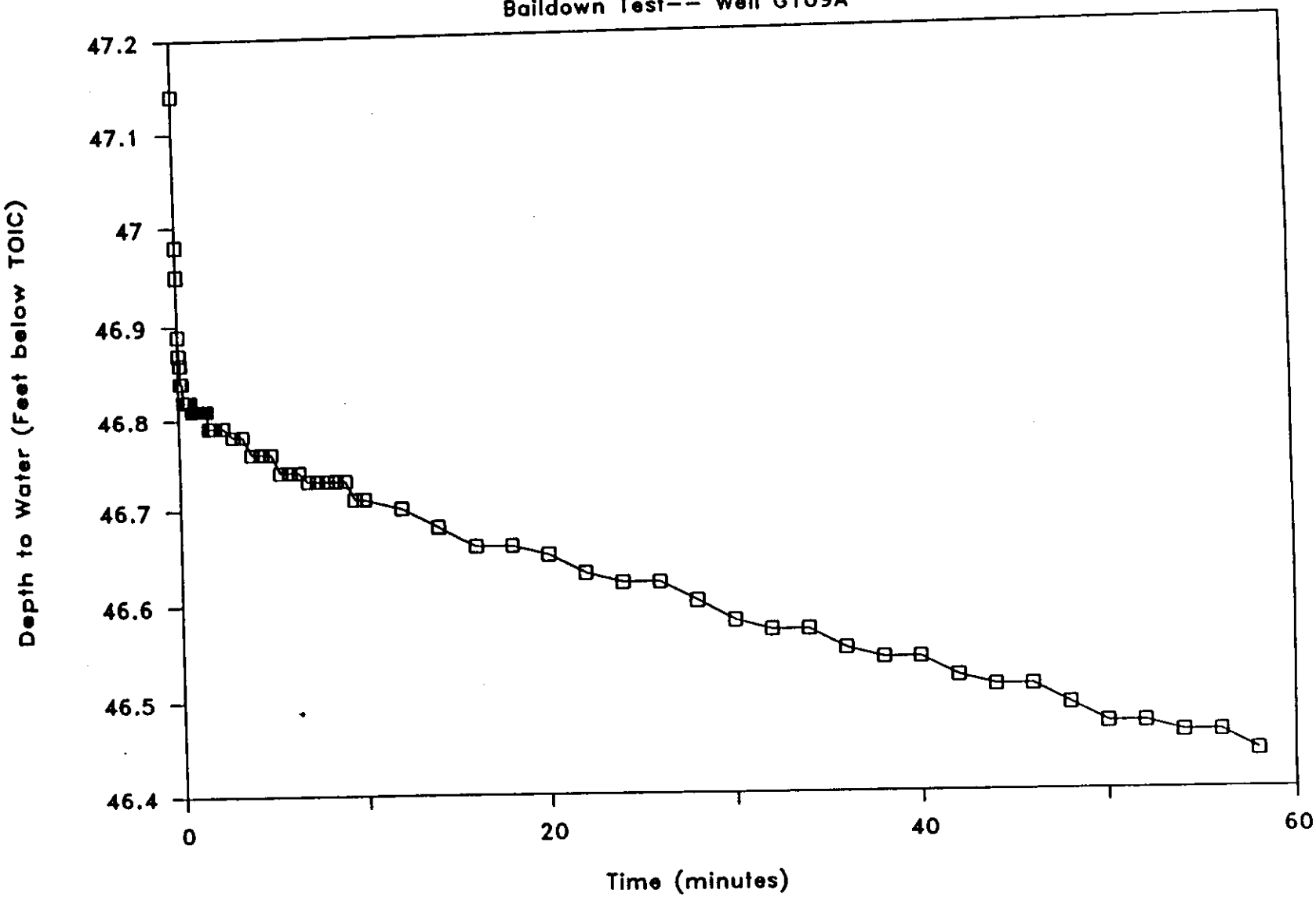
Data for G109A

Time (min	Depth to Water	Water level Change	Natural Log of Water Level Change	REGR LINE CALC.
0	44.66	-0.83	ERR	0.268
0.0033	46.19	0.70	-0.357	0.268
0.0066	47.29	1.80	0.588	0.268
0.0099	45.74	0.25	-1.386	0.268
0.0133	46.92	1.43	0.358	0.268
0.0166	43.44	-2.05	ERR	0.268
0.02	46.73	1.24	0.215	0.268
0.0233	45.49	0.00	ERR	0.268
0.0266	46.98	1.49	0.399	0.268
0.03	47.14	1.65	0.501	0.268
0.0333	46.95	1.46	0.378	0.268
0.05	46.89	1.40	0.336	0.268
0.0666	46.87	1.38	0.322	0.268
0.0833	46.87	1.38	0.322	0.268
0.1	46.87	1.38	0.322	0.268
0.1166	46.86	1.37	0.315	0.268
0.1333	46.84	1.35	0.300	0.268
0.15	46.86	1.37	0.315	0.268
0.1666	46.84	1.35	0.300	0.268
0.1833	46.84	1.35	0.300	0.267
0.2	46.84	1.35	0.300	0.267
0.2166	46.84	1.35	0.300	0.267
0.2333	46.84	1.35	0.300	0.267
0.25	46.84	1.35	0.300	0.267
0.2666	46.82	1.33	0.285	0.267
0.2833	46.82	1.33	0.285	0.267
0.3	46.82	1.33	0.285	0.267
0.3166	46.82	1.33	0.285	0.267
0.3333	46.82	1.33	0.285	0.267
0.4167	46.82	1.33	0.285	0.266
0.5	46.82	1.33	0.285	0.266
0.5833	46.82	1.33	0.285	0.265
0.6667	46.82	1.33	0.285	0.265
0.75	46.81	1.32	0.278	0.264
0.8333	46.81	1.32	0.278	0.264
0.9167	46.81	1.32	0.278	0.263
1	46.81	1.32	0.278 *	0.263
1.0833	46.81	1.32	0.278 *	0.262
1.1667	46.81	1.32	0.278 *	0.262
1.25	46.81	1.32	0.278 *	0.261
1.3333	46.81	1.32	0.278 *	0.261
1.4166	46.81	1.32	0.278 *	0.260
1.5	46.81	1.32	0.278 *	0.260
1.5833	46.81	1.32	0.278 *	0.259
1.6667	46.79	1.30	0.262 *	0.259
1.75	46.79	1.30	0.262 *	0.259
1.8333	46.79	1.30	0.262 *	0.258
1.9167	46.79	1.30	0.262 *	0.258
2	46.79	1.30	0.262 *	0.257
2.5	46.79	1.30	0.262 *	0.254
3	46.78	1.29	0.255 *	0.251
3.5	46.78	1.29	0.255 *	0.249
4	46.76	1.27	0.239 *	0.246
4.5	46.76	1.27	0.239 *	0.243
5	46.76	1.27	0.239 *	0.240

5.5	46.74	1.25	0.223	*	0.237
6	46.74	1.25	0.223	*	0.234
6.5	46.74	1.25	0.223	*	0.232
7	46.73	1.24	0.215	*	0.229
7.5	46.73	1.24	0.215	*	0.226
8	46.73	1.24	0.215	*	0.223
8.5	46.73	1.24	0.215	*	0.220
9	46.73	1.24	0.215	*	0.217
9.5	46.71	1.22	0.199	*	0.215
10	46.71	1.22	0.199	*	0.212
12	46.7	1.21	0.191	*	0.200
14	46.68	1.19	0.174	*	0.189
16	46.66	1.17	0.157	*	0.178
18	46.66	1.17	0.157	*	0.166
20	46.65	1.16	0.148	*	0.155
22	46.63	1.14	0.131	*	0.144
24	46.62	1.13	0.122	*	0.132
26	46.62	1.13	0.122	*	0.121
28	46.6	1.11	0.104	*	0.110
30	46.58	1.09	0.086	*	0.098
32	46.57	1.08	0.077	*	0.087
34	46.57	1.08	0.077	*	0.076
36	46.55	1.06	0.058	*	0.064
38	46.54	1.05	0.049	*	0.053
40	46.54	1.05	0.049	*	0.041
42	46.52	1.03	0.030	*	0.030
44	46.51	1.02	0.020	*	0.019
46	46.51	1.02	0.020	*	0.007
48	46.49	1.00	0.000	*	-0.004
50	46.47	0.98	-0.020	*	-0.015
52	46.47	0.98	-0.020	*	-0.027
54	46.46	0.97	-0.030	*	-0.038
56	46.46	0.97	-0.030	*	-0.049
58	46.44	0.95	-0.051	*	-0.061

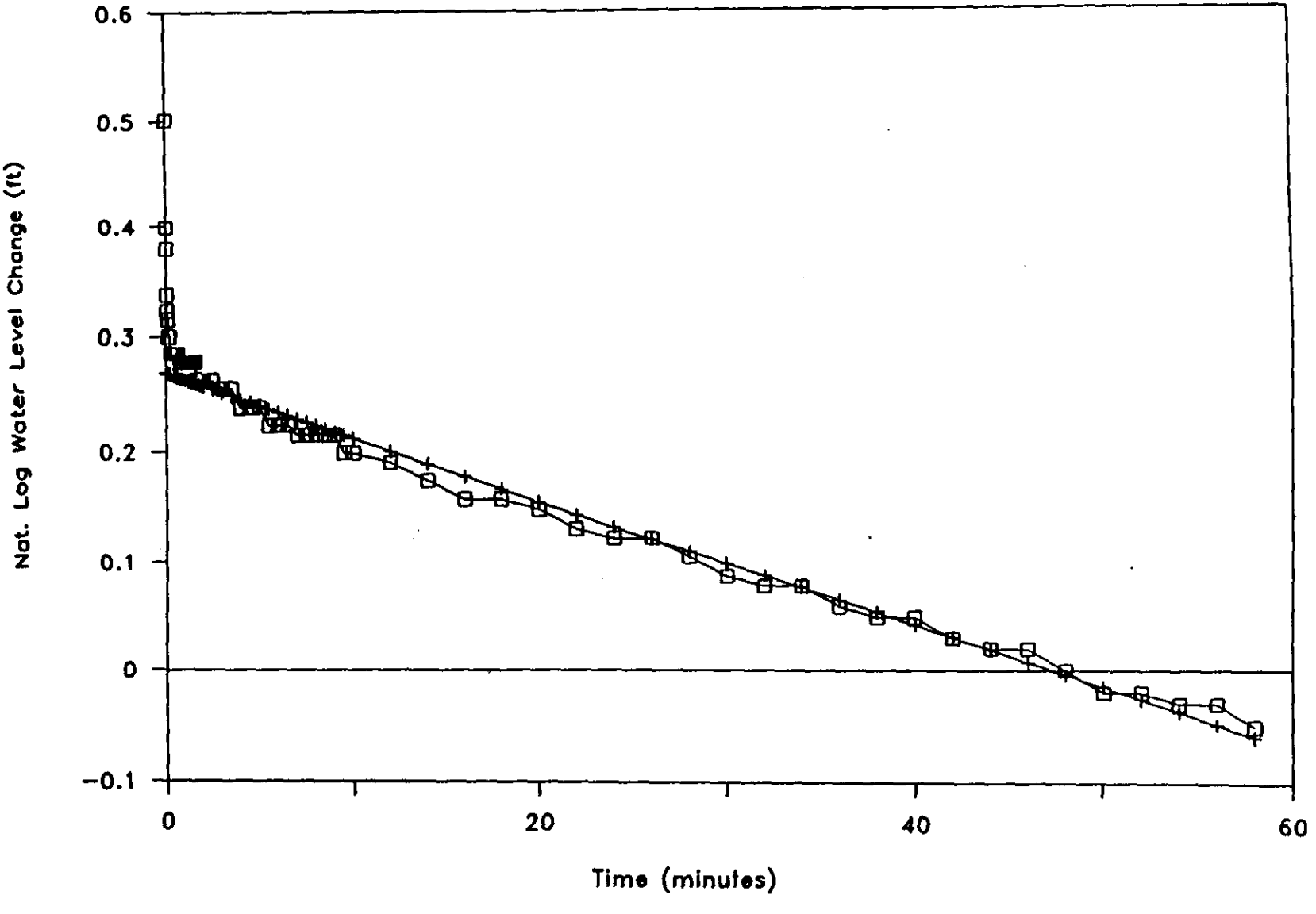
Recovery of Water Level

Baildown Test-- Well G109A



Nat. Log of Water Level Change (ft)

Baildown Test--Well G109A



SLUG TEST RESULTS FOR: Well B9
SITE: Winnebago Reclamation Landfill

Based on " A Slug Test for Determining Hydraulic Conductivity of Unconfined Aquifers with Completely or Patially Penetrating Wells" by H. Bouwer and R. C. Rice, Water Resources Research, June 1976, p423-428

WELL INFORMATION		TEST DATA	
Casing Diameter (inches)	2	Depth to Water (TOIC, feet)	40.17
Screen Diameter (inches)	2.0	Beginning Water Level Elevation (ft, MSL)	718.41
Borehole Diameter (inches)	4	Reference from Data Logger (ft)	40.17
Sand Pack Porosity(decimal)	0.2	Last Data Point (ft)	40.34
Screen Length (feet)	5	Final Water Level Elevation (ft)	40.20
Top of Inner Casing (feet, MSL)	758.58		
Total Well Depth (TOIC, feet)	45.2		
Stick-UP (feet)	2.7		
Bottom of Screen Elevation (ft, MSL)	713.40		

VARIABLES		AQUIFER PARAMETERS / OTHER WELL DATA
RC---Effective Casing Radius	1.26	Soil or Rock Type: Dolomite
------CHOOSE ONE---------		Confined or Unconfined Conditions? : Unconfined
Water Level Above Screen (inches) OR	1	Est. Aquifer Thickness: 200.0 Feet
in Disturbed Zone (inches)	1.26	Percent Well Penetration: 2.515 %
RW---Radial Distance to Undisturbed Aquifer	2.00	Filter Pack Type: #30 Flint sand
------CHOOSE ONE---------		
Filter Pack Permeability = Aquifer , OR	1	
Disturbed Zone Permeability >>> Aquifer	2	
L---Effective Screen Length (feet)	5	
H---Depth of Well Penetration	5.03	

CALCULATED PARAMETERS		REGRESSION RESULTS	
LE / RW	30.0	Regression Output:	
Dimensionless Coefficients (Fig. 3 Bouwer and Rice, 1976)		Constant	0.250701
Partially Penetrating Well		Std Err of Y Est	0.018325
--- A ----	2.5	R Squared	0.998034
--- B---	0.40	No. of Observations	42
ln (Re / rw)Partially Penetrating	2.00	Degrees of Freedom	40
ln ((D-h)/rw)--If > 6, Use results so marked	7.06		
ln (Re / rw)Partially Penetrating (>6)	2.06	X Coefficient(s)	-0.03882
Or, Fully Pentrating Well		Std Err of Coef.	0.000272
--- C---	NA		
ln (Re / rw) Fully Penetrating	NA		
SLOPE OF BEST FIT LINE:			
1/t * ln (Yo /Yt)	0.0388		

RESULTS	FT/MIN	FT/DAY	GPD/SQ.FT	CM/SEC
Hydraulic Conductivity Fully-P	NA	NA	NA	NA
Hydraulic Conductivity Partial-P	8.56E-05	1.23E-01	9.22E-01	4.35E-05
Hydraulic Conductivity Partial-P (>6)	8.81E-05	1.27E-01	9.48E-01	4.47E-05
	SQ.FT/MIN	SQ.FT/DAY	GPD/FT	SQ.M/SEC
Transmissivity Fully-P	NA	NA	NA	NA
Transmissivity Partial-P	1.71E-02	2.46E+01	1.84E+02	2.65E-05
Transmissivity Partial-P (>6)	1.76E-02	2.54E+01	1.90E+02	2.73E-05

Tested by: MJH

Evaluated by: MJH

Checked by: DSP

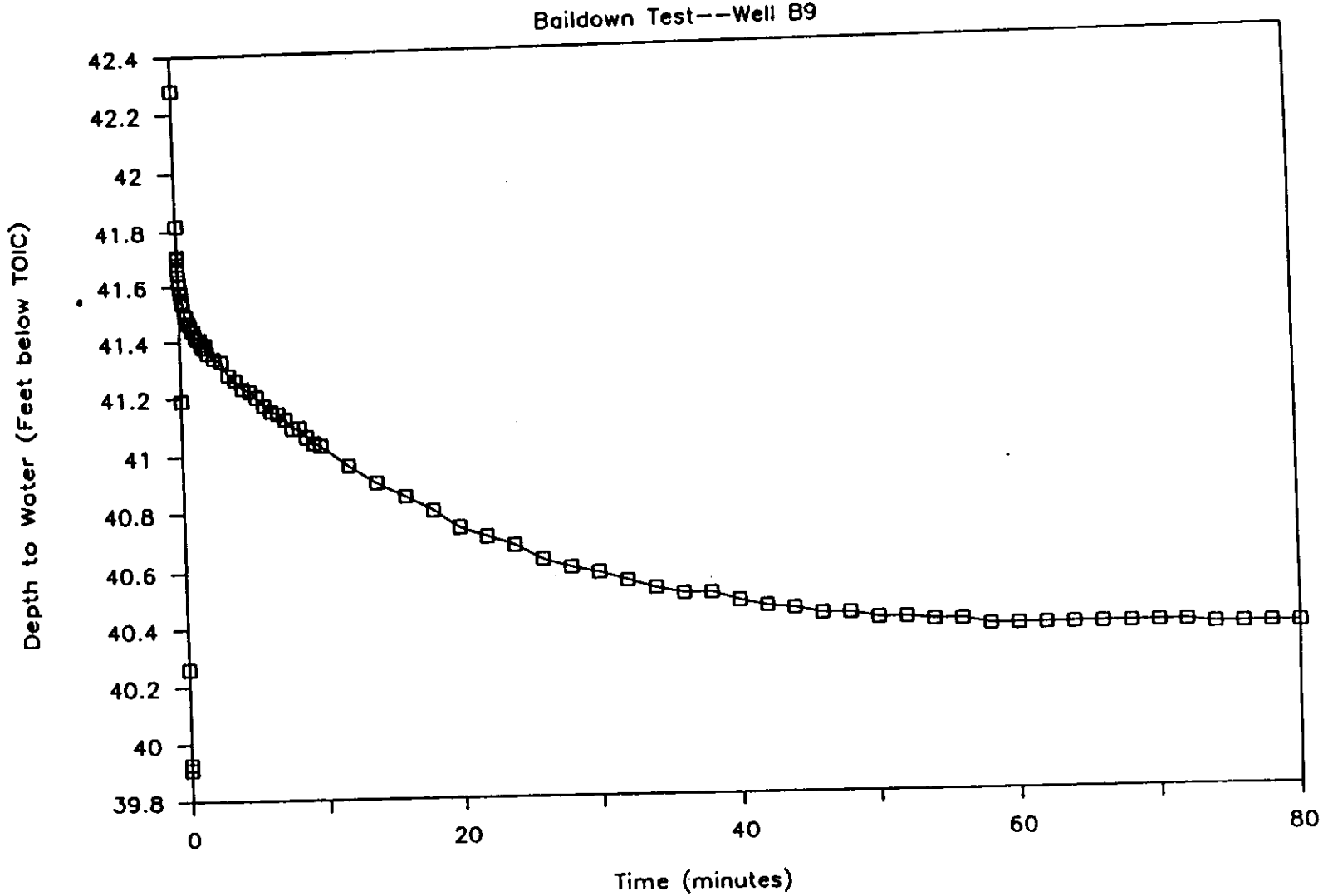
Data for Well B9

Time (min	Depth to Water	Water level Change	Natural Log of Water Level Change	REGR LINE CALC.
0.0000	39.91	-0.26	ERR	0.251
0.0033	39.93	-0.24	ERR	0.251
0.0066	39.93	-0.24	ERR	0.250
0.0099	40.26	0.09	-2.408	0.250
0.0133	42.28	2.11	0.747	0.250
0.0166	41.19	1.02	0.020	0.250
0.0200	41.82	1.65	0.501	0.250
0.0233	41.71	1.54	0.432	0.250
0.0266	41.71	1.54	0.432	0.250
0.0300	41.68	1.51	0.412	0.250
0.0333	41.70	1.53	0.425	0.249
0.0500	41.65	1.48	0.392	0.249
0.0666	41.65	1.48	0.392	0.248
0.0833	41.62	1.45	0.372	0.247
0.1000	41.62	1.45	0.372	0.247
0.1166	41.62	1.45	0.372	0.246
0.1333	41.60	1.43	0.358	0.246
0.1500	41.58	1.41	0.344	0.245
0.1666	41.58	1.41	0.344	0.244
0.1833	41.58	1.41	0.344	0.244
0.2000	41.58	1.41	0.344	0.243
0.2166	41.57	1.40	0.336	0.242
0.2333	41.57	1.40	0.336	0.242
0.2500	41.55	1.38	0.322	0.241
0.2666	41.54	1.37	0.315	0.240
0.2833	41.54	1.37	0.315	0.240
0.3000	41.54	1.37	0.315	0.239
0.3166	41.54	1.37	0.315	0.238
0.3333	41.54	1.37	0.315	0.238
0.4167	41.50	1.33	0.285	0.235
0.5000	41.49	1.32	0.278	0.231
0.5833	41.49	1.32	0.278	0.228
0.6667	41.47	1.30	0.262	0.225
0.7500	41.47	1.30	0.262	0.222
0.8333	41.46	1.29	0.255	0.218
0.9167	41.44	1.27	0.239	0.215
1.0000	41.44	1.27	0.239 *	0.212
1.0833	41.44	1.27	0.239 *	0.209
1.1667	41.42	1.25	0.223 *	0.205
1.2500	41.41	1.24	0.215 *	0.202
1.3333	41.41	1.24	0.215 *	0.199
1.4166	41.41	1.24	0.215 *	0.196
1.5000	41.41	1.24	0.215 *	0.192
1.5833	41.39	1.22	0.199 *	0.189
1.6667	41.38	1.21	0.191 *	0.186
1.7500	41.38	1.21	0.191 *	0.183
1.8333	41.39	1.22	0.199 *	0.180
1.9167	41.38	1.21	0.191 *	0.176
2.00	41.36	1.19	0.174 *	0.173
2.50	41.34	1.17	0.157 *	0.154
3.00	41.33	1.16	0.148 *	0.134
3.50	41.28	1.11	0.104 *	0.115
4.00	41.26	1.09	0.086 *	0.095
4.50	41.23	1.06	0.058 *	0.076
5.00	41.22	1.05	0.049 *	0.057

5.50	41.20	1.03	0.030 *	0.037
6.00	41.17	1.00	0.000 *	0.018
6.50	41.15	0.98	-0.020 *	-0.002
7.00	41.14	0.97	-0.030 *	-0.021
7.50	41.12	0.95	-0.051 *	-0.041
8.00	41.09	0.92	-0.083 *	-0.060
8.50	41.09	0.92	-0.083 *	-0.079
9.00	41.06	0.89	-0.117 *	-0.099
9.50	41.04	0.87	-0.139 *	-0.118
10	41.03	0.86	-0.151 *	-0.138
12	40.96	0.79	-0.236 *	-0.215
14	40.90	0.73	-0.315 *	-0.293
16	40.85	0.68	-0.386 *	-0.371
18	40.80	0.63	-0.462 *	-0.448
20	40.74	0.57	-0.562 *	-0.526
22	40.71	0.54	-0.616 *	-0.604
24	40.68	0.51	-0.673 *	-0.681
26	40.63	0.46	-0.777 *	-0.759
28	40.60	0.43	-0.844 *	-0.837
30	40.58	0.41	-0.892 *	-0.914
32	40.55	0.38	-0.968 *	-0.992
34	40.52	0.35	-1.050 *	-1.070
36	40.50	0.33	-1.109 *	-1.147
38	40.50	0.33	-1.109 *	-1.225
40	40.47	0.30	-1.204 *	-1.302
42	40.45	0.28	-1.273 *	-1.380
44	40.44	0.27	-1.309 *	-1.458
46	40.42	0.25	-1.386 *	-1.535
48	40.42	0.25	-1.386 *	-1.613
50	40.40	0.23	-1.470 *	-1.691
52	40.40	0.23	-1.470 *	-1.768
54	40.39	0.22	-1.514 *	-1.846
56	40.39	0.22	-1.514 *	-1.924
58	40.37	0.20	-1.609	-2.001
60	40.37	0.20	-1.609	-2.079
62	40.37	0.20	-1.609	-2.157
64	40.37	0.20	-1.609	-2.234
66	40.37	0.20	-1.609	-2.312
68	40.37	0.20	-1.609	-2.390
70	40.37	0.20	-1.609	-2.467
72	40.37	0.20	-1.609	-2.545
74	40.36	0.19	-1.661	-2.623
76	40.36	0.19	-1.661	-2.700
78	40.36	0.19	-1.661	-2.778
80	40.36	0.19	-1.661	-2.856
82	40.36	0.19	-1.661	-2.933
84	40.36	0.19	-1.661	-3.011
86	40.36	0.19	-1.661	-3.089
88	40.36	0.19	-1.661	-3.166
90	40.36	0.19	-1.661	-3.244
92	40.36	0.19	-1.661	-3.322
94	40.36	0.19	-1.661	-3.399
96	40.37	0.20	-1.609	-3.477
98	40.36	0.19	-1.661	-3.555
100	40.36	0.19	-1.661	-3.632
110	40.34	0.17	-1.772	-4.021
120	40.34	0.17	-1.772	-4.409
130	40.34	0.17	-1.772	-4.797
140	40.34	0.17	-1.772	-5.185

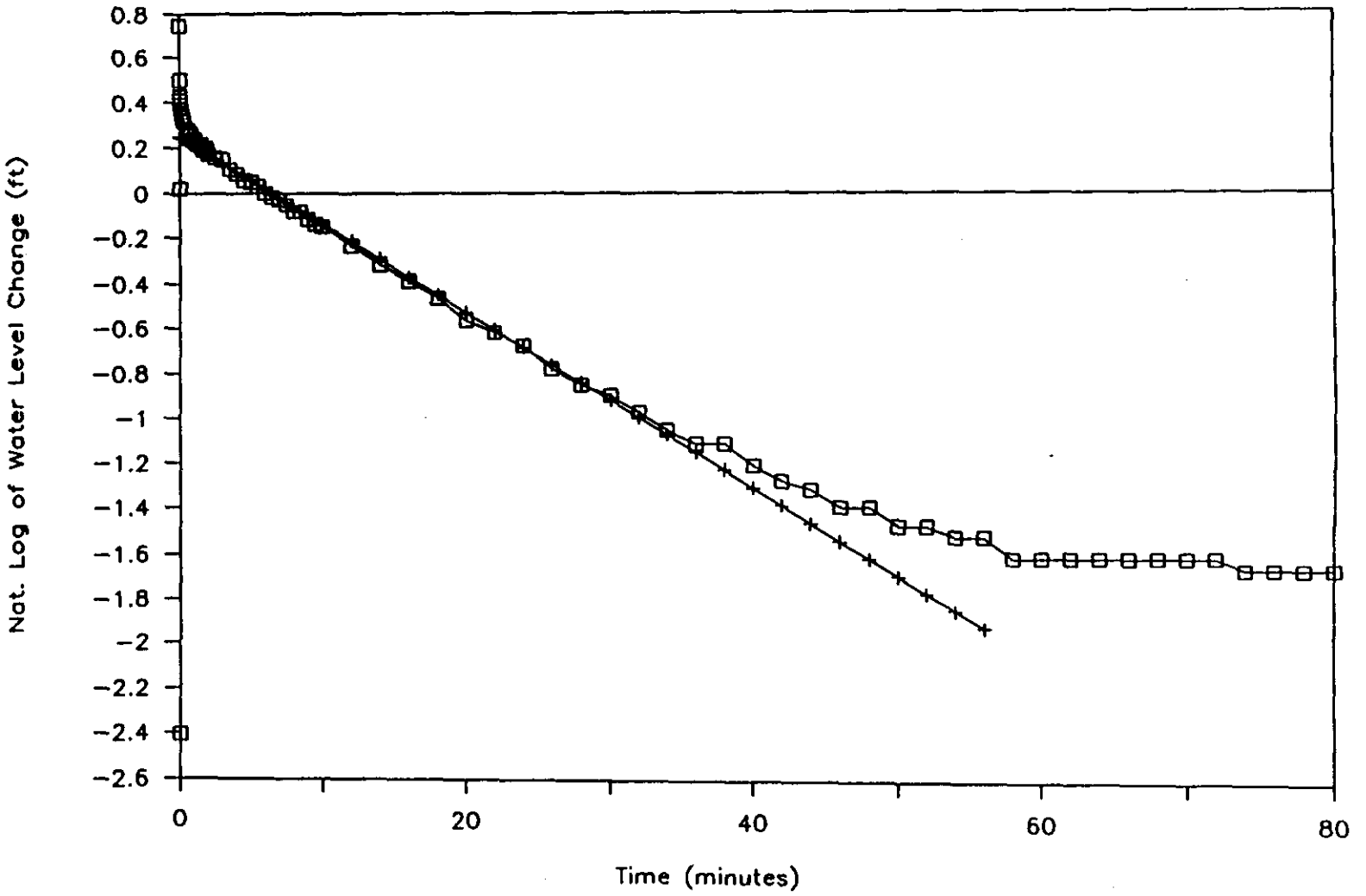
Recovery of Water Level

Baildown Test--Well B9



Nat. Log of Water Level Change

Baildown Test--Well B9



SLUG TEST RESULTS FOR: Well G108
SITE: Winnebago Reclamation Landfill

Based on " A Slug Test for Determining Hydraulic Conductivity of Unconfined Aquifers with Completely or Patially Penetrating Wells" by H. Bouwer and R. C. Rice, Water Resources Research, June 1976,p423-428

WELL INFORMATION		TEST DATA	
Casing Diameter (inches)	2	Depth to Water (TOIC, feet)	39.36
Screen Diameter (inches)	2.0	Beginning Water Level Elevation (ft, MSL)	711.93
Borehole Diameter (inches)	4	Reference from Data Logger (ft)	39.36
Sand Pack Porosity(decimal)	0.2	Last Data Point (ft)	39.34
Screen Length (feet)	10	Final Water Level Elevation (ft)	NT
Top of Inner Casing (feet, MSL)	751.29		
Total Well Depth (TOIC, feet)	46.2		
Stick-UP (feet)	2		
Bottom of Screen Elevation (ft, MSL)	705.11		

VARIABLES		AQUIFER PARAMETERS / OTHER WELL DATA
RC---Effective Casing Radius	1.26	Soil or Rock Type: Dolomite
------CHOOSE ONE---------		Confined or Unconfined Conditions? : Unconfined
Water Level Above Screen (inches) OR	1	Est. Aquifer Thickness: 200.0 Feet
in Disturbed Zone (inches)	1.26	Percent Well Penetration: 3.42 %
RW---Radial Distance to Undisturbed Aquifer	2.00	Filter Pack Type: #30 Flint sand
------CHOOSE ONE---------		
Filter Pack Permeability = Aquifer , OR	1	
Disturbed Zone Permeability >>> Aquifer	2	
L---Effective Screen Length (feet)	6.84	
H---Depth of Well Penetration	6.84	

CALCULATED PARAMETERS		REGRESSION RESULTS	
LE / RW	41.0	Regression Output:	
Dimensionless Coefficients (Fig. 3 Bouwer and Rice, 1976)		Constant	0.824766
Partially Penetrating Well		Std Err of Y Est	0.079319
--- A ----	2.6	R Squared	0.962256
--- B---	0.50	No. of Observations	30
ln (Re / rw)Partially Penetrating	2.24	Degrees of Freedom	28
ln ((D-h)/rw)--If > 6, Use results so marked	7.06		
ln (Re / rw)Partially Penetrating (>6)	2.31	X Coefficient(s) -2.90085	
Or, Fully Pentrating Well		Std Err of Coef. 0.108573	
--- C---	NA		
ln (Re / rw) Fully Penetrating	NA		
SLOPE OF BEST FIT LINE:			
1/t * ln (Yo /Yt)	2.9009		

RESULTS	FT/MIN	FT/DAY	GPD/SQ.FT	CM/SEC
Hydraulic Conductivity Fully-P	NA	NA	NA	NA
Hydraulic Conductivity Partial-P	5.25E-03	7.56E+00	5.65E+01	2.67E-03
Hydraulic Conductivity Partial-P (>6)	5.40E-03	7.78E+00	5.82E+01	2.75E-03
	SQ.FT/MIN	SQ.FT/DAY	GPD/FT	SQ.M/SEC
Transmissivity Fully-P	NA	NA	NA	NA
Transmissivity Partial-P	1.05E+00	1.51E+03	1.13E+04	1.62E-03
Transmissivity Partial-P (>6)	1.08E+00	1.56E+03	1.16E+04	1.67E-03

Tested by: MJH

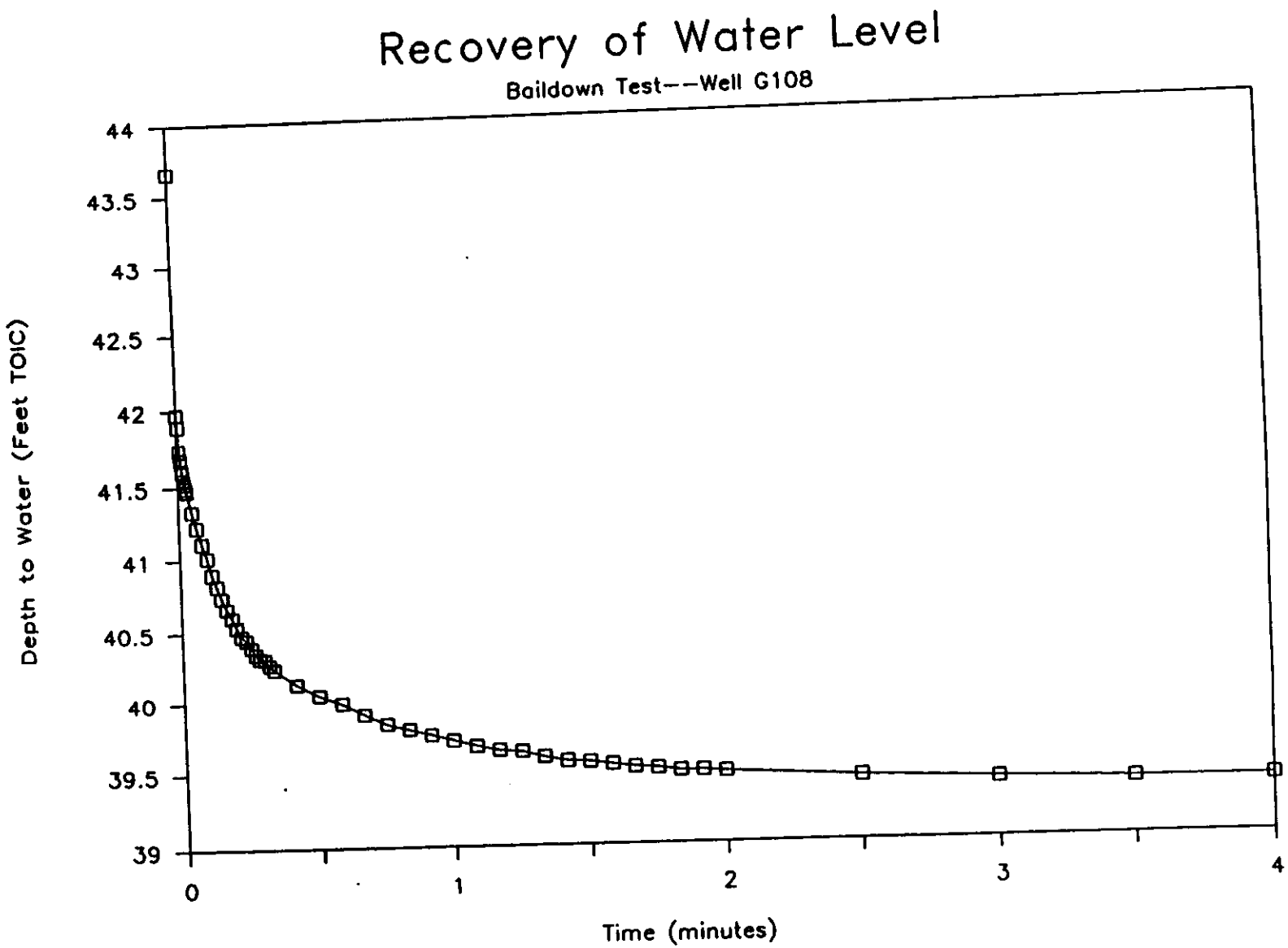
Evaluated by: MJH

Checked by: DSP

Data for Well G108

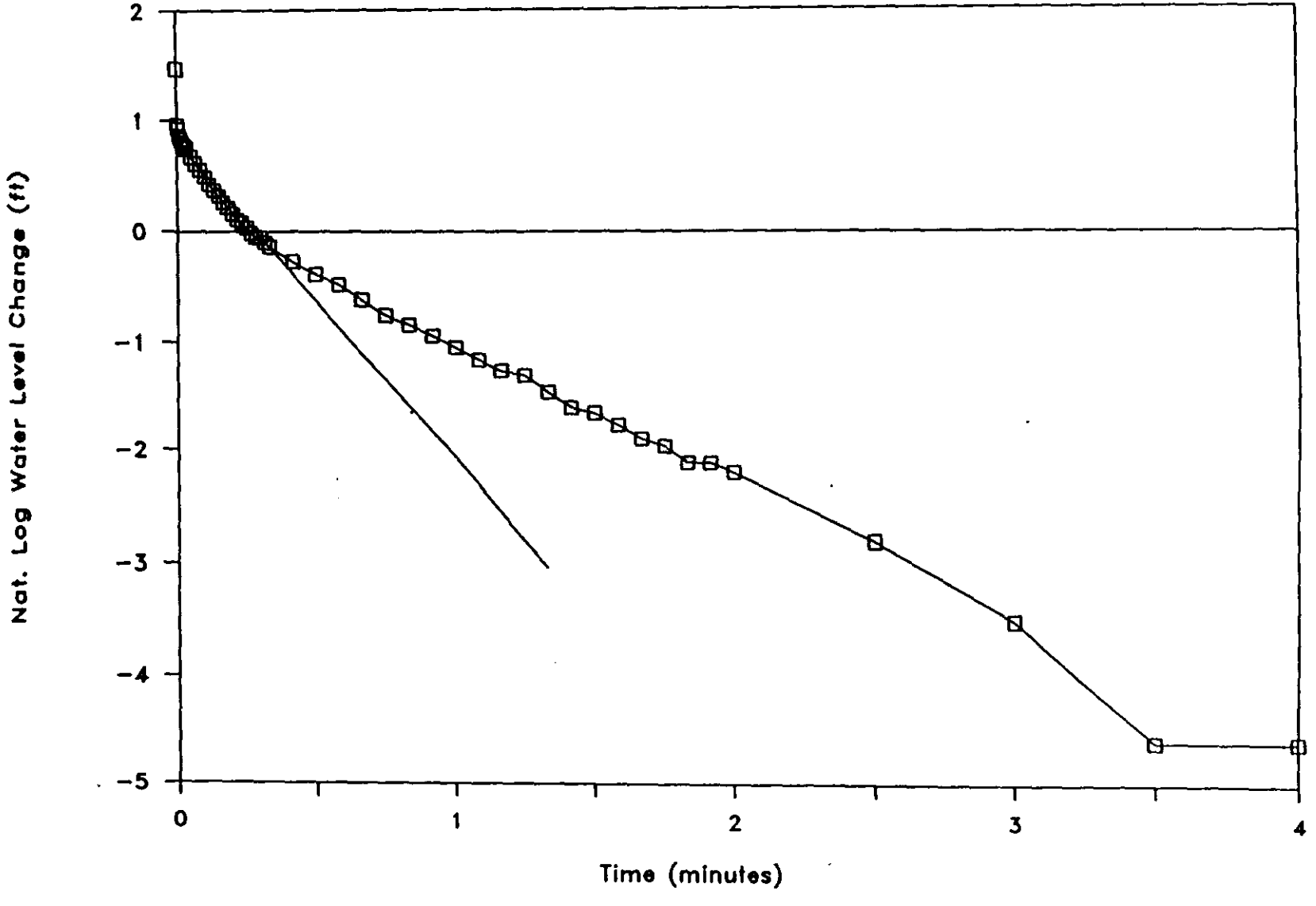
Time (min	Depth to Water	Water level Change	Natural Log of Water Level Change	REGR LINE CALC.
0	43.66	4.30	1.459	0.825
0.0033	41.97	2.61	0.959 *	0.815
0.0066	41.89	2.53	0.928 *	0.806
0.0099	41.73	2.37	0.863 *	0.796
0.0133	41.67	2.31	0.837 *	0.786
0.0166	41.6	2.24	0.806 *	0.777
0.02	41.59	2.23	0.802 *	0.767
0.0233	41.54	2.18	0.779 *	0.757
0.0266	41.52	2.16	0.770 *	0.748
0.03	41.49	2.13	0.756 *	0.738
0.0333	41.47	2.11	0.747 *	0.728
0.05	41.33	1.97	0.678 *	0.680
0.0666	41.22	1.86	0.621 *	0.632
0.0833	41.11	1.75	0.560 *	0.583
0.1	41.01	1.65	0.501 *	0.535
0.1166	40.9	1.54	0.432 *	0.487
0.1333	40.82	1.46	0.378 *	0.438
0.15	40.74	1.38	0.322 *	0.390
0.1666	40.66	1.30	0.262 *	0.341
0.1833	40.6	1.24	0.215 *	0.293
0.2	40.53	1.17	0.157 *	0.245
0.2166	40.47	1.11	0.104 *	0.196
0.2333	40.44	1.08	0.077 *	0.148
0.25	40.39	1.03	0.030 *	0.100
0.2666	40.34	0.98	-0.020 *	0.051
0.2833	40.31	0.95	-0.051 *	0.003
0.3	40.3	0.94	-0.062 *	-0.045
0.3166	40.26	0.90	-0.105 *	-0.094
0.3333	40.23	0.87	-0.139 *	-0.142
0.4167	40.12	0.76	-0.274 *	-0.384
0.5	40.04	0.68	-0.386 *	-0.626
0.5833	39.98	0.62	-0.478	-0.867
0.6667	39.9	0.54	-0.616	-1.109
0.75	39.83	0.47	-0.755	-1.351
0.8333	39.79	0.43	-0.844	-1.593
0.9167	39.75	0.39	-0.942	-1.834
1	39.71	0.35	-1.050	-2.076
1.0833	39.67	0.31	-1.171	-2.318
1.1667	39.64	0.28	-1.273	-2.560
1.25	39.63	0.27	-1.309	-2.801
1.3333	39.59	0.23	-1.470	-3.043
1.4166	39.56	0.20	-1.609	-3.285
1.5	39.55	0.19	-1.661	-3.527
1.5833	39.53	0.17	-1.772	-3.768
1.6667	39.51	0.15	-1.897	-4.010
1.75	39.5	0.14	-1.966	-4.252
1.8333	39.48	0.12	-2.120	-4.493
1.9167	39.48	0.12	-2.120	-4.735
2	39.47	0.11	-2.207	-4.977
2.5	39.42	0.06	-2.813	-6.427
3	39.39	0.03	-3.507	-7.878
3.5	39.37	0.01	-4.605	-9.328
4	39.37	0.01	-4.605	-10.779
4.5	39.36	0.00	ERR	-12.229
5	39.36	0.00	ERR	-13.680

5.5	39.36	0.00	ERR	-15.130
6	39.34	-0.02	ERR	-16.580
6.5	39.34	-0.02	ERR	-18.031
7	39.34	-0.02	ERR	-19.481
7.5	39.34	-0.02	ERR	-20.932
8	39.34	-0.02	ERR	-22.382
8.5	39.34	-0.02	ERR	-23.832
9	39.34	-0.02	ERR	-25.283
9.5	39.34	-0.02	ERR	-26.733
10	39.34	-0.02	ERR	-28.184
12	39.34	-0.02	ERR	-33.985
14	39.34	-0.02	ERR	-39.787
16	39.34	-0.02	ERR	-45.589
18	39.34	-0.02	ERR	-51.391
20	39.34	-0.02	ERR	-57.192
22	39.34	-0.02	ERR	-62.994
24	39.34	-0.02	ERR	-68.796
26	39.34	-0.02	ERR	-74.597
28	39.34	-0.02	ERR	-80.399
30	39.34	-0.02	ERR	-86.201
32	39.34	-0.02	ERR	-92.003
34	39.34	-0.02	ERR	-97.804
36	39.34	-0.02	ERR	-103.606
38	39.34	-0.02	ERR	-109.408
40	39.36	0.00	ERR	-115.209
42	39.34	-0.02	ERR	-121.011
44	39.34	-0.02	ERR	-126.813
46	39.34	-0.02	ERR	-132.615


Recovery of Water Level
Baildown Test--Well G108
Depth to Water (Feet TOIC)
44
43.5
43
42.5
42
41.5
41
40.5
40
39.5
39
0
1
2
3
4
Time (minutes)

Nat. Log Water Level Change (ft)

Baildown Test--Well G108



SLUG TEST RESULTS FOR: G110
SITE: Winnebago Reclamation Landfill

Based on " A Slug Test for Determining Hydraulic Conductivity of Unconfined Aquifers with Completely or Patially Penetrating Wells" by H. Bouwer and R. C. Rice, Water Resources Research, June 1976, p423-428

WELL INFORMATION		TEST DATA	
Casing Diameter (inches)	2	Depth to Water (TOIC, feet)	34.77
Screen Diameter (inches)	2	Beginning Water Level Elevation (ft, MSL)	713.31
Borehole Diameter (inches)	4	Reference from Data Logger (ft)	34.77
Sand Pack Porosity(decimal)	0.2	Last Data Point (ft)	34.72
Screen Length (feet)	10	Final Water Level Elevation (ft)	NT
Top of Inner Casing (feet, MSL)	748.08		
Total Well Depth (TOIC, feet)	45.8		
Stick-UP (feet)	2.3		
Bottom of Screen Elevation (ft, MSL)	702.30		

VARIABLES		AQUIFER PARAMETERS / OTHER WELL DATA
RC---Effective Casing Radius	1.26	Soil or Rock Type: Dolomite
------CHOOSE ONE---------		Confined or Unconfined Conditions? : Unconfined
Water Level Above Screen (inches) OR	1	Est. Aquifer Thickness: 200.0 Feet
in Disturbed Zone (inches)	1.26	Percent Well Penetration: 5.515 %
RW---Radial Distance to Undisturbed Aquifer	2.00	Filter Pack Type: flint sand
------CHOOSE ONE---------		
Filter Pack Permeability = Aquifer , OR	1	
Disturbed Zone Permeability >>> Aquifer	2	
L---Effective Screen Length (feet)	10	
N---Depth of Well Penetration	11.03	

CALCULATED PARAMETERS		REGRESSION RESULTS	
L / RW	60.0	Regression Output:	
Dimensionless Coefficients (Fig. 3 Bouwer and Rice, 1976)		Constant	0.270491
Partially Penetrating Well		Std Err of Y Est	0.051510
--- A ----	3.3	R Squared	0.992811
--- B---	0.60	No. of Observations	12
ln (Re / rw)Partially Penetrating	2.58	Degrees of Freedom	10
ln ((D-h)/rw)--If > 6, Use results so marked	7.03		
ln (Re / rw)Partially Penetrating (>6)	2.65	X Coefficient(s) -1.92097	
Or, Fully Pentrating Well		Std Err of Coef. 0.051691	
--- C---	NA		
ln (Re / rw) Fully Penetrating	NA		
SLOPE OF BEST FIT LINE:			
1/t * ln (Yo /Yt)	1.9210		

RESULTS	FT/MIN	FT/DAY	GPD/SQ.FT	CM/SEC
Hydraulic Conductivity Fully-P	NA	NA	NA	NA
Hydraulic Conductivity Partial-P	2.73E-03	3.93E+00	2.94E+01	1.39E-03
Hydraulic Conductivity Partial-P (>6)	2.81E-03	4.04E+00	3.02E+01	1.43E-03
	SQ.FT/MIN	SQ.FT/DAY	GPD/FT	SQ.M/SEC
Transmissivity Fully-P	NA	NA	NA	NA
Transmissivity Partial-P	5.46E-01	7.87E+02	5.88E+03	8.46E-04
Transmissivity Partial-P (>6)	5.61E-01	8.08E+02	6.04E+03	8.69E-04

Tested by: DSP
Evaluated by: MJH
Checked by: DSP

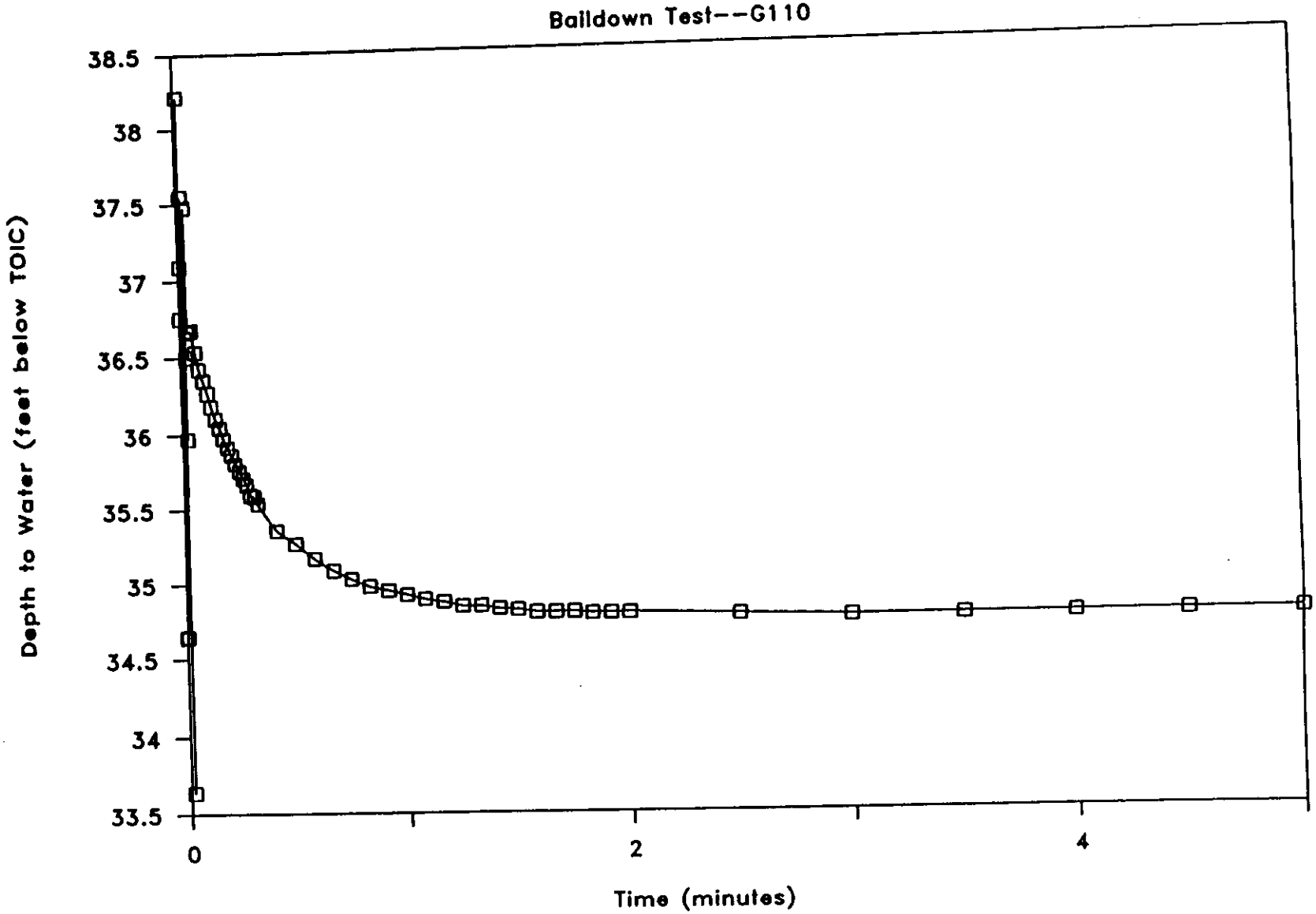
Data for G110

Time (min	Depth to Water	Water level Change	Natural Log of Water Level Change	REGR LINE CALC.
0.0000	34.64	-0.08	ERR	0.270
0.0033	34.65	-0.07	ERR	0.264
0.0066	36.75	2.03	0.708	0.258
0.0099	37.09	2.37	0.863	0.251
0.0133	38.21	3.49	1.250	0.245
0.0166	33.64	-1.08	ERR	0.239
0.0200	37.55	2.83	1.040	0.232
0.0233	35.97	1.25	0.223	0.226
0.0266	36.50	1.78	0.577	0.219
0.0300	37.48	2.76	1.015	0.213
0.0333	36.66	1.94	0.663	0.207
0.0500	36.67	1.95	0.668	0.174
0.0666	36.53	1.81	0.593	0.143
0.0833	36.42	1.70	0.531	0.110
0.1000	36.35	1.63	0.489	0.078
0.1166	36.27	1.55	0.438	0.047
0.1333	36.18	1.46	0.378	0.014
0.1500	36.10	1.38	0.322	-0.018
0.1666	36.04	1.32	0.278	-0.050
0.1833	35.97	1.25	0.223	-0.082
0.2000	35.91	1.19	0.174	-0.114
0.2166	35.86	1.14	0.131	-0.146
0.2333	35.80	1.08	0.077	-0.178
0.2500	35.75	1.03	0.030	-0.210
0.2666	35.70	0.98	-0.020	-0.242
0.2833	35.66	0.94	-0.062	-0.274
0.3000	35.59	0.87	-0.139	-0.306
0.3166	35.58	0.86	-0.151	-0.338
0.3333	35.53	0.81	-0.211	-0.370
0.4167	35.35	0.63	-0.462	-0.530
0.5000	35.26	0.54	-0.616 *	-0.690
0.5833	35.16	0.44	-0.821 *	-0.850
0.6667	35.08	0.36	-1.022 *	-1.010
0.7500	35.02	0.30	-1.204 *	-1.170
0.8333	34.97	0.25	-1.386 *	-1.330
0.9167	34.94	0.22	-1.514 *	-1.490
1.0000	34.91	0.19	-1.661 *	-1.650
1.0833	34.88	0.16	-1.833 *	-1.811
1.1667	34.86	0.14	-1.966 *	-1.971
1.2500	34.83	0.11	-2.207 *	-2.131
1.3333	34.83	0.11	-2.207 *	-2.291
1.4166	34.81	0.09	-2.408 *	-2.451
1.5000	34.80	0.08	-2.526	-2.611
1.5833	34.78	0.06	-2.813	-2.771
1.6667	34.78	0.06	-2.813	-2.931
1.7500	34.78	0.06	-2.813	-3.091
1.8333	34.77	0.05	-2.996	-3.251
1.9167	34.77	0.05	-2.996	-3.411
2	34.77	0.05	-2.996	-3.571
2.5	34.75	0.03	-3.507	-4.532
3	34.73	0.01	-4.605	-5.492
3.5	34.73	0.01	-4.605	-6.453
4	34.73	0.01	-4.605	-7.413
4.5	34.73	0.01	-4.605	-8.374

5	34.73	0.01	-4.605	-9.334
5.5	34.73	0.01	-4.605	-10.295
6	34.73	0.01	-4.605	-11.255
6.5	34.72	0.00	ERR	-12.216
7	34.73	0.01	-4.605	-13.176
7.5	34.72	0.00	ERR	-14.137
8	34.73	0.01	-4.605	-15.097
8.5	34.72	0.00	ERR	-16.058
9	34.72	0.00	ERR	-17.018
9.5	34.72	0.00	ERR	-17.979
10	34.73	0.01	-4.605	-18.939
12	34.72	0.00	ERR	-22.781
14	34.72	0.00	ERR	-26.623
16	34.72	0.00	ERR	-30.465
18	34.72	0.00	ERR	-34.307
20	34.72	0.00	ERR	-38.149
22	34.72	0.00	ERR	-41.991
24	34.72	0.00	ERR	-45:833
26	34.72	0.00	ERR	-49.675
28	34.72	0.00	ERR	-53.517

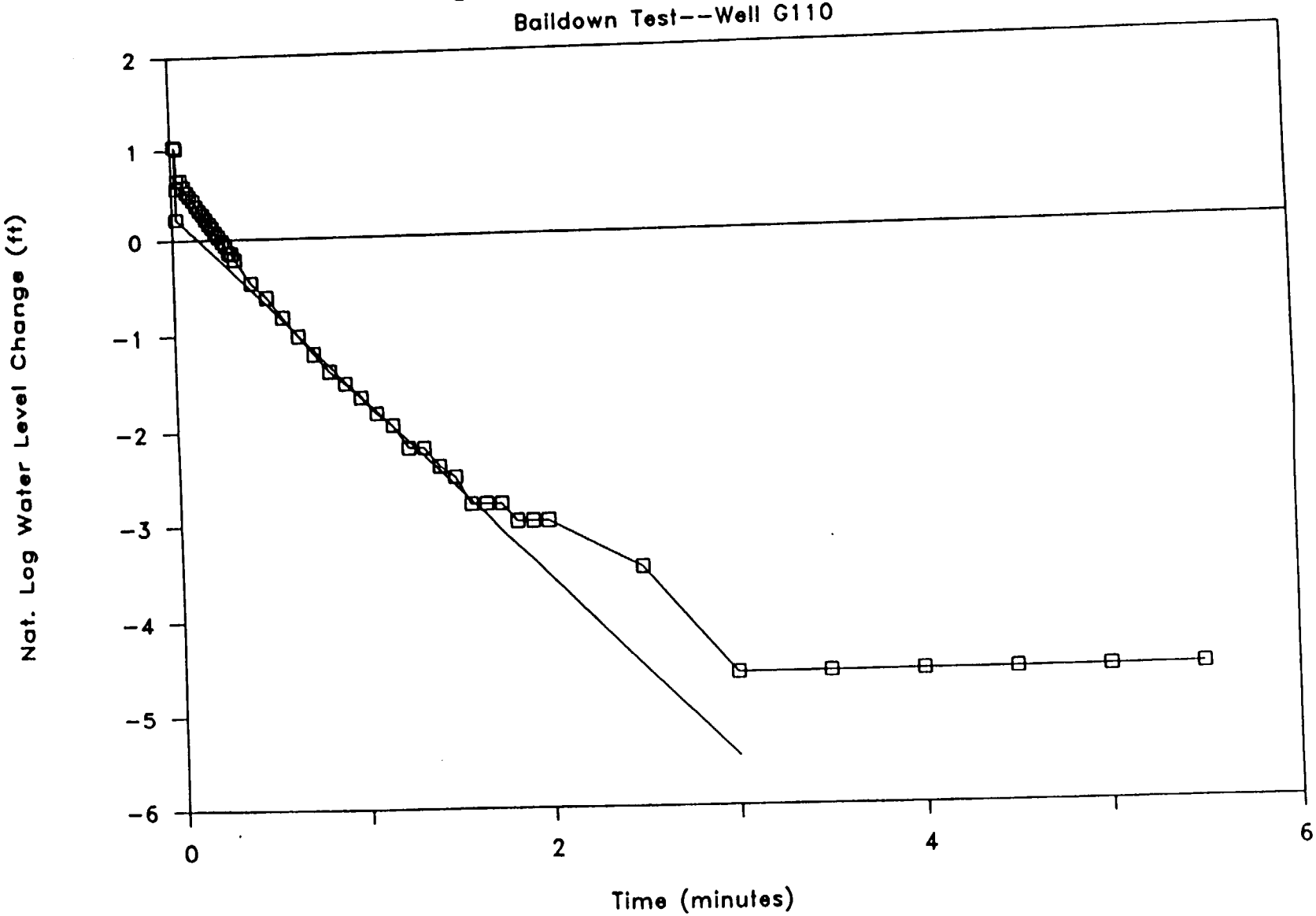
Recovery of Water Level

Baildown Test--G110



Nat. Log of Water Level Change (ft)

Baildown Test--Well G110



APPENDIX E

WATER LEVEL MEASUREMENTS

Winnebago Reclamation Landfill
Summary of Water Table Elevations

Boring Number	Year Installed	TOIC Elevation (ft,MSL)	Water Elevation 06 April	Water Elevation 17 May	Water Elevation 16 June	1988 Water Elevation 05 Aug.	Water Elevation 29 Aug.	Water Elevation 25 Oct.	Water Elevation 09 Nov.	1989 Water Elevation 08 June	Water Elevation 08 Dec.	1990 Water Elevation 05 Feb.	Water Elevation 05 March	Water Elevation 20 April	Well Type
B1	1982	772.87	NA	734.59	733.46	731.09	729.97	727.65	727.16	725.33	DRY	DRY	DRY	726.24	W
B2	1982	792.40	NA	734.60	733.28	730.87	729.81	727.41	726.95	724.56	733.09	722.67	723.20	725.76	W
B3	1982	745.00	NA	738.74	738.15	735.95	732.62	729.51	729.15	739.00	738.61	740.23	NA	740.53	B
B4	1982	757.66	734.96	734.35	731.91	729.18	728.12	726.21	725.78	724.96	723.44	723.08	724.21	729.49	W
B5	1982	752.85	NA	729.55	727.92	726.05	725.17	723.60	723.27	722.62	720.72	720.86	721.58	723.67	W
B6S	1982	754.02	734.71	730.29	727.01	724.32	723.44	721.76	721.47	720.97	719.48	719.45	720.24	724.27	B
B6D	1982	754.21	728.39	726.61	724.83	722.69	721.92	720.52	720.25	719.60	718.27	718.35	718.91	721.63	B
B7	1982	751.85	736.04	732.19	729.51	726.99	726.06	724.31	723.96	723.09	721.96	723.89	723.10	727.72	W
B8	1982	750.22	NA	723.50	722.12	720.57	720.09	718.92	718.69	718.32	717.21	717.24	NA	719.13	B
B9	1982	758.58	724.60	724.72	723.03	721.09	720.37	719.03	718.85	718.07	717.03	719.55	718.83	719.45	W
B10	1982	744.34	713.77	713.75	713.05	712.34	712.02	711.34	711.19	710.81	710.32	710.32	710.49	711.75	W
B10A	1984	743.94	NA	NA	714.47	713.32	712.80	711.90	711.70	711.20	710.68	710.69	710.87	712.36	B
B11	1982	760.74	722.92	723.84	720.75	719.29	718.51	716.76	716.48	715.46	714.83	714.67	715.29	717.24	W
B11A	1984	759.09	722.31	722.56	720.74	718.57	717.90	716.47	716.22	715.30	714.64	714.57	714.59	716.81	B
B12	1982	760.52	722.23	723.89	721.89	719.64	718.73	717.31	717.14	716.47	715.70	715.36	715.80	718.10	W
B13	1982	739.46	715.72	714.92	714.17	713.20	712.82	712.44	712.34	712.34	711.55	711.87	712.19	712.93	W
B14	1982	717.30	713.40	712.32	711.64	710.87	710.65	710.69	710.57	710.92	710.18	710.73	711.05	711.62	W
B15	1982	744.55	709.67	708.62	708.01	707.48	707.23	706.87	706.84	706.95	706.40	706.64	706.83	707.23	W
B15R	1984	746.29	709.11	708.83	708.33	707.64	707.39	706.99	706.94	707.04	706.52	706.73	706.92	707.32	W
B15P	1987	743.52	709.26	708.98	708.39	707.84	707.58	707.22	707.16	707.22	706.70	706.94	707.11	707.59	B
B16	1982	762.87	730.03	727.63	725.56	722.85	721.97	720.19	719.91	718.50	717.89	718.09	718.12	721.11	W
B16A	1984	762.72	730.02	727.88	725.55	722.88	722.00	720.26	719.97	718.57	717.99	718.11	718.17	721.13	B
G107	1984	739.58	711.38	709.90	709.19	708.44	708.06	707.55	707.41	707.38	706.72	706.96	707.33	707.80	W
G108	1984	751.29	717.86	717.70	715.34	714.91	714.27	713.16	712.99	712.33	711.83	711.76	711.97	713.74	W
G109	1984	760.79	722.15	723.88	721.92	719.57	718.65	717.21	716.99	716.39	715.61	715.23	715.68	718.21	W
G109A	1984	761.03	721.00	723.47	721.56	719.37	718.47	717.08	716.83	716.23	715.45	715.14	715.54	717.87	B
G110	1984	748.08	717.26	716.85	716.85	714.89	714.44	713.80	713.72	713.56	712.78	712.96	713.29	714.29	W
G111	1984	741.04	719.69	719.21	718.29	716.74	716.16	715.44	713.28	715.03	714.05	714.29	714.69	715.75	W
G112	1987	763.29	723.25	725.07	723.20	721.21	720.04	718.19	717.97	716.64	DRY	DRY	DRY	718.26	W
G113	1987	762.22	720.95	721.42	720.06	718.52	717.78	716.67	716.56	716.05	715.16	715.18	715.59	717.00	W
G113A	1987	762.89	721.01	721.24	719.93	718.41	717.75	716.64	716.52	716.02	715.12	715.14	715.54	716.92	B

Table continued on the following page.

Winnebago Reclamation Landfill
Summary of Water Table Elevations

Boring Number	Year Installed	TOIC Elevation (ft,MSL)	Water Elevation 06 April	Water Elevation 17 May	Water Elevation 16 June	1988 Water Elevation 05 Aug.	Water Elevation 29 Aug.	Water Elevation 25 Oct.	Water Elevation 09 Nov.	1989 Water Elevation 08 June	Water Elevation 08 Dec.	1990 Water Elevation 05 Feb.	Water Elevation 05 March	Water Elevation 20 April	Well Type
G114	1987	758.11	721.28	722.11	720.41	718.55	717.67	716.36	716.28	715.76	715.09	714.84	715.17	717.37	W
G115	1987	729.03	713.13	713.03	710.63	709.09	708.86	708.86	708.78	712.58	708.71	709.16	712.45	713.12	W
G116	1987	713.76	707.90	706.88	706.55	706.09	706.00	706.08	705.71	706.35	705.91	706.33	706.50	706.61	W
G116A	1987	714.06	707.88	706.93	706.63	706.17	706.04	706.12	706.24	706.38	705.95	706.35	706.52	706.66	B
G117	1987	723.25	708.41	707.86	707.29	706.82	706.59	705.45	706.33	706.59	706.10	706.45	706.71	706.97	W
G118A	1987	718.21	708.79	708.34	707.89	707.19	706.98	706.76	706.62	706.81	706.30	706.58	706.76	707.13	B
G118R	1988	717.61	NA	NA	707.80	707.17	706.90	706.76	706.63	706.86	NA	706.64	706.85	707.48	W
G119	1987	720.22	708.27	707.95	707.34	706.71	706.42	706.20	706.09	706.20	705.71	706.00	706.18	706.56	W
G119A	1987	720.04	708.01	707.82	707.22	706.52	706.26	705.98	705.85	705.84	705.38	705.61	705.78	706.16	B
P1	1984	727.69	708.03	707.16	706.81	706.47	706.34	706.35	706.27	706.64	706.18	706.56	706.74	706.91	B
P3R	1987	749.58	708.08	707.26	706.98	706.58	706.47	706.36	706.37	706.66	706.17	706.55	706.75	706.93	W
P4R	1987	749.80	708.14	707.39	707.13	706.73	706.62	706.51	706.48	706.81	706.32	706.70	706.90	707.07	B
P6	1984	739.71	715.32	714.42	713.71	712.78	712.41	712.07	711.99	711.98	711.21	711.56	711.85	712.58	B
P7	1984	NS													W
P8	1984	748.18	NA	NA	728.55	726.49	720.58	723.98	723.60	724.06	721.02	721.49	722.71	724.86	B
P9	1984	748.67	NA	NA	728.47	726.54	725.64	724.05	723.66	NA	721.08	721.56	722.72	724.90	B
MW-101	1984	NS													B
MW-102	1984	NS													B
MW-103	1984	751.17	NA	734.01	732.79	730.49	729.36	727.20	726.72	725.96	723.24	723.81	724.55	726.63	B
MW-104	1984	756.72	NA	NA	727.80	725.95	725.11	723.54	723.20	722.36	720.67	720.80	721.39	723.20	B
MW-105	1984	752.82	734.89	730.26	726.95	724.42	723.55	721.90	721.60	721.20	719.65	719.74	720.47	724.40	B
MW-106	1984	725.89	707.76	707.13	706.82	706.46	706.35	705.90	704.79	706.66	706.20	706.57	706.71	706.93	B
MW-107	1984	749.78	NA	NA	722.51	720.50	719.52	716.74	717.31	714.98	714.80	714.60	714.72	716.56	B
SG-1	1990	708.51	NI	NI	NI	NI	NI	NI	NI	NI	NI	706.25	705.86	705.86	--
SG-2	1990	708.50	NI	NI	NI	NI	NI	NI	NI	NI	NI	706.60	706.70	706.73	--
SG-3	1990	709.41	NI	NI	NI	NI	NI	NI	NI	NI	NI	707.66	707.83	707.80	--

PAGELH2O.wk1/MJH/DSP

Notes:
TOIC = The top of the inner well casing.
NA = No measurment was made at the well during that event.
B = Denotes a well screened below the surface of the water table (piezometer) or a well screened in clay soils.
W = Denotes a well screened at or near the surface of the water table.
NI = Staff Gage was not yet installed.
NS = The well has not been surveyed.

All elevations are expressed in feet above mean sea level (ft,MSL).

The TOIC elevations reported in this table suprecede those reported on the well construction diagrams contained in Appendix B.

The wells were resurveyed for elevation and location during August 1989.

F

APPENDIX F

PREVIOUS REPORTS

WARZYN

LOG OF TEST BORING

Project NRG

Location Winnebago County, Illinois

Boring No. SB-1
Surface Elevation 721.4
Job No. 60741
Sheet 1 of 1

2100 CORPORATE DRIVE ADDISON, IL 60101 TEL (312) 691-5000

SAMPLE No.	Type	Rec (in.)	Moist	N	Depth	VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES qu (qa) (tsf)	HNU	Explosive Gas	Field VOC Water	Nano-tox
						Gray Silty CLAY, Trace Fine to Coarse Sand					
1		18	M	14	5						
2		15	M	82	10	Brown Fine to Coarse SAND and GRAVEL, Trace Silt & Clay					
3		18	W	77	15	Brown Fine to Coarse SAND, Trace Fine Gravel, Trace Clay					
					20	BEDROCK					
						End Boring at 20'					
					25						
					30						
					35						
					40						

WATER LEVEL OBSERVATIONS

While Drilling ▽ _____ Upon Completion of Drilling _____
Time After Drilling _____ _____ _____ _____
Depth to Water _____ _____ _____ _____ ▼
Depth to Cave in _____

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

GENERAL NOTES

Start 10/4/89 End 10/4/89
Driller ETI Chief GS Rig CME 55
Logger SB Editor SB
Drill Method

WARZYN

LOG OF TEST BORING

Project NRG

Location Winnebago County, Illinois

Boring No. SB-2
Surface Elevation 721.4
Job No. 60741
Sheet 1 of 1

2100 CORPORATE DRIVE ADDISON, IL 60101 TEL (312) 691-5000

SAMPLE No.	Type	Rec (in.)	Moist	N	Depth	VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES qu (qa) (tsf)	NMu	Explosive Gas	Field VOC Water	Monotox
						Brown/Gray Silty CLAY, Trace Fine to Coarse Sand, Trace Gravel					
1	■	18	M	32	5						
2	■	16	M	21	10						
3	■	13	W	12	15	Brown Fine to Coarse SAND & GRAVEL, Trace Silt and Clay					
					20	BEDROCK					
						End Boring at 20'					
					25						
					30						
					35						
					40						

WATER LEVEL OBSERVATIONS

While Drilling ▽ _____ Upon Completion of Drilling _____
Time After Drilling _____ _____ _____ _____
Depth to Water _____ _____ _____ _____ ▼
Depth to Cave in _____ _____ _____ _____

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

GENERAL NOTES

Start 10/3/89 End 10/3/89
Driller ETI Chief GS Rig CME 55
Logger SB Editor SB
Drill Method

WARZYN

LOG OF TEST BORING

Project NRG

Location Winnebago County, Illinois

Boring No. SB-3
Surface Elevation 736.0
Job No. 60741
Sheet 1 of 1

2100 CORPORATE DRIVE ADDISON, IL 60101 TEL (312) 691-5000

SAMPLE

No.	Type	Rec (in.)	Moist	N	Depth
1		18	D	22	5
2		16	M	153	10
3		13	W	97	15
4		18	W	59	20
5		17	W	63	25
6		10	W	102	30
7		2	W	50	35

VISUAL CLASSIFICATION and Remarks

Clayey TOPSOIL

Brown Silty SAND

Brown SAND & GRAVEL, Fine to Coarse Gravel, Trace Silt

Brown Fine SAND

Brown SAND & GRAVEL

BEDROCK

End Boring at 40'

SOIL PROPERTIES

qu (qa) (tsf)	HNu	Explosive Gas	Field VOC Water	Monotox

WATER LEVEL OBSERVATIONS

While Drilling ▽ Upon Completion of Drilling

Time After Drilling

Depth to Water ▼

Depth to Cave in

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

GENERAL NOTES

Start 10/4/89 End 10/4/89

Driller ETI Chief GS Rig CME 55

Logger SB Editor SB

Drill Method

WARZYN

LOG OF TEST BORING

Project NRG

Location Winnebago County, Illinois

Boring No. SB-4
Surface Elevation 738.2
Job No. 60741
Sheet 1 of 1

2100 CORPORATE DRIVE ADDISON, IL 60101 TEL (312) 691-5000

SAMPLE No.	Type	Rec (in.)	Moist	N	Depth	VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES qu (qa) (tsf)	HNu	Explosive Gas	Field VOC Water	Nono-tox
						Black TOPSOIL					
						Brown Silty CLAY, Trace Fine to Coarse Sand					
1		18	D	17	5						
2		18	D	27	10						
3		18	D	20	15	Grades to Gray					
4		18	D	20	20						
5		18	D	25	25						
6		18	M	39	30	Gray Clayey SILT, Trace Fine Sand					
						Boulders, Cobbles					
					35						
						End Boring at 37'					
					40						

WATER LEVEL OBSERVATIONS

While Drilling ▽ _____ Upon Completion of Drilling _____
Time After Drilling _____ _____ _____ _____
Depth to Water _____ _____ _____ _____ ▼
Depth to Cave in _____ _____ _____ _____

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

GENERAL NOTES

Start 10/4/89 End 10/4/89
Driller ETI Chief GS Rig CME 55
Logger SB Editor SB
Drill Method

WARZYN

LOG OF TEST BORING

Project NRG

Location Winnebago County, Illinois

Boring No. SB-5
Surface Elevation 722.4
Job No. 60741
Sheet 1 of 1

2100 CORPORATE DRIVE ADDISON, IL 60101 TEL (312) 691-5000

SAMPLE No.	Type	Rec (in.)	Moist	N	Depth	VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES qu (qa) (tsf)	HNu	Explosive Gas	Field VOC Water	Monotox
						Brown Fine to Coarse SAND, Trace Fine to Coarse Gravel, Trace Silt and Clay					
1		16	D	38	5						
2		18	M	65	10	Brown Fine to Coarse SAND & GRAVEL					
3		15	W	18	15						
4		16	W	41	20						
5		18	W	79	25						
6		18	W	58	30						
7		18	W	98	35						
8		6	W	114	40						
						End Boring at 40'					

WATER LEVEL OBSERVATIONS

While Drilling ▽ _____ Upon Completion of Drilling _____
Time After Drilling _____ _____ _____ _____
Depth to Water _____ _____ _____ _____ ▼
Depth to Cave in _____

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

GENERAL NOTES

Start 10/4/89 End 10/4/89
Driller ETI Chief GS Rig CME
Logger SB Editor SB 55
Drill Method

WARZYN
ENGINEERING INC

Engineers & Scientists · Environmental · Geological · Civil · Structural · Geotechnical · Chemical/Materials Testing · Soil Borings · Surveying

1409 EMIL STREET, P.O. BOX 9538, MADISON, WIS. 53715 · TEL. (608) 257-4848

July 12, 1985
~~C 11684~~ 13160

Mr. Chuck Howard
Winnebago Reclamation Services, Inc.
4920 Forest Hills Road
Loves Park, IL 61105

Re: Groundwater Level Monitoring
Winnebago Reclamation Service Inc. Landfill

Dear Mr. Howard:

Please find enclosed recent water-level data collected from groundwater monitoring wells on and around the Winnebago Reclamation Service Inc. Landfill. The data has been used to develop water table maps to illustrate changes in flow configuration. Also enclosed are vertical gradients calculated from the water-level observations. This data is presented in the same format as the groundwater level measurements and vertical gradient calculations in Appendix E of our recent report "Supplemental Investigation - Winnebago Reclamation Landfill, Rockford, Illinois", dated March 5, 1985. The data can be considered a supplement to the information contained in that report.

Groundwater level measurements were collected on March 4, April 4, May 2, and May 30, 1985. In the course of collecting the groundwater level measurements, significant observations were noted by our field technicians. They are as follows below:

- March 4, 1985

  Heavy precipitation and runoff were noted during the collection of levels. The intermittent tributary to Killbuck Creek which runs across the ACME Solvents site was noted to be overflowing the banks with Monitoring Wells G-101, MW-103, P-8 and P-9 being inundated with water backed up from the creek. At a 52-inch diameter culvert upstream from Monitoring Wells B-16 and B-16A, an estimated flow of 133 cubic feet per second was noted. A marked drop off in the flow was noted downstream from Monitoring Wells B-16 and B-16A. Portions of the road across the ACME Solvent's property were noted to have been washed away. Several empty 55-gallon drums were observed in the Creek bed.

- April 4, 1985

  Some rain occurred during the collection of the water levels. Run-off was observed to be minimal. The intermittent tributary to Killbuck Creek at ACME Solvents was observed to be dry in the upper reaches (east of MW-103). Just downstream of MW-103, two underdrains were observed discharging into the creek. Flow was noted in the creek from that location to near the culvert at B-7. Downstream from B-7 no flow was observed and the stream bed was noted to have been highly scoured with bedrock being exposed. Apparently during times of high-stream flow, the stream flows directly on the bedrock surface.

- May 2, 1985

  The intermittent tributary to Killbuck Creek had little flow from where it merged with the underdrains near MW-103 to the bridge (culvert) near B-7. No flow was observed downstream of B-7. Monitoring Well B-15R has apparently been hit by equipment and was tilted at a 45-degree angle. A water level was obtained from B-15R, but it will be impossible to obtain a sample from this well in the future if it is not repaired.

- May 30, 1985

  Flow conditions in the intermittent tributary were similar to those noted on May 2, 1985.

The collection of groundwater levels on March 4, 1985 coincides with a major recharge event. The water-level data from March 4, 1985 had 20 of the monitoring wells with the highest groundwater levels noted to date by Warzyn personnel. Preparation of a water table map from levels collected on March 4, 1985 indicate a large groundwater mound in a triangular area roughly defined by Monitoring Wells B-7, B-9 and P-8. The mounding associated with the apparent rapid recharge of the aquifer by the tributary to Killbuck Creek increased the horizontal gradients between Monitoring Wells B-9 (at edge of ACME Solvents) and B12 (at the edge of Winnebago Reclamation Landfill) from approximately 0.0017 foot per foot on January 15, 1985 to 0.0143 foot per foot on March 4, 1985. The noted increase in the horizontal gradients immediately upgradient of the Winnebago Reclamation Services Inc. Landfill should act to significantly decrease transport time of any contaminants emanating from ACME Solvents and migrating toward Winnebago Landfill. In addition, the large amount of relatively clean recharge water from the tributary may act to break up the contaminant plume.

The difference in March 4 water table elevations between Monitoring Well G-109, which is located immediately adjacent to the edge of refuse at the Winnebago Reclamation facility, and Monitoring Well B-12, located approximately 100 feet (south) from the facility, was significant. The water table at Monitoring Well G-109 was 0.88 feet higher than the water level at nearby Monitoring Well B-12. This compares to a difference in levels of 0.26 feet on January 15, 1985. After periods of recharge, groundwater mounding beneath a landfill

tends to increase in magnitude. The observations of March 4, 1985 could be construed to represent mounding of groundwater due to leakage through the landfill liner. However, there is typically a lag period between recharge events and increased mounding beneath a landfill. The increased gradient from G-109 to B-12 could be attributable to previous recharge events. Alternatively, the relatively higher water level at G-109 may be attributed to an increase of recharge at the edge of the site from runoff channelled off of the site. It is possible that both are contributing to mounding. An absolute determination of why gradients increased at the edge of site cannot be made with available data. No other anomalies in groundwater flow were noted that would confirm mounding associated with the landfill.

Vertical gradients on March 4 at the nested monitoring wells, except at nests B-11/B-11A, P-3/P-5 and P-4/P-5, were of similar direction and magnitude, compared to previous observations. At nests P-3/P-5 and P4/P-5, the vertical gradients reversed themselves and were downward. This is probably due to the recharge conditions associated with the heavy precipitation events during and previous to these water level measurements. The switch in vertical gradients from generally downward to upward at Piezometer Nest B11/B-11A may indicate the severity of the mounding associated with intermittent creek is somehow acting to induce upward flow at a distance away from the mound. Switching of vertical gradients coupled with intense recharge events may account for the spotty nature of contaminants in the shallow groundwater (e.g., contaminants at ACME Solvent are recharged, and then flow upward at a distance away from the groundwater recharge mound).

The April 4, 1985 data was also collected during a period of apparent groundwater recharge. On April 4, 1985, an additional 20 of the monitoring wells had the highest groundwater levels recorded by Warzyn personnel. There is no similarity in the wells which recorded groundwater highs on March 4 compared to April 4. However, wells which were at highs on March 4 generally only showed slight decreases on April 4, 1985. Levels in most wells are significantly higher than the observations included in our March 5 report.

The April 4, 1985 levels show a significantly different groundwater recharge pattern than noted on March 4, 1985. The April levels delineate a groundwater mound which is linear and is defined by Monitoring Wells B-7, B-4 and MW-103. The watertable drops off rapidly to the southwest, with lesser horizontal gradients to the north and northwest. The relatively high horizontal gradients noted immediately upgradient of Winnebago Reclamation Services Inc. Landfill decreased by April 4, 1985 to the point where they were similar to observations noted in our report. The difference in water table elevations between Monitoring Well G-109 and B-12 was only 0.02 feet.

On April 4, 1985, deviations from previous observations of vertical gradients were noted at Piezometer Nests B-6S/MW-105 and at B-11/B-11A. The vertical gradients at Nest B-11/B-11A switched from upward back to downward between March and April, with the downward gradients being much greater than previously value observed. Vertical gradients at B-6S/MW-105 switched from upward to downward, indicating recharge conditions can change vertical gradients at the ACME Solvents site and enhance downward migration of contaminants.

The groundwater levels collected in May, 1985 were generally lower than those collected in March and April, and probably represent a transition period from recharge back to the normal groundwater flow conditions. The May 30, 1985 levels are generally lower than the levels of May 2, 1985, but are higher than the January 15, 1985 levels. Due to the similarity in flow patterns between the May 2 and May 30 levels, a water table map was only prepared for the May 2, 1985 data. The water table configuration noted on May 2, 1985 is similar to that noted in April, with a groundwater mound being generally linear between Monitoring Wells B-7, B-4 and MW-103. On May 2, the horizontal gradient between Wells G-109 and B-12 was observed to be reversed, with Monitoring Well B-12 having a water table elevation approximately 0.11 feet higher than G-109.

Overall, the groundwater flow pattern downgradient of the landfill was not significantly different than any of the previous observations. In May, 1985, groundwater recharge events apparently have a much greater influence on groundwater flow configuration on the ACME Solvent property than on areas downgradient of Winnebago Reclamation Services, Inc. Landfill. This may be attributable to the shallow depth to bedrock and the immediate recharge of the aquifer due to flow through fractures and/or voids.

Vertical groundwater flow direction noted at nested wells on May 2, 1985, was generally consistent with observations from our March 5, 1985 report, However, the gradients values were significantly higher than observations noted in our report, at Piezometer Nest B-6S/MW-105, B-10/B-10A and B-11/B11A.

Vertical gradients on May 30, 1985 were generally similar to those noted May 2. Downward gradients were again noted at Nest B-6S/MW105. Of more significance is the detection of upward vertical gradients at Nest G109/G109A. The detection of upward gradients at the immediate edge of the landfill lends credence to the hypothesis that contaminants from ACME may be flowing upward beneath the landfill site.

Below is a summary of the apparently significant aspects of the groundwater-flow system noted in the vicinity of Winnebago Reclamation Services Inc. Landfill:

- Large amounts of recharge into the groundwater system apparently are attributable to the intermittent creek flowing across the ACME Solvent site. This recharge may tend to break up the contaminant plume and move contaminants already in the aquifer west of ACME Solvent at an accelerated rate.

- Significant downward vertical gradients were noted on the ACME Solvent site. Upward vertical gradients at locations west of the facility were also noted, which normally have downward vertical gradients. The combination of strong downward gradients at the ACME site and temporary upward gradients at a distance from the site could provide the mechanism for transport of the contaminants at depth away from ACME Solvents, with the reemergence of the the contaminants at a higher point in the aquifer closer to Winnebago Reclamation Services Inc. Landfill.

- Runoff from the ACME Solvents site was observed to be in direct contact with bedrock in the creek bed north of the site.

The observations and data collected indicate the groundwater flow system upgradient of Winnebago Reclamation Services, Inc. is highly variable. The variablility in the flow supports Winnebago Reclamation Services, Inc. contention that ACME Solvents is the primary source of organic contamination beneath the landfill.

The collection of additional groundwater elevation data is worthwhile. We have already obtained significant insights into the groundwater flow system. We will continue groundwater level monitoring on a monthly basis, per our recent discussion.

We also suggest that Monitoring Well B-15R be repaired. Our technicians will repair this monitoring well concurrent with the collection of the next set of groundwater levels, if possible, with your authorization.

If you have any questions or comments about the data contained in this letter, please feel free to contact us.

Sincerely,

WARZYN ENGINEERING INC.

James A. Hill
Hydrogeologist

Daniel W. Hall

Daniel W. Hall, CPGS
Project Manager

JAH/DWH/nac/DRV
[nac-3-34]

Encls: Groundwater Level Observations
Groundwater Flow Maps 03/14/85, 04/04/85 and 05/02/85
(Drawing C 11684-B5 through -B7)

cc (w/encls.): Mr. Ridgeway M. Hall, Jr. - Crowell & Moring
Mr. John Holstrom

WARZYN
ENGINEERING INC

APPENDIX E SUPPLEMENT
RESULTS OF GROUNDWATER LEVEL MEASUREMENTS
WINNEBAGO RECLAMATION SERVICE LANDFILL

WELL	TOP OF CASING ELEVATION	GROUND ELEVATION	MARCH 4,1985 DEPTH	MARCH 4,1985 GW ELEV	APRIL 4,1985 DEPTH	APRIL 4,1985 GW ELEV	May 2,1985 DEPTH	May 2,1985 GW ELEV	May 30,1985 DEPTH	May 30,1985 GW ELEV
B1	772.96	770.55	43.15	729.81	40.90	732.06	41.04	731.92	41.47	731.49
B2	792.34	790.14	63.15	729.19	59.91	732.43	60.24	732.10	60.56	731.78
B3	744.79	742.14	4.45	740.33	4.99	739.79	6.38	738.40	6.39	738.39
B4	757.58	755.06	24.95	732.63	21.66	735.92	23.57	734.01	24.59	732.99
B5	749.50	747.05	24.38	725.12	23.46	726.04	25.08	724.42	25.87	723.63
B6S	754.00	751.55	21.39	732.61	21.02	732.98	28.93	725.07	24.60	729.40
B6D	754.14	751.55	27.96	726.18	26.98	727.16	24.58	729.56	28.63	725.51
B7	751.75	749.84	16.95	734.80	17.23	734.52	19.97	731.78	18.29	733.46
B8	749.97	747.15	28.06	721.91	27.00	722.97	27.94	722.03	28.53	721.44
B9	758.33	755.11	25.12	733.21	34.09	724.24	35.35	722.98	36.10	722.23
B10	744.17	741.77	29.92	714.25	30.31	713.86	30.99	713.18	31.34	712.83
B10A	743.78	742.10	27.78	716.00	28.34	715.44	29.41	714.37	30.01	713.77
B11	760.57	757.58	40.74	719.83	37.62	722.95	39.07	721.50	39.95	720.62
B11A	758.92	757.10	38.65	720.27	36.93	721.99	38.40	720.52	39.21	719.71
B12	760.35	758.22	38.61	721.74	36.74	723.61	38.19	722.16	39.32	721.03
B13	739.28	736.43	24.07	715.21	24.56	714.72	25.39	713.89	25.78	713.50
B14	716.87	713.93	2.69	714.18	4.36	712.51	5.19	711.68	5.47	711.40
B15	744.47	741.80	34.96	709.51	35.75	708.72	36.41	708.06	36.69	707.78
B15R	743.70	742.00	34.06	709.64	34.86	708.84	35.45	708.25	35.76	707.94
B16	762.31	760.54	34.99	727.92	33.31	729.50	36.47	726.34	36.58	726.23
B16A	762.58	760.60	34.84	727.74	33.26	729.32	36.24	726.34	36.47	726.11
G101			8.88		11.81		16.60		18.26	
G102			19.80		21.98		23.49		24.32	
G107	739.45	737.60	28.43	711.02	29.52	709.93	30.31	709.14	30.69	708.76
G108	751.13	749.20	33.51	717.62	33.45	717.68	34.84	716.29	35.53	715.60
G109	760.60	758.90	37.98	722.62	36.97	723.63	38.55	722.05	40.31	720.29
G109A	760.90	758.90	38.99	721.91	37.82	723.08	39.25	721.65	39.73	721.17
G110	747.90	745.20	31.50	716.40	31.39	716.51	32.19	715.71	32.53	715.37
G111	740.59	738.80	22.16	718.43	22.08	718.51	22.08	718.51	23.41	717.18
MW101	799.20	796.92	70.25	728.95	67.34	731.86	67.28	731.92		
MW102	760.64	759.24	25.17	735.47	27.07	733.57	27.81	732.83	28.37	732.27
MW103	751.10	748.36	20.44	730.66	19.18	731.92	19.75	731.35	20.33	730.77
MW104	756.58	754.28	29.55	727.03	28.62	727.96	29.53	727.05	30.11	726.47
MW105	752.89	750.65	20.13	732.76	19.98	732.91	23.40	729.49	23.55	729.34
MW106	725.85	724.65	16.52	709.33	18.47	707.38	18.94	706.91	18.11	707.74
MW107	749.92	747.90	27.83	722.09	27.08	722.84	28.17	721.75	28.71	721.21
P1	727.65	725.30	18.03	709.62	20.29	707.36	20.76	706.89	20.87	706.78
P3	725.59	723.32	15.80	709.79	17.97	707.62	18.49	707.10	18.62	706.97
P4	724.67	721.89	14.88	709.79	17.12	707.55	17.56	707.11	17.70	706.97
P5	722.85	721.13	13.10	709.75	15.21	707.64	15.73	707.12	15.83	707.02
P6	739.53	738.96	24.66	714.87	25.33	714.20	26.08	713.45	26.41	713.12
P7	728.75	727.13	19.34	709.41	20.58	708.17	21.10	707.65	21.32	707.43
P8	748.12	745.72	18.00	730.12	17.43	730.69	19.53	728.59	20.53	727.59
P9	748.60	745.80	18.50	730.10	18.06	730.54	20.01	728.59	21.01	727.59

WELL NEST	SEAL	SCREEN MTW				
B6S-MW105	716.00	686.90	0.0052	-0.0024	0.1519	-0.0021
B10-B10A	689.20	725.00	0.0699	0.0641	0.0496	0.0398
B11-B11A	691.10	728.58	0.0153	-0.0301	-0.0322	-0.0308
B13-P6	693.50	716.43	-0.0157	-0.0245	-0.0216	-0.0190
B16-B16A	699.60	737.54	-0.0028	-0.0060	.0000	-0.0045
G109-G109A	688.90	722.90	-0.0211	-0.0158	-0.0121	0.0280
MW106-P1	677.65	698.30	0.0141	-0.0010	-0.0010	-0.0466
P3-P4	688.40	709.80	.0000	-0.0037	0.0005	.0000
P3-P5	667.60	709.80	-0.0009	0.0005	0.0005	0.0013
P4-P5	667.60	688.40	-0.0019	0.0043	0.0005	0.0024
P8-P9	700.80	715.72	-0.0013	-0.0101	0.0000	0.0000

ALL DEPTH MEASURMENTS FROM TOP OF THE INNER WELL CASING

WARZYN

Engineers & Scientists
Environmental Services
Waste Management
Water Resources
Site Development
Special Structures
Geotechnical Analysis

July 18, 1986
C ~~11684~~ 13160

Mr. Charles Howard
Winnebago Reclamation Services, Inc.
4920 Forest Hills Road
Loves Park, IL 61105

Re: Groundwater Level Monitoring
Pagel's Pit Landfill

Dear Mr. Howard:

With Remedial Investigation activities soon to start at Pagel's Pit Landfill (Winnebago Reclamation Services, Inc.), a summary of groundwater level monitoring results to date has been prepared. Groundwater level monitoring was initiated in December, 1984 and continued until May, 1986 on a monthly basis. Attached is a summary of all calculated groundwater elevations and vertical groundwater gradients. The groundwater monitoring data from December 1984 and January 1985 were discussed in our report entitled "Supplemental Investigation Winnebago Reclamation Landfill, Rockford, Illinois" (March 5, 1985). Groundwater monitoring results from March, April and May of 1985 are discussed in a letter dated July 12, 1985. This letter provides an evaluation of groundwater flow monitoring between July 2, 1985 and May 7, 1986 and is intended to supplement previous assessments. Monthly groundwater level monitoring will resume with initiation of the Remedial Investigation activities.

Groundwater generally flows east to west in the vicinity of the landfill. The flow direction places Acme Solvents upgradient of the landfill. Flow direction within the general east to west flow regime varies considerably. The flow configurations relate to the occurrence (or lack) of recharge to the shallow bedrock aquifer by the intermittent waterway which crosses the Acme Solvents facility. The following is a brief description of conditions observed in the creek during measurements and interpreted groundwater flow patterns:

- July 2, 1985 - The waterway across the Acme Solvents facility was observed to have very low flow. A non-recharge groundwater flow configuration was interpreted.

- July 30, 1985 - No flow was observed in the waterway across the Acme Solvents facility. A non-recharge groundwater flow configuration was interpreted.

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- September 6, 1985 - Very low flow was observed in the intermittent waterway across the Acme Solvents facility. A non-recharge groundwater flow configuration was interpreted.

- October 1, 1985 - No on flow in the creek was observed. A non-recharge groundwater flow configuration was interpreted. Drawing C 11684-B6 is a water table map based on the October 1, 1985 data.

- November 6, 1985 - Heavy flow was observed in the intermittent waterway on the Acme solvents site. The groundwater flow configuration is that of a recharge pattern with a groundwater mound adjacent to the creek (defined by wells B-4, B-7 and Nest B-6S/B-6D/ MW105), and increased horizontal gradients west of the creek. The flow pattern was similar to recharge conditions in Spring 1985, as documented in our July 12, 1985 letter.

- December 5, 1985 - Extremely heavy flow was noted in the intermittent waterway which crosses the Acme Solvents site. The groundwater flow configuration is indicative of recharge conditions. A groundwater mound centered around monitoring wells B-4, B-7 and Nest B-6S/ B-6B/ MW-105 was interpreted. Drawing C 11684-B7 illustrates groundwater flow for December 5, 1985.

- January 9, 1986 - The intermittent waterway was observed to be approximately 90% covered with ice and snow. One to two feet of snow was observed on the ground. The groundwater flow configuration was typical of non-recharge flow conditions.

- February 7, 1986 - Some flow was observed in the intermittent waterway crossing the Acme Solvents site. Snow was on the ground. Groundwater flow configuration was such that no groundwater mounds were associated with the intermittent waterway.

- March 3, 1986 - Low flow was observed in the intermittent waterway crossing the Acme Solvents site. The groundwater flow configuration was typical of non-recharge flow conditions.

- April 4, 1986 - Some flow was observed in the intermittent waterway. A slight mound was interpreted in the vicinity of Monitoring Well B-4, with increased horizontal gradients noted between Monitoring Wells B-7 and B-16. The groundwater flow conditions are probably a transition from a recharge event between the March 3 and April 4, 1986 readings. Recharge could have been induced by heavy rainfall or snowmelt. Drawing C 11684-B8 presents the groundwater flow configuration on April 4, 1986.

- May 7, 1986 - No flow was observed in the intermittent waterway. A slight groundwater mound was noted between Monitoring Wells B-4 and B-7. Horizontal gradients west of the mound were steeper than normally observed. The increased horizontal gradients could be residual effects from recharge by the intermittent waterway.

Groundwater levels in the immediate vicinity of the landfill and Acme Solvent sites apparently respond substantially to recharge of the aquifer by the intermittent waterway which flows across the Acme facility. Recharge to the groundwater is a normal seasonal condition which usually occurs in fall and spring, when precipitation or snowmelt contributes to groundwater and raises water table.

The highest water levels noted during monitoring were found on December 5, 1985 at all wells, except MW-101 and MW-103, which had their highest observed levels on January 9, 1986. In contrast, the lowest observed levels were noted on October 1, 1985 at most monitoring wells. The October 1, levels are generally lower because it follows a period when infiltration is comparatively low and water usage by plants and evaporation is high. As a result, low flow or no flow was observed in the waterway between the two sites. Those wells with lower levels than on October 1, 1985 were Wells B-3 (July 30, 1985), G-110 (September 6, 1985), and MW-107 (December 27, 1984).

Attached are plots of groundwater levels over time (hydrographs) for wells B-4, B-6S, B-9, B-10A B-15, MW-102, MW-105, G-107, G-109 and G-109A. Wells B-4, B-6S and MW-105, located immediately adjacent to the intermittent waterway in the area, typically show groundwater mounding when recharge events occur. These wells indicate water level fluctuations up to about 12.5 feet. The water level changes follow the pattern of recharge events in the spring and winter, with decreasing levels in late winter and summer months. Well MW-102, the furthest upgradient monitoring point adjacent to the intermittent waterway, shows similar but lesser fluctuations (approximately 9.5 feet).

Wells G-109 and G-109A, a piezometer nest located immediately adjacent to the southeast corner of the landfill, is upgradient of the landfill and downgradient of Acme Solvents site. The well hydrographs exhibit fluctuations similar to those at wells adjacent to the intermittent waterway. The differences between high and low levels are approximately 9-1/2 feet.

Monitoring Wells G-107 and B-15, screened in the sand and gravel soils on the north side of the landfill, show smaller water level fluctuations. However, the level changes appear to be correlated to the recharge conditions caused by the intermittent waterway on the Acme site. Well B-15 had water level fluctuations of approximately 3-1/2 feet, while Well G-107 had fluctuations of approximately 4-1/2 feet.

Changes in the well hydrographs indicate recharge by the intermittent creek crossing the Acme solvents facility influences the groundwater flow configuration. The well hydrographs also indicate that recharge events have the greatest influence on water levels in wells immediately adjacent to the waterway. Other wells located further away or upgradient from the creek showing familiar, but lesser fluctuations, are influenced by areal recharge (through soils by precipitation). Steeper hydraulic gradients west of the waterway are likely influenced by surface water recharge, as well as areal recharge, during times of heavy precipitation and/or snowmelt.

The summary of groundwater levels also contains calculated vertical gradients at nested monitoring wells. The following observations on vertical gradients were noted:

- MW-105/B-6S/B-6D - Upward gradients were observed except for November 6, 1985 and April 4, 1986. Major recharge events were noted on those dates. With the proximity of the wells to the intermittent waterway, recharge by the waterway appears to reverse the vertical gradients on occasion.

- Nests B-10/B-10A and G-109/G-109A - Nests with both wells installed in bedrock were observed to have consistently upward gradients.

- B-11/B-11A - Was observed to have consistently downward gradients. Both wells in the nest are installed in the bedrock aquifer.

- Nest B-13/P-6 - Was observed to have downward horizontal gradients except on July 30, 1985, when a slight upward gradient was noted.

- Nest P-1/MW-106 - Installed adjacent to Killbuck Creek and shows alternating upward and downward gradients. The magnitude of calculated gradients vary slightly at this nest. The gradient reversals may indicate that Killbuck Creek switches from being a groundwater discharge point during low creek flow to a recharge source during high flow.

The vertical gradients calculated from the period of July 2, 1985 through May 7, 1986, indicate that very slight upward gradients are generally present in the bedrock aquifer. Downward gradients in the bedrock are associated with recharge events at the intermittent waterway which crosses the Acme Solvents site.

The location of the waterway between the two sites and its relation to recharge of the aquifer, in this unique setting, will be a significant factor in the interpretation of water quality/water level data gathered during the Remedial Investigation. It is important to note that field observations indicate that portions of the waterway between the two facilities lie directly on bedrock. As a result, surface water flows directly over bedrock allowing for rapid recharge of the bedrock aquifer. Because creek flow is likely to have fairly good water quality, it may have impacts on contamination plume characteristics during recharge events. For instance, as previously hypothesized by Warzyn, the creek recharge may dilute and break up the contaminant plume eminating from the Acme Solvent site. Further, contaminants may move deeper in the aquifer, due to the downward vertical gradients during recharge. The hypothesis was partially supported by interpretation of the water quality data presented in the Supplemental Groundwater Investigation. The hypothesis is further supported by the analysis of this subsequently collected groundwater level data.

In summary, the groundwater flow conditions at and adjacent to Pagel's Pit Landfill indicate a bi-annual recharge event; in the spring and late fall of each year. The recharge events substantially increase water levels

adjacent to the intermittent waterway which crosses Acme Solvents, and steepen the water table to the west (downgradient). The recharge also changes vertical flow from generally upward to downward, in direct response to recharge.

The groundwater recharge may move contaminants downward in the aquifer. The recharge of groundwater with relatively clean surface water may dilute and/or breakup any contaminant plume associated with releases from the Acme Solvents facility.

We suggest this data be submitted to the U.S. EPA and/or incorporated into the Remedial Investigation. The monthly collection of the water level measurements has provided data which strengthens our understanding of the relationship between the intermittent waterway and groundwater flow patterns in the area.

Sincerely,

WARZYN ENGINEERING INC.

James A. Hill
Project Hydrogeologist

Daniel W. Hall

Daniel W. Hall, CPGS
Project Manager

JAH/adf/DWH/DRV
[adf-35-37]

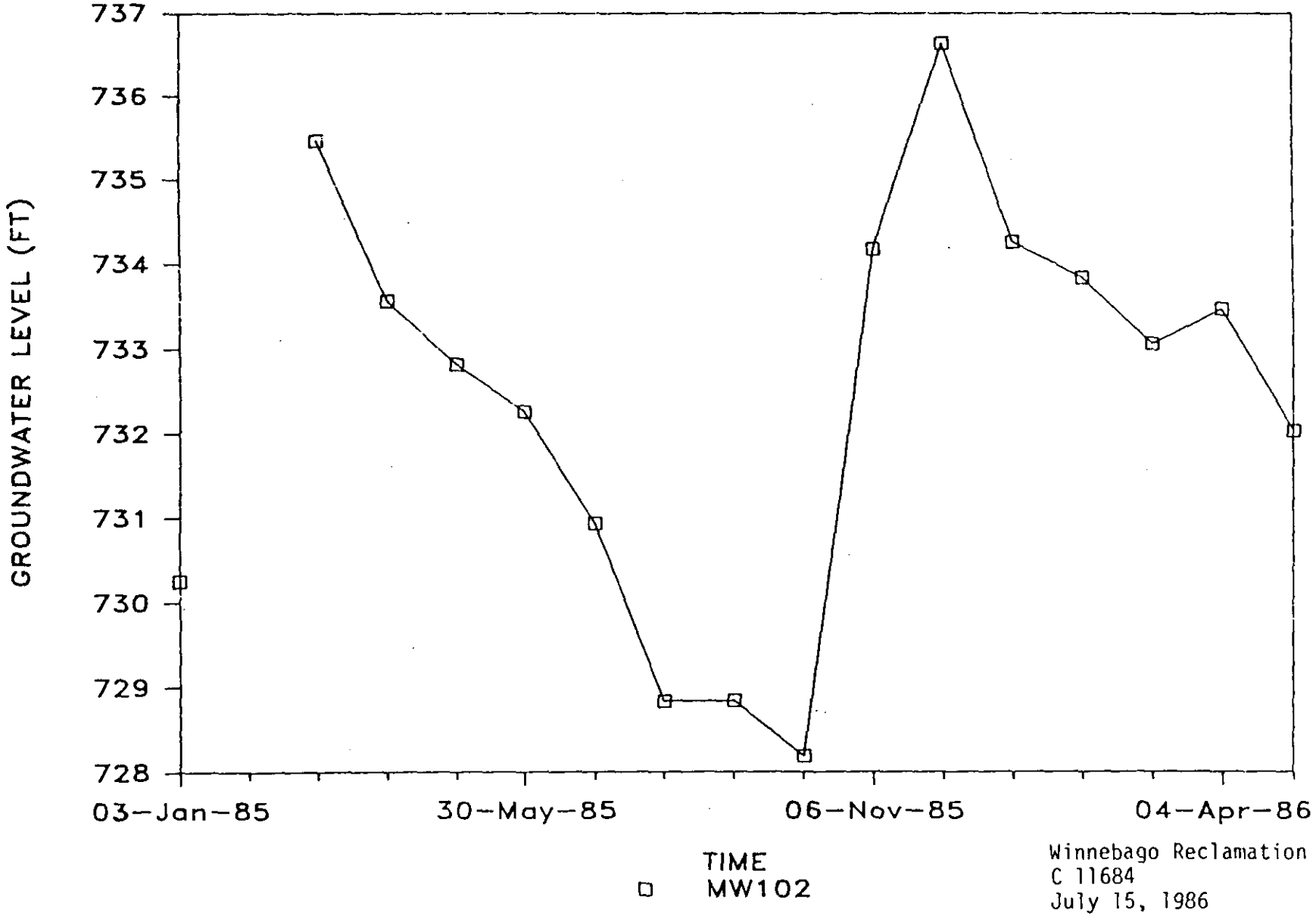
Enclosures: Drawings C 11684-B-6 through B-8
Hydrographs
Groundwater Levels and Vertical Gradient Observations

cc: Mr. Ridgway Hall - Crowell and Moring, Washington, D.C.
Mr. John Holmstrom - Holmstrom & Green
Mr. Gary Marzorati - Winnebago Reclamation Services, Inc.

WARZYN

GROUNDWATER ELEVATIONS

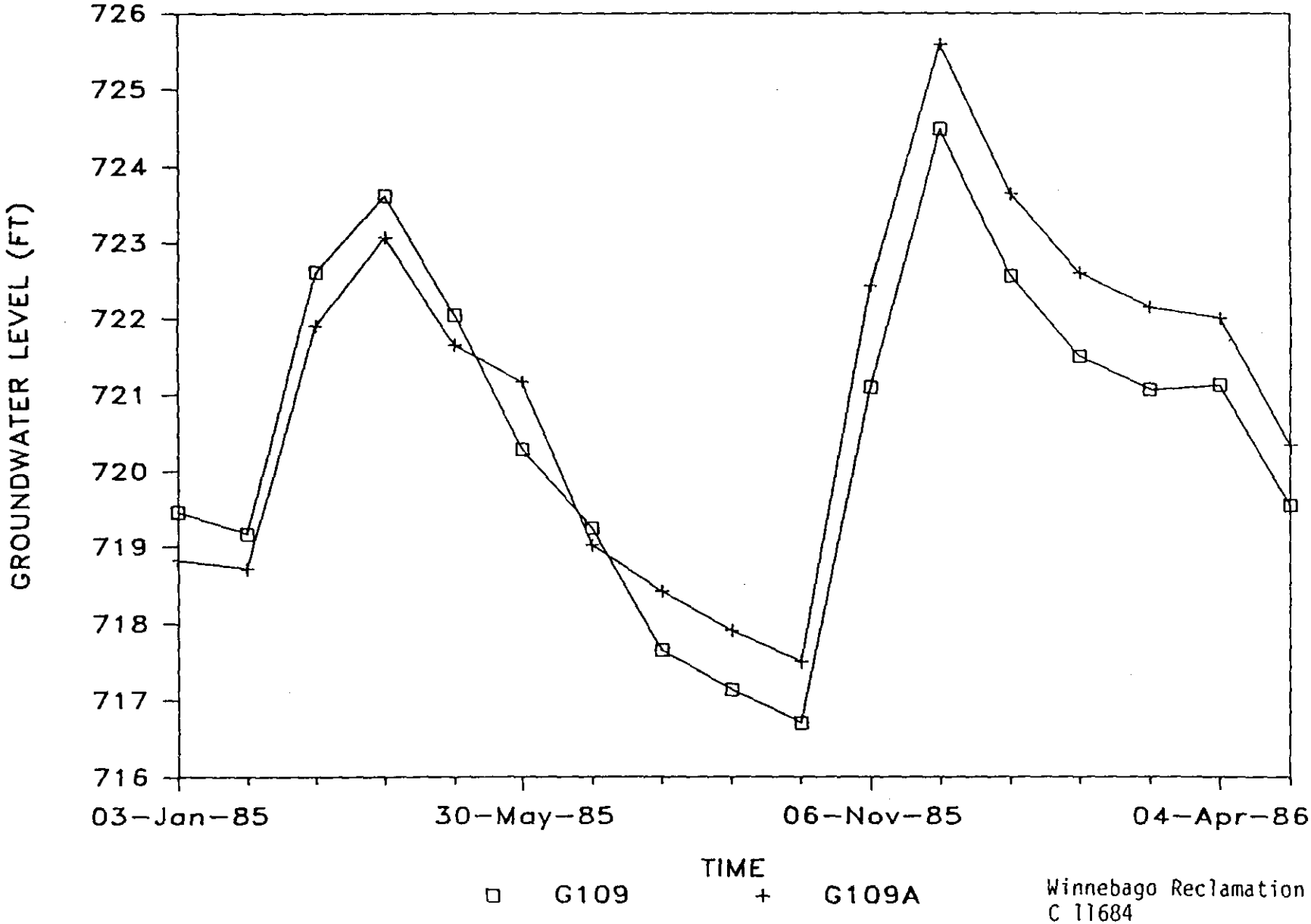
MONITORING WELL MW102



Winnebago Reclamation Services
C 11684
July 15, 1986

GROUNDWATER ELEVATIONS

MONITORING WELLS G109 and G109A



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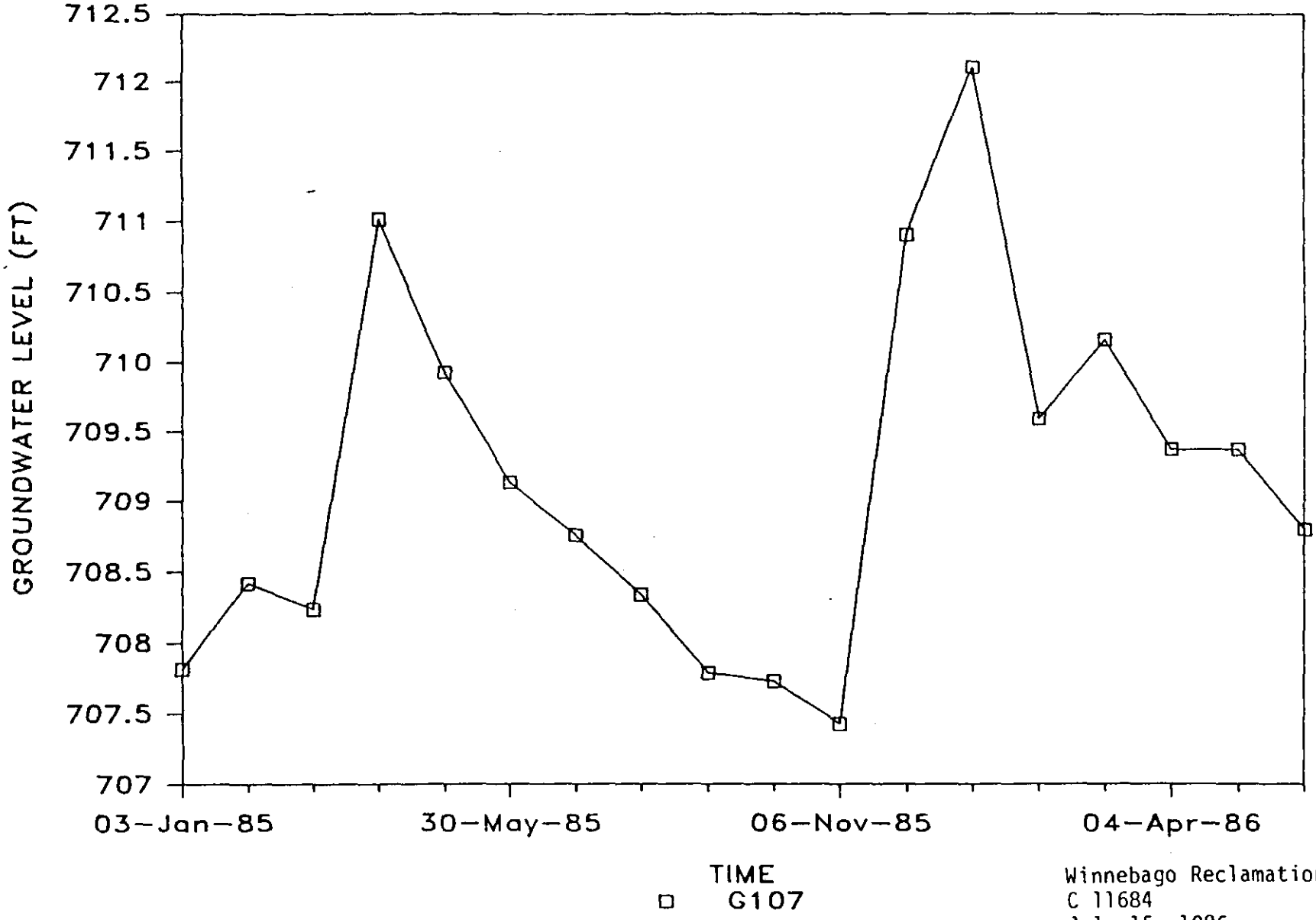
GROUNDWATER ELEVATIONS

MONITORING WELL G107



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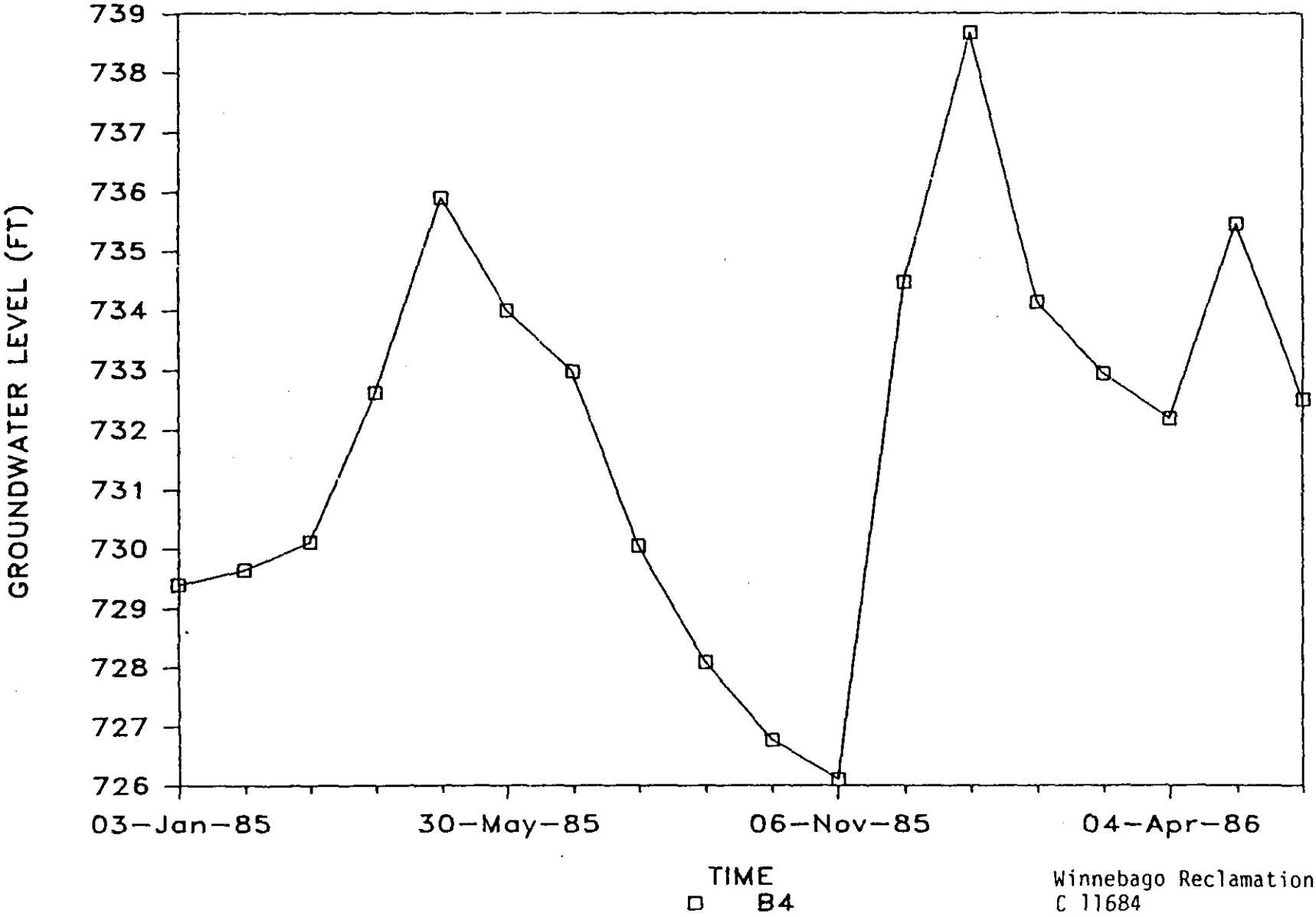
July 15, 1986

GROUNDWATER ELEVATIONS

MONITORING WELL B4



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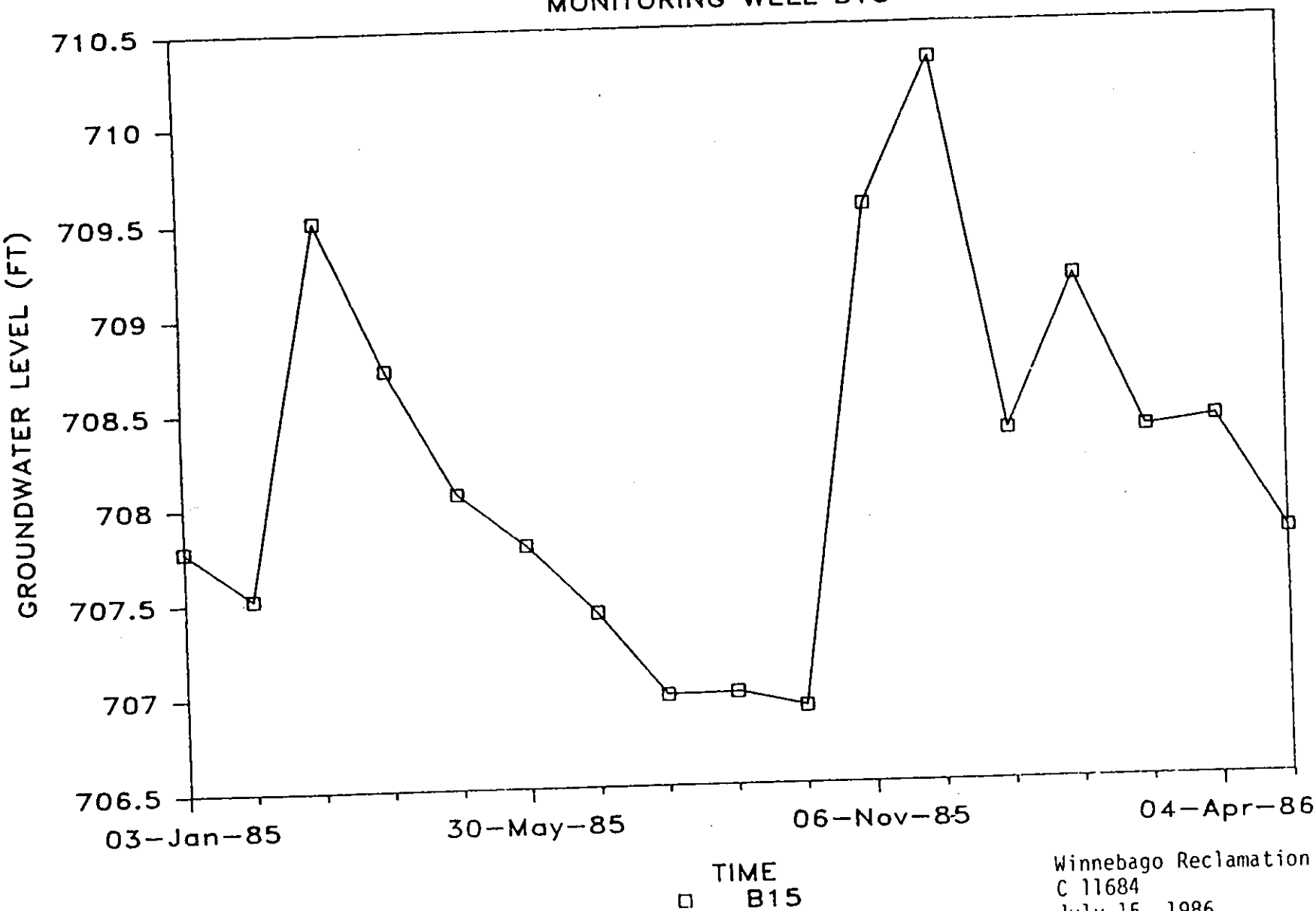
GROUNDWATER ELEVATIONS

MONITORING WELL B15



Winnebago Reclamation Services
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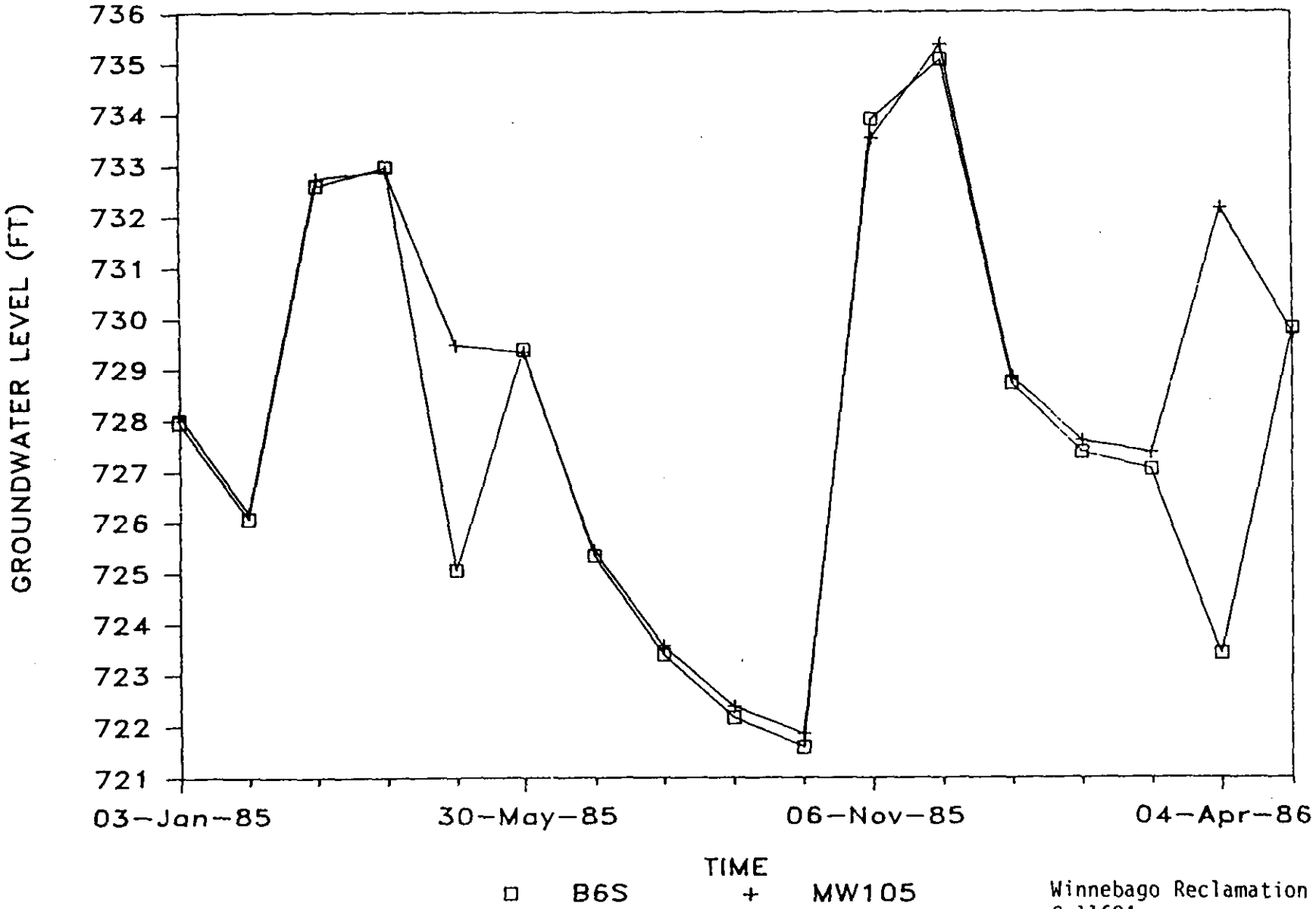
July 15, 1986

GROUNDWATER ELEVATIONS

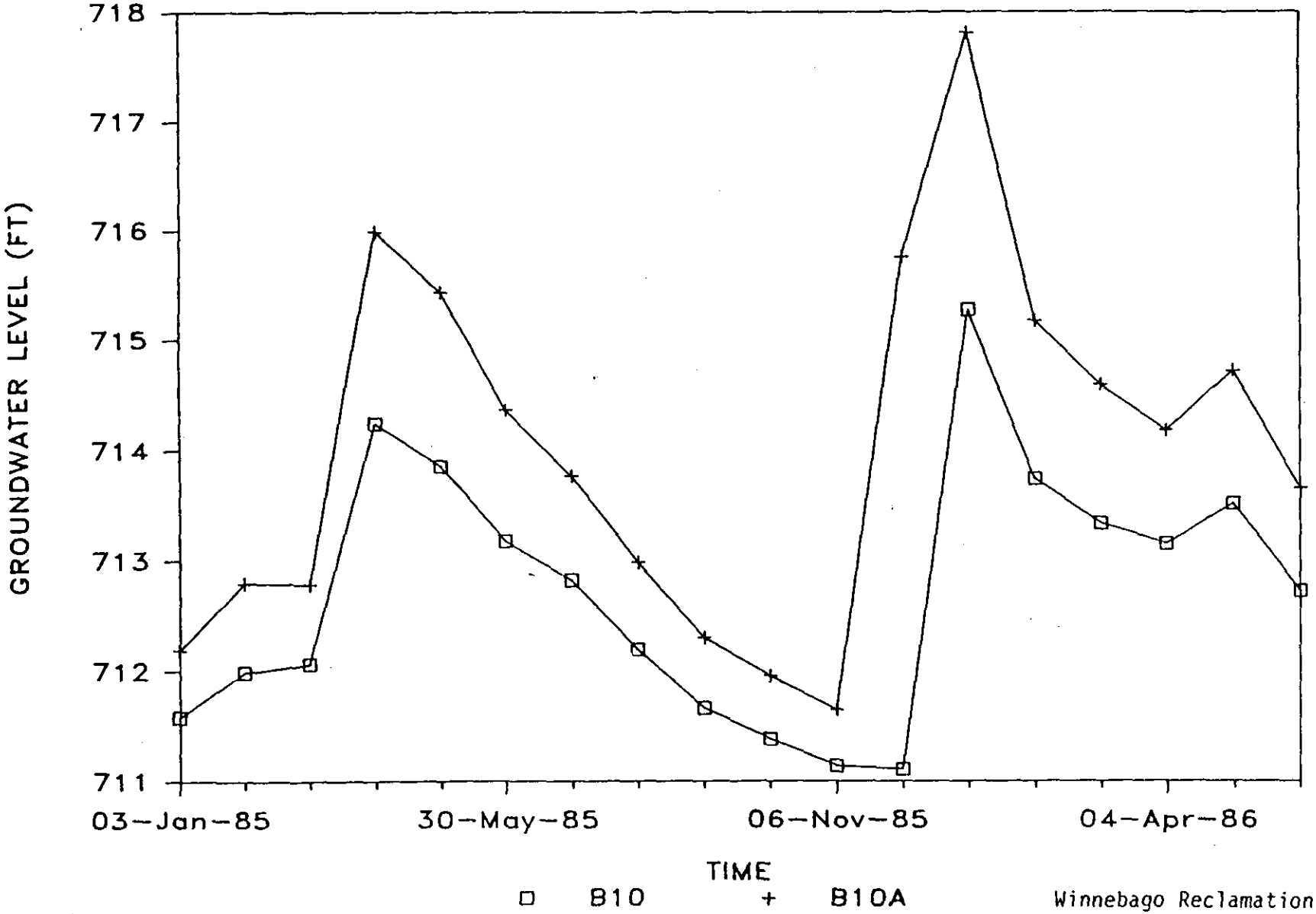
MONITORING WELLS B6S and MW105



Winnebago Reclamation Services
C 11684
July 15, 1986

GROUNDWATER ELEVATIONS

MONITORING WELLS B10 and B10A



Winnebago Reclamation Services
C 11684
July 15, 1986

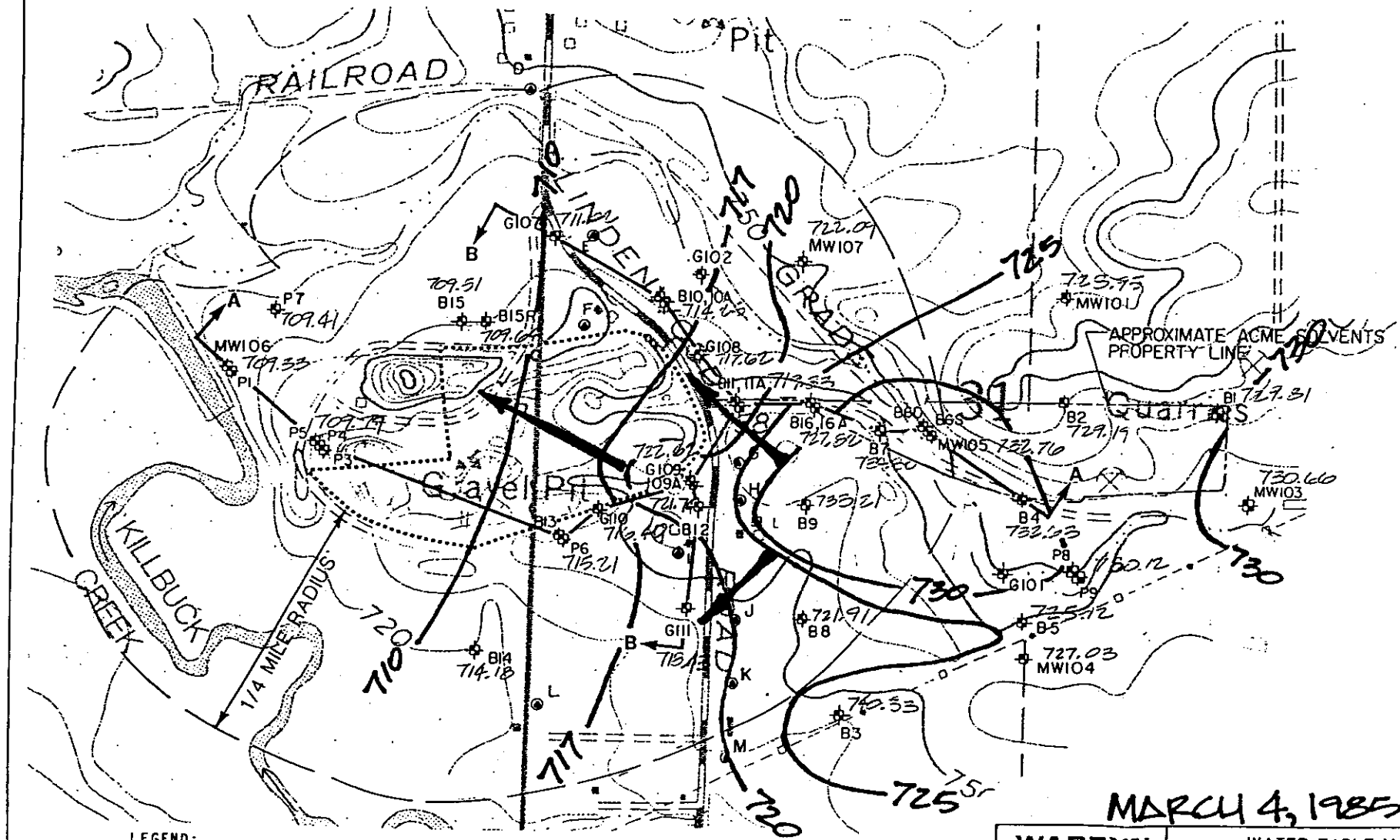
APPENDII E SUPPLEMENT
RESULTS OF GROUNDWATER LEVEL MEASUREMENTS
WINNEBAGO RECLAMATION SERVICE LANDFILL

WELL	TOP OF CASING ELEVATION	GROUND ELEVATION	DEC 27,1984 DEPTH	DEC 27,1984 GW ELEV	JAN 3, 1985 DEPTH	JAN 3, 1985 GW ELEV	JAN 15, 1985 DEPTH	JAN 15, 1985 GW ELEV	MARCH 4,1985 DEPTH	MARCH 4,1985 GW ELEV	APRIL 4,1985 DEPTH	APRIL 4,1985 GW ELEV	May 2,1985 DEPTH	May 2,1985 GW ELEV	May 30,1985 DEPTH	May 30,1985 GW ELEV
B1	772.96	770.55	44.38	728.58	44.10	728.86	44.15	728.81	43.15	729.81	40.90	732.06	41.04	731.92	41.47	731.49
B2	792.34	790.14	64.26	728.08	64.28	728.06	64.00	728.34	63.15	729.19	59.91	732.43	60.24	732.10	60.56	731.78
B3	744.78	742.14	4.59	740.19	5.14	739.64	5.37	739.41	4.45	740.33	4.99	739.79	6.38	738.40	6.09	738.69
B4	757.58	755.06	28.38	729.20	27.93	729.65	27.46	730.12	24.95	732.63	21.66	735.92	23.57	734.01	24.59	732.99
B5	749.50	747.05	27.69	721.81	27.72	721.78	27.13	722.37	24.38	725.12	23.46	726.04	25.08	724.42	25.37	723.63
B6S	754.00	751.55	29.01	724.99	26.03	727.97	27.93	726.07	21.39	732.61	21.02	732.98	28.93	725.07	24.60	729.40
B6D	754.14	751.55	31.85	722.29	30.23	723.91	31.46	722.68	27.96	726.18	26.98	727.16	24.58	729.56	28.63	725.51
B7	751.75	748.84	24.78	726.97	20.59	731.16	22.96	728.79	16.95	734.80	17.23	734.52	19.97	731.78	18.29	733.46
B8	749.97	747.15	29.97	720.00	29.43	720.54	29.63	720.34	28.06	721.91	27.00	722.97	27.94	722.03	28.53	721.44
B9	758.33	755.11	38.56	719.77	38.07	720.26	38.09	720.24	25.12	733.21	34.09	724.24	35.35	722.98	36.10	722.23
B10	744.17	741.77	32.58	711.59	32.18	711.99	32.10	712.07	29.92	714.25	30.31	713.86	30.99	713.18	31.34	712.83
B10A	743.78	742.10	31.59	712.19	30.98	712.80	30.99	712.79	27.78	716.00	28.34	715.44	29.41	714.37	30.01	713.77
B11	760.57	757.58	43.66	716.91	43.26	717.31	43.21	717.36	40.74	719.83	37.62	722.95	39.07	721.50	39.95	720.62
B11A	758.92	757.10	42.21	716.71	41.66	717.26	41.74	717.18	38.65	720.27	36.93	721.99	38.40	720.52	39.21	719.71
B12	760.35	758.22	42.02	718.33	41.29	719.06	41.44	718.91	38.61	721.74	36.74	723.61	38.19	722.16	39.32	721.03
B13	739.28	736.43	26.04	713.24	25.62	713.66			24.07	715.21	24.56	714.72	25.39	713.89	25.78	713.50
B14	716.87	713.93	5.53	711.34	4.94	711.93	5.47	711.40	2.69	714.18	4.36	712.51	5.19	711.68	5.47	711.40
B15	744.47	741.80	37.11	707.36	36.69	707.78	36.95	707.52	34.96	709.51	35.75	708.72	36.41	708.06	36.69	707.78
B15R	743.70	742.00	36.23	707.47	35.89	707.81	36.06	707.64	34.06	709.64	34.86	708.84	35.45	708.25	35.76	707.94
B16	762.81	760.54	41.99	720.82	40.25	722.56	40.68	722.13	34.99	727.82	33.31	729.50	36.47	726.34	36.58	726.23
B16A	762.58	760.60	41.74	720.84	40.10	722.48	40.56	722.02	34.84	727.74	33.26	729.32	36.24	726.34	36.47	726.11
G101			19.73		17.20		18.87		8.88		11.81		16.60		18.26	
G102			26.38		25.37		25.37		19.80		21.98		23.49		24.32	
G107	739.45	737.60	31.63	707.82	31.03	708.42	31.21	708.24	28.43	711.02	29.52	709.93	30.31	709.14	30.69	708.76
G108	751.13	749.20	37.67	713.46	36.86	714.27	36.98	714.15	33.51	717.62	33.45	717.68	34.84	716.29	35.53	715.60
G109	760.60	758.90	41.84	718.76	41.14	719.46	41.43	719.17	37.98	722.62	36.97	723.63	38.55	722.05	40.31	720.29
G109A	760.90	758.90	42.69	718.21	42.08	718.82	42.19	718.71	38.99	721.91	37.82	723.08	39.25	721.65	39.73	721.17
G110	747.98	745.20	33.43	714.47	32.91	714.99	33.36	714.54	31.50	716.40	31.39	716.51	32.19	715.71	32.53	715.37
G111	740.59	738.80	24.45	716.14	23.92	716.67	24.23	716.36	22.16	718.43	22.08	718.51	22.08	718.51	23.41	717.18
MW101	799.20	796.92	71.09	728.11	71.15	728.05	70.90	728.30	70.25	728.95	67.34	731.86	67.28	731.92		
MW102	760.64	759.24	31.52	729.12	30.38	730.26			25.17	735.47	27.07	733.57	27.81	732.83	28.37	732.27
MW103	751.10	748.36	22.61	728.49	22.00	729.10	22.41	728.69	20.44	730.66	19.18	731.92	19.75	731.35	20.33	730.77
MW104	756.58	754.28	31.95	724.63	31.25	725.33	31.59	724.99	29.55	727.03	28.62	727.96	29.53	727.05	30.11	726.47
MW105	752.89	750.65	27.77	725.12	24.77	728.12	26.70	726.19	20.13	732.76	19.98	732.91	23.40	729.49	23.55	729.34
MW106	725.85	724.65	19.03	706.82	18.44	707.41	19.07	706.78	16.52	709.33	18.47	707.38	18.94	706.91	18.11	707.74
MW107	749.92	747.90	32.26	717.66	30.35	719.57	31.50	718.42	27.83	722.09	27.08	722.84	28.17	721.75	28.71	721.21
P1	727.65	725.30	20.84	706.81	20.25	707.40	20.88	706.77	18.03	709.62	20.29	707.36	20.76	706.89	20.87	706.78
P3	725.59	723.32	18.45	707.14	18.05	707.54	18.60	706.99	15.80	709.79	17.97	707.62	18.49	707.10	18.62	706.97
P4	724.67	721.89	17.52	707.15	17.11	707.56	17.76	706.91	14.88	709.79	17.12	707.55	17.56	707.11	17.70	706.97
P5	722.85	721.13	15.68	707.17	15.26	707.59	15.82	707.03	13.10	709.75	15.21	707.64	15.73	707.12	15.83	707.02
P6	739.53	736.96	25.70	713.83	26.25	713.28			24.66	714.87	25.33	714.20	26.08	713.45	26.41	713.12
P7	728.75	727.13	21.67	707.08	21.20	707.55	21.56	707.19	19.34	709.41	20.58	708.17	21.10	707.65	21.32	707.43
P8	748.12	745.72							18.00	730.12	17.43	730.69	19.53	728.59	20.53	727.59
P9	748.60	745.80							18.50	730.10	18.06	730.54	20.01	728.59	21.01	727.59

VERTICAL GRADIENTS

WELL NEST	SEAL	SCREEN NTW	12/27/84	1/3/85	1/15/84				
B6S-MW105	716.00	686.90	0.0045	0.0052	0.0041	0.0052	-0.0024	0.1519	-0.0021
B10-B10A	689.20	725.00	0.0268	0.0355	0.0315	0.0699	0.0641	0.0496	0.0398
B11-B11A	691.10	728.58	-0.0077	-0.0019	-0.0069	0.0153	-0.0301	-0.0322	-0.0308
B13-P6	693.50	716.43	0.0299	-0.0188		-0.0157	-0.0245	-0.0216	-0.0190
B16-B16A	699.60	737.54	0.0009	-0.0035	-0.0049	-0.0028	-0.0060	.0000	-0.0045
G109-G109A	688.90	722.90	-0.0184	-0.0209	-0.0152	-0.0211	-0.0158	-0.0121	0.0280
MW106-P1	677.65	698.30	-0.0005	-0.0005	-0.0005	0.0141	-0.0010	-0.0010	-0.0466
P3-P4	688.40	709.80	0.0005	0.0011	-0.0044	.0000	-0.0037	0.0005	.0000
P3-P5	667.60	709.80	0.0008	0.0013	0.0010	-0.0009	0.0005	0.0005	0.0013
P4-P5	667.60	688.40	0.0010	0.0014	0.0058	-0.0019	0.0043	0.0005	0.0024
P8-P9	700.80	715.72				-0.0013	-0.0101	0.0000	0.0000

ALL DEPTH MEASURMENTS FROM TOP OF THE INNER WELL CASING
*FROM MODIFYED TOP OF CASING 746.16



MARCH 4, 1985

LEGEND:

B15 708.06 MONITORING WELL LOCATION, NUMBER AND GROUNDWATER ELEVATION.

DIRECTION OF GROUNDWATER FLOW

A A CROSS SECTION LOCATION (SEE FIGURE C11684-B3, C11684-B4 OF MARCH 5, 1985 REPORT.

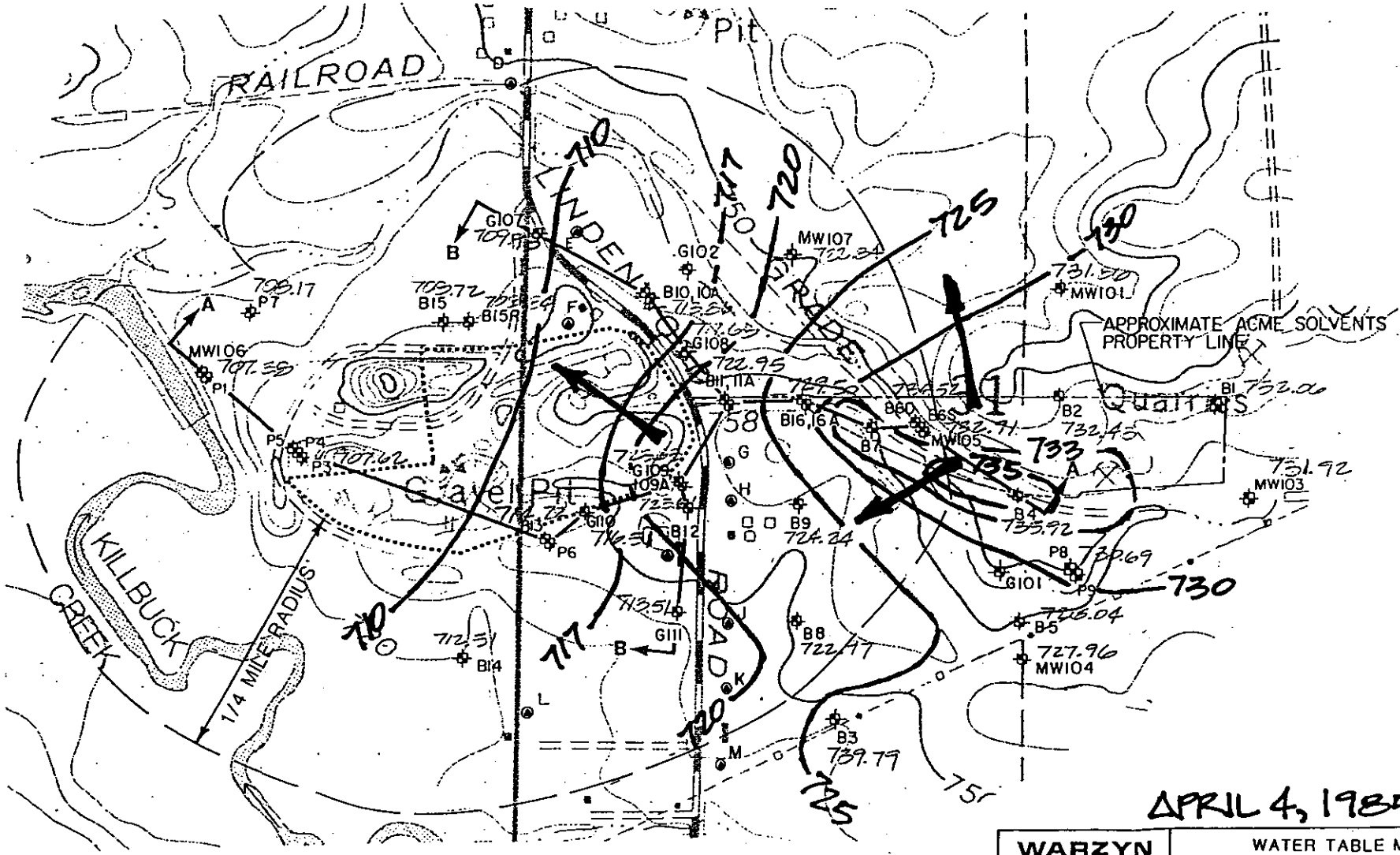
-723- GROUNDWATER CONTOUR

WARZYN ENGINEERING INC.

WATER TABLE MAP
WINNEBAGO RECLAMATION
SERVICE LANDFILL
WINNEBAGO COUNTY, ILLINOIS

DRAWN	CHECKED	APPROVED	DATE	SCALE	DRAWING NO.
TJW	JAH	RWH	6/10/85	1" = 500'	C11684-B5

TELEDYNE POST N52452

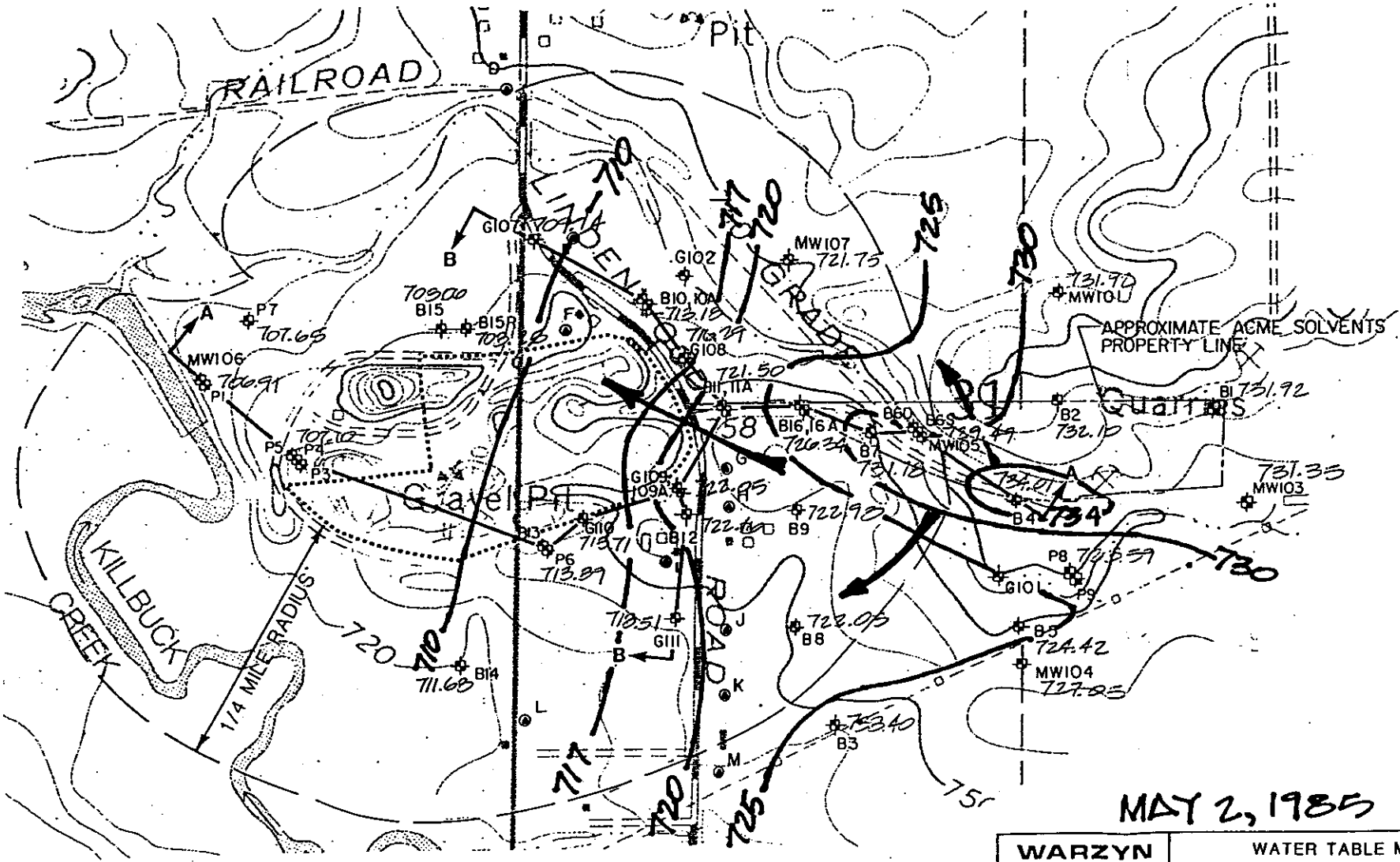


APRIL 4, 1985

LEGEND:

SEE FIGURE C11684-B1 FOR ADDITIONAL NOTES AND LEGEND.

WARZYN ENGINEERING INC.	WATER TABLE MAP WINNEBAGO RECLAMATION SERVICE LANDFILL WINNEBAGO COUNTY, ILLINOIS				
DRAWN	CHECKED	APPROVED	DATE	SCALE	DRAWING NO.
TJW	JAH	DWH	6/20/85	1"=500'	C11684-B6



MAY 2, 1985

WARZYN ENGINEERING INC.	WATER TABLE MAP WINNEBAGO RECLAMATION SERVICE LANDFILL WINNEBAGO COUNTY, ILLINOIS				
DRAWN	CHECKED	APPROVED	DATE	SCALE	DRAWING NO.
TJW	GWH	GWH	6/20/85	1"=500'	C11684-B7

SEE FIGURE C11684-B1 FOR ADDITIONAL NOTES AND LEGEND.

WELL	TOP OF CASING ELEVATION	GROUND ELEVATION	July 2 ,1985 DEPTH	GW ELEV	July 30 ,1985 DEPTH	GW ELEV	Sept 6 ,1985 DEPTH	GW ELEV	Oct 1 ,1985 DEPTH	GW ELEV	Nov 6 ,1985 DEPTH	GW ELEV	Dec 5 ,1985 DEPTH	GW ELEV	Jan 9 ,1986 DEPTH	GW ELEV
B1	772.96	770.55	42.78	730.18	43.90	729.06	44.80	728.16	45.57	727.39	42.38	730.58	39.54	733.42	39.56	733.40
B2	792.34	790.14	62.15	730.19	63.45	728.89	64.38	727.96	65.19	727.15	62.04	730.30	58.58	733.76	58.63	733.71
B3	744.78	742.14	6.33	738.45	8.03	736.75	CML				4.63	740.15	4.74	740.04	5.75	739.03
B4	757.58	755.06	27.53	730.05	29.49	728.09	30.80	726.78	31.46	726.12	23.10	734.48	18.90	738.68	23.43	734.15
B5	749.50	747.05	27.27	722.23	28.29	721.21	29.05	720.45	29.54	719.96	23.60	725.90	22.31	727.19	24.52	724.98
B6S	754.00	751.55	28.65	725.35	30.61	723.39	31.83	722.17	32.40	721.60	20.09	733.91	18.92	735.08	25.27	728.73
B6D	754.14	751.55	31.68	722.46	32.86	721.28	33.55	720.59	34.02	720.12	27.50	726.64	25.52	728.62	28.96	725.18
B7	751.75	748.84	23.11	728.64	25.42	726.33	26.83	724.92	27.50	724.25	16.71	735.04	15.38	736.37	20.07	731.68
B8	749.97	747.15	29.56	720.41	30.44	719.53	30.97	719.00	31.34	718.63	27.71	722.26	25.92	724.05	27.64	722.33
B9	758.33	755.11	37.55	720.78	36.98	721.35	39.36	718.97	39.80	718.53	35.94	722.39	31.55	726.78	34.68	723.65
B10	744.17	741.77	31.97	712.20	32.50	711.67	32.78	711.39	33.03	711.14	30.06	714.11	28.88	715.29	30.42	713.75
B10A	743.78	742.10	30.79	712.99	31.47	712.31	31.82	711.96	32.13	711.65	28.01	715.77	25.97	717.81	28.59	715.19
B11	760.57	757.58	41.49	719.08	42.67	717.90	43.58	716.99	44.17	716.40	41.26	719.29	34.95	725.62	37.44	723.13
B11A	758.92	757.10	40.58	718.34	41.66	717.26	42.36	716.56	42.85	716.07	39.13	719.79	34.26	724.66	37.06	721.86
B12	760.35	758.22	40.96	719.39	42.09	718.26	42.64	717.71	43.08	717.27	39.14	721.21	35.14	725.21	36.94	723.41
B13	739.28	736.43	26.25	713.03	26.99	712.29	27.11	712.17	27.24	712.04	24.25	715.03	23.45	715.83	25.12	714.16
B14	716.87	713.93	5.82	711.05	6.51	710.36	6.50	710.37	6.60	710.27	3.72	713.15	3.30	713.57	5.05	711.82
B15	744.47	741.80	37.05	707.42	37.49	706.98	37.48	706.99	37.56	706.91	34.92	709.55	34.16	710.31	36.12	708.35
B15R	743.70	742.00	36.12	710.04 *	39.06	707.10 *	39.18	706.98 *	39.20	706.96 *	36.54	709.62 *	35.17	710.99 *	37.64	708.52
B16	762.81	760.54	39.22	723.59	40.90	721.91	42.01	720.80	42.52	720.29	35.16	727.65	29.27	733.54	35.58	727.23
B16A	762.58	760.60	39.13	723.45	40.75	721.83	41.78	720.80	42.35	720.23	NEW LOCK		NEW LOCK		NEW	LOCK
G101			20.54		21.72		22.46		22.91		9.98		10.19		17.07	
G102			25.30		26.03		26.39		26.68		19.96		17.55		22.48	
G107	739.45	737.60	31.11	708.34	31.66	707.79	31.72	707.73	32.02	707.43	28.54	710.91	27.34	712.11	29.85	709.60
G108	751.13	749.20	36.56	714.57	37.42	713.71	37.90	713.23	38.20	712.93	33.96	717.17	30.94	720.19	33.77	717.36
G109	760.60	758.90	41.35	719.25	42.94	717.66	43.46	717.14	43.90	716.70	39.50	721.10	36.11	724.49	38.02	722.58
G109A	760.90	758.90	41.86	719.04	42.48	718.42	42.99	717.91	43.40	717.50	38.45	722.45	35.31	725.59	37.24	723.66
G110	747.90	745.20	33.17	714.73	33.94	713.96	35.15	712.75	34.36	713.54	31.52	716.38	30.18	717.72	31.62	716.28
G111	740.59	738.80	24.18	716.41	25.01	715.58	25.33	715.26	25.57	715.02	22.20	718.39	20.94	719.65	22.57	718.02
MW101	799.20	796.92	68.83	730.37	70.03	729.17	CML		71.67	727.53	UNDERWATER				65.54	733.66
MW102	760.64	759.24	29.69	730.95	31.80	728.84	31.79	728.85	32.45	728.19	26.46	734.18	24.00	736.64	26.38	734.26
MW103	751.10	748.36	21.62	729.48	22.74	728.36	23.65	727.45	24.34	726.76	19.92	731.18	18.75	732.35	18.46	732.64
MW104	756.58	754.28	31.32	725.26	32.32	724.26	33.00	723.58	33.49	723.09	29.22	727.36	27.62	728.96	28.76	727.82
MW105	752.89	750.65	27.43	725.46	29.33	723.56	30.51	722.38	31.03	721.86	19.34	733.55	17.51	735.38	24.02	728.87
MW106	725.85	724.65	19.12	706.73	20.60	705.25	19.51	706.34	19.56	706.29	17.62	708.23	17.52	708.33	18.88	706.97
MW107	749.92	747.90	29.92	720.00	30.96	718.96	31.62	718.30	32.22	717.70	27.86	722.06	24.00	725.92	26.64	723.28
P1	727.65	725.30	20.92	706.73	21.39	706.26	21.34	706.31	21.37	706.28	19.50	708.15	19.27	708.38	20.70	706.95
P3	725.59	723.32	18.67	706.92	19.18	706.41	19.14	706.45								
P4	724.67	721.89	17.73	706.94	18.22	706.45	18.17	706.50								
P5	722.85	721.13	15.90	706.95	16.39	706.46	16.29	706.56								
P6	739.53	736.96	26.59	712.94	26.72	712.81	27.85	711.68	27.88	711.65	25.00	714.53	24.21	715.32	25.82	713.71
P7	728.75	727.13	21.61	707.14	22.07	706.68	22.11	706.64	22.17	706.58	19.75	709.00	19.17	709.58	20.98	707.77
P8	748.12	745.72	22.16	725.96	23.23	724.89	23.95	724.17	24.49	723.63	17.30	730.82	16.54	731.58	18.95	729.17
P9	748.60	745.80	22.59	726.01	23.66	724.94	24.38	724.22	24.90	723.70	17.94	730.66	17.13	731.47	19.43	729.17

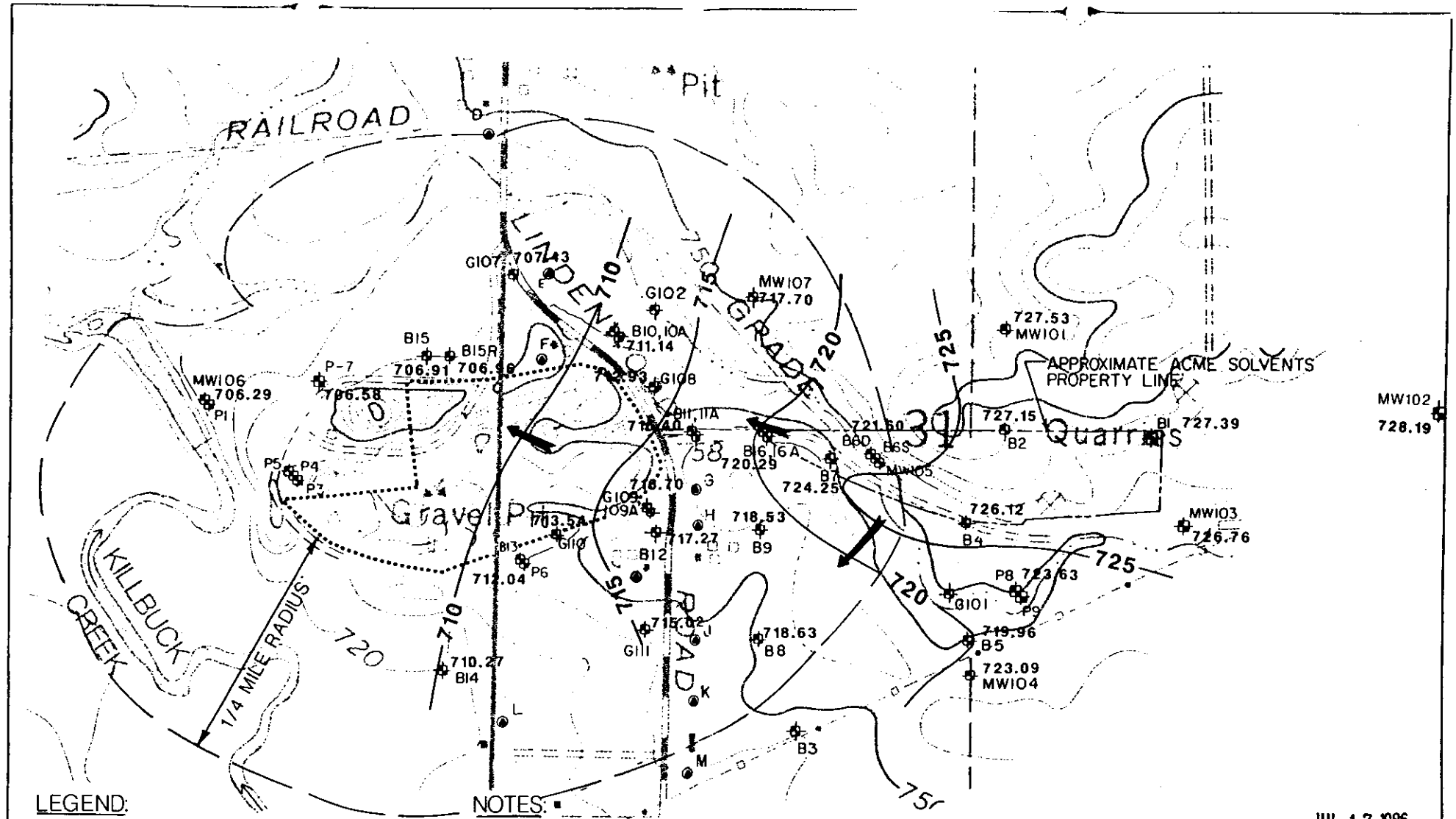
WELL WEST	SEAL	SCREEN WTN														
B6S-MW105	716.00	686.90		0.0038		0.0058		0.0072		0.0089		-0.0124		0.0103		0.0048
B10-B10A	689.20	725.00		0.0343		0.0285		0.0257		0.0232		0.0666		0.0966		0.0587
B11-B11A	691.10	728.58		-0.0264		-0.0239		-0.0166		-0.0130		0.0177		-0.0278		-0.0397
B13-P6	693.50	716.43		-0.0046		0.0277		-0.0262		-0.0210		-0.0252		-0.0228		-0.0218
B16-B16A	699.60	737.54		-0.0058		-0.0036		.0000		-0.0029						
G109-G109A	688.90	722.90		-0.0069		0.0264		0.0273		0.0288		0.0419		0.0309		0.0321
MW106-P1	677.65	698.30		0.0000		0.0490		-0.0015		-0.0005		-0.0019		0.0024		-0.0010
P3-P4	688.40	709.80		0.0011		0.0022		0.0028								
P3-P5	667.60	709.80		0.0008		0.0013		0.0028								
P4-P5	667.60	688.40		0.0005		0.0005		0.0029								
P8-P9	700.80	715.72		0.0034		0.0034		0.0034		0.0047		-0.0107		-0.0074		.0000

ALL DEPTH MEASUREMENTS FROM TOP OF THE INNER WELL CASING
*FROM MODIFYED TOP OF CASING 746.16

WELL	TOP OF CASING ELEVATION	GROUND ELEVATION	Feb 7 ,1986 DEPTH	GW ELEV	March 3,1986 DEPTH	GW ELEV	April 4,1986 DEPTH	GW ELEV	May 7 ,1985 DEPTH	GW ELEV
B1	772.96	770.55	39.70	733.26	40.49	732.47	40.27	732.69	41.48	731.48
B2	792.34	790.14	59.13	733.21	59.95	732.39	59.61	732.73	61.02	731.32
B3	744.78	742.14	4.72	740.06	4.71	740.07	5.32	739.46	5.81	738.97
B4	757.58	755.06	24.62	732.96	25.38	732.20	22.10	735.48	25.06	732.52
B5	749.50	747.05	24.51	724.99	25.29	724.21	24.26	725.24	25.86	723.64
B6S	754.00	751.55	26.61	727.39	26.95	727.05	21.59	732.41	24.18	729.82
B6D	754.14	751.55	29.23	724.91	33.13	721.01	28.00	726.14	29.86	723.28
B7	751.75	748.84	20.61	731.14	21.70	730.05	19.05	732.70	16.70	733.05
B8	749.97	747.15	27.68	722.29	28.28	721.69	27.47	722.50	28.71	721.26
B9	758.33	755.11	33.62	724.71	35.97	722.36	34.96	723.37	36.59	721.74
B10	744.17	741.77	30.83	713.34	31.02	713.15	30.65	713.52	31.44	712.73
B10A	743.78	742.10	29.18	714.60	29.60	714.18	29.05	714.73	30.12	713.66
B11	760.57	757.58	38.03	722.54	39.66	720.91	39.14	721.43	40.74	719.83
B11A	758.92	757.10	37.71	721.21	39.02	719.90	38.35	720.57	39.38	719.54
B12	760.35	758.22	38.37	721.98	38.38	721.97	38.56	721.79	40.24	720.11
B13	739.28	736.43	24.41	714.87	25.23	714.05	25.05	714.23	25.69	713.59
B14	716.87	713.93	4.03	712.84	4.85	712.02	4.92	711.95	5.48	711.39
B15	744.47	741.80	35.31	709.16	36.12	708.35	36.07	708.40	36.68	707.79
B15R	743.70	742.00	36.85	709.31 *	37.74	708.42 *	37.71	708.45 *	38.23	707.93
B16	762.81	760.54	36.69	726.12	37.78	725.03	36.30	726.51	37.73	725.08
B16A	762.58	760.60	NEW	LOCK		LOCK		LOCK		LOCK
G101			16.88		15.48		14.13		17.71	
G102			23.31		23.77		23.05		24.46	
G107	739.45	737.60	29.26	710.17	30.07	709.38	30.07	709.38	30.65	708.80
G108	751.13	749.20	34.63	716.50	35.28	715.85	34.56	716.57	35.88	715.25
G109	760.60	758.90	39.10	721.50	39.53	721.07	39.47	721.13	41.05	719.55
G109A	760.90	758.90	38.29	722.61	38.74	722.16	38.89	722.01	40.56	720.34
G110	747.90	745.20	31.31	716.59	32.17	715.73	31.80	716.10	32.55	715.35
G111	740.59	738.00	22.18	718.41	22.96	717.63	22.47	718.12	23.41	717.18
MW101	799.20	796.92	NO ACCESS		66.71	732.49	66.53	732.67		
MW102	760.64	759.24	26.80	733.84	27.57	733.07	27.16	733.48	28.59	732.05
MW103	751.10	748.36	18.79	732.31	19.38	731.72	19.03	732.07	20.27	730.83
MW104	756.58	754.28	28.71	727.87	29.50	727.08	28.96	727.72	30.10	726.48
MW105	752.89	750.65	25.28	727.61	25.52	727.37	20.72	732.17	23.16	729.73
MW106	725.85	724.65	18.02	707.83	18.55	707.30	18.81	707.04	19.02	706.83
MW107	749.92	747.90	27.54	722.38	28.03	721.89	27.29	722.63	28.74	721.18
P1	727.65	725.30	19.81	707.84	20.31	707.34	20.55	707.10	20.85	706.80
P3	725.59	723.32								
P4	724.67	721.89								
P5	722.85	721.13								
P6	739.53	736.96	25.09	714.44	25.95	713.58	25.79	713.74	26.39	713.14
P7	728.75	727.13	20.03	708.72	21.06	707.69	20.90	707.85	21.39	707.36
P8	748.12	745.72	18.86	729.26	19.96	728.16	18.92	729.20	20.61	727.51
P9	748.60	745.80	19.35	729.25	20.44	728.16	19.44	729.16	21.08	727.52

WELL NEST	SEAL	SCREEN WTN				
B6S-MW105	716.00	686.90	0.0076	0.0110	-0.0082	-0.0031
B10-B10A	689.20	725.00	0.0522	0.0430	0.0498	0.0395
B11-B11A	691.10	728.58	-0.0423	-0.0339	-0.0284	-0.0101
B13-P6	693.50	716.43	-0.0201	-0.0229	-0.0235	-0.0224
B16-B16A	699.60	737.54				
G109-G109A	688.90	727.90	0.0340	0.0339	0.0273	0.0258
MW106-P1	677.65	698.30	0.0005	0.0019	0.0029	-0.0015
P3-P4	688.40	709.80				
P3-P5	667.60	709.90				
P4-P5	667.60	688.40				
P8-P9	700.80	715.72	-0.0007	0.0000	-0.0027	0.0007

ALL DEPTH MEASUREMENTS FROM TOP OF THE INNER WELL CASING
*FROM MODIFYED TOP OF CASING 746.16



LEGEND:

B15 706.91 — MONITORING WELL LOCATION, NUMBER AND GROUNDWATER ELEVATION.

DIRECTION OF GROUNDWATER FLOW

725 — GROUNDWATER CONTOURS

NOTES:

1. BASE MAP OBTAINED FROM ENLARGING THE ROCKFORD SOUTH USGS 7.5 MIN. QUADRANGLE MAP DATED 1971.
2. WELL LOCATIONS ARE BASED ON LOCATIONS SHOWN IN THE E. C. JORDAN REPORT, A LIMITED SURVEY BY WARZYN ENGINEERING INC. AND BY PLACEMENT BASED ON PHYSICAL FEATURES SHOWN ON THE MAP.
3. ALL WATER WELLS OBTAINED BY WARZYN ENGINEERING INC. ONLY GROUNDWATER ELEVATIONS FOR WATER TABLE WELL SHOWN.

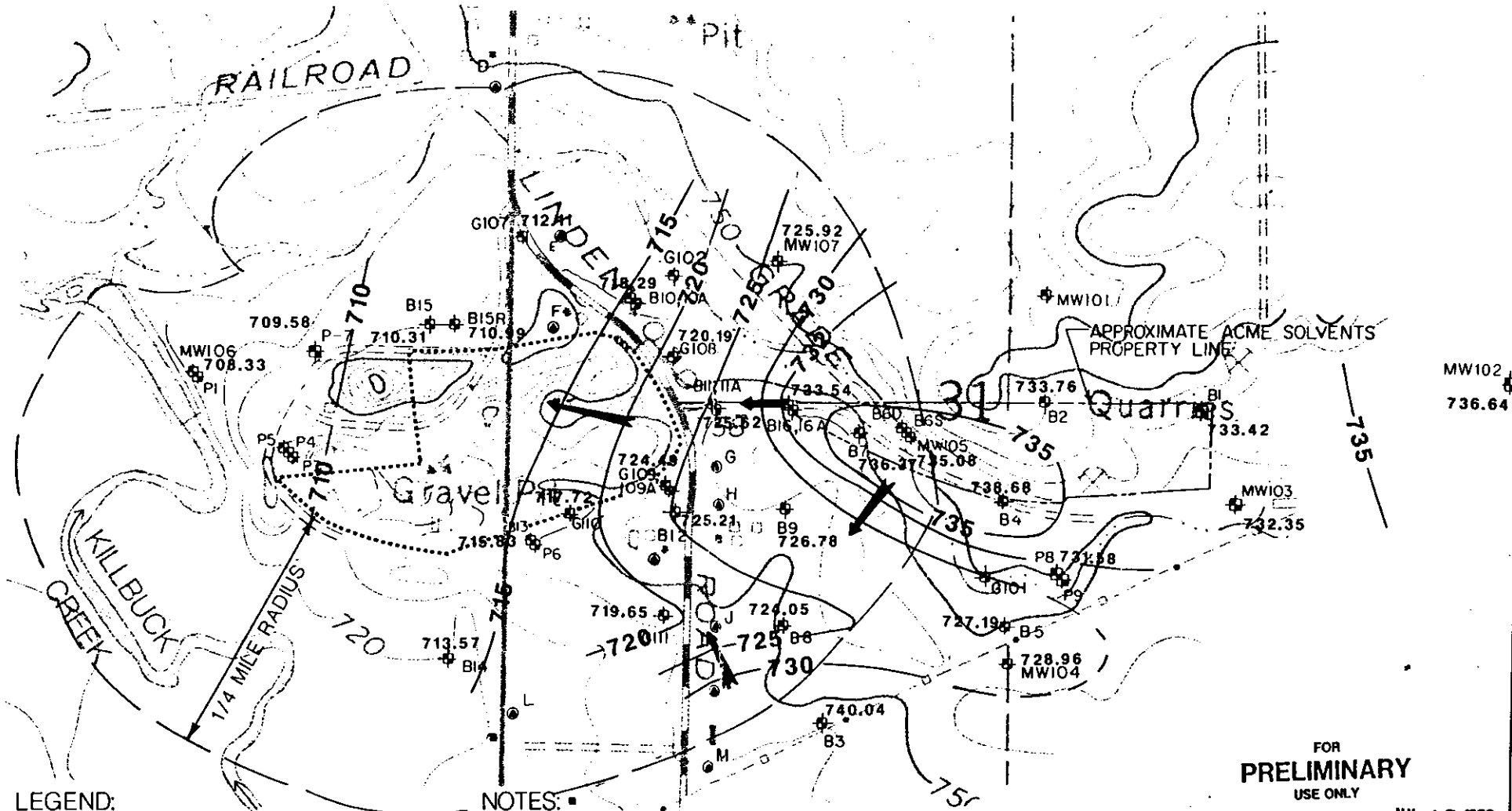
JUL 17 1986

WARZYN ENGINEERING INC.

WATER TABLE MAP OCT 1,1985

WINNEBAGO RECLAMATION SERVICE LANDFILL
WINNEBAGO COUNTY, ILLINOIS

DRAWN	CHECKED	APPROVED	DATE	SCALE	DRAWING NO.
ALH	JAH	Daniel W. Hall	7/17/86	1"=500'	CI1684-B6



LEGEND:

B15 706.91	MONITORING WELL LOCATION, NUMBER AND GROUNDWATER ELEVATION.
→	DIRECTION OF GROUNDWATER FLOW
—725—	GROUNDWATER CONTOURS

NOTES:

1. BASE MAP OBTAINED FROM ENLARGING THE ROCKFORD SOUTH USGS 7.5 MIN. QUADRANGLE MAP DATED 1971.
2. WELL LOCATIONS ARE BASED ON LOCATIONS SHOWN IN THE E. C. JORDAN REPORT, A LIMITED SURVEY BY WARZYN ENGINEERING INC. AND BY PLACEMENT BASED ON PHYSICAL FEATURES SHOWN ON THE MAP.
3. ALL WATER WELLS OBTAINED BY WARZYN ENGINEERING INC. ONLY GROUNDWATER ELEVATIONS FOR WATER TABLE WELL SHOWN.

FOR
PRELIMINARY
USE ONLY

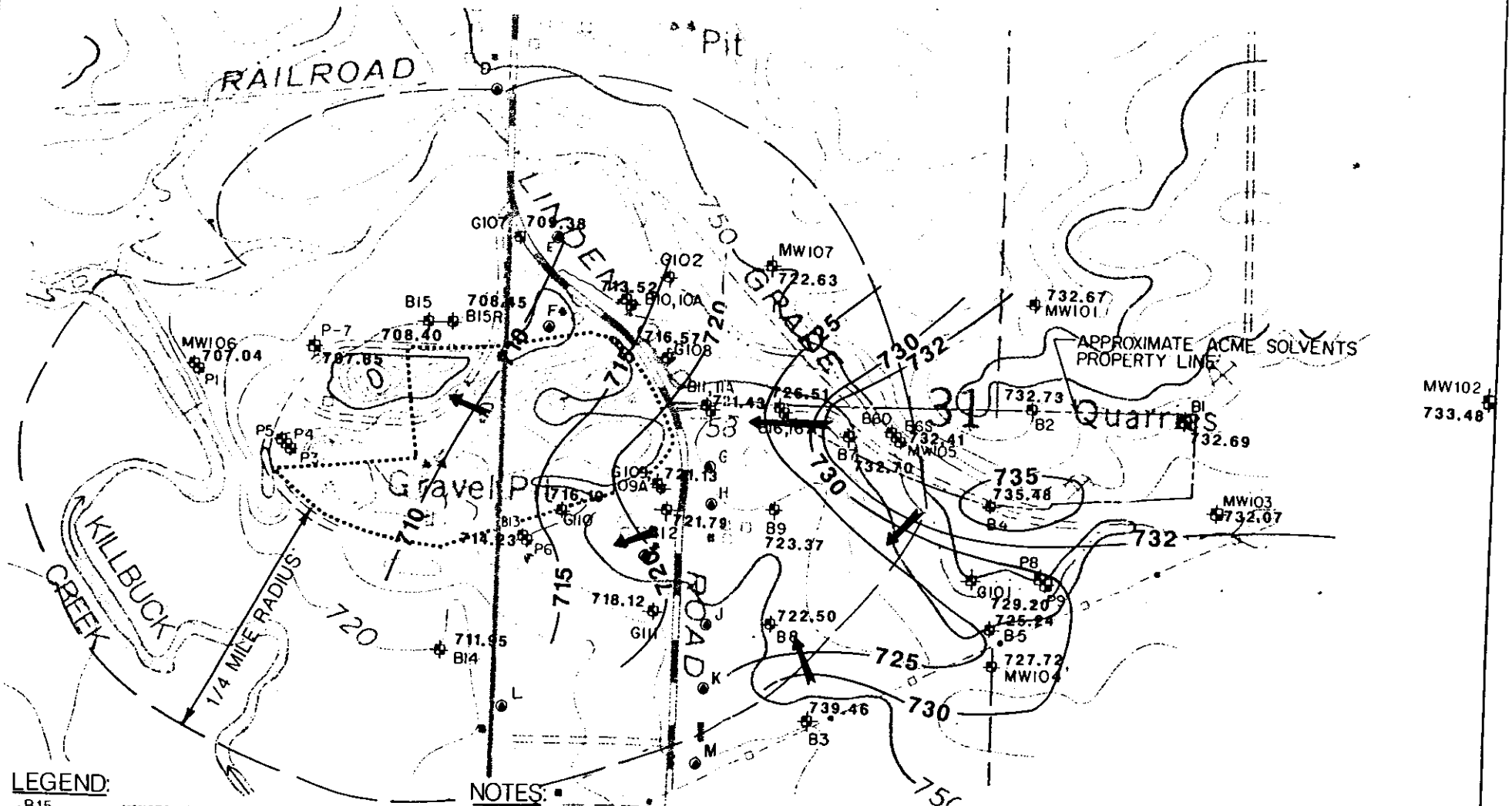
JUL 17 1986

WARZYN ENGINEERING INC.

WATER TABLE MAP DEC. 5,1985

WINNEBAGO RECLAMATION SERVICE LANDFILL
WINNEBAGO COUNTY, ILLINOIS

DRAWN	CHECKED	APPROVED	DATE	SCALE	DRAWING NO.
ALH	TAH	[illegible]	7/17/86	1"=500'	[illegible]



LEGEND:

B15 706.91	MONITORING WELL LOCATION, NUMBER AND GROUNDWATER ELEVATION.
→	DIRECTION OF GROUNDWATER FLOW
—725—	GROUNDWATER CONTOURS

NOTES:

1. BASE MAP OBTAINED FROM ENLARGING THE ROCKFORD SOUTH USGS 7.5 MIN. QUADRANGLE MAP DATED 1971.
2. WELL LOCATIONS ARE BASED ON LOCATIONS SHOWN IN THE E. C. JORDAN REPORT, A LIMITED SURVEY BY WARZYN ENGINEERING INC. AND BY PLACEMENT BASED ON PHYSICAL FEATURES SHOWN ON THE MAP.
3. ALL WATER WELLS OBTAINED BY WARZYN ENGINEERING INC. ONLY GROUNDWATER ELEVATIONS FOR WATER TABLE WELL SHOWN.

JUL 17 1986

WARZYN ENGINEERING INC.

WATER TABLE MAP APRIL 4,1986

WINNEBAGO RECLAMATION SERVICE LANDFILL
WINNEBAGO COUNTY, ILLINOIS

DRAWN	CHECKED	APPROVED	DATE	SCALE	DRAWING NO.
ALH	TAH	[illegible]	7/17/86	1"=500'	[illegible]

TELEDYNE POST N52453

G

APPENDIX G

USGS STREAMFLOW DATA

United States Department of the Interior

GEOLOGICAL SURVEY

TAKE PRIDE IN AMERICA

4th Floor
102 East Main Street
Urbana, IL 61801
May 25, 1989

Route
Hamper
File (Sur Rec)

RECEIVED
MAY 31 1989
WARZYN-ILLINOIS

Mr. Bernard Schorle
Remedial Project Manager
U.S. Environmental Protection Agency
Region V, Mail Stop 5HS-11
230 S. Dearborn Street
Chicago, IL 60604

Dear Bernard:

Enclosed please find two copies of stream flow and water-quality data for Killbuck Creek south of New Milford from October 1987 to September 1988. These data show that the rate of streamflow during the April sampling round at Pagel's Pit was significantly higher than during the rest of the year. These data also show that the rate of streamflow during the June sampling round at Pagel's Pit was probably more or less normal. There does not appear to be any significant change in the water quality of the creek during the April sampling round except that turbidity, nitrogen, and total residue are high and fecal coliform is low. The concentration of barium ion cited in this report is in good agreement with the concentration measured by Warzyn.

Please pass on one of these copies to Jim Hill at Warzyn. Feel free to call me at FTS 958-5368 with any questions or comments.

Sincerely,

Robert Kay

Robert Kay
Hydrologist

Enclosures
cc: Nicholas
Avery

Water Resources Data
Illinois
Water Year 1988

Volume 1. Illinois except Illinois River Basin

U.S. GEOLOGICAL SURVEY WATER DATA REPORT IL-88-1
Prepared in cooperation with the State of Illinois
and with other agencies

ROCK RIVER BASIN

05440520 KILLBUCK CREEK NEAR NEW MILFORD, IL

LOCATION.--Lat 42°09'36", long 89°04'32", in SW1/4NW1/4 sec.35, T.43 N., R.1 E., Winnebago County, Hydrologic Unit 07090006, at bridge on State Highway 251, 1.7 mi south of New Milford, 12.8 mi downstream from Spring Run, and at mile 2.4.

DRAINAGE AREA.--136 mi^2.

PERIOD OF RECORD.--Water years 1979 to current year. Additional chemical data for water years 1958, 1960-63, 1965-77 are published in Water-Resources Investigations 78-23 and 79-24 as site PBQ 02.

WATER QUALITY DATA, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	TIME	AGENCY COLLECTING SAMPLE (CODE NUMBER) (00027)	AGENCY ANALYZING SAMPLE (CODE NUMBER) (00028)	STREAM-FLOW, INSTANTANEOUS (CFS) (00061)	SPECIFIC CONDUCTANCE (US/CM) (00095)	PH (STANDARD UNITS) (00400)	TEMPERATURE WATER (DEG C) (00010)	TURBIDITY (FTU) (00076)	OXYGEN, DISSOLVED (MG/L) (00300)	OXYGEN DEMAND, CHEMICAL (LOW LEVEL) (MG/L) (00335)	COLIFORM, FECAL, 0.45 UM-MF (COLS./100 ML) (31616)	HARDNESS TOTAL (MG/L AS CACO3) (00900)
OCT												
28...	0930	17002	17002	51	682	7.70	7.0	1.8	11.8	9	<10	360
NOV												
23...	1400	17002	17002	72	645	7.70	8.5	2.0	9.3	10	K27	310
JAN												
26...	1100	17002	17002	150	682	6.80	0.0	4.1	12.9	8	K20	360
MAR												
08...	1000	17002	17002	98	700	7.20	8.5	3.5	10.5	19	410	370
APR												
12...	1600	17002	17002	188	678	7.30	12.5	8.4	10.2	10	K13	350
MAY												
17...	1430	17002	17002	66	661	7.90	19.0	1.5	12.7	7	K60	340
JUL												
19...	0730	17002	17002	29	653	7.40	21.5	8.4	7.3	13	K600	300
AUG												
11...	1400	17002	17002	19	637	7.90	28.5	2.0	8.8	10	K170	350
SEP												
15...	1230	17002	17002	16	628	7.60	21.0	1.1	7.6	13	K150	350

Round 1 sampling

Round 2 sampling, June, 88

DATE	CALCIUM TOTAL RECOVERABLE (MG/L AS CA) (00916)	CALCIUM DISSOLVED (MG/L AS CA) (00915)	MAGNESIUM, TOTAL RECOVERABLE (MG/L AS MG) (00927)	MAGNESIUM, DISSOLVED (MG/L AS MG) (00925)	SODIUM, TOTAL RECOVERABLE (MG/L AS NA) (00929)	SODIUM, DISSOLVED (MG/L AS NA) (00930)	POTASSIUM, TOTAL RECOVERABLE (MG/L AS K) (00937)	POTASSIUM, DISSOLVED (MG/L AS K) (00935)	RESIDUE TOTAL AT 105 DEG. C, SUSPENDED (MG/L) (00530)	RESIDUE VOLATILE, SUSPENDED (MG/L) (00535)	NITROGEN, NO2+NO3 TOTAL (MG/L AS N) (00630)	NITROGEN, AMMONIA TOTAL (MG/L AS N) (00610)
OCT												
28...	85	80	42	40	8.2	7.8	1.3	1.3	6	5	7.40	0.220
NOV												
23...	79	72	35	32	6.0	5.5	0.6	0.30	30	8	3.60	0.090
JAN												
26...	86	83	39	37	7.8	7.5	1.2	1.0	21	5	9.90	0.320
MAR												
08...	85	83	40	39	9.7	9.5	1.2	1.1	11	5	8.50	0.320
APR												
12...	83	79	38	36	8.1	7.9	1.1	0.79	35	6	12.0	0.210
MAY												
17...	76	72	39	39	7.9	7.9	1	0.80	7	2	8.40	0.220
JUL												
19...	65	63	36	35	7.5	7.3	1.4	1.3	44	10	3.50	0.560
AUG												
11...	72	71	42	41	8.9	9.0	1.6	1.6	23	4	3.80	0.280
SEP												
15...	68	68	44	44	9.3	9.3	1.5	1.4	3	2	3.20	0.640

05440520 KILLBUCK CREEK NEAR NEW MILFORD, IL--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	AMMONIA UN-IONIZED (MG/L AS N) (00619)	PHOS-PHOROUS TOTAL (MG/L AS P) (00665)	PHOS-PHOROUS DIS-SOLVED (MG/L AS P) (00666)	ALUM-INUM, TOTAL RECOV-ERABLE (UG/L AS AL) (01105)	ALUM-INUM, DIS-SOLVED (UG/L AS AL) (01106)	BARIUM, TOTAL RECOV-ERABLE (UG/L AS BA) (01007)	BARIUM, DIS-SOLVED (UG/L AS BA) (01005)	BERYL-LIUM, TOTAL RECOV-ERABLE (UG/L AS BE) (01012)	BERYL-LIUM, DIS-SOLVED (UG/L AS BE) (01010)	BORON, TOTAL RECOV-ERABLE (UG/L AS B) (01022)	BORON, DIS-SOLVED (UG/L AS B) (01020)	CADMIUM TOTAL RECOV-ERABLE (UG/L AS CD) (01027)
OCT												
28...	0.002	0.030	<0.025	210	<50	80	71	<0.5	<0.5	<50	<50	<3
NOV												
23...	<0.001	0.070	<0.010	450	<50	60	46	<0.5	<0.5	<50	<50	<3
JAN												
26...	<0.001	0.060	0.030	480	<50	80	70	<0.5	<0.5	<50	<50	<3
MAR												
08...	<0.001	0.070	0.040	310	<50	80	70	<0.5	<0.5	<50	<50	<3
APR												
12...	<0.001	0.090	0.040	500	<50	90	73	<0.5	<0.5	<50	<50	<3
MAY												
17...	0.007	0.020	0.010	170	90	80	75	<0.5	<0.5	<50	<50	<3
JUL												
19...	0.007	0.100	0.050	620	60	80	75	<0.5	<0.5	<50	<50	<3
AUG												
11...	0.016	0.080	0.040	480	<50	80	74	<0.5	<0.5	<50	<50	<3
SEP												
15...	0.011	0.040	0.010	100	<50	80	80	<0.5	<0.5	<50	<50	<3

DATE	CADMIUM DIS-SOLVED (UG/L AS CD) (01025)	CHRO-MIUM, TOTAL RECOV-ERABLE (UG/L AS CR) (01034)	CHRO-MIUM, DIS-SOLVED (UG/L AS CR) (01030)	COBALT, TOTAL RECOV-ERABLE (UG/L AS CO) (01037)	COBALT, DIS-SOLVED (UG/L AS CO) (01035)	COPPER, TOTAL RECOV-ERABLE (UG/L AS CU) (01042)	COPPER, DIS-SOLVED (UG/L AS CU) (01040)	IRON, TOTAL RECOV-ERABLE (UG/L AS FE) (01045)	IRON, DIS-SOLVED (UG/L AS FE) (01046)	LEAD, TOTAL RECOV-ERABLE (UG/L AS PB) (01051)	LEAD, DIS-SOLVED (UG/L AS PB) (01049)	MANGA-NESE, TOTAL RECOV-ERABLE (UG/L AS MN) (01055)
OCT												
28...	<3	<5	<5	<5	<5	<5	<5	330	<50	<50	<50	44
NOV												
23...	<3	<5	<5	<5	<5	<5	<5	1000	<50	<50	<50	100
JAN												
26...	<3	<5	<5	<5	<5	<5	<5	740	<50	<50	<50	47
MAR												
08...	<3	<5	<5	<5	<5	<5	<5	480	<50	<50	<50	31
APR												
12...	<3	<5	<5	<5	<5	<5	<5	790	<50	<50	<50	43
MAY												
17...	<3	<5	<5	<5	<5	<5	<5	230	<50	<50	<50	41
JUL												
19...	<3	<5	<5	<5	<5	<5	<5	830	<50	<50	<50	91
AUG												
11...	<3	<5	<5	<5	<5	<5	<5	650	<50	<5	<5	80
SEP												
15...	<3	<5	<5	<5	<5	<5	<5	230	55	<5	<5	94

05440520 KILLBUCK CREEK NEAR NEW MILFORD, IL--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DATE	MANGANESE, DISSOLVED (UG/L AS MN) (01056)	NICKEL, TOTAL RECOVERABLE (UG/L AS NI) (01067)	NICKEL, DISSOLVED (UG/L AS NI) (01065)	SILVER, TOTAL RECOVERABLE (UG/L AS AG) (01077)	SILVER, DISSOLVED (UG/L AS AG) (01075)	STRONTIUM, TOTAL RECOVERABLE (UG/L AS SR) (01082)	STRONTIUM, DISSOLVED (UG/L AS SR) (01080)	VANADIUM, TOTAL (UG/L AS V) (01087)	VANADIUM, DISSOLVED (UG/L AS V) (01085)	ZINC, TOTAL RECOVERABLE (UG/L AS ZN) (01092)	ZINC, DISSOLVED (UG/L AS ZN) (01090)
OCT											
28...	24	<5	<5	<3	<3.0	110	100	<5	<5	<100	<50
NOV											
23...	65	<5	<5	<3	<3.0	80	75	<5	<5	190	230
JAN											
26...	27	<5	<5	<3	<3.0	110	110	<5	<5	<50	<50
MAR											
08...	35	<5	<5	<3	<3.0	110	110	<5	<5	<50	<50
APR											
12...	9	<5	<5	<3	<3.0	110	110	<5	<5	<50	<100
MAY											
17...	30	<5	<5	<3	<3.0	110	110	<5	<5	<100	<50
JUL											
19...	30	<5	<5	<3	<3.0	90	91	<5	<5	<50	<50
AUG											
11...	35	<5	<5	<3	<3.0	80	83	<5	<5	<50	<50
SEP											
15...	77	<5	5	<3	<3.0	80	86	<5	<5	100	<100

H

APPENDIX H
DATA VALIDATION

Data generated though the collection and analysis of samples from the Site are used for Site characterization. Data usage can be limited by the quality of the sampling, transportation, and laboratory analysis. Data quality is assessed based on the laboratory and field quality control (QC) criteria described in the Pagel Pit RI/FS Quality Assurance Project Plan (QAPP). Assessment of data quality is made by the performing laboratory during analysis and by Warzyn during data validation. Laboratory QC is set forth in the Contract Laboratory Program Statement of Work and in the analytical methods presented in the QAPP. Guidelines established by the U.S. EPA (U.S.EPA, 1985 and 1988) were used as the basis for this data validation.

As a result of this validation process, data not meeting all required criteria are qualified with a letter or symbol code indicating the effect on data usability. Data validation qualifiers are defined in Appendix C-1. The qualifier symbols and definitions are consistent with U.S.EPA protocol, with the exception of the inorganic qualifier "B" (old qualifier, "[ ]" for less than the contract required detection limit), which has been replaced by "K" in later data summaries to avoid confusion with the organic data symbol, "B", for blank contamination.

Appendix C presents validated analytical results reported on a dry weight basis for all analyses. Both data validation qualifiers and laboratory qualifiers are presented in the tables. Due to changes in data reporting during this project, early rounds of metals data have non-detects reported in Appendix C tables as blanks, while later rounds list the laboratory detection limit and qualifiers. This does not affect the usability of the data. For all organic results, the laboratory qualifier "U" (undetected) has been omitted for clarity. A blank in the table generally indicates the compound was not detected in the sample, but the parameter list for that round of sampling should be consulted. The undetected ("U" qualifier) is listed only when a data validation qualifier is required.

The data validation process evaluates laboratory performance and sample-dependent criteria in order to assess precision and accuracy of the data. Sampling is monitored through the used of field blanks to show potential contamination introduced through collection devices or sampling conditions. Method blanks are prepared and analyzed in the laboratory along with the samples to identify contamination potentially introduced during analysis. Instrument performance is evaluated to identify the efficiency of the analysis. Matrix spike and duplicate analyses are used to identify sample matrix related problems. Raw data for each sample is reviewed for correctness and completeness of interpretation.

Based on this assessment, individual analyte results are qualified as to the usability of the data. General comments on qualified data are presented below.

Blank Contamination

Analyte concentrations judged to be the result of cross-contamination during sampling or analysis as indicated through analysis of field, trip, or laboratory blanks are qualified by raising the limit of detection appropriately. These data appear in the tables with the elevated detection limit and the validation qualifier "U".

It should be noted that only compounds with detection limits elevated during validation (due to blank contamination or matrix interference) have the data validation qualifier "U". Non-detects, while originally reported by the analytical lab with the laboratory qualifier "U", are identified in Appendix C tables by a blank. (Also consult parameter list for the particular round.) Sample concentrations greater than 5 times the blank level (or ten times for common laboratory contaminants) are reported, and qualified as "B". In all cases, the effect of the blank contamination was considered to be minimal and does not affect the overall use of the data.

Estimated Data

Analytical results are qualified as estimated when one or more QC criteria monitoring the quantitation accuracy and precision are not met, but the compound identification is

acceptable. Such data are still considered usable. These criteria include instrument tuning, performance and calibration specifications, and sample-specific problems related to matrix effects. The "J" qualifier does not indicate the direction or degree of the uncertainty for each qualified analyte. Estimated data are considered to be of sufficient quality to be used with unqualified data for site characterization.

Based on the data validation, the following general comments on estimated values should be noted:

- Hold times
  Volatile Organic Compound (VOC) analysis were performed by GC and confirmed by GC/MS. Validation guidelines specify 7 and 14 day hold times for aromatic and halogenated VOCs, respectively, while the analytical methods specify 14 days for all VOCs. GC results on some samples have been judged to be estimated due to missed hold times for aromatics. In these instances, the results have been qualified based on duration of the hold time prior to analysis. Where hold times were exceeded by one to seven days, the results were qualified as estimated. This is justified by the relative consistency between results for the different rounds. All hold times for GC/MS VOCs were within hold times.

- Laboratory Performance.
  Some results are qualified due to laboratory performance, including problems with instrument calibration and missed QC acceptance criteria. In each case, the specific problem was evaluated during data validation and qualified as indicated in the table of analytical results.

- Air Sample Analysis
  Samples collected for air analysis were held prior to analysis for 42 and 43 days. The QAPP specifies a hold time of 14 days. Based strictly on this criterion, all the data would be qualified as "R" (unusable). The analytical laboratory (Radian Corporation) has documented acceptable hold times of six weeks (42 days). In order to allow the limited use of these data, all results have been qualified as "J" (estimated), and all detection limits as "UJ" (undetected, estimated DL) based on hold time criteria.

The quality of the air data is questionable based upon accuracy and precision criteria. The long hold time may have contributed to both the loss of some compounds through degradation and the gain of others through contamination during storage. Surrogate recoveries were outside criteria limits for at least one surrogate in all samples. Internal standard results were below QC criteria in four samples. No Matrix Spike analyses were performed. The field duplicates, while collected at different flow rates, show similar total mass (in ng) results prior to concentration calculations, instead of similar concentration results, which would be expected. Similar results for both Site samples and samples from other Warzyn projects analyzed at this laboratory indicate possible laboratory contamination problems. A confirmatory sampling round was not performed, nor were split samples analyzed by a different laboratory. The user is cautioned to consider the data quality objectives of the project task when using the air data in Site analysis.

Unusable Data

When individual analyte results are judged to be unusable, the qualifier "R" is applied. Data may be considered unusable as a result of analytical difficulties, due either to difficult sample matrices or to laboratory problems, including missed hold times, instrument tuning, calibration, or performance problems, or poor or ambiguous sample data. Unusable data do not meet compound identification criteria, does not provide defensible information about the presence or absence of a particular compound or analyte, and should not be used for site characterization.

Based on the data validation, the following data were qualified as unusable:

Volatile Organic Compounds (VOC) analysis by GC on leachate samples resulted in unusable data for either groups of compounds or the entire list of compounds for some samples. This is due to matrix interferences, demonstrated by surrogate compound recoveries below the acceptable QC limits. Surrogates are added to the sample prior to analysis and monitor the recovery of the target compounds. The leachate matrix proved to be not amenable to the GC detectors, particularly for the halogenated compounds (Hall detector). Recoveries for the aromatic compounds (PID detector) also appeared to be affected. Samples run undiluted were affected most severely, those requiring dilutions to a lesser degree. For those samples where surrogate

recovery was within acceptable QC limits, but still low, poor recovery indicates the difficulties encountered with the sample matrix, and probably a low bias of compound concentrations. Refer to Appendix C tables for specific compounds and samples that are qualified as unusable.

VOC analysis by GC/MS provided more acceptable results. Some results for 2-butanone were qualified as unusable due to calibration response factors less than the QC criteria.

Some VOC leachate samples exceeded hold times (greater than seven days past hold times) and were qualified as unusable.

Air VOC analysis results for 2-butanone have been qualified as "R" (unusable) due to extremely poor recovery in calibration standards. Air sample TIC results are considered unusable due to incorrect calculations and missing library searches for some peaks.

Metals results for aluminum and potassium on sediment samples are unusable due to low recoveries for laboratory control spikes.

Only data with the validation qualifier "R" are considered unusable. The remaining data are of sufficient quality to be used for interpretation and will support the conclusions made in this report.

APPENDIX I

ECAO TOXICITY VALUES

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL CRITERIA AND ASSESSMENT OFFICE
CINCINNATI, OHIO 45268

NOV 0 9 1990

Subject: Toxicity Values (Pagel's Pit/Illinois)

From: Pei-Fung Hurst
Coordinator
Superfund Health Risk Technology Support Center
Chemical Mixtures Assessment Branch

To: Bernard J. Schorle
U.S. EPA
Region V

Thru: W. Bruce Peirano
Acting Chief
Chemical Mixtures Assessment Branch

This memo is in response to the request by your contractor, Mike Kierski of Warzyn Engineering, regarding the most recent and relevant information available to us regarding oral and dermal reference doses (RfD) and carcinogenicity slope factors for the list of chemicals provided. In the information that follows, not available indicates that criteria were not derived in a U.S. EPA document.

Please do not hesitate to contact me at FTS 684-7300 if I can be of further assistance.

Attachment

cc: C. DeRosa (ECAO-Cin)
M. Kierski (Warzyn Engineering)
B. Means (OS-230)
T. O'Bryan (OS-230)

513-569-7300

Table 1. Oral Absorption Factors

Chemical	EPA Documents	ATSDR
Aluminum	HEA 1987 Animals: No data Humans: Some absorption	No ATSDR
Antimony	HEA 1987 Animals: 1-15% Humans: No data	No ATSDR
Arsenic	HEA 1984 Animals: 30-98% Humans: 60-95%	Animals: 30-75% Humans: 46-95%
Copper	DWCD 1987 Animals and Humans: Some absorption but not quantifiable	Animals: absorbed but not quantifiable Human: 15-97%
Iron	HEA 1984 Animals and Humans: 1-25% depending upon the presence of heme	No ATSDR
Lead	HEA 1984 Animals and Humans: absorbed but not quantifiable	No ATSDR
Inorganic Mercury	HEA 1984 Animals: <0.01% Humans: <15%	Animals: 15% Humans: 1-38%
Alkyl Mercury	HEA 1984 Animals: No data Humans: essentially complete absorption	Animals: 95% Humans: >80%

Chemical	EPA Document	ATSDR
Silver	DWCD 1988 Animals: 1-3% Humans: Absorbed but not quantifiable	No ATSDR
1,1,2-Trichloroethane	HEA 1984 Animals and Humans: Rapidly absorbed by anology to similar compounds	Animals: >81% Humans: No data

Toxicity Values for Pagel's Pit

Aluminum

Oral RfD. Not available. The HEA (U.S. EPA, 1987) for aluminum considers the data base for aluminum inadequate for the derivation of an RfD.

Oral slope factor. Not available. A cancer classification of C was assigned to aluminum in the HEA (U.S. EPA, 1987), however, a slope factor was not calculated.

U.S. EPA. 1987. Health Effects Assessment for Aluminum. Prepared by the Office of Health and Environmental Assessment, Environmental Criteria and Assessment Office, Cincinnati, OH. For the Office of Solid Waste and Emergency Response, Washington, D.C.

Antimony

Oral RfD. Verified oral RfD of 4E-4 mg/kg/day.

Oral slope factor. Not available.

Calcium

Oral RfD. Not available.

Oral slope factor. Not available.

Cobalt

Oral RfD. An interim oral RfD of 1E-5 mg/kg/day has been calculated by the TSC and detailed information available upon request.

Oral slope factor. Not available.

Copper

Oral RfD. Not available. The current drinking water standard is 1.3 mg/L. The Drinking Water Criteria Document concluded that the toxicity data were inadequate for calculation of an RfD for copper (U.S. EPA, 1987).

Oral slope factor. Not available. The verified cancer classification for copper is D, thus data are inadequate for derivation of a cancer slope factor.

U.S. EPA. 1987. Drinking Water Criteria Document for Copper. Prepared by the Office of Health and Environmental Assessment, Environmental Criteria and Assessment Office, Cincinnati, OH for the Office of Emergency and Remedial Response, Washington D.C.

2,4-Dimethylphenol

Oral RfD. Verified oral RfD of 2E-2 mg/kg/day, pending input onto IRIS.

Oral slope factor. Not available.

Iron

Oral RfD. Not available. The HEA (U.S. EPA, 1984) considered the database to be insufficient for the derivation of an RfD.

Oral slope factor. Not available.

U.S. EPA. 1984. Health Effects Assessment for Iron. Prepared by the Office of Health and Environmental Assessment, Environmental Criteria and Assessment Office, Cincinnati, OH. For the Office of Solid Waste and Emergency Response, Washington, D.C.

Lead

Oral RfD. Not available. It appears that some of the effects associated with lead exposures, particularly changes in the levels of certain blood enzymes and in aspects of children's neurobehavioral development, may occur at blood levels so low as to be essentially without a threshold. The Agency's RfD Work Group has discussed inorganic lead (and lead compounds) at two meetings and considered it inappropriate to develop RfDs and RfCs for inorganic lead. An Uptake/Biokinetic Model for lead has been developed by ECAO and we can run the model to predict blood levels and potential health effects if site specific values can be provided to us.

Oral slope factor. Not available. The CRAVE Work Group recommends that a numerical estimate not be used because quantifying lead's cancer risk involves many uncertainties, some of which may be unique to lead. Age, health, nutritional state, body burden, and exposure duration influence the absorption, release, and excretion of lead. It is also felt that current knowledge of lead pharmacokinetics indicates that an estimate derived by standard procedures would not truly describe the potential risk.

Magnesium

Oral RfD. Not available.

Oral slope factor. Not available.

Mercury

Oral RfD. Verified oral RfD for inorganic mercury of 3E-4 mg/kg/day, this RfD is pending input onto IRIS. There is also a verified oral RfD for methyl mercury of 3E-4 (mg/kg/day). The RfD for methyl mercury is currently being reconsidered by the RfD Work Group.

Oral slope factor. Not available. There is a verified cancer classification for mercury of D, thus the data are inadequate for the derivation of a cancer slope factor.

2-Methylphenol

Oral RfD. Not available.

Oral slope factor. Not available.

Potassium

Oral RfD. Not available.

Oral slope factor. Not available.

Silver

Oral RfD. Verified oral RfD of 3E-3 mg/kg/day.

Oral slope factor. Not available. Verified cancer classification of D, thus data are inadequate for the derivation of a cancer slope factor.

Sodium

Oral RfD. Not available.

Oral slope factor. Not available.

1,1,2-Trichloroethane

Oral RfD. An oral RfD of 4E-3 mg/kg/day is available on IRIS.

Oral slope factor. Group C Classification with an oral slope factor of 5.7E-2 $(mg/kg/day)^{-1}$ available on IRIS.

Dermal Route of Exposure

Because toxicity values for dermal exposure are generally not available, current EPA methods specify that dermal toxicity values are to be extrapolated only from values derived for oral exposure. Adequate dermal toxicity data are sometimes available for carcinogenicity (e.g., skin painting studies). These studies can be used to support or oppose the appropriateness of route-to-route extrapolation, but there is currently no EPA method for using dermal data as the basis for a toxicity value. Since dermal exposure is expressed as an absorbed dose, oral toxicity values used for dermal risk assessment must also be expressed as an absorbed dose, Most oral toxicity values are expressed as administered doses and therefore will require absorption adjustment. Slope factors are adjusted to an absorbed dose by dividing by percent oral absorption, and reference doses are adjusted by multiplying by percent oral absorption.