THE CITY OF KINGSVILLE LANDFILL

TCEQ PERMIT MSW 235-C

PERMIT AMENDMENT APPLICATION

Volume 3 of 6

City of Kingsville
TEXAS

CITY OF KINGSVILLE, TEXAS

September 2018
Revision 0

STATE OF TEXAS
JON M. REINHARD
64541
LICENSED PROFESSIONAL ENGINEER
09/12/18

Prepared by

HANSON
Engineering | Planning | Allied Services

HANSON PROJECT NO. 16L0438-0003

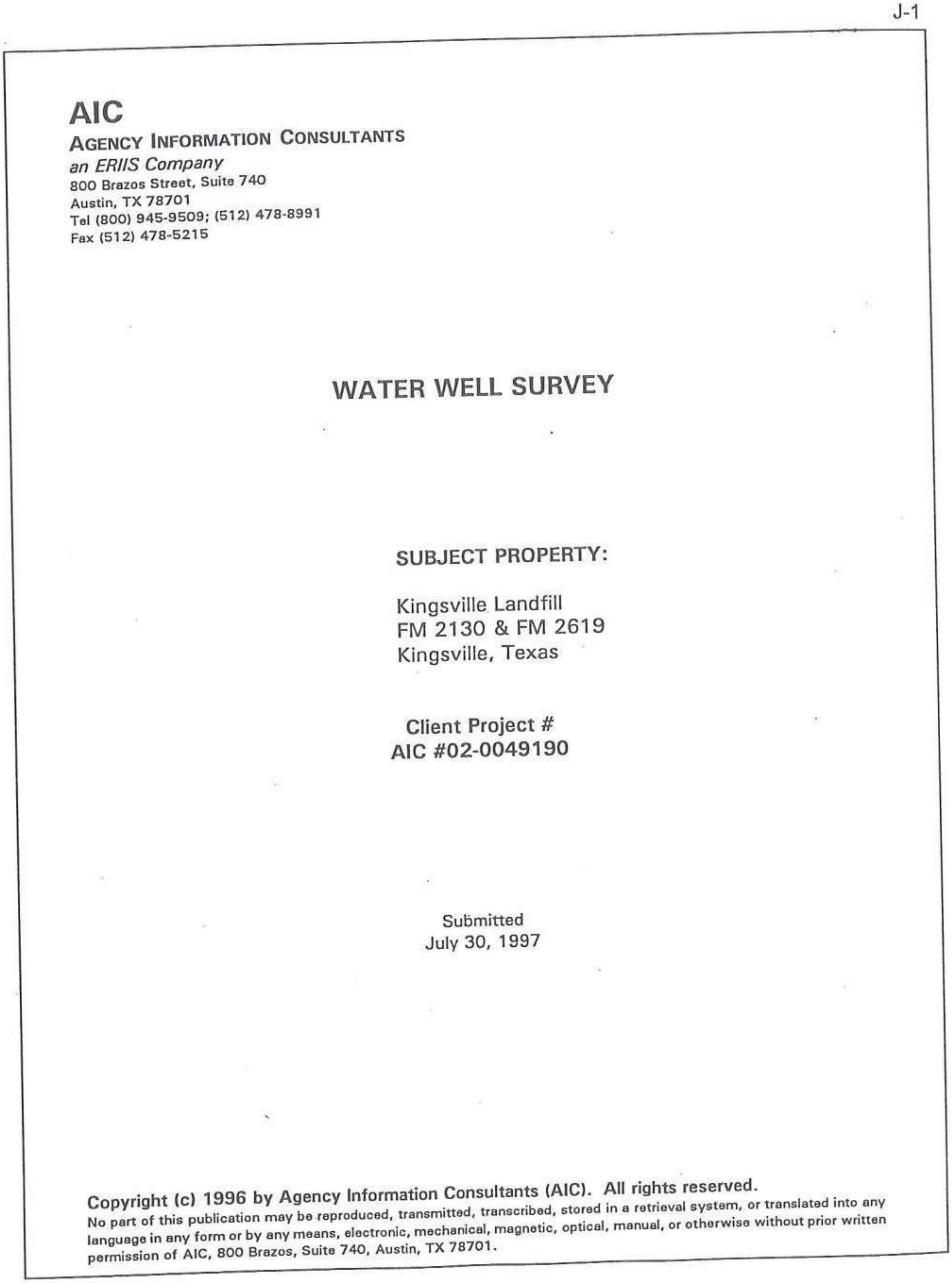
ATTACHMENT J

APPENDIX J

WATER WELL SURVEY

APPENDIX J (CONTINUED)

November 1997



J-1

AIC
AGENCY INFORMATION CONSULTANTS
an ERIIS Company
800 Brazos Street, Suite 740
Austin, TX 78701
Tel (800) 945-9509; (512) 478-8991
Fax (512) 478-5215

WATER WELL SURVEY

SUBJECT PROPERTY:

Kingsville Landfill
FM 2130 & FM 2619
Kingsville, Texas

Client Project #
AIC #02-0049190

Submitted
July 30, 1997

J-

WATER WELL SURVEY

Research Protocol

Agency Information Consultants (AIC) reviews records at the Texas Water Development Board (TWDB) and the Texas Natural Resource Conservation Commission (TNRCC) to obtain information concerning public and private water wells within the requested Area of Review (AOR). As documentation, AIC locates identified wells on a color copy of a USGS 7.5 Minute Topographic Map and provides copies of Drillers' Logs.

AIC cannot guarantee the accuracy of the information provided by state agencies. This report is intended to provide the user with a "working approximation" of reported well locations. Following are the specific research procedures utilized to produce the results in this report.

- ▲ Identify all Located Wells within the AOR according to the TWDB files, county highway maps and topographic maps.
- ▲ Identify all Plotted Wells within the AOR according to the TWDB county highway maps.
- ▲ Identify all Partially Numbered Wells within the AOR according to the TNRCC files containing records submitted by the well driller.
- ▲ Identify all Unnumbered Wells within the AOR according to the TNRCC files containing records submitted by the well driller.

As part of the standard Water Well Survey Protocol, AIC does not review Plugged & Abandoned or Unplotted Well files. These files can be reviewed upon special request by the client.

Description of Terms

Located Water Well:	Well locations that have been field checked by a TWDB or USGS staff member, spotted on a USGS 7.5' topographical or county highway map, assigned an unique identification number, and filed at the TWDB.
Plotted Water Well:	Approximate well locations spotted on county highway maps by the TWDB staff members according to information submitted on the Driller's Log. The state assigned unique identification numbers to these wells, but in high density areas, a single identification number may represent multiple well locations. The TWDB eliminated this plotting activity in June 1986.
Partially Numbered Water Well:	Well locations established to within a 2.5 minute topographic quadrangle by the TNRCC according to maps submitted with the Driller's Log. The TNRCC assigned a State ID Number corresponding to this generalized location. This procedure for records processing has been in effect since June 1986.

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WATER WELL SURVEY

Unnumbered Water Well: Well locations are not assigned by either the TWDB or the TNRCC. The Driller's Log and any corresponding maps are filed by county at the TNRCC. This procedure for records processing has been in effect since June 1991.

Thank you for your order.

If you have any questions or comments regarding this report, please call AIC at (800)945-9509 or locally at (512)478-8991.

DISCLAIMER
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WATER WELL SURVEY

REPORT SUMMARY

Submitted July 30, 1997

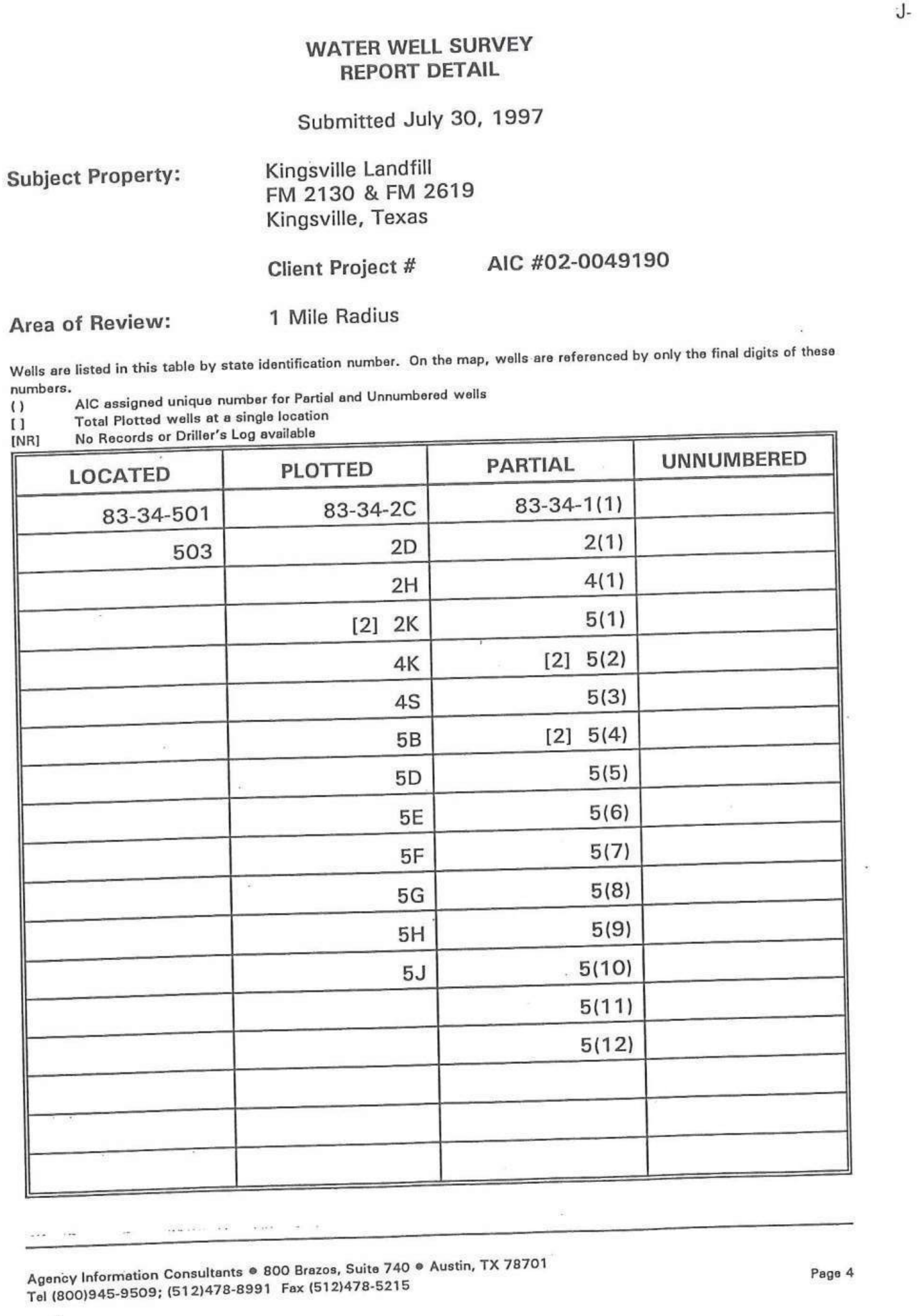
Subject Property: Kingsville Landfill
FM 2130 & FM 2619
Kingsville, Texas

Client Project # **AIC #02-0049190**

Area of Review: 1 Mile Radius

WELL TYPE	TOTAL NUMBER FOUND
Located Water Wells	2
Plotted Water Wells	14
Partially Numbered Water Wells	17
Unnumbered Water Wells	0
TOTAL NUMBER FOUND	33

NOTE: When well drillers do not submit a locational map or when maps are misplaced in state files, AIC may not be able to determine the exact well location. When the exact location of a well can not be determined, it is still included in the above totals. Any available records are labeled "LU" for Location Unknown and are included in the Records Section of the report.



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WATER WELL SURVEY
REPORT DETAIL

Submitted July 30, 1997

Subject Property: Kingsville Landfill
FM 2130 & FM 2619
Kingsville, Texas

Client Project # AIC #02-0049190

Area of Review: 1 Mile Radius

Wells are listed in this table by state identification number. On the map, wells are referenced by only the final digits of these numbers.

( )	AIC assigned unique number for Partial and Unnumbered wells
[ ]	Total Plotted wells at a single location
[NR]	No Records or Driller's Log available

LOCATED	PLOTTED	PARTIAL	UNNUMBERED
83-34-501	83-34-2C	83-34-1(1)	
503	2D	2(1)	
	2H	4(1)	
	[2] 2K	5(1)	
	4K	[2] 5(2)	
	4S	5(3)	
	5B	[2] 5(4)	
	5D	5(5)	
	5E	5(6)	
	5F	5(7)	
	5G	5(8)	
	5H	5(9)	
	5J	5(10)	
		5(11)	
		5(12)	

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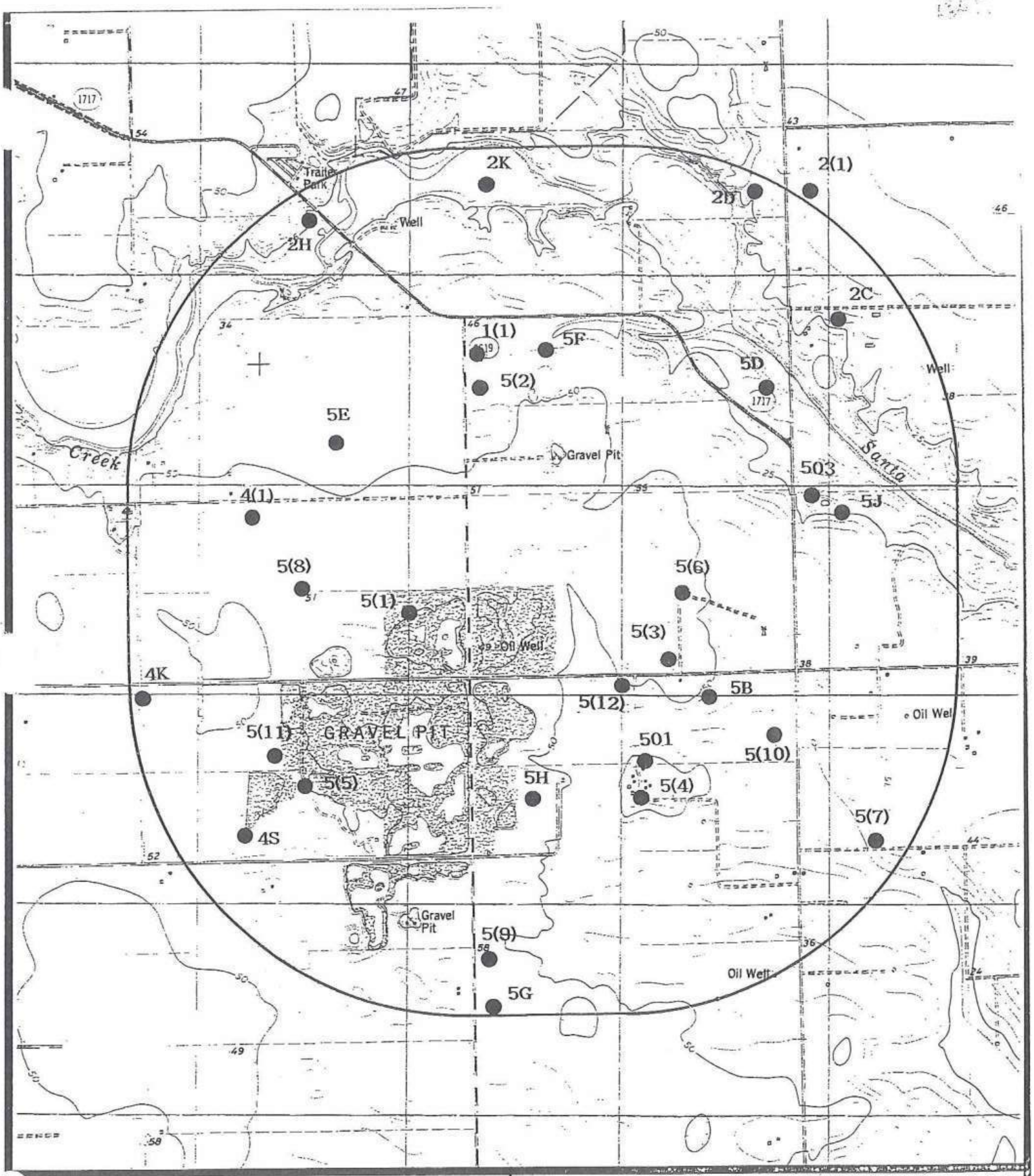

Finch Energy & Environmental

Subject Property:
Kingsville Landfill, FM 2130 & FM 2619, Kingsville, TX

1 Mile Water Well Survey
Prepared by Agency Information Consultants
AIC #02-0049190 07/28/97

Ricardo, TX (1979)
7.5′ USGS Quad, Scale 1:24000

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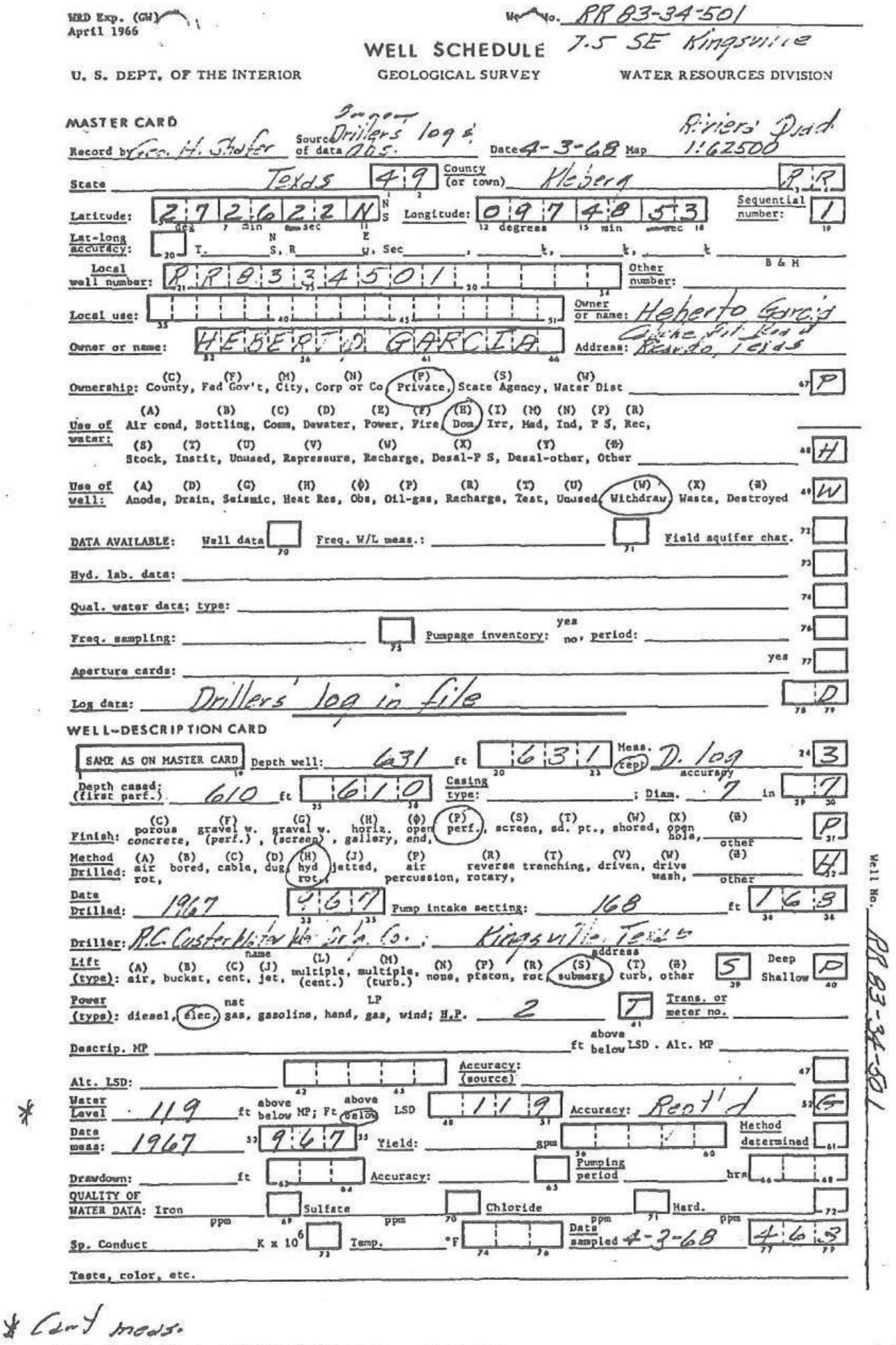


WRD Exp. (GW)
April 1966

Well No. RR 83-34-501

WELL SCHEDULE

7.5 SE Kingsville

U. S. DEPT. OF THE INTERIOR GEOLOGICAL SURVEY WATER RESOURCES DIVISION

MASTER CARD

Record by Geo. H. Shafer Source of data Driller's log & Owner Obs. Date 4-3-68 Map Riviera Quad 1:62500

State Texas 4 9 County (or town) Kleberg R R

Latitude: 2 7 2 6 2 2 N (deg, min, sec) Longitude: 0 9 7 4 8 5 3 (degrees, min, sec) Sequential number: 1

Lat-long accuracy: ☐ T. ___ N S, R ___ E W, Sec ___, ___ ¼, ___ ¼, ___ ¼ ___ B & M

Local well number: R R 8 3 3 4 5 0 1 Other number: ___

Local use: ☐ Owner or name: Heberto Garcia

Owner or name: HEBERTO GARCIA Address: Ojo de Agua Pit Road Ricardo, Texas

Ownership: (C) County, (F) Fed Gov't, (M) City, (N) Corp or Co, [✓ (P) Private], (S) State Agency, (W) Water Dist ___ 67 P

Use of water: (A) Air cond, (B) Bottling, (C) Comm, (D) Dewater, (E) Power, (F) Fire, [✓ (H) Dom], (I) Irr, (M) Med, (N) Ind, (P) P S, (R) Rec, (S) Stock, (T) Instit, (U) Unused, (V) Repressure, (W) Recharge, (X) Desal-P S, (Y) Desal-other, (Z) Other ___ 68 H

Use of well: (A) Anode, (D) Drain, (G) Seismic, (H) Heat Res, (O) Obs, (P) Oil-gas, (R) Recharge, (T) Test, (U) Unused, [✓ (W) Withdraw], (X) Waste, (Z) Destroyed 69 W

DATA AVAILABLE: Well data ☐ 70 Freq. W/L meas.: ___ ☐ 71 Field aquifer char. 72 ☐

Hyd. lab. data: ___ 73 ☐

Qual. water data; type: ___ 74 ☐

Freq. sampling: ___ ☐ 75 Pumpage inventory: yes no, period: ___ 76 ☐

Aperture cards: ___ yes 77 ☐

Log data: Drillers' log in file 78 79 D

WELL-DESCRIPTION CARD

SAME AS ON MASTER CARD (1–19) Depth well: 631 ft 6 3 1 (20–23) Meas. [✓ rept] D. log accuracy 24 3

Depth cased: (first perf.) 610 ft 6 1 0 (25–28) Casing type: ___; Diam. 7 in 7 (29–30)

Finish: (C) porous concrete, (F) gravel w. (perf.), (G) gravel w. (screen), (H) horiz. gallery, (O) open end, [✓ (P) perf.], (S) screen, (T) sd. pt., (W) shored, (X) open hole, (Z) ___ other 31 P

Method Drilled: (A) air rot, (B) bored, (C) cable, (D) dug, [✓ (H) hyd rot], (J) jetted, (P) air percussion, (R) reverse rotary, (T) trenching, (V) driven, (W) drive wash, (Z) ___ other 32 H

Date Drilled: 1967 9 6 7 (33–35) Pump intake setting: 168 ft 1 6 8 (36–38)

Driller: R.C. Custer Water Well Drlg. Co. (name); Kingsville, Texas (address)

Lift (type): (A) air, (B) bucket, (C) cent, (J) jet, (L) multiple (cent.), (M) multiple (turb.), (N) none, (P) piston, (R) rot, [✓ (S) submerg], (T) turb, (Z) other 39 S Deep Shallow 40 D

Power (type): diesel, [✓ elec], nat gas, gasoline, hand, LP gas, wind; H.P. 2 41 T Trans. or meter no. ___

Descrip. MP ___ ft above below LSD . Alt. MP ___

Alt. LSD: ___ ☐ (42–45) Accuracy: (source) ___ 47 ☐

* Water Level 119 ft above below MP; Ft above [✓ below] LSD 1 1 9 (48–51) Accuracy: Rept'd 52 G

Date meas.: 1967 33 9 6 7 35 Yield: ___ gpm ☐ (56–60) Method determined ☐ 61

Drawdown: ___ ft ☐ (63–64) Accuracy: ___ ☐ 65 Pumping period ___ hrs ☐ (66–68)

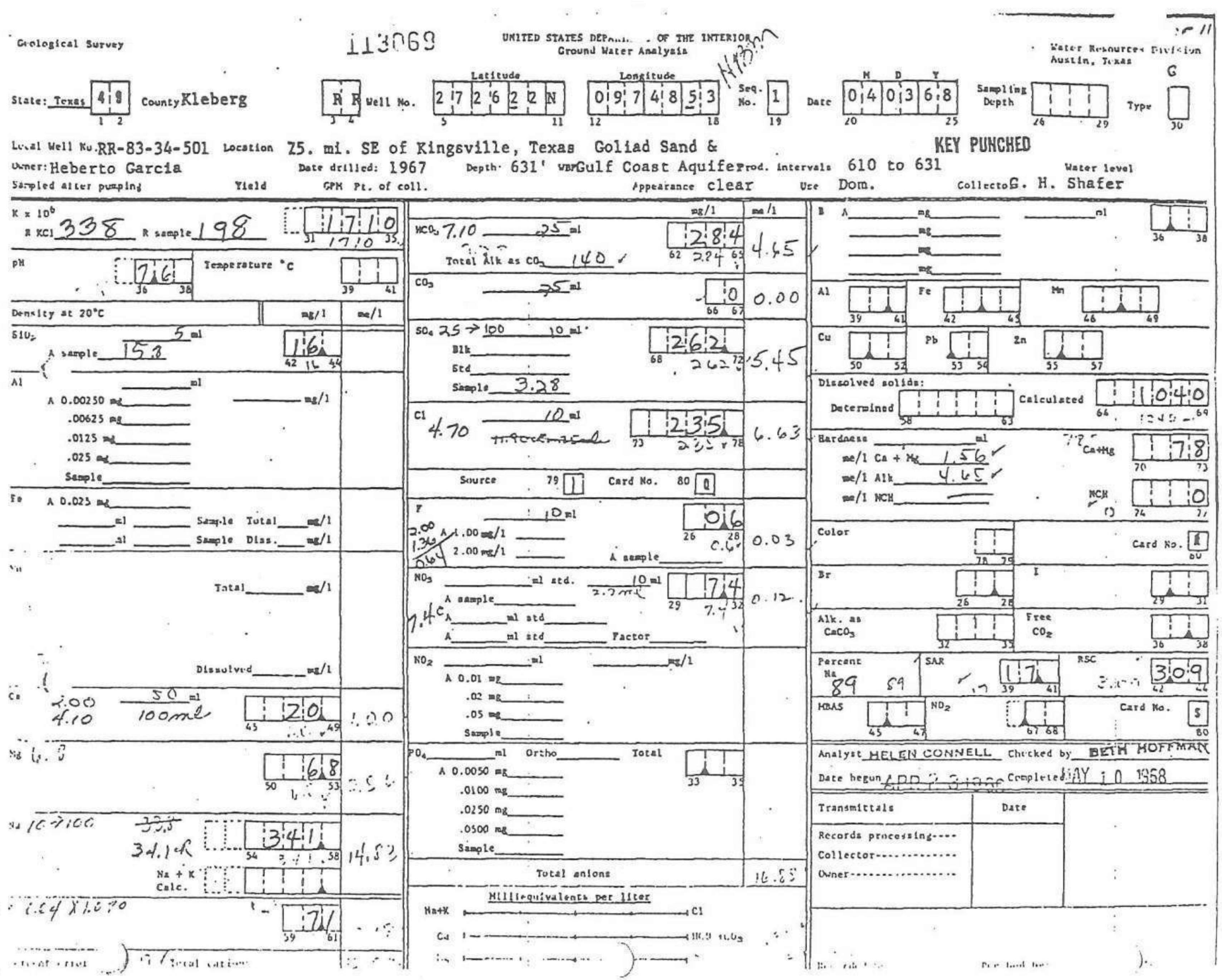
QUALITY OF WATER DATA: Iron ___ ppm ☐ 69 Sulfate ___ ppm ☐ 70 Chloride ___ ppm ☐ 71 Hard. ___ ppm ☐ 72

Sp. Conduct ___ K x 10^6 ☐ 73 Temp. ___ °F ☐ (74–76) Date sampled 4-3-68 4 6 8 (77–79)

Taste, color, etc. ___

Well No. RR 83-34-501

* Can't meas.



Geological Survey 113069 UNITED STATES DEP... OF THE INTERIOR Ground Water Analysis Water Resources Division Austin, Texas

N1 ?

:r 11

State: Texas 4 8 (1 2) County Kleberg R R (3 4) Well No. Latitude 2 7 2 6 2 2 N (5 11) Longitude 0 9 7 4 8 5 3 (12 18) Seq. No. 1 (19) Date M D Y 0 4 0 3 6 8 (20 25) Sampling Depth (26 29) Type G (30)

Local Well No. RR-83-34-501 Location 25. mi. SE of Kingsville, Texas Goliad Sand & KEY PUNCHED

Owner: Heberto Garcia Date drilled: 1967 Depth 631' WBFGulf Coast Aquifer Prod. intervals 610 to 631 Water level

Sampled after pumping Yield GPM Pt. of coll. Appearance clear Use Dom. Collector G. H. Shafer

K x 10^6 R KCl 338 R sample 198 1 7 1 0 (31 1710 35)

pH 7 6 (36 38) Temperature °C (39 41)

Density at 20°C mg/l me/l

SiO_2 5 ml A sample 15.3 1 6 (42 16 44)

Al ml A 0.00250 mg .00625 mg .0125 mg .025 mg Sample mg/l

Fe A 0.025 mg ml Sample Total mg/l; ml Sample Diss. mg/l

Mn Total mg/l

Dissolved mg/l

Ca 2.00 4.10 50 ml / 100ml 2 0 (43 49) 1.00

Mg 6.8 6 8 (50 53)

Na 10→100 33.3 34.1 3 4 1 (54 3.41 58) 14.83

Na + K Calc.

K 1.64 X 1.070 7 1 (59 61)

Total cations

HCO_3 7.10 25 ml Total Alk as CO_3 140 ✓ mg/l 2 8 4 (62 2.84 65) me/l 4.65 ✓

CO_3 25 ml 0 (66 67) 0.00

SO_4 25 → 100 10 ml Blk Std Sample 3.28 2 6 2 (68 262 72) 5.45

Cl 4.70 10 ml ~~11.90ml~~ 2 3 5 (73 235 78) 6.63

Source 79 1 Card No. 80 Q

F 10 ml 2.00 / 1.36 / 0.64 A 1.00 mg/l 2.00 mg/l A sample 0 6 (26 0.6 28) 0.03

NO_3 ml std. 10 ml 2.2 ml A sample 7.4c A ml std A ml std Factor 7 4 (29 7.4 32) 0.12

NO_2 ml mg/l A 0.01 mg .02 mg .05 mg Sample

PO_4 ml Ortho Total (33 35) A 0.0050 mg .0100 mg .0250 mg .0500 mg Sample

Total anions 16.85

Milliequivalents per liter Na+K — Cl Ca — HCO_3

B A mg mg mg mg ml (36 38)

Al (39 41) Fe (42 45) Mn (46 49)

Cu (50 52) Pb (53 54) Zn (55 57)

Dissolved solids: Determined (58 63) Calculated 1 0 4 0 (64 1040 69)

Hardness ml me/l Ca + Mg 1.56 ✓ me/l Alk 4.65 ✓ me/l NCH — 78 Ca+Mg 7 8 (70 73) NCH 0 0 (74 77)

Color (78 79) Card No. R (80)

Br (26 28) I (29 31)

Alk. as $CaCO_3$ (32 35) Free CO_2 (36 38)

Percent Na 89 89 SAR 1.7 1 7 (39 41) RSC 3.09 3 0 9 (42 44)

MBAS (45 47) NO_2 (67 68) Card No. S (80)

Analyst HELEN CONNELL Checked by BETH HOFFMAN

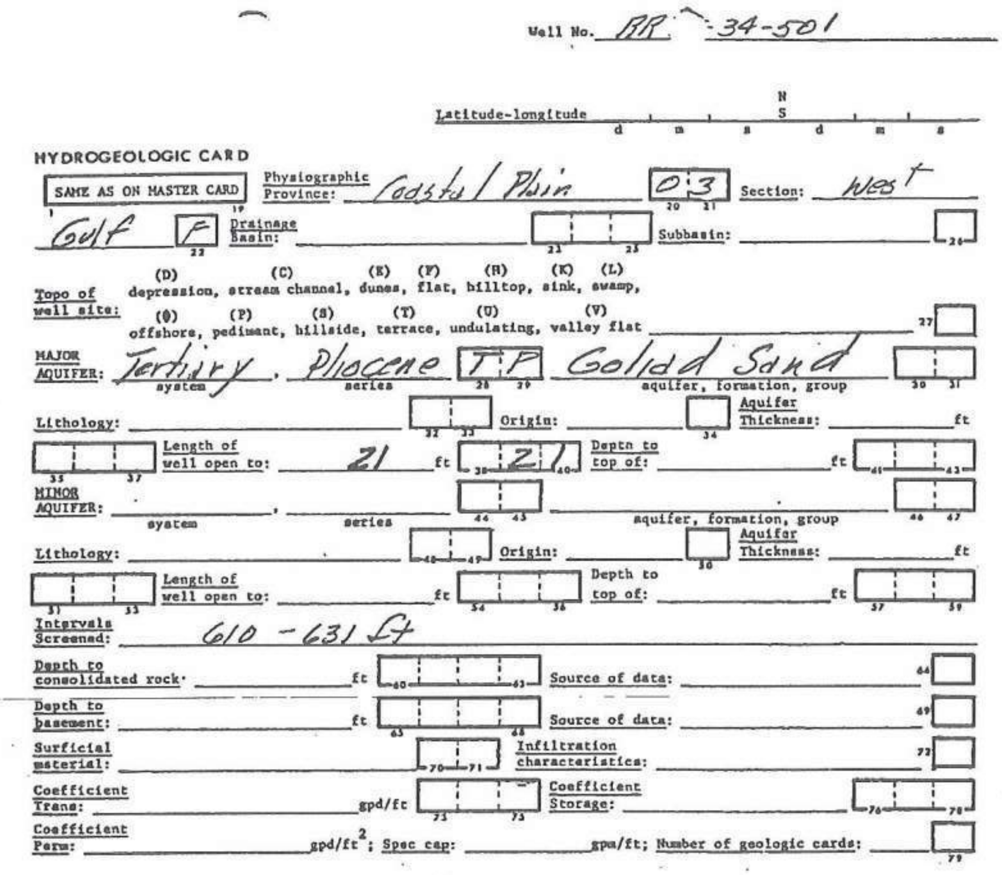
Date begun APR 2 3 1968 Completed MAY 1 0 1968

Transmittals Date

Records processing----

Collector-------------

Owner----------------



Well No. RR -34-501

Latitude-longitude d m s N S d m s

HYDROGEOLOGIC CARD

SAME AS ON MASTER CARD 1 19

Physiographic Province: Coastal Plain 03 20 21 Section: West Gulf F 22

Drainage Basin: ______ 23 25 Subbasin: ______ 26

Topo of well site: (D) depression, (C) stream channel, (E) dunes, (F) flat, (H) hilltop, (K) sink, (L) swamp, (O) offshore, (P) pediment, (S) hillside, (T) terrace, (U) undulating, (V) valley flat ______ 27

MAJOR AQUIFER: Tertiary system, Pliocene series TP 28 29 Goliad Sand aquifer, formation, group 30 31

Lithology: ______ 32 33 Origin: ______ 34 Aquifer Thickness: ______ ft

35 37 Length of well open to: 21 ft 21 38 40 Depth to top of: ______ ft 41 43

MINOR AQUIFER: ______ system, ______ series 44 45 ______ aquifer, formation, group 46 47

Lithology: ______ 48 49 Origin: ______ 50 Aquifer Thickness: ______ ft

51 53 Length of well open to: ______ ft 54 56 Depth to top of: ______ ft 57 59

Intervals Screened: 610 - 631 ft

Depth to consolidated rock: ______ ft 60 63 Source of data: ______ 64

Depth to basement: ______ ft 65 68 Source of data: ______ 69

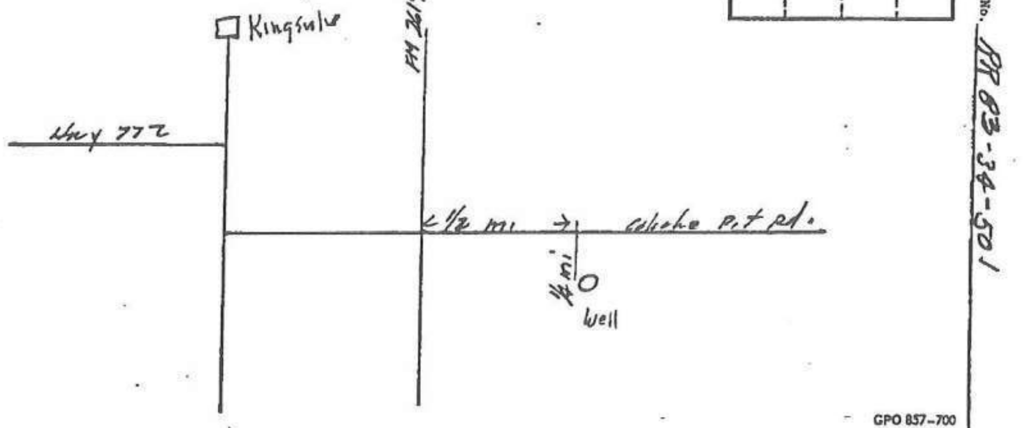
Surficial material: ______ 70 71 Infiltration characteristics: ______ 72

Coefficient Trans: ______ gpd/ft 73 75 Coefficient Storage: ______ 76 78

Coefficient Perm: ______ gpd/ft²; Spec cap: ______ gpm/ft; Number of geologic cards: ______ 79

21' screen sections

Rept'd: Water is undesirable(?) from all sands from 19' to 506'.



Well No. RR 83-34-501

GPO 857-700

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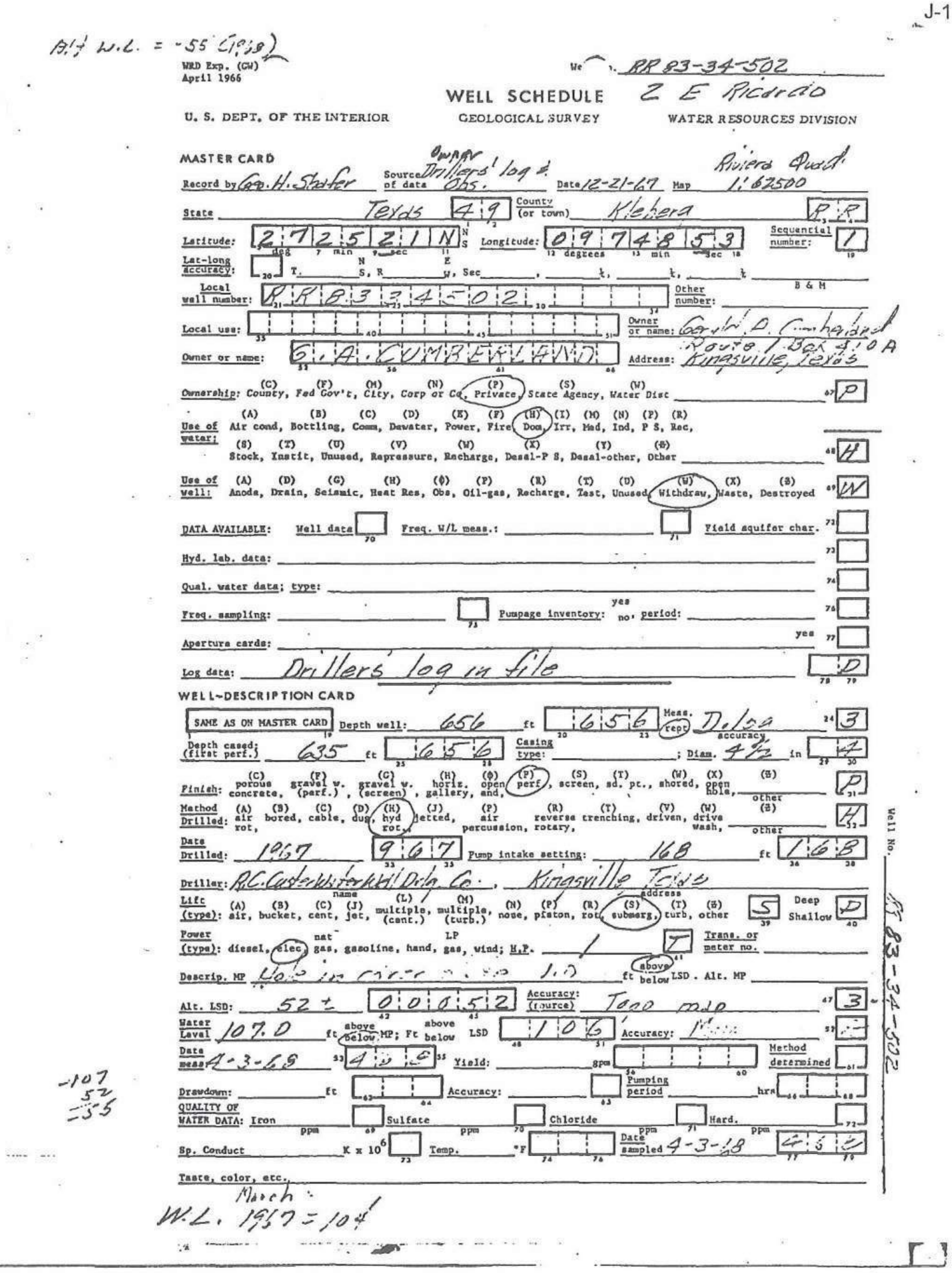


B.? W.L. = -55 (1958)

WRD Exp. (GW)
April 1966

We[illegible]. RR 83-34-502

WELL SCHEDULE Z E Ricardo

U. S. DEPT. OF THE INTERIOR GEOLOGICAL SURVEY WATER RESOURCES DIVISION

MASTER CARD

Record by Geo. H. Shafer Source of data Owner Drillers' log & Obs. Date 12-21-67 Map Riviera Quad 1:62500

State Texas 4 9 County (or town) Kleberg R R

Latitude: 2 7 2 5 2 1 N Longitude: 0 9 7 4 8 5 3 Sequential number: 1

Lat-long accuracy: ☐ T. ____ S, R ____ W, Sec ____, ____ ¼, ____ ¼, ____ ¼ ____ B & M

Local well number: R R 8 3 3 4 5 0 2 Other number:

Local use: Owner or name: Gerald D. Cumberland

Owner or name: G. A. CUMBERLAND Address: Route 1 Box 410 A Kingsville, Texas

Ownership: (C) County, (F) Fed Gov't, (M) City, (N) Corp or Co, [✓ (P) Private], (S) State Agency, (W) Water Dist P

Use of water: (A) Air cond, (B) Bottling, (C) Comm, (D) Dewater, (E) Power, (F) Fire, [✓ (H) Dom], (I) Irr, (M) Med, (N) Ind, (P) P S, (R) Rec, (S) Stock, (T) Instit, (U) Unused, (V) Repressure, (W) Recharge, (X) Desal-P S, (Y) Desal-other, (Z) Other H

Use of well: (A) Anode, (D) Drain, (G) Seismic, (H) Heat Res, (O) Obs, (P) Oil-gas, (R) Recharge, (T) Test, (U) Unused, [✓ (W) Withdraw], (X) Waste, (Z) Destroyed W

DATA AVAILABLE: Well data ☐ Freq. W/L meas.: ☐ Field aquifer char. ☐

Hyd. lab. data: ☐

Qual. water data; type: ☐

Freq. sampling: ☐ Pumpage inventory: yes no, period: ☐

Apertura cards: yes ☐

Log data: Drillers' log in file D

WELL-DESCRIPTION CARD

SAME AS ON MASTER CARD Depth well: 656 ft 6 5 6 Meas. [✓ rept] D.log accuracy 3

Depth cased: (first perf.) 635 ft 6 5 6 Casing type: ; Diam. 4½ in 4

Finish: (C) porous concrete, (F) gravel w. (perf.), (G) gravel w. (screen), (H) horiz. gallery, (O) open end, [✓ (P) perf], (S) screen, (T) sd. pt., (W) shored, (X) open hole, (Z) other P

Method Drilled: (A) air rot, (B) bored, (C) cable, (D) dug, [✓ (H) hyd rot], (J) jetted, (P) air percussion, (R) reverse rotary, (T) trenching, (V) driven, (W) drive wash, (Z) other H

Date Drilled: 1967 9 6 7 Pump intake setting: 168 ft 1 6 8

Driller: R.C. Custer Water Well Drlg. Co. name, Kingsville Texas address

Lift (type): (A) air, (B) bucket, (C) cent, (J) jet, (L) multiple (cent.), (M) multiple (turb.), (N) none, (P) piston, (R) rot, [✓ (S) submerg], (T) turb, (Z) other S Deep Shallow D

Power (type): diesel, [✓ elec], nat gas, gasoline, hand, LP gas, wind; H.P. 1 T Trans. or meter no.

Descrip. MP [illegible] 1.0 ft [✓ above] below LSD. Alt. MP

Alt. LSD: 52 ± 0 0 0 5 2 Accuracy: (source) Topo map 3

Water Level 107.0 ft above [✓ below] MP; Ft above below LSD 1 0 6 Accuracy: [illegible]

Date meas 4-3-68 4 [illegible] Yield: gpm Method determined ☐

Drawdown: ft Accuracy: ☐ Pumping period hrs

QUALITY OF WATER DATA: Iron ppm ☐ Sulfate ppm ☐ Chloride ppm ☐ Hard. ppm ☐

Sp. Conduct K x 10⁶ ☐ Temp. °F Date sampled 4-3-68 4 3 8

Taste, color, etc.

March
W.L. 1957 = 104'

-107
52
-55

Well No. RR 83-34-502

J-1

Well No. FR 8. 34-502

Latitude-longitude ___ d ___ m ___ s N/S ___ d ___ m ___ s

HYDROGEOLOGIC CARD

SAME AS ON MASTER CARD

Physiographic Province: Coastal Plain [0 3] Section: West Gulf [F]

Drainage Basin: ______ Subbasin: ______

Topo of well site: (D) depression, (C) stream channel, (E) dunes, (F) flat, (H) hilltop, (K) sink, (L) swamp, (O) offshore, (P) pediment, (S) hillside, (T) terrace, (U) undulating, (V) valley flat ______

MAJOR AQUIFER: Tertiary (system), Pliocene (series) [T P] Goliad Sand (aquifer, formation, group)

Lithology: ______ Origin: ______ Aquifer Thickness: ______ ft

Length of well open to: 21 ft [2 1] Depth to top of: ______ ft

MINOR AQUIFER: ______ (system), ______ (series) ______ (aquifer, formation, group)

Lithology: ______ Origin: ______ Aquifer Thickness: ______ ft

Length of well open to: ______ ft Depth to top of: ______ ft

Intervals Screened: 635-656 ft (1/8" x 1')

Depth to consolidated rock: ______ ft Source of data: ______

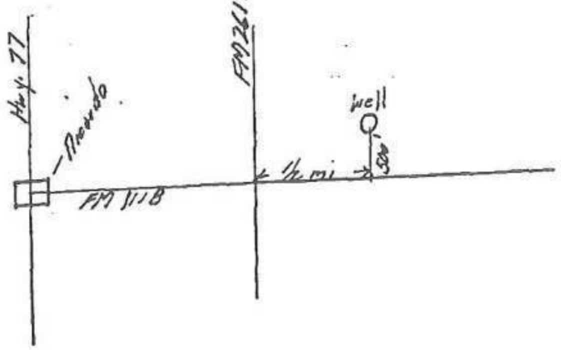
Depth to basement: ______ ft Source of data: ______

Surficial material: ______ Infiltration characteristics: ______

Coefficient Trans: ______ gpd/ft Coefficient Storage: ______

Coefficient Perm: ______ gpd/ft²; Spec cap: ______ gpm/ft; Number of geologic cards: ______

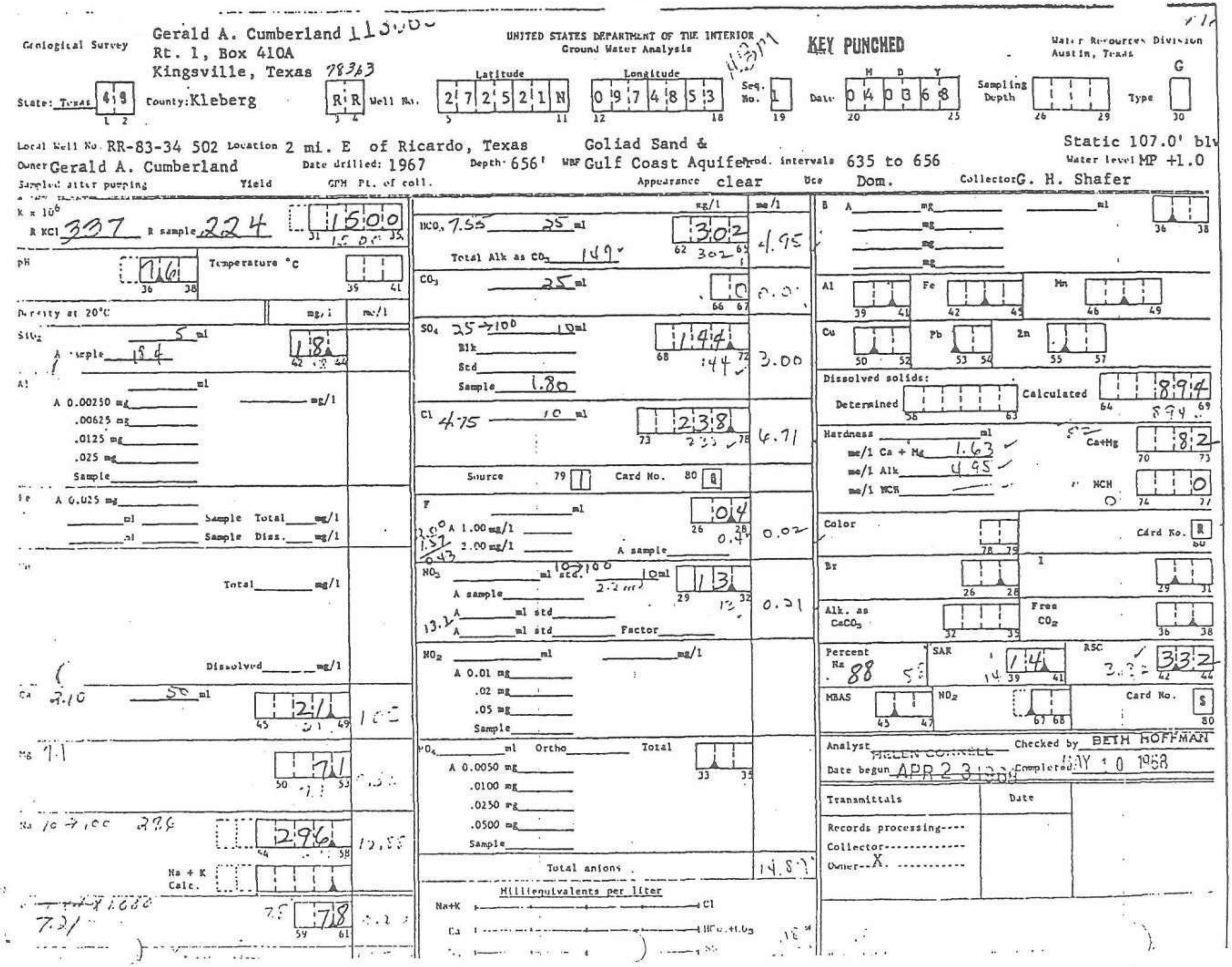
21' screen section,
4½-in csg. 0-635'
Rept'd: All sands from 0 to 571
contained undesirable(?) water.



GPO 857-700

Well No. FR 83-34-502

J-1



Geological Survey

UNITED STATES DEPARTMENT OF THE INTERIOR
Ground Water Analysis

KEY PUNCHED

Water Resources Division
Austin, Texas

Gerald A. Cumberland 113000
Rt. 1, Box 410A
Kingsville, Texas 78363

State: Texas 4 8 — County: Kleberg — R R Well No. 2 7 2 5 2 1 N (Latitude) — 0 9 7 4 8 5 3 (Longitude) — Seq. No. 1 — Date (M D Y) 0 4 0 3 6 8 — Sampling Depth — Type G

Local Well No. RR-83-34 502 Location 2 mi. E of Ricardo, Texas — Goliad Sand & Gulf Coast Aquifer — Static 107.0' blw

Owner Gerald A. Cumberland — Date drilled: 1967 — Depth 656' — WBF — Prod. intervals 635 to 656 — Water level MP +1.0

Sampled after pumping — Yield — GPM Pt. of coll. — Appearance clear — Use Dom. — Collector G. H. Shafer

K x 10⁶ R KCl 337 R sample 224 — 1500 (31–35) 1500

pH 7.6 (36–38) — Temperature °C (39–41)

Density at 20°C — mg/l — me/l

SiO₂ 5 ml — A sample 15.4 — 18 (42–44)

Al ml — A 0.00250 mg — .00625 mg — .0125 mg — .025 mg — Sample — mg/l

Fe A 0.025 mg — ml Sample Total mg/l — ml Sample Diss. mg/l

Mn Total mg/l — Dissolved mg/l

Ca 2.10 — 50 ml — 21 (45–49) — 1.05

Mg 7.1 — 7.1 (50–53)

Na 10 → 100 296 — 296 (54–58) — 12.88

Na + K Calc.

K 7.31 — 7.8 (59–61)

	mg/l	me/l
HCO₃ 7.55 — 25 ml — Total Alk as CO₃ 149	302 (62–65) 302	4.95
CO₃ 25 ml	0 (66–67)	0.0
SO₄ 25 → 100 10 ml — Blk — Std — Sample 1.80	144 (68–72) 144	3.00
Cl 4.75 — 10 ml	238 (73–78) 238	6.71
Source 79 [1] — Card No. 80 [Q]		
F ml — 2.00 A 1.00 mg/l — 1.57 2.00 mg/l — 0.43 — A sample	04 (26–28) 0.4	0.02
NO₃ ml std. 10 → 100 10 ml 2.2 ml — A sample — 13.2 A ml std — A ml std Factor	13 (29–32) 13	0.21
NO₂ ml mg/l — A 0.01 mg — .02 mg — .05 mg — Sample		
PO₄ ml Ortho Total — A 0.0050 mg — .0100 mg — .0250 mg — .0500 mg — Sample	(33–35)	
Total anions		14.87

Milliequivalents per liter
Na+K — Cl
Ca — HCO₃+CO₃
Mg — SO₄

B A mg ml (36–38)

Al (39–41) — Fe (42–45) — Mn (46–49)

Cu (50–52) — Pb (53–54) — Zn (55–57)

Dissolved solids: Determined (56–63) — Calculated 894 (64–69) 894

Hardness ml — me/l Ca + Mg 1.63 — me/l Alk 4.95 — me/l NCH — Ca+Mg 82 (70–73) — NCH 0 (74–77)

Color (78–79) — Card No. R (80)

Br (26–28) — I (29–31)

Alk. as CaCO₃ (32–35) — Free CO₂ (36–38)

Percent Na 88 — SAR 14 1.4 (39–41) — RSC 3.32 (42–44)

MBAS (43–47) — NO₂ (67–68) — Card No. S (80)

Analyst HELEN CORNELL — Checked by BETH HOFFMAN
Date begun APR 23 1968 — Completed MAY 10 1968

Transmittals	Date
Records processing----	
Collector-------------	
Owner--X. ----------	

J-1

CROSS REFERENCE SHEET

Name or Subject CR-GWTD
KLEBERG Located Well Data
RR 83-34-503

Date

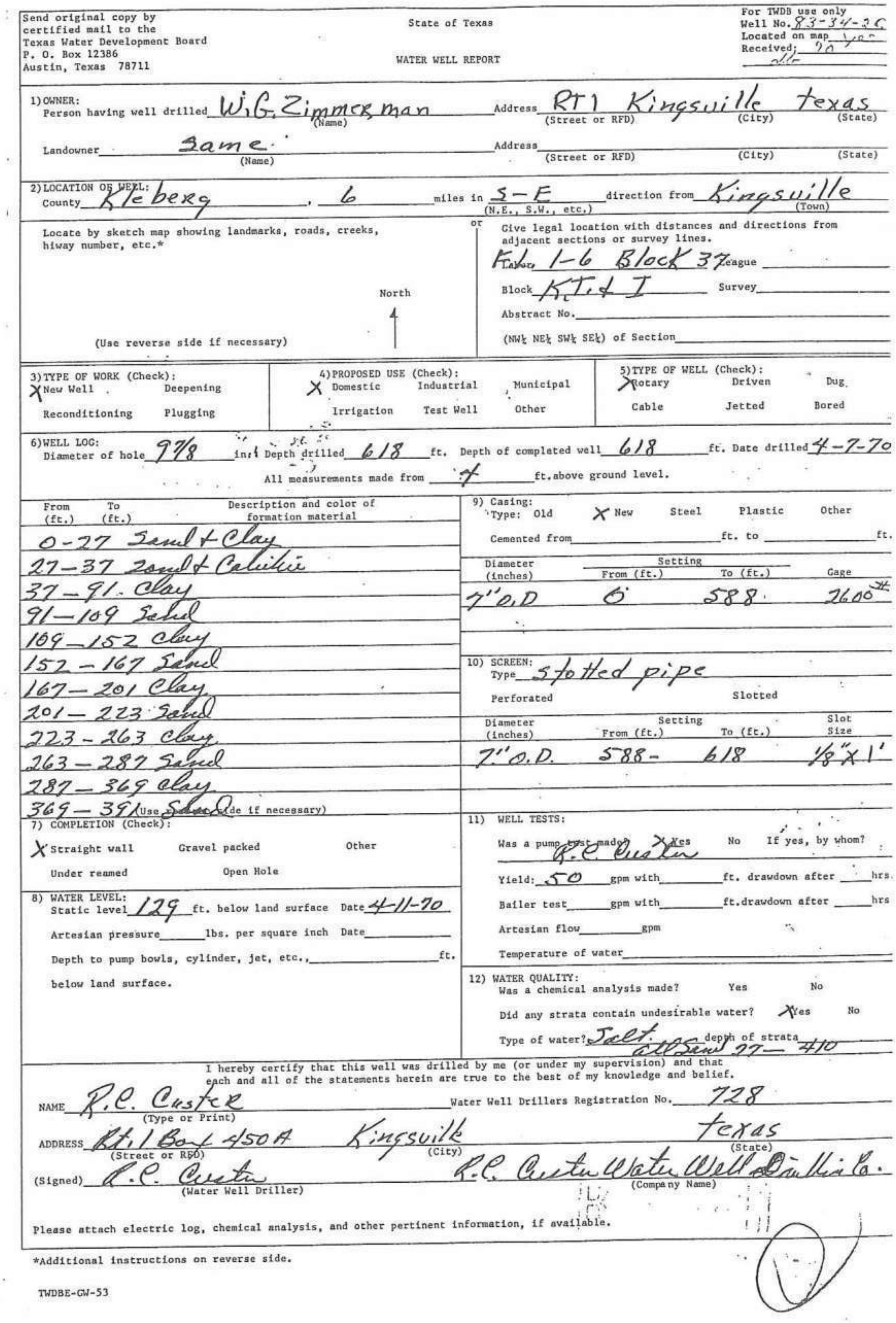
Regarding Electric Log

SEE

Name or Subject GW-SC
ELECTRIC LOG FILE Q-18

TWDBS-M-3

J-1



Send original copy by
certified mail to the
Texas Water Development Board
P. O. Box 12386
Austin, Texas 78711

State of Texas

WATER WELL REPORT

For TWDB use only
Well No. 83-34-2C
Located on map yes
Received: 20

1) OWNER:
Person having well drilled W.G. Zimmerman (Name) Address RT1 (Street or RFD) Kingsville (City) texas (State)

Landowner Same (Name) Address (Street or RFD) (City) (State)

2) LOCATION OF WELL:
County Kleberg, 6 miles in S-E (N.E., S.W., etc.) direction from Kingsville (Town)

Locate by sketch map showing landmarks, roads, creeks, hiway number, etc.*

North

(Use reverse side if necessary)

or Give legal location with distances and directions from adjacent sections or survey lines.
Labor [illegible] 1-6 Block 37 League
Block K.T. & I Survey
Abstract No.
(NW¼ NE¼ SW¼ SE¼) of Section

3) TYPE OF WORK (Check): [✓ New Well] Deepening Reconditioning Plugging

4) PROPOSED USE (Check): [✓ Domestic] Industrial Municipal Irrigation Test Well Other

5) TYPE OF WELL (Check): [✓ Rotary] Driven Dug Cable Jetted Bored

6) WELL LOG:
Diameter of hole 9 7/8 in. Depth drilled 618 ft. Depth of completed well 618 ft. Date drilled 4-7-70
All measurements made from 4 ft. above ground level.

From (ft.)	To (ft.)	Description and color of formation material
0	27	Sand + Clay
27	37	Sand + Caliche
37	91	Clay
91	109	Sand
109	152	Clay
152	167	Sand
167	201	Clay
201	223	Sand
223	263	Clay
263	287	Sand
287	369	Clay
369	391	Sand

(Use reverse side if necessary)

9) Casing:
Type: Old [✓ New] Steel Plastic Other
Cemented from ft. to ft.

Diameter (inches)	Setting From (ft.)	Setting To (ft.)	Gage
7" O.D	0	588	2600#

10) SCREEN:
Type slotted pipe
Perforated Slotted

Diameter (inches)	Setting From (ft.)	Setting To (ft.)	Slot Size
7" O.D.	588-	618	1/8" x 1'

7) COMPLETION (Check):
[✓ Straight wall] Gravel packed Other
Under reamed Open Hole

8) WATER LEVEL:
Static level 129 ft. below land surface Date 4-11-70
Artesian pressure lbs. per square inch Date
Depth to pump bowls, cylinder, jet, etc., ft. below land surface.

11) WELL TESTS:
Was a pump test made? [✓ Yes] No If yes, by whom? R.C. Custer
Yield: 50 gpm with ft. drawdown after hrs.
Bailer test gpm with ft. drawdown after hrs
Artesian flow gpm
Temperature of water

12) WATER QUALITY:
Was a chemical analysis made? Yes No
Did any strata contain undesirable water? [✓ Yes] No
Type of water? Salt depth of strata all Sand 27— 410

I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief.

NAME R.C. Custer (Type or Print) Water Well Drillers Registration No. 728

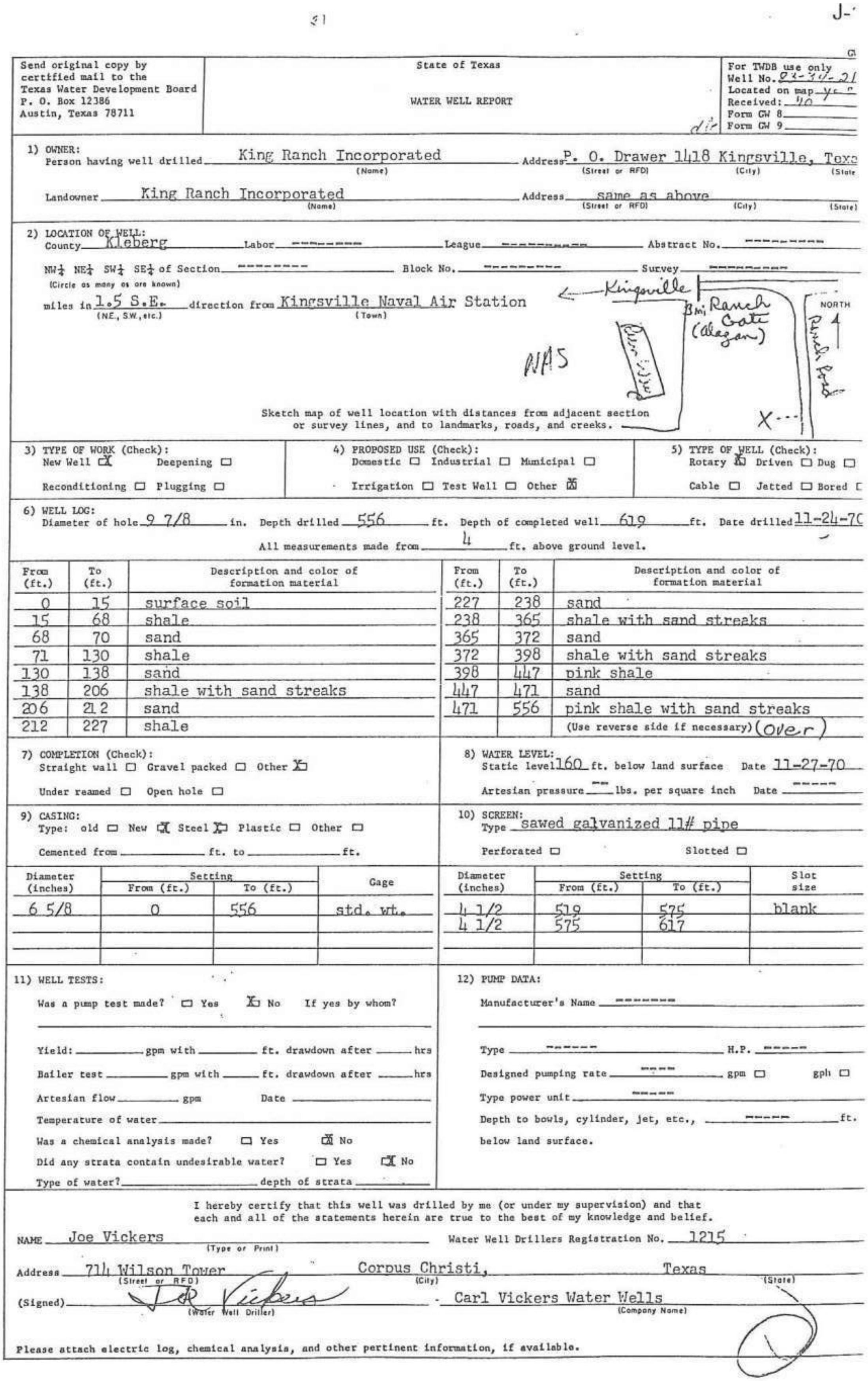
ADDRESS Rt. 1 Box 450A (Street or RFD) Kingsville (City) texas (State)

(Signed) R.C. Custer (Water Well Driller) R.C. Custer Water Well Drilling Co. (Company Name)

Please attach electric log, chemical analysis, and other pertinent information, if available.

*Additional instructions on reverse side.

TWDBE-GW-53



81 J-

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Austin, Texas 78711

State of Texas

WATER WELL REPORT

dir

For TWDB use only
Well No. 83-34-21
Located on map yes
Received: 40
Form GW 8
Form GW 9

1) OWNER:
Person having well drilled King Ranch Incorporated (Name) Address P. O. Drawer 1418 (Street or RFD) Kingsville, (City) Texa (State)

Landowner King Ranch Incorporated (Name) Address same as above (Street or RFD) (City) (State)

2) LOCATION OF WELL:
County Kleberg Labor --------- League ----------- Abstract No. ---------

NW¼ NE¼ SW¼ SE¼ of Section --------- Block No. --------- Survey ---------
(Circle as many as are known)

miles in 1.5 S.E. (NE., SW., etc.) direction from Kingsville Naval Air Station (Town)

Sketch map of well location with distances from adjacent section or survey lines, and to landmarks, roads, and creeks.

3) TYPE OF WORK (Check):
New Well ☒ Deepening ☐
Reconditioning ☐ Plugging ☐

4) PROPOSED USE (Check):
Domestic ☐ Industrial ☐ Municipal ☐
Irrigation ☐ Test Well ☐ Other ☒

5) TYPE OF WELL (Check):
Rotary ☒ Driven ☐ Dug ☐
Cable ☐ Jetted ☐ Bored ☐

6) WELL LOG:
Diameter of hole 9 7/8 in. Depth drilled 556 ft. Depth of completed well 619 ft. Date drilled 11-24-70

All measurements made from 4 ft. above ground level.

From (ft.)	To (ft.)	Description and color of formation material	From (ft.)	To (ft.)	Description and color of formation material
0	15	surface soil	227	238	sand
15	68	shale	238	365	shale with sand streaks
68	70	sand	365	372	sand
71	130	shale	372	398	shale with sand streaks
130	138	sand	398	447	pink shale
138	206	shale with sand streaks	447	471	sand
206	212	sand	471	556	pink shale with sand streaks
212	227	shale			(Use reverse side if necessary) (over)

7) COMPLETION (Check):
Straight wall ☐ Gravel packed ☐ Other ☒
Under reamed ☐ Open hole ☐

8) WATER LEVEL:
Static level 160 ft. below land surface Date 11-27-70
Artesian pressure -- lbs. per square inch Date -----

9) CASING:
Type: old ☐ New ☒ Steel ☒ Plastic ☐ Other ☐
Cemented from ft. to ft.

Diameter (inches)	Setting From (ft.)	Setting To (ft.)	Gage
6 5/8	0	556	std. wt.

10) SCREEN:
Type sawed galvanized 11# pipe
Perforated ☐ Slotted ☐

Diameter (inches)	Setting From (ft.)	Setting To (ft.)	Slot size
4 1/2	519	575	blank
4 1/2	575	617	

11) WELL TESTS:
Was a pump test made? ☐ Yes ☒ No If yes by whom?
Yield: gpm with ft. drawdown after hrs
Bailer test gpm with ft. drawdown after hrs
Artesian flow gpm Date
Temperature of water
Was a chemical analysis made? ☐ Yes ☒ No
Did any strata contain undesirable water? ☐ Yes ☒ No
Type of water? depth of strata

12) PUMP DATA:
Manufacturer's Name -------
Type ------ H.P. -----
Designed pumping rate ---- gpm ☐ gph ☐
Type power unit -----
Depth to bowls, cylinder, jet, etc., ----- ft. below land surface.

I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief.

NAME Joe Vickers (Type or Print) Water Well Drillers Registration No. 1215

Address 714 Wilson Tower (Street or RFD) Corpus Christi, (City) Texas (State)

(Signed) J R Vickers (Water Well Driller) Carl Vickers Water Wells (Company Name)

Please attach electric log, chemical analysis, and other pertinent information, if available.

J-

Send original copy by
certified mail to the
Texas Water Development Board
P. O. Box 13087
Austin, Texas 78711

State of Texas

WATER WELL REPORT

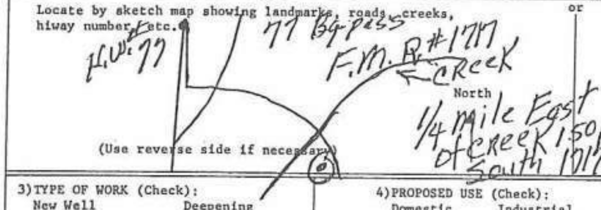
For TWDB use only
Well No. 83-31-2 H
Located on map YES
Received: 73
dk

1) OWNER:
Person having well drilled W. Barnes (Name) Address 1105 E Huisache (Street or RFD) (City) (State)

Landowner Same (Name) Address (Street or RFD) (City) (State)

2) LOCATION OF WELL:
County Kleberg, 3 miles in E (N.E., S.W., etc.) direction from Kingsville (Town)

Locate by sketch map showing landmarks, roads, creeks, hiway number, etc.



(Use reverse side if necessary)

or

Give legal location with distances and directions from adjacent sections or survey lines.
Labor Pat. L16 B30 League K+I
Block ____ Survey ____
Abstract No. ____
(NW¼ NE¼ SW¼ SE¼) of Section ____

3) TYPE OF WORK (Check):
New Well Deepening
Reconditioning Plugging

4) PROPOSED USE (Check):
[✓ Domestic] Industrial Municipal
Irrigation Test Well Other

5) TYPE OF WELL (Check):
[✓ Rotary] Driven Dug
Cable Jetted Bored

6) WELL LOG:
Diameter of hole 9 7/8 in. Depth drilled 618 ft. Depth of completed well 618 ft. Date drilled 11-25-
All measurements made from ____ ft. above ground level.

From (ft.)	To (ft.)	Description and color of formation material
0	19	Sand+Clay
19	31	Sand
31	247	Clay
247	259	Sand
259	381	Clay
381	399	Sand
399	489	Clay
489	509	Sand
509	594	Red Shale
594	618	Sand

(Use reverse side if necessary)

9) Casing:
Type: Old [✓ New] Steel Plastic Other
Cemented from ____ ft. to ____ ft.

Diameter (inches)	Setting From (ft.)	Setting To (ft.)	Gage
7"	0	580	26.00#

10) SCREEN:
Type Box Lug S.S.
Perforated Slotted

Diameter (inches)	Setting From (ft.)	Setting To (ft.)	Slot Size
4½	597	618	.012

7) COMPLETION (Check):
Straight wall Gravel packed Other
Under reamed Open Hole

8) WATER LEVEL:
Static level ____ ft. below land surface Date ____
Artesian pressure ____ lbs. per square inch Date ____
Depth to pump bowls, cylinder, jet, etc., ____ ft. below land surface.

11) WELL TESTS:
Was a pump test made? Yes [✓ No] If yes, by whom?
Yield: ____ gpm with ____ ft. drawdown after ____ hrs.
Bailer test ____ gpm with ____ ft. drawdown after ____ hrs.
Artesian flow ____ gpm
Temperature of water ____

12) WATER QUALITY:
Was a chemical analysis made? Yes [✓ No]
Did any strata contain undesirable water? [✓ Yes] No.
Type of water? Salt depth of strata all sands 19 – 489

I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief.

NAME R.C. Custer (Type or Print) Water Well Drillers Registration No. 728

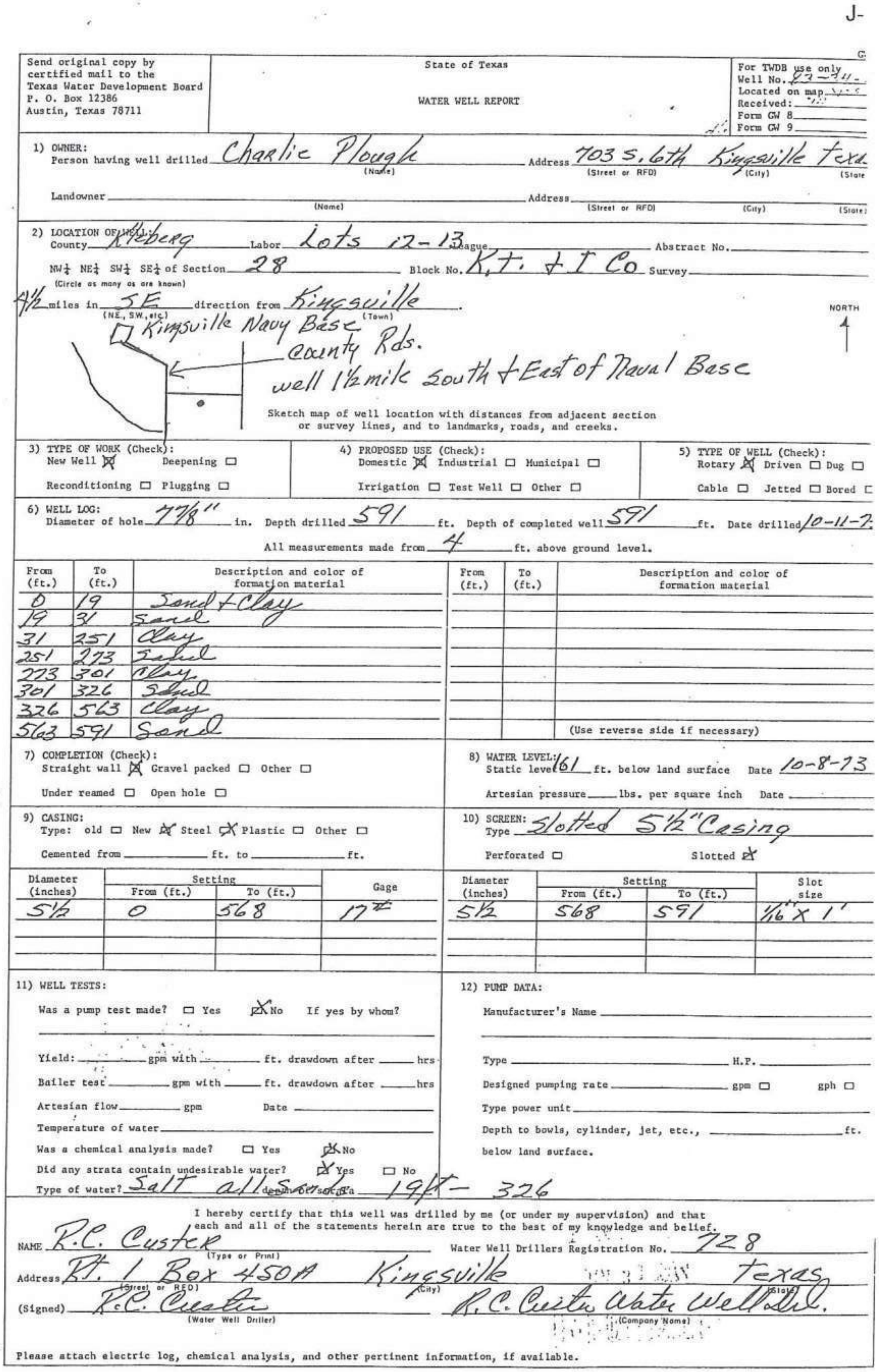
ADDRESS R.C. Custer Rt. 1 Box 450A Kingsville Texas (Street or RFD) (City) (State)

(Signed) R.C. Custer (Water Well Driller) R.C. Custer Water Well Drilling (Company Name)

Please attach electric log, chemical analysis, and other pertinent information, if available.

*Additional instructions on reverse side.

VDBE-WD-8



J-

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Texas Water Development Board
P. O. Box 12386
Austin, Texas 78711

State of Texas

WATER WELL REPORT

For TWDB use only
Well No. [illegible]
Located on map [illegible]
Received: [illegible]
Form GW 8
Form GW 9

1) OWNER:
Person having well drilled Charlie Plough (Name) Address 703 S. 6th (Street or RFD) Kingsville (City) Texas (State)

Landowner (Name) Address (Street or RFD) (City) (State)

2) LOCATION OF WELL:
County Kleberg Labor Lots 12-13 League Abstract No.
NW¼ NE¼ SW¼ SE¼ of Section 28 Block No. K.T. & I Co Survey
(Circle as many as are known)
4½ miles in SE (NE, SW, etc) direction from Kingsville (Town).

Kingsville Navy Base
County Rds.
well 1½ mile South & East of Naval Base

NORTH

Sketch map of well location with distances from adjacent section or survey lines, and to landmarks, roads, and creeks.

3) TYPE OF WORK (Check):
New Well ☒ Deepening ☐
Reconditioning ☐ Plugging ☐

4) PROPOSED USE (Check):
Domestic ☒ Industrial ☐ Municipal ☐
Irrigation ☐ Test Well ☐ Other ☐

5) TYPE OF WELL (Check):
Rotary ☒ Driven ☐ Dug ☐
Cable ☐ Jetted ☐ Bored ☐

6) WELL LOG:
Diameter of hole 7⅞" in. Depth drilled 591 ft. Depth of completed well 591 ft. Date drilled 10-11-7
All measurements made from 4 ft. above ground level.

From (ft.)	To (ft.)	Description and color of formation material	From (ft.)	To (ft.)	Description and color of formation material
0	19	Sand & Clay			
19	31	Sand			
31	251	Clay			
251	273	Sand			
273	301	Clay			
301	326	Sand			
326	563	Clay			
563	591	Sand			(Use reverse side if necessary)

7) COMPLETION (Check):
Straight wall ☒ Gravel packed ☐ Other ☐
Under reamed ☐ Open hole ☐

8) WATER LEVEL:
Static level 161 ft. below land surface Date 10-8-73
Artesian pressure lbs. per square inch Date

9) CASING:
Type: old ☐ New ☒ Steel ☒ Plastic ☐ Other ☐
Cemented from ft. to ft.

10) SCREEN:
Type Slotted 5½" Casing
Perforated ☐ Slotted ☒

Diameter (inches)	Setting From (ft.)	Setting To (ft.)	Gage
5½	0	568	17#

Diameter (inches)	Setting From (ft.)	Setting To (ft.)	Slot size
5½	568	591	1/16" x 1"

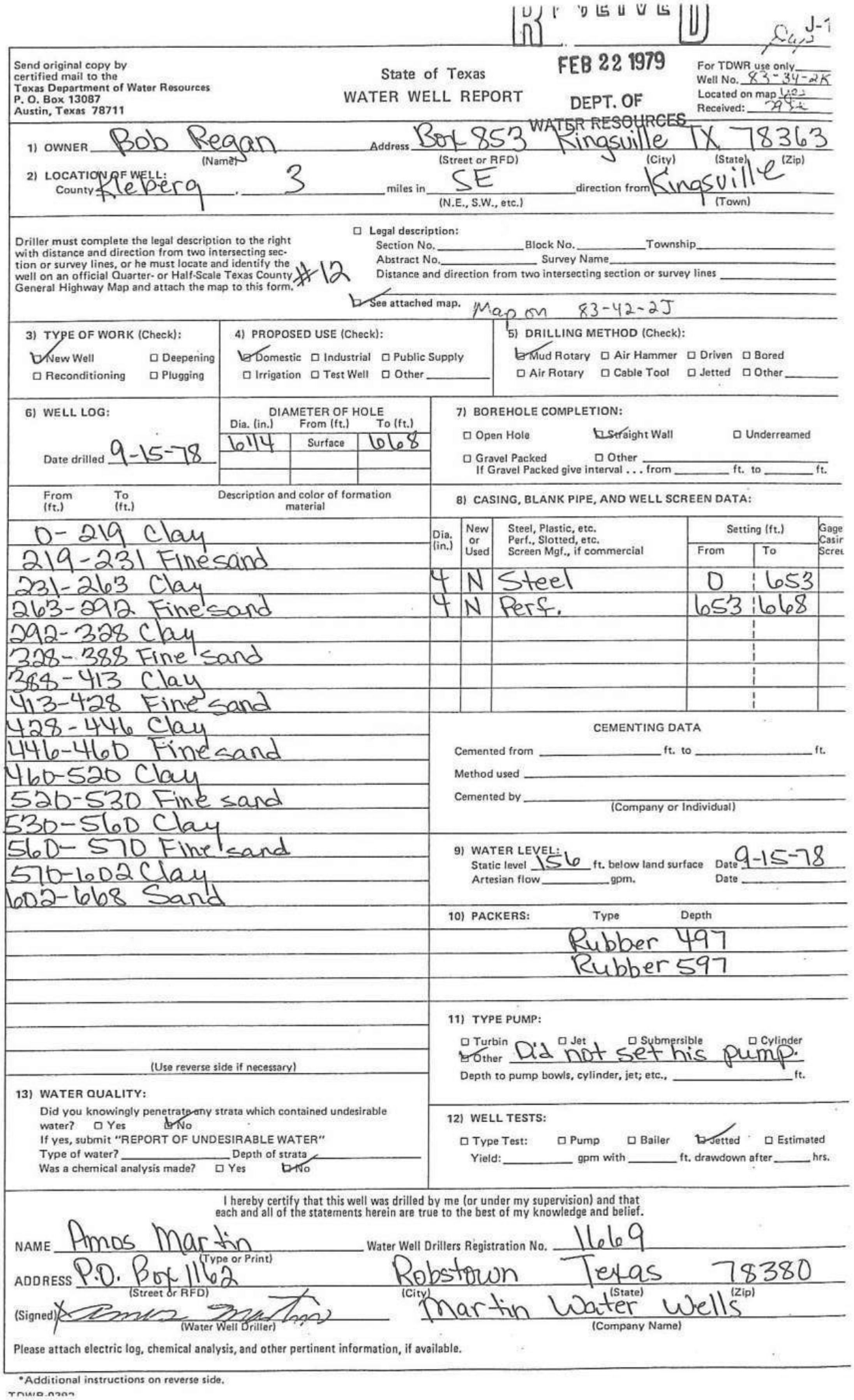
11) WELL TESTS:
Was a pump test made? ☐ Yes ☒ No If yes by whom?
Yield: gpm with ft. drawdown after hrs
Bailer test gpm with ft. drawdown after hrs
Artesian flow gpm Date
Temperature of water
Was a chemical analysis made? ☐ Yes ☒ No
Did any strata contain undesirable water? ☒ Yes ☐ No
Type of water? Salt all Sand depth of strata 19ft - 326

12) PUMP DATA:
Manufacturer's Name
Type H.P.
Designed pumping rate gpm ☐ gph ☐
Type power unit
Depth to bowls, cylinder, jet, etc., ft. below land surface.

I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief.

NAME R.C. Custer (Type or Print) Water Well Drillers Registration No. 728
Address Rt. 1 Box 450A (Street or RFD) Kingsville (City) Texas (State)
(Signed) R.C. Custer (Water Well Driller) R.C. Custer Water Well Dril. (Company Name)

Please attach electric log, chemical analysis, and other pertinent information, if available.



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WATER RESOURCES

J-1

Send original copy by
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Texas Department of Water Resources
P. O. Box 13087
Austin, Texas 78711

State of Texas
WATER WELL REPORT

For TDWR use only
Well No. 83-34-2K
Located on map
Received:

1) OWNER Bob Reagan (Name) Address Box 853 (Street or RFD) Kingsville (City) TX (State) 78363 (Zip)

2) LOCATION OF WELL:
County Kleberg , 3 miles in SE (N.E., S.W., etc.) direction from Kingsville (Town)

Driller must complete the legal description to the right with distance and direction from two intersecting section or survey lines, or he must locate and identify the well on an official Quarter- or Half-Scale Texas County General Highway Map and attach the map to this form. #12

☐ Legal description:
Section No. ______ Block No. ______ Township ______
Abstract No. ______ Survey Name ______
Distance and direction from two intersecting section or survey lines ______

☑ See attached map. Map on 83-42-2J

3) TYPE OF WORK (Check):
☑ New Well ☐ Deepening
☐ Reconditioning ☐ Plugging

4) PROPOSED USE (Check):
☑ Domestic ☐ Industrial ☐ Public Supply
☐ Irrigation ☐ Test Well ☐ Other ______

5) DRILLING METHOD (Check):
☑ Mud Rotary ☐ Air Hammer ☐ Driven ☐ Bored
☐ Air Rotary ☐ Cable Tool ☐ Jetted ☐ Other ______

6) WELL LOG:

Date drilled 9-15-78

DIAMETER OF HOLE

Dia. (in.)	From (ft.)	To (ft.)
6 1/4	Surface	668

7) BOREHOLE COMPLETION:
☐ Open Hole ☑ Straight Wall ☐ Underreamed
☐ Gravel Packed ☐ Other ______
If Gravel Packed give interval . . . from ______ ft. to ______ ft.

From (ft.)	To (ft.)	Description and color of formation material
0- 219 Clay		
219-231 Finesand		
231-263 Clay		
263-292 Fine sand		
292-328 Clay		
328-388 Fine sand		
388-413 Clay		
413-428 Fine sand		
428-446 Clay		
446-460 Fine sand		
460-520 Clay		
520-530 Fine sand		
530-560 Clay		
560- 570 Fine sand		
570-602 Clay		
602-668 Sand		

(Use reverse side if necessary)

8) CASING, BLANK PIPE, AND WELL SCREEN DATA:

Dia. (in.)	New or Used	Steel, Plastic, etc. Perf., Slotted, etc. Screen Mgf., if commercial	Setting (ft.) From	Setting (ft.) To	Gage Casing Screen
4	N	Steel	0	653	
4	N	Perf.	653	668	

CEMENTING DATA
Cemented from ______ ft. to ______ ft.
Method used ______
Cemented by ______ (Company or Individual)

9) WATER LEVEL:
Static level 156 ft. below land surface Date 9-15-78
Artesian flow ______ gpm. Date ______

10) PACKERS:

Type	Depth
Rubber	497
Rubber	597

11) TYPE PUMP:
☐ Turbin ☐ Jet ☐ Submersible ☐ Cylinder
☑ Other Did not set his pump.
Depth to pump bowls, cylinder, jet; etc., ______ ft.

12) WELL TESTS:
☐ Type Test: ☐ Pump ☐ Bailer ☑ Jetted ☐ Estimated
Yield: ______ gpm with ______ ft. drawdown after ______ hrs.

13) WATER QUALITY:
Did you knowingly penetrate any strata which contained undesirable water? ☐ Yes ☑ No
If yes, submit "REPORT OF UNDESIRABLE WATER"
Type of water? ______ Depth of strata ______
Was a chemical analysis made? ☐ Yes ☑ No

I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief.

NAME Amos Martin (Type or Print) Water Well Drillers Registration No. 1669

ADDRESS P.O. Box 1162 (Street or RFD) Robstown (City) Texas (State) 78380 (Zip)

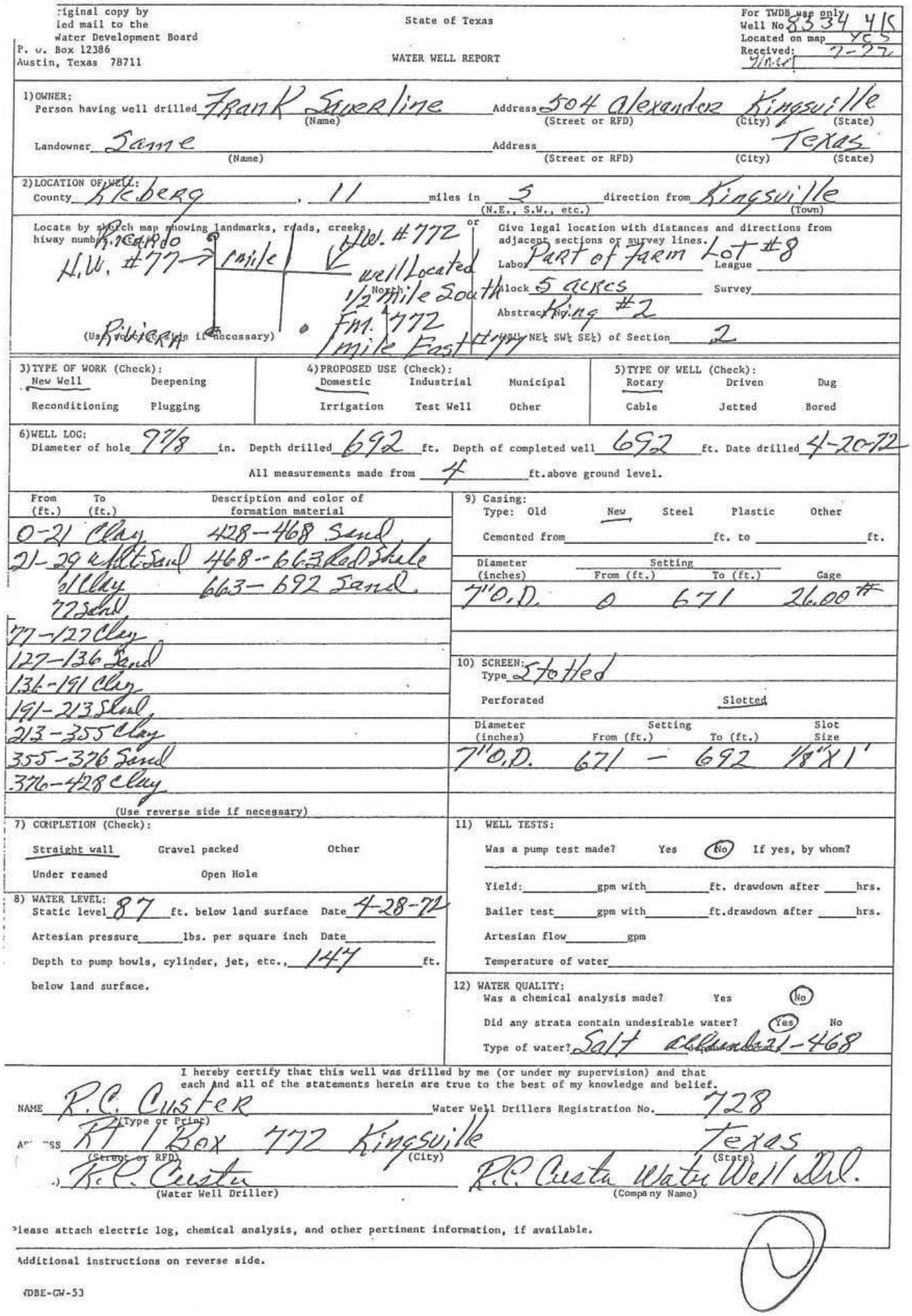
(Signed) Amos Martin (Water Well Driller) Martin Water Wells (Company Name)

Please attach electric log, chemical analysis, and other pertinent information, if available.

*Additional instructions on reverse side.

TDWR-0392

J-



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Water Development Board
P. O. Box 12386
Austin, Texas 78711

State of Texas

WATER WELL REPORT

For TWDB use only
Well No. 83 34 415
Located on map YC5
Received: 7-72
[illegible]

1) OWNER:
Person having well drilled Frank Sverline (Name) Address 504 alexander (Street or RFD) Kingsville (City) (State)
Landowner Same (Name) Address (Street or RFD) (City) Texas (State)

2) LOCATION OF WELL:
County Kleberg, 11 miles in S (N.E., S.W., etc.) direction from Kingsville (Town)

Locate by sketch map showing landmarks, roads, creeks, hiway number, etc.
Ricardo
H.W. #77 → 1 mile
Hw. #772
well Located
1/2 mile South
North
Fm. 772
1 mile East Hwy 77
Riviera
(Use reverse side if necessary)

or

Give legal location with distances and directions from adjacent sections or survey lines.
Labor Part of Farm Lot #8 League
Block 5 acres Survey
Abstract No. King #2
(NW¼ NE¼ SW¼ SE¼) of Section 2

3) TYPE OF WORK (Check): [✓ New Well] Deepening Reconditioning Plugging

4) PROPOSED USE (Check): [✓ Domestic] Industrial Municipal Irrigation Test Well Other

5) TYPE OF WELL (Check): [✓ Rotary] Driven Dug Cable Jetted Bored

6) WELL LOG:
Diameter of hole 7 7/8 in. Depth drilled 692 ft. Depth of completed well 692 ft. Date drilled 4-20-72
All measurements made from 4 ft. above ground level.

From (ft.) To (ft.)	Description and color of formation material
0-21 Clay	428-468 Sand
21-29 white Sand	468-663 Red Shale
61 Clay	663-692 Sand.
77 Sand	
77-127 Clay	
127-136 Sand	
136-191 Clay	
191-213 Shal,	
213-355 Clay	
355-376 Sand	
376-428 Clay	

(Use reverse side if necessary)

9) Casing:
Type: Old [✓ New] Steel Plastic Other
Cemented from ft. to ft.

Diameter (inches)	Setting From (ft.)	Setting To (ft.)	Gage
7" O.D.	0	671	26.00#

10) SCREEN:
Type Slotted
Perforated [✓ Slotted]

Diameter (inches)	Setting From (ft.)	Setting To (ft.)	Slot Size
7" O.D.	671 -	692	1/8" X 1'

7) COMPLETION (Check): [✓ Straight wall] Gravel packed Other Under reamed Open Hole

8) WATER LEVEL:
Static level 87 ft. below land surface Date 4-28-72
Artesian pressure lbs. per square inch Date
Depth to pump bowls, cylinder, jet, etc., 147 ft. below land surface.

11) WELL TESTS:
Was a pump test made? Yes [✓ No] If yes, by whom?
Yield: gpm with ft. drawdown after hrs.
Bailer test gpm with ft. drawdown after hrs.
Artesian flow gpm
Temperature of water

12) WATER QUALITY:
Was a chemical analysis made? Yes [✓ No]
Did any strata contain undesirable water? [✓ Yes] No
Type of water? Salt [illegible] 21-468

I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief.

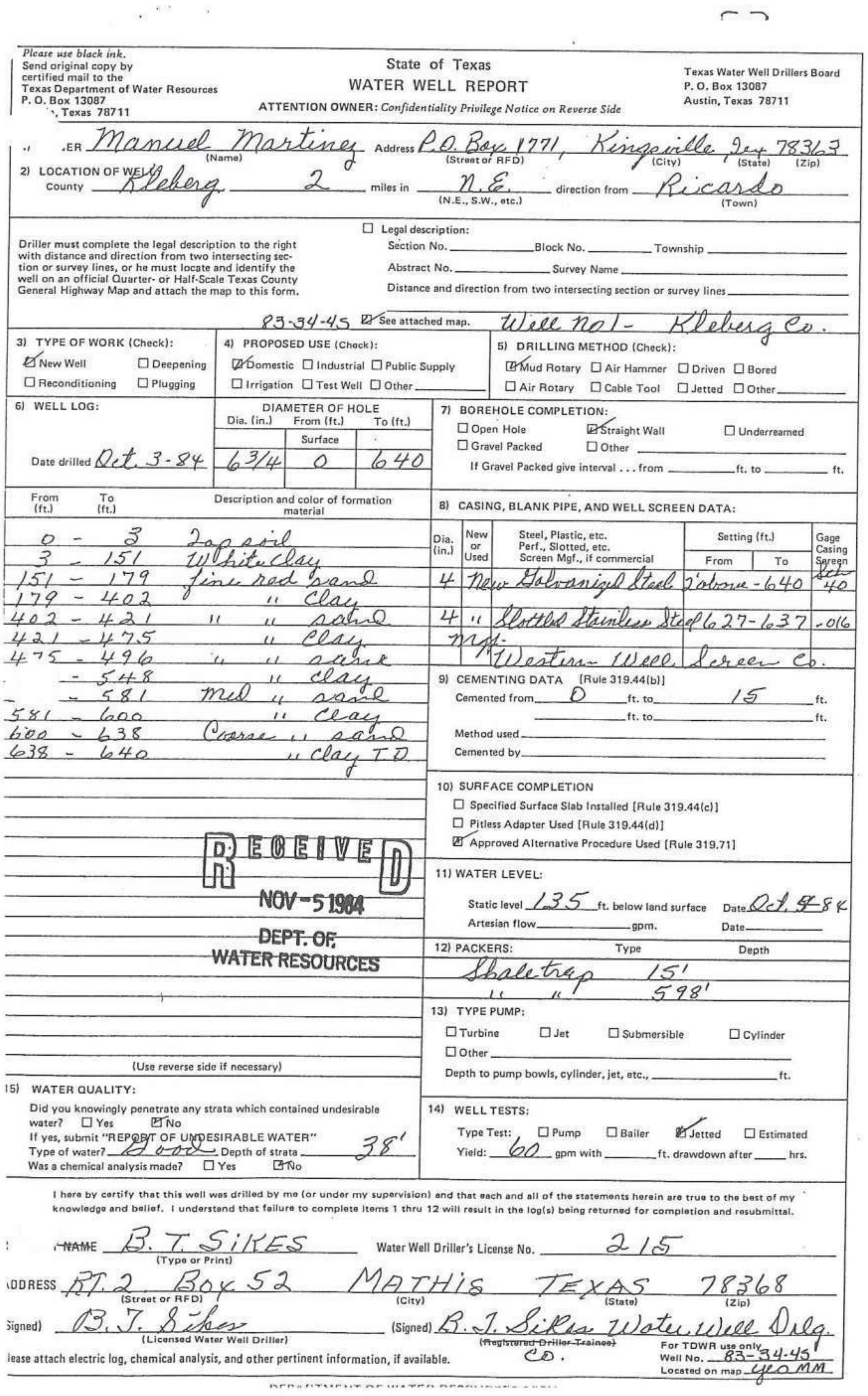
NAME R.C. Custer (Type or Print) Water Well Drillers Registration No. 728
ADDRESS Rt 1 Box 772 (Street or RFD) Kingsville (City) Texas (State)
R.C. Custer (Water Well Driller) R.C. Custer Water Well Dril. (Company Name)

Please attach electric log, chemical analysis, and other pertinent information, if available.

Additional instructions on reverse side.

WDBE-GW-53

J-



Please use black ink.
Send original copy by
certified mail to the
Texas Department of Water Resources
P. O. Box 13087
, Texas 78711

State of Texas
WATER WELL REPORT
ATTENTION OWNER: *Confidentiality Privilege Notice on Reverse Side*

Texas Water Well Drillers Board
P. O. Box 13087
Austin, Texas 78711

.ER Manuel Martinez (Name) Address P.O. Box 1771, Kingsville, Tex 78363 (Street or RFD) (City) (State) (Zip)

2) LOCATION OF WELL: County Kleberg 2 miles in N.E. (N.E., S.W., etc.) direction from Ricardo (Town)

Driller must complete the legal description to the right with distance and direction from two intersecting section or survey lines, or he must locate and identify the well on an official Quarter- or Half-Scale Texas County General Highway Map and attach the map to this form.

☐ Legal description:
Section No. ______ Block No. ______ Township ______
Abstract No. ______ Survey Name ______
Distance and direction from two intersecting section or survey lines ______

83-34-45 ☒ See attached map. Well no 1 - Kleberg Co.

3) TYPE OF WORK (Check): ☒ New Well ☐ Deepening ☐ Reconditioning ☐ Plugging

4) PROPOSED USE (Check): ☒ Domestic ☐ Industrial ☐ Public Supply ☐ Irrigation ☐ Test Well ☐ Other ______

5) DRILLING METHOD (Check): ☒ Mud Rotary ☐ Air Hammer ☐ Driven ☐ Bored ☐ Air Rotary ☐ Cable Tool ☐ Jetted ☐ Other ______

6) WELL LOG:

Date drilled Oct. 3-84

DIAMETER OF HOLE

Dia. (in.)	From (ft.)	To (ft.)
	Surface	
6 3/4	0	640

7) BOREHOLE COMPLETION:
☐ Open Hole ☒ Straight Wall ☐ Underreamed
☐ Gravel Packed ☐ Other ______
If Gravel Packed give interval . . . from ______ ft. to ______ ft.

From (ft.)	To (ft.)	Description and color of formation material
0	3	Top soil
3	151	White clay
151	179	fine red sand
179	402	" Clay
402	421	" " sand
421	475	" Clay
475	496	" " sand
	548	" clay
	581	med " sand
581	600	" Clay
600	638	Coarse " sand
638	640	" clay T.D.

(Use reverse side if necessary)

8) CASING, BLANK PIPE, AND WELL SCREEN DATA:

Dia. (in.)	New or Used	Steel, Plastic, etc. Perf., Slotted, etc. Screen Mgf., if commercial	Setting (ft.) From	Setting (ft.) To	Gage Casing Screen
4	New	Galvanized Steel	2' above	640	Sch 40
4	"	Slotted Stainless Steel	627	637	.016
	mfg.	Western Well Screen Co.			

9) CEMENTING DATA [Rule 319.44(b)]
Cemented from 0 ft. to 15 ft.
______ ft. to ______ ft.
Method used ______
Cemented by ______

10) SURFACE COMPLETION
☐ Specified Surface Slab Installed [Rule 319.44(c)]
☐ Pitless Adapter Used [Rule 319.44(d)]
☒ Approved Alternative Procedure Used [Rule 319.71]

RECEIVED
NOV - 5 1984
DEPT. OF
WATER RESOURCES

11) WATER LEVEL:
Static level 135 ft. below land surface Date Oct. 4-84
Artesian flow ______ gpm. Date ______

12) PACKERS:

Type	Depth
Shaletrap	15'
" "	598'

13) TYPE PUMP:
☐ Turbine ☐ Jet ☐ Submersible ☐ Cylinder
☐ Other ______
Depth to pump bowls, cylinder, jet, etc., ______ ft.

14) WELL TESTS:
Type Test: ☐ Pump ☐ Bailer ☒ Jetted ☐ Estimated
Yield: 60 gpm with ______ ft. drawdown after ______ hrs.

15) WATER QUALITY:
Did you knowingly penetrate any strata which contained undesirable water? ☐ Yes ☒ No
If yes, submit "REPORT OF UNDESIRABLE WATER"
Type of water? Good Depth of strata 38'
Was a chemical analysis made? ☐ Yes ☒ No

I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief. I understand that failure to complete items 1 thru 12 will result in the log(s) being returned for completion and resubmittal.

~~NAME~~ B. T. SIKES (Type or Print) Water Well Driller's License No. 215

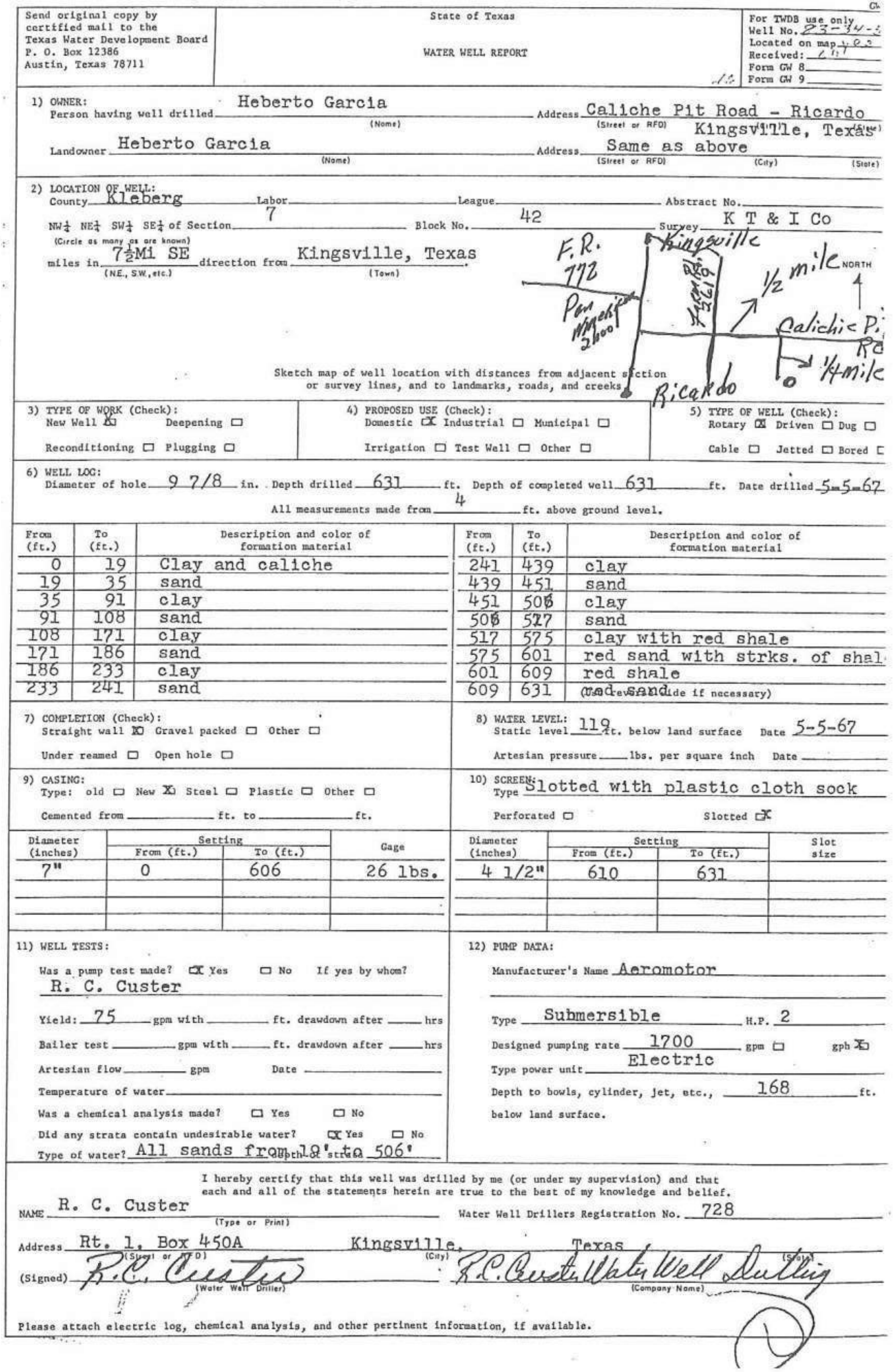
ADDRESS RT. 2 BOX 52 (Street or RFD) MATHIS (City) TEXAS (State) 78368 (Zip)

(Signed) B. T. Sikes (Licensed Water Well Driller) (Signed) B. T. Sikes Water Well Drlg. Co. ~~(Registered Driller Trainee)~~

Please attach electric log, chemical analysis, and other pertinent information, if available.

For TDWR use only
Well No. 83-34-45
Located on map yeo MM

J-



Send original copy by certified mail to the Texas Water Development Board
P. O. Box 12386
Austin, Texas 78711

State of Texas

WATER WELL REPORT

For TWDB use only
Well No. 23-34-
Located on map
Received:
Form GW 8
Form GW 9

1) OWNER:
Person having well drilled Heberto Garcia (Name) Address Caliche Pit Road - Ricardo (Street or RFD) Kingsville, Texas (City) (State)

Landowner Heberto Garcia (Name) Address Same as above (Street or RFD) (City) (State)

2) LOCATION OF WELL:
County Kleberg Labor League Abstract No.
NW¼ NE¼ SW¼ SE¼ of Section 7 Block No. 42 Survey K T & I Co
(Circle as many as are known)
miles in 7½Mi SE (N.E., S.W., etc.) direction from Kingsville, Texas (Town)

Sketch map of well location with distances from adjacent section or survey lines, and to landmarks, roads, and creeks

3) TYPE OF WORK (Check):
New Well ☒ Deepening ☐
Reconditioning ☐ Plugging ☐

4) PROPOSED USE (Check):
Domestic ☒ Industrial ☐ Municipal ☐
Irrigation ☐ Test Well ☐ Other ☐

5) TYPE OF WELL (Check):
Rotary ☒ Driven ☐ Dug ☐
Cable ☐ Jetted ☐ Bored ☐

6) WELL LOG:
Diameter of hole 9 7/8 in. Depth drilled 631 ft. Depth of completed well 631 ft. Date drilled 5-5-67
All measurements made from 4 ft. above ground level.

From (ft.)	To (ft.)	Description and color of formation material	From (ft.)	To (ft.)	Description and color of formation material
0	19	Clay and caliche	241	439	clay
19	35	sand	439	451	sand
35	91	clay	451	506	clay
91	108	sand	506	517	sand
108	171	clay	517	575	clay with red shale
171	186	sand	575	601	red sand with strks. of shal
186	233	clay	601	609	red shale
233	241	sand	609	631	red sand

(Use reverse side if necessary)

7) COMPLETION (Check):
Straight wall ☒ Gravel packed ☐ Other ☐
Under reamed ☐ Open hole ☐

8) WATER LEVEL:
Static level 119 ft. below land surface Date 5-5-67
Artesian pressure lbs. per square inch Date

9) CASING:
Type: old ☐ New ☒ Steel ☐ Plastic ☐ Other ☐
Cemented from ft. to ft.

Diameter (inches)	Setting From (ft.)	Setting To (ft.)	Gage
7"	0	606	26 lbs.

10) SCREEN:
Type Slotted with plastic cloth sock
Perforated ☐ Slotted ☒

Diameter (inches)	Setting From (ft.)	Setting To (ft.)	Slot size
4 1/2"	610	631	

11) WELL TESTS:
Was a pump test made? ☒ Yes ☐ No If yes by whom? R. C. Custer
Yield: 75 gpm with ft. drawdown after hrs
Bailer test gpm with ft. drawdown after hrs
Artesian flow gpm Date
Temperature of water
Was a chemical analysis made? ☐ Yes ☐ No
Did any strata contain undesirable water? ☒ Yes ☐ No
Type of water? All sands from 19' to 506' Depth of strata

12) PUMP DATA:
Manufacturer's Name Aeromotor
Type Submersible H.P. 2
Designed pumping rate 1700 gpm ☐ gph ☒
Type power unit Electric
Depth to bowls, cylinder, jet, etc., 168 ft. below land surface.

I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief.

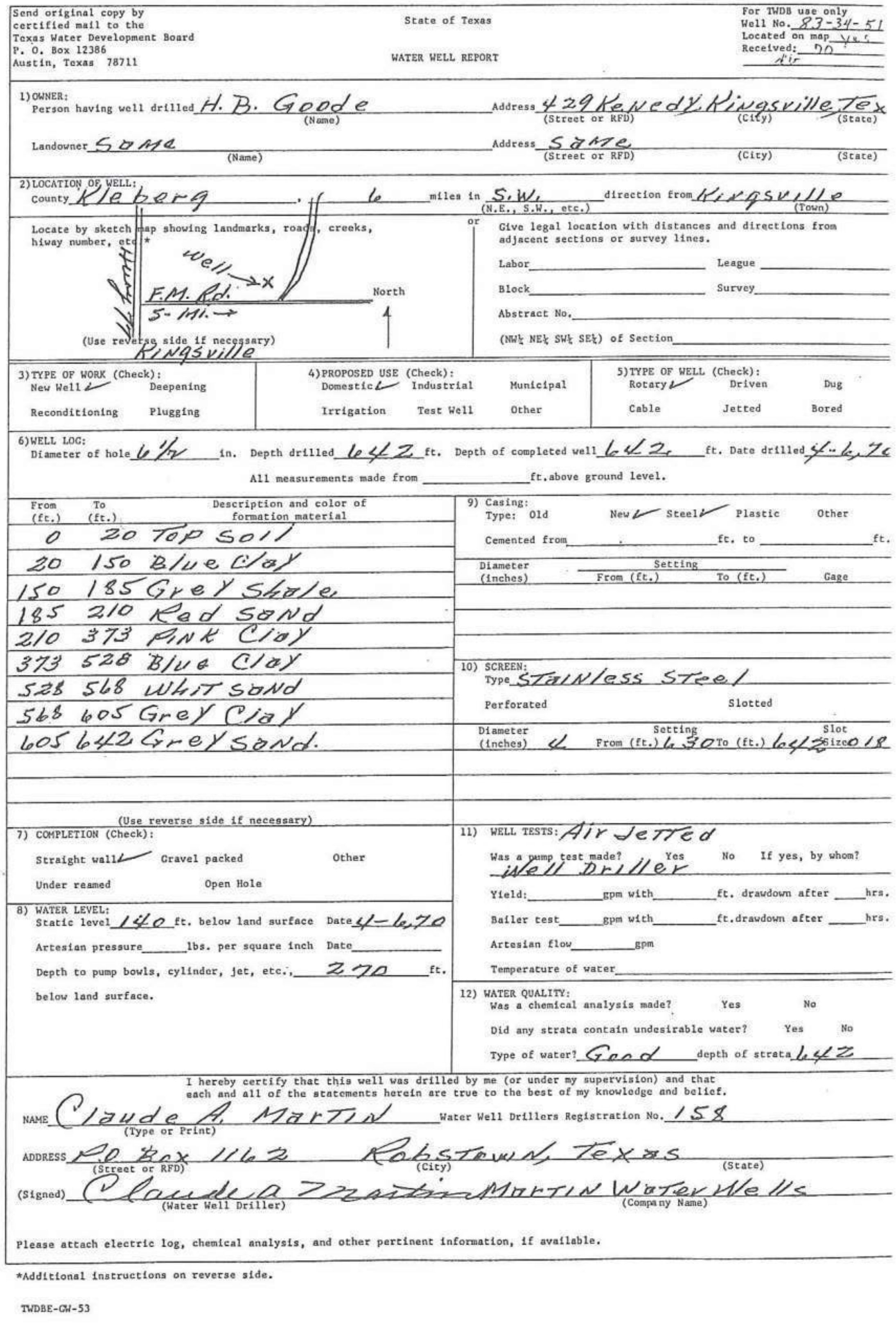
NAME R. C. Custer (Type or Print) Water Well Drillers Registration No. 728

Address Rt. 1, Box 450A (Street or RFD) Kingsville, (City) Texas (State)

(Signed) R.C. Custer (Water Well Driller) R.C. Custer Water Well Drilling (Company Name)

Please attach electric log, chemical analysis, and other pertinent information, if available.

J-



Send original copy by
certified mail to the
Texas Water Development Board
P. O. Box 12386
Austin, Texas 78711

State of Texas

WATER WELL REPORT

For TWDB use only
Well No. 83-34-51
Located on map Yes
Received: 70
Air

1) OWNER:
Person having well drilled H. B. Goode (Name) Address 429 Kenedy. Kingsville, Tex (Street or RFD) (City) (State)

Landowner Same (Name) Address Same (Street or RFD) (City) (State)

2) LOCATION OF WELL:
County Kleberg, 6 miles in S.W. (N.E., S.W., etc.) direction from Kingsville (Town)

Locate by sketch map showing landmarks, roads, creeks, hiway number, etc.*

(Use reverse side if necessary)

or Give legal location with distances and directions from adjacent sections or survey lines.

Labor ____ League ____
Block ____ Survey ____
Abstract No. ____
(NW¼ NE¼ SW¼ SE¼) of Section ____

3) TYPE OF WORK (Check): [✓ New Well] Deepening Reconditioning Plugging

4) PROPOSED USE (Check): [✓ Domestic] Industrial Municipal Irrigation Test Well Other

5) TYPE OF WELL (Check): [✓ Rotary] Driven Dug Cable Jetted Bored

6) WELL LOG:
Diameter of hole 6 1/4 in. Depth drilled 642 ft. Depth of completed well 642 ft. Date drilled 4-6-7

All measurements made from ____ ft. above ground level.

From (ft.)	To (ft.)	Description and color of formation material
0	20	Top Soil
20	150	Blue Clay
150	185	Grey Shale
185	210	Red Sand
210	373	Pink Clay
373	528	Blue Clay
528	568	Whit Sand
568	605	Grey Clay
605	642	Grey Sand.

(Use reverse side if necessary)

9) Casing:
Type: Old [✓ New] [✓ Steel] Plastic Other
Cemented from ____ ft. to ____ ft.

Diameter (inches)	Setting From (ft.)	Setting To (ft.)	Gage

10) SCREEN:
Type Stainless Steel
Perforated Slotted

Diameter (inches)	Setting From (ft.)	Setting To (ft.)	Slot Size
4	630	642	018

7) COMPLETION (Check):
[✓ Straight wall] Gravel packed Other
Under reamed Open Hole

8) WATER LEVEL:
Static level 140 ft. below land surface Date 4-6-70
Artesian pressure ____ lbs. per square inch Date ____
Depth to pump bowls, cylinder, jet, etc., 270 ft. below land surface.

11) WELL TESTS: Air Jetted
Was a pump test made? Yes No If yes, by whom? Well Driller
Yield: ____ gpm with ____ ft. drawdown after ____ hrs.
Bailer test ____ gpm with ____ ft. drawdown after ____ hrs.
Artesian flow ____ gpm
Temperature of water ____

12) WATER QUALITY:
Was a chemical analysis made? Yes No
Did any strata contain undesirable water? Yes No
Type of water? Good depth of strata 642

I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief.

NAME Claude A. Martin (Type or Print) Water Well Drillers Registration No. 158

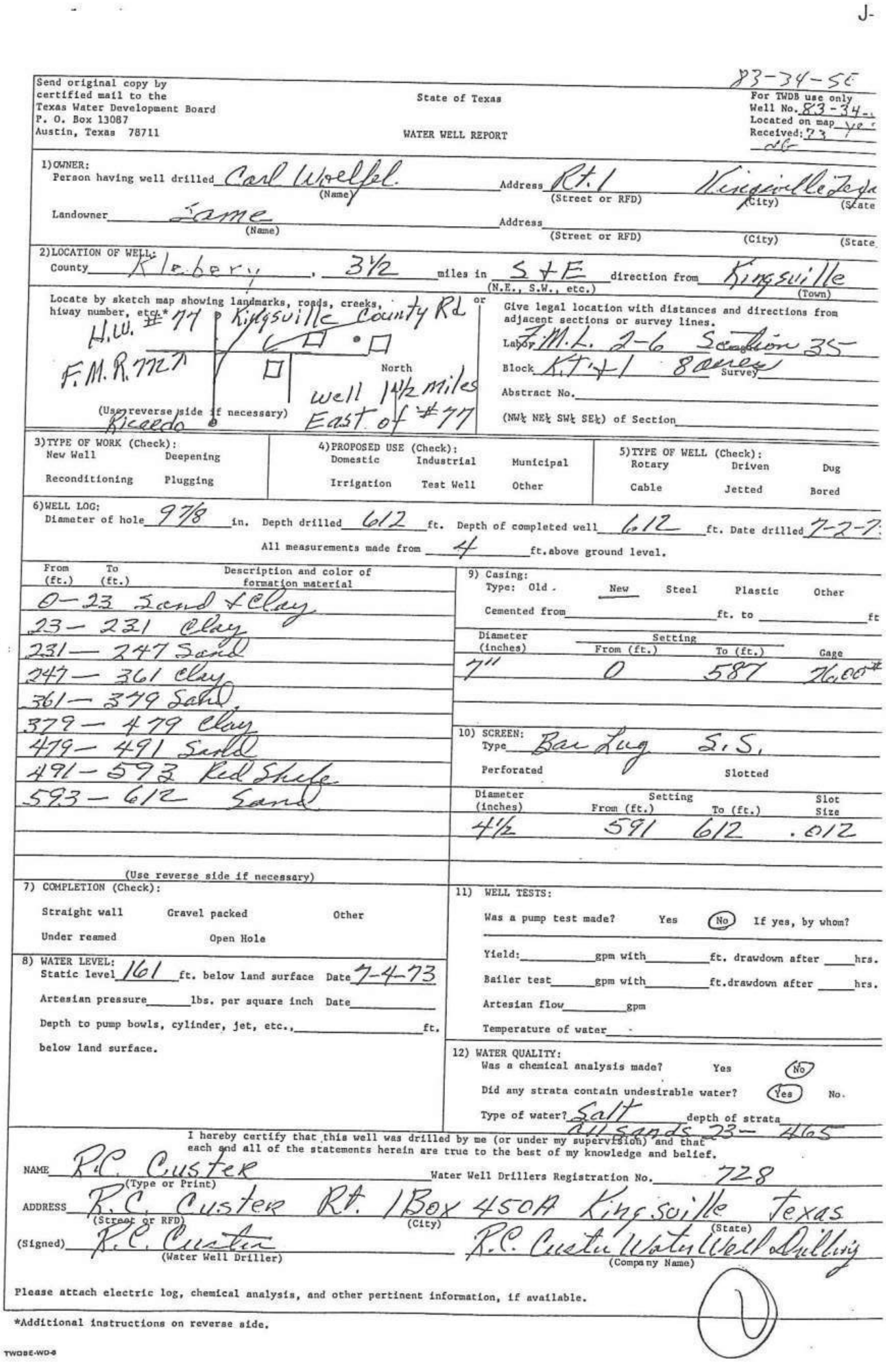
ADDRESS P.O. Box 1162 (Street or RFD) Robstown, Texas (City) (State)

(Signed) Claude A. Martin (Water Well Driller) Martin Water Wells (Company Name)

Please attach electric log, chemical analysis, and other pertinent information, if available.

*Additional instructions on reverse side.

TWDBE-GW-53



J-

83-34-5E

Send original copy by
certified mail to the
Texas Water Development Board
P. O. Box 13087
Austin, Texas 78711

State of Texas

WATER WELL REPORT

For TWDB use only
Well No. 83-34-
Located on map yes
Received: 73

1) OWNER:
Person having well drilled Carl Woelfel. (Name) Address Rt. 1 (Street or RFD) Kingsville Texas (City) (State)
Landowner Same (Name) Address (Street or RFD) (City) (State)

2) LOCATION OF WELL:
County Kleberg, 3½ miles in S + E (N.E., S.W., etc.) direction from Kingsville (Town)

Locate by sketch map showing landmarks, roads, creeks, hiway number, etc.* (Use reverse side if necessary)
H.W. #77
Kingsville County Rd
F.M.R. 772
North
well 1½ miles East of #77
Ricardo

or Give legal location with distances and directions from adjacent sections or survey lines.
Labor F.M.L. 2-6 Section 35
Block K.T. + 1 8 acres Survey
Abstract No.
(NW¼ NE¼ SW¼ SE¼) of Section

3) TYPE OF WORK (Check): New Well Deepening Reconditioning Plugging

4) PROPOSED USE (Check): Domestic Industrial Municipal Irrigation Test Well Other

5) TYPE OF WELL (Check): Rotary Driven Dug Cable Jetted Bored

6) WELL LOG:
Diameter of hole 9 7/8 in. Depth drilled 612 ft. Depth of completed well 612 ft. Date drilled 7-2-7
All measurements made from 4 ft. above ground level.

From (ft.)	To (ft.)	Description and color of formation material
0	23	Sand & Clay
23	231	Clay
231	247	Sand
247	361	Clay
361	379	Sand
379	479	Clay
479	491	Sand
491	593	Red Shale
593	612	Sand

(Use reverse side if necessary)

9) Casing:
Type: Old . [✓ New] Steel Plastic Other
Cemented from ft. to ft

Diameter (inches)	Setting From (ft.)	Setting To (ft.)	Gage
7"	0	587	26.00#

10) SCREEN:
Type Bar Lug S.S.
Perforated Slotted

Diameter (inches)	Setting From (ft.)	Setting To (ft.)	Slot Size
4½	591	612	.012

7) COMPLETION (Check):
Straight wall Gravel packed Other
Under reamed Open Hole

8) WATER LEVEL:
Static level 161 ft. below land surface Date 7-4-73
Artesian pressure lbs. per square inch Date
Depth to pump bowls, cylinder, jet, etc., ft. below land surface.

11) WELL TESTS:
Was a pump test made? Yes [✓ No] If yes, by whom?
Yield: gpm with ft. drawdown after hrs.
Bailer test gpm with ft. drawdown after hrs.
Artesian flow gpm
Temperature of water -

12) WATER QUALITY:
Was a chemical analysis made? Yes [✓ No]
Did any strata contain undesirable water? [✓ Yes] No.
Type of water? Salt depth of strata all sands 23- 465

I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief.

NAME R.C. Custer (Type or Print) Water Well Drillers Registration No. 728
ADDRESS R.C. Custer Rt. 1 Box 450A (Street or RFD) Kingsville (City) Texas (State)
(Signed) R.C. Custer (Water Well Driller) R.C. Custer Water Well Drilling (Company Name)

Please attach electric log, chemical analysis, and other pertinent information, if available.

*Additional instructions on reverse side.

TWDBE-WD-8

J-2

Send original copy by
certified mail to the
Texas Water Development Board
P. O. Box 13087
Austin, Texas 78711

State of Texas

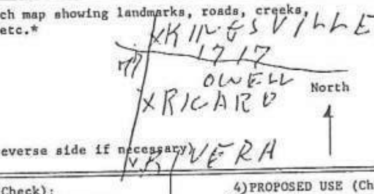
WATER WELL REPORT

For TWDB use only
Well No. 83-34-5F
Located on map yes
Received: 78

1) OWNER:
Person having well drilled Theo. P. Lorfing (Name) Address 517 E. Miller St. (Street or RFD) (City) (State)
Landowner Same (Name) Address Kingsville, Tx. 78363 (Street or RFD) (City) (State)

2) LOCATION OF WELL:
County ~~Jim Wells~~ Kleberg, 6 miles in S.E. (N.E., S.W., etc.) direction from Kingsville (Town)

Locate by sketch map showing landmarks, roads, creeks, hiway number, etc.*



(Use reverse side if necessary)

or Give legal location with distances and directions from adjacent sections or survey lines.
Labor ______ League ______
Block ______ Survey ______
Abstract No. ______
(NW¼ NE¼ SW¼ SE¼) of Section ______

3) TYPE OF WORK (Check): ✓ New Well Deepening Reconditioning Plugging

4) PROPOSED USE (Check): ✓ Domestic Industrial Municipal Irrigation Test Well Other

5) TYPE OF WELL (Check): ✓ Rotary Driven Dug Cable Jetted Bored

6) WELL LOG:
Diameter of hole 6 1/8 in. Depth drilled 727 ft. Depth of completed well 727 ft. Date drilled 8-26-7
All measurements made from 0 ft. above ground level.

From (ft.)	To (ft.)	Description and color of formation material
	3	top soil
3	15	shale
15	30	sand
30	480	shale
480	490	sand
490	500	shale
500	515	sand
515	590	shale
590	612	sand
612	679	shale
679	727	sand

(Use reverse side if necessary)

9) Casing:
Type: Old ✓ New Steel ✓ Plastic Other
Cemented from ______ ft. to ______ ft

Diameter (inches)	Setting From (ft.)	Setting To (ft.)	Gage
4 1/2 od	0	727	Sched. 40

10) SCREEN:
Type ______
Perforated ✓ Slotted

Diameter (inches)	Setting From (ft.)	Setting To (ft.)	Slot Size
4 1/2 od	679	727	.016

7) COMPLETION (Check):
✓ Straight wall Gravel packed Other
Under reamed Open Hole

8) WATER LEVEL:
Static level 133 ft. below land surface Date 8-28-77
Artesian pressure ______ lbs. per square inch Date ______
Depth to pump bowls, cylinder, jet, etc., ______ ft. below land surface.

11) WELL TESTS:
Was a pump test made? Yes No If yes, by whom? ______
Yield: ______ gpm with ______ ft. drawdown after ______ hrs
Bailer test ______ gpm with ______ ft. drawdown after ______ hrs
Artesian flow ______ gpm
Temperature of water ______

12) WATER QUALITY:
Was a chemical analysis made? Yes No
Did any strata contain undesirable water? Yes ✓ No
Type of water? ______ depth of strata 48 ft.

I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief.

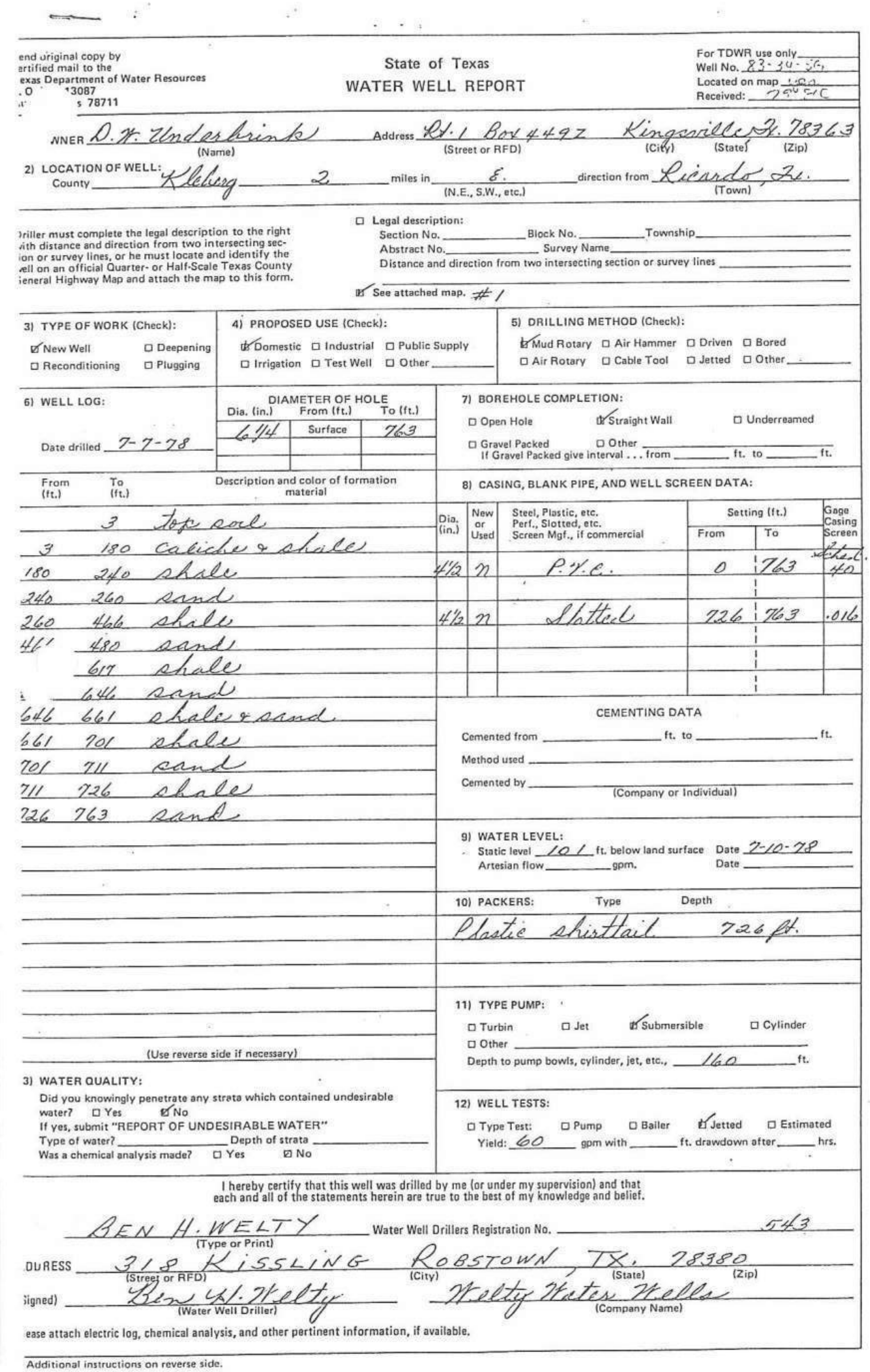
NAME Ben H. Welty (Type or Print) Water Well Drillers Registration No. 543
ADDRESS 318 Kissling (Street or RFD) Robstown (City), Tx. 78380 (State)
(Signed) Ben H. Welty (Water Well Driller) Welty Water Wells (Company Name)

Please attach electric log, chemical analysis, and other pertinent information, if available.

*Additional instructions on reverse side.

TWDBE-WD-8

J-25



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ertified mail to the
exas Department of Water Resources
. O *3087
s 78711

State of Texas
WATER WELL REPORT

For TDWR use only
Well No. 83-34-56
Located on map
Received:

WNER D. W. Underbrink (Name) Address Rt. 1 Box 4492 (Street or RFD) Kingsville (City) Tx. (State) 78363 (Zip)

2) LOCATION OF WELL: County Kleberg 2 miles in E. (N.E., S.W., etc.) direction from Ricardo, Tx. (Town)

)riller must complete the legal description to the right vith distance and direction from two intersecting section or survey lines, or he must locate and identify the vell on an official Quarter- or Half-Scale Texas County ieneral Highway Map and attach the map to this form.

☐ Legal description:
Section No. ____ Block No. ____ Township ____
Abstract No. ____ Survey Name ____
Distance and direction from two intersecting section or survey lines ____

☑ See attached map. #1

3) TYPE OF WORK (Check):
☑ New Well ☐ Deepening
☐ Reconditioning ☐ Plugging

4) PROPOSED USE (Check):
☑ Domestic ☐ Industrial ☐ Public Supply
☐ Irrigation ☐ Test Well ☐ Other ____

5) DRILLING METHOD (Check):
☑ Mud Rotary ☐ Air Hammer ☐ Driven ☐ Bored
☐ Air Rotary ☐ Cable Tool ☐ Jetted ☐ Other ____

6) WELL LOG:

Date drilled 7-7-78

DIAMETER OF HOLE Dia. (in.)	From (ft.)	To (ft.)
6¼	Surface	763

From (ft.)	To (ft.)	Description and color of formation material
	3	top soil
3	180	caliche & shale
180	240	shale
240	260	sand
260	466	shale
46'	480	sand
	617	shale
	646	sand
646	661	shale & sand
661	701	shale
701	711	sand
711	726	shale
726	763	sand

(Use reverse side if necessary)

7) BOREHOLE COMPLETION:
☐ Open Hole ☑ Straight Wall ☐ Underreamed
☐ Gravel Packed ☐ Other ____
If Gravel Packed give interval . . . from ____ ft. to ____ ft.

8) CASING, BLANK PIPE, AND WELL SCREEN DATA:

Dia. (in.)	New or Used	Steel, Plastic, etc. Perf., Slotted, etc. Screen Mgf., if commercial	Setting (ft.) From	Setting (ft.) To	Gage Casing Screen
4½	n	P.V.C.	0	763	Sched. 40
4½	n	Slotted	726	763	.016

CEMENTING DATA

Cemented from ____ ft. to ____ ft.
Method used ____
Cemented by ____ (Company or Individual)

9) WATER LEVEL:
Static level 101 ft. below land surface Date 7-10-78
Artesian flow ____ gpm. Date ____

10) PACKERS: Type Depth
Plastic shirttail 726 ft.

11) TYPE PUMP:
☐ Turbin ☐ Jet ☑ Submersible ☐ Cylinder
☐ Other ____
Depth to pump bowls, cylinder, jet, etc., 160 ft.

3) WATER QUALITY:
Did you knowingly penetrate any strata which contained undesirable water? ☐ Yes ☑ No
If yes, submit "REPORT OF UNDESIRABLE WATER"
Type of water? ____ Depth of strata ____
Was a chemical analysis made? ☐ Yes ☒ No

12) WELL TESTS:
☐ Type Test: ☐ Pump ☐ Bailer ☑ Jetted ☐ Estimated
Yield: 60 gpm with ____ ft. drawdown after ____ hrs.

I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief.

BEN H. WELTY (Type or Print) Water Well Drillers Registration No. 543

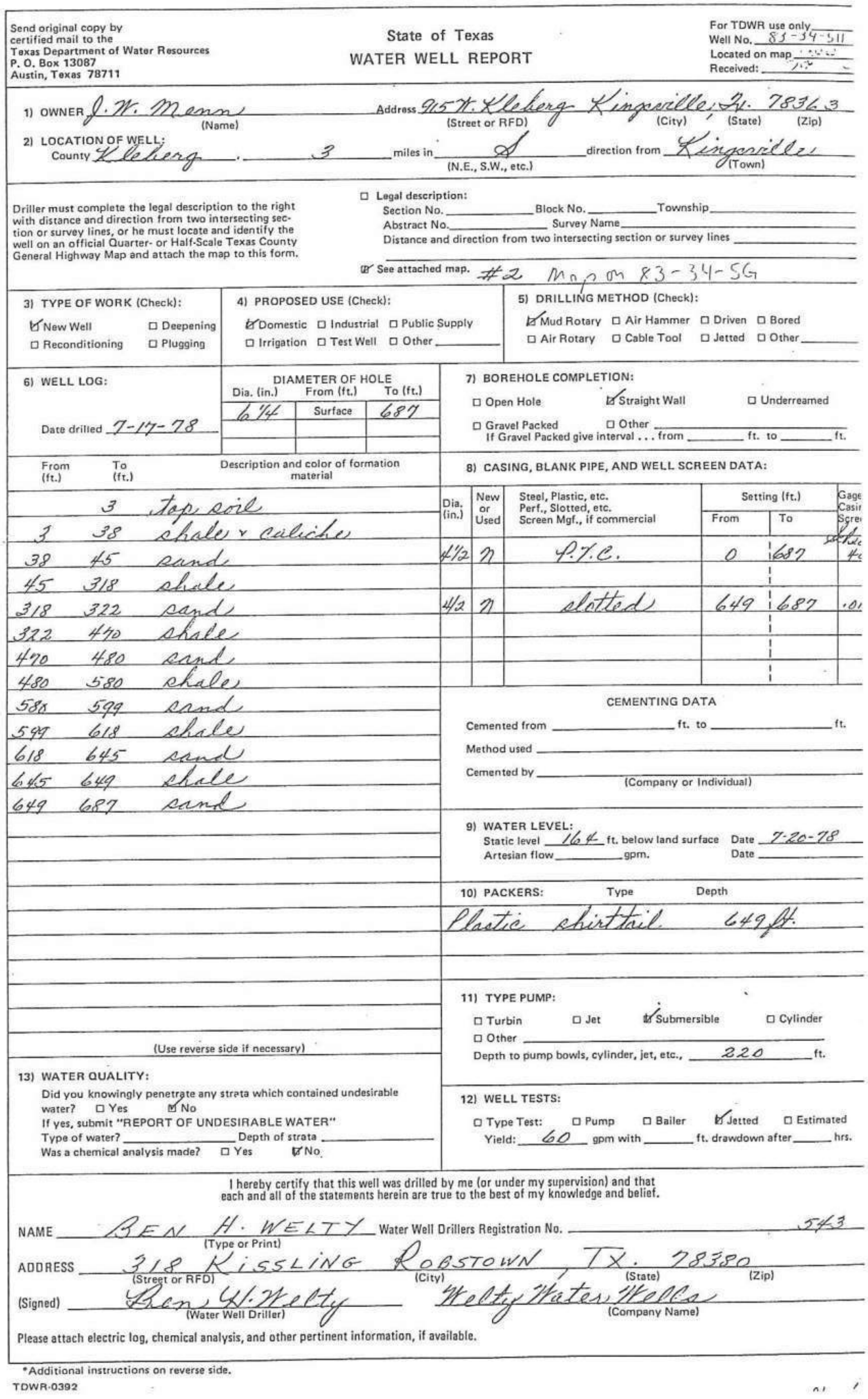
DDRESS 318 KISSLING (Street or RFD) ROBSTOWN (City) TX. (State) 78380 (Zip)

Signed) Ben H. Welty (Water Well Driller) Welty Water Wells (Company Name)

ease attach electric log, chemical analysis, and other pertinent information, if available.

Additional instructions on reverse side.

J-2



Send original copy by
certified mail to the
Texas Department of Water Resources
P. O. Box 13087
Austin, Texas 78711

State of Texas
WATER WELL REPORT

For TDWR use only
Well No. 83-34-511
Located on map
Received:

1) OWNER J. W. Menn (Name) Address 915 W. Kleberg Kingsville, Tx. 78363 (Street or RFD) (City) (State) (Zip)

2) LOCATION OF WELL:
County Kleberg . 3 miles in S (N.E., S.W., etc.) direction from Kingsville (Town)

Driller must complete the legal description to the right with distance and direction from two intersecting section or survey lines, or he must locate and identify the well on an official Quarter- or Half-Scale Texas County General Highway Map and attach the map to this form.

☐ Legal description:
Section No. ______ Block No. ______ Township ______
Abstract No. ______ Survey Name ______
Distance and direction from two intersecting section or survey lines ______

☑ See attached map. #2 Map on 83-34-5G

3) TYPE OF WORK (Check):
☑ New Well ☐ Deepening
☐ Reconditioning ☐ Plugging

4) PROPOSED USE (Check):
☑ Domestic ☐ Industrial ☐ Public Supply
☐ Irrigation ☐ Test Well ☐ Other ______

5) DRILLING METHOD (Check):
☑ Mud Rotary ☐ Air Hammer ☐ Driven ☐ Bored
☐ Air Rotary ☐ Cable Tool ☐ Jetted ☐ Other ______

6) WELL LOG:

Date drilled 7-17-78

DIAMETER OF HOLE

Dia. (in.)	From (ft.)	To (ft.)
6 1/4	Surface	687

From (ft.)	To (ft.)	Description and color of formation material
	3	top soil
3	38	shale + caliche
38	45	sand
45	318	shale
318	322	sand
322	470	shale
470	480	sand
480	580	shale
580	599	sand
599	618	shale
618	645	sand
645	649	shale
649	687	sand

(Use reverse side if necessary)

7) BOREHOLE COMPLETION:
☐ Open Hole ☑ Straight Wall ☐ Underreamed
☐ Gravel Packed ☐ Other ______
If Gravel Packed give interval . . . from ______ ft. to ______ ft.

8) CASING, BLANK PIPE, AND WELL SCREEN DATA:

Dia. (in.)	New or Used	Steel, Plastic, etc. Perf., Slotted, etc. Screen Mgf., if commercial	Setting (ft.)		Gage Casi Scre
			From	To	
4 1/2	n	P.V.C.	0	687	4
4 1/2	n	slotted	649	687	.01

CEMENTING DATA

Cemented from ______ ft. to ______ ft.
Method used ______
Cemented by ______ (Company or Individual)

9) WATER LEVEL:
Static level 164 ft. below land surface Date 7-20-78
Artesian flow ______ gpm. Date ______

10) PACKERS: Type Depth
Plastic shirttail 649 ft.

11) TYPE PUMP:
☐ Turbin ☐ Jet ☑ Submersible ☐ Cylinder
☐ Other ______
Depth to pump bowls, cylinder, jet, etc., 220 ft.

12) WELL TESTS:
☐ Type Test: ☐ Pump ☐ Bailer ☑ Jetted ☐ Estimated
Yield: 60 gpm with ______ ft. drawdown after ______ hrs.

13) WATER QUALITY:
Did you knowingly penetrate any strata which contained undesirable water? ☐ Yes ☑ No
If yes, submit "REPORT OF UNDESIRABLE WATER"
Type of water? ______ Depth of strata ______
Was a chemical analysis made? ☐ Yes ☑ No

I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief.

NAME BEN H. WELTY (Type or Print) Water Well Drillers Registration No. 543

ADDRESS 318 KISSLING (Street or RFD) ROBSTOWN (City), TX. (State) 78380 (Zip)

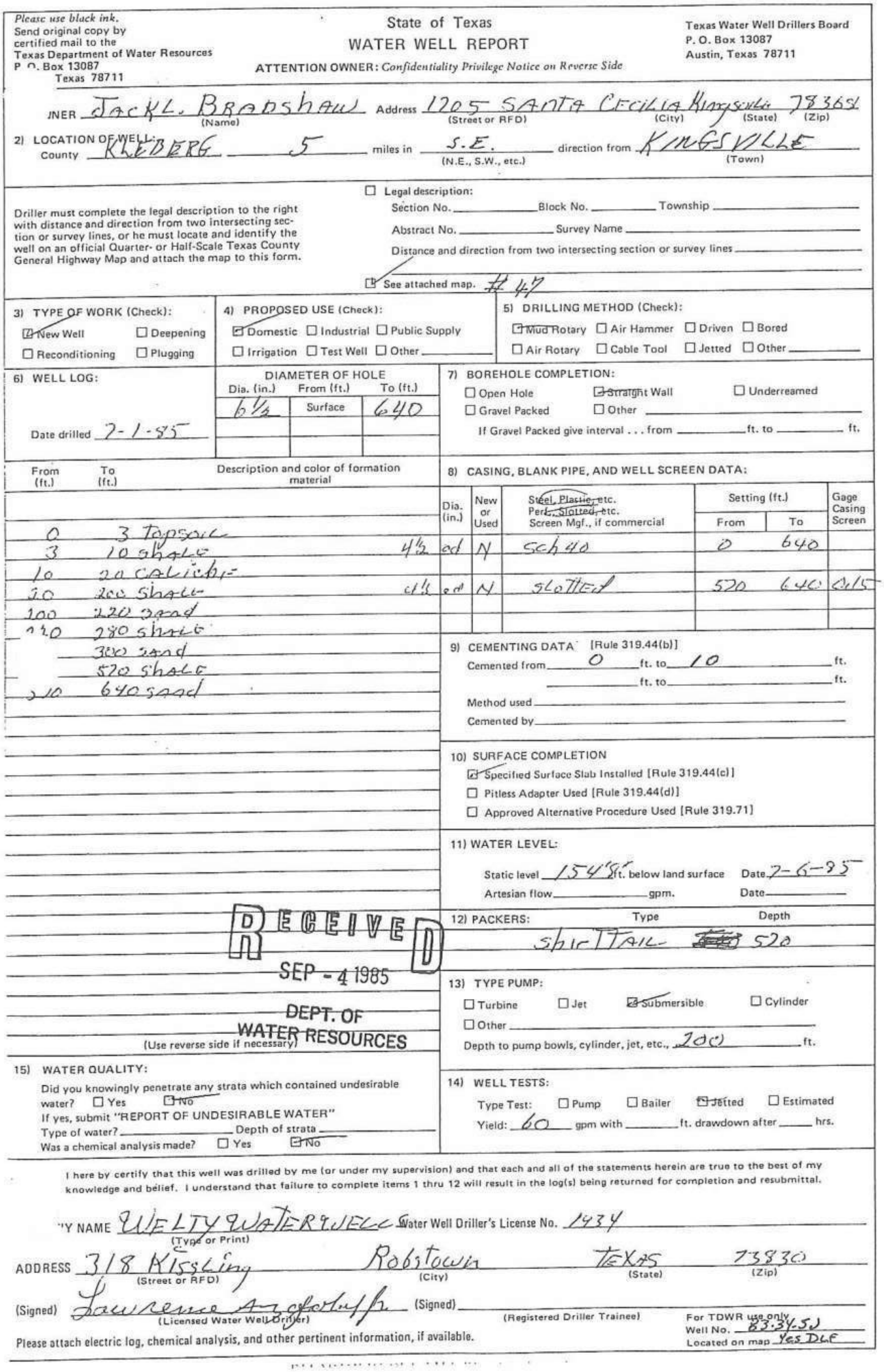
(Signed) Ben H. Welty (Water Well Driller) Welty Water Wells (Company Name)

Please attach electric log, chemical analysis, and other pertinent information, if available.

*Additional instructions on reverse side.

TDWR-0392

J-2



Please use black ink.
Send original copy by
certified mail to the
Texas Department of Water Resources
P. O. Box 13087
Texas 78711

State of Texas
WATER WELL REPORT

ATTENTION OWNER: *Confidentiality Privilege Notice on Reverse Side*

Texas Water Well Drillers Board
P. O. Box 13087
Austin, Texas 78711

1) OWNER JACK L. BRADSHAW (Name) Address 1205 SANTA CECILIA (Street or RFD) Kingsville (City) (State) 78363 (Zip)

2) LOCATION OF WELL: County KLEBERG 5 miles in S.E. (N.E., S.W., etc.) direction from KINGSVILLE (Town)

Driller must complete the legal description to the right with distance and direction from two intersecting section or survey lines, or he must locate and identify the well on an official Quarter- or Half-Scale Texas County General Highway Map and attach the map to this form.

☐ Legal description:
Section No. ______ Block No. ______ Township ______
Abstract No. ______ Survey Name ______
Distance and direction from two intersecting section or survey lines ______

☑ See attached map. # 47

3) TYPE OF WORK (Check): ☑ New Well ☐ Deepening ☐ Reconditioning ☐ Plugging

4) PROPOSED USE (Check): ☑ Domestic ☐ Industrial ☐ Public Supply ☐ Irrigation ☐ Test Well ☐ Other ______

5) DRILLING METHOD (Check): ☑ Mud Rotary ☐ Air Hammer ☐ Driven ☐ Bored ☐ Air Rotary ☐ Cable Tool ☐ Jetted ☐ Other ______

6) WELL LOG:

Date drilled 7-1-85

DIAMETER OF HOLE

Dia. (in.)	From (ft.)	To (ft.)
6½	Surface	640

From (ft.)	To (ft.)	Description and color of formation material
0	3	Topsoil
3	10	shale
10	20	CAliche
20	200	shale
100	220	sand
120	280	shale
	300	sand
	520	shale
[illegible]	640	sand

(Use reverse side if necessary)

7) BOREHOLE COMPLETION:
☐ Open Hole ☑ Straight Wall ☐ Underreamed
☐ Gravel Packed ☐ Other ______
If Gravel Packed give interval . . . from ______ ft. to ______ ft.

8) CASING, BLANK PIPE, AND WELL SCREEN DATA:

Dia. (in.)	New or Used	Steel, ~~Plastic, etc.~~ ~~Perf., Slotted, etc.~~ Screen Mgf., if commercial	Setting (ft.)		Gage Casing Screen
			From	To	
4½ od	N	sch 40	0	640	
4½ od	N	slotted	520	640	.015

9) CEMENTING DATA [Rule 319.44(b)]
Cemented from 0 ft. to 10 ft.
______ ft. to ______ ft.
Method used ______
Cemented by ______

10) SURFACE COMPLETION
☑ Specified Surface Slab Installed [Rule 319.44(c)]
☐ Pitless Adapter Used [Rule 319.44(d)]
☐ Approved Alternative Procedure Used [Rule 319.71]

11) WATER LEVEL:
Static level 154'8" ft. below land surface Date 7-6-85
Artesian flow ______ gpm. Date ______

12) PACKERS: Type shirtTAIL Depth ~~[illegible]~~ 520

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DEPT. OF WATER RESOURCES

13) TYPE PUMP:
☐ Turbine ☐ Jet ☑ Submersible ☐ Cylinder
☐ Other ______
Depth to pump bowls, cylinder, jet, etc., 200 ft.

14) WELL TESTS:
Type Test: ☐ Pump ☐ Bailer ☑ Jetted ☐ Estimated
Yield: 60 gpm with ______ ft. drawdown after ______ hrs.

15) WATER QUALITY:
Did you knowingly penetrate any strata which contained undesirable water? ☐ Yes ☑ No
If yes, submit "REPORT OF UNDESIRABLE WATER"
Type of water? ______ Depth of strata ______
Was a chemical analysis made? ☐ Yes ☑ No

I here by certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief. I understand that failure to complete items 1 thru 12 will result in the log(s) being returned for completion and resubmittal.

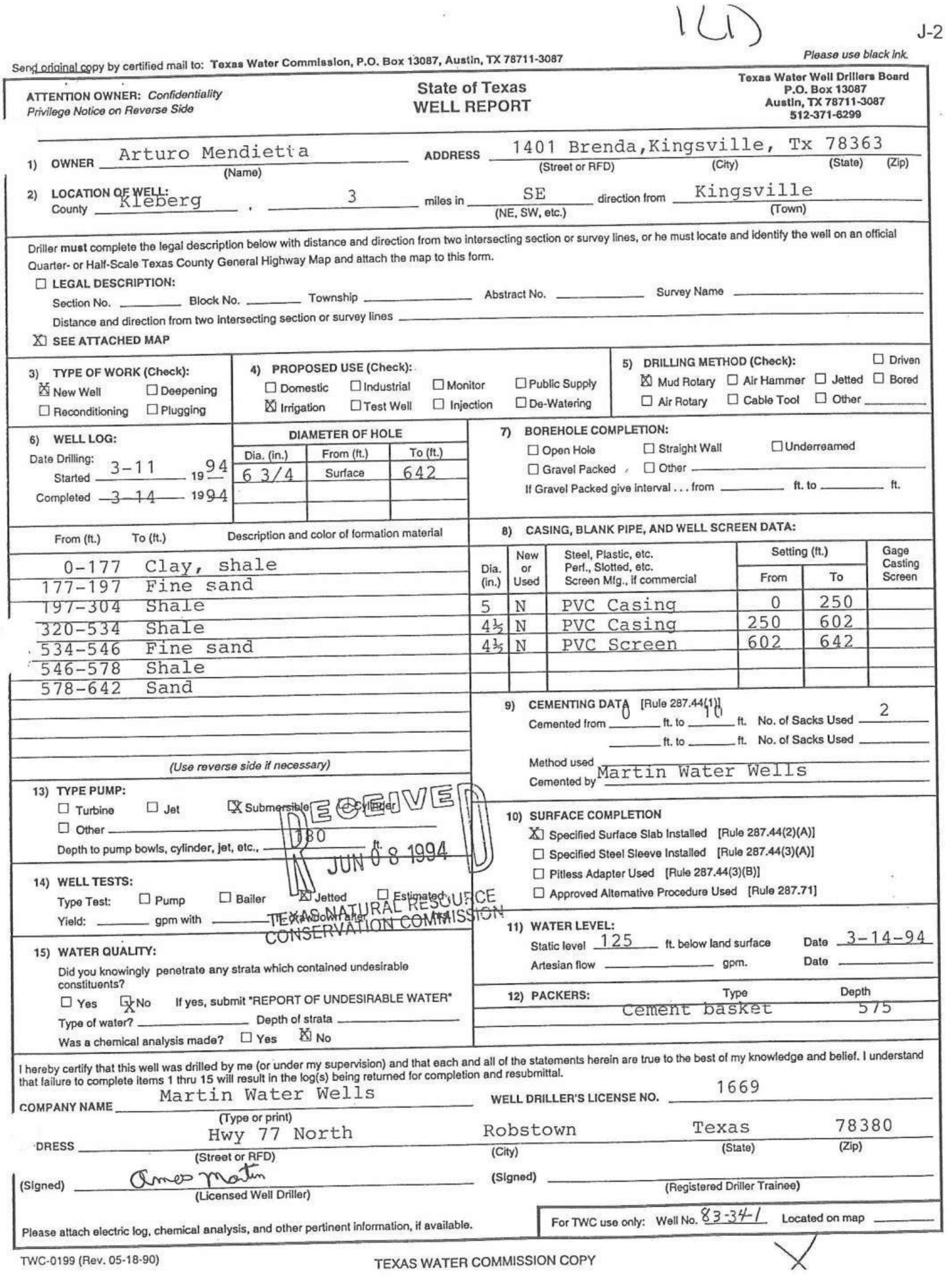
COMPANY NAME WELTY WATERWELLS (Type or Print) Water Well Driller's License No. 1434

ADDRESS 318 Kissling (Street or RFD) Robstown (City) TEXAS (State) 78380 (Zip)

(Signed) Lawrence Angerhofer (Licensed Water Well Driller) (Signed) ______ (Registered Driller Trainee)

For TDWR use only
Well No. 83-34-5J
Located on map Yes DLF

Please attach electric log, chemical analysis, and other pertinent information, if available.



1(4)

J-2

Send original copy by certified mail to: Texas Water Commission, P.O. Box 13087, Austin, TX 78711-3087

Please use black ink.

ATTENTION OWNER: *Confidentiality Privilege Notice on Reverse Side*

State of Texas WELL REPORT

Texas Water Well Drillers Board
P.O. Box 13087
Austin, TX 78711-3087
512-371-6299

1) OWNER Arturo Mendietta (Name) ADDRESS 1401 Brenda, Kingsville, Tx 78363 (Street or RFD) (City) (State) (Zip)

2) LOCATION OF WELL: County Kleberg , 3 miles in SE (NE, SW, etc.) direction from Kingsville (Town)

Driller **must** complete the legal description below with distance and direction from two intersecting section or survey lines, or he must locate and identify the well on an official Quarter- or Half-Scale Texas County General Highway Map and attach the map to this form.

☐ LEGAL DESCRIPTION:
Section No. ______ Block No. ______ Township ______ Abstract No. ______ Survey Name ______
Distance and direction from two intersecting section or survey lines ______
☒ SEE ATTACHED MAP

3) TYPE OF WORK (Check): ☒ New Well ☐ Deepening ☐ Reconditioning ☐ Plugging

4) PROPOSED USE (Check): ☐ Domestic ☐ Industrial ☐ Monitor ☐ Public Supply ☒ Irrigation ☐ Test Well ☐ Injection ☐ De-Watering

5) DRILLING METHOD (Check): ☐ Driven ☒ Mud Rotary ☐ Air Hammer ☐ Jetted ☐ Bored ☐ Air Rotary ☐ Cable Tool ☐ Other ______

6) WELL LOG:
Date Drilling:
Started 3-11 19 94
Completed 3-14 1994

DIAMETER OF HOLE

Dia. (in.)	From (ft.)	To (ft.)
6 3/4	Surface	642

7) BOREHOLE COMPLETION:
☐ Open Hole ☐ Straight Wall ☐ Underreamed
☐ Gravel Packed ☐ Other ______
If Gravel Packed give interval . . . from ______ ft. to ______ ft.

From (ft.) To (ft.)	Description and color of formation material
0-177	Clay, shale
177-197	Fine sand
197-304	Shale
320-534	Shale
534-546	Fine sand
546-578	Shale
578-642	Sand

(Use reverse side if necessary)

8) CASING, BLANK PIPE, AND WELL SCREEN DATA:

Dia. (in.)	New or Used	Steel, Plastic, etc. Perf., Slotted, etc. Screen Mfg., if commercial	Setting (ft.) From	Setting (ft.) To	Gage Casting Screen
5	N	PVC Casing	0	250	
4½	N	PVC Casing	250	602	
4½	N	PVC Screen	602	642	

9) CEMENTING DATA [Rule 287.44(1)]
Cemented from 0 ft. to 10 ft. No. of Sacks Used 2
______ ft. to ______ ft. No. of Sacks Used ______
Method used ______
Cemented by Martin Water Wells

13) TYPE PUMP:
☐ Turbine ☐ Jet ☒ Submersible ☐ Cylinder
☐ Other ______
Depth to pump bowls, cylinder, jet, etc., 180 ft.

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10) SURFACE COMPLETION
☒ Specified Surface Slab Installed [Rule 287.44(2)(A)]
☐ Specified Steel Sleeve Installed [Rule 287.44(3)(A)]
☐ Pitless Adapter Used [Rule 287.44(3)(B)]
☐ Approved Alternative Procedure Used [Rule 287.71]

14) WELL TESTS:
Type Test: ☐ Pump ☐ Bailer ☒ Jetted ☐ Estimated
Yield: ______ gpm with ______ ft. drawdown after ______ hrs.

11) WATER LEVEL:
Static level 125 ft. below land surface Date 3-14-94
Artesian flow ______ gpm. Date ______

15) WATER QUALITY:
Did you knowingly penetrate any strata which contained undesirable constituents?
☐ Yes ☒ No If yes, submit "REPORT OF UNDESIRABLE WATER"
Type of water? ______ Depth of strata ______
Was a chemical analysis made? ☐ Yes ☒ No

12) PACKERS:

Type	Depth
Cement basket	575

I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief. I understand that failure to complete items 1 thru 15 will result in the log(s) being returned for completion and resubmittal.

COMPANY NAME Martin Water Wells (Type or print) WELL DRILLER'S LICENSE NO. 1669

ADDRESS Hwy 77 North (Street or RFD) Robstown (City) Texas (State) 78380 (Zip)

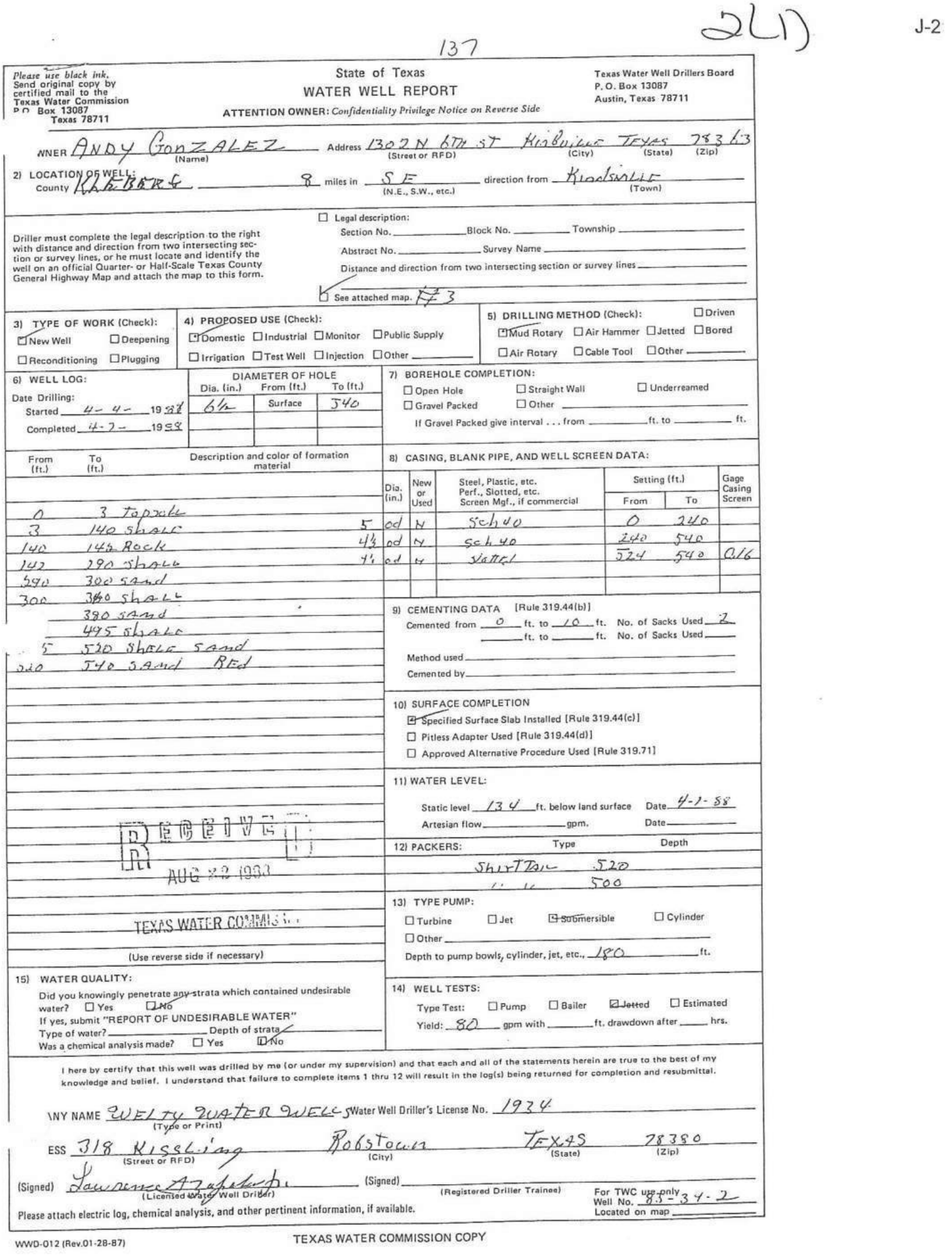
(Signed) Amos Martin (Licensed Well Driller) (Signed) ______ (Registered Driller Trainee)

Please attach electric log, chemical analysis, and other pertinent information, if available.

For TWC use only: Well No. 83-34-1 Located on map ______

X

TWC-0199 (Rev. 05-18-90) TEXAS WATER COMMISSION COPY



2(1) J-2

137

Please use black ink.
Send original copy by
certified mail to the
Texas Water Commission
P O Box 13087
Texas 78711

State of Texas
WATER WELL REPORT

ATTENTION OWNER: *Confidentiality Privilege Notice on Reverse Side*

Texas Water Well Drillers Board
P. O. Box 13087
Austin, Texas 78711

1) OWNER Andy Gonzalez (Name) Address 1302 N 6th St (Street or RFD) Kingsville (City) Texas (State) 78363 (Zip)

2) LOCATION OF WELL:
County Kleberg 8 miles in SE (N.E., S.W., etc.) direction from Kingsville (Town)

Driller must complete the legal description to the right with distance and direction from two intersecting section or survey lines, or he must locate and identify the well on an official Quarter- or Half-Scale Texas County General Highway Map and attach the map to this form.

☐ Legal description:
Section No. ______ Block No. ______ Township ______
Abstract No. ______ Survey Name ______
Distance and direction from two intersecting section or survey lines ______
☑ See attached map. #3

3) TYPE OF WORK (Check): ☑ New Well ☐ Deepening ☐ Reconditioning ☐ Plugging

4) PROPOSED USE (Check): ☑ Domestic ☐ Industrial ☐ Monitor ☐ Public Supply ☐ Irrigation ☐ Test Well ☐ Injection ☐ Other ______

5) DRILLING METHOD (Check): ☐ Driven ☑ Mud Rotary ☐ Air Hammer ☐ Jetted ☐ Bored ☐ Air Rotary ☐ Cable Tool ☐ Other ______

6) WELL LOG:
Date Drilling:
Started 4-4- 19 88
Completed 4-7- 19 88

DIAMETER OF HOLE

Dia. (in.)	From (ft.)	To (ft.)
6½	Surface	540

7) BOREHOLE COMPLETION:
☐ Open Hole ☐ Straight Wall ☐ Underreamed
☐ Gravel Packed ☐ Other ______
If Gravel Packed give interval . . . from ______ ft. to ______ ft.

From (ft.)	To (ft.)	Description and color of formation material
0	3	Topsoil
3	140	shale
140	145	Rock
142	290	shale
290	300	sand
300	340	shale
	380	sand
	495	shale
5	520	shale sand
520	540	sand Red

(Use reverse side if necessary)

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8) CASING, BLANK PIPE, AND WELL SCREEN DATA:

Dia. (in.)	New or Used	Steel, Plastic, etc. Perf., Slotted, etc. Screen Mgf., if commercial	Setting (ft.) From	Setting (ft.) To	Gage Casing Screen
5 od	N	Sch 40	0	240	
4½ od	N	Sch 40	240	540	
4½ od	N	Slotted	524	540	0.16

9) CEMENTING DATA [Rule 319.44(b)]
Cemented from 0 ft. to 10 ft. No. of Sacks Used 2
______ ft. to ______ ft. No. of Sacks Used ______
Method used ______
Cemented by ______

10) SURFACE COMPLETION
☑ Specified Surface Slab Installed [Rule 319.44(c)]
☐ Pitless Adapter Used [Rule 319.44(d)]
☐ Approved Alternative Procedure Used [Rule 319.71]

11) WATER LEVEL:
Static level 134 ft. below land surface Date 4-7-88
Artesian flow ______ gpm. Date ______

12) PACKERS:

Type	Depth
Shirttail	520
" "	500

13) TYPE PUMP:
☐ Turbine ☐ Jet ☑ Submersible ☐ Cylinder
☐ Other ______
Depth to pump bowls, cylinder, jet, etc., 180 ft.

14) WELL TESTS:
Type Test: ☐ Pump ☐ Bailer ☑ Jetted ☐ Estimated
Yield: 80 gpm with ______ ft. drawdown after ______ hrs.

15) WATER QUALITY:
Did you knowingly penetrate any strata which contained undesirable water? ☐ Yes ☑ No
If yes, submit "REPORT OF UNDESIRABLE WATER"
Type of water? ______ Depth of strata ______
Was a chemical analysis made? ☐ Yes ☑ No

I here by certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief. I understand that failure to complete items 1 thru 12 will result in the log(s) being returned for completion and resubmittal.

COMPANY NAME Welty Water Wells (Type or Print) Water Well Driller's License No. 1934

ADDRESS 318 Kissling (Street or RFD) Robstown (City) Texas (State) 78380 (Zip)

(Signed) Lawrence (Licensed Water Well Driller) (Signed) ______ (Registered Driller Trainee)

For TWC use only
Well No. 83-34-2
Located on map ______

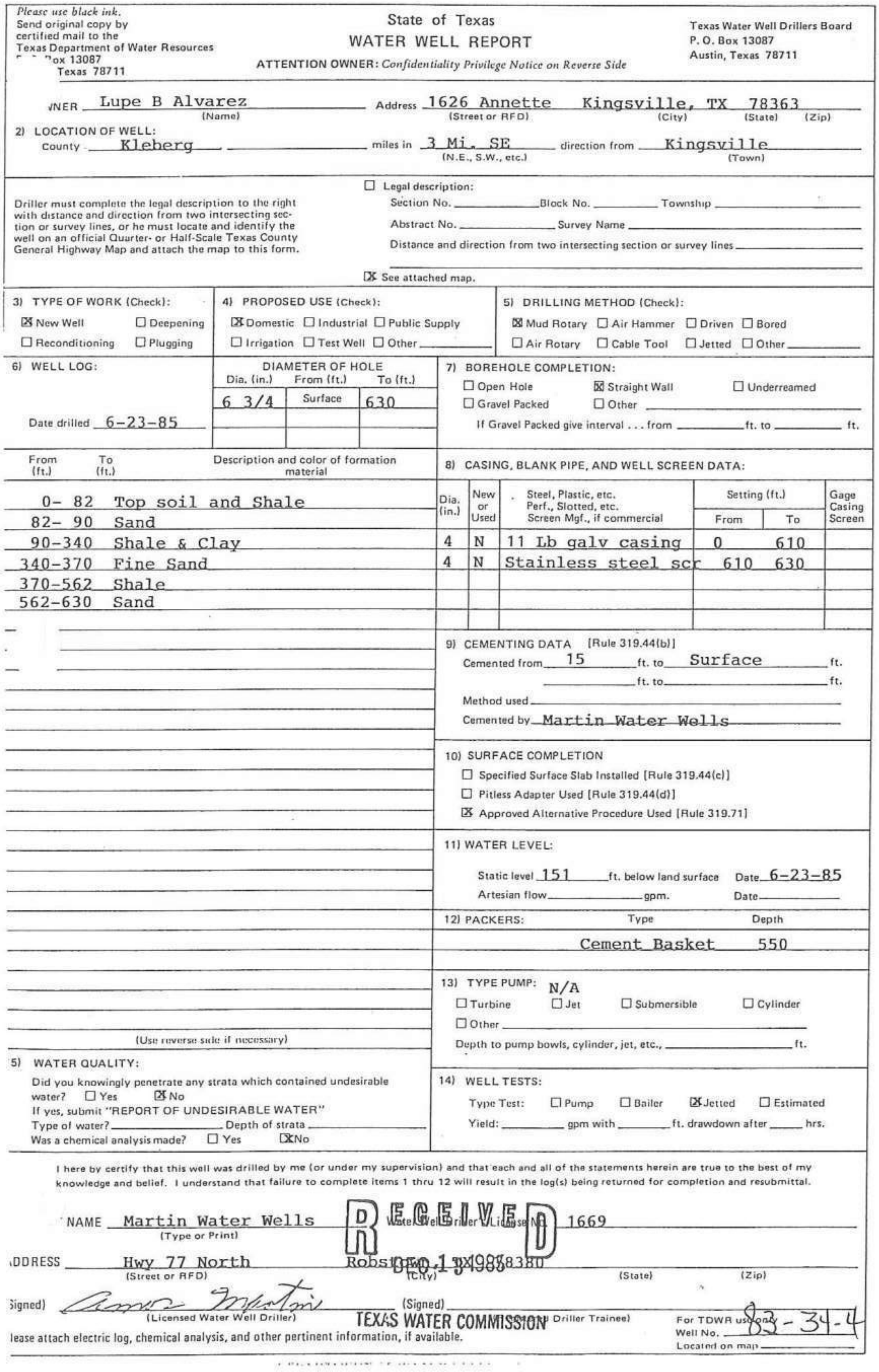
Please attach electric log, chemical analysis, and other pertinent information, if available.

WWD-012 (Rev.01-28-87)

TEXAS WATER COMMISSION COPY

4(1)

J-3



Please use black ink.
Send original copy by certified mail to the
Texas Department of Water Resources
ox 13087
Texas 78711

State of Texas
WATER WELL REPORT

Texas Water Well Drillers Board
P. O. Box 13087
Austin, Texas 78711

ATTENTION OWNER: *Confidentiality Privilege Notice on Reverse Side*

NER Lupe B Alvarez (Name) Address 1626 Annette (Street or RFD) Kingsville, (City) TX (State) 78363 (Zip)

2) LOCATION OF WELL:
County Kleberg miles in 3 Mi. SE (N.E., S.W., etc.) direction from Kingsville (Town)

Driller must complete the legal description to the right with distance and direction from two intersecting section or survey lines, or he must locate and identify the well on an official Quarter- or Half-Scale Texas County General Highway Map and attach the map to this form.

☐ Legal description:
Section No. ____ Block No. ____ Township ____
Abstract No. ____ Survey Name ____
Distance and direction from two intersecting section or survey lines ____
☒ See attached map.

3) TYPE OF WORK (Check):
☒ New Well ☐ Deepening
☐ Reconditioning ☐ Plugging

4) PROPOSED USE (Check):
☒ Domestic ☐ Industrial ☐ Public Supply
☐ Irrigation ☐ Test Well ☐ Other ____

5) DRILLING METHOD (Check):
☒ Mud Rotary ☐ Air Hammer ☐ Driven ☐ Bored
☐ Air Rotary ☐ Cable Tool ☐ Jetted ☐ Other ____

6) WELL LOG:
Date drilled 6-23-85

DIAMETER OF HOLE

Dia. (in.)	From (ft.)	To (ft.)
6 3/4	Surface	630

7) BOREHOLE COMPLETION:
☐ Open Hole ☒ Straight Wall ☐ Underreamed
☐ Gravel Packed ☐ Other ____
If Gravel Packed give interval . . . from ____ ft. to ____ ft.

From (ft.)	To (ft.)	Description and color of formation material
0-	82	Top soil and Shale
82-	90	Sand
90-	340	Shale & Clay
340-	370	Fine Sand
370-	562	Shale
562-	630	Sand

(Use reverse side if necessary)

8) CASING, BLANK PIPE, AND WELL SCREEN DATA:

Dia. (in.)	New or Used	Steel, Plastic, etc. Perf., Slotted, etc. Screen Mgf., if commercial	Setting (ft.) From	Setting (ft.) To	Gage Casing Screen
4	N	11 Lb galv casing	0	610	
4	N	Stainless steel scr	610	630	

9) CEMENTING DATA [Rule 319.44(b)]
Cemented from 15 ft. to Surface ft.
____ ft. to ____ ft.
Method used ____
Cemented by Martin Water Wells

10) SURFACE COMPLETION
☐ Specified Surface Slab Installed [Rule 319.44(c)]
☐ Pitless Adapter Used [Rule 319.44(d)]
☒ Approved Alternative Procedure Used [Rule 319.71]

11) WATER LEVEL:
Static level 151 ft. below land surface Date 6-23-85
Artesian flow ____ gpm. Date ____

12) PACKERS:

Type	Depth
Cement Basket	550

13) TYPE PUMP: N/A
☐ Turbine ☐ Jet ☐ Submersible ☐ Cylinder
☐ Other ____
Depth to pump bowls, cylinder, jet, etc., ____ ft.

5) WATER QUALITY:
Did you knowingly penetrate any strata which contained undesirable water? ☐ Yes ☒ No
If yes, submit "REPORT OF UNDESIRABLE WATER"
Type of water? ____ Depth of strata ____
Was a chemical analysis made? ☐ Yes ☒ No

14) WELL TESTS:
Type Test: ☐ Pump ☐ Bailer ☒ Jetted ☐ Estimated
Yield: ____ gpm with ____ ft. drawdown after ____ hrs.

I here by certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief. I understand that failure to complete items 1 thru 12 will result in the log(s) being returned for completion and resubmittal.

NAME Martin Water Wells (Type or Print) Water Well Driller's License No. 1669

DDRESS Hwy 77 North (Street or RFD) Robst[illegible] (City) TX [illegible]8380 (State) (Zip)

Signed) Amos Martin (Licensed Water Well Driller) (Signed) ____ (Registered Driller Trainee)

lease attach electric log, chemical analysis, and other pertinent information, if available.

For TDWR use only
Well No. 83-34-4
Located on map ____

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DEC 13 1985
TEXAS WATER COMMISSION

5(1)

J-3

Send original copy by certified mail to: **Texas Water Commission, P.O. Box 13087, Austin, Texas 78711**

Please use black ink.

ATTENTION OWNER: *Confidentiality Privilege Notice on Reverse Side*

State of Texas
WELL REPORT

Texas Water Well Drillers Board
P.O. Box 13087
Austin, Texas 78711

OWNER Juventino Garcia (Name) ADDRESS Route 1, Box 488-E, Kingsville, Texas (Street or RFD) (City) (State) (Zip)

2) LOCATION OF WELL: County Kleberg , 4½ miles in SW (NE, SW, etc.) direction from Ricardo (Town)

Driller must complete the legal description below with distance and direction from two intersecting section or survey lines, or he must locate and identify the well on an official Quarter- or Half-Scale Texas County General Highway Map and attach the map to this form.

☐ LEGAL DESCRIPTION:

Section No. ______ Block No. ______ Township ______ Abstract No. ______ Survey Name ______

Distance and direction from two intersecting section or survey lines ______

☒ SEE ATTACHED MAP

3) TYPE OF WORK (Check): ☒ New Well ☐ Deepening ☐ Reconditioning ☐ Plugging

4) PROPOSED USE (Check): ☒ Domestic ☐ Industrial ☐ Monitor ☐ Public Supply ☐ Irrigation ☐ Test Well ☐ Injection ☐ De-Watering

5) DRILLING METHOD (Check): ☐ Driven ☒ Mud Rotary ☐ Air Hammer ☐ Jetted ☐ Bored ☐ Air Rotary ☐ Cable Tool ☐ Other ______

6) WELL LOG:

Date Drilling:
Started 2-22 1993
Completed 2-26 1993

DIAMETER OF HOLE

Dia. (in.)	From (ft.)	To (ft.)
6 3/4	Surface	573

7) BOREHOLE COMPLETION:

☐ Open Hole ☒ Straight Wall ☐ Underreamed
☐ Gravel Packed ☐ Other ______
If Gravel Packed give interval . . . from ______ ft. to ______ ft.

From (ft.)	To (ft.)	Description and color of formation material
0	69	Clay, shale
69	74	Fine sand
74	217	Shale
217	248	Fine sand
248	457	Shale
457	472	Fine sand
472	534	Shale
534	573	Sand

(Use reverse side if necessary)

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JUL 08 1993
TEXAS WATER COMMISSION

8) CASING, BLANK PIPE, AND WELL SCREEN DATA:

Dia. (in.)	New or Used	Steel, Plastic, etc. Perf., Slotted, etc. Screen Mfg., if commercial	Setting (ft.) From	Setting (ft.) To	Gage Casting Screen
4	N	PVC Casing	0	533	
4	N	PVC Screen	533	573	

9) CEMENTING DATA [Rule 287.44(1)]

Cemented from 10 ft. to 0 ft. No. of Sacks Used 2
______ ft. to ______ ft. No. of Sacks Used ______

Method used ______
Cemented by Martin Water Wells

13) TYPE PUMP:

☐ Turbine ☐ Jet ☒ Submersible ☐ Cylinder
☐ Other ______
Depth to pump bowls, cylinder, jet, etc., 160 ft.

10) SURFACE COMPLETION

☒ Specified Surface Slab Installed [Rule 287.44(2)(A)]
☐ Specified Steel Sleeve Installed [Rule 287.44(3)(A)]
☐ Pitless Adapter Used [Rule 287.44(3)(B)]
☐ Approved Alternative Procedure Used [Rule 287.71]

14) WELL TESTS:

Type Test: ☐ Pump ☐ Bailer ☒ Jetted ☐ Estimated
Yield: ______ gpm with ______ ft. drawdown after ______ hrs.

11) WATER LEVEL:

Static level 111 ft. below land surface Date 2-26-93
Artesian flow ______ gpm. Date ______

15) WATER QUALITY:

Did you knowingly penetrate any strata which contained undesirable constituents?
☐ Yes ☒ No If yes, submit "REPORT OF UNDESIRABLE WATER"
Type of water? ______ Depth of strata ______
Was a chemical analysis made? ☐ Yes ☒ No

12) PACKERS:

Type	Depth
Cement basket	530

ereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief. I understand at failure to complete items 1 thru 15 will result in the log(s) being returned for completion and resubmittal.

OMPANY NAME Martin Water Wells (Type or print) WELL DRILLER'S LICENSE NO. 1669

SS Hwy 77 ;North (Street or RFD) Robstown (City) Texas (State) 78380 (Zip)

igned) Amos Martin (Licensed Well Driller) (Signed) ______ (Registered Driller Trainee)

lease attach electric log, chemical analysis, and other pertinent information, if available.

For TWC use only: Well No. ______ Located on map 83·34·5

WD-012 (Rev. 05-18-90)

TEXAS WATER COMMISSION COPY

5(2)

J-3

Send original copy by certified mail to: **Texas Water Commission, P.O. Box 13087, Austin, Texas 78711**

Please use black ink.

ATTENTION OWNER: *Confidentiality Privilege Notice on Reverse Side*

State of Texas
WELL REPORT

Texas Water Well Drillers Board
P.O. Box 13087
Austin, Texas 78711

OWNER ~~Enrique~~ Ricardo Trevino (Name)

ADDRESS Route 2, Box 317-S, Kingsville, Texas (Street or RFD) (City) (State) (Zip)

2) **LOCATION OF WELL:**
County Kleberg , 2 miles in SE (NE, SW, etc.) direction from Kingsville (Town)

Driller must complete the legal description below with distance and direction from two intersecting section or survey lines, or he must locate and identify the well on an official Quarter- or Half-Scale Texas County General Highway Map and attach the map to this form.

☐ **LEGAL DESCRIPTION:**
Section No. ______ Block No. ______ Township ______ Abstract No. ______ Survey Name ______
Distance and direction from two intersecting section or survey lines ______

☒ **SEE ATTACHED MAP**

3) **TYPE OF WORK (Check):**
☒ New Well ☐ Deepening
☐ Reconditioning ☐ Plugging

4) **PROPOSED USE (Check):**
☒ Domestic ☐ Industrial ☐ Monitor ☐ Public Supply
☐ Irrigation ☐ Test Well ☐ Injection ☐ De-Watering

5) **DRILLING METHOD (Check):**
☐ Driven
☒ Mud Rotary ☐ Air Hammer ☐ Jetted ☐ Bored
☐ Air Rotary ☐ Cable Tool ☐ Other ______

6) **WELL LOG:**
Date Drilling:
Started 6-15 19 90
Completed 6-20 19 90

DIAMETER OF HOLE

Dia. (in.)	From (ft.)	To (ft.)
6 3/4	Surface	630

7) **BOREHOLE COMPLETION:**
☐ Open Hole ☒ Straight Wall ☐ Underreamed
☐ Gravel Packed ☐ Other ______
If Gravel Packed give interval . . . from ______ ft. to ______ ft.

From (ft.)	To (ft.)	Description and color of formation material
0-198		Clay, shale
198-230		Fine sand
230-238		Shale
238-283		Caliche
283-570		Shale
570-630		Sand

(Use reverse side if necessary)

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SEP 17 1990
TEXAS WATER COMMISSION

8) **CASING, BLANK PIPE, AND WELL SCREEN DATA:**

Dia. (in.)	New or Used	Steel, Plastic, etc. Perf., Slotted, etc. Screen Mfg., if commercial	Setting (ft.) From	Setting (ft.) To	Gage Casting Screen
5	N	PVC Casing	0	300	
4	N	PVC Casing	300	600	
4	N	PVC Screen	600	630	

9) **CEMENTING DATA** [Rule 287.44(1)]
Cemented from 10 ft. to 0 ft. No. of Sacks Used 2
______ ft. to ______ ft. No. of Sacks Used ______
Method used ______
Cemented by Martin Water Wells

13) **TYPE PUMP:**
☐ Turbine ☐ Jet ☒ Submersible ☐ Cylinder
☐ Other ______
Depth to pump bowls, cylinder, jet, etc., 220 ft.

10) **SURFACE COMPLETION**
☒ Specified Surface Slab Installed [Rule 287.44(2)(A)]
☐ Pitless Adapter Used [Rule 287.44(3)(B)]
☐ Approved Alternative Procedure Used [Rule 287.71]

14) **WELL TESTS:**
Type Test: ☐ Pump ☐ Bailer ☒ Jetted ☐ Estimated
Yield: ______ gpm with ______ ft. drawdown after ______ hrs.

11) **WATER LEVEL:**
Static level 150 ft. below land surface Date 6-20-90
Artesian flow ______ gpm. Date ______

15) **WATER QUALITY:**
Did the drilling penetrate any strata which contained undesirable constituents?
☐ Yes ☒ No If yes, submit "REPORT OF UNDESIRABLE WATER"
Type of water? ______ Depth of strata ______
Was a chemical analysis made? ☐ Yes ☒ No

12) **PACKERS:**

Type	Depth
Cement basket	560

I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief. I understand that failure to complete items 1 thru 15 will result in the log(s) being returned for completion and resubmittal.

ANY NAME Martin Water Wells (Type or print)
WELL DRILLER'S LICENSE NO. 1669

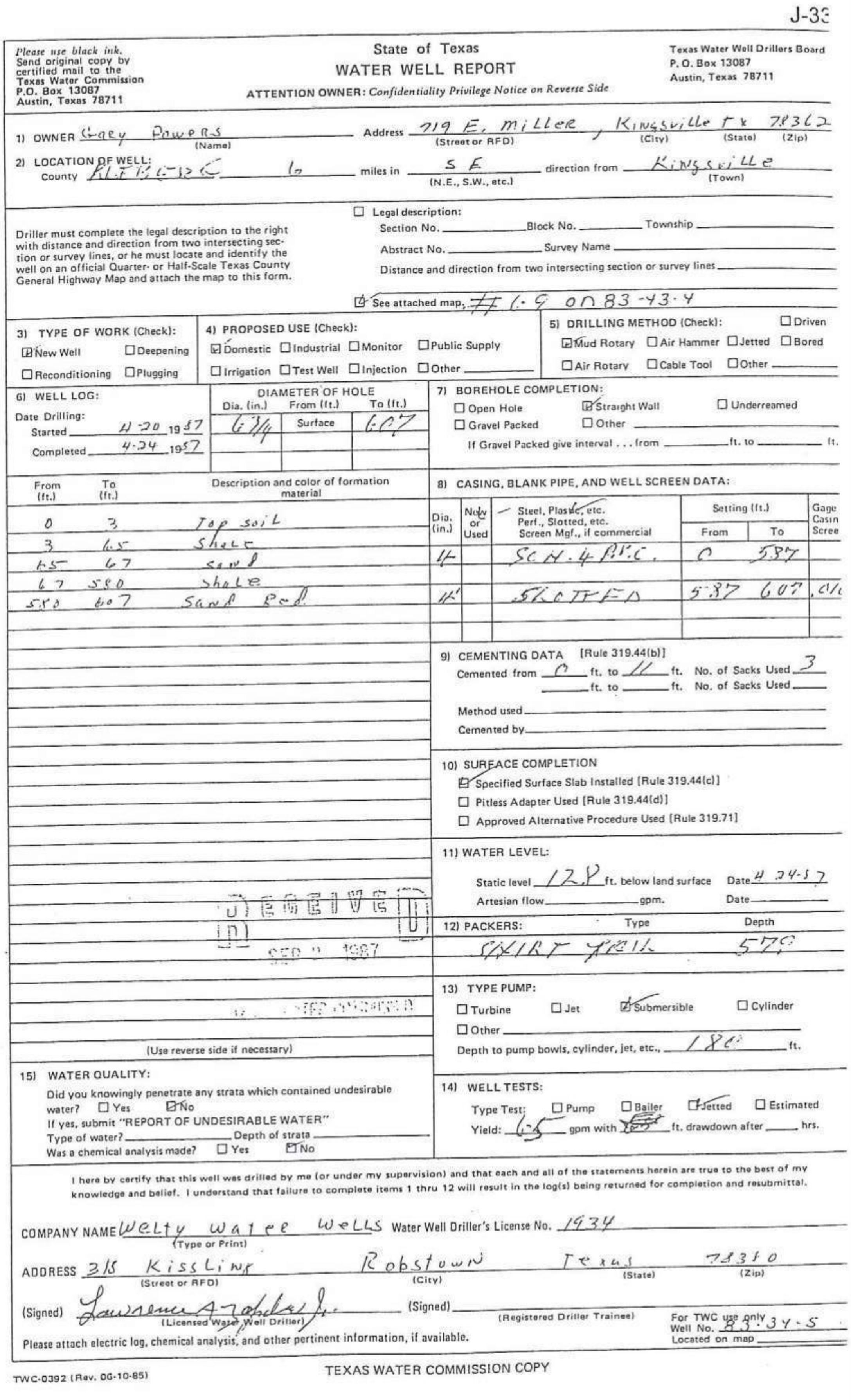
SS Hwy 77 North (Street or RFD) Robstown (City) Texas (State) 78380 (Zip)

(Signed) ______ (Licensed Well Driller)
(Signed) ______ (Registered Driller Trainee)

Please attach electric log, chemical analysis, and other pertinent information, if available.

For TWC use only: Well No. 83-34-5 Located on map ______

WWD 013 (Rev. 09/21/88)



J-33

Please use black ink.
Send original copy by
certified mail to the
Texas Water Commission
P.O. Box 13087
Austin, Texas 78711

State of Texas
WATER WELL REPORT

Texas Water Well Drillers Board
P. O. Box 13087
Austin, Texas 78711

ATTENTION OWNER: *Confidentiality Privilege Notice on Reverse Side*

1) OWNER Gaey Powers (Name) Address 719 E. miller, Kingsville tx 78362 (Street or RFD) (City) (State) (Zip)

2) LOCATION OF WELL:
County KLEBERG 6 miles in S E (N.E., S.W., etc.) direction from Kingsville (Town)

Driller must complete the legal description to the right with distance and direction from two intersecting section or survey lines, or he must locate and identify the well on an official Quarter- or Half-Scale Texas County General Highway Map and attach the map to this form.

☐ Legal description:
Section No. ____ Block No. ____ Township ____
Abstract No. ____ Survey Name ____
Distance and direction from two intersecting section or survey lines ____

☑ See attached map, # 1.9 on 83-43-4

3) TYPE OF WORK (Check):
☑ New Well ☐ Deepening
☐ Reconditioning ☐ Plugging

4) PROPOSED USE (Check):
☑ Domestic ☐ Industrial ☐ Monitor ☐ Public Supply
☐ Irrigation ☐ Test Well ☐ Injection ☐ Other ____

5) DRILLING METHOD (Check):
☑ Mud Rotary ☐ Air Hammer ☐ Jetted ☐ Bored ☐ Driven
☐ Air Rotary ☐ Cable Tool ☐ Other ____

6) WELL LOG:
Date Drilling:
Started 4-20 19 57
Completed 4-24 1957

DIAMETER OF HOLE

Dia. (in.)	From (ft.)	To (ft.)
6 3/4	Surface	607

7) BOREHOLE COMPLETION:
☐ Open Hole ☑ Straight Wall ☐ Underreamed
☐ Gravel Packed ☐ Other ____
If Gravel Packed give interval . . . from ____ ft. to ____ ft.

From (ft.)	To (ft.)	Description and color of formation material
0	3	Top soil
3	65	Shale
65	67	sand
67	580	shale
580	607	Sand Red

(Use reverse side if necessary)

RECEIVED
SEP [illegible] 1987

8) CASING, BLANK PIPE, AND WELL SCREEN DATA:

Dia. (in.)	New or Used	Steel, Plastic, etc. Perf., Slotted, etc. Screen Mgf., if commercial	Setting (ft.) From	Setting (ft.) To	Gage Casin Scree
4		SCH. 4 PVC.	0	587	
4		SLOTTED	587	607	.01

9) CEMENTING DATA [Rule 319.44(b)]
Cemented from 0 ft. to 11 ft. No. of Sacks Used 3
____ ft. to ____ ft. No. of Sacks Used ____
Method used ____
Cemented by ____

10) SURFACE COMPLETION
☑ Specified Surface Slab Installed [Rule 319.44(c)]
☐ Pitless Adapter Used [Rule 319.44(d)]
☐ Approved Alternative Procedure Used [Rule 319.71]

11) WATER LEVEL:
Static level 128 ft. below land surface Date 4-24-57
Artesian flow ____ gpm. Date ____

12) PACKERS:

Type	Depth
SKIRT TAIL	579

13) TYPE PUMP:
☐ Turbine ☐ Jet ☑ Submersible ☐ Cylinder
☐ Other ____
Depth to pump bowls, cylinder, jet, etc., 180 ft.

14) WELL TESTS:
Type Test: ☐ Pump ☐ Bailer ☑ Jetted ☐ Estimated
Yield: 6.5 gpm with [illegible] ft. drawdown after ____ hrs.

15) WATER QUALITY:
Did you knowingly penetrate any strata which contained undesirable water? ☐ Yes ☑ No
If yes, submit "REPORT OF UNDESIRABLE WATER"
Type of water? ____ Depth of strata ____
Was a chemical analysis made? ☐ Yes ☑ No

I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief. I understand that failure to complete items 1 thru 12 will result in the log(s) being returned for completion and resubmittal.

COMPANY NAME Welty Water Wells (Type or Print) Water Well Driller's License No. 1934

ADDRESS 315 Kissling Robstown Texas 78380
(Street or RFD) (City) (State) (Zip)

(Signed) Lawrence A. Zobel Jr. (Licensed Water Well Driller) (Signed) ____ (Registered Driller Trainee)

For TWC use only
Well No. 83-34-5
Located on map ____

Please attach electric log, chemical analysis, and other pertinent information, if available.

TWC-0392 (Rev. 06-10-85)

TEXAS WATER COMMISSION COPY

5(3)

J-3

Send original copy by certified mail to: Texas Water Commission, P.O. Box 13087, Austin, TX 78711-3087 *Please use black ink.*

ATTENTION OWNER: Confidentiality Privilege Notice on Reverse Side

State of Texas
WELL REPORT

Texas Water Well Drillers Board
P.O. Box 13087
Austin, TX 78711-3087
512-371-6299

1) OWNER Robert Silguero (Name) ADDRESS 1714 E. Johnston, Kingsville, Tx (Street or RFD) (City) (State) (Zip)

2) LOCATION OF WELL: County Kleberg , 2 miles in NE (NE, SW, etc.) direction from Ricardo (Town)

Driller must complete the legal description below with distance and direction from two intersecting section or survey lines, or he must locate and identify the well on an official Quarter- or Half-Scale Texas County General Highway Map and attach the map to this form.

☐ LEGAL DESCRIPTION:
Section No. ______ Block No. ______ Township ______ Abstract No. ______ Survey Name ______
Distance and direction from two intersecting section or survey lines ______

☒ SEE ATTACHED MAP

3) TYPE OF WORK (Check):
☒ New Well ☐ Deepening
☐ Reconditioning ☐ Plugging

4) PROPOSED USE (Check):
☒ Domestic ☐ Industrial ☐ Monitor ☐ Public Supply
☐ Irrigation ☐ Test Well ☐ Injection ☐ De-Watering

5) DRILLING METHOD (Check): ☐ Driven
☒ Mud Rotary ☐ Air Hammer ☐ Jetted ☐ Bored
☐ Air Rotary ☐ Cable Tool ☐ Other ______

6) WELL LOG:
Date Drilling:
Started 10-11 19 94
Completed 10-14 19 94

DIAMETER OF HOLE

Dia. (in.)	From (ft.)	To (ft.)
6 3/4	Surface	662

7) BOREHOLE COMPLETION:
☐ Open Hole ☒ Straight Wall ☐ Underreamed
☐ Gravel Packed ☐ Other ______
If Gravel Packed give interval . . . from ______ ft. to ______ ft.

From (ft.)	To (ft.)	Description and color of formation material
0	10	Top soil
10	30	Caliche
30	96	Shale
6	106	Fine sand
6	408	Shale
08	430	Fine sand
430	567	Shale
567	590	Sand
590	600	Shale
600	662	Sand

(Use reverse side if necessary)

8) CASING, BLANK PIPE, AND WELL SCREEN DATA:

Dia. (in.)	New or Used	Steel, Plastic, etc. Perf., Slotted, etc. Screen Mfg., if commercial	Setting (ft.)		Gage Casting Screen
			From	To	
4½	N	PVC Casing	0	300	
4	N	PVC Casing	300	622	
4	N	PVC Screen	622	662	

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9) CEMENTING DATA [Rule 287.44(1)]
Cemented from 0 ft. to 10 ft. No. of Sacks Used 2
______ ft. to ______ ft. No. of Sacks Used ______
Method used ______
Cemented by Martin Water Wells

13) TYPE PUMP:
☐ Turbine ☐ Jet ☒ Submersible ☐ Cylinder
☐ Other ______
Depth to pump bowls, cylinder, jet, etc., 180 ft.

10) SURFACE COMPLETION
☒ Specified Surface Slab Installed [Rule 287.44(2)(A)]
☐ Specified Steel Sleeve Installed [Rule 287.44(3)(A)]
☐ Pitless Adapter Used [Rule 287.44(3)(B)]
☐ Approved Alternative Procedure Used [Rule 287.71]

14) WELL TESTS:
Type Test: ☐ Pump ☐ Bailer ☒ Jetted ☐ Estimated
Yield: ______ gpm with ______ ft. drawdown after ______ hrs.

11) WATER LEVEL:
Static level 125 ft. below land surface Date 10-14-94
Artesian flow ______ gpm. Date ______

15) WATER QUALITY:
Did you knowingly penetrate any strata which contained undesirable constituents?
☐ Yes ☒ No If yes, submit "REPORT OF UNDESIRABLE WATER"
Type of water? ______ Depth of strata ______
Was a chemical analysis made? ☐ Yes ☒ No

12) PACKERS:

Type	Depth
Rubber	595

I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief. I understand that failure to complete items 1 thru 15 will result in the log(s) being returned for completion and resubmittal.

COMPANY NAME Martin Water Wells (Type or print) WELL DRILLER'S LICENSE NO. 1669

ADDRESS Hwy 77 North (Street or RFD) Robstown (City) Texas (State) 78380 (Zip)

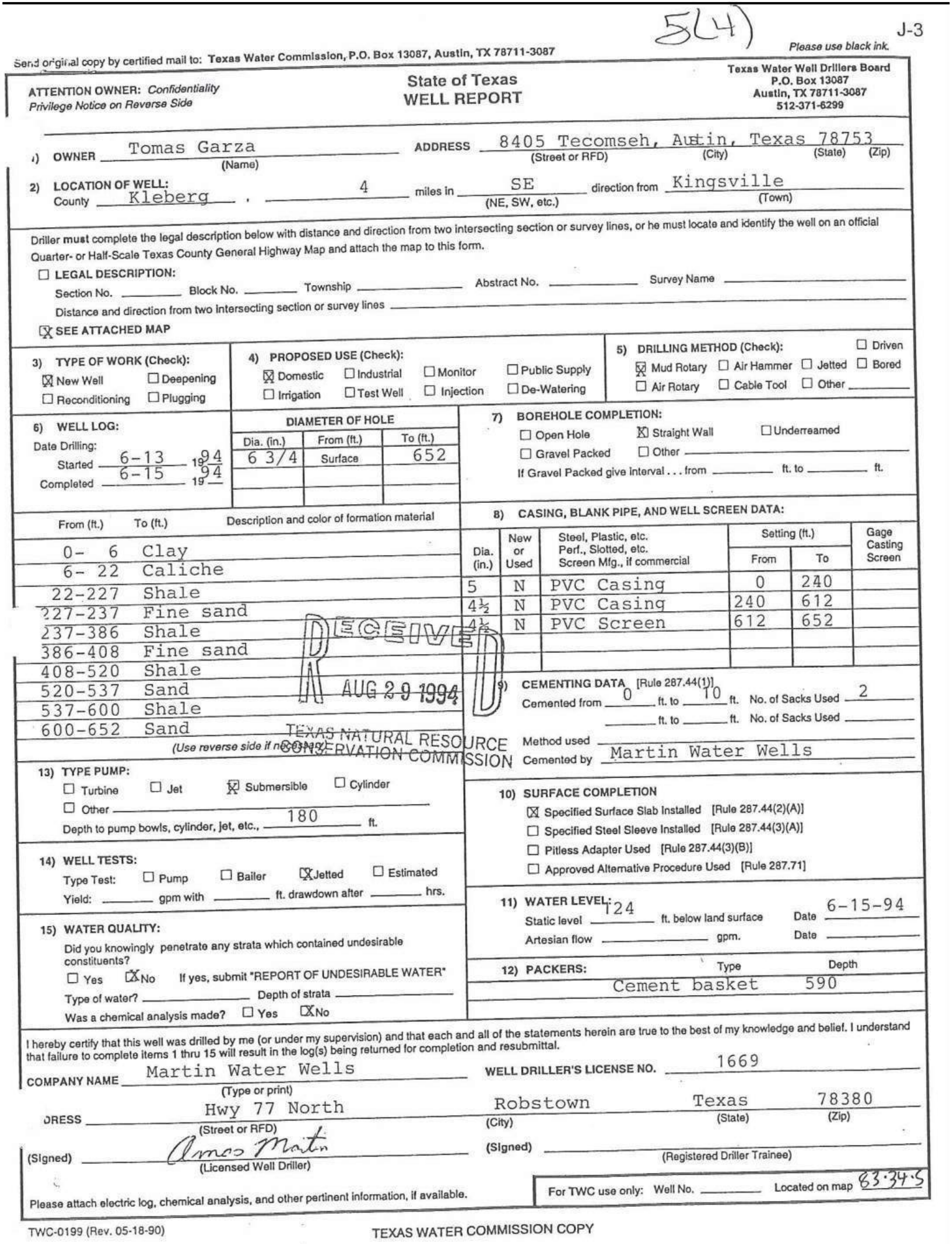
(Signed) Amos Martin (Licensed Well Driller) (Signed) ______ (Registered Driller Trainee)

Please attach electric log, chemical analysis, and other pertinent information, if available.

For TWC use only: Well No. ______ Located on map 83-34-5

TWC-0199 (Rev. 05-18-90)

TEXAS WATER COMMISSION COPY



5(4)

J-3

Send original copy by certified mail to: Texas Water Commission, P.O. Box 13087, Austin, TX 78711-3087

Please use black ink.

ATTENTION OWNER: Confidentiality Privilege Notice on Reverse Side

State of Texas
WELL REPORT

Texas Water Well Drillers Board
P.O. Box 13087
Austin, TX 78711-3087
512-371-6299

1) OWNER Tomas Garza (Name) ADDRESS 8405 Tecomseh, Austin, Texas 78753 (Street or RFD) (City) (State) (Zip)

2) LOCATION OF WELL: County Kleberg , 4 miles in SE (NE, SW, etc.) direction from Kingsville (Town)

Driller must complete the legal description below with distance and direction from two intersecting section or survey lines, or he must locate and identify the well on an official Quarter- or Half-Scale Texas County General Highway Map and attach the map to this form.

☐ LEGAL DESCRIPTION:

Section No. ____ Block No. ____ Township ____ Abstract No. ____ Survey Name ____

Distance and direction from two intersecting section or survey lines ____

☒ SEE ATTACHED MAP

3) TYPE OF WORK (Check): ☒ New Well ☐ Deepening ☐ Reconditioning ☐ Plugging

4) PROPOSED USE (Check): ☒ Domestic ☐ Industrial ☐ Monitor ☐ Public Supply ☐ Irrigation ☐ Test Well ☐ Injection ☐ De-Watering

5) DRILLING METHOD (Check): ☐ Driven ☒ Mud Rotary ☐ Air Hammer ☐ Jetted ☐ Bored ☐ Air Rotary ☐ Cable Tool ☐ Other ____

6) WELL LOG:

Date Drilling:
Started 6-13 1994
Completed 6-15 1994

DIAMETER OF HOLE

Dia. (in.)	From (ft.)	To (ft.)
6 3/4	Surface	652

7) BOREHOLE COMPLETION: ☐ Open Hole ☒ Straight Wall ☐ Underreamed ☐ Gravel Packed ☐ Other ____

If Gravel Packed give interval . . . from ____ ft. to ____ ft.

From (ft.)	To (ft.)	Description and color of formation material
0	6	Clay
6	22	Caliche
22	227	Shale
227	237	Fine sand
237	386	Shale
386	408	Fine sand
408	520	Shale
520	537	Sand
537	600	Shale
600	652	Sand

(Use reverse side if necessary)

RECEIVED
AUG 29 1994
TEXAS NATURAL RESOURCE CONSERVATION COMMISSION

8) CASING, BLANK PIPE, AND WELL SCREEN DATA:

Dia. (in.)	New or Used	Steel, Plastic, etc. Perf., Slotted, etc. Screen Mfg., if commercial	Setting (ft.) From	Setting (ft.) To	Gage Casting Screen
5	N	PVC Casing	0	240	
4½	N	PVC Casing	240	612	
4½	N	PVC Screen	612	652	

9) CEMENTING DATA [Rule 287.44(1)]

Cemented from 0 ft. to 10 ft. No. of Sacks Used 2
____ ft. to ____ ft. No. of Sacks Used ____

Method used ____

Cemented by Martin Water Wells

13) TYPE PUMP: ☐ Turbine ☐ Jet ☒ Submersible ☐ Cylinder ☐ Other ____

Depth to pump bowls, cylinder, jet, etc., 180 ft.

10) SURFACE COMPLETION

☒ Specified Surface Slab Installed [Rule 287.44(2)(A)]
☐ Specified Steel Sleeve Installed [Rule 287.44(3)(A)]
☐ Pitless Adapter Used [Rule 287.44(3)(B)]
☐ Approved Alternative Procedure Used [Rule 287.71]

14) WELL TESTS:

Type Test: ☐ Pump ☐ Bailer ☒ Jetted ☐ Estimated

Yield: ____ gpm with ____ ft. drawdown after ____ hrs.

11) WATER LEVEL:

Static level 124 ft. below land surface Date 6-15-94
Artesian flow ____ gpm. Date ____

15) WATER QUALITY:

Did you knowingly penetrate any strata which contained undesirable constituents?

☐ Yes ☒ No If yes, submit "REPORT OF UNDESIRABLE WATER"

Type of water? ____ Depth of strata ____

Was a chemical analysis made? ☐ Yes ☒ No

12) PACKERS:

Type	Depth
Cement basket	590

I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief. I understand that failure to complete items 1 thru 15 will result in the log(s) being returned for completion and resubmittal.

COMPANY NAME Martin Water Wells (Type or print) WELL DRILLER'S LICENSE NO. 1669

ADDRESS Hwy 77 North (Street or RFD) Robstown (City) Texas (State) 78380 (Zip)

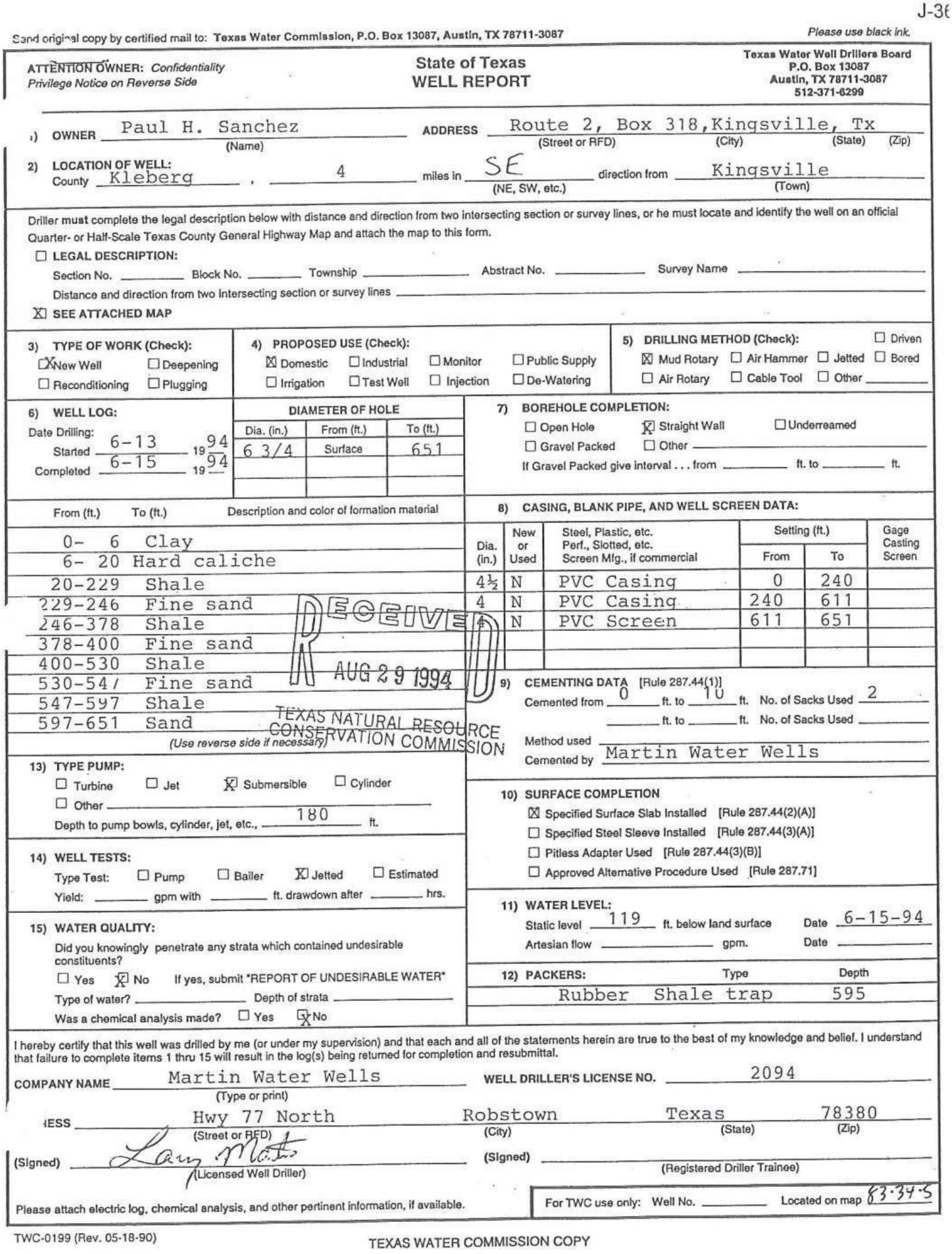
(Signed) Amos Martin (Licensed Well Driller) (Signed) ____ (Registered Driller Trainee)

Please attach electric log, chemical analysis, and other pertinent information, if available.

For TWC use only: Well No. ____ Located on map 83-34-5

TWC-0199 (Rev. 05-18-90)

TEXAS WATER COMMISSION COPY



J-36

Send original copy by certified mail to: Texas Water Commission, P.O. Box 13087, Austin, TX 78711-3087

Please use black ink.

ATTENTION OWNER: *Confidentiality Privilege Notice on Reverse Side*

State of Texas
WELL REPORT

Texas Water Well Drillers Board
P.O. Box 13087
Austin, TX 78711-3087
512-371-6299

1) OWNER Paul H. Sanchez (Name) ADDRESS Route 2, Box 318, Kingsville, Tx (Street or RFD) (City) (State) (Zip)

2) LOCATION OF WELL: County Kleberg , 4 miles in SE (NE, SW, etc.) direction from Kingsville (Town)

Driller must complete the legal description below with distance and direction from two intersecting section or survey lines, or he must locate and identify the well on an official Quarter- or Half-Scale Texas County General Highway Map and attach the map to this form.

☐ LEGAL DESCRIPTION:

Section No. ______ Block No. ______ Township ______ Abstract No. ______ Survey Name ______

Distance and direction from two intersecting section or survey lines ______

☒ SEE ATTACHED MAP

3) TYPE OF WORK (Check): ☒ New Well ☐ Deepening ☐ Reconditioning ☐ Plugging

4) PROPOSED USE (Check): ☒ Domestic ☐ Industrial ☐ Monitor ☐ Public Supply ☐ Irrigation ☐ Test Well ☐ Injection ☐ De-Watering

5) DRILLING METHOD (Check): ☐ Driven ☒ Mud Rotary ☐ Air Hammer ☐ Jetted ☐ Bored ☐ Air Rotary ☐ Cable Tool ☐ Other ______

6) WELL LOG:

Date Drilling:
Started 6-13 19 94
Completed 6-15 19 94

DIAMETER OF HOLE

Dia. (in.)	From (ft.)	To (ft.)
6 3/4	Surface	651

7) BOREHOLE COMPLETION: ☐ Open Hole ☒ Straight Wall ☐ Underreamed ☐ Gravel Packed ☐ Other ______

If Gravel Packed give interval . . . from ______ ft. to ______ ft.

From (ft.) To (ft.)	Description and color of formation material
0- 6	Clay
6- 20	Hard caliche
20-229	Shale
229-246	Fine sand
246-378	Shale
378-400	Fine sand
400-530	Shale
530-547	Fine sand
547-597	Shale
597-651	Sand

(Use reverse side if necessary)

RECEIVED
AUG 29 1994
TEXAS NATURAL RESOURCE CONSERVATION COMMISSION

8) CASING, BLANK PIPE, AND WELL SCREEN DATA:

Dia. (in.)	New or Used	Steel, Plastic, etc. Perf., Slotted, etc. Screen Mfg., if commercial	Setting (ft.) From	Setting (ft.) To	Gage Casting Screen
4½	N	PVC Casing	0	240	
4	N	PVC Casing	240	611	
4	N	PVC Screen	611	651	

9) CEMENTING DATA [Rule 287.44(1)]
Cemented from 0 ft. to 10 ft. No. of Sacks Used 2
______ ft. to ______ ft. No. of Sacks Used ______
Method used ______
Cemented by Martin Water Wells

10) SURFACE COMPLETION
☒ Specified Surface Slab Installed [Rule 287.44(2)(A)]
☐ Specified Steel Sleeve Installed [Rule 287.44(3)(A)]
☐ Pitless Adapter Used [Rule 287.44(3)(B)]
☐ Approved Alternative Procedure Used [Rule 287.71]

11) WATER LEVEL:
Static level 119 ft. below land surface Date 6-15-94
Artesian flow ______ gpm. Date ______

12) PACKERS:

Type	Depth
Rubber Shale trap	595

13) TYPE PUMP: ☐ Turbine ☐ Jet ☒ Submersible ☐ Cylinder ☐ Other ______

Depth to pump bowls, cylinder, jet, etc., 180 ft.

14) WELL TESTS: Type Test: ☐ Pump ☐ Bailer ☒ Jetted ☐ Estimated

Yield: ______ gpm with ______ ft. drawdown after ______ hrs.

15) WATER QUALITY:
Did you knowingly penetrate any strata which contained undesirable constituents?
☐ Yes ☒ No If yes, submit "REPORT OF UNDESIRABLE WATER"
Type of water? ______ Depth of strata ______
Was a chemical analysis made? ☐ Yes ☒ No

I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief. I understand that failure to complete items 1 thru 15 will result in the log(s) being returned for completion and resubmittal.

COMPANY NAME Martin Water Wells (Type or print) WELL DRILLER'S LICENSE NO. 2094

ADDRESS Hwy 77 North (Street or RFD) Robstown (City) Texas (State) 78380 (Zip)

(Signed) ______ (Licensed Well Driller) (Signed) ______ (Registered Driller Trainee)

Please attach electric log, chemical analysis, and other pertinent information, if available.

For TWC use only: Well No. ______ Located on map 83-34-5

TWC-0199 (Rev. 05-18-90)

TEXAS WATER COMMISSION COPY

565)

J-3

Send original copy by certified mail to: **Texas Water Commission, P.O. Box 13087, Austin, Texas 78711** *Please use black ink.*

ATTENTION OWNER: *Confidentiality Privilege Notice on Reverse Side*

State of Texas
WELL REPORT

Texas Water Well Drillers Board
P.O. Box 13087
Austin, Texas 78711

OWNER Joe M. Cavazos (Name) ADDRESS Box 964, Kingsville, Tx 78364 (Street or RFD) (City) (State) (Zip)

2) **LOCATION OF WELL:** County Kleberg , 2 miles in NE (NE, SW, etc.) direction from Ricardo (Town)

Driller **must** complete the legal description below with distance and direction from two intersecting section or survey lines, or he must locate and identify the well on an official Quarter- or Half-Scale Texas County General Highway Map and attach the map to this form.

☐ **LEGAL DESCRIPTION:**

Section No. ________ Block No. ________ Township ________ Abstract No. ________ Survey Name ________

Distance and direction from two intersecting section or survey lines ________

☒ **SEE ATTACHED MAP**

3) **TYPE OF WORK (Check):** ☒ New Well ☐ Deepening ☐ Reconditioning ☐ Plugging

4) **PROPOSED USE (Check):** ☒ Domestic ☐ Industrial ☐ Monitor ☐ Public Supply ☐ Irrigation ☐ Test Well ☐ Injection ☐ De-Watering

5) **DRILLING METHOD (Check):** ☐ Driven ☒ Mud Rotary ☐ Air Hammer ☐ Jetted ☐ Bored ☐ Air Rotary ☐ Cable Tool ☐ Other ________

6) **WELL LOG:**

Date Drilling:
Started 8-18 19 93
Completed 8-25 19 93

DIAMETER OF HOLE

Dia. (in.)	From (ft.)	To (ft.)
6 3/4	Surface	661

From (ft.) To (ft.)	Description and color of formation material
0- 8	Top soil
8- 56	Caliche
56-228	Shale
8-247	Fine sand
7-560	Shale
0-590	Sand
590-598	Shale
598-661	Sand

(Use reverse side if necessary)

7) **BOREHOLE COMPLETION:** ☐ Open Hole ☒ Straight Wall ☐ Underreamed ☐ Gravel Packed ☐ Other ________
If Gravel Packed give interval . . . from ________ ft. to ________ ft.

8) **CASING, BLANK PIPE, AND WELL SCREEN DATA:**

Dia. (in.)	New or Used	Steel, Plastic, etc. Perf., Slotted, etc. Screen Mfg., if commercial	Setting (ft.) From	Setting (ft.) To	Gage Casting Screen
5	N	PVC Casing	0	300	
4	N	PVC Casing	300	621	
4	N	PVC Screen	621	661	

9) **CEMENTING DATA** [Rule 287.44(1)]
Cemented from 0 ft. to 10 ft. No. of Sacks Used 2
________ ft. to ________ ft. No. of Sacks Used ________
Method used ________
Cemented by Martin Water Wells

10) **SURFACE COMPLETION**
☒ Specified Surface Slab Installed [Rule 287.44(2)(A)]
☐ Specified Steel Sleeve Installed [Rule 287.44(3)(A)]
☐ Pitless Adapter Used [Rule 287.44(3)(B)]
☐ Approved Alternative Procedure Used [Rule 287.71]

11) **WATER LEVEL:**
Static level 126 ft. below land surface Date 8-25-93
Artesian flow ________ gpm. Date ________

12) **PACKERS:**

Type	Depth
Cement basket	596

13) **TYPE PUMP:**
☐ Turbine ☐ Jet ☒ Submersible ☐ Cylinder
☐ Other ________
Depth to pump bowls, cylinder, jet, etc., 180 ft.

14) **WELL TESTS:**
Type Test: ☐ Pump ☐ Bailer ☒ Jetted ☐ Estimated
Yield: ________ gpm with ________ ft. drawdown after ________ hrs.

15) **WATER QUALITY:**
Did you knowingly penetrate any strata which contained undesirable constituents?
☐ Yes ☒ No If yes, submit "REPORT OF UNDESIRABLE WATER"
Type of water? ________ Depth of strata ________
Was a chemical analysis made? ☐ Yes ☒ No

ereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief. I understand at failure to complete items 1 thru 15 will result in the log(s) being returned for completion and resubmittal.

OMPANY NAME Martin Water Wells (Type or print) WELL DRILLER'S LICENSE NO. 1669

S Hwy 77 North (Street or RFD) Robstown (City) Texas (State) 78380 (Zip)

igned) Amos Martin (Licensed Well Driller) (Signed) ________ (Registered Driller Trainee)

ease attach electric log, chemical analysis, and other pertinent information, if available.

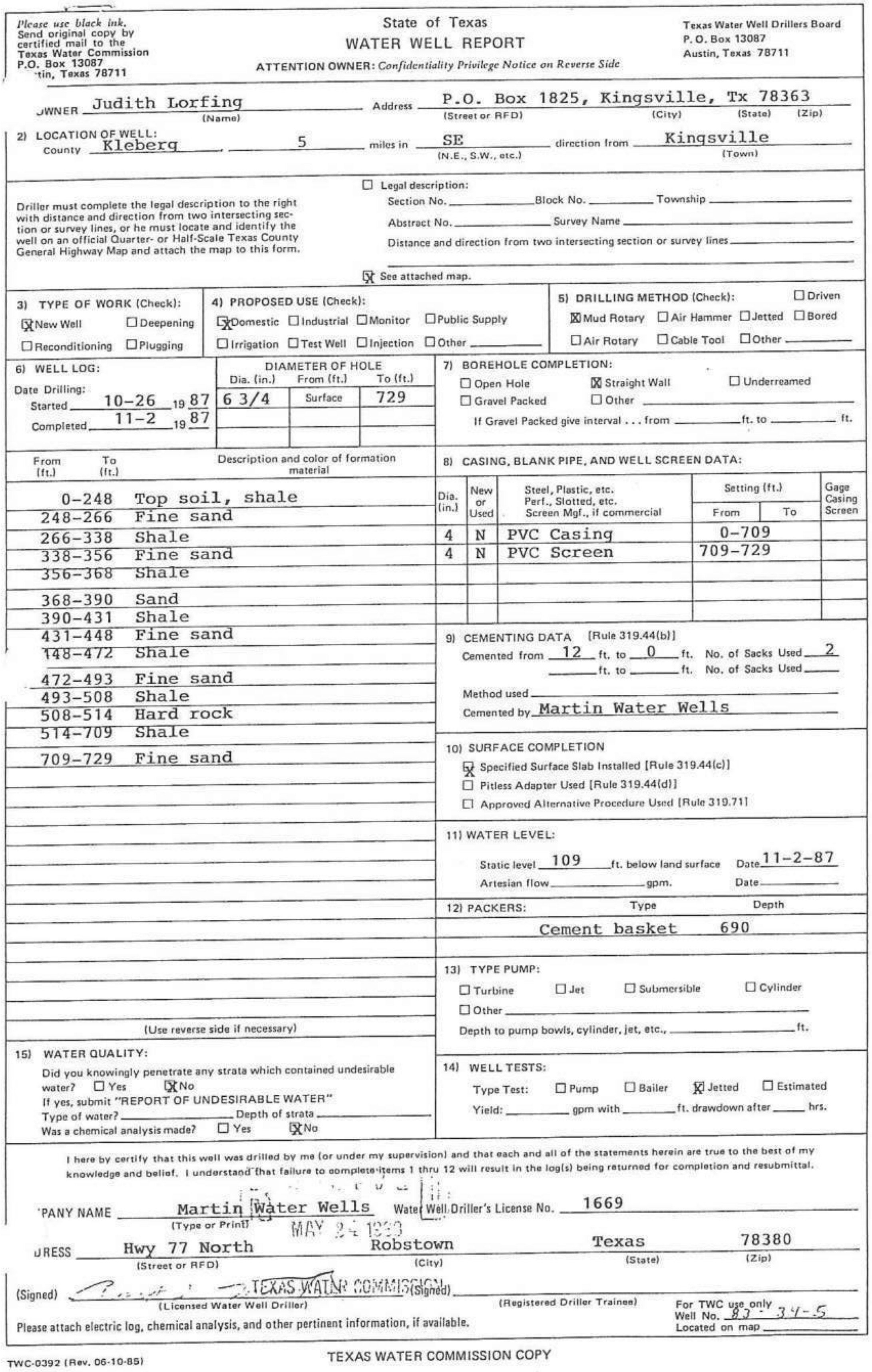
For TWC use only: Well No. ________ Located on map 83-34-5

WD-012 (Rev. 05-18-90)

TEXAS WATER COMMISSION COPY

5(6)

J-38



Please use black ink.
Send original copy by certified mail to the Texas Water Commission
P.O. Box 13087
Austin, Texas 78711

State of Texas
WATER WELL REPORT

Texas Water Well Drillers Board
P. O. Box 13087
Austin, Texas 78711

ATTENTION OWNER: *Confidentiality Privilege Notice on Reverse Side*

OWNER Judith Lorfing (Name) Address P.O. Box 1825, Kingsville, Tx 78363 (Street or RFD) (City) (State) (Zip)

2) LOCATION OF WELL: County Kleberg, 5 miles in SE (N.E., S.W., etc.) direction from Kingsville (Town)

Driller must complete the legal description to the right with distance and direction from two intersecting section or survey lines, or he must locate and identify the well on an official Quarter- or Half-Scale Texas County General Highway Map and attach the map to this form.

☐ Legal description:
Section No. ________ Block No. ________ Township ________
Abstract No. ________ Survey Name ________
Distance and direction from two intersecting section or survey lines ________

☒ See attached map.

3) TYPE OF WORK (Check): ☒ New Well ☐ Deepening ☐ Reconditioning ☐ Plugging

4) PROPOSED USE (Check): ☒ Domestic ☐ Industrial ☐ Monitor ☐ Public Supply ☐ Irrigation ☐ Test Well ☐ Injection ☐ Other ________

5) DRILLING METHOD (Check): ☐ Driven ☒ Mud Rotary ☐ Air Hammer ☐ Jetted ☐ Bored ☐ Air Rotary ☐ Cable Tool ☐ Other ________

6) WELL LOG:
Date Drilling:
Started 10-26 19 87
Completed 11-2 19 87

DIAMETER OF HOLE

Dia. (in.)	From (ft.)	To (ft.)
6 3/4	Surface	729

7) BOREHOLE COMPLETION:
☐ Open Hole ☒ Straight Wall ☐ Underreamed
☐ Gravel Packed ☐ Other ________
If Gravel Packed give interval . . . from ________ ft. to ________ ft.

From (ft.) To (ft.)	Description and color of formation material
0-248	Top soil, shale
248-266	Fine sand
266-338	Shale
338-356	Fine sand
356-368	Shale
368-390	Sand
390-431	Shale
431-448	Fine sand
448-472	Shale
472-493	Fine sand
493-508	Shale
508-514	Hard rock
514-709	Shale
709-729	Fine sand

(Use reverse side if necessary)

8) CASING, BLANK PIPE, AND WELL SCREEN DATA:

Dia. (in.)	New or Used	Steel, Plastic, etc. Perf., Slotted, etc. Screen Mgf., if commercial	Setting (ft.) From	To	Gage Casing Screen
4	N	PVC Casing	0-709		
4	N	PVC Screen	709-729		

9) CEMENTING DATA [Rule 319.44(b)]
Cemented from 12 ft. to 0 ft. No. of Sacks Used 2
________ ft. to ________ ft. No. of Sacks Used ________
Method used ________
Cemented by Martin Water Wells

10) SURFACE COMPLETION
☒ Specified Surface Slab Installed [Rule 319.44(c)]
☐ Pitless Adapter Used [Rule 319.44(d)]
☐ Approved Alternative Procedure Used [Rule 319.71]

11) WATER LEVEL:
Static level 109 ft. below land surface Date 11-2-87
Artesian flow ________ gpm. Date ________

12) PACKERS:

Type	Depth
Cement basket	690

13) TYPE PUMP:
☐ Turbine ☐ Jet ☐ Submersible ☐ Cylinder
☐ Other ________
Depth to pump bowls, cylinder, jet, etc., ________ ft.

14) WELL TESTS:
Type Test: ☐ Pump ☐ Bailer ☒ Jetted ☐ Estimated
Yield: ________ gpm with ________ ft. drawdown after ________ hrs.

15) WATER QUALITY:
Did you knowingly penetrate any strata which contained undesirable water? ☐ Yes ☒ No
If yes, submit "REPORT OF UNDESIRABLE WATER"
Type of water? ________ Depth of strata ________
Was a chemical analysis made? ☐ Yes ☒ No

I here by certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief. I understand that failure to complete items 1 thru 12 will result in the log(s) being returned for completion and resubmittal.

COMPANY NAME Martin Water Wells (Type or Print) Water Well Driller's License No. 1669

MAY 24 1988

ADDRESS Hwy 77 North (Street or RFD) Robstown (City) Texas (State) 78380 (Zip)

(Signed) ________ (Licensed Water Well Driller) TEXAS WATER COMMISSION (Signed) ________ (Registered Driller Trainee)

Please attach electric log, chemical analysis, and other pertinent information, if available.

For TWC use only
Well No. 83-34-5
Located on map ________

TWC-0392 (Rev. 06-10-85) TEXAS WATER COMMISSION COPY

1.2m: N/SL
.6m: W/EL

5(7)

J-3

Please use black ink.
Send original copy by
certified mail to the
Texas Water Commission
P.O. Box 13087
tin, Texas 78711

State of Texas
WATER WELL REPORT

ATTENTION OWNER: *Confidentiality Privilege Notice on Reverse Side*

Texas Water Well Drillers Board
P. O. Box 13087
Austin, Texas 78711

WNER MacLane Oil Co (Name) Address 1200 17th St, (Street or RFD) Denver (City) Colorado (State) 80203 (Zip)

2) LOCATION OF WELL:
County Kleberg 6 miles in S (N.E., S.W., etc.) direction from Kingsville (Town)

Driller must complete the legal description to the right with distance and direction from two intersecting section or survey lines, or he must locate and identify the well on an official Quarter- or Half-Scale Texas County General Highway Map and attach the map to this form.

☐ Legal description:
Section No. ______ Block No. ______ Township ______
Abstract No. ______ Survey Name ______
Distance and direction from two intersecting section or survey lines ______

☑ See attached map.

3) TYPE OF WORK (Check):
☑ New Well ☐ Deepening
☐ Reconditioning ☐ Plugging

4) PROPOSED USE (Check):
☐ Domestic ☐ Industrial ☐ Monitor ☐ Public Supply
☐ Irrigation ☐ Test Well ☐ Injection ☑ Other Supply

5) DRILLING METHOD (Check):
☐ Driven
☑ Mud Rotary ☐ Air Hammer ☐ Jetted ☐ Bored
☐ Air Rotary ☐ Cable Tool ☐ Other ______

6) WELL LOG:
Date Drilling:
Started 1-31 1987
Completed 2-1 1987

DIAMETER OF HOLE

Dia. (in.)	From (ft.)	To (ft.)
6 3/4	Surface	720

7) BOREHOLE COMPLETION:
☐ Open Hole ☑ Straight Wall ☐ Underreamed
☐ Gravel Packed ☐ Other ______
If Gravel Packed give interval . . . from ______ ft. to ______ ft.

From (ft.)	To (ft.)	Description and color of formation material
0	5	Black dirt
5	50	clay
50	55	sand
55	110	clay
110	140	sand
140	180	clay
180	210	sand
210	~~255~~ 270	clay
220	-- 290	sand
2	320	clay
20	360	sand
360	375	clay
375	405	sand
405	500	clay
500	520	sand
520	535	clay
535	600	sand
600	650	clay
650	720	sand

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FEB 17 1987
TEXAS WATER COMMISSION

(Use reverse side if necessary)

8) CASING, BLANK PIPE, AND WELL SCREEN DATA:

Dia. (in.)	New or Used	Steel, Plastic, etc. Perf., Slotted, etc. Screen Mgf., if commercial	Setting (ft.) From	Setting (ft.) To	Gage Casing Screen
4	N	Plastic	0	680	
4	N	Plastic-Perf	680	720	.016

9) CEMENTING DATA [Rule 319.44(b)]
Cemented from 0 ft. to 10 ft. No. of Sacks Used 2
______ ft. to ______ ft. No. of Sacks Used ______
Method used ______
Cemented by M+C Waterwell Dlg

10) SURFACE COMPLETION
☐ Specified Surface Slab Installed [Rule 319.44(c)]
☐ Pitless Adapter Used [Rule 319.44(d)]
☑ Approved Alternative Procedure Used [Rule 319.71]

11) WATER LEVEL:
Static level 140 ft. below land surface Date 2-1-87
Artesian flow ______ gpm. Date ______

12) PACKERS:

	Type	Depth
4''	Rubber	640
4''	Rubber	440

13) TYPE PUMP:
☐ Turbine ☐ Jet ☐ Submersible ☐ Cylinder
☐ Other ______
Depth to pump bowls, cylinder, jet, etc., ______ ft.

15) WATER QUALITY:
Did you knowingly penetrate any strata which contained undesirable water? ☐ Yes ☑ No
If yes, submit "REPORT OF UNDESIRABLE WATER"
Type of water? ______ Depth of strata ______
Was a chemical analysis made? ☐ Yes ☑ No

14) WELL TESTS:
Type Test: ☐ Pump ☐ Bailer ☑ Jetted ☐ Estimated
Yield: 80 gpm with 10 ft. drawdown after 1 hrs.

I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief. I understand that failure to complete items 1 thru 12 will result in the log(s) being returned for completion and resubmittal.

ANY NAME M+C Waterwell Dlg (Type or Print) Water Well Driller's License No. 2689

SS P.O. Box 533 (Street or RFD) Pettus (City) TX (State) 78146 (Zip)

(Signed) Joe Carroll (Licensed Water Well Driller) (Signed) ______ (Registered Driller Trainee)

Please attach electric log, chemical analysis, and other pertinent information, if available.

For TWC use only
Well No. 83-34-5
Located on map ______

TWC-0392 (Rev. 06-10-85)

TEXAS WATER COMMISSION COPY

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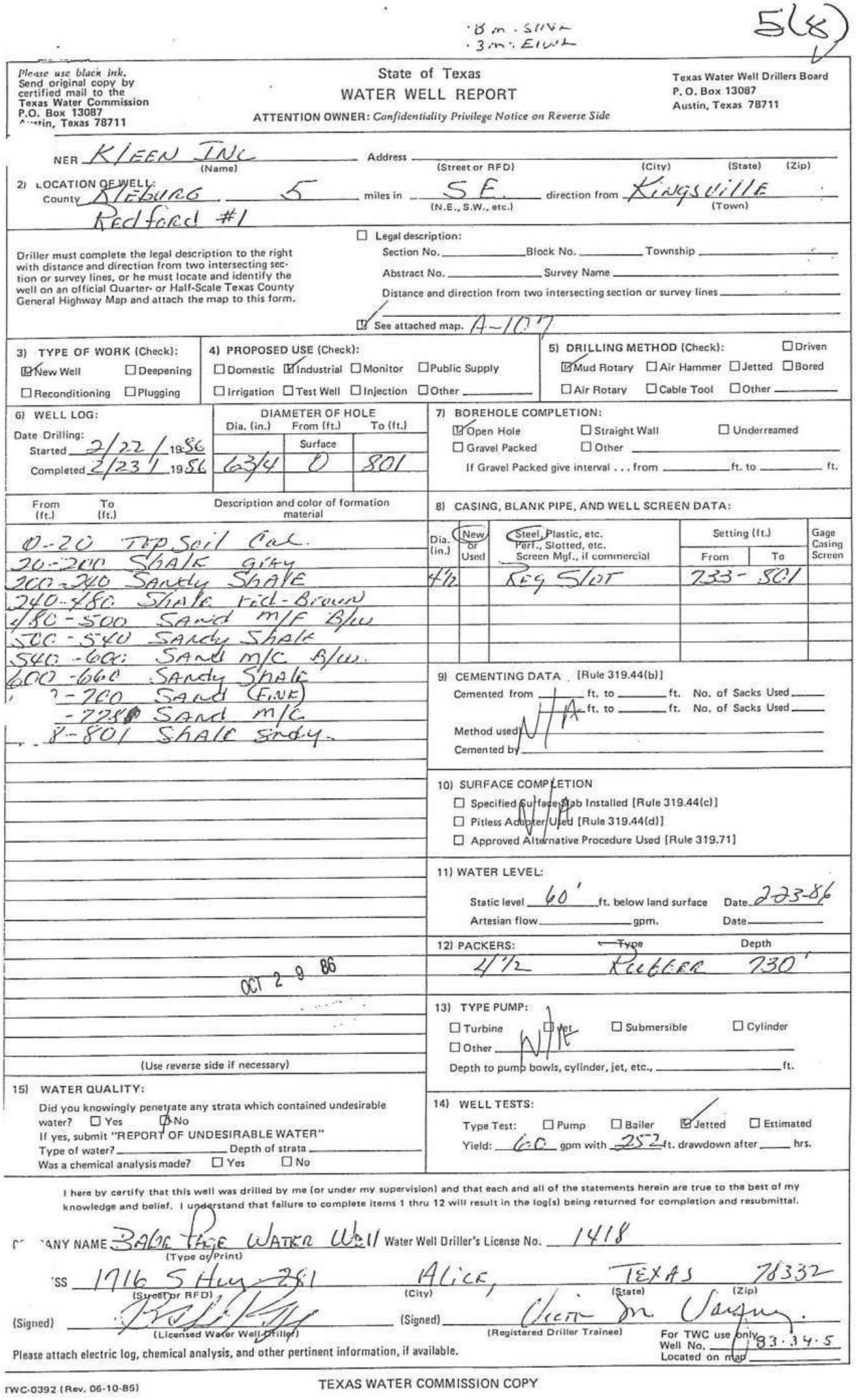

·8 m. S/W
·3 m. E/W

5(8)

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Texas Water Commission
P.O. Box 13087
Austin, Texas 78711

State of Texas
WATER WELL REPORT
ATTENTION OWNER: *Confidentiality Privilege Notice on Reverse Side*

Texas Water Well Drillers Board
P. O. Box 13087
Austin, Texas 78711

NER KLEEN INC (Name) Address ______ (Street or RFD) (City) (State) (Zip)

2) LOCATION OF WELL:
County KLEBURG 5 miles in S.E. (N.E., S.W., etc.) direction from Kingsville (Town)
Redford #1

Driller must complete the legal description to the right with distance and direction from two intersecting section or survey lines, or he must locate and identify the well on an official Quarter- or Half-Scale Texas County General Highway Map and attach the map to this form.

☐ Legal description:
Section No. ______ Block No. ______ Township ______
Abstract No. ______ Survey Name ______
Distance and direction from two intersecting section or survey lines ______

☑ See attached map. A-107

3) TYPE OF WORK (Check): ☑ New Well ☐ Deepening ☐ Reconditioning ☐ Plugging

4) PROPOSED USE (Check): ☐ Domestic ☑ Industrial ☐ Monitor ☐ Public Supply ☐ Irrigation ☐ Test Well ☐ Injection ☐ Other ______

5) DRILLING METHOD (Check): ☐ Driven ☑ Mud Rotary ☐ Air Hammer ☐ Jetted ☐ Bored ☐ Air Rotary ☐ Cable Tool ☐ Other ______

6) WELL LOG:
Date Drilling:
Started 2/22/1986
Completed 2/23/1986

DIAMETER OF HOLE

Dia. (in.)	From (ft.)	To (ft.)
	Surface	
6 3/4	0	801

7) BOREHOLE COMPLETION:
☑ Open Hole ☐ Straight Wall ☐ Underreamed
☐ Gravel Packed ☐ Other ______
If Gravel Packed give interval . . . from ______ ft. to ______ ft.

From (ft.)	To (ft.)	Description and color of formation material
0-20		Top Soil Cal.
20-200		Shale gray
200-240		Sandy Shale
240-480		Shale red-Brown
480-500		Sand m/F B/w
500-540		Sandy Shale
540-600		Sand m/C B/w.
600-660		Sandy Shale
?-700		Sand (Fine)
-728		Sand m/C
8-801		Shale Sndy.

(Use reverse side if necessary)

8) CASING, BLANK PIPE, AND WELL SCREEN DATA:

Dia. (in.)	New or Used	Steel, Plastic, etc. Perf., Slotted, etc. Screen Mgf., if commercial	Setting (ft.) From	Setting (ft.) To	Gage Casing Screen
4½		REG SLOT	733-	801	

9) CEMENTING DATA [Rule 319.44(b)]
Cemented from ______ ft. to ______ ft. No. of Sacks Used ______
______ ft. to ______ ft. No. of Sacks Used ______
Method used N/A
Cemented by ______

10) SURFACE COMPLETION
☐ Specified Surface Slab Installed [Rule 319.44(c)]
☐ Pitless Adapter Used [Rule 319.44(d)]
☐ Approved Alternative Procedure Used [Rule 319.71]
N/A

11) WATER LEVEL:
Static level 60' ft. below land surface Date 2-23-86
Artesian flow ______ gpm. Date ______

12) PACKERS: Type Depth
4½ Rubber 730'

OCT 2 9 86

13) TYPE PUMP:
☐ Turbine ☐ Jet ☐ Submersible ☐ Cylinder
☐ Other N/A
Depth to pump bowls, cylinder, jet, etc., ______ ft.

15) WATER QUALITY:
Did you knowingly penetrate any strata which contained undesirable water? ☐ Yes ☑ No
If yes, submit "REPORT OF UNDESIRABLE WATER"
Type of water? ______ Depth of strata ______
Was a chemical analysis made? ☐ Yes ☐ No

14) WELL TESTS:
Type Test: ☐ Pump ☐ Bailer ☑ Jetted ☐ Estimated
Yield: 60 gpm with 252 ft. drawdown after ______ hrs.

I here by certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief. I understand that failure to complete items 1 thru 12 will result in the log(s) being returned for completion and resubmittal.

ANY NAME Bade Page Water Well (Type or Print) Water Well Driller's License No. 1418

SS 1716 S Hwy 281 (Street or RFD) Alice, (City) TEXAS (State) 78332 (Zip)

(Signed) ______ (Licensed Water Well Driller) (Signed) ______ (Registered Driller Trainee)

For TWC use only
Well No. 83·34·5
Located on map ______

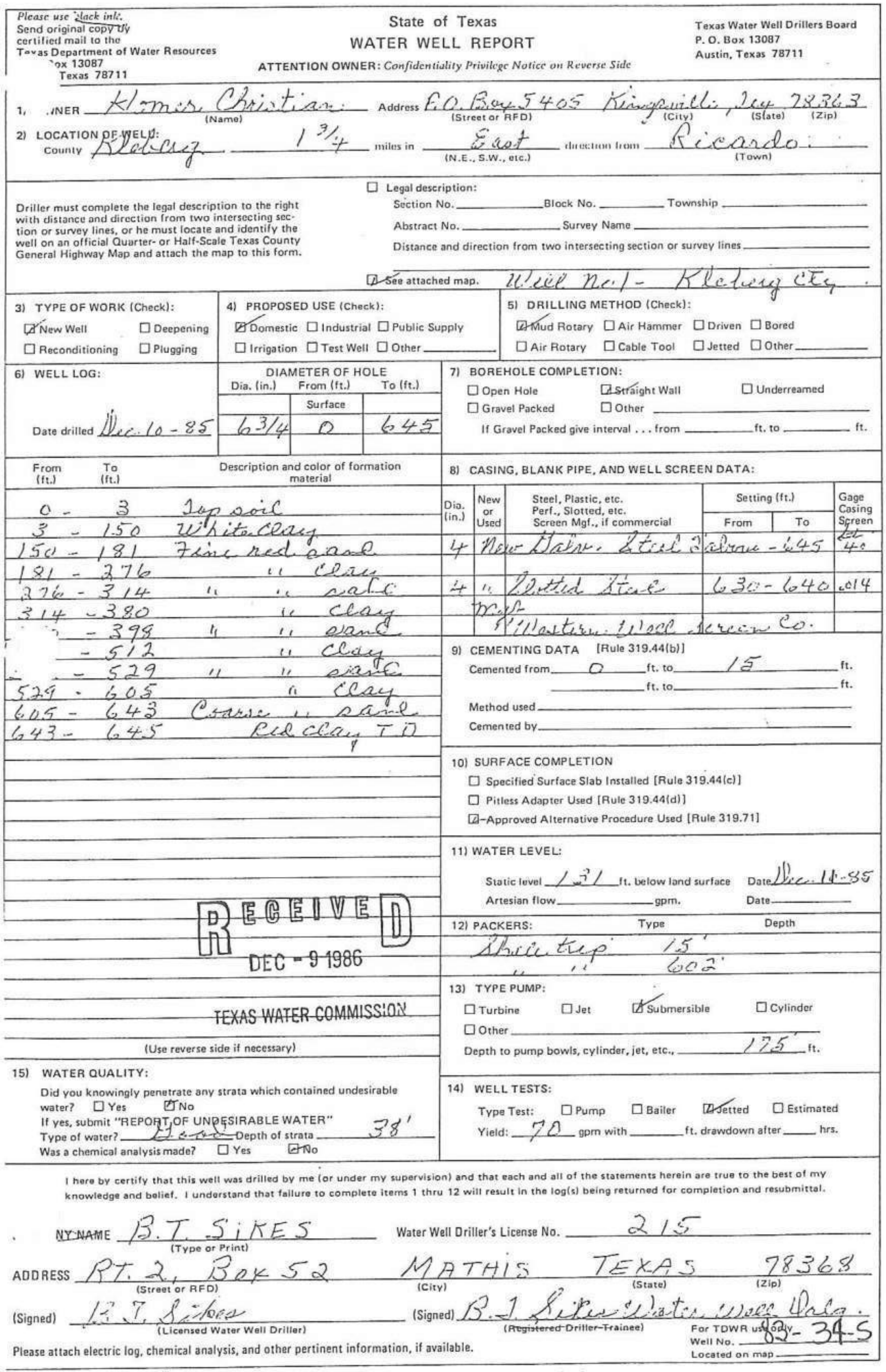
Please attach electric log, chemical analysis, and other pertinent information, if available.

TWC-0392 (Rev. 06-10-85)

TEXAS WATER COMMISSION COPY

5(a)

J-4



Please use black ink.
Send original copy by
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Texas Department of Water Resources
Box 13087
Texas 78711

State of Texas
WATER WELL REPORT

Texas Water Well Drillers Board
P. O. Box 13087
Austin, Texas 78711

ATTENTION OWNER: *Confidentiality Privilege Notice on Reverse Side*

1) OWNER Klomes, Christian (Name) Address P.O. Box 5405 (Street or RFD) Kingsville, (City) Tex (State) 78363 (Zip)

2) LOCATION OF WELL: County Kleberg 1 3/4 miles in East (N.E., S.W., etc.) direction from Ricardo. (Town)

Driller must complete the legal description to the right with distance and direction from two intersecting section or survey lines, or he must locate and identify the well on an official Quarter- or Half-Scale Texas County General Highway Map and attach the map to this form.

☐ Legal description:
Section No. ____ Block No. ____ Township ____
Abstract No. ____ Survey Name ____
Distance and direction from two intersecting section or survey lines ____

☑ See attached map. Well No. 1 - Kleberg Cty.

3) TYPE OF WORK (Check):
☑ New Well ☐ Deepening
☐ Reconditioning ☐ Plugging

4) PROPOSED USE (Check):
☑ Domestic ☐ Industrial ☐ Public Supply
☐ Irrigation ☐ Test Well ☐ Other ____

5) DRILLING METHOD (Check):
☑ Mud Rotary ☐ Air Hammer ☐ Driven ☐ Bored
☐ Air Rotary ☐ Cable Tool ☐ Jetted ☐ Other ____

6) WELL LOG:

Date drilled Dec. 10 - 85

DIAMETER OF HOLE

Dia. (in.)	From (ft.)	To (ft.)
	Surface	
6 3/4	0	645

From (ft.)	To (ft.)	Description and color of formation material
0 -	3	Top soil
3 -	150	White Clay
150 -	181	Fine red sand
181 -	276	" clay
276 -	314	" " sand
314 -	380	" clay
	- 398	" " sand
	- 512	" clay
	- 529	" " sand
529 -	605	" clay
605 -	643	Coarse " sand
643 -	645	Red clay T.D.

(Use reverse side if necessary)

7) BOREHOLE COMPLETION:
☐ Open Hole ☑ Straight Wall ☐ Underreamed
☐ Gravel Packed ☐ Other ____
If Gravel Packed give interval . . . from ____ ft. to ____ ft.

8) CASING, BLANK PIPE, AND WELL SCREEN DATA:

Dia. (in.)	New or Used	Steel, Plastic, etc. Perf., Slotted, etc. Screen Mgf., if commercial	Setting (ft.) From	Setting (ft.) To	Gage Casing Screen
4	New	Galv. Steel	2' above	- 645	Sch. 40
4	"	Slotted Steel	630	- 640	.014
	Mfg.	Western Well Screen Co.			

9) CEMENTING DATA [Rule 319.44(b)]
Cemented from 0 ft. to 15 ft.
____ ft. to ____ ft.
Method used ____
Cemented by ____

10) SURFACE COMPLETION
☐ Specified Surface Slab Installed [Rule 319.44(c)]
☐ Pitless Adapter Used [Rule 319.44(d)]
☑ –Approved Alternative Procedure Used [Rule 319.71]

11) WATER LEVEL:
Static level 131 ft. below land surface Date Dec. 11-85
Artesian flow ____ gpm. Date ____

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TEXAS WATER COMMISSION

12) PACKERS:

Type	Depth
Shale trap	15'
" "	602'

13) TYPE PUMP:
☐ Turbine ☐ Jet ☑ Submersible ☐ Cylinder
☐ Other ____
Depth to pump bowls, cylinder, jet, etc., 175' ft.

14) WELL TESTS:
Type Test: ☐ Pump ☐ Bailer ☑ Jetted ☐ Estimated
Yield: 70 gpm with ____ ft. drawdown after ____ hrs.

15) WATER QUALITY:
Did you knowingly penetrate any strata which contained undesirable water? ☐ Yes ☑ No
If yes, submit "REPORT OF UNDESIRABLE WATER"
Type of water? Good Depth of strata 38'
Was a chemical analysis made? ☐ Yes ☑ No

I here by certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief. I understand that failure to complete items 1 thru 12 will result in the log(s) being returned for completion and resubmittal.

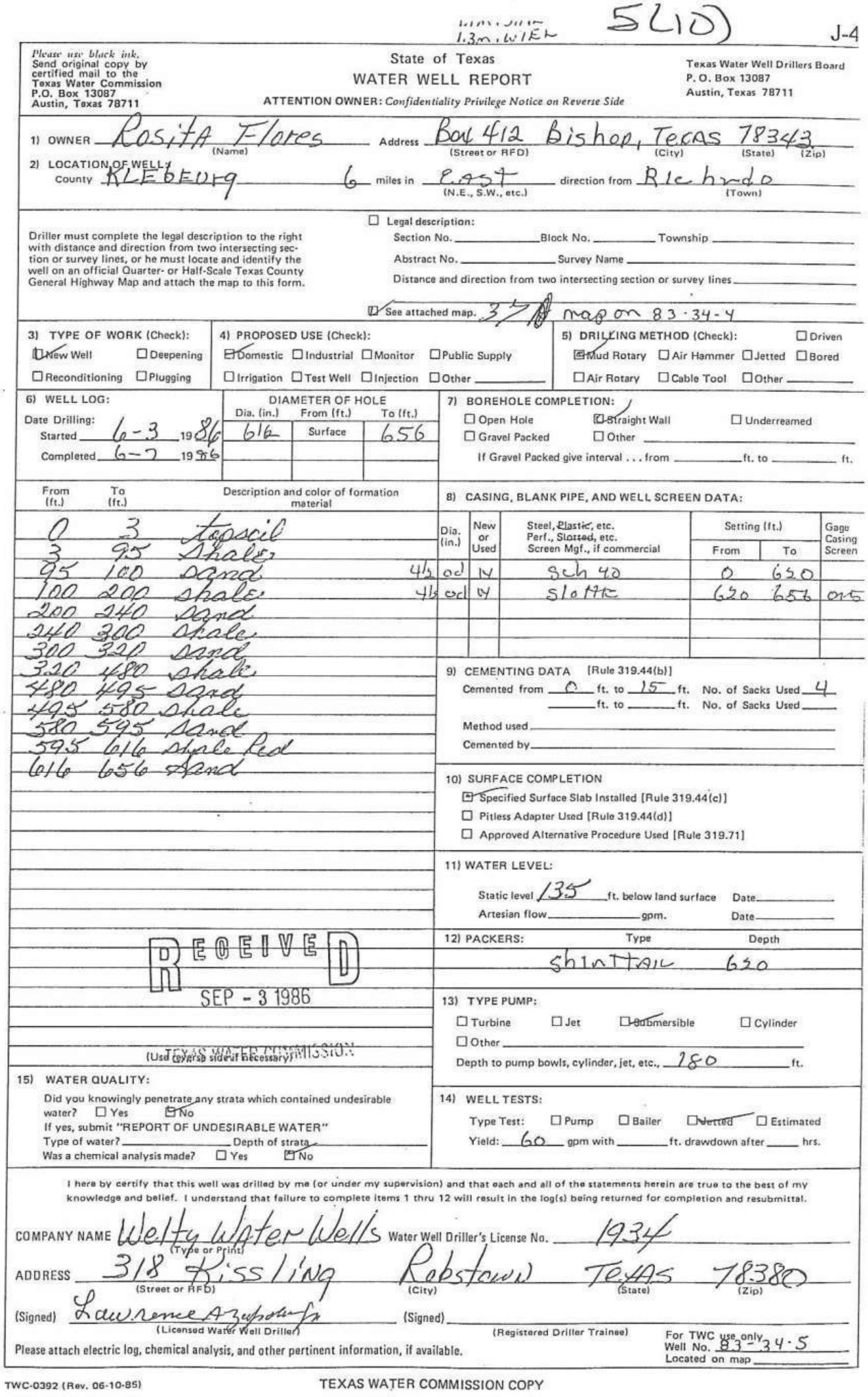
~~NY NAME~~ B.T. SIKES (Type or Print) Water Well Driller's License No. 215

ADDRESS RT. 2, BOX 52 (Street or RFD) MATHIS (City) TEXAS (State) 78368 (Zip)

(Signed) B. T. Sikes (Licensed Water Well Driller) (Signed) B. T. Sikes Water Well Drlg. (~~Registered Driller-Trainee~~)

For TDWR use only
Well No. 83-34-5
Located on map ____

Please attach electric log, chemical analysis, and other pertinent information, if available.



1.3m. WIEL 5(10) J-4

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Texas Water Commission
P.O. Box 13087
Austin, Texas 78711

State of Texas
WATER WELL REPORT
ATTENTION OWNER: *Confidentiality Privilege Notice on Reverse Side*

Texas Water Well Drillers Board
P. O. Box 13087
Austin, Texas 78711

1) OWNER Rosita Flores (Name) Address Box 412 (Street or RFD) Bishop, (City) Texas (State) 78343 (Zip)

2) LOCATION OF WELL: County Kleberg 6 miles in East (N.E., S.W., etc.) direction from Richardo (Town)

Driller must complete the legal description to the right with distance and direction from two intersecting section or survey lines, or he must locate and identify the well on an official Quarter- or Half-Scale Texas County General Highway Map and attach the map to this form.

☐ Legal description:
Section No. ______ Block No. ______ Township ______
Abstract No. ______ Survey Name ______
Distance and direction from two intersecting section or survey lines ______

☑ See attached map. 37 map on 83-34-4

3) TYPE OF WORK (Check): ☑ New Well ☐ Deepening ☐ Reconditioning ☐ Plugging

4) PROPOSED USE (Check): ☑ Domestic ☐ Industrial ☐ Monitor ☐ Public Supply ☐ Irrigation ☐ Test Well ☐ Injection ☐ Other ______

5) DRILLING METHOD (Check): ☐ Driven ☑ Mud Rotary ☐ Air Hammer ☐ Jetted ☐ Bored ☐ Air Rotary ☐ Cable Tool ☐ Other ______

6) WELL LOG:
Date Drilling:
Started 6-3 1986
Completed 6-7 1986

DIAMETER OF HOLE Dia. (in.)	From (ft.)	To (ft.)
616	Surface	656

7) BOREHOLE COMPLETION: ☐ Open Hole ☑ Straight Wall ☐ Underreamed ☐ Gravel Packed ☐ Other ______
If Gravel Packed give interval . . . from ______ ft. to ______ ft.

From (ft.)	To (ft.)	Description and color of formation material
0	3	topsoil
3	95	Shale
95	100	sand
100	200	shale
200	240	sand
240	300	shale
300	320	sand
320	480	shale
480	495	sand
495	580	shale
580	595	sand
595	616	shale Red
616	656	Sand

(Use reverse side if necessary)

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SEP - 3 1986
TEXAS WATER COMMISSION

8) CASING, BLANK PIPE, AND WELL SCREEN DATA:

Dia. (in.)	New or Used	Steel, ~~Plastic~~, etc. Perf., ~~Slotted~~, etc. Screen Mgf., if commercial	Setting (ft.) From	Setting (ft.) To	Gage Casing Screen
4½ od	N	Sch 40	0	620	
4½ od	N	Slotted	620	656	015

9) CEMENTING DATA [Rule 319.44(b)]
Cemented from 0 ft. to 15 ft. No. of Sacks Used 4
______ ft. to ______ ft. No. of Sacks Used ______
Method used ______
Cemented by ______

10) SURFACE COMPLETION
☑ Specified Surface Slab Installed [Rule 319.44(c)]
☐ Pitless Adapter Used [Rule 319.44(d)]
☐ Approved Alternative Procedure Used [Rule 319.71]

11) WATER LEVEL:
Static level 135 ft. below land surface Date ______
Artesian flow ______ gpm. Date ______

12) PACKERS:

Type	Depth
Shinttail	620

13) TYPE PUMP: ☐ Turbine ☐ Jet ☑ Submersible ☐ Cylinder ☐ Other ______
Depth to pump bowls, cylinder, jet, etc., 180 ft.

14) WELL TESTS:
Type Test: ☐ Pump ☐ Bailer ☑ Jetted ☐ Estimated
Yield: 60 gpm with ______ ft. drawdown after ______ hrs.

15) WATER QUALITY:
Did you knowingly penetrate any strata which contained undesirable water? ☐ Yes ☑ No
If yes, submit "REPORT OF UNDESIRABLE WATER"
Type of water? ______ Depth of strata ______
Was a chemical analysis made? ☐ Yes ☑ No

I here by certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief. I understand that failure to complete items 1 thru 12 will result in the log(s) being returned for completion and resubmittal.

COMPANY NAME Welty Water Wells (Type or Print) Water Well Driller's License No. 1934

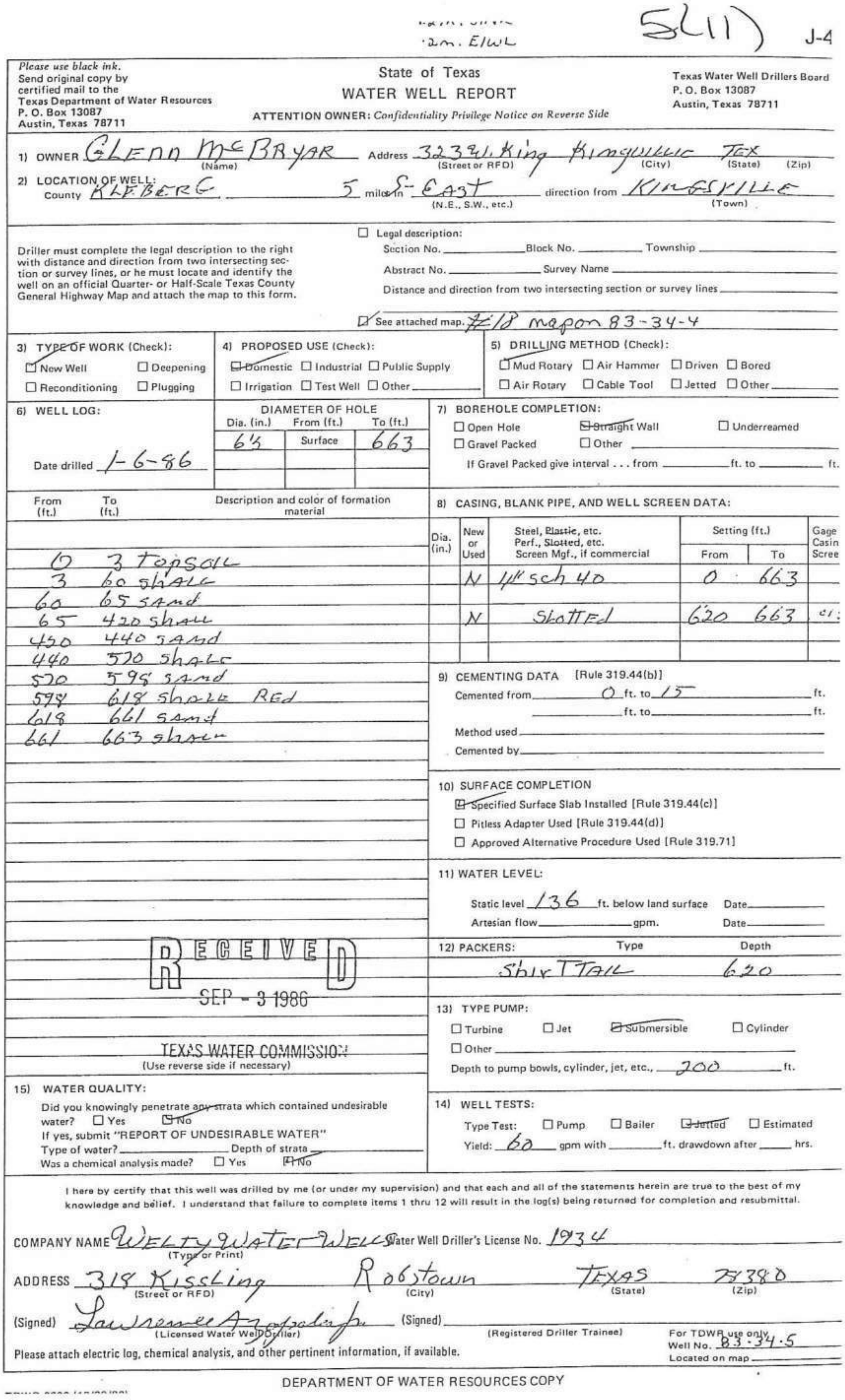
ADDRESS 318 Kissling (Street or RFD) Robstown (City) Texas (State) 78380 (Zip)

(Signed) Lawrence Azepotan Jr (Licensed Water Well Driller) (Signed) ______ (Registered Driller Trainee)

Please attach electric log, chemical analysis, and other pertinent information, if available.

For TWC use only
Well No. 83-34-5
Located on map ______

TWC-0392 (Rev. 06-10-85) TEXAS WATER COMMISSION COPY



·2m. E/WL

5(11)

J-4

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Texas Department of Water Resources
P. O. Box 13087
Austin, Texas 78711

State of Texas
WATER WELL REPORT

ATTENTION OWNER: *Confidentiality Privilege Notice on Reverse Side*

Texas Water Well Drillers Board
P. O. Box 13087
Austin, Texas 78711

1) OWNER GLENN McBRYAR (Name) Address 3232 W. King (Street or RFD) Kingsville (City) TEX (State) (Zip)

2) LOCATION OF WELL: County KLEBERG 5 miles in S-EAST (N.E., S.W., etc.) direction from KINGSVILLE (Town)

Driller must complete the legal description to the right with distance and direction from two intersecting section or survey lines, or he must locate and identify the well on an official Quarter- or Half-Scale Texas County General Highway Map and attach the map to this form.

☐ Legal description:
Section No. ______ Block No. ______ Township ______
Abstract No. ______ Survey Name ______
Distance and direction from two intersecting section or survey lines ______

☑ See attached map. #18 map on 83-34-4

3) TYPE OF WORK (Check): ☑ New Well ☐ Deepening ☐ Reconditioning ☐ Plugging

4) PROPOSED USE (Check): ☑ Domestic ☐ Industrial ☐ Public Supply ☐ Irrigation ☐ Test Well ☐ Other ______

5) DRILLING METHOD (Check): ☐ Mud Rotary ☐ Air Hammer ☐ Driven ☐ Bored ☐ Air Rotary ☐ Cable Tool ☐ Jetted ☐ Other ______

6) WELL LOG:

Date drilled 1-6-86

DIAMETER OF HOLE

Dia. (in.)	From (ft.)	To (ft.)
6½	Surface	663

7) BOREHOLE COMPLETION:
☐ Open Hole ☑ Straight Wall ☐ Underreamed
☐ Gravel Packed ☐ Other ______
If Gravel Packed give interval . . . from ______ ft. to ______ ft.

From (ft.)	To (ft.)	Description and color of formation material
0	3	Topsoil
3	60	shale
60	65	sand
65	420	shale
420	440	sand
440	570	shale
570	598	sand
598	618	shale RED
618	661	sand
661	663	shale

(Use reverse side if necessary)

RECEIVED
SEP - 3 1986
TEXAS WATER COMMISSION

8) CASING, BLANK PIPE, AND WELL SCREEN DATA:

Dia. (in.)	New or Used	Steel, ~~Plastic~~, etc. Perf., ~~Slotted~~, etc. Screen Mgf., if commercial	Setting (ft.) From	Setting (ft.) To	Gage Casin Scree
	N	4" sch 40	0	663	
	N	Slotted	620	663	

9) CEMENTING DATA [Rule 319.44(b)]
Cemented from 0 ft. to 15 ft.
______ ft. to ______ ft.
Method used ______
Cemented by ______

10) SURFACE COMPLETION
☑ Specified Surface Slab Installed [Rule 319.44(c)]
☐ Pitless Adapter Used [Rule 319.44(d)]
☐ Approved Alternative Procedure Used [Rule 319.71]

11) WATER LEVEL:
Static level 136 ft. below land surface Date ______
Artesian flow ______ gpm. Date ______

12) PACKERS: Type Shirt Tail Depth 620

13) TYPE PUMP:
☐ Turbine ☐ Jet ☑ Submersible ☐ Cylinder
☐ Other ______
Depth to pump bowls, cylinder, jet, etc., 200 ft.

14) WELL TESTS:
Type Test: ☐ Pump ☐ Bailer ☑ Jetted ☐ Estimated
Yield: 60 gpm with ______ ft. drawdown after ______ hrs.

15) WATER QUALITY:
Did you knowingly penetrate any strata which contained undesirable water? ☐ Yes ☑ No
If yes, submit "REPORT OF UNDESIRABLE WATER"
Type of water? ______ Depth of strata ______
Was a chemical analysis made? ☐ Yes ☑ No

I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief. I understand that failure to complete items 1 thru 12 will result in the log(s) being returned for completion and resubmittal.

COMPANY NAME WELTY WATER WELLS (Type or Print) Water Well Driller's License No. 1934

ADDRESS 318 Kissling (Street or RFD) Robstown (City) TEXAS (State) 78380 (Zip)

(Signed) Lawrence [illegible] (Licensed Water Well Driller) (Signed) ______ (Registered Driller Trainee)

For TDWR use only
Well No. 83-34-5
Located on map ______

Please attach electric log, chemical analysis, and other pertinent information, if available.

DEPARTMENT OF WATER RESOURCES COPY

5(12) J-4

Please use black ink.
Send original copy by
certified mail to the
Texas Water Commission
P.O. Box 13087
Austin, Texas 78711

State of Texas
WATER WELL REPORT

Texas Water Well Drillers Board
P. O. Box 13087
Austin, Texas 78711

ATTENTION OWNER: *Confidentiality Privilege Notice on Reverse Side*

1) OWNER Marvin Hamilton (Name) Address 1130 E. Johnson (Street or RFD) Kingsville (City) TX (State) 78363 (Zip)

2) LOCATION OF WELL: County KLEBERG 8 miles in S.E (N.E., S.W., etc.) direction from Kingsville (Town)

Driller must complete the legal description to the right with distance and direction from two intersecting section or survey lines, or he must locate and identify the well on an official Quarter- or Half-Scale Texas County General Highway Map and attach the map to this form.

☐ Legal description:
Section No. ______ Block No. ______ Township ______
Abstract No. ______ Survey Name ______
Distance and direction from two intersecting section or survey lines ______

☑ See attached map. #70 on 83-43-4

3) TYPE OF WORK (Check): ☑ New Well ☐ Deepening ☐ Reconditioning ☐ Plugging

4) PROPOSED USE (Check): ☑ Domestic ☐ Industrial ☐ Monitor ☐ Public Supply ☐ Irrigation ☐ Test Well ☐ Injection ☐ Other ______

5) DRILLING METHOD (Check): ☐ Driven ☑ Mud Rotary ☐ Air Hammer ☐ Jetted ☐ Bored ☐ Air Rotary ☐ Cable Tool ☐ Other ______

6) WELL LOG:
Date Drilling:
Started 4-24 1987
Completed 4-28 1987

DIAMETER OF HOLE

Dia. (in.)	From (ft.)	To (ft.)
6-3/4	Surface	612

7) BOREHOLE COMPLETION: ☐ Open Hole ☑ Straight Wall ☐ Underreamed ☐ Gravel Packed ☐ Other ______
If Gravel Packed give interval . . . from ______ ft. to ______ ft.

From (ft.)	To (ft.)	Description and color of formation material
0	3	Topsoil
3	184	shale
184	203	sand
203	247	shale
247	265	sand
265	554	shale
554	612	sand Red

(Use reverse side if necessary)

8) CASING, BLANK PIPE, AND WELL SCREEN DATA:

Dia. (in.)	New or Used	Steel, Plastic, etc. Perf., Slotted, etc. Screen Mgf., if commercial	Setting (ft.) From	Setting (ft.) To	Gage Casing Screen
4		SCH. 40	0	592	
4		SLOTTED	592	612	.016

9) CEMENTING DATA [Rule 319.44(b)]
Cemented from 0 ft. to 10 ft. No. of Sacks Used 3
______ ft. to ______ ft. No. of Sacks Used ______
Method used ______
Cemented by ______

RECEIVED SEP 2 1987

10) SURFACE COMPLETION
☑ Specified Surface Slab Installed [Rule 319.44(c)]
☐ Pitless Adapter Used [Rule 319.44(d)]
☐ Approved Alternative Procedure Used [Rule 319.71]

11) WATER LEVEL:
Static level 128 ft. below land surface Date 4-28-87
Artesian flow ______ gpm. Date ______

12) PACKERS:

Type	Depth
SKIRT TAIL	553

13) TYPE PUMP: ☐ Turbine ☐ Jet ☑ Submersible ☐ Cylinder ☐ Other ______
Depth to pump bowls, cylinder, jet, etc., 180 ft.

14) WELL TESTS:
Type Test: ☐ Pump ☐ Bailer ☑ Jetted ☐ Estimated
Yield: 60 gpm with ______ ft. drawdown after ______ hrs.

15) WATER QUALITY:
Did you knowingly penetrate any strata which contained undesirable water? ☐ Yes ☑ No
If yes, submit "REPORT OF UNDESIRABLE WATER"
Type of water? ______ Depth of strata ______
Was a chemical analysis made? ☐ Yes ☑ No

I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief. I understand that failure to complete items 1 thru 12 will result in the log(s) being returned for completion and resubmittal.

COMPANY NAME Welty Water Wells (Type or Print) Water Well Driller's License No. 1934

ADDRESS 318 Kissling (Street or RFD) Robstown (City) Texas (State) 78380 (Zip)

(Signed) Lawrence Azopardo (Licensed Water Well Driller) (Signed) ______ (Registered Driller Trainee)

For TWC use only
Well No. 83-34-5
Located on map ______

Please attach electric log, chemical analysis, and other pertinent information, if available.

TWC-0392 (Rev. 06-10-85)

TEXAS WATER COMMISSION COPY

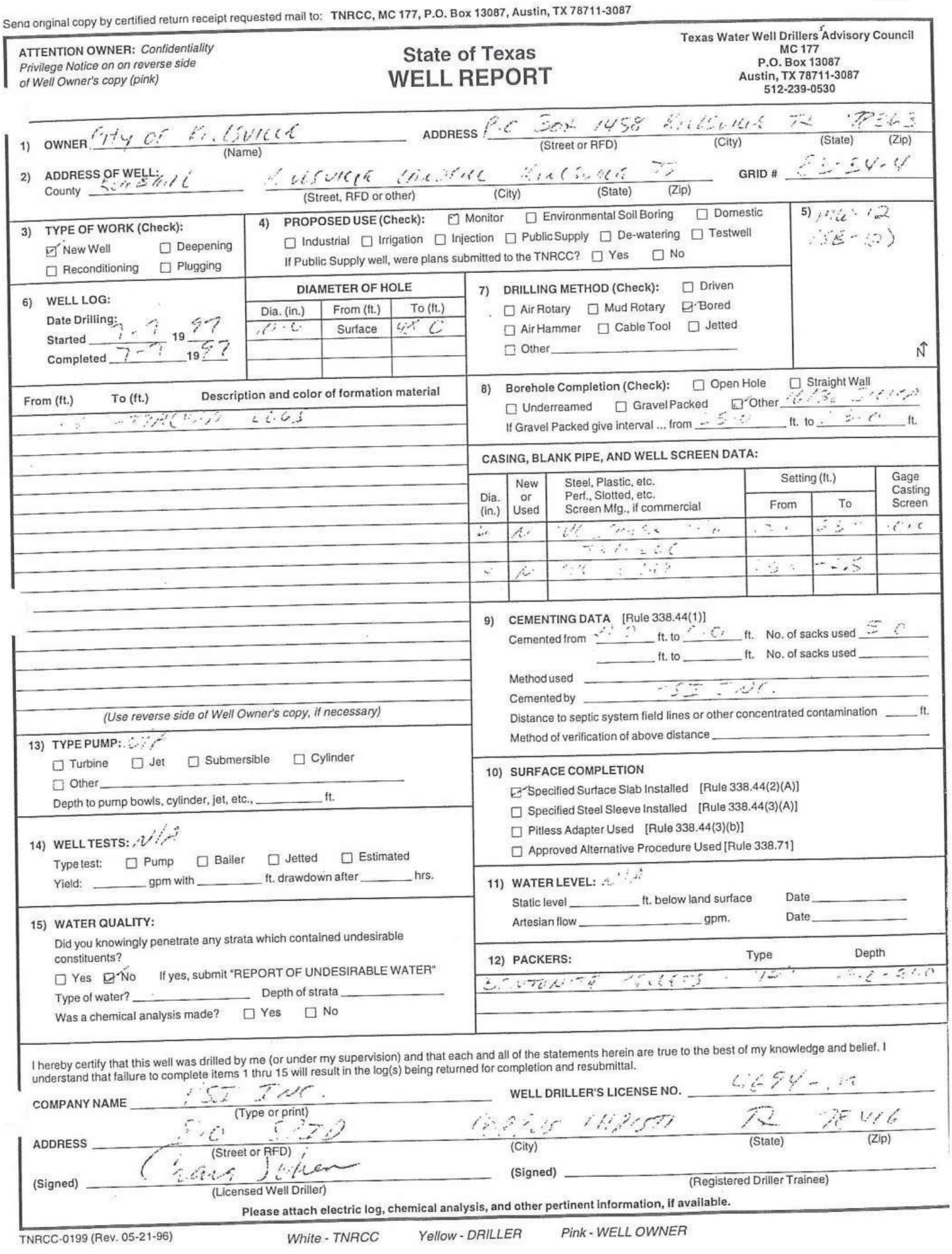
ATTACHMENT K

APPENDIX K

SOIL BORINGS SB-12 through SB-18, SB-21, SB-23, SB-24 & SB-25

November 1997
Revision 1 - June 1998

K-1



Send original copy by certified return receipt requested mail to: **TNRCC, MC 177, P.O. Box 13087, Austin, TX 78711-3087**

ATTENTION OWNER: *Confidentiality Privilege Notice on on reverse side of Well Owner's copy (pink)*

State of Texas
WELL REPORT

Texas Water Well Drillers Advisory Council
MC 177
P.O. Box 13087
Austin, TX 78711-3087
512-239-0530

1) **OWNER** City of Kingsville (Name) **ADDRESS** P.O. Box 1458 (Street or RFD) Kingsville (City) TX (State) 78363 (Zip)

2) **ADDRESS OF WELL:** County Kleberg [illegible] (Street, RFD or other) Kingsville (City) TX (State) (Zip) **GRID #** 83-34-4

3) **TYPE OF WORK (Check):**
☑ New Well ☐ Deepening
☐ Reconditioning ☐ Plugging

4) **PROPOSED USE (Check):** ☑ Monitor ☐ Environmental Soil Boring ☐ Domestic
☐ Industrial ☐ Irrigation ☐ Injection ☐ Public Supply ☐ De-watering ☐ Testwell
If Public Supply well, were plans submitted to the TNRCC? ☐ Yes ☐ No

5) MW-12 (SB-10)

N↑

6) **WELL LOG:**
Date Drilling:
Started 7-7 19 97
Completed 7-7 19 97

DIAMETER OF HOLE		
Dia. (in.)	From (ft.)	To (ft.)
10.0	Surface	48.0

7) **DRILLING METHOD (Check):** ☐ Driven
☐ Air Rotary ☐ Mud Rotary ☑ Bored
☐ Air Hammer ☐ Cable Tool ☐ Jetted
☐ Other

From (ft.)	To (ft.)	Description and color of formation material
		See attached logs

(Use reverse side of Well Owner's copy, if necessary)

8) **Borehole Completion (Check):** ☐ Open Hole ☐ Straight Wall
☐ Underreamed ☐ Gravel Packed ☑ Other [illegible]
If Gravel Packed give interval ... from 35.0 ft. to 50.0 ft.

CASING, BLANK PIPE, AND WELL SCREEN DATA:

Dia. (in.)	New or Used	Steel, Plastic, etc. Perf., Slotted, etc. Screen Mfg., if commercial	Setting (ft.)		Gage Casting Screen
			From	To	
2	N	Sch 40 PVC [illegible]	0	35	.010
		Threaded			
2	N	[illegible]	35	45	

9) **CEMENTING DATA** [Rule 338.44(1)]
Cemented from 28 ft. to 0.0 ft. No. of sacks used 50
ft. to ft. No. of sacks used
Method used
Cemented by IST Inc.
Distance to septic system field lines or other concentrated contamination ft.
Method of verification of above distance

10) **SURFACE COMPLETION**
☑ Specified Surface Slab Installed [Rule 338.44(2)(A)]
☐ Specified Steel Sleeve Installed [Rule 338.44(3)(A)]
☐ Pitless Adapter Used [Rule 338.44(3)(b)]
☐ Approved Alternative Procedure Used [Rule 338.71]

11) **WATER LEVEL:** N/A
Static level ft. below land surface Date
Artesian flow gpm. Date

12) **PACKERS:**

	Type	Depth
Bentonite pellets	1/2"	28-33.0

13) **TYPE PUMP:** N/A
☐ Turbine ☐ Jet ☐ Submersible ☐ Cylinder
☐ Other
Depth to pump bowls, cylinder, jet, etc., ft.

14) **WELL TESTS:** N/A
Type test: ☐ Pump ☐ Bailer ☐ Jetted ☐ Estimated
Yield: gpm with ft. drawdown after hrs.

15) **WATER QUALITY:**
Did you knowingly penetrate any strata which contained undesirable constituents?
☐ Yes ☑ No If yes, submit "REPORT OF UNDESIRABLE WATER"
Type of water? Depth of strata
Was a chemical analysis made? ☐ Yes ☐ No

I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief. I understand that failure to complete items 1 thru 15 will result in the log(s) being returned for completion and resubmittal.

COMPANY NAME IST Inc. (Type or print) WELL DRILLER'S LICENSE NO. 4694-M

ADDRESS P.O. [illegible] (Street or RFD) Corpus Christi (City) TX (State) 78416 (Zip)

(Signed) Craig [illegible] (Licensed Well Driller) (Signed) (Registered Driller Trainee)

Please attach electric log, chemical analysis, and other pertinent information, if available.

TNRCC-0199 (Rev. 05-21-96) *White - TNRCC* *Yellow - DRILLER* *Pink - WELL OWNER*

K

Send original copy by certified return receipt requested mail to: **TNRCC, MC 177, P.O. Box 13087, Austin, TX 78711-3087**

ATTENTION OWNER: *Confidentiality Privilege Notice on on reverse side of Well Owner's copy (pink)*

State of Texas
WELL REPORT

Texas Water Well Drillers Advisory Council
MC 177
P.O. Box 13087
Austin, TX 78711-3087
512-239-0530

1) **OWNER** City of Kingsville (Name) **ADDRESS** PO Box 1458 (Street or RFD) Kingsville (City) TX (State) 78363 (Zip)

2) **ADDRESS OF WELL:** County Kleberg Kingsville Landfill (Street, RFD or other) Kingsville (City) TX (State) (Zip) **GRID #** 83-34-4

3) **TYPE OF WORK (Check):**
☑ New Well ☐ Deepening
☐ Reconditioning ☐ Plugging

4) **PROPOSED USE (Check):** ☑ Monitor ☐ Environmental Soil Boring ☐ Domestic
☐ Industrial ☐ Irrigation ☐ Injection ☐ Public Supply ☐ De-watering ☐ Testwell
If Public Supply well, were plans submitted to the TNRCC? ☐ Yes ☐ No

5) MW-13
(SB-13)

N

6) **WELL LOG:**
Date Drilling:
Started [illegible] 19 97
Completed [illegible] 19 97

DIAMETER OF HOLE

Dia. (in.)	From (ft.)	To (ft.)
8.0	Surface	50.0

7) **DRILLING METHOD (Check):** ☐ Driven
☐ Air Rotary ☐ Mud Rotary ☑ Bored
☐ Air Hammer ☐ Cable Tool ☐ Jetted
☐ Other

From (ft.)	To (ft.)	Description and color of formation material
[illegible]	[illegible]	[illegible]

(Use reverse side of Well Owner's copy, if necessary)

8) **Borehole Completion (Check):** ☐ Open Hole ☐ Straight Wall
☐ Underreamed ☐ Gravel Packed ☐ Other See Screen
If Gravel Packed give interval ... from 48.0 ft. to 50.0 ft.

CASING, BLANK PIPE, AND WELL SCREEN DATA:

Dia. (in.)	New or Used	Steel, Plastic, etc. Perf., Slotted, etc. Screen Mfg., if commercial	Setting (ft.) From	Setting (ft.) To	Gage Casing Screen
2	N	PVC Screen Sch 40 Thread	40.0	50.0	.010
4	N	PVC Riser	30.0	+2.5	

9) **CEMENTING DATA** [Rule 338.44(1)]
Cemented from 26.0 ft. to 0.0 ft. No. of sacks used 50
ft. to ft. No. of sacks used
Method used
Cemented by ST Inc.
Distance to septic system field lines or other concentrated contamination ft.
Method of verification of above distance

10) **SURFACE COMPLETION**
☑ Specified Surface Slab Installed [Rule 338.44(2)(A)]
☐ Specified Steel Sleeve Installed [Rule 338.44(3)(A)]
☐ Pitless Adapter Used [Rule 338.44(3)(b)]
☐ Approved Alternative Procedure Used [Rule 338.71]

11) **WATER LEVEL:** N/A
Static level ft. below land surface Date
Artesian flow gpm. Date

12) **PACKERS:**

	Type	Depth
Bentonite Pellets	1/2"	48.0 - 26.0

13) **TYPE PUMP:** N/A
☐ Turbine ☐ Jet ☐ Submersible ☐ Cylinder
☐ Other
Depth to pump bowls, cylinder, jet, etc., ft.

14) **WELL TESTS:** N/A
Type test: ☐ Pump ☐ Bailer ☐ Jetted ☐ Estimated
Yield: gpm with ft. drawdown after hrs.

15) **WATER QUALITY:**
Did you knowingly penetrate any strata which contained undesirable constituents?
☐ Yes ☑ No If yes, submit "REPORT OF UNDESIRABLE WATER"
Type of water? Depth of strata
Was a chemical analysis made? ☐ Yes ☐ No

I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief. I understand that failure to complete items 1 thru 15 will result in the log(s) being returned for completion and resubmittal.

COMPANY NAME ST Inc. (Type or print) **WELL DRILLER'S LICENSE NO.** 4694-M

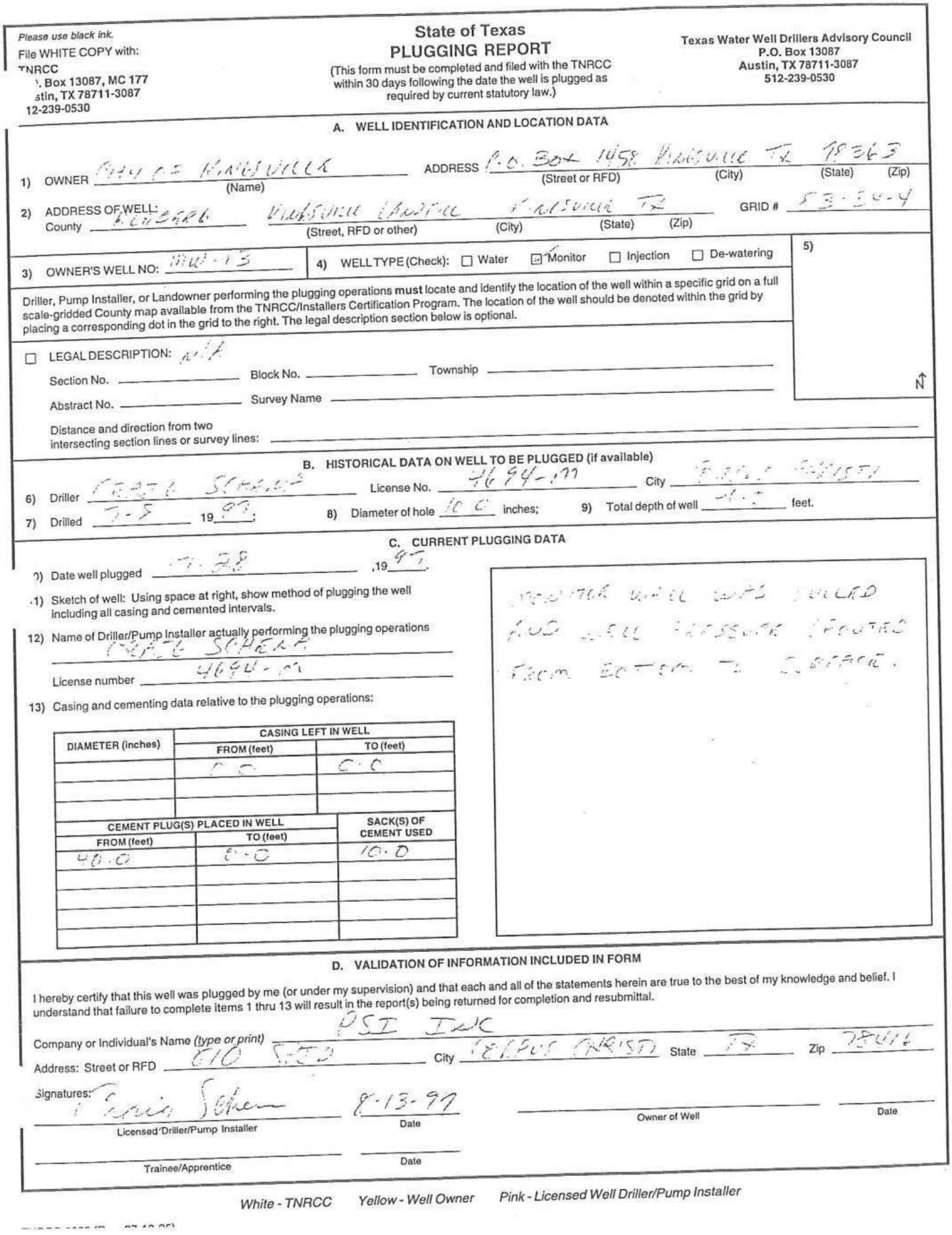
ADDRESS PO 5220 (Street or RFD) Corpus Christi (City) TX (State) 78416 (Zip)

(Signed) (Licensed Well Driller) (Signed) (Registered Driller Trainee)

Please attach electric log, chemical analysis, and other pertinent information, if available.

TNRCC-0199 (Rev. 05-21-96) *White - TNRCC* *Yellow - DRILLER* *Pink - WELL OWNER*

K-



Please use black ink.
File WHITE COPY with:
TNRCC
. Box 13087, MC 177
stin, TX 78711-3087
12-239-0530

State of Texas
PLUGGING REPORT

(This form must be completed and filed with the TNRCC within 30 days following the date the well is plugged as required by current statutory law.)

Texas Water Well Drillers Advisory Council
P.O. Box 13087
Austin, TX 78711-3087
512-239-0530

A. WELL IDENTIFICATION AND LOCATION DATA

1) OWNER City of Kingsville (Name) ADDRESS P.O. Box 1458 (Street or RFD) Kingsville (City) TX (State) 78363 (Zip)

2) ADDRESS OF WELL: County Kleberg Kingsville Landfill (Street, RFD or other) Kingsville (City) TX (State) (Zip) GRID # 83-30-4

3) OWNER'S WELL NO: MW-13

4) WELL TYPE (Check): ☐ Water ☑ Monitor ☐ Injection ☐ De-watering

5)

Driller, Pump Installer, or Landowner performing the plugging operations **must** locate and identify the location of the well within a specific grid on a full scale-gridded County map available from the TNRCC/Installers Certification Program. The location of the well should be denoted within the grid by placing a corresponding dot in the grid to the right. The legal description section below is optional.

N↑

☐ LEGAL DESCRIPTION: N/A
Section No. ______ Block No. ______ Township ______
Abstract No. ______ Survey Name ______
Distance and direction from two intersecting section lines or survey lines: ______

B. HISTORICAL DATA ON WELL TO BE PLUGGED (if available)

6) Driller Craig Scherr License No. 4694-M City Corpus Christi

7) Drilled 7-8 19 97;

8) Diameter of hole 10.0 inches;

9) Total depth of well 40.0 feet.

C. CURRENT PLUGGING DATA

0) Date well plugged 7-28 ,19 97.

.1) Sketch of well: Using space at right, show method of plugging the well including all casing and cemented intervals.

Monitor well was pulled and well pressure grouted from bottom to surface.

12) Name of Driller/Pump Installer actually performing the plugging operations Craig Scherr

License number 4694-M

13) Casing and cementing data relative to the plugging operations:

DIAMETER (inches)	CASING LEFT IN WELL	
	FROM (feet)	TO (feet)
	0.0	0.0

CEMENT PLUG(S) PLACED IN WELL		SACK(S) OF CEMENT USED
FROM (feet)	TO (feet)	
40.0	0.0	10.0

D. VALIDATION OF INFORMATION INCLUDED IN FORM

I hereby certify that this well was plugged by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief. I understand that failure to complete items 1 thru 13 will result in the report(s) being returned for completion and resubmittal.

Company or Individual's Name *(type or print)* PSI Inc
Address: Street or RFD 610 [illegible] City Corpus Christi State TX Zip 78416
Signatures: Craig Scherr 8-13-97

Licensed Driller/Pump Installer — Date — Owner of Well — Date
Trainee/Apprentice — Date

White - TNRCC *Yellow - Well Owner* *Pink - Licensed Well Driller/Pump Installer*

K-4

Send original copy by certified return receipt requested mail to: TNRCC, MC 177, P.O. Box 13087, Austin, TX 78711-3087

ATTENTION OWNER: Confidentiality Privilege Notice on on reverse side of Well Owner's copy (pink)

State of Texas WELL REPORT

Texas Water Well Drillers Advisory Council
MC 177
P.O. Box 13087
Austin, TX 78711-3087
512-239-0530

1) OWNER City of Kingsville (Name) ADDRESS P.O. Box 1458 Kingsville (Street or RFD) (City) TX (State) 78363 (Zip)

2) ADDRESS OF WELL: County Kleberg Kingsville Landfill (Street, RFD or other) Kingsville (City) TX (State) (Zip) GRID # 83-34-4

3) TYPE OF WORK (Check): ☑ New Well ☐ Deepening ☐ Reconditioning ☐ Plugging

4) PROPOSED USE (Check): ☑ Monitor ☐ Environmental Soil Boring ☐ Domestic ☐ Industrial ☐ Irrigation ☐ Injection ☐ Public Supply ☐ De-watering ☐ Testwell
If Public Supply well, were plans submitted to the TNRCC? ☐ Yes ☐ No

5) MW-14 (LS-14)

N↑

6) WELL LOG:
Date Drilling:
Started 7-8 19 97
Completed 7-8 19 97

DIAMETER OF HOLE

Dia. (in.)	From (ft.)	To (ft.)
[illegible]	Surface	45.0

7) DRILLING METHOD (Check): ☐ Driven ☐ Air Rotary ☐ Mud Rotary ☑ Bored ☐ Air Hammer ☐ Cable Tool ☐ Jetted ☐ Other

From (ft.)	To (ft.)	Description and color of formation material
[illegible]		

(Use reverse side of Well Owner's copy, if necessary)

8) Borehole Completion (Check): ☐ Open Hole ☐ Straight Wall ☐ Underreamed ☐ Gravel Packed ☑ Other [illegible]
If Gravel Packed give interval ... from 33.0 ft. to 45.0 ft.

CASING, BLANK PIPE, AND WELL SCREEN DATA:

Dia. (in.)	New or Used	Steel, Plastic, etc. Perf., Slotted, etc. Screen Mfg., if commercial	Setting (ft.)		Gage Casting Screen
			From	To	
4	N	PVC [illegible]	35.0	45.0	.010
		[illegible]			
4	N	PVC [illegible]	35.0	+2.5	

9) CEMENTING DATA [Rule 338.44(1)]
Cemented from 31.0 ft. to 0.0 ft. No. of sacks used 5
ft. to ft. No. of sacks used
Method used
Cemented by JST Inc.
Distance to septic system field lines or other concentrated contamination ft.
Method of verification of above distance

10) SURFACE COMPLETION
☑ Specified Surface Slab Installed [Rule 338.44(2)(A)]
☐ Specified Steel Sleeve Installed [Rule 338.44(3)(A)]
☐ Pitless Adapter Used [Rule 338.44(3)(b)]
☐ Approved Alternative Procedure Used [Rule 338.71]

11) WATER LEVEL: N/A
Static level ft. below land surface Date
Artesian flow gpm. Date

12) PACKERS: Type Depth
BENTONITE PELLETS [illegible] [illegible]

13) TYPE PUMP: N/A
☐ Turbine ☐ Jet ☐ Submersible ☐ Cylinder
☐ Other
Depth to pump bowls, cylinder, jet, etc., ft.

14) WELL TESTS: N/A
Type test: ☐ Pump ☐ Bailer ☐ Jetted ☐ Estimated
Yield: gpm with ft. drawdown after hrs.

15) WATER QUALITY:
Did you knowingly penetrate any strata which contained undesirable constituents?
☐ Yes ☑ No If yes, submit "REPORT OF UNDESIRABLE WATER"
Type of water? Depth of strata
Was a chemical analysis made? ☐ Yes ☐ No

I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief. I understand that failure to complete items 1 thru 15 will result in the log(s) being returned for completion and resubmittal.

COMPANY NAME JST Inc (Type or print) WELL DRILLER'S LICENSE NO. 4694-M

ADDRESS 810 [illegible] (Street or RFD) Corpus Christi (City) TX (State) 78416 (Zip)

(Signed) Craig [illegible] (Licensed Well Driller) (Signed) (Registered Driller Trainee)

Please attach electric log, chemical analysis, and other pertinent information, if available.

TNRCC-0199 (Rev. 05-21-96) *White - TNRCC* *Yellow - DRILLER* *Pink - WELL OWNER*

K-

Send original copy by certified return receipt requested mail to: TNRCC, MC 177, P.O. Box 13087, Austin, TX 78711-3087

ATTENTION OWNER: Confidentiality Privilege Notice on on reverse side of Well Owner's copy (pink)

State of Texas
WELL REPORT

Texas Water Well Drillers Advisory Council
MC 177
P.O. Box 13087
Austin, TX 78711-3087
512-239-0530

1) OWNER City of Kingsville (Name) ADDRESS PO Box 1458 Kingsville TX [illegible] (Street or RFD) (City) (State) (Zip)

2) ADDRESS OF WELL: County Kleberg Kingsville Landfill Kingsville TX (Street, RFD or other) (City) (State) (Zip) GRID # 83-34-4

3) TYPE OF WORK (Check):
☑ New Well ☐ Deepening
☐ Reconditioning ☐ Plugging

4) PROPOSED USE (Check): ☑ Monitor ☐ Environmental Soil Boring ☐ Domestic
☐ Industrial ☐ Irrigation ☐ Injection ☐ Public Supply ☐ De-watering ☐ Testwell
If Public Supply well, were plans submitted to the TNRCC? ☐ Yes ☐ No

5) MW-5 ([illegible])

N↑

6) WELL LOG:
Date Drilling:
Started 7-8 19 97
Completed 7-8 19 97

DIAMETER OF HOLE

Dia. (in.)	From (ft.)	To (ft.)
11.0	Surface	37.0

7) DRILLING METHOD (Check): ☐ Driven
☐ Air Rotary ☐ Mud Rotary ☑ Bored
☐ Air Hammer ☐ Cable Tool ☐ Jetted
☐ Other

From (ft.)	To (ft.)	Description and color of formation material
		See attached log

(Use reverse side of Well Owner's copy, if necessary)

8) Borehole Completion (Check): ☐ Open Hole ☐ Straight Wall
☐ Underreamed ☐ Gravel Packed ☑ Other [illegible]
If Gravel Packed give interval ... from [illegible] ft. to [illegible] ft.

CASING, BLANK PIPE, AND WELL SCREEN DATA:

Dia. (in.)	New or Used	Steel, Plastic, etc. Perf., Slotted, etc. Screen Mfg., if commercial	Setting (ft.)		Gage Casting Screen
			From	To	
4	N	PVC SCH40 [illegible]	[illegible]	[illegible]	[illegible]
		TRI-LOC			
4	N	PVC SCR	[illegible]	[illegible]	

9) CEMENTING DATA [Rule 338.44(1)]
Cemented from 19.1 ft. to 0.0 ft. No. of sacks used 5.0
ft. to ft. No. of sacks used
Method used
Cemented by SJT Inc
Distance to septic system field lines or other concentrated contamination ft.
Method of verification of above distance

10) SURFACE COMPLETION
☑ Specified Surface Slab Installed [Rule 338.44(2)(A)]
☐ Specified Steel Sleeve Installed [Rule 338.44(3)(A)]
☐ Pitless Adapter Used [Rule 338.44(3)(b)]
☐ Approved Alternative Procedure Used [Rule 338.71]

11) WATER LEVEL: N/A
Static level ft. below land surface Date
Artesian flow gpm. Date

12) PACKERS:

	Type	Depth
BENTONITE PELLETS	3/8"	21.0 - 19.1

13) TYPE PUMP: N/A
☐ Turbine ☐ Jet ☐ Submersible ☐ Cylinder
☐ Other
Depth to pump bowls, cylinder, jet, etc., ft.

14) WELL TESTS: N/A
Type test: ☐ Pump ☐ Bailer ☐ Jetted ☐ Estimated
Yield: gpm with ft. drawdown after hrs.

15) WATER QUALITY:
Did you knowingly penetrate any strata which contained undesirable constituents?
☐ Yes ☑ No If yes, submit "REPORT OF UNDESIRABLE WATER"
Type of water? Depth of strata
Was a chemical analysis made? ☐ Yes ☐ No

I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief. I understand that failure to complete items 1 thru 15 will result in the log(s) being returned for completion and resubmittal.

OMPANY NAME SJT INC (Type or print) WELL DRILLER'S LICENSE NO. 4654-M

ADDRESS 810 [illegible] Corpus Christi TX 784[illegible] (Street or RFD) (City) (State) (Zip)

(Signed) Craig (Licensed Well Driller) (Signed) (Registered Driller Trainee)

Please attach electric log, chemical analysis, and other pertinent information, if available.

TNRCC-0199 (Rev. 05-21-96) White - TNRCC Yellow - DRILLER Pink - WELL OWNER

K-

Send original copy by certified return receipt requested mail to: **TNRCC, MC 177, P.O. Box 13087, Austin, TX 78711-3087**

ATTENTION OWNER: *Confidentiality Privilege Notice on on reverse side of Well Owner's copy (pink)*

State of Texas
WELL REPORT

Texas Water Well Drillers Advisory Council
MC 177
P.O. Box 13087
Austin, TX 78711-3087
512-239-0530

1) **OWNER** City of Kingsville (Name) **ADDRESS** P.O. Box 1458 (Street or RFD) Kingsville (City) TX (State) 78363 (Zip)

2) **ADDRESS OF WELL:** County Kleberg Kingsville Landfill (Street, RFD or other) Kingsville (City) TX (State) (Zip) **GRID #** 83-34-4

3) **TYPE OF WORK (Check):** ☑ New Well ☐ Deepening ☐ Reconditioning ☐ Plugging

4) **PROPOSED USE (Check):** ☑ Monitor ☐ Environmental Soil Boring ☐ Domestic ☐ Industrial ☐ Irrigation ☐ Injection ☐ Public Supply ☐ De-watering ☐ Testwell
If Public Supply well, were plans submitted to the TNRCC? ☐ Yes ☐ No

5) MW-16 (B3-16)

N↑

6) **WELL LOG:**
Date Drilling:
Started 7-10 19 97
Completed 7-10 19 97

DIAMETER OF HOLE

Dia. (in.)	From (ft.)	To (ft.)
10.0	Surface	47.0

7) **DRILLING METHOD (Check):** ☐ Driven ☐ Air Rotary ☐ Mud Rotary ☑ Bored ☐ Air Hammer ☐ Cable Tool ☐ Jetted ☐ Other

From (ft.)	To (ft.)	Description and color of formation material
		See attached log

(Use reverse side of Well Owner's copy, if necessary)

8) **Borehole Completion (Check):** ☐ Open Hole ☐ Straight Wall ☐ Underreamed ☐ Gravel Packed ☑ Other [illegible] Silica
If Gravel Packed give interval ... from 47.0 ft. to 28.0 ft.

CASING, BLANK PIPE, AND WELL SCREEN DATA:

Dia. (in.)	New or Used	Steel, Plastic, etc. Perf., Slotted, etc. Screen Mfg., if commercial	Setting (ft.)		Gage Casting Screen
			From	To	
4	N	PVC [illegible] pipe TRI-LOC	47.0	30.0	.010
4	N	PVC Riser	[illegible]	+2.5	

9) **CEMENTING DATA** [Rule 338.44(1)]
Cemented from 26.0 ft. to 0.0 ft. No. of sacks used 7.0
ft. to ft. No. of sacks used
Method used
Cemented by PSI Inc.
Distance to septic system field lines or other concentrated contamination ft.
Method of verification of above distance

10) **SURFACE COMPLETION**
☑ Specified Surface Slab Installed [Rule 338.44(2)(A)]
☐ Specified Steel Sleeve Installed [Rule 338.44(3)(A)]
☐ Pitless Adapter Used [Rule 338.44(3)(b)]
☐ Approved Alternative Procedure Used [Rule 338.71]

11) **WATER LEVEL:** N/A
Static level ft. below land surface Date
Artesian flow gpm. Date

12) **PACKERS:**

	Type	Depth
Bentonite Pellets	1/2	[illegible]-36.0

13) **TYPE PUMP:** N/A
☐ Turbine ☐ Jet ☐ Submersible ☐ Cylinder
☐ Other
Depth to pump bowls, cylinder, jet, etc., ft.

14) **WELL TESTS:** N/A
Type test: ☐ Pump ☐ Bailer ☐ Jetted ☐ Estimated
Yield: gpm with ft. drawdown after hrs.

15) **WATER QUALITY:**
Did you knowingly penetrate any strata which contained undesirable constituents?
☐ Yes ☑ No If yes, submit "REPORT OF UNDESIRABLE WATER"
Type of water? Depth of strata
Was a chemical analysis made? ☐ Yes ☐ No

I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief. I understand that failure to complete items 1 thru 15 will result in the log(s) being returned for completion and resubmittal.

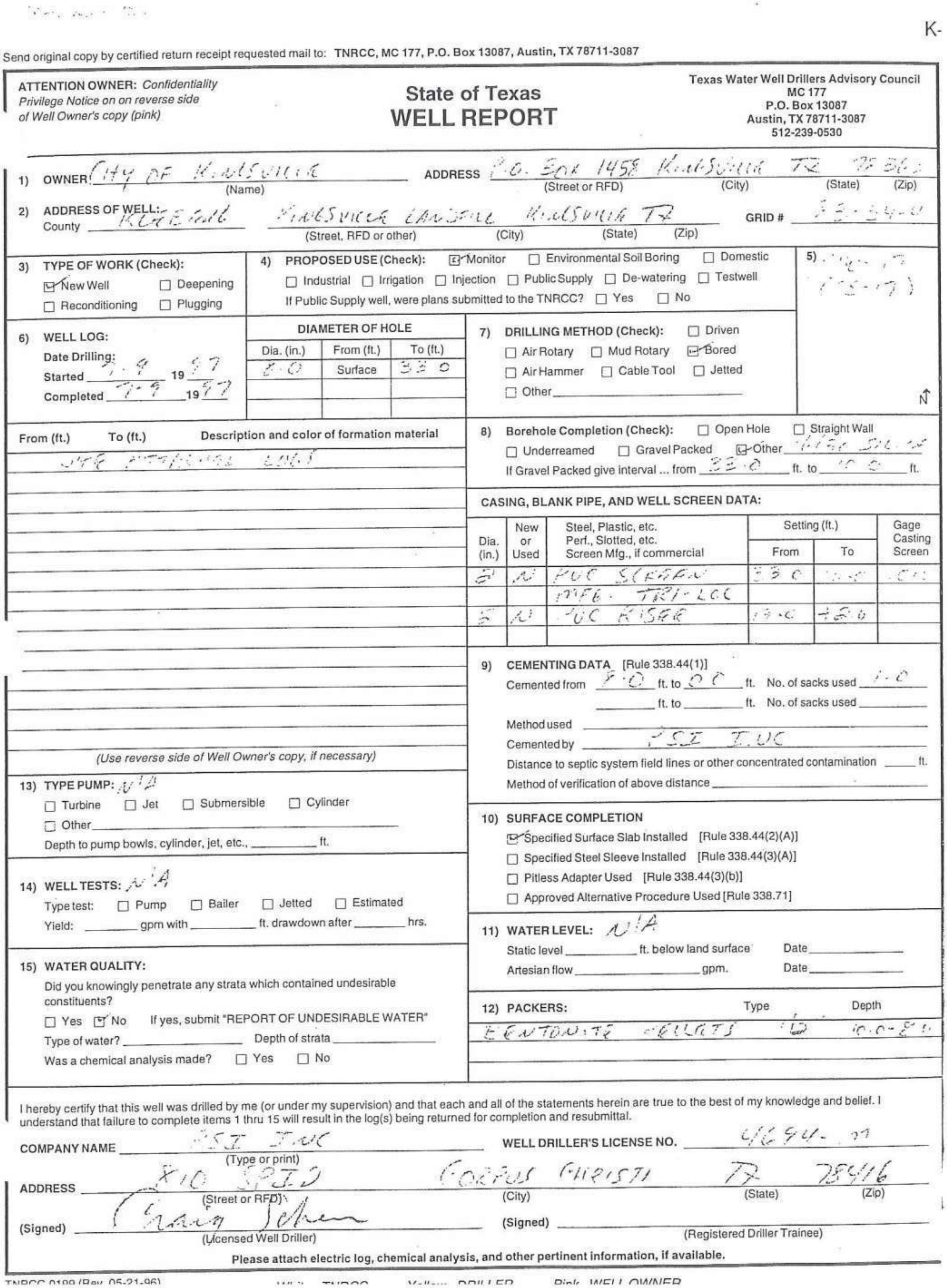
COMPANY NAME PSI Inc (Type or print) **WELL DRILLER'S LICENSE NO.** 4694-M

ADDRESS 810 SPID (Street or RFD) Corpus Christi (City) TX (State) 78416 (Zip)

(Signed) Craig [illegible] (Licensed Well Driller) (Signed) (Registered Driller Trainee)

Please attach electric log, chemical analysis, and other pertinent information, if available.

TNRCC-0199 (Rev. 05-21-96) White - TNRCC Yellow - DRILLER Pink - WELL OWNER



K-

Send original copy by certified return receipt requested mail to: TNRCC, MC 177, P.O. Box 13087, Austin, TX 78711-3087

ATTENTION OWNER: *Confidentiality Privilege Notice on on reverse side of Well Owner's copy (pink)*

State of Texas
WELL REPORT

Texas Water Well Drillers Advisory Council
MC 177
P.O. Box 13087
Austin, TX 78711-3087
512-239-0530

1) OWNER City of Kingsville (Name) ADDRESS P.O. Box 1458 (Street or RFD) Kingsville (City) TX (State) [illegible] (Zip)

2) ADDRESS OF WELL: County Kleberg Kingsville Landfill (Street, RFD or other) Kingsville (City) TX (State) (Zip) GRID # [illegible]

3) TYPE OF WORK (Check):
- ☑ New Well
- ☐ Deepening
- ☐ Reconditioning
- ☐ Plugging

4) PROPOSED USE (Check): ☑ Monitor ☐ Environmental Soil Boring ☐ Domestic ☐ Industrial ☐ Irrigation ☐ Injection ☐ Public Supply ☐ De-watering ☐ Testwell
If Public Supply well, were plans submitted to the TNRCC? ☐ Yes ☐ No

5) [illegible] (S-17)
N↑

6) WELL LOG:
Date Drilling:
Started 7-9 19 97
Completed 7-9 19 97

DIAMETER OF HOLE

Dia. (in.)	From (ft.)	To (ft.)
8.0	Surface	33.0

7) DRILLING METHOD (Check): ☐ Driven ☐ Air Rotary ☐ Mud Rotary ☑ Bored ☐ Air Hammer ☐ Cable Tool ☐ Jetted ☐ Other ______

From (ft.)	To (ft.)	Description and color of formation material
See Attached Log		

(Use reverse side of Well Owner's copy, if necessary)

8) Borehole Completion (Check): ☐ Open Hole ☐ Straight Wall ☐ Underreamed ☐ Gravel Packed ☑ Other [illegible]
If Gravel Packed give interval ... from 33.0 ft. to 10.0 ft.

CASING, BLANK PIPE, AND WELL SCREEN DATA:

Dia. (in.)	New or Used	Steel, Plastic, etc. Perf., Slotted, etc. Screen Mfg., if commercial	Setting (ft.) From	Setting (ft.) To	Gage Casting Screen
2"	N	PVC Screen	33.0	[illegible]	.010
		MFG. TRI-LOC			
2	N	PVC Riser	18.0	+2.0	

9) CEMENTING DATA [Rule 338.44(1)]
Cemented from 8.0 ft. to 0.0 ft. No. of sacks used 1.0
______ ft. to ______ ft. No. of sacks used ______
Method used ______
Cemented by PSI Inc.
Distance to septic system field lines or other concentrated contamination ______ ft.
Method of verification of above distance ______

10) SURFACE COMPLETION
- ☑ Specified Surface Slab Installed [Rule 338.44(2)(A)]
- ☐ Specified Steel Sleeve Installed [Rule 338.44(3)(A)]
- ☐ Pitless Adapter Used [Rule 338.44(3)(b)]
- ☐ Approved Alternative Procedure Used [Rule 338.71]

11) WATER LEVEL: N/A
Static level ______ ft. below land surface Date ______
Artesian flow ______ gpm. Date ______

12) PACKERS:

	Type	Depth
Bentonite Pellets	[illegible]	10.0-8.0

13) TYPE PUMP: N/A
☐ Turbine ☐ Jet ☐ Submersible ☐ Cylinder
☐ Other ______
Depth to pump bowls, cylinder, jet, etc., ______ ft.

14) WELL TESTS: N/A
Type test: ☐ Pump ☐ Bailer ☐ Jetted ☐ Estimated
Yield: ______ gpm with ______ ft. drawdown after ______ hrs.

15) WATER QUALITY:
Did you knowingly penetrate any strata which contained undesirable constituents?
☐ Yes ☑ No If yes, submit "REPORT OF UNDESIRABLE WATER"
Type of water? ______ Depth of strata ______
Was a chemical analysis made? ☐ Yes ☐ No

I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief. I understand that failure to complete items 1 thru 15 will result in the log(s) being returned for completion and resubmittal.

COMPANY NAME PSI Inc. (Type or print) WELL DRILLER'S LICENSE NO. 4694-M

ADDRESS 810 SPID (Street or RFD) Corpus Christi (City) TX (State) 78416 (Zip)

(Signed) Craig [illegible] (Licensed Well Driller) (Signed) ______ (Registered Driller Trainee)

Please attach electric log, chemical analysis, and other pertinent information, if available.

TNRCC 0199 (Rev. 05-21-96) White - TNRCC Yellow - DRILLER Pink - WELL OWNER

K-

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ATTENTION OWNER: *Confidentiality Privilege Notice on on reverse side of Well Owner's copy (pink)*

State of Texas
WELL REPORT

Texas Water Well Drillers Advisory Council
MC 177
P.O. Box 13087
Austin, TX 78711-3087
512-239-0530

1) **OWNER** City of Kingsville (Name) **ADDRESS** P.O. Box 1458 (Street or RFD) Kingsville (City) TX (State) 78363 (Zip)

2) **ADDRESS OF WELL:** County Kleberg Kingsville Landfill (Street, RFD or other) Kingsville (City) TX (State) (Zip) **GRID #** 83-24-4

3) **TYPE OF WORK (Check):**
☑ New Well ☐ Deepening
☐ Reconditioning ☐ Plugging

4) **PROPOSED USE (Check):** ☑ Monitor ☐ Environmental Soil Boring ☐ Domestic
☐ Industrial ☐ Irrigation ☐ Injection ☐ Public Supply ☐ De-watering ☐ Testwell
If Public Supply well, were plans submitted to the TNRCC? ☐ Yes ☐ No

5) MW-18
(SB-18)

N↑

6) **WELL LOG:**
Date Drilling:
Started 7-9 19 97
Completed 7-9 19 97

DIAMETER OF HOLE

Dia. (in.)	From (ft.)	To (ft.)
8.5	Surface	42.0

7) **DRILLING METHOD (Check):** ☐ Driven
☐ Air Rotary ☐ Mud Rotary ☑ Bored
☐ Air Hammer ☐ Cable Tool ☐ Jetted
☐ Other

From (ft.)	To (ft.)	Description and color of formation material
		SEE ATTACHED LOGS

(Use reverse side of Well Owner's copy, if necessary)

8) **Borehole Completion (Check):** ☐ Open Hole ☐ Straight Wall
☐ Underreamed ☐ Gravel Packed ☑ Other [illegible] SILICA
If Gravel Packed give interval ... from 42.0 ft. to 19.0 ft.

CASING, BLANK PIPE, AND WELL SCREEN DATA:

Dia. (in.)	New or Used	Steel, Plastic, etc. Perf., Slotted, etc. Screen Mfg., if commercial	Setting (ft.)		Gage Casting Screen
			From	To	
2	N	PVC SCREEN	42.0	32.0	.010
		, MFG. TRI-LOC			
2	N	PVC [illegible]			

9) **CEMENTING DATA** [Rule 338.44(1)]
Cemented from 17.0 ft. to 3.0 ft. No. of sacks used 3.0
ft. to ft. No. of sacks used
Method used
Cemented by PSI INC.
Distance to septic system field lines or other concentrated contamination ft.
Method of verification of above distance

10) **SURFACE COMPLETION**
☑ Specified Surface Slab Installed [Rule 338.44(2)(A)]
☐ Specified Steel Sleeve Installed [Rule 338.44(3)(A)]
☐ Pitless Adapter Used [Rule 338.44(3)(b)]
☐ Approved Alternative Procedure Used [Rule 338.71]

11) **WATER LEVEL:** N/A
Static level ft. below land surface Date
Artesian flow gpm. Date

12) **PACKERS:**

	Type	Depth
BENTONITE PELLETS	1/2"	19.0 - 17.0

13) **TYPE PUMP:** N/A
☐ Turbine ☐ Jet ☐ Submersible ☐ Cylinder
☐ Other
Depth to pump bowls, cylinder, jet, etc., ft.

14) **WELL TESTS:** N/A
Type test: ☐ Pump ☐ Bailer ☐ Jetted ☐ Estimated
Yield: gpm with ft. drawdown after hrs.

15) **WATER QUALITY:**
Did you knowingly penetrate any strata which contained undesirable constituents?
☐ Yes ☑ No If yes, submit "REPORT OF UNDESIRABLE WATER"
Type of water? Depth of strata
Was a chemical analysis made? ☐ Yes ☐ No

I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief. I understand that failure to complete items 1 thru 15 will result in the log(s) being returned for completion and resubmittal.

COMPANY NAME PSI INC (Type or print) **WELL DRILLER'S LICENSE NO.** 4694-M

ADDRESS 810 SPID (Street or RFD) CORPUS CHRISTI (City) TX (State) 78416 (Zip)

(Signed) Craig Sch (Licensed Well Driller) **(Signed)** (Registered Driller Trainee)

Please attach electric log, chemical analysis, and other pertinent information, if available.

K-

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State of Texas
WELL REPORT

Texas Water Well Drillers Advisory Council
MC 177
P.O. Box 13087
Austin, TX 78711-3087
512-239-0530

1) **OWNER** City of Kingsville (Name) **ADDRESS** P.O. Box 1458 (Street or RFD) Kingsville (City) Texas (State) 78363 (Zip)

2) **ADDRESS OF WELL:** County Kleberg Kingsville Landfill (Street, RFD or other) Kingsville (City) Texas (State) (Zip) **GRID #** 83-34-4

3) **TYPE OF WORK (Check):** ☒ New Well ☐ Deepening ☐ Reconditioning ☒ Plugging

4) **PROPOSED USE (Check):** ☐ Monitor ☒ Environmental Soil Boring ☐ Domestic ☐ Industrial ☐ Irrigation ☐ Injection ☐ Public Supply ☐ De-watering ☐ Testwell
If Public Supply well, were plans submitted to the TNRCC? ☐ Yes ☐ No

5) N

6) **WELL LOG:**
Date Drilling:
Started 4-27 19 98
Completed 4-27 19 98

DIAMETER OF HOLE

Dia. (in.)	From (ft.)	To (ft.)
6.0	Surface	84.0

7) **DRILLING METHOD (Check):** ☐ Driven ☐ Air Rotary ☐ Mud Rotary ☒ Bored ☐ Air Hammer ☐ Cable Tool ☐ Jetted ☐ Other

From (ft.)	To (ft.)	Description and color of formation material
see attached log		MW-21

(Use reverse side of Well Owner's copy, if necessary)

8) **Borehole Completion (Check):** ☐ Open Hole ☐ Straight Wall ☐ Underreamed ☐ Gravel Packed ☒ Other grout
If Gravel Packed give interval ... from ____ ft. to ____ ft.

CASING, BLANK PIPE, AND WELL SCREEN DATA: N/A

Dia. (in.)	New or Used	Steel, Plastic, etc. Perf., Slotted, etc. Screen Mfg., if commercial	Setting (ft.) From	Setting (ft.) To	Gage Casting Screen

9) **CEMENTING DATA** [Rule 338.44(1)]
Cemented from 84.0 ft. to 0.0 ft. No. of sacks used 12.5
____ ft. to ____ ft. No. of sacks used ____
Method used mixed with 5% bentonite
Cemented by PSI Inc.
Distance to septic system field lines or other concentrated contamination ____ ft.
Method of verification of above distance ____

10) **SURFACE COMPLETION** N/A
☐ Specified Surface Slab Installed [Rule 338.44(2)(A)]
☐ Specified Steel Sleeve Installed [Rule 338.44(3)(A)]
☐ Pitless Adapter Used [Rule 338.44(3)(b)]
☐ Approved Alternative Procedure Used [Rule 338.71]

11) **WATER LEVEL:** N/AS
Static level ____ ft. below land surface Date ____
Artesian flow ____ gpm. Date ____

12) **PACKERS:** N/A Type Depth

13) **TYPE PUMP:** N/A
☐ Turbine ☐ Jet ☐ Submersible ☐ Cylinder
☐ Other ____
Depth to pump bowls, cylinder, jet, etc., ____ ft.

14) **WELL TESTS:** N/A
Type test: ☐ Pump ☐ Bailer ☐ Jetted ☐ Estimated
Yield: ____ gpm with ____ ft. drawdown after ____ hrs.

15) **WATER QUALITY:**
Did you knowingly penetrate any strata which contained undesirable constituents?
☐ Yes ☒ No If yes, submit "REPORT OF UNDESIRABLE WATER"
Type of water? ____ Depth of strata ____
Was a chemical analysis made? ☐ Yes ☐ No

I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief. I understand that failure to complete items 1 thru 15 will result in the log(s) being returned for completion and resubmittal.

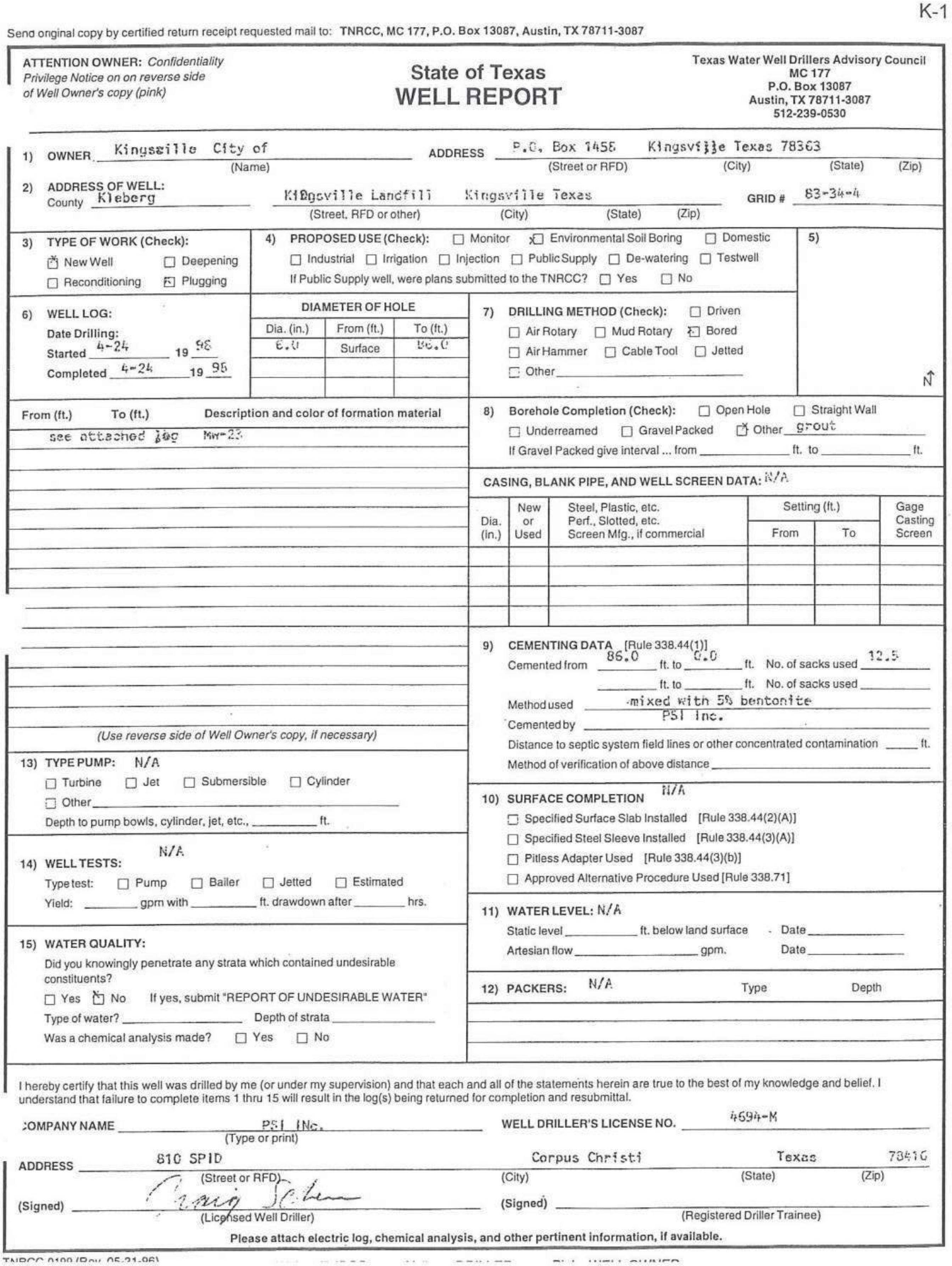
COMPANY NAME PSI Inc. (Type or print) **WELL DRILLER'S LICENSE NO.** 4694-M

ADDRESS 810 SPID (Street or RFD) Corpus Christi (City) Texas (State) 78416 (Zip)

(Signed) Craig Sohema (Licensed Well Driller) (Signed) ____ (Registered Driller Trainee)

Please attach electric log, chemical analysis, and other pertinent information, if available.

K-1



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State of Texas
WELL REPORT

Texas Water Well Drillers Advisory Council
MC 177
P.O. Box 13087
Austin, TX 78711-3087
512-239-0530

1) **OWNER** Kingsville City of (Name) **ADDRESS** P.O. Box 1458 Kingsville Texas 78363 (Street or RFD) (City) (State) (Zip)

2) **ADDRESS OF WELL:** County Kleberg Kingsville Landfill Kingsville Texas (Street, RFD or other) (City) (State) (Zip) **GRID #** 83-34-4

3) **TYPE OF WORK (Check):**
☒ New Well ☐ Deepening
☐ Reconditioning ☒ Plugging

4) **PROPOSED USE (Check):** ☐ Monitor ☒ Environmental Soil Boring ☐ Domestic
☐ Industrial ☐ Irrigation ☐ Injection ☐ Public Supply ☐ De-watering ☐ Testwell
If Public Supply well, were plans submitted to the TNRCC? ☐ Yes ☐ No

5) N

6) **WELL LOG:**
Date Drilling:
Started 4-24 19 98
Completed 4-24 19 95

DIAMETER OF HOLE

Dia. (in.)	From (ft.)	To (ft.)
6.0	Surface	86.0

7) **DRILLING METHOD (Check):** ☐ Driven
☐ Air Rotary ☐ Mud Rotary ☒ Bored
☐ Air Hammer ☐ Cable Tool ☐ Jetted
☐ Other

From (ft.)	To (ft.)	Description and color of formation material
see attached log		MW-23

(Use reverse side of Well Owner's copy, if necessary)

8) **Borehole Completion (Check):** ☐ Open Hole ☐ Straight Wall
☐ Underreamed ☐ Gravel Packed ☒ Other grout
If Gravel Packed give interval ... from ____ ft. to ____ ft.

CASING, BLANK PIPE, AND WELL SCREEN DATA: N/A

Dia. (in.)	New or Used	Steel, Plastic, etc. Perf., Slotted, etc. Screen Mfg., if commercial	Setting (ft.)		Gage Casting Screen
			From	To	

9) **CEMENTING DATA** [Rule 338.44(1)]
Cemented from 86.0 ft. to 0.0 ft. No. of sacks used 12.5
____ ft. to ____ ft. No. of sacks used ____
Method used -mixed with 5% bentonite
Cemented by PSI Inc.
Distance to septic system field lines or other concentrated contamination ____ ft.
Method of verification of above distance ____

10) **SURFACE COMPLETION** N/A
☐ Specified Surface Slab Installed [Rule 338.44(2)(A)]
☐ Specified Steel Sleeve Installed [Rule 338.44(3)(A)]
☐ Pitless Adapter Used [Rule 338.44(3)(b)]
☐ Approved Alternative Procedure Used [Rule 338.71]

11) **WATER LEVEL:** N/A
Static level ____ ft. below land surface Date ____
Artesian flow ____ gpm. Date ____

12) **PACKERS:** N/A Type Depth

13) **TYPE PUMP:** N/A
☐ Turbine ☐ Jet ☐ Submersible ☐ Cylinder
☐ Other ____
Depth to pump bowls, cylinder, jet, etc., ____ ft.

14) **WELL TESTS:** N/A
Type test: ☐ Pump ☐ Bailer ☐ Jetted ☐ Estimated
Yield: ____ gpm with ____ ft. drawdown after ____ hrs.

15) **WATER QUALITY:**
Did you knowingly penetrate any strata which contained undesirable constituents?
☐ Yes ☒ No If yes, submit "REPORT OF UNDESIRABLE WATER"
Type of water? ____ Depth of strata ____
Was a chemical analysis made? ☐ Yes ☐ No

I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief. I understand that failure to complete items 1 thru 15 will result in the log(s) being returned for completion and resubmittal.

COMPANY NAME PSI INc. (Type or print) **WELL DRILLER'S LICENSE NO.** 4694-M

ADDRESS 810 SPID (Street or RFD) Corpus Christi (City) Texas (State) 78416 (Zip)

(Signed) ____ (Licensed Well Driller) **(Signed)** ____ (Registered Driller Trainee)

Please attach electric log, chemical analysis, and other pertinent information, if available.

TNRCC-0199 (Rev. 05-21-96)

K-1

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State of Texas
WELL REPORT

Texas Water Well Drillers Advisory Council
MC 177
P.O. Box 13087
Austin, TX 78711-3087
512-239-0530

1) **OWNER** City of Kingsville (Name) **ADDRESS** P.O..Box 1458 (Street or RFD) Kingsville (City) Texas (State) 78363 (Zip)

2) **ADDRESS OF WELL:** County Kleberg Kingsville Landfill (Street, RFD or other) Kingsville (City) Texas (State) (Zip) **GRID #** 83-34-4

3) **TYPE OF WORK (Check):** ☒ New Well ☐ Deepening ☐ Reconditioning ☐ Plugging

4) **PROPOSED USE (Check):** ☒ Monitor ☐ Environmental Soil Boring ☐ Domestic ☐ Industrial ☐ Irrigation ☐ Injection ☐ Public Supply ☐ De-watering ☐ Testwell
If Public Supply well, were plans submitted to the TNRCC? ☐ Yes ☐ No

5) N↑

6) **WELL LOG:**
Date Drilling:
Started 4-28 19 98
Completed 4-29 19 98

DIAMETER OF HOLE

Dia. (in.)	From (ft.)	To (ft.)
6.0	Surface	72.0
11.0		33.0

7) **DRILLING METHOD (Check):** ☐ Driven ☐ Air Rotary ☐ Mud Rotary X☐ Bored ☐ Air Hammer ☐ Cable Tool ☐ Jetted ☐ Other ______

From (ft.)	To (ft.)	Description and color of formation material
see attached log		MW-24

(Use reverse side of Well Owner's copy, if necessary)

8) **Borehole Completion (Check):** ☐ Open Hole ☐ Straight Wall ☐ Underreamed ☐ Gravel Packed ☒ Other 16/30 silica sand
If Gravel Packed give interval ... from 33.0 ft. to 16.0 ft.

CASING, BLANK PIPE, AND WELL SCREEN DATA:

Dia. (in.)	New or Used	Steel, Plastic, etc. Perf., Slotted, etc. Screen Mfg., if commercial	Setting (ft.)		Gage Casting Screen
			From	To	
4	N	Pvc screen Mfg. National	33.0	18.0	.010
		Wells&Supply			
4	N	Pvc riser	18.0,	+2.5	

9) **CEMENTING DATA** [Rule 338.44(1)]
Cemented from 72.0 ft. to 33.0 ft. No. of sacks used 6.0
14.0 ft. to 0.0 ft. No. of sacks used 1.5
Method used mixed with 5% bentonite
Cemented by PSI INc.
Distance to septic system field lines or other concentrated contamination ____ ft.
Method of verification of above distance ______

10) **SURFACE COMPLETION**
☒ Specified Surface Slab Installed [Rule 338.44(2)(A)]
☐ Specified Steel Sleeve Installed [Rule 338.44(3)(A)]
☐ Pitless Adapter Used [Rule 338.44(3)(b)]
☐ Approved Alternative Procedure Used [Rule 338.71]

11) **WATER LEVEL:** N/A
Static level ______ ft. below land surface Date ______
Artesian flow ______ gpm. Date ______

12) **PACKERS:**

	Type	Depth
bentonite pellets	2'	16'-14'

13) **TYPE PUMP:** N/A
☐ Turbine ☐ Jet ☐ Submersible ☐ Cylinder
☐ Other ______
Depth to pump bowls, cylinder, jet, etc., ______ ft.

14) **WELL TESTS:** N/A
Type test: ☐ Pump ☐ Bailer ☐ Jetted ☐ Estimated
Yield: ______ gpm with ______ ft. drawdown after ______ hrs.

15) **WATER QUALITY:**
Did you knowingly penetrate any strata which contained undesirable constituents?
☐ Yes ☒ No If yes, submit "REPORT OF UNDESIRABLE WATER"
Type of water? ______ Depth of strata ______
Was a chemical analysis made? ☐ Yes ☐ No

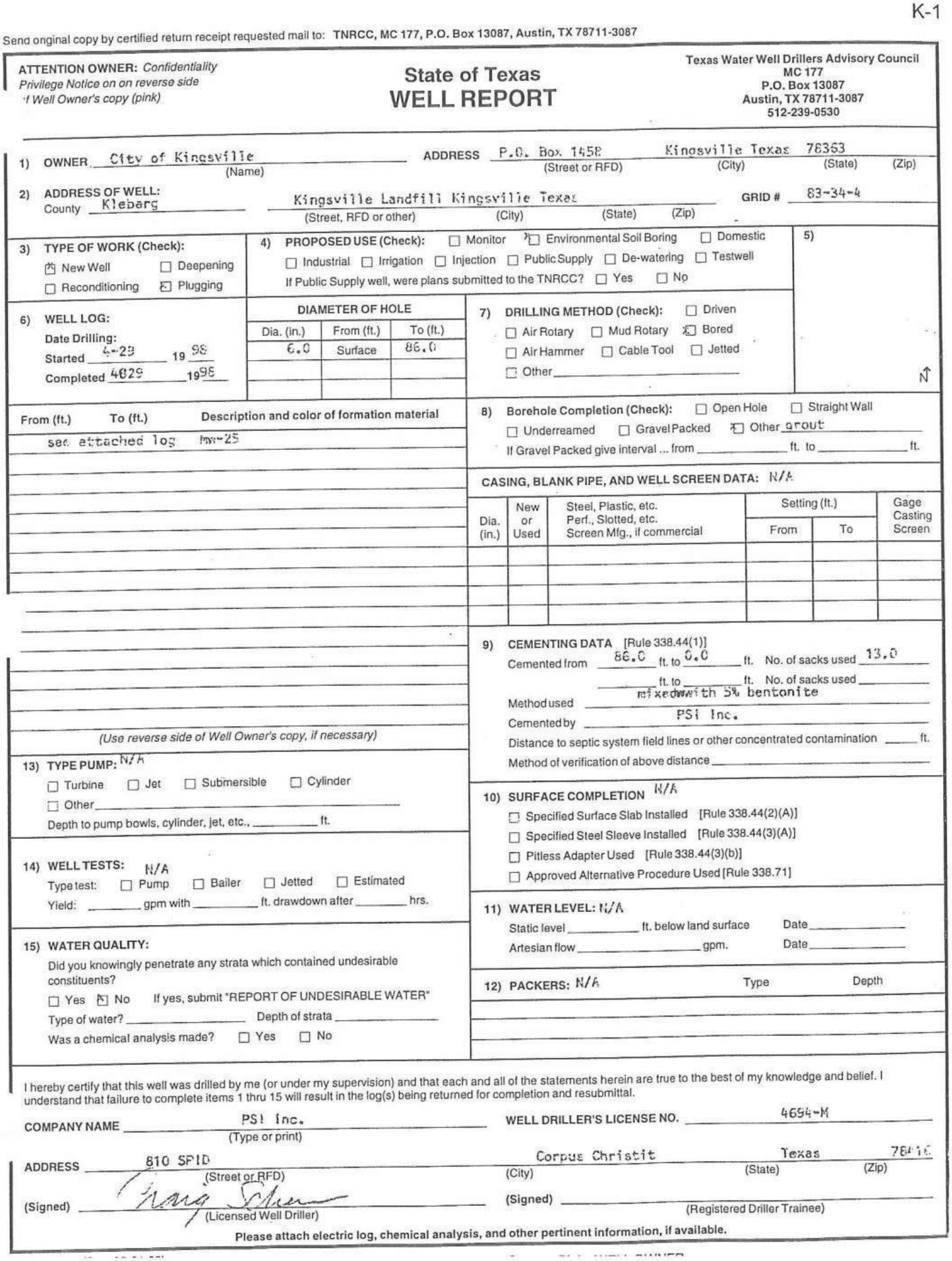
I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief. I understand that failure to complete items 1 thru 15 will result in the log(s) being returned for completion and resubmittal.

COMPANY NAME PSI Inc. (Type or print) **WELL DRILLER'S LICENSE NO.** 4694-M

ADDRESS 810 SPID (Street or RFD) Corpus Christi (City) Texas (State) 78416 (Zip)

(Signed) Craig Schen (Licensed Well Driller) **(Signed)** ______ (Registered Driller Trainee)

Please attach electric log, chemical analysis, and other pertinent information, if available.



K-1

Send original copy by certified return receipt requested mail to: **TNRCC, MC 177, P.O. Box 13087, Austin, TX 78711-3087**

ATTENTION OWNER: *Confidentiality Privilege Notice on on reverse side of Well Owner's copy (pink)*

State of Texas
WELL REPORT

Texas Water Well Drillers Advisory Council
MC 177
P.O. Box 13087
Austin, TX 78711-3087
512-239-0530

1) **OWNER** City of Kingsville (Name) **ADDRESS** P.O. Box 1458 (Street or RFD) Kingsville (City) Texas (State) 78363 (Zip)

2) **ADDRESS OF WELL:** County Kleberg Kingsville Landfill (Street, RFD or other) Kingsville (City) Texas (State) (Zip) **GRID #** 83-34-4

3) **TYPE OF WORK (Check):**
☒ New Well ☐ Deepening
☐ Reconditioning ☒ Plugging

4) **PROPOSED USE (Check):** ☐ Monitor ☒ Environmental Soil Boring ☐ Domestic ☐ Industrial ☐ Irrigation ☐ Injection ☐ Public Supply ☐ De-watering ☐ Testwell
If Public Supply well, were plans submitted to the TNRCC? ☐ Yes ☐ No

5)

6) **WELL LOG:**
Date Drilling:
Started 4-29 19 98
Completed 4029 1998

DIAMETER OF HOLE

Dia. (in.)	From (ft.)	To (ft.)
6.0	Surface	86.0

7) **DRILLING METHOD (Check):** ☐ Driven ☐ Air Rotary ☐ Mud Rotary ☒ Bored ☐ Air Hammer ☐ Cable Tool ☐ Jetted ☐ Other

From (ft.)	To (ft.)	Description and color of formation material
see attached log		MW-25

(Use reverse side of Well Owner's copy, if necessary)

8) **Borehole Completion (Check):** ☐ Open Hole ☐ Straight Wall ☐ Underreamed ☐ Gravel Packed ☒ Other grout
If Gravel Packed give interval ... from ______ ft. to ______ ft.

CASING, BLANK PIPE, AND WELL SCREEN DATA: N/A

Dia. (in.)	New or Used	Steel, Plastic, etc. Perf., Slotted, etc. Screen Mfg., if commercial	Setting (ft.)		Gage Casting Screen
			From	To	

9) **CEMENTING DATA** [Rule 338.44(1)]
Cemented from 86.0 ft. to 0.0 ft. No. of sacks used 13.0
______ ft. to ______ ft. No. of sacks used ______
Method used mixedwwith 5% bentonite
Cemented by PSI Inc.
Distance to septic system field lines or other concentrated contamination ______ ft.
Method of verification of above distance ______

10) **SURFACE COMPLETION** N/A
☐ Specified Surface Slab Installed [Rule 338.44(2)(A)]
☐ Specified Steel Sleeve Installed [Rule 338.44(3)(A)]
☐ Pitless Adapter Used [Rule 338.44(3)(b)]
☐ Approved Alternative Procedure Used [Rule 338.71]

11) **WATER LEVEL:** N/A
Static level ______ ft. below land surface Date ______
Artesian flow ______ gpm. Date ______

12) **PACKERS:** N/A Type Depth

13) **TYPE PUMP:** N/A
☐ Turbine ☐ Jet ☐ Submersible ☐ Cylinder
☐ Other ______
Depth to pump bowls, cylinder, jet, etc., ______ ft.

14) **WELL TESTS:** N/A
Type test: ☐ Pump ☐ Bailer ☐ Jetted ☐ Estimated
Yield: ______ gpm with ______ ft. drawdown after ______ hrs.

15) **WATER QUALITY:**
Did you knowingly penetrate any strata which contained undesirable constituents?
☐ Yes ☒ No If yes, submit "REPORT OF UNDESIRABLE WATER"
Type of water? ______ Depth of strata ______
Was a chemical analysis made? ☐ Yes ☐ No

I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief. I understand that failure to complete items 1 thru 15 will result in the log(s) being returned for completion and resubmittal.

COMPANY NAME PSI Inc. (Type or print) **WELL DRILLER'S LICENSE NO.** 4694-M

ADDRESS 810 SPID (Street or RFD) Corpus Christit (City) Texas (State) 78416 (Zip)

(Signed) ______ (Licensed Well Driller) (Signed) ______ (Registered Driller Trainee)

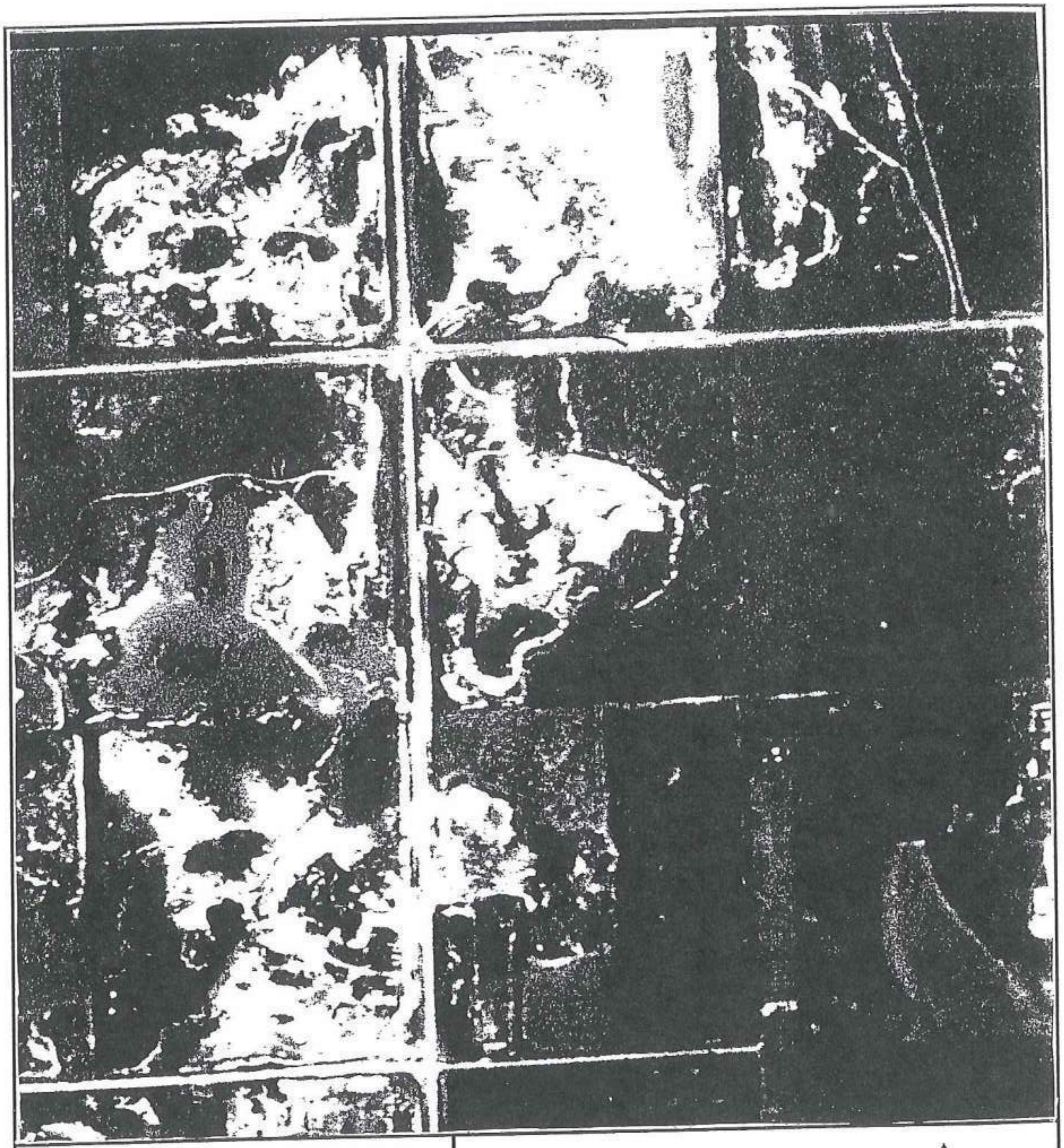
Please attach electric log, chemical analysis, and other pertinent information, if available.

ATTACHMENT L

APPENDIX L

HISTORIC AERIAL PHOTOS of SITE

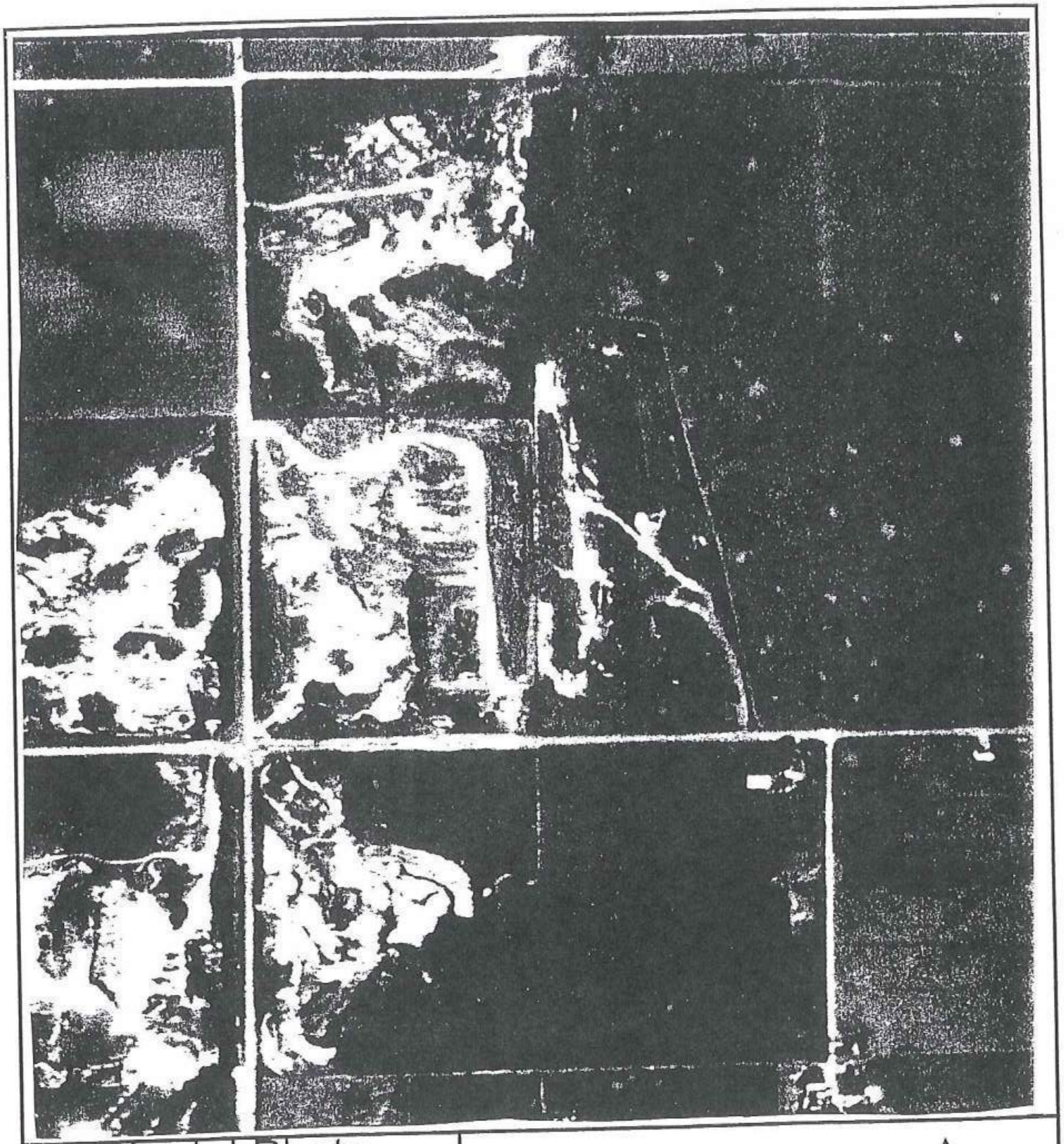
November 1997



Aerial Photo
City of Kingsville
MSWLF Area
1983

FINCH ENERGY &
ENVIRONMENTAL
SERVICES, Inc.

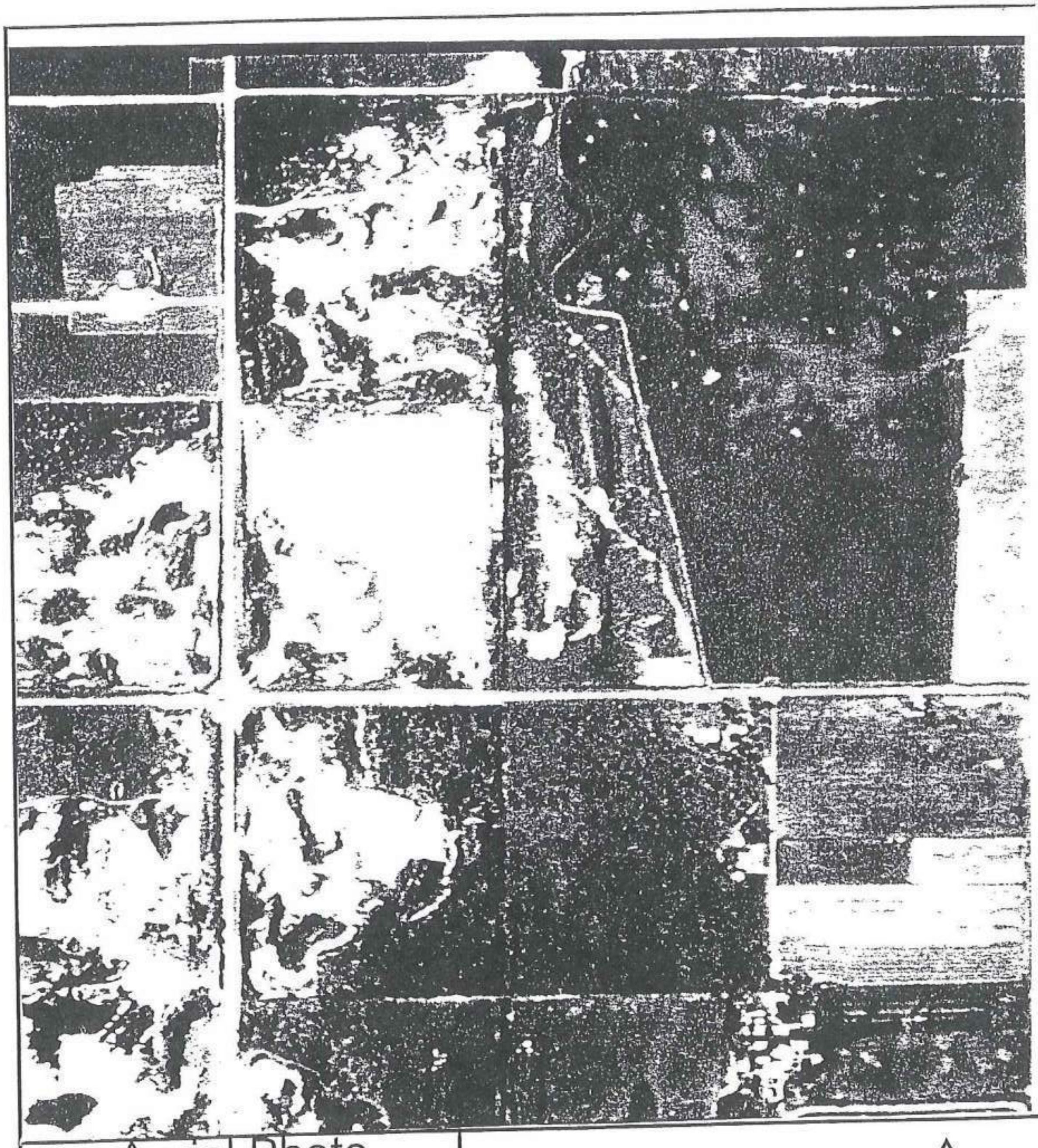
L-1



Aerial Photo
City of Kingsville
MSWLF Area
1984

FINCH ENERGY &
ENVIRONMENTAL
SERVICES, Inc.

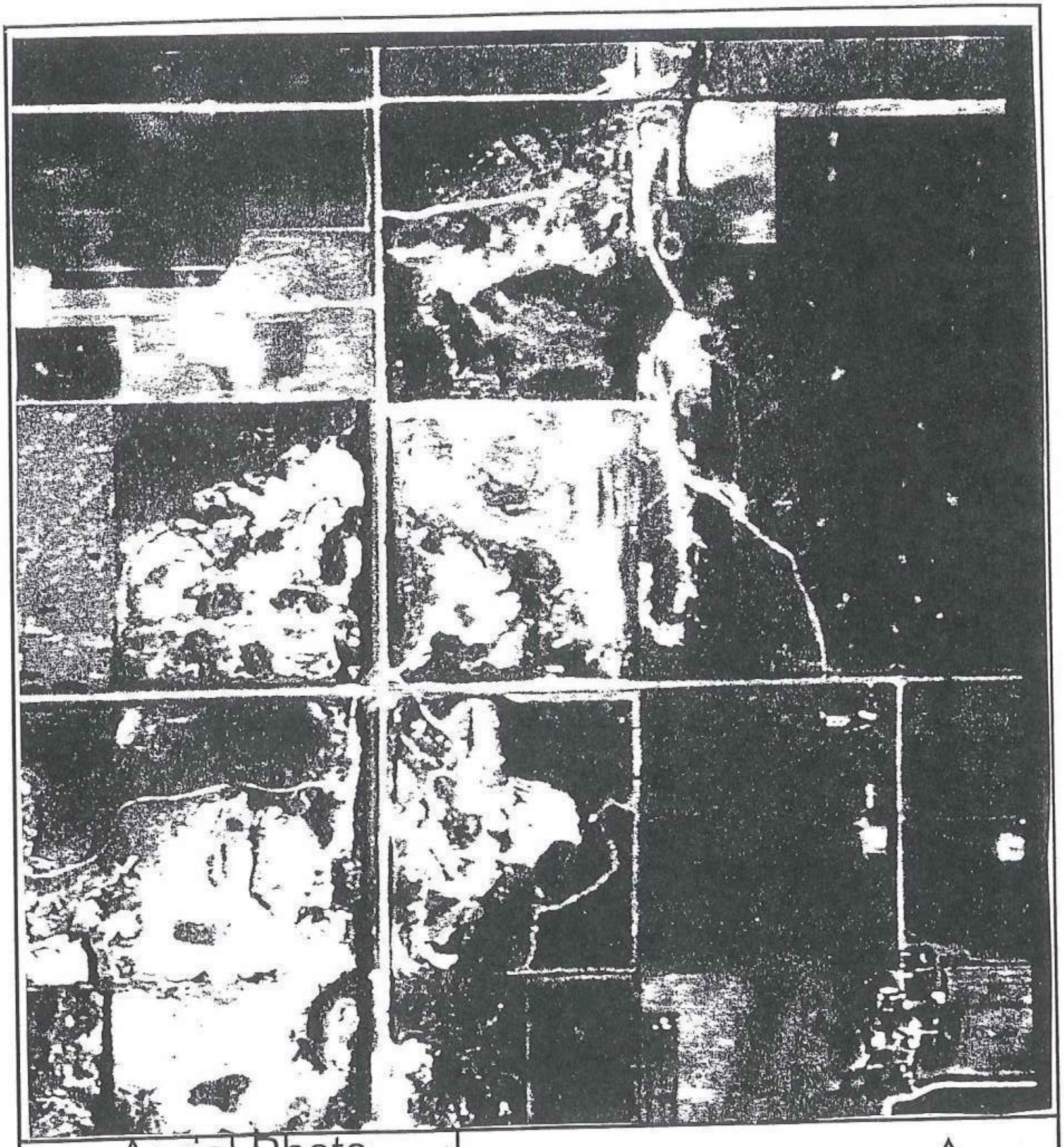
L-2



Aerial Photo
City of Kingsville
MSWLF Area
1985

FINCH ENERGY &
ENVIRONMENTAL
SERVICES, Inc.

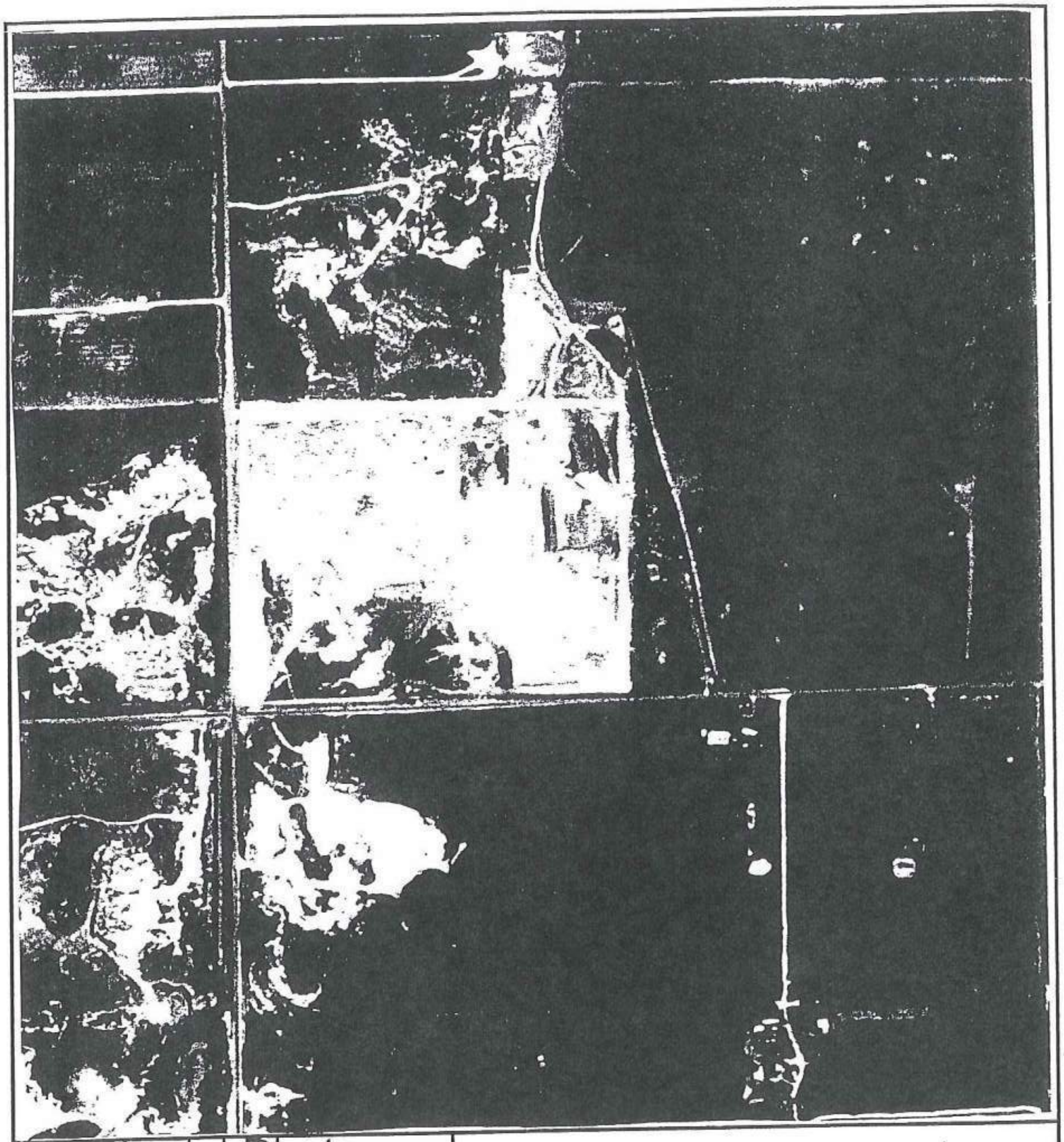
L-3



Aerial Photo
City of Kingsville
MSWLF Area
1986

FINCH ENERGY &
ENVIRONMENTAL
SERVICES, Inc.

L-4



Aerial Photo
City of Kingsville
MSWLF Area
1988

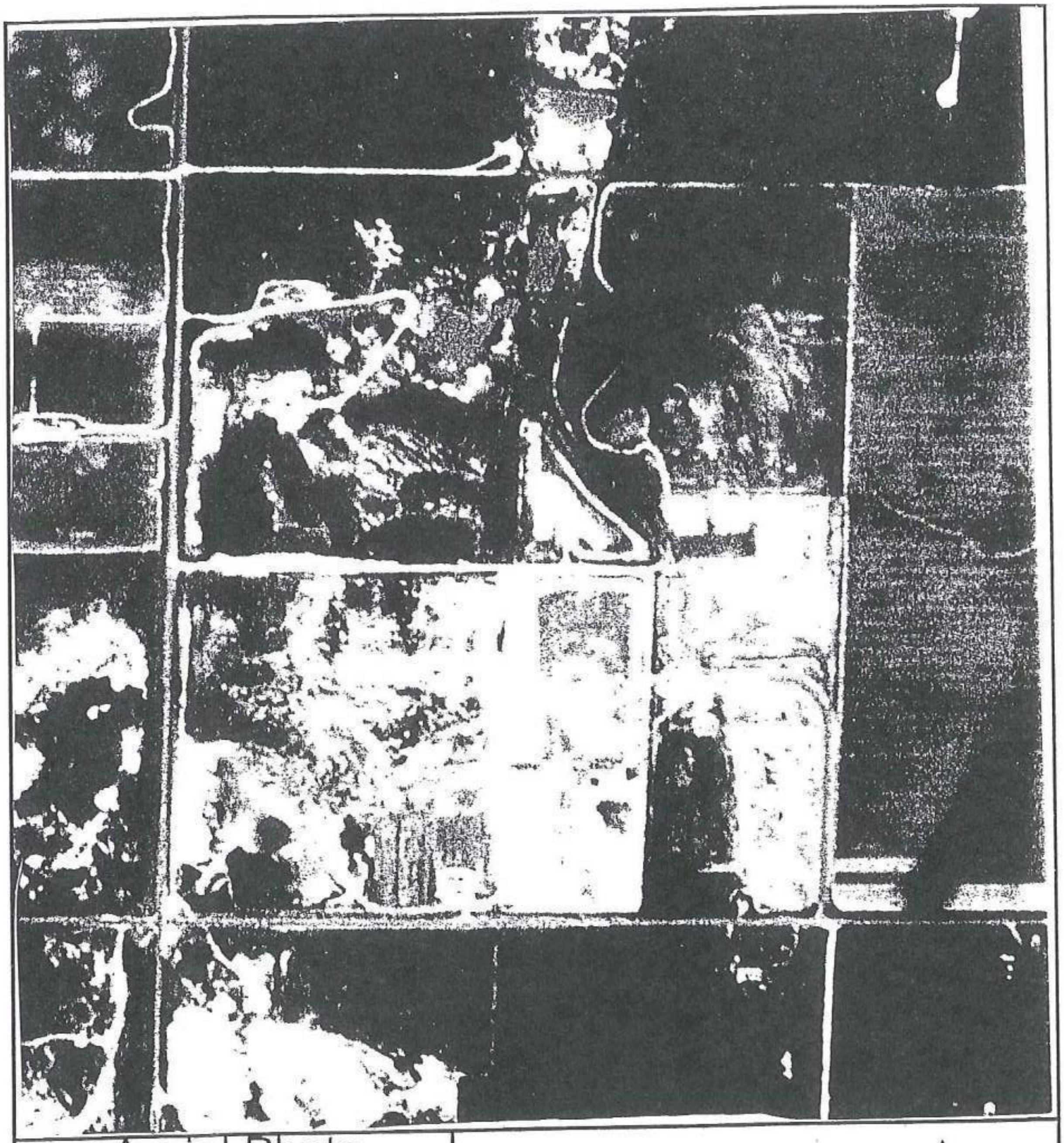
FINCH ENERGY &
ENVIRONMENTAL
SERVICES, Inc.

L-5

Aerial Photo
City of Kingsville
MSWLF Area
1989

FINCH ENERGY &
ENVIRONMENTAL
SERVICES, Inc.

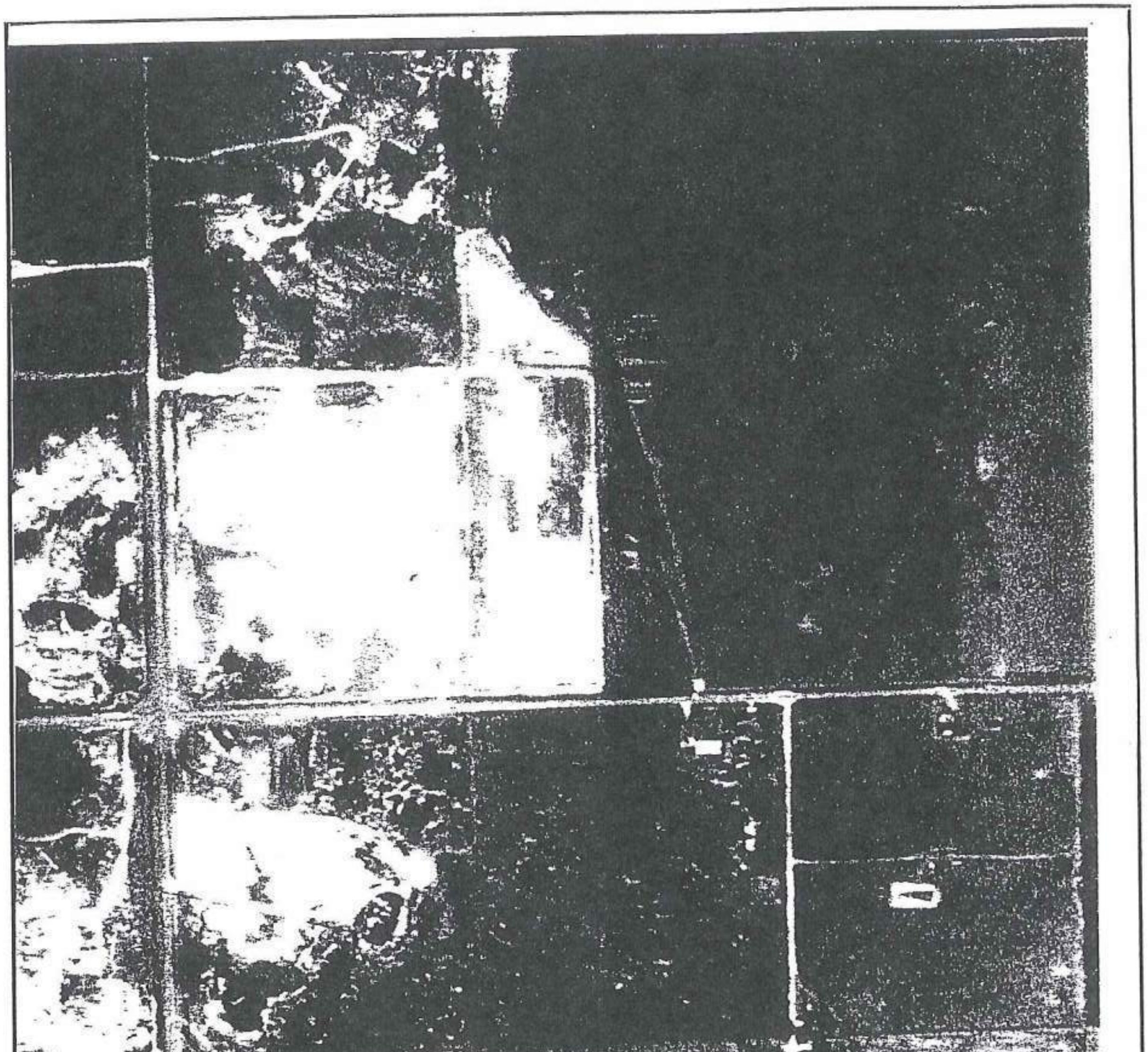
L-6



Aerial Photo
City of Kingsville
MSWLF Area
1990

FINCH ENERGY &
ENVIRONMENTAL
SERVICES, Inc.

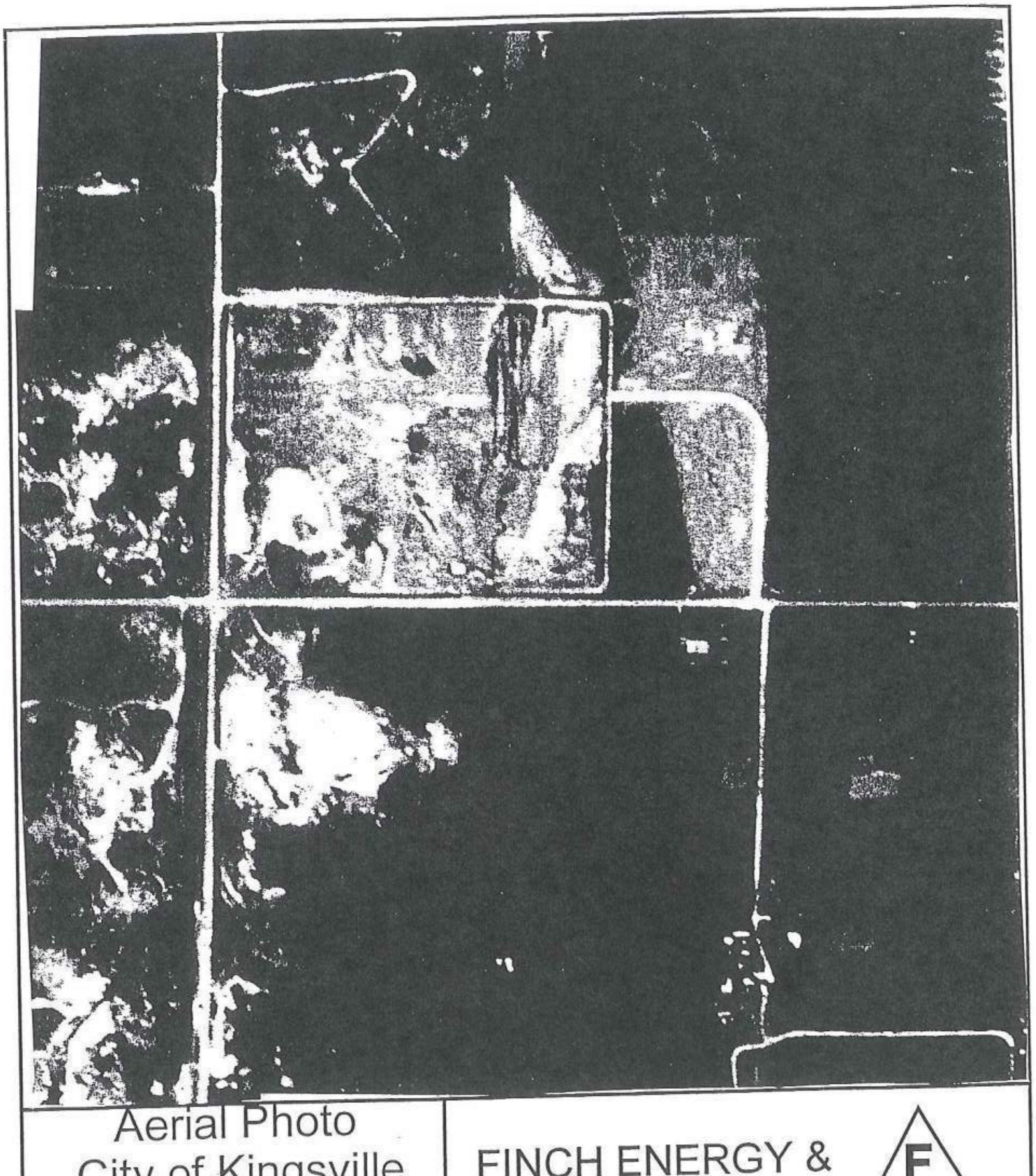
L-7



Aerial Photo
City of Kingsville
MSWLF Area
1991

FINCH ENERGY &
ENVIRONMENTAL
SERVICES, Inc.

L-8



Aerial Photo
City of Kingsville
MSWLF Area
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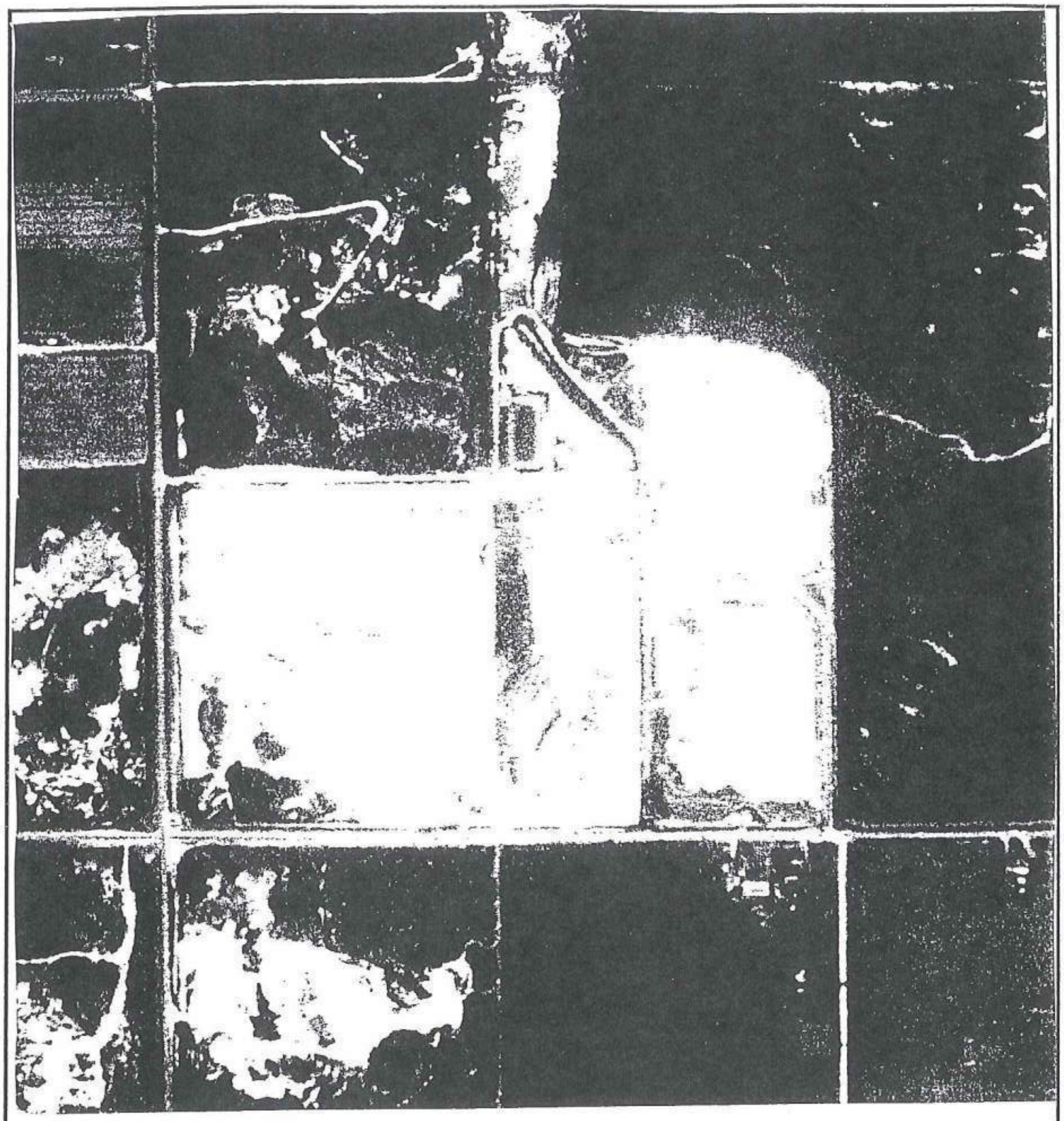
SERVICES, Inc.

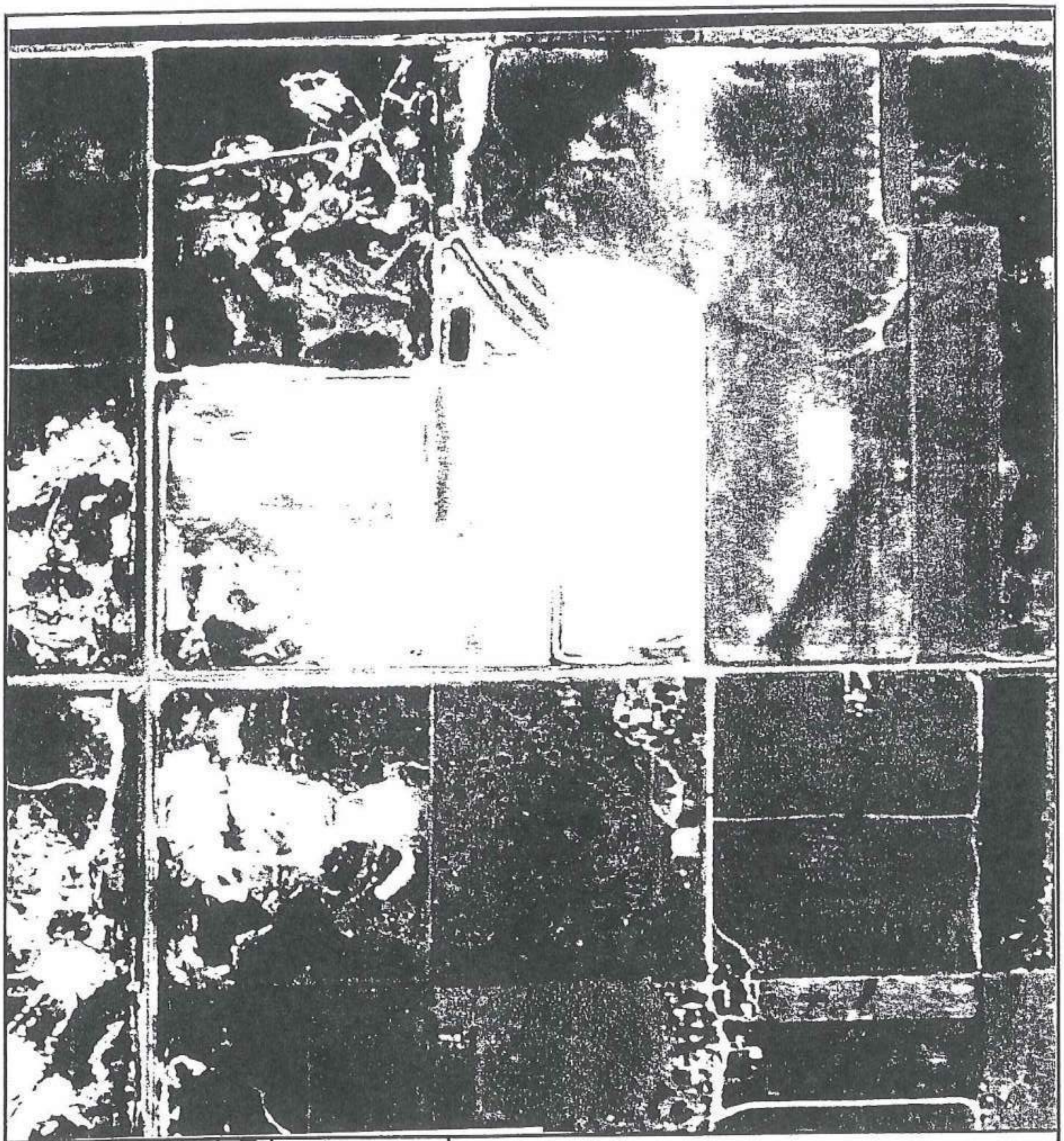
L-9



Aerial Photo
City of Kingsville
MSWLF Area
1994

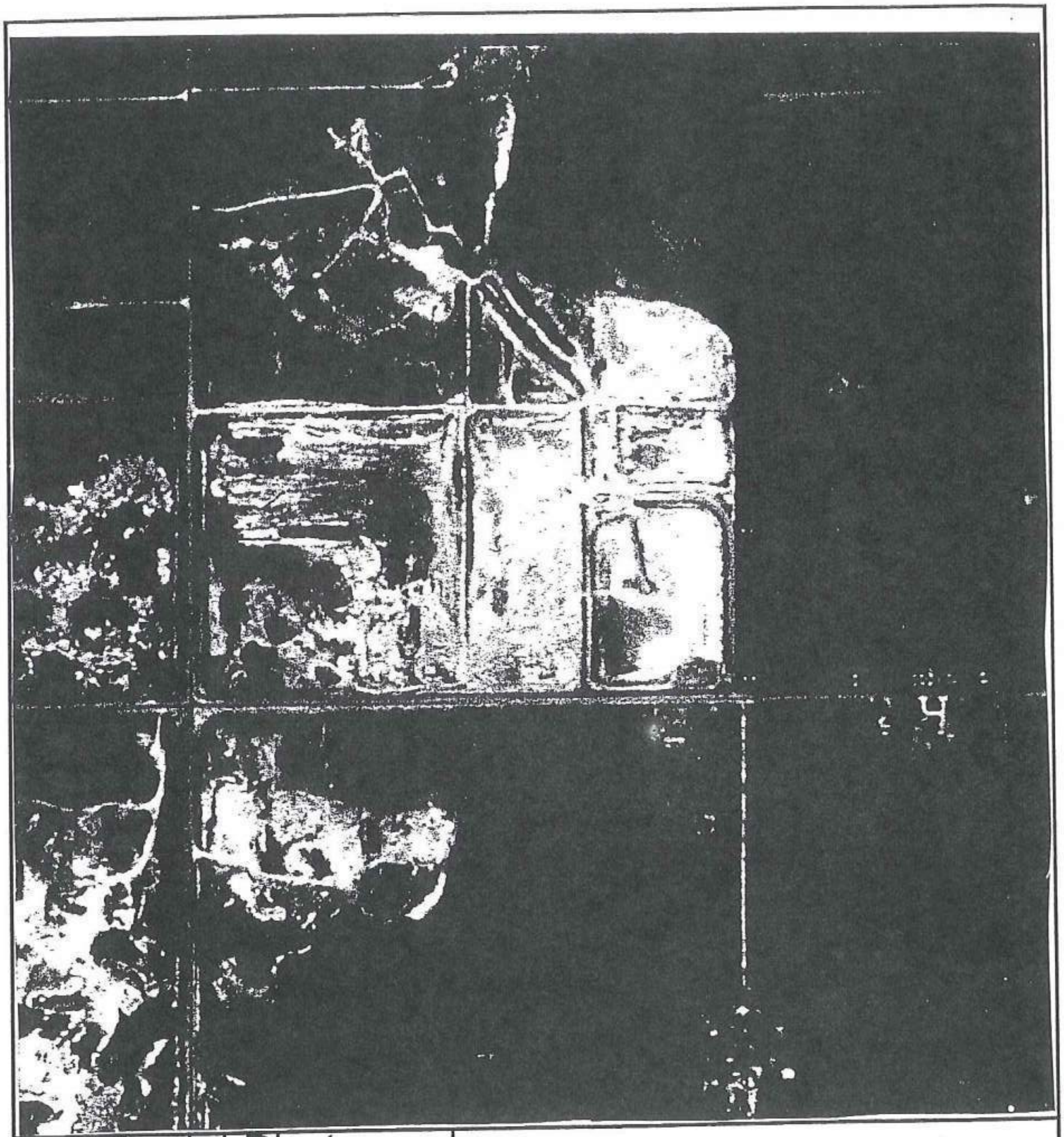
FINCH ENERGY &
ENVIRONMENTAL
SERVICES, Inc.

L-10



Aerial Photo
City of Kingsville
MSWLF Area
1995

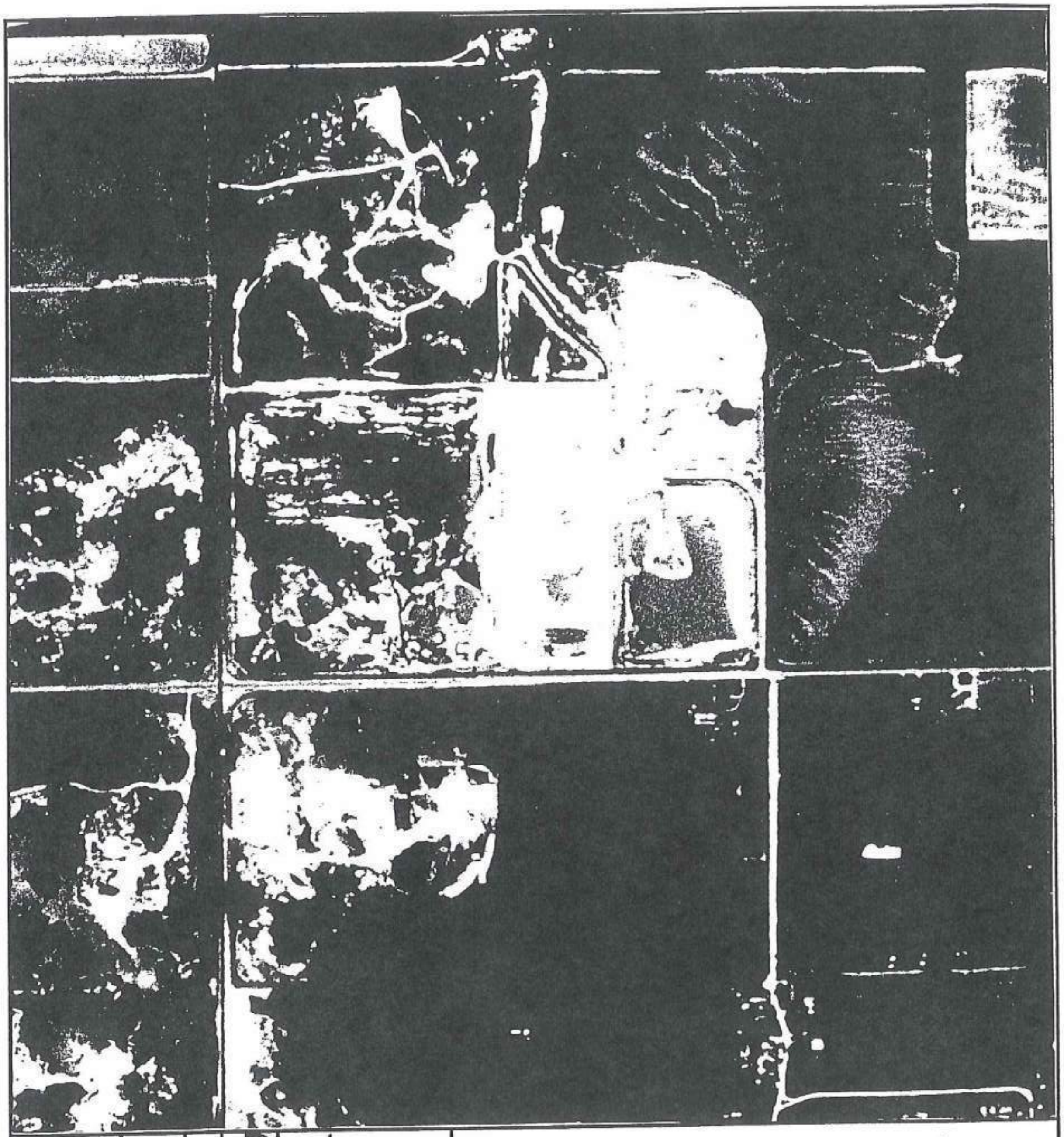
FINCH ENERGY &
ENVIRONMENTAL
SERVICES, Inc.



Aerial Photo
City of Kingsville
MSWLF Area
1996

FINCH ENERGY &
ENVIRONMENTAL
SERVICES, Inc.

L-12



Aerial Photo
City of Kingsville
MSWLF Area
1997

FINCH ENERGY &
ENVIRONMENTAL
SERVICES, Inc.

L-13

ATTACHMENT M

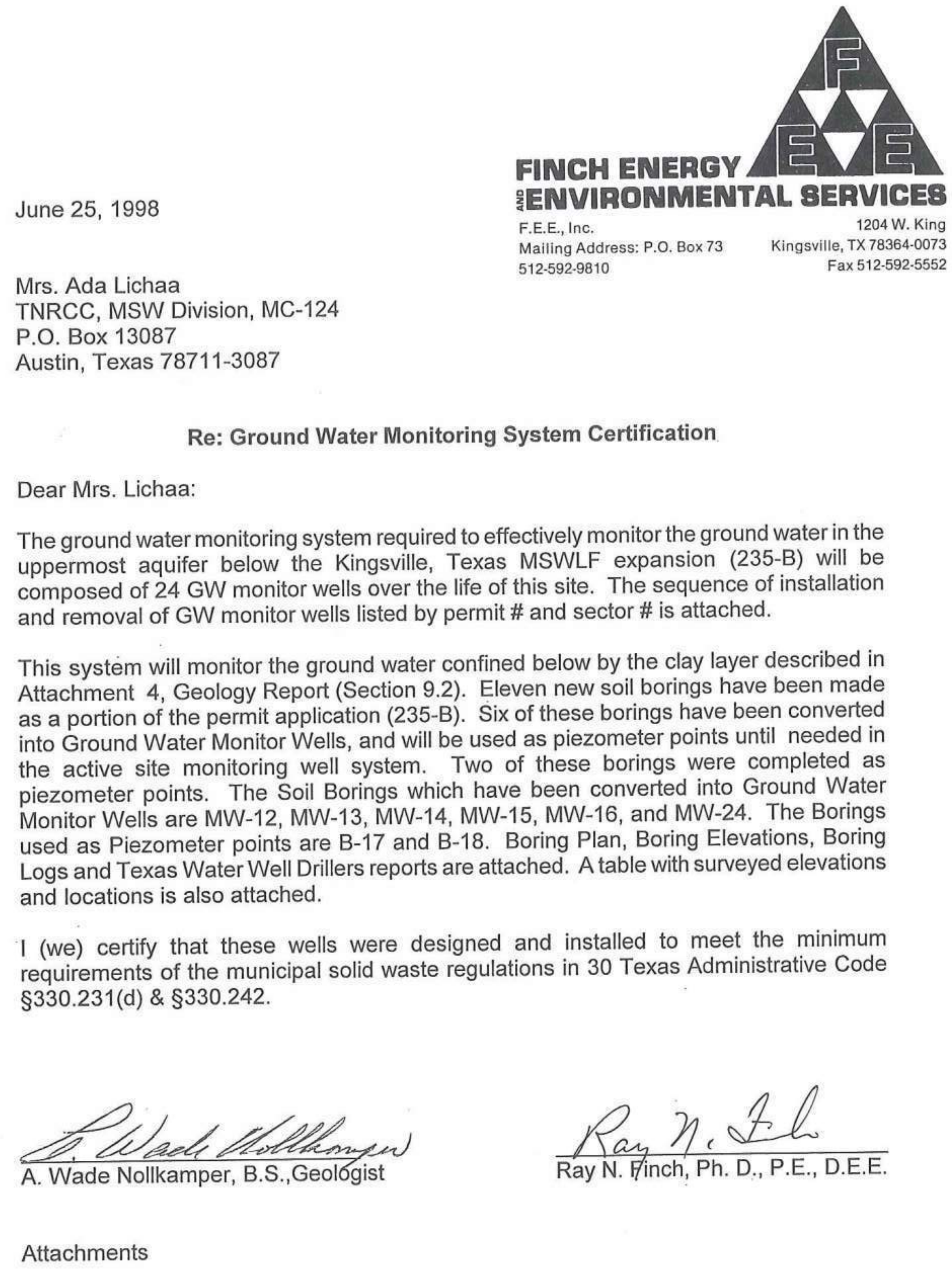
APPENDIX M

DESIGN GROUNDWATER SYSTEM CERTIFICATION

RAY N. FINCH
30926
9-30-98

November 1997
Revision 2 - September 1998

THIS DOCUMENT IS ISSUED FOR PERMITTING PURPOSES ONLY,
INCLUDES PAGES M-1 THROUGH M-36.



FINCH ENERGY AND ENVIRONMENTAL SERVICES
F.E.E., Inc.
Mailing Address: P.O. Box 73
512-592-9810
1204 W. King
Kingsville, TX 78364-0073
Fax 512-592-5552

June 25, 1998

Mrs. Ada Lichaa
TNRCC, MSW Division, MC-124
P.O. Box 13087
Austin, Texas 78711-3087

Re: Ground Water Monitoring System Certification

Dear Mrs. Lichaa:

The ground water monitoring system required to effectively monitor the ground water in the uppermost aquifer below the Kingsville, Texas MSWLF expansion (235-B) will be composed of 24 GW monitor wells over the life of this site. The sequence of installation and removal of GW monitor wells listed by permit # and sector # is attached.

This system will monitor the ground water confined below by the clay layer described in Attachment 4, Geology Report (Section 9.2). Eleven new soil borings have been made as a portion of the permit application (235-B). Six of these borings have been converted into Ground Water Monitor Wells, and will be used as piezometer points until needed in the active site monitoring well system. Two of these borings were completed as piezometer points. The Soil Borings which have been converted into Ground Water Monitor Wells are MW-12, MW-13, MW-14, MW-15, MW-16, and MW-24. The Borings used as Piezometer points are B-17 and B-18. Boring Plan, Boring Elevations, Boring Logs and Texas Water Well Drillers reports are attached. A table with surveyed elevations and locations is also attached.

I (we) certify that these wells were designed and installed to meet the minimum requirements of the municipal solid waste regulations in 30 Texas Administrative Code §330.231(d) & §330.242.

A. Wade Nollkamper
A. Wade Nollkamper, B.S.,Geologist

Ray N. Finch
Ray N. Finch, Ph. D., P.E., D.E.E.

Attachments

TABLE 5.7
City of Kingsville, TX - MSWLF

Monitor Well Installation and Removal Sequence								
MW No.	235	235-A	235-B	235-B	235-B	235-B	235-B	235-B
	Old	Sector 1	Sector 2	Sector 3	Sector 4	Sector 5	Sector 6	Sector 7
1	x	x	x	x	x	x	x	x
2	x	P&A	P&A	P&A	P&A	P&A	P&A	P&A
3	x	x	x	P&A	P&A	P&A	P&A	P&A
4	x	x	x	x	P&A	P&A	P&A	P&A
5	P&A	P&A	P&A	P&A	P&A	P&A	P&A	P&A
6	x	o	o	o	x	x	x	x
8	x	o	x	x	x	x	x	x
9	x	P&A	P&A	P&A	P&A	P&A	P&A	P&A
9R	x	o	o	o	o	o	o	P&A
10	x	x	x	x	x	x	x	P&A
11	ND	x	x	x	x	x	P&A	P&A
12	ND	ND	x	x	x	x	x	x
13	ND	ND	x	x	x	x	x	x
14	ND	ND	o	o	x	x	x	x
15	ND	ND	o	o	o	o	o	x
16	ND	ND	o	o	o	o	o	x
17	ND	ND	o	o	o	x	x	P&A
18	ND	ND	o	x	x	P&A	P&A	P&A
19	ND	ND	x	x	x	x	x	x
20	ND	ND	ND	ND	x	x	x	x
21	ND	ND	ND	ND	x	x	x	x
22	ND	ND	ND	ND	o	x	x	x
23	ND	ND	ND	ND	o	o	o	x
24	ND	ND	x	x	x	x	x	x
25	ND	ND	P&A	P&A	P&A	P&A	P&A	P&A
26	ND	ND	ND	ND	x	x	P&A	P&A
27	ND	ND	ND	ND	ND	x	x	x
28	ND	ND	x	x	x	x	x	x

M-1a

TABLE 5.7
City of Kingsville, TX - MSWLF
Symbol Definition

Symbol	Identification
x	An operating ground water monitor well which is in the current MW system.
o	An operating ground water monitor well which is not in the current MW system.
P&A	A ground water monitor well which has been plugged and abandoned.
ND	A ground water monitor well which has not been drilled yet.

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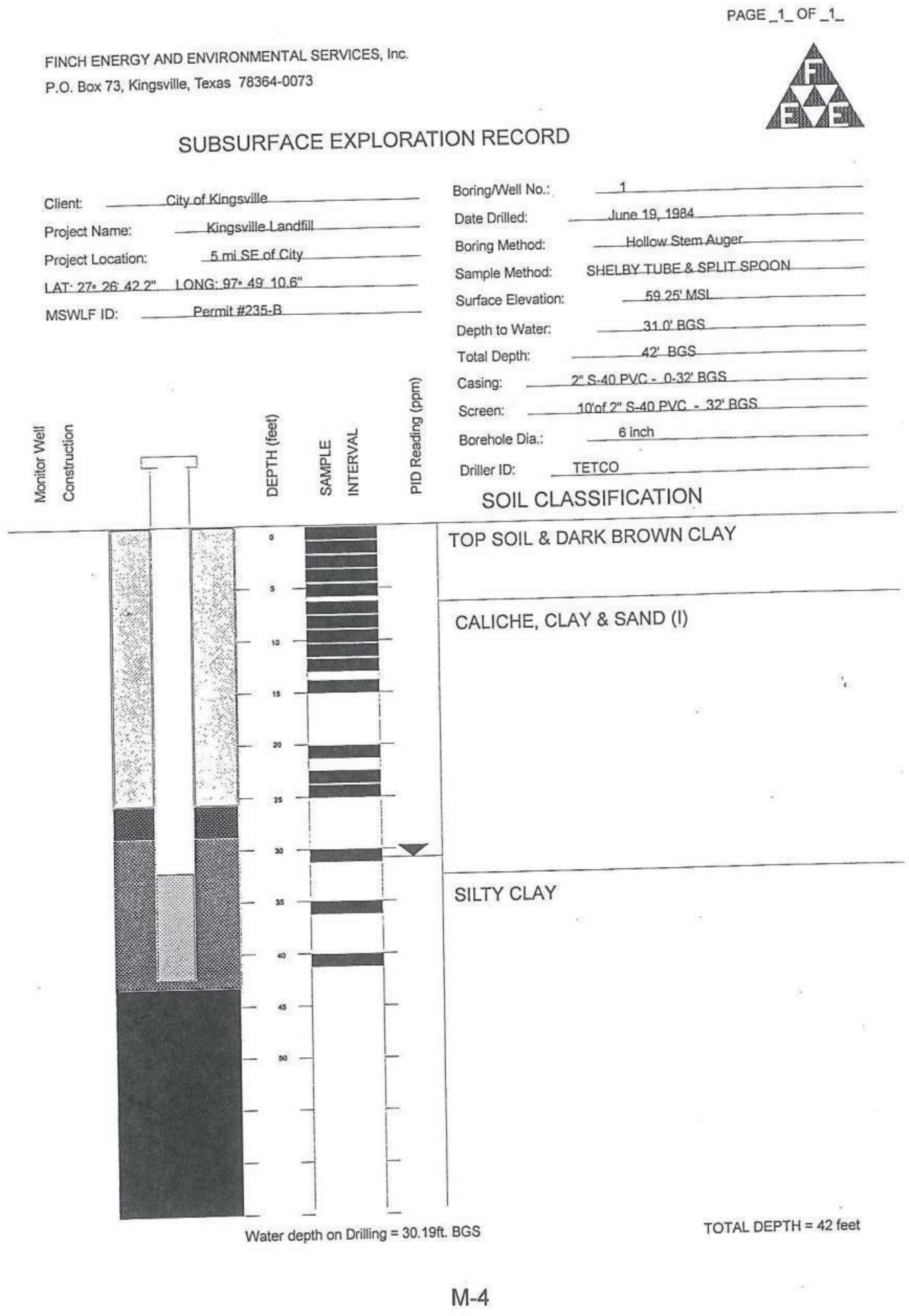
"SEE FIGURES 4.17 THROUGH 4.30 IN SECTION 6.2 OF ATTACHMENT 4, PAGES 47 THROUGH 60 FOR GEOLOGY CROSS SECTIONS, ISOPACH AND PLANS OF MSWLF SUBSURFACE"



PAGE _1_ OF _1_

FINCH ENERGY AND ENVIRONMENTAL SERVICES, Inc.
P.O. Box 73, Kingsville, Texas 78364-0073

SUBSURFACE EXPLORATION RECORD

Client: City of Kingsville
Project Name: Kingsville Landfill
Project Location: 5 mi SE of City
LAT: 27• 26' 42.2" LONG: 97• 49' 10.6"
MSWLF ID: Permit #235-B

Boring/Well No.: 1
Date Drilled: June 19, 1984
Boring Method: Hollow Stem Auger
Sample Method: SHELBY TUBE & SPLIT SPOON
Surface Elevation: 59.25' MSL
Depth to Water: 31.0' BGS
Total Depth: 42' BGS
Casing: 2" S-40 PVC - 0-32' BGS
Screen: 10'of 2" S-40 PVC - 32' BGS
Borehole Dia.: 6 inch
Driller ID: TETCO

SOIL CLASSIFICATION

TOP SOIL & DARK BROWN CLAY

CALICHE, CLAY & SAND (I)

SILTY CLAY

Water depth on Drilling = 30.19ft. BGS

TOTAL DEPTH = 42 feet

M-4

PAGE _1_ OF _1_

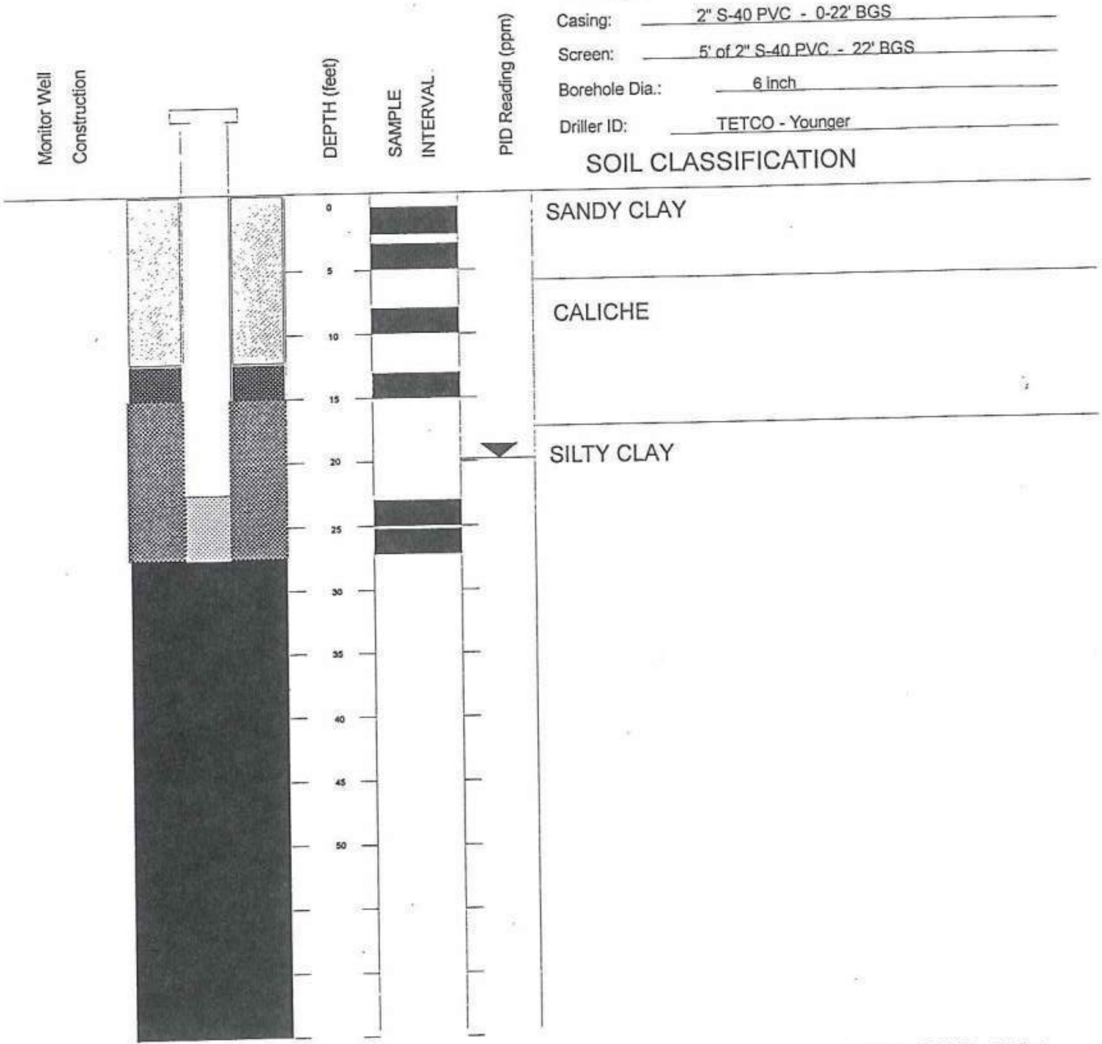
FINCH ENERGY AND ENVIRONMENTAL SERVICES, Inc.
P.O. Box 73, Kingsville, Texas 78364-0073

SUBSURFACE EXPLORATION RECORD

Client: City of Kingsville
Project Name: Kingsville Landfill
Project Location: 5 mi SE of City

MSWLF ID: Permit #235-B

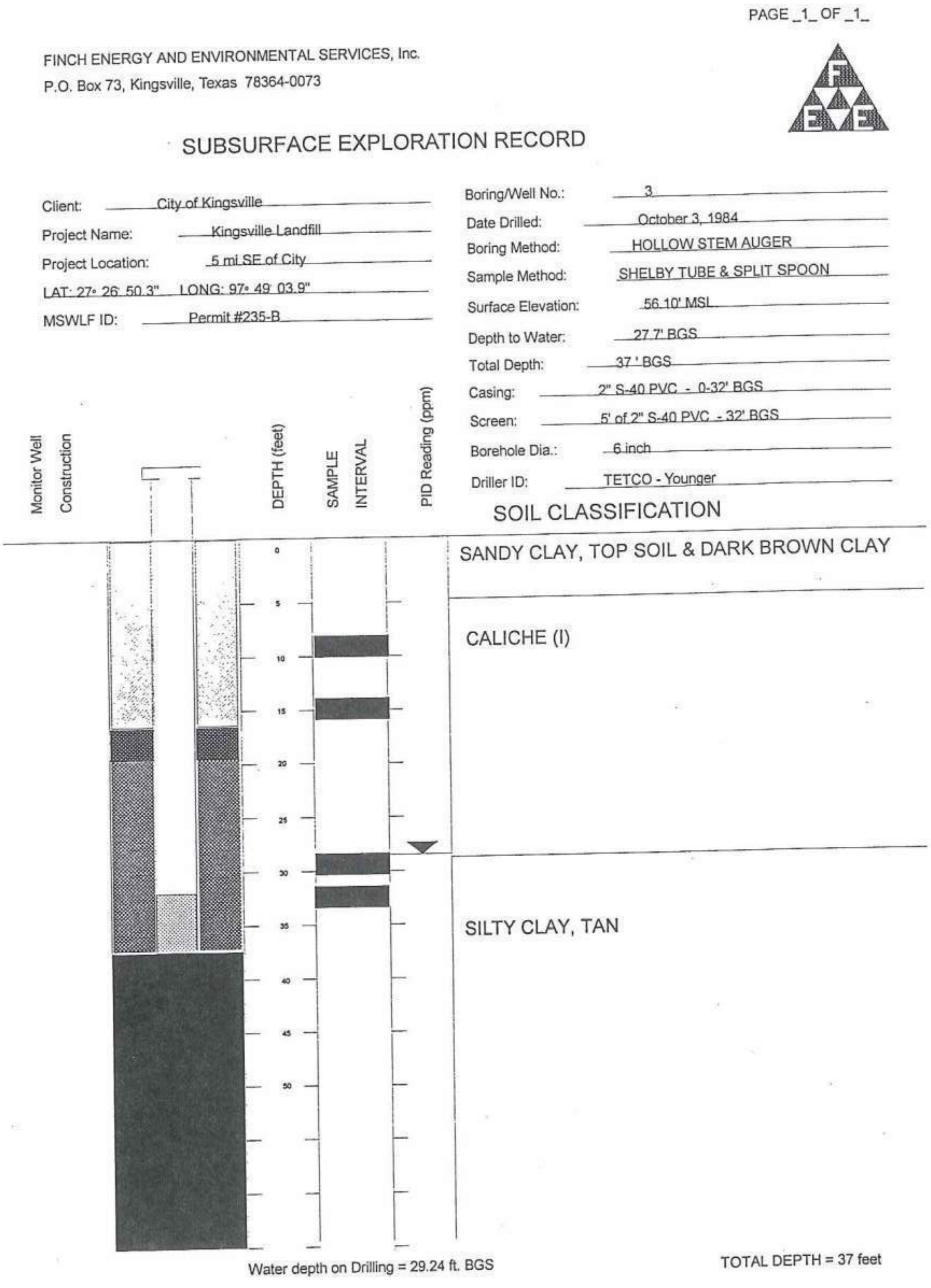
Boring/Well No.: 2
Date Drilled: October 6, 1984
Boring Method: Hollow Stem Auger
Sample Method: SHELBY TUBE & SPLIT SPOON
Surface Elevation: 52.64' MSL
Depth to Water: 19.9' BGS
Total Depth: 27' BGS
Casing: 2" S-40 PVC - 0-22' BGS
Screen: 5' of 2" S-40 PVC - 22' BGS
Borehole Dia.: 6 inch
Driller ID: TETCO - Younger



Water depth on Drilling = 25.49 ft. BGS

TOTAL DEPTH = 27 feet

M-5



PAGE _1_ OF _1_

FINCH ENERGY AND ENVIRONMENTAL SERVICES, Inc.
P.O. Box 73, Kingsville, Texas 78364-0073

SUBSURFACE EXPLORATION RECORD

Client: City of Kingsville
Project Name: Kingsville Landfill
Project Location: 5 mi SE of City
LAT: 27° 26' 50.3" LONG: 97° 49' 03.9"
MSWLF ID: Permit #235-B

Boring/Well No.: 3
Date Drilled: October 3, 1984
Boring Method: HOLLOW STEM AUGER
Sample Method: SHELBY TUBE & SPLIT SPOON
Surface Elevation: 56.10' MSL
Depth to Water: 27.7' BGS
Total Depth: 37 ' BGS
Casing: 2" S-40 PVC - 0-32' BGS
Screen: 5' of 2" S-40 PVC - 32' BGS
Borehole Dia.: 6 inch
Driller ID: TETCO - Younger

SOIL CLASSIFICATION

SANDY CLAY, TOP SOIL & DARK BROWN CLAY

CALICHE (I)

SILTY CLAY, TAN

Water depth on Drilling = 29.24 ft. BGS

TOTAL DEPTH = 37 feet

M-6

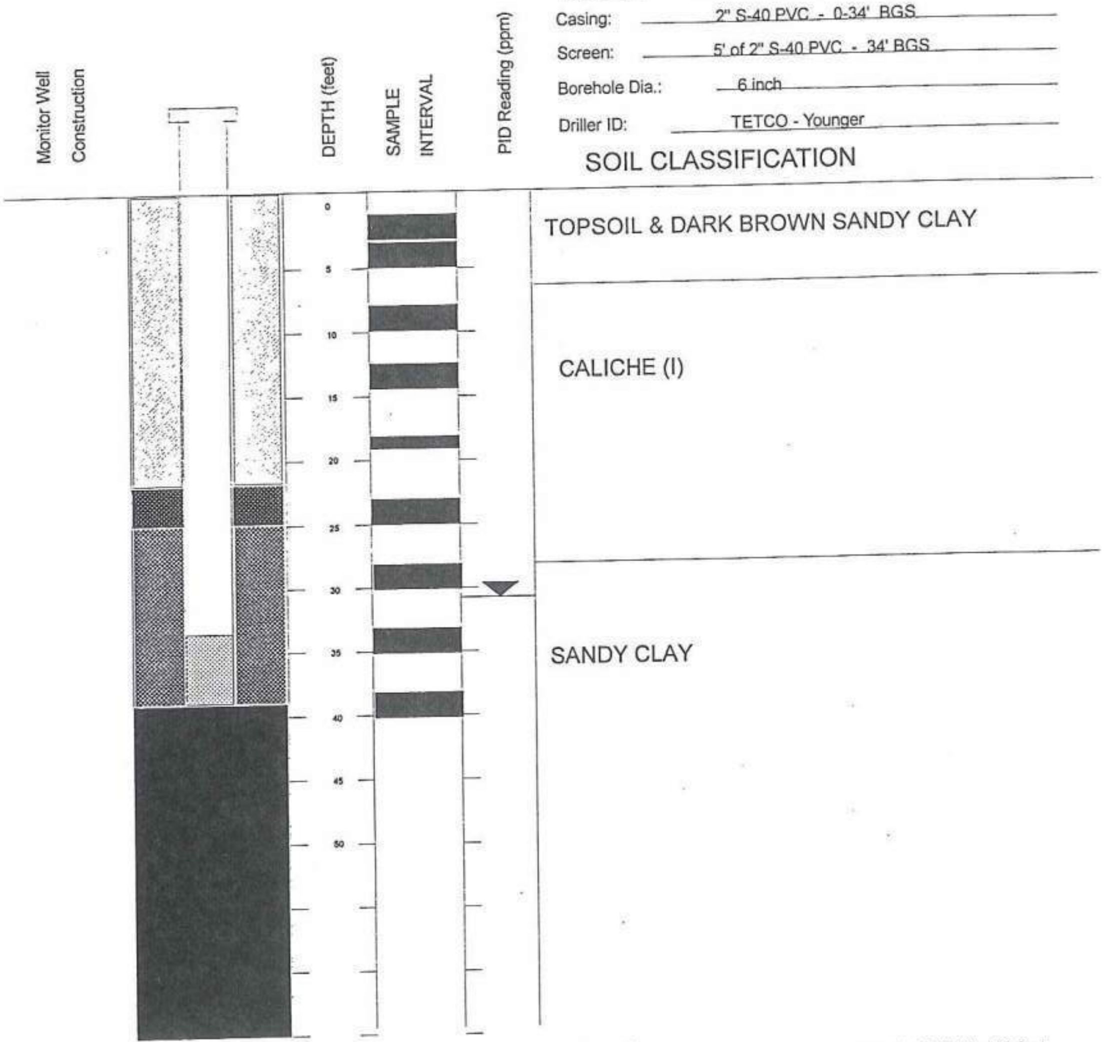
PAGE _1_ OF _1_

FINCH ENERGY AND ENVIRONMENTAL SERVICES, Inc.
P.O. Box 73, Kingsville, Texas 78364-0073

SUBSURFACE EXPLORATION RECORD

Client: City of Kingsville
Project Name: Kingsville Landfill
Project Location: 5 mi SE of City
LAT: 27° 26' 55.2" LONG: 97° 49' 03.9"
MSWLF ID: Permit #235-B

Boring/Well No.: 4
Date Drilled: October 3, 1984
Boring Method: HOLLOW STEM AUGER
Sample Method: SHELBY TUBE & SPLIT SPOON
Surface Elevation: 58.01' MSL
Depth to Water: 31.2' BGS
Total Depth: 39' BGS
Casing: 2" S-40 PVC - 0-34' BGS
Screen: 5' of 2" S-40 PVC - 34' BGS
Borehole Dia.: 6 inch
Driller ID: TETCO - Younger



Water depth on Drilling = 27.98 ft. BGS

TOTAL DEPTH = 39 feet

M-7

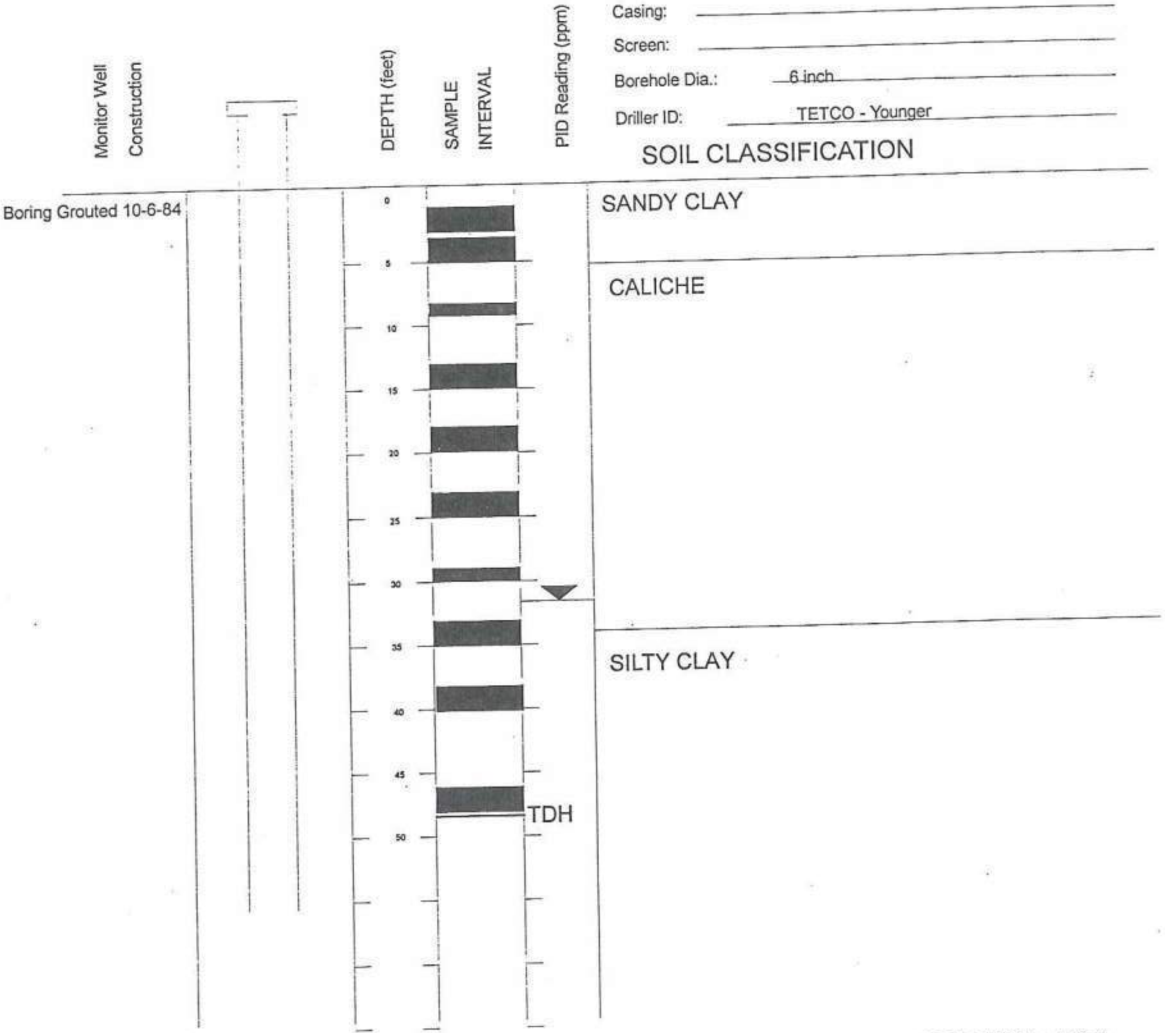
PAGE _1_ OF _1_

FINCH ENERGY AND ENVIRONMENTAL SERVICES, Inc.
P.O. Box 73, Kingsville, Texas 78364-0073

SUBSURFACE EXPLORATION RECORD

Client: City of Kingsville
Project Name: Kingsville Landfill
Project Location: 5 mi SE of City
MSWLF ID: Permit #235-B

Boring/Well No.: 5
Date Drilled: October 5, 1984
Boring Method: Hollow Stem Auger
Sample Method: SHELBY TUBE & SPLIT SPOON
Surface Elevation: 60.54' MSL
Depth to Water: 31.5' BGS
Total Depth: 48' BGS
Casing:
Screen:
Borehole Dia.: 6 inch
Driller ID: TETCO - Younger



TOTAL DEPTH = 48 feet

M-8

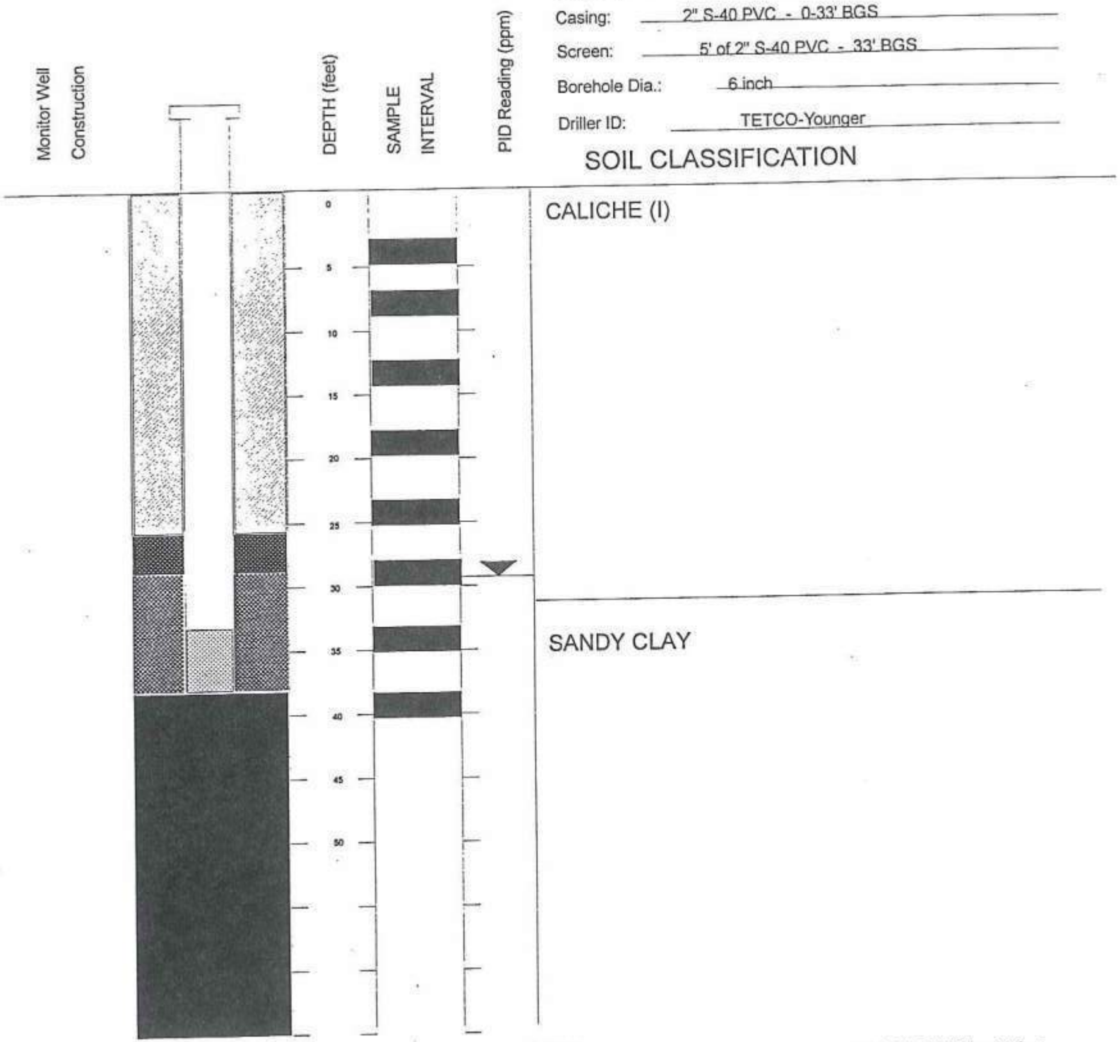
PAGE _1_ OF _1_

FINCH ENERGY AND ENVIRONMENTAL SERVICES, Inc.
P.O. Box 73, Kingsville, Texas 78364-0073

SUBSURFACE EXPLORATION RECORD

Client: City of Kingsville
Project Name: Kingsville Landfill
Project Location: 5 mi SE of City
LAT: 27° 27' 09.2" LONG: 97° 49' 09.9"
MSWLF ID: Permit #235-B

Boring/Well No.: 6
Date Drilled: October 3, 1984
Boring Method: HOLLOW STEM AUGER
Sample Method: SHELBY TUBE & SPLIT SPOON
Surface Elevation: 55.46' MSL
Depth to Water: 29.1' BGS
Total Depth: 38' BGS
Casing: 2" S-40 PVC - 0-33' BGS
Screen: 5' of 2" S-40 PVC - 33' BGS
Borehole Dia.: 6 inch
Driller ID: TETCO-Younger



Water depth on Drilling = 27.92 ft. BGS

TOTAL DEPTH = 38 feet

M-9

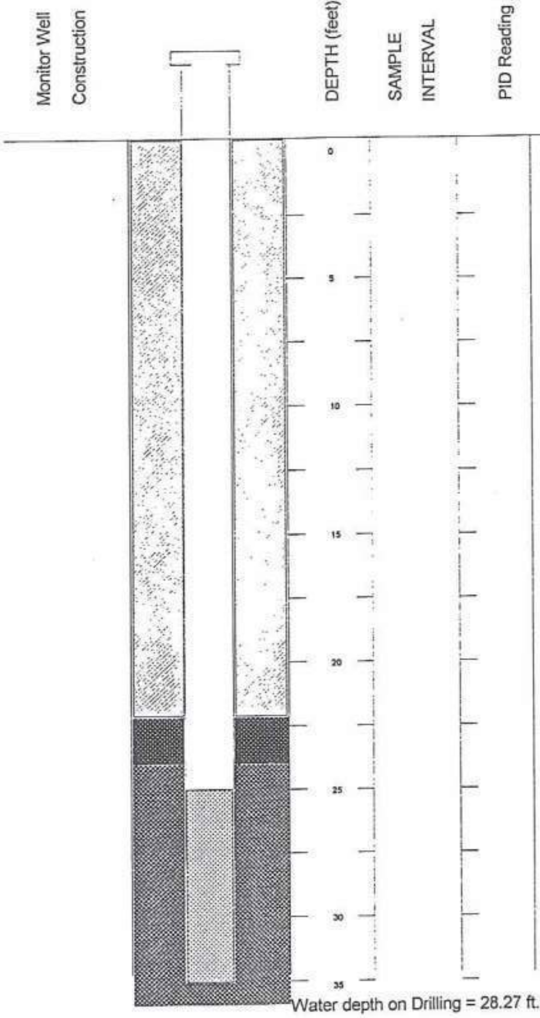
PAGE _1_ OF _1_

FINCH ENERGY AND ENVIRONMENTAL SERVICES, Inc.
P.O. Box 73, Kingsville, Texas 78364-0073

SUBSURFACE EXPLORATION RECORD

Client: City of Kingsville
Project Name: Kingsville Landfill
Project Location: 5 mi SE of City
LAT: 27• 26' 43.9" LONG: 97• 49' 23.3"
MSWLF ID: Permit #235-B

Boring/Well No,: 7
Date Drilled: August 1990
Boring Method:
Sample Method:
Surface Elevation: 61.05 ' MSL
Depth to Water:
Total Depth: 36' BGS
Casing:
Screen:
Borehole Dia.:
Driller ID: Martin Water Wells



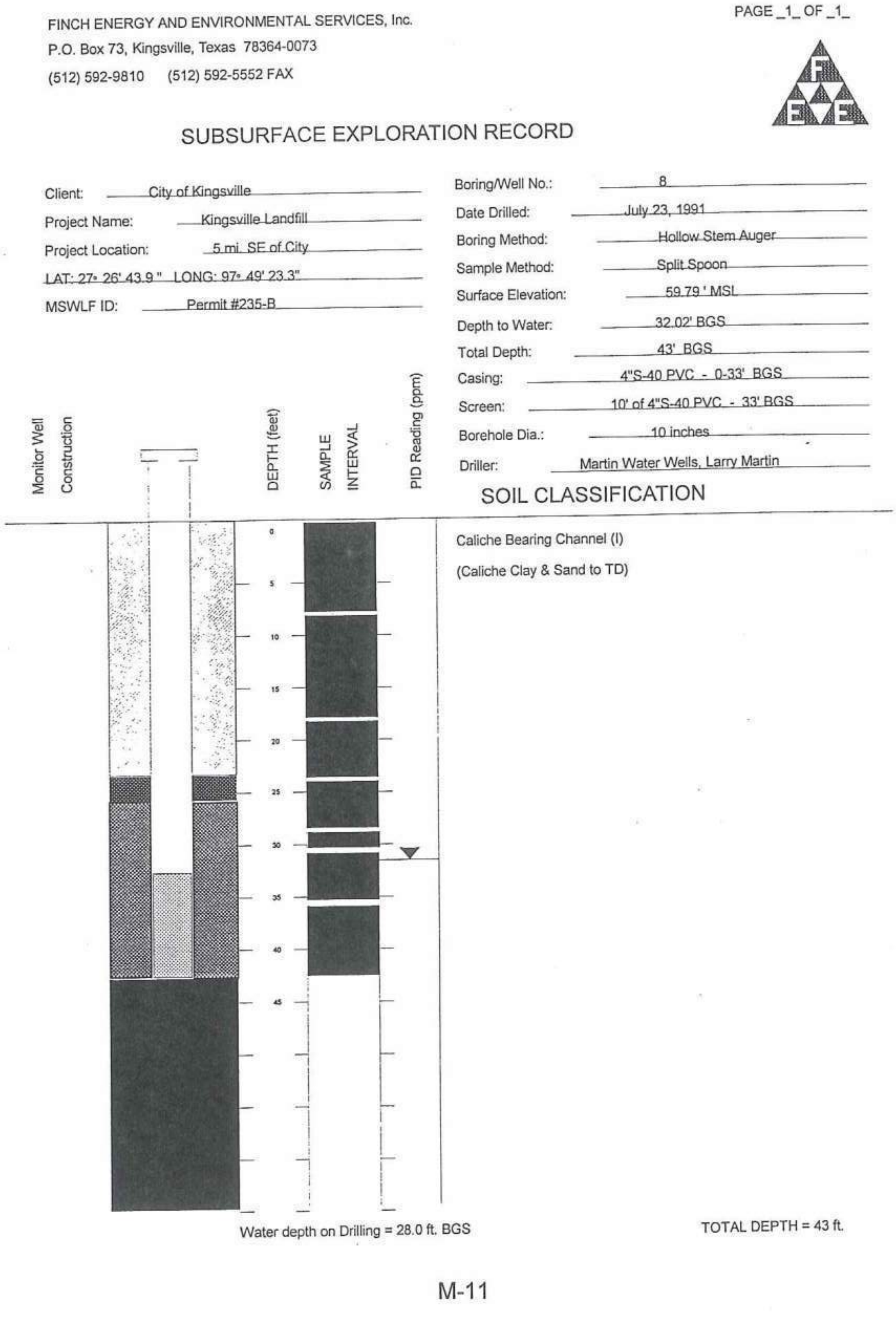
SOIL CLASSIFICATION

Monitor Well was P&A on 7-23-91

Water depth on Drilling = 28.27 ft. BGS

TOTAL DEPTH = 36 feet

M-10



FINCH ENERGY AND ENVIRONMENTAL SERVICES, Inc.
P.O. Box 73, Kingsville, Texas 78364-0073
(512) 592-9810 (512) 592-5552 FAX

PAGE _1_ OF _1_

SUBSURFACE EXPLORATION RECORD

Client: City of Kingsville
Project Name: Kingsville Landfill
Project Location: 5 mi. SE of City
LAT: 27° 26' 43.9 " LONG: 97° 49' 23.3"
MSWLF ID: Permit #235-B

Boring/Well No.: 8
Date Drilled: July 23, 1991
Boring Method: Hollow Stem Auger
Sample Method: Split Spoon
Surface Elevation: 59.79 ' MSL
Depth to Water: 32.02' BGS
Total Depth: 43' BGS
Casing: 4"S-40 PVC - 0-33' BGS
Screen: 10' of 4"S-40 PVC - 33' BGS
Borehole Dia.: 10 inches
Driller: Martin Water Wells, Larry Martin

SOIL CLASSIFICATION

Caliche Bearing Channel (I)
(Caliche Clay & Sand to TD)

Water depth on Drilling = 28.0 ft. BGS

TOTAL DEPTH = 43 ft.

M-11

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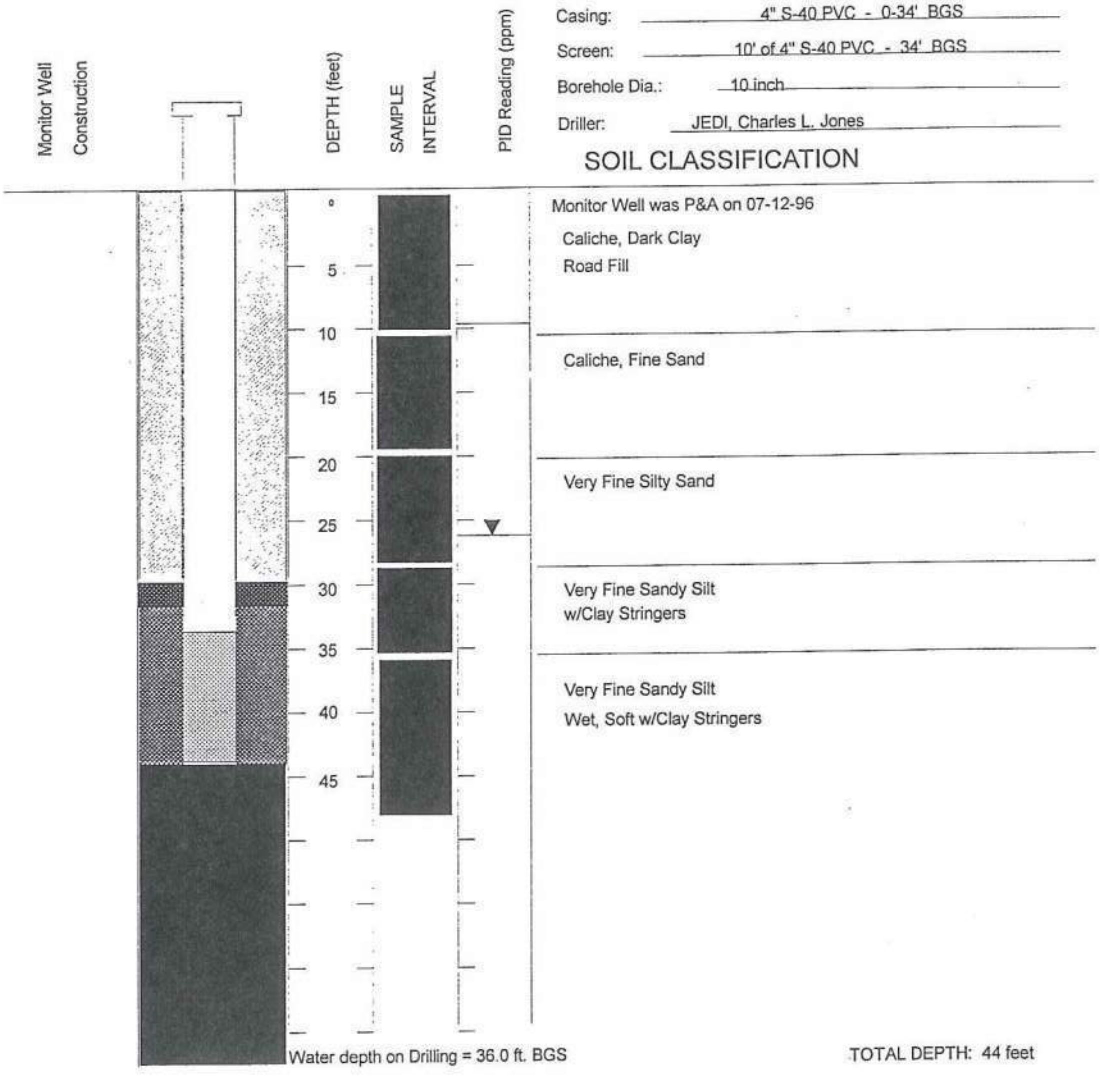
PAGE _1_ OF _1_

SUBSURFACE EXPLORATION RECORD

Client: City of Kingsville
Project Name: Kingsville Landfill
Project Location: 5 mi. SE of City
LAT: 27° 27' 54 " LONG: 97° 49' 20.1 "
MSWLF ID: Permit #235-B

Boring/Well No.: 9
Date Drilled: March 24, 1992
Boring Method: Hollow Stem Auger
Sample Method: 5 foot core barrel
Surface Elevation: 62.51' MSL
Depth to Water: 26' BGS
Total Depth: 44' BGS
Casing: 4" S-40 PVC - 0-34' BGS
Screen: 10' of 4" S-40 PVC - 34' BGS
Borehole Dia.: 10 inch
Driller: JEDI, Charles L. Jones



Monitor Well was P&A on 07-12-96

Caliche, Dark Clay
Road Fill

Caliche, Fine Sand

Very Fine Silty Sand

Very Fine Sandy Silt
w/Clay Stringers

Very Fine Sandy Silt
Wet, Soft w/Clay Stringers

Water depth on Drilling = 36.0 ft. BGS

TOTAL DEPTH: 44 feet

M-12

FINCH ENERGY AND ENVIRONMENTAL SERVICES, Inc.
P.O. Box 73, Kingsville, Texas 78364-0073
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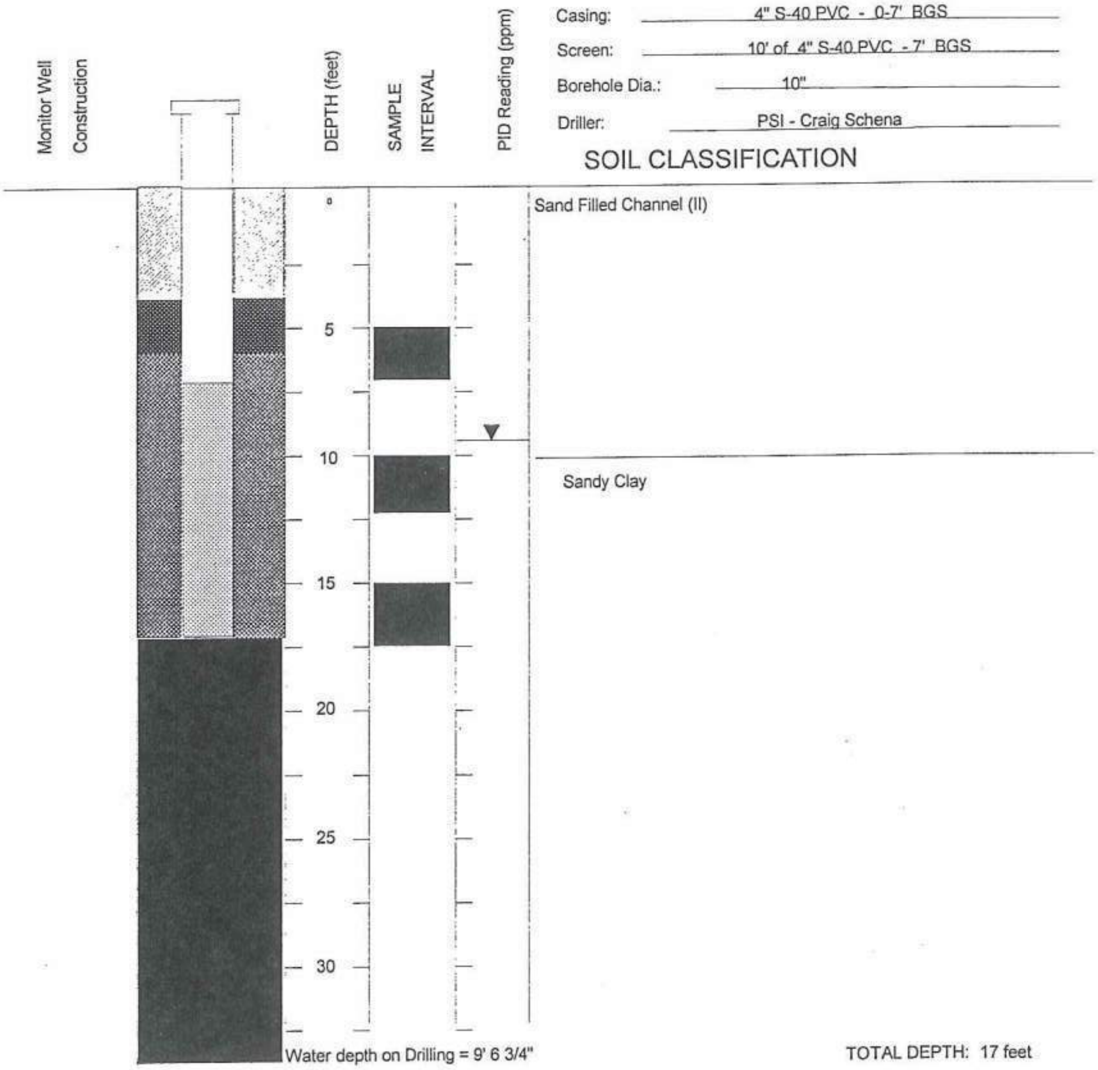
PAGE _1_ OF _1_

SUBSURFACE EXPLORATION RECORD

Client: City of Kingsville
Project Name: Kingsville Landfill
Project Location: 5 mi. SE of City
LAT: 27• 26' 57.2" LONG: 97• 49' 20.1 "
MSWLF ID: Permit #235-B

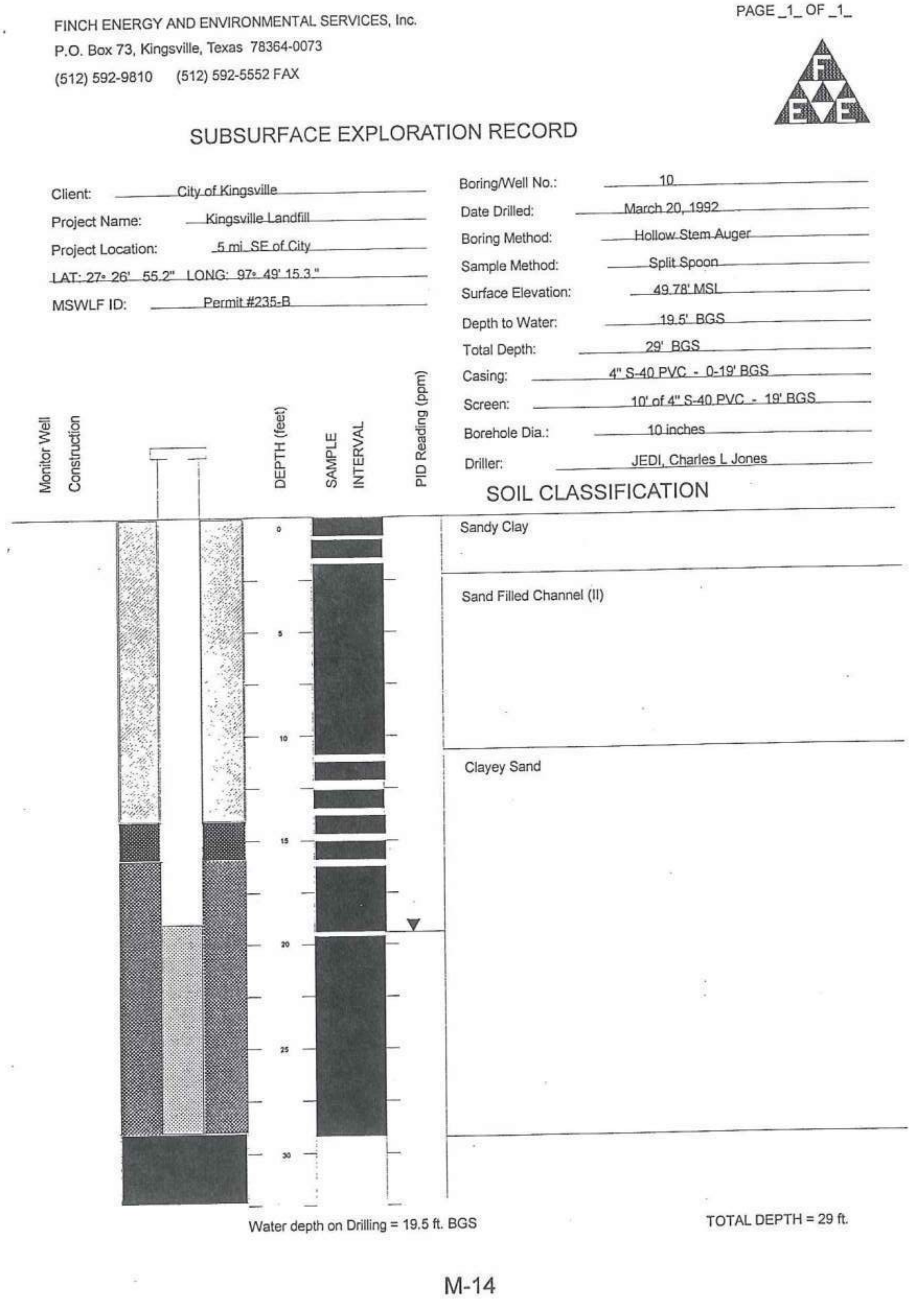
Boring/Well No.: 9R
Date Drilled: July 11, 1996
Boring Method: Hollow Stem Auger
Sample Method: Split spoon
Surface Elevation: 41.41' MSL
Depth to Water: 9.6' BGS
Total Depth: 17' BGS
Casing: 4" S-40 PVC - 0-7' BGS
Screen: 10' of 4" S-40 PVC - 7' BGS
Borehole Dia.: 10"
Driller: PSI - Craig Schena



Water depth on Drilling = 9' 6 3/4"

TOTAL DEPTH: 17 feet

M-13



PAGE _1_ OF _1_

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(512) 592-9810 (512) 592-5552 FAX

SUBSURFACE EXPLORATION RECORD

Client: City of Kingsville
Project Name: Kingsville Landfill
Project Location: 5 mi. SE of City
LAT: 27° 26' 55.2" LONG: 97° 49' 15.3"
MSWLF ID: Permit #235-B

Boring/Well No.: 10
Date Drilled: March 20, 1992
Boring Method: Hollow Stem Auger
Sample Method: Split Spoon
Surface Elevation: 49.78' MSL
Depth to Water: 19.5' BGS
Total Depth: 29' BGS
Casing: 4" S-40 PVC - 0-19' BGS
Screen: 10' of 4" S-40 PVC - 19' BGS
Borehole Dia.: 10 inches
Driller: JEDI, Charles L Jones

SOIL CLASSIFICATION

Sandy Clay

Sand Filled Channel (II)

Clayey Sand

Water depth on Drilling = 19.5 ft. BGS

TOTAL DEPTH = 29 ft.

M-14

FINCH ENERGY AND ENVIRONMENTAL SERVICES, Inc.
P.O. Box 73, Kingsville, Texas 78364-0073
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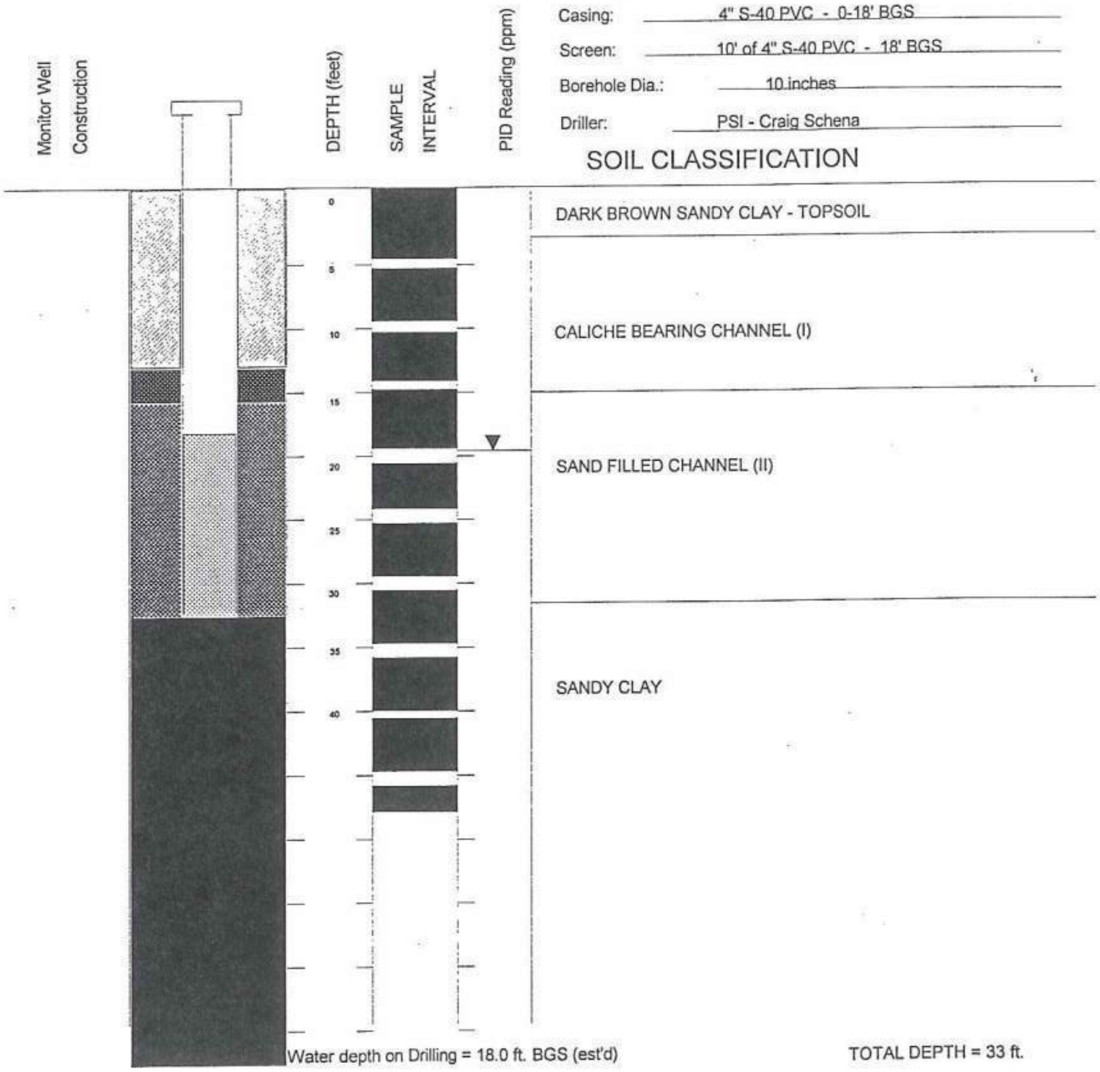
PAGE _1_ OF _1_

SUBSURFACE EXPLORATION RECORD

Client: City of Kingsville
Project Name: Kingsville Landfill
Project Location: 5 mi. SE of City
LAT: 27° 26' 57" LONG: 97° 49' 10"
MSWLF ID: Permit #235 - B

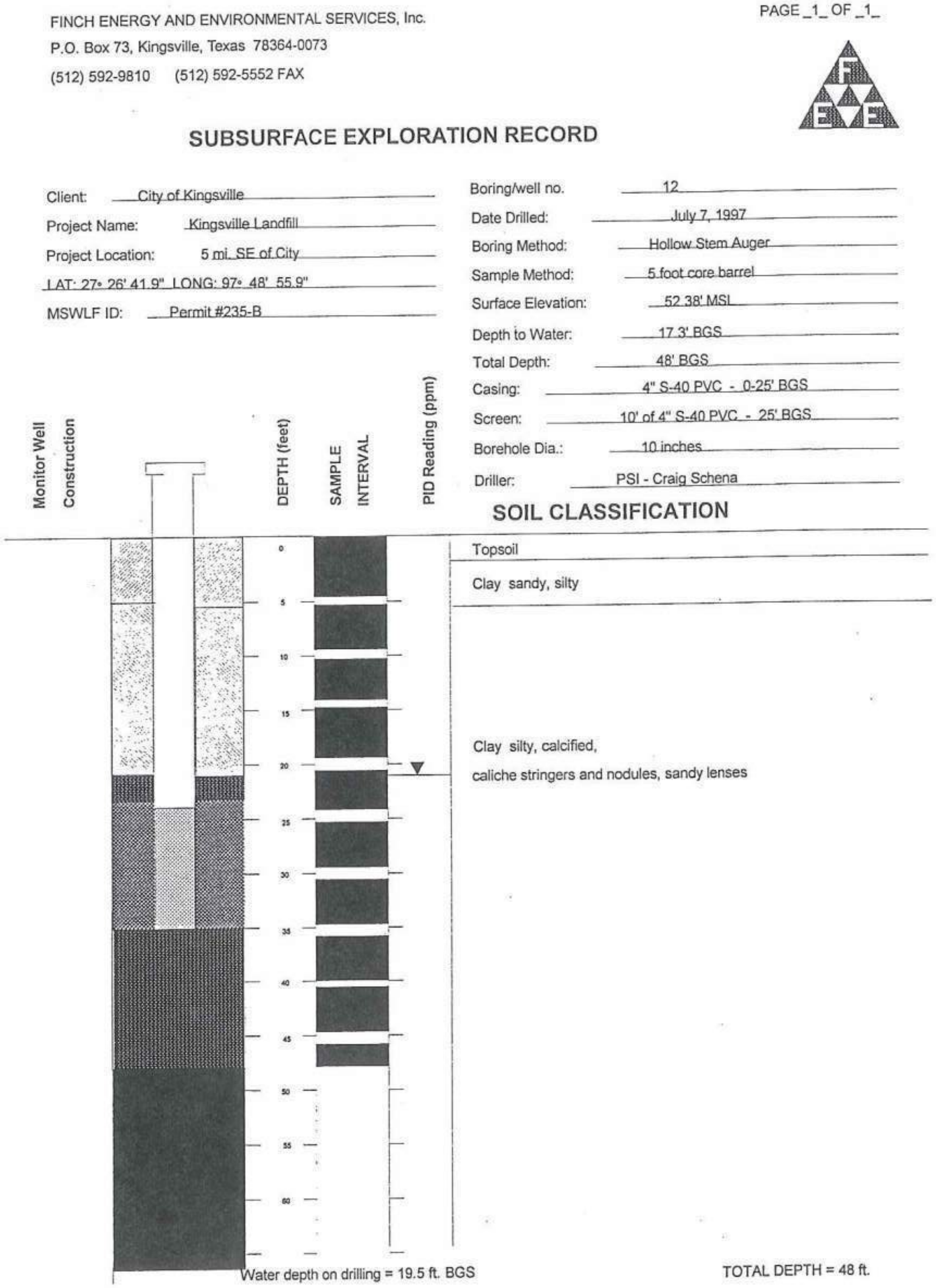
Boring/Well No.: 11
Date Drilled: July 11, 1996
Boring Method: Hollow Stem Auger
Sample Method: Split Spoon
Surface Elevation: 60.20' MSL
Depth to Water: 26.3' BGS
Total Depth: 33' BGS
Casing: 4" S-40 PVC - 0-18' BGS
Screen: 10' of 4" S-40 PVC - 18' BGS
Borehole Dia.: 10 inches
Driller: PSI - Craig Schena



Water depth on Drilling = 18.0 ft. BGS (est'd)

TOTAL DEPTH = 33 ft.

M-15



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PAGE _1_ OF _1_

SUBSURFACE EXPLORATION RECORD

Client: City of Kingsville
Project Name: Kingsville Landfill
Project Location: 5 mi. SE of City
LAT: 27° 26' 41.9" LONG: 97° 48' 55.9"
MSWLF ID: Permit #235-B

Boring/well no. 12
Date Drilled: July 7, 1997
Boring Method: Hollow Stem Auger
Sample Method: 5 foot core barrel
Surface Elevation: 52.38' MSL
Depth to Water: 17.3' BGS
Total Depth: 48' BGS
Casing: 4" S-40 PVC - 0-25' BGS
Screen: 10' of 4" S-40 PVC - 25' BGS
Borehole Dia.: 10 inches
Driller: PSI - Craig Schena

SOIL CLASSIFICATION

Topsoil

Clay sandy, silty

Clay silty, calcified,
caliche stringers and nodules, sandy lenses

Water depth on drilling = 19.5 ft. BGS

TOTAL DEPTH = 48 ft.

M-16

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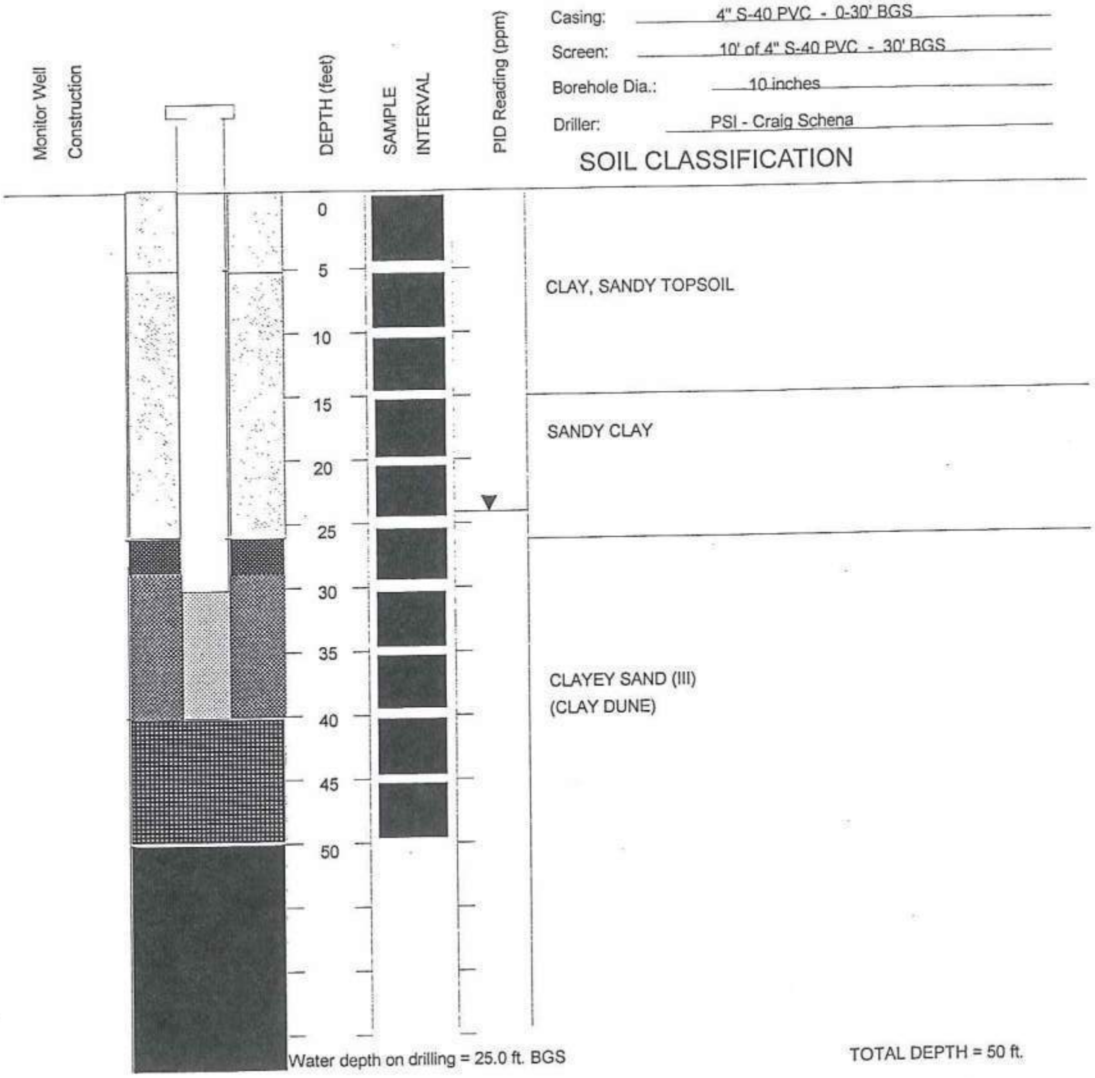
PAGE _1_ OF _1_

SUBSURFACE EXPLORATION RECORD

Client: City of Kingsville
Project Name: Kingsville Landfill
Project Location: 5 mi. SE of City
LAT: 27° 26' 55.7 " LONG: 97° 48' 56"
MSWLF ID: Permit #235-B

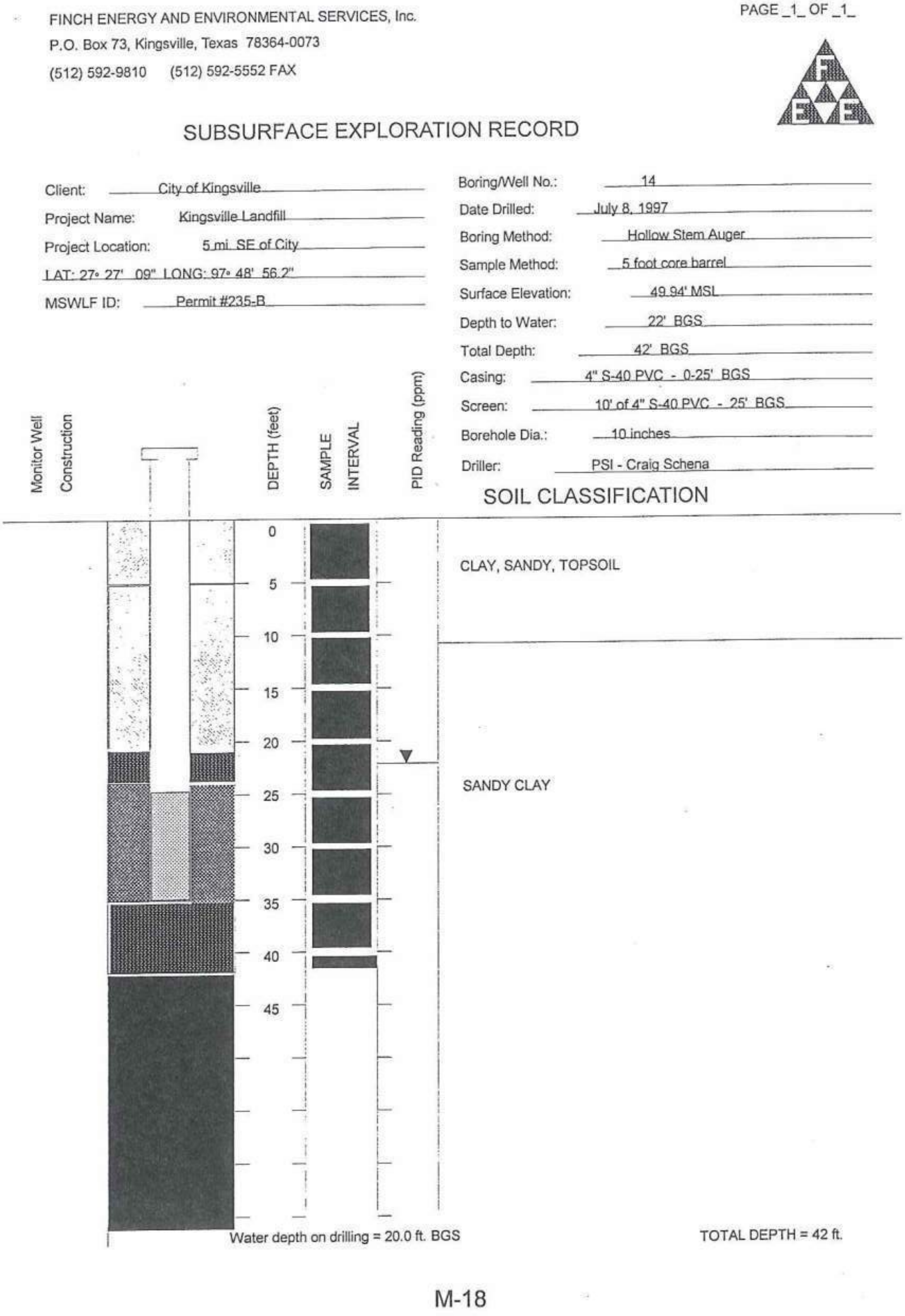
Boring/Well No.: 13
Date Drilled: July 28, 1997
Boring Method: Hollow Stem Auger
Sample Method: 5 foot core barrel
Surface Elevation: 59.13' MSL
Depth to Water: 24' BGS
Total Depth: 50' BGS
Casing: 4" S-40 PVC - 0-30' BGS
Screen: 10' of 4" S-40 PVC - 30' BGS
Borehole Dia.: 10 inches
Driller: PSI - Craig Schena



Water depth on drilling = 25.0 ft. BGS

TOTAL DEPTH = 50 ft.

M-17



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PAGE _1_ OF _1_

SUBSURFACE EXPLORATION RECORD

Client: City of Kingsville
Project Name: Kingsville Landfill
Project Location: 5 mi. SE of City
LAT: 27° 27' 09" LONG: 97° 48' 56.2"
MSWLF ID: Permit #235-B

Boring/Well No.: 14
Date Drilled: July 8, 1997
Boring Method: Hollow Stem Auger
Sample Method: 5 foot core barrel
Surface Elevation: 49.94' MSL
Depth to Water: 22' BGS
Total Depth: 42' BGS
Casing: 4" S-40 PVC - 0-25' BGS
Screen: 10' of 4" S-40 PVC - 25' BGS
Borehole Dia.: 10 inches
Driller: PSI - Craig Schena

Water depth on drilling = 20.0 ft. BGS

TOTAL DEPTH = 42 ft.

M-18

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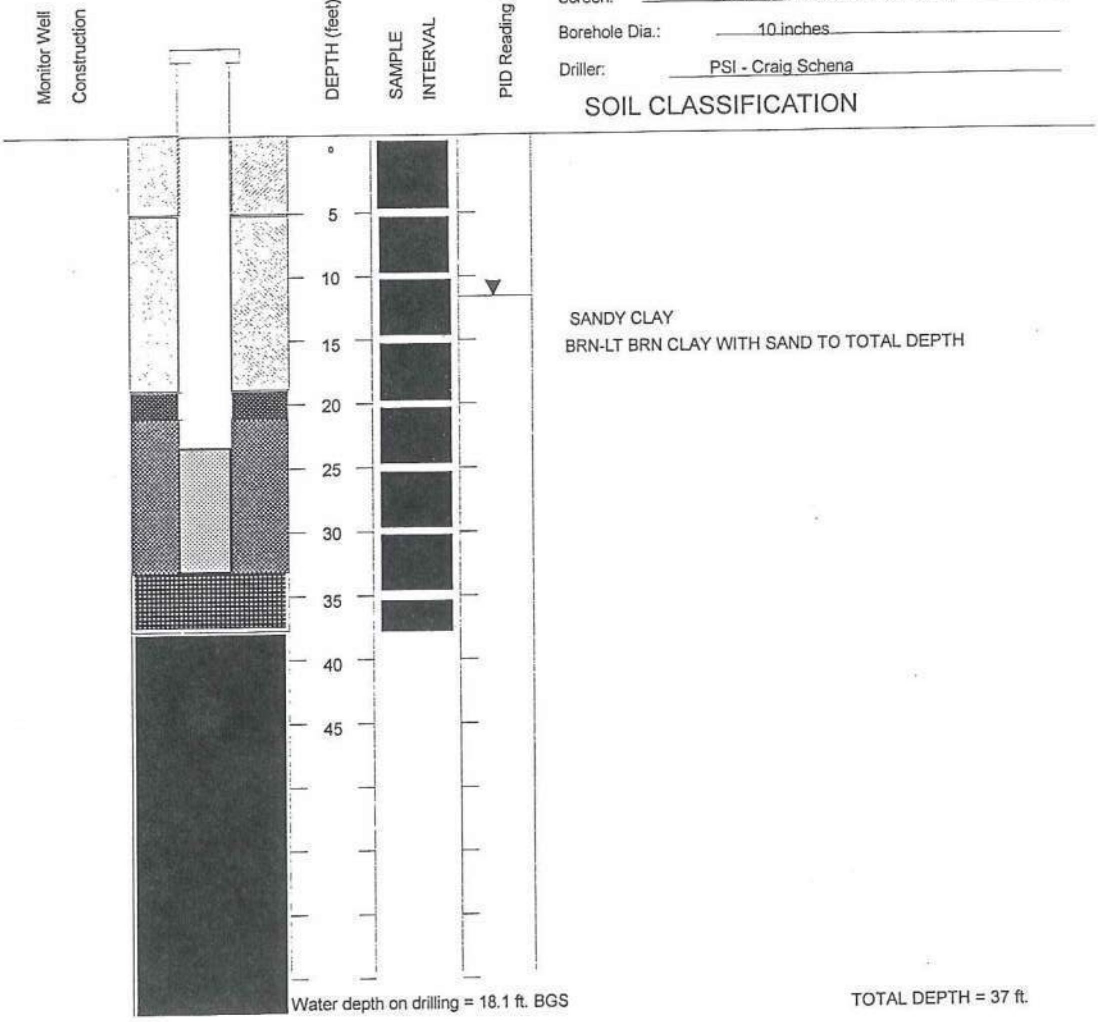
PAGE _1_ OF _1_

SUBSURFACE EXPLORATION RECORD

Client: City of Kingsville
Project Name: Kingsville Landfill
Project Location: 5 mi SE of City
LAT: 27° 27' 08.7" LONG: 97° 49' 23.7"
MSWLF ID: Permit #235-B

Boring/Well No.: 15
Date Drilled: July 8, 1997
Boring Method: Hollow Stem Auger
Sample Method: 5 foot core barrel
Surface Elevation: 48.39' MSL
Depth to Water: 12' BGS
Total Depth: 37' BGS
Casing: 4" S-40 PVC - 0-23' BGS
Screen: 10' of 4" S-40 PVC - 23' BGS
Borehole Dia.: 10 inches
Driller: PSI - Craig Schena

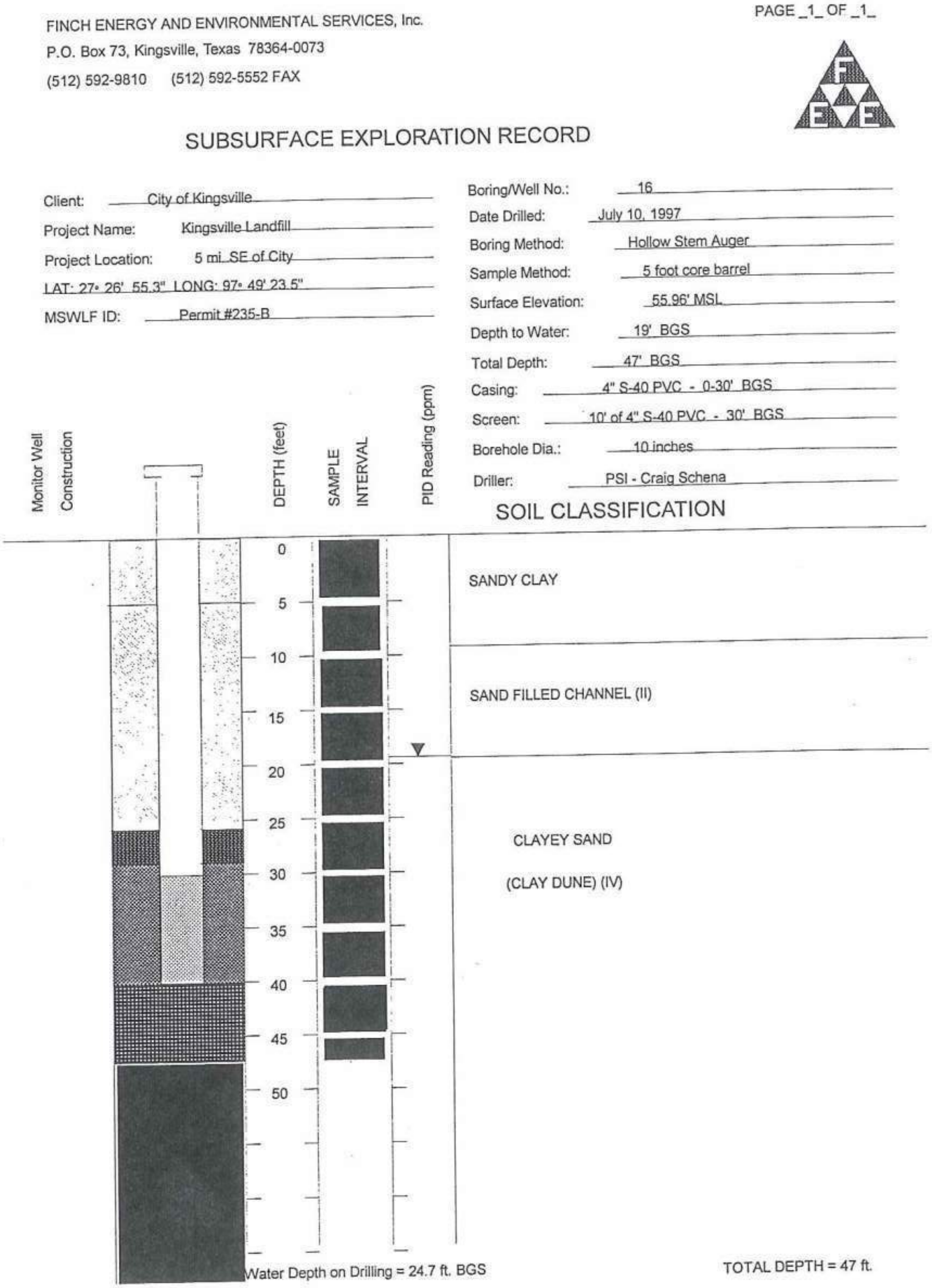


SANDY CLAY
BRN-LT BRN CLAY WITH SAND TO TOTAL DEPTH

Water depth on drilling = 18.1 ft. BGS

TOTAL DEPTH = 37 ft.

M-19



FINCH ENERGY AND ENVIRONMENTAL SERVICES, Inc.
P.O. Box 73, Kingsville, Texas 78364-0073
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PAGE _1_ OF _1_

SUBSURFACE EXPLORATION RECORD

Client: City of Kingsville
Project Name: Kingsville Landfill
Project Location: 5 mi SE of City
LAT: 27° 26' 55.3" LONG: 97° 49' 23.5"
MSWLF ID: Permit #235-B

Boring/Well No.: 16
Date Drilled: July 10, 1997
Boring Method: Hollow Stem Auger
Sample Method: 5 foot core barrel
Surface Elevation: 55.96' MSL
Depth to Water: 19' BGS
Total Depth: 47' BGS
Casing: 4" S-40 PVC - 0-30' BGS
Screen: 10' of 4" S-40 PVC - 30' BGS
Borehole Dia.: 10 inches
Driller: PSI - Craig Schena

SOIL CLASSIFICATION

SANDY CLAY

SAND FILLED CHANNEL (II)

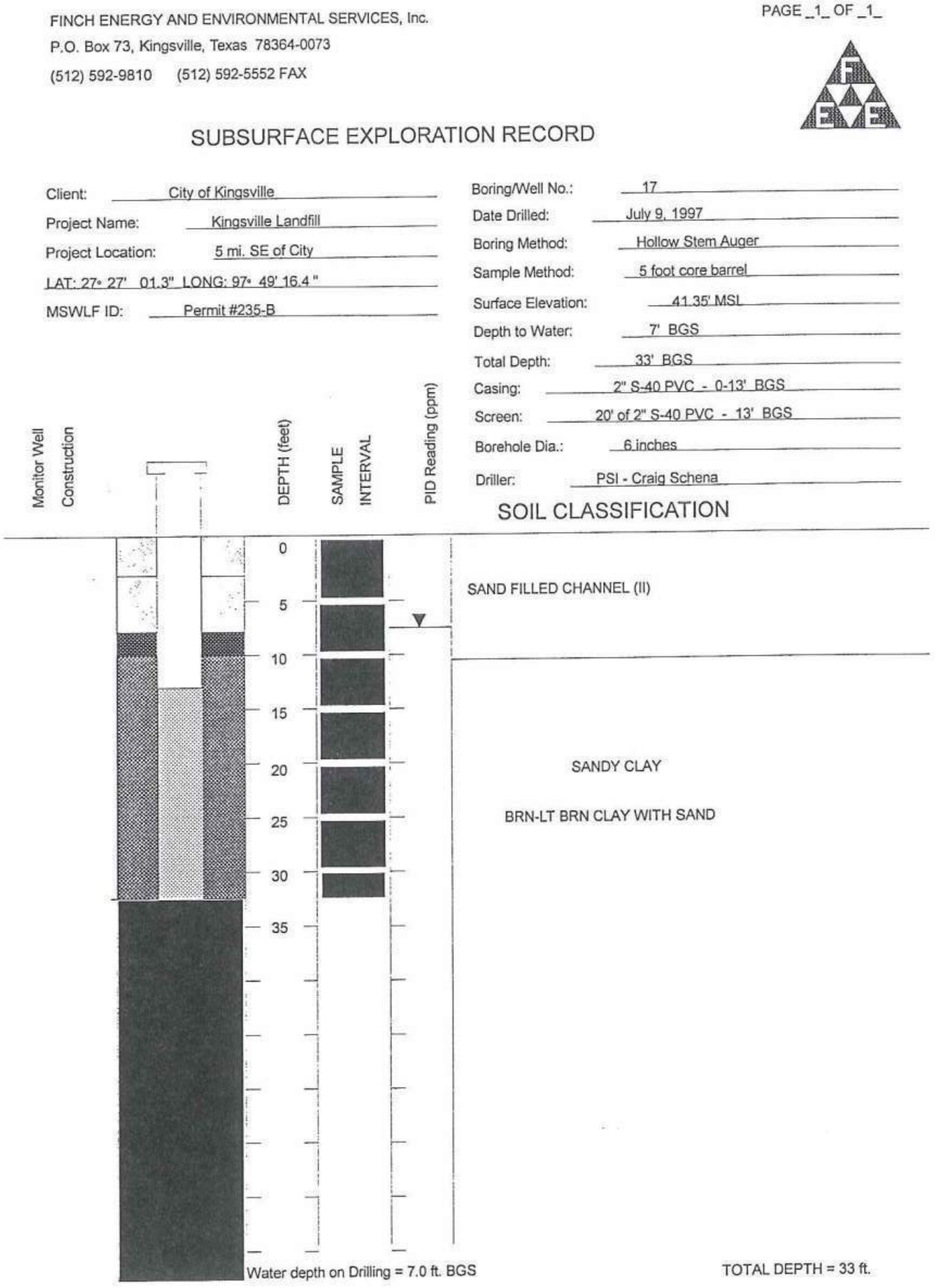
CLAYEY SAND

(CLAY DUNE) (IV)

Water Depth on Drilling = 24.7 ft. BGS

TOTAL DEPTH = 47 ft.

M-20



FINCH ENERGY AND ENVIRONMENTAL SERVICES, Inc.
P.O. Box 73, Kingsville, Texas 78364-0073
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PAGE _1_ OF _1_

SUBSURFACE EXPLORATION RECORD

Client: City of Kingsville
Project Name: Kingsville Landfill
Project Location: 5 mi. SE of City
LAT: 27° 27' 01.3" LONG: 97° 49' 16.4 "
MSWLF ID: Permit #235-B

Boring/Well No.: 17
Date Drilled: July 9, 1997
Boring Method: Hollow Stem Auger
Sample Method: 5 foot core barrel
Surface Elevation: 41.35' MSL
Depth to Water: 7' BGS
Total Depth: 33' BGS
Casing: 2" S-40 PVC - 0-13' BGS
Screen: 20' of 2" S-40 PVC - 13' BGS
Borehole Dia.: 6 inches
Driller: PSI - Craig Schena

SOIL CLASSIFICATION

SAND FILLED CHANNEL (II)

SANDY CLAY

BRN-LT BRN CLAY WITH SAND

Water depth on Drilling = 7.0 ft. BGS

TOTAL DEPTH = 33 ft.

M-21

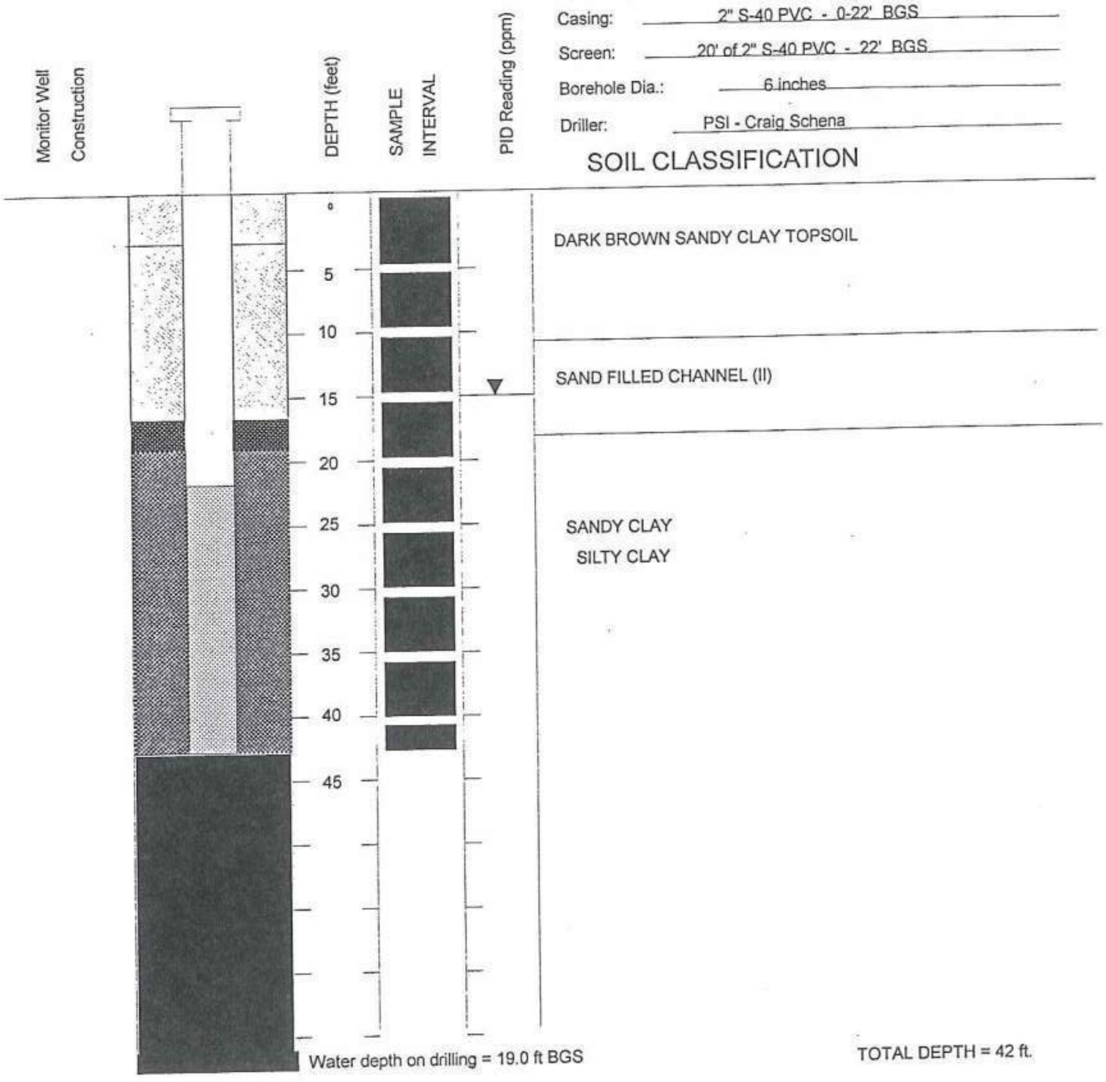
PAGE _1_ OF _1_

FINCH ENERGY AND ENVIRONMENTAL SERVICES, Inc.
P.O. Box 73, Kingsville, Texas 78364-0073
(512) 592-9810 (512) 592-5552 FAX

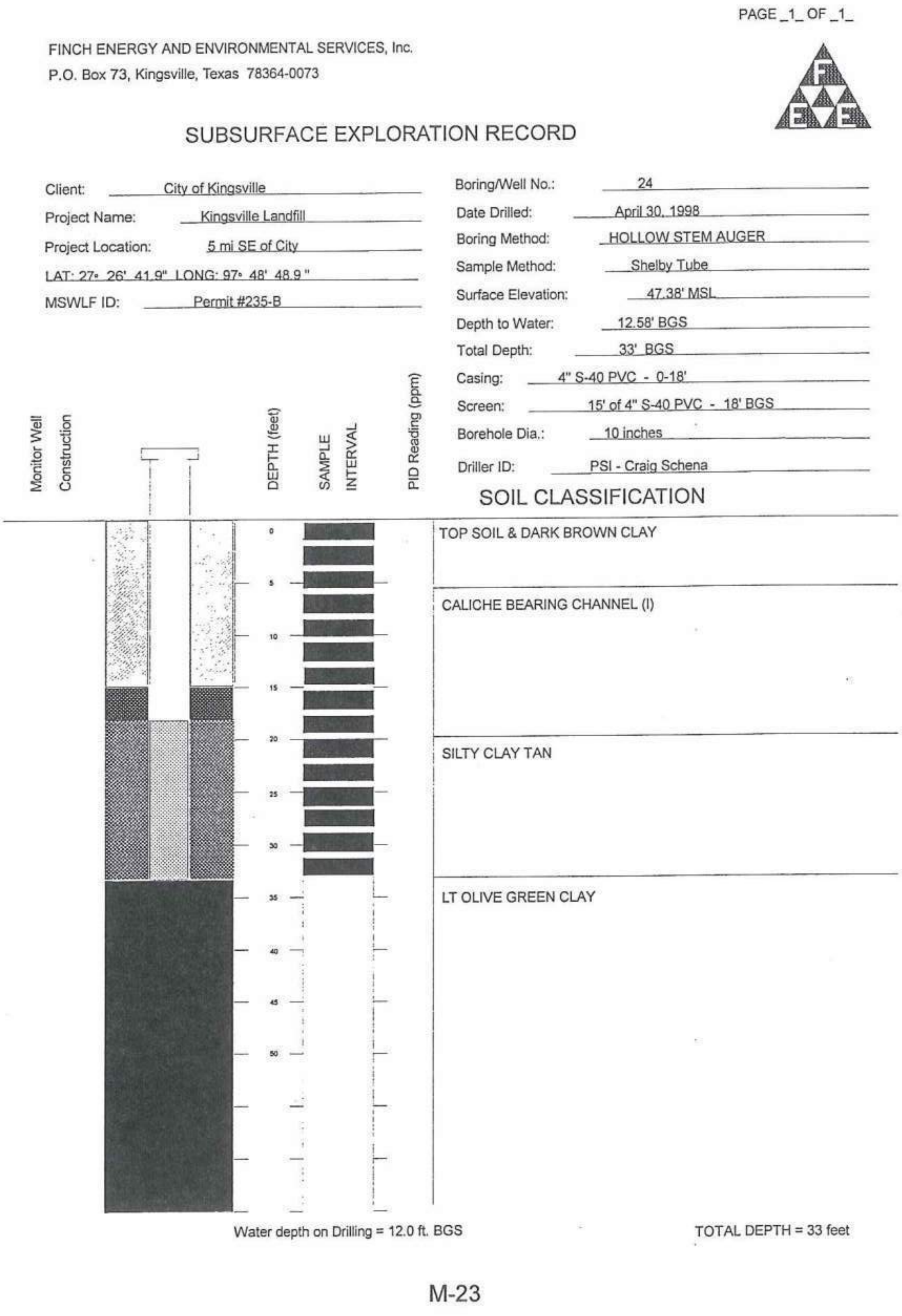
SUBSURFACE EXPLORATION RECORD

Client: City of Kingsville
Project Name: Kingsville Landfill
Project Location: 5 mi. SE of City
LAT: 27° 27' 01.4" LONG: 97° 49' 04 "
MSWLF ID: Permit #235-B

Boring/Well No.: 18
Date Drilled: July 9, 1997
Boring Method: Hollow Stem Auger
Sample Method: 5 foot core barrel
Surface Elevation: 50.04' MSL
Depth to Water: 15' BGS
Total Depth: 42' BGS
Casing: 2" S-40 PVC - 0-22' BGS
Screen: 20' of 2" S-40 PVC - 22' BGS
Borehole Dia.: 6 inches
Driller: PSI - Craig Schena



M-22



PAGE _1_ OF _1_

FINCH ENERGY AND ENVIRONMENTAL SERVICES, Inc.
P.O. Box 73, Kingsville, Texas 78364-0073

SUBSURFACE EXPLORATION RECORD

Client: City of Kingsville
Project Name: Kingsville Landfill
Project Location: 5 mi SE of City
LAT: 27° 26' 41.9" LONG: 97° 48' 48.9 "
MSWLF ID: Permit #235-B

Boring/Well No.: 24
Date Drilled: April 30, 1998
Boring Method: HOLLOW STEM AUGER
Sample Method: Shelby Tube
Surface Elevation: 47.38' MSL
Depth to Water: 12.58' BGS
Total Depth: 33' BGS
Casing: 4" S-40 PVC - 0-18'
Screen: 15' of 4" S-40 PVC - 18' BGS
Borehole Dia.: 10 inches
Driller ID: PSI - Craig Schena

SOIL CLASSIFICATION

TOP SOIL & DARK BROWN CLAY

CALICHE BEARING CHANNEL (I)

SILTY CLAY TAN

LT OLIVE GREEN CLAY

Water depth on Drilling = 12.0 ft. BGS

TOTAL DEPTH = 33 feet

M-23

Send original copy by certified return receipt requested mail to: TNRCC, MC 177, P.O. Box 13087, Austin, TX 78711-3087

ATTENTION OWNER: *Confidentiality Privilege Notice on on reverse side of Well Owner's copy (pink)*

State of Texas
WELL REPORT

Texas Water Well Drillers' Advisory Council
MC 177
P.O. Box 13087
Austin, TX 78711-3087
512-239-0530

1) **OWNER** City of Kingsville (Name) **ADDRESS** P.O. Box 1458 (Street or RFD) Kingsville (City) TX (State) 78363 (Zip)

2) **ADDRESS OF WELL:** County Kleberg Kingsville Landfill (Street, RFD or other) Kingsville (City) TX (State) (Zip) **GRID #** 83-34-4

3) **TYPE OF WORK (Check):**
☑ New Well ☐ Deepening
☐ Reconditioning ☐ Plugging

4) **PROPOSED USE (Check):** ☑ Monitor ☐ Environmental Soil Boring ☐ Domestic ☐ Industrial ☐ Irrigation ☐ Injection ☐ Public Supply ☐ De-watering ☐ Testwell
If Public Supply well, were plans submitted to the TNRCC? ☐ Yes ☐ No

5) MW-12 (SB-12)

N

6) **WELL LOG:**
Date Drilling:
Started 7-7 19 97
Completed 7-7 19 97

DIAMETER OF HOLE

Dia. (in.)	From (ft.)	To (ft.)
10.0	Surface	45.0

7) **DRILLING METHOD (Check):** ☐ Driven ☐ Air Rotary ☐ Mud Rotary ☑ Bored ☐ Air Hammer ☐ Cable Tool ☐ Jetted ☐ Other ______

From (ft.)	To (ft.)	Description and color of formation material
		See attached logs

(Use reverse side of Well Owner's copy, if necessary)

8) **Borehole Completion (Check):** ☐ Open Hole ☐ Straight Wall ☐ Underreamed ☐ Gravel Packed ☑ Other 16/30 silica
If Gravel Packed give interval ... from 35.0 ft. to 23.0 ft.

CASING, BLANK PIPE, AND WELL SCREEN DATA:

Dia. (in.)	New or Used	Steel, Plastic, etc. Perf., Slotted, etc. Screen Mfg., if commercial	Setting (ft.) From	Setting (ft.) To	Gage Casting Screen
4	N	PVC screen .010 TRI-LOC	25.0	35.0	.010
4	N	PVC riser	25.0	+2.5	

9) **CEMENTING DATA** [Rule 338.44(1)]
Cemented from 21.0 ft. to 0.0 ft. No. of sacks used 5.0
______ ft. to ______ ft. No. of sacks used ______
Method used ______
Cemented by PSI INC.
Distance to septic system field lines or other concentrated contamination ______ ft
Method of verification of above distance ______

10) **SURFACE COMPLETION**
☑ Specified Surface Slab Installed [Rule 338.44(2)(A)]
☐ Specified Steel Sleeve Installed [Rule 338.44(3)(A)]
☐ Pitless Adapter Used [Rule 338.44(3)(b)]
☐ Approved Alternative Procedure Used [Rule 338.71]

11) **WATER LEVEL:** N/A
Static level ______ ft. below land surface Date ______
Artesian flow ______ gpm. Date ______

12) **PACKERS:**

	Type	Depth
Bentonite pellets	1/4"	23.0 - 21.0

13) **TYPE PUMP:** N/A
☐ Turbine ☐ Jet ☐ Submersible ☐ Cylinder
☐ Other ______
Depth to pump bowls, cylinder, jet, etc., ______ ft.

14) **WELL TESTS:** N/A
Type test: ☐ Pump ☐ Bailer ☐ Jetted ☐ Estimated
Yield: ______ gpm with ______ ft. drawdown after ______ hrs.

15) **WATER QUALITY:**
Did you knowingly penetrate any strata which contained undesirable constituents?
☐ Yes ☑ No If yes, submit "REPORT OF UNDESIRABLE WATER"
Type of water? ______ Depth of strata ______
Was a chemical analysis made? ☐ Yes ☐ No

I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief. I understand that failure to complete items 1 thru 15 will result in the log(s) being returned for completion and resubmittal.

COMPANY NAME PSI INC. (Type or print) WELL DRILLER'S LICENSE NO. 4694-M

ADDRESS P.O. [illegible] (Street or RFD) Corpus Christi (City) TX (State) [illegible] (Zip)

(Signed) ______ (Licensed Well Driller) M-24 (Signed) ______ (Registered Driller Trainee)

Please attach electric log, chemical analysis, and other pertinent information, if available.

Send original copy by certified return receipt requested mail to: **TNRCC, MC 177, P.O. Box 13087, Austin, TX 78711-3087**

ATTENTION OWNER: *Confidentiality Privilege Notice on on reverse side*
Well Owner's copy (pink)

State of Texas
WELL REPORT

Texas Water Well Drillers Advisory Council
MC 177
P.O. Box 13087
Austin, TX 78711-3087
512-239-0530

1) **OWNER** City of Kingsville (Name) **ADDRESS** P.O Box 1458 (Street or RFD) Kingsville (City) TX (State) 78363 (Zip)

2) **ADDRESS OF WELL:** County Kleberg Kingsville Landfill (Street, RFD or other) Kingsville (City) TX (State) (Zip) **GRID #** 83-34-4

3) **TYPE OF WORK (Check):**
☑ New Well ☐ Deepening
☐ Reconditioning ☐ Plugging

4) **PROPOSED USE (Check):** ☑ Monitor ☐ Environmental Soil Boring ☐ Domestic
☐ Industrial ☐ Irrigation ☐ Injection ☐ Public Supply ☐ De-watering ☐ Testwell
If Public Supply well, were plans submitted to the TNRCC? ☐ Yes ☐ No

5) MW-13
(SB-13)

N↑

6) **WELL LOG:**
Date Drilling:
Started 7-28 19 97
Completed 7-28 19 97

DIAMETER OF HOLE

Dia. (in.)	From (ft.)	To (ft.)
8.0	Surface	50.0

7) **DRILLING METHOD (Check):** ☐ Driven
☐ Air Rotary ☐ Mud Rotary ☑ Bored
☐ Air Hammer ☐ Cable Tool ☐ Jetted
☐ Other

From (ft.)	To (ft.)	Description and color of formation material
See attached log		

(Use reverse side of Well Owner's copy, if necessary)

8) **Borehole Completion (Check):** ☐ Open Hole ☐ Straight Wall
☐ Underreamed ☐ Gravel Packed ☐ Other 1/4 in Silica
If Gravel Packed give interval ... from 40.0 ft. to 28.0 ft.

CASING, BLANK PIPE, AND WELL SCREEN DATA:

Dia. (in.)	New or Used	Steel, Plastic, etc. Perf., Slotted, etc. Screen Mfg., if commercial	Setting (ft.)		Gage Casting Screen
			From	To	
4	N	PVC Screen Sch. 40	40.0	30.0	.010
		TRI-LOC			
4	N	PVC Riser	30.0	+2.5	

9) **CEMENTING DATA** [Rule 338.44(1)]
Cemented from 26.0 ft. to 0.0 ft. No. of sacks used 5.0
ft. to ft. No. of sacks used
Method used
Cemented by PSI Inc.
Distance to septic system field lines or other concentrated contamination ft.
Method of verification of above distance

10) **SURFACE COMPLETION**
☑ Specified Surface Slab Installed [Rule 338.44(2)(A)]
☐ Specified Steel Sleeve Installed [Rule 338.44(3)(A)]
☐ Pitless Adapter Used [Rule 338.44(3)(b)]
☐ Approved Alternative Procedure Used [Rule 338.71]

11) **WATER LEVEL:** N/A
Static level ft. below land surface Date
Artesian flow gpm. Date

12) **PACKERS:**

	Type	Depth
Bentonite Pellets	1/2"	28.0 - 26.0

13) **TYPE PUMP:** N/A
☐ Turbine ☐ Jet ☐ Submersible ☐ Cylinder
☐ Other
Depth to pump bowls, cylinder, jet, etc., ft.

14) **WELL TESTS:** N/A
Type test: ☐ Pump ☐ Bailer ☐ Jetted ☐ Estimated
Yield: gpm with ft. drawdown after hrs.

15) **WATER QUALITY:**
Did you knowingly penetrate any strata which contained undesirable constituents?
☐ Yes ☑ No If yes, submit "REPORT OF UNDESIRABLE WATER"
Type of water? Depth of strata
Was a chemical analysis made? ☐ Yes ☐ No

I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief. I understand that failure to complete items 1 thru 15 will result in the log(s) being returned for completion and resubmittal.

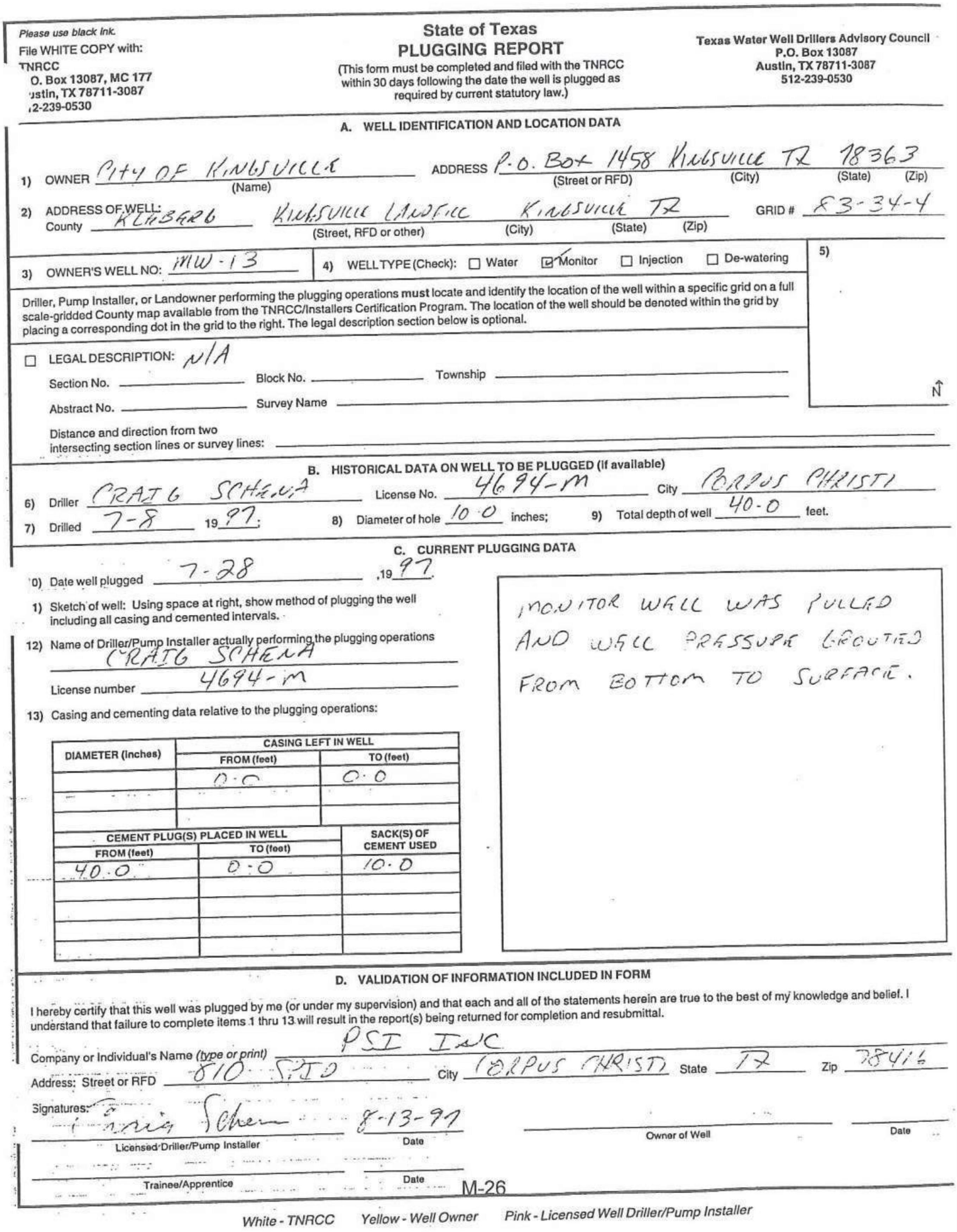
COMPANY NAME PSI Inc. (Type or print) **WELL DRILLER'S LICENSE NO.** 4694-M

ADDRESS PO 8280 (Street or RFD) Corpus Christi (City) TX (State) 78416 (Zip)

(Signed) (Licensed Well Driller) **(Signed)** (Registered Driller Trainee)

M-25

Please attach electric log, chemical analysis, and other pertinent information, if available.



Please use black ink.
File WHITE COPY with:
TNRCC
O. Box 13087, MC 177
ustin, TX 78711-3087
2-239-0530

State of Texas
PLUGGING REPORT

(This form must be completed and filed with the TNRCC within 30 days following the date the well is plugged as required by current statutory law.)

Texas Water Well Drillers Advisory Council
P.O. Box 13087
Austin, TX 78711-3087
512-239-0530

A. WELL IDENTIFICATION AND LOCATION DATA

1) OWNER CITY OF KINGSVILLE (Name) ADDRESS P.O. BOX 1458 (Street or RFD) KINGSVILLE (City) TX (State) 18363 (Zip)

2) ADDRESS OF WELL: County KLEBERG KINGSVILLE LANDFILL (Street, RFD or other) KINGSVILLE (City) TX (State) (Zip) GRID # 83-34-4

3) OWNER'S WELL NO: MW-13

4) WELL TYPE (Check): ☐ Water ☑ Monitor ☐ Injection ☐ De-watering

5)

Driller, Pump Installer, or Landowner performing the plugging operations **must** locate and identify the location of the well within a specific grid on a full scale-gridded County map available from the TNRCC/Installers Certification Program. The location of the well should be denoted within the grid by placing a corresponding dot in the grid to the right. The legal description section below is optional.

☐ LEGAL DESCRIPTION: N/A

Section No. Block No. Township

Abstract No. Survey Name

Distance and direction from two intersecting section lines or survey lines:

N

B. HISTORICAL DATA ON WELL TO BE PLUGGED (If available)

6) Driller CRAIG SCHENA License No. 4694-M City CORPUS CHRISTI

7) Drilled 7-8 19 97

8) Diameter of hole 10.0 inches;

9) Total depth of well 40.0 feet.

C. CURRENT PLUGGING DATA

10) Date well plugged 7-28, 19 97

11) Sketch of well: Using space at right, show method of plugging the well including all casing and cemented intervals.

MONITOR WELL WAS PULLED AND WELL PRESSURE GROUTED FROM BOTTOM TO SURFACE.

12) Name of Driller/Pump Installer actually performing the plugging operations CRAIG SCHENA

License number 4694-M

13) Casing and cementing data relative to the plugging operations:

DIAMETER (Inches)	CASING LEFT IN WELL	
	FROM (feet)	TO (feet)
	0.0	0.0

CEMENT PLUG(S) PLACED IN WELL		SACK(S) OF CEMENT USED
FROM (feet)	TO (feet)	
40.0	0.0	10.0

D. VALIDATION OF INFORMATION INCLUDED IN FORM

I hereby certify that this well was plugged by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief. I understand that failure to complete items 1 thru 13 will result in the report(s) being returned for completion and resubmittal.

Company or Individual's Name (*type or print*) PSI INC

Address: Street or RFD 810 SPID City CORPUS CHRISTI State TX Zip 78416

Signatures: Craig Schen 8-13-97

Licensed Driller/Pump Installer Date Owner of Well Date

Trainee/Apprentice Date

M-26

White - TNRCC *Yellow - Well Owner* *Pink - Licensed Well Driller/Pump Installer*

Send original copy by certified return receipt requested mail to: **TNRCC, MC 177, P.O. Box 13087, Austin, TX 78711-3087**

ATTENTION OWNER: *Confidentiality Privilege Notice on on reverse side*
Well Owner's copy (pink)

State of Texas
WELL REPORT

Texas Water Well Drillers Advisory Council
MC 177
P.O. Box 13087
Austin, TX 78711-3087
512-239-0530

1) **OWNER** CITY OF KINGSVILLE (Name) **ADDRESS** P.O. BOX 1458 (Street or RFD) KINGSVILLE (City) TX (State) 78363 (Zip)

2) **ADDRESS OF WELL:** County KLEBERG KINGSVILLE LANDFILL (Street, RFD or other) KINGSVILLE (City) TX (State) (Zip) **GRID #** 83-34-4

3) **TYPE OF WORK (Check):**
☒ New Well ☐ Deepening
☐ Reconditioning ☐ Plugging

4) **PROPOSED USE (Check):** ☒ Monitor ☐ Environmental Soil Boring ☐ Domestic ☐ Industrial ☐ Irrigation ☐ Injection ☐ Public Supply ☐ De-watering ☐ Testwell
If Public Supply well, were plans submitted to the TNRCC? ☐ Yes ☐ No

5) MW-14
(SB-14)

N↑

6) **WELL LOG:**
Date Drilling:
Started 7-8 19 97
Completed 7-8 19 97

DIAMETER OF HOLE

Dia. (in.)	From (ft.)	To (ft.)
10.0	Surface	42.0

7) **DRILLING METHOD (Check):** ☐ Driven ☐ Air Rotary ☐ Mud Rotary ☒ Bored ☐ Air Hammer ☐ Cable Tool ☐ Jetted ☐ Other

From (ft.)	To (ft.)	Description and color of formation material
SEE ATTACHED LOGS		

(Use reverse side of Well Owner's copy, if necessary)

8) **Borehole Completion (Check):** ☐ Open Hole ☐ Straight Wall ☐ Underreamed ☐ Gravel Packed ☒ Other 16/30 SILICA
If Gravel Packed give interval ... from 35.0 ft. to 23.0 ft.

CASING, BLANK PIPE, AND WELL SCREEN DATA:

Dia. (in.)	New or Used	Steel, Plastic, etc. Perf., Slotted, etc. Screen Mfg., if commercial	Setting (ft.)		Gage Casting Screen
			From	To	
4	N	PVC SCREEN MFG.	35.0	25.0	.010
		TRI-LOC			
4	N	PVC RISER	25.0	+2.5	

9) **CEMENTING DATA** [Rule 338.44(1)]
Cemented from 21.0 ft. to 0.0 ft. No. of sacks used 5
ft. to ft. No. of sacks used
Method used
Cemented by FSI INC.
Distance to septic system field lines or other concentrated contamination ft.
Method of verification of above distance

13) **TYPE PUMP:** N/A
☐ Turbine ☐ Jet ☐ Submersible ☐ Cylinder
☐ Other
Depth to pump bowls, cylinder, jet, etc., ft.

10) **SURFACE COMPLETION**
☒ Specified Surface Slab Installed [Rule 338.44(2)(A)]
☐ Specified Steel Sleeve Installed [Rule 338.44(3)(A)]
☐ Pitless Adapter Used [Rule 338.44(3)(b)]
☐ Approved Alternative Procedure Used [Rule 338.71]

14) **WELL TESTS:** N/A
Type test: ☐ Pump ☐ Bailer ☐ Jetted ☐ Estimated
Yield: gpm with ft. drawdown after hrs.

11) **WATER LEVEL:** N/A
Static level ft. below land surface Date
Artesian flow gpm. Date

15) **WATER QUALITY:**
Did you knowingly penetrate any strata which contained undesirable constituents?
☐ Yes ☒ No If yes, submit "REPORT OF UNDESIRABLE WATER"
Type of water? Depth of strata
Was a chemical analysis made? ☐ Yes ☐ No

12) **PACKERS:**

	Type	Depth
BENTONITE PELLETS	3/8	23.0-21.0

I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief. I understand that failure to complete items 1 thru 15 will result in the log(s) being returned for completion and resubmittal.

COMPANY NAME FSI INC (Type or print) **WELL DRILLER'S LICENSE NO.** 4694-M

ADDRESS 810 SPID (Street or RFD) CORPUS CHRISTI (City) TX (State) 78416 (Zip)

(Signed) Craig (Licensed Well Driller) (Signed) (Registered Driller Trainee)

M-27

Please attach electric log, chemical analysis, and other pertinent information, if available.

Send original copy by certified return receipt requested mail to: **TNRCC, MC 177, P.O. Box 13087, Austin, TX 78711-3087**

ATTENTION OWNER: *Confidentiality Privilege Notice on on reverse side*
Well Owner's copy (pink)

State of Texas
WELL REPORT

Texas Water Well Drillers Advisory Council
MC 177
P.O. Box 13087
Austin, TX 78711-3087
512-239-0530

1) **OWNER** City of Kingsville (Name) **ADDRESS** PO Box 1458 (Street or RFD) Kingsville (City) TX (State) 78363 (Zip)

2) **ADDRESS OF WELL:** County Kleberg Kingsville Landfill (Street, RFD or other) Kingsville (City) TX (State) (Zip) **GRID #** 83-34-4

3) **TYPE OF WORK (Check):**
☑ New Well ☐ Deepening
☐ Reconditioning ☐ Plugging

4) **PROPOSED USE (Check):** ☑ Monitor ☐ Environmental Soil Boring ☐ Domestic
☐ Industrial ☐ Irrigation ☐ Injection ☐ Public Supply ☐ De-watering ☐ Testwell
If Public Supply well, were plans submitted to the TNRCC? ☐ Yes ☐ No

5) MW-15
(58-15)

N↑

6) **WELL LOG:**
Date Drilling:
Started 7-8 19 97
Completed 7-8 19 97

DIAMETER OF HOLE

Dia. (in.)	From (ft.)	To (ft.)
10.0	Surface	37.0

7) **DRILLING METHOD (Check):** ☐ Driven
☐ Air Rotary ☐ Mud Rotary ☑ Bored
☐ Air Hammer ☐ Cable Tool ☐ Jetted
☐ Other ______

From (ft.)	To (ft.)	Description and color of formation material
		See attached logs

(Use reverse side of Well Owner's copy, if necessary)

8) **Borehole Completion (Check):** ☐ Open Hole ☐ Straight Wall
☐ Underreamed ☐ Gravel Packed ☑ Other 16/30 silica
If Gravel Packed give interval ... from 33.0 ft. to 21.0 ft.

CASING, BLANK PIPE, AND WELL SCREEN DATA:

Dia. (in.)	New or Used	Steel, Plastic, etc. Perf., Slotted, etc. Screen Mfg., if commercial	Setting (ft.) From	Setting (ft.) To	Gage Casting Screen
4	N	PVC Screen Mfg.	33.0	23.0	.010
		TRI-LOC			
4	N	PVC Riser	23.0	+2.5	

9) **CEMENTING DATA** [Rule 338.44(1)]
Cemented from 19.0 ft. to 0.0 ft. No. of sacks used 5.0
________ ft. to ________ ft. No. of sacks used ________
Method used ________
Cemented by PSI INC
Distance to septic system field lines or other concentrated contamination ____ ft.
Method of verification of above distance ________

10) **SURFACE COMPLETION**
☑ Specified Surface Slab Installed [Rule 338.44(2)(A)]
☐ Specified Steel Sleeve Installed [Rule 338.44(3)(A)]
☐ Pitless Adapter Used [Rule 338.44(3)(b)]
☐ Approved Alternative Procedure Used [Rule 338.71]

11) **WATER LEVEL:** N/A
Static level ________ ft. below land surface Date ________
Artesian flow ________ gpm. Date ________

12) **PACKERS:**

	Type	Depth
Bentonite pellets	1/2"	21.0-19.0

13) **TYPE PUMP:** N/A
☐ Turbine ☐ Jet ☐ Submersible ☐ Cylinder
☐ Other ________
Depth to pump bowls, cylinder, jet, etc., ________ ft.

14) **WELL TESTS:** N/A
Type test: ☐ Pump ☐ Bailer ☐ Jetted ☐ Estimated
Yield: ________ gpm with ________ ft. drawdown after ________ hrs.

15) **WATER QUALITY:**
Did you knowingly penetrate any strata which contained undesirable constituents?
☐ Yes ☑ No If yes, submit "REPORT OF UNDESIRABLE WATER"
Type of water? ________ Depth of strata ________
Was a chemical analysis made? ☐ Yes ☐ No

I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief. I understand that failure to complete items 1 thru 15 will result in the log(s) being returned for completion and resubmittal.

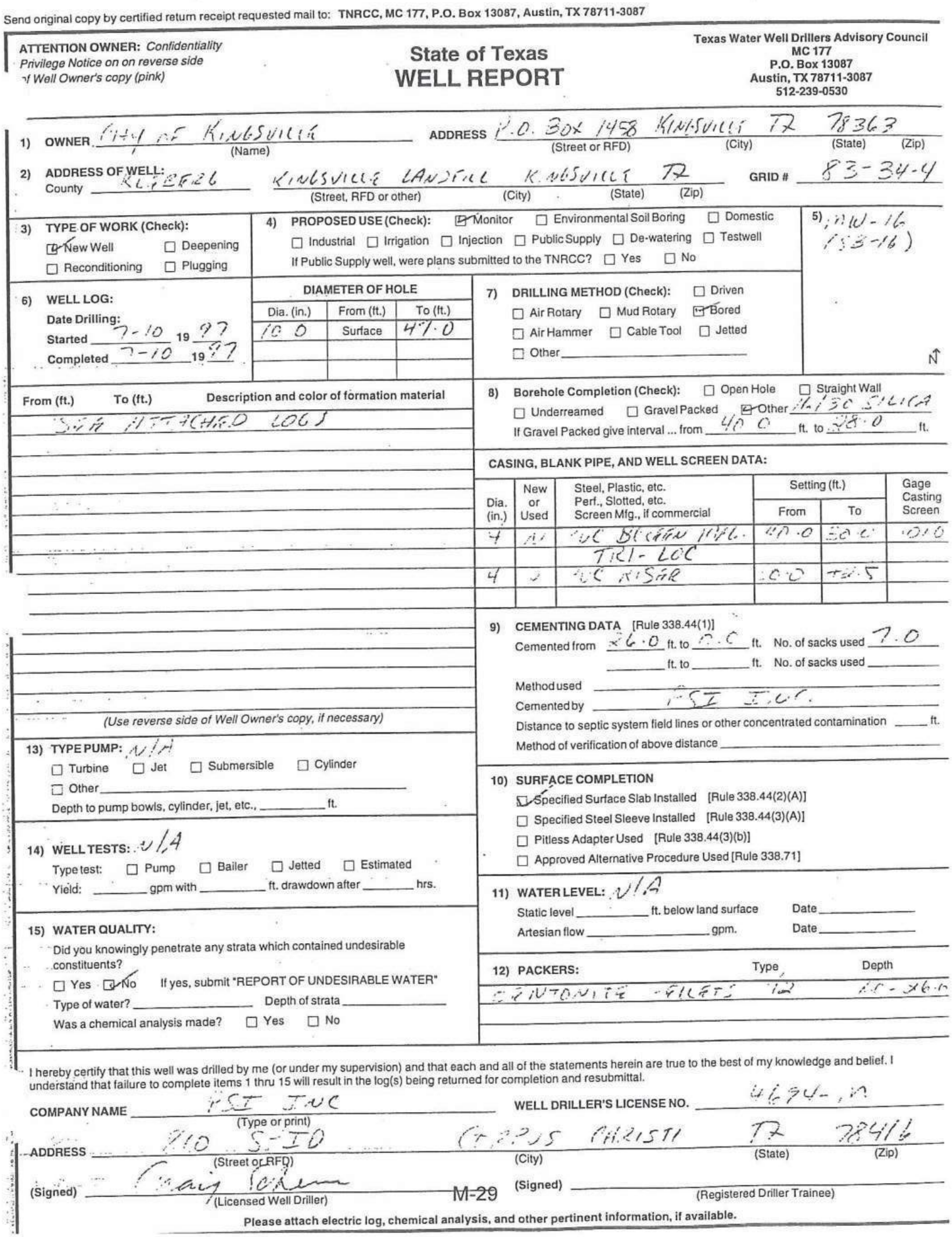
COMPANY NAME PSI INC (Type or print) **WELL DRILLER'S LICENSE NO.** 4654-M

ADDRESS 810 ... S.P.I.D. (Street or RFD) Corpus Christi (City) TX (State) 78411 (Zip)

(Signed) Craig (Licensed Well Driller) (Signed) ________ (Registered Driller Trainee)

M-28

Please attach electric log, chemical analysis, and other pertinent information, if available.



Send original copy by certified return receipt requested mail to: **TNRCC, MC 177, P.O. Box 13087, Austin, TX 78711-3087**

ATTENTION OWNER: *Confidentiality Privilege Notice on on reverse side of Well Owner's copy (pink)*

State of Texas
WELL REPORT

Texas Water Well Drillers Advisory Council
MC 177
P.O. Box 13087
Austin, TX 78711-3087
512-239-0530

1) **OWNER** City of Kingsville (Name) **ADDRESS** P.O. Box 1458 (Street or RFD) Kingsville (City) TX (State) 78363 (Zip)

2) **ADDRESS OF WELL:** County Kleberg Kingsville Landfill (Street, RFD or other) Kingsville (City) TX (State) (Zip) **GRID #** 83-34-4

3) **TYPE OF WORK (Check):** ☑ New Well ☐ Deepening ☐ Reconditioning ☐ Plugging

4) **PROPOSED USE (Check):** ☑ Monitor ☐ Environmental Soil Boring ☐ Domestic ☐ Industrial ☐ Irrigation ☐ Injection ☐ Public Supply ☐ De-watering ☐ Testwell
If Public Supply well, were plans submitted to the TNRCC? ☐ Yes ☐ No

5) MW-16 (SB-16)

N↑

6) **WELL LOG:**
Date Drilling:
Started 7-10 19 97
Completed 7-10 19 97

DIAMETER OF HOLE

Dia. (in.)	From (ft.)	To (ft.)
10.0	Surface	47.0

7) **DRILLING METHOD (Check):** ☐ Driven ☐ Air Rotary ☐ Mud Rotary ☑ Bored ☐ Air Hammer ☐ Cable Tool ☐ Jetted ☐ Other

From (ft.)	To (ft.)	Description and color of formation material
		See Attached Logs

(Use reverse side of Well Owner's copy, if necessary)

8) **Borehole Completion (Check):** ☐ Open Hole ☐ Straight Wall ☐ Underreamed ☐ Gravel Packed ☑ Other 16/30 Silica
If Gravel Packed give interval ... from 40.0 ft. to 28.0 ft.

CASING, BLANK PIPE, AND WELL SCREEN DATA:

Dia. (in.)	New or Used	Steel, Plastic, etc. Perf., Slotted, etc. Screen Mfg., if commercial	Setting (ft.)		Gage Casting Screen
			From	To	
4	N	PVC Screen Mfg.	40.0	30.0	.010
		TRI-LOC			
4	N	PVC Riser	30.0	+2.5	

9) **CEMENTING DATA** [Rule 338.44(1)]
Cemented from 26.0 ft. to 0.0 ft. No. of sacks used 7.0
ft. to ft. No. of sacks used
Method used
Cemented by PSI Inc.
Distance to septic system field lines or other concentrated contamination ft.
Method of verification of above distance

10) **SURFACE COMPLETION**
☑ Specified Surface Slab Installed [Rule 338.44(2)(A)]
☐ Specified Steel Sleeve Installed [Rule 338.44(3)(A)]
☐ Pitless Adapter Used [Rule 338.44(3)(b)]
☐ Approved Alternative Procedure Used [Rule 338.71]

11) **WATER LEVEL:** N/A
Static level ft. below land surface Date
Artesian flow gpm. Date

12) **PACKERS:**

	Type	Depth
Bentonite Pellets	1/2	28.0 - 26.0

13) **TYPE PUMP:** N/A
☐ Turbine ☐ Jet ☐ Submersible ☐ Cylinder
☐ Other
Depth to pump bowls, cylinder, jet, etc., ft.

14) **WELL TESTS:** N/A
Type test: ☐ Pump ☐ Bailer ☐ Jetted ☐ Estimated
Yield: gpm with ft. drawdown after hrs.

15) **WATER QUALITY:**
Did you knowingly penetrate any strata which contained undesirable constituents?
☐ Yes ☑ No If yes, submit "REPORT OF UNDESIRABLE WATER"
Type of water? Depth of strata
Was a chemical analysis made? ☐ Yes ☐ No

I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief. I understand that failure to complete items 1 thru 15 will result in the log(s) being returned for completion and resubmittal.

COMPANY NAME PSI Inc (Type or print) **WELL DRILLER'S LICENSE NO.** 4694-M

ADDRESS 910 S. ID (Street or RFD) Corpus Christi (City) TX (State) 78416 (Zip)

(Signed) Craig (Licensed Well Driller) **(Signed)** (Registered Driller Trainee)

M-29

Please attach electric log, chemical analysis, and other pertinent information, if available.

Send original copy by certified return receipt requested mail to: **TNRCC, MC 177, P.O. Box 13087, Austin, TX 78711-3087**

ATTENTION OWNER: *Confidentiality Privilege Notice on on reverse side*
Well Owner's copy (pink)

State of Texas
WELL REPORT

Texas Water Well Drillers Advisory Council
MC 177
P.O. Box 13087
Austin, TX 78711-3087
512-239-0530

1) **OWNER** CITY OF KINGSVILLE (Name) **ADDRESS** P.O. BOX 1458 (Street or RFD) KINGSVILLE (City) TX (State) 78363 (Zip)

2) **ADDRESS OF WELL:** County KLEBERG KINGSVILLE LANDFILL (Street, RFD or other) KINGSVILLE (City) TX (State) (Zip) **GRID #** 83-34-4

3) **TYPE OF WORK (Check):**
☑ New Well ☐ Deepening
☐ Reconditioning ☐ Plugging

4) **PROPOSED USE (Check):** ☑ Monitor ☐ Environmental Soil Boring ☐ Domestic
☐ Industrial ☐ Irrigation ☐ Injection ☐ Public Supply ☐ De-watering ☐ Testwell
If Public Supply well, were plans submitted to the TNRCC? ☐ Yes ☐ No

5) MW-17
(SB-17)

N↑

6) **WELL LOG:**
Date Drilling:
Started 7-9 19 97
Completed 7-9 19 97

DIAMETER OF HOLE

Dia. (in.)	From (ft.)	To (ft.)
8.0	Surface	33.0

7) **DRILLING METHOD (Check):** ☐ Driven
☐ Air Rotary ☐ Mud Rotary ☑ Bored
☐ Air Hammer ☐ Cable Tool ☐ Jetted
☐ Other

From (ft.)	To (ft.)	Description and color of formation material
SEE ATTACHED LOGS		

(Use reverse side of Well Owner's copy, if necessary)

8) **Borehole Completion (Check):** ☐ Open Hole ☐ Straight Wall
☐ Underreamed ☐ Gravel Packed ☑ Other 16/30 SILICA
If Gravel Packed give interval ... from 33.0 ft. to 10.0 ft.

CASING, BLANK PIPE, AND WELL SCREEN DATA:

Dia. (in.)	New or Used	Steel, Plastic, etc. Perf., Slotted, etc. Screen Mfg., if commercial	Setting (ft.)		Gage Casting Screen
			From	To	
2	N	PVC SCREEN	33.0	13.0	.010
		MFG. TRI-LOC			
2	N	PVC RISER	13.0	+2.0	

9) **CEMENTING DATA** [Rule 338.44(1)]
Cemented from 8.0 ft. to 0.0 ft. No. of sacks used 1.0
ft. to ft. No. of sacks used
Method used
Cemented by PSI INC
Distance to septic system field lines or other concentrated contamination ft.
Method of verification of above distance

10) **SURFACE COMPLETION**
☑ Specified Surface Slab Installed [Rule 338.44(2)(A)]
☐ Specified Steel Sleeve Installed [Rule 338.44(3)(A)]
☐ Pitless Adapter Used [Rule 338.44(3)(b)]
☐ Approved Alternative Procedure Used [Rule 338.71]

11) **WATER LEVEL:** N/A
Static level ft. below land surface Date
Artesian flow gpm. Date

12) **PACKERS:**

	Type	Depth
BENTONITE PELLETS	B	10.0-8.0

13) **TYPE PUMP:** N/A
☐ Turbine ☐ Jet ☐ Submersible ☐ Cylinder
☐ Other
Depth to pump bowls, cylinder, jet, etc., ft.

14) **WELL TESTS:** N/A
Type test: ☐ Pump ☐ Bailer ☐ Jetted ☐ Estimated
Yield: gpm with ft. drawdown after hrs.

15) **WATER QUALITY:**
Did you knowingly penetrate any strata which contained undesirable constituents?
☐ Yes ☑ No If yes, submit "REPORT OF UNDESIRABLE WATER"
Type of water? Depth of strata
Was a chemical analysis made? ☐ Yes ☐ No

I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief. I nderstand that failure to complete items 1 thru 15 will result in the log(s) being returned for completion and resubmittal.

COMPANY NAME PSI INC (Type or print) **WELL DRILLER'S LICENSE NO.** 4694-M

ADDRESS 810 SPID (Street or RFD) CORPUS CHRISTI (City) TX (State) 78416 (Zip)

(Signed) (Licensed Well Driller) M-30 (Signed) (Registered Driller Trainee)

Please attach electric log, chemical analysis, and other pertinent information, if available.

Send original copy by certified return receipt requested mail to: **TNRCC, MC 177, P.O. Box 13087, Austin, TX 78711-3087**

ATTENTION OWNER: *Confidentiality Privilege Notice on on reverse side of Well Owner's copy (pink)*

State of Texas
WELL REPORT

Texas Water Well Drillers Advisory Council
MC 177
P.O. Box 13087
Austin, TX 78711-3087
512-239-0530

1) **OWNER** CITY OF KINGSVILLE (Name) **ADDRESS** P.O. BOX 1458 (Street or RFD) KINGSVILLE (City) TX (State) 78363 (Zip)

2) **ADDRESS OF WELL:** County KLEBERG KINGSVILLE LANDFILL (Street, RFD or other) KINGSVILLE (City) TX (State) (Zip) **GRID #** 83-34-4

3) **TYPE OF WORK (Check):**
☑ New Well ☐ Deepening
☐ Reconditioning ☐ Plugging

4) **PROPOSED USE (Check):** ☑ Monitor ☐ Environmental Soil Boring ☐ Domestic
☐ Industrial ☐ Irrigation ☐ Injection ☐ Public Supply ☐ De-watering ☐ Testwell
If Public Supply well, were plans submitted to the TNRCC? ☐ Yes ☐ No

5) MW-18 (SB-18)

N↑

6) **WELL LOG:**
Date Drilling:
Started 7-9 19 97
Completed 7-9 19 97

DIAMETER OF HOLE

Dia. (in.)	From (ft.)	To (ft.)
8.0	Surface	42.0

7) **DRILLING METHOD (Check):** ☐ Driven
☐ Air Rotary ☐ Mud Rotary ☑ Bored
☐ Air Hammer ☐ Cable Tool ☐ Jetted
☐ Other ______

From (ft.)	To (ft.)	Description and color of formation material
SEE ATTACHED LOGS		

(Use reverse side of Well Owner's copy, if necessary)

8) **Borehole Completion (Check):** ☐ Open Hole ☐ Straight Wall
☐ Underreamed ☐ Gravel Packed ☑ Other 16/30 SILICA
If Gravel Packed give interval ... from 42.0 ft. to 19.0 ft.

CASING, BLANK PIPE, AND WELL SCREEN DATA:

Dia. (in.)	New or Used	Steel, Plastic, etc. Perf., Slotted, etc. Screen Mfg., if commercial	Setting (ft.)		Gage Casting Screen
			From	To	
2	N	PVC SCREEN	42.0	22.0	.010
		MFG. TRI-LOC			
2	N	PVC RISER			

9) **CEMENTING DATA** [Rule 338.44(1)]
Cemented from 17.0 ft. to 3.0 ft. No. of sacks used 3.0
______ ft. to ______ ft. No. of sacks used ______
Method used ______
Cemented by PSI INC
Distance to septic system field lines or other concentrated contamination ____ ft.
Method of verification of above distance ______

10) **SURFACE COMPLETION**
☑ Specified Surface Slab Installed [Rule 338.44(2)(A)]
☐ Specified Steel Sleeve Installed [Rule 338.44(3)(A)]
☐ Pitless Adapter Used [Rule 338.44(3)(b)]
☐ Approved Alternative Procedure Used [Rule 338.71]

11) **WATER LEVEL:** N/A
Static level ______ ft. below land surface Date ______
Artesian flow ______ gpm. Date ______

12) **PACKERS:**

	Type	Depth
BENTONITE PELLETS	1/2"	19.0-17.0

13) **TYPE PUMP:** N/A
☐ Turbine ☐ Jet ☐ Submersible ☐ Cylinder
☐ Other ______
Depth to pump bowls, cylinder, jet, etc., ______ ft.

14) **WELL TESTS:** N/A
Type test: ☐ Pump ☐ Bailer ☐ Jetted ☐ Estimated
Yield: ______ gpm with ______ ft. drawdown after ______ hrs.

15) **WATER QUALITY:**
Did you knowingly penetrate any strata which contained undesirable constituents?
☐ Yes ☑ No If yes, submit "REPORT OF UNDESIRABLE WATER"
Type of water? ______ Depth of strata ______
Was a chemical analysis made? ☐ Yes ☐ No

I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief. I understand that failure to complete items 1 thru 15 will result in the log(s) being returned for completion and resubmittal.

COMPANY NAME PSI INC (Type or print) **WELL DRILLER'S LICENSE NO.** 4694-M

ADDRESS 810 SPID (Street or RFD) CORPUS CHRISTI (City) TX (State) 78416 (Zip)

(Signed) Craig Sch (Licensed Well Driller) M-31 (Signed) ______ (Registered Driller Trainee)

Please attach electric log, chemical analysis, and other pertinent information, if available.

Send original copy by certified return receipt requested mail to: **TNRCC, MC 177, P.O. Box 13087, Austin, TX 78711-3087**

ATTENTION OWNER: *Confidentiality Privilege Notice on on reverse side of Well Owner's copy (pink)*

State of Texas
WELL REPORT

Texas Water Well Drillers Advisory Council
MC 177
P.O. Box 13087
Austin, TX 78711-3087
512-239-0530

1) **OWNER** City of Kingsville (Name) **ADDRESS** P.O. Box 1458 (Street or RFD) Kingsville (City) Texas (State) 78363 (Zip)

2) **ADDRESS OF WELL:** County Kleberg Kingsville Landfill (Street, RFD or other) Kingsville (City) Texas (State) (Zip) **GRID #** 83-34-4

3) **TYPE OF WORK (Check):**
☒ New Well ☐ Deepening
☐ Reconditioning ☒ Plugging

4) **PROPOSED USE (Check):** ☐ Monitor ☒ Environmental Soil Boring ☐ Domestic ☐ Industrial ☐ Irrigation ☐ Injection ☐ Public Supply ☐ De-watering ☐ Testwell
If Public Supply well, were plans submitted to the TNRCC? ☐ Yes ☐ No

5)

N↑

6) **WELL LOG:**
Date Drilling:
Started 4-27 19 98
Completed 4-27 19 98

DIAMETER OF HOLE

Dia. (in.)	From (ft.)	To (ft.)
6.0	Surface	84.0

7) **DRILLING METHOD (Check):** ☐ Driven ☐ Air Rotary ☐ Mud Rotary ☒ Bored ☐ Air Hammer ☐ Cable Tool ☐ Jetted ☐ Other ______

From (ft.)	To (ft.)	Description and color of formation material
see attached log		MW-21

(Use reverse side of Well Owner's copy, if necessary)

8) **Borehole Completion (Check):** ☐ Open Hole ☐ Straight Wall ☐ Underreamed ☐ Gravel Packed ☒ Other grout
If Gravel Packed give interval ... from ______ ft. to ______ ft.

CASING, BLANK PIPE, AND WELL SCREEN DATA: N/A

Dia. (in.)	New or Used	Steel, Plastic, etc. Perf., Slotted, etc. Screen Mfg., if commercial	Setting (ft.)		Gage Casting Screen
			From	To	

9) **CEMENTING DATA** [Rule 338.44(1)]
Cemented from 84.0 ft. to 0.0 ft. No. of sacks used 12.5
______ ft. to ______ ft. No. of sacks used ______
Method used mixed with 5% bentonite
Cemented by PSI Inc.
Distance to septic system field lines or other concentrated contamination ____ ft.
Method of verification of above distance ______

10) **SURFACE COMPLETION** N/A
☐ Specified Surface Slab Installed [Rule 338.44(2)(A)]
☐ Specified Steel Sleeve Installed [Rule 338.44(3)(A)]
☐ Pitless Adapter Used [Rule 338.44(3)(b)]
☐ Approved Alternative Procedure Used [Rule 338.71]

11) **WATER LEVEL:** N/AS
Static level ______ ft. below land surface Date ______
Artesian flow ______ gpm. Date ______

12) **PACKERS:** N/A

	Type	Depth

13) **TYPE PUMP:** N/A
☐ Turbine ☐ Jet ☐ Submersible ☐ Cylinder
☐ Other ______
Depth to pump bowls, cylinder, jet, etc., ______ ft.

14) **WELL TESTS:** N/A
Type test: ☐ Pump ☐ Bailer ☐ Jetted ☐ Estimated
Yield: ______ gpm with ______ ft. drawdown after ______ hrs.

15) **WATER QUALITY:**
Did you knowingly penetrate any strata which contained undesirable constituents?
☐ Yes ☒ No If yes, submit "REPORT OF UNDESIRABLE WATER"
Type of water? ______ Depth of strata ______
Was a chemical analysis made? ☐ Yes ☐ No

I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief. I understand that failure to complete items 1 thru 15 will result in the log(s) being returned for completion and resubmittal.

COMPANY NAME PSI Inc. (Type or print) **WELL DRILLER'S LICENSE NO.** -694-M

ADDRESS 810 SPID (Street or ~~RFD~~) Corpus Christi (City) Texas (State) 78416 (Zip)

(Signed) ______ (Licensed Well Driller) **(Signed)** ______ (Registered Driller Trainee)

M-32

Please attach electric log, chemical analysis, and other pertinent information, if available.

Send original copy by certified return receipt requested mail to: **TNRCC, MC 177, P.O. Box 13087, Austin, TX 78711-3087**

ATTENTION OWNER: *Confidentiality Privilege Notice on on reverse side of Well Owner's copy (pink)*

State of Texas
WELL REPORT

Texas Water Well Drillers Advisory Council
MC 177
P.O. Box 13087
Austin, TX 78711-3087
512-239-0530

1) **OWNER** Kingsville City of (Name) **ADDRESS** P.O. Box 1458 Kingsville Texas 78363 (Street or RFD) (City) (State) (Zip)

2) **ADDRESS OF WELL:** County Kleberg Kingsville Landfill Kingsville Texas (Street, RFD or other) (City) (State) (Zip) **GRID #** 83-34-4

3) **TYPE OF WORK (Check):**
☒ New Well ☐ Deepening
☐ Reconditioning ☒ Plugging

4) **PROPOSED USE (Check):** ☐ Monitor ☒ Environmental Soil Boring ☐ Domestic
☐ Industrial ☐ Irrigation ☐ Injection ☐ Public Supply ☐ De-watering ☐ Testwell
If Public Supply well, were plans submitted to the TNRCC? ☐ Yes ☐ No

5)

N↑

6) **WELL LOG:**
Date Drilling:
Started 4-24 19 98
Completed 4-24 19 98

DIAMETER OF HOLE

Dia. (in.)	From (ft.)	To (ft.)
6.0	Surface	86.0

7) **DRILLING METHOD (Check):** ☐ Driven
☐ Air Rotary ☐ Mud Rotary ☒ Bored
☐ Air Hammer ☐ Cable Tool ☐ Jetted
☐ Other ______

From (ft.)	To (ft.)	Description and color of formation material
see attached log Mw-23		

(Use reverse side of Well Owner's copy, if necessary)

8) **Borehole Completion (Check):** ☐ Open Hole ☐ Straight Wall
☐ Underreamed ☐ Gravel Packed ☒ Other grout
If Gravel Packed give interval ... from ______ ft. to ______ ft.

CASING, BLANK PIPE, AND WELL SCREEN DATA: N/A

Dia. (in.)	New or Used	Steel, Plastic, etc. Perf., Slotted, etc. Screen Mfg., if commercial	Setting (ft.) From	Setting (ft.) To	Gage Casting Screen

9) **CEMENTING DATA** [Rule 338.44(1)]
Cemented from 86.0 ft. to 0.0 ft. No. of sacks used 12.5
______ ft. to ______ ft. No. of sacks used ______
Method used mixed with 5% bentonite
Cemented by PSI Inc.
Distance to septic system field lines or other concentrated contamination ______ ft.
Method of verification of above distance ______

10) **SURFACE COMPLETION** N/A
☐ Specified Surface Slab Installed [Rule 338.44(2)(A)]
☐ Specified Steel Sleeve Installed [Rule 338.44(3)(A)]
☐ Pitless Adapter Used [Rule 338.44(3)(b)]
☐ Approved Alternative Procedure Used [Rule 338.71]

11) **WATER LEVEL:** N/A
Static level ______ ft. below land surface Date ______
Artesian flow ______ gpm. Date ______

12) **PACKERS:** N/A Type Depth

13) **TYPE PUMP:** N/A
☐ Turbine ☐ Jet ☐ Submersible ☐ Cylinder
☐ Other ______
Depth to pump bowls, cylinder, jet, etc., ______ ft.

14) **WELL TESTS:** N/A
Type test: ☐ Pump ☐ Bailer ☐ Jetted ☐ Estimated
Yield: ______ gpm with ______ ft. drawdown after ______ hrs.

15) **WATER QUALITY:**
Did you knowingly penetrate any strata which contained undesirable constituents?
☐ Yes ☒ No If yes, submit "REPORT OF UNDESIRABLE WATER"
Type of water? ______ Depth of strata ______
Was a chemical analysis made? ☐ Yes ☐ No

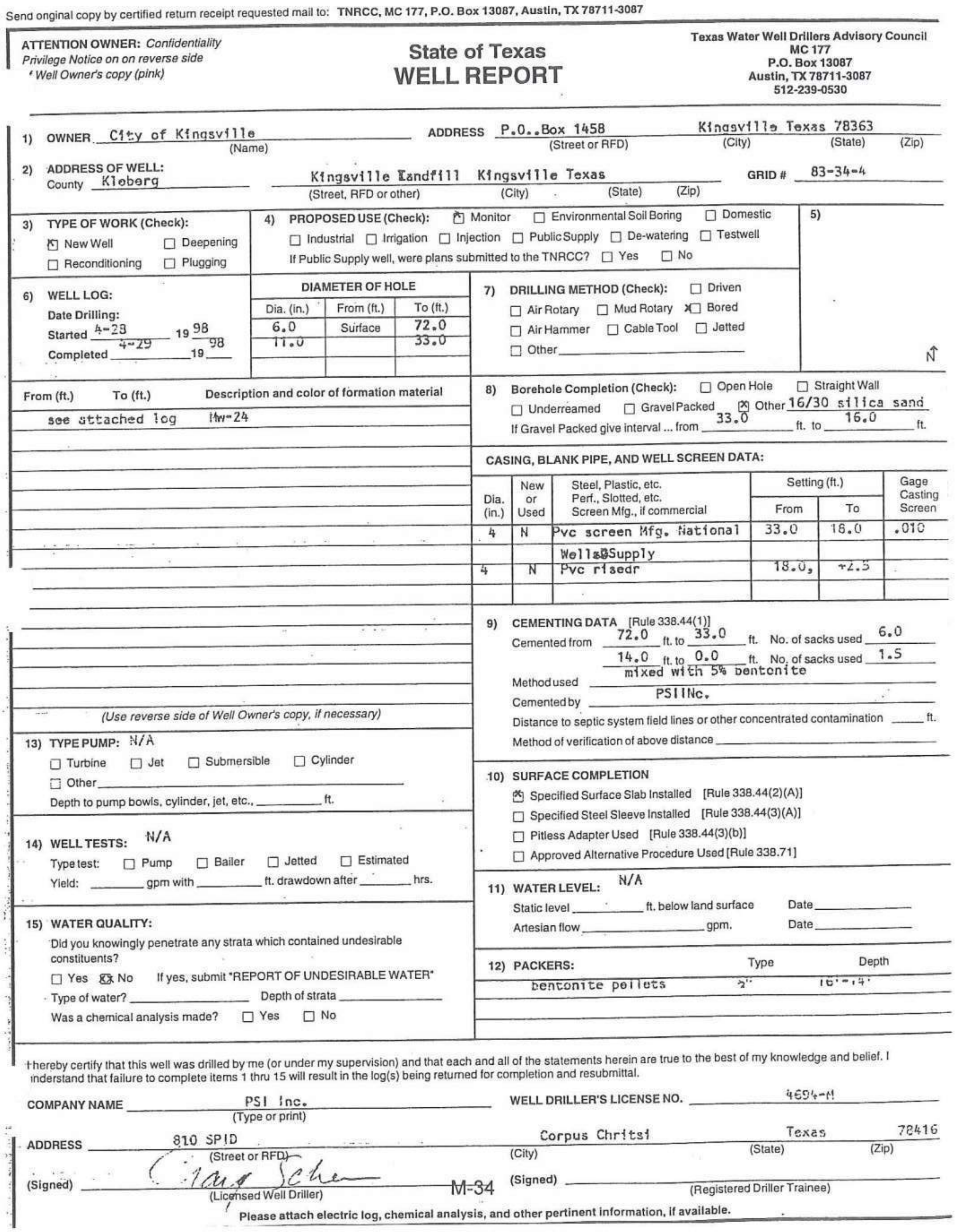
I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief. I understand that failure to complete items 1 thru 15 will result in the log(s) being returned for completion and resubmittal.

COMPANY NAME PSI INc. (Type or print) **WELL DRILLER'S LICENSE NO.** 4694-M

ADDRESS 810 SPID (Street or RFD) Corpus Christi (City) Texas (State) 78416 (Zip)

(Signed) ______ (Licensed Well Driller) M-33 (Signed) ______ (Registered Driller Trainee)

Please attach electric log, chemical analysis, and other pertinent information, if available.



Send original copy by certified return receipt requested mail to: **TNRCC, MC 177, P.O. Box 13087, Austin, TX 78711-3087**

ATTENTION OWNER: *Confidentiality Privilege Notice on on reverse side*
Well Owner's copy (pink)

State of Texas
WELL REPORT

Texas Water Well Drillers Advisory Council
MC 177
P.O. Box 13087
Austin, TX 78711-3087
512-239-0530

1) **OWNER** City of Kingsville (Name) **ADDRESS** P.O..Box 1458 (Street or RFD) Kingsville (City) Texas (State) 78363 (Zip)

2) **ADDRESS OF WELL:** County Kleberg Kingsville Landfill (Street, RFD or other) Kingsville (City) Texas (State) (Zip) **GRID #** 83-34-4

3) **TYPE OF WORK (Check):** ☒ New Well ☐ Deepening ☐ Reconditioning ☐ Plugging

4) **PROPOSED USE (Check):** ☒ Monitor ☐ Environmental Soil Boring ☐ Domestic ☐ Industrial ☐ Irrigation ☐ Injection ☐ Public Supply ☐ De-watering ☐ Testwell

If Public Supply well, were plans submitted to the TNRCC? ☐ Yes ☐ No

5)

6) **WELL LOG:**
Date Drilling:
Started 4-28 19 98
Completed 4-29 19 98

DIAMETER OF HOLE

Dia. (in.)	From (ft.)	To (ft.)
6.0	Surface	72.0
11.0		33.0

7) **DRILLING METHOD (Check):** ☐ Driven ☐ Air Rotary ☐ Mud Rotary ☒ Bored ☐ Air Hammer ☐ Cable Tool ☐ Jetted ☐ Other

From (ft.)	To (ft.)	Description and color of formation material
see attached log		Mw-24

(Use reverse side of Well Owner's copy, if necessary)

8) **Borehole Completion (Check):** ☐ Open Hole ☐ Straight Wall ☐ Underreamed ☐ Gravel Packed ☒ Other 16/30 silica sand

If Gravel Packed give interval ... from 33.0 ft. to 16.0 ft.

CASING, BLANK PIPE, AND WELL SCREEN DATA:

Dia. (in.)	New or Used	Steel, Plastic, etc. Perf., Slotted, etc. Screen Mfg., if commercial	Setting (ft.)		Gage Casting Screen
			From	To	
4	N	Pvc screen Mfg. National	33.0	16.0	.010
		Wells@Supply			
4	N	Pvc risedr	18.0,	+2.5	

9) **CEMENTING DATA** [Rule 338.44(1)]
Cemented from 72.0 ft. to 33.0 ft. No. of sacks used 6.0
14.0 ft. to 0.0 ft. No. of sacks used 1.5
Method used mixed with 5% bentonite
Cemented by PSIINc.
Distance to septic system field lines or other concentrated contamination ft.
Method of verification of above distance

10) **SURFACE COMPLETION**
☒ Specified Surface Slab Installed [Rule 338.44(2)(A)]
☐ Specified Steel Sleeve Installed [Rule 338.44(3)(A)]
☐ Pitless Adapter Used [Rule 338.44(3)(b)]
☐ Approved Alternative Procedure Used [Rule 338.71]

11) **WATER LEVEL:** N/A
Static level ft. below land surface Date
Artesian flow gpm. Date

12) **PACKERS:**

	Type	Depth
bentonite pellets	2"	16'-14'

13) **TYPE PUMP:** N/A
☐ Turbine ☐ Jet ☐ Submersible ☐ Cylinder
☐ Other
Depth to pump bowls, cylinder, jet, etc., ft.

14) **WELL TESTS:** N/A
Type test: ☐ Pump ☐ Bailer ☐ Jetted ☐ Estimated
Yield: gpm with ft. drawdown after hrs.

15) **WATER QUALITY:**
Did you knowingly penetrate any strata which contained undesirable constituents?
☐ Yes ☒ No If yes, submit "REPORT OF UNDESIRABLE WATER"
Type of water? Depth of strata
Was a chemical analysis made? ☐ Yes ☐ No

I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief. I understand that failure to complete items 1 thru 15 will result in the log(s) being returned for completion and resubmittal.

COMPANY NAME PSI Inc. (Type or print) **WELL DRILLER'S LICENSE NO.** 4694-M

ADDRESS 810 SPID (Street or RFD) Corpus Chritsi (City) Texas (State) 78416 (Zip)

(Signed) (Licensed Well Driller) M-34 **(Signed)** (Registered Driller Trainee)

Please attach electric log, chemical analysis, and other pertinent information, if available.

Send original copy by certified return receipt requested mail to: **TNRCC, MC 177, P.O. Box 13087, Austin, TX 78711-3087**

ATTENTION OWNER: *Confidentiality Privilege Notice on on reverse side of Well Owner's copy (pink)*

State of Texas
WELL REPORT

Texas Water Well Drillers Advisory Council
MC 177
P.O. Box 13087
Austin, TX 78711-3087
512-239-0530

1) **OWNER** City of Kingsville (Name) **ADDRESS** P.O. Box 1458 (Street or RFD) Kingsville (City) Texas (State) 78363 (Zip)

2) **ADDRESS OF WELL:** County Kleberg Kingsville Landfill (Street, RFD or other) Kingsville (City) Texas (State) (Zip) **GRID #** 83-34-4

3) **TYPE OF WORK (Check):**
☒ New Well ☐ Deepening
☐ Reconditioning ☒ Plugging

4) **PROPOSED USE (Check):** ☐ Monitor ☒ Environmental Soil Boring ☐ Domestic ☐ Industrial ☐ Irrigation ☐ Injection ☐ Public Supply ☐ De-watering ☐ Testwell
If Public Supply well, were plans submitted to the TNRCC? ☐ Yes ☐ No

5)

N↑

6) **WELL LOG:**
Date Drilling:
Started 4-29 19 98
Completed 4029 1998

DIAMETER OF HOLE

Dia. (in.)	From (ft.)	To (ft.)
6.0	Surface	86.0

7) **DRILLING METHOD (Check):** ☐ Driven ☐ Air Rotary ☐ Mud Rotary ☒ Bored ☐ Air Hammer ☐ Cable Tool ☐ Jetted ☐ Other

From (ft.)	To (ft.)	Description and color of formation material
see attached log		Mw-25

(Use reverse side of Well Owner's copy, if necessary)

8) **Borehole Completion (Check):** ☐ Open Hole ☐ Straight Wall ☐ Underreamed ☐ Gravel Packed ☒ Other grout
If Gravel Packed give interval ... from ft. to ft.

CASING, BLANK PIPE, AND WELL SCREEN DATA: N/A

Dia. (in.)	New or Used	Steel, Plastic, etc. Perf., Slotted, etc. Screen Mfg., if commercial	Setting (ft.) From	Setting (ft.) To	Gage Casting Screen

9) **CEMENTING DATA** [Rule 338.44(1)]
Cemented from 86.0 ft. to 0.0 ft. No. of sacks used 13.0
ft. to ft. No. of sacks used
Method used mixedwwith 5% bentonite
Cemented by PSI Inc.
Distance to septic system field lines or other concentrated contamination ft.
Method of verification of above distance

10) **SURFACE COMPLETION** N/A
☐ Specified Surface Slab Installed [Rule 338.44(2)(A)]
☐ Specified Steel Sleeve Installed [Rule 338.44(3)(A)]
☐ Pitless Adapter Used [Rule 338.44(3)(b)]
☐ Approved Alternative Procedure Used [Rule 338.71]

11) **WATER LEVEL:** N/A
Static level ft. below land surface Date
Artesian flow gpm. Date

12) **PACKERS:** N/A Type Depth

13) **TYPE PUMP:** N/A
☐ Turbine ☐ Jet ☐ Submersible ☐ Cylinder
☐ Other
Depth to pump bowls, cylinder, jet, etc., ft.

14) **WELL TESTS:** N/A
Type test: ☐ Pump ☐ Bailer ☐ Jetted ☐ Estimated
Yield: gpm with ft. drawdown after hrs.

15) **WATER QUALITY:**
Did you knowingly penetrate any strata which contained undesirable constituents?
☐ Yes ☒ No If yes, submit "REPORT OF UNDESIRABLE WATER"
Type of water? Depth of strata
Was a chemical analysis made? ☐ Yes ☐ No

I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief. I understand that failure to complete items 1 thru 15 will result in the log(s) being returned for completion and resubmittal.

COMPANY NAME PSI Inc. (Type or print) **WELL DRILLER'S LICENSE NO.** 4654-M

ADDRESS 610 SPID (Street or RFD) Corpus Christit (City) Texas (State) 78416 (Zip)

(Signed) (Licensed Well Driller) **(Signed)** (Registered Driller Trainee)

M-35

Please attach electric log, chemical analysis, and other pertinent information, if available.

Summary of Site Survey Data

City of Kingsville, Texas

Municipal Solid Waste Landfill, 235-B

Location Number	Designation	Top of PVC Elevation ft, MSL	Ground Surface ft, MSL	Total Depth of Boring ft, BGS	Bottom Elevation ft, MSL	Current Status	Stabilized GW Level ft, MSL	X-Distance UTM meters	Y-Distance UTM meters	X-Distance Coord. ft	Y-Distance Coord. ft
Benchmark	MW-12							2221994.103	646980.6224	0.104	1.5806
MW-1	MW	61.867	59.249	43	16.249	A	33.47	2220665.243	646999.5297	-1328.7561	20.4879
MW-2	MW					P&A					
MW-3	MW	59.173	56.096	37.5	18.596	A	35.27	2221265.118	647820.8196	-728.8815	841.7778
MW-4	MW	60.125	58.008	40	18.008	A	35.53	2221259.953	648317.7851	-734.046	1338.7433
MW-5	MW					P&A					
MW-6	MW	56.604	55.456	40	15.456	A	32.12	2220718.485	649721.5091	-1275.5146	2742.4673
MW-7	MW				0	P&A					
MW-8	MW	61.178	59.787	43	16.787	A	33.03	2219519.731	647166.5781	-2474.2682	187.5363
MW-9	MW				0	P&A					
MW-9R	MW	44.849	41.411	17	24.411	A	34.99	2219802.581	648511.0793	-2191.4181	1532.0375
MW-10	MW	52.684	49.78	29	20.78	A	34.42	2220240.82	648308.7984	-1753.1797	1329.7566
MW-11	MW	62.401	60.197	33	27.197	A	35.4	2220718.664	648494.0559	-1275.3351	1515.0141
MW-12	B/MW	54.879	52.375	48	4.375	A	32.78	2221993.999	646979.0418	0	0
MW-13	B/MW	62.096	59.131	50	9.131	A	32.83	2221973.889	648365.0778	-20.1103	1386.036
MW-14	B/MW	52.677	49.938	42	7.938	A	26.9	2221949.041	649712.8948	-44.9587	2733.853
MW-15	B/MW	51.624	48.386	37	11.386	A	32.97	2219474.512	649668.9772	-2519.487	2689.9354
MW-16	B/MW	58.839	55.958	47	8.958	A	34.02	2219497.15	648312.4767	-2496.8494	1333.4349
BP-17	B	43.868	41.345	33	8.345	A	34.87	2220139.183	648928.7974	-1854.8164	1949.7556
BP-18	B	52.438	50.039	42	8.039	A	33.72	2221252.488	648943.6517	-741.5117	1964.6099
BP-21	B		52.41	84	-31.59	A		2221237.99	649701.98		2722.9382
BP-23	B		49.5	86	-36.5	A		2219486.9	648937.78		1958.7382
BP-24	B/MW		47.38	72	-24.62	A		2221358.12	646971.06		-7.9818
BP-25	B		61.12	88	-26.88	A		2220722.02	648314.56		1335.5182
S/W Corner	0,0							2219514.47	646930.27	-2479.5292	-48.7718

M-36

Revision 1

Footnotes:

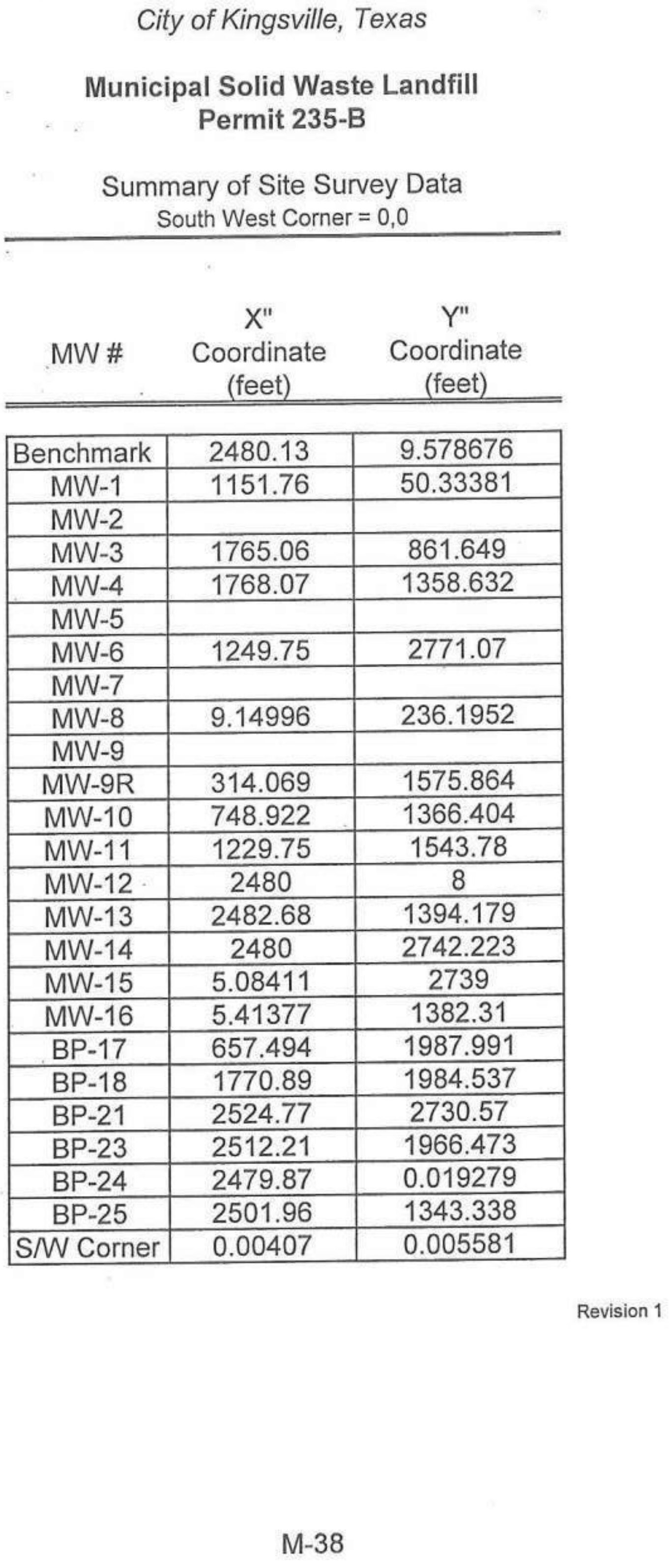
Soil Borings 1, 2, 3, 4, 5, & 6 completed by REI: 6-19-84 to 10-3-84
Soil Borings 7 & 8 completed by Martin Water Well: 7-31-91
Soil Borings 9 & 10 completed by JEDI: 3-20-92 to 3-24-92
Soil Borings 9R & 11 completed by PSI: 7-11-96
Soil Borings 12 through 18 completed by PSI: 7-7-97 to 7-28-97

The deepest excavation elevation is +8.37 feet NGVD

Coordinates for deep soil borings (B-21 - B-25) are currently being verified.

KEY:

A=Active
B=Boring
MW=Monitor Well
P&A=Plugged & Abandoned



City of Kingsville, Texas

Municipal Solid Waste Landfill
Permit 235-B

Summary of Site Survey Data
South West Corner = 0,0

MW #	X" Coordinate (feet)	Y" Coordinate (feet)
Benchmark	2480.13	9.578676
MW-1	1151.76	50.33381
MW-2		
MW-3	1765.06	861.649
MW-4	1768.07	1358.632
MW-5		
MW-6	1249.75	2771.07
MW-7		
MW-8	9.14996	236.1952
MW-9		
MW-9R	314.069	1575.864
MW-10	748.922	1366.404
MW-11	1229.75	1543.78
MW-12	2480	8
MW-13	2482.68	1394.179
MW-14	2480	2742.223
MW-15	5.08411	2739
MW-16	5.41377	1382.31
BP-17	657.494	1987.991
BP-18	1770.89	1984.537
BP-21	2524.77	2730.57
BP-23	2512.21	1966.473
BP-24	2479.87	0.019279
BP-25	2501.96	1343.338
S/W Corner	0.00407	0.005581

Revision 1

ATTACHMENT N

APPENDIX N

Local Ponding Study - Impact on Ground Water

RAY N. FINCH
30926

6-26-98

November 1997

THIS DOCUMENT IS ISSUED FOR PERMITTING PURPOSES ONLY, INCLUDES PAGES N-1 THROUGH N-2.

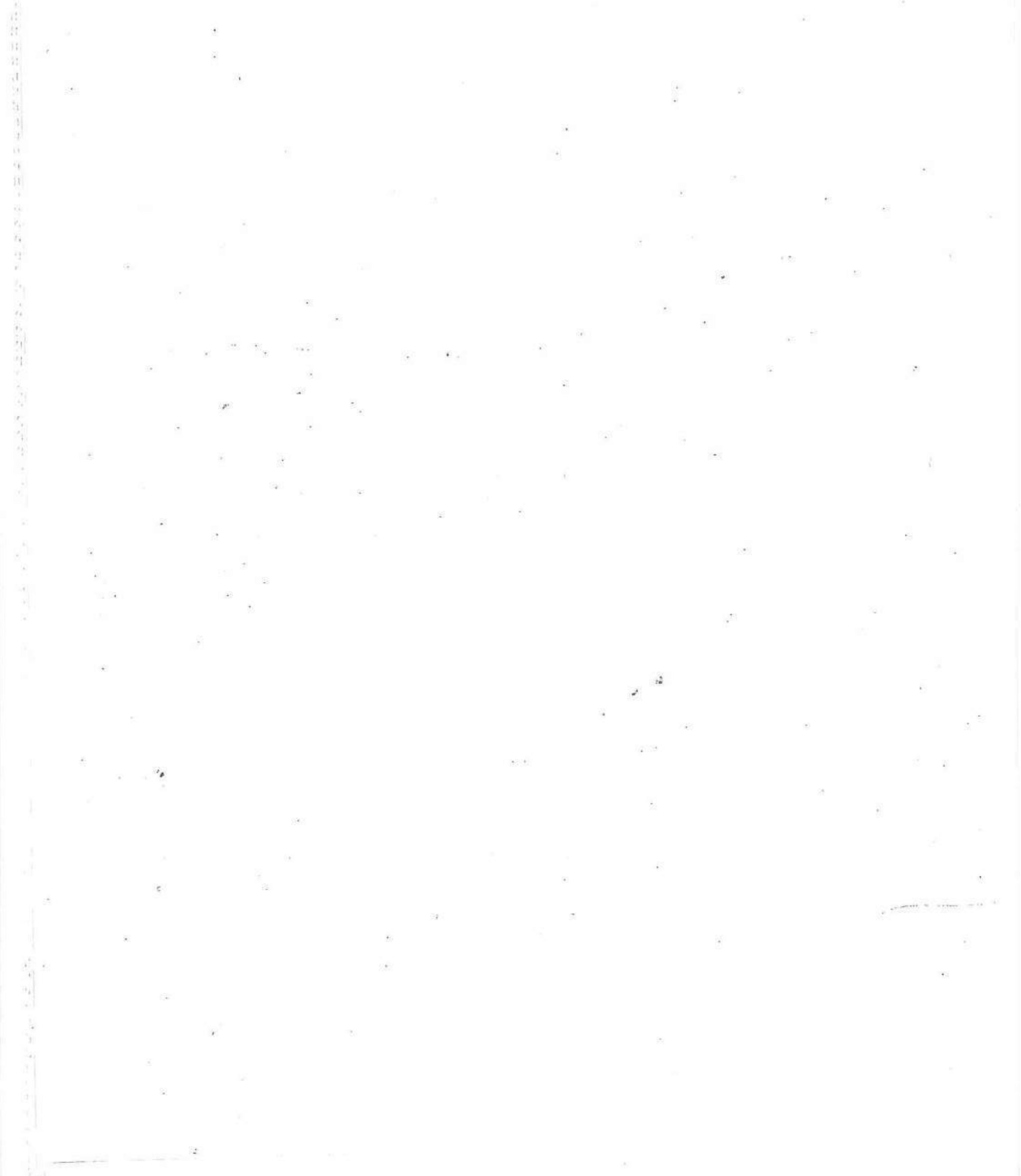


FIGURE 1
Topographical Map of the
COK MSWLF Area

REVISION 1
June 1998
N-1

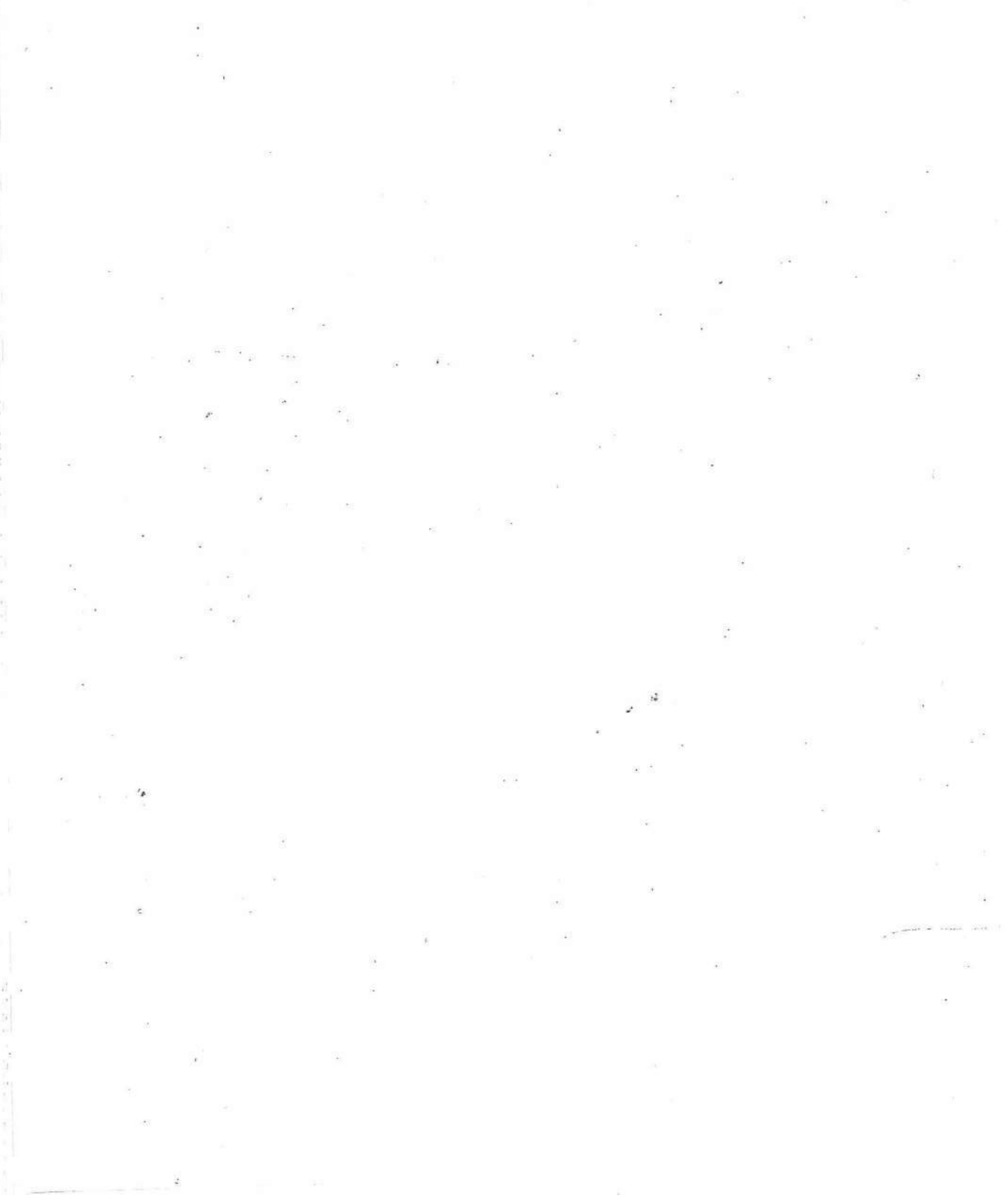
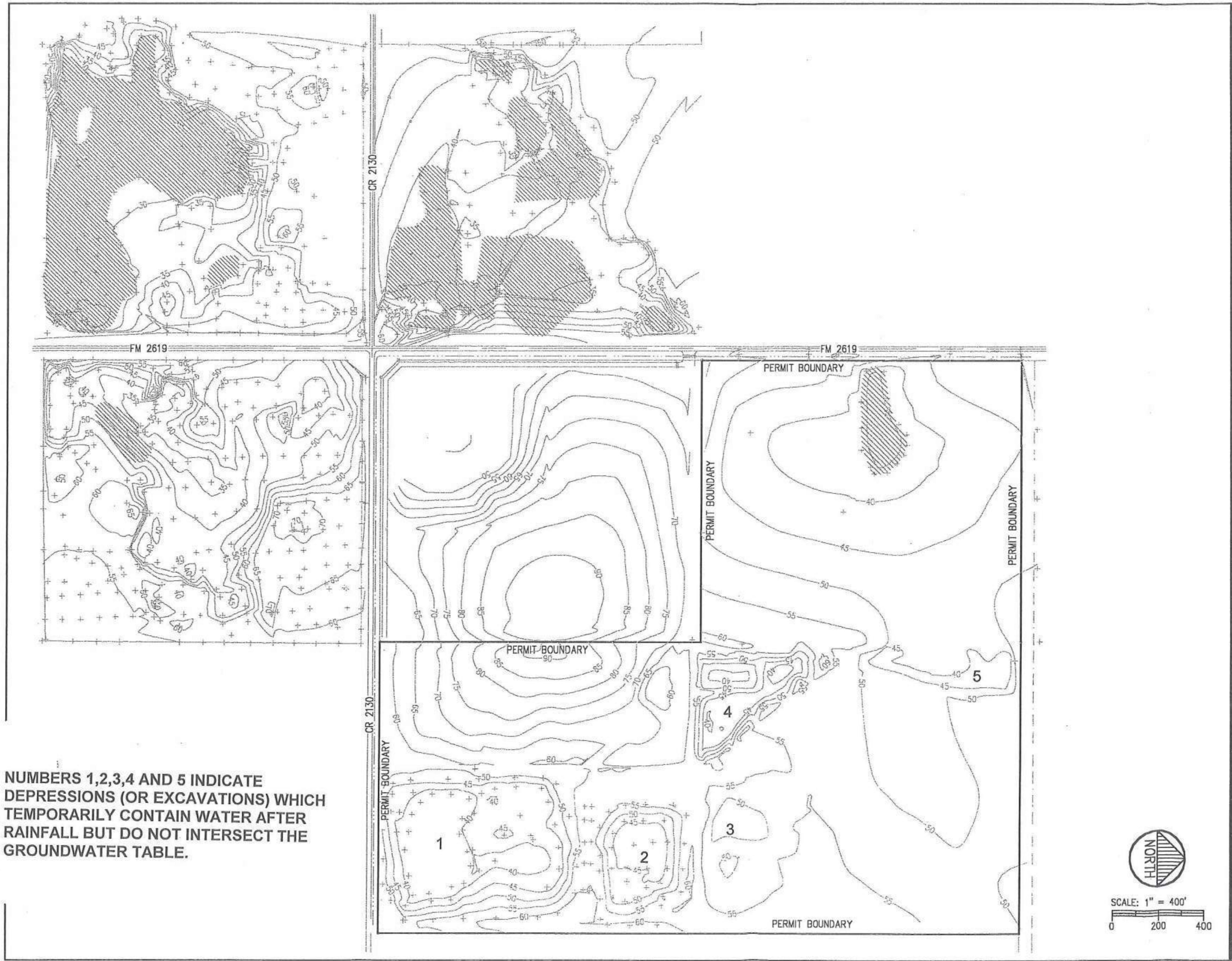


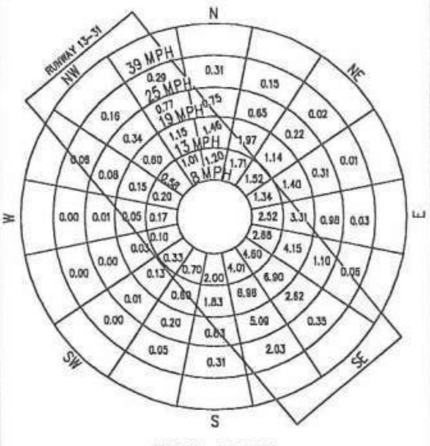
FIGURE 1
Topographical Map of the
COK MSWLF Area

REVISION 1
June 1998
N-1

FOR PERMIT PURPOSES ONLY



NUMBERS 1,2,3,4 AND 5 INDICATE DEPRESSIONS (OR EXCAVATIONS) WHICH TEMPORARILY CONTAIN WATER AFTER RAINFALL BUT DO NOT INTERSECT THE GROUNDWATER TABLE.



WIND ROSE

HOMERO CASTILLO
57621
5-29-98

LEGEND

▨ PONDED WATER AS OF MAY 1998
PERMIT BOUNDARY
50 EXISTING CONTOUR

REVISION

⚠ NEW SHEET

LOCAL PONDING
SOLID WASTE LANDFILL PERMIT 235-B AMENDMENT

OWNER
CITY OF KINGSVILLE
200 EAST KLEBERG KINGSVILLE, TEXAS 78363

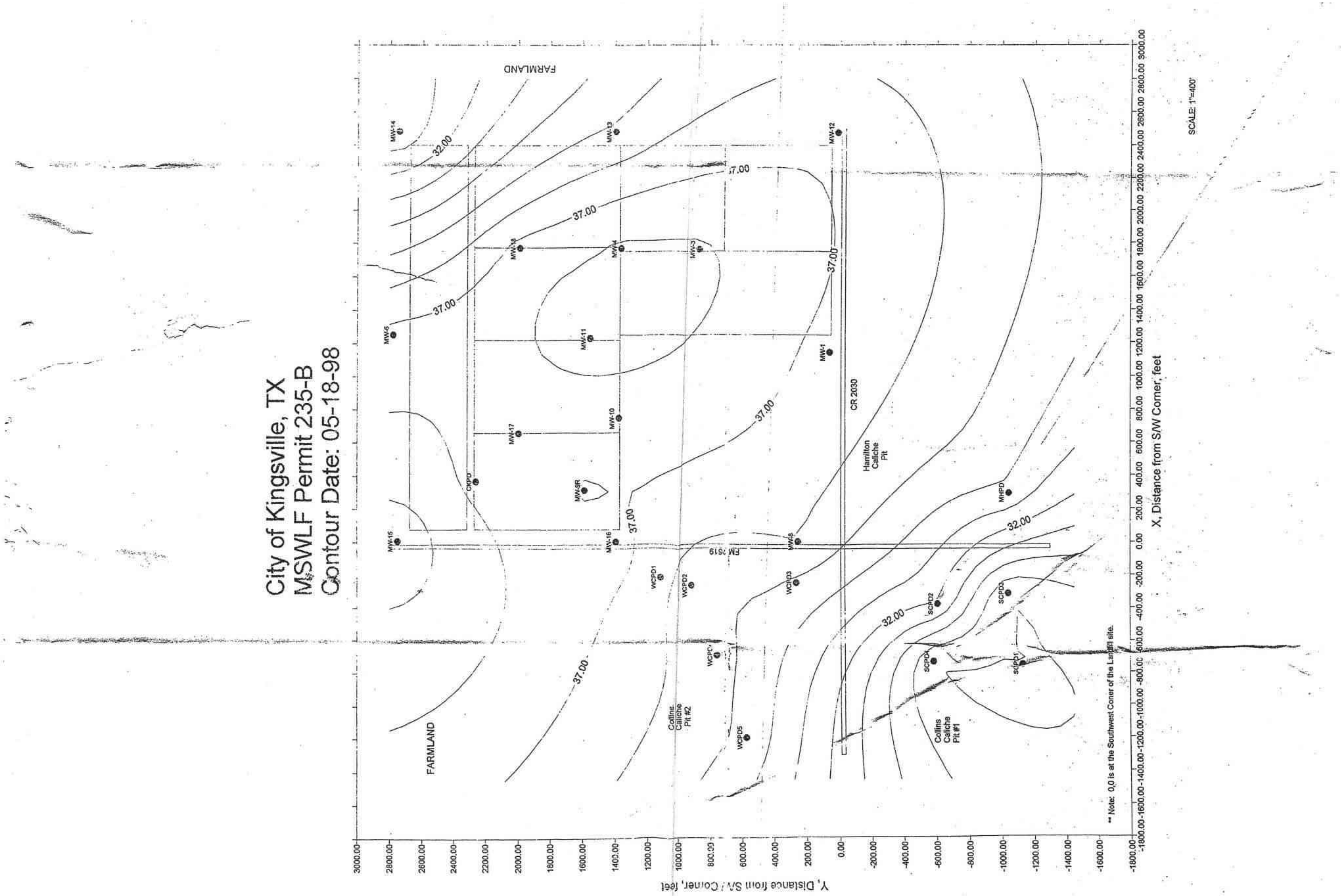
ALPHA ENGINEERING
109 NORTH FIFTH STREET
KINGSVILLE, TEXAS 78363
HOMERO CASTILLO, PE (512) 592-2977

PROJECT NO. 9708-01
SCALE 1"=400'
DRAWN BY D.S./E.L.
DESIGNED BY HOMERO C.
CHECKED BY HOMERO C.
DATE 24 JUN 98
ATTACHMENT 4
FIGURE

THIS DOCUMENT FOR PERMIT PURPOSES ONLY

FIGURE 2
Groundwater Contour Map
of COK MSWLF Area

REVISION 1
June 1998
N-2


City of Kingsville, TX
MSWLF Permit 235-B
Contour Date: 05-18-98
FARMLAND
FARMLAND
MW-14
MW-13
MW-12
MW-18
MW-4
MW-3
MW-6
MW-11
MW-1
MW-10
MW-17
MW-9R
CKPD
MW-15
MW-16
MW-8
MHPD
WCPD1
WCPD2
WCPD3
WCPD4
WCPD5
SCPD2
SCPD3
SCPD4
SCPD1
CR 2030
FM 2619
Hamilton Caliche Pit
Collins Caliche Pit #2
Collins Caliche Pit #1
32.00
37.00
SCALE: 1"=400'
** Note: 0,0 is at the Southwest Corner of the Landfill site.
X, Distance from S/W Corner, feet
Y, Distance from S/W Corner, feet
3000.00
2800.00
2600.00
2400.00
2200.00
2000.00
1800.00
1600.00
1400.00
1200.00
1000.00
800.00
600.00
400.00
200.00
0.00
-200.00
-400.00
-600.00
-800.00
-1000.00
-1200.00
-1400.00
-1600.00
-1800.00

ATTACHMENT O

APPENDIX O

APPENDIX O

Soil Data for COK MSWLF Site

November 1997
Revision 1 - June 1998

REVISION 1
June 1998
O-1

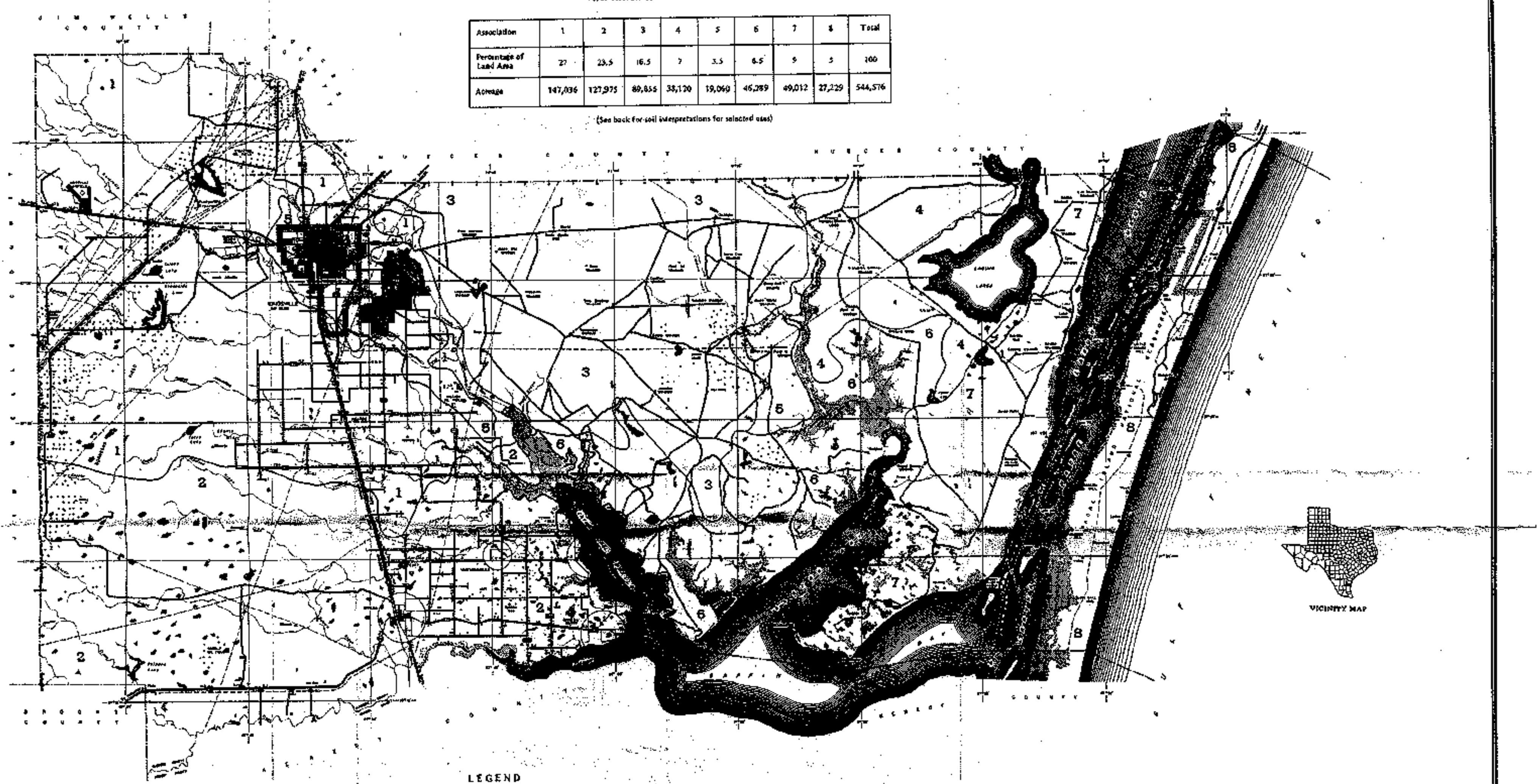
U.S. DEPARTMENT OF AGRICULTURE

SOIL CONSERVATION SERVICE

PROPORTION OF ASSOCIATION IN THE COUNTY

Association	1	2	3	4	5	6	7	8	Total
Percentage of Land Area	27	23.5	16.5	7	3.5	6.5	9	5	100
Acreage	147,036	127,975	89,855	38,120	19,060	46,289	49,012	27,229	544,576

(See back for soil interpretations for selected uses)



LEGEND

AREAS DOMINATED BY CLAYEY TO SANDY SOILS ON NEARLY LEVEL TO GENTLY SLOPING UPLANDS.

1 **CZAR–DELFINA–ORELIA:** Somewhat poorly to well drained loamy fine sands, fine sandy loams and sandy clay loams that have moderately to very slowly permeable lower layers with low and moderate shrink-swell potentials. This unit consists of about 35 percent Czar soils, 30 percent Delfina soils, 20 percent Orelia soils, and 15 percent other soils. Czar soils have a friable, mildly alkaline, dark grayish brown fine sandy loam surface layer about 14 inches thick. The next 28 inches is friable, mildly and moderately alkaline, dark grayish brown and brown sandy clay loam. From 42 to 74 inches the soil is friable, moderately alkaline, pale brown sandy clay loam with soft masses and concretions of calcium carbonate. Delfina soils have a very friable, slightly acid, brown fine sandy loam surface layer about 12 inches thick. The next 24 inches is very firm, neutral and mildly alkaline, brown sandy clay loam that is mottled in shades of brown, gray, and yellow. From 36 to 80 inches the soil is firm, moderately alkaline, light brown and reddish yellow sandy clay loam. Orelia soils have a friable, slightly acid, gray fine sandy loam surface layer about 5 inches thick. The next 27 inches is firm and very firm, mildly and moderately alkaline, dark gray and gray sandy clay loam. From 32 to 50 inches the soil is friable, moderately alkaline, saline, light gray sandy clay loam with soft masses and concretions of calcium carbonate. Most of this unit is used for cropland and improved pastures.

2 **DELFINA–NUECES–EDROY:** Poorly and moderately well drained fine sands, loamy fine sands, fine sandy loams, and clays that have moderately slowly and very slowly permeable lower layers with moderate and high shrink-swell potentials. This unit consists of about 60 percent Delfina soils, 15 percent Nueces soils, 10 percent Edroy soils, and 15 percent other soils. Delfina soils have a very friable, slightly acid, brown fine sandy loam surface layer about 12 inches thick. The next 24 inches is very firm, neutral and mildly alkaline, brown sandy clay loam that is mottled in shades of brown, gray, and yellow. From 36 to 80 inches the soil is firm, moderately alkaline, light brown and reddish yellow sandy clay loam. Nueces soils have a very friable, neutral, pale brown and brown fine sand surface layer about 32 inches thick. From 32 to 80 inches the soil is firm, neutral to moderately alkaline, light brownish gray, light gray, and yellow sandy clay loam that is mottled in shades of red, brown, yellow, and gray. Edroy soils have a friable, slightly acid, dark gray clay surface layer about 18 inches thick. The next 35 inches is firm and very firm, moderately alkaline, gray and light gray clay loam. From 53 to 72 inches the soil is very friable, moderately alkaline, white loamy fine sand. Most of this unit is used for cropland and improved pastures.

AREAS DOMINATED BY CLAYEY AND LOAMY SOILS ON NEARLY LEVEL TO GENTLY SLOPING UPLANDS.

3 **VICTORIA–CLAREVILLE:** Somewhat poorly and well drained clays and clay loams that have moderately slowly to very slowly permeable lower layers with high and very high shrink-swell potentials. This unit consists of about 65 percent Victoria soils, 20 percent Clareville soils, and 15 percent other soils. Victoria soils have a firm and very firm, moderately alkaline, dark gray clay surface layer about 38 inches thick with intersecting slickensides in the lower part. The next 22 inches is very firm, moderately alkaline, gray clay with intersecting slickensides. From 60 to 72 inches the soil is extremely firm, moderately alkaline, saline, light gray clay. Clareville soils have a friable, neutral, very dark gray clay loam surface layer about 11 inches thick. The next 27 inches is firm and very firm, mildly and moderately alkaline, very dark gray, dark grayish brown, brown, and grayish brown clay loam. From 38 to 64 inches the soil is firm and friable, moderately alkaline, grayish brown and very pale brown clay loam and loam with soft masses and concretions of calcium carbonate. Most of this unit is used for cropland and improved pastures.

4 **ORELIA–VICTORIA:** Somewhat poorly drained fine sandy loams and clays that have very slowly permeable lower layers with moderate and very high shrink-swell potentials. This unit consists of about 60 percent Orelia soils, 20 percent Victoria soils, and 20 percent other soils. Orelia soils have a friable, slightly acid, gray fine sandy loam surface layer about 5 inches thick. The next 27 inches is firm and very firm, mildly and moderately alkaline, dark gray and gray sandy clay loam. From 32 to 50 inches the soil is friable, moderately alkaline, saline, light gray sandy clay loam with soft masses and concretions of calcium carbonate. Victoria soils have a firm and very firm, moderately alkaline, dark gray clay surface layer about 38 inches thick with intersecting slickensides in the lower part. The next 22 inches is very firm, moderately alkaline, gray clay with intersecting slickensides. From 60 to 72 inches the soil is extremely firm, moderately alkaline, saline, light gray clay. Most of this unit is used for rangeland and improved pastures.

5 **VICTORIA–RAYMONDVILLE–CLAREVILLE:** Somewhat poorly to well drained clays and clay loams that have moderately slowly to very slowly permeable lower layers with high and very high shrink-swell potentials. This unit consists of about 30 percent Victoria soils, 25 percent Raymondville soils, 25 percent Clareville soils, and 20 percent other soils. Victoria soils have a firm and very firm, moderately alkaline, dark gray clay surface layer about 38 inches thick with intersecting slickensides in the lower part. The next 22 inches is very firm, moderately alkaline, gray clay with intersecting slickensides. From 60 to 72 inches the soil is extremely firm, moderately alkaline, saline, light gray clay. Raymondville soils have a friable, moderately alkaline, gray clay loam surface layer about 14 inches thick. The next 23 inches is firm and very firm, moderately alkaline, gray and light brownish gray clay loam and clay with threads and soft masses of calcium carbonate. From 37 to 78 inches the soil is very firm, moderately alkaline, light gray and light brownish gray clay with concretions and soft masses of calcium carbonate. Clareville soils have a friable, neutral, very dark gray clay loam surface layer about 11 inches thick. The next 27 inches is firm and very firm, mildly and moderately alkaline, very dark gray, dark grayish brown, brown, and grayish brown clay loam. From 38 to 64 inches the soil is firm and friable, moderately alkaline, grayish brown and very pale brown clay loam and loam with soft masses and concretions of calcium carbonate. Most of this unit is used for cropland, urban, and Federal land.

AREAS DOMINATED BY LOAMY AND SANDY SOILS ON NEARLY LEVEL TO GENTLY SLOPING UPLANDS.

6 **ORELIA–TATTON–NARTA:** Very poorly, and somewhat poorly drained or ponded loamy sands, fine sandy loams, and sandy clay loams that have rapidly and very slowly permeable lower layers with very low, low, and moderate shrink-swell potentials. This unit consists of about 60 percent Orelia soils, 10 percent Tatton soils, 10 percent Narta soils, and 20 percent other soils. Orelia soils have a friable, slightly acid, gray fine sandy loam surface layer about 5 inches thick. The next 27 inches is firm and very firm, mildly and moderately alkaline, dark gray and gray sandy clay loam. From 32 to 50 inches the soil is friable, moderately alkaline, saline, light gray sandy clay loam with soft masses and concretions of calcium carbonate. Tatton soils have a very friable, moderately alkaline, saline, light gray loamy sand surface layer about 5 inches thick. From 5 to 60 inches the soil is very friable, moderately alkaline, saline, white loamy sand. Narta soils have a friable, moderately alkaline, gray fine sandy loam surface layer about 8 inches thick. The next 28 inches is firm, moderately alkaline, saline, very dark gray and gray silty clay loam. From 36 to 60 inches the soil is firm, moderately alkaline, saline, light brownish gray and light gray clay loam with soft masses and concretions of calcium carbonate. Most of this unit is used for rangeland.

AREAS DOMINATED BY SANDY SOILS ON NEARLY LEVEL TO SLOPING COASTAL TERRACES AND BARRIER ISLANDS.

7 **GALVESTON–MUSTANG:** Poorly and somewhat excessively drained fine sands that have very rapidly and rapidly permeable lower layers with low shrink-swell potential. This unit consists of about 40 percent Galveston soils, 35 percent Mustang soils, and 25 percent other soils. Galveston soils have a loose, neutral, light gray fine sand surface layer about 4 inches thick. From 4 to 70 inches the soil is loose, mildly alkaline, white fine sand with a permanent water table between 40 and 72 inches. Mustang soils have a loose, neutral, light brownish gray fine sand surface layer about 6 inches thick. From 6 to 72 inches the soil is loose, neutral, light gray fine sand with a permanent water table less than 40 inches. Most of this unit is used for rangeland.

8 **GALVESTON–MUSTANG–ACTIVE SAND DUNES:** Poorly and somewhat excessively drained fine sands that have very rapidly and rapidly permeable lower layers with low shrink-swell potential. This unit consists of about 35 percent Galveston soils, 25 percent Mustang soils, 20 percent Active Sand Dunes, and 20 percent other soils. Galveston soils have a loose, neutral, light gray fine sand surface layer about 4 inches thick. From 4 to 70 inches the soil is loose, mildly alkaline, white fine sand with a permanent water table between 40 and 72 inches. Mustang soils have a loose, neutral, light brownish gray fine sand surface layer about 6 inches thick. From 6 to 72 inches the soil is loose, neutral, light gray fine sand with a permanent water table less than 40 inches. Active sand dunes are loose, neutral, light gray fine sands. Most of this unit is used for rangeland and recreation.

Note: This general soil map is suitable for broad planning purposes only. For more detailed planning on individual tracts of land, a detailed soil survey is needed.

GENERAL SOIL MAP
KLEBERG COUNTY, TEXAS

SOIL CONSERVATION SERVICE
IN COOPERATION WITH
TEXAS AGRICULTURAL EXPERIMENT STATION

0 1 2 3 4 5
Approximate Scale - Miles

BASE COMPILED FROM LATEST TEXAS GENERAL HIGHWAY MAP, POLYCONIC PROJECTION.

SOURCE: Original draft by State Soil Survey Staff.

OCTOBER 1977 4-R-36365

HOW TO USE THE GENERAL SOIL MAP AND INTERPRETATIONS

This General Soil Map shows the soil units in Kleberg County. A soil unit is a landscape that has distinctive proportional patterns named, although several minor soils may also be included.

This map is useful to people who want a general idea of the soils in the county, who want to compare different parts of the county, or who want to determine suitability of the soils to certain land uses for general planning. More specific interpretations should be based on a detailed soil survey and onsite examination. The soils within one unit may differ widely in slope, drainage, texture and other characteristics that affect use and management.

The interpretation table lists the soil limitations and the principal factors affecting use for major soils within each unit. The table lists only the principal adverse factors affecting uses. The soils of small acreage within the unit are not rated in the table.

LIMITATIONS:

SLIGHT - Limitations are so minor they are easily overcome.
MODERATE - Limitations can be overcome or modified.
SEVERE - Limitations are difficult and costly to modify or overcome.

SUITABILITY:

GOOD - Soils have properties favorable for rated use.
FAIR - Soils have properties moderately favorable for rated use.
POOR - Soils have one or more properties unfavorable for rated use.

ASSOCIATED FEATURES:

COMPRESSIBLE	Decrease in soil volume excessive under load.
CUTBANKS CAVE	Walls of cuts are not stable. Soil sloughs easily.
DUSTY	Soil particles detach easily and cause dust.
EXCESS FINES	Soil contains too much silt and clay for use as sand or gravel in construction.
EXCESS SALT	The amount of soluble salt in the soil is so high that it restricts the growth of most plants.
EXCESS SODIUM	Exchangeable sodium imparts poor physical properties that restrict the growth of plants.
FLOODS	Soil temporarily flooded by stream overflow, runoff or unusually high tides.
LOW STRENGTH	Soil has inadequate strength to support loads.
PERCS SLOWLY	Water moves through the soil slowly, affecting the specified use.
PIPING	Soil is susceptible to the formation of tunnels or pipelike cavities by moving water.
SEEPAGE	Water moves through the soil too rapidly.
SHRINK-SWELL	Soil expands on wetting and shrinks on drying, which may cause damage to roads, dams, building foundations, or other structures.
SLOPE	Slope too great.
THIN LAYER	Suitable soil material is not thick enough for use as borrow material or topsoil.
TOO CLAYEY	Soil slippery and sticky when wet and slow to dry.
TOO SANDY	Soil soft and loose; droughty and low in fertility.
UNSTABLE FILL	Banks of fill are likely to cave in or slough.
WETNESS	Soil wet during period of use.

SOIL LIMITATIONS AND SUITABILITY RATINGS FOR SELECTED USES

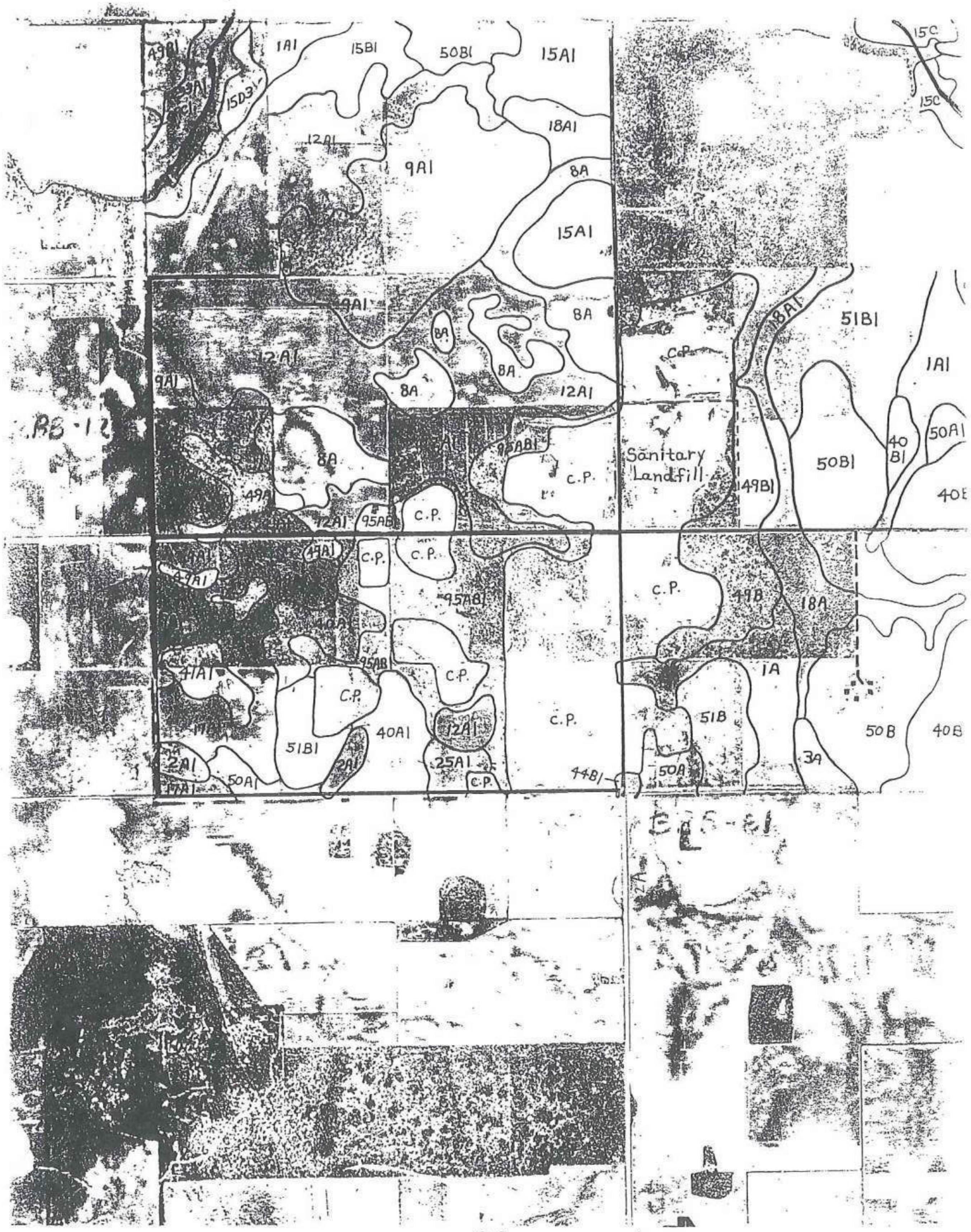
SOIL ASSOCIATIONS	DOMINANT SOILS AND PROPORTION OF ASSOCIATION	POTENTIAL FOR		SANITARY FACILITIES					COMMUNITY DEVELOPMENT			SOURCE MATERIAL			WATER MANAGEMENT		RECREATION			POTENTIAL AS HABITAT FOR	
		CROPLAND	RANGELAND	SEPTIC TANK ABSORPTION FIELDS	SEWAGE LAGOON AREAS	SANITARY LANDFILL (TRENCH TYPE)	SANITARY LANDFILL (AREA TYPE)	DAILY COVER FOR LANDFILL	SHALLOW EXCAVATIONS	DWELLINGS WITHOUT BASEMENTS*	LOCAL ROADS AND STREETS	ROADFILL	TOPSOIL	SAND AND GRAVEL	POND RESERVOIR AREA	EMBANKMENTS DIKES AND LEVEES	CAMP AREAS	PICNIC AREAS	PLAYGROUNDS	OPENLAND WILDLIFE	RANGELAND WILDLIFE
CZAR DELFINA ORELIA 1	CZAR 35%	HIGH	HIGH	SLIGHT	MODERATE 1/	SLIGHT	SLIGHT	GOOD	SLIGHT	SLIGHT	MODERATE 2/	FAIR 2/	FAIR 3/	UNSUITED 4/	MODERATE 1/	SLIGHT	SLIGHT	SLIGHT	0-2%: SLIGHT 2-3%: MODERATE 5/	HIGH	HIGH
	DELFINA 30%	MEDIUM 19/	MEDIUM 19/	MODERATE 6/	0-2%: SLIGHT 2-5%: MODERATE 5/	SLIGHT	SLIGHT	FSL: GOOD LFS: FAIR 7/	SLIGHT	MODERATE 8/, 2/	MODERATE 8/, 2/	FAIR 8/, 2/	FSL: FAIR 3/ LFS: POOR 7/	UNSUITED 4/	MODERATE 1/	SLIGHT	FSL: MODERATE 6/ LFS: MODERATE 6/, 7/	FSL: SLIGHT LFS: MODERATE 7/	0-2% FSL: SLIGHT 2-5% FSL: MODERATE 5/ 0-2% LFS: MODERATE 7/ 2-5% LFS: MODERATE 7/, 5/	HIGH	HIGH
	ORELIA 20%	MEDIUM 19/	HIGH	SEVERE 6/	SLIGHT	MODERATE 9/	MODERATE 9/	FAIR 10/	MODERATE 9/	MODERATE 8/, 2/, 9/	MODERATE 8/, 2/, 9/	POOR 2/	POOR 10/, 11/	UNSUITED 4/	SLIGHT	MODERATE 12/	SEVERE 6/	MODERATE 9/, 13/	SEVERE 6/	MEDIUM	HIGH
DELFINA NUECES EDROY 2	DELFINA 60%	MEDIUM 19/	MEDIUM 19/	MODERATE 6/	0-2%: SLIGHT 2-5%: MODERATE 5/	SLIGHT	SLIGHT	FSL: GOOD LFS: FAIR 7/	SLIGHT	MODERATE 8/, 2/	MODERATE 8/, 2/	FAIR 8/, 2/	FSL: FAIR 3/ LFS: POOR 7/	UNSUITED 4/	MODERATE 1/	SLIGHT	FSL: MODERATE 6/ LFS: MODERATE 6/, 7/	FSL: SLIGHT LFS: MODERATE 7/	0-2% FSL: SLIGHT 2-5% FSL: MODERATE 5/ 0-2% LFS: MODERATE 7/ 2-5% LFS: MODERATE 7/, 5/	HIGH	HIGH
	NUECES 15%	LOW 7/, 19/	HIGH	SEVERE 6/	SEVERE 1/	SLIGHT	SLIGHT	POOR 7/	MODERATE 16/	SLIGHT	MODERATE 2/	FAIR 2/	POOR 7/	UNSUITED 4/	MODERATE 1/	MODERATE 17/, 18/	SEVERE 7/	SEVERE 7/	SEVERE 7/	MEDIUM	HIGH
	EDROY 10%	LOW 9/	HIGH	SEVERE 6/, 9/	SLIGHT	SEVERE 14/, 9/, 15/	SEVERE 14/, 9/	POOR 15/, 9/	SEVERE 14/, 9/, 16/	SEVERE 14/, 9/, 8/	SEVERE 14/, 9/, 8/	POOR 8/, 2/	POOR 15/, 9/	UNSUITED 4/	MODERATE 1/, 3/	MODERATE 12/	SEVERE 9/, 14/, 15/	SEVERE 9/, 14/, 15/	SEVERE 9/, 14/, 15/	LOW	LOW
VICTORIA CLAREVILLE 3	VICTORIA 65%	HIGH	HIGH	SEVERE 6/	SLIGHT	SEVERE 15/	MODERATE 9/	POOR 15/	SEVERE 15/, 16/	SEVERE 8/, 2/	SEVERE 8/, 2/	POOR 8/, 2/	POOR 15/	UNSUITED 4/	SLIGHT	MODERATE 12/, 17/	SEVERE 15/, 6/	SEVERE 15/	SEVERE 15/, 6/	MEDIUM	LOW
	CLAREVILLE 20%	HIGH	HIGH	MODERATE 6/	SLIGHT	MODERATE 15/	SLIGHT	FAIR 15/	MODERATE 15/	MODERATE 8/	SEVERE 2/	POOR 2/	FAIR 15/	UNSUITED 4/	MODERATE 1/	MODERATE 12/	MODERATE 15/, 6/	MODERATE 15/	MODERATE 15/, 6/	HIGH	MEDIUM
ORELIA VICTORIA 4	ORELIA 60%	MEDIUM 19/	HIGH	SEVERE 6/	SLIGHT	MODERATE 9/	MODERATE 9/	FAIR 10/	MODERATE 9/	MODERATE 8/, 2/, 9/	MODERATE 8/, 2/, 9/	POOR 2/	POOR 10/, 11/	UNSUITED 4/	SLIGHT	MODERATE 12/	SEVERE 6/	MODERATE 9/, 13/	SEVERE 9/	MEDIUM	HIGH
	VICTORIA 20%	HIGH	HIGH	SEVERE 6/	SLIGHT	SEVERE 15/	MODERATE 9/	POOR 15/	SEVERE 15/, 16/	SEVERE 8/, 2/	SEVERE 8/, 2/	POOR 8/, 2/	POOR 15/	UNSUITED 4/	SLIGHT	MODERATE 12/, 17/	SEVERE 15/, 6/	SEVERE 15/	SEVERE 15/, 6/	MEDIUM	LOW
VICTORIA RAYMONDVILLE CLAREVILLE 5	VICTORIA 30%	HIGH	HIGH	SEVERE 6/	SLIGHT	SEVERE 15/	MODERATE 9/	POOR 15/	SEVERE 15/, 16/	SEVERE 8/, 2/	SEVERE 8/, 2/	POOR 8/, 2/	POOR 15/	UNSUITED 4/	SLIGHT	MODERATE 12/, 17/	SEVERE 15/, 6/	SEVERE 15/	SEVERE 15/, 6/	MEDIUM	LOW
	RAYMONDVILLE 25%	HIGH	HIGH	SEVERE 6/	SLIGHT	SEVERE 15/	SLIGHT	FAIR 15/	SEVERE 15/, 16/	SEVERE 8/, 2/	SEVERE 8/, 2/	POOR 8/, 2/	FAIR 15/, 5/	UNSUITED 4/	SLIGHT	MODERATE 12/	MODERATE 6/, 15/	MODERATE 15/	MODERATE 6/, 15/	HIGH	MEDIUM
	CLAREVILLE 25%	HIGH	HIGH	MODERATE 6/	SLIGHT	MODERATE 15/	SLIGHT	FAIR 15/	MODERATE 15/	MODERATE 8/	SEVERE 2/	POOR 2/	FAIR 15/	UNSUITED 4/	MODERATE 1/	MODERATE 12/	MODERATE 15/, 6/	MODERATE 15/	MODERATE 15/, 6/	HIGH	MEDIUM
ORELIA TATTON NARTA 6	ORELIA 60%	MEDIUM 19/	HIGH	SEVERE 6/	SLIGHT	MODERATE 9/	MODERATE 9/	FAIR 10/	MODERATE 9/	MODERATE 8/, 2/, 9/	MODERATE 8/, 2/, 9/	POOR 2/	POOR 10/, 11/	UNSUITED 4/	SLIGHT	MODERATE 12/	SEVERE 6/	MODERATE 9/, 13/	SEVERE 6/	MEDIUM	HIGH
	TATTON 10%	NONE 9/, 11/, 14/, 19/	NONE 11/, 10/	SEVERE 14/, 9/	SEVERE 1/, 14/, 9/	SEVERE 1/, 14/, 9/	SEVERE 1/, 14/, 9/	POOR 7/, 11/, 9/	SEVERE 14/, 9/, 16/	SEVERE 15/, 9/	SEVERE 14/, 9/	POOR 9/	POOR 11/, 7/, 9/	UNSUITED 4/	SEVERE 1/	SEVERE 1/, 18/, 11/	FS: SEVERE 14/, 9/, 7/ FSL LS: SEVERE 9/	FS: SEVERE 9/, 7/ FSL LS: SEVERE 9/	FS: SEVERE 14/, 9/, 7/ FSL LS: SEVERE 14/, 9/	LOW	LOW
	NARTA 10%	NONE 10/, 11/	LOW 10/, 11/, 19/	SEVERE 6/	SLIGHT	MODERATE 9/, 15/	MODERATE 9/	FAIR 9/	SEVERE 9/	SEVERE 8/, 2/	SEVERE 8/, 2/	POOR 8/, 2/	POOR 11/, 10/, 3/	UNSUITED 4/	SLIGHT	MODERATE 12/	SEVERE 6/, 9/	MODERATE 9/	SEVERE 6/, 9/	LOW	LOW
GALVESTON MUSTANG 7	GALVESTON 40%	LOW 7/, 19/	MEDIUM 7/, 19/	SEVERE 14/, 9/	SEVERE 14/, 9/, 1/	SEVERE 14/, 9/, 1/	SEVERE 14/, 9/, 1/	POOR 7/, 9/	SEVERE 14/, 9/, 16/	SEVERE 14/, 9/	SEVERE 14/, 9/	POOR 9/	POOR 7/	SAND: FAIR 4/ GRAVEL: UNSUITED 4/	SEVERE 1/	SEVERE 17/, 1/	SEVERE 7/	SEVERE 7/	SEVERE 7/	MEDIUM	MEDIUM
	MUSTANG 35%	LOW 7/, 9/	MEDIUM 7/, 9/	SEVERE 14/, 9/	SEVERE 14/, 9/	SEVERE 14/, 9/, 1/	SEVERE 14/, 9/, 1/	POOR 7/, 9/	SEVERE 14/, 9/, 16/	SEVERE 14/, 9/	SEVERE 14/, 9/	POOR 9/	POOR 7/, 9/	SAND: FAIR 4/ GRAVEL: UNSUITED 4/	SEVERE 1/	SEVERE 17/, 1/	SEVERE 9/, 14/, 7/	SEVERE 9/, 7/	SEVERE 9/, 14/, 7/	LOW	MEDIUM
GALVESTON MUSTANG ACTIVE SAND DUNES 8	GALVESTON 35%	LOW 7/, 19/	MEDIUM 7/, 19/	SEVERE 14/, 9/	SEVERE 14/, 9/, 1/	SEVERE 14/, 9/, 1/	SEVERE 14/, 9/, 1/	POOR 7/, 9/	SEVERE 14/, 9/, 16/	SEVERE 14/, 9/	SEVERE 14/, 9/	POOR 9/	POOR 7/	SAND: FAIR 4/ GRAVEL: UNSUITED 4/	SEVERE 1/	SEVERE 17/, 1/	SEVERE 7/	SEVERE 7/	SEVERE 7/	MEDIUM	MEDIUM
	MUSTANG 25%	LOW 7/, 9/	MEDIUM 7/, 9/	SEVERE 14/, 9/	SEVERE 14/, 9/, 1/	SEVERE 14/, 9/, 1/	SEVERE 14/, 9/, 1/	POOR 7/, 9/	SEVERE 14/, 9/, 16/	SEVERE 14/, 9/	SEVERE 14/, 9/	POOR 9/	POOR 7/, 9/	SAND: FAIR 4/ GRAVEL: UNSUITED 4/	SEVERE 1/	SEVERE 17/, 1/	SEVERE 9/, 14/, 7/	SEVERE 9/, 7/	SEVERE 9/, 14/, 7/	LOW	MEDIUM
	ACTIVE SAND DUNES 20%	NONE 7/, 13/, 19/	LOW 7/, 13/, 19/	MODERATE 14/	SEVERE 14/, 1/	SEVERE 1/, 7/	SEVERE 1/	POOR 7/	SEVERE 16/	SEVERE 14/	MODERATE 14/	GOOD	POOR 7/	SAND: FAIR 4/ GRAVEL: UNSUITED 4/	SEVERE 1/	SEVERE 17/, 1/	SEVERE 14/, 7/	SEVERE 7/	SEVERE 7/	LOW	LOW

*Same ratings can be used for small commercial buildings.

FOOTNOTES

1/ Seepage	7/ Too Sandy	13/ Dusty
2/ Low Strength	8/ Shrink-Swell	14/ Floods
3/ Thin Layer	9/ Wetness	15/ Too Clayey
4/ Excess Fines	10/ Excess Sodium	16/ Cutbanks Cave
5/ Slope	11/ Excess Salt	17/ Unstable Fill
6/ Percs Slowly	12/ Compressible	18/ Piping
		19/ Droughty

(Back 4-R-36363)


15C
15C
A9B1
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15D3
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RB-12
8A
49A
95AB1
C.P.
Sanitary Landfill
49B1
18A1
51B1
1A1
50B1
40 B1
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40B
C.P.
47A1
95AB
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C.P.
49A1
95AB1
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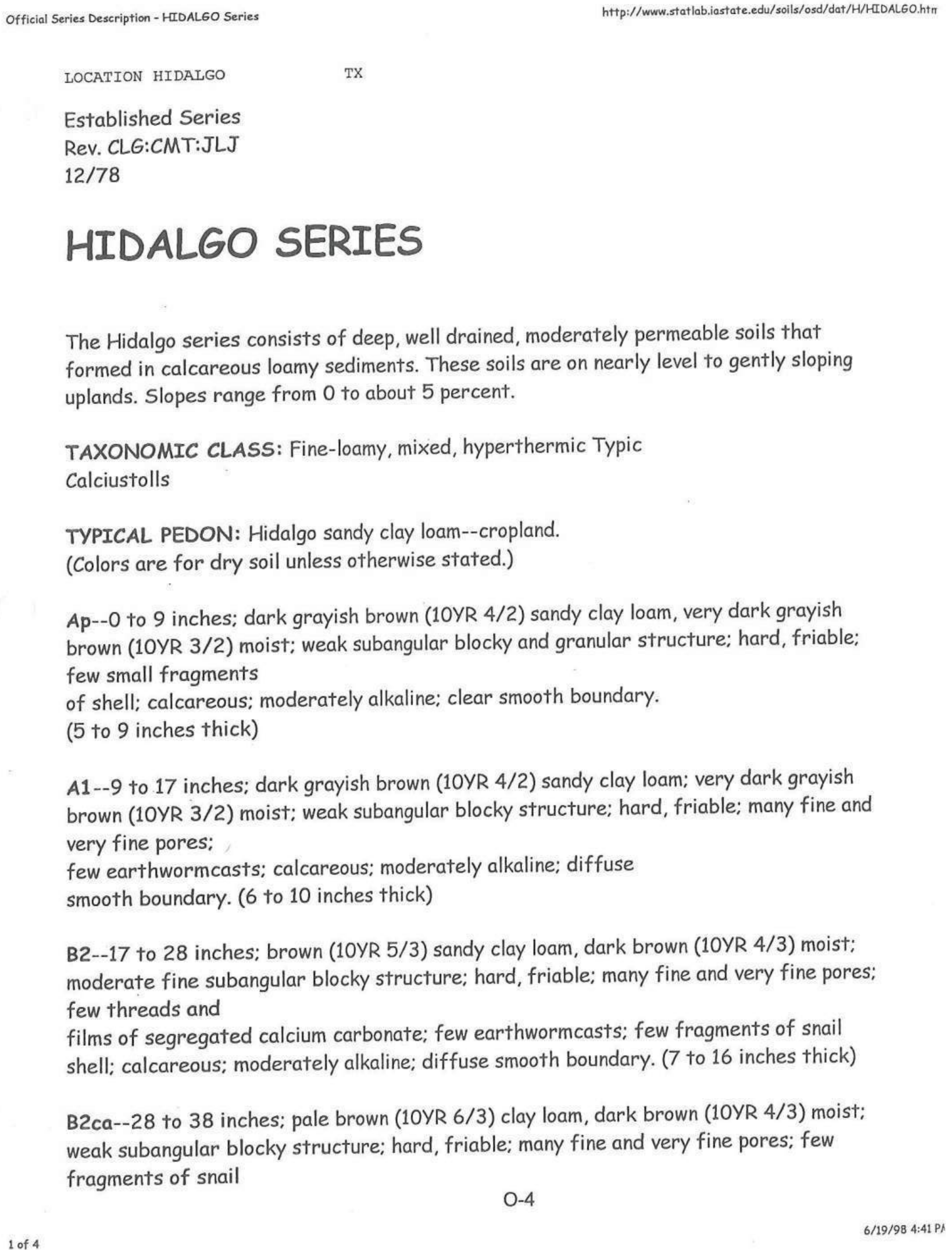
49B
18A
40A1
95AB
C.P.
47A1
C.P.
1A
51B
12A1
40A1
51B1
2A1
25A1
C.P.
44B1
50A
50B
40B
3A
2A1
50A1
47A1
C.P.

O-2

O-3

Map mbol	Soil Name	Slope (%)	Dryland Cap. Subclass	Irrigated Cap. Subclass	Pasture & Hayland Group	Range/ Wildlife Site
A1	Orelia fine sandy loam	0-1%	IIIw	IIIw	8A	Claypan Prairie
	Orelia fine sandy loam	1-3%	IIIe	IIIe	8A	Claypan Prairie
	Edroy clay	0-1%	IVw	IVw	7A	Claypan Prairie
3A1	Edroy clay, depressional	0-1%	Vw	Vw	7E	Lakebed
7A1	Victoria clay	0-1%	IIs	IIs	7A	Blackland
9A1	Raymondville clay loam	0-1%	IIs	IIs	7C	Clay Loam
9B1	Raymondville clay loam	1-3%	IIe	IIe	7C	Clay Loam
11A1	Orelia sandy clay loam	0-1%	IIIw	IIIw	7C	Clay Loam
12A1	Clareville clay loam	0-1%	IIc	I	7C	Clay Loam
14A1	Orelia fine sandy loam, saline	0-1%	IVs	IVs	7G	Salty Prairie
15A1	Hidalgo sandy clay loam	0-1%	IIc	I	7C	Gray Sandy Loam
15B1	Hidalgo sandy clay loam	1-3%	IIe	IIe	7C	Gray Sandy Loam
15C1	Hidalgo sandy clay loam	3-5%	IIIe	IIIe	7C	Gray Sandy Loam
15C3	Hidalgo sandy clay loam, gullied	3-5%	IVe	--	7C	Gray Sandy Loam
17A1	Willacy sandy clay loam	0-1%	IIc	I	7C	Clay Loam
17B1	Willacy sandy clay loam	1-3%	IIe	IIe	7C	Clay Loam
18A1	Racombes sandy clay loam	0-1%	IIw	IIw	7C	Clay Loam
20A1	Racombes sandy clay loam, saline	0-1%	IVs	IVs	7G	Salty Prairie
21A1	Mercedes clay, depressional	0-1%	IVw	--	7E	Lakebed
24BD	Gullied land, saline	2-8%	VIIe	--	--	Local Determination
25A1	Czar fine sandy loam	0-1%	IIc	I	8C	Sandy Loam
25B1	Czar fine sandy loam	1-3%	IIe	IIe	8C	Sandy Loam
28A1	Aransas clay, saline	0-1%	VIw	--	7F	Salty Bottomland
33A1	Sinton sandy clay loam, freq. flooded	0-1%	Vw	Vw	2A	Loamy Bottomland
36A1	Aransas clay, freq. flooded	0-1%	Vw	Vw	1A	Clayey Bottomland
38A1	Papalote fine sandy loam	0-1%	IIs	IIw	8A	Tight Sandy Loam
B1	Papalote fine sandy loam	1-3%	IIe	IIe	8A	Tight Sandy Loam
1	Miguel fine sandy loam	3-5%	IVe	IVe	8A	Tight Sandy Loam
38C3	Miguel fine sandy loam, gullied	3-5%	VIe	--	8A	Tight Sandy Loam
39A1	Narta fine sandy loam	0-1%	VIs	--	7F	Salty Prairie
40A1	Delfina fine sandy loam	0-1%	IIs	IIw	8A	Tight Sandy Loam
40B1	Delfina fine sandy loam	1-3%	IIIe	IIe	8A	Tight Sandy Loam
43A1	Delfina fine sandy loam, saline	0-1%	IVs	--	7F	Salty Prairie
49A1	Hidalgo fine sandy loam	0-1%	IIc	I	8C	Gray Sandy Loam
49B1	Hidalgo fine sandy loam	1-3%	IIe	IIe	8C	Gray Sandy Loam
49C1	Hidalgo fine sandy loam	3-5%	IIIe	IIIe	8C	Gray Sandy Loam
49C3	Hidalgo fine sandy loam, gullied	3-5%	IVe	--	8C	Gray Sandy Loam
50A1	Willacy fine sandy loam	0-1%	IIc	I	8C	Sandy Loam
50B1	Willacy fine sandy loam	1-3%	IIe	IIe	8C	Sandy Loam
50BC	Willacy fine sandy loam, gullied	1-5%	IIIe	--	8C	Sandy Loam
50C1	Willacy fine sandy loam	3-5%	IIIe	IIIe	8C	Sandy Loam
51B1	Runge fine sandy loam	1-3%	IIe	IIe	8C	Sandy Loam
59A1	Papagua soils	0-1%	IIIw	IIIw	7E	Ramadero
68AB1	Papalote loamy fine sand	0-3%	IIIe	IIIe	9A	Loamy Sand
68AB3	Papalote loamy fine sand, gullied	0-3%	IVe	--	9A	Loamy Sand
68C1	Papalote loamy fine sand	3-5%	IIIe	IIIe	9A	Loamy Sand
69AB1	Delfina loamy fine sand	0-2%	IIIe	IIIe	9A	Loamy Sand
74BC	Comitas loamy fine sand	0-5%	VIe	IVe	9A	Loamy Sand
79AB1	Leming loamy fine sand	0-3%	IIIe	IIIe	9A	Sandy
80AC1	Nueces fine sand	0-5%	IVe	IVe	9A	Sandy
81AC1	Falfurrias fine sand	0-5%	VIIe	--	9B	Sand Hill
82AC1	Nueces-Sarita fine sand	0-5%	IVe/VIe	IVe/IVe	9A/9B	Sandy/Sandy
4AC1	Sarita fine sand	0-5%	VIe	IVe	9B	Sandy
5AC1	Galveston-Mustang fine sand	0-5%	VIe/VIw	--	9B/9C	Coastal Sand/Low Coastal Sand
94AB1	Lacoste fine sandy loam	0-3%	IVs	--	14A	Shallow Sandy Loam
99BD1	Psamments (Coastal Dunes)	1-8%	VIIIe	--	--	--
100A1	Orelia fine sandy loam, depressional	0-1%	IIIw	IIIw	7E	Claypan Prairie
101	Gullied Land	1-8%	VIIe	--	--	Local Determination
103	Tatton soils	0-1%	VIIIs	--	--	--
[illegible]	Psamments (Coastal Beach)	0-1%	VIIIs	--	--	--



LOCATION HIDALGO TX

Established Series
Rev. CLG:CMT:JLJ
12/78

HIDALGO SERIES

The Hidalgo series consists of deep, well drained, moderately permeable soils that formed in calcareous loamy sediments. These soils are on nearly level to gently sloping uplands. Slopes range from 0 to about 5 percent.

TAXONOMIC CLASS: Fine-loamy, mixed, hyperthermic Typic Calciustolls

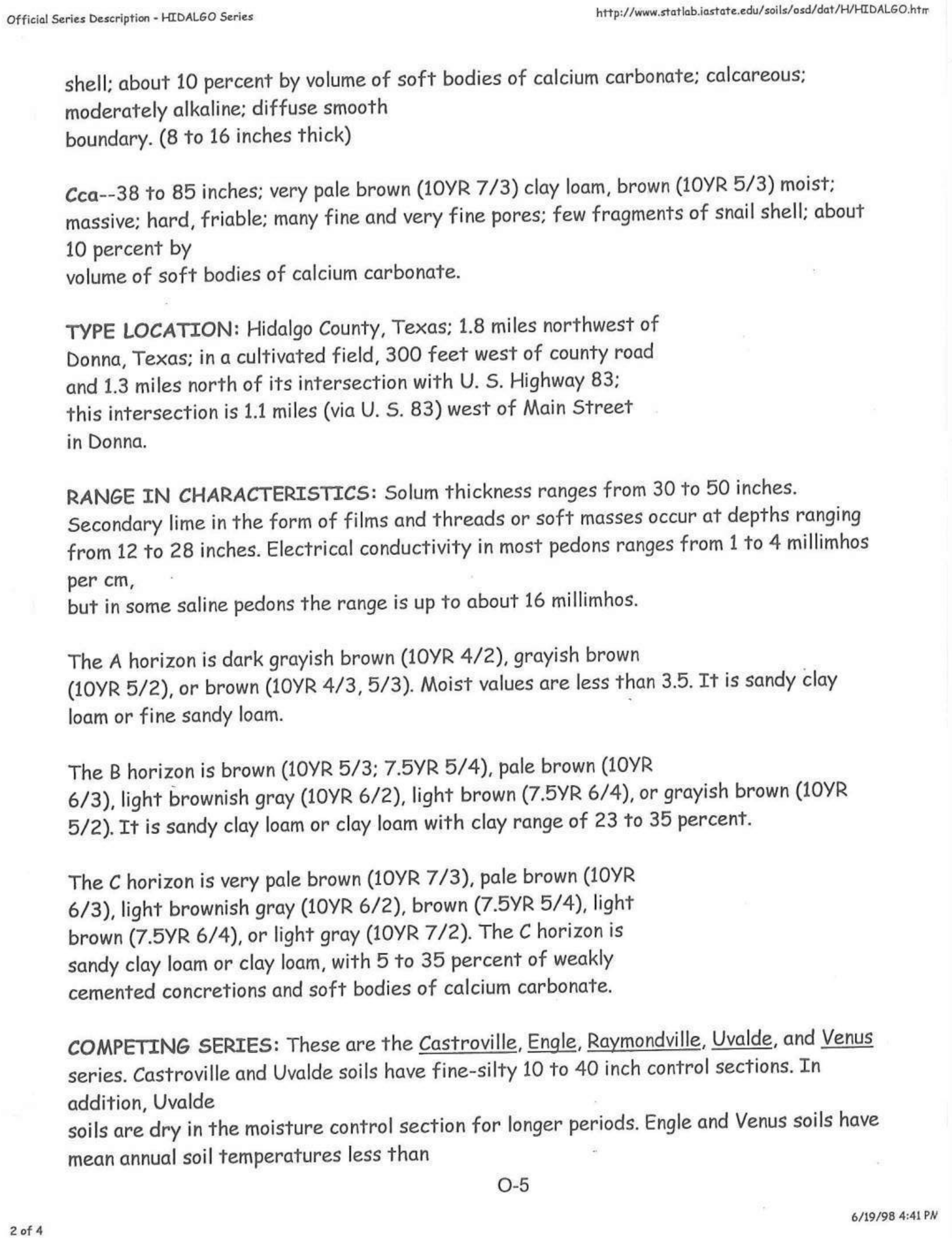
TYPICAL PEDON: Hidalgo sandy clay loam--cropland. (Colors are for dry soil unless otherwise stated.)

Ap--0 to 9 inches; dark grayish brown (10YR 4/2) sandy clay loam, very dark grayish brown (10YR 3/2) moist; weak subangular blocky and granular structure; hard, friable; few small fragments of shell; calcareous; moderately alkaline; clear smooth boundary. (5 to 9 inches thick)

A1--9 to 17 inches; dark grayish brown (10YR 4/2) sandy clay loam; very dark grayish brown (10YR 3/2) moist; weak subangular blocky structure; hard, friable; many fine and very fine pores; few earthwormcasts; calcareous; moderately alkaline; diffuse smooth boundary. (6 to 10 inches thick)

B2--17 to 28 inches; brown (10YR 5/3) sandy clay loam, dark brown (10YR 4/3) moist; moderate fine subangular blocky structure; hard, friable; many fine and very fine pores; few threads and films of segregated calcium carbonate; few earthwormcasts; few fragments of snail shell; calcareous; moderately alkaline; diffuse smooth boundary. (7 to 16 inches thick)

B2ca--28 to 38 inches; pale brown (10YR 6/3) clay loam, dark brown (10YR 4/3) moist; weak subangular blocky structure; hard, friable; many fine and very fine pores; few fragments of snail



shell; about 10 percent by volume of soft bodies of calcium carbonate; calcareous; moderately alkaline; diffuse smooth boundary. (8 to 16 inches thick)

Cca--38 to 85 inches; very pale brown (10YR 7/3) clay loam, brown (10YR 5/3) moist; massive; hard, friable; many fine and very fine pores; few fragments of snail shell; about 10 percent by volume of soft bodies of calcium carbonate.

TYPE LOCATION: Hidalgo County, Texas; 1.8 miles northwest of Donna, Texas; in a cultivated field, 300 feet west of county road and 1.3 miles north of its intersection with U. S. Highway 83; this intersection is 1.1 miles (via U. S. 83) west of Main Street in Donna.

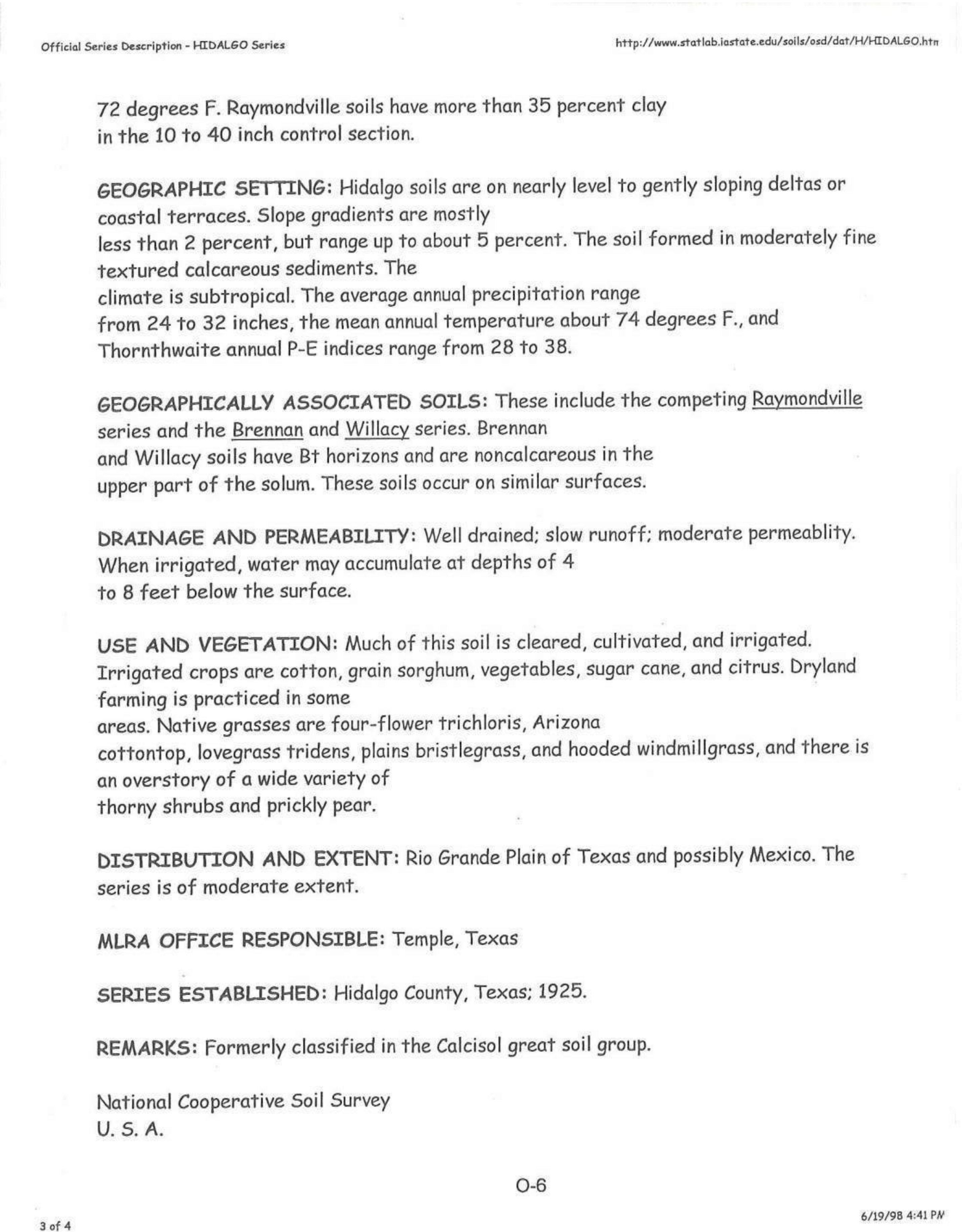
RANGE IN CHARACTERISTICS: Solum thickness ranges from 30 to 50 inches. Secondary lime in the form of films and threads or soft masses occur at depths ranging from 12 to 28 inches. Electrical conductivity in most pedons ranges from 1 to 4 millimhos per cm, but in some saline pedons the range is up to about 16 millimhos.

The A horizon is dark grayish brown (10YR 4/2), grayish brown (10YR 5/2), or brown (10YR 4/3, 5/3). Moist values are less than 3.5. It is sandy clay loam or fine sandy loam.

The B horizon is brown (10YR 5/3; 7.5YR 5/4), pale brown (10YR 6/3), light brownish gray (10YR 6/2), light brown (7.5YR 6/4), or grayish brown (10YR 5/2). It is sandy clay loam or clay loam with clay range of 23 to 35 percent.

The C horizon is very pale brown (10YR 7/3), pale brown (10YR 6/3), light brownish gray (10YR 6/2), brown (7.5YR 5/4), light brown (7.5YR 6/4), or light gray (10YR 7/2). The C horizon is sandy clay loam or clay loam, with 5 to 35 percent of weakly cemented concretions and soft bodies of calcium carbonate.

COMPETING SERIES: These are the Castroville, Engle, Raymondville, Uvalde, and Venus series. Castroville and Uvalde soils have fine-silty 10 to 40 inch control sections. In addition, Uvalde soils are dry in the moisture control section for longer periods. Engle and Venus soils have mean annual soil temperatures less than



72 degrees F. Raymondville soils have more than 35 percent clay in the 10 to 40 inch control section.

GEOGRAPHIC SETTING: Hidalgo soils are on nearly level to gently sloping deltas or coastal terraces. Slope gradients are mostly less than 2 percent, but range up to about 5 percent. The soil formed in moderately fine textured calcareous sediments. The climate is subtropical. The average annual precipitation range from 24 to 32 inches, the mean annual temperature about 74 degrees F., and Thornthwaite annual P-E indices range from 28 to 38.

GEOGRAPHICALLY ASSOCIATED SOILS: These include the competing Raymondville series and the Brennan and Willacy series. Brennan and Willacy soils have Bt horizons and are noncalcareous in the upper part of the solum. These soils occur on similar surfaces.

DRAINAGE AND PERMEABILITY: Well drained; slow runoff; moderate permeablity. When irrigated, water may accumulate at depths of 4 to 8 feet below the surface.

USE AND VEGETATION: Much of this soil is cleared, cultivated, and irrigated. Irrigated crops are cotton, grain sorghum, vegetables, sugar cane, and citrus. Dryland farming is practiced in some areas. Native grasses are four-flower trichloris, Arizona cottontop, lovegrass tridens, plains bristlegrass, and hooded windmillgrass, and there is an overstory of a wide variety of thorny shrubs and prickly pear.

DISTRIBUTION AND EXTENT: Rio Grande Plain of Texas and possibly Mexico. The series is of moderate extent.

MLRA OFFICE RESPONSIBLE: Temple, Texas

SERIES ESTABLISHED: Hidalgo County, Texas; 1925.

REMARKS: Formerly classified in the Calcisol great soil group.

National Cooperative Soil Survey
U. S. A.

LOCATION RACOMBES TX

Established Series
Rev. CLG:JLJ:FEM
9/82

RACOMBES SERIES

The Racombes series consists of deep, moderately well drained, moderately permeable soils that formed in thick alkaline sediments. These soils are on nearly level deltaic coastal terraces that have plane or concave surfaces. Water runs off the surface at a slow or medium rate. Slope is less than 1 percent.

TAXONOMIC CLASS: Fine-loamy, mixed, hyperthermic Pachic Argiustolls

TYPICAL PEDON: Racombes sandy clay loam--irrigated cropland. (Colors are for dry soil unless otherwise stated.)

Ap--0 to 6 inches; very dark gray (10YR 3/1) sandy clay loam, black (10YR 2/1) moist; moderate fine granular structure; slightly hard, friable; many fine pores; mildly alkaline; clear smooth boundary. (5 to 9 inches thick)

A1--6 to 13 inches; very dark gray (10YR 3/1) sandy clay loam, black (10YR 2/1) moist; moderate fine subangular blocky structure; slightly hard, friable; many fine pores; mildly alkaline; clear smooth boundary. (5 to 18 inches thick)

Bt1--13 to 25 inches; dark grayish brown (10YR 4/2) sandy clay loam, very dark grayish brown (10YR 3/2) moist; moderate medium blocky structure; hard, friable; many fine pores; clay films on surfaces of peds; mildly alkaline; clear smooth boundary. (8 to 24 inches thick)

Bt2--25 to 37 inches; brown (10YR 5/3) sandy clay loam, dark brown (10YR 4/3) moist; weak medium prismatic structure parting to moderate medium blocky; very hard, firm; common pores; patchy clay films on surfaces of peds; mildly alkaline; clear smooth boundary. (10 to 17 inches thick)

Bw--37 to 49 inches; brown (7.5YR 5/4) sandy clay loam, dark brown (7.5YR 4/4) moist; few faint strong brown (10YR 5/6) mottles; weak subangular blocky structure; hard, friable; calcareous; moderately alkaline; gradual smooth boundary. (12 to 24 inches thick)

Ck1--49 to 65 inches; light brown (7.5YR 6/4) sandy clay loam, brown (7.5YR 5/4) moist; few faint strong brown (10YR 5/6) mottles; structureless; hard, friable; common soft bodies and concretions of calcium carbonate; calcareous; moderately alkaline; gradual smooth boundary. (12 to 16 inches thick)

Ck2--65 to 72 inches; light brown (7.5YR 6/4) sandy clay loam, brown (7.5YR 5/4) moist; structureless; common soft bodies and concretions of calcium carbonate; calcareous; moderately alkaline.

TYPE LOCATION: Hidalgo County, Texas; about 3.5 miles east of the intersection of Farm Road 107 and Farm Road 491 at La Villa, Texas, then 0.6 mile north on county road to field road, then 0.4 mile east on field road and 75 feet south of road in field.

RANGE IN CHARACTERISTICS: Solum thickness ranges from 40 to 60 inches. The mollic epipedon ranges from 20 to 44 inches thick. Depth to secondary carbonates ranges from 24 to 50 inches. Electrical conductivity is 1 to 4 mmhos/cm in most pedons, but ranges from 4 to 16 mmhos/cm in saline pedons.

The A horizon is very dark gray (10YR 3/1), very dark grayish brown (10YR 3/2), dark grayish brown (10YR 4/2), or dark gray (10YR 4/1). It is loam or sandy clay loam with clay content ranging from 16 to about 28 percent. It is neutral or mildly alkaline.

Weighted average clay content of the Bt horizon ranges from 26 to 34 percent. Texture is sandy clay loam or clay loam. Clay films are thin and patchy to nearly continuous on both horizontal and vertical surfaces of peds. Structure is weak to moderate fine or medium blocky. Weak to moderate medium or coarse prisms occur in some pedons.

The Bt1 horizon is very dark grayish brown (10YR 3/2), dark grayish brown (10YR 4/2), very dark gray (10YR 3/1), dark gray (10YR 4/1), grayish brown (10YR 5/2), dark brown (10YR 4/3, 3/3), or brown (10YR 5/3). It ranges from neutral to moderately alkaline.

The Bt2 horizon is dark grayish brown (10YR 4/2), brown (10YR 5/3; 7.5YR 5/2, 5/4), grayish brown (10YR 5/2), pale brown (10YR 6/3), or yellowish brown (10YR 5/4). It is mildly alkaline or moderately alkaline.

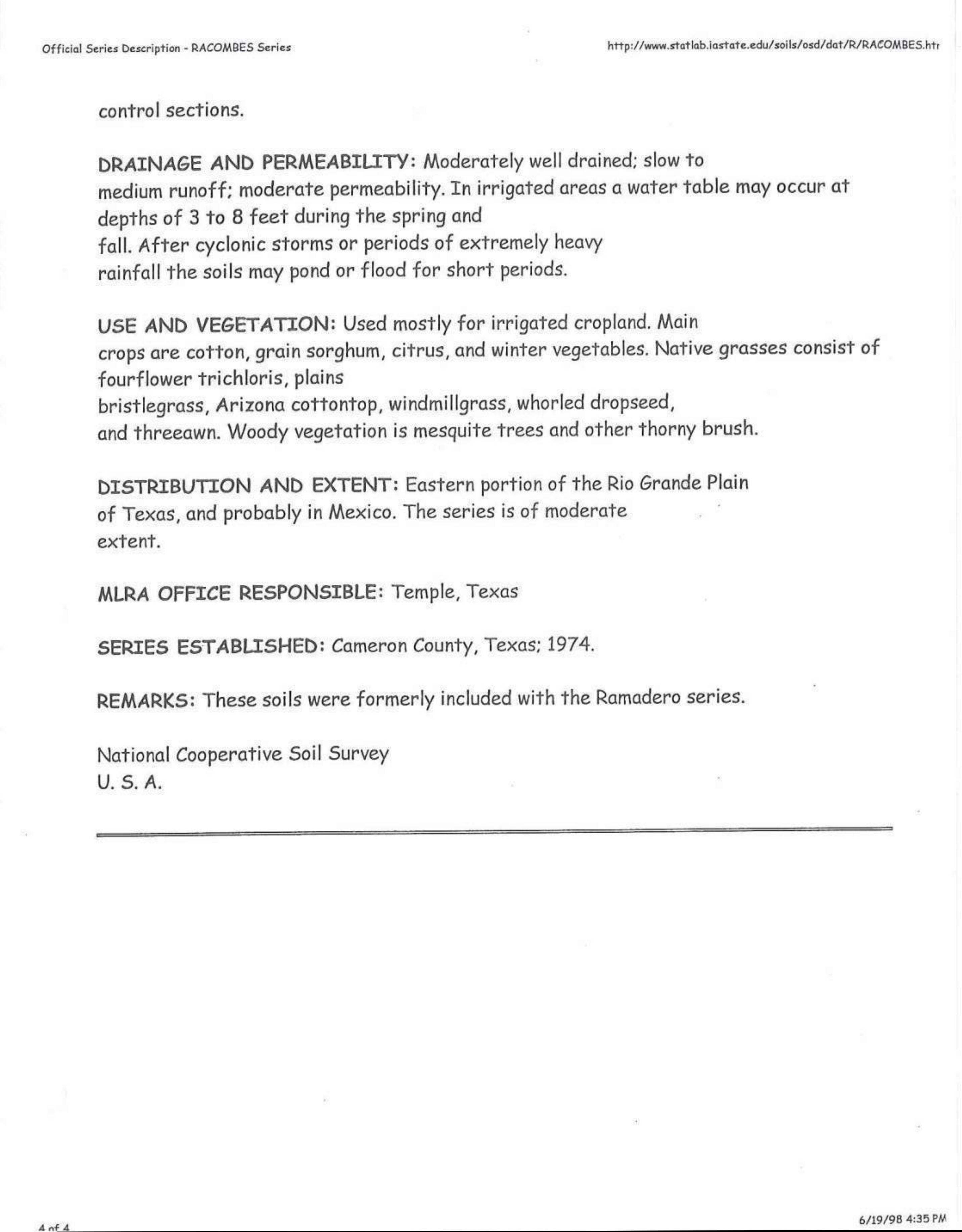
The Bw is grayish brown (10YR 5/2), brown (10YR 5/3; 7.5YR 5/4), light brownish gray (10YR 6/2), light brown (7.5YR 6/4), or pale brown (10YR 6/3). In some pedons this horizon contains secondary calcium carbonate and is designated as a Bk horizon.

The C horizon is light brown (7.5YR 6/4), pink (7.5YR 7/4), reddish yellow (7.5YR 6/6, 7/6), very pale brown (10YR 7/3, 7/4, 8/4), or pale brown (10YR 6/3). It is sandy clay loam or clay loam. Weakly cemented concretions and soft bodies of calcium carbonate range from about 3 to 15 percent by volume.

COMPETING SERIES: These include Altus, Bippus, Bosque, Christine, Clareville, Cuero, Czar, Medley, Ramadero, Rio, Sinton, Smithville, and Tordia series. Altus, Bippus, Bosque, Medley, and Smithville soils have mean annual soil temperatures less than 72 degrees F. Clareville, Rio, and Tordia soils have more than 35 percent clay in their control sections. Christine soils have < 4 mmhos/cm conductivity in the Bt horizons. Cuero soils are moist in the moisture control section for longer periods of time. Czar soils have from 18 to 26 percent clay in the B2t horizon. Ramadero and Sinton soils lack Bt horizons.

GEOGRAPHIC SETTING: Racombes soils are on nearly level deltaic or coastal terraces with plane to concave surfaces having gradients less than 1 percent. The soil formed in alkaline sediments 8 to 10 feet thick. The climate is subtropical with a mean annual precipitation of 23 to about 30 inches. The mean annual temperature is 70 to 74 degrees F., and the Thornthwaite annual P-E index is 22 to about 40.

GEOGRAPHICALLY ASSOCIATED SOILS: These include the competing Rio series, and Hidalgo, Lyford, Raymondville, and Willacy series which occur in the adjacent uplands. Hidalgo, Lyford, Raymondville, and Willacy soils have a mollic epipedon less than 20 inches thick; in addition, Raymondville soils have more than 35 percent clay in their



control sections.

DRAINAGE AND PERMEABILITY: Moderately well drained; slow to medium runoff; moderate permeability. In irrigated areas a water table may occur at depths of 3 to 8 feet during the spring and fall. After cyclonic storms or periods of extremely heavy rainfall the soils may pond or flood for short periods.

USE AND VEGETATION: Used mostly for irrigated cropland. Main crops are cotton, grain sorghum, citrus, and winter vegetables. Native grasses consist of fourflower trichloris, plains bristlegrass, Arizona cottontop, windmillgrass, whorled dropseed, and threeawn. Woody vegetation is mesquite trees and other thorny brush.

DISTRIBUTION AND EXTENT: Eastern portion of the Rio Grande Plain of Texas, and probably in Mexico. The series is of moderate extent.

MLRA OFFICE RESPONSIBLE: Temple, Texas

SERIES ESTABLISHED: Cameron County, Texas; 1974.

REMARKS: These soils were formerly included with the Ramadero series.

National Cooperative Soil Survey
U. S. A.

LOCATION WILLACY TX

Established Series
Rev. CLG:JLJ
2/83

WILLACY SERIES

The Willacy series consists of deep, well drained, moderately permeable soils that formed in alkaline loamy sediments. The soils are on nearly level to moderately sloping uplands. Slopes range from 0 to 5 percent.

TAXONOMIC CLASS: Fine-loamy, mixed, hyperthermic Udic Argiustolls

TYPICAL PEDON: Willacy fine sandy loam--cultivated. (Colors are for dry soil unless otherwise stated.)

Ap-=0 to 7 inches; dark grayish brown (10YR 4/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; slightly hard; friable; mildly alkaline; abrupt smooth boundary. (5 to 9 inches thick)

A--7 to 14 inches; dark grayish brown (10YR 4/2) fine sandy loam, very dark brown (10YR 2/2) moist; weak fine granular and subangular blocky structure; slightly hard, friable; many fine and very fine pores and root channels; mildly alkaline; clear smooth boundary. (6 to 11 inches thick)

Bt1--14 to 19 inches; dark grayish brown (10YR 4/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; moderate medium prismatic breaking to weak fine subangular blocky structure; slightly hard, friable; many fine pores and root channels; patchy clay films on faces of prisms and in pores; many insect channels; mildly alkaline; clear wavy boundary. (4 to 9 inches thick)

Bt2--19 to 36 inches; brown (10YR 5/3) sandy clay loam, dark brown (10YR 4/3) moist; moderate medium prismatic breaking to weak fine subangular blocky structure; hard, friable; many fine pores and root channels; patchy clay films on faces of prisms and in pores; mildly alkaline; clear wavy boundary. (13 to 20 inches thick)

Bk--36 to 42 inches; brown (10YR 5/3) sandy clay loam, dark brown (10YR 4/3) moist; weak fine subangular blocky structure; hard, friable; few films and threads and few soft bodies of calcium carbonate; calcareous; moderately alkaline; clear wavy boundary. (4 to 11 inches thick)

Ck1--42 to 52 inches; pale brown (10YR 6/3) sandy clay loam, brown (10YR 5/3) moist; structureless; hard, friable; common fine and very fine pores; 5 percent of soft bodies and weakly cemented concretions of calcium carbonate; calcareous; moderately alkaline; clear wavy boundary. (8 ?o 16 inches thick)

Ck2--52 to 74 inches; pale brown (10YR 6/3) sandy clay loam, brown (10YR 5/3) moist; structureless; hard, friable; 4 percent of soft bodies and strongly cemented concretions of calcium carbonate; calcareous; moderately alkaline.

TYPE LOCATION: Cameron County, Texas; 11.0 miles north 30 degrees west of Harlingen. In a cultivated field 135 feet north and 215 feet west of the southeast corner of Block 16, Combes Subdivision, which is 1.0 mile east of U.S. Highway 77 on a county road. (Intersection of county road and U.S. Highway 77 is 1.0 mile south of Willacy-Cameron County line.)

RANGE IN CHARACTERISTICS: Solum thickness ranges from 39 to 60 inches, and secondary lime occurs at depths of 36 to 50 inches below the surface. Salinity ranges from none to as much as 8 mmhos/cm in areas irrigated with saline water.

The A horizon is very dark grayish brown (10YR 3/2), dark grayish brown (10YR 4/2), or grayish brown (10YR 5/2). Moist values are less than 3.5. The A horizon is fine sandy loam, loam, or sandy clay loam, and the reaction is neutral or mildly alkaline.

The B horizons are dark grayish brown (10YR 4/2), grayish brown (10YR 5/2), dark brown (10YR 4/3), or brown (10YR 5/3). Some pedons are light brownish gray (10YR 6/2) or pale brown (10YR

6/3) in the lower part. They are fine sandy loam or sandy clay loam; clay content ranges from 18 to 33 percent. Structure of the B horizons ranges from weak to moderately prismatic and subangular blocky. Reaction is neutral or mildly alkaline in the upper part of the B horizon and moderately alkaline in the lower part.

The C horizon is pale brown (10YR 6/3) very pale brown (10YR 7/3) or light brownish gray (10YR 6/2). Visible accumulation of calcium carbonate in the C horizon ranges from 3 to 5 percent by volume and remains relatively constant with depth.

Competing Series: There are no series in the same family. Similar soils include Brennan, Clareville, Cuero, Czar, Duval, Klump, Parasol, Ramadero, Stoneburg, and Tela series. Brennan and Duval soils contain less than 1 percent organic matter in the epipedon. Clareville, Cuero, Czar, and Ramadero soils have mollic epipedons thicker than 20 inches. Klump and Stoneburg soils have mean annual soil temperatures less than 72 degrees F. Parasol soils have a difference of less than 9 degrees F. between mean summer and mean winter soil temperatures. Tela soils contain secondary lime at depths less than 34 inches.

GEOGRAPHIC SETTING: Willacy soils occur in nearly level coastal terraces and deltas with slope gradients mostly less than 2 percent but range up to about 5 percent along local drainageways. The soil formed in alkaline, loamy sediments 10 feet or more deep. The climate is dry subhumid. Average annual precipitation ranges from 26 to 34 inches and the mean annual air temperature ranges from 72 to 74 degrees F. Annual Thornthwaite P-E index ranges from 28 to 44.

GEOGRAPHICALLY ASSOCIATED SOILS: These include Hargill, Hidalgo, Racombes, and Raymondville series. Hargill soils have sola more than 60 inches thick. Hidalgo and Raymondville soils are calcareous throughout and in addition, Raymondville soils have more than 35 percent clay in the 10- to 40-inch control section. Racombes soils have mollic epipedons more than 20 inches thick. All these soils occur on similar surfaces.

Drainage and Permeability: Well drained; medium runoff; moderate permeability. Under irrigation, seasonal watertables accumulate 5 to 8 feet below the surface.

USE AND VEGETATION: Mostly cultivated and mostly irrigated. Few areas in native rangeland. Use for wide variety of vegetables, citrus, cotton, grain sorghums, and flax. In rangeland, the grasses are mostly fourflower trichloris, Arizona cottontop, lovegrass tridens, plains bristlegrass, hooded windmillgrass, and hairy grama. Woody vegetation consists of mesquite and Texas ebony trees, and spiny hackberry, blackbrush, catclaw, lote, brazil, and pricklypear.

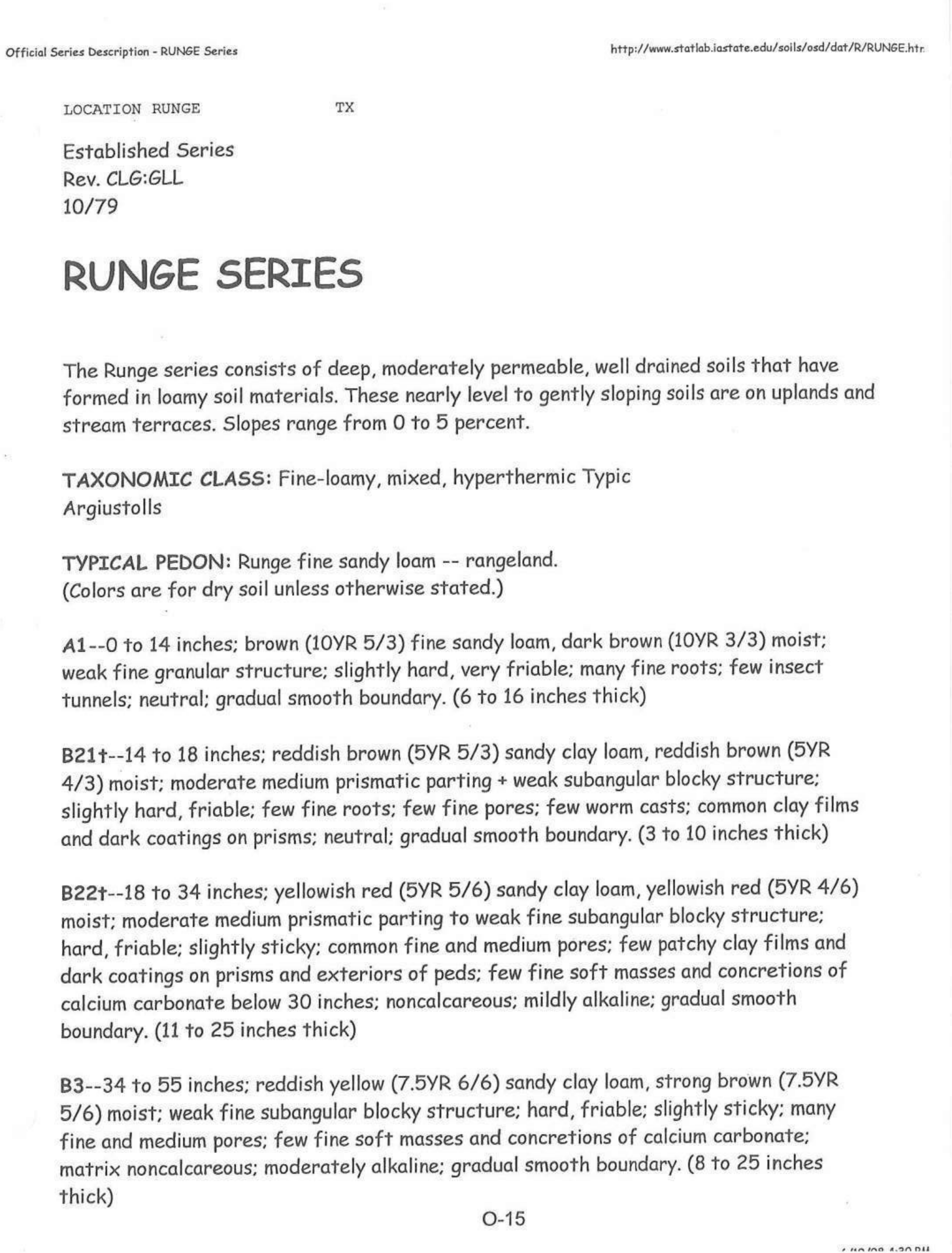
DISTRIBUTION AND EXTENT: Mainly within the lower Rio Grande Plain and Gulf Coast Prairies in southern Texas. Possibly in Mexico. Series is of moderate extent comprising about 90,000 acres.

MLRA OFFICE RESPONSIBLE: Temple, Texas

SERIES ESTABLISHED: Hidalgo County, Texas; 1925.

REMARKS: Limited laboratory data available from ARS-SCS cooperative study.

National Cooperative Soil Survey
U. S. A.



LOCATION RUNGE TX

Established Series
Rev. CLG:GLL
10/79

RUNGE SERIES

The Runge series consists of deep, moderately permeable, well drained soils that have formed in loamy soil materials. These nearly level to gently sloping soils are on uplands and stream terraces. Slopes range from 0 to 5 percent.

TAXONOMIC CLASS: Fine-loamy, mixed, hyperthermic Typic Argiustolls

TYPICAL PEDON: Runge fine sandy loam -- rangeland.
(Colors are for dry soil unless otherwise stated.)

A1--0 to 14 inches; brown (10YR 5/3) fine sandy loam, dark brown (10YR 3/3) moist; weak fine granular structure; slightly hard, very friable; many fine roots; few insect tunnels; neutral; gradual smooth boundary. (6 to 16 inches thick)

B21t--14 to 18 inches; reddish brown (5YR 5/3) sandy clay loam, reddish brown (5YR 4/3) moist; moderate medium prismatic parting + weak subangular blocky structure; slightly hard, friable; few fine roots; few fine pores; few worm casts; common clay films and dark coatings on prisms; neutral; gradual smooth boundary. (3 to 10 inches thick)

B22t--18 to 34 inches; yellowish red (5YR 5/6) sandy clay loam, yellowish red (5YR 4/6) moist; moderate medium prismatic parting to weak fine subangular blocky structure; hard, friable; slightly sticky; common fine and medium pores; few patchy clay films and dark coatings on prisms and exteriors of peds; few fine soft masses and concretions of calcium carbonate below 30 inches; noncalcareous; mildly alkaline; gradual smooth boundary. (11 to 25 inches thick)

B3--34 to 55 inches; reddish yellow (7.5YR 6/6) sandy clay loam, strong brown (7.5YR 5/6) moist; weak fine subangular blocky structure; hard, friable; slightly sticky; many fine and medium pores; few fine soft masses and concretions of calcium carbonate; matrix noncalcareous; moderately alkaline; gradual smooth boundary. (8 to 25 inches thick)

Cca--55 to 72 inches; reddish yellow (7.5YR 8/6) sandy clay loam, reddish yellow (7.5YR 7/6) moist; structureless; slightly hard, friable; about 5 percent by volume of concretions and soft masses of calcium carbonate; calcareous; moderately alkaline.

TYPE LOCATION: Jim Wells County, Texas; 1 mile south of Ben Bolt on U. S. Highway 281, 1.7 miles west on a graded road, 1 mile south of road and 100 feet west of Hoffman ranch east boundary fence. This point is 2.7 miles southwest of Ben Bolt, Texas.

RANGE IN CHARACTERISTICS: Solum thickness is 40 to 60 inches. The mollic epipedon is 10 to 18 inches thick and includes the upper part of the argillic horizon in some pedons. Depth to secondary carbonates is 20 to 36 inches.

The A horizon has hue of 7.5YR and 10YR, value of 3 to 5, chroma of 2 or 3. It is fine sandy loam or loam and slightly acid through mildly alkaline.

The Bt horizon has hue of 5YR and 7.5YR, value of 4 to 7, chroma of 2 to 8. Colors as in the A horizon are included in the upper Bt horizon of some pedons. It is sandy clay loam or clay loam with clay content of 22 to 35 percent. Reaction is neutral through moderately alkaline.

The B3 and Cca horizons are yellowish or brownish sandy clay loam, clay loam, or loam and moderately alkaline. Threads, films, soft masses and concretions of calcium carbonate range from 0 to 5 percent in the B3 horizon and from 5 to 15 percent in the Cca horizon.

COMPETING SERIES: These include he Bukreek, Cuero, Lyford, Ramadero and Tela series. Bukreek soils have mean annual soil temperatures less than 72 degrees F. Cuero and Ramadero soils have mollic epipedons more than 20 inches thick. Lyford soils have an epipedon that is very hard when dry. Tela soils have hue of 10YR in the Bt horizon.

GEOGRAPHIC SETTING: Runge soils occur on nearly level to sloping uplands and streams terraces. Slope gradients are convex and dominantly less than 3 percent but range up to 5 percent in a few places. The soil formed in loamy calcareous materials derived from sandstone or alluvium. Average annual precipitation ranges from about 24 to 35 inches and mean annual temperature ranges from 70 degrees to 74 degrees F. Annual Thornthwaite P-E index is 30 to 44.

GEOGRAPHICALLY ASSOCIATED SOILS: These include the Clareville, Goliad, Hidalgo, and Willacy soils. Clareville and Goliad soils have more than 35 percent clay in their control sections. Hidalgo soils lack Bt horizons. Willacy soils lack secondary calcium carbonate within 36 inches.

DRAINAGE AND PERMEABILITY: Well drained; medium runoff; moderate permeability.

USE AND VEGETATION: Most of this soil is in cropland, but a few areas are in rangeland and improved pastures. Native grasses are mainly four-flower trichloris, Arizona cottontop, tanglehead, sideoats grama, plains bristlegrass, hooded windmillgrass, and pinhole bluestem. Woody vegetation consists of mesquite, spiny hackberry, desert yaupon, catclaw, elbowbush, limepricklyash, and pricklypear.

DISTRIBUTION AND EXTENT: Inner Coastal Bend in eastern part of Rio Grande Plain. Series is of moderate extent.

MLRA OFFICE RESPONSIBLE: Temple, Texas

SERIES ESTABLISHED: Wilson County, Texas; 1972.

REMARKS: The Runge soils were formerly classified in the Reddish Chestnut great soil group.

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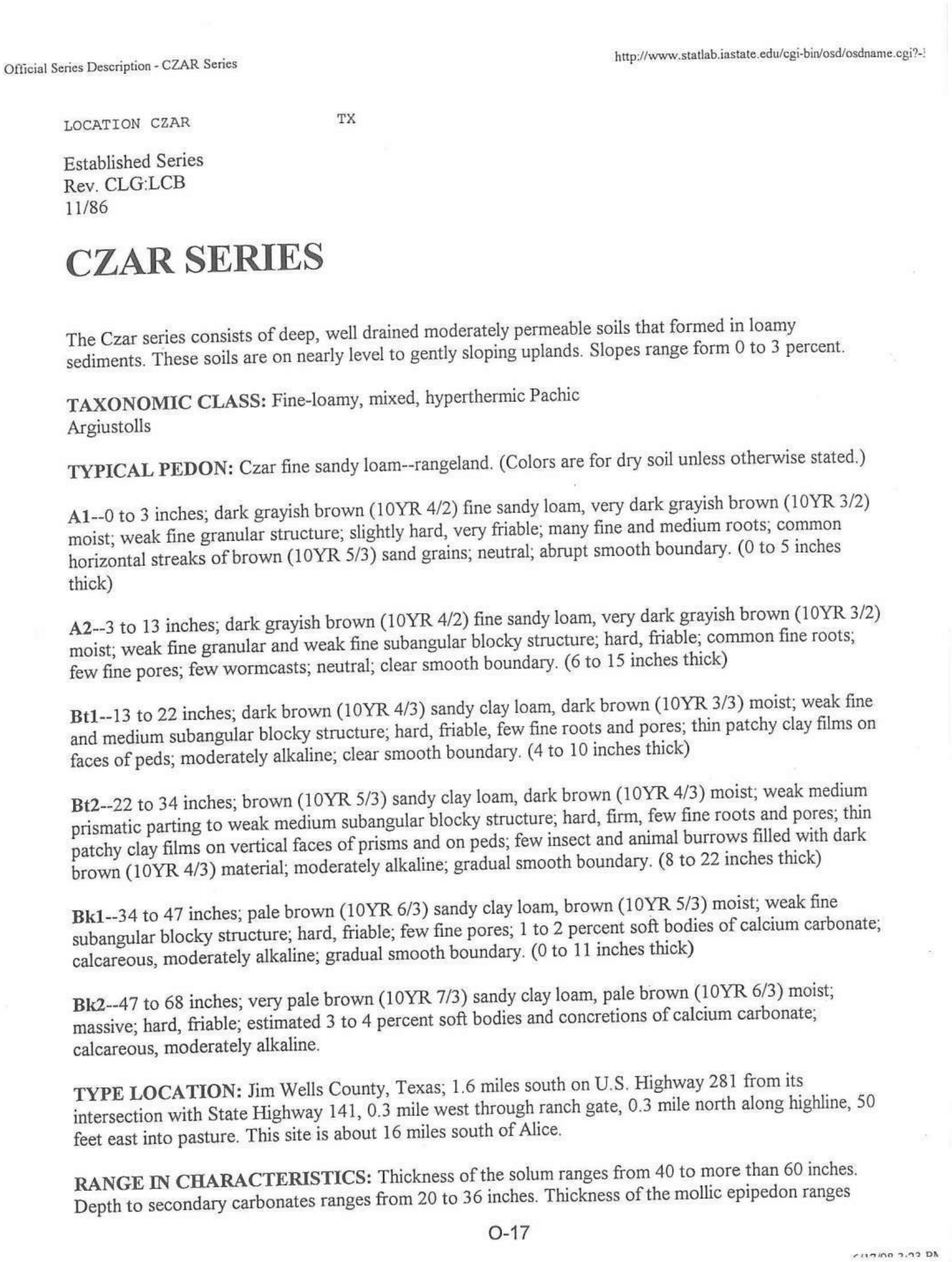


LOCATION CZAR TX

Established Series
Rev. CLG:LCB
11/86

CZAR SERIES

The Czar series consists of deep, well drained moderately permeable soils that formed in loamy sediments. These soils are on nearly level to gently sloping uplands. Slopes range form 0 to 3 percent.

TAXONOMIC CLASS: Fine-loamy, mixed, hyperthermic Pachic Argiustolls

TYPICAL PEDON: Czar fine sandy loam--rangeland. (Colors are for dry soil unless otherwise stated.)

A1--0 to 3 inches; dark grayish brown (10YR 4/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; slightly hard, very friable; many fine and medium roots; common horizontal streaks of brown (10YR 5/3) sand grains; neutral; abrupt smooth boundary. (0 to 5 inches thick)

A2--3 to 13 inches; dark grayish brown (10YR 4/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine granular and weak fine subangular blocky structure; hard, friable; common fine roots; few fine pores; few wormcasts; neutral; clear smooth boundary. (6 to 15 inches thick)

Bt1--13 to 22 inches; dark brown (10YR 4/3) sandy clay loam, dark brown (10YR 3/3) moist; weak fine and medium subangular blocky structure; hard, friable, few fine roots and pores; thin patchy clay films on faces of peds; moderately alkaline; clear smooth boundary. (4 to 10 inches thick)

Bt2--22 to 34 inches; brown (10YR 5/3) sandy clay loam, dark brown (10YR 4/3) moist; weak medium prismatic parting to weak medium subangular blocky structure; hard, firm, few fine roots and pores; thin patchy clay films on vertical faces of prisms and on peds; few insect and animal burrows filled with dark brown (10YR 4/3) material; moderately alkaline; gradual smooth boundary. (8 to 22 inches thick)

Bk1--34 to 47 inches; pale brown (10YR 6/3) sandy clay loam, brown (10YR 5/3) moist; weak fine subangular blocky structure; hard, friable; few fine pores; 1 to 2 percent soft bodies of calcium carbonate; calcareous, moderately alkaline; gradual smooth boundary. (0 to 11 inches thick)

Bk2--47 to 68 inches; very pale brown (10YR 7/3) sandy clay loam, pale brown (10YR 6/3) moist; massive; hard, friable; estimated 3 to 4 percent soft bodies and concretions of calcium carbonate; calcareous, moderately alkaline.

TYPE LOCATION: Jim Wells County, Texas; 1.6 miles south on U.S. Highway 281 from its intersection with State Highway 141, 0.3 mile west through ranch gate, 0.3 mile north along highline, 50 feet east into pasture. This site is about 16 miles south of Alice.

RANGE IN CHARACTERISTICS: Thickness of the solum ranges from 40 to more than 60 inches. Depth to secondary carbonates ranges from 20 to 36 inches. Thickness of the mollic epipedon ranges from 20 to 30 inches.

The A horizon has hue of 10YR, value of 3 to 5, and chroma of 1 to 3. Reaction is neutral or mildly alkaline.

The Bt horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 2 or 3. Texture is sandy clay loam or fine sandy loam. Clay content ranges from 18 to 28 percent. Reaction is mildly or moderately alkaline.

The Bk1 horizon has hue of 10YR or 7.5YR, value of 5 or 6, and chroma of 2 to 4. Texture is sandy clay loam or fine sandy loam. It is moderately alkaline and calcareous. Soft bodies and concretions of calcium carbonate range from 1 to 5 percent.

The Bk2 horizon has hue of 10YR or 7.5YR, value of 6 to 8, and chroma of 2 to 8. Texture is sandy clay loam or fine sandy loam. It is moderately alkaline and calcareous. Soft bodies and concretions of calcium carbonate range from 3 to 15 percent. Some pedons have a BC horizon below the Bk horizon.

COMPETING SERIES: These include the Christine and Racomes series in the same family and the similar Bosque, Clareville, Cuero, Ramadero, Sinton, and Smithville series. Christine soils have more than 4 percent exchangeable sodium and more than 4mmhos conductivity in the upper Bt horizon. Racomes soils have more than 25 percent clay in their control section and have secondary carbonates at depths greater than 36 inches. Bosque, Cuero and Smithville soils have mean annual temperatures less than 72 degrees F. Clareville soils are in a fine family. Ramadero and Sinton soils lack Bt horizons.

GEOGRAPHIC SETTING: Czar soils occupy nearly level to gently sloping uplands. Slope gradients range from 0 to 3 percent and surfaces are plane to convex. The soil formed in calcareous loamy sediments of Pleistocene and Holocene Age. Some areas flood during cyclonic storms. Mean annual temperature is 70 degrees to 74 degrees F., mean annual precipitation is 23 to 32 inches, and the Thornthwaite annual P-E index is 28 to 44.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the competing Clareville, Racombes, and Sinton series, and the Delfina, Orelia, Papalote, Pharr, and Runge series. Delfina, Orelia, and Papalote soils lack a mollic epipedon. Pharr and Runge soils have a mollic epipedon
less than 20 inches thick.

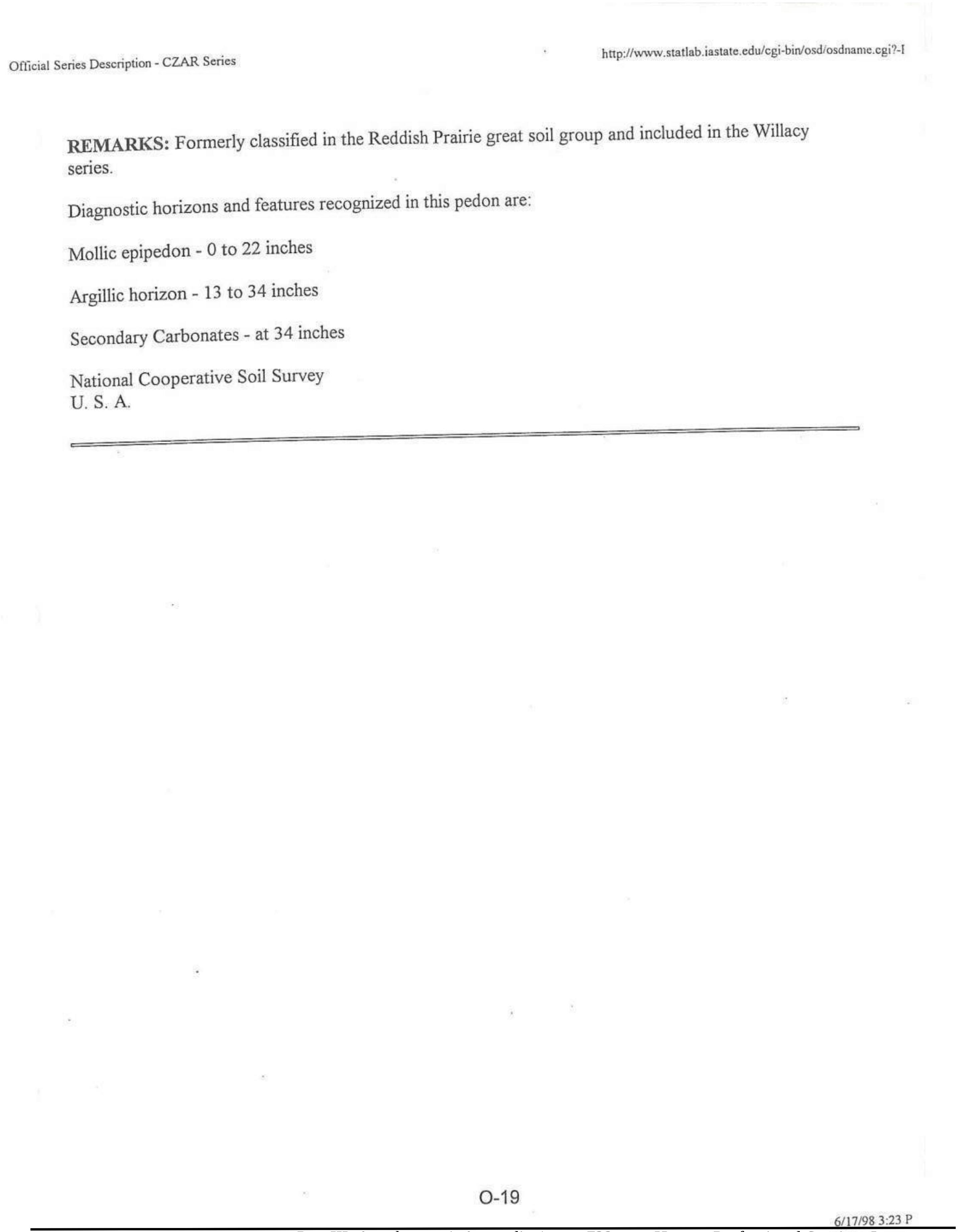
DRAINAGE AND PERMEABILITY: Well drained; slow to medium surface runoff; moderate permeability.

USE AND VEGETATION: Used about equally as cropland, pastureland, and rangeland. The major crop is grain sorghum. Improved pastures are coastal bermuda and buffelgrass. Native grasses are mainly two and four-flower trichloris, hooded windmillgrass, Wrights threeawn, and plains bristlegrass. Woody vegetation includes scattered mesquite, spiny hackberry, and pricklypear.

DISTRIBUTION AND EXTENT: East central Rio Grande Plain and southern Gulf Coast Prairie of Texas. The series is moderately extensive.

MLRA OFFICE RESPONSIBLE: Temple, Texas

SERIES ESTABLISHED: Jim Wells County, Texas; 1976.



REMARKS: Formerly classified in the Reddish Prairie great soil group and included in the Willacy series.

Diagnostic horizons and features recognized in this pedon are:

Mollic epipedon - 0 to 22 inches

Argillic horizon - 13 to 34 inches

Secondary Carbonates - at 34 inches

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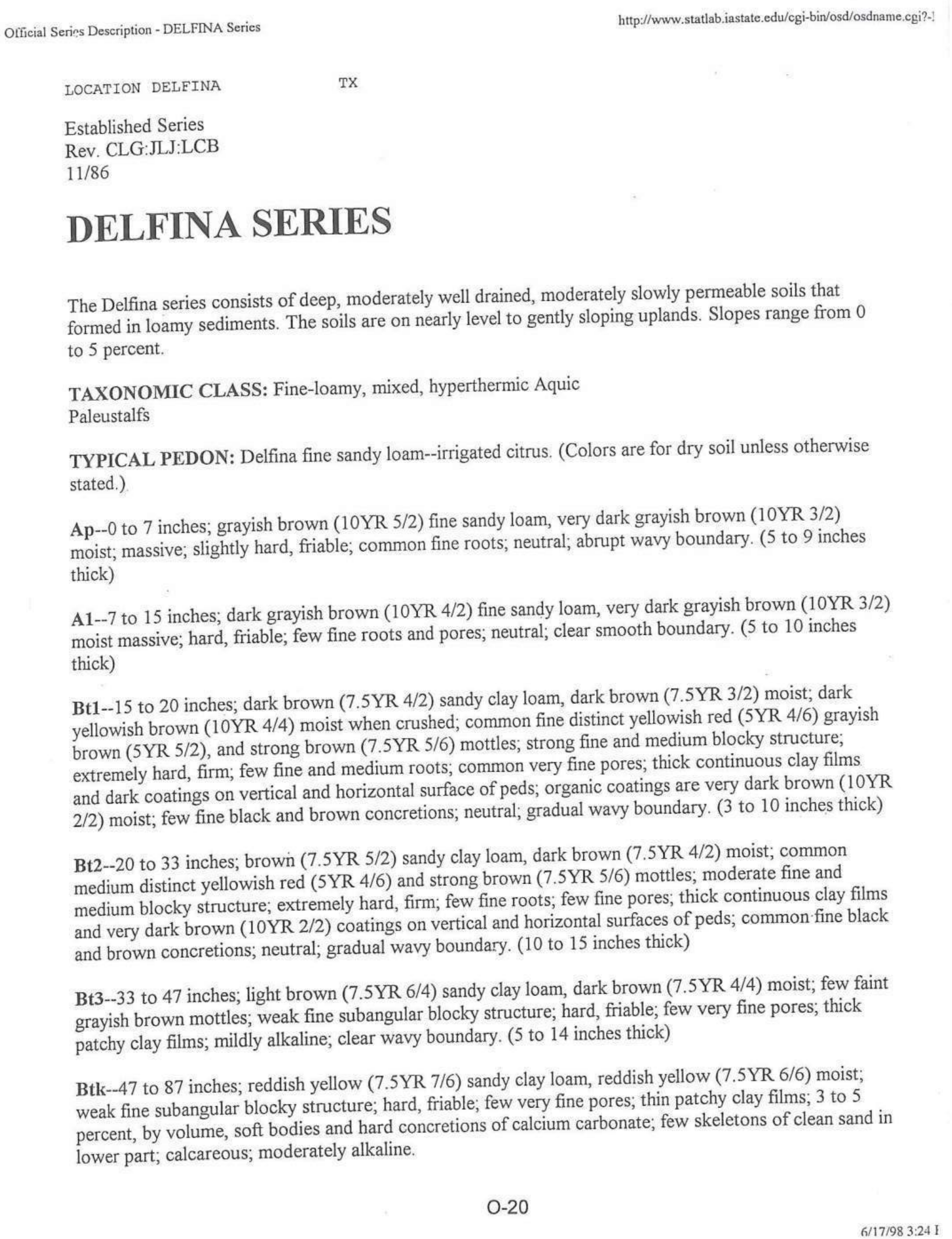


LOCATION DELFINA TX

Established Series
Rev. CLG:JLJ:LCB
11/86

DELFINA SERIES

The Delfina series consists of deep, moderately well drained, moderately slowly permeable soils that formed in loamy sediments. The soils are on nearly level to gently sloping uplands. Slopes range from 0 to 5 percent.

TAXONOMIC CLASS: Fine-loamy, mixed, hyperthermic Aquic Paleustalfs

TYPICAL PEDON: Delfina fine sandy loam--irrigated citrus. (Colors are for dry soil unless otherwise stated.)

Ap--0 to 7 inches; grayish brown (10YR 5/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; massive; slightly hard, friable; common fine roots; neutral; abrupt wavy boundary. (5 to 9 inches thick)

A1--7 to 15 inches; dark grayish brown (10YR 4/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist massive; hard, friable; few fine roots and pores; neutral; clear smooth boundary. (5 to 10 inches thick)

Bt1--15 to 20 inches; dark brown (7.5YR 4/2) sandy clay loam, dark brown (7.5YR 3/2) moist; dark yellowish brown (10YR 4/4) moist when crushed; common fine distinct yellowish red (5YR 4/6) grayish brown (5YR 5/2), and strong brown (7.5YR 5/6) mottles; strong fine and medium blocky structure; extremely hard, firm; few fine and medium roots; common very fine pores; thick continuous clay films and dark coatings on vertical and horizontal surface of peds; organic coatings are very dark brown (10YR 2/2) moist; few fine black and brown concretions; neutral; gradual wavy boundary. (3 to 10 inches thick)

Bt2--20 to 33 inches; brown (7.5YR 5/2) sandy clay loam, dark brown (7.5YR 4/2) moist; common medium distinct yellowish red (5YR 4/6) and strong brown (7.5YR 5/6) mottles; moderate fine and medium blocky structure; extremely hard, firm; few fine roots; few fine pores; thick continuous clay films and very dark brown (10YR 2/2) coatings on vertical and horizontal surfaces of peds; common fine black and brown concretions; neutral; gradual wavy boundary. (10 to 15 inches thick)

Bt3--33 to 47 inches; light brown (7.5YR 6/4) sandy clay loam, dark brown (7.5YR 4/4) moist; few faint grayish brown mottles; weak fine subangular blocky structure; hard, friable; few very fine pores; thick patchy clay films; mildly alkaline; clear wavy boundary. (5 to 14 inches thick)

Btk--47 to 87 inches; reddish yellow (7.5YR 7/6) sandy clay loam, reddish yellow (7.5YR 6/6) moist; weak fine subangular blocky structure; hard, friable; few very fine pores; thin patchy clay films; 3 to 5 percent, by volume, soft bodies and hard concretions of calcium carbonate; few skeletons of clean sand in lower part; calcareous; moderately alkaline.

TYPE LOCATION: Willacy County, Texas; 8 miles west of Raymondville on Texas Hwy 186; 2.8 miles south on Farm Road 1015; 0.7 miles west on County Road; then 350 feet south and 100 feet east, in citrus orchard.

RANGE IN CHARACTERISTICS: Solum thickness ranges from 60 to 90 inches. Secondary lime occurs at depths of 36 to 80 inches.

The A horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 2 to 4. It is fine sandy loam or loamy fine sand, and is slightly acid to mildly alkaline. Organic matter content is less than 1 percent.

The Bt or 2Bt horizon has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 2 to 6 with few to common distinct and faint mottles of brown, gray, and red, chromas of 1 through 8. Peds with matrix chroma of 3 or more have mottles with chroma of 2 or less. The Bt horizon is sandy clay loam or clay loam with a clay content of 25 to 35 percent. It is neutral to moderately alkaline. Structure ranges from moderate to strong blocky and subangular blocky.

The Btk horizon has hue of 10YR to 5YR, value of 5 to 7, and chroma of 2 to 8. Most pedons have common coarse mottles with chromas of 6 or 8. It is fine sandy loam or sandy clay loam. calcium carbonate in the Btca horizon ranges from a few concretions to about 5 percent by volume, and the calcium carbonate equivalent ranges from 5 to 15 percent.

COMPETING SERIES: There are no competing series in the same family. Similar soils are the Brystal, Delmita, Leming, Miguel, Nueces, and Papalote series. Brystal soils lack mottles with chroma 2 or less and are dry in the moisture control section for longer periods. Delmita soils have petrocalcic horizons at depths of less than 40 inches. Leming, Miguel, and Papalote soils have B2t horizons with more than 35 percent clay in the upper 20 inches. Nueces soils have sandy epipedons more than 20 inches thick.

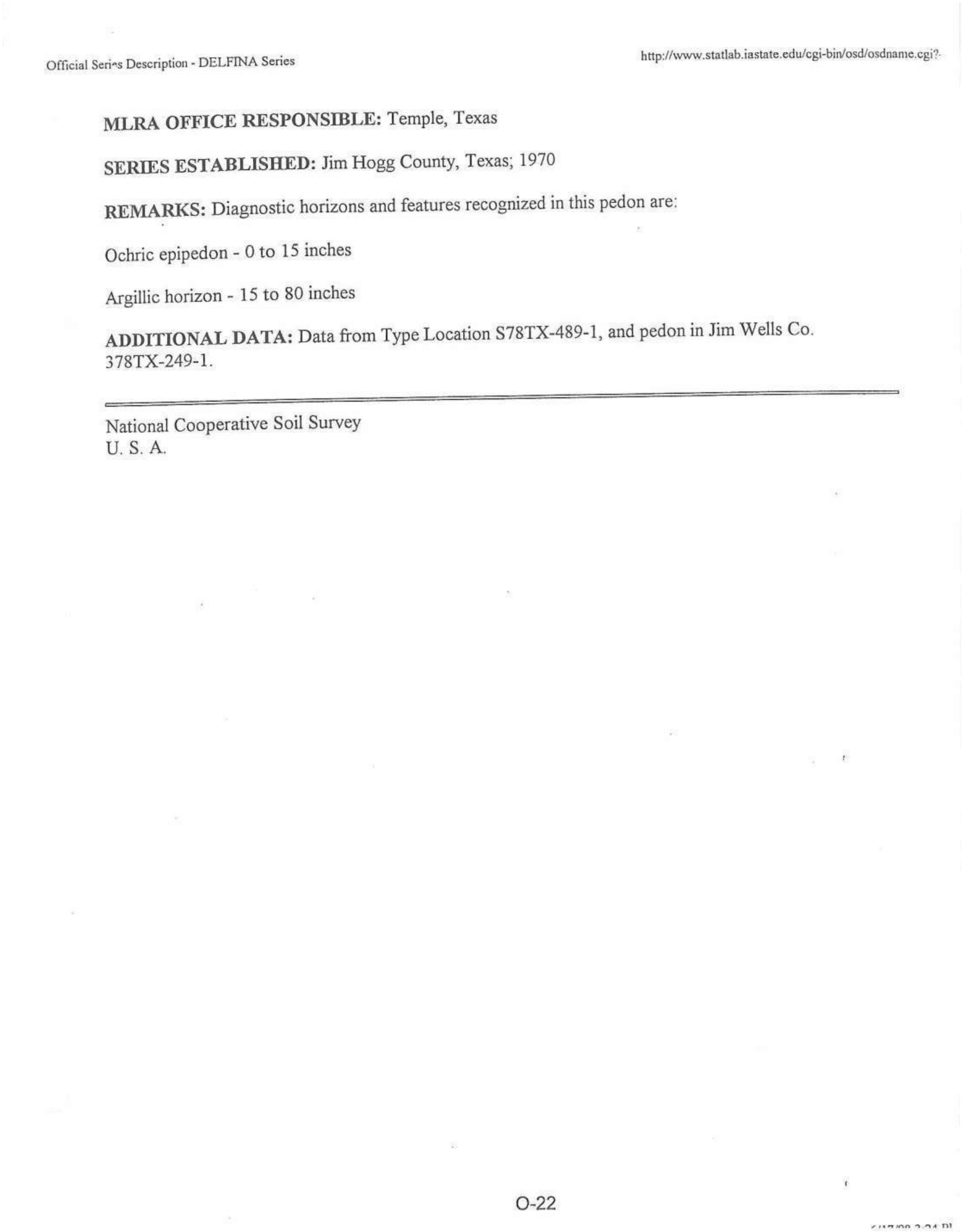
GEOGRAPHIC SETTING: Delfina soils occupy nearly level to gently sloping uplands or old stream terraces. The soils formed in calcareous and loamy sediments. Slopes range from 0 to 5 percent, mostly less than 2 percent, and the surface is plane or convex. The climate is warm dry subhumid to semiarid. Mean annual precipitation ranges from 20 to 30 inches, mean annual air temperature ranges from 72 to 75 degrees F., and Thornthwaite P-E index ranges from 31 to 44.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the competing Delmita, Miguel, Nueces, and Papalote series, and the Rio, Tiocano, and Willacy series. Rio and Willacy soils have mollic epipedons. Tiocano soils are poorly drained clays with intersecting slickensides.

DRAINAGE AND PERMEABILITY: Moderately well drained, slow to medium runoff; moderately slow permeability.

USE AND VEGETATION: Used primarily for irrigated and dry land crops, such as citrus, cotton, grain sorghum, and a wide variety of cool season vegetables. A small acreage is used for watermelons and peanuts. Native vegetation consists of trichloris, Arizona cottontop, pink pappusgrass, and crinkleawn. In eastern range of occurrence, some seacoast bluestem and brownseed paspalum grasses occur. Mesquite, granjeno, catclaw, tassajillo, and prickly pear are the principal woody plants.

DISTRIBUTION AND EXTENT: Southern Rio Grande Plain and Gulf Coast Prairie of Texas. The series is moderate in extent, probably about 75,000 acres.



MLRA OFFICE RESPONSIBLE: Temple, Texas

SERIES ESTABLISHED: Jim Hogg County, Texas; 1970

REMARKS: Diagnostic horizons and features recognized in this pedon are:

Ochric epipedon - 0 to 15 inches

Argillic horizon - 15 to 80 inches

ADDITIONAL DATA: Data from Type Location S78TX-489-1, and pedon in Jim Wells Co. 378TX-249-1.

National Cooperative Soil Survey
U. S. A.

LOCATION ORELIA TX

Established Series
Rev. CLG:WJG
5/84

ORELIA SERIES

The Orelia series consists of deep, somewhat poorly drained, very slowly permeable soils that formed in thick marine sediments on coastal terraces. These soils are on nearly level to gently sloping uplands. Slopes range from 0 to 3 percent.

TAXONOMIC CLASS: Fine-loamy, mixed, hyperthermic Typic Ochraqualfs

TYPICAL PEDON: Orelia fine sandy loam--rangeland.
(Colors are for dry soil unless otherwise stated.)

A--0 to 5 inches; gray (10YR 5/1) fine sandy loam, dark gray (10YR 4/1) moist; massive; hard, friable; common fine roots; few fine pores and insect tunnels; slightly acid; abrupt smooth boundary. (2 to 8 inches thick)

Btg1--5 to 10 inches; dark gray (10YR 4/1) sandy clay loam, very dark gray (10YR 3/1) moist; moderate coarse prismatic structure parting to moderate medium blocky; very hard, firm; common roots between peds; few patchy clay films on peds; neutral; clear smooth boundary. (3 to 8 inches thick)

Btg2--10 to 25 inches; dark gray (10YR 4/1) sandy clay loam, very dark gray (10YR 3/1) moist; few fine dark root stains; weak coarse prismatic structure parting to moderate medium blocky; extremely hard, very firm; roots between peds; nearly continuous clay films on surfaces of peds; few fine FeMn concretions; mildly alkaline; gradual smooth boundary. (9 to 20 inches thick)

Bkzg--25 to 32 inches; gray (10YR 6/1) sandy clay loam, gray (10YR 5/1) moist; weak fine subangular structure; friable, very hard, slightly sticky; about 5 percent fine calcium carbonate concretions; moderately saline; calcareous; moderately alkaline; gradual smooth boundary. (5 to 30 inches thick)

Ckz--32 to 50 inches; light gray (10YR 7/2) sandy clay loam, light brownish gray (10YR 6/2) moist with a few fine faint yellowish brown mottles; massive; hard, friable; about 5 percent concretions and soft bodies of calcium carbonate; calcareous; strongly saline; moderately alkaline.

TYPE LOCATION: San Patricio County, Texas; from the intersection of U.S. Highway 181 and Farm Road 3089, 8.0 miles west on Farm Road 3089, 5.4 miles north on Farm Road 796 and 50 feet east in pasture.

RANGE IN CHARACTERISTICS: Solum thickness ranges from 28 to 50 inches.

The A horizon is dark gray (10YR 4/1), gray (10YR 5/1), or grayish brown (10YR 5/2). It is fine sandy loam, clay loam, or sandy clay loam. Structure ranges from massive to weak fine subangular blocky and is hard setting. Reaction is slightly acid through mildly alkaline, the exchangeable sodium percentage is 3 to about 8, and the soil salinity ranges from 0.4 to 4.0 millimhos per centimeter.

The Btg horizon is gray (10R 5/1), dark gray (10YR 4/1) or very dark gray (10YR 3/1), or it may be mottled with these colors. Common brownish and yellowish mottles occur in some pedons. It is sandy clay loam or clay loam with a clay content of 28 to 35 percent. Structure is coarse to medium prismatic or moderate to strong medium blocky. Reaction is neutral to moderately alkaline. The exchangeable sodium percentage is 6 to 14 and soil salinity is 1 to 8 mmilimhos per centimeter.

The Bk horizon is gray (10YR 5/1), light gray (10YR 7/2, 6/2), grayish brown (10YR 5/2) or white (10YR 8/2). It is sandy clay loam containing from a few to 10 percent of weakly and strongly cemented calcium carbonate concretions and soft bodies. The exchangeable sodium percentage is 12 to about 20 percent with values exceeding 15 percent at depths of more than 16 inches below the top of the Bt horizon.

The C horizon is light gray (10YR 6/1, 7/1, 7/2), white (10YR 8/2; 2.5Y 8/2), or light brownish gray (10YR 6/2) sandy clay loam or loam containing from 5 to 10 percent of concretions and soft bodies of calcium carbonate. The exchangeable sodium percentage of the Bk and C horizons ranges from about 12 to 20 and soil salinity ranges from 1 to 12 millimhos per centimeter.

COMPETING SERIES: These are no other series in this family. Similar soils include the Bradenton, Clodine, Edna, Miguel, Tuckerman, Waller, and Wilson series. Bradenton soils have less than 18 percent clay in the upper 20 inches of the Btg horizon. Clodine, Tuckerman, and Waller soils have sola more than 50 inches thick and have mean annual soil temperatures less than 72 degrees F. Edna, Miguel, and Wilson soils have more than 35 percent clay in the upper 20 inches of the B horizon and in addition, Edna and Wilson soils have mean annual soil temperatures less than 72 degrees F.

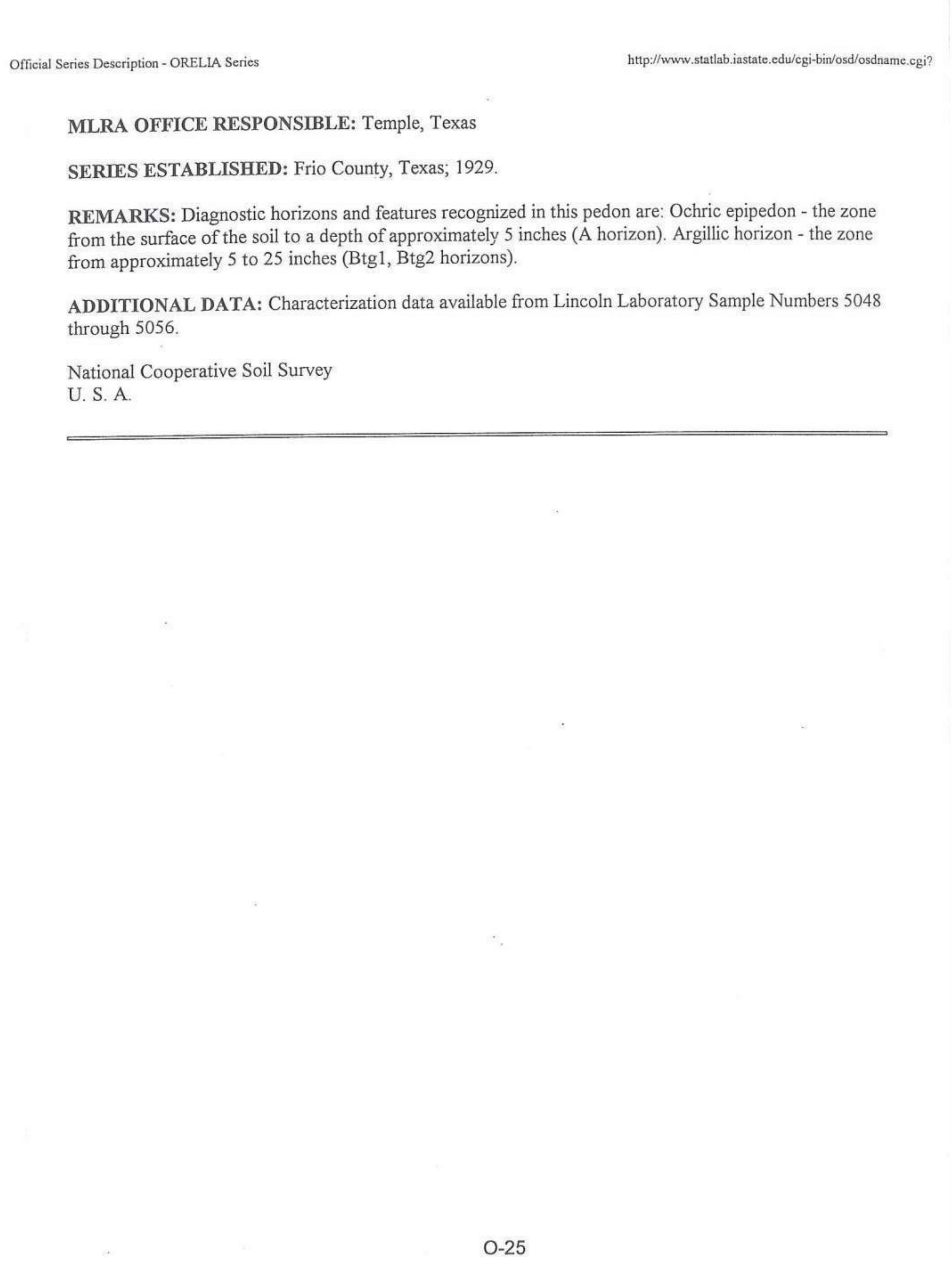
GEOGRAPHIC SETTING: Orelia soils occur on nearly level or slightly concave to gently sloping uplands and coastal terraces. Slopes are dominantly less than 0.2 percent, but range up to 3 percent. The soil formed in loamy sediments of about Pleistocene age. The climate is dry subhumid. The mean annual precipitation range is 25 to 30 inches and mean annual air temperature of 70 to 74 degrees F. Thornthwaite annual P-E index ranges from 30 to 44.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the competing Miguel series and the Clareville, Edroy, Raymondville, and Victoria series. Clareville, Raymondville, and Victoria soils are on similar surfaces. Clareville and Raymondville soils, as well as, Edroy soils, have mollic epipedons. Edroy soils are in depressions. Miguel soils have steeper slopes and are at higher elevations. Victoria soils have intersecting slickensides.

DRAINAGE AND PERMEABILITY: Somewhat poorly drained; slow runoff; very slow permeability. A perched water table occurs in the A and upper Btg horizons for periods up to 30 days during September or May.

USE AND VEGETATION: Approximately half of Orelia soils are cultivated to cotton, grain sorghum, and vegetables. Small areas are used for pasture and the balance used for rangeland. Native vegetation consists of curlymesquite, feather bluestem, fourflower, trichloris, grassbur, threeawn, mesquite trees, blackbrush, spiny hackberry, pricklypear, and tasajillo. Gulf cordgrass is the dominant grass in saline areas.

DISTRIBUTION AND EXTENT: Rio Grande Plain of southern Texas. The series is extensive.



MLRA OFFICE RESPONSIBLE: Temple, Texas

SERIES ESTABLISHED: Frio County, Texas; 1929.

REMARKS: Diagnostic horizons and features recognized in this pedon are: Ochric epipedon - the zone from the surface of the soil to a depth of approximately 5 inches (A horizon). Argillic horizon - the zone from approximately 5 to 25 inches (Btg1, Btg2 horizons).

ADDITIONAL DATA: Characterization data available from Lincoln Laboratory Sample Numbers 5048 through 5056.

National Cooperative Soil Survey
U. S. A.

LOCATION CLAREVILLE TX

Established Series
Rev. ACT-CLN
9/97

CLAREVILLE SERIES

The Clareville series consists of very deep, well drained, moderately slowly permeable soils. These loamy soils formed in alluvial and colluvial sediments of Pleistocene age. These soils are on nearly level to gently sloping stream terraces. Slopes range from 0 to 5 percent.

TAXONOMIC CLASS: Fine, smectitic, hyperthermic Pachic Argiustolls

TYPICAL PEDON: Clareville loam--cropland.
(Colors are for dry soil unless otherwise stated.)

Ap--0 to 5 inches; dark gray (10YR 4/1) loam, very dark gray (10YR 3/1) moist; weak fine granular structure; hard, friable; slightly sticky; few fine roots; neutral; abrupt smooth boundary. (3 to 8 inches thick)

A--5 to 11 inches; very dark gray (10YR 3/1) clay loam, black (10YR 2/1) moist; weak fine subangular blocky structure; hard, friable; sticky; few fine roots; few fine pores; neutral; clear smooth boundary. (4 to 8 inches thick)

Bt1--11 to 18 inches; very dark gray (10YR 3/1) clay loam, black (10YR 2/1) moist; moderate fine and medium subangular blocky structure; very hard, firm, sticky; few fine roots; many fine pores; few distinct clay films; slightly alkaline; gradual smooth boundary. (0 to 25 inches thick)

Bt2--18 to 25 inches; dark grayish brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) moist; moderate medium prismatic structure parting to moderate medium blocky; very hard, firm, sticky; few fine roots; many fine pores; common distinct clay films; few wormcasts; slightly alkaline; gradual wavy boundary. (6 to 12 inches thick)

Btk--25 to 33 inches; brown (10YR 5/3) clay loam, dark brown (10YR 4/3) moist; moderate medium blocky structure; very hard, very firm, sticky; few fine roots; many fine pores; common distinct clay films; few masses of calcium carbonate; few wormcasts; slightly effervescent; moderately alkaline; gradual wavy boundary. (4 to 12 inches thick)

Bk1--33 to 38 inches; grayish brown (10YR 5/2) clay loam, dark grayish brown (10YR 4/2) moist; weak medium blocky structure; very hard, very firm, sticky; few fine roots; few fine pores; many wormcasts; few masses and concretions of calcium carbonate; slightly effervescent; moderately alkaline; clear wavy boundary. (3 to 10 inches thick)

Bk2--38 to 46 inches; grayish brown (10YR 5/2) clay loam, dark grayish brown (10YR 4/2) moist; weak coarse subangular blocky structure; hard, firm, sticky; few fine roots; few fine pores; about 20 percent masses and concretions of calcium carbonate; strongly effervescent; moderately alkaline; gradual smooth boundary. (4 to 12 inches thick)

BCk--46 to 80 inches; very pale brown (10YR 8/3) loam, very pale brown (10YR 7/3) moist; weak coarse subangular blocky structure; hard, friable; few masses and concretions of calcium carbonate; slightly effervescent; moderately alkaline.

TYPE LOCATION: Jim Wells County, Texas; From the intersection of U.S. Highway 281 and Texas Highway 359 in Alice, 16 miles northeast on Texas Highway 359; 130 yards east of gas pipeline marker and right-of-way marker in cropland; (this point is 1.55 miles southwest of the intersection of Texas Highway 359 and Farm Road 624 in Orange Grove).

RANGE IN CHARACTERISTICS: Solum thickness ranges from 60 to 80 inches. The mollic epipedon is 20 to 50 inches thick. Depth to secondary calcium carbonate is 24 to 36 inches. Weighted average clay content of the upper 20 inches of the argillic horizon ranges from 35 to 45 percent.

The A horizon has hue of 10YR, value of 2 or 4, and chroma of 1 to 3. Texture is loam, clay loam or sandy clay loam. Reaction is neutral or slightly alkaline.

The Bt horizons have hue of 7.5YR or 10YR, value of 2 to 4, and chroma of 1 or 2. Texture is sandy clay loam, clay loam, sandy clay, or clay. Reaction is neutral or slightly alkaline.

The Btk and Bk horizons have hue of 7.5YR or 10YR, value of 3 to 6, and chroma of 1 to 4. Value and chroma increases with depth. Texture is clay loam, sandy clay, or clay. Calcium carbonate equivalent ranges from 5 to 30 percent. Reaction is moderately alkaline.

The BCk horizon has hue of 7.5YR or 10YR, value of 5 to 8, and chroma of 2 to 6. Calcium carbonate equivalent is 15 to about 50 percent. Texture is loam, clay loam, or sandy clay loam. Reaction is moderately alkaline.

COMPETING SERIES: There are no other series in this family. Similar soils include Abilene, Blanket, Cuero, Ramadero, Runge, and Smithville series. Abilene, Blanket, and Smithville soils have mean annual soil temperature of less than 72 degrees F. Cuero, Ramadero, Runge, and Smithville soils have a fine-loamy particle-size control section. In addition, Runge soils have a mollic epipedon less than 20 inches thick.

GEOGRAPHIC SETTING: Clareville soils are on nearly level to gently sloping stream terraces or broad valley fill positions. Slope gradients are dominantly 0 to 2 percent but range up to 5 percent. The soil formed in alluvium or colluvium mainly of Pleistocene age. Mean annual precipitation ranges from 25 to 34 inches. Mean annual temperature is 70 to 74 degrees F. Frost free days range from 250 to 300. Elevation ranges form 100 to 400 feet. Thornthwaite P-E indices range from 31 to 44.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the competing Runge series and the Edroy, Hidalgo, Lattas, Orelia, Raymondville, Victoria, Weesatche, and Willacy series. Hidalgo, Orelia, and Willacy soils occur on similar surfaces. Edroy, Lattas, Raymondville, and Victoria soils are slightly lower in the landscape. Weesatche soils are slightly higher in the landscape. Edroy, Hidalgo, Raymondville, and Victoria soils do not have a Bt horizon. In addition, Edroy and Raymondville soils have COLE of more than 0.07. Orelia soils have an ochric epipedon. In addition, Orelia soils as well as Willacy soils have fine-loamy control sections. Lattas and Victoria soils are Vertisols. Willacy soils have a mollic epipedon less than 20 inches thick.

DRAINAGE AND PERMEABILITY: Well drained. Moderately slow permeability. Runoff is negligible on slopes of less than 1 percent, very low on 1 to 3 percent slopes, and low on 3 to 5 percent slopes.

USE AND VEGETATION: Used mainly as cropland but some areas are in rangeland. Cultivated crops are cotton, grain sorghum, and corn. Native grasses include Arizona cottontop, little bluestem, sideoats grama, curlymesquite, and Texas bristlegrass. Woody invaders are whitebrush, spiny hackberry, and mesquite.

DISTRIBUTION AND EXTENT: Central and Eastern part of the Rio Grande Plain and Gulf Coast Prairies of southern Texas (MLRA 83A, 83B, 83C, 150A). The series is moderately extensive.

MLRA OFFICE RESPONSIBLE: Temple, Texas

SERIES ESTABLISHED: Bee County, Texas; 1932.

REMARKS: Diagnostic horizons and features recognized in this pedon are:

Mollic epipedon -- 0 to 25 inches

Argillic horizon --11 to 33 inches

Calcic horizon -- 25 to 64 inches

ADDITIONAL DATA: NSSL Lincoln lab. sample numbers 71L843-71L845 and 71L846-71L848 for mineralogy and particle size analyses and samples T2L207-T2L214 for particle size analyses and water content at 15 bars.

National Cooperative Soil Survey
U.S.A.

LOCATION VICTORIA TX

Established Series
Rev. CLG
02/97

VICTORIA SERIES

The Victoria series consists of deep, somewhat poorly drained, very slowly permeable soils that formed in clayey marine sediments. These soils are on nearly level to gently sloping marine terraces. Slopes range from 0 to 3 percent.

TAXONOMIC CLASS: Fine, smectitic, hyperthermic Udic Pellusterts

TYPICAL PEDON: Victoria clay--cropland.
(Colors are for dry soil unless otherwised stated.)

Ap--0 to 6 inches; dark gray (10YR 4/1) clay, very dark gray (10YR 3/1) moist; weak very fine subangular blocky structure; mulch of fine discrete aggregates on the surface; hard; firm, very plastic, and very sticky; many fine roots; few fine strongly cemented calcium carbonate concretions and snail shell fragments; calcareous; moderately alkaline; abrupt smooth boundary. (4 to 7 inches thick)

A1--6 to 12 inches; dark gray (10YR 4/1) clay, very dark gray (10YR 3/1) moist; moderate fine and very fine angular blocky structure; very hard, very firm, very plastic, and very sticky; many fine roots; shiny pressure faces on surfaces of peds; few very fine calcium carbonate concretions calcareous, moderately alkaline; gradual wavy boundary. (4 to 18 inches thick)

A2--12 to 38 inches; dark gray (10YR 4/1) clay, very dark gray (10YR 3/1) moist; parallelepipeds tilted about 30 degrees from horizontal axis, parting to moderate fine and very fine angular blocky structure; very hard, very firm, very plastic and sticky; many fine roots; many vertical cracks 0.4 to 2 inches wide extending through lower boundary; common intersecting slickensides up to 3 feet across; few thin seams of uncoated sand grains in old closed cracks; calcareous; moderately alkaline; gradual wavy boundary. (22 to 34 inches thick)

Bkyz--38 to 60 inches; gray (10YR 6/1) clay, gray (10YR 5/1) moist, common dark gray (10YR 4/1) streaks along partially closed cracks; distinct parallelepipeds tilted 30 to 40 degrees from horizontal, which part to moderate fine angular blocky structure; extremely hard, very firm; common interesecting slickensides up to 3 feet across; few fine snail shell fragments, and fine calcium carbonate concretions; few fine seams of gypsum and threads of other salts in lower part; calcareous; moderately alkaline; gradual wavy boundary. (18 to 30 inches thick)

Ckyz--60 to 72 inches; light gray (10YR 7/2) clay, light brownish gray (10YR 6/2) moist; massive to weak angular blocky structure; extremely hard, extremely firm; few fine calcium carbonate concretions and few threads and pockets of gypsum and other salts; saline; calcareous; moderately alkaline.

TYPE LOCATION: Nueces County, Texas; 1.8 miles S-SW of the intersection of U. S. Highway 77 and Texas Highway 44 in the east part of Robstown to an intersection with a hard surfaced road; then 2 miles east on hard surfaced road; and 2,640 feet south into cultivated field.

RANGE IN CHARACTERISTICS: The A and B horizons are clay or silty clay with a combined thickness of about 50 to 72 inches. Thickness of the A horizon in individual pedons varies from the microknolls to the microbasins being thinnest in the microknolls and thickest in the microbasins. The amplitude of the boundary between the A and B horizons ranges from about 20 to 40 inches. When dry, these soils have cracks 0.4 inches to about 3 inches wide that extent from the surface or from the base of an Ap horizon to the C horizon. The soils are calcareous except the A horizon is noncalcareous in the matrix to depths of 18 inches in some pedons in the microbasins. Salinity increases with depth and electrical conductivity of the saturation extract ranges from 0.5 to 4 mmhos/cm in the A horizons and from 1 to 8 mmhos/cm in the B and 4 to 16 in the C horizons. The clay content of the 10- to 40-inch control section ranges from about 45 to 60 percent.

The A horizon is dark gray (10YR 4/1), black (10YR 2/1), or very dark gray (10YR 3/1). Thickness of the A horizon ranges from 30 to about 50 inches in more than half of a pedon.

The B horizon is grayish brown (10YR 5/2), pale brown (10YR 6/3), light brownish gray (10YR 6/2), or gray (10YR 6/1, 5/1). It is moderately alkaline or strongly alkaline.

Competing Series: These are the Buchel, Tiocano and Victine series in the same family and the Benito, Branyon, Houston Black, Lomalta, Mercedes, Monteola, Montell, and Santa Isabel series. Buchel soils are typically moist for longer periods of time and have amplitude of the boundary between the A and B horizon of less than 20 inches. Tiocano soils are ponded during portions of the growing season in most years. Victine soils have more than 40 percent exchangeable Na+Mg in the upper 10 inches. Benito and Lomalta soils have more than 60 percent clay in the 10- to 40-inch control section. In addition, Lomalta soils, as well as Mercedes and Montell soils have moist color values of more than 3.5.
Branyon and Houston Black soils have mean annual soil temperatures less than 72 degrees F. Monteola soils have less than 14 inches amplitude in the boundary between the A and B horizons. Montell soils are dry for longer periods and have dark colors to shallower depths. Santa Isabel soils have less than 9 degrees F. variation between summer and winter soils temperatures at a depth of 20 inches.

GEOGRAPHIC SETTING: Victoria soils occupy nearly level marine terraces along the Coastal Bend area of southern Texas. Areas that have not been plowed or disturbed have distinct gilgai microrelief with the microknolls up to 18 inches higher than the microbasins. The soil formed in calcareous clayey Pleistocene marine sediments many feet thick. Slope gradients range from 0 to 3 percent. The climate in subhumid. The mean annual precipitation ranges from 28 to 38 inches. The mean annual air temperature ranges from 70 to 74 degrees F., and Thornthwaite P-E index ranges from 34 to 44.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the Clareville, Orelia, and Raymondville series. These soils occur on similar surfaces. Clareville and Orelia soils have agrillic horizons. Raymondville soils have clay loam A horizons, and lack intersecting slickensides.

DRAINAGE AND PERMEABILITY: Somewhat poorly drained; slow to very slow runoff and internal drainage; water enters the soil rapidly when it is dry and cracked and very slow when it is moist; very slow permeability.

USE AND VEGETATION: Most areas of Victoria clay are in cropland (dryland); supplemental irrigation is used in a few areas where suitable water is available. Crops are mainly grain sorghum and cotton but some vegetables and flax are also grown. Some of the soils are used as rangeland. Principal native grasses are little bluestem, seacoast bluestem, fourflower trichloris, vine-mesquite, and indiangrass. Native woody plants are invaders and consists mainly of mesquite trees, spiny hackberry, brazil, and lotebush.

DISTRIBUTION AND EXTENT: Western Gulf Coast and Coastal Bend area in the Gulf Coast Prairie and Rio Grande Plain of southern Texas; series is extensive.

MLRA OFFICE RESPONSIBLE: Temple, Texas

SERIES ESTABLISHED: Nueces County, Texas; 1908

REMARKS: Diagnostic horizons and features recognized in this pedon are: Intersecting slickensides - the zone from approximately 12 to 60 inches. (A2, Bkyz horizons) Titled parallelepipeds - the zone from approximately 12 to 60 inches (A2, Bkyz horizons)

ADDITIONAL DATA: Characterization data by Lincoln Soil Survey Laboratory samples Nos. K393-397, K383-387, K388-392, 5032-5039, and 5018-5024. Grumusols of the Coast Prairie of Texas in Vol. 27 No. 4, July-August 1963, pages 412-421 of Soil Science Society of American Proceedings.

National Cooperative Soil Survey
U. S. A.

ATTACHMENT P

APPENDIX P

QUALIFICATIIONS OF GROUND WATER TECHNICAL STAFF

Revision 1
June, 1998

RESUME
OF
A. WADE NOLLKAMPER

Rt. 2 Box 259-A
Kingsville, Texas 78363
Off: 512/592-0980

Date of Birth: 2/19/55
Height: 6' Wt: 210 lbs.
Married with 1 child

EXPERIENCE

August 1979, Bachelor of Science, Geology, Texas A & I University, Kingsville, Texas

1979 - 1981, Geologist with Gillring Oil Co. & V. F. Neuhaus Properties, Inc., McAllen, Texas
Responsibilities included wellsite geologist and drilling/workover supervision in South Texas Gulf Coast, Permian Basin and San Juan Basin.

1981 – 1985, Exploration Geologist with Risa Energy Corp., a small independent based in Corpus Christi, Texas. Responsibilities included prospect generation and evaluation of outside deals. Areas worked included Texas Gulf Coast, Central Texas and North Louisiana.

1985 – 1993, Independent Geologist with offices in Corpus Christi, Texas. Generated and turned prospects, with and without acreage, to various small to large independents. Areas worked include; Texas Gulf Coast, Permian Basin & Rockies. In addition, consulting, field studies, prospect evaluation, and well site supervision services provided to clients.

1993 – Present, Retained by V. F. Neuhaus Properties, Inc.
Responsibilities include evaluation of outside deals, ongoing field development programs, and prospect generation. V. F. Neuhaus Properties is presently involved in exploration or development projects in Central and South Texas, Mississippi, New Mexico, Colorado, California and Nevada.

Experienced in the use of the following tools: subsurface & surface mapping, gravity, magnetics, 2-D and 3-D seismic.
Experience in horizontal drilling in Texas Gulf Coast and Rockies.
Experience in viability studies and development of coalbed methane.
Experience in Monitor Well grids, South Texas Uranium.

Professional Affiliations: American Association of Petroleum Geologists
Wyoming Geological Association
Geological Society of America
Corpus Christi Geological Library

References:
Mark Richards, President, V.F. Neuhaus Properties, Inc., McAllen, Texas
Ken Boester, Kebo Oil & Gas, Inc., Corpus Christi, Texas
Richard Wilschusen, W-2 & Associates, Corpus Christi, Texas
Joe McMahon, McMahon-Bullington, Denver, Colorado
Clayton Hoover, Hoover Oil & Gas, Inc., Corpus Christi, Texas
Kent Denzing, Denzing Exploration Inc., Dallas, Texas
James Strickler, Burlington Resources, Farmington, New Mexico
Richard Horn, General American Oil Properties, Inc., Denver, Colorado
Don Simpson, Shell Western E & P, Houston, Texas
Phillip Cook, Cook Energy, Inc., Jackson, Mississippi

RAY N. FINCH, PH.D., P.E.

Consulting Engineer & President

EDUCATION

Bachelor of Science: Major in Chemical Engineering; Minors in Math and Chemistry, Texas A&M University, 1957.

Master of Science Degree: Major in Chemical Engineering; Minors in Math and Chemistry; Thesis titled "Vapor-Liquid Equilibrium". Texas University, 1961.

Doctor of Philosophy Degree: Major in Chemical Engineering; Minors in Math and Chemistry; Dissertation titled "Efficiency and Pressure Drop of Sieve Trays", Texas University, 1963.

SPECIAL TRAINING

Princeton Groundwater School, July 12 - 16, 1993, San Francisco, CA

REGISTRATION

Registered Professional Engineer in the states of Texas and Louisiana.

Diplomate - American Academy of Environmental Engineers (Hazardous Waste)

TNRCC registered Corrective Action Project Manager; CAPM01314

PROFESSIONAL SUMMARY

Over twenty (20) years of professional experience in the chemical industry. This includes both direct engineering and technical management. All phases of engineering have been encountered, i.e., plant process engineering, project process engineering, chemical plant management, research and development in chemical processes, technical evaluation of research and development work, process design and economics, research and development management, engineering and construction management, environmental affairs management. Major technical strengths are in the areas of phase equilibria, distillation, process design, economics, process development and environmental regulations (especially RCRA & TOSCA). However, my technical strengths are well balanced, and I function quite well as a general chemical engineering practitioner.

DETAILED MANAGEMENT AND PROFESSIONAL EXPERIENCE

Finch Energy & Environmental Services, Inc.- 1982 to date

Professional Engineering Consultant in Environmental and Energy fields. Certification of closures of RCRA hazardous waste facilities, RCRA permit applications, ground water monitoring, air permits, air permit exemptions, air emissioins modeling, environmental assessments & auditing, storm water monitoring, SPCC plans, solids handling of organic materials, natural gas dehydration trouble shooting, oil reclamation from brine and muds.

Texas A&M University - Kingsville - August 1984 to August 1997

September 1991 to August 1997 - **Chairman, Environmental Engineering Department and Associate Professor in Chemical and Natural Gas Engineering** teaching courses in solid/hazardous waste design, environmental engineering, fluid flow, cryogenics, natural gas processing and distillation - phase equilibria. Research programs in environmental engineering, non-ideal phase equilibria and L.P.G. utilization

August 1984 to September 1991 - **Chairman, Chemical and Natural Gas Engineering Department and Associate Professor** in Chemical and Natural Gas Engineering teaching courses in fluid flow, cryogenics, environmental engineering, natural gas processing, and distillation - phase equilibria. Research programs in L.P.G. utilization, non-ideal phase, equilibria, and environmental engineering

El Paso Products Company - August 1972 to August 1984.

June 1982 to August 1984 - **Director of Environmental Affairs**. Four man department, $380M budget. Permits reports and compliance for NEPA, CAA, DWA, SWDA, RCRA, CERCLA, TOSCA, FDA, USDA, CPSC and agencies - EPA, TACB, TWC (TDWR), TDH, RRC, FDA, etc. Natural gas liquids plants - air operating and construction permits - PSD NPDES water discharge permits, UIC permits injection wells, SWDA, RCRA facilities including Part A and Part B Permits - land farm, activated sludge process, land fills, waste piles, surface impoundments, incinerators, CERCLA - several compliance projects - successful, TOSCA - PCB's handling, disposal, PMN applications and compliance negotiated settlement, state - ground water cleanup.

June 1981 - June 1982 - **Director of Engineering and Construction**. Fifty-five man department, $3.5MM budget. Natural gas liquids (expander) plants, energy recovery projects in petrochemicals plants, natural gas liquids amine treating plants, salt water storage tanks for natural gas liquids storage wells (Kansas), acetylene removal reactors relocation in Olefin plant.

August 1972 - June 1981 - **Director of Research and Development**. Fifty-eight man department, $4MM budget. Process development and technical service for adipic acid, styrene, butadiene, ethylene, propylene, ammonia, nitric acid, hydrogen, utilities and pollution control, natural gas liquids processing, specialty chemicals, dibasic acid esters, pigment intermediates, specialty monomers.

Celanese Chemical Company - July 1962 to August 1972.

January 1971 - July 1972 - **Development Associate**. Process design and economics - vinyl acetate, polyvinyl alcohol, acetic acid, propionic acid.

June 1969 - December 1979 - **Manager of Technical Evaluation.** Corporate staff assignment - evaluation of overall technical expenditures and individual research and development projects. Participated in licensing negotiations (in and out).

June 1967 - May 1969 - **Group Leader Development.** Technical and administrative supervision of five to six development engineers on major fiber intermediates projects - terephthalic acid, bis-hydroxy ethyl terephthalate, ethylene oxide, reaction and purification in semi-works pilot plant.

June 1965 to May 1967 - **Project Leader.** Development - Technical supervision of three to four development engineers on initiation of major fiber intermediate project - terephthalic acid, bis-hydroxy ethyl terephthalate, ethylene oxide, reactor and purification. Responsible for design and economics for four bench scale pilot plants.

July 1964 - May 1965 - **Unit Superintendent, Adipic Acid plant.** 48 operators and shift supervisors - trained, started up and successfully operated new 50MM lbs/yr Adipic Acid Plant. Operating cost responsibility.

October 1963 - June 1964 - **Process Engineer for major Nylon Intermediates Project.** Designed the Adipic Acid Plant completely and monitored through all phases of design, construction and startup. Responsible for process design for nylon salt plant, nitric acid plant - all utilities and pollution control and off sites for new nylon intermediates facility liaison with overseas companies in technology acquisitions and training of operators.

July 1962 - September 1963 - **Plant Process Engineer for New Grass Roots Facility** Wacker 2 stage air oxidation of ethylene to acetaldehyde and aldol condensation and hydrogenation of acetaldehyde to make 2-ethyl hexanol and n-butanol. Responsible for first major debottlenecking expansion of acetaldehyde unit. Did experimental work for biological waste disposals.

PROFESSIONAL ACTIVITIES

Air & Waste Management Association - 1994 to current

American Academy of Environmental Engineers - 1996 to current

National Ground Water Association - 1993 to current

South Texas Water Authority, Board of Directors - January 1997 to current

American Institute of Chemical Engineers - 1957 to current

American Chemical Society - 1957 to current

ATTACHMENT 5

ATTACHMENT 5

Groundwater Characterization Report

Finch Energy & Environmental Services, Inc.
P.O. Box 73/1204 W. King, Kingsville, TX 78364
Phone: (512) 592-9810 Fax: (512) 592-5552

ATTACHMENT 5

GROUNDWATER CHARACTERIZATION REPORT

City of Kingsville MSWLF

Permit 235B

Prepared by:

Finch Energy & Environmental Services, Inc.

November 1997

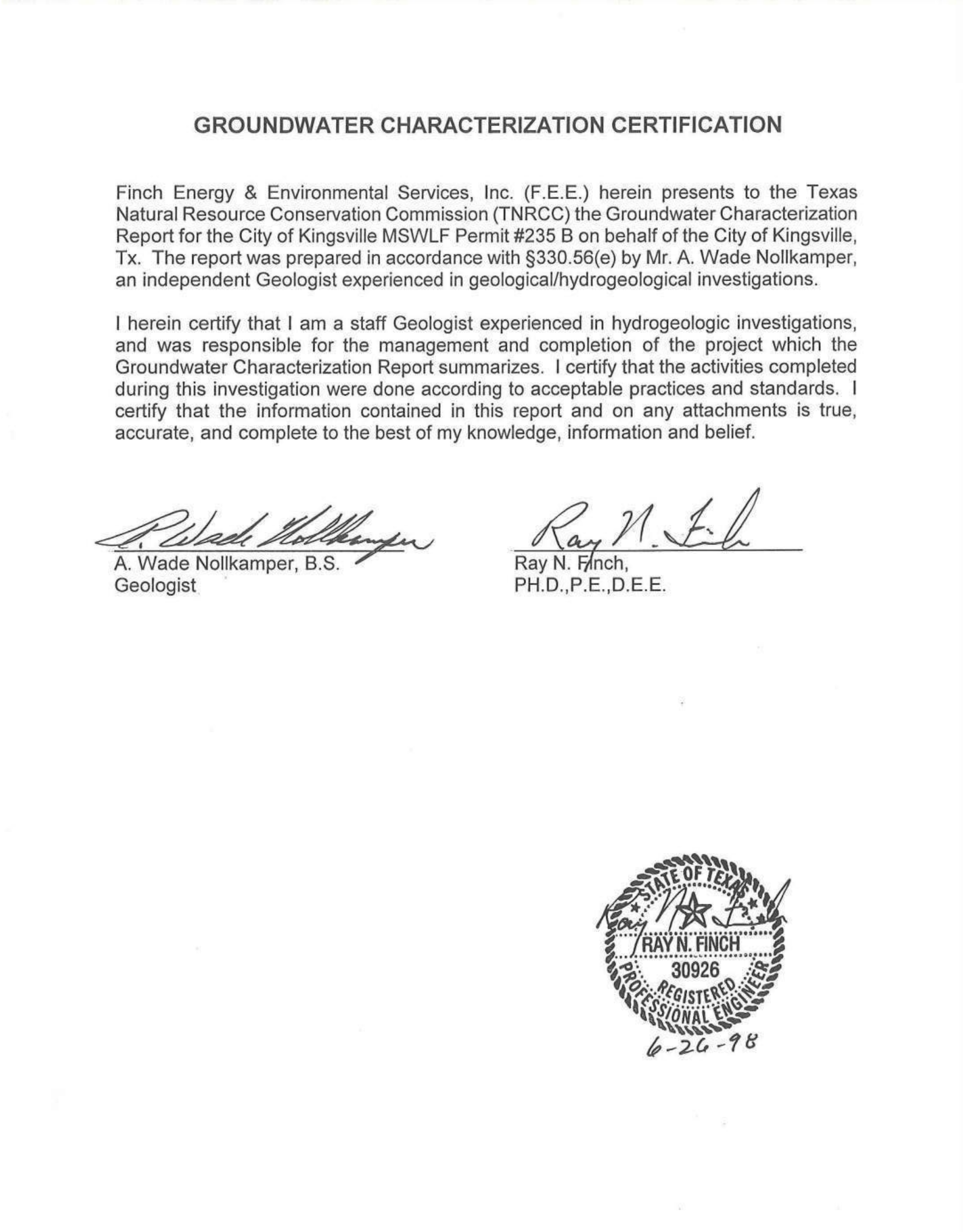
Revision 1 - June 1998

Revision 2 - September 1998

STATE OF TEXAS
RAY N. FINCH
30926
REGISTERED PROFESSIONAL ENGINEER

9-30-98

THIS DOCUMENT IS ISSUED FOR PERMITTING PURPOSES ONLY INCLUDING PAGES 1 THROUGH 51 AND APPENDICES.



GROUNDWATER CHARACTERIZATION CERTIFICATION

Finch Energy & Environmental Services, Inc. (F.E.E.) herein presents to the Texas Natural Resource Conservation Commission (TNRCC) the Groundwater Characterization Report for the City of Kingsville MSWLF Permit #235 B on behalf of the City of Kingsville, Tx. The report was prepared in accordance with §330.56(e) by Mr. A. Wade Nollkamper, an independent Geologist experienced in geological/hydrogeological investigations.

I herein certify that I am a staff Geologist experienced in hydrogeologic investigations, and was responsible for the management and completion of the project which the Groundwater Characterization Report summarizes. I certify that the activities completed during this investigation were done according to acceptable practices and standards. I certify that the information contained in this report and on any attachments is true, accurate, and complete to the best of my knowledge, information and belief.

A. Wade Nollkamper
A. Wade Nollkamper, B.S.
Geologist

Ray N. Finch
Ray N. Finch,
PH.D.,P.E.,D.E.E.

Ray N. Finch
RAY N. FINCH
30926
6-26-98

ATTACHMENT 5 - GROUNDWATER CHARACTERIZATION REPORT
PERMIT AMENDMENT APPLICATION-CITY OF KINGSVILLE LANDFILL
CITY OF KINGSVILLE, KLEBERG COUNTY, TEXAS

Permit Amendment No. MSW 235-B

Prepared for:
City of Kingsville
P.O. Box 1458
Kingsville, Tx 78364

Prepared by:
F.E.E., Inc.
P.O. Box 73
Kingsville, Tx 78364
(512)592-9810

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THIS DOCUMENT IS ISSUED FOR PERMITTING PURPOSES ONLY INCLUDING PAGES 1 THROUGH 51 AND APPENDICES.

RAY N. FINCH
30926

9-30-98

Revision 2 - September 1998

FIGURES

APPENDICES

STATE OF TEXAS
RAY N. FINCH
30926
REGISTERED PROFESSIONAL ENGINEER

Ray N. Finch

9-30-98

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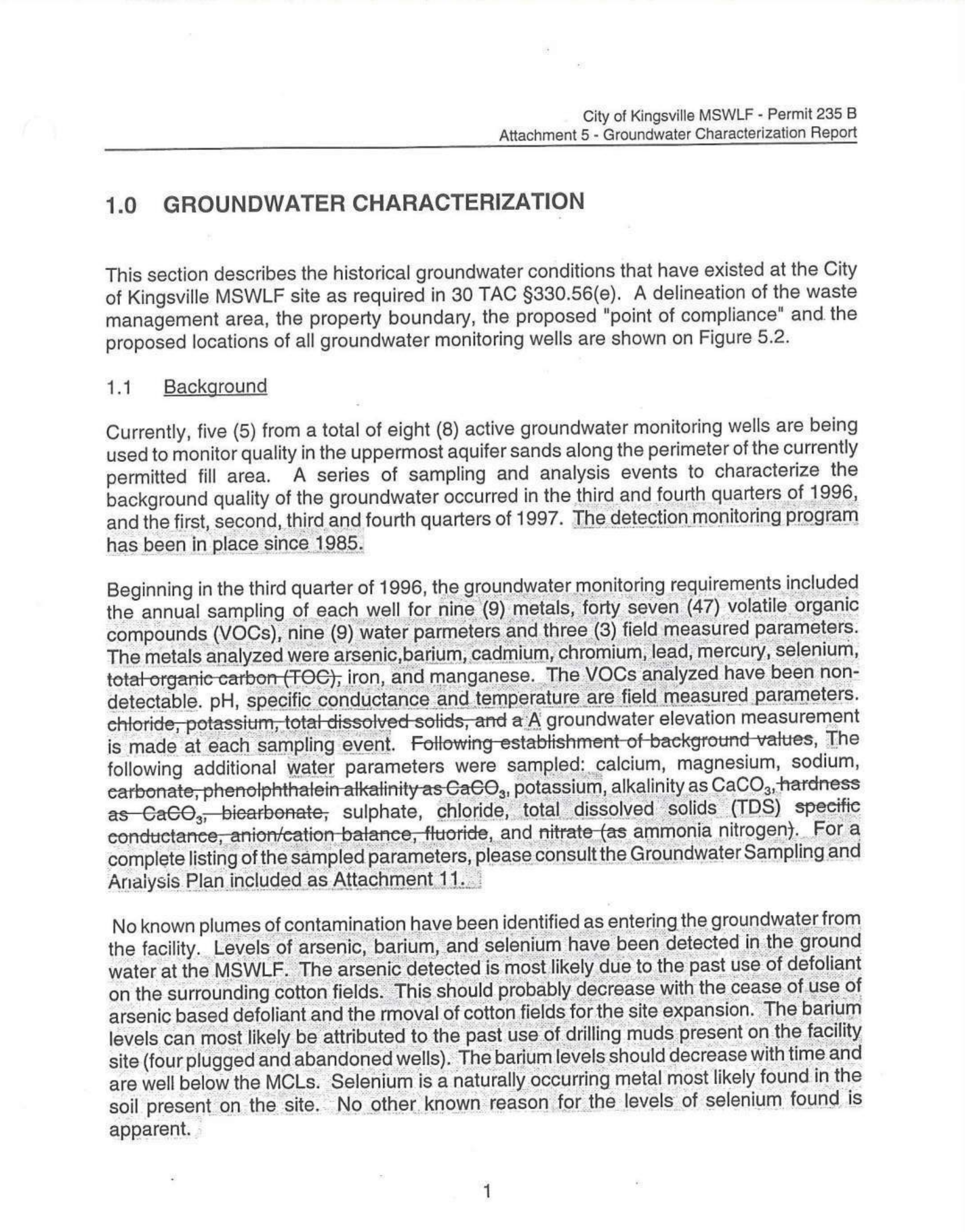
INCLUDING PAGES 1 THROUGH 51 AND APPENDICES.

Revision 2 - September 1998

1.0 GROUNDWATER CHARACTERIZATION



1.0 GROUNDWATER CHARACTERIZATION

This section describes the historical groundwater conditions that have existed at the City of Kingsville MSWLF site as required in 30 TAC §330.56(e). A delineation of the waste management area, the property boundary, the proposed "point of compliance" and the proposed locations of all groundwater monitoring wells are shown on Figure 5.2.

1.1 Background

Currently, five (5) from a total of eight (8) active groundwater monitoring wells are being used to monitor quality in the uppermost aquifer sands along the perimeter of the currently permitted fill area. A series of sampling and analysis events to characterize the background quality of the groundwater occurred in the third and fourth quarters of 1996, and the first, second, third and fourth quarters of 1997. The detection monitoring program has been in place since 1985.

Beginning in the third quarter of 1996, the groundwater monitoring requirements included the annual sampling of each well for nine (9) metals, forty seven (47) volatile organic compounds (VOCs), nine (9) water parmeters and three (3) field measured parameters. The metals analyzed were arsenic,barium, cadmium, chromium, lead, mercury, selenium, ~~total organic carbon (TOC),~~ iron, and manganese. The VOCs analyzed have been non-detectable. pH, specific conductance and temperature are field measured parameters. ~~chloride, potassium, total dissolved solids, and a~~ A groundwater elevation measurement is made at each sampling event. ~~Following establishment of background values~~, The following additional water parameters were sampled: calcium, magnesium, sodium, ~~carbonate, phenolphthalein alkalinity as $CaCO_3$~~, potassium, alkalinity as $CaCO_3$~~, hardness as $CaCO_3$, bicarbonate,~~ sulphate, chloride, total dissolved solids (TDS) ~~specific conductance, anion/cation balance, fluoride~~, and ~~nitrate (as~~ ammonia nitrogen~~)~~. For a complete listing of the sampled parameters, please consult the Groundwater Sampling and Analysis Plan included as Attachment 11.

No known plumes of contamination have been identified as entering the groundwater from the facility. Levels of arsenic, barium, and selenium have been detected in the ground water at the MSWLF. The arsenic detected is most likely due to the past use of defoliant on the surrounding cotton fields. This should probably decrease with the cease of use of arsenic based defoliant and the rmoval of cotton fields for the site expansion. The barium levels can most likely be attributed to the past use of drilling muds present on the facility site (four plugged and abandoned wells). The barium levels should decrease with time and are well below the MCLs. Selenium is a naturally occurring metal most likely found in the soil present on the site. No other known reason for the levels of selenium found is apparent.

1.2 Relevant Groundwater Quality Data Tabulation

In order to compare with regional groundwater quality data, relevant analytes were selected from background groundwater samples collected from groundwater monitor wells screened within the uppermost aquifer sands at the City of Kingsville MSWLF site over a six quarter period. These analytes included pH, manganese (dissolved), iron (dissolved), chlorides, and total dissolved solids (TDS). Groundwater samples collected from the uppermost aquifer sand (MW-1 through MW-11) have reported pH values (field) ranging from 6.75 standard units (s.u.) from MW-1 to 8.20 s.u. also from MW-1. Dissolved manganese concentration have ranged from Non-Detect from MW-10 to 0.67 µg/l from MW-3. Dissolved iron concentration have ranged from non-detect (MW-4) to 0.68 µg/l (MW-4). Chloride values have ranged from 66 milligrams per liter (mg/l or parts per million - ppm) from MW-11 to 2600 mg/l from MW-4. TDS concentrations ranged from 1580 mg/l (MW-11) to 5,780 mg/l (MW-4). Table 5.1b includes all ground water analytical results by well since 1985 which were above the detectable limit for the constituent analyzed. No ground water analytical data was available from 1986 to 1990.

As part of the study performed by Shafer (1973), 272 groundwater samples were collected from water wells in the Kleberg, Kennedy, and Southern Jim Wells County area, ranging in depth from 25 feet below ground surface (ft bgs) to 1,206 ft bgs. Groundwater samples were collected from 1913 to 1969 in order to determine the quality of groundwater supplies in the area. The analyses consisted of dissolved mineral constituents, which determined the fitness of water for industrial, agricultural, and domestic use without reference to the sanitary quality of the sample. A summary list of chemical analyses of groundwater samples collected from the Goliad aquifer in North Central Kleberg County is included within Table 5.2a.

In general, the samples from the Goliad aquifer were fairly uniform throughout the northwestern portion of Kleberg County. Specific conductance and chloride content generally increased with depth, as a result of brackish or salt water intrusion. The Total Dissolved Solids contents were high and ranged from 894 ppm to 2,000 ppm. The Goliad aquifer is more than 500 feet below the ground surface (bgs) in the vicinity of the MSWLF.

A similar list of ground water analytical results from the Beaumont-Lissie undifferentiated (Q_{bl}, or Chicot) aquifer in Kleberg County is shown in Table 5.2b. This table shows the quality of ground water from wells in the much shallower (200' to 300' bgs) Chicot aquifer is generally of very poor quality. There are a few wells in the Chicot aquifer in Kleberg County, and the few of these are only used for stock wells. (None of these wells are shown in block 34 where the landfill is located.) Total dissolved solids for Chicot aquifer varies from 2,460 ppm to 21,200 ppm. Typical values for TDS from this formation range from 8,000 to 10,000 ppm. The Chlorides vary from 960 to 9,900 ppm. Sodium varies from 828 to 5,520 ppm. Water from the Chicot varies from moderately to extremely saline. It is sometimes low pH and can cause difficulty with water wells in the deeper Goliad which are not properly cemented through this aquifer.

The analytical results of the groundwater samples from the site reported values well within the regional values reported in the studies by Shafer (1973). The highest value for chloride has been reported at 2,600 mg/l, which was within the regional chloride values which ranged from 135 mg/l to 2,700 mg/l. The highest value for TDS has been 5,780 mg/l, well within range of the regional values of 175 mg/l to 21,200 mg/l.

2.0 HYDROGEOLOGIC CONDITIONS

2.0 HYDROGEOLOGIC CONDITIONS

2.1 Uppermost Aquifer

Eleven new borings were completed to obtain basic data necessary to complete a Soil Characterization. Six of these wells were subsequently completed as Monitor Wells. Nine other previous soil borings were available to assist in the subsurface investigation. The completions will be discussed in the Ground Water Characterization Section. The first seven borings were completed to a depth approximately 10 feet above Mean Sea Level (MSL). The second four borings were completed to depths varying from 72 feet to 88 feet below ground surface (bgs). A generalized description of the sediments encountered follows.

The section describes the characteristics of the soil samples collected and tested during the investigation. The locations of all subsurface boring explorations performed for the design of engineered cells, and for the Geological/Geotechnical investigation are shown on Figure 5.16. Subsurface geologic correlations showing stratigraphy and structure beneath the site are presented on the following exhibits included herein; Figures 5.3 through 5.15. These figures include a Cross Section Location Map, Geologic Cross sections A-A' through I-I' (9 total), [Note Maximum ground water levels.], A Structure Map of the Top "Light Olive Green Clay", Isopach Map Sand Units I & II, and Isopach Map Sand Units III & IV.

The primary geologic formations exposed at the surface of the site are recent Holocene South Texas Eolian Plain Deposits. The topsoil (approx 0 feet - 20 feet) consists of a clay which is black, silty and contains humic material. This soil is overlain in the extreme northeast corner with a veneer of loess. Sediments encountered in borings at the site are Holocene to Pleistocene in age and consist of clays, silts, sands, and caliches deposited in two (2) separate and distinct environments of deposition. Cross section A – A' serves to illustrate theses environments of deposition. The cross section traverses the MSWLF site using four (4) deep borings all deep enough to penetrate a minimum thickness of 38' of a massive, low permeability, light olive green clay ("Light Olive Green Clay") believed to have been deposited in a marine (estuarian) environment.

The "Light Olive Green Clay" is the aquiclude for the MSWLF facility. In turn, the "Light Olive Green Clay" is capped by a sheet sand ("Orange sand") possibly 2 to 10' thick across the site of the MSWLF. Stratigraphically above the "Orange sand", the environment of deposition changes to fluvial-deltaic for the remaining 40 to 50' of section, measured back to surface. These beds are comprised of sands, silts, caliches and clays deposited as superimposed channel sands and clayey dunes or bars. A detailed cross section net was constructed using all sample borings at the MSWLF and four significant sand bodies are believed to be present within the fluvial-deltaic sequence. Location of these sand bodies are shown on isopach maps included herewith. Bodies I & II are superimposed, caliche or sand filled channels with Body I having the larger areal extent. Bodies III & IV are interpreted as dunes or bars of limited extent and are comprised of clayey sand. All of the above sand bodies are incised into, or embedded within, a tan, silty clay containing abundant mottles of organic matter.

Taken together, the marine clay section ("Light Olive Green Clay") overlain by fluvial-deltaics section represents a single regressive cycle, with respect to sea level, at the top of the Pleistocene Beaumont formation. It is believed that the entire fluvial-deltaic section is comprised of Holocene sediments with the Holocene – Pleistocene boundary represented by the top of the "Light Olive Green Clay" or "Orange sand".

The shallow subsurface geological structure at the Kingsville MSWLF site is shown by the Structure Map- Top "Light Olive Green Clay" to be monoclinal dip to the northeast at approximately 20 feet per mile. This horizon was chosen is most representative of structure affecting and underlying the MSWLF site. Any structural mapping on beds above the "Light Olive Green Clay" are less correlative and would reflect local scouring of channel sands causing structural inconsistencies due to stratigraphic variation within the fluvial-deltaic section. Correlations are excellent on the top of the "Light Olive Green Clay" and the surface is the most likely to be planar in nature. Some scouring of this surface probably occurs at the extreme southwest corner of the MSWLF site due to the incisement of the overlying Body I, caliche bearing channel.

Deposition of the above sediments postdates uplift of the Kingsville Dome.

2.2 Aquiclude

Detailed correlation of borings show that the Holocene sediments which will host the proposed City of Kingsville MSWLF were deposited in a fluvial-deltaic environment. The massive “Light Olive Green Clay” which is believed to be of Pleistocene age and deposited in a near shore marine environment underlies the section. As noted previously, the clay serves as the aquiclude between the Holocene sediments hosting the MSWLF and the underlying, saline, “Chicot” sand and the even deeper regional “Evangeline”(Goliad) aquifer.

Although excellent vertical separation exists between the Holocene sediments which will host the MSWLF and underlying Pleistocene beds, lateral migration of groundwater occurs within and through the host beds. From a potentiometric standpoint, it is evident from existing monitor well data that migration of groundwater within the Holocene host sediments is occurring in almost all directions away from the MSWLF site, the exception being to the northwest.

From a geologic perspective, it is evident that migration of groundwater should occur primarily away from the MSWLF site to the northeast and southwest. Controlling this trend is the presence of the incised channel containing sands, clays and caliche noted on cross sections and maps as Sand Body I. This body, which hosts the thin to massively bedded caliche deposits in the area, strikes northeast and is approximately ½ mile in width. Body I trends directly through both the existing and proposed landfill sites. Other sand bodies in the host section are noted on the cross sections as II, III, and IV. Sand body II is, again, an incised, sand filled channel with limited areal extent. Sand Body II is truncated along its strike on the northeast and southwest by the overlying Body I. Sand Bodies III and IV are interpreted as being clay dunes or bars of limited areal extent. It should be noted that the entire Holocene section which contains all of the above sand bodies is permeable and therefore all are in communication. Even so, the orientation of Sand Body I should exert an influence on preferential ground water migration to the northeast and southwest and away from the City of Kingsville's MSWLF site.

Note that ground water modeling using site specific data was performed using HELP3 and Multi-Media computer models. The results of these studies are given in Attachment 15, Appendices B & C, and in Attachment 10, Appendices C & D.

2.3 Groundwater Flow Direction and Rate

2.3.1 Basis

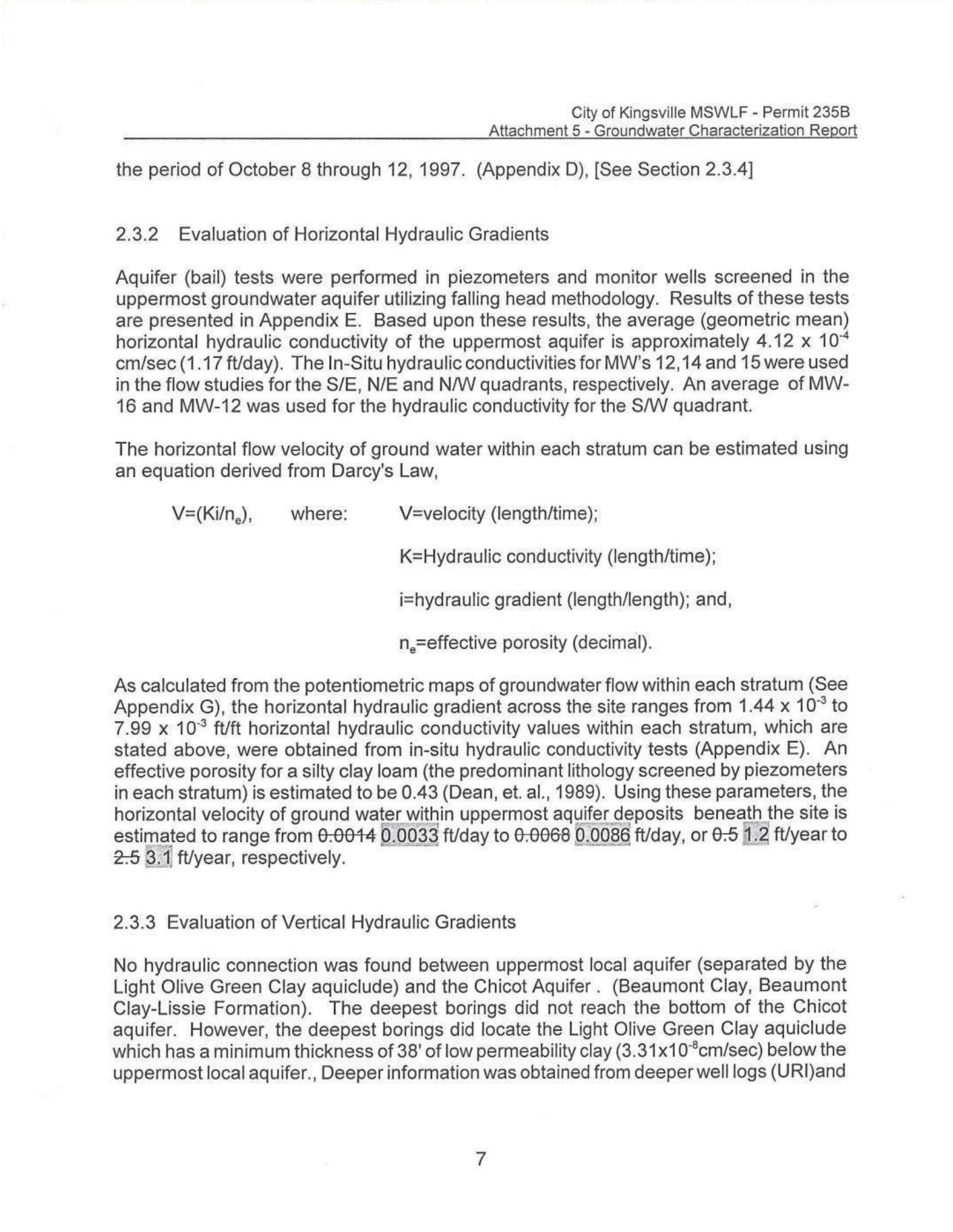
The local groundwater flow regime at the site was determined by the collection of physical data (such as the elevation of the potentiometric surface) and the completion of in-situ hydraulic conductivity (slug) testing from on-site groundwater monitoring points. Depth-to-water measurements were obtained from existing on-site monitor wells and piezometers on June 16, May 18, February 18, February 2, January 20, and January 5, 1998; December 22, December 8, November 24, November 10, October 24, October 16, September 29, September 15, August 15, and August 4, 1997; and December 23, 1996, May 10, 1995, March 14, 1994 and April 5, 1993. The depth-to-water measurements were subtracted from a surveyed reference datum (top of PVC casing) to establish a potentiometric surface relative to 1929 National Geodetic Vertical Datum (NGVD). The groundwater elevation data and resultant potentiometric contour maps for the uppermost permeable stratum are presented in Appendices A, B & C. The water level data measured from soil borings and monitoring well measurements are presented in Appendix B and in Table 5.4.

Analysis of the ground water level data over the period past ten months indicate that the ground water flow tends to leave the MSWLF site in all directions except to the northwest. However, prior to the major rainfall event ground water actually flowed toward the northwest also. The table below determined from the data referred to above gives the following summary of average values of ground water direction, gradient and flow rate.

Landfill Quadrant	Direction degrees	Gradient ft/ft	Flow Rate ft/yr	Well Used No.	Hydr. Cond. cm/sec
N/E	36.0	0.00799	1.200	6,14,13	0.000127
S/E	257.3	0.00144	3.124	1,12,13	0.000724
S/W	204.3	0.00216	1.503	1,8,16	0.000674
N/W	202.6	0.00387	2.137	6,15,16	0.000531

From the above table it can be shown that the flow is predominantly away from the MSWLF along the axis of the caliche bearing channel (I). The flow from the Northeast quadrant flows on the average at 36 degrees or to the north-northeast with a relatively strong gradient of 0.008 ft/ft. However, the flow rate is fairly low (1.2 ft/yr) due to the relatively lower permeability. On the other hand, the direction from the southwest quadrant is at 204 degrees or south-southwest. The gradient is about 1/4 as large, but the flow rate is slightly larger (1.5 ft/yr) due to the higher permeability. The unexpected conclusion from this study is that, on the average, both the northwest quadrant and the southeast quadrant flow toward the southwest and along the caliche bearing channel axis. The Southwest quadrant average direction of flow is 257 degrees or west- southwest. The Northeast quadrant average direction is 203 degrees or south-southwest. In other words, both are being pulled into the flow along the Caliche bearing channel. At this point it is important to mention the ponding effect study of on-site and off-site ponds in the area. The off-site contour map shows that the gradient becomes much stronger to the southwest and the deeper caliche pits after it passes under the cross roads of CR-2030 and FM-2619. Thus, even though the strongest gradient on-site is to the northeast, the greatest rate of flow is to the southwest. The northwest and southeast quadrants actually change flow directions depending on the rate of recharge from the surface or from the loss of water through evapotranspiration during drouth periods. Even though these flows are relatively greater to the southwest, all of the flow rates are very low, i.e. a few feet per year. Graphs of daily versus average flow rates are given in Appendix G as are the tabulated calculations for directions, gradients and flow rates.

F.E.E., Inc prepared a hydrograph of existing monitor wells on site using data collected from previous ground water sampling events since March 1991, and data collected during this investigation. Based on the seasonal data from the site collected to date, the potentiometric surface was slightly lower during periods of low precipitation (summer and early fall) and slightly higher during periods of excess precipitation (winter and spring). Given the minimal seasonal fluctuations, the horizontal gradients and flow directions for the uppermost aquifer are more strongly influenced by excessive rainfall events (October 11 & 12, 1997 and September 14 & 15, 1967. The hydrograph indicated no significant changes in groundwater elevations since 1991 until recent excessive rainfall events during



the period of October 8 through 12, 1997. (Appendix D), [See Section 2.3.4]

2.3.2 Evaluation of Horizontal Hydraulic Gradients

Aquifer (bail) tests were performed in piezometers and monitor wells screened in the uppermost groundwater aquifer utilizing falling head methodology. Results of these tests are presented in Appendix E. Based upon these results, the average (geometric mean) horizontal hydraulic conductivity of the uppermost aquifer is approximately 4.12 x 10^{-4} cm/sec (1.17 ft/day). The In-Situ hydraulic conductivities for MW's 12,14 and 15 were used in the flow studies for the S/E, N/E and N/W quadrants, respectively. An average of MW-16 and MW-12 was used for the hydraulic conductivity for the S/W quadrant.

The horizontal flow velocity of ground water within each stratum can be estimated using an equation derived from Darcy's Law,

$V=(Ki/n_e)$, where: V=velocity (length/time);

K=Hydraulic conductivity (length/time);

i=hydraulic gradient (length/length); and,

n_e=effective porosity (decimal).

As calculated from the potentiometric maps of groundwater flow within each stratum (See Appendix G), the horizontal hydraulic gradient across the site ranges from 1.44 x 10^{-3} to 7.99 x 10^{-3} ft/ft horizontal hydraulic conductivity values within each stratum, which are stated above, were obtained from in-situ hydraulic conductivity tests (Appendix E). An effective porosity for a silty clay loam (the predominant lithology screened by piezometers in each stratum) is estimated to be 0.43 (Dean, et. al., 1989). Using these parameters, the horizontal velocity of ground water within uppermost aquifer deposits beneath the site is estimated to range from ~~0.0014~~ 0.0033 ft/day to ~~0.0068~~ 0.0086 ft/day, or ~~0.5~~ 1.2 ft/year to ~~2.5~~ 3.1 ft/year, respectively.

2.3.3 Evaluation of Vertical Hydraulic Gradients

No hydraulic connection was found between uppermost local aquifer (separated by the Light Olive Green Clay aquiclude) and the Chicot Aquifer . (Beaumont Clay, Beaumont Clay-Lissie Formation). The deepest borings did not reach the bottom of the Chicot aquifer. However, the deepest borings did locate the Light Olive Green Clay aquiclude which has a minimum thickness of 38' of low permeability clay (3.31x10^{-8}cm/sec) below the uppermost local aquifer., Deeper information was obtained from deeper well logs (URI)and from water well data in the vicinity (AIC Survey). These elevations show that the bottom of the Chicot aquifer is located approximately 200 feet below ground surface in the MSLWF vicinity. These elevations further show that there is at least 38' and probably 140' of a low permeability clay between the uppermost aquifer at the landfill site and the Chicot aquifer. Further there is 200' to 300' of shale/clay below the Chicot aquifer before reaching the Evangeline (Goliad) aquifer. The light Olive Green Clay described above and in Attachment 4 is the aquiclude for the MSWLF facility. There are no water wells in the area with screens set above 524 feet below ground surface. Further, TAC Rule 33.56(d)(S)(A)(ii) states that "Aquifers more than 300 feet below the lowest excavation and where the estimated travel for constituents to the aquifer are in excess of 30 years plus the estimated life of the site, need not be identified by borings." This is the case for the COK MSWLF.

2.3.4 Relationship of Ponded Water to Water Table

During the six day period from September 19 through September 25, 1967 massive amount of rainfall fell in South Texas which exceeded annual average rainfall (30 inches). This large rainfall resulted in numerous ponds of water in the relatively flat South Texas area. A joint study of the relationship of this ponded water to groundwater levels in the uppermost, unconfined aquifer was made jointly by the United States Geological Survey and the Texas Water Development Board, (TDWB, #138, December, 1971). This date is relevant to water levels below the City of Kingsville, Texas (COK) Municipal Solid Waste Landfill (MSWLF) site.

The King Ranch site was most representative of the COK MSWLF site. It had water in ponds well above the normal water level in the uppermost aquifer. The massive rainfall from Hurricane Beulah (15 inches) resulted in water table levels continuing to rise below and around the pond for a period of eight months after these above normal rainfall events. The COK MSWLF had a similar large rainfall event during the period October 8 through 12, 1997.

The COK MSWLF site has several excavations which are adjacent to the currently permitted MSWLF and on the same land for which MSWLF expansion is proposed. These excavations were prepared for two reasons: first to provide cover soil for the existing MSWLF; second, to prepare the excavations for future MSWLF cells. The net result of these excavations was to provide depressions in the earth's surface which collect ponded water from rainfall events. This ponded water provides recharge to the uppermost, confined aquifer by percolation through the unsaturated zone to the around water table. This recharge causes higher than normal water levels (mounding) below and near these ponds. This the same result as experienced in the 1968-69 TDWB studies of ponded water on the King Ranch.

The King Ranch study showed that water levels were influenced by recharge from ponded water as far as 500 feet from the pond. This was confirmed by both water levels and dilution of total dissolved solids (TDS) in the ground water. The COK MSWLF site experienced similar results after the excessive rainfall events of October 8-12, 1997. Unfortunately, this rainfall event was right in the middle of a six month study of water levels being made as part of the permitting process for the expansion of the COK MSWLF. This event requires that the design be modified to protect against such events so that groundwater levels will not rise into bottom liners of the expanded landfill. The proposed design change is to provide pumping capacity for non-active excavations such that ponded water is not allowed to accumulate in excavations after rainfall events. The rainfall in expanded active areas will be handled by the leachate collection system.

3.0 GROUNDWATER MONITORING PROGRAM

3.0 GROUNDWATER MONITORING PROGRAM

3.1 Proposed Monitoring Well Network

As previously discussed, the uppermost aquifer beneath the site is confined by the Light Olive Green Clay aquiclude located at 5 to 15 foot above MSL below the landfill. This clay extends at least 38 feet and probably 140 feet below the uppermost aquifer. It is, therefore, proposed that the groundwater monitoring system monitor the uppermost aquifer above the Light Olive Green Clay aquiclude. Proposed groundwater monitoring well locations, which comprise a network designed to monitor groundwater quality around the permitted landfill and expansion area, are shown on Figure 5.2. Monitor wells should have their screens located within one foot or less of the aquiclude clay. Recommended elevations for well screens along with approximate horizontal survey coordinates at each proposed location are summarized in ~~Table 5.3.~~Table 5.6.

Based upon an understanding of the local ground water regime and site stratigraphy, the site groundwater monitoring network will monitor the uppermost aquifer separated from below by the Light Olive Green Clay aquiclude. The monitor well network completed within the uppermost aquifer will ultimately be comprised of a total of twenty four (24) monitor wells. Monitor well locations are illustrated on Figure 5.2. A ground water monitor well sequencing table showing required installation and removal times is shown in Table 5.7.

As required by TAC §330.231(e)(3), the Executive Director will be notified in writing of any changes in the direction and rate of groundwater flow that my require the installation of additional monitor wells. Any additional monitor wells installed will be addressed in a modification to the Site Development Plan.

3.2 Groundwater Sampling and Analysis

A detailed plan and engineering report describing the proposed groundwater monitoring program is presented in Attachment 11 of Part III, Groundwater Sampling and Analysis Plan (GWSAP). The goal of the GWSAP is to establish consistent sampling and analysis procedures that ensure monitoring results are representative of groundwater quality at the background and down gradient monitoring well locations. The procedures in the GWSAP are considered applicable for all groundwater wells included in the administratively approved monitoring network.

The site groundwater monitoring network will be sampled for constituents listed in the GWSAP. As discussed the GWSAP, semi-annual sampling of groundwater within the Chicot unit will ensure that samples are independent. The development of background values for each constituent, and the sampling, analysis and statistical comparison procedures to be utilized in evaluation of groundwater monitoring data, are also addressed in the GWSAP.

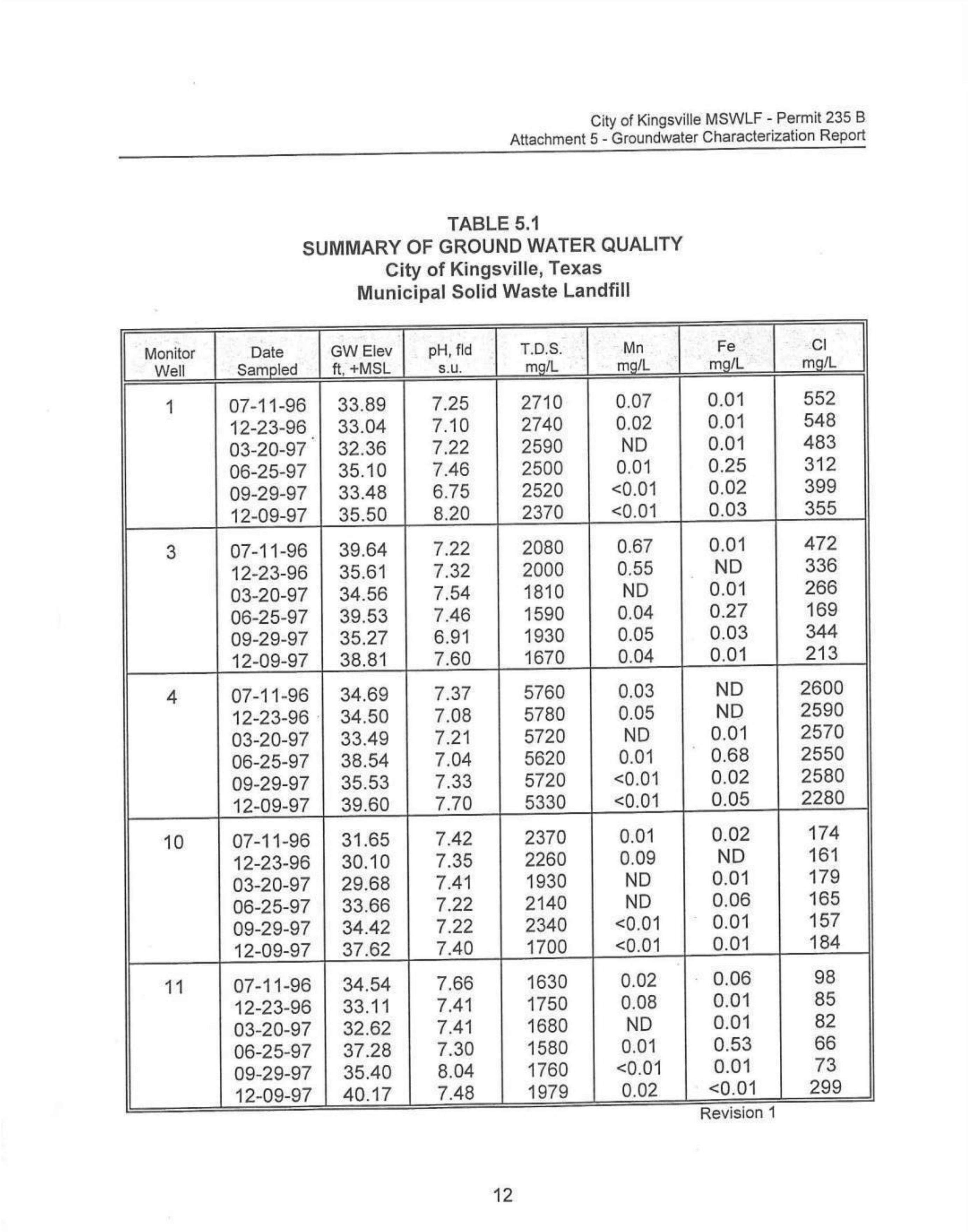


TABLE 5.1
SUMMARY OF GROUND WATER QUALITY
City of Kingsville, Texas
Municipal Solid Waste Landfill

Monitor Well	Date Sampled	GW Elev ft, +MSL	pH, fld s.u.	T.D.S. mg/L	Mn mg/L	Fe mg/L	Cl mg/L
1	07-11-96	33.89	7.25	2710	0.07	0.01	552
	12-23-96	33.04	7.10	2740	0.02	0.01	548
	03-20-97	32.36	7.22	2590	ND	0.01	483
	06-25-97	35.10	7.46	2500	0.01	0.25	312
	09-29-97	33.48	6.75	2520	<0.01	0.02	399
	12-09-97	35.50	8.20	2370	<0.01	0.03	355
3	07-11-96	39.64	7.22	2080	0.67	0.01	472
	12-23-96	35.61	7.32	2000	0.55	ND	336
	03-20-97	34.56	7.54	1810	ND	0.01	266
	06-25-97	39.53	7.46	1590	0.04	0.27	169
	09-29-97	35.27	6.91	1930	0.05	0.03	344
	12-09-97	38.81	7.60	1670	0.04	0.01	213
4	07-11-96	34.69	7.37	5760	0.03	ND	2600
	12-23-96	34.50	7.08	5780	0.05	ND	2590
	03-20-97	33.49	7.21	5720	ND	0.01	2570
	06-25-97	38.54	7.04	5620	0.01	0.68	2550
	09-29-97	35.53	7.33	5720	<0.01	0.02	2580
	12-09-97	39.60	7.70	5330	<0.01	0.05	2280
10	07-11-96	31.65	7.42	2370	0.01	0.02	174
	12-23-96	30.10	7.35	2260	0.09	ND	161
	03-20-97	29.68	7.41	1930	ND	0.01	179
	06-25-97	33.66	7.22	2140	ND	0.06	165
	09-29-97	34.42	7.22	2340	<0.01	0.01	157
	12-09-97	37.62	7.40	1700	<0.01	0.01	184
11	07-11-96	34.54	7.66	1630	0.02	0.06	98
	12-23-96	33.11	7.41	1750	0.08	0.01	85
	03-20-97	32.62	7.41	1680	ND	0.01	82
	06-25-97	37.28	7.30	1580	0.01	0.53	66
	09-29-97	35.40	8.04	1760	<0.01	0.01	73
	12-09-97	40.17	7.48	1979	0.02	<0.01	299

Revision 1

Table 5.1b

Groundwater Quality
City of Kingsville, TX - MSWLF

MW -1

		10-10-85	03-30-91	09-29-92	04-06-93	03-15-94	05-10-95	07-11-96	12-23-96	03-20-97	06-25-97	09-29-97	12-09-97
Component	Units												
Arsenic	mg/L	0.018						0.029	0.034	0.031	0.026	0.03	0.025
Barium	mg/L							0.02	0.02	0.03	0.01	0.03	0.01
Cadmium	mg/L	0.0061						0.0005	0.0015	0.0009	0.0014	0.0008	0.0007
Lead	mg/L	0.029											
Selenium	mg/L							0.009	0.007	0.008	0.009	0.007	0.008
Iron	mg/L	5.1	3	0.37	4.3	2.2	0.94		0.01	0.01	0.25	0.02	0.03
Manganese	mg/L	0.61	0.09	0.01	0.15	0.06	0.02	0.07	0.02		0.01		
T. Alkalinity	mg/L	430				454		865	928	946	1070	1030	1010
Calcium	mg/L	110				84		60	49	44	56	51	54
Magnesium	mg/L	236				140		95	95	96	81	85	80
Sodium	mg/L	965				975		795	775	790	735	730	695
Potassium	mg/L	23				22		18	18	21	18	18	17
Sulfate	mg/L	438				312		538	488	506	543	457	453
Chloride	mg/L	1720	1839	1657	1638	1547	1370	552	548	483	312	399	355
TDS	mg/L	3910	3590	3700	3750	3590	3440	2710	2740	2590	2500	2520	2370
TOC	mg/L	8.5	4.5	3.25	3.75	2	3.5						
C. Disulfide	ug/L							26					
M. Bromide	ug/L												

Note: Only constituents which were above the detectable limit were reported in this table.

Revision 2

Table 5.1b

Groundwater Quality
City of Kingsville, TX -MSWLF

MW-2

		10-10-85
Component	Units	
Arsenic	mg/L	0.175
Barium	mg/L	
Cadmium	mg/L	0.0059
Lead	mg/L	0.013
Selenium	mg/L	
Iron	mg/L	1.7
Manganese	mg/L	0.32
T. Alkalinity	mg/L	1840
Calcium	mg/L	39
Magnesium	mg/L	52
Sodium	mg/L	1090
Potassium	mg/L	19
Sulfate	mg/L	389
Chloride	mg/L	363
TDS	mg/L	3200
TOC	mg/L	11.5

Note: Only constituents which were above the detectable limit were reported in this table.

Revision 2

Table 5.1b

Groundwater Quality
City of Kingsville, TX - MSWLF

MW-3

		10-10-85	03-30-91	07-31-91	09-29-92	04-06-93	03-15-94	05-10-95	07-11-96	12-23-96	03-20-97	06-25-97	09-29-97	12-09-97
Component	Units													
Arsenic	mg/L	0.037							0.071	0.075	0.079	0.087	0.073	0.089
Barium	mg/L								0.11	0.08	0.07	0.05	0.09	0.05
Cadmium	mg/L	0.0104							0.0001	0.0001	0.0006	0.0003	0.0015	0.0006
Lead	mg/L	0.009												
Selenium	mg/L									0.003	0.003	0.001	0.002	
Iron	mg/L	1.1	0.17	0.63	0.25	3.8	0.28	0.45			0.01	0.27	0.03	0.01
Manganese	mg/L	0.06	0.02		0.02	0.09	0.04	0.03	0.67	0.55		0.04	0.05	0.04
T. Alkalinity	mg/L	880					970		830	905	915	983	896	977
Calcium	mg/L	130					13		44	30	26	24	45	26
Magnesium	mg/L	248					16		57	41	37	28	53	31
Sodium	mg/L	1390					489		680	610	585	550	580	570
Potassium	mg/L	12					4.1		4.4	12	6	6	6.3	6.7
Sulfate	mg/L	425					90		218	193	166	116	200	123
Chloride	mg/L	2093	579	373	100	88	52	91	472	336	266	169	344	213
TDS	mg/L	5070	2570	2200	1580	1560	1400	1470	2080		1810	1590	1930	1670
TOC	mg/L	7.25	15.5	8.25	2.5	2	5.5	2.25						
C. Tet. Chloride	ug/L											6.6		
M. Bromide	ug/L								5.8					

Note: Only constituents which were above the detectable limit were reported in this table.

Revision 2

Table 5.1b

Groundwater Quality
City of Kingsville, Tx - MSWLF

MW-4

		10-10-85	03-30-91	09-29-92	04-06-93	03-15-94	05-10-95	07-11-96	12-23-96	03-20-97	06-25-97	09-29-97	12-09-97
Component	Units												
Arsenic	mg/L	0.052						0.054	0.054	0.055	0.055	0.055	0.064
Barium	mg/L							0.04	0.04	0.04	0.04	0.04	0.03
Cadmium	mg/L	0.0102						0.0017	0.0025	0.0011	0.0005	0.0006	0.0006
Lead	mg/L	0.015											
Selenium	mg/L	0.001						0.006	0.007		0.008	0.006	0.007
Iron	mg/L	4.1	0.41	0.26	2.1		1.7			0.01	0.68	0.02	0.05
Manganese	mg/L	0.26	0.01	0.01	0.05		0.03	0.03	0.05		0.01		
T. Alkalinity	mg/L	458				551		565	580	570	541	565	522
Calcium	mg/L	69				60		80	63	58	75	68	65
Magnesium	mg/L	128				134		135	135	27	123	135	128
Sodium	mg/L	1830				1950		1890	1930	1980	1860	1890	1730
Potassium	mg/L	29				21		22	22	22	25	22	21
Sulfate	mg/L	331				579		537	529	527	569	530	630
Chloride	mg/L	2868	2700	2580	2566	2695	2610	2600	2590	2570	2550	2580	2280
TDS	mg/L	5670	5940	5860	5670	5910	5750	5760	5780	5720	5620	5720	5330
TOC	mg/L	5	5.5	3	2.5	2.5	3						
C. Disulfide	ug/L										5.1		
M. Bromide	ug/L												

Note: Only constituents which were above the detectable limit were reported in this table.

Revision 2

Table 5.1b

Groundwater Quality
City of Kingsville, TX - MSWLF

MW-6

		10-10-85	03-30-91	09-29-92	04-06-93	03-15-94
Component	Units					
Arsenic	mg/L	0.036				
Barium	mg/L					
Cadmium	mg/L	0.0102				
Lead	mg/L	0.024				
Selenium	mg/L	0.014				
Iron	mg/L	3.7	1.4	0.37	1.4	
Manganese	mg/L	0.44	0.04	0.02	0.05	
T. Alkalinity	mg/L	565				980
Calcium	mg/L	222				55
Magnesium	mg/L	325				95
Sodium	mg/L	3240				1500
Potassium	mg/L	47				21
Sulfate	mg/L	1730				1346
Chloride	mg/L	4758	4020	2390	2098	1010
TDS	mg/L	10900	9280	6820	6380	4810
TOC	mg/L	6.25	5.25	4	3.5	5.75

Note: Only constituents which were above the detectable limit were reported in this table.

Revision 2

Table 5.1b

Groundwater Quality
City of Kingsville, TX - MSWLF

MW-7

		03-30-91
Component	Units	
Arsenic	mg/L	
Barium	mg/L	
Cadmium	mg/L	
Lead	mg/L	
Selenium	mg/L	
Iron	mg/L	0.89
Manganese	mg/L	0.05
T. Alkalinity	mg/L	
Calcium	mg/L	
Magnesium	mg/L	
Sodium	mg/L	
Potassium	mg/L	
Sulfate	mg/L	
Chloride	mg/L	114
TDS	mg/L	833
TOC	mg/L	15.75

Note: Only constituents which were above the detectable limit were reported in this table.

Revision 1

Table 5.1b

Groundwater Quality
City of Kingsville, Tx - MSWLF

MW-8

		07-31-91	06-10-92	09-29-92	03-30-93	12-22-93	03-15-94	05-10-95	07-23-96
Component	Units								
Arsenic	mg/L		0.014	0.017	0.015	0.014			
Barium	mg/L		0.21	0.13	0.19	0.13			
Cadmium	mg/L					0.0003			
Lead	mg/L		0.003	0.002		0.002			
Selenium	mg/L					0.001			
Iron	mg/L	0.24	2.7	0.34	4.1	0.32	0.94	7.6	0.83
Manganese	mg/L	0.01	0.26	0.01	0.08	0.01	0.03	0.03	0.19
T. Alkalinity	mg/L		388	379	369	358			
Calcium	mg/L		35	33	28	39			
Magnesium	mg/L		23	24	24	33			
Sodium	mg/L		305	300	306	382			
Potassium	mg/L		9.4	9.1	8.8	13			
Sulfate	mg/L		71	62	60	98			
Chloride	mg/L	873	274	276	309	414	305	351	315
TDS	mg/L	2330	1050	1080	1110	1270	1090	1110	1080
TOC	mg/L	15	2.25	2.75	3.25	2.5	1	1	2.5

Note: Only constituents which were above the detectable limit were reported in this table.

Revision 2

Table 5.1b

Groundwater Quality
City of Kingsville, TX - MSWLF

MW-9

		06-10-92	09-29-92	03-30-93	12-22-93	03-15-94	05-10-95
Component	Units						
Arsenic	mg/L	0.11	0.04	0.114	0.104		
Barium	mg/L	0.1	0.15	0.21	0.14		
Cadmium	mg/L						
Lead	mg/L		0.003	0.001			
Selenium	mg/L			0.001			
Iron	mg/L	0.47	1.6	6.9	0.9	0.59	0.3
Manganese	mg/L	0.08	0.06	0.41	0.12	0.13	0.11
T. Alkalinity	mg/L	640	858	956	800		
Calcium	mg/L	8.4	14	14	11		
Magnesium	mg/L	7.2	14	18	14		
Sodium	mg/L	320	488	469	420		
Potassium	mg/L	5.6	7.8	7.7	6.7		
Sulfate	mg/L	55	43	64	63		
Chloride	mg/L	25	160	70	55	38	18
TDS	mg/L	907	1390	1370	1160	1020	960
TOC	mg/L	4	4.25	5.25	5.25	2.75	2.5

Note: Only constituents which were above the detectable limit were reported in this table.

Revision 2

Table 5.1b

Groundwater Quality
City of Kingsville, TX - MSWLF

MW-9R

		07-23-96
Component	Units	
Arsenic	mg/L	
Barium	mg/L	
Cadmium	mg/L	
Lead	mg/L	
Selenium	mg/L	
Iron	mg/L	3.6
Manganese	mg/L	0.38
T. Alkalinity	mg/L	
Calcium	mg/L	
Magnesium	mg/L	
Sodium	mg/L	
Potassium	mg/L	
Sulfate	mg/L	
Chloride	mg/L	68
TDS	mg/L	773
TOC	mg/L	2.25

Note: Only constituents which were above the detectable limit were reported in this table.

Revision 1

Table 5.1b

Groundwater Quality
City of Kingsville, TX - MSWLF

MW-10

[illegible]	[illegible]	06-10-92	09-29-92	03-30-93	12-22-93	03-15-94	05-10-95	07-11-96	12-23-96	03-20-97	06-25-97	09-29-97	12-09-97
Component	Units												
Arsenic	mg/L	0.041	0.037	0.038	0.031			0.025	0.025	0.029	0.027	0.027	0.037
Barium	mg/L	0.1	0.16	0.21	0.29			0.31	0.32	0.25	0.28	0.31	0.15
Cadmium	mg/L								0.0001	0.0002	0.0002		
Lead	mg/L		0.001								0.001		
Selenium	mg/L	0.001		0.002	0.001								
Iron	mg/L	0.06	1.5	2.4	0.66	0.28	0.21			0.01	0.06	0.01	0.01
Manganese	mg/L	0.01	0.07	0.05	0.03	0.01	0.01	0.01	0.09				
T. Alkalinity	mg/L	660	940	925	1270			1680	1600	1350	1530	1730	1090
Calcium	mg/L	14	14	17	19			26	38	17	23	14	15
Magnesium	mg/L	9.3	28	18	27			43	42	33	38	43	24
Sodium	mg/L	410	472	512	657			820	740	680	755	810	600
Potassium	mg/L	6.7	8.5	7.5	12			11	11	8.8	9.5	10	7.8
Sulfate	mg/L	43	57	43	50			85	68	56	71	82	63
Chloride	mg/L	171	108	163	158	165	186	174	161	179	165	157	184
TDS	mg/L	1250	1390	1480	1850	1940	2270	2370	2260	1930	2140	2340	1700
TOC	mg/L	5	5	4.25	6.75	4.75	5.75						

Note: Only constituents which were above the detectable limit were reported in this table.

Revision 2

Table 5.1b

Groundwater Quality
City of Kingsville, TX - MSWLF

MW-11

		07-11-96	12-23-96	03-20-97	06-25-97	09-29-97	12-09-97
Component	Units						
Arsenic	mg/L	0.054	0.049	0.05	0.065	0.066	0.071
Barium	mg/L	0.05	0.05	0.06	0.04	0.06	0.06
Cadmium	mg/L		0.0006	0.0001	0.0002		
Lead	mg/L						
Selenium	mg/L	0.004	0.004	0.003	0.003	0.003	0.007
Iron	mg/L		0.01	0.01	0.53	0.01	0.02
Manganese	mg/L	0.02	0.08		0.01		
T. Alkalinity	mg/L	810	1000	1060	972	1070	1170
Calcium	mg/L	23	21	20	19	14	46
Magnesium	mg/L	27	30	30	25	28	46
Sodium	mg/L	510	535	555	510	580	745
Potassium	mg/L	8.3	7.5	7.6	6.8	6.9	12
Sulfate	mg/L	273	234	195	204	216	308
Chloride	mg/L	98	85	82	66	73	299
TDS	mg/L	1630	1750	1680	1580	1760	2330
TOC	mg/L						

Note: Only constituents which were above the detectable limit were reported in this table.

Revision 2

TABLE 5.2a
SUMMARY OF ANALYSES OF GROUND WATER IN KLEBERG COUNTY, TEXAS
(Goliad Aquifer)

DESCRIPTION WELL	DATE OF COLLECTION	WELL DEPTH(FT)	SPECIFIC CONDUCTANCE	TEMPERATURE DEGREES F	pH	SILICA (PPM)	IRON (PPM)	CALCIUM (PPM)	MAGNESIUM (PPM)	SODIUM (PPM)	POTASSIUM (PPM)	BICARBONATE (PPM)	SULFATE (PPM)	CHLORIDE (PPM)	FLUORIDE (ppm)	DISSOLVED SOLIDS (PPM)
34-101	3-29-65	884	2,046	NR	7.9	NR	0.02	33	12	339	339	283	247	269	0.8	1,200
34-101	2-26-68	884	1,991	NR	8	NR	0.06	33	11	340	340	288	243	272	0.8	1,200
34-101	3-11-68	884	2,000	NR	7.8	NR	0.17	34	11	340	340	288	250	264	0.7	1,200
34-106	4-03-68	556-576	1,830	NR	7.4	20	NR	45	11	343	8	238	325	250	0.6	1,130
34-107	3-29-65	894	3,472	NR	8	NR	0.02	66	21	560	560	192	720	376	0.8	1,940
34-107	2-27-68	1,074	3,614	NR	8	NR	0.06	68	21	570	570	189	750	399	0.8	2,000
34-209	5-17-68	540-670	1,920	NR	7.6	19	NR	35	11	360	7.6	276	264	292	0.6	1,140
34-301	7-12-68	1,050	1,890	NR	8.2	17	NR	23	7.8	380	6.7	288	243	310	0.6	1,140
34-410	4-08-68	600-680	1,420	NR	7.7	19	NR	25	8.9	275	8.3	318	142	210	0.4	858
34-501	4-03-68	610-631	1,710	NR	7.6	16	NR	20	6.8	341	7.1	284	262	235	0.6	1,040
RR-83-34-502	4-03-68	635-656	1,500	NR	7.6	18	NR	21	7.1	296	7.8	302	144	238	0.4	894
34-601	8-08-68	760	1,640	NR	8	13	NR	10	3.3	346	3.2	352	137	265	1.2	953
34-704	4-04-68	654-694	1,480	NR	7.8	19	NR	27	10	283	8.8	304	174	214	0.4	892
34-706	4-05-68	757-781	1,450	NR	7.7	20	NR	32	10	274	8.7	306	227	175	0.3	903
34-801	4-02-68	759-777	1,650	NR	7.7	16	NR	31	11	323	9.3	264	307	200	0.6	1,030
34-903	4-30-68	699-720	1,970	NR	8.3	6.3	NR	14	5.5	400	6.4	306	176	360	0.7	1,120

TABLE 5.2b
SUMMARY OF ANALYSES OF GROUND WATER IN KLEBERG COUNTY, TEXAS
(Beaumont-Lissie undifferentiated (Chicot) Aquifer)

DESCRIPTION WELL	DATE OF COLLECTION	WELL DEPTH(FT)	SPECIFIC CONDUCTANCE	TEMPERATURE DEGREES F	pH	SILICA (PPM)	IRON (PPM)	CALCIUM (PPM)	MAGNESIUM (PPM)	SODIUM (PPM)	POTASSIUM (PPM)	BICARBONATE (PPM)	SULFATE (PPM)	CHLORIDE (PPM)	FLUORIDE (ppm)	DISSOLVED SOLIDS (PPM)
29-603	7-17-68	140	4,540	NR	8.0	24	NR	31	18	976	10	704	364	960	NR	2,730
30-702	5-8-69	146	4,510	NR	8.0	30	0.34	67	37	831	W/Na	392	78	1,220	NR	2,460
37-602	10-2-69	74	8,060	NR	6.8	NR	NR	NR	NR	NR	NR	236	NR	2,500	NR	NR
38-301	6-19-69	335-347	11,700	NR	7.8	14	0.1	146	130	2,320	W/Na	426	612	3,520	NR	6,950
40-503	3-11-68	282	8,380	NR	7.4	16	NR	148	138	1,560	31	424	872	2,250	2.9	5,240
42-402	5-14-68	31	18,500	77	5.8	5.3	NR	540	252	2,780	27	77	1,290	5,020	NR	9,950
42-402	9-16-68	31	16,300	NR	6.4	13	51	428	240	2,960	25	376	2,300	4,450	1.6	10,600
42-402	12-10-68	31	15,000	75	6.7	NR	NR	308	222	NR	NR	574	NR	3,950	NR	NR
42-403	5-14-68	52	5,110	79	5.9	4.9	NR	226	14	828	15	22	412	1,430	NR	2,950
42-403	9-16-68	52	18,200	NR	3.3	NR	666	900	235	2,160	24	NA	1,050	5,780	0.8	10,200
42-403	12-10-68	52	31,000	75	5.0	NR	NR	1,050	620	NR	NR	5	NR	9,800	NR	NR
42-404	5-14-68	38	23,000	77	2.5	NR	NR	775	308	2,800	29	NA	2,230	6,320	NR	NR
42-404	9-16-68	38	30,300	NR	5.6	NR	214	930	670	5,520	42	24	4,310	9,700	1.9	21,200
42-404	12-10-68	38	31,800	75	5.5	NR	NR	940	675	NR	NR	46	NR	9,900	NR	NR

Table 5.3

Summary of Site Survey Data

City of Kingsville, Texas

Municipal Solid Waste Landfill, 235-B

Location Number	Designation	Top of PVC Elevation ft, MSL	Ground Surface ft, MSL	Total Depth of Boring ft, BGS	Bottom Elevation ft, MSL	Current Status	Stabilized GW Level ft, MSL	X-Distance UTM meters	Y-Distance UTM meters	X-Distance Coord. ft	Y-Distance Coord. ft
Benchmark	MW-12							2221994.103	646980.6224	0.104	1.5806
MW-1	MW	61.867	59.249	43	16.249	A	33.47	2220665.243	646999.5297	-1328.7561	20.4879
MW-2	MW					P&A					
MW-3	MW	59.173	56.096	37.5	18.596	A	35.27	2221265.118	647820.8196	-728.8815	841.7778
MW-4	MW	60.125	58.008	40	18.008	A	35.53	2221259.953	648317.7851	-734.046	1338.7433
MW-5	MW					P&A					
MW-6	MW	56.604	55.456	40	15.456	A	32.12	2220718.485	649721.5091	-1275.5146	2742.4673
MW-7	MW				0	P&A					
MW-8	MW	61.178	59.787	43	16.787	A	33.03	2219519.731	647166.5781	-2474.2682	187.5363
MW-9	MW				0	P&A					
MW-9R	MW	44.849	41.411	17	24.411	A	34.99	2219802.581	648511.0793	-2191.4181	1532.0375
MW-10	MW	52.684	49.78	29	20.78	A	34.42	2220240.82	648308.7984	-1753.1797	1329.7566
MW-11	MW	62.401	60.197	33	27.197	A	35.4	2220718.664	648494.0559	-1275.3351	1515.0141
MW-12	B/MW	54.879	52.375	48	4.375	A	32.78	2221993.999	646979.0418	0	0
MW-13	B/MW	62.096	59.131	50	9.131	A	32.83	2221973.889	648365.0778	-20.1103	1386.036
MW-14	B/MW	52.677	49.938	42	7.938	A	26.9	2221949.041	649712.8948	-44.9587	2733.853
MW-15	B/MW	51.624	48.386	37	11.386	A	32.97	2219474.512	649668.9772	-2519.487	2689.9354
MW-16	B/MW	58.839	55.958	47	8.958	A	34.02	2219497.15	648312.4767	-2496.8494	1333.4349
BP-17	B	43.868	41.345	33	8.345	A	34.87	2220139.183	648928.7974	-1854.8164	1949.7556
BP-18	B	52.438	50.039	42	8.039	A	33.72	2221252.488	648943.6517	-741.5117	1964.6099
BP-21	B		52.41	84	-31.59	A		2221237.99	649701.98		2722.9382
BP-23	B		49.5	86	-36.5	A		2219486.9	648937.78		1958.7382
BP-24	B/MW		47.38	72	-24.62	A		2221358.12	646971.06		-7.9818
BP-25	B		61.12	88	-26.88	A		2220722.02	648314.56		1335.5182
S/W Corner	0,0							2219514.47	646930.27	-2479.5292	-48.7718

Revision 1

Table 5.3 (cont'd)

Footnotes:

Soil Borings 1, 2, 3, 4, 5, & 6 completed by REI: 6-19-84 to 10-3-84
Soil Borings 7 & 8 completed by Martin Water Well: 7-31-91
Soil Borings 9 & 10 completed by JEDI: 3-20-92 to 3-24-92
Soil Borings 9R & 11 completed by PSI: 7-11-96
Soil Borings 12 through 18 completed by PSI: 7-7-97 to 7-28-97

The deepest excavation elevation is +8.37 feet NGVD

Coordinates for deep soil borings (B-21 - B-25) are currently being verified.

KEY:

A=Active
B=Boring
MW=Monitor Well
P&A=Plugged & Abandoned

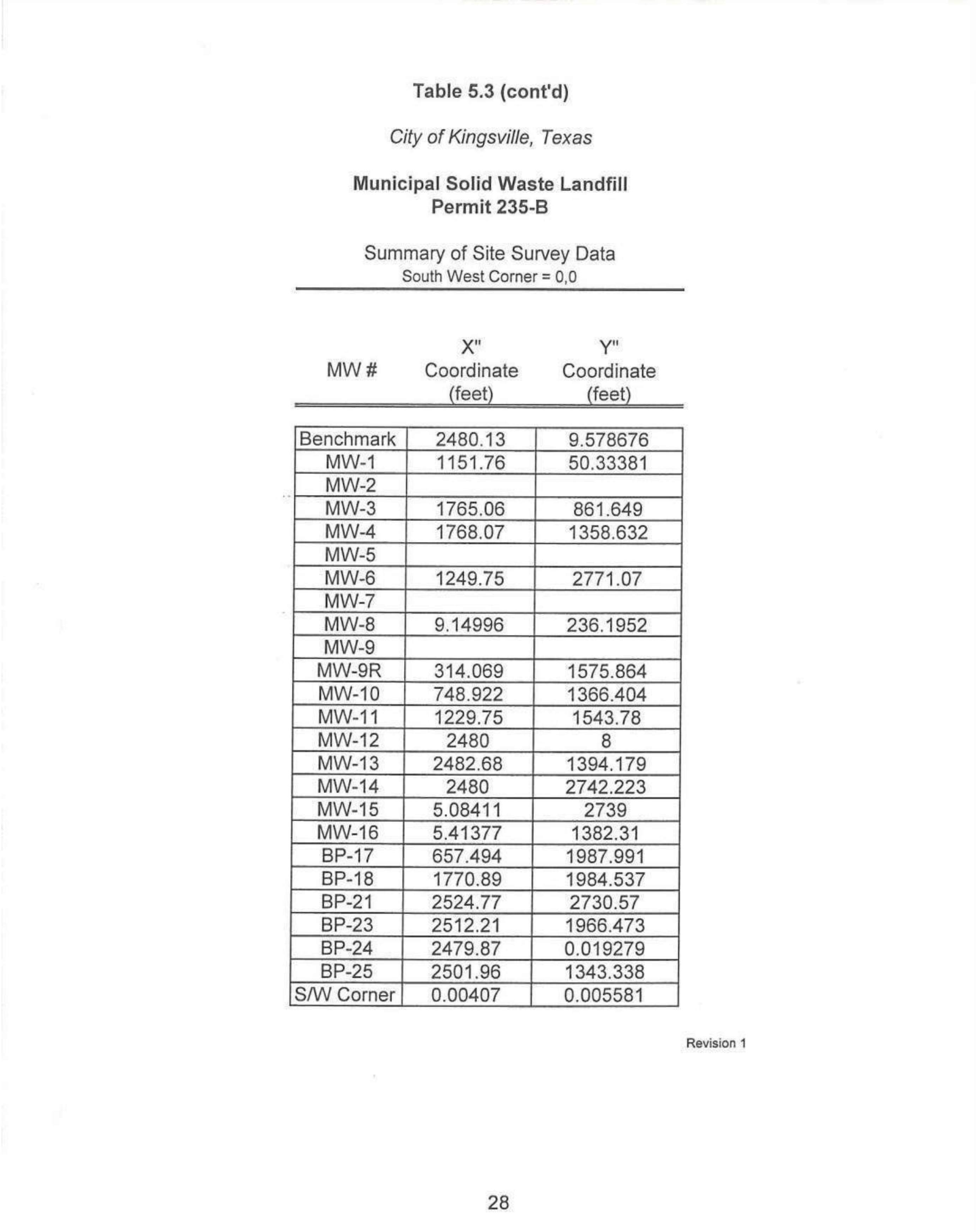


Table 5.3 (cont'd)

City of Kingsville, Texas

Municipal Solid Waste Landfill
Permit 235-B

Summary of Site Survey Data
South West Corner = 0,0

MW #	X" Coordinate (feet)	Y" Coordinate (feet)
Benchmark	2480.13	9.578676
MW-1	1151.76	50.33381
MW-2		
MW-3	1765.06	861.649
MW-4	1768.07	1358.632
MW-5		
MW-6	1249.75	2771.07
MW-7		
MW-8	9.14996	236.1952
MW-9		
MW-9R	314.069	1575.864
MW-10	748.922	1366.404
MW-11	1229.75	1543.78
MW-12	2480	8
MW-13	2482.68	1394.179
MW-14	2480	2742.223
MW-15	5.08411	2739
MW-16	5.41377	1382.31
BP-17	657.494	1987.991
BP-18	1770.89	1984.537
BP-21	2524.77	2730.57
BP-23	2512.21	1966.473
BP-24	2479.87	0.019279
BP-25	2501.96	1343.338
S/W Corner	0.00407	0.005581

Revision 1

TABLE 5.4 (cont'd.)
Ground Water Level Elevations - 1991-1998

Piezometer No.	Elevation, PVC Casing, ft MSL	07-11-96	12-23-96	03-20-97	06-25-97	07-18-97	08-04-97	08-18-97	09-02-97	09-15-97
MW-01	61.87	32.87	32.02	31.34	34.08	Not Msd	34.19	38.92	26.22	33.59
MW-03	59.17	37.17	33.14	32.09	37.06	36.80	36.34	35.91	35.54	35.38
MW-04	60.13	33.00	32.81	31.80	36.85	36.55	35.88	35.36	35.08	35.29
MW-06	56.6	30.31	28.41	28.54	Not Msd	Not Msd	33.29	32.59	32.07	31.91
MW-08	61.18	31.78	30.80	30.96	Not Msd	Not Msd	33.80	25.81	25.41	32.76
MW-09	62.31					P&A				
MW-9R	44.85	32.28	30.83	31.09	Not Msd	Not Msd	34.35	34.28	34.39	34.42
MW-10	52.68	52.68	31.77	31.35	35.33	Not Msd	34.52	34.52	34.37	34.36
MW-11	62.4	33.63	32.20	31.71	36.37	34.74	35.30	35.09	34.95	35.05
MW-12	54.88			Not Drilled		Not Msd	33.90	33.45	33.05	32.87
MW-13	62.10			Not Drilled		Not Msd	33.23	32.84	32.93	32.77
MW-14	52.68			Not Drilled		Not Msd	27.02	26.79	26.62	26.73
MW-15	51.62			Not Drilled		Not Msd	34.15	33.45	33.15	32.94
MW-16	58.84			Not Drilled		Not Msd	34.62	34.20	33.89	33.89
MW-17	43.87			Not Drilled		Not Msd	34.53	34.17	33.94	34.19
MW-18	52.44			Not Drilled		Not Msd	33.82	33.96	33.51	33.66

TABLE 5.4 (cont'd.)
Ground Water Level Elevations - 1991-1998

Piezometer No.	Elevation, PVC Casing, ft MSL	09-29-97	10-16-97	10-28-97	11-10-97	11-24-97	12-08-97	12-22-97	01-05-98	01-20-98
MW-01	61.87	33.47	33.29	34.86	34.76	35.17	35.50	35.67	35.81	35.98
MW-03	59.17	35.27	36.86	37.28	37.97	38.57	38.81	38.69	38.52	38.44
MW-04	60.13	35.53	36.96	38.31	37.93	39.47	39.60	39.39	39.13	38.88
MW-06	56.6	32.12	38.86	39.01	38.30	38.37	38.25	37.49	37.18	37.05
MW-08	61.18	33.03	38.43	39.10	38.44	38.11	37.34	36.79	36.45	36.26
MW-09	62.31				P&A					
MW-9R	44.85	34.99	38.42	38.13	38.60	38.74	38.49	38.24	37.91	37.49
MW-10	52.68	34.42	36.12	37.10	37.33	37.67	37.62	37.49	37.44	37.43
MW-11	62.4	35.40	38.64	40.15	40.48	40.68	40.17	39.71	39.41	39.18
MW-12	54.88	32.78	35.29	35.26	35.53	36.22	36.36	36.33	36.36	36.38
MW-13	62.10	32.83	33.56	34.54	34.97	35.41	35.60	35.48	35.38	35.28
MW-14	52.68	26.90	27.21	27.59	28.01	28.42	28.78	29.03	29.04	29.30
MW-15	51.62	32.97	41.43	41.46	43.48	43.43	44.00	42.57	41.73	41.08
MW-16	58.84	34.02	35.51	36.08	36.37	36.89	37.13	37.12	37.17	37.16
MW-17	43.87	34.87	39.58	39.42	40.22	39.85	39.41	38.95	38.28	37.73
MW-18	52.44	33.72	35.78	36.63	37.29	37.81	38.18	37.95	37.76	37.55

TABLE 5.4 (cont'd.)
Ground Water Level Elevations - 1991 - 1998

Piezometer No.	Elevation, PVC Casing, ft MSL	02-18-98	05-18-98	06-16-98	xx--98	xx--98	xx--98	xx--98	xx--98	xx--98
MW-01	61.87	36.19	36.65	36.32						
MW-03	59.17	38.74	38.13	37.59						
MW-04	60.13	39.40	38.16	37.43						
MW-06	56.6	37.96	37.30	36.22						
MW-08	61.18	38.03	35.98	35.28						
MW-09	62.31				P&A					
MW-9R	44.85	38.61	36.91	36.19						
MW-10	52.68	37.98	37.50	37.10						
MW-11	62.4	40.18	38.38	37.50						
MW-12	54.88	37.06	36.78	36.05						
MW-13	62.10	35.47	35.47	34.99						
MW-14	52.68	29.57	30.15	30.00						
MW-15	51.62	42.71	39.64	38.46						
MW-16	58.84	37.55	37.21	36.56						
MW-17	43.87	39.49	37.46	36.46						
MW-18	52.44	38.20	37.24	36.51						

TABLE 5.5
SUMMARY OF IN-SITU HYDRAULIC CONDUCTIVITY TEST RESULTS
Municipal Solid Waste Landfill
Kingsville, Texas

Piezometer Number	Estimated Horizontal Hydraulic Conductivity (K)			
	ft/sec	ft/min	ft/day	cm/sec
MW-11	$6.6\text{x}10^{-6}$	$3.96\text{x}10^{-4}$	0.57	$2.01\text{x}10^{-4}$
MW-12	$2.4\text{x}10^{-5}$	$1.43\text{x}10^{-3}$	2.05	$7.24\text{x}10^{-4}$
MW-13	$8.9\text{x}10^{-6}$	$5.33\text{x}10^{-4}$	0.77	$2.71\text{x}10^{-4}$
MW-14	$4.2\text{x}10^{-6}$	$2.49\text{x}10^{-4}$	0.36	$1.27\text{x}10^{-4}$
MW-15	$1.7\text{x}10^{-5}$	$1.05\text{x}10^{-3}$	1.51	$5.31\text{x}10^{-4}$
MW-16	$2.0\text{x}10^{-5}$	$1.22\text{x}10^{-3}$	1.75	$6.18\text{x}10^{-4}$
Averages	$1.35\text{x}10^{-5}$	$8.13\text{x}10^{-4}$	1.17	$4.12\text{x}10^{-4}$

TABLE 5.6
SUMMARY OF PROPOSED GROUND WATER MONITOR WELLS

Monitor Well #	Total Depth (ft, bgs)	Ground Elev (ft, MSL)	TOC Elevation (ft, MSL)	Depth to GW (ft, bgs)	Screen Depth (ft, bgs)	Screen Elev. (ft, MSL)	Filter Pack (ft, bgs)	Up/Down Gradient	Status
MW-1	42.00	59.249	61.87	31.00	32.00	27.25	28.00	D(POC)	A
MW-2									P&A
MW-3	37.00	56.096	59.17	27.70	32.00	24.10	20.00	D(POC)	A
MW-4	39.00	58.008	60.13	31.20	34.00	24.01	25.00	D	A
MW-5									P&A
MW-6	38.00	55.456	56.60	29.10	33.00	22.46	28.00	D	A
MW-7									P&A
34 MW-8	43.00	59.787	61.18	32.02	33.00	26.79	26.00	D	A
MW-9									P&A
MW-9R	17.00	41.411	44.85	9.60	7.00	34.41	6.00	D	A
MW-10	29.00	49.78	52.68	19.50	19.00	30.78	16.00	D	A
MW-11	33.00	60.197	62.40	26.30	17.50	42.70	16.00	D	A
MW-12	48.00	52.375	54.88	17.30	25.00	27.38	23.00	D(POC)	A
MW-13	50.00	59.131	62.10	24.00	30.00	29.13	29	D(POC)	A
MW-14	42.00	49.938	52.68	22.00	25.00	24.94	23.50	D	A
MW-15	37.00	48.386	51.62	12.00	22.50	25.89	21.00	D	A
MW-16	47.00	55.958	58.84	19.00	30.00	25.96	29.00	D	A
MW-17	33.00	41.345	43.87	7.00	12.50	28.85	10.00	D	A
MW-18	42.00	50.039	52.44	15.00	22.00	28.04	19.00	D	A
MW-24	33.00	47.380	49.580	12.58	18.00	29.38	18.00	D	A

Note: These POC designated wells are for Sector 2 only - the first sector to be activated.

Revision 1

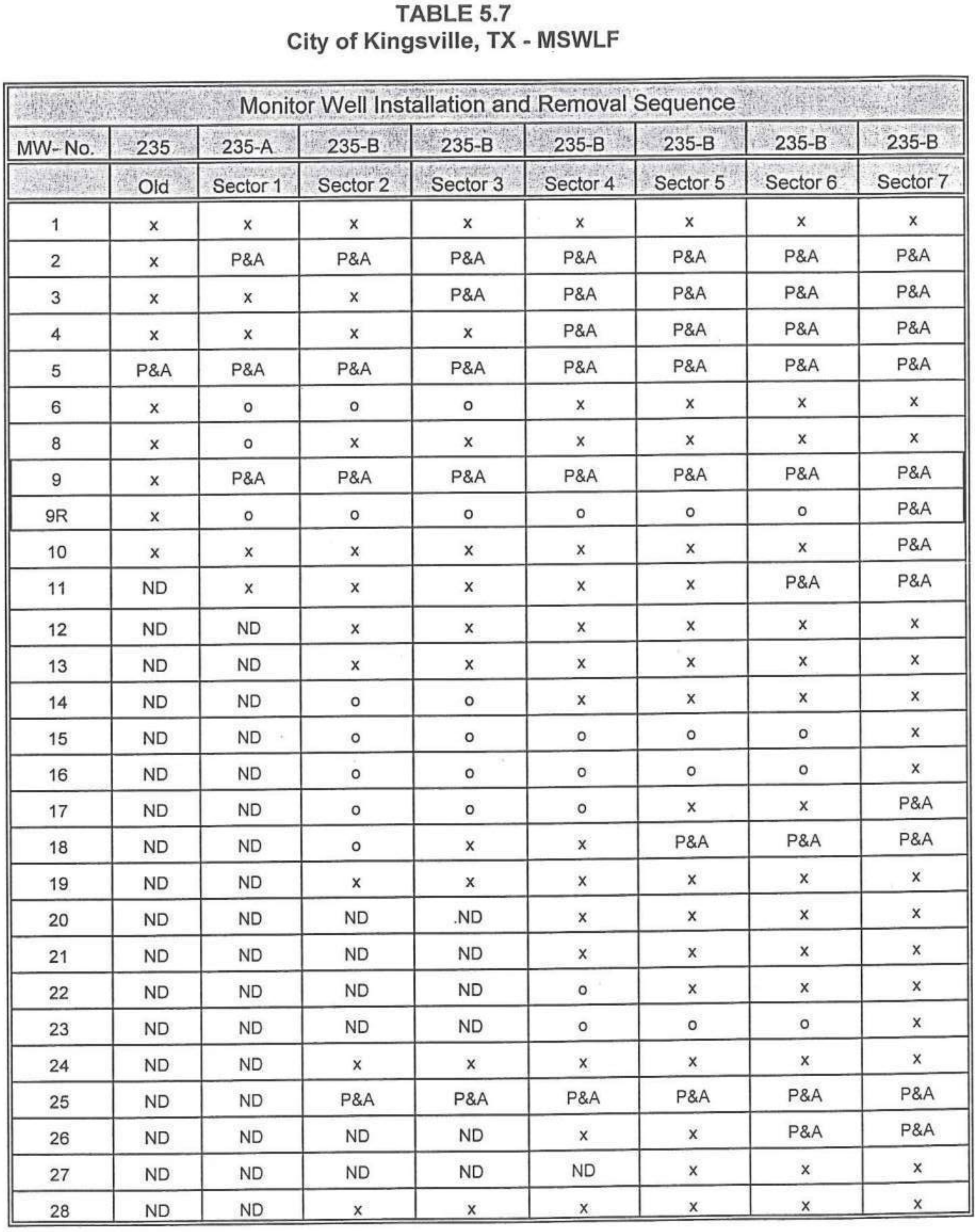


TABLE 5.7
City of Kingsville, TX - MSWLF

Monitor Well Installation and Removal Sequence								
MW- No.	235	235-A	235-B	235-B	235-B	235-B	235-B	235-B
	Old	Sector 1	Sector 2	Sector 3	Sector 4	Sector 5	Sector 6	Sector 7
1	x	x	x	x	x	x	x	x
2	x	P&A	P&A	P&A	P&A	P&A	P&A	P&A
3	x	x	x	P&A	P&A	P&A	P&A	P&A
4	x	x	x	x	P&A	P&A	P&A	P&A
5	P&A	P&A	P&A	P&A	P&A	P&A	P&A	P&A
6	x	o	o	o	x	x	x	x
8	x	o	x	x	x	x	x	x
9	x	P&A	P&A	P&A	P&A	P&A	P&A	P&A
9R	x	o	o	o	o	o	o	P&A
10	x	x	x	x	x	x	x	P&A
11	ND	x	x	x	x	x	P&A	P&A
12	ND	ND	x	x	x	x	x	x
13	ND	ND	x	x	x	x	x	x
14	ND	ND	o	o	x	x	x	x
15	ND	ND	o	o	o	o	o	x
16	ND	ND	o	o	o	o	o	x
17	ND	ND	o	o	o	x	x	P&A
18	ND	ND	o	x	x	P&A	P&A	P&A
19	ND	ND	x	x	x	x	x	x
20	ND	ND	ND	ND	x	x	x	x
21	ND	ND	ND	ND	x	x	x	x
22	ND	ND	ND	ND	o	x	x	x
23	ND	ND	ND	ND	o	o	o	x
24	ND	ND	x	x	x	x	x	x
25	ND	ND	P&A	P&A	P&A	P&A	P&A	P&A
26	ND	ND	ND	ND	x	x	P&A	P&A
27	ND	ND	ND	ND	ND	x	x	x
28	ND	ND	x	x	x	x	x	x

35

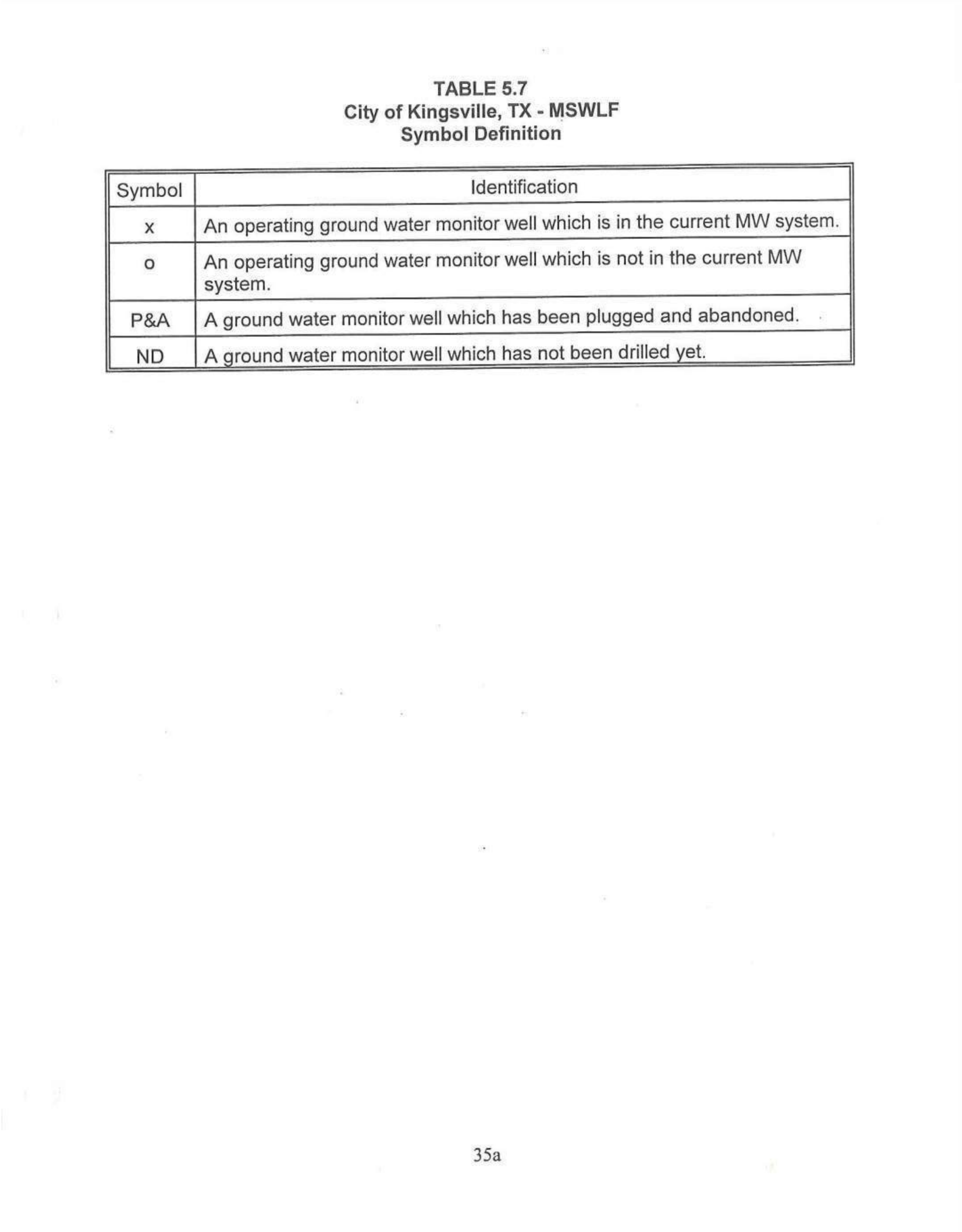
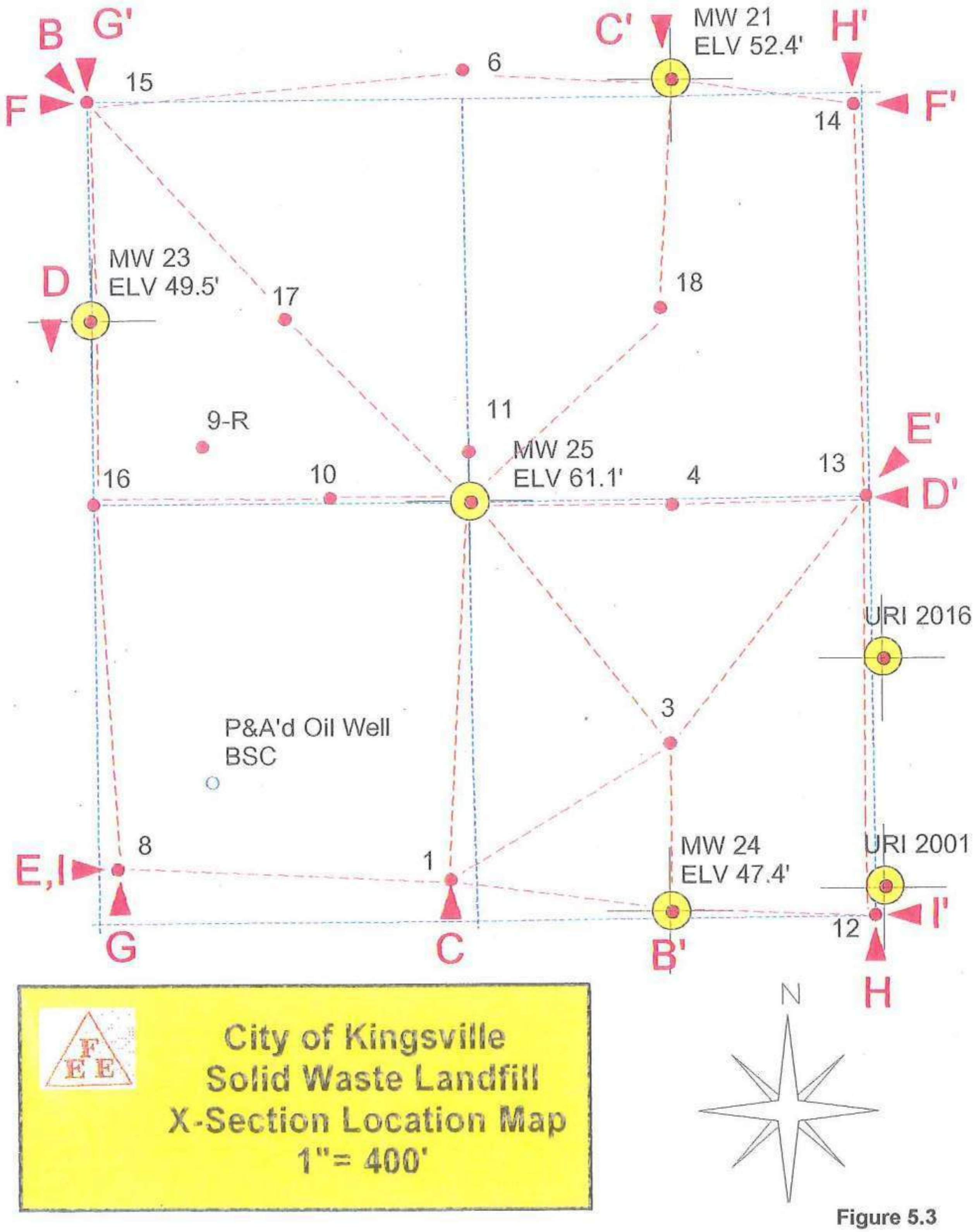


TABLE 5.7
City of Kingsville, TX - MSWLF
Symbol Definition

Symbol	Identification
x	An operating ground water monitor well which is in the current MW system.
o	An operating ground water monitor well which is not in the current MW system.
P&A	A ground water monitor well which has been plugged and abandoned.
ND	A ground water monitor well which has not been drilled yet.



City of Kingsville
Solid Waste Landfill
X-Section Location Map
1"= 400'

Figure 5.3

CROSS SECTION LOCATION MAP

REVISION 1
37

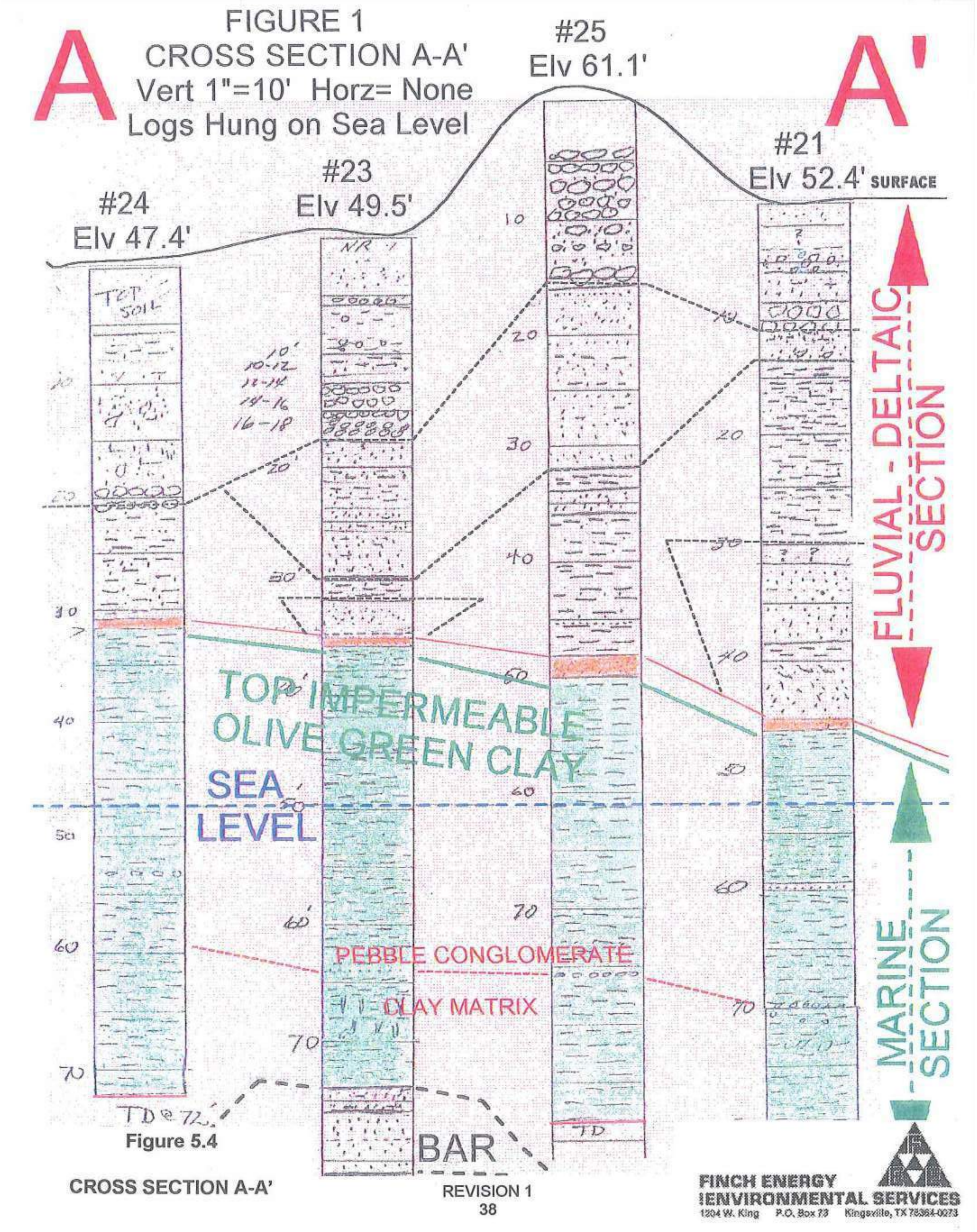


Figure 5.4

CROSS SECTION A-A'

REVISION 1
38

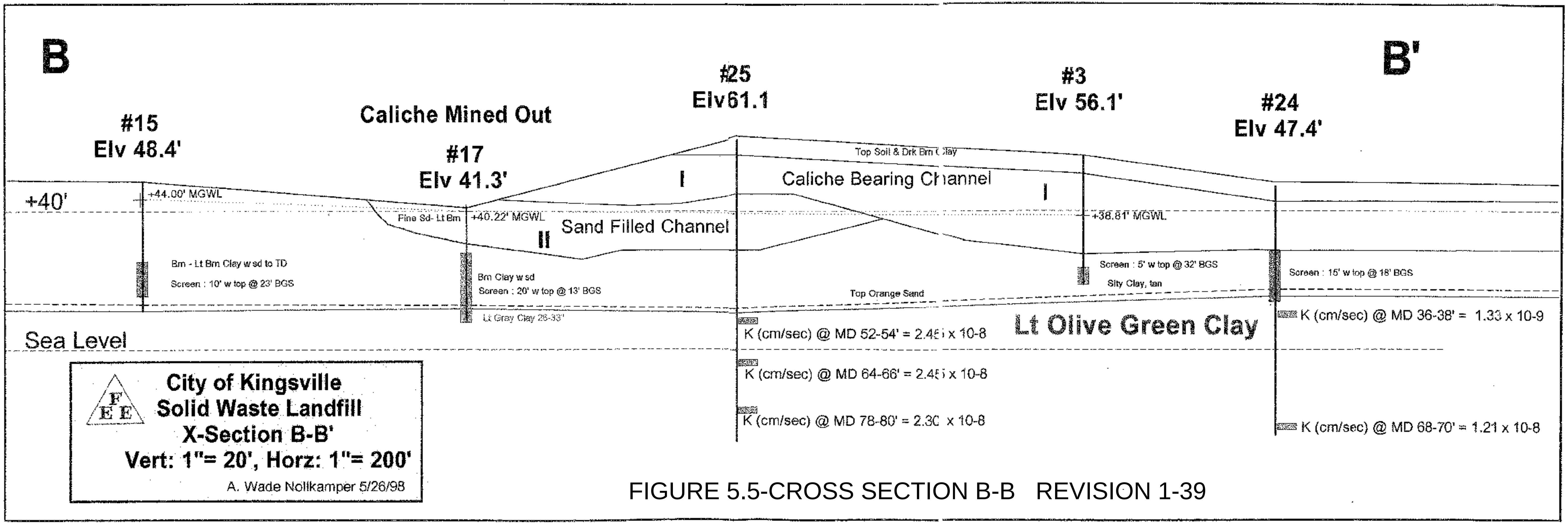


FIGURE 5.5-CROSS SECTION B-B REVISION 1-39

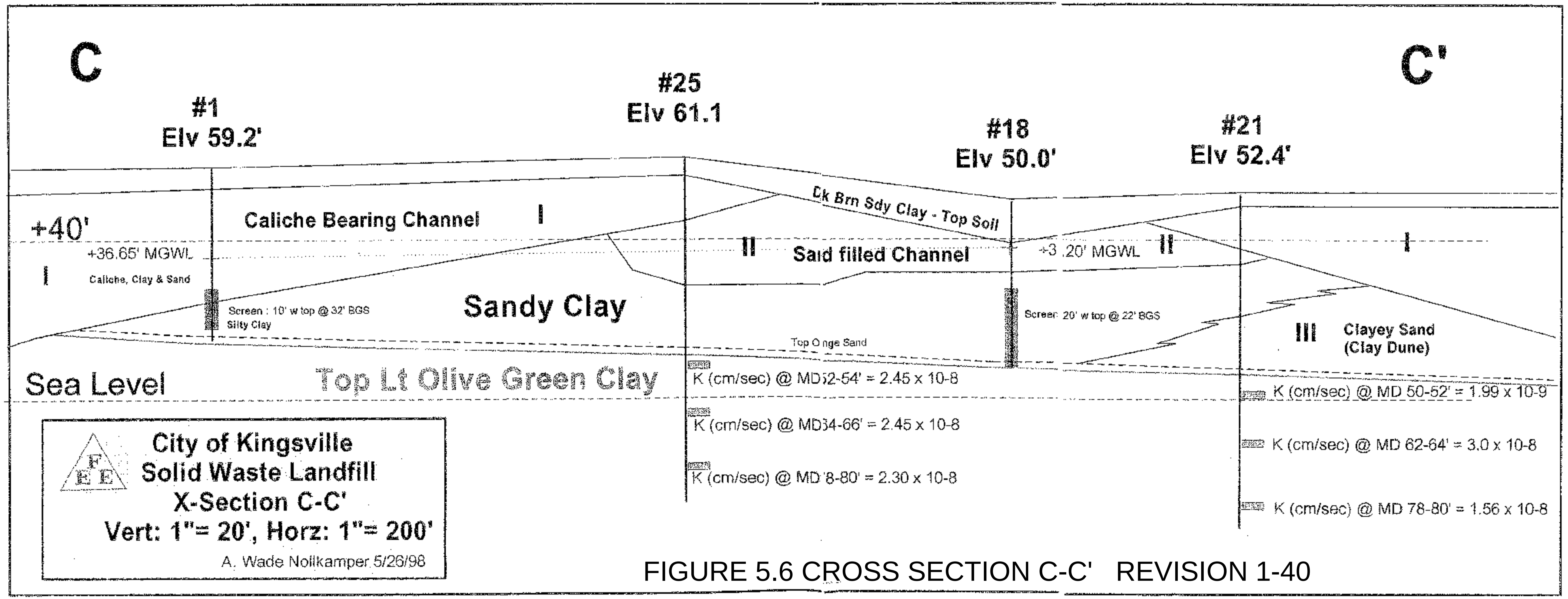


FIGURE 5.6 CROSS SECTION C-C'   REVISION 1-40

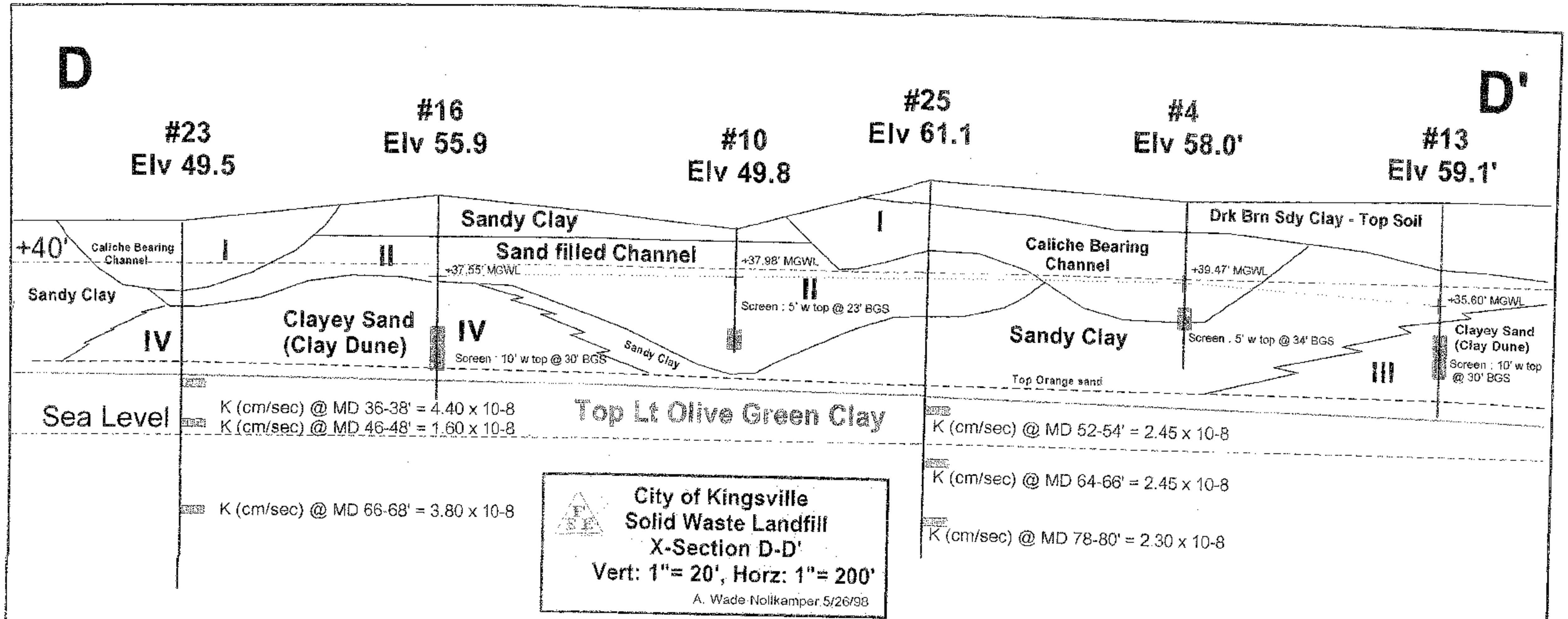
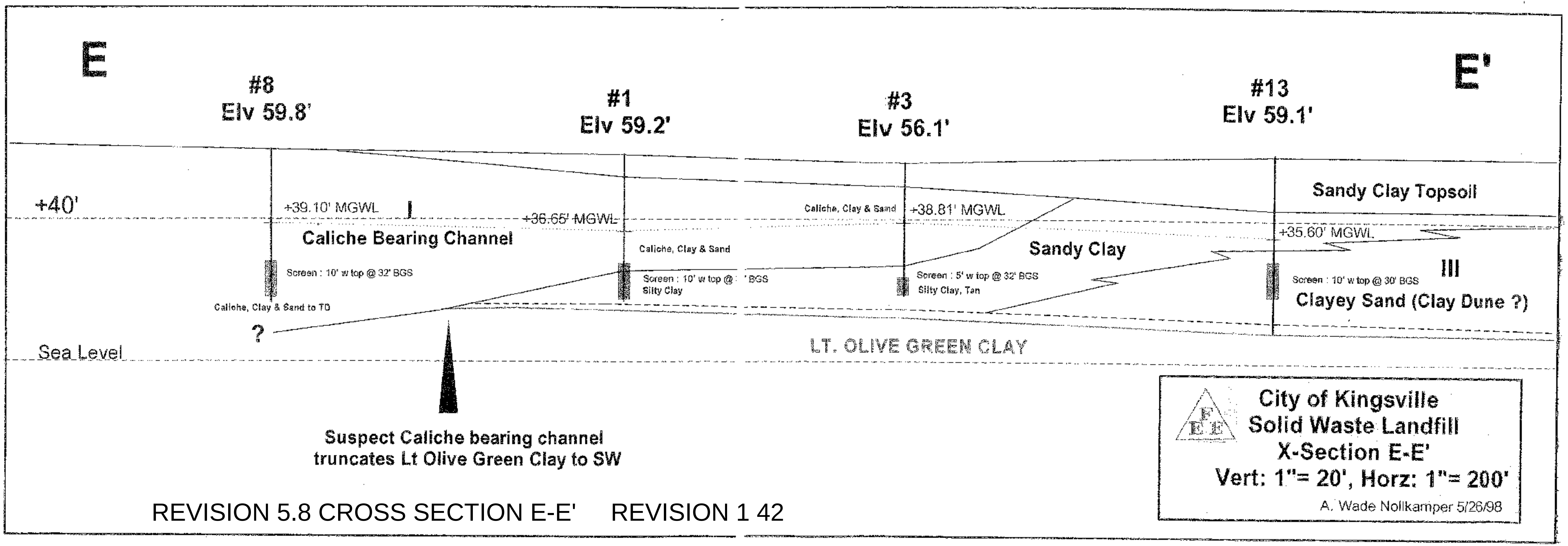


FIGURE 5.7 CROSS SECTION D-D' REVISION 1-41



REVISION 5.8 CROSS SECTION E-E' REVISION 1 42

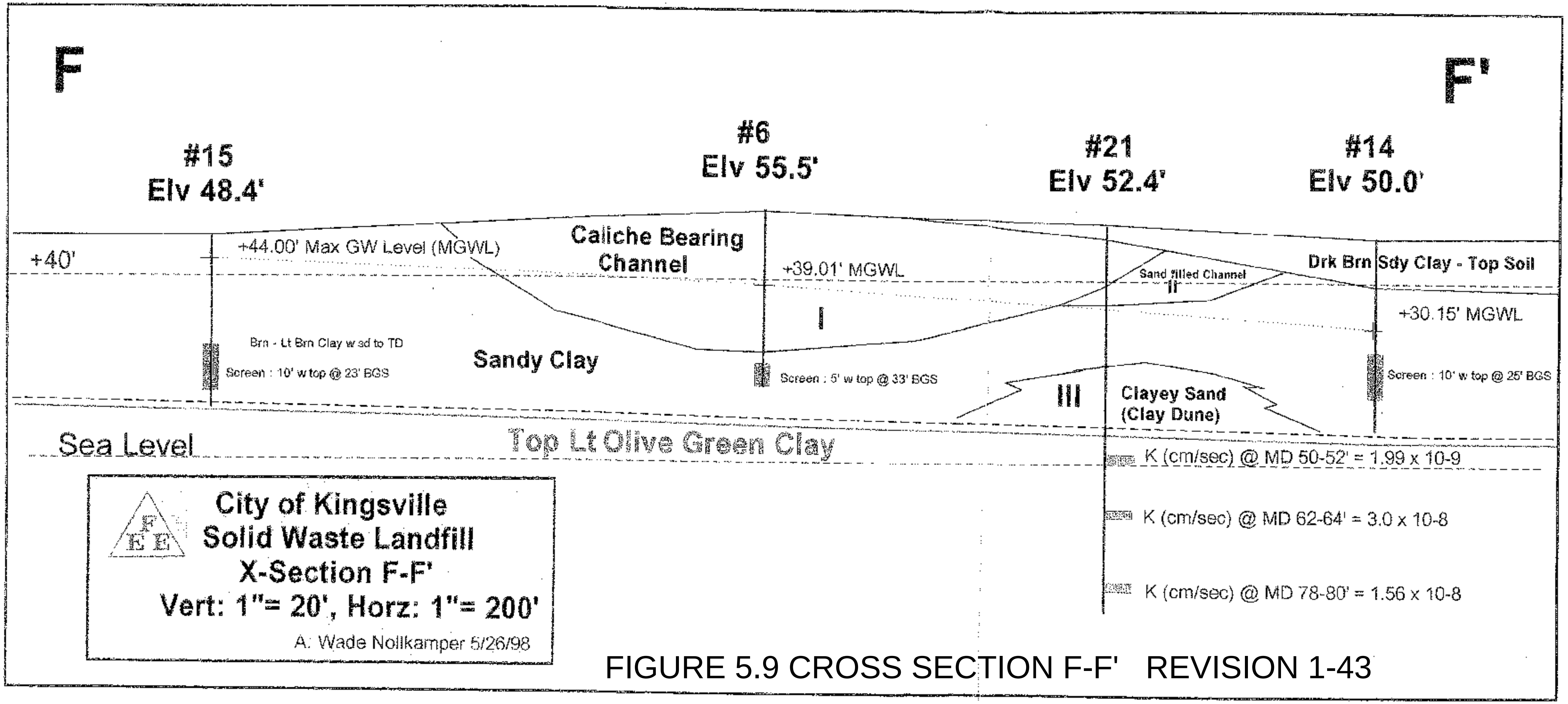


FIGURE 5.9 CROSS SECTION F-F' REVISION 1-43

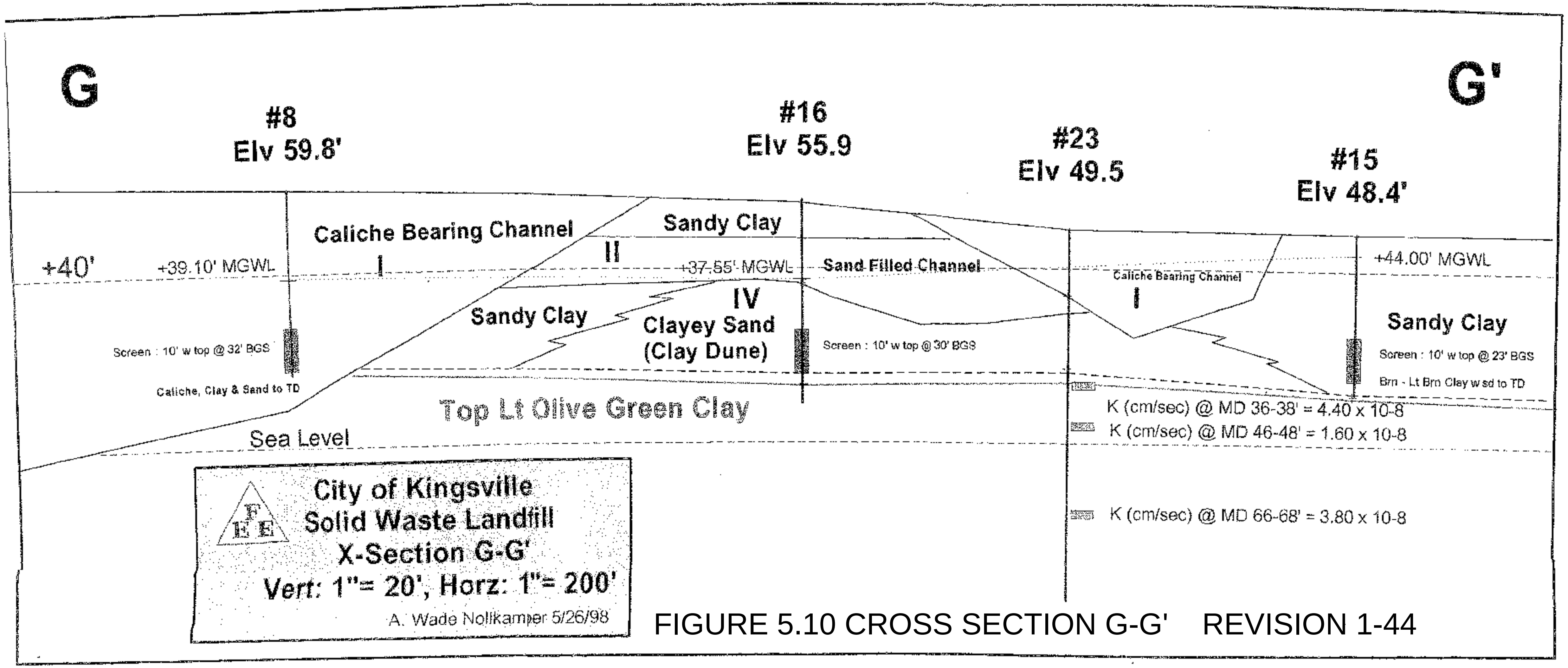
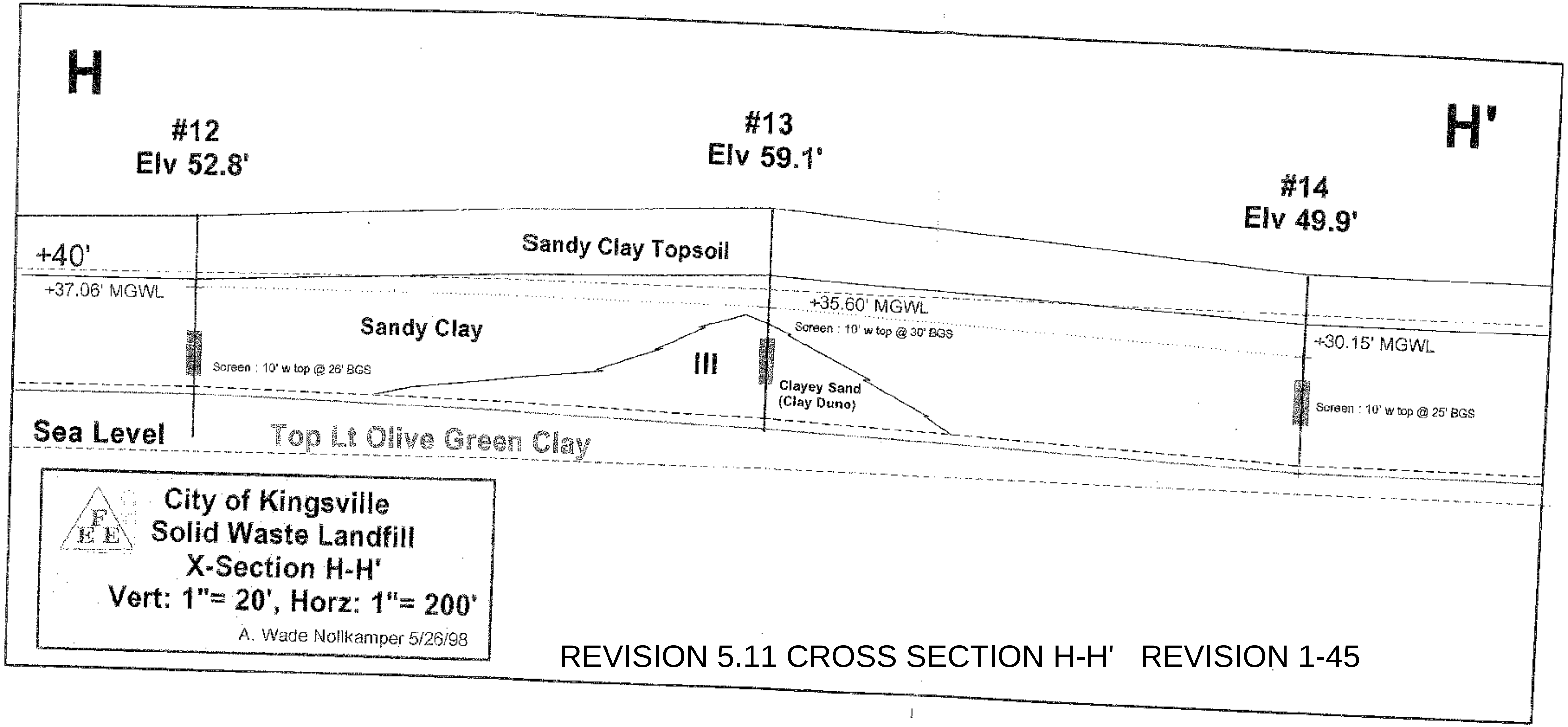


FIGURE 5.10 CROSS SECTION G-G'   REVISION 1-44



REVISION 5.11 CROSS SECTION H-H'   REVISION 1-45

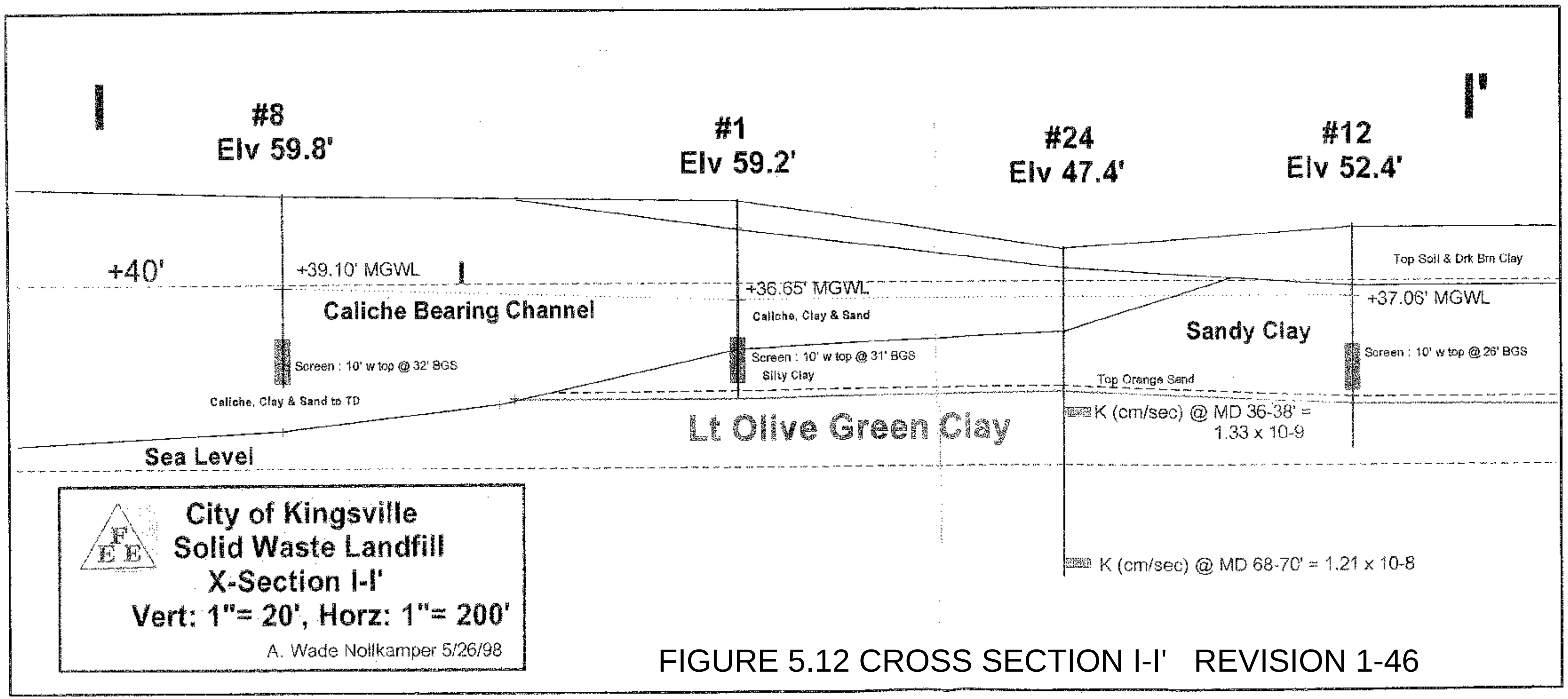


FIGURE 5.12 CROSS SECTION I-I' REVISION 1-46

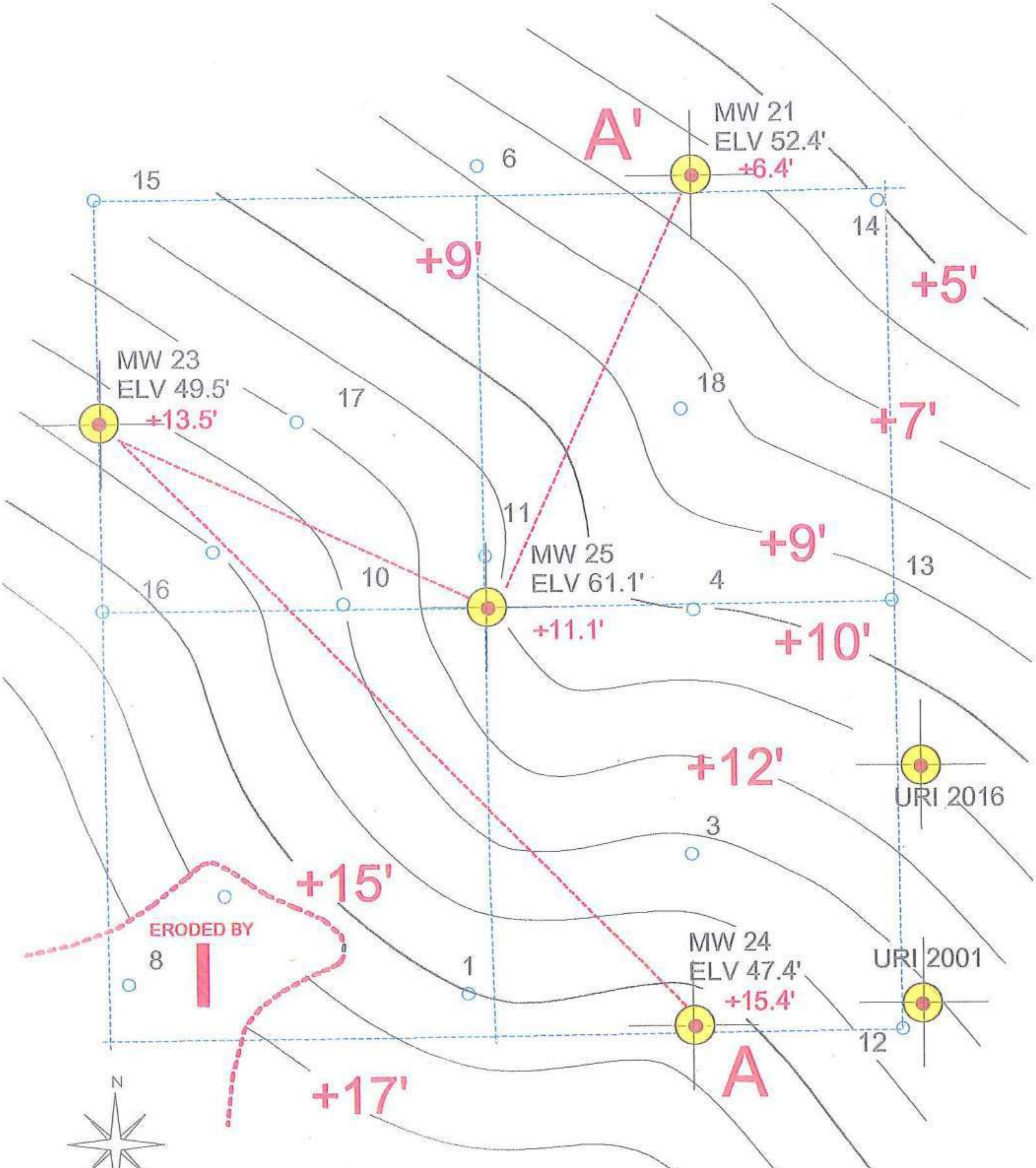


FIGURE 2
STRUCTURE TOP OLIVE GREEN CLAY
C.I.= 1' SCALE: 1"= 400'
A.W.N. 4/30/98
REVISION 1
47

Figure 5.13
STRUCTURE TOP OLIVE GREEN CLAY

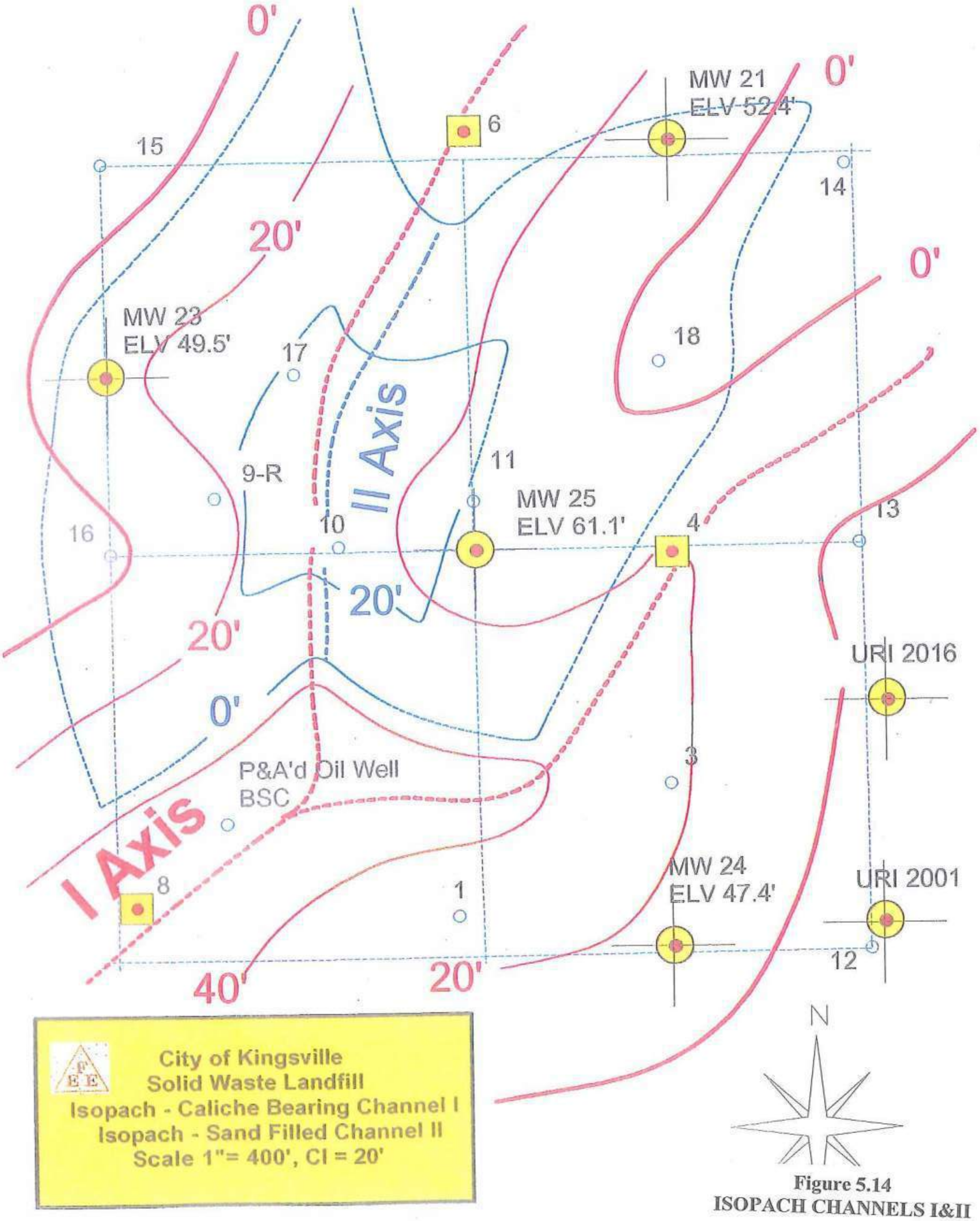


Figure 5.14
ISOPACH CHANNELS I&II

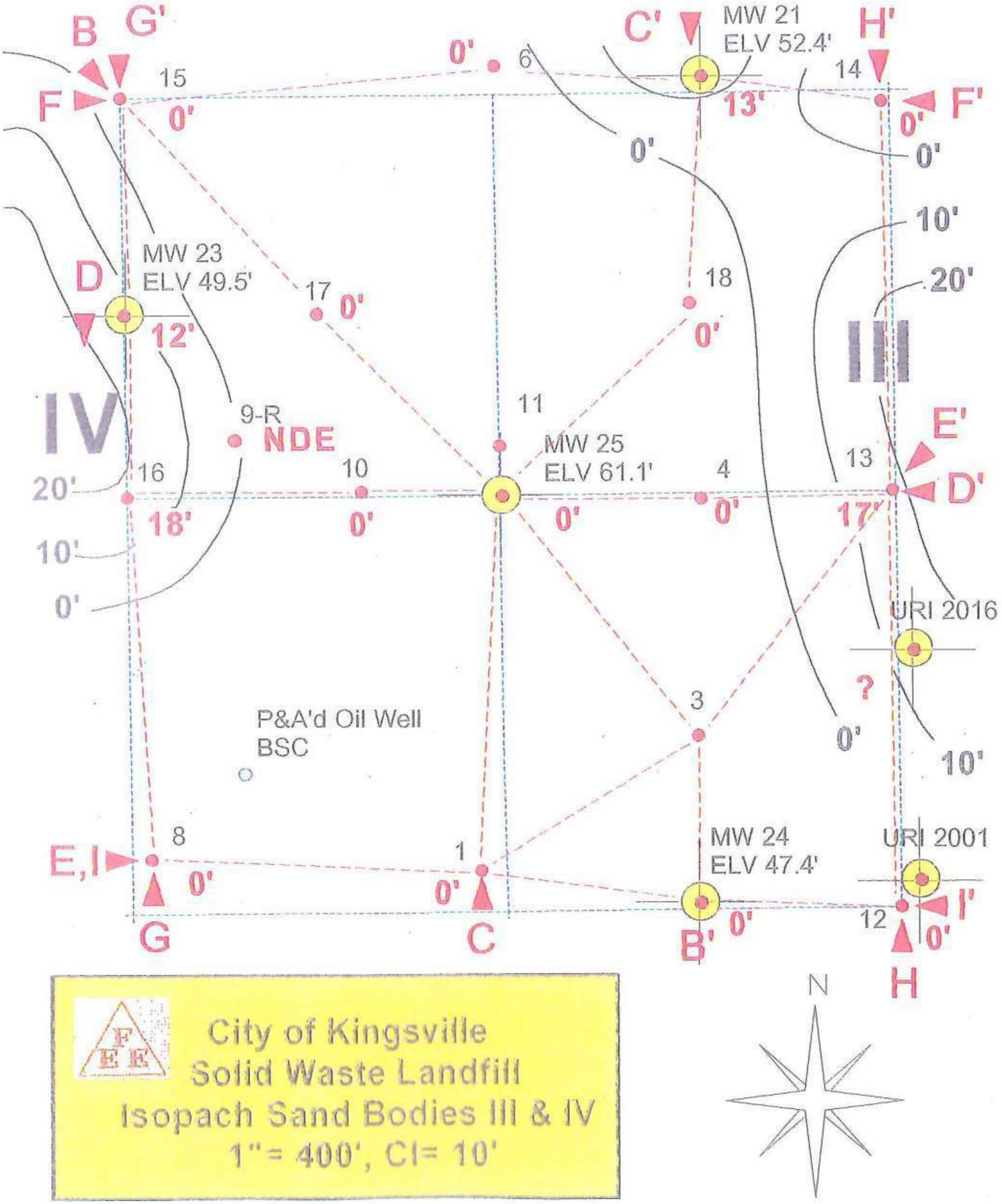


Figure 5.15
CROSS SECTION E-E'

REVISION 1
49

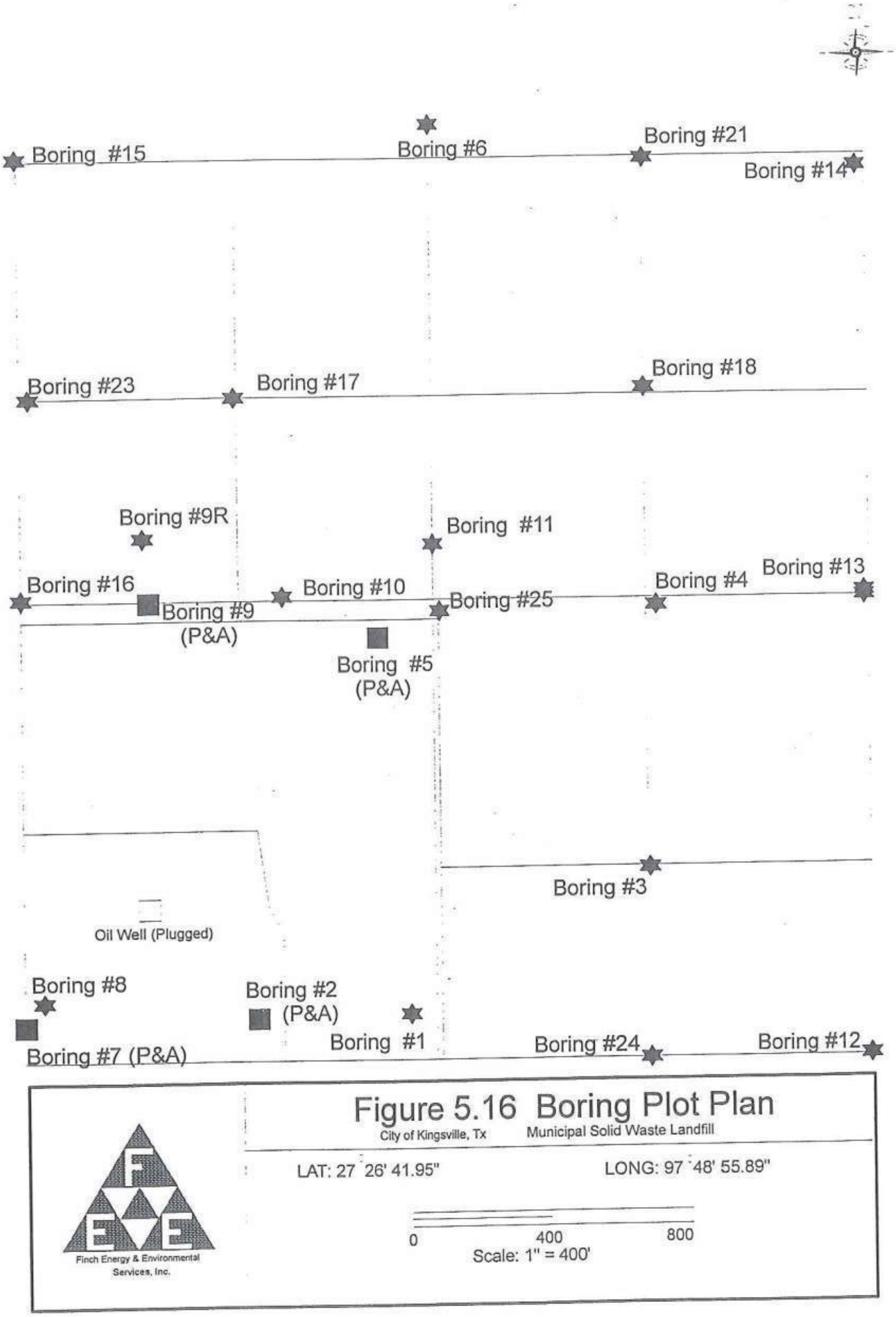


Figure 5.16 Boring Plot Plan

4.0 REFERENCES

4.0 REFERENCE

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APPENDIX A

APPENDIX A

Depth to Water Measurement Data Sheets

Revision 2 - September 1998

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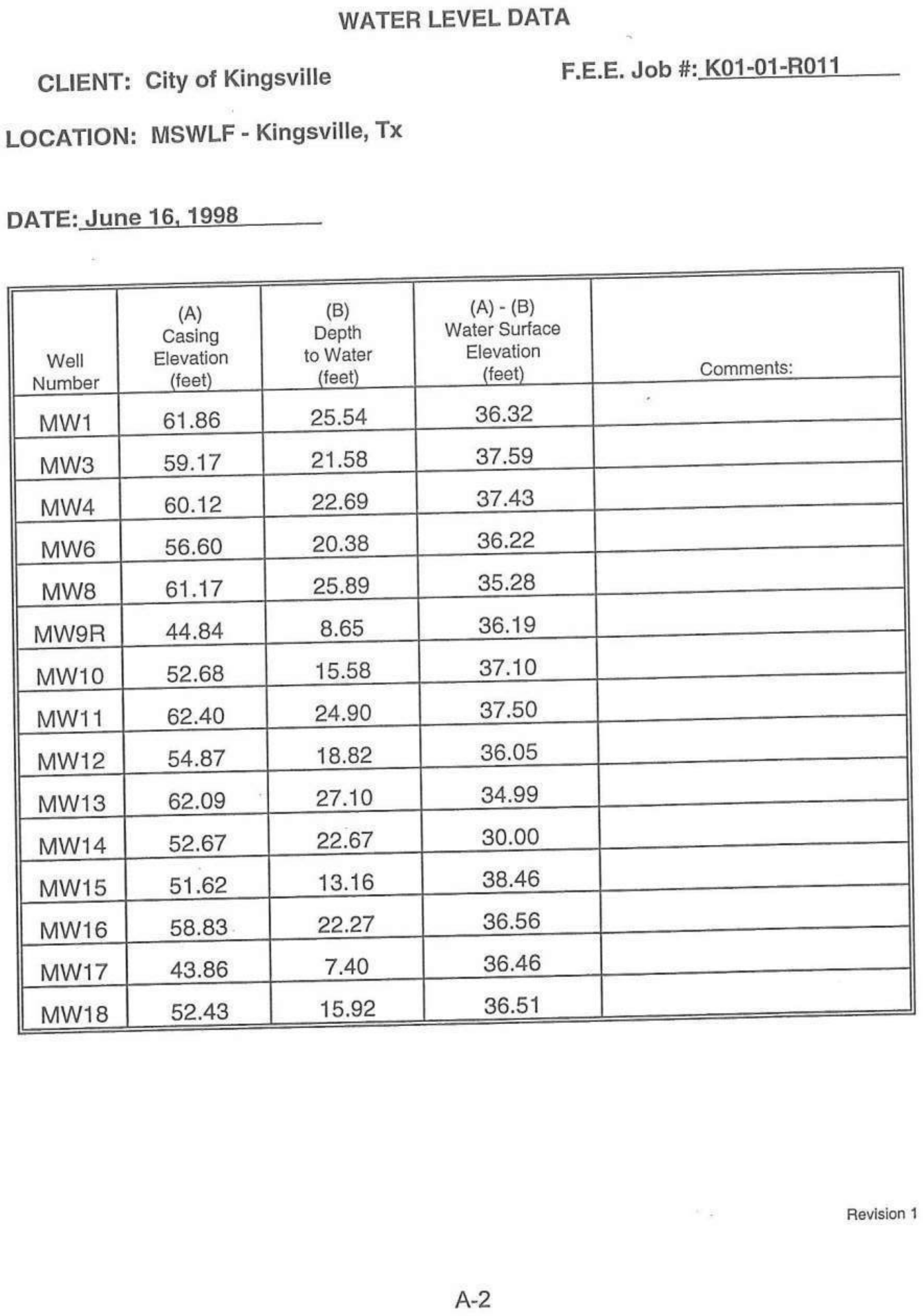


WATER LEVEL DATA

CLIENT: City of Kingsville

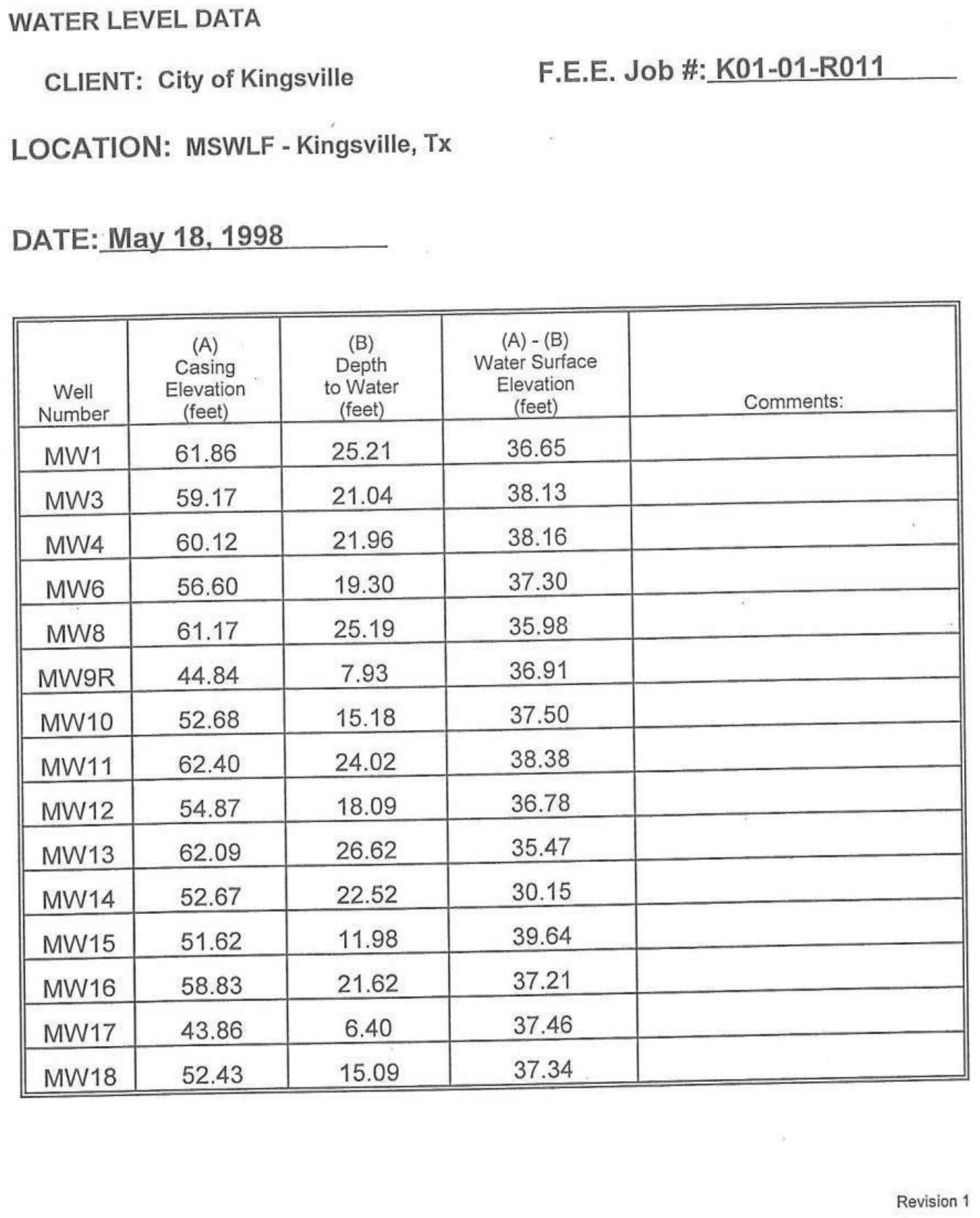
F.E.E. Job #: K01-01-R011

LOCATION: MSWLF - Kingsville, Tx

DATE: June 16, 1998

Well Number	(A) Casing Elevation (feet)	(B) Depth to Water (feet)	(A) - (B) Water Surface Elevation (feet)	Comments:
MW1	61.86	25.54	36.32	
MW3	59.17	21.58	37.59	
MW4	60.12	22.69	37.43	
MW6	56.60	20.38	36.22	
MW8	61.17	25.89	35.28	
MW9R	44.84	8.65	36.19	
MW10	52.68	15.58	37.10	
MW11	62.40	24.90	37.50	
MW12	54.87	18.82	36.05	
MW13	62.09	27.10	34.99	
MW14	52.67	22.67	30.00	
MW15	51.62	13.16	38.46	
MW16	58.83	22.27	36.56	
MW17	43.86	7.40	36.46	
MW18	52.43	15.92	36.51	

Revision 1



WATER LEVEL DATA

CLIENT: City of Kingsville

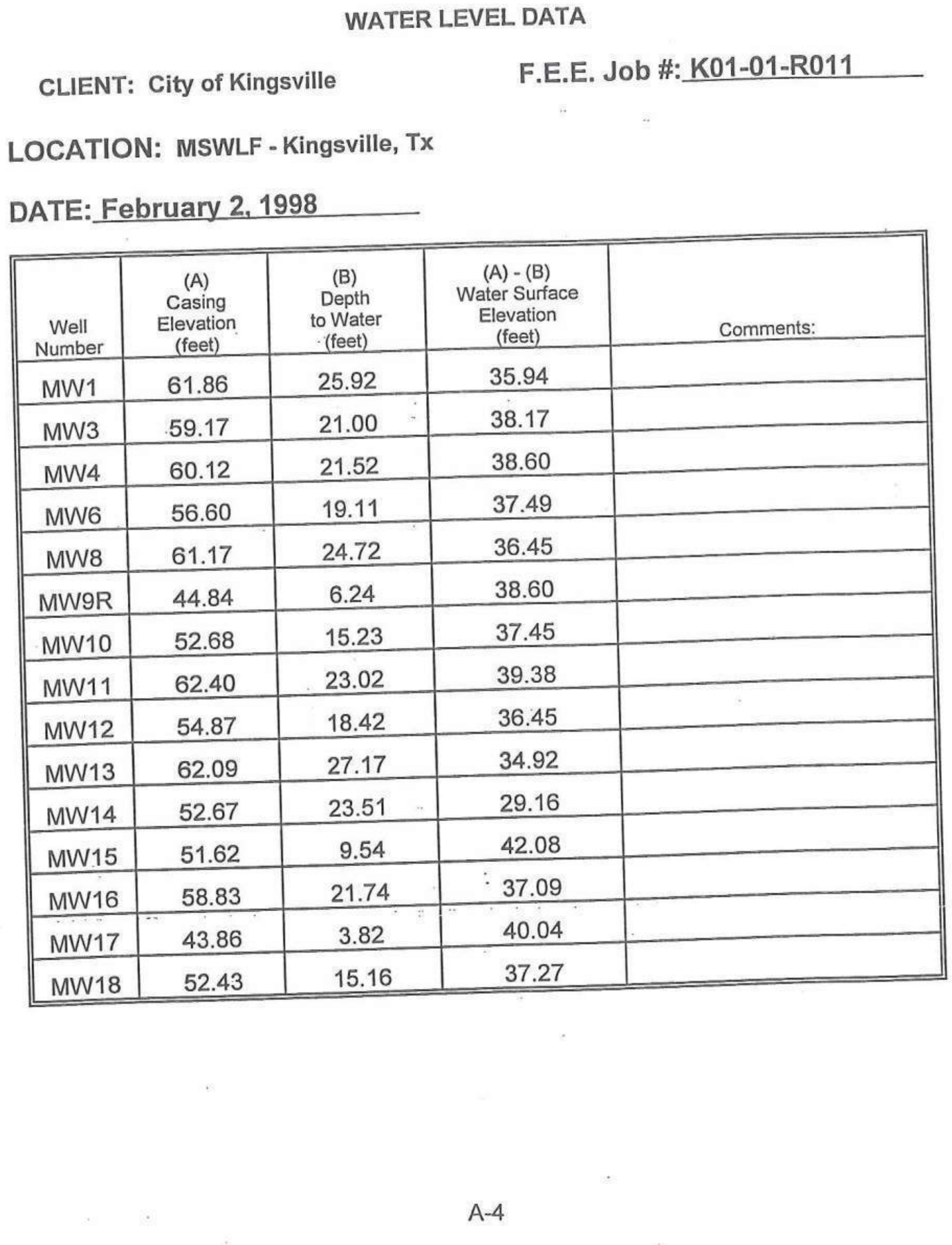
F.E.E. Job #: K01-01-R011

LOCATION: MSWLF - Kingsville, Tx

DATE: May 18, 1998

Well Number	(A) Casing Elevation (feet)	(B) Depth to Water (feet)	(A) - (B) Water Surface Elevation (feet)	Comments:
MW1	61.86	25.21	36.65	
MW3	59.17	21.04	38.13	
MW4	60.12	21.96	38.16	
MW6	56.60	19.30	37.30	
MW8	61.17	25.19	35.98	
MW9R	44.84	7.93	36.91	
MW10	52.68	15.18	37.50	
MW11	62.40	24.02	38.38	
MW12	54.87	18.09	36.78	
MW13	62.09	26.62	35.47	
MW14	52.67	22.52	30.15	
MW15	51.62	11.98	39.64	
MW16	58.83	21.62	37.21	
MW17	43.86	6.40	37.46	
MW18	52.43	15.09	37.34	

Revision 1



WATER LEVEL DATA

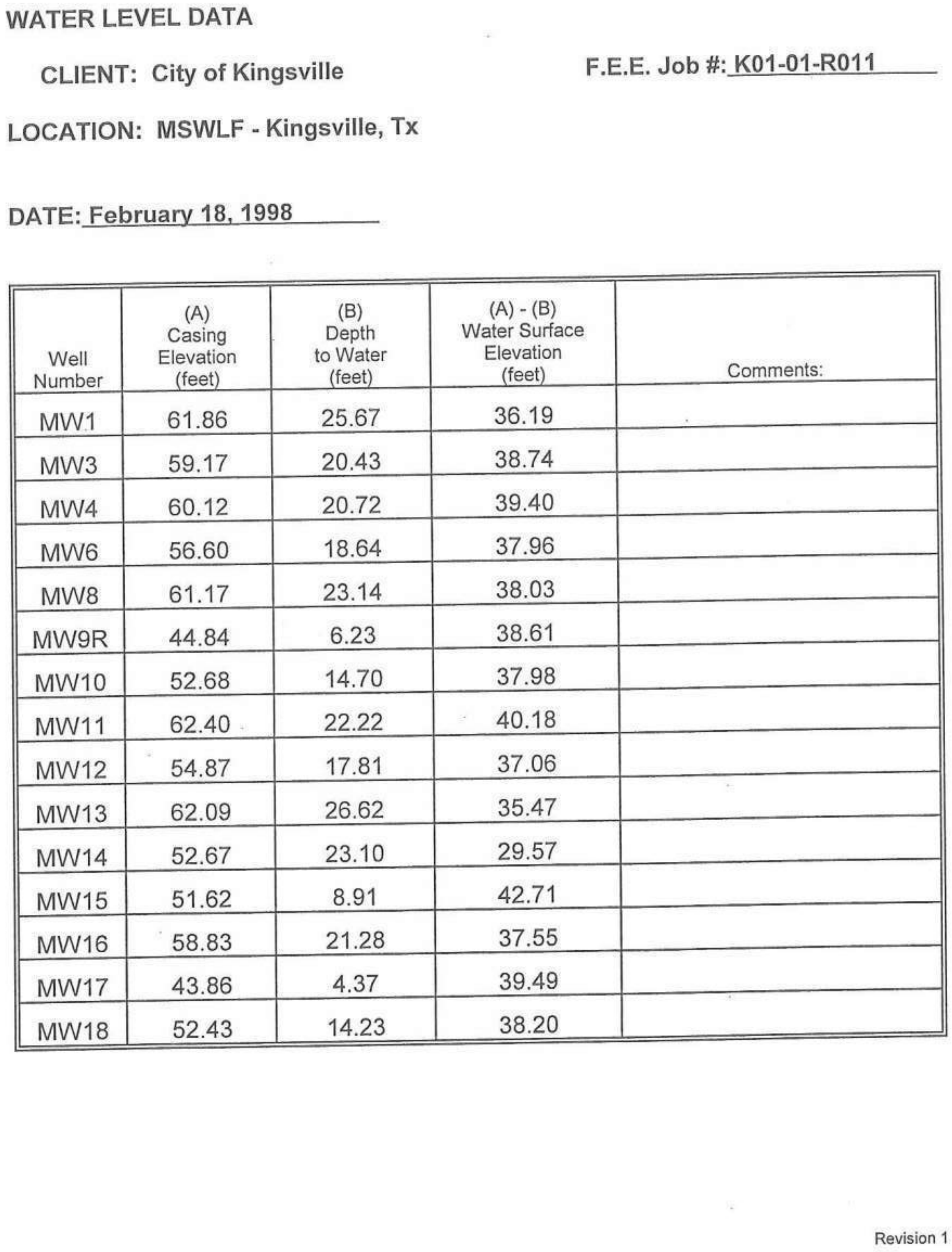
CLIENT: City of Kingsville

F.E.E. Job #: K01-01-R011

LOCATION: MSWLF - Kingsville, Tx

DATE: February 2, 1998

Well Number	(A) Casing Elevation (feet)	(B) Depth to Water (feet)	(A) - (B) Water Surface Elevation (feet)	Comments:
MW1	61.86	25.92	35.94	
MW3	59.17	21.00	38.17	
MW4	60.12	21.52	38.60	
MW6	56.60	19.11	37.49	
MW8	61.17	24.72	36.45	
MW9R	44.84	6.24	38.60	
MW10	52.68	15.23	37.45	
MW11	62.40	23.02	39.38	
MW12	54.87	18.42	36.45	
MW13	62.09	27.17	34.92	
MW14	52.67	23.51	29.16	
MW15	51.62	9.54	42.08	
MW16	58.83	21.74	37.09	
MW17	43.86	3.82	40.04	
MW18	52.43	15.16	37.27	



WATER LEVEL DATA

CLIENT: City of Kingsville

F.E.E. Job #: K01-01-R011

LOCATION: MSWLF - Kingsville, Tx

DATE: February 18, 1998

Well Number	(A) Casing Elevation (feet)	(B) Depth to Water (feet)	(A) - (B) Water Surface Elevation (feet)	Comments:
MW1	61.86	25.67	36.19	
MW3	59.17	20.43	38.74	
MW4	60.12	20.72	39.40	
MW6	56.60	18.64	37.96	
MW8	61.17	23.14	38.03	
MW9R	44.84	6.23	38.61	
MW10	52.68	14.70	37.98	
MW11	62.40	22.22	40.18	
MW12	54.87	17.81	37.06	
MW13	62.09	26.62	35.47	
MW14	52.67	23.10	29.57	
MW15	51.62	8.91	42.71	
MW16	58.83	21.28	37.55	
MW17	43.86	4.37	39.49	
MW18	52.43	14.23	38.20	

Revision 1

WATER LEVEL DATA

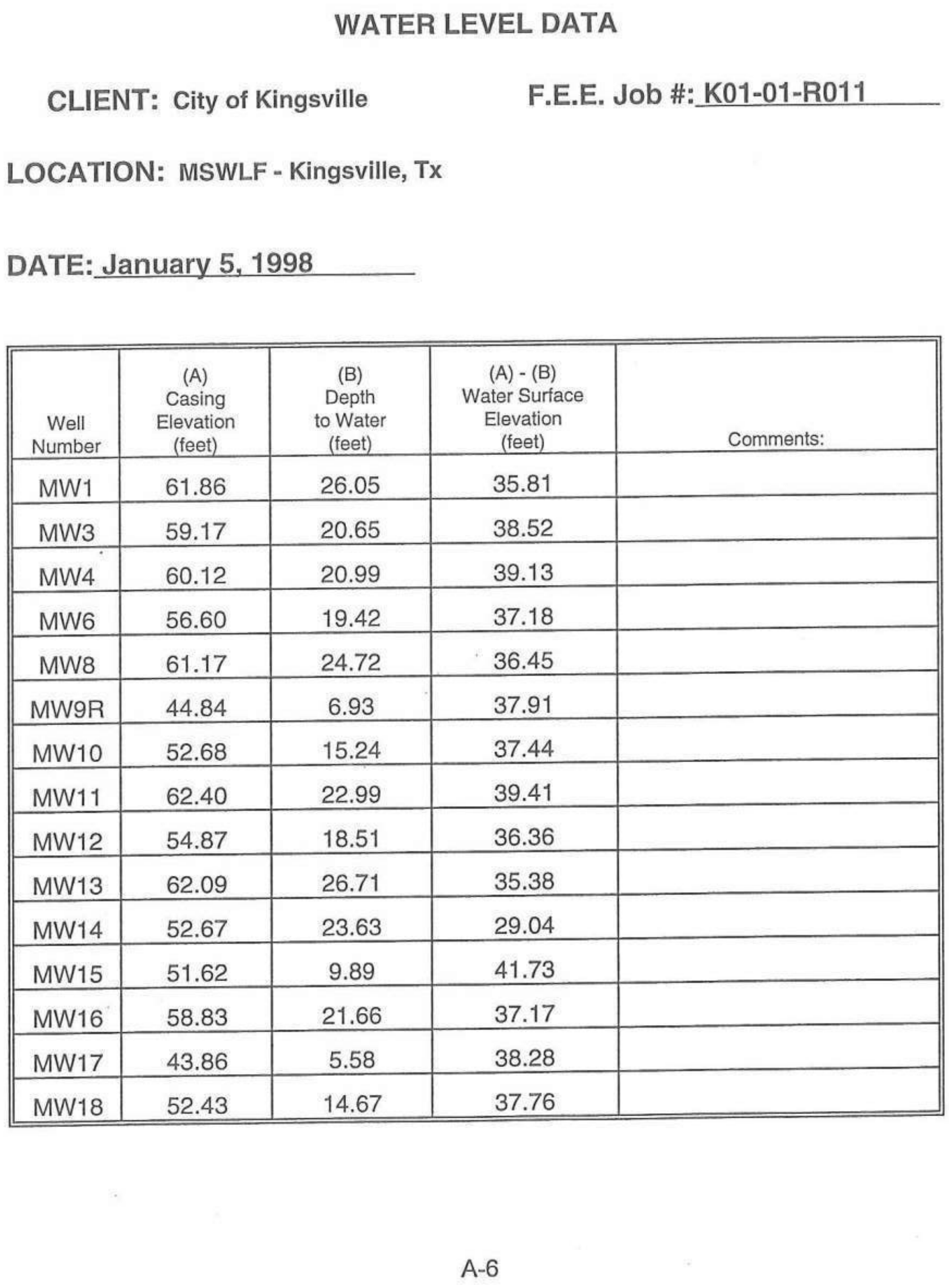
CLIENT: City of Kingsville

F.E.E. Job #: K01-01-R011

LOCATION: MSWLF - Kingsville, Tx

DATE: January 20, 1998

Well Number	(A) Casing Elevation (feet)	(B) Depth to Water (feet)	(A) - (B) Water Surface Elevation (feet)	Comments:
MW1	61.86	25.88	35.98	
MW3	59.17	20.73	38.44	
MW4	60.12	21.24	38.88	
MW6	56.60	19.55	37.05	
MW8	61.17	24.91	36.26	
MW9R	44.84	7.35	37.49	
MW10	52.68	15.25	37.43	
MW11	62.40	23.22	39.18	
MW12	54.87	18.49	36.38	
MW13	62.09	26.81	35.28	
MW14	52.67	23.37	29.30	
MW15	51.62	10.54	41.08	
MW16	58.83	21.67	37.16	
MW17	43.86	6.13	37.73	
MW18	52.43	14.88	37.55	



WATER LEVEL DATA

CLIENT: City of Kingsville **F.E.E. Job #:** K01-01-R011

LOCATION: MSWLF - Kingsville, Tx

DATE: January 5, 1998

Well Number	(A) Casing Elevation (feet)	(B) Depth to Water (feet)	(A) - (B) Water Surface Elevation (feet)	Comments:
MW1	61.86	26.05	35.81	
MW3	59.17	20.65	38.52	
MW4	60.12	20.99	39.13	
MW6	56.60	19.42	37.18	
MW8	61.17	24.72	36.45	
MW9R	44.84	6.93	37.91	
MW10	52.68	15.24	37.44	
MW11	62.40	22.99	39.41	
MW12	54.87	18.51	36.36	
MW13	62.09	26.71	35.38	
MW14	52.67	23.63	29.04	
MW15	51.62	9.89	41.73	
MW16	58.83	21.66	37.17	
MW17	43.86	5.58	38.28	
MW18	52.43	14.67	37.76	

WATER LEVEL DATA

CLIENT: City of Kingsville **F.E.E. Job #:** K01-01-R011
LOCATION: MSWLF - Kingsville, Tx

DATE: December 22, 1997

Well Number	(A) Casing Elevation (feet)	(B) Depth to Water (feet)	(A) - (B) Water Surface Elevation (feet)	Comments:
MW1	61.86	26.19	35.67	
MW3	59.17	20.48	38.69	
MW4	60.12	20.73	39.39	
MW6	56.60	19.11	37.49	
MW8	61.17	24.38	36.79	
MW9R	44.84	6.60	38.24	
MW10	52.68	15.19	37.49	
MW11	62.40	22.69	39.71	
MW12	54.87	18.54	36.33	
MW13	62.09	26.61	35.48	
MW14	52.67	23.64	29.03	
MW15	51.62	9.05	42.57	
MW16	58.83	21.71	37.12	
MW17	43.86	4.91	38.95	
MW18	52.43	14.48	37.95	

WATER LEVEL DATA

CLIENT: City of Kingsville **F.E.E. Job #:** K01-01-R011
LOCATION: MSWLF - Kingsville, Tx

DATE: December 8, 1997

Well Number	(A) Casing Elevation (feet)	(B) Depth to Water (feet,MSL)	(A) - (B) Water Surface Elevation (feet,MSL)	Comments:
MW1	61.86	26.36	35.50	
MW3	59.17	20.36	38.81	
MW4	60.12	20.52	39.60	
MW6	56.60	18.35	38.25	
MW8	61.17	23.83	37.34	
MW9R	44.84	6.35	38.49	
MW10	52.68	15.06	37.62	
MW11	62.40	22.23	40.17	
MW12	54.87	18.51	36.36	
MW13	62.09	26.49	35.60	
MW14	52.67	23.89	28.78	
MW15	51.62	7.62	44.00	
MW16	58.83	21.70	37.13	
MW17	43.86	4.45	39.41	
MW18	52.43	14.25	38.18	

WATER LEVEL DATA

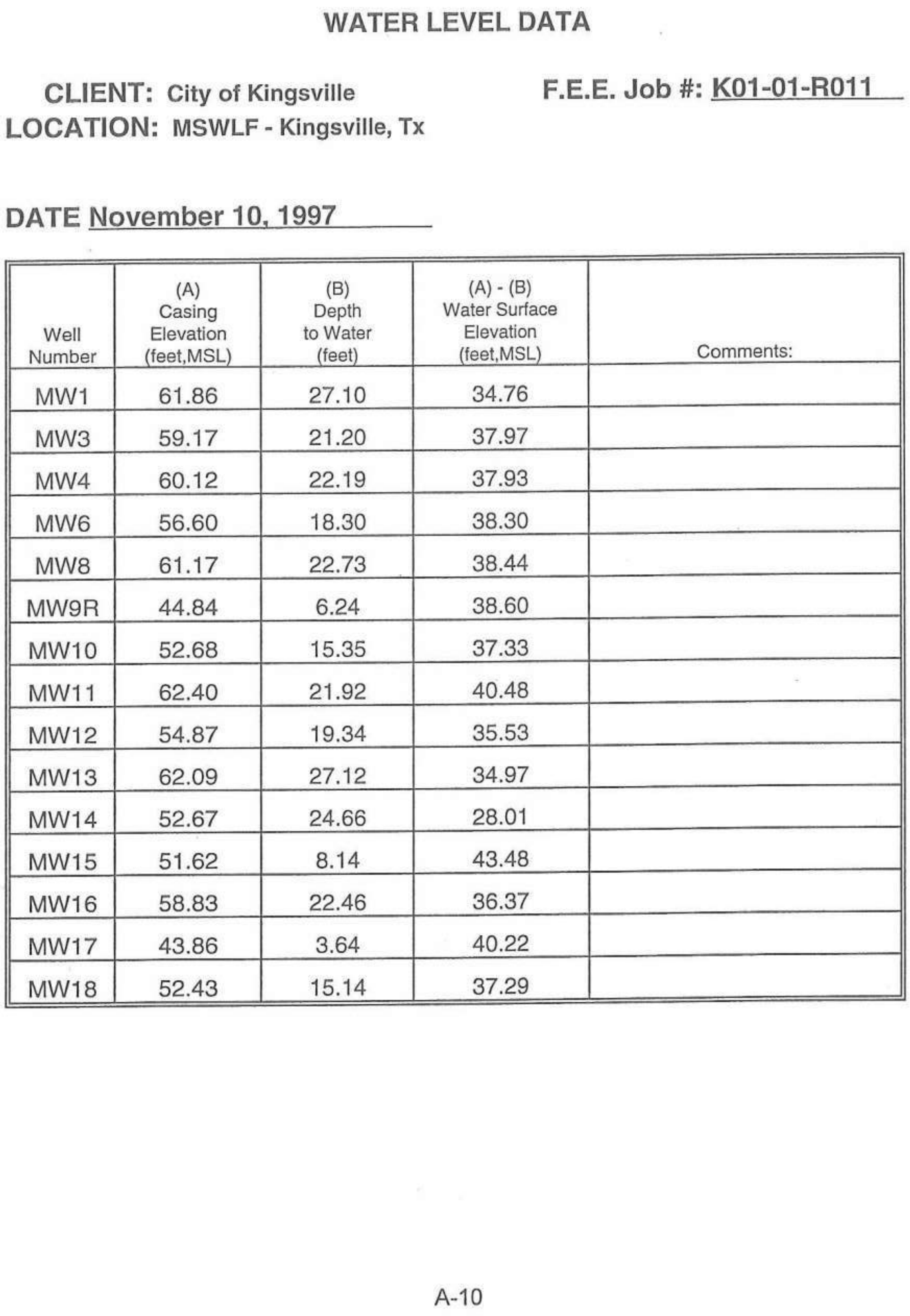
CLIENT: City of Kingsville

F.E.E. Job #:K01-01-R011

LOCATION: MSWLF - Kingsville, Tx

DATE: November 24, 1997

Well Number	(A) Casing Elevation (feet,MSL)	(B) Depth to Water (feet)	(A) - (B) Water Surface Elevation (feet,MSL)	Comments:
MW1	61.86	26.69	35.17	
MW3	59.17	20.60	38.57	
MW4	60.12	20.65	39.47	
MW6	56.60	18.23	38.37	
MW8	61.17	23.06	38.11	
MW9R	44.84	6.10	38.74	
MW10	52.68	15.01	37.67	
MW11	62.40	21.72	40.68	
MW12	54.87	18.65	36.22	
MW13	62.09	26.68	35.41	
MW14	52.67	24.25	28.42	
MW15	51.62	8.19	43.43	
MW16	58.83	21.94	36.89	
MW17	43.86	4.01	39.85	
MW18	52.43	14.62	37.81	



WATER LEVEL DATA

CLIENT: City of Kingsville
LOCATION: MSWLF - Kingsville, Tx

F.E.E. Job #: K01-01-R011

DATE November 10, 1997

Well Number	(A) Casing Elevation (feet,MSL)	(B) Depth to Water (feet)	(A) - (B) Water Surface Elevation (feet,MSL)	Comments:
MW1	61.86	27.10	34.76	
MW3	59.17	21.20	37.97	
MW4	60.12	22.19	37.93	
MW6	56.60	18.30	38.30	
MW8	61.17	22.73	38.44	
MW9R	44.84	6.24	38.60	
MW10	52.68	15.35	37.33	
MW11	62.40	21.92	40.48	
MW12	54.87	19.34	35.53	
MW13	62.09	27.12	34.97	
MW14	52.67	24.66	28.01	
MW15	51.62	8.14	43.48	
MW16	58.83	22.46	36.37	
MW17	43.86	3.64	40.22	
MW18	52.43	15.14	37.29	

WATER LEVEL DATA

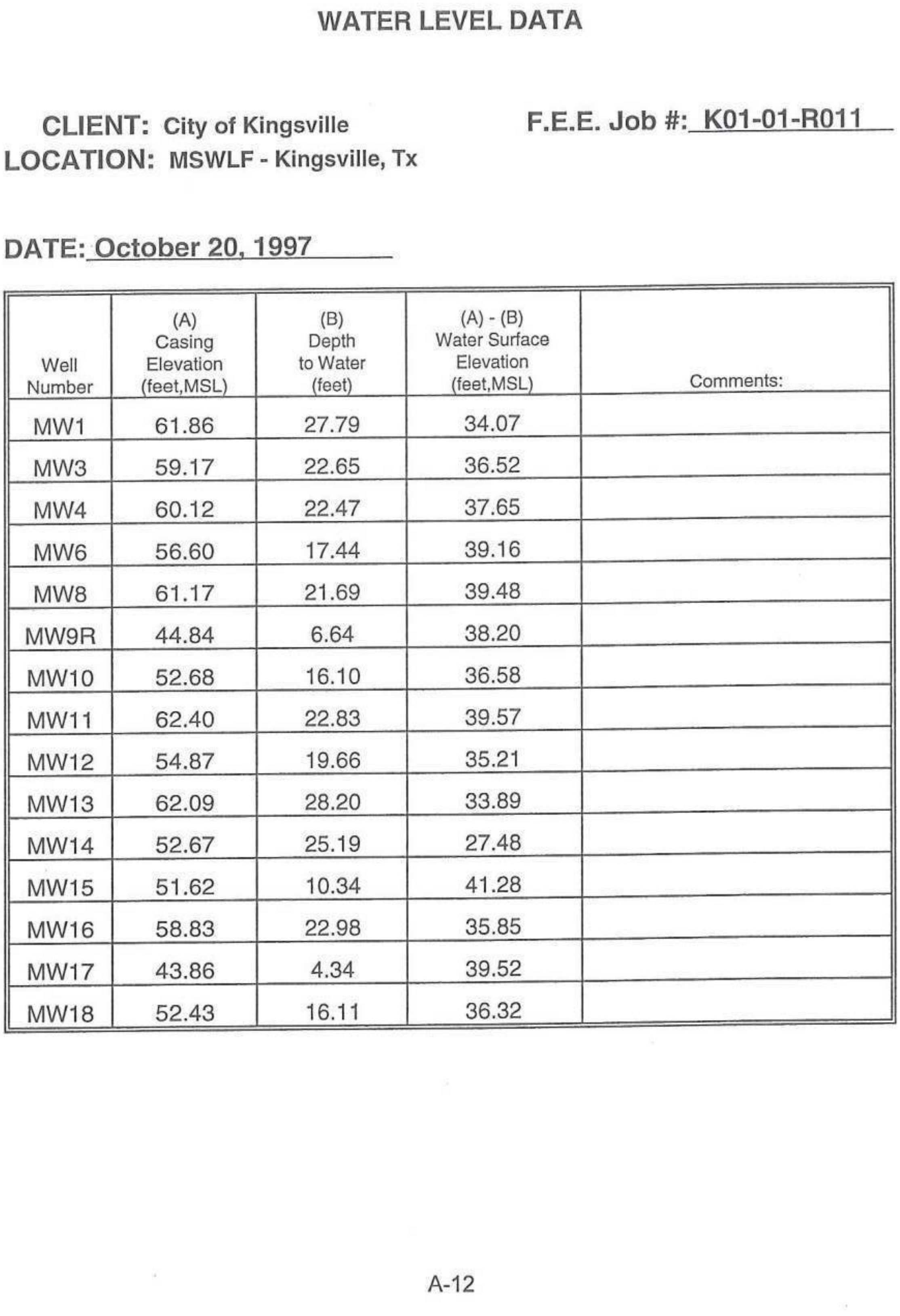
CLIENT: City of Kingsville

LOCATION: MSWLF - Kingsville, Tx

F.E.E. Job #: K01-01-R011

DATE: October 28, 1997

Well Number	(A) Casing Elevation (feet,MSL)	(B) Depth to Water (feet)	(A) - (B) Water Surface Elevation (feet,MSL)	Comments:
MW1	61.86	27.50	34.36	
MW3	59.17	21.89	37.28	
MW4	60.12	21.81	38.31	
MW6	56.60	17.59	39.01	
MW8	61.17	22.07	39.10	
MW9R	44.84	6.71	38.13	
MW10	52.68	15.58	37.10	
MW11	62.40	22.25	40.15	
MW12	54.87	19.61	35.26	
MW13	62.09	27.55	34.54	
MW14	52.67	25.08	27.59	
MW15	51.62	10.16	41.46	
MW16	58.83	22.75	36.08	
MW17	43.86	4.44	39.42	
MW18	52.43	15.80	36.63	



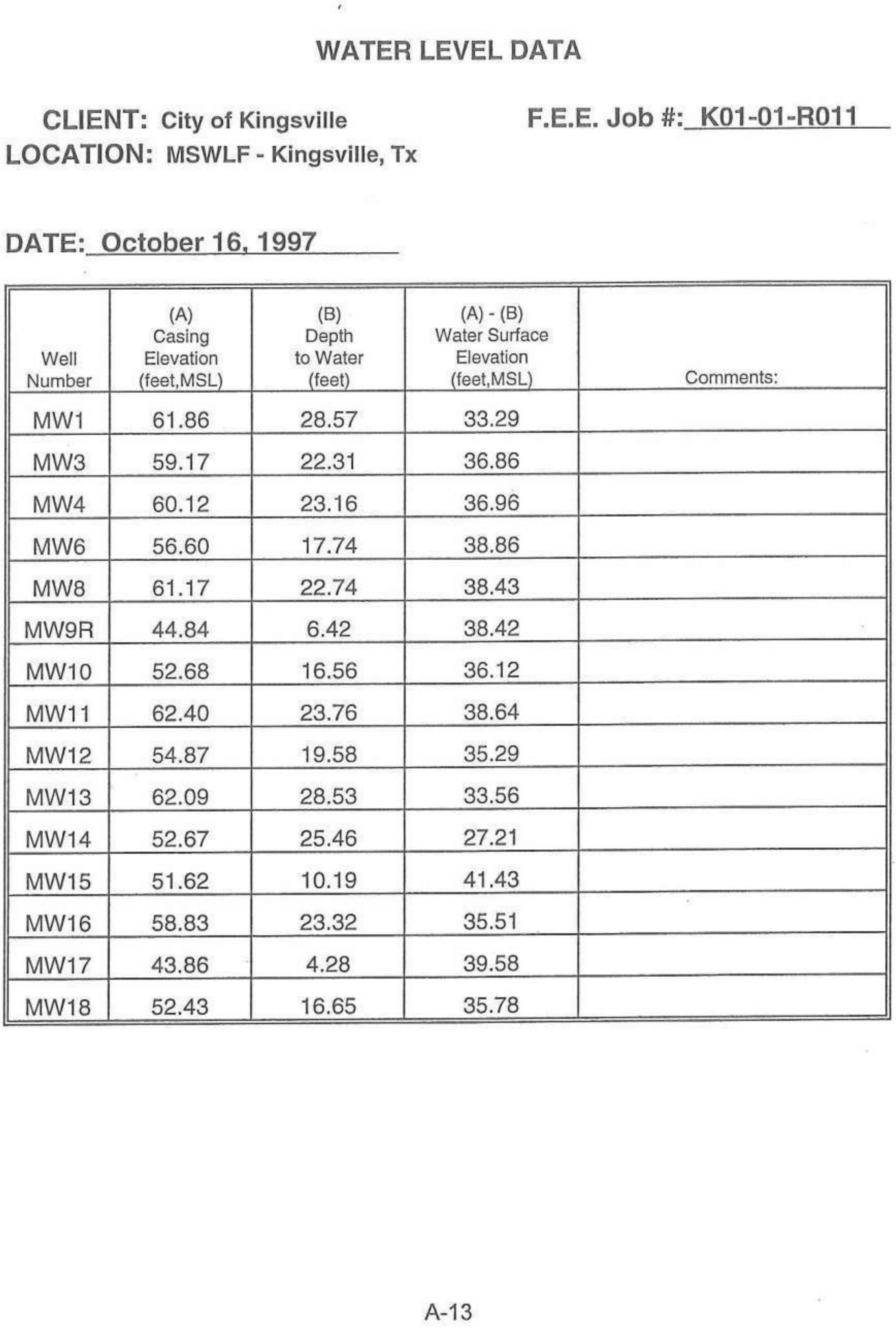
WATER LEVEL DATA

CLIENT: City of Kingsville
LOCATION: MSWLF - Kingsville, Tx

F.E.E. Job #: K01-01-R011

DATE: October 20, 1997

Well Number	(A) Casing Elevation (feet,MSL)	(B) Depth to Water (feet)	(A) - (B) Water Surface Elevation (feet,MSL)	Comments:
MW1	61.86	27.79	34.07	
MW3	59.17	22.65	36.52	
MW4	60.12	22.47	37.65	
MW6	56.60	17.44	39.16	
MW8	61.17	21.69	39.48	
MW9R	44.84	6.64	38.20	
MW10	52.68	16.10	36.58	
MW11	62.40	22.83	39.57	
MW12	54.87	19.66	35.21	
MW13	62.09	28.20	33.89	
MW14	52.67	25.19	27.48	
MW15	51.62	10.34	41.28	
MW16	58.83	22.98	35.85	
MW17	43.86	4.34	39.52	
MW18	52.43	16.11	36.32	

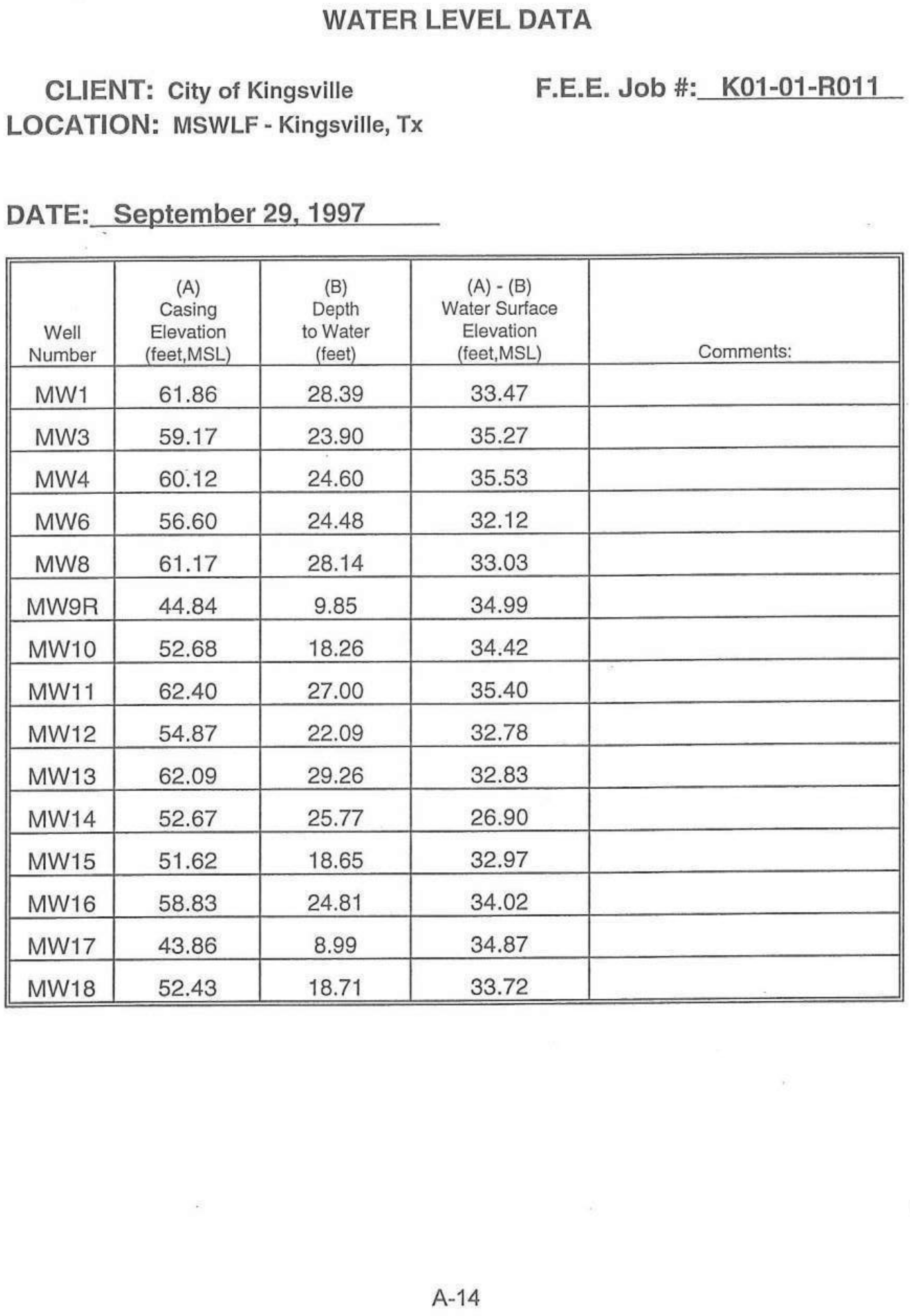


WATER LEVEL DATA

CLIENT: City of Kingsville **F.E.E. Job #:** K01-01-R011
LOCATION: MSWLF - Kingsville, Tx

DATE: October 16, 1997

Well Number	(A) Casing Elevation (feet,MSL)	(B) Depth to Water (feet)	(A) - (B) Water Surface Elevation (feet,MSL)	Comments:
MW1	61.86	28.57	33.29	
MW3	59.17	22.31	36.86	
MW4	60.12	23.16	36.96	
MW6	56.60	17.74	38.86	
MW8	61.17	22.74	38.43	
MW9R	44.84	6.42	38.42	
MW10	52.68	16.56	36.12	
MW11	62.40	23.76	38.64	
MW12	54.87	19.58	35.29	
MW13	62.09	28.53	33.56	
MW14	52.67	25.46	27.21	
MW15	51.62	10.19	41.43	
MW16	58.83	23.32	35.51	
MW17	43.86	4.28	39.58	
MW18	52.43	16.65	35.78	

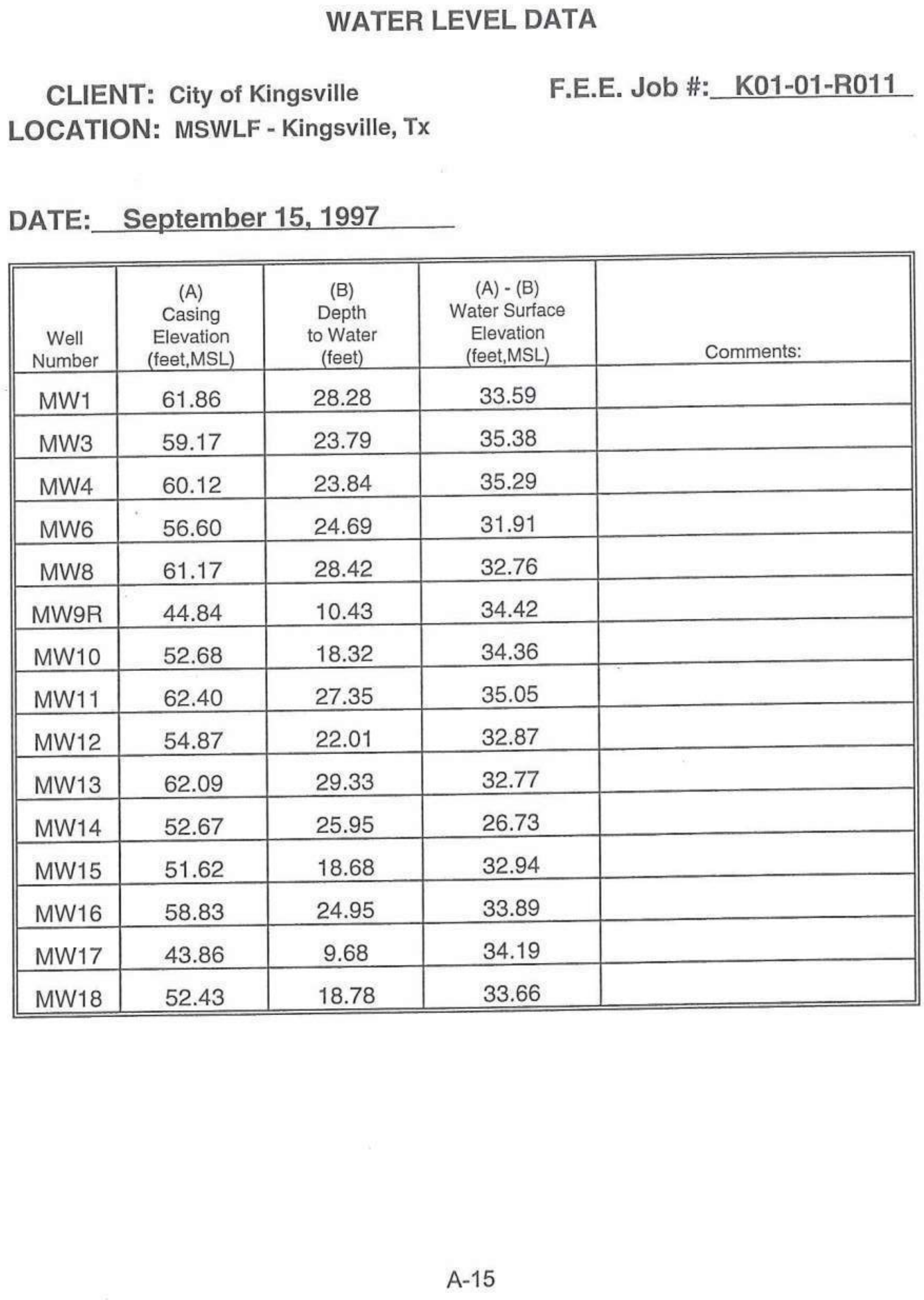


WATER LEVEL DATA

CLIENT: City of Kingsville **F.E.E. Job #:** K01-01-R011
LOCATION: MSWLF - Kingsville, Tx

DATE: September 29, 1997

Well Number	(A) Casing Elevation (feet,MSL)	(B) Depth to Water (feet)	(A) - (B) Water Surface Elevation (feet,MSL)	Comments:
MW1	61.86	28.39	33.47	
MW3	59.17	23.90	35.27	
MW4	60.12	24.60	35.53	
MW6	56.60	24.48	32.12	
MW8	61.17	28.14	33.03	
MW9R	44.84	9.85	34.99	
MW10	52.68	18.26	34.42	
MW11	62.40	27.00	35.40	
MW12	54.87	22.09	32.78	
MW13	62.09	29.26	32.83	
MW14	52.67	25.77	26.90	
MW15	51.62	18.65	32.97	
MW16	58.83	24.81	34.02	
MW17	43.86	8.99	34.87	
MW18	52.43	18.71	33.72	



WATER LEVEL DATA

CLIENT: City of Kingsville **F.E.E. Job #:** K01-01-R011
LOCATION: MSWLF - Kingsville, Tx

DATE: September 15, 1997

Well Number	(A) Casing Elevation (feet,MSL)	(B) Depth to Water (feet)	(A) - (B) Water Surface Elevation (feet,MSL)	Comments:
MW1	61.86	28.28	33.59	
MW3	59.17	23.79	35.38	
MW4	60.12	23.84	35.29	
MW6	56.60	24.69	31.91	
MW8	61.17	28.42	32.76	
MW9R	44.84	10.43	34.42	
MW10	52.68	18.32	34.36	
MW11	62.40	27.35	35.05	
MW12	54.87	22.01	32.87	
MW13	62.09	29.33	32.77	
MW14	52.67	25.95	26.73	
MW15	51.62	18.68	32.94	
MW16	58.83	24.95	33.89	
MW17	43.86	9.68	34.19	
MW18	52.43	18.78	33.66	

WATER LEVEL DATA

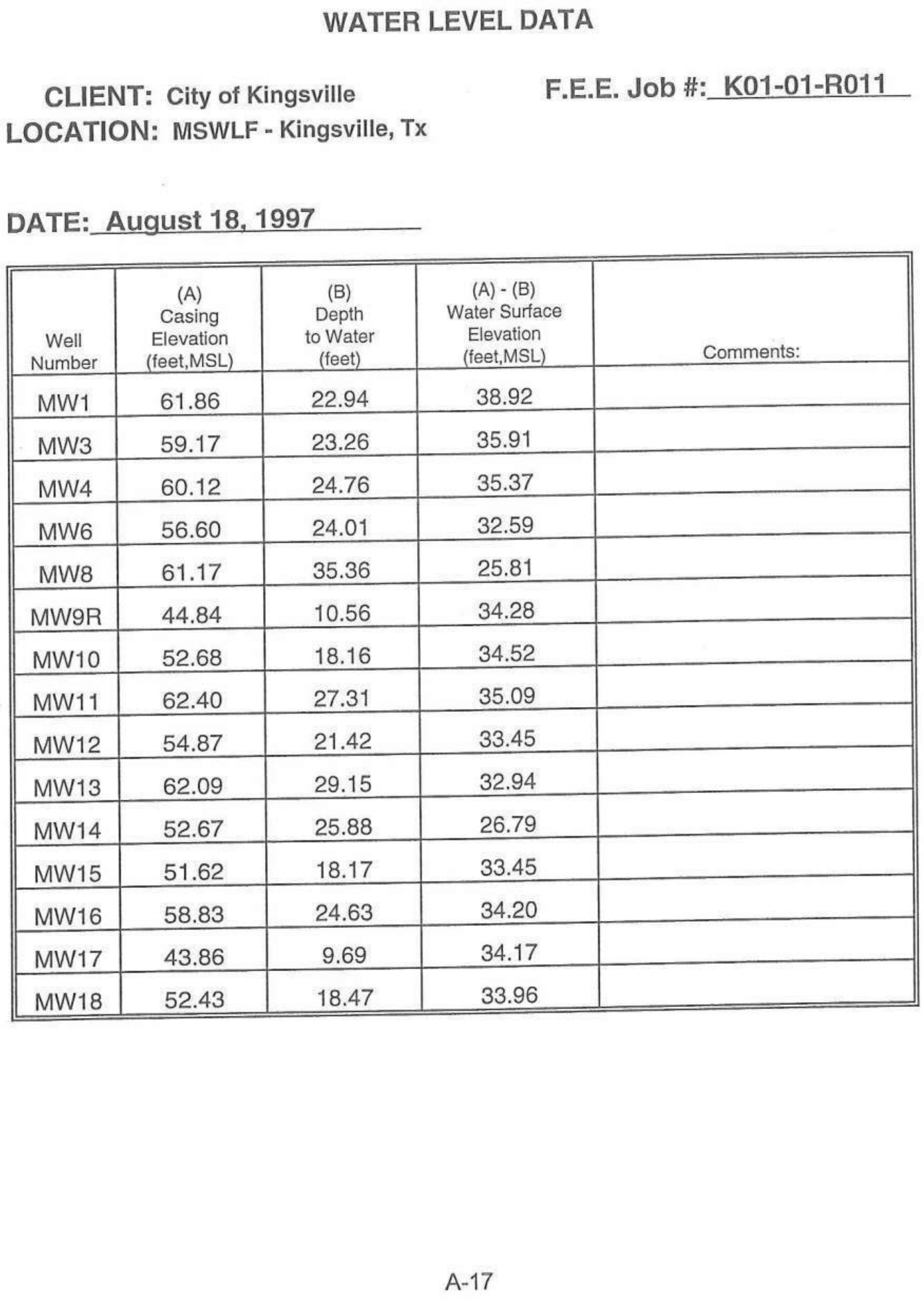
CLIENT: City of Kingsville

F.E.E. Job #: K01-01-R011

LOCATION: MSWLF - Kingsville, Tx

DATE: September 2, 1997

Well Number	(A) Casing Elevation (feet,MSL)	(B) Depth to Water (feet)	(A) - (B) Water Surface Elevation (feet,MSL)	Comments:
MW1	61.86	35.64	26.22	
MW3	59.17	23.63	35.54	
MW4	60.12	25.04	35.09	
MW6	56.60	24.53	32.07	
MW8	61.17	35.76	25.41	
MW9R	44.84	10.45	34.39	
MW10	52.68	18.31	34.37	
MW11	62.40	27.45	34.95	
MW12	54.87	21.82	33.05	
MW13	62.09	29.16	32.93	
MW14	52.67	26.05	26.62	
MW15	51.62	18.47	33.15	
MW16	58.83	24.94	33.89	
MW17	43.86	9.92	33.94	
MW18	52.43	18.92	33.51	



WATER LEVEL DATA

CLIENT: City of Kingsville
LOCATION: MSWLF - Kingsville, Tx

F.E.E. Job #: K01-01-R011

DATE: August 18, 1997

Well Number	(A) Casing Elevation (feet,MSL)	(B) Depth to Water (feet)	(A) - (B) Water Surface Elevation (feet,MSL)	Comments:
MW1	61.86	22.94	38.92	
MW3	59.17	23.26	35.91	
MW4	60.12	24.76	35.37	
MW6	56.60	24.01	32.59	
MW8	61.17	35.36	25.81	
MW9R	44.84	10.56	34.28	
MW10	52.68	18.16	34.52	
MW11	62.40	27.31	35.09	
MW12	54.87	21.42	33.45	
MW13	62.09	29.15	32.94	
MW14	52.67	25.88	26.79	
MW15	51.62	18.17	33.45	
MW16	58.83	24.63	34.20	
MW17	43.86	9.69	34.17	
MW18	52.43	18.47	33.96	

WATER LEVEL DATA

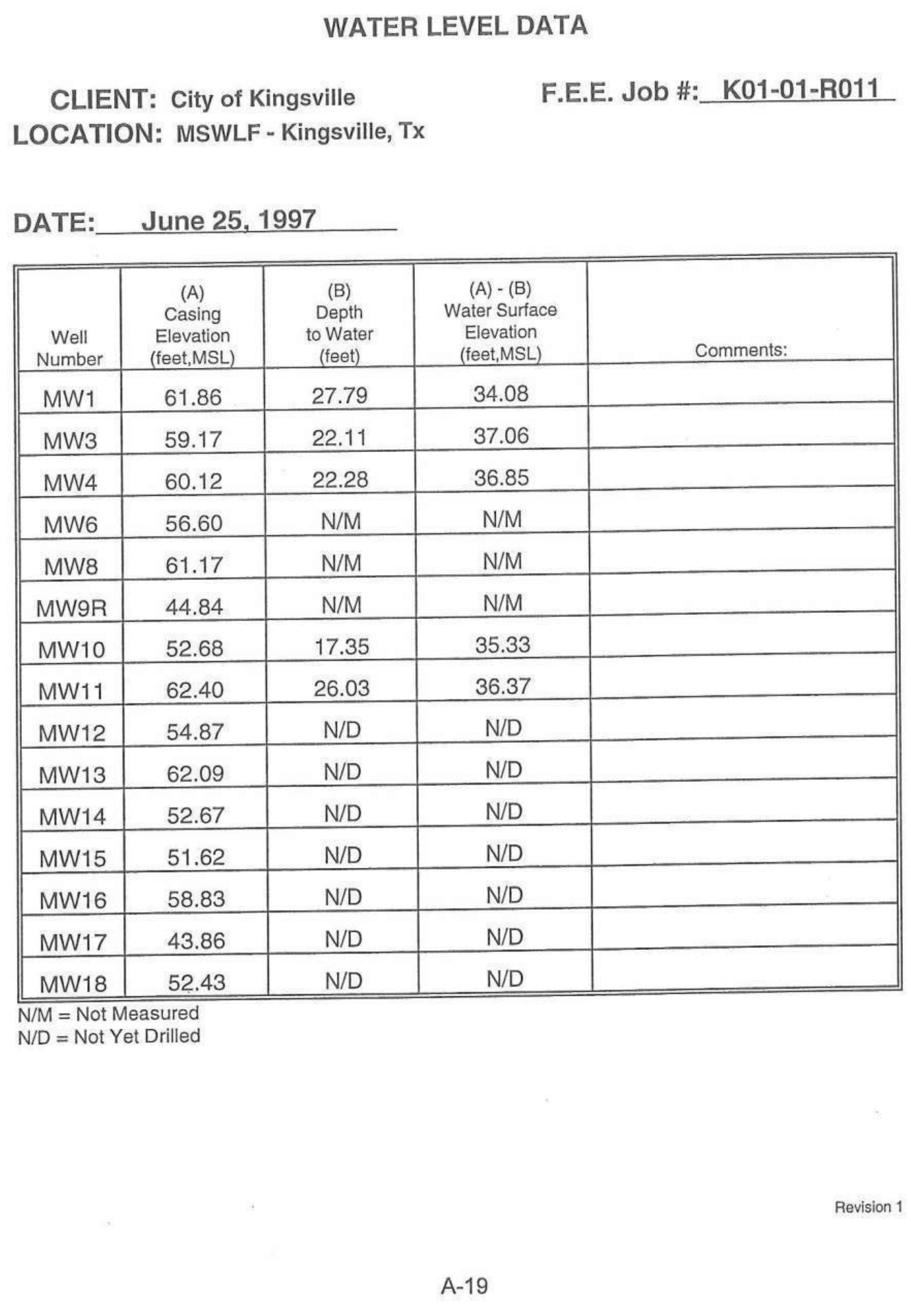
CLIENT: City of Kingsville

F.E.E. Job #: K01-01-R011

LOCATION: MSWLF - Kingsville, Tx

DATE: August 4, 1997

Well Number	(A) Casing Elevation (feet,MSL)	(B) Depth to Water (feet)	(A) - (B) Water Surface Elevation (feet,MSL)	Comments:
MW1	61.86	27.67	34.19	
MW3	59.17	22.83	36.34	
MW4	60.12	24.24	35.89	
MW6	56.60	23.31	33.29	
MW8	61.17	27.37	33.80	
MW9R	44.84	10.49	34.35	
MW10	52.68	18.16	34.52	
MW11	62.40	27.10	35.30	
MW12	54.87	20.97	33.90	
MW13	62.09	28.86	33.23	
MW14	52.67	25.65	27.02	
MW15	51.62	17.47	34.15	
MW16	58.83	24.21	34.62	
MW17	43.86	9.33	34.53	
MW18	52.43	18.61	33.82	



WATER LEVEL DATA

CLIENT: City of Kingsville
LOCATION: MSWLF - Kingsville, Tx

F.E.E. Job #: K01-01-R011

DATE: June 25, 1997

Well Number	(A) Casing Elevation (feet,MSL)	(B) Depth to Water (feet)	(A) - (B) Water Surface Elevation (feet,MSL)	Comments:
MW1	61.86	27.79	34.08	
MW3	59.17	22.11	37.06	
MW4	60.12	22.28	36.85	
MW6	56.60	N/M	N/M	
MW8	61.17	N/M	N/M	
MW9R	44.84	N/M	N/M	
MW10	52.68	17.35	35.33	
MW11	62.40	26.03	36.37	
MW12	54.87	N/D	N/D	
MW13	62.09	N/D	N/D	
MW14	52.67	N/D	N/D	
MW15	51.62	N/D	N/D	
MW16	58.83	N/D	N/D	
MW17	43.86	N/D	N/D	
MW18	52.43	N/D	N/D	

N/M = Not Measured
N/D = Not Yet Drilled

Revision 1

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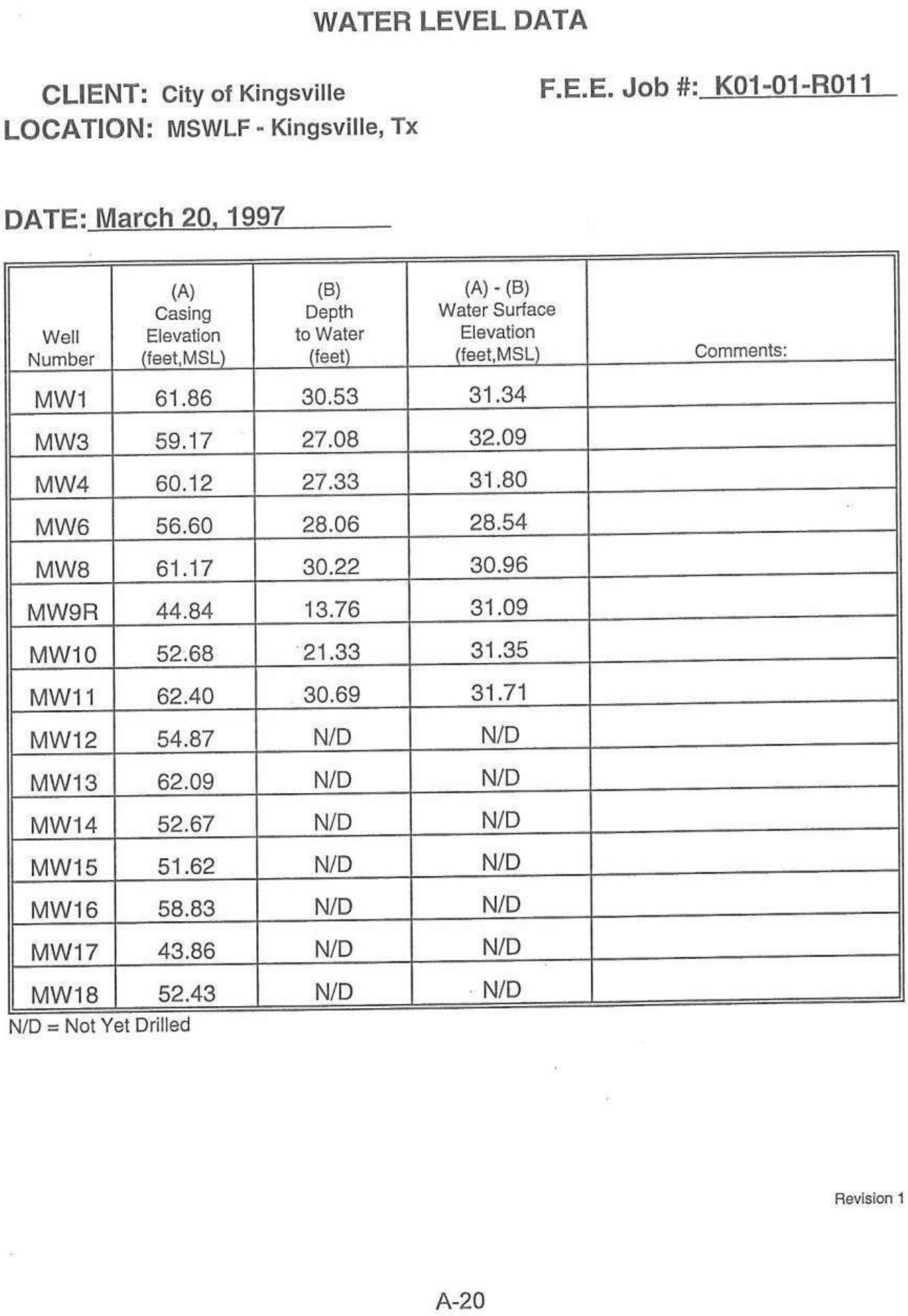


WATER LEVEL DATA

CLIENT: City of Kingsville

LOCATION: MSWLF - Kingsville, Tx

F.E.E. Job #: K01-01-R011

DATE: March 20, 1997

Well Number	(A) Casing Elevation (feet,MSL)	(B) Depth to Water (feet)	(A) - (B) Water Surface Elevation (feet,MSL)	Comments:
MW1	61.86	30.53	31.34	
MW3	59.17	27.08	32.09	
MW4	60.12	27.33	31.80	
MW6	56.60	28.06	28.54	
MW8	61.17	30.22	30.96	
MW9R	44.84	13.76	31.09	
MW10	52.68	21.33	31.35	
MW11	62.40	30.69	31.71	
MW12	54.87	N/D	N/D	
MW13	62.09	N/D	N/D	
MW14	52.67	N/D	N/D	
MW15	51.62	N/D	N/D	
MW16	58.83	N/D	N/D	
MW17	43.86	N/D	N/D	
MW18	52.43	N/D	N/D	

N/D = Not Yet Drilled

Revision 1

WATER LEVEL DATA

CLIENT: City of Kingsville
LOCATION: MSWLF - Kingsville, Tx

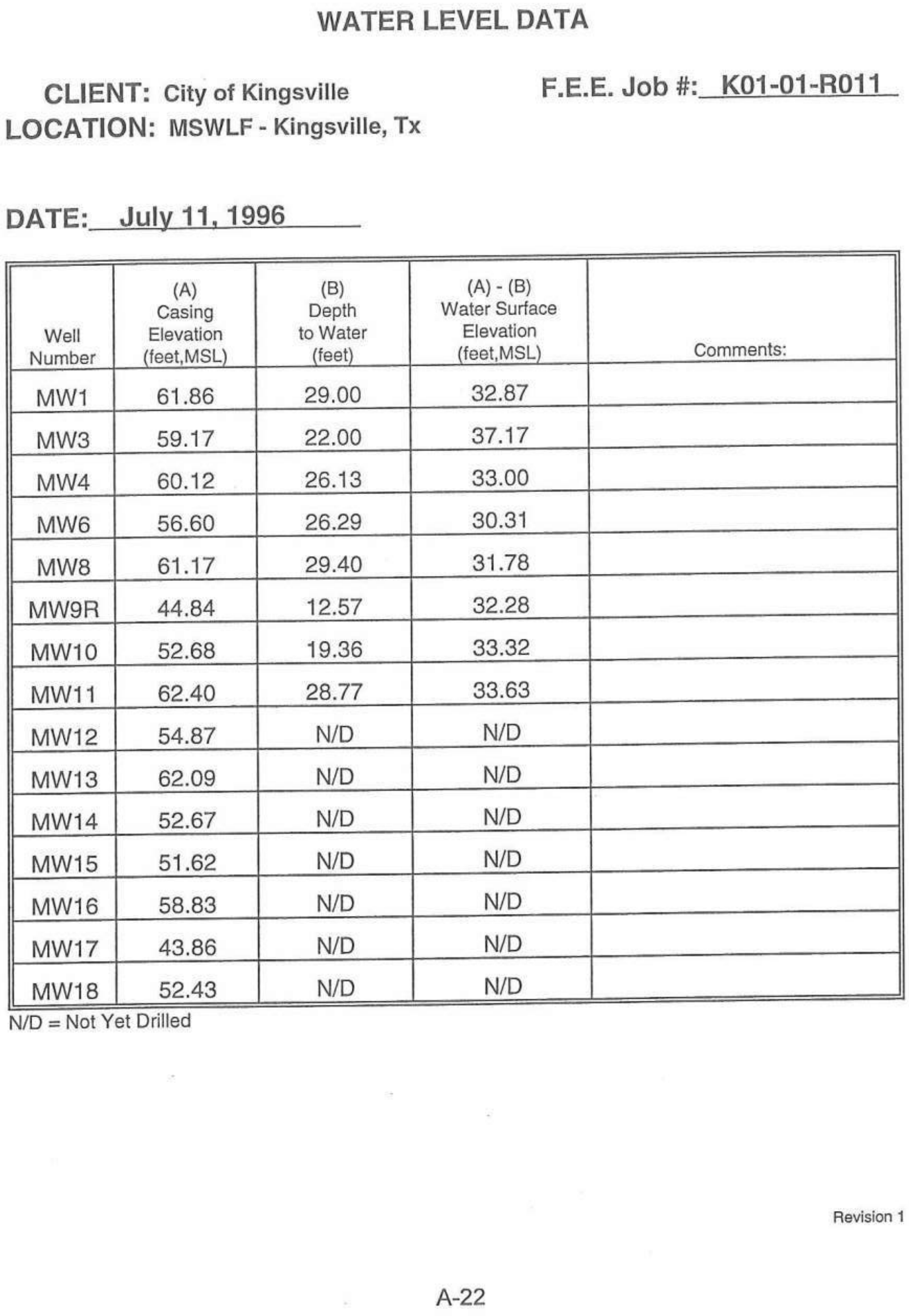
F.E.E. Job #: K01-01-R011

DATE: December 23, 1996

Well Number	(A) Casing Elevation (feet,MSL)	(B) Depth to Water (feet)	(A) - (B) Water Surface Elevation (feet,MSL)	Comments:
MW1	61.86	29.85	32.02	
MW3	59.17	26.03	33.14	
MW4	60.12	26.32	32.81	
MW6	56.60	28.19	28.41	
MW8	61.17	30.38	30.80	
MW9R	44.84	14.02	30.83	
MW10	52.68	20.91	31.77	
MW11	62.40	30.20	32.20	
MW12	54.87	N/D	N/D	
MW13	62.09	N/D	N/D	
MW14	52.67	N/D	N/D	
MW15	51.62	N/D	N/D	
MW16	58.83	N/D	N/D	
MW17	43.86	N/D	N/D	
MW18	52.43	N/D	N/D	

N/D = Not Yet Drilled

Revision 1



WATER LEVEL DATA

CLIENT: City of Kingsville
LOCATION: MSWLF - Kingsville, Tx

F.E.E. Job #: K01-01-R011

DATE: July 11, 1996

Well Number	(A) Casing Elevation (feet,MSL)	(B) Depth to Water (feet)	(A) - (B) Water Surface Elevation (feet,MSL)	Comments:
MW1	61.86	29.00	32.87	
MW3	59.17	22.00	37.17	
MW4	60.12	26.13	33.00	
MW6	56.60	26.29	30.31	
MW8	61.17	29.40	31.78	
MW9R	44.84	12.57	32.28	
MW10	52.68	19.36	33.32	
MW11	62.40	28.77	33.63	
MW12	54.87	N/D	N/D	
MW13	62.09	N/D	N/D	
MW14	52.67	N/D	N/D	
MW15	51.62	N/D	N/D	
MW16	58.83	N/D	N/D	
MW17	43.86	N/D	N/D	
MW18	52.43	N/D	N/D	

N/D = Not Yet Drilled

Revision 1

WATER LEVEL DATA

CLIENT: City of Kingsville **F.E.E. Job #:** K01-01-R011

LOCATION: MSWLF - Kingsville, Tx

DATE: May 10, 1995 (K/P)

Well Number	(A) Casing Elevation (feet,MSL)	(B) Depth to Water (feet)	(A) - (B) Water Surface Elevation (feet,MSL)	Comments:
MW1	61.86	29.02	32.85	
MW3	59.17	22.98	36.19	
MW4	60.12	25.02	34.11	
MW6	56.60	N/M	N/M	
MW8	61.17	28.46	32.72	
MW9R	44.84	N/D	N/D	
MW10	52.68	N/D	N/D	
MW11	62.40	N/D	N/D	
MW12	54.87	N/D	N/D	
MW13	62.09	N/D	N/D	
MW14	52.67	N/D	N/D	
MW15	51.62	N/D	N/D	
MW16	58.83	N/D	N/D	
MW17	43.86	N/D	N/D	
MW18	52.43	N/D	N/D	

K/P = Measured by City of Kingsville using a "Plopper".
N/M = Not Measured
N/D = Not Yet Drilled

Revision 1

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WATER LEVEL DATA

CLIENT: City of Kingsville

LOCATION: MSWLF - Kingsville, Tx

F.E.E. Job #: K01-01-R011

DATE: March 14, 1994 (K/P)

Well Number	(A) Casing Elevation (feet,MSL)	(B) Depth to Water (feet)	(A) - (B) Water Surface Elevation (feet,MSL)	Comments:
MW1	61.86	31.40	30.47	
MW3	59.17	26.00	33.17	
MW4	60.12	28.00	31.13	
MW6	56.60	25.25	31.35	
MW8	61.17	28.10	33.08	
MW9R	44.84	N/D	N/D	
MW10	52.68	N/D	N/D	
MW11	62.40	N/D	N/D	
MW12	54.87	N/D	N/D	
MW13	62.09	N/D	N/D	
MW14	52.67	N/D	N/D	
MW15	51.62	N/D	N/D	
MW16	58.83	N/D	N/D	
MW17	43.86	N/D	N/D	
MW18	52.43	N/D	N/D	

K/P = Measured by City of Kingsville using a "Plopper".
N/D = Not Yet Drilled

Revision 1

WATER LEVEL DATA

CLIENT: City of Kingsville **F.E.E. Job #:** K01-01-R011
LOCATION: MSWLF - Kingsville, Tx

DATE: April 5, 1993

Well Number	(A) Casing Elevation (feet,MSL)	(B) Depth to Water (feet)	(A) - (B) Water Surface Elevation (feet,MSL)	Comments:
MW1	61.86	28.61	33.25	
MW3	59.17	27.02	32.15	
MW4	60.12	30.11	30.01	
MW6	56.6	27.11	29.49	
MW8	61.17	29.17	32.00	
MW9R	44.84	N/D	N/D	
MW10	52.68	17.76	34.92	
MW11	62.40	N/D	N/D	
MW12	54.87	N/D	N/D	
MW13	62.09	N/D	N/D	
MW14	52.67	N/D	N/D	
MW15	51.62	N/D	N/D	
MW16	58.83	N/D	N/D	
MW17	43.86	N/D	N/D	
MW18	52.43	N/D	N/D	

N/D = Not Yet Drilled

Revision 1

WATER LEVEL DATA

CLIENT: City of Kingsville

F.E.E. Job #: K01-01-R011

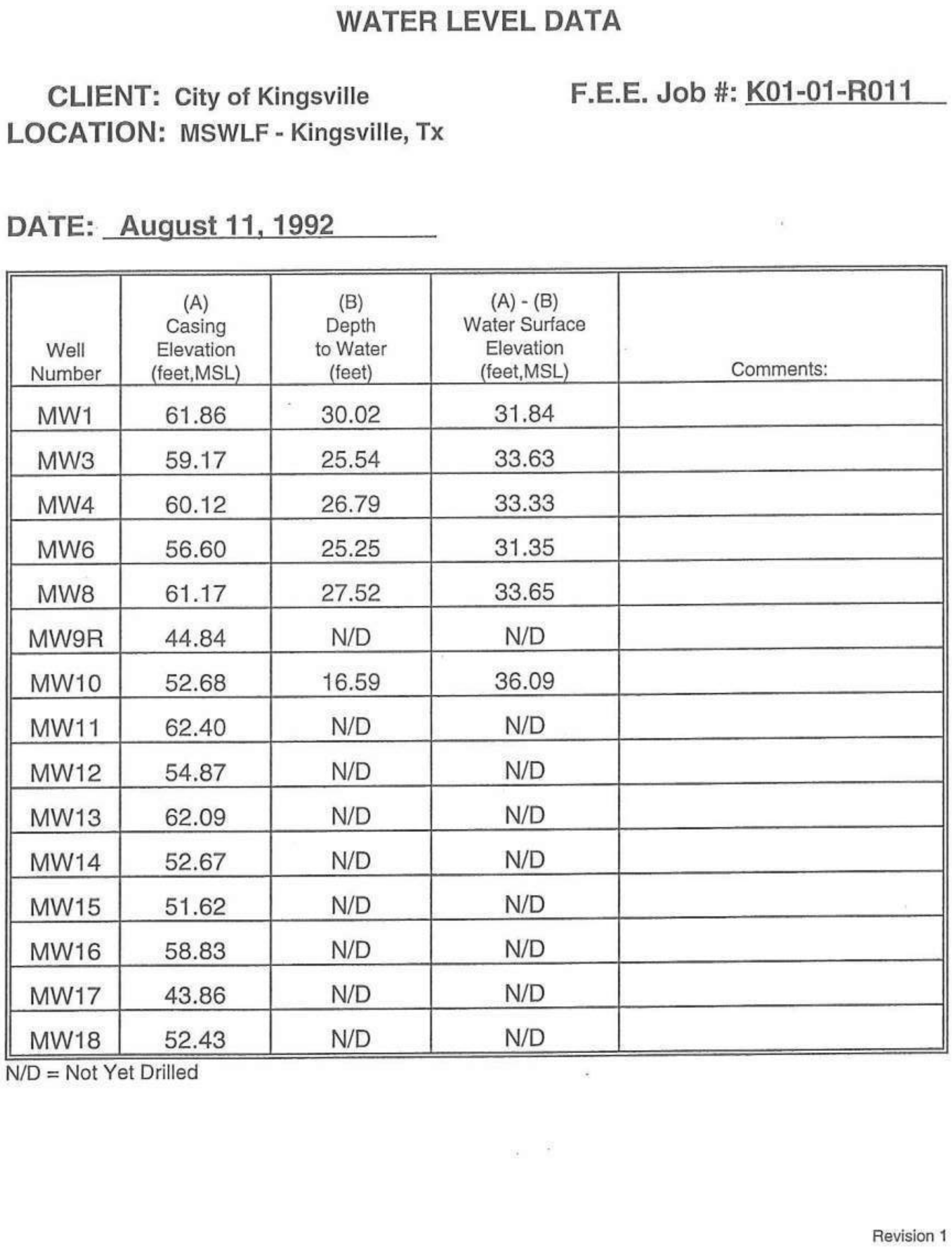
LOCATION: MSWLF - Kingsville, Tx

DATE: September 28, 1992

Well Number	(A) Casing Elevation (feet,MSL)	(B) Depth to Water (feet)	(A) - (B) Water Surface Elevation (feet,MSL)	Comments:
MW1	61.86	30.6	31.26	
MW3	59.17	25.7	33.47	
MW4	60.12	30.4	29.72	
MW6	56.60	27.0	29.60	
MW8	61.17	28.3	32.87	
MW9R	44.84	N/D	N/D	
MW10	52.68	18.9	33.78	
MW11	62.40	N/D	N/D	
MW12	54.87	N/D	N/D	
MW13	62.09	N/D	N/D	
MW14	52.67	N/D	N/D	
MW15	51.62	N/D	N/D	
MW16	58.83	N/D	N/D	
MW17	43.86	N/D	N/D	
MW18	52.43	N/D	N/D	

N/D = Not Yet Drilled

Revision 1



WATER LEVEL DATA

CLIENT: City of Kingsville
LOCATION: MSWLF - Kingsville, Tx

F.E.E. Job #: K01-01-R011

DATE: August 11, 1992

Well Number	(A) Casing Elevation (feet,MSL)	(B) Depth to Water (feet)	(A) - (B) Water Surface Elevation (feet,MSL)	Comments:
MW1	61.86	30.02	31.84	
MW3	59.17	25.54	33.63	
MW4	60.12	26.79	33.33	
MW6	56.60	25.25	31.35	
MW8	61.17	27.52	33.65	
MW9R	44.84	N/D	N/D	
MW10	52.68	16.59	36.09	
MW11	62.40	N/D	N/D	
MW12	54.87	N/D	N/D	
MW13	62.09	N/D	N/D	
MW14	52.67	N/D	N/D	
MW15	51.62	N/D	N/D	
MW16	58.83	N/D	N/D	
MW17	43.86	N/D	N/D	
MW18	52.43	N/D	N/D	

N/D = Not Yet Drilled

Revision 1

WATER LEVEL DATA

CLIENT: City of Kingsville
LOCATION: MSWLF - Kingsville, Tx

F.E.E. Job #: K01-01-R011

DATE: April 14, 1992

Well Number	(A) Casing Elevation (feet,MSL)	(B) Depth to Water (feet)	(A) - (B) Water Surface Elevation (feet,MSL)	Comments:
MW1	61.86	36.88	24.98	
MW3	59.17	26.75	32.42	
MW4	60.12	27.39	32.73	
MW6	56.60	21.92	34.68	
MW8	61.17	26.77	34.40	
MW9R	44.84	N/D	N/D	
MW10	52.68	18.49	34.19	
MW11	62.40	N/D	N/D	
MW12	54.87	N/D	N/D	
MW13	62.09	N/D	N/D	
MW14	52.67	N/D	N/D	
MW15	51.62	N/D	N/D	
MW16	58.83	N/D	N/D	
MW17	43.86	N/D	N/D	
MW18	52.43	N/D	N/D	

N/D = Not Yet Drilled

Revision 1

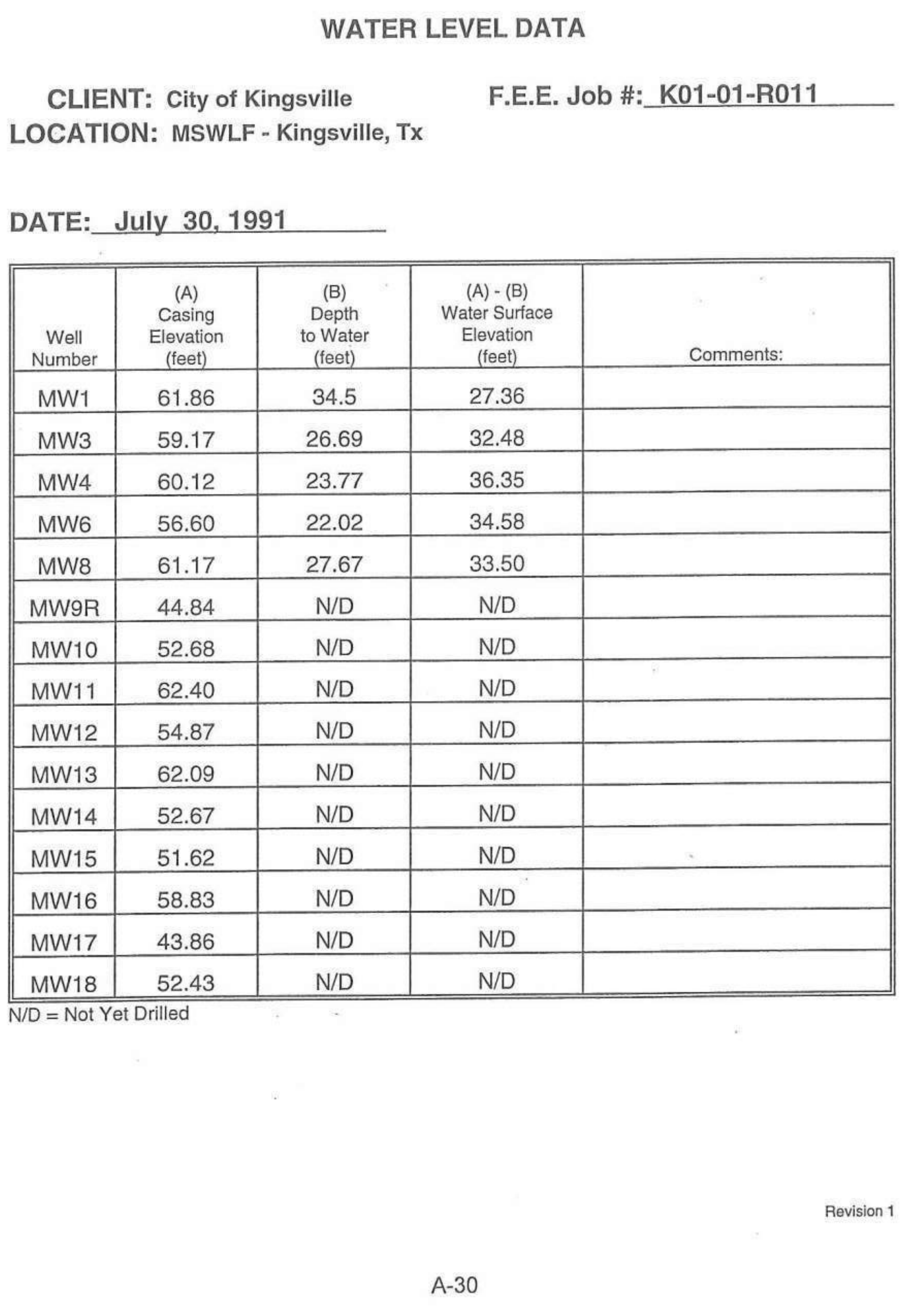
WATER LEVEL DATA

CLIENT: City of Kingsville **F.E.E. Job #:** K01-01-R011
LOCATION: MSWLF - Kingsville, Tx

DATE: August 8, 1991

Well Number	(A) Casing Elevation (feet)	(B) Depth to Water (feet,MSL)	(A) - (B) Water Surface Elevation (feet,MSL)	Comments:
MW1	61.86	34.69	27.17	
MW3	59.17	26.86	32.31	
MW4	60.12	24.56	35.56	
MW6	56.60	21.44	35.16	
MW8	61.17	27.5	33.67	
MW9R	44.84	N/D	N/D	
MW10	52.68	N/D	N/D	
MW11	62.40	N/D	N/D	
MW12	54.87	N/D	N/D	
MW13	62.09	N/D	N/D	
MW14	52.67	N/D	N/D	
MW15	51.62	N/D	N/D	
MW16	58.83	N/D	N/D	
MW17	43.86	N/D	N/D	
MW18	52.43	N/D	N/D	

N/D = Not Yet Drilled



WATER LEVEL DATA

CLIENT: City of Kingsville

LOCATION: MSWLF - Kingsville, Tx

F.E.E. Job #: K01-01-R011

DATE: July 30, 1991

Well Number	(A) Casing Elevation (feet)	(B) Depth to Water (feet)	(A) - (B) Water Surface Elevation (feet)	Comments:
MW1	61.86	34.5	27.36	
MW3	59.17	26.69	32.48	
MW4	60.12	23.77	36.35	
MW6	56.60	22.02	34.58	
MW8	61.17	27.67	33.50	
MW9R	44.84	N/D	N/D	
MW10	52.68	N/D	N/D	
MW11	62.40	N/D	N/D	
MW12	54.87	N/D	N/D	
MW13	62.09	N/D	N/D	
MW14	52.67	N/D	N/D	
MW15	51.62	N/D	N/D	
MW16	58.83	N/D	N/D	
MW17	43.86	N/D	N/D	
MW18	52.43	N/D	N/D	

N/D = Not Yet Drilled

Revision 1

A-30

WATER LEVEL DATA

CLIENT: City of Kingsville

F.E.E. Job #: K01-01-R011

LOCATION: MSWLF - Kingsville, Tx

DATE: March 29, 1991

Well Number	(A) Casing Elevation (feet)	(B) Depth to Water (feet)	(A) - (B) Water Surface Elevation (feet)	Comments:
MW1	61.86	35.6	26.26	
MW3	59.17	25.59	33.58	
MW4	60.12	23.98	36.14	
MW6	56.60	21.35	35.25	
MW8	61.17	N/D	N/D	
MW9R	44.84	N/D	N/D	
MW10	52.68	N/D	N/D	
MW11	62.40	N/D	N/D	
MW12	54.87	N/D	N/D	
MW13	62.09	N/D	N/D	
MW14	52.67	N/D	N/D	
MW15	51.62	N/D	N/D	
MW16	58.83	N/D	N/D	
MW17	43.86	N/D	N/D	
MW18	52.43	N/D	N/D	

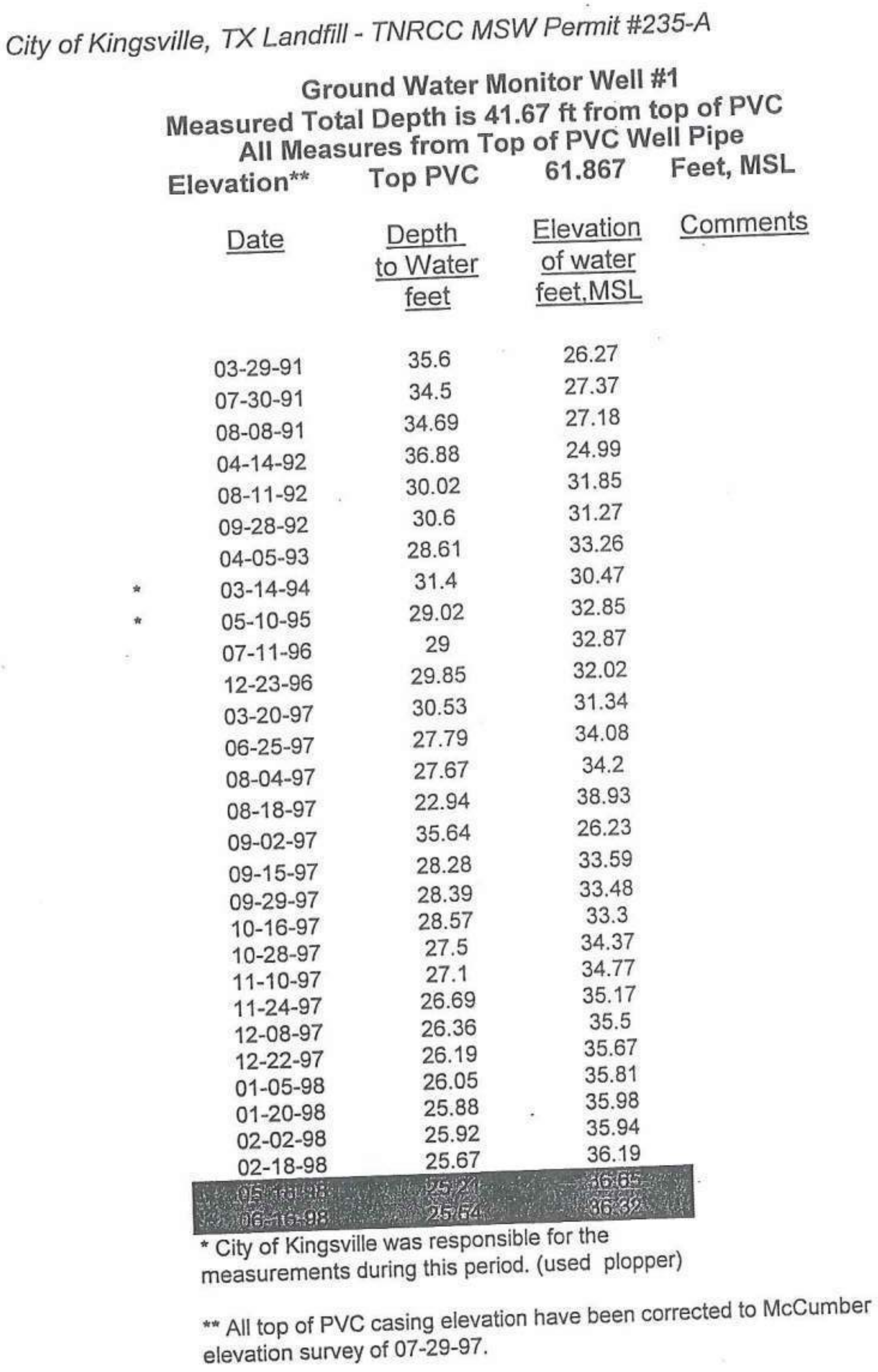
Revision 1

APPENDIX B

APPENDIX B

Depth to Water Measurement Data by Well No.

November 1997
Revision 1 - June 1998



City of Kingsville, TX Landfill - TNRCC MSW Permit #235-A

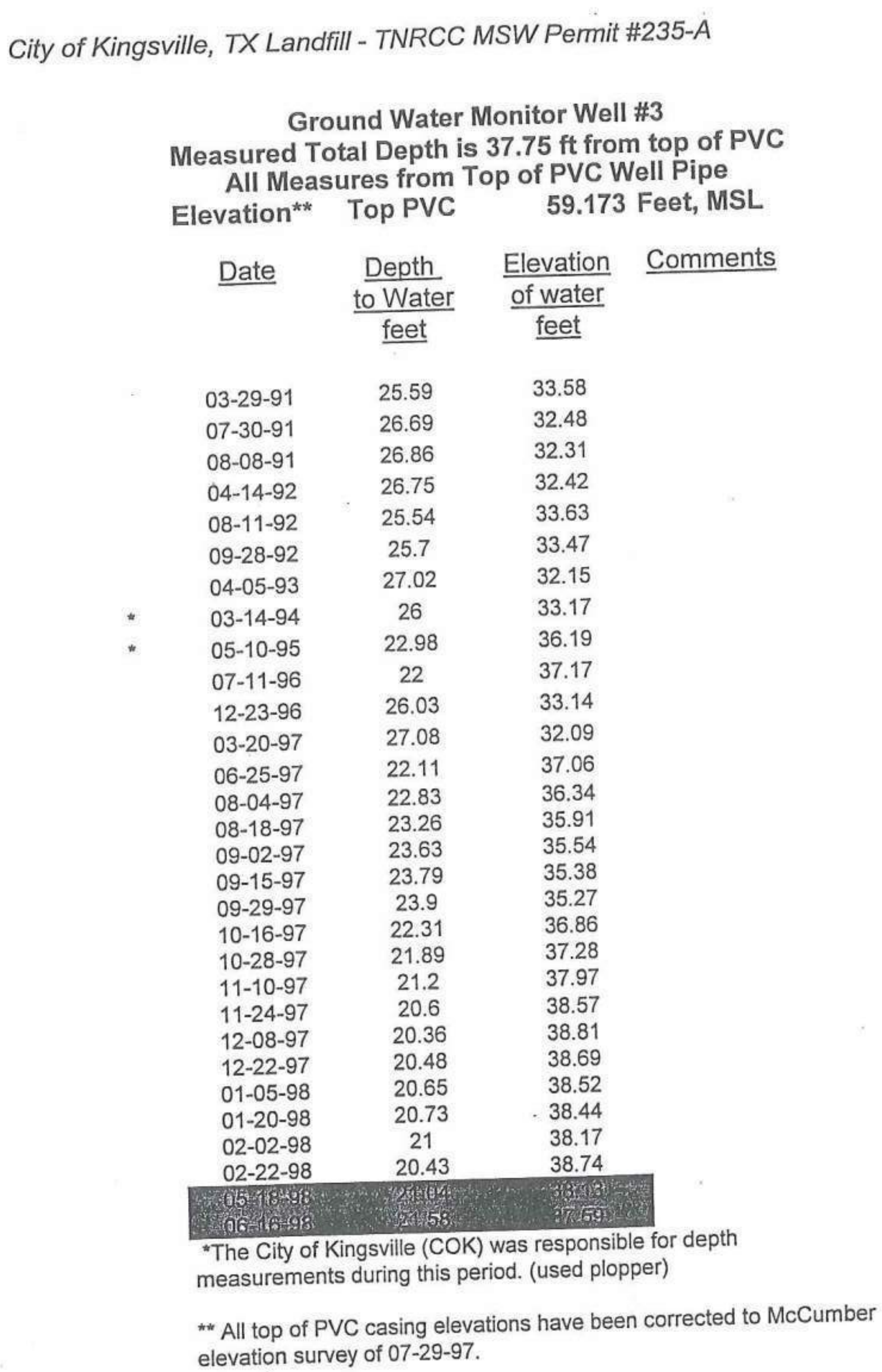
Ground Water Monitor Well #1
Measured Total Depth is 41.67 ft from top of PVC
All Measures from Top of PVC Well Pipe
Elevation Top PVC 61.867 Feet, MSL**

Date	Depth to Water feet	Elevation of water feet,MSL	Comments
03-29-91	35.6	26.27	
07-30-91	34.5	27.37	
08-08-91	34.69	27.18	
04-14-92	36.88	24.99	
08-11-92	30.02	31.85	
09-28-92	30.6	31.27	
04-05-93	28.61	33.26	
* 03-14-94	31.4	30.47	
* 05-10-95	29.02	32.85	
07-11-96	29	32.87	
12-23-96	29.85	32.02	
03-20-97	30.53	31.34	
06-25-97	27.79	34.08	
08-04-97	27.67	34.2	
08-18-97	22.94	38.93	
09-02-97	35.64	26.23	
09-15-97	28.28	33.59	
09-29-97	28.39	33.48	
10-16-97	28.57	33.3	
10-28-97	27.5	34.37	
11-10-97	27.1	34.77	
11-24-97	26.69	35.17	
12-08-97	26.36	35.5	
12-22-97	26.19	35.67	
01-05-98	26.05	35.81	
01-20-98	25.88	35.98	
02-02-98	25.92	35.94	
02-18-98	25.67	36.19	
05-[illegible]-98	25.21	36.65	
06-16-98	25.54	36.32	

* City of Kingsville was responsible for the measurements during this period. (used plopper)

** All top of PVC casing elevation have been corrected to McCumber elevation survey of 07-29-97.

B-1



City of Kingsville, TX Landfill - TNRCC MSW Permit #235-A

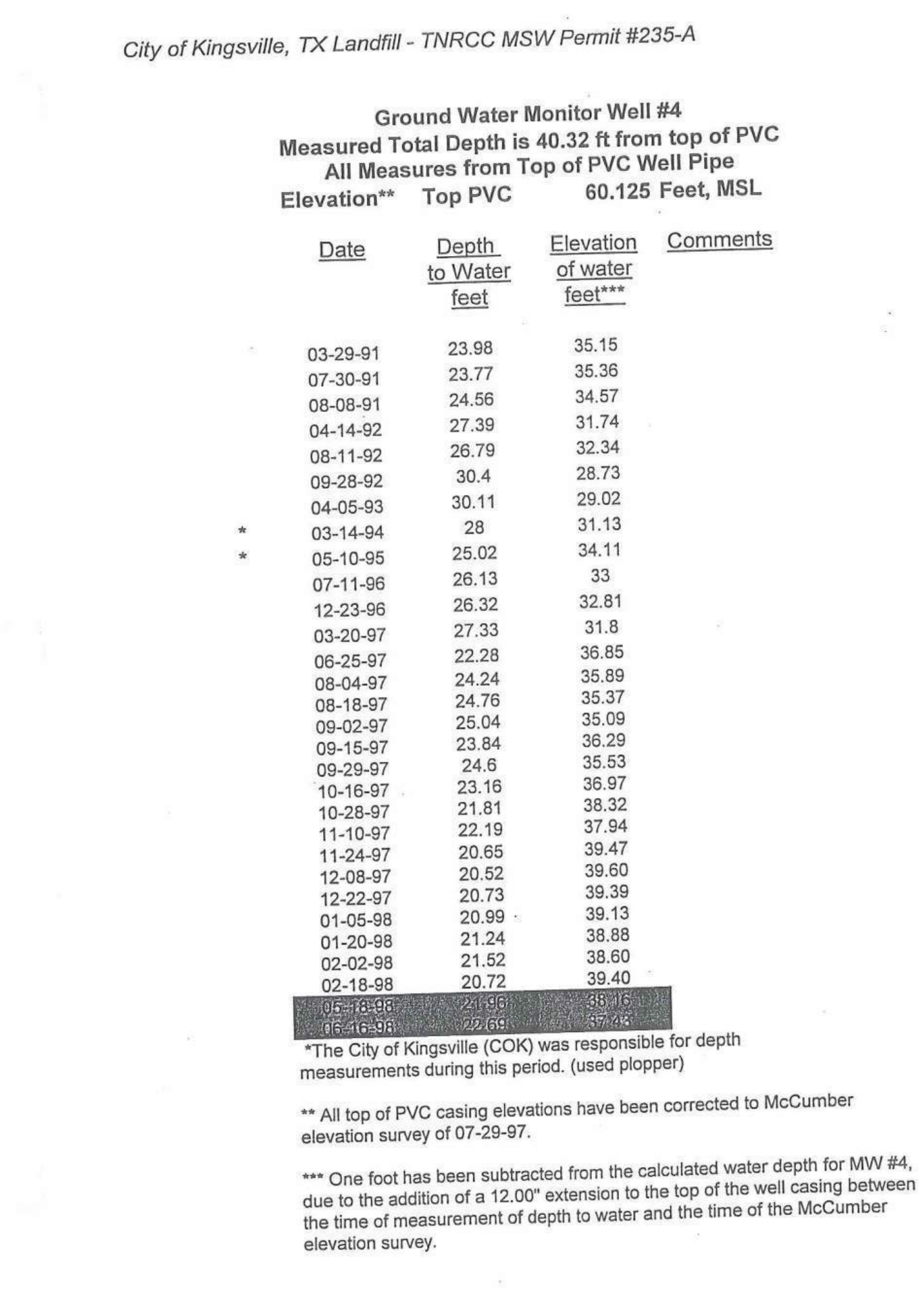
Ground Water Monitor Well #3
Measured Total Depth is 37.75 ft from top of PVC
All Measures from Top of PVC Well Pipe

Elevation Top PVC 59.173 Feet, MSL**

	Date	Depth to Water feet	Elevation of water feet	Comments
	03-29-91	25.59	33.58	
	07-30-91	26.69	32.48	
	08-08-91	26.86	32.31	
	04-14-92	26.75	32.42	
	08-11-92	25.54	33.63	
	09-28-92	25.7	33.47	
	04-05-93	27.02	32.15	
*	03-14-94	26	33.17	
*	05-10-95	22.98	36.19	
	07-11-96	22	37.17	
	12-23-96	26.03	33.14	
	03-20-97	27.08	32.09	
	06-25-97	22.11	37.06	
	08-04-97	22.83	36.34	
	08-18-97	23.26	35.91	
	09-02-97	23.63	35.54	
	09-15-97	23.79	35.38	
	09-29-97	23.9	35.27	
	10-16-97	22.31	36.86	
	10-28-97	21.89	37.28	
	11-10-97	21.2	37.97	
	11-24-97	20.6	38.57	
	12-08-97	20.36	38.81	
	12-22-97	20.48	38.69	
	01-05-98	20.65	38.52	
	01-20-98	20.73	38.44	
	02-02-98	21	38.17	
	02-22-98	20.43	38.74	
	05-18-98	21.04	38.13	
	06-16-98	21.58	37.59	

*The City of Kingsville (COK) was responsible for depth measurements during this period. (used plopper)

** All top of PVC casing elevations have been corrected to McCumber elevation survey of 07-29-97.



City of Kingsville, TX Landfill - TNRCC MSW Permit #235-A

Ground Water Monitor Well #4

Measured Total Depth is 40.32 ft from top of PVC
All Measures from Top of PVC Well Pipe
Elevation Top PVC 60.125 Feet, MSL**

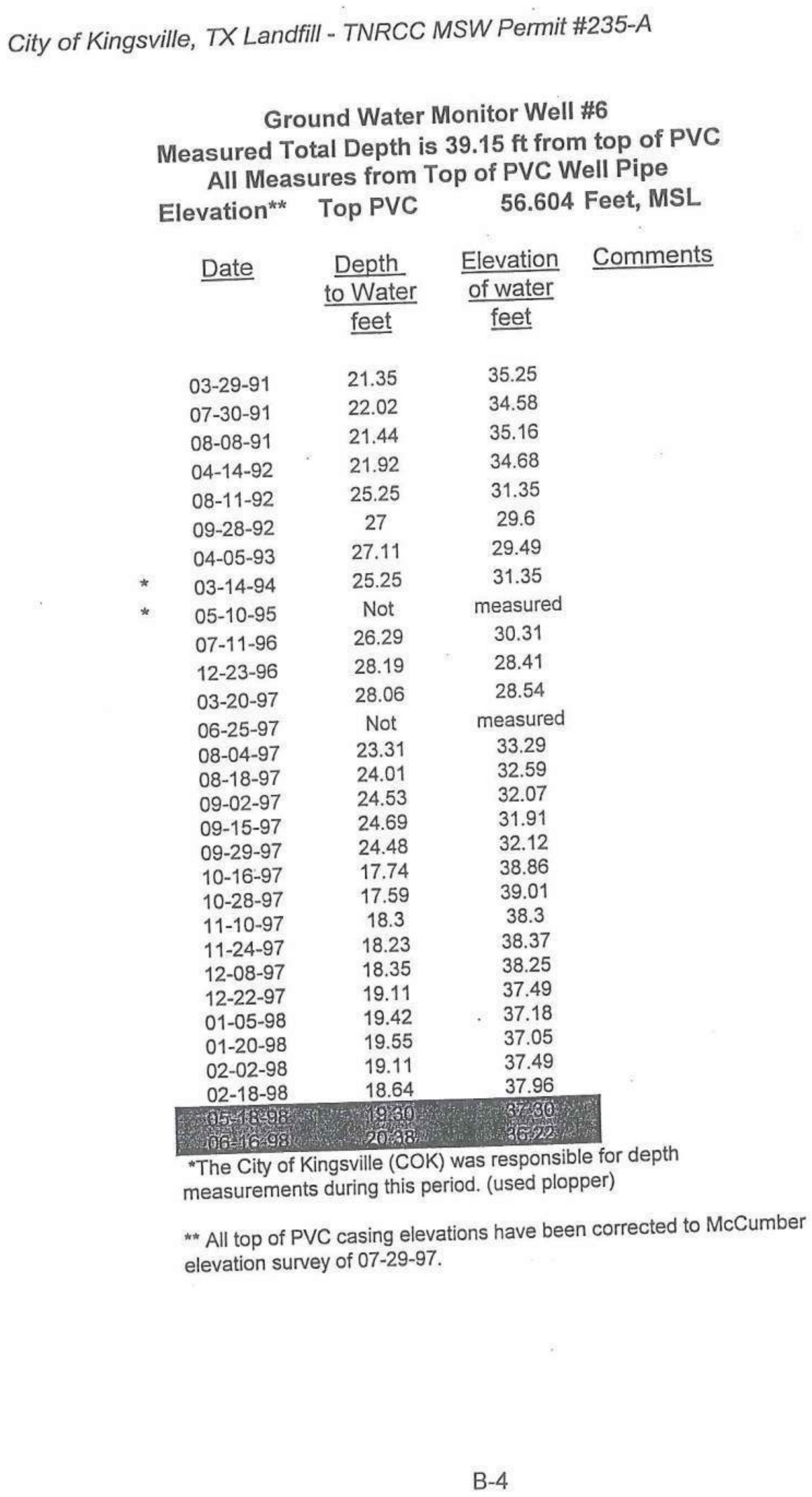
	Date	Depth to Water feet	Elevation of water feet***	Comments
	03-29-91	23.98	35.15	
	07-30-91	23.77	35.36	
	08-08-91	24.56	34.57	
	04-14-92	27.39	31.74	
	08-11-92	26.79	32.34	
	09-28-92	30.4	28.73	
	04-05-93	30.11	29.02	
*	03-14-94	28	31.13	
*	05-10-95	25.02	34.11	
	07-11-96	26.13	33	
	12-23-96	26.32	32.81	
	03-20-97	27.33	31.8	
	06-25-97	22.28	36.85	
	08-04-97	24.24	35.89	
	08-18-97	24.76	35.37	
	09-02-97	25.04	35.09	
	09-15-97	23.84	36.29	
	09-29-97	24.6	35.53	
	10-16-97	23.16	36.97	
	10-28-97	21.81	38.32	
	11-10-97	22.19	37.94	
	11-24-97	20.65	39.47	
	12-08-97	20.52	39.60	
	12-22-97	20.73	39.39	
	01-05-98	20.99	39.13	
	01-20-98	21.24	38.88	
	02-02-98	21.52	38.60	
	02-18-98	20.72	39.40	
	05-18-98	21.96	38.16	
	06-16-98	22.69	37.43	

*The City of Kingsville (COK) was responsible for depth measurements during this period. (used plopper)

** All top of PVC casing elevations have been corrected to McCumber elevation survey of 07-29-97.

*** One foot has been subtracted from the calculated water depth for MW #4, due to the addition of a 12.00" extension to the top of the well casing between the time of measurement of depth to water and the time of the McCumber elevation survey.

B-3



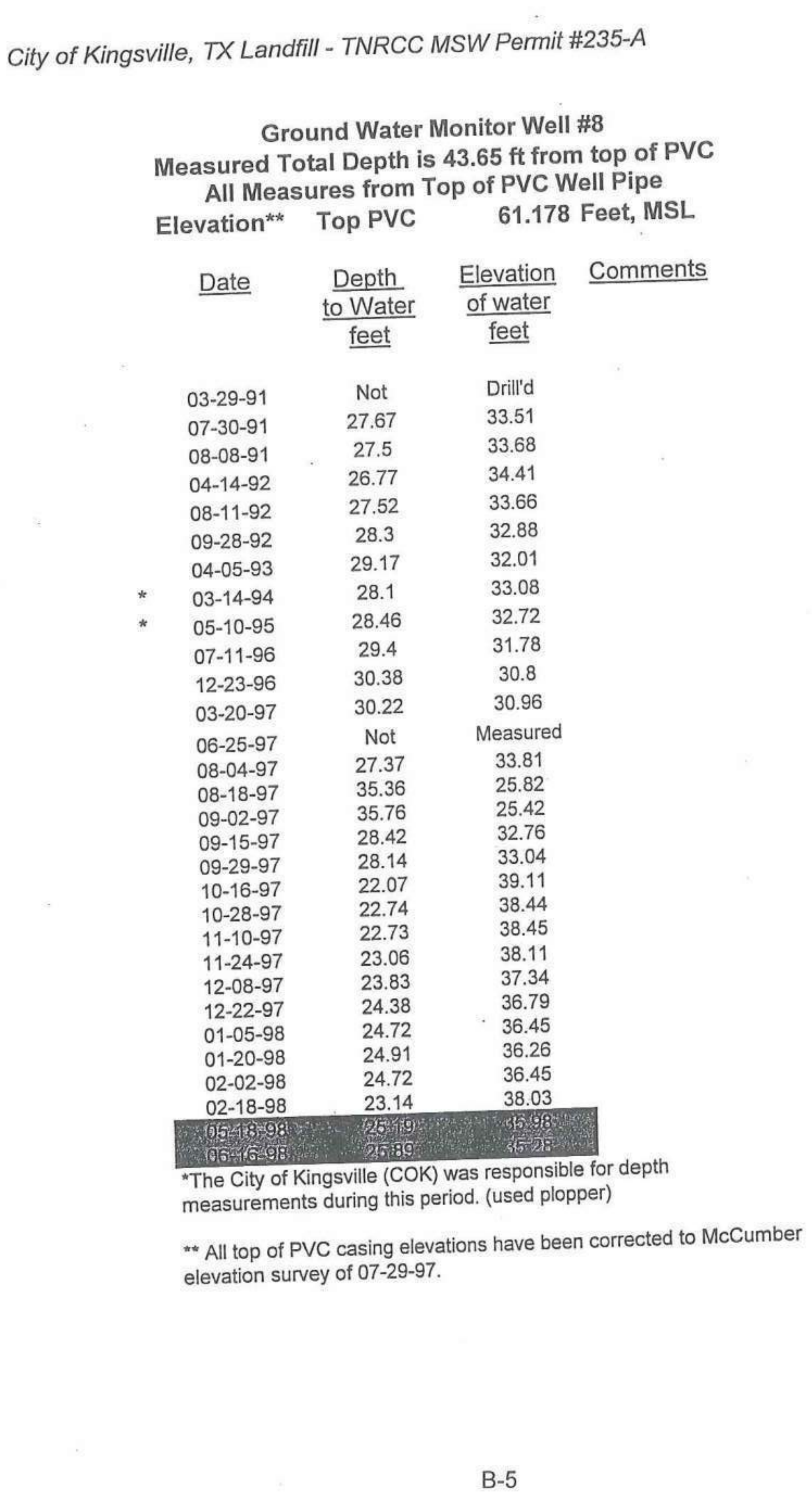
City of Kingsville, TX Landfill - TNRCC MSW Permit #235-A

Ground Water Monitor Well #6
Measured Total Depth is 39.15 ft from top of PVC
All Measures from Top of PVC Well Pipe
Elevation Top PVC 56.604 Feet, MSL**

Date	Depth to Water feet	Elevation of water feet	Comments
03-29-91	21.35	35.25	
07-30-91	22.02	34.58	
08-08-91	21.44	35.16	
04-14-92	21.92	34.68	
08-11-92	25.25	31.35	
09-28-92	27	29.6	
04-05-93	27.11	29.49	
* 03-14-94	25.25	31.35	
* 05-10-95	Not	measured	
07-11-96	26.29	30.31	
12-23-96	28.19	28.41	
03-20-97	28.06	28.54	
06-25-97	Not	measured	
08-04-97	23.31	33.29	
08-18-97	24.01	32.59	
09-02-97	24.53	32.07	
09-15-97	24.69	31.91	
09-29-97	24.48	32.12	
10-16-97	17.74	38.86	
10-28-97	17.59	39.01	
11-10-97	18.3	38.3	
11-24-97	18.23	38.37	
12-08-97	18.35	38.25	
12-22-97	19.11	37.49	
01-05-98	19.42	37.18	
01-20-98	19.55	37.05	
02-02-98	19.11	37.49	
02-18-98	18.64	37.96	
05-18-98	19.30	37.30	
06-16-98	20.38	36.22	

*The City of Kingsville (COK) was responsible for depth measurements during this period. (used plopper)

** All top of PVC casing elevations have been corrected to McCumber elevation survey of 07-29-97.



City of Kingsville, TX Landfill - TNRCC MSW Permit #235-A

Ground Water Monitor Well #8

Measured Total Depth is 43.65 ft from top of PVC

All Measures from Top of PVC Well Pipe

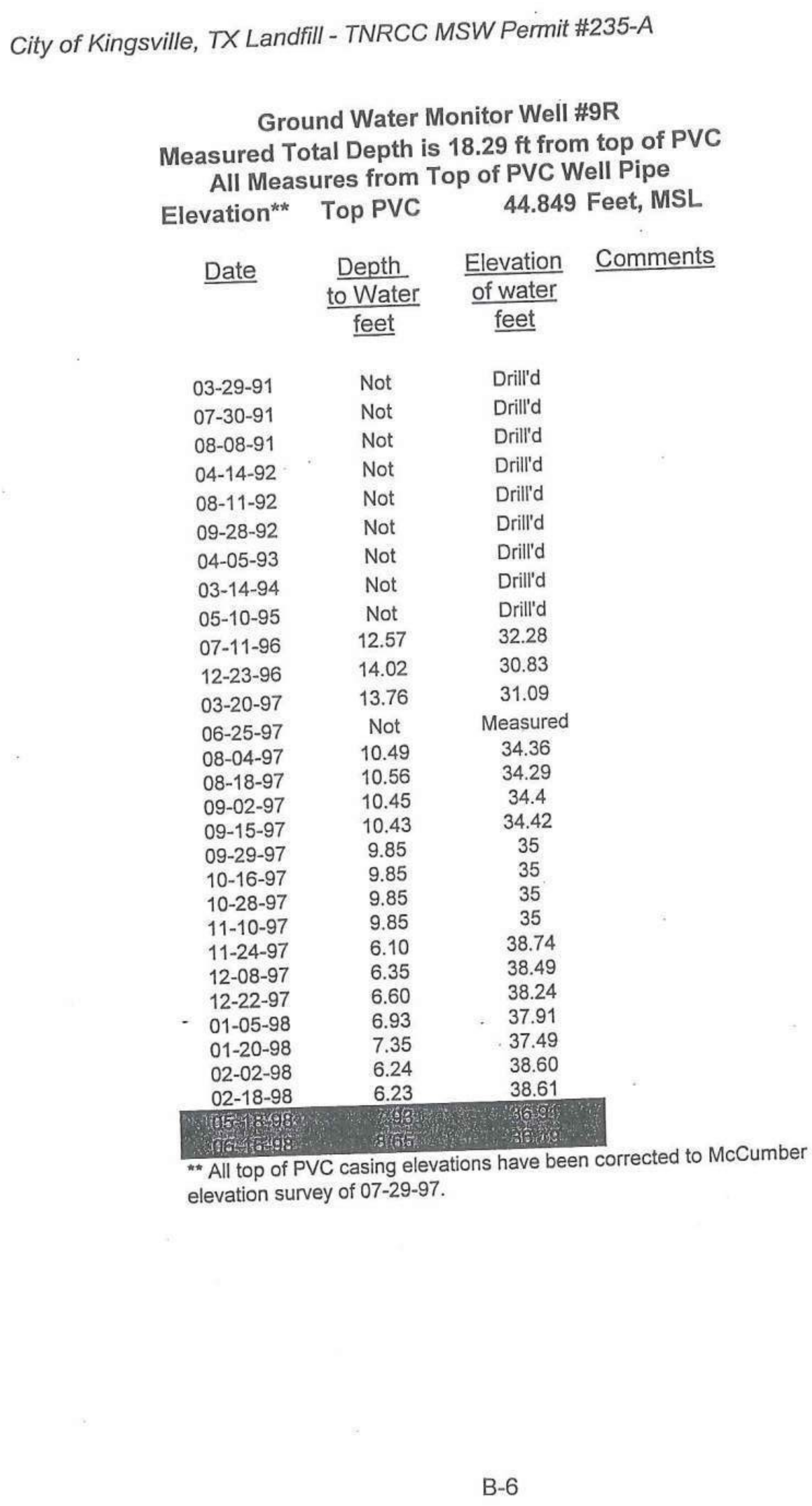
Elevation Top PVC 61.178 Feet, MSL**

	Date	Depth to Water feet	Elevation of water feet	Comments
	03-29-91	Not	Drill'd	
	07-30-91	27.67	33.51	
	08-08-91	27.5	33.68	
	04-14-92	26.77	34.41	
	08-11-92	27.52	33.66	
	09-28-92	28.3	32.88	
	04-05-93	29.17	32.01	
*	03-14-94	28.1	33.08	
*	05-10-95	28.46	32.72	
	07-11-96	29.4	31.78	
	12-23-96	30.38	30.8	
	03-20-97	30.22	30.96	
	06-25-97	Not	Measured	
	08-04-97	27.37	33.81	
	08-18-97	35.36	25.82	
	09-02-97	35.76	25.42	
	09-15-97	28.42	32.76	
	09-29-97	28.14	33.04	
	10-16-97	22.07	39.11	
	10-28-97	22.74	38.44	
	11-10-97	22.73	38.45	
	11-24-97	23.06	38.11	
	12-08-97	23.83	37.34	
	12-22-97	24.38	36.79	
	01-05-98	24.72	36.45	
	01-20-98	24.91	36.26	
	02-02-98	24.72	36.45	
	02-18-98	23.14	38.03	
	05-18-98	25.19	35.98	
	06-16-98	25.89	35.28	

*The City of Kingsville (COK) was responsible for depth measurements during this period. (used plopper)

** All top of PVC casing elevations have been corrected to McCumber elevation survey of 07-29-97.

B-5



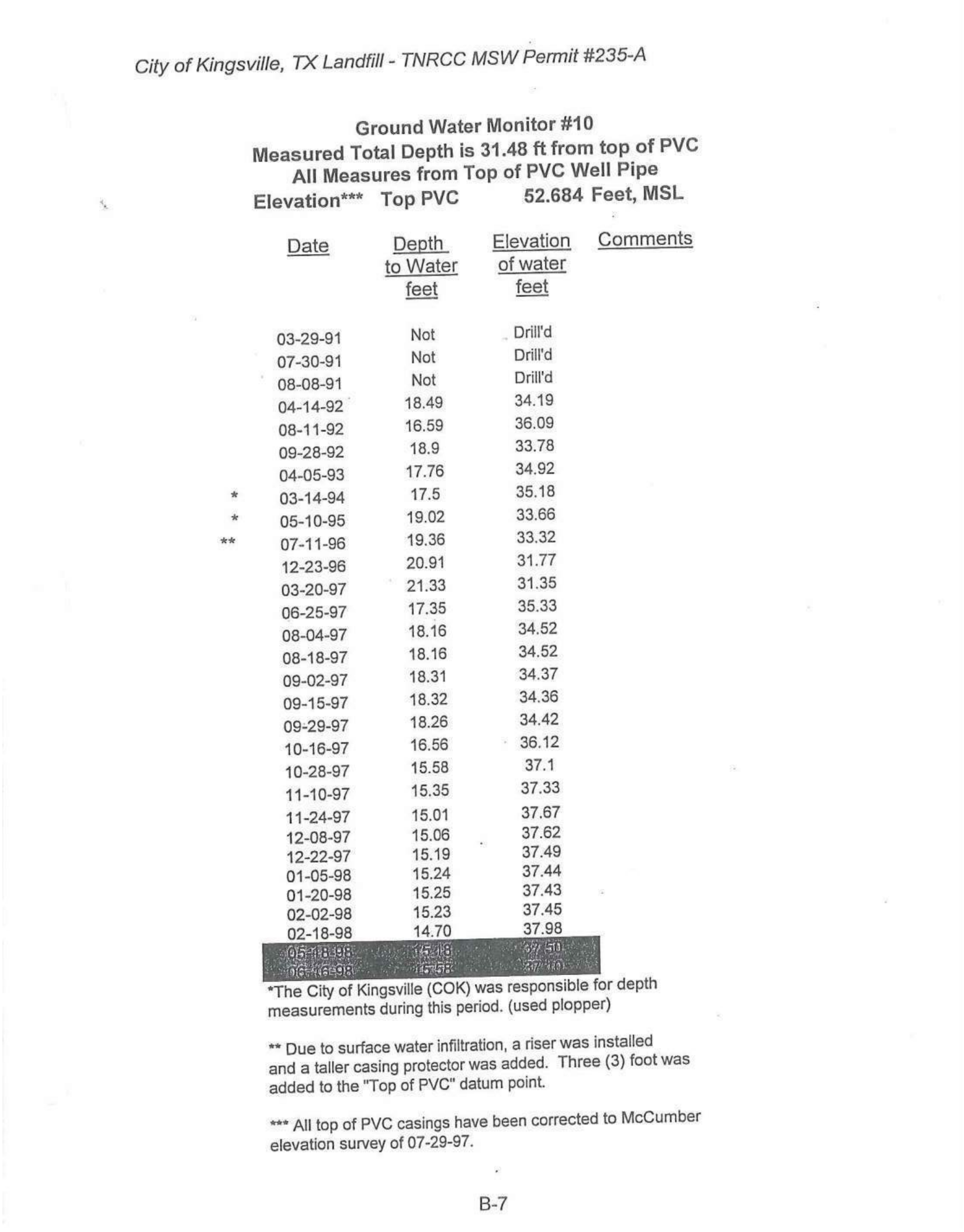
City of Kingsville, TX Landfill - TNRCC MSW Permit #235-A

Ground Water Monitor Well #9R
Measured Total Depth is 18.29 ft from top of PVC
All Measures from Top of PVC Well Pipe

Elevation Top PVC 44.849 Feet, MSL**

Date	Depth to Water feet	Elevation of water feet	Comments
03-29-91	Not	Drill'd	
07-30-91	Not	Drill'd	
08-08-91	Not	Drill'd	
04-14-92	Not	Drill'd	
08-11-92	Not	Drill'd	
09-28-92	Not	Drill'd	
04-05-93	Not	Drill'd	
03-14-94	Not	Drill'd	
05-10-95	Not	Drill'd	
07-11-96	12.57	32.28	
12-23-96	14.02	30.83	
03-20-97	13.76	31.09	
06-25-97	Not	Measured	
08-04-97	10.49	34.36	
08-18-97	10.56	34.29	
09-02-97	10.45	34.4	
09-15-97	10.43	34.42	
09-29-97	9.85	35	
10-16-97	9.85	35	
10-28-97	9.85	35	
11-10-97	9.85	35	
11-24-97	6.10	38.74	
12-08-97	6.35	38.49	
12-22-97	6.60	38.24	
01-05-98	6.93	37.91	
01-20-98	7.35	37.49	
02-02-98	6.24	38.60	
02-18-98	6.23	38.61	
05-18-98	7.93	36.92	
06-16-98	8.65	36.20	

** All top of PVC casing elevations have been corrected to McCumber elevation survey of 07-29-97.



City of Kingsville, TX Landfill - TNRCC MSW Permit #235-A

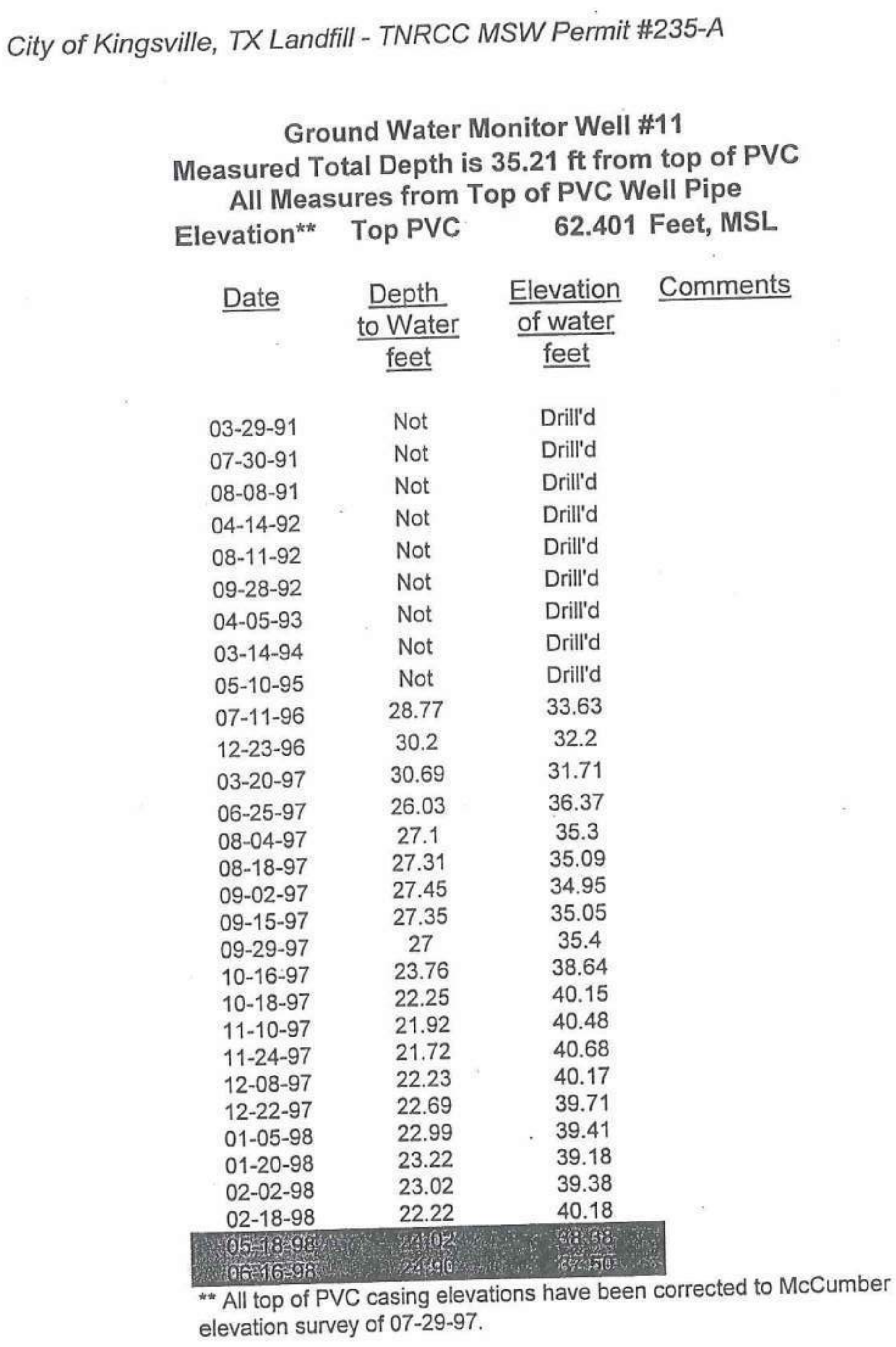
Ground Water Monitor #10
Measured Total Depth is 31.48 ft from top of PVC
All Measures from Top of PVC Well Pipe
Elevation*** Top PVC 52.684 Feet, MSL

Date	Depth to Water feet	Elevation of water feet	Comments
03-29-91	Not	Drill'd	
07-30-91	Not	Drill'd	
08-08-91	Not	Drill'd	
04-14-92	18.49	34.19	
08-11-92	16.59	36.09	
09-28-92	18.9	33.78	
04-05-93	17.76	34.92	
* 03-14-94	17.5	35.18	
* 05-10-95	19.02	33.66	
** 07-11-96	19.36	33.32	
12-23-96	20.91	31.77	
03-20-97	21.33	31.35	
06-25-97	17.35	35.33	
08-04-97	18.16	34.52	
08-18-97	18.16	34.52	
09-02-97	18.31	34.37	
09-15-97	18.32	34.36	
09-29-97	18.26	34.42	
10-16-97	16.56	36.12	
10-28-97	15.58	37.1	
11-10-97	15.35	37.33	
11-24-97	15.01	37.67	
12-08-97	15.06	37.62	
12-22-97	15.19	37.49	
01-05-98	15.24	37.44	
01-20-98	15.25	37.43	
02-02-98	15.23	37.45	
02-18-98	14.70	37.98	
05-18-98	15.18	37.50	
06-16-98	15.58	37.10	

*The City of Kingsville (COK) was responsible for depth measurements during this period. (used plopper)

** Due to surface water infiltration, a riser was installed and a taller casing protector was added. Three (3) foot was added to the "Top of PVC" datum point.

*** All top of PVC casings have been corrected to McCumber elevation survey of 07-29-97.



City of Kingsville, TX Landfill - TNRCC MSW Permit #235-A

Ground Water Monitor Well #11

Measured Total Depth is 35.21 ft from top of PVC

All Measures from Top of PVC Well Pipe

Elevation Top PVC 62.401 Feet, MSL**

Date	Depth to Water feet	Elevation of water feet	Comments
03-29-91	Not	Drill'd	
07-30-91	Not	Drill'd	
08-08-91	Not	Drill'd	
04-14-92	Not	Drill'd	
08-11-92	Not	Drill'd	
09-28-92	Not	Drill'd	
04-05-93	Not	Drill'd	
03-14-94	Not	Drill'd	
05-10-95	Not	Drill'd	
07-11-96	28.77	33.63	
12-23-96	30.2	32.2	
03-20-97	30.69	31.71	
06-25-97	26.03	36.37	
08-04-97	27.1	35.3	
08-18-97	27.31	35.09	
09-02-97	27.45	34.95	
09-15-97	27.35	35.05	
09-29-97	27	35.4	
10-16-97	23.76	38.64	
10-18-97	22.25	40.15	
11-10-97	21.92	40.48	
11-24-97	21.72	40.68	
12-08-97	22.23	40.17	
12-22-97	22.69	39.71	
01-05-98	22.99	39.41	
01-20-98	23.22	39.18	
02-02-98	23.02	39.38	
02-18-98	22.22	40.18	
05-18-98	24.02	38.38	
06-16-98	24.90	37.50	

** All top of PVC casing elevations have been corrected to McCumber elevation survey of 07-29-97.

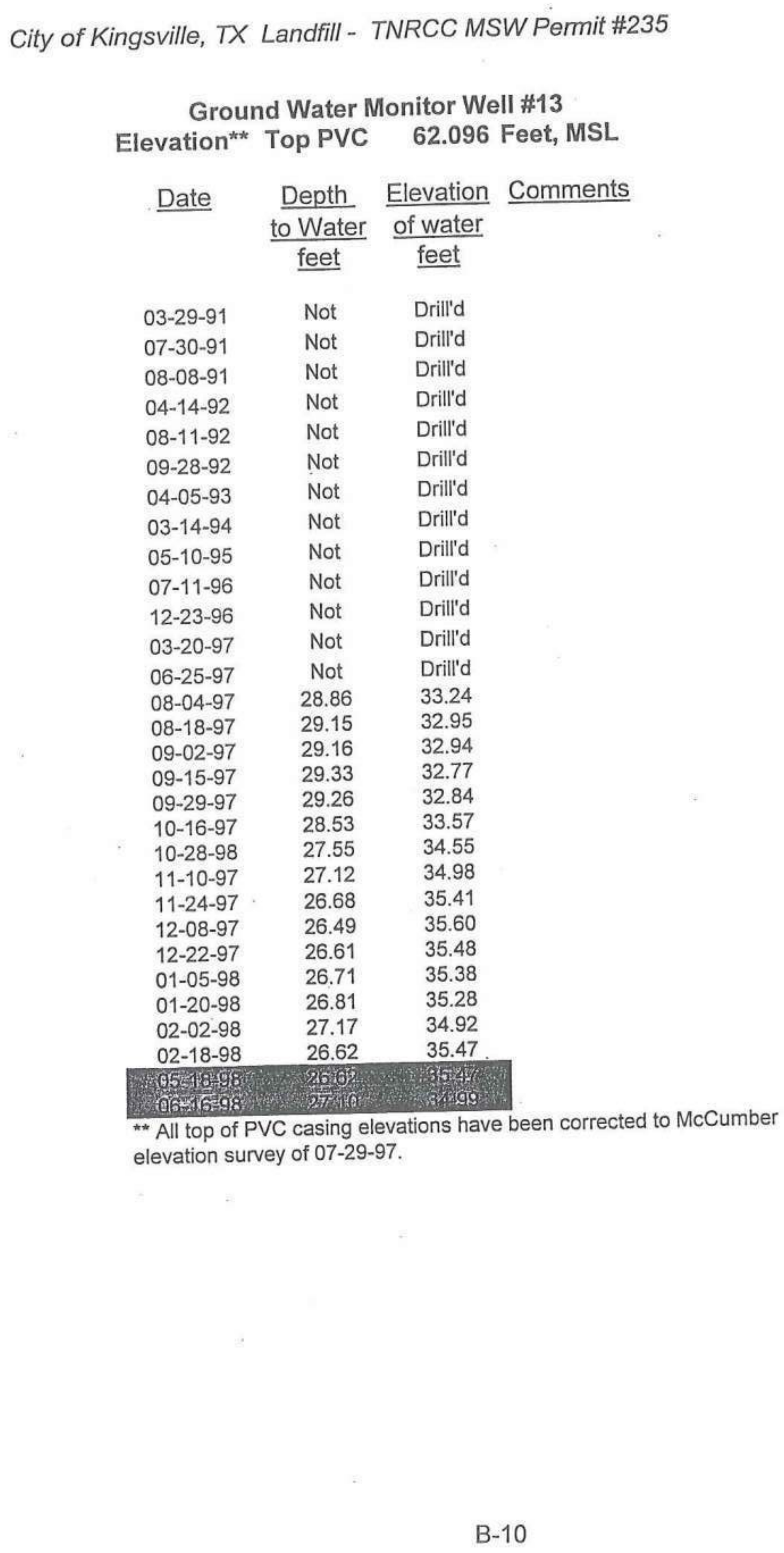
City of Kingsville, TX Landfill - TNRCC MSW Permit #235

Ground Water Monitor Well #12

Elevation Top PVC 54.879 Feet, MSL**

Date	Depth to Water feet	Elevation of water feet	Comments
03-29-91	Not	Drill'd	
07-30-91	Not	Drill'd	
08-08-91	Not	Drill'd	
04-14-92	Not	Drill'd	
08-11-92	Not	Drill'd	
09-28-92	Not	Drill'd	
04-05-93	Not	Drill'd	
03-14-94	Not	Drill'd	
05-10-95	Not	Drill'd	
07-11-96	Not	Drill'd	
12-23-96	Not	Drill'd	
03-20-97	Not	Drill'd	
06-25-97	Not	Drill'd	
08-04-97	20.97	33.91	
08-18-97	21.42	33.46	
09-02-97	21.82	33.06	
09-15-97	22.01	32.87	
09-29-97	22.09	32.79	
10-16-97	19.58	35.3	
10-28-97	19.61	35.27	
11-10-97	19.34	35.54	
11-24-97	18.65	36.22	
12-08-97	18.51	36.36	
12-22-97	18.54	36.33	
01-05-98	18.51	36.36	
01-20-98	18.49	36.38	
02-02-98	18.42	36.45	
02-18-98	17.81	37.06	
05-18-98	18.09	36.78	
06-15-98	18.42	36.45	

** All top of PVC casing elevations have been corrected to McCumber elevation survey of 07-29-97.



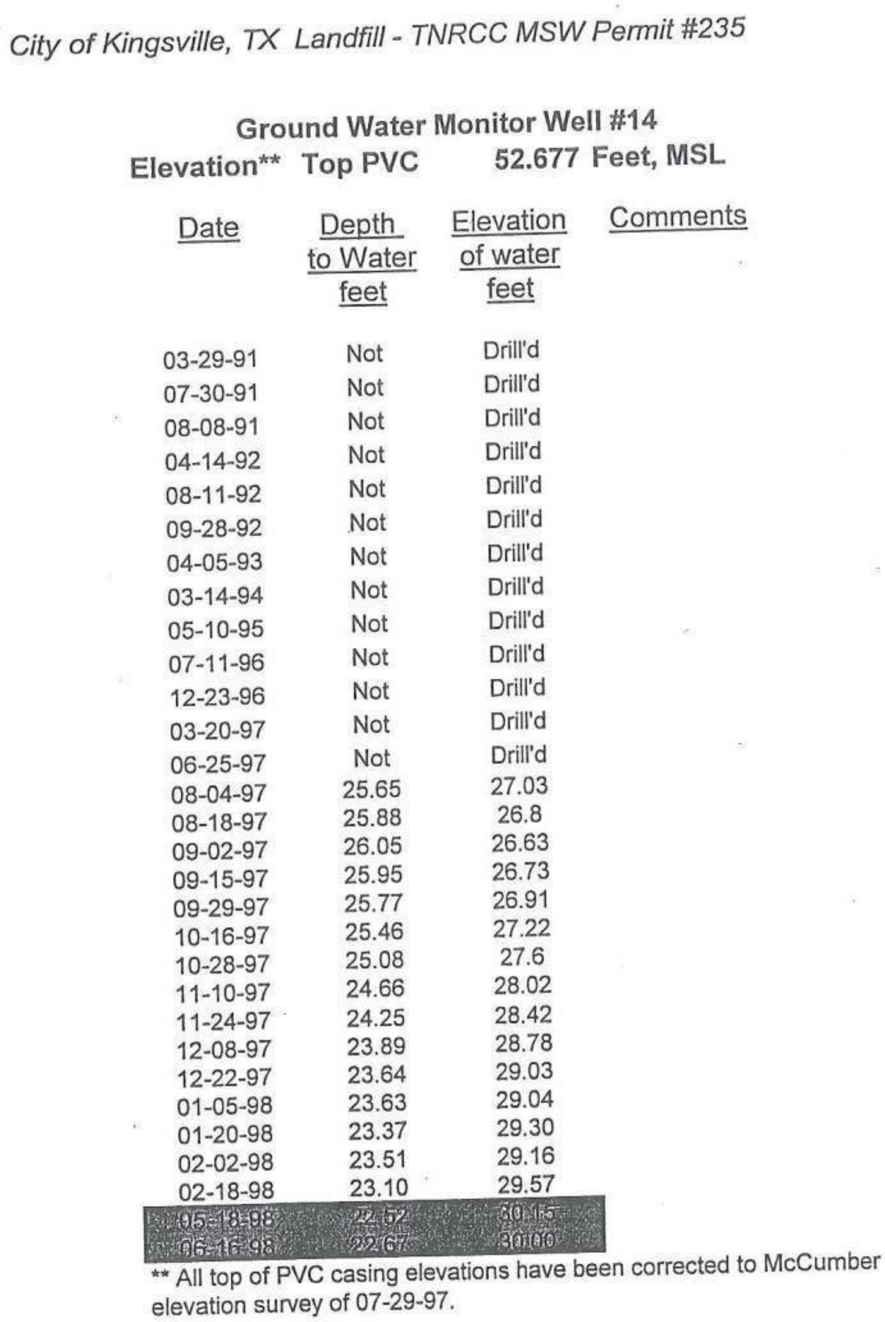
City of Kingsville, TX Landfill - TNRCC MSW Permit #235

Ground Water Monitor Well #13

Elevation Top PVC 62.096 Feet, MSL**

Date	Depth to Water feet	Elevation of water feet	Comments
03-29-91	Not	Drill'd	
07-30-91	Not	Drill'd	
08-08-91	Not	Drill'd	
04-14-92	Not	Drill'd	
08-11-92	Not	Drill'd	
09-28-92	Not	Drill'd	
04-05-93	Not	Drill'd	
03-14-94	Not	Drill'd	
05-10-95	Not	Drill'd	
07-11-96	Not	Drill'd	
12-23-96	Not	Drill'd	
03-20-97	Not	Drill'd	
06-25-97	Not	Drill'd	
08-04-97	28.86	33.24	
08-18-97	29.15	32.95	
09-02-97	29.16	32.94	
09-15-97	29.33	32.77	
09-29-97	29.26	32.84	
10-16-97	28.53	33.57	
10-28-98	27.55	34.55	
11-10-97	27.12	34.98	
11-24-97	26.68	35.41	
12-08-97	26.49	35.60	
12-22-97	26.61	35.48	
01-05-98	26.71	35.38	
01-20-98	26.81	35.28	
02-02-98	27.17	34.92	
02-18-98	26.62	35.47	
05-18-98	26.62	35.47	
06-16-98	27.10	34.99	

** All top of PVC casing elevations have been corrected to McCumber elevation survey of 07-29-97.



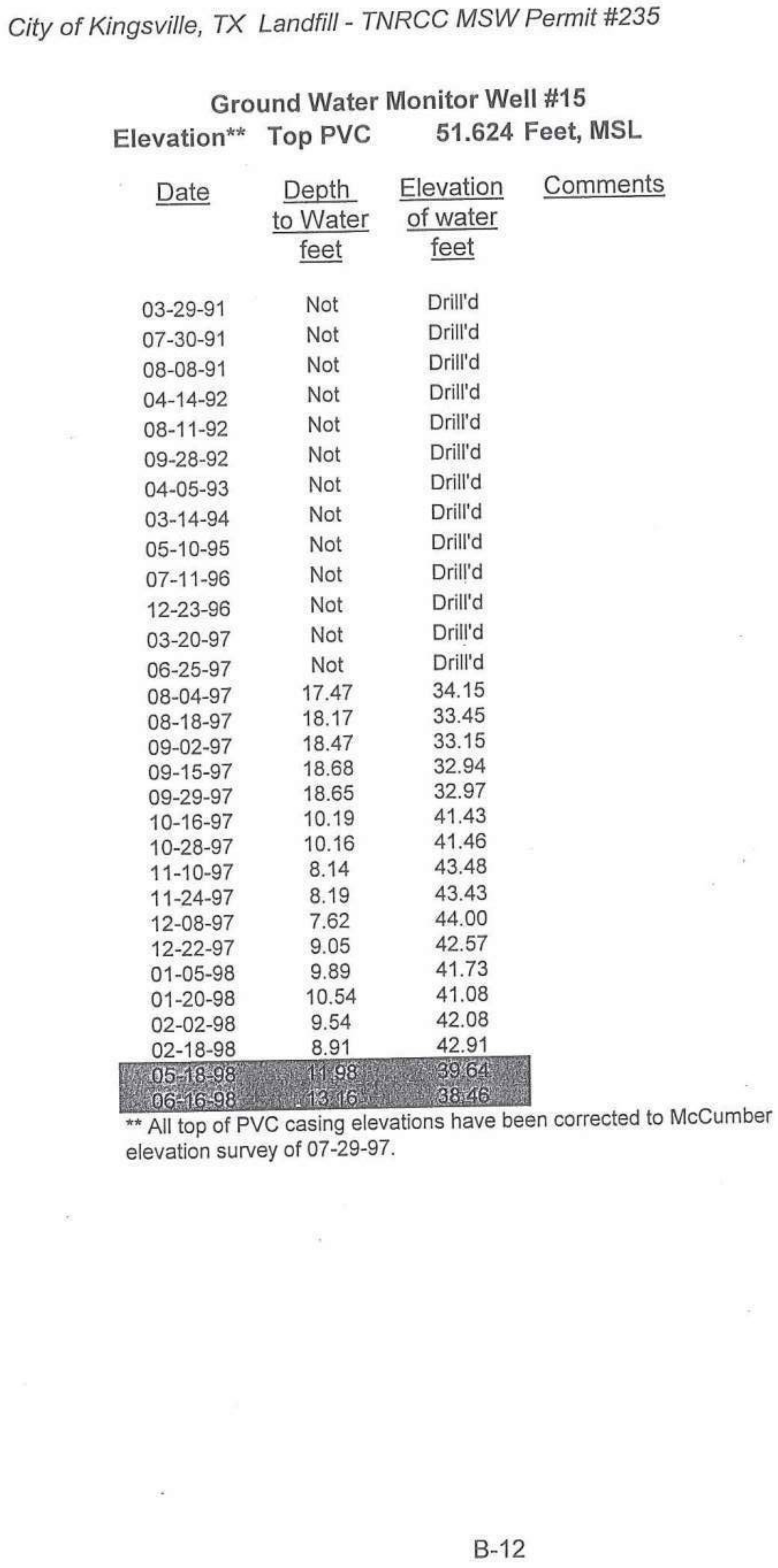
City of Kingsville, TX Landfill - TNRCC MSW Permit #235

Ground Water Monitor Well #14

Elevation Top PVC 52.677 Feet, MSL**

Date	Depth to Water feet	Elevation of water feet	Comments
03-29-91	Not	Drill'd	
07-30-91	Not	Drill'd	
08-08-91	Not	Drill'd	
04-14-92	Not	Drill'd	
08-11-92	Not	Drill'd	
09-28-92	Not	Drill'd	
04-05-93	Not	Drill'd	
03-14-94	Not	Drill'd	
05-10-95	Not	Drill'd	
07-11-96	Not	Drill'd	
12-23-96	Not	Drill'd	
03-20-97	Not	Drill'd	
06-25-97	Not	Drill'd	
08-04-97	25.65	27.03	
08-18-97	25.88	26.8	
09-02-97	26.05	26.63	
09-15-97	25.95	26.73	
09-29-97	25.77	26.91	
10-16-97	25.46	27.22	
10-28-97	25.08	27.6	
11-10-97	24.66	28.02	
11-24-97	24.25	28.42	
12-08-97	23.89	28.78	
12-22-97	23.64	29.03	
01-05-98	23.63	29.04	
01-20-98	23.37	29.30	
02-02-98	23.51	29.16	
02-18-98	23.10	29.57	
05-18-98	22.52	30.15	
06-16-98	22.67	30.00	

** All top of PVC casing elevations have been corrected to McCumber elevation survey of 07-29-97.



City of Kingsville, TX Landfill - TNRCC MSW Permit #235

Ground Water Monitor Well #15

Elevation Top PVC 51.624 Feet, MSL**

Date	Depth to Water feet	Elevation of water feet	Comments
03-29-91	Not	Drill'd	
07-30-91	Not	Drill'd	
08-08-91	Not	Drill'd	
04-14-92	Not	Drill'd	
08-11-92	Not	Drill'd	
09-28-92	Not	Drill'd	
04-05-93	Not	Drill'd	
03-14-94	Not	Drill'd	
05-10-95	Not	Drill'd	
07-11-96	Not	Drill'd	
12-23-96	Not	Drill'd	
03-20-97	Not	Drill'd	
06-25-97	Not	Drill'd	
08-04-97	17.47	34.15	
08-18-97	18.17	33.45	
09-02-97	18.47	33.15	
09-15-97	18.68	32.94	
09-29-97	18.65	32.97	
10-16-97	10.19	41.43	
10-28-97	10.16	41.46	
11-10-97	8.14	43.48	
11-24-97	8.19	43.43	
12-08-97	7.62	44.00	
12-22-97	9.05	42.57	
01-05-98	9.89	41.73	
01-20-98	10.54	41.08	
02-02-98	9.54	42.08	
02-18-98	8.91	42.91	
05-18-98	11.98	39.64	
06-16-98	13.16	38.46	

** All top of PVC casing elevations have been corrected to McCumber elevation survey of 07-29-97.

City of Kingsville, TX Landfill - TNRCC MSW Permit #235

Ground Water Monitor Well #16

Elevation Top PVC 58.839 Feet, MSL**

Date	Depth to Water feet	Elevation of water feet	Comments
03-29-91	Not	Drill'd	
07-30-91	Not	Drill'd	
08-08-91	Not	Drill'd	
04-14-92	Not	Drill'd	
08-11-92	Not	Drill'd	
09-28-92	Not	Drill'd	
04-05-93	Not	Drill'd	
03-14-94	Not	Drill'd	
05-10-95	Not	Drill'd	
07-11-96	Not	Drill'd	
12-23-96	Not	Drill'd	
03-20-97	Not	Drill'd	
06-25-97	Not	Drill'd	
08-04-97	24.21	34.63	
08-18-97	24.63	34.21	
09-02-97	24.94	33.9	
09-15-97	24.95	33.89	
09-29-97	24.81	34.03	
10-16-97	23.32	35.52	
10-28-97	22.75	36.09	
11-10-97	22.46	36.38	
11-24-97	21.94	36.89	
12-08-97	21.70	37.13	
12-22-97	21.71	37.12	
01-05-98	21.66	37.17	
01-20-98	21.67	37.16	
02-02-98	21.74	37.09	
02-18-98	21.28	37.55	
05-18-98	21.62	37.21	
06-16-98	22.27	36.56	

** All top of PVC casing elevations have been corrected to McCumber elevation survey of 07-29-97.

City of Kingsville, TX Landfill - TNRCC MSW Permit #235

Ground Water Monitor Well #17

Elevation Top PVC 43.868 Feet, MSL**

Date	Depth to Water feet	Elevation of water feet	Comments
03-29-91	Not	Drill'd	
07-30-91	Not	Drill'd	
08-08-91	Not	Drill'd	
04-14-92	Not	Drill'd	
08-11-92	Not	Drill'd	
09-28-92	Not	Drill'd	
04-05-93	Not	Drill'd	
03-14-94	Not	Drill'd	
05-10-95	Not	Drill'd	
07-11-96	Not	Drill'd	
12-23-96	Not	Drill'd	
03-20-97	Not	Drill'd	
06-25-97	Not	Drill'd	
08-04-97	9.33	34.54	
08-18-97	9.69	34.18	
09-02-97	9.92	33.95	
09-15-97	9.68	34.19	
09-29-97	8.99	34.88	
10-16-97	4.28	39.59	
10-28-97	4.44	39.43	
11-10-97	3.64	40.23	
11-24-97	4.01	39.85	
12-08-97	4.45	39.41	
12-22-97	4.91	38.95	
01-05-98	5.58	38.28	
01-20-98	6.13	37.73	
02-02-98	3.82	40.04	
02-18-98	4.37	39.49	
05-18-98	6.40	37.46	
06-16-98	7.40	36.46	

** All top of PVC casing elevations have been corrected to McCumber elevation survey of 07-29-97.

City of Kingsville, TX Landfill - TNRCC MSW Permit #235

Ground Water Monitor Well #18

Elevation Top PVC 52.438 Feet, MSL**

Date	Depth to Water feet	Elevation of water feet	Comments
03-29-91	Not	Drill'd	
07-30-91	Not	Drill'd	
08-08-91	Not	Drill'd	
04-14-92	Not	Drill'd	
08-11-92	Not	Drill'd	
09-28-92	Not	Drill'd	
04-05-93	Not	Drill'd	
03-14-94	Not	Drill'd	
05-10-95	Not	Drill'd	
07-11-96	Not	Drill'd	
12-23-96	Not	Drill'd	
03-20-97	Not	Drill'd	
06-25-97	Not	Drill'd	
08-04-97	18.61	33.83	
08-18-97	18.47	33.97	
09-02-97	18.92	33.52	
09-15-97	18.78	33.66	
09-29-97	18.71	33.73	
10-16-97	16.65	35.79	
10-28-97	15.8	36.64	
11-10-97	15.14	37.3	
11-24-97	14.62	37.81	
12-08-97	14.25	38.18	
12-22-97	14.48	37.95	
01-05-98	14.67	37.76	
01-20-98	14.88	37.55	
02-02-98	15.16	37.27	
02-18-98	14.23	38:20	
05-18-98	15.09	37.34	
06-16-98	15.92	36.51	

** All top of PVC casing elevations have been corrected to McCumber elevation survey of 07-29-97.

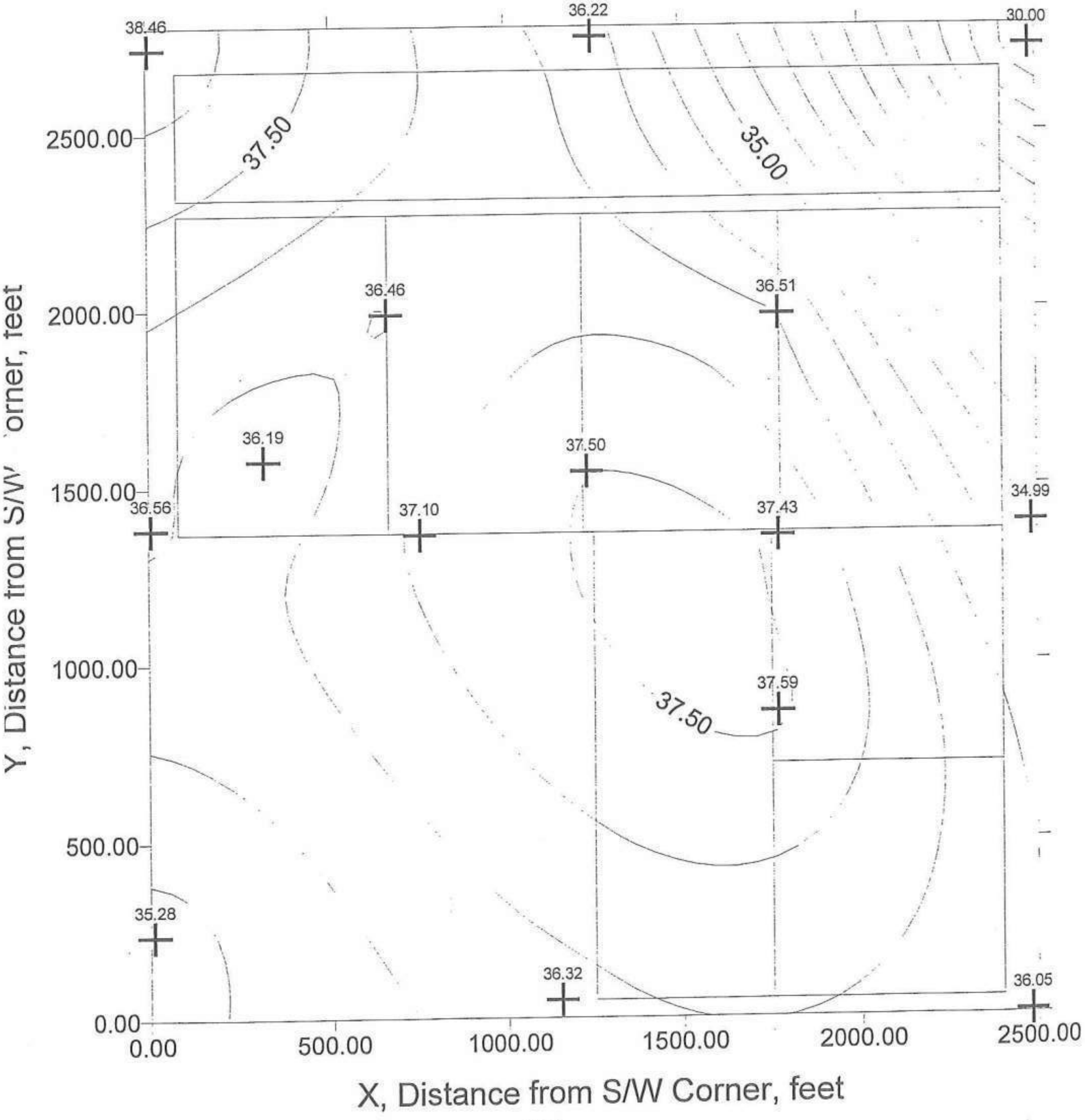
APPENDIX C

APPENDIX C

Ground Water Contours by Date

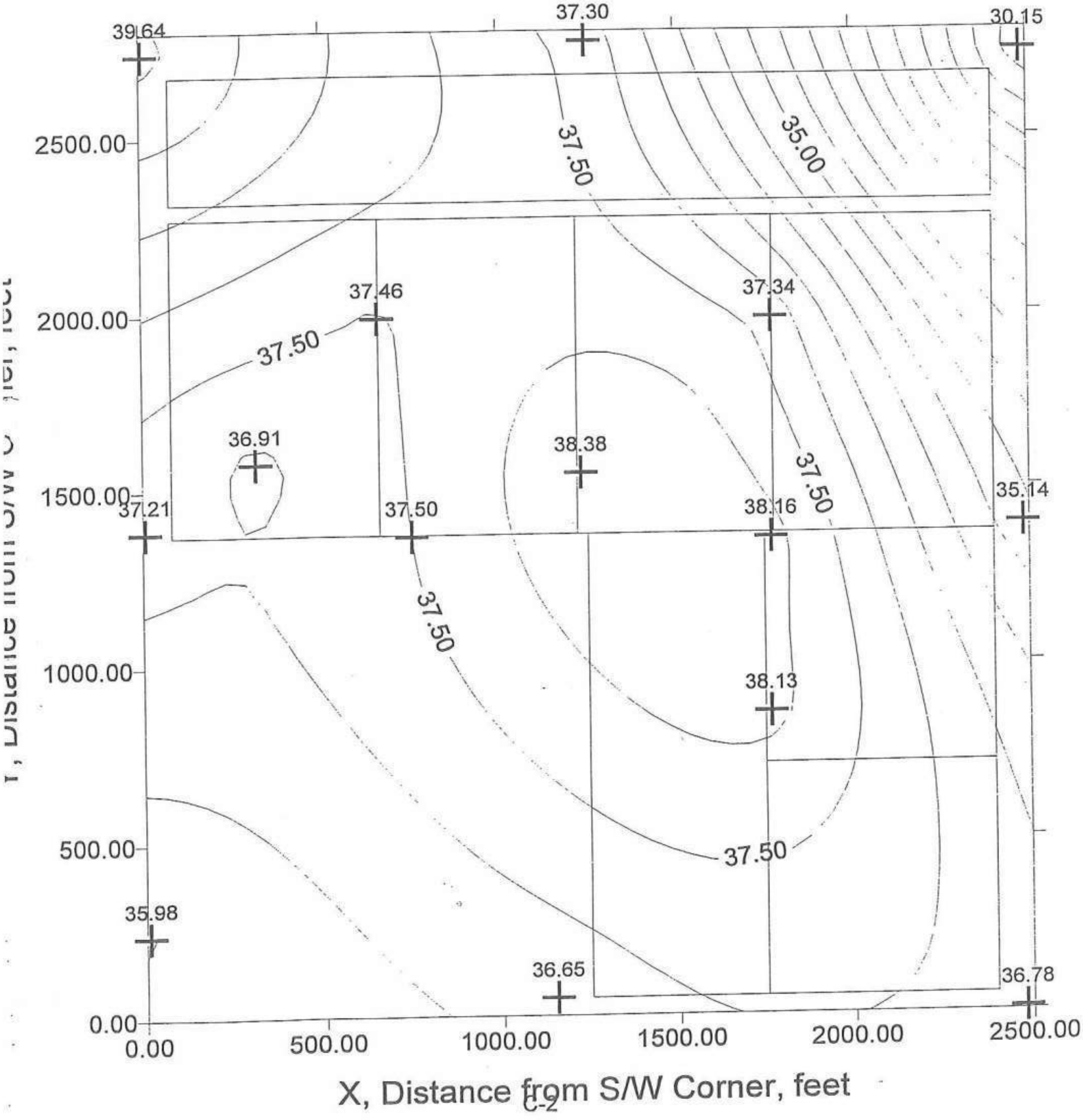
November 1997
Revision 1 - June 1998

City of Kingsville, TX
MSWLF GW Levels
06-16-98



C-1

City of Kingsville, TX
MSWLF GW Levels
05-18-98



City of Kingsville, TX
MSWLF GW Levels
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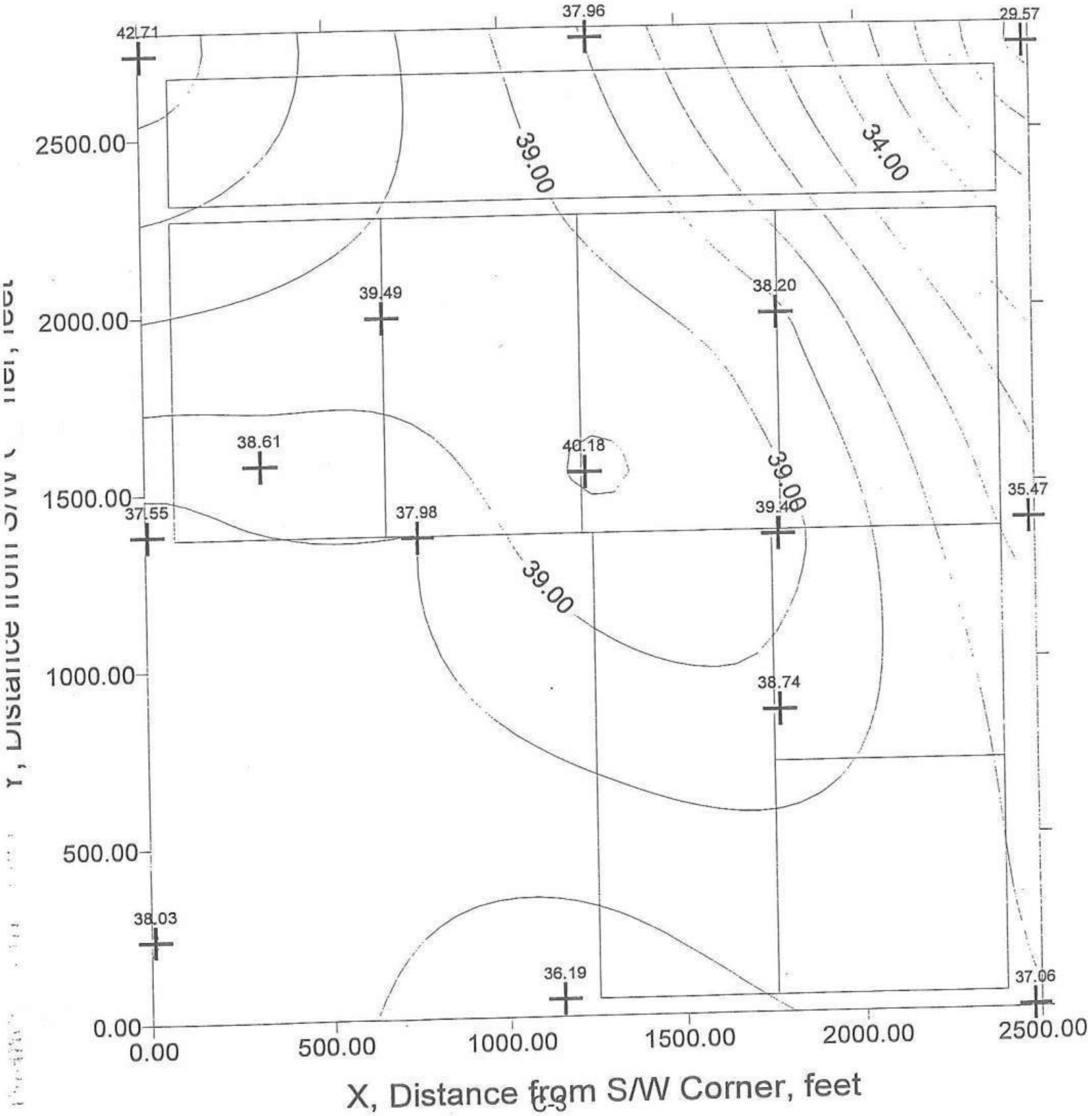
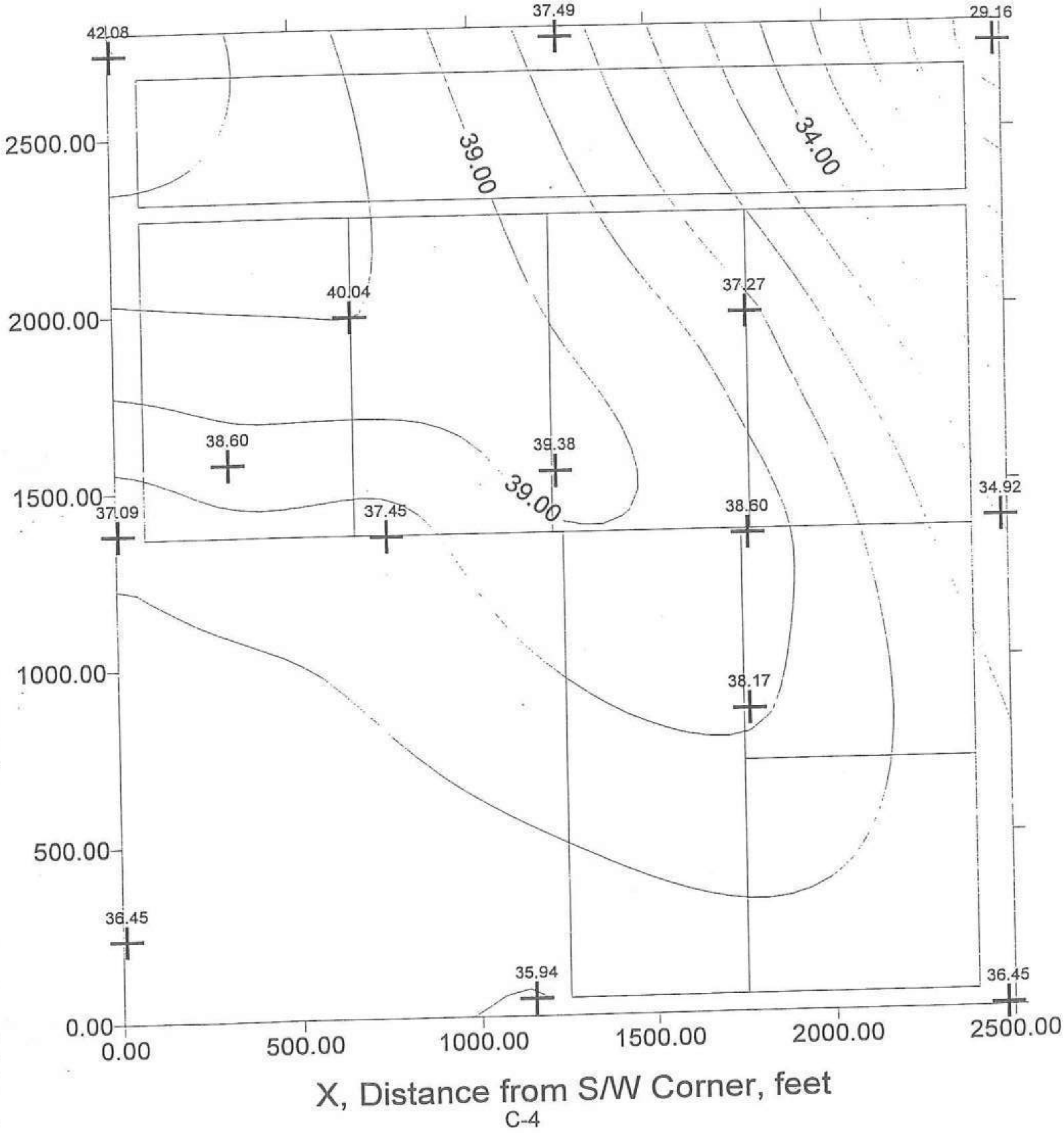
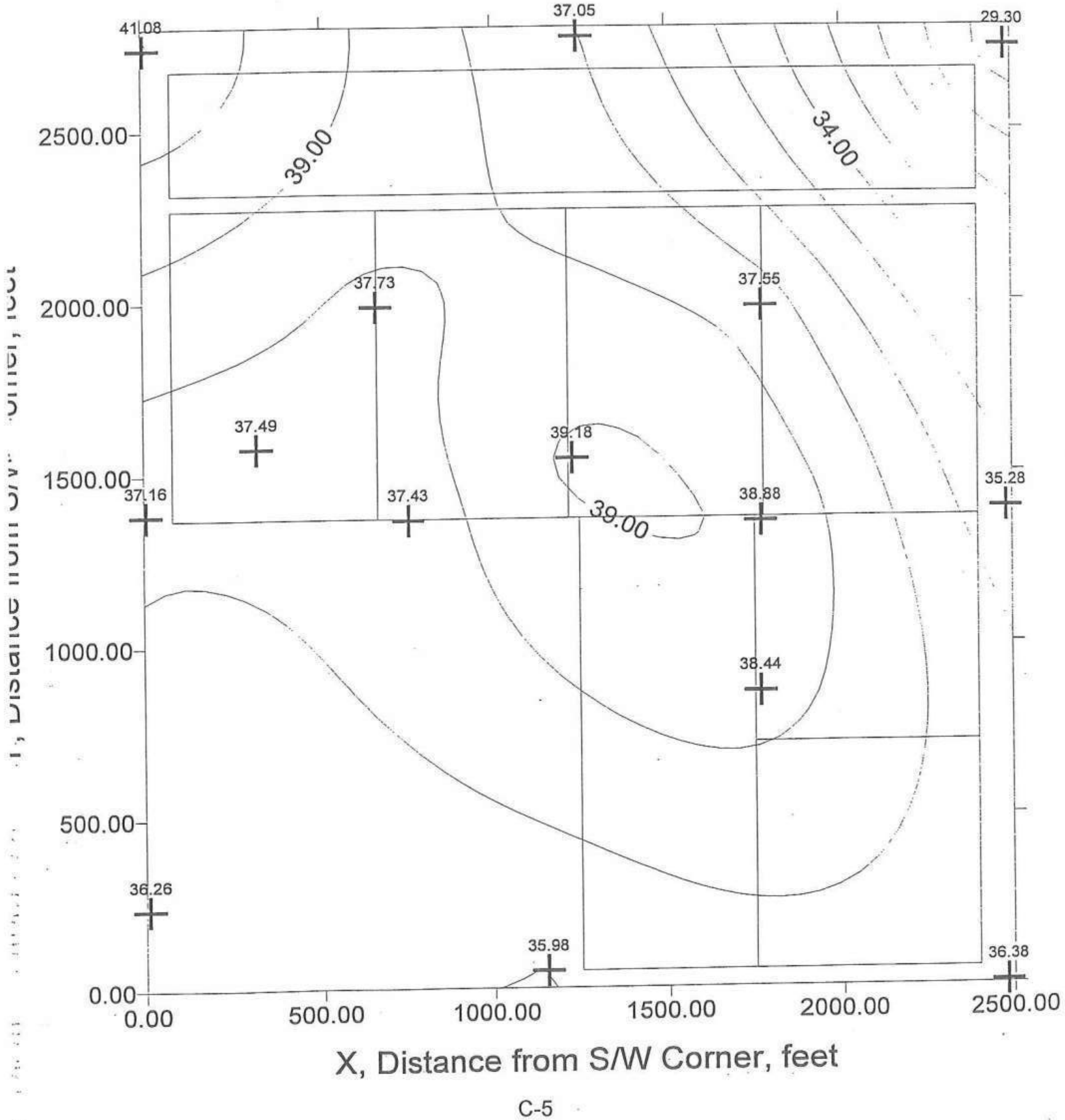


City of Kingsville
MSWLF GW Levels
02-02-98



C-4

City of Kingsville, TX
MSWLF GW Levels
01-20-98



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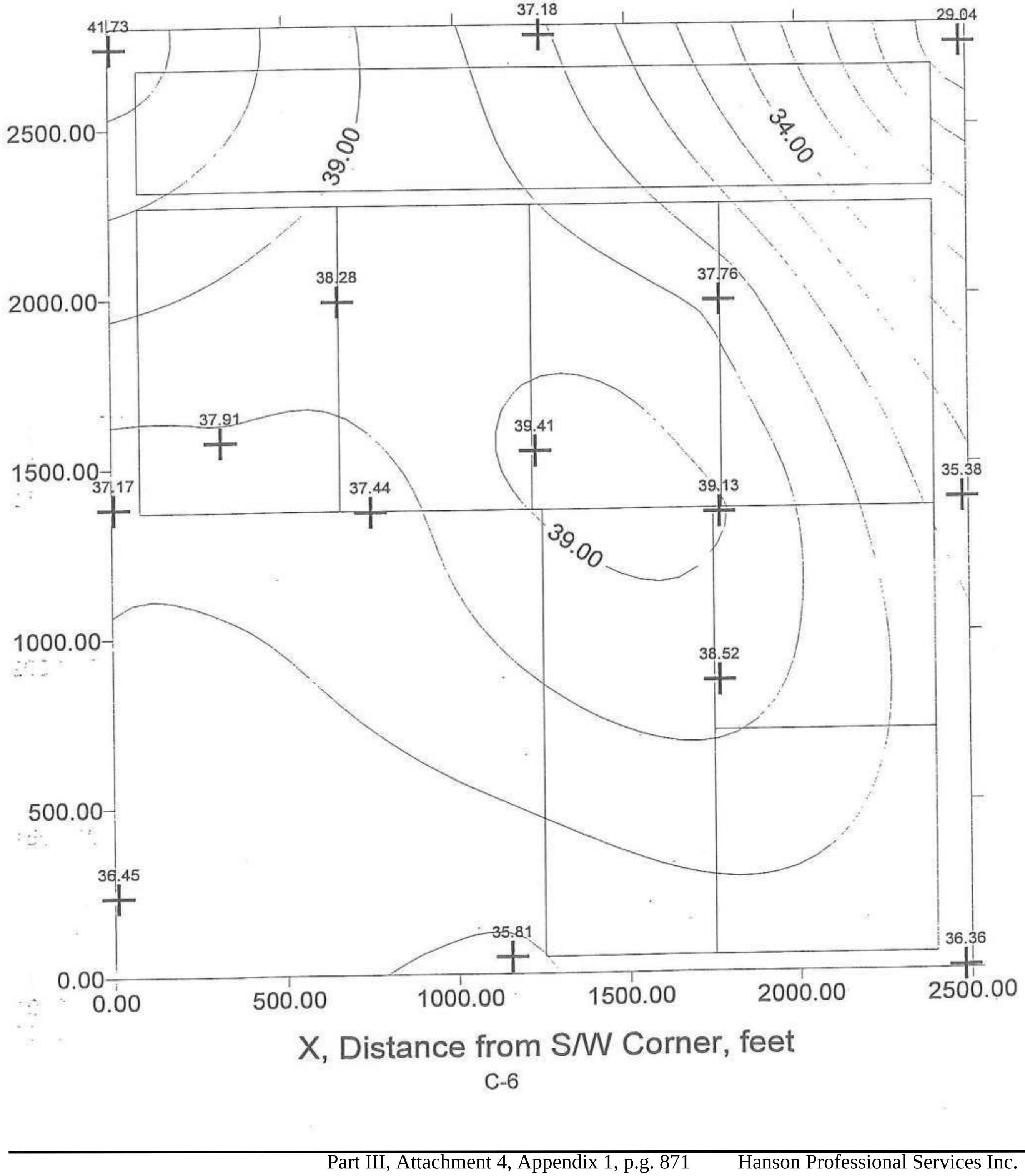
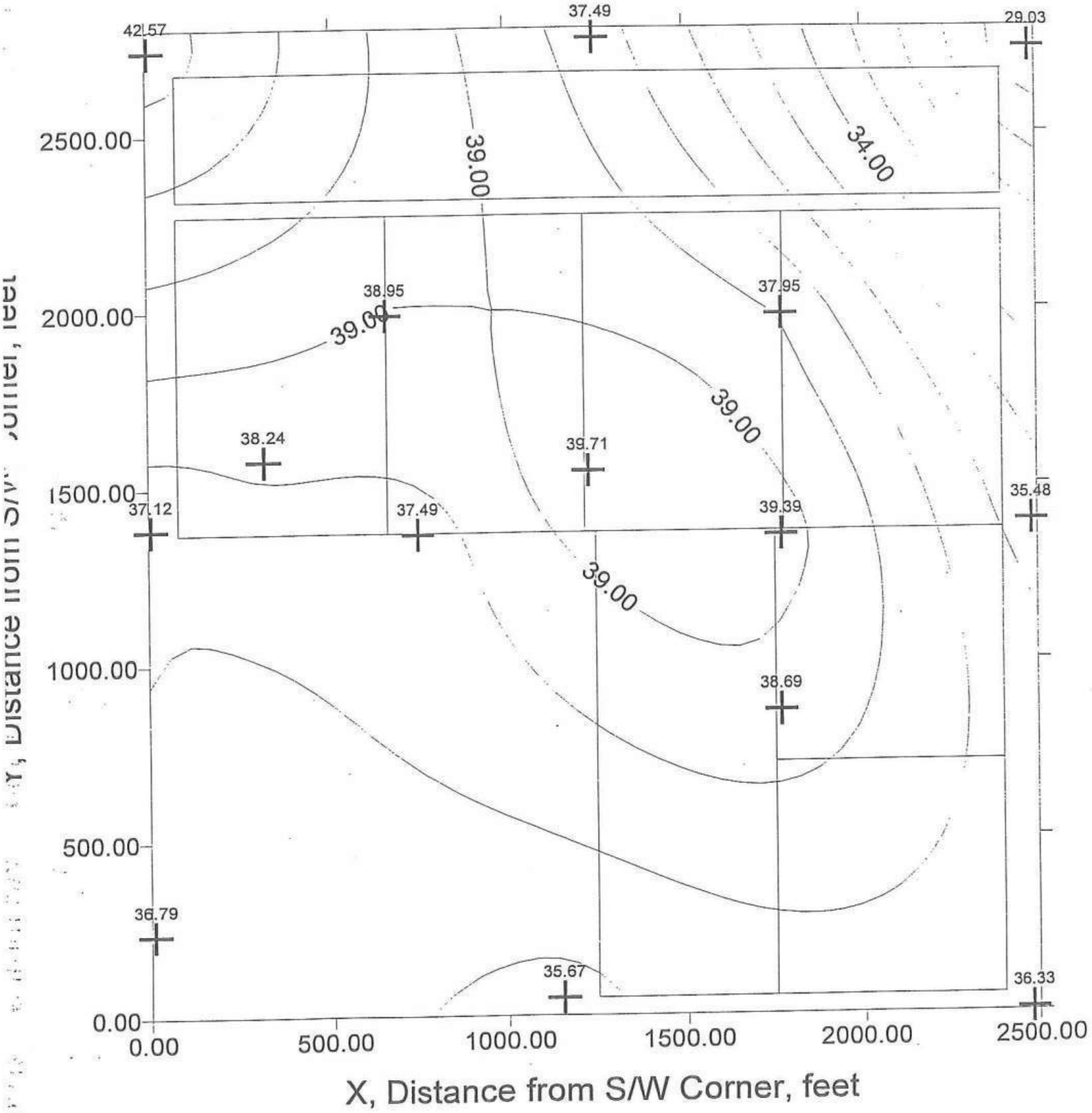
City of Kingsville, TX
MSWLF GW Levels
01-05-98



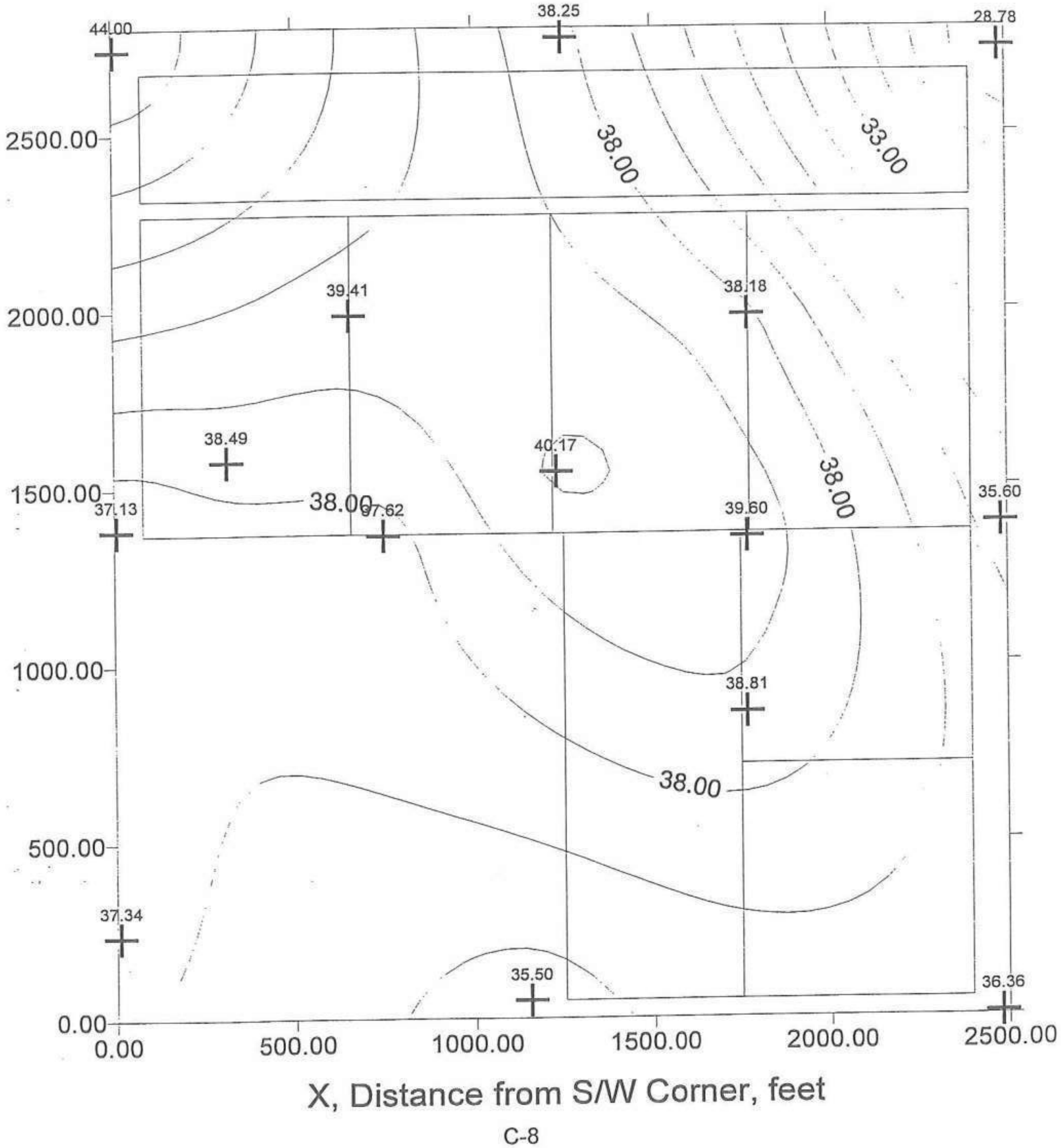
C-6

City of Kingsville, TX
MSWLF GW Levels
12-22-97



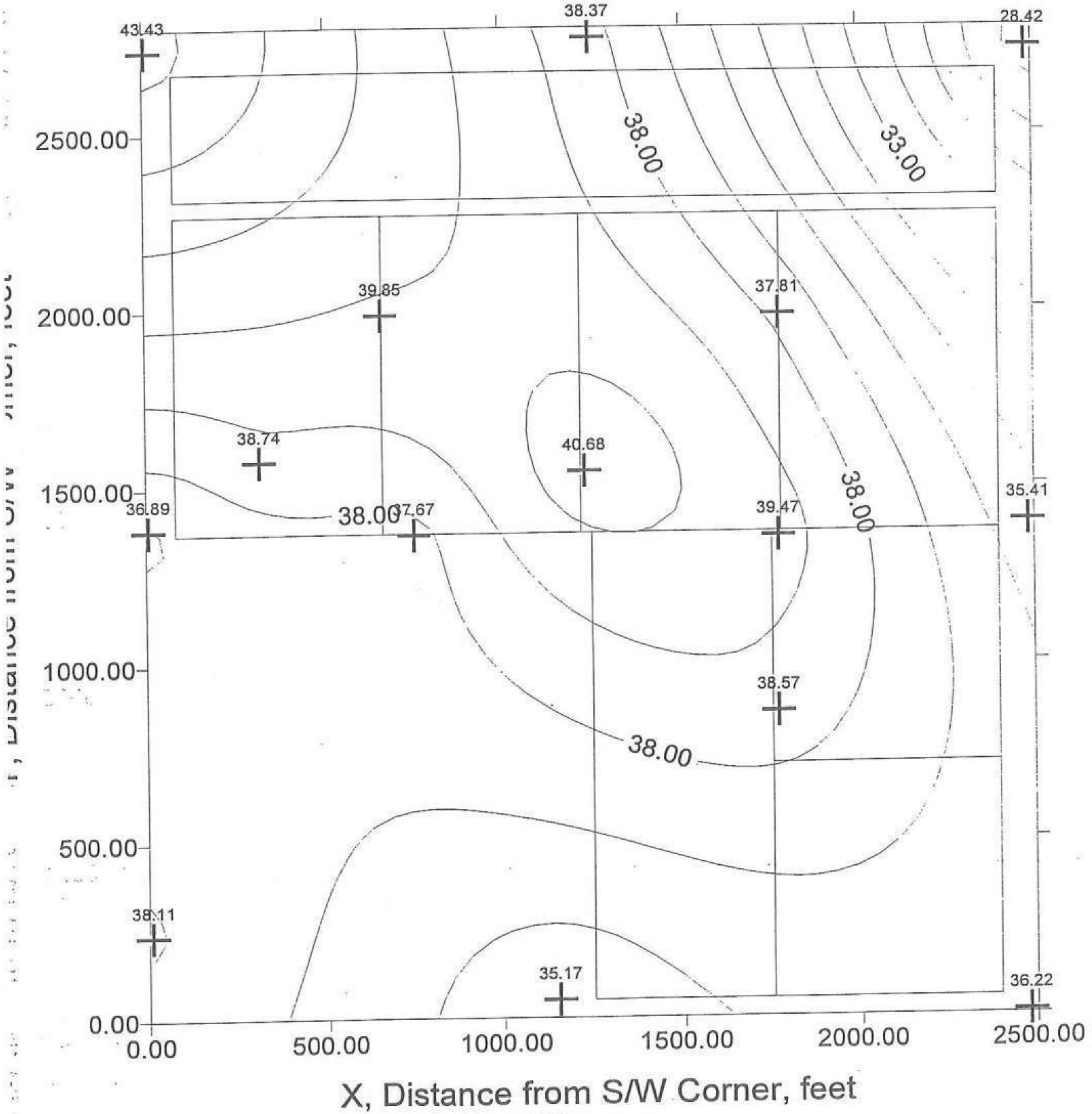
C-7

City of Kingsville, TX
MSWLF GW Levels
12-08-97



C-8

City of Kingsville, TX
MSWLF GW Levels
11-24-97



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City of Kingsville, TX
MSWLF GW Levels
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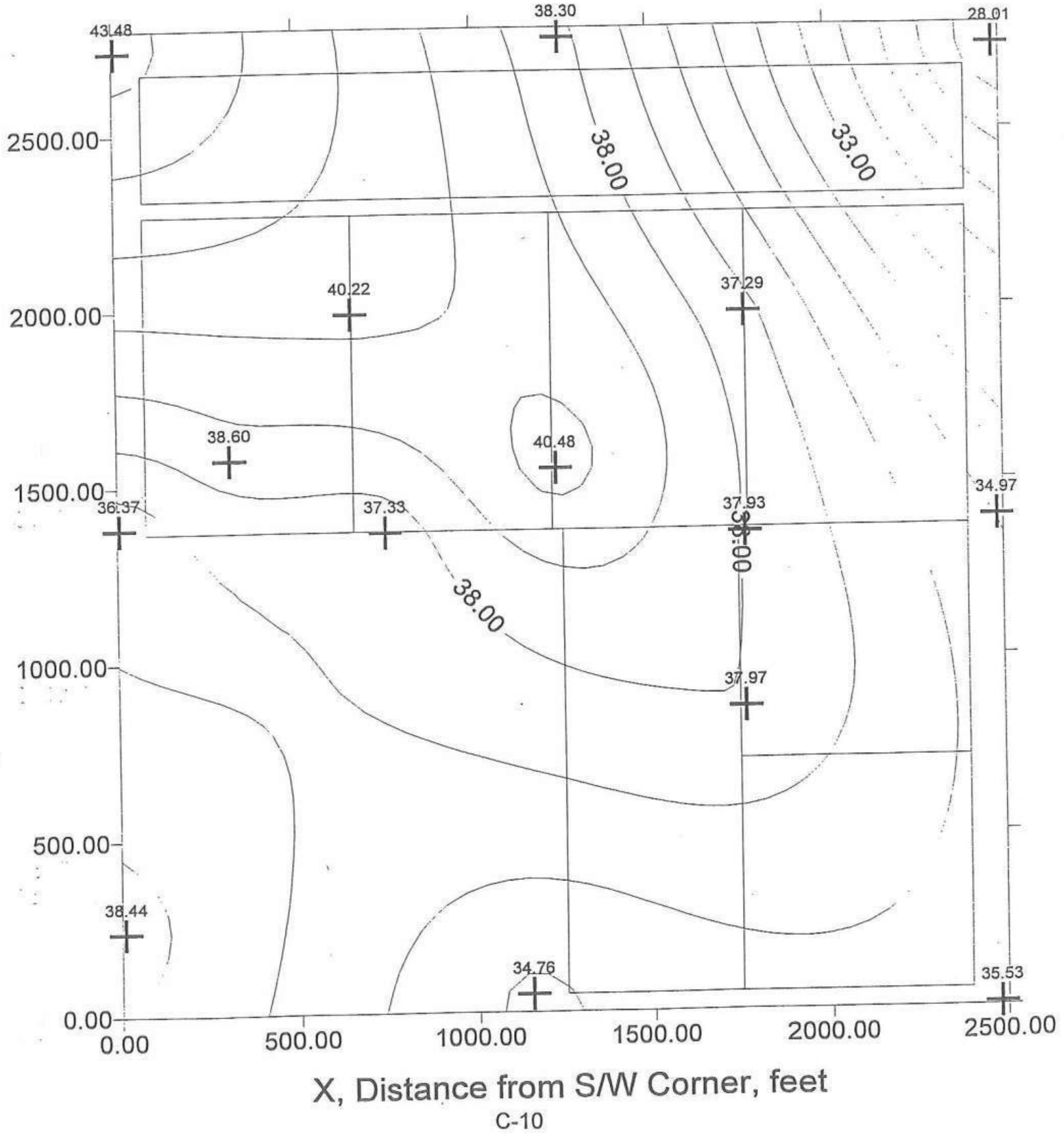

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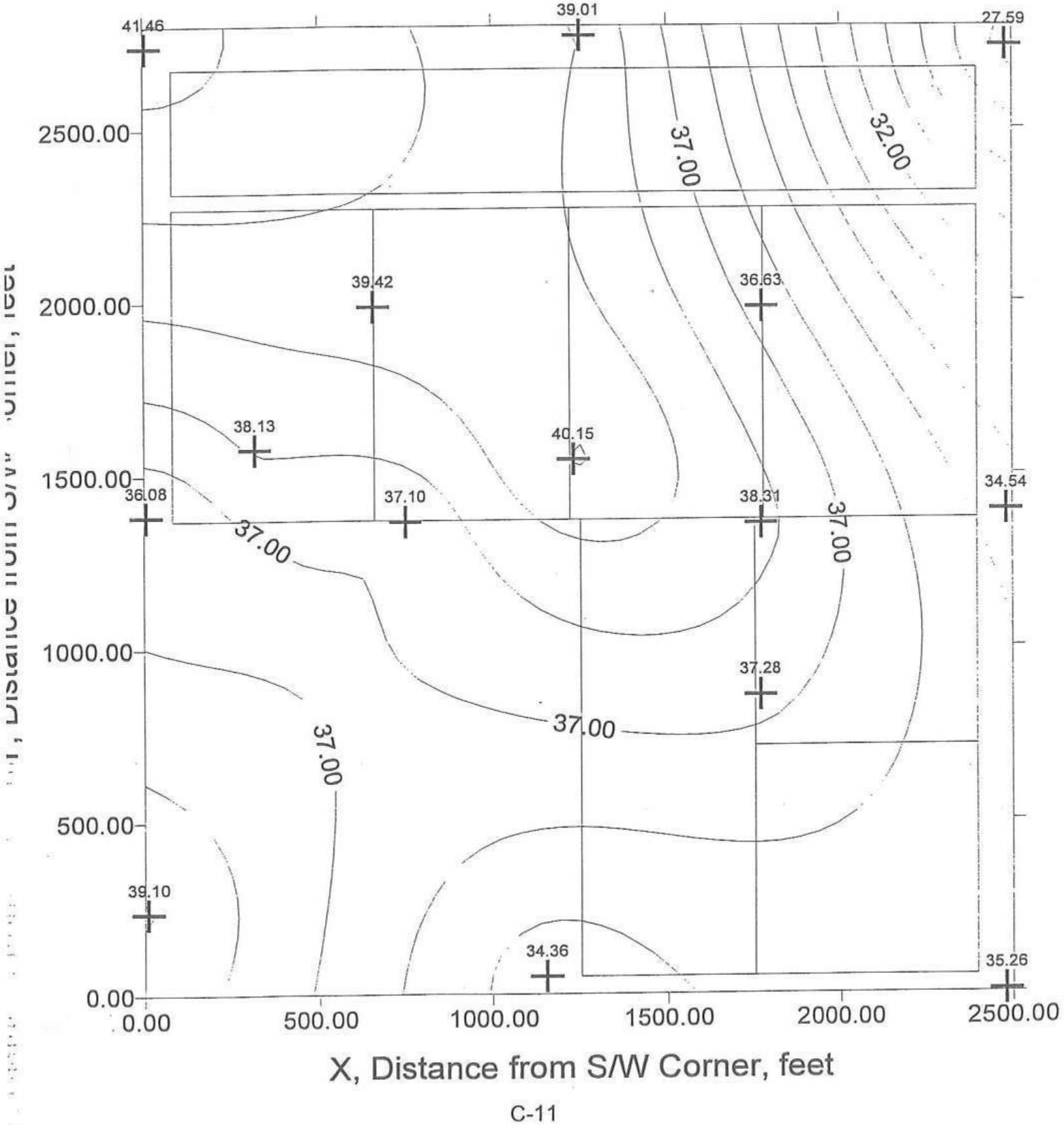
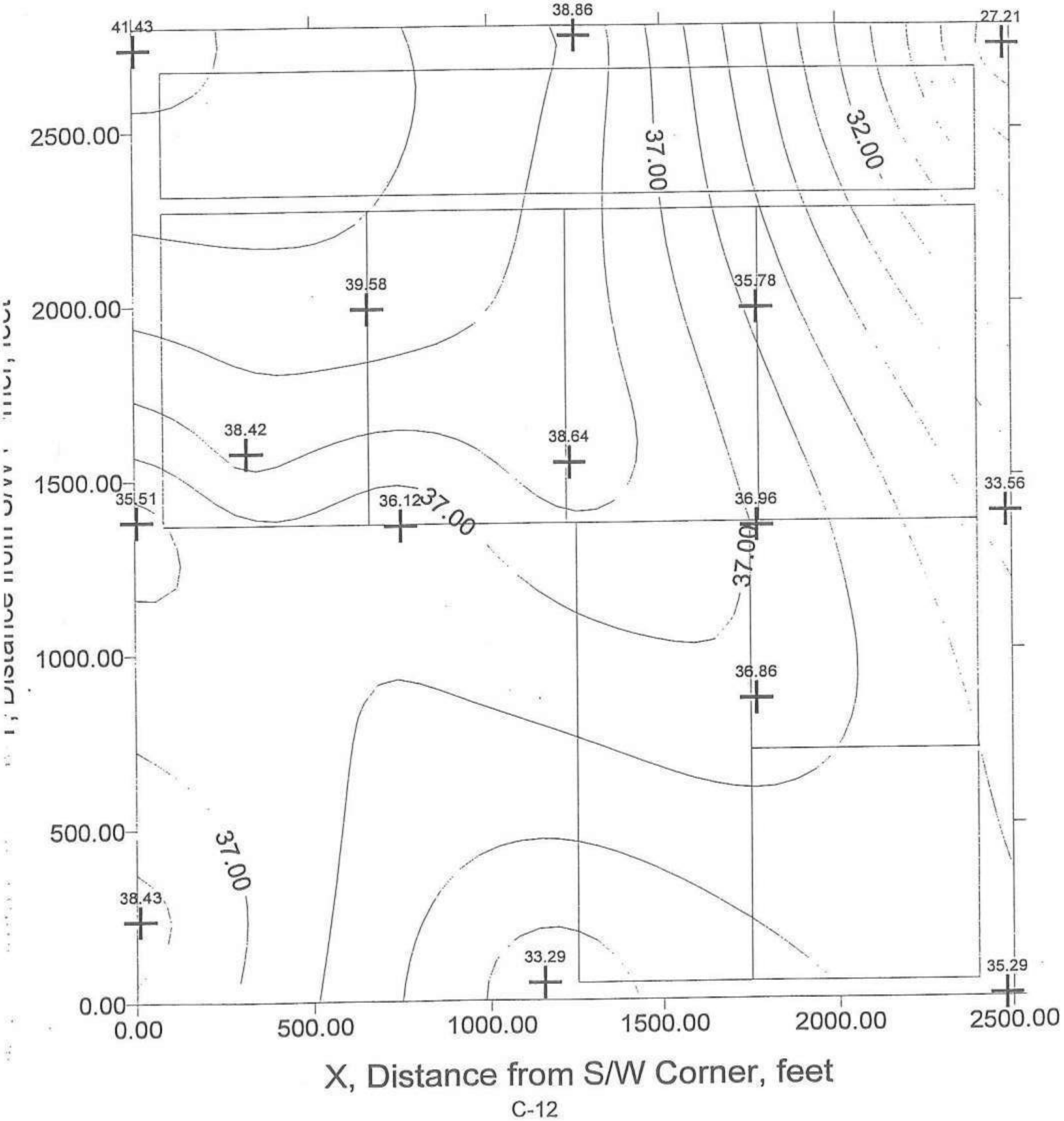
City of Kingsville, TX
MSWLF GW Levels
10-28-97



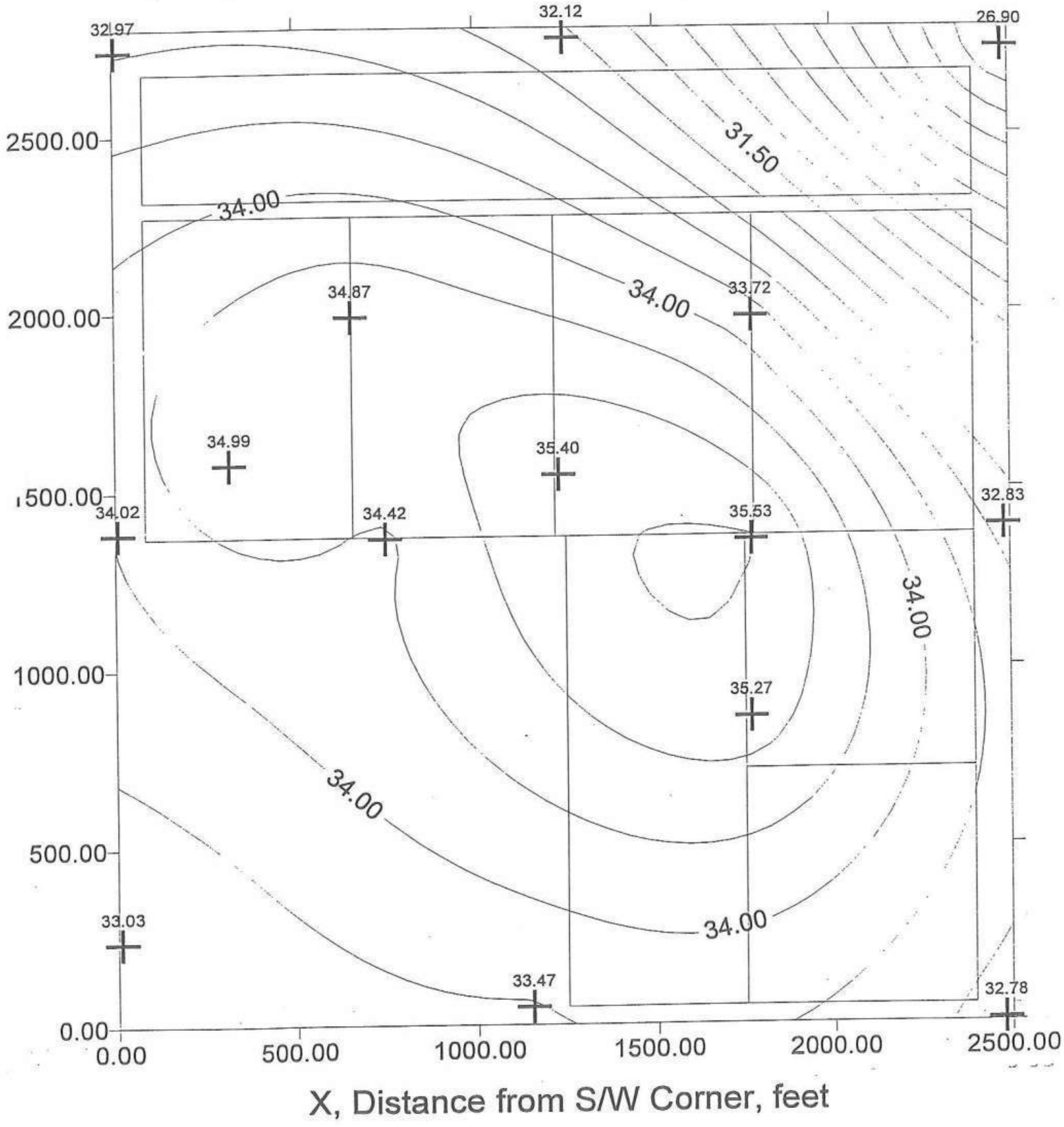
C-11

City of Kingsville, TX
MSWLF GW Levels
10-16-97

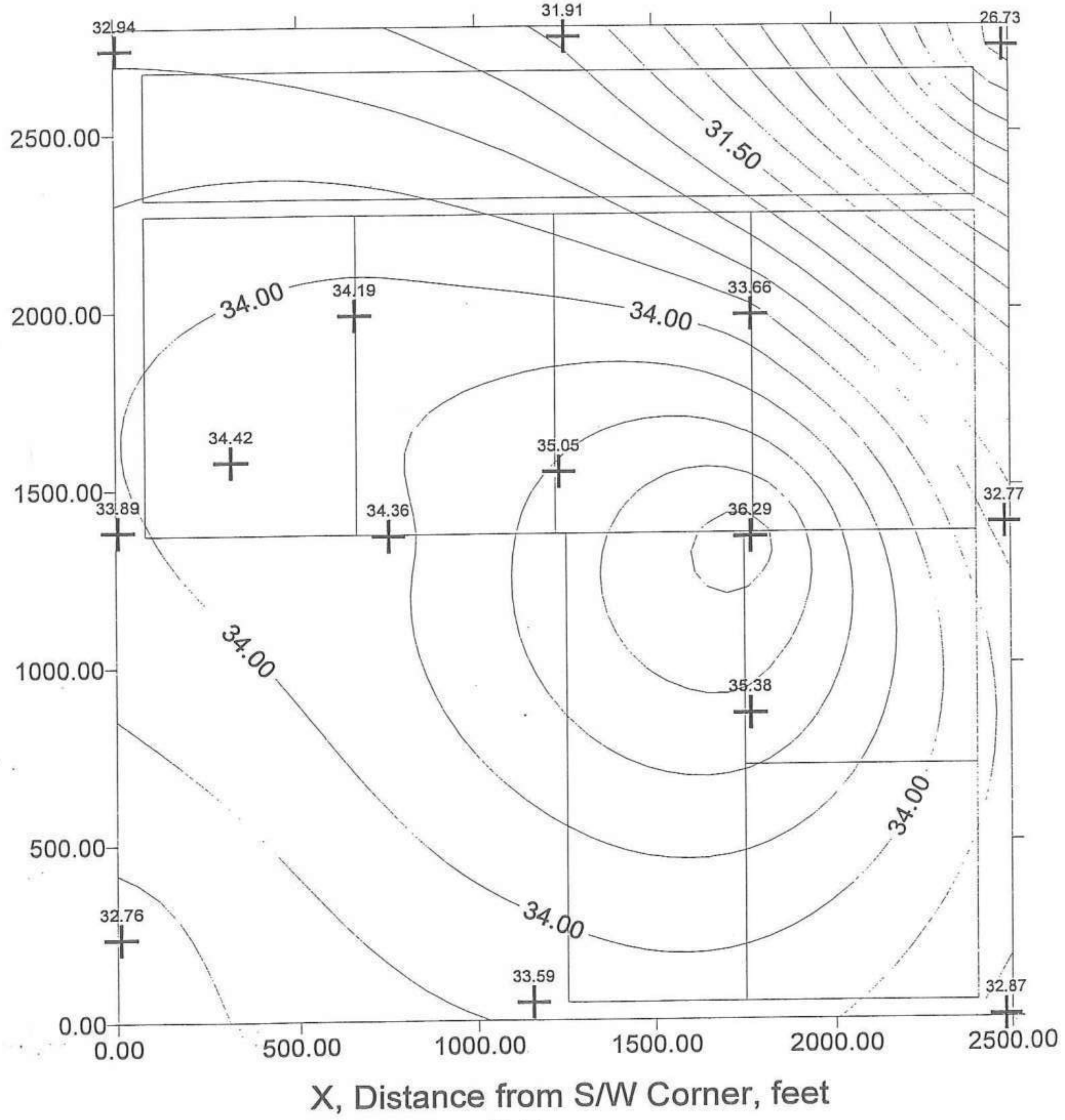


C-12

City of Kingsville, TX
MSWLF GW Levels
09-29-97



City of Kingsville, TX
MSWLF GW Levels
09-15-97



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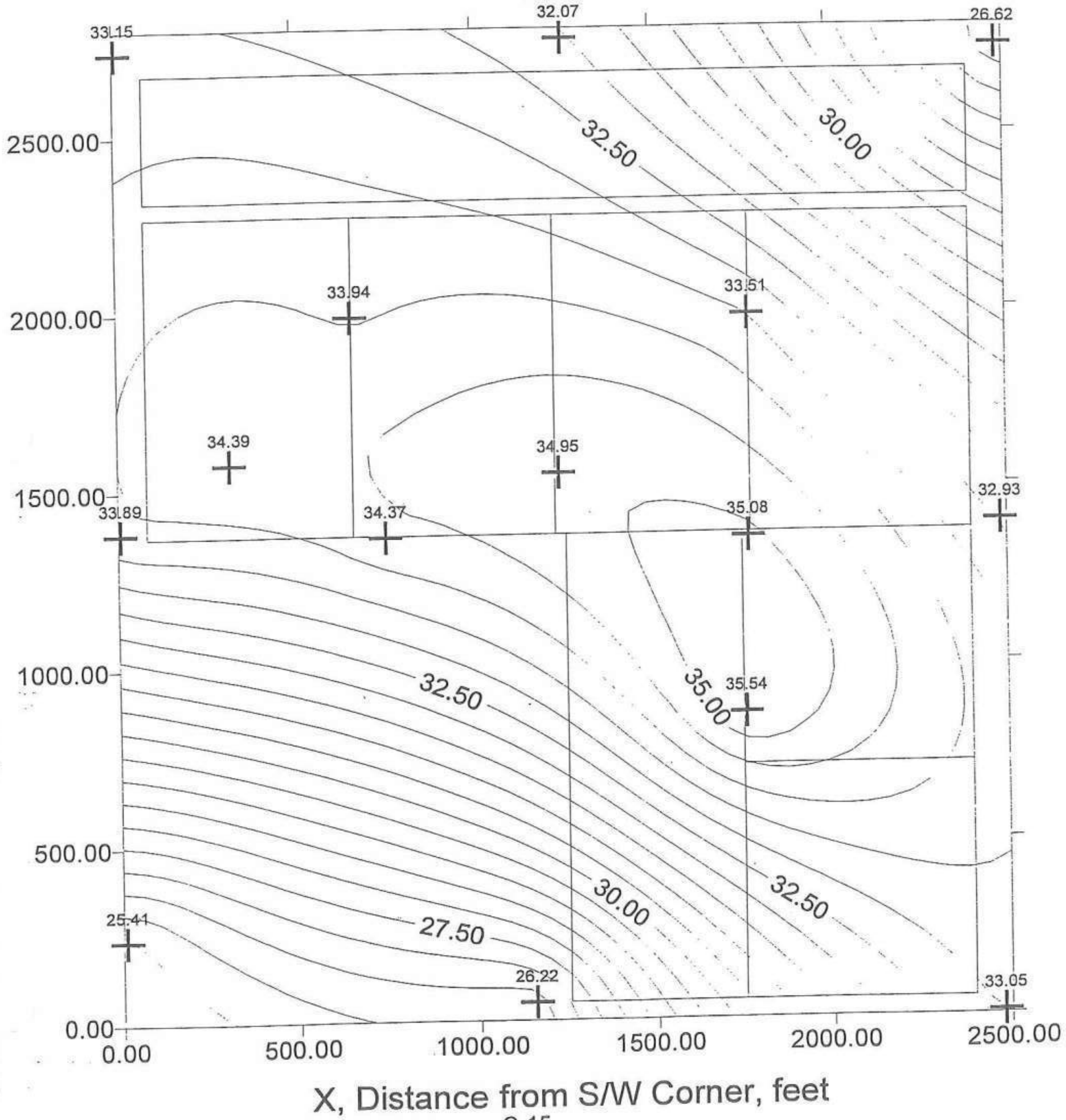
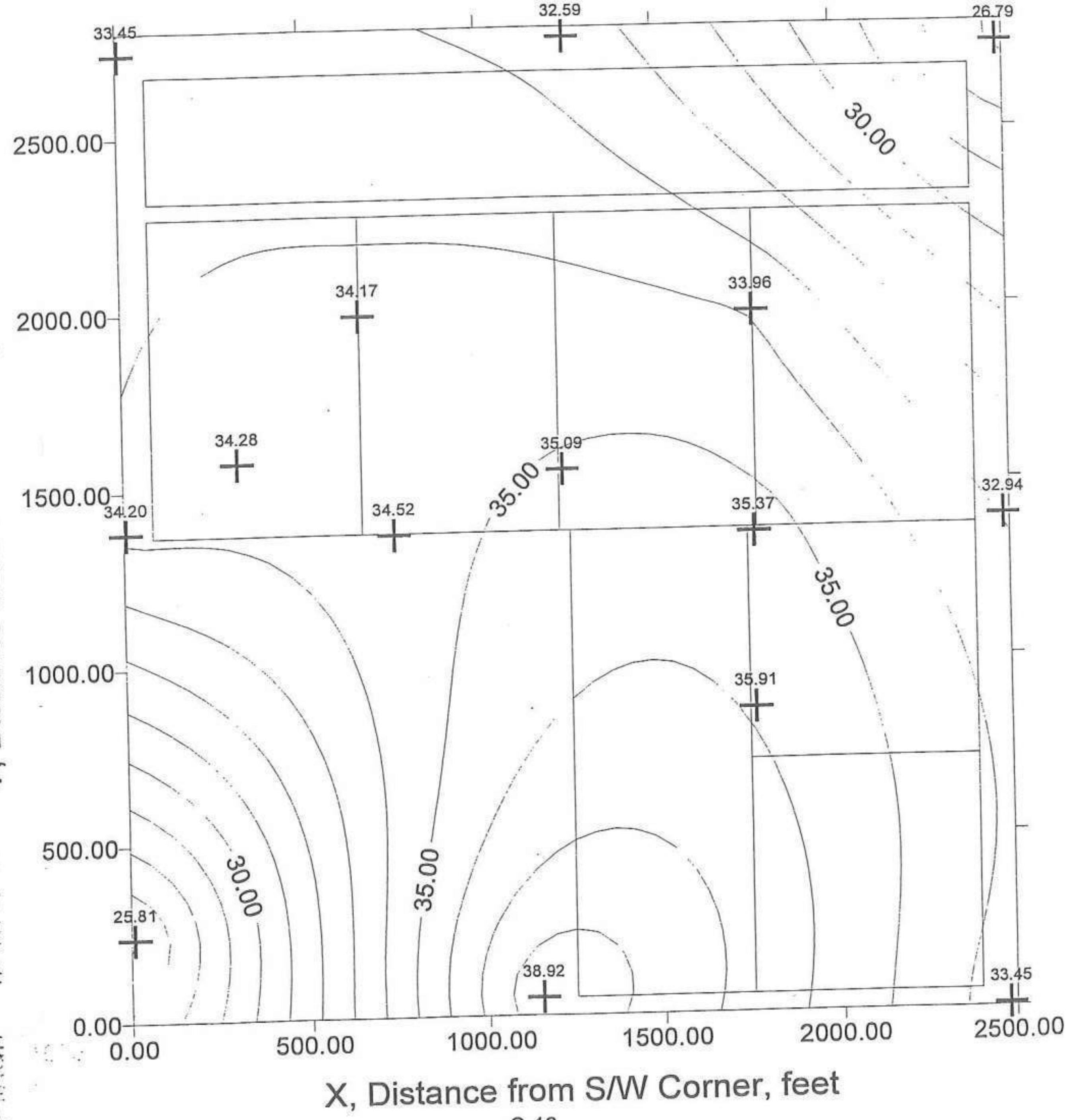
City of Kingsville, TX
MSWLF GW Levels
09-02-97



C-15

City of Kingsville, TX
MSWLF GW Levels
08-18-97



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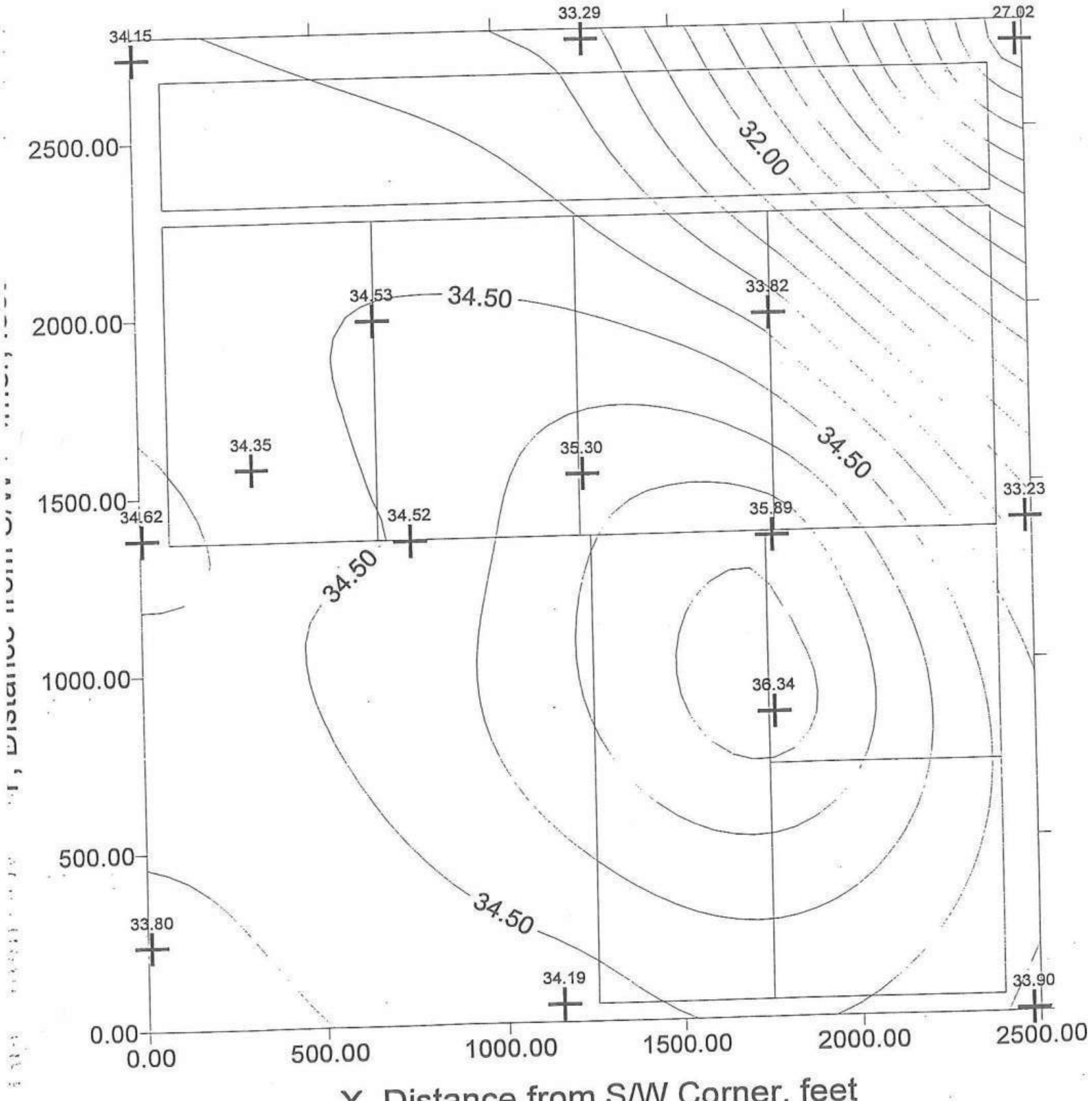
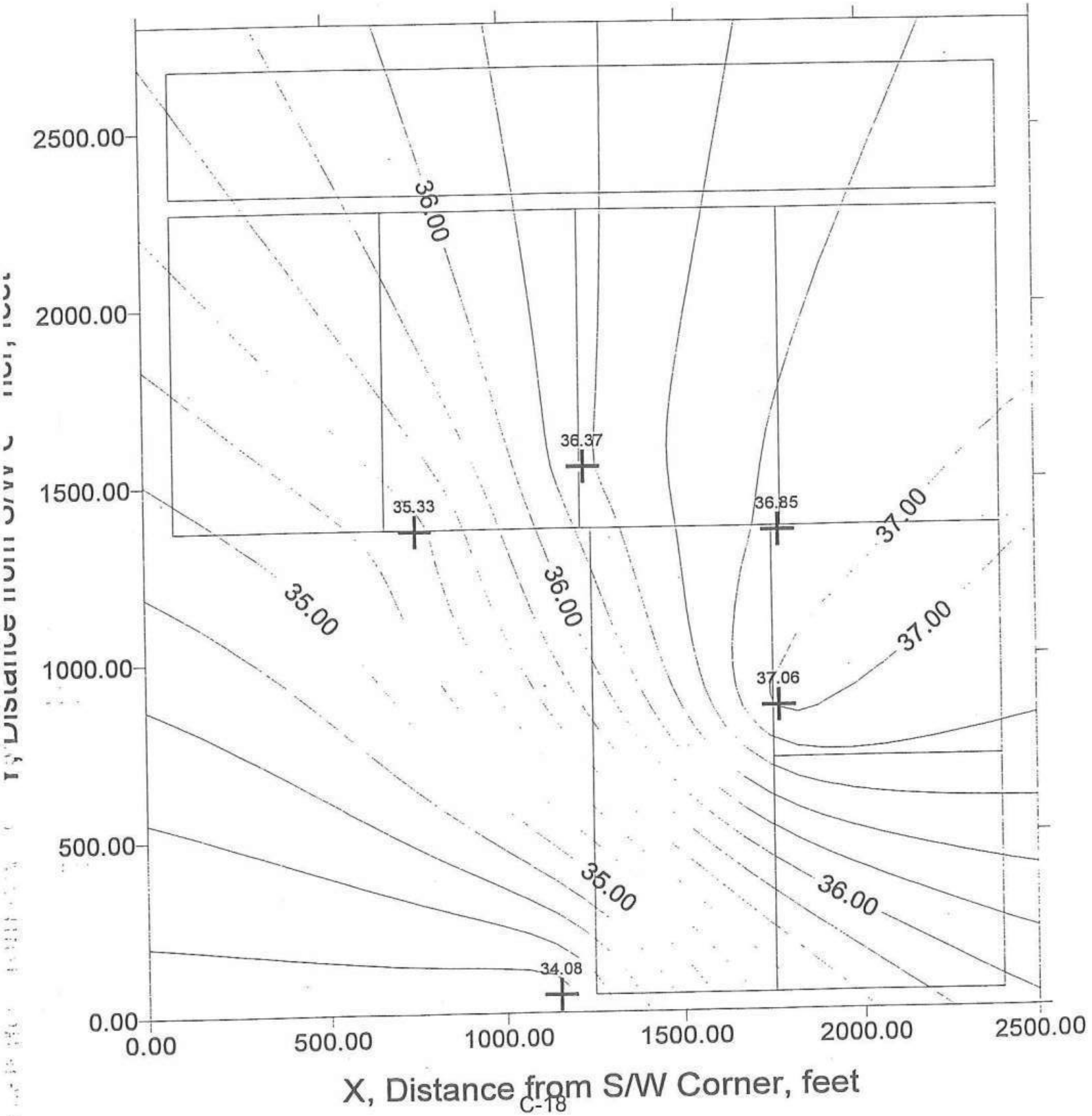
City of Kingsville, TX
MSWLF GW Levels
08-04-97

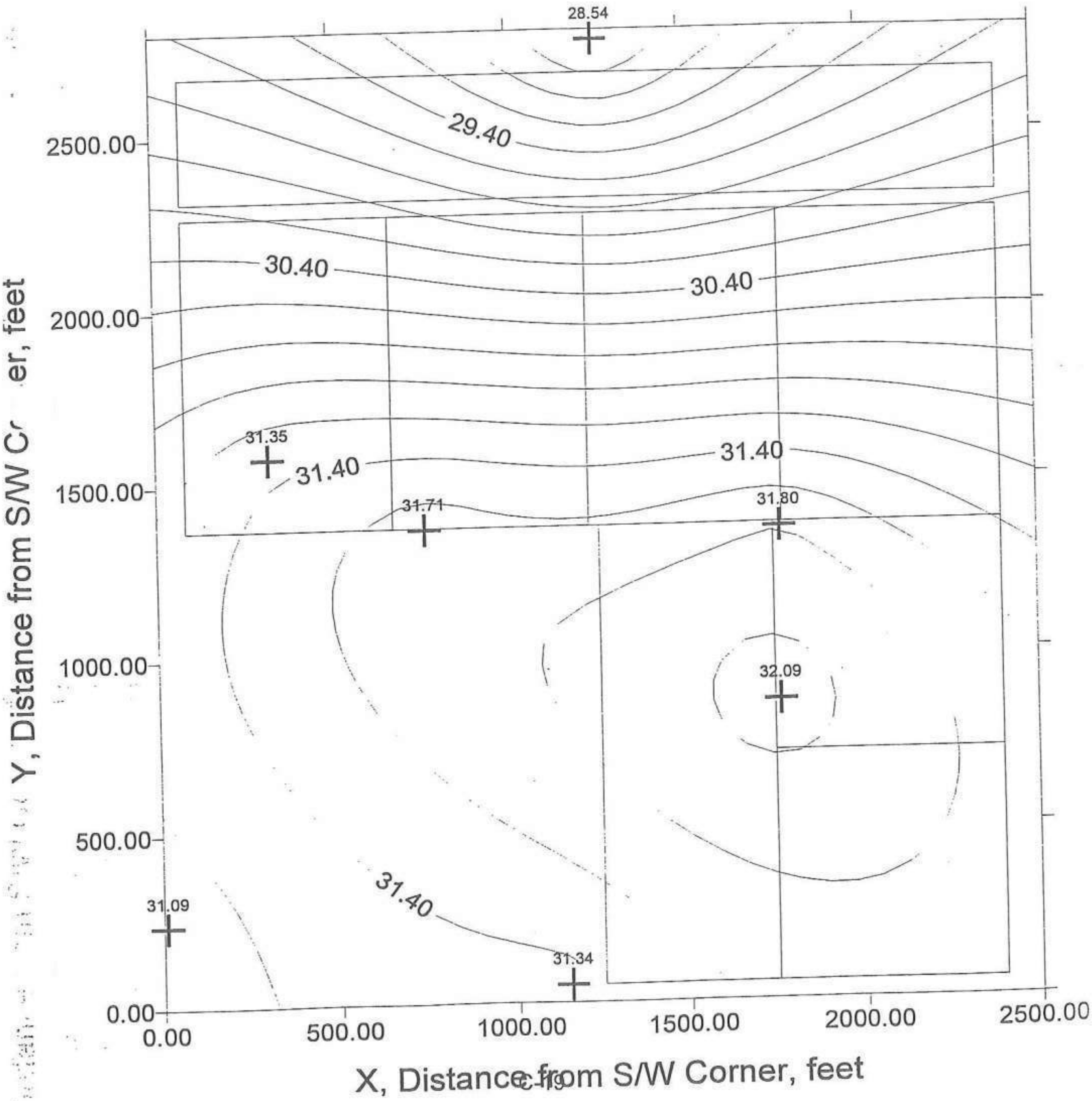


C-17

City of Kingsville
MSWLF GW Levels
06-25-97

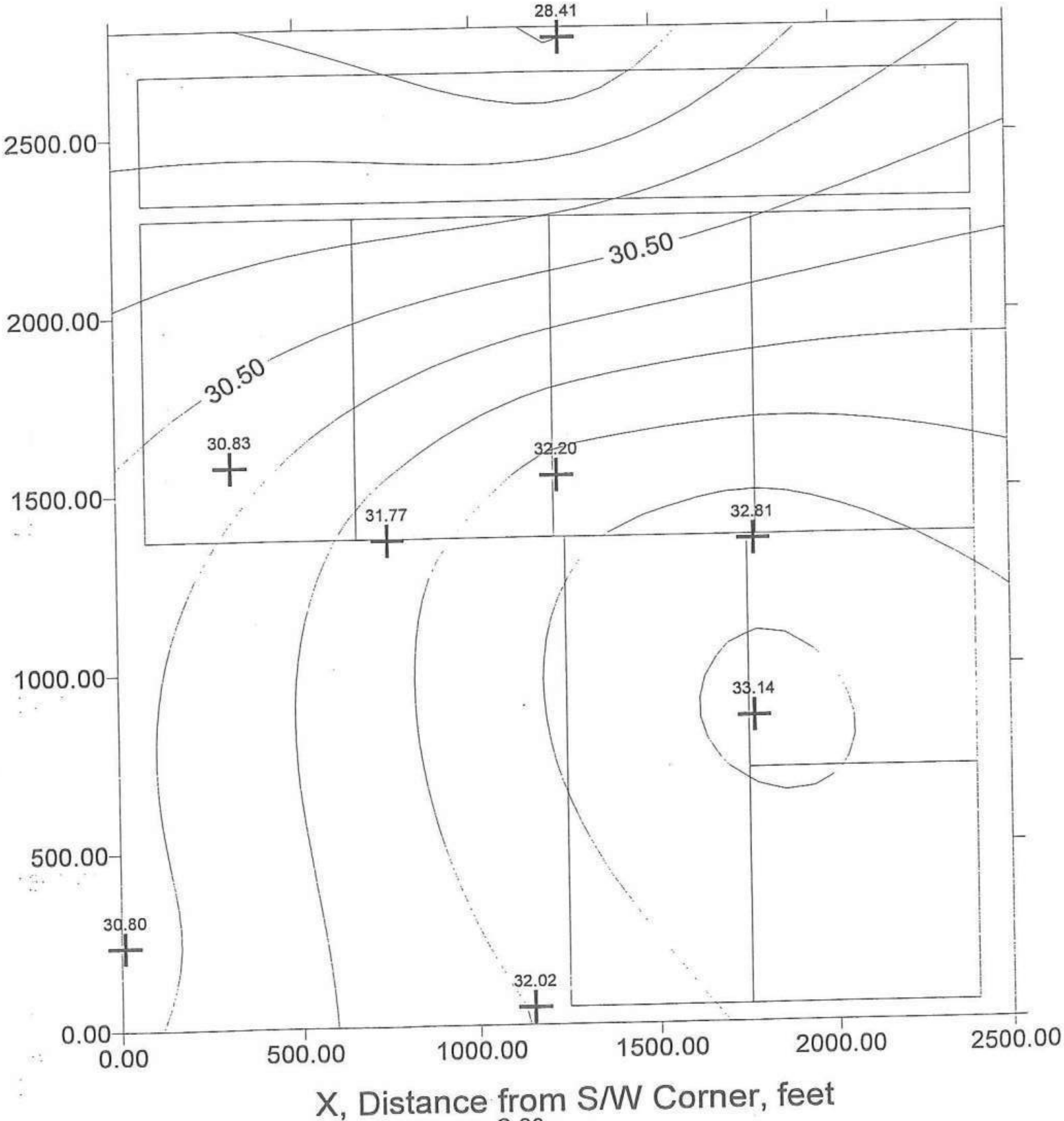


City of Kingsville, TX
MSWLF GW Levels
03-20-97



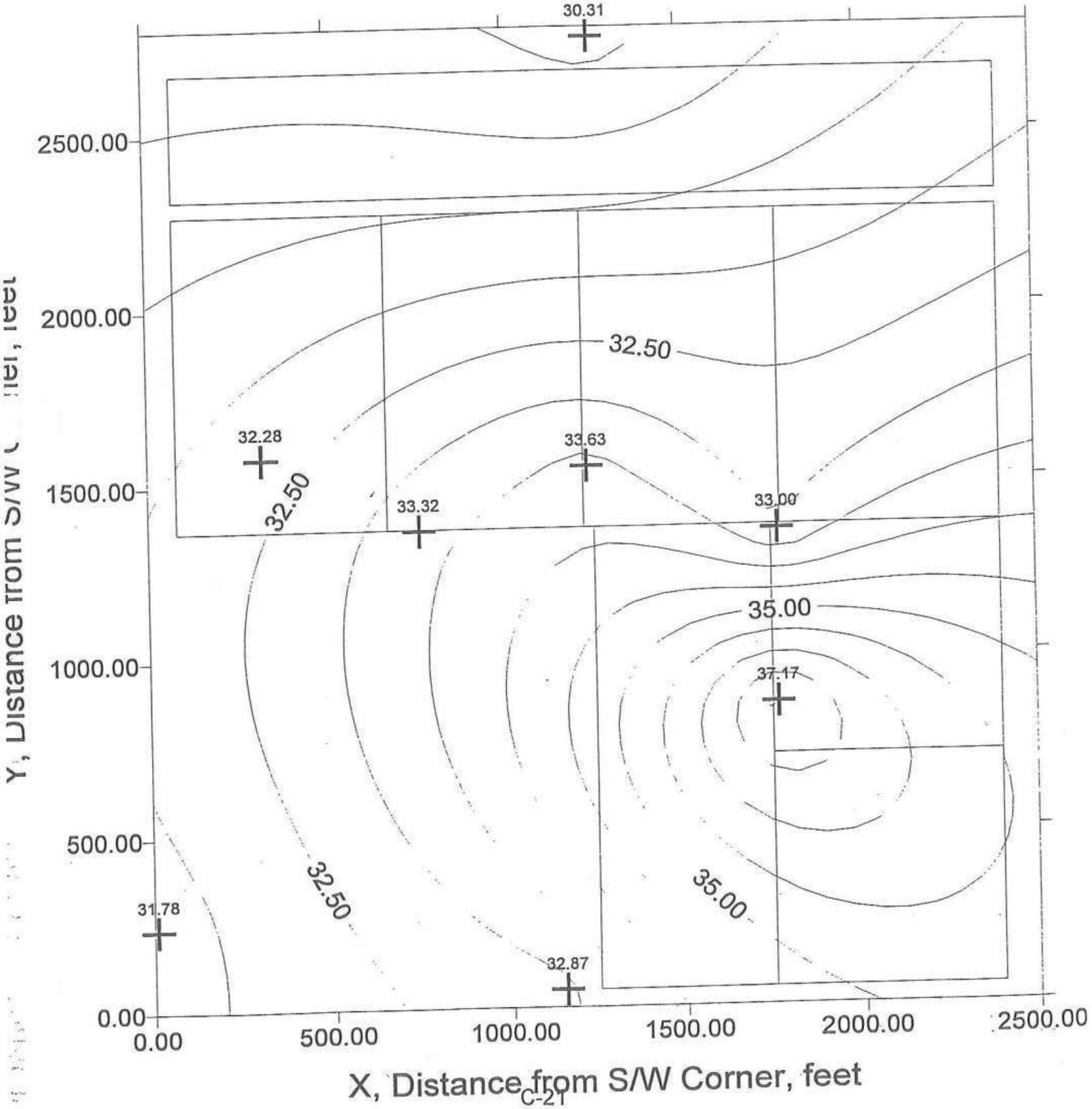
C-19

City of Kingsville, TX
MSWLF GW Levels
12-23-96

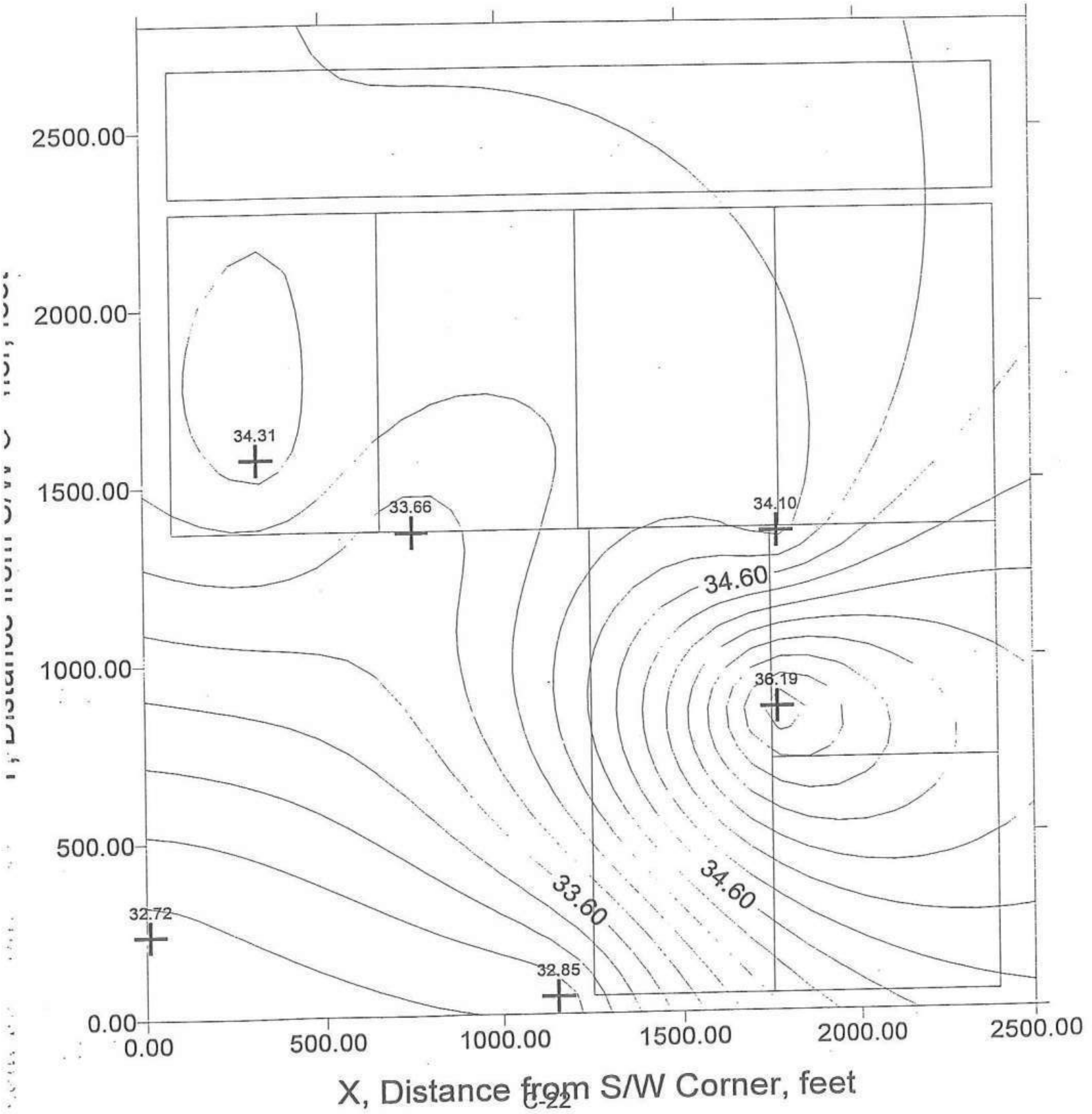


C-20

City of Kingsville, TX
MSWLF GW Levels
07-11-96



City of Kingsville, TX
MSWLF GW Levels
05-10-95



City of Kingsville, TX
MSWLF GW Levels
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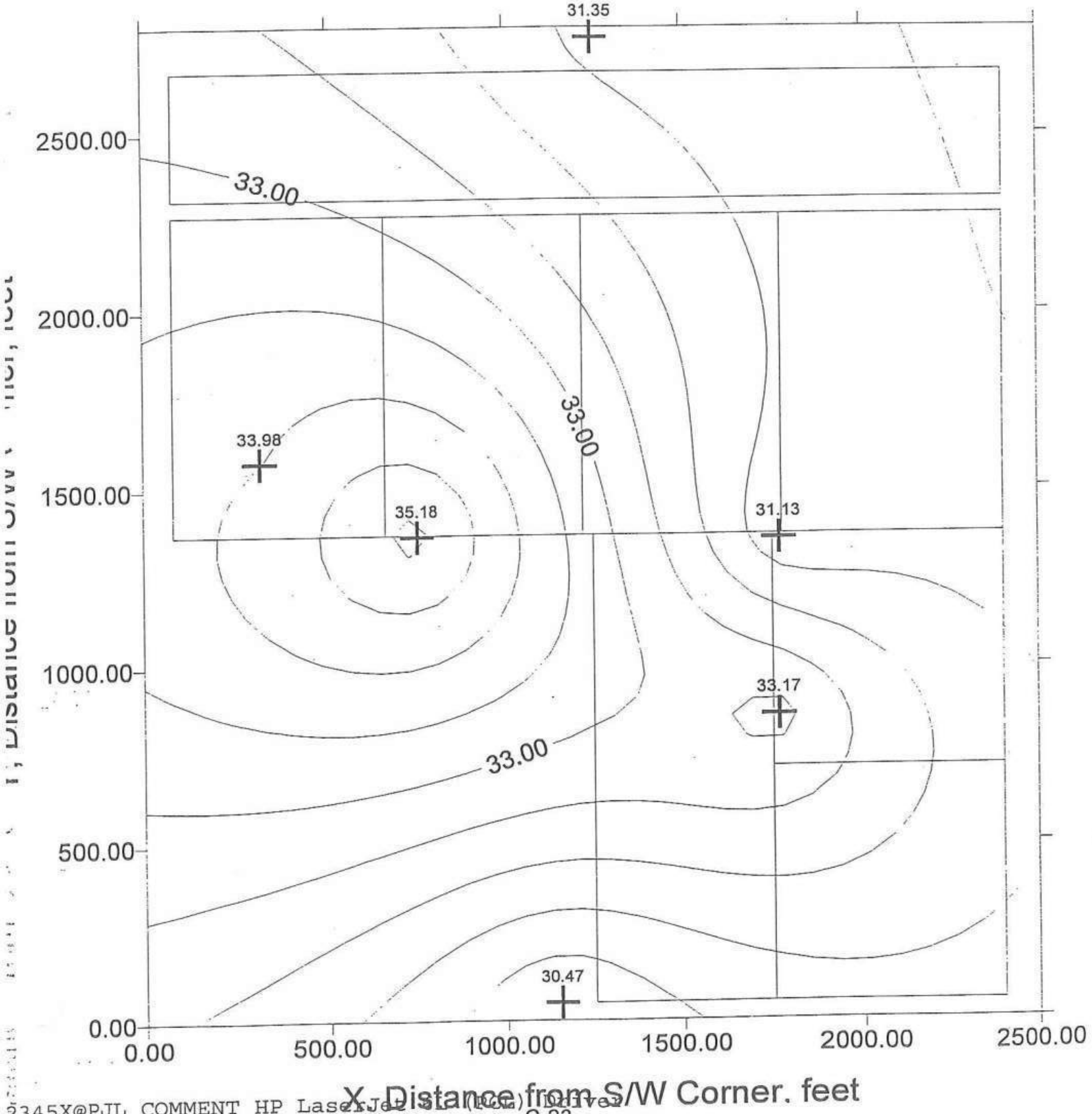
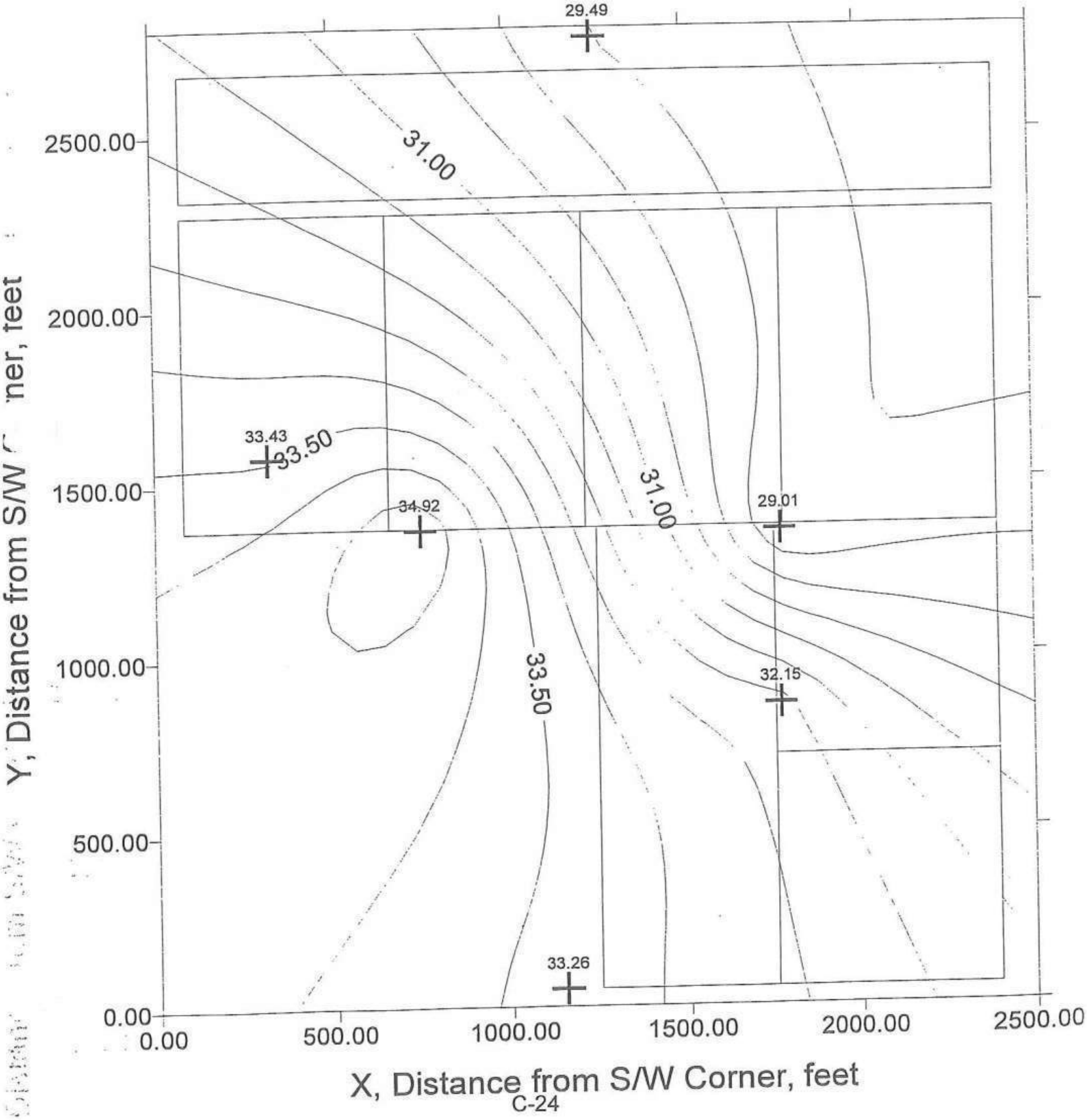


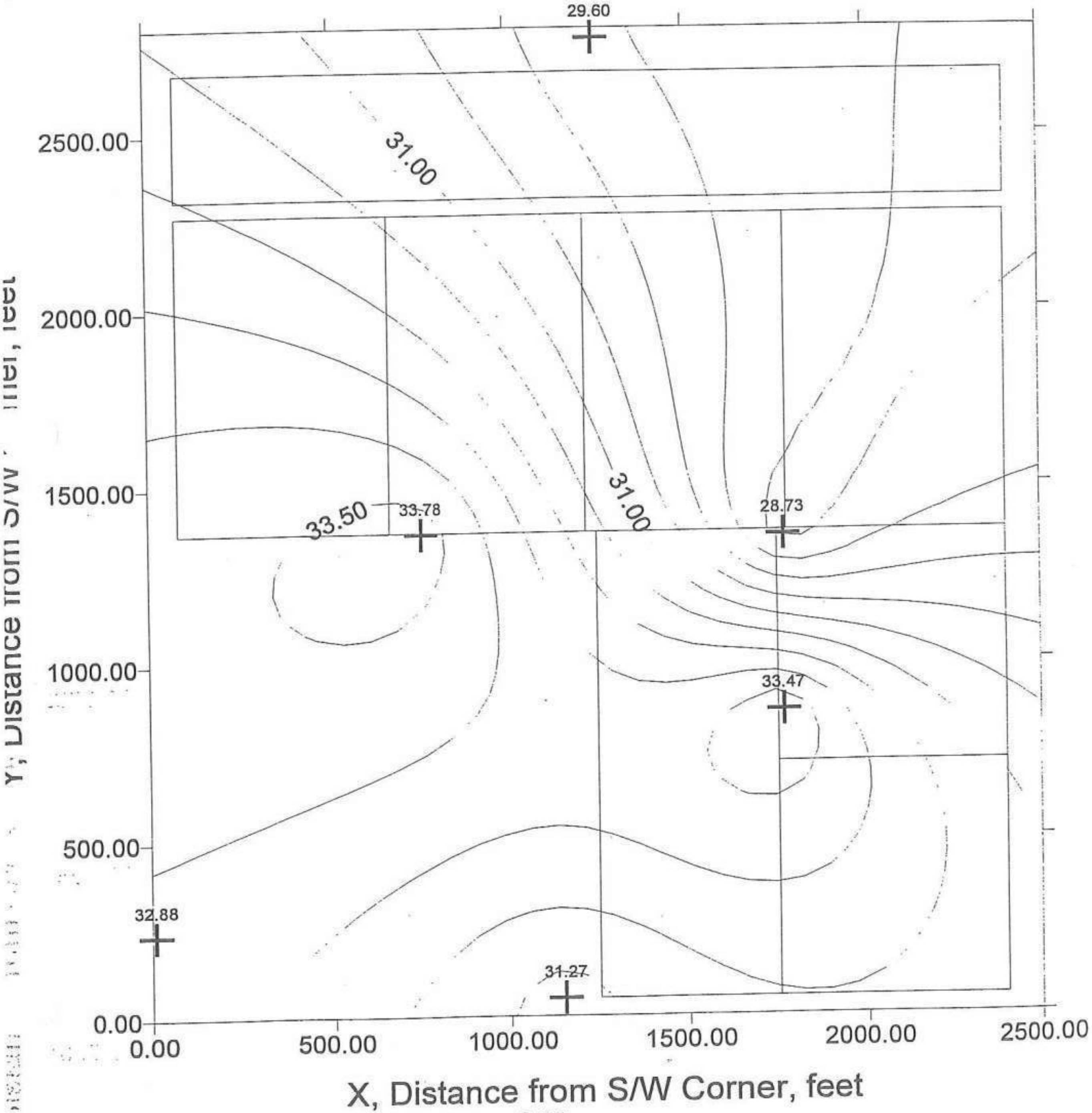
2345X@PJL COMMENT HP LaserJet 4L (PCL) Driver

City of Kingsville, TX
MSWLF GW Levels
04-05-93



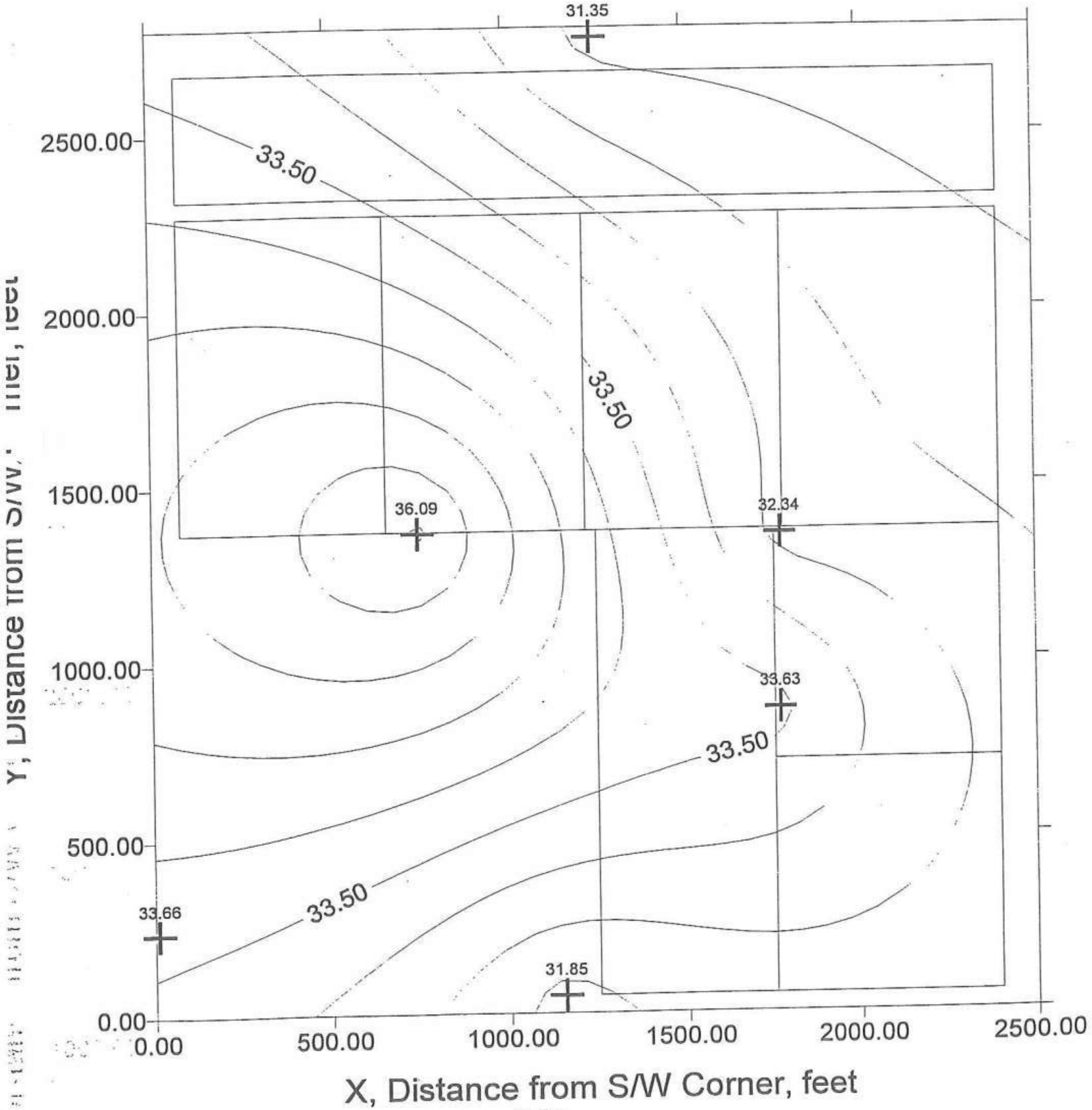
C-24

City of Kingsville, TX
MSWLF GW Levels
09-28-92



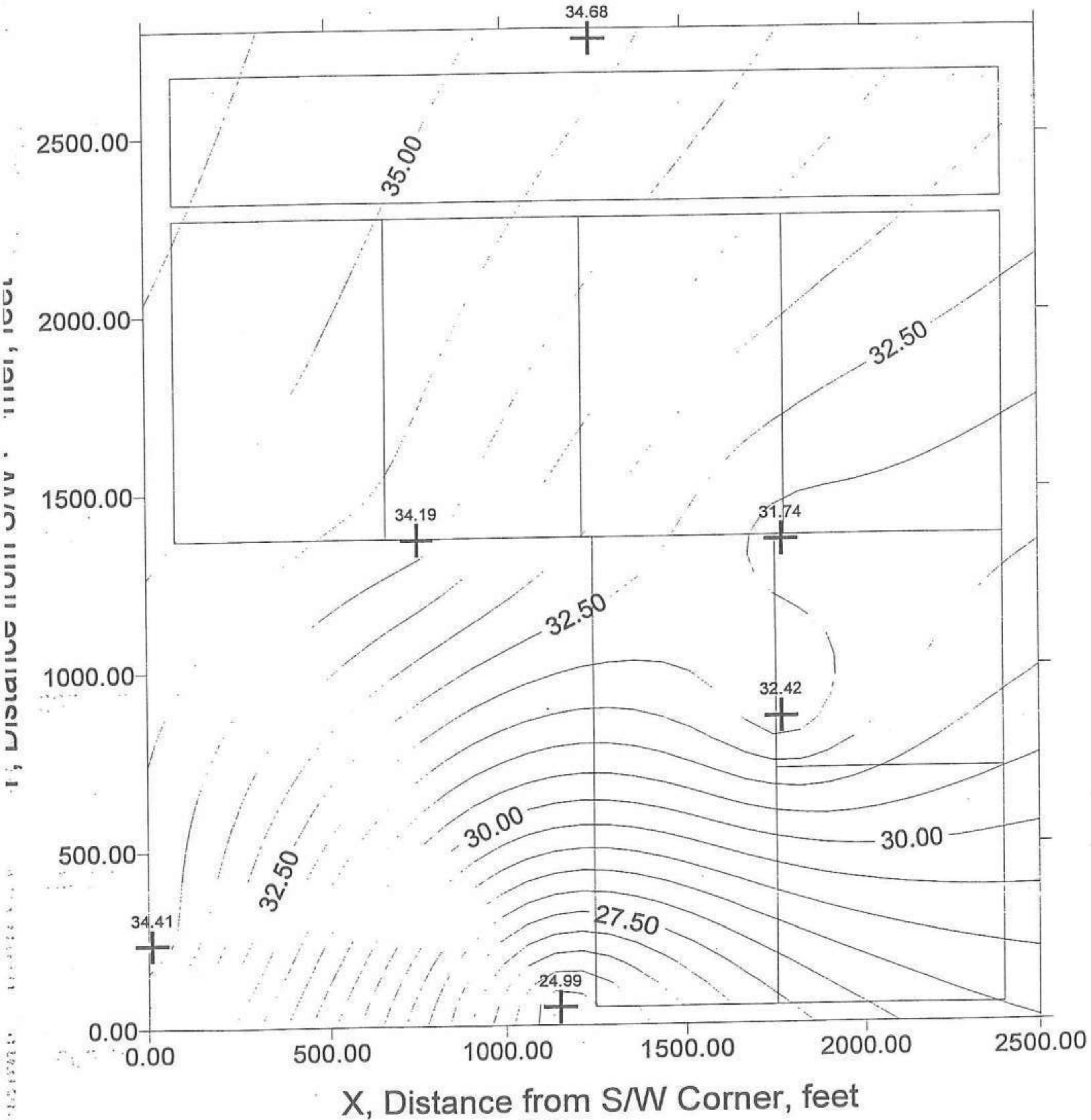
C-25

City of Kingsville, TX
MSWLF GW Levels
08-11-92



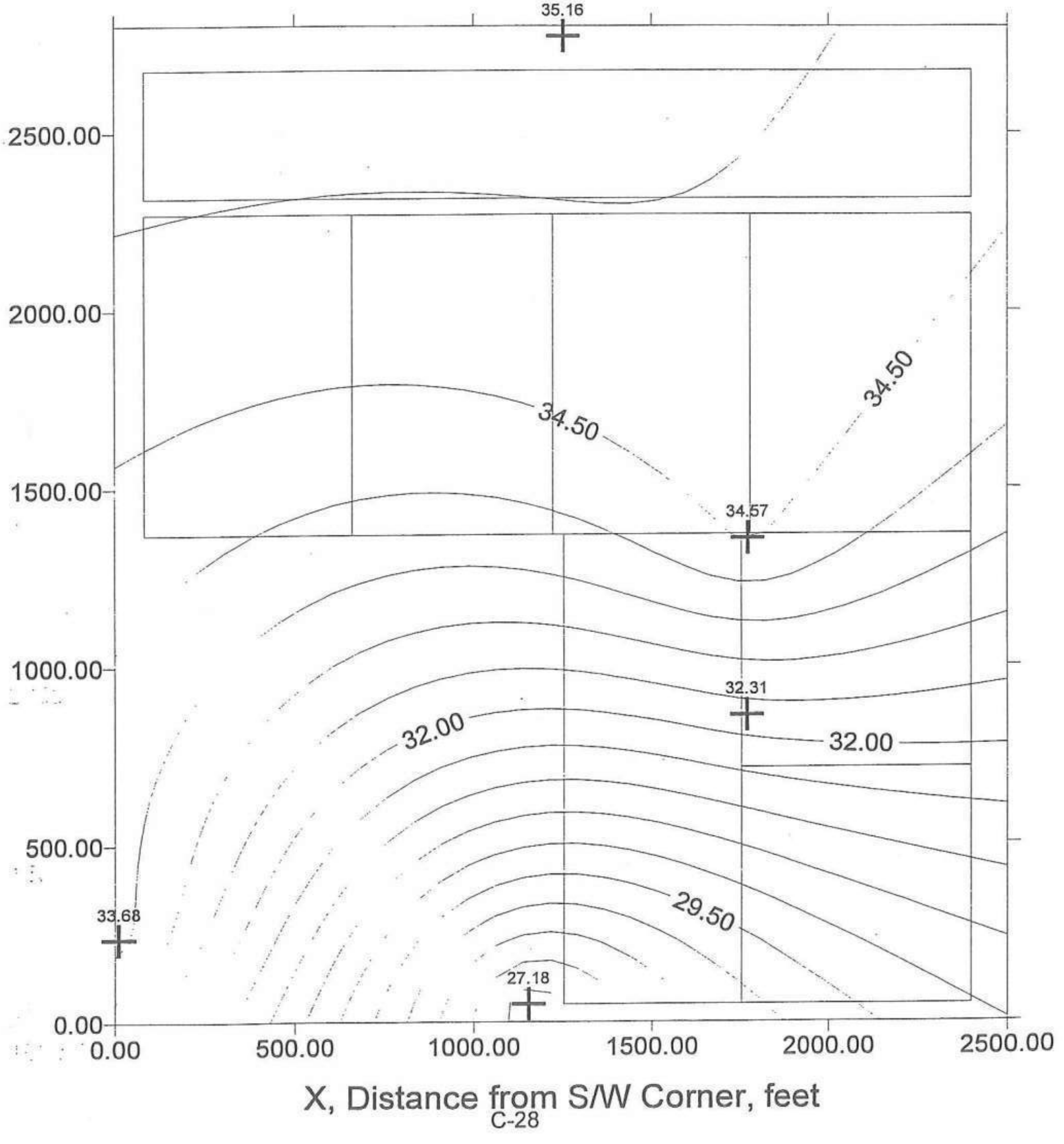
C-26

City of Kingsville, TX
MSWLF GW Levels
04-14-92



C-27

City of Kingsville, TX
MSWLF GW Levels
08-08-91



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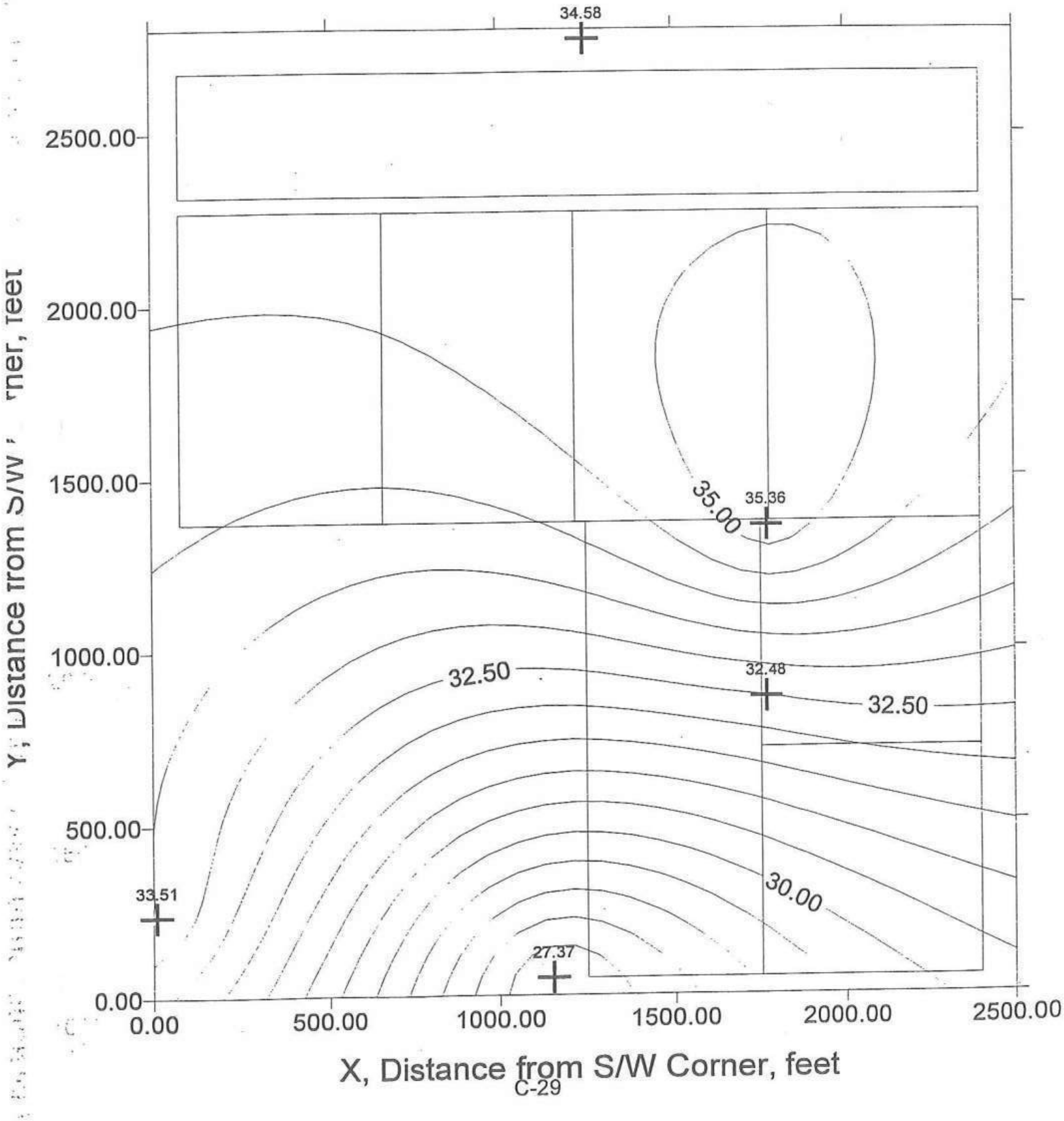
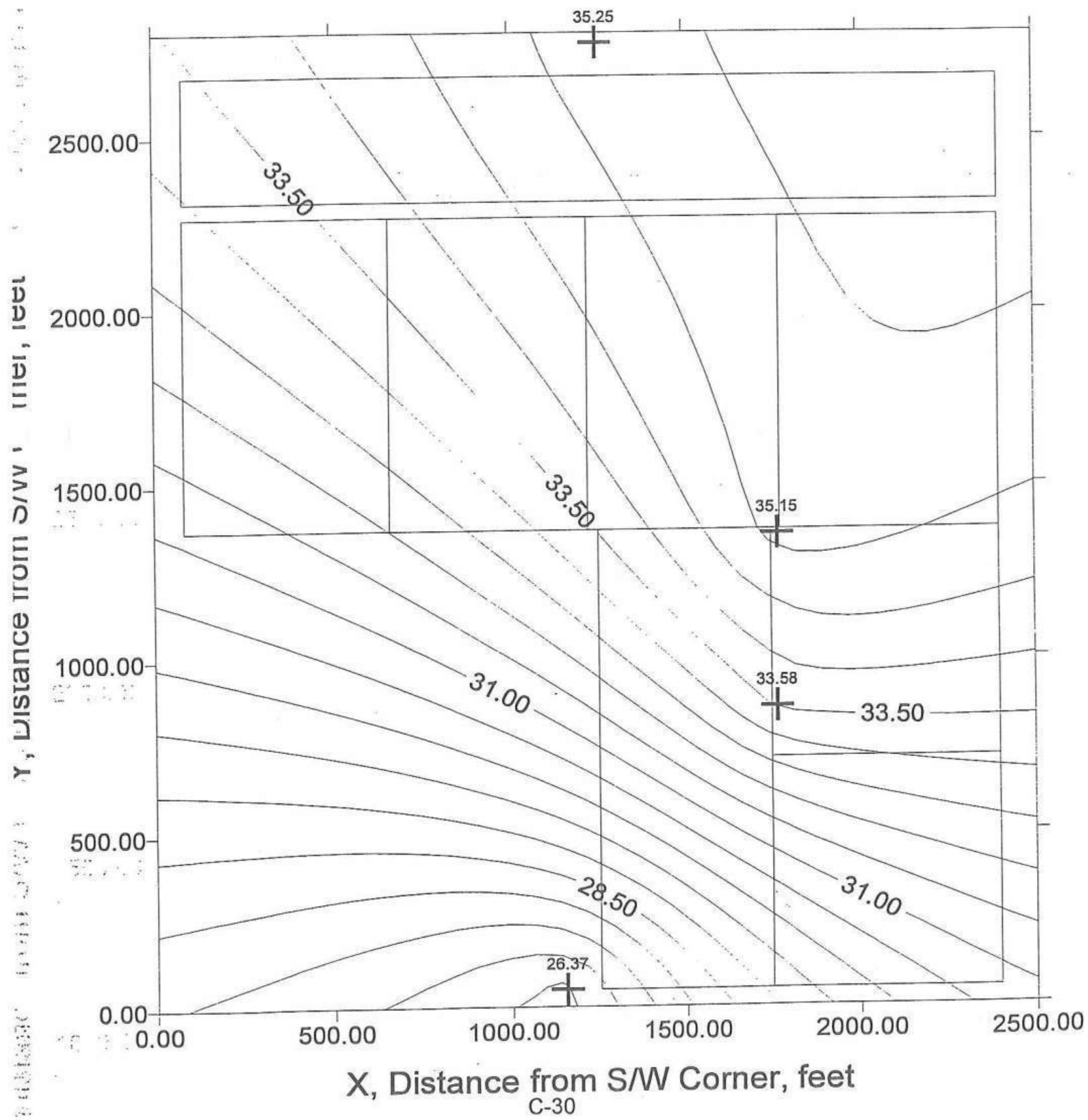
City of Kingsville, TX
MSWLF GW Levels
07-30-91



C-29

City of Kingsville, TX
MSWLF GW Levels
03-29-91



C-30

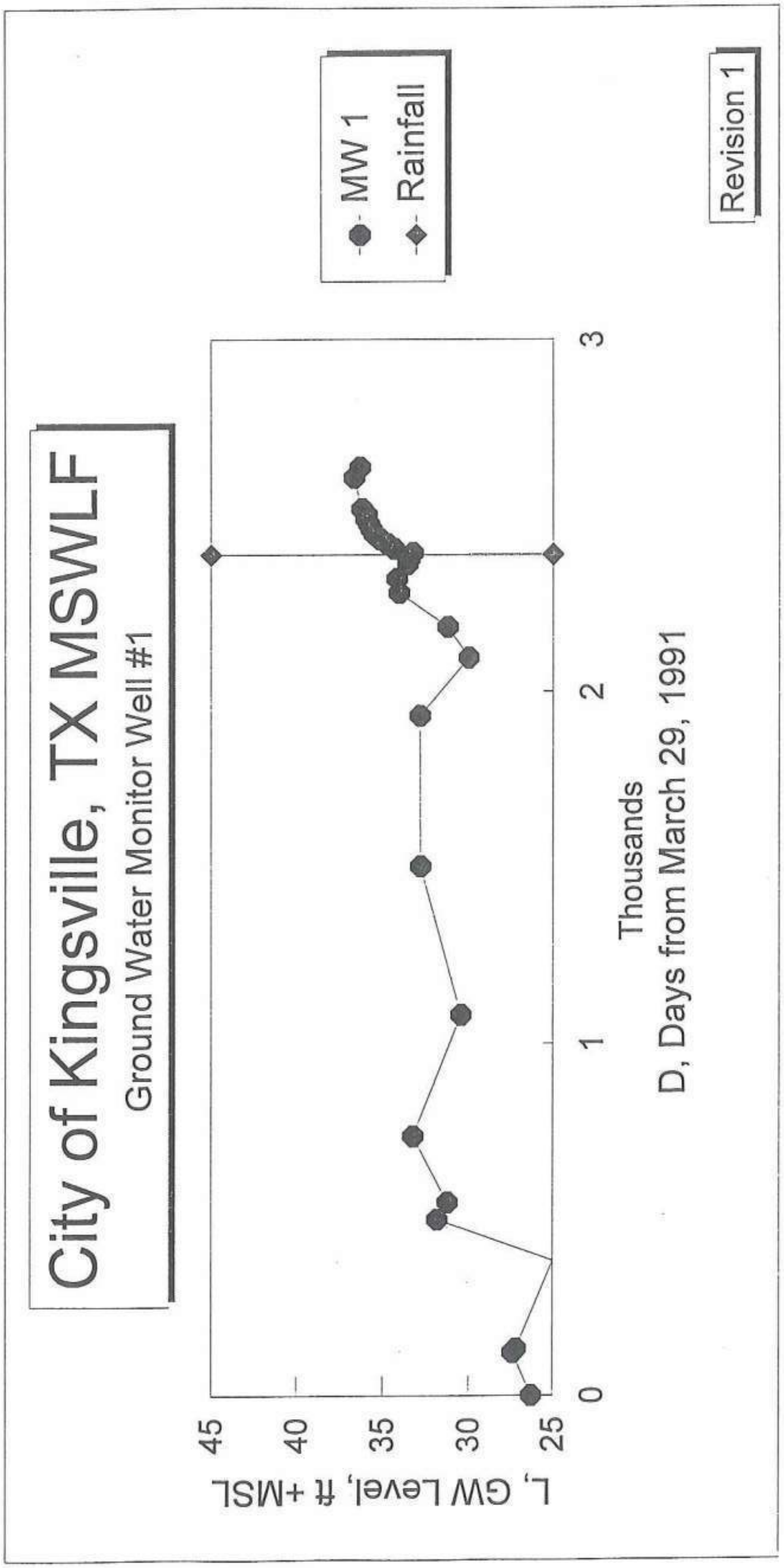
APPENDIX D

APPENDIX D

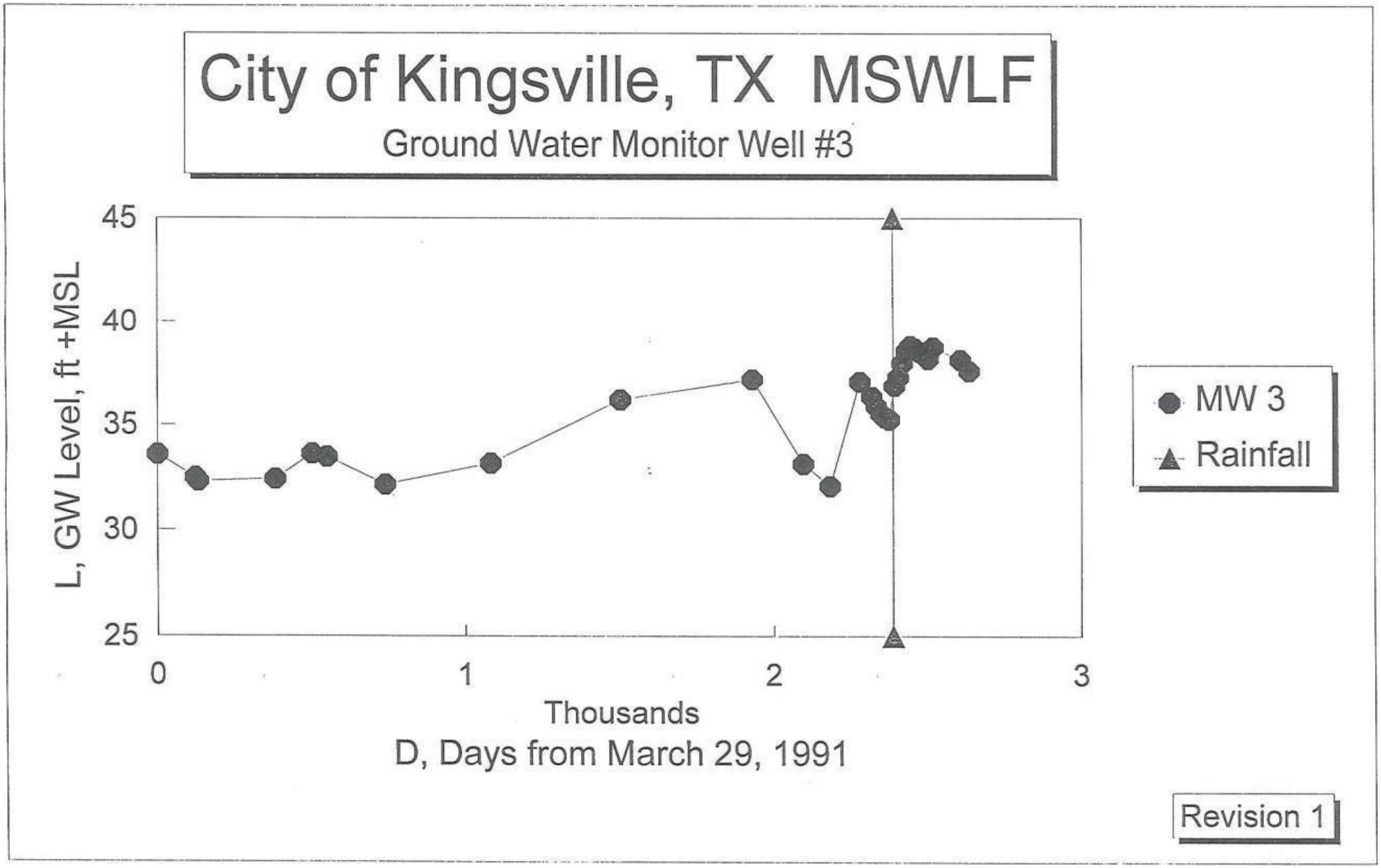
Hydrographs

November 1997

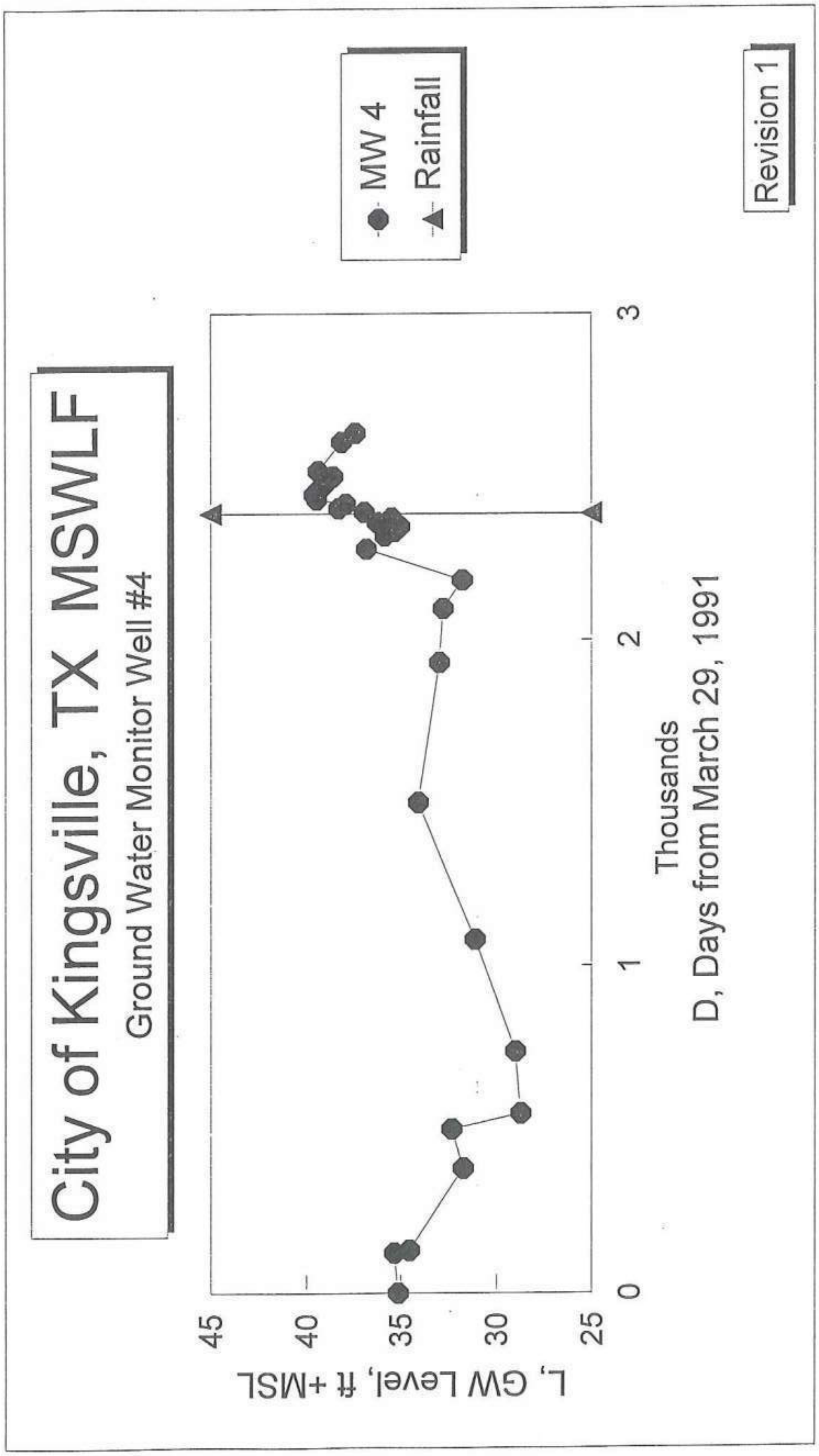
Revision 1 - June 1998


City of Kingsville, TX MSWLF
Ground Water Monitor Well #1
MW 1
Rainfall
Revision 1
L, GW Level, ft +MSL
45
40
35
30
25
0
1
2
3
Thousands
D, Days from March 29, 1991

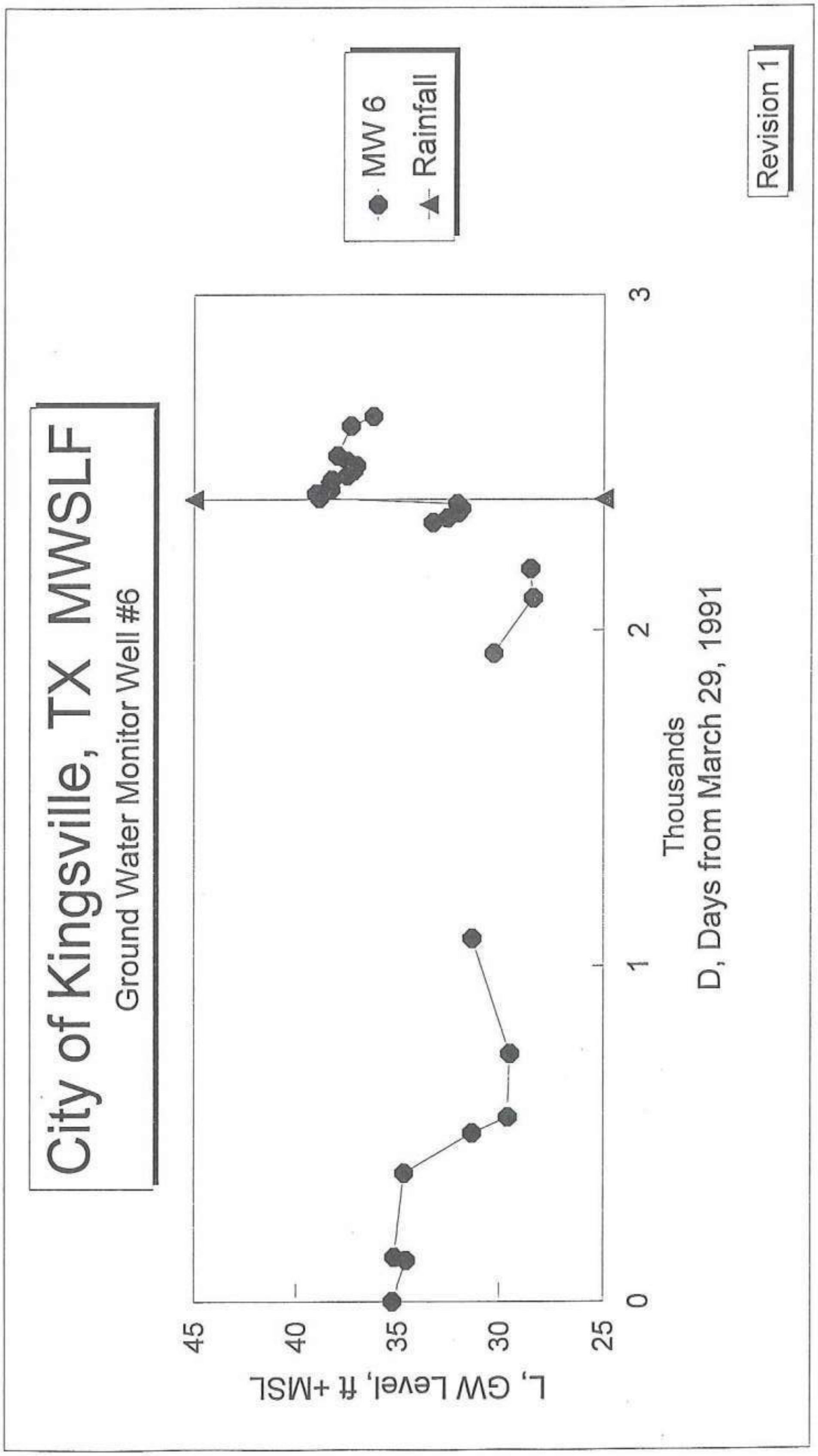
D-1

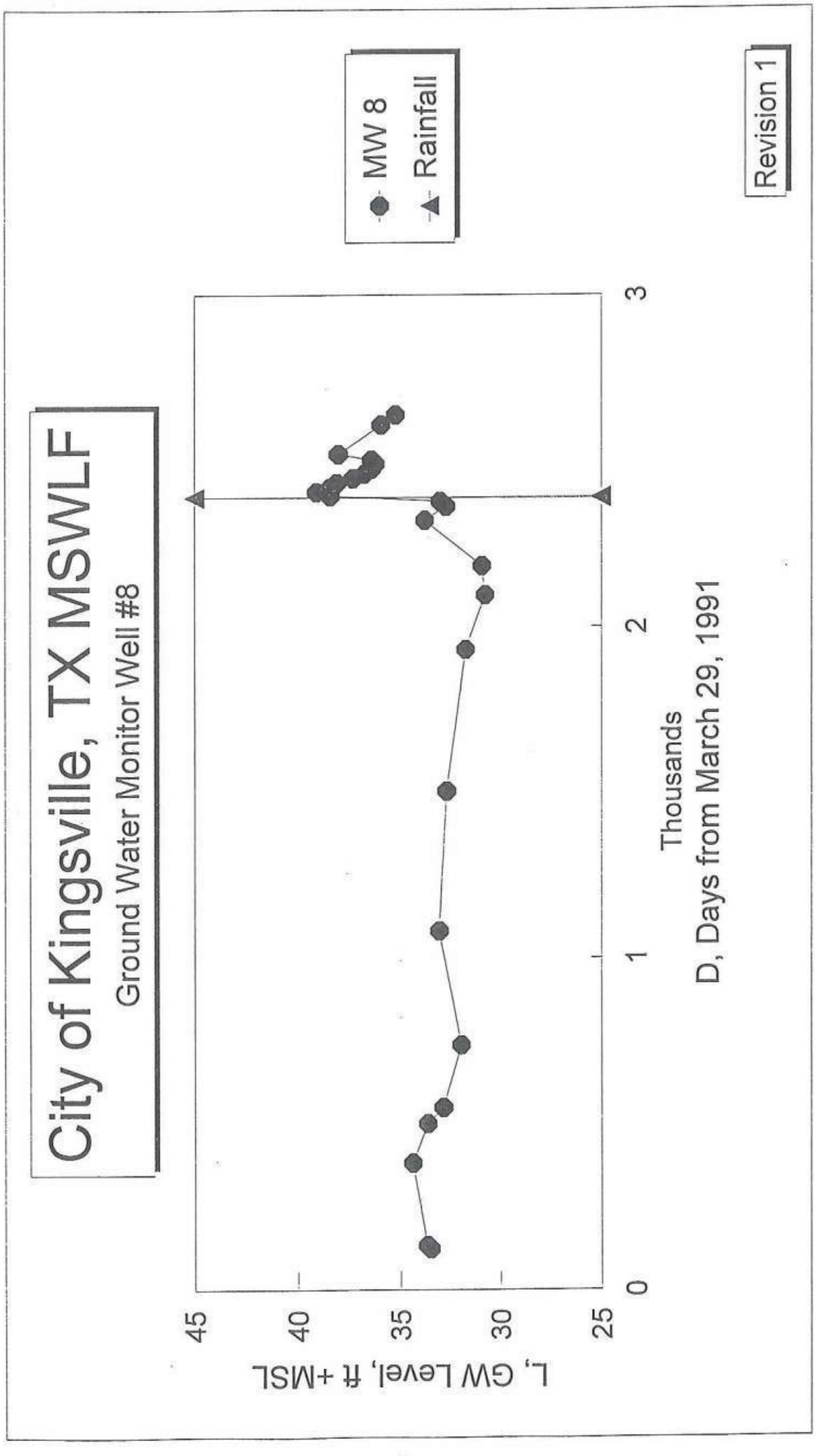

City of Kingsville, TX MSWLF
Ground Water Monitor Well #3
L, GW Level, ft +MSL
45
40
35
30
25
0
1
2
3
Thousands
D, Days from March 29, 1991
MW 3
Rainfall
Revision 1

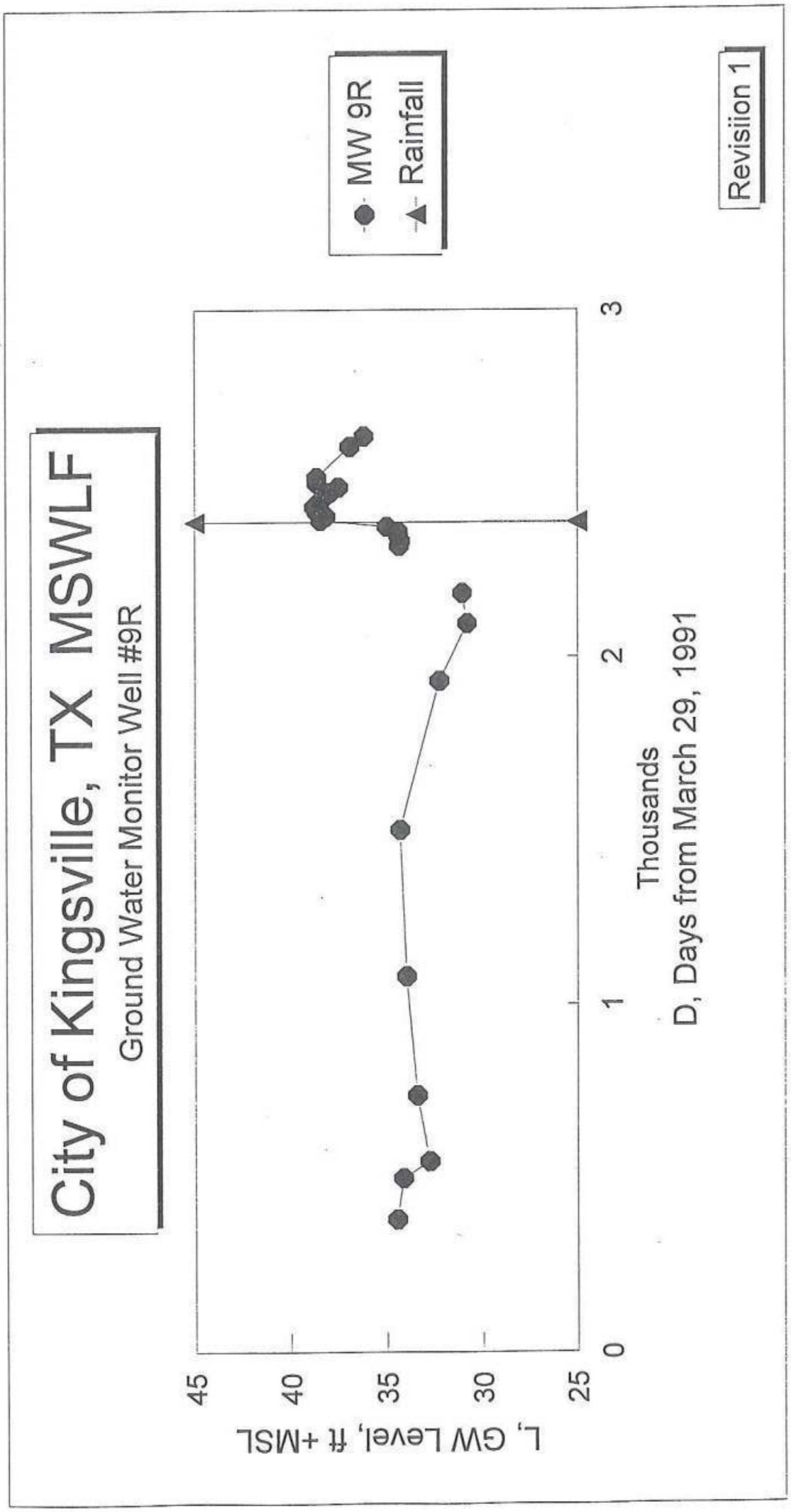
D-2


City of Kingsville, TX MSWLF
Ground Water Monitor Well #4
MW 4
Rainfall
Revision 1
L, GW Level, ft +MSL
45
40
35
30
25
0
1
2
3
Thousands
D, Days from March 29, 1991

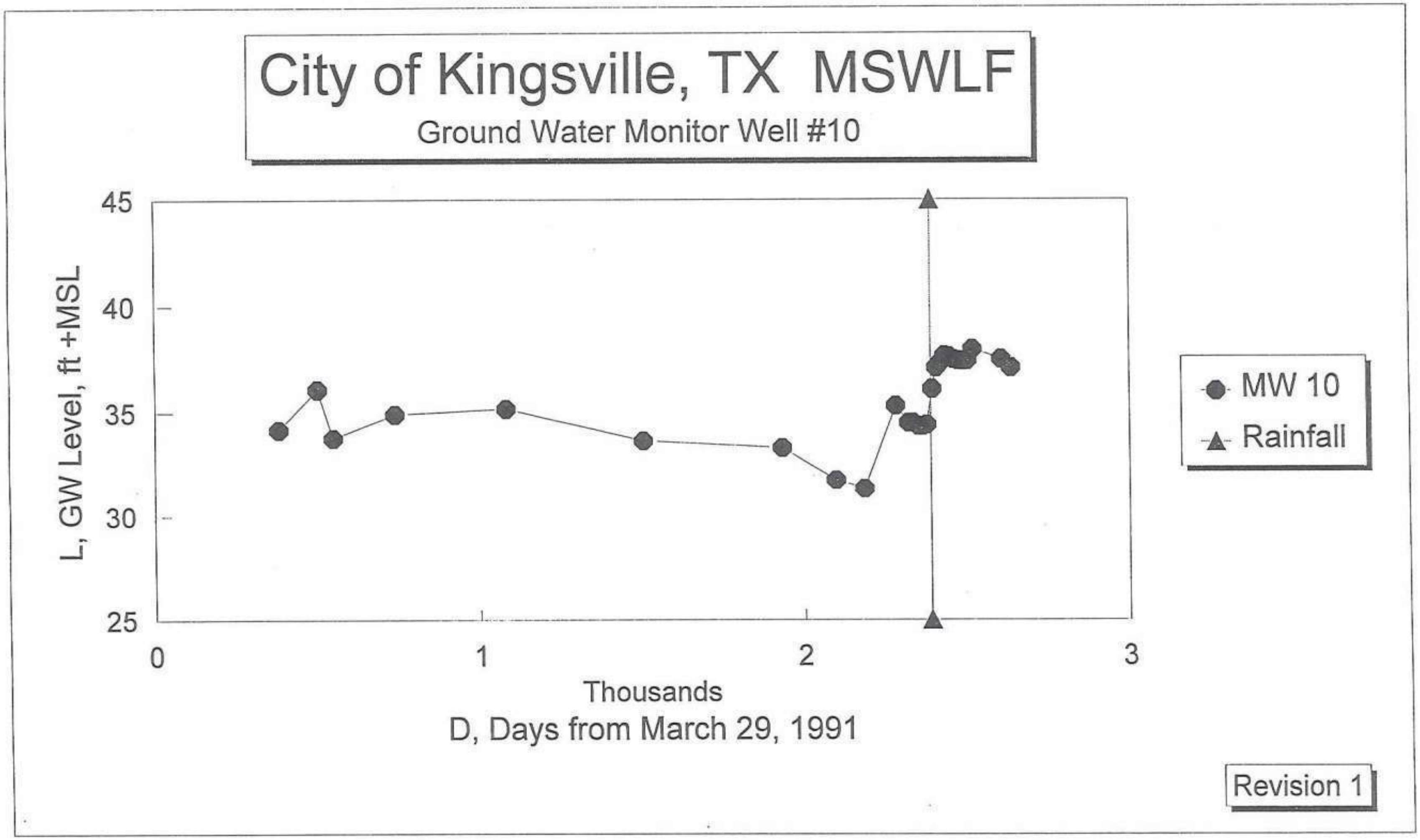
D-3

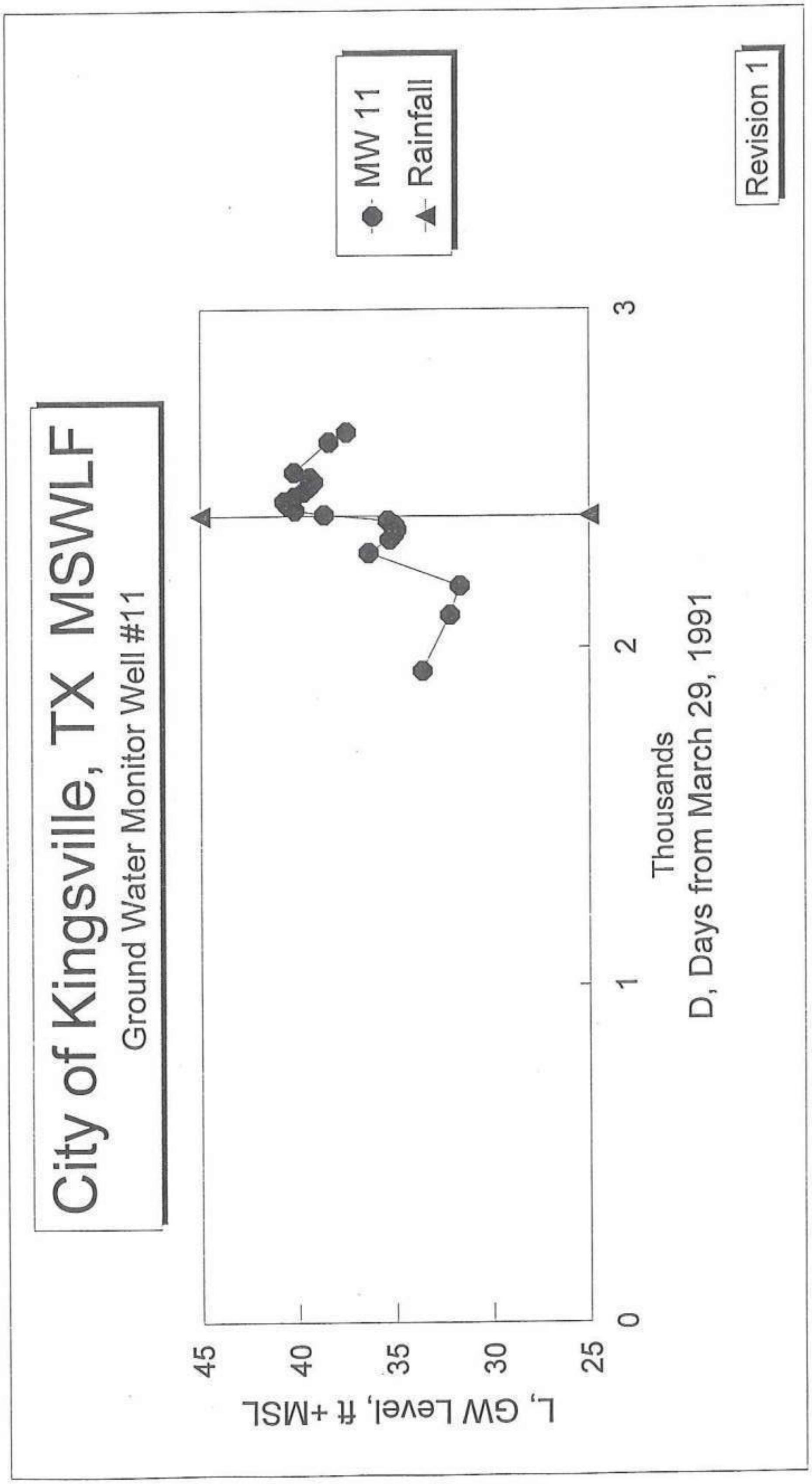

City of Kingsville, TX MWSLF
Ground Water Monitor Well #6
L, GW Level, ft +MSL
45
40
35
30
25
0
1
2
3
Thousands
D, Days from March 29, 1991
MW 6
Rainfall
Revision 1


City of Kingsville, TX MSWLF
Ground Water Monitor Well #8
MW 8
Rainfall
Revision 1
L, GW Level, ft +MSL
45
40
35
30
25
0
1
2
3
Thousands
D, Days from March 29, 1991

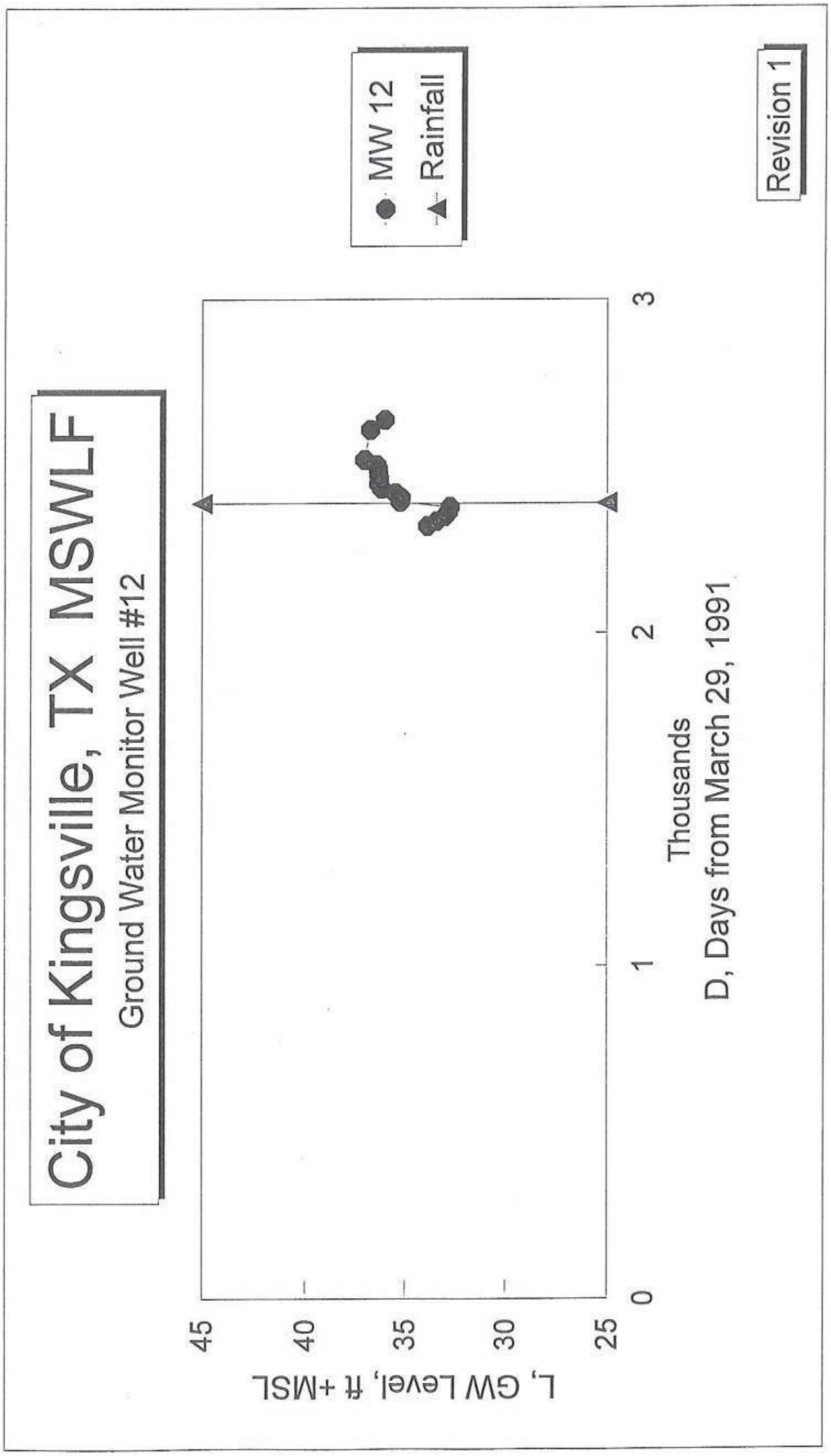

City of Kingsville, TX MSWLF
Ground Water Monitor Well #9R
MW 9R
Rainfall
Revision 1
L, GW Level, ft +MSL
45
40
35
30
25
0
1
2
3
Thousands
D, Days from March 29, 1991

D-6

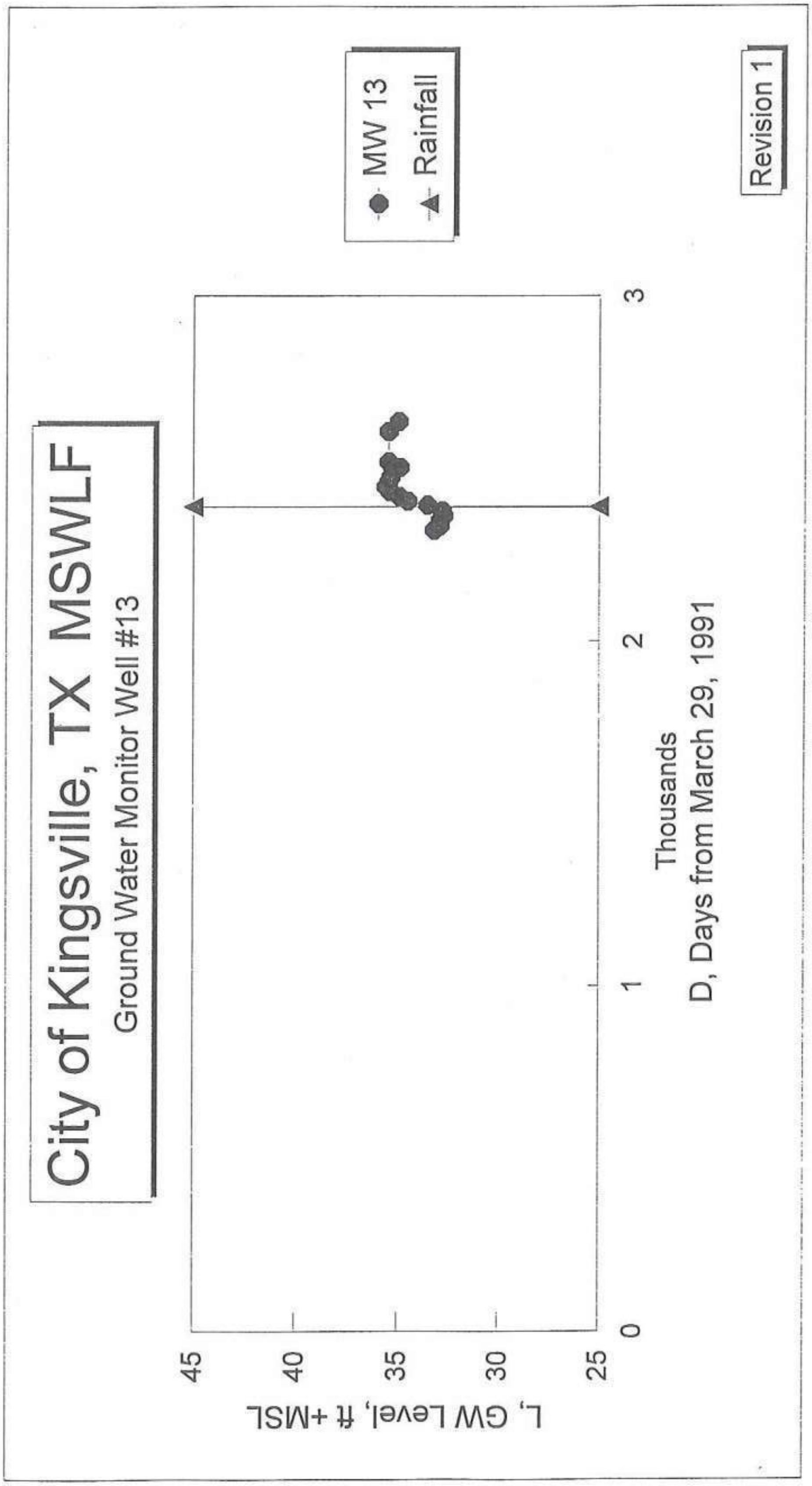

City of Kingsville, TX MSWLF
Ground Water Monitor Well #10
L, GW Level, ft +MSL
45
40
35
30
25
0
1
2
3
Thousands
D, Days from March 29, 1991
MW 10
Rainfall
Revision 1


City of Kingsville, TX MSWLF
Ground Water Monitor Well #11
MW 11
Rainfall
Revision 1
L, GW Level, ft +MSL
45
40
35
30
25
0
1
2
3
Thousands
D, Days from March 29, 1991

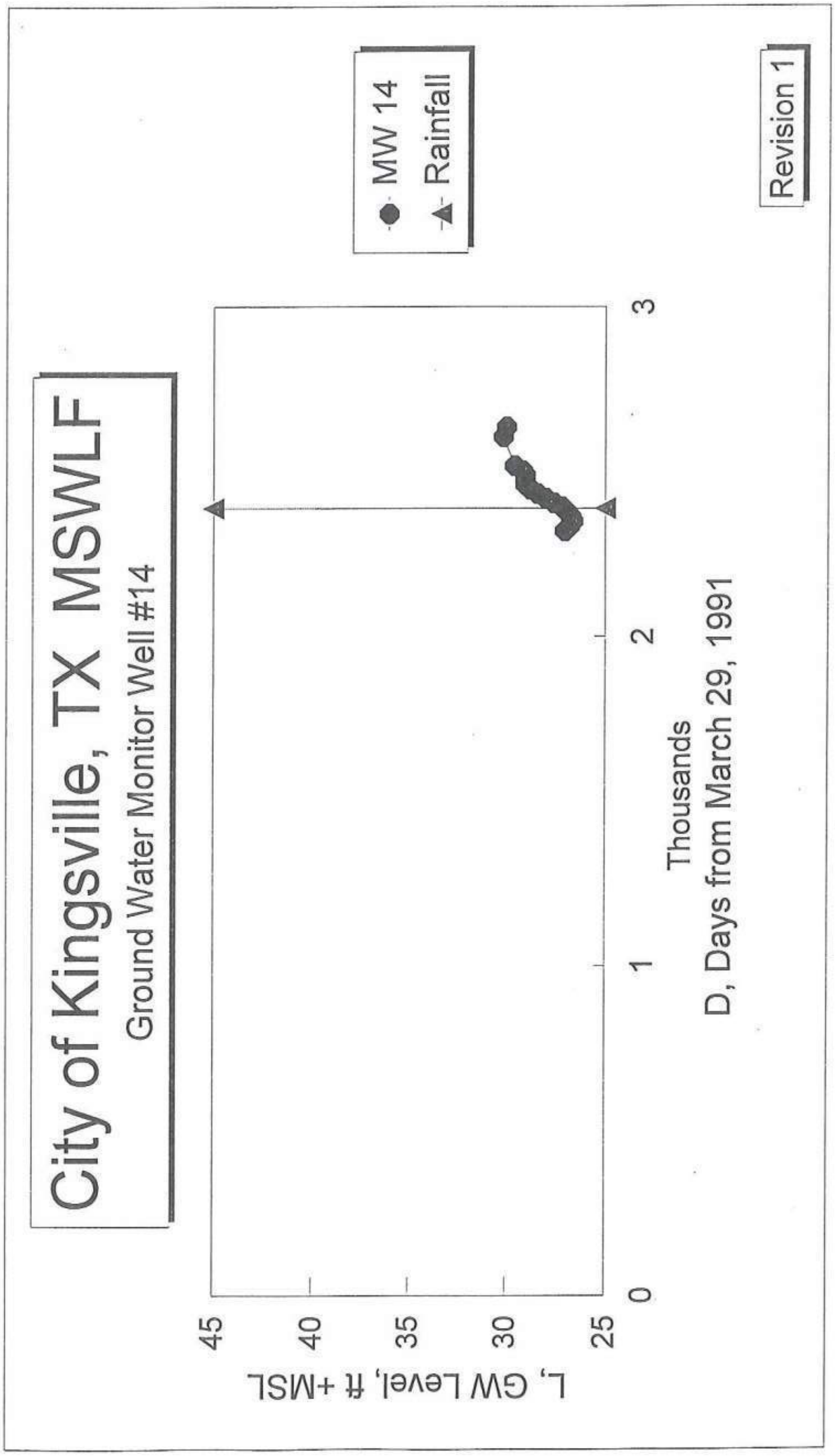
D-8


City of Kingsville, TX MSWLF
Ground Water Monitor Well #12
MW 12
Rainfall
Revision 1
L, GW Level, ft +MSL
45
40
35
30
25
0
1
2
3
Thousands
D, Days from March 29, 1991

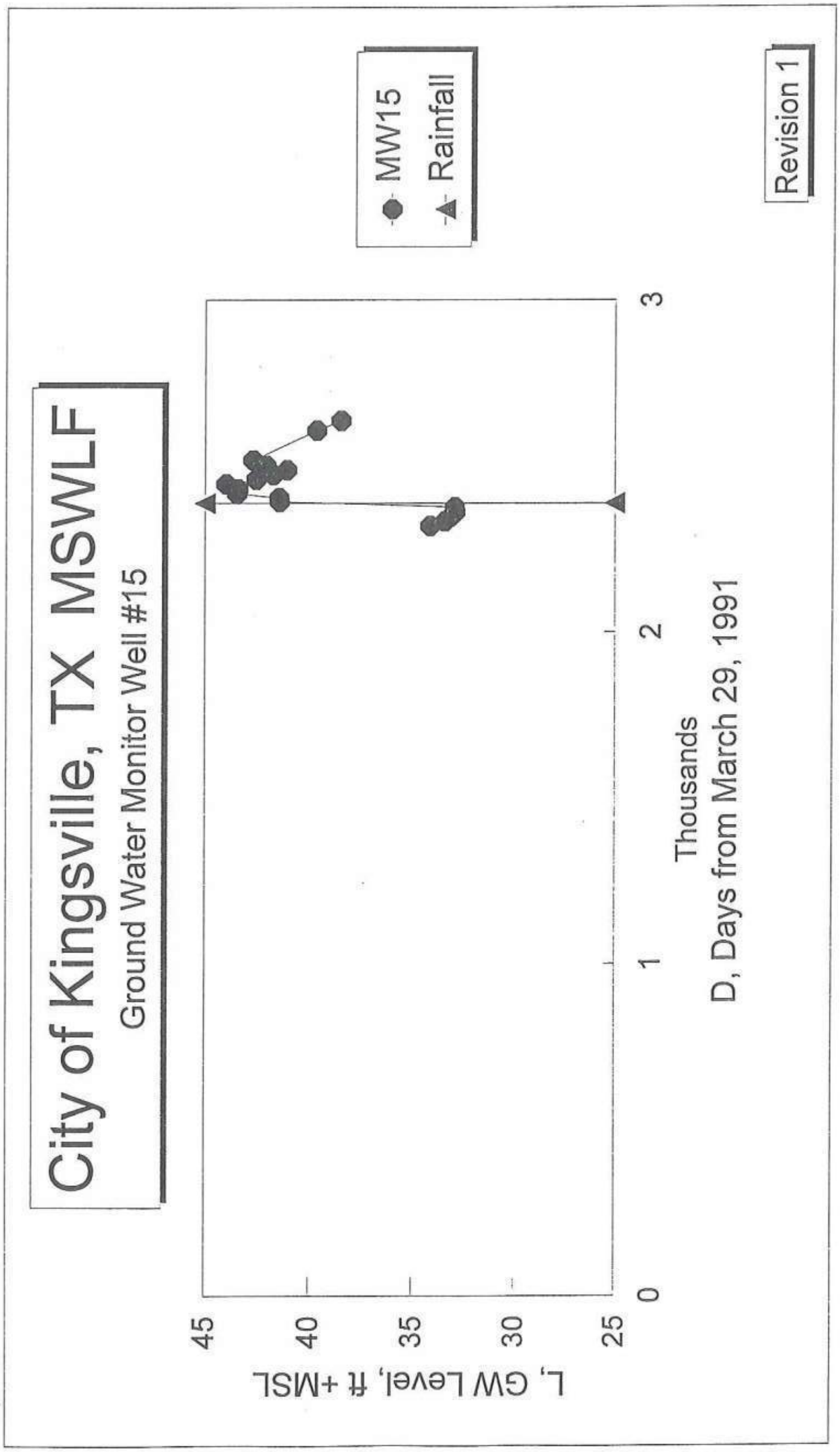
D-9


City of Kingsville, TX MSWLF
Ground Water Monitor Well #13
L, GW Level, ft +MSL
45
40
35
30
25
0
1
2
3
Thousands
D, Days from March 29, 1991
MW 13
Rainfall
Revision 1

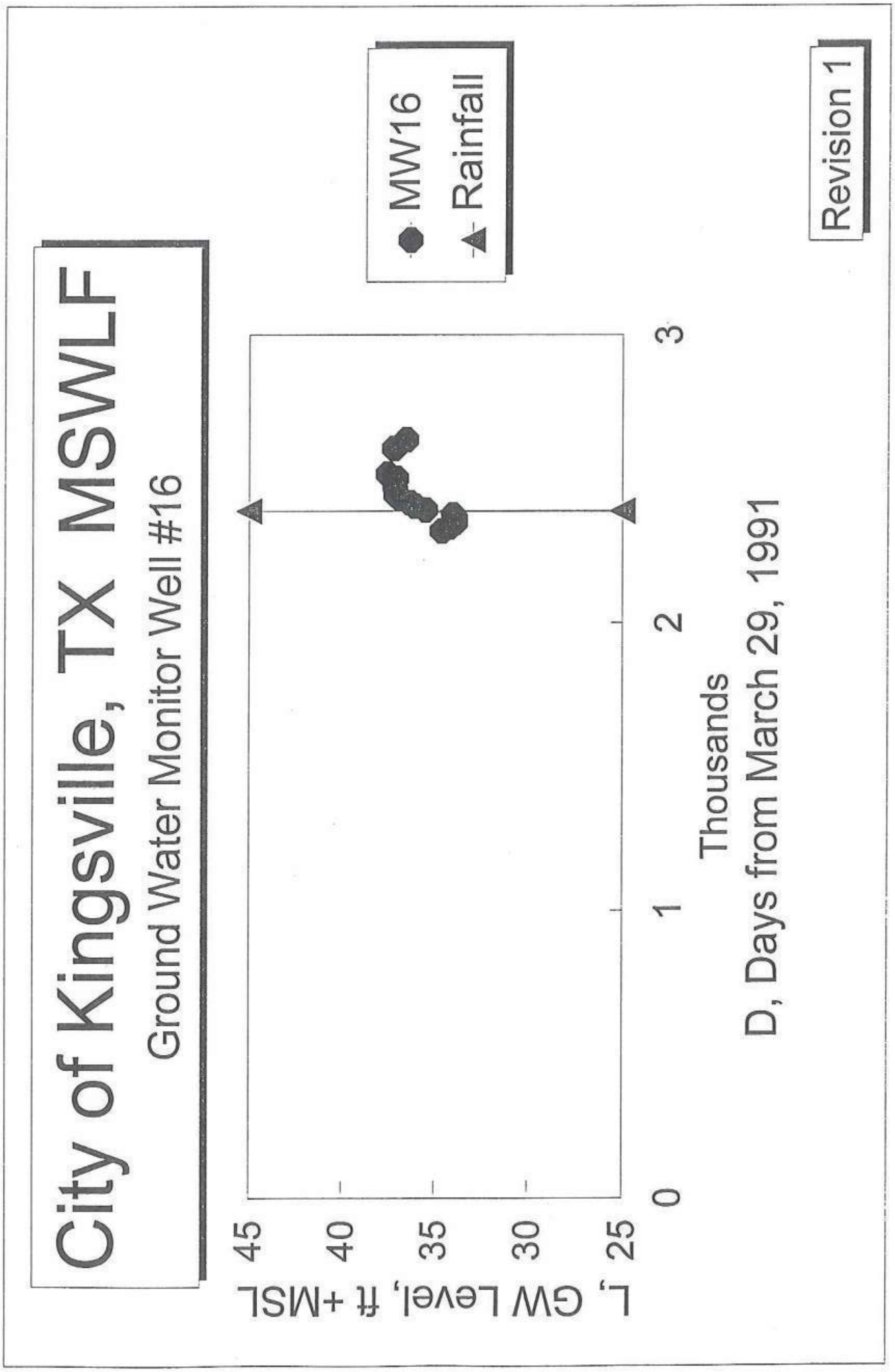
D-10


City of Kingsville, TX MSWLF
Ground Water Monitor Well #14
MW 14
Rainfall
Revision 1
L, GW Level, ft +MSL
45
40
35
30
25
0
1
2
3
Thousands
D, Days from March 29, 1991

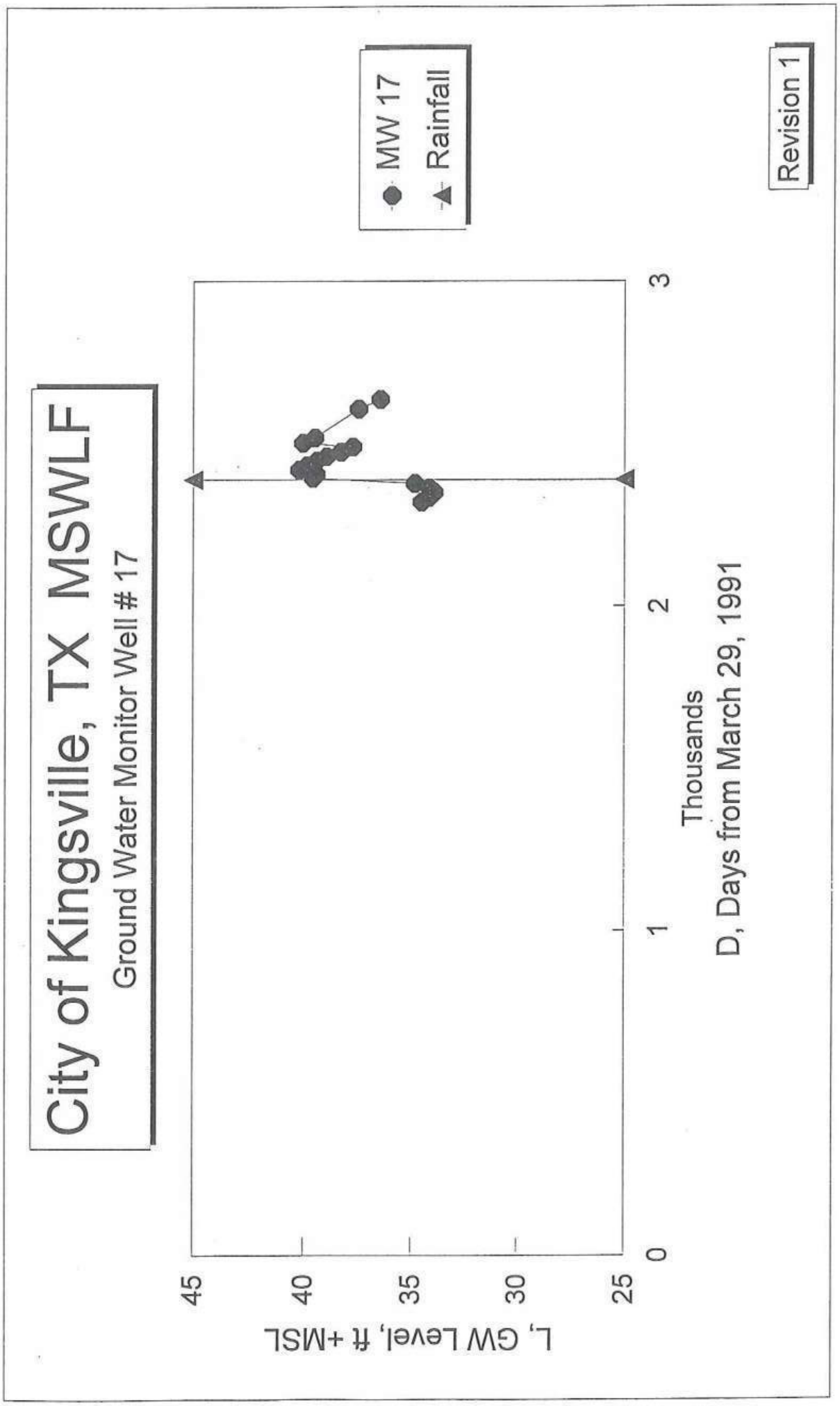
D-11


City of Kingsville, TX MSWLF
Ground Water Monitor Well #15
MW15
Rainfall
Revision 1
45
40
35
30
25
L, GW Level, ft +MSL
0
1
2
3
Thousands
D, Days from March 29, 1991

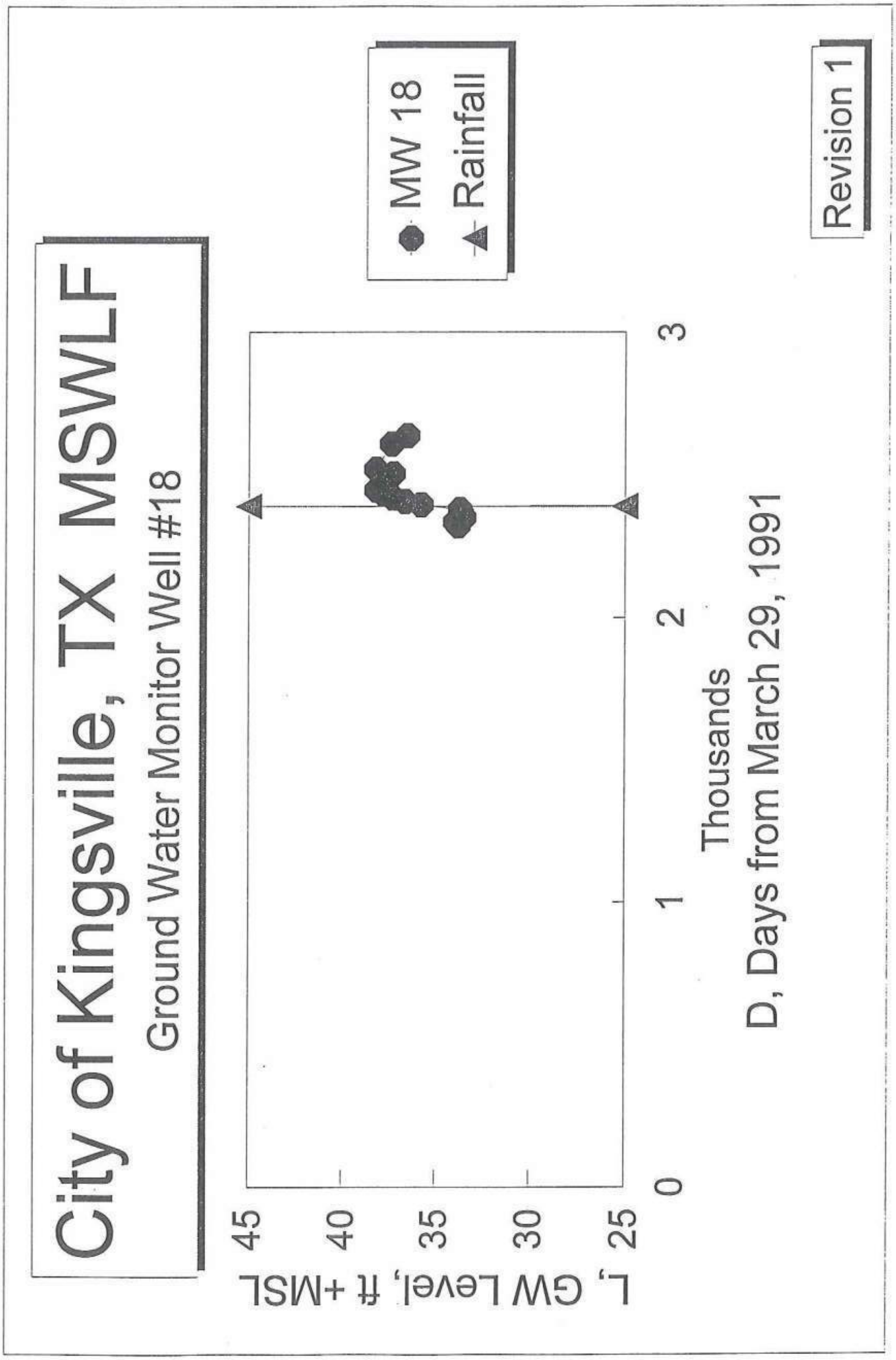
D-12


City of Kingsville, TX MSWLF
Ground Water Monitor Well #16
MW16
Rainfall
Revision 1
L, GW Level, ft +MSL
45
40
35
30
25
0
1
2
3
Thousands
D, Days from March 29, 1991

D-13


City of Kingsville, TX MSWLF
Ground Water Monitor Well # 17
L, GW Level, ft +MSL
45
40
35
30
25
0
1
2
3
Thousands
D, Days from March 29, 1991
● MW 17
▲ Rainfall
Revision 1

D-14


City of Kingsville, TX MSWLF
Ground Water Monitor Well #18
MW 18
Rainfall
Revision 1
L, GW Level, ft +MSL
45
40
35
30
25
0
1
2
3
Thousands
D, Days from March 29, 1991

APPENDIX E

APPENDIX E

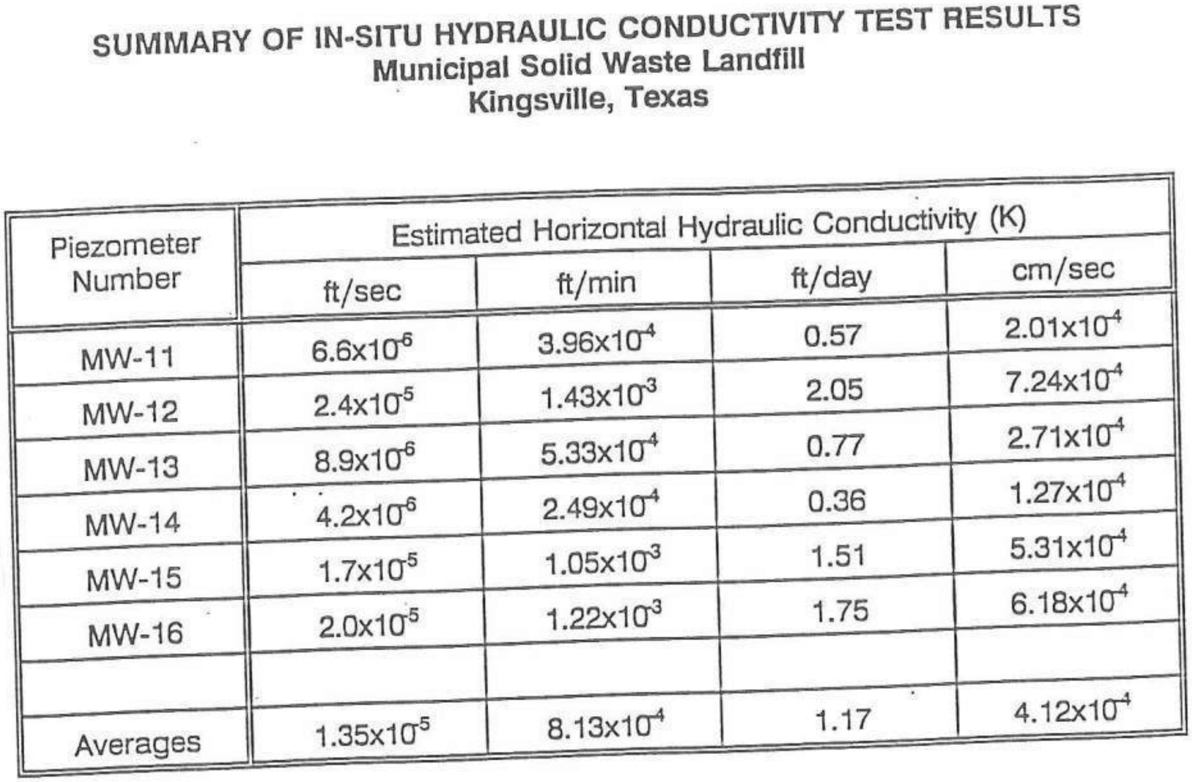
In-Situ Hydraulic Conductivity Test Data

November 1997

*THIS DOCUMENT IS ISSUED FOR PERMITTING PURPOSES ONLY.
INCLUDES PAGES E1 THROUGH E13*

STATE OF TEXAS
RAY N. FINCH
30926
REGISTERED PROFESSIONAL ENGINEER

6-26-98



SUMMARY OF IN-SITU HYDRAULIC CONDUCTIVITY TEST RESULTS
Municipal Solid Waste Landfill
Kingsville, Texas

Piezometer Number	Estimated Horizontal Hydraulic Conductivity (K)			
	ft/sec	ft/min	ft/day	cm/sec
MW-11	$6.6x10^{-6}$	$3.96x10^{-4}$	0.57	$2.01x10^{-4}$
MW-12	$2.4x10^{-5}$	$1.43x10^{-3}$	2.05	$7.24x10^{-4}$
MW-13	$8.9x10^{-6}$	$5.33x10^{-4}$	0.77	$2.71x10^{-4}$
MW-14	$4.2x10^{-6}$	$2.49x10^{-4}$	0.36	$1.27x10^{-4}$
MW-15	$1.7x10^{-5}$	$1.05x10^{-3}$	1.51	$5.31x10^{-4}$
MW-16	$2.0x10^{-5}$	$1.22x10^{-3}$	1.75	$6.18x10^{-4}$
Averages	$1.35x10^{-5}$	$8.13x10^{-4}$	1.17	$4.12x10^{-4}$

City of Kingsville MSWLF - Permeability

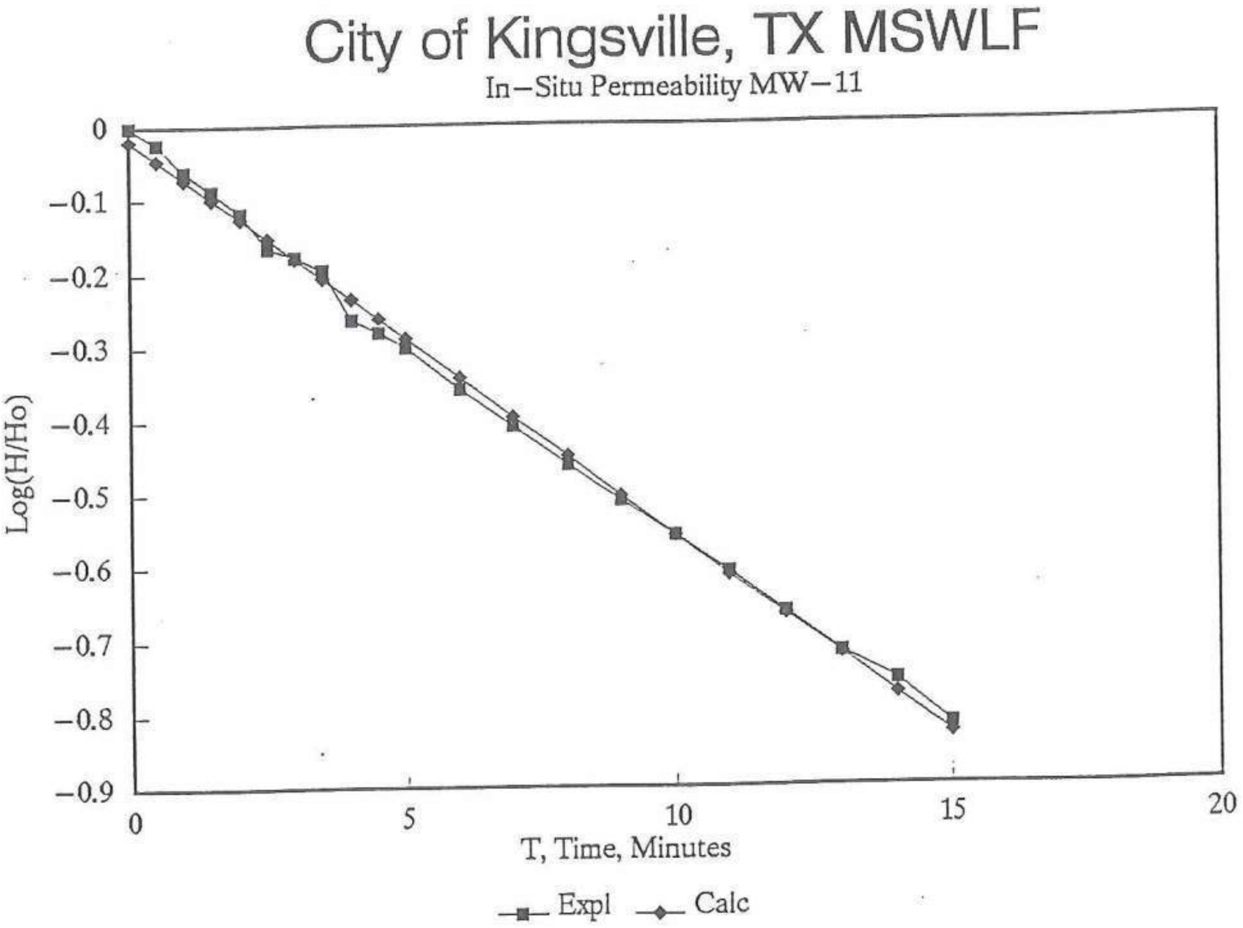
Well Number 11

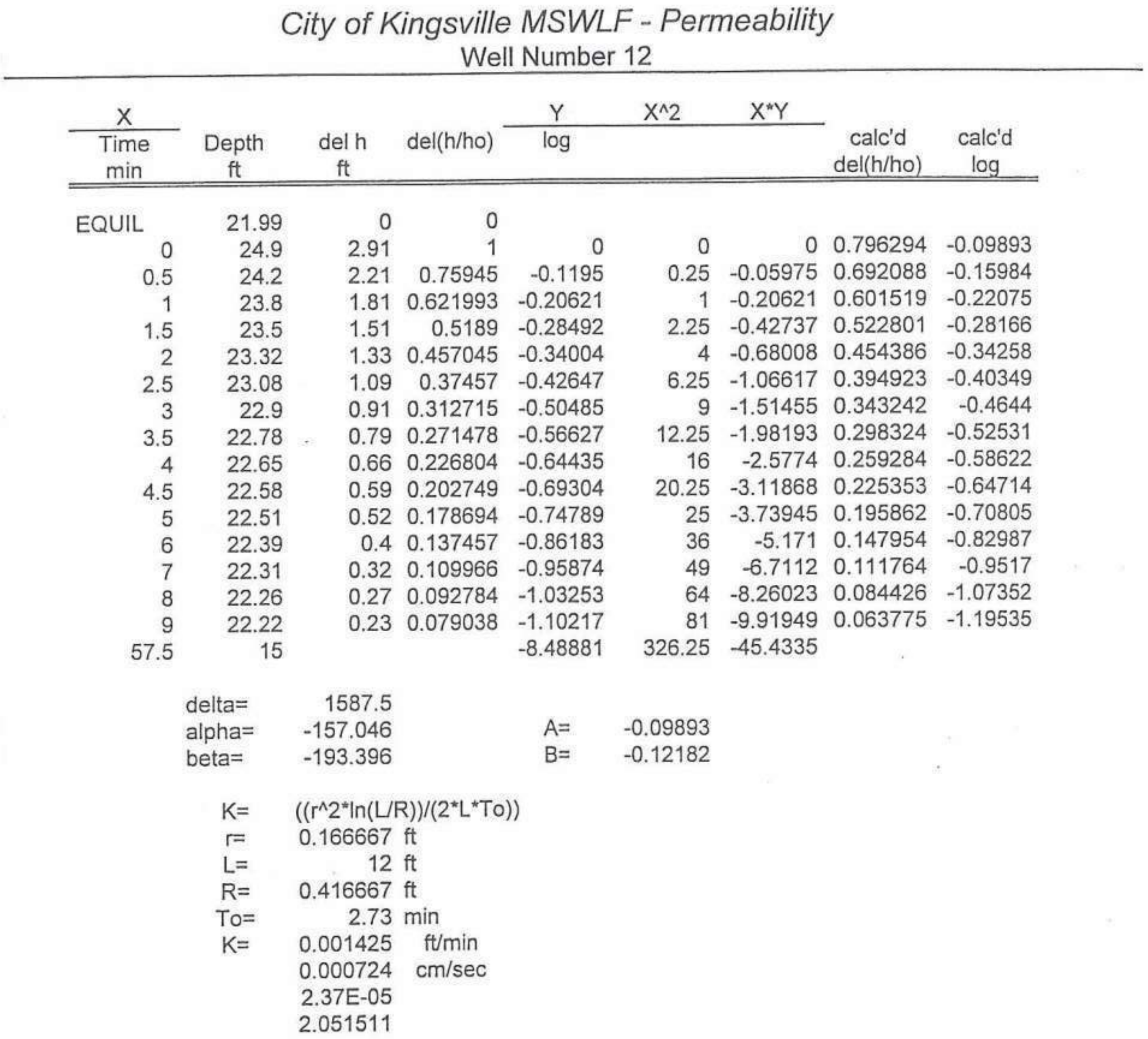
X				Y	X^2	X*Y		
Time min	Depth ft	del h ft	del(h/ho)	log			calc'd del(h/ho)	calc'd log
EQUIL	27.34	0	0					
0	30.42	3.08	1	0	0	0	0.957611	-0.01881
0.5	30.25	2.91	0.944805	-0.02466	0.25	-0.01233	0.899938	-0.04579
1	30.01	2.67	0.866883	-0.06204	1	-0.06204	0.845739	-0.07276
1.5	29.85	2.51	0.814935	-0.08888	2.25	-0.13332	0.794804	-0.09974
2	29.68	2.34	0.75974	-0.11933	4	-0.23867	0.746936	-0.12672
2.5	29.44	2.1	0.681818	-0.16633	6.25	-0.41583	0.701952	-0.15369
3	29.38	2.04	0.662338	-0.17892	9	-0.53676	0.659676	-0.18067
3.5	29.3	1.96	0.636364	-0.19629	12.25	-0.68703	0.619947	-0.20765
4	29.02	1.68	0.545455	-0.26324	16	-1.05297	0.58261	-0.23462
4.5	28.95	1.61	0.522727	-0.28172	20.25	-1.26776	0.547522	-0.2616
5	28.88	1.54	0.5	-0.30103	25	-1.50515	0.514548	-0.28857
6	28.69	1.35	0.438312	-0.35822	36	-2.1493	0.454436	-0.34253
7	28.54	1.2	0.38961	-0.40937	49	-2.86559	0.401347	-0.39648
8	28.4	1.06	0.344156	-0.46324	64	-3.70596	0.35446	-0.45043
9	28.29	0.95	0.308442	-0.51083	81	-4.59744	0.313051	-0.50439
10	28.19	0.85	0.275974	-0.55913	100	-5.59132	0.276479	-0.55834
11	28.1	0.76	0.246753	-0.60774	121	-6.68511	0.24418	-0.61229
12	28.01	0.67	0.217532	-0.66248	144	-7.94971	0.215654	-0.66624
13	27.93	0.59	0.191558	-0.7177	169	-9.33008	0.19046	-0.7202
14	27.88	0.54	0.175325	-0.75616	196	-10.5862	0.16821	-0.77415
15	27.81	0.47	0.152597	-0.81645	225	-12.2468	0.148559	-0.8281
132.5	21			-7.54376	1281.25	-71.6194		

delta=	9350		
alpha=	-175.883	A=	-0.01881
beta=	-504.458	B=	-0.05395

K=	((r^2*ln(L/R))/(2*L*To))		
r=	0.166667	ft	
L=	17	ft	
R=	0.416667	ft	
To=	7.65	min	7.654617
K=	0.000396	ft/min	
	0.000201	cm/sec	
	6.6E-06	ft/sec	
	0.570347	ft/day	

FIGURE 6


City of Kingsville, TX MSWLF
In–Situ Permeability MW–11
Log(H/Ho)
0
–0.1
–0.2
–0.3
–0.4
–0.5
–0.6
–0.7
–0.8
–0.9
0
5
10
15
20
T, Time, Minutes
Expl
Calc



City of Kingsville MSWLF - Permeability

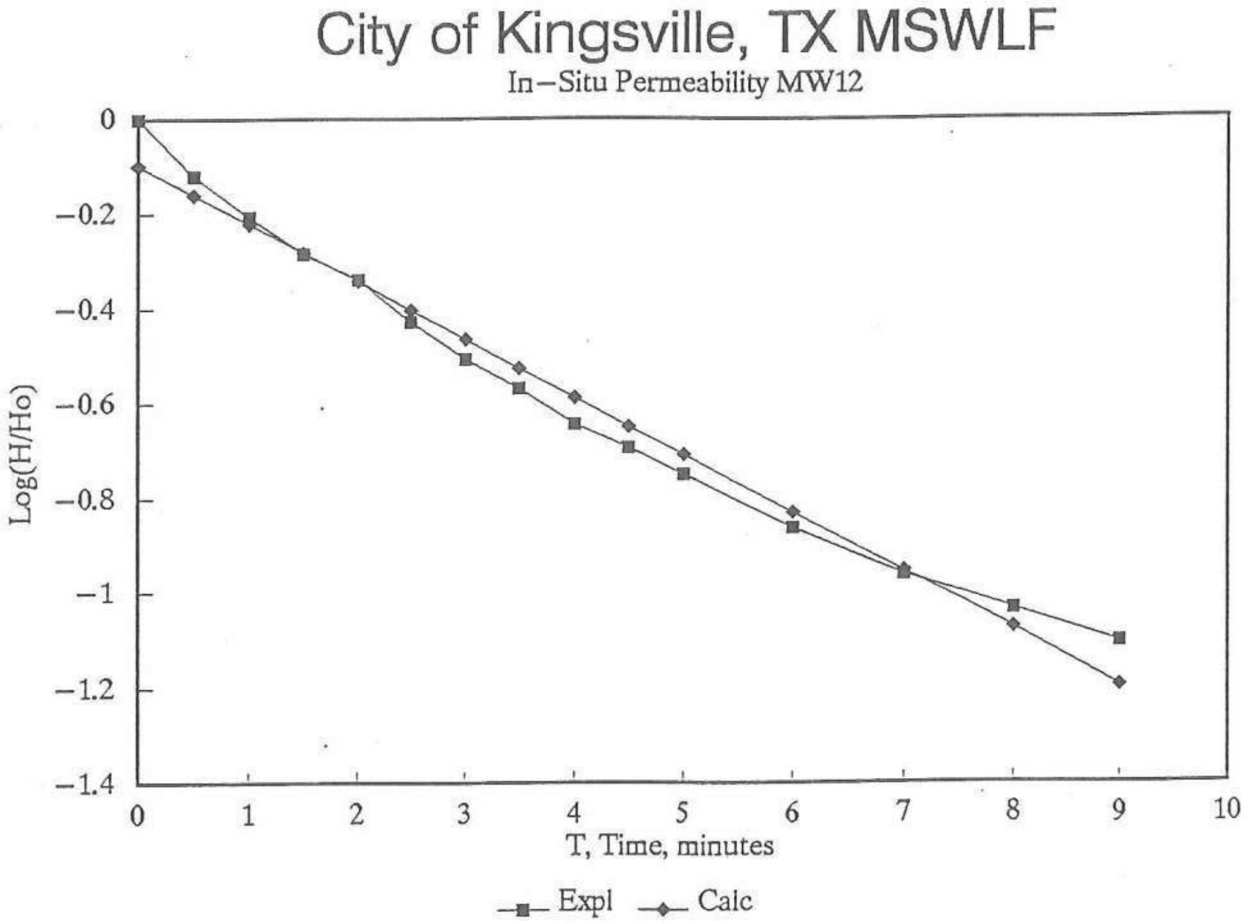
Well Number 12

X				Y	X^2	X*Y		
Time min	Depth ft	del h ft	del(h/ho)	log			calc'd del(h/ho)	calc'd log
EQUIL	21.99	0	0					
0	24.9	2.91	1	0	0	0	0.796294	-0.09893
0.5	24.2	2.21	0.75945	-0.1195	0.25	-0.05975	0.692088	-0.15984
1	23.8	1.81	0.621993	-0.20621	1	-0.20621	0.601519	-0.22075
1.5	23.5	1.51	0.5189	-0.28492	2.25	-0.42737	0.522801	-0.28166
2	23.32	1.33	0.457045	-0.34004	4	-0.68008	0.454386	-0.34258
2.5	23.08	1.09	0.37457	-0.42647	6.25	-1.06617	0.394923	-0.40349
3	22.9	0.91	0.312715	-0.50485	9	-1.51455	0.343242	-0.4644
3.5	22.78	0.79	0.271478	-0.56627	12.25	-1.98193	0.298324	-0.52531
4	22.65	0.66	0.226804	-0.64435	16	-2.5774	0.259284	-0.58622
4.5	22.58	0.59	0.202749	-0.69304	20.25	-3.11868	0.225353	-0.64714
5	22.51	0.52	0.178694	-0.74789	25	-3.73945	0.195862	-0.70805
6	22.39	0.4	0.137457	-0.86183	36	-5.171	0.147954	-0.82987
7	22.31	0.32	0.109966	-0.95874	49	-6.7112	0.111764	-0.9517
8	22.26	0.27	0.092784	-1.03253	64	-8.26023	0.084426	-1.07352
9	22.22	0.23	0.079038	-1.10217	81	-9.91949	0.063775	-1.19535
57.5	15			-8.48881	326.25	-45.4335		

delta= 1587.5
alpha= -157.046 A= -0.09893
beta= -193.396 B= -0.12182

K= ((r^2*ln(L/R))/(2*L*To))
r= 0.166667 ft
L= 12 ft
R= 0.416667 ft
To= 2.73 min
K= 0.001425 ft/min
0.000724 cm/sec
2.37E-05
2.051511

FIGURE 7


City of Kingsville, TX MSWLF
In–Situ Permeability MW12
0
−0.2
−0.4
−0.6
−0.8
−1
−1.2
−1.4
Log(H/Ho)
0
1
2
3
4
5
6
7
8
9
10
T, Time, minutes
Expl
Calc

City of Kingsville MSWLF - Permeability

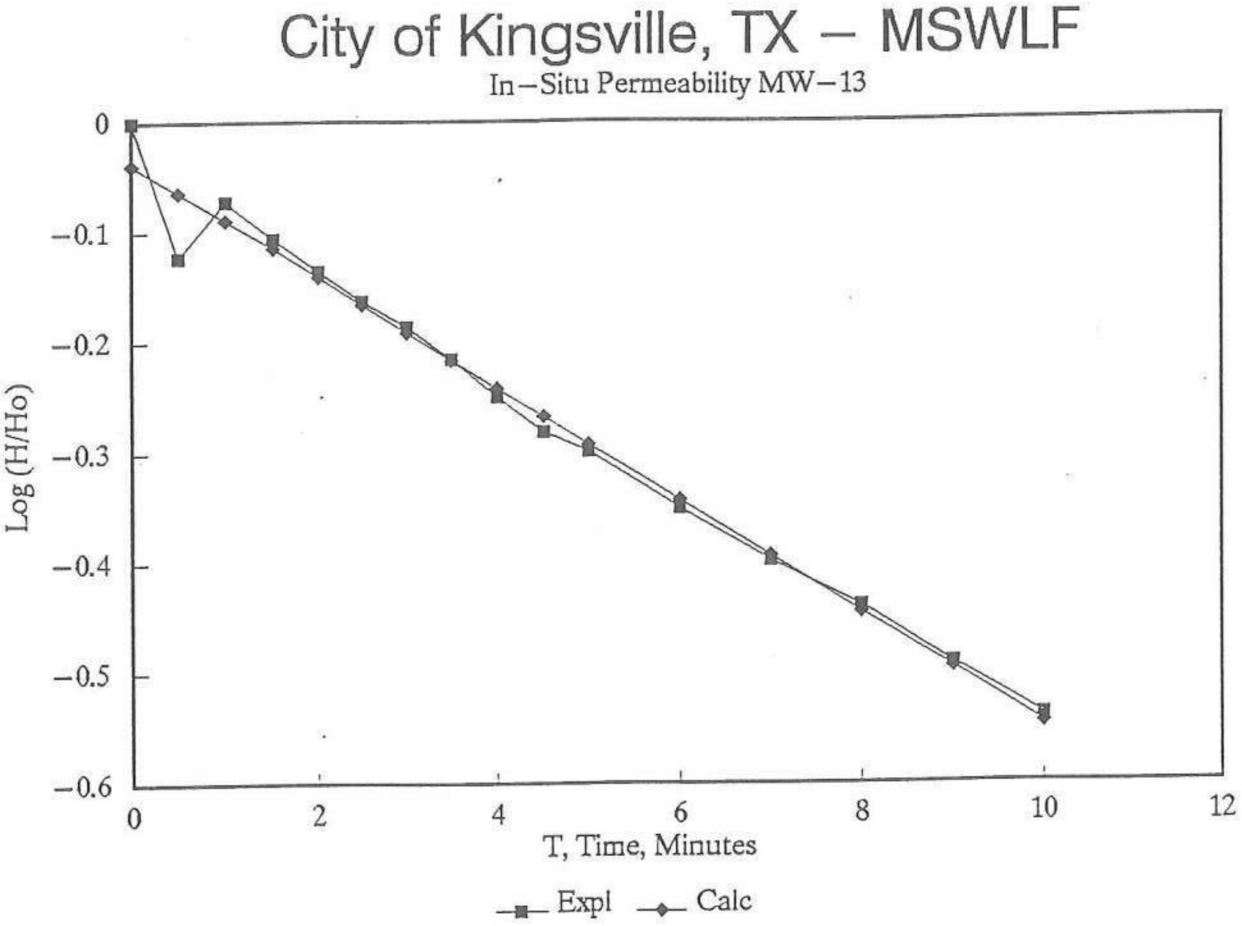
Well Number 13

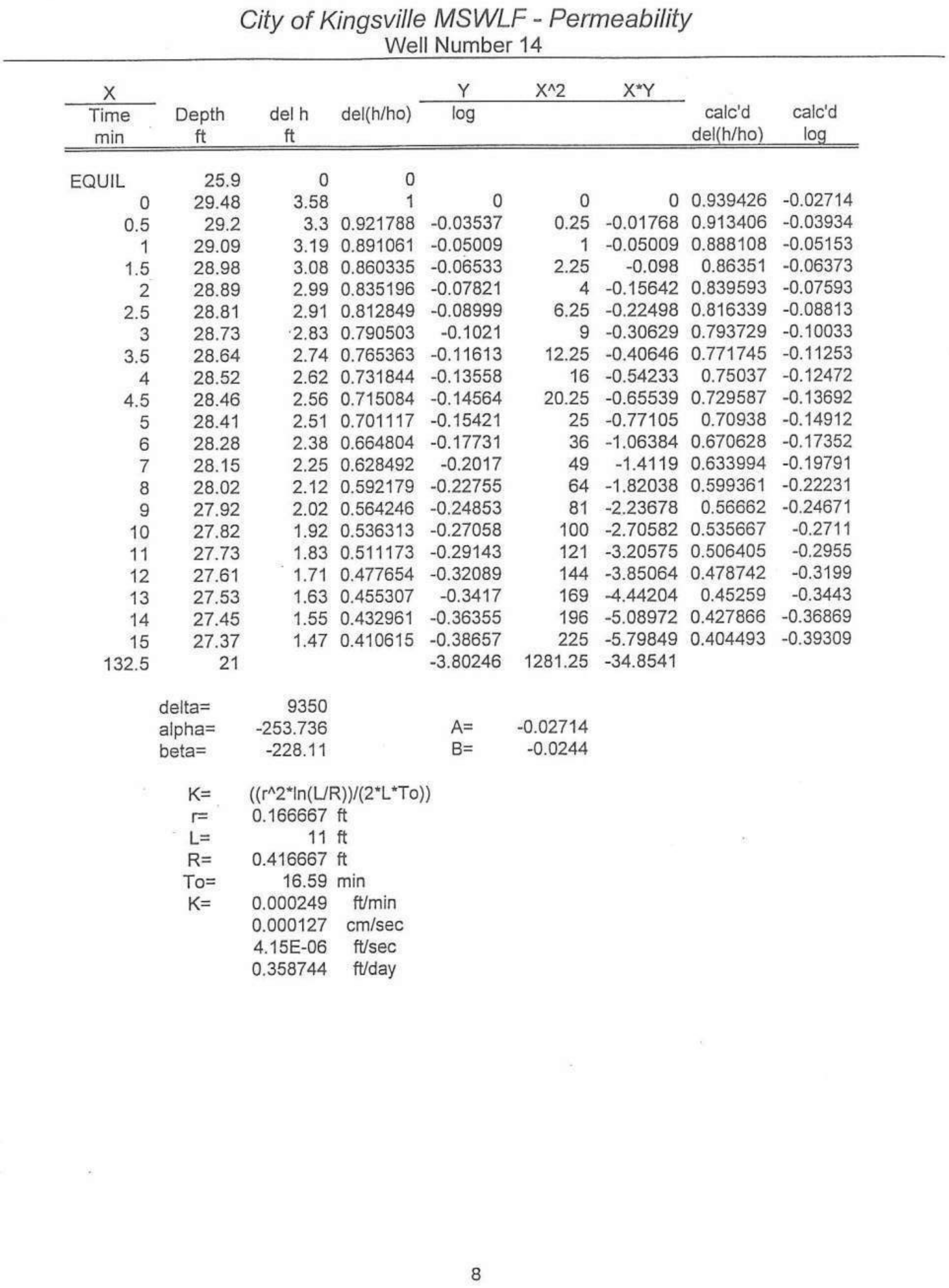
X				Y	X^2	X*Y		
Time min	Depth ft	del h ft	del(h/ho)	log			calc'd del(h/ho)	calc'd log
EQUIL	29.28	0	0					
0	32.6	3.32	1	0	0	0	0.91348	-0.0393
0.5	31.78	2.5	0.753012	-0.1232	0.25	-0.0616	0.861725	-0.06463
1	32.09	2.81	0.846386	-0.07243	1	-0.07243	0.812902	-0.08996
1.5	31.88	2.6	0.783133	-0.10616	2.25	-0.15925	0.766845	-0.11529
2	31.71	2.43	0.731928	-0.13553	4	-0.27106	0.723397	-0.14062
2.5	31.56	2.28	0.686747	-0.1632	6.25	-0.40801	0.682411	-0.16595
3	31.44	2.16	0.650602	-0.18668	9	-0.56005	0.643748	-0.19128
3.5	31.3	2.02	0.608434	-0.21579	12.25	-0.75525	0.607274	-0.21662
4	31.15	1.87	0.563253	-0.2493	16	-0.99719	0.572868	-0.24195
4.5	31.02	1.74	0.524096	-0.28059	20.25	-1.26265	0.54041	-0.26728
5	30.95	1.67	0.503012	-0.29842	25	-1.49211	0.509792	-0.29261
6	30.76	1.48	0.445783	-0.35088	36	-2.10526	0.453662	-0.34327
7	30.61	1.33	0.400602	-0.39729	49	-2.78101	0.403711	-0.39393
8	30.49	1.21	0.364458	-0.43835	64	-3.50682	0.359261	-0.44459
9	30.35	1.07	0.322289	-0.49175	81	-4.42579	0.319704	-0.49525
10	30.24	0.96	0.289157	-0.53887	100	-5.38867	0.284503	-0.54591
67.5	16			-4.04844	426.25	-24.2471		

delta= 2263.75
alpha= -88.9673 A= -0.0393
beta= -114.684 B= -0.05066

K= ((r^2*ln(L/R))/(2*L*To))
r= 0.166667 ft
L= 11 ft
R= 0.416667 ft
To= 7.75 min
K= 0.000533 ft/min
0.000271 cm/sec
8.89E-06 ft/sec
0.767944 ft/day

FIGURE 8


City of Kingsville, TX – MSWLF
In–Situ Permeability MW–13
0
−0.1
−0.2
−0.3
−0.4
−0.5
−0.6
Log (H/Ho)
0
2
4
6
8
10
12
T, Time, Minutes
Expl
Calc



City of Kingsville MSWLF - Permeability

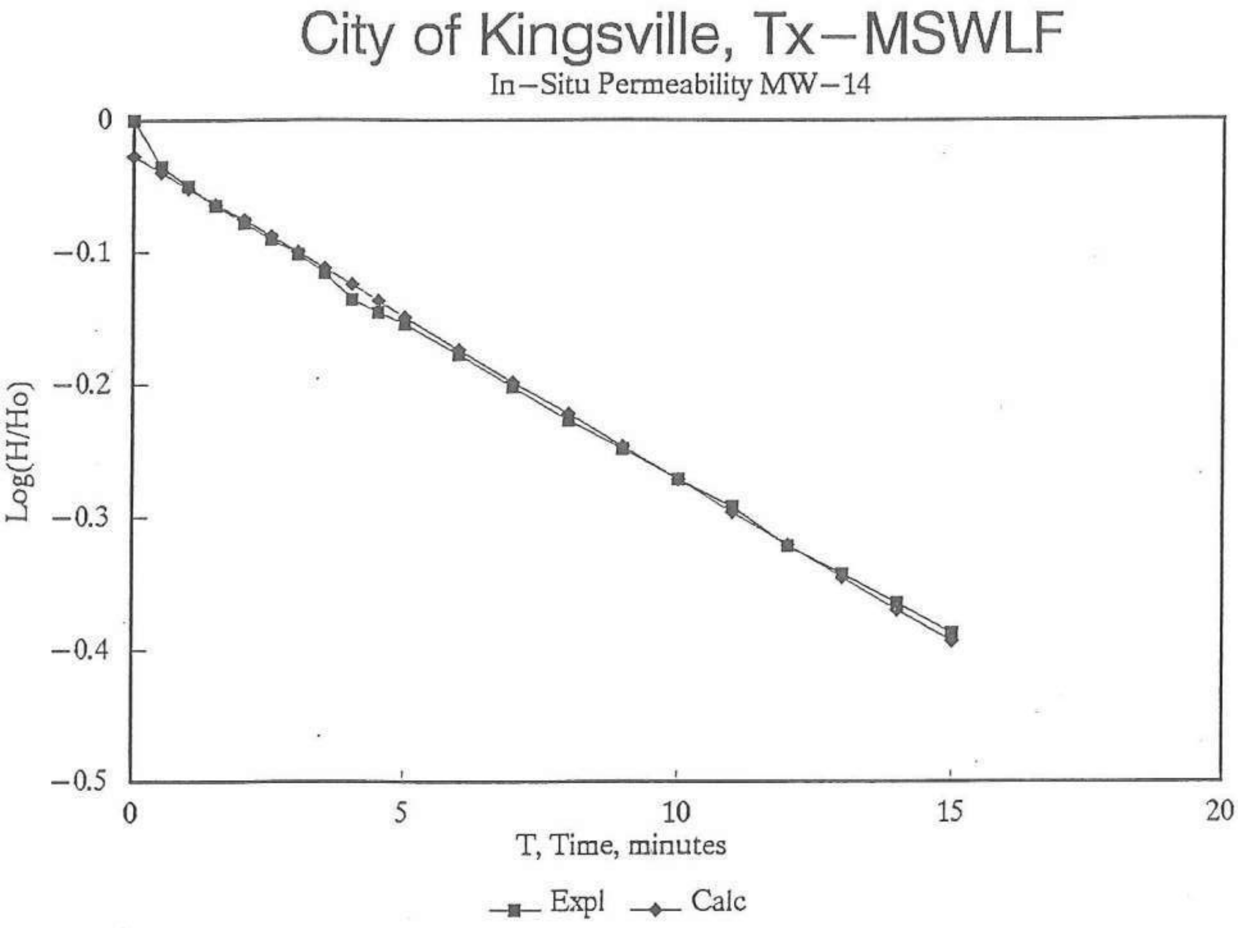
Well Number 14

X Time min	Depth ft	del h ft	del(h/ho)	Y log	X^2	X*Y	calc'd del(h/ho)	calc'd log
EQUIL	25.9	0	0					
0	29.48	3.58	1	0	0	0	0.939426	-0.02714
0.5	29.2	3.3	0.921788	-0.03537	0.25	-0.01768	0.913406	-0.03934
1	29.09	3.19	0.891061	-0.05009	1	-0.05009	0.888108	-0.05153
1.5	28.98	3.08	0.860335	-0.06533	2.25	-0.098	0.86351	-0.06373
2	28.89	2.99	0.835196	-0.07821	4	-0.15642	0.839593	-0.07593
2.5	28.81	2.91	0.812849	-0.08999	6.25	-0.22498	0.816339	-0.08813
3	28.73	2.83	0.790503	-0.1021	9	-0.30629	0.793729	-0.10033
3.5	28.64	2.74	0.765363	-0.11613	12.25	-0.40646	0.771745	-0.11253
4	28.52	2.62	0.731844	-0.13558	16	-0.54233	0.75037	-0.12472
4.5	28.46	2.56	0.715084	-0.14564	20.25	-0.65539	0.729587	-0.13692
5	28.41	2.51	0.701117	-0.15421	25	-0.77105	0.70938	-0.14912
6	28.28	2.38	0.664804	-0.17731	36	-1.06384	0.670628	-0.17352
7	28.15	2.25	0.628492	-0.2017	49	-1.4119	0.633994	-0.19791
8	28.02	2.12	0.592179	-0.22755	64	-1.82038	0.599361	-0.22231
9	27.92	2.02	0.564246	-0.24853	81	-2.23678	0.56662	-0.24671
10	27.82	1.92	0.536313	-0.27058	100	-2.70582	0.535667	-0.2711
11	27.73	1.83	0.511173	-0.29143	121	-3.20575	0.506405	-0.2955
12	27.61	1.71	0.477654	-0.32089	144	-3.85064	0.478742	-0.3199
13	27.53	1.63	0.455307	-0.3417	169	-4.44204	0.45259	-0.3443
14	27.45	1.55	0.432961	-0.36355	196	-5.08972	0.427866	-0.36869
15	27.37	1.47	0.410615	-0.38657	225	-5.79849	0.404493	-0.39309
132.5	21			-3.80246	1281.25	-34.8541		

delta= 9350
alpha= -253.736 A= -0.02714
beta= -228.11 B= -0.0244

K= ((r^2*ln(L/R))/(2*L*To))
r= 0.166667 ft
L= 11 ft
R= 0.416667 ft
To= 16.59 min
K= 0.000249 ft/min
0.000127 cm/sec
4.15E-06 ft/sec
0.358744 ft/day

FIGURE 9


City of Kingsville, Tx–MSWLF
In–Situ Permeability MW–14
0
−0.1
−0.2
−0.3
−0.4
−0.5
Log(H/Ho)
0
5
10
15
20
T, Time, minutes
Expl
Calc

City of Kingsville MSWLF - Permeabiity

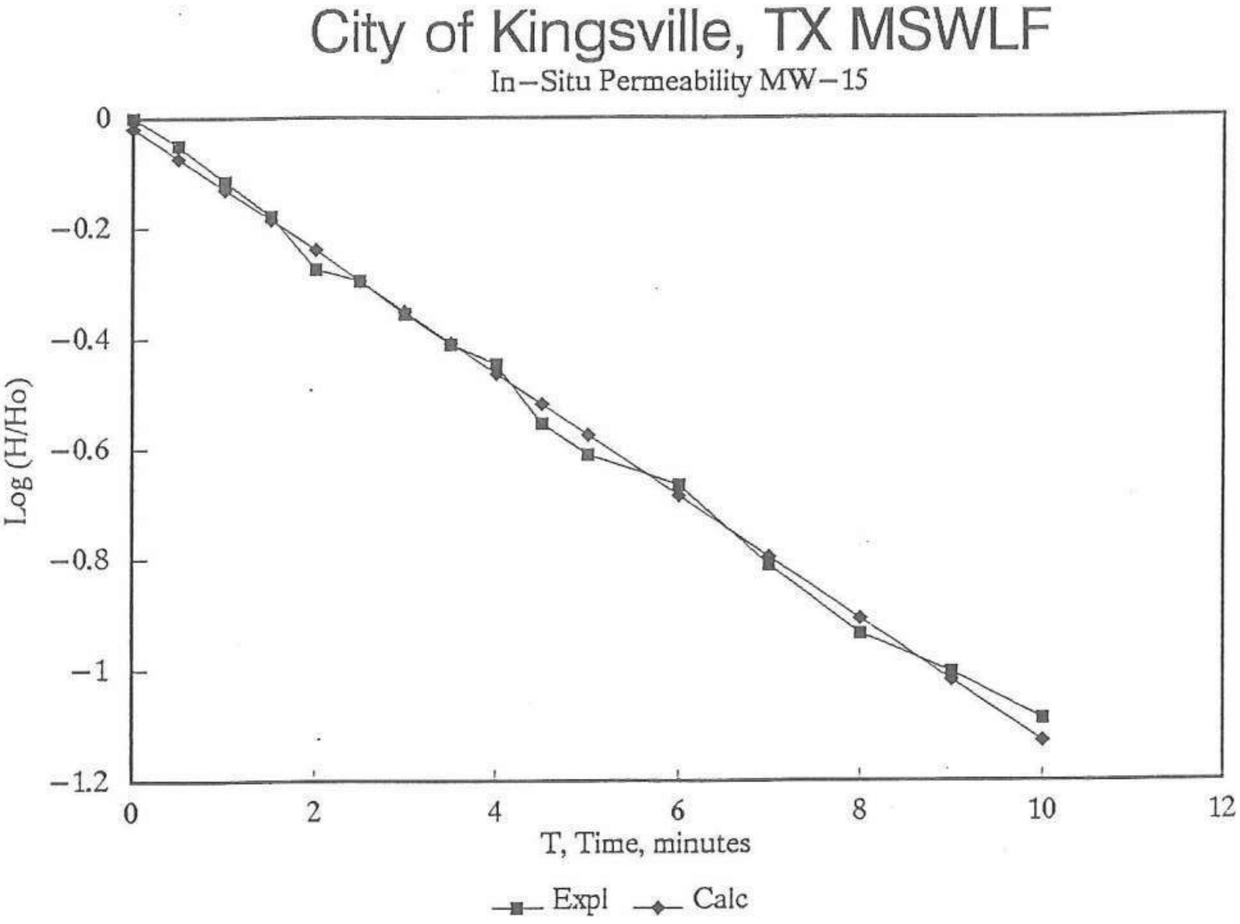
Well Number 15

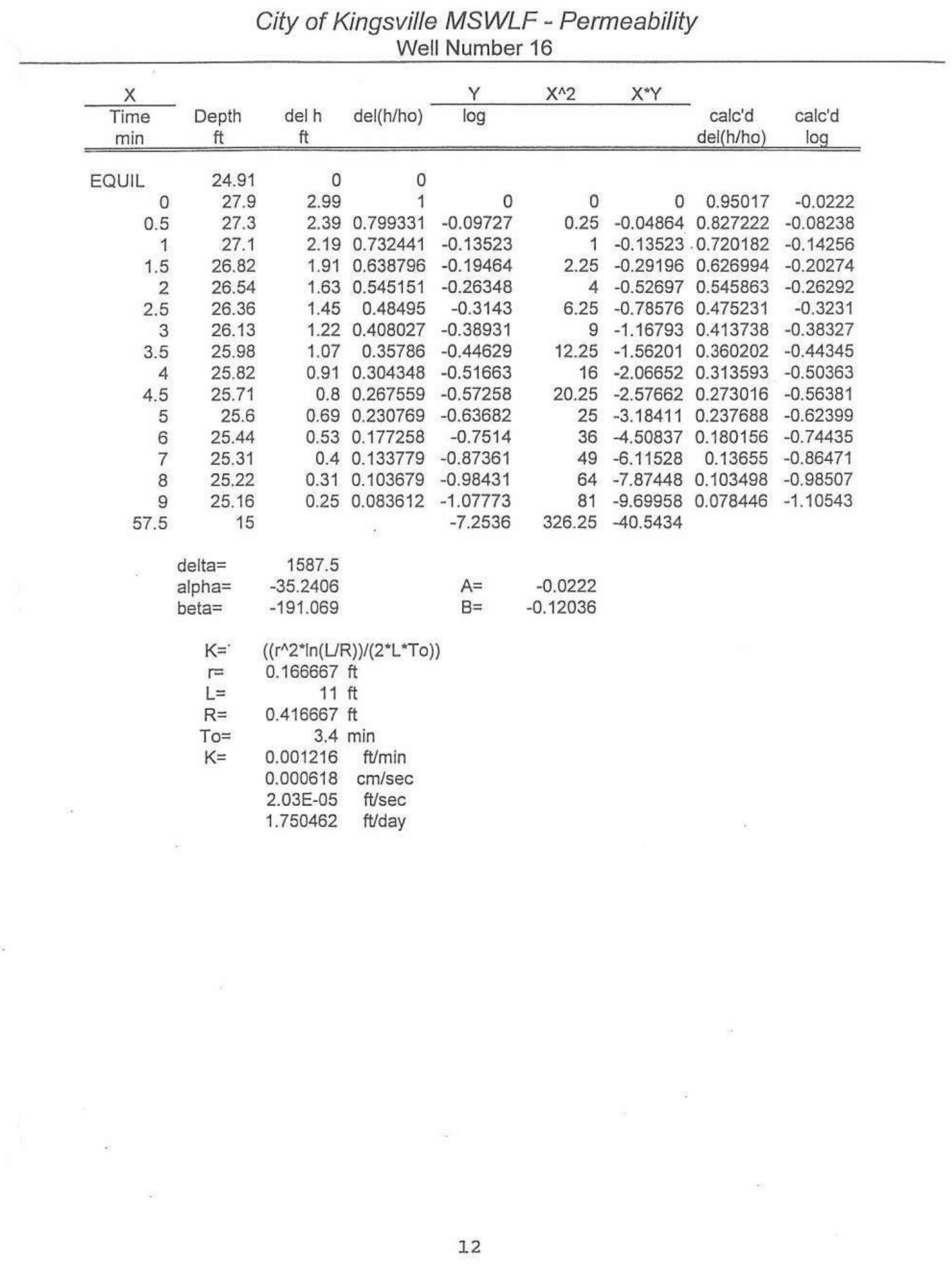
X Time min	Depth ft	del h ft	del(h/ho)	Y log	X^2	X*Y	calc'd del(h/ho)	calc'd log
EQUIL	18.57	0	0					
0	22	3.43	1	0	0	0	0.95653	-0.0193
0.5	21.62	3.05	0.889213	-0.05099	0.25	-0.0255	0.841835	-0.07477
1	21.2	2.63	0.766764	-0.11534	1	-0.11534	0.740892	-0.13025
1.5	20.84	2.27	0.661808	-0.17927	2.25	-0.2689	0.652053	-0.18572
2	20.39	1.82	0.530612	-0.27522	4	-0.55045	0.573867	-0.24119
2.5	20.3	1.73	0.504373	-0.29725	6.25	-0.74312	0.505056	-0.29666
3	20.08	1.51	0.440233	-0.35632	9	-1.06895	0.444496	-0.35213
3.5	19.9	1.33	0.387755	-0.41144	12.25	-1.44005	0.391197	-0.4076
4	19.8	1.23	0.358601	-0.44539	16	-1.78156	0.344289	-0.46308
4.5	19.53	0.96	0.279883	-0.55302	20.25	-2.4886	0.303006	-0.51855
5	19.41	0.84	0.244898	-0.61101	25	-3.05507	0.266674	-0.57402
6	19.31	0.74	0.215743	-0.66606	36	-3.99637	0.206555	-0.68496
7	19.1	0.53	0.154519	-0.81102	49	-5.67713	0.15999	-0.79591
8	18.97	0.4	0.116618	-0.93323	64	-7.46587	0.123922	-0.90685
9	18.91	0.34	0.099125	-1.00382	81	-9.03434	0.095985	-1.01779
10	18.85	0.28	0.081633	-1.08814	100	-10.8814	0.074347	-1.12874
67.5	16			-7.79752	426.25	-48.5926		

delta=	2263.75		
alpha=	-43.6935	A=	-0.0193
beta=	-251.149	B=	-0.11094

K=	((r^2*ln(L/R))/(2*L*To))	
r=	0.166667	ft
L=	12	ft
R=	0.416667	ft
To=	3.72	min
K=	0.001046	ft/min
	0.000531	cm/sec
	1.74E-05	ft/sec
	1.505544	ft/day

FIGURE 10


City of Kingsville, TX MSWLF
In–Situ Permeability MW–15
Log (H/Ho)
0
−0.2
−0.4
−0.6
−0.8
−1
−1.2
0
2
4
6
8
10
12
T, Time, minutes
Expl
Calc



City of Kingsville MSWLF - Permeability

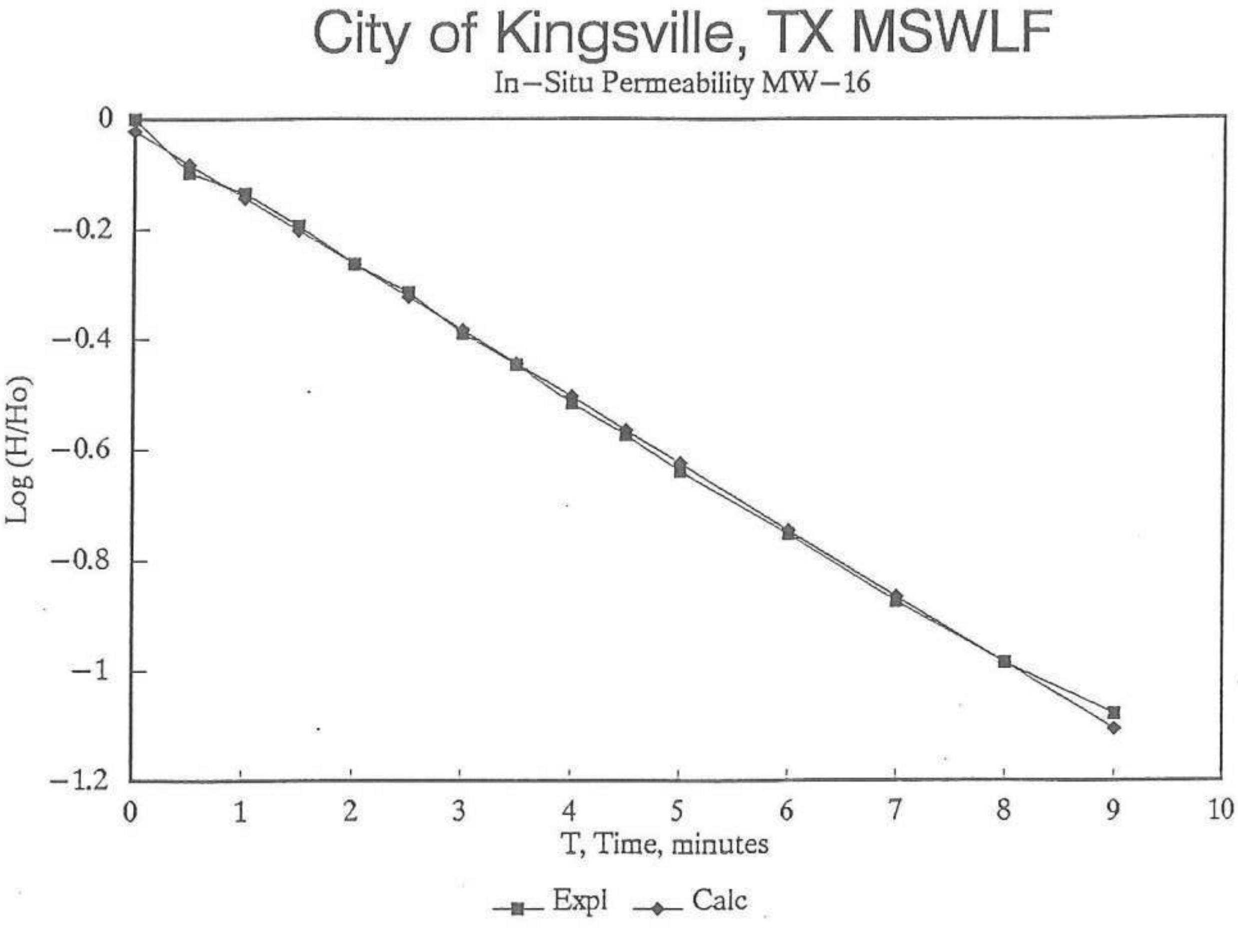
Well Number 16

X Time min	Depth ft	del h ft	del(h/ho)	Y log	X^2	X*Y	calc'd del(h/ho)	calc'd log
EQUIL	24.91	0	0					
0	27.9	2.99	1	0	0	0	0.95017	-0.0222
0.5	27.3	2.39	0.799331	-0.09727	0.25	-0.04864	0.827222	-0.08238
1	27.1	2.19	0.732441	-0.13523	1	-0.13523	0.720182	-0.14256
1.5	26.82	1.91	0.638796	-0.19464	2.25	-0.29196	0.626994	-0.20274
2	26.54	1.63	0.545151	-0.26348	4	-0.52697	0.545863	-0.26292
2.5	26.36	1.45	0.48495	-0.3143	6.25	-0.78576	0.475231	-0.3231
3	26.13	1.22	0.408027	-0.38931	9	-1.16793	0.413738	-0.38327
3.5	25.98	1.07	0.35786	-0.44629	12.25	-1.56201	0.360202	-0.44345
4	25.82	0.91	0.304348	-0.51663	16	-2.06652	0.313593	-0.50363
4.5	25.71	0.8	0.267559	-0.57258	20.25	-2.57662	0.273016	-0.56381
5	25.6	0.69	0.230769	-0.63682	25	-3.18411	0.237688	-0.62399
6	25.44	0.53	0.177258	-0.7514	36	-4.50837	0.180156	-0.74435
7	25.31	0.4	0.133779	-0.87361	49	-6.11528	0.13655	-0.86471
8	25.22	0.31	0.103679	-0.98431	64	-7.87448	0.103498	-0.98507
9	25.16	0.25	0.083612	-1.07773	81	-9.69958	0.078446	-1.10543
57.5	15			-7.2536	326.25	-40.5434		

delta=	1587.5		
alpha=	-35.2406	A=	-0.0222
beta=	-191.069	B=	-0.12036

K=	((r^2*ln(L/R))/(2*L*To))	
r=	0.166667	ft
L=	11	ft
R=	0.416667	ft
To=	3.4	min
K=	0.001216	ft/min
	0.000618	cm/sec
	2.03E-05	ft/sec
	1.750462	ft/day

FIGURE 11


City of Kingsville, TX MSWLF
In–Situ Permeability MW–16
0
−0.2
−0.4
−0.6
−0.8
−1
−1.2
Log (H/Ho)
0
1
2
3
4
5
6
7
8
9
10
T, Time, minutes
Expl
Calc

APPENDIX F

APPENDIX F

Monitor Well Schematic

STATE OF TEXAS
RAY N. FINCH
30926
REGISTERED PROFESSIONAL ENGINEER

6-26-98

November 1997

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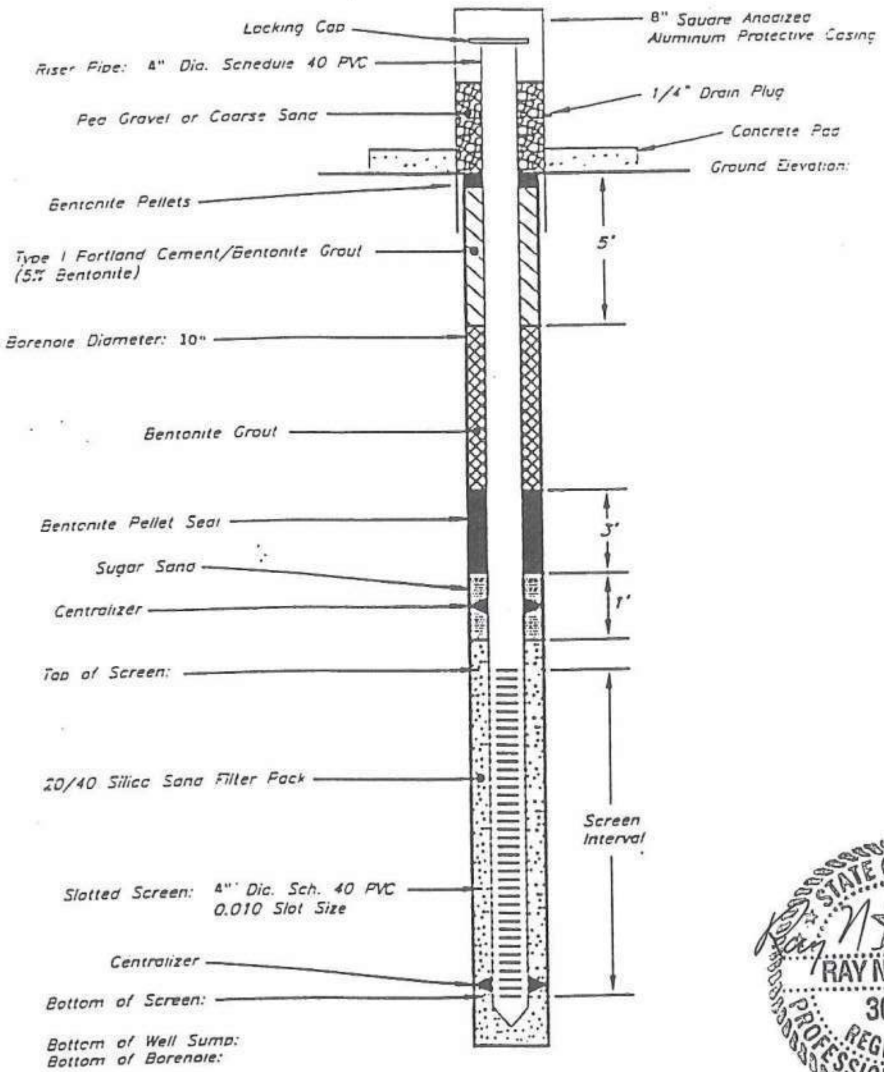
INCLUDES PAGE E-1



Notes:

1) Elevations referenced to National Geographic Vertical Datum (NGVD).

2) Depths are referenced to feet below ground surface.

RAY N. FINCH
30926

6-26-98

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Proposed Monitor Well Schematic

FINCH ENERGY & ENVIRONMENTAL SERVICES, Inc.

F-1

APPENDIX G

APPENDIX G

Ground Water Direction, Gradient, & Flow Rate

STATE OF TEXAS
RAY N. FINCH
30926
REGISTERED PROFESSIONAL ENGINEER
9-30-98

NOVEMBER, 1997

Revision 2 September 1998

THIS DOCUMENT IS ISSUED FOR PERMITTING PURPOSES ONLY INCLUDING PAGE G-0 THROUGH G-20a.

Calculations for Ground Water Direction, Gradient, and Flow Rate

The direction and gradient of ground water flow can be determined from ground water monitor well data by using a minimum of three wells. If more than three data points are used, then a least squares technique must be used to obtain the best fit to the data. The ground water elevation in these three wells define three points in three dimensional space which define the equation of a plane surface of the ground water in that region. Once the equation of the plane through the ground water surface has been determined, it is an easy step to determine the slope of that plane which gives the direction and the gradient of ground water flow. In order to make these calculations sufficiently accurate, these three wells must be sufficiently far apart due to the very shallow slopes of these ground water planes. However, the three well must also be in reasonable proximity to one another so that curvature of the ground water surface over larger areas does not distort the results. This type of calculation is can be done readily on a computer spread sheet program. The following pages are the results of Lotus 123 spreadsheet calculations.

The general form of the equation of a plane in three dimensional space is as follows:

$$Ax + By + Cz + D = 0$$

If, $A \neq 0,$

the equation may be reduced to the form:

$$x + by + cz + d = 0$$

where, $b = \frac{B}{A}$, $c = \frac{C}{A}$, and $d = \frac{D}{A}$.

Let x, y, & z represent the linear coordinates of a ground water elevation measurement in a well: x is the east west direction, y is the north south direction and z is the vertical elevation.

Then, the three data points can be put into three equations as given above and solved with matrices or vectors. This is what is done on the attached spread sheet.

The <u>first column</u> gives the number of the three ground water monitor wells used.
The <u>second column</u> gives the elevation of top of the lip of the ground water well casing in feet, Mean Sea Level (MSL), or NGVD.
The <u>third column</u> gives the depth to ground water measured from the top of the casing lip in feet to the nearest hundredths of a foot.
The <u>fourth column</u> gives the calculated height of the ground water relative to MSL in feet by taking the difference between the top of the casing lip in column one and the depth to ground water in column two.

The values for x and y for the ground water monitor wells are taken from the last part of Table 5.3 in the text portion of Attachment 5, i.e. X" and Y" values. These values are determined from the surveyed UTM coordinates in the first part of Table 5.3 and rotated to give x and y parallel to the site boundaries.

The matrix solutions are set up following the space after the first nine rows of data. The solution to the matrices are given as delta, alpha, beta and gamma. These are use to solve for the coefficients as follows:

$a = \frac{\delta}{\delta}$, $b = \frac{\alpha}{\delta}$, $c = \frac{\beta}{\delta}$, and $d = \frac{\gamma}{\delta}$.

From these numbers, the direction of ground water flow and the gradient can readily be determined:

Direction of ground water flow in the plane of the land surface, ie. x-y direction is:

$$Direction = \tan^{-1}\left(\frac{a}{b}\right)$$

The gradient of ground water flow in the direction of flow is:

$$Slope\ Angle\ of\ plane = \theta = \cos^{-1}\left[\frac{c}{\sqrt{a^2+b^2+c^2}}\right]$$

$$Gradient = \tan^{-1}\theta$$

The direction is from 0° to 360° with 0° being site north.
The gradient if ft/ft, but is converted into more convenient units below the determination.

For the determination of direction and gradient in a particular quadrant, three well are chosen which best represent that quadrant, i.e.northeast quadrant use MW #s 6,14 & 13.

In order to calculate ground water flow, a hydraulic conductivity is required (called permeability on the spread sheet). The hydraulic gradient was selected for the monitor well at the extreme corner of that quadrant. These are the in-situ measured hydraulic conductivities given in Appendix E of Attachment 5.

The flow rate is calculated by the Darcy equation for permeable flow,.i.e.

$$v = \frac{q}{A} = \frac{Ki}{\Theta}$$

where v = velocity of ground water flow

q = volume rate of GW flow

A = cross section perpedicular to flow

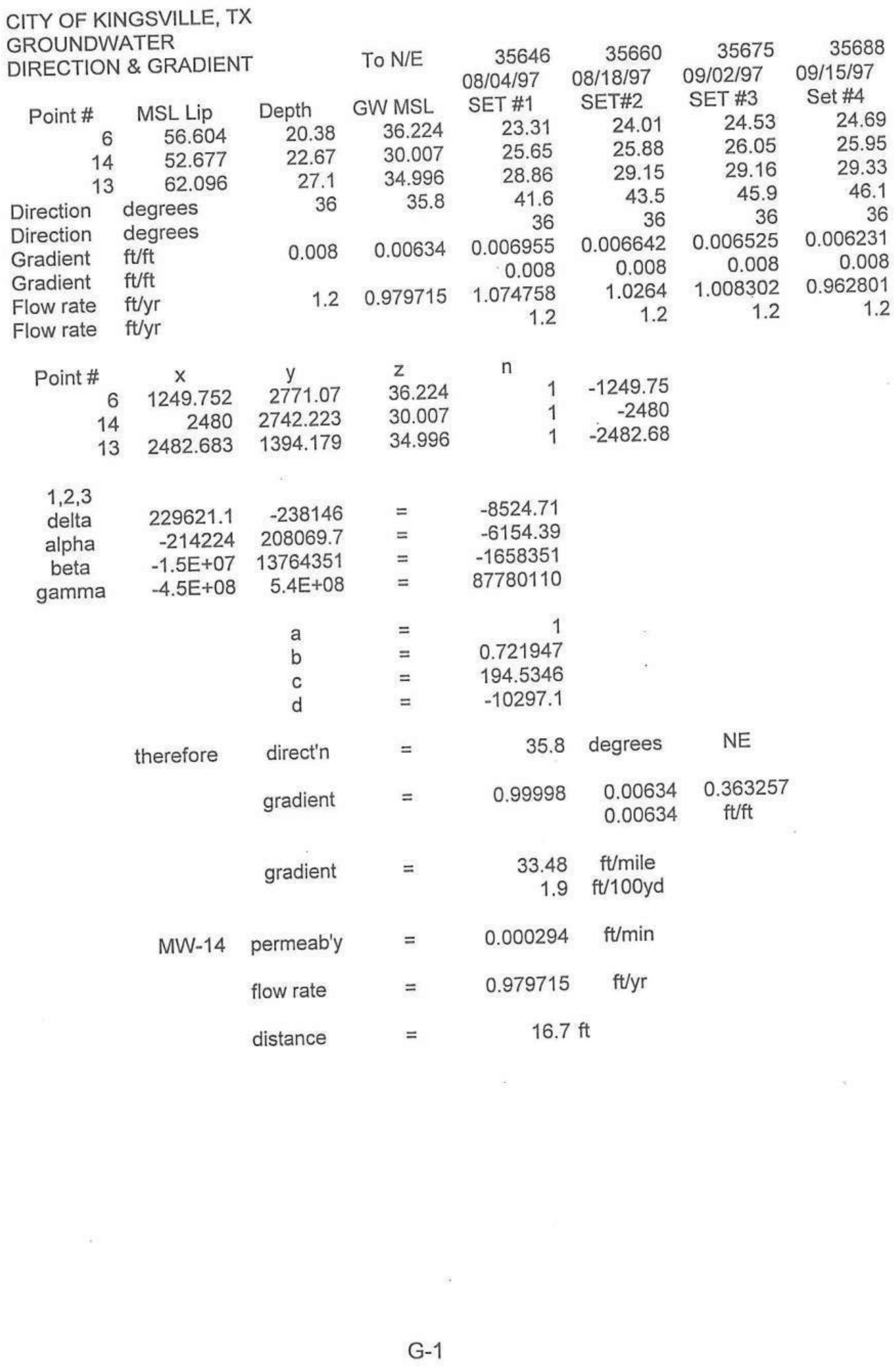
K = hydraulic conductivity, L / T

i = gradient, L / L

The spread sheet was set up so that a particular date and set of MW measurements was used to calculate ground water direction, gradient, and flow rate in a particular area. This data was then recorded permanently under the proper date and another set calculated for the ten month test period. The six rows of data below the input table gives the following data from top to bottom of the table:

Direction of GW flow on that date
Direction of GW flow averaged for the ten month period.
Gradient of GW flow on that date
Gradient of GW flow averaged for the ten month period.
Flow rate of GW for that date
Flow rate of GW averaged for the ten month period.

Both instantaneous and 10 month average data for direction, gradient, and flow rate are plotted on charts after the spread sheets.



CITY OF KINGSVILLE, TX
GROUNDWATER
DIRECTION & GRADIENT

			To N/E	35646 08/04/97 SET #1	35660 08/18/97 SET#2	35675 09/02/97 SET #3	35688 09/15/97 Set #4
Point #	MSL Lip	Depth	GW MSL				
6	56.604	20.38	36.224	23.31	24.01	24.53	24.69
14	52.677	22.67	30.007	25.65	25.88	26.05	25.95
13	62.096	27.1	34.996	28.86	29.15	29.16	29.33
Direction	degrees	36	35.8	41.6	43.5	45.9	46.1
Direction	degrees			36	36	36	36
Gradient	ft/ft	0.008	0.00634	0.006955	0.006642	0.006525	0.006231
Gradient	ft/ft			0.008	0.008	0.008	0.008
Flow rate	ft/yr	1.2	0.979715	1.074758	1.0264	1.008302	0.962801
Flow rate	ft/yr			1.2	1.2	1.2	1.2

Point #	x	y	z	n	
6	1249.752	2771.07	36.224	1	-1249.75
14	2480	2742.223	30.007	1	-2480
13	2482.683	1394.179	34.996	1	-2482.68

1,2,3				
delta	229621.1	-238146	=	-8524.71
alpha	-214224	208069.7	=	-6154.39
beta	-1.5E+07	13764351	=	-1658351
gamma	-4.5E+08	5.4E+08	=	87780110

a = 1
b = 0.721947
c = 194.5346
d = -10297.1

therefore direct'n = 35.8 degrees NE

gradient = 0.99998 0.00634 0.363257
0.00634 ft/ft

gradient = 33.48 ft/mile
1.9 ft/100yd

MW-14 permeab'y = 0.000294 ft/min

flow rate = 0.979715 ft/yr

distance = 16.7 ft

G-1

CITY OF KINGSVILLE, TX
GROUNDWATER
DIRECTION & GRADIENT

35702	35719	35731	35744	35758	35772	35786	35800	35815	35828	35844	35933	35962
09/29/97	10/16/97	10/28/97	11/10/97	11/24/97	12/08/97	12/22/97	01/05/98	01/20/98	02/02/98	02/18/98	05/18/98	06/16/98
#5	#6	#7	#8	#9	#10	#11	#12	#13	#14	#15	#16	#17
24.48	17.74	17.59	18.3	18.23	18.35	19.11	19.42	19.55	19.11	18.64	19.3	20.38
25.77	25.46	25.08	24.66	24.25	23.89	23.64	23.63	23.37	23.51	23.1	22.52	22.67
29.26	28.53	27.55	27.12	26.68	26.49	26.61	26.71	26.81	27.17	26.62	26.62	27.1
45.4	26.3	28.8	31.4	32.4	33	34.5	35	34.8	32	32.4	33.8	35.8
36	36	36	36	36	36	36	36	36	36	36	36	36
0.006188	0.010682	0.010731	0.009939	0.009716	0.009317	0.008745	0.008213	0.007795	0.008096	0.008195	0.007106	0.00634
0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008
0.956197	1.650626	1.658229	1.535872	1.501446	1.439724	1.309687	1.269186	1.204545	1.251108	1.266366	1.098088	0.979715
1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2

CITY OF KINGSVILLE, TX
GROUNDWATER
DIRECTION & GRADIENT

			to S/W	35646 08/04/97	35660 08/18/97	35675 09/02/97	35688 09/15/97
Point #	MSL Lip	Depth	GW MSL	SET #1	SET#2	SET #3	Set #4
1	61.867	27.67	34.197	27.67	22.94	35.64	28.28
16	58.839	24.21	34.629	24.21	24.63	24.94	24.95
8	61.178	27.37	33.808	27.37	35.36	35.76	28.42
Direction	degrees	204.3	59.1	239.1	300.7	224.6	252.5
Direction	degrees		204.3	204.3	204.3	204.3	204.3
Gradient	ft/ft	0.00216	-0.00071	0.00071	0.00723	0.00897	0.00088
Gradient	ft/ft			0.00216	0.00216	0.00216	0.00216
Flow Rate	ft/yr	1.503	-0.495	0.495	5.035	6.248	0.613
Flow Rate	ft/yr			1.503	1.503	1.503	1.503

Point #	x	y	z	n	
1	1249.752	2771.07	34.197	1	-1249.75
6	2480	2742.223	34.629	1	-2480
8	2482.683	1394.179	33.808	1	-2482.68

1,2,3						
delta	236345.2	-235739	=	606.0384		
alpha	-212022	213033	=	1011.193		
beta	-1.5E+07	13764351	=	-1658351		
gamma	-4.7E+08	5.3E+08	=	53151142		
		a	=	1		
		b	=	1.668529		
		c	=	-2736.38		
		d	=	87702.6		
	therefore	direct'n	=	59.1 239.1	degrees	NE
		gradient	=	-1	3.140882 -0.00071	179.9593
		gradient	=	-3.75 -0.21	ft/mile ft/100yd	
Avg	MW-16&12	permeab'y	=	0.001325	ft/min	
		flow rate	=	-0.49507	ft/yr	
		distance	=	-8.4 ft		

CITY OF KINGSVILLE, TX
GROUNDWATER
DIRECTION & GRADIENT

35702	35719	35731	35744	35758	35772	35786	35800	35815	35828	35844	35933	35962
09/29/97	10/16/97	10/28/97	11/10/97	11/24/97	12/08/97	12/22/97	01/05/98	01/20/98	02/02/98	02/18/98	05/18/98	06/16/98
#5	#6	#7	#8	#9	#10	#11	#12	#13	#14	#15	#16	#17
28.39	28.57	27.5	27.1	26.69	26.36	26.19	26.05	25.88	25.92	25.67	25.21	25.54
24.81	23.32	22.75	22.46	21.94	21.7	21.71	21.66	21.67	21.74	21.28	21.62	22.67
28.14	22.07	22.74	22.73	23.06	23.83	24.83	24.72	24.91	24.72	23.14	25.19	25.89
237.7	123.3	128	129.7	146.8	173.4	206	205	214.5	206.7	162.2	242.4	279.8
204.3	204.3	204.3	204.3	204.3	204.3	204.3	204.3	204.3	204.3	204.3	204.3	204.3
0.00087	0.00318	0.00221	0.00199	0.00165	0.00133	0.00133	0.00124	0.00118	0.00106	0.00115	0.00103	0.00066
0.00216	0.00216	0.00216	0.00216	0.00216	0.00216	0.00216	0.00216	0.00216	0.00216	0.00216	0.00216	0.00216
0.607	2.214	1.537	1.388	1.147	0.927	0.925	0.865	0.825	0.739	0.804	0.718	0.462
1.503	1.503	1.503	1.503	1.503	1.503	1.503	1.503	1.503	1.503	1.503	1.503	1.503

CITY OF KINGSVILLE, TX
GROUNDWATER
DIRECTION & GRADIENT

			To S/E	35646 08/04/97	35660 08/18/97	35675 09/02/97
Point #	MSL Lip	Depth	GW MSL	SET #1	SET#2	SET #3
1	61.867	25.21	36.657	27.67	22.94	35.64
12	54.879	18.09	36.789	20.97	21.42	21.82
13	62.096	26.62	35.476	28.86	29.15	29.16
Direction	degrees	257.3	82.4	294	355.2	181.1
Direction	degrees			257.3	257.3	257.3
Gradient	ft/ft	0.00144	-0.00098	0.00055	0.00445	0.00556
Gradient	ft/ft			0.00144	0.00144	0.00144
Flow rate	ft/yr	3.124	-2.134	1.186	9.663	12.062
Flow rate	ft/yr			3.124	3.124	3.124

Point #	x	y	z	n	
6	1249.752	2771.07	36.657	1	-1249.75
14	2480	2742.223	36.789	1	-2480
13	2482.683	1394.179	35.476	1	-2482.68

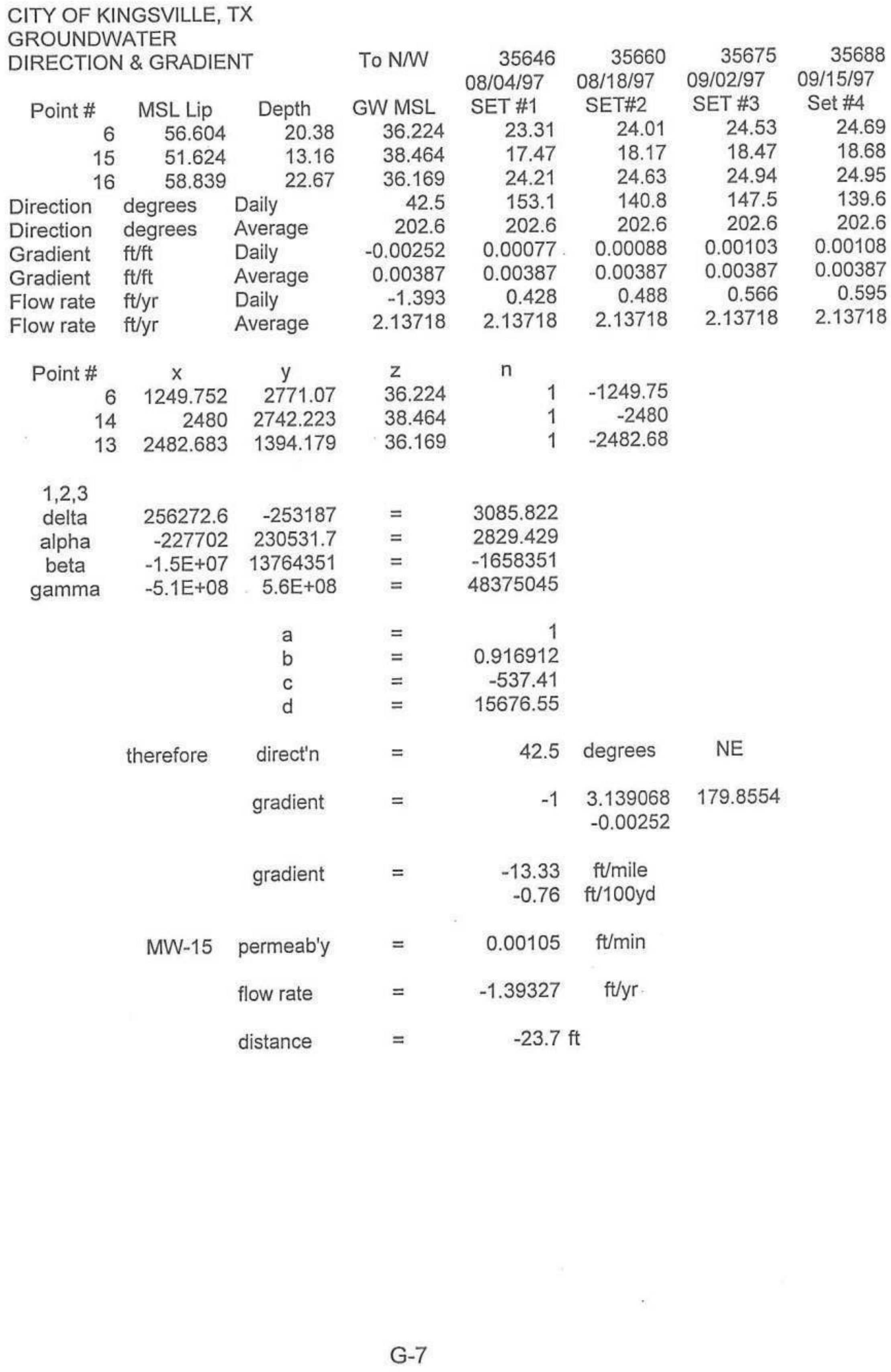
1,2,3				
delta	250334.4	-250119	=	215.8179
alpha	-224965	226581	=	1615.67
beta	-1.5E+07	13764351	=	-1658351
gamma	-5.0E+08	5.6E+08	=	56043316

a = 1
b = 7.486263
c = -7684.03
d = 259678.7

therefore	direct'n	=	82.4	degrees	NE
	gradient	=	-1	3.14061 -0.00098	179.9437
	gradient	=	-5.19 -0.29	ft/mile ft/100yd	
MW-12	permeab'y	=	0.00413	ft/min	
	flow rate	=	-2.13364	ft/yr	
	distance	=	-36.3	ft	

CITY OF KINGSVILLE, TX
GROUNDWATER
DIRECTION & GRADIENT

35702	35719	35731	35744	35758	35772	35786	35800	35815	35828	35844	35933	35962
09/29/97	10/16/97	10/28/97	11/10/97	11/24/97	12/08/97	12/22/97	01/05/98	01/20/98	02/02/98	02/18/98	05/18/98	06/16/98
#5	#6	#7	#8	#9	#10	#11	#12	#13	#14	#15	#16	#17
28.39	28.57	27.5	27.1	26.69	26.36	26.19	26.05	25.88	25.92	25.67	25.21	25.54
22.09	19.58	19.61	19.34	18.65	18.51	18.54	18.51	18.49	18.42	17.81	18.09	18.82
29.26	28.53	27.55	27.12	26.68	26.49	26.61	26.71	26.81	27.17	26.62	26.62	27.1
363.7	217.9	215.8	213.3	214.8	218.5	228.9	237.5	247.1	248.7	238.1	262.4	284.2
257.3	257.3	257.3	257.3	257.3	257.3	257.3	257.3	257.3	257.3	257.3	257.3	257.3
0.00056	0.0021	0.00092	0.00076	0.00106	0.00091	0.00084	0.00087	0.00089	0.00122	0.00139	0.00098	0.00081
0.00144	0.00144	0.00144	0.00144	0.00144	0.00144	0.00144	0.00144	0.00144	0.00144	0.00144	0.00144	0.00144
1.218	4.558	1.996	1.656	2.299	1.98	1.826	1.88	1.93	2.651	3.025	2.134	1.765
3.124	3.124	3.124	3.124	3.124	3.124	3.124	3.124	3.124	3.124	3.124	3.124	3.124



CITY OF KINGSVILLE, TX
GROUNDWATER
DIRECTION & GRADIENT

			To N/W	35646	35660	35675	35688
				08/04/97	08/18/97	09/02/97	09/15/97
Point #	MSL Lip	Depth	GW MSL	SET #1	SET#2	SET #3	Set #4
6	56.604	20.38	36.224	23.31	24.01	24.53	24.69
15	51.624	13.16	38.464	17.47	18.17	18.47	18.68
16	58.839	22.67	36.169	24.21	24.63	24.94	24.95
Direction	degrees	Daily	42.5	153.1	140.8	147.5	139.6
Direction	degrees	Average	202.6	202.6	202.6	202.6	202.6
Gradient	ft/ft	Daily	-0.00252	0.00077	0.00088	0.00103	0.00108
Gradient	ft/ft	Average	0.00387	0.00387	0.00387	0.00387	0.00387
Flow rate	ft/yr	Daily	-1.393	0.428	0.488	0.566	0.595
Flow rate	ft/yr	Average	2.13718	2.13718	2.13718	2.13718	2.13718

Point #	x	y	z	n	
6	1249.752	2771.07	36.224	1	-1249.75
14	2480	2742.223	38.464	1	-2480
13	2482.683	1394.179	36.169	1	-2482.68

1,2,3				
delta	256272.6	-253187	=	3085.822
alpha	-227702	230531.7	=	2829.429
beta	-1.5E+07	13764351	=	-1658351
gamma	-5.1E+08	5.6E+08	=	48375045

a = 1
b = 0.916912
c = -537.41
d = 15676.55

therefore direct'n = 42.5 degrees NE

gradient = -1 3.139068 179.8554
-0.00252

gradient = -13.33 ft/mile
-0.76 ft/100yd

MW-15 permeab'y = 0.00105 ft/min

flow rate = -1.39327 ft/yr

distance = -23.7 ft

G-7

CITY OF KINGSVILLE, TX
GROUNDWATER
DIRECTION & GRADIENT

35702	35719	35731	35744	35758	35772	35786	35800	35815	35828	35844	35933	35962
09/29/97	10/16/97	10/28/97	11/10/97	11/24/97	12/08/97	12/22/97	01/05/98	01/20/98	02/02/98	02/18/98	05/18/98	06/16/98
#5	#6	#7	#8	#9	#10	#11	#12	#13	#14	#15	#16	#17
24.48	17.74	17.59	18.3	18.23	18.35	19.11	19.42	19.55	19.11	18.64	19.3	20.38
18.65	10.19	10.16	8.14	8.19	7.62	9.05	9.89	10.54	9.54	8.91	11.98	13.16
24.81	23.32	22.75	22.46	21.94	21.7	21.71	21.66	21.67	21.74	21.28	21.62	22.67
130.7	243.5	242.4	230.6	229	226.8	223.8	221.9	221	224.1	224.1	222.8	222.5
202.6	202.6	202.6	202.6	202.6	202.6	202.6	202.6	202.6	202.6	202.6	202.6	202.6
0.00103	0.00491	0.0045	0.00683	0.00644	0.007	0.00585	0.00507	0.00443	0.00532	0.0055	0.00265	0.00252
0.00387	0.00387	0.00387	0.00387	0.00387	0.00387	0.00387	0.00387	0.00387	0.00387	0.00387	0.00387	0.00387
0.569	2.709	2.485	3.77	3.553	3.864	3.229	2.8	2.447	2.936	3.037	1.463	1.393
2.13718	2.13718	2.13718	2.13718	2.13718	2.13718	2.13718	2.13718	2.13718	2.13718	2.13718	2.13718	2.13718

CITY OF KINGSVILLE, TX
GROUNDWATER
DIRECTION & GRADIENT

Point #	MSL Lip	Depth	Central GW MSL	35646 08/04/97 SET #1	35660 08/18/97 SET#2	35675 09/02/97 SET #3	35688 09/15/97 Set #4
12	54.879	18.82	36.059	33.909	33.459	33.059	32.869
14	52.677	22.67	30.007	27.027	26.797	26.627	26.727
15	51.624	13.16	38.464	34.154	33.454	33.154	32.944
Direction	degrees	Daily	33	41.2	42.2	41.8	41.8
Direction	degrees	Average	31.6	31.6	31.6	31.6	31.6
Gradient	ft/ft	Daily	0.00407	0.00382	0.00363	0.00353	0.00337
Gradient	ft/ft	Average	0.00519	0.00519	0.00519	0.00519	0.00519
Flow rate	ft/yr	Daily	2.246	2.109	2.002	1.949	1.859
Flow rate	ft/yr	Average	2.86665	2.86665	2.86665	2.86665	2.86665

Point #	x	y	z	n	
12	2480	8	36.059	1	-2480
14	2480	2742.223	30.007	1	-2480
15	5.08411	2739	38.464	1	-5.08411

1,2,3				
delta	204482.5	-181379	=	23103.82
alpha	-169991	184969.6	=	14978.19
beta	-6826502	13593474	=	6766972
gamma	-5.1E+08	2.1E+08	=	-3.0E+08

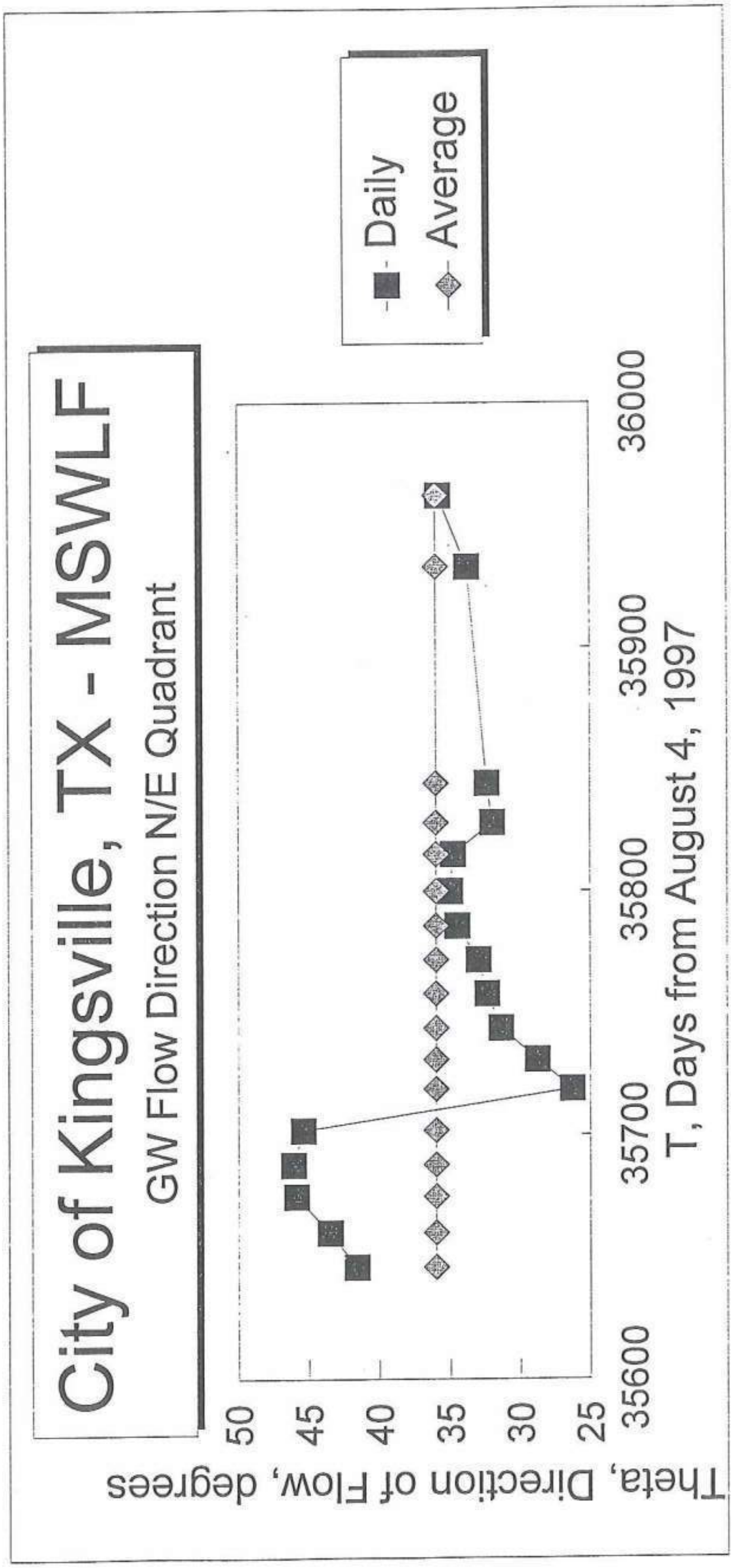
a = 7.487086
b = 4.853873
c = 2192.923
d = -97681.4

therefore	direct'n	=	33	degrees	NE
	gradient	=	0.999992	0.004069 0.004069	0.23313
	gradient	=	21.48 1.22	ft/mile ft/100yd	
MW-15	permeab'y	=	0.00105	ft/min	
	flow rate	=	2.245551	ft/yr	
	distance	=	38.2 ft		

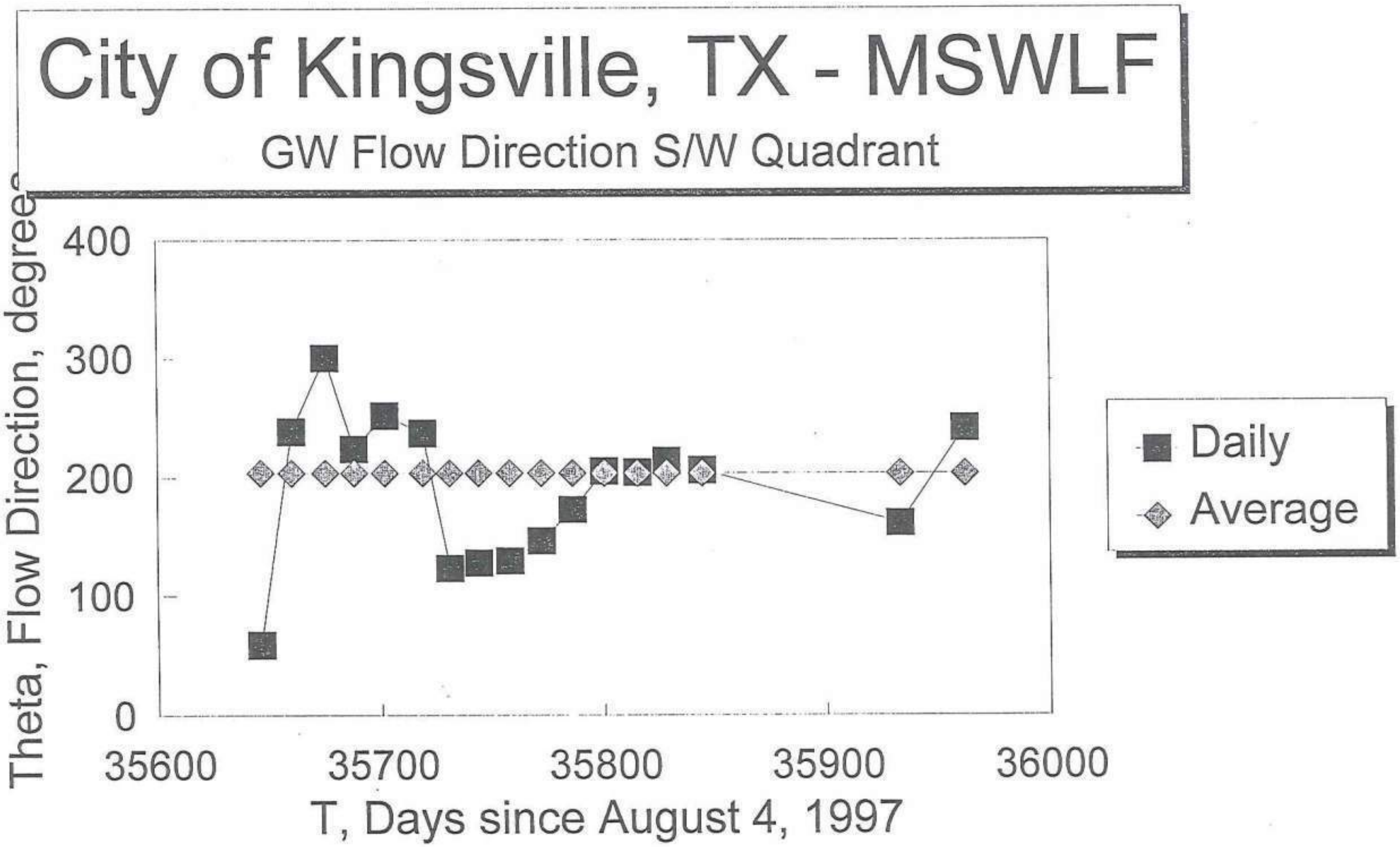
CITY OF KINGSVILLE, TX
GROUNDWATER
DIRECTION & GRADIENT

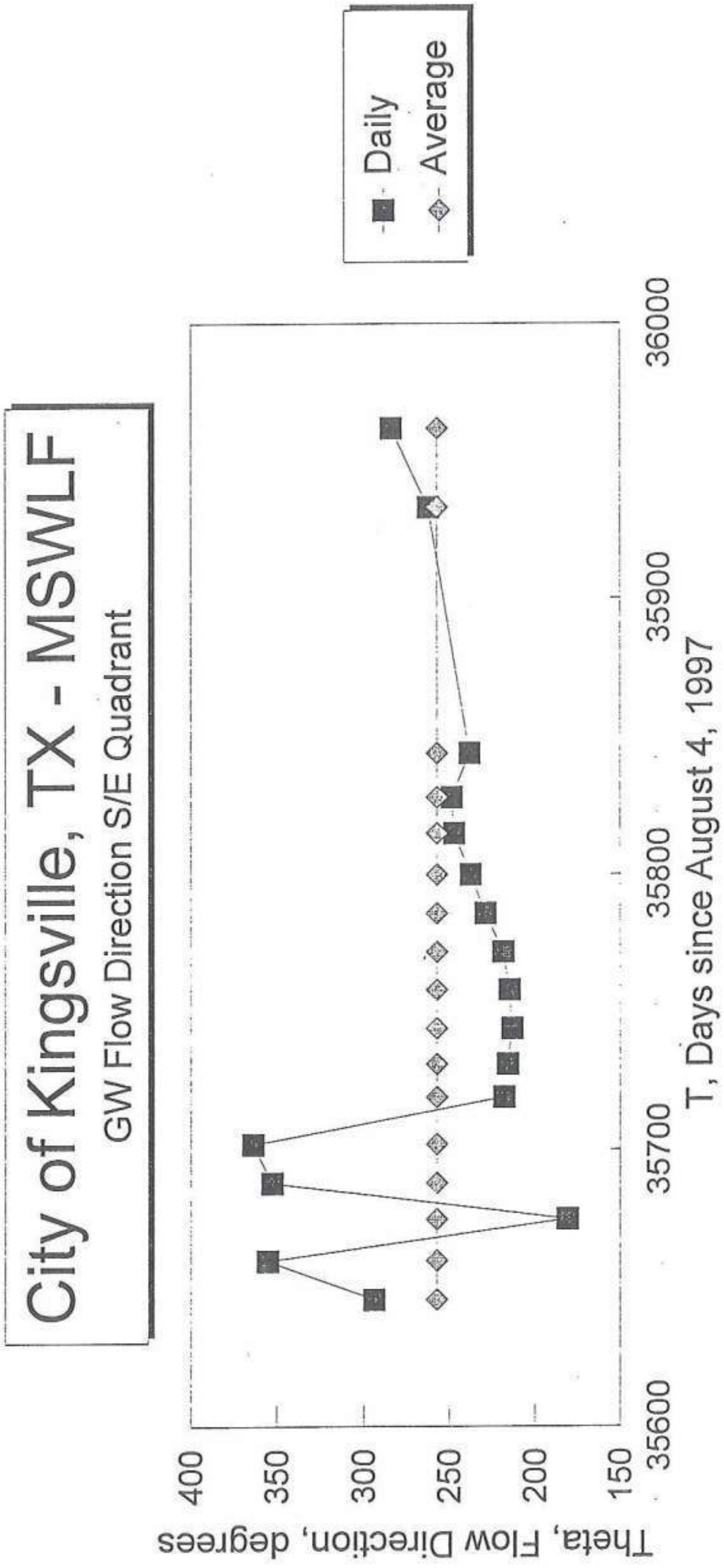
35702	35719	35731	35744	35758	35772	35786	35800	35815	35828	35844	35933	35962
09/29/97	10/16/97	10/28/97	11/10/97	11/24/97	12/08/97	12/22/97	01/05/98	01/20/98	02/02/98	02/18/98	05/18/98	06/16/98
#5	#6	#7	#8	#9	#10	#11	#12	#13	#14	#15	#16	#17
32.789	35.299	35.269	35.539	36.229	36.369	36.339	36.369	36.389	36.459	37.069	36.789	36.059
26.907	27.217	27.597	28.017	28.027	28.787	29.037	29.047	29.307	29.167	29.577	30.157	30.007
32.974	41.434	41.464	43.484	43.434	44.004	42.574	41.734	41.084	42.084	42.714	39.644	38.464
41.3	27.2	26.6	23.8	25.2	24.3	26	27.6	28.6	27.1	27.3	32.3	33
31.6	31.6	31.6	31.6	31.6	31.6	31.6	31.6	31.6	31.6	31.6	31.6	31.6
0.00326	0.00646	0.00626	0.00682	0.0067	0.00674	0.00608	0.00578	0.00541	0.00586	0.00597	0.00453	0.00407
0.00519	0.00519	0.00519	0.00519	0.00519	0.00519	0.00519	0.00519	0.00519	0.00519	0.00519	0.00519	0.00519
1.799	3.563	3.456	3.767	3.697	3.721	3.357	3.19	2.988	3.233	3.295	2.502	2.246
2.86665	2.86665	2.86665	2.86665	2.86665	2.86665	2.86665	2.86665	2.86665	2.86665	2.86665	2.86665	2.86665

G-8b

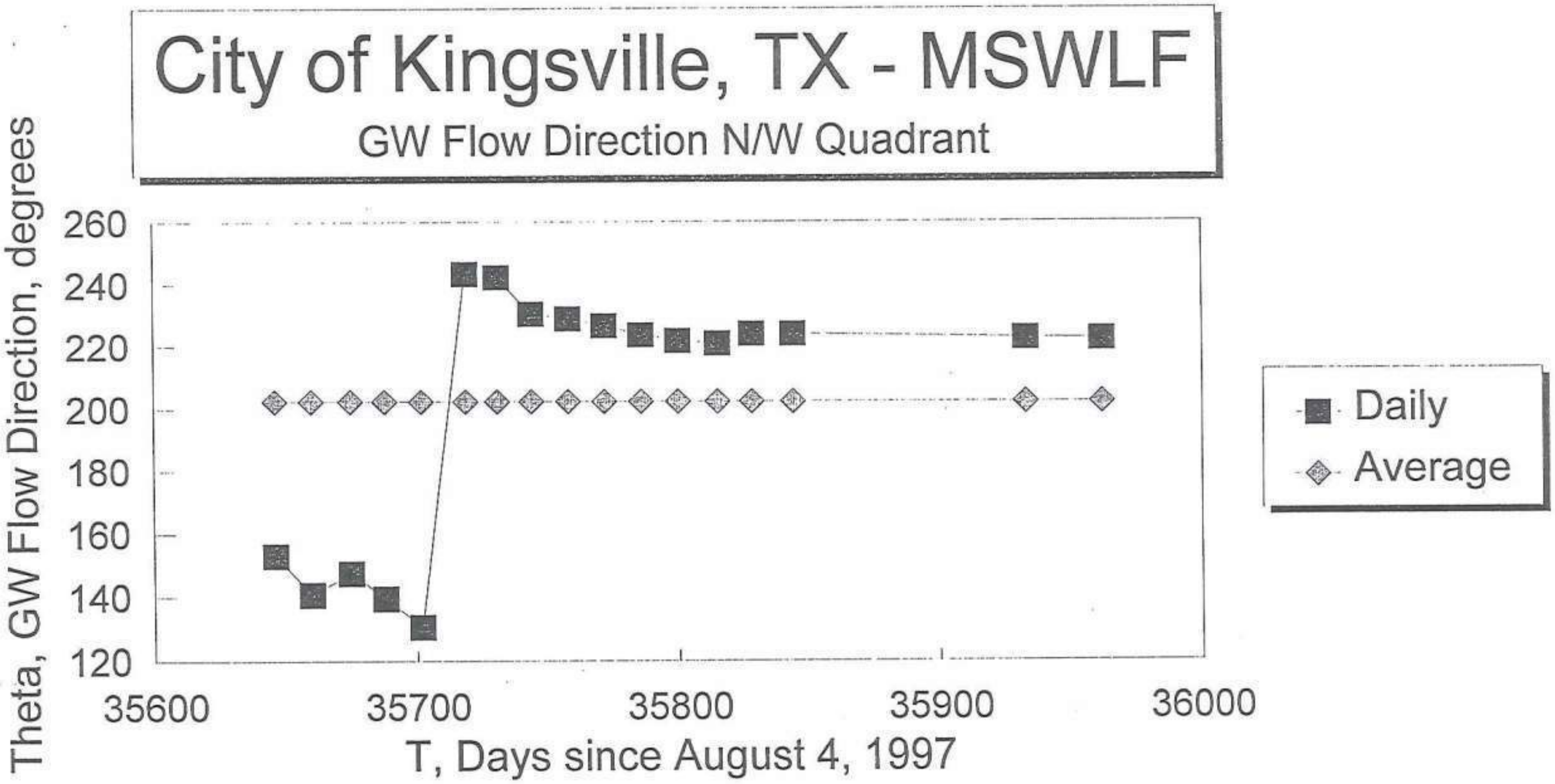

City of Kingsville, TX - MSWLF
GW Flow Direction N/E Quadrant
Daily
Average
Theta, Direction of Flow, degrees
50
45
40
35
30
25
35600
35700
35800
35900
36000
T, Days from August 4, 1997

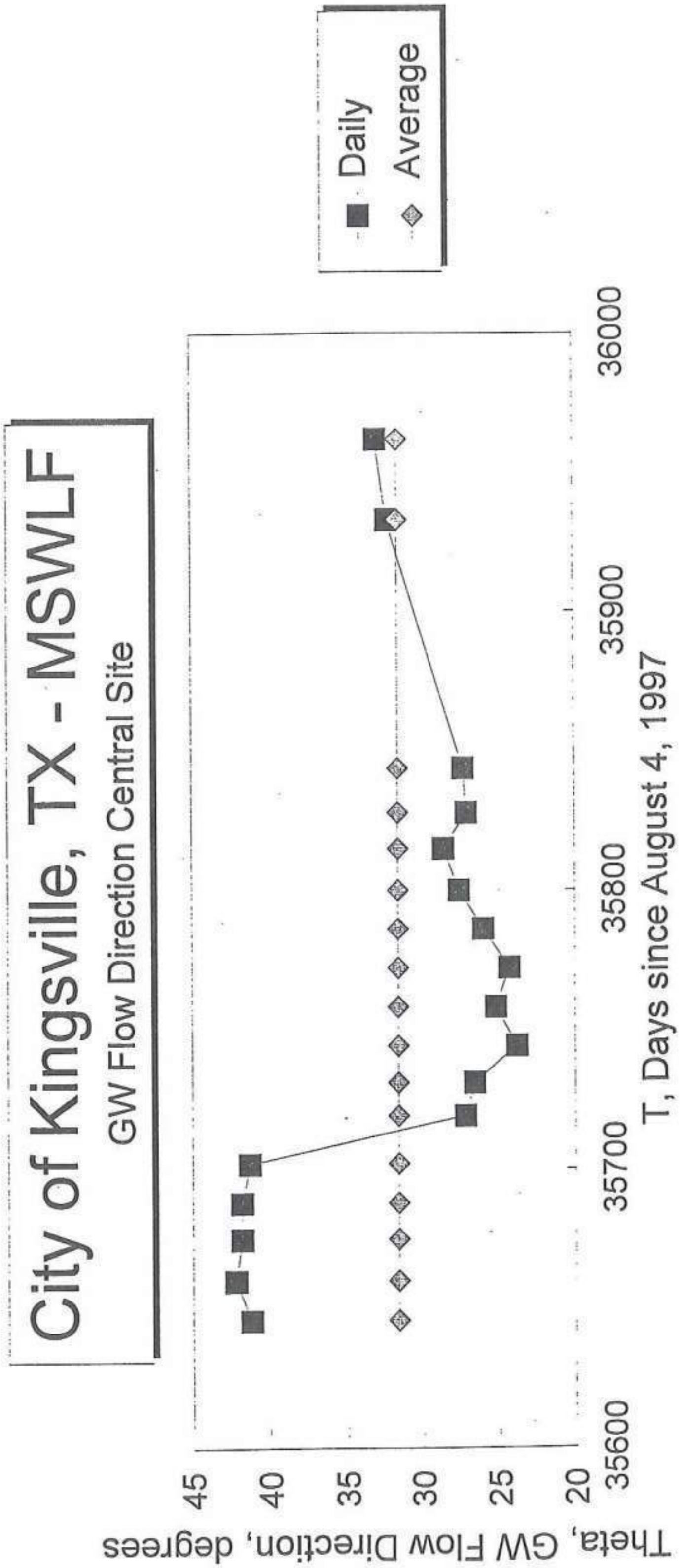
G-9


City of Kingsville, TX - MSWLF
GW Flow Direction S/W Quadrant
Theta, Flow Direction, degrees
400
300
200
100
0
35600
35700
35800
35900
36000
T, Days since August 4, 1997
Daily
Average

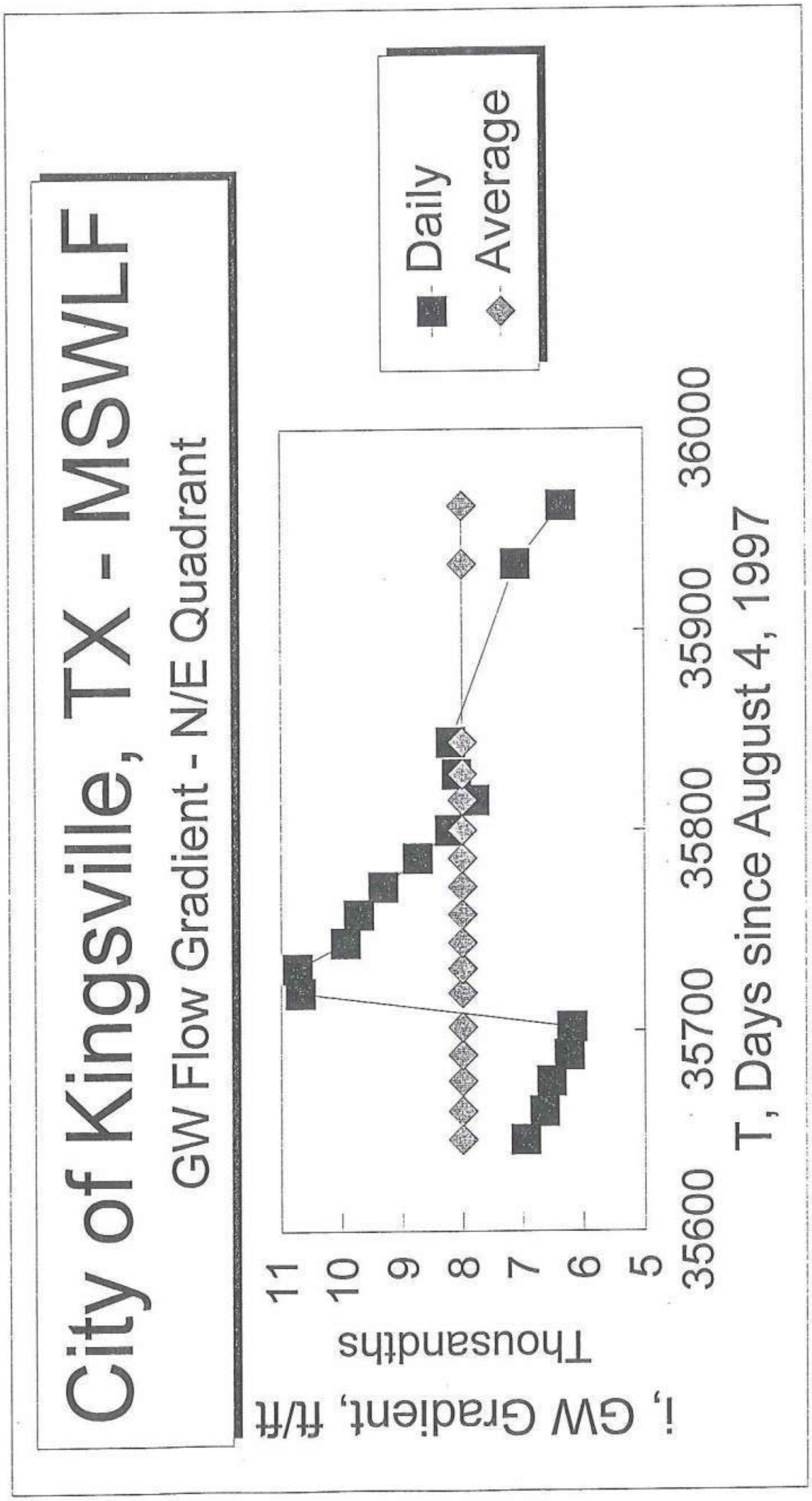

City of Kingsville, TX - MSWLF
GW Flow Direction S/E Quadrant
Daily
Average
Theta, Flow Direction, degrees
400
350
300
250
200
150
35600
35700
35800
35900
36000
T, Days since August 4, 1997

G-11

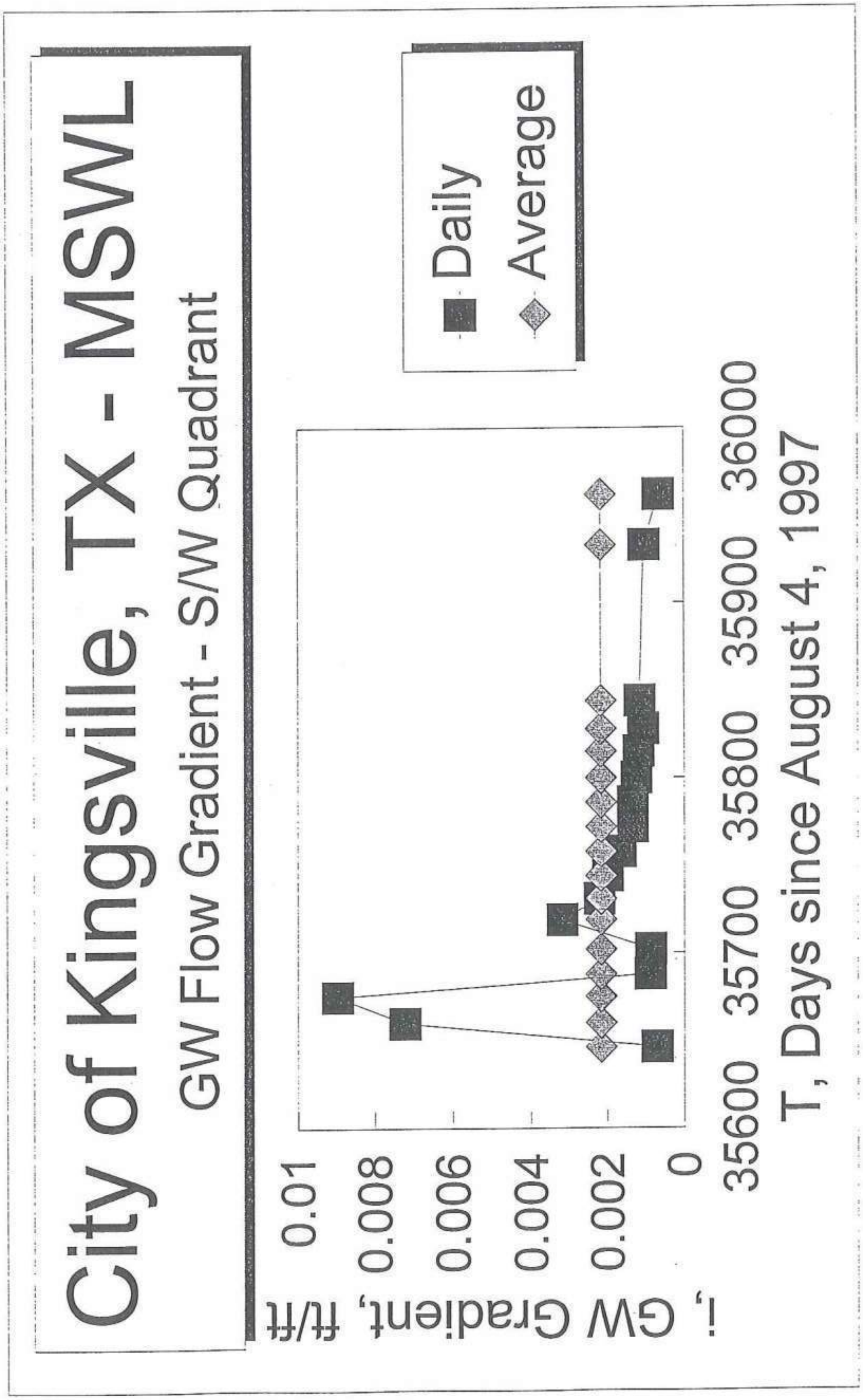

City of Kingsville, TX - MSWLF
GW Flow Direction N/W Quadrant
Theta, GW Flow Direction, degrees
260
240
220
200
180
160
140
120
35600
35700
35800
35900
36000
T, Days since August 4, 1997
Daily
Average


City of Kingsville, TX - MSWLF
GW Flow Direction Central Site
Daily
Average
Theta, GW Flow Direction, degrees
45
40
35
30
25
20
35600
35700
35800
35900
36000
T, Days since August 4, 1997

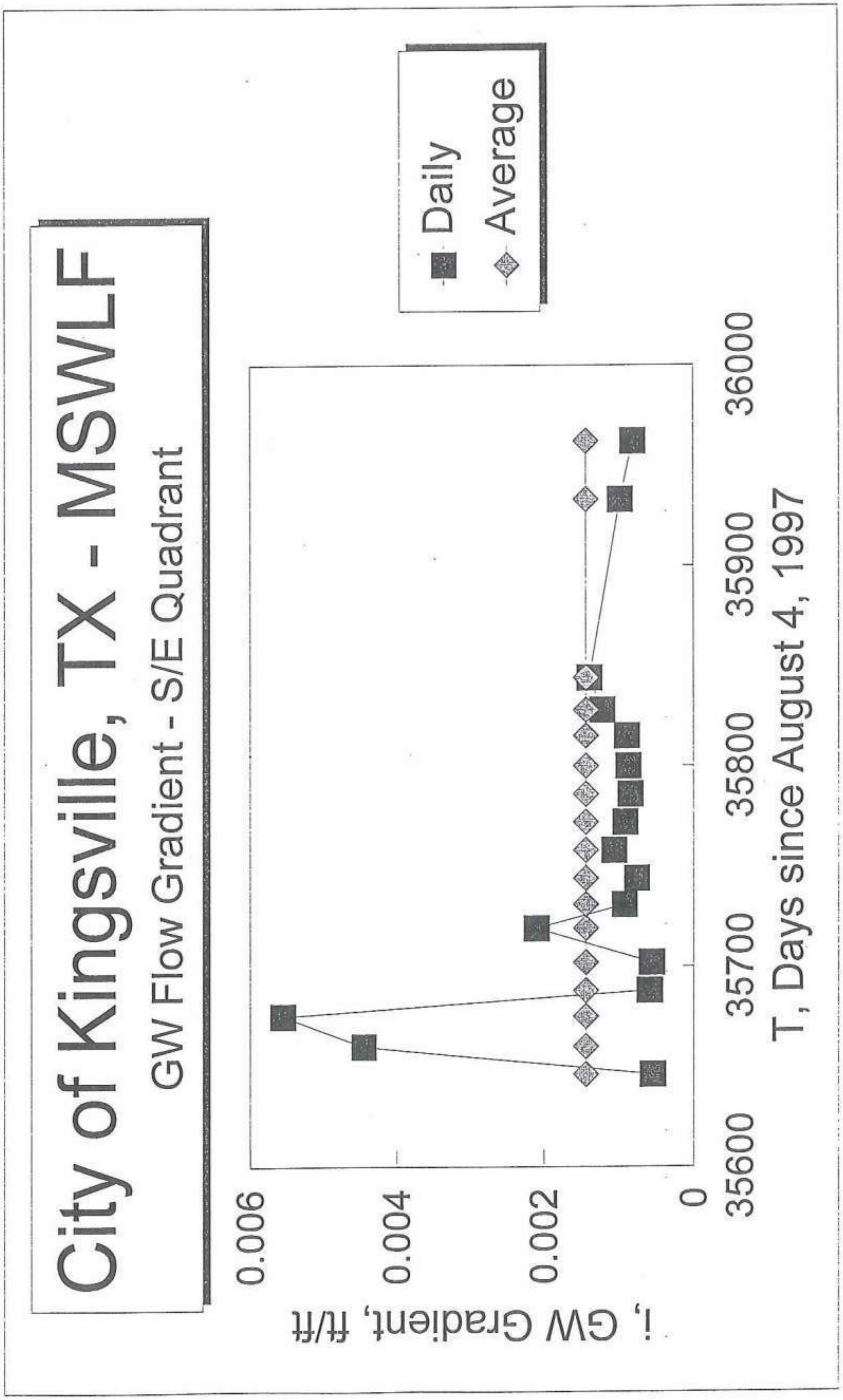
G-12a


City of Kingsville, TX - MSWLF
GW Flow Gradient - N/E Quadrant
Daily
Average
i, GW Gradient, ft/ft
Thousandths
11
10
9
8
7
6
5
35600
35700
35800
35900
36000
T, Days since August 4, 1997

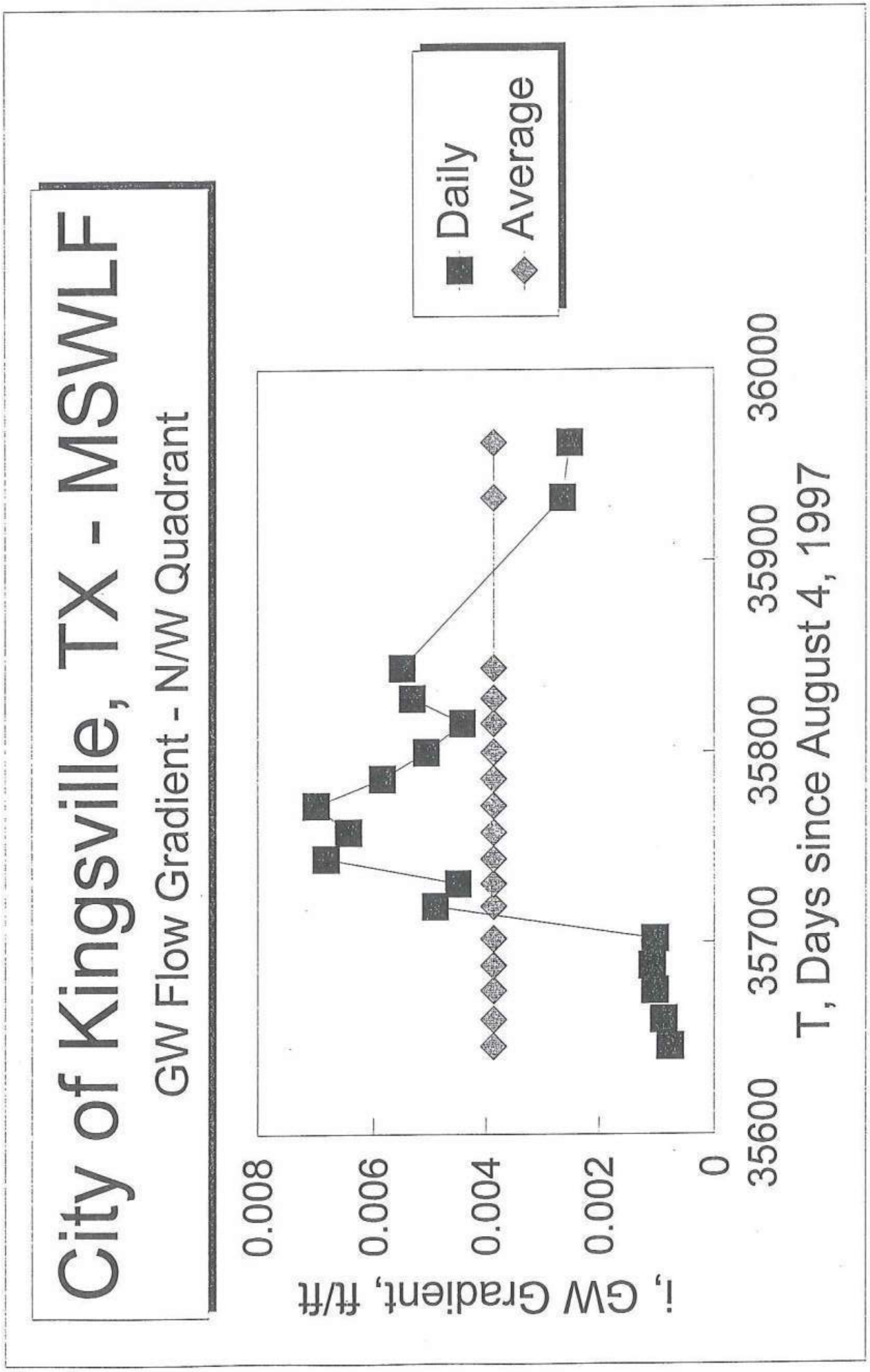
G-13


City of Kingsville, TX - MSWL
GW Flow Gradient - S/W Quadrant
Daily
Average
i, GW Gradient, ft/ft
0.01
0.008
0.006
0.004
0.002
0
35600
35700
35800
35900
36000
T, Days since August 4, 1997

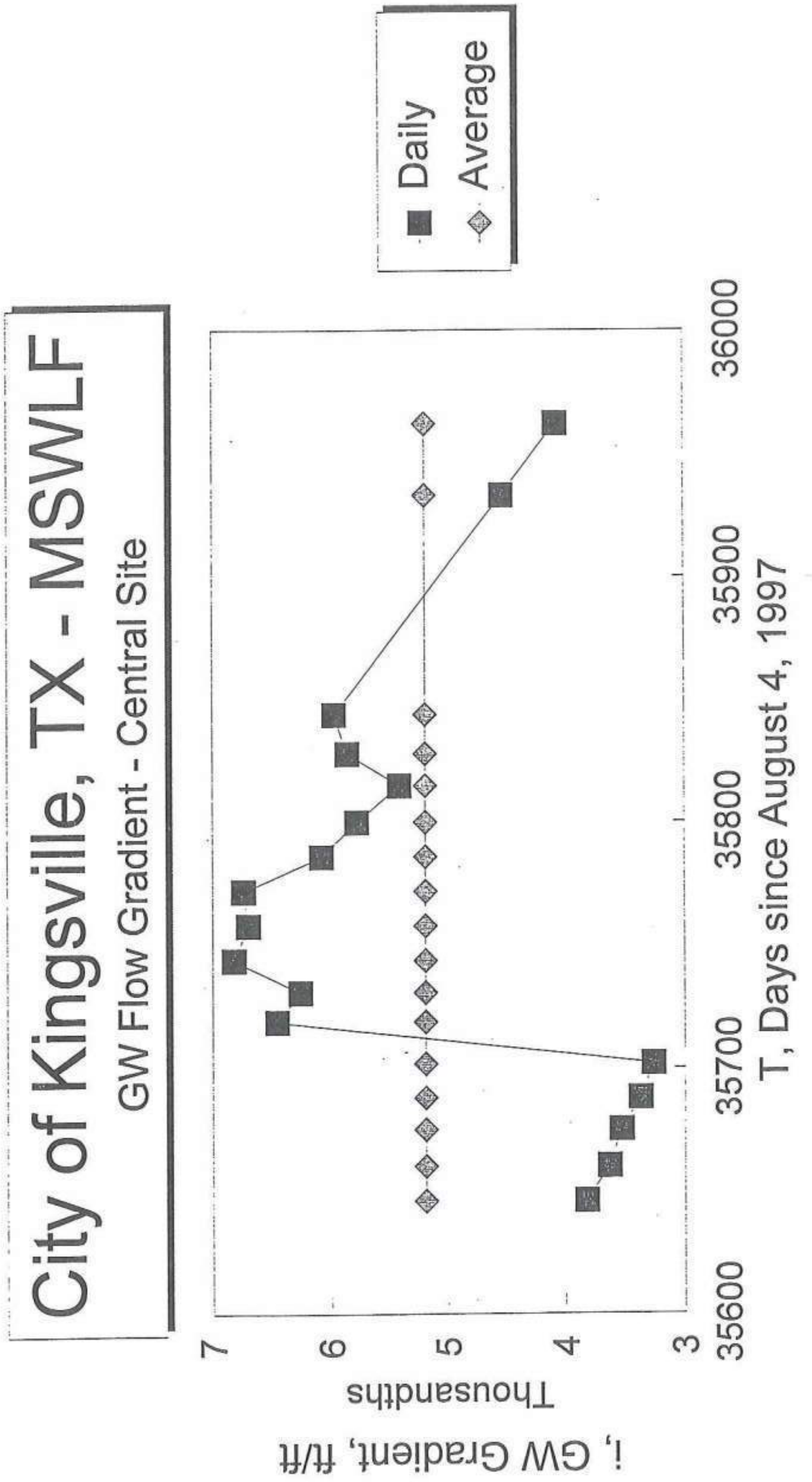
G-14


City of Kingsville, TX - MSWLF
GW Flow Gradient - S/E Quadrant
i, GW Gradient, ft/ft
0.006
0.004
0.002
0
T, Days since August 4, 1997
35600
35700
35800
35900
36000
Daily
Average

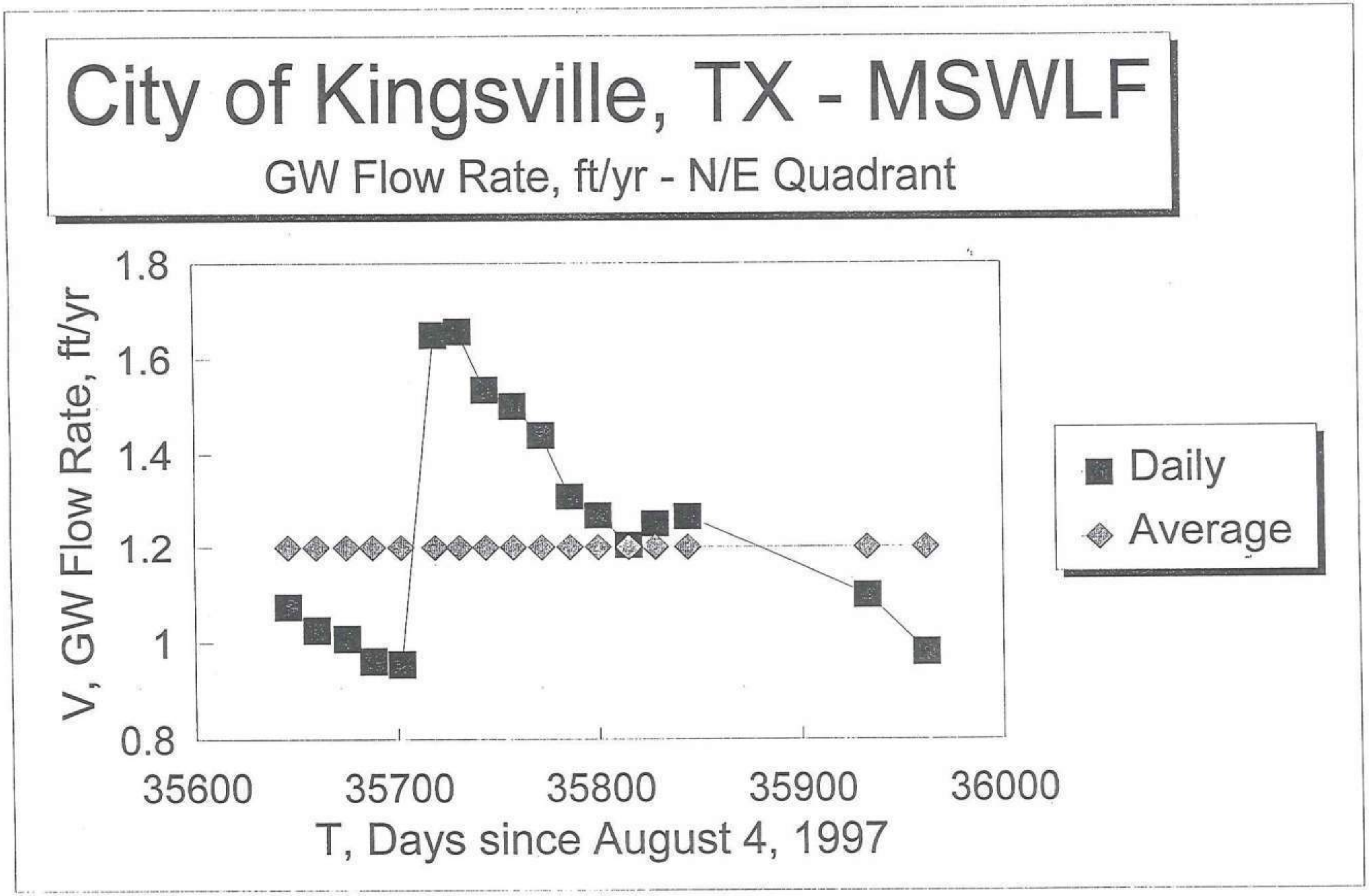
G-15


City of Kingsville, TX - MSWLF
GW Flow Gradient - N/W Quadrant
Daily
Average
i, GW Gradient, ft/ft
0.008
0.006
0.004
0.002
0
35600
35700
35800
35900
36000
T, Days since August 4, 1997

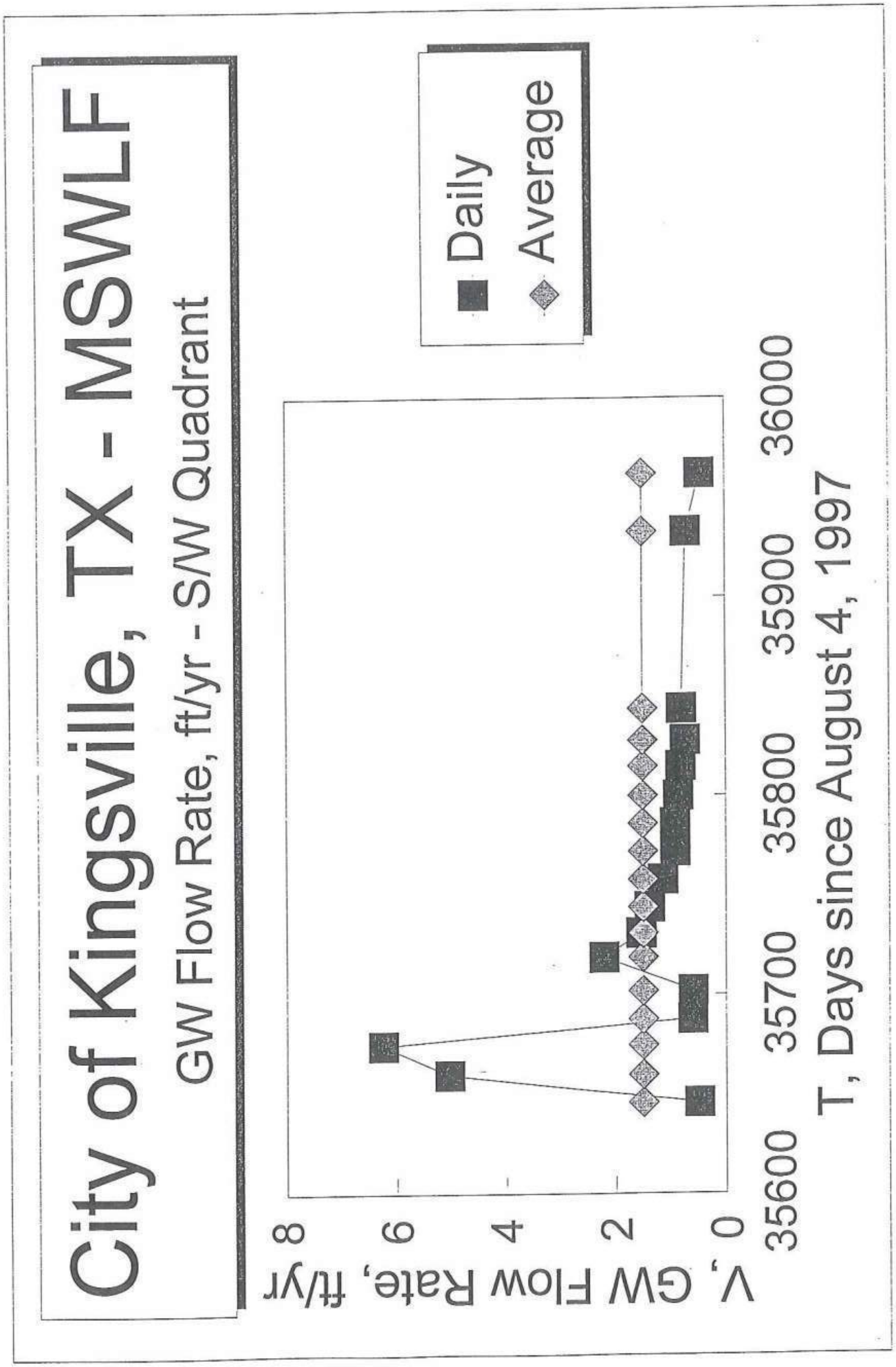
G-16


City of Kingsville, TX - MSWLF
GW Flow Gradient - Central Site
Daily
Average
i, GW Gradient, ft/ft
Thousandths
7
6
5
4
3
35600
35700
35800
35900
36000
T, Days since August 4, 1997

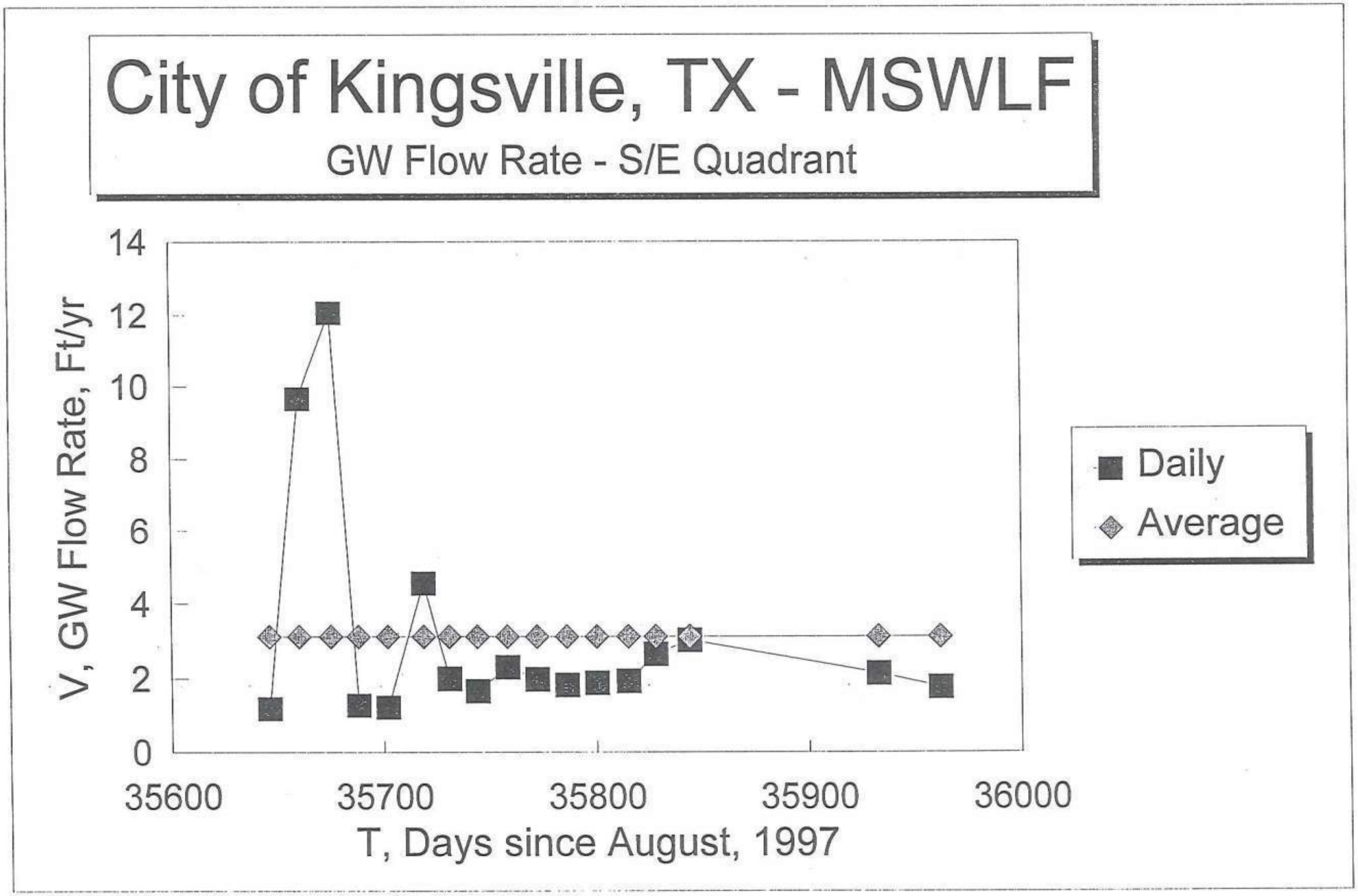
G-16a


City of Kingsville, TX - MSWLF
GW Flow Rate, ft/yr - N/E Quadrant
V, GW Flow Rate, ft/yr
1.8
1.6
1.4
1.2
1
0.8
35600
35700
35800
35900
36000
T, Days since August 4, 1997
Daily
Average

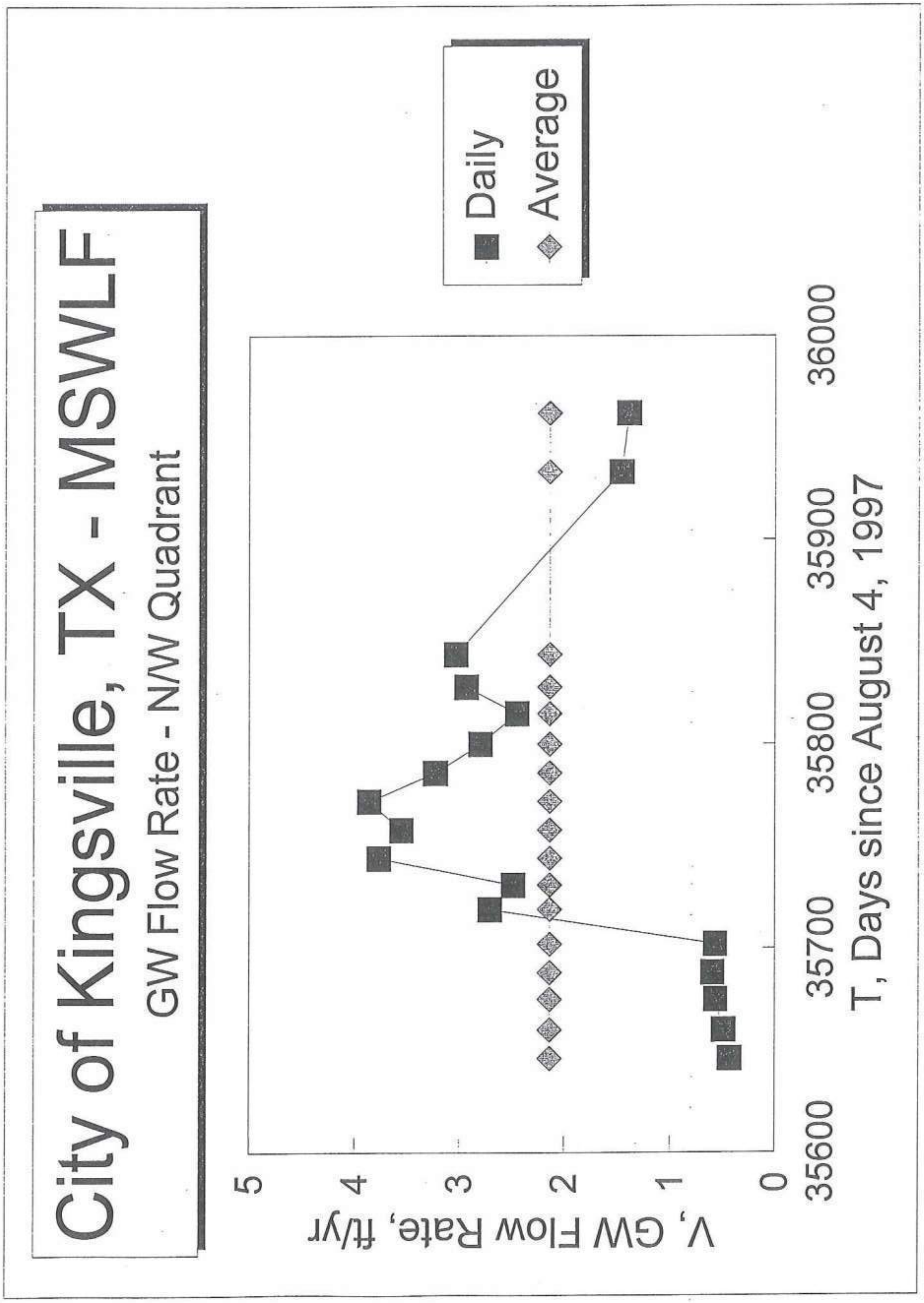
G-17


City of Kingsville, TX - MSWLF
GW Flow Rate, ft/yr - S/W Quadrant
Daily
Average
V, GW Flow Rate, ft/yr
0
2
4
6
8
35600
35700
35800
35900
36000
T, Days since August 4, 1997

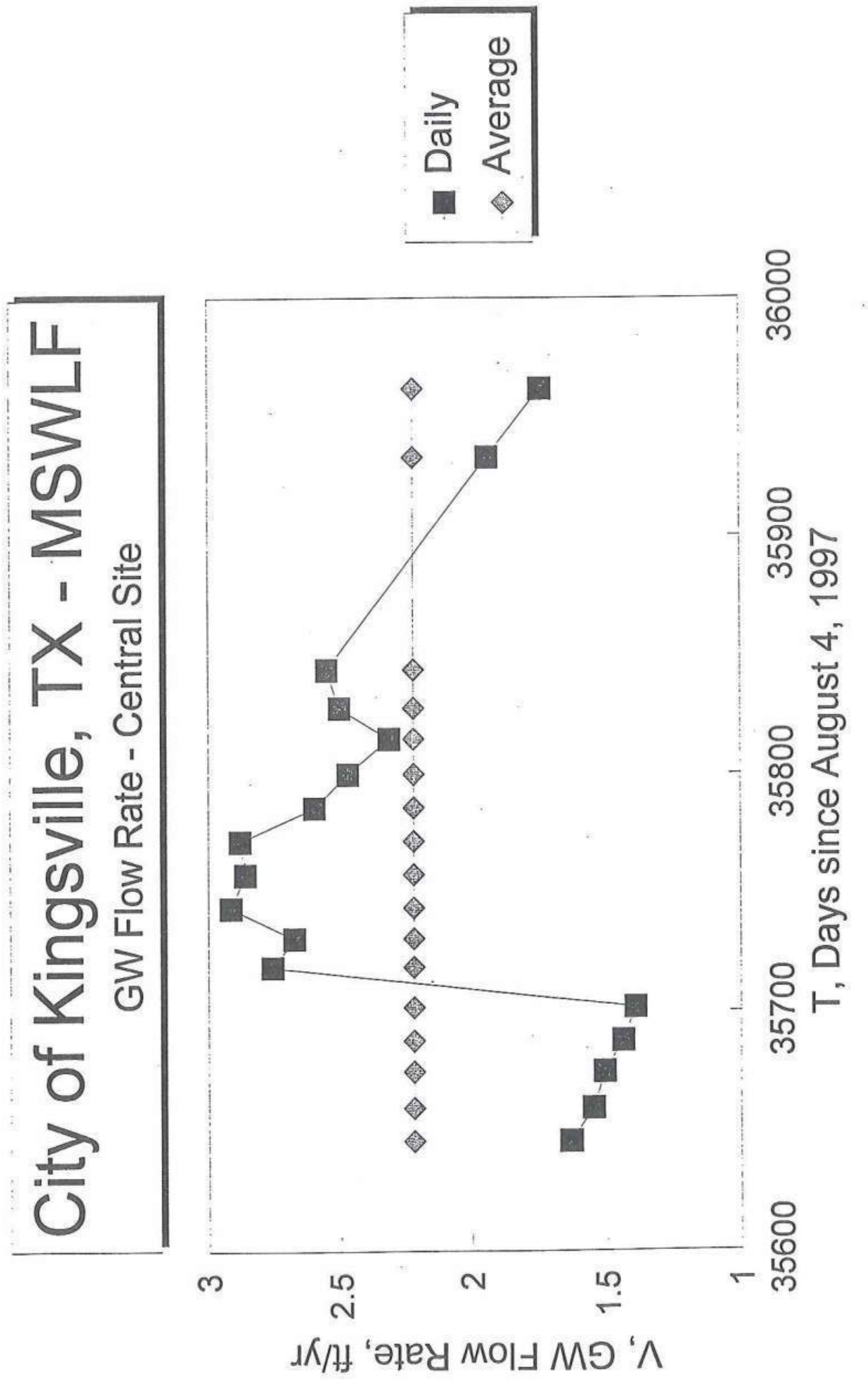
G-18


City of Kingsville, TX - MSWLF
GW Flow Rate - S/E Quadrant
V, GW Flow Rate, Ft/yr
14
12
10
8
6
4
2
0
35600
35700
35800
35900
36000
T, Days since August, 1997
Daily
Average

G-19


City of Kingsville, TX - MSWLF
GW Flow Rate - N/W Quadrant
Daily
Average
V, GW Flow Rate, ft/yr
0
1
2
3
4
5
35600
35700
35800
35900
36000
T, Days since August 4, 1997

G-20


City of Kingsville, TX - MSWLF
GW Flow Rate - Central Site
V, GW Flow Rate, ft/yr
3
2.5
2
1.5
1
35600
35700
35800
35900
36000
T, Days since August 4, 1997
Daily
Average

G-20a

APPENDIX H

APPENDIX H

Boring Logs

November 1997

Revision 1 - June 1998

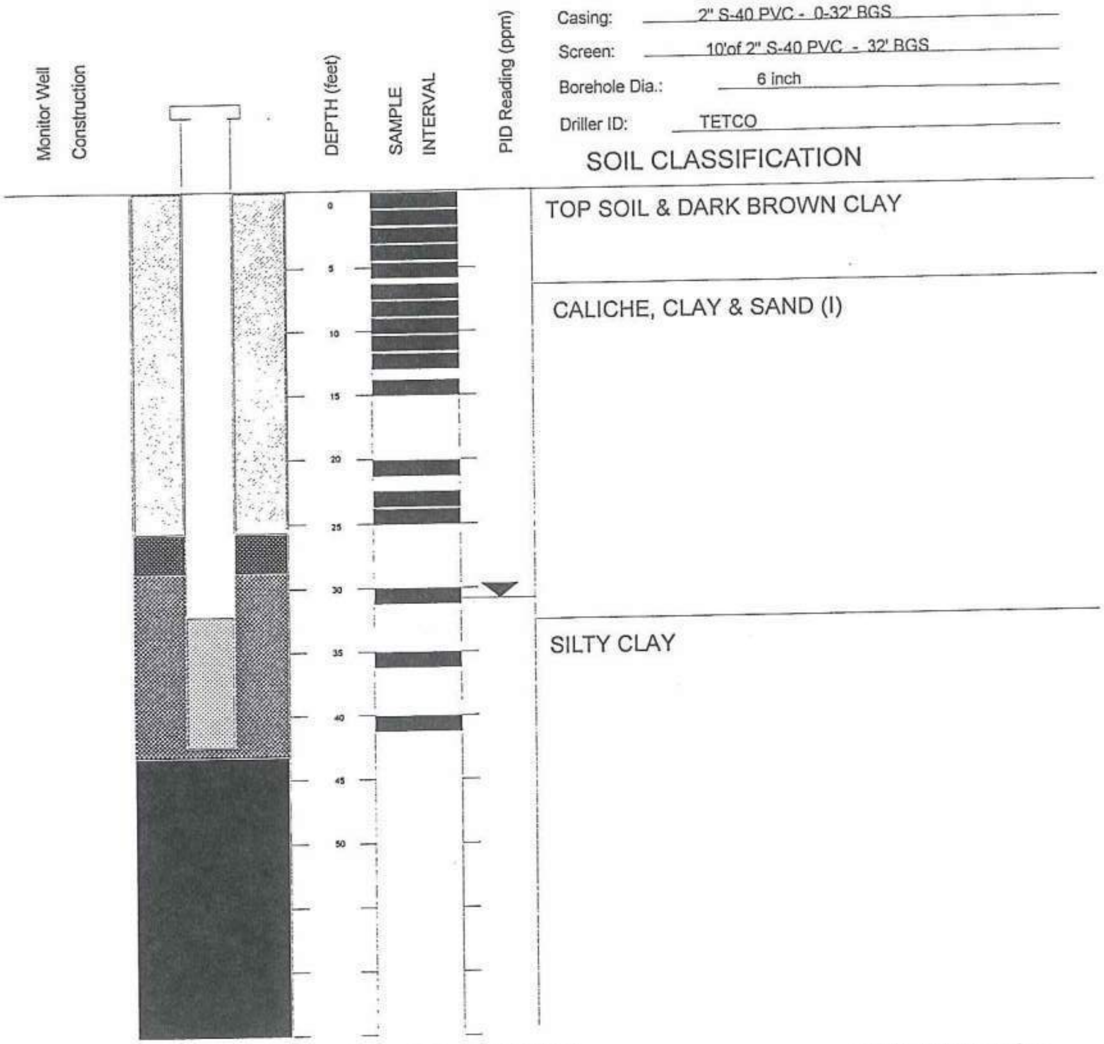
PAGE _1_ OF _1_

FINCH ENERGY AND ENVIRONMENTAL SERVICES, Inc.
P.O. Box 73, Kingsville, Texas 78364-0073

SUBSURFACE EXPLORATION RECORD

Client: City of Kingsville
Project Name: Kingsville Landfill
Project Location: 5 mi SE of City
LAT: 27° 26' 42.2" LONG: 97° 49' 10.6"
MSWLF ID: Permit #235-B

Boring/Well No.: 1
Date Drilled: June 19, 1984
Boring Method: Hollow Stem Auger
Sample Method: SHELBY TUBE & SPLIT SPOON
Surface Elevation: 59.25' MSL
Depth to Water: 31.0' BGS
Total Depth: 42' BGS
Casing: 2" S-40 PVC - 0-32' BGS
Screen: 10'of 2" S-40 PVC - 32' BGS
Borehole Dia.: 6 inch
Driller ID: TETCO



Water depth on Drilling = 30.19ft. BGS

TOTAL DEPTH = 42 feet

H-1

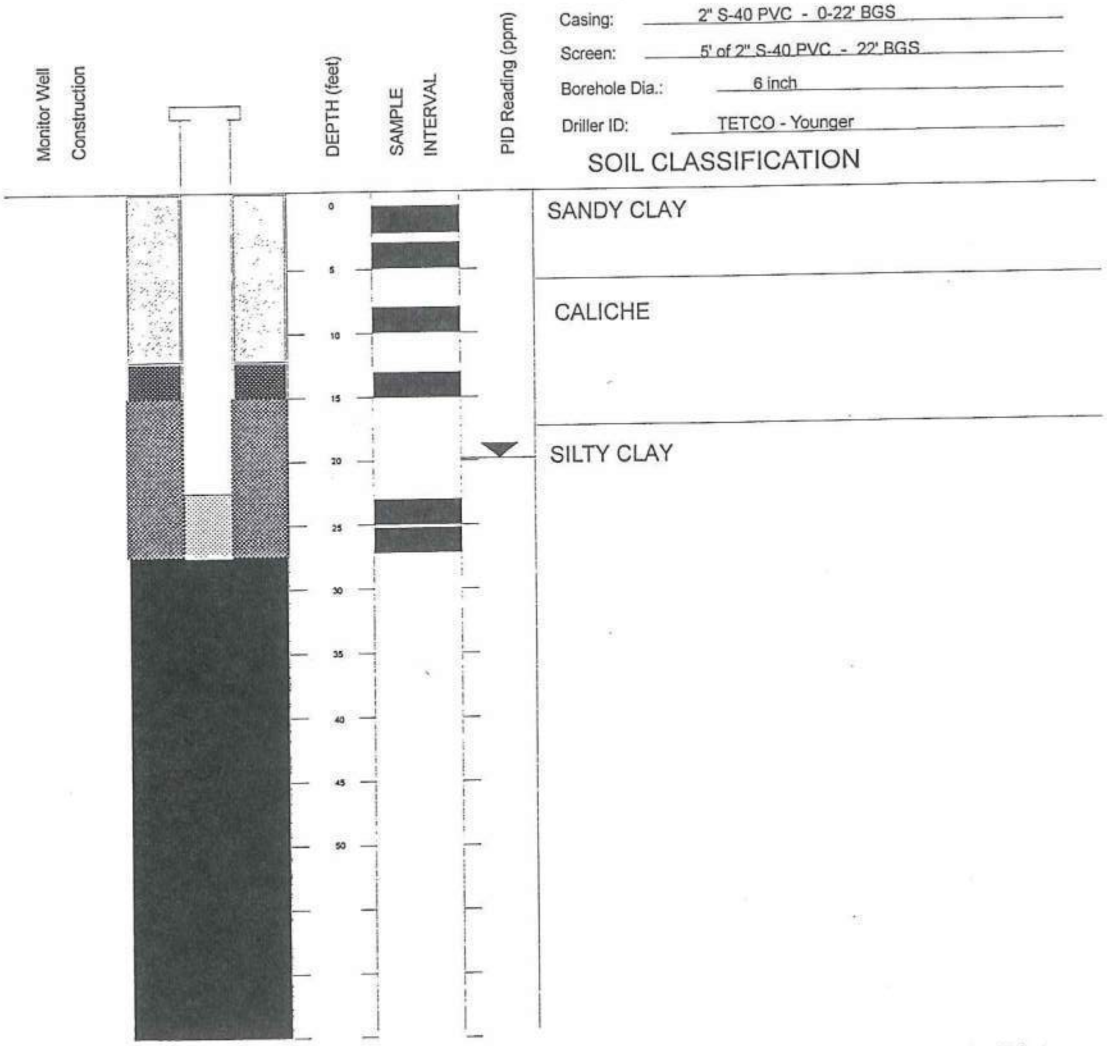
PAGE _1_ OF _1_

FINCH ENERGY AND ENVIRONMENTAL SERVICES, Inc.
P.O. Box 73, Kingsville, Texas 78364-0073

SUBSURFACE EXPLORATION RECORD

Client: City of Kingsville
Project Name: Kingsville Landfill
Project Location: 5 mi SE of City
MSWLF ID: Permit #235-B

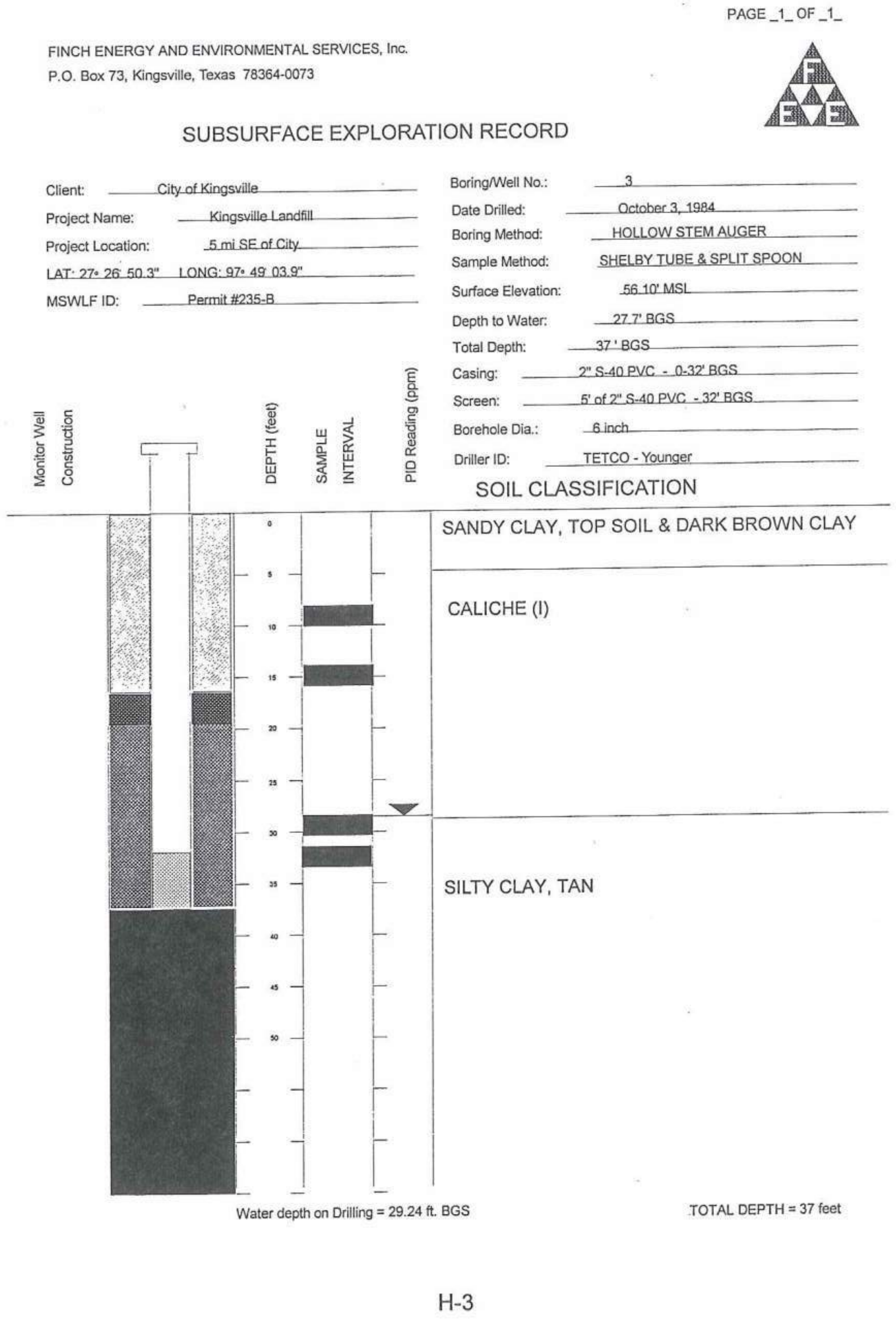
Boring/Well No.: 2
Date Drilled: October 6, 1984
Boring Method: Hollow Stem Auger
Sample Method: SHELBY TUBE & SPLIT SPOON
Surface Elevation: 52.64' MSL
Depth to Water: 19.9' BGS
Total Depth: 27' BGS
Casing: 2" S-40 PVC - 0-22' BGS
Screen: 5' of 2" S-40 PVC - 22' BGS
Borehole Dia.: 6 inch
Driller ID: TETCO - Younger



Water depth on Drilling = 25.49 ft. BGS

TOTAL DEPTH = 27 feet

H-2



PAGE _1_ OF _1_

FINCH ENERGY AND ENVIRONMENTAL SERVICES, Inc.
P.O. Box 73, Kingsville, Texas 78364-0073

SUBSURFACE EXPLORATION RECORD

Client: City of Kingsville
Project Name: Kingsville Landfill
Project Location: 5 mi SE of City
LAT: 27° 26' 50.3" LONG: 97° 49' 03.9"
MSWLF ID: Permit #235-B

Boring/Well No.: 3
Date Drilled: October 3, 1984
Boring Method: HOLLOW STEM AUGER
Sample Method: SHELBY TUBE & SPLIT SPOON
Surface Elevation: 56.10' MSL
Depth to Water: 27.7' BGS
Total Depth: 37 ' BGS
Casing: 2" S-40 PVC - 0-32' BGS
Screen: 5' of 2" S-40 PVC - 32' BGS
Borehole Dia.: 6 inch
Driller ID: TETCO - Younger

SOIL CLASSIFICATION

SANDY CLAY, TOP SOIL & DARK BROWN CLAY

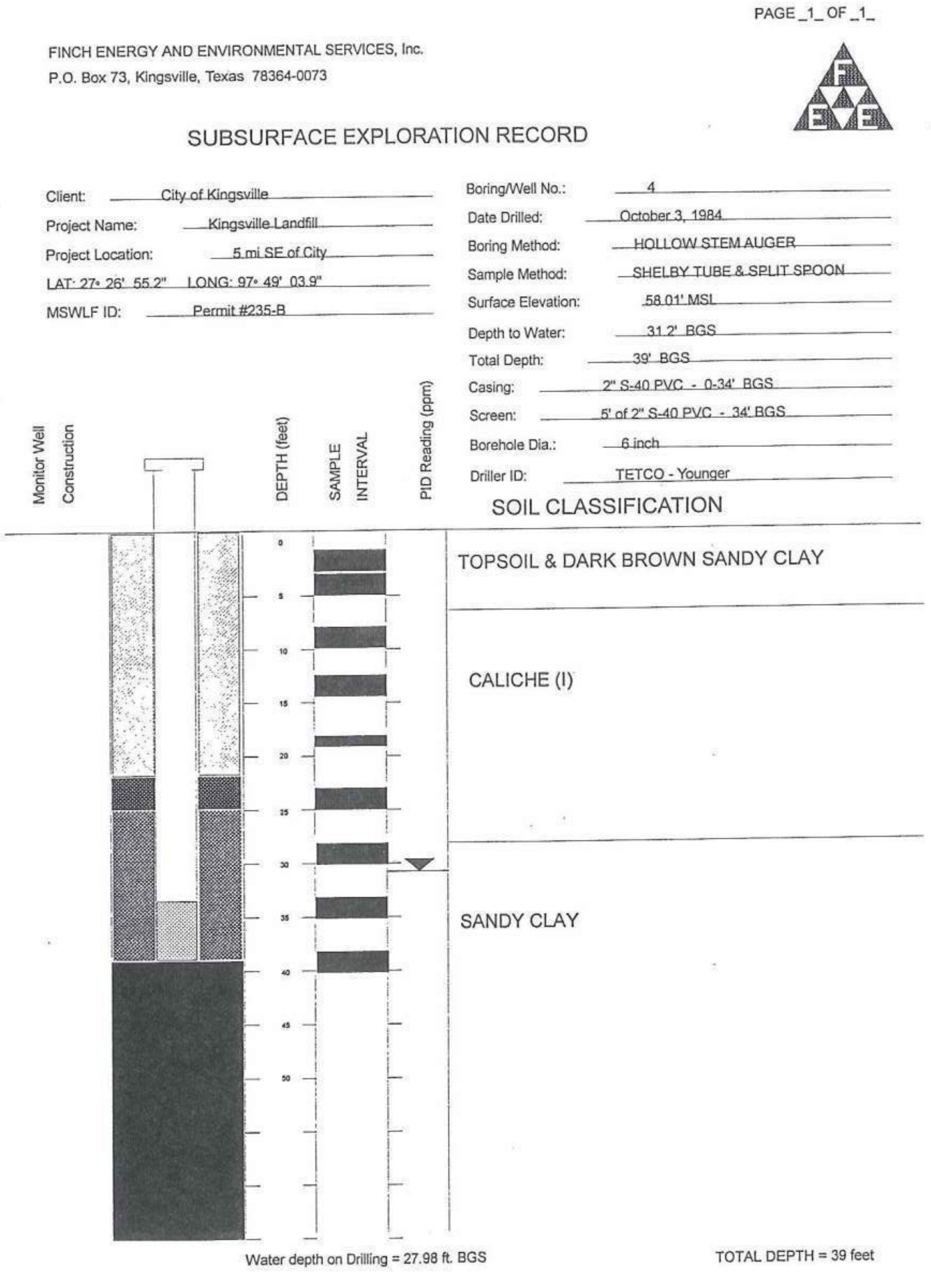
CALICHE (I)

SILTY CLAY, TAN

Water depth on Drilling = 29.24 ft. BGS

TOTAL DEPTH = 37 feet

H-3



PAGE _1_ OF _1_

FINCH ENERGY AND ENVIRONMENTAL SERVICES, Inc.
P.O. Box 73, Kingsville, Texas 78364-0073

SUBSURFACE EXPLORATION RECORD

Client: City of Kingsville
Project Name: Kingsville Landfill
Project Location: 5 mi SE of City
LAT: 27• 26' 55.2" LONG: 97• 49' 03.9"
MSWLF ID: Permit #235-B

Boring/Well No.: 4
Date Drilled: October 3, 1984
Boring Method: HOLLOW STEM AUGER
Sample Method: SHELBY TUBE & SPLIT SPOON
Surface Elevation: 58.01' MSL
Depth to Water: 31.2' BGS
Total Depth: 39' BGS
Casing: 2" S-40 PVC - 0-34' BGS
Screen: 5' of 2" S-40 PVC - 34' BGS
Borehole Dia.: 6 inch
Driller ID: TETCO - Younger

Water depth on Drilling = 27.98 ft. BGS

TOTAL DEPTH = 39 feet

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PAGE _1_ OF _1_

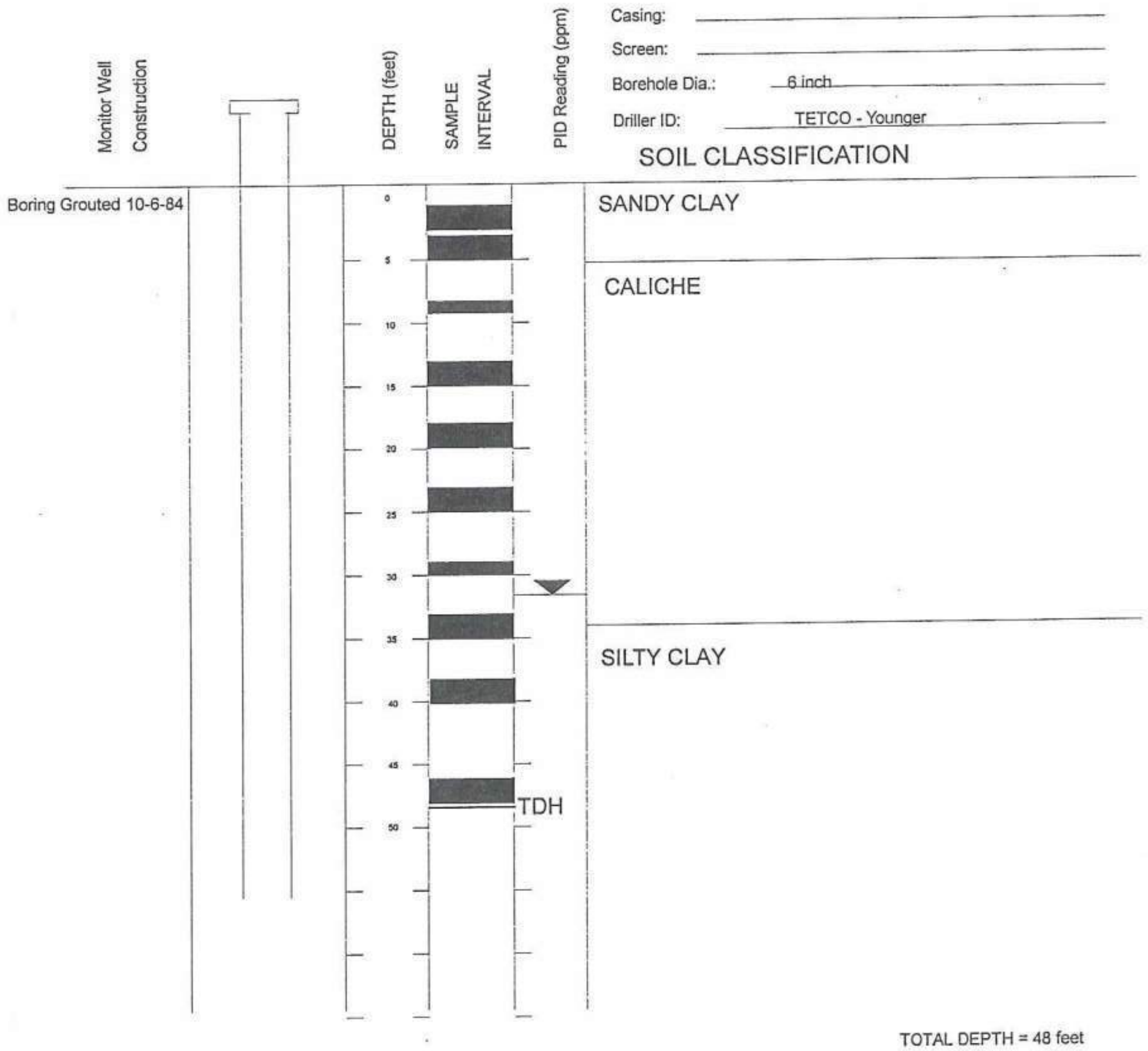
FINCH ENERGY AND ENVIRONMENTAL SERVICES, Inc.
P.O. Box 73, Kingsville, Texas 78364-0073

SUBSURFACE EXPLORATION RECORD

Client: City of Kingsville
Project Name: Kingsville Landfill
Project Location: 5 mi SE of City

MSWLF ID: Permit #235-B

Boring/Well No.: 5
Date Drilled: October 5, 1984
Boring Method: Hollow Stem Auger
Sample Method: SHELBY TUBE & SPLIT SPOON
Surface Elevation: 60.54' MSL
Depth to Water: 31.5' BGS
Total Depth: 48' BGS
Casing:
Screen:
Borehole Dia.: 6 inch
Driller ID: TETCO - Younger



TOTAL DEPTH = 48 feet

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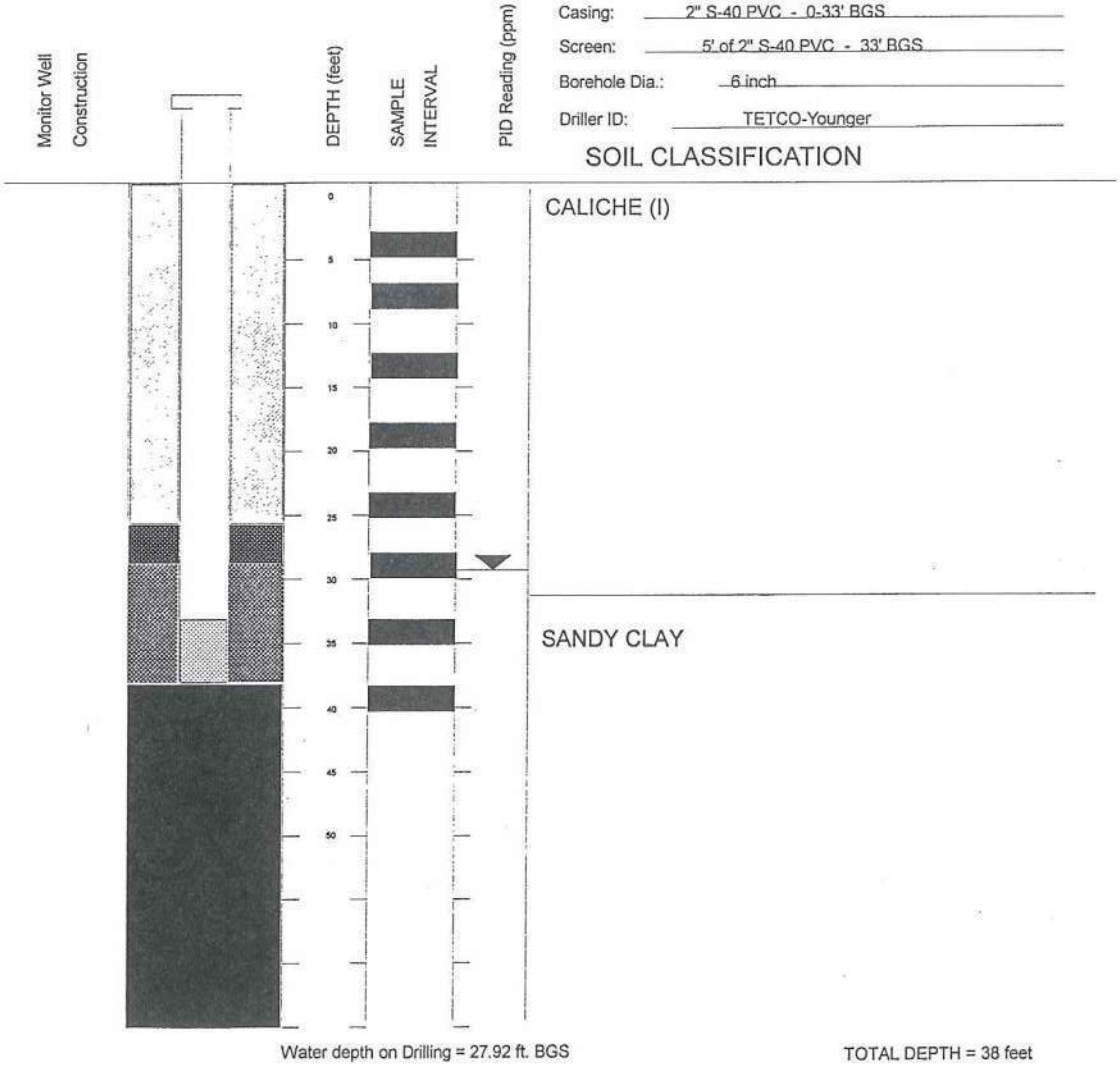
PAGE _1_ OF _1_

FINCH ENERGY AND ENVIRONMENTAL SERVICES, Inc.
P.O. Box 73, Kingsville, Texas 78364-0073

SUBSURFACE EXPLORATION RECORD

Client: City of Kingsville
Project Name: Kingsville Landfill
Project Location: 5 mi SE of City
LAT: 27• 27' 09.2" LONG: 97• 49' 09.9"
MSWLF ID: Permit #235-B

Boring/Well No.: 6
Date Drilled: October 3, 1984
Boring Method: HOLLOW STEM AUGER
Sample Method: SHELBY TUBE & SPLIT SPOON
Surface Elevation: 55.46' MSL
Depth to Water: 29.1' BGS
Total Depth: 38' BGS
Casing: 2" S-40 PVC - 0-33' BGS
Screen: 5' of 2" S-40 PVC - 33' BGS
Borehole Dia.: 6 inch
Driller ID: TETCO-Younger



Water depth on Drilling = 27.92 ft. BGS

TOTAL DEPTH = 38 feet

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PAGE _1_ OF _1_

FINCH ENERGY AND ENVIRONMENTAL SERVICES, Inc.
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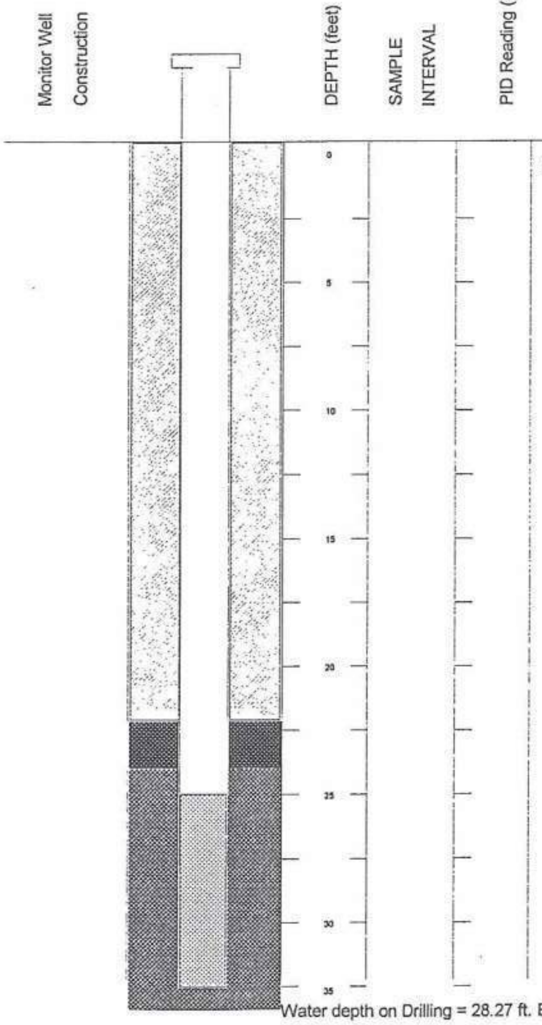
SUBSURFACE EXPLORATION RECORD

Client: City of Kingsville
Project Name: Kingsville Landfill
Project Location: 5 mi SE of City
LAT: 27° 26' 43.9" LONG: 97° 49' 23.3"
MSWLF ID: Permit #235-B

Boring/Well No,: 7
Date Drilled: August 1990
Boring Method:
Sample Method:
Surface Elevation: 61.05 ' MSL
Depth to Water:
Total Depth: 36' BGS
Casing:
Screen:
Borehole Dia.:
Driller ID: Martin Water Wells



SOIL CLASSIFICATION

Monitor Well was P&A on 7-23-91

Water depth on Drilling = 28.27 ft. BGS

TOTAL DEPTH = 36 feet

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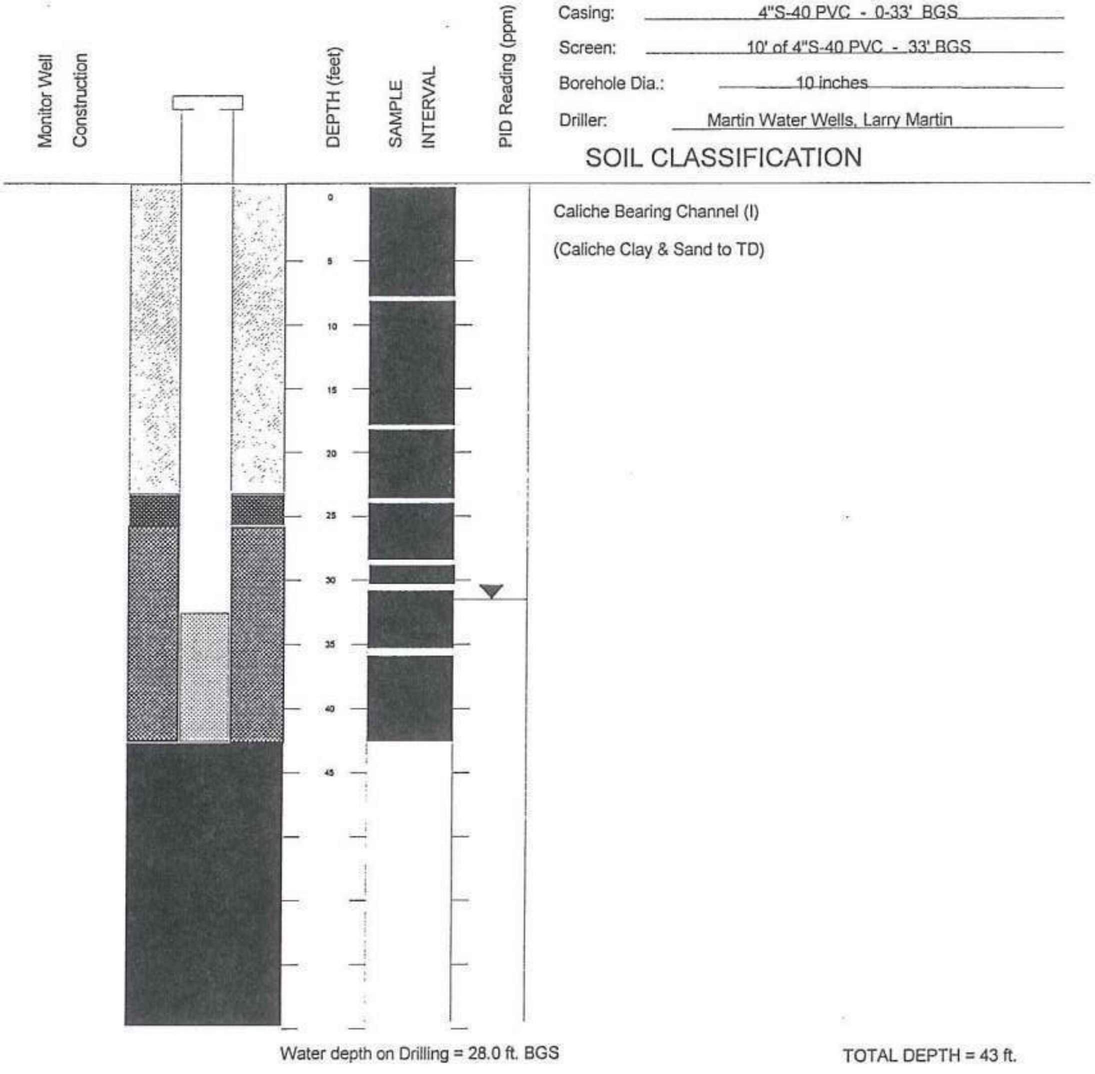
(512) 592-9810 (512) 592-5552 FAX

PAGE 1 OF 1

SUBSURFACE EXPLORATION RECORD

Client: City of Kingsville
Project Name: Kingsville Landfill
Project Location: 5 mi. SE of City
LAT: 27° 26' 43.9" LONG: 97° 49' 23.3"
MSWLF ID: Permit #235-B

Boring/Well No.: 8
Date Drilled: July 23, 1991
Boring Method: Hollow Stem Auger
Sample Method: Split Spoon
Surface Elevation: 59.79 ' MSL
Depth to Water: 32.02' BGS
Total Depth: 43' BGS
Casing: 4"S-40 PVC - 0-33' BGS
Screen: 10' of 4"S-40 PVC - 33' BGS
Borehole Dia.: 10 inches
Driller: Martin Water Wells, Larry Martin



SOIL CLASSIFICATION

Caliche Bearing Channel (I)

(Caliche Clay & Sand to TD)

Water depth on Drilling = 28.0 ft. BGS

TOTAL DEPTH = 43 ft.

H-8

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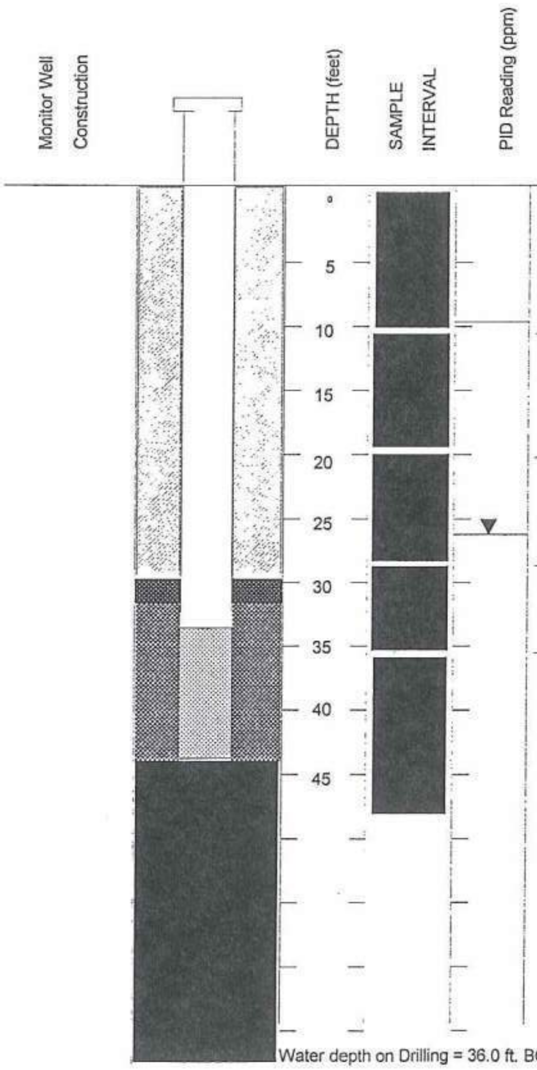
PAGE _1_ OF _1_

SUBSURFACE EXPLORATION RECORD

Client: City of Kingsville
Project Name: Kingsville Landfill
Project Location: 5 mi. SE of City
LAT: 27° 27' 54 " LONG: 97° 49' 20.1 "
MSWLF ID: Permit #235-B

Boring/Well No.: 9
Date Drilled: March 24, 1992
Boring Method: Hollow Stem Auger
Sample Method: 5 foot core barrel
Surface Elevation: 62.51' MSL
Depth to Water: 26' BGS
Total Depth: 44' BGS
Casing: 4" S-40 PVC - 0-34' BGS
Screen: 10' of 4" S-40 PVC - 34' BGS
Borehole Dia.: 10 inch
Driller: JEDI, Charles L. Jones



SOIL CLASSIFICATION

Monitor Well was P&A on 07-12-96

Caliche, Dark Clay
Road Fill

Caliche, Fine Sand

Very Fine Silty Sand

Very Fine Sandy Silt
w/Clay Stringers

Very Fine Sandy Silt
Wet, Soft w/Clay Stringers

Water depth on Drilling = 36.0 ft. BGS

TOTAL DEPTH: 44 feet

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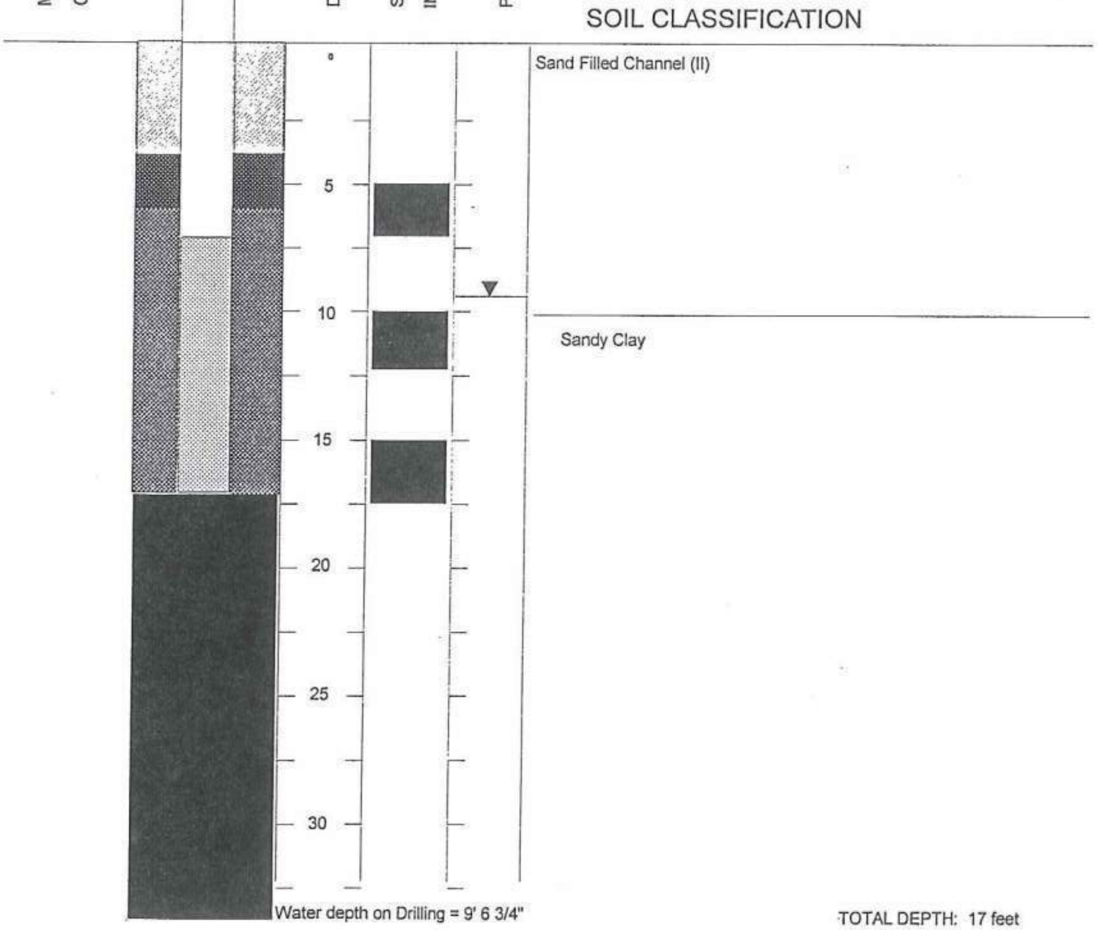
PAGE _1_ OF _1_

SUBSURFACE EXPLORATION RECORD

Client: City of Kingsville
Project Name: Kingsville Landfill
Project Location: 5 mi. SE of City
LAT: 27° 26' 57.2" LONG: 97° 49' 20.1 "
MSWLF ID: Permit #235-B

Boring/Well No.: 9R
Date Drilled: July 11, 1996
Boring Method: Hollow Stem Auger
Sample Method: Split spoon
Surface Elevation: 41.41' MSL
Depth to Water: 9.6' BGS
Total Depth: 17' BGS
Casing: 4" S-40 PVC - 0-7' BGS
Screen: 10' of 4" S-40 PVC - 7' BGS
Borehole Dia.: 10"
Driller: PSI - Craig Schena



Water depth on Drilling = 9' 6 3/4"

TOTAL DEPTH: 17 feet

H-10

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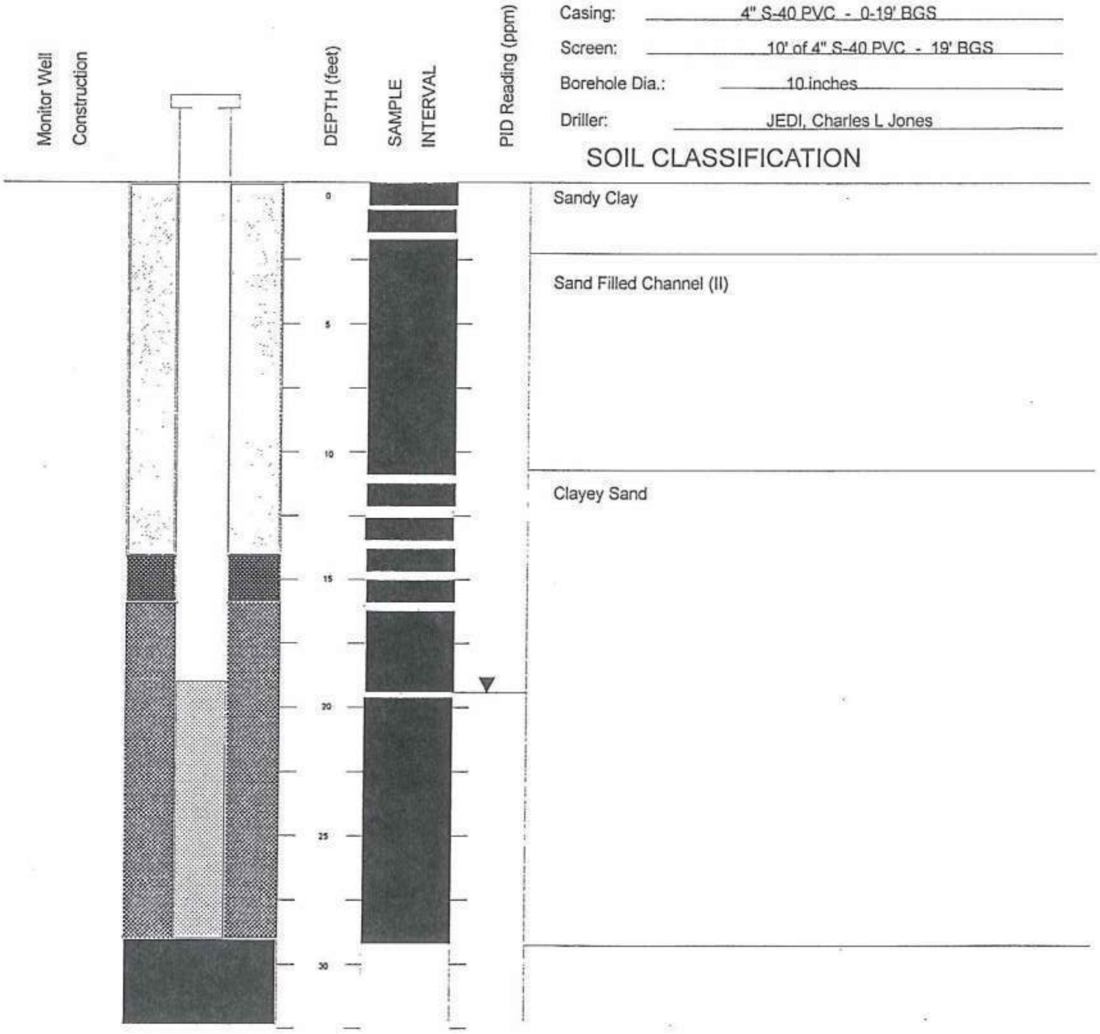
SUBSURFACE EXPLORATION RECORD

Client: City of Kingsville
Project Name: Kingsville Landfill
Project Location: 5 mi. SE of City
LAT: 27• 26' 55.2" LONG: 97• 49' 15.3 "
MSWLF ID: Permit #235-B

Boring/Well No.: 10
Date Drilled: March 20, 1992
Boring Method: Hollow Stem Auger
Sample Method: Split Spoon
Surface Elevation: 49.78' MSL
Depth to Water: 19.5' BGS
Total Depth: 29' BGS
Casing: 4" S-40 PVC - 0-19' BGS
Screen: 10' of 4" S-40 PVC - 19' BGS
Borehole Dia.: 10 inches
Driller: JEDI, Charles L Jones



Water depth on Drilling = 19.5 ft. BGS

TOTAL DEPTH = 29 ft.

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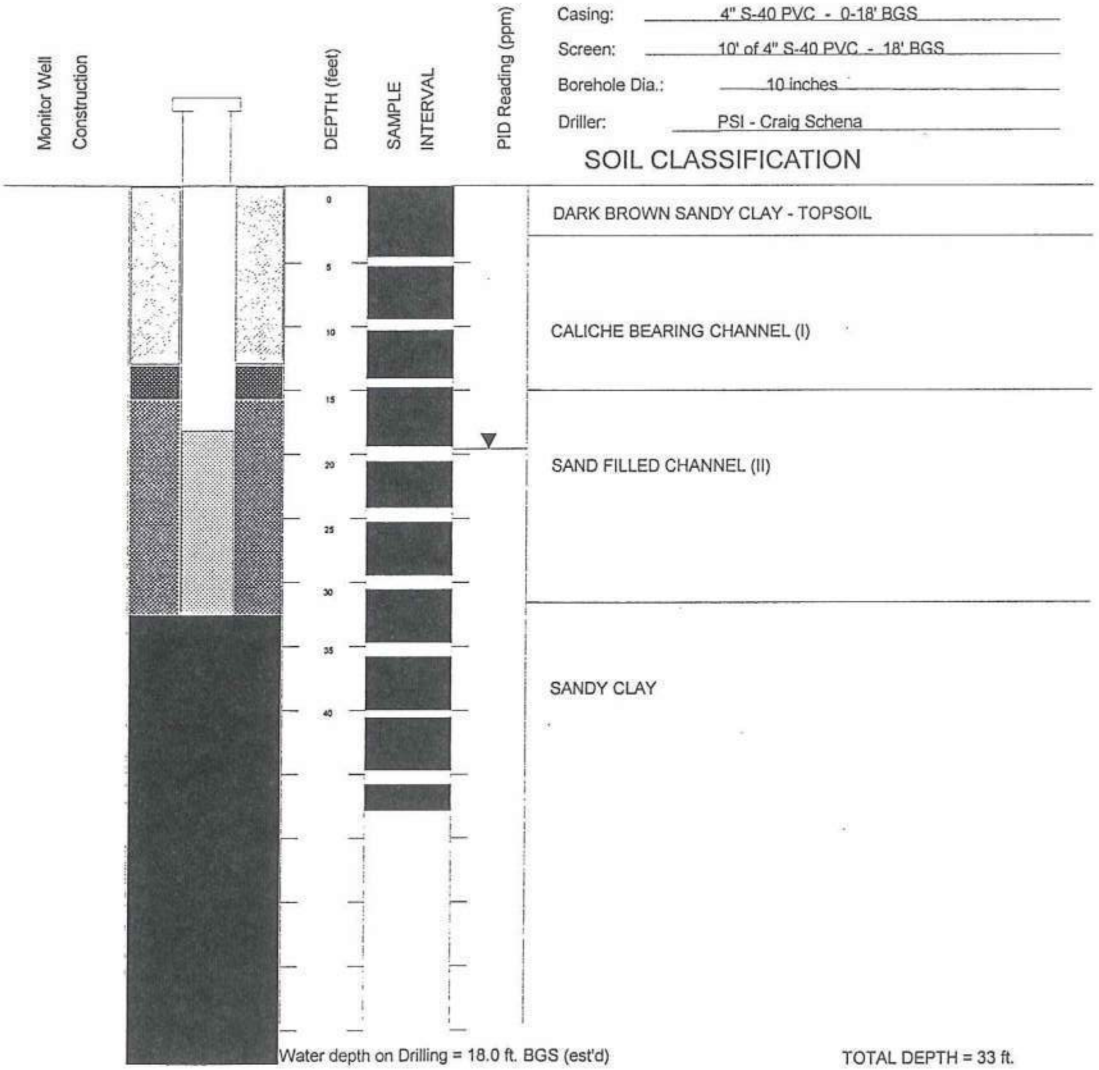
PAGE 1 OF 1

SUBSURFACE EXPLORATION RECORD

Client: City of Kingsville
Project Name: Kingsville Landfill
Project Location: 5 mi. SE of City
LAT: 27° 26' 57" LONG: 97° 49' 10"
MSWLF ID: Permit #235 - B

Boring/Well No.: 11
Date Drilled: July 11, 1996
Boring Method: Hollow Stem Auger
Sample Method: Split Spoon
Surface Elevation: 60.20' MSL
Depth to Water: 26.3' BGS
Total Depth: 33' BGS
Casing: 4" S-40 PVC - 0-18' BGS
Screen: 10' of 4" S-40 PVC - 18' BGS
Borehole Dia.: 10 inches
Driller: PSI - Craig Schena



SOIL CLASSIFICATION

DARK BROWN SANDY CLAY - TOPSOIL

CALICHE BEARING CHANNEL (I)

SAND FILLED CHANNEL (II)

SANDY CLAY

Water depth on Drilling = 18.0 ft. BGS (est'd)

TOTAL DEPTH = 33 ft.

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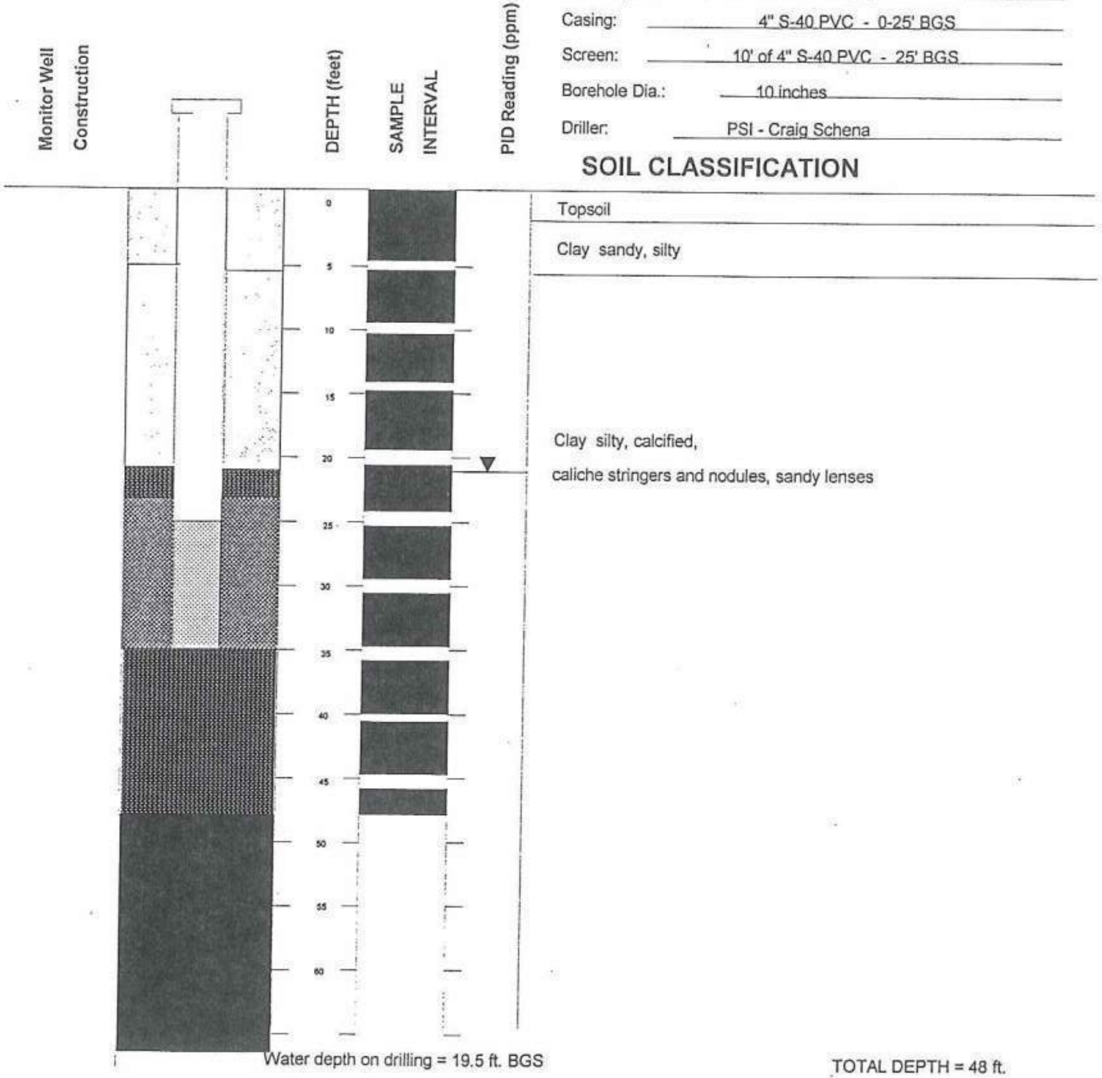
SUBSURFACE EXPLORATION RECORD

Client: City of Kingsville
Project Name: Kingsville Landfill
Project Location: 5 mi. SE of City
LAT: 27° 26' 41.9" LONG: 97° 48' 55.9"
MSWLF ID: Permit #235-B

Boring/well no. 12
Date Drilled: July 7, 1997
Boring Method: Hollow Stem Auger
Sample Method: 5 foot core barrel
Surface Elevation: 52.38' MSL
Depth to Water: 17.3' BGS
Total Depth: 48' BGS
Casing: 4" S-40 PVC - 0-25' BGS
Screen: 10' of 4" S-40 PVC - 25' BGS
Borehole Dia.: 10 inches
Driller: PSI - Craig Schena



Water depth on drilling = 19.5 ft. BGS

TOTAL DEPTH = 48 ft.

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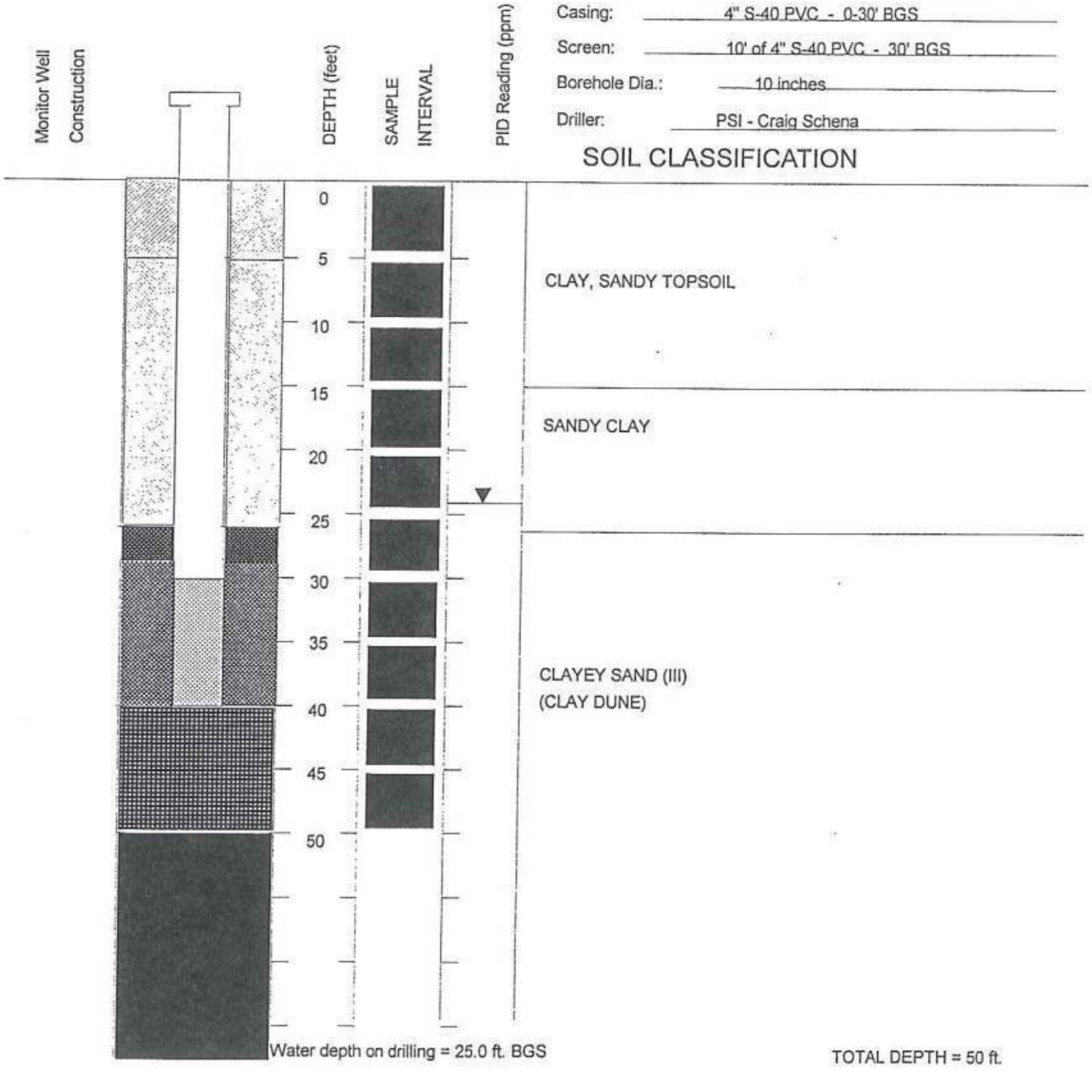
PAGE _1_ OF _1_

SUBSURFACE EXPLORATION RECORD

Client: City of Kingsville
Project Name: Kingsville Landfill
Project Location: 5 mi. SE of City
LAT: 27° 26' 55.7 " LONG: 97° 48' 56"
MSWLF ID: Permit #235-B

Boring/Well No.: 13
Date Drilled: July 28, 1997
Boring Method: Hollow Stem Auger
Sample Method: 5 foot core barrel
Surface Elevation: 59.13' MSL
Depth to Water: 24' BGS
Total Depth: 50' BGS
Casing: 4" S-40 PVC - 0-30' BGS
Screen: 10' of 4" S-40 PVC - 30' BGS
Borehole Dia.: 10 inches
Driller: PSI - Craig Schena



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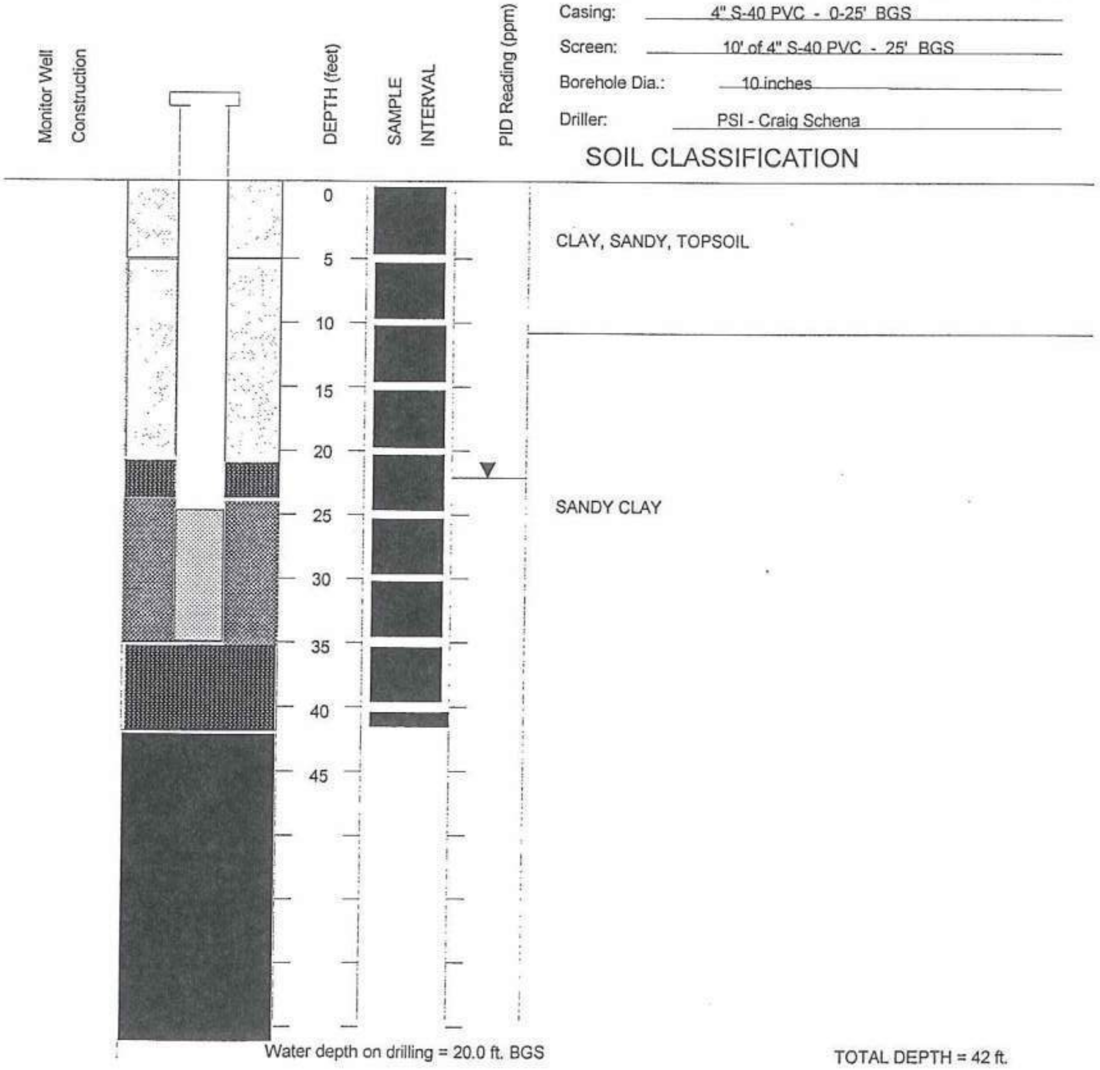
PAGE _1_ OF _1_

SUBSURFACE EXPLORATION RECORD

Client: City of Kingsville
Project Name: Kingsville Landfill
Project Location: 5 mi. SE of City
LAT: 27° 27' 09" LONG: 97° 48' 56.2"
MSWLF ID: Permit #235-B

Boring/Well No.: 14
Date Drilled: July 8, 1997
Boring Method: Hollow Stem Auger
Sample Method: 5 foot core barrel
Surface Elevation: 49.94' MSL
Depth to Water: 22' BGS
Total Depth: 42' BGS
Casing: 4" S-40 PVC - 0-25' BGS
Screen: 10' of 4" S-40 PVC - 25' BGS
Borehole Dia.: 10 inches
Driller: PSI - Craig Schena



Water depth on drilling = 20.0 ft. BGS

TOTAL DEPTH = 42 ft.

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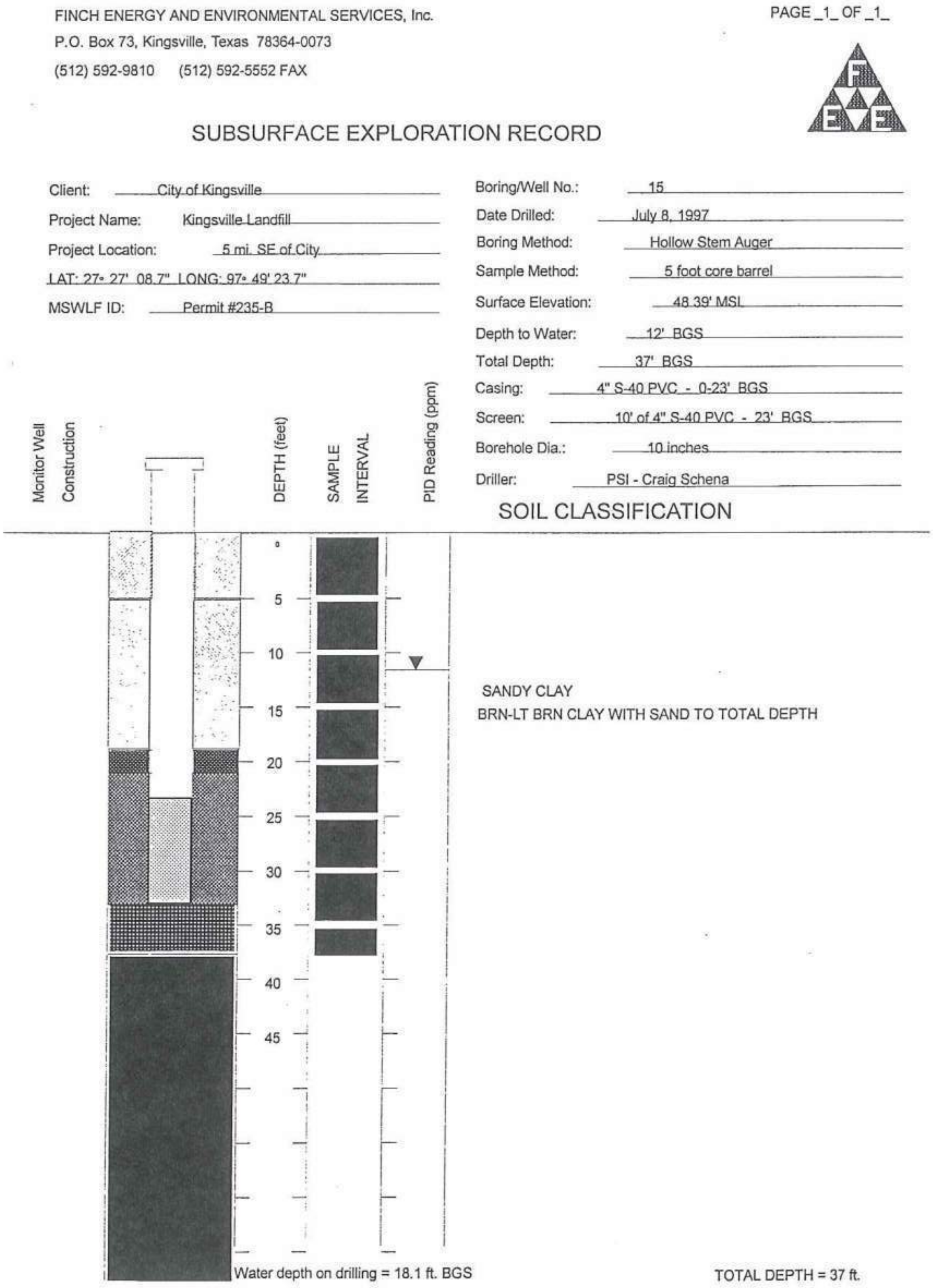

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PAGE _1_ OF _1_

SUBSURFACE EXPLORATION RECORD

Client: City of Kingsville
Project Name: Kingsville Landfill
Project Location: 5 mi. SE of City
LAT: 27° 27' 08.7" LONG: 97° 49' 23.7"
MSWLF ID: Permit #235-B

Boring/Well No.: 15
Date Drilled: July 8, 1997
Boring Method: Hollow Stem Auger
Sample Method: 5 foot core barrel
Surface Elevation: 48.39' MSL
Depth to Water: 12' BGS
Total Depth: 37' BGS
Casing: 4" S-40 PVC - 0-23' BGS
Screen: 10' of 4" S-40 PVC - 23' BGS
Borehole Dia.: 10 inches
Driller: PSI - Craig Schena

SANDY CLAY
BRN-LT BRN CLAY WITH SAND TO TOTAL DEPTH

Water depth on drilling = 18.1 ft. BGS

TOTAL DEPTH = 37 ft.

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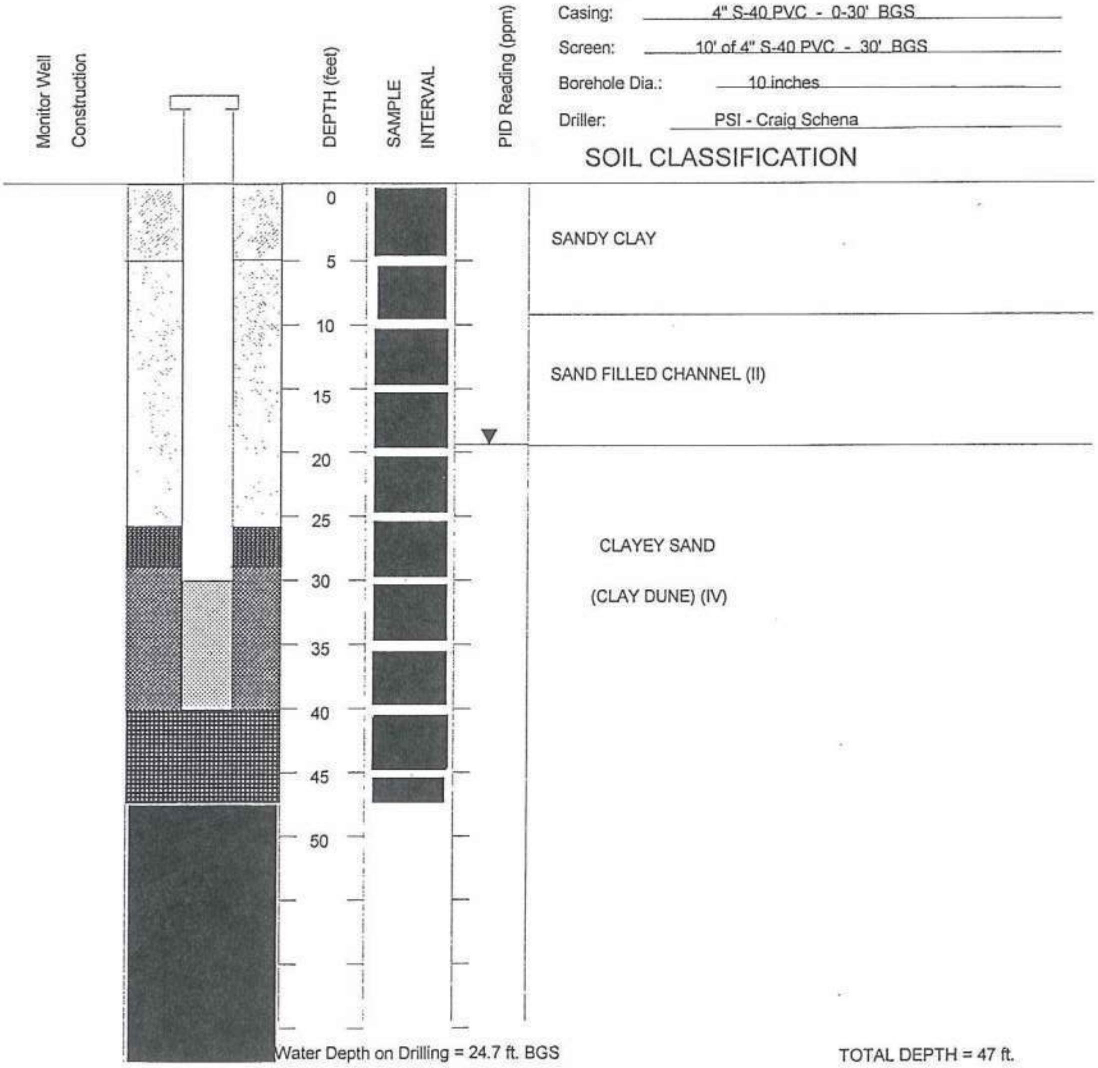
PAGE _1_ OF _1_

SUBSURFACE EXPLORATION RECORD

Client: City of Kingsville
Project Name: Kingsville Landfill
Project Location: 5 mi. SE of City
LAT: 27° 26' 55.3" LONG: 97° 49' 23.5"
MSWLF ID: Permit #235-B

Boring/Well No.: 16
Date Drilled: July 10, 1997
Boring Method: Hollow Stem Auger
Sample Method: 5 foot core barrel
Surface Elevation: 55.96' MSL
Depth to Water: 19' BGS
Total Depth: 47' BGS
Casing: 4" S-40 PVC - 0-30' BGS
Screen: 10' of 4" S-40 PVC - 30' BGS
Borehole Dia.: 10 inches
Driller: PSI - Craig Schena



Water Depth on Drilling = 24.7 ft. BGS

TOTAL DEPTH = 47 ft.

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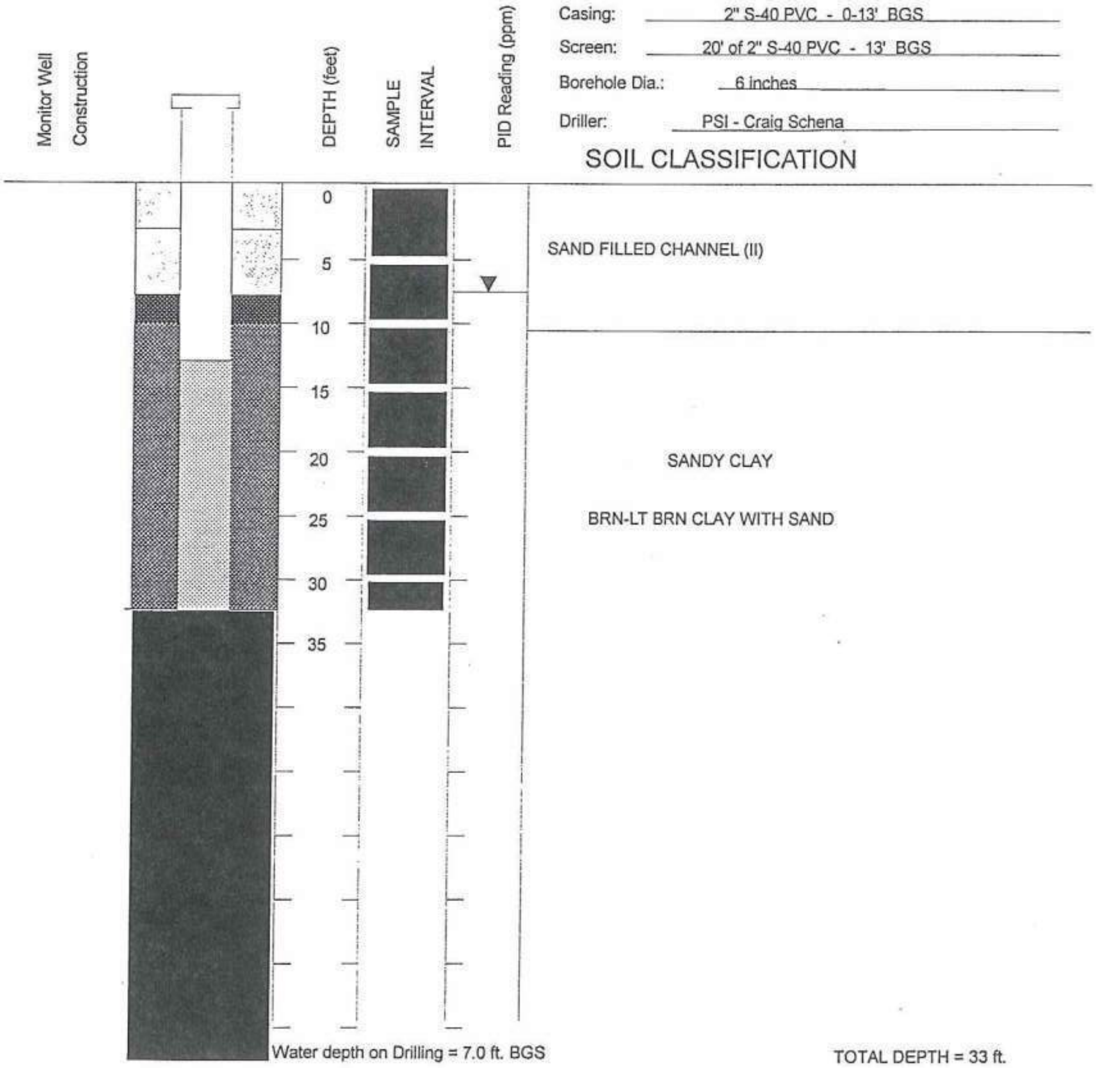
PAGE _1_ OF _1_

SUBSURFACE EXPLORATION RECORD

Client: City of Kingsville
Project Name: Kingsville Landfill
Project Location: 5 mi. SE of City
LAT: 27° 27' 01.3" LONG: 97° 49' 16.4 "
MSWLF ID: Permit #235-B

Boring/Well No.: 17
Date Drilled: July 9, 1997
Boring Method: Hollow Stem Auger
Sample Method: 5 foot core barrel
Surface Elevation: 41.35' MSL
Depth to Water: 7' BGS
Total Depth: 33' BGS
Casing: 2" S-40 PVC - 0-13' BGS
Screen: 20' of 2" S-40 PVC - 13' BGS
Borehole Dia.: 6 inches
Driller: PSI - Craig Schena



Water depth on Drilling = 7.0 ft. BGS

TOTAL DEPTH = 33 ft.

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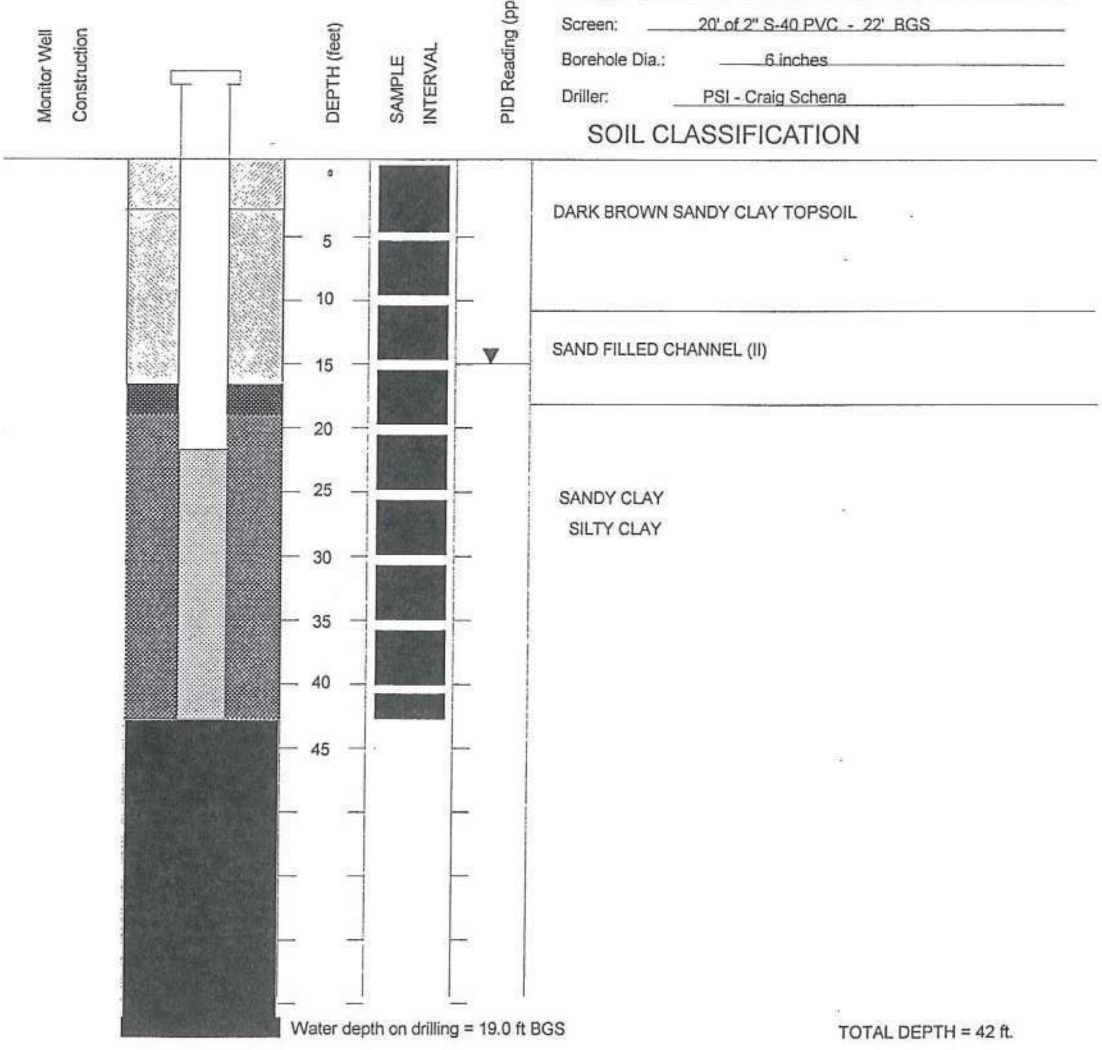
PAGE _1_ OF _1_

SUBSURFACE EXPLORATION RECORD

Client: City of Kingsville
Project Name: Kingsville Landfill
Project Location: 5 mi. SE of City
LAT: 27• 27' 01.4" LONG: 97• 49' 04 "
MSWLF ID: Permit #235-B

Boring/Well No.: 18
Date Drilled: July 9, 1997
Boring Method: Hollow Stem Auger
Sample Method: 5 foot core barrel
Surface Elevation: 50.04' MSL
Depth to Water: 15' BGS
Total Depth: 42' BGS
Casing: 2" S-40 PVC - 0-22' BGS
Screen: 20' of 2" S-40 PVC - 22' BGS
Borehole Dia.: 6 inches
Driller: PSI - Craig Schena



Water depth on drilling = 19.0 ft BGS

TOTAL DEPTH = 42 ft.

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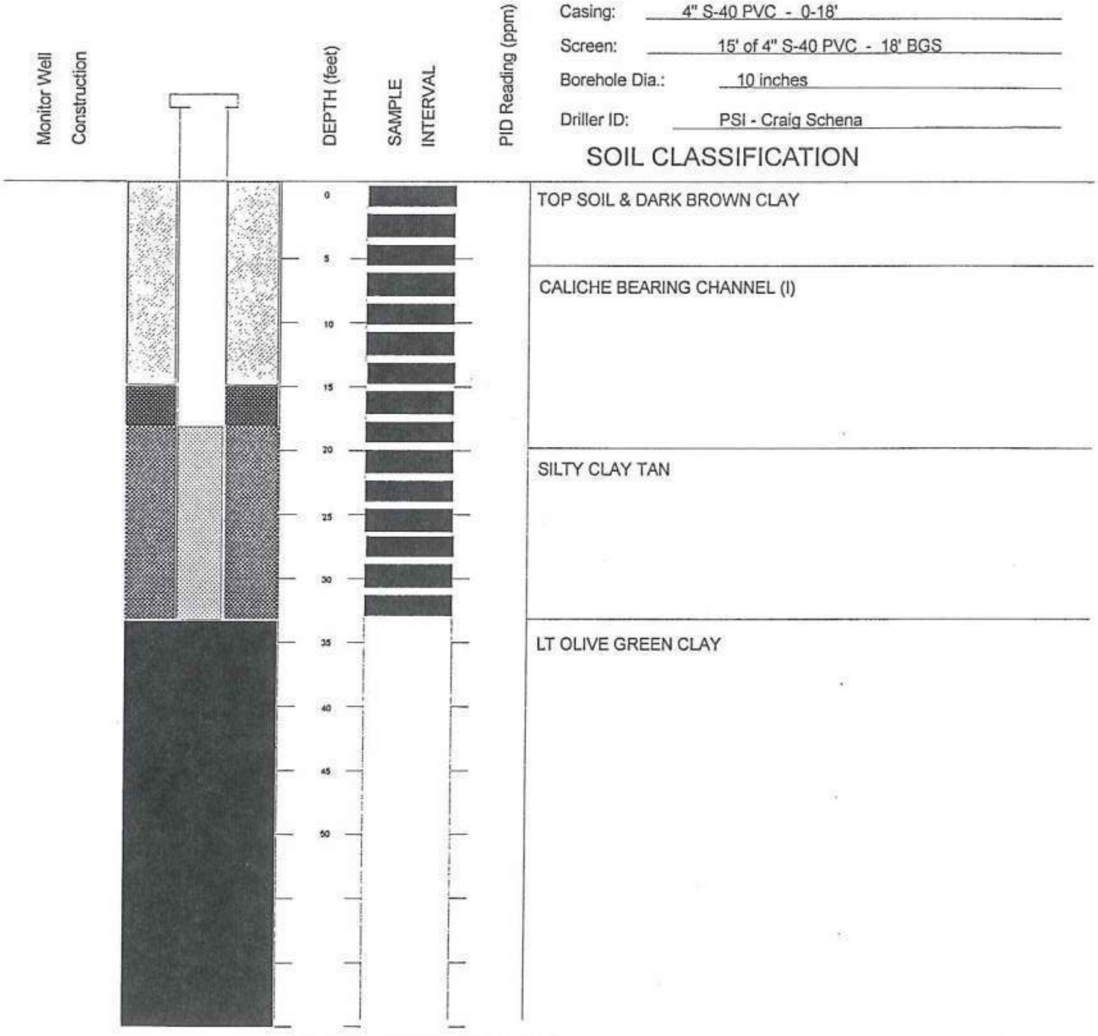
PAGE _1_ OF _1_

FINCH ENERGY AND ENVIRONMENTAL SERVICES, Inc.
P.O. Box 73, Kingsville, Texas 78364-0073

SUBSURFACE EXPLORATION RECORD

Client: City of Kingsville
Project Name: Kingsville Landfill
Project Location: 5 mi SE of City
LAT: 27° 26' 41.9" LONG: 97° 48' 48.9 "
MSWLF ID: Permit #235-B

Boring/Well No.: 24
Date Drilled: April 30, 1998
Boring Method: HOLLOW STEM AUGER
Sample Method: Shelby Tube
Surface Elevation: 47.38' MSL
Depth to Water: 12.58' BGS
Total Depth: 33' BGS
Casing: 4" S-40 PVC - 0-18'
Screen: 15' of 4" S-40 PVC - 18' BGS
Borehole Dia.: 10 inches
Driller ID: PSI - Craig Schena



Water depth on Drilling = 12.0 ft. BGS

TOTAL DEPTH = 33 feet

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PAGE _1_ OF _1_

FINCH ENERGY AND ENVIRONMENTAL SERVICES, Inc.
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SUBSURFACE EXPLORATION RECORD

Client: City of Kingsville

Project Name: Kingsville Landfill

Project Location: 5 mi SE of City

LAT: 27• 26' 09" LONG: 97• 48' 47.6"

MSWLF ID: Permit #235-B

Boring/Well No.: 21

Date Drilled: April 27, 1998

Boring Method: HOLLOW STEM AUGER

Sample Method: Shelby Tube

Surface Elevation: 52.41' MSL

Depth to Water: 17.8' BGS

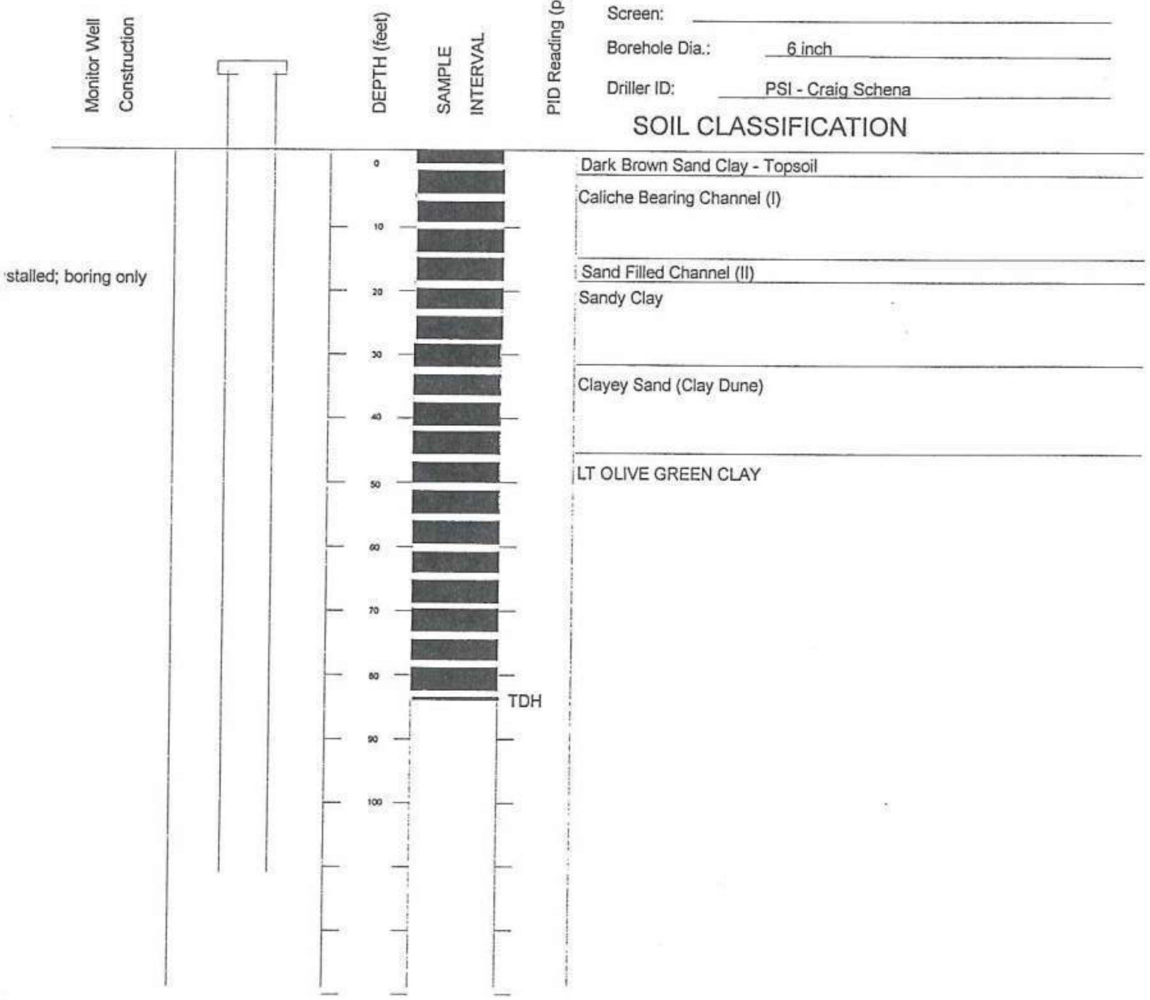
Total Depth: 84' BGS

Casing:

Screen:

Borehole Dia.: 6 inch

Driller ID: PSI - Craig Schena



Water depth on Drilling = 25.0 ft. BGS

TOTAL DEPTH = 84 feet

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FINCH ENERGY AND ENVIRONMENTAL SERVICES, Inc.
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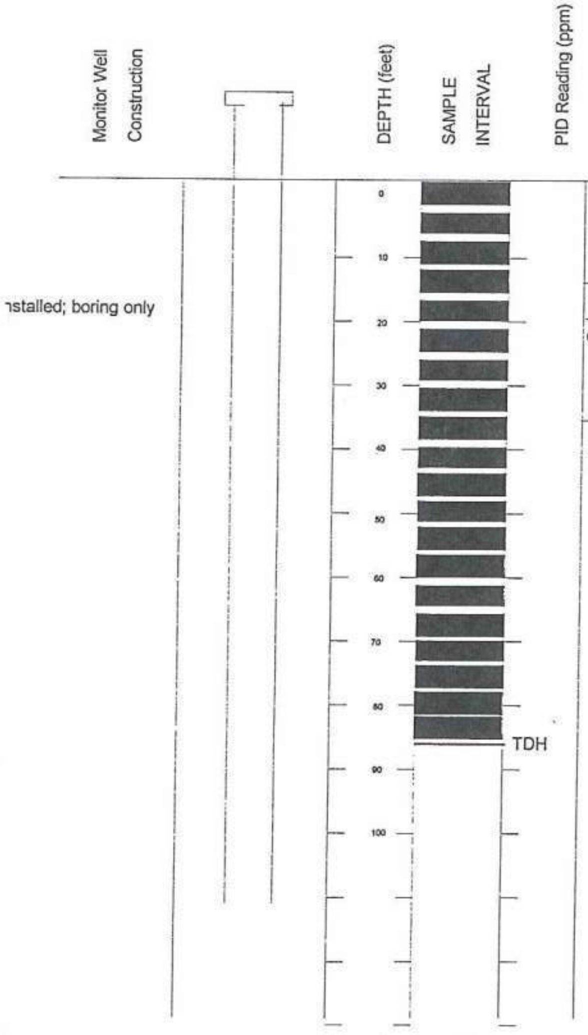
SUBSURFACE EXPLORATION RECORD

Client: City of Kingsville
Project Name: Kingsville Landfill
Project Location: 5 mi SE of City
LAT: 27• 27' 01.4" LONG: 97• 48' 28.2"
MSWLF ID: Permit #235-B

Boring/Well No.: 23
Date Drilled: April 24, 1998
Boring Method: HOLLOW STEM AUGER
Sample Method: Shelby Tube
Surface Elevation: 49.50' MSL
Depth to Water: 8.8' BGS
Total Depth: 86' BGS
Casing:
Screen:
Borehole Dia.: 6 inch
Driller ID: PSI - Craig Schena



SOIL CLASSIFICATION

CALICHE BEARING CHANNEL (I)

SAND FILLED CHANNEL (II)

CLAYEY SAND (CLAY DUNE)

LT OLIVE GREEN CLAY

Water depth on Drilling = 25.0 ft. BGS

TOTAL DEPTH = 86 feet

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PAGE _1_ OF _1_

FINCH ENERGY AND ENVIRONMENTAL SERVICES, Inc.
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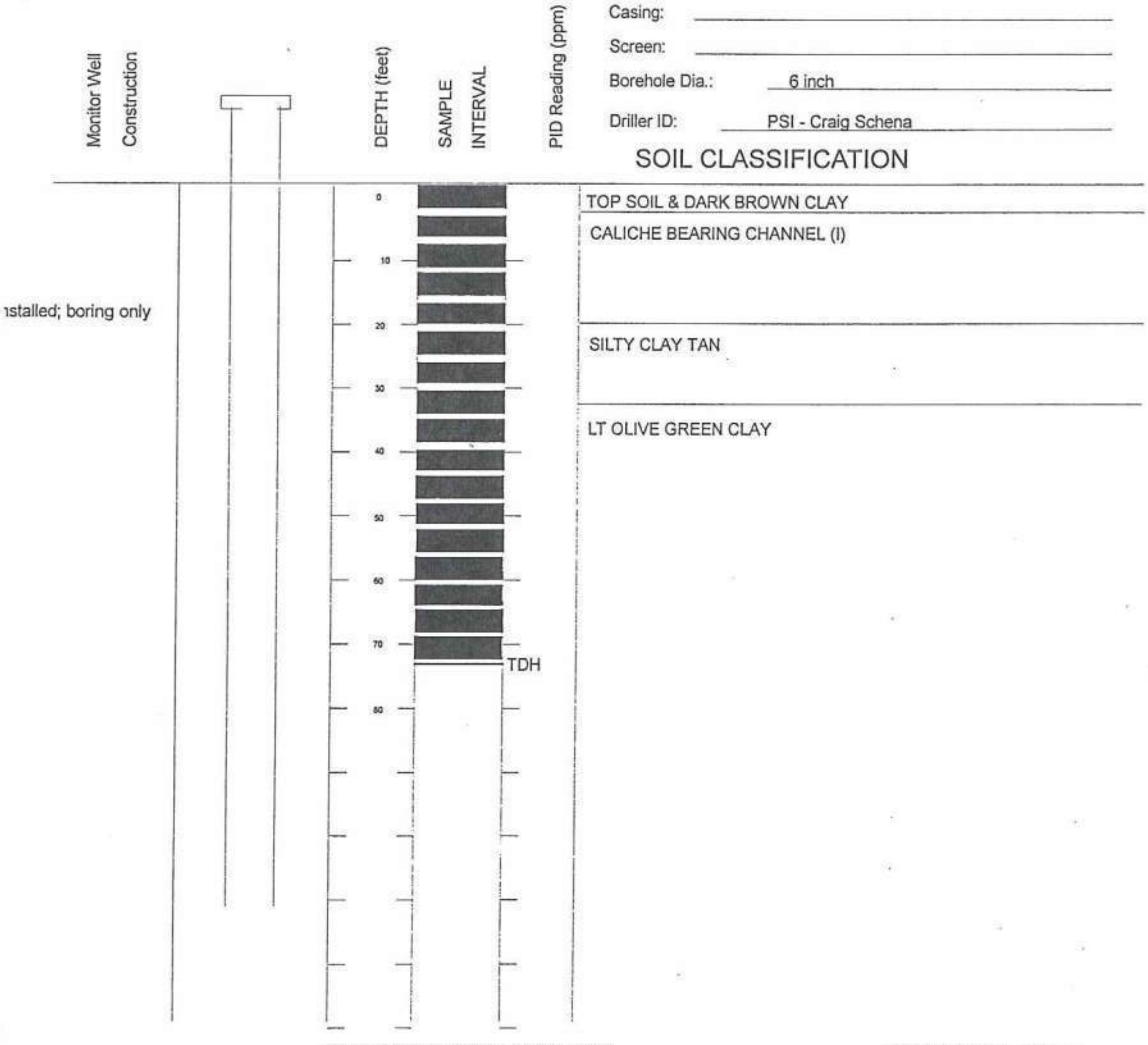
SUBSURFACE EXPLORATION RECORD

Client: City of Kingsville
Project Name: Kingsville Landfill
Project Location: 5 mi SE of City
LAT: 27° 26' 41.9" LONG: 97° 48' 48.9"
MSWLF ID: Permit #235-B

Boring/Well No.: 24
Date Drilled: April 30, 1998
Boring Method: HOLLOW STEM AUGER
Sample Method: Shelby Tube
Surface Elevation: 47.38' MSL
Depth to Water: 10.0' BGS
Total Depth: 72 ' BGS
Casing:
Screen:
Borehole Dia.: 6 inch
Driller ID: PSI - Craig Schena



SOIL CLASSIFICATION

TOP SOIL & DARK BROWN CLAY

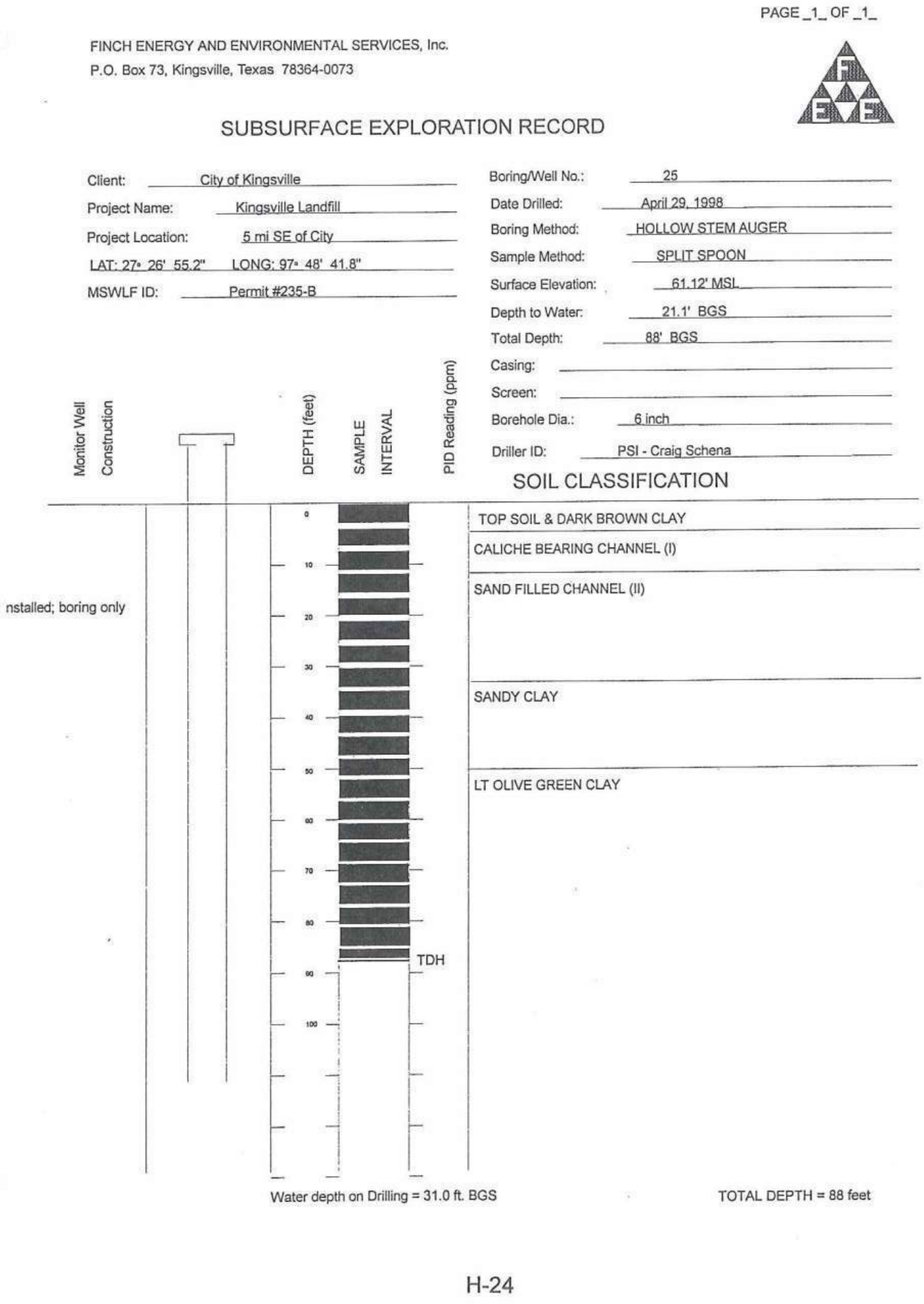
CALICHE BEARING CHANNEL (I)

SILTY CLAY TAN

LT OLIVE GREEN CLAY

Water depth on Drilling = 12.0 ft. BGS

TOTAL DEPTH = 72 feet



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SUBSURFACE EXPLORATION RECORD

Client: City of Kingsville
Project Name: Kingsville Landfill
Project Location: 5 mi SE of City
LAT: 27• 26' 55.2" LONG: 97• 48' 41.8"
MSWLF ID: Permit #235-B

Boring/Well No.: 25
Date Drilled: April 29, 1998
Boring Method: HOLLOW STEM AUGER
Sample Method: SPLIT SPOON
Surface Elevation: 61.12' MSL
Depth to Water: 21.1' BGS
Total Depth: 88' BGS
Casing:
Screen:
Borehole Dia.: 6 inch
Driller ID: PSI - Craig Schena

SOIL CLASSIFICATION

TOP SOIL & DARK BROWN CLAY
CALICHE BEARING CHANNEL (I)
SAND FILLED CHANNEL (II)
SANDY CLAY
LT OLIVE GREEN CLAY

Water depth on Drilling = 31.0 ft. BGS

TOTAL DEPTH = 88 feet

H-24

CITY OF KINGSVILLE LANDFILL

PART III, ATTACHMENT 4

APPENDIX 2

TOLUNAY-WONG ENGINEERS, INC. GEOTECHNICAL ENGINEERING STUDY

Tolunay-Wong Engineers, Inc.

GEOTECHNICAL ENGINEERING STUDY CITY OF KINGSVILLE MUNICIPAL SOLID WASTE LANDFILL EXPANSION KINGSVILLE, TEXAS

Prepared for:

Naismith/Hanson
Corpus Christi, Texas

Prepared by:

Tolunay-Wong Engineers, Inc.
826 South Padre Island Drive
Corpus Christi, Texas 78416

August 30, 2018

Project No. 16.53.042 / Report No. 12788R1

GEOTECHNICAL ENGINEERING, DEEP FOUNDATIONS TESTING,
ENVIRONMENTAL SERVICES, CONSTRUCTION MATERIALS TESTING

1-888-887-9932
WWW.TWEINC.COM

Tolunay-Wong Engineers, Inc.
826 South Padre Island Drive • Corpus Christi, Texas 78416 • Phone (361) 884-5050

August 30, 2018

Naismith/Hanson
4501 Gollihar Road
Corpus Christi, Texas 78410

Attn: Mr. Jon Reinhard, P.E.
JReinhard@hanson-inc.com

Ref: Geotechnical Engineering Study
City of Kingsville
Municipal Solid Waste Landfill Expansion
Kingsville, Texas
TWE Project No. 16.53.042 / Report No. 12788R1

Dear Mr. Reinhard,

Tolunay-Wong Engineers, Inc. (TWE) is pleased to submit this revised report of our geotechnical engineering study for the above referenced project. This report contains a detailed description of the field program and laboratory services performed for this geotechnical engineering study as well as soil boring logs. Also included in this report are results of settlement predictions and waste mass stability analyses of the proposed landfill expansion and reinforcement recommendations as means to reduce settlement below future liner systems.

We appreciate the opportunity to work with you on this phase of the project and we look forward to the opportunity of providing additional services as the project progresses. If you have any questions or comments regarding this report or if we can be of further assistance, please contact us.

Sincerely,

TOLUNAY-WONG ENGINEERS, INC.
Texas Board of Professional Engineers Firm Registration Number F-000124

Jialin Li

Jialin Li, E.I.T.
Geotechnical Staff Engineer

Don R. Rokohl, P.E.
Branch Manager

DON R. ROKOHL
65150
8.30.18

DRR/JL/drr

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TABLES AND APPENDICES

TABLES

APPENDICES

1 INTRODUCTION AND PROJECT DESCRIPTION

1.1 Introduction

This report presents the results of our geotechnical engineering study performed for the proposed municipal solid waste landfill vertical and lateral expansion in Kingsville, Texas. Our geotechnical engineering study was conducted in accordance with TWE Proposal No. P15-C105R1 dated December 31, 2015. The study was authorized by Grant Jackson, P.E. of Naismith/Hanson (NEI).

1.2 Project Description

The City of Kingsville is planning a vertical and lateral expansion of the existing municipal solid waste (MSW) landfill (Permit No. MSW 235-B) located at the northeast corner of the intersection of County Road E 2130 and Farm to Market Road 2619 near Kingsville (Kleberg County), Texas. The current landfill permit boundary covers an area of about 120 acres and is located immediately adjacent to a closed Pre-Subtitle D MSW landfill (Permit No. MSW 235). The closed landfill includes about 40 acres and is located southwest of Permit No. MSW 235-B.

The landfill expansion will include placement of MSW refuse over areas of the previously filled, closed Permit MSW 235 landfill. Like the remainder of the landfill, the top of the closed Permit No. MSW 235 landfill will receive a liner and leachate collection system prior to receiving new MSW. Permit No. MSW 235 has not received new MSW since 1992 and first began receiving MSW sometime around mid 1970's. Since it is planned so that the Permit No. MSW 235 area will contain the last sectors to receive waste, it will be about 70+ years before any new waste is placed over Permit No. MSW 235 area. The final landfill top elevation will be about 200-ft, with a maximum thickness of new MSW refuse above the existing MSW refuse of about 115- ft. The final landfill side slopes will be at a maximum of 4(H):1(V).

2 PURPOSE AND SCOPE OF SERVICES

The purposes of our geotechnical engineering study were to investigate the soil and groundwater conditions within the project site and to provide geotechnical design and construction recommendations for the proposed facility.

Our scope of services performed for the project consisted of:

1. Drilling 12 soil borings to depths of 33.5-ft to 86-ft within the project site to evaluate subsurface stratigraphy and groundwater conditions;
2. Performing geotechnical laboratory tests on recovered soil samples to evaluate the physical and engineering properties of the strata encountered;
3. Providing estimated compression of the waste within the existing landfill due to construction of the new vertical expansion;
4. Providing geosynthetic reinforcement requirements to be incorporated into the cover design at the base of the vertical landfill construction; and,
5. Performing waste mass stability analyses of the new landfill construction.

Our scope of services did not include any environmental assessments for the presence or absence of wetlands or of hazardous or toxic materials within or on the soil, air or water within this project site. Any statements in this report or on the boring logs regarding odors, colors or unusual or suspicious items or conditions are strictly for the information of the Client. A geological fault study was also beyond the scope of our services associated with this geotechnical engineering study.

3 FIELD PROGRAM

3.1 Soil Borings

TWE conducted an exploration of subsurface soil and groundwater conditions at the project site during June, July, and August 2016 by drilling and sampling 12 soil borings to depths of 33.5-ft to 86-ft below grade. The soil boring locations are presented on TWE Drawing No. 16.53.042-1 in Appendix A of this report. Drilling and sampling of the soil borings were performed using conventional truck-mounted drilling equipment. Our field personnel coordinated the field activities and logged the boreholes. The boring locations were staked at the site by professional public land surveyor. The latitude and longitude for each boring location were determined by the surveyor and are presented on the boring logs. The borings were pressure grouted from the bottom with a cementitious bentonite mixture.

Twenty three (23) exploratory borings were previously drilled at the site for development of the existing landfill. The previously drilled exploratory boring locations are presented on TWE Drawing No. 16.53.042.1 in Appendix A.

3.2 Drilling Methods

Field operations were performed in general accordance with the *Standard Practice for Soil Investigation and Sampling by Auger Borings [American Society for Testing and Materials (ASTM) D 1452]*. The soil borings were drilled using a truck-mounted drilling rig. Typically, borings are dry-augered using a flight auger to advance the boreholes until groundwater is encountered or until the boreholes become unstable and/or collapse. At that point, soil borings are completed using wash-rotary drilling techniques. Samples were obtained at intervals of 5-ft from existing ground surface to the completion depths of borings B-30, B-32, B-33, B-35, B-36, B-37, and B-41. A 2-ft sampling interval was used to the completion depths of borings B-31, B-34, B-38, B-39, and B-40. The completion depths of the borings were 33.5-ft to 86-ft below the ground surface at the time of the field exploration.

3.3 Soil Sampling

Fine-grained, cohesive soil samples were recovered from the soil borings by hydraulically pushing 3-in diameter, thin-walled Shelby tubes a distance of about 24-in. The field sampling procedures were conducted in general accordance with the *Standard Practice for Thin-Walled Tube Sampling of Soils (ASTM D 1587).* Our geotechnician visually classified the recovered soils and obtained field strength measurements using a pocket penetrometer. A factor of 0.67 is typically applied to the penetrometer measurement to estimate the undrained shear strength of the Gulf Coast cohesive soils. The samples were extruded in the field, wrapped in foil, placed in moisture sealed containers and protected from disturbance prior to transport to the laboratory.

Cohesionless, semi-cohesionless, and dry, brittle cohesive samples were collected with the standard penetration test (SPT) sampler driven 18-in by blows from a 140-lb hammer falling 30-in in accordance with the *Standard Test Method for Standard Penetration Test (SPT) and Spilt-Barrel Sampling of Soils (ASTM D 1586).* The number of blows required to advance the sampler three (3) consecutive 6-in depths are recorded for each corresponding sample on the boring logs. The N-value, in blows per foot, is obtained from SPTs by adding the last two (2) blow count numbers. The compactness of cohesionless and semi-cohesionless samples are inferred from the N-value. The samples obtained from the split-barrel sampler were visually classified, placed in moisture sealed containers and transported to our laboratory.

The recovered soil sample depths with corresponding pocket penetrometer measurements and SPT blowcounts are presented on the boring logs in Appendix B.

3.4 Boring Logs

Our interpretations of general subsurface soil and groundwater conditions at the soil boring locations are included on the boring logs. Our interpretations of the soil types throughout the boring depths and the locations of strata changes were based on visual classifications during field sampling and laboratory testing in accordance with *Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System) (ASTM D 2487)* and *Standard Practice for Description and Identification of Soils (Visual-Manual Procedure) (ASTM D 2488).*

The boring logs include the type and interval depth for each sample along with its corresponding pocket penetrometer measurements and SPT blow counts. The boring logs and a key to terms and symbols used on boring logs are presented in Appendix B.

3.5 Groundwater Measurements

Groundwater level measurements were attempted in the open boreholes during dry-auger drilling. Water level readings were attempted in the open boreholes when groundwater was first encountered and after a ten (10) to fifteen (15) minute time period. The groundwater observations are summarized in Section 5.5 of this report entitled *"Groundwater Observations."*

4 LABORATORY SERVICES

A laboratory testing program was conducted on selected samples to assist in classification and evaluation of the physical and engineering properties of the soils encountered in the project borings. Laboratory tests were performed in general accordance with *ASTM International* standards to measure physical and engineering properties of the recovered samples. The types and brief descriptions of the laboratory tests performed are presented in Table 4-1 below.

Table 4-1: Laboratory Testing Program

Test Description	Test Method
Amount of Material in Soils Finer than No. 200 Sieve	ASTM D 1140
Unconfined Compressive Strength of Cohesive Soil (UC)	ASTM D 2166
Water (Moisture) Content of Soil	ASTM D 2216
Liquid Limit, Plastic Limit and Plasticity Index of Soils	ASTM D 4318
Density (Unit Weight) of Soil Specimens	ASTM D 2937
One-Dimensional, Incremental Loading Consolidation	ASTM D 2435
Consolidated-Undrained Triaxial Compression w/ Pore Water Pressure	ASTM D 4767

Standard geotechnical laboratory test results and soil properties encountered in the project borings are presented on the logs of borings in Appendix B of this report. Results of completed one-dimensional consolidation and consolidated-undrained triaixial compression tests performed on the selected cohesive soil samples obtained for this study are included in Appendix C.

5 SITE AND SUBSURFACE CONDITIONS

5.1 General

Our interpretations of soil and groundwater conditions within the project site are based on information obtained at the soil boring locations only. This information has been used as the basis for our conclusions and recommendations included in this report. Subsurface conditions may vary at areas not explored by the soil borings. Significant variations at areas not explored by the soil borings will require reassessment of our recommendations.

5.2 Site Description and Surface Conditions

The present MSW landfill (project site) is located at the northeast corner of the intersection of County Road E 2130 and Farm to Market Road 2619 near Kingsville (Kleberg County), Texas. The landfill covers an area of about 120 acres. Several active disposal areas are excavated and at various stages of use.

5.3 Subsurface Conditions

The soil profile encountered in the project borings consisted of alternating strata of cohesive clay soils (fat clays, sandy lean clays, and sandy lean silty clays) and semi-cohesionless clayey sands and silty sands, and cohesionless poorly graded sands with clay. The consistency of the cohesive clay soils was typically very stiff to hard, but occasionally stiff. The relative density of the semi-cohesionless silty sands/clayey sands and cohesionless poorly graded sands was typically medium dense to very dense, but occasionally loose. The borings were terminated at depths ranging from 33.5-ft to 86-ft. Detailed descriptions of the soils encountered at the boring locations are presented on the boring logs in Appendix B.

5.4 Subsurface Soil Properties

In-situ moisture contents of selected cohesive clay samples ranged from 18% to 34%. Results of Atterberg Limits tests on selected clay samples indicated liquid limits (LL) ranging from 31 to 81 with plasticity indices (PI) ranging from 18 to 58. The amount of materials finer than the No. 200 sieve on the selected samples ranged from 55% to 100%. In-situ moisture contents of selected silty sand samples ranged from 23% to 24%. The amount of materials finer than the No. 200 sieve on the selected samples tested for grain size distribution ranged from 14% to 38%.

Undrained shear strengths derived from field pocket penetrometer readings ranged from 0.25-tsf to 4.50-tsf. Undrained shear strengths derived from laboratory unconfined compressive (UC) strength testing ranged from 0.16-tsf to 3.41-tsf with corresponding total unit weights of 86-pcf to 105-pcf. Shear strength of cohesive soils inferred from SPT blow counts generally were similar. Based on this undrained shear strength data, the consistency of the cohesive soils encountered in the project borings is considered to be very soft to very stiff.

Tabulated laboratory test results at the recovered sample depths are presented on the boring logs in Appendix B.

5.5 Groundwater Observations

Groundwater measurements were attempted in the project borings during dry-auger drilling. Groundwater level measurements are shown in Table 5-1 below.

Table 5-1: Groundwater Level Measurements

Boring No.	Boring Depth (feet)	Groundwater Level Depth	
		Encountered During Drilling (feet)	Observed in the Open Borehole after a 10 to 15 minute waiting period (feet)
B-30	82.5	21	10.5
B-31	68.0	23	21.5
B-32	82.5	18	14.6
B-33	86	32.5	28.1
B-34	43	31	28.3
B-35	72.5	34	30.8
B-36	68	23	18.3
B-37	48	15	9.3
B-38	58	11	5.4
B-39	68	27	26.5
B-40	33.5	21	19
B-41	62.5	19.5	19.2

Groundwater levels may fluctuate with climatic and seasonal variations and should be verified before construction. Accurate determination of the static groundwater level is typically made with a standpipe piezometer. Installation of a piezometer to evaluate the long-term groundwater condition was not included within the current scope of services.

6 VERTICAL AND LATERAL LANDFILL EXPANSION

6.1 General

The results of engineering analyses performed are presented in the sections below. Project information provided to us was utilized in the analyses and represents our understanding of the proposed construction. It is imperative that we are contacted if any changes from the described information are made so that we can evaluate whether modifications to our findings will need to be made.

6.2 Permit No. MSW 235 Existing Waste Settlement

Classic consolidation theory describes compression settlement of municipal solid waste (MSW) when loaded by the weight of additional waste from vertical expansion as the total of primary settlement and secondary settlement. Specific testing to evaluate compression characteristics of municipal solid waste was not performed for this study. We, therefore, assumed the following parameters, which are based on published information (1) (2), for our analyses.

- Unit weight of new waste = 65 pounds per cubic foot (pcf)
- Unit weight of existing waste = 65 pcf
- Modified primary compression index, C_c', of existing waste = 0.17 to 0.36
- Modified secondary compression index, C_α', of existing waste = 0.03 to 0.10
- Age of existing waste = 33 years
- Ending time of secondary settlement = 90 years

For our calculations, we used procedures presented in the publications presented above and geometry from cross-sections presented on the following NEI drawing:

- Appendix C, Cross Section J & O, City of Kingsville, Fig No. 2, dated 08/26/2018

The cross section is presented in Appendix C. Settlement estimates resulting from compression of the existing solid waste due to the weight of the new, overlying waste are presented in Table 6.1 below for various primary and secondary compression indices.

One-dimensional consolidation tests were performed using select samples from the soil borings completed for this study to evaluate the compressibility characteristics of the foundation soils. The results of the consolidation tests are presented in Appendix D. The calculated settlements resulting from consolidation of the foundation soils due to the weight of the overlying landfill material are on the order of magnitude of 1 foot. This consolidation settlement should be added to existing waste total settlement presented in Table 6.1 below to obtain total settlement of the solid waste and the foundation soils.

Table 6.1 - Marker-J-Section

Section	Existing Waste Thickness (feet)	New MSW Thickness (feet)	Estimated Settlement (feet) of Existing Waste					
			$C_c' = 0.17, C_\alpha' = 0.03$			$C_c' = 0.36, C_\alpha' = 0.10$		
			Primary Settlement	Secondary Settlement	Total Settlement	Primary Settlement	Secondary Settlement	Total Settlement
C	20	15	1.4	0.2	1.6	2.9	0.5	3.4
E	26	60	3.3	0.2	3.5	7.0	0.7	7.7
G	31	100	4.6	0.2	4.8	9.7	0.8	10.5
I	34	95	4.7	0.3	5.0	10.0	0.9	10.9
K	35	105	5.0	0.3	5.3	10.6	0.9	11.5
L	35	108	5.1	0.3	5.4	10.8	0.9	11.7
M	30	115	4.8	0.2	5.0	10.1	0.8	10.9

As biological decomposition of waste occurs, waste volume is reduced as the density increases, resulting in settlements of the overall landfill mass. This, in effect, will pre-compress the existing waste, reducing settlement due to placement of future waste. The magnitude of the settlement could be rather significant since it is planned that new waste will not be placed over the existing waste for another 70+ years. Site preparation will result in placement of soils in the Permit No. MSW 235 area. The additional weight of soils will surcharge the waste in this area, resulting in further pre-compression of the waste.

6.3 Reinforcement Design

The anticipated liner section to be constructed over the top of the existing waste will consist of (from bottom upwards) 24 inches of lightly compacted soil “foundation soil”, a 6-inch thickness of compacted soil “interim cover soil”, a geogrid stabilization layer, a geosynthetic clay liner (GCL), a 60 mil HDPE geomembrane, and a layer of drainage geocomposite. If the planned liner profile will be different from the assumed, TWE should be contacted so further evaluation can be made if necessary.

The geosynthetic reinforcement design uses the procedure provided in Qian, X. et.al., (2002) publication, and is based on the possible development of a void that is located immediately below the liner. The liner is assumed to bridge over the void, carrying the load from the proposed overlying waste. As commonly accepted scenario, the case of the “rusted refrigerator” is used, with the design depression having a radius of 3 feet. Other assumptions used in the design are listed below and in Tables 6.2 and 6.3.

- Design life of 50 years
- Maximum elevation of MSW on the lining system is 115 feet

Table 6.2 – Assumed Material Properties

Material	Unit Weight (pcf)	Friction Angle (deg.)	Cohesion (psf)
MSW	60	23	0
Interim Cover Soil	120	30	0

Table 6.3 – Assumed Geosynthetic Properties

Material	Yield Strain (%)
HDPE	10
GCL	8

Based on the results of the analyses, we recommend that geosynthetic reinforcement consisting of two layers of chemically resistant uniaxial geogrid placed perpendicular to each other be used. The geogrid should have a minimum design tensile strength of 2500 pounds per foot at an allowable stress of 5% or less over the 50 year design life. The geogrid should be placed on top of a minimum 6 inch thick layer of compacted soil "interim cover soil" placed between the foundation layer and the new GCL. It should be noted that the inclusion of geogrid reinforcement is intended to reduce, but not eliminate, the likelihood of failure.

7 WASTE MASS STABILITY

7.1 Background Information

We understand that the liner system for the new expansion will consist of a 6-in thick layer of compacted native soil covered by a geosynthetic clay liner (GCL). A 60 mil HDPE geomembrane will be placed on the GCL, and will be anchored within trenches at the top of slope. The geomembrane will be textured on both sides and covered by a geocomposite drainage layer.

Deep-seated stability of the waste mass was evaluated by performing two dimensional, effective stress slope stability analyses for the final, closed geometry, using the computer program SLIDE. The program performs vertical slice limit equilibrium analysis for potential mass movement along assumed failure surfaces randomly generated by the program. We assumed potential deep-seated failure of the waste material within the waste or along the top of the HDPE liner, since failure would not be expected to occur in the foundation soils due to relatively high shear strength of this material.

For analyses purposes, we used geometry from the cross-sections presented on the following NEI drawings:

- Appendix C, Cross Section Plan, City of Kingsville Landfill, Fig. No. 1, dated 08/26/2018
- Appendix C, Cross Section J & O, City of Kingsville Landfill, Fig. No. 2, dated 08/26/2018
- Appendix C, Cross Section 12 & 18, City of Kingsville Landfill, dated 08/26/2018

Copies of these sections are presented in Appendix C.

7.2 Design Parameters

Consolidated-undrained (C-U) triaxial shear tests were performed using select samples from the soil borings to evaluate long-term effective stress shear strength of the foundation soils. The results of the C-U triaxial tests are presented in Appendix E.

Laboratory tests for liner material properties were not performed as part of the current scope of services. The stability analyses are based on laboratory tests results for the foundation soils and on assumed or published strength and interface friction values for the geocomposite drainage layer and the textured HDPE membrane. It is essential that the assumed parameters be verified by specific testing prior to construction.

Due to heterogeneous nature of municipal waste, traditional in-situ testing or laboratory testing to evaluate engineering properties of the waste is not feasible. As a result, we used published and assumed estimated effective stress values of shear strength, cohesion, and unit weight for municipal solid waste for our analyses(2) (3). The engineering properties used in the analyses are presented in Table 7.1 below.

Table 7.1 – Assumed Engineering Properties

Material	Effective Friction Angle, peak ϕ' (deg)	Effective Friction Angle, LD[1] ϕ' (deg)	Unit Weight γ (pcf)	Effective Cohesion, peak, c' (psf)	Effective Cohesion, LD[1], c' (psf)
MSW Refuse	23	22	60	250	0
Geocomposite/Textured HDPE	28	23	N/A	0	0

7.3 Analysis and Results

We analyzed both potential circular failure surfaces and potential block or sliding failure surfaces. The following assumptions were used during the analyses:

- Less than one foot of head will develop above the geocomposite drainage layer, and
- Excess pore pressure will not develop within the waste either through hydrostatic or waste gas pressure. The development of excess pore pressure could substantially reduce the factor of safety for stability.

The results of our stability analyses for peak strength parameters are presented in Table 7.2 below.

Table 7.2 – Results of Waste Mass Stability Analysis – Peak Parameters

Cross Section	Factor of Safety – Circular Failure	Factor of Safety – Block Failure
12	2.18	1.71
18	2.27	1.68
J	3.65	2.71
O	2.27	1.72

To evaluate the potential for progressive failure, we also performed stability analyses using assumed large displacement interface shear strengths. The results of these analyses are presented in Table 7.3 below.

Table 7.3 – Results of Waste Mass Stability Analysis – Large Displacement Parameters

Cross Section	Factor of Safety – Circular Failure	Factor of Safety – Block Failure
12	1.65	1.50
18	1.81	1.52
J	3.51	2.49
O	1.93	1.54

The results of the mass stability analyses are presented graphically in Appendix F.

7.4 Conclusions

The calculated factor of safety for peak shear strength conditions exceeded 1.5 for our assumed strength and unit weight parameters, the analyzed cross sections, and assumed failure geometry. In addition, the calculated factor of safety for large displacement condition exceeds 1.5, which in our judgment, and based on published information, is acceptable.

Based on our results, in our opinion, we anticipate that the planned landfill configuration should be stable, provided excess pore pressures are not generated within the waste mass or that there is no increase in piezometric head above 1 foot within the underlying liner cover material or leachate collection system. The generation of pore pressures and increase in piezometric head within the materials could substantially reduce the factor of safety and increase the risk for stability problems.

Laboratory testing using the specific HDPE liner material chosen for the project should be performed to confirm our assumed interface friction values used in our analyses. Noticeable differences between the assumed parameters and parameters determined by testing could require that additional stability analyses be performed.

8 LIMITATIONS AND DESIGN REVIEW

8.1 Limitations

This report has been prepared for the exclusive use of Naismith/Hanson Engineering and the project team for specific application to the design of the proposed City of Kingsville Municipal Solid Waste Landfill Aerial Expansion in Kleberg County, Texas. Our report has been prepared in accordance with the generally accepted geotechnical engineering practice common to the local area. No other warranty, express or implied, is made.

The analyses and recommendations contained in this report are based on the data obtained from the referenced subsurface explorations within the project site. The soil boring indicates subsurface conditions only at the specific location, time and depth penetrated. The soil borings do not necessarily reflect strata variations that could exist at other locations within the project site. The validity of our recommendations is based in part on assumptions about the stratigraphy made by the Geotechnical Engineer. Such assumptions may be confirmed only during construction of the project. Our recommendations presented in this report must be reevaluated if subsurface conditions during the construction phase are different from those described in this report.

If any changes in the nature, design or location of the project are planned, the conclusions and recommendations contained in this report should not be considered valid unless the changes are reviewed and the conclusions modified or verified in writing by TWE. TWE is not responsible for any claims, damages or liability associated with interpretation or reuse of the subsurface data or engineering analyses without the expressed written authorization of TWE.

8.2 Design Review

Review of the design and construction drawings as well as the specifications should be performed by TWE before release. The review is aimed at determining if the geotechnical design and construction recommendations contained in this report have been properly interpreted. Design review is not within the authorized scope of work for this study.

8.3 Construction Monitoring

Construction surveillance is recommended and has been assumed in preparing our recommendations. These field services are required to check for changes in conditions that may result in modifications to our recommendations. The quality of the construction practices will affect performance and should be monitored. TWE would be pleased to provide construction monitoring, testing and inspection services for the project.

8.4 Closing Remarks

We appreciate the opportunity to be of service during this phase of the project and we look forward to continuing our services during the construction phase and on future projects.

9 REFERENCES

1. Qian, X., et.al., (2002), "Geotechnical Aspects of Landfill Design and Construction," Prentice Hall

2. Eid, H.T., et.al., (2000), "Municipal Solid Waste Slope Failure I: Waste and foundation Soil Properties," *Journal of Geotechnical and Geoenvironmental Engineering*, ASCE, 126(5) PP. 397-407

3. Singh, S. and Murphy, B., "Evaluation of Stability of Sanitary Landfills," (1990), *in* Geotechnics of Waste Fill – Theory and Practice, ASTM STP 1070, Landva, A., and Knowles, G.D., eds.

APPENDIX A

SOIL BORING LOCATION PLAN
TWE DRAWING NO. 16.53.042-1

FOR PERMIT PURPOSES ONLY

VICINITY MAP

SOIL BORING COORDINATES

BORING	DEPTH	LATITUDE	LONGITUDE
B–30	82.5'	N 27° 26' 44.0"	W 97° 49' 23.1"
B–31	67.5'	N 27° 26' 50.1"	W 97° 49' 24.3"
B–32	82.5'	N 27° 26' 48.0"	W 97° 49' 19.6"
B–33	86.0'	N 27° 26' 55.9"	W 97° 49' 11.3"
B–34	43.0'	N 27° 26' 43.4"	W 97° 49' 11.4"
B–35	72.5'	N 27° 26' 50.5"	W 97° 48' 57.2"
B–36	68.0'	N 27° 26' 56.8"	W 97° 49' 04.9"
B–37	48.0'	N 27° 26' 57.1"	W 97° 49' 17.6"
B–38	58.0'	N 27° 27' 03.8"	W 97° 49' 12.2"
B–39	68.0'	N 27° 27' 01.3"	W 97° 48' 57.3"
B–40	33.5'	N 27° 27' 10.0"	W 97° 49' 11.2"
B–41	62.5'	N 27° 27' 09.8"	W 97° 49' 17.4"

LEGEND

SYMBOL	DESCRIPTION
🔴	SOIL BORING LOCATION
🔵	PREVIOUS SOIL BORING LOCATION

Tolunay-Wong Engineers, Inc.

Boring Location Plan
MSWL Aerial Expansion
City of Kingsville Municipal Solid Waste

Drawn	*R.S.*	*08/22/2016*
Checked	*R.A.S.*	*08/22/2016*
Approved	*D.R.R.*	*11/07/2016*
Scale	*N.T.S.*	

TWE DRAWING NO. *16.53.042–1*

APPENDIX B

LOGS OF PROJECT BORINGS AND A KEY TO TERMS AND SYMBOLS USED ON BORING LOGS

TWE
Project No. 16.53.042
Report No. 12788R1

LOG OF BORING B-30

PROJECT: City of Kingsville
Municipal Solid Waste Landfill
Aerial Expansion

CLIENT: Naismith Engineering, Inc.

COORDINATES: N 27° 26' 44.0"
W 97° 49' 23.1"
SURFACE ELEVATION:
DRILLING METHOD:
Dry Augered: 0-ft. to 82.5-ft.
Wash Bored: -- to --

DEPTH (ft)	SAMPLE TYPE	SYMBOL/USCS	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (psf)	STD. PENETRATION TEST (blows/ft)	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
0														
	☒	SC	Dense to very dense tan and gray CLAYEY SAND (SC) with gypsum crystals		11/6" 23/6" 50/5"	16		42	17				37	
5	☒		-color changes to tan with ferrous staining		34/6" 50/3"									
	☒		-with sand partings		13/6" 50/3"									
10		▼												
	☒				7/6" 12/6" 20/6"	35							33	
15														
	☒		-color changes to reddish tan and light gray		6/6" 15/6" 20/6"									
20		▽												
	☒	CH	Very stiff to hard reddish tan and light gray FAT CLAY (CH) with gypsum crystals		10/6" 17/6" 26/6"									
25	☒		-color changes to reddish tan and tan		10/6" 18/6" 30/6"	25		50	28				92	
	☒		-color changes to tan and reddish brown		8/6" 11/6" 16/6"									
30														
	☒		-color changes to tan and gray		8/6" 12/6" 18/6"									
35														

COMPLETION DEPTH:	82.5 ft
DATE BORING STARTED:	07/22/2016
DATE BORING COMPLETED:	07/23/2016
LOGGER:	J. Gonzalez
PROJECT NO.:	16.53.042

REMARKS: Free water was encounterd at an approximate depth of 21' below existing grade during drilling operations. After a 10 to 15-minute waiting period, water was at a depth of 10'-6". At the completion of the boring, the open bore-hole was backfilled with cement-bentonite grout.

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TOLUNAY-WONG ENGINEERS, INC.

LOG OF BORING B-30

PROJECT: City of Kingsville
Municipal Solid Waste Landfill
Aerial Expansion

CLIENT: Naismith Engineering, Inc.

COORDINATES: N 27° 26' 44.0"
W 97° 49' 23.1"
SURFACE ELEVATION:
DRILLING METHOD:
Dry Augered: 0-ft. to 82.5-ft.
Wash Bored: -- to --

DEPTH (ft)	SAMPLE TYPE	SYMBOL/USCS	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (psf)	STD. PENETRATION TEST (blows/ft)	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
35		▨	Very stiff to hard reddish tan and tan FAT CLAY (CH) with gypsum crystals and ferrous stains											
	☒	▨			10/6" 17/6" 21/6"	30							90	
40		▨												
	☒	▨	-color changes to tan and reddish brown		9/6" 14/6" 21/6"									
45	☒	▨			13/6" 19/6" 29/6"									
	☒	▨	-becomes sandy 48' to 52'		8/6" 11/6" 13/6"	30							70	
50		▨												
	■	▨	-color changes to tan and becomes slickensided	(P) 4.50+		23	100	71	51				87	
55		▨												
	■	▨		(P) 4.50+										
60	■	▨		(P) 4.50+										
	■	▨	-becomes sandy and color changes to tan and gray	(P) 4.50+		26	97	54	30	1.75	3		69	
65		▨												
	■	▨	-color changes to tan and reddish brown with trace calcareous nodules	(P) 3.00										
70														

COMPLETION DEPTH:	82.5 ft
DATE BORING STARTED:	07/22/2016
DATE BORING COMPLETED:	07/23/2016
LOGGER:	J. Gonzalez
PROJECT NO.:	16.53.042

REMARKS: Free water was encounterd at an approximate depth of 21' below existing grade during drilling operations. After a 10 to 15-minute waiting period, water was at a depth of 10'-6". At the completion of the boring, the open bore-hole was backfilled with cement-bentonite grout.

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TOLUNAY-WONG ENGINEERS, INC.

LOG OF BORING B-30

PROJECT: City of Kingsville
Municipal Solid Waste Landfill
Aerial Expansion

CLIENT: Naismith Engineering, Inc.

COORDINATES: N 27° 26' 44.0"
W 97° 49' 23.1"
SURFACE ELEVATION:
DRILLING METHOD:
Dry Augered: 0-ft. to 82.5-ft.
Wash Bored: -- to --

DEPTH (ft)	SAMPLE TYPE	SYMBOL/USCS	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (psf)	STD. PENETRATION TEST (blows/ft)	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
70			Very stiff to hard tan and reddish brown FAT CLAY (CH) with calcareous nodules											
75			Very dense tan CLAYEY SAND (SC) with calcareous nodules		16/6" 43/6" 50/5"	17							17	
			Very stiff to hard tan and gray FAT CLAY (CH) with ferrous staining		10/6" 11/6" 17/6"									
80			-becomes slickensided with ferrous staining	(P) 4.50+										
			Bottom @ 82.5'											
85														
90														
95														
100														
105														

COMPLETION DEPTH:	82.5 ft
DATE BORING STARTED:	07/22/2016
DATE BORING COMPLETED:	07/23/2016
LOGGER:	J. Gonzalez
PROJECT NO.:	16.53.042

REMARKS: Free water was encounterd at an approximate depth of 21' below existing grade during drilling operations. After a 10 to 15-minute waiting period, water was at a depth of 10'-6". At the completion of the boring, the open bore-hole was backfilled with cement-bentonite grout.

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TOLUNAY-WONG ENGINEERS, INC.

LOG OF BORING B-31

PROJECT: City of Kingsville
Municipal Solid Waste Landfill
Aerial Expansion

CLIENT: Naismith Engineering, Inc.

COORDINATES: N 27° 26' 50.1"
W 97° 49' 24.3"
SURFACE ELEVATION: --
DRILLING METHOD:
Dry Augered: 0-ft. to 68-ft.
Wash Bored: -- to --

DEPTH (ft)	SAMPLE TYPE	SYMBOL/USCS	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (psf)	STD. PENETRATION TEST (blows/ft)	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
0			Medium dense to very dense gray CLAYEY SAND (SC)		4/6" 5/6" 7/6"									
			-with calcareous nodules and sand pockets		10/6" 22/6" 18/6"									
5					4/6" 5/6" 6/6"	11							46	
					5/6" 6/6" 8/6"									
10					6/6" 8/6" 12/6"									
			-with cemented sand layers		8/6" 27/6" 29/6"	27							22	
			-color changes to tan		18/6" 32/6" 39/6"									
15			Very dense tan POORLY GRADED SAND with CLAY (SP-SC) and sand partings		36/6" 50/5"									
					12/6" 50/5"	15							9	
					45/6" 50/5"									
20					35/6" 50/4"									
		▼			17/6" 26/6" 50/5"									
		▽			17/6" 38/6" 38/6"									
25			Hard reddish tan and light gray SANDY LEAN SILTY CLAY (CL-ML) with sand partings		13/6" 20/6" 31/6" 23/6" 34/6" 50/4" 12/6" 17/6" 50/5"	26		29	7				66	
30			-color changes to reddish tan and tan with ferrous stains		13/6" 32/6" 50/5"									
					7/6" 36/6" 39/6"									
					10/6" 21/6" 36/6" 10/6" 18/6" 35/6"	25							62	
35														

COMPLETION DEPTH:	68 ft
DATE BORING STARTED:	07/20/2016
DATE BORING COMPLETED:	07/21/2016
LOGGER:	J. Gonzalez
PROJECT NO.:	16.53.042

REMARKS: Free water was encounterd at an approximate depth of 23' below existing grade during drilling operations. After a 10 to 15-minute waiting period, water was at a depth of 21'-6". At the completion of the boring, the open bore-hole was backfilled with cement-bentonite grout.

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TOLUNAY-WONG ENGINEERS, INC.

LOG OF BORING B-31

PROJECT: City of Kingsville
Municipal Solid Waste Landfill
Aerial Expansion

CLIENT: Naismith Engineering, Inc.

COORDINATES: N 27° 26' 50.1"
W 97° 49' 24.3"
SURFACE ELEVATION: --
DRILLING METHOD:
Dry Augered: 0-ft. to 68-ft.
Wash Bored: -- to --

DEPTH (ft)	SAMPLE TYPE	SYMBOL/USCS	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (psf)	STD. PENETRATION TEST (blows/ft)	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
35			Hard reddish tan and tan SANDY LEAN CLAY (CL) with ferrous stains and laminated sands		17/6" 25/6" 35/6"									
					17/6" 13/6" 19/6"									
					7/6" 16/6" 17/6"									
40			Very stiff to hard reddish tan and tan FAT CLAY with SAND (CH) and ferrous stains		3/6" 7/6" 10/6"	37		59	36				76	
					9/6" 20/6" 27/6"									
					5/6" 14/6" 17/6"									
45			-with trace gypsum crystals and ferrous stains		10/6" 18/6" 21/6"									
					18/6" 23/6" 30/6"									
					6/6" 20/6" 21/6"	30							83	
50					9/6" 17/6" 19/6"									
					9/6" 18/6" 23/6"									
			-with calcareous nodules and ferrous stains	(P) 4.50+	11/6" 23/6" 26/6"	32	91	83	50	4.14	2		87	
55				(P) 4.50+										
				(P) 4.50+										
				(P) 4.50+		34	87			2.88	2		83	
60			-with trace gypsum crystals and ferrous stains	(P) 4.50+										
				(P) 4.50+										
65				(P) 4.50+										
				(P) 4.50+										
			Bottom @ 68'											
70														

COMPLETION DEPTH:	68 ft
DATE BORING STARTED:	07/20/2016
DATE BORING COMPLETED:	07/21/2016
LOGGER:	J. Gonzalez
PROJECT NO.:	16.53.042

REMARKS: Free water was encounterd at an approximate depth of 23' below existing grade during drilling operations. After a 10 to 15-minute waiting period, water was at a depth of 21'-6". At the completion of the boring, the open bore-hole was backfilled with cement-bentonite grout.

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TOLUNAY-WONG ENGINEERS, INC.

LOG OF BORING B-32

PROJECT: City of Kingsville
Municipal Solid Waste Landfill
Aerial Expansion

CLIENT: Naismith Engineering, Inc.

COORDINATES: N 27° 26' 49.7"
W 97° 49' 17.0"
SURFACE ELEVATION: --
DRILLING METHOD:
Dry Augered: 0-ft. to 82.5-ft.
Wash Bored: -- to --

DEPTH (ft)	SAMPLE TYPE	SYMBOL/USCS	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (psf)	STD. PENETRATION TEST (blows/ft)	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
0	☒	▨	Stiff to hard tan and gray SANDY LEAN CLAY (CL) with gypsum crystals and trace organics		3/6" 5/6" 6/6"	9		34	18				54	
5	☒	▨			6/6" 21/6" 23/6"									
10	☒	▨			11/6" 26/6" 50/3"									
	☒	░	Medium dense to dense reddish tan and gray CLAYEY SAND (SC) with gypsum crystals		17/6" 50/6"	28							34	
15		░ ▼												
	☒	░ ▽	-color changes to tan and gray with sand partings		10/6" 17/6" 22/6"									
20	☒	░	-with ferrous stains		4/6" 8/6" 13/6"									
25	☒	░	-color changes to reddish tan		10/6" 18/6" 21/6"	22		31	10				29	
30	☒	░	-color changes to reddish brown and tan		6/6" 8/6" 12/6"									
35	☒	░			8/6" 8/6" 12/6"									

COMPLETION DEPTH:	82.5 ft
DATE BORING STARTED:	07/27/2016
DATE BORING COMPLETED:	07/28/2016
LOGGER:	J. Gonzalez
PROJECT NO.:	16.53.042

REMARKS: Free water was encounterd at an approximate depth of 18' below existing grade during drilling operations. After a 10 to 15-minute waiting period, water was at a depth of 14'-7". At the completion of the boring, the open bore-hole was backfilled with cement-bentonite grout.

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TOLUNAY-WONG ENGINEERS, INC.

LOG OF BORING B-32

PROJECT: City of Kingsville
Municipal Solid Waste Landfill
Aerial Expansion

CLIENT: Naismith Engineering, Inc.

COORDINATES: N 27° 26' 49.7"
W 97° 49' 17.0"
SURFACE ELEVATION: --
DRILLING METHOD:
Dry Augered: 0-ft. to 82.5-ft.
Wash Bored: -- to --

DEPTH (ft)	SAMPLE TYPE	SYMBOL/USCS	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (psf)	STD. PENETRATION TEST (blows/ft)	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
35			Medium dense to dense reddish tan and gray CLAYEY SAND (SC) with gypsum crystals											
			Very stiff to hard tan FAT CLAY with SAND (CH), slickensided, with calcareous nodules	(P) 4.50+		29	89						79	
40														
			-color changes to tan and reddish brown with gypsum crystals and ferrous stains		8/6" 12/6" 15/6"									
45			-color changes to tan, gray, and reddish brown	(P) 4.50+										
50			-color changes to tan and reddish brown		4/6" 9/6" 10/6"	30		73	51				82	
				(P) 4.50+										
55														
			-color changes to tan and gray	(P) 4.50+										
60														
				(P) 4.50+		26	94			0.61	2		81	
65			-color changes to tan, red, and brown	(P) 4.00										
			-color changes to tan and gray	(P) 4.50+										
70														

COMPLETION DEPTH:	82.5 ft
DATE BORING STARTED:	07/27/2016
DATE BORING COMPLETED:	07/28/2016
LOGGER:	J. Gonzalez
PROJECT NO.:	16.53.042

REMARKS: Free water was encounterd at an approximate depth of 18' below existing grade during drilling operations. After a 10 to 15-minute waiting period, water was at a depth of 14'-7". At the completion of the boring, the open bore-hole was backfilled with cement-bentonite grout.

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TOLUNAY-WONG ENGINEERS, INC.

LOG OF BORING B-32

PROJECT: City of Kingsville
Municipal Solid Waste Landfill
Aerial Expansion

CLIENT: Naismith Engineering, Inc.

COORDINATES: N 27° 26' 49.7"
W 97° 49' 17.0"
SURFACE ELEVATION: --
DRILLING METHOD:
Dry Augered: 0-ft. to 82.5-ft.
Wash Bored: -- to --

DEPTH (ft)	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (psf)	STD. PENETRATION TEST (blows/ft)	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
70	Very stiff to hard tan and gray FAT CLAY with SAND (CH), slickensided with gypsum crystals and calcareous nodules											
	Medium dense to dense tan CLAYEY SAND (SC) with calcareous nodules	(P) 0.75		21		24	8				24	
75												
	-with gypsum crystals and ferrous stains		5/6" 10/6" 13/6"									
80												
			13/6" 20/6" 20/6"									
	Bottom @ 82.5'											
85												
90												
95												
100												
105												

COMPLETION DEPTH:	82.5 ft
DATE BORING STARTED:	07/27/2016
DATE BORING COMPLETED:	07/28/2016
LOGGER:	J. Gonzalez
PROJECT NO.:	16.53.042

REMARKS: Free water was encounterd at an approximate depth of 18' below existing grade during drilling operations. After a 10 to 15-minute waiting period, water was at a depth of 14'-7". At the completion of the boring, the open bore-hole was backfilled with cement-bentonite grout.

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TOLUNAY-WONG ENGINEERS, INC.

LOG OF BORING B-33

PROJECT: City of Kingsville
Municipal Solid Waste Landfill
Aerial Expansion

CLIENT: Naismith Engineering, Inc.

COORDINATES: N 27° 26' 55.9"
W 97° 49' 11.3"
SURFACE ELEVATION: --
DRILLING METHOD:
Dry Augered: 0-ft. to 86-ft.
Wash Bored: -- to --

DEPTH (ft)	SAMPLE TYPE	SYMBOL/USCS	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (psf)	STD. PENETRATION TEST (blows/ft)	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
0														
			Medium dense to very dense tan CLAYEY SAND (SC) with gypsum crystals		2/6" 7/6" 9/6"									
5			-color changes to dark gray and gray with trace gravel		7/6" 11/6" 9/6"	16							47	
			-color changes to tan and light gray sand partings		27/6" 50/6"									
10														
			-color changes to tan and white with trace caliche		50/5"									
15														
			Dense to very dense tan and white POORLY GRADED SAND with SILT (SP-SM), and trace caliche		17/6" 48/6" 50/3"	11		35	8				12	
20														
					17/6" 21/6" 27/6"									
25			-color changes to light gray and tan with gypsum crystals and ferrous stains		15/6" 17/6" 32/6"									
		▼												
			Medium dense to dense gray and white CLAYEY SAND (SC) with gypsum crystals		14/6" 22/6" 26/6"	42							20	
30														
		▽												
			-color changes to tan		13/6" 21/6" 22/6"									
35														

COMPLETION DEPTH:	86 ft
DATE BORING STARTED:	08/05/2016
DATE BORING COMPLETED:	08/05/2016
LOGGER:	J. Gonzalez
PROJECT NO.:	16.53.042

REMARKS: Free water was encounterd at an approximate depth of 32'-6" below existing grade during drilling operations. After a 10 to 15-minute waiting period, water was at a depth of 28'-2". At the completion of the boring, the open bore-hole was backfilled with cement-bentonite grout.

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TOLUNAY-WONG ENGINEERS, INC.

LOG OF BORING B-33

PROJECT: City of Kingsville
Municipal Solid Waste Landfill
Aerial Expansion

CLIENT: Naismith Engineering, Inc.

COORDINATES: N 27° 26' 55.9"
W 97° 49' 11.3"
SURFACE ELEVATION: --
DRILLING METHOD:
Dry Augered: 0-ft. to 86-ft.
Wash Bored: -- to --

DEPTH (ft)	SAMPLE TYPE	SYMBOL/USCS	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (psf)	STD. PENETRATION TEST (blows/ft)	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
35			Medium dense to dense reddish tan CLAYEY SAND (SC) with gypsum crystals and ferrous stains		6/6" 9/6" 12/6"									
40			-color changes to tan and reddish tan		8/6" 16/6" 18/6"									
45			Stiff to very stiff reddish tan LEAN CLAY with SAND (CL), slickensided, with ferrous stains		9/6" 12/6" 18/6"	29		43	24				79	
50			-color changes to reddish tan and tan with gypsum crystals		5/6" 6/6" 9/6"									
			Stiff to very stiff LEAN CLAY (CL), slickensided, with ferrous stains	(P) 2.00		40	79			1.06	3		96	
55			-color changes to reddish brown and tan with gypsum crystals	(P) 3.50										
60				(P) 4.00		34	87							
65			Very stiff to hard tan FAT CLAY (CH), slickensided, with gypsum crystals and ferrous stains	(P) 4.50+		32	42	64	33	2.57	2		95	
70			-color changes to tan and reddish brown		7/6" 12/6" 14/6"									

COMPLETION DEPTH:	86 ft
DATE BORING STARTED:	08/05/2016
DATE BORING COMPLETED:	08/05/2016
LOGGER:	J. Gonzalez
PROJECT NO.:	16.53.042

REMARKS: Free water was encounterd at an approximate depth of 32'-6" below existing grade during drilling operations. After a 10 to 15-minute waiting period, water was at a depth of 28'-2". At the completion of the boring, the open bore-hole was backfilled with cement-bentonite grout.

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TOLUNAY-WONG ENGINEERS, INC.

LOG OF BORING B-33

PROJECT: City of Kingsville
Municipal Solid Waste Landfill
Aerial Expansion

CLIENT: Naismith Engineering, Inc.

COORDINATES: N 27° 26' 55.9"
W 97° 49' 11.3"
SURFACE ELEVATION: --
DRILLING METHOD:
Dry Augered: 0-ft. to 86-ft.
Wash Bored: -- to --

DEPTH (ft)	SAMPLE TYPE	SYMBOL/USCS	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (psf)	STD. PENETRATION TEST (blows/ft)	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
70			Very stiff to hard tan and reddish brown FAT CLAY (CH), slickensided, with gypsum crystals and ferrous stains	(P) 4.50+										
			-color changes to tan and light gray											
75														
			-with layers of calcareous nodules		9/6" 10/6" 21/6"									
80			Very stiff to hard tan FAT CLAY with SAND (CH) with gypsum crystals and ferrous stains	(P) 4.50+		18	106			3.57	3		77	
			-color changes to tan and white	(P) 4.50+										
85														
			Bottom @ 86'											
90														
95														
100														
105														

COMPLETION DEPTH:	86 ft
DATE BORING STARTED:	08/05/2016
DATE BORING COMPLETED:	08/05/2016
LOGGER:	J. Gonzalez
PROJECT NO.:	16.53.042

REMARKS: Free water was encounterd at an approximate depth of 32'-6" below existing grade during drilling operations. After a 10 to 15-minute waiting period, water was at a depth of 28'-2". At the completion of the boring, the open bore-hole was backfilled with cement-bentonite grout.

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TOLUNAY-WONG ENGINEERS, INC.

LOG OF BORING B-34

PROJECT: City of Kingsville
Municipal Solid Waste Landfill
Aerial Expansion

CLIENT: Naismith Engineering, Inc.

COORDINATES: N 27° 26' 43.4"
W 97° 49' 11.4"
SURFACE ELEVATION: --
DRILLING METHOD:
Dry Augered: 0 ft. to 30 ft.
Wash Bored: 30 ft. to 43 ft.

DEPTH (ft)	SAMPLE TYPE	SYMBOL/USCS	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (psf)	STD. PENETRATION TEST (blows/ft)	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
0			Medium dense dark gray, gray, and light gray CLAYEY SAND (SC) with trace of organics		2/6" 5/6" 6/6"									
				(P) 4.50+		15	112			2.53	6		42	
5			Very stiff to hard gray and light gray SANDY LEAN SILTY CLAY (CL-ML) with calcareous nodules	(P) 4.50+		15	115	21	7				59	
				(P) 4.50+		14	114			6.13	4		62	
			-color changes to light gray											
10			-color changes to light gray and tan		4/6" 12/6" 16/6"									
			-color changes to white and light gray		11/6" 18/6" 16/6"									
			-becomes stiff		5/6" 6/6" 8/6"									
15			Medium dense to dense white and light gray SILTY SAND (SM) with calcareous nodules		4/6" 6/6" 8/6"	17		38	7				31	
			-color changes to light gray and tan with ferrous stains		4/6" 10/6" 19/6"									
					23/6" 50/5"									
20					23/6" 50/4"									
			-color changes to light gray		27/6" 35/6" 50/4"	22							25	
25					5/6" 37/6" 45/6"									
					20/6" 39/6" 37/6"									
30			▼ ▽ -becomes medium dense		8/6" 12/6" 9/6"	26		39	2				28	
					4/6" 12/6" 10/6"	33							39	
					5/6" 6/6" 10/6"									
35			-color changes to tan and marine green		3/6"									

COMPLETION DEPTH:	43 ft
DATE BORING STARTED:	06/22/2016
DATE BORING COMPLETED:	06/22/2016
LOGGER:	J. Garcia
PROJECT NO.:	16.53.042

REMARKS: Free water was encounterd at an approximate depth of 31' below existing grade during drilling operations. After a 10 to 15-minute waiting period, water was at a depth of 28'-4". At the completion of the boring, the open bore-hole was backfilled with cement-bentonite grout.

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TOLUNAY-WONG ENGINEERS, INC.

LOG OF BORING B-34

PROJECT: City of Kingsville
Municipal Solid Waste Landfill
Aerial Expansion

CLIENT: Naismith Engineering, Inc.

COORDINATES: N 27° 26' 43.4"
W 97° 49' 11.4"
SURFACE ELEVATION: --
DRILLING METHOD:
Dry Augered: 0 ft. to 30 ft.
Wash Bored: 30 ft. to 43 ft.

DEPTH (ft)	SAMPLE TYPE	SYMBOL/USCS	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (psf)	STD. PENETRATION TEST (blows/ft)	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
35			Medium dense tan and marine green SILTY SAND (SM) with sand lenses and trace organics		8/6" 13/6"									
			Hard tan and light gray LEAN CLAY (CL)	(P) 4.50+										
				(P) 4.50+		30	91	40	17	0.93	1		91	
40				(P) 4.50+										
				(P) 4.50+										
			Bottom @ 43'											
45														
50														
55														
60														
65														
70														

COMPLETION DEPTH:	43 ft
DATE BORING STARTED:	06/22/2016
DATE BORING COMPLETED:	06/22/2016
LOGGER:	J. Garcia
PROJECT NO.:	16.53.042

REMARKS: Free water was encounterd at an approximate depth of 31' below existing grade during drilling operations. After a 10 to 15-minute waiting period, water was at a depth of 28'-4". At the completion of the boring, the open bore-hole was backfilled with cement-bentonite grout.

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TOLUNAY-WONG ENGINEERS, INC.

LOG OF BORING B-35

PROJECT: City of Kingsville
Municipal Solid Waste Landfill
Aerial Expansion

CLIENT: Naismith Engineering, Inc.

COORDINATES: N 27° 26' 50.5"
W 97° 48' 57.2"
SURFACE ELEVATION: --
DRILLING METHOD:
Dry Augered: 0-ft. to 72.5-ft.
Wash Bored: -- to --

DEPTH (ft)	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (psf)	STD. PENETRATION TEST (blows/ft)	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
0	Medium dense tan and brown CLAYEY SAND (SC) with trace caliche		5/6" 8/6" 7/6"									
5	-color changes to reddish brown with ferrous stains		5/6" 8/6" 5/6"	12		31	17				38	
	Very stiff to hard reddish tan SANDY LEAN CLAY (CL) with gypsum crystals	(P) 4.50+		14	117			2.22	3		52	
10												
	-color changes to reddish tan and tan with ferrous stains		5/6" 10/6" 12/6"									
15												
	-color changes to reddish tan	(P) 4.50+		17	109	42	25					
20	-color changes to reddish tan and tan	(P) 4.50+										
	Medium dense to dense reddish tan and tan CLAYEY SAND (SC) with gypsum crystals and ferrous stains	(P) 4.50+		17	104			1.29	3		40	
25												
	-color changes to reddish tan		4/6" 7/6" 9/6"									
30												
			8/6" 13/6" 20/6"									
35												

COMPLETION DEPTH: 72.5 ft
DATE BORING STARTED: 07/29/2016
DATE BORING COMPLETED: 07/29/2016
LOGGER: J. Gonzalez
PROJECT NO.: 16.53.042

REMARKS: Free water was encounterd at an approximate depth of 34' below existing grade during drilling operations. After a 10 to 15-minute waiting period, water was at a depth of 30'-9". At the completion of the boring, the open bore-hole was backfilled with cement-bentonite grout.

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TOLUNAY-WONG ENGINEERS, INC.

LOG OF BORING B-35

PROJECT: City of Kingsville
Municipal Solid Waste Landfill
Aerial Expansion

CLIENT: Naismith Engineering, Inc.

COORDINATES: N 27° 26' 50.5"
W 97° 48' 57.2"
SURFACE ELEVATION: --
DRILLING METHOD:
Dry Augered: 0-ft. to 72.5-ft.
Wash Bored: -- to --

DEPTH (ft)	SAMPLE TYPE	SYMBOL/USCS	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (psf)	STD. PENETRATION TEST (blows/ft)	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
35			Medium dense to dense reddish tan and tan CLAYEY SAND (SC) with gypsum crystals and ferrous stains											
			Hard tan and light gray FAT CLAY with SAND (CH), gypsum crystals, and ferrous stains		17/6" 26/6" 30/6"	25		109	72				77	
40			-color changes to tan and reddish brown		8/6" 15/6" 24/6"									
45			-with sand partings		10/6" 16/6" 16/6"									
50			Stiff to hard reddish brown and tan FAT CLAY (CH) with gypsum crystals and ferrous stains		4/6" 7/6" 10/6"	34							96	
			-becomes slickensided with sand layers	(P) 2.00										
55														
			-color changes to tan		4/6" 7/6" 10/6"									
60				(P) 3.75		33	89	90	67	3.88	4		89	
65				(P) 4.25										
			-color changes to tan and reddish brown	(P) 4.50+										
70														

COMPLETION DEPTH:	72.5 ft
DATE BORING STARTED:	07/29/2016
DATE BORING COMPLETED:	07/29/2016
LOGGER:	J. Gonzalez
PROJECT NO.:	16.53.042

REMARKS: Free water was encounterd at an approximate depth of 34' below existing grade during drilling operations. After a 10 to 15-minute waiting period, water was at a depth of 30'-9". At the completion of the boring, the open bore-hole was backfilled with cement-bentonite grout.

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TOLUNAY-WONG ENGINEERS, INC.

LOG OF BORING B-35

PROJECT: City of Kingsville
Municipal Solid Waste Landfill
Aerial Expansion

CLIENT: Naismith Engineering, Inc.

COORDINATES: N 27° 26' 50.5"
W 97° 48' 57.2"
SURFACE ELEVATION: --
DRILLING METHOD:
Dry Augered: 0-ft. to 72.5-ft.
Wash Bored: -- to --

DEPTH (ft)	SAMPLE TYPE	SYMBOL/USCS	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (psf)	STD. PENETRATION TEST (blows/ft)	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
70	■	▨	Very stiff to hard reddish brown and tan FAT CLAY (CH), slickensided, with gypsum crystals and ferrous stains	(P) 4.50+		32	89			2.68	1		95	
			Bottom @ 72.5'											
75														
80														
85														
90														
95														
100														
105														

COMPLETION DEPTH:	72.5 ft
DATE BORING STARTED:	07/29/2016
DATE BORING COMPLETED:	07/29/2016
LOGGER:	J. Gonzalez
PROJECT NO.:	16.53.042

REMARKS: Free water was encounterd at an approximate depth of 34' below existing grade during drilling operations. After a 10 to 15-minute waiting period, water was at a depth of 30'-9". At the completion of the boring, the open bore-hole was backfilled with cement-bentonite grout.

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TOLUNAY-WONG ENGINEERS, INC.

LOG OF BORING B-36

PROJECT: City of Kingsville
Municipal Solid Waste Landfill
Aerial Expansion

CLIENT: Naismith Engineering, Inc.

COORDINATES: N 27° 26' 56.8"
W 97° 49' 04.9"
SURFACE ELEVATION: --
DRILLING METHOD:
Dry Augered: 0-ft. to 22-ft.
Wash Bored: 22-ft. to 68-ft.

DEPTH (ft)	SAMPLE TYPE	SYMBOL/USCS	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (psf)	STD. PENETRATION TEST (blows/ft)	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
0			Loose to medium dense dark gray and gray CLAYEY SAND (SC)											
			-with calcareous nodules		18/6" 20/6" 21/6"	10							36	
5														
			-color changes to light gray and tan		4/6" 5/6" 5/6"									
10			-color changes to tan		4/6" 5/6" 6/6"	12		47	28				44	
15					2/6" 4/6" 6/6"									
		▼	-color changes to light gray with ferrous stains		4/6" 10/6" 14/6"									
20														
		▽	-becomes very dense and color changes to light gray and tan		15/6" 24/6" 50/6"	25							32	
25														
					12/6" 14/6" 15/6"									
30			-becomes dense		5/6" 17/6" 27/6"									
35					4/6"									

COMPLETION DEPTH:	68 ft
DATE BORING STARTED:	06/24/2016
DATE BORING COMPLETED:	06/24/2016
LOGGER:	J. Garcia
PROJECT NO.:	16.53.042

REMARKS: Free water was encounterd at an approximate depth of 23' below existing grade during drilling operations. After a 10 to 15-minute waiting period, water was at a depth of 18'-3". At the completion of the boring, the open bore-hole was backfilled with cement-bentonite grout.

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TOLUNAY-WONG ENGINEERS, INC.

LOG OF BORING B-36

PROJECT: City of Kingsville
Municipal Solid Waste Landfill
Aerial Expansion

CLIENT: Naismith Engineering, Inc.

COORDINATES: N 27° 26' 56.8"
W 97° 49' 04.9"
SURFACE ELEVATION: --
DRILLING METHOD:
Dry Augered: 0-ft. to 22-ft.
Wash Bored: 22-ft. to 68-ft.

DEPTH (ft)	SAMPLE TYPE	SYMBOL/USCS	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (psf)	STD. PENETRATION TEST (blows/ft)	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
35			Medium dense light gray and tan CLAYEY SAND (SC)		7/6" 8/6"									
			-with sand seams, calcareous nodules, and ferrous staining		6/6" 10/6" 13/6"	21		47	30				35	
40														
			-color changes to reddish brown and light gray		4/6" 8/6" 10/6"									
45														
			Stiff to very stiff reddish brown and light gray FAT CLAY (CH), slickensided, with ferrous staining	(P) 4.50+										
50														
			-with sand seams and calcareous nodules		4/6" 6/6" 8/6"	42							96	
55			-color changes to light gray with sand layers		11/6" 12/6" 14/6"									
			-becomes hard		11/6" 21/6" 26/6"	37		70	44				94	
60														
					7/6" 8/6" 9/6"									
65														
			-color changes to brown yellow, reddish brown, and light gray		7/6" 10/6" 10/6"									
			Bottom @ 68'											
70														

COMPLETION DEPTH:	68 ft
DATE BORING STARTED:	06/24/2016
DATE BORING COMPLETED:	06/24/2016
LOGGER:	J. Garcia
PROJECT NO.:	16.53.042

REMARKS: Free water was encounterd at an approximate depth of 23' below existing grade during drilling operations. After a 10 to 15-minute waiting period, water was at a depth of 18'-3". At the completion of the boring, the open bore-hole was backfilled with cement-bentonite grout.

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TOLUNAY-WONG ENGINEERS, INC.

LOG OF BORING B-37

PROJECT: City of Kingsville
Municipal Solid Waste Landfill
Aerial Expansion

CLIENT: Naismith Engineering, Inc.

COORDINATES: N 27° 26' 57.1"
W 97° 49' 17.6"
SURFACE ELEVATION: --
DRILLING METHOD:
Dry Augered: 0-ft. to 12-ft.
Wash Bored: 12-ft. to 48-ft.

DEPTH (ft)	SAMPLE TYPE	SYMBOL/USCS	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (psf)	STD. PENETRATION TEST (blows/ft)	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
0			Very dense light gray and tan SILTY SAND (SM)											
	☒		-with ferrous staining		6/6" 16/6" 50/5"									
5														
	☒				11/6" 50/5"	20		33	9				20	
		▼												
10	☒		-with calcareous nodules		23/6" 37/6" 50/6"									
		▽												
15	☒		Very stiff to hard tan and light tan SANDY LEAN SILTY CLAY (CL-ML)		6/6" 7/6" 10/6"	31							52	
	☒		-color changes to tan and light gray with ferrous staining		9/6" 17/6" 27/6"									
20														
	☒				7/6" 12/6" 13/6"									
25														
	☒		Stiff to very stiff reddish brown and light gray FAT CLAY (CH) with calcareous nodules and ferrous staining		4/6" 5/6" 9/6"	33		56	39				99	
30	☒		-color changes to light gray with sand layers		5/6" 7/6" 12/6"									
35	☒				5/6"	34							86	

COMPLETION DEPTH: 48 ft
DATE BORING STARTED: 06/24/2016
DATE BORING COMPLETED: 06/25/2016
LOGGER: J. Garcia
PROJECT NO.: 16.53.042

REMARKS: Free water was encounterd at an approximate depth of 15' below existing grade during drilling operations. After a 10 to 15-minute waiting period, water was at a depth of 9'-3". At the completion of the boring, the open bore-hole was backfilled with cement-bentonite grout.

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TOLUNAY-WONG ENGINEERS, INC.

LOG OF BORING B-37

PROJECT: City of Kingsville
Municipal Solid Waste Landfill
Aerial Expansion

CLIENT: Naismith Engineering, Inc.

COORDINATES: N 27° 26' 57.1"
W 97° 49' 17.6"
SURFACE ELEVATION: --
DRILLING METHOD:
Dry Augered: 0-ft. to 12-ft.
Wash Bored: 12-ft. to 48-ft.

DEPTH (ft)	SAMPLE TYPE	SYMBOL/USCS	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (psf)	STD. PENETRATION TEST (blows/ft)	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
35	☒	▨	Stiff to very stiff light gray and brownish tan FAT CLAY (CH) with sand seams, calcareous nodules, and ferrous staining		7/6" 12/6"									
	☒	▨			4/6" 5/6" 7/6"									
40		▨												
	☒	▨	-color changes to light gray and reddish brown		6/6" 6/6" 9/6"									
45		▨												
	☒	▨	-color changes to light gray		4/6" 5/6" 9/6"	35		80	51				86	
			Bottom @ 48'											
50														
55														
60														
65														
70														

COMPLETION DEPTH:	48 ft
DATE BORING STARTED:	06/24/2016
DATE BORING COMPLETED:	06/25/2016
LOGGER:	J. Garcia
PROJECT NO.:	16.53.042

REMARKS: Free water was encounterd at an approximate depth of 15' below existing grade during drilling operations. After a 10 to 15-minute waiting period, water was at a depth of 9'-3". At the completion of the boring, the open bore-hole was backfilled with cement-bentonite grout.

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TOLUNAY-WONG ENGINEERS, INC.

LOG OF BORING B-38

PROJECT: City of Kingsville
Municipal Solid Waste Landfill
Aerial Expansion

CLIENT: Naismith Engineering, Inc.

COORDINATES: N 27° 27' 03.76"
W 97° 49' 12.19"
SURFACE ELEVATION: --
DRILLING METHOD:
Dry Augered: 0 ft. to 10 ft.
Wash Bored: 10 ft. to 58 ft.

DEPTH (ft)	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (psf)	STD. PENETRATION TEST (blows/ft)	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
0	Very stiff to hard light gray SANDY FAT CLAY (CH) with ferrous stains and trace calcareous nodules		10/6" 18/6" 31/6"	17		50	19				55	
			20/6" 45/6" 50/4"									
5			3/6" 33/6" 50/5"									
			12/6" 27/6" 37/6"									
			17/6" 36/6" 50/3"	30							66	
10			18/6" 35/6" 50/3"									
			13/6" 33/6" 50/2"									
15	-color changes to light gray and tan		8/6" 14/6" 20/6"									
			7/6" 12/6" 19/6"									
			6/6" 10/6" 14/6"	28		60	40				57	
20			6/6" 11/6" 15/6"									
	-becomes stiff		5/6" 7/6" 8/6"									
25			6/6" 8/6" 13/6"									
			4/6" 9/6" 9/6"									
		(P) 4.50+		25	92	47	29					
30		(P) 4.50+										
	-color changes to brown and light gray and becomes stiff with sand layers		4/6" 5/6" 8/6"									
35			9/6"									

COMPLETION DEPTH: 58 ft
DATE BORING STARTED: 06/23/2016
DATE BORING COMPLETED: 06/23/2016
LOGGER: J. Garcia
PROJECT NO.: 16.53.042

REMARKS: Free water was encounterd at an approximate depth of 11' below existing grade during drilling operations. After a 10 to 15-minute waiting period, water was at a depth of 5'-5". At the completion of the boring, the open bore-hole was backfilled with cement-bentonite grout.

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TOLUNAY-WONG ENGINEERS, INC.

LOG OF BORING B-38

PROJECT: City of Kingsville
Municipal Solid Waste Landfill
Aerial Expansion

CLIENT: Naismith Engineering, Inc.

COORDINATES: N 27° 27' 03.76"
W 97° 49' 12.19"
SURFACE ELEVATION: --
DRILLING METHOD:
Dry Augered: 0 ft. to 10 ft.
Wash Bored: 10 ft. to 58 ft.

DEPTH (ft)	SAMPLE TYPE	SYMBOL/USCS	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (psf)	STD. PENETRATION TEST (blows/ft)	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
35			Very stiff to hard reddish brown and light gray SANDY FAT CLAY (CH) with sand seams and layers	(P) 4.50+	8/6" 10/6"									
			Stiff to hard light gray FAT CLAY (CH), slickensided, with calcareous nodules and ferrous stains	(P) 4.50+		42	78	100	72	2.95	2		93	
40			-color changes to reddish brown and light gray	(P) 4.50+										
				(P) 4.50+										
			-color changes to tannish brown and light gray with trace organics	(P) 4.50+										
45														
			-color changes to light gray		5/6" 6/6" 8/6"									
				(P) 4.50+		30	91			2.14	3		87	
50														
					6/6" 7/6" 7/6"									
					4/6" 5/6" 8/6"									
55			-color changes to tannish brown and light gray		5/6" 7/6" 9/6"									
			-color changes to light gray		6/6" 7/6" 9/6"									
			Bottom @ 58'											
60														
65														
70														

COMPLETION DEPTH:	58 ft
DATE BORING STARTED:	06/23/2016
DATE BORING COMPLETED:	06/23/2016
LOGGER:	J. Garcia
PROJECT NO.:	16.53.042

REMARKS: Free water was encounterd at an approximate depth of 11' below existing grade during drilling operations. After a 10 to 15-minute waiting period, water was at a depth of 5'-5". At the completion of the boring, the open bore-hole was backfilled with cement-bentonite grout.

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TOLUNAY-WONG ENGINEERS, INC.

LOG OF BORING B-39

PROJECT: City of Kingsville
Municipal Solid Waste Landfill
Aerial Expansion

CLIENT: Naismith Engineering, Inc.

COORDINATES: N 27° 27' 01.3"
W 97° 48' 57.3"
SURFACE ELEVATION: --
DRILLING METHOD:
Dry Augered: 0 ft. to 26 ft.
Wash Bored: 26 ft. to 68 ft.

DEPTH (ft)	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (psf)	STD. PENETRATION TEST (blows/ft)	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
0	Medium dense to dense tan and light gray CLAYEY SAND FILL with trace gravel		8/6" 9/6" 6/6"	18							33	
	-color changes to brown		40/6" 27/6" 19/6"									
5	Medium dense to dense brown and reddish brown CLAYEY SAND (SC)		6/6" 7/6" 8/6"									
	-color changes to tan and gray with calcareous nodules		4/6" 5/6" 6/6"									
			5/6" 6/6" 8/6"	11		36	20				49	
10	-color changes to tan and light gray		4/6" 6/6" 7/6"									
	-color changes to light gray		7/6" 8/6" 11/6"									
15	-color changes to light gray and tan with ferrous stains		6/6" 12/6" 19/6"									
	-color changes to light gray		11/6" 19/6" 22/6"									
	Stiff to hard light gray SANDY LEAN CLAY (CL) with calcareous nodules and ferrous stains		3/6" 4/6" 5/6"	19							65	
20			6/6" 9/6" 13/6"									
			8/6" 11/6" 20/6"									
25	-color changes to light tan and light gray	(P) 4.50+										
	▼ -color changes to light gray	(P) 4.00										
	▽											
			7/6" 11/6" 13/6"									
30	-color changes to light gray and tan	(P) 4.50+		19	102			1.14	7		50	
			12/6" 16/6" 20/6"									
35			8/6"									

COMPLETION DEPTH: 68 ft
DATE BORING STARTED: 06/20/2016
DATE BORING COMPLETED: 06/24/2016
LOGGER: J. Garcia
PROJECT NO.: 16.53.042

REMARKS: Free water was encounterd at an approximate depth of 27' below existing grade during drilling operations. After a 10 to 15-minute waiting period, water was at a depth of 26'-6". At the completion of the boring, the open bore-hole was backfilled with cement-bentonite grout.

Page 1 of 2

TOLUNAY-WONG ENGINEERS, INC.

LOG OF BORING B-39

PROJECT: City of Kingsville
Municipal Solid Waste Landfill
Aerial Expansion

CLIENT: Naismith Engineering, Inc.

COORDINATES: N 27° 27' 01.3"
W 97° 48' 57.3"
SURFACE ELEVATION: --
DRILLING METHOD:
Dry Augered: 0 ft. to 26 ft.
Wash Bored: 26 ft. to 68 ft.

DEPTH (ft)	SAMPLE TYPE	SYMBOL/USCS	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (psf)	STD. PENETRATION TEST (blows/ft)	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
35			Stiff to hard light gray and tan SANDY LEAN CLAY (CL) with ferrous stains		12/6" 16/6"									
			Medium dense to dense light gray CLAYEY SAND (SC) with ferrous stains		7/6" 8/6" 11/6"									
					6/6" 11/6" 12/6"									
40					7/6" 10/6" 13/6"	25		69	51				45	
					13/6" 19/6" 21/6"									
45			Dense light gray POORLY GRADED SAND with CLAY (SP- SC)		12/6" 21/6" 20/6"									
					11/6" 16/6" 16/6"									
			Hard reddish brown and light gray FAT CLAY with SAND (CH)	(P) 4.50+										
50				(P) 4.50+		28	93			0.85	1		72	
			-becomes slickensided with calcareous nodules	(P) 4.50+										
55			-with ferrous stains	(P) 4.50+										
				(P) 4.50+										
				(P) 4.50+										
60				(P) 4.50+										
			-becomes stiff		7/6" 7/6" 7/6"									
65														
			Medium dense light gray CLAYEY SAND (SC) with calcareous nodules and ferrous stains		6/6" 10/6" 13/6"	20	102	61	45	1.91	5		46	
			Bottom @ 68'											
70														

COMPLETION DEPTH: 68 ft
DATE BORING STARTED: 06/20/2016
DATE BORING COMPLETED: 06/24/2016
LOGGER: J. Garcia
PROJECT NO.: 16.53.042

REMARKS: Free water was encounterd at an approximate depth of 27' below existing grade during drilling operations. After a 10 to 15-minute waiting period, water was at a depth of 26'-6". At the completion of the boring, the open bore-hole was backfilled with cement-bentonite grout.

Page 2 of 2

TOLUNAY-WONG ENGINEERS, INC.

LOG OF BORING B-40

PROJECT: City of Kingsville
Municipal Solid Waste Landfill
Aerial Expansion

CLIENT: Naismith Engineering, Inc.

COORDINATES: N 27° 27' 09.97"
W 97° 49' 11.18"
SURFACE ELEVATION: --
DRILLING METHOD:
Dry Augered: 0 ft. to 22 ft.
Wash Bored: 22 ft. to 33.75 ft.

DEPTH (ft)	SAMPLE TYPE	SYMBOL/USCS	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (psf)	STD. PENETRATION TEST (blows/ft)	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
0			Loose to very dense light gray and gray SILTY SAND (SM) with trace caliche		4/6" 4/6" 6/6"									
			-color changes to light gray and tan with ferrous stains		5/6" 7/6" 11/6"	16		35	10				31	
5					7/6" 17/6" 17/6"									
			-color changes to light gray with calcareous nodules		12/6" 21/6" 34/6"									
			-color changes to light gray and white		12/6" 27/6" 50/3"	18							34	
10			-color changes to white		15/6" 50/3"									
			-color changes to light gray and white		25/6" 50/4"									
15			Hard light gray FAT CLAY with SAND (CH), calcareous nodules, and ferrous stains		7/6" 26/6" 50/5"	22		70	41				80	
					5/6" 17/6" 28/6"									
20					10/6" 30/6" 35/6"									
			Hard light gray SANDY FAT CLAY (CH) with calcareous nodules and ferrous stains		9/6" 25/6" 35/6"	31							59	
					16/6" 32/6" 50/5"									
25					16/6" 31/6" 50/5"									
			Dense to very dense light gray CLAYEY SAND (SC) with calcareous nodules		8/6" 18/6" 27/6"	30		53	32				49	
30					6/6" 18/6" 50/6"									
					6/6" 20/6" 50/5"									
					3/6" 40/6" 50/3"	16							30	
35			Bottom @ 33.5'											

COMPLETION DEPTH:	33.5 ft
DATE BORING STARTED:	06/21/2016
DATE BORING COMPLETED:	06/22/2016
LOGGER:	J. Garcia
PROJECT NO.:	16.53.042

REMARKS: Free water was encounterd at an approximate depth of 21' below existing grade during drilling operations. After a 10 to 15-minute waiting period, water was at a depth of 19'. At the completion of the boring, the open bore-hole was backfilled with cement-bentonite grout.

Page 1 of 1

TOLUNAY-WONG ENGINEERS, INC.

LOG OF BORING B-41

PROJECT: City of Kingsville
Municipal Solid Waste Landfill
Aerial Expansion

CLIENT: Naismith Engineering, Inc.

COORDINATES: N 27° 27' 09.8"
W 97° 49' 17.4"
SURFACE ELEVATION: --
DRILLING METHOD:
Dry Augered: 0-ft. to 62.5-ft.
Wash Bored: -- to --

DEPTH (ft)	SAMPLE TYPE	SYMBOL/USCS	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (psf)	STD. PENETRATION TEST (blows/ft)	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
0														
			Loose to medium dense gray CLAYEY SAND (SC) with calcareous nodules		4/6" 5/6" 5/6"	8							35	
5			-color changes to light gray		4/6" 5/6" 6/6"									
			Stiff to very stiff gray SANDY FAT CLAY (CH)		5/6" 8/6" 11/6"	20		78	52				64	
10														
			-becomes hard and color changes to brown with interbedded sand seams		9/6" 17/6" 25/6"									
15														
			-color changes to brown and tan		7/6" 12/6" 14/6"									
20														
			-color changes to tan with sand layers		3/6" 4/6" 6/6"	36							64	
25			-color changes to brown with sand partings		5/6" 4/6" 6/6"									
			-color changes to brown and tan		6/6" 7/6" 8/6"	31		52	30				51	
30														
					4/6" 6/6" 6/6"									
35														

COMPLETION DEPTH:	62.5 ft
DATE BORING STARTED:	07/20/2016
DATE BORING COMPLETED:	07/20/2016
LOGGER:	M. Anderson
PROJECT NO.:	16.53.042

REMARKS: Free water was encounterd at an approximate depth of 19'-6" below existing grade during drilling operations. After a 10 to 15-minute waiting period, water was at a depth of 19'-3". At the completion of the boring, the open bore-hole was backfilled with cement-bentonite grout.

Page 1 of 2

TOLUNAY-WONG ENGINEERS, INC.

LOG OF BORING B-41

PROJECT: City of Kingsville
Municipal Solid Waste Landfill
Aerial Expansion

CLIENT: Naismith Engineering, Inc.

COORDINATES: N 27° 27' 09.8"
W 97° 49' 17.4"
SURFACE ELEVATION: --
DRILLING METHOD:
Dry Augered: 0-ft. to 62.5-ft.
Wash Bored: -- to --

DEPTH (ft)	SAMPLE TYPE	SYMBOL/USCS	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (psf)	STD. PENETRATION TEST (blows/ft)	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
35			Stiff to very stiff gray SANDY FAT CLAY (CH)											
			Very stiff brown FAT CLAY with SAND (CH)	(P) 3.25		27	92						77	
40			-color changes to brown and tan		6/6" 13/6" 11/6"									
45					4/6" 9/6" 14/6"									
					6/6" 8/6" 9/6"	35		97	75				84	
50														
			-color changes to brown and gray		7/6" 9/6" 12/6"									
55														
			-color changes to gray	(P) 4.50+										
60														
				(P) 3.50										
			Bottom @ 62.5'											
65														
70														

COMPLETION DEPTH:	62.5 ft
DATE BORING STARTED:	07/20/2016
DATE BORING COMPLETED:	07/20/2016
LOGGER:	M. Anderson
PROJECT NO.:	16.53.042

REMARKS: Free water was encounterd at an approximate depth of 19'-6" below existing grade during drilling operations. After a 10 to 15-minute waiting period, water was at a depth of 19'-3". At the completion of the boring, the open bore-hole was backfilled with cement-bentonite grout.

Page 2 of 2

TOLUNAY-WONG ENGINEERS, INC.

KEY TO SYMBOLS AND TERMS USED ON BORING LOGS FOR SOIL

Most Common Unified Soil Classifications System Symbols

▨	Lean Clay (CL)
▨	Lean Clay w/ Sand (CL)
▨	Sandy Lean Clay (CL)
▨	Fat Clay (CH)
▨	Fat Clay w/ Sand (CH)
▨	Sandy Fat Clay (CH)
▨	Silty Clay (CL-ML)
▨	Sandy Silty Clay (CL-ML)
▨	Silty Clayey Sand (SC-SM)
▨	Clayey Sand (SC)
▥	Sandy Silt (ML)
▥	Silty Sand (SM)
▥	Silt w/ Sand (ML)
⁙	Well Graded Sand (SW)
⁙	Well Graded Sand w/ Gravel (SW-GM)
⁙	Poorly Graded Sand (SP)
⁙	Poorly Graded Sand w/ Silt (SP-SM)
▥	Silt (ML)
▥	Elastic Silt (MH)
▥	Elastic Silt w/ Sand (MH-SP)
●	Silty Gravel (GM)
●	Clayey Gravel (GC)
●	Well Graded Gravel (GW)
●	Well Graded Gravel w/ Sand (SP-GM)
●	Poorly Graded Gravel (GP)
≋	Peat

Miscellaneous Materials

△	Fill
△	Concrete
■	Asphalt and/or Base

Sampler Symbols	**Meaning**
▯	Pavement core
■	Thin - walled tube sample
☒	Standard Penetration Test (SPT)
◩	Auger sample
▱	Sampling attempt with no recovery
⧗	TxDOT Cone Penetrometer Test

Field Test Data

2.50	Pocket penetrometer reading in tons per square foot
(T)1.13	Torvane Measurement in tons per square foot
8/6"	Blow count per 6 - in. interval of the Standard Penetration Test
▽	Observed free water during drilling
▼	Observed static water level

Laboratory Test Data

Wc (%)	Moisture content in percent
Dens. (pcf)	Dry unit weight in pounds per cubic foot
Qu (tsf)	Unconfined compressive strength in tons per square foot
UU (tsf)	Compressive strength under confining pressure in tons per square foot
Str. (%)	Strain at failure in percent
LL	Liquid Limit in percent
PI	Plasticity Index
#200 (%)	Percent passing the No. 200 mesh sieve
( )	Confining pressure in pounds per square inch
*	Slickensided failure
**	Did not fail @ 15% strain

RELATIVE DENSITY OF COHESIONLESS & SEMI-COHESIONLESS SOILS

The following descriptive terms for relative density apply to cohesionless soils such as gravels, silty sands, and sands as well as semi-cohesive and semi-cohesionless soils such as sandy silts, and clayey sands.

Relative Density	Typical N_{60} Value Range*
Very Loose	0-4
Loose	5-10
Medium Dense	11-30
Dense	31-50
Very Dense	Over 50

* N_{60} is the number of blows from a 140-lb weight having a free fall of 30-in. required to penetrate the final 12-in. of an 18-in. sample interval, corrected for field procedure to an average energy ratio of 60% (Terzaghi, Peck, and Mesri, 1996).

CONSISTENCY OF COHESIVE SOILS

The following descriptive terms for consistency apply to cohesive soils such as clays, sandy clays, and silty clays.

Typical Compressive Strength (tsf)	Consistency	Typical SPT "N_{60}" Value Range**
$q_u < 0.25$	Very soft	≤ 2
$0.25 \leq q_u < 0.50$	Soft	3-4
$0.50 \leq q_u < 1.00$	Firm	5-8
$1.00 \leq q_u < 2.00$	Stiff	9-15
$2.00 \leq q_u < 4.00$	Very Stiff	16-30
$q_u \geq 4.00$	Hard	≥ 31

** An "N_{60}" value of 31 or greater corresponds to a hard consistency. The correlation of consistency with a typical SPT "N_{60}" value range is approximate.

Tolunay-Wong Engineers, Inc.

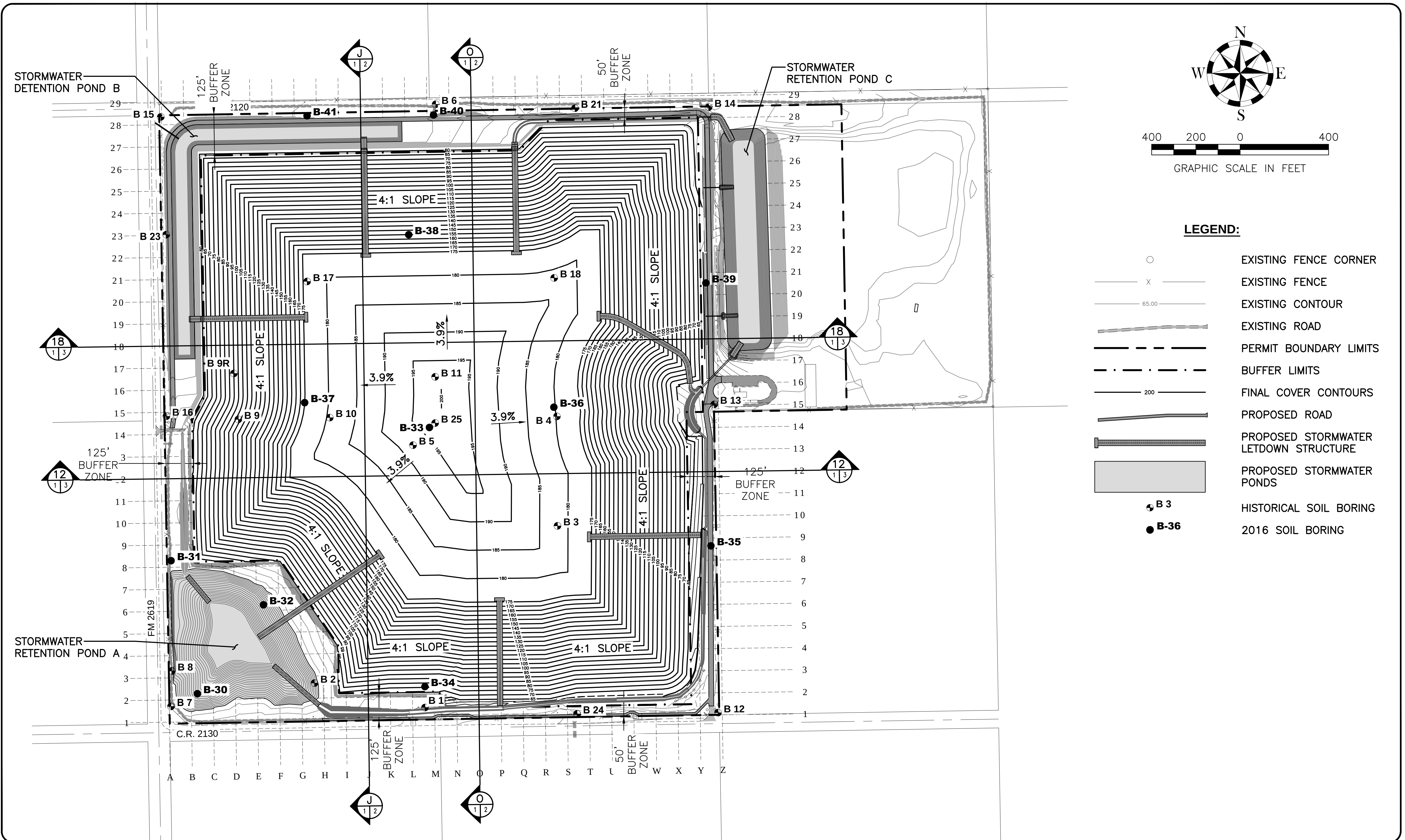
REVISION DATE 1-5-12
GEOSYSTEM

APPENDIX C

CROSS SECTION PLAN, CROSS SECTION J & O, CROSS SECTION 12 & 18

TWE
Project No. 16.53.042
Report No. 12788R1

FOR PERMIT PURPOSES ONLY



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NUMBER	REVISION	DATE	DRAWN	DESIGNED	REVIEWED

STATE OF TEXAS
JON M. REINHARD
64541
LICENSED PROFESSIONAL ENGINEER
08/27/18

Hanson No. 16L0438
Filename
Scale AS SHOWN
Date 08/27/2018

LAYOUT	DT	08/27/2018
DRAWN	DT	08/27/2018
REVIEWED	JMR	08/27/2018

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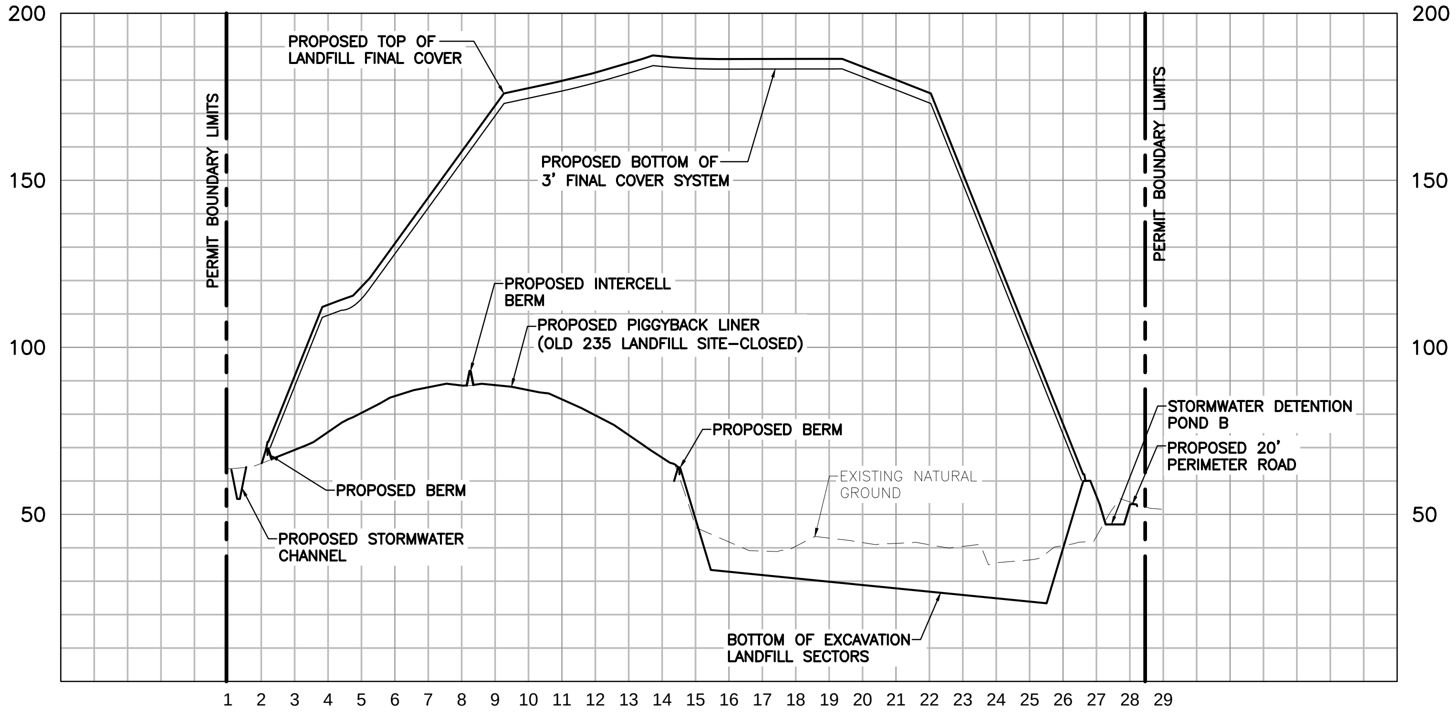
APPENDIX C
CROSS SECTION PLAN
CITY OF KINGSVILLE LANDFILL
MSW PERMIT No. 235-C
KINGSVILLE, TEXAS
KLEBERG COUNTY, TEXAS

FIGURE:
1

FOR PERMIT PURPOSES ONLY



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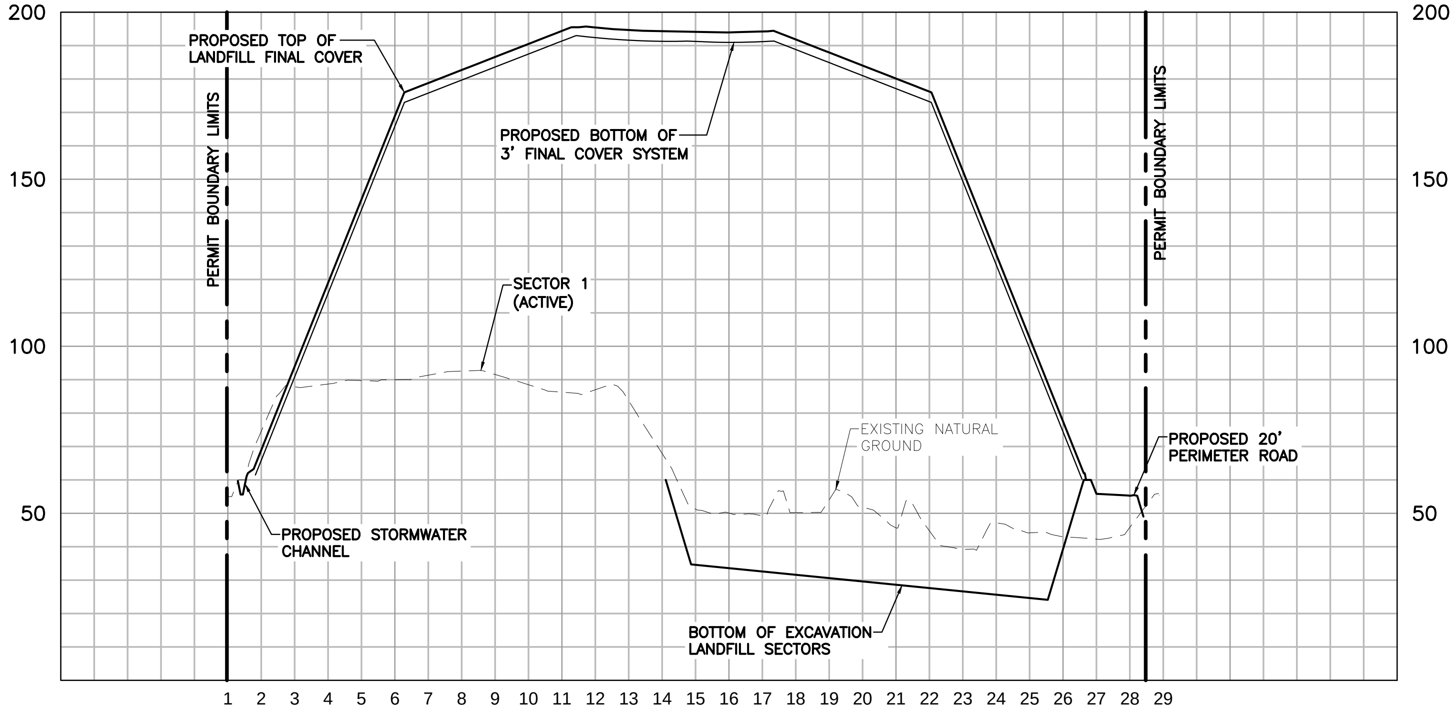

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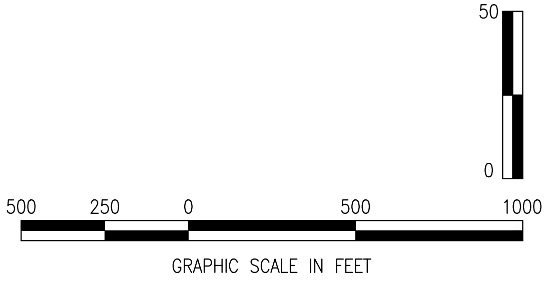

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NUMBER	REVISION	DATE	DRAWN	DESIGNED	REVIEWED

JON M. REINHARD
64541
08/27/18

Hanson No. 16L0438
Filename
Scale AS SHOWN
Date 08/27/2018

LAYOUT	DT	08/27/2018
DRAWN	DT	08/27/2018
REVIEWED	JMR	08/27/2018

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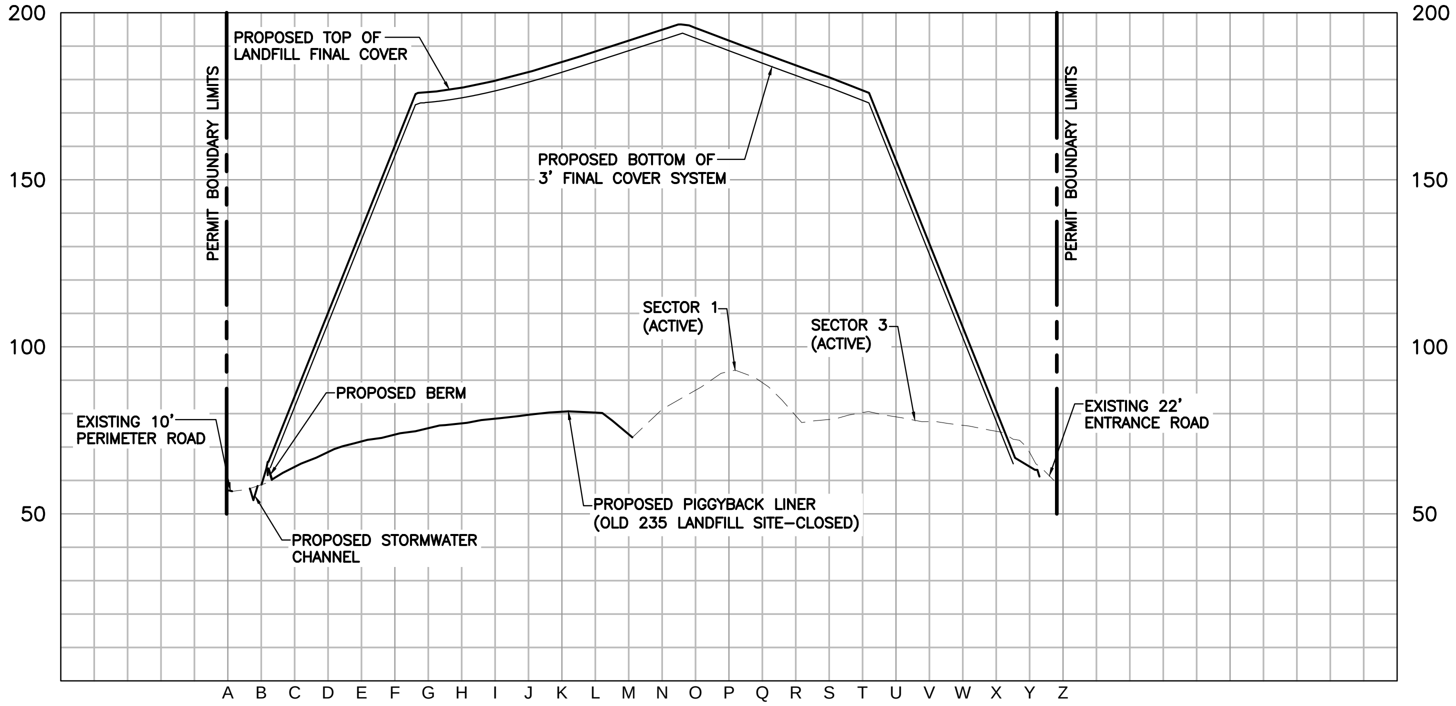
APPENDIX C
CROSS SECTION J & O
CITY OF KINGSVILLE LANDFILL
MSW PERMIT No. 235-C
KINGSVILLE, TEXAS
KLEBERG COUNTY, TEXAS

FIGURE:
2

FOR PERMIT PURPOSES ONLY



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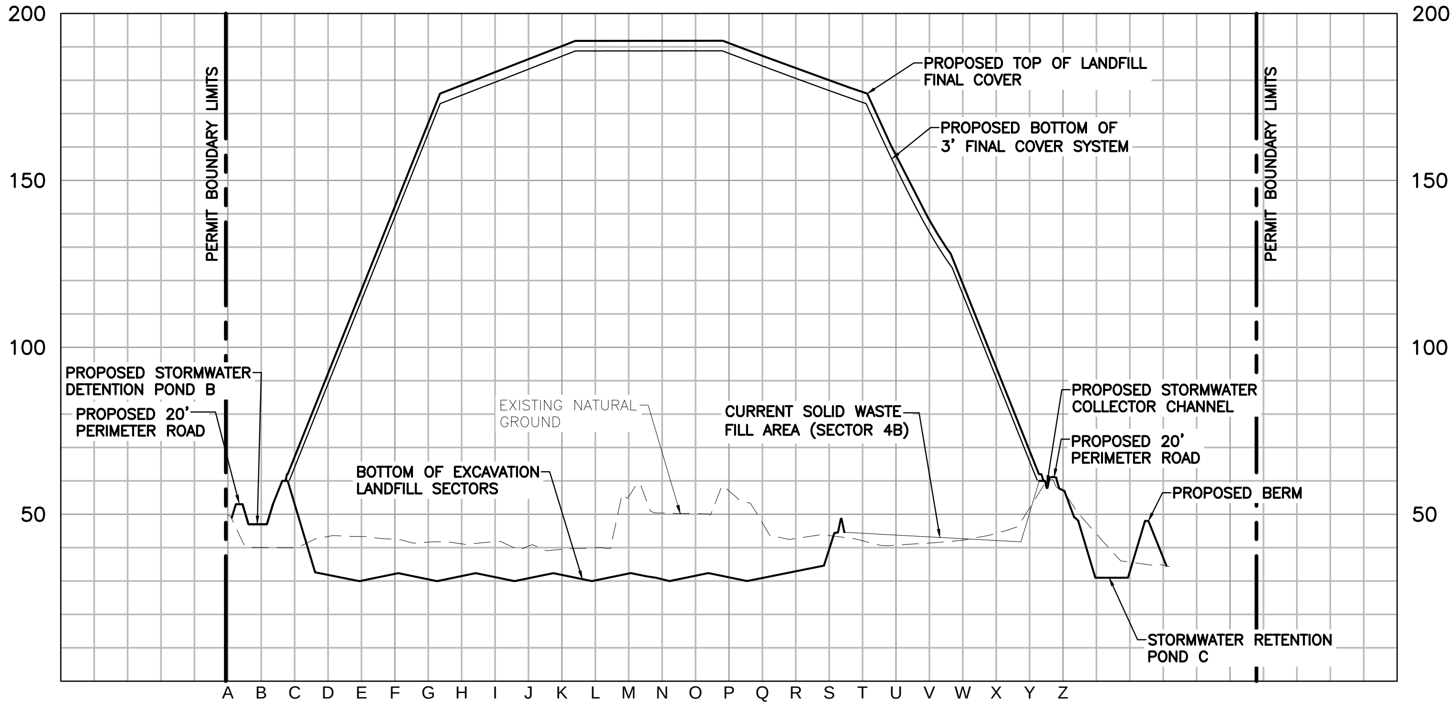

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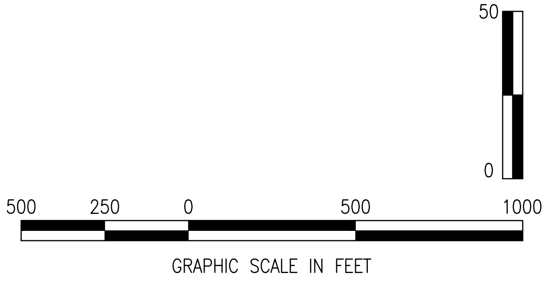

GRAPHIC SCALE IN FEET

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NUMBER	REVISION	DATE	DRAWN	DESIGNED	REVIEWED

JON M. REINHARD
64541
08/27/18

Hanson No. 16L0438
Filename
Scale AS SHOWN
Date 08/27/2018

LAYOUT	DT	08/27/2018
DRAWN	DT	08/27/2018
REVIEWED	JMR	08/27/2018

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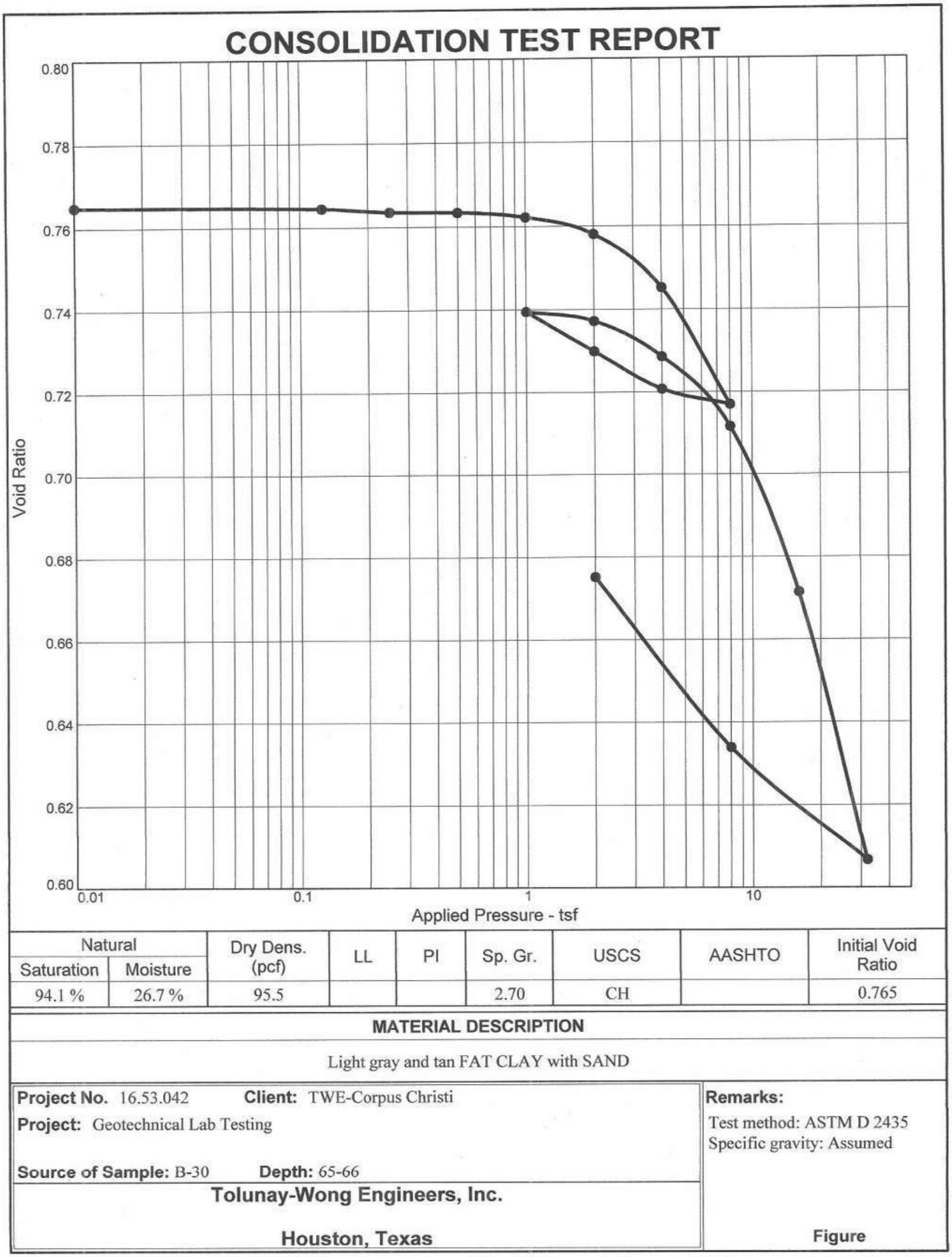
APPENDIX C
CROSS SECTION 12 & 18
CITY OF KINGSVILLE LANDFILL
MSW PERMIT No. 235-C
KINGSVILLE, TEXAS
KLEBERG COUNTY, TEXAS

FIGURE:
3

APPENDIX D

ONE-DIMENSIONAL CONSOLIDATION TESTS RESULTS

TWE
Project No. 16.53.042
Report No. 12788R1



CONSOLIDATION TEST REPORT

Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	USCS	AASHTO	Initial Void Ratio
Saturation	Moisture							
94.1 %	26.7 %	95.5			2.70	CH		0.765

MATERIAL DESCRIPTION

Light gray and tan FAT CLAY with SAND

Project No. 16.53.042 **Client:** TWE-Corpus Christi

Project: Geotechnical Lab Testing

Source of Sample: B-30 **Depth:** 65-66

Tolunay-Wong Engineers, Inc.

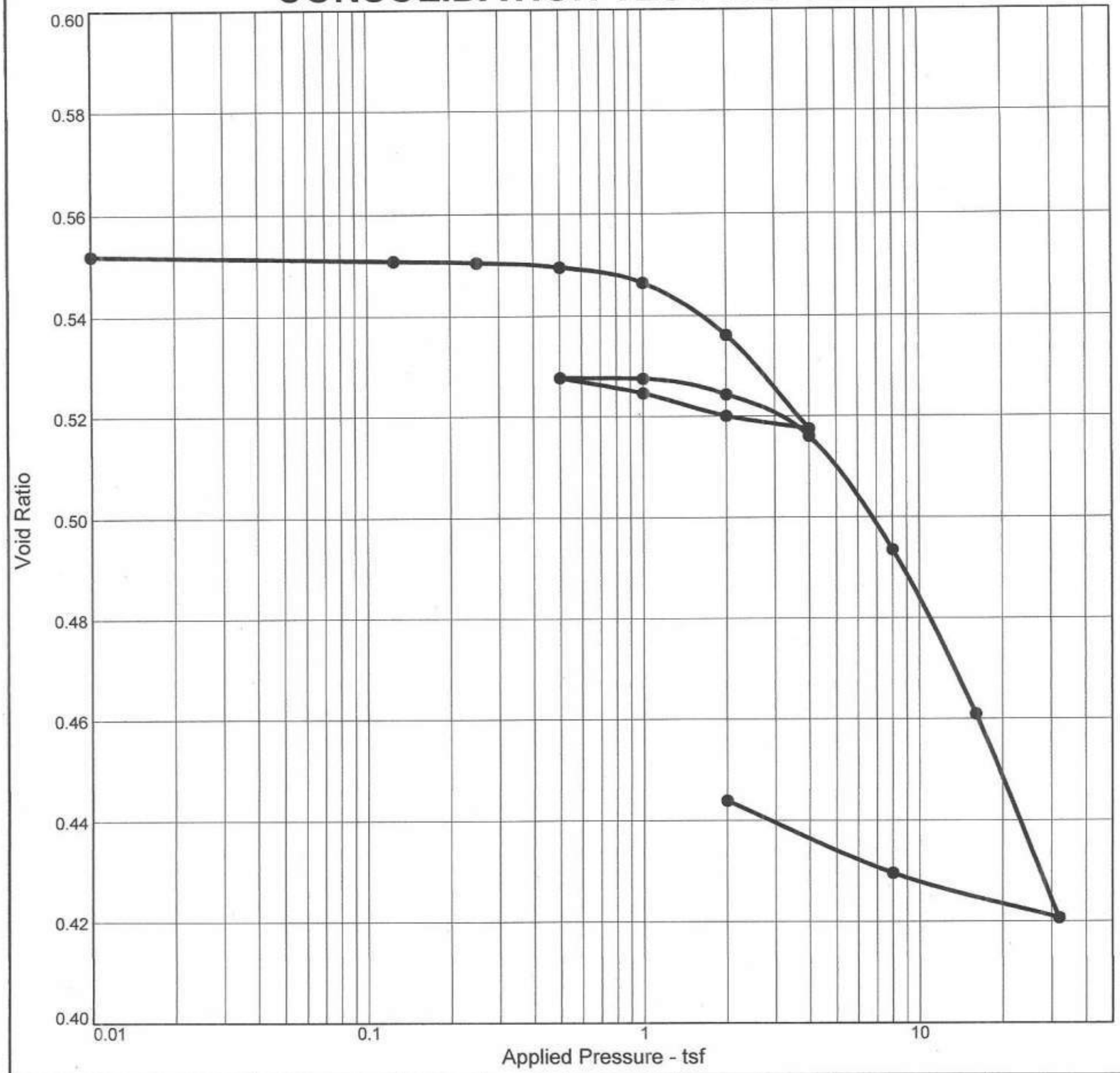
Houston, Texas

Remarks:

Test method: ASTM D 2435
Specific gravity: Assumed

Figure

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	USCS	AASHTO	Initial Void Ratio
Saturation	Moisture							
84.1 %	17.2 %	108.6	42	25	2.70	CL		0.552

MATERIAL DESCRIPTION

Tan SANDY LEAN CLAY

Project No. 16.53.042 **Client:** TWE-Corpus Christi

Project: Geotechnical Lab Testing

Source of Sample: B-35 **Depth:** 16-18

Tolunay-Wong Engineers, Inc.

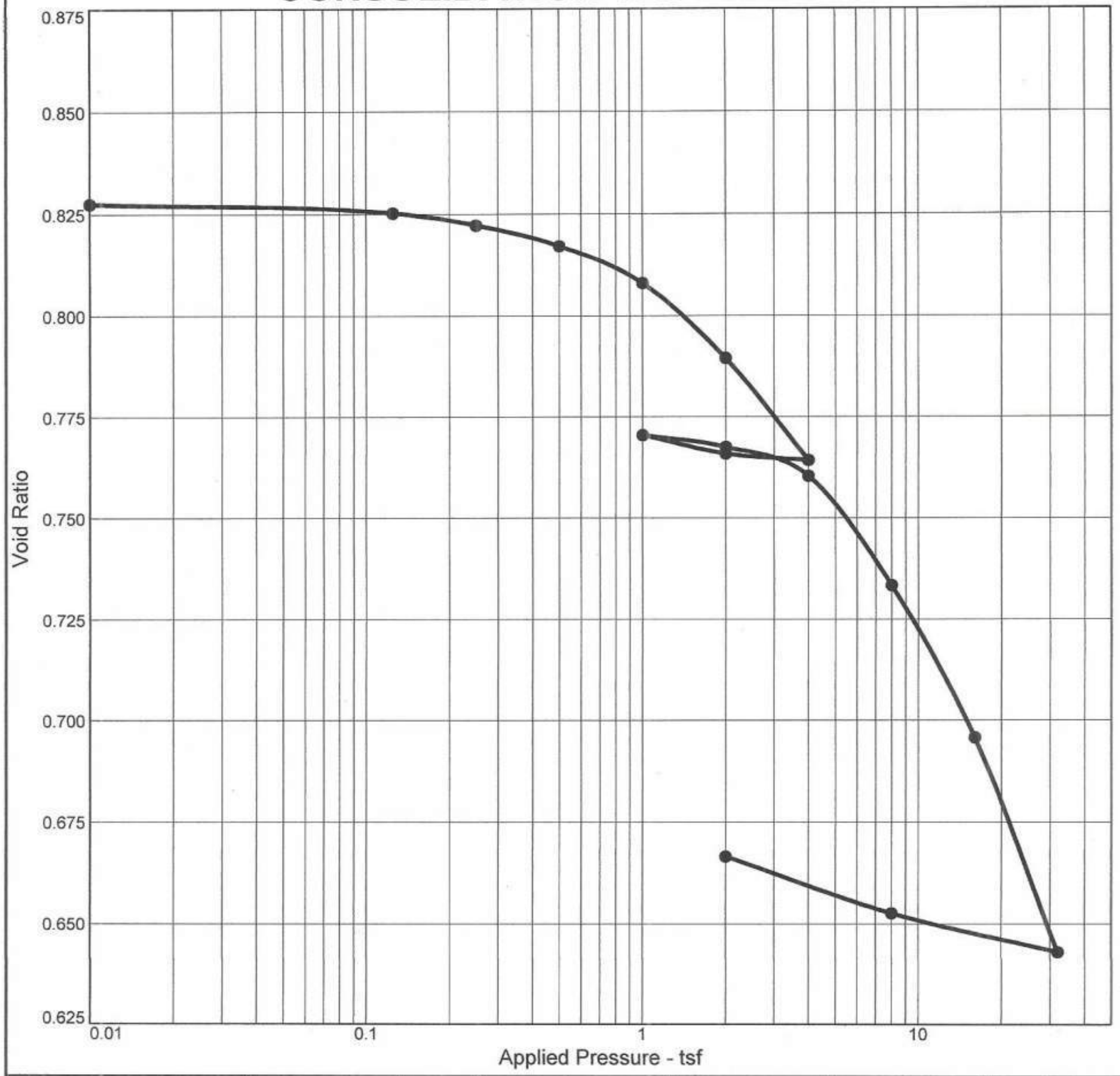
Houston, Texas

Remarks:

Test method: ASTM D 2435
Specific gravity: Assumed

Figure

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	USCS	AASHTO	Initial Void Ratio
Saturation	Moisture							
80.1 %	24.6 %	92.2	47	29	2.70	SC		0.827

MATERIAL DESCRIPTION

Tan and light gray CLAYEY SAND

Project No. 16.53.042 **Client:** TWE-Corpus Christi

Project: Geotechnical Lab Testing

Source of Sample: B-38 **Depth:** 28-30

Tolunay-Wong Engineers, Inc.

Houston, Texas

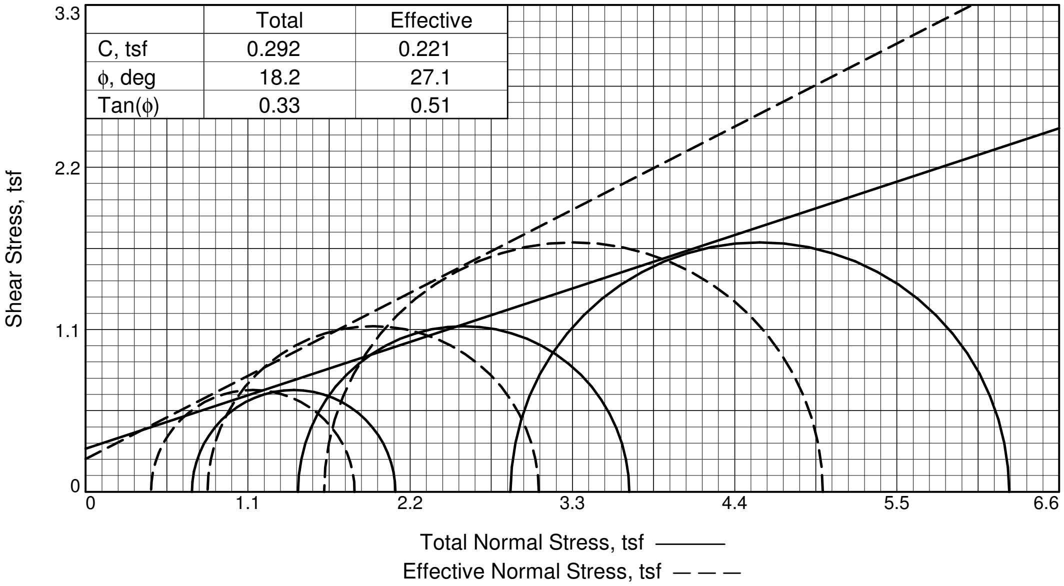
Remarks:

Test method: ASTM D 2435
Specific gravity: Assumed

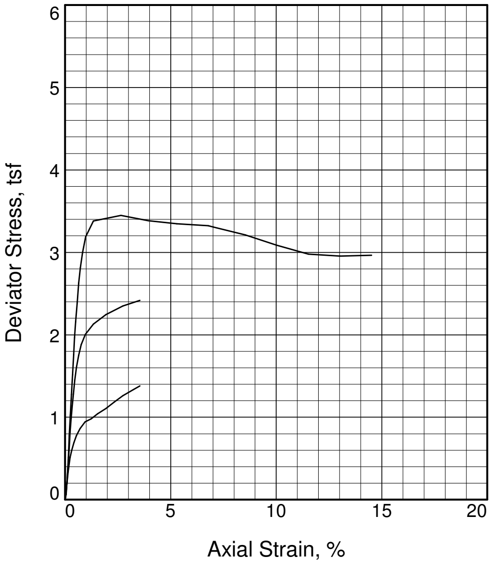
Figure

APPENDIX E

CONSOLIDATED-UNDRAINED TRIAXIAL SHEAR TESTS RESULTS



	Total	Effective
C, tsf	0.292	0.221
ϕ, deg	18.2	27.1
Tan(ϕ)	0.33	0.51



Sample No.		1	2	3
Initial	Water Content, %	28.3	28.3	28.3
	Dry Density, pcf	88.5	88.5	88.5
	Saturation, %	84.6	84.6	84.6
	Void Ratio	0.9043	0.9043	0.9043
	Diameter, in.	2.06	2.06	2.06
	Height, in.	4.17	4.17	4.17
At Test	Water Content, %	26.8	26.8	26.8
	Dry Density, pcf	97.7	97.7	97.7
	Saturation, %	100.0	100.0	100.0
	Void Ratio	0.7246	0.7246	0.7246
	Diameter, in.	1.96	1.99	2.02
	Height, in.	4.17	4.05	3.94
Strain rate, %/min.		0.01	0.01	0.01
Eff. Cell Pressure, psi		10.00	20.00	40.00
Fail. Stress, tsf		1.38	2.24	3.38
Excess Pore Pr., tsf		0.28	0.61	1.26
Strain, %		3.5	1.9	1.3
Ult. Stress, tsf		1.38	2.42	3.45
Excess Pore Pr., tsf		0.28	0.50	1.21
Strain, %		3.5	3.5	2.6
$\bar{\sigma}_1$ Failure, tsf		1.82	3.07	5.00
$\bar{\sigma}_3$ Failure, tsf		0.44	0.83	1.62

Type of Test:
CU with Pore Pressures

Sample Type: Undisturbed

Description: Light gray and tan FAT CLAY with little calcareous nodules

Assumed Specific Gravity= 2.70

Remarks:
Test method: ASTM D 4767
Failure type: Slickensided

Pg 1 of 2

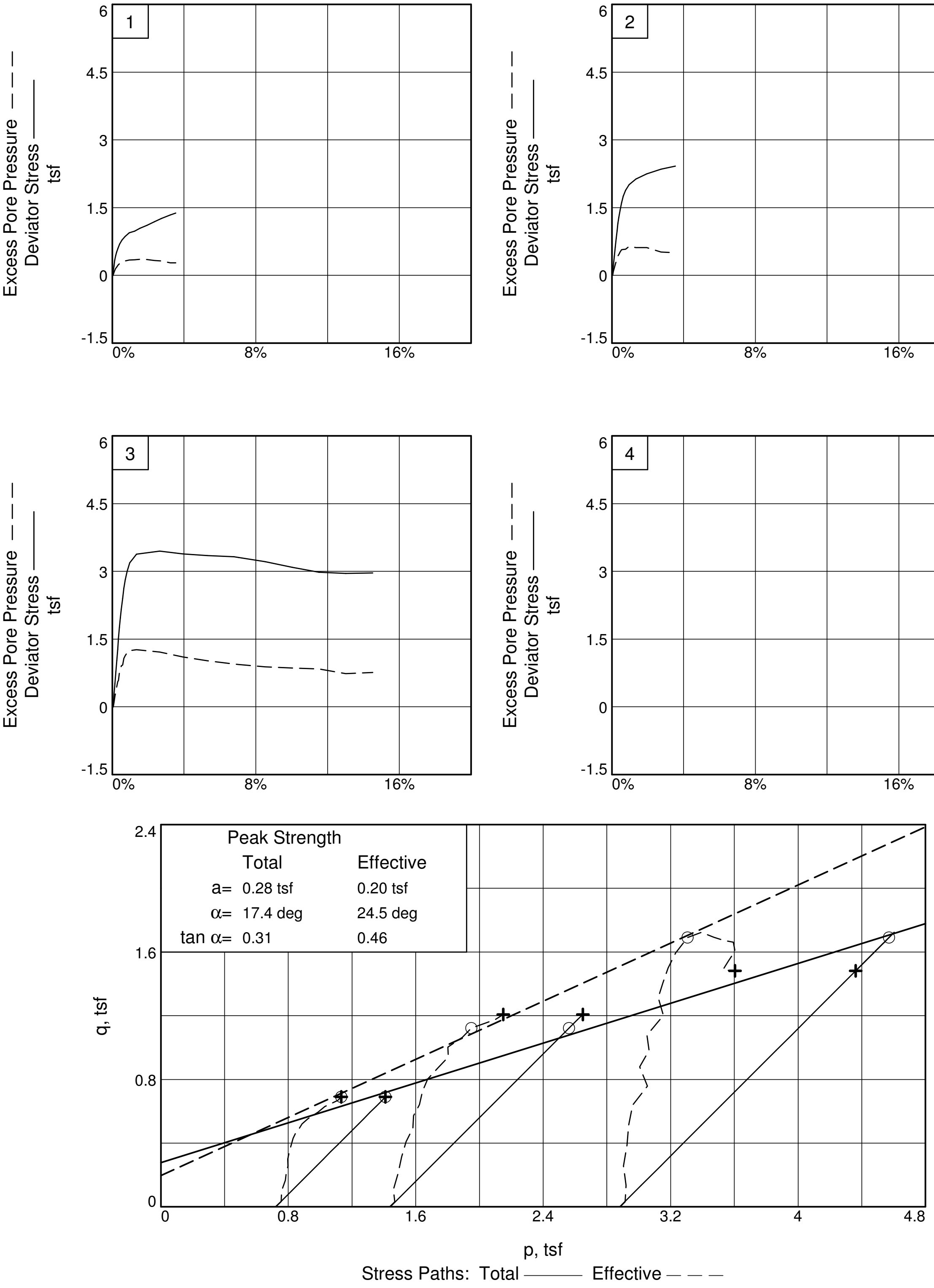
Client: TWE-Corpus Christi

Project: Geotechnical Lab Testing

Source of Sample: B-30 **Depth:** 52'-54'

Proj. No.: 16.53.042 **Date Sampled:** 8/25/16

TRIAXIAL SHEAR TEST REPORT
Tolunay-Wong Engineers, Inc.
Houston, Texas



Peak Strength

	Total	Effective
a=	0.28 tsf	0.20 tsf
α=	17.4 deg	24.5 deg
tan α=	0.31	0.46

Client: TWE-Corpus Christi

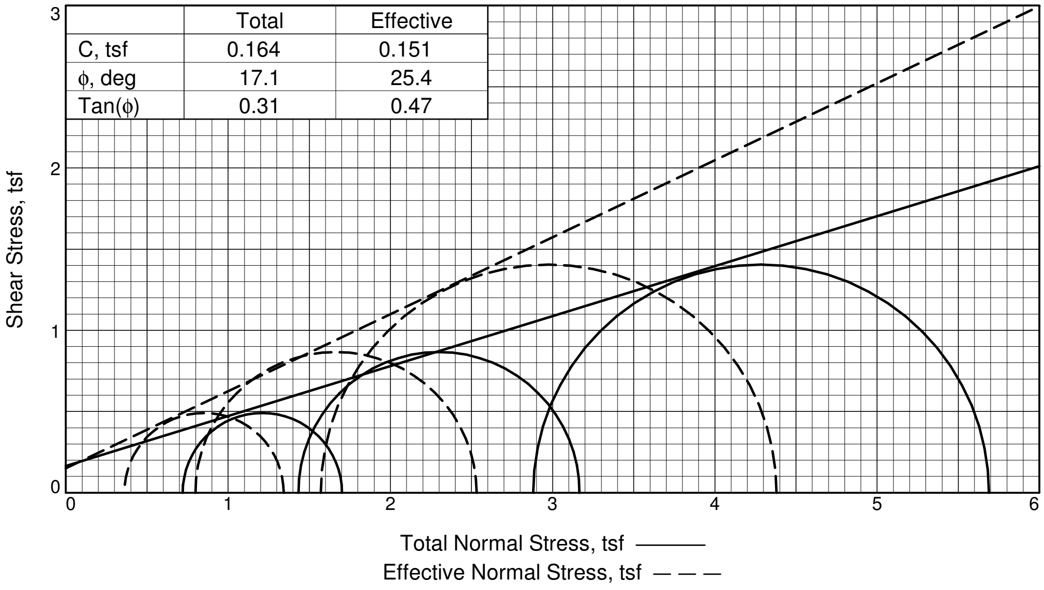
Project: Geotechnical Lab Testing

Source of Sample: B-30 **Depth:** 52'-54'

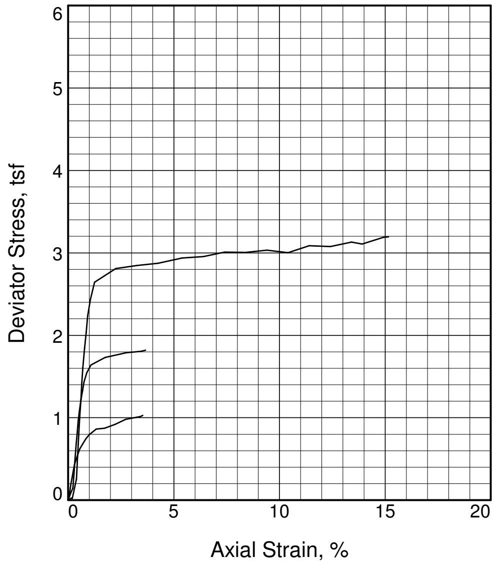
Project No.: 16.53.042

Pg 2 of 2

TOLUNAY-WONG ENGINEERS, INC.



	Total	Effective
C, tsf	0.164	0.151
ϕ, deg	17.1	25.4
Tan(ϕ)	0.31	0.47



	Sample No.	1	2	3
Initial	Water Content, %	31.2	31.2	31.2
	Dry Density, pcf	86.6	86.6	86.6
	Saturation, %	89.0	89.0	89.0
	Void Ratio	0.9473	0.9473	0.9473
	Diameter, in.	2.87	2.87	2.87
	Height, in.	5.59	5.59	5.59
At Test	Water Content, %	33.8	33.8	33.8
	Dry Density, pcf	88.1	88.1	88.1
	Saturation, %	100.0	100.0	100.0
	Void Ratio	0.9136	0.9136	0.9136
	Diameter, in.	2.85	2.90	2.94
	Height, in.	5.58	5.40	5.23
	Strain rate, %/min.	0.01	0.01	0.01
	Eff. Cell Pressure, psi	10.00	19.90	40.00
	Fail. Stress, tsf	0.98	1.73	2.81
	Excess Pore Pr., tsf	0.36	0.63	1.31
	Strain, %	2.7	1.8	2.2
	Ult. Stress, tsf	1.03	1.82	3.19
	Excess Pore Pr., tsf	0.33	0.57	0.87
	Strain, %	3.5	3.7	15.2
	$\bar{\sigma}_1$ Failure, tsf	1.34	2.53	4.38
	$\bar{\sigma}_3$ Failure, tsf	0.36	0.80	1.57

Type of Test:
CU with Pore Pressures

Sample Type: Undisturbed

Description: Light gray and reddish-brown FAT CLAY with few calcareous nodules

Assumed Specific Gravity= 2.70

Remarks:
Test method: ASTM D 4767
Failure type: Slickensided

Figure Pg 1 of 2

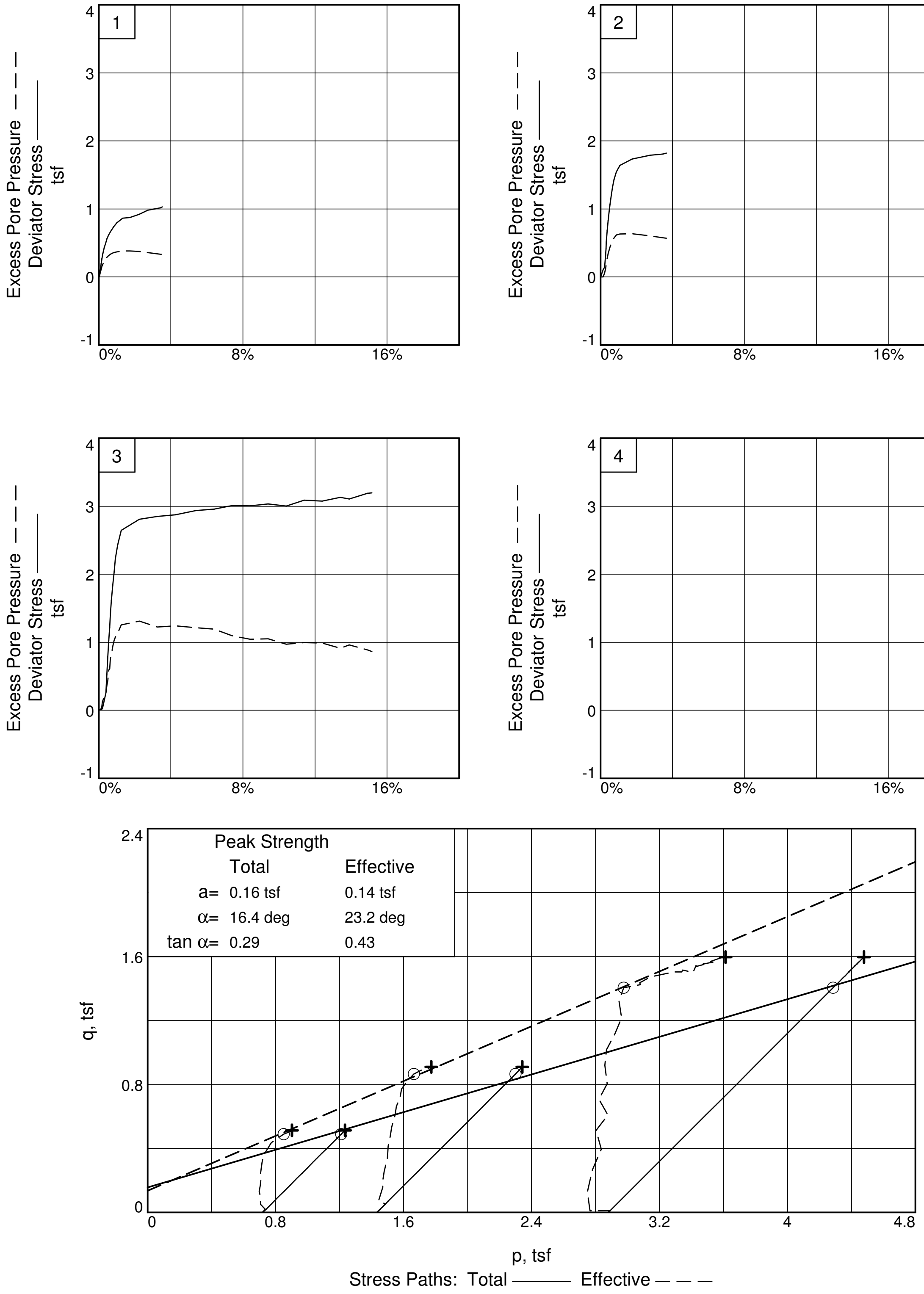
Client: TWE-Corpus Christi

Project: Geotechnical Lab Testing

Source of Sample: B-32 **Depth:** 45'-47'

Proj. No.: 16.53.042 **Date Sampled:** 8/26/16

TRIAXIAL SHEAR TEST REPORT
Tolunay-Wong Engineers, Inc.
Houston, Texas



Peak Strength	Total	Effective
a=	0.16 tsf	0.14 tsf
α=	16.4 deg	23.2 deg
tan α=	0.29	0.43

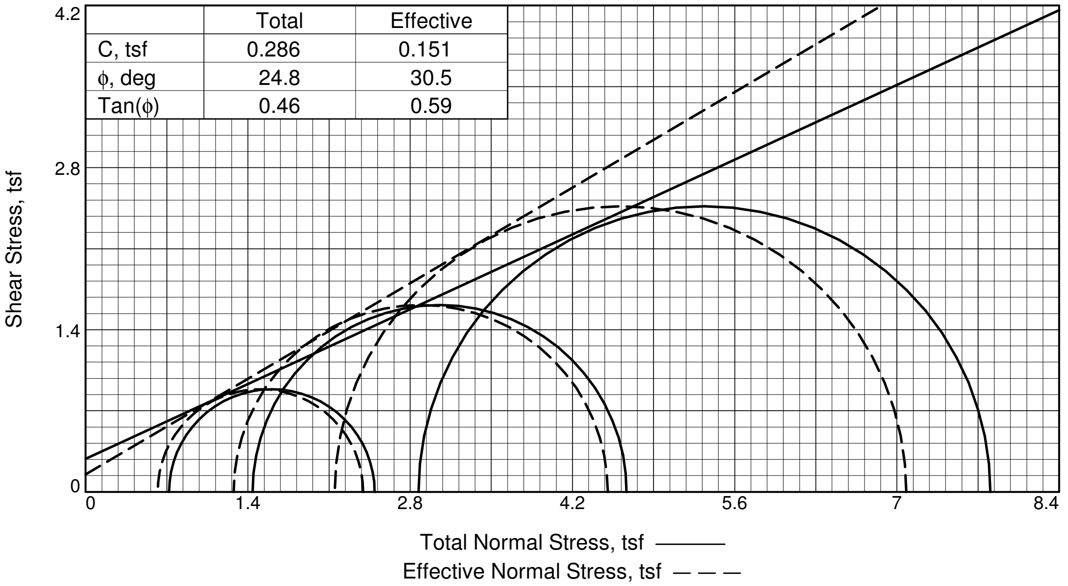
Client: TWE-Corpus Christi

Project: Geotechnical Lab Testing

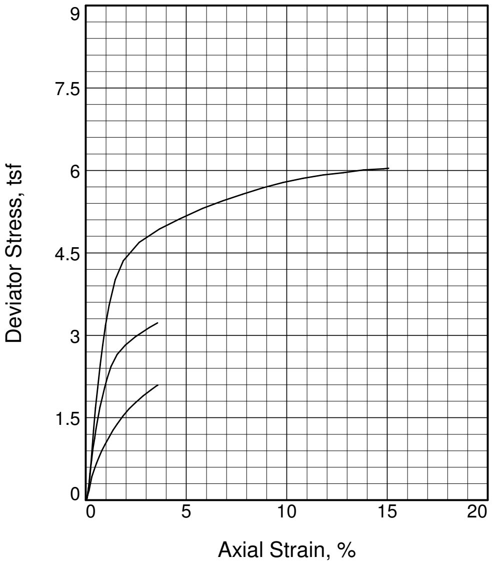
Source of Sample: B-32 **Depth:** 45'-47'

Project No.: 16.53.042 **Figure** Pg 2 of 2

TOLUNAY-WONG ENGINEERS, INC.



	Total	Effective
C, tsf	0.286	0.151
ϕ, deg	24.8	30.5
Tan(ϕ)	0.46	0.59



	Sample No.	1	2	3
Initial	Water Content, %	13.6	13.6	13.6
	Dry Density, pcf	114.1	114.1	114.1
	Saturation, %	76.8	76.8	76.8
	Void Ratio	0.4771	0.4771	0.4771
	Diameter, in.	2.87	2.87	2.87
	Height, in.	5.56	5.56	5.56
At Test	Water Content, %	15.2	15.2	15.2
	Dry Density, pcf	119.5	119.5	119.5
	Saturation, %	100.0	100.0	100.0
	Void Ratio	0.4100	0.4100	0.4100
	Diameter, in.	2.81	2.87	2.92
	Height, in.	5.55	5.32	5.12
	Strain rate, %/min.	0.01	0.01	0.01
	Eff. Cell Pressure, psi	10.00	20.00	39.90
	Fail. Stress, tsf	1.77	3.23	4.93
	Excess Pore Pr., tsf	0.10	0.16	0.72
	Strain, %	2.5	3.6	3.7
	Ult. Stress, tsf	2.09	3.23	6.04
	Excess Pore Pr., tsf	-0.02	0.16	0.04
	Strain, %	3.6	3.6	15.1
	$\bar{\sigma}_1$ Failure, tsf	2.39	4.50	7.08
	$\bar{\sigma}_3$ Failure, tsf	0.62	1.28	2.15

Type of Test:
CU with Pore Pressures

Sample Type: Undisturbed

Description: Light gray and tan SANDY LEAN CLAY

LL= 36 **PL=** 16 **PI=** 20

Assumed Specific Gravity= 2.70

Remarks:

Test method: ASTM D 4767

Failure type: Bulge

Pg 1 of 2

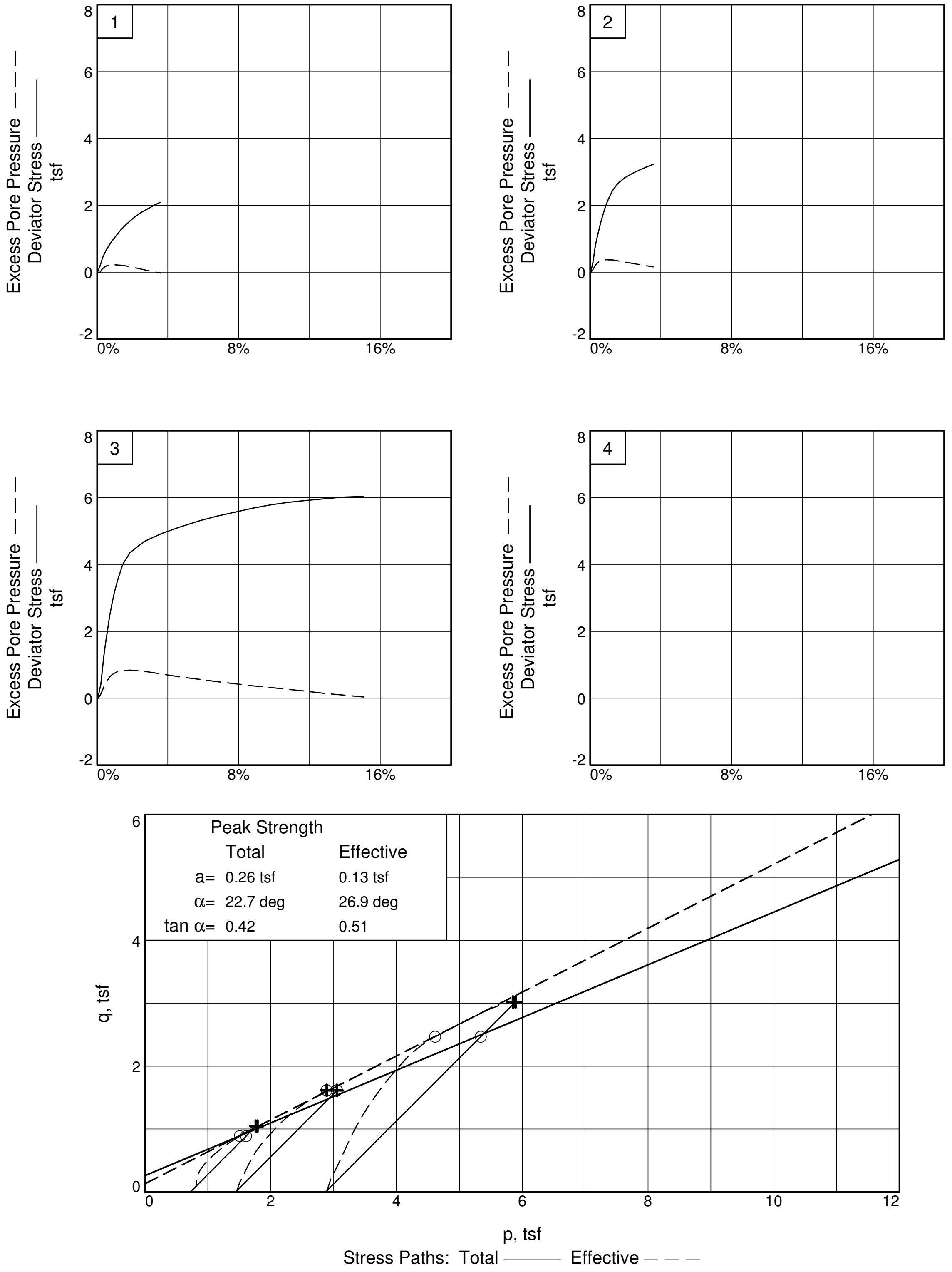
Client: TWE-Corpus Christi

Project: Geotechnical Lab Testing

Source of Sample: B-35 **Depth:** 8'-10'

Proj. No.: 16.53.042 **Date Sampled:** 8/25/16

TRIAXIAL SHEAR TEST REPORT
Tolunay-Wong Engineers, Inc.
Houston, Texas



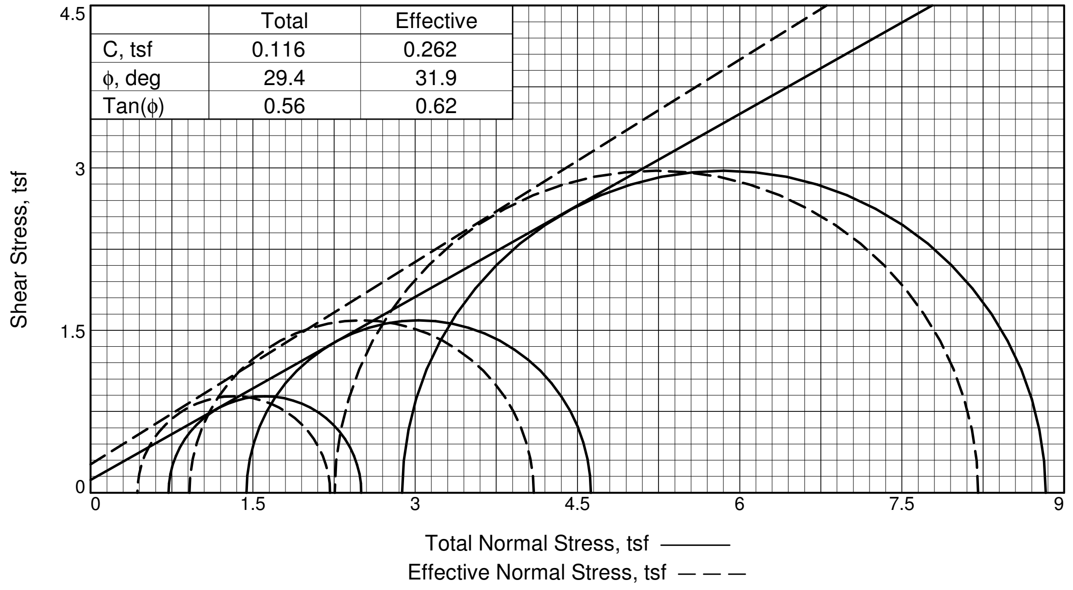
Peak Strength

	Total	Effective
a=	0.26 tsf	0.13 tsf
α=	22.7 deg	26.9 deg
tan α=	0.42	0.51

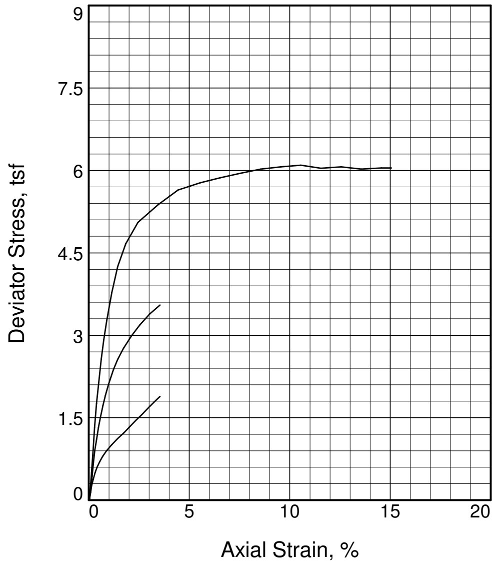
Client: TWE-Corpus Christi
Project: Geotechnical Lab Testing
Source of Sample: B-35 **Depth:** 8'-10'
Project No.: 16.53.042

Pg 2 of 2

TOLUNAY-WONG ENGINEERS, INC.



	Total	Effective
C, tsf	0.116	0.262
ϕ, deg	29.4	31.9
Tan(ϕ)	0.56	0.62



	Sample No.	1	2	3
Initial	Water Content, %	20.7	20.7	20.7
	Dry Density, pcf	103.5	103.5	103.5
	Saturation, %	89.1	89.1	89.1
	Void Ratio	0.6282	0.6282	0.6282
	Diameter, in.	2.82	2.82	2.82
	Height, in.	5.58	5.58	5.58
At Test	Water Content, %	20.4	20.4	20.4
	Dry Density, pcf	108.6	108.6	108.6
	Saturation, %	100.0	100.0	100.0
	Void Ratio	0.5518	0.5518	0.5518
	Diameter, in.	2.77	2.81	2.84
	Height, in.	5.50	5.37	5.25
	Strain rate, %/min.	0.01	0.01	0.01
	Eff. Cell Pressure, psi	10.00	20.00	40.00
	Fail. Stress, tsf	1.78	3.18	5.95
	Excess Pore Pr., tsf	0.29	0.53	0.62
	Strain, %	3.2	2.5	7.5
	Ult. Stress, tsf	1.89	3.55	6.09
	Excess Pore Pr., tsf	0.26	0.40	0.49
	Strain, %	3.5	3.5	10.6
	$\bar{\sigma}_1$ Failure, tsf	2.21	4.10	8.20
	$\bar{\sigma}_3$ Failure, tsf	0.43	0.91	2.26

Type of Test:
CU with Pore Pressures

Sample Type: Undisturbed

Description: Light gray and tan SANDY FAT CLAY

LL= 52 **PL=** 19 **PI=** 33

Assumed Specific Gravity= 2.70

Remarks:
Test method: ASTM D 4767
Failure type: Bulge

Pg 1 of 2

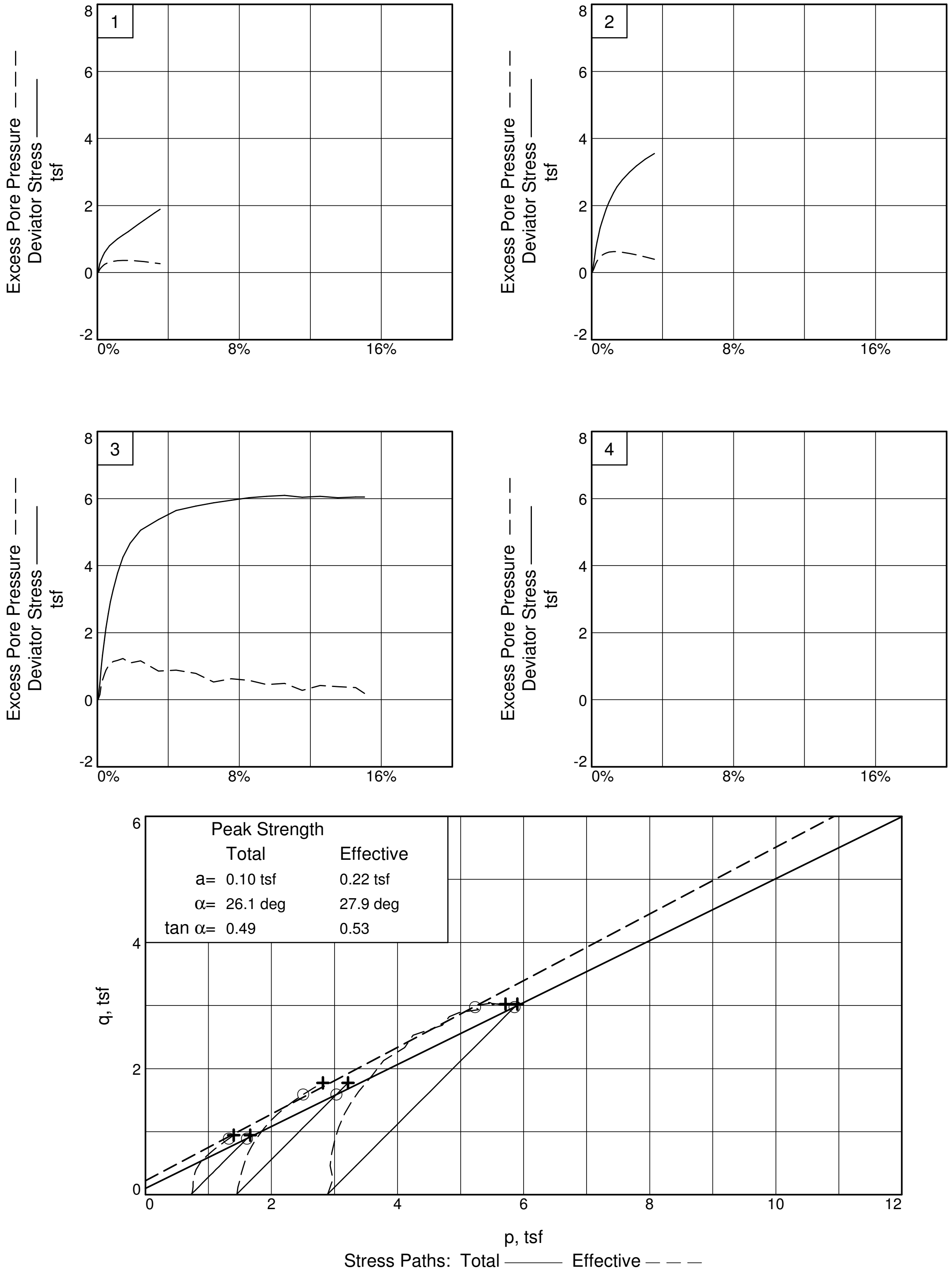
Client: TWE-Corpus Christi

Project: Geotechnical Lab Testing

Source of Sample: B-39 **Depth:** 24'-26'

Proj. No.: 16.53.042 **Date Sampled:** 8/25/16

TRIAXIAL SHEAR TEST REPORT
Tolunay-Wong Engineers, Inc.
Houston, Texas



Client: TWE-Corpus Christi

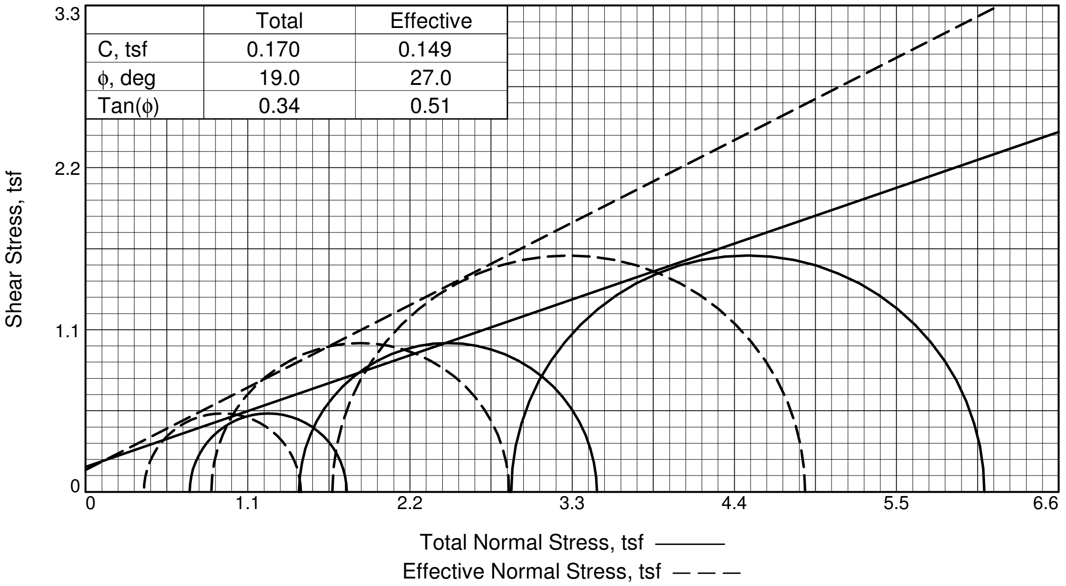
Project: Geotechnical Lab Testing

Source of Sample: B-39 **Depth:** 24'-26'

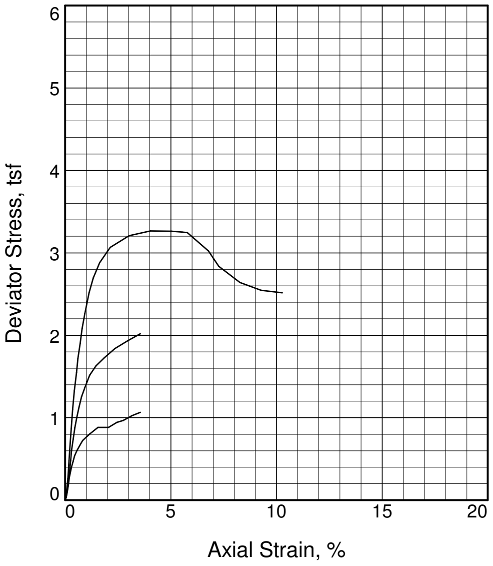
Project No.: 16.53.042

Pg 2 of 2

TOLUNAY-WONG ENGINEERS, INC.



	Total	Effective
C, tsf	0.170	0.149
ϕ, deg	19.0	27.0
Tan(ϕ)	0.34	0.51



Sample No.		1	2	3
Initial	Water Content, %	30.9	30.9	30.9
	Dry Density, pcf	91.8	91.8	91.8
	Saturation, %	97.8	97.8	97.8
	Void Ratio	0.8696	0.8696	0.8696
	Diameter, in.	2.77	2.77	2.77
	Height, in.	5.58	5.58	5.58
At Test	Water Content, %	31.7	31.7	31.7
	Dry Density, pcf	91.7	91.7	91.7
	Saturation, %	100.0	100.0	100.0
	Void Ratio	0.8728	0.8728	0.8728
	Diameter, in.	2.78	2.82	2.86
	Height, in.	5.57	5.39	5.23
Strain rate, %/min.		0.01	0.0060	0.0070
Eff. Cell Pressure, psi		9.80	20.10	40.10
Fail. Stress, tsf		1.06	2.02	3.21
Excess Pore Pr., tsf		0.31	0.59	1.21
Strain, %		3.6	3.6	3.0
Ult. Stress, tsf		1.06	2.02	3.27
Excess Pore Pr., tsf		0.31	0.59	1.18
Strain, %		3.6	3.6	4.0
$\bar{\sigma}_1$ Failure, tsf		1.46	2.87	4.88
$\bar{\sigma}_3$ Failure, tsf		0.39	0.85	1.67

Type of Test:
CU with Pore Pressures

Sample Type: Undisturbed

Description: Light gray and tan FAT CLAY with SAND and some calcareous nodules

LL= 77 **PL=** 24 **PI=** 53

Assumed Specific Gravity= 2.75

Remarks:
Test method: ASTM D 4767
Failure type: Slickensided

Figure Pg 1 of 2

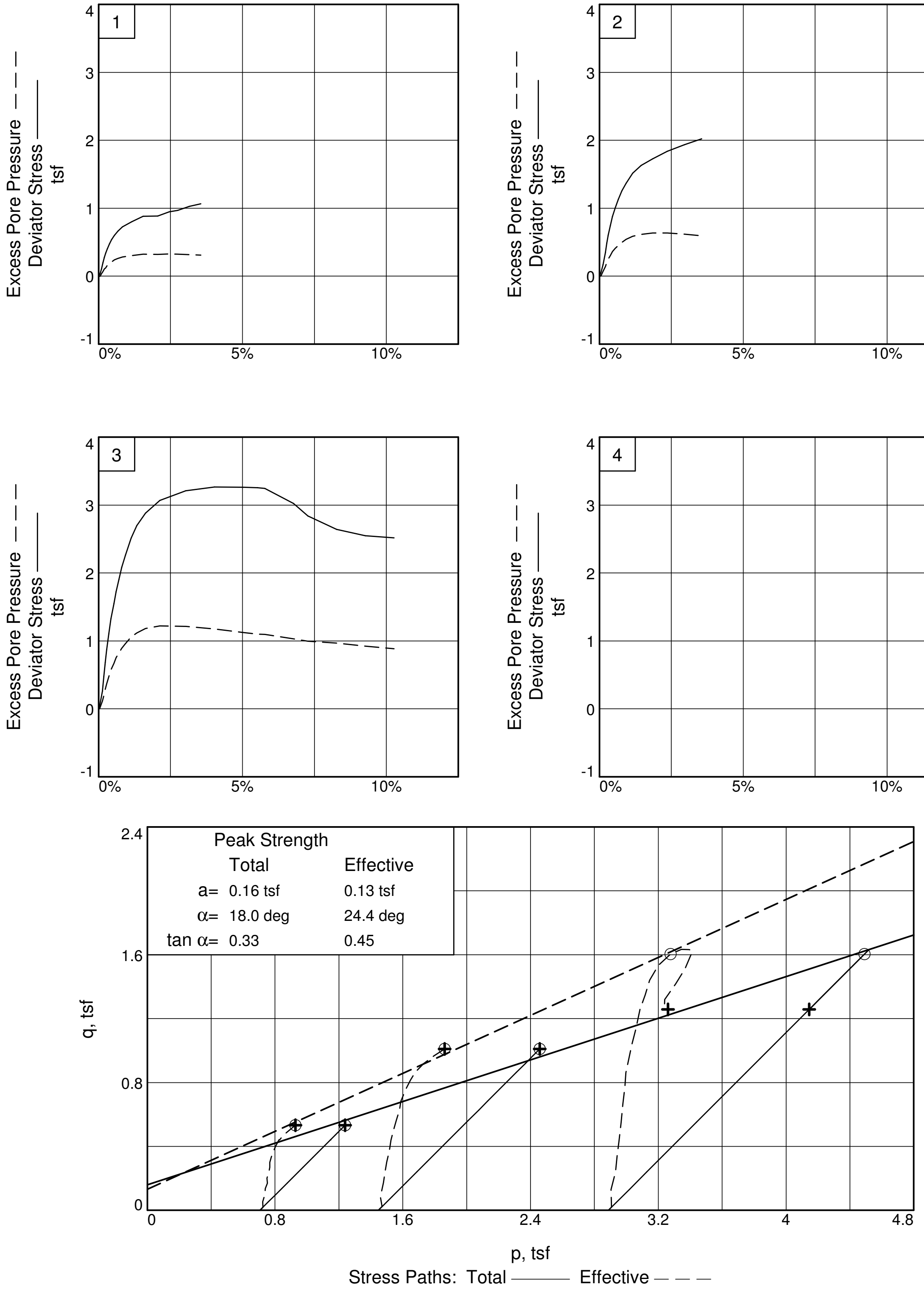
Client: TWE-Corpus Christi

Project: Geotechnical Lab Testing

Source of Sample: B-41A **Depth:** 60.5'-62.5'

Proj. No.: 16.53.042 **Date Sampled:**

TRIAXIAL SHEAR TEST REPORT
Tolunay-Wong Engineers, Inc.
Houston, Texas



Peak Strength

	Total	Effective
a=	0.16 tsf	0.13 tsf
α=	18.0 deg	24.4 deg
tan α=	0.33	0.45

Client: TWE-Corpus Christi
Project: Geotechnical Lab Testing
Source of Sample: B-41A **Depth:** 60.5'-62.5'
Project No.: 16.53.042 **Figure** Pg 2 of 2

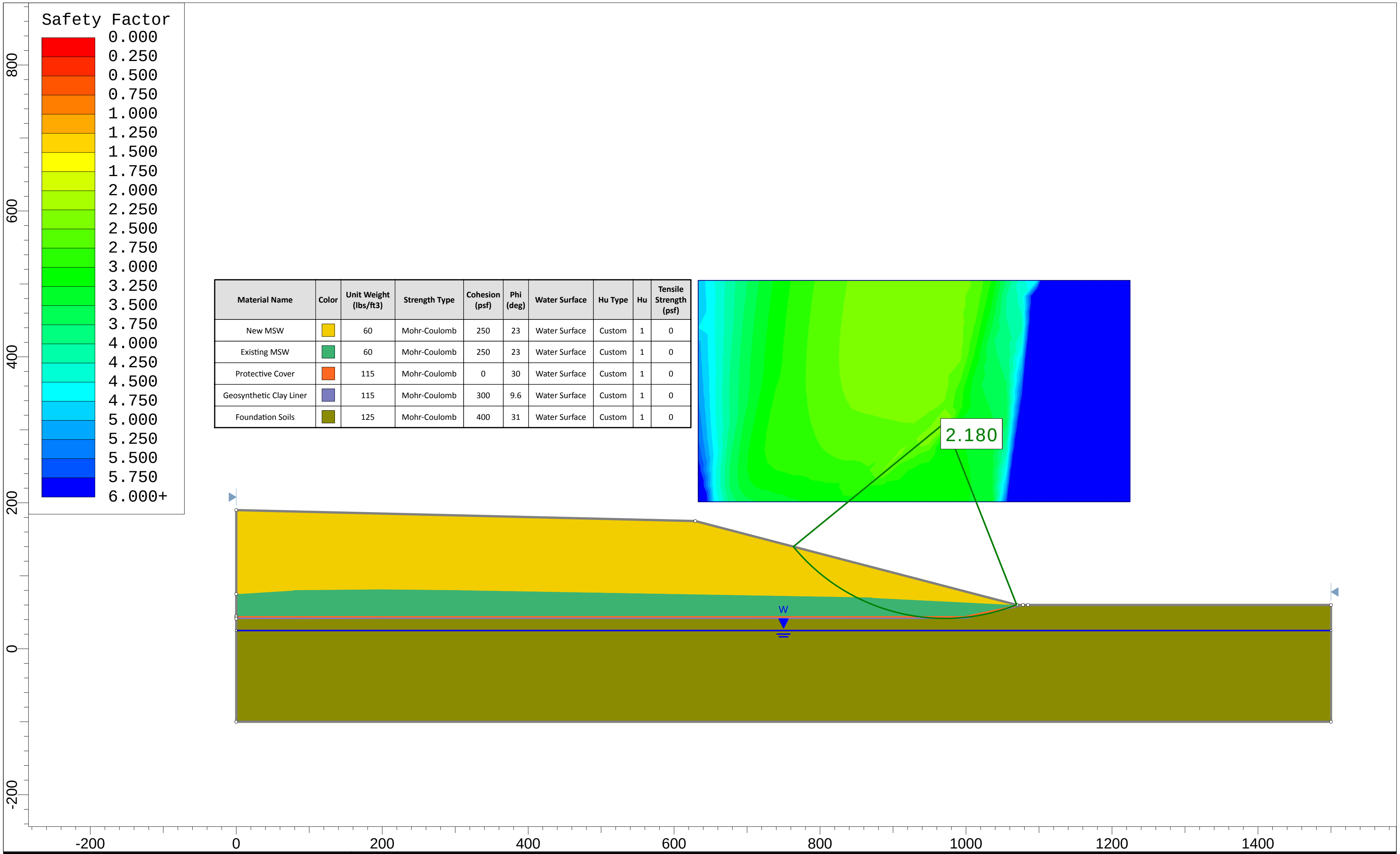
TOLUNAY-WONG ENGINEERS, INC.

APPENDIX F

GRAPHICAL PRESENTATION OF MASS STABILITY ANALYSES RESULTS

TWE
Project No. 16.53.042
Report No. 12788R1

FOR PERMIT PURPOSES ONLY

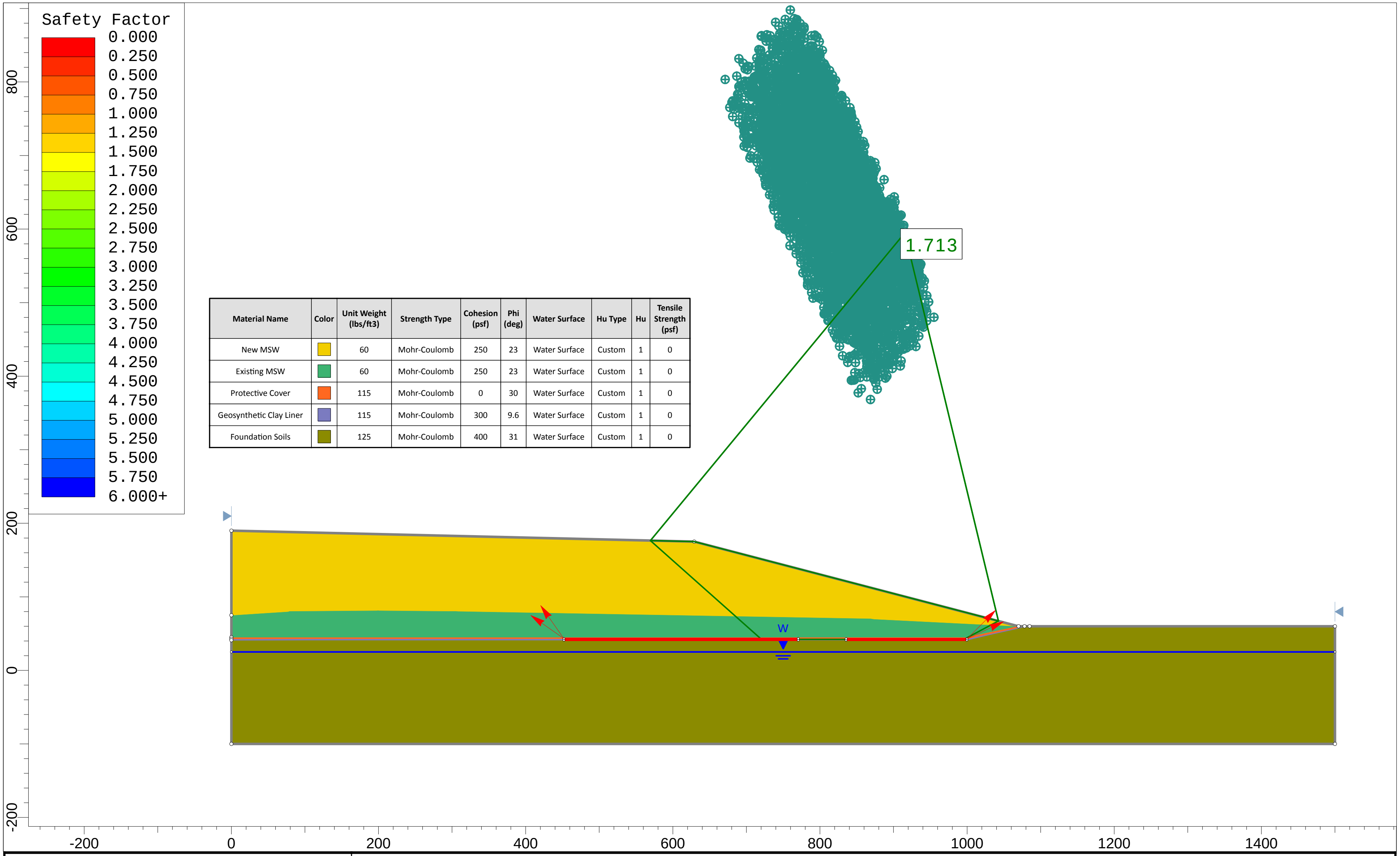


Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Hu Type	Hu	Tensile Strength (psf)
New MSW	🟨	60	Mohr-Coulomb	250	23	Water Surface	Custom	1	0
Existing MSW	🟩	60	Mohr-Coulomb	250	23	Water Surface	Custom	1	0
Protective Cover	🟧	115	Mohr-Coulomb	0	30	Water Surface	Custom	1	0
Geosynthetic Clay Liner	🟪	115	Mohr-Coulomb	300	9.6	Water Surface	Custom	1	0
Foundation Soils	🟫	125	Mohr-Coulomb	400	31	Water Surface	Custom	1	0

Tolunay-Wong Engineers, Inc.

SLIDEINTERPRET 7.017

Project	Kingsville MSW Landfill Project		
Analysis Description	Marker 12 Section - Final Waste Slope (Long-Term Analysis) - Circular Arc Failure		
Drawn By		*Scale* 1:2182	*Company* Tolunay-Wong Engineers, Inc.
Date	12/2/2016, 2:04:42 PM	*File Name*	Marker 12 Section.slim



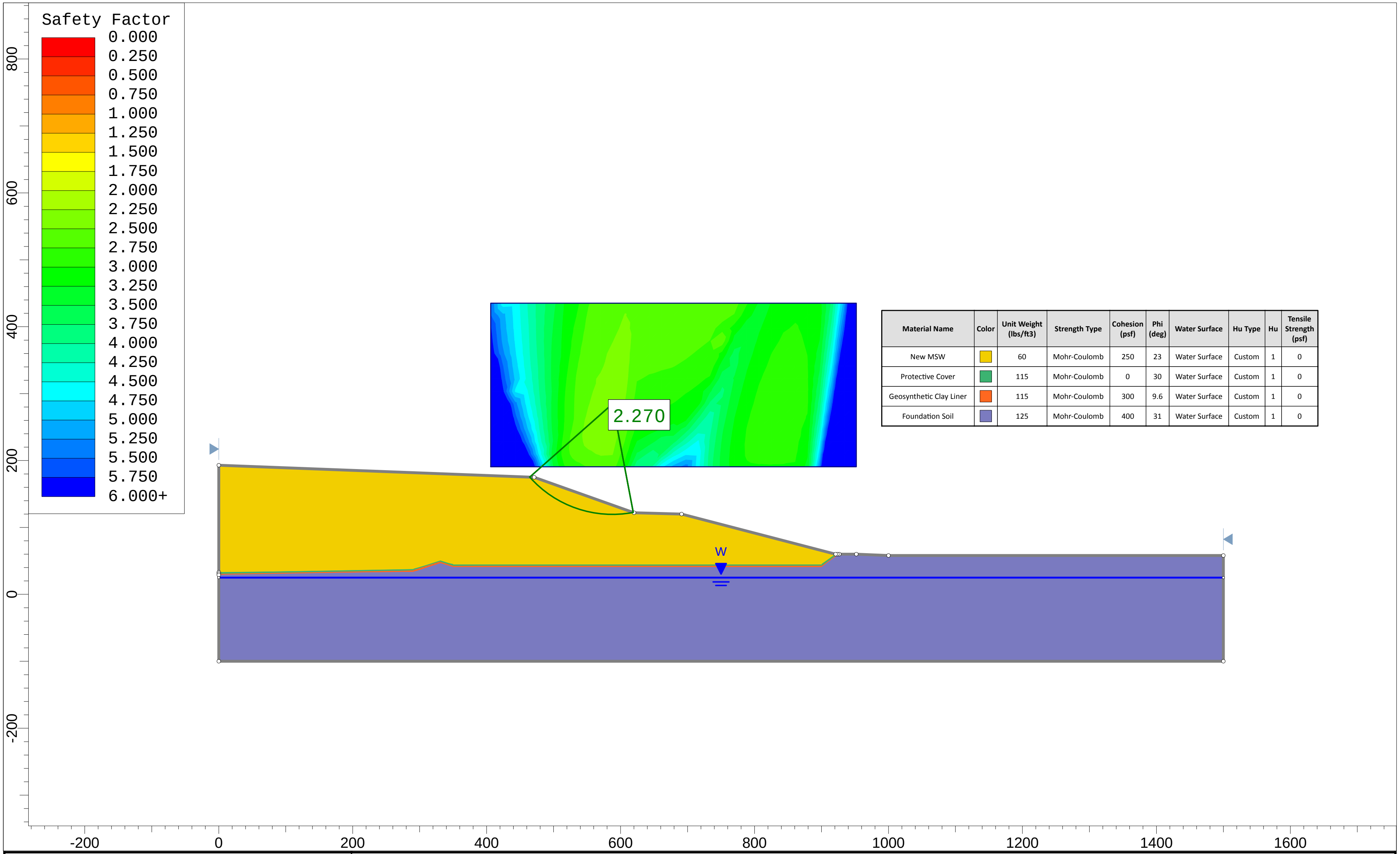
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Hu Type	Hu	Tensile Strength (psf)
New MSW	🟨	60	Mohr-Coulomb	250	23	Water Surface	Custom	1	0
Existing MSW	🟩	60	Mohr-Coulomb	250	23	Water Surface	Custom	1	0
Protective Cover	🟧	115	Mohr-Coulomb	0	30	Water Surface	Custom	1	0
Geosynthetic Clay Liner	🟪	115	Mohr-Coulomb	300	9.6	Water Surface	Custom	1	0
Foundation Soils	🟫	125	Mohr-Coulomb	400	31	Water Surface	Custom	1	0

Tolunay-Wong Engineers, Inc.

SLIDEINTERPRET 7.017

Project	Kingsville MSW Landfill Project		
Analysis Description	Marker 12 Section - Final Waste Slope (Long-Term Analysis) - Sliding Block Failure		
Drawn By		*Scale* 1:2164	*Company* Tolunay-Wong Engineers, Inc.
Date	12/2/2016, 2:04:42 PM	*File Name*	Marker 12 Section.slim

FOR PERMIT PURPOSES ONLY



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Hu Type	Hu	Tensile Strength (psf)
New MSW	🟨	60	Mohr-Coulomb	250	23	Water Surface	Custom	1	0
Protective Cover	🟩	115	Mohr-Coulomb	0	30	Water Surface	Custom	1	0
Geosynthetic Clay Liner	🟧	115	Mohr-Coulomb	300	9.6	Water Surface	Custom	1	0
Foundation Soil	🟪	125	Mohr-Coulomb	400	31	Water Surface	Custom	1	0

Tolunay-Wong Engineers, Inc.

SLIDEINTERPRET 7.017

Project Kingsville MSW Landfill Project

Analysis Description Marker 18 Section - Final Waste Slope (Long-Term Analysis) - Circular Arc Failure

Drawn By

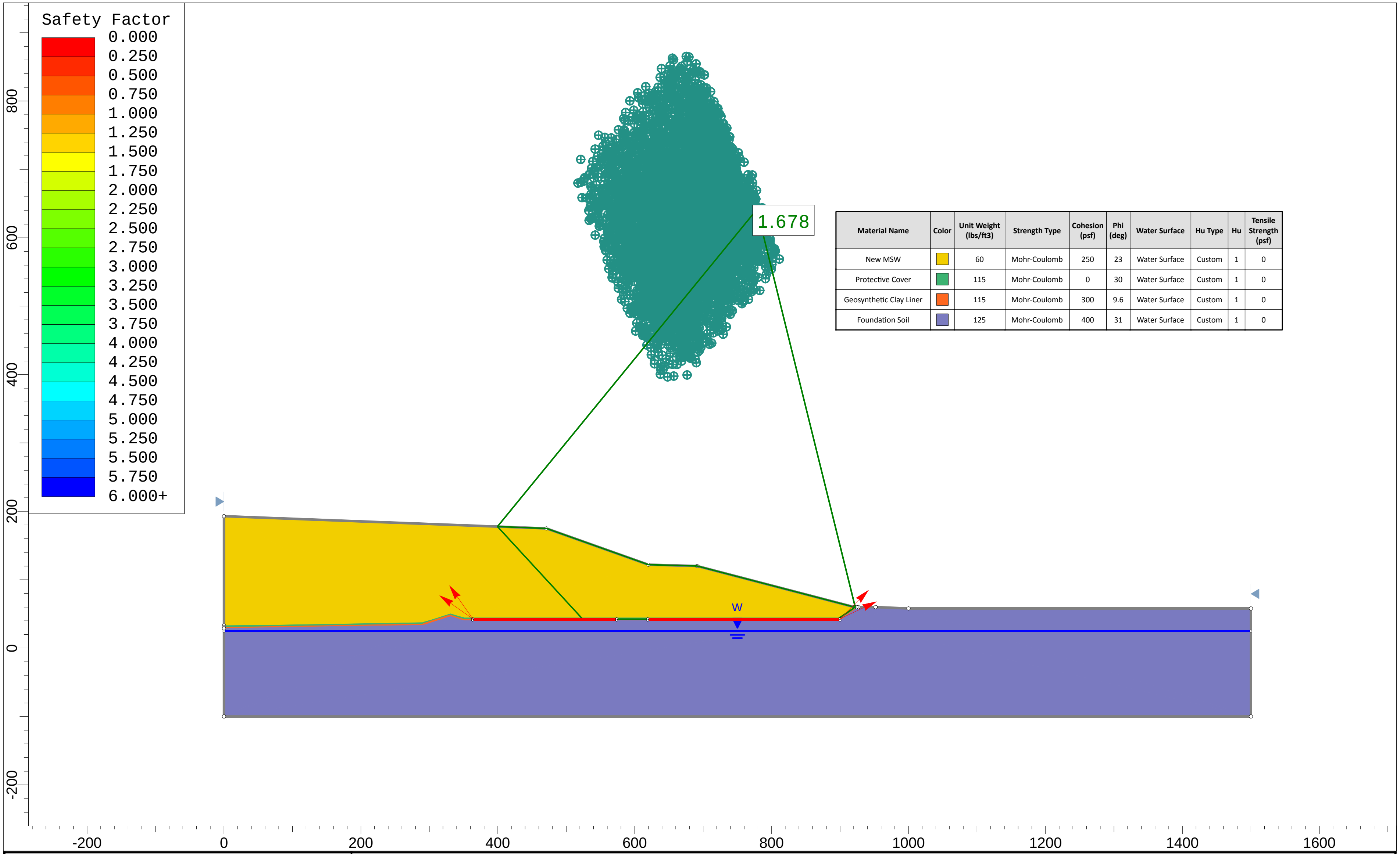
Scale 1:2378

Company Tolunay-Wong Engineers, Inc.

Date 12/2/2016, 2:39:49 PM

File Name Marker 18 Section - Circular Arc.slim

FOR PERMIT PURPOSES ONLY



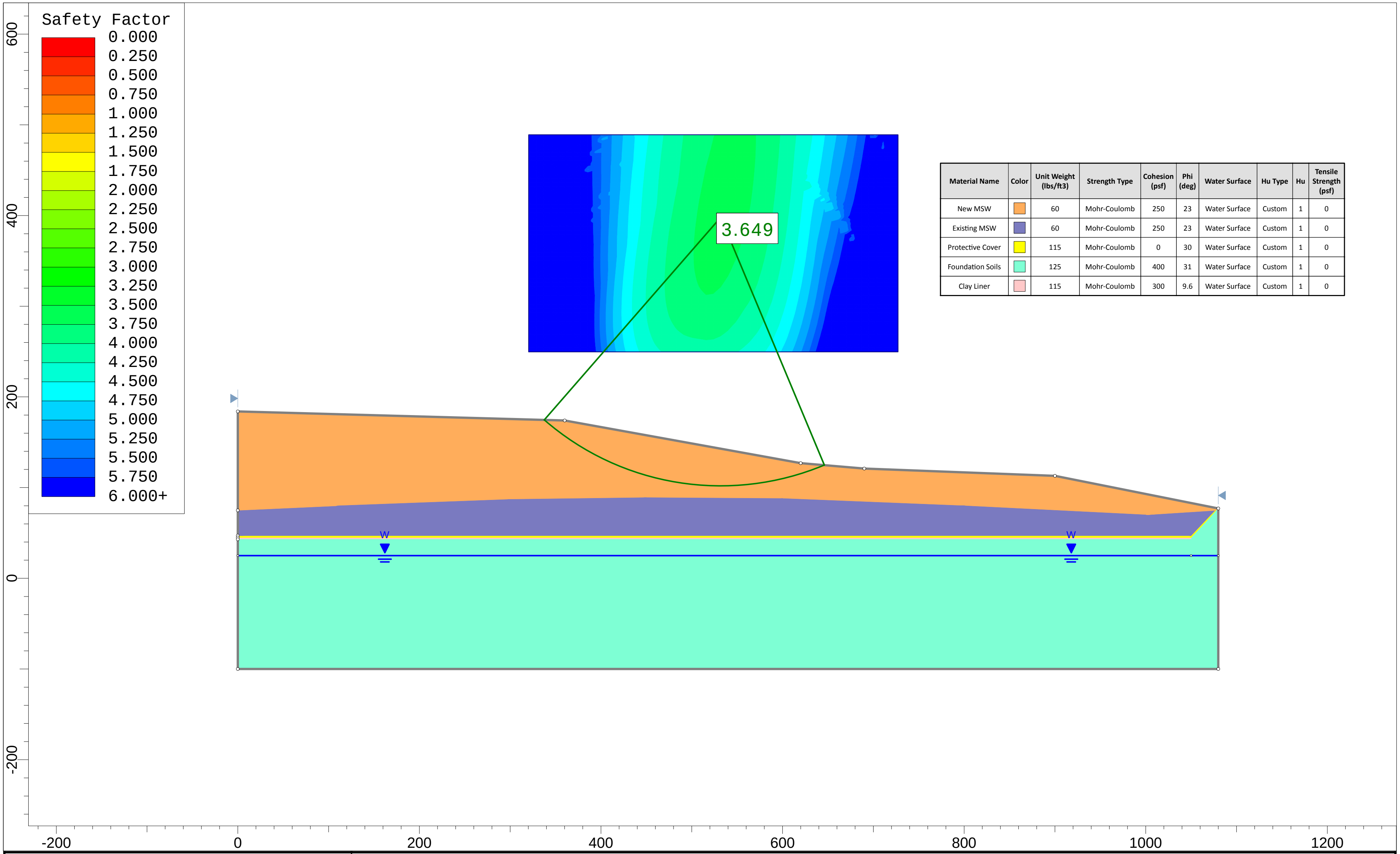
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Hu Type	Hu	Tensile Strength (psf)
New MSW	🟨	60	Mohr-Coulomb	250	23	Water Surface	Custom	1	0
Protective Cover	🟩	115	Mohr-Coulomb	0	30	Water Surface	Custom	1	0
Geosynthetic Clay Liner	🟧	115	Mohr-Coulomb	300	9.6	Water Surface	Custom	1	0
Foundation Soil	🟪	125	Mohr-Coulomb	400	31	Water Surface	Custom	1	0

Tolunay-Wong Engineers, Inc.

SLIDEINTERPRET 7.017

Project	Kingsville MSW Landfill Project
Analysis Description	Marker 18 Section - Final Waste Slope (Long-Term Analysis) - Sliding Block Failure
Drawn By	
Scale	1:2326
Company	Tolunay-Wong Engineers, Inc.
Date	12/2/2016, 2:39:49 PM
File Name	Marker 18 Section - Sliding Block.slim

FOR PERMIT PURPOSES ONLY



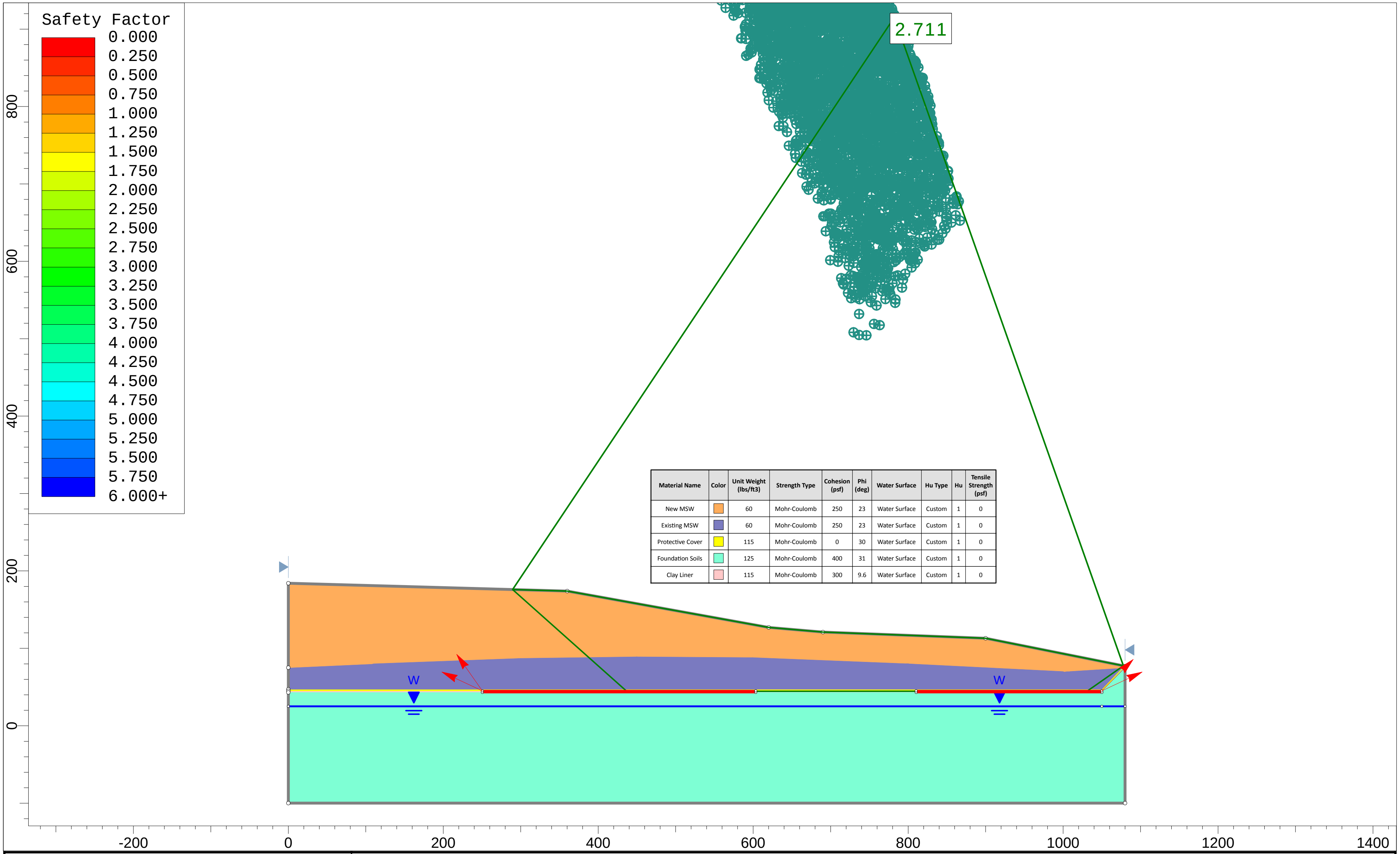
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Hu Type	Hu	Tensile Strength (psf)
New MSW	🟧	60	Mohr-Coulomb	250	23	Water Surface	Custom	1	0
Existing MSW	🟪	60	Mohr-Coulomb	250	23	Water Surface	Custom	1	0
Protective Cover	🟨	115	Mohr-Coulomb	0	30	Water Surface	Custom	1	0
Foundation Soils	🟩	125	Mohr-Coulomb	400	31	Water Surface	Custom	1	0
Clay Liner	🟥	115	Mohr-Coulomb	300	9.6	Water Surface	Custom	1	0

Tolunay-Wong Engineers, Inc.

SLIDEINTERPRET 7.017

Project	Kingsville Municipal Solid Waste Landfill		
Analysis Description	Marker J Section - Final Waste Slope (Long-Term Analysis) - Circular Arc Failure		
Drawn By		*Scale* 1:1754	*Company* Tolunay-Wong Engineers, Inc.
Date	11/28/2016, 5:45:35 PM	*File Name*	Marker J Section.slim

FOR PERMIT PURPOSES ONLY



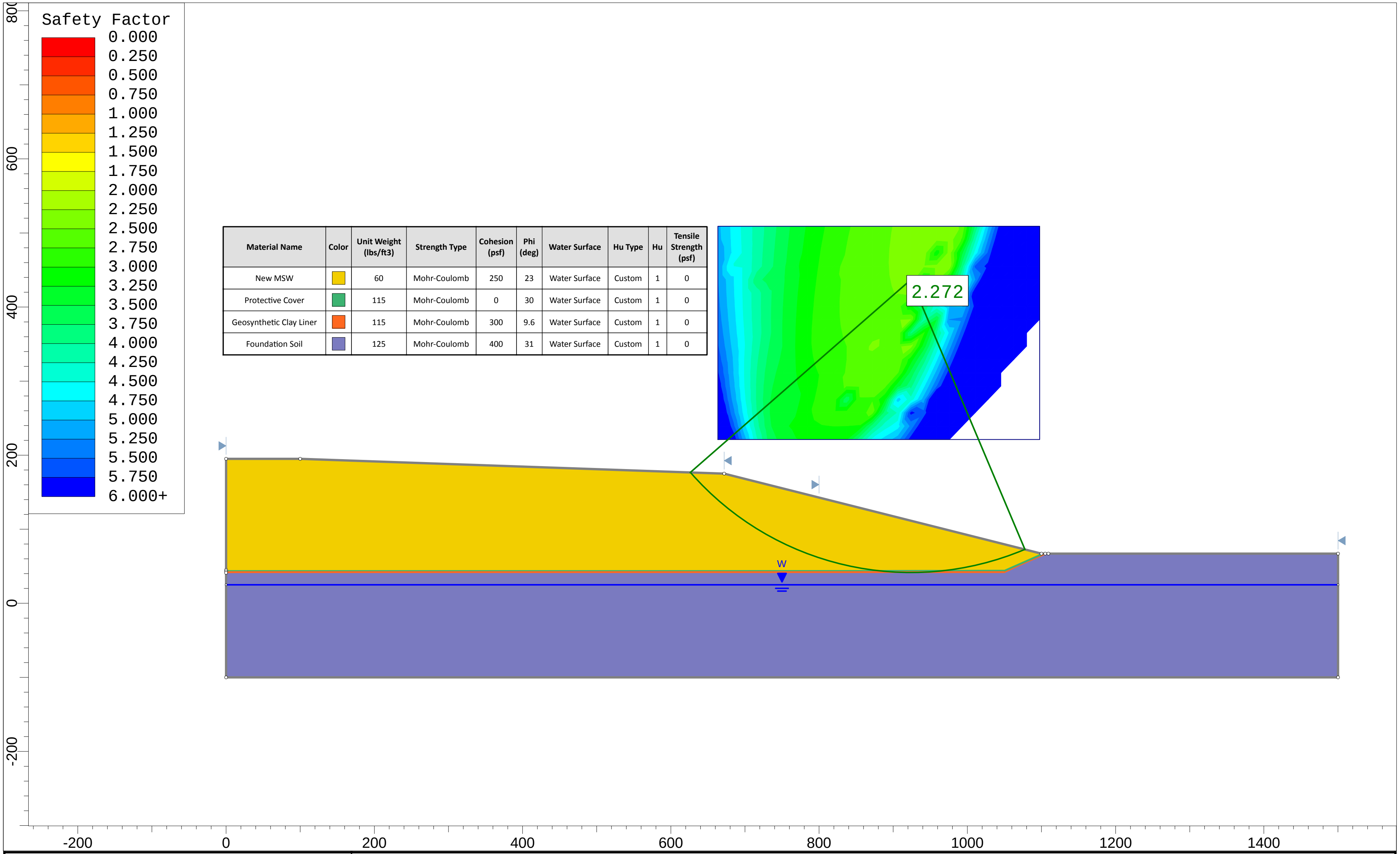
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Hu Type	Hu	Tensile Strength (psf)
New MSW	🟧	60	Mohr-Coulomb	250	23	Water Surface	Custom	1	0
Existing MSW	🟪	60	Mohr-Coulomb	250	23	Water Surface	Custom	1	0
Protective Cover	🟨	115	Mohr-Coulomb	0	30	Water Surface	Custom	1	0
Foundation Soils	🟩	125	Mohr-Coulomb	400	31	Water Surface	Custom	1	0
Clay Liner	🟥	115	Mohr-Coulomb	300	9.6	Water Surface	Custom	1	0

Tolunay-Wong Engineers, Inc.

SLIDEINTERPRET 7.017

Project	Kingsville Municipal Solid Waste Landfill
Analysis Description	Marker J Section - Final Waste Slope (Long-Term Analysis) - Sliding Block Failure
Drawn By	
Scale	1:2055
Company	Tolunay-Wong Engineers, Inc.
Date	11/28/2016, 5:45:35 PM
File Name	Marker J Section - Sliding Block.slim

FOR PERMIT PURPOSES ONLY



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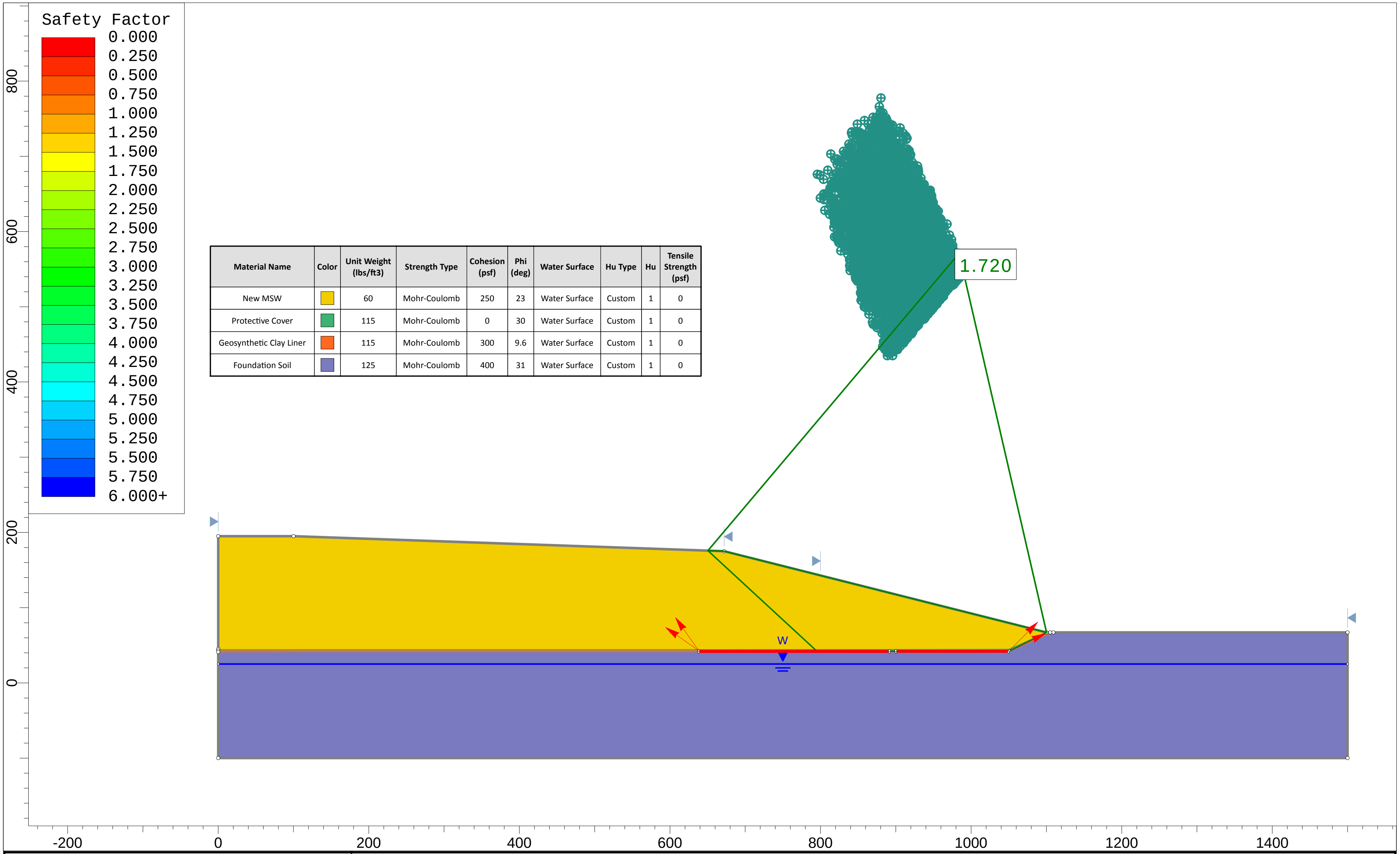
New MSW	🟨	60	Mohr-Coulomb	250	23	Water Surface	Custom	1	0
Protective Cover	🟩	115	Mohr-Coulomb	0	30	Water Surface	Custom	1	0
Geosynthetic Clay Liner	🟧	115	Mohr-Coulomb	300	9.6	Water Surface	Custom	1	0
Foundation Soil	🟪	125	Mohr-Coulomb	400	31	Water Surface	Custom	1	0

Tolunay-Wong Engineers, Inc.

SLIDEINTERPRET 7.017

Project	Kingsville MSW Landfill Project
Analysis Description	Marker O Section - Final Waste Slope (Long-Term Analysis) - Circular Arc Failure
Drawn By	
Scale	1:2148
Company	Tolunay-Wong Engineers, Inc.
Date	12/2/2016, 10:23:00 AM
File Name	Marker O Section - Circular Arc.slim



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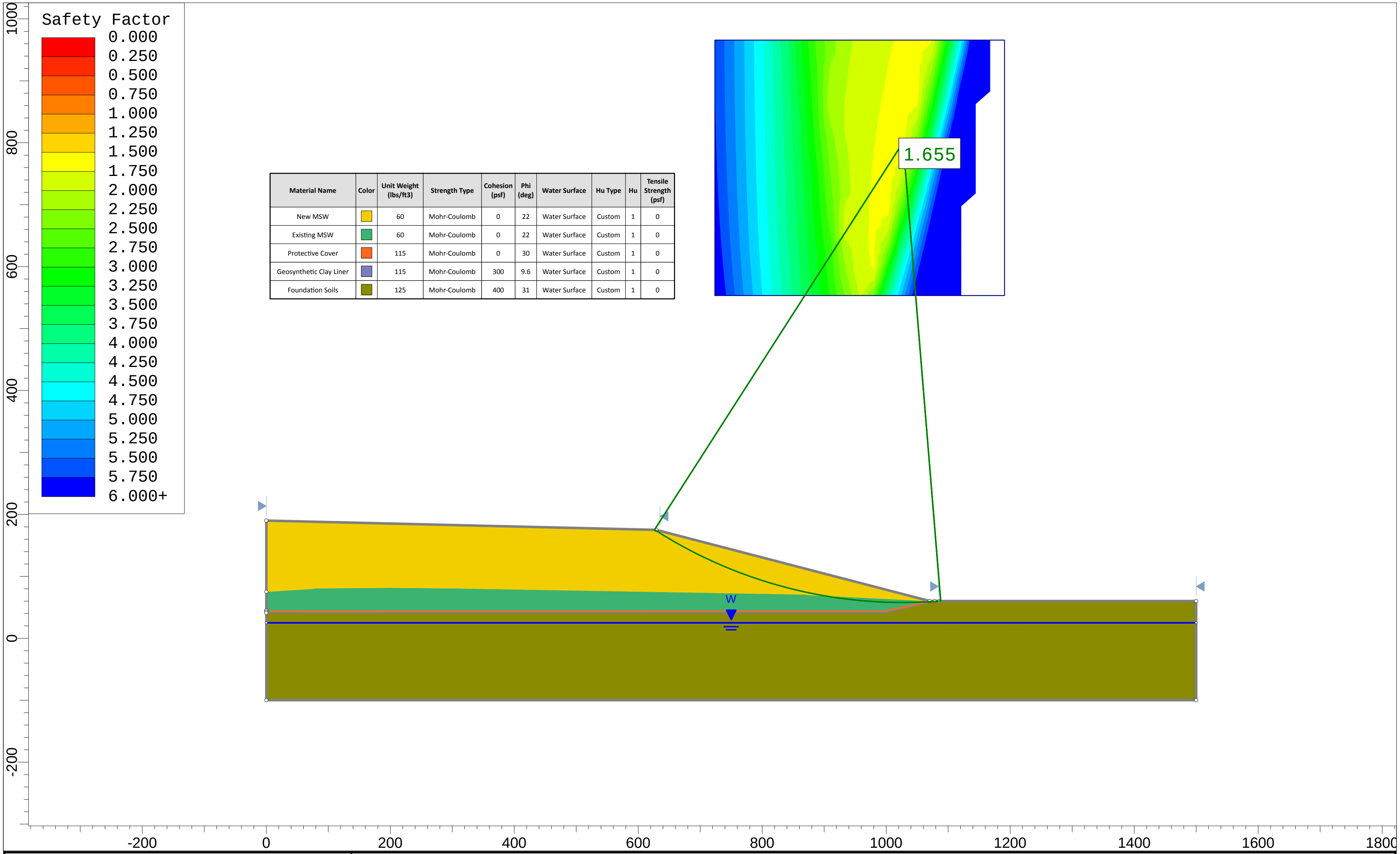
Protective Cover	🟩	115	Mohr-Coulomb	0	30	Water Surface	Custom	1	0
Geosynthetic Clay Liner	🟧	115	Mohr-Coulomb	300	9.6	Water Surface	Custom	1	0
Foundation Soil	🟪	125	Mohr-Coulomb	400	31	Water Surface	Custom	1	0

Tolunay-Wong Engineers, Inc.

SLIDEINTERPRET 7.017

Project	Kingsville MSW Landfill Project		
Analysis Description	Marker O Section - Final Waste Slope (Long-Term Analysis) - Sliding Block Failure		
Drawn By		*Scale* 1:2115	*Company* Tolunay-Wong Engineers, Inc.
Date	12/2/2016, 10:23:00 AM	*File Name*	Marker O Section - Sliding Block.slim

FOR PERMIT PURPOSES ONLY



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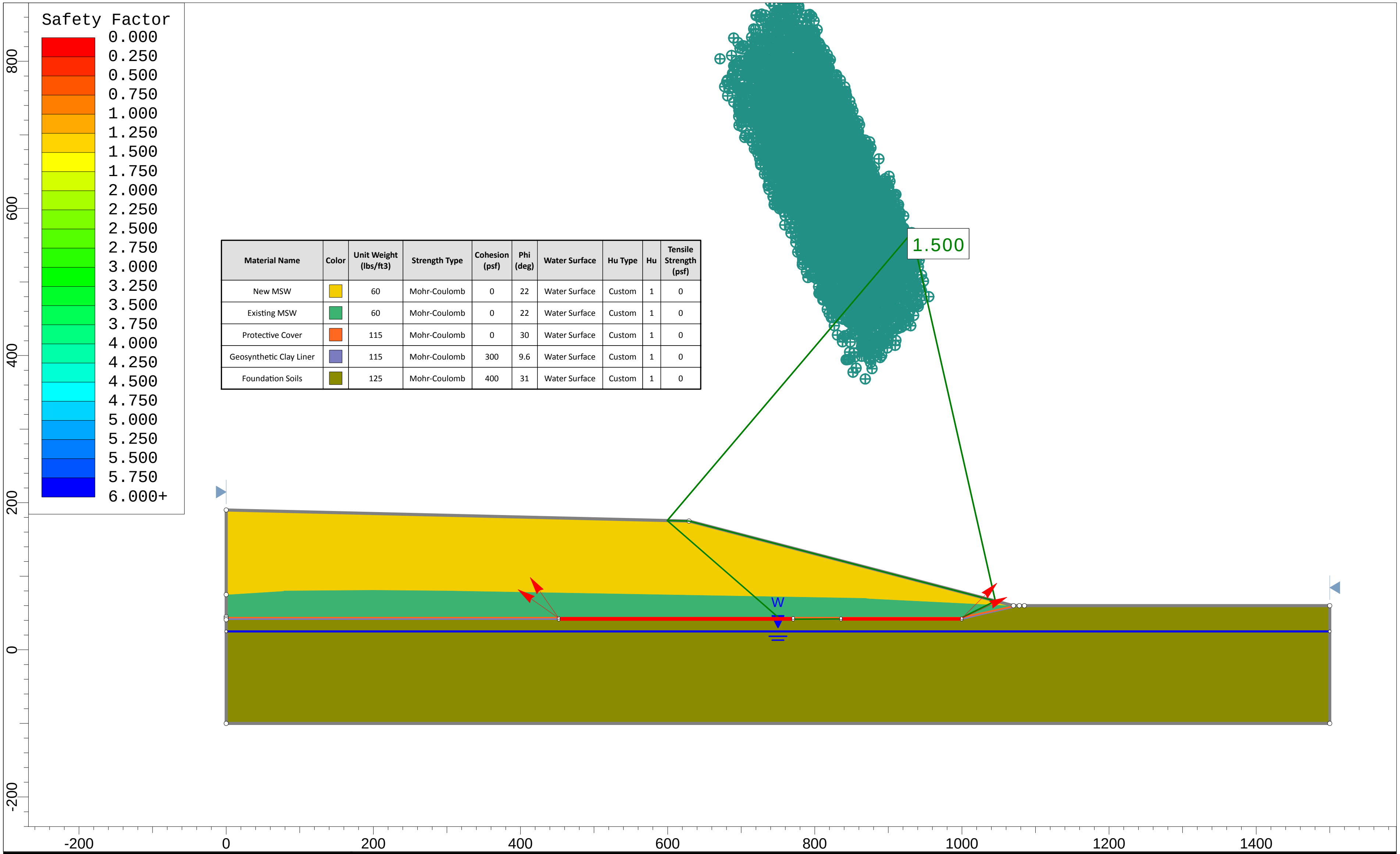
New MSW	🟨	60	Mohr-Coulomb	0	22	Water Surface	Custom	1	0
Existing MSW	🟩	60	Mohr-Coulomb	0	22	Water Surface	Custom	1	0
Protective Cover	🟧	115	Mohr-Coulomb	0	30	Water Surface	Custom	1	0
Geosynthetic Clay Liner	🟪	115	Mohr-Coulomb	300	9.6	Water Surface	Custom	1	0
Foundation Soils	🟫	125	Mohr-Coulomb	400	31	Water Surface	Custom	1	0

Tolunay-Wong Engineers, Inc.

SLIDEINTERPRET 7.017

Project	Kingsville MSW Landfill Project		
Analysis Description	Marker 12 Section - Final Waste Slope (Long-Term Analysis - Large Displacement) - Circular Arc Failure		
Drawn By		*Scale*	1:2569
Company	Tolunay-Wong Engineers, Inc.		
Date	12/2/2016, 2:04:42 PM	*File Name*	Marker 12 Section - Circular Arc.slim

FOR PERMIT PURPOSES ONLY



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Existing MSW	🟩	60	Mohr-Coulomb	0	22	Water Surface	Custom	1	0
Protective Cover	🟧	115	Mohr-Coulomb	0	30	Water Surface	Custom	1	0
Geosynthetic Clay Liner	🟪	115	Mohr-Coulomb	300	9.6	Water Surface	Custom	1	0
Foundation Soils	🟫	125	Mohr-Coulomb	400	31	Water Surface	Custom	1	0

Tolunay-Wong Engineers, Inc.

SLIDEINTERPRET 7.017

Project
Kingsville MSW Landfill Project

Analysis Description
Marker 12 Section - Final Waste Slope (Long-Term Analysis - Large Displacement) - Sliding Block Failure

Drawn By

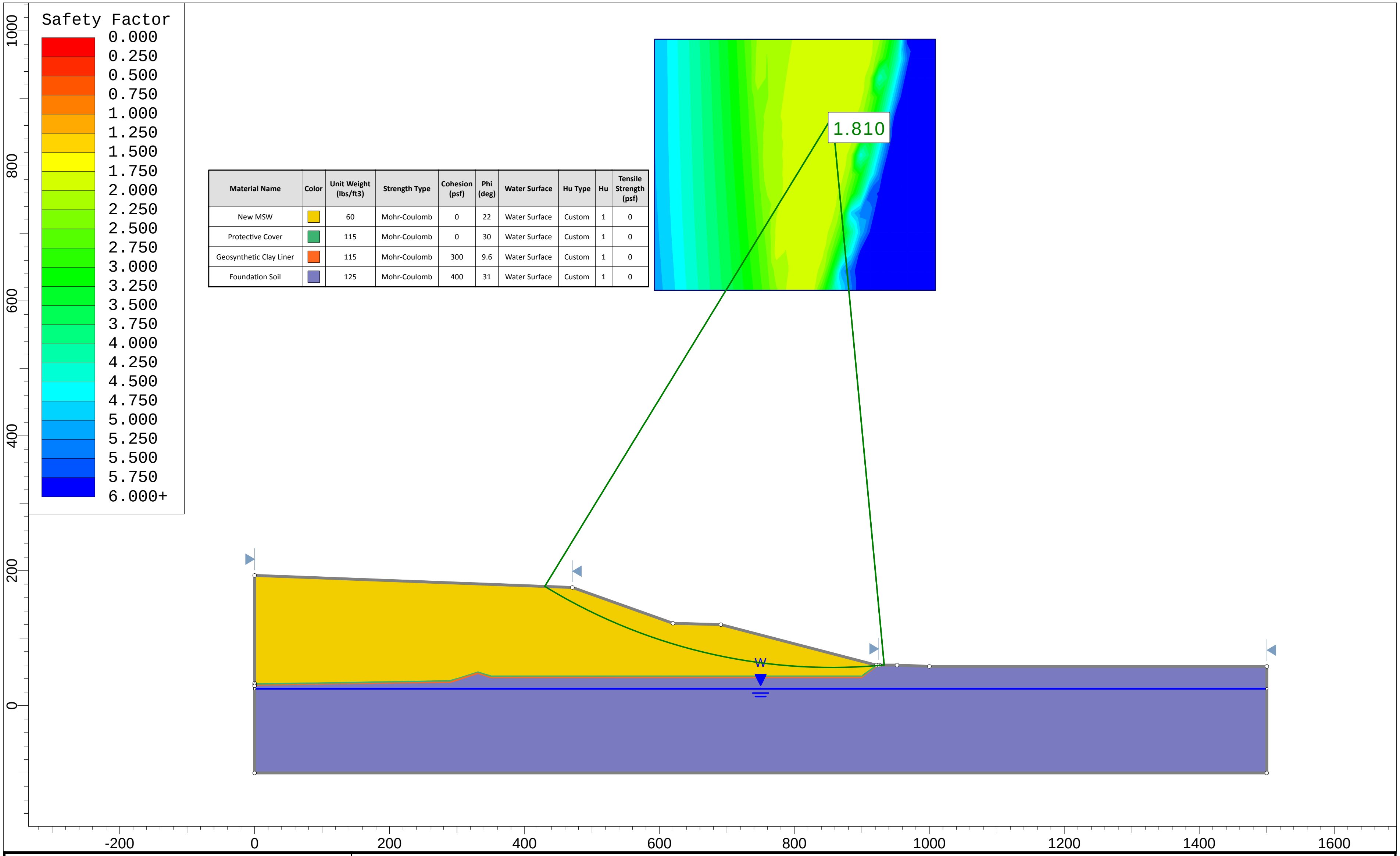
Scale 1:2164

Company Tolunay-Wong Engineers, Inc.

Date 12/2/2016, 2:04:42 PM

File Name Marker 12 Section - Sliding Block.slim

FOR PERMIT PURPOSES ONLY



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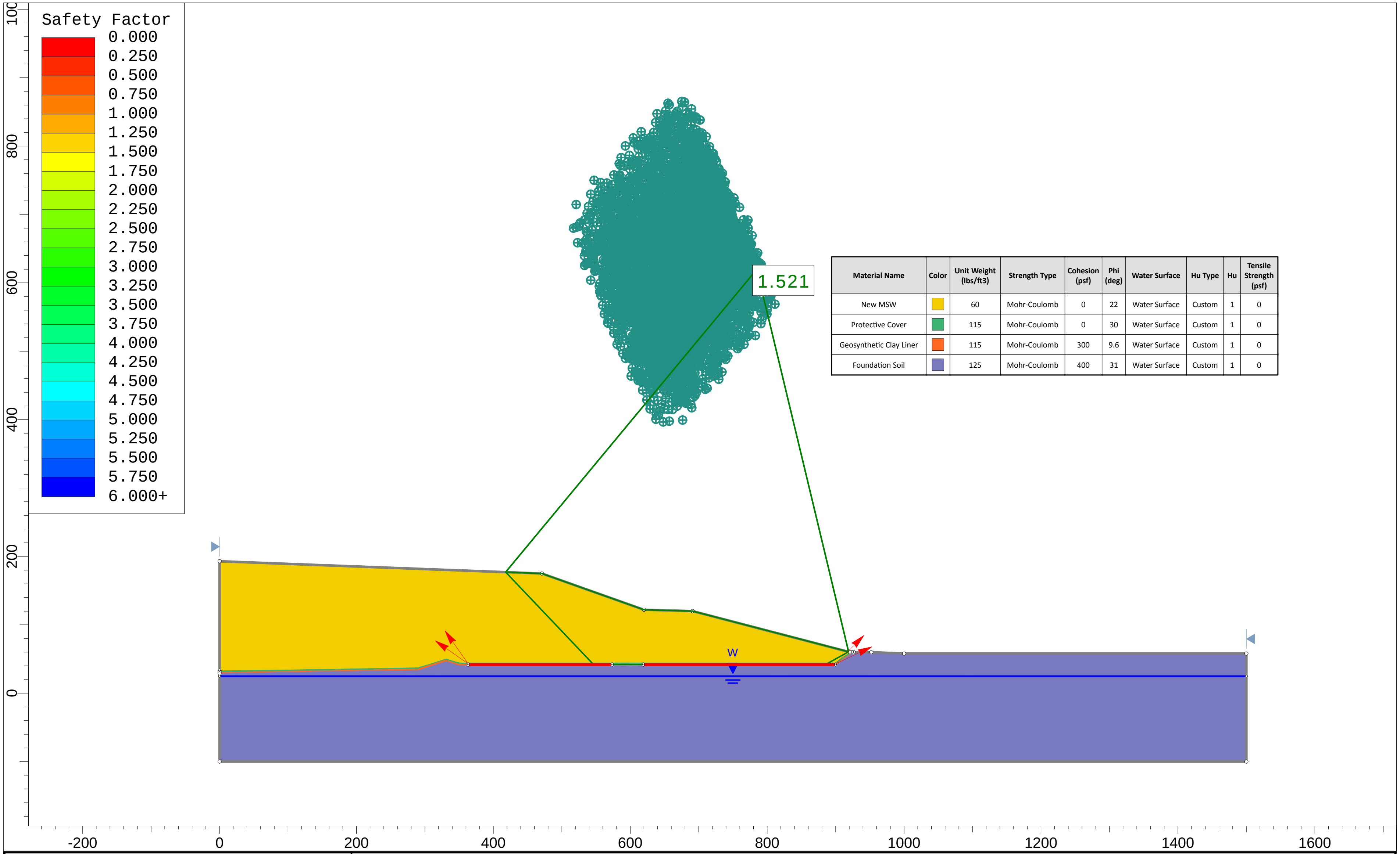
Protective Cover	🟩	115	Mohr-Coulomb	0	30	Water Surface	Custom	1	0
Geosynthetic Clay Liner	🟧	115	Mohr-Coulomb	300	9.6	Water Surface	Custom	1	0
Foundation Soil	🟪	125	Mohr-Coulomb	400	31	Water Surface	Custom	1	0

Tolunay-Wong Engineers, Inc.

SLIDEINTERPRET 7.017

Project	Kingsville MSW Landfill Project
Analysis Description	Marker 18 Section - Final Waste Slope (Long-Term Analysis - Large Displacement) - Circular Arc Failure
Drawn By	
Scale	1:2360
Company	Tolunay-Wong Engineers, Inc.
Date	12/2/2016, 2:39:49 PM
File Name	Marker 18 Section - Circular Arc.slim

FOR PERMIT PURPOSES ONLY



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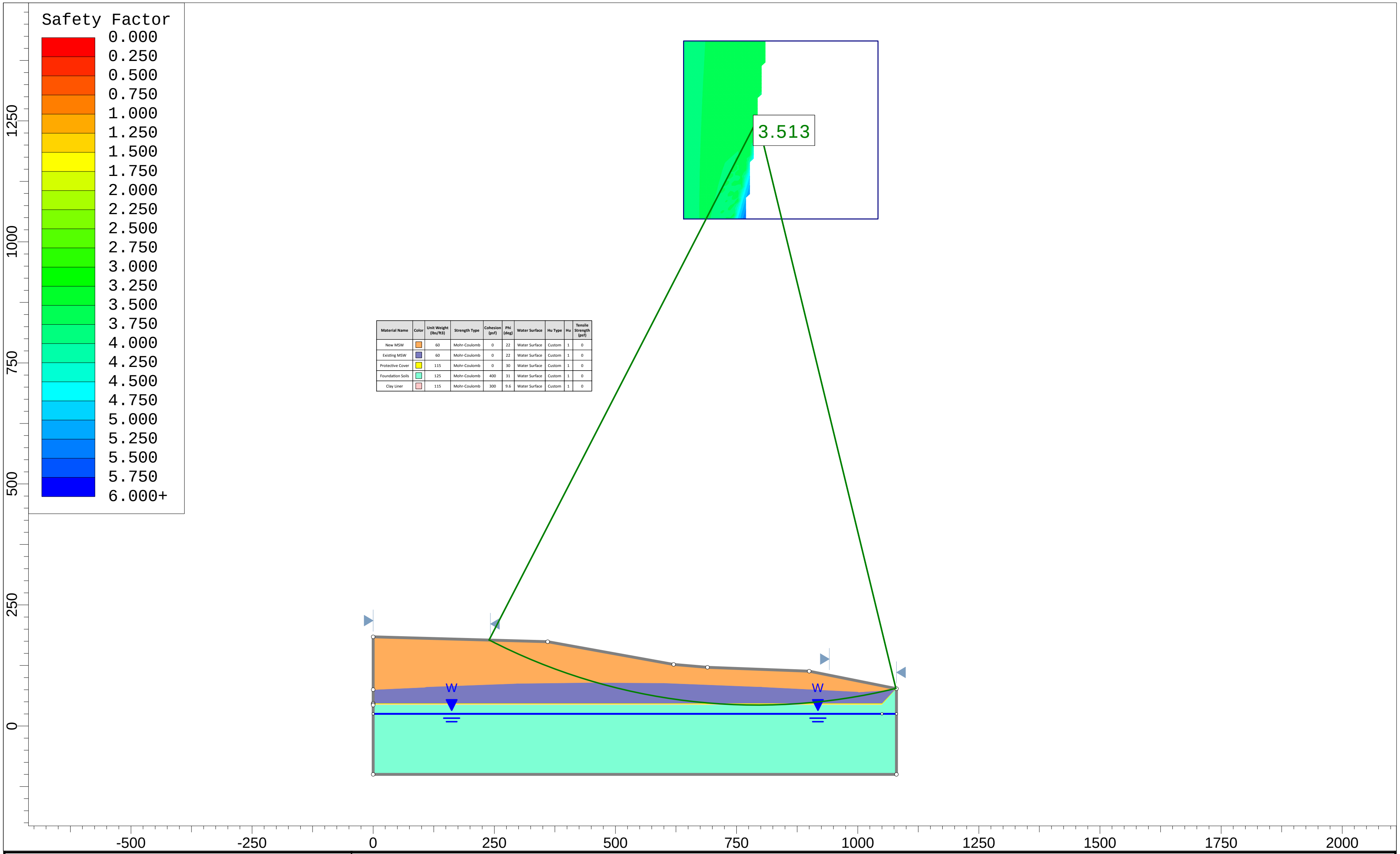
New MSW	🟨	60	Mohr-Coulomb	0	22	Water Surface	Custom	1	0
Protective Cover	🟩	115	Mohr-Coulomb	0	30	Water Surface	Custom	1	0
Geosynthetic Clay Liner	🟧	115	Mohr-Coulomb	300	9.6	Water Surface	Custom	1	0
Foundation Soil	🟪	125	Mohr-Coulomb	400	31	Water Surface	Custom	1	0

Tolunay-Wong Engineers, Inc.

SLIDEINTERPRET 7.017

Project	Kingsville MSW Landfill Project		
Analysis Description	Marker 18 Section - Final Waste Slope (Long-Term Analysis - Large Displacement) -Sliding Block Failure		
Drawn By		*Scale* 1:2326	*Company* Tolunay-Wong Engineers, Inc.
Date	12/2/2016, 2:39:49 PM	*File Name*	Marker 18 Section - Sliding Block.slim

FOR PERMIT PURPOSES ONLY



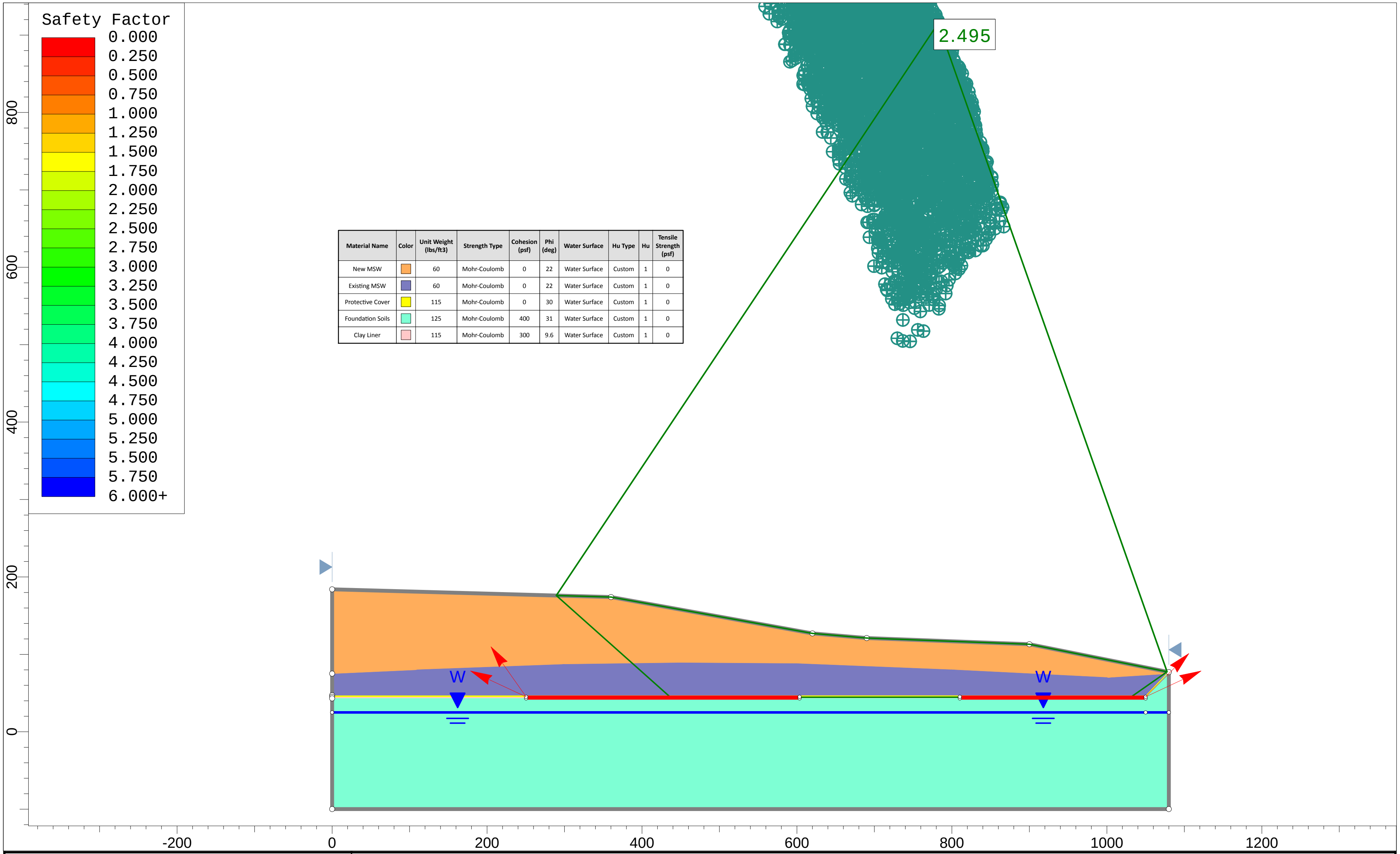
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Hu Type	Hu	Tensile Strength (psf)
New MSW	🟧	60	Mohr-Coulomb	0	22	Water Surface	Custom	1	0
Existing MSW	🟪	60	Mohr-Coulomb	0	22	Water Surface	Custom	1	0
Protective Cover	🟨	115	Mohr-Coulomb	0	30	Water Surface	Custom	1	0
Foundation Soils	🟩	125	Mohr-Coulomb	400	31	Water Surface	Custom	1	0
Clay Liner	🟥	115	Mohr-Coulomb	300	9.6	Water Surface	Custom	1	0

Tolunay-Wong Engineers, Inc.

SLIDEINTERPRET 7.017

Project	Kingsville MSW Landfill Project		
Analysis Description	Marker J Section - Final Waste Slope (Long-Term Analysis - Large Displacement) -Circular Arc Failure		
Drawn By		*Scale* 1:3287	*Company* Tolunay-Wong Engineers, Inc.
Date	11/28/2016, 5:45:35 PM	*File Name*	Marker J Section - Circular.slim

FOR PERMIT PURPOSES ONLY



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Hu Type	Hu	Tensile Strength (psf)
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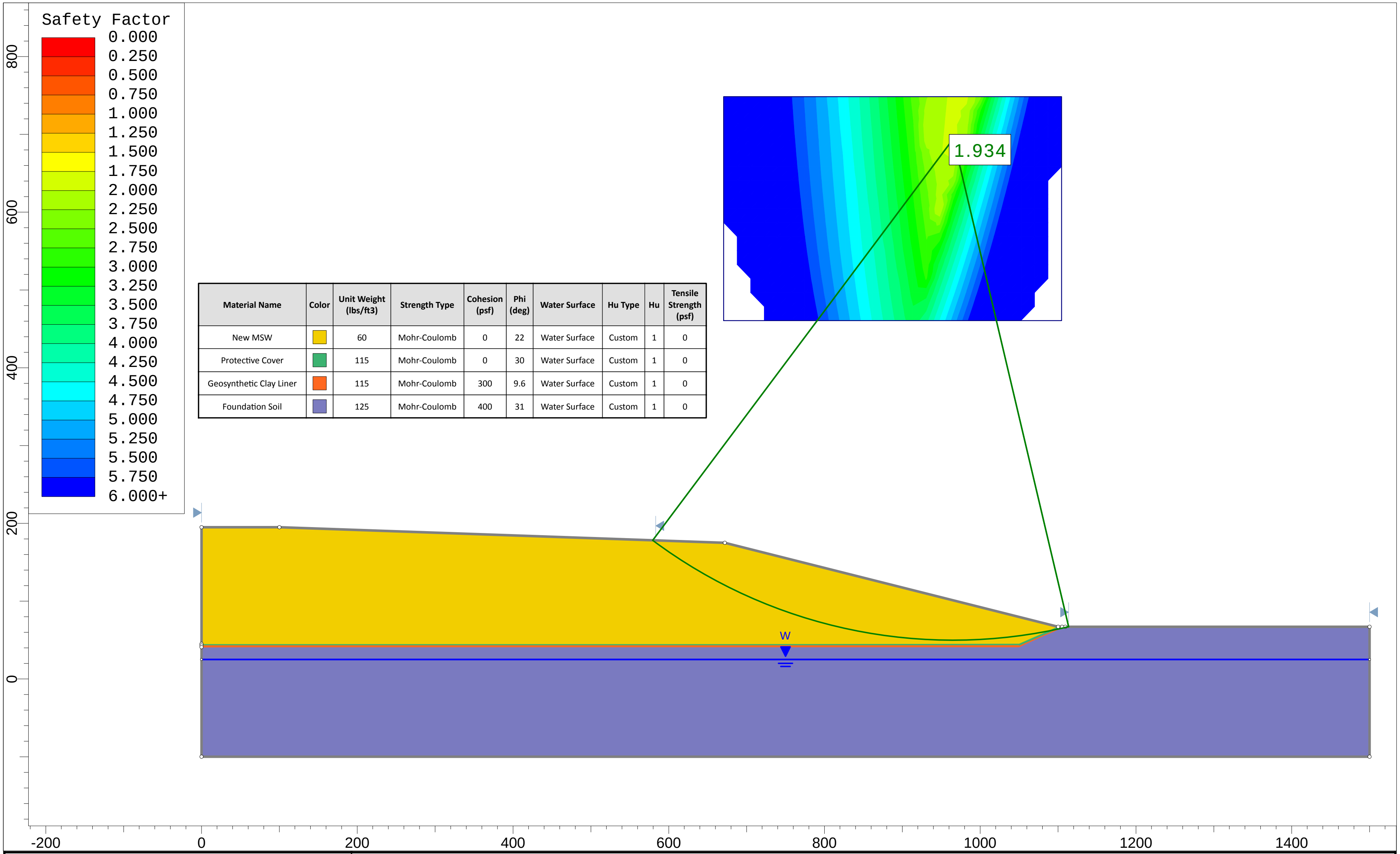
Existing MSW	🟪	60	Mohr-Coulomb	0	22	Water Surface	Custom	1	0
Protective Cover	🟨	115	Mohr-Coulomb	0	30	Water Surface	Custom	1	0
Foundation Soils	🟩	125	Mohr-Coulomb	400	31	Water Surface	Custom	1	0
Clay Liner	🟥	115	Mohr-Coulomb	300	9.6	Water Surface	Custom	1	0

Tolunay-Wong Engineers, Inc.

SLIDEINTERPRET 7.017

Project	Kingsville MSW Landfill Project
Analysis Description	Marker J Section - Final Waste Slope (Long-Term Analysis - Large Displacement) - Sliding Block Failure
Drawn By	
Scale	1:2055
Company	Tolunay-Wong Engineers, Inc.
Date	11/28/2016, 5:45:35 PM
File Name	Marker J Section - Sliding Block.slim

FOR PERMIT PURPOSES ONLY



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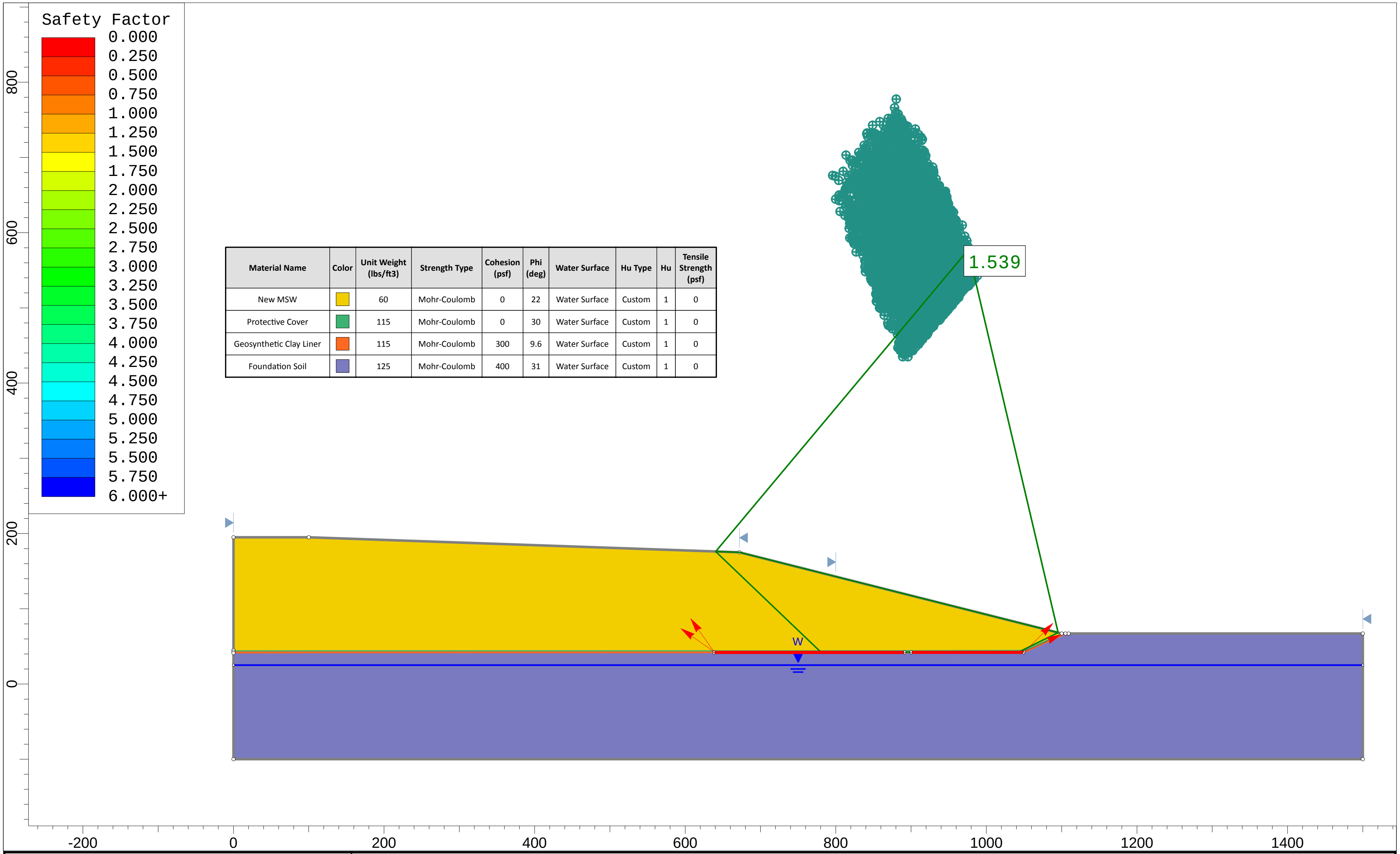
Protective Cover	🟩	115	Mohr-Coulomb	0	30	Water Surface	Custom	1	0
Geosynthetic Clay Liner	🟧	115	Mohr-Coulomb	300	9.6	Water Surface	Custom	1	0
Foundation Soil	🟪	125	Mohr-Coulomb	400	31	Water Surface	Custom	1	0

Tolunay-Wong Engineers, Inc.

SLIDEINTERPRET 7.017

Project	Kingsville MSW Landfill Project		
Analysis Description	Marker O Section - Final Waste Slope (Long-Term Analysis - Large Displacement) -Circular Arc Failure		
Drawn By		*Scale* 1:2045	*Company* Tolunay-Wong Engineers, Inc.
Date	12/2/2016, 10:23:00 AM	*File Name*	Marker O Section - Circular Arc.slim

FOR PERMIT PURPOSES ONLY



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New MSW	🟨	60	Mohr-Coulomb	0	22	Water Surface	Custom	1	0
Protective Cover	🟩	115	Mohr-Coulomb	0	30	Water Surface	Custom	1	0
Geosynthetic Clay Liner	🟧	115	Mohr-Coulomb	300	9.6	Water Surface	Custom	1	0
Foundation Soil	🟪	125	Mohr-Coulomb	400	31	Water Surface	Custom	1	0

Tolunay-Wong Engineers, Inc.

SLIDEINTERPRET 7.017

Project
Kingsville MSW Landfill Project

Analysis Description
Marker O Section - Final Waste Slope (Long-Term Analysis - Large Displacement) - Sliding Block Failure

Drawn By

Scale
1:2115

Company
Tolunay-Wong Engineers, Inc.

Date
12/2/2016, 10:23:00 AM

File Name
Marker O Section - Sliding Block.slim

CITY OF KINGSVILLE LANDFILL

PART III, ATTACHMENT 4

APPENDIX 3

HANSON PROFESSIONAL SERVICES, INC. SOIL BORING REPORT

SCOT E. COLLINS
GEOLOGY
10398

8/28/2018

Soil Boring Report
City of Kingsville Landfill

August 2018

Prepared for:
The City of Kingsville, Texas
Municipal Solid Waste Landfill
Permit Amendment Application No. MSW 235-C

August 28, 2018

Table of Contents

Exhibits

Exhibit I	**Property Location Map**
Exhibit II	**Geotechnical Engineering Study Report**
Exhibit III	**Soil Boring Location Map**
Exhibit IV	**Soil Boring Cross Sections**

1. Introduction

On behalf of the City of Kingsville, Hanson Professional Services, Inc. is preparing a permit amendment application for the City of Kingsville Landfill. This amendment includes both a horizontal and vertical expansion of the current Municipal Solid Waste (MSW) Landfill located in Kleberg County, Texas. The City of Kingsville Landfill is located approximately 5 miles southeast of the City of Kingsville at the northeast corner of the intersection of Farm to Market Road 2619 and East County Road 2130 as shown on Exhibit I.

2. Geotechnical Exploration

In order to identify the engineering characteristics of the subsurface materials in accordance with 30 TAC 330.63 (e)(4), a geotechnical exploration was conducted at the City of Kingsville Landfill. This exploration was completed by Tolunay-Wong Engineers, Inc. during June, July, and August of 2016.

Twelve soil borings were installed using a truck-mounted drill rig, utilizing hollow-stem auger and wash rotary drilling techniques. Boring depths ranged from 33.5 feet to 86 feet below grade. Twenty three (23) exploratory borings were previously drilled at the site for development of the existing landfill and the locations of these can be seen in Exhibit III. Surveyed locations and surface elevations for the twelve new soil borings can also be seen in Exhibit III. Upon completion of drilling, the new borings were pressure grouted from the bottom with a cement-bentonite mixture.

During the sampling procedure, standard penetration tests (SPT) were performed at pre-determined intervals to obtain the standard penetration resistance value of the soil. The standard value or “N-value” was recorded and can be found on the boring logs located in Appendix B of Exhibit II. Standard penetration tests utilized a 140-lb hammer falling 30 inches in accordance with the *Standard Test Method for Standard Penetration Test (SPT) and Split Barrel Sampling of Soils (ASTM D 1586)*.

Fine grained cohesive soil samples were obtained using thin walled sampling (ASTM D1587) procedures. A geotechnician visually classified recovered soils and obtained field strength measurements using a pocket penetrometer for samples collected via thin walled sampling. These samples were extruded in the field, wrapped in foil, placed in moisture sealed containers, and protected from disturbance prior to transport to the laboratory.

Cohesionless, semi-cohesionless, and dry, brittle cohesive soil samples were obtained using split-barrel sampling (ASTM D1586) procedures. The compactness of cohesionless and semi-cohesionless samples are inferred from the N-value. The samples obtained from the split-barrel sampler were visually classified, placed in moisture sealed containers, and transported to the laboratory.

The recovered soil sample depths with corresponding pocket penetrometer measurements and SPT blowcounts can be found on the boring logs provided in Appendix B of Exhibit II. Interpretations of soil types throughout the boring depths and the locations of strata changes were based on visual classifications during field sampling and laboratory testing in accordance with *Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System) (ASTM D 2487) and Standard Practice for Description and Identification of Soils (Visual-Manual Procedure) (ASTM D 2488).*

3. Subsurface Conditions

3.1 Typical Profile

Typical soil profiles encountered in the soil borings consisted of alternating strata of cohesive clay soils (fat clays, sandy lean clays, and sandy lean silty clays) and semi-cohesionless clayey sands and silty sands, and cohesionless poorly graded sands with clay. The consistency of the cohesive clay soils was typically very stiff to hard, but occasionally stiff. The relative density of the semi-cohesionless silty sands/clayey sands and cohesionless poorly graded sands was typically medium dense to very dense, but occasionally loose. Depths of boring termination ranged from 33.5 ft to 86 ft. Detailed descriptions of the soils encountered at each boring location are presented on the boring logs that have been included in Appendix B of Exhibit II.

3.2 Groundwater

Typically borings were dry-augered using hollow stem augers to advance the boreholes until groundwater was encountered. Wash rotary drilling techniques were then used as necessary in order to continue advancing the borings. Groundwater measurements were recorded at depths ranging from approximately 11 ft to 34 ft BGS in the open boreholes when groundwater was first encountered. Groundwater measurements were recorded again after a 10 to 15 minute time period and those depths ranged from 5.4 ft to 30.8 ft. Depths to which groundwater was observed during drilling and after the 10 to 15 minute waiting period can be seen on the Groundwater Level Measurements Table below.

Groundwater Level Measurements

Boring No.	Boring Depth (feet)	Groundwater Level Depth	
		Encountered During Drilling (feet)	Observed in Open Borehole After 10 to 15 Minute Waiting Period (feet)
B-30	82.5	12	10.5
B-31	68	23	21.5
B-32	82.5	18	14.6
B-33	86	32.5	28.1
B-34	43	31	28.3
B-35	72.5	34	30.8
B-36	68	23	18.3
B-37	48	15	9.3
B-38	58	11	5.4
B-39	68	27	26.5
B-40	33.5	21	19
B-41	62.5	19.5	19.2

These groundwater observations were made during the installation of the soil borings. Groundwater conditions may be different at the time of construction due to seasonal variations in rainfall, runoff, irrigation, or other conditions not apparent at the time of drilling.

4. Laboratory Testing

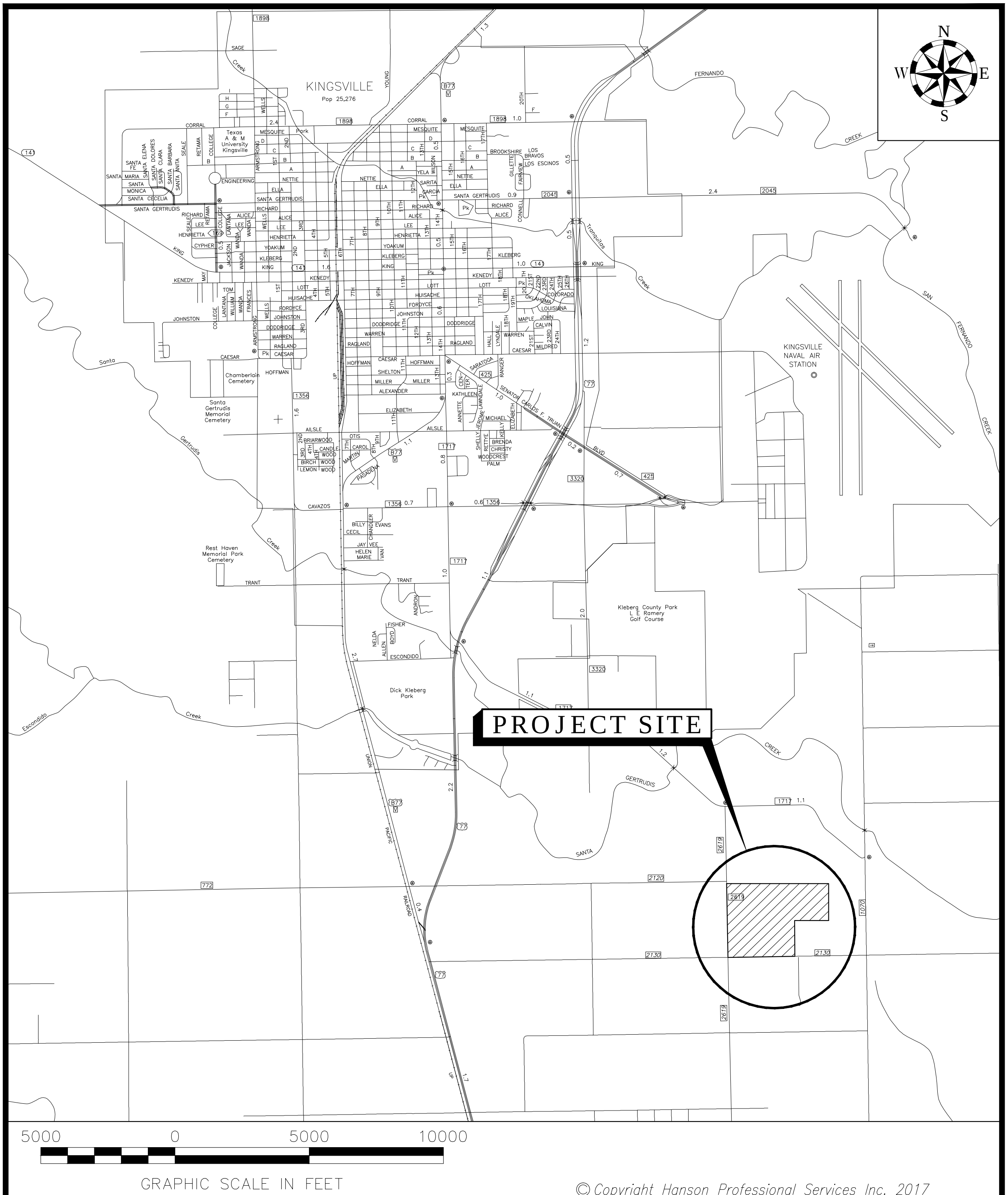
In order to further classify and evaluate the physical and engineering properties of the soils encountered in the project borings, laboratory testing was conducted on selected samples. Laboratory tests were conducted in general accordance with ASTM International standards to measure physical and engineering properties of the recovered samples. Laboratory testing descriptions and methods can be viewed in the table below.

Test Description	**Test Method**
Amount of Material in Soils Finer than No. 200 Sieve	ASTM D 1140
Unconfined Compressive Strength of Cohesive Soil (UC)	ASTM D 2166
Water (Moisture) Content of Soil	ASTM D 2216
Liquid Limit, Plastic Limit and Plasticity Index of Soils	ASTM D 4318
Density (Unit Weight) of Soil Specimens	ASTM D 2937
One-Dimensional, Incremental Loading Consolidation	ASTM D 2435
Consolidated-Undrained Triaxial Compression w/ Pore Water Pressure	ASTM D 4767

Standard geotechnical laboratory test results and soil properties encountered in the project borings are presented on the boring logs provided in Appendix B of Exhibit II. Results of completed one-dimensional consolidation and consolidated-undrained triaixial compression tests performed on the selected cohesive soil samples obtained for this study are included in Appendix D of Exhibit II.

Exhibit I

Property Location Map



FEB 01, 2017 1:53 PM TORRE01809
Z:\8514-CITY OF KINGSVILLE\8514-03\CAD-PART-II\8514-03-EXH1-PROP LOC MAP.DWG

HANSON
Hanson Professional Services Inc.

TBPE F-417 / TBPLS F-10039500
TBAE F-BR 2458 / TBPG F-50556

CITY OF KINGSVILLE LANDFILL

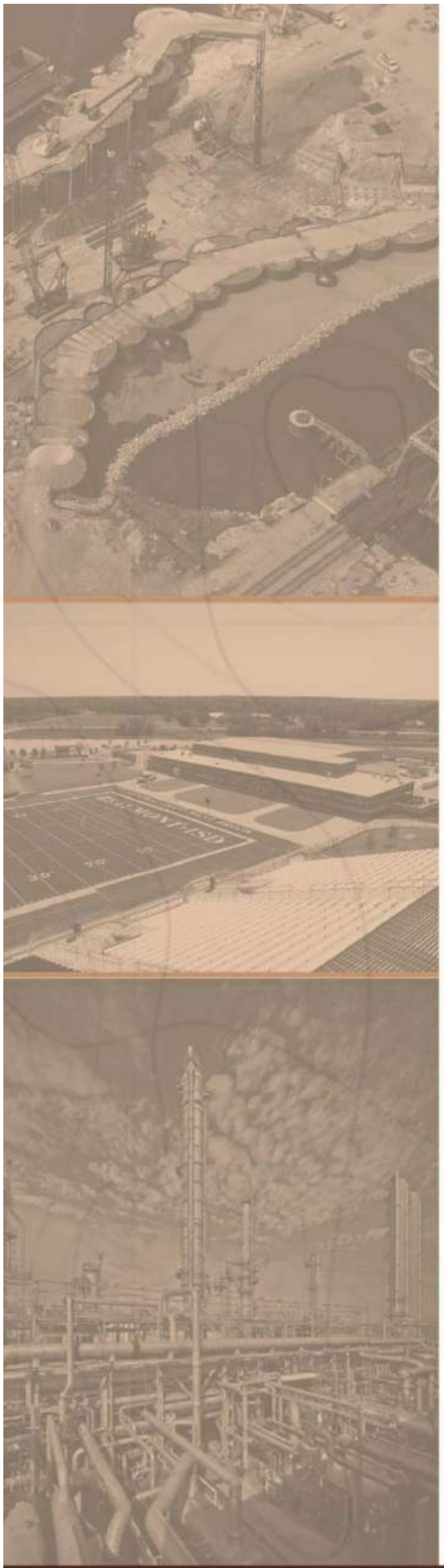
SOIL BORING REPORT
PROPERTY LOCATION MAP
KLEBERG COUNTY, TEXAS

16L0438

EXHIBIT I

Exhibit II

Geotechnical Engineering Study Report



Tolunay-Wong Engineers, Inc.

GEOTECHNICAL ENGINEERING STUDY
CITY OF KINGSVILLE MUNICIPAL SOLID WASTE LANDFILL EXPANSION
KINGSVILLE, TEXAS

Prepared for:

Naismith/Hanson
Corpus Christi, Texas

Prepared by:

Tolunay-Wong Engineers, Inc.
826 South Padre Island Drive
Corpus Christi, Texas 78416

August 30, 2018

Project No. 16.53.042 / Report No. 12788R1

GEOTECHNICAL ENGINEERING, DEEP FOUNDATIONS TESTING,
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August 30, 2018

Naismith/Hanson
4501 Gollihar Road
Corpus Christi, Texas 78410

Attn: Mr. Jon Reinhard, P.E.
JReinhard@hanson-inc.com

Ref: Geotechnical Engineering Study
City of Kingsville
Municipal Solid Waste Landfill Expansion
Kingsville, Texas
TWE Project No. 16.53.042 / Report No. 12788R1

Dear Mr. Reinhard,

Tolunay-Wong Engineers, Inc. (TWE) is pleased to submit this revised report of our geotechnical engineering study for the above referenced project. This report contains a detailed description of the field program and laboratory services performed for this geotechnical engineering study as well as soil boring logs. Also included in this report are results of settlement predictions and waste mass stability analyses of the proposed landfill expansion and reinforcement recommendations as means to reduce settlement below future liner systems.

We appreciate the opportunity to work with you on this phase of the project and we look forward to the opportunity of providing additional services as the project progresses. If you have any questions or comments regarding this report or if we can be of further assistance, please contact us.

Sincerely,

TOLUNAY-WONG ENGINEERS, INC.
Texas Board of Professional Engineers Firm Registration Number F-000124

Jialin Li

Jialin Li, E.I.T.
Geotechnical Staff Engineer

D R Rokohl

Don R. Rokohl, P.E.
Branch Manager

DON R. ROKOHL
65150

8-30-18

DRR/JL/drr

TABLE OF CONTENTS

TABLES AND APPENDICES

TABLES

APPENDICES

1 INTRODUCTION AND PROJECT DESCRIPTION

1.1 Introduction

This report presents the results of our geotechnical engineering study performed for the proposed municipal solid waste landfill vertical and lateral expansion in Kingsville, Texas. Our geotechnical engineering study was conducted in accordance with TWE Proposal No. P15-C105R1 dated December 31, 2015. The study was authorized by Grant Jackson, P.E. of Naismith/Hanson (NEI).

1.2 Project Description

The City of Kingsville is planning a vertical and lateral expansion of the existing municipal solid waste (MSW) landfill (Permit No. MSW 235-B) located at the northeast corner of the intersection of County Road E 2130 and Farm to Market Road 2619 near Kingsville (Kleberg County), Texas. The current landfill permit boundary covers an area of about 120 acres and is located immediately adjacent to a closed Pre-Subtitle D MSW landfill (Permit No. MSW 235). The closed landfill includes about 40 acres and is located southwest of Permit No. MSW 235-B.

The landfill expansion will include placement of MSW refuse over areas of the previously filled, closed Permit MSW 235 landfill. Like the remainder of the landfill, the top of the closed Permit No. MSW 235 landfill will receive a liner and leachate collection system prior to receiving new MSW. Permit No. MSW 235 has not received new MSW since 1992 and first began receiving MSW sometime around mid 1970’s. Since it is planned so that the Permit No. MSW 235 area will contain the last sectors to receive waste, it will be about 70+ years before any new waste is placed over Permit No. MSW 235 area. The final landfill top elevation will be about 200-ft, with a maximum thickness of new MSW refuse above the existing MSW refuse of about 115- ft. The final landfill side slopes will be at a maximum of 4(H):1(V).

2 PURPOSE AND SCOPE OF SERVICES

The purposes of our geotechnical engineering study were to investigate the soil and groundwater conditions within the project site and to provide geotechnical design and construction recommendations for the proposed facility.

Our scope of services performed for the project consisted of:

1. Drilling 12 soil borings to depths of 33.5-ft to 86-ft within the project site to evaluate subsurface stratigraphy and groundwater conditions;

2. Performing geotechnical laboratory tests on recovered soil samples to evaluate the physical and engineering properties of the strata encountered;

3. Providing estimated compression of the waste within the existing landfill due to construction of the new vertical expansion;

4. Providing geosynthetic reinforcement requirements to be incorporated into the cover design at the base of the vertical landfill construction; and,

5. Performing waste mass stability analyses of the new landfill construction.

Our scope of services did not include any environmental assessments for the presence or absence of wetlands or of hazardous or toxic materials within or on the soil, air or water within this project site. Any statements in this report or on the boring logs regarding odors, colors or unusual or suspicious items or conditions are strictly for the information of the Client. A geological fault study was also beyond the scope of our services associated with this geotechnical engineering study.

3 FIELD PROGRAM

3.1 Soil Borings

TWE conducted an exploration of subsurface soil and groundwater conditions at the project site during June, July, and August 2016 by drilling and sampling 12 soil borings to depths of 33.5-ft to 86-ft below grade. The soil boring locations are presented on TWE Drawing No. 16.53.042-1 in Appendix A of this report. Drilling and sampling of the soil borings were performed using conventional truck-mounted drilling equipment. Our field personnel coordinated the field activities and logged the boreholes. The boring locations were staked at the site by professional public land surveyor. The latitude and longitude for each boring location were determined by the surveyor and are presented on the boring logs. The borings were pressure grouted from the bottom with a cementitious bentonite mixture.

Twenty three (23) exploratory borings were previously drilled at the site for development of the existing landfill. The previously drilled exploratory boring locations are presented on TWE Drawing No. 16.53.042.1 in Appendix A.

3.2 Drilling Methods

Field operations were performed in general accordance with the *Standard Practice for Soil Investigation and Sampling by Auger Borings [American Society for Testing and Materials (ASTM) D 1452]*. The soil borings were drilled using a truck-mounted drilling rig. Typically, borings are dry-augered using a flight auger to advance the boreholes until groundwater is encountered or until the boreholes become unstable and/or collapse. At that point, soil borings are completed using wash-rotary drilling techniques. Samples were obtained at intervals of 5-ft from existing ground surface to the completion depths of borings B-30, B-32, B-33, B-35, B-36, B-37, and B-41. A 2-ft sampling interval was used to the completion depths of borings B-31, B-34, B-38, B-39, and B-40. The completion depths of the borings were 33.5-ft to 86-ft below the ground surface at the time of the field exploration.

3.3 Soil Sampling

Fine-grained, cohesive soil samples were recovered from the soil borings by hydraulically pushing 3-in diameter, thin-walled Shelby tubes a distance of about 24-in. The field sampling procedures were conducted in general accordance with the *Standard Practice for Thin-Walled Tube Sampling of Soils (ASTM D 1587).* Our geotechnician visually classified the recovered soils and obtained field strength measurements using a pocket penetrometer. A factor of 0.67 is typically applied to the penetrometer measurement to estimate the undrained shear strength of the Gulf Coast cohesive soils. The samples were extruded in the field, wrapped in foil, placed in moisture sealed containers and protected from disturbance prior to transport to the laboratory.

Cohesionless, semi-cohesionless, and dry, brittle cohesive samples were collected with the standard penetration test (SPT) sampler driven 18-in by blows from a 140-lb hammer falling 30-in in accordance with the *Standard Test Method for Standard Penetration Test (SPT) and Spilt-Barrel Sampling of Soils (ASTM D 1586).* The number of blows required to advance the sampler three (3) consecutive 6-in depths are recorded for each corresponding sample on the boring logs. The N-value, in blows per foot, is obtained from SPTs by adding the last two (2) blow count numbers. The compactness of cohesionless and semi-cohesionless samples are inferred from the N-value. The samples obtained from the split-barrel sampler were visually classified, placed in moisture sealed containers and transported to our laboratory.

The recovered soil sample depths with corresponding pocket penetrometer measurements and SPT blowcounts are presented on the boring logs in Appendix B.

3.4 Boring Logs

Our interpretations of general subsurface soil and groundwater conditions at the soil boring locations are included on the boring logs. Our interpretations of the soil types throughout the boring depths and the locations of strata changes were based on visual classifications during field sampling and laboratory testing in accordance with *Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System) (ASTM D 2487)* and *Standard Practice for Description and Identification of Soils (Visual-Manual Procedure) (ASTM D 2488).*

The boring logs include the type and interval depth for each sample along with its corresponding pocket penetrometer measurements and SPT blow counts. The boring logs and a key to terms and symbols used on boring logs are presented in Appendix B.

3.5 Groundwater Measurements

Groundwater level measurements were attempted in the open boreholes during dry-auger drilling. Water level readings were attempted in the open boreholes when groundwater was first encountered and after a ten (10) to fifteen (15) minute time period. The groundwater observations are summarized in Section 5.5 of this report entitled *"Groundwater Observations."*

4 LABORATORY SERVICES

A laboratory testing program was conducted on selected samples to assist in classification and evaluation of the physical and engineering properties of the soils encountered in the project borings. Laboratory tests were performed in general accordance with *ASTM International* standards to measure physical and engineering properties of the recovered samples. The types and brief descriptions of the laboratory tests performed are presented in Table 4-1 below.

Table 4-1: Laboratory Testing Program

Test Description	Test Method
Amount of Material in Soils Finer than No. 200 Sieve	ASTM D 1140
Unconfined Compressive Strength of Cohesive Soil (UC)	ASTM D 2166
Water (Moisture) Content of Soil	ASTM D 2216
Liquid Limit, Plastic Limit and Plasticity Index of Soils	ASTM D 4318
Density (Unit Weight) of Soil Specimens	ASTM D 2937
One-Dimensional, Incremental Loading Consolidation	ASTM D 2435
Consolidated-Undrained Triaxial Compression w/ Pore Water Pressure	ASTM D 4767

Standard geotechnical laboratory test results and soil properties encountered in the project borings are presented on the logs of borings in Appendix B of this report. Results of completed one-dimensional consolidation and consolidated-undrained triaixial compression tests performed on the selected cohesive soil samples obtained for this study are included in Appendix C.

5 SITE AND SUBSURFACE CONDITIONS

5.1 General

Our interpretations of soil and groundwater conditions within the project site are based on information obtained at the soil boring locations only. This information has been used as the basis for our conclusions and recommendations included in this report. Subsurface conditions may vary at areas not explored by the soil borings. Significant variations at areas not explored by the soil borings will require reassessment of our recommendations.

5.2 Site Description and Surface Conditions

The present MSW landfill (project site) is located at the northeast corner of the intersection of County Road E 2130 and Farm to Market Road 2619 near Kingsville (Kleberg County), Texas. The landfill covers an area of about 120 acres. Several active disposal areas are excavated and at various stages of use.

5.3 Subsurface Conditions

The soil profile encountered in the project borings consisted of alternating strata of cohesive clay soils (fat clays, sandy lean clays, and sandy lean silty clays) and semi-cohesionless clayey sands and silty sands, and cohesionless poorly graded sands with clay. The consistency of the cohesive clay soils was typically very stiff to hard, but occasionally stiff. The relative density of the semi-cohesionless silty sands/clayey sands and cohesionless poorly graded sands was typically medium dense to very dense, but occasionally loose. The borings were terminated at depths ranging from 33.5-ft to 86-ft. Detailed descriptions of the soils encountered at the boring locations are presented on the boring logs in Appendix B.

5.4 Subsurface Soil Properties

In-situ moisture contents of selected cohesive clay samples ranged from 18% to 34%. Results of Atterberg Limits tests on selected clay samples indicated liquid limits (LL) ranging from 31 to 81 with plasticity indices (PI) ranging from 18 to 58. The amount of materials finer than the No. 200 sieve on the selected samples ranged from 55% to 100%. In-situ moisture contents of selected silty sand samples ranged from 23% to 24%. The amount of materials finer than the No. 200 sieve on the selected samples tested for grain size distribution ranged from 14% to 38%.

Undrained shear strengths derived from field pocket penetrometer readings ranged from 0.25-tsf to 4.50-tsf. Undrained shear strengths derived from laboratory unconfined compressive (UC) strength testing ranged from 0.16-tsf to 3.41-tsf with corresponding total unit weights of 86-pcf to 105-pcf. Shear strength of cohesive soils inferred from SPT blow counts generally were similar. Based on this undrained shear strength data, the consistency of the cohesive soils encountered in the project borings is considered to be very soft to very stiff.

Tabulated laboratory test results at the recovered sample depths are presented on the boring logs in Appendix B.

5.5 Groundwater Observations

Groundwater measurements were attempted in the project borings during dry-auger drilling. Groundwater level measurements are shown in Table 5-1 below.

Table 5-1: Groundwater Level Measurements

Boring No.	Boring Depth (feet)	Groundwater Level Depth	
		Encountered During Drilling (feet)	Observed in the Open Borehole after a 10 to 15 minute waiting period (feet)
B-30	82.5	21	10.5
B-31	68.0	23	21.5
B-32	82.5	18	14.6
B-33	86	32.5	28.1
B-34	43	31	28.3
B-35	72.5	34	30.8
B-36	68	23	18.3
B-37	48	15	9.3
B-38	58	11	5.4
B-39	68	27	26.5
B-40	33.5	21	19
B-41	62.5	19.5	19.2

Groundwater levels may fluctuate with climatic and seasonal variations and should be verified before construction. Accurate determination of the static groundwater level is typically made with a standpipe piezometer. Installation of a piezometer to evaluate the long-term groundwater condition was not included within the current scope of services.

6 VERTICAL AND LATERAL LANDFILL EXPANSION

6.1 General

The results of engineering analyses performed are presented in the sections below. Project information provided to us was utilized in the analyses and represents our understanding of the proposed construction. It is imperative that we are contacted if any changes from the described information are made so that we can evaluate whether modifications to our findings will need to be made.

6.2 Permit No. MSW 235 Existing Waste Settlement

Classic consolidation theory describes compression settlement of municipal solid waste (MSW) when loaded by the weight of additional waste from vertical expansion as the total of primary settlement and secondary settlement. Specific testing to evaluate compression characteristics of municipal solid waste was not performed for this study. We, therefore, assumed the following parameters, which are based on published information (1) (2), for our analyses.

- Unit weight of new waste = 65 pounds per cubic foot (pcf)
- Unit weight of existing waste = 65 pcf
- Modified primary compression index, C_c', of existing waste = 0.17 to 0.36
- Modified secondary compression index, C_α', of existing waste = 0.03 to 0.10
- Age of existing waste = 33 years
- Ending time of secondary settlement = 90 years

For our calculations, we used procedures presented in the publications presented above and geometry from cross-sections presented on the following NEI drawing:

- Appendix C, Cross Section J & O, City of Kingsville, Fig No. 2, dated 08/26/2018

The cross section is presented in Appendix C. Settlement estimates resulting from compression of the existing solid waste due to the weight of the new, overlying waste are presented in Table 6.1 below for various primary and secondary compression indices.

One-dimensional consolidation tests were performed using select samples from the soil borings completed for this study to evaluate the compressibility characteristics of the foundation soils. The results of the consolidation tests are presented in Appendix D. The calculated settlements resulting from consolidation of the foundation soils due to the weight of the overlying landfill material are on the order of magnitude of 1 foot. This consolidation settlement should be added to existing waste total settlement presented in Table 6.1 below to obtain total settlement of the solid waste and the foundation soils.

Table 6.1 - Marker-J-Section

Section	Existing Waste Thickness (feet)	New MSW Thickness (feet)	Estimated Settlement (feet) of Existing Waste					
			$C_c' = 0.17$, $C_\alpha' = 0.03$			$C_c' = 0.36$, $C_\alpha' = 0.10$		
			Primary Settlement	Secondary Settlement	Total Settlement	Primary Settlement	Secondary Settlement	Total Settlement
C	20	15	1.4	0.2	1.6	2.9	0.5	3.4
E	26	60	3.3	0.2	3.5	7.0	0.7	7.7
G	31	100	4.6	0.2	4.8	9.7	0.8	10.5
I	34	95	4.7	0.3	5.0	10.0	0.9	10.9
K	35	105	5.0	0.3	5.3	10.6	0.9	11.5
L	35	108	5.1	0.3	5.4	10.8	0.9	11.7
M	30	115	4.8	0.2	5.0	10.1	0.8	10.9

As biological decomposition of waste occurs, waste volume is reduced as the density increases, resulting in settlements of the overall landfill mass. This, in effect, will pre-compress the existing waste, reducing settlement due to placement of future waste. The magnitude of the settlement could be rather significant since it is planned that new waste will not be placed over the existing waste for another 70+ years. Site preparation will result in placement of soils in the Permit No. MSW 235 area. The additional weight of soils will surcharge the waste in this area, resulting in further pre-compression of the waste.

6.3 Reinforcement Design

The anticipated liner section to be constructed over the top of the existing waste will consist of (from bottom upwards) 24 inches of lightly compacted soil “foundation soil”, a 6-inch thickness of compacted soil “interim cover soil”, a geogrid stabilization layer, a geosynthetic clay liner (GCL), a 60 mil HDPE geomembrane, and a layer of drainage geocomposite. If the planned liner profile will be different from the assumed, TWE should be contacted so further evaluation can be made if necessary.

The geosynthetic reinforcement design uses the procedure provided in Qian, X. et.al., (2002) publication, and is based on the possible development of a void that is located immediately below the liner. The liner is assumed to bridge over the void, carrying the load from the proposed overlying waste. As commonly accepted scenario, the case of the “rusted refrigerator” is used, with the design depression having a radius of 3 feet. Other assumptions used in the design are listed below and in Tables 6.2 and 6.3.

- Design life of 50 years
- Maximum elevation of MSW on the lining system is 115 feet

Table 6.2 – Assumed Material Properties

Material	Unit Weight (pcf)	Friction Angle (deg.)	Cohesion (psf)
MSW	60	23	0
Interim Cover Soil	120	30	0

Table 6.3 – Assumed Geosynthetic Properties

Material	Yield Strain (%)
HDPE	10
GCL	8

Based on the results of the analyses, we recommend that geosynthetic reinforcement consisting of two layers of chemically resistant uniaxial geogrid placed perpendicular to each other be used. The geogrid should have a minimum design tensile strength of 2500 pounds per foot at an allowable stress of 5% or less over the 50 year design life. The geogrid should be placed on top of a minimum 6 inch thick layer of compacted soil "interim cover soil" placed between the foundation layer and the new GCL. It should be noted that the inclusion of geogrid reinforcement is intended to reduce, but not eliminate, the likelihood of failure.

7 WASTE MASS STABILITY

7.1 Background Information

We understand that the liner system for the new expansion will consist of a 6-in thick layer of compacted native soil covered by a geosynthetic clay liner (GCL). A 60 mil HDPE geomembrane will be placed on the GCL, and will be anchored within trenches at the top of slope. The geomembrane will be textured on both sides and covered by a geocomposite drainage layer.

Deep-seated stability of the waste mass was evaluated by performing two dimensional, effective stress slope stability analyses for the final, closed geometry, using the computer program SLIDE. The program performs vertical slice limit equilibrium analysis for potential mass movement along assumed failure surfaces randomly generated by the program. We assumed potential deep-seated failure of the waste material within the waste or along the top of the HDPE liner, since failure would not be expected to occur in the foundation soils due to relatively high shear strength of this material.

For analyses purposes, we used geometry from the cross-sections presented on the following NEI drawings:

- Appendix C, Cross Section Plan, City of Kingsville Landfill, Fig. No. 1, dated 08/26/2018
- Appendix C, Cross Section J & O, City of Kingsville Landfill, Fig. No. 2, dated 08/26/2018
- Appendix C, Cross Section 12 & 18, City of Kingsville Landfill, dated 08/26/2018

Copies of these sections are presented in Appendix C.

7.2 Design Parameters

Consolidated-undrained (C-U) triaxial shear tests were performed using select samples from the soil borings to evaluate long-term effective stress shear strength of the foundation soils. The results of the C-U triaxial tests are presented in Appendix E.

Laboratory tests for liner material properties were not performed as part of the current scope of services. The stability analyses are based on laboratory tests results for the foundation soils and on assumed or published strength and interface friction values for the geocomposite drainage layer and the textured HDPE membrane. It is essential that the assumed parameters be verified by specific testing prior to construction.

Due to heterogeneous nature of municipal waste, traditional in-situ testing or laboratory testing to evaluate engineering properties of the waste is not feasible. As a result, we used published and assumed estimated effective stress values of shear strength, cohesion, and unit weight for municipal solid waste for our analyses(2) (3). The engineering properties used in the analyses are presented in Table 7.1 below.

Table 7.1 – Assumed Engineering Properties

Material	Effective Friction Angle, peak ϕ' (deg)	Effective Friction Angle, LD[1] ϕ' (deg)	Unit Weight γ (pcf)	Effective Cohesion, peak, c' (psf)	Effective Cohesion, LD[1] , c' (psf)
MSW Refuse	23	22	60	250	0
Geocomposite/Textured HDPE	28	23	N/A	0	0

7.3 Analysis and Results

We analyzed both potential circular failure surfaces and potential block or sliding failure surfaces. The following assumptions were used during the analyses:

- Less than one foot of head will develop above the geocomposite drainage layer, and
- Excess pore pressure will not develop within the waste either through hydrostatic or waste gas pressure. The development of excess pore pressure could substantially reduce the factor of safety for stability.

The results of our stability analyses for peak strength parameters are presented in Table 7.2 below.

Table 7.2 – Results of Waste Mass Stability Analysis – Peak Parameters

Cross Section	Factor of Safety – Circular Failure	Factor of Safety – Block Failure
12	2.18	1.71
18	2.27	1.68
J	3.65	2.71
O	2.27	1.72

To evaluate the potential for progressive failure, we also performed stability analyses using assumed large displacement interface shear strengths. The results of these analyses are presented in Table 7.3 below.

Table 7.3 – Results of Waste Mass Stability Analysis – Large Displacement Parameters

Cross Section	Factor of Safety – Circular Failure	Factor of Safety – Block Failure
12	1.65	1.50
18	1.81	1.52
J	3.51	2.49
O	1.93	1.54

The results of the mass stability analyses are presented graphically in Appendix F.

7.4 Conclusions

The calculated factor of safety for peak shear strength conditions exceeded 1.5 for our assumed strength and unit weight parameters, the analyzed cross sections, and assumed failure geometry. In addition, the calculated factor of safety for large displacement condition exceeds 1.5, which in our judgment, and based on published information, is acceptable.

Based on our results, in our opinion, we anticipate that the planned landfill configuration should be stable, provided excess pore pressures are not generated within the waste mass or that there is no increase in piezometric head above 1 foot within the underlying liner cover material or leachate collection system. The generation of pore pressures and increase in piezometric head within the materials could substantially reduce the factor of safety and increase the risk for stability problems.

Laboratory testing using the specific HDPE liner material chosen for the project should be performed to confirm our assumed interface friction values used in our analyses. Noticeable differences between the assumed parameters and parameters determined by testing could require that additional stability analyses be performed.

8 LIMITATIONS AND DESIGN REVIEW

8.1 Limitations

This report has been prepared for the exclusive use of Naismith/Hanson Engineering and the project team for specific application to the design of the proposed City of Kingsville Municipal Solid Waste Landfill Aerial Expansion in Kleberg County, Texas. Our report has been prepared in accordance with the generally accepted geotechnical engineering practice common to the local area. No other warranty, express or implied, is made.

The analyses and recommendations contained in this report are based on the data obtained from the referenced subsurface explorations within the project site. The soil boring indicates subsurface conditions only at the specific location, time and depth penetrated. The soil borings do not necessarily reflect strata variations that could exist at other locations within the project site. The validity of our recommendations is based in part on assumptions about the stratigraphy made by the Geotechnical Engineer. Such assumptions may be confirmed only during construction of the project. Our recommendations presented in this report must be reevaluated if subsurface conditions during the construction phase are different from those described in this report.

If any changes in the nature, design or location of the project are planned, the conclusions and recommendations contained in this report should not be considered valid unless the changes are reviewed and the conclusions modified or verified in writing by TWE. TWE is not responsible for any claims, damages or liability associated with interpretation or reuse of the subsurface data or engineering analyses without the expressed written authorization of TWE.

8.2 Design Review

Review of the design and construction drawings as well as the specifications should be performed by TWE before release. The review is aimed at determining if the geotechnical design and construction recommendations contained in this report have been properly interpreted. Design review is not within the authorized scope of work for this study.

8.3 Construction Monitoring

Construction surveillance is recommended and has been assumed in preparing our recommendations. These field services are required to check for changes in conditions that may result in modifications to our recommendations. The quality of the construction practices will affect performance and should be monitored. TWE would be pleased to provide construction monitoring, testing and inspection services for the project.

8.4 Closing Remarks

We appreciate the opportunity to be of service during this phase of the project and we look forward to continuing our services during the construction phase and on future projects.

9 REFERENCES

1. Qian, X., et.al., (2002), "Geotechnical Aspects of Landfill Design and Construction," Prentice Hall

2. Eid, H.T., et.al., (2000), "Municipal Solid Waste Slope Failure I: Waste and foundation Soil Properties," *Journal of Geotechnical and Geoenvironmental Engineering*, ASCE, 126(5) PP. 397-407

3. Singh, S. and Murphy, B., "Evaluation of Stability of Sanitary Landfills," (1990), *in* Geotechnics of Waste Fill – Theory and Practice, ASTM STP 1070, Landva, A., and Knowles, G.D., eds.

APPENDIX A

SOIL BORING LOCATION PLAN
TWE DRAWING NO. 16.53.042-1

VICINITY MAP

SOIL BORING COORDINATES

BORING	DEPTH	LATITUDE	LONGITUDE
B–30	82.5'	N 27° 26' 44.0"	W 97° 49' 23.1"
B–31	67.5'	N 27° 26' 50.1"	W 97° 49' 24.3"
B–32	82.5'	N 27° 26' 48.0"	W 97° 49' 19.6"
B–33	86.0'	N 27° 26' 55.9"	W 97° 49' 11.3"
B–34	43.0'	N 27° 26' 43.4"	W 97° 49' 11.4"
B–35	72.5'	N 27° 26' 50.5"	W 97° 48' 57.2"
B–36	68.0'	N 27° 26' 56.8"	W 97° 49' 04.9"
B–37	48.0'	N 27° 26' 57.1"	W 97° 49' 17.6"
B–38	58.0'	N 27° 27' 03.8"	W 97° 49' 12.2"
B–39	68.0'	N 27° 27' 01.3"	W 97° 48' 57.3"
B–40	33.5'	N 27° 27' 10.0"	W 97° 49' 11.2"
B–41	62.5'	N 27° 27' 09.8"	W 97° 49' 17.4"

LEGEND

SYMBOL	DESCRIPTION
🔴	SOIL BORING LOCATION
🔵	PREVIOUS SOIL BORING LOCATION

Tolunay-Wong Engineers, Inc.

Boring Location Plan
MSWL Aerial Expansion
City of Kingsville Municipal Solid Waste

Drawn	*R.S.*	*08/22/2016*
Checked	*R.A.S.*	*08/22/2016*
Approved	*D.R.R.*	*11/07/2016*
Scale	*N.T.S.*	

TWE DRAWING NO. *16.53.042–1*

APPENDIX B

LOGS OF PROJECT BORINGS AND A KEY TO TERMS AND SYMBOLS USED ON BORING LOGS

TWE
Project No. 16.53.042
Report No. 12788R1

LOG OF BORING B-30

PROJECT: City of Kingsville
Municipal Solid Waste Landfill
Aerial Expansion

CLIENT: Naismith Engineering, Inc.

COORDINATES: N 27° 26' 44.0"
W 97° 49' 23.1"
SURFACE ELEVATION:
DRILLING METHOD:
Dry Augered: 0-ft. to 82.5-ft.
Wash Bored: -- to --

DEPTH (ft)	SAMPLE TYPE	SYMBOL/USCS	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (psf)	STD. PENETRATION TEST (blows/ft)	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
0			Dense to very dense tan and gray CLAYEY SAND (SC) with gypsum crystals		11/6" 23/6" 50/5"	16		42	17				37	
5			-color changes to tan with ferrous staining		34/6" 50/3"									
			-with sand partings		13/6" 50/3"									
10			▼											
					7/6" 12/6" 20/6"	35							33	
15														
			-color changes to reddish tan and light gray		6/6" 15/6" 20/6"									
20			▽											
			Very stiff to hard reddish tan and light gray FAT CLAY (CH) with gypsum crystals		10/6" 17/6" 26/6"									
25			-color changes to reddish tan and tan		10/6" 18/6" 30/6"	25		50	28				92	
			-color changes to tan and reddish brown		8/6" 11/6" 16/6"									
30														
			-color changes to tan and gray		8/6" 12/6" 18/6"									
35														

COMPLETION DEPTH:	82.5 ft
DATE BORING STARTED:	07/22/2016
DATE BORING COMPLETED:	07/23/2016
LOGGER:	J. Gonzalez
PROJECT NO.:	16.53.042

REMARKS: Free water was encounterd at an approximate depth of 21' below existing grade during drilling operations. After a 10 to 15-minute waiting period, water was at a depth of 10'-6". At the completion of the boring, the open bore-hole was backfilled with cement-bentonite grout.

Page 1 of 3

TOLUNAY-WONG ENGINEERS, INC.

LOG OF BORING B-30

PROJECT: City of Kingsville
Municipal Solid Waste Landfill
Aerial Expansion

CLIENT: Naismith Engineering, Inc.

COORDINATES: N 27° 26' 44.0"
W 97° 49' 23.1"
SURFACE ELEVATION:
DRILLING METHOD:
Dry Augered: 0-ft. to 82.5-ft.
Wash Bored: -- to --

DEPTH (ft)	SAMPLE TYPE	SYMBOL/USCS	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (psf)	STD. PENETRATION TEST (blows/ft)	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
35			Very stiff to hard reddish tan and tan FAT CLAY (CH) with gypsum crystals and ferrous stains		10/6" 17/6" 21/6"	30							90	
40			-color changes to tan and reddish brown		9/6" 14/6" 21/6"									
45					13/6" 19/6" 29/6"									
			-becomes sandy 48' to 52'		8/6" 11/6" 13/6"	30							70	
50														
			-color changes to tan and becomes slickensided	(P) 4.50+		23	100	71	51				87	
55														
				(P) 4.50+										
60				(P) 4.50+										
			-becomes sandy and color changes to tan and gray	(P) 4.50+		26	97	54	30	1.75	3		69	
65														
			-color changes to tan and reddish brown with trace calcareous nodules	(P) 3.00										
70														

COMPLETION DEPTH:	82.5 ft
DATE BORING STARTED:	07/22/2016
DATE BORING COMPLETED:	07/23/2016
LOGGER:	J. Gonzalez
PROJECT NO.:	16.53.042

REMARKS: Free water was encounterd at an approximate depth of 21' below existing grade during drilling operations. After a 10 to 15-minute waiting period, water was at a depth of 10'-6". At the completion of the boring, the open bore-hole was backfilled with cement-bentonite grout.

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TOLUNAY-WONG ENGINEERS, INC.

LOG OF BORING B-30

PROJECT: City of Kingsville
Municipal Solid Waste Landfill
Aerial Expansion

CLIENT: Naismith Engineering, Inc.

COORDINATES: N 27° 26' 44.0"
W 97° 49' 23.1"
SURFACE ELEVATION:
DRILLING METHOD:
Dry Augered: 0-ft. to 82.5-ft.
Wash Bored: -- to --

DEPTH (ft)	SAMPLE TYPE	SYMBOL/USCS	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (psf)	STD. PENETRATION TEST (blows/ft)	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
70		▨	Very stiff to hard tan and reddish brown FAT CLAY (CH) with calcareous nodules											
	☒	▒	Very dense tan CLAYEY SAND (SC) with calcareous nodules		16/6" 43/6" 50/5"	17							17	
75														
	☒	▨	Very stiff to hard tan and gray FAT CLAY (CH) with ferrous staining		10/6" 11/6" 17/6"									
80														
	■	▨	-becomes slickensided with ferrous staining	(P) 4.50+										
			Bottom @ 82.5'											
85														
90														
95														
100														
105														

COMPLETION DEPTH:	82.5 ft
DATE BORING STARTED:	07/22/2016
DATE BORING COMPLETED:	07/23/2016
LOGGER:	J. Gonzalez
PROJECT NO.:	16.53.042

REMARKS: Free water was encounterd at an approximate depth of 21' below existing grade during drilling operations. After a 10 to 15-minute waiting period, water was at a depth of 10'-6". At the completion of the boring, the open bore-hole was backfilled with cement-bentonite grout.

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TOLUNAY-WONG ENGINEERS, INC.

LOG OF BORING B-31

PROJECT: City of Kingsville
Municipal Solid Waste Landfill
Aerial Expansion

CLIENT: Naismith Engineering, Inc.

COORDINATES: N 27° 26' 50.1"
W 97° 49' 24.3"
SURFACE ELEVATION: --
DRILLING METHOD:
Dry Augered: 0-ft. to 68-ft.
Wash Bored: -- to --

DEPTH (ft)	SAMPLE TYPE	SYMBOL/USCS	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (psf)	STD. PENETRATION TEST (blows/ft)	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
0			Medium dense to very dense gray CLAYEY SAND (SC)		4/6" 5/6" 7/6"									
			-with calcareous nodules and sand pockets		10/6" 22/6" 18/6"									
5					4/6" 5/6" 6/6"	11							46	
					5/6" 6/6" 8/6"									
					6/6" 8/6" 12/6"									
10			-with cemented sand layers		8/6" 27/6" 29/6"	27							22	
			-color changes to tan		18/6" 32/6" 39/6"									
15			Very dense tan POORLY GRADED SAND with CLAY (SP-SC) and sand partings		36/6" 50/5"									
					12/6" 50/5"	15							9	
					45/6" 50/5"									
20					35/6" 50/4"									
					17/6" 26/6" 50/5"									
					17/6" 38/6" 38/6"									
			Hard reddish tan and light gray SANDY LEAN SILTY CLAY (CL-ML) with sand partings		13/6" 20/6" 31/6"	26		29	7				66	
25					23/6" 34/6" 50/4"									
					12/6" 17/6" 50/5"									
			-color changes to reddish tan and tan with ferrous stains		13/6" 32/6" 50/5"									
30					7/6" 36/6" 39/6"									
					10/6" 21/6" 36/6"									
					10/6" 18/6" 35/6"	25							62	
35														

COMPLETION DEPTH:	68 ft
DATE BORING STARTED:	07/20/2016
DATE BORING COMPLETED:	07/21/2016
LOGGER:	J. Gonzalez
PROJECT NO.:	16.53.042

REMARKS: Free water was encounterd at an approximate depth of 23' below existing grade during drilling operations. After a 10 to 15-minute waiting period, water was at a depth of 21'-6". At the completion of the boring, the open bore-hole was backfilled with cement-bentonite grout.

Page 1 of 2

TOLUNAY-WONG ENGINEERS, INC.

LOG OF BORING B-31

PROJECT: City of Kingsville
Municipal Solid Waste Landfill
Aerial Expansion

CLIENT: Naismith Engineering, Inc.

COORDINATES: N 27° 26' 50.1"
W 97° 49' 24.3"
SURFACE ELEVATION: --
DRILLING METHOD:
Dry Augered: 0-ft. to 68-ft.
Wash Bored: -- to --

DEPTH (ft)	SAMPLE TYPE	SYMBOL/USCS	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (psf)	STD. PENETRATION TEST (blows/ft)	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
35			Hard reddish tan and tan SANDY LEAN CLAY (CL) with ferrous stains and laminated sands		17/6" 25/6" 35/6" 17/6" 13/6" 19/6" 7/6" 16/6" 17/6"									
40			Very stiff to hard reddish tan and tan FAT CLAY with SAND (CH) and ferrous stains		3/6" 7/6" 10/6" 9/6" 20/6" 27/6" 5/6" 14/6" 17/6" 10/6" 18/6" 21/6" 18/6" 23/6" 30/6" 6/6" 20/6" 21/6" 9/6" 17/6" 19/6" 9/6" 18/6" 23/6" 11/6" 23/6" 26/6"	37		59	36				76	
45			-with trace gypsum crystals and ferrous stains											
						30							83	
50														
			-with calcareous nodules and ferrous stains	(P) 4.50+		32	91	83	50	4.14	2		87	
55				(P) 4.50+										
				(P) 4.50+										
				(P) 4.50+		34	87			2.88	2		83	
60			-with trace gypsum crystals and ferrous stains	(P) 4.50+										
				(P) 4.50+										
65				(P) 4.50+										
				(P) 4.50+										
			Bottom @ 68'											
70														

COMPLETION DEPTH:	68 ft
DATE BORING STARTED:	07/20/2016
DATE BORING COMPLETED:	07/21/2016
LOGGER:	J. Gonzalez
PROJECT NO.:	16.53.042

REMARKS: Free water was encounterd at an approximate depth of 23' below existing grade during drilling operations. After a 10 to 15-minute waiting period, water was at a depth of 21'-6". At the completion of the boring, the open bore-hole was backfilled with cement-bentonite grout.

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TOLUNAY-WONG ENGINEERS, INC.

LOG OF BORING B-32

PROJECT: City of Kingsville
Municipal Solid Waste Landfill
Aerial Expansion

CLIENT: Naismith Engineering, Inc.

COORDINATES: N 27° 26' 49.7"
W 97° 49' 17.0"
SURFACE ELEVATION: --
DRILLING METHOD:
Dry Augered: 0-ft. to 82.5-ft.
Wash Bored: -- to --

DEPTH (ft)	SAMPLE TYPE	SYMBOL/USCS	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (psf)	STD. PENETRATION TEST (blows/ft)	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
0	☒	▨	Stiff to hard tan and gray SANDY LEAN CLAY (CL) with gypsum crystals and trace organics		3/6" 5/6" 6/6"	9		34	18				54	
5	☒	▨			6/6" 21/6" 23/6"									
	☒	▨			11/6" 26/6" 50/3"									
10		▨												
	☒	▒	Medium dense to dense reddish tan and gray CLAYEY SAND (SC) with gypsum crystals		17/6" 50/6"	28							34	
15		▒ ▼												
	☒	▒ ▽	-color changes to tan and gray with sand partings		10/6" 17/6" 22/6"									
20		▒												
	☒	▒	-with ferrous stains		4/6" 8/6" 13/6"									
25	☒	▒	-color changes to reddish tan		10/6" 18/6" 21/6"	22		31	10				29	
	☒	▒	-color changes to reddish brown and tan		6/6" 8/6" 12/6"									
30		▒												
	☒	▒			8/6" 8/6" 12/6"									
35														

COMPLETION DEPTH:	82.5 ft
DATE BORING STARTED:	07/27/2016
DATE BORING COMPLETED:	07/28/2016
LOGGER:	J. Gonzalez
PROJECT NO.:	16.53.042

REMARKS: Free water was encounterd at an approximate depth of 18' below existing grade during drilling operations. After a 10 to 15-minute waiting period, water was at a depth of 14'-7". At the completion of the boring, the open bore-hole was backfilled with cement-bentonite grout.

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TOLUNAY-WONG ENGINEERS, INC.

LOG OF BORING B-32

PROJECT: City of Kingsville
Municipal Solid Waste Landfill
Aerial Expansion

CLIENT: Naismith Engineering, Inc.

COORDINATES: N 27° 26' 49.7"
W 97° 49' 17.0"
SURFACE ELEVATION: --
DRILLING METHOD:
Dry Augered: 0-ft. to 82.5-ft.
Wash Bored: -- to --

DEPTH (ft)	SAMPLE TYPE	SYMBOL/USCS	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (psf)	STD. PENETRATION TEST (blows/ft)	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
35		▨	Medium dense to dense reddish tan and gray CLAYEY SAND (SC) with gypsum crystals											
	■	▨	Very stiff to hard tan FAT CLAY with SAND (CH), slickensided, with calcareous nodules	(P) 4.50+		29	89						79	
40		▨												
	☒	▨	-color changes to tan and reddish brown with gypsum crystals and ferrous stains		8/6" 12/6" 15/6"									
45	■	▨	-color changes to tan, gray, and reddish brown	(P) 4.50+										
50	☒	▨	-color changes to tan and reddish brown		4/6" 9/6" 10/6"	30		73	51				82	
	■	▨		(P) 4.50+										
55		▨												
	■	▨	-color changes to tan and gray	(P) 4.50+										
60		▨												
	■	▨		(P) 4.50+		26	94			0.61	2		81	
65	■	▨	-color changes to tan, red, and brown	(P) 4.00										
	■	▨	-color changes to tan and gray	(P) 4.50+										
70														

COMPLETION DEPTH:	82.5 ft
DATE BORING STARTED:	07/27/2016
DATE BORING COMPLETED:	07/28/2016
LOGGER:	J. Gonzalez
PROJECT NO.:	16.53.042

REMARKS: Free water was encounterd at an approximate depth of 18' below existing grade during drilling operations. After a 10 to 15-minute waiting period, water was at a depth of 14'-7". At the completion of the boring, the open bore-hole was backfilled with cement-bentonite grout.

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TOLUNAY-WONG ENGINEERS, INC.

LOG OF BORING B-32

PROJECT: City of Kingsville
Municipal Solid Waste Landfill
Aerial Expansion

CLIENT: Naismith Engineering, Inc.

COORDINATES: N 27° 26' 49.7"
W 97° 49' 17.0"
SURFACE ELEVATION: --
DRILLING METHOD:
Dry Augered: 0-ft. to 82.5-ft.
Wash Bored: -- to --

DEPTH (ft)	SAMPLE TYPE	SYMBOL/USCS	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (psf)	STD. PENETRATION TEST (blows/ft)	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
70			Very stiff to hard tan and gray FAT CLAY with SAND (CH), slickensided with gypsum crystals and calcareous nodules											
			Medium dense to dense tan CLAYEY SAND (SC) with calcareous nodules	(P) 0.75		21		24	8				24	
75														
			-with gypsum crystals and ferrous stains		5/6" 10/6" 13/6"									
80														
					13/6" 20/6" 20/6"									
			Bottom @ 82.5'											
85														
90														
95														
100														
105														

COMPLETION DEPTH:	82.5 ft
DATE BORING STARTED:	07/27/2016
DATE BORING COMPLETED:	07/28/2016
LOGGER:	J. Gonzalez
PROJECT NO.:	16.53.042

REMARKS: Free water was encounterd at an approximate depth of 18' below existing grade during drilling operations. After a 10 to 15-minute waiting period, water was at a depth of 14'-7". At the completion of the boring, the open bore-hole was backfilled with cement-bentonite grout.

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TOLUNAY-WONG ENGINEERS, INC.

LOG OF BORING B-33

PROJECT: City of Kingsville
Municipal Solid Waste Landfill
Aerial Expansion

CLIENT: Naismith Engineering, Inc.

COORDINATES: N 27° 26' 55.9"
W 97° 49' 11.3"
SURFACE ELEVATION: --
DRILLING METHOD:
Dry Augered: 0-ft. to 86-ft.
Wash Bored: -- to --

DEPTH (ft)	SAMPLE TYPE	SYMBOL/USCS	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (psf)	STD. PENETRATION TEST (blows/ft)	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
0	☒		Medium dense to very dense tan CLAYEY SAND (SC) with gypsum crystals		2/6" 7/6" 9/6"									
5	☒		-color changes to dark gray and gray with trace gravel		7/6" 11/6" 9/6"	16							47	
	☒		-color changes to tan and light gray sand partings		27/6" 50/6"									
10														
	☒		-color changes to tan and white with trace caliche		50/5"									
15														
	☒		Dense to very dense tan and white POORLY GRADED SAND with SILT (SP-SM), and trace caliche		17/6" 48/6" 50/3"	11		35	8				12	
20														
	☒				17/6" 21/6" 27/6"									
25	☒		-color changes to light gray and tan with gypsum crystals and ferrous stains		15/6" 17/6" 32/6"									
		▼												
	☒		Medium dense to dense gray and white CLAYEY SAND (SC) with gypsum crystals		14/6" 22/6" 26/6"	42							20	
30														
		▽												
	☒		-color changes to tan		13/6" 21/6" 22/6"									
35														

COMPLETION DEPTH:	86 ft
DATE BORING STARTED:	08/05/2016
DATE BORING COMPLETED:	08/05/2016
LOGGER:	J. Gonzalez
PROJECT NO.:	16.53.042

REMARKS: Free water was encounterd at an approximate depth of 32'-6" below existing grade during drilling operations. After a 10 to 15-minute waiting period, water was at a depth of 28'-2". At the completion of the boring, the open bore-hole was backfilled with cement-bentonite grout.

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TOLUNAY-WONG ENGINEERS, INC.

LOG OF BORING B-33

PROJECT: City of Kingsville
Municipal Solid Waste Landfill
Aerial Expansion

CLIENT: Naismith Engineering, Inc.

COORDINATES: N 27° 26' 55.9"
W 97° 49' 11.3"
SURFACE ELEVATION: --
DRILLING METHOD:
Dry Augered: 0-ft. to 86-ft.
Wash Bored: -- to --

DEPTH (ft)	SAMPLE TYPE	SYMBOL/USCS	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (psf)	STD. PENETRATION TEST (blows/ft)	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
35			Medium dense to dense reddish tan CLAYEY SAND (SC) with gypsum crystals and ferrous stains											
	☒				6/6" 9/6" 12/6"									
40	☒		-color changes to tan and reddish tan		8/6" 16/6" 18/6"									
45	☒		Stiff to very stiff reddish tan LEAN CLAY with SAND (CL), slickensided, with ferrous stains		9/6" 12/6" 18/6"	29		43	24				79	
50	☒		-color changes to reddish tan and tan with gypsum crystals		5/6" 6/6" 9/6"									
	■		Stiff to very stiff LEAN CLAY (CL), slickensided, with ferrous stains	(P) 2.00		40	79			1.06	3		96	
55	■		-color changes to reddish brown and tan with gypsum crystals	(P) 3.50										
60	■			(P) 4.00		34	87							
65	■		Very stiff to hard tan FAT CLAY (CH), slickensided, with gypsum crystals and ferrous stains	(P) 4.50+		32	42	64	33	2.57	2		95	
70	☒		-color changes to tan and reddish brown		7/6" 12/6" 14/6"									

COMPLETION DEPTH:	86 ft
DATE BORING STARTED:	08/05/2016
DATE BORING COMPLETED:	08/05/2016
LOGGER:	J. Gonzalez
PROJECT NO.:	16.53.042

REMARKS: Free water was encounterd at an approximate depth of 32'-6" below existing grade during drilling operations. After a 10 to 15-minute waiting period, water was at a depth of 28'-2". At the completion of the boring, the open bore-hole was backfilled with cement-bentonite grout.

LOG OF BORING B-33

PROJECT: City of Kingsville
Municipal Solid Waste Landfill
Aerial Expansion

CLIENT: Naismith Engineering, Inc.

COORDINATES: N 27° 26' 55.9"
W 97° 49' 11.3"
SURFACE ELEVATION: --
DRILLING METHOD:
Dry Augered: 0-ft. to 86-ft.
Wash Bored: -- to --

DEPTH (ft)	SAMPLE TYPE	SYMBOL/USCS	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (psf)	STD. PENETRATION TEST (blows/ft)	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
70			Very stiff to hard tan and reddish brown FAT CLAY (CH), slickensided, with gypsum crystals and ferrous stains	(P) 4.50+										
			-color changes to tan and light gray											
75			-with layers of calcareous nodules		9/6" 10/6" 21/6"									
80			Very stiff to hard tan FAT CLAY with SAND (CH) with gypsum crystals and ferrous stains	(P) 4.50+		18	106			3.57	3		77	
85			-color changes to tan and white	(P) 4.50+										
			Bottom @ 86'											
90														
95														
100														
105														

COMPLETION DEPTH:	86 ft
DATE BORING STARTED:	08/05/2016
DATE BORING COMPLETED:	08/05/2016
LOGGER:	J. Gonzalez
PROJECT NO.:	16.53.042

REMARKS: Free water was encounterd at an approximate depth of 32'-6" below existing grade during drilling operations. After a 10 to 15-minute waiting period, water was at a depth of 28'-2". At the completion of the boring, the open bore-hole was backfilled with cement-bentonite grout.

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TOLUNAY-WONG ENGINEERS, INC.

LOG OF BORING B-34

PROJECT: City of Kingsville
Municipal Solid Waste Landfill
Aerial Expansion

CLIENT: Naismith Engineering, Inc.

COORDINATES: N 27° 26' 43.4"
W 97° 49' 11.4"
SURFACE ELEVATION: --
DRILLING METHOD:
Dry Augered: 0 ft. to 30 ft.
Wash Bored: 30 ft. to 43 ft.

DEPTH (ft)	SAMPLE TYPE	SYMBOL/USCS	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (psf)	STD. PENETRATION TEST (blows/ft)	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
0			Medium dense dark gray, gray, and light gray CLAYEY SAND (SC) with trace of organics		2/6" 5/6" 6/6"									
				(P) 4.50+		15	112			2.53	6		42	
5			Very stiff to hard gray and light gray SANDY LEAN SILTY CLAY (CL-ML) with calcareous nodules	(P) 4.50+		15	115	21	7				59	
				(P) 4.50+		14	114			6.13	4		62	
			-color changes to light gray											
10			-color changes to light gray and tan		4/6" 12/6" 16/6"									
			-color changes to white and light gray		11/6" 18/6" 16/6"									
			-becomes stiff		5/6" 6/6" 8/6"									
15			Medium dense to dense white and light gray SILTY SAND (SM) with calcareous nodules		4/6" 6/6" 8/6"	17		38	7				31	
			-color changes to light gray and tan with ferrous stains		4/6" 10/6" 19/6"									
					23/6" 50/5"									
20					23/6" 50/4"									
			-color changes to light gray		27/6" 35/6" 50/4"	22							25	
25					5/6" 37/6" 45/6"									
					20/6" 39/6" 37/6"									
30			▼ -becomes medium dense ▽		8/6" 12/6" 9/6"	26		39	2				28	
					4/6" 12/6" 10/6"	33							39	
					5/6" 6/6" 10/6"									
35			-color changes to tan and marine green		3/6"									

COMPLETION DEPTH:	43 ft
DATE BORING STARTED:	06/22/2016
DATE BORING COMPLETED:	06/22/2016
LOGGER:	J. Garcia
PROJECT NO.:	16.53.042

REMARKS: Free water was encounterd at an approximate depth of 31' below existing grade during drilling operations. After a 10 to 15-minute waiting period, water was at a depth of 28'-4". At the completion of the boring, the open bore-hole was backfilled with cement-bentonite grout.

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TOLUNAY-WONG ENGINEERS, INC.

LOG OF BORING B-34

PROJECT: City of Kingsville
Municipal Solid Waste Landfill
Aerial Expansion

CLIENT: Naismith Engineering, Inc.

COORDINATES: N 27° 26' 43.4"
W 97° 49' 11.4"
SURFACE ELEVATION: --
DRILLING METHOD:
Dry Augered: 0 ft. to 30 ft.
Wash Bored: 30 ft. to 43 ft.

DEPTH (ft)	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (psf)	STD. PENETRATION TEST (blows/ft)	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
35	Medium dense tan and marine green SILTY SAND (SM) with sand lenses and trace organics		8/6" 13/6"									
	Hard tan and light gray LEAN CLAY (CL)	(P) 4.50+										
		(P) 4.50+		30	91	40	17	0.93	1		91	
40		(P) 4.50+										
		(P) 4.50+										
	Bottom @ 43'											
45												
50												
55												
60												
65												
70												

COMPLETION DEPTH:	43 ft
DATE BORING STARTED:	06/22/2016
DATE BORING COMPLETED:	06/22/2016
LOGGER:	J. Garcia
PROJECT NO.:	16.53.042

REMARKS: Free water was encounterd at an approximate depth of 31' below existing grade during drilling operations. After a 10 to 15-minute waiting period, water was at a depth of 28'-4". At the completion of the boring, the open bore-hole was backfilled with cement-bentonite grout.

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TOLUNAY-WONG ENGINEERS, INC.

LOG OF BORING B-35

PROJECT: City of Kingsville
Municipal Solid Waste Landfill
Aerial Expansion

CLIENT: Naismith Engineering, Inc.

COORDINATES: N 27° 26' 50.5"
W 97° 48' 57.2"
SURFACE ELEVATION: --
DRILLING METHOD:
Dry Augered: 0-ft. to 72.5-ft.
Wash Bored: -- to --

DEPTH (ft)	SAMPLE TYPE	SYMBOL/USCS	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (psf)	STD. PENETRATION TEST (blows/ft)	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
0	☒	▨	Medium dense tan and brown CLAYEY SAND (SC) with trace caliche		5/6" 8/6" 7/6"									
5	☒	▨	-color changes to reddish brown with ferrous stains		5/6" 8/6" 5/6"	12		31	17				38	
10	■	▨	Very stiff to hard reddish tan SANDY LEAN CLAY (CL) with gypsum crystals	(P) 4.50+		14	117			2.22	3		52	
	☒	▨	-color changes to reddish tan and tan with ferrous stains		5/6" 10/6" 12/6"									
15	■	▨	-color changes to reddish tan	(P) 4.50+		17	109	42	25					
20	■	▨	-color changes to reddish tan and tan	(P) 4.50+										
25	■	▨	Medium dense to dense reddish tan and tan CLAYEY SAND (SC) with gypsum crystals and ferrous stains	(P) 4.50+		17	104			1.29	3		40	
30	☒	▨	-color changes to reddish tan		4/6" 7/6" 9/6"									
			▼											
	☒	▨	▽		8/6" 13/6" 20/6"									
35														

COMPLETION DEPTH: 72.5 ft
DATE BORING STARTED: 07/29/2016
DATE BORING COMPLETED: 07/29/2016
LOGGER: J. Gonzalez
PROJECT NO.: 16.53.042

REMARKS: Free water was encounterd at an approximate depth of 34' below existing grade during drilling operations. After a 10 to 15-minute waiting period, water was at a depth of 30'-9". At the completion of the boring, the open bore-hole was backfilled with cement-bentonite grout.

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TOLUNAY-WONG ENGINEERS, INC.

LOG OF BORING B-35

PROJECT: City of Kingsville
Municipal Solid Waste Landfill
Aerial Expansion

CLIENT: Naismith Engineering, Inc.

COORDINATES: N 27° 26' 50.5"
W 97° 48' 57.2"
SURFACE ELEVATION: --
DRILLING METHOD:
Dry Augered: 0-ft. to 72.5-ft.
Wash Bored: -- to --

DEPTH (ft)	SAMPLE TYPE	SYMBOL/USCS	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (psf)	STD. PENETRATION TEST (blows/ft)	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
35			Medium dense to dense reddish tan and tan CLAYEY SAND (SC) with gypsum crystals and ferrous stains											
			Hard tan and light gray FAT CLAY with SAND (CH), gypsum crystals, and ferrous stains		17/6" 26/6" 30/6"	25		109	72				77	
40			-color changes to tan and reddish brown		8/6" 15/6" 24/6"									
45			-with sand partings		10/6" 16/6" 16/6"									
			Stiff to hard reddish brown and tan FAT CLAY (CH) with gypsum crystals and ferrous stains		4/6" 7/6" 10/6"	34							96	
50			-becomes slickensided with sand layers	(P) 2.00										
55			-color changes to tan		4/6" 7/6" 10/6"									
60				(P) 3.75		33	89	90	67	3.88	4		89	
65				(P) 4.25										
			-color changes to tan and reddish brown	(P) 4.50+										
70														

COMPLETION DEPTH: 72.5 ft
DATE BORING STARTED: 07/29/2016
DATE BORING COMPLETED: 07/29/2016
LOGGER: J. Gonzalez
PROJECT NO.: 16.53.042

REMARKS: Free water was encounterd at an approximate depth of 34' below existing grade during drilling operations. After a 10 to 15-minute waiting period, water was at a depth of 30'-9". At the completion of the boring, the open bore-hole was backfilled with cement-bentonite grout.

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TOLUNAY-WONG ENGINEERS, INC.

LOG OF BORING B-35

PROJECT: City of Kingsville
Municipal Solid Waste Landfill
Aerial Expansion

CLIENT: Naismith Engineering, Inc.

COORDINATES: N 27° 26' 50.5"
W 97° 48' 57.2"
SURFACE ELEVATION: --
DRILLING METHOD:
Dry Augered: 0-ft. to 72.5-ft.
Wash Bored: -- to --

DEPTH (ft)	SAMPLE TYPE	SYMBOL/USCS	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (psf)	STD. PENETRATION TEST (blows/ft)	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
70	■	▨	Very stiff to hard reddish brown and tan FAT CLAY (CH), slickensided, with gypsum crystals and ferrous stains	(P) 4.50+		32	89			2.68	1		95	
			Bottom @ 72.5'											
75														
80														
85														
90														
95														
100														
105														

COMPLETION DEPTH:	72.5 ft
DATE BORING STARTED:	07/29/2016
DATE BORING COMPLETED:	07/29/2016
LOGGER:	J. Gonzalez
PROJECT NO.:	16.53.042

REMARKS: Free water was encounterd at an approximate depth of 34' below existing grade during drilling operations. After a 10 to 15-minute waiting period, water was at a depth of 30'-9". At the completion of the boring, the open bore-hole was backfilled with cement-bentonite grout.

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TOLUNAY-WONG ENGINEERS, INC.

LOG OF BORING B-36

PROJECT: City of Kingsville
Municipal Solid Waste Landfill
Aerial Expansion

CLIENT: Naismith Engineering, Inc.

COORDINATES: N 27° 26' 56.8"
W 97° 49' 04.9"
SURFACE ELEVATION: --
DRILLING METHOD:
Dry Augered: 0-ft. to 22-ft.
Wash Bored: 22-ft. to 68-ft.

DEPTH (ft)	SAMPLE TYPE	SYMBOL/USCS	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (psf)	STD. PENETRATION TEST (blows/ft)	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
0			Loose to medium dense dark gray and gray CLAYEY SAND (SC)											
			-with calcareous nodules		18/6" 20/6" 21/6"	10							36	
5														
			-color changes to light gray and tan		4/6" 5/6" 5/6"									
10														
			-color changes to tan		4/6" 5/6" 6/6"	12		47	28				44	
15					2/6" 4/6" 6/6"									
			-color changes to light gray with ferrous stains		4/6" 10/6" 14/6"									
20														
			-becomes very dense and color changes to light gray and tan		15/6" 24/6" 50/6"	25							32	
25														
					12/6" 14/6" 15/6"									
30														
			-becomes dense		5/6" 17/6" 27/6"									
35					4/6"									

COMPLETION DEPTH:	68 ft
DATE BORING STARTED:	06/24/2016
DATE BORING COMPLETED:	06/24/2016
LOGGER:	J. Garcia
PROJECT NO.:	16.53.042

REMARKS: Free water was encounterd at an approximate depth of 23' below existing grade during drilling operations. After a 10 to 15-minute waiting period, water was at a depth of 18'-3". At the completion of the boring, the open bore-hole was backfilled with cement-bentonite grout.

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TOLUNAY-WONG ENGINEERS, INC.

LOG OF BORING B-36

PROJECT: City of Kingsville
Municipal Solid Waste Landfill
Aerial Expansion

CLIENT: Naismith Engineering, Inc.

COORDINATES: N 27° 26' 56.8"
W 97° 49' 04.9"
SURFACE ELEVATION: --
DRILLING METHOD:
Dry Augered: 0-ft. to 22-ft.
Wash Bored: 22-ft. to 68-ft.

DEPTH (ft)	SAMPLE TYPE	SYMBOL/USCS	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (psf)	STD. PENETRATION TEST (blows/ft)	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
35			Medium dense light gray and tan CLAYEY SAND (SC)		7/6" 8/6"									
40			-with sand seams, calcareous nodules, and ferrous staining		6/6" 10/6" 13/6"	21		47	30				35	
			-color changes to reddish brown and light gray		4/6" 8/6" 10/6"									
45			Stiff to very stiff reddish brown and light gray FAT CLAY (CH), slickensided, with ferrous staining	(P) 4.50+										
50			-with sand seams and calcareous nodules		4/6" 6/6" 8/6"	42							96	
55			-color changes to light gray with sand layers		11/6" 12/6" 14/6"									
60			-becomes hard		11/6" 21/6" 26/6"	37		70	44				94	
					7/6" 8/6" 9/6"									
65			-color changes to brown yellow, reddish brown, and light gray		7/6" 10/6" 10/6"									
70			Bottom @ 68'											

COMPLETION DEPTH:	68 ft
DATE BORING STARTED:	06/24/2016
DATE BORING COMPLETED:	06/24/2016
LOGGER:	J. Garcia
PROJECT NO.:	16.53.042

REMARKS: Free water was encounterd at an approximate depth of 23' below existing grade during drilling operations. After a 10 to 15-minute waiting period, water was at a depth of 18'-3". At the completion of the boring, the open bore-hole was backfilled with cement-bentonite grout.

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TOLUNAY-WONG ENGINEERS, INC.

LOG OF BORING B-37

PROJECT: City of Kingsville
Municipal Solid Waste Landfill
Aerial Expansion

CLIENT: Naismith Engineering, Inc.

COORDINATES: N 27° 26' 57.1"
W 97° 49' 17.6"
SURFACE ELEVATION: --
DRILLING METHOD:
Dry Augered: 0-ft. to 12-ft.
Wash Bored: 12-ft. to 48-ft.

DEPTH (ft)	SAMPLE TYPE	SYMBOL/USCS	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (psf)	STD. PENETRATION TEST (blows/ft)	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
0			Very dense light gray and tan SILTY SAND (SM)											
			-with ferrous staining		6/6" 16/6" 50/5"									
5														
					11/6" 50/5"	20		33	9				20	
10			-with calcareous nodules		23/6" 37/6" 50/6"									
15			Very stiff to hard tan and light tan SANDY LEAN SILTY CLAY (CL-ML)		6/6" 7/6" 10/6"	31							52	
			-color changes to tan and light gray with ferrous staining		9/6" 17/6" 27/6"									
20														
					7/6" 12/6" 13/6"									
25														
			Stiff to very stiff reddish brown and light gray FAT CLAY (CH) with calcareous nodules and ferrous staining		4/6" 5/6" 9/6"	33		56	39				99	
30			-color changes to light gray with sand layers		5/6" 7/6" 12/6"									
35					5/6"	34							86	

COMPLETION DEPTH: 48 ft
DATE BORING STARTED: 06/24/2016
DATE BORING COMPLETED: 06/25/2016
LOGGER: J. Garcia
PROJECT NO.: 16.53.042

REMARKS: Free water was encounterd at an approximate depth of 15' below existing grade during drilling operations. After a 10 to 15-minute waiting period, water was at a depth of 9'-3". At the completion of the boring, the open bore-hole was backfilled with cement-bentonite grout.

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TOLUNAY-WONG ENGINEERS, INC.

LOG OF BORING B-37

PROJECT: City of Kingsville
Municipal Solid Waste Landfill
Aerial Expansion

CLIENT: Naismith Engineering, Inc.

COORDINATES: N 27° 26' 57.1"
W 97° 49' 17.6"
SURFACE ELEVATION: --
DRILLING METHOD:
Dry Augered: 0-ft. to 12-ft.
Wash Bored: 12-ft. to 48-ft.

DEPTH (ft)	SAMPLE TYPE	SYMBOL/USCS	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (psf)	STD. PENETRATION TEST (blows/ft)	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
35			Stiff to very stiff light gray and brownish tan FAT CLAY (CH) with sand seams, calcareous nodules, and ferrous staining		7/6" 12/6"									
40					4/6" 5/6" 7/6"									
			-color changes to light gray and reddish brown		6/6" 6/6" 9/6"									
45														
			-color changes to light gray		4/6" 5/6" 9/6"	35		80	51				86	
			Bottom @ 48'											
50														
55														
60														
65														
70														

COMPLETION DEPTH:	48 ft
DATE BORING STARTED:	06/24/2016
DATE BORING COMPLETED:	06/25/2016
LOGGER:	J. Garcia
PROJECT NO.:	16.53.042

REMARKS: Free water was encounterd at an approximate depth of 15' below existing grade during drilling operations. After a 10 to 15-minute waiting period, water was at a depth of 9'-3". At the completion of the boring, the open bore-hole was backfilled with cement-bentonite grout.

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TOLUNAY-WONG ENGINEERS, INC.

LOG OF BORING B-38

PROJECT: City of Kingsville
Municipal Solid Waste Landfill
Aerial Expansion

CLIENT: Naismith Engineering, Inc.

COORDINATES: N 27° 27' 03.76"
W 97° 49' 12.19"
SURFACE ELEVATION: --
DRILLING METHOD:
Dry Augered: 0 ft. to 10 ft.
Wash Bored: 10 ft. to 58 ft.

DEPTH (ft)	SAMPLE TYPE	SYMBOL/USCS	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (psf)	STD. PENETRATION TEST (blows/ft)	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
0			Very stiff to hard light gray SANDY FAT CLAY (CH) with ferrous stains and trace calcareous nodules		10/6" 18/6" 31/6"	17		50	19				55	
					20/6" 45/6" 50/4"									
5					3/6" 33/6" 50/5"									
					12/6" 27/6" 37/6"									
					17/6" 36/6" 50/3"	30							66	
10					18/6" 35/6" 50/3"									
					13/6" 33/6" 50/2"									
15			-color changes to light gray and tan		8/6" 14/6" 20/6"									
					7/6" 12/6" 19/6"									
					6/6" 10/6" 14/6"	28		60	40				57	
20					6/6" 11/6" 15/6"									
			-becomes stiff		5/6" 7/6" 8/6"									
25					6/6" 8/6" 13/6"									
					4/6" 9/6" 9/6"									
				(P) 4.50+		25	92	47	29					
30				(P) 4.50+										
			-color changes to brown and light gray and becomes stiff with sand layers		4/6" 5/6" 8/6"									
35					9/6"									

COMPLETION DEPTH:	58 ft
DATE BORING STARTED:	06/23/2016
DATE BORING COMPLETED:	06/23/2016
LOGGER:	J. Garcia
PROJECT NO.:	16.53.042

REMARKS: Free water was encounterd at an approximate depth of 11' below existing grade during drilling operations. After a 10 to 15-minute waiting period, water was at a depth of 5'-5". At the completion of the boring, the open bore-hole was backfilled with cement-bentonite grout.

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TOLUNAY-WONG ENGINEERS, INC.

LOG OF BORING B-38

PROJECT: City of Kingsville
Municipal Solid Waste Landfill
Aerial Expansion

CLIENT: Naismith Engineering, Inc.

COORDINATES: N 27° 27' 03.76"
W 97° 49' 12.19"
SURFACE ELEVATION: --
DRILLING METHOD:
Dry Augered: 0 ft. to 10 ft.
Wash Bored: 10 ft. to 58 ft.

DEPTH (ft)	SAMPLE TYPE	SYMBOL/USCS	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (psf)	STD. PENETRATION TEST (blows/ft)	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
35			Very stiff to hard reddish brown and light gray SANDY FAT CLAY (CH) with sand seams and layers	(P) 4.50+	8/6" 10/6"									
			Stiff to hard light gray FAT CLAY (CH), slickensided, with calcareous nodules and ferrous stains	(P) 4.50+		42	78	100	72	2.95	2		93	
40			-color changes to reddish brown and light gray	(P) 4.50+										
				(P) 4.50+										
45			-color changes to tannish brown and light gray with trace organics	(P) 4.50+										
			-color changes to light gray		5/6" 6/6" 8/6"									
				(P) 4.50+		30	91			2.14	3		87	
50														
					6/6" 7/6" 7/6"									
					4/6" 5/6" 8/6"									
55			-color changes to tannish brown and light gray		5/6" 7/6" 9/6"									
			-color changes to light gray		6/6" 7/6" 9/6"									
			Bottom @ 58'											
60														
65														
70														

COMPLETION DEPTH:	58 ft
DATE BORING STARTED:	06/23/2016
DATE BORING COMPLETED:	06/23/2016
LOGGER:	J. Garcia
PROJECT NO.:	16.53.042

REMARKS: Free water was encounterd at an approximate depth of 11' below existing grade during drilling operations. After a 10 to 15-minute waiting period, water was at a depth of 5'-5". At the completion of the boring, the open bore-hole was backfilled with cement-bentonite grout.

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TOLUNAY-WONG ENGINEERS, INC.

LOG OF BORING B-39

PROJECT: City of Kingsville
Municipal Solid Waste Landfill
Aerial Expansion

CLIENT: Naismith Engineering, Inc.

COORDINATES: N 27° 27' 01.3"
W 97° 48' 57.3"
SURFACE ELEVATION: --
DRILLING METHOD:
Dry Augered: 0 ft. to 26 ft.
Wash Bored: 26 ft. to 68 ft.

DEPTH (ft)	SAMPLE TYPE	SYMBOL/USCS	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (psf)	STD. PENETRATION TEST (blows/ft)	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
0			Medium dense to dense tan and light gray CLAYEY SAND FILL with trace gravel		8/6" 9/6" 6/6"	18							33	
			-color changes to brown		40/6" 27/6" 19/6"									
5			Medium dense to dense brown and reddish brown CLAYEY SAND (SC)		6/6" 7/6" 8/6"									
			-color changes to tan and gray with calcareous nodules		4/6" 5/6" 6/6"									
					5/6" 6/6" 8/6"	11		36	20				49	
10			-color changes to tan and light gray		4/6" 6/6" 7/6"									
			-color changes to light gray		7/6" 8/6" 11/6"									
15			-color changes to light gray and tan with ferrous stains		6/6" 12/6" 19/6"									
			-color changes to light gray		11/6" 19/6" 22/6"									
			Stiff to hard light gray SANDY LEAN CLAY (CL) with calcareous nodules and ferrous stains		3/6" 4/6" 5/6"	19							65	
20					6/6" 9/6" 13/6"									
					8/6" 11/6" 20/6"									
25			-color changes to light tan and light gray	(P) 4.50+										
			▼ -color changes to light gray	(P) 4.00										
			▽											
					7/6" 11/6" 13/6"									
30			-color changes to light gray and tan	(P) 4.50+		19	102			1.14	7		50	
					12/6" 16/6" 20/6"									
35					8/6"									

COMPLETION DEPTH:	68 ft
DATE BORING STARTED:	06/20/2016
DATE BORING COMPLETED:	06/24/2016
LOGGER:	J. Garcia
PROJECT NO.:	16.53.042

REMARKS: Free water was encounterd at an approximate depth of 27' below existing grade during drilling operations. After a 10 to 15-minute waiting period, water was at a depth of 26'-6". At the completion of the boring, the open bore-hole was backfilled with cement-bentonite grout.

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TOLUNAY-WONG ENGINEERS, INC.

LOG OF BORING B-39

PROJECT: City of Kingsville
Municipal Solid Waste Landfill
Aerial Expansion

CLIENT: Naismith Engineering, Inc.

COORDINATES: N 27° 27' 01.3"
W 97° 48' 57.3"
SURFACE ELEVATION: --
DRILLING METHOD:
Dry Augered: 0 ft. to 26 ft.
Wash Bored: 26 ft. to 68 ft.

DEPTH (ft)	SAMPLE TYPE	SYMBOL/USCS	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (psf)	STD. PENETRATION TEST (blows/ft)	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
35	☒	▨	Stiff to hard light gray and tan SANDY LEAN CLAY (CL) with ferrous stains		12/6" 16/6"									
	☒	▨	Medium dense to dense light gray CLAYEY SAND (SC) with ferrous stains		7/6" 8/6" 11/6"									
40	☒	▨			6/6" 11/6" 12/6"									
	☒	▨			7/6" 10/6" 13/6"	25		69	51				45	
	☒	▨			13/6" 19/6" 21/6"									
45	☒	▨	Dense light gray POORLY GRADED SAND with CLAY (SP- SC)		12/6" 21/6" 20/6"									
	☒	▨			11/6" 16/6" 16/6"									
	■	▨	Hard reddish brown and light gray FAT CLAY with SAND (CH)	(P) 4.50+										
50	■	▨		(P) 4.50+		28	93			0.85	1		72	
	■	▨	-becomes slickensided with calcareous nodules	(P) 4.50+										
	■	▨	-with ferrous stains	(P) 4.50+										
55	■	▨		(P) 4.50+										
	■	▨		(P) 4.50+										
60	■	▨		(P) 4.50+										
	☒	▨	-becomes stiff		7/6" 7/6" 7/6"									
65		▨												
	☒	▨	Medium dense light gray CLAYEY SAND (SC) with calcareous nodules and ferrous stains		6/6" 10/6" 13/6"	20	102	61	45	1.91	5		46	
			Bottom @ 68'											
70														

COMPLETION DEPTH:	68 ft
DATE BORING STARTED:	06/20/2016
DATE BORING COMPLETED:	06/24/2016
LOGGER:	J. Garcia
PROJECT NO.:	16.53.042

REMARKS: Free water was encounterd at an approximate depth of 27' below existing grade during drilling operations. After a 10 to 15-minute waiting period, water was at a depth of 26'-6". At the completion of the boring, the open bore-hole was backfilled with cement-bentonite grout.

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TOLUNAY-WONG ENGINEERS, INC.

LOG OF BORING B-40

PROJECT: City of Kingsville
Municipal Solid Waste Landfill
Aerial Expansion

CLIENT: Naismith Engineering, Inc.

COORDINATES: N 27° 27' 09.97"
W 97° 49' 11.18"
SURFACE ELEVATION: --
DRILLING METHOD:
Dry Augered: 0 ft. to 22 ft.
Wash Bored: 22 ft. to 33.75 ft.

DEPTH (ft)	SAMPLE TYPE	SYMBOL/USCS	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (psf)	STD. PENETRATION TEST (blows/ft)	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
0			Loose to very dense light gray and gray SILTY SAND (SM) with trace caliche		4/6" 4/6" 6/6"									
			-color changes to light gray and tan with ferrous stains		5/6" 7/6" 11/6"	16		35	10				31	
5					7/6" 17/6" 17/6"									
			-color changes to light gray with calcareous nodules		12/6" 21/6" 34/6"									
10			-color changes to light gray and white		12/6" 27/6" 50/3"	18							34	
			-color changes to white		15/6" 50/3"									
			-color changes to light gray and white		25/6" 50/4"									
15			Hard light gray FAT CLAY with SAND (CH), calcareous nodules, and ferrous stains		7/6" 26/6" 50/5"	22		70	41				80	
					5/6" 17/6" 28/6"									
20		▼ ▽			10/6" 30/6" 35/6"									
			Hard light gray SANDY FAT CLAY (CH) with calcareous nodules and ferrous stains		9/6" 25/6" 35/6"	31							59	
					16/6" 32/6" 50/5"									
25					16/6" 31/6" 50/5"									
			Dense to very dense light gray CLAYEY SAND (SC) with calcareous nodules		8/6" 18/6" 27/6"	30		53	32				49	
30					6/6" 18/6" 50/6"									
					6/6" 20/6" 50/5"									
					3/6" 40/6" 50/3"	16							30	
35			Bottom @ 33.5'											

COMPLETION DEPTH:	33.5 ft
DATE BORING STARTED:	06/21/2016
DATE BORING COMPLETED:	06/22/2016
LOGGER:	J. Garcia
PROJECT NO.:	16.53.042

REMARKS: Free water was encounterd at an approximate depth of 21' below existing grade during drilling operations. After a 10 to 15-minute waiting period, water was at a depth of 19'. At the completion of the boring, the open bore-hole was backfilled with cement-bentonite grout.

Page 1 of 1

TOLUNAY-WONG ENGINEERS, INC.

LOG OF BORING B-41

PROJECT: City of Kingsville
Municipal Solid Waste Landfill
Aerial Expansion

CLIENT: Naismith Engineering, Inc.

COORDINATES: N 27° 27' 09.8"
W 97° 49' 17.4"
SURFACE ELEVATION: --
DRILLING METHOD:
Dry Augered: 0-ft. to 62.5-ft.
Wash Bored: -- to --

DEPTH (ft)	SAMPLE TYPE	SYMBOL/USCS	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (psf)	STD. PENETRATION TEST (blows/ft)	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
0	☒		Loose to medium dense gray CLAYEY SAND (SC) with calcareous nodules		4/6" 5/6" 5/6"	8							35	
5	☒		-color changes to light gray		4/6" 5/6" 6/6"									
10	☒		Stiff to very stiff gray SANDY FAT CLAY (CH)		5/6" 8/6" 11/6"	20		78	52				64	
	☒		-becomes hard and color changes to brown with interbedded sand seams		9/6" 17/6" 25/6"									
15														
	☒		-color changes to brown and tan		7/6" 12/6" 14/6"									
		▼ ▽												
20	☒		-color changes to tan with sand layers		3/6" 4/6" 6/6"	36							64	
25	☒		-color changes to brown with sand partings		5/6" 4/6" 6/6"									
30	☒		-color changes to brown and tan		6/6" 7/6" 8/6"	31		52	30				51	
35	☒				4/6" 6/6" 6/6"									

COMPLETION DEPTH:	62.5 ft
DATE BORING STARTED:	07/20/2016
DATE BORING COMPLETED:	07/20/2016
LOGGER:	M. Anderson
PROJECT NO.:	16.53.042

REMARKS: Free water was encounterd at an approximate depth of 19'-6" below existing grade during drilling operations. After a 10 to 15-minute waiting period, water was at a depth of 19'-3". At the completion of the boring, the open bore-hole was backfilled with cement-bentonite grout.

Page 1 of 2

TOLUNAY-WONG ENGINEERS, INC.

LOG OF BORING B-41

PROJECT: City of Kingsville
Municipal Solid Waste Landfill
Aerial Expansion

CLIENT: Naismith Engineering, Inc.

COORDINATES: N 27° 27' 09.8"
W 97° 49' 17.4"
SURFACE ELEVATION: --
DRILLING METHOD:
Dry Augered: 0-ft. to 62.5-ft.
Wash Bored: -- to --

DEPTH (ft)	SAMPLE TYPE	SYMBOL/USCS	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (psf)	STD. PENETRATION TEST (blows/ft)	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
35			Stiff to very stiff gray SANDY FAT CLAY (CH)											
			Very stiff brown FAT CLAY with SAND (CH)	(P) 3.25		27	92						77	
40														
			-color changes to brown and tan		6/6" 13/6" 11/6"									
45					4/6" 9/6" 14/6"									
					6/6" 8/6" 9/6"	35		97	75				84	
50														
			-color changes to brown and gray		7/6" 9/6" 12/6"									
55														
			-color changes to gray	(P) 4.50+										
60														
				(P) 3.50										
			Bottom @ 62.5'											
65														
70														

COMPLETION DEPTH:	62.5 ft
DATE BORING STARTED:	07/20/2016
DATE BORING COMPLETED:	07/20/2016
LOGGER:	M. Anderson
PROJECT NO.:	16.53.042

REMARKS: Free water was encounterd at an approximate depth of 19'-6" below existing grade during drilling operations. After a 10 to 15-minute waiting period, water was at a depth of 19'-3". At the completion of the boring, the open bore-hole was backfilled with cement-bentonite grout.

Page 2 of 2

TOLUNAY-WONG ENGINEERS, INC.

KEY TO SYMBOLS AND TERMS USED ON BORING LOGS FOR SOIL

Most Common Unified Soil Classifications System Symbols

- ▨ Lean Clay (CL)
- ▨ Lean Clay w/ Sand (CL)
- ▨ Sandy Lean Clay (CL)
- ▨ Fat Clay (CH)
- ▨ Fat Clay w/ Sand (CH)
- ▨ Sandy Fat Clay (CH)
- ▨ Silty Clay (CL-ML)
- ▨ Sandy Silty Clay (CL-ML)
- ▨ Silty Clayey Sand (SC-SM)
- ▨ Clayey Sand (SC)
- ▥ Sandy Silt (ML)
- ▥ Silty Sand (SM)
- ▥ Silt w/ Sand (ML)
- ⬚ Well Graded Sand (SW)
- ⬚ Well Graded Sand w/ Gravel (SW-GM)
- ⬚ Poorly Graded Sand (SP)
- ⬚ Poorly Graded Sand w/ Silt (SP-SM)
- ▥ Silt (ML)
- ▥ Elastic Silt (MH)
- ▥ Elastic Silt w/ Sand (MH-SP)
- ⬚ Silty Gravel (GM)
- ⬚ Clayey Gravel (GC)
- ⬚ Well Graded Gravel (GW)
- ⬚ Well Graded Gravel w/ Sand (SP-GM)
- ⬚ Poorly Graded Gravel (GP)
- ▒ Peat

Miscellaneous Materials

- ⬚ Fill
- ⬚ Concrete
- ■ Asphalt and/or Base

Sampler Symbols	**Meaning**
▯	Pavement core
▮	Thin - walled tube sample
⊠	Standard Penetration Test (SPT)
◩	Auger sample
▯	Sampling attempt with no recovery
⧗	TxDOT Cone Penetrometer Test

Field Test Data

2.50	Pocket penetrometer reading in tons per square foot
(T)1.13	Torvane Measurement in tons per square foot
8/6"	Blow count per 6 - in. interval of the Standard Penetration Test
▽	Observed free water during drilling
▼	Observed static water level

Laboratory Test Data

Wc (%)	Moisture content in percent
Dens. (pcf)	Dry unit weight in pounds per cubic foot
Qu (tsf)	Unconfined compressive strength in tons per square foot
UU (tsf)	Compressive strength under confining pressure in tons per square foot
Str. (%)	Strain at failure in percent
LL	Liquid Limit in percent
PI	Plasticity Index
#200 (%)	Percent passing the No. 200 mesh sieve
( )	Confining pressure in pounds per square inch
*	Slickensided failure
**	Did not fail @ 15% strain

RELATIVE DENSITY OF COHESIONLESS & SEMI-COHESIONLESS SOILS

The following descriptive terms for relative density apply to cohesionless soils such as gravels, silty sands, and sands as well as semi-cohesive and semi-cohesionless soils such as sandy silts, and clayey sands.

Relative Density	Typical N_{60} Value Range*
Very Loose	0-4
Loose	5-10
Medium Dense	11-30
Dense	31-50
Very Dense	Over 50

* N_{60} is the number of blows from a 140-lb weight having a free fall of 30-in. required to penetrate the final 12-in. of an 18-in. sample interval, corrected for field procedure to an average energy ratio of 60% (Terzaghi, Peck, and Mesri, 1996).

CONSISTENCY OF COHESIVE SOILS

The following descriptive terms for consistency apply to cohesive soils such as clays, sandy clays, and silty clays.

Typical Compressive Strength (tsf)	Consistency	Typical SPT "N_{60}" Value Range**
$q_u < 0.25$	Very soft	≤ 2
$0.25 \le q_u < 0.50$	Soft	3-4
$0.50 \le q_u < 1.00$	Firm	5-8
$1.00 \le q_u < 2.00$	Stiff	9-15
$2.00 \le q_u < 4.00$	Very Stiff	16-30
$q_u \ge 4.00$	Hard	≥ 31

** An "N_{60}" value of 31 or greater corresponds to a hard consistency. The correlation of consistency with a typical SPT "N_{60}" value range is approximate.

Tolunay-Wong Engineers, Inc.

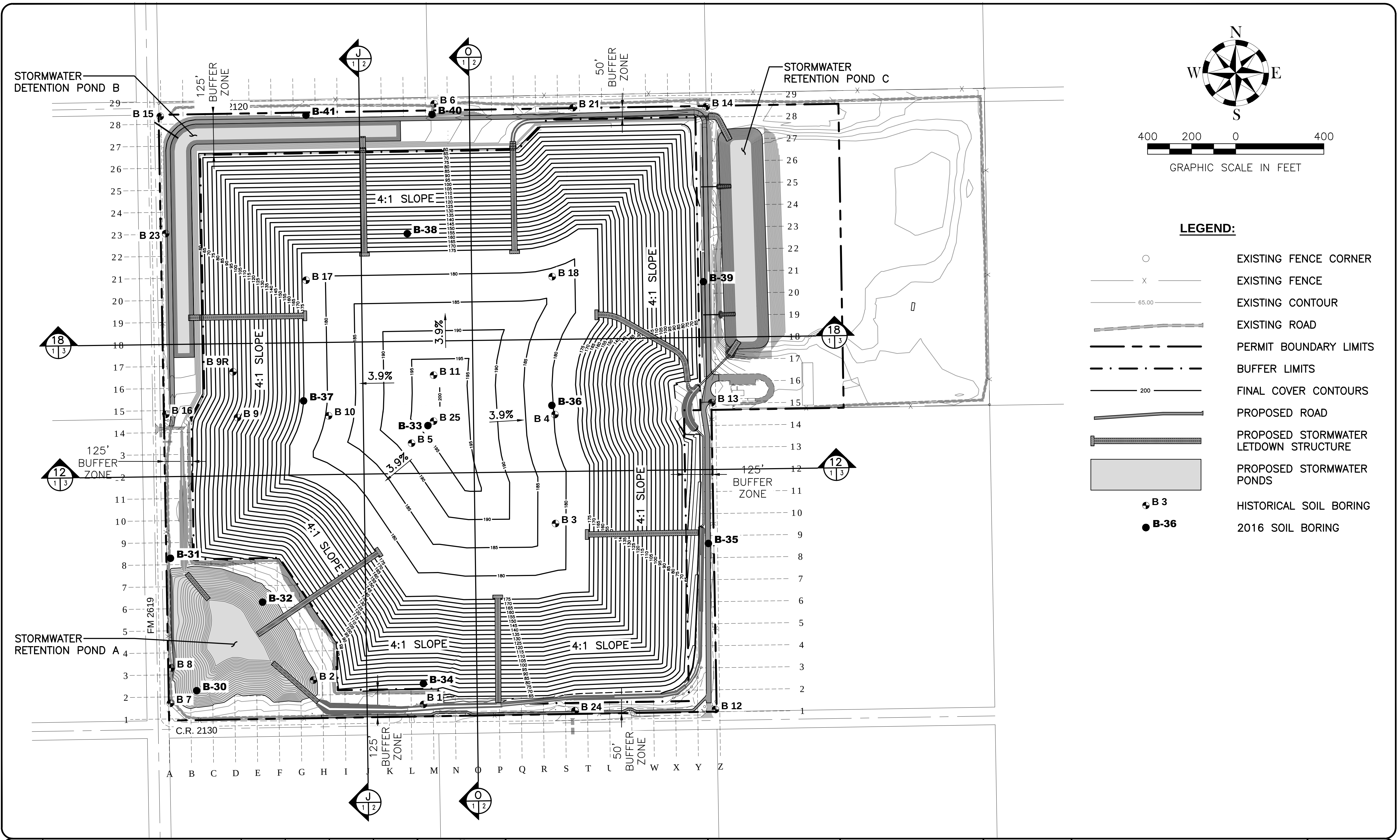
REVISION DATE 1-5-12
GEOSYSTEM

APPENDIX C

CROSS SECTION PLAN, CROSS SECTION J & O, CROSS SECTION 12 & 18

TWE
Project No. 16.53.042
Report No. 12788R1

FOR PERMIT PURPOSES ONLY



NUMBER	REVISION	DATE	DRAWN	DESIGNED	REVIEWED

STATE OF TEXAS
JON M. REINHARD
64541
LICENSED
PROFESSIONAL ENGINEER
08/27/18

Hanson No. 16L0438
Filename
Scale AS SHOWN
Date 08/27/2018

LAYOUT	DT	08/27/2018
DRAWN	DT	08/27/2018
REVIEWED	JMR	08/27/2018

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APPENDIX C
CROSS SECTION PLAN
CITY OF KINGSVILLE LANDFILL
MSW PERMIT No. 235-C
KINGSVILLE, TEXAS
KLEBERG COUNTY, TEXAS

FIGURE:
1

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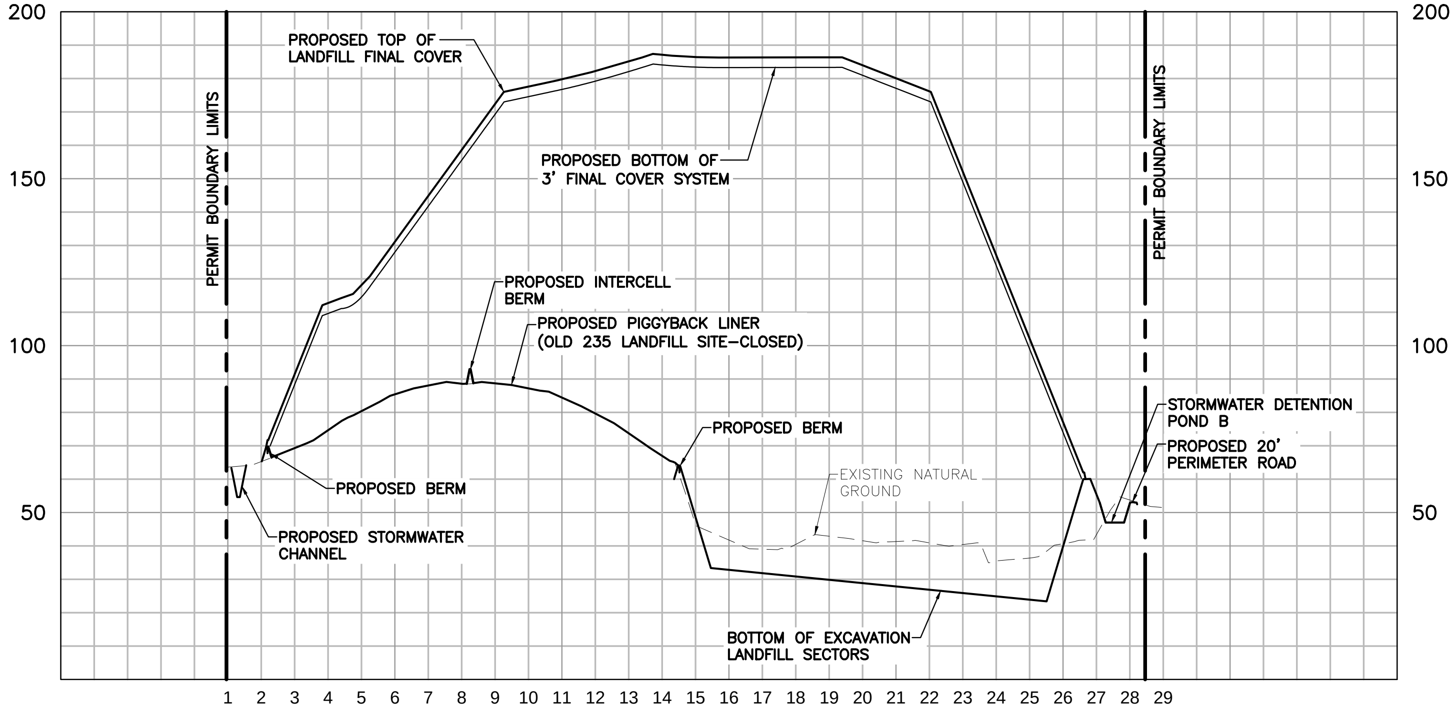

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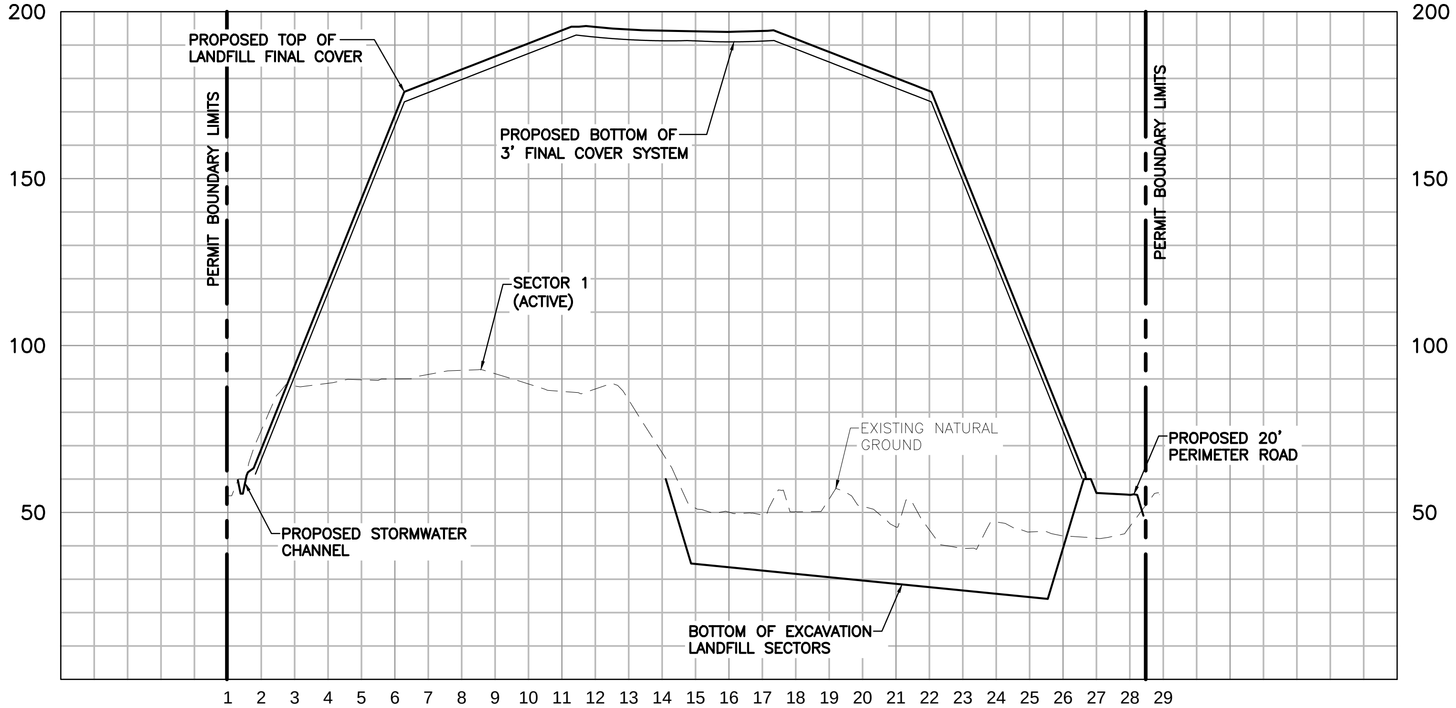

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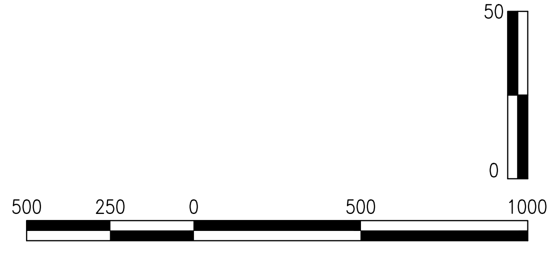

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NUMBER	REVISION	DATE	DRAWN	DESIGNED	REVIEWED

JON M. REINHARD
64541
08/27/18

Hanson No. 16L0438
Filename
Scale AS SHOWN
Date 08/27/2018

LAYOUT	DT	08/27/2018
DRAWN	DT	08/27/2018
REVIEWED	JMR	08/27/2018

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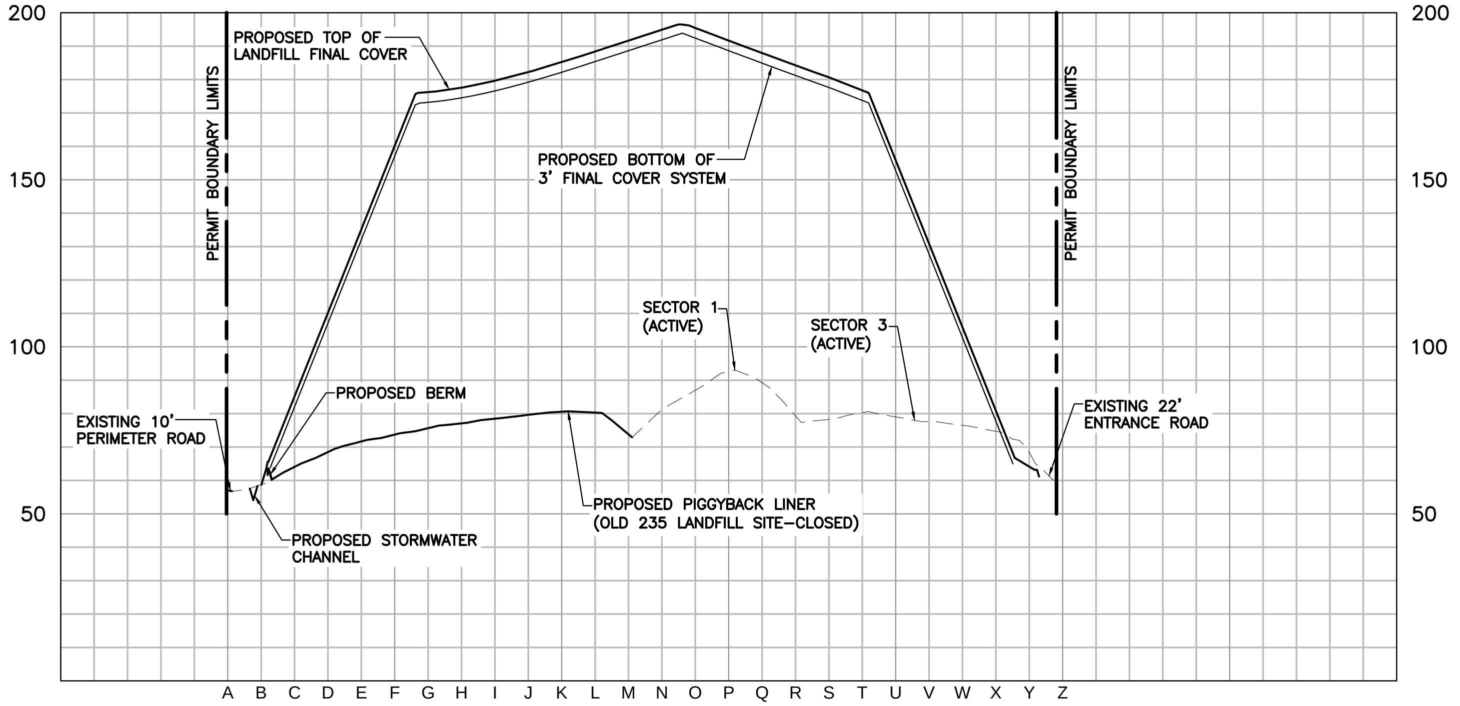
APPENDIX C
CROSS SECTION J & O
CITY OF KINGSVILLE LANDFILL
MSW PERMIT No. 235-C
KINGSVILLE, TEXAS
KLEBERG COUNTY, TEXAS

FIGURE:
2

FOR PERMIT PURPOSES ONLY



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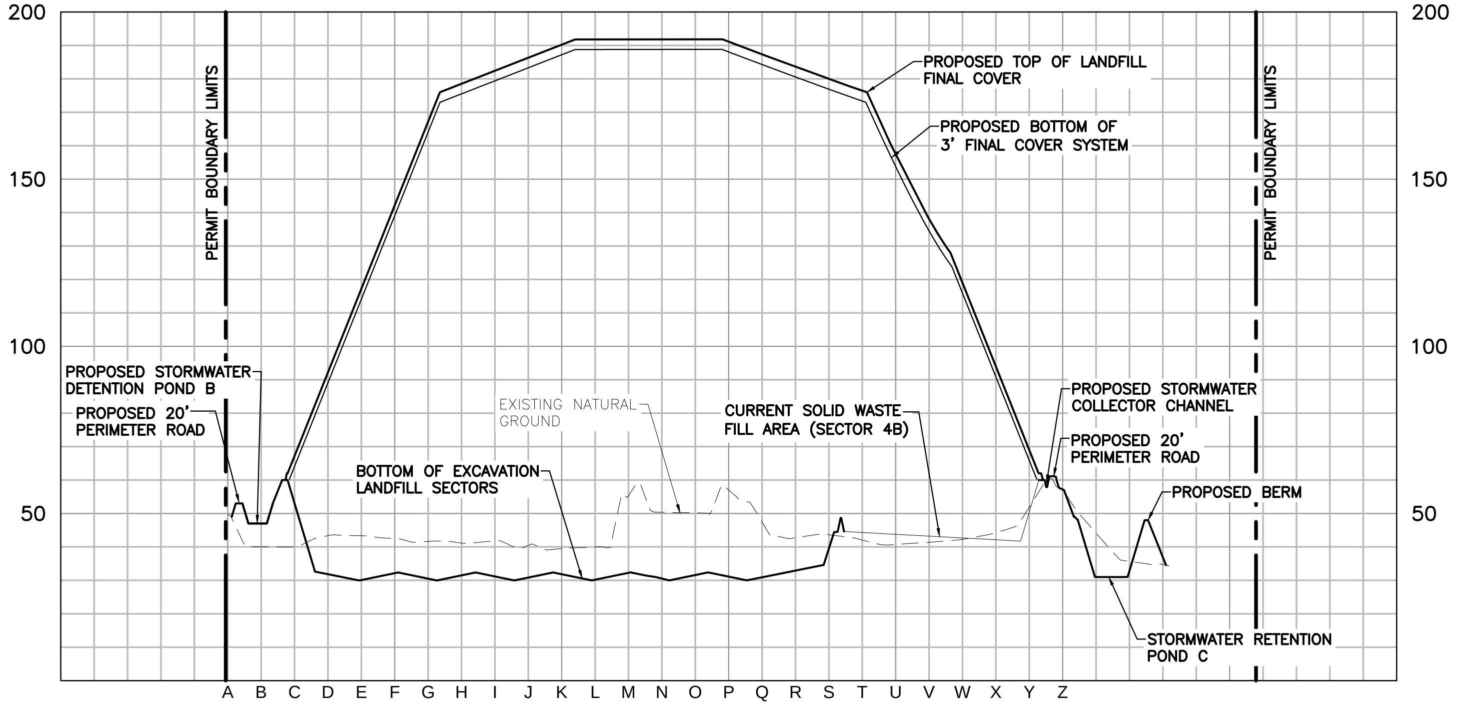

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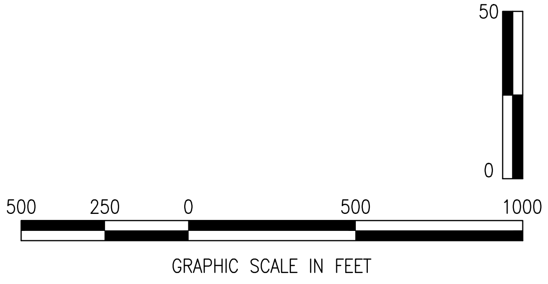

NUMBER	REVISION	DATE	DRAWN	DESIGNED	REVIEWED

JON M. REINHARD
64541
08/27/18

Hanson No. 16L0438
Filename
Scale AS SHOWN
Date 08/27/2018

LAYOUT	DT	08/27/2018
DRAWN	DT	08/27/2018
REVIEWED	JMR	08/27/2018

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APPENDIX C
CROSS SECTION 12 & 18
CITY OF KINGSVILLE LANDFILL
MSW PERMIT No. 235-C
KINGSVILLE, TEXAS
KLEBERG COUNTY, TEXAS

FIGURE:
3

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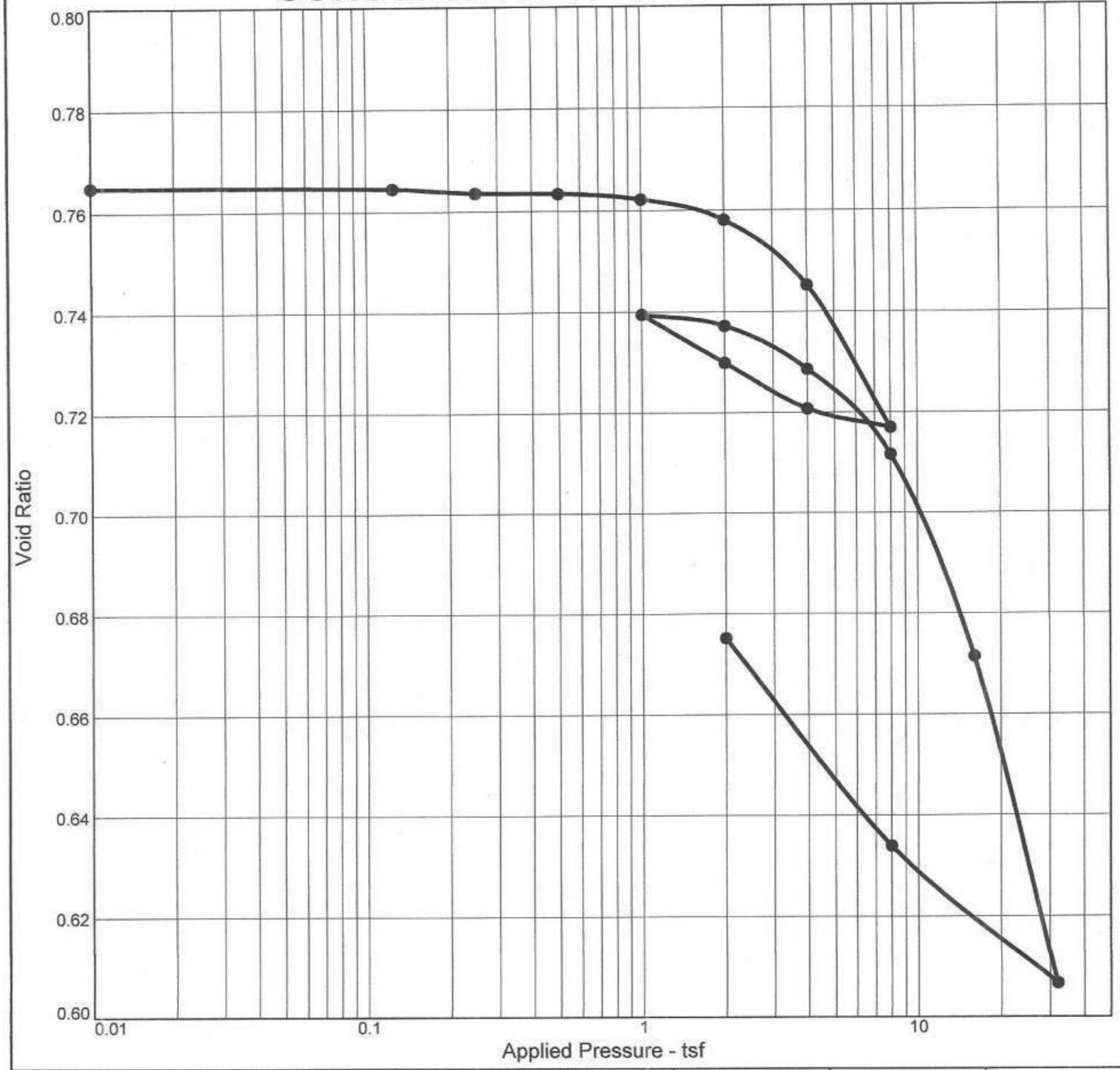
APPENDIX D

ONE-DIMENSIONAL CONSOLIDATION TESTS RESULTS

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	USCS	AASHTO	Initial Void Ratio
Saturation	Moisture							
94.1 %	26.7 %	95.5			2.70	CH		0.765

MATERIAL DESCRIPTION

Light gray and tan FAT CLAY with SAND

Project No. 16.53.042 **Client:** TWE-Corpus Christi

Project: Geotechnical Lab Testing

Source of Sample: B-30 **Depth:** 65-66

Tolunay-Wong Engineers, Inc.

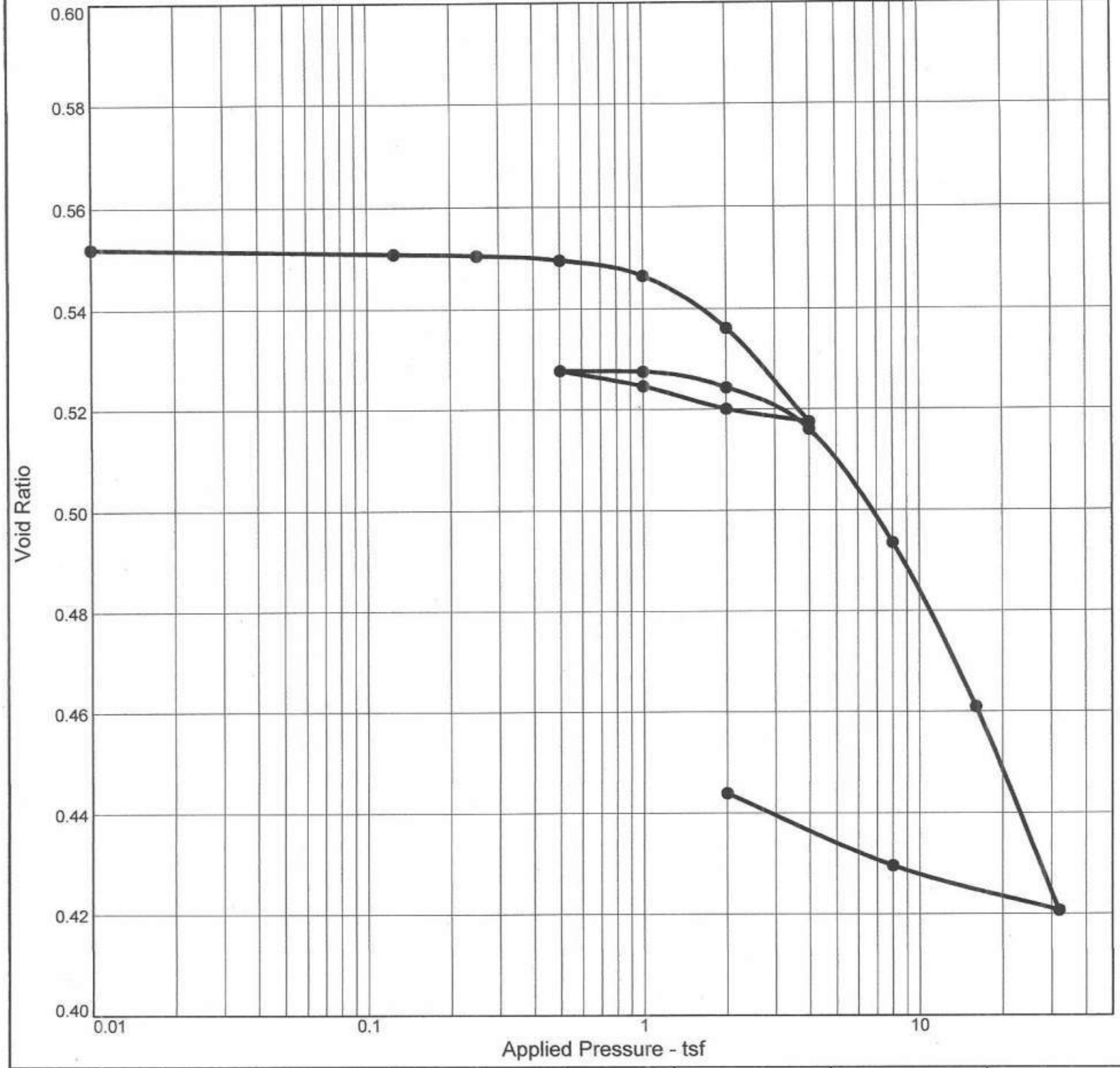
Houston, Texas

Remarks:

Test method: ASTM D 2435
Specific gravity: Assumed

Figure

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	USCS	AASHTO	Initial Void Ratio
Saturation	Moisture							
84.1 %	17.2 %	108.6	42	25	2.70	CL		0.552

MATERIAL DESCRIPTION

Tan SANDY LEAN CLAY

Project No. 16.53.042 **Client:** TWE-Corpus Christi
Project: Geotechnical Lab Testing

Source of Sample: B-35 **Depth:** 16-18

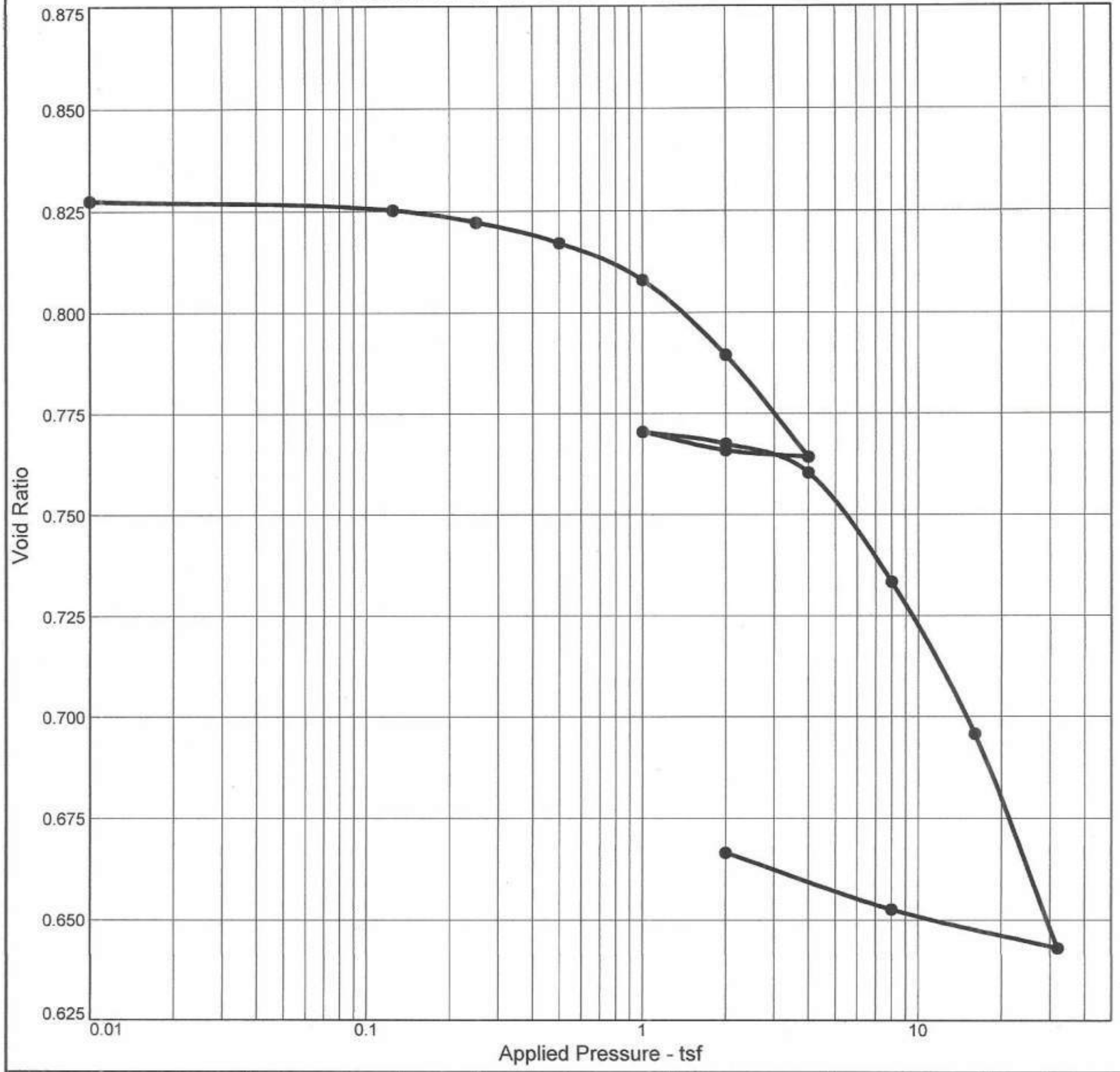
Remarks:
Test method: ASTM D 2435
Specific gravity: Assumed

Tolunay-Wong Engineers, Inc.

Houston, Texas

Figure

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	USCS	AASHTO	Initial Void Ratio
Saturation	Moisture							
80.1 %	24.6 %	92.2	47	29	2.70	SC		0.827

MATERIAL DESCRIPTION

Tan and light gray CLAYEY SAND

Project No. 16.53.042 **Client:** TWE-Corpus Christi
Project: Geotechnical Lab Testing

Source of Sample: B-38 **Depth:** 28-30

Tolunay-Wong Engineers, Inc.

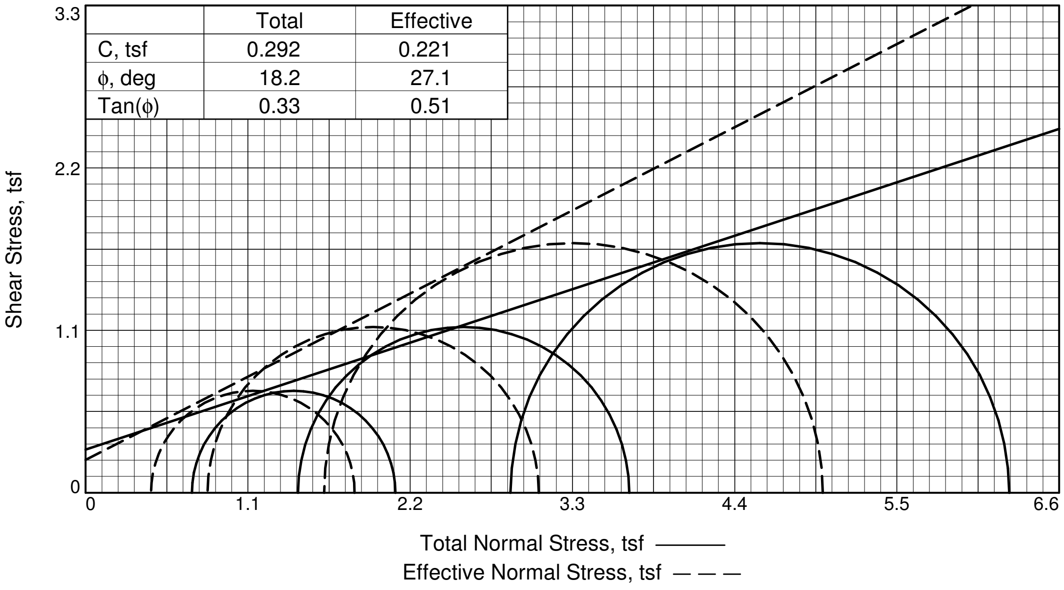
Houston, Texas

Remarks:
Test method: ASTM D 2435
Specific gravity: Assumed

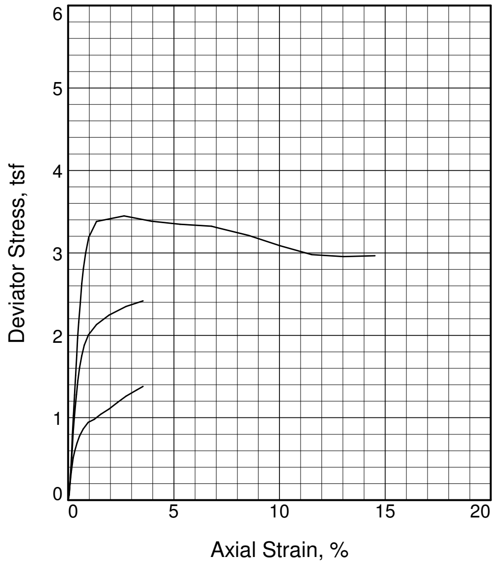
Figure

APPENDIX E

CONSOLIDATED-UNDRAINED TRIAXIAL SHEAR TESTS RESULTS



	Total	Effective
C, tsf	0.292	0.221
ϕ, deg	18.2	27.1
Tan(ϕ)	0.33	0.51



Sample No.		1	2	3
Initial	Water Content, %	28.3	28.3	28.3
	Dry Density, pcf	88.5	88.5	88.5
	Saturation, %	84.6	84.6	84.6
	Void Ratio	0.9043	0.9043	0.9043
	Diameter, in.	2.06	2.06	2.06
	Height, in.	4.17	4.17	4.17
At Test	Water Content, %	26.8	26.8	26.8
	Dry Density, pcf	97.7	97.7	97.7
	Saturation, %	100.0	100.0	100.0
	Void Ratio	0.7246	0.7246	0.7246
	Diameter, in.	1.96	1.99	2.02
	Height, in.	4.17	4.05	3.94
Strain rate, %/min.		0.01	0.01	0.01
Eff. Cell Pressure, psi		10.00	20.00	40.00
Fail. Stress, tsf		1.38	2.24	3.38
Excess Pore Pr., tsf		0.28	0.61	1.26
Strain, %		3.5	1.9	1.3
Ult. Stress, tsf		1.38	2.42	3.45
Excess Pore Pr., tsf		0.28	0.50	1.21
Strain, %		3.5	3.5	2.6
$\overline{\sigma}_1$ Failure, tsf		1.82	3.07	5.00
$\overline{\sigma}_3$ Failure, tsf		0.44	0.83	1.62

Type of Test:
CU with Pore Pressures

Sample Type: Undisturbed

Description: Light gray and tan FAT CLAY with little calcareous nodules

Assumed Specific Gravity= 2.70

Remarks:

Test method: ASTM D 4767

Failure type: Slickensided

Client: TWE-Corpus Christi

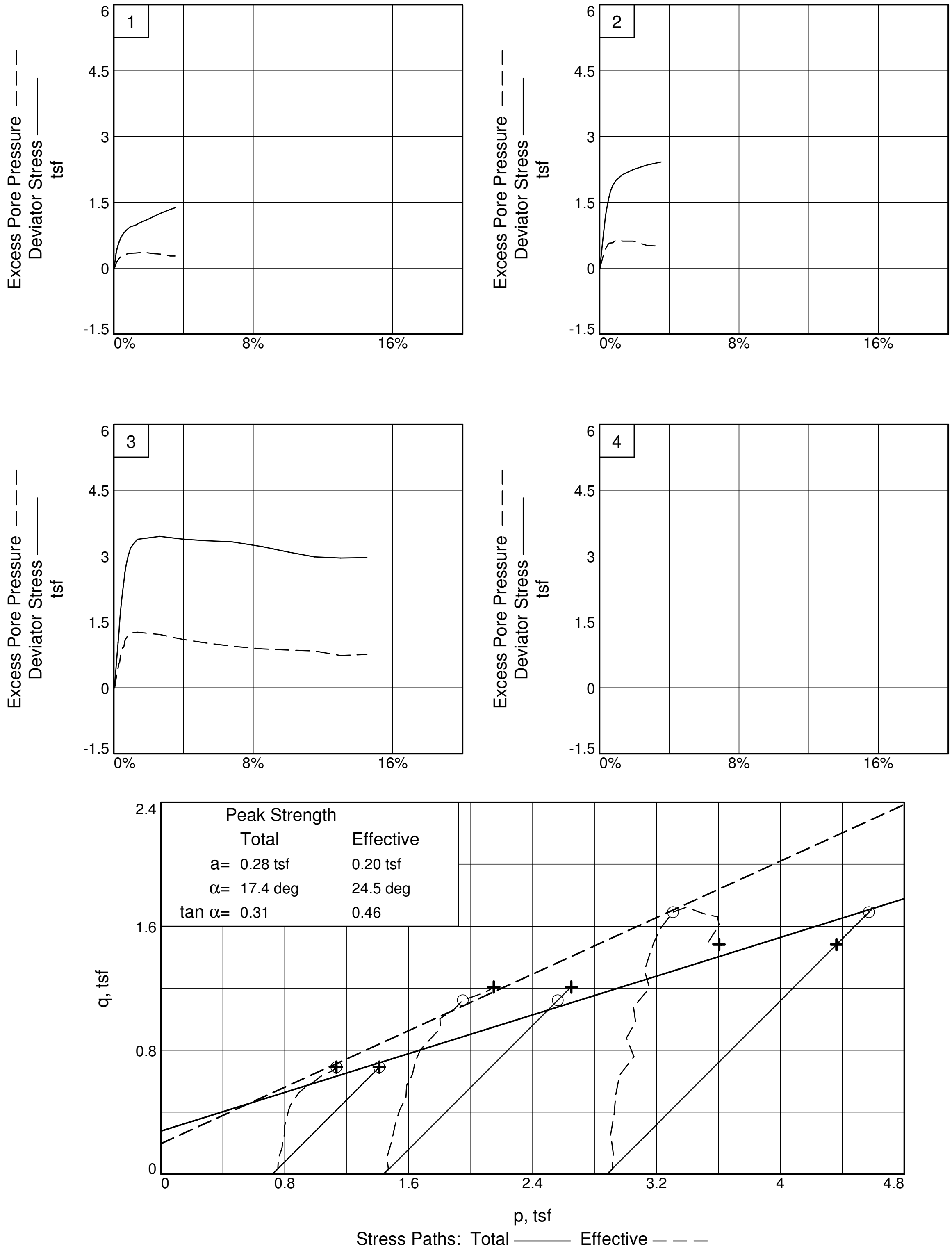
Project: Geotechnical Lab Testing

Source of Sample: B-30 **Depth:** 52'-54'

Proj. No.: 16.53.042 **Date Sampled:** 8/25/16

TRIAXIAL SHEAR TEST REPORT
Tolunay-Wong Engineers, Inc.
Houston, Texas

Pg 1 of 2



Peak Strength

	Total	Effective
a=	0.28 tsf	0.20 tsf
α=	17.4 deg	24.5 deg
tan α=	0.31	0.46

Client: TWE-Corpus Christi

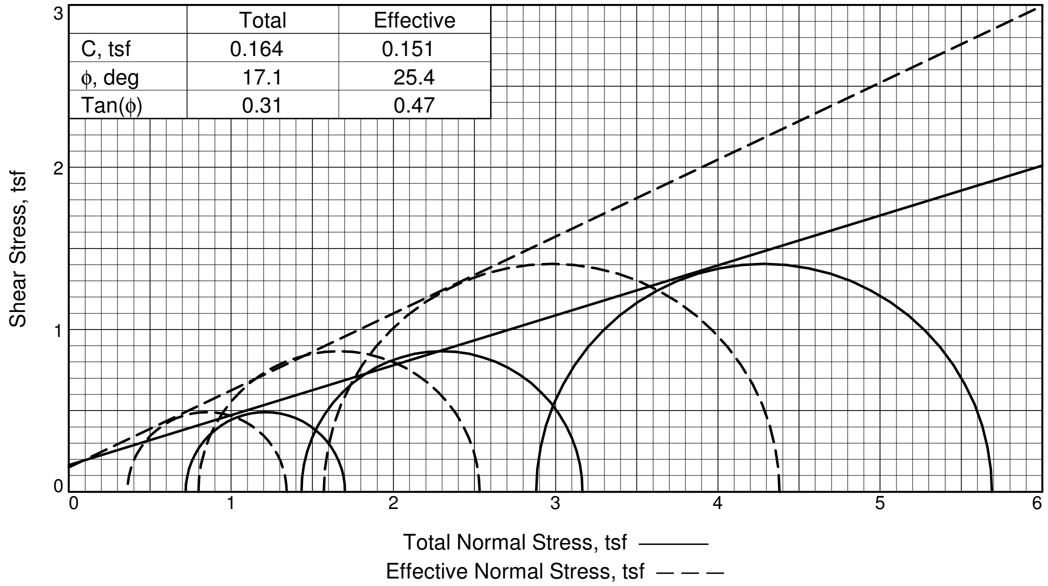
Project: Geotechnical Lab Testing

Source of Sample: B-30 **Depth:** 52'-54'

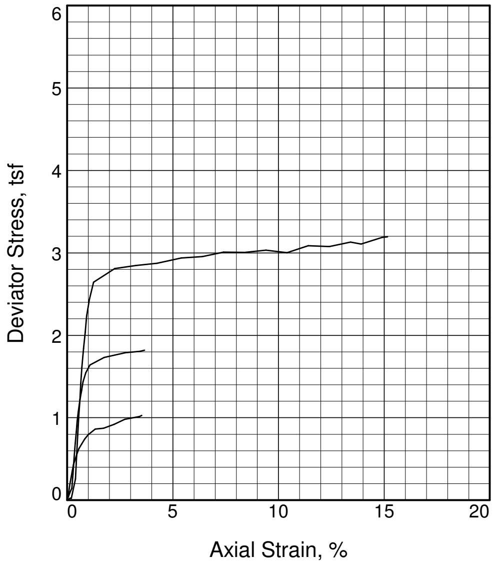
Project No.: 16.53.042

Pg 2 of 2

TOLUNAY-WONG ENGINEERS, INC.



	Total	Effective
C, tsf	0.164	0.151
ϕ, deg	17.1	25.4
Tan(ϕ)	0.31	0.47



	Sample No.	1	2	3
Initial	Water Content, %	31.2	31.2	31.2
	Dry Density, pcf	86.6	86.6	86.6
	Saturation, %	89.0	89.0	89.0
	Void Ratio	0.9473	0.9473	0.9473
	Diameter, in.	2.87	2.87	2.87
	Height, in.	5.59	5.59	5.59
At Test	Water Content, %	33.8	33.8	33.8
	Dry Density, pcf	88.1	88.1	88.1
	Saturation, %	100.0	100.0	100.0
	Void Ratio	0.9136	0.9136	0.9136
	Diameter, in.	2.85	2.90	2.94
	Height, in.	5.58	5.40	5.23
	Strain rate, %/min.	0.01	0.01	0.01
	Eff. Cell Pressure, psi	10.00	19.90	40.00
	Fail. Stress, tsf	0.98	1.73	2.81
	Excess Pore Pr., tsf	0.36	0.63	1.31
	Strain, %	2.7	1.8	2.2
	Ult. Stress, tsf	1.03	1.82	3.19
	Excess Pore Pr., tsf	0.33	0.57	0.87
	Strain, %	3.5	3.7	15.2
	$\overline{\sigma}_1$ Failure, tsf	1.34	2.53	4.38
	$\overline{\sigma}_3$ Failure, tsf	0.36	0.80	1.57

Type of Test:
CU with Pore Pressures

Sample Type: Undisturbed

Description: Light gray and reddish-brown FAT CLAY with few calcareous nodules

Assumed Specific Gravity= 2.70

Remarks:

Test method: ASTM D 4767

Failure type: Slickensided

Figure Pg 1 of 2

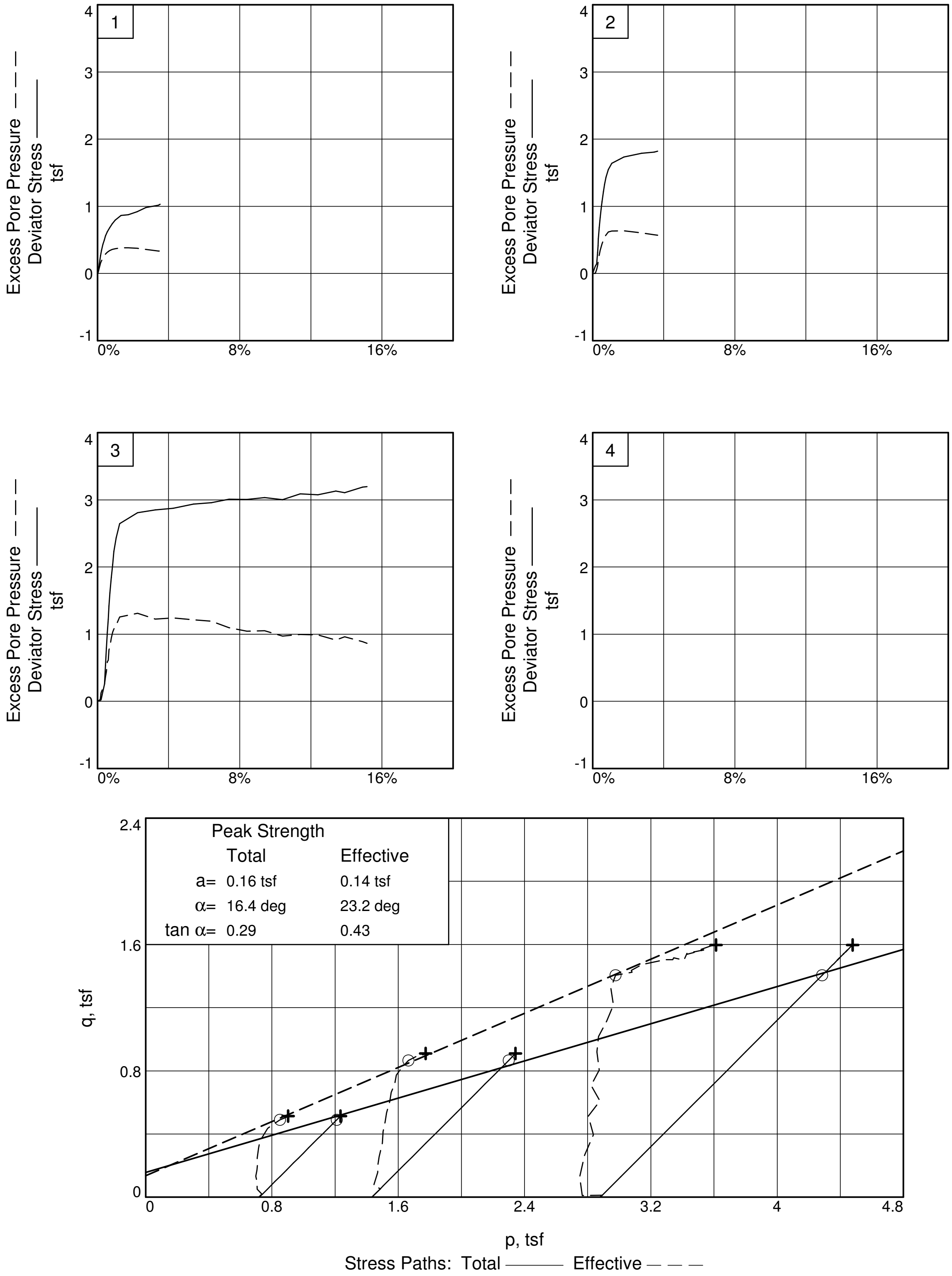
Client: TWE-Corpus Christi

Project: Geotechnical Lab Testing

Source of Sample: B-32 **Depth:** 45'-47'

Proj. No.: 16.53.042 **Date Sampled:** 8/26/16

TRIAXIAL SHEAR TEST REPORT
Tolunay-Wong Engineers, Inc.
Houston, Texas



Peak Strength

	Total	Effective
a=	0.16 tsf	0.14 tsf
α=	16.4 deg	23.2 deg
tan α=	0.29	0.43

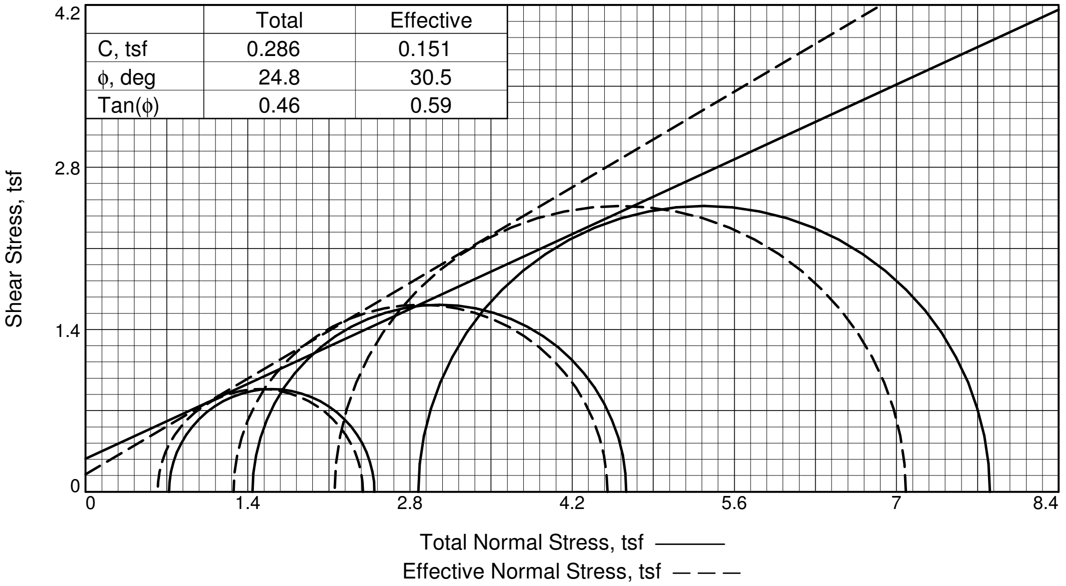
Client: TWE-Corpus Christi

Project: Geotechnical Lab Testing

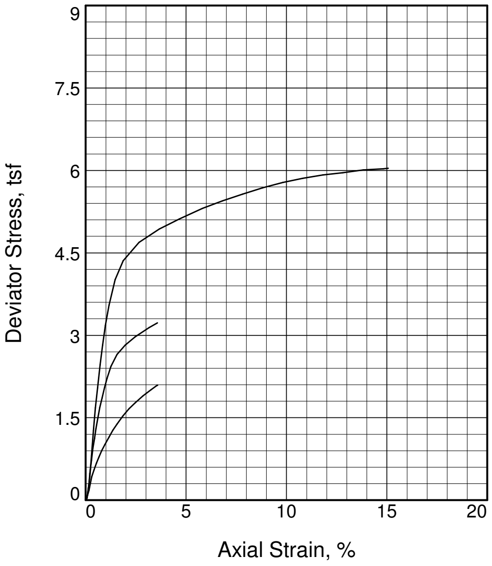
Source of Sample: B-32 **Depth:** 45'-47'

Project No.: 16.53.042 **Figure** Pg 2 of 2

TOLUNAY-WONG ENGINEERS, INC.



	Total	Effective
C, tsf	0.286	0.151
ϕ, deg	24.8	30.5
Tan(ϕ)	0.46	0.59



	Sample No.	1	2	3
Initial	Water Content, %	13.6	13.6	13.6
	Dry Density, pcf	114.1	114.1	114.1
	Saturation, %	76.8	76.8	76.8
	Void Ratio	0.4771	0.4771	0.4771
	Diameter, in.	2.87	2.87	2.87
	Height, in.	5.56	5.56	5.56
At Test	Water Content, %	15.2	15.2	15.2
	Dry Density, pcf	119.5	119.5	119.5
	Saturation, %	100.0	100.0	100.0
	Void Ratio	0.4100	0.4100	0.4100
	Diameter, in.	2.81	2.87	2.92
	Height, in.	5.55	5.32	5.12
	Strain rate, %/min.	0.01	0.01	0.01
	Eff. Cell Pressure, psi	10.00	20.00	39.90
	Fail. Stress, tsf	1.77	3.23	4.93
	Excess Pore Pr., tsf	0.10	0.16	0.72
	Strain, %	2.5	3.6	3.7
	Ult. Stress, tsf	2.09	3.23	6.04
	Excess Pore Pr., tsf	-0.02	0.16	0.04
	Strain, %	3.6	3.6	15.1
	$\overline{\sigma}_1$ Failure, tsf	2.39	4.50	7.08
	$\overline{\sigma}_3$ Failure, tsf	0.62	1.28	2.15

Type of Test:
CU with Pore Pressures

Sample Type: Undisturbed

Description: Light gray and tan SANDY LEAN CLAY

LL= 36 **PL=** 16 **PI=** 20

Assumed Specific Gravity= 2.70

Remarks:
Test method: ASTM D 4767
Failure type: Bulge

Pg 1 of 2

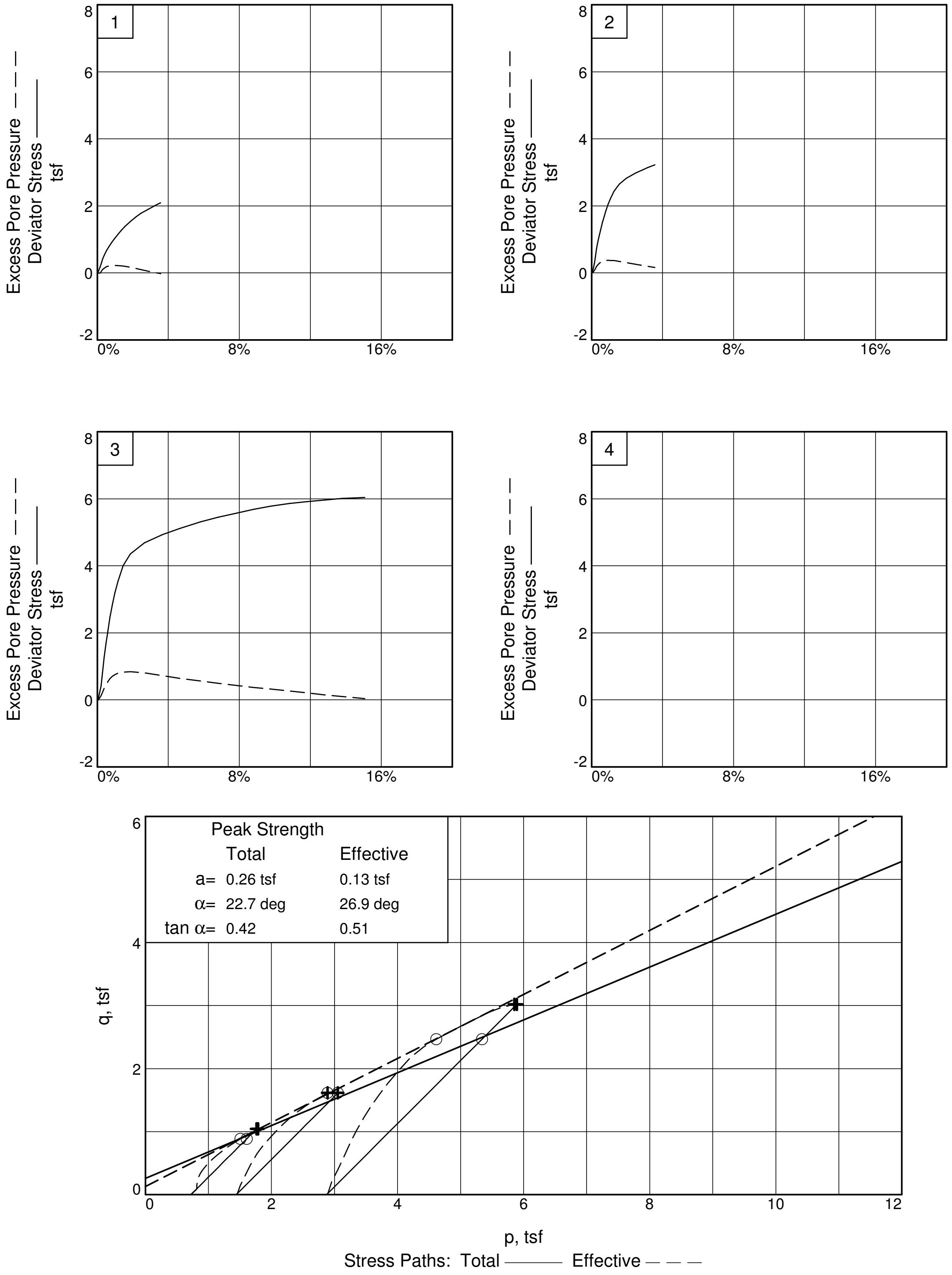
Client: TWE-Corpus Christi

Project: Geotechnical Lab Testing

Source of Sample: B-35 **Depth:** 8'-10'

Proj. No.: 16.53.042 **Date Sampled:** 8/25/16

TRIAXIAL SHEAR TEST REPORT
Tolunay-Wong Engineers, Inc.
Houston, Texas



Client: TWE-Corpus Christi

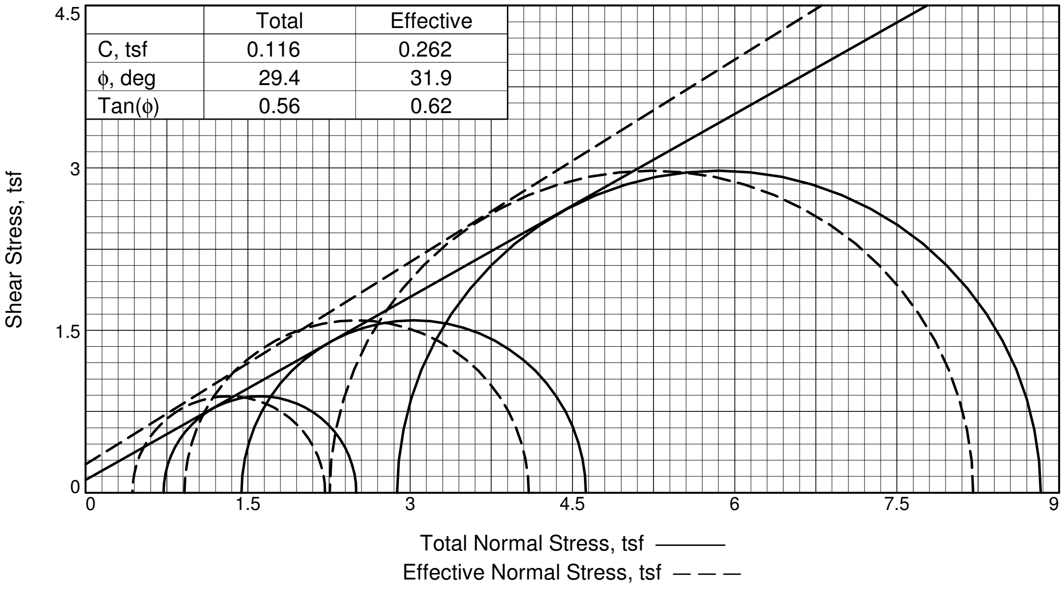
Project: Geotechnical Lab Testing

Source of Sample: B-35 **Depth:** 8'-10'

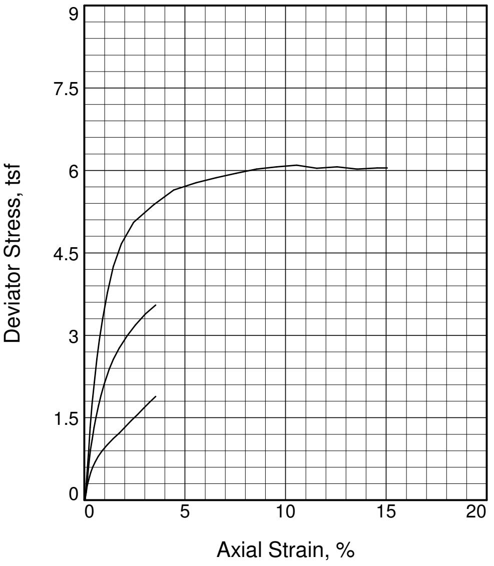
Project No.: 16.53.042

Pg 2 of 2

TOLUNAY-WONG ENGINEERS, INC.



	Total	Effective
C, tsf	0.116	0.262
φ, deg	29.4	31.9
Tan(φ)	0.56	0.62



	Sample No.	1	2	3
Initial	Water Content, %	20.7	20.7	20.7
	Dry Density, pcf	103.5	103.5	103.5
	Saturation, %	89.1	89.1	89.1
	Void Ratio	0.6282	0.6282	0.6282
	Diameter, in.	2.82	2.82	2.82
	Height, in.	5.58	5.58	5.58
At Test	Water Content, %	20.4	20.4	20.4
	Dry Density, pcf	108.6	108.6	108.6
	Saturation, %	100.0	100.0	100.0
	Void Ratio	0.5518	0.5518	0.5518
	Diameter, in.	2.77	2.81	2.84
	Height, in.	5.50	5.37	5.25
	Strain rate, %/min.	0.01	0.01	0.01
	Eff. Cell Pressure, psi	10.00	20.00	40.00
	Fail. Stress, tsf	1.78	3.18	5.95
	Excess Pore Pr., tsf	0.29	0.53	0.62
	Strain, %	3.2	2.5	7.5
	Ult. Stress, tsf	1.89	3.55	6.09
	Excess Pore Pr., tsf	0.26	0.40	0.49
	Strain, %	3.5	3.5	10.6
	$\bar{\sigma}_1$ Failure, tsf	2.21	4.10	8.20
	$\bar{\sigma}_3$ Failure, tsf	0.43	0.91	2.26

Type of Test:
CU with Pore Pressures

Sample Type: Undisturbed

Description: Light gray and tan SANDY FAT CLAY

LL= 52 **PL=** 19 **PI=** 33

Assumed Specific Gravity= 2.70

Remarks:

Test method: ASTM D 4767

Failure type: Bulge

Pg 1 of 2

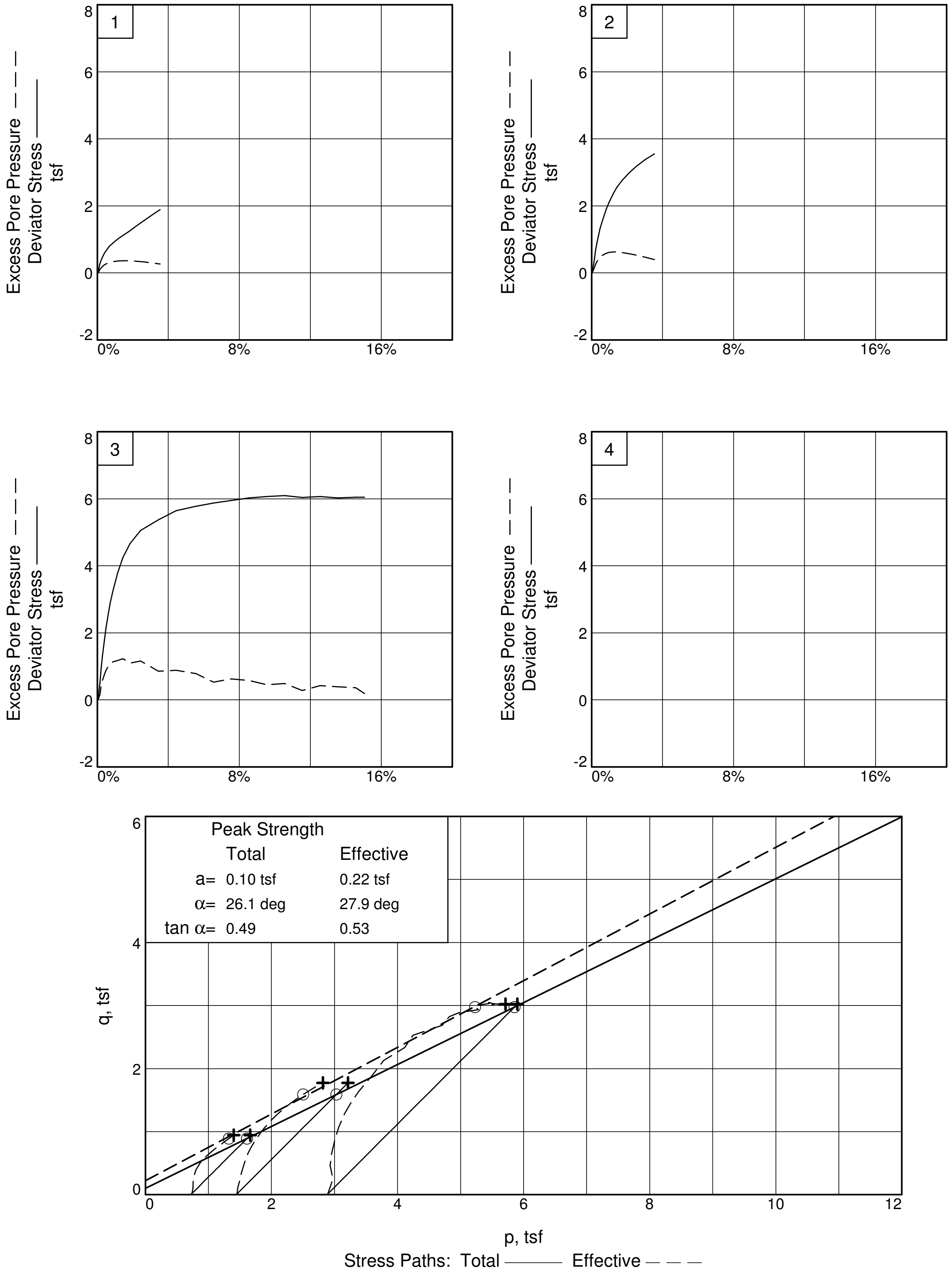
Client: TWE-Corpus Christi

Project: Geotechnical Lab Testing

Source of Sample: B-39 **Depth:** 24'-26'

Proj. No.: 16.53.042 **Date Sampled:** 8/25/16

TRIAXIAL SHEAR TEST REPORT
Tolunay-Wong Engineers, Inc.
Houston, Texas



Client: TWE-Corpus Christi

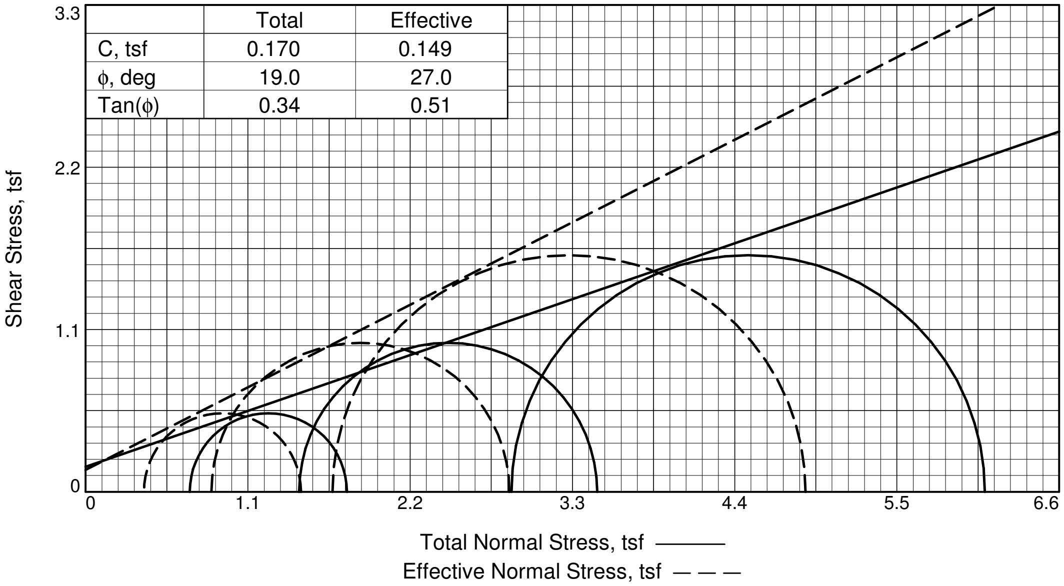
Project: Geotechnical Lab Testing

Source of Sample: B-39 **Depth:** 24'-26'

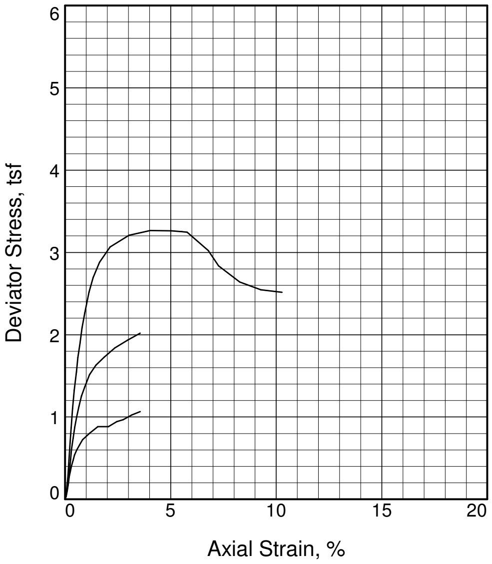
Project No.: 16.53.042

Pg 2 of 2

TOLUNAY-WONG ENGINEERS, INC.



	Total	Effective
C, tsf	0.170	0.149
φ, deg	19.0	27.0
Tan(φ)	0.34	0.51



Sample No.		1	2	3
Initial	Water Content, %	30.9	30.9	30.9
	Dry Density, pcf	91.8	91.8	91.8
	Saturation, %	97.8	97.8	97.8
	Void Ratio	0.8696	0.8696	0.8696
	Diameter, in.	2.77	2.77	2.77
	Height, in.	5.58	5.58	5.58
At Test	Water Content, %	31.7	31.7	31.7
	Dry Density, pcf	91.7	91.7	91.7
	Saturation, %	100.0	100.0	100.0
	Void Ratio	0.8728	0.8728	0.8728
	Diameter, in.	2.78	2.82	2.86
	Height, in.	5.57	5.39	5.23
Strain rate, %/min.		0.01	0.0060	0.0070
Eff. Cell Pressure, psi		9.80	20.10	40.10
Fail. Stress, tsf		1.06	2.02	3.21
Excess Pore Pr., tsf		0.31	0.59	1.21
Strain, %		3.6	3.6	3.0
Ult. Stress, tsf		1.06	2.02	3.27
Excess Pore Pr., tsf		0.31	0.59	1.18
Strain, %		3.6	3.6	4.0
$\bar{\sigma}_1$ Failure, tsf		1.46	2.87	4.88
$\bar{\sigma}_3$ Failure, tsf		0.39	0.85	1.67

Type of Test:
CU with Pore Pressures

Sample Type: Undisturbed

Description: Light gray and tan FAT CLAY with SAND and some calcareous nodules

LL= 77 **PL=** 24 **PI=** 53

Assumed Specific Gravity= 2.75

Remarks:
Test method: ASTM D 4767
Failure type: Slickensided

Figure Pg 1 of 2

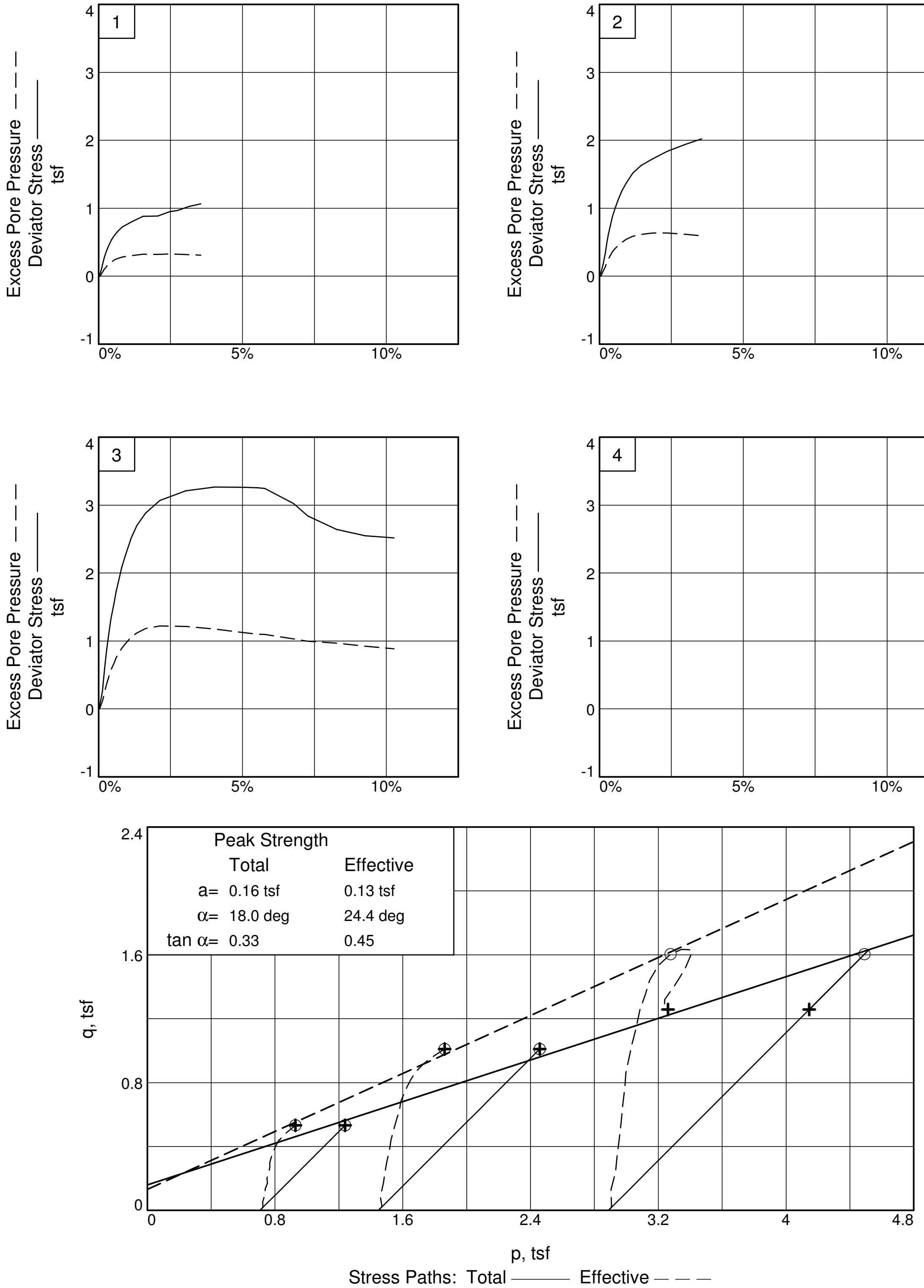
Client: TWE-Corpus Christi

Project: Geotechnical Lab Testing

Source of Sample: B-41A **Depth:** 60.5'-62.5'

Proj. No.: 16.53.042 **Date Sampled:**

TRIAXIAL SHEAR TEST REPORT
Tolunay-Wong Engineers, Inc.
Houston, Texas



Client: TWE-Corpus Christi

Project: Geotechnical Lab Testing

Source of Sample: B-41A **Depth:** 60.5'-62.5'

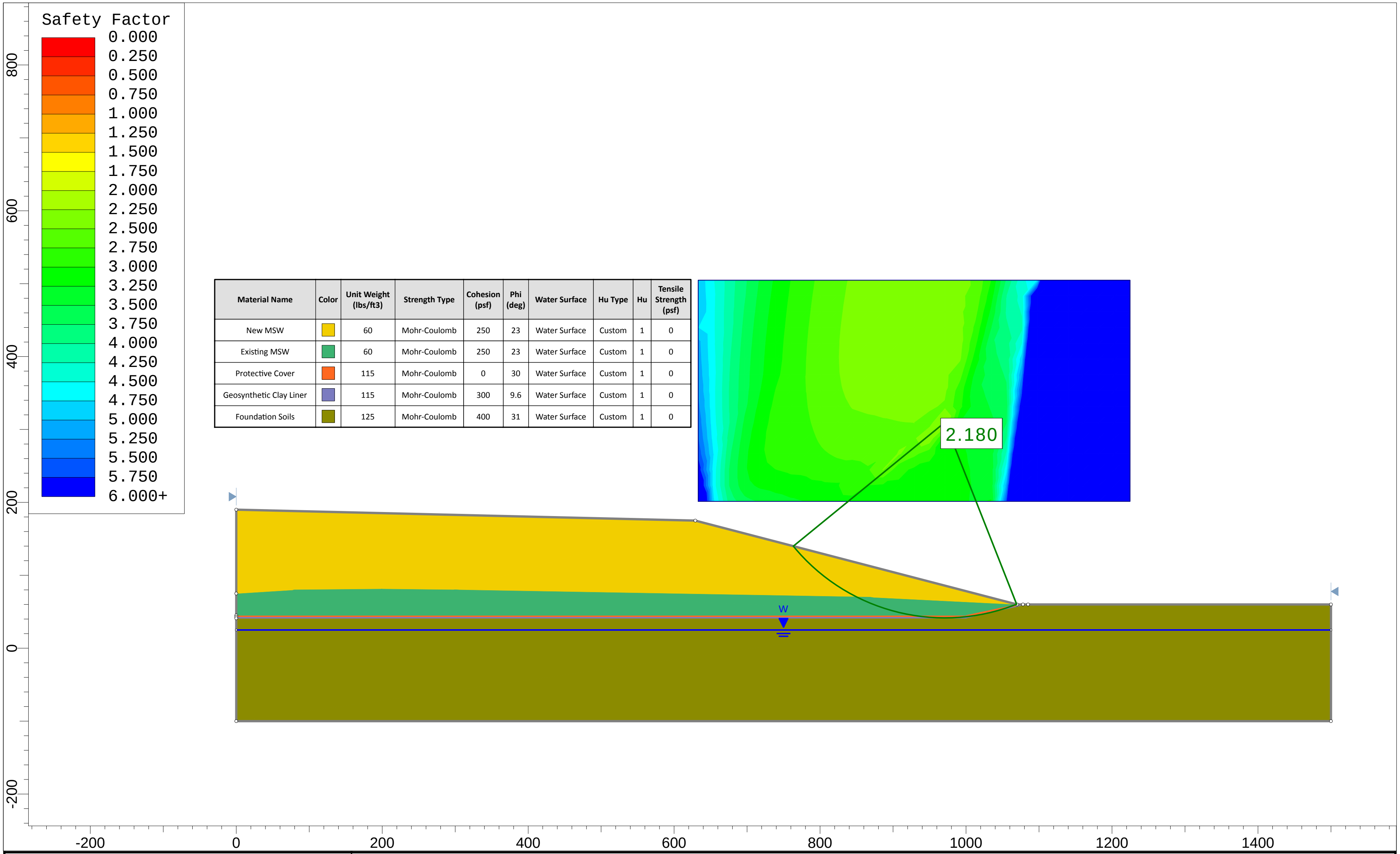
Project No.: 16.53.042 **Figure** Pg 2 of 2

TOLUNAY-WONG ENGINEERS, INC.

APPENDIX F

GRAPHICAL PRESENTATION OF MASS STABILITY ANALYSES RESULTS

TWE
Project No. 16.53.042
Report No. 12788R1



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Hu Type	Hu	Tensile Strength (psf)
New MSW	🟨	60	Mohr-Coulomb	250	23	Water Surface	Custom	1	0
Existing MSW	🟩	60	Mohr-Coulomb	250	23	Water Surface	Custom	1	0
Protective Cover	🟧	115	Mohr-Coulomb	0	30	Water Surface	Custom	1	0
Geosynthetic Clay Liner	🟪	115	Mohr-Coulomb	300	9.6	Water Surface	Custom	1	0
Foundation Soils	🟫	125	Mohr-Coulomb	400	31	Water Surface	Custom	1	0

Tolunay-Wong Engineers, Inc.

SLIDEINTERPRET 7.017

Project Kingsville MSW Landfill Project

Analysis Description Marker 12 Section - Final Waste Slope (Long-Term Analysis) - Circular Arc Failure

Drawn By

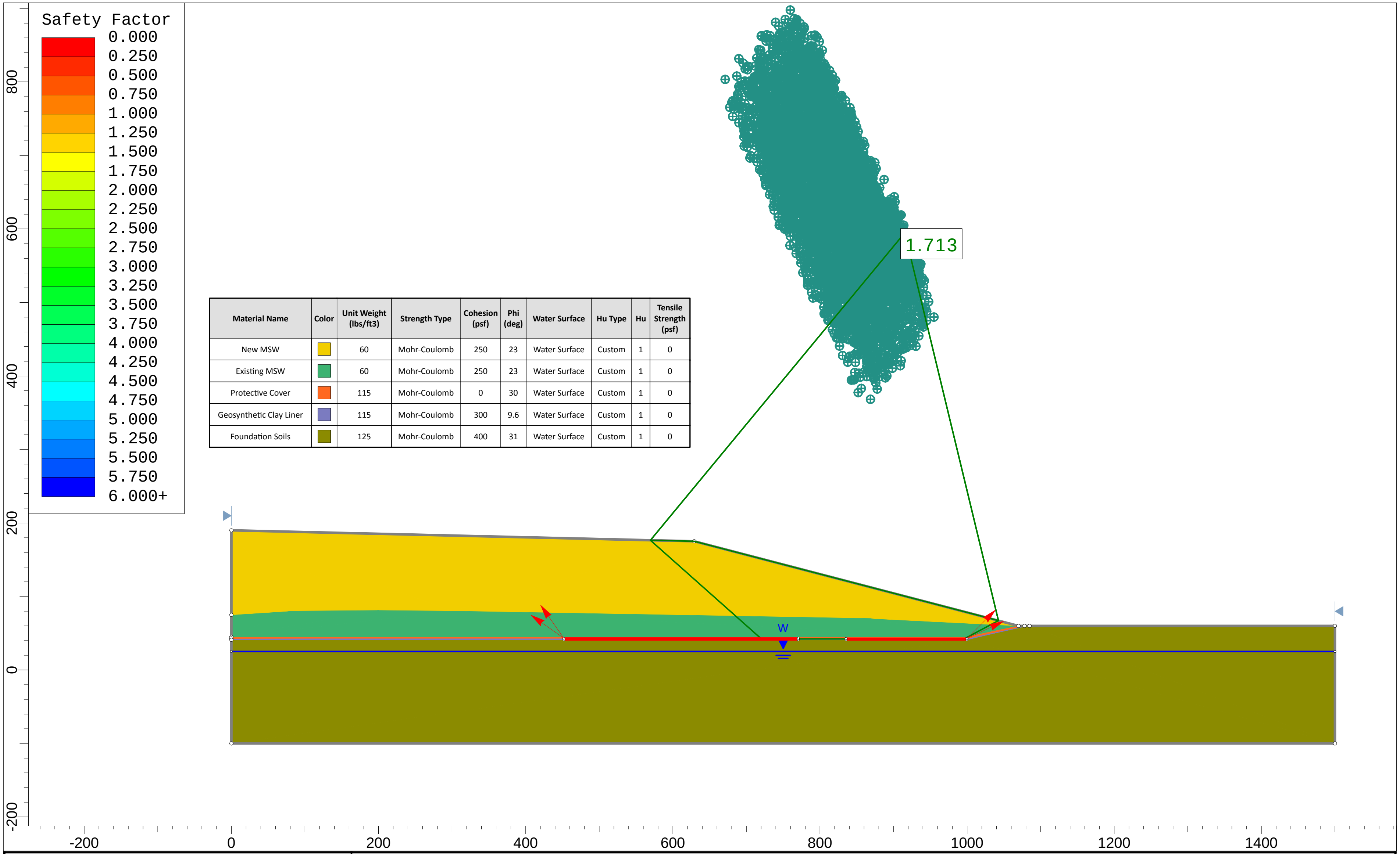
Scale 1:2182

Company Tolunay-Wong Engineers, Inc.

Date 12/2/2016, 2:04:42 PM

File Name Marker 12 Section.slim

FOR PERMIT PURPOSES ONLY



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Hu Type	Hu	Tensile Strength (psf)
New MSW	🟨	60	Mohr-Coulomb	250	23	Water Surface	Custom	1	0
Existing MSW	🟩	60	Mohr-Coulomb	250	23	Water Surface	Custom	1	0
Protective Cover	🟧	115	Mohr-Coulomb	0	30	Water Surface	Custom	1	0
Geosynthetic Clay Liner	🟪	115	Mohr-Coulomb	300	9.6	Water Surface	Custom	1	0
Foundation Soils	🟫	125	Mohr-Coulomb	400	31	Water Surface	Custom	1	0

Tolunay-Wong Engineers, Inc.

SLIDEINTERPRET 7.017

Project Kingsville MSW Landfill Project

Analysis Description Marker 12 Section - Final Waste Slope (Long-Term Analysis) - Sliding Block Failure

Drawn By

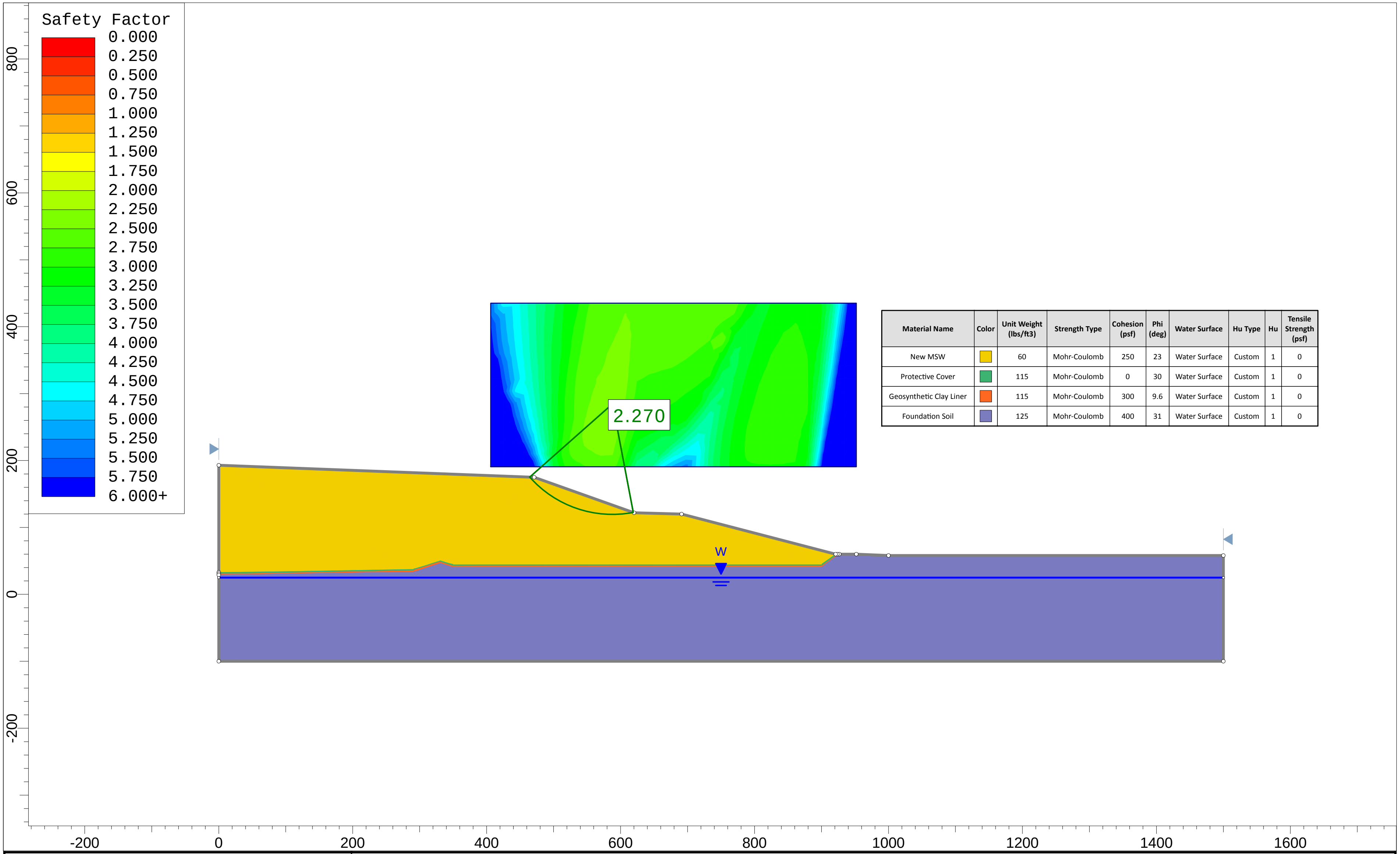
Scale 1:2164

Company Tolunay-Wong Engineers, Inc.

Date 12/2/2016, 2:04:42 PM

File Name Marker 12 Section.slim

FOR PERMIT PURPOSES ONLY



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Hu Type	Hu	Tensile Strength (psf)
New MSW	🟨	60	Mohr-Coulomb	250	23	Water Surface	Custom	1	0
Protective Cover	🟩	115	Mohr-Coulomb	0	30	Water Surface	Custom	1	0
Geosynthetic Clay Liner	🟧	115	Mohr-Coulomb	300	9.6	Water Surface	Custom	1	0
Foundation Soil	🟪	125	Mohr-Coulomb	400	31	Water Surface	Custom	1	0

Tolunay-Wong Engineers, Inc.

SLIDEINTERPRET 7.017

Project Kingsville MSW Landfill Project

Analysis Description Marker 18 Section - Final Waste Slope (Long-Term Analysis) - Circular Arc Failure

Drawn By

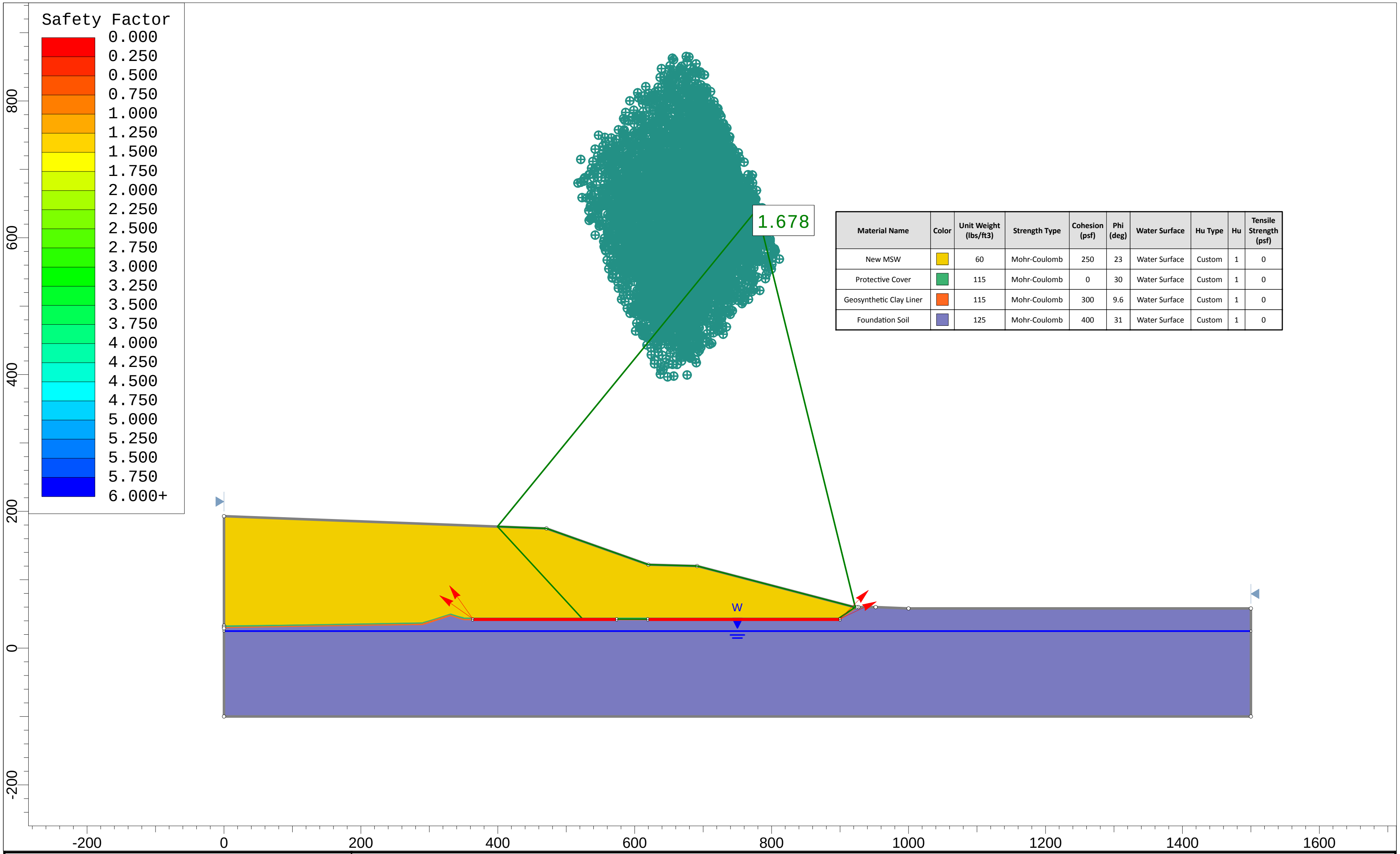
Scale 1:2378

Company Tolunay-Wong Engineers, Inc.

Date 12/2/2016, 2:39:49 PM

File Name Marker 18 Section - Circular Arc.slim

FOR PERMIT PURPOSES ONLY



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Hu Type	Hu	Tensile Strength (psf)
New MSW	🟨	60	Mohr-Coulomb	250	23	Water Surface	Custom	1	0
Protective Cover	🟩	115	Mohr-Coulomb	0	30	Water Surface	Custom	1	0
Geosynthetic Clay Liner	🟧	115	Mohr-Coulomb	300	9.6	Water Surface	Custom	1	0
Foundation Soil	🟪	125	Mohr-Coulomb	400	31	Water Surface	Custom	1	0

Tolunay-Wong Engineers, Inc.

SLIDEINTERPRET 7.017

Project Kingsville MSW Landfill Project

Analysis Description Marker 18 Section - Final Waste Slope (Long-Term Analysis) - Sliding Block Failure

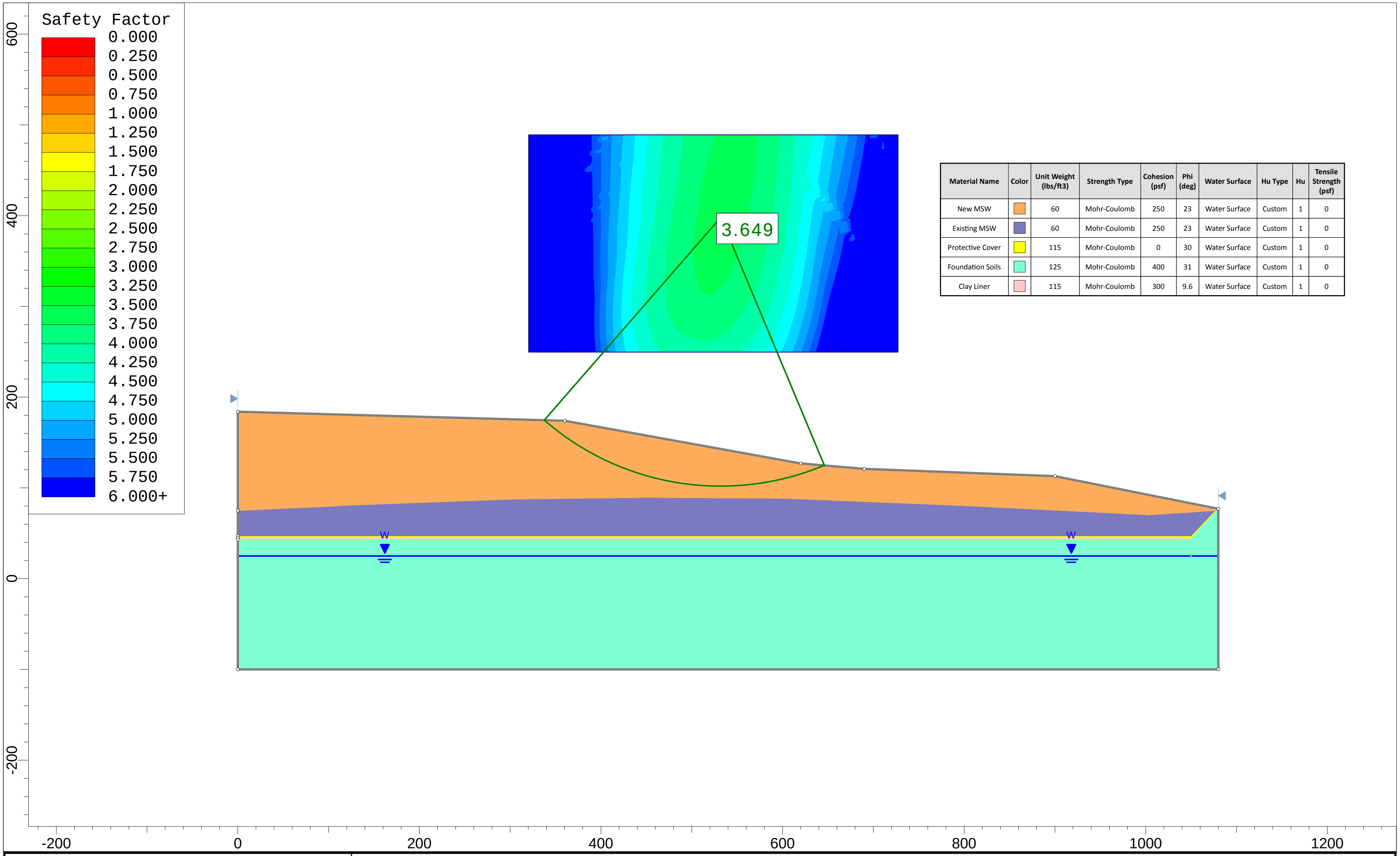
Drawn By

Scale 1:2326

Company Tolunay-Wong Engineers, Inc.

Date 12/2/2016, 2:39:49 PM

File Name Marker 18 Section - Sliding Block.slim



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Hu Type	Hu	Tensile Strength (psf)
New MSW	🟧	60	Mohr-Coulomb	250	23	Water Surface	Custom	1	0
Existing MSW	🟪	60	Mohr-Coulomb	250	23	Water Surface	Custom	1	0
Protective Cover	🟨	115	Mohr-Coulomb	0	30	Water Surface	Custom	1	0
Foundation Soils	🟩	125	Mohr-Coulomb	400	31	Water Surface	Custom	1	0
Clay Liner	🟥	115	Mohr-Coulomb	300	9.6	Water Surface	Custom	1	0

Tolunay-Wong Engineers, Inc.

SLIDEINTERPRET 7.017

Project
Kingsville Municipal Solid Waste Landfill

Analysis Description
Marker J Section - Final Waste Slope (Long-Term Analysis) - Circular Arc Failure

Drawn By

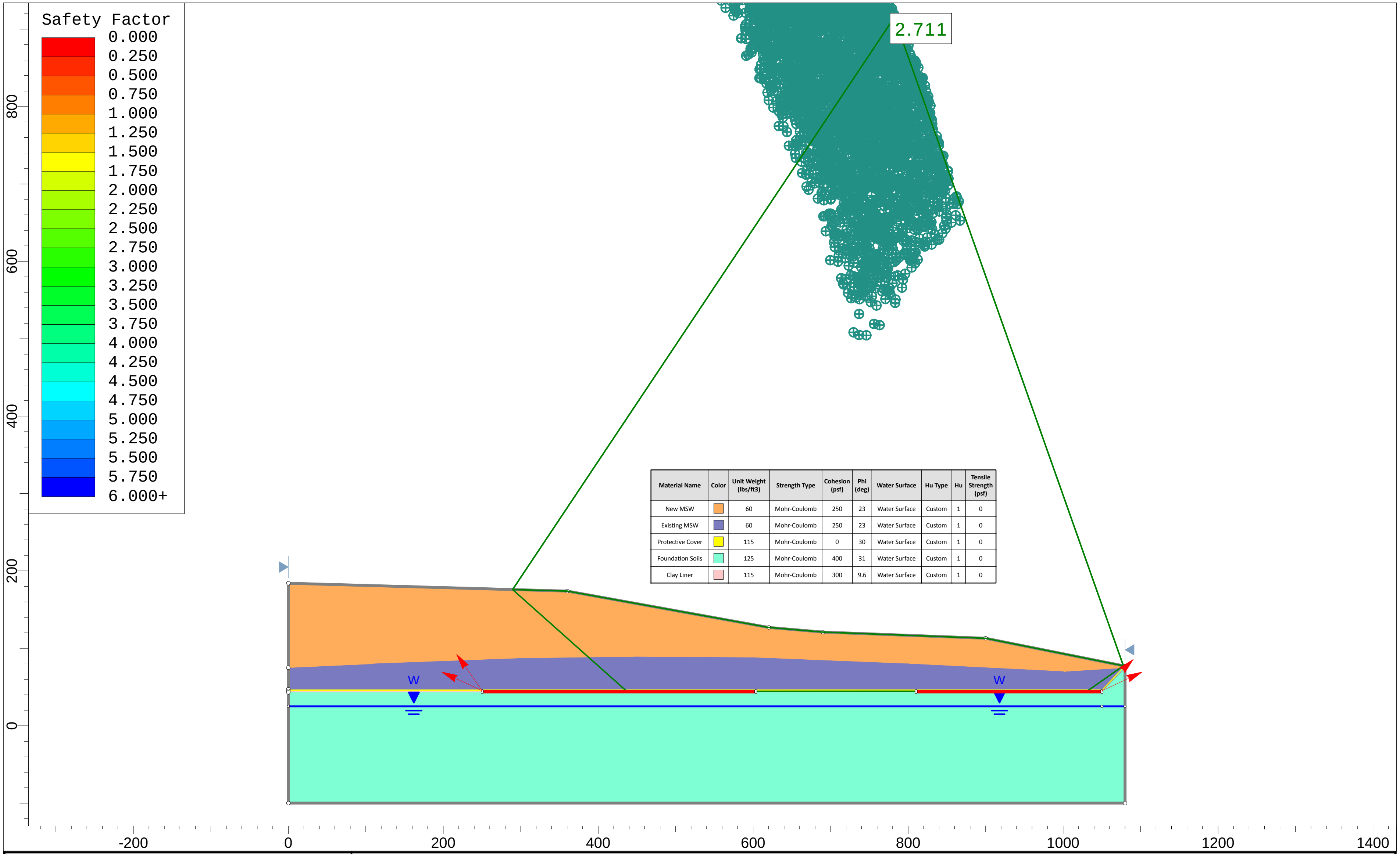
Scale
1:1754

Company
Tolunay-Wong Engineers, Inc.

Date
11/28/2016, 5:45:35 PM

File Name
Marker J Section.slim

FOR PERMIT PURPOSES ONLY



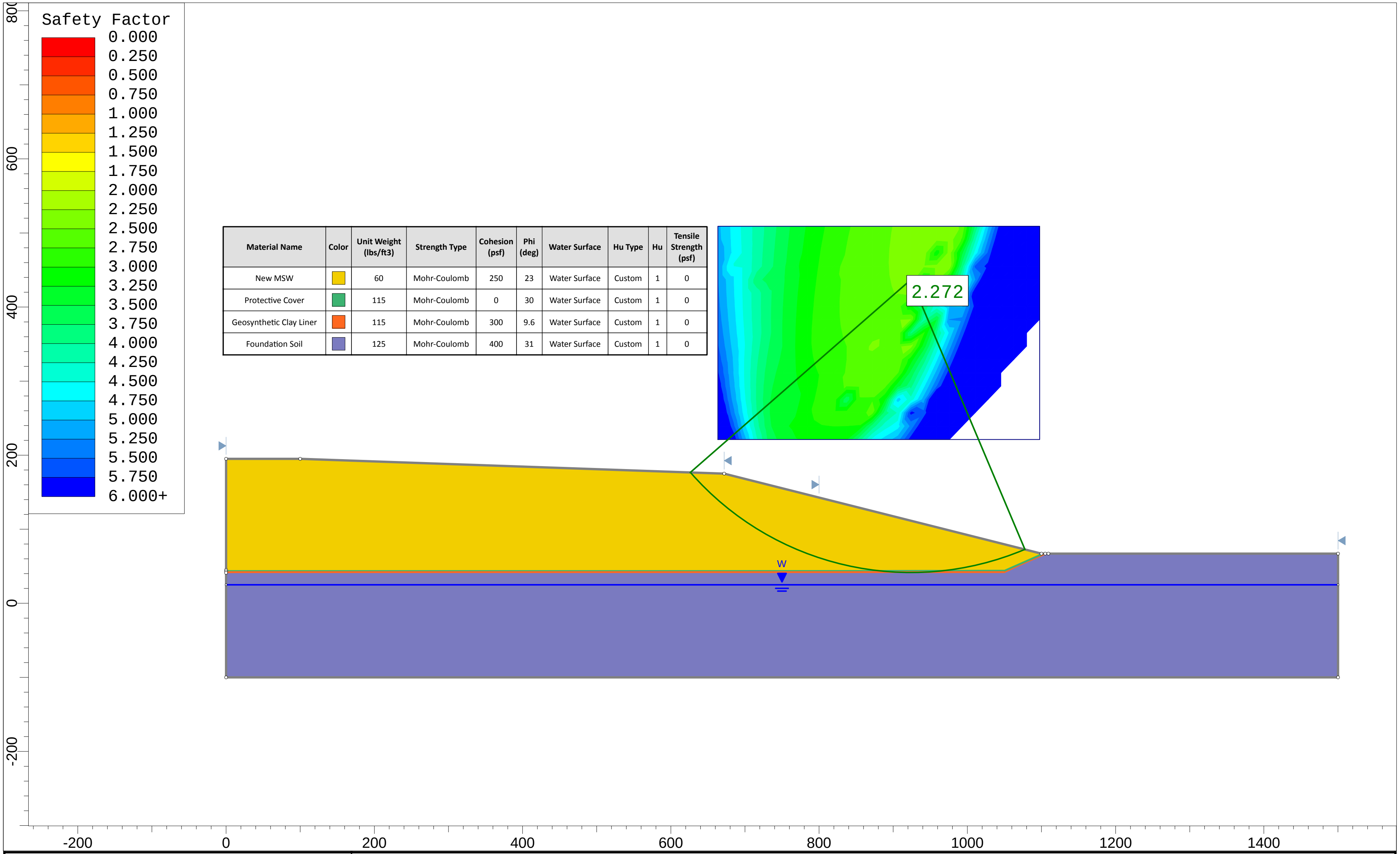
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Hu Type	Hu	Tensile Strength (psf)
New MSW	🟧	60	Mohr-Coulomb	250	23	Water Surface	Custom	1	0
Existing MSW	🟪	60	Mohr-Coulomb	250	23	Water Surface	Custom	1	0
Protective Cover	🟨	115	Mohr-Coulomb	0	30	Water Surface	Custom	1	0
Foundation Soils	🟩	125	Mohr-Coulomb	400	31	Water Surface	Custom	1	0
Clay Liner	🟥	115	Mohr-Coulomb	300	9.6	Water Surface	Custom	1	0

Tolunay-Wong Engineers, Inc.

SLIDEINTERPRET 7.017

Project	Kingsville Municipal Solid Waste Landfill
Analysis Description	Marker J Section - Final Waste Slope (Long-Term Analysis) - Sliding Block Failure
Drawn By	
Scale	1:2055
Company	Tolunay-Wong Engineers, Inc.
Date	11/28/2016, 5:45:35 PM
File Name	Marker J Section - Sliding Block.slim

FOR PERMIT PURPOSES ONLY



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Hu Type	Hu	Tensile Strength (psf)
New MSW	🟨	60	Mohr-Coulomb	250	23	Water Surface	Custom	1	0
Protective Cover	🟩	115	Mohr-Coulomb	0	30	Water Surface	Custom	1	0
Geosynthetic Clay Liner	🟧	115	Mohr-Coulomb	300	9.6	Water Surface	Custom	1	0
Foundation Soil	🟪	125	Mohr-Coulomb	400	31	Water Surface	Custom	1	0

Tolunay-Wong Engineers, Inc.

SLIDEINTERPRET 7.017

Project Kingsville MSW Landfill Project

Analysis Description Marker O Section - Final Waste Slope (Long-Term Analysis) - Circular Arc Failure

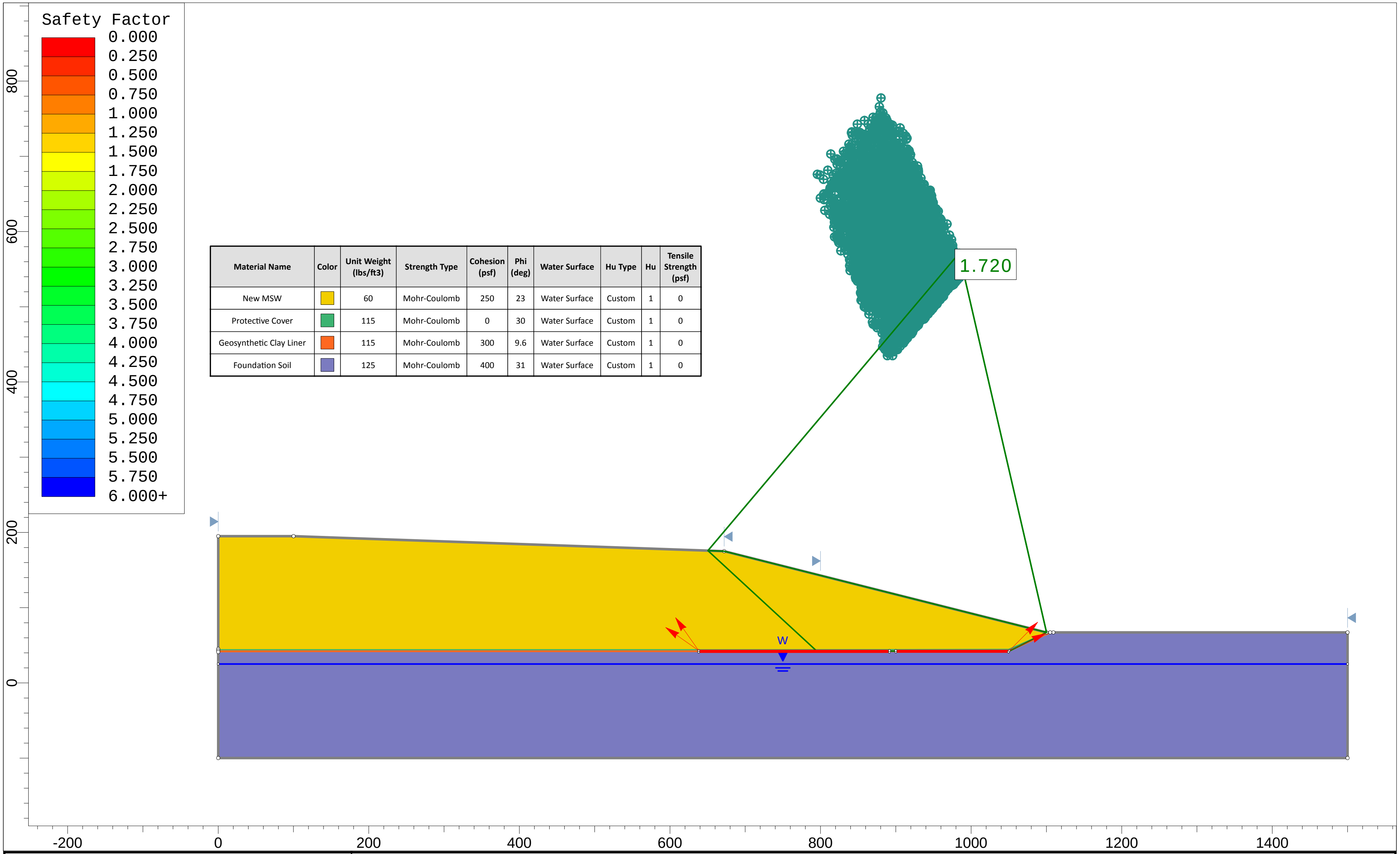
Drawn By

Scale 1:2148

Company Tolunay-Wong Engineers, Inc.

Date 12/2/2016, 10:23:00 AM

File Name Marker O Section - Circular Arc.slim



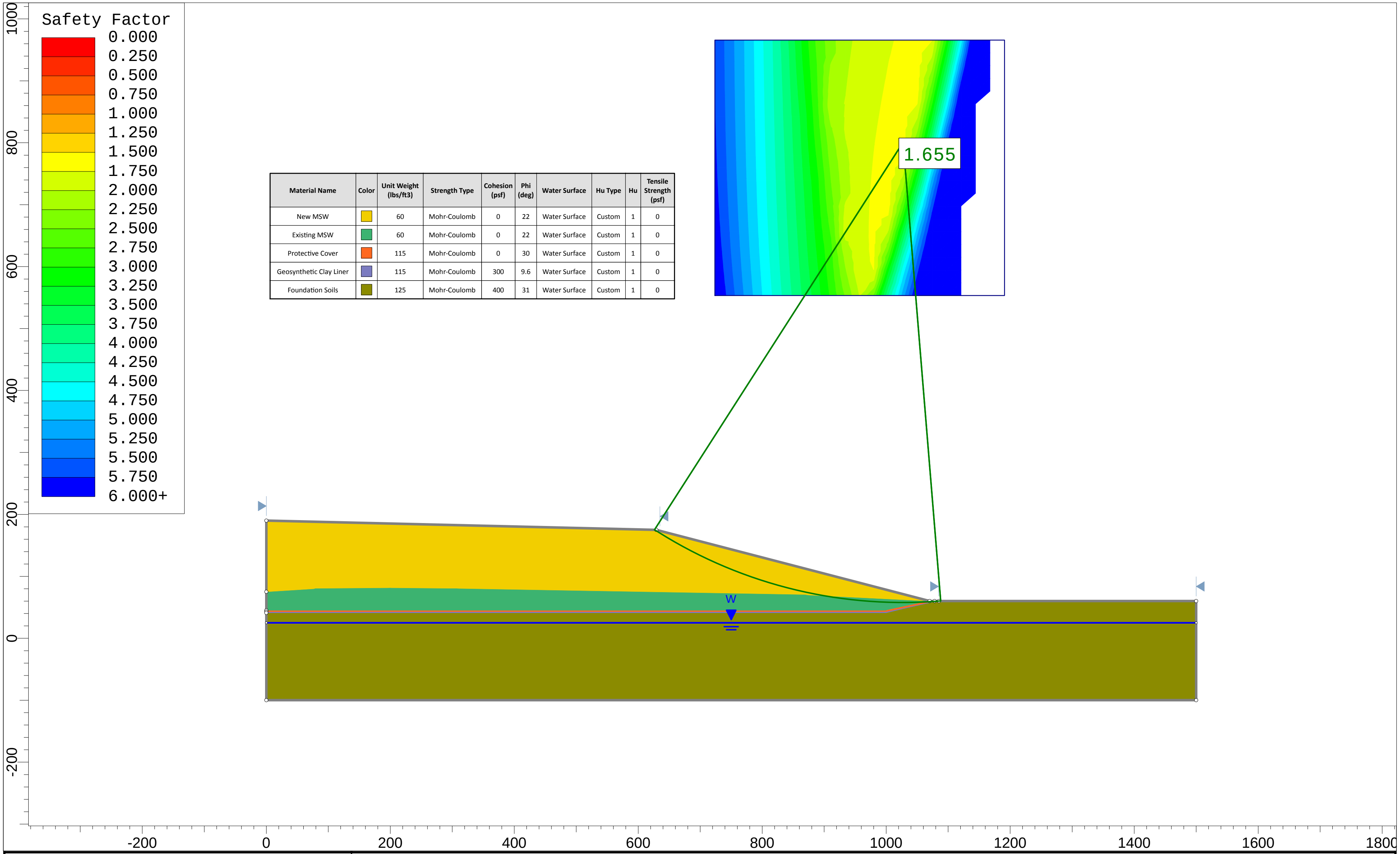
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Hu Type	Hu	Tensile Strength (psf)
New MSW	🟨	60	Mohr-Coulomb	250	23	Water Surface	Custom	1	0
Protective Cover	🟩	115	Mohr-Coulomb	0	30	Water Surface	Custom	1	0
Geosynthetic Clay Liner	🟧	115	Mohr-Coulomb	300	9.6	Water Surface	Custom	1	0
Foundation Soil	🟪	125	Mohr-Coulomb	400	31	Water Surface	Custom	1	0

Tolunay-Wong Engineers, Inc.

SLIDEINTERPRET 7.017

Project	Kingsville MSW Landfill Project
Analysis Description	Marker O Section - Final Waste Slope (Long-Term Analysis) - Sliding Block Failure
Drawn By	
Scale	1:2115
Company	Tolunay-Wong Engineers, Inc.
Date	12/2/2016, 10:23:00 AM
File Name	Marker O Section - Sliding Block.slim

FOR PERMIT PURPOSES ONLY



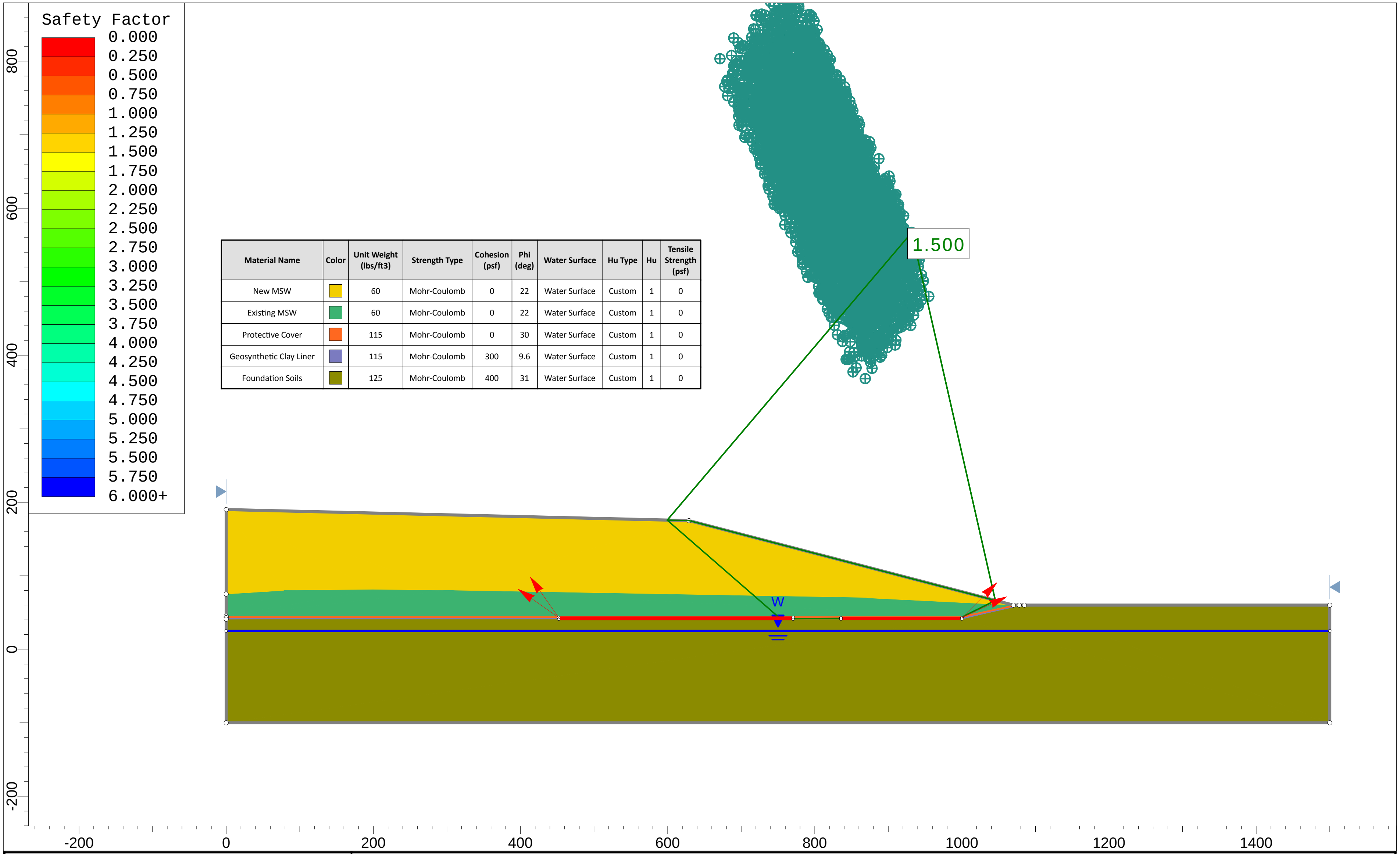
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Hu Type	Hu	Tensile Strength (psf)
New MSW	🟨	60	Mohr-Coulomb	0	22	Water Surface	Custom	1	0
Existing MSW	🟩	60	Mohr-Coulomb	0	22	Water Surface	Custom	1	0
Protective Cover	🟧	115	Mohr-Coulomb	0	30	Water Surface	Custom	1	0
Geosynthetic Clay Liner	🟪	115	Mohr-Coulomb	300	9.6	Water Surface	Custom	1	0
Foundation Soils	🟫	125	Mohr-Coulomb	400	31	Water Surface	Custom	1	0

Tolunay-Wong Engineers, Inc.

SLIDEINTERPRET 7.017

Project	Kingsville MSW Landfill Project		
Analysis Description	Marker 12 Section - Final Waste Slope (Long-Term Analysis - Large Displacement) - Circular Arc Failure		
Drawn By		*Scale* 1:2569	*Company* Tolunay-Wong Engineers, Inc.
Date	12/2/2016, 2:04:42 PM	*File Name*	Marker 12 Section - Circular Arc.slim

FOR PERMIT PURPOSES ONLY



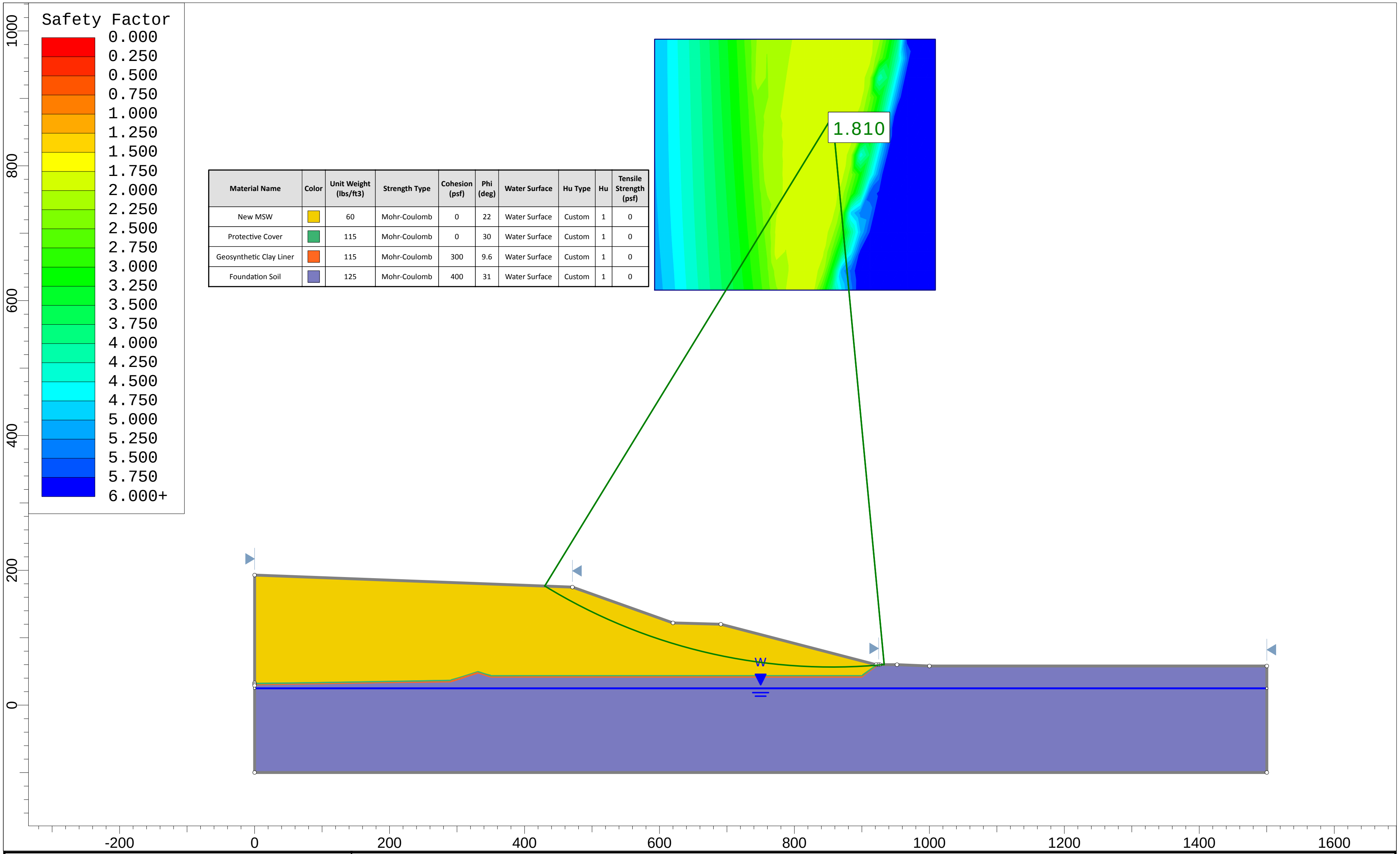
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Hu Type	Hu	Tensile Strength (psf)
New MSW	🟨	60	Mohr-Coulomb	0	22	Water Surface	Custom	1	0
Existing MSW	🟩	60	Mohr-Coulomb	0	22	Water Surface	Custom	1	0
Protective Cover	🟧	115	Mohr-Coulomb	0	30	Water Surface	Custom	1	0
Geosynthetic Clay Liner	🟪	115	Mohr-Coulomb	300	9.6	Water Surface	Custom	1	0
Foundation Soils	🟫	125	Mohr-Coulomb	400	31	Water Surface	Custom	1	0

Tolunay-Wong Engineers, Inc.

SLIDEINTERPRET 7.017

Project	Kingsville MSW Landfill Project		
Analysis Description	Marker 12 Section - Final Waste Slope (Long-Term Analysis - Large Displacement) - Sliding Block Failure		
Drawn By		*Scale* 1:2164	*Company* Tolunay-Wong Engineers, Inc.
Date	12/2/2016, 2:04:42 PM	*File Name*	Marker 12 Section - Sliding Block.slim

FOR PERMIT PURPOSES ONLY



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Hu Type	Hu	Tensile Strength (psf)
New MSW	🟨	60	Mohr-Coulomb	0	22	Water Surface	Custom	1	0
Protective Cover	🟩	115	Mohr-Coulomb	0	30	Water Surface	Custom	1	0
Geosynthetic Clay Liner	🟧	115	Mohr-Coulomb	300	9.6	Water Surface	Custom	1	0
Foundation Soil	🟪	125	Mohr-Coulomb	400	31	Water Surface	Custom	1	0

Tolunay-Wong Engineers, Inc.

SLIDEINTERPRET 7.017

Project
Kingsville MSW Landfill Project

Analysis Description
Marker 18 Section - Final Waste Slope (Long-Term Analysis - Large Displacement) - Circular Arc Failure

Drawn By

Scale
1:2360

Company
Tolunay-Wong Engineers, Inc.

Date
12/2/2016, 2:39:49 PM

File Name
Marker 18 Section - Circular Arc.slim

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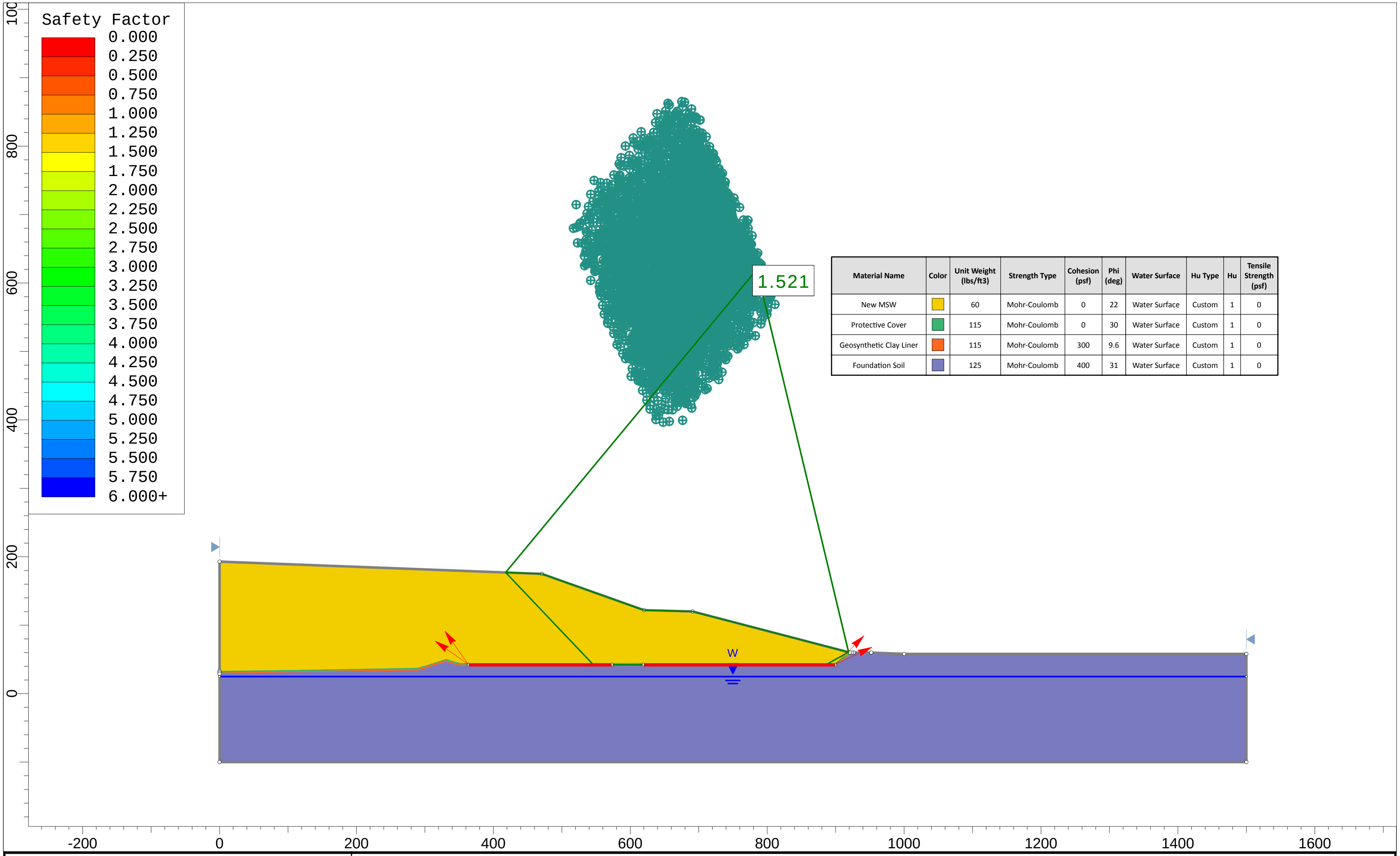
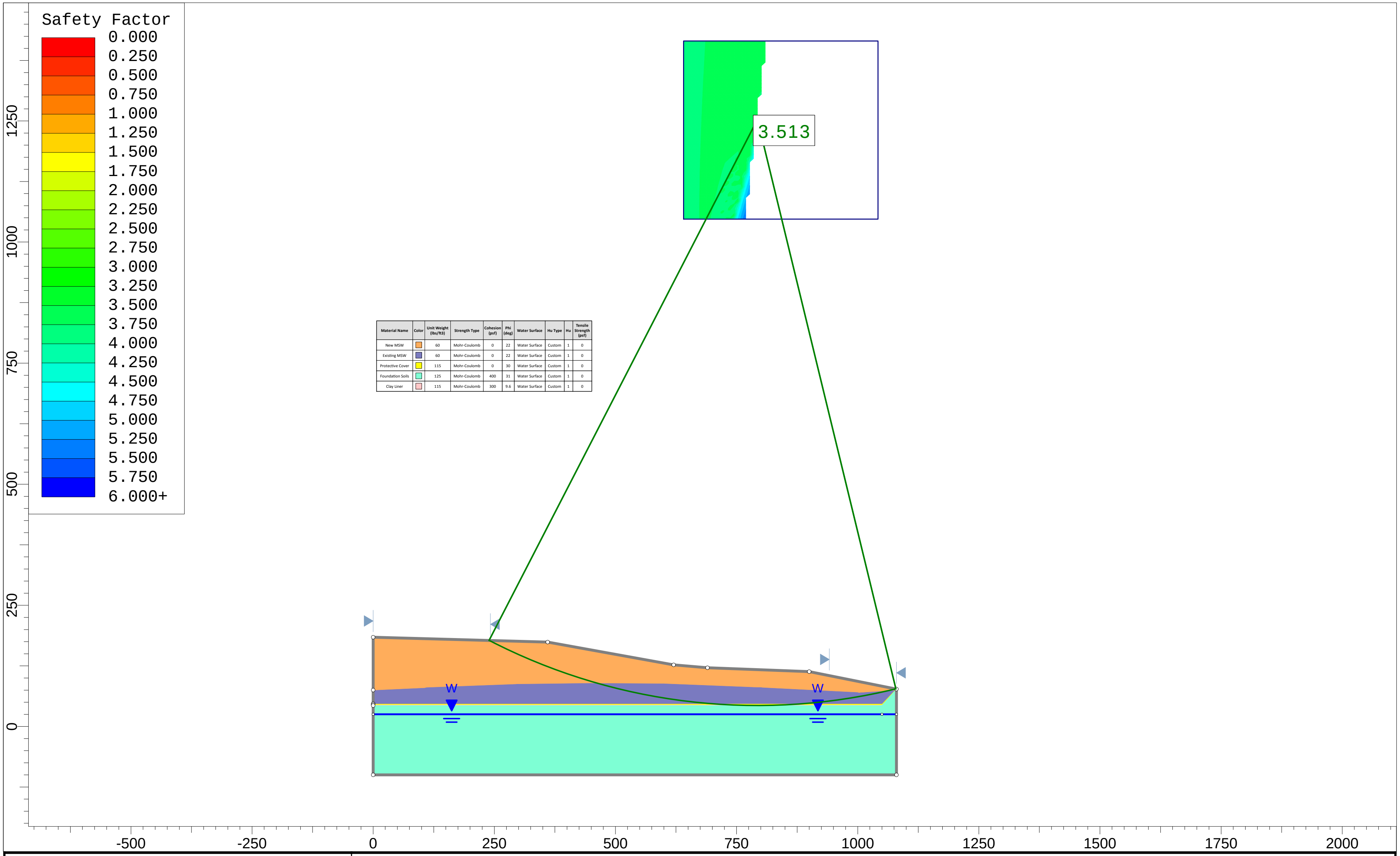


Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Hu Type	Hu	Tensile Strength (psf)
New MSW	🟨	60	Mohr-Coulomb	0	22	Water Surface	Custom	1	0
Protective Cover	🟩	115	Mohr-Coulomb	0	30	Water Surface	Custom	1	0
Geosynthetic Clay Liner	🟧	115	Mohr-Coulomb	300	9.6	Water Surface	Custom	1	0
Foundation Soil	🟪	125	Mohr-Coulomb	400	31	Water Surface	Custom	1	0

Tolunay-Wong Engineers, Inc.

SLIDEINTERPRET 7.017

Project	Kingsville MSW Landfill Project
Analysis Description	Marker 18 Section - Final Waste Slope (Long-Term Analysis - Large Displacement) -Sliding Block Failure
Drawn By	
Scale	1:2326
Company	Tolunay-Wong Engineers, Inc.
Date	12/2/2016, 2:39:49 PM
File Name	Marker 18 Section - Sliding Block.slim



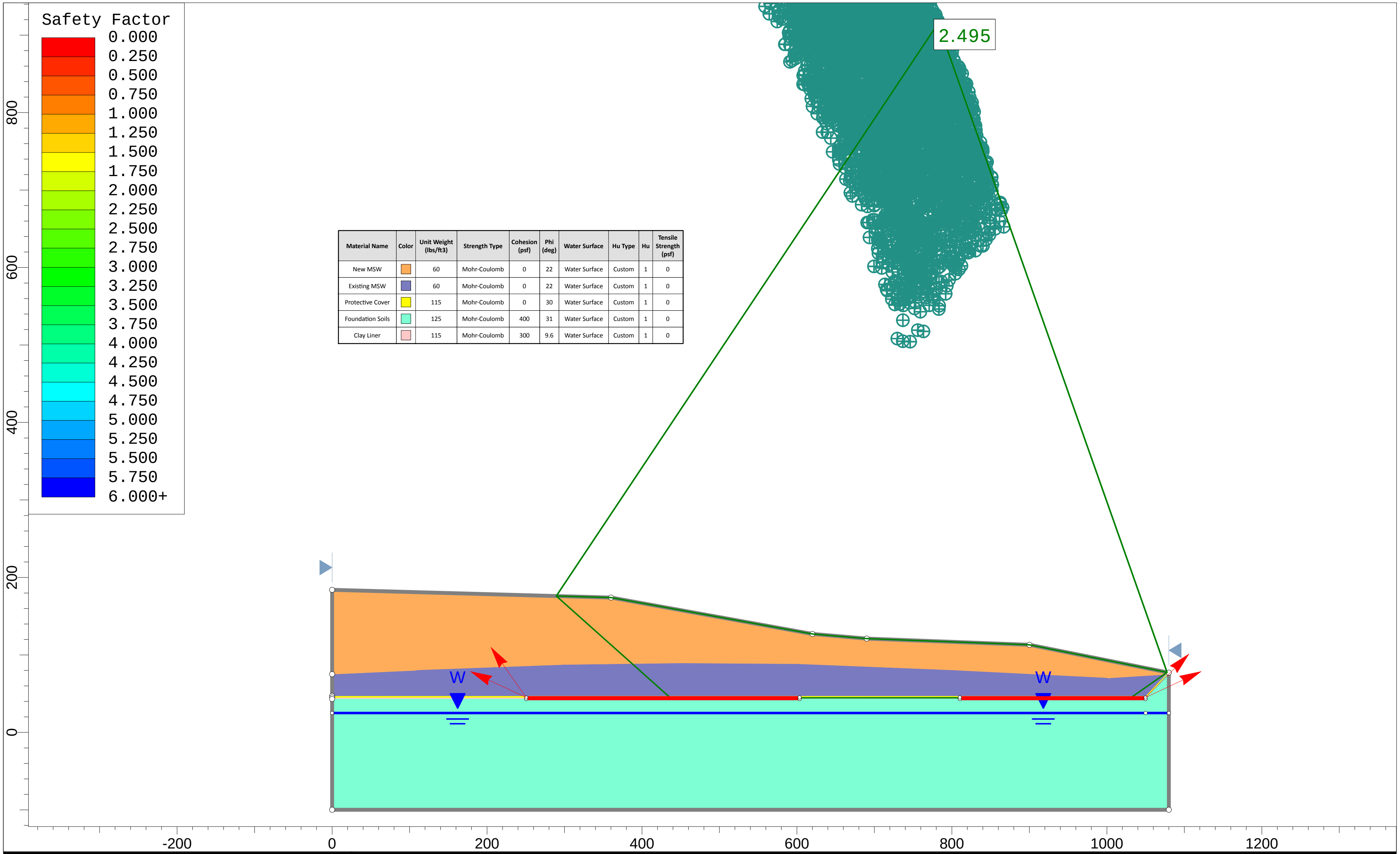
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Hu Type	Hu	Tensile Strength (psf)
New MSW	🟧	60	Mohr-Coulomb	0	22	Water Surface	Custom	1	0
Existing MSW	🟪	60	Mohr-Coulomb	0	22	Water Surface	Custom	1	0
Protective Cover	🟨	115	Mohr-Coulomb	0	30	Water Surface	Custom	1	0
Foundation Soils	🟩	125	Mohr-Coulomb	400	31	Water Surface	Custom	1	0
Clay Liner	🟥	115	Mohr-Coulomb	300	9.6	Water Surface	Custom	1	0

Tolunay-Wong Engineers, Inc.

SLIDEINTERPRET 7.017

Project	Kingsville MSW Landfill Project
Analysis Description	Marker J Section - Final Waste Slope (Long-Term Analysis - Large Displacement) -Circular Arc Failure
Drawn By	
Scale	1:3287
Company	Tolunay-Wong Engineers, Inc.
Date	11/28/2016, 5:45:35 PM
File Name	Marker J Section - Circular.slim

FOR PERMIT PURPOSES ONLY



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Hu Type	Hu	Tensile Strength (psf)
New MSW	🟧	60	Mohr-Coulomb	0	22	Water Surface	Custom	1	0
Existing MSW	🟪	60	Mohr-Coulomb	0	22	Water Surface	Custom	1	0
Protective Cover	🟨	115	Mohr-Coulomb	0	30	Water Surface	Custom	1	0
Foundation Soils	🟩	125	Mohr-Coulomb	400	31	Water Surface	Custom	1	0
Clay Liner	🟥	115	Mohr-Coulomb	300	9.6	Water Surface	Custom	1	0

Tolunay-Wong Engineers, Inc.

SLIDEINTERPRET 7.017

Project Kingsville MSW Landfill Project

Analysis Description Marker J Section - Final Waste Slope (Long-Term Analysis - Large Displacement) - Sliding Block Failure

Drawn By

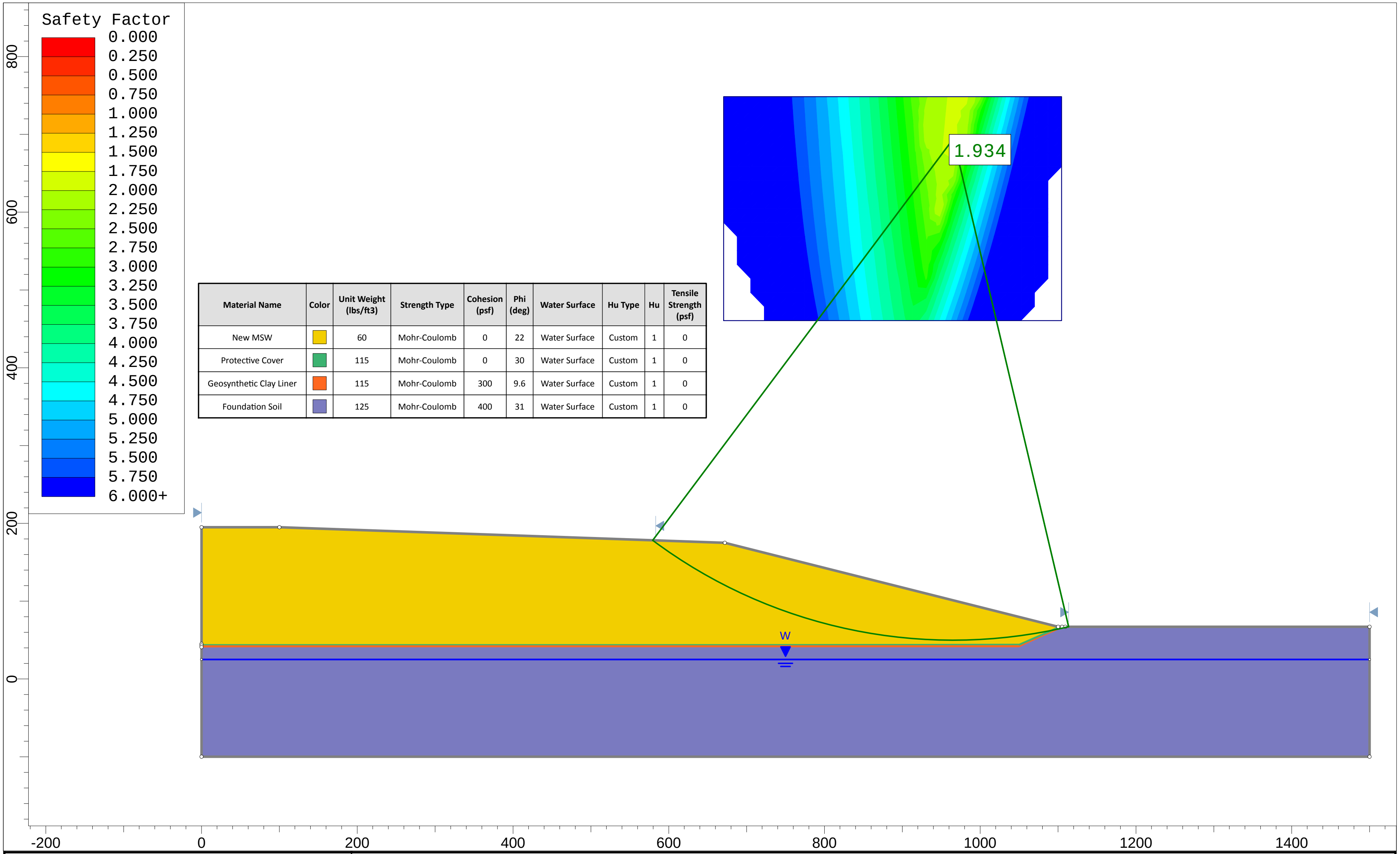
Scale 1:2055

Company Tolunay-Wong Engineers, Inc.

Date 11/28/2016, 5:45:35 PM

File Name Marker J Section - Sliding Block.slim

FOR PERMIT PURPOSES ONLY



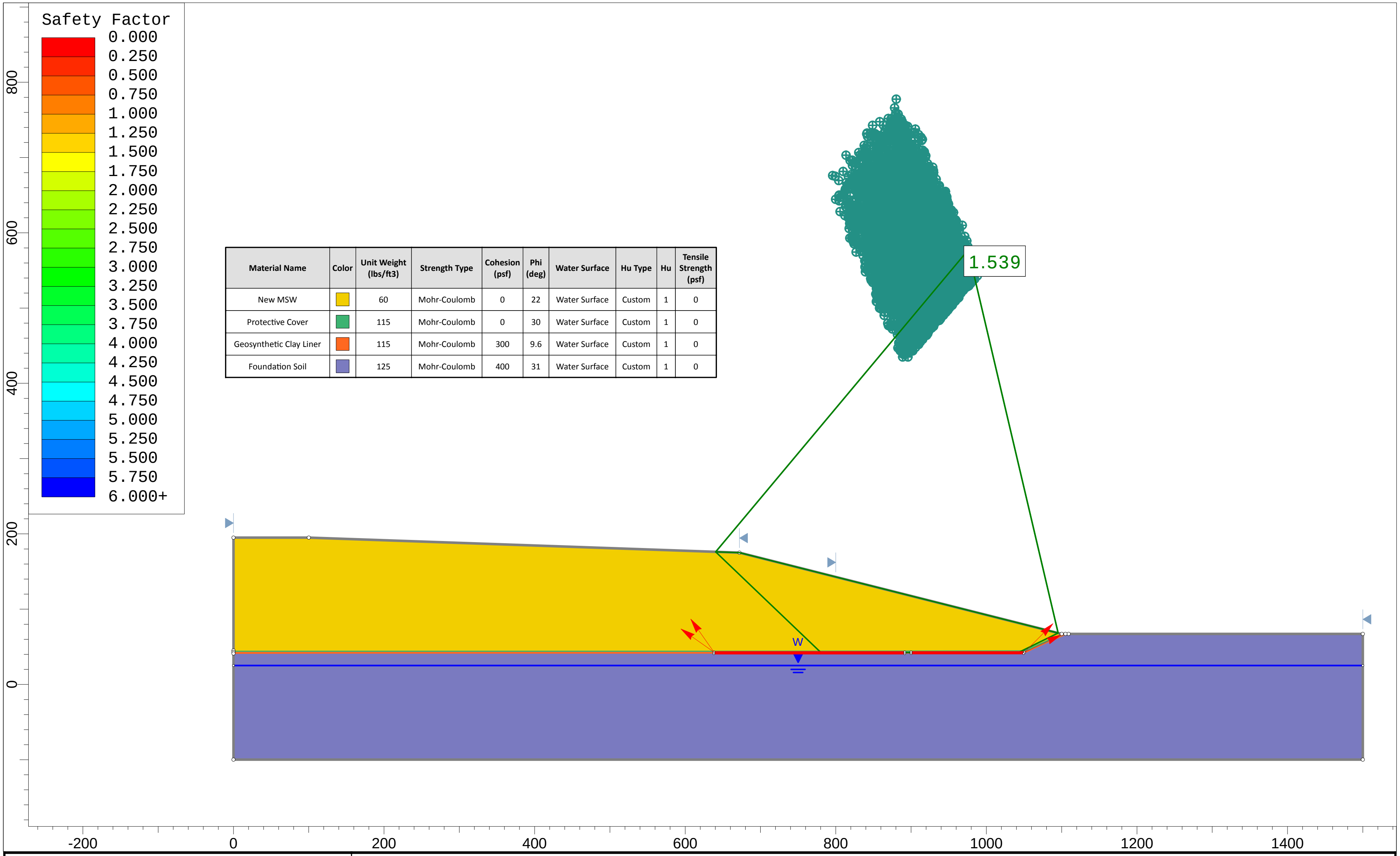
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Hu Type	Hu	Tensile Strength (psf)
New MSW	🟨	60	Mohr-Coulomb	0	22	Water Surface	Custom	1	0
Protective Cover	🟩	115	Mohr-Coulomb	0	30	Water Surface	Custom	1	0
Geosynthetic Clay Liner	🟧	115	Mohr-Coulomb	300	9.6	Water Surface	Custom	1	0
Foundation Soil	🟪	125	Mohr-Coulomb	400	31	Water Surface	Custom	1	0

Tolunay-Wong Engineers, Inc.

SLIDEINTERPRET 7.017

Project	Kingsville MSW Landfill Project		
Analysis Description	Marker O Section - Final Waste Slope (Long-Term Analysis - Large Displacement) -Circular Arc Failure		
Drawn By		*Scale* 1:2045	*Company* Tolunay-Wong Engineers, Inc.
Date	12/2/2016, 10:23:00 AM	*File Name*	Marker O Section - Circular Arc.slim

FOR PERMIT PURPOSES ONLY



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Hu Type	Hu	Tensile Strength (psf)
New MSW	🟨	60	Mohr-Coulomb	0	22	Water Surface	Custom	1	0
Protective Cover	🟩	115	Mohr-Coulomb	0	30	Water Surface	Custom	1	0
Geosynthetic Clay Liner	🟧	115	Mohr-Coulomb	300	9.6	Water Surface	Custom	1	0
Foundation Soil	🟪	125	Mohr-Coulomb	400	31	Water Surface	Custom	1	0

Tolunay-Wong Engineers, Inc.

SLIDEINTERPRET 7.017

Project
Kingsville MSW Landfill Project

Analysis Description
Marker O Section - Final Waste Slope (Long-Term Analysis - Large Displacement) - Sliding Block Failure

Drawn By

Scale
1:2115

Company
Tolunay-Wong Engineers, Inc.

Date
12/2/2016, 10:23:00 AM

File Name
Marker O Section - Sliding Block.slim

Exhibit III

Soil Boring Location Map

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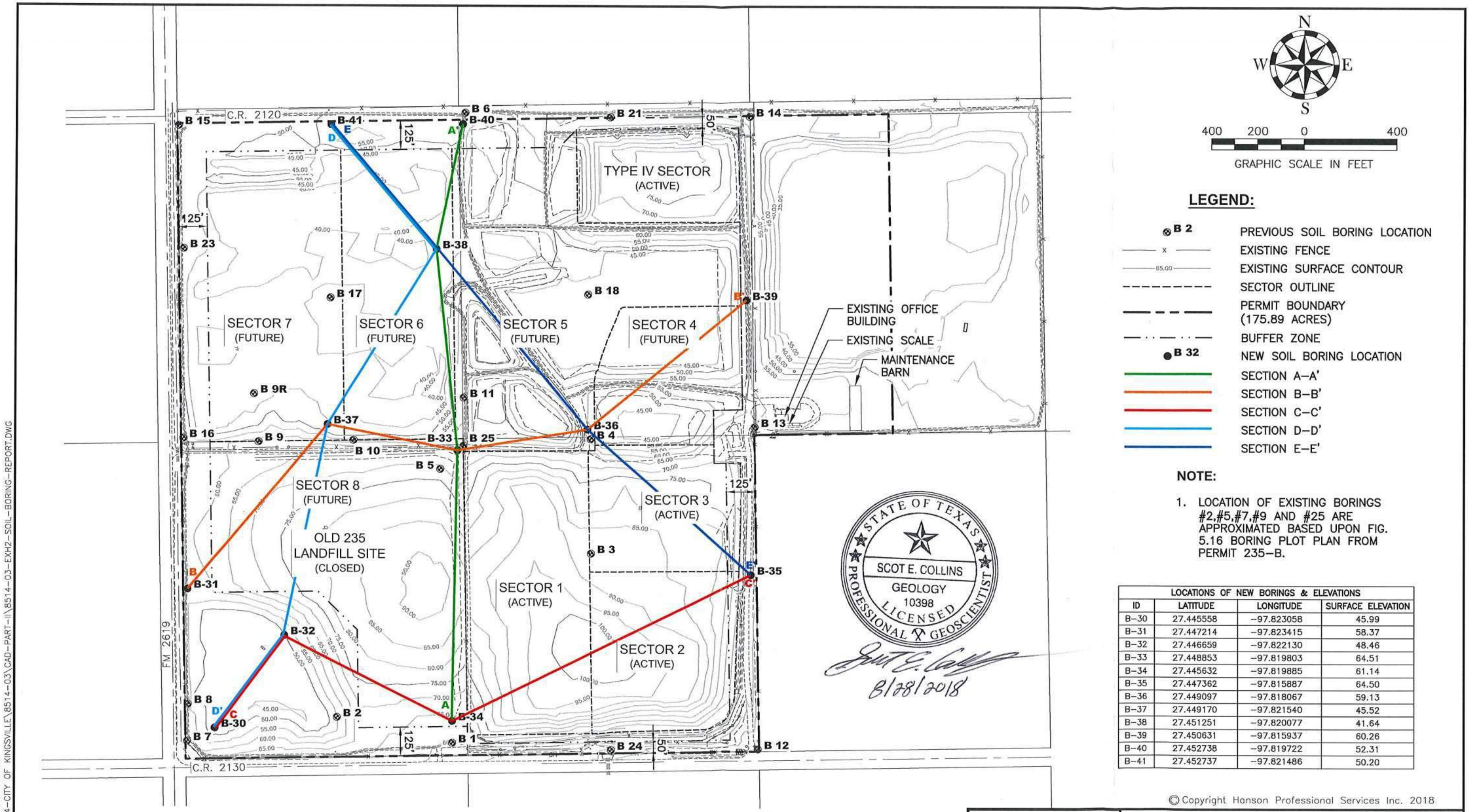

LEGEND:

⊗ B 2	PREVIOUS SOIL BORING LOCATION
—— x ——	EXISTING FENCE
—— 65.00 ——	EXISTING SURFACE CONTOUR
- - - - - -	SECTOR OUTLINE
— — —	PERMIT BOUNDARY (175.89 ACRES)
— · · —	BUFFER ZONE
● B 32	NEW SOIL BORING LOCATION
🟩	SECTION A–A'
🟧	SECTION B–B'
🟥	SECTION C–C'
🟦	SECTION D–D'
🟦	SECTION E–E'

NOTE:

1. LOCATION OF EXISTING BORINGS #2,#5,#7,#9 AND #25 ARE APPROXIMATED BASED UPON FIG. 5.16 BORING PLOT PLAN FROM PERMIT 235–B.

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10398

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8/28/2018

LOCATIONS OF NEW BORINGS & ELEVATIONS			
ID	LATITUDE	LONGITUDE	SURFACE ELEVATION
B–30	27.445558	–97.823058	45.99
B–31	27.447214	–97.823415	58.37
B–32	27.446659	–97.822130	48.46
B–33	27.448853	–97.819803	64.51
B–34	27.445632	–97.819885	61.14
B–35	27.447362	–97.815887	64.50
B–36	27.449097	–97.818067	59.13
B–37	27.449170	–97.821540	45.52
B–38	27.451251	–97.820077	41.64
B–39	27.450631	–97.815937	60.26
B–40	27.452738	–97.819722	52.31
B–41	27.452737	–97.821486	50.20

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CITY OF KINGSVILLE LANDFILL

SOIL BORING REPORT
SOIL BORING LOCATION MAP
KLEBERG COUNTY, TEXAS

16L0438
EXHIBIT III

AUG 06, 2018 3:49 PM TORRE01809
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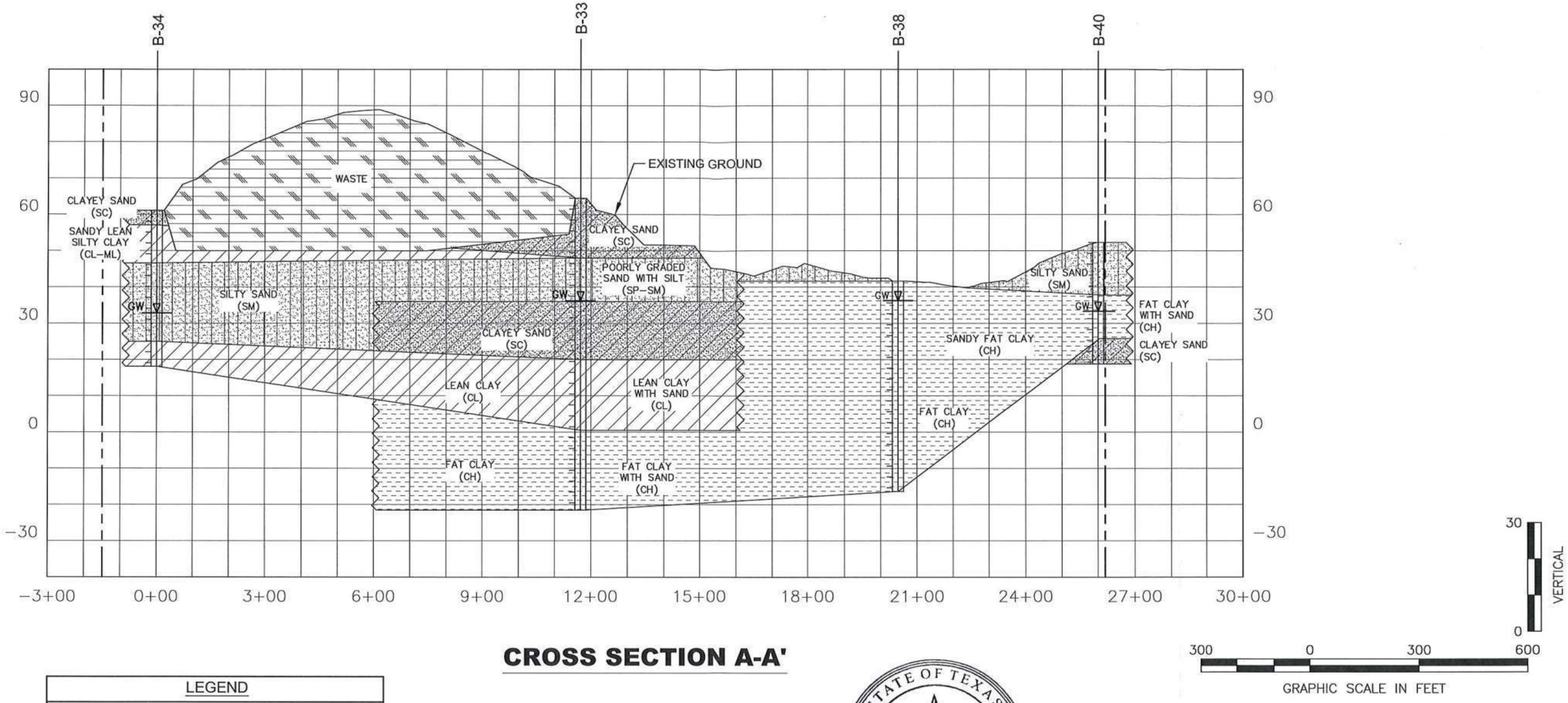
Exhibit IV

Soil Boring Cross Sections

FOR PERMIT PURPOSES ONLY



CROSS SECTION A-A'

LEGEND

▧	WASTE
▨	LEAN CLAY, LEAN CLAY WITH SAND, SANDY LEAN SILTY CLAY (CL, CL–ML)
▩	CLAYEY SAND (SC)
▦	SILTY SAND, POORLY GRADED SAND WITH SILT (SM, SP–SM)
▤	FAT CLAY, SANDY FAT CLAY FAT CLAY WITH SAND (CH)
▽	GROUND WATER (GW)
— — —	PERMIT BOUNDARY

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SOIL BORING REPORT
CROSS SECTION A-A'
KLEBERG COUNTY, TEXAS

16L0438 EXHIBIT IV

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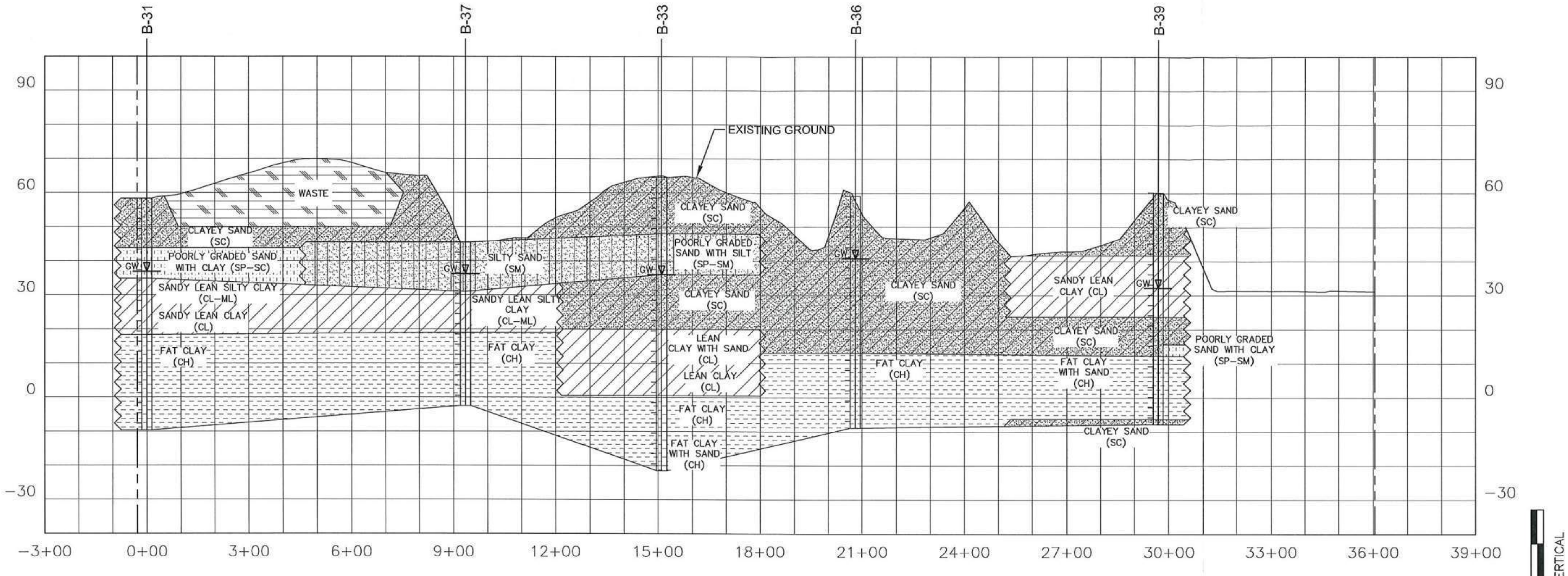

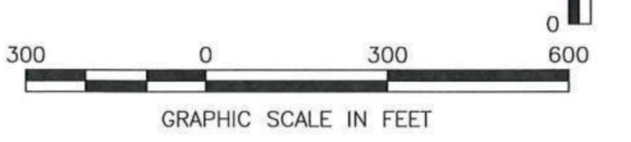

CROSS SECTION B-B'

LEGEND

- ▨ WASTE
- ▨ LEAN CLAY, LEAN CLAY WITH SAND, SANDY LEAN SILTY CLAY (CL, CL-ML)
- ▨ CLAYEY SAND (SC)
- ▨ SILTY SAND, POORLY GRADED SAND WITH SILT (SM, SP-SM)
- ▨ FAT CLAY, SANDY FAT CLAY FAT CLAY WITH SAND (CH)
- ▨ POORLY GRADED SAND WITH CLAY (SP-SC)
- ▽ GROUND WATER (GW)
- — — — PERMIT BOUNDARY

STATE OF TEXAS
SCOT E. COLLINS
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LICENSED
PROFESSIONAL GEOSCIENTIST

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CITY OF KINGSVILLE LANDFILL

SOIL BORING REPORT
CROSS SECTION B-B'
KLEBERG COUNTY, TEXAS

16L0438

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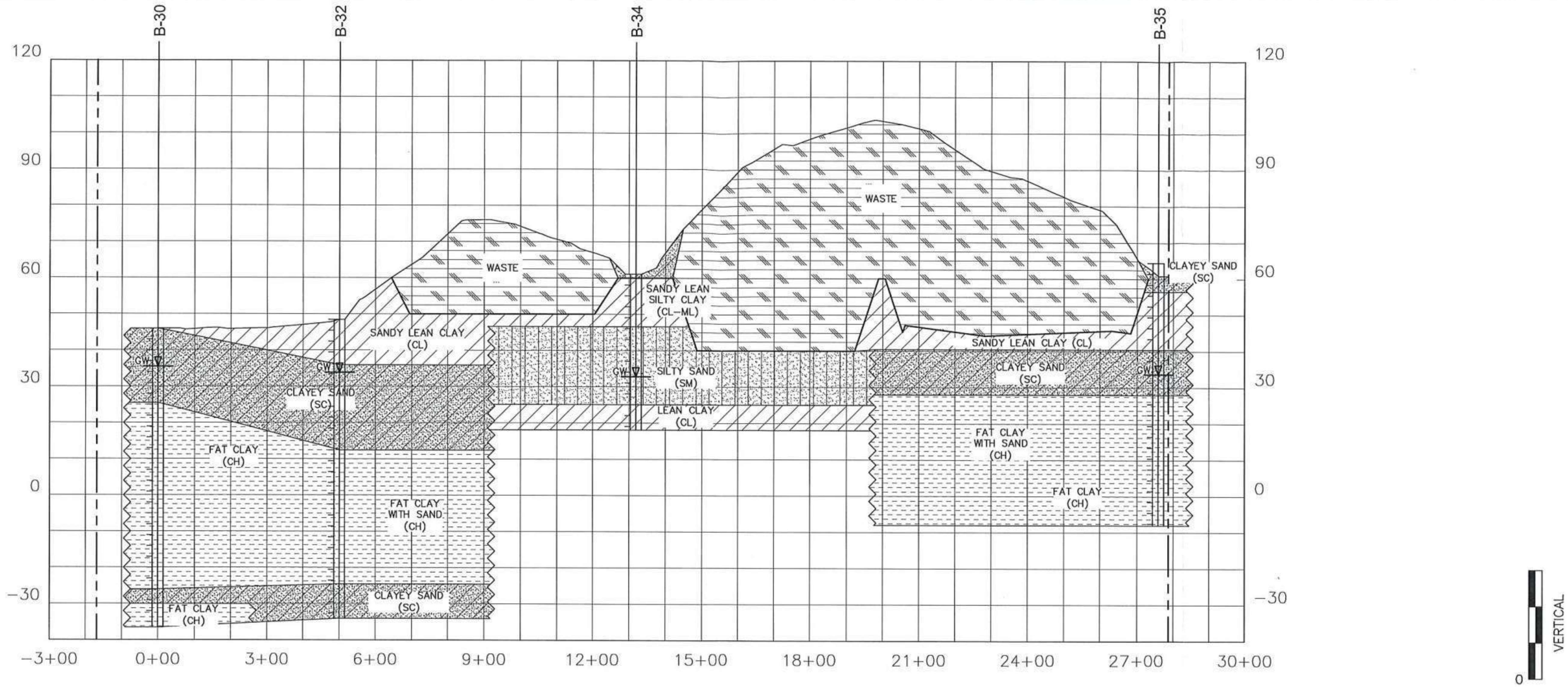

300 0 300 600
GRAPHIC SCALE IN FEET

CROSS SECTION C-C'

LEGEND

▧	WASTE
▨	LEAN CLAY, LEAN CLAY WITH SAND, SANDY LEAN SILTY CLAY (CL, CL–ML)
▩	CLAYEY SAND (SC)
▦	SILTY SAND, POORLY GRADED SAND WITH SILT (SM, SP–SM)
▤	FAT CLAY, SANDY FAT CLAY (CH)
∇	GROUND WATER (GW)
— — —	PERMIT BOUNDARY

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SOIL BORING REPORT
CROSS SECTION C-C'
KLEBERG COUNTY, TEXAS

16L0438
EXHIBIT IV

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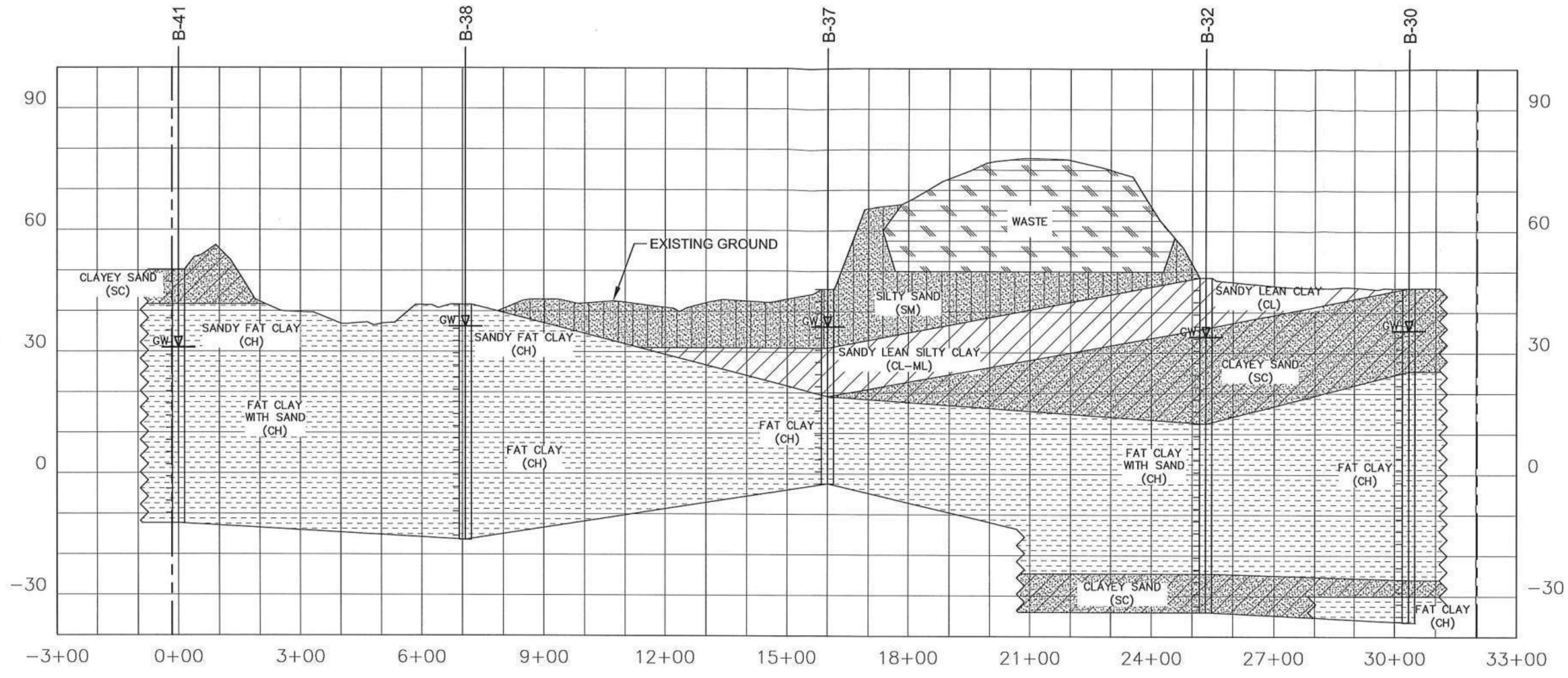

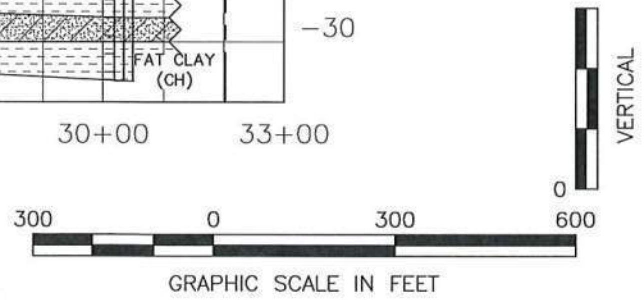

CROSS SECTION D-D'

LEGEND

▧	WASTE
▨	LEAN CLAY, LEAN CLAY WITH SAND, SANDY LEAN SILTY CLAY (CL, CL–ML)
▩	CLAYEY SAND (SC)
▦	SILTY SAND, POORLY GRADED SAND WITH SILT (SM, SP–SM)
▤	FAT CLAY, SANDY FAT CLAY (CH)
▽	GROUND WATER (GW)
— — —	PERMIT BOUNDARY

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CITY OF KINGSVILLE LANDFILL

SOIL BORING REPORT
CROSS SECTION D-D'
KLEBERG COUNTY, TEXAS

16L0438
EXHIBIT IV

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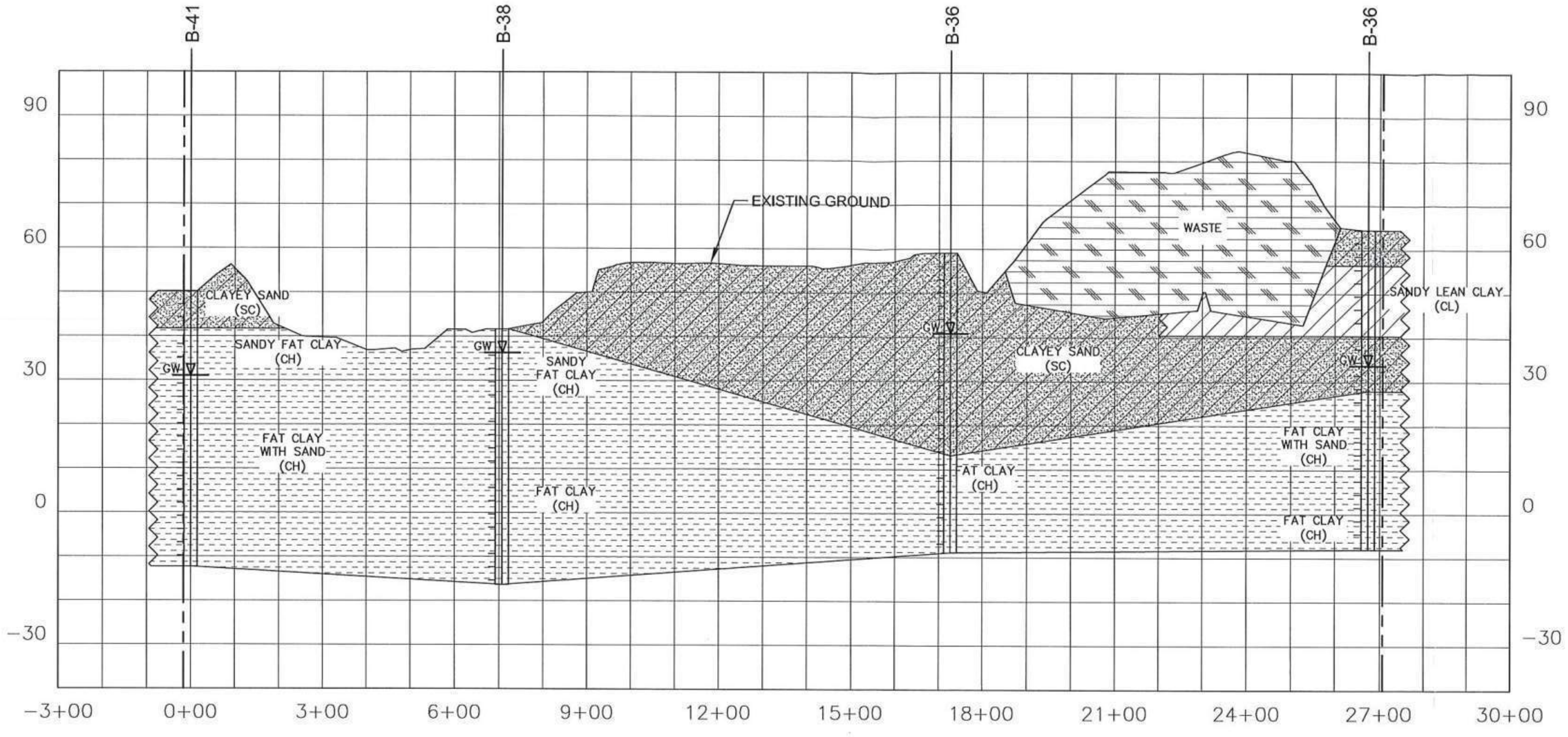
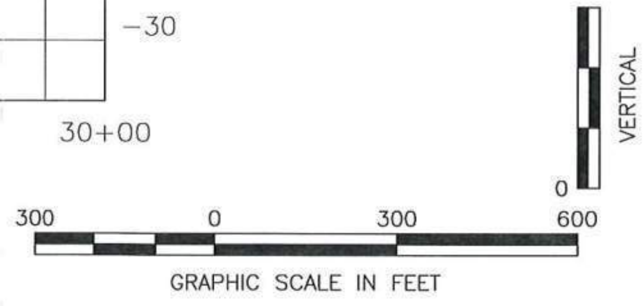


CROSS SECTION E-E'



LEGEND

▧	WASTE
▨	LEAN CLAY, LEAN CLAY WITH SAND, SANDY LEAN SILTY CLAY (CL, CL-ML)
▩	CLAYEY SAND (SC)
▤	FAT CLAY, SANDY FAT CLAY (CH)
▽	GROUND WATER (GW)
— — —	PERMIT BOUNDARY

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CITY OF KINGSVILLE LANDFILL

SOIL BORING REPORT
CROSS SECTION E-E'
KLEBERG COUNTY, TEXAS

16L0438
EXHIBIT IV

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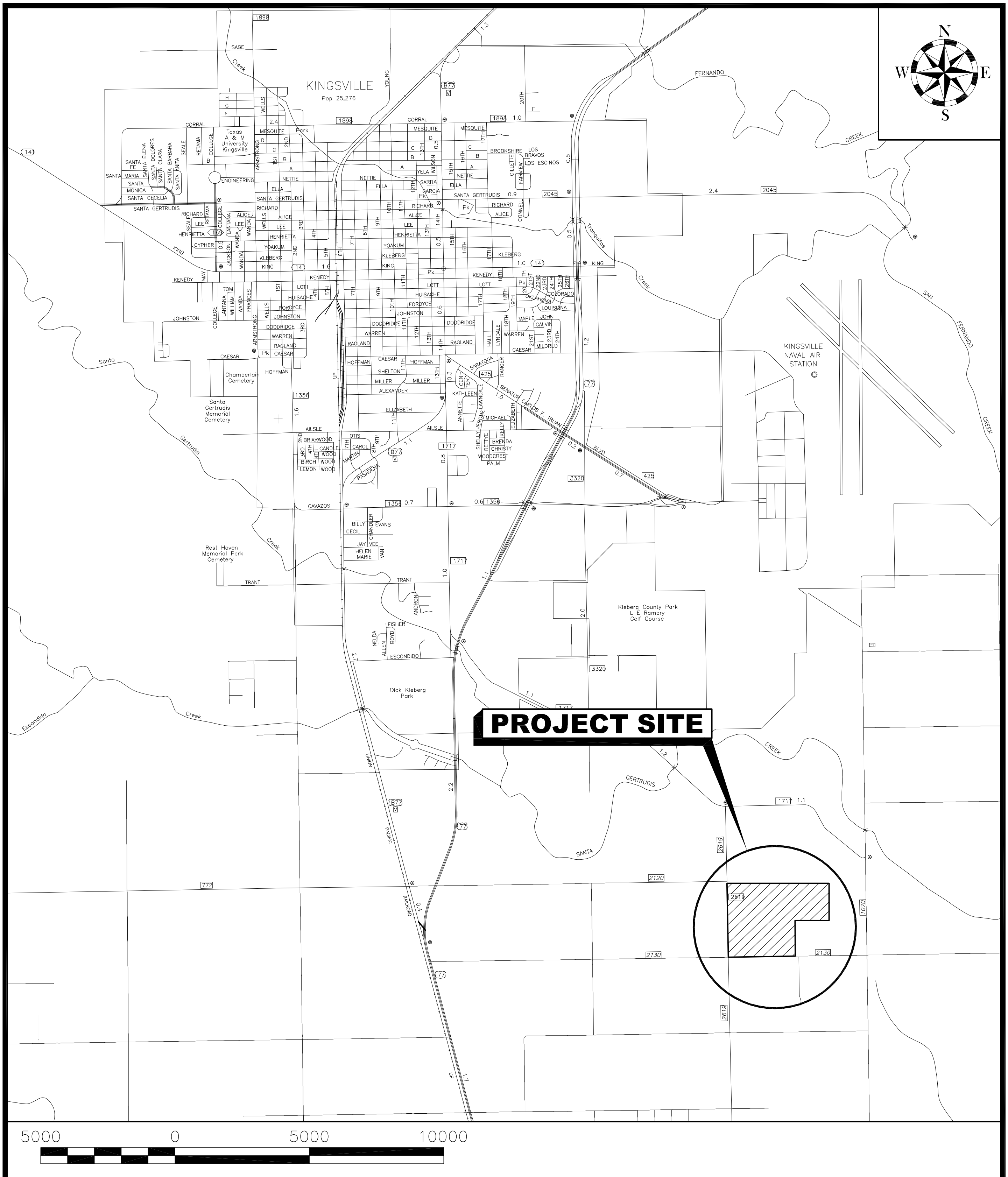
CITY OF KINGSVILLE LANDFILL

PART III, ATTACHMENT 4

ATTACHMENT 1

LOCATION MAP



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PART III-ATTACHMENT 4
ATTACHMENT 1
PROPERTY LOCATION MAP
CITY OF KINGSVILLE LANDFILL
MSW PERMIT No. 235-C
KINGSVILLE, TEXAS
KLEBERG COUNTY, TEXAS

Drawn By: DT	Appr. By: TAG	Scale: AS SHOWN	Dwg. File: 8514-03-LeachateSystem-Detail	FIGURE: III.4-1-1
Checked By: TAG	Project No.: 16L0438	Date: 09/10/2018	ATTACHMENT 1	

SEP 10, 2018 2:40 PM TORRE01809
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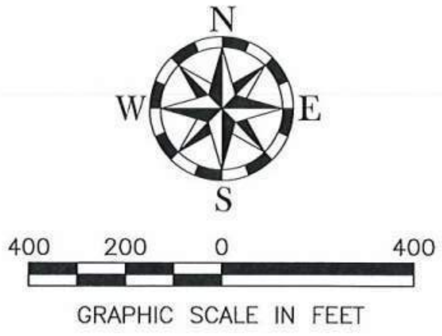
CITY OF KINGSVILLE LANDFILL

PART III, ATTACHMENT 4

ATTACHMENT 2

SOIL BORING LOCATION MAP



GRAPHIC SCALE IN FEET

LEGEND:

⊗ B 2	PREVIOUS SOIL BORING LOCATION
—— x ——	EXISTING FENCE
—— 65.00 ——	EXISTING SURFACE CONTOUR
- - - - - - - -	SECTOR OUTLINE
—— — — ——	PERMIT BOUNDARY (175.89 ACRES)
—— · ——	BUFFER ZONE
● B 32	NEW SOIL BORING LOCATION

NOTE:

1. LOCATION OF EXISTING BORINGS #2,#5,#7,#9 AND #25 ARE APPROXIMATED BASED UPON FIG. 5.16 BORING PLOT PLAN FROM PERMIT 235-B.

LOCATIONS OF NEW BORINGS & ELEVATIONS			
ID	LATITUDE	LONGITUDE	SURFACE ELEVATION
B-30	27.445558	-97.823058	45.99
B-31	27.447214	-97.823415	58.37
B-32	27.446659	-97.822130	48.46
B-33	27.448853	-97.819803	64.51
B-34	27.445632	-97.819885	61.14
B-35	27.447362	-97.815887	64.50
B-36	27.449097	-97.818067	59.13
B-37	27.449170	-97.821540	45.52
B-38	27.451251	-97.820077	41.64
B-39	27.450631	-97.815937	60.26
B-40	27.452738	-97.819722	52.31
B-41	27.452737	-97.821486	50.20

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10398

Scot E. Collins
9/11/2018

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NUMBER	REVISION	DATE	DRAWN	DESIGNED	REVIEWED

Hanson No. 16L0438
Filename
Scale 1"=400'
Date 09/10/18

LAYOUT	DT	09/10/18
DRAWN	DT	09/10/18
REVIEWED	TAG	09/10/18

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PART III, ATTACHMENT 4
ATTACHMENT 2
SOIL BORING LOCATION MAP
CITY OF KINGSVILLE LANDFILL
MSW PERMIT No. 235-C
KINGSVILLE, TEXAS
KLEBERG COUNTY, TEXAS

FIGURE:
III.4-2-1

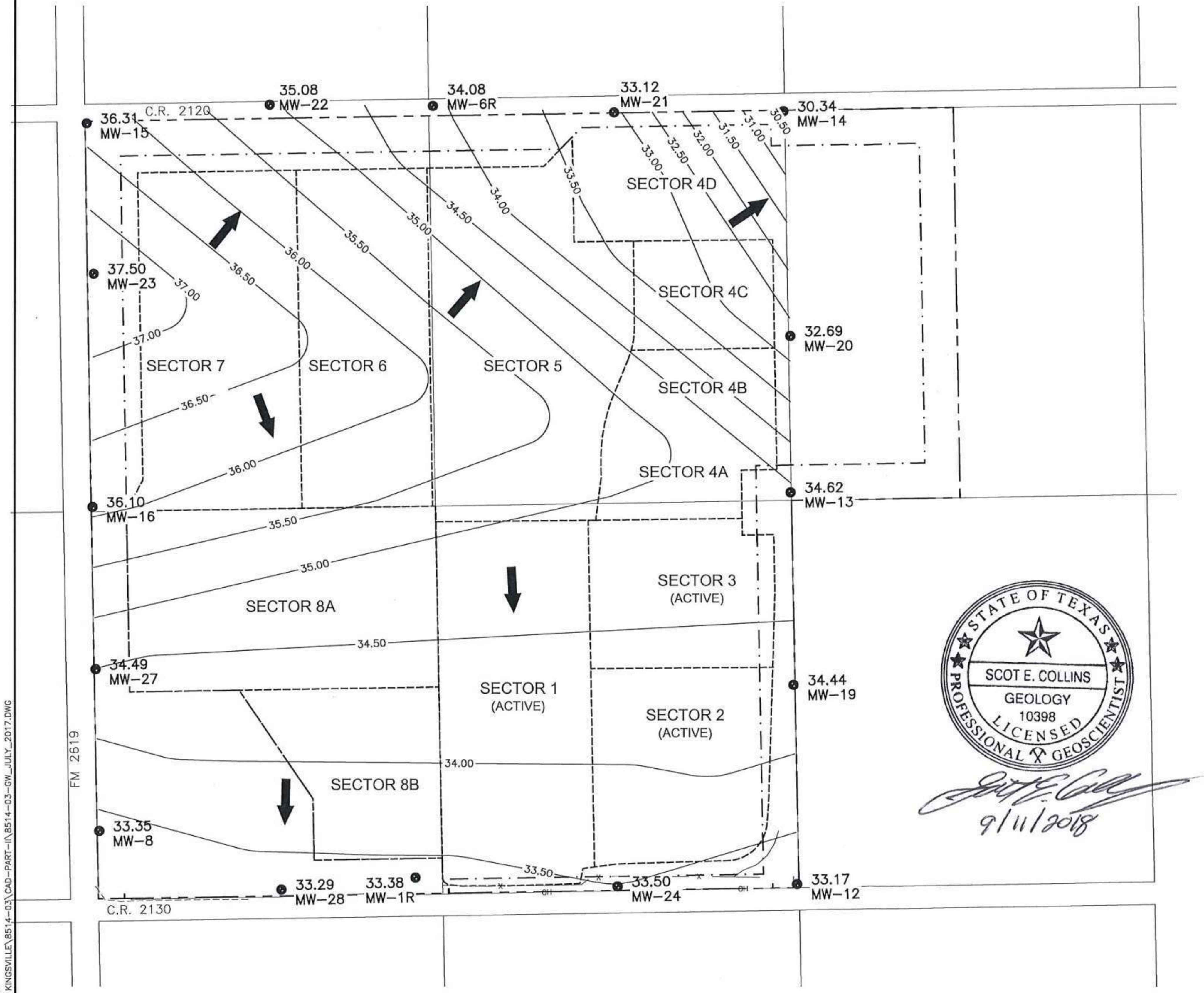
CITY OF KINGSVILLE LANDFILL

PART III, ATTACHMENT 4

ATTACHMENT 3

GROUNDWATER CONTOUR MAP

EXHIBIT 1 – GROUNDWATER ELEVATION TABLE
EXHIBIT 2 – ANALYTICAL DATA SUMMARY



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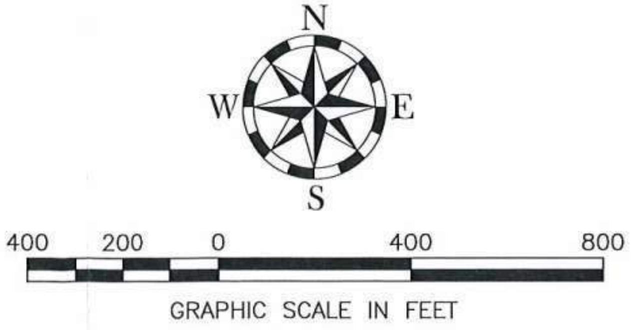
GEOLOGY
10398

9/11/2018



LEGEND:

⊗ 32.69 MW-20	MONITOR WELL WITH GROUNDWATER ELEVATION(FEET AMSL)
—— 35.00 ——	GROUNDWATER CONTOUR (FEET AMSL)
➡	GROUNDWATER DIRECTIONAL FLOW ARROW
- - - - - - - -	SECTOR OUTLINE
—— — — ——	PERMIT BOUNDARY (175.89 ACRES)
—— · ——	BUFFER LIMITS

SITE COORDINATES		
MONITOR WELL LOCATIONS		
MW	Northing	Easting
MW-1R	17051309.05	1204795.45
MW-6R	17054038.00	1204859.33
MW-8	17051473.78	1203673.74
MW-12	17051286.30	1206148.09
MW-13	17052672.16	1206127.95
MW-14	17054020.04	1206103.02
MW-15	17053976.10	1203628.61
MW-16	17052619.76	1203651.21
MW-19	17051991.35	1206137.50
MW-20	17053225.01	1206127.20
MW-21	17054015.40	1205502.94
MW-22	17054042.52	1204280.12
MW-23	17053444.05	1203654.88
MW-24	17051277.99	1205512.42
MW-27	17052045.52	1203661.75
MW-28	17051266.46	1204320.24

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NUMBER	REVISION	DATE	DRAWN	DESIGNED	REVIEWED

Hanson No. 16L0438
Filename
Scale 1"=400'
Date 09/10/18

LAYOUT	DT	09/10/18
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PART III, ATTACHMENT 4
ATTACHMENT 3
GROUNDWATER CONTOUR MAP
JANUARY 2017
CITY OF KINGSVILLE LANDFILL
MSW PERMIT No. 235-C
KINGSVILLE, TEXAS
KLEBERG COUNTY, TEXAS

FIGURE:
III.4-3-1

Groundwater Elevations
City of Kingsville Landfill
January 2017 Monitoring Event

Well	**TOC Elev.**	**DTW (BTOC)**	**GW Elevation**
MW-1R	62.59	29.21	33.38
MW-6R	57.31	23.23	34.08
MW-8	61.11	27.76	33.35
MW-12	54.78	21.61	33.17
MW-13	61.98	27.36	34.62
MW-14	52.54	22.20	30.34
MW-15	51.55	15.24	36.31
MW-16	58.80	22.70	36.10
MW-19	63.07	28.63	34.44
MW-20	60.66	27.97	32.69
MW-21	52.74	19.62	33.12
MW-22	52.81	17.73	35.08
MW-23	51.63	14.13	37.50
MW-24	54.65	21.15	33.50
MW-27	61.08	26.59	34.49
MW-28	68.91	35.62	33.29

*TOC Elevations were re-surveyed on August 29, 2011

January 2017 Analytical Data Summary

	MW-1R	MW-6R	MW-8	MW-12	MW-13	MW-14	MW-15	MW-16	MW-19	MW-20	MW-24	MW-27	MW-28
Groundwater elevation	33.38	34.08	33.35	33.17	34.62	30.34	36.31	36.10	34.44	32.69	33.50	34.49	33.29
Antimony	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Arsenic	0.05	0.16	0.02	0.17	0.16	0.21	0.07	0.03	0.16	0.07	0.27	0.02	0.05
Barium	0.05	0.05	0.14	0.11	0.08	0.07	0.03	0.05	0.11	0.03	0.06	0.08	1.03
Beryllium	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Cadmium	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Chromium	<0.020	<0.02	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.02	<0.020	<0.020	<0.020
Cobalt	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Copper	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Lead	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
Nickel	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Selenium	<0.05	<0.05	<0.05	<0.05	<0.05	<0.050	<0.050	<0.05	<0.05	<0.05	<0.050	<0.050	<0.050
Silver	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Thallium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Vanadium	0.19	0.34	0.14	0.85	0.53	0.68	0.16	0.30	0.47	0.31	0.96	0.03	0.08
Zinc	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
pH	7.19	8.08	7.76	7.45	7.47	7.24	7.12	7.29	7.56	7.03	7.60	7.27	7.20
Specific Conductance umho/cm	4109.00	2089.00	1131.00	5183.00	3619.00	8761.00	8644.00	3895.00	1627.00	16760.00	1635.00	2072.00	6356.00
Acetone	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Acrylonitrile	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Benzene	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.00
Bromochloromethane	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bromodichloromethane	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bromoform	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Carbon Disulfide	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Carbon tetrachloride	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chlorobenzene	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Chloroethane (ethyl chloride)	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chloroform (trichloromethane)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Dibromochloromethane	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
1,2-Dibromo-3-Chloropropane (DBCP)	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,2-Dibromoethane (ethylene dibromide, EDB)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
o-Dichlorobenzene (1,2-dichlorobenzene)	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
p-Dichlorobenzene (1,4-dichlorobenzene)	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
trans-1,4-Dichloro-2-butene	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,1-Dichloroethane (ethylidene chloride)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,2-Dichloroethane (ethylene dichloride)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,1-Dichloroethylene (1,1-dichloroethene, vinylidene c	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
cis-1,2-Dichloroethylene (cis-1,2-dichloroethene)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
trans-1,2 Dichloroethylene (trans-1,2-dichloroethene)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,2-Dichloropropane (Propylene dichloride)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

January 2017 Analytical Data Summary

	MW-1R	MW-6R	MW-8	MW-12	MW-13	MW-14	MW-15	MW-16	MW-19	MW-20	MW-24	MW-27	MW-28
cis-1,3-Dichloropropene	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
trans-1,3-Dichloropropene	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Ethylbenzene	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
2-Hexanone (methyl butyl ketone)	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Methyl bromide (bromomethane)	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Methyl Chloride (chloromethane)	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Methylene bromide (dibromomethane)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Methylene chloride (dichloromethane)	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Methyl ethyl ketone (MEK,2-butanone)	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Methyl iodide (iodomethane)	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
4-Methyl-2-pentanone (methyl isobutyl ketone)	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Styrene	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
1,1,1,2-Tetrachloroethane	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
1,1,2,2-Tetrachloroethane	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Tetrachloroethylene (tetrachloroethene, perchloroethy	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Toluene	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,1,1-Trichloroethane (methylchloroform)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,1,2-Trichloroethane	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Trichloroethylene (trichloroethene)	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Trichlorofluoromethane (CFC-11)	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
1,2,3-Trichloropropane	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Vinyl acetate	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100
Vinyl chloride	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Xylenes	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
All units mg/L unless otherwise noted.													

CITY OF KINGSVILLE LANDFILL

PART III, ATTACHMENT 4

ATTACHMENT 4

SEISMIC-HAZARD MAPS FOR THE CONTERMINOUS UNITED STATES

Seismic-Hazard Maps for the Conterminous United States, 2014

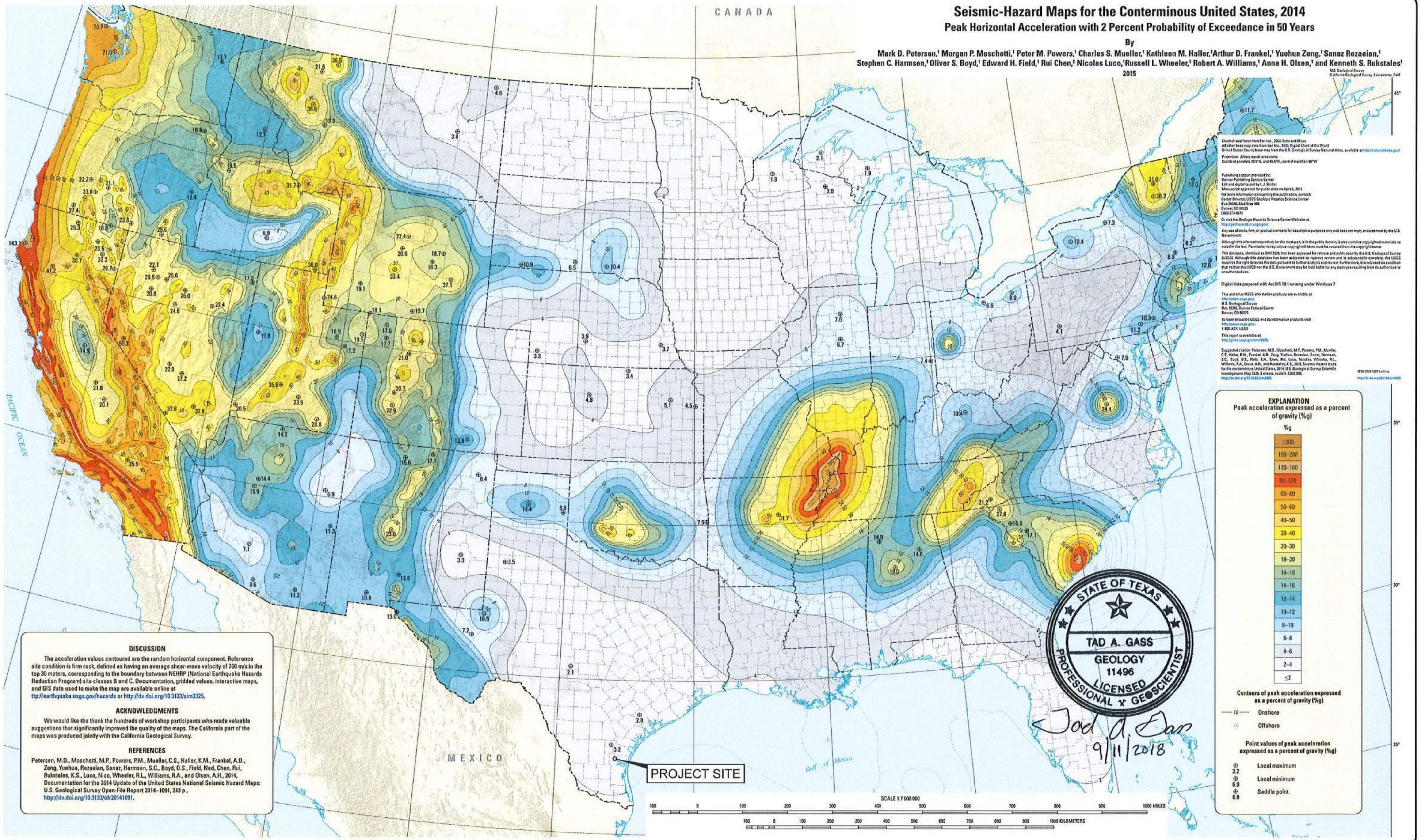
Peak Horizontal Acceleration with 2 Percent Probability of Exceedance in 50 Years

By

Mark D. Petersen,[1] Morgan P. Moschetti,[1] Peter M. Powers,[1] Charles S. Mueller,[1] Kathleen M. Haller,[1] Arthur D. Frankel,[1] Yuehua Zeng,[1] Sanaz Rezaeian,[1] Stephen C. Harmsen,[1] Oliver S. Boyd,[1] Edward H. Field,[1] Rui Chen,[2] Nicolas Luco,[1] Russell L. Wheeler,[1] Robert A. Williams,[1] Anna H. Olsen,[1] and Kenneth S. Rukstales[1]

[1] U.S. Geological Survey
[2] California Geological Survey, Sacramento, Calif.

2015



Shaded relief base from Esri Inc., 2008, Data and Maps
All other base map data from Esri Inc., 1993, Digital Chart of the World
United States County base map from the U.S. Geological Survey National Atlas, available at http://nationalatlas.gov/

Projection: Albers equal-area conic
Standard parallels 29.5°N. and 45.5°N., central meridian 96°W

Publishing support provided by:
Denver Publishing Service Center
Edit and digital layout by L.J. Binder
Manuscript approved for publication on April 6, 2015

For more information concerning this publication, contact:
Center Director, USGS Geologic Hazards Science Center
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Or visit the Geologic Hazards Science Center Web site at:
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Digital data prepared with ArcGIS 10.1 running under Windows 7

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Suggested citation: Petersen, M.D., Moschetti, M.P., Powers, P.M., Mueller, C.S., Haller, K.M., Frankel, A.D., Zeng, Yuehua, Rezaeian, Sanaz, Harmsen, S.C., Boyd, O.S., Field, E.H., Chen, Rui, Luco, Nicolas, Wheeler, R.L., Williams, R.A., Olsen, A.H., and Rukstales, K.S., 2015, Seismic-hazard maps for the conterminous United States, 2014: U.S. Geological Survey Scientific Investigations Map 3325, 6 sheets, scale 1:7,000,000, http://dx.doi.org/10.3133/sim3325.

ISSN 2329-132X (online)
http://dx.doi.org/10.3133/sim3325

EXPLANATION

Peak acceleration expressed as a percent of gravity (%g)

%g
≥200
160–200
120–160
80–120
60–80
50–60
40–50
30–40
20–30
18–20
16–18
14–16
12–14
10–12
8–10
6–8
4–6
2–4
≤2

Contours of peak acceleration expressed as a percent of gravity (%g)

—10—	Onshore
10	Offshore

Point values of peak acceleration expressed as a percent of gravity (%g)

⊙ 3.2	Local maximum
⊕ 6.9	Local minimum
⊕ 8.8	Saddle point

DISCUSSION

The acceleration values contoured are the random horizontal component. Reference site condition is firm rock, defined as having an average shear-wave velocity of 760 m/s in the top 30 meters, corresponding to the boundary between NEHRP (National Earthquake Hazards Reduction Program) site classes B and C. Documentation, gridded values, interactive maps, and GIS data used to make the map are available online at ttp://earthquake.usgs.gov/hazards or http://dx.doi.org/10.3133/sim3325.

ACKNOWLEDGMENTS

We would like the thank the hundreds of workshop participants who made valuable suggestions that significantly improved the quality of the maps. The California part of the maps was produced jointly with the California Geological Survey.

REFERENCES

Petersen, M.D., Moschetti, M.P., Powers, P.M., Mueller, C.S., Haller, K.M., Frankel, A.D., Zeng, Yuehua, Rezaeian, Sanaz, Harmsen, S.C., Boyd, O.S., Field, Ned, Chen, Rui, Rukstales, K.S., Luco, Nico, Wheeler, R.L., Williams, R.A., and Olsen, A.H., 2014, Documentation for the 2014 Update of the United States National Seismic Hazard Maps: U.S. Geological Survey Open-File Report 2014–1091, 243 p., http://dx.doi.org/10.3133/ofr20141091.

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9/11/2018

NUMBER	REVISION	DATE	DRAWN	DESIGNED	REVIEWED

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Scientific Investigations Map 3325
Sheet 2 of 6

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PART III-ATTACHMENT 4
ATTACHMENT 4
SEISMIC-HAZARD MAP
CITY OF KINGSVILLE LANDFILL
MSW PERMIT No. 235-C
KINGSVILLE, TEXAS
KLEBERG COUNTY, TEXAS

FIGURE:
III.4-4-1

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