



JAMES J. BLANCHARD, Governor

DEPARTMENT OF PUBLIC HEALTH

3500 N. LOGAN
P.O. BOX 20015, LANSING, MICHIGAN 48209
GLORIA R. SMITH, Ph.D., M.P.H., F.A.A.N., Director

PRINCIPAL STAFF			
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A/RA		PAO	
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ORMSP			
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ML			
OL		FILE	

May 16, 1983

Mr. James Miller
U. S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Mr. Miller:

On May 6, 1983 I informed Mr. William Menczer, NRC Region III, Director of State and Governmental Affairs, about radioactive material found in a landfill and on Michigan Department of Natural Resources (DNR) land near Bay City. During follow-up telephone conversations with other members of my staff, the situation was described to Mr. Don Sreniewski, NRC Region III, who stated that he would refer the matter to you.

Briefly, surveys and an analysis indicated the presence of thorium over an area of about 250 feet x 75 feet on DNR property. Some barrels of waste were protruding slightly from the ground, and analysis of a sample from a barrel revealed 670 ± 40 pCi/l gm (dry) of thorium-232. DNR representatives and Mr. Pete Tedeschi, Regional Director, Radiation Branch, Environmental Protection Agency, also joined in the survey. Mr. Tedeschi also collected a sample for analysis and qualitatively confirmed the presence of thorium. An aerial survey of the area in 1980 requested by the U. S. EPA and performed by EG&G, NRC contractor, indicated the presence of thallium 208 (a thorium-232 daughter) in the area surveyed and also in a larger adjacent parcel of land, part of the SCA Services Landfill. Visual examination of the material, the analysis, and historical data indicate that the material may be from an NRC licensee. Our investigations will include an effort to further identify the material and an additional survey/sampling trip during the last week of May.

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PDR FOIA
MAYFIEL92-128 PDR

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Mr. James Miller
May 16, 1983
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Mr. Sreniewski stated that the NRC would probably not take any action unless the involvement of an NRC licensee is definitely indicated. He also indicated that the matter would be referred to you.

As we develop more information, we will keep you informed.

Sincerely,

ENVIRONMENTAL AND OCCUPATIONAL
HEALTH SERVICES ADMINISTRATION

for *Joseph W. Bruchmann*
George W. Bruchmann, Acting Chief
Radiological Health Services Division

GWB/JHbs
cc: Mr. Don Sreniewski

Jim

5/23/83

*I talked to Don
about this. He does
not plan to send anyone
unless they pinpoint
a specific NRC
licensee.*

Bruch

*Bruchmann
17700
17700
17700*

TH Net

SFH

$$40,000 \text{ lb/yr} = 222 \text{ lb/yr}$$

$$\rightarrow 0.1 \text{ lb/yr} = 100.0 \text{ lb/yr} = 50.0 \text{ lb/yr}$$

$$L_1 1970 \quad 20.304 \text{ vol of } 1 \text{ mottle} = 50.0 \text{ lb/2000 lb}$$

reducible to < 50.0 and then at any \dots local \dots and buried at $\geq 4 \text{ ft}$, buried separately by 6 ft and no more than 12 local, per year.

$$50.0 \text{ lb} \times 12 = 600 \text{ m lb/yr} \approx 6000 \text{ lb/yr}$$

$$\text{if at } 1\% \text{ could bury } 69,000 \times 100 = 6,900 \text{ lb/yr} \text{ of sludge at } 1\%$$

$$\text{or } 1.5 \text{ lb/yr } 10\% \text{ sludge}$$

ATTACHMENT 1

DESCRIPTION OF SAMPLING LOCATIONS

LOCATION	DESCRIPTION
SP-1	Well inside DNR slurry wall.
SP-2	Well outside (west) DNR slurry wall.
SP-3	Well outside (north) DNR slurry wall.
SP-4	Well outside (east) DNR slurry wall.
MW-5	Well outside (east) DNR slurry wall.
MW-6	Well outside (north) DNR slurry wall.
MW-7	Well outside DNR slurry wall, west and south of DNR well SP-2.
MW-43	Well between DNR and SCA slurry walls.
MW-12	Well near boundary between DNR and SCA sites.
INS-1	Well inside SCA slurry wall (south).
UP-1	Well outside SCA slurry wall (south).
INS-2	Well inside SCA slurry wall (west).
DWN-3	Well outside SCA slurry wall (west).
INS-3	Well inside SCA slurry wall (north).
DWN-2	Well outside SCA slurry wall (north).
MW-15	Well outside and west of SCA slurry wall.
MW-18	Well outside and east of SCA slurry wall.
L-1	Surface water from lagoon north of DNR slurry wall.
L-2	Surface water from lagoon between DNR and SCA slurry walls.
L-3	Surface water from lagoon near Beaver Road.
SW-17	Surface water from lagoon south of SCA slurry wall.

*Location designations except L-1, L-2, AND L-3, are those used by WMI and DNR.

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ATTACHMENT 1

DESCRIPTION OF SAMPLING LOCATIONS

LOCATION*	DESCRIPTION
SP-1	Well inside DNR slurry wall.
SP-2	Well outside (west) DNR slurry wall.
SP-3	Well outside (north) DNR slurry wall.
SP-4	Well outside (east) DNR slurry wall.
MW-5	Well outside (east) DNR slurry wall.
MW-6	Well outside (north) DNR slurry wall.
MW-7	Well outside DNR slurry wall, west and south of DNR well SP-2.
MW-43	Well between DNR and SCA slurry walls.
MW-12	Well near boundary between DNR and SCA sites.
INS-1	Well inside SCA slurry wall (south).
UP-1	Well outside SCA slurry wall (south).
INS-2	Well inside SCA slurry wall (west).
DWN-3	Well outside SCA slurry wall (west).
INS-3	Well inside SCA slurry wall (north).
DWN-2	Well outside SCA slurry wall (north).
MW-15	Well outside and west of SCA slurry wall.
MW-18	Well outside and east of SCA slurry wall.
L-1	Surface water from lagoon north of DNR slurry wall.
L-2	Surface water from lagoon between DNR and SCA slurry walls.
L-3	Surface water from lagoon near Beaver Road.
SW-17	Surface water from lagoon south of SCA slurry wall.

*Location designations except L-1, L-2, AND L-3, are those used by WMI and DNR.

ATTACHMENT 3
WMI MONITORING SITES - KAWYAWLIN, MI
WATER SAMPLES OF NOVEMBER 1, 1989
RESULTS IN dCi/LITER; UNCERTAINTY ONE STANDARD DEVIATION

LOCATION	SAMPLE NUMBER	GROSS ACTIVITY		ISOTOPIC THORIUM			ISOTOPIC RADIUM	
		ALPHA	BETA	Th232	Th230	Th230	Ra226	Ra226
MONITOR WELL SP-1	NRC #89-829	0.6 +-5	-30 +-20					
MONITOR WELL SP-2	NRC #89-822	11.0 +-5	0 +-20	.011 +- .038	-.05 +- .05	-.06 +- .05	.22 +- .08	2.0 +- 2
MONITOR WELL SP-3	NRC #89-828	4.0 +-4	11 +-25					
MONITOR WELL SP-4	NO SAMPLE TAKEN							
MONITOR WELL MW-5	NO SAMPLE TAKEN							
MONITOR WELL MW-6	NRC #89-824	4.0 +-2	-3 +-9					
MONITOR WELL MW-7	NRC #89-823	5.0 +-7	-10 +-20					
WMI WELL MW-12	NRC #89-809	1.7 +-4.7	30 +-20					
WMI WELL MW-15	NO SAMPLE TAKEN							
WMI WELL MW-18	NRC #89-810	0 +-4	20 +-20					
WMI WELL MW-40A	NRC #89-811	10 +-15	30 +-40	.05 +- .03	.11 +- .05	.15 +- .08	.31 +- .07	1.7 +-1.6
WMI WELL MW-43	NRC #89-812	0 +-4	13 +-20					
WMI WELL UP-1	NRC #89-819	2 +-6	-30 +-20					
WMI WELL INS-1	NRC #89-818	17 +-9	-11 +-30	.05 +- .03	.31 +- .05	-.15 +- .06	.57 +- .08	6 +-2
WMI WELL INS-2	NRC #89-815	0 +-7	13 +-25					
WMI WELL INS-3	NRC #89-817	4 +-13	80 +-50					
WMI WELL DWN-2	NRC #89-816	0 +-14	20 +-50					
WMI WELL DWN-3	NRC #89-814	50 +-20	12 +-27	.06 +- .03	.09 +- .04	-.1 +- .08	.56 +- .08	7 +-2
SURFACE WATER L-1	NRC #89-827	4 +-2	12 +-10					
SURFACE WATER L-2	NRC #89-813	4 +-8	40 +-20					
SURFACE WATER L-3	NRC #89-830	1.6 +-2.2	30 +-30					
WMI WELL SW-17	NRC #89-821	1 +-2	-10 +-9					

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Mr. Palmer E. G. Jordan 100 Canada
Team 12, 100, 101, 102

Roller 100

Malcolm 100

Ed 100

100 100

ORBIN Perry Small 100, 100

ATTACHMENT 3
WMI/MDNR SITES - KAWKAULYN, HI
WATER SAMPLES OF NOVEMBER 1, 1989
RESULTS IN pCi/LITER; UNCERTAINTY ONE STANDARD DEVIATION

LOCATION	SAMPLE NO.	GROSS ACTIVITY		ISOTOPIC THORIUM			ISOTOPIC RADIUM	
		alpha	beta	Th232	Th230	Th230	Ra226	Ra228
MDNR WELL SF-1	NRC #89-B29	0 +/- 5	30 +/- 20					
MDNR WELL SF-2	NRC #89-B22	11 +/- 4	0 +/- 20	.011 +/- .008	-.05 +/- .01	-.06 +/- .01	.22 +/- .08	2 +/- 2
MDNR WELL SF-3	NRC #89-B28	4 +/- 6	11 +/- 25					
MDNR WELL SF-4	NO SAMPLE							
MDNR WELL MW-5	NO SAMPLE							
MDNR WELL MW-6	NRC #89-B24	4 +/- 2						
MDNR WELL MW-7	NRC #89-B23	5 +/- 7	10 +/- 20					
MDNR WELL MW-8	NEW WELL	NEW WELL AS OF JAN. 1991		NEW WELL AS OF JAN. 1991			NO 1989 RESULTS	
MDNR WELL MW-9	NEW WELL	NEW WELL AS OF JAN. 1991		NEW WELL AS OF JAN. 1991			NO 1989 RESULTS	
WELL MW-12	NRC #89-B09	1.7 +/- 4.7	50 +/- 20					
WMI WELL MW-15	NO SAMPLE							
WMI WELL MW-18	NRC #89-B10	0 +/- 4	20 +/- 20					
WMI WELL MW-40A	NRC #89-B11	10 +/- 15	30 +/- 40	.05 +/- .03	.11 +/- .05	.15 +/- .08	.31 +/- .07	1.7 +/- 1.6
WMI WELL MW-42	NRC #89-B12	0 +/- 4	13 +/- 20					
WMI WELL UP-1	NRC #89-B19	2 +/- 6	30 +/- 20					
WMI WELL INS-1	NRC #89-B18	17 +/- 9	11 +/- 30	.05 +/- .03	.31 +/- .03	-.15 +/- .06	.57 +/- .08	6 +/- 2
WMI WELL INS-2	NRC #89-B15	0 +/- 7	13 +/- 25					
WMI WELL INS-3	NRC #89-B17	4 +/- 13	80 +/- 50					
WMI WELL DWN-2	NRC #89-B16	0 +/- 14	20 +/- 50					
WMI WELL DWN-3	NRC #89-B14	50 +/- 20	12 +/- 27	.06 +/- .03	.09 +/- .04	-.1 +/- .08	.56 +/- .08	7 +/- 2
SURFACE WATER L1	NRC #89-B27	4 +/- 2	12 +/- 10					
SURFACE WATER L2	NRC #89-B13	4 +/- 6	40 +/- 20					
WATER L3	NRC #89-B30	1.6 +/- 2.2	30 +/- 30					
WMI WELL BU-17	NRC #89-B21	1 +/- 2	10 +/- 9					

P1/8		GROSS		ISOTOPIC THORIUM			ISOTOPIC RADIUM		ORIGINAL	
LDC	TIME	ALPHA	BETA	Th232	Th228	Th230	Ra226	Ra228		
SP1	6/85	4.1 ± 0.8	14 ± 15							
	11/85	SAMPLE NOT AVAILABLE								
	11/86	3.5 ± 0.9	19 ± 14							
	11/87	1.4 ± 0.6	75 ± 13							
	11/88	1.3 ± 0.7	90 ± 20							
✓	11/89	0 ± 5	-30 ± 20							
SP2	6/85	4.3 ± 1.1	12 ± 27							
	11/85	3.4 ± 0.9	17 ± 13							
	11/86	2.9 ± 0.9	21 ± 14							
	11/87	2.9 ± 0.9	10 ± 14							
	11/88	4.6 ± 1.3	-10 ± 15							
✓	11/89	11 ± 6	0 ± 20	$-0.11 \pm .038$	$-0.05 \pm .05$	$-0.06 \pm .05$	$-22 \pm .08$	2 ± 2		
SP3	11/85	7 ± 1	21 ± 13	$.11 \pm .04$	$.13 \pm .09$	$-.27 \pm .12$				
	11/86	3.6 ± 0.9	-7 ± 13							
	11/87	20 ± 4	45 ± 16	$.07 \pm .03$	$.18 \pm .07$	$.09 \pm .08$	$.55 \pm .09$	14 ± 3		
	11/88	28 ± 1.2	19 ± 16							
✓	11/89	4 ± 6	11 ± 25							

ATTACHMENT A SUMMARY OF ALL SAMPLES

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LOC	TIME	GROSS		ISOTOPIC THORIUM			ISOTOPIC RADIUM	
		ALPHA	BETA	Th 232	Th 228	Th 230	Ra 226	Po 228
UPI	11/85	2 ± 1	12 ± 14					
	11/86	-0.1 ± 0.5	6 ± 14					
	11/87	1.2 ± 0.5	25 ± 7					
	11/88	3.1 ± 1.0	19 ± 8					
✓	11/89	2 ± 6	-30 ± 20					
INS1	11/85	1.8 ± 0.7	27 ± 14					
	11/86	8 ± 2	30 ± 20	.03 ± .03	.6 ± .1	.2 ± .1		
	11/87	1.9 ± 0.9	130 ± 20					
	11/88	4.4 ± 1.2	770 ± 40					
✓	11/89	17 ± 9	-11 ± 30	.05 ± .03	.31 ± .05	7.15 ± .06	.57 ± .08	6 ± 2
INS2	11/85	2 ± 1	340 ± 40					
	11/86	1.3 ± 0.7	-50 ± 130					
	11/87	4.5 ± 0.9	13 ± 6					
	11/88	2.9 ± 0.6	6 ± 6					
✓	11/89	0 ± 7	13 ± 25					

4		GROSS		ISOTOPIC THORIUM			ISOTOPIC RADIUM	
LOC	TIME	ALPHA	BETA	Th 232	Th 228	Th 230	Ra 226	Ra 228
INS3	11/85	9 ± 2	30 ± 20	.01 ± .04	.26 ± .07	-.28 ± .10		
	11/86	7 ± 2	30 ± 20	.01 ± .02	.42 ± .04	0 ± .06		
	11/87	11 ± 2	40 ± 20	.03 ± .03	.015 ± .053	.07 ± .09	1.23 ± .12	6 ± 3
	11/88	1.8 ± .8	0 ± 15					
	✓ 11/89	4 ± 13	80 ± 50					
DWN2	11/85	4.7 ± 1.3	30 ± 20					
	11/86	5.4 ± 1.6	70 ± 20	.04 ± .02	.08 ± .06	.04 ± .02		
	11/87	4.6 ± .03	90 ± 20					
	11/88	32 ± 5	30 ± 30	.5 ± .6	1.09 ± .08	.2 ± .08	1.91 ± .13	-.1 ± 1.4
	11/89	0 ± 14	20 ± 50					
DWN3	11/85	1.3 ± 0.9	0 ± 20					
	11/86	3 ± 1	15 ± 14					
	11/87	1.6 ± 1.0	34 ± 16					
	11/88	3 ± 1	-18 ± 14					
	✓ 11/89	50 ± 20	12 ± 27	.06 ± .03	.09 ± .04	-.1 ± .06	.56 ± .08	7 ± 2

[illegible]

[illegible]

[illegible]

[illegible]

NRC NO.	WELL/SITE LOCATION, #	DATE	TIME	COMMENTS
89-809	MW-12	11/1/89	0910 EST	WMI
{ 810	MW-18	11/1/89	0938 EST	WMI
89-811	MW-40A	11/1/89	1000 EST	WMI
89-812	MW43A	11/1/89	1030 EST	WMI
89-813	L-2	11/1/89	1020 EST	WMI
89-814	DWN-3	11/1/89	1053 EST	WMI
89-815	INS-2	11/1/89	1115 EST	WMI
89-816	DWN-2	11/1/89	1136 EST	WMI
89-817	INS-3	11/1/89	1149 EST	WMI
89-818	INS-1	11/1/89	1214 EST	WMI
89-819	LLP-1	11/1/89	1229 EST	WMI
89-820	MW-15	11/1/89	—	Well DRY No SAMPLE TAKEN
89-821	SW-17	11/1/89	1240 EST	WMI
89-822	SP-2	11/1/89	1305 EST	MDNR
89-823	MW-7	11/1/89	1320 EST	MDNR; PARTIAL SAMPLE, < ½ CUBITAINER; ALSO, NEW WELL
89-824	MW-6	11/1/89	1333 EST	MDNR
89-825	MW-5	11/1/89	—	WELL DRY NO SAMPLE TAKEN
89-826	SP-4	11/1/89	—	WELL DRY NO SAMPLE TAKEN
89-827	L-1	11/1/89	1343 EST	MDNR
89-828	SP-3	11/1/89	1441 EST	MDNR
89-829	SP-1	11/1/89	1420 EST	MDNR
89-830	L-3	11/1/89	1535 EST	WMI
-)				

ES-215

sol $4.1 \pm 0.8 \text{ pg/l}$

and $(12 \pm 3 \text{ pg/g}) \times 0.035 \text{ g} = 0.42 \pm 0.105 \text{ pg}$

& then we assume

$$\frac{0.42 \pm 0.105 \text{ pg}}{50 \times 10^3 \text{ L}} = 8.4 \pm 2.1 \text{ pg/L}$$

Total $(4.1 + 8.4) \pm \sqrt{(0.8)^2 + (2.1)^2} = 12.5 \pm 2.2 \text{ pg/L}$

Also assume that 0.035g was filtered from 50 ml of
 Note: 4 sediment fraction of 0.27 g was scanned - I assume
 these came from the 400 ml that was scanned again

$$\frac{400 \text{ ml}}{0.27 \text{ g}} = 1481 ; \quad \frac{50 \text{ ml}}{0.035 \text{ g}} = 1429 \quad \text{close enough}$$

ES-253: sol $(1.4 \pm 1.5) \times 10^3 \text{ pg/L}$

and $20 \pm 20 \text{ pg/g} \times 0.001 \text{ g} = 0.2 \pm 0.2 \text{ pg}$, $\frac{2 \text{ pg}}{50 \times 10^3 \text{ L}} = 4 \text{ pg/L}$

or $14 \pm 16 \text{ pg/L}$

Total $(14 \pm 15) + (24 \pm 14) \Rightarrow 28 \pm \sqrt{15^2 + 14^2} = 28 \pm 21$

ES-216: sol $4.3 \pm 1.1 \text{ pg/L}$ and $(16 \pm 4 \text{ pg/g}) \times 0.015 \text{ g} \times \frac{1}{25000 \text{ L}} = 9.6 \pm 3.6 \text{ pg/L}$

Total $(4.3 + 9.6) \pm \sqrt{1.1^2 + 3.6^2} = 13.9 \pm 3.8 \text{ pg/L}$

or $12 \pm 27 \text{ pg/L}$ and $30 \pm 40 \text{ pg/g} \times 0.001 \text{ g} \times \frac{1}{25000 \text{ L}} = 18 \pm 20 \text{ pg/L}$

Total $(12 + 18) \pm \sqrt{27^2 + 20^2} = 30 \pm 36 \text{ pg/L}$

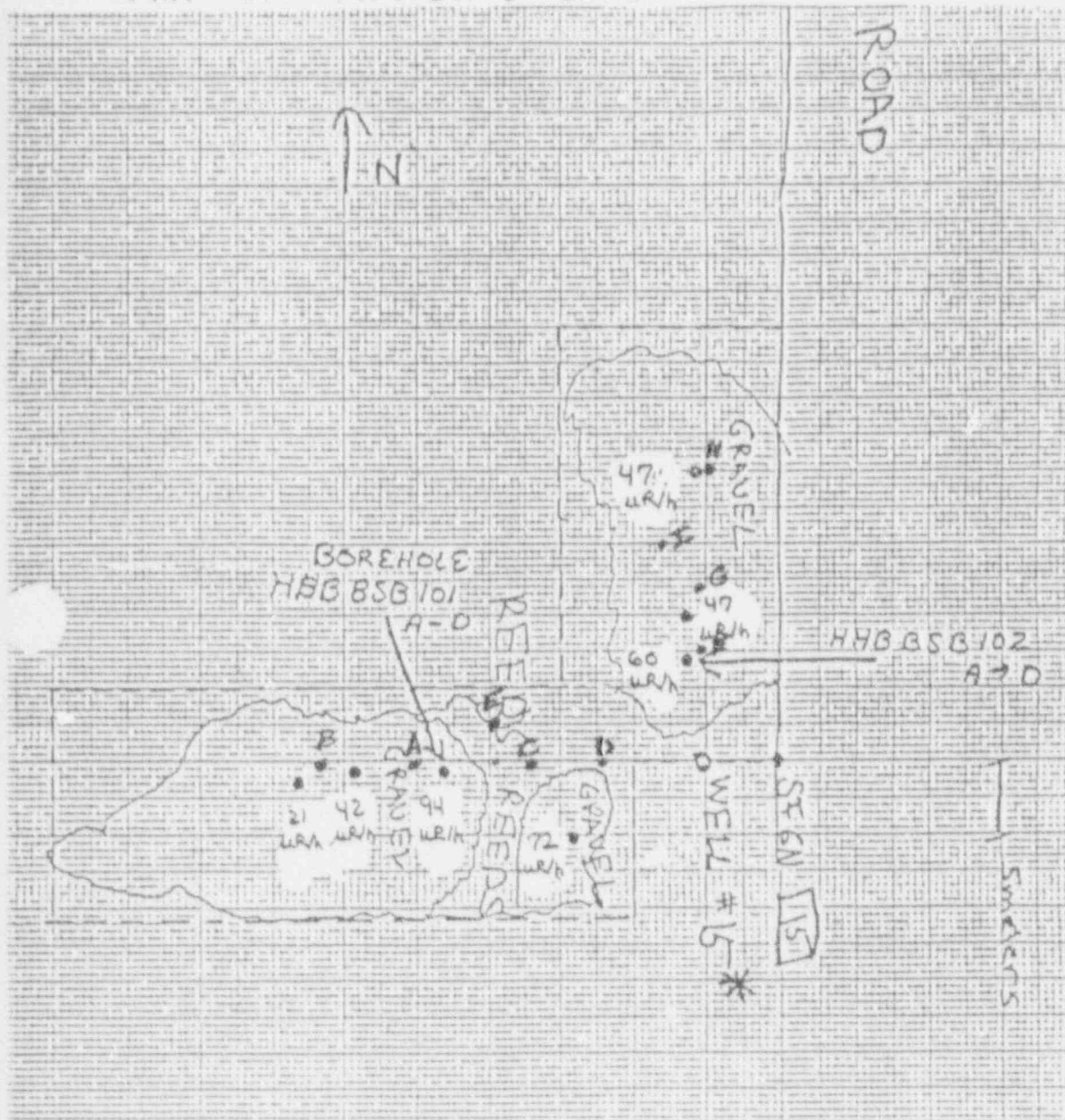
Total $T_0 = \frac{85 \text{ ml}}{1000} = 1667 \text{ (no date)}$

So the sediment and (assumed) are quite similar below the
 line

Note: This sheet shows samples
TAKEN BY AHC ON 8/22/84.

ATTACHMENT 1

MAP OF HARTLEY'S LAND



SITE HBB

Location 10 m
- 41 square
- 15-16 - 41 m
- 15-16 - 41 m
- 15-16 - 41 m
- 15-16 - 41 m

* WELL #15 IS 48 METERS NORTH AND (-) TWENTY SIX
METERS EAST OF IRON PIN IN ROAD ON *property*
SOUTHWEST CORNER OF SCA PROPERTY.

--- INDICATES AREAS EXCEEDING 10 UR/h.

SEE BACKSIDE FOR SAMPLES TAKEN 8/22/84 BY MCG, DAC, & MJO

SAMPLE #	Location	CONTACT READINGS				PRM-6 CONVERTED UR/μV	TOTAL K233
		UR meter UR/μV	PRM-6 cpm	Factor UR/μV/10cpm			
A	20 meter W of Well 15	18	8,100	2.25		12	
B	26½ m W of Well 15	16	7,000	2.29		10.2	
C	12 m W of Well 15	20	12,000	1.67		18	
D	7 m W of Well 15	10	4,000	2.5		5.5	
E	14 m W, 5 m N of Well 15	90	60,000	1.5		94	
F	7 m N of Well 15	18	10,000	1.8		15	
G	12 m N of Well 15	11-12	5,000	2.3		7.1	
H	20 m N of Well 15	12	7,000	1.71		10.3	
I	15 m N, 3 m W of Well 15	17	10,000	1.7		15	

the technique of artificial transmutation. With the discovery of a new isotope, neptunium-237 (a long-lived transuranium element which is artificially produced), the $(4n+1)$ series was named the *neptunium series*.

a. *The thorium series, $(4n)$.* With its half life of 1.50×10^{10} years, Th^{232} is the longest-lived of all the members of this series. ThC is similar to RaC in its decay scheme. ThC exhibits a 65 per cent branching by beta decay and 35 per cent by alpha decay. Thoron ($_{86}\text{Rn}^{220}$) is the only gaseous member of the series and corresponds to radon in the uranium series. A complete list of all the members of the thorium series appears in Table 4-2, together with pertinent data about the radiation emitted by each radionuclide in the series. In Fig. 4-8 an $N - P$ plot of the series is presented.

TABLE 4-2

THE THORIUM SERIES

Name	Symbols	Half life	Energy of radiation (MeV)		
			α	β	γ
Thorium	$_{90}\text{Th}^{232}$	1.50×10^{10} yr	4.80	—	—
Mesothorium 1	$_{90}\text{Ra}^{228}$ (MeTh)	6.7 yr	—	0.053	—
Mesothorium 2	$_{90}\text{Ac}^{228}$ (MeTh)	6.13 hr	4.5	1.55	0.96
Radiothorium	$_{90}\text{Th}^{230}$ (RdTh)	1.90 yr	5.42	—	0.08
Thorium X	$_{90}\text{Ra}^{226}$ (ThX)	3.64 days	5.63	—	0.85
Thoron	$_{86}\text{Rn}^{220}$ (Th)	54.5 sec	6.48	—	—
Thorium A	$_{84}\text{Po}^{216}$ (ThA)	0.158 sec	6.77	β	—
Thorium B	$_{84}\text{Pb}^{212}$ (ThB)	10.6 hr	—	0.36	—
Thorium C	$_{84}\text{Bi}^{212}$ (ThC)	60.5 min	6.05	—	γ
Thorium C'	$_{84}\text{Po}^{212}$ (ThC')	3×10^{-14} sec	8.95	—	—
Thorium C''	$_{84}\text{Tl}^{212}$ (ThC'')	3.1 min	—	1.82	2.62
Thorium D	$_{84}\text{Pb}^{208}$ (ThD)	Stable	—	—	—

b. *The actinium series, $(4n+3)$.* Table 4-3 lists the members of the actinium series. In order to show the striking similarity which this series bears to the thorium series, it has been plotted on the same $N - P$ diagram (Fig. 4-8), except that the abscissa has been shifted slightly in order to keep the two series from overlapping. The longest-lived member of this series is U^{235} (actinouranium, AcU) which has a half life of 7.07×10^8 years. Actinon ($_{86}\text{Rn}^{219}$), also called actinium emanation, is a gaseous decay product having a half life of only 4 seconds. AcC decays principally (99.7 per cent branching) by alpha decay, in contrast to 99.96 beta branching in the case of RaC .

TABLE 4-3
THE ACTINIUM SERIES

Name	Symbols	Half life	Energy of radiation (MeV)		
			α	β	γ
Actinouranium	$_{91}\text{U}^{235}$	7.07×10^8 yr	4.54	—	—
Actinium Y	$_{91}\text{Th}^{231}$ (UY)	44.6 hr	—	~0.4	0.05
Protactinium	$_{91}\text{Pa}^{231}$	3.4×10^4 yr	5.03	—	0.56
Actinium	$_{91}\text{Ac}^{227}$	15.5 yr	5.0	0.44	—
Radioactinium	$_{91}\text{Th}^{227}$ (RaAc)	18.9 days	6.03	—	—
Actinium X	$_{91}\text{Ra}^{226}$ (AcX)	11.9 days	5.74	—	—
Actinon	$_{87}\text{Rn}^{219}$ (Ac)	3.96 sec	6.84	—	—
Actinium A	$_{87}\text{Po}^{215}$ (AcA)	1.80×10^{-4} sec	7.26	—	—
Actinium B	$_{87}\text{Pb}^{215}$ (AcB)	26.1 min	—	0.5	0.8
Actinium C	$_{87}\text{Bi}^{215}$ (AcC)	2.16 min	6.68	—	—
Actinium C'	$_{87}\text{Po}^{215}$ (AcC')	5×10^{-14} sec	7.85	—	—
Actinium C''	$_{87}\text{Tl}^{215}$ (AcC'')	4.26 min	—	—	—
Actinium D	$_{87}\text{Pb}^{213}$	Stable	—	1.47	—

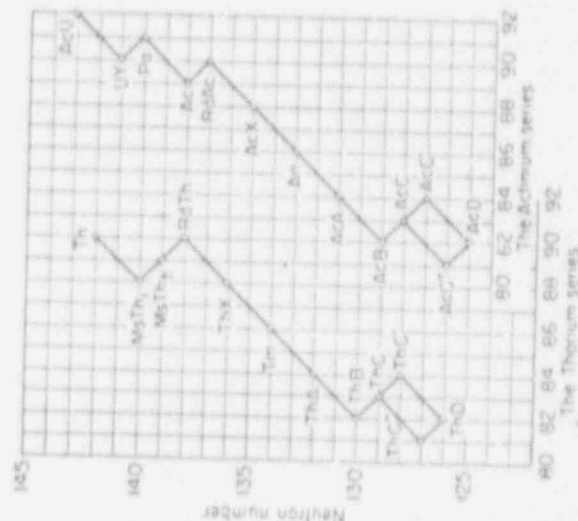


Fig. 4-8 The thorium and actinium series.

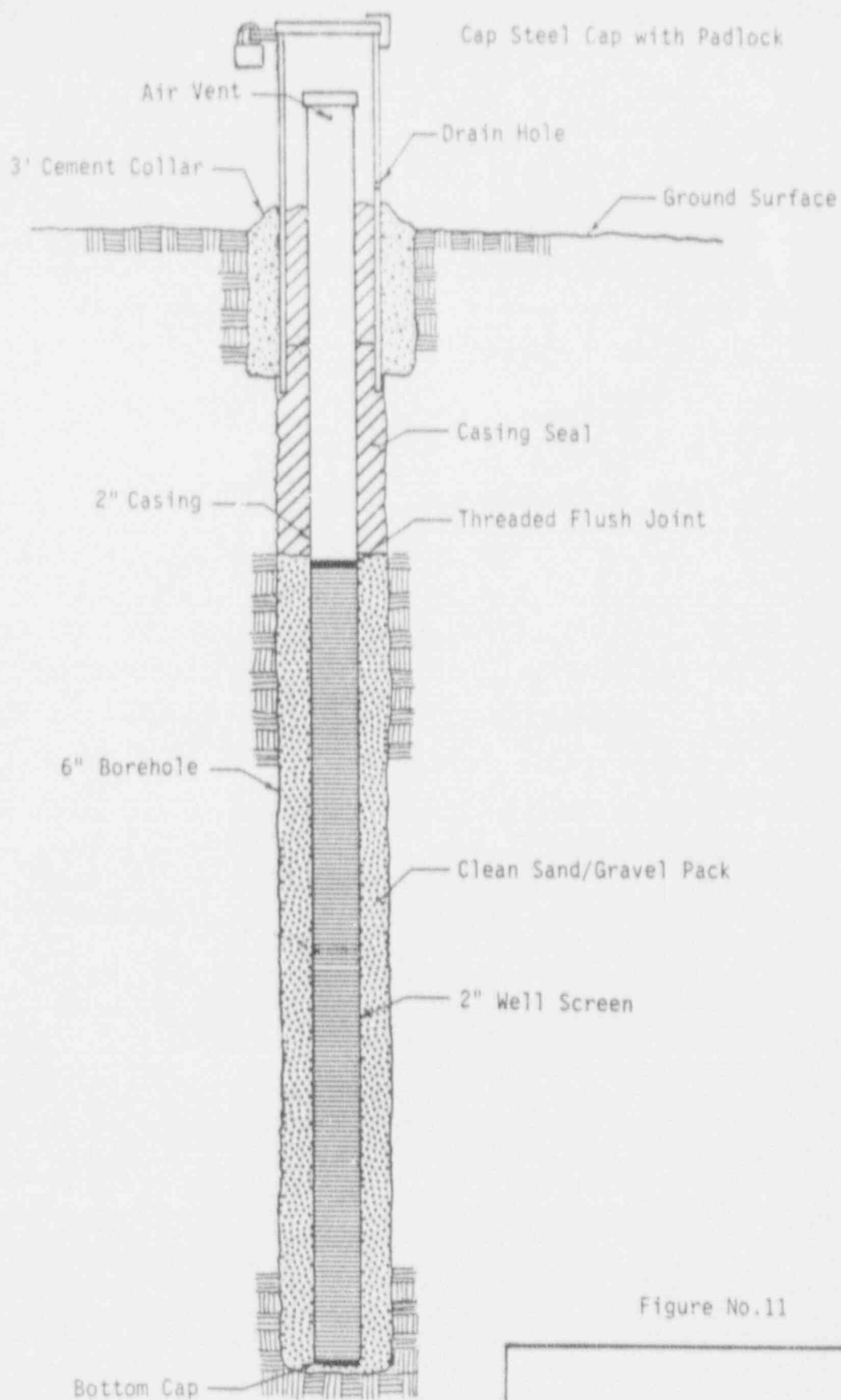
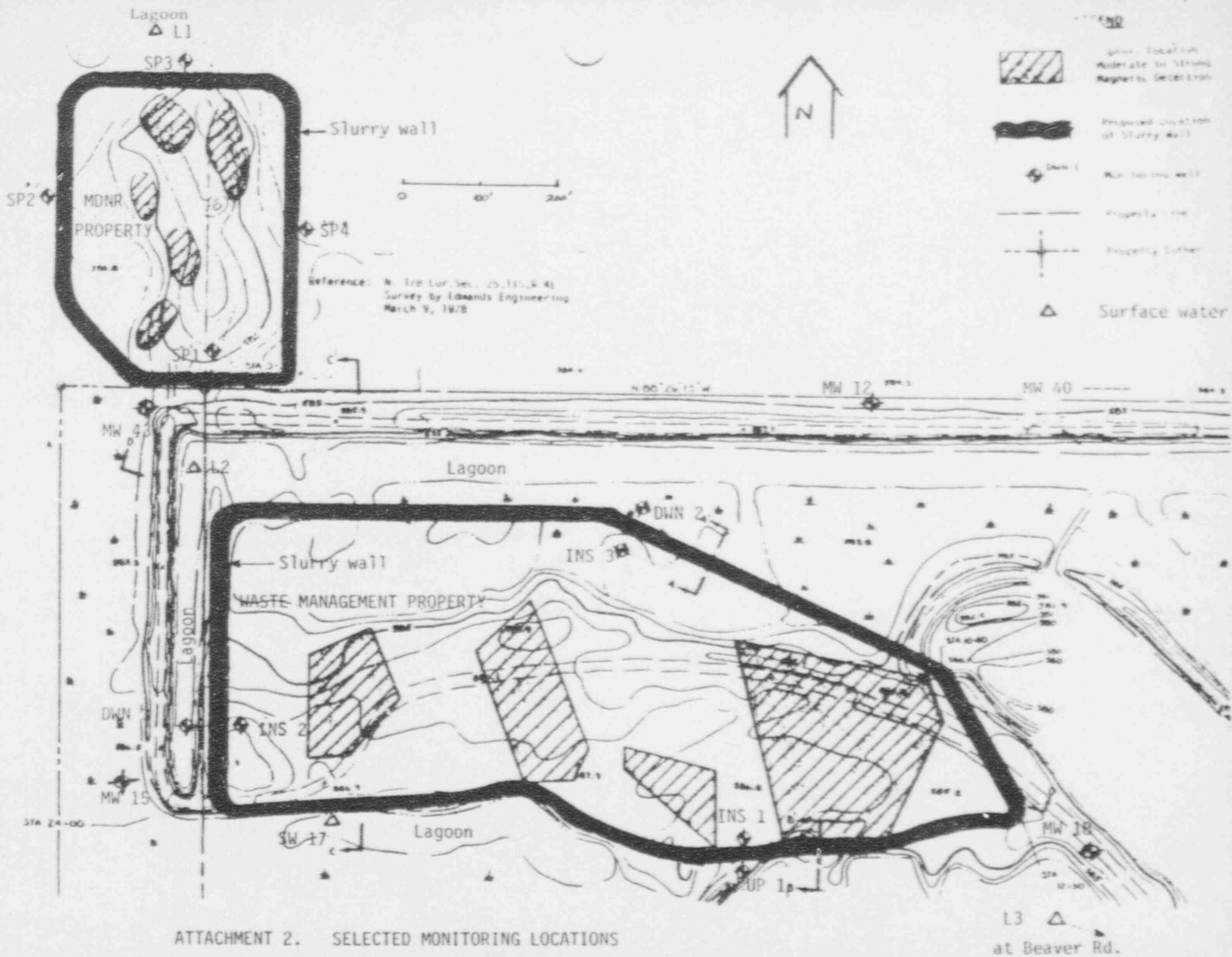


Figure No.11

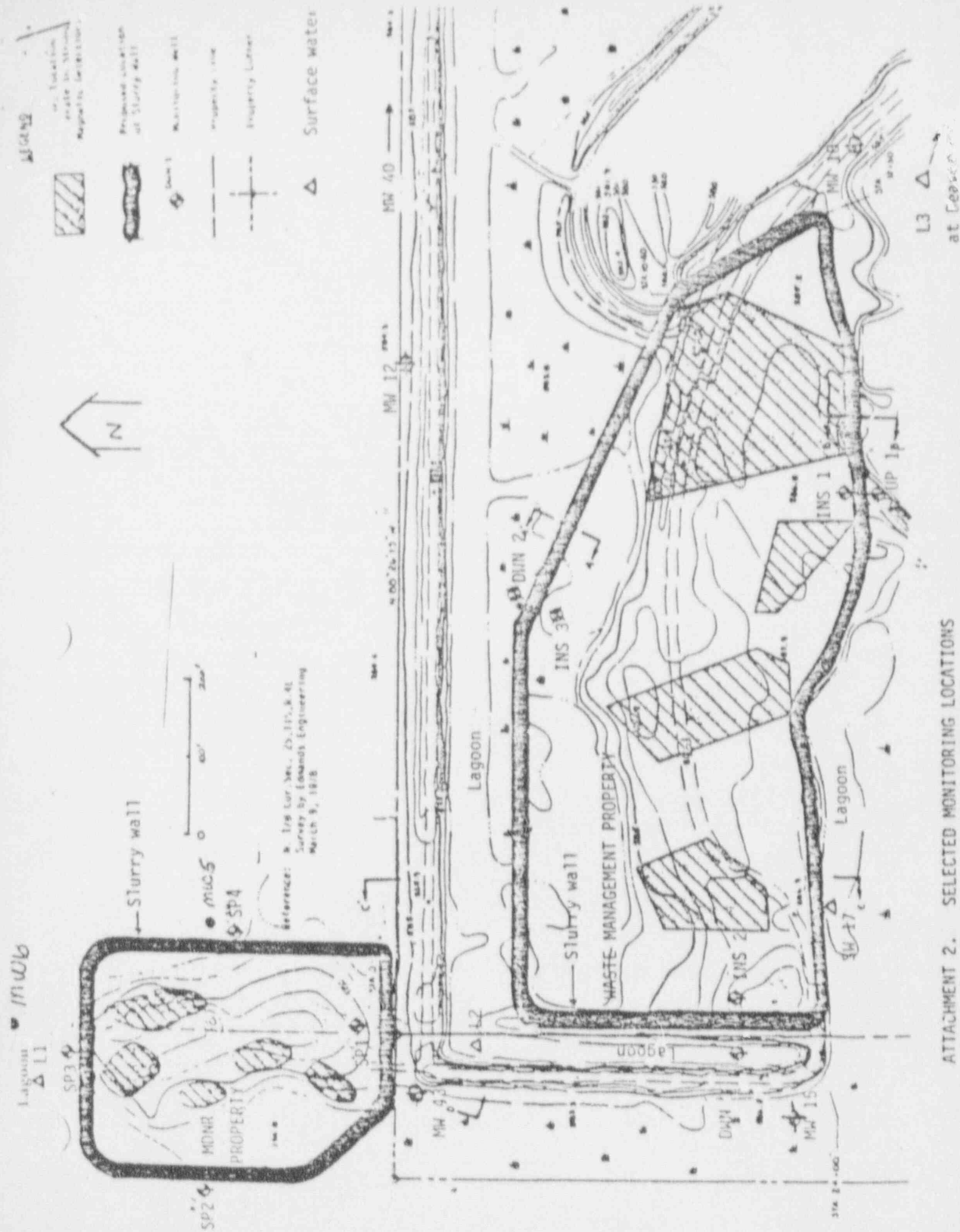
Monitoring Well Detail



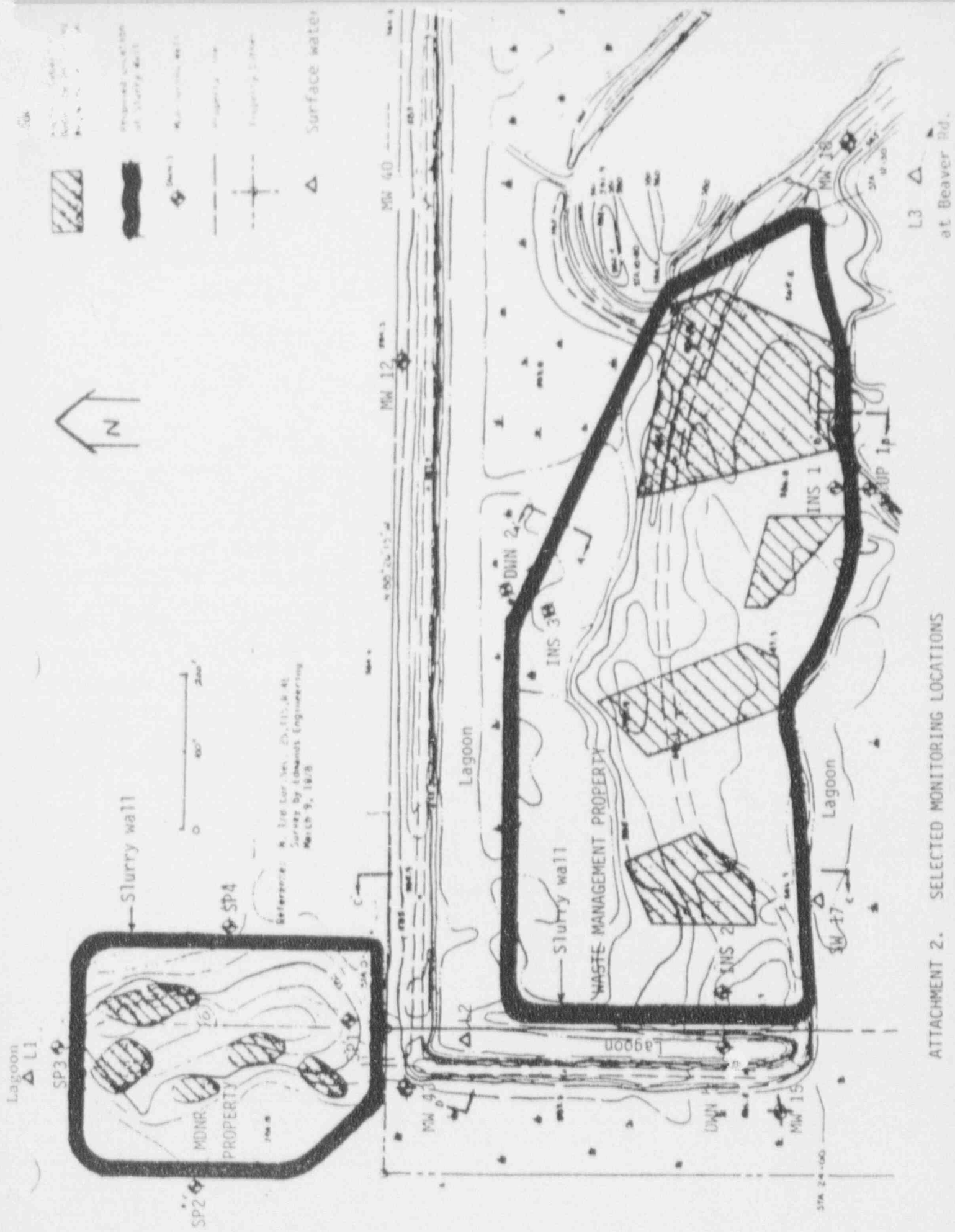
GROUNDWATER TECHNOLOGY, INC

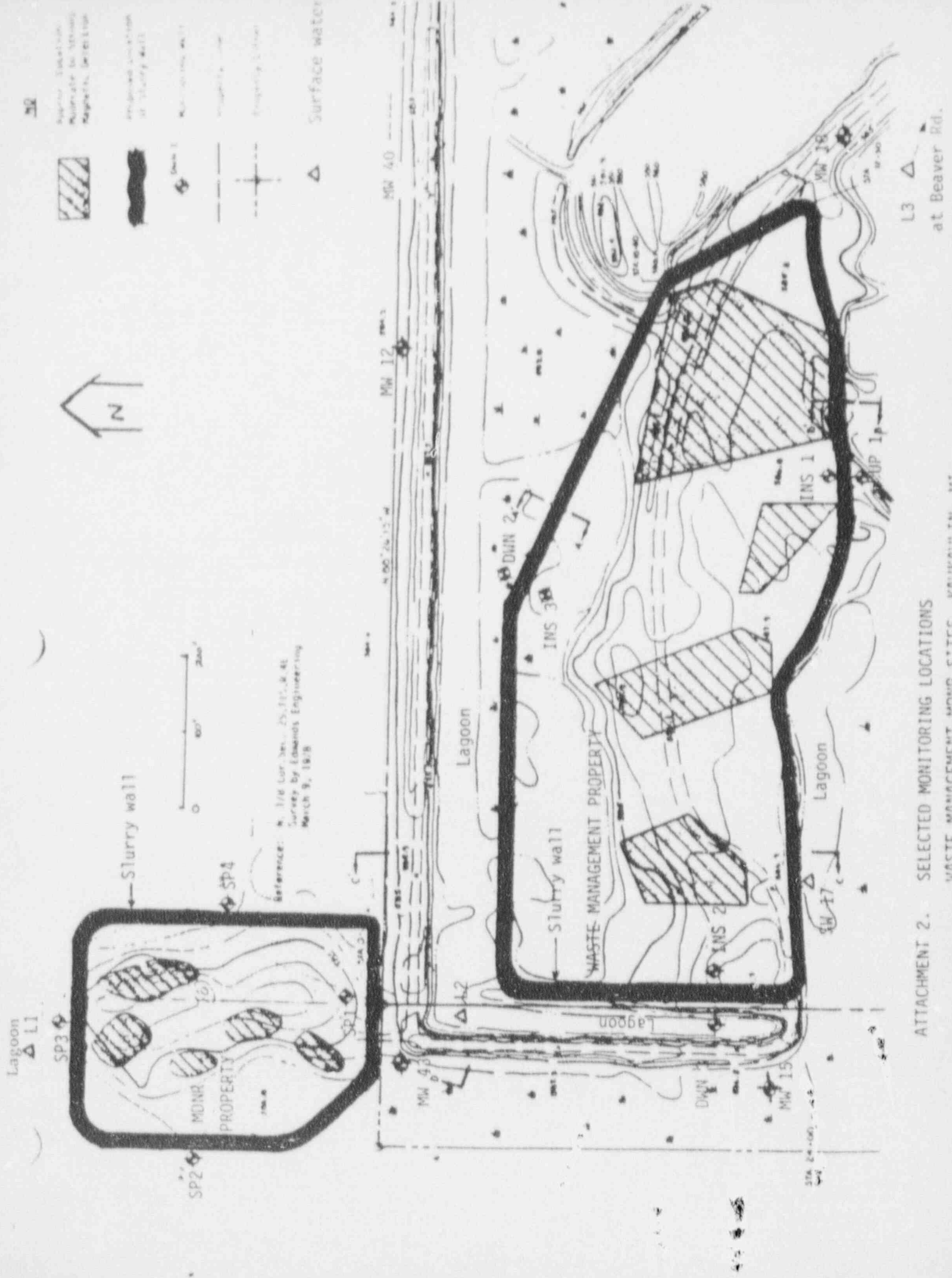


ATTACHMENT 2. SELECTED MONITORING LOCATIONS



ATTACHMENT 2. SELECTED MONITORING LOCATIONS





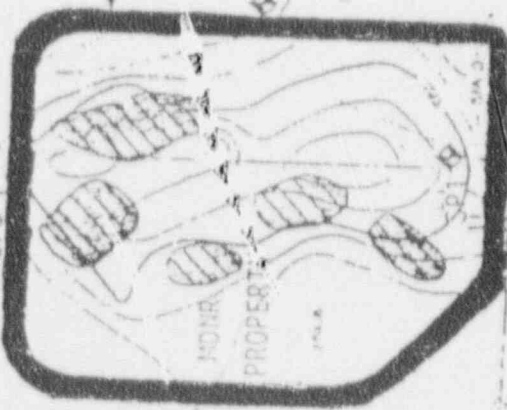
ATTACHMENT 2. SELECTED MONITORING LOCATIONS

WASTE MANAGEMENT MONITORING LOCATIONS

Lagoon MW 6

SP2

SP3



Reference: N. 1st Ltr. Vol. 25, 117, R. 41
Survey by Edwards Engineering
March 9, 1978



Surface water

MW 12

MW 40

Lagoon

Slurry wall

WASTE-MANAGEMENT PROPERTY

INS 3A

DWN 2

INS 2

INS 1

Lagoon

SW 17

MW 15

DWN 1

SW 18

SW 19

SW 20

SW 21

SW 22

SW 23

SW 24

SW 25

SW 26

SW 27

SW 28

SW 29

SW 30

SW 31

SW 32

SW 33

SW 34

SW 35

SW 36

SW 37

SW 38

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SW 41

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SW 81

SW 82

SW 83

SW 84

SW 85

SW 86

SW 87

SW 88

SW 89

SW 90

SW 91

SW 92

SW 93

SW 94

SW 95

SW 96

SW 97

SW 98

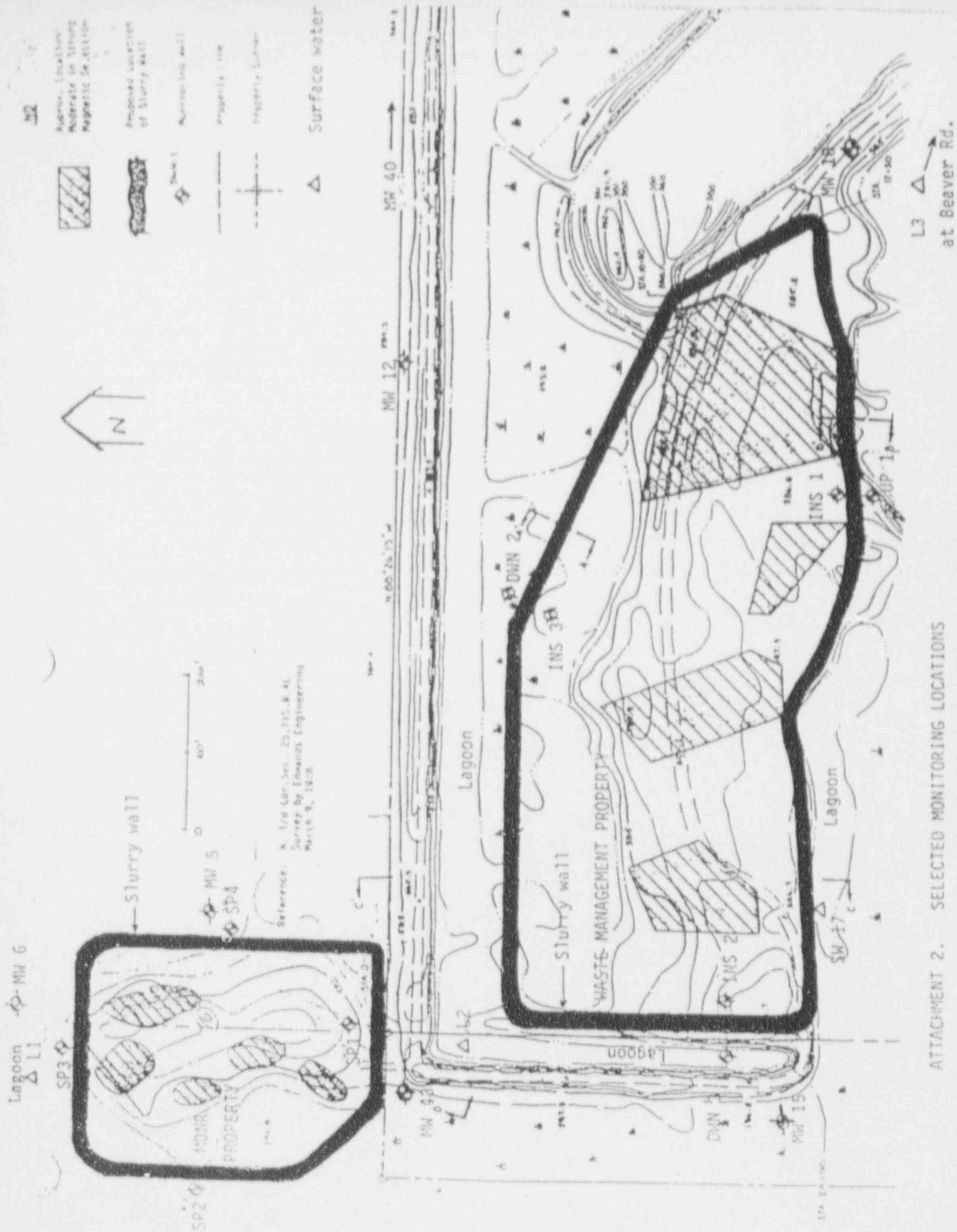
SW 99

SW 100

ATTACHMENT 2. SELECTED MONITORING LOCATIONS

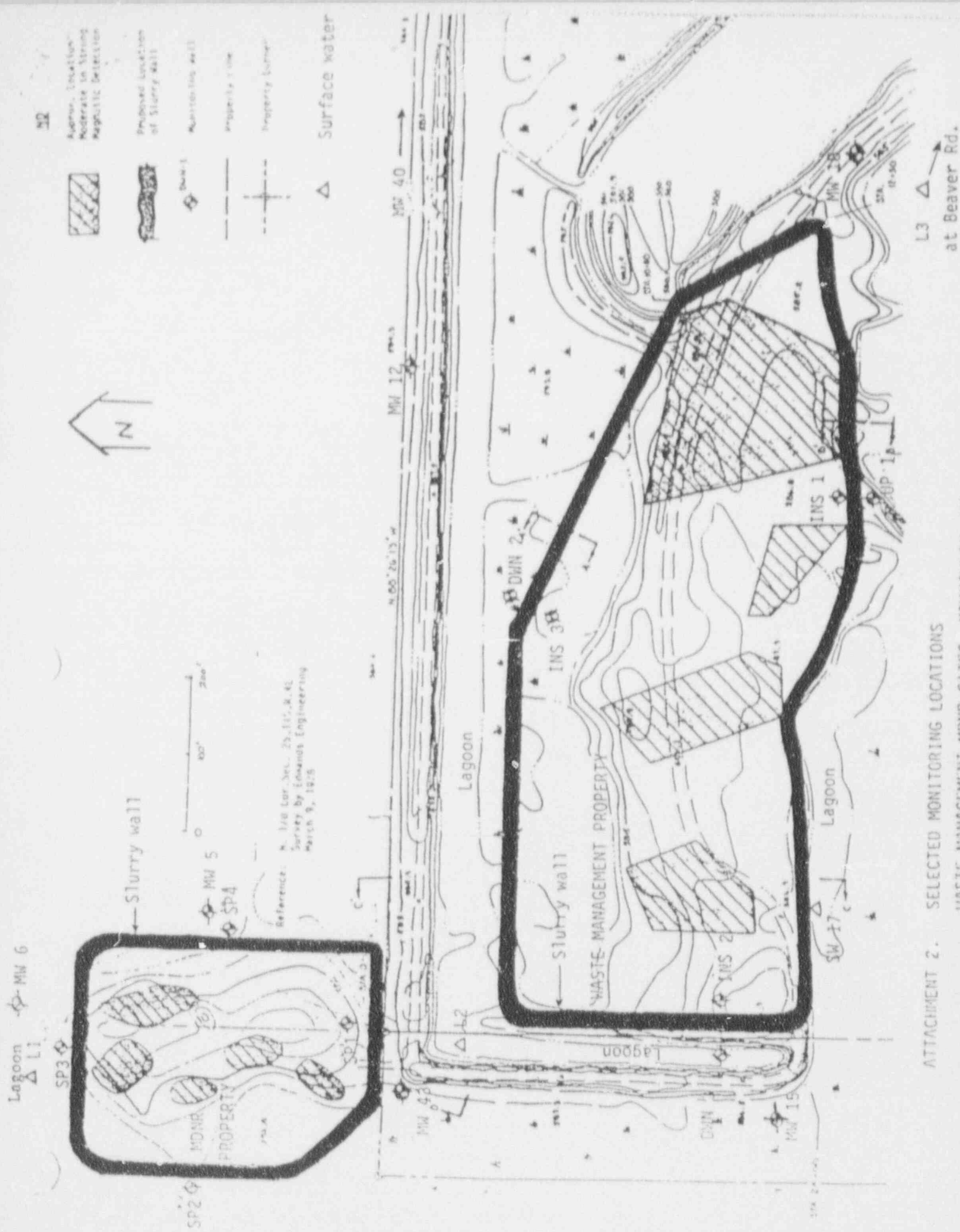
WASTE MANAGEMENT-MONR SITES, KAWKAWLIN, MI.

L3 Δ at Beaver Rd.



ATTACHMENT 2. SELECTED MONITORING LOCATIONS

WASTE MANAGEMENT-MONITORING SITES, KAWKAWULIN, MT.



ATTACHMENT 2. SELECTED MONITORING LOCATIONS
WASTE MANAGEMENT-DMNR SITES, KAWKAWLIN, MI.

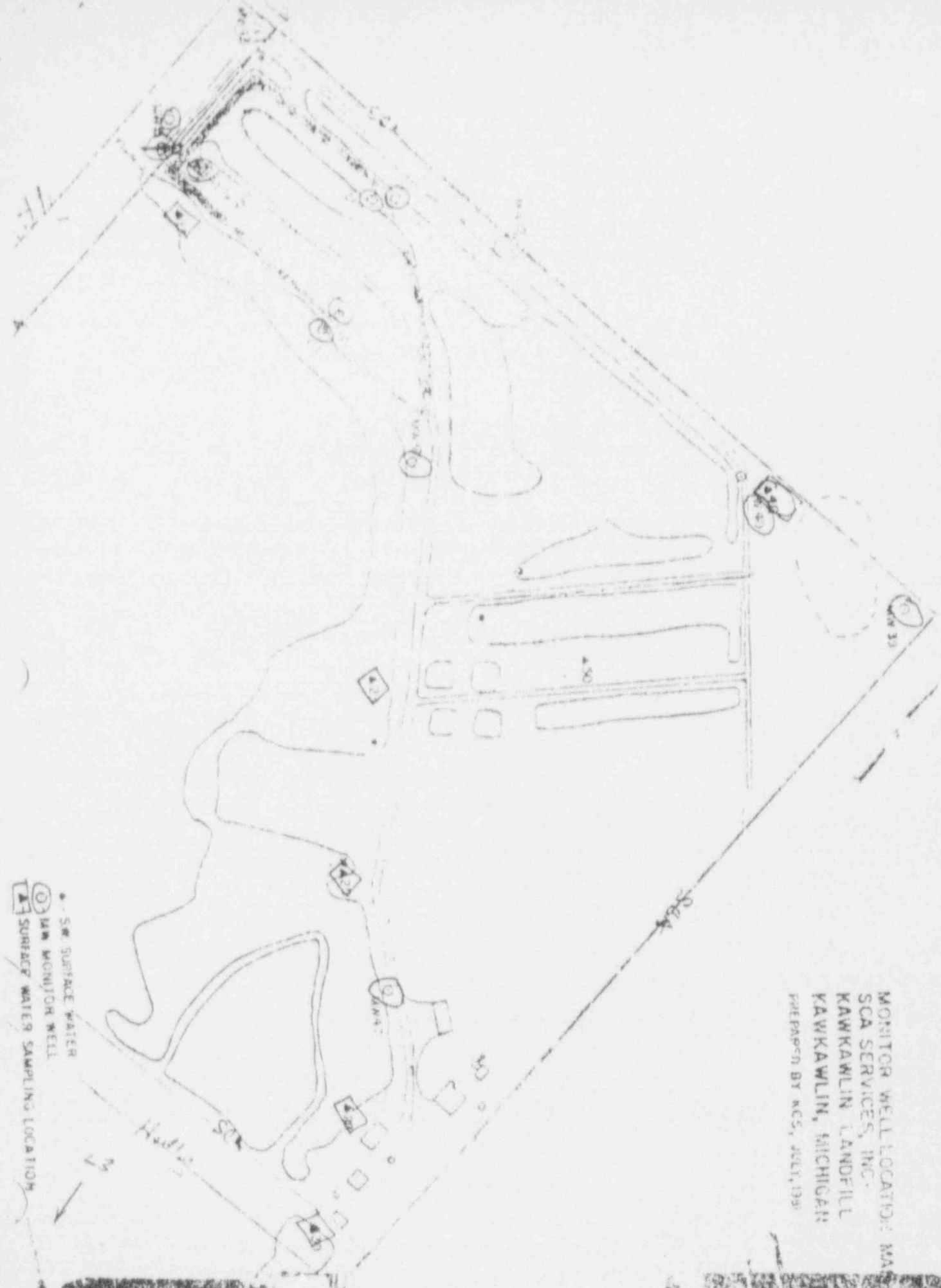
Copy - from proposed
agreement provided
by Mich. H/L To SCA Attorney
by letter on 1/22/74

Attached is a drawing of the facility, which includes the approximate locations of the slurry wall, monitor wells and surface water sampling areas. The monitor wells (MW's) and surface water (SW) locations are identified as follows:

MW 12	MW 43	SW 12	SW 40
MW 15	MW 47	SW 23	SW 47
MW 18	MW UP - 1	SW 25	
MW 39	MW DWN - 2	SW 28	
MW 40	MW DWN - 3	SW 30	

NCA shall sample the locations above as provided for in the Agreement, and shall conduct the analyses referenced in Exhibit C on all samples. For the monitor wells identified on the attached map as INS-1, INS-2 and INS-3, SCA shall collect samples at the same time and frequency as the above, but the analytical parameters shall be the following:

TOC (Total organic carbon- mg/l)
pH
Magnesium (Dissolved, mg/l)
Lead (Dissolved, mg/l)
Chrome (mg/l)



MONITOR WELL LOCATION MAP
 SCA SERVICES, INC.
 KAWKAWLIN LANDFILL
 KAWKAWLIN, MICHIGAN
 PREPARED BY NCS, JULY, 1991

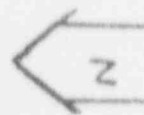
• SW SURFACE WATER
 ○ MONITOR WELL
 □ SURFACE WATER SAMPLING LOCATION

Selected Monitoring Locations (circled)



Well Water

Surface Water



Slurry Wall



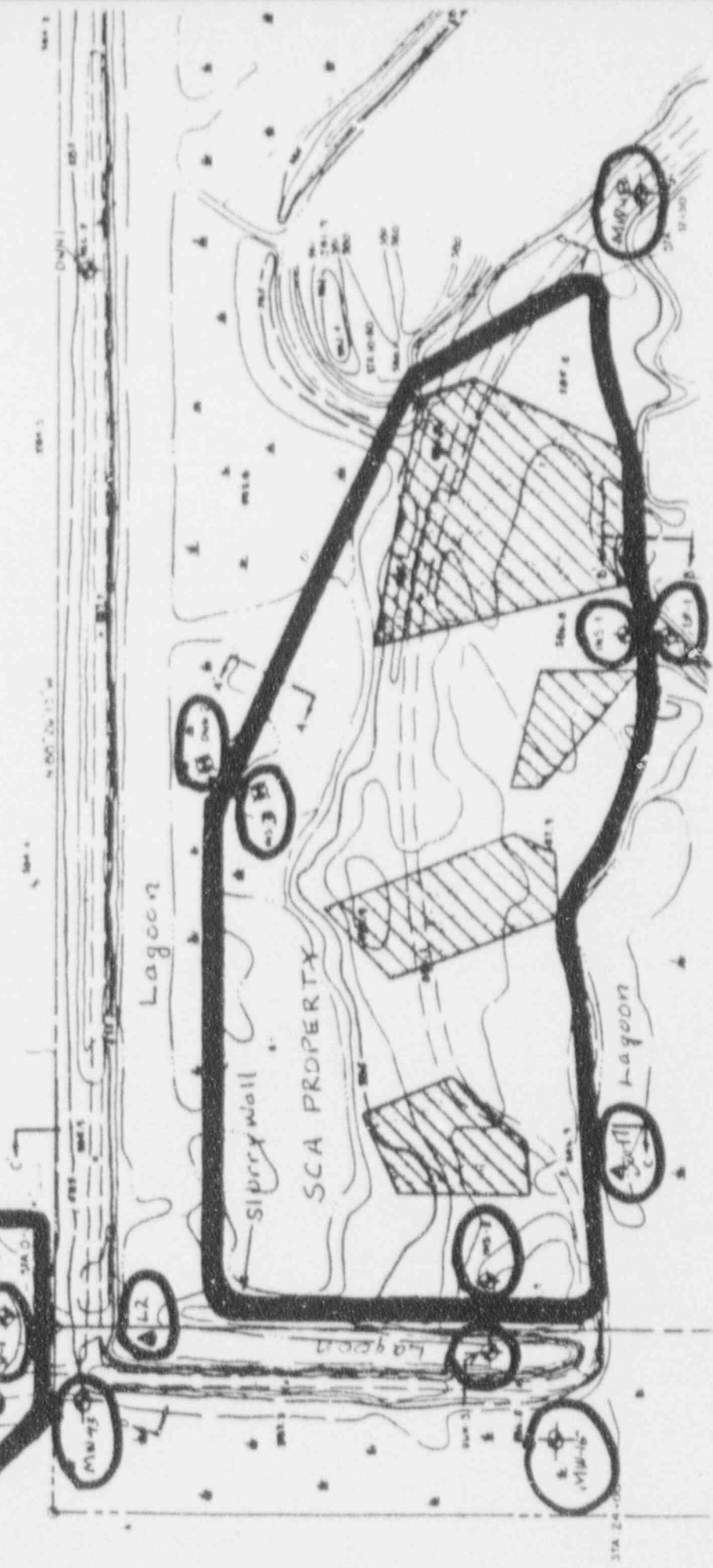
Selected Monitoring Locations



Well

Surface Water

Reference: N. 1/4 Sec. 25, T11N, R. 4E
Survey by Edwards Engineering
March 9, 1978



Reference: N. 1/8 Lot, Sec. 25, T15, R. 41
Survey by Edwards Engineering
March 9, 1978





proposed construction
Moderate to Steep
Negative Slope



proposed construction
at Quarry wall



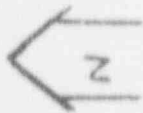
proposed construction
at Quarry wall



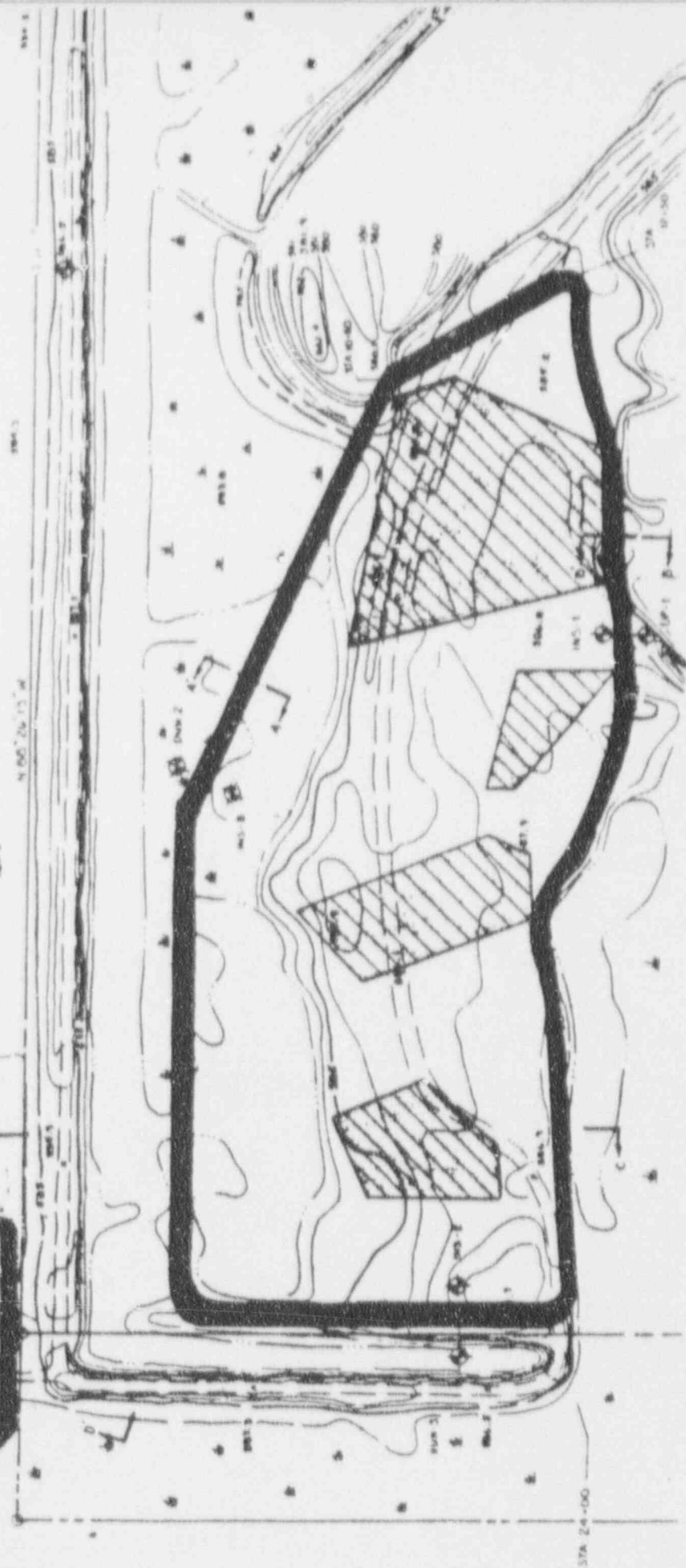
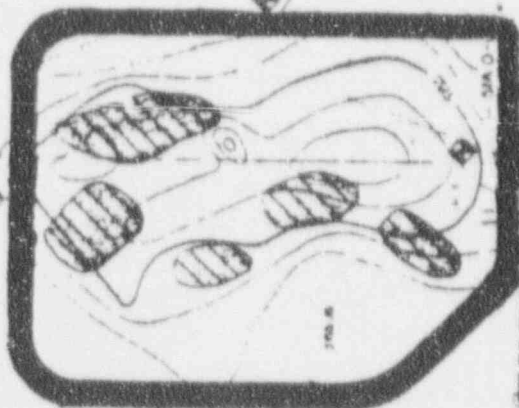
proposed construction
at Quarry wall



proposed construction
at Quarry wall



Reference: N. 116 Loc. Sec. 25, T11, R. 41
Survey by Edwards Engineering
March 9, 1978



NO



grass, forestation
moderate to strong
magnetic disturbance



proposed construction
of slurry wall



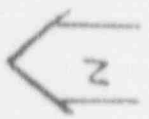
manhole with well



property line

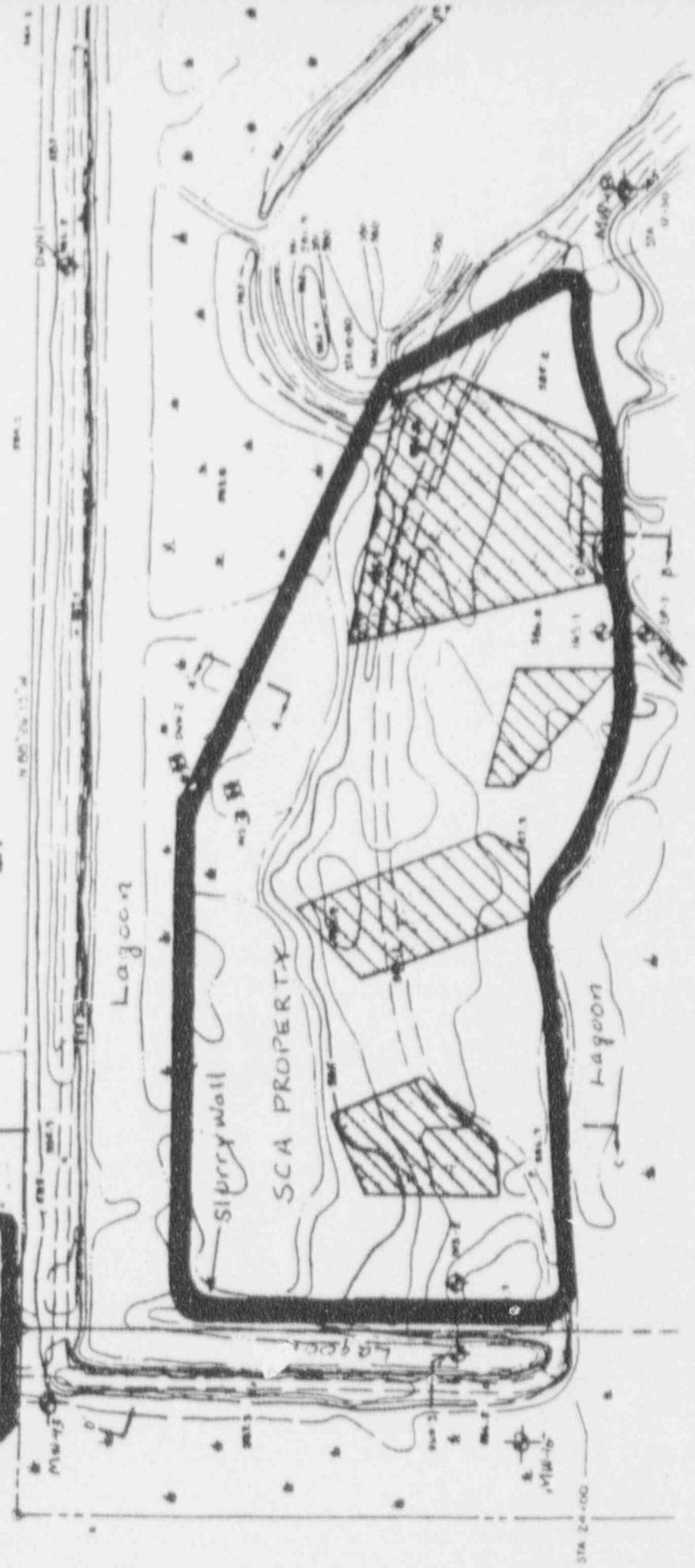
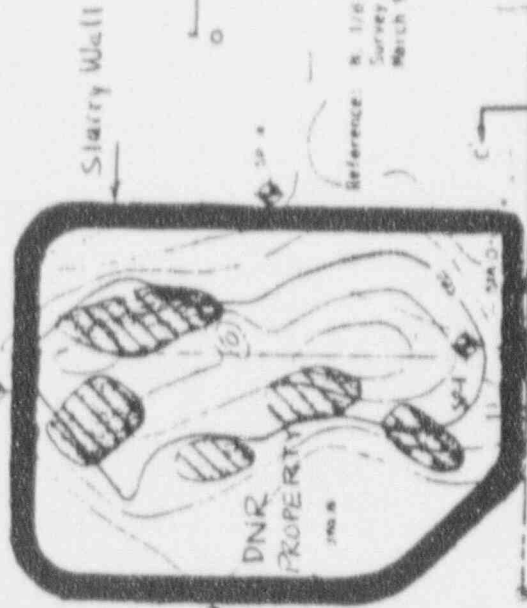


property corner



Reference: R. 176 Cor. Sec. 25, 110, & R.
Survey by Lohndes Engineering
March 9, 1978

2400-7 STB



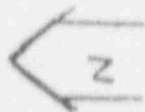
STA 24+00

END



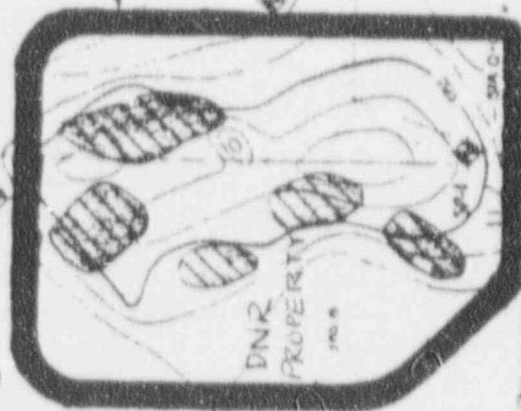
Area to be excavated
As indicated by N.T.S. map
Map sheets 25-115, R.4E

Proposed excavation
As indicated by N.T.S. map



Reference: N. 1/4 Cor. Sec. 25, T15, R.4E
Survey by Edwards Engineering
March 9, 1978

Lagoon



Slurry Wall

DNR
PROPERTY

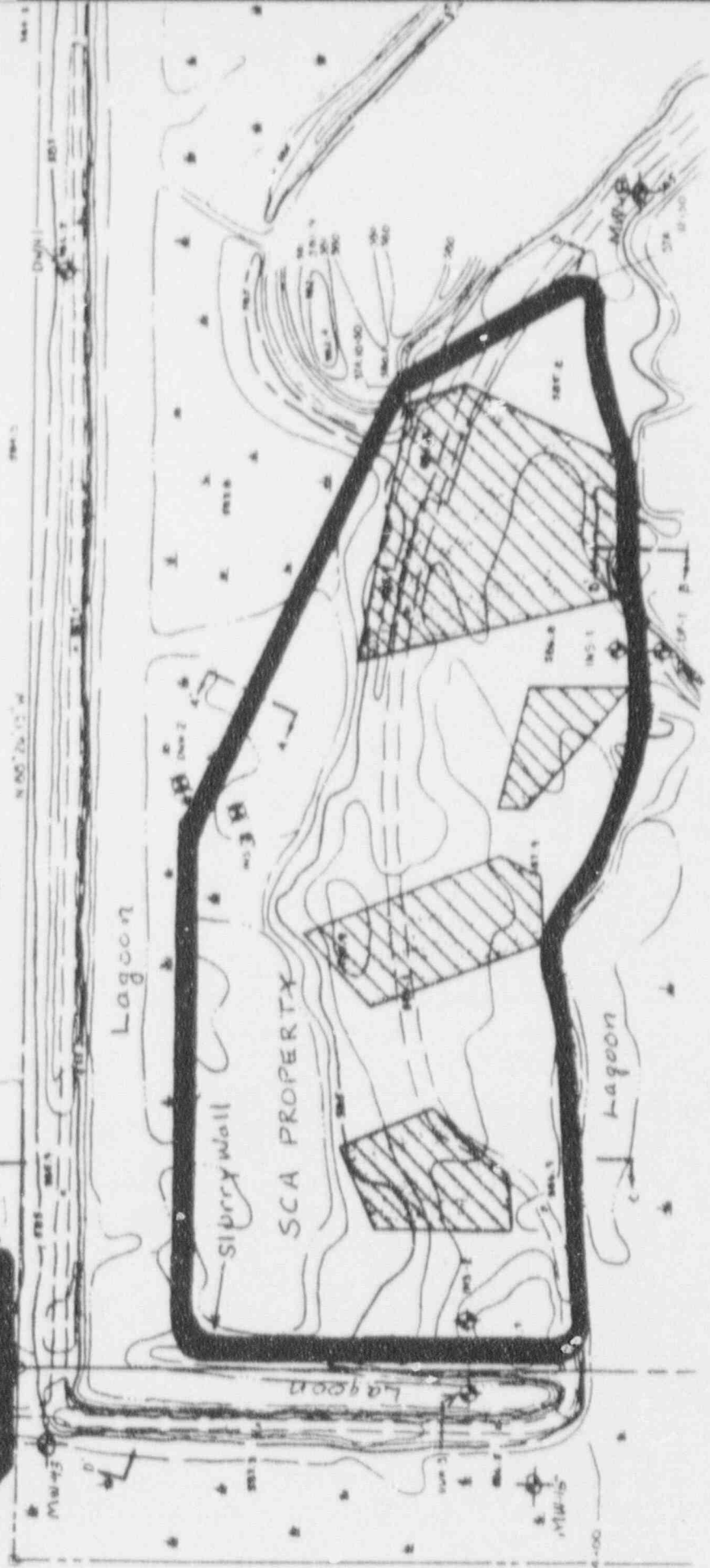
Lagoon

Slurry Wall

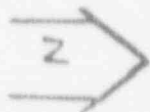
SCA PROPERTY

Lagoon

STA 24+00



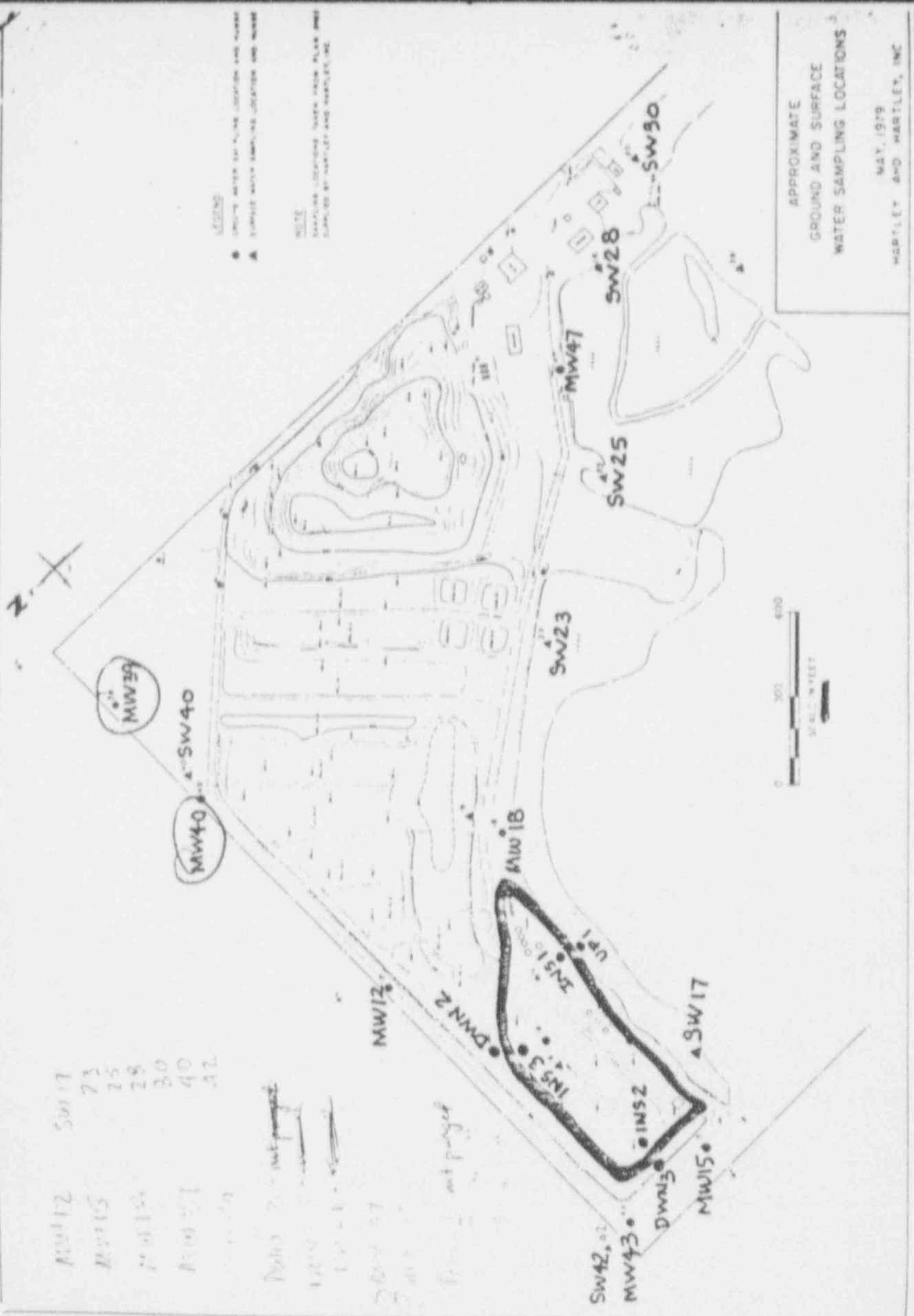
14565



Submitted by: **David L. Smith**
 Date: **March 9, 1978**



L3 Δ₁
at Rowan Rd



MW12 SW17
 MW15 23
 MW15 25
 MW15 28
 MW15 30
 MW15 40
 MW15 42

Point 7 - not plotted
 Point 8 - not plotted
 Point 9 - not plotted
 Point 10 - not plotted
 Point 11 - not plotted
 Point 12 - not plotted
 Point 13 - not plotted
 Point 14 - not plotted
 Point 15 - not plotted
 Point 16 - not plotted
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 Point 18 - not plotted
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 Point 98 - not plotted
 Point 99 - not plotted
 Point 100 - not plotted

0.16 mg
H₂O₂ 5.0
multiple analyzed

TABLE I

GROUND/WATER ANALYTICAL RESULTS

MONITORING WELLS IN AND AROUND AFFECTED AREA⁽¹⁾

Chemical Oxygen Demand, mg/L	64-3200
Total Organic Carbon	7-500
Phenol	N.D-2.33
pH (No Units)	6.33-7.46
Chloride, mg/L	140-2200
Sulphate	<1-260
Alkalinity	110-1080
Conductivity, μ mhos/cm	1600-6800
Benzene, μ g/l	2900-10,000
Chloroethane	180 ⁽²⁾
Chloroform	9000
1,1 Dichloroethane	40-170,000
1,2 Dichloroethane	200-650
1,1 Dichloroethylene	29-100
1,2 Dichloropropane	200
Ethyl Benzene	1400-2400
Methylene Chloride	14-21
Tetrachloroethylene	600-2000
Toluene	13-28000
trans 1,2 Dichloroethylene	36-70-760
1,1,1 Trichloroethane	15-350
1,1,2 Trichloroethane	13,000
Trichloroethylene	46->100,000

A/2

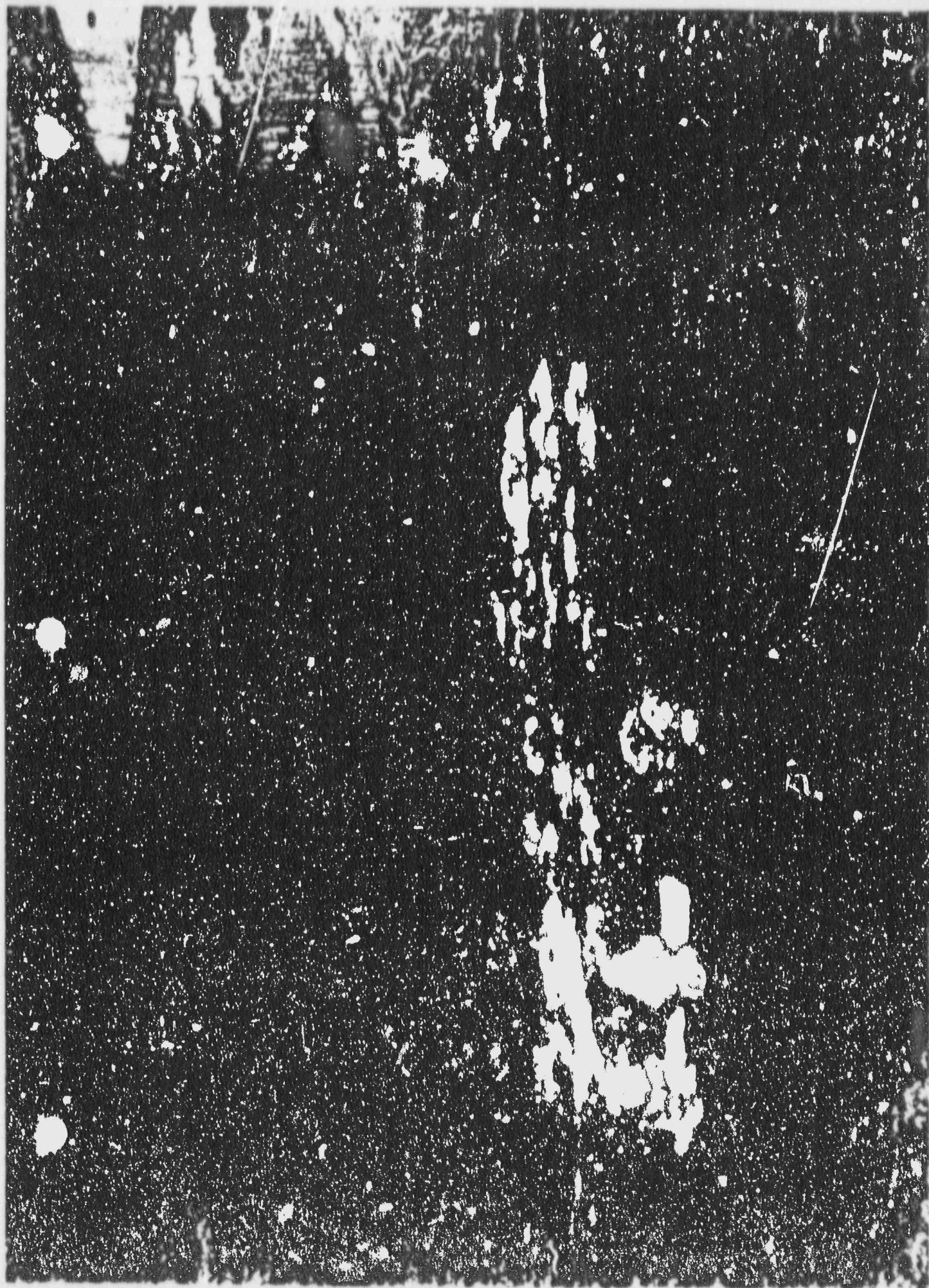
Trichloro fluoromethane	µg/L	11-16
Vinyl Chloride		14-7910
2 Chlorophenol		10
Pentachlorophenol		26
Acenaphthene		28-12,000
Antracene		16000
Benzo(a)Anthracene		1900
Benzo(a)Pyrene		1500
Benzo(k)Fluoranthene		1200
Chrysene		2400
Fluoranthene		1800
Fluorene		13000
Naphthalene		744-260,000
Pyrene		3900

- (1) Includes Monitoring Wells 12,15, 16, 18, 43, 45 (Figure 2)
- (2) Compounds With Only One Analytical Result Given Were Detected in Only One Sample

HAWKAWLIN

AB





OCT 29 1973

WATER WELL RECORD

ACT 294 PA 1965

MICHIGAN DEPARTMENT
OF
PUBLIC HEALTH

1 LOCATION OF WELL		2		3		4		5		6		7		8		9		10		11		12		13		14		15		16		17									
County: Bay		Township Name: Kawkawlin		Range Number: 15		Section Number: 36		Town Number: 15		Range Number: 4		OWNER OF WELL: Name: Albert N. Boucher Address: 2813 E. Kawkawlin Rv. Kawkawlin, MI		WELL DEPTH: (Completed) 52 ft. Date of Completion: Oct 9, 73		CABLE TOOL: <input type="checkbox"/> Cable tool <input type="checkbox"/> Rotary <input type="checkbox"/> Driven <input type="checkbox"/> Dup <input type="checkbox"/> Hollow rod <input type="checkbox"/> Jetted <input checked="" type="checkbox"/> Bored <input type="checkbox"/>		USE: <input checked="" type="checkbox"/> Domestic <input type="checkbox"/> Public Supply <input type="checkbox"/> Industry <input type="checkbox"/> Irrigation <input type="checkbox"/> Air Conditioning <input type="checkbox"/> Commercial <input type="checkbox"/> Test Well <input type="checkbox"/>		CASING: Threaded <input type="checkbox"/> Welded <input type="checkbox"/> Height: Above/Surface <input type="checkbox"/> Surface <input type="checkbox"/> 1 ft. Diam. 12" Crock in. to ft. Depth Weight lbs./ft. Drive Shoe? Yes <input type="checkbox"/> No <input type="checkbox"/>		SCREEN: Type: _____ Dia.: _____ Slot/Gauze _____ Length _____ Set between _____ ft. and _____ ft. Fittings: _____		STATIC WATER LEVEL: _____ ft. below land surface		PUMPING LEVEL below land surface: _____ ft. after _____ hrs. pumping _____ g.p.m. _____ ft. after _____ hrs. pumping _____ g.p.m.		WATER QUALITY in Parts Per Million: Iron (Fe) _____ Chlorides (Cl) _____ Hardness _____ Other _____		WELL HEAD COMPLETION: <input type="checkbox"/> In Approved Pit <input type="checkbox"/> Fittless Adapter <input checked="" type="checkbox"/> 12" Above Grade		Well Grouted? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Neat Cement <input type="checkbox"/> Bentonite <input type="checkbox"/> Depth: From _____ ft. to _____ ft.		Nearest Source of possible contamination: 150 feet 5 Direction: Septic Type _____ Well disinfected upon completion <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		PUMP: <input checked="" type="checkbox"/> Not installed Manufacturer's Name _____ Model Number _____ HP _____ Volts _____ Length of Drop Pipe _____ ft. capacity _____ G.P.M. Type: <input type="checkbox"/> Submersible <input type="checkbox"/> Jet <input type="checkbox"/> Reciprocating		REMARKS: 0 to 12' sand 12 to 16' sand and clay 16 to 50 blue clay 50 to 52 clay and gravel 12' slip seal tile 3 bags cement		WATER WELL CONTRACTOR'S CERTIFICATION: This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief. Name: Gale Prime 1007 Address: Akron Mich Signed: Gale Prime Date: Oct 9, 72 AUTHORIZED REPRESENTATIVE	

D67d

100M (Rev. 12-68)

GEOLOGICAL SURVEY COPY

JUL 18 1973

WATER WELL RECORD

ACT 294 PA 3865

MICHIGAN DEPARTMENT
OF
PUBLIC HEALTH

1 LOCATION OF WELL		TOWNSHIP NAME		FRAC.		SECTION NUMBER		TOWN NUMBER		RANGE NUMBER	
County <u>Bay</u>		Twp <u>KawKawlin</u>		NE 1/4 NW 1/4		36		15 N 2		4 E	
Note: And Direction from Road Intersections <u>Approx. 1/2 East of M-13, pass the Ross Cnd RR.</u> <u>on South side of Beaver Rd</u> <u>KawKawlin, Mich.</u>											
Street address & City of Well Location Locate with "X" in section below											
Sketch Map:											
2 FORMATION		THICKNESS OF STRATUM		DEPTH TO BOTTOM OF STRATUM		3 OWNER OF WELL					
<u>Sand</u>		<u>12</u>		<u>12</u>		Name <u>Jim Christian</u> Address <u>Beaver Rd</u> <u>KawKawlin, Mich.</u>					
<u>clay</u>		<u>73</u>		<u>85</u>		4 WELL DEPTH: (completed) Date of Completion					
<u>Sand</u>		<u>25</u>		<u>110</u>		<u>110 ft.</u> <u>June 73</u>					
5 USE: <input checked="" type="checkbox"/> Domestic <input type="checkbox"/> Public Supply <input type="checkbox"/> Industry <input type="checkbox"/> Irrigation <input type="checkbox"/> Air Conditioning <input type="checkbox"/> Commercial <input type="checkbox"/> Test Well						6 CASING: Threaded <input checked="" type="checkbox"/> Welded <input type="checkbox"/> Height: Above/Below Diam. <u>2 in. to</u> ft. Depth <u>Weight</u> 'bs./ft. <u>in. to</u> ft. Depth <u>Drive Shoe?</u> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>					
7 SCREEN: Type <u>1 1/4</u> Dia. <u>8'</u> Slot/Gauze <u>102</u> ft. and <u>110</u> ft. Fittings: <u>Chute, etc.</u>						8 STATIC WATER LEVEL <u>ft. below land surface</u> 10 PUMPING LEVEL below land surface <u>ft. after</u> hrs. pumping <u>g.p.m.</u> <u>ft. after</u> hrs. pumping <u>g.p.m.</u>					
9 WATER QUALITY in Parts Per Million: Iron (Fe) <u>Chlorides (Cl)</u> Hardness <u>Other</u>						11 WELL HEAD COMPLETION: <input type="checkbox"/> In Approved Pit <input type="checkbox"/> Pitless Adapter <input checked="" type="checkbox"/> 12" Above Grade					
12 Well Grouted? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Neat Cement <input type="checkbox"/> Bentonite <input type="checkbox"/> Depth: From <u>ft. to</u> ft.						13 Nearest Source of possible contamination <u>ft.</u> Direction <u>Type</u> Well disinfected upon completion <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No					
14 PUMP: <input checked="" type="checkbox"/> Not Installed Manufacturer's Name <u>Model Number</u> HP <u>Volts</u> Length of Drop Pipe <u>ft.</u> capacity <u>G.P.M.</u> Type: <input type="checkbox"/> Submersible <input type="checkbox"/> Jet <input type="checkbox"/> Reciprocating						15 WATER WELL CONTRACTOR'S CERTIFICATION: This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief. <u>Phil Woodruff</u> <u>1125-</u> REGISTERED BUSINESS NAME REGISTRATION NO. Address <u>Rd 1 - Lansing, Mich.</u> Signed <u>Phil Woodruff</u> Date <u>June 73</u> AUTHORIZED REPRESENTATIVE					
16 Remarks: elevation, source of data, etc. ADDED INFO. BY DRILLER <u>1125-</u> *CORRECTED <u>1125-</u> **ADDITION <u>1125-</u>											

D67d

100M (Rev. 12-68)

GEOLOGICAL SURVEY COPY

MAY 22 1973

WATER WELL RECORD

ACT 294 PA 1965

MICHIGAN DEPARTMENT
OF
PUBLIC HEALTH

1 LOCATION OF WELL		TOWNSHIP NAME		Fraction	Section Number	Town Number	Range Number
Bay		HawKawlin		N10W N15E	36	15 N	4 E/W
Distance and Direction from Road Intersections		Street address & City of Well Location		3 OWNER OF WELL:			
1/2 mi. east of Old Kan L. Rd on Laine Rd		HawKawlin Mi.		Jack Rubey Laine Rd HawKawlin, Mi.			
Locate with "X" in section below		Sketch Map:		4 WELL DEPTH: (completed) Date of Completion			
				126 ft. May 1973			
2 FORMATION		THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM	5 CASING: Threaded <input checked="" type="checkbox"/> Welded <input type="checkbox"/> Height: Above/Below Surface <u>1</u> ft.			
clay	100	100	5 <input type="checkbox"/> Cable tool <input type="checkbox"/> Rotary <input type="checkbox"/> Driven <input type="checkbox"/> Dug				
sand	10	110	<input checked="" type="checkbox"/> Hollow rod <input type="checkbox"/> Jetted <input type="checkbox"/> Bored <input type="checkbox"/>				
Rock	16	126	6 USE: <input checked="" type="checkbox"/> Domestic <input type="checkbox"/> Public Supply <input type="checkbox"/> Industry				
			<input type="checkbox"/> Irrigation <input type="checkbox"/> Air Conditioning <input type="checkbox"/> Commercial				
			<input type="checkbox"/> Test Well <input type="checkbox"/>				
			7 CASING: Threaded <input checked="" type="checkbox"/> Welded <input type="checkbox"/> Weight: _____ lbs./ft.				
			2 in. to 111 ft. Depth Drive Shoe? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>				
			8 SCREEN:				
			Type: _____ Dia.: _____				
			Slot/Gauze _____ Length _____				
			Set between _____ ft. and _____ ft.				
			Fittings: _____				
			9 STATIC WATER LEVEL				
			_____ ft. below land surface				
			10 PUMPING LEVEL below land surface				
			_____ ft. after _____ hrs. pumping _____ g.p.m.				
			_____ ft. after _____ hrs. pumping _____ g.p.m.				
			11 WATER QUALITY in Parts Per Million:				
			Iron (Fe) _____ Chlorides (Cl) _____				
			Hardness _____ Other _____				
			12 WELL HEAD COMPLETION: <input type="checkbox"/> In Approved Pit				
			<input type="checkbox"/> Pitless Adapter <input checked="" type="checkbox"/> 12" Above Grade				
			13 Well Grouted? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No				
			<input type="checkbox"/> Neat Cement <input type="checkbox"/> Bentonite <input type="checkbox"/>				
			Depth: From _____ ft. to _____ ft.				
			14 Nearest Source of possible contamination				
			60 feet Direction S-E Type _____				
			Well disinfected upon completion <input type="checkbox"/> Yes <input type="checkbox"/> No				
			15 PUMP: <input type="checkbox"/> Not installed				
			Manufacturer's Name _____				
			Model Number _____ HP _____ Volts _____				
			Length of Drop Pipe _____ ft. capacity _____ G.P.M.				
			Type: <input type="checkbox"/> Submersible				
			<input type="checkbox"/> Jet <input type="checkbox"/> Reciprocating				
16 Remarks, elevation, source of data, etc.		17 WATER WELL CONTRACTOR'S CERTIFICATION:					
ADDED INFO. BY DRILLER ITEM NO.		This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.					
CORRECTED BY <u>B</u>		PHS Well No. 1125-					
**ADDITION <u>1</u>		REGISTERED BUSINESS NAME					
		Address <u>PHS - Lansing</u>					
		Signed <u>PHS - Lansing</u> Date <u>May 73</u>					
		AUTHORIZED REPRESENTATIVE					

WATER WELL RECORD

ACT 294 PA 1965

MICHIGAN DEPARTMENT
OF
PUBLIC HEALTH

1 LOCATION OF WELL		County <u>Bay County</u>		Town <u>Kawkawlin</u>		Fraction <u>NW-NE NW</u>		Section No. <u>36</u>		Town <u>15 NE</u>		Range <u>4 E</u>	
Roads and Direction from Road Intersections		Rd 5 at NW corner of NE 1/4 NW 1/4		OWNER No. _____		3 OWNER OF WELL:		George R. Hartford		Address <u>2658 E Beaver Rd</u>		Kawkawlin Mich. 48631	
Street address & City of Well Location		2658 E Beaver Rd Kawkawlin		Kawkawlin Mich. 48631		4 WELL DEPTH: (completed)		Date of Completion		63 ft.		Sept 26, 1969	
2 FORMATION		THICKNESS OF STRATUM		DEPTH TO BOTTOM OF STRATUM		5 <input type="checkbox"/> Cable tool <input type="checkbox"/> Rotary <input type="checkbox"/> Driven <input type="checkbox"/> Dug		<input type="checkbox"/> Hollow rod <input type="checkbox"/> Jetted <input checked="" type="checkbox"/> Bored <input type="checkbox"/> _____		6 USE: <input checked="" type="checkbox"/> Domestic <input type="checkbox"/> Public Supply <input type="checkbox"/> Industry		<input type="checkbox"/> Irrigation <input type="checkbox"/> Air Conditioning <input type="checkbox"/> Commercial	
0 to 21 yellow clay						7 CASING: Diam. _____		Threaded <input type="checkbox"/> Welded <input type="checkbox"/>		Height: Above/Below surface <u>2</u> ft.		Weight _____ lbs/ft.	
21 to 61 blue clay						_____ in. to _____ ft. Depth		12 inch		_____ in. to _____ ft. Depth		Drive Shoe? Yes <input type="checkbox"/> No <input type="checkbox"/>	
61 to 63 sand and water						8 SCREEN:		Type: _____ Dia.: _____		Slot/Gauge _____ Length _____		Set between _____ ft. and _____ ft.	
						Fittings: _____		9 STATIC WATER LEVEL		_____ ft. below land surface		10 PUMPING LEVEL below land surface	
								_____ ft. after _____ hrs. pumping _____ g.p.m.		_____ ft. after _____ hrs. pumping _____ g.p.m.		11 WATER QUALITY in Parts Per Million:	
								Iron (Fe) _____ Chlorides (Cl) _____		Hardness _____		12 WELL HEAD COMPLETION: <input type="checkbox"/> In Approved Pit	
								<input type="checkbox"/> Pitless Adapter <input checked="" type="checkbox"/> 12" Above Grade		13 GROUTING:		Well Grouted? <input type="checkbox"/> Yes <input type="checkbox"/> No	
								Material: <input type="checkbox"/> Neat Cement <input type="checkbox"/> _____		Depth: From _____ ft. to _____ ft.		14 SANITARY:	
								Nearest Source of possible contamination		<u>75</u> feet <u>E</u> Direction <u>septic</u> Type		Well disinfected upon completion <input type="checkbox"/> Yes <input type="checkbox"/> No	
								15 PUMP:		Manufacturer's Name <u>Best not available</u>		Model Number _____ HP	
								Length of Drop Pipe _____ ft. capacity _____ G.P.M.		Type: <input type="checkbox"/> Submersible <input type="checkbox"/> _____		<input type="checkbox"/> Jet <input type="checkbox"/> Reciprocating	
16 Remarks, elevation, source of data, etc.		Well owner will cement		17 WATER WELL CONTRACTOR'S CERTIFICATION:		This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.		Signature <u>Bob Prime</u>		1007		REGISTRATION NO.	
ADDED INFO. BY DRILLER, ITEM NO.		CORRECTED BY: <u>[Signature]</u>		Address <u>Abbe, Mich</u>		Signed <u>Bob Prime</u>		Date <u>9.21.69</u>		AUTHORIZED REPRESENTATIVE			
ADDITION BY:													

D67D 100M 6-65

GEOLOGICAL SURVEY COPY

WATERWELL RECORD

ACT 294 PA 1965

MICHIGAN DEPARTMENT
OF
PUBLIC HEALTH

APR 30 1969

1 LOCATION OF WELL		County <u>BAY</u>		Twp <u>11 W 1/2 N 1/2 E</u>		Fraction <u>NE 1/4 NE 1/4</u>		Section No. <u>36</u>		Town <u>15 N</u>		Range <u>4 E</u>													
2 FORMATION		THICKNESS OF STRATUM		DEPTH TO BOTTOM OF STRATUM		3 OWNER OF WELL		OWNER No. <u>G-11-2005</u>		Address		Address													
<u>6' to 8' silt</u> <u>40' Part of U.S. 23</u> <u>on Beaver Road on</u> <u>the South Side</u> <u>0 to 3' sand</u> <u>3' to 21' yellow clay</u> <u>21' to 29' blue clay</u> <u>29' to 31' blue clay and gravel</u> <u>31' to 39' blue clay</u> <u>39' to 40' gravel</u>						4 WELL DEPTH: (completed) <u>40'</u> ft. <u>1-21-1969</u> 5 <input type="checkbox"/> Cable tool <input type="checkbox"/> Rotary <input type="checkbox"/> Driven <input type="checkbox"/> Dug <input type="checkbox"/> Hollow rod <input type="checkbox"/> Jetted <input checked="" type="checkbox"/> Bored <input type="checkbox"/>		6 USE <input checked="" type="checkbox"/> Domestic <input type="checkbox"/> Public Supply <input type="checkbox"/> Industry <input type="checkbox"/> Irrigation <input type="checkbox"/> Air Conditioning <input type="checkbox"/> Commercial <input type="checkbox"/> Test Well <input type="checkbox"/>		7 CASING: Diam. <u>4"</u> Threaded <input type="checkbox"/> Welded <input type="checkbox"/> Height: Above/Below surface <u>11"</u> ft. <u>in. to</u> <u>ft. Depth</u> <u>Weight</u> <u>lbs./ft.</u> <u>in. to</u> <u>ft. Depth</u> <u>Drive Shoe? Yes</u> <input type="checkbox"/> <u>No</u> <input type="checkbox"/>		8 SCREEN: <u>None</u> Type <u>None</u> Dia. <u>None</u> Slot/Gauge <u>None</u> Length <u>None</u> Set between <u>None</u> ft. and <u>None</u> ft. Fittings: <u>None</u>		9 STATIC WATER LEVEL <u>3</u> ft. below land surface 10 PUMPING LEVEL below land surface <u>Did not Pump</u> <u>ft. after</u> <u>hrs. pumping</u> <u>p.m.</u> <u>ft. after</u> <u>hrs. pumping</u> <u>p.m.</u>		11 WATER QUALITY in Parts Per Million: Iron (Fe) <u>None</u> Chlorides (Cl) <u>None</u> Hardness <u>None</u>		12 WELL HEAD COMPLETION: <input type="checkbox"/> In Approved Pit <input checked="" type="checkbox"/> Pitless Adapter <input checked="" type="checkbox"/> 12" Above Grade		13 GROUTING: Well Grouted? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No Material: <input type="checkbox"/> Neat Cement <input type="checkbox"/> Depth: From <u>None</u> ft. to <u>None</u> ft.		14 SANITARY: Nearest Source of possible contamination <u>75</u> feet <u>W</u> Direction <u>1/2</u> ft. <u>W</u> type Well disinfected upon completion <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		15 PUMP: Manufacturer's Name <u>Little install</u> Model Number <u>None</u> HP <u>None</u> Length of Drop Pipe <u>None</u> ft. capacity <u>None</u> G.P.M. Type: <input type="checkbox"/> Submersible <input type="checkbox"/> <input type="checkbox"/> Jet <input type="checkbox"/> Reciprocating	
16 Remarks, elevation, source of data, etc.																									
17 WATER WELL CONTRACTOR'S CERTIFICATION: This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief. <u>Gab Paine</u> <u>1007</u> REGISTERED BUSINESS NAME REGISTRATION NO. Address <u>Adrian Mich</u> Signed <u>Gab Paine</u> Date <u>None</u> AUTHORIZED REPRESENTATIVE																									

ADDED INFO. BY DRILLER, IF ANY

CORRECTED BY:

NOTED BY:

D67D

100M 6-66

APR 30 1969

GEOLOGICAL SURVEY COPY

NOV 24 1980

WATER WELL RECORD

ACT 294 PA 1965

MICHIGAN DEPARTMENT
OF
PUBLIC HEALTH

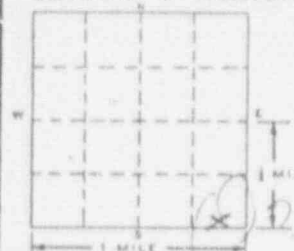
1 LOCATION OF WELL

County Bay 09 Township Name KawKawlin Fraction SE 1/4 SE 1/4 Section Number 2636 Town Number 15 Range Number 4 E

and A-1 Direction from Road Intersections
about 200' E. of Beaver Rd and
M-13 Rd. intersections located on
S. side of Beaver Rd.
Street address & City of Well Location

Locate with "X" in section below

Sketch Map:



Sketch Map:
N
W
E
S
M-13
BEAVER RD
HOUSE
WELL

3 OWNER OF WELL: Margaret Wetters
Address 2502 Old KawKawlin Rd.
KawKawlin, MI.

4 WELL DEPTH: (completed) Date of Completion
139 ft. 9/1/80

5 ☐ Cable tool ☐ Rotary ☐ Driven ☐ Dug
☒ Hollow rod ☐ Jetted ☐ Bored ☐
6 USE: ☒ Domestic ☐ Public Supply ☐ Industry
☐ Irrigation ☐ Air Conditioning ☐ Commercial
☐ Test Well ☐

7 CASING: Threaded ☒ Welded ☐ Height: Above "BOTTOM"
Diam. 2 in. to 96 ft. Depth Surface 1 ft.
Weight 3.75 lbs./ft. Drive Shoe? Yes ☒ No ☐

8 SCREEN: NO
Type: _____ Dia: _____
Slot/Gauze _____ Length _____
Set between _____ ft. and _____ ft.
Fittings: _____

9 STATIC WATER LEVEL
29 ft. below land surface

10 PUMPING LEVEL below land surface
38 ft. after 1 hrs. pumping 7 g.p.m.
_____ ft. after _____ hrs. pumping _____ g.p.m.

11 WATER QUALITY in Parts Per Million:
Iron (Fe) _____ Chlorides (Cl) _____
Hardness _____ Other _____

12 WELL HEAD COMPLETION: ☐ In Approved Pit
☒ Pitless Adapter ☐ 12" Above Grade

13 Well Grouted? ☐ Yes ☒ No
☐ Neat Cement ☐ Bentonite ☐
Depth: From _____ ft. to _____ ft.

14 Nearest Source of possible contamination
90 feet SE Direction Septic Type
Well disinfected upon completion ☒ Yes ☐ No

15 PUMP: ☐ Not installed
Manufacturer's Name PLINTZ WALLING
Model Number _____ HP 1/4 Volts 230
Length of Drop Pipe 63 ft. capacity 7 G.P.M.
Type: ☐ Submersible ☒ Jet ☐ Reciprocating

2 FORMATION

FORMATION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM
Sand	17	17
Clay	78	95
Shale	22	117
limestone - shale	8	125
sandstone - coarse	14	139

16 Remarks, elevation, source of data, etc.

ADDED INFO BY DRILLER, ITEM RW
*CORRECTED BY SW
**ACCORDION BY
ELEVATION
DEPTH TO ROCK

17 WATER WELL CONTRACTOR'S CERTIFICATION:

This well was drilled under my jurisdiction and this report is true
to the best of my knowledge and belief.
Ray Well Drilling 09-1670
REGISTERED BUSINESS NAME REGISTRATION NO.
Address 2137 E. Anderson Rd. Tipton
Signed Randall J. Poter Date 10/7/80
AUTHORIZED REPRESENTATIVE

MICHIGAN DEPARTMENT OF CONSERVATION
GEOLOGICAL SURVEY DIVISION

Permit No.

Owner No.

Page

1 of 1

Sample No.

WATER WELL RECORD

County

Twp.

Bay

Kawkawlin

NE & NW & NE & Sec. 36

Town

15 N/4

Range

4

1/4

Distance from Roads, Section Lines, etc.

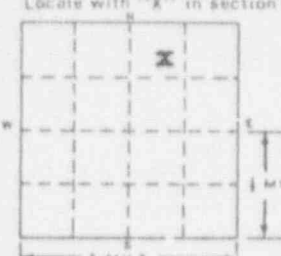
100' from road

2610 E. BEAVER Road

Kawkawlin, Michigan

FORMATION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM	Owner:
40 rods east of U. S. 23 on Beaver			Mrs. Ethel Arnold
Road on the south side			Address: 2610 East Beaver Road Kawkawlin
0 to 3' sand			Driller and Address: Gale Prime Akron, Michigan
3' to 21' yellow clay			Well Depth: 40 ft. Date of Completion: 12/21/68
21' to 29' blue clay			<input type="checkbox"/> Cable tool <input type="checkbox"/> Rotary <input type="checkbox"/> Dug <input type="checkbox"/> P.C. <input type="checkbox"/> Driven <input type="checkbox"/> Jetted <input checked="" type="checkbox"/> Bored
29' to 31' blue clay and gravel			Use: <input checked="" type="checkbox"/> Domestic <input type="checkbox"/> Public Supply <input type="checkbox"/> Industry <input type="checkbox"/> Irrigation <input type="checkbox"/> Air Conditioning <input type="checkbox"/> Dewatering <input type="checkbox"/> Test Well <input type="checkbox"/>
31' to 39' blue clay			Casing: Diam. _____ in. to _____ ft. Depth _____ ft. Height: Above/Below surface 16' 78% Type-Weight _____
39' to 40' gravel			Screen: Type: None Dia: _____ Slot/Gauze _____ Length _____ Set between _____ ft. and _____ ft. Accessories: _____
			Water level: _____ ft. above/below _____ _____ ft. above/below _____ Meas. by _____ Date _____
			Drawdown: _____ ft. after _____ hrs. pumping _____ g.p.m. _____ ft. after _____ hrs. pumping _____ g.p.m. Meas. by _____ Date _____
			Flow: _____ g.p.m./g.p.h. Temp: _____ °F
			Water Quality in Parts Per Million: Iron (Fe) _____ Chlorides (Cl) _____ Hardness _____
			Elevation: _____ ft. above
			Source of data: _____
			Record by: _____ Date: _____
Remarks:			

WATER WELL RECORD
ACT 294 PA 1965MICHIGAN DEPARTMENT
OF
PUBLIC HEALTH

1 LOCATION OF WELL		Fraction		Section Number		Town Number		Range Number	
County <u>Bay</u>		Township Name <u>Kawkawlin</u>		<u>NW 14 NW 14</u>		<u>36</u>		<u>15 N 4 E 4</u>	
Place And Direction from Road Intersections <u>South?</u>				3 OWNER OF WELL:					
3/4 Mile East of M-13, North side of Beaver Rd.				Address <u>Alfred Lopez</u>					
Street address & City of Well Location <u>2774 E. Beaver Rd., Kawkawlin</u>				Address <u>200 S. Arbor</u>					
Locate with "X" in section below				Date of Completion <u>October 28, 1974</u>					
				4 WELL DEPTH: (completed) <u>105</u> ft.					
				5 <input type="checkbox"/> Cable tool <input checked="" type="checkbox"/> Rotary <input type="checkbox"/> Driven <input type="checkbox"/> Dug <input type="checkbox"/> Hollow rod <input type="checkbox"/> Jetted <input type="checkbox"/> Bored <input type="checkbox"/>					
				6 USE: <input checked="" type="checkbox"/> Domestic <input type="checkbox"/> Public Supply <input type="checkbox"/> Industry <input type="checkbox"/> Irrigation <input type="checkbox"/> Air Conditioning <input type="checkbox"/> Commercial <input type="checkbox"/> Test Well <input type="checkbox"/>					
				7 CASING: Threaded <input checked="" type="checkbox"/> Welded <input type="checkbox"/> Height: Above xxx Surface <u>1</u> ft. Weight <u>3.75</u> lbs./ft. Drive Shoe? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>					
2 FORMATION		THICKNESS OF STRATUM		DEPTH TO BOTTOM OF STRATUM					
Surface Soil		3		3		8 SCREEN:			
Clay		87		90		Type: <u>Galvanized</u> Dia.: <u>1 1/2"</u>			
Sand & Gravel		15		105		Slot/No. <u>xxx</u> No. <u>10</u> Length <u>8</u> ft.			
						Set between <u>97</u> ft. and <u>105</u> ft.			
						Fittings: <u>4 ft. tail pipe, K-Packer</u>			
						<u>2" Check Valve</u>			
						9 STATIC WATER LEVEL			
						<u>10</u> ft. below land surface			
						10 PUMPING LEVEL below land surface			
						<u>20</u> ft. after <u>1</u> hrs. pumping <u>15</u> g.p.m.			
						ft. after ___ hrs. pumping ___ g.p.m.			
						11 WATER QUALITY in Parts Per Million:			
						Iron (Fe) ___ Chlorides (Cl) ___			
						Hardness ___ Other ___			
						12 WELL HEAD COMPLETION: <input type="checkbox"/> In Approved Pit <input type="checkbox"/> Pitless Adapter <input checked="" type="checkbox"/> 12" Above Grade			
						13 Well Grouted? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Neat Cement <input type="checkbox"/> Bentonite <input checked="" type="checkbox"/> Heavy Drilling			
						Depth: From ___ ft. to ___ ft. <u>Mud</u>			
						14 Nearest Source of possible contamination			
						<u>60</u> feet <u>N.W.</u> Direction <u>Septic</u> Type			
						Well disinfected upon completion <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No			
						15 PUMP: <input checked="" type="checkbox"/> Not installed			
						Manufacturer's Name _____			
						Model Number _____ HP _____ Volts _____			
						Length of Drop Pipe _____ ft. capacity _____ G.P.M.			
						Type: <input type="checkbox"/> Submersible <input type="checkbox"/> Jet <input type="checkbox"/> Reciprocating			
USE A 2ND SHEET IF NEEDED									
16 Remarks, elevation, source of data, etc. <u>BY DRILLER, ITEM NO. 150</u> <u>BY</u> <u>EF</u> <u>TO - 800</u>						17 WATER WELL CONTRACTOR'S CERTIFICATION:			
						This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.			
						<u>J & R Well Drilling</u> <u>1510</u>			
						REGISTERED BUSINESS NAME REGISTRATION NO.			
						Address <u>5687 Melita Rd., Pinconning, MI. 48650</u>			
						Signed <u>Joe Krawczyk</u> Date <u>11-12-74</u>			
						AUTHORIZED REPRESENTATIVE			

AUG 22 1983
GEOLOGICAL SURVEY NO.

MICHIGAN DEPARTMENT OF PUBLIC HEALTH

WATER WELL AND PUMP RECORD

PART 127 ACT 368 P.A. 1978

PERMIT NUMBER

1 LOCATION OF WELL		TOWNSHIP NAME		FRACTION		SECTION NUMBER		TOWN NUMBER		RANGE NUMBER	
County Bay		Bangor		SE 1/4 SE 1/4 SE 1/4		33		15 N 1/2		5 E 1/2	
Name And Direction From Road Intersection a Wenona Beach Estates											
Street Address & City of Well Location 4444 National Ave. Bay City, Mich.											
Address Same As Well Location? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No											
3 OWNER OF WELL Wenona Beach Estates 4444 National Ave. Bay City, Mich.											
4 WELL DEPTH (completed) 27 ft Date of Completion 6-21-83											
5 <input type="checkbox"/> Cable tool <input checked="" type="checkbox"/> Rotary <input type="checkbox"/> Driven <input type="checkbox"/> Dug <input type="checkbox"/> Hollow rod <input type="checkbox"/> Auger <input type="checkbox"/> Jetted <input type="checkbox"/>											
6 USE <input type="checkbox"/> Domestic <input type="checkbox"/> Type I Public <input type="checkbox"/> Type III Public <input type="checkbox"/> Irrigation <input type="checkbox"/> Type IIa Public <input type="checkbox"/> Heat pump <input type="checkbox"/> Test Well <input type="checkbox"/> Type IIb Public <input checked="" type="checkbox"/> Car Wash											
7 CASING Diameter <input checked="" type="checkbox"/> Steel <input type="checkbox"/> Threaded <input type="checkbox"/> Plastic <input type="checkbox"/> Welded 2 in. to 6 ft depth Height: Above XXX Surface 1 ft Weight 3.75 lbs./ft. Grouted Drill Hole Diameter _____ in. to _____ ft depth Drive Shoe <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No											
8 SCREEN <input type="checkbox"/> Not installed Type plastic Diameter 2 Slot XXX 10 Length 6 Set between 5 ft and 11 ft FITTINGS <input type="checkbox"/> K-Packer <input type="checkbox"/> Lead Packer <input type="checkbox"/> Bremer Check <input type="checkbox"/> Blank above screen _____ ft Other on end of casing											
9 STATIC WATER LEVEL 3 ft below land surface <input type="checkbox"/> Flow											
10 PUMPING LEVEL below land surface _____ ft after _____ hrs. pumping at _____ GPM _____ ft after _____ hrs. pumping at _____ GPM											
11 WELL HEAD COMPLETION <input type="checkbox"/> Pitless adapter <input checked="" type="checkbox"/> 12" above grade <input type="checkbox"/> Basement offset <input type="checkbox"/> Approved pit											
12 WELL GROUTED? <input checked="" type="checkbox"/> No <input type="checkbox"/> Yes From _____ to _____ ft <input type="checkbox"/> Neat cement <input type="checkbox"/> Bentonite <input checked="" type="checkbox"/> Other drilling No. of bags of cement _____ Additives _____											
13 Nearest source of possible contamination Type _____ Distance _____ ft Direction _____ Well disinfected upon completion? <input type="checkbox"/> Yes <input type="checkbox"/> No											
14 PUMP <input checked="" type="checkbox"/> Not installed <input type="checkbox"/> Pump installation Only Manufacturer's name _____ Model number _____ HP _____ Volts _____ Length of Drop Pipe _____ ft capacity _____ GPM TYPE <input type="checkbox"/> Submersible <input type="checkbox"/> Jet PRESSURE TANK Manufacturer's name _____ Model number _____ Capacity _____ Gallons											
15 REMARKS: elevation, source of data, etc. well drilled to 27 feet, owner wanted shallow well for car washing only, screen set in sand formation											
16 WATER WELL CONTRACTOR'S CERTIFICATION This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief Everett Cragg & Sons, Inc. 73-0711 REGISTERED BUSINESS NAME REGISTRATION NO. Address 2765 McCarty Rd. Saginaw, Mich. Signed <i>James Cragg</i> Date 6-21-83 AUTHORIZED REPRESENTATIVE											

D67d

(Rev. 10-80)

GEOLOGICAL SURVEY COPY

OCT 30 1972

WATER WELL RECORD

ACT 294

PA 1965

MICHIGAN DEPARTMENT
OF
PUBLIC HEALTH

1 LOCATION OF WELL

County

Township Name

Fraction

Section Number

Town Number

Range Number

Bay County Kawkawlin

SE 50SW

25

15N

4E

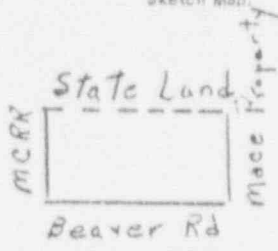
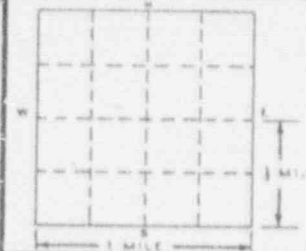
and And Direction from Road Intersections

2635 E BEAVER RD.

Street address & City of Well Location

Locate with "X" in section below

Sketch Map:



3 OWNER OF WELL

Leonard Gaster & Joe Thurlow

Address 2635 E. Beaver Rd. Kawkawlin, Mich.

4 WELL DEPTH: (completed) Date of Completion

60 ft. Sept 15, 72

5 ☐ Cable tool ☐ Rotary ☐ Driven ☐ Dug
☐ Hollow rod ☐ Jetted ☒ Bored ☐6 USE: ☒ Domestic ☐ Public Supply ☐ Industry
☐ Irrigation ☐ Air Conditioning ☐ Commercial
☐ Test Well ☐7 CASING: Threaded ☐ Welded ☐ Height: Above/Below

Diam. 12" Crock

Surface 1 ft.

Weight lbs./ft.

Drive Shoe? Yes ☐ No ☐

8 SCREEN:

Type: _____ Dia: _____

Slot/Gauze _____ Length _____

Set between _____ ft. and _____ ft.

Fittings: _____

9 STATIC WATER LEVEL

_____ ft. below land surface

10 PUMPING LEVEL below land surface

_____ ft. after _____ hrs. pumping _____ g.p.m.

_____ ft. after _____ hrs. pumping _____ g.p.m.

11 WATER QUALITY in Parts Per Million:

Iron (Fe) _____ Chlorides (Cl) _____

Hardness _____ Other _____

12 WELL HEAD COMPLETION: ☐ In Approved Pit☐ Pitless Adapter ☒ 12" Above Grade13 Well Grouted? ☐ Yes ☐ No☐ Neat Cement ☐ Bentonite ☐

Depth: From _____ ft. to _____ ft.

14 Nearest Source of possible contamination

90 ft. N. +

Well disinfected upon completion ☐ Yes ☒ No15 PUMP: ☒ Not installed

Manufacturer's Name _____

Model Number _____ HP _____ Volts _____

Length of Drop Pipe _____ ft. capacity _____ G.P.M.

Type: ☐ Submersible ☐ Jet ☐ Reciprocating

16 Remarks, elevation, source of data, etc.

ADDED INFO. BY DRILLER, ILM

CORRECTED BY:

ADDITION BY:

17 WATER WELL CONTRACTOR'S CERTIFICATION:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

REGISTERED BUSINESS NAME

REGISTRATION NO.

Address

Signed

AUTHORIZED REPRESENTATIVE

Date

1007

1007

1007

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2

NOV 28 1979

WATER WELL RECORD

MICHIGAN DEPARTMENT
OF
PUBLIC HEALTH

1 LOCATION OF WELL		County <u>Bay</u>		Township Name <u>Keweenaw</u>		Fraction <u>1/4</u> <u>1/4</u> <u>1/4</u>		Section Number <u>26</u>		Town Number <u>15 N/S.</u>		Range Number <u>1 E/W.</u>	
Once And Direction from Road Intersections <u>1/2 mile N on Rte 1</u> <u>on M113 Keweenaw</u>						3 OWNER OF WELL: Address <u>Walter H. L...</u> <u>7113 Keweenaw</u>							
Street address & City of Well Location Locate with "X" in section below						Sketch Map:							
						4 WELL DEPTH: (completed) <u>200</u> ft. Date of Completion <u>Sept 79</u>							
5 <input type="checkbox"/> Cable tool <input checked="" type="checkbox"/> Rotary <input type="checkbox"/> Driven <input type="checkbox"/> Dug <input type="checkbox"/> Hollow rod <input type="checkbox"/> Jetted <input type="checkbox"/> Bored						6 USE: <input checked="" type="checkbox"/> Domestic <input type="checkbox"/> Public Supply <input type="checkbox"/> Industry <input type="checkbox"/> Irrigation <input type="checkbox"/> Air Conditioning <input type="checkbox"/> Commercial <input type="checkbox"/> Test Well							
7 CASING: Threaded <input checked="" type="checkbox"/> Welded <input type="checkbox"/> Height: Above/Below Surface <u>1</u> ft. Diam. <u>2</u> in. to <u>4</u> ft. Depth <u>1</u> in. to <u>1</u> ft. Depth Weight <u>1</u> lbs./ft. Drive Shoe? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>						8 SCREEN: Type: <u>1/2" Dia.</u> Dia.: <u>1/2"</u> Slot/Gauze <u>1/16"</u> Length <u>10</u> ft. Set between <u>1</u> ft. and <u>1</u> ft. Fittings: <u>1/2" x 1/2"</u>							
9 STATIC WATER LEVEL <u>1</u> ft. below land surface						10 PUMPING LEVEL below land surface <u>1</u> ft. after <u>1</u> hrs. pumping <u>1</u> g.p.m. <u>1</u> ft. after <u>1</u> hrs. pumping <u>1</u> g.p.m.							
11 WATER QUALITY in Parts Per Million: Iron (Fe) <u>1</u> Chlorides (Cl) <u>1</u> Hardness <u>1</u> Other <u>1</u>						12 WELL HEAD COMPLETION: <input type="checkbox"/> In Approved Pit <input checked="" type="checkbox"/> Pitless Adapter <input type="checkbox"/> 12" Above Grade							
13 Well Grouted? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Neat Cement <input type="checkbox"/> Bentonite <input checked="" type="checkbox"/> <u>1</u> Depth: From <u>1</u> ft. to <u>1</u> ft.						14 Nearest Source of possible contamination <u>60</u> feet <u>SE</u> Direction <u>Septic</u> Type <u>1</u> Well disinfected upon completion <input type="checkbox"/> Yes <input type="checkbox"/> No							
15 PUMP: <input type="checkbox"/> Not installed Manufacturer's Name <u>1</u> Model Number <u>1</u> HP <u>1</u> Volts <u>1</u> Length of Drop Pipe <u>12</u> ft. capacity <u>1</u> G.P.M. Type: <input type="checkbox"/> Submersible <input checked="" type="checkbox"/> Jet <input type="checkbox"/> Reciprocating						16 Remarks, elevation, source of data, etc. ADDED INFO BY DRILLER, ITEM NO. <u>1</u> *CORRECTED BY <u>1</u> **ADDITION BY <u>1</u> ELEVATION <u>1</u> DEPTH TO ROCK <u>1</u>							
17 WATER WELL CONTRACTOR'S CERTIFICATION: This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief. <u>1</u> REGISTERED BUSINESS NAME <u>1</u> REGISTRATION NO. <u>1</u> Address <u>1</u> Signed <u>1</u> Date <u>1</u> AUTHORIZED REPRESENTATIVE						18 USE A 2ND SHEET IF NEEDED							

WATER WELL RECORD
ACT 294 PA 1965

MICHIGAN DEPARTMENT
OF
PUBLIC HEALTH

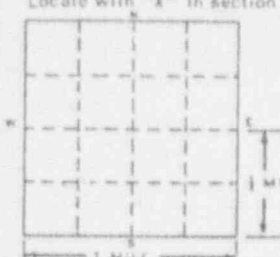
1 LOCATION OF WELL		County <u>Bay</u>		Town <u>Kawkawlin</u>		Range <u>15</u>		Section No. <u>26</u>		Fraction <u>SW 1/4 SE 1/4</u>	
2 FORMATION		THICKNESS OF STRATUM		DEPTH TO BOTTOM OF STRATUM		3 OWNER OF WELL		OWNER No. <u>2105</u>		Address <u>111 Chippewa Kawkawlin, Mich 48631</u>	
0 to 8' sand						4 WELL DEPTH: (completed)		Date of Completion <u>May 21, 1969</u>			
8' to 19' yellow clay						5 <input type="checkbox"/> Cable tool <input type="checkbox"/> Rotary <input type="checkbox"/> Driven <input type="checkbox"/> Dug					
19' to 26' blue clay						<input type="checkbox"/> Hollow rod <input type="checkbox"/> Jetted <input checked="" type="checkbox"/> Bored <input type="checkbox"/>					
26' to 30' blue clay						6 USE: <input checked="" type="checkbox"/> Domestic <input type="checkbox"/> Public Supply <input type="checkbox"/> Industry					
and gravel with water						<input type="checkbox"/> Irrigation <input type="checkbox"/> Air Conditioning <input type="checkbox"/> Commercial					
30' to 43' blue clay						<input type="checkbox"/> Test Well <input type="checkbox"/>					
43' to 45' gravel						7 CASING: <input type="checkbox"/> Threaded <input type="checkbox"/> Welded <input type="checkbox"/>		Height: Above Bottom surface <u>12</u> ft.			
						Diam. _____ in. to _____ ft. Depth _____ in. to _____ ft. Depth _____ in. to _____ ft. Depth _____ in. to _____ ft.		Weight _____ lbs./ft.		Drive Shoe? Yes <input type="checkbox"/> No <input type="checkbox"/>	
						8 SCREEN:					
						Type: _____ Dia: _____					
						Slot/Gauge _____ Length _____					
						Set between _____ ft. and _____ ft.					
						Fittings: _____					
						9 STATIC WATER LEVEL					
						_____ ft. below land surface					
						10 PUMPING LEVEL below land surface					
						_____ ft. after _____ hrs. pumping _____ g.p.m.					
						_____ ft. after _____ hrs. pumping _____ g.p.m.					
						11 WATER QUALITY in Parts Per Million:					
						Iron (Fe) _____ Chlorides (Cl) _____					
						Hardness _____					
						12 WELL HEAD COMPLETION: <input type="checkbox"/> In Approved Pit					
						<input type="checkbox"/> Pitless Adapter <input checked="" type="checkbox"/> 12" Above Grade					
						13 GROUTING:					
						Well Grouted? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No					
						Material: <input type="checkbox"/> Neat Cement <input type="checkbox"/>					
						Depth: From _____ ft. to _____ ft.					
						14 SANITARY:					
						Nearest Source of possible contamination					
						<u>75</u> feet <u>N</u> Direction <u>Septic</u> Type					
						Well disinfected upon completion <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No					
						15 PUMP:					
						Manufacturer's Name <u>Not installed</u>					
						Model Number _____ HP _____					
						Length of Drop Pipe _____ ft. capacity _____ G.P.M.					
						Type: <input type="checkbox"/> Submersible <input type="checkbox"/>					
						<input type="checkbox"/> Jet <input type="checkbox"/> Reciprocating					
16 Remarks, elevation, source of data, etc.						17 WATER WELL CONTRACTOR'S CERTIFICATION:					
ADDITIONAL BY DRILLER: ITEM #7 CORRECTED BY: RE-ADDITION BY:						This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief. <u>Gabe Prime</u> REGISTERED BUSINESS NAME Address <u>Aburn Mich</u> Signed <u>Gabe Prime</u> Date <u>June 2, 1969</u> AUTHORIZED REPRESENTATIVE					
						1007 REGISTRATION NO.					

D67D 100M 6-66

JUN 18 1969

GEOLOGICAL SURVEY COPY

WATER WELL RECORD
ACT 294 PA 1965MICHIGAN DEPARTMENT
OF
PUBLIC HEALTH

1 LOCATION OF WELL County <u>Bay</u> Township Name <u>Kawkawlin</u> Fraction <u>1/4</u> <u>1/4</u> <u>1/4</u> Section Number <u>26</u> Town Number <u>15</u> Range Number <u>4</u> <u>W.</u> <small>Indicate Area Direction from Road Intersections</small>		3 OWNER OF WELL: <u>William A. Dore Jr.</u> Address <u>2184 Jose Rd. Kawkawlin</u>																									
2 FORMATION <table border="1" style="width: 100%; border-collapse: collapse;"><thead><tr><th>FORMATION</th><th>THICKNESS OF STRATUM</th><th>DEPTH TO BOTTOM OF STRATUM</th></tr></thead><tbody><tr><td><u>0 to 8 sand</u></td><td></td><td></td></tr><tr><td><u>8 to 12 clay</u></td><td></td><td></td></tr><tr><td><u>12 to 20 Clay and sand</u></td><td></td><td></td></tr><tr><td><u>20 to 40 blue Clay</u></td><td></td><td></td></tr><tr><td><u>40 to 42 Clay and sand</u></td><td></td><td></td></tr><tr><td><u>12' slip seal tile</u></td><td></td><td></td></tr><tr><td><u>Clay fill</u></td><td></td><td></td></tr></tbody></table>		FORMATION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM	<u>0 to 8 sand</u>			<u>8 to 12 clay</u>			<u>12 to 20 Clay and sand</u>			<u>20 to 40 blue Clay</u>			<u>40 to 42 Clay and sand</u>			<u>12' slip seal tile</u>			<u>Clay fill</u>			4 WELL DEPTH: (completed) <u>42'</u> Date of Completion <u>Oct 4, 1977</u>	
		FORMATION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM																							
<u>0 to 8 sand</u>																											
<u>8 to 12 clay</u>																											
<u>12 to 20 Clay and sand</u>																											
<u>20 to 40 blue Clay</u>																											
<u>40 to 42 Clay and sand</u>																											
<u>12' slip seal tile</u>																											
<u>Clay fill</u>																											
Sketch Map: 		5 <input type="checkbox"/> Cable tool <input type="checkbox"/> Rotary <input type="checkbox"/> Driven <input type="checkbox"/> Dug <input type="checkbox"/> Hollow rod <input type="checkbox"/> Jetted <input checked="" type="checkbox"/> Bored																									
		6 USE: <input checked="" type="checkbox"/> Domestic <input type="checkbox"/> Public Supply <input type="checkbox"/> Industry <input type="checkbox"/> Irrigation <input type="checkbox"/> Air Conditioning <input type="checkbox"/> Commercial <input type="checkbox"/> Test Well																									
		7 CASING: Threaded <input type="checkbox"/> Welded <input type="checkbox"/> Diam. <u>12" crack</u> Height: Above <u>Surface</u> <u>1</u> ft. Weight <u>1</u> lbs./ft. Drive Shoe? Yes <input type="checkbox"/> No <input type="checkbox"/>																									
		8 SCREEN Type: _____ Dia.: _____ Slot/Gauze _____ Length _____ Set between _____ ft. and _____ ft. Fittings: _____																									
		9 STATIC WATER LEVEL _____ ft. below land surface																									
		10 PUMPING LEVEL below land surface _____ ft. after _____ hrs. pumping _____ g.p.m. _____ ft. after _____ hrs. pumping _____ g.p.m.																									
		11 WATER QUALITY in Parts Per Million: Iron (Fe) _____ Chlorides (Cl) _____ Hardness _____ Other _____																									
		12 WELL HEAD COMPLETION: <input type="checkbox"/> In Approved Pit <input type="checkbox"/> Pitless Adapter <input checked="" type="checkbox"/> 12" Above Grade																									
		13 Well Grouted? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Neat Cement <input type="checkbox"/> Bentonite <input type="checkbox"/> Depth: From _____ ft. to _____ ft.																									
		14 Nearest Source of possible contamination <u>60</u> feet <u>E</u> Direction <u>Septic</u> Type _____ Well disinfected upon completion <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No																									
		15 PUMP: <input checked="" type="checkbox"/> Not installed Manufacturer's Name _____ Model Number _____ HP _____ Volts _____ Length of Drop Pipe _____ ft. capacity _____ G.P.M. Type: <input type="checkbox"/> Submersible <input type="checkbox"/> Jet <input type="checkbox"/> Reciprocating																									
		17 WATER WELL CONTRACTOR'S CERTIFICATION: This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief. <u>Gabe Pruitt</u> 1007 REGISTERED BUSINESS NAME REGISTRATION NO. Address <u>Akron Mich</u> Signed <u>Gabe Pruitt</u> Date <u>Oct 6, 77</u> AUTHORIZED REPRESENTATIVE																									
16 Remarks, elevation, source of data, etc. <u>Sand</u>																											

WATER WELL RECORD
ACT 294 PA 1965

MICHIGAN DEPARTMENT
OF
PUBLIC HEALTH

1 LOCATION OF WELL		County <u>Bay</u> Twp. <u>Kaw Kawlin</u> Fraction <u>SW 1/4 SE 1/4 NW 1/4</u> Section No. <u>26</u> Town <u>15 N 1/2</u> Range <u>4 E 1/2</u>	
2 And Direction from Road Intersections <u>N. W. M 23</u> <u>1/4 M. E 4 Mile Road</u> Street address & City of Well Location		OWNER No. _____ <u>Jose Road</u> <u>Kaw Kawlin, Mich.</u>	3 OWNER OF WELL: <u>Wilbur D. Hacker</u> Address <u>Jose Road</u> <u>Kaw Kawlin, Mich.</u>
2 FORMATION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM	4 WELL DEPTH: (completed) <u>30</u> ft. Date of Completion <u>Sept 30, 1969</u>
<u>0 to 8' sand</u>			5 <input type="checkbox"/> Cable tool <input type="checkbox"/> Rotary <input type="checkbox"/> Driven <input type="checkbox"/> Dug <input type="checkbox"/> Hollow rod <input type="checkbox"/> Jetted <input checked="" type="checkbox"/> Bored <input type="checkbox"/>
<u>8 to 26 clay</u>			6 USE: <input checked="" type="checkbox"/> Domestic <input type="checkbox"/> Public Supply <input type="checkbox"/> Industry <input type="checkbox"/> Irrigation <input type="checkbox"/> Air Conditioning <input type="checkbox"/> Commercial <input type="checkbox"/> Test Well <input type="checkbox"/>
<u>26 to 30 clay and gravel</u>			7 CASING: Threaded <input type="checkbox"/> Welded <input type="checkbox"/> Height: Above/Below surface <u>1</u> ft. Diam. _____ in. to _____ ft. Depth _____ ft. Weight _____ lbs./ft. Drive Shoe? Yes <input type="checkbox"/> No <input type="checkbox"/>
<u>Boyd I.</u> <u>Kirk J.</u> <u>Mary H.</u>		8 SCREEN: <u>Hacker</u> Dia.: _____ Plot/Gauge _____ Length _____ Set between _____ ft. and _____ ft. Fittings: <u>Hacker</u>	
		9 STATIC WATER LEVEL _____ ft. below land surface	
		10 PUMPING LEVEL below land surface _____ ft. after _____ hrs. pumping _____ g.p.m. _____ ft. after _____ hrs. pumping _____ g.p.m.	
		11 WATER QUALITY in Parts Per Million: Iron (Fe) _____ Chlorides (Cl) _____ Hardness _____	
<u>X</u>		12 WELL HEAD COMPLETION: <input type="checkbox"/> In Approved Pit <input type="checkbox"/> Pitless Adapter <input checked="" type="checkbox"/> 12" Above Grade	
		13 GROUTING: Well Grouted? <input type="checkbox"/> Yes <input type="checkbox"/> No Material: <input type="checkbox"/> Neat Cement <input type="checkbox"/> Depth from _____ ft. to _____ ft.	
		14 SANITARY: Nearest Source of possible contamination <u>75</u> feet <u>E</u> Direction <u>Septic</u> Type _____ Well disinfected upon completion <input type="checkbox"/> Yes <input type="checkbox"/> No	
		15 PUMP: <u>Did not install</u> Manufacturer's Name _____ Model Number _____ HP _____ Length of Drop Pipe _____ ft. capacity _____ G.P.M. Type: <input type="checkbox"/> Submersible <input type="checkbox"/> <input type="checkbox"/> Jet <input type="checkbox"/> Reciprocating	
16 Remarks, elevation, source of data, etc. <u>Well owner will cement</u>		17 WATER WELL CONTRACTOR'S CERTIFICATION: This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief. <u>Gale P. Pinn</u> 1007 REGISTERED BUSINESS NAME REGISTRATION NO. Address <u>Akron Mich</u> Signed <u>Gale P. Pinn</u> Date <u>9, 30, 69</u> AUTHORIZED REPRESENTATIVE	

MICHIGAN DEPARTMENT OF NATURAL RESOURCES

INTEROFFICE COMMUNICATION

April 28, 1983

TO: Bill Bradford, Acting Chief, Groundwater Quality Division
Dave Dennis, Compliance Section #2 Supervisor, GWQD

FROM: Dan Schultz, Compliance #2, GWQD

SUBJECT: Hartley & Hartley - Tobico Marsh
Bay County

On March 3, 1983, staff collected three sets of surface water samples from the area around the northwest and southwest portion of the property now owned by SCA Services in Massachusetts. There is an area of buried drums off the northwest corner that extends into the Tobico Marsh, which has been called the 'state's peninsula.' One set of samples consisted of a composite from the east side of this peninsula; one set was a composite from the west side; and the third set was taken (not a composite) from the southwest corner of SCA's property. The chemicals found and their concentrations are as follows.

	West Side Ug/l	East Side Ug/l	SW SCA Ug/l
1,2 - Dichloroethane	1700.00	390.00	-----
1,2 - Dichloroethene	-----	15000.00	23.00
Benzene	93.00	-----	-----
Xylenes	370.00	3000.00	-----
Toluene	-----	730.00	-----
Hexachlorocyclopentadien	-----	1.50	-----
Diethyl Phthalate	130.00	-----	-----
Dibutyl Phthalate	-----	460.00	-----
Bis (2-Ethylhexyl Phalate	-----	95.00	-----
Phenol	130.00	-----	-----
2-Chlorophenol	60.00	1200.00	-----
2,4-Dinitrophenol	110.00	6100.00	-----
4,6-Dinitro-o-cresol	120.00	-----	-----
2,4-Dimethylphenol	-----	180.00	-----

The toxic chemical evaluation section reviewed their material to attempt to assess the hazards for terrestrial wildlife. There was insufficient data to assess some of the materials, but the following were deemed unacceptable for the protection of wildlife at the reported concentrations: Diethylhexyl Phthalate; 1,2-Dichloroethane; O,M,P-Xylene; Hexachlorocyclopentadiene; and Benzene. A copy of this report is attached.

nm

Attachment

A/S

ATTACHMENT 1

Description of Water Sampling Locations

<u>Location*</u>	<u>Description</u>
SP-1	Well inside DNR slurry wall
SP-2	Well outside (west) DNR slurry wall
SP-3	Well outside (north) DNR slurry wall
SP-4	Well outside (east) DNR slurry wall
MW-5	Well outside (east) DNR slurry wall
MW-6	Well outside (north) DNR slurry wall
MW-43	Well between DNR and SCA slurry walls
MW-12	Well near boundary between DNR and SCA sites
INS-1	Well inside SCA slurry wall (south)
UP-1	Well outside SCA slurry wall (south)
INS-2	Well inside SCA slurry wall (west)
DWN-3	Well outside SCA slurry wall (west)
INS-3	Well inside SCA slurry wall (north)
DWN-2	Well outside SCA slurry wall (north)
MW-15	Well outside and west of SCA slurry wall
MW-18	Well outside and east of SCA slurry wall
L1	Surface water from lagoon north of DNR slurry wall
L2	Surface water from lagoon between DNR and SCA slurry walls
SW-17	Surface water from lagoon south of SCA slurry wall
L3	Surface water from lagoon near Beaver Road

*Location designations except L1, L2, and L3, are those used by WMI and DNR.

Analytical Results from wells
Inside Encapsulation in mg/l
(unless otherwise indicated)

Pesticide/PCB scan	SP-1 ND	RL-8 ND	RL-9 ND	Detection Limit 0.001 or 0.005
Base Neutral/Acid Extractables scan				
Bis-(2-Ethyl Hexyl)Phthalate	0.003	ND	ND	0.001
Naphthalene	0.002	ND	ND	0.001
pH Value (lab)	6.54	5.53	5.85	
Conductivity @ 25 C	1850	19170	3860	5 umohs/cm
Chloride	175	1010	964	2
Sulfate	127	284	5.9	5
Alkalinity, Total	716	348	380	2
Volatile Fraction				
Benzene ✓	0.18	ND	1.6	1
Trans- 1,2-Dichloroethylene ✓	7.4	190	210	1
Toluene	0.23	3.4	3.7	1
Vinyl Chloride ✓	5.4	1.7	7.8	1
1,2-Dichloroethane	ND	22	6.8	1
Methylene Chloride	ND	1.6	1.4	1
Trichloroethylene ✓	ND	110	39	1
Ethylbenzene	ND	ND	1.1	1
Bicarbonate	874	424	464	2
Carbonate	ND	ND	ND	2
Chromium, Hexavalent	ND	ND	ND	0.05
Chemical Oxygen Demand	289	5770	3720	5
Total Organic Carbon	74	1250	660	1
Nitrate	ND	ND	ND	0.05
Nitrite	ND	ND	ND	0.05
Ammonia	7.2	59	34	0.05
Total Kjeldahl Nitrogen	8.3	147	46	2
Phosphorous, Total	0.03	0.06	0.02	0.02
Calcium, Dissolved	200	200	92	0.5
Magnesium, Dissolved	100	110	130	0.5
Sodium, Dissolved	79	81	290	0.5
Potassium, Dissolved	8.3	82	130	0.5
Cadmium, Dissolved	ND	ND	ND	0.01
Chromium, Dissolved	ND	ND	ND	0.05
Copper, Dissolved	0.04	0.02	0.03	0.01
Nickel, Dissolved	0.24	0.48	0.04	0.01
Lead, Dissolved	ND	ND	ND	0.05
Zinc, Dissolved	0.04	16	3.2	0.02
Iron, Dissolved	0.65	340	190	0.01
Cobalt, Dissolved	ND	0.05	ND	0.01

HARTLEY & HARTLEY
STATE OWNED PORTION

Analytical Results from wells
Inside Encapsulation in mg/l
(unless otherwise indicated)

	SP-1	RL-8	RL-9	Detection Limit
Lithium, Dissolved	0.02	0.26	0.36	0.02
Manganese, Dissolved	0.51	25	1.6	0.01
Aluminum, Dissolved	0.58	2.4	2.6	0.25
Barium, Dissolved	0.23	0.19	0.2	0.02
Beryllium, Dissolved	ND	ND	ND	0.01
Molybdenum, Dissolved	ND	ND	ND	0.1
Titanium, Dissolved	ND	ND	ND	0.1
Vanadium, Dissolved	0.46	0.47	0.61	0.1
Silver, Dissolved	0.02	0.02	0.03	0.01
Mercury, Dissolved	ND	ND	ND	0.0002
Arsenic, Dissolved	ND	ND	11	0.002
Selenium, Dissolved	ND	ND	ND	0.02
Antimony, Dissolved	ND	ND	ND	0.02



Defence

NATURAL RESOURCES COMMISSION

JOHN A. HEDDERLEY
JOHN A. HEDDERLEY
JOHN A. HEDDERLEY
JOHN A. HEDDERLEY
JOHN A. HEDDERLEY
JOHN A. HEDDERLEY
JOHN A. HEDDERLEY

JAMES J. BLANCHARD, Governor

DEPARTMENT OF NATURAL RESOURCES

STEVENS T. MASON BUILDING
BOX 30028
LANSING, MI 48209
HOWARD A. TANNER, Director

May 17, 1983

Mr. Ross Powers
U.S. Environmental Protection
Agency
9311 Groh Road
Grosse Ile, Michigan 48138

Re: SCA/Hartley & Hartley

Dear Mr. Powers:

I have attached a Michigan Department of Public Health (MDPH) memo describing the preliminary results of the states April 20, 1983 radiological surveys on state land adjacent to the closed SCA/Hartley & Hartley landfill in Bay County, Michigan.

Ongoing laboratory work and site investigation by the state may identify the type and source of those materials as well as restrictions in handling and ultimate disposal. If boring, core sampling, or other subsurface work is planned on either DNR or adjacent SCA property we will notify EPA as early as possible so you may participate. We are currently working with state and local public health officials to confirm a May 25, 1983 site visit to take further radiological measurements and will call you if any changes are made in the date for this investigation.

By copy of this letter and attachment I am also notifying Pete Tedeschi, John Dourjalian and Joe Fredle of our work.

Please feel free to call me at 517/373-3503 if you have further questions.

Sincerely,

Gary Gettel
Environmental Enforcement Division

CG:smi
attachment

A/7

MEMORANDUM

FROM: Robert L. Deloan, Chief
Environmental Monitoring Unit

SUBJECT: Radioactivity Survey of DNR Land Near Bay City, Michigan

On April 20, 1983, Harold Johnson and I accompanied Michigan Department of Natural Resources (DNR) and U. S. Environmental Protection Agency (EPA) representatives on a radioactivity survey of a small portion of the DNR land near Bay City, Michigan. Personnel present for this survey in addition to us were:

- Representing the EPA:
1. Pete Tedeschi, Regional Director
Radiation Branch
 2. Tom DeFouw and John Dourjalian
Roy F. Weston, Inc.
Spill Prevention & Emergency Response
Division (EPA contracted consulting firm)

- Representing the DNR:
1. Gary Gettel, Resource Specialist
Environmental Enforcement Division
 2. Gordy Hahn, Criminal Investigator,
Environmental Enforcement Division
 3. Dan Schultz, Water Quality Specialist
Ground Water Quality Division

The property was formally owned by Hartley and Hartley and was used as a landfill. DNR reportedly acquired the land from Hartley and Hartley as part of a court settlement. Also, as part of the settlement, Hartley and Hartley was to remove all the barrels of waste from the property. Hartley and Hartley has since sold the remainder of the landfill to SCA Corporation.

Recently, DNR found some corroded barrels at or just below the ground surface on a small portion (about the size of a football field) of their property. Also a DNR Wildlife Biologist recalled seeing barrels labeled "Radioactive" stored on the property when Hartley and Hartley was using it as a landfill. Hence, DNR requested EPA and our assistance to survey the area and determine what kind and how much radioactivity is present there.

Attached is a crude sketch of the surveyed area. All distance measurements are referenced to a land survey line marked out by 2" x 2" wood and metal nail-type stakes. Using our Micro R meter, we found several areas with elevated readings (Background was determined to be 3-5 μ R/hr.). The readings were taken at waist level (~1 meter above the ground surface) and ranged from background to 80 μ R/hr. We have approximately drawn in the areas for 20 μ R/hr. contours and included the highest reading within each contour. All elevated readings were found in areas where

Joseph M. Hennigan, P.E., Chief

May 2, 1983

Page 2

the ground was exposed (no grass or shrub cover). In some of these areas, the ground was greyish-white in color and had a clumpy to powdery texture.

In one of the elevated reading areas, we removed some of the ground (6-8 inches) and found the remains of a corroded barrel with the greyish-white substance in it. A sample of this material was brought back to the lab and was analyzed. The analysis revealed 670 ± 40 pCi/g dry of ^{232}Th . All daughters of ^{232}Th were confirmed to be present.

DNR is planning a ground penetrating radar study of the area which should assist in estimating the number of barrels buried there. Also aerial photographs will be taken of the area, and copies will be sent to us.

RLD/bls

Attachment

cc: George

GRASS & SHRUB
AREA

GRASS & SHRUB
AREA

H₂O!?

H₂O!?

MOISTLY EXPOSED
EARTH W/ SOME EXPOSED
ROOTS

(3-5) $\mu R/hr$

DIRT ROAD

- ① SURVEY STAKES (5' APART)
- ② 2" x 2" SURVEY POSTS (315' APART)

RED: $\sim 20 \mu R/hr$
CONTOUR

BLUE: MAX. READING
WITHIN $2 \mu R/hr$
CONTOUR

NOTE: ALL $\mu R/hr$
READINGS TAKE
AT WAIST HIGH

- ② 8 $\mu R/hr$
- ③ 20 $\mu R/hr$
- ④ 8 $\mu R/hr$
- ⑤ 12 $\mu R/hr$
- ⑥ 9 $\mu R/hr$
- ⑦ 14 $\mu R/hr$
- ⑧ 20 $\mu R/hr$
- ⑨ 9 $\mu R/hr$
- ⑩ 9 $\mu R/hr$
- ⑪ 25 $\mu R/hr$
- ⑫ 40 $\mu R/hr$
- ⑬ 9 $\mu R/hr$
- ⑭ 6 $\mu R/hr$
- ⑮ 5 $\mu R/hr$
- ⑯ 4 $\mu R/hr$
- ⑰ 5 $\mu R/hr$

25

8

20

8

12

9

14

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80

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40

2 May 1983

TAT-05-F-00139

VIA: Mr. Jack Thorsen

RE: Radiological Survey at Hartley and Hartley Liquid Incineration and Treatment Plant, Kaw'kawlin, Michigan
TDD# 5-8304-12

On Wednesday 19 April, TAT members John Dourjalian and Tom DeFouw conducted a radiological survey at the Hartley and Hartley Liquid Incinerator and Treatment Facility. Hartley and Hartley is located in an isolated area at 2370 Two Mile Road in Kawkawlin, Michigan. The facility started incineration operations in 1969 after receiving a "Permit to Install" from the Michigan Air Pollution Control Commission to install a liquid waste incinerator. The company stored waste liquids received from a number of companies in open ponds and, periodically these ponds caught fire. *on some wet?*

Inspections conducted by the Michigan Department of Natural Resources disclosed a number of chronic air pollution and water pollution problems related to the incinerator and these open pits. In 1970, steel drums containing various chemicals and oil wastes were discovered in the Tobico Marsh Game Area located adjacent to the facility. State inspectors also suspected that drums were being crushed and buried at the facility.

In 1978, the State determined that the facility was not being operated properly by SCA, who had purchased the facility in 1976. The company had buried drums of waste either in the fill or on-site in an unapproved manner. Oil storage ponds on the north and west sides of the facility were "cleaned up" by depositing asbestos and other demolition material in the ponds to absorb the oil. Other ponds were utilized to make metallic hydroxides out of metal plating wastes by adding acids and bases to the ponds.

On 28 June 1978, SCA was served with a cease and desist order because of numerous violations of the State's environmental protection laws. The DNR stated that: 1) the industrial waste incinerator was being operated without proper pollution controls; 2) the company accepted and

Improperly disposed of liquid industrial wastes in its landfill; 3) the construction of waste lagoons was undertaken without approval; and 4) the Tobacco Marsh Game Area had been polluted. The State ordered that a complete hydrogeological investigation be undertaken to determine if wastes had contaminated the ground water, and, if contamination was found, the facility implement a program to remove the contamination and prevent any further contamination.

As of 31 December 1978, no additional wastes were accepted at the facility. A clay cap had been placed over the disposal areas and a ten foot high clay dike surrounds the facility. All liquid waste that had been in storage has been removed. Monitoring of ground water levels continues by SCA.

MDNR personnel informed Mr. Ross Powers of the U.S. EPA that an undetermined number of 55-gallon drums were buried on State owned land. A magnetometer study conducted by SCA services verified the information provided by the MDNR.

Markings and labels on a number of the drums prior to their burial indicated that the contents included radioactive materials. A survey of the area by Mr. Ross Powers of the U.S. EPA and Mr. Dan Schultz of the MDNR on 13 April 1983 indicated that radioactive material was present at various locations around the site. Mr. Powers and Mr. Schultz surveyed the State land using a hand-held Beta Gama meter. Readings ranging from 0.2 mR/hr to 0.3 mR/hr were recorded on the Beta Gama survey meter. The location of the hot areas were marked and segregated by stringing caution tape around the contaminated area.

On 20 April 1983, TAT members John Dourjalian and Tom DeFouw conducted a survey of the site in an effort to further define and delineate the contaminated areas discovered on 13 April 1983. Mr. Dourjalian and Mr. DeFouw were assisted in their efforts by Mr. Dan Schultz of the MDNR, Mr. Robert DeHaan of the MDPH, and Mr. Pete Tedeschi of the U.S. EPA Air Program Radiation Section.

A survey of the area using a hand-held Beta Gama survey meter was completed. Nine locations were marked with wooden stakes as potential hot spots. Mr. Tedeschi, using an Eberline PRM-5 survey meter, recorded readings at each of the nine designated hot spots (refer to the attached table). Readings were recorded in counts per minute and mR/hr. Two samples were collected by Mr. Tedeschi. The sample material consisted of the surrounding soils with a mixture of gray slag material that apparently was scattered over the site and used as a fill. Samples will be shipped by Mr. Tedeschi to the EPA Eastern Environmental Radiation Laboratory for analysis. Photographs of the sample locations and the nine sites designated as hot spots are attached.

Analysis of samples collected by Mr. Tedeschi will assist in the effort to define the type and level of radioactive material as well as to determine the potential health effects to the surrounding human and wildlife populations. The preliminary field analysis indicated that radioactivity was being emitted from the slag material which covers the area. This material was apparently used as a fill. The source of the slag is yet to be determined. In addition, Mr. Tedeschi indicated that he could arrange to have ground and surface water samples analyzed for radioactive materials. A detailed site sketch will be attached after the MDNR completed an aerial survey. The fly-over is scheduled to be completed during the week of 18 April 1983.

John Dourjalian
John Dourjalian (4)

JD/js

.04-11-1

FIELD ANALYTICAL DATA

<u>Location</u>	<u>mR/HR*</u>	<u>CPM **</u>
Stake #1	.15	30,000
Stake #2	.5	100,000
Stake #3	1.0	40,000
Stake #4	.5	4,000
Stake #5	.6	70,000
Stake #6	.8	47,000
Stake #7	1.4	125,000
Stake #8	.6	47,000
Stake #9	.4	47,000

* mR/HR = millirem per hour. Reading was recorded using a beta gamma survey meter.

** CPM = counts per minute. Reading was recorded using an Eberline PRM-5 survey meter with a sodium iodide crystal.

SAMPLE ID: 853-2137
 ANALYST: EOH
 COLLECTION DATE, TIME: 5/17/83 01:0
 RECEIPT DATE: 5/22/83
 COMPLETION DATE: 5/22/83
 AG DATE: 7/2/83
 LOCATION: B311 GAYLOR LN
 OTHER ID'S: BAG 41
 COMMENTS: SMALL AMT. OF SAMPLE
 REPORT TO: CHUCK PHILLIPS

SAMPLE FROM TUBING
 MARSH AREA - FORMER
 HARTLEY & HARTLEY LUMBER CO.

TYPE OF ANALYSIS: ***** GAMMA *****
 VERIFIED BY: MS (5/17/83) AND CP (5/17/83)
 DATE, TIME COUNTED: 5/12/83 15:28
 LENGTH OF COUNT: 1000 MIN
 PREPARER: GLMM
 COUNTING SYSTEM: IGE4
 SAMPLE SIZE: 41.700 GWET
 COMMENTS:

NUCLIDE	ACTIVITY	2 SIG ERROR	UNITS	DATE
K-40	3.3000E+01	8.00 %	PCI/GWET	5/12/83
PB-214	1.9000E+00	101.00 %	PCI/GWET	5/12/83
BI-214	1.7000E+00	25.00 %	PCI/GWET	5/12/83
TH-232	3.9000E+02	1.00 %	PCI/GWET	5/12/83 AC-228
U-238	8.9000E+01	37.00 %	PCI/GWET	5/12/83
RA-226	9.3000E+00	54.00 %	PCI/GWET	5/12/83
K-40	4.9000E+01	8.00 %	PCI/GDRY	5/12/83
PB-214	2.8000E+00	101.00 %	PCI/GDRY	5/12/83
BI-214	2.5000E+00	25.00 %	PCI/GDRY	5/12/83
TH-232	5.8110E+02	1.00 %	PCI/GDRY	5/12/83 AC-228
U-238	1.3260E+02	37.00 %	PCI/GDRY	5/12/83
RA-226	1.3800E+01	54.00 %	PCI/GDRY	5/12/83

TYPE OF ANALYSIS: ***** ALPHA *****
 VERIFIED BY: GL (5/20/83) AND MM (5/20/83)
 DATE, TIME COUNTED: 5/ 3/83 0: 0
 LENGTH OF COUNT: 100 MIN
 PREPARER: GLMM
 COUNTING SYSTEM: FC
 SAMPLE SIZE: 0.670000 GDRY
 COMMENTS:

NUCLIDE	ACTIVITY	2 SIG ERROR	UNITS	DATE
ALPHA	9.2500E+01	9.00 %	PCI/GDRY	9/ 9/99

TYPE OF ANALYSIS: ***** BETA *****
 VERIFIED BY: GL (5/20/83) AND MM (5/20/83)
 DATE, TIME COUNTED: 5/ 3/83 0: 0
 LENGTH OF COUNT: 50 MIN
 PREPARER: GLMM
 COUNTING SYSTEM: TN
 SAMPLE SIZE: 0.670000 GDRY
 COMMENTS:

NUCLIDE	ACTIVITY	2 SIG ERROR	UNITS	DATE
BETA	1.0657E+03	1.00 %	PCI/GDRY	9/ 9/99

A/8

ANALYST ID
 SAMPLE TYPE
 COLLECTION DATE, TIME
 RECEIPT DATE
 COMPLETION DATE
 AG DATE
 LOCATION
 OTHER ID'S
 REPORT TO

RSTB3 30/83
 501
 5/ 9/83
 5/ 2/83
 5/20/83
 7/ 2/83
 MI:KAWKAWLIN
 BAG 42
 CHICK PHILLIPS

TYPE OF ANALYSIS ***** GAMMA *****
 VERIFIED BY MS (5/20/83) AND CP (5/20/83)
 DATE, TIME COUNTL 5/ 5/83 15:17
 LENGTH OF COUNT 1000 MIN
 PREPARER GLMM
 COUNTING SYSTEM GEL2
 SAMPLE SIZE 402.000 GWET
 COMMENTS

NUCLIDE	ACTIVITY	2 SIG ERROR	UNITS	DATE
K-40	4.6000E+00	14.00 %	PCI/GWET	5/ 5/83
CS-137	4.5000E-02	88.00 %	PCI/GWET	5/ 5/83
PB-214	4.7000E-01	25.00 %	PCI/GWET	5/ 5/83
BI-214	4.6000E-01	21.00 %	PCI/GWET	5/ 5/83
TH-232	3.3000E+01	1.00 %	PCI/GWET	5/ 5/83
RA-226	2.1000E+00	56.00 %	PCI/GWET	5/ 5/83
K-40	6.0000E+00	14.00 %	PCI/GDRY	5/ 5/83
CS-137	6.0000E-02	88.00 %	PCI/GDRY	5/ 5/83
PB-214	6.2000E-01	25.00 %	PCI/GDRY	5/ 5/83
BI-214	6.1000E-01	21.00 %	PCI/GDRY	5/ 5/83
TH-232	4.3900E+01	1.00 %	PCI/GDRY	5/ 5/83
RA-226	2.8000E+00	56.00 %	PCI/GDRY	5/ 5/83

AC-228 3.30
 2.1
 AC-228 4.3.1

TYPE OF ANALYSIS ***** ALPHA *****
 VERIFIED BY GL (5/20/83) AND MM (5/20/83)
 DATE, TIME COUNTED 5/ 3/83 0: 0
 LENGTH OF COUNT 100 MIN
 PREPARER GLMM
 COUNTING SYSTEM PC
 SAMPLE SIZE 0.750000 GDRY
 COMMENTS

NUCLIDE	ACTIVITY	2 SIG ERROR	UNITS	DATE
ALPHA	2.8000E+01	16.00 %	PCI/GDRY	9/ 9/99

TYPE OF ANALYSIS ***** BETA *****
 VERIFIED BY GL (5/20/83) AND MM (5/20/83)
 DATE, TIME COUNTED 5/ 3/83 0: 0
 LENGTH OF COUNT 50 MIN
 PREPARER GLMM
 COUNTING SYSTEM TN
 SAMPLE SIZE 0.750000 GDRY
 COMMENTS

NUCLIDE	ACTIVITY	2 SIG ERROR	UNITS	DATE
BETA	5.2700E+01	6.00 %	PCI/GDRY	9/ 9/99

U.S. NUCLEAR REGULATORY COMMISSION

REGION III

LABORATORY ANALYSIS REPORT

 DATE: 20 JUL 1984 4:26:24 PM
 TITLE: SOIL SAMPLES FROM SCA/HARTLEY SITE
 INSTRUMENT: LAB ND6620
 SAMPLES FROM: SCA/HARTLEY
 SAMPLE TYPE: SOIL/SLAG
 COLLECTED BY: SCHUMACHER / POZAK
 COLLECTED ON: 7/17/84

ERRORS ARE AT THE 67% (1 SIGMA) CONFIDENCE LEVEL

SAMPLE ID.=84-295

; SAMPLE DESCRIPTION: #51 Hartley property W. of access road.

COMMENTS: *Fine silt is dried sample sifted through #35 mesh sieve. Remainder ground, sample sample average*

RA-228	(5.19+/-0.39)E -6 UCI/G FINE S	} thru 35 mesh	5.2 pg/g
RA-224	(4.08+/-0.20)E -6 UCI/G FINE S		
RA-228	(2.69+/-0.08)E -5 UCI/G GROUND	} > 35 mesh	26.9
RA-224	(2.59+/-0.04)E -5 UCI/G GROUND		
RA-228	(1.05+/-0.05)E -5 UCI/G SAMPLE	} weighted avg.	10.5
RA-224	(9.44+/-0.25)E -6 UCI/G SAMPLE		

SAMPLE ID.=84-296

; SAMPLE DESCRIPTION: *✓ further back* #52 Hartley property W. of access road.

COMMENTS:

RA-228	(1.42+/-0.12)E -5 UCI/G FINE S	14.2 pg/g
RA-224	(1.39+/-0.05)E -5 UCI/G FINE S	13.9
RA-228	(5.43+/-0.12)E -5 UCI/G GROUND	52.3
RA-224	(5.52+/-0.06)E -5 UCI/G GROUND	55.2
RA-228	(3.49+/-0.12)E -5 UCI/G SAMPLE	34.9
RA-224	(3.52+/-0.06)E -5 UCI/G SAMPLE	35.2

SAMPLE ID.=84-297

; SAMPLE DESCRIPTION: #53 DNR property

COMMENTS:

RA-228	(1.77+/-0.13)E -5 UCI/G FINE S	17.7 pg/g
RA-224	(1.41+/-0.06)E -5 UCI/G FINE S	14.1
RA-228	(2.25+/-0.15)E -5 UCI/G GROUND	22.5
RA-224	(2.31+/-0.07)E -5 UCI/G GROUND	23.1
RA-228	(1.98+/-0.14)E -5 UCI/G SAMPLE	19.8
RA-224	(1.81+/-0.06)E -5 UCI/G SAMPLE	18.1

NRC REGION 3 DATA

SAMPLE ID. = 84-295

SAMPLE DESCRIPTION: *Soil/Clay Shale, gray, w/ 7% clay*

COMMENTS:

TH-232	< 7.10E	1 PCI/G SIFTED	
TH-230	< 3.40E	1 PCI/G SIFTED	
TH-228	(2.90+/-1.60)E	1 PCI/G SIFTED	
TH-228	(5.50+/-0.41)E	0 PCI/G SIFTED	
TH-224	(3.99+/-0.17)E	0 PCI/G SIFTED	
TH-232	< 1.85E	2 PCI/G ROCKS	
TH-230	< 8.60E	1 PCI/G ROCKS	
TH-228	< 8.60E	1 PCI/G ROCKS	
RA-228	(2.72+/-0.08)E	1 PCI/G ROCKS	
RA-224	(2.64+/-0.04)E	1 PCI/G ROCKS	
RA-228	(1.08+/-0.05)E	1 PCI/G SAMPLE	10.8 p/g
RA-224	(9.49+/-0.23)E	0 PCI/G SAMPLE	9.49 p/g

SAMPLE ID. = 84-296

SAMPLE DESCRIPTION: *Soil/Clay Shale, gray, w/ 7% clay*

COMMENTS:

TH-232	< 1.25E	2 PCI/G SIFTED	
TH-230	< 5.50E	1 PCI/G SIFTED	
TH-228	< 5.70E	1 PCI/G SIFTED	
TH-228	(1.52+/-0.05)E	1 PCI/G SIFTED	
RA-224	(1.39+/-0.03)E	1 PCI/G SIFTED	
TH-232	< 3.00E	2 PCI/G ROCKS	
TH-230	(1.06+/-0.40)E	2 PCI/G ROCKS	
TH-228	< 1.45E	2 PCI/G ROCKS	
RA-228	(5.74+/-0.13)E	1 PCI/G ROCKS	
RA-224	(5.57+/-0.06)E	1 PCI/G ROCKS	
RA-228	(3.70+/-0.09)E	1 PCI/G SAMPLE	37.0 p/g
RA-224	(3.55+/-0.05)E	1 PCI/G SAMPLE	35.5 p/g

U.S. NUCLEAR REGULATORY COMMISSION

REGION III

LABORATORY ANALYSIS REPORT

 DATE: 10 AUG 1984 3:35:11 PM
 TITLE: SCA/HARTLEY/MICHIGAN DNR SAMPLES, FROM BAY CITY AREA
 INSTRUMENT: LAB ND6620
 SAMPLES FROM: SCA SITE AND VICINITY
 SAMPLE TYPE: SOIL/SLAG/METAL/MISC
 COLLECTED BY: PAPERIELLO/SCHUMACHER/ROZAK/DRAU
 COLLECTED ON: 5/1/84 7/17/84 7/24/84
 ERRORS ARE AT THE 67% (1 SIGMA) CONFIDENCE LEVEL

SAMPLE ID. =84-235 : SAMPLE DESCRIPTION: Wrapper from inside SCA bag
 COMMENTS: 5/1/84

RA-228 8.70E 0 PCI
 RA-224 (5.10+/-1.10)E 0 PCI

SAMPLE ID. =84-236 : SAMPLE DESCRIPTION: Rocky slag piece from SCA/Hartley landfill
 COMMENTS: Really almost pure metal. Density ~ 2 g/cm³ 5/1/84

RA-228 < 2.20E 0 PCI/G
 RA-224 (2.20+/-0.30)E 0 PCI/G

SAMPLE ID. =84-237 : SAMPLE DESCRIPTION: Star shaped metal piece 14.6 g
 COMMENTS: Density ~ 2 g/cm³ 5/1/84

TH-232 < 3.84E 3 PCI/G
 TH-230 (2.34+/-0.04)E 4 PCI/G
 TH-228 (1.75+/-0.32)E 3 PCI/G
 U-238 (2.59+/-0.48)E 2 PCI/G
 RA-228 (1.42+/-0.01)E 3 PCI/G
 RA-224 (1.36+/-0.00)E 3 PCI/G

1.3% Th-232 by wgt. assuming
 equilibrium with Ra-226/Ra-224
 1.2 µg Th-230 per gram of sample

SAMPLE ID. =84-238 : SAMPLE DESCRIPTION: Bar shaped metal piece 237g
 COMMENTS: Density ~ 2 g/cm³ 5/1/84

RA-228 < 2.00E 0 PCI/G
 RA-224 < 1.50E 0 PCI/G

SAMPLE ID. =84-295 : SAMPLE DESCRIPTION: Soil/slag Hartley prop w/ fecal waste
 COMMENTS:

TH-232 < 7.10E 1 PCI/G SIFTED
 TH-230 < 3.40E 1 PCI/G SIFTED
 TH-228 (2.90+/-1.60)E 1 PCI/G SIFTED
 RA-228

COMMENTS:

TH-232	(1.84E 3 PCI/G SIFTED	
TH-230	(1.45+/-0.24)E 3 PCI/G SIFTED	
TH-228	(8.68+/-2.51)E 2 PCI/G SIFTED	
RA-228	(1.04+/-0.01)E 3 PCI/G SIFTED	
A-224	(9.98+/-0.04)E 2 PCI/G SIFTED	
238	(8.50E 1 PCI/G SIFTED	<i>2.54E 2.0E</i>
U-235	(1.60E 1 PCI/G SIFTED	<i>1.43 uEV - 2.0E</i>
TH-232	(8.80E 2 PCI/G ROCKS	
TH-230	(5.05+/-1.24)E 2 PCI/G ROCKS	
TH-228	(3.68+/-1.48)E 2 PCI/G ROCKS	
RA-228	(3.01+/-0.04)E 2 PCI/G ROCKS	
RA-224	(2.87+/-0.02)E 2 PCI/G ROCKS	
U-238	(3.10+/-1.20)E 1 PCI/G ROCKS	<i>1.43 uEV - 2.0E</i>
U-235	(8.00E 0 PCI/G ROCKS	
TH-230	(1.15+/-0.20)E 3 PCI/G SAMPLE	<i>0.72% Th-232 by wt & assuming equilibrium with Ra-226/Rn-224</i>
TH-228	(7.08+/-2.18)E 2 PCI/G SAMPLE	
RA-228	(8.04+/-0.08)E 2 PCI/G SAMPLE	
RA-224	(7.71+/-0.03)E 2 PCI/G SAMPLE	<i>0.06 µg Th-230 per gram of sample.</i>

RA-224 (3.99+/-0.17)E 0 PCI/G SIFTED
 TH-232 (1.86E 2 PCI/G ROCKS
 TH-230 (8.60E 1 PCI/G ROCKS
 TH-228 (8.60E 1 PCI/G ROCKS
 RA-228 (2.72+/-0.08)E 1 PCI/G ROCKS
 RA-224 (2.64+/-0.04)E 1 PCI/G ROCKS
 TH-228 (1.08+/-0.05)E 1 PCI/G SAMPLE
 RA-224 (9.49+/-0.23)E 0 PCI/G SAMPLE

SAMPLE ID. =84-296

SAMPLE DESCRIPTION: *Soil/slag Heavy prop 10 of 1000000*

COMMENTS:

TH-232 (1.25E 2 PCI/G SIFTED
 TH-230 (5.50E 1 PCI/G SIFTED
 TH-228 (5.70E 1 PCI/G SIFTED
 RA-228 (1.52+/-0.05)E 1 PCI/G SIFTED
 RA-224 (1.39+/-0.03)E 1 PCI/G SIFTED
 TH-232 (3.00E 2 PCI/G ROCKS
 TH-230 (1.06+/-0.40)E 2 PCI/G ROCKS
 TH-228 (1.45E 2 PCI/G ROCKS
 RA-228 (5.74+/-0.13)E 1 PCI/G ROCKS
 RA-224 (5.57+/-0.06)E 1 PCI/G ROCKS
 RA-228 (3.70+/-0.09)E 1 PCI/G SAMPLE
 RA-224 (3.55+/-0.05)E 1 PCI/G SAMPLE

SAMPLE ID. =84-297

SAMPLE DESCRIPTION: *Soil/slag DNR property*

COMMENTS:

TH-232 (1.40E 2 PCI/G SIFTED
 TH-230 (1.80+/-0.26)E 2 PCI/G SIFTED
 TH-228 (5.80E 1 PCI/G SIFTED
 RA-228 (1.50+/-0.05)E 1 PCI/G SIFTED
 RA-224 (1.38+/-0.03)E 1 PCI/G SIFTED
 TH-232 (1.90E 2 PCI/G ROCKS
 TH-230 (2.90+/-0.30)E 2 PCI/G ROCKS
 TH-228 (8.20E 1 PCI/G ROCKS
 RA-228 (2.36+/-0.07)E 1 PCI/G ROCKS
 RA-224 (2.29+/-0.04)E 1 PCI/G ROCKS
 RA-228 (1.88+/-0.06)E 1 PCI/G SAMPLE
 RA-224 (1.79+/-0.03)E 1 PCI/G SAMPLE

SAMPLE ID. =84-298

SAMPLE DESCRIPTION: *Soil/slag DNR property*

COMMENTS:

TH-232 (7.90E 1 PCI/G SIFTED
 TH-230 (2.90E 1 PCI/G SIFTED
 TH-228 (3.47+/-1.48)E 1 PCI/G SIFTED
 RA-228 (3.56+/-0.43)E 0 PCI/G SIFTED
 RA-224 (3.04+/-0.18)E 0 PCI/G SIFTED
 TH-232 (8.40E 1 PCI/G ROCKS
 TH-230 (2.90E 1 PCI/G ROCKS
 TH-228 (3.40E 1 PCI/G ROCKS
 RA-228 (2.76+/-0.38)E 0 PCI/G ROCKS
 RA-224 (1.70+/-0.10)E 0 PCI/G ROCKS
 RA-228 (3.17+/-0.41)E 0 PCI/G SAMPLE
 RA-224 (2.38+/-0.14)E 0 PCI/G SAMPLE

PI/S		GROSS PC/100		ISOTOPIC THORIUM			ISOTOPIC RADIUM		10/20/85 COPY		
LOC	TIME	ALPHA	BETA	Th 232	Th 230	Th 230	Ra 226	Ra 228			
SP1	6/85	4.1 ± 0.8	14 ± 15								
	11/85	SAMPLE	NOT AVAILABLE								
	11/86	3.5 ± 0.9	19 ± 14								
	11/87	1.4 ± 0.6	75 ± 13								
	11/88	1.3 ± 0.7	90 ± 20								
SP2	6/85	4.3 ± 1.1	12 ± 27								
	11/85	3.4 ± 0.9	17 ± 13								
	11/86	2.9 ± 0.9	21 ± 14								
	11/87	2.9 ± 0.9	10 ± 14								
	11/88	4.6 ± 1.3	16 ± 15								
SP3	11/85	7 ± 1	21 ± 13	.11 ± .04	.13 ± .08	-.27 ± .12					
	11/86	3.6 ± 0.9	-7 ± 13								
	11/87	20 ± 4	45 ± 16	.07 ± .03	.18 ± .07	.09 ± .08	.55 ± .09	14 ± 3			
	11/88	28 ± 1.2	19 ± 16								

2		GROSS		ISOTOPIC THORIUM			ISOTOPIC RADIUM				
LDC	TIME	ALPHA	BETA	Th 232	Th 228	Th 330	Ra 226	Po 228			
SP4	11/85	15 ± 2	13 ± 13	.12 ± .04	.17 ± .07	.27 ± .12					
	11/86	9 ± 2	14 ± 14	.05 ± .03	.08 ± .05	.06 ± .06					
	11/87	19 ± 4	14 ± 15	0 ± .03	.13 ± .06	.16 ± .08	.16 ± .07	NOT DONE			
	11/88	11 ± 2	2 ± 15	-.012 ± .033	.05 ± .03	.06 ± .07	.08 ± .06	.08 ± 1.1			
							</				

3 -		GROSS		ISOTOPIC THORIUM			ISOTOPIC RADIUM				
LDC	TIME	ALPHA	BETA	Th 232	Th 232F	Th 230	Ra 226	Po 228			
UPI	11/85	2 ± 1	12 ± 14								
	11/86	-0.1 ± 0.5	0 ± 14								
	11/87	1.2 ± 0.5	25 ± 7								
	11/88	3.1 ± 1.0	19 ± 8								
INS1	11/85	1.8 ± 0.7	27 ± 14								
	11/86	8 ± 2	30 ± 20	.03 ± .03	.6 ± .1	.2 ± .1					
	11/87	1.9 ± 0.9	130 ± 20								
	11/88	4.0 ± 1.2	770 ± 40								
INS2	11/85	2 ± 1	340 ± 40								
	11/86	1.3 ± 0.7	-50 ± 130								
	11/87	4.5 ± 0.9	13 ± 6								
	11/88	2.9 ± 0.6	6 ± 6								

4		GROSS		ISOTOPIC THORIUM			ISOTOPIC RADIUM				
LDC	TIME	ALPHA	BETA	Th 232	Th 228	Th 230	Ra 226	Ra 228			
1K53	11/15	9 ± 2	30 ± 30	.08 ± .04	.26 ± .07	.28 ± .10					
	11/16	7 ± 2	30 ± 20	.01 ± .02	.12 ± .04	0 ± .06					
	11/17	11 ± 2	40 ± 20	.03 ± .03	.015 ± .053	.07 ± .09	1.23 ± .12	4 ± 3			
	11/18	1.8 ± .8	6 ± 15								
DWD2	11/15	4.7 ± 1.3	30 ± 20								
	11/16	5.4 ± 1.6	20 ± 20	.04 ± .02	.08 ± .06	.04 ± .02					
	11/17	4.6 ± .03	90 ± 20								
	11/18	32 ± 5	30 ± 30	.5 ± .6	1.09 ± .08	.2 ± .8	1.91 ± .13	2.1 ± 1.4			
DWD3	11/15	13 ± 0.9	0 ± 20								
	11/16	3 ± 1	15 ± 14								
	11/17	1.6 ± 1.0	34 ± 16								
	11/18	3 ± 1	-18 ± 14								

S		GROSS		ISOTOPIC THORIUM			ISOTOPIC RADIUM				
LOC	TIME	ALPHA	BETA	Th 232	Th 232	Th 230	Ra 226	Ra 228			
MW12	11/85	0.2 ± 0.5	14 ± 14								
	11/86	3 ± 0.1	22 ± 14								
	11/87	1.8 ± 0.8	22 ± 7								
	11/88	0.8 ± 0.5	18 ± 7								
MW15	11/85	1.1 ± 0.7	30 ± 20								
	11/86	1.4 ± 0.7	9 ± 14								
	11/87	8.7 ± 1.8	18 ± 14	-0.01 ± 0.03	-0.10 ± 0.06	-0.19 ± 0.08	0.23 ± 0.09	NOT DONE			
MW18	11/85	0.6 ± 0.4	33 ± 13								
	11/86	0.6 ± 0.6	32 ± 14								
	11/87	0.3 ± 0.5	11 ± 6								
	11/88	1.3 ± 0.4	5 ± 6								

6		GROSS		ISOTOPIC THORIUM			ISOTOPIC RADIUM	
LOC	TIME	ALPHA	BETA	Th232	Th228	Th230	Ra226	Ra228
MW39	11/85	NOT SAMPLED						
	11/86	1.6 ± 0.5	16 ± 13					
	11/87	NOT SAMPLED						
MW40	11/85	10 ± 3	12 ± 66	0 ± .03	.04 ± .06	-.35 ± .11		
	11/86	1 ± 2	40 ± 20					
	11/87	NOT SAMPLED						
	11/88	1.3 ± 2	10 ± 30					
MW43	11/85	4.2 ± 1.4	14 ± 3					
	11/86	2.2 ± 1.1	-7 ± 15					
	11/87	8 ± 2	45 ± 16	-.01 ± .03	.01 ± .06	-.01 ± .06	1.9 ± .12	2 ± 3
	11/88	28 ± 4	-1 ± 1.6	.04 ± .04	.27 ± .05	-.14 ± .08	.51 ± .10	-1.5 ± 1.4

7		GROSS		ISOTOPIC THORIUM			ISOTOPIC RADIUM	
LOC	TIME	ALPHA	BETA	Th 232	Th 230	Th 230	Ra 226	Ra 228
L1								
	11/85	0.6 ± 0.2	21 ± 11					
	11/86	2 ± 1	3 ± 13					
	11/87	0.3 ± 0.2	20 ± 6					
	11/88	0.11 ± 0.27	4 ± 6					
L2								
	11/85	1.1 ± 0.4	17 ± 13					
	11/86	0.4 ± 0.6	15 ± 12					
	11/87	NOT TAKEN						
	11/88	0.6 ± 0.5	23 ± 14					
L3								
	11/85	1.1 ± 0.3	4 ± 12					
	11/86	0.5 ± 0.4	10 ± 13					
	11/87	0.4 ± 0.3	37 ± 7					
	11/88	1.6 ± 0.6	20 ± 7					

8/8		GROSS		ISOTOPIC THORIUM			ISOTOPIC RADIUM	
LOC	TIME	ALPHA	BETA	Th232	Th228	Th230	Ra226	Po228
SW17								
	"/85	07 ± 0.3	14 ± 7					
	"/86	NOT SAMPLED						
	"/87	-0.3 ± 0.5	24 ± 7					
	"/88	0.7 ± 0.3	17 ± 7					
GILMAN POND								
	"/85	$28 \pm .14$	12 ± 11					
	"/86	NOT SAMPLED						
	"/87	NOT SAMPLED						
SCHULTZ WELL								
	"/86	0.2 ± 1.1	15 ± 15					
	"/86	NOT SAMPLED						
	"/87	NOT SAMPLED						

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June 3, 1983

ENVIRONMENTAL ENFORCEMENT
DIVISION

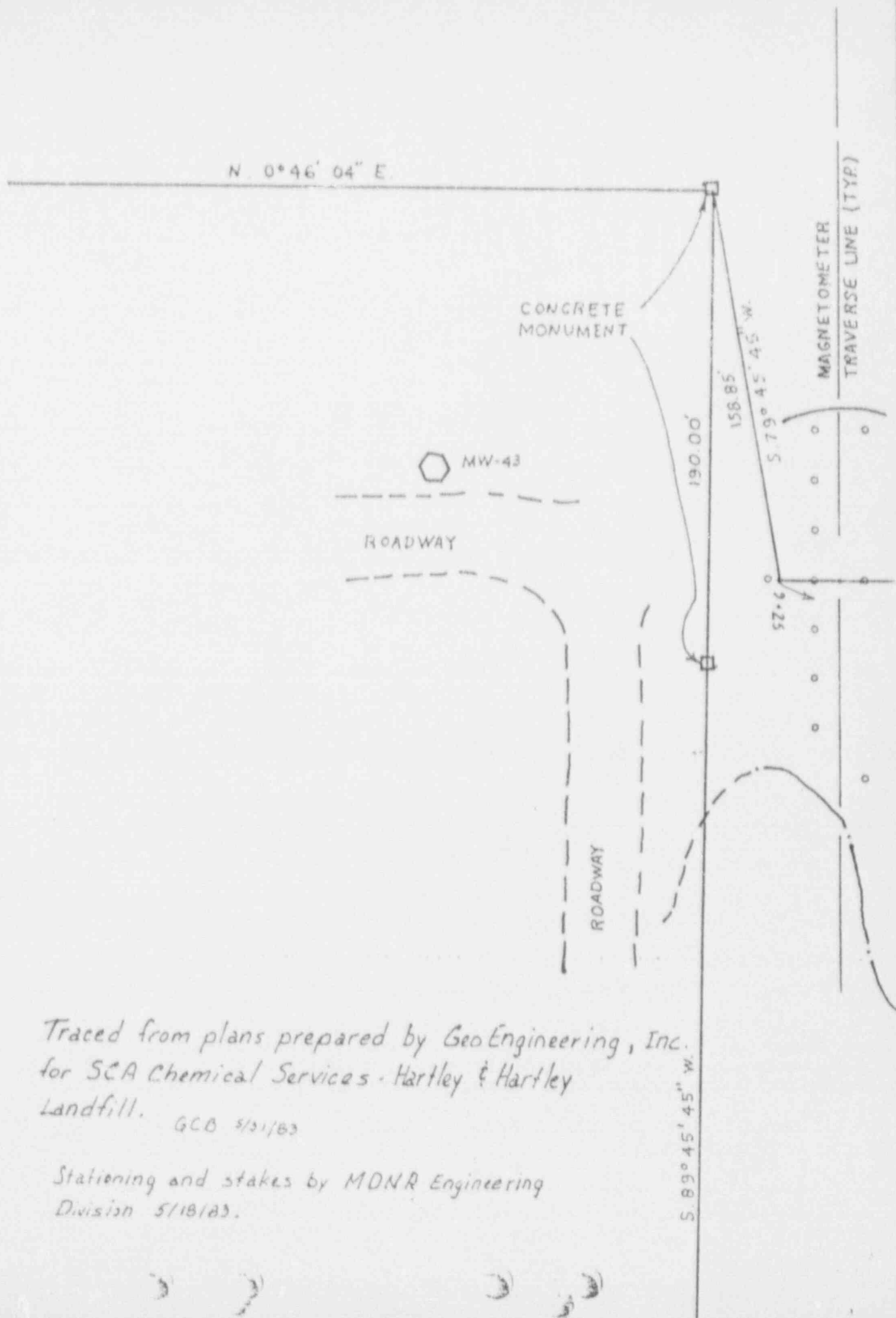
TO: Robert Curry, Groundwater Quality Division
FROM: Gary C. Bilow, Engineering Division
SUBJECT: SCA/Hartley and Hartley Landfill, Bay County
Engineering Division Project No. 35-6907

Enclosed are two copies of our sketch of the "State Peninsula" on the subject site showing the reference stakes set for your magnetometry. We used the baseline established by SCA's consultants but set out own stationing. Elevations at each stake are available if you need them, based on an assumed elevation of 100.00 on the top of the concrete monument southeasterly of station 9 + 25. All stakes are at 20 foot intervals of stationing and at even multiples of 20 feet right and left of the baseline.

The sketch is intended to be a work sheet. If you will need a map with a more finished appearance, please let me know. I will be out of the office until June 20th, so if you have any questions, contact Don Reed at 21321.

GCB:ejr
Enclosures
cc: Gary Gettel w/enclosures
Don Reed

A/9

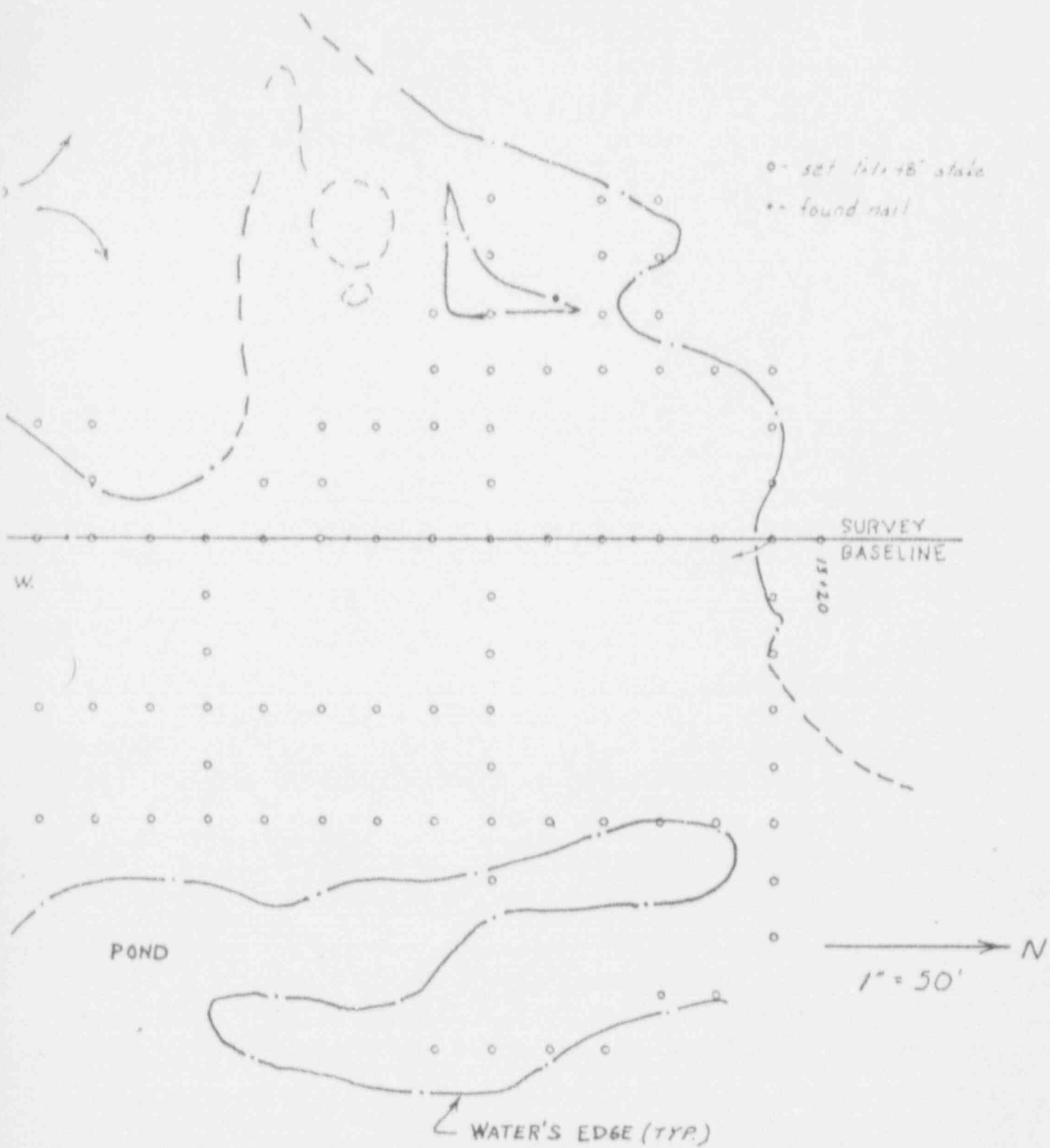


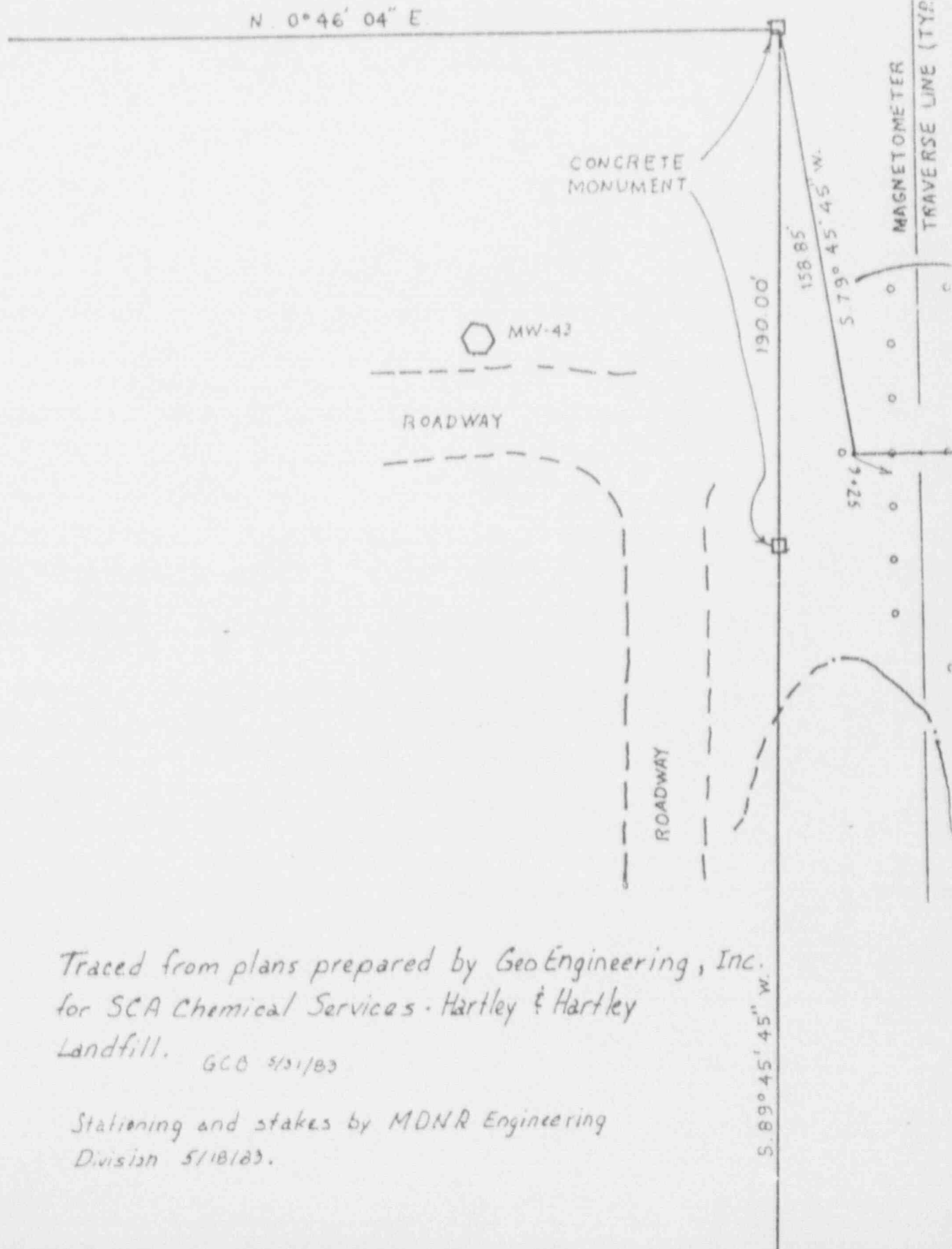
Traced from plans prepared by GeoEngineering, Inc.
for SCA Chemical Services - Hartley & Hartley
Landfill. GCB 5/31/83

Stationing and stakes by MDNR Engineering
Division 5/18/83.

○ set 1/4" x 48" stake

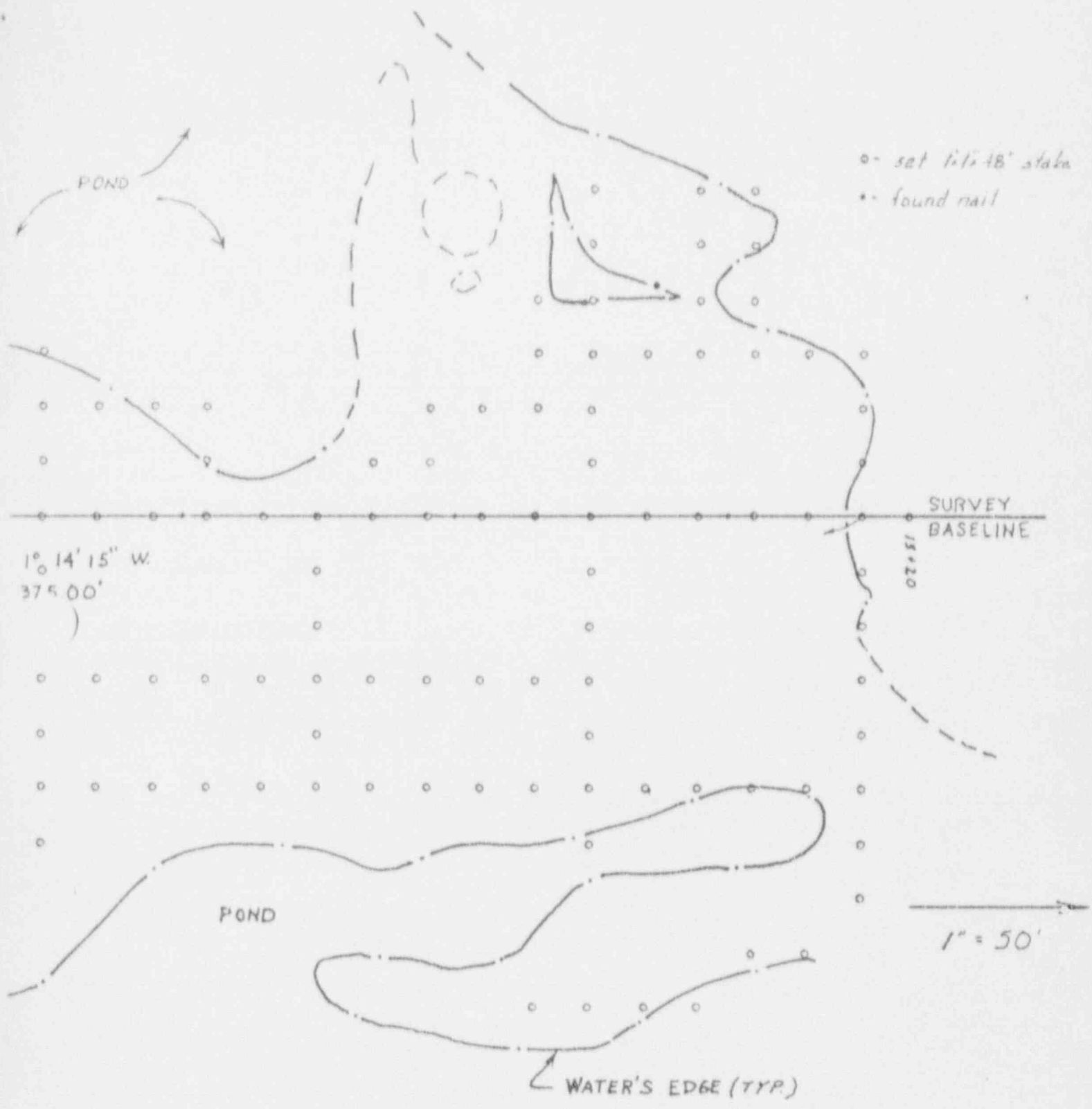
• found nail

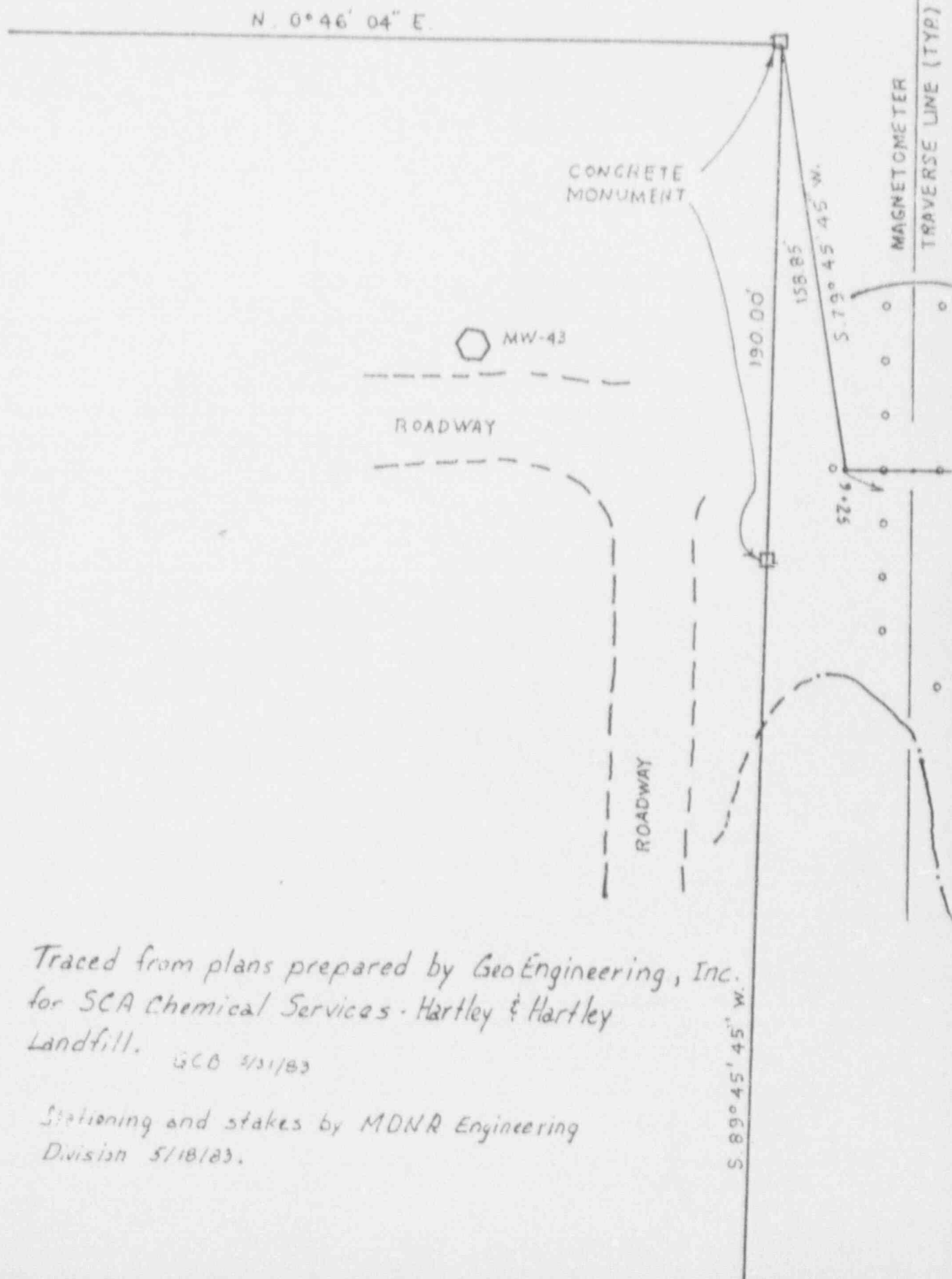




Traced from plans prepared by GeoEngineering, Inc.
for SCA Chemical Services - Hartley & Hartley
Landfill. GCB 5/31/83

Stationing and stakes by MDNR Engineering
Division 5/10/83.





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for SCA Chemical Services - Hartley & Hartley
Landfill. GCB 5/31/83

Stationing and stakes by MDNR Engineering
Division 5/18/83.

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XXXXXXXXXXXXXXXXXXXX

James Cleary, Acting Director

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Mich. Dept. of Public Health

JUL 28 1983

Center for Environmental
Health Sciences

July 27, 1983

Mr. Joe Fredle
U.S. EPA
25089 Center Ridge Road
Westlake, Ohio 44145Mr. Roy Klaviter
Department of Public Health
Chemicals & Health Center
3500 N. Logan
Lansing, Michigan 48909

Re: SCA/Hartley & Hartley Cleanup

Dear Messrs. Fredle and Klaviter:

I attach for your information copies of the Magnetometer Survey Report which has been recently completed by our Groundwater Quality Division. As we discussed by telephone on July 21, 1983, please use these DNR estimates of 18,500 barrels buried to a depth of six feet instead of the 4,000 barrels previously estimated from our 1969 aerial photo.

I hope these estimates will be useful for you. Please contact me if you have questions and as you develop your own work products.

Sincerely,

Gary Gettel
Environmental Enforcement DivisionGG:sm
attachments
cc: John Dourjalian
Ron Wilson

A/11