Appendix E

NFSS Vicinity Property W

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Assessment Data

Excerpt from Comprehensive Radiological Survey
Off-Site Property W
Niagara Falls Storage Site

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COMPREHENSIVE RADICLOGICAL SURVEY

OFF-SITE PROPERTY W
NIAGARA FALLS STORAGE SITE
LEWISTON, NEW YORK

Prepared for

U.S. Department of Energy
as part of the
Formerly Utilized Sites — Remedial Action Program

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FINAL REPORT

February 1984

This report is based on work performed under contract number DE-AC05-760R00033 with the Department of Energy.

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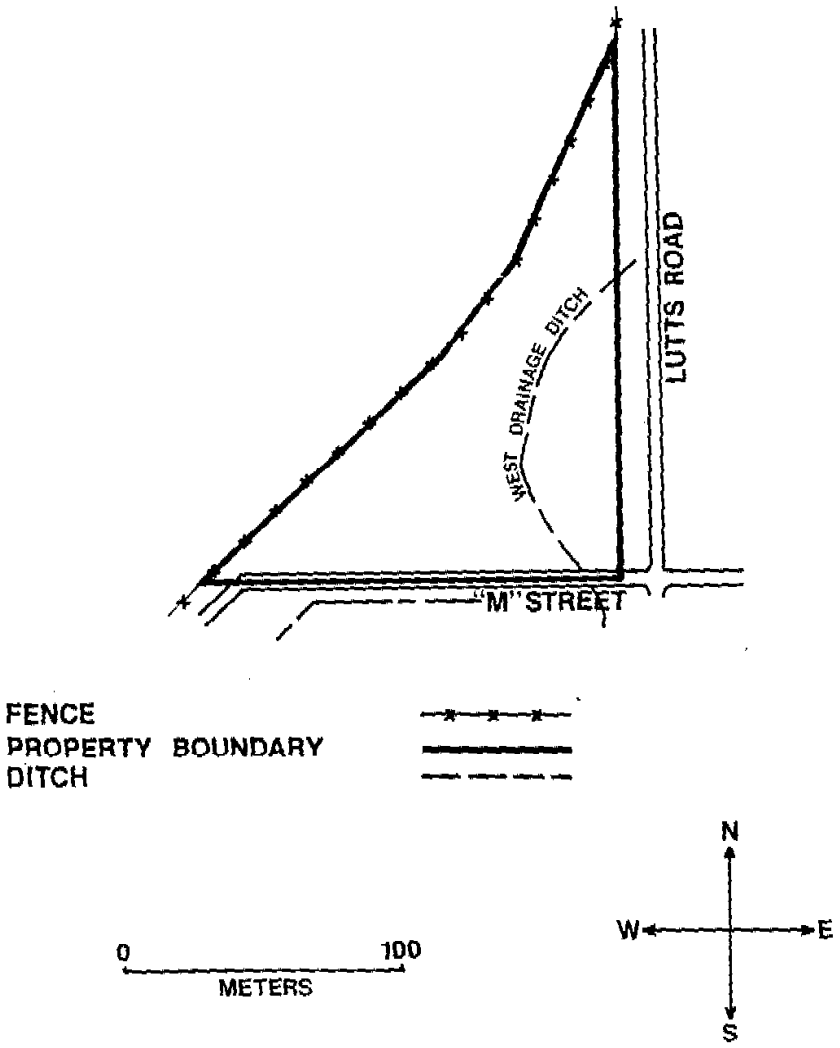
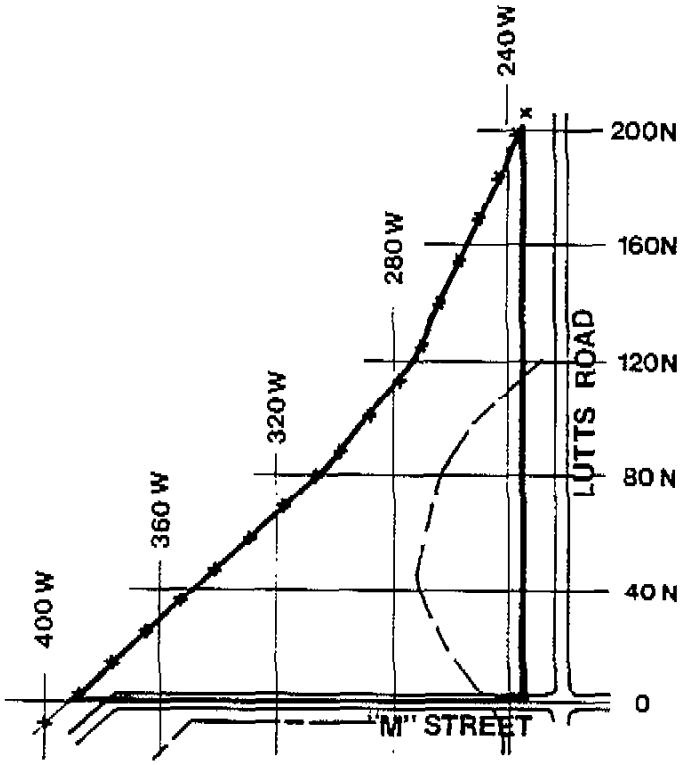


FIGURE 2. Plan View of Off-Site Property W Indicating Prominent Surface Features.



FENCE
PROPERTY BOUNDARY
DITCH

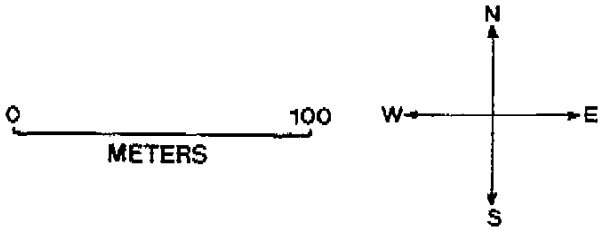


FIGURE 3. Map of Off-Site Property W Indicating the Grid System Established for Survey Reference.

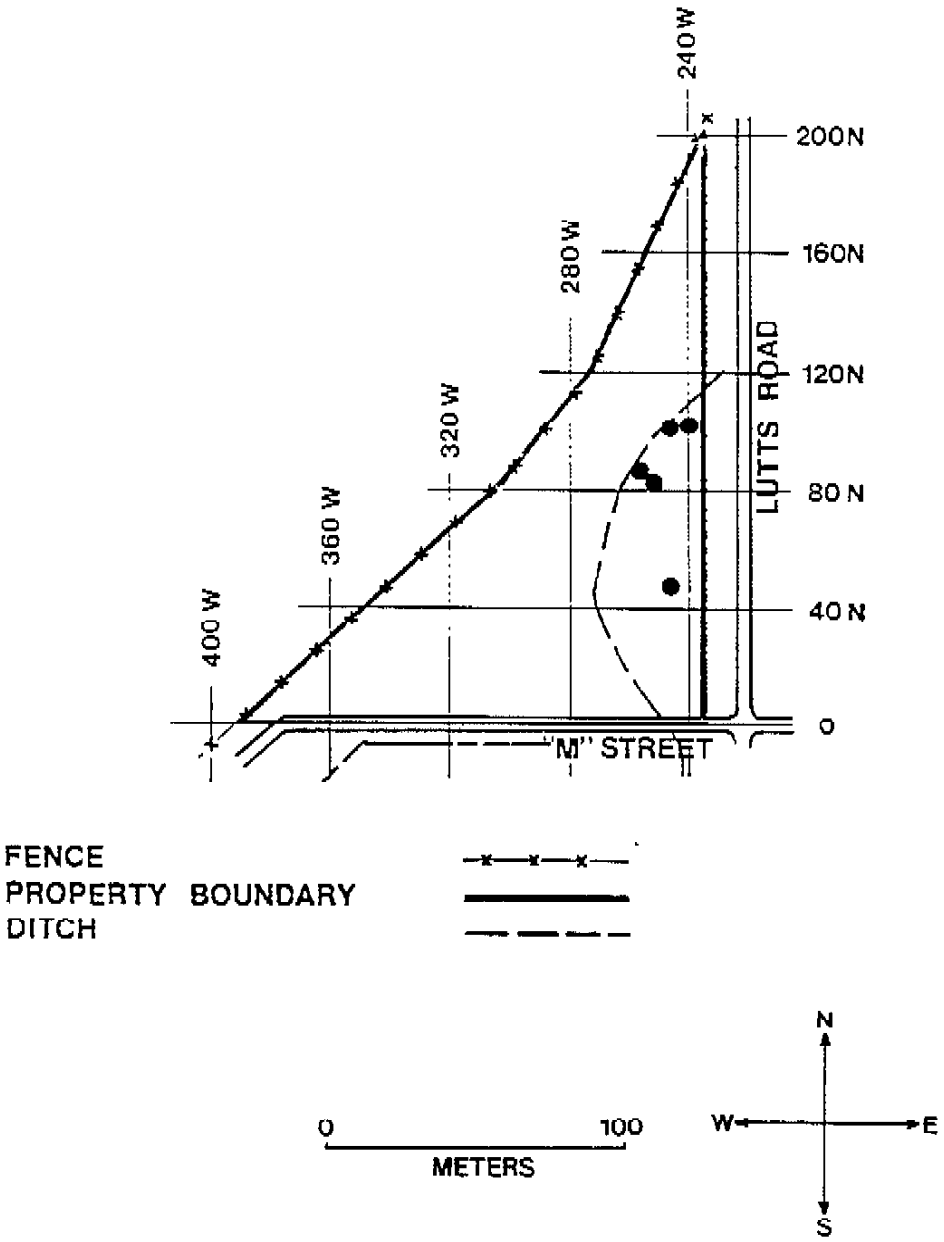


FIGURE 4. Locations of Elevated Direct Radiation Levels Identified by the Walkover Scan.

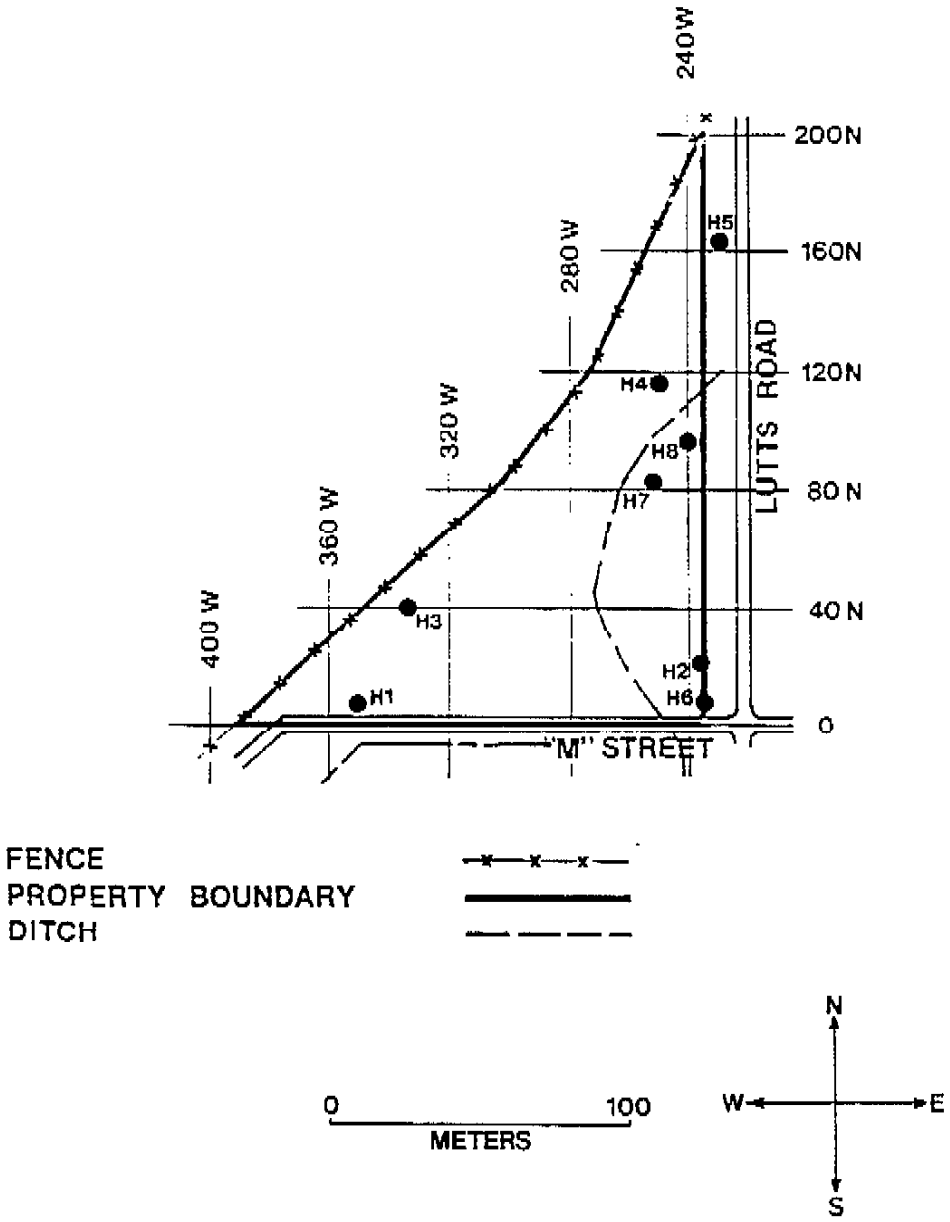


FIGURE 5. Locations of Boreholes for Subsurface Investigations.

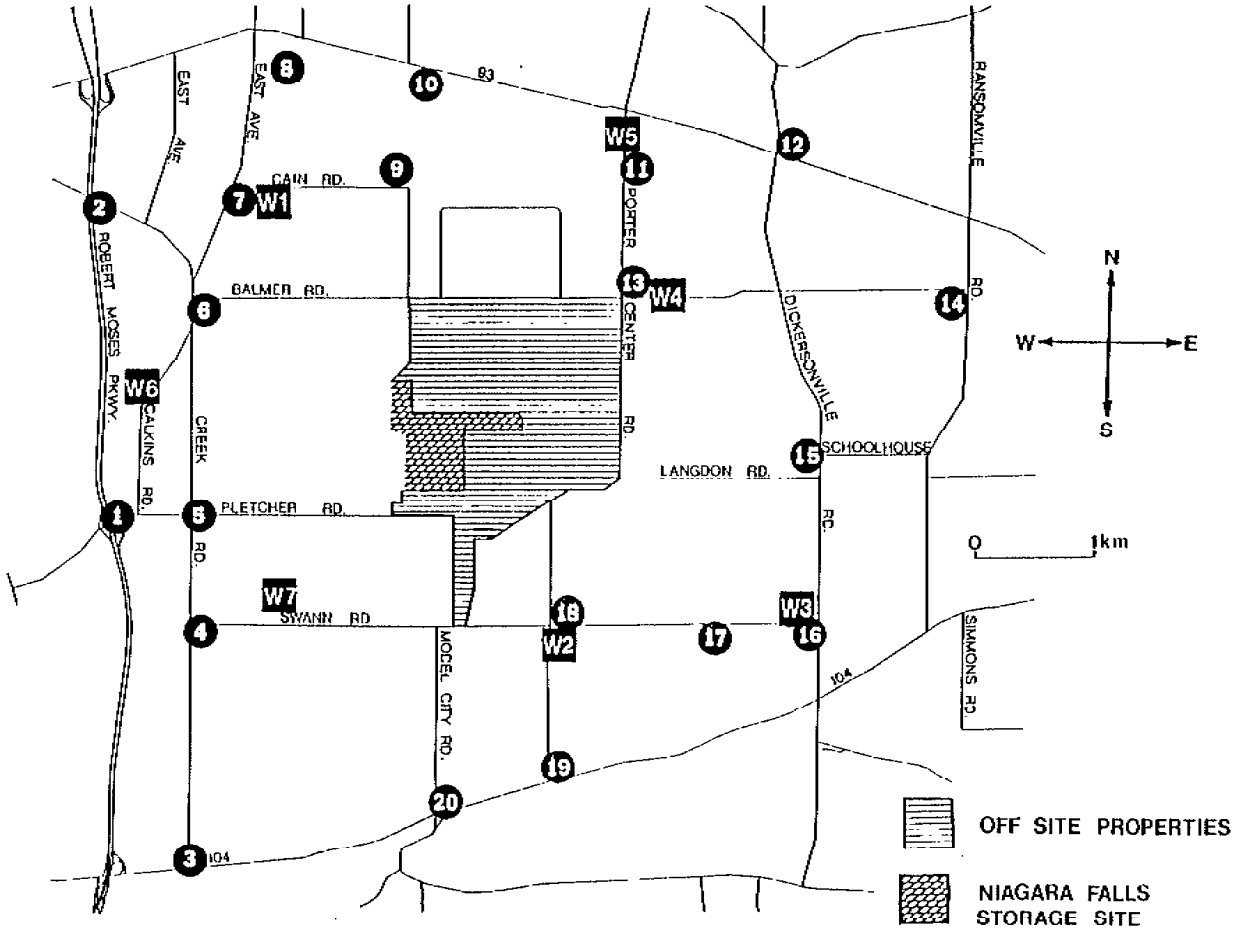


FIGURE 6. Map of Northern Niagara County, New York, Showing Locations of Background Measurements and Baseline Samples (#1-20: Soil Samples and Direct Measurements; W1-W7: Water Samples).

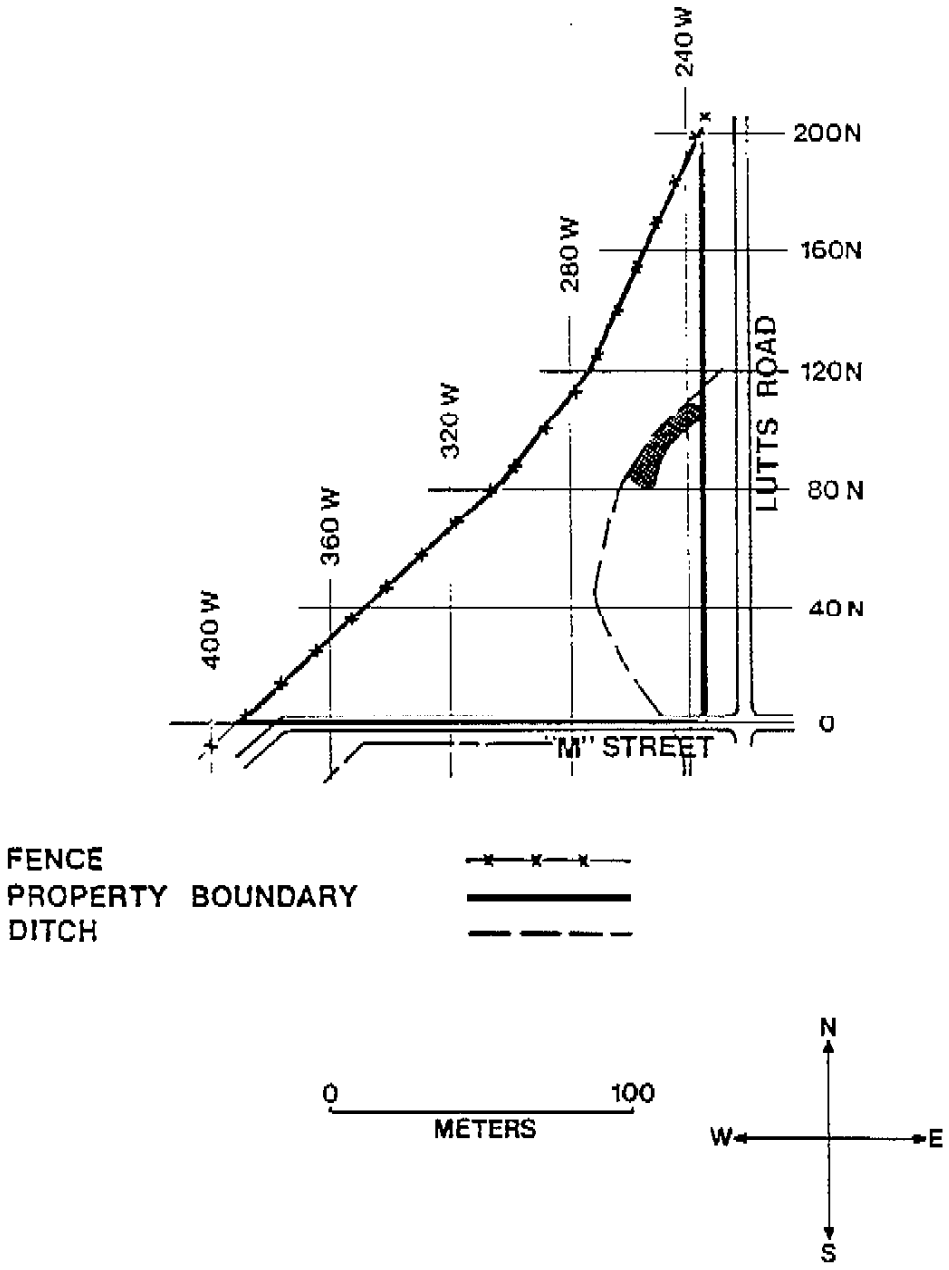


FIGURE 7. Map of NFSS Off-Site Property W Indicating Locations (Shaded) Where Ra-226 Concentrations in Soil Exceed Criteria Levels.

TABLE 1-A

BACKGROUND EXPOSURE RATES
AND
RADIONUCLIDE CONCENTRATIONS IN BASELINE SOIL SAMPLES

Location [a]	Exposure Rate [b] (μR/h)	Radionuclide Concentrations (pCi/g)				
		Ra-226	U-235	U-238	Th-232	Cs-137
1	6.8	0.74 ± 0.16 [c]	<0.19	<2.89	0.70 ± 0.46	0.29 ± 0.08
2	6.8	0.75 ± 0.19	<0.19	<3.35	0.86 ± 0.24	0.24 ± 0.08
3	8.3	0.71 ± 0.18	0.46 ± 0.41	<3.72	0.88 ± 0.33	0.34 ± 0.09
4	7.9	0.67 ± 0.18	<0.22	<4.10	1.18 ± 0.35	0.12 ± 0.07
5	7.3	0.70 ± 0.16	<0.17	<3.34	0.68 ± 0.24	0.14 ± 0.07
6	7.7	0.50 ± 0.15	<0.16	<2.33	0.52 ± 0.38	0.17 ± 0.09
7	7.7	0.63 ± 0.13	<0.17	<2.73	0.83 ± 0.24	0.35 ± 0.08
8	7.6	0.59 ± 0.12	<0.14	<2.20	0.54 ± 0.23	<0.02
9	7.1	0.63 ± 0.20	<0.23	<4.16	0.83 ± 0.38	0.69 ± 0.11
10	7.1	0.70 ± 0.16	<0.19	<2.98	0.59 ± 0.25	0.69 ± 0.10
11	6.7	<0.09	<0.19	<2.83	0.49 ± 0.31	0.48 ± 0.14
12	7.1	0.48 ± 0.13	<0.16	<2.84	0.65 ± 0.26	0.68 ± 0.10
13	6.7	0.57 ± 0.14	<0.17	<2.36	0.49 ± 0.26	0.41 ± 0.08
14	6.8	0.68 ± 0.17	<0.19	<3.24	0.67 ± 0.25	0.70 ± 0.10
15	8.2	0.65 ± 0.14	<0.17	<3.20	0.72 ± 0.35	0.23 ± 0.08
16	7.4	0.91 ± 0.17	<0.71	<3.58	0.83 ± 0.28	0.61 ± 0.09
17	7.0	0.48 ± 0.14	<0.16	<2.73	0.32 ± 0.22	0.38 ± 0.08
18	7.7	0.73 ± 0.16	<0.18	6.26 ± 9.23	1.01 ± 0.44	0.32 ± 0.12
19	8.8	1.22 ± 0.22	<0.23	<3.79	1.08 ± 0.49	1.05 ± 0.13
20	8.6	0.83 ± 0.17	<0.21	<3.59	0.84 ± 0.29	0.08 ± 0.07
Range	6.8 to 8.8	<0.09 to 1.22	<0.14 to 0.46	<2.20 to 6.26	0.32 to 1.18	<0.02 to 1.05

[a] Refer to Figure 6.
[b] Measured at 1 m above the surface.
[c] Errors are 2σ based on counting statistics.

TABLE 1-B

RADIONUCLIDE CONCENTRATIONS IN BASELINE WATER SAMPLES

Location[a]	Radionuclide Concentrations (pCi/l)	
	Gross Alpha	Gross Beta
W1	0.95 ± 0.93 [b]	4.79 ± 1.15
W2	0.95 ± 0.94	9.17 ± 1.31
W3	0.55 ± 0.78	2.73 ± 1.05
W4	0.63 ± 0.89	5.37 ± 1.17
W5	0.73 ± 0.68	<0.64
W6	1.87 ± 1.84	14.3 ± 2.4
W7	1.16 ± 0.66	<0.63
Range	0.55 to 1.87	<0.63 to 14.3

[a] Refer to Figure 6.
[b] Errors are 2σ based on counting statistics.

TABLE 2

DIRECT RADIATION LEVELS MEASURED
AT APPROXIMATELY 40 M GRID INTERVALS

Grid Location	Gamma Exposure Rates at 1 m Above the Surface (μR/h)	Gamma Exposure Rates at the Surface (μR/h)	Beta-Gamma Dose Rates at 1 cm Above the Surface (μrad/h)
0 ,240W	6	6	7
0 ,280W	6	6	6
0 ,320W	6	6	6
0 ,360W	6	6	6
0 ,380W	7	7	30
40N,240W	8	8	16
40N,280W	9	8	11
40N,320W	8	8	14
40N,350W	8	8	26
80N,240W	9	9	19
80N,280W	8	8	17
80N,300W	8	8	30
120N,240W	9	8	26
120N,278W	8	8	8
160N,240W	7	8	22
200N,235W	8	8	21

TABLE 3

DIRECT RADIATION LEVELS AT LOCATIONS
IDENTIFIED BY THE WALKOVER SURFACE SCAN

Grid Point	Exposure Rate (μR/h)		Surface Dose Rate (μrad/h)	Sample[a] Identification	Contact Exposure Rate after Sample Removal (μR/h)
	Contact	1 m above surface			
46N,246W	22	10	110	B1	17
80-83N,251-255W	29-68	---[b]	---	---	---
80N,253W	43	27	160	B2	40
81N,252W	68	27	120	B3	90
81N,254W	53	23	220	B4	57
83N,260W	76	20	250	B5	90
95N,250W	54	---	---	---	---
97-102N,238-242W	17-45	---	---	---	---
99N,240W	45	21	130	B6	68
98-103N,250-253W	29-55	---	---	---	---
100N,250W	36	---	---	---	---
102N,252W	55	---	---	---	---
102N,253W	42	---	---	---	---

[a] Soil concentrations presented in Table 4.
[b] *Dash indicates measurement or sampling was not performed.*

TABLE 4

RADIONUCLIDE CONCENTRATIONS IN SURFACE SOIL SAMPLES
FROM APPROXIMATELY 40 M GRID INTERVALS

Grid Location	Radionuclide Concentrations (pCi/g)			
	Ra-226	U-235	U-238	Cs-137
0 240W	1.23 ± 0.28[a]	<0.22	<0.78	0.83 ± 0.14
0 280W	1.03 ± 0.23	<0.29	<0.86	1.33 ± 0.16
0 320W	0.87 ± 0.19	<0.29	<4.92	0.65 ± 0.14
0 360W	0.54 ± 0.18	0.33 ± 0.40	<0.63	0.81 ± 0.11
0 380W	1.00 ± 0.20	0.59 ± 0.47	<0.74	0.33 ± 0.10
40N 240W	0.58 ± 0.22	<0.17	0.96 ± 0.92	0.36 ± 0.15
40N 280W	0.68 ± 0.20	<0.29	4.67 ± 1.68	0.42 ± 0.09
40N 320W	1.00 ± 0.27	<0.22	0.94 ± 1.66	0.31 ± 0.15
40N 350W	0.82 ± 0.22	<0.28	3.06 ± 1.31	0.42 ± 0.09
80N 240W	0.71 ± 0.25	<0.22	<0.65	0.54 ± 0.11
80N 280W	<0.15	<0.21	1.58 ± 1.97	<0.08
80N 300W	0.68 ± 0.21	<0.27	<0.83	0.38 ± 0.09
120N 240W	0.80 ± 0.24	<0.27	<0.85	0.22 ± 0.08
120N 278W	0.51 ± 0.23	<0.27	<0.85	0.43 ± 0.09
160N 240W	0.58 ± 0.17	<0.19	1.63 ± 1.67	0.39 ± 0.13
200N 235W	0.58 ± 0.18	<0.20	2.14 ± 1.12	<0.03

[a] Errors are 2σ based on counting statistics.

TABLE 5

RADIONUCLIDE CONCENTRATIONS IN SURFACE SAMPLES
FROM SELECTED LOCATIONS IDENTIFIED BY THE WALKOVER SCAN

Sample Identification	Grid Location	Radionuclide Concentrations (pCi/g)[a]			
		Ra-226	U-235	U-238	Cs-137
B1	46N,246W	55.0 ± 1.8[b]	1.83 ± 2.30	<3.66	0.51 ± 0.17
B2	80N,253W	81.8 ± 1.8	<1.42	9.31 ± 5.68	<0.16
B3	81N,252W	102 ± 2	<1.30	<3.58	0.90 ± 0.23
B4	81N,254W	66.1 ± 1.8	4.14 ± 2.21	4.73 ± 5.30	0.80 ± 0.17
B5	83N,260W	25.3 ± 4.9	7.05 ± 3.94	10.8 ± 11.4	1.64 ± 0.40
B6[c]	99N,240W	91.4 ± 2.1	1.36 ± 2.60	<4.67	1.31 ± 0.26

[a] Refer to Table 3 for direct radiation levels.
[b] Errors are 2σ based on counting statistics.
[c] Also contains 0.35 ± 0.19 pCi/g of Sr-90.

TABLE 6

RADIONUCLIDE CONCENTRATIONS IN BOREHOLE SOIL SAMPLES

Borehole No.[a]	Grid Location	Depth (m)	Radionuclide Concentrations (pCi/g) Ra-226	U-235	U-238	Cs-137
H1	4N,351W	Surface	0.81 ± 0.33[b]	<0.27	<0.88	0.28 ± 0.10
		0.5	0.95 ± 0.23	<0.19	<0.80	<0.04
		1.0	1.29 ± 0.33	<0.35	2.70 ± 2.27	<0.05
		2.0	0.81 ± 0.20	<0.31	1.35 ± 0.96	<0.04
H2	20N,236W	Surface	0.78 ± 0.28	<0.31	0.83 ± 1.85	0.37 ± 0.11
		0.5	1.00 ± 0.26	<0.24	<0.85	<0.04
		1.0	0.69 ± 0.16	<0.28	<0.85	<0.03
		2.0	0.55 ± 0.16	<0.18	1.58 ± 1.83	<0.03
H3	40N,335W	Surface	0.68 ± 0.26	<0.19	1.84 ± 1.38	0.15 ± 0.06
		0.5	1.15 ± 0.26	<0.33	<1.06	<0.04
		1.0	0.83 ± 0.23	<0.20	<0.70	<0.02
		2.0	0.88 ± 0.24	<0.28	<0.95	<0.04
H4	118N,255W	Surface	1.01 ± 0.29	<0.27	<0.87	<0.04
		0.5	0.65 ± 0.23	<0.22	1.79 ± 1.50	<0.04
		1.0	0.84 ± 0.35	<0.27	<0.80	<0.04
		2.0	0.85 ± 0.18	<0.19	0.94 ± 1.42	<0.03
H5	160N,229W	Surface	0.83 ± 0.20	<0.25	1.36 ± 1.43	0.12 ± 0.04
		0.5	0.79 ± 0.21	<0.21	<0.69	<0.03
		1.0	1.01 ± 0.24	<0.26	2.19 ± 1.93	<0.04
		2.0	0.98 ± 0.29	<0.25	1.72 ± 1.81	<0.04
H6	4N,235W	Surface	4.00 ± 0.49	<0.29	1.75 ± 1.89	0.25 ± 0.08
		0.3	1.15 ± 0.25	<0.28	<0.92	<0.04
		0.6	1.29 ± 0.25	<0.26	1.61 ± 1.77	0.08 ± 0.13

TABLE 6, Cont.

RADIONUCLIDE CONCENTRATIONS IN BOREHOLE SOIL SAMPLES

Borehole No.	Grid Location	Depth (m)	Radionuclide Concentrations (pCi/g) Ra-226	U-235	U-238	Cs-137
H7	81N,252W	Surface	102 ± 2	<1.30	<3.58	0.90 ± 0.23
		0.15	3.93 ± 0.44	<0.39	1.60 ± 2.02	0.20 ± 0.09
		0.5	2.19 ± 0.30	<0.33	0.90 ± 1.45	<0.05
		2.0	1.01 ± 0.24	<0.29	<0.94	<0.04
H8[c]	99N,240W	Surface	91.4 ± 2.1	1.36 ± 2.60	<4.67	1.31 ± 0.26
		0.15	81.5 ± 2.0	3.23 ± 2.51	<4.39	0.42 ± 0.18
		0.5	3.59 ± 0.44	<0.30	<0.86	<0.04
		1.0	4.20 ± 0.49	<0.40	3.15 ± 1.44	<0.04
		2.0	2.38 ± 0.29	0.33 ± 0.54	<0.73	<0.04

[a] Refer to Figure 5.
[b] Errors are 2σ based on counting statistics.
[c] Also contains 0.35 ± 0.19 pCi/g of Sr-90 at surface and 0.23 ± 0.18 pCi/g of Sr-90 at 0.15 m depth.

TABLE 7

RADIONUCLIDE CONCENTRATIONS IN BOREHOLE WATER SAMPLES

Sample Identification	Sample Type	Grid Location	Radionuclide Concentrations (pCi/l) Gross Alpha	Gross Beta
W1	Subsurface (Borehole H2)[a]	20N,236W	<0.66	1.00 ± 1.08[b]
W2	Subsurface (Borehole H3)	40N,335W	7.09 ± 3.88	6.88 ± 3.61
W3	Subsurface (Borehole H5)	160N,229W	4.23 ± 1.49	6.62 ± 1.42

[a] Refer to Figure 5.
[b] Errors are 2σ based on counting statistics.

Excavated Area

Excerpt from Post-Remedial Action Report for the Niagara Falls Storage Site Vicinity Properties—1985 and 1986

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DOE/OR/20722-133

Formerly Utilized Sites Remedial Action Program (FUSRAP)
Contract No. DE-AC05-81OR20722

POST-REMEDIAL ACTION REPORT FOR THE NIAGARA FALLS STORAGE SITE VICINITY PROPERTIES—1985 AND 1986

Lewiston, New York

January 1989

Bechtel National, Inc.

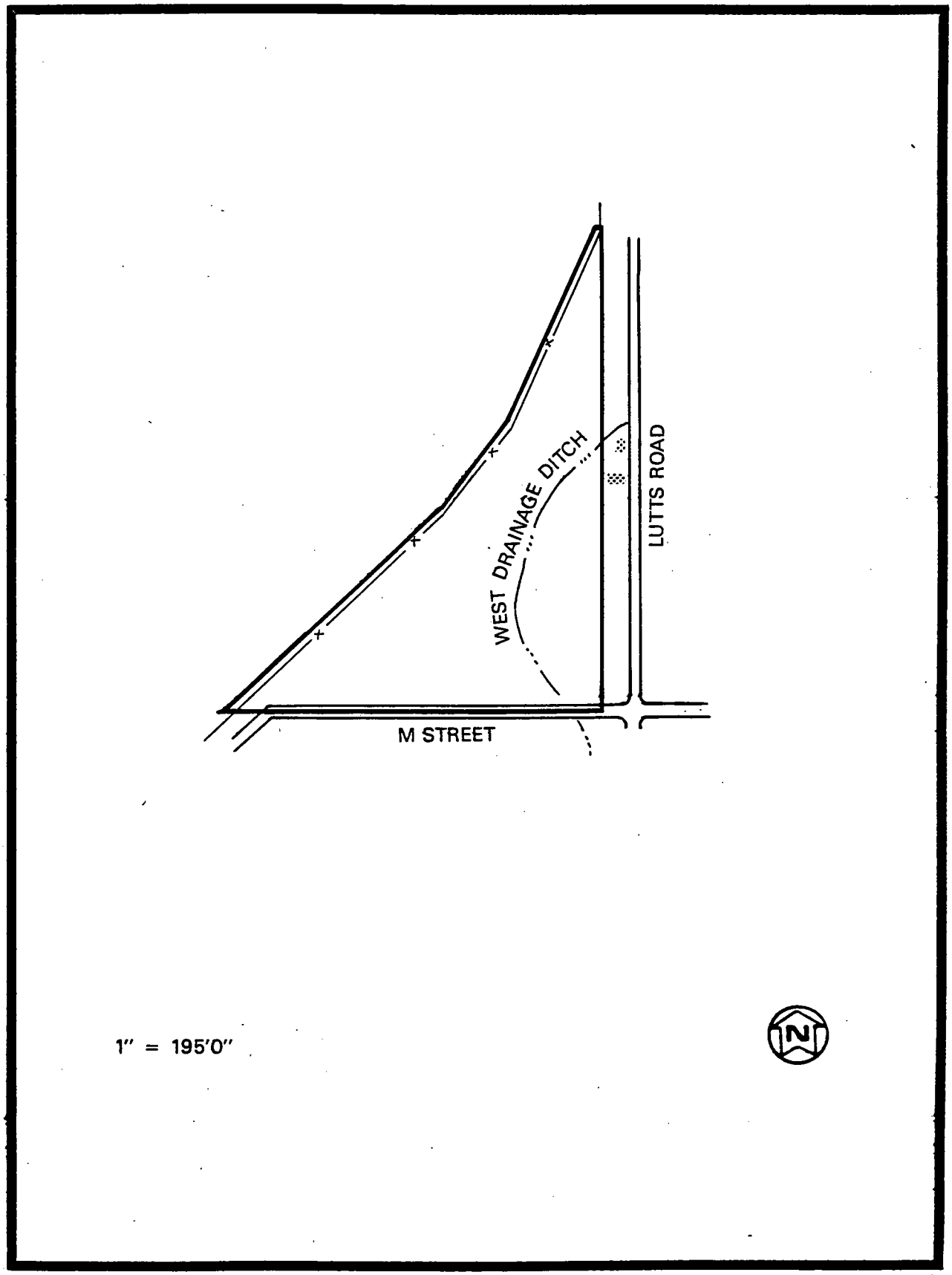

FIGURE 37 EXCAVATED AREAS ON PROPERTY W

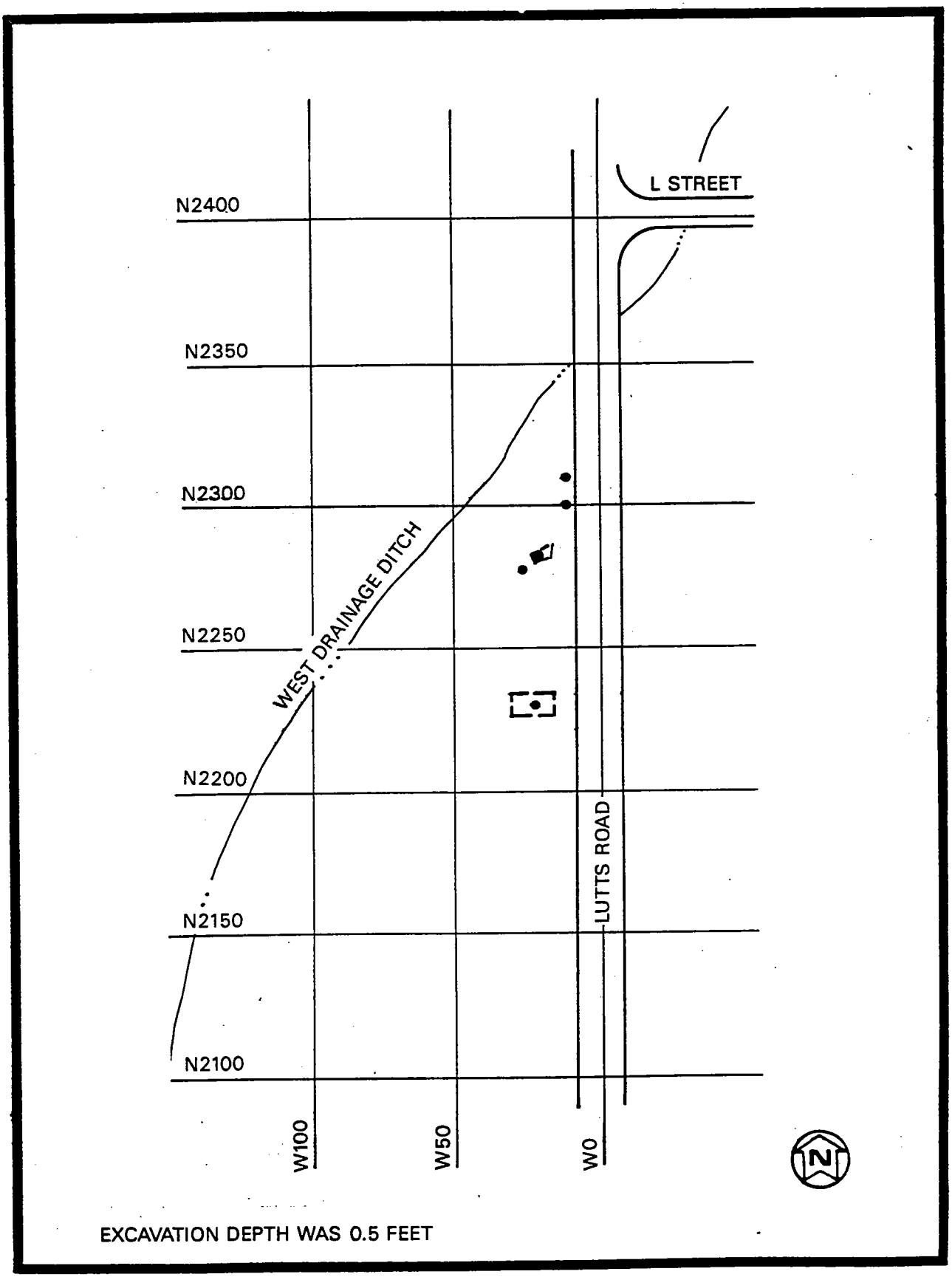

FIGURE 38 POST-REMEDIAL ACTION SAMPLING LOCATIONS ON PROPERTY W

TABLE 11
POST-REMEDIAL ACTION SAMPLING RESULTS
FOR PROPERTY W

Grid Coordinates E,W	Grid Coordinates N,S	Concentrations (pCi/g +/- 1 sigma) Uranium-238	Radium-226	Thorium-232
W0010	N2300	A	4.3 ± 0.2	1.0 ± 0.2
W0010	N2310	A	1.2 ± 0.1	1.7 ± 0.2
W0021	N2280	3.6 ± 1.3	1.0 ± 0.1	1.5 ± 0.2
W0022	N2230	A	1.8 ± 0.4	2.0 ± 0.4
W0026	N2277	A	4.1 ± 0.2	0.8 ± 0.2

'A' denotes less than detectable activity.

Verification Data

Excerpt from Verification of 1985 and 1986 Remedial Actions, Niagara Falls Storage Site Vicinity Properties, Lewiston, New York, July 1990

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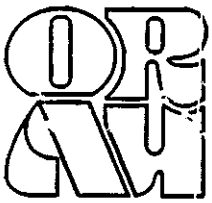


Prepared by
Oak Ridge Associated Universities

Prepared for the Decontamination and Decommissioning Division

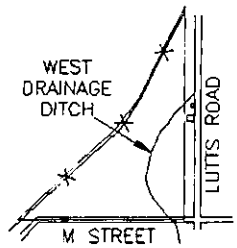
U.S. Department of Energy

VERIFICATION OF 1985 AND 1986 REMEDIAL ACTIONS NIAGARA FALLS STORAGE SITE VICINITY PROPERTIES LEWISTON, NEW YORK

J. D. BERGER

Environmental Survey and Site Assessment Program
Energy/Environment Systems Division

FINAL REPORT
JULY 1990



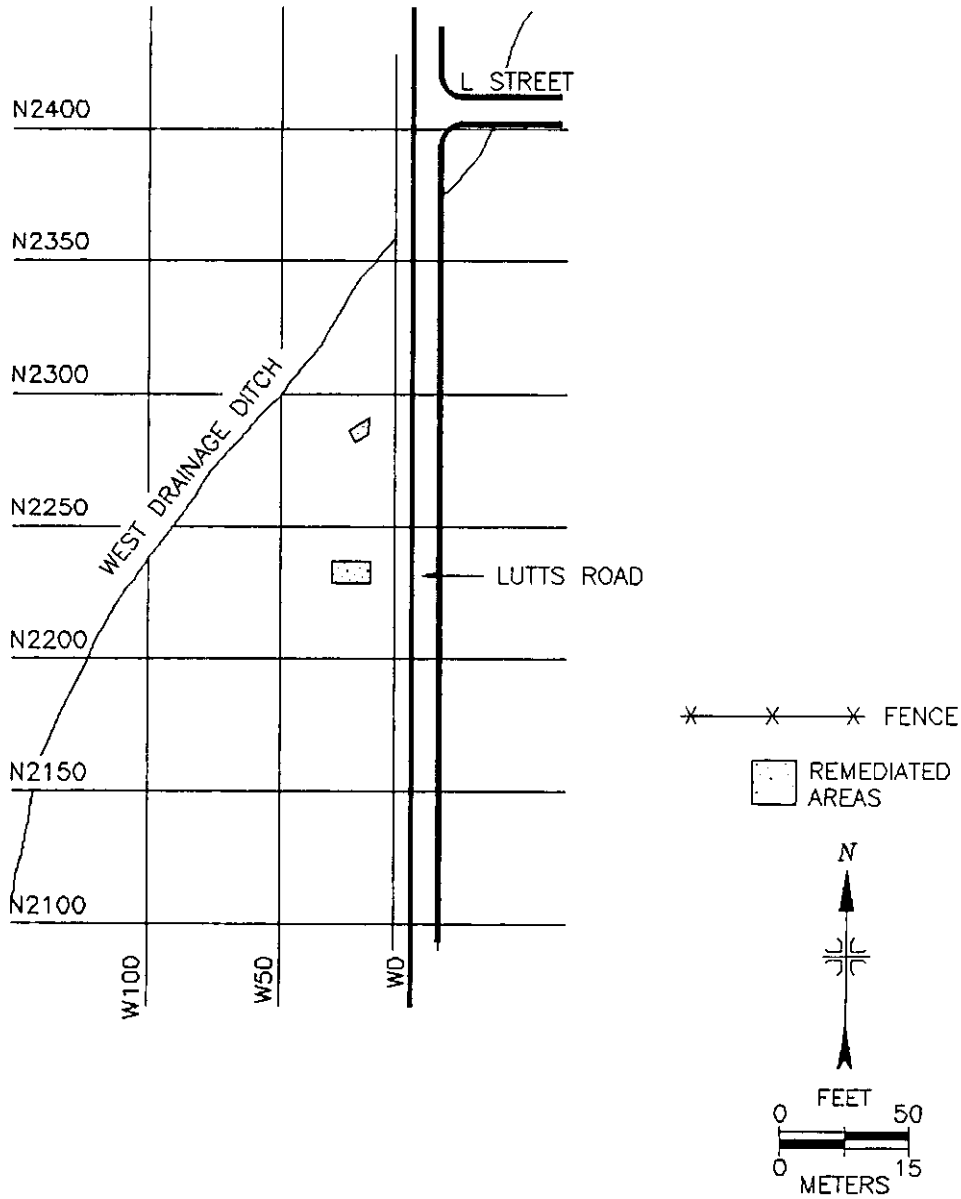


FIGURE 31: Plot Plan of Remediated Areas of Vicinity Property W

TABLE 12

RADIONUCLIDE CONCENTRATIONS IN SOIL SAMPLES
FROM PROPERTY W
NIAGARA FALLS STORAGE SITE VICINITY PROPERTIES
LEWISTON, NEW YORK

Location[a] N	Location[a] W	Radionuclide Concentrations (pCi/g) Ra-226	U-238	Th-232
2138	121	3.4 ± 1.2[b]	1.8 ± 1.3	1.2 ± 0.4
2227	55	1.0 ± 0.3	0.6 ± 1.2	0.9 ± 0.3
2227	111	0.8 ± 0.3	<0.6	0.7 ± 0.3
2250	65	1.3 ± 0.3	1.5 ± 1.7	1.0 ± 0.4
2267	72	1.1 ± 0.3	<0.8	1.1 ± 0.4
2272	34	5.2 ± 0.5	<0.8	0.9 ± 0.6
2276	49	1.7 ± 0.3	0.5 ± 1.3	0.6 ± 0.5

[a]Refer to Figure 31.
[b]Uncertainties represent the 95% confidence levels, based only on counting statistics; additional laboratory uncertainties of ± 6 to 10% have not been propagated into these data.

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