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RADIOLOGICAL SURVEY OF LATTY AVENUE IN THE VICINITY OF THE FORMER COTTER SITE, HAZELWOOD/BERKELEY, MISSOURI (LM001)

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HEALTH AND SAFETY RESEARCH DIVISION

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RADIOLOGICAL SURVEY OF LATTY AVENUE IN THE VICINITY OF THE FORMER COTTER SITE, HAZELWOOD/BERKELEY, MISSOURI (LM001)

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ABSTRACT

A radiological survey was conducted over a proposed construction corridor along Latty Avenue, Hazelwood/Berkeley, Missouri, in the vicinity of the former Cotter site at 9200 Latty Avenue. The survey included gamma exposure rates at the ground surface and at 1 m above the surface throughout the site, sampling of surface soil, sampling of subsurface soil from auger holes, gamma logging of auger holes, and sampling of subsurface water. The results of the survey demonstrated some degree of radioactive contamination in all areas of the construction corridor, extending north and south in some regions onto adjacent private properties. Redistribution of the contamination by flooding, surface runoff, and road and utility line activities was evident. The pattern of contamination ranged from widespread to isolated spots and was found to occur from near the surface to depths of ~1.8 m. The most highly contaminated region was noted on both sides of Latty Avenue adjacent to the former Cotter site. Concentrations of ^{230}Th in soil from that region were as high as 16,000 pCi/g.

INTRODUCTION

Process waste and residues associated with the production and refining of uranium materials were generated by the Mallinckrodt Chemical Works, St. Louis, Missouri, during the period 1942 through the 1950s. According to a Nuclear Regulatory Commission (NRC) report,[1] residues which had been stored at the St. Louis Airport property were moved by the Continental Mining and Milling Company of Chicago, Illinois, to the Latty Avenue Storage Site in Hazelwood, Missouri, in early 1966. The Latty Avenue storage site is located in a low-lying industrialized area in Hazelwood/Berkeley, Missouri, approximately 12 miles northwest of St. Louis (Fig. 1). The Commercial Discount Corporation, Chicago, Illinois, purchased the residues in January 1967. Much of the material was dried and shipped to the Cotter Corporation facilities in Canon City, Colorado. These materials included ore residues and uranium-, thorium-, and radium-bearing process wastes. Materials remaining at the Latty Avenue Storage Site were sold to the Cotter Corporation in December 1969. Records indicate that residues remaining on the site at that time included 74,000 tons of Belgian Congo pitchblende raffinate containing 113 tons of uranium, 32,500 tons of Colorado raffinate containing 48 tons of uranium, and 8700 tons of leached barium sulfate containing about 7 tons of uranium. During August through November 1970, Cotter Corporation dried some of the remaining residues and shipped them to a Cotter mill in Canon City, Colorado. An estimated 10,000 tons of Colorado raffinate and 8700 tons of leached barium sulfate remained at the Latty Avenue site in December 1970.

In April 1974, an NRC inspector was informed that the remaining Colorado raffinate had been shipped to Canon City during the prior year (1973) without drying, and that the leached barium sulfate had been transported to a landfill area in St. Louis County. Twelve to eighteen inches of top soil were reported to have been stripped from the Latty Avenue site surface and supposedly were removed from the site with the leached barium sulfate. However, analysis of soil samples taken during an NRC investigation of the site in 1976 indicated the presence of uranium- and thorium-bearing residues.

In 1977, a survey was conducted by Oak Ridge National Laboratory (ORNL) to characterize the radiological condition of the site. It was determined that alpha and beta-gamma contamination levels on building surfaces exceeded the NRC guidelines for release of decontaminated property for unrestricted use.[2] Numerous areas having gamma exposure rates of 300–500 μR/h were clearly above criteria recommended by the International Commission on Radiological Protection (ICRP).[3] It was estimated that the top three inches of soil on much of the area contained an average of 140 pCi/g of ^{226}Ra and probably higher average concentrations of ^{238}U, ^{230}Th, and ^{227}Ac.

At the request of the U.S. Department of Energy (DOE), a preliminary survey of properties adjacent to and in the vicinity of the former Cotter site at 9200 Latty Avenue was made in September 1983 to determine if contamination was present on any vicinity properties and to evaluate the scope of work required to perform radiological assessment surveys of these properties.[4] Elevated gamma radiation levels were observed on all properties adjacent to 9200 Latty Avenue, especially on those properties to the north, east, and south.

A radiological survey was performed by ORNL during the period January through April, 1984, over a section of Latty Avenue in the vicinity of the former Cotter site (the Jarboe Realty and Investment Co.). The area surveyed was a proposed construction corridor along Latty Avenue and included the asphalt-covered street and shoulders and ditches on both sides of the street. The width of the corridor varied from 70 to 295 ft and extended from Coldwater Creek eastward along Latty Avenue to its intersection with interstate highway 170, a distance of 3850 ft. The results of surveys of the fence line surrounding the former Cotter site and of other private properties in the vicinity of that site are provided in separate reports.[5,6]

SURVEY METHODS

The survey included the following measurements: (1) gamma radiation exposure rates at the surface and at 1 m from the surface throughout the site; (2) concentrations of ^{226}Ra, ^{230}Th, and ^{238}U in surface and subsurface soil on the site; (3) concentrations of ^{226}Ra, ^{230}Th, ^{238}U, and ^{210}Pb in subsurface water on the site; and (4) gamma radiation levels at various depths in auger holes drilled on site. The radiological survey followed a general plan developed at ORNL for vicinity properties in Hazelwood and Berkeley, Missouri.[7]

The site was divided into 50 ft $\times$ 50 ft "survey blocks" by the rectangular grid system shown in Fig. 2. A comprehensive description of survey methods and instrumentation is given in a separate report.[8]

SURVEY RESULTS

Applicable federal guidelines for radiation exposure to the general public are summarized in Table 1. Normal radiation background levels and radionuclide concentrations in soil in the Hazelwood/St. Louis area are presented in Table 2. These data are provided for comparison with the survey results presented in this section.

All direct measurements presented in this report are gross readings: background radiation levels have not been subtracted. Similarly, background concentrations have not been subtracted from radionuclide concentrations measured in environmental samples.

GAMMA EXPOSURE RATE MEASUREMENTS

Results of grid point measurements of gamma exposure rates at the surface and at 1 m above the surface and the range of gamma radiation levels detected during the gamma scan of grid blocks are presented in Table 3. Grid point and grid block locations are shown in Fig. 2. The maximum gamma exposure rate measured on this site during the grid block scan, 720 μR/h, exceeds background by a factor of about 60. The gamma exposure rates measured at grid points at the ground surface ranged from 4 to 490 μR/h and averaged 17. Grid point gamma exposure rates at 1 m above the ground surface ranged from 4 to 380 μR/h with a mean of about 16.

SURFACE SOIL SAMPLES

Surface soil samples were collected from systematic locations to provide representative sampling of the site. Samples were normally collected from a depth of 0–15 cm. However, in some cases, for further definition of contamination, sampling was extended to depths of 75 cm. In addition to systematic sampling, samples were collected from selected locations showing elevated gamma radiation levels and are designated as "biased" samples. Sample locations are shown in Figs. 3–15, with results of sample analyses provided in Table 4.

Concentrations of ^{226}Ra in systematic surface soil samples ranged from 1.0 to 12 pCi/g and averaged 2.7 pCi/g: ^{238}U concentrations ranged from 0.99 to 15 pCi/g and averaged 2.1 pCi/g. Mean concentrations of ^{226}Ra and ^{238}U exceeded background levels by factors of about 3 and 2, respectively. Concentrations of ^{230}Th in surface soil ranged from 1.6 to 630 pCi/g with a mean of 54 pCi/g. The maximum concentration of ^{230}Th exceeded the DOE soil guideline by a factor of ~120 while the mean concentration exceeded the guideline value by about 10.

The three biased samples were found to contain concentrations of ^{230}Th ranging from 350 to 810 pCi/g. Concentrations of ^{226}Ra and ^{238}U ranged from 8.3 to 12 pCi/g, and 5.4 to 8.7 pCi/g, respectively.

SUBSURFACE SOIL SAMPLES AND GAMMA LOGGING OF AUGER HOLES

Holes were augered at locations shown in Figs. 16–31. One or more soil samples were collected from each hole. The sampling depths chosen usually included the region of maximum gamma radiation level as indicated by the gamma log. At selected locations, Shelby tubes and/or split-spoon samplers were used to collect subsurface samples at known depths. Concentrations of ^{226}Ra, ^{230}Th, and ^{238}U in subsurface soil are given in Table 4.

The maximum concentration of each radionuclide was found in sample 148 taken from a depth of 0 to 15 cm. Those values are 660, 22,000, and 790 pCi/g for ^{226}Ra, ^{230}Th, and ^{238}U, respectively.

Each of the auger holes and core holes were "logged" using a gamma scintillation detector. A plastic pipe (PVC Schedule 40) with a 4-in inside diameter was placed in the hole and a NaI scintillation probe was lowered inside the pipe. The probe was encased in a lead shield with a horizontal row of collimating slits on the side. This collimation allows measurement of gamma radiation intensities resulting from contamination within small fractions of hole depth. Measurements were usually made at 15- or 30-cm intervals. Logging of the core holes was done to determine the extent of subsurface contamination at each location. Profiles of gamma intensity as a function of depth are presented in the Appendix.

The logging technique used here is not radionuclide specific. However, the logging data, in conjunction with the soil analyses data, may be used to estimate the region of contamination in the auger holes. It appears from a comparison of these data that a reading of 1000 cpm or greater using the shielded scintillator indicates the presence of elevated

concentrations of ^{226}Ra and/or ^{238}U. Consequently, soil giving rise to 1000 cpm or greater on the scintillator or containing radionuclide concentrations above criteria (Table 1) as determined from soil analysis was considered as contaminated soil. Using these criteria, an estimate of the region of contamination in each hole was made. These data are listed in Table 5. A word of caution should be added in the interpretation of the data presented in Table 5. Only those holes yielding a positive indication of contamination, using the previously stated criteria, are listed as having a region of contamination; an entry of "none" opposite a location means only that no positive indication of contamination was observed using the "logging" and sampling procedures employed on this site. Because of the difficulty of detecting ^{230}Th with this in-situ hole logging device, concentrations of ^{230}Th in the absence of ^{226}Ra considerably in excess of 5 pCi/g may have gone undetected.

SUBSURFACE WATER SAMPLES

Water samples were collected from auger holes and analyzed for ^{226}Ra, ^{238}U, ^{230}Th, and ^{210}Pb. Locations of the holes from which the samples were taken are shown in Figs. 5 and 6 with the results of laboratory analyses provided in Table 6. Concentrations of ^{226}Ra, ^{238}U, ^{230}Th, and ^{210}Pb were well below the concentration guides for water for unrestricted use (10 CFR 20).

SIGNIFICANCE OF FINDINGS

A summary of survey measurements and results is provided in Table 7. Radioactive contamination was found to some extent in all areas of the construction corridor. The corridor may be further characterized by areas as follows.

1. 0+00 to 4+50 (Figs. 3 and 4): This area lies in a flood plain. The contamination is fairly uniformly distributed over the surface and generally extends to a depth of about 30 cm. In a few isolated areas where the soil has been disturbed, the materials may extend to depths of 120 cm. Soil mixed with the radioactive materials was apparently eroded from the former processing site and carried to this area by flood waters. Concentrations of ^{230}Th in this area ranged from about 5 pCi/g to 280 pCi/g.

2. 4+50 to 9+00 (Figs. 5 and 6): This section of the corridor encompasses drainage ditches, culverts, road shoulders, and asphalt roadways and extends into private property on both the north and south sides of Latty Avenue. The drainage ditches, culverts, and road shoulders are highly contaminated. The private property is contaminated to some extent. The contamination extends to depths greater than 1.8 m along the road shoulders on the north side of Latty Avenue (drill holes 119 and 212, Table 6), extends under the asphalt of the roadway at least 1.8 m from the north edge of the pavement (drill holes 116 and 118, Table 6), and may in some places underlie the complete width of the asphalt surface. Concentrations of ^{230}Th in soil samples from this area were as high as 22,000 pCi/g. The north end of the former Cotter site lies along the south edge of Latty Avenue and a strip of the former site, ~200 ft deep, was included in the construction corridor. Radioactive contamination on this part of the site extends to depths as great as 1.8 m.

3. 9+00 to 30+00 (Figs. 7 to 15): The contamination along this section of Latty Avenue is spotty and, except for areas that have been disturbed by construction, lies near the surface (<0.5 m). In areas that have undergone construction (e.g., laying of pipe lines or rebuilding of roadway), the radioactively contaminated soil may extend to depths of 1.5 m or greater (Table 6). The pattern of contamination in this area suggests that radioactive residues may have spilled from trucks traveling this route to and from the site and that the contamination may have been further redistributed by surface runoff, road repair, and the laying and/or repair of underground utility lines.

4. 30+00 to 38+50 (Figs. 28 to 31): This section of Latty Avenue has been replaced with a new concrete roadway that appears to be elevated above the original grade of the old road. Sampling along this section was confined to areas not covered by concrete. No attempt was made to sample the fill underneath the concrete roadway. Radioactive contamination found along this section of Latty Avenue appears to be confined to isolated spots and concentrations in general are much lower than those measured in other areas of the corridor.

5. Asphalt Road Surface: Much of the asphalt road surface along Latty Avenue has become contaminated with radioactive materials. Nineteen of 47 asphalt samples analyzed were found to contain concentrations of ^{230}Th above the DOE guideline of 5 pCi/g. The concentrations of ^{230}Th in asphalt ranged from <1 to 600 pCi/g.

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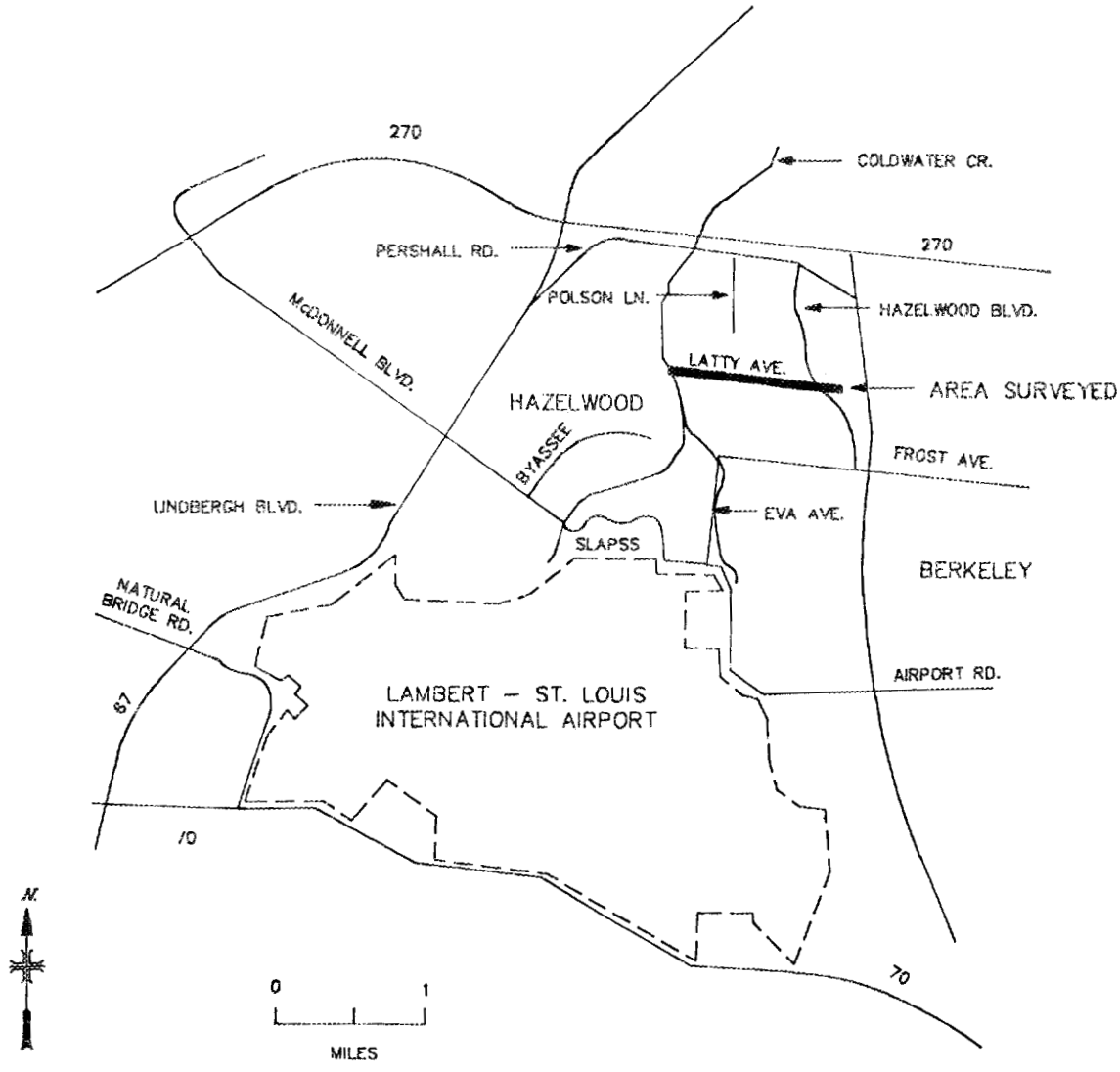

Fig. 1. Diagram showing general location of the Latty Avenue survey (LM001).

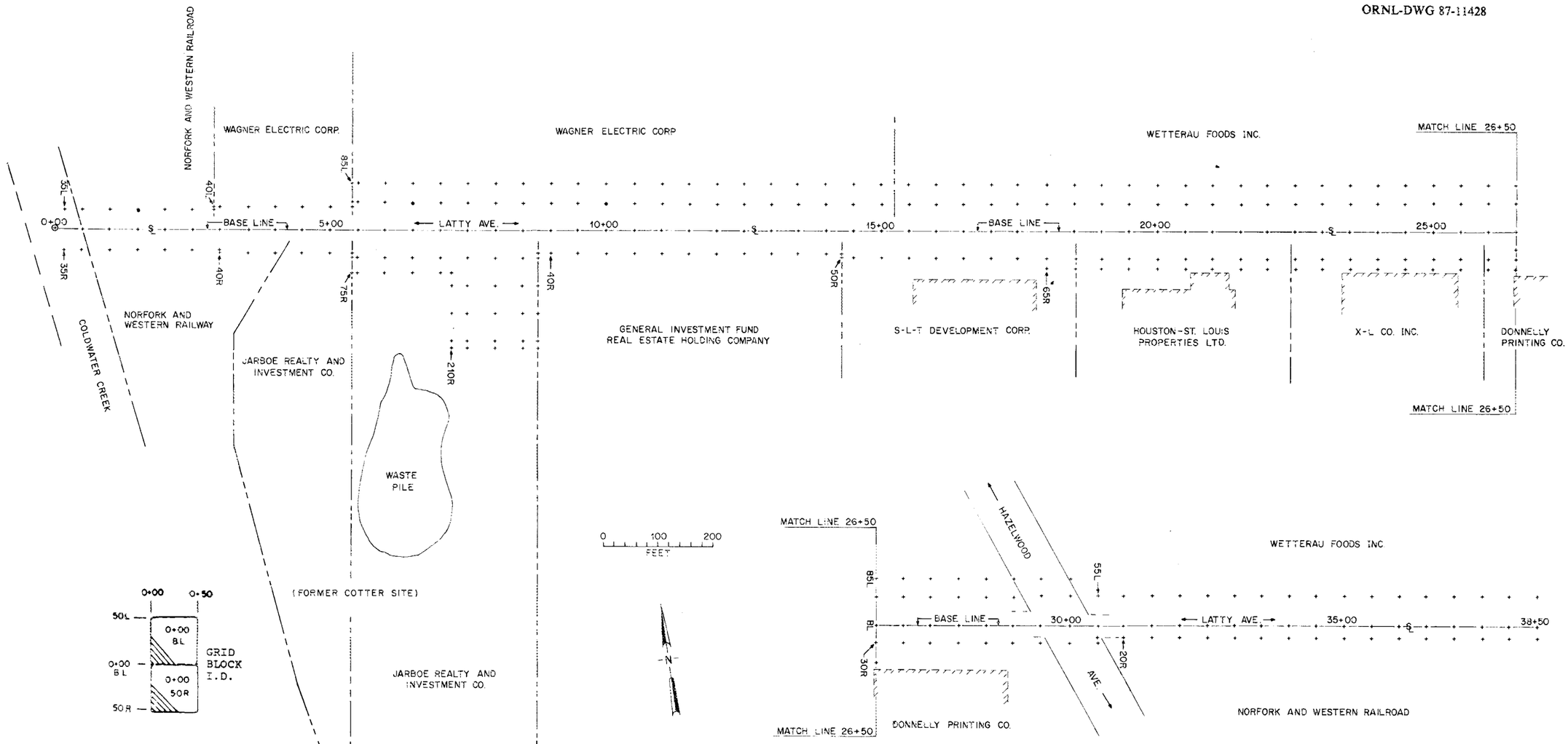

Fig. 2. Diagram showing grid system used at Latty Avenue (LM001).

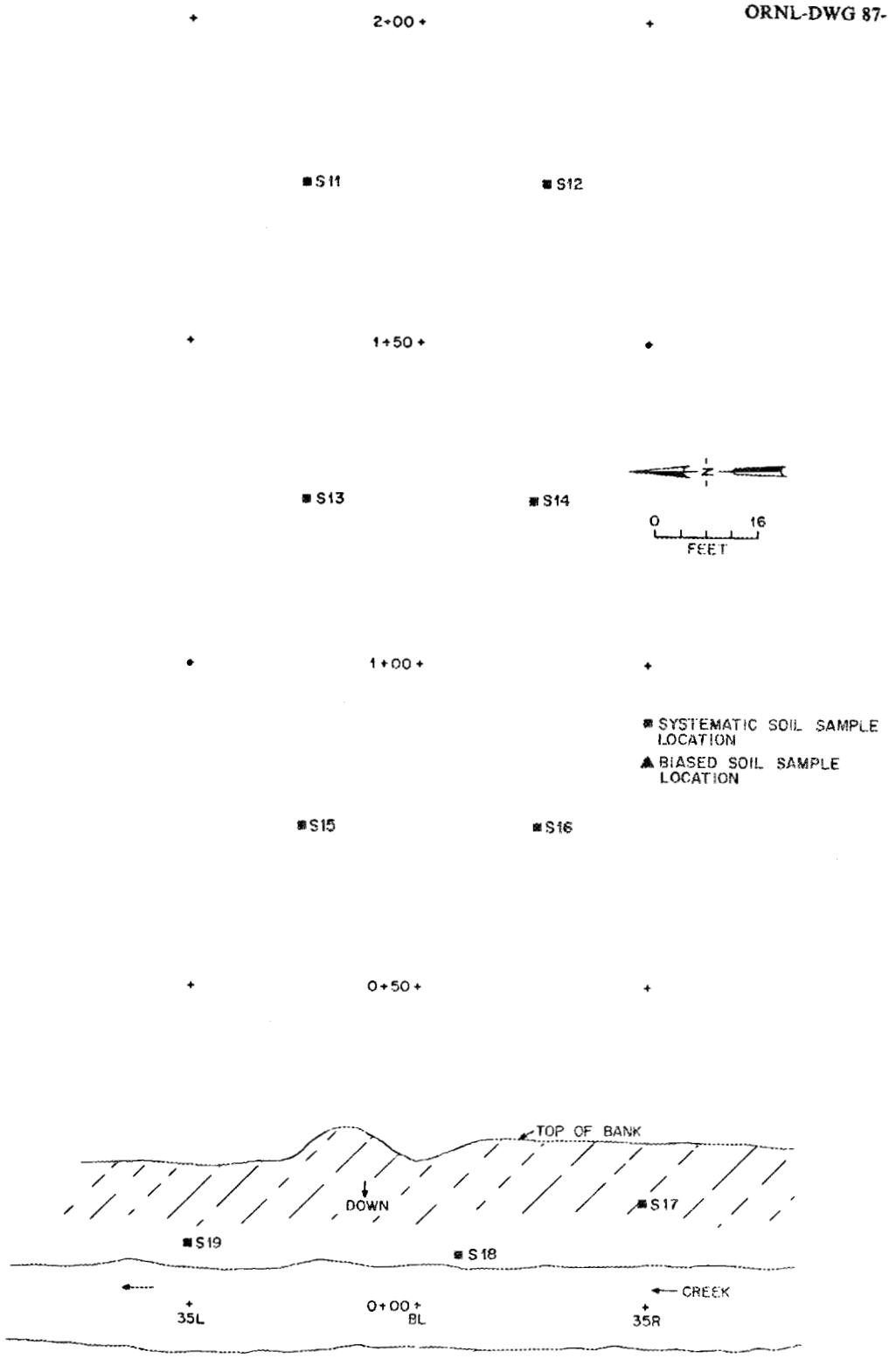

Fig. 3. Locations of surface soil samples taken at Latty Avenue (LM001) between 0+00, BL and 2+00, BL.

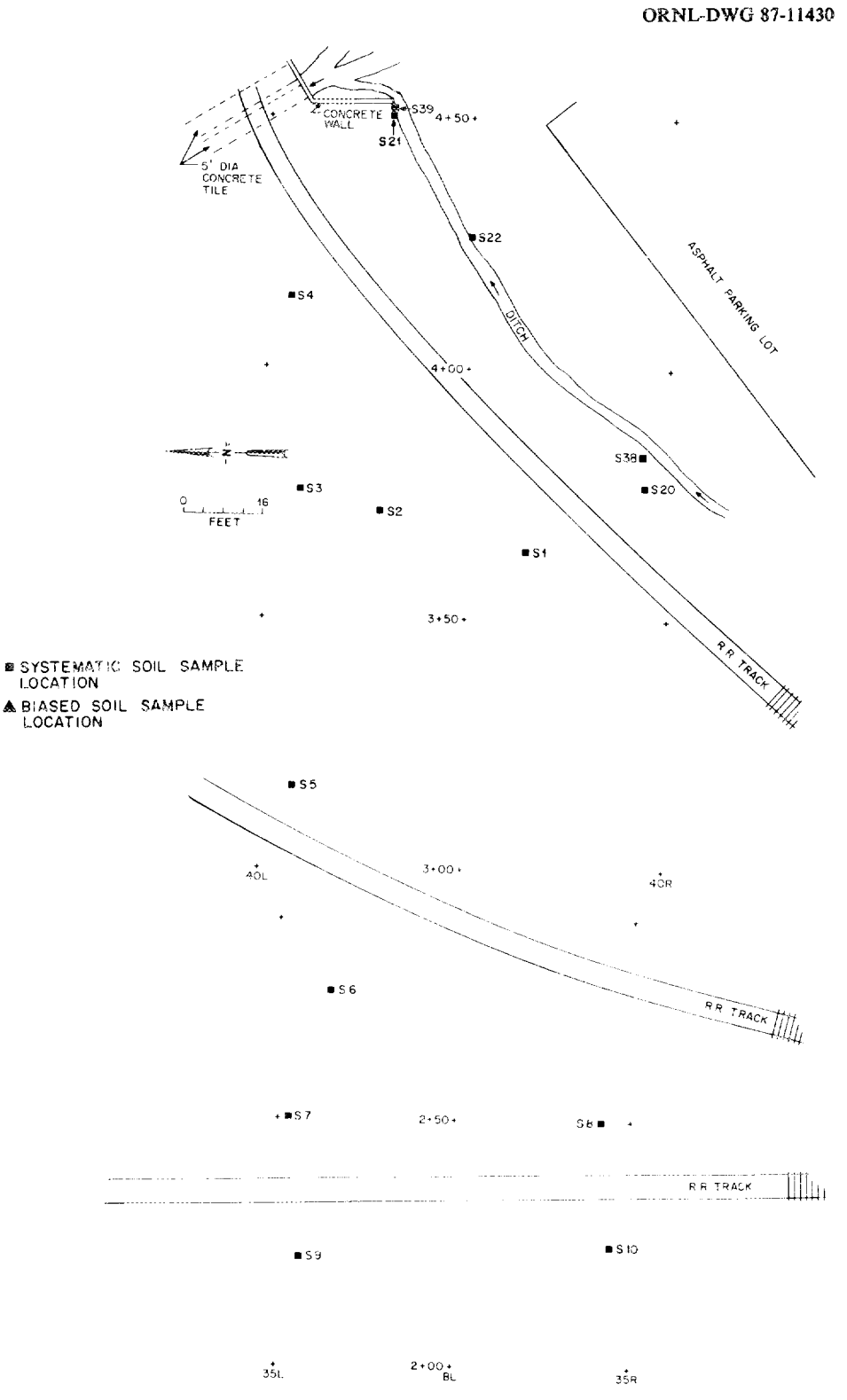

Fig. 4. Locations of surface soil samples taken at Latty Avenue (LM001) between 2+00, BL and 4+50, BL.

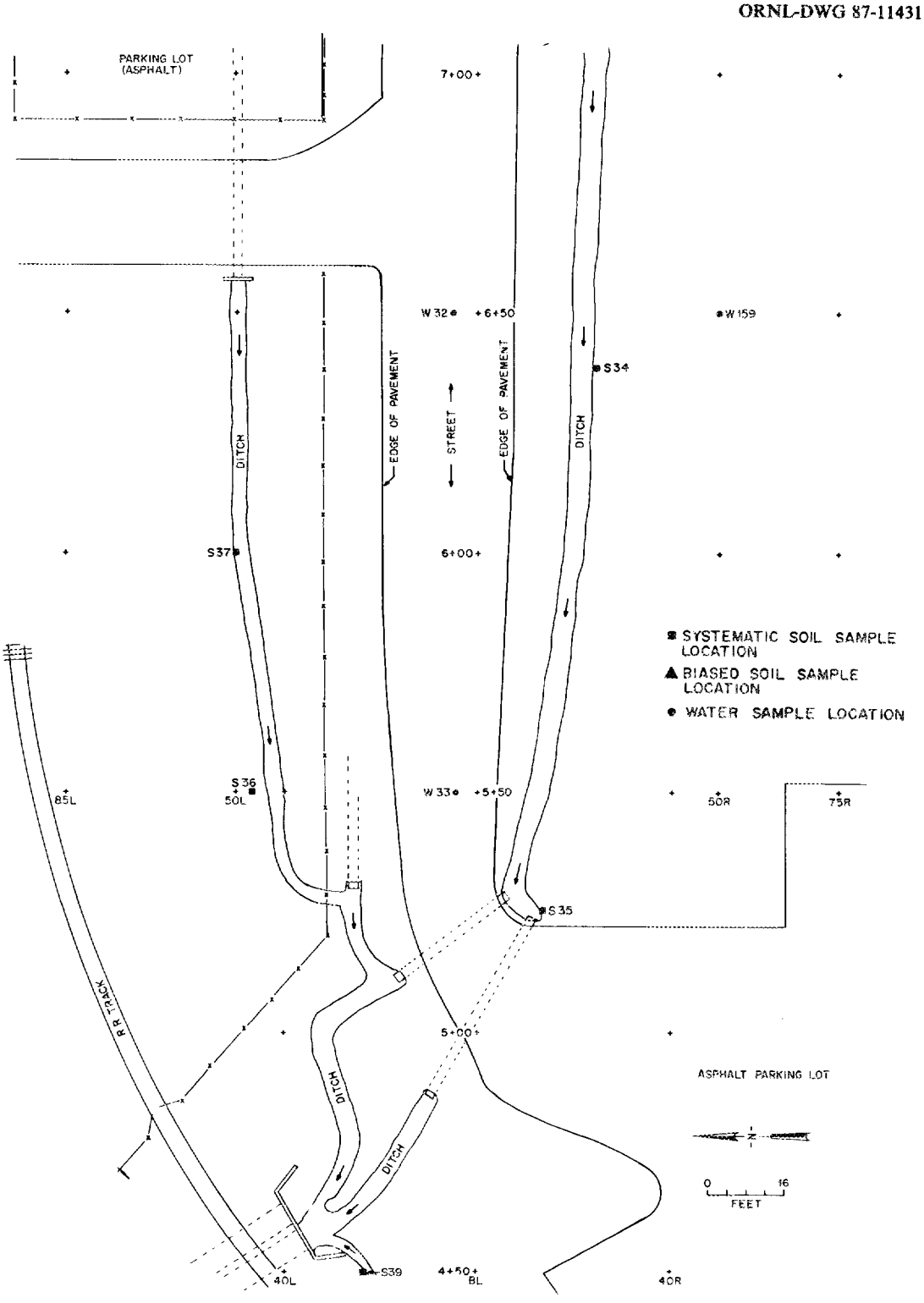

Fig. 5. Locations of surface soil and water samples taken at Latty Avenue (LM001) between 4+50, BL and 7+00, BL.

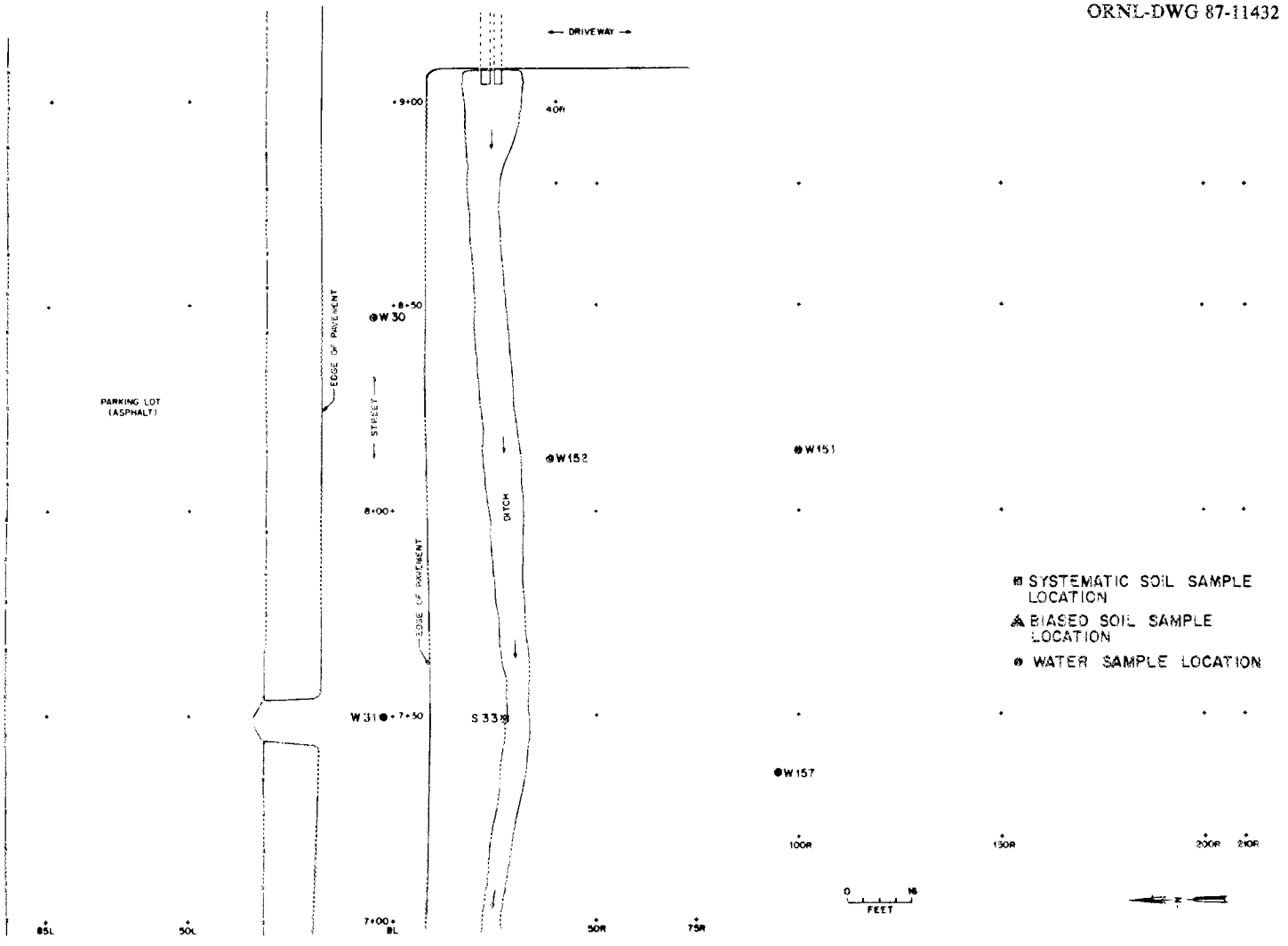

Fig. 6. Locations of surface soil and water samples taken at Latty Avenue (LM001) between 7+00, BL and 9+00, BL.

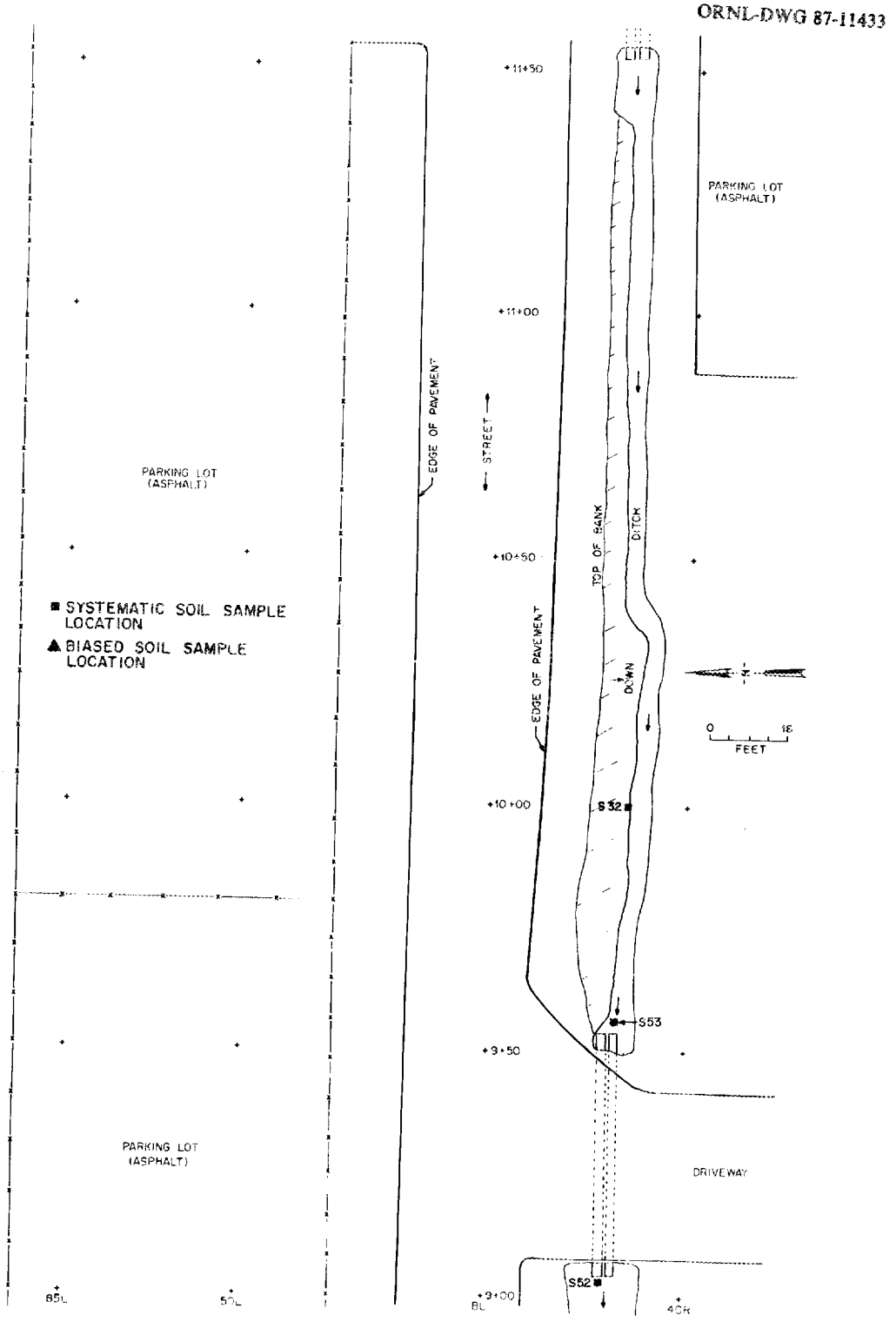

Fig. 7. Locations of surface soil samples taken at Latty Avenue (LM001) between 9+00, BL and 11+50, BL.

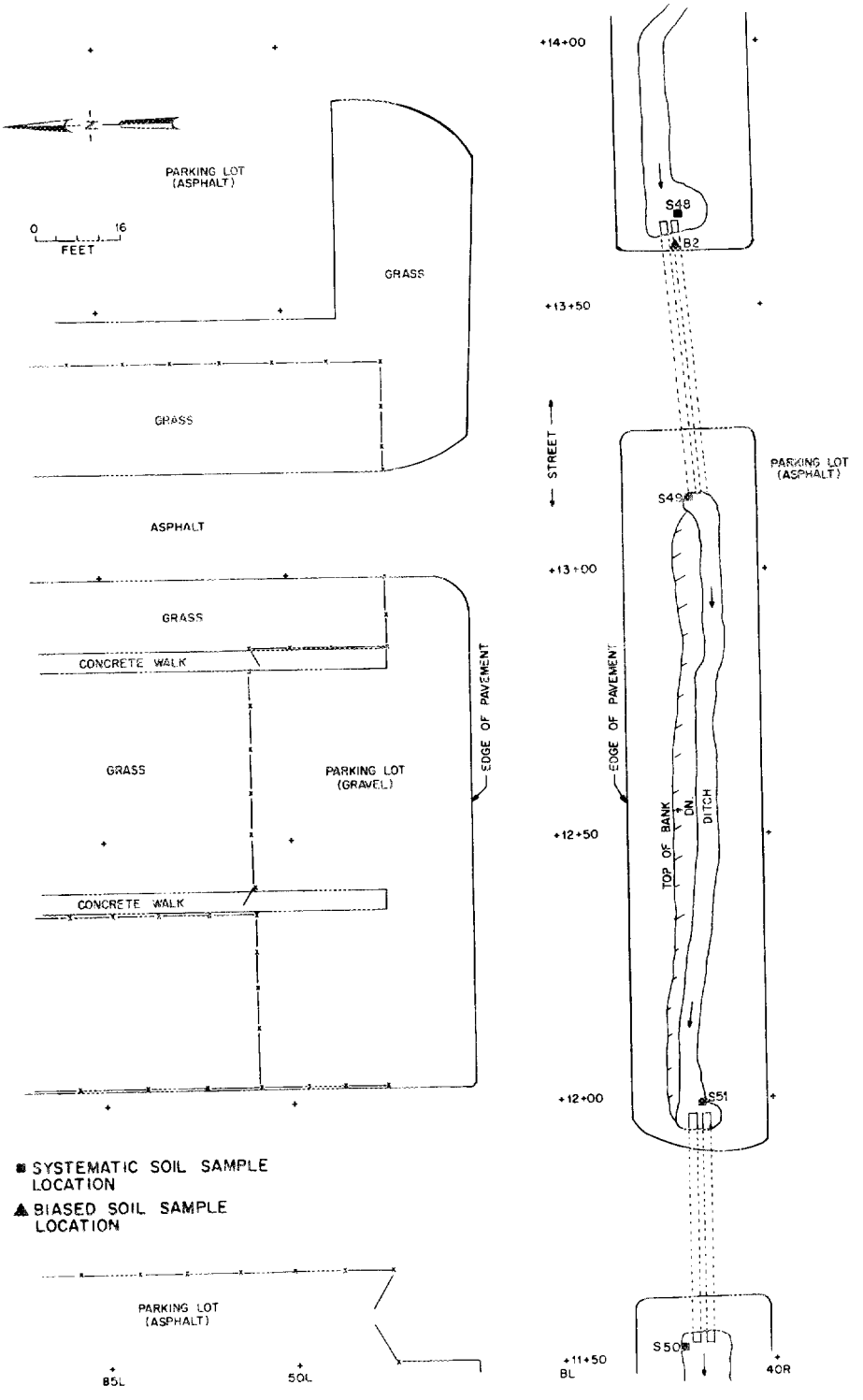

Fig. 8. Locations of surface soil samples taken at Latty Avenue (LM001) between 11+50, BL and 14+00, BL.

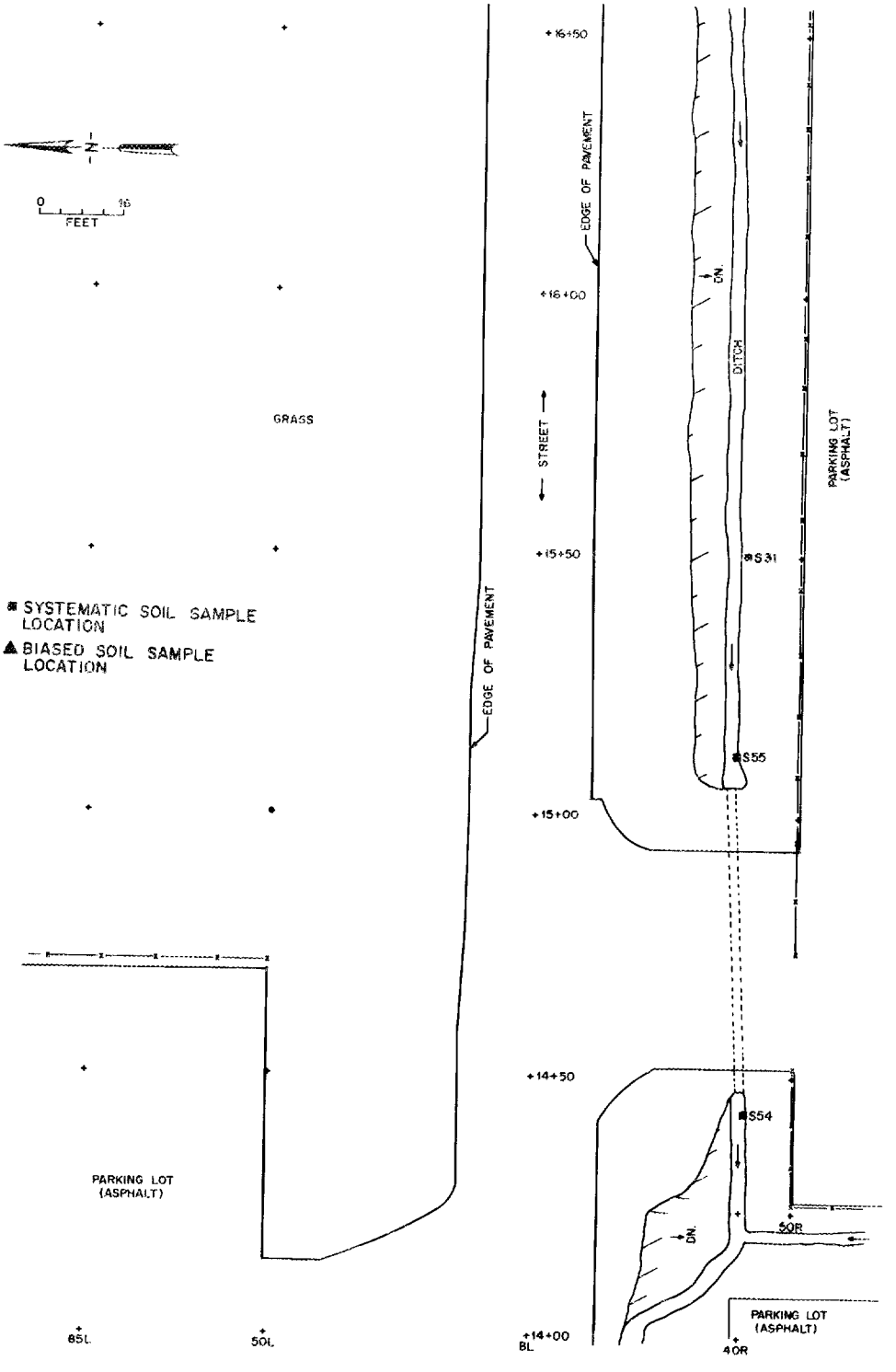

Fig. 9. Locations of surface soil samples taken at Latty Avenue (LM001) between 14+00, BL and 16+50, BL.

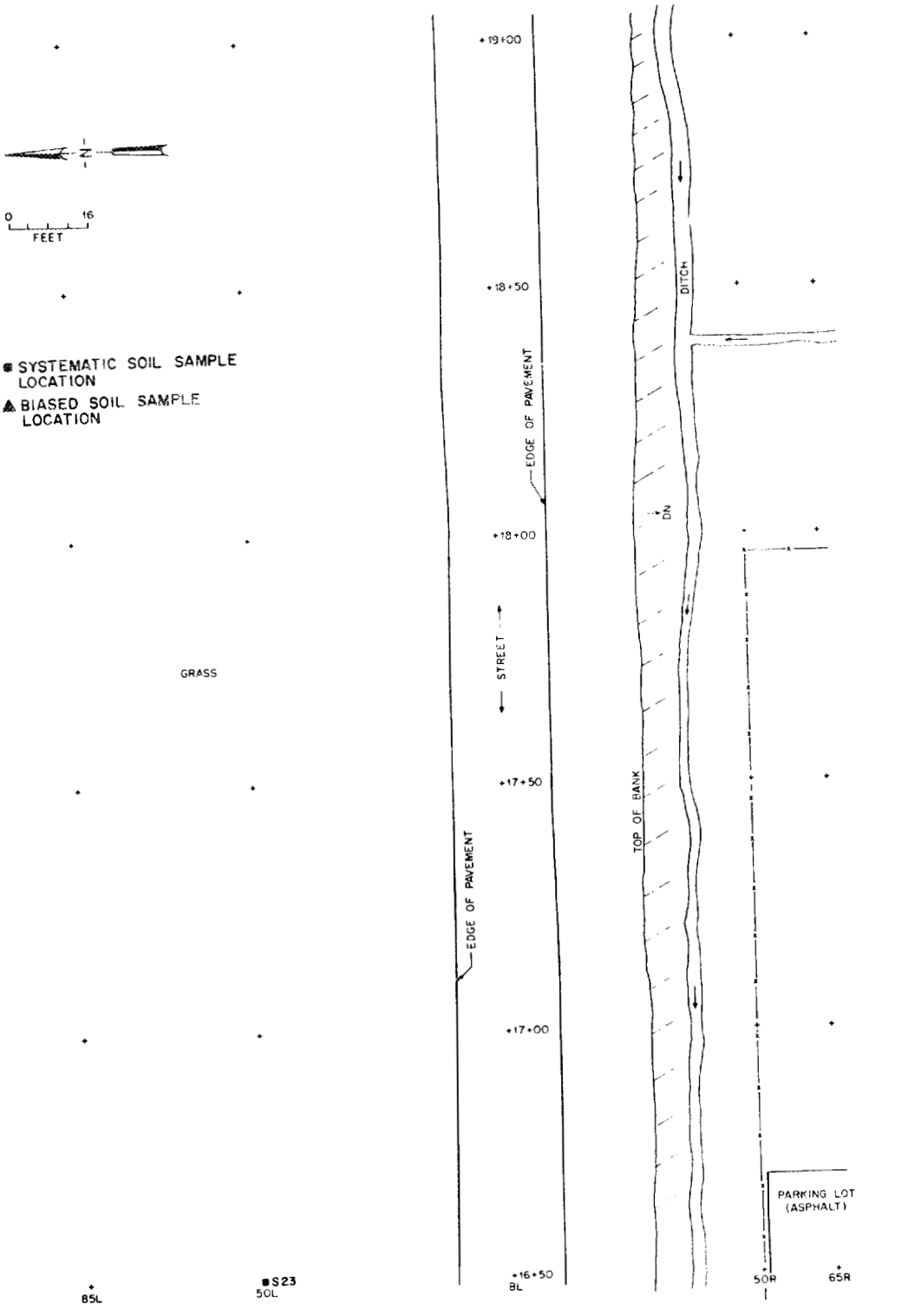

Fig. 10. Locations of surface soil samples taken at Latty Avenue (LM001) between 16+50, BL and 19+00, BL.

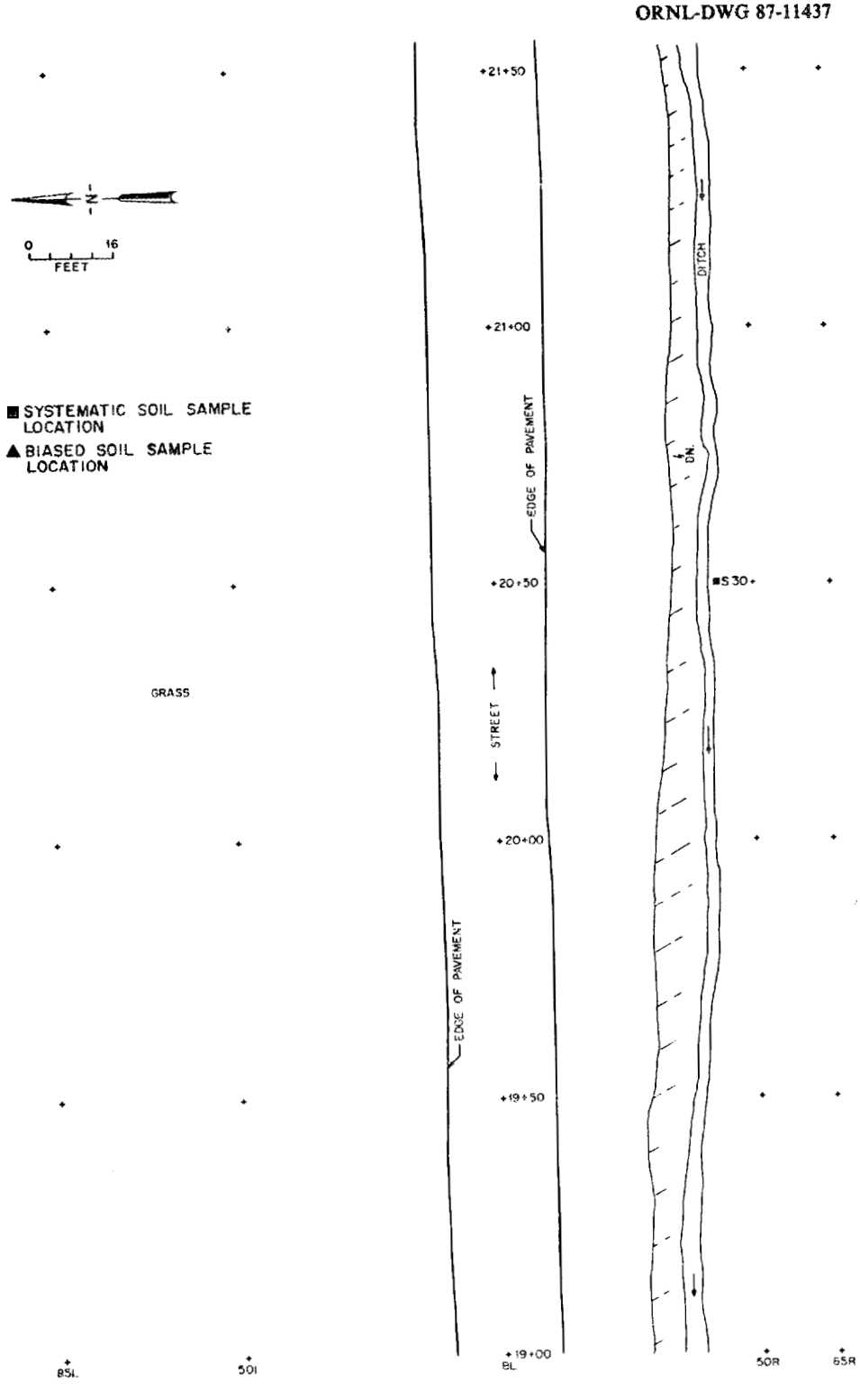

Fig. 11. Locations of surface soil samples taken at Latty Avenue (LM001) between 19+00, BL and 21+50, BL.

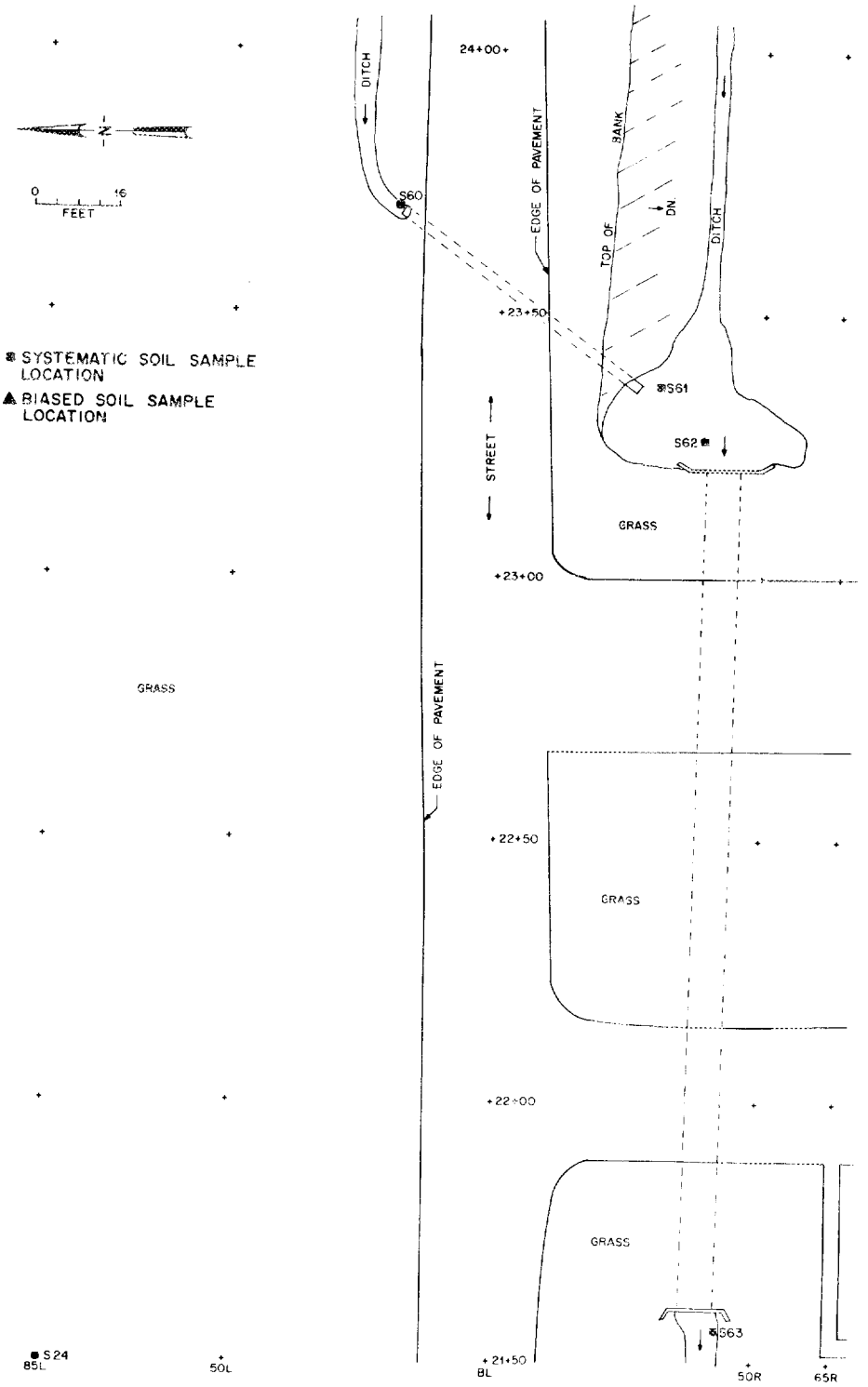

Fig. 12. Locations of surface soil samples taken at Latty Avenue (LM001) between 21+50, BL and 24+00, BL.

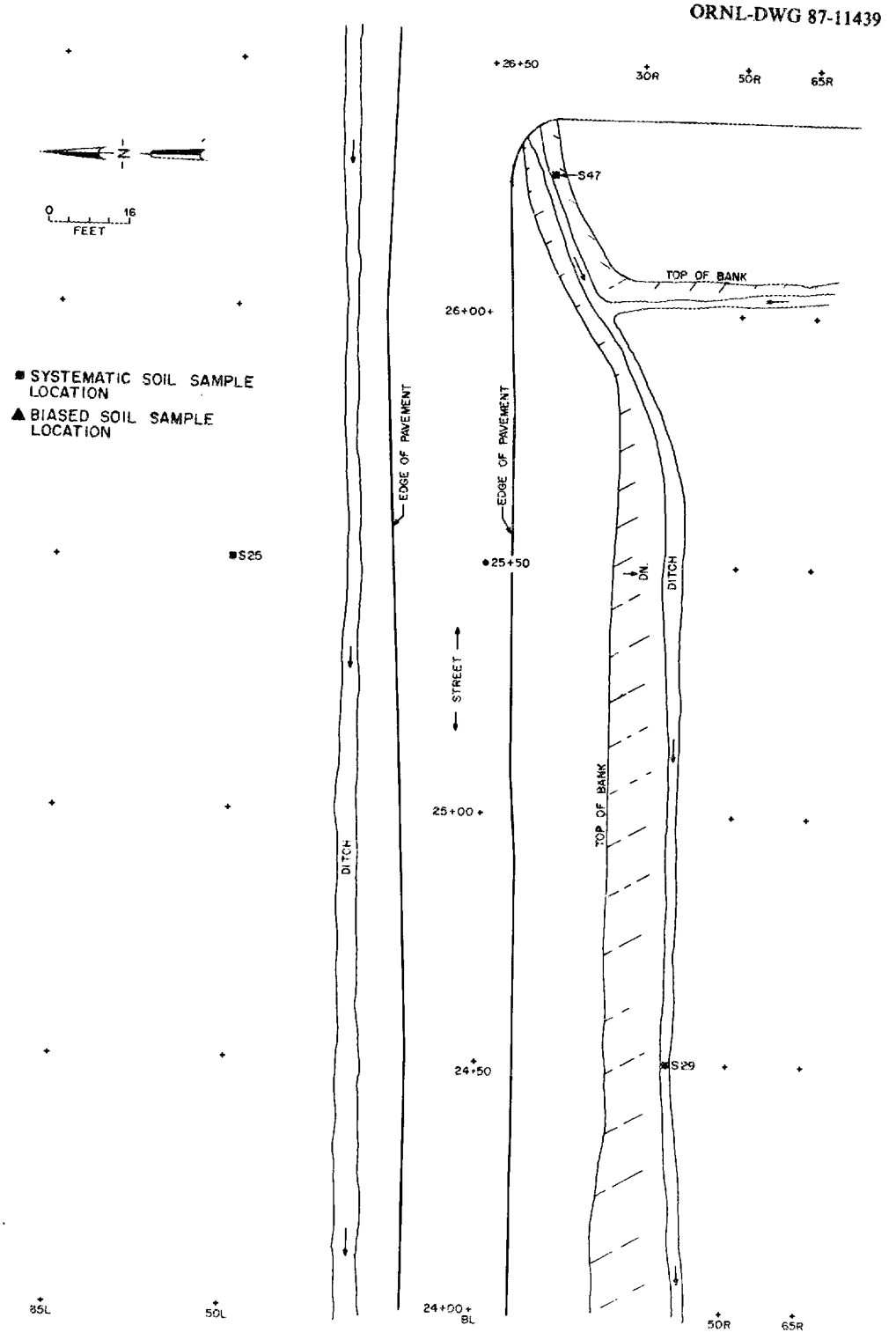

Fig. 13. Locations of surface soil samples taken at Latty Avenue (LM001) between 24+00, BL and 26+50, BL.

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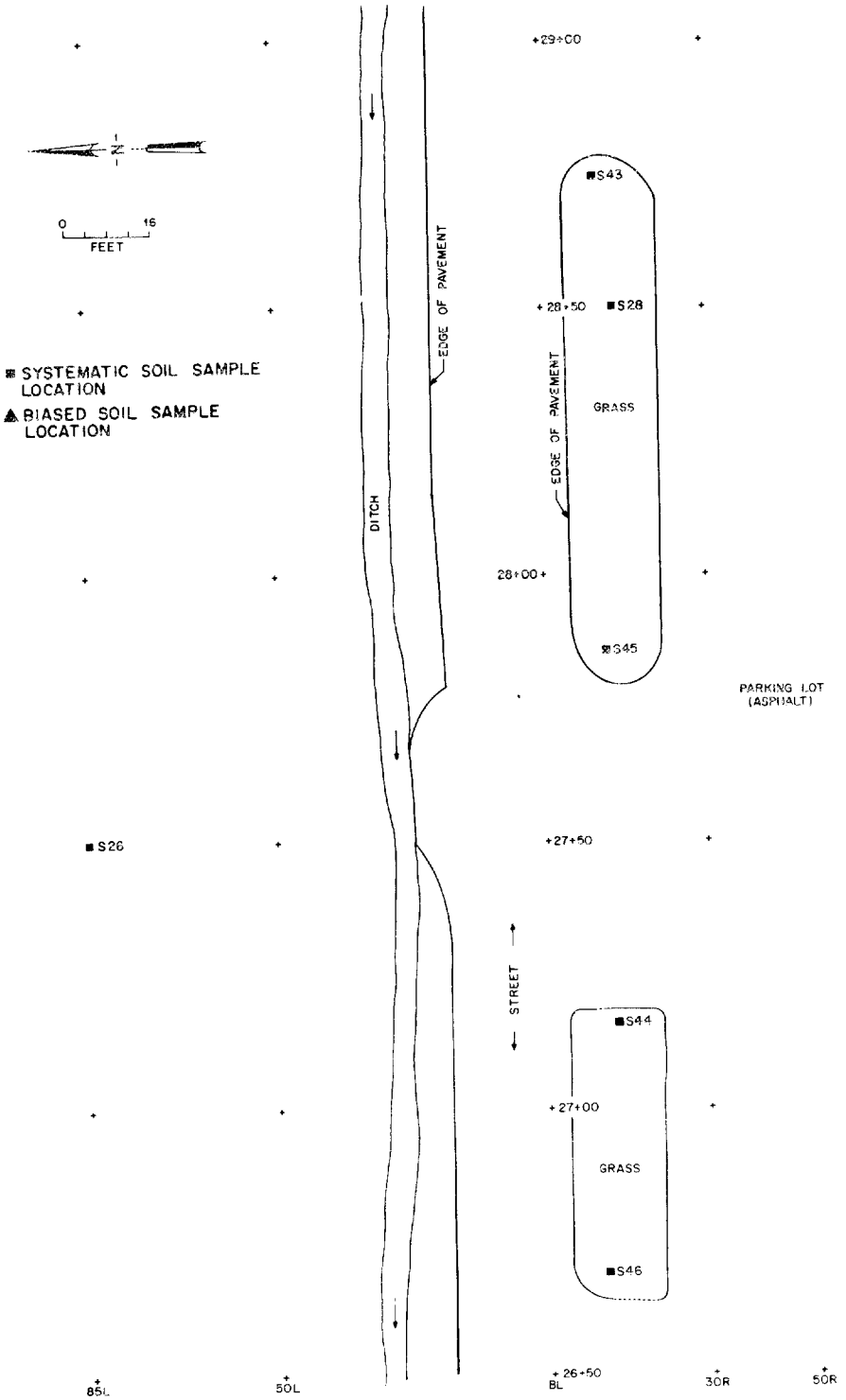

Fig. 14. Locations of surface soil samples taken at Latty Avenue (LM001) between 26+50, BL and 29+00, BL.

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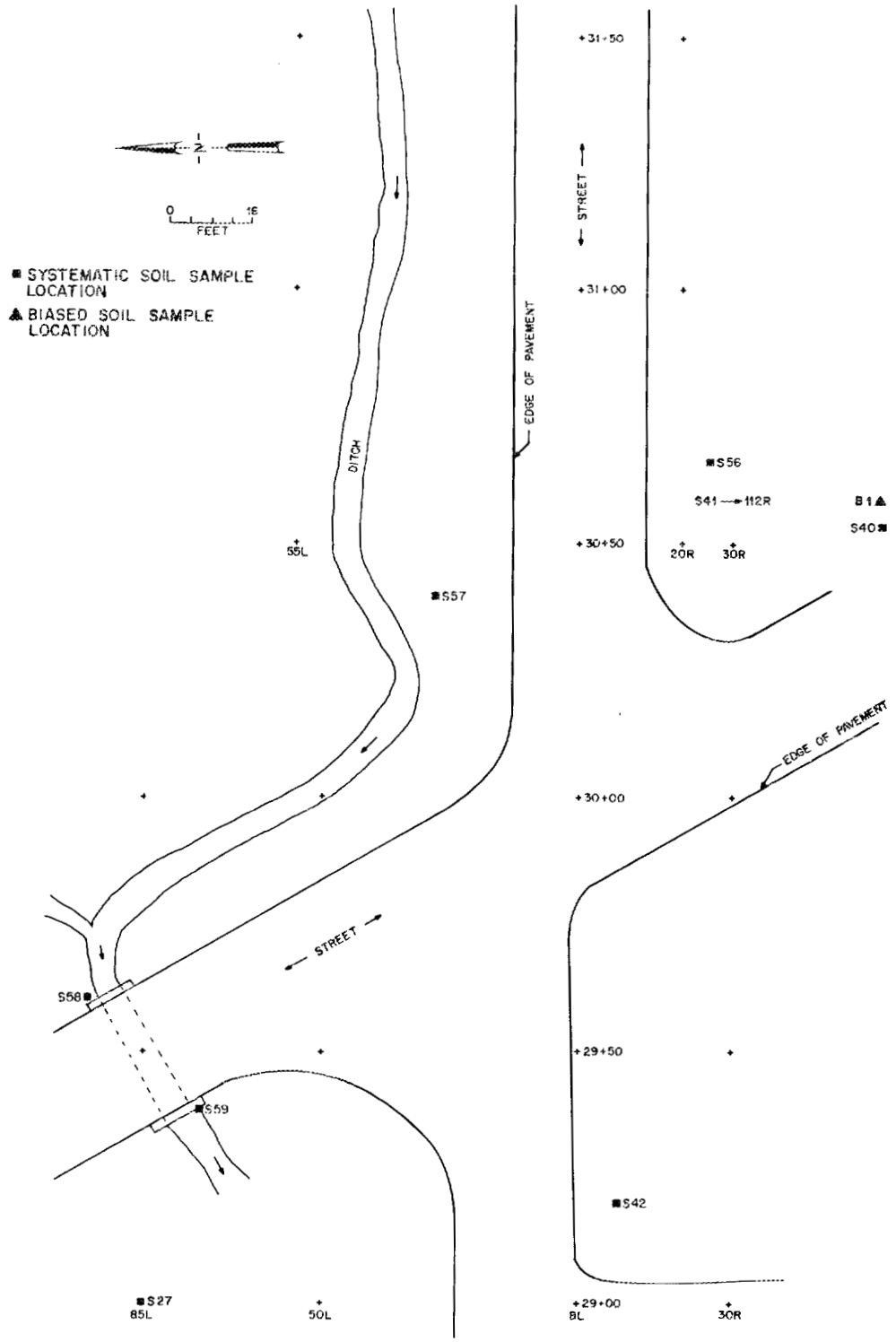

Fig. 15. Locations of surface soil samples taken at Latty Avenue (LM001) between 29+00, BL and 31+50, BL.

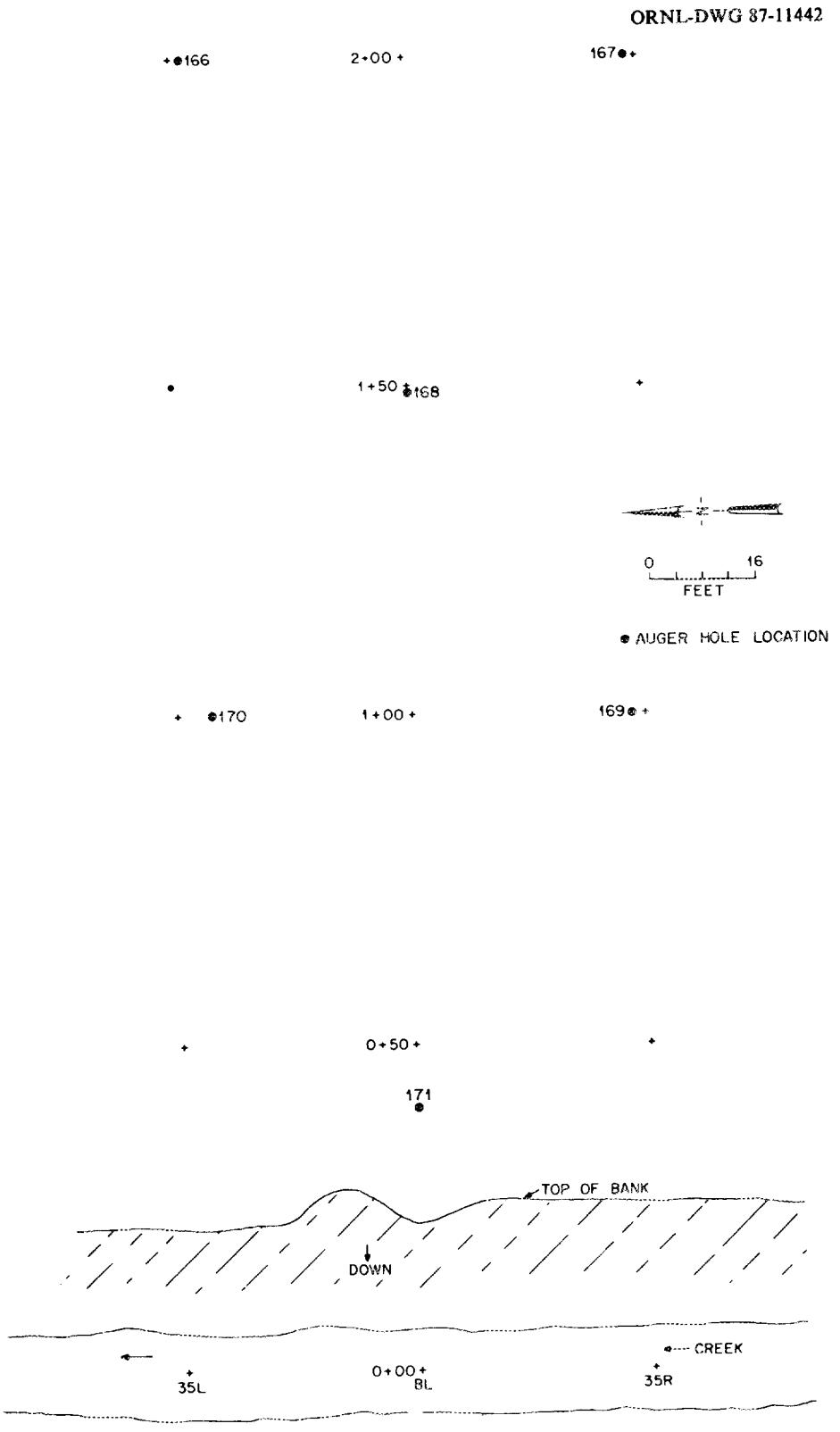

Fig. 16. Locations of auger holes at Latty Avenue (LM001) between 0+00, BL and 2+00, BL.

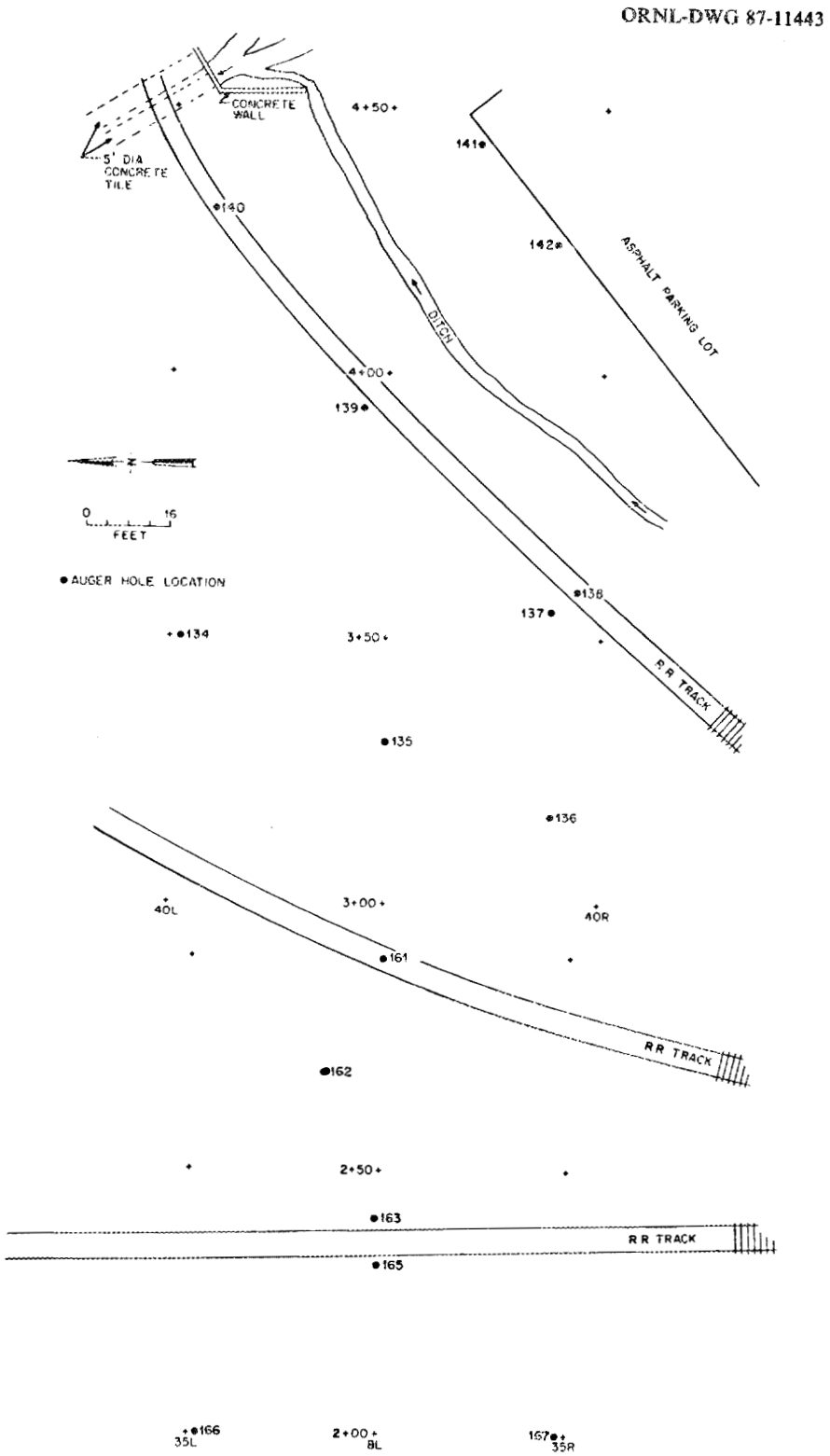

Fig. 17. Locations of auger holes at Latty Avenue (LM001) between 2+00, BL and 4+50, BL.

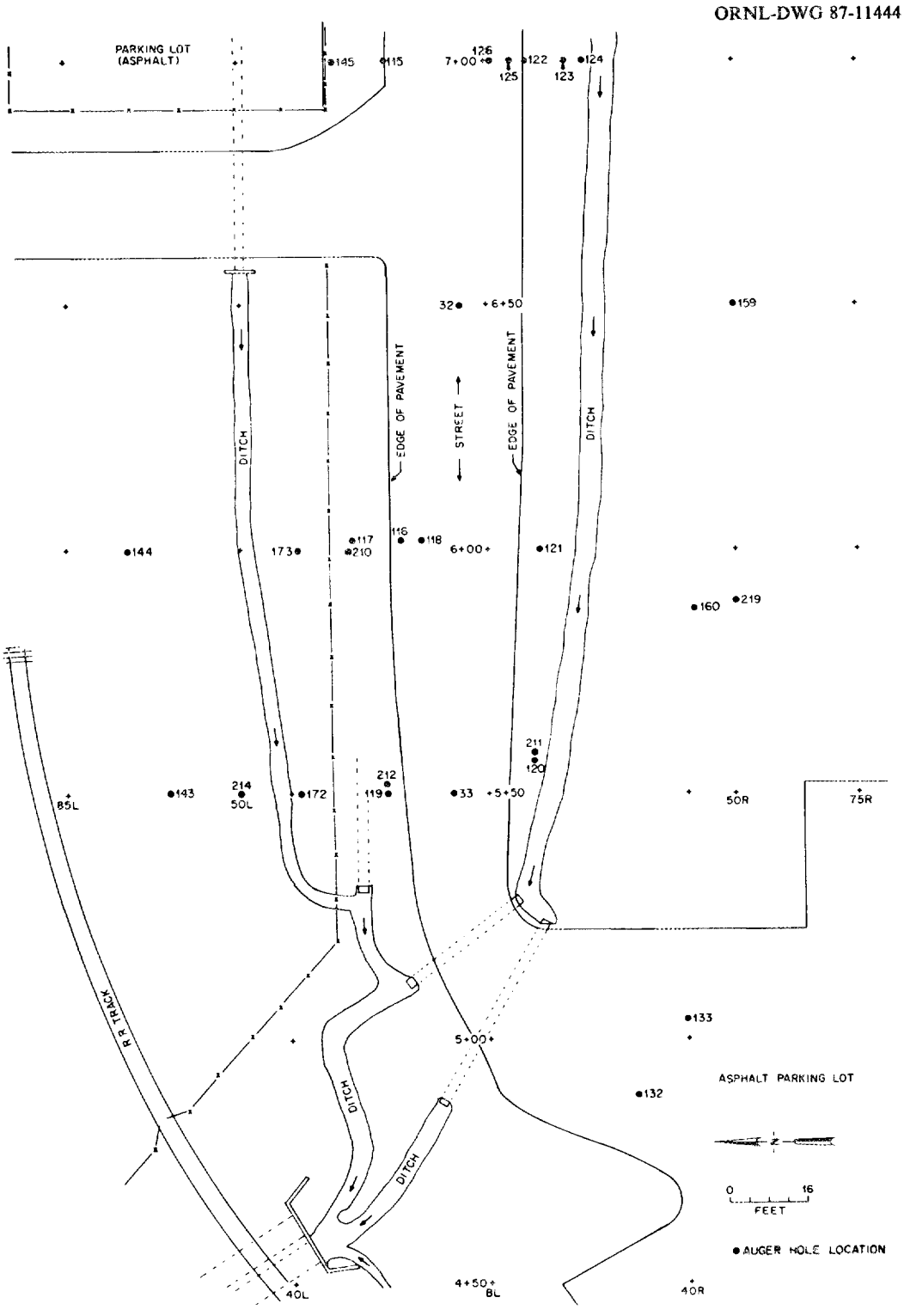

Fig. 18. Locations of auger holes at Latty Avenue (LM001) between 4+50, BL and 7+00, BL.

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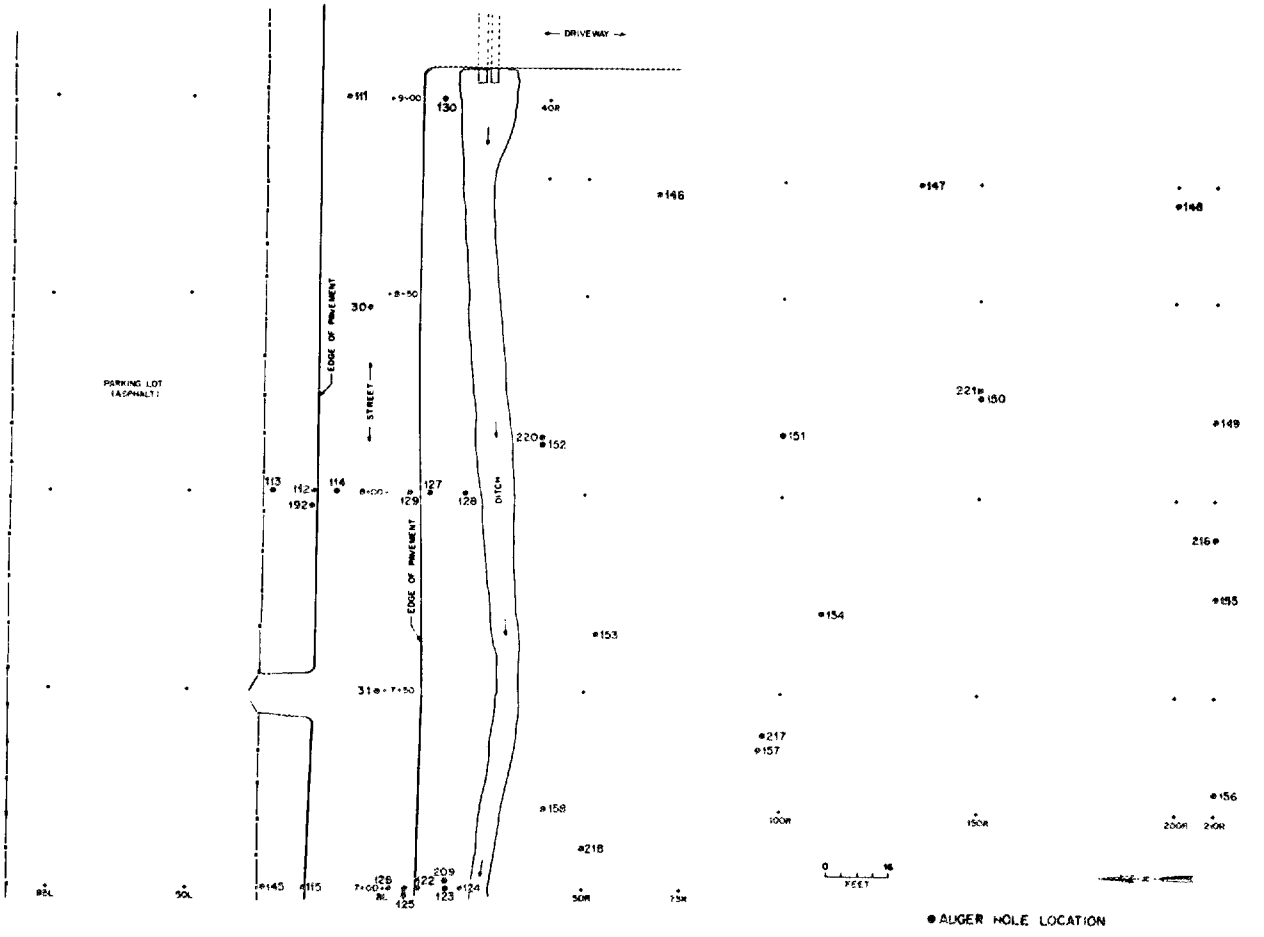

Fig. 19. Locations of auger holes at Latty Avenue (LM001) between 7+00, BL and 9+00, BL.

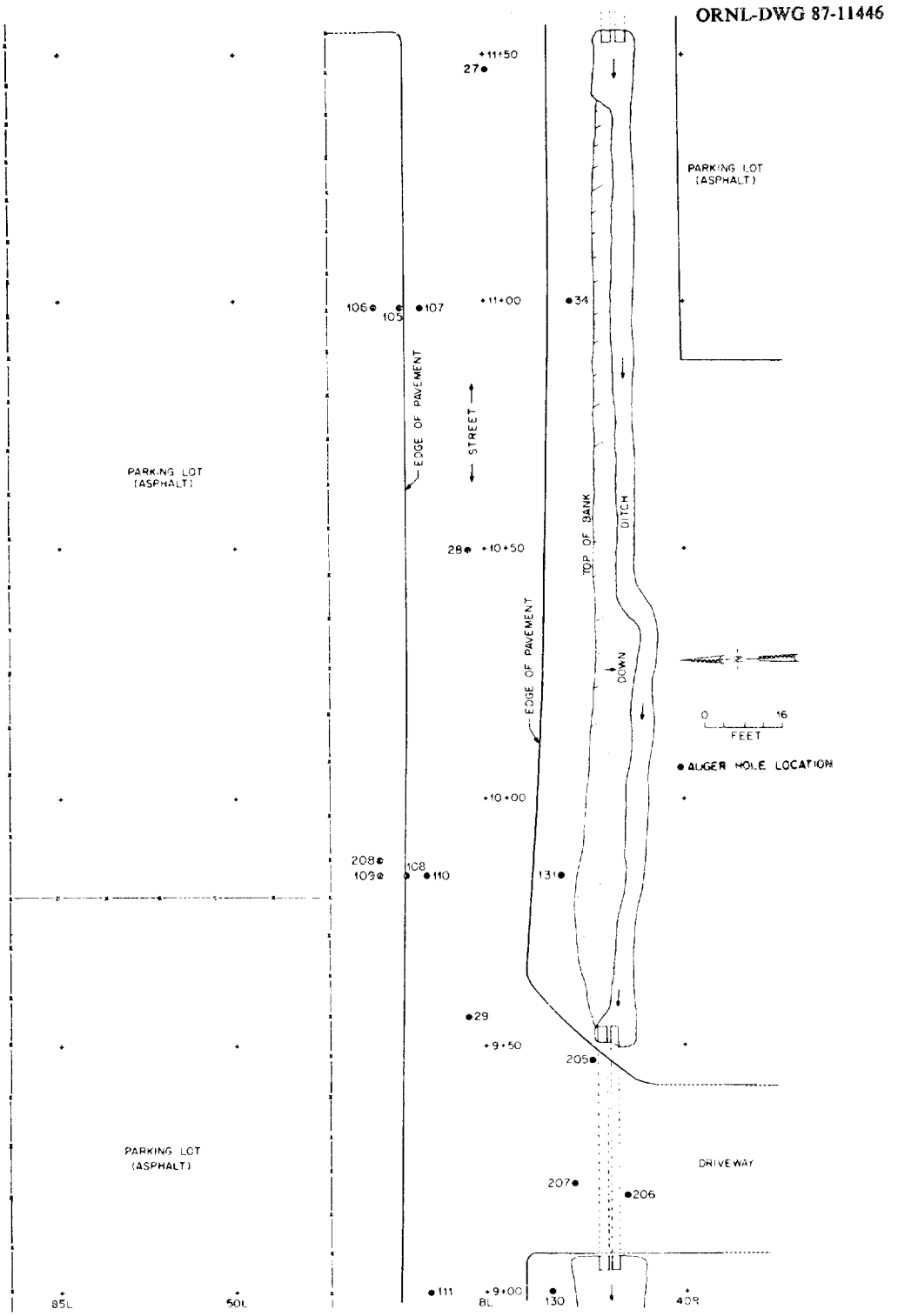

Fig. 20. Locations of auger holes at Latty Avenue (LM001) between 9+00, BL and 11+50, BL.

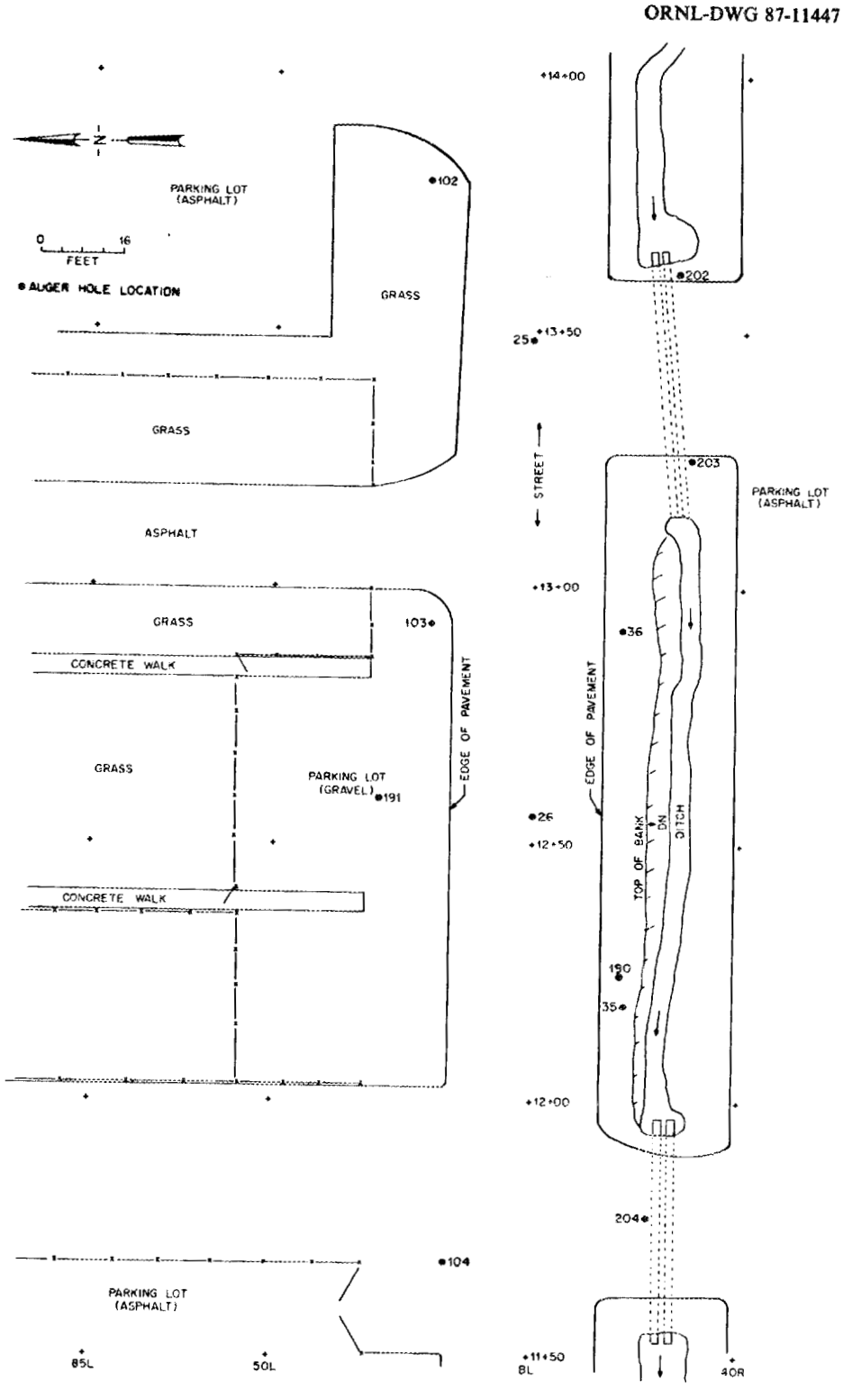

Fig. 21. Locations of auger holes at Latty Avenue (LM001) between 11+50, BL and 14+00, BL.

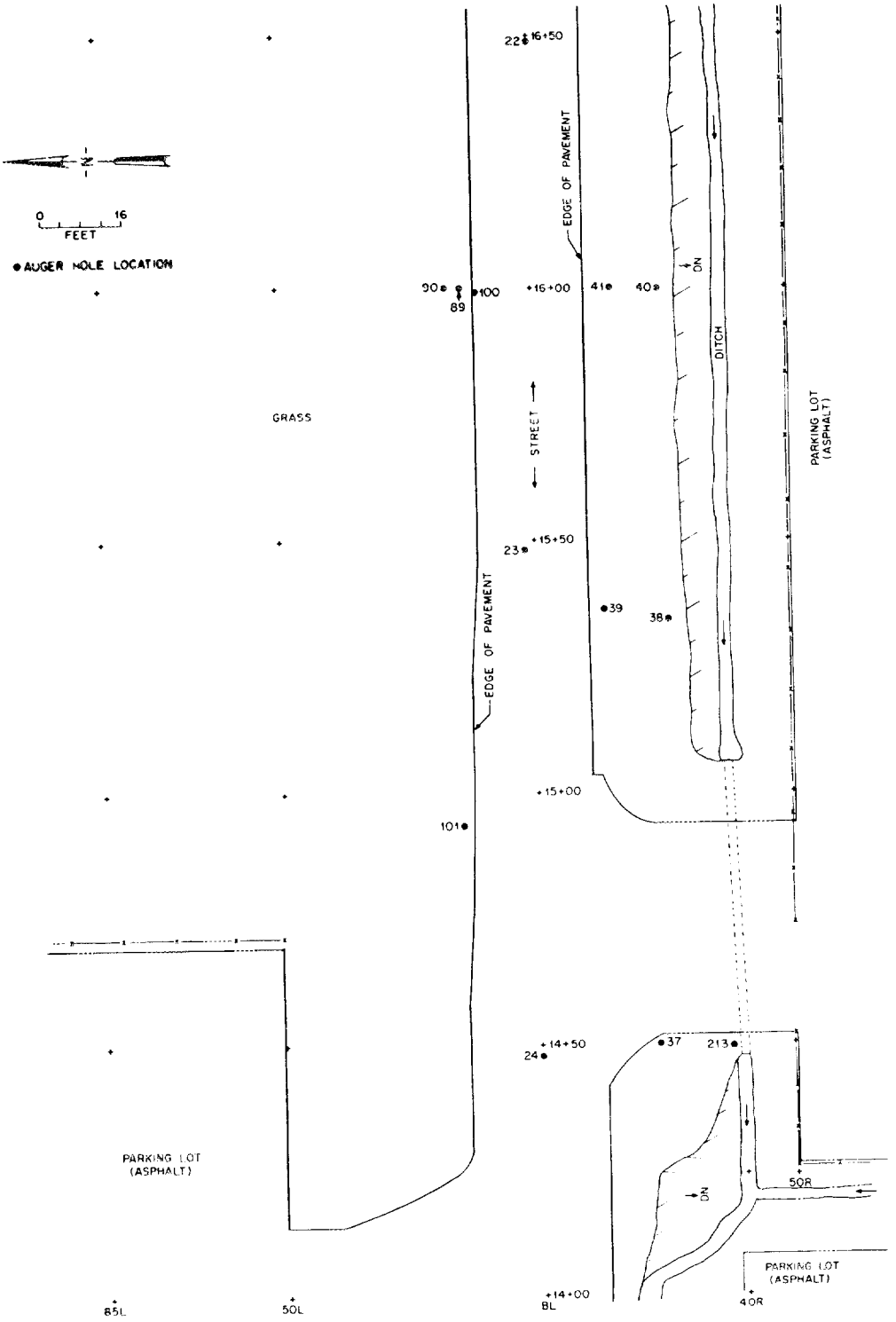

Fig. 22. Locations of auger holes at Latty Avenue (LM001) between 14+00, BL and 16+50, BL.

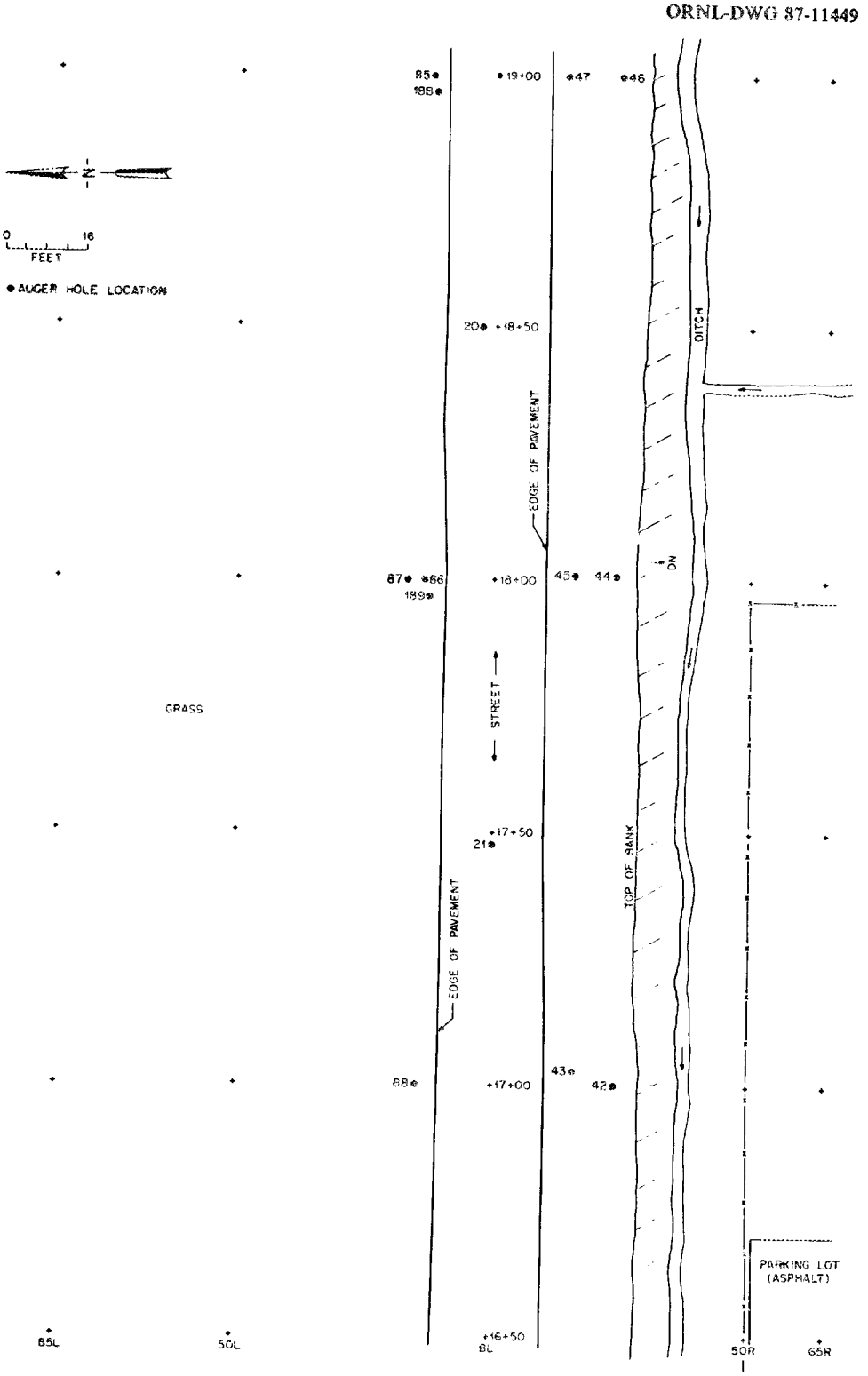

Fig. 23. Locations of auger holes at Latty Avenue (LM001) between 16+50, BL and 19+00, BL.

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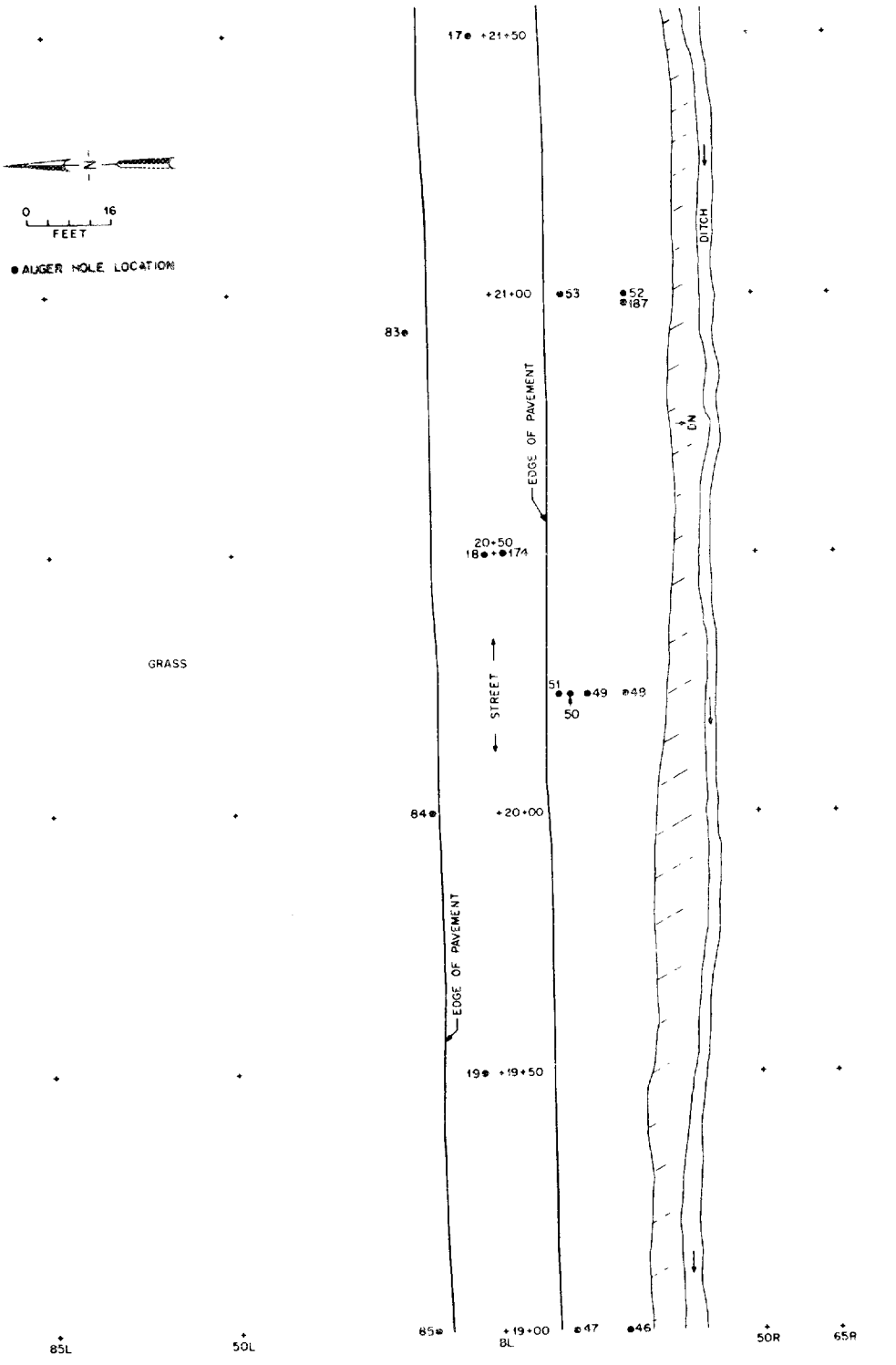

Fig. 24. Locations of auger holes at Latty Avenue (LM001) between 19+00, BL and 21+50, BL.

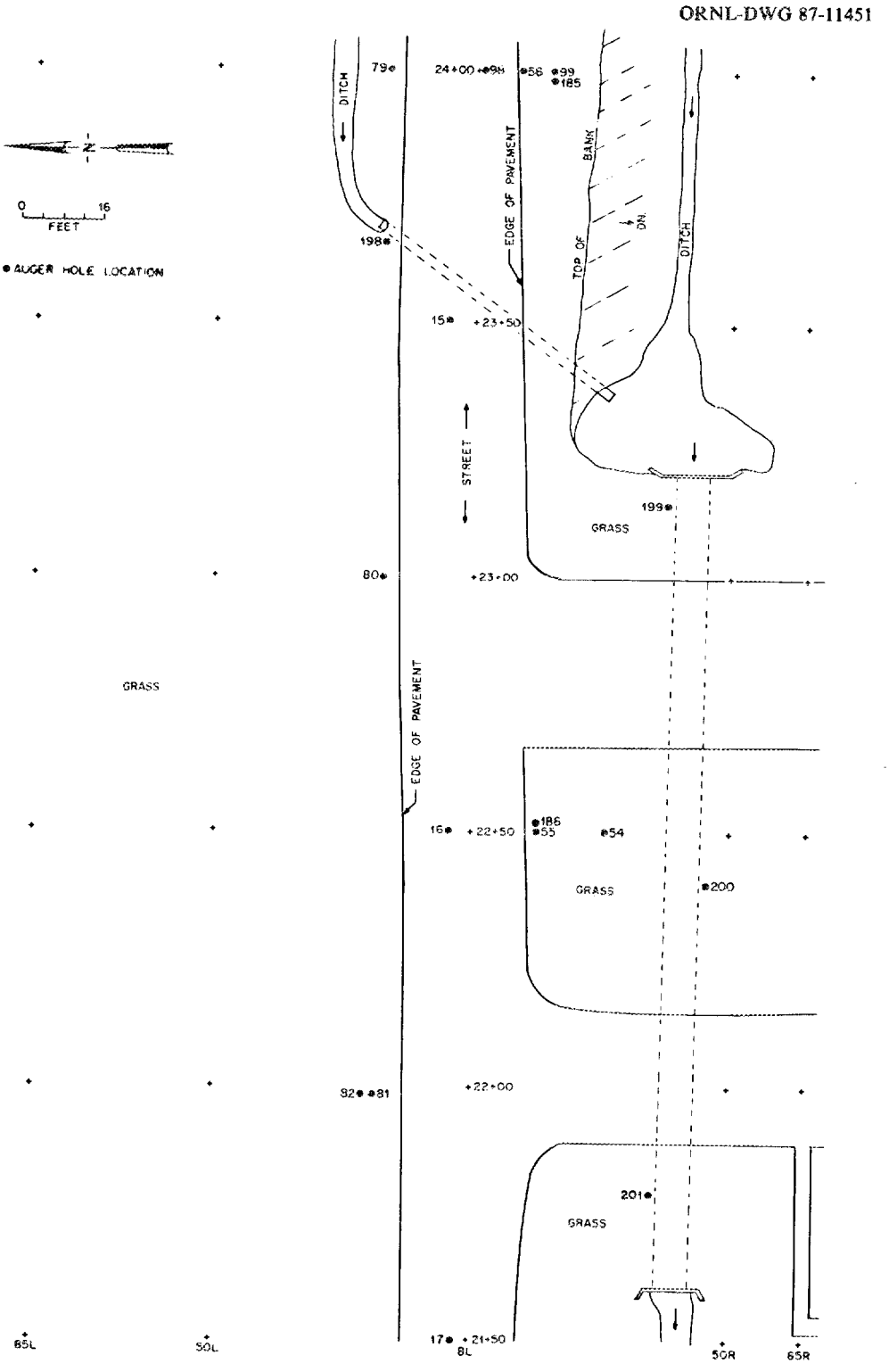

Fig. 25. Locations of auger holes at Latty Avenue (LM001) between 21+50, BL and 24+00, BL.

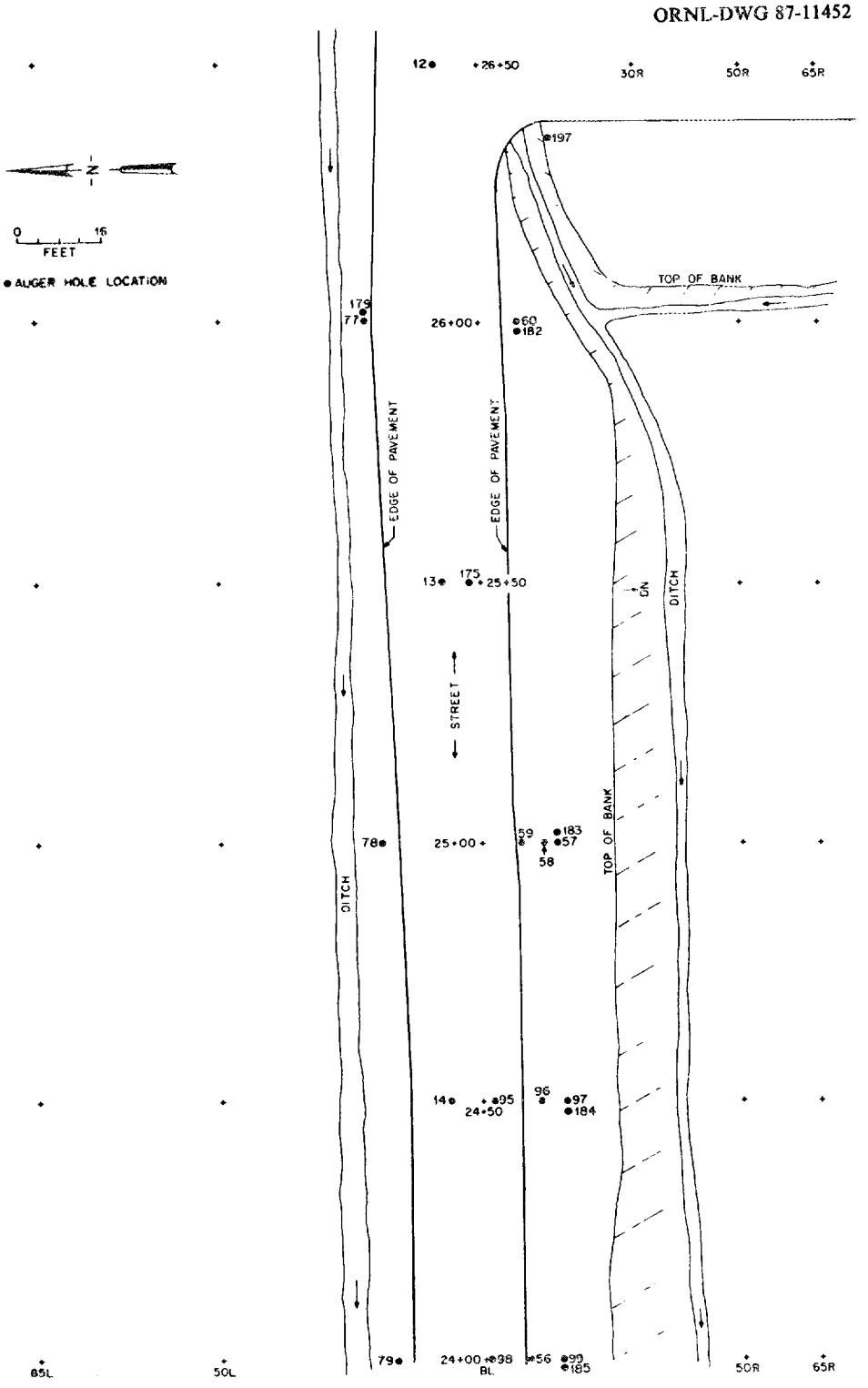

Fig. 26. Locations of auger holes at Latty Avenue (LM001) between 24+00, BL and 26+50, BL.

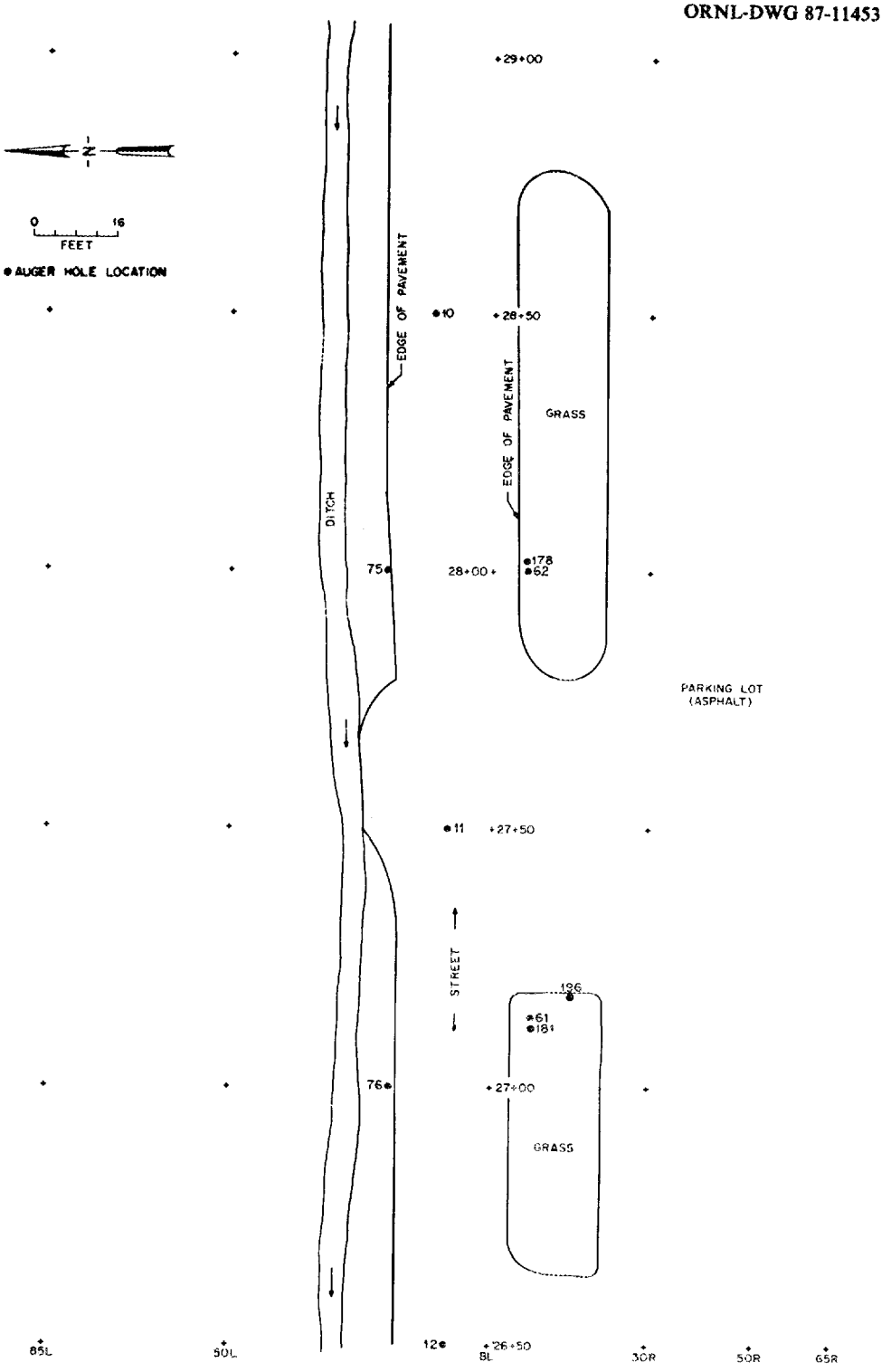

Fig. 27. Locations of auger holes at Latty Avenue (LM001) between 26+50, BL and 29+00, BL.

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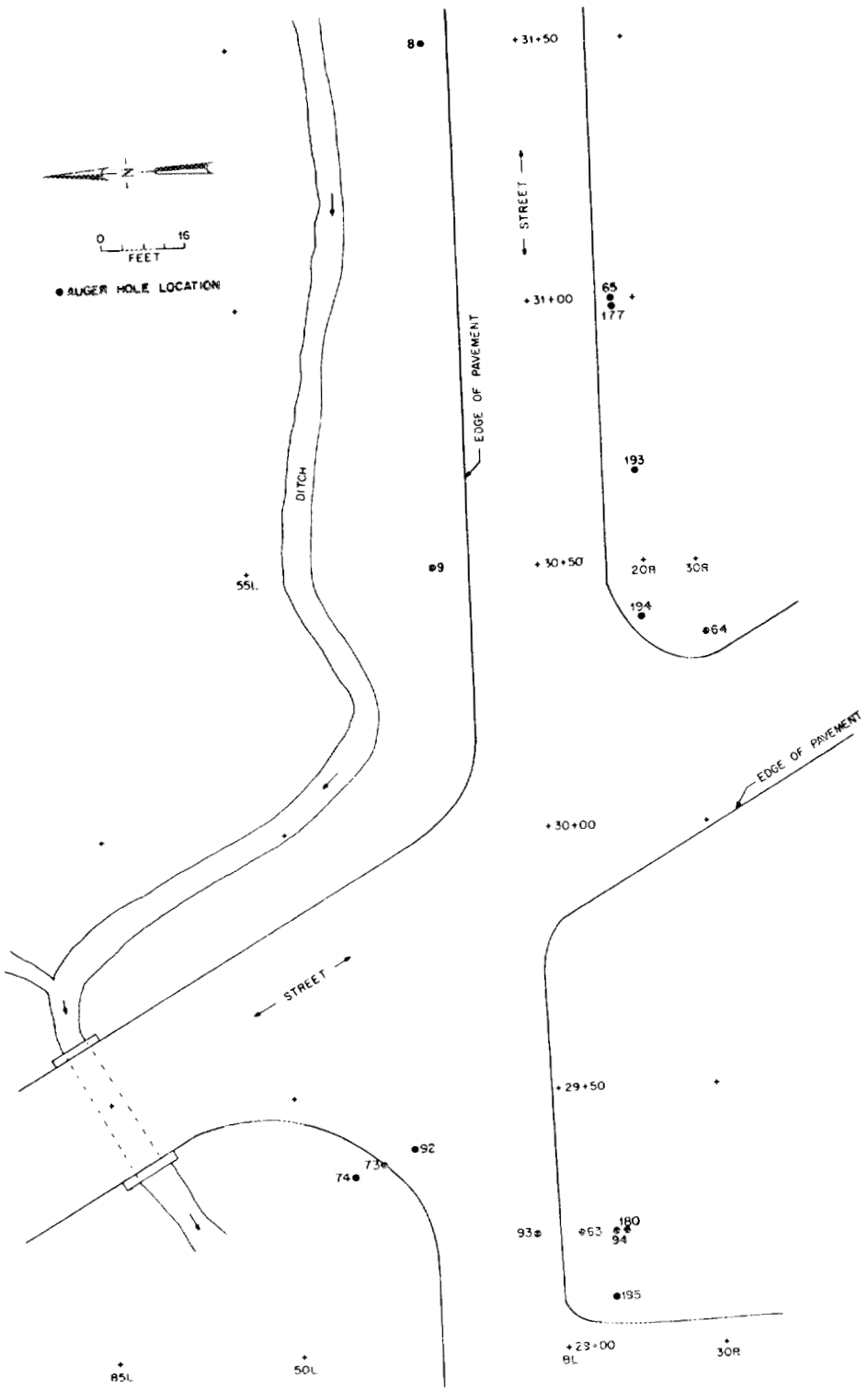

Fig. 28. Locations of auger holes at Latty Avenue (LM001) between 29+00, BL and 31+50, BL.

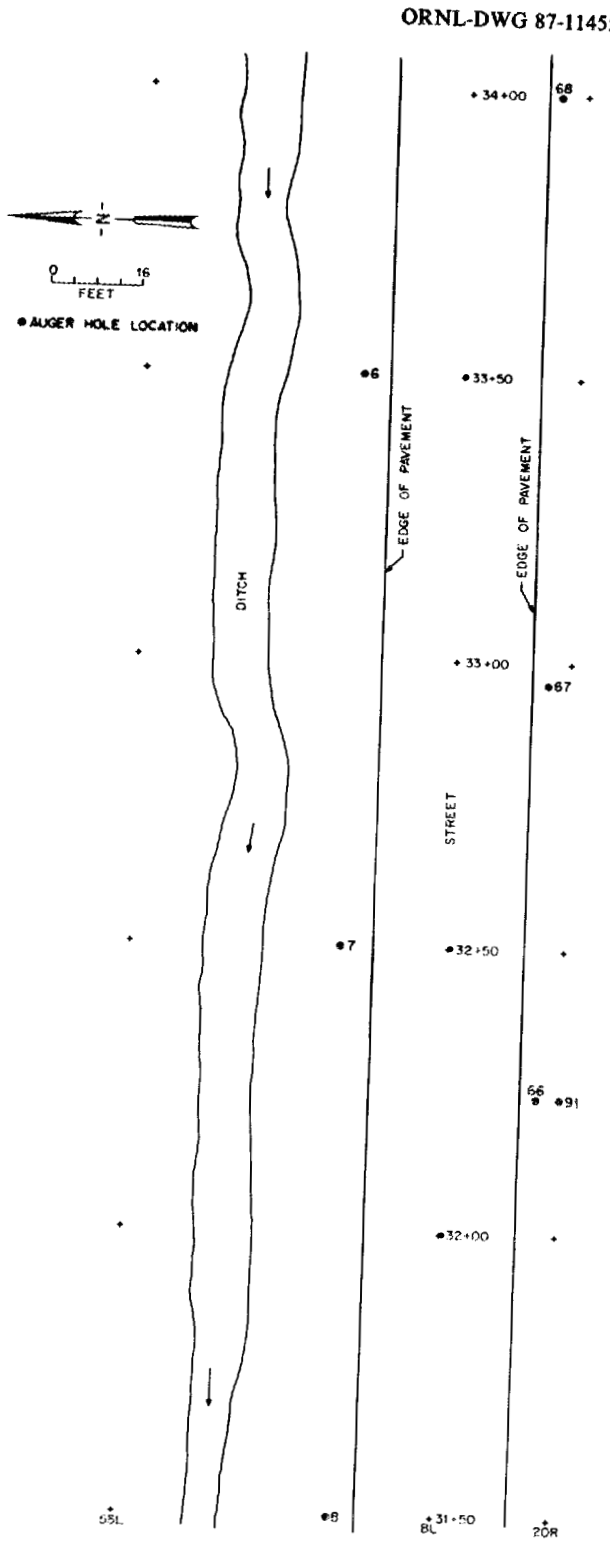

Fig. 29. Locations of auger holes at Latty Avenue (LM001) between 31+50, BL and 34+00, BL.

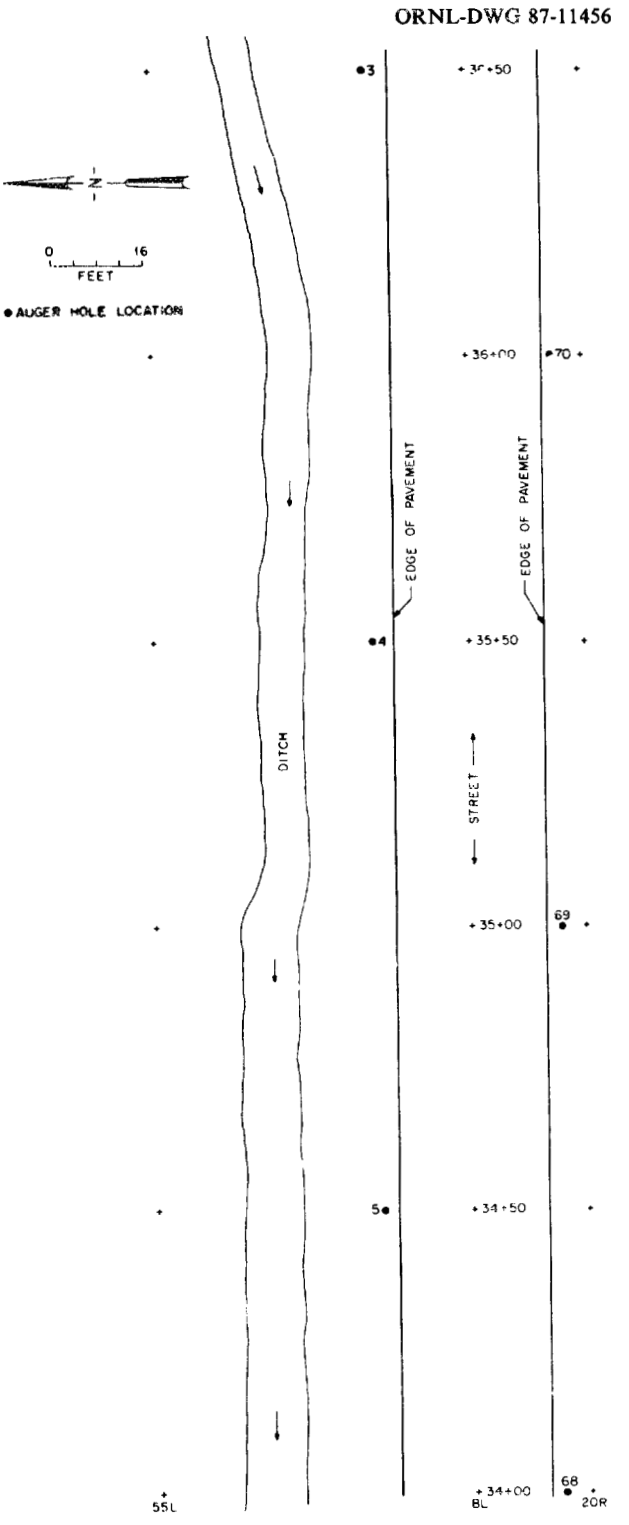

Fig. 30. Locations of auger holes at Latty Avenue (LM001) between 34+00, BL and 36+50, BL.

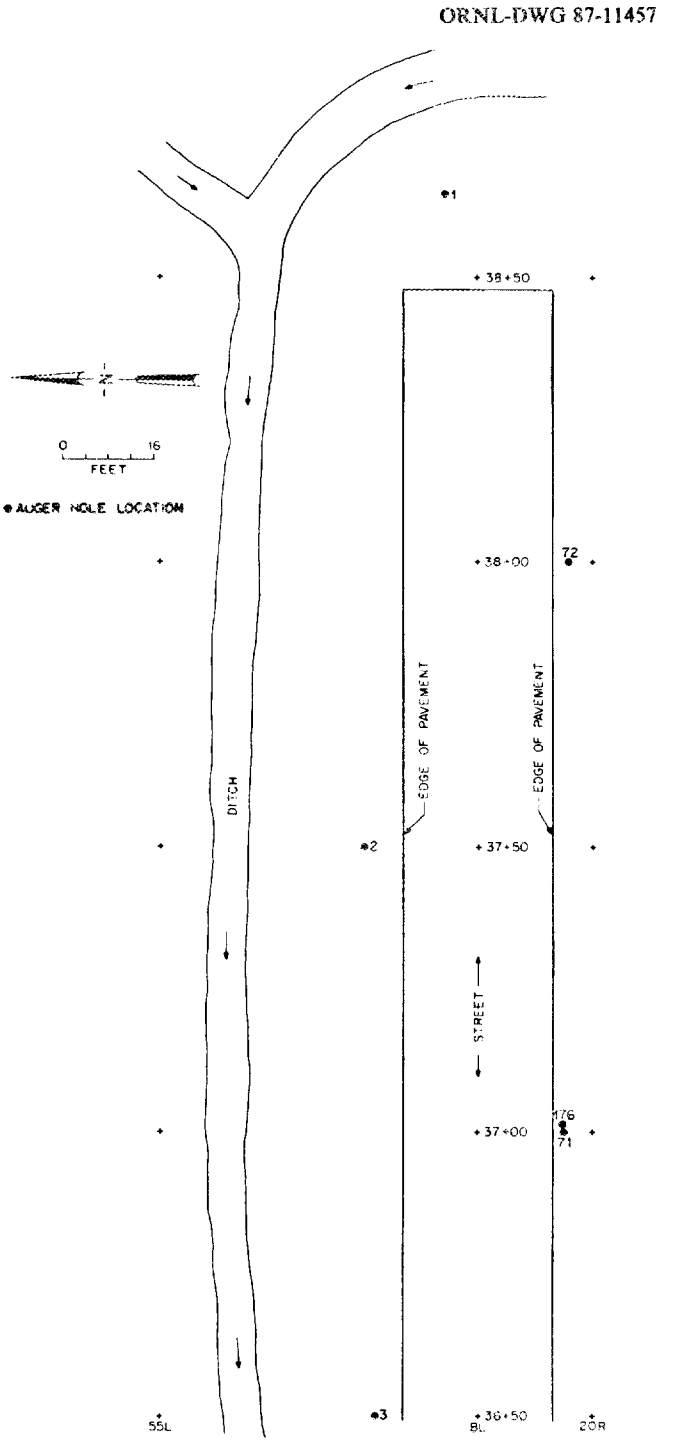

Fig. 31. Locations of auger holes at Latty Avenue (LM001) between 36+50, BL and 38+50, BL.

Table 1. Applicable guidelines for protection against radiation

Mode of exposure	Exposure conditions	Guideline value	Guideline source
Radionuclide concentrations in soil	Maximum permissible concentration of the following radionuclides in soil above background levels averaged over 100 m^2 area	5 pCi/g averaged over the first 15 cm of soil below the surface; 15 pCi/g when averaged over 15-cm-thick soil layers, more than 15 cm below the surface	U.S. Department of Energy Guidelines for Residual Radioactivity at Formerly Utilized Sites Remedial Action Program and Remote Surplus Facilities Management
	^{232}Th		
	^{230}Th		
	^{228}Ra		
	^{226}Ra		
Radionuclides in water	Maximum permissible concentration of the following radionuclides in water for unrestricted use		NRC 10 CFR 20.106 Appendix B, Table II
	^{238}U	4×10^4 pCi/L	
	^{230}Th	2×10^3 pCi/L	
	^{226}Ra	30 pCi/L	
	^{210}Pb	100 pCi/L	
	Maximum contaminant level combined ^{226}Ra and ^{228}Ra in drinking water	5 pCi/L	EPA-National Primary Drinking Water Regulations (40 CFR 141)

Table 2. Background radiation levels in the St. Louis area

Type of radiation measurement or sample	Radiation level or radionuclide concentration	
	Range	Average
Gamma exposure rate at 1 m above floor or ground surface (μR/h)	5–8	6
Concentration of radionuclides in soil (pCi/g)		
^{238}U	0.33–1.2	0.91
^{226}Ra	0.31–1.3	0.96
^{230}Th[a]	0.33–1.2	0.91

[a] ^{230}Th assumed to be in equilibrium with ^{238}U.

Table 3. Gamma exposure rate measurements at Latty Avenue (LM001)

Grid location[a]	Grid point measurements[b] (μR/h)		Range of gamma exposure rates during scan of grid block[c] (μR/h)
	Gamma exposure rate at 1 m	Gamma exposure rate at the surface	
0+00, BL	7	8	7–10
0+50, BL	9	10	9–11
1+00, BL	10	11	9–12
1+50, BL	10	11	9–12
2+00, BL	12	11	11–21
2+50, BL	11	11	9–15
3+00, BL	12	12	9–16
3+50, BL	14	14	13–17
4+00, BL	13	12	11–26
4+50, BL	23	21	11–160
5+00, BL	20	20	15–160
5+40, BL	28	21	21–39
5+50, BL	26	21	21–39
6+00, BL	32	21	21–26
6+50. BL	34	26	17–26
7+00, BL	28	23	14–23
7+50, BL	21	21	13–21
8+00, BL	21	21	11–21
8+50, BL	21	21	6–30
9+00, BL	16	15	11–55
9+50, BL	13	13	11–46
10+00, BL	13	13	9–29
10+50, BL	11	10	9–24
11+00, BL	7	7	6–26
11+50, BL	7	7	6–24
12+00, BL	7	7	6–10
12+50, BL	7	7	6–20
13+00, BL	6	6	5–11
13+50, BL	6	6	5–11
14+00, BL	6	6	05–13
14+50, BL	7	6	06–49
15+00, BL	6	6	05–37
15+50, BL	8	7	05–33
16+00, BL	7	7	06–33
16+50, BL	9	8	06–37
17+00, BL	8	7	05–20
17+50, BL	7	7	06–28

Table 3 (continued)

Grid location[a]	Grid point measurements[b] (μR/h)		Range of gamma exposure rates during scan of grid block[c] (μR/h)
	Gamma exposure rate at 1 m	Gamma exposure rate at the surface	
18+00, BL	7	6	5–21
18+50, BL	6	6	5–28
19+00, BL	7	6	5–23
19+50, BL	7	7	6–28
20+00, BL	7	7	5–39
20+50, BL	6	7	5–32
21+00, BL	6	6	5–21
21+50, BL	6	6	5–26
22+00, BL	5	5	5–12
22+50, BL	6	9	5–10
23+00, BL	5	7	5–10
23+50, BL	6	6	5–17
24+00, BL	6	6	5–17
24+50, BL	6	6	5–13
25+00, BL	7	6	4–10
25+50, BL	6	6	5–10
26+00, BL	6	5	4–10
26+50, BL	5	5	5–10
27+00, BL	5	5	4–9
27+50, BL	6	6	5–15
28+00, BL	5	6	4–9
28+50, BL	5	6	5–12
29+00, BL	5	6	4–24
29+50, BL	11	19	4–21
30+00, BL	5	5	4–21
30+50, BL	5	5	5–10
31+00, BL	5	5	5–10
31+50, BL	5	6	5–10
32+00, BL	6	5	5–10
32+50, BL	6	6	5–10
33+00, BL	5	5	5–10
33+50, BL	5	6	5–10
34+00, BL	6	5	5–10
34+50, BL	5	6	5–7
35+00, BL	5	6	5–7
35+50, BL	6	5	5–7
36+00, BL	6	6	5–7
36+50, BL	5	6	5–7
37+00, BL	5	6	5–7

Table 3 (continued)

Grid location[a]	Grid point measurements[b] (μR/h)		Range of gamma exposure rates during scan of grid block[c] (μR/h)
	Gamma exposure rate at 1 m	Gamma exposure rate at the surface	
37+50, BL	5	6	5–7
38+00, BL	5	6	5–7
38+50, BL	6	8	–
0+00, 35R	d	d	7–10
0+50, 35R	10	10	9–11
1+00, 35R	12	11	9–12
1+50, 35R	10	11	9–12
2+00, 35R	12	12	11–21
2+50, 35R	14	15	11–21
3+00, 35R	12	12	–
3+00, 40R	12	12	12–15
3+50, 40R	12	12	12–20
4+00, 40R	16	17	15–59
4+50, 40R	21	19	19–160
5+00, 40R	26	23	21–660
5+50, 40R	79	57	–
5+50, 50R	79	92	92–280
6+00, 50R	180	180	26–720
6+50, 50R	59	46	26–330
7+00, 50R	240	260	13–260
7+50, 50R	79	87	12–130
8+00, 50R	26	24	19–29
8+50, 50R	24	24	21–39
8+80, 40R	26	26	17–26
9+00, 40R	26	26	13–26
9+50, 40R	23	23	13–33
10+00, 40R	16	15	13–59
10+50, 40R	14	14	9–39
11+00, 40R	11	11	9–26
11+50, 40R	9	9	6–9
12+00, 40R	9	8	6–26
12+50, 40R	8	7	6–21
13+00, 40R	6	6	6–7
13+50, 40R	6	5	6–26
14+00, 40R	6	6	6–53
14+24, 50R	9	8	–
14+50, 50R	7	9	5–12
15+00, 50R	7	6	6–99
15+50, 50R	6	8	6–53

Table 3 (continued)

Grid location[a]	Grid point measurements[b] (μR/h)		Range of gamma exposure rates during scan of grid block[c] (μR/h)
	Gamma exposure rate at 1 m	Gamma exposure rate at the surface	
16+00, 50R	7	8	6–53
16+50, 50R	7	7	6–55
17+00, 50R	9	9	6–49
17+50. 50R	9	9	6–50
18+00, 50R	8	7	6–20
18+50, 50R	9	9	6–22
19+00, 50R	9	9	6–29
19+50, 50R	10	9	6–32
20+00, 50R	9	9	6–33
20+50, 50R	9	9	6–22
21+00, 50R	10	9	6–29
21+50, 50R	9	10	6–17
22+00, 50R	4	4	4–12
22+50, 50R	7	7	4–10
23+00, 50R	5	5	5–19
23+50, 50R	9	8	5–11
24+00, 50R	7	9	5–23
24+50, 50R	9	9	6–21
25+00, 50R	7	8	5–26
25+50, 50R	7	7	5–26
26+00, 50R	7	6	4–26
26+50, 30R	5	4	–
26+50, 50R	4	6	4–32
27+00, 30R	4	5	4–12
27+50, 30R	4	5	4–21
28+00, 30R	4	4	4–26
28+50, 30R	5	5	4–21
29+00, 30R	5	5	8–29
29+50, 30R	8	9	7–29
30+00, 30R	6	6	6–26
30+50, 30R	9	9	–
30+50, 20R	9	9	7–10
31+00, 20R	7	7	7–10
31+50, 20R	7	8	7–10
32+00, 20R	7	7	7–86
32+50, 20R	7	8	7–10
33+00, 20R	7	7	7–10
33+50, 20R	8	7	7–10
34+00, 20R	7	8	7–10

Table 3 (continued)

Grid location[a]	Grid point measurements[b] (μR/h)		Range of gamma exposure rates during scan of grid block[c] (μR/h)
	Gamma exposure rate at 1 m	Gamma exposure rate at the surface	
34+50, 20R	7	6	6–10
35+00, 20R	7	8	7–10
35+50, 20R	7	7	7–10
36+00, 20R	8	7	7–10
36+50, 20R	6	7	7–10
37+00, 20R	9	9	7–10
37+50, 20R	8	8	7–10
38+00, 20R	7	8	7–10
38+50, 20R	6	7	--
18+00, 65R	7	6	7–9
18+50, 65R	8	8	7–9
19+00, 65R	7	7	7–10
19+50, 65R	10	10	8–11
20+00, 65R	9	9	8–11
20+50, 65R	6	7	6–10
21+00, 65R	10	10	6–10
21+50, 65R	6	6	4–9
22+00, 65R	5	4	4–9
22+50, 65R	6	6	4–9
23+00, 65R	5	5	6–10
23+50, 65R	7	9	7–9
24+00, 65R	8	9	7–9
24+50, 65R	8	8	7–9
25+00, 65R	7	7	7–9
25+50, 65R	6	5	6–9
26+00, 65R	7	7	6–9
26+50, 65R	4	4	--
5+50, 75R	72	68	39–720
6+00, 75R	160	160	39–210
6+50, 75R	42	39	39–460
7+00, 75R	53	37	39–340
7+20, 75R	130	120	--
7+20, 100R	33	26	39–280
7+50, 100R	45	42	24–290
8+00, 100R	92	63	20–110
8+50, 100R	99	79	20–260
7+20, 150R	26	22	33–79
7+50, 150R	32	32	39–400
8+00, 150R	87	59	79–530

Table 3 (continued)

Grid location[a]	Grid point measurements[b] (μR/h)		Range of gamma exposure rates during scan of grid block[c] (μR/h)
	Gamma exposure rate at 1 m	Gamma exposure rate at the surface	
8+50, 150R	380	490	79–530
7+20, 200R	58	55	33–79
7+50, 200R	76	84	39–200
8+00, 200R	66	66	66–560
8+50, 200R	86	130	99–600
7+20, 210R	42	46	46–99
7+50, 210R	59	55	53–105
8+00, 210R	68	64	53–132
8+50, 210R	66	55	66–329
0+00, 35L	e	e	–
0+50, 35L	11	11	–
1+00, 35L	9	9	–
1+50, 35L	10	10	–
2+00, 35L	11	11	–
2+50, 35L	14	14	–
2+90, 35L	10	10	–
2+90, 40L	10	10	–
3+00, 40L	10	9	–
3+50, 40L	13	14	–
4+00, 40L	16	17	–
4+50, 40L	16	12	–
5+00, 40L	28	26	–
5+50, 40L	26	26	–
5+50, 50L	21	21	19–23
6+00, 50L	21	23	17–28
6+50, 50L	30	28	11–28
7+00, 50L	15	14	14–17
7+50, 50L	15	15	13–16
8+00, 50L	9	9	9–14
8+50, 50L	10	9	9–13
9+00, 50L	9	9	9–11
9+50, 50L	9	9	7–12
10+00, 50L	10	10	9–12
10+50, 50L	9	7	7–10
11+00, 50L	8	8	6–9
11+50, 50L	7	7	6–9
12+50, 50L	7	7	6–10
12+00, 50L	7	8	6–11

Table 3 (continued)

Grid location[a]	Grid point measurements[b] (μR/h)		Range of gamma exposure rates during scan of grid block[c] (μR/h)
	Gamma exposure rate at 1 m	Gamma exposure rate at the surface	
13+00, 50L	7	6	6–11
13+50, 50L	4	4	5–7
14+00, 50L	5	6	5–7
14+50, 50L	6	6	5–7
15+00, 50L	5	7	5–10
15+50, 50L	8	8	6–10
16+00, 50L	8	9	6–10
16+50, 50L	7	8	6–10
17+00, 50L	9	9	6–10
17+50, 50L	9	9	6–10
18+00, 50L	9	8	6–10
18+50, 50L	9	8	6–10
19+00, 50L	8	8	6–10
19+50, 50L	7	8	6–10
20+00, 50L	9	8	6–10
20+50, 50L	8	8	6–10
21+00, 50L	9	9	6–10
21+50, 50L	8	9	6–10
22+00, 50L	9	8	6–10
22+50, 50L	9	7	6–10
23+00, 50L	9	9	6–10
23+50, 50L	8	9	6–10
24+00, 50L	8	9	6–10
24+50, 50L	8	8	6–10
25+00, 50L	7	8	6–10
25+50, 50L	9	8	6–10
26+00, 50L	7	7	6–10
26+50, 50L	8	8	6–10
27+00, 50L	7	9	6–10
27+50, 50L	7	8	6–10
28+00, 50L	8	8	6–10
28+50, 50L	7	7	6–10
29+00, 50L	7	7	6–10
29+50, 50L	5	5	–
30+00, 55L	9	9	–
30+50, 55L	7	7	–
31+00, 55L	7	7	–
31+50, 55L	6	6	–
32+00, 55L	7	6	–

Table 3 (continued)

Grid location[a]	Grid point measurements[b] (μR/h)		Range of gamma exposure rates during scan of grid block[c] (μR/h)
	Gamma exposure rate at 1 m	Gamma exposure rate at the surface	
32+50, 55L	7	7	–
33+00, 55L	7	7	–
33+50, 55L	7	8	–
34+00, 55L	6	7	–
34+50, 55L	7	7	–
35+00, 55L	7	7	–
35+50, 55L	6	7	–
36+00, 55L	7	7	–
36+50, 55L	6	8	–
37+00, 55L	7	7	–
37+50, 55L	6	7	–
38+00, 55L	6	7	–
38+50, 55L	9	7	–
5+40, 85L	16	7	–
5+50, 85L	16	16	–
6+00, 85L	17	16	–
6+50, 85L	17	15	–
7+00, 85L	15	13	–
7+50, 85L	11	8	–
8+00, 85L	12	9	–
8+50, 85L	9	6	–
9+00, 85L	7	5	–
9+50, 85L	6	6	–
10+00, 85L	9	10	–
10+50, 85L	5	5	–
11+00, 85L	7	7	–
11+50, 85L	7	7	–
12+00, 85L	7	7	–
12+50, 85L	9	8	–
13+00, 85L	7	7	–
13+50, 85L	4	4	–
14+00, 85L	5	5	–
14+50, 85L	5	5	–
15+00, 85L	4	5	–
15+50, 85L	8	8	–
16+00, 85L	7	7	–
16+50, 85L	7	8	–
17+00, 85L	9	8	–
17+50, 85L	9	9	–

Table 3 (continued)

Grid location[a]	Grid point measurements[b] (μR/h)		Range of gamma exposure rates during scan of grid block[c] (μR/h)
	Gamma exposure rate at 1 m	Gamma exposure rate at the surface	
18+00, 85L	9	9	–
18+50, 85L	9	9	–
19+00, 85L	7	8	–
19+50, 85L	7	8	–
20+00, 85L	9	8	–
20+50, 85L	9	9	–
21+00, 85L	8	8	–
21+50, 85L	7	8	–
22+00, 85L	7	7	–
22+50, 85L	9	7	–
23+00, 85L	6	7	–
23+50, 85L	8	9	–
24+00, 85L	9	9	–
24+50, 85L	8	8	–
25+00, 85L	8	8	–
25+50, 85L	9	8	–
26+00, 85L	7	7	–
26+50, 85L	9	9	–
27+00, 85L	8	8	–
27+50, 85L	8	8	–
28+00, 85L	8	8	–
28+50, 85L	7	8	–
29+00, 85L	7	7	–
29+50, 85L	5	6	–

[a]Grid location shown on Fig. 1.
[b]Grid point measurements are discrete measurements at grid point.
[c]Grid block measurements are obtained by a gamma scan of the entire block.
[d]Inaccessible.

Table 4. Results of analyses of soil samples taken at Latty Avenue (LM001)

Sample/ hole number	Location[a]	Depth (cm)	Radionuclide concentration (pCi/g)		
			^{226}Ra[b]	^{230}Th[c]	^{238}U[d]
		Systematic samples[e]			
S1	3+65, 12R	0–15	1.9 ±0.7	51	1.9
S2A	3+70, 16L	0–15	2.7 ±0.3	68	2.4
B		15–30	1.8 ±0.04	28	1.6
S3A	3+75, 32L	0–15	2.5 ±0.4	72	2.5
B		15–30	1.2 ±0.3	12	1.2
C		30–45	1.3 ±0.1	<5.4	1.1
D		45–60	1.1 ±0.2	<4.5	1.0
S4A	4+15, 36L	0–15	2.0 ±0.4	47	1.9
B		15–30	1.6 ±0.2	22	1.6
S5	3+15, 32L	0–15	2.2 ±0.3	54	2.2
S6	2+88, 28L	0–15	1.5 ±0.3	17	1.5
S7A	2+50, 32L	0–15	3.6 ±0.1	19	3.3
B		15–30	3.5 ±0.3	15	3.2
C		30–45	3.1 ±0.3	9.5	3.0
D		50–60	2.9 ±0.3	7.8	2.8
S8	2+50, 30R	0–15	1.6 ±0.1	14	1.6
S9A	2+25, 32L	0–15	3.6 ±0.1	21	3.2
B		15–30	3.4 ±0.1	9.0	3.2
S10	2+25, 32R	0–15	2.8 ±0.2	25	2.6
S11A	1+75, 18L	0–15	1.7 ±0.4	30	1.5
B		15–30	1.6 ±0.1	19	1.4
C		30–45	1.2 ±0.08	<3.6	1.0
D		45–60	1.3 ±0.2	<3.2	1.1
S12A	1+75, 18R	0–15	1.9 ±0.1	38	1.8
B		15–30	1.4 ±0.3	7.2	1.3
C		30–45	1.1 ±0.2	2.9	1.0
D		45–60	1.1 ±0.2	<3.2	0.99
S13	1+25, 18L	0–10	1.4 ±0.2	31	1.4
S14A	1+25, 18R	0–15	1.4 ±0.2	16	1.3
B		15–30	1.5 ±0.4	20	1.4
S15A	0+75, 18L	0–15	1.9 ±0.4	30	1.9
B	0+75, 18L	15–30	1.5 ±0.3	16	1.4
C	0+75, 18L	30–45	1.1 ±0.2	<5.0	1.0
D	0+75, 18L	45–60	1.2 ±0.2	<3.2	1.0
S16A	0+75, 18R	0–15	1.7 ±0.05	23	1.5
B		15–30	1.4 ±0.1	18	1.4
C		30–45	1.2 ±0.03	7.3	1.2
D		45–60	1.1 ±0.2	3.8	1.1

Table 4 (continued)

Sample/ hole number	Location[a]	Depth (cm)	Radionuclide concentration (pCi/g)		
			^{226}Ra[b]	^{230}Th[c]	^{238}U[d]
S17	Creek bed	0–15	1.2 ± 0.1	4.1	1.0
S18	Creek bed	0–15	1.3 ± 0.1	4.3	1.1
S19	Creek bed	0–15	1.2 ± 0.1	4.4	1.1
S20A	3+80, 35R	0–15	3.2 ± 0.4	98	5.3
B		15–30	2.2 ± 0.4	39	3.8
S21A	4+50, 15L	0–15	1.1 ± 0.2	120	4.0
B		15–30	3.0 ± 0.1	55	3.3
S22A	4+31, BL	0–15	3.1 ± 0.3	110	2.9
B		15–30	5.1 ± 0.3	96	15
C		30–45	1.6 ± 0.3	13	12
D		45–60	1.4 ± 0.08	4.1	8.9
S23	16+50, 50L	0–15	1.3 ± 0.07	11	1.3
S24	21+50, 85L	0–15	1.3 ± 0.3	1.9	1.0
S25A	25+50, 50L	0–15	1.3 ± 0.2	2.3	1.1
B		15–30	1.2 ± 0.2	2.6	1.1
C		30–35	1.2 ± 0.2	2.1	1.1
D		45–50	1.2 ± 0.3	1.6	1.2
S26	27+50, 85L	0–15	1.4 ± 0.3	2.3	1.0
S27	29+00, 85L	0–15	1.2 ± 0.2	7.4	1.1
S28	28+50, 12R	0–8	2.3 ± 0.4	82	1.4
S29	24+50, 36R	0–8	1.3 ± 0.2	20	1.0
S30	20+50, 42R	0–15	1.2 ± 0.1	6.3	1.0
S31	15+50, 40R	0–15	1.3 ± 0.2	17	1.1
S32	10+00, 29R	0–15	1.3 ± 0.1	11	1.2
S33	7+50, 28R	0–15	1.5 ± 0.04	27	1.4
S34	6+39, 22R	0–15	2.2 ± 0.1	62	4.0
S35	5+25, 13R	0–15	7.1 ± 0.4	410	5.4
S36A	5+50, 47L	0–15	4.7 ± 0.4	230	3.0
B		45–60	1.6 ± 0.3	29	1.5
S37A	6+00, 50L	0–15	3.6 ± 0.2	170	2.1
B		45–60	1.2 ± 0.1	6.7	1.3
S38A	3+80, 35R	0–15	2.7 ± 0.07	77	2.5
B		15–30	1.7 ± 0.1	20	1.6
C		50–60	1.6 ± 0.2	81	1.2
S39A	4+50, 15L	0–15	4.6 ± 0.2	200	4.0
B		15–30	6.4 ± 0.6	280	6.1
C		30–45	4.0 ± 0.6	140	4.3
D		45–60	2.4 ± 0.03	68	3.3
E		60–75	2.1 ± 0.1	54	3.1

Table 4 (continued)

Sample/ hole number	Location[a]	Depth (cm)	Radionuclide concentration (pCi/g)		
			^{226}Ra[b]	^{230}Th[c]	^{238}U[d]
S40A	30+55, 60R	0–15	9.3±0.3	430	6.7
B		15–30	10 ±0.3	410	13
C		60–75	1.5±0.09	18	1.5
S41A	30+60, 112R	0–5	12 ±0.6	38	11
B		15–30	2.1±0.1	630	3.6
C		55–60	1.4±0.3	6.3	1.5
S42A	29+19, 08R	0–30	4.4±0.4	240	4.3
B		30–45	1.5±0.3	8.6	1.5
C		45–55	1.5±0.1	7.2	1.2
S43A	28+75, 10R	0–30	5.8±0.8	54	2.6
B		30–45	2.0±0.2	5.4	1.5
C		45–55	1.3±0.2	17	1.2
S44	27+15, 12R	0–15	1.0±0.2	23	1.0
S45	27+85, 11R	0–15	1.2±0.2	11	1.1
S46A	26+69, 10R	0–15	3.5±0.1	140	2.7
B		15–30	1.8±0.06	29	2.0
S47A	26+27, 12R	0–15	2.1±0.3	50	1.0
B		15–30	1.8±0.1	32	1.6
S48	13+67, 25R	0–15	4.5±0.3	5.4	1.2
S49	13+15, 25R	0–15	1.6±0.08	6.3	1.0
S50	11+55, 26R	0–15	2.7±0.1	35	1.6
S51	11+98, 26R	0–15	5.2±0.4	13	1.3
S52	9+06, 24R	0–15	1.9±0.2	20	1.8
S53	9+56, 24R	0–15	2.1±0.08	8.6	1.2
S54	14+38, 41R	0–15	1.3±0.1	<3.2	0.99
S55	15+12, 38R	0–15	4.9±0.2	<3.6	1.3
S56	30+65, 25R	0–15	1.8±0.2	28	1.4
S57	30+39, 28L	0–15	1.3±0.4	17	1.2
S58	29+60, 95L	0–15	2.9±0.4	<5.0	1.1
S59	29+38, 79L	0–15	3.2±0.2	<3.2	1.1
S60	23+70, 22L	0–15	3.8±0.2	<1.8	1.1
S61	23+38, 30R	0–15	1.7±0.2	<3.6	1.0
S62	23+27, 38R	0–15	2.2±0.1	11	1.2
S63	21+56, 44R	0–15	2.9±0.3	<2.7	1.1
		Biased samples[f]			
B1	30+60, 60R	0–15	8.7±0.9	500	8.7
B2A	13+60, 23R	0–5	8.3±1.0	350	5.4
B	13+60, 23R	5–10	12 ±0.3	810	8.6

Table 4 (continued)

Sample/ hole number	Location[a]	Depth (cm)	Radionuclide concentration (pCi/g)		
			^{226}Ra[b]	^{230}Th[c]	^{238}U[d]
		Auger samples[g]			
1	38+64, 05L	0–15	1.2 ±0.07	1.1	0.99
2	37+50, 19L	0–15	1.3 ±0.1	9.0	1.1
3	36+50, 17L	0–15	1.5 ±0.2	17	1.2
4	37+50, 16L	0–15	1.2 ±0.07	3.8	1.0
5	34+50, 15L	0–15	1.3 ±0.03	6.3	1.1
6	33+50, 17L	0–15	1.2 ±0.2	1.8	1.0
7	32+50, 18L	0–15	1.3 ±0.05	3.0	1.1
8	31+50, 17L	0–15	1.3 ±0.1	0.90	0.98
9	30+50, 19L	0–15	1.4 ±0.3	14	1.3
10A	28+50, 11L	0–15	0.81±0.03	1.7	0.39
B		15–30	1.4 ±0.1	0.59	1.1
11A	27+50, 08L	0–15	0.55±0.1	2.7	0.60
B		15–30	1.5 ±0.4	0.54	1.2
12A	26+50, 08L	0–15	0.66±0.1	0.54	0.71
B		15–30	1.2 ±0.1	6.3	1.1
13A	25+50, 07L	0–15	1.6 ±0.4	7.7	0.72
B		15–30	1.1 ±0.1	1.4	1.0
14A	24+50, 06L	0–15	0.94±0.06	8.1	0.96
B		15–30	1.3 ±0.08	1.2	1.1
15A	23+50, 05L	0–15	0.77±0.1	22	0.86
B		15–30	1.3 ±0.08	<0.90	1.2
16A	22+50, 04L	0–15	0.87±0.09	4.6	0.82
B		15–30	0.99±0.1	4.5	1.1
17A	21+50, 03L	0–15	0.83±0.08	2.5	0.91
B		15–30	0.97±0.2	1.2	1.1
18A	20+50, 03L	0–15	0.75±0.1	2.8	0.75
B		15–30	1.0 ±0.1	1.3	1.2
19A	19+50, 01L	0–15	0.87±0.1	1.5	0.97
B		15–30	1.6 ±0.2	1.9	1.5
20A	18+50, 01L	0–15	0.86±0.08	1.6	0.96
B		15–30	1.1 ±1	1.2	1.2
21A	17+47, BL	0–15	0.94±0.1	8.2	1.0
B		15–30	1.1 ±0.3	1.2	1.1
22A	16+49, BL	0–15	0.72±0.07	1.5	0.77
B		15–30	1.2 ±0.1	1.2	1.1
23A	15+48, 01L	0–15	0.76±0.06	3.7	0.84
B		15–30	1.5 ±0.4	1.3	1.4
24A	14+48, BL	0–15	0.83±0.1	8.8	0.90
B		15–30	1.2 ±0.2	1.8	1.2
C		30–60	1.1 ±0.1	1.3	1.1

Table 4 (continued)

Sample/ hole number	Location[a]	Depth (cm)	Radionuclide concentration (pCi/g)		
			^{226}Ra[b]	^{230}Th[c]	^{238}U[d]
25A	13+48, 01L	0–15	0.72±0.2	1.2	0.69
B		15–30	1.0 ±0.1	1.2	1.1
26A	12+55, BL	0–15	0.58±0.07	1.0	0.60
B		15–30	1.4 ±0.2	1.7	1.4
27A	11+47, BL	0–15	0.62±0.05	2.0	0.67
B		15–30	1.2 ±0.2	1.5	1.2
28A	10+50, 03L	0–15	0.60±0.07	2.7	0.64
B		15–30	1.2 ±0.1	1.2	1.2
29A	9+56, 03L	0–15	1.6 ±0.3	24	1.3
B		15–30	1.1 ±0.1	1.1	1.0
30A	8+47, 05L	0–15	0.75±0.08	3.3	0.80
B		15–30	1.1 ±0.1	0.72	1.0
31A	7+50, 02L	0–15	0.69±0.2	3.7	0.65
B		15–30	1.2 ±0.09	1.4	1.1
32A	6+50, 05L	0–15	0.56±0.2	6.3	0.59
B		15–30	1.0 ±0.09	1.6	1.0
33A	5+50, 07L	0–15	0.32±0.1	1.4	0.43
B		15–30	0.98±0.09	1.2	1.0
34A	11+00, 17R	0–15	2.7 ±0.1	93	2.7
B		15–30	1.3 ±0.3	9.4	1.6
35A	12+18, 17R	0–15	2.1 ±0.2	94	1.7
B		15–30	1.5 ±0.2	7.4	2.2
C		30–45	1.5 ±0.3	25	1.4
36A	12+92, 16R	0–15	1.7 ±0.1	16	1.8
B		15–30	1.2 ±0.09	24	0.96
37A	14+50, 22R	0–15	2.9 ±0.05	130	3.0
B		15–30	1.2 ±0.3	5.6	1.3
38A	15+35, 25R	0–15	2.3 ±0.2	60	2.1
B		15–30	1.1 ±0.3	0.77	1.2
39A	15+38, 13R	0–15	12 ±0.8	500	10
B		15–30	1.7 ±0.4	24	3.3
C		30–45	1.3 ±0.1	2.1	2.7
D		45–60	1.3 ±0.2	1.2	1.3
E		90–105	1.5 ±0.2	1.4	1.0
40A	16+00, 24R	0–15	1.9 ±0.08	37	1.8
B		15–30	2.0 ±0.2	1.2	2.2
41A	16+00, 15R	0–15	5.9 ±0.3	260	6.3
B		15–30	1.2 ±0.3	4.5	1.8
42A	17+00, 23R	0–15	1.9 ±0.1	37	1.7
B		15–30	0.98±0.2	3.2	1.1

Table 4 (continued)

Sample/ hole number	Location[a]	Depth (cm)	Radionuclide concentration (pCi/g)		
			^{226}Ra[b]	^{230}Th[c]	^{238}U[d]
43A	17+03, 15R	0–15	2.4 ±0.1	41	6.9
B		15–30	1.2 ±0.2	4.5	3.0
C		30–45	1.1 ±0.1	0.77	1.1
D		45–60	1.1 ±0.2	0.90	1.1
44A	18+01, 23R	0–15	1.6 ±0.3	31	1.6
B		15–30	1.2 ±0.09	6.8	1.3
45A	18+01, 15R	0–15	2.6 ±0.5	54	2.3
B		15–30	1.3 ±0.2	8.1	1.5
46A	19+00, 23R	0–15	1.7 ±0.4	23	1.5
B		15–30	1.3 ±0.1	7.2	1.3
47A	19+00, 13R	0–15	19 ±1	1,400	18
B		15–30	1.3 ±0.1	4.5	5.3
C		30–45	1.2 ±0.2	6.8	5.2
48A	20+23, 23R	0–15	2.1 ±0.2	54	1.9
B		15–30	1.6 ±0.2	8.2	1.3
49A	20+23, 16R	0–15	3.6 ±0.2	140	3.2
B		15–30	1.2 ±0.3	6.8	1.8
50A	20+23, 13R	0–15	15 ±1	1,100	16
B		15–30	1.3 ±0.2	4.5	6.3
C		30–45	1.1 ±0.1	3.6	3.4
51A	20+23, 11R	0–15	7.6 ±0.2	620	8.2
B		15–30	1.4 ±0.5	18	2.0
C		30–45	1.3 ±0.3	3.8	1.4
52A	21+00, 25R	0–15	1.7 ±0.1	36	1.8
B		15–30	1.8 ±0.1	30	1.7
53A	21+00, 13R	0–15	10 ±3	550	8.4
B		15–30	1.2 ±0.2	5.0	3.7
C		30–45	1.3 ±0.3	1.4	1.7
54A	22+50, 25R	0–15	1.6 ±0.1	14	1.3
55A	22+50, 12R	0–15	3.3 ±0.08	110	2.9
B		15–30	4.9 ±0.7	210	4.6
C		30–45	1.2 ±0.2	63	2.9
56A	24+00, 08R	0–15	1.7 ±0.1	50	1.9
B		15–30	7.1 ±0.5	660	9.8
C		30–45	5.7 ±1	270	5.8
D		45–60	1.6 ±0.3	19	1.5
57A	25+00, 13R	0–15	0.79±0.3	18	1.3
B		45–60	4.3 ±0.6	190	2.5
58A	25+00, 11R	0–15	6.5 ±0.3	360	4.6
B		15–30	1.7 ±0.1	45	1.2

Table 4 (continued)

Sample/ hole number	Location[a]	Depth (cm)	Radionuclide concentration (pCi/g)		
			^{226}Ra[b]	^{230}Th[c]	^{238}U[d]
59A	25+00, 07R	0–15	5.0 ±0.6	210	4.0
B		15–30	1.3 ±0.1	6.0	1.2
60	26+00, 13R	0–15	3.9 ±0.1	120	3.8
61	27+13, 07R	0–15	1.9 ±0.5	67	2.2
62A	28+00, 06R	0–15	4.0 ±0.3	150	3.1
B		15–30	2.5 ±0.4	69	3.7
63A	29+21, 03R	0–15	7.7 ±0.6	380	4.0
B		15–30	7.9 ±0.8	300	8.3
C		60–75	1.5 ±0.3	9.0	2.7
64A	30+35, 30R	0–15	5.8 ±0.4	390	2.6
B		15–30	1.4 ±0.1	9.5	2.0
65	31+00, 15R	0–15	2.0 ±0.2	53	1.9
66A	32+25, 15R	0–15	28 ±1	1,600	33
B		45–60	1.2 ±0.2	4.9	1.0
67	32+96, 15R	0–15	1.4 ±0.1	14	1.3
68	34+00, 15R	0–15	1.6 ±0.4	14	1.2
69	35+00, 15R	0–15	1.7 ±0.05	13	1.4
70	36+00, 14R	0–15	1.4 ±0.2	12	1.2
71	37+00, 14R	0–15	1.6 ±0.2	25	1.4
72	38+00, 15R	0–15	1.3 ±0.08	5.4	1.1
73A	29+37, 32L	0–15	0.49 ±0.09	1.1	0.52
B		15–30	29 ±0.7	2,000	25
C		30–45	1.4 ±0.2	5.4	1.3
D		45–60	1.1 ±0.2	6.8	1.2
E		60–75	1.2 ±0.2	3.4	0.38
74A	29+35, 38L	0–15	1.9 ±0.9	23	1.5
B		15–30	1.4 ±0.2	5.4	1.2
75	28+00, 19L	0–15	1.2 ±	8.1	1.1
76	27+00, 19L	0–15	1.3 ±0.09	3.6	1.2
77A	26+00, 21L	0–15	2.1 ±0.3	54	1.4
B		15–30	2.2 ±0.1	54	1.5
C		30–45	2.2 ±0.05	43	1.5
78	25+00, 18L	0–15	1.4 ±0.08	12	1.3
79A	24+00, 16L	0–15	5.4 ±0.5	260	7.2
B		45–60	1.3 ±0.3	9.5	1.8
80	23+00, 16L	0–15	1.8 ±0.1	23	1.8
81A	21+98, 18L	0–15	8.7 ±0.3	230	4.4
B		15–30	6.2 ±0.3	330	8.0
C		60–75	1.4 ±0.03	3.6	3.5

Table 4 (continued)

Sample/ hole number	Location[a]	Depth (cm)	Radionuclide concentration (pCi/g)		
			^{226}Ra[b]	^{230}Th[c]	^{238}U[d]
82A	21+98, 20L	0–15	2.6 ±0.4	190	3.6
B		45–60	1.3 ±0.2	1.8	1.4
83A	20+93, 15L	0–15	24 ±0.8	1,200	19
B		30–45	1.6 ±0.4	28	5.2
C		60–75	1.4 ±0.3	1.7	3.4
84	20+00, 12L	0–15	1.4 ±0.2	6.8	1.5
85A	19+00, 12L	0–15	17 ±0.7	1,000	10
B		75–90	1.6 ±0.3	19	2.8
86A	18+00, 13L	0–15	4.4 ±0.3	150	7.3
B		90–105	1.5 ±0.2	4.5	1.2
87	18+00, 16L	0–15	2.5 ±0.2	230	2.0
88A	17+00, 14L	0–15	6.3 ±0.3	290	6.6
B		60–75	1.4 ±0.1	8.6	1.7
89A	16+00, 13L	0–15	43 ±0.9	1,600	41
B		75–90	1.5 ±0.07	8.6	1.4
90A	16+00, 16L	15–30	1.5 ±0.09	5.9	1.7
B		60–75	1.5 ±0.3	2.3	1.0
91	32+24, 20R	0–15	1.7 ±0.3	22	1.6
92A	29+40, 26L	0–15	0.56±0.05	34	0.62
B		15–30	0.75±0.1	5.0	0.74
93A	29+21, 05L	0–15	1.0 ±0.06	7.5	1.1
B		15–30	1.1 ±0.2	2.8	1.1
94	29+21, 09R	0–15	3.7 ±0.6	180	2.8
95A	24+50, 02R	0–15	1.2 ±0.2	3.1	1.4
B		15–30	1.1 ±0.07	2.6	1.1
96A	24+50, 10R	0–15	3.9 ±0.3	140	2.4
B		15–30	5.2 ±0.3	160	4.9
C		75–90	1.3 ±0.3	2.2	1.6
97	24+50, 15R	0–15	6.9 ±0.1	250	3.9
98A	24+00, 01R	0–15	0.93±0.2	25	1.1
B		15–30	1.5 ±0.07	1.6	1.4
99	24+00, 14R	0–15	4.6 ±0.3	140	2.6
100A	15+99, 10L	0–15	1.4 ±0.3	31	1.1
B		15–30	1.2 ±0.2	3.0	1.1
101A	14+94, 14L	0–15	3.8 ±0.4	140	4.6
B		15–30	1.4 ±0.09	2.7	2.0
C		45–60	1.5 ±0.3	1.4	1.1
102A	13+80, 20L	0–15	1.1 ±0.1	24	1.1
B		15–30	0.99±0.1	4.5	1.1

Table 4 (continued)

Sample/ hole number	Location[a]	Depth (cm)	Radionuclide concentration (pCi/g)		
			^{226}Ra[b]	^{230}Th[c]	^{238}U[d]
103A	12+93, 19L	0–15	3.9 ±0.3	160	3.1
B		15–30	1.2 ±0.3	13	1.2
C		60–75	1.1 ±0.2	0.68	1.2
104A	11+65, 15L	0–15	0.77 ±0.2	13	0.67
B		15–30	1.2 ±0.08	10	1.2
105A	10+98, 16L	0–15	5.0 ±0.4	240	4.2
B		15–30	1.3 ±0.08	5.0	1.4
106A	10+98, 21L	0–15	1.7 ±0.07	40	1.7
B		15–30	1.3 ±0.1	6.8	1.3
107A	10+98, 12L	0–15	0.42 ±0.05	1.5	0.43
B		15–30	1.1 ±0.2	1.5	0.96
C		60–75	1.2 ±0.3	0.81	1.1
108A	9+86, 15L	0–15	0.76 ±0.2	42	0.64
B		15–30	1.9 ±0.2	22	4.7
C		30–45	1.5 ±0.1	3.2	1.6
109A	9+86, 20L	0–15	2.6 ±0.4	21	2.7
B		15–30	2.1 ±0.2	38	2.0
110A	9+86, 11L	0–15	0.96 ±0.2	3.3	0.73
B		15–30	1.2 ±0.2	2.9	1.1
111A	9+00, 11L	0–15	5.2 ±0.2	250	6.2
B		15–30	1.3 ±0.2	7.2	3.7
112A	No sample				
B	No sample				
C	8+00, 19L	30–40	1.1 ±0.2	1.5	1.0
113A	No sample				
B	No sample				
114A	8+00, 13L	0–15	0.79 ±0.09	4.5	0.81
B		15–30	1.9 ±0.3	15	1.4
115A	7+00, 19L	0–15	0.62 ±0.03	4.2	0.60
B		15–30	0.84 ±0.1	2.1	0.87
116A	6+02, 17L	0–15	13 ±0.59	600	10
B		15–30	8.5 ±0.5	410	7.3
C		30–45	5.7 ±0.3	330	5.0
D		45–60	7.1 ±0.5	450	5.9
E		60–75	2.0 ±0.3	63	2.0
117A	6+02, 28L	0–15	11 ±1	500	2.6
B		15–30	7.2 ±0.2	330	8.2
C		45–60	4.5 ±0.4	200	5.9
D		60–75	7.9 ±0.5	400	8.4

Table 4 (continued)

Sample/ hole number	Location[a]	Depth (cm)	Radionuclide concentration (pCi/g)		
			^{226}Ra[b]	^{230}Th[c]	^{238}U[d]
118A	6+02, 13L	0–15	0.41 ±0.08	3.7	2.7
B		15–30	2.6 ±0.3	98	0.41
119A	5+50, 20L	0–15	19 (+-2	900	20
B		15–30	4.4 ±0.2	120	5.3
C		30–45	2.2 ±0.1	84	2.8
D		45–60	1.4 ±0.3	20	1.4
E		60–75	4.5 ±0.6	340	3.3
120A	5+56, 09R	0–15	3.3 ±0.2	200	4.2
B		15–30	16 ±1	800	16
C		30–45	56 ±4	3,000	54
D		45–60	14 ±0.7	570	11
E		60–75	11 ±0.6	610	8.2
121A	6+00, 10R	0–15	37 ±3	2,000	42
B		15–30	5.1 ±0.3	250	6.3
C		45–60	1.7 ±0.07	37	2.1
122A	7+00, 08R	0–15	7.2 ±0.6	370	4.9
B		45–60	1.4 ±0.4	20	1.9
123A	7+00, 16R	0–15	13 ±0.7	790	11
B		45–60	1.3 ±0.1	18	1.8
124A	7+00, 19R	0–15	14 ±0.5	670	10
B		15–30	3.3 ±0.08	120	4.7
C		60–75	1.5 ±0.09	45	1.7
125A	7+00, 05R	0–15	1.4 ±0.2	51	1.5
B		15–30	41 ±2	2,400	41
C		30–45	1.4 ±0.2	40	1.2
126A	7+00, 01R	0–15	0.94 ±0.08	14	0.98
B		15–30	1.3 ±0.2	32	1.7
127A	8+00, 11R	0–15	6.2 ±0.4	330	6.9
B		15–30	6.8 ±0.51	120	8.5
C		60–75	1.7 ±0.3	22	2.0
128A	8+00, 20R	0–15	2.7 ±0.1	66	2.3
B		30–45	1.2 ±1	6.7	1.1
C		75–90	1.2 ±0.1	3.6	1.2
129A	8+00, 06R	0–15	0.89 ±0.3	6.8	0.96
B		15–30	4.6 ±0.3	220	5.3
130A	9+00, 13R	0–15	5.6 ±0.4	260	4.4
B		15–30	2.7 ±0.1	93	3.3
C		60–75	1.2 ±0.2	3.2	1.4
131A	9+85, 15R	0–15	3.0 ±0.1	100	2.6
B		15–30	1.4 ±0.2	4.9	2.0

Table 4 (continued)

Sample/ hole number	Location[a]	Depth (cm)	Radionuclide concentration (pCi/g)		
			^{226}Ra[b]	^{230}Th[c]	^{238}U[d]
132A	4+80, 29R	0–15	1.4 ±0.09	51	1.0
B		15–30	0.76±0.1	3.0	0.76
133A	5+04, 40R	0–15	0.67±0.07	5.1	0.90
B		15–30	0.99±0.08	0.50	0.91
134A	3+50, 38L	0–15	1.6 ±0.2	15	1.3
B		15–30	1.2 ±0.2	1.3	1.0
C		60–75	1.4 ±0.2	6.4	1.0
135A	3+30, BL	0–15	1.5 ±0.2	18	1.4
B		15–30	1.2 ±0.2	1.3	1.1
136A	3+15, 29R	0–15	1.4 ±0.2	14	1.3
B		15–30	1.2 ±0.2	4.0	1.1
C		60–75	1.5 ±0.6	2.9	1.1
137A	3+55, 30R	0–15	1.0 ±0.1	6.7	0.99
B		15–30	1.0 ±0.3	5.2	1.1
C		45–60	1.1 ±0.2	1.1	1.1
138A	3+58, 35R	0–15	1.4 ±0.2	2.4	1.1
B		15–30	1.2 ±0.07	4.3	1.0
139A	3+94, 04L	0–15	1.0 ±0.2	6.5	0.91
B		15–30	1.1 ±0.3	1.5	0.92
C		60–75	1.2 ±0.1	0.70	1.1
140A	4+28, 32L	0–15	1.1 ±0.2	5.8	0.99
B		15–30	1.0 ±0.06	9.9	0.99
C		105–120	1.2 ±0.1	8.5	1.0
141A	4+43, 16R	0–15	1.3 ±0.08	3.2	1.1
B		15–30	1.3 ±0.06	5.0	1.2
C		45–60	1.2 ±0.2	2.2	1.1
142A	4+25, 30R	0–15	1.6 ±0.3	19	1.5
B		15–30	1.3 ±0.1	6.3	1.2
C		45–60	1.2 ±0.2	0.99	1.1
143A	5+50, 64L	0–15	3.2 ±0.2	120	2.1
B		15–30	1.2 ±0.4	9.0	1.3
C		45–60	1.1 ±0.2	1.4	1.0
144A	6+00, 73L	0–15	1.7 ±0.2	34	1.4
B		15–30	1.2 ±0.1	8.6	1.4
C		45–60	1.2 ±0.1	1.7	1.0
145A	7+00, 30L	0–15	1.9 ±0.1	17	1.9
B		15–30	1.5 ±0.1	9.5	1.8
C		45–60	1.2 ±0.1	1.6	0.96
146A	8+77, 69R	0–15	1.6 ±0.3	14	1.2
B		60–75	1.1 ±0.2	1.2	0.90

Table 4 (continued)

Sample/ hole number	Location[a]	Depth (cm)	Radionuclide concentration (pCi/g)		
			^{226}Ra[b]	^{230}Th[c]	^{238}U[d]
147A	8+80, 135R	0–15	69 ±3	6,100	80
B		75–90	1.0±0.3	0.99	1.1
148A	8+75, 200R	0–15	660 ±30	22,000	790
B		90–105	1.5±0.3	23	2.6
149A	8+20, 210R	45–60	1.8±0.4	14	1.2
B		95–100	2.3±0.4	32	1.6
150A	8+24, 150R	0–15	35 ±2	2,000	48
B		60–75	2.7±0.1	53	3.3
151A	8+15, 100R	0–15	16 ±0.6	1,000	24
B		45–60	1.3±0.1	23	5.8
152A	8+13, 39R	0–15	3.3±0.1	190	3.5
B		15–30	1.8±0.3	50	2.8
153A	7+64, 52R	0–15	11 ±0.8	550	13
B		45–60	1.1±0.2	5.0	1.8
154A	7+70, 111R	90–105	1.2±0.2	6.8	2.7
155A	7+75, 210R	60–75	1.6±0.2	11	1.3
B		90–95	2.8±0.5	57	2.4
156A	7+25, 210R	60–90	1.9±0.2	25	1.7
B		90–95	1.8±0.2	30	1.6
157A	7+36, 94R	75–90	1.2±0.3	14	1.8
158A	7+20, 40R	0–15	200 ±7	10,000	240
B		60–75	2.2±0.07	67	3.6
159A	6+50, 50R	75–90	1.4±0.3	65	3.0
160A	5+88, 41R	0–15	300 ±10	16,000	240
B		90–95	1.4±0.3	12	2.9
161A	2+88, BL	45–60	1.2±0.2	1.1	1.1
B		120–125	1.2±0.05	2.7	1.1
162A	2+68, 10L	0–15	2.0±0.2	32	2.0
B		60–75	1.2±0.1	1.7	1.1
C		120–125	1.2±0.2	3.6	1.2
163A	2+42, BL	30–45	1.3±0.1	3.8	1.3
B		120–125	1.2±0.3	5.0	1.4
164A	(Hole designation not used)		–	–	–
165A	2+29, BL	30–45	1.4±0.3	220	1.4
B		120–125	1.2±0.3	0.86	1.2
166A	2+00, 33L	0–15	1.7±0.09	21	1.5
B		105–110	1.1±0.2	1.3	0.98
167A	2+00, 33R	0–15	1.5±0.1	15	1.4
B		105–110	1.2±0.3	20	0.95
168A	1+49, BL	0–15	1.8±0.09	32	1.7
B		105–110	1.0±0.2	1.3	0.90

Table 4 (continued)

Sample/ hole number	Location[a]	Depth (cm)	Radionuclide concentration (pCi/g)		
			^{226}Ra[b]	^{230}Th[c]	^{238}U[d]
169A	1+00, 33R	0–15	1.7±0.1	21	1.6
B		120–125	1.1±0.1	27	1.0
170A	1+00, 30L	0–15	1.6±0.3	15	1.5
B		105–110	1.2±0.09	6.7	0.98
171A	0+40, BL	0–15	1.1±0.1	5.8	0.95
B		120–125	1.0±0.06	3.1	0.93
172A	5+50, 38L	0–15	2.6±0.2	86	2.2
B		45–60	1.1±0.2	7.0	1.3
C		115–120	1.1±0.1	5.2	0.95
173A	6+00, 38L	0–15	2.3±0.1	49	2.1
B		45–60	1.0±0.3	9.0	1.2
C		60–75	1.4±0.2	18	1.2
174A	20+50, 02R	30–60	1.2±0.07	<2.7	1.1
B		60–90	1.2±0.2	<3.2	1.1
C		90–120	1.5±1	<2.7	1.2
175A	25+50, 04L	30–60	1.1±0.1	<1.1	1.0
B		60–90	1.2±0.2	<3.2	1.0
C		105–120	1.2±0.2	<2.7	0.97
176A	37+02, 14R	15–30	1.3±0.1	<5.4	1.0
B		30–60	1.4±0.2	<2.7	1.0
C		60–90	1.3±0.09	<3.2	1.0
D		90–120	1.2±0.05	<2.7	1.0
177A	30+93, 15R	15–30	1.2±0.1	<5.4	1.3
B		30–60	1.2±0.08	<4.0	0.97
C		60–90	1.1±0.09	<1.8	1.0
D		90–120	1.2±0.06	<3.2	0.96
178A	28+02, 06R	30–60	1.7±0.2	28	1.6
B		60–90	1.3±0.1	<3.6	1.0
C		90–120	1.1±0.2	<4.5	1.1
179A	26+02, 21L	45–60	1.5±0.08	<1.4	1.1
B		60–90	1.5±0.06	<1.8	1.0
C		90–120	1.6±0.2	<4.5	1.1
180A	29+21, 12R	15–30	1.9±0.2	4.0	1.9
B		30–60	1.5±0.2	2.7	1.1
180C		60–90	1.3±0.2	2.9	0.97
D		90–120	1.4±0.2	28	1.0
181A	27+10, 07R	15–30	1.2±0.2	3.7	1.8
B		30–60	1.3±0.1	1.8	1.1
C		60–90	1.5±0.1	2.0	0.97
D		90–120	1.2±0.2	2.1	0.93

Table 4 (continued)

Sample/ hole number	Location[a]	Depth (cm)	Radionuclide concentration (pCi/g)		
			^{226}Ra[b]	^{230}Th[c]	^{238}U[d]
182A	25+97, 07R	15–30	1.6 ± 0.25	18	2.3
B		30–60	1.3 ± 0.2	3.4	1.1
C		60–90	1.4 ± 0.06	2.5	0.94
D		90–120	1.6 ± 0.05	2.6	0.95
183A	25+04, 13R	60–90	1.4 ± 0.08	2.4	1.7
B		90–120	1.6 ± 0.09	2.1	1.4
184A	24+47, 15R	15–30	1.4 ± 0.2	11	1.4
B		30–60	1.6 ± 0.2	19	1.4
C		60–90	1.2 ± 0.1	2.1	1.1
D		90–120	1.2 ± 0.09	2.6	0.97
185A	23+98, 14R	15–30	1.2 ± 0.2	6.8	1.1
B		30–60	1.5 ± 0.2	15	1.5
C		60–90	1.2 ± 0.08	2.9	0.95
D		90–120	1.3 ± 0.16	2.4	0.95
186A	22+25, 12R	45–60	1.2 ± 0.2	2.1	1.1
B		60–90	1.2 ± 0.1	2.5	1.0
C		90–120	1.4 ± 0.04	3.7	1.0
187A	20+98, 25R	30–60	1.3 ± 0.2	6.3	1.3
B		60–90	1.3 ± 0.2	2.5	1.2
C		90–120	1.4 ± 0.2	2.4	1.2
188A	18+94, 12L	30–60	1.4 ± 0.2	6.2	4.8
B		60–90	1.3 ± 0.2	3.1	3.0
C		90–120	1.4 ± 0.2	3.2	1.4
189A	17+96, 13L	15–30	9.2 ± 0.8	360	6.3
B		30–60	1.2 ± 0.3	4.4	5.9
C		60–90	1.3 ± 0.3	1.7	2.9
190A	12+24, 17R	15–30	1.2 ± 0.2	3.8	1.5
B		30–60	1.5 ± 0.1	1.6	1.3
C		60–90	1.4 ± 0.2	1.9	1.1
191A	12+60, 32L	15–30	1.1 ± 0.2	1.7	1.1
B		30–60	1.2 ± 0.2	2.2	1.1
C		60–90	1.4 ± 0.05	2.1	1.2
D		90–120	1.4 ± 0.2	2.0	1.2
192A	7+96, 19L	0–30	14 ± 0.3	870	10
B		30–60	1.1 ± 0.07	2.7	1.0
C		60–90	1.0 ± 0.3	<1.5	1.0
D		90–120	1.2 ± 0.1	2.1	1.0
193A	30+65, 19R	0–30	1.3 ± 0.1	7.6	1.2
B		30–60	1.1 ± 0.3	0.90	0.99
C		60–90	1.1 ± 0.06	8.1	0.97
D		90–120	1.3 ± 0.08	9.8	0.91

Table 4 (continued)

Sample/ hole number	Location[a]	Depth (cm)	Radionuclide concentration (pCi/g)		
			^{226}Ra[b]	^{230}Th[c]	^{238}U[d]
194A	30+39, 19L	0–30	1.2 ±0.2	0.80	1.0
B		30–60	1.1 ±0.09	0.70	1.0
C		60–90	1.0 ±0.09	1.0	1.0
D		90–120	1.2 ±0.2	0.50	1.0
195A	29+09, 10R	0–30	2.7 ±0.1	53	1.6
B		30–60	2.4 ±0.3	53	1.8
196A	27+18, 14R	0–30	2.0 ±0.09	23	1.4
B		30–60	2.4 ±0.1	29	2.5
197A	26+32, 13R	0–30	2.4 ±0.2	40	2.8
B		30–60	2.0 ±0.07	27	2.0
C		60–90	1.3 ±0.2	2.1	1.1
198A	23+66, 17L	0–30	11 ±0.2	400	6.2
B		30–60	3.4 ±0.2	59	3.6
C		60–90	0.91±0.1	3.9	1.1
D		90–120	1.1 ±0.1	7.4	1.1
199A	23+09, 37R	0–30	1.3 ±0.2	2.0	1.0
B		30–60	1.2 ±0.08	1.3	0.94
C		60–90	1.2 ±0.4	1.3	0.93
D		90–120	1.2 ±0.1	1.4	0.88
E		120–150	1.5 ±0.07	2.7	1.1
F		150–185	1.3 ±0.2	4.1	1.0
G		185–215	1.1 ±0.2	<3.2	0.92
H		215–245	0.98±0.1	<3.2	0.85
200A	22+40, 45R	0–30	1.2 ±0.2	4.4	1.0
B		30–60	1.3 ±0.2	7.9	1.2
C		60–90	1.2 ±0.3	2.0	1.0
D		90–120	1.1 ±0.2	2.1	1.0
E		120–150	1.1 ±0.2	<3.2	1.0
F		150–185	1.2 ±0.2	<5.4	1.1
G		185–215	1.3 ±0.09	1.3	1.0
H		215–245	1.1 ±0.1	0.70	0.91
201A	21+81, 38R	0–30	1.4 ±0.4	4.6	1.3
B		30–60	1.2 ±0.2	1.4	1.0
C		60–90	1.1 ±0.04	1.8	1.0
D		90–120	1.3 ±0.2	0.80	1.0
E		120–150	1.2 ±0.2	1.5	1.0
F		150–185	1.2 ±0.3	1.0	1.0
G		185–225	1.1 ±0.1	0.70	0.95

Table 4 (continued)

Sample/ hole number	Location[a]	Depth (cm)	Radionuclide concentration (pCi/g)		
			^{226}Ra[b]	^{230}Th[c]	^{238}U[d]
202A	13+59, 27R	0–30	0.83±0.08	3.3	1.1
B		30–60	1.0 ±0.1	1.3	1.1
C		60–90	1.0 ±0.08	1.3	1.0
D		90–120	0.98±0.07	1.8	1.0
E		165–185	0.98±0.3	1.9	0.93
203A	13+30, 28R	5–30	0.96±0.09	0.80	1.0
B		30–60	0.87±0.1	0.70	0.94
C		60–90	0.93±0.1	0.90	0.91
D		90–120	1.0 ±0.2	2.2	0.98
E		120–165	1.2 ±0.3	1.3	0.93
F		165–185	1.0 ±0.1	0.80	0.95
204A	11+77, 24R	5–30	0.95±0.05	0.60	0.93
B		30–60	0.92±0.08	0.60	0.93
C		60–90	1.1 ±0.09	0.70	1.1
D		90–120	1.3 ±0.1	1.0	1.3
E		120–145	1.2 ±0.2	0.80	1.1
F		145–165	1.4 ±0.2	1.3	1.1
205A	9+48, 22R	5–30	0.97±0.1	<2.3	1.0
B		30–60	0.98±0.09	<1.8	1.1
C		60–90	1.1 ±0.05	<3.6	0.99
D		90–120	1.2 ±0.4	<3.2	1.1
E		120–145	1.3 ±0.1	<2.3	0.97
F		145–165	1.4 ±0.3	<3.6	0.97
206A	9+20, 28R	5–30	1.1 ±0.3	<3.6	1.1
B		30–60	0.96±0.3	<3.2	1.0
C		60–90	1.1 ±0.05	9.0	1.1
D		90–120	1.1 ±0.09	<4.5	0.97
E		120–145	1.1 ±0.2	<3.6	1.0
F		145–165	1.1 ±0.2	<2.3	0.92
207A	9+22, 16R	5–30	0.97±0.08	<0.90	0.99
B		30–60	1.1 ±0.1	<2.3	1.1
C		60–90	1.1 ±0.2	<2.3	0.94
D		90–120	1.0 ±0.1	<3.2	1.0
208A	9+88, 20L	30–60	1.2 ±0.08	<1.5	1.6
B		60–90	1.4 ±0.09	2.1	0.96
C		90–120	1.5 ±0.3	1.8	0.96
209A	7+02, 16R	60–90	1.1 ±0.1	4.1	1.7
B		90–120	1.3 ±0.2	2.4	1.5
C		120–150	1.3 ±0.3	10	1.8
D		150–185	1.3 ±1	6.6	1.4

Table 4 (continued)

Sample/ hole number	Location[a]	Depth (cm)	Radionuclide concentration (pCi/g)		
			^{226}Ra[b]	^{230}Th[c]	^{238}U[d]
210A	6+00, 28L	60–90	1.4 ±0.2	11	1.4
B		90–120	1.3 ±0.2	<2.3	0.94
211A	5+58, 09R	60–90	5.4 ±0.08	230	4.5
B		90–120	1.2 ±0.1	14	1.2
C		120–150	1.1 ±0.2	2.8	1.3
D		150–165	1.5 ±0.2	33	1.3
212A	5+52, 20L	60–90	10 ±0.5	450	11
B		90–120	1.1 ±0.3	<2.7	1.1
C		120–150	1.2 ±0.07	2.4	0.96
D		150–185	4.7 ±0.2	200	5.6
E		185–215	1.3 ±0.1	3.1	0.96
F		215–245	1.3 ±0.3	11	1.2
213A	14+48, 35R	0–30	1.8 ±0.2	44	1.8
B		30–60	0.77 ±0.1	<5.0	0.77
C		60–90	0.85 ±0.2	<3.6	0.79
D		90–120	0.98 ±0.6	<5.4	0.80
E		120–145	1.5 ±0.1	<5.0	1.0
F		145–165	1.2 ±0.06	<3.2	0.92
214A	5+50, 50L	60–90	1.2 ±0.2	<0.90	1.1
B		90–120	1.1 ±0.3	<3.2	1.1
C		120–150	1.2 ±0.3	3.9	0.89
215A	4+50, 106L	0–30	1.5 ±0.1	19	1.5
B		30–60	1.1 ±0.2	<2.7	1.0
C		60–90	1.1 ±0.3	<3.6	0.99
D		90–120	1.2 ±0.2	<3.2	0.92
E		120–145	1.4 ±0.4	<3.2	0.81
F		145–165	1.3 ±0.2	<3.6	0.76
216A	7+90, 210R	0–30	55 ±3	2,700	2.4
B		30–60	1.4 ±0.1	<4.1	0.80
C		60–75	1.3 ±0.4	<5.4	1.0
D		75–90	1.5 ±0.2	<5.4	1.0
217A	7+39, 96R	0–30	4.5 ±0.4	150	5.5
B		30–60	28 ±2	1,300	24
C		60–75	1.4 ±0.1	15	3.6
D		60–90	2.1 ±0.3	86	3.7
E		90–120	1.9 ±0.2	<4.1	1.8
218A	7+10, 50R	0–30	16 ±1	520	19
B		30–45	2.6 ±0.2	49	3.9
C		60–90	1.3 ±0.08	13	2.3
D		90–120	1.4 ±0.2	16	1.8

Table 4 (continued)

Sample/ hole number	Location[a]	Depth (cm)	Radionuclide concentration (pCi/g)		
			^{226}Ra[b]	^{230}Th[c]	^{238}U[d]
219A	5+89, 50R	60–90	2.1 ± 0.3	<5.4	6.0
B		90–120	1.7 ± 0.1	<2.3	2.9
220A	8+11, 43R	0–30	3.6 ± 0.2	110	3.1
B		30–60	1.2 ± 0.06	4.7	1.4
C		60–75	1.1 ± 0.2	8.0	1.0
D		75–95	1.1 ± 0.2	<2.3	0.99
E		95–115	1.3 ± 0.4	<3.6	0.89
221A	8+25, 150R	0–30	82 ± 3	3,700	93
B		30–60	2.6 ± 0.4	35	7.0
C		70–105	1.8 ± 0.07	14	3.1
D		105–135	1.4 ± 0.1	17	2.0

[a]Locations of soil samples are shown on Figs. 3–31.

[b]Indicated counting error is at the 95% confidence level ($\pm 2\sigma$).

[c]The error of the reported radionuclide concentration is ± 5% (95% confidence level).

[d]Total analytical error of measurement results is ± 3% (95% confidence level).

[e]Systematic samples are taken at grid locations irrespective of gamma exposure.

[f]Biased samples were taken from areas shown to have elevated gamma exposure rates.

[g]Auger samples are those taken from holes drilled to further define the depth and extent of contamination. Holes may be drilled in either contaminated or uncontaminated regions.

Table 5. Extent of subsurface contamination on the Latty Avenue site (LM001) as indicated by scintillation probe loggings and sample analyses

Hole	Location[a]	Depth of hole (m)	Estimated vertical extent of contaminated soil[b] (cm)	Region of maximum contamination (cm)	Radionuclide concentration in region of maximum contamination (pCi/g)		
					^{226}Ra	^{230}Th[c]	^{238}U[d]
1	38+64, 05L	2.7	None				
2	37+50, 19L	2.7	0–15	0–15	1.3 ±0.1	9.0	1.1
3	36+50, 17L	2.6	0–15	0–15	1.5 ±0.2	17	1.2
4	35+50, 16L	2.4	None				
5	34+50, 15L	2.6	0–15	0–15	1.3 ±0.05	6.3	1.1
6	33+50, 17L	2.6	None				
7	32+50, 18L	2.6	None				
8	31+50, 17L	2.7	None				
9	30+50, 19L	2.6	0–15	0–15	1.4 ±0.3	14	1.3
10	28+50, 11L	1.7	None				
11	27+50, 08L	1.7	None				
12	26+50, 08L	1.7	None				
13	25+50, 07L	1.7	0–15	0–15	1.6 ±0.4	7.7	0.72
14	24+50, 06L	1.7	0–15	0–15	0.94±0.06	8.1	0.96
15	23+50, 05L	1.7	0–15	0–15	0.77±0.1	22	0.86
16	22+50, 04L	1.7	None				
17	21+50, 03L	1.7	None				
18	20+50, 03L	1.7	None				
19	19+50, 01L	1.7	None				
20	18+50, 01L	1.7	None				
21	17+47, BL	1.2	0–15	0–15	0.94±0.1	8.2	1.0
22	16+49, BL	1.7	None				
23	15+48, 01L	1.7	None				
24	14+48, BL	2.6	0–15	0–15	0.83±0.1	8.8	0.90
25	13+48, 01L	1.7	None				
26	12+55, BL	1.7	None				
27	11+47, BL	1.1	None				
28	10+50, 03L	1.7	None				
29	9+56, 03L	1.7	0–15	0–15	1.6 ±0.3	24	1.3
30	8+47, 05L	1.7	None				
31	7+50, 02L	1.7	None				
32	6+50, 05L	1.7	0–15	0–15	0.56±0.2	6.3	0.59
33	5+50, 05L	1.7	None				
34	11+00, 17R	1.1	0–15	0–15	2.7 ±0.1	93	2.7
35	12+18, 17R	1.1	0–60	0–15	2.1 ±0.2	94	1.7
36	12+92, 16R	1.1	0–60	15–30	1.2 ±0.09	24	0.96
37	14+50, 22R	1.1	0–15	0–15	2.9 ±0.05	130	3.0
38	15+35, 25R	1.2	0–15	0–15	2.3 ±0.3	60	2.1
39	15+38, 13R	1.2	0–30	0–15	12 ±0.8	500	10
40	16+00, 24R	1.2	0–15	0–15	1.9 ±0.08	37	1.8
41	16+00, 15R	1.2	0–15	0–15	5.9 ±0.3	260	6.3
42	17+00, 23R	1.2	0–15	0–15	1.9 ±0.1	37	1.7
43	17+03, 15R	1.1	0–15	0–15	2.4 ±0.1	41	6.9
44	18+01, 23R	1.2	0–15	0–15	1.6 ±0.3	31	1.6
45	18+01, 15R	1.2	0–15	0–15	2.6 ±0.5	54	2.3

Table 5 (continued)

Hole	Location[a]	Depth of hole (m)	Estimated vertical extent of contaminated soil[b] (cm)	Region of maximum contamination (cm)	Radionuclide concentration in region of maximum contamination (pCi/g)		
					^{226}Ra	^{230}Th[c]	^{238}U[d]
46	19+00, 23R	1.2	0–15	0–15	1.7±0.4	23	1.5
47	19+00, 13R	1.2	0–15	0–15	19 ±1.0	1400	18
48	20+23, 23R	1.2	0–15	0–15	2.1±0.2	54	1.9
49	20+23, 16R	1.1	0–15	0–15	3.6±0.2	140	3.2
50	20+23, 13R	1.2	0–15	0–15	15 ±1.0	1100	16
51	20+23, 11R	0.8	0–30	0–15	7.6±0.2	620	8.2
52	21+00, 25R	1.2	0–30	0–15	1.7±0.1	36	1.8
53	21+00, 13R	1.1	0–15	0–15	10 ±3.0	550	8.4
54	22+50, 25R	1.2	0–15	0–15	1.6±0.1	14	1.3
55	22+50, 12R	1.2	0–45	15–30	4.9±0.7	210	4.6
56	24+00, 08R	1.1	0–75	15–30	7.1±0.5	660	9.8
57	25+00, 13R	1.2	0–90	45–60	4.3±0.6	190	2.5
58	25+00, 11R	1.1	0–60	0–15	6.5±0.3	360	4.6
59	25+00, 07R	1.1	0–15	0–15	5.0±0.6	210	4.0
60	26+00, 07R	0.9	0–90	0–15	3.9±0.1	120	3.8
61	27+13, 07R	1.5	0–75	0–15	1.9±0.5	67	2.2
62	28+00, 06R	1.1	0–60	0–15	4.0±0.3	150	3.1
63	29+21, 03R	1.1	0–60	0–15	7.7±0.6	380	4.0
64	30+35, 30R	0.6	0–15	0–15	5.8±0.4	390	2.6
65	31+00, 15R	1.2	0–15	0–15	2.0±0.2	53	1.9
66	32+25, 15R	1.2	0–45	0–15	28 ±1.0	1600	33
67	32+96, 15R	1.1	0–15	0–15	1.4±0.1	14	1.3
68	34+00, 15R	1.2	0–30	0–15	1.6±0.4	14	1.2
69	35+00, 15R	1.2	0–15	0–15	1.7±0.5	13	1.4
70	36+00, 14R	1.2	0–15	0–15	1.4±0.2	12	1.2
71	37+00, 14R	1.2	0–15	0–15	1.6±0.2	25	1.4
72	38+00, 15R	1.2	0–15	0–15	1.3±0.08	5.4	1.1
73	29+37, 32L	1.8	15–30	15–30	29 ±0.7	2000	25
74	29+35, 38L	1.2	0–15	0–15	1.9±0.9	23	1.5
75	28+00, 19L	1.2	0–15	0–15	1.2±0.2	8.1	1.1
76	27+00, 19L	1.1	None				
77	26+00, 21L	1.1	0–45	0–30	2.2±0.10	54	1.5
78	25+00, 18L	1.2	0–30	0–15	1.4±0.08	12	1.3
79	24+00, 16L	0.9	0–45	0–15	5.4±0.5	260	7.2
80	23+00, 16L	1.2	0–30	0–15	1.8±0.1	23	1.8
81	21+98, 18L	1.1	0–60	15–30	6.2±0.3	330	8.0
82	21+98, 20L	1.1	0–45	0–15	2.6±0.4	190	3.6
83	20+93, 15L	1.1	0–60	0–15	24 ±0.8	1,200	19
84	20+00, 12L	1.1	0–30	0–15	1.4±0.2	6.8	1.5
85	19+00, 12L	1.1	0–105	0–15	17 ±0.7	1,000	10
86	18+00, 13L	1.1	0–90	15–30	4.4±0.3	150	7.3
87	18+00, 16L	1.1	0–60	0–15	2.5±0.2	230	2.0
88	17+00, 14L	1.1	0–60	0–15	6.3±0.3	290	6.6
89	16+00, 13L	0.9	0–75	0–15	43 ±0.9	1,600	41
90	16+00, 16L	1.2	0–15	15–30	1.5±0.07	8.6	1.4
91	32+24, 20R	1.5	0–45	0–15	1.7±0.3	22	1.6

Table 5 (continued)

Hole	Location[a]	Depth of hole (m)	Estimated vertical extent of contaminated soil[b] (cm)	Region of maximum contamination (cm)	Radionuclide concentration in region of maximum contamination (pCi/g)		
					^{226}Ra	^{230}Th[c]	^{238}U[d]
92	29+40, 26L	1.2	0–15	0–15	0.56 ± 0.05	34	0.62
93	29+21, 05L	1.2	0–15	0–15	1.0 ± 0.06	7.5	1.1
94	29+21, 09R	0.9	0–60	0–15	3.7 ± 0.6	180	2.8
95	24+50, 02R	1.1	None				
96	24+50, 10R	1.2	0–75	30–60	Not sampled at point of max cont.		
97	24+50, 15R	1.2	0–30	0–15	6.9 ± 0.1	250	3.9
98	24+00, 01R	1.2	0–15	0–15	0.93 ± 0.2	25	1.1
99	24+00, 14R	1.2	0–75	0–15	4.6 ± 0.3	140	2.6
100	15+99, 10L	1.1	0–15	0–15	1.4 ± 0.3	31	1.1
101	14+94, 14L	1.1	0–15	0–15	3.8 ± 0.4	140	4.6
102	13+80, 20L	1.2	0–15	0–15	1.1 ± 0.1	24	1.1
103	12+93, 19L	1.2	0–15	0–15	3.9 ± 0.3	160	3.1
104	11+67, 15L	1.1	0–15	0–15	0.77 ± 0.2	13	0.67
105	10+98, 16L	1.1	0–15	0–15	5.0 ± 0.4	240	4.2
106	10+98, 21L	1.1	0–15	0–15	1.7 ± 0.07	40	1.7
107	10+98, 12L	1.1	None				
108	9+86, 15L	0.9	0–30	0–15	0.76 ± 0.2	42	0.64
109	9+86, 20L	1.1	0–30	15–30	2.1 ± 0.2	38	2.0
110	9+86, 11L	1.1	None				
111	9+00, 11L	0.9	0–15	0–15	5.2 ± 0.2	250	6.2
112	8+00, 19L	1.2	0–30	15–30	Not sampled		
113	8+00, 29L	1.2	0–30	15–30	Not sampled		
114	8+00, 13L	1.2	0–30	15–30	1.9 ± 0.3	15	1.4
115	7+00, 19L	1.2	None				
116	6+02, 17L	2.7	0–75	0–15	13 ± 0.6	600	10
117	6+02, 28L	1.2	0–90	0–15	11 ± 1.0	500	2.6
118	6+02, 13L	1.8	0–75	0–15	2.6 ± 0.3	98	0.41
119	5+50, 20L	1.8	0–180	0–15	19 ± 2.0	900	20
120	5+56, 09R	1.8	0–105	30–45	56 ± 4.0	3,000	54
121	6+00, 10R	1.8	0–90	0–15	37 ± 3.0	2,000	42
122	7+00, 08R	1.8	0–90	0–15	7.2 ± 0.6	370	4.9
123	7+00, 16R	1.8	0–90	0–15	13 ± 0.7	790	11
124	7+00, 19R	1.8	0–90	0–15	14 ± 0.5	670	10
125	7+00, 05R	1.8	0–90	15–30	41 ± 2.0	2,400	41
126	7+00, 01R	1.8	0–90	15–30	1.3 ± 0.2	32	1.7
127	8+00, 11R	1.5	0–90	0–15	6.2 ± 0.4	330	6.9
128	8+00, 20R	1.8	0–30	0–15	2.7 ± 0.1	66	2.3
129	8+00, 06R	1.8	0–90	15–30	4.6 ± 0.3	220	5.3
130	9+00, 13R	1.8	0–60	0–15	5.6 ± 0.4	260	4.4
131	9+85, 15R	1.5	0–15	0–15	3.0 ± 0.1	100	2.6
132	4+80, 29R	1.8	0–15	0–15	1.4 ± 0.09	51	1.0
133	5+04, 40R	1.8	0–15	0–15	0.67 ± 0.07	5.1	0.90
134	3+50, 38L	1.8	0–15	0–15	1.6 ± 0.2	15	1.3
135	3+30, BL	1.2	0–15	0–15	1.5 ± 0.2	18	1.4
136	3+15, 29R	1.2	0–15	0–15	1.4 ± 0.2	14	1.3
137	3+55, 30R	1.1	0–75	0–15	1.0 ± 0.1	6.7	0.99

Table 5 (continued)

Hole	Location[a]	Depth of hole (m)	Estimated vertical extent of contaminated soil[b] (cm)	Region of maximum contamination (cm)	Radionuclide concentration in region of maximum contamination (pCi/g)		
					^{226}Ra	^{230}Th[c]	^{238}U[d]
138	3+58, 35R	1.8	105–180		Not sampled		
139	3+94, 04L	1.8	0–15	0–15	1.0±0.2	6.5	0.91
140	4+28, 32L	3.0	0–15	0–15	1.1±0.2	5.8	0.99
141	4+43, 16R	1.8	None				
142	4+25, 30R	1.8	0–15	0–15	1.6±0.3	19	1.5
143	5+50, 64L	1.8	0–15	0–15	3.2±0.2	120	2.1
144	6+00, 73L	1.2	0–15	0–15	1.7±0.2	34	1.4
145	7+00, 30L	1.8	0–15	0–15	1.9±0.1	17	1.9
146	8+77, 69R	1.8	0–15	0–15	1.6±0.3	14	1.2
147	8+80, 135R	1.8	0–75	0–15	69 ±3.0	6,100	80
148	8+75, 200R	1.8	0–105	0–15	660 ±30	22,000	790
149	8+20, 210R	0.9	0–105	90–105	2.3±0.4	32	1.6
150	8+24, 150R	1.8	0–90	0–15	35 ±2.0	2,000	48
151	8+15, 100R	1.8	0–105	0–15	16 ±0.6	1,000	24
152	8+13, 39R	1.8	0–90	0–15	3.3±0.1	190	3.5
153	7+64, 52R	1.8	0–75	0–15	11 ±0.8	550	13
154	7+70, 111R	1.8	0–90	30–45	Not sampled		
155	7+75, 210R	0.9	0–120	0–30	Not sampled		
156	7+25, 210R	0.9	0–105	15–30	Not sampled		
157	7+36, 94R	1.8	0–90	30–45	Not sampled		
158	7+20, 40R	1.8	0–90	0–15	200 ±7	10,000	240
159	6+50, 50R	1.7	0–105	15–30	Not sampled		
160	5+88, 41R	0.9	0–90	0–15	300 ±10	16,000	240
161	2+88, BL	1.2	None				
162	2+68, 10L	1.2	0–30	0–15	2 ±0.2	32	2.0
163	2+42, BL	1.2	None				
165	2+29, BL	1.2	0–120	30–45	1.4±0.3	220	1.4
166	2+00, 33L	1.1	0–30	0–15	1.7±0.09	21	1.5
167	2+00, 33R	1.1	0–30	90–105	1.2±0.03	20	0.95
168	1+49, BL	1.1	0–30	0–15	1.8±0.09	32	1.7
169	1+00, 33R	1.2	0–30	120–135	1.1±0.1	27	1.0
170	1+00, 30L	1.1	0–30	0–15	1.6±0.3	15	1.5
171	0+40, BL	1.2	0–15	0–15	1.1±0.1	5.8	0.95
172	5+50, 38L	0.9	0–45	15–30	Not sampled		
173	6+00, 38L	0.9	0–75	0–15	2.3±0.1	49	2.1
174	20+50, 02R	1.2	None				
175	25+50, 04L	1.2	0–15	0–15	Not sampled (see hole No. 13)		
176	37+02, 14R	1.2	0–15	0–15	Not sampled (see hole No. 71)		
177	30+98, 15R	1.2	0–15	0–15	Not sampled (see hole No. 65)		
178	28+02, 06R	1.2	0–60	0–15	Not sampled (see hole No. 62)		
179	26+02, 21L	1.2	0–45	0–15	Not sampled (see hole No. 77)		
180	29+21, 12R	1.2	0–120	90–120	1.4±0.2	28	1.0
181	27+10, 07R	1.2	0–15	0–15	Not sampled (see hole No. 61)		
182	25+97, 07R	1.2	0–30	0–15	Not sampled (see hole No. 60)		
183	25+04, 23R	1.2	0–60	45–60	Not sampled (see hole No. 57)		
184	24+47, 15R	1.2	0–15	0–15	Not sampled (see hole No. 97)		

Table 5 (continued)

Hole	Location[a]	Depth of hole (m)	Estimated vertical extent of contaminated soil[b] (cm)	Region of maximum contamination (cm)	Radionuclide concentration in region of maximum contamination (pCi/g)		
					^{226}Ra	^{230}Th[c]	^{238}U[d]
185	23+98, 14R	1.2	0–60	0–15	Not sampled (see hole No. 99)		
186	22+52, 12R	1.2	0–45	15–30	Not sampled (see hole No. 55)		
187	20+98, 25R	1.2	0–30	15–30	Not sampled (see hole No. 52)		
188	18+94, 12L	1.2	0–90	0–15	Not sampled (see hole No. 85)		
189	17+96, 13L	0.9	0–30	15–30	9.2±0.8	360	6.3
190	12+24, 17R	1.2	0–15	0–15	Not sampled (see hole No. 35)		
191	12+60, 32L	1.2	None				
192	7+96, 19L	1.2	0–30	0–30	14 ±0.3	870	10
193	30+56, 19R	1.2	0–30	0–30	1.3±0.1	7.6	1.2
194	30+39, 19L	1.2	None				
195	29+09, 10R	0.6	0–120	0–60	2.7±0.1	53	1.6
196	27+18, 14R	0.6	0–90	30–60	2.4±0.1	29	2.5
197	26+32, 13R	0.9	0–60	0–30	2.4±0.2	40	2.8
198	23+66, 17L	1.2	0–60	0–30	11 ±0.2	400	6.2
199	23+09, 37R	2.4	None				
200	22+40, 45R	2.4	None				
201	21+81, 38R	2.3	None				
202	13+59, 27R	1.8	None				
203	13+30, 28R	1.8	None				
204	11+77, 24R	1.7	None				
205	9+48, 22R	1.7	None				
206	9+20, 28R	1.7	None				
207	9+22, 16R	1.2	None				
208	9+88, 20L	1.2	0–30	15–30	Not sampled (see hole No. 109)		
209	7+02, 16R	1.8	0–75	0–15	Not sampled (see holes No. 122, 123, 124)		
210	6+00, 28L	1.2	0–75	0–15	Not sampled (see hole No. 117)		
211	5+58, 09R	1.7	0–165	30–45	Not sampled (see hole No. 120)		
212	5+52, 20L	2.4	0–180	60–90	10 ±0.5	450	11
213	14+48, 35R	1.7	0–30	0–30	1.8±0.2	44	1.8
214	5+50, 50L	1.5	0–15	0–15	Not sampled (see holes No. 143, 172)		
215	4+50, 106L	1.7	0–15	0–15	1.5±0.1	19	1.5
216	7+90, 210R	0.9	0–30	0–30	55 ±3.0	2,700	2.4
217	7+39, 96R	1.2	0–90	30–60	28 ±2.0	1,300	24
218	7+10, 50R	1.4	0–120	0–30	16 ±1.0	520	19
219	5+89, 50R	1.2	0–60	0–15	Not sampled (see hole No. 160)		
220	8+11, 43R	1.2	0–30	0–30	3.6±0.2	110	3.1
221	8+25, 150R	1.4	0–135	0–15	82 ±0.3	3,700	93

[a]See Figs. 16–31 for location.

[b]Contaminated soil is defined as soil having concentrations of ^{226}Ra or ^{230}Th equal to or greater than the criteria given in Table 1; or giving rise to 1,000 cpm or more on the shielded scintillator.

[c]The error of the reported radionuclide concentration is less than ±5% (95% confidence level).

[d]The total analytical error is less than ±3% (95% confidence level).

Table 6. Concentration of selected radionuclides in water samples taken from auger holes at the Latty Avenue site (LM001)

Sample number	Grid location[a]	Concentration of radionuclide[b] (pCi/L)			
		^{226}Ra	^{238}U	^{230}Th	^{210}Pb
30	8+47, 05L	<0.27	<6.7	<0.81	0.27±2.2
31	7+50, 02L	<0.27	<6.7	<0.81	0.27±2.2
32	6+50, 05L	<0.27	<6.7	<1.1	2.2 ±2.4
33	5+50, 07L	<0.81	<6.7	<0.81	0.27±2.2
151	8+15, 100R	<8.1	30	1.1 ±0.14	<1.9
152	8+13, 39R	1.9 ±3.5	3.7±1.3	2.0 ±0.16	0.27±2.2
157	7+36, 95R	<0.54	53	<1.6	0.27±2.2
159	6+50, 50R	<0.54	63	0.86±0.11	2.7 ±2.7

[a]See Figs. 16–31 for locations of auger holes.
[b]Indicated errors associated with concentrations are 2σ (95% confidence level).

Table 7. Summary of measurements and sample results at Latty Avenue (LM001)

Measurement or sample type	Number of measurement/ samples	Range	Mean
Gamma exposure rate at 1 m (μR/h)[a]	336	4–380	16
Gamma exposure rate at surface (μR/h)[a]	336	4–490	17
Scan, gamma exposure rate near surface (μR/h)[b]	–	4–720	–
Concentration of ^{226}Ra in surface soil (pCi/g), systematic locations[c]	111	1.0–12	2.7
Concentration of ^{230}Th in surface soil (pCi/g), systematic locations[c]	111	1.6–630	54
Concentration of ^{238}U in surface soil (pCi/g), systematic locations[c]	111	0.99–15	2.1
Concentration of ^{226}Ra in surface soil (pCi/g), biased locations[d]	3	8.3–12	9.7
Concentration of ^{230}Th in surface soil (pCi/g), biased locations[d]	3	350–810	550
Concentration of ^{238}U in surface soil (pCi/g), biased locations[d]	3	5.4–8.7	7.6
Maximum ^{226}Ra concentration in soil from auger holes, (pCi/g)[e]	221	0.56–660	–
Maximum ^{230}Th concentration in soil from auger holes, (pCi/g)[e]	221	0.90–22,000	–
Maximum ^{238}U concentration in soil from auger holes, (pCi/g)[e]	221	0.41–790	–
Concentration of ^{226}Ra in water from auger holes, (pCi/L)[f]	8	<0.27–<8.1	1.6
Concentration of ^{230}Th in water from auger holes, (pCi/L)[f]	8	<0.81–2.0	1.1
Concentration of ^{238}U in water from auger holes, (pCi/L)[f]	8	3.7–63	22
Concentration of ^{210}Pb in water from auger holes, (pCi/L)[f]	8	<0.27–2.7	1.0

[a]At grid points.
[b]Scan of entire property.
[c]Systematic samples, Table 4.
[d]Biased samples, Table 4.
[e]Auger hole samples, Table 4.
[f]Water samples, Table 6.

APPENDIX

GAMMA PROFILE GRAPHS OF AUGER HOLES AT PROPERTY LM001

ORNL-DWG 87-11458

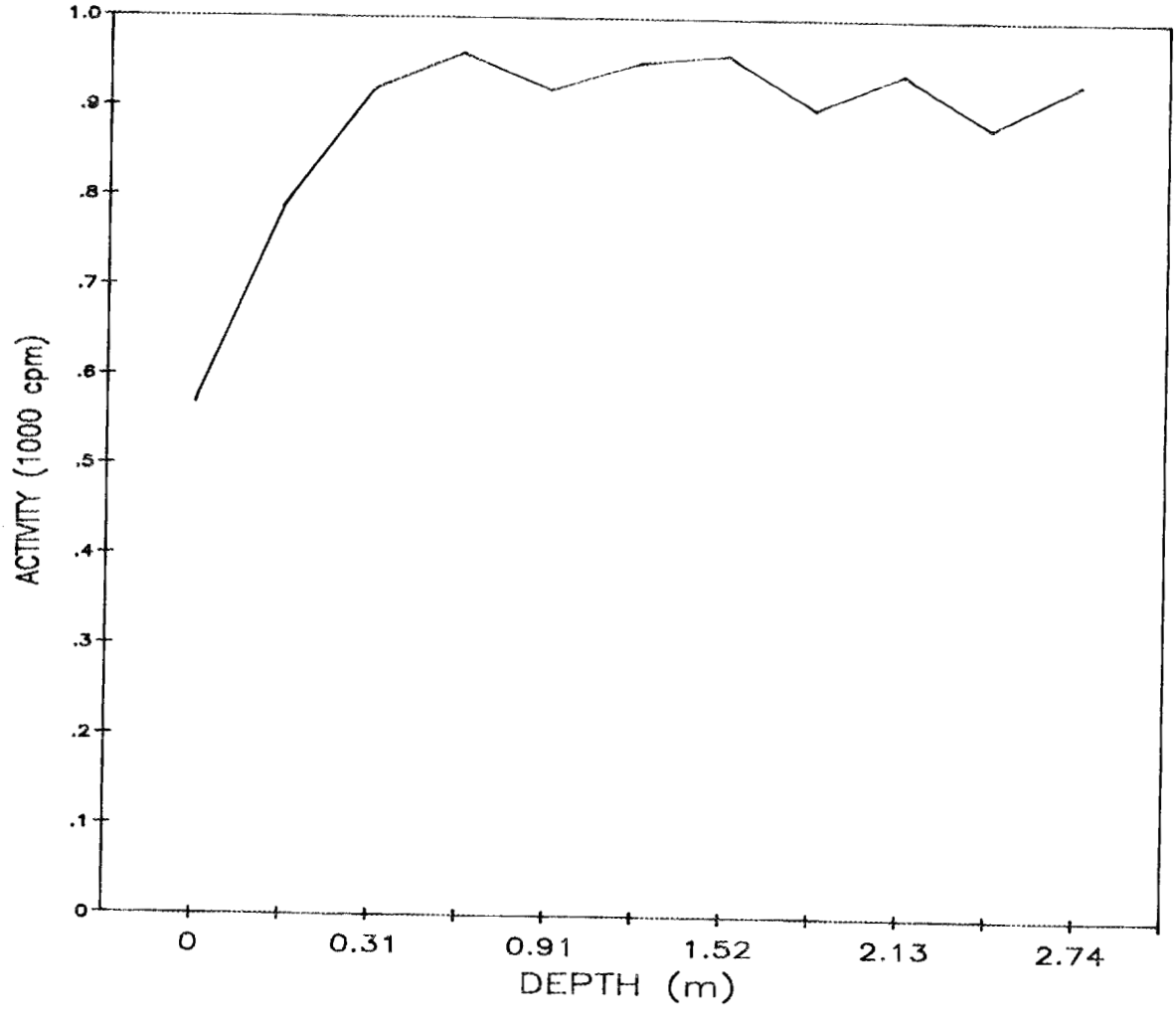

Fig. A.1. Gamma profile of auger hole 1.

ORNL-DWG 87-11459

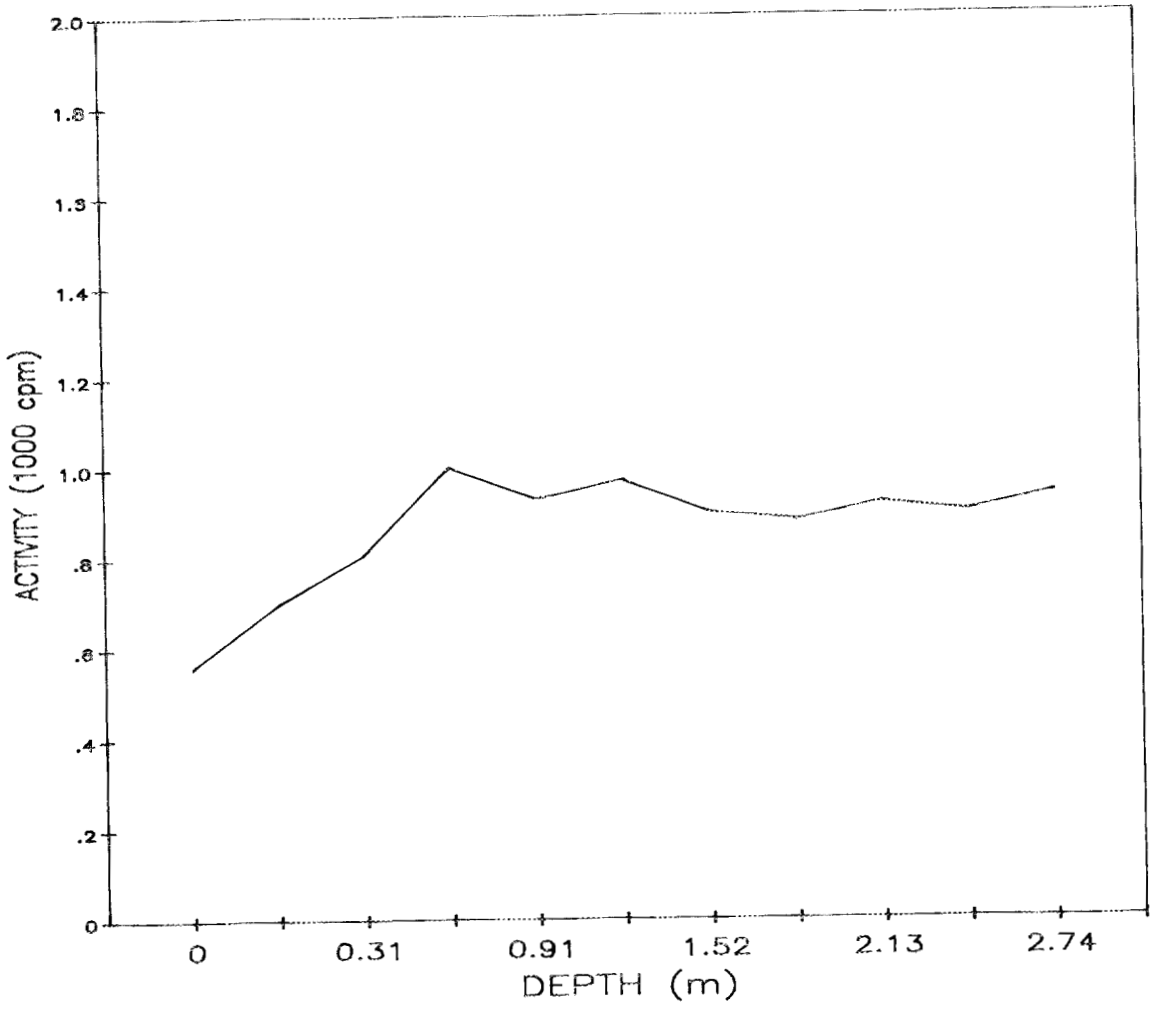

Fig. A.2. Gamma profile of auger hole 2.

ORNL-DWG 87-11460

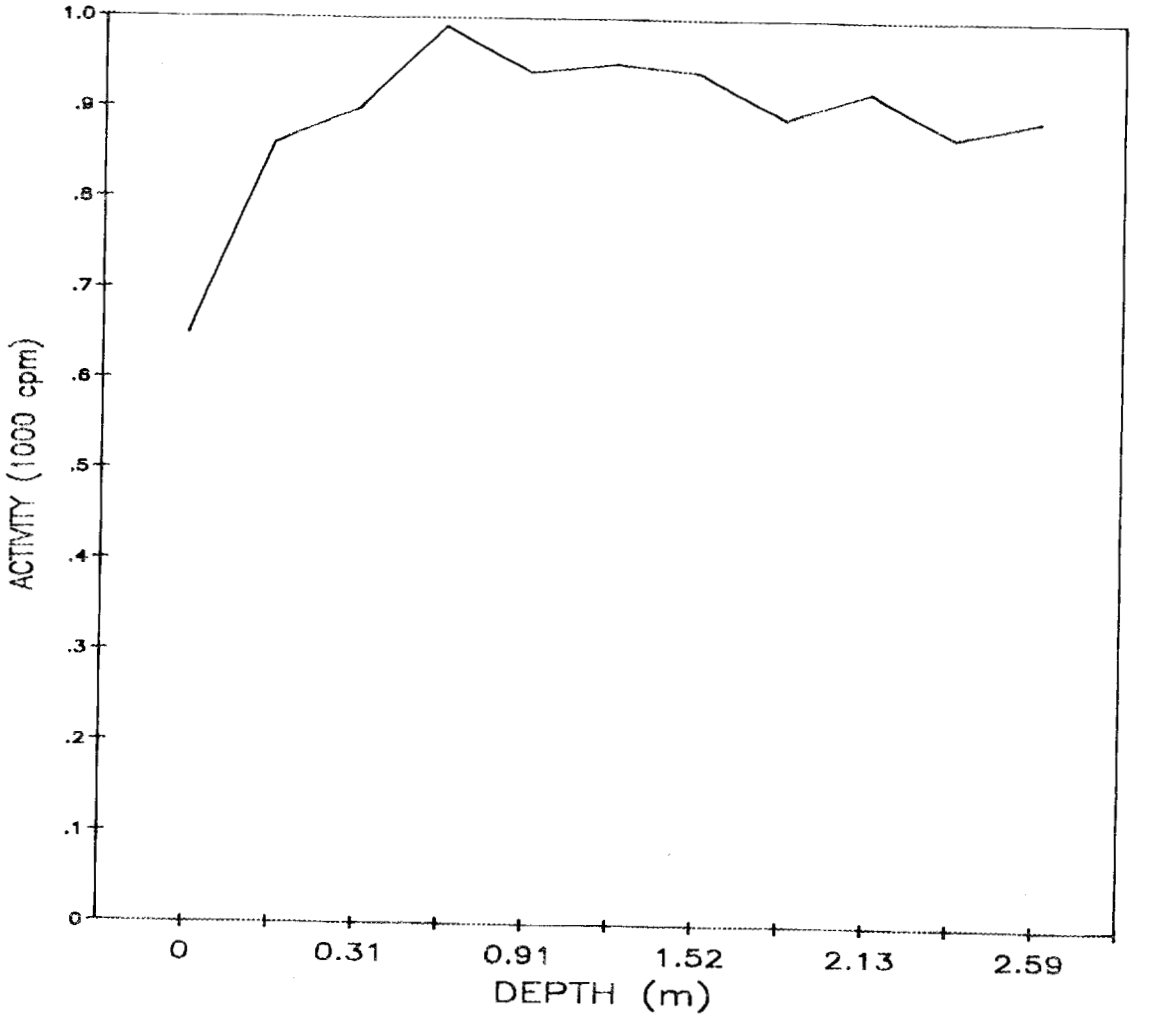

Fig. A.3. Gamma profile of auger hole 3.

ORNL-DWG 87-11461

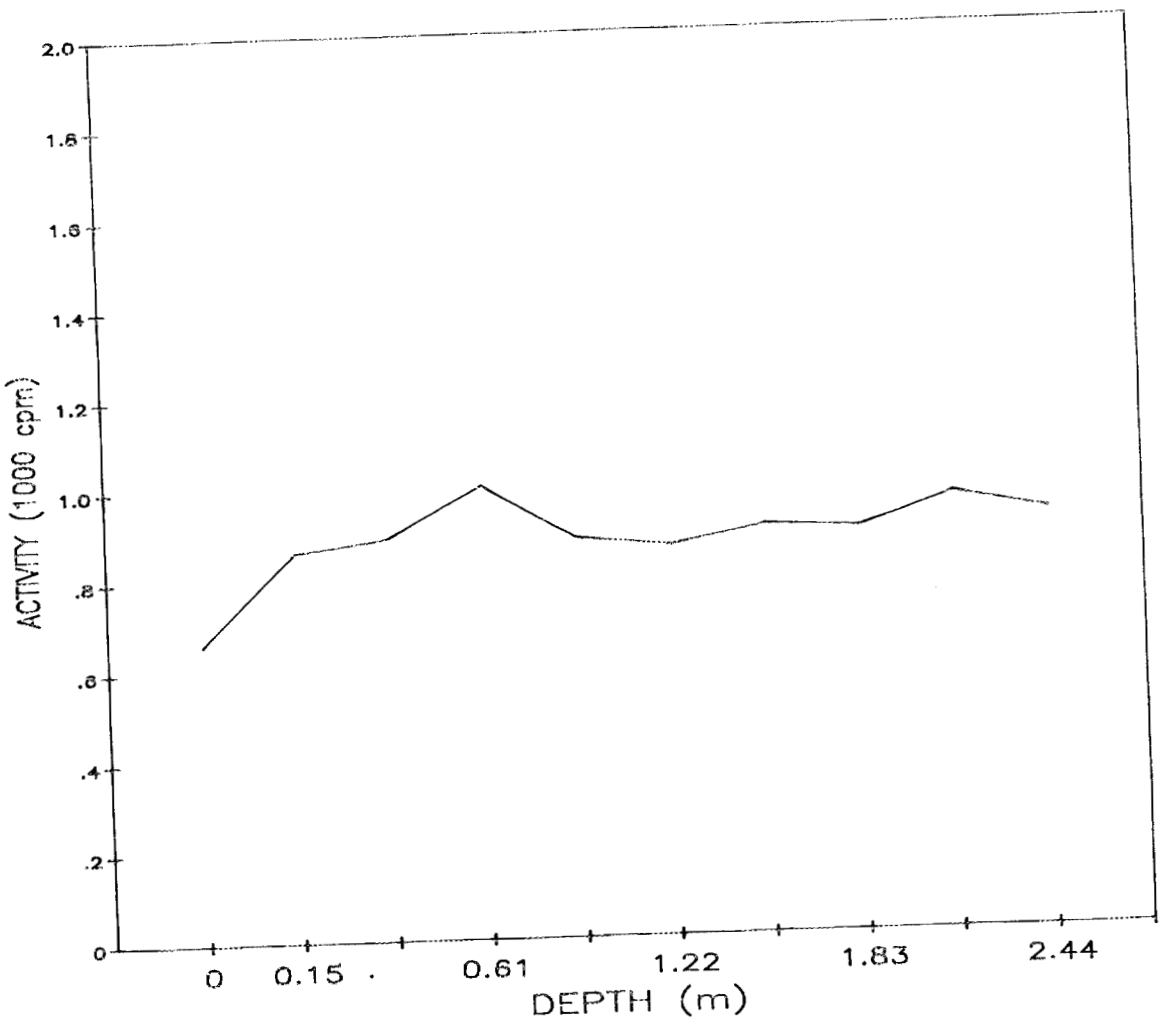

Fig. A.4. Gamma profile of auger hole 4.

ORNL-DWG 87-11462

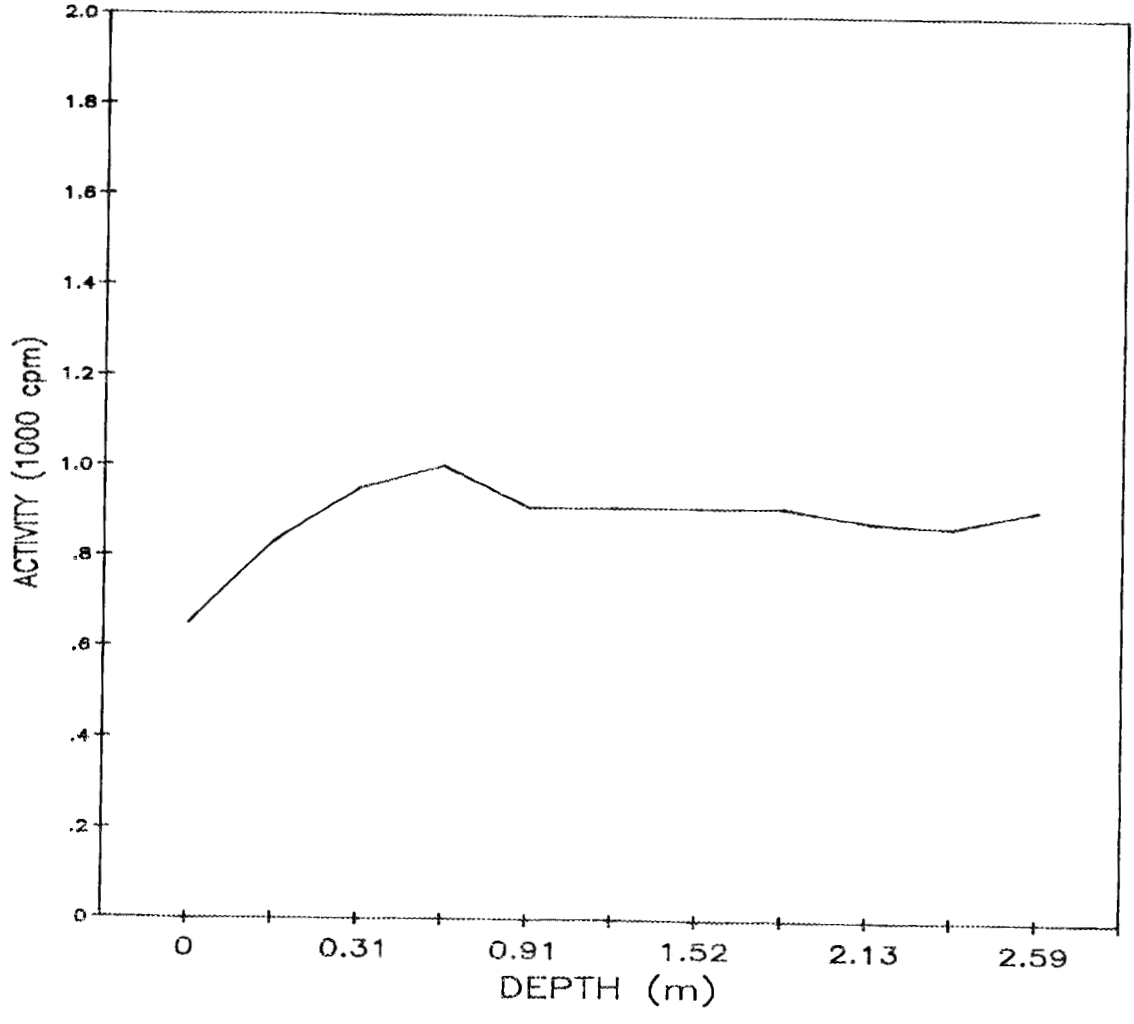

Fig. A.5. Gamma profile of auger hole 5.

ORNL-DWG 87-11463

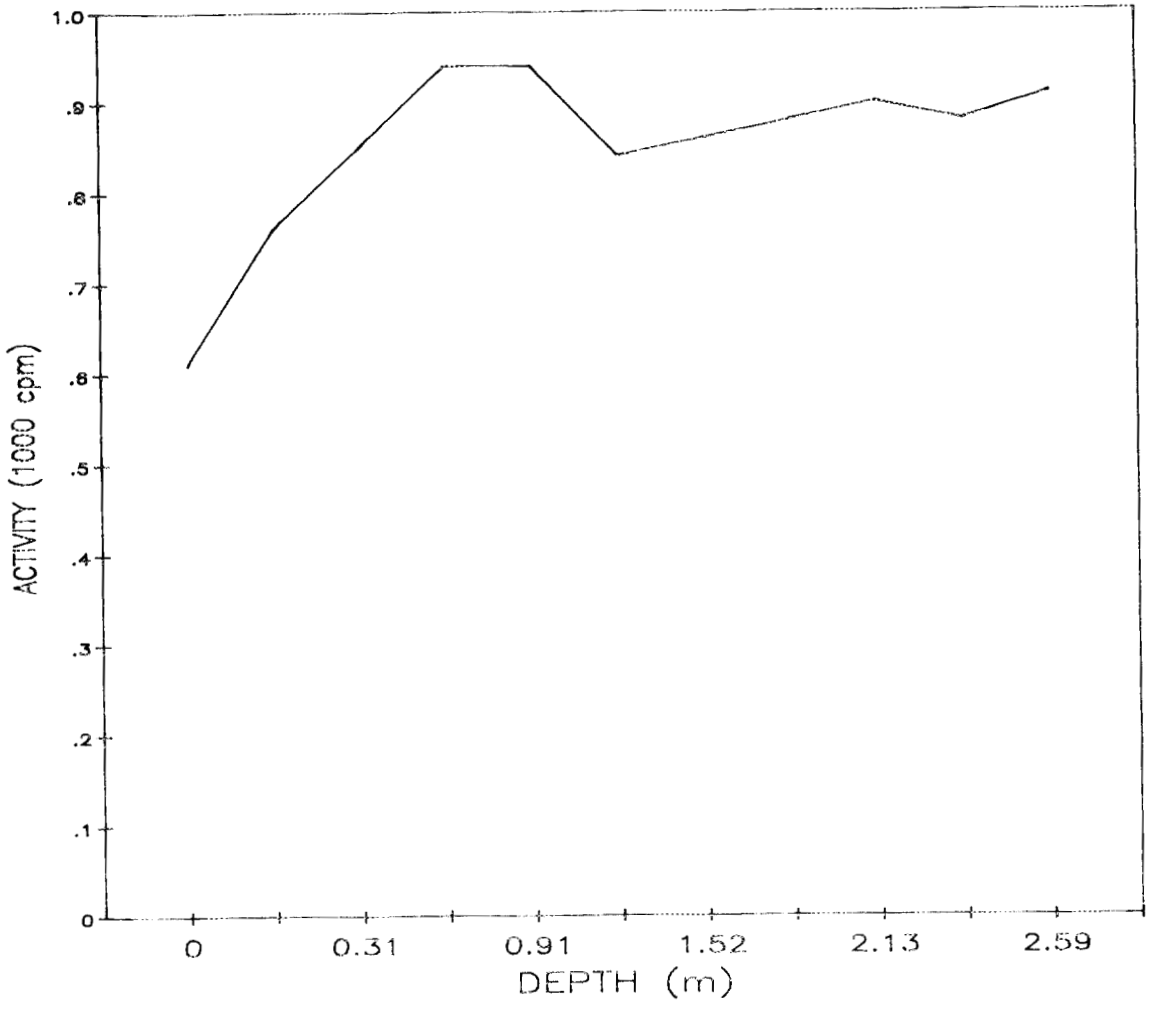

Fig. A.6. Gamma profile of auger hole 6.

ORNL-DWG 87-11464

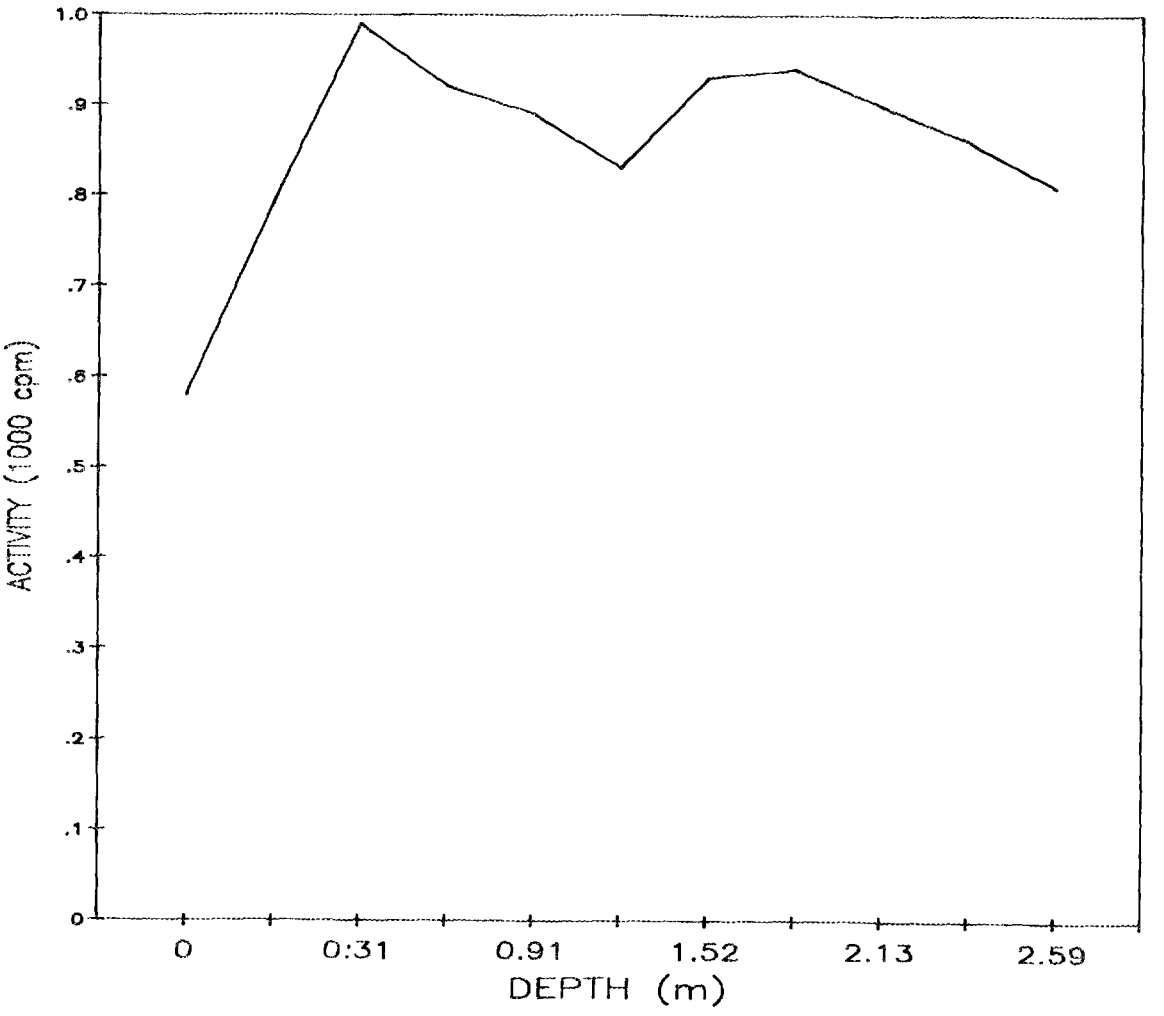

Fig. A.7. Gamma profile of auger hole 7.

ORNL-DWG 87-11465

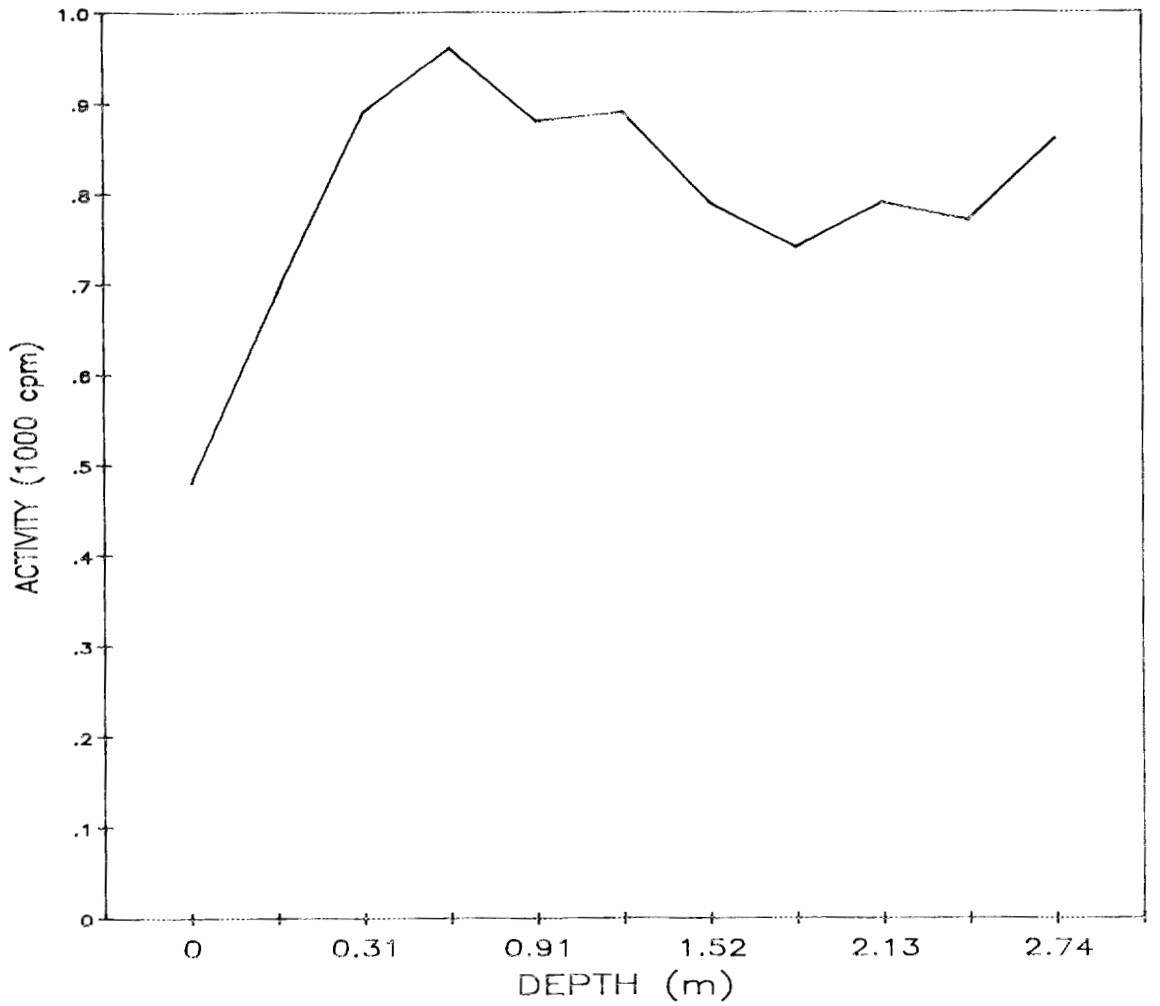

Fig. A.8. Gamma profile of auger hole 8.

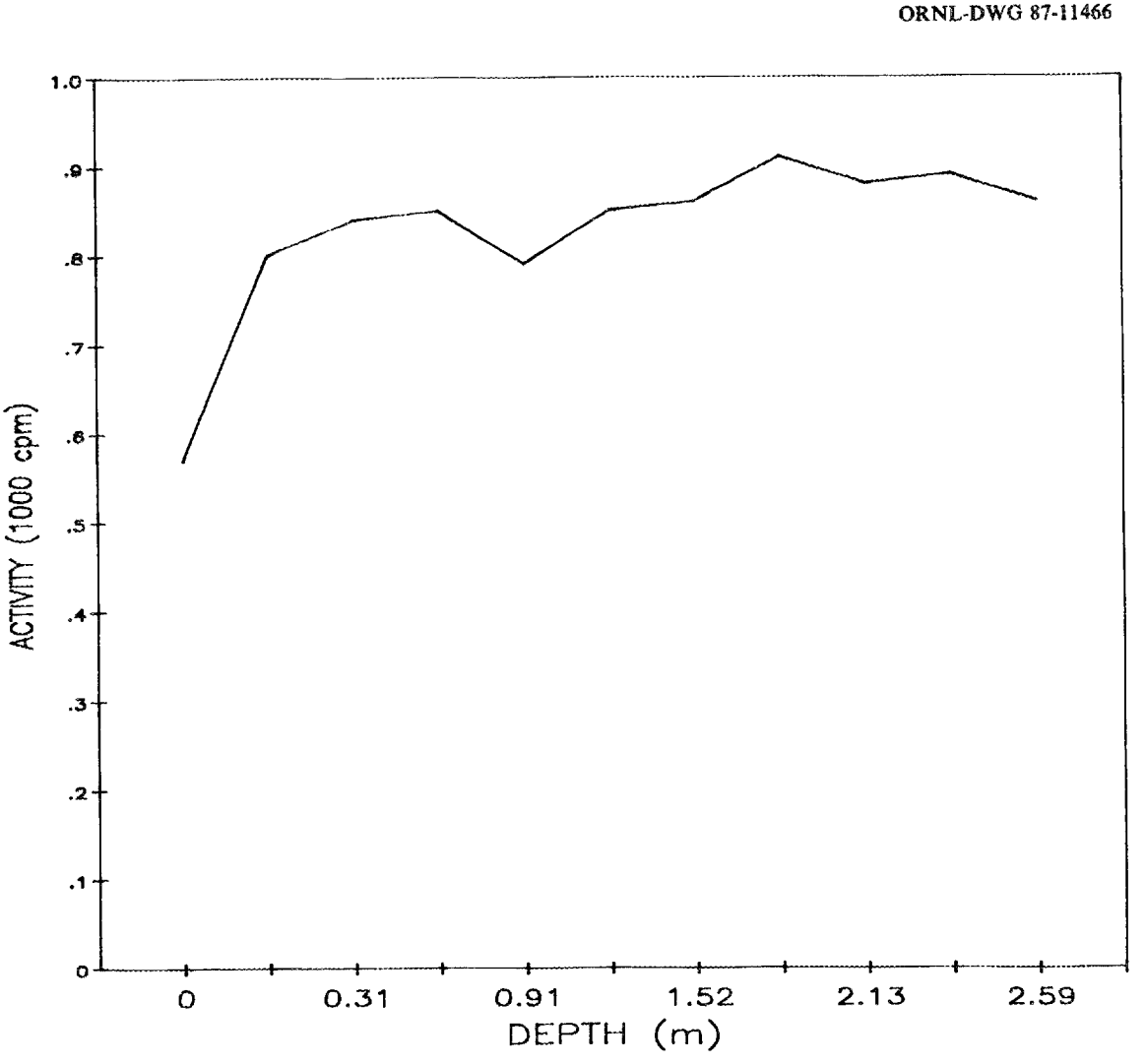

Fig. A.9. Gamma profile of auger hole 9.

ORNL-DWG 87-11467

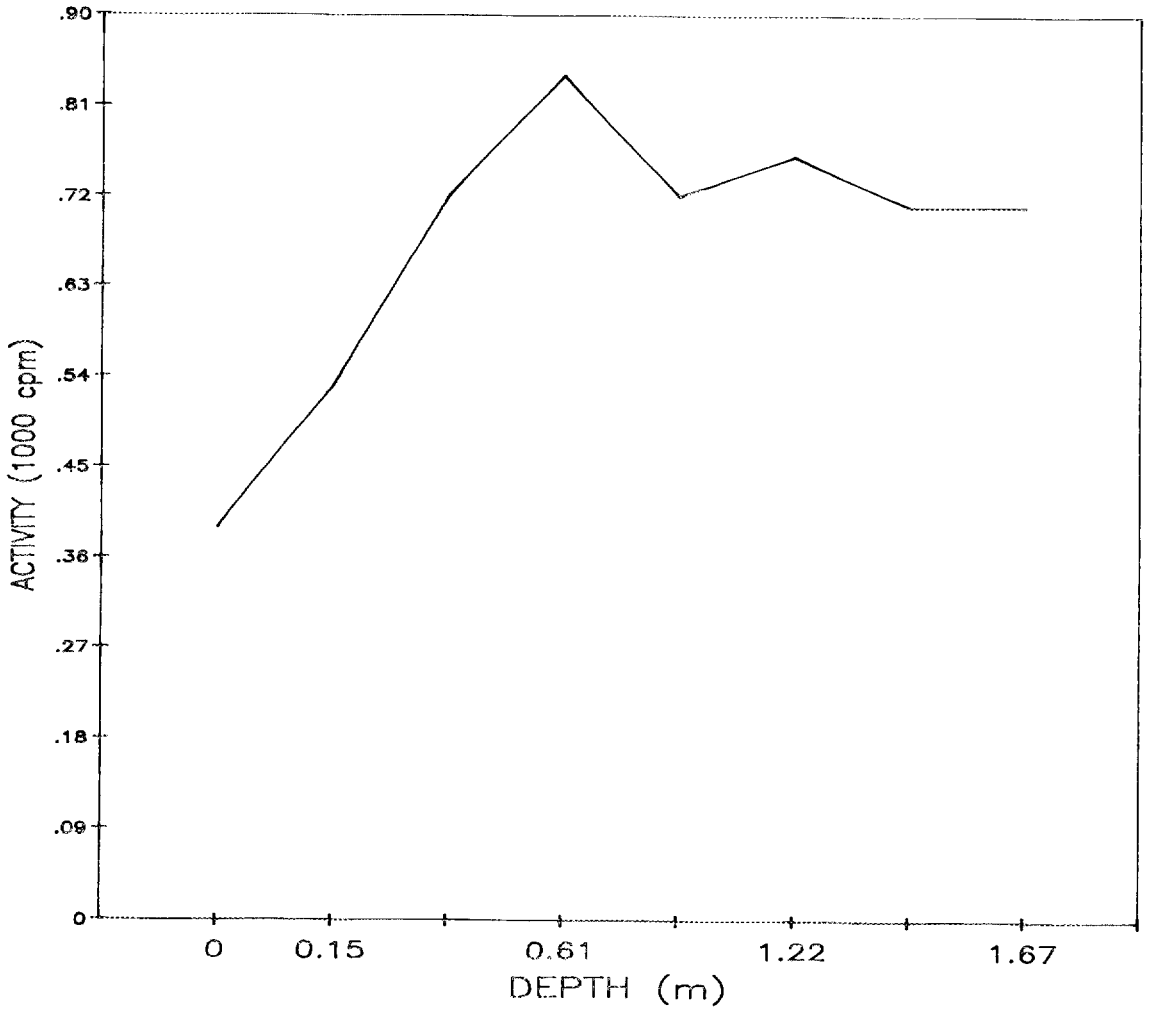

Fig. A.10. Gamma profile of auger hole 10.

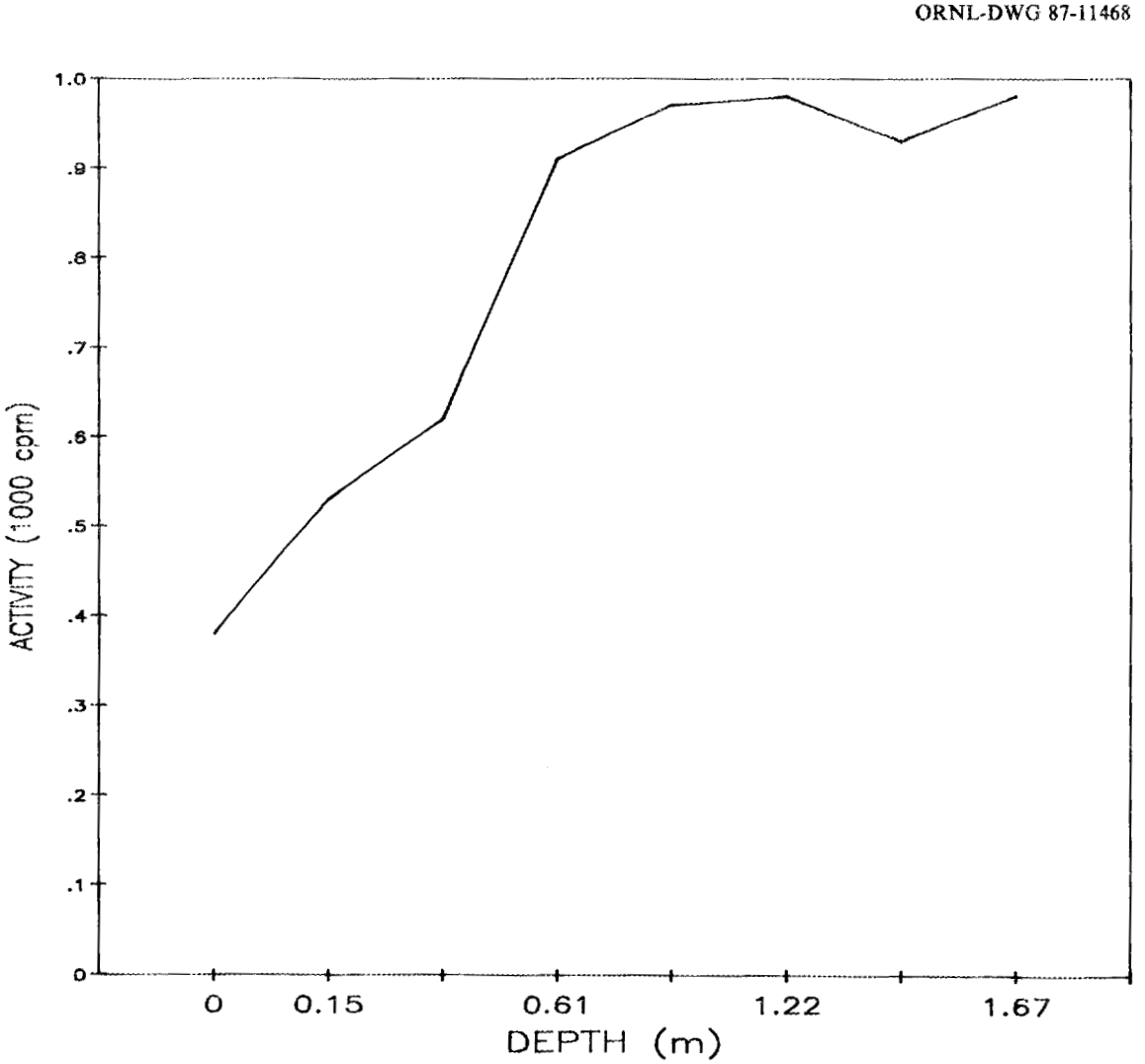

Fig. A.11. Gamma profile of auger hole 11.

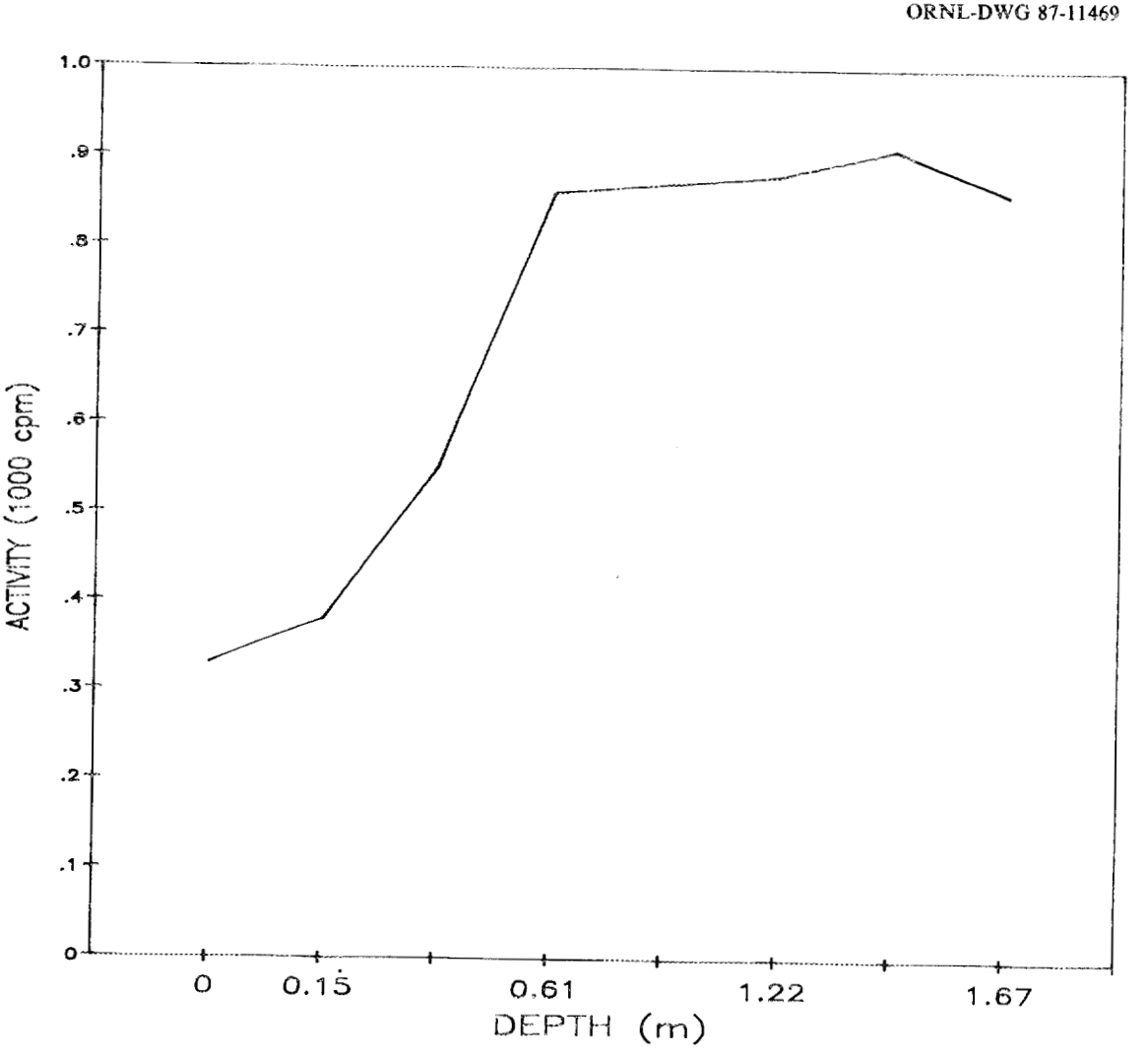

Fig. A.12. Gamma profile of auger hole 12.

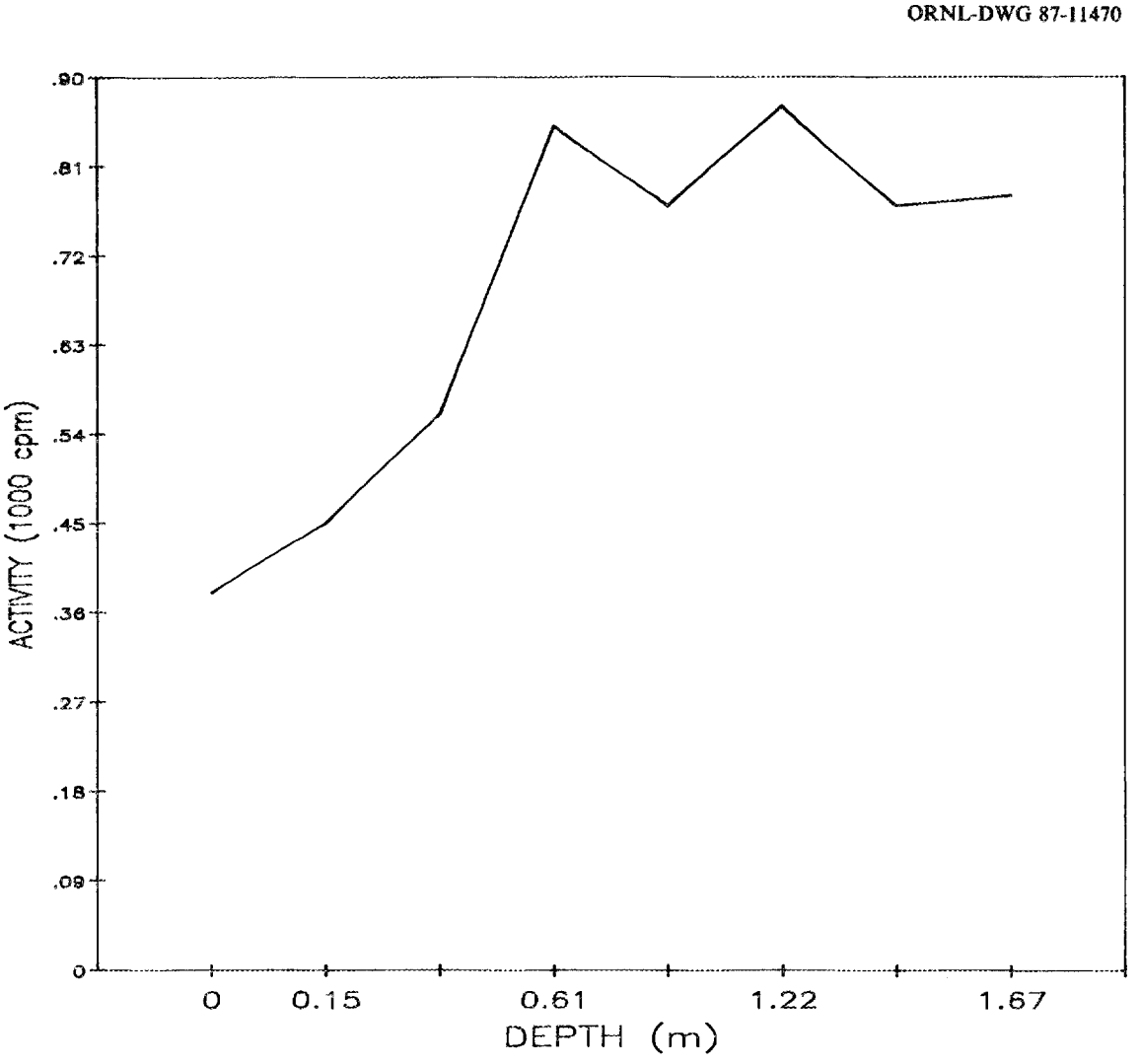

Fig. A.13. Gamma profile of auger hole 13.

ORNL-DWG 87-11471

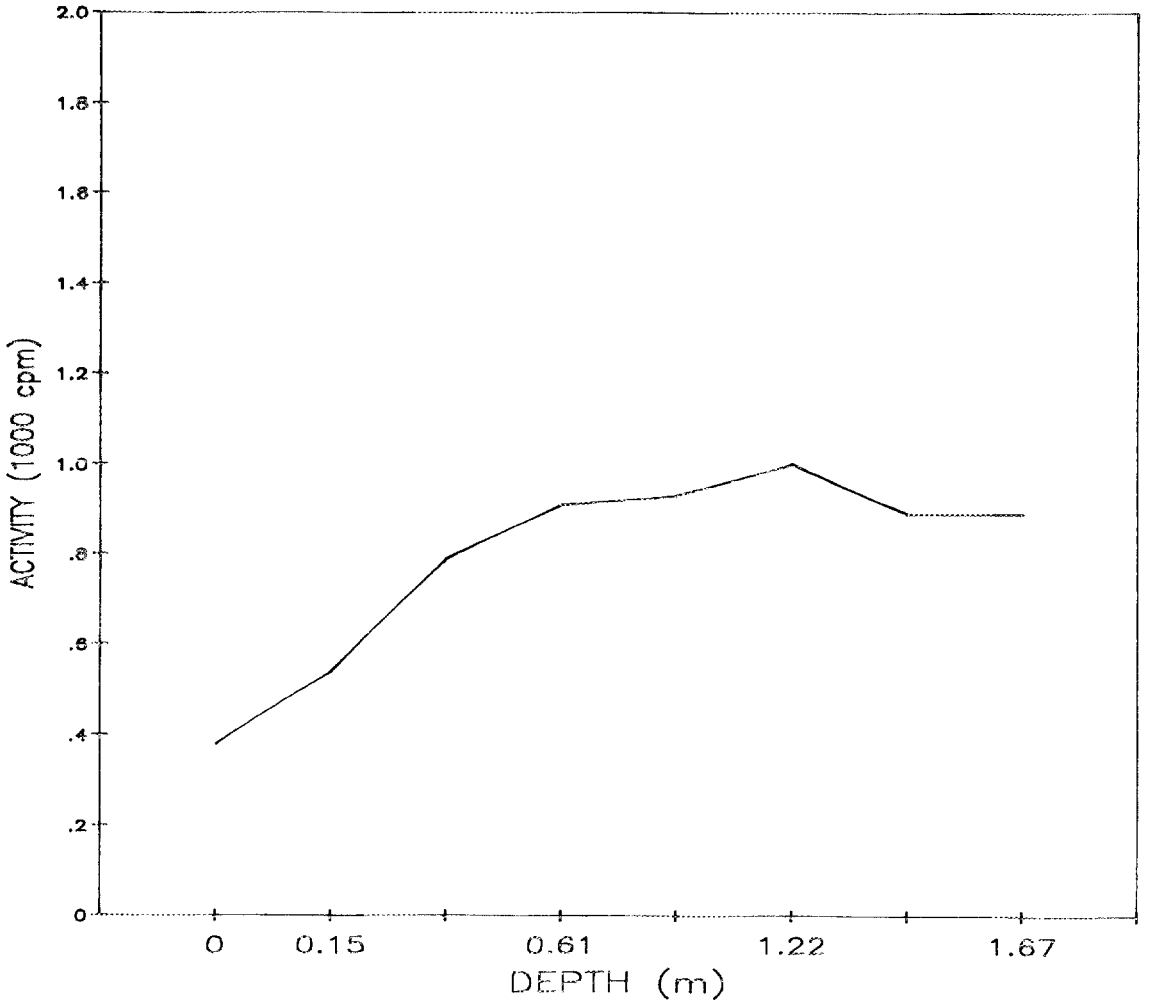

Fig. A.14. Gamma profile of auger hole 14.

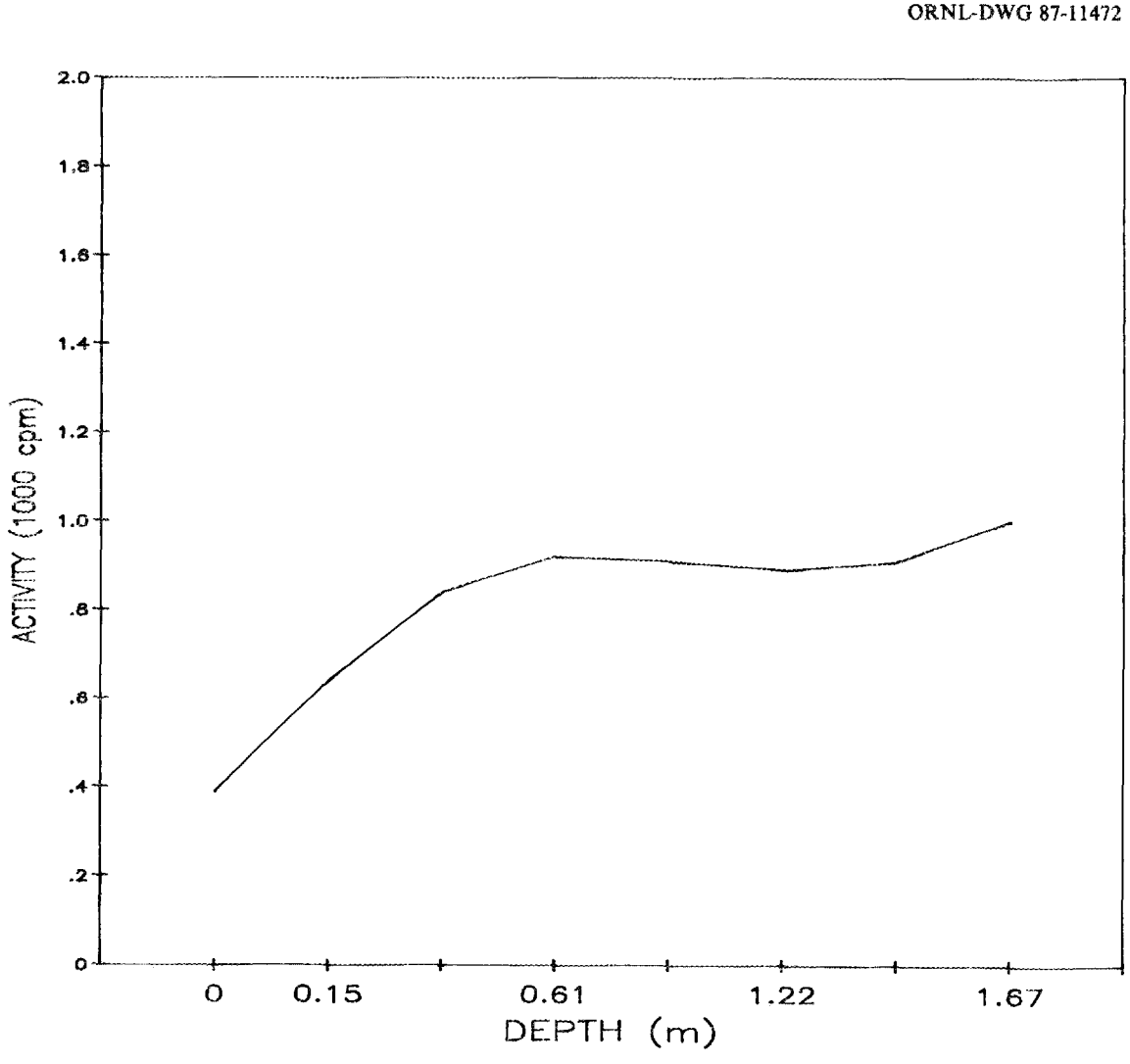

Fig. A.15. Gamma profile of auger hole 15.

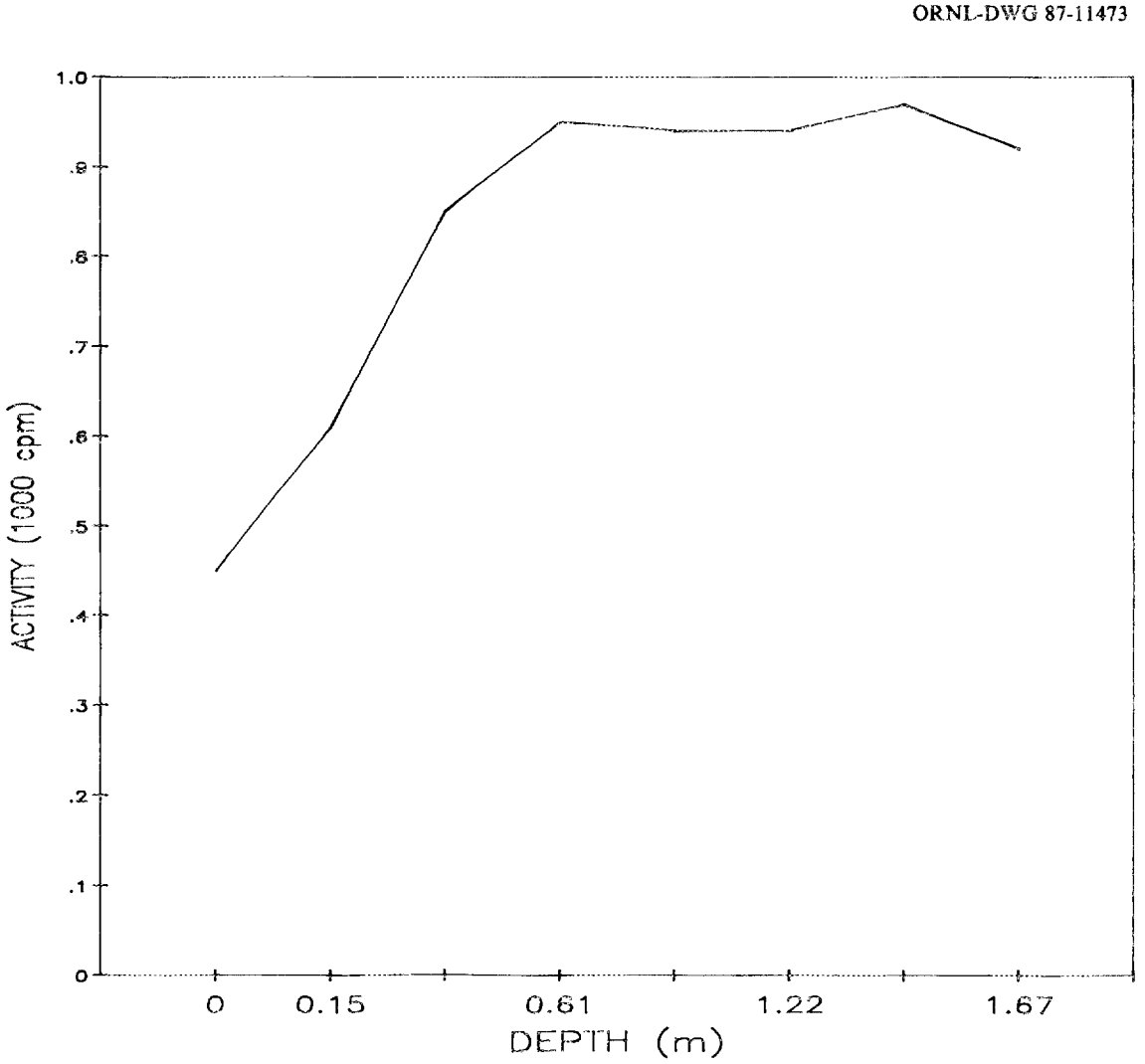

Fig. A.16. Gamma profile of auger hole 16.

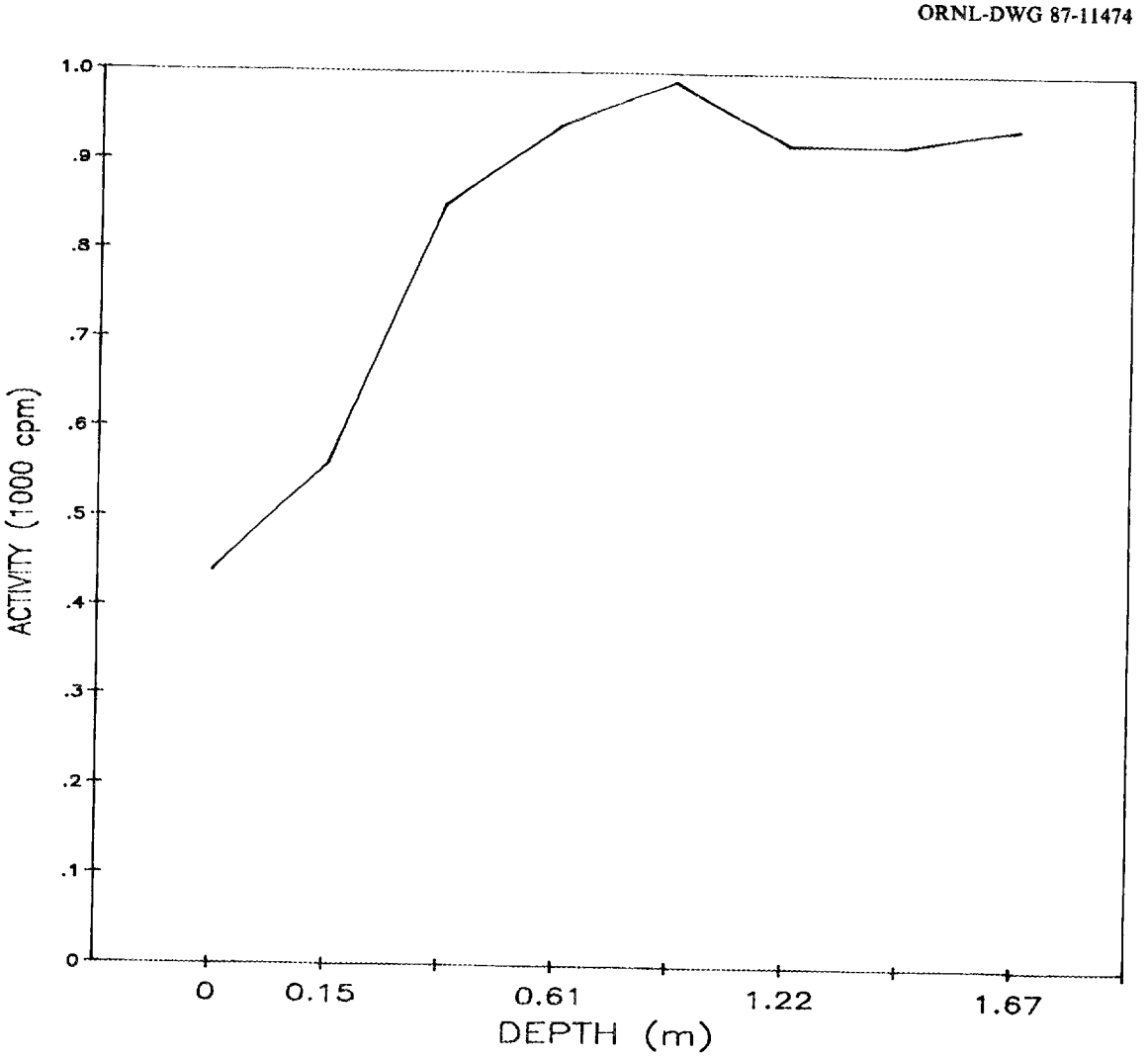

Fig. A.17. Gamma profile of auger hole 17.

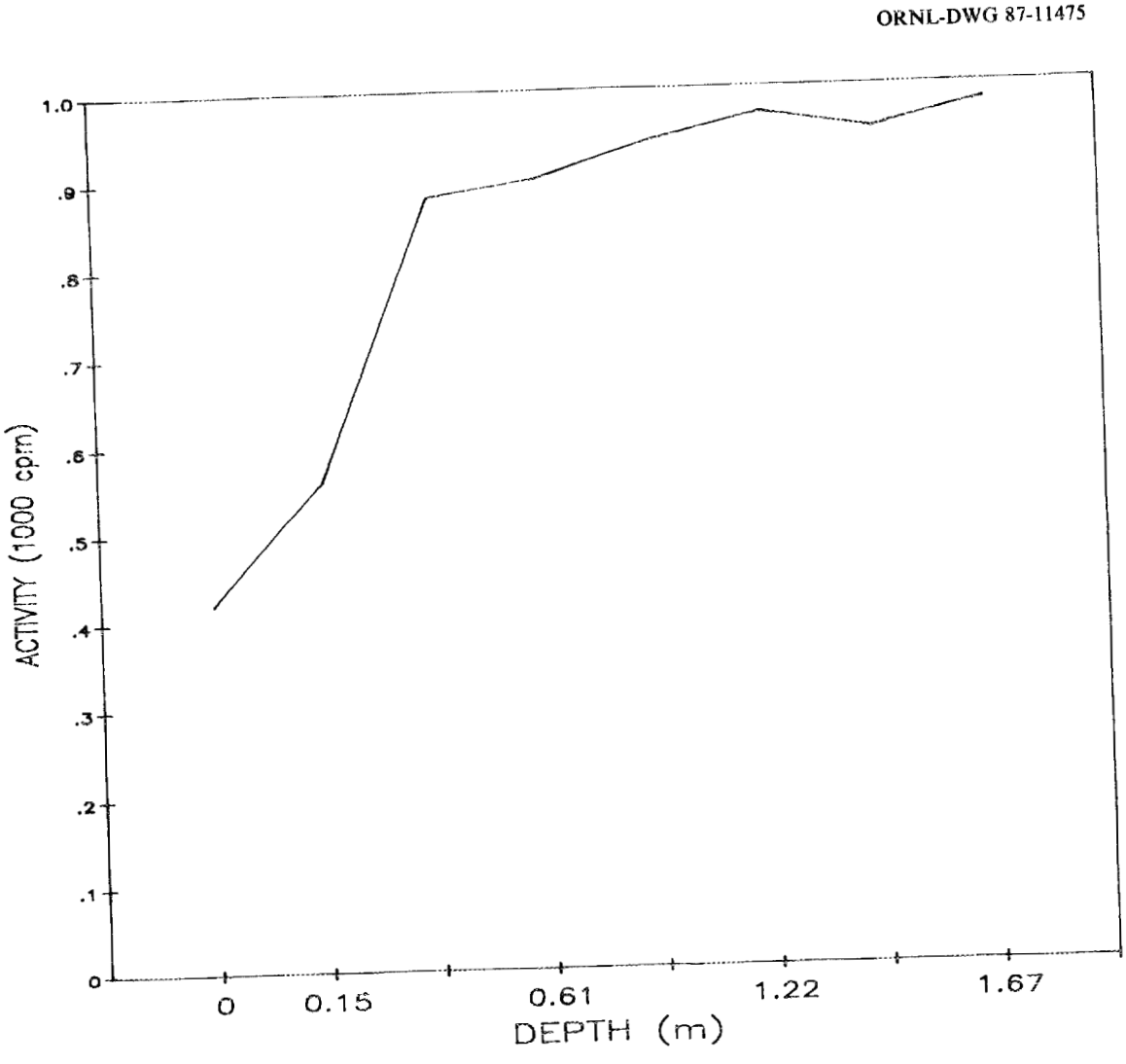

Fig. A.18. Gamma profile of auger hole 18.

ORNL-DWG 87-11476

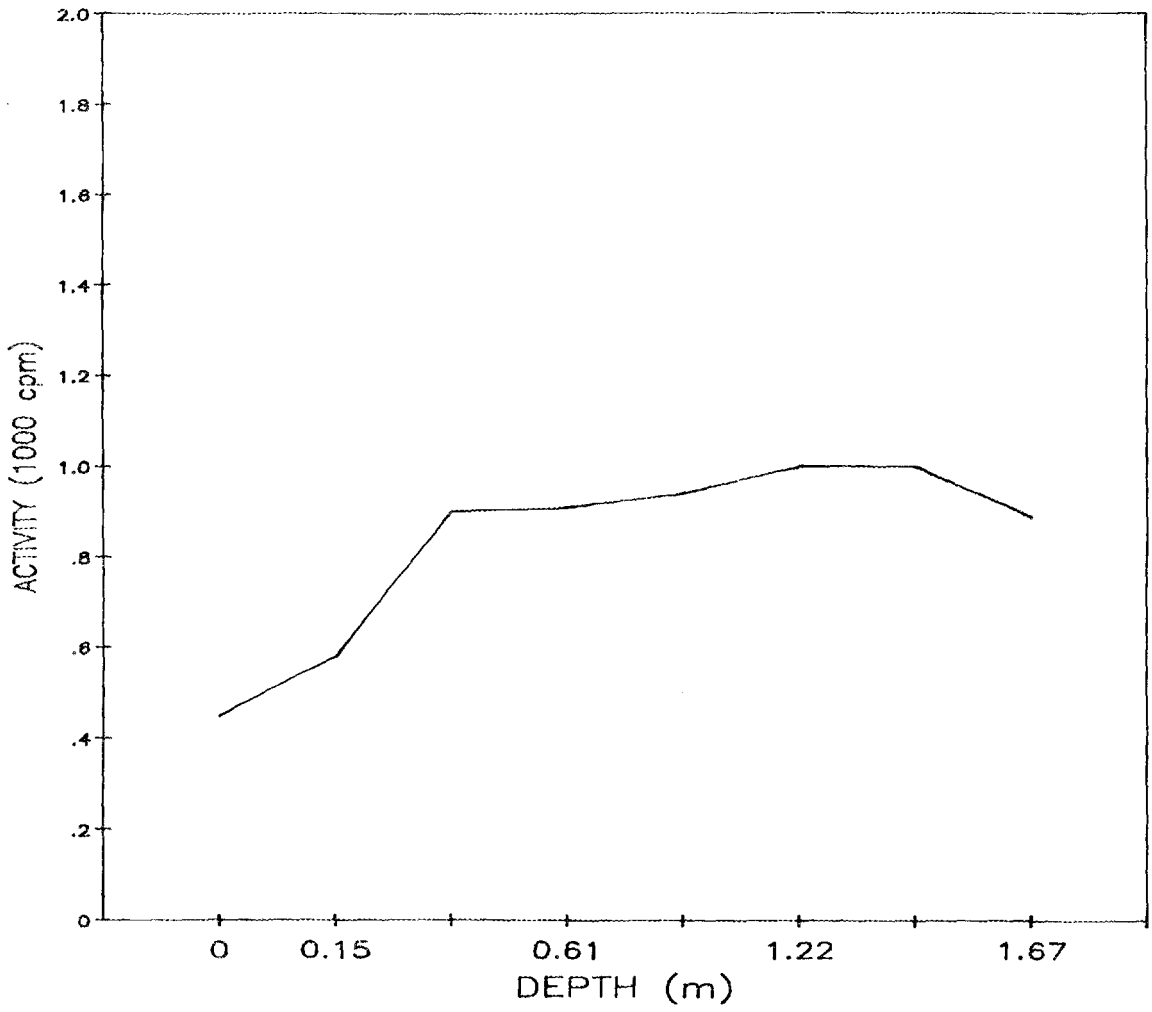

Fig. A.19. Gamma profile of auger hole 19.

ORNL-DWG 87-11477

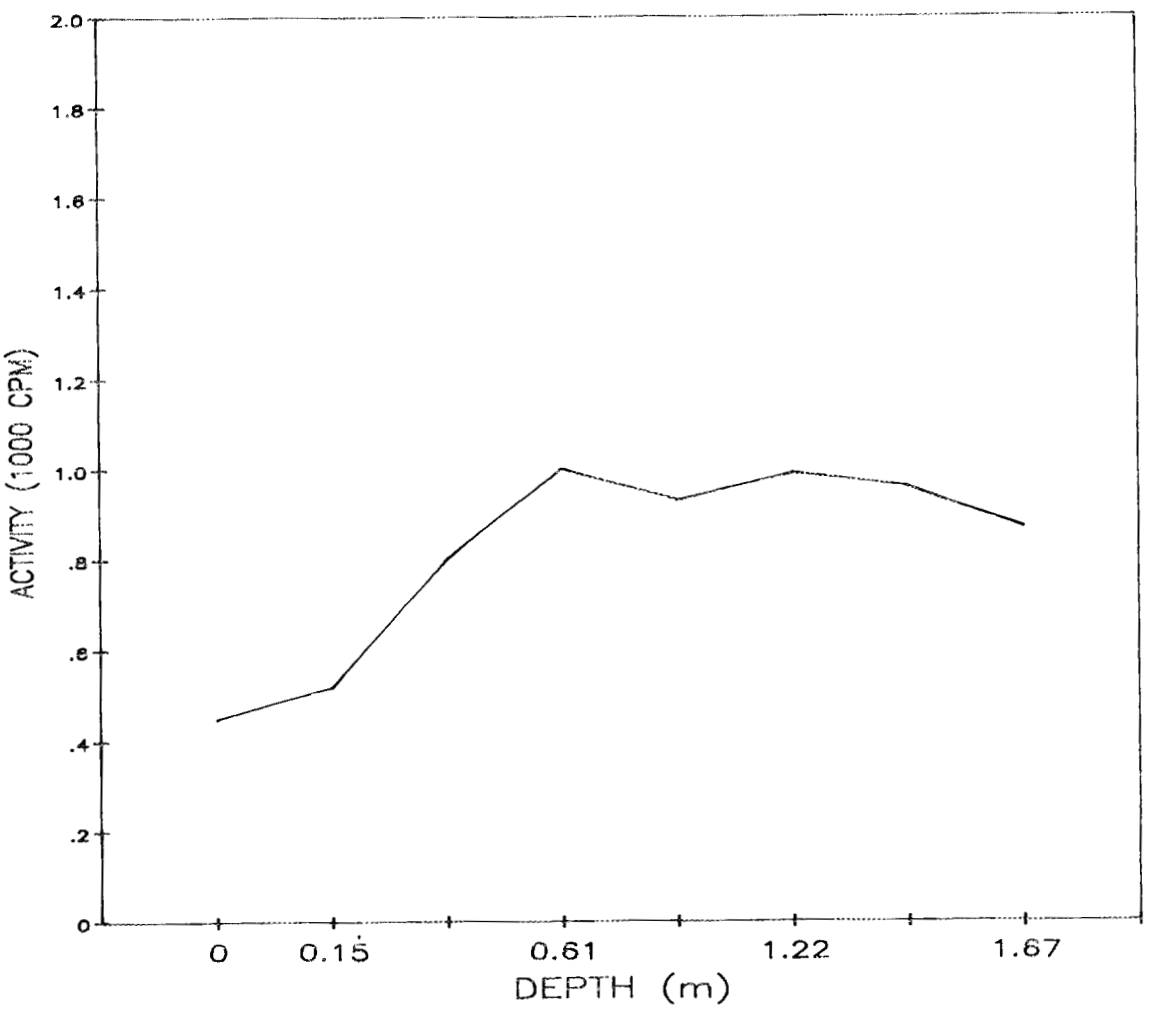

Fig. A.20. Gamma profile of auger hole 20.

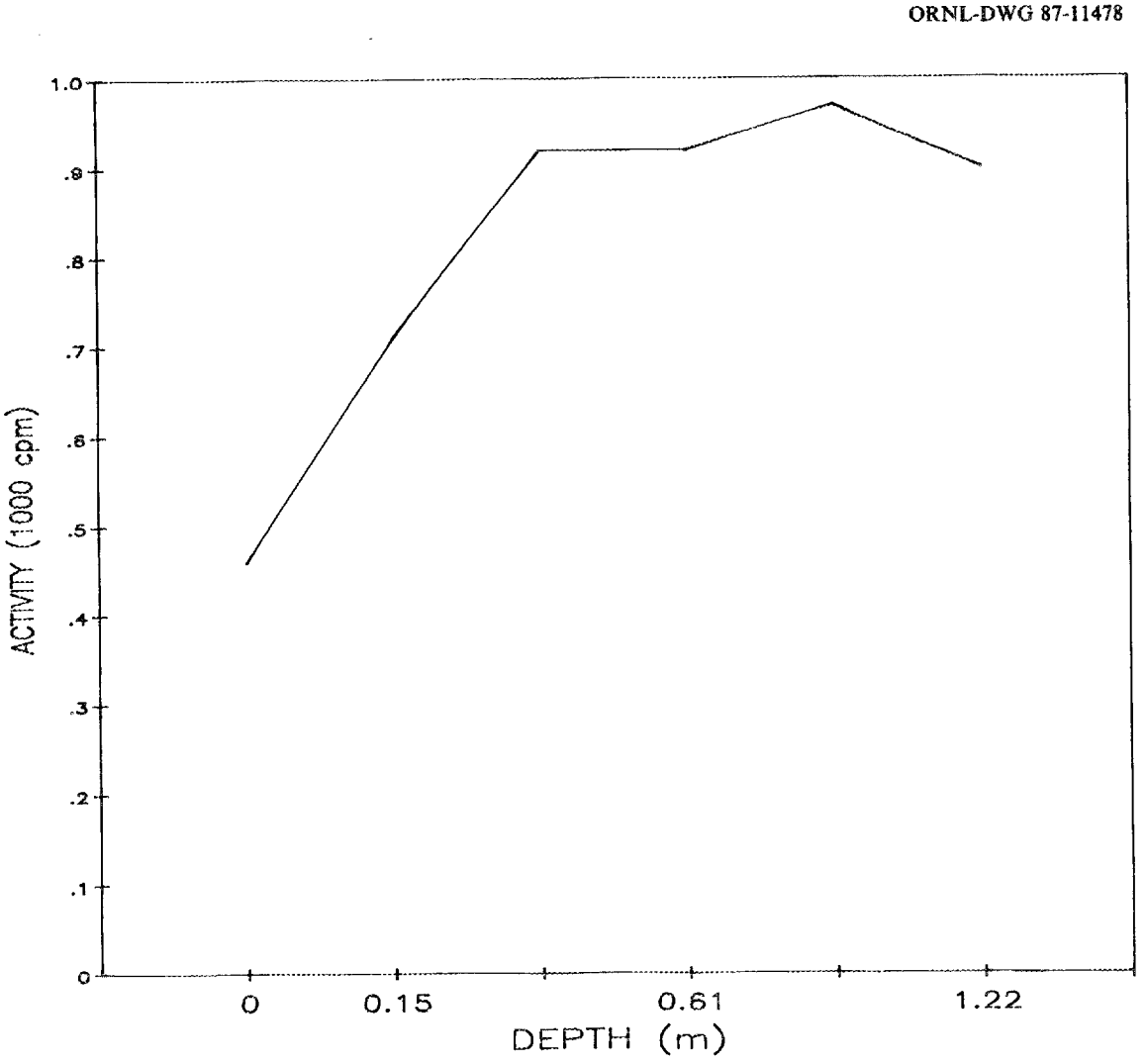

Fig. A.21. Gamma profile of auger hole 21.

ORNL-DWG 87-11479

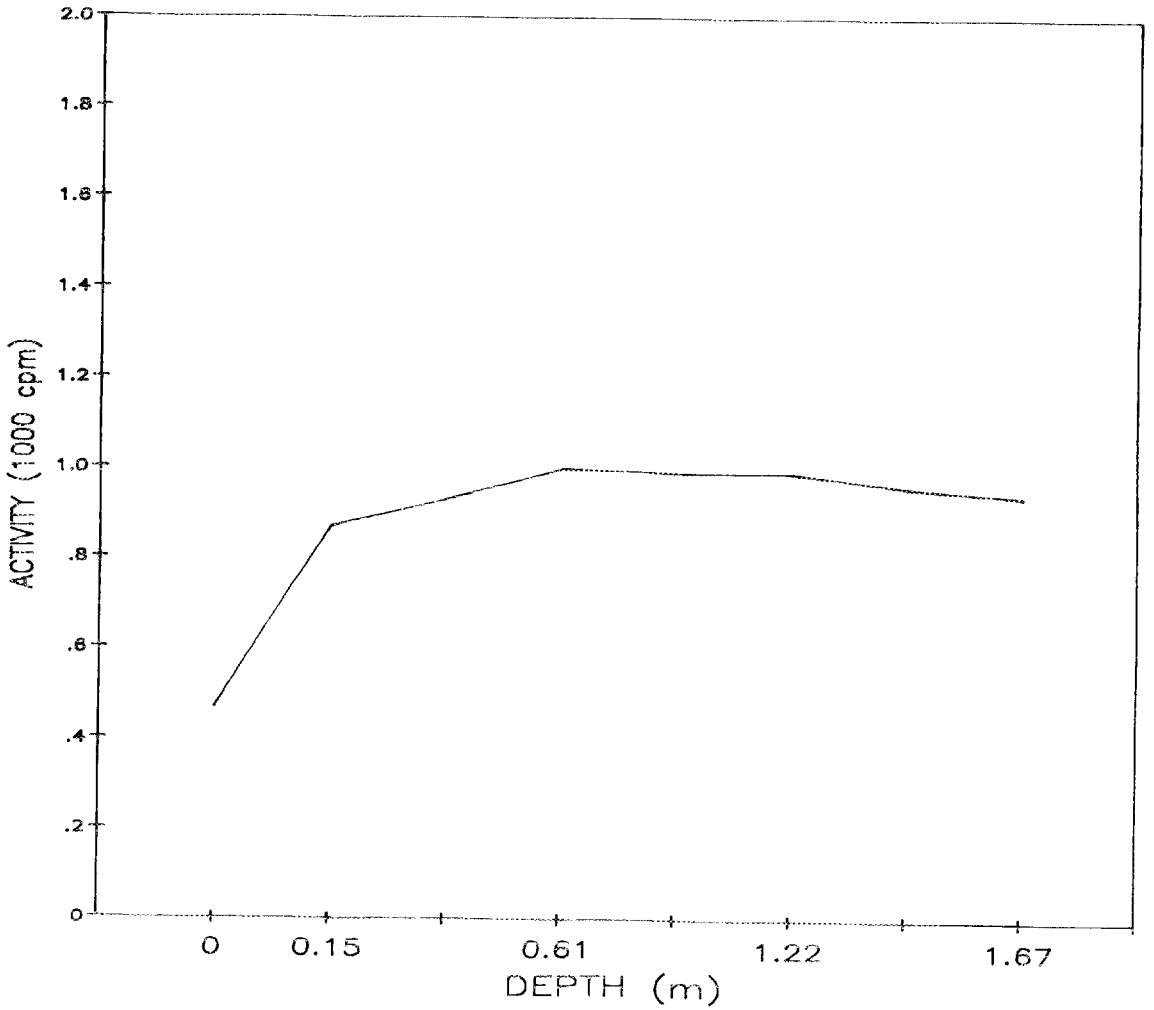

Fig. A.22. Gamma profile of auger hole 22.

ORNL-DWG 87-11480

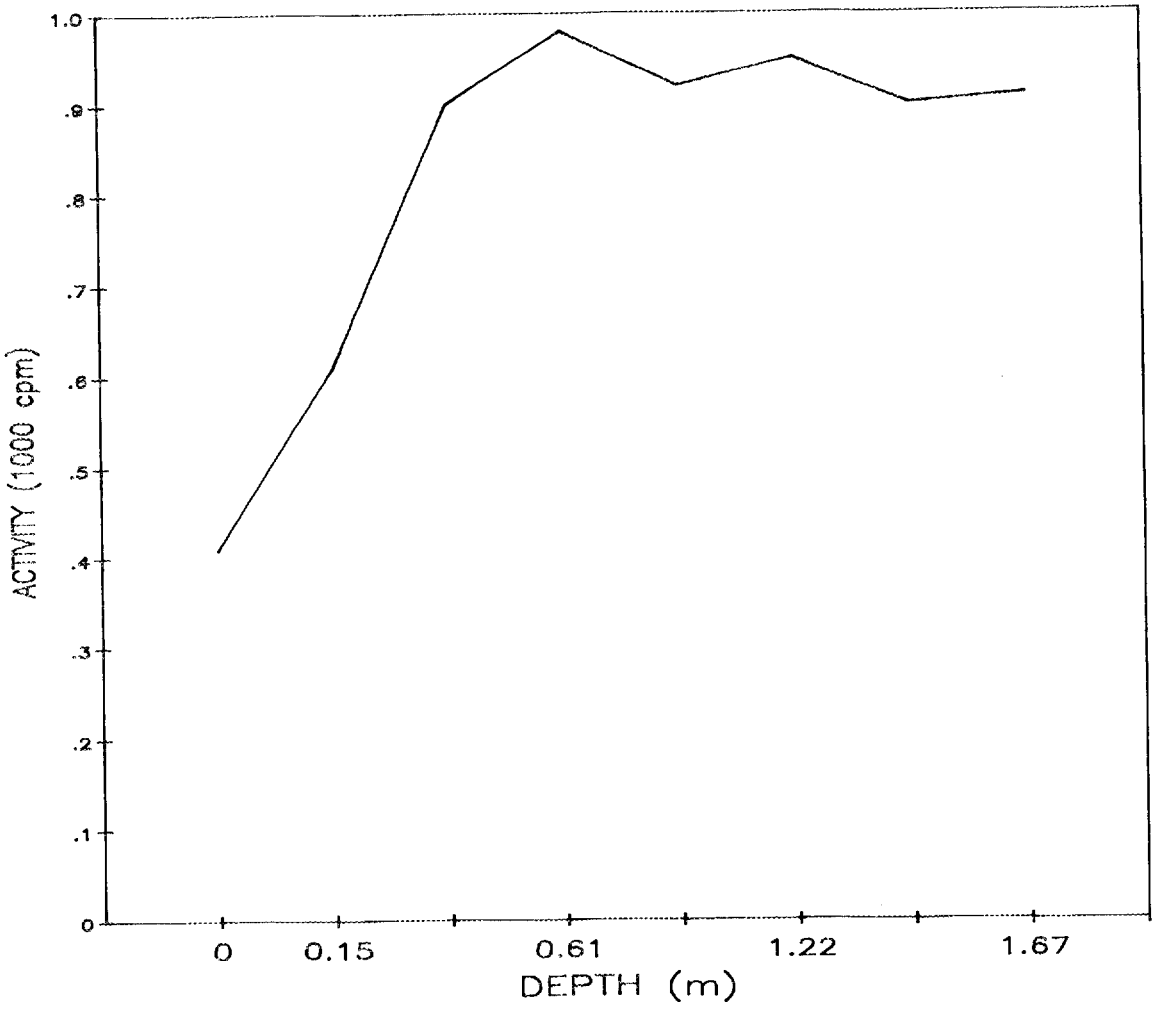

Fig. A.23. Gamma profile of auger hole 23.

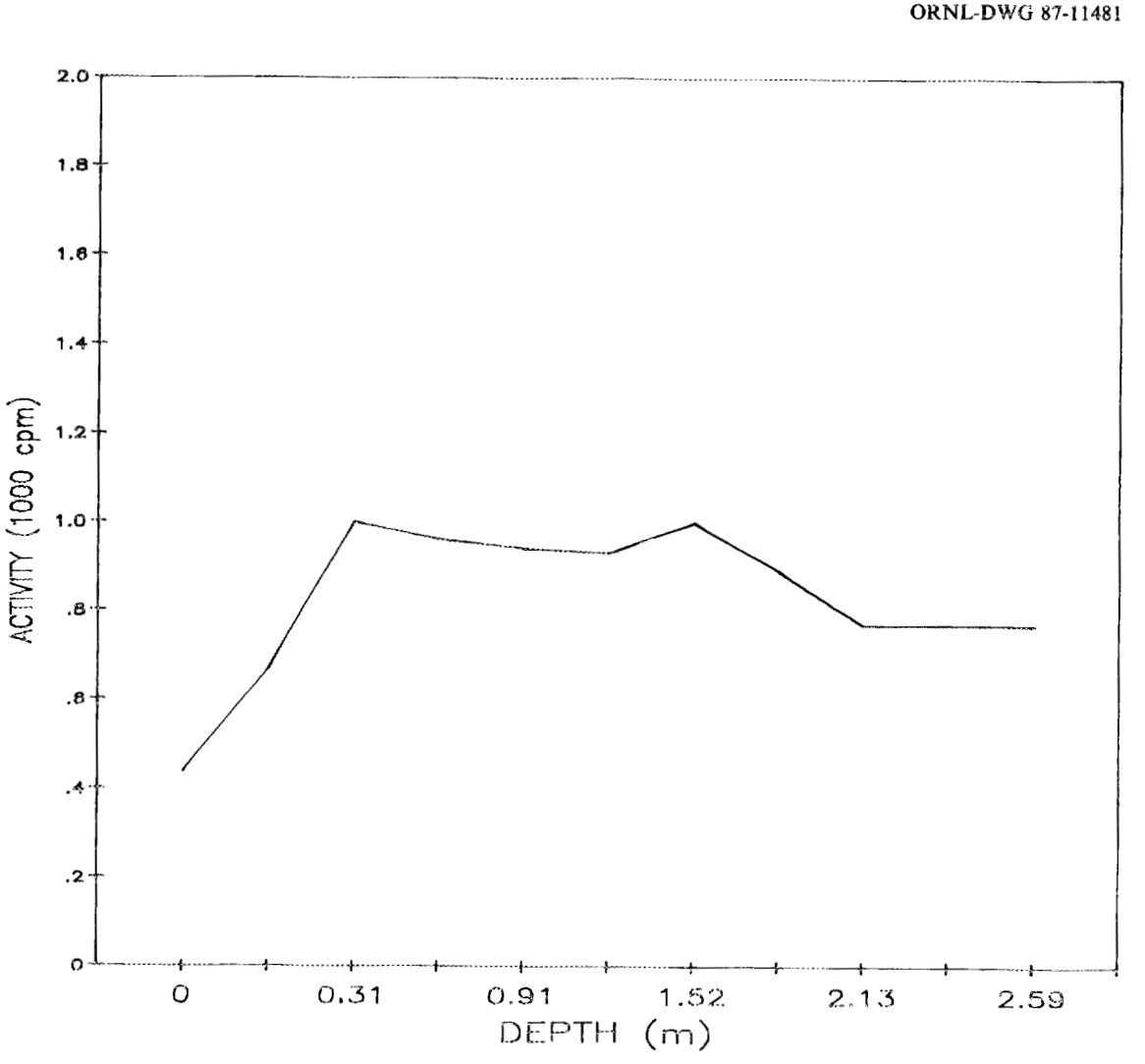

Fig. A.24. Gamma profile of auger hole 24.

ORNL-DWG 87-11482

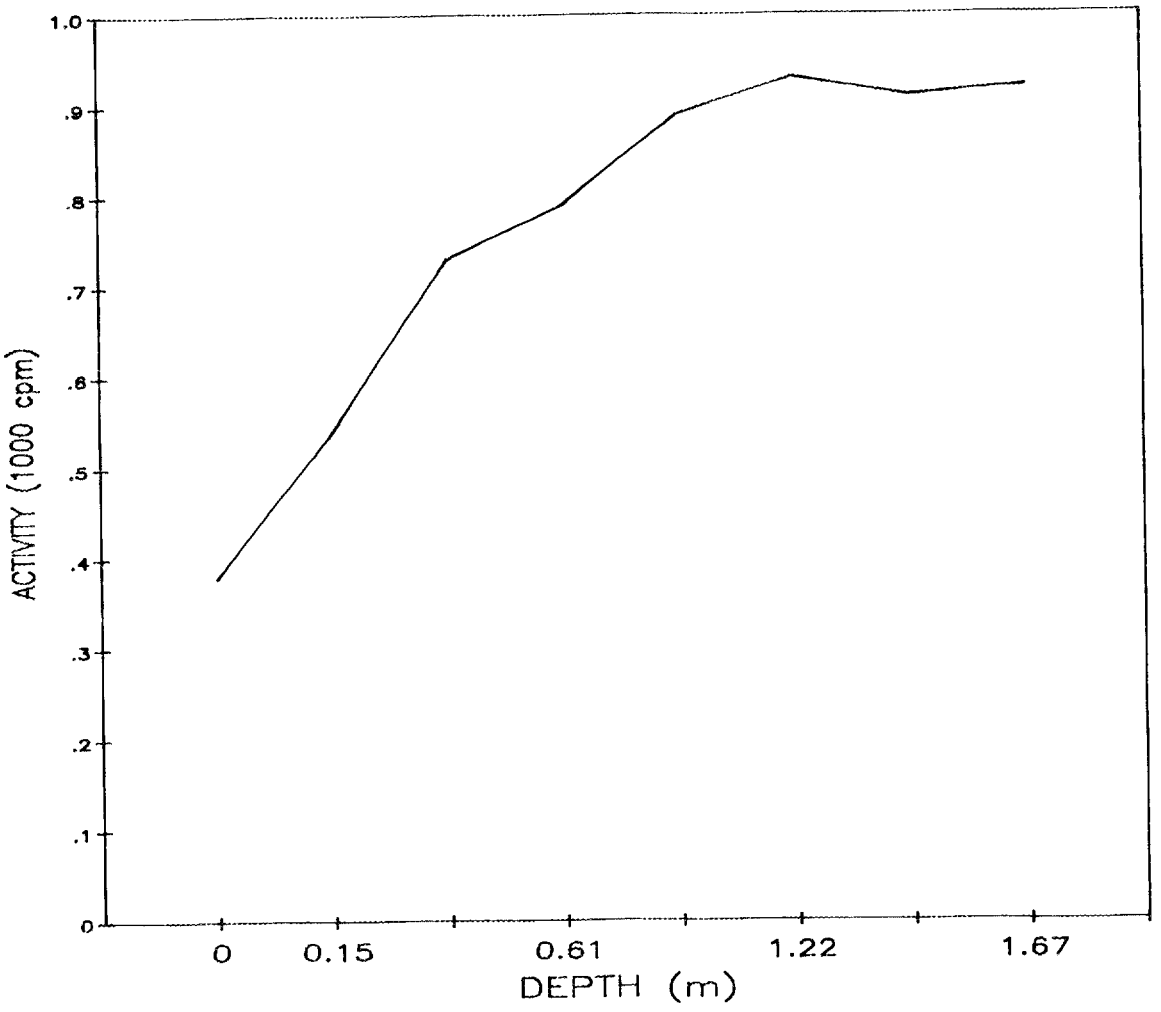

Fig. A.25. Gamma profile of auger hole 25.

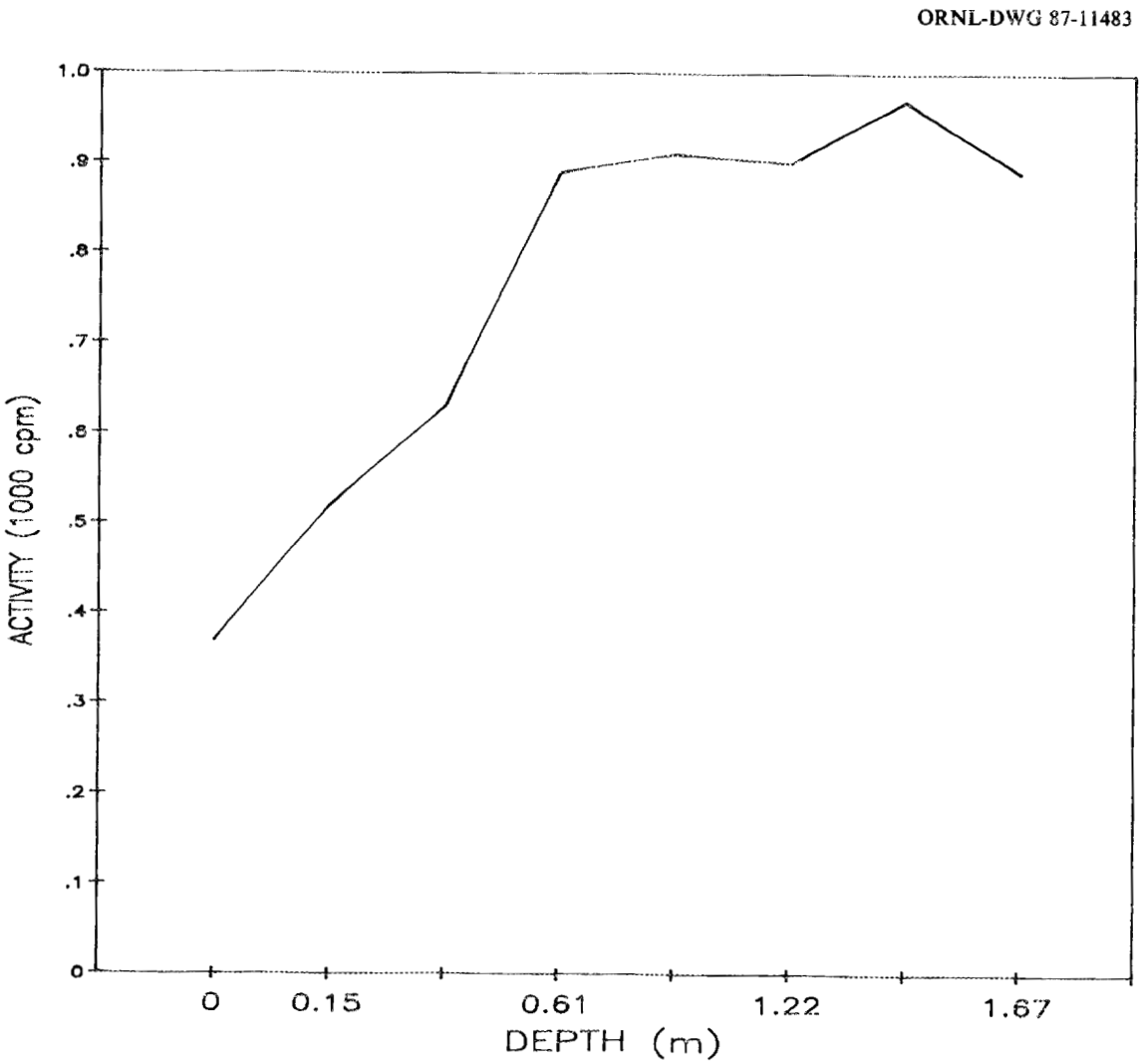

Fig. A.26. Gamma profile of auger hole 26.

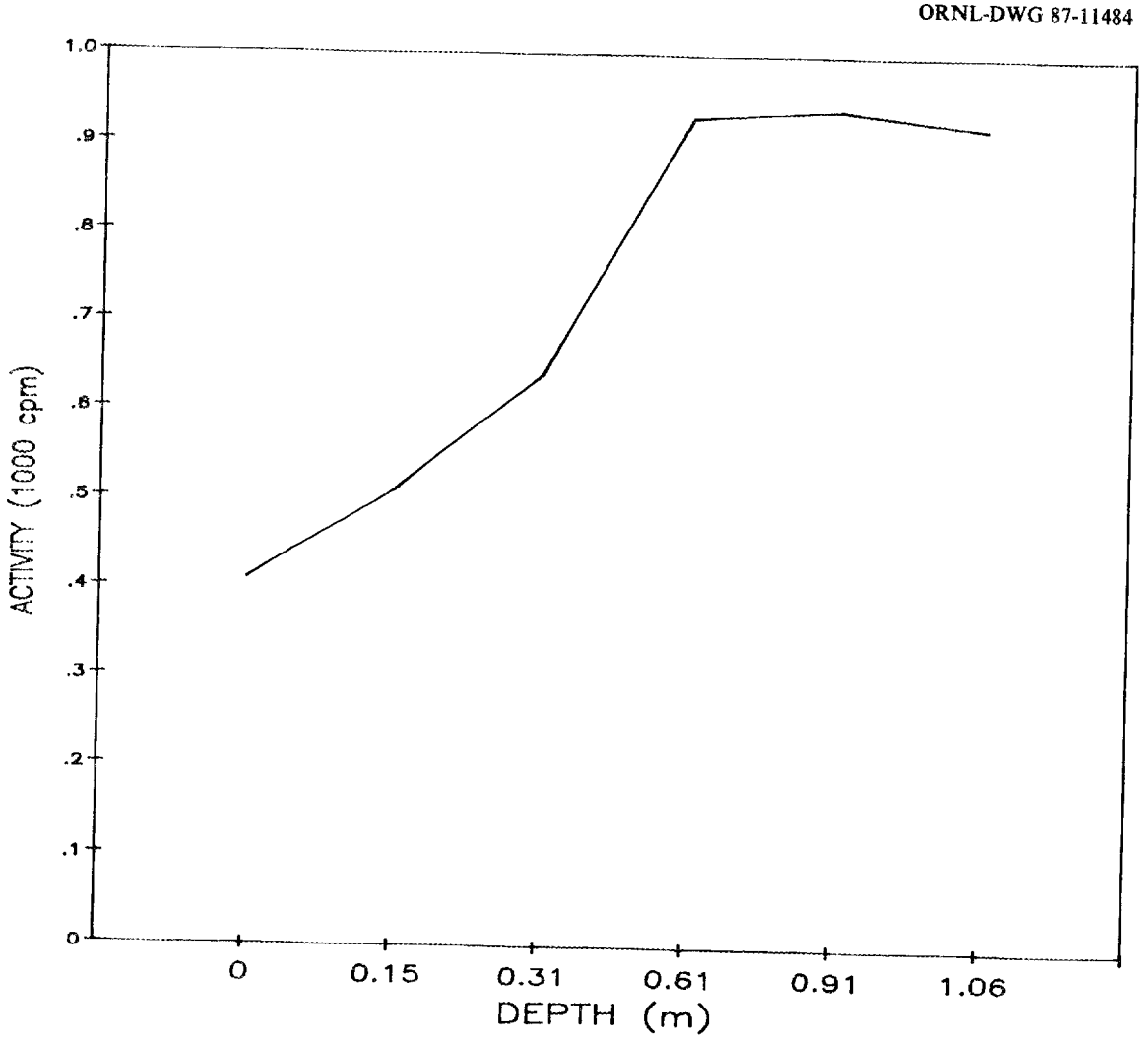

Fig. A.27. Gamma profile of auger hole 27.

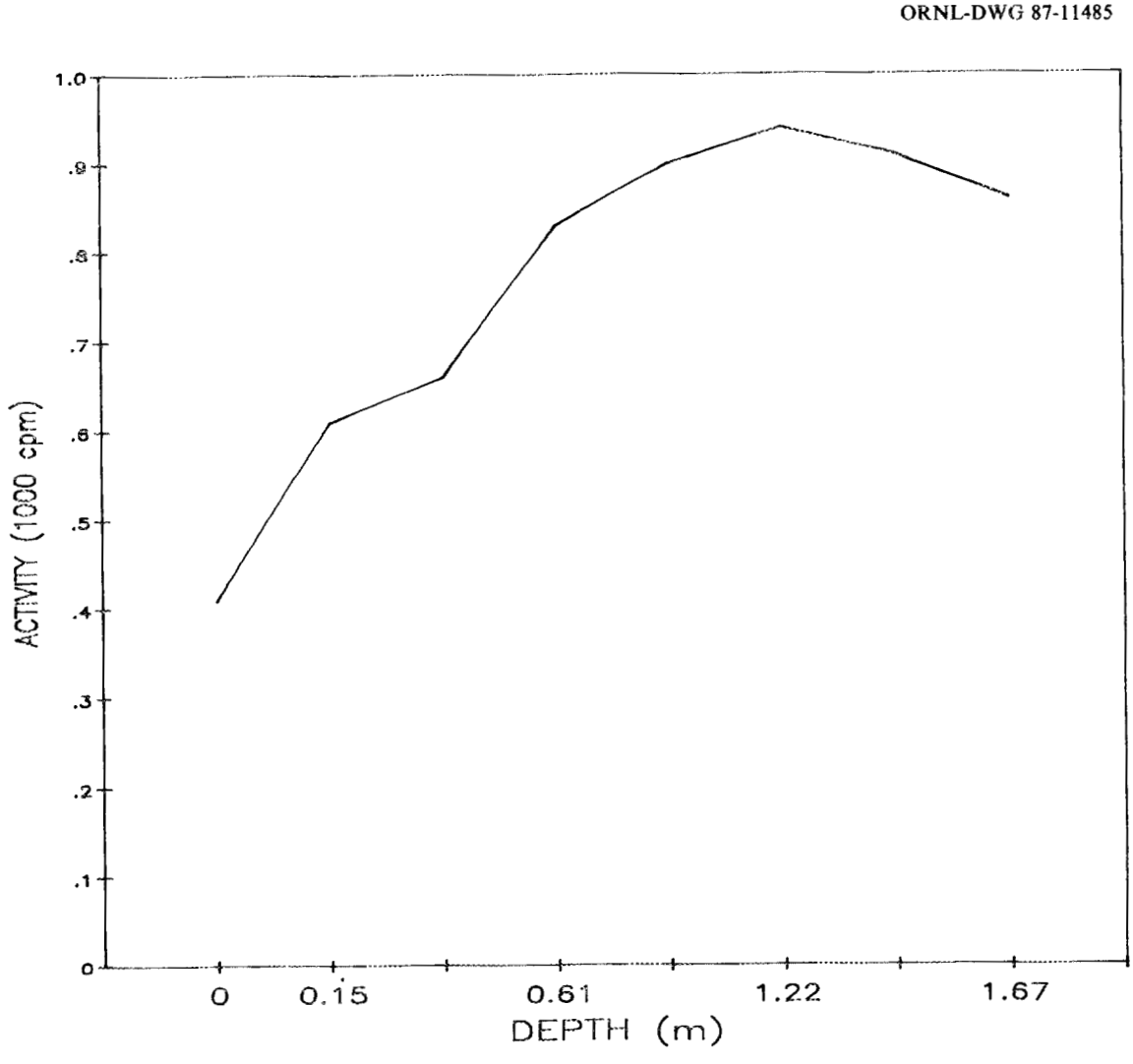

Fig. A.28. Gamma profile of auger hole 28.

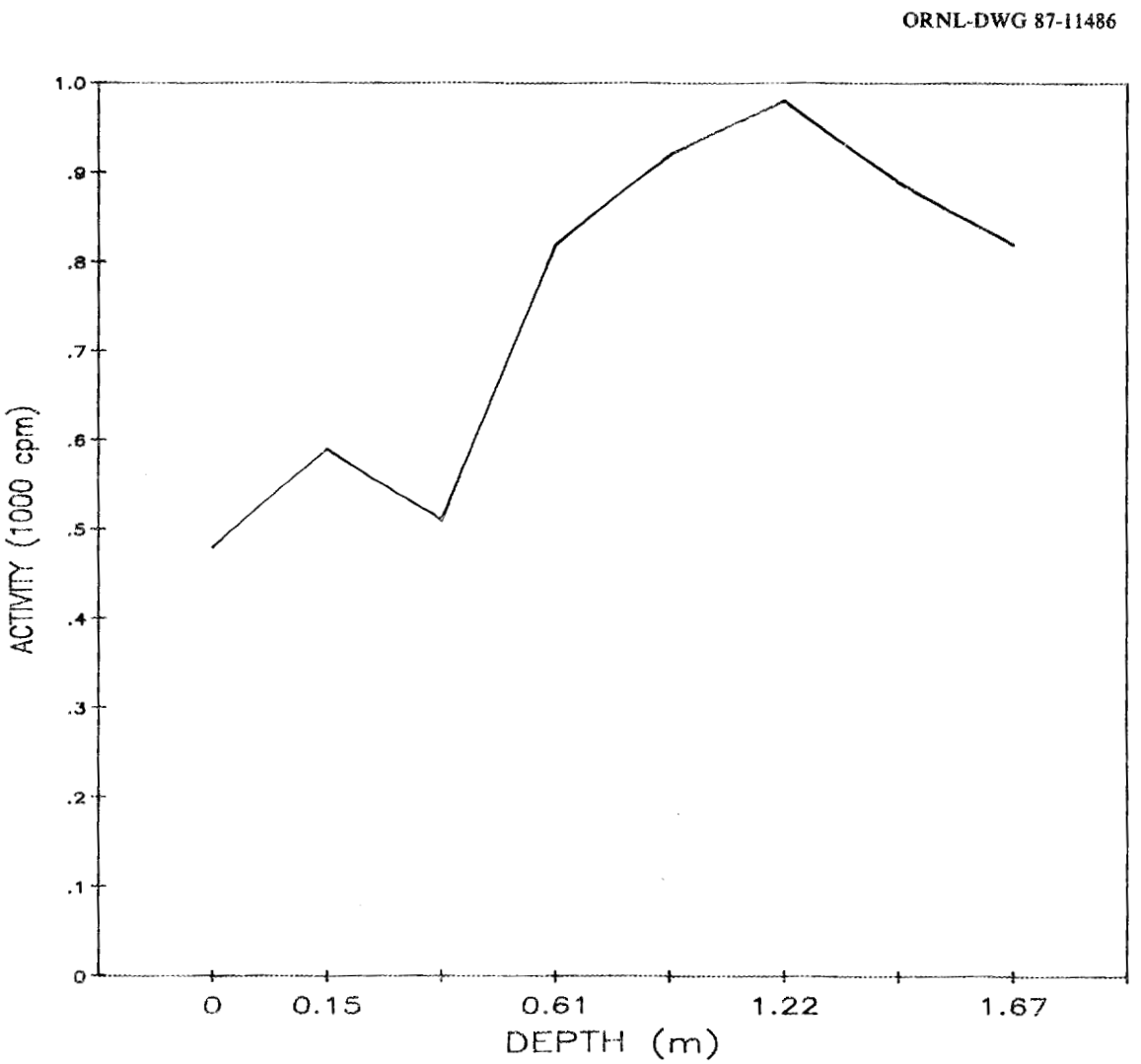

Fig. A.29. Gamma profile of auger hole 29.

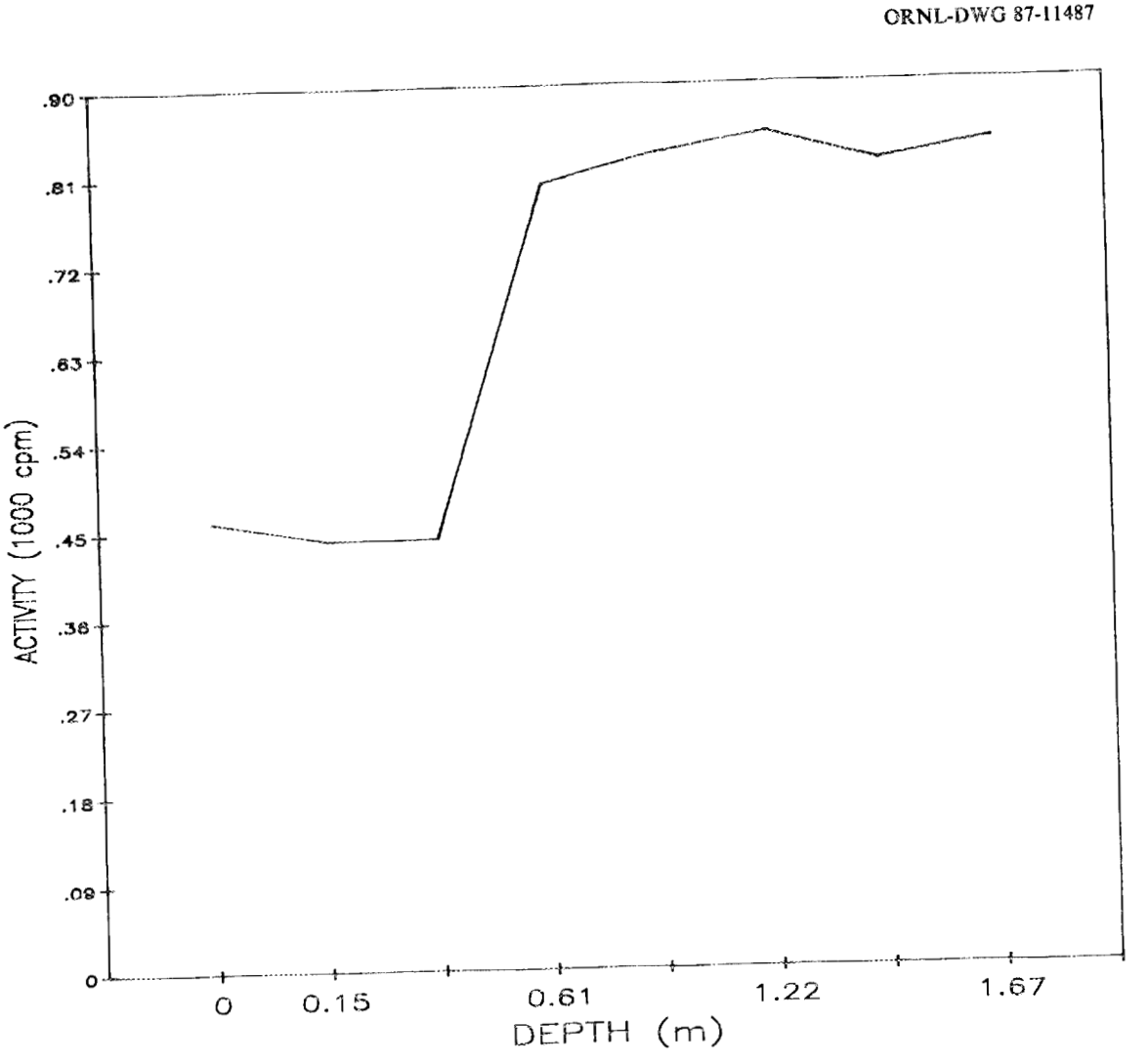

Fig. A.30. Gamma profile of auger hole 30.

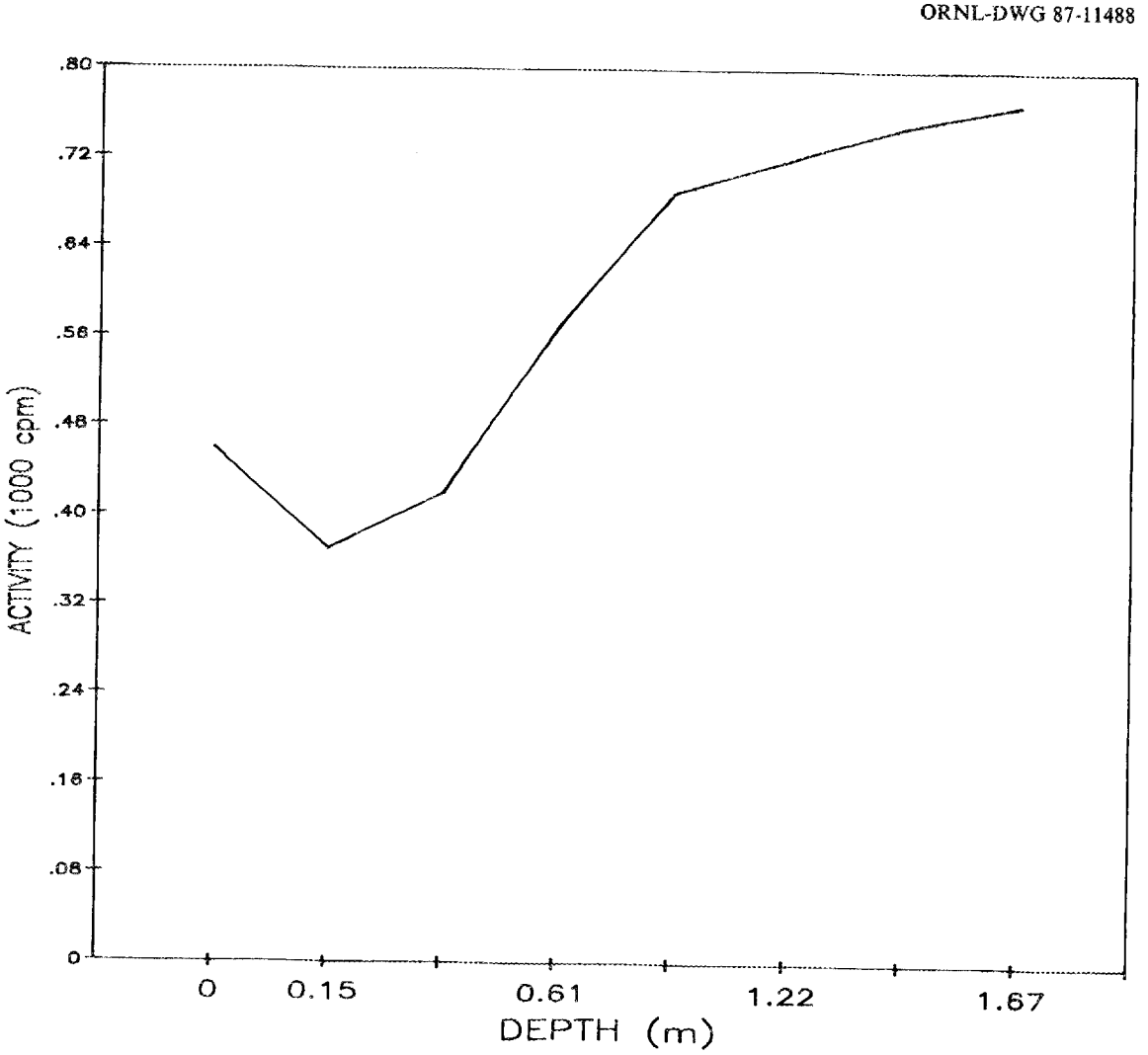

Fig. A.31. Gamma profile of auger hole 31.

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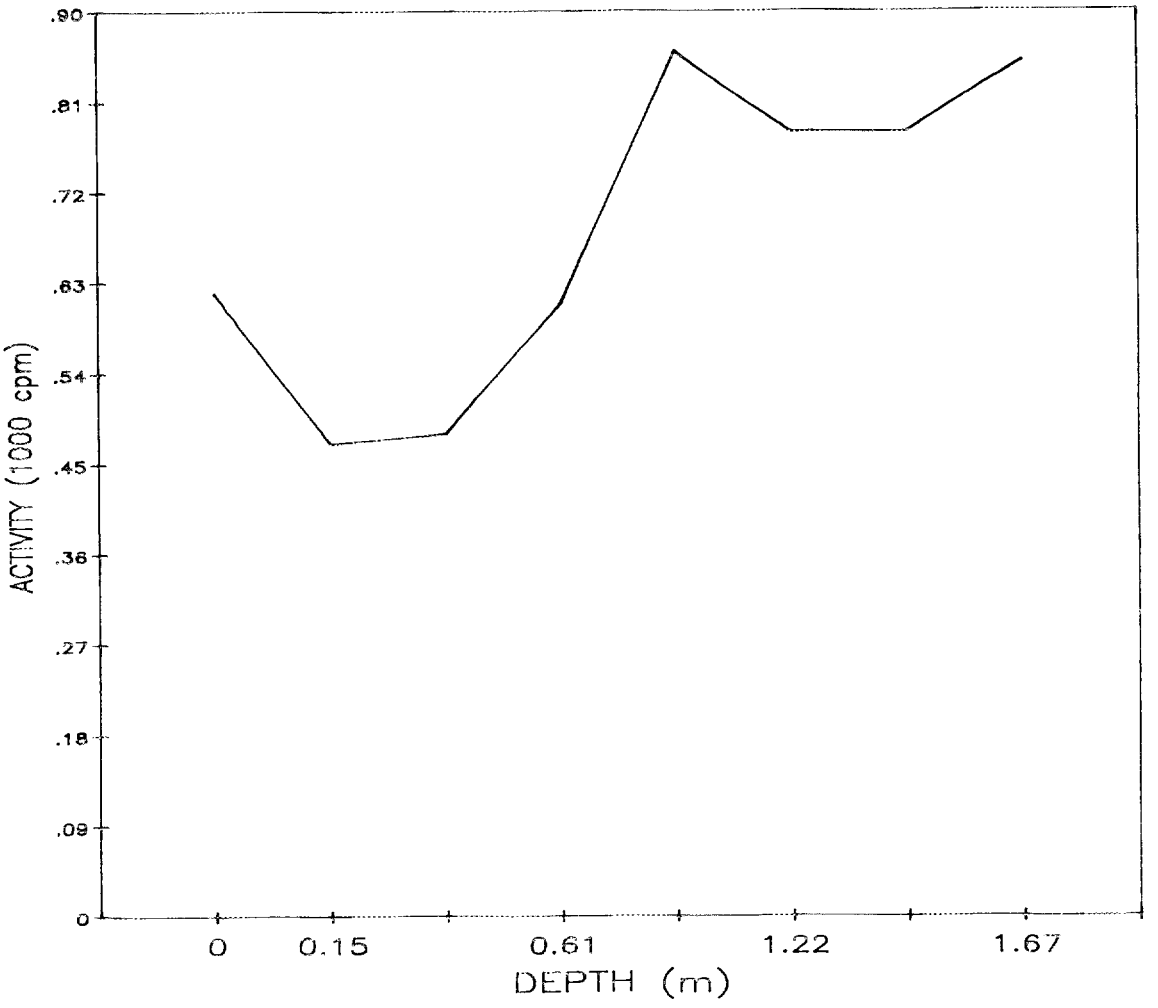

Fig. A.32. Gamma profile of auger hole 32.

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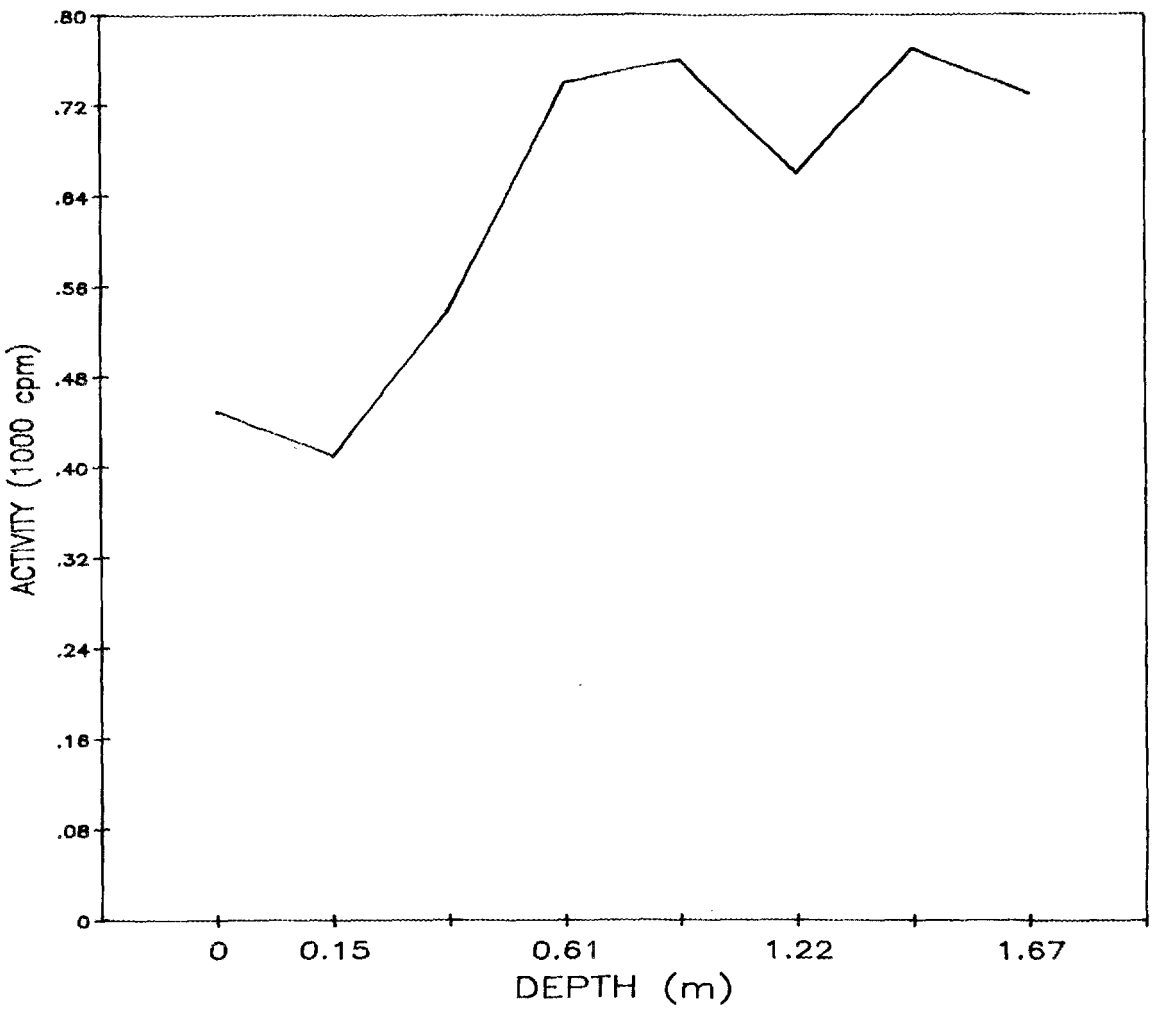

Fig. A.33. Gamma profile of auger hole 33.

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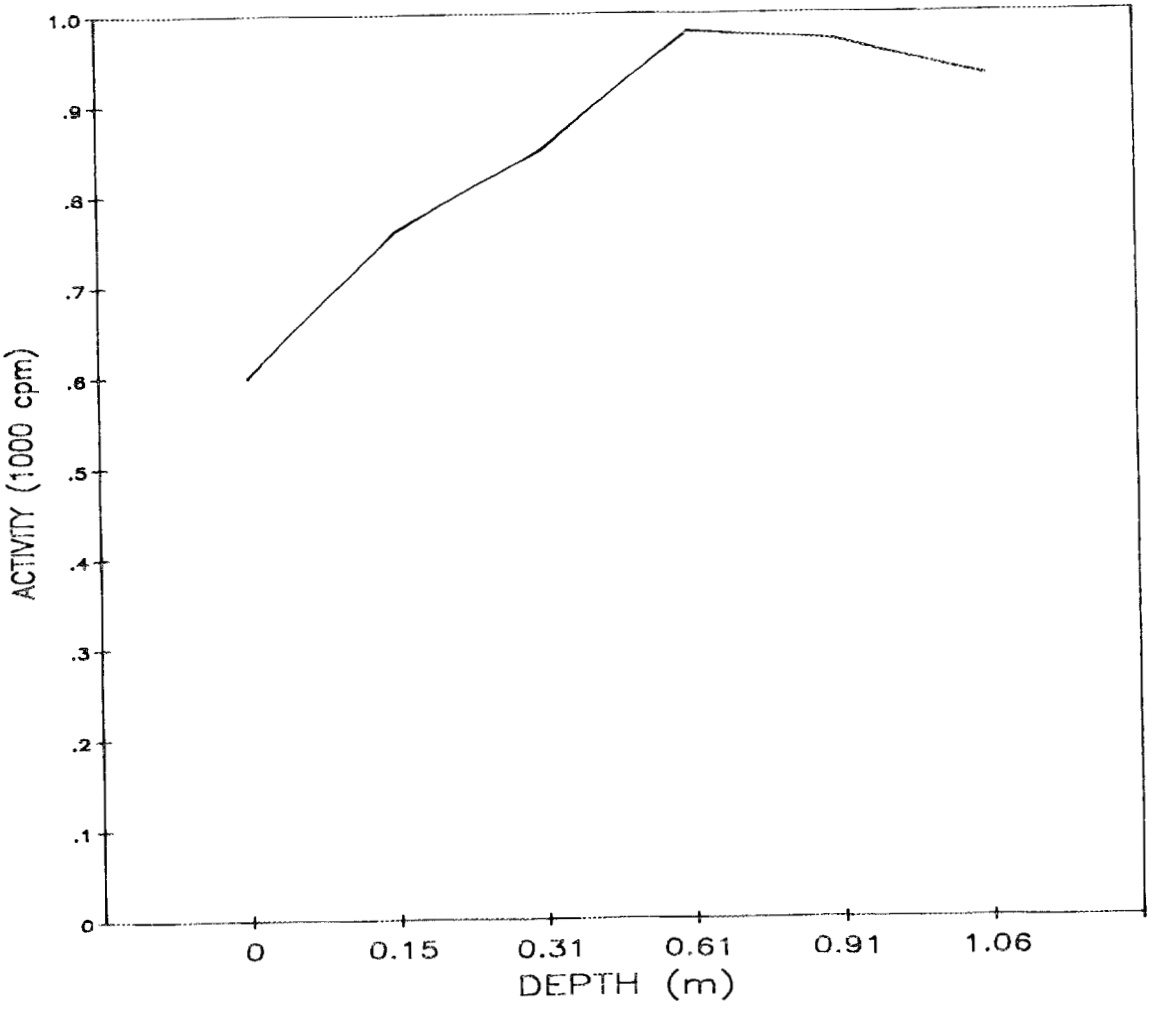

Fig. A.34. Gamma profile of auger hole 34.

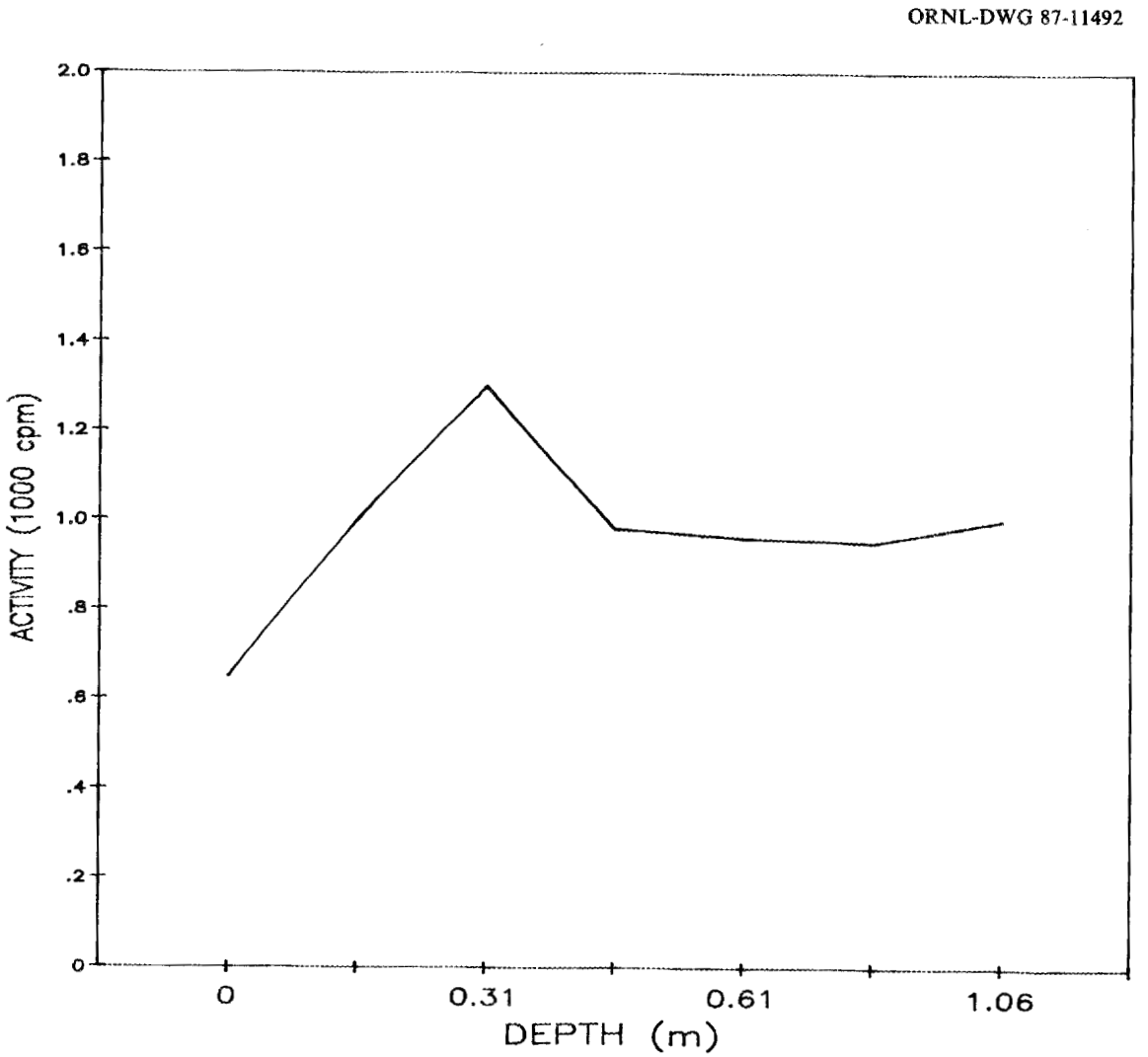

Fig. A.35. Gamma profile of auger hole 35.

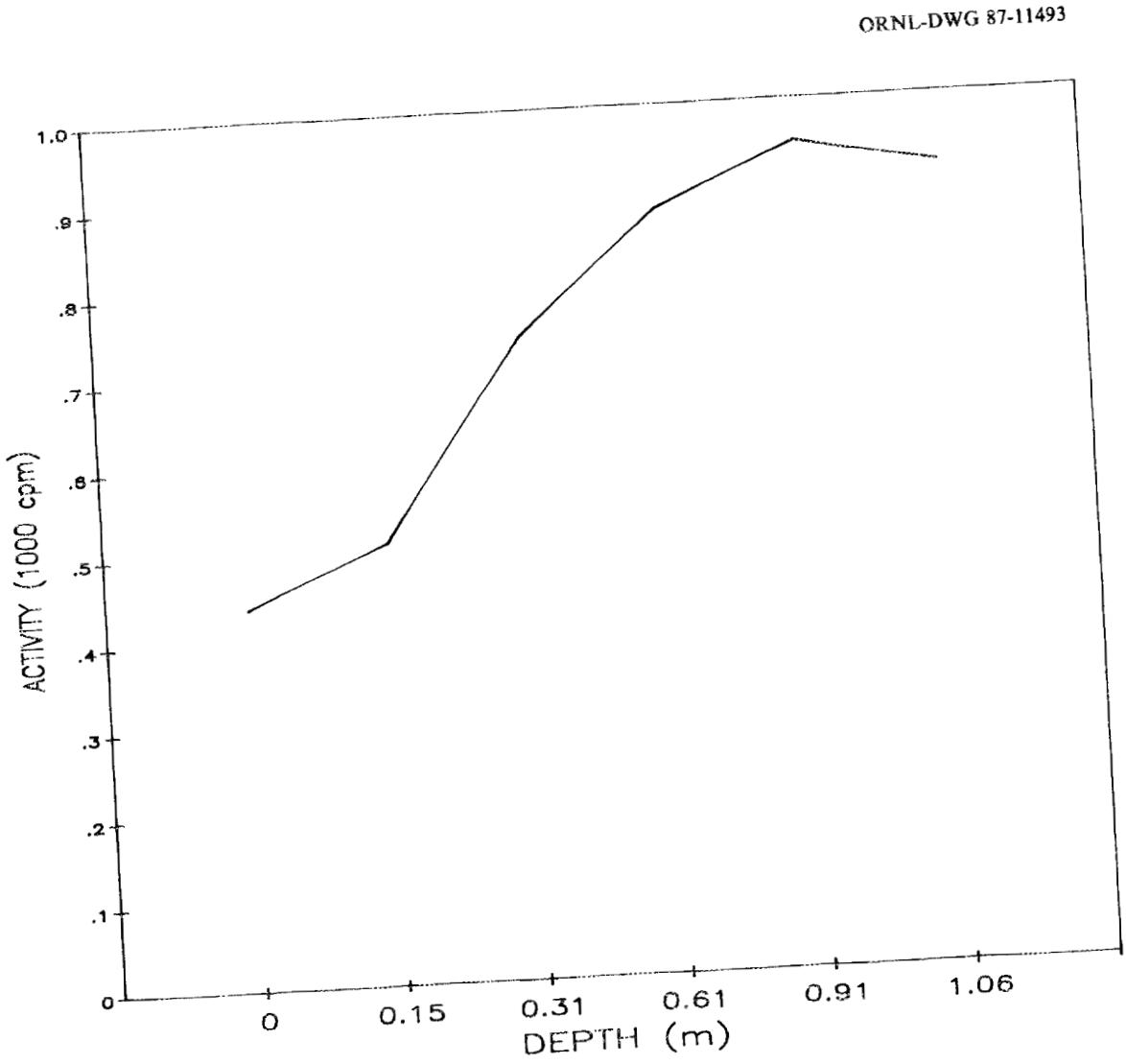

Fig. A.36. Gamma profile of auger hole 36.

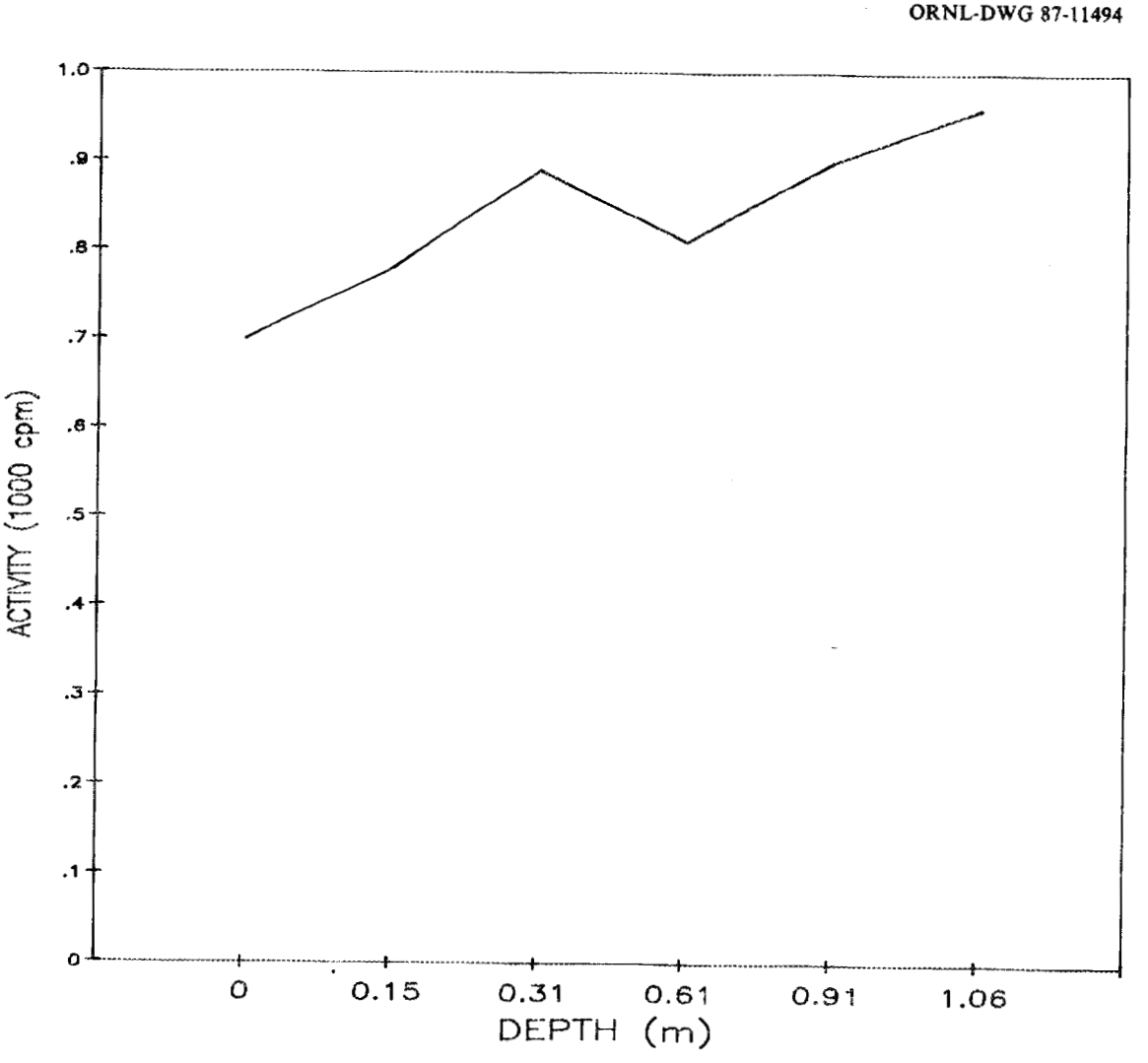

Fig. A.37. Gamma profile of auger hole 37.

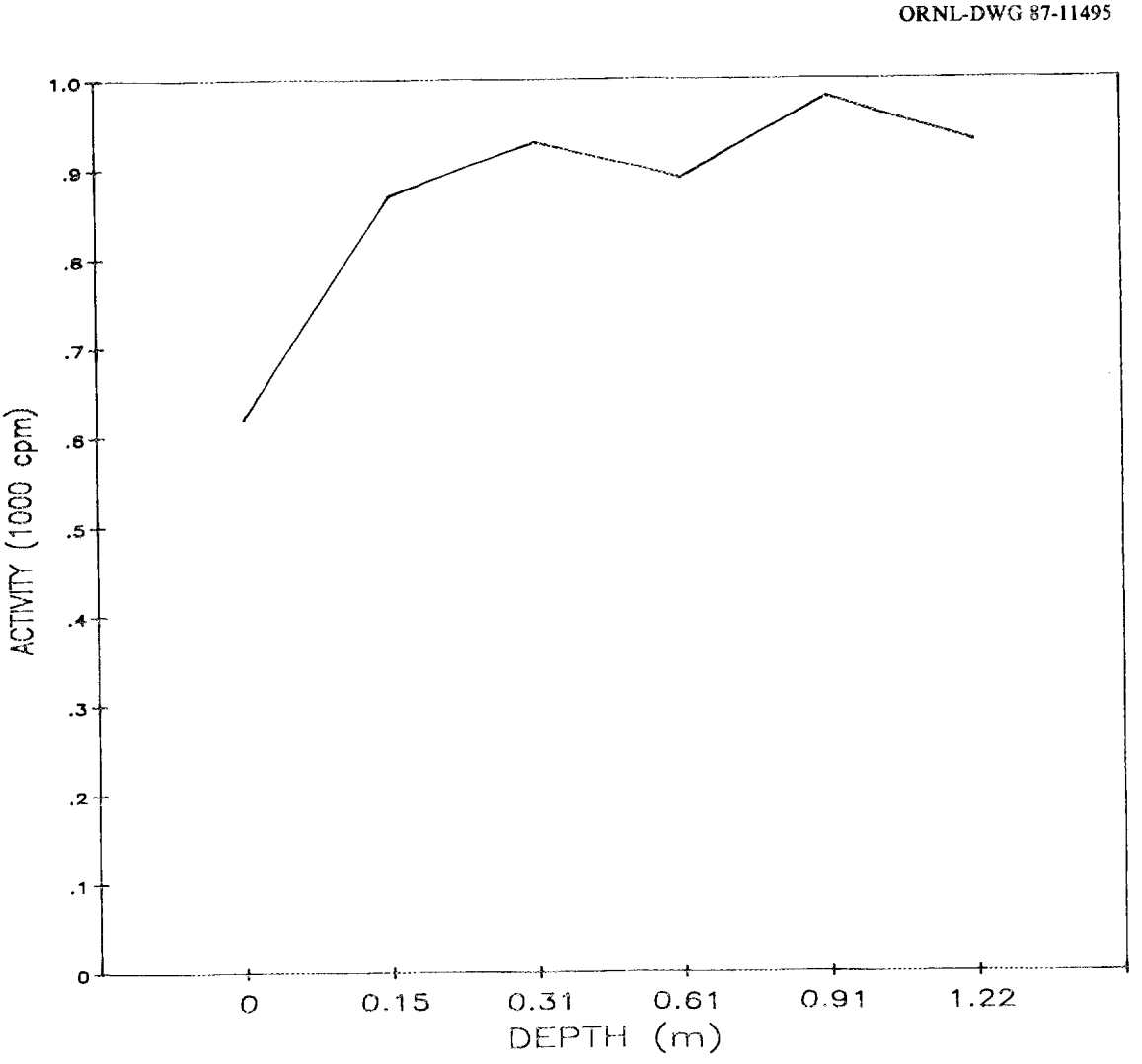

Fig. A.38. Gamma profile of auger hole 38.

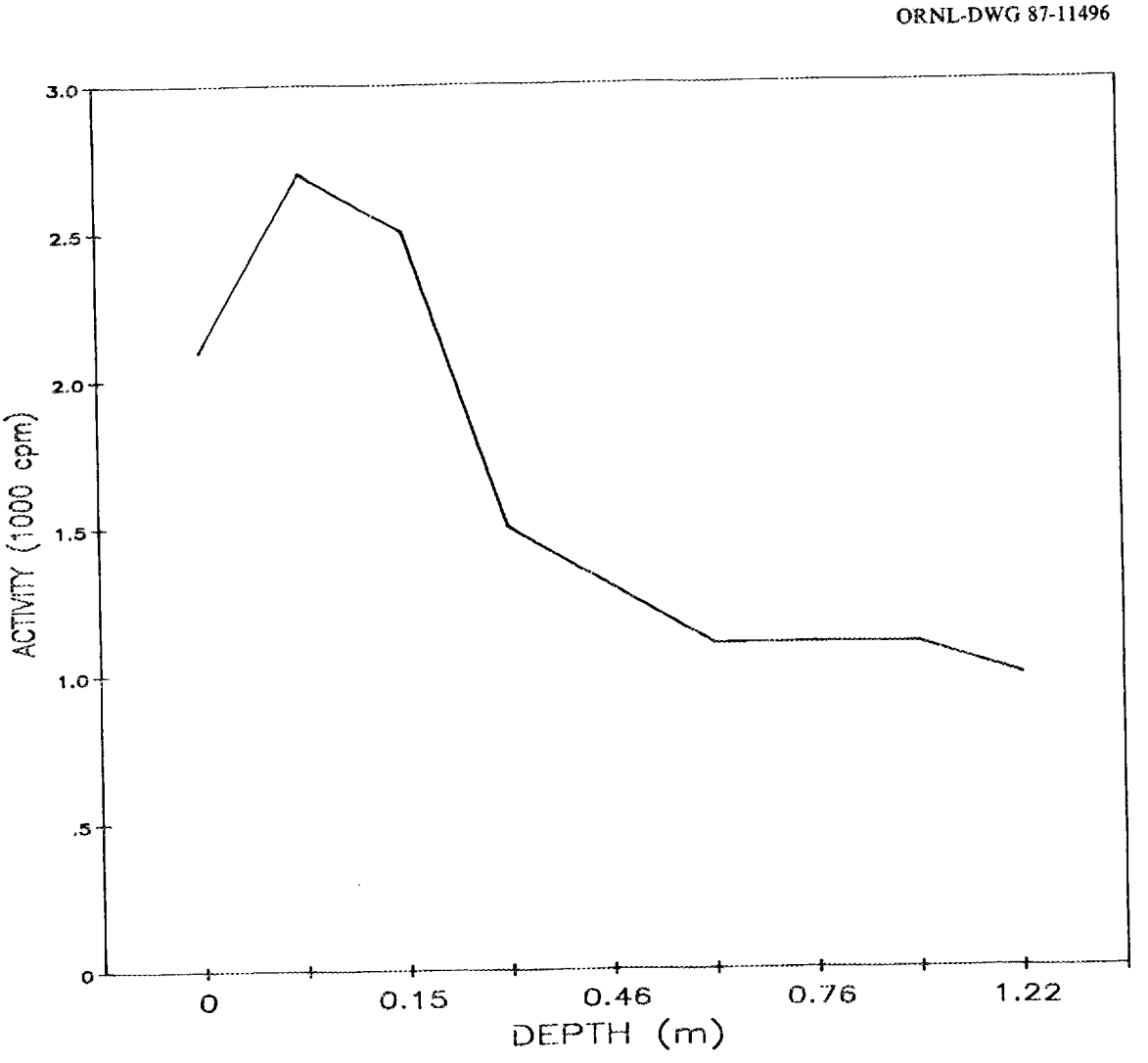

Fig. A.39. Gamma profile of auger hole 39.

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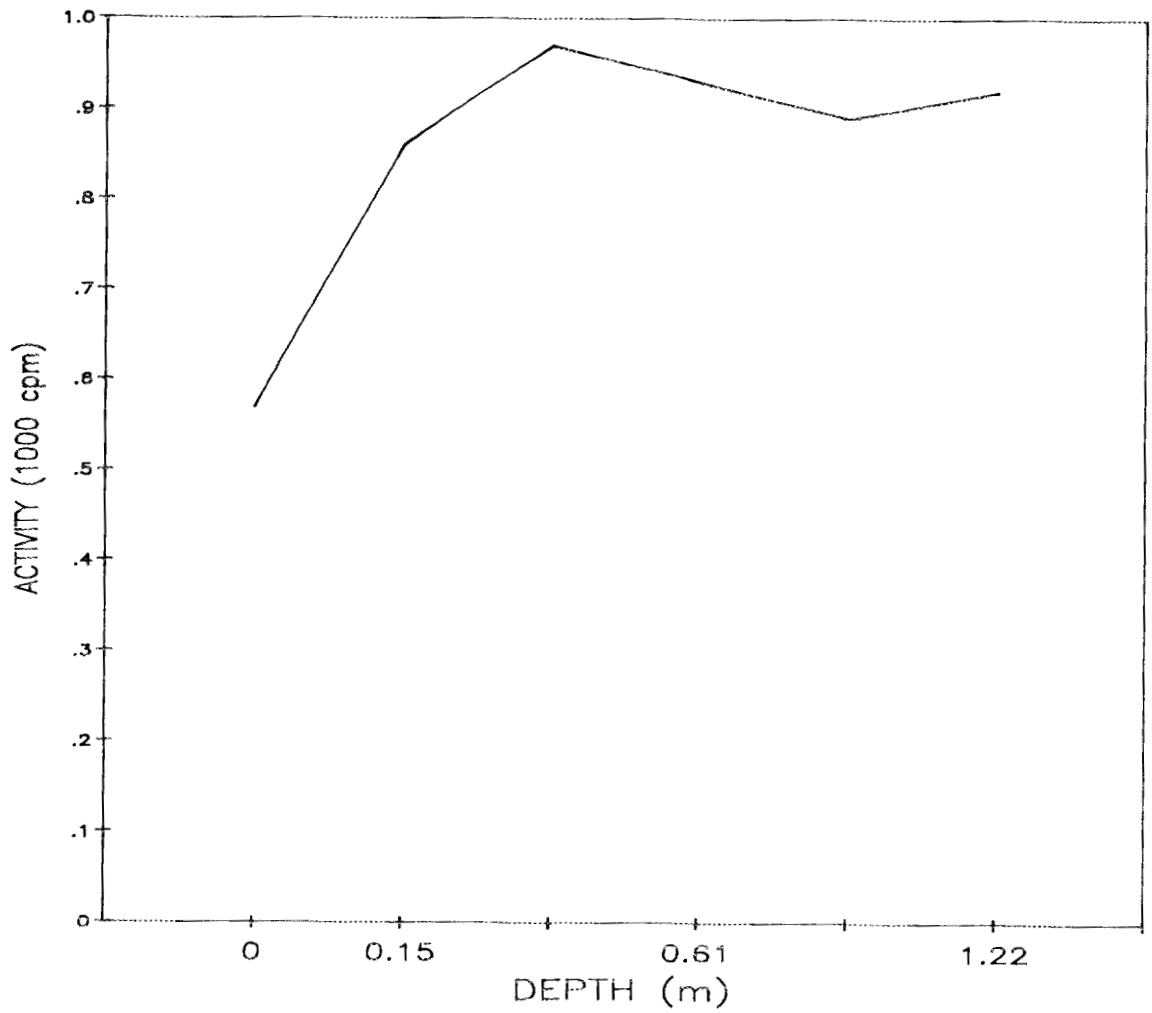

Fig. A.40. Gamma profile of auger hole 40.

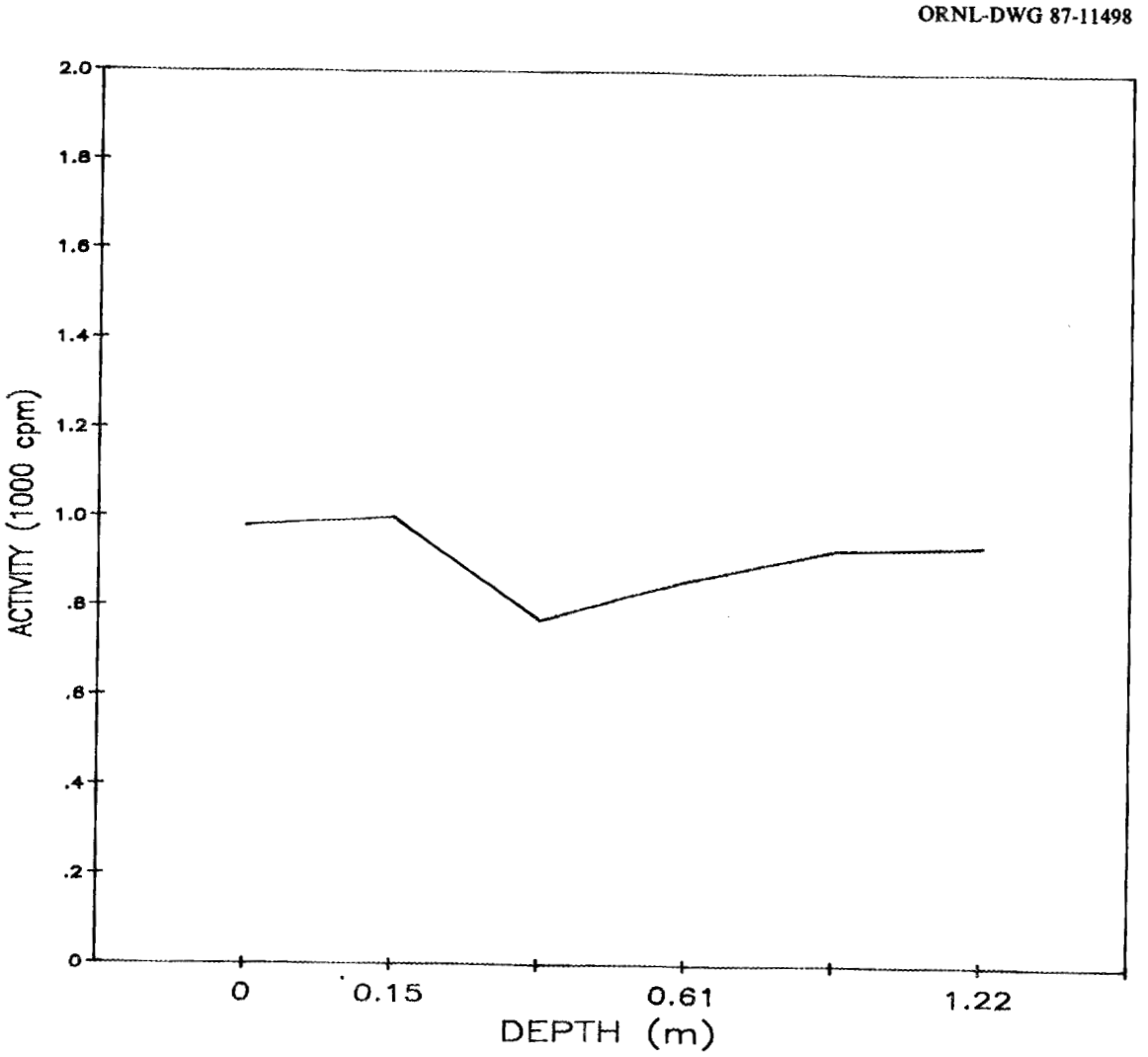

Fig. A.41. Gamma profile of auger hole 41.

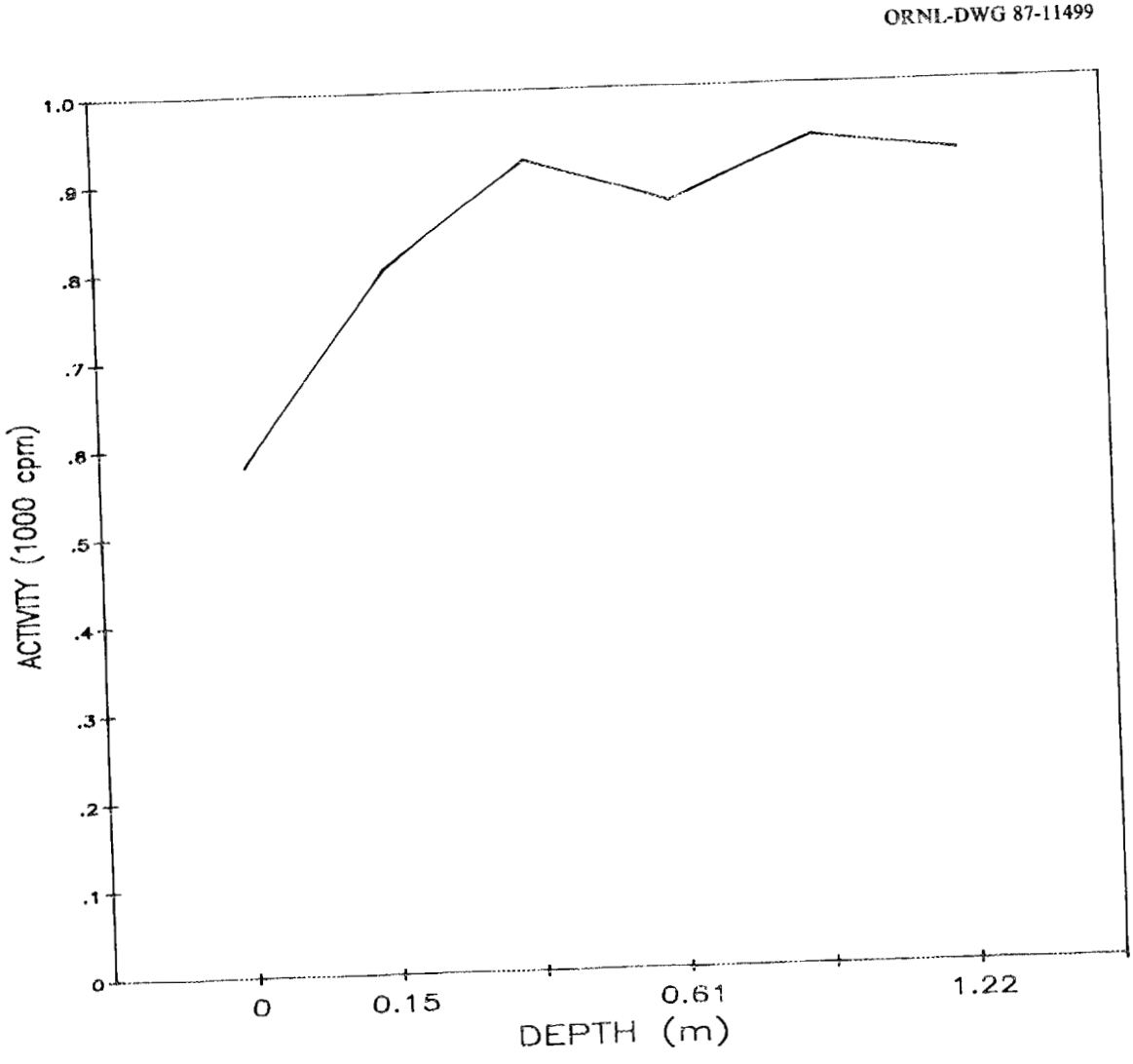

Fig. A.42. Gamma profile of auger hole 42.

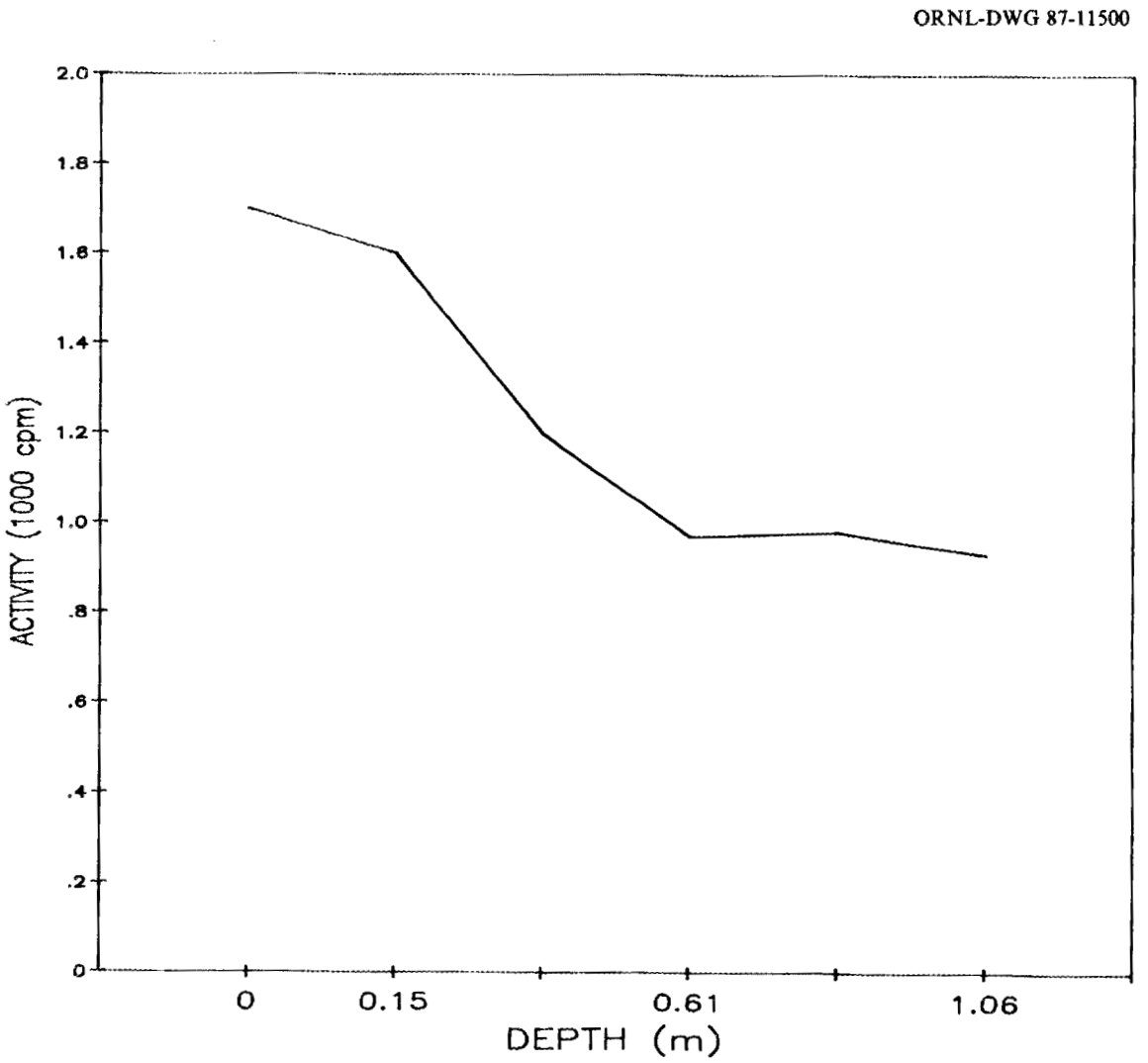

Fig. A.43. Gamma profile of auger hole 43.

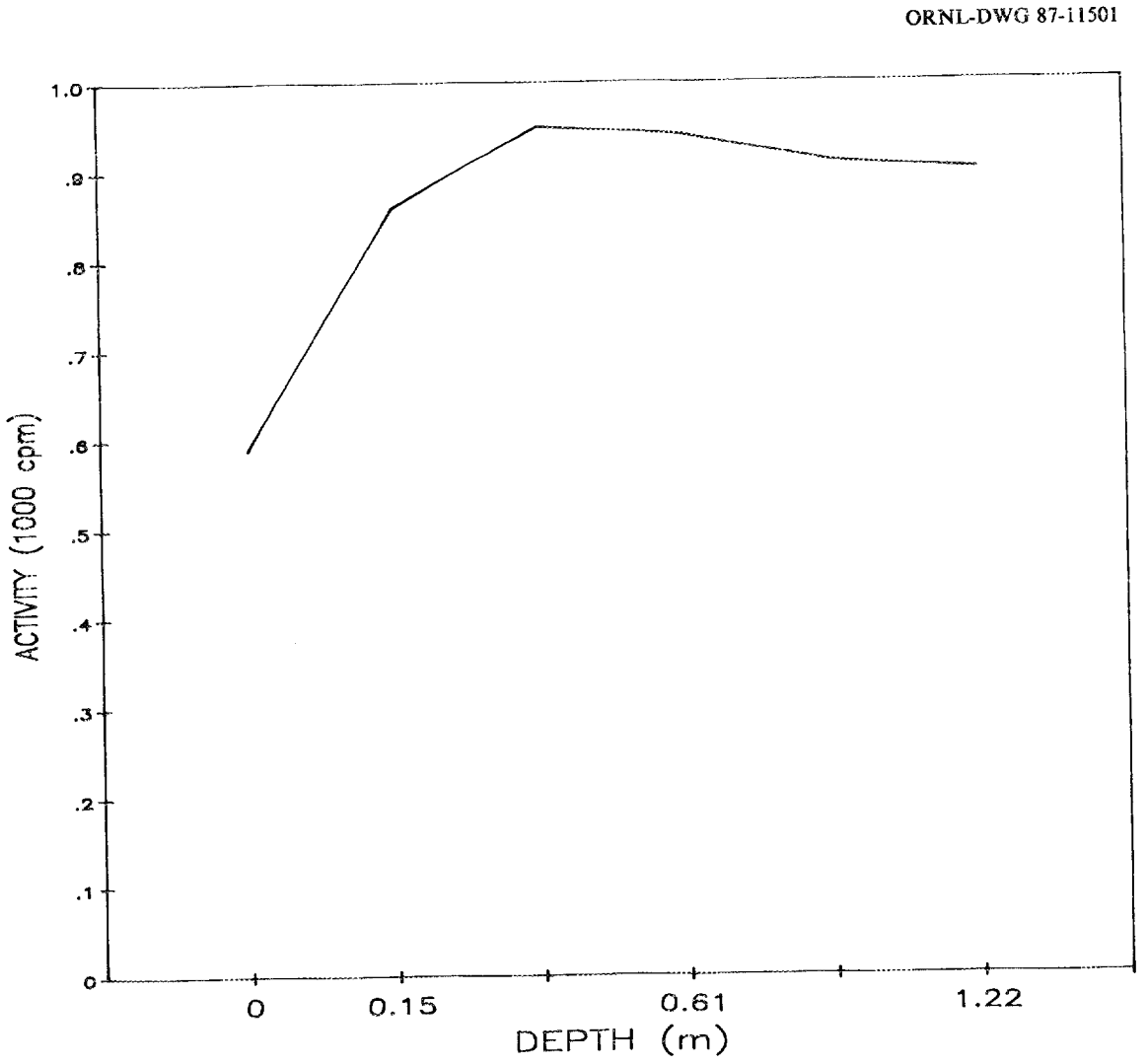

Fig. A.44. Gamma profile of auger hole 44.

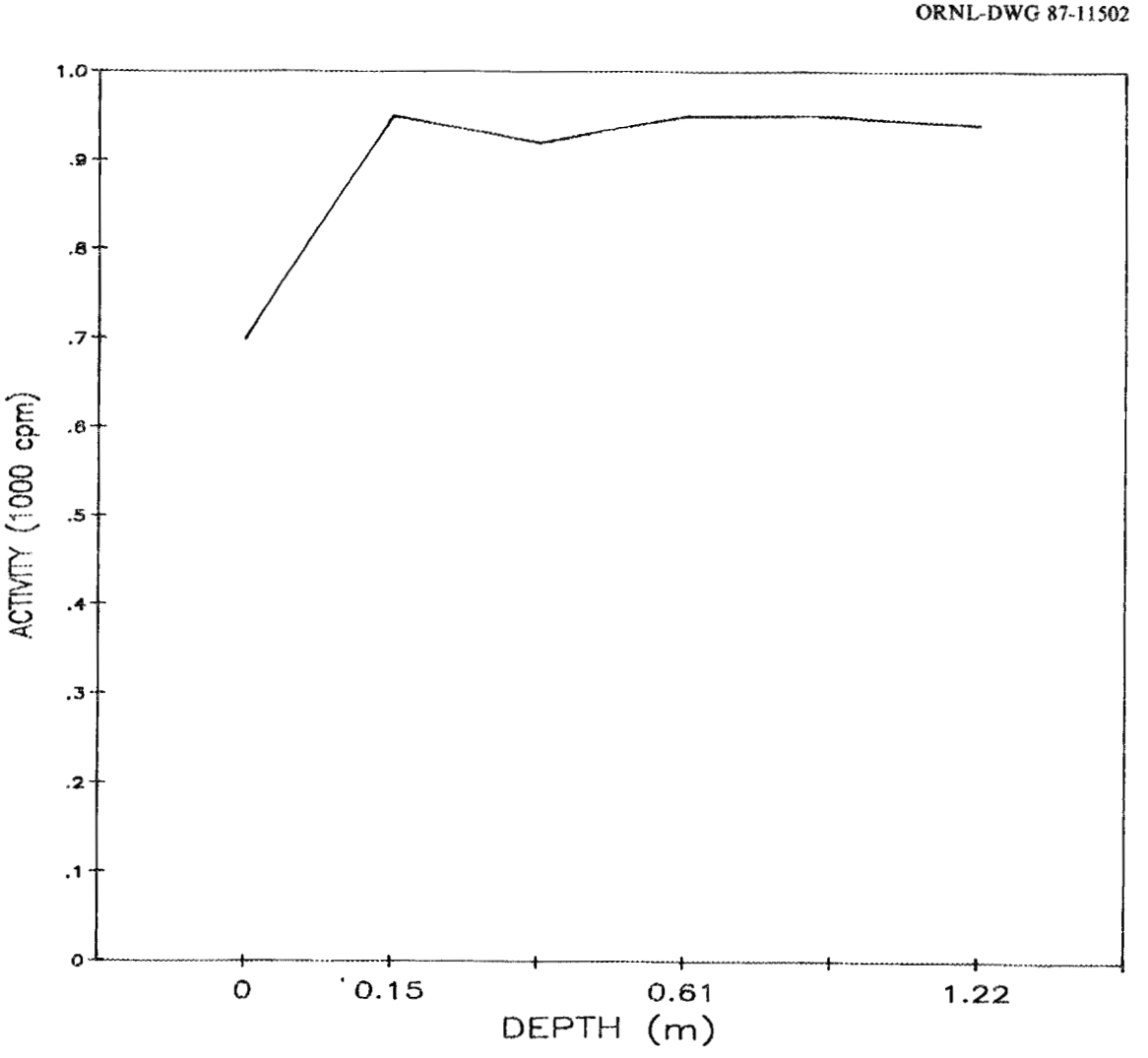

Fig. A.45. Gamma profile of auger hole 45.

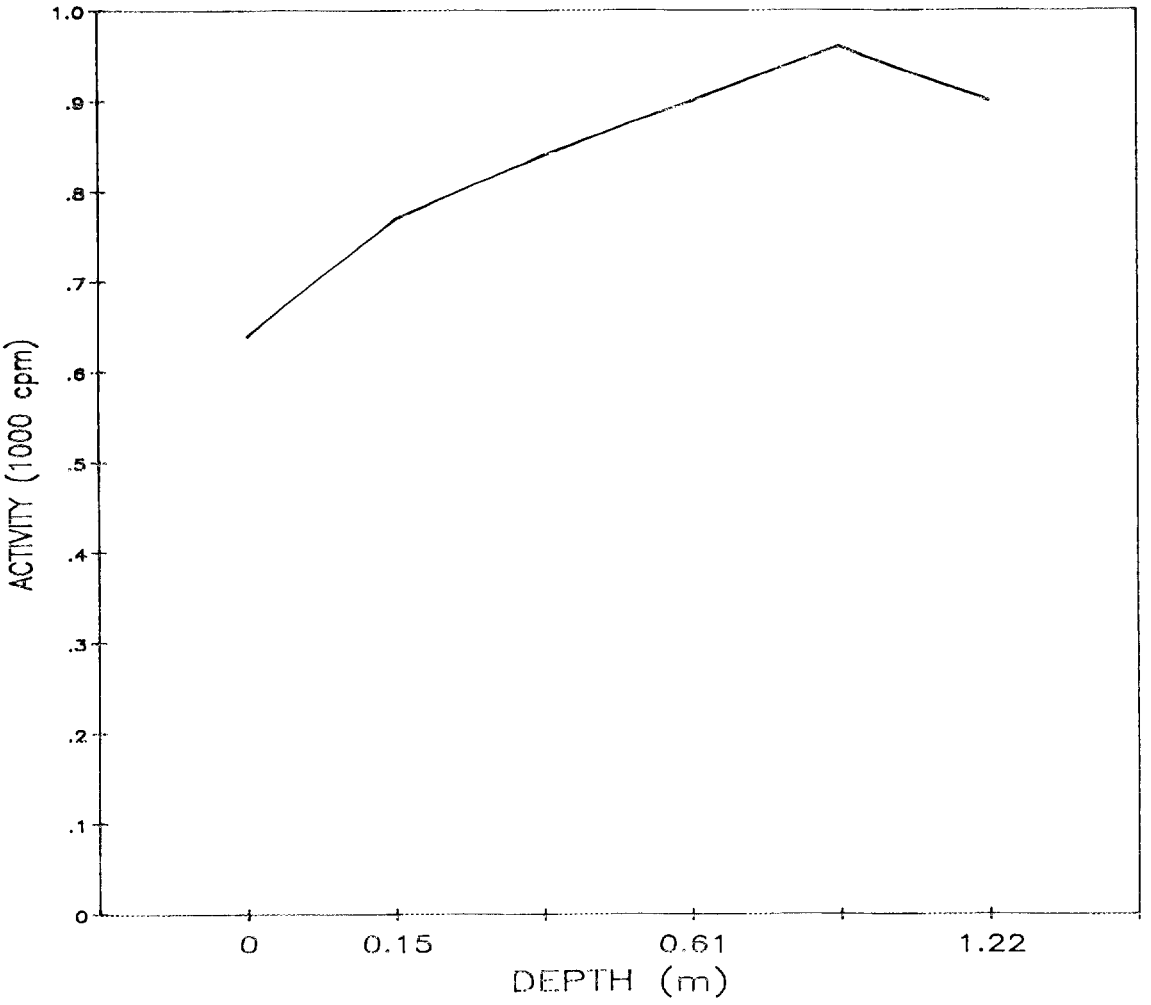

Fig. A.46. Gamma profile of auger hole 46.

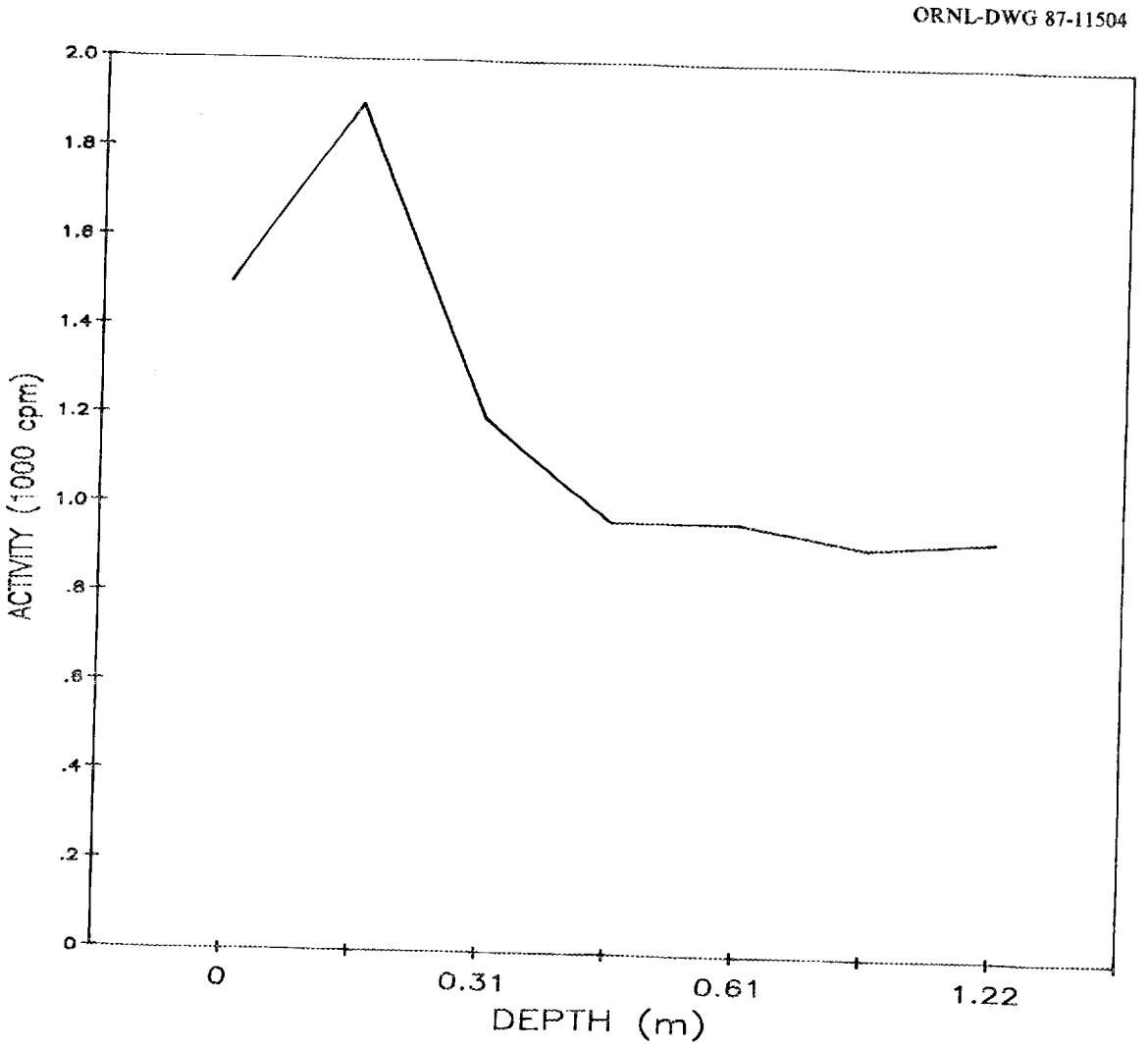

Fig. A.47. Gamma profile of auger hole 47.

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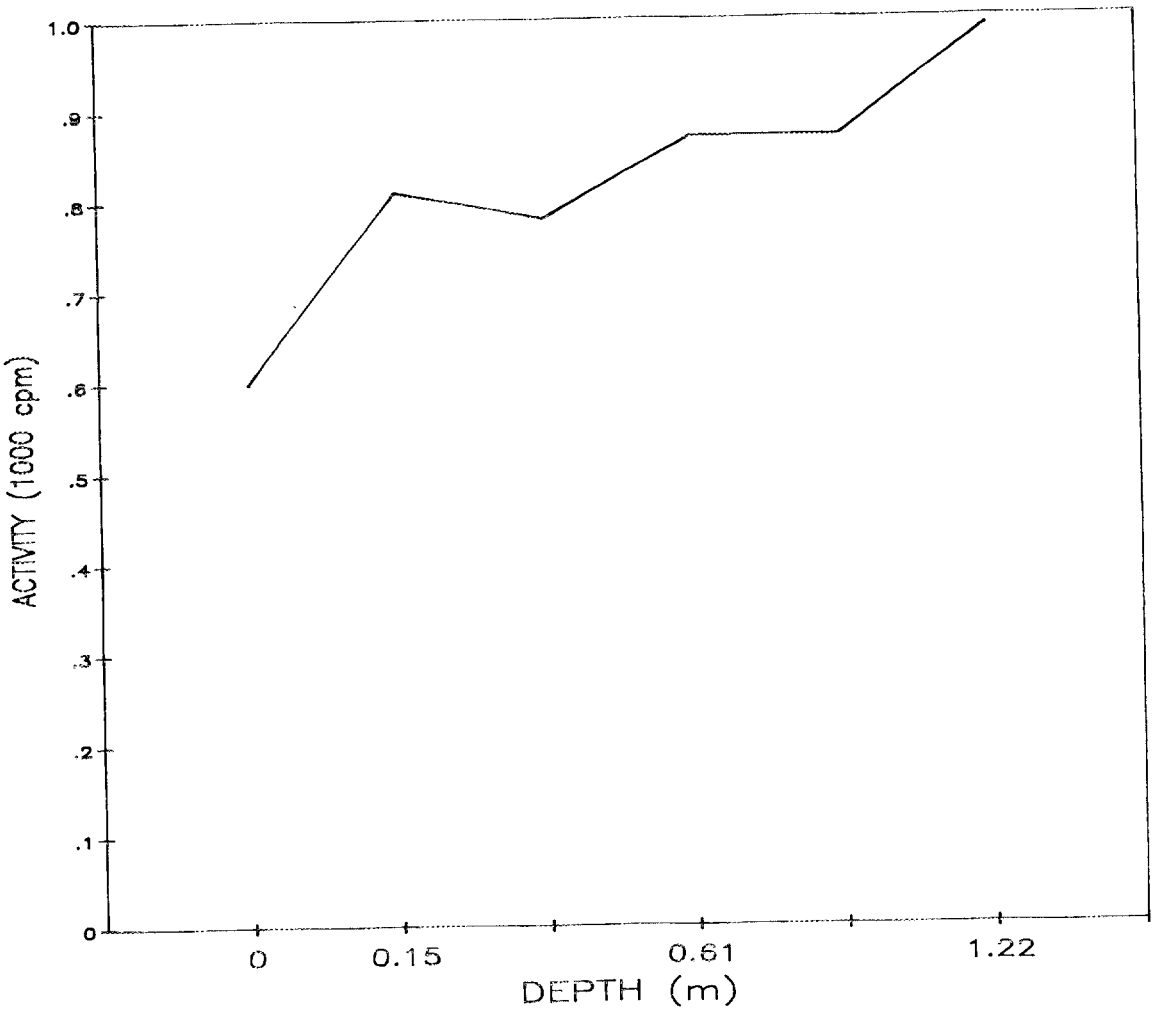

Fig. A.48. Gamma profile of auger hole 48.

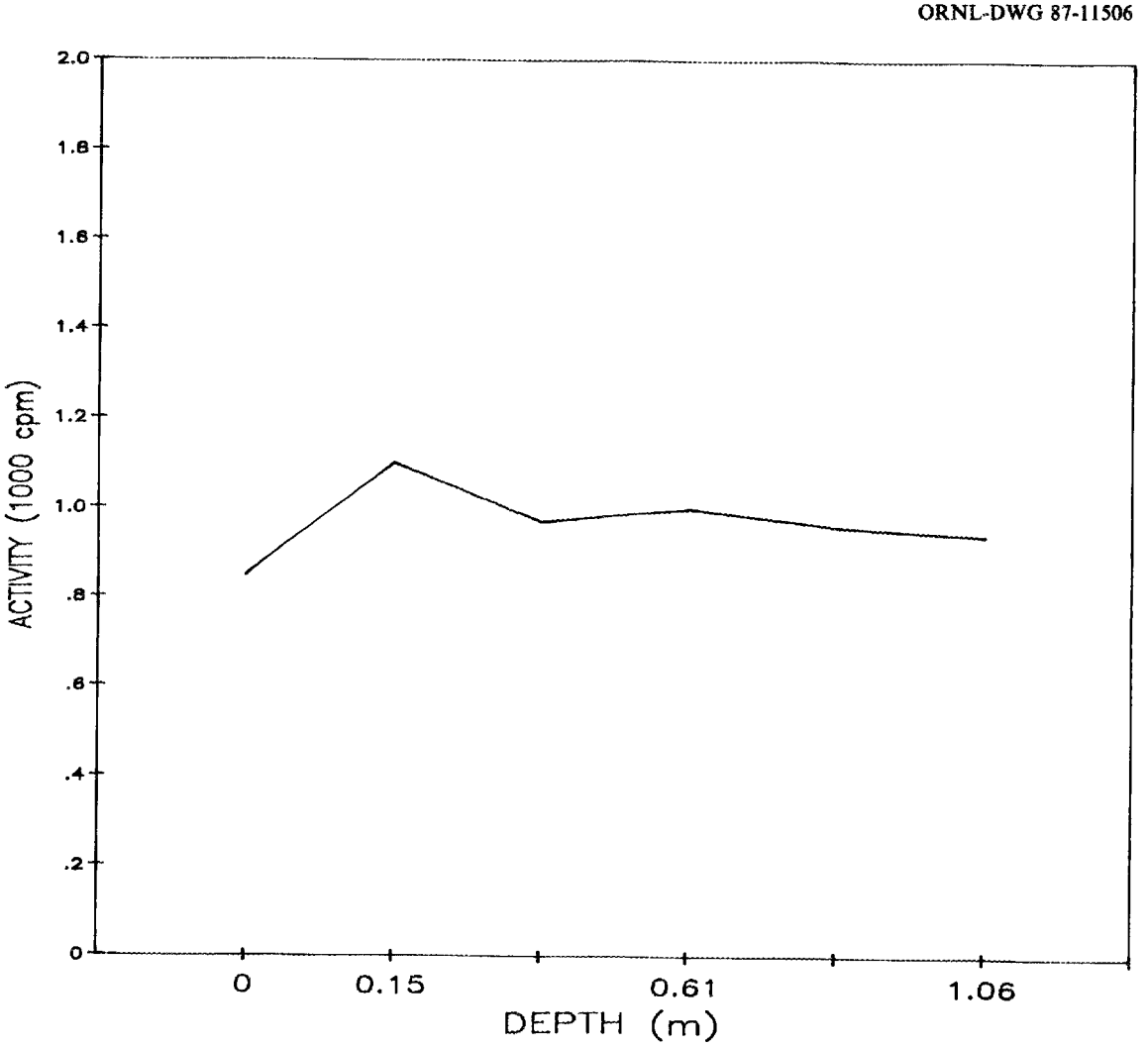

Fig. A.49. Gamma profile of auger hole 49.

ORNL-DWG 87-11507

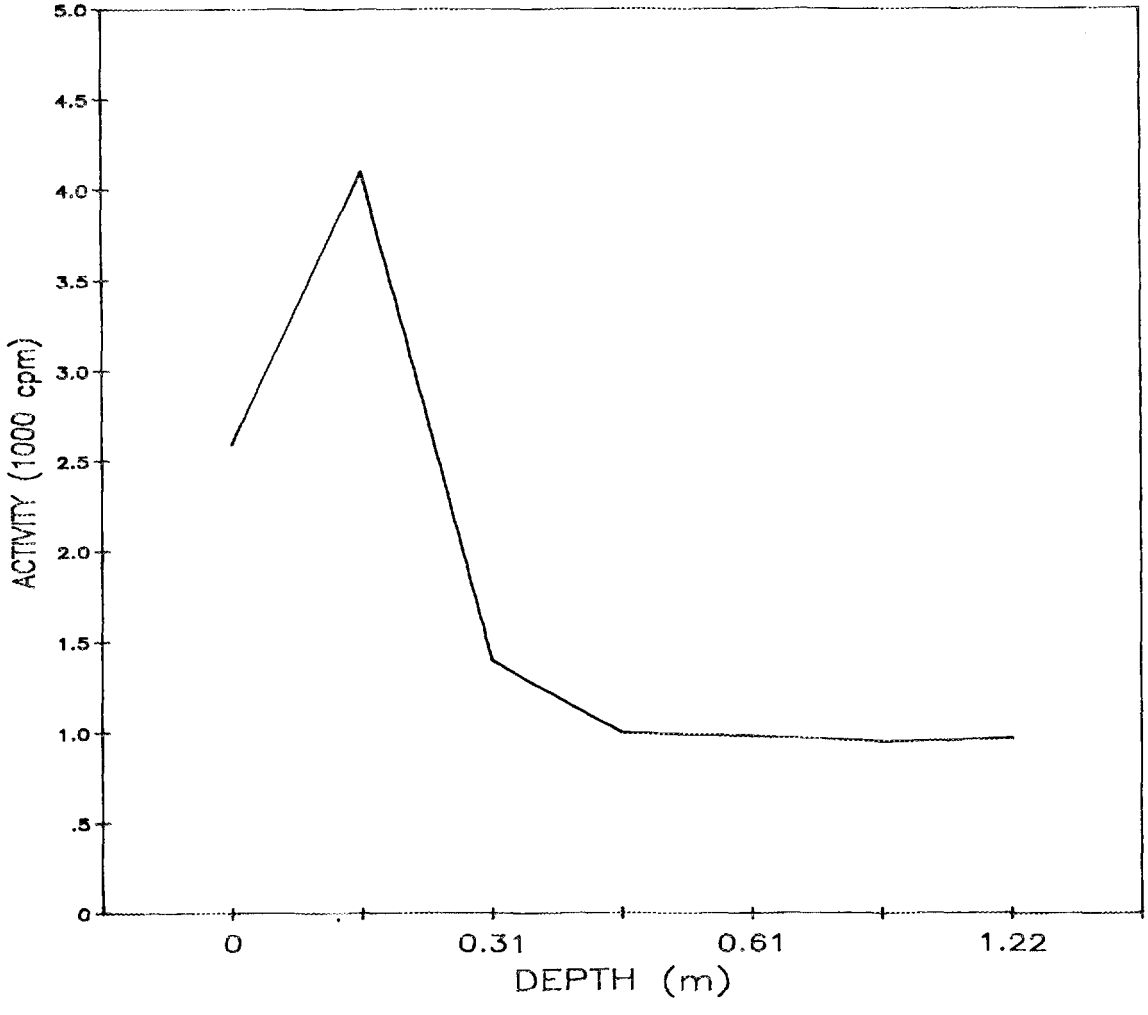

Fig. A.50. Gamma profile of auger hole 50.

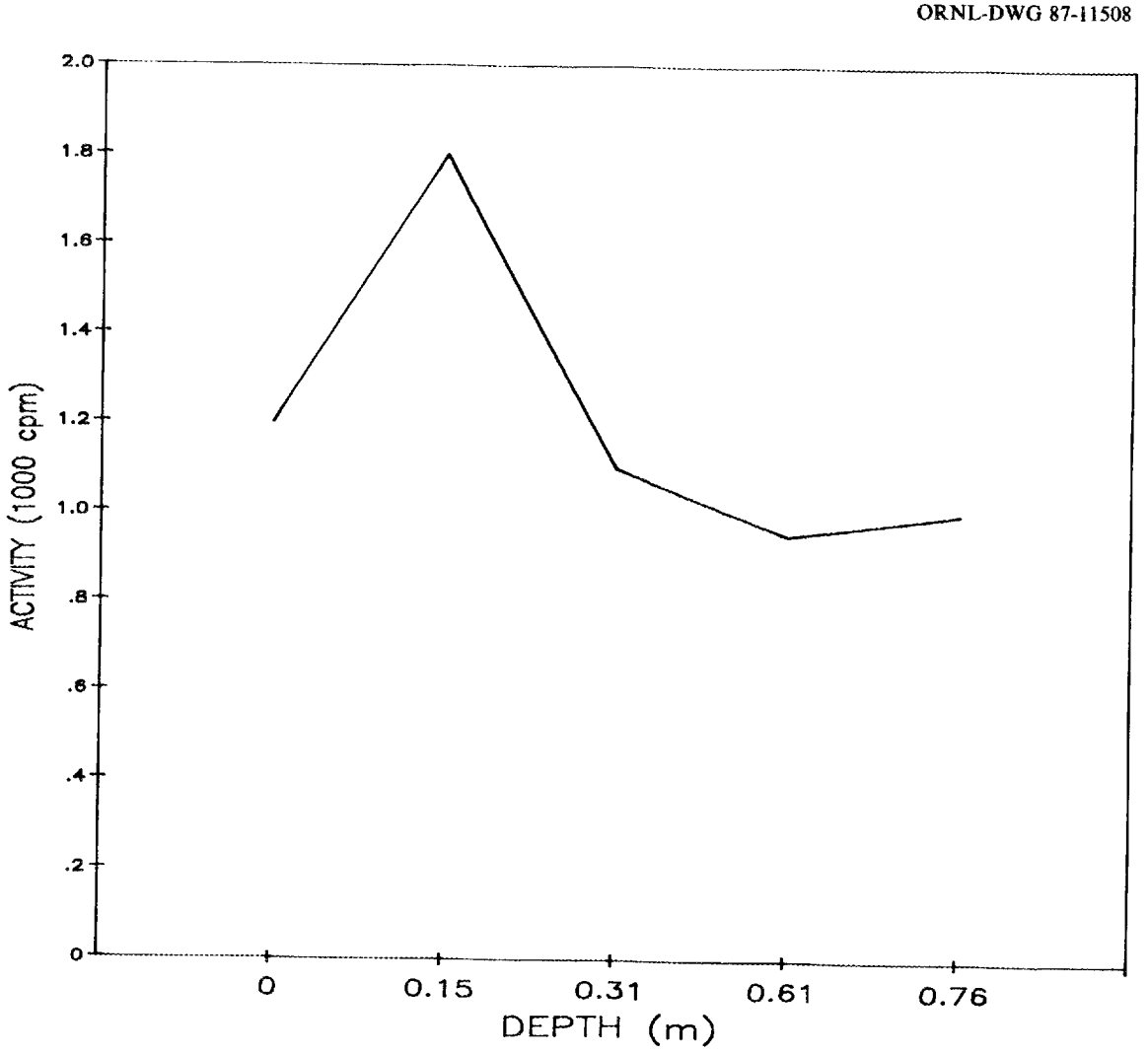

Fig. A.51. Gamma profile of auger hole 51.

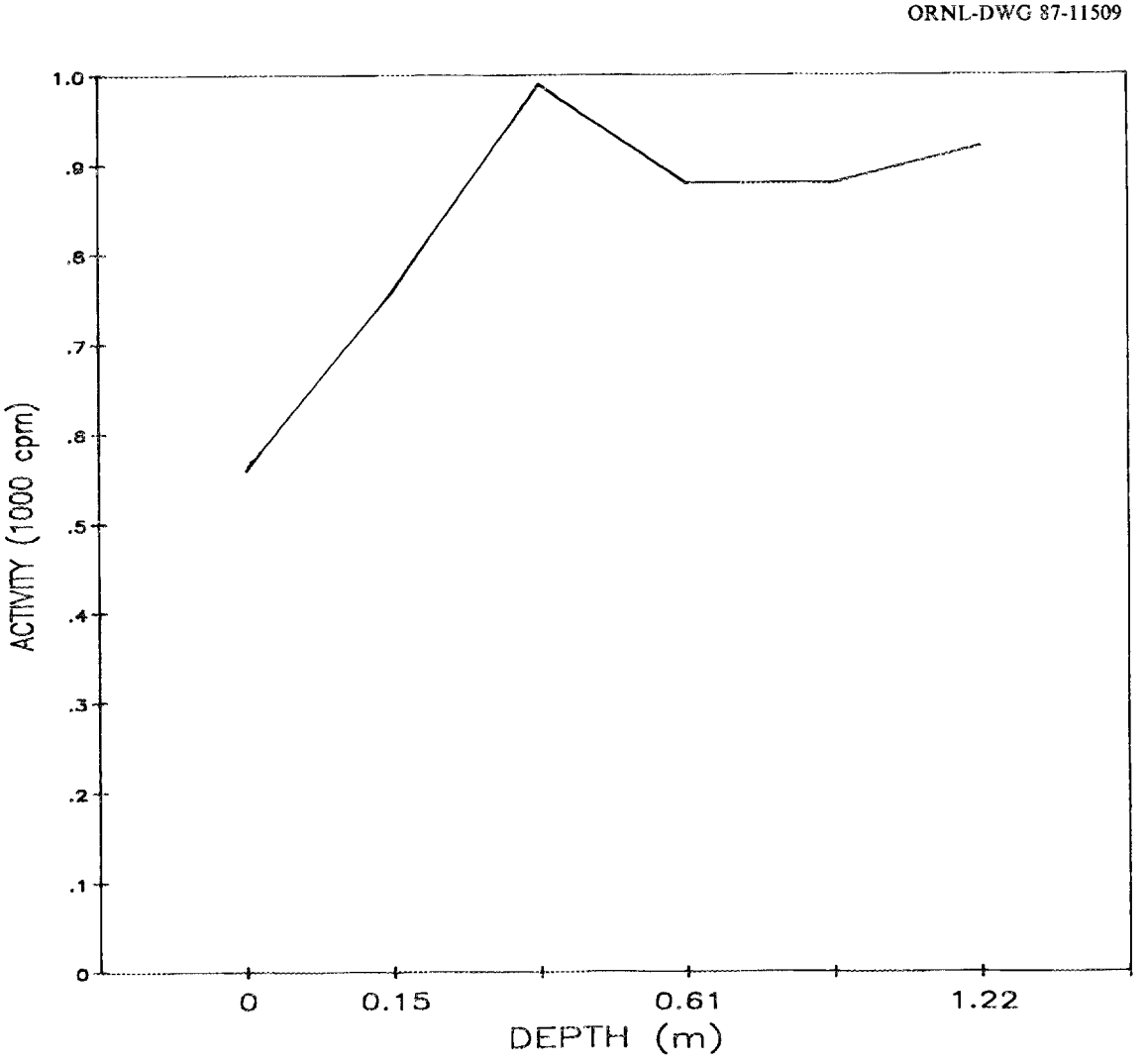

Fig. A.52. Gamma profile of auger hole 52.

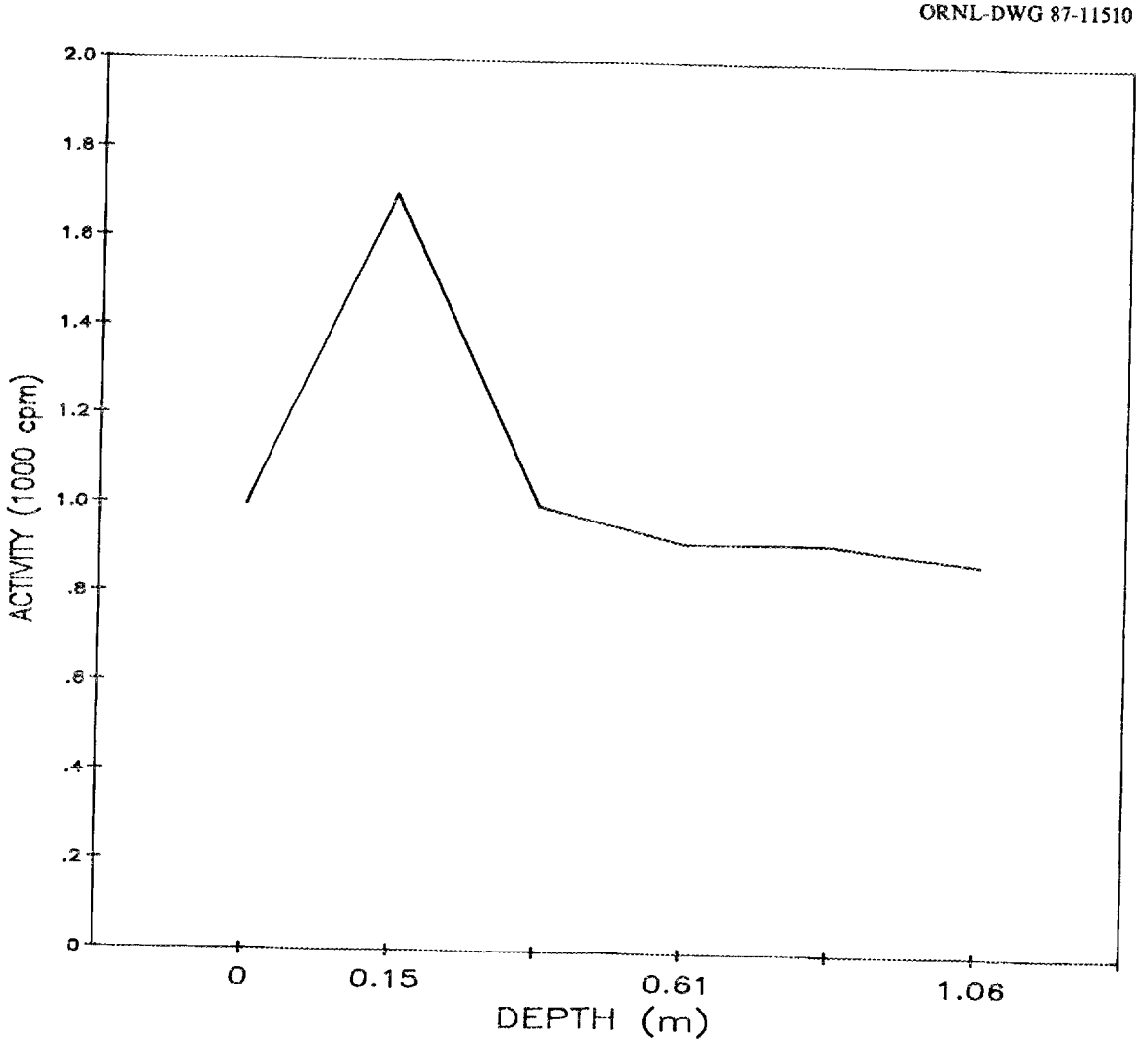

Fig. A.53. Gamma profile of auger hole 53.

ORNL-DWG 87-11511

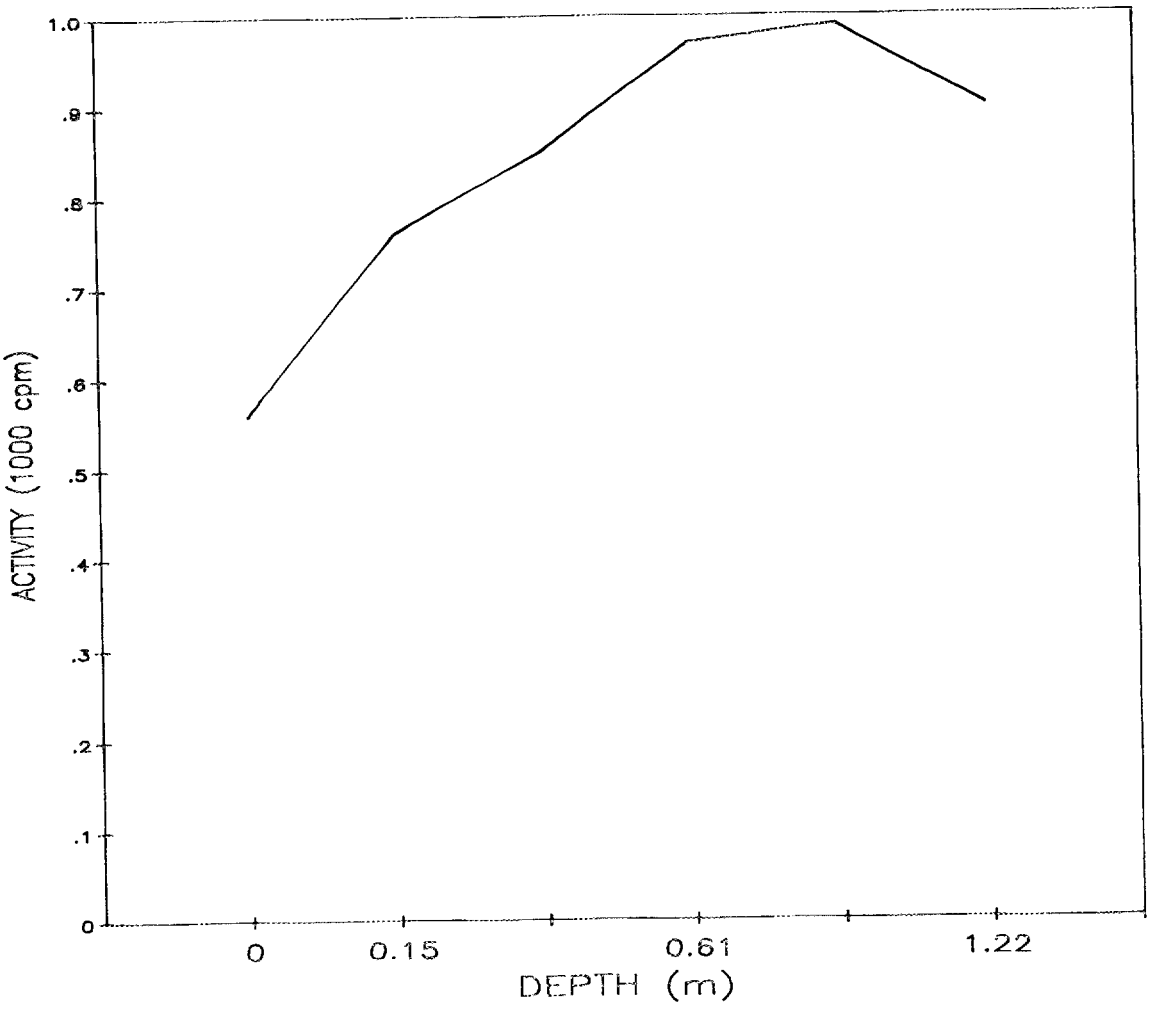

Fig. A.54. Gamma profile of auger hole 54.

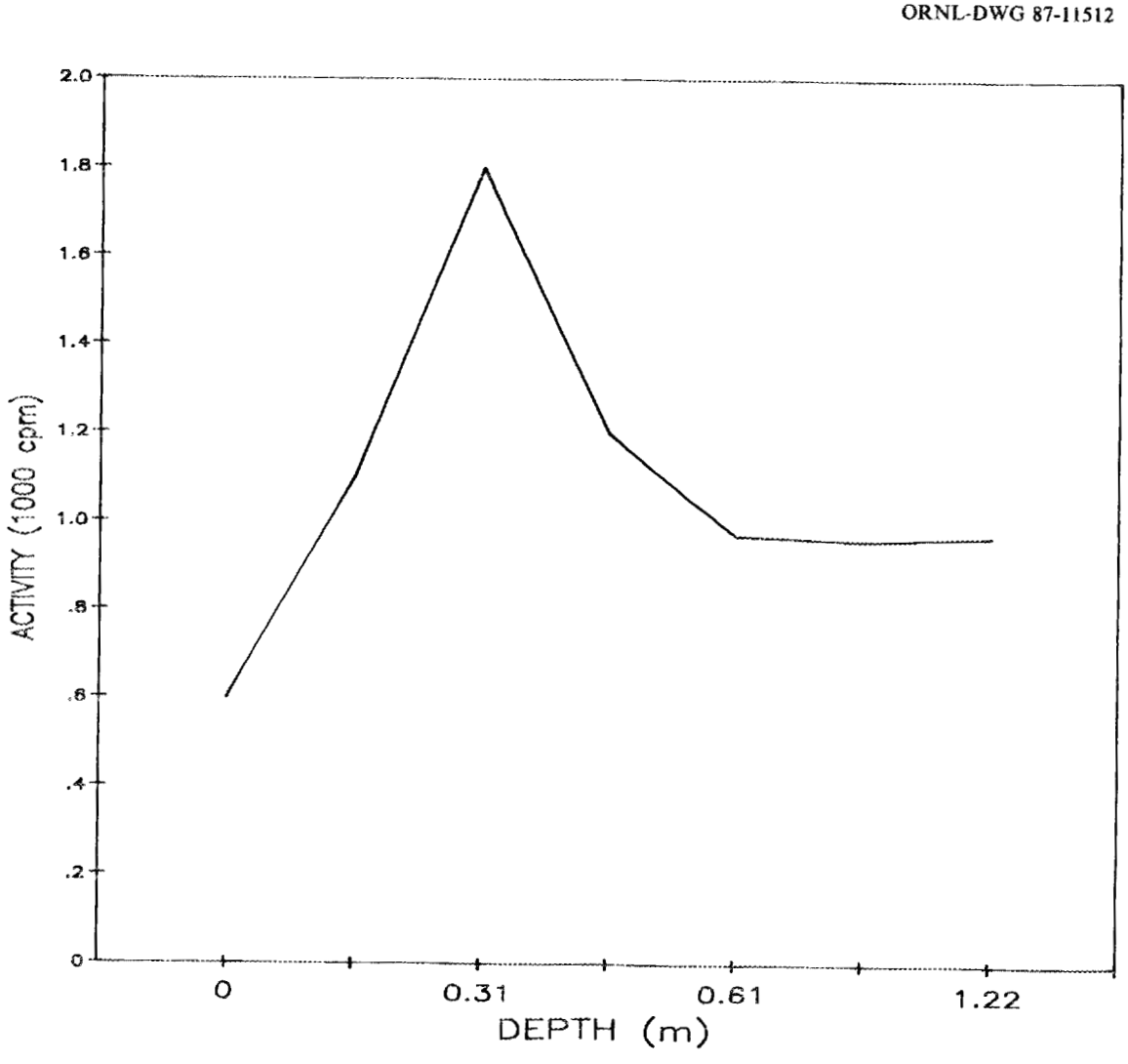

Fig. A.55. Gamma profile of auger hole 55.

ORNL-DWG 87-11513

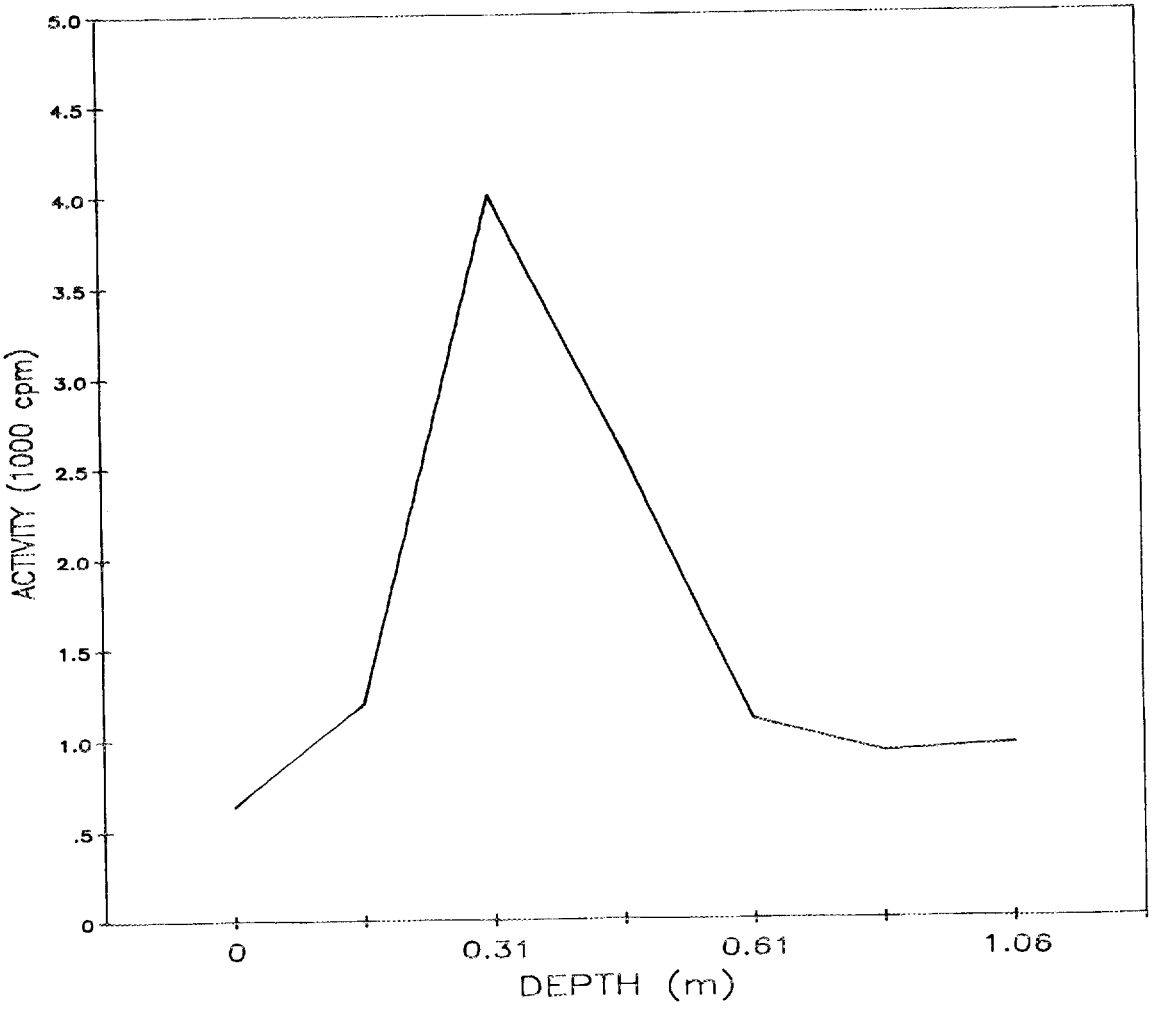

Fig. A.56. Gamma profile of auger hole 56.

ORNL-DWG 87-11514

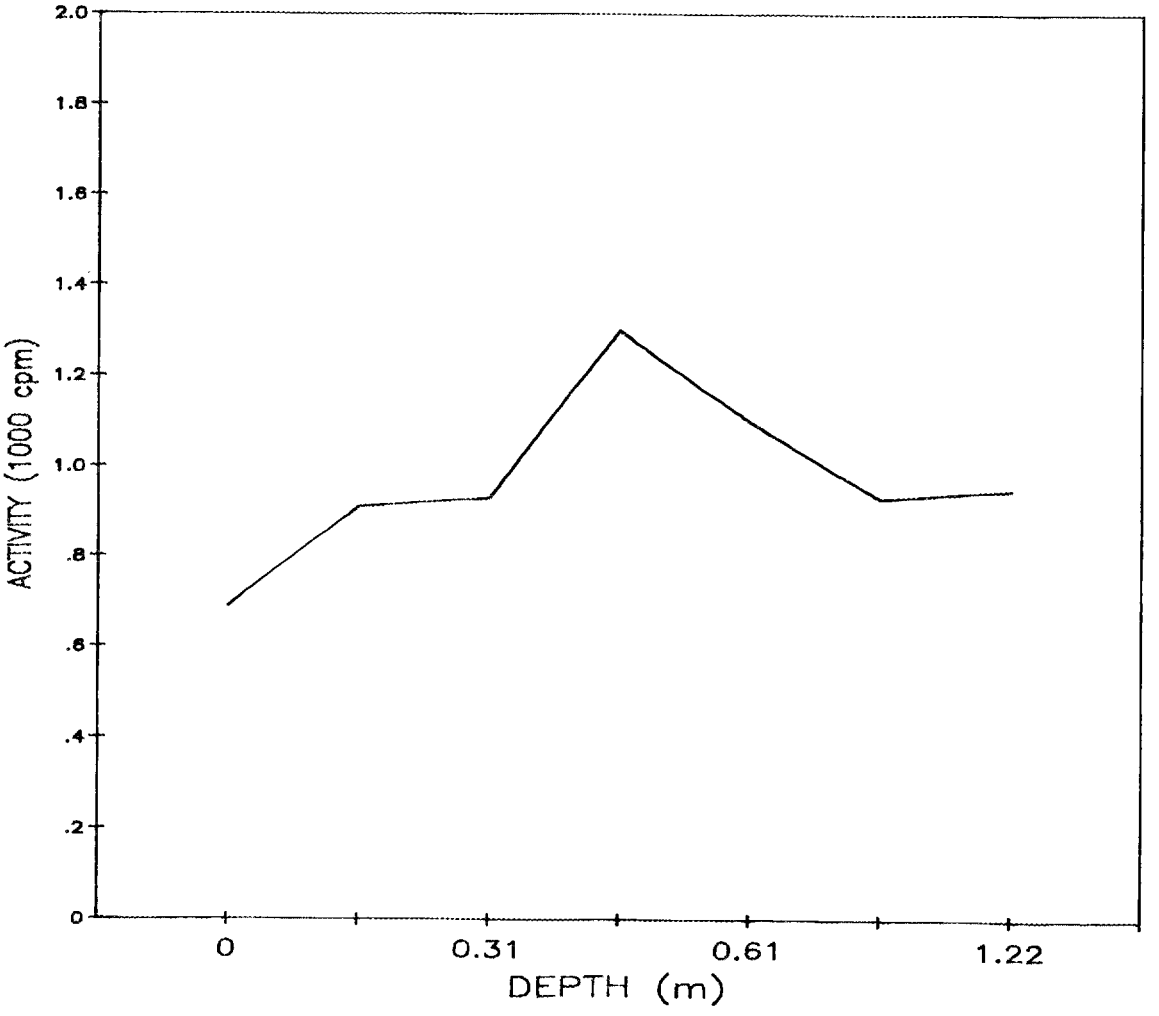

Fig. A.57. Gamma profile of auger hole 57.

ORNL-DWG 87-11515

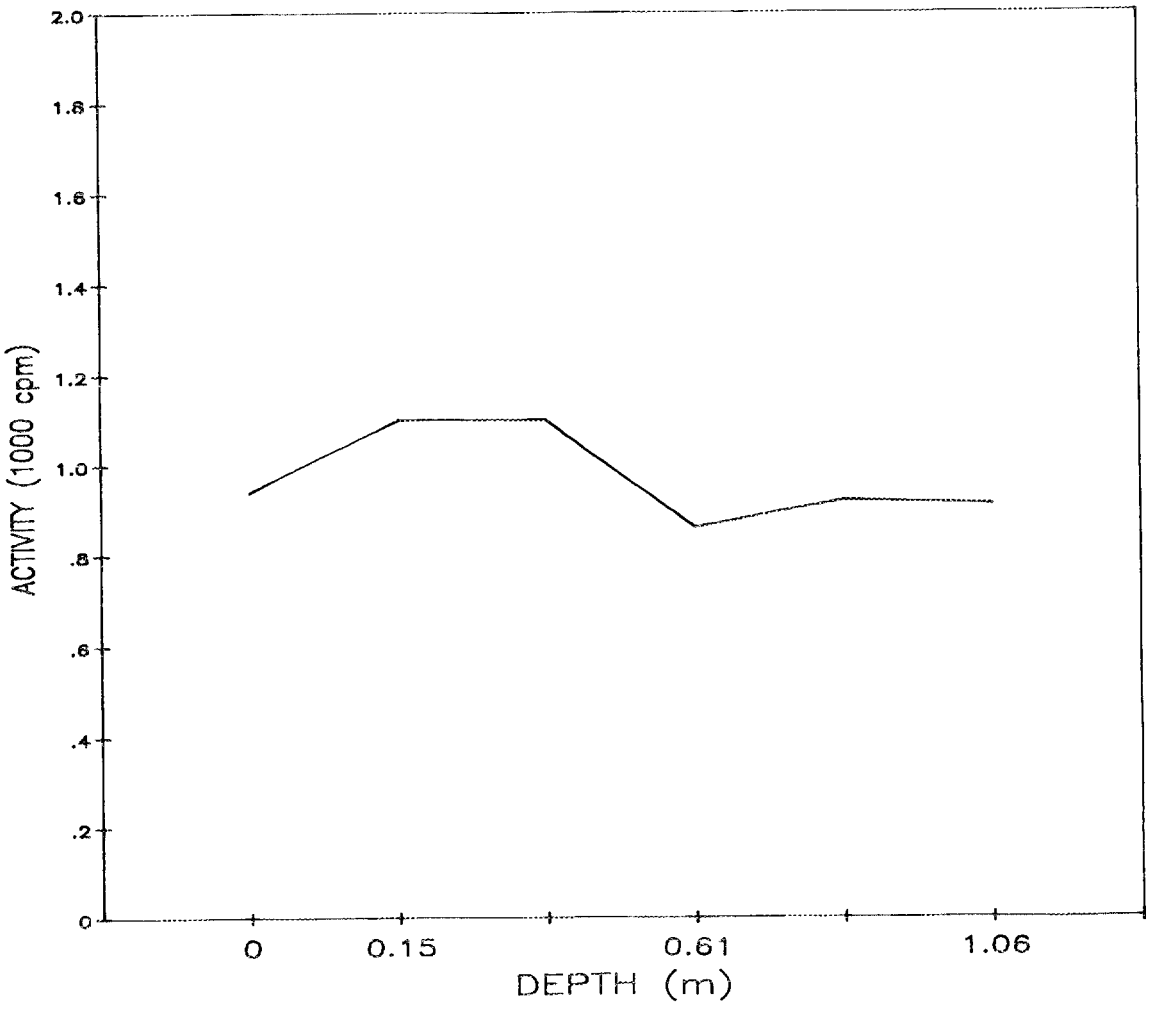

Fig. A.58. Gamma profile of auger hole 58.

ORNL-DWG 87-11516

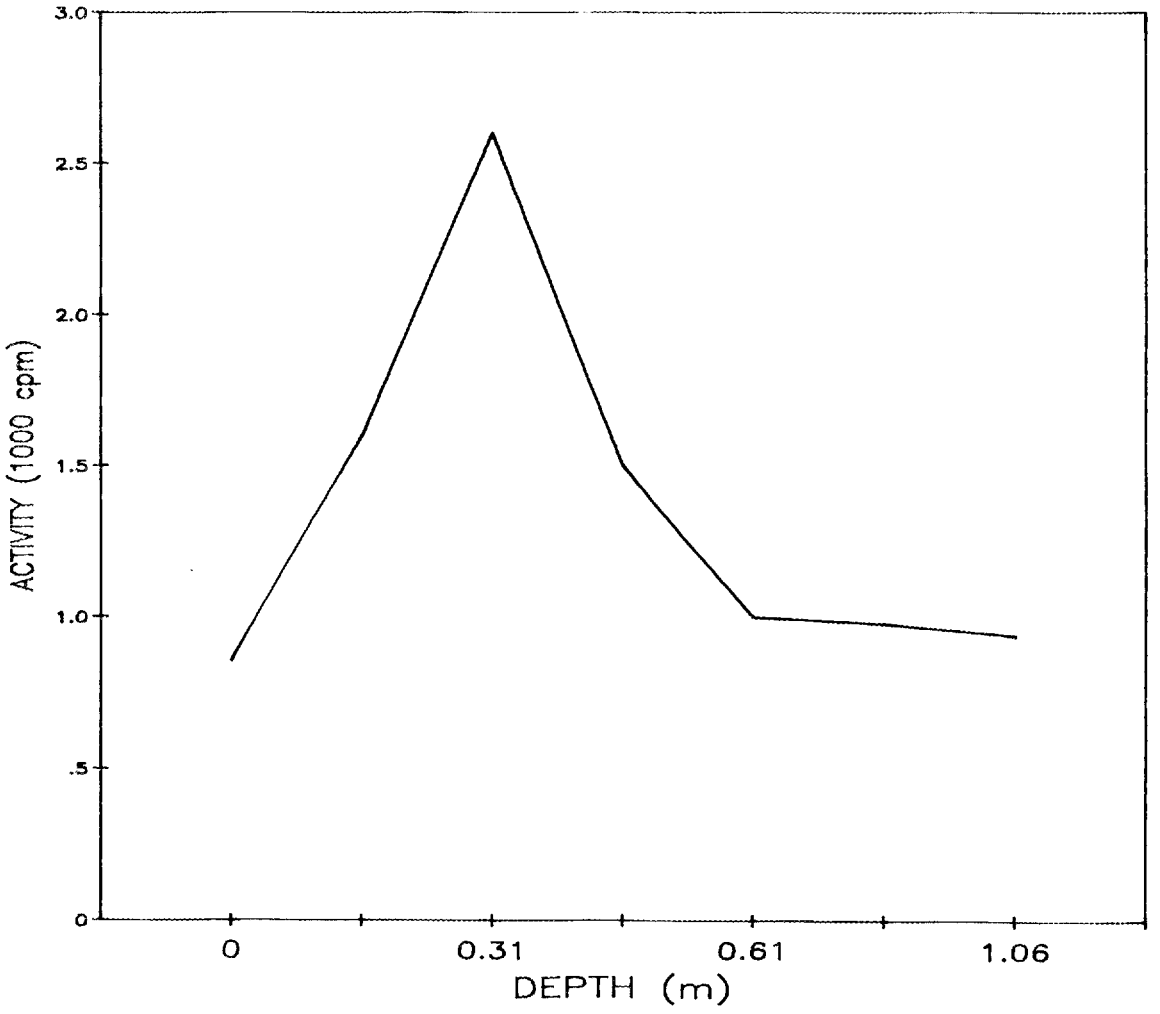

Fig. A.59. Gamma profile of auger hole 59.

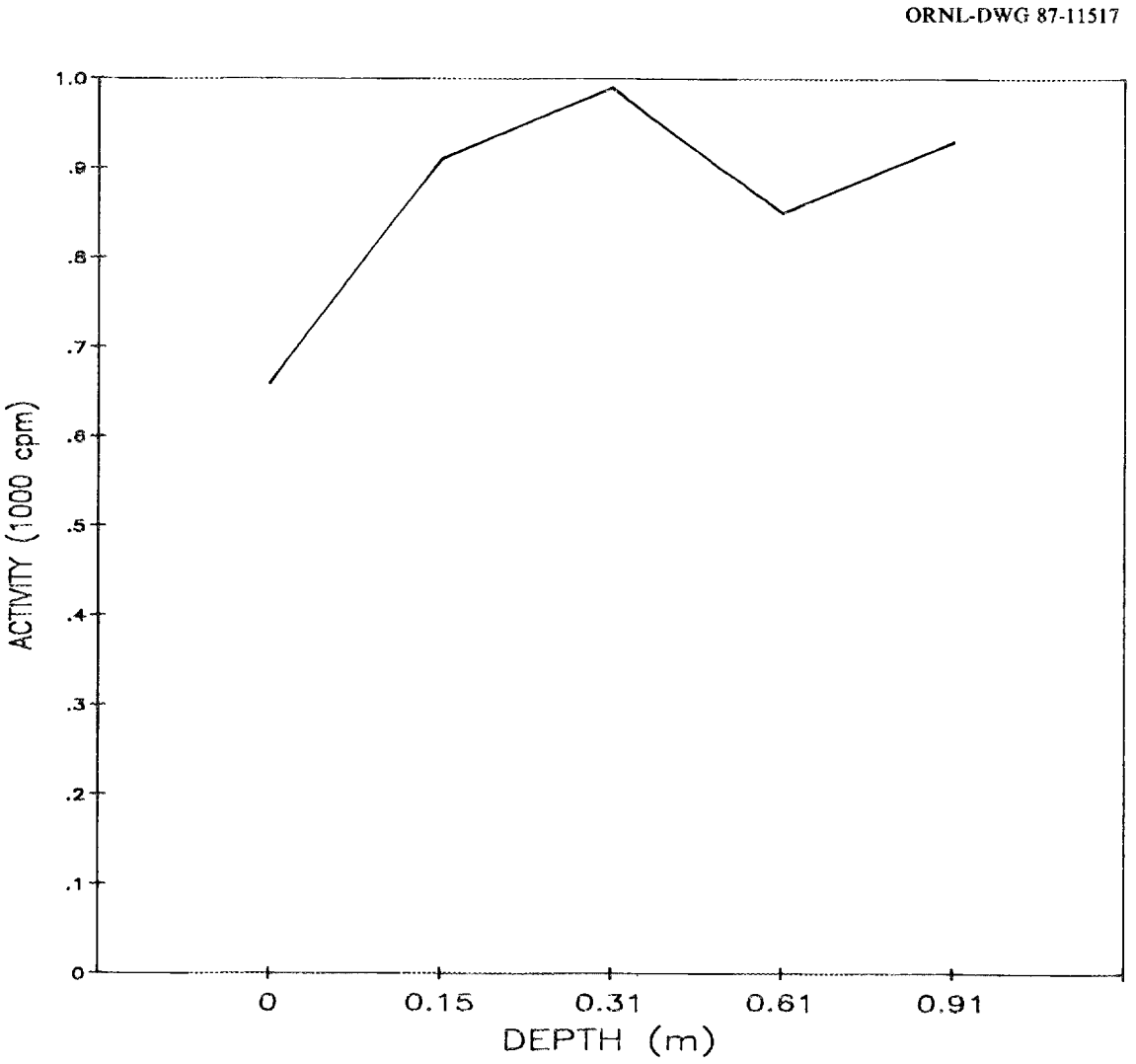

Fig. A.60. Gamma profile of auger hole 60.

ORNL-DWG 87-11518

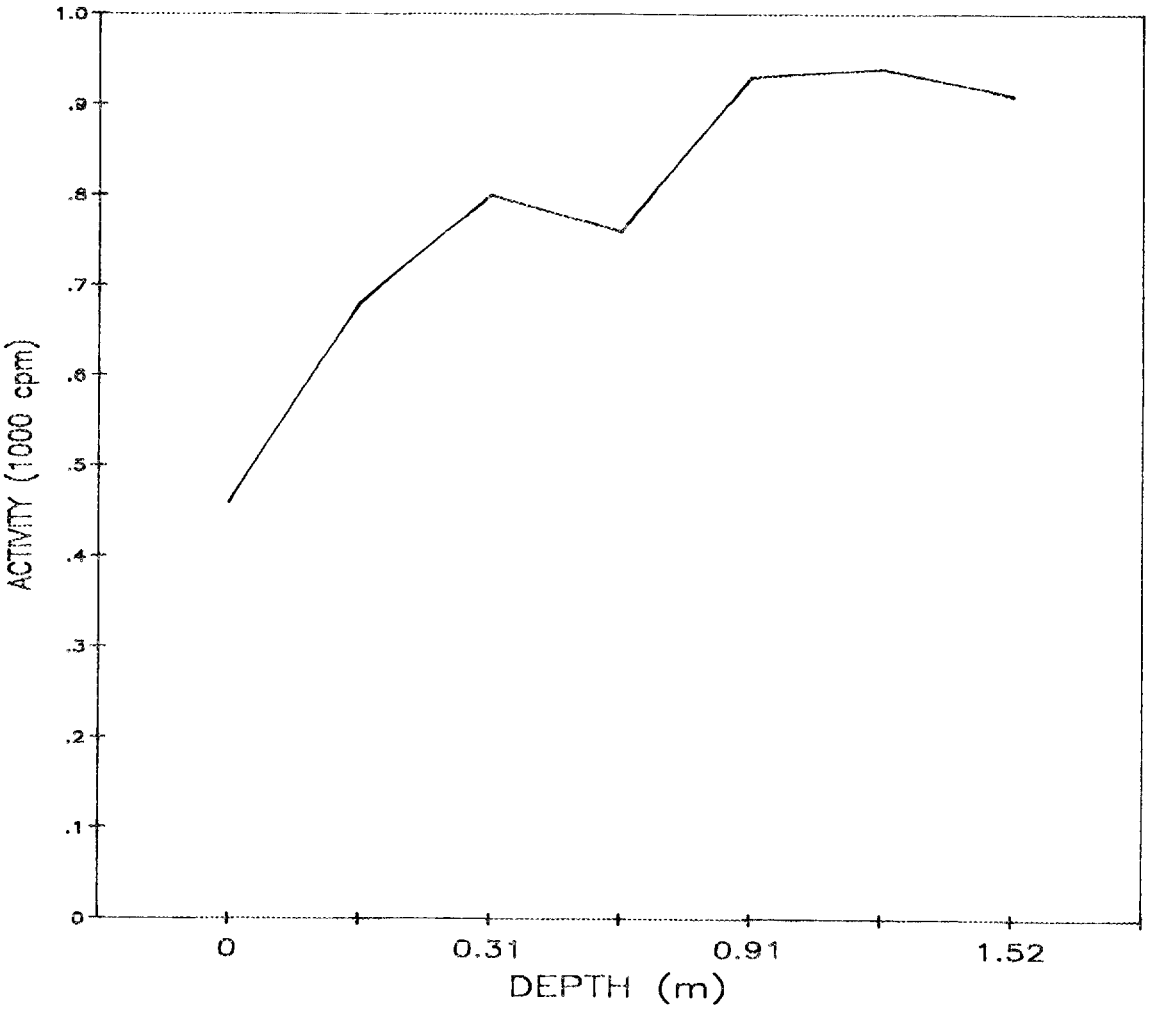

Fig. A.61. Gamma profile of auger hole 61.

ORNL-DWG 87-11519

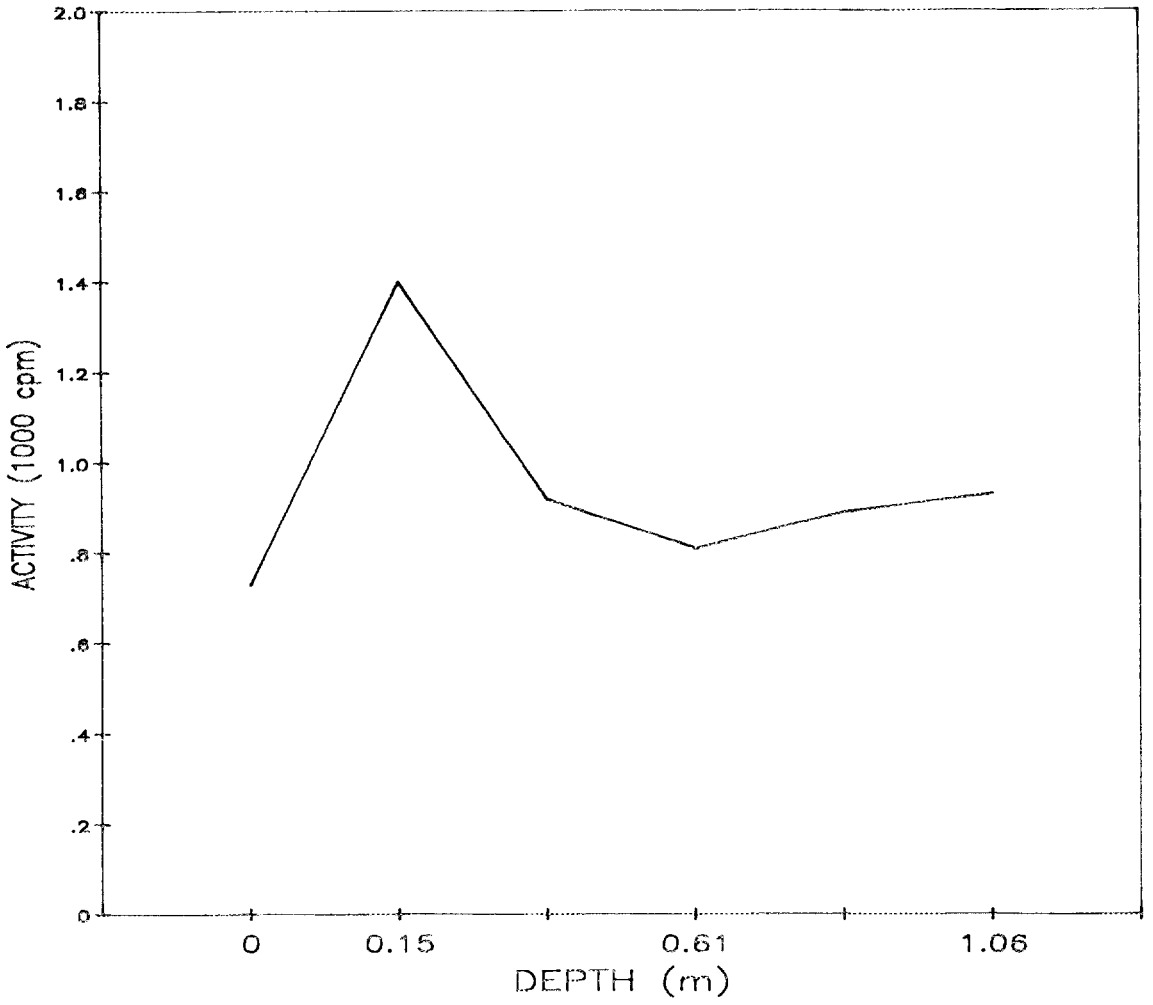

Fig. A.62. Gamma profile of auger hole 62.

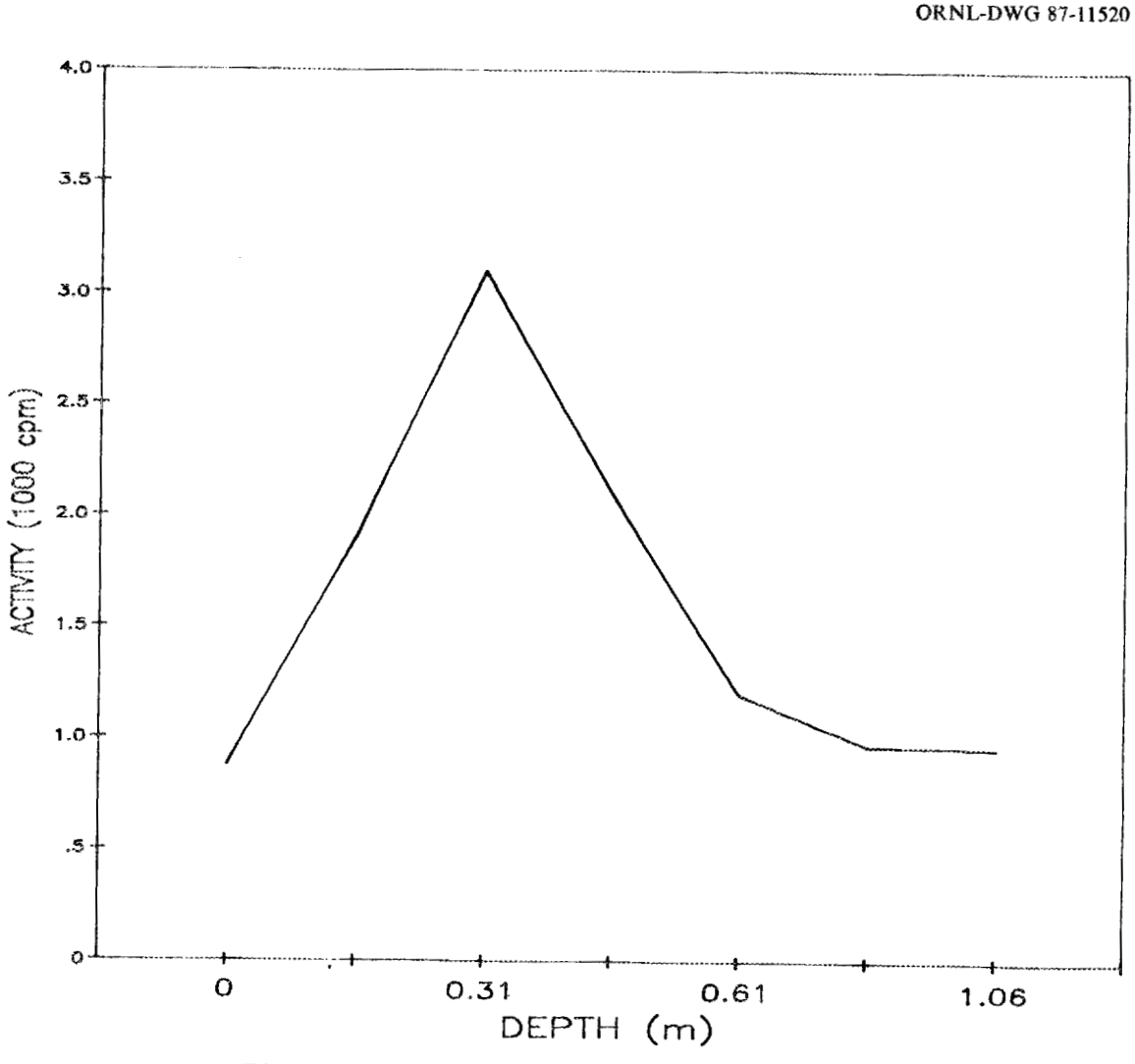

Fig. A.63. Gamma profile of auger hole 63.

ORNL-DWG 87-11521

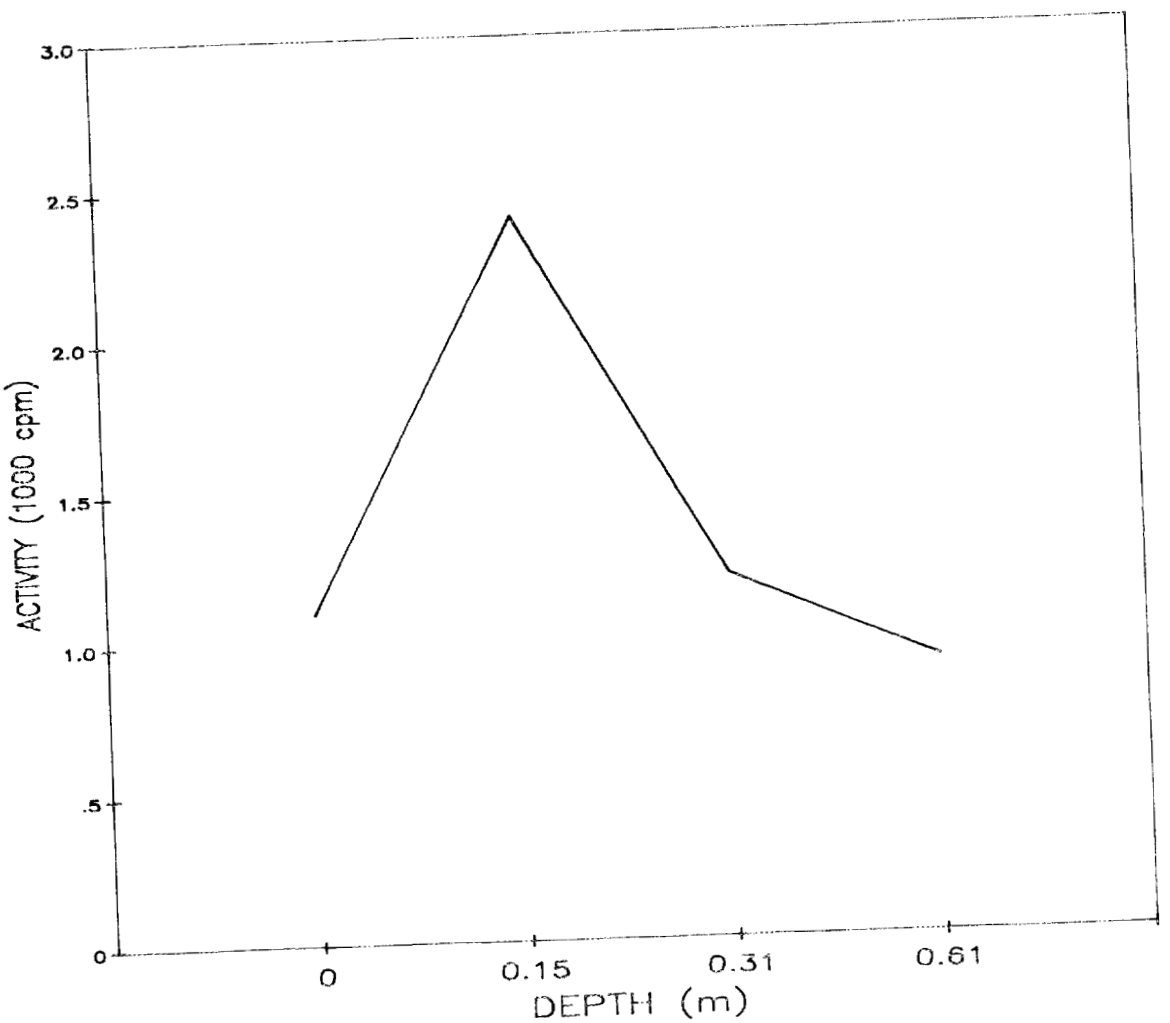

Fig. A.64. Gamma profile of auger hole 64.

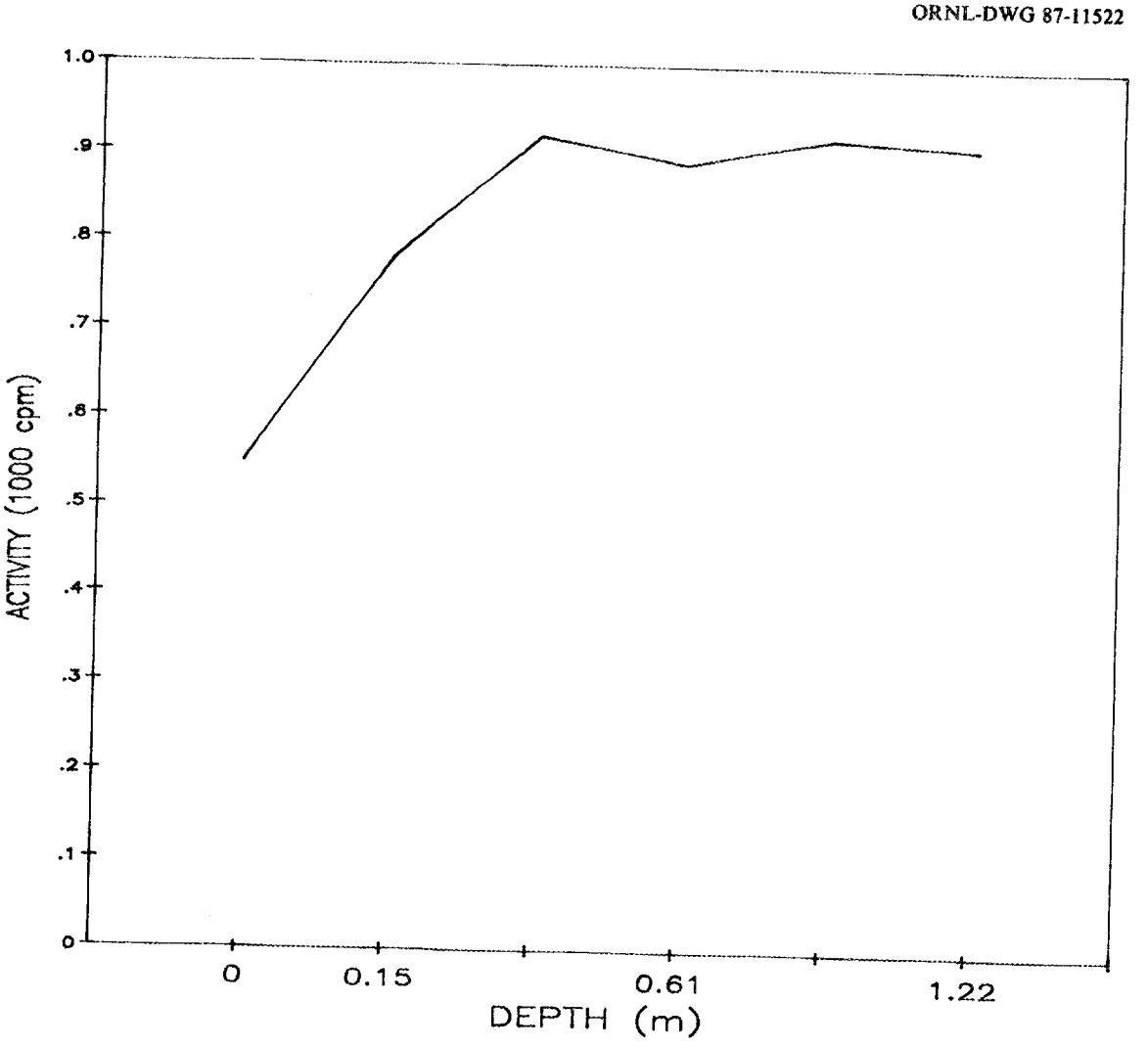

Fig. A.65. Gamma profile of auger hole 65.

ORNL-DWG 87-11523

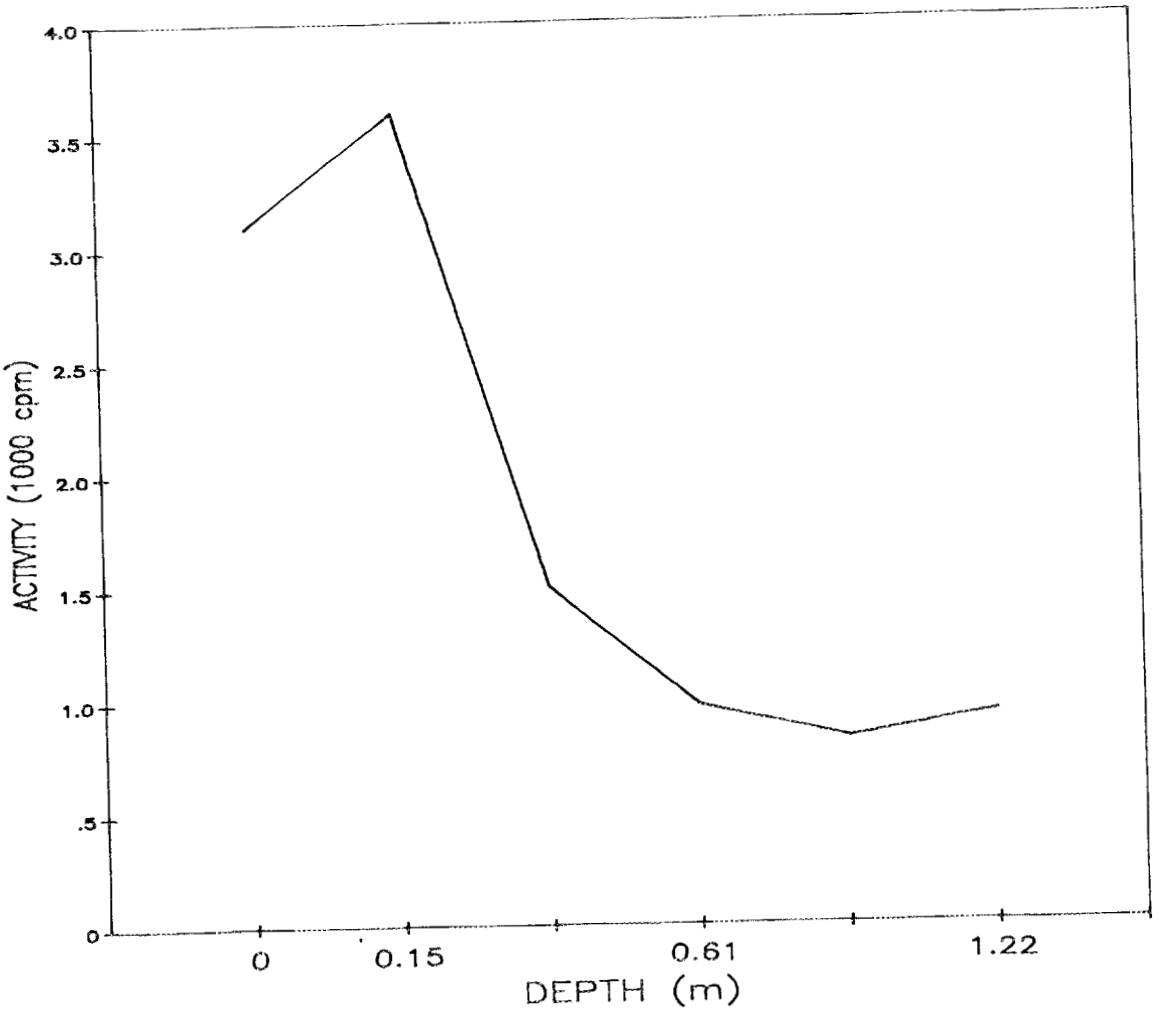

Fig. A.66. Gamma profile of auger hole 66.

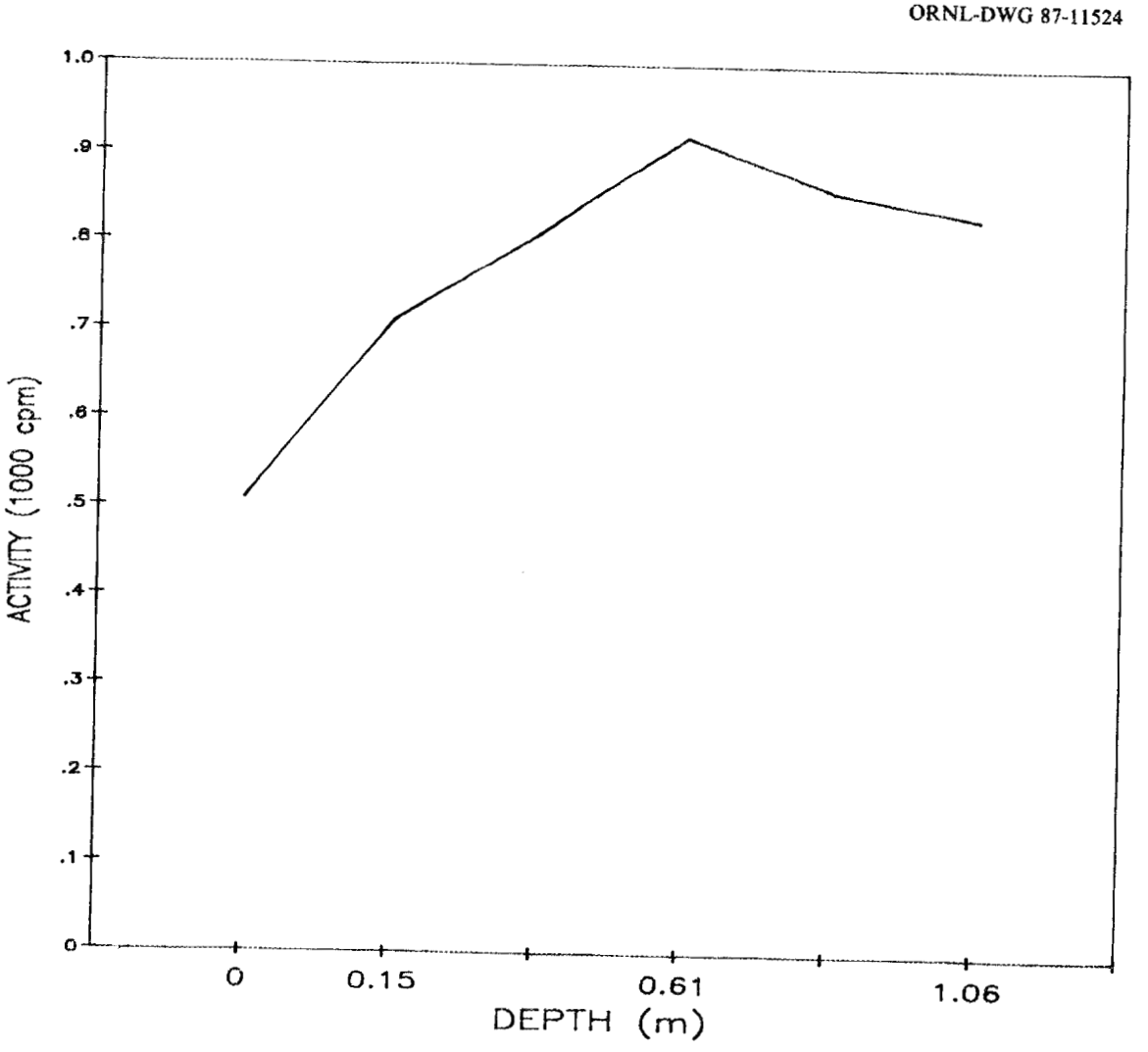

Fig. A.67. Gamma profile of auger hole 67.

ORNL-DWG 87-11525

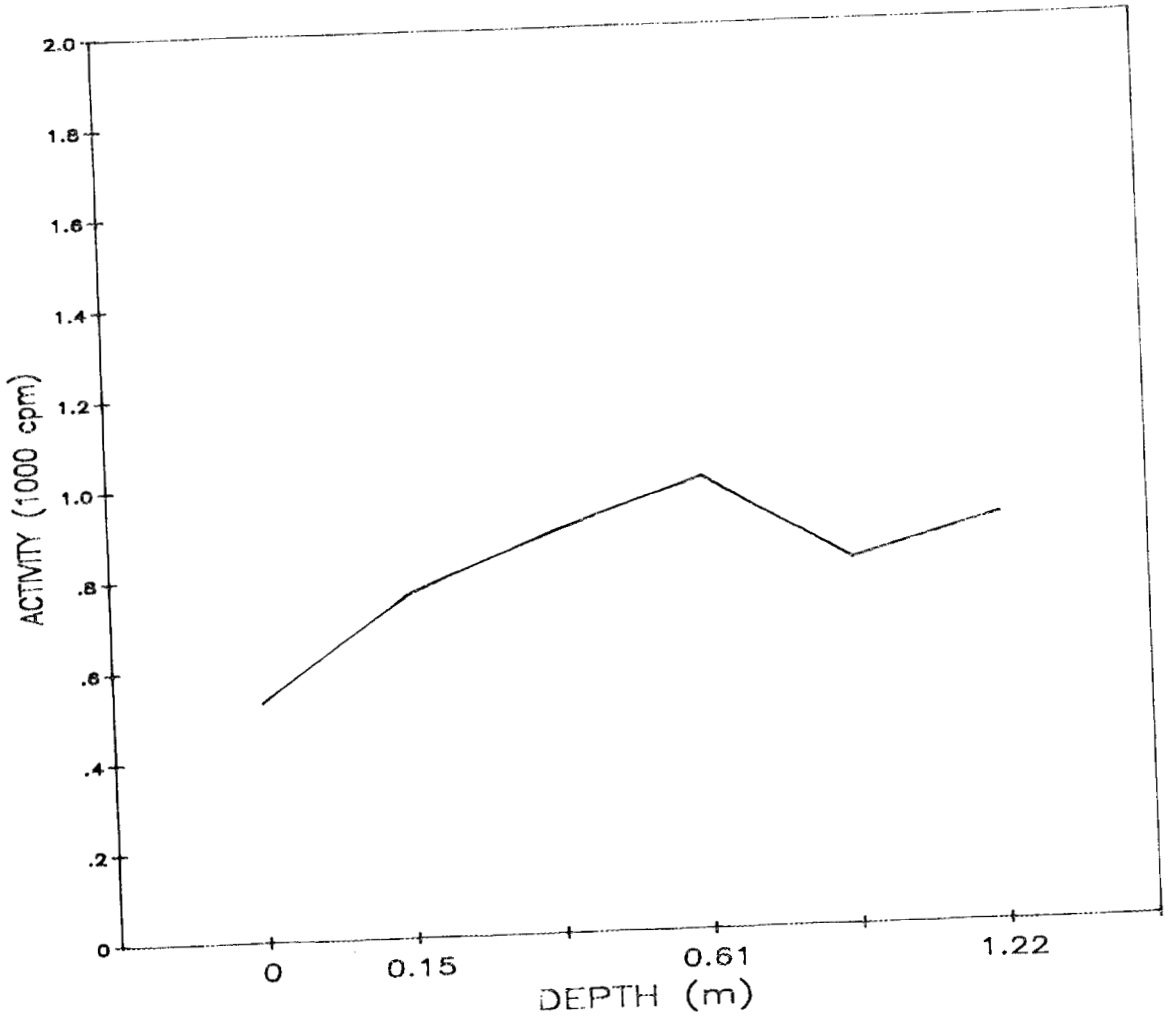

Fig. A.68. Gamma profile of auger hole 68.

ORNL-DWG 87-11526

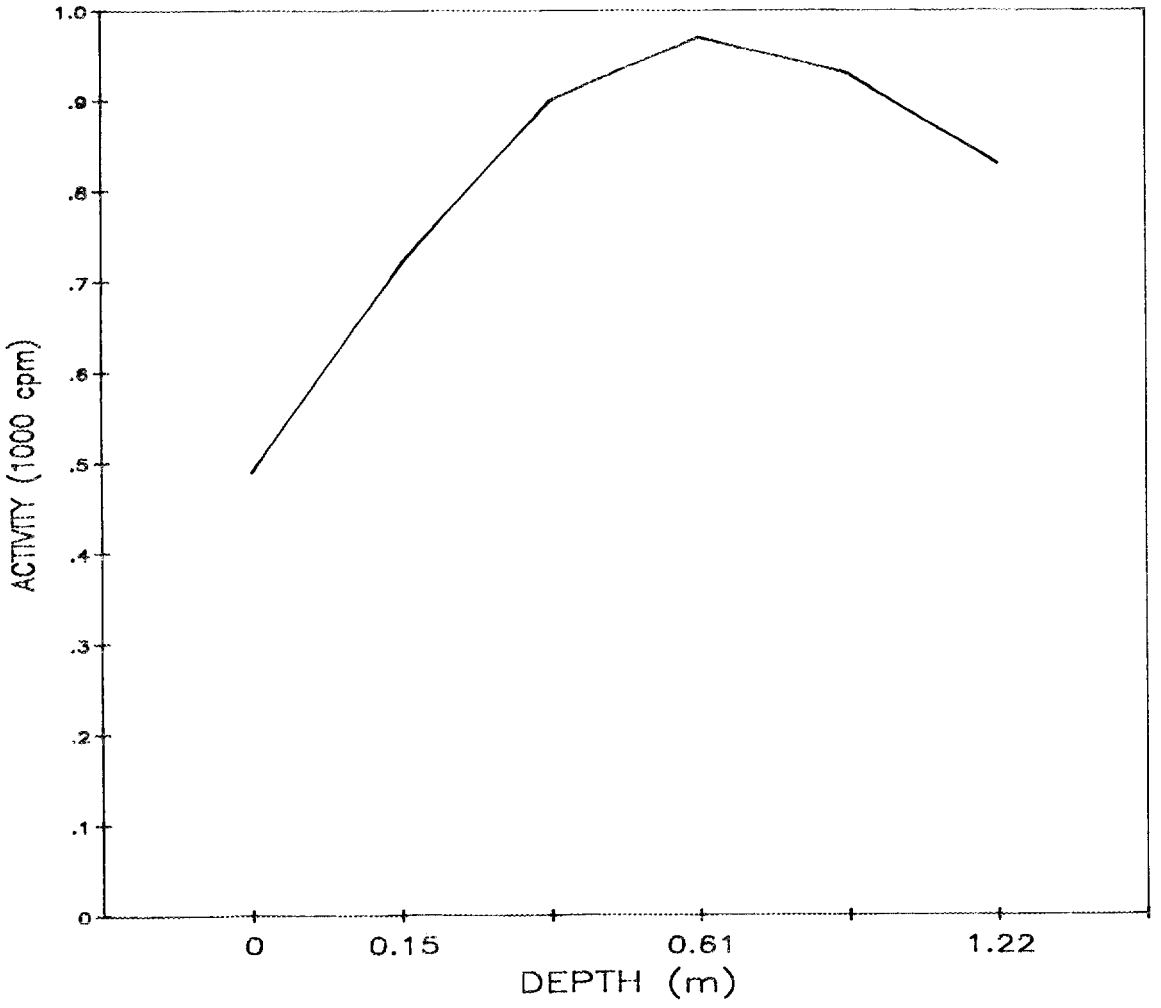

Fig. A.69. Gamma profile of auger hole 69.

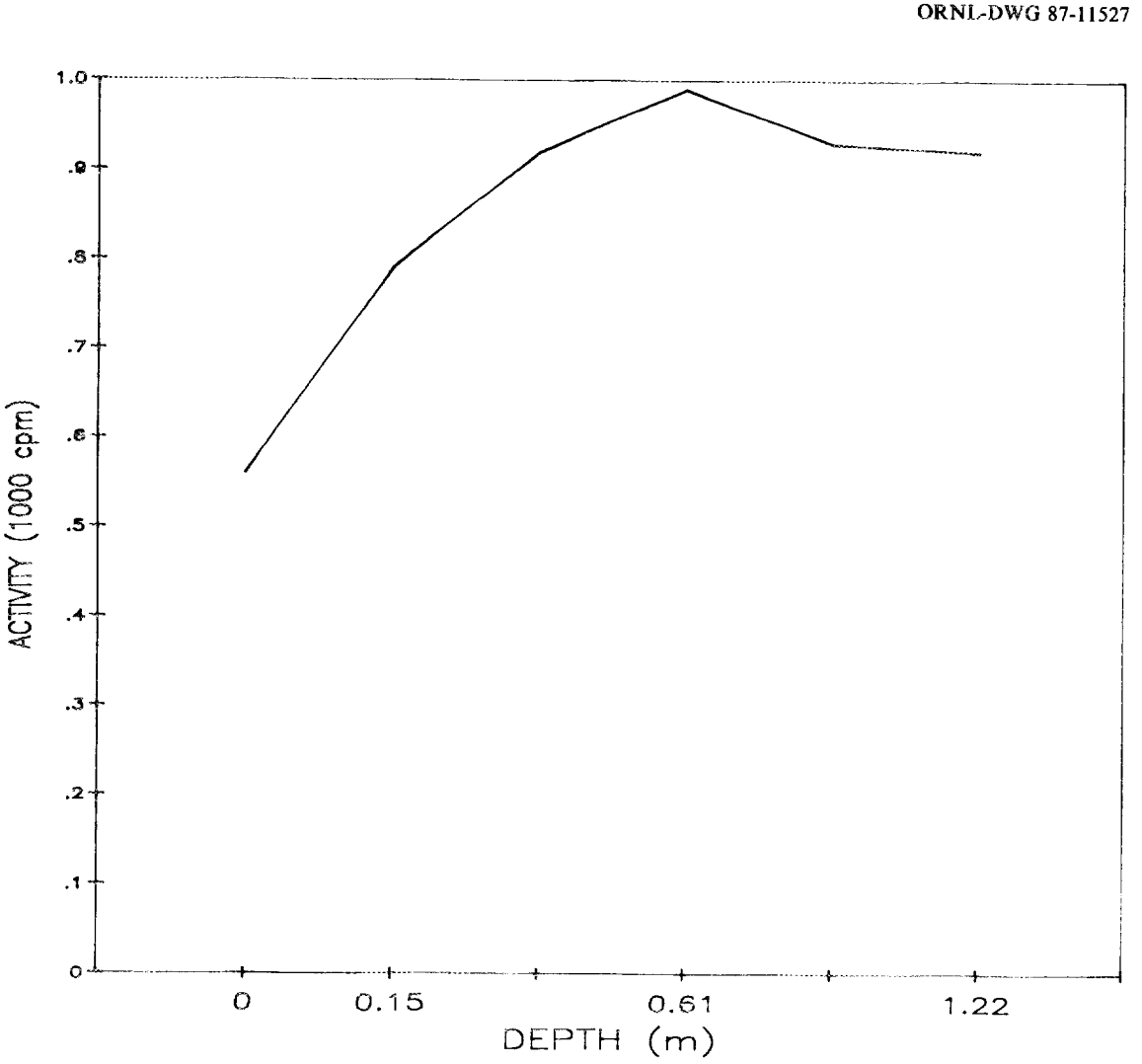

Fig. A.70. Gamma profile of auger hole 70.

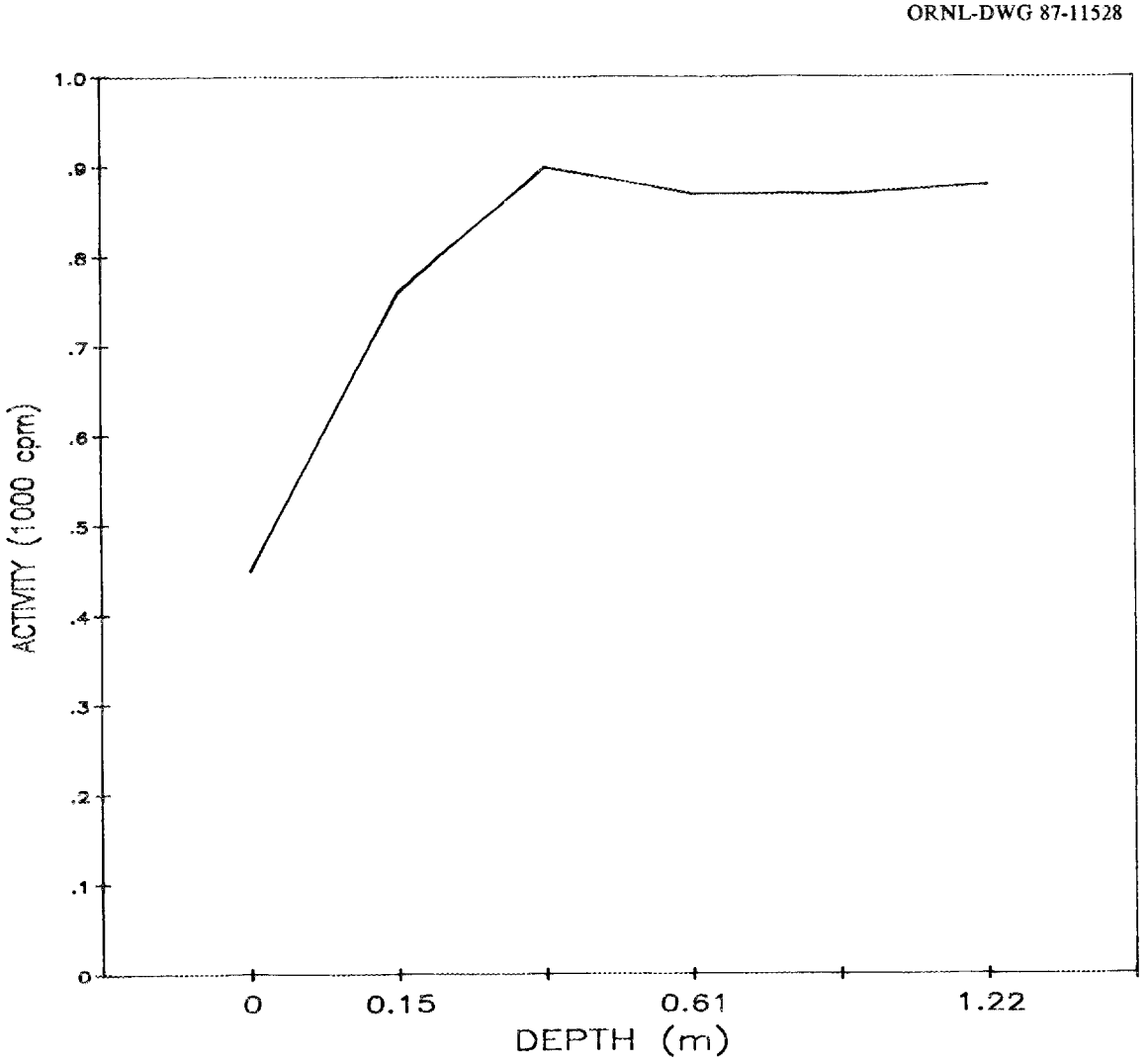

Fig. A.71. Gamma profile of auger hole 71.

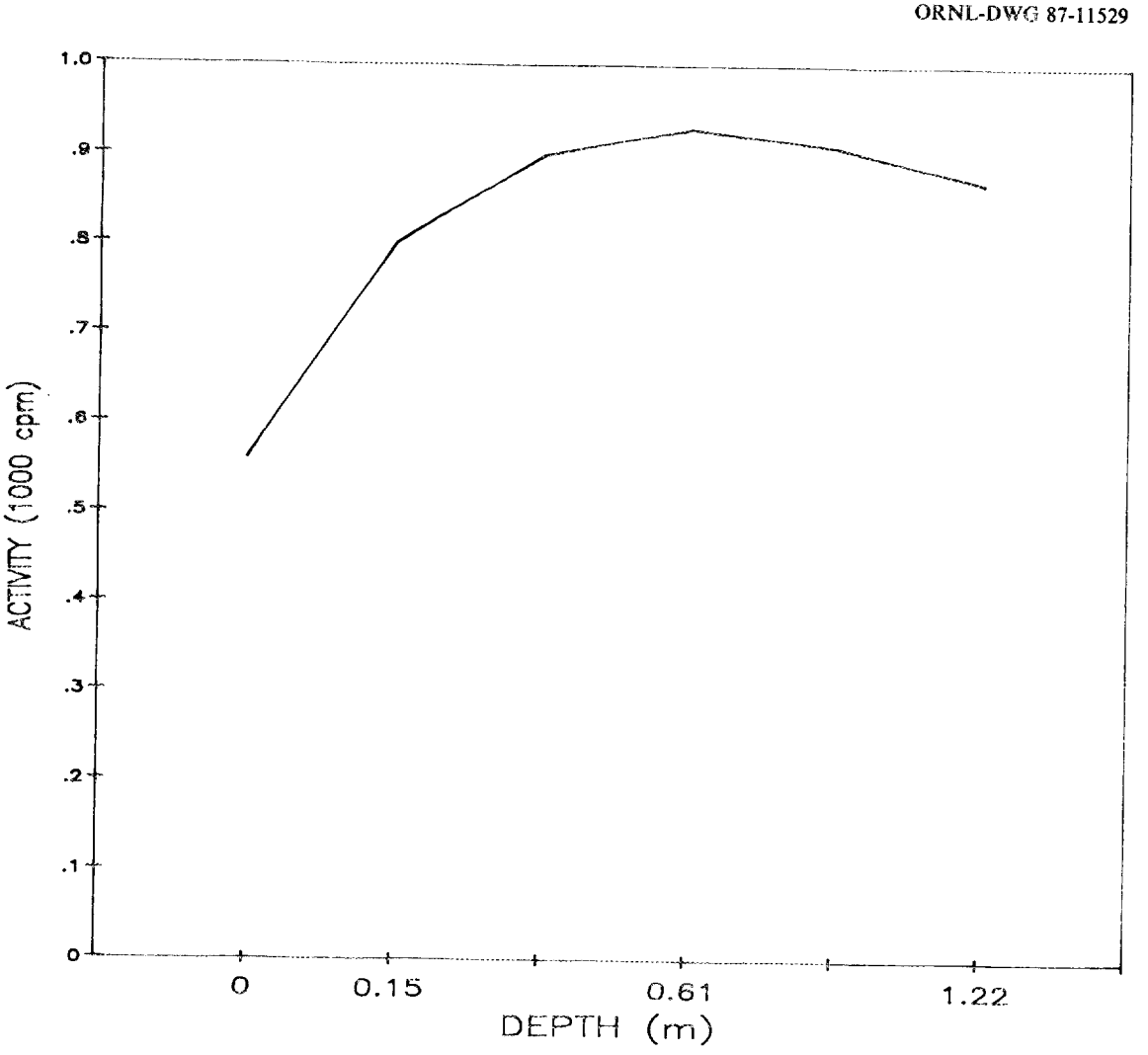

Fig. A.72. Gamma profile of auger hole 72.

ORNL-DWG 87-11530

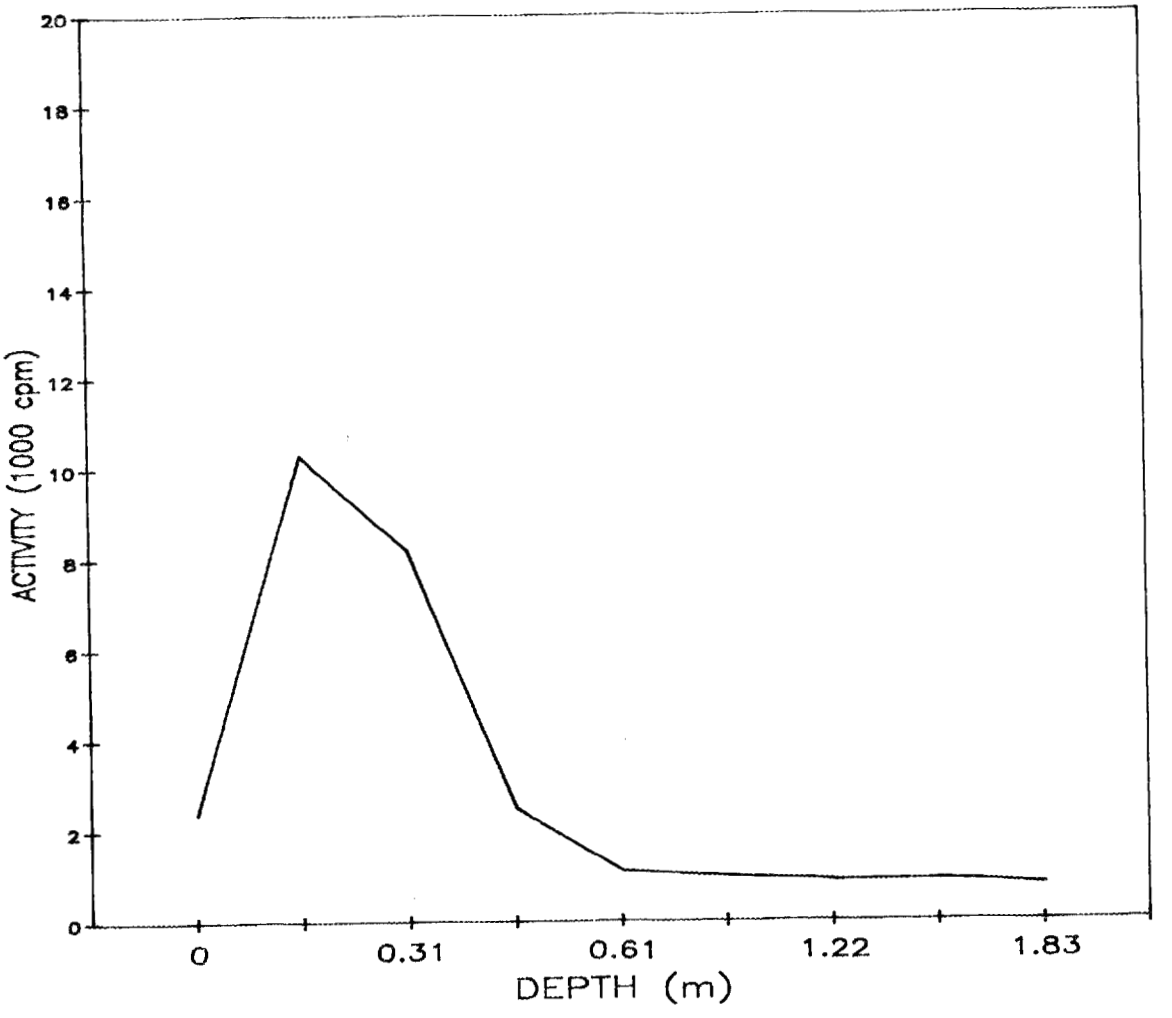

Fig. A.73. Gamma profile of auger hole 73.

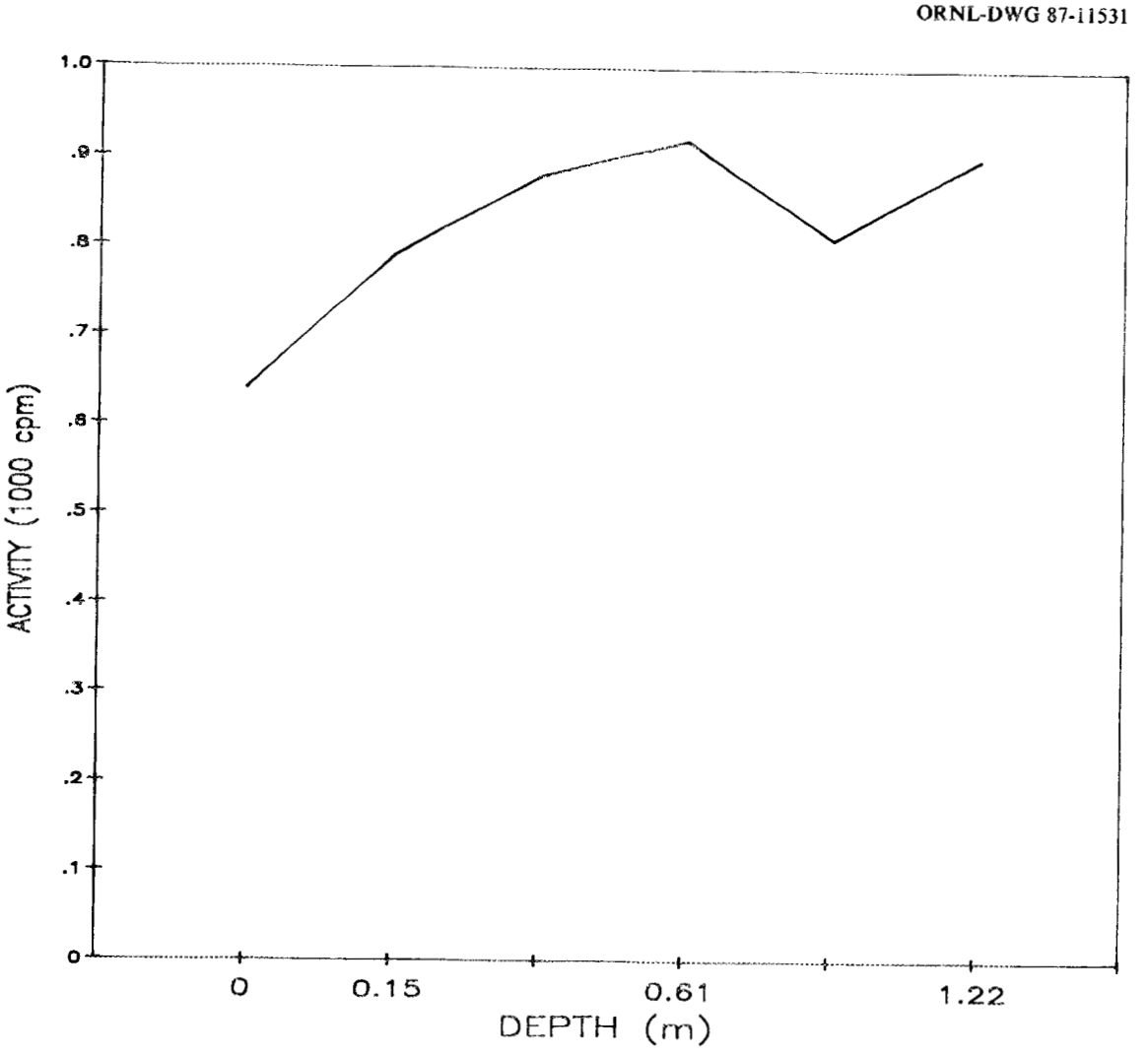

Fig. A.74. Gamma profile of auger hole 74.

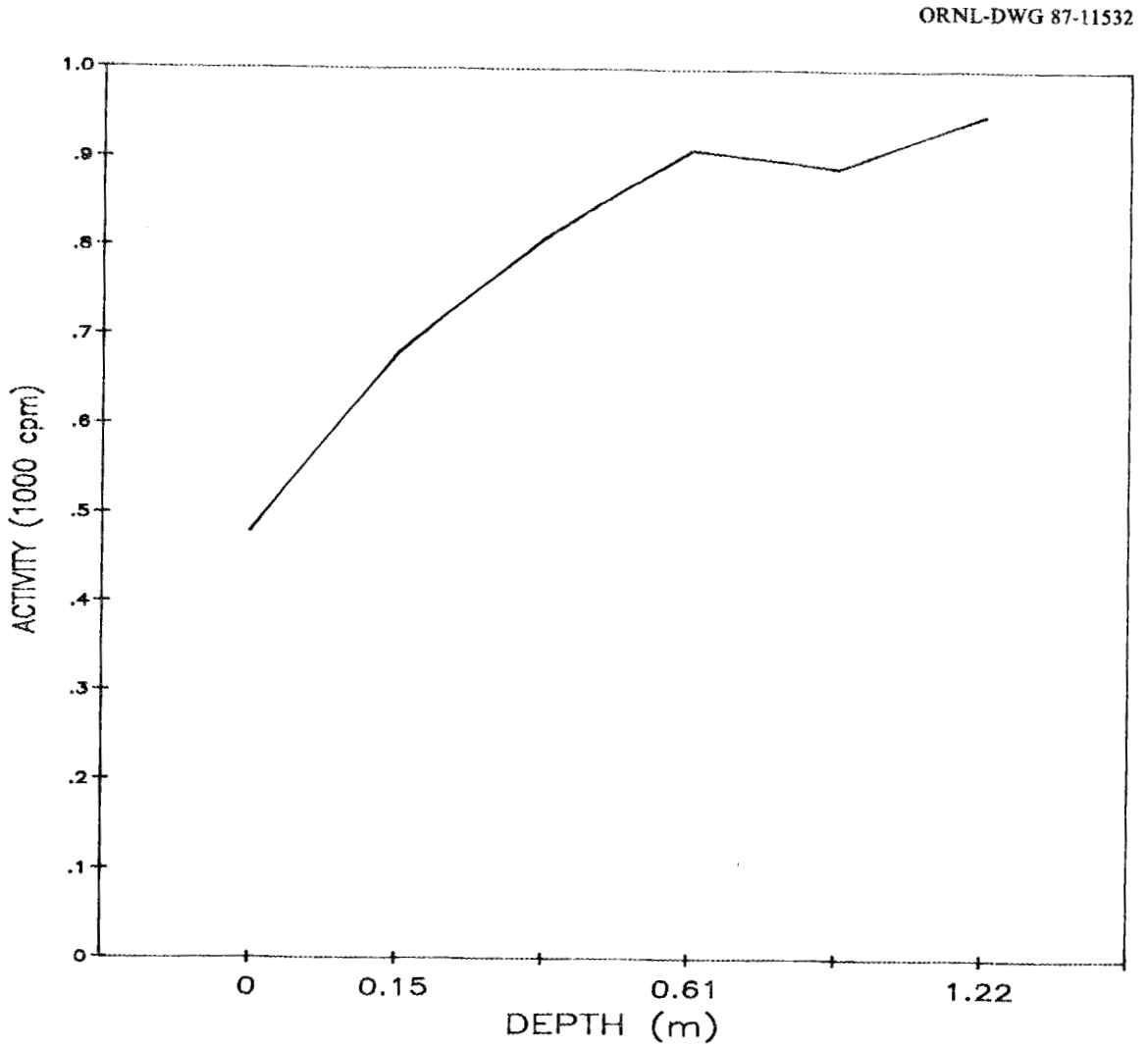

Fig. A.75. Gamma profile of auger hole 75.

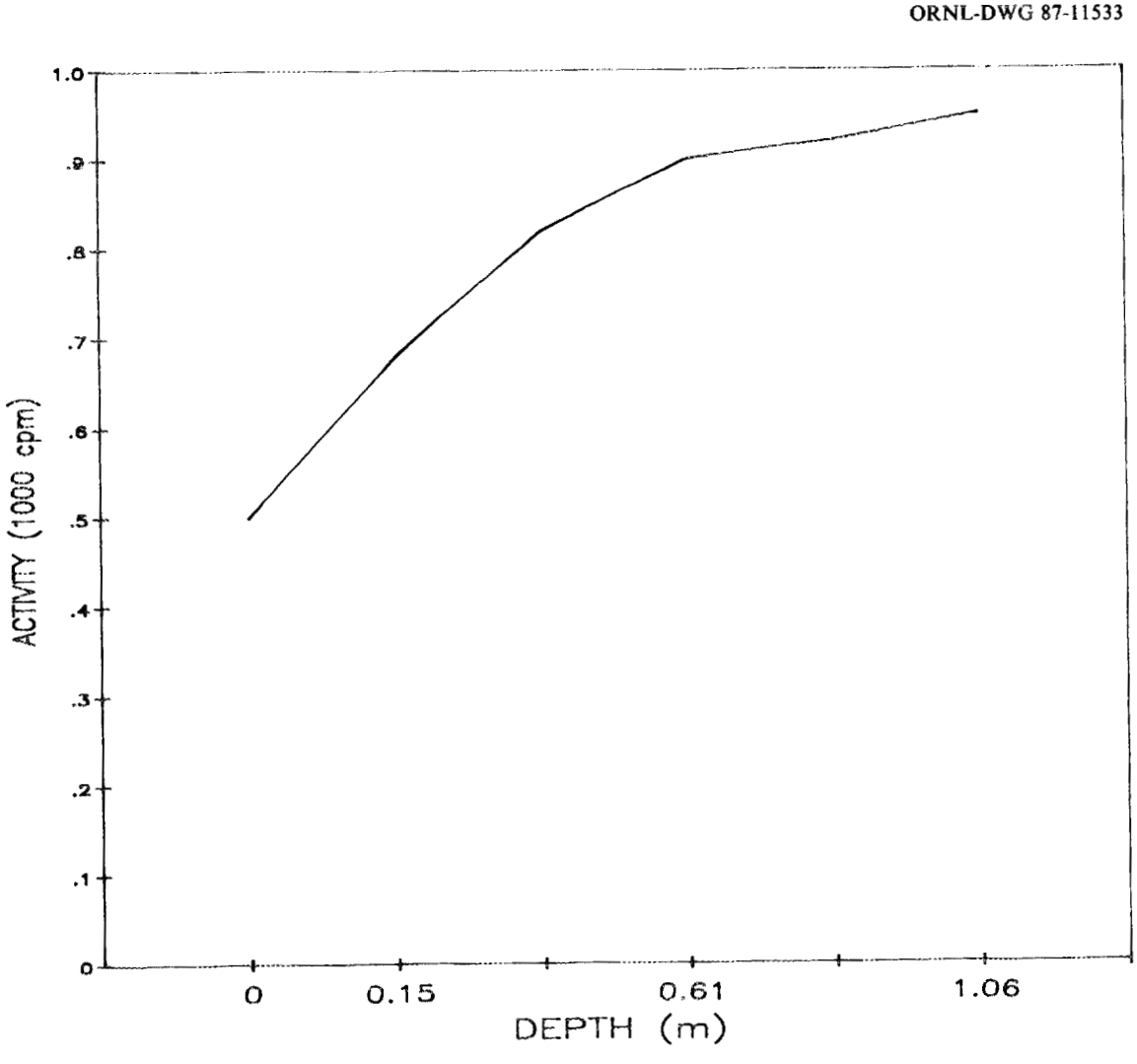

Fig. A.76. Gamma profile of auger hole 76.

ORNL-DWG 87-11534

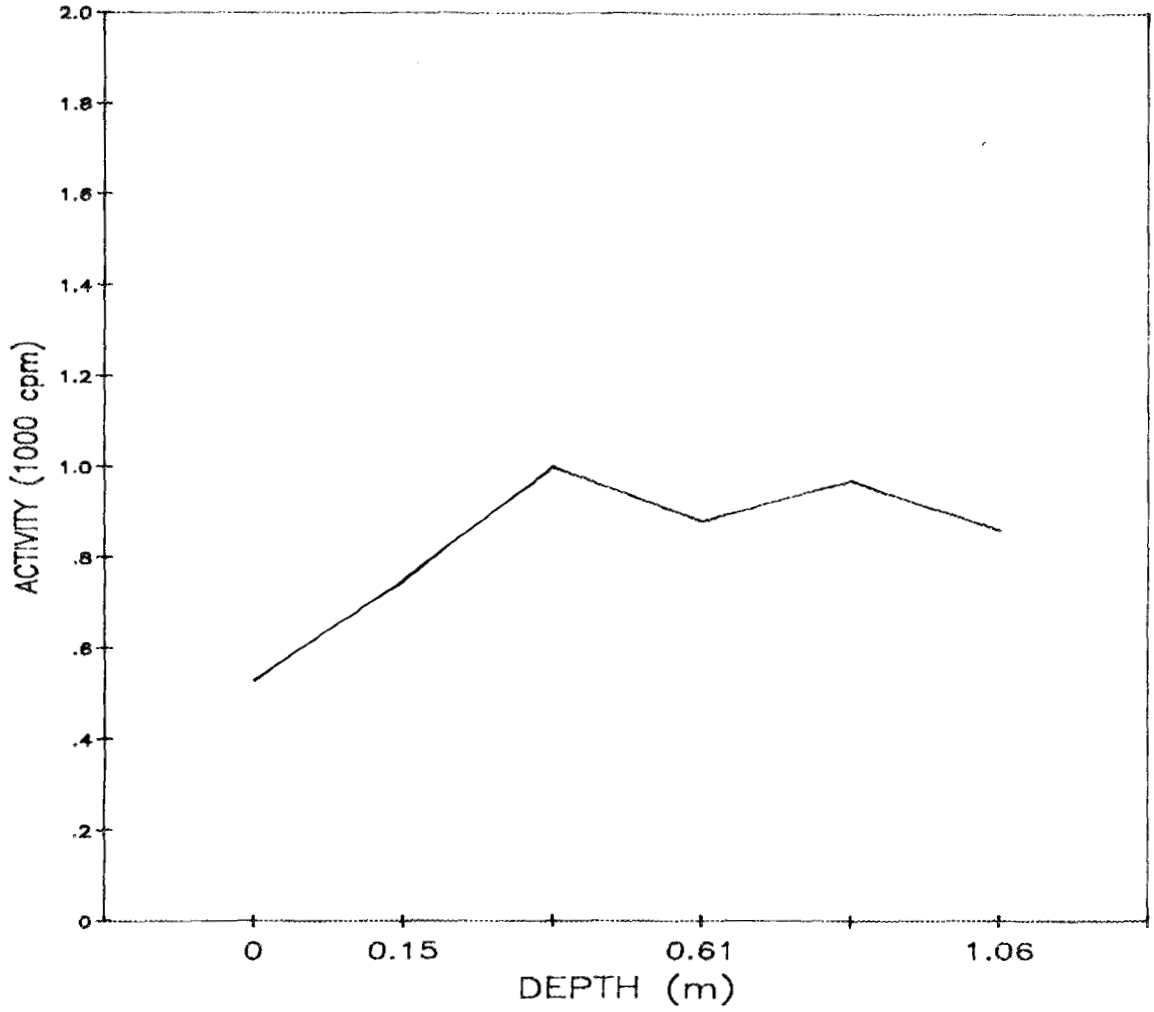

Fig. A.77. Gamma profile of auger hole 77.

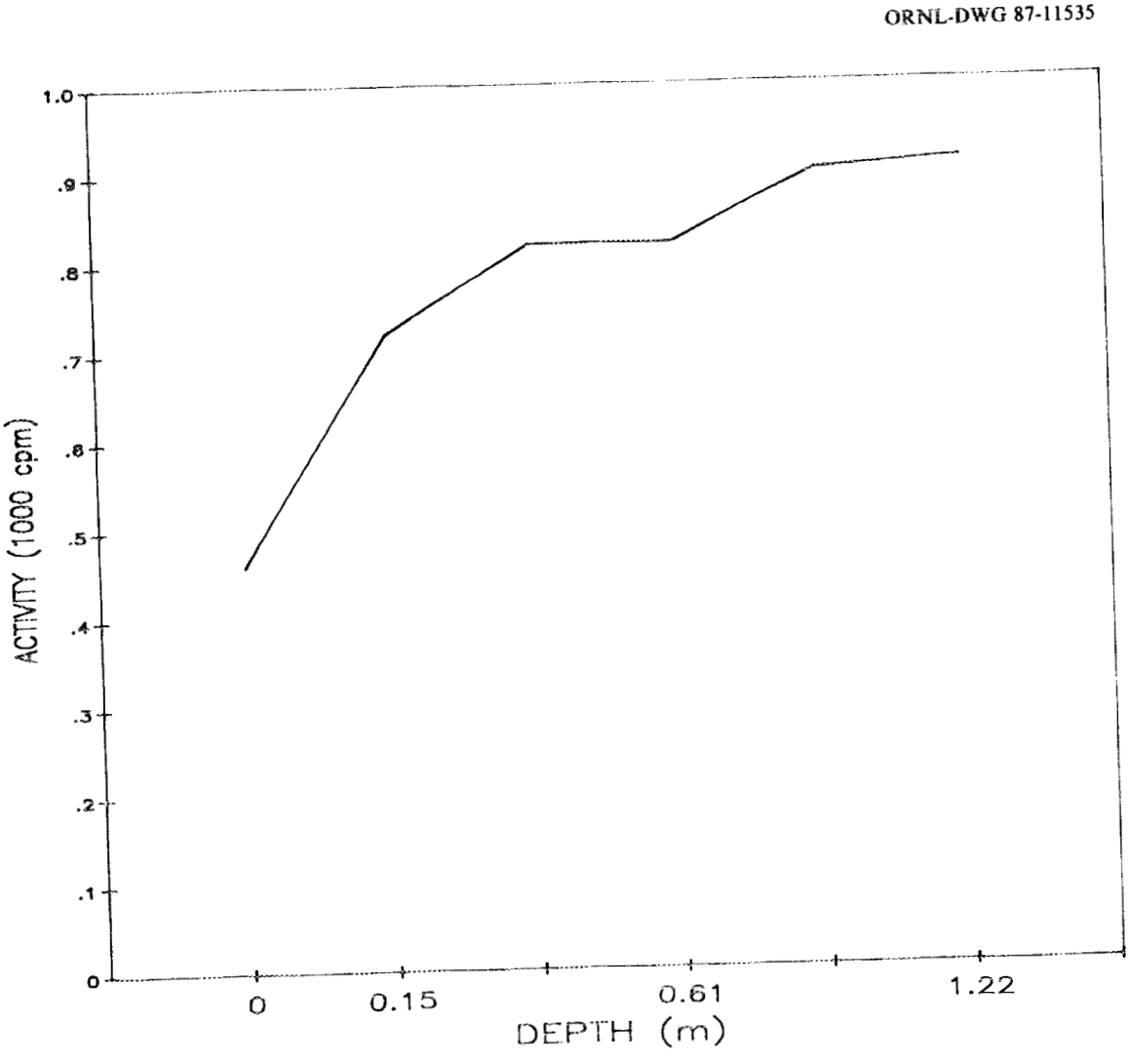

Fig. A.78. Gamma profile of auger hole 78.

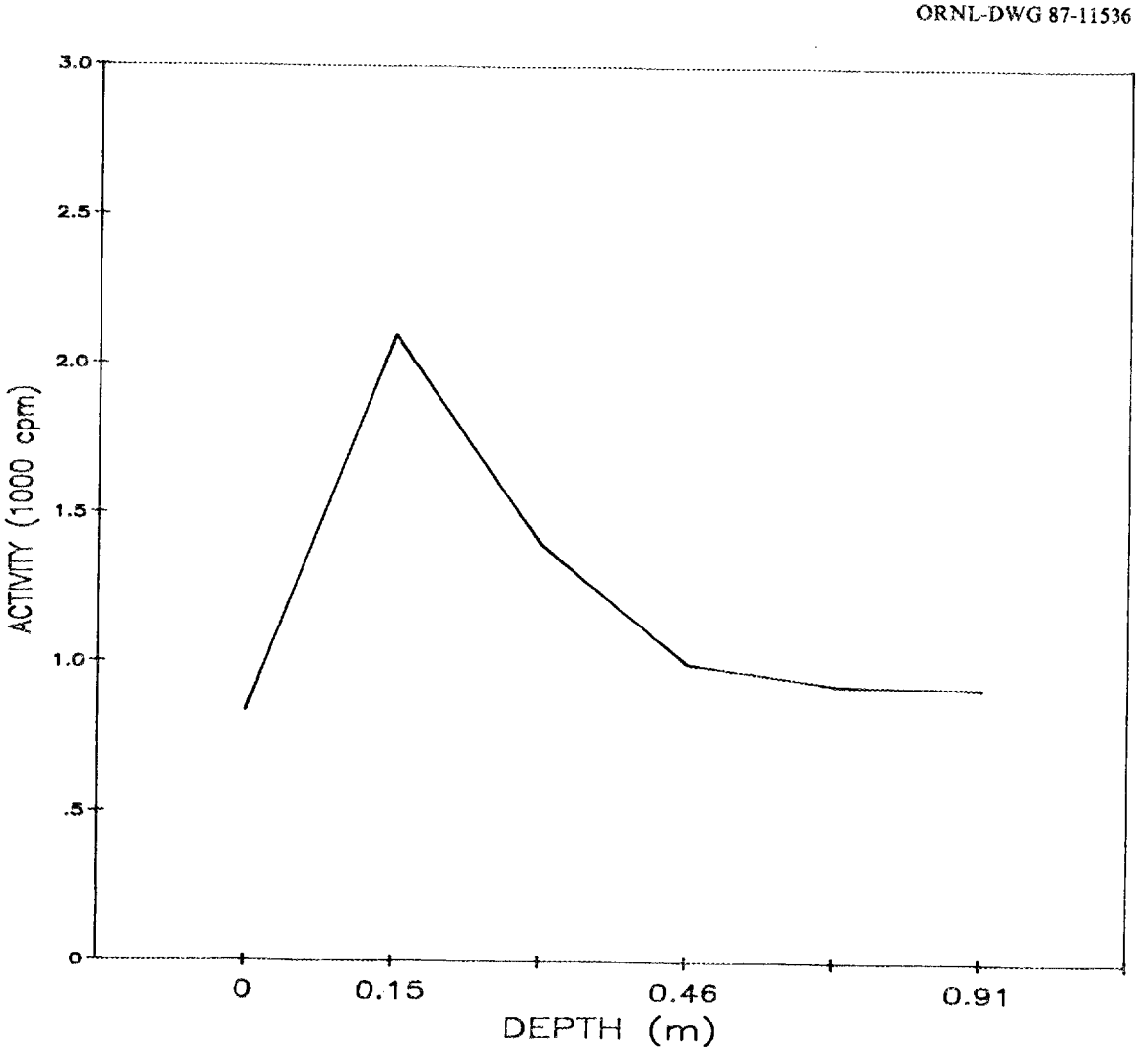

Fig. A.79. Gamma profile of auger hole 79.

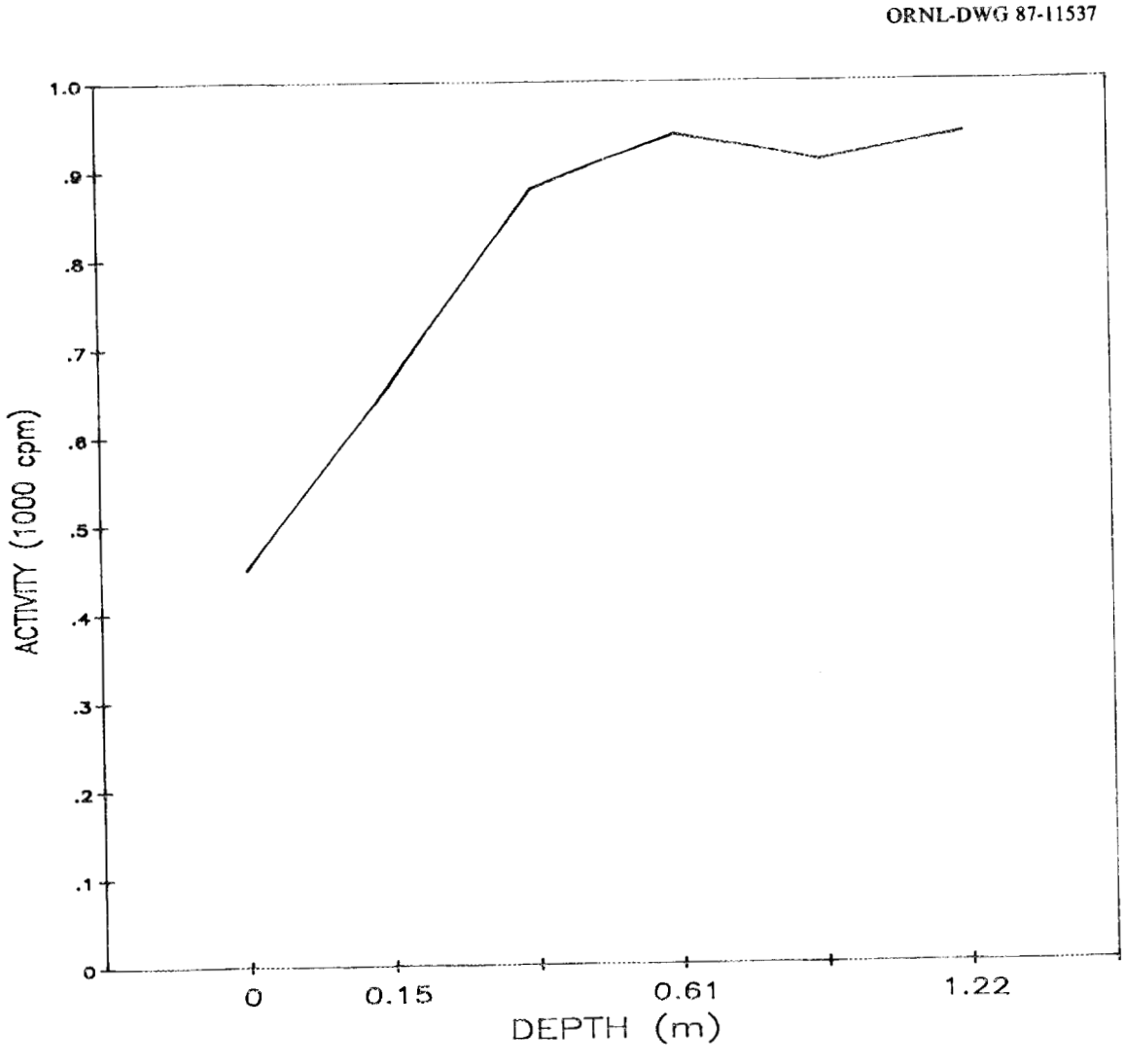

Fig. A.80. Gamma profile of auger hole 80.

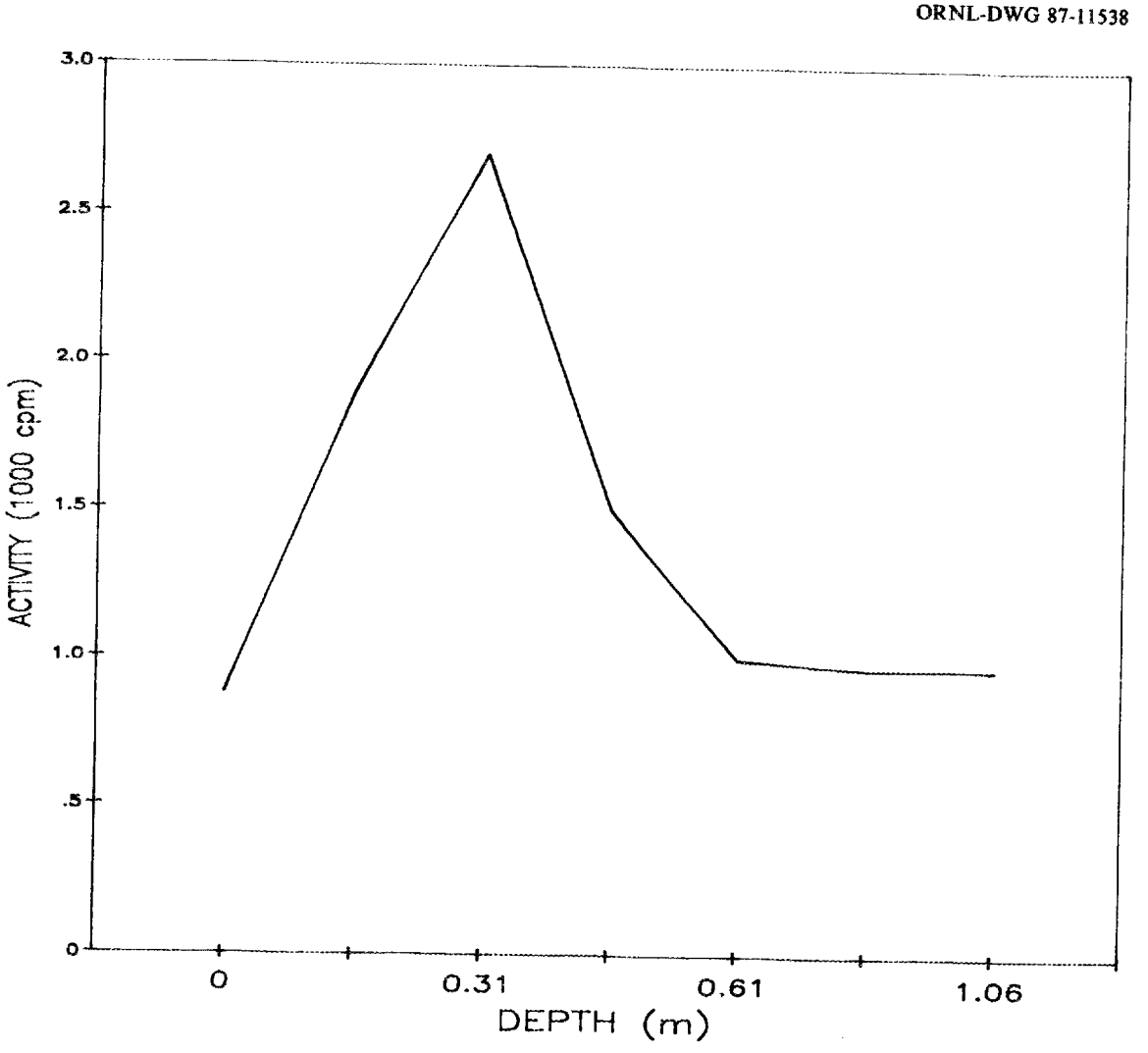

Fig. A.81. Gamma profile of auger hole 81.

ORNL-DWG 87-11539

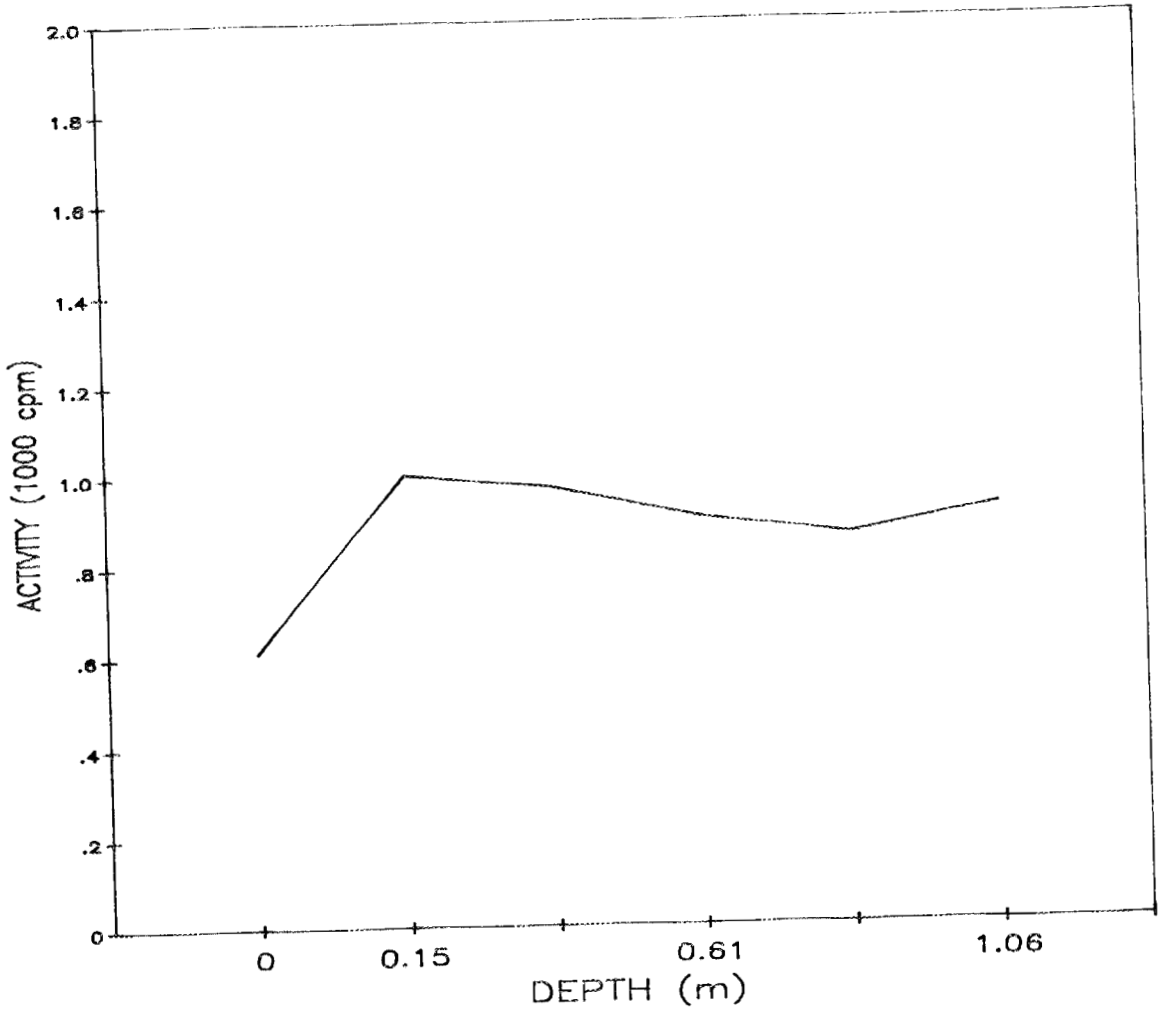

Fig. A.82. Gamma profile of auger hole 82.

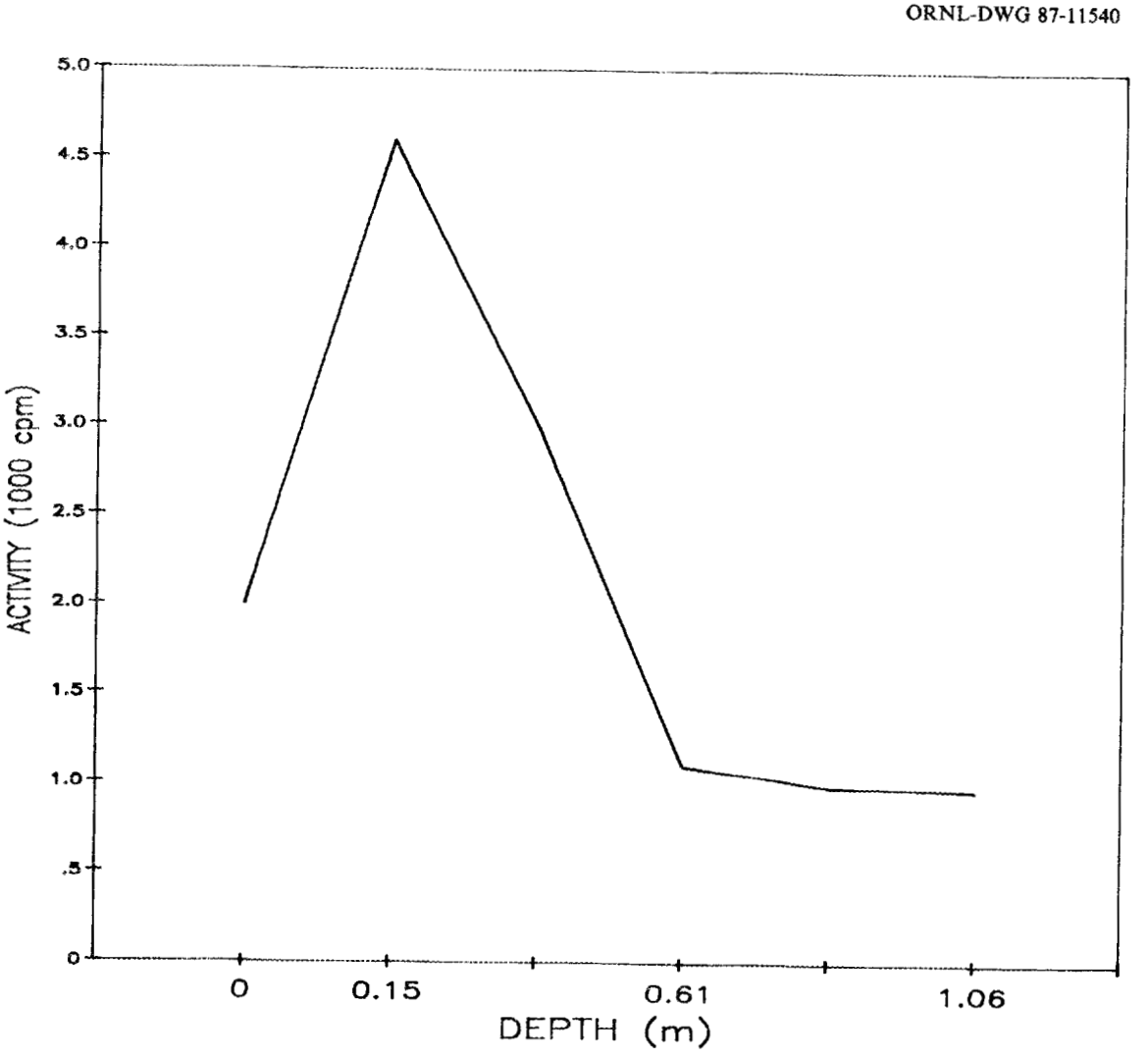

Fig. A.83. Gamma profile of auger hole 83.

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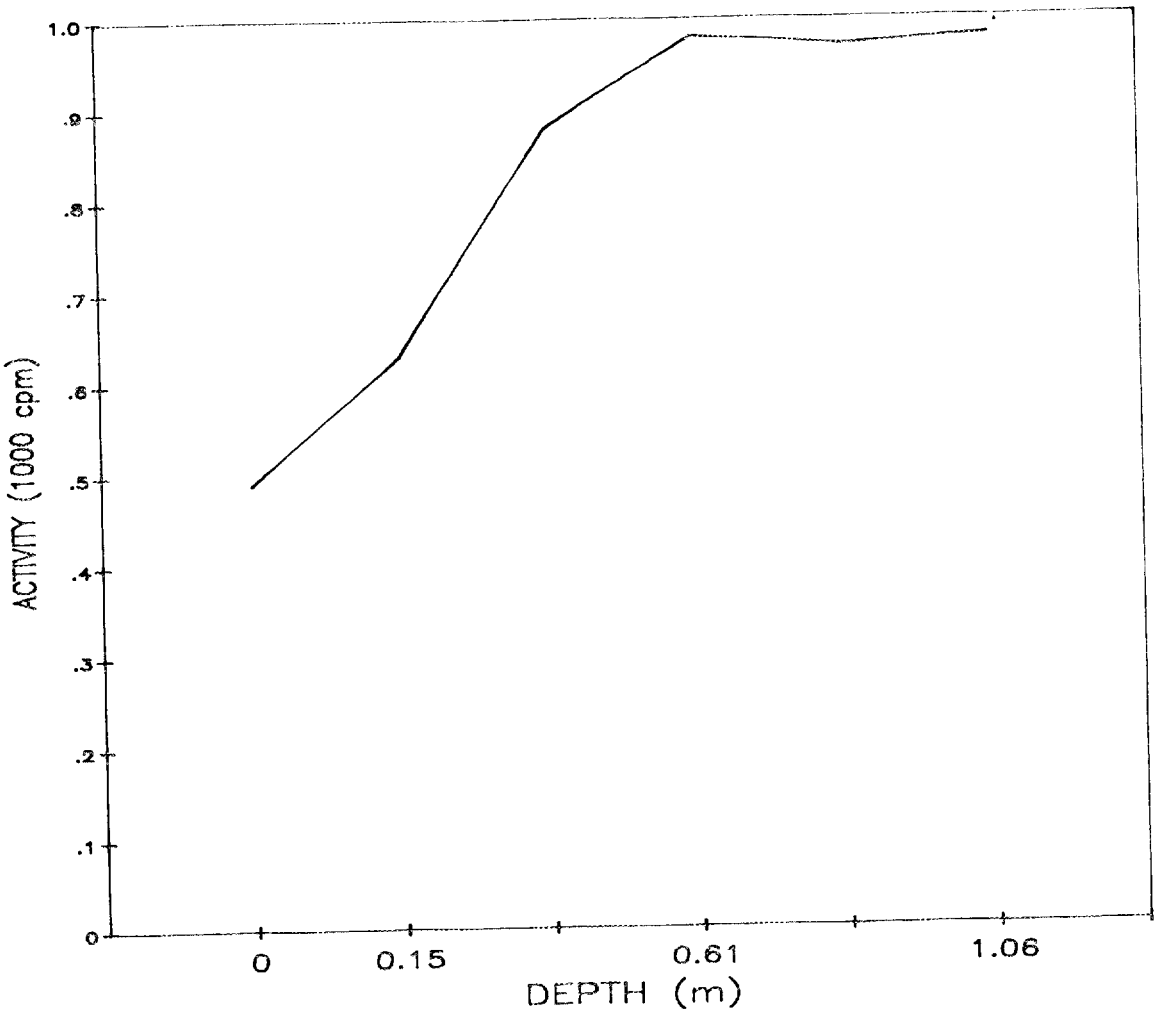

Fig. A.84. Gamma profile of auger hole 84.

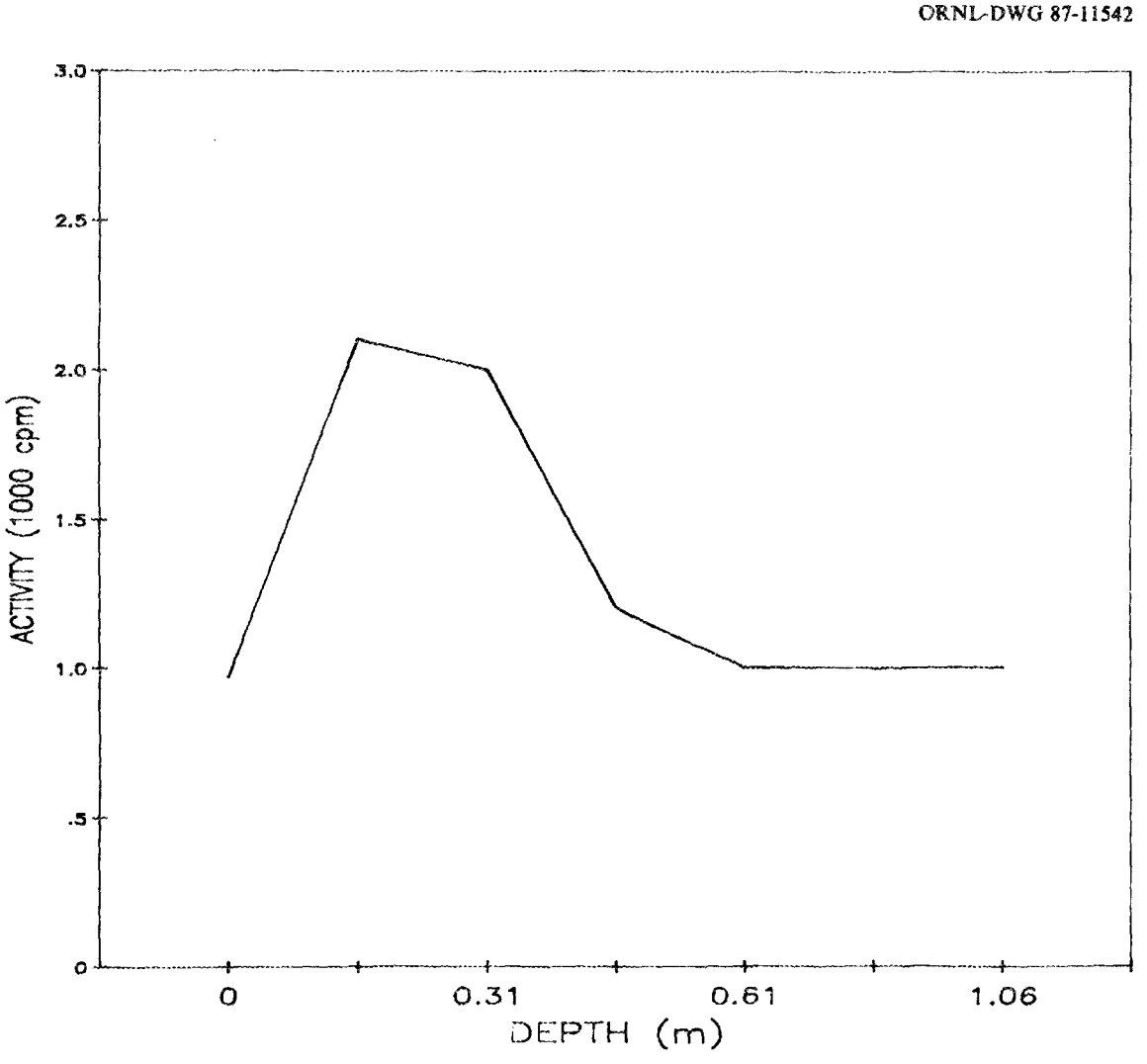

Fig. A.85. Gamma profile of auger hole 85.

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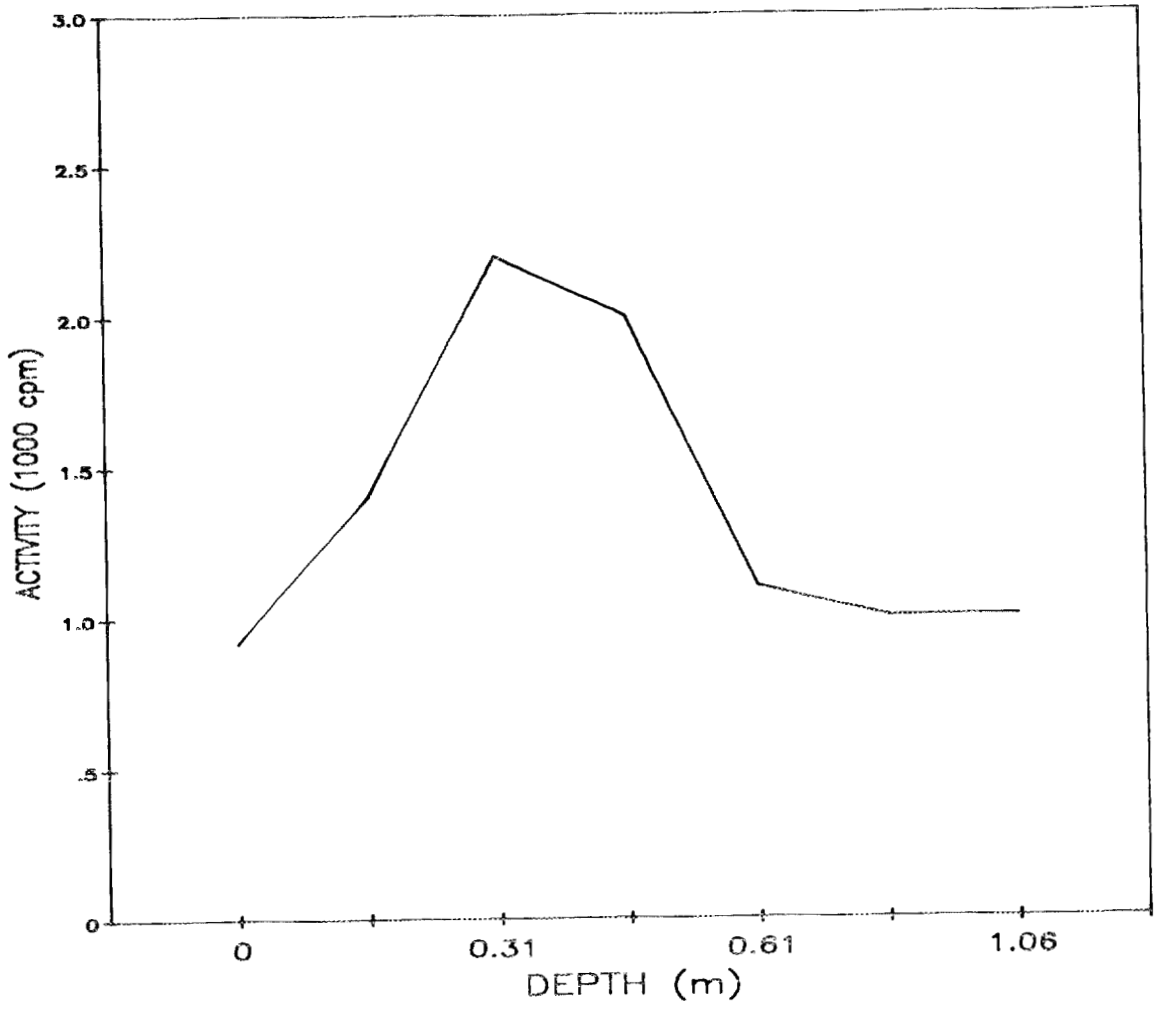

Fig. A.86. Gamma profile of auger hole 86.

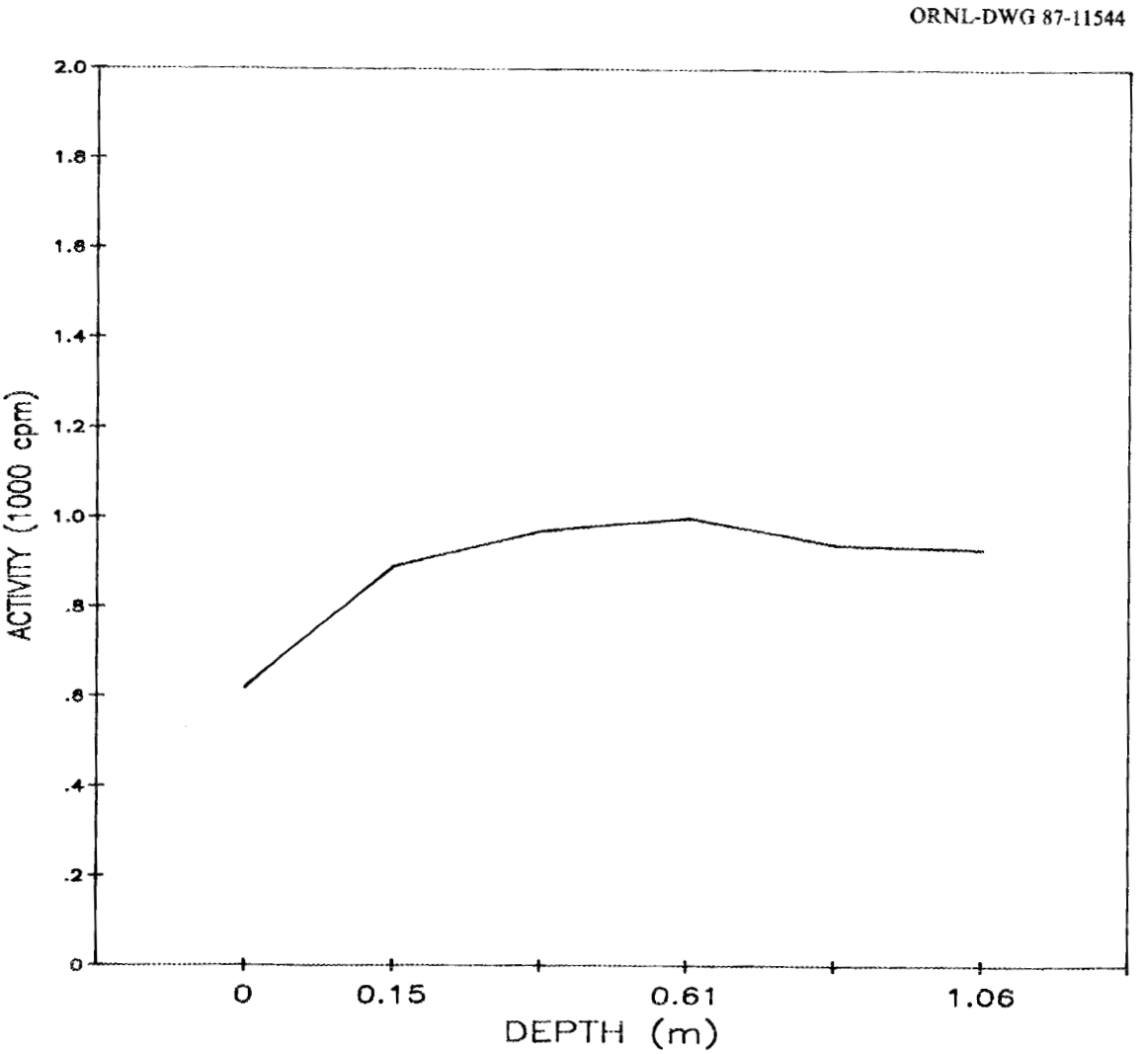

Fig. A.87. Gamma profile of auger hole 87.

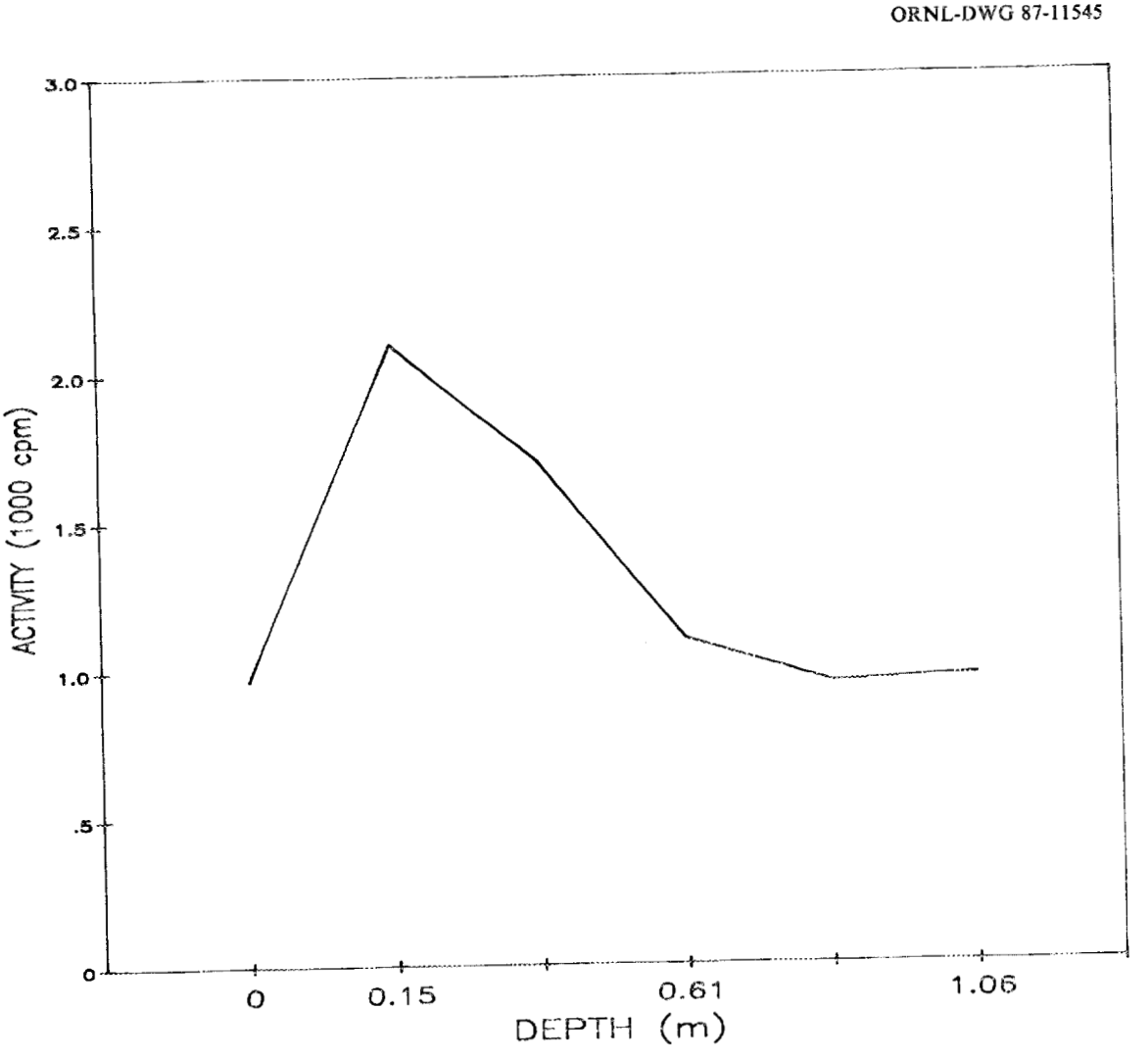

Fig. A.88. Gamma profile of auger hole 88.

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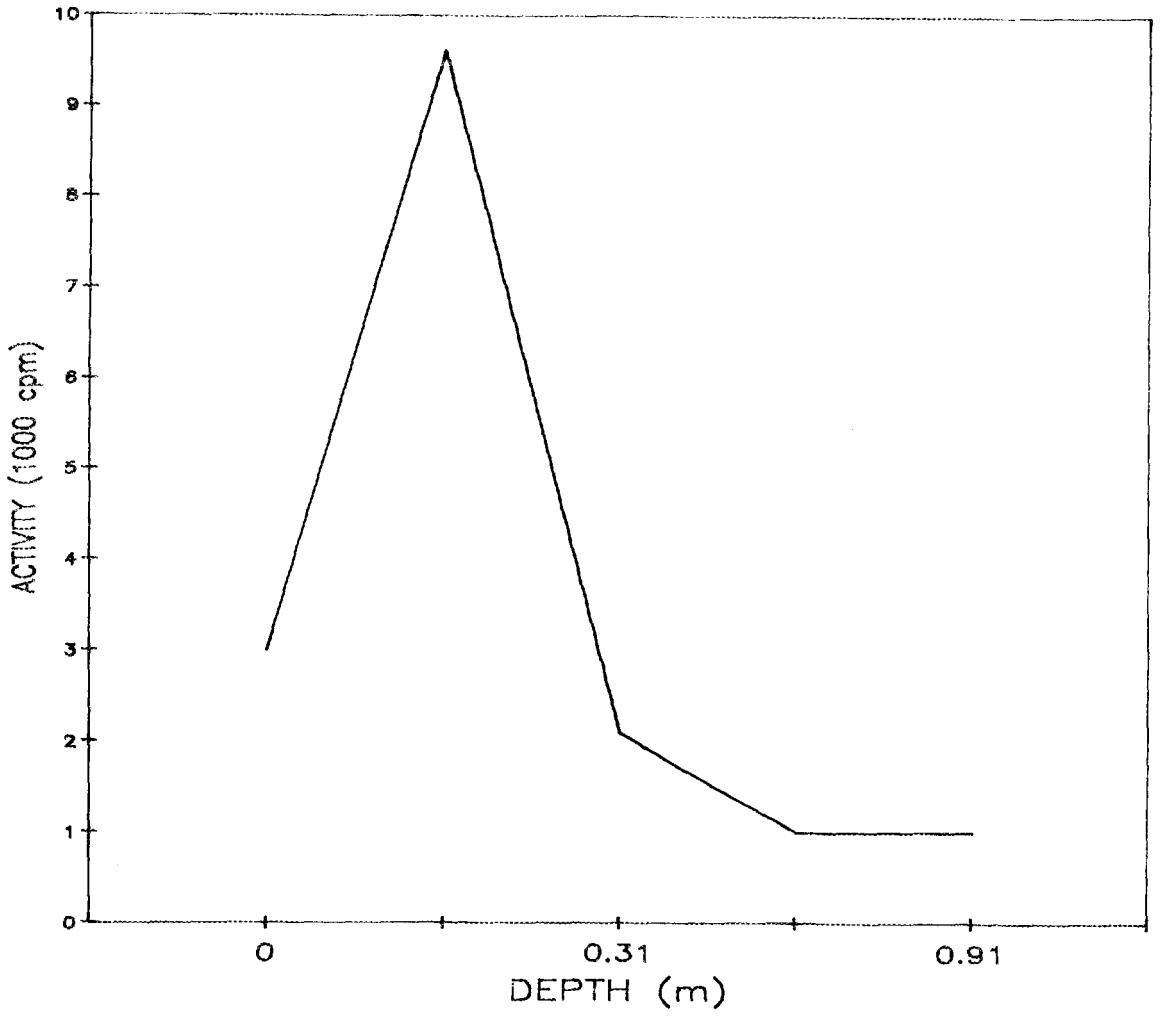

Fig. A.89. Gamma profile of auger hole 89.

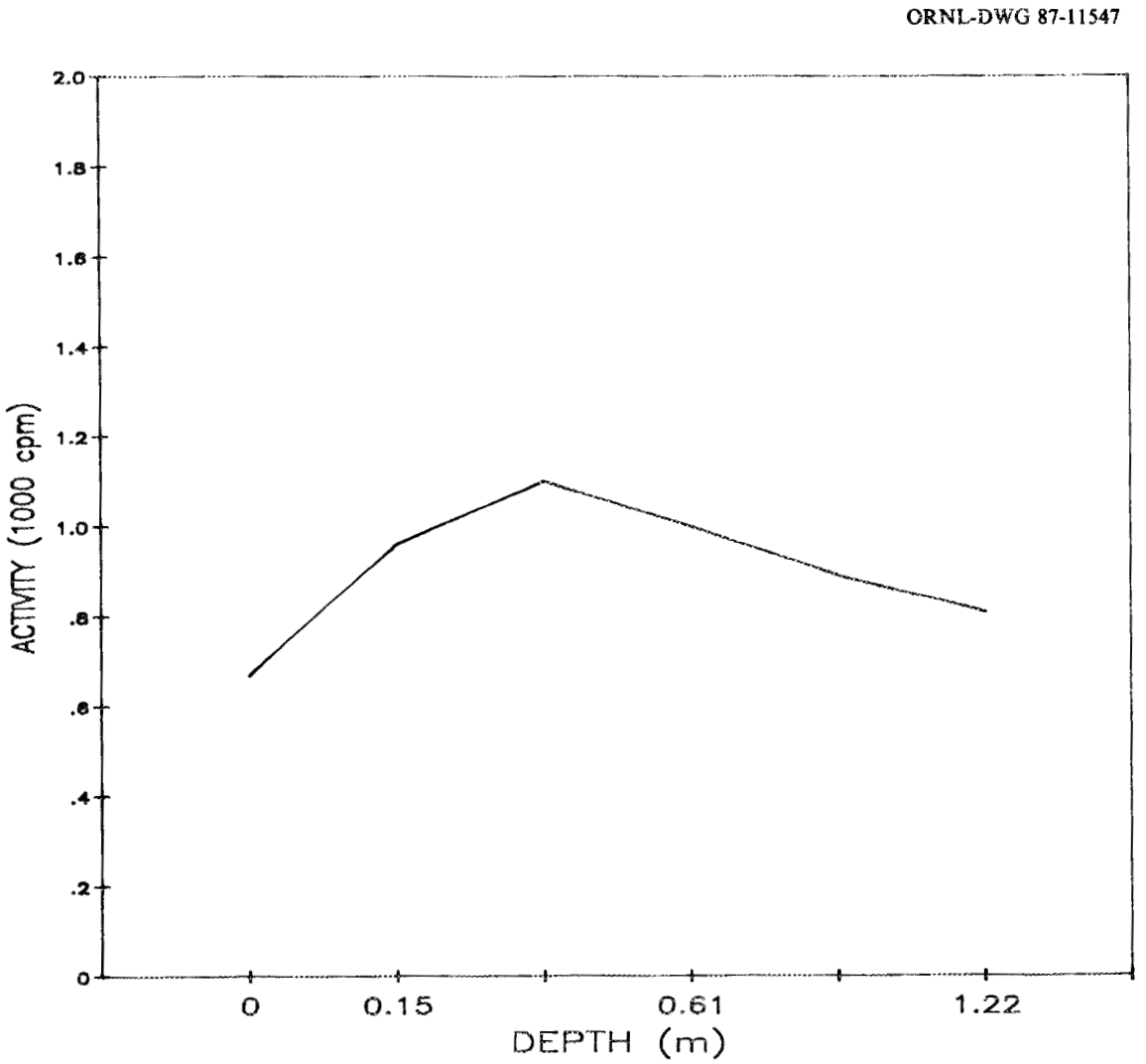

Fig. A.90. Gamma profile of auger hole 90.

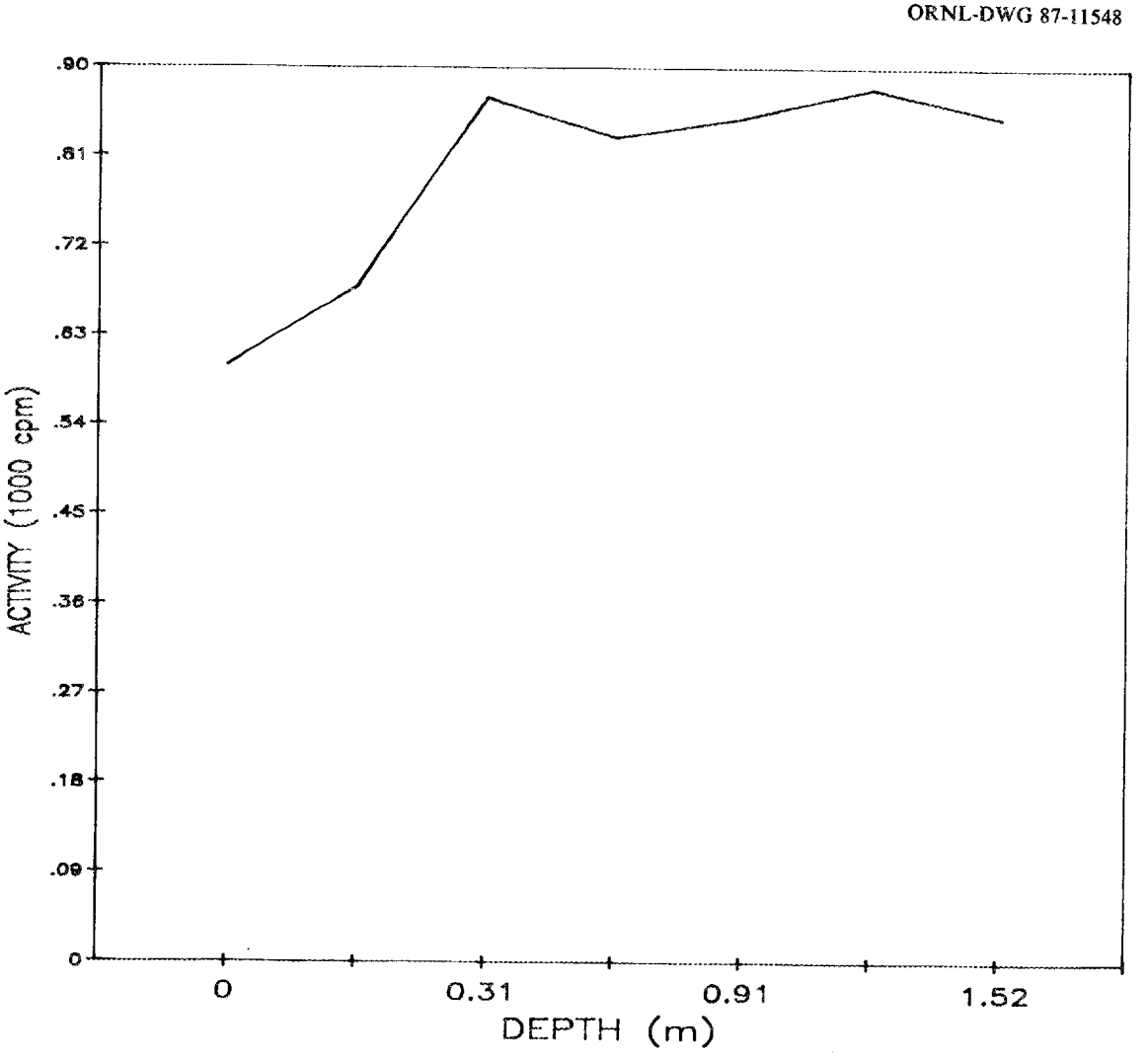

Fig. A.91. Gamma profile of auger hole 91.

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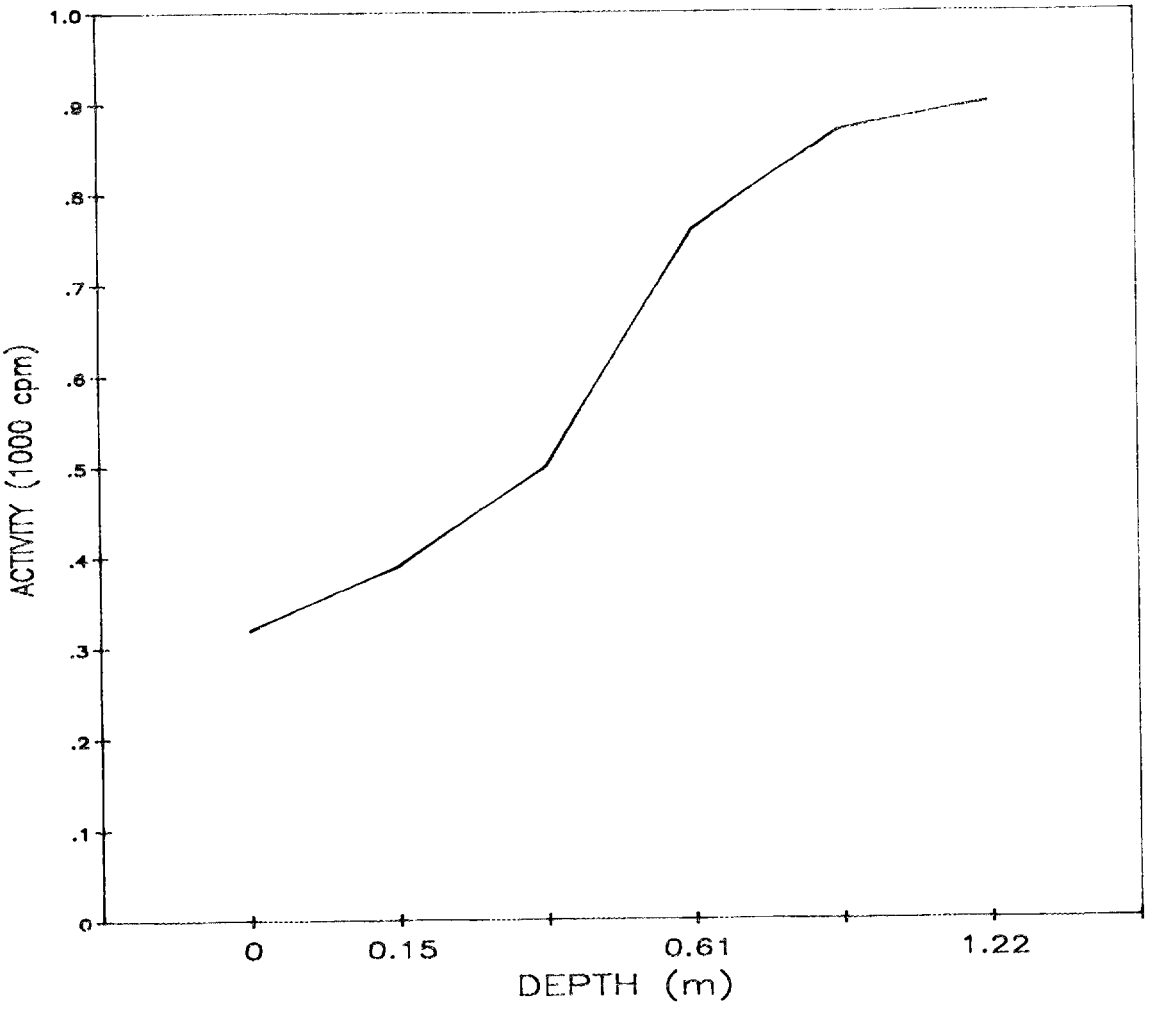

Fig. A.92. Gamma profile of auger hole 92.

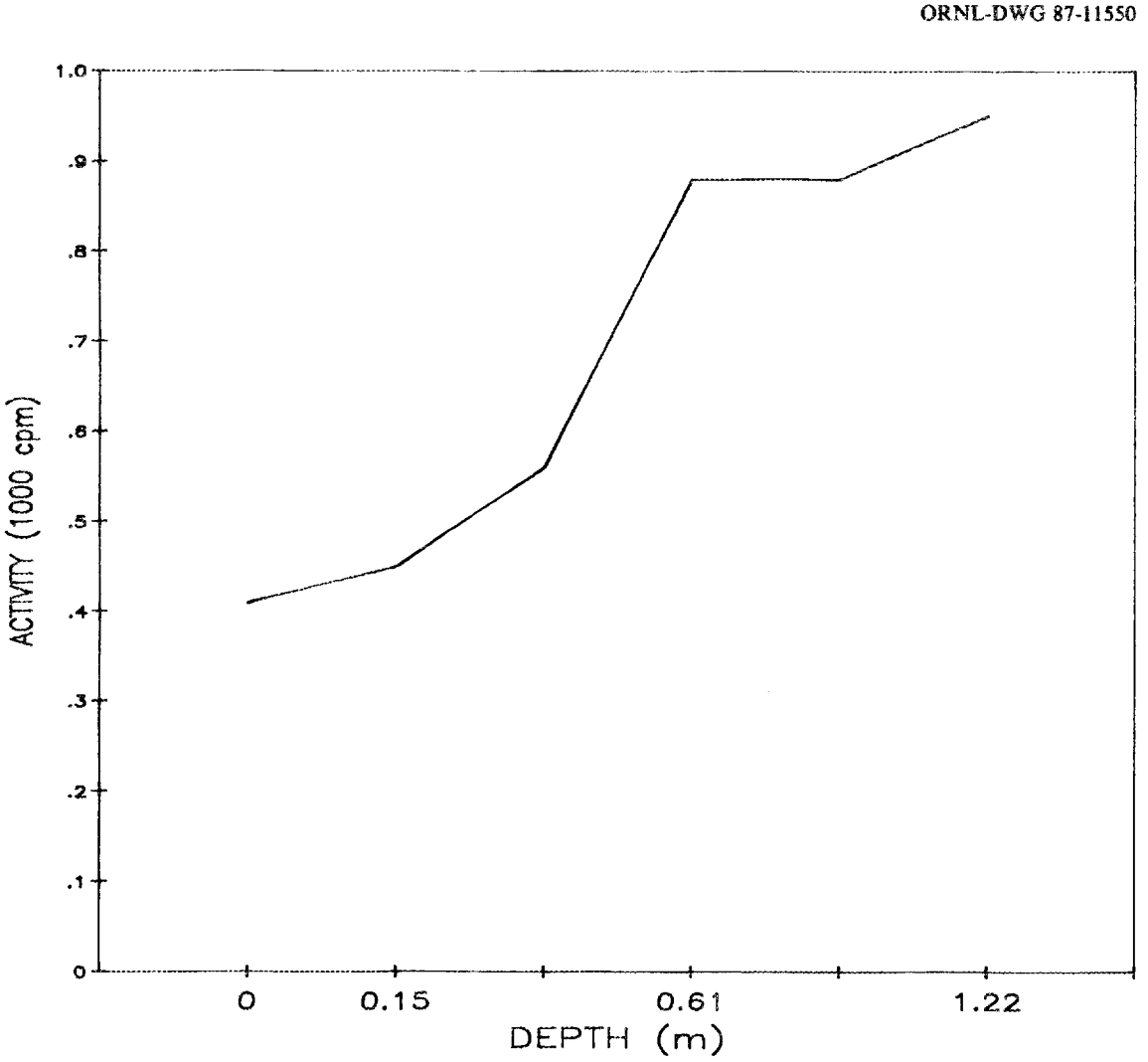

Fig. A.93. Gamma profile of auger hole 93.

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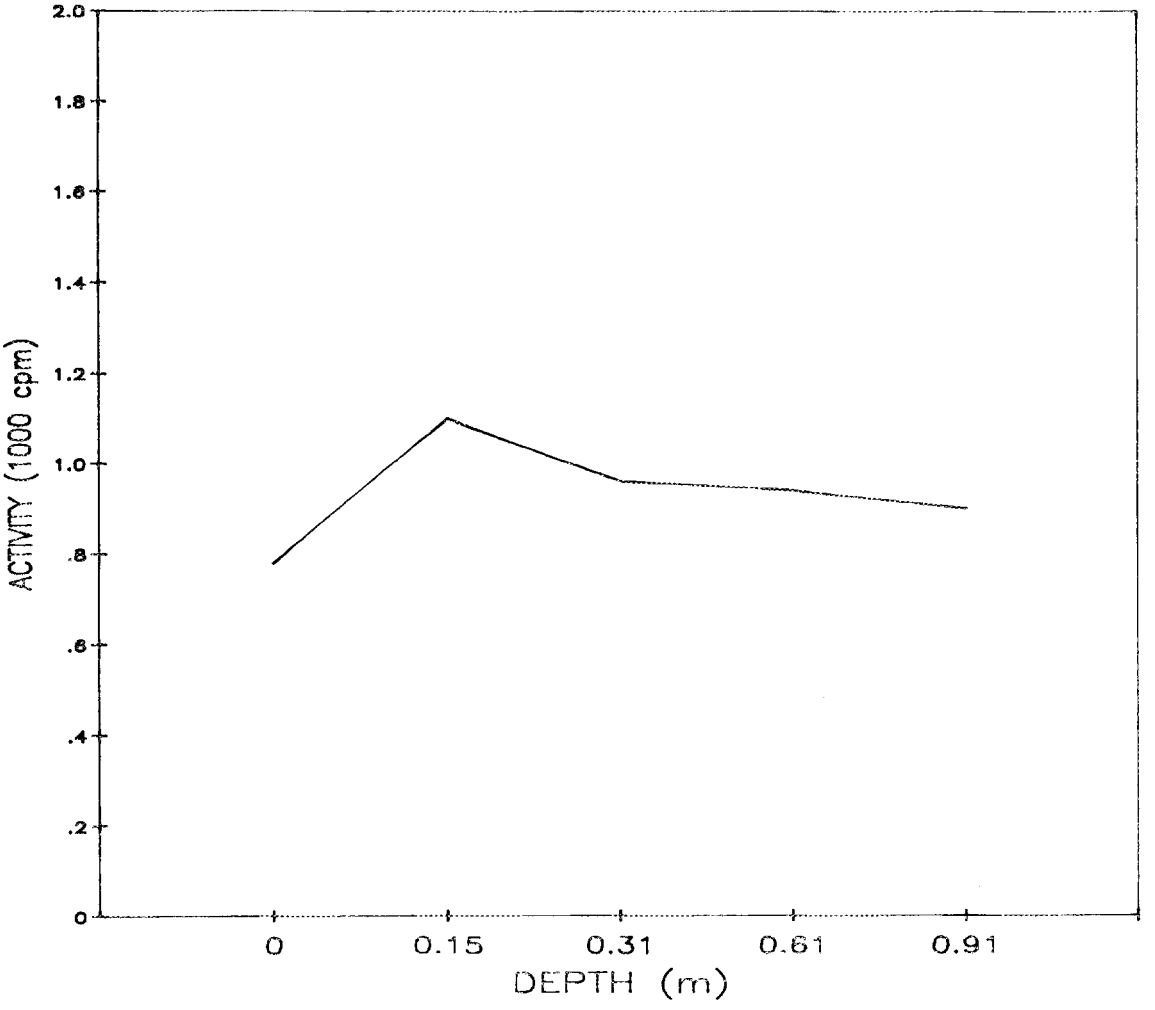

Fig. A.94. Gamma profile of auger hole 94.

ORNL-DWG 87-11552

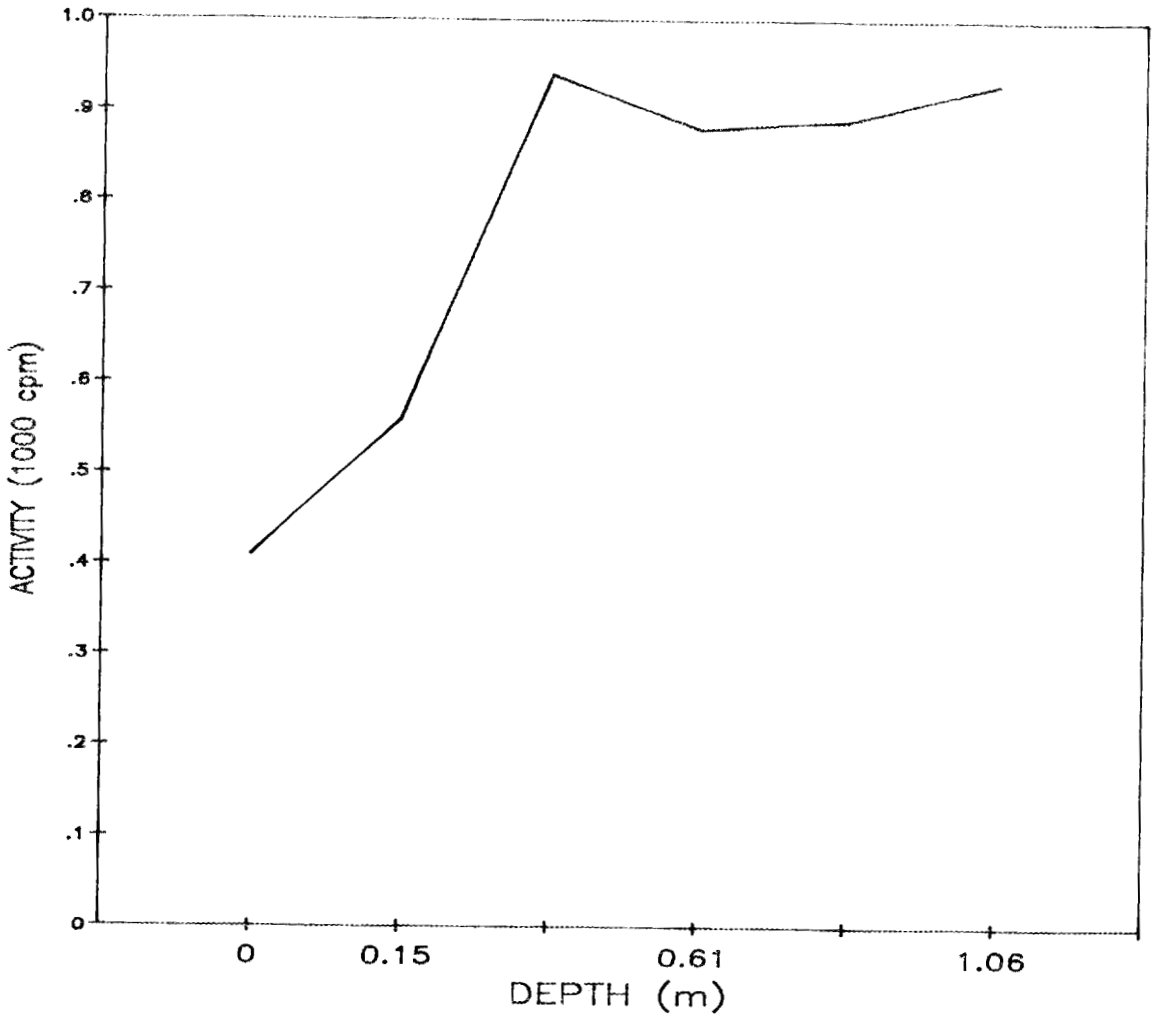

Fig. A.95. Gamma profile of auger hole 95.

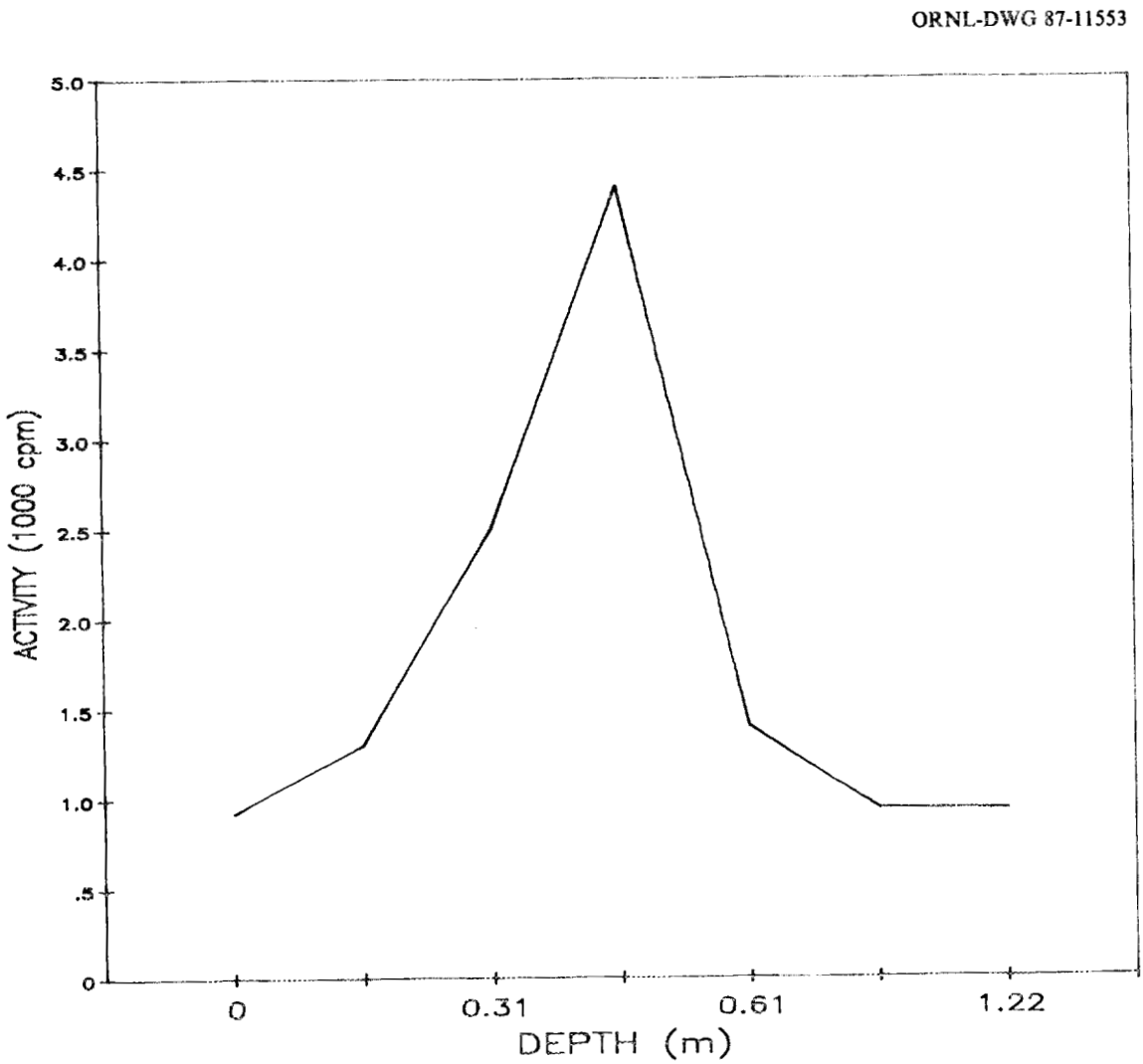

Fig. A.96. Gamma profile of auger hole 96.

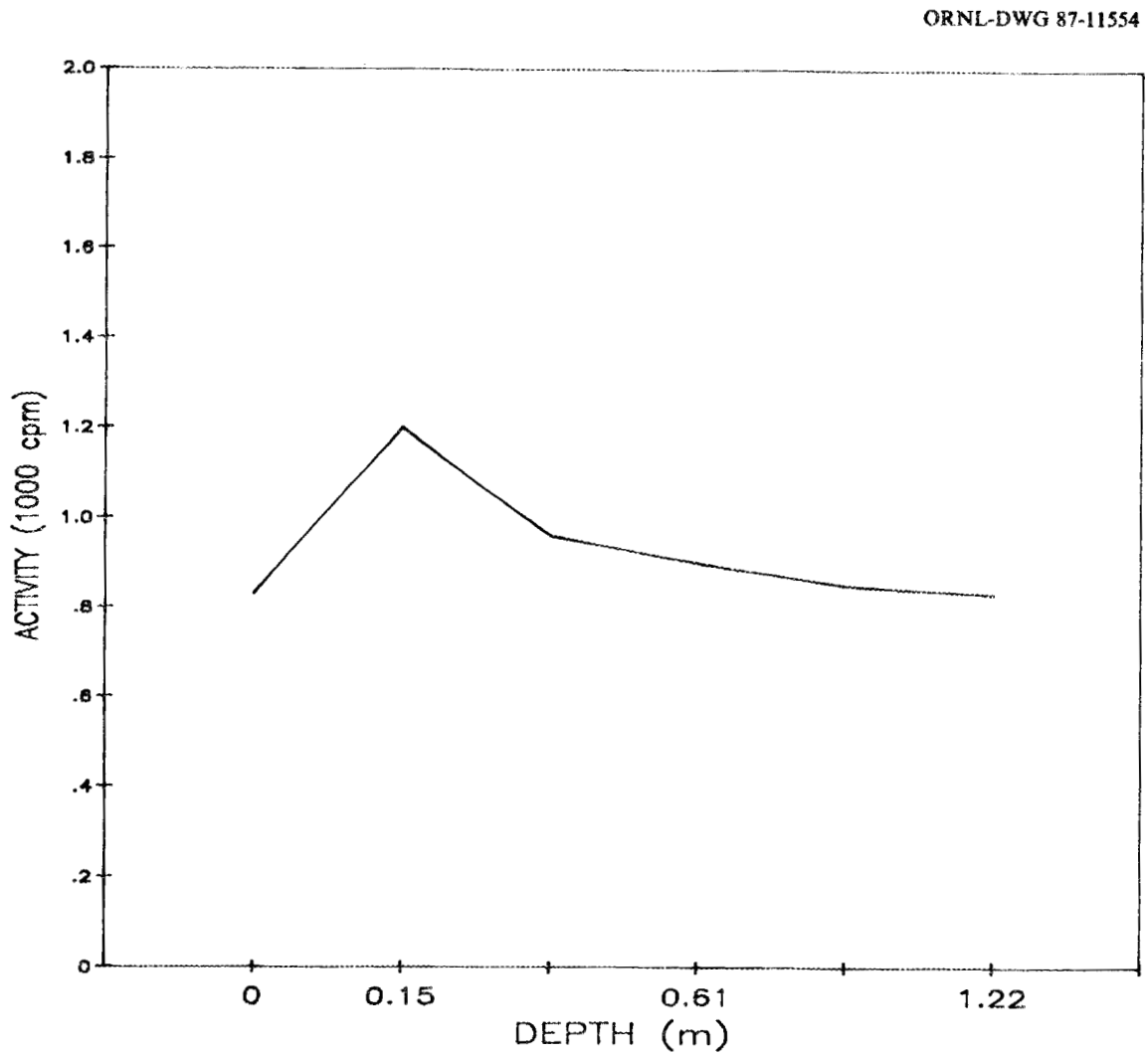

Fig. A.97. Gamma profile of auger hole 97.

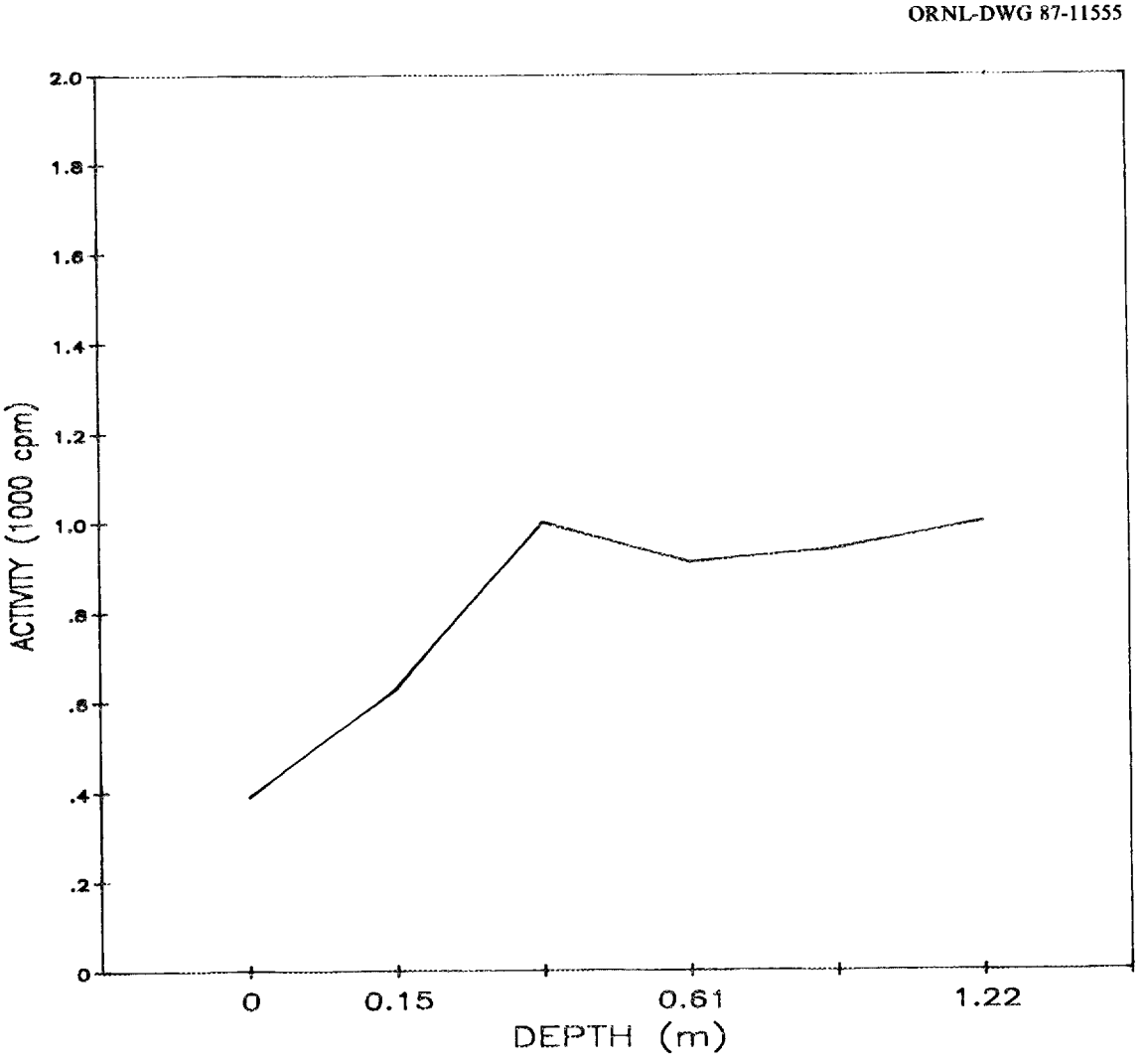

Fig. A.98. Gamma profile of auger hole 98.

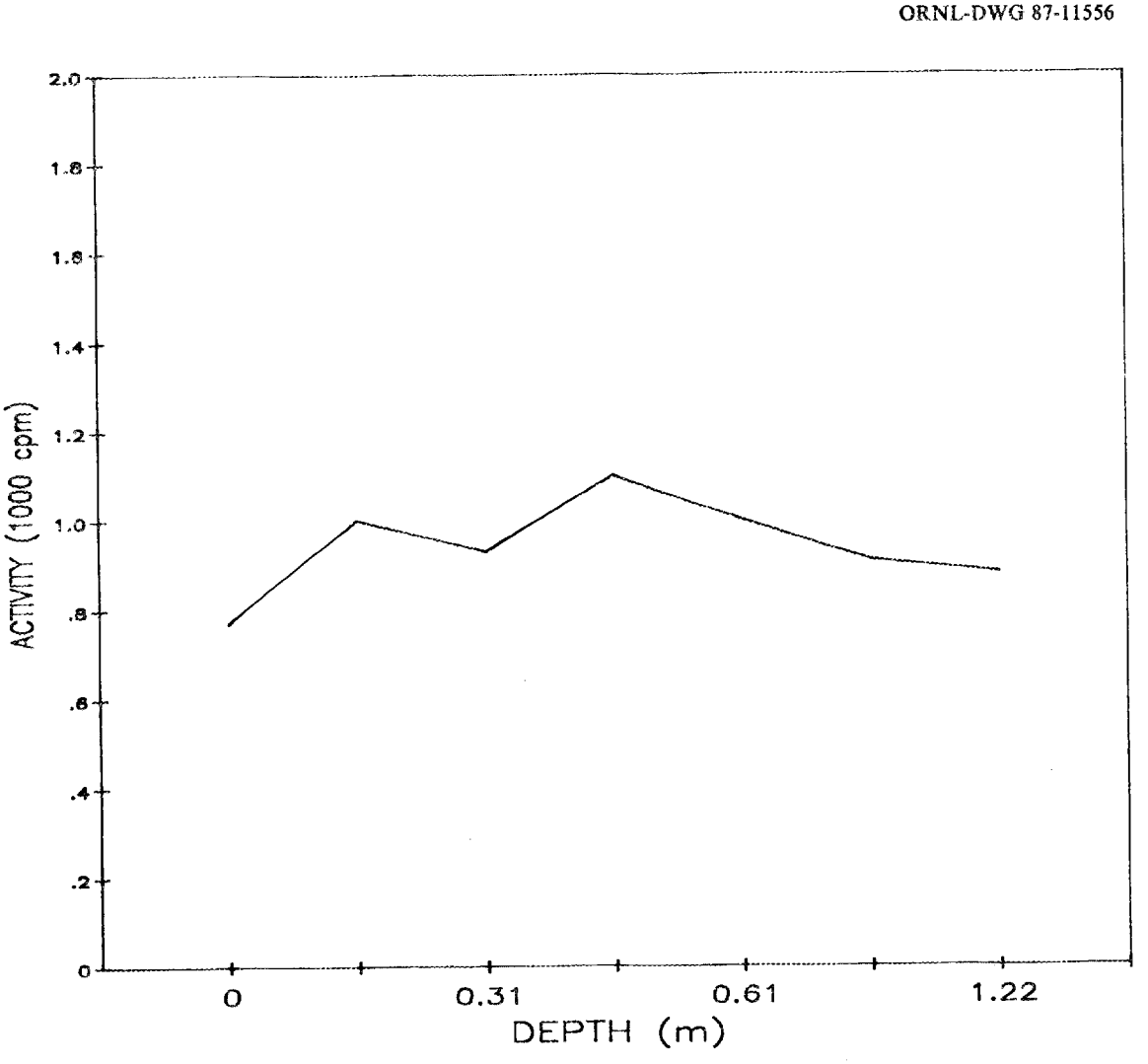

Fig. A.99. Gamma profile of auger hole 99.

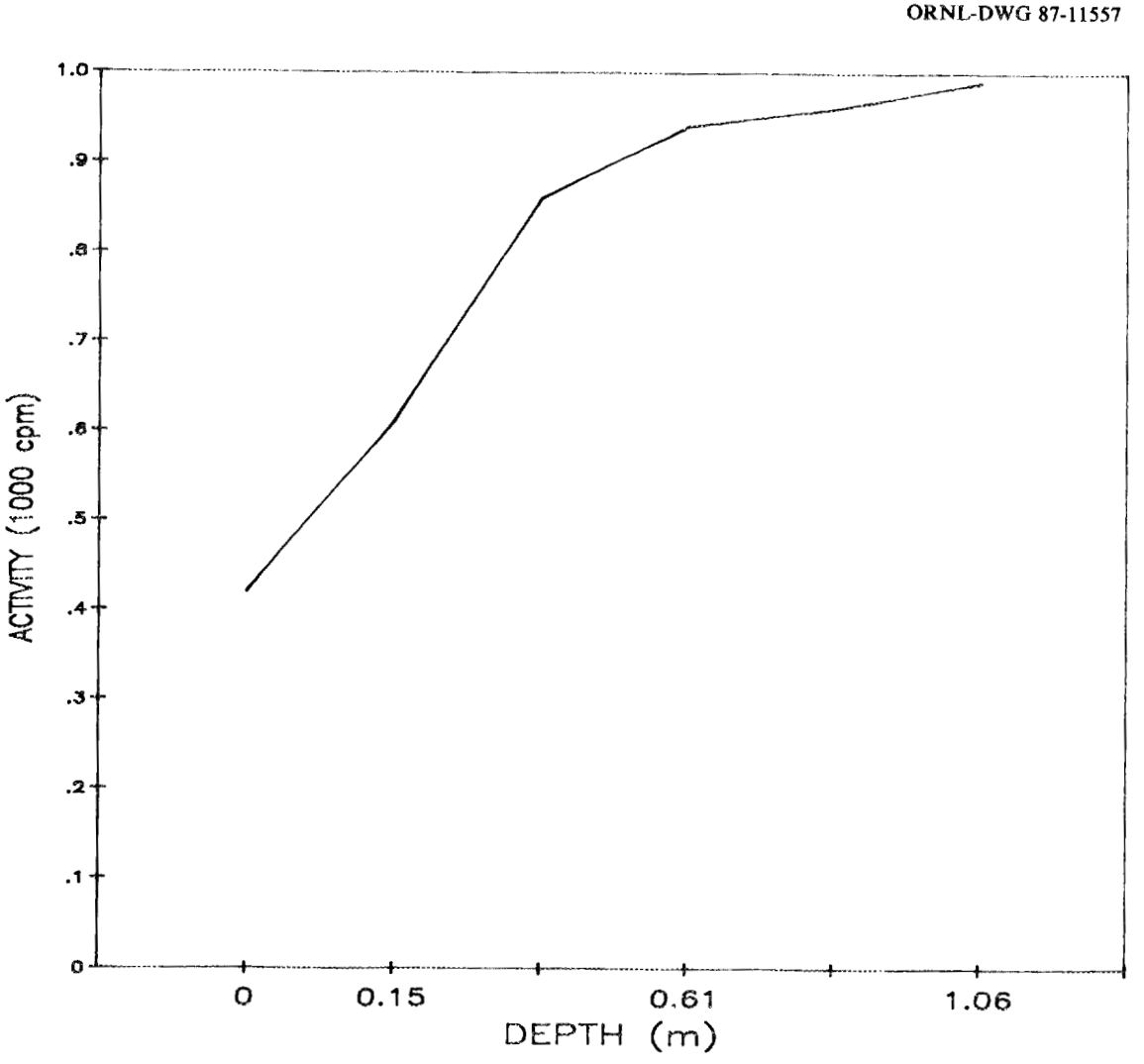

Fig. A.100. Gamma profile of auger hole 100.

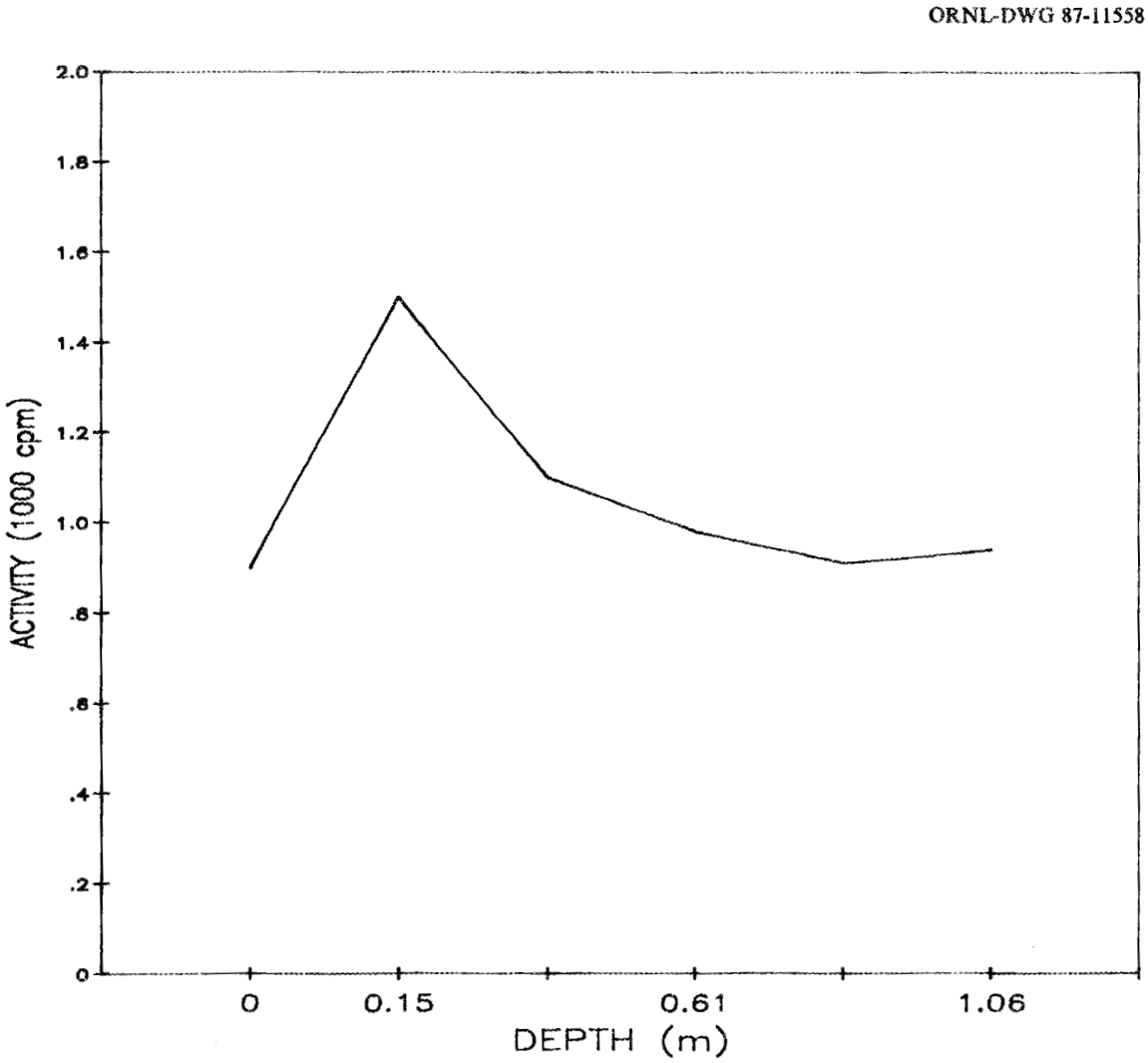

Fig. A.101. Gamma profile of auger hole 101.

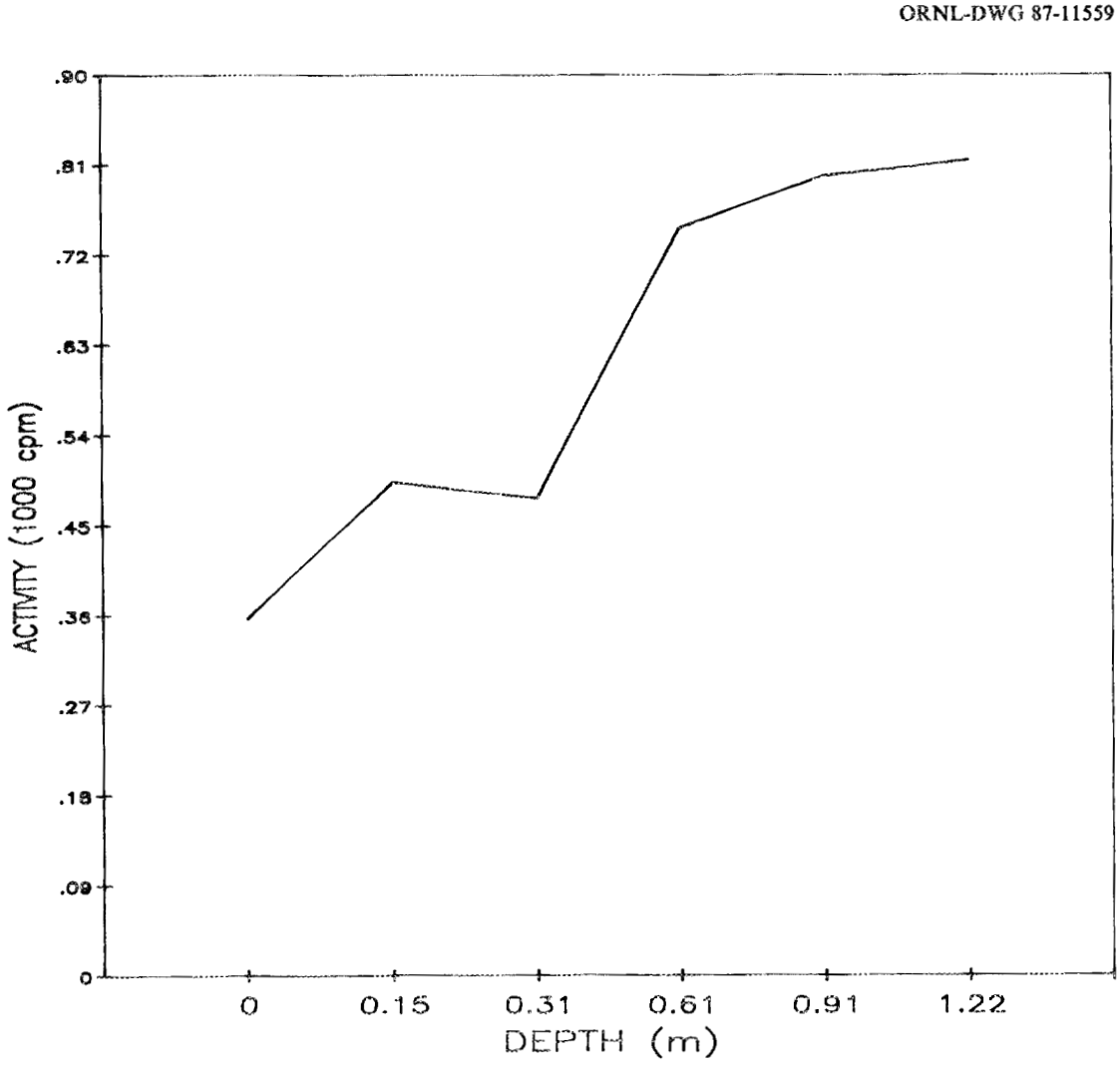

Fig. A.102. Gamma profile of auger hole 102.

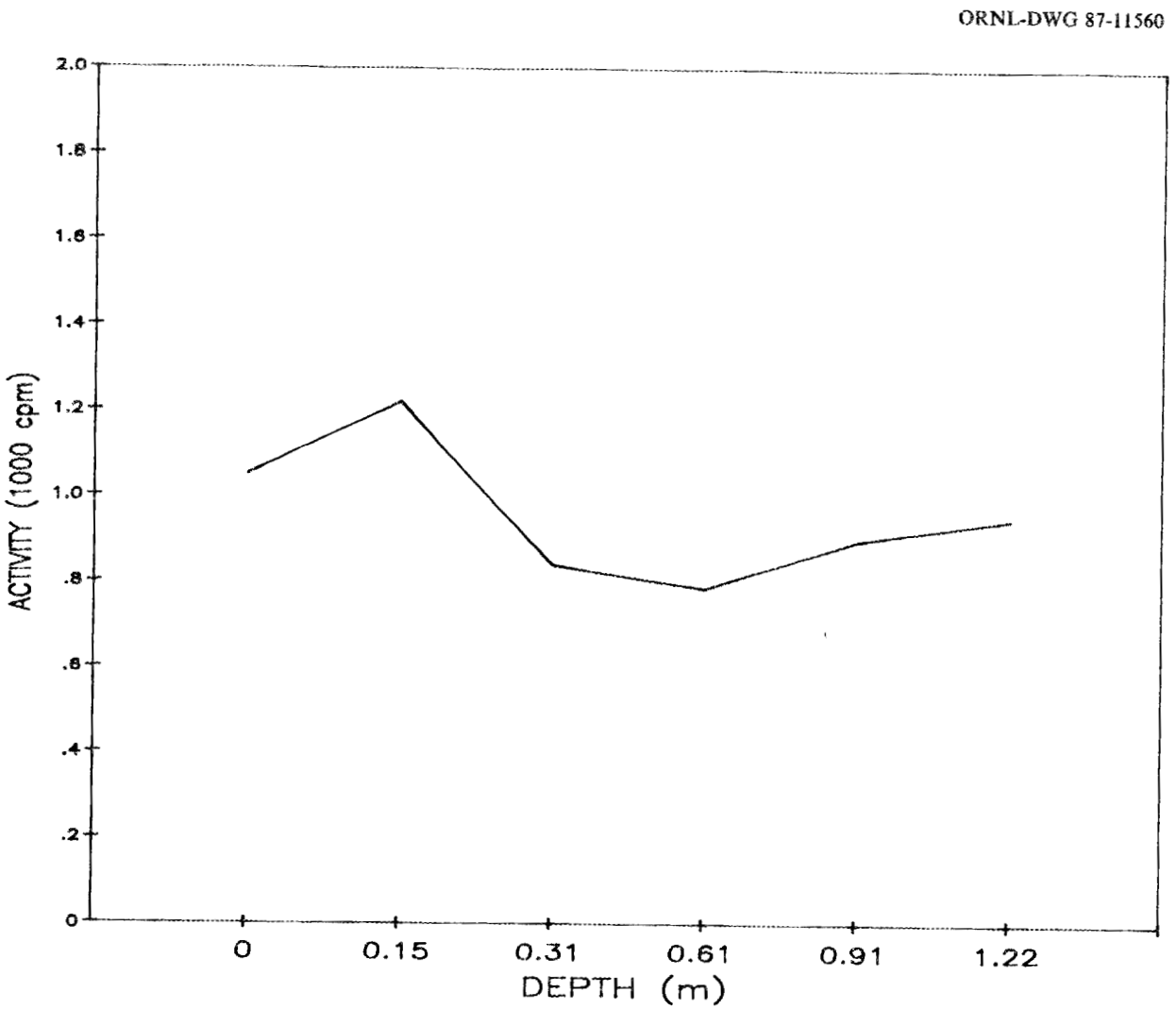

Fig. A.103. Gamma profile of auger hole 103.

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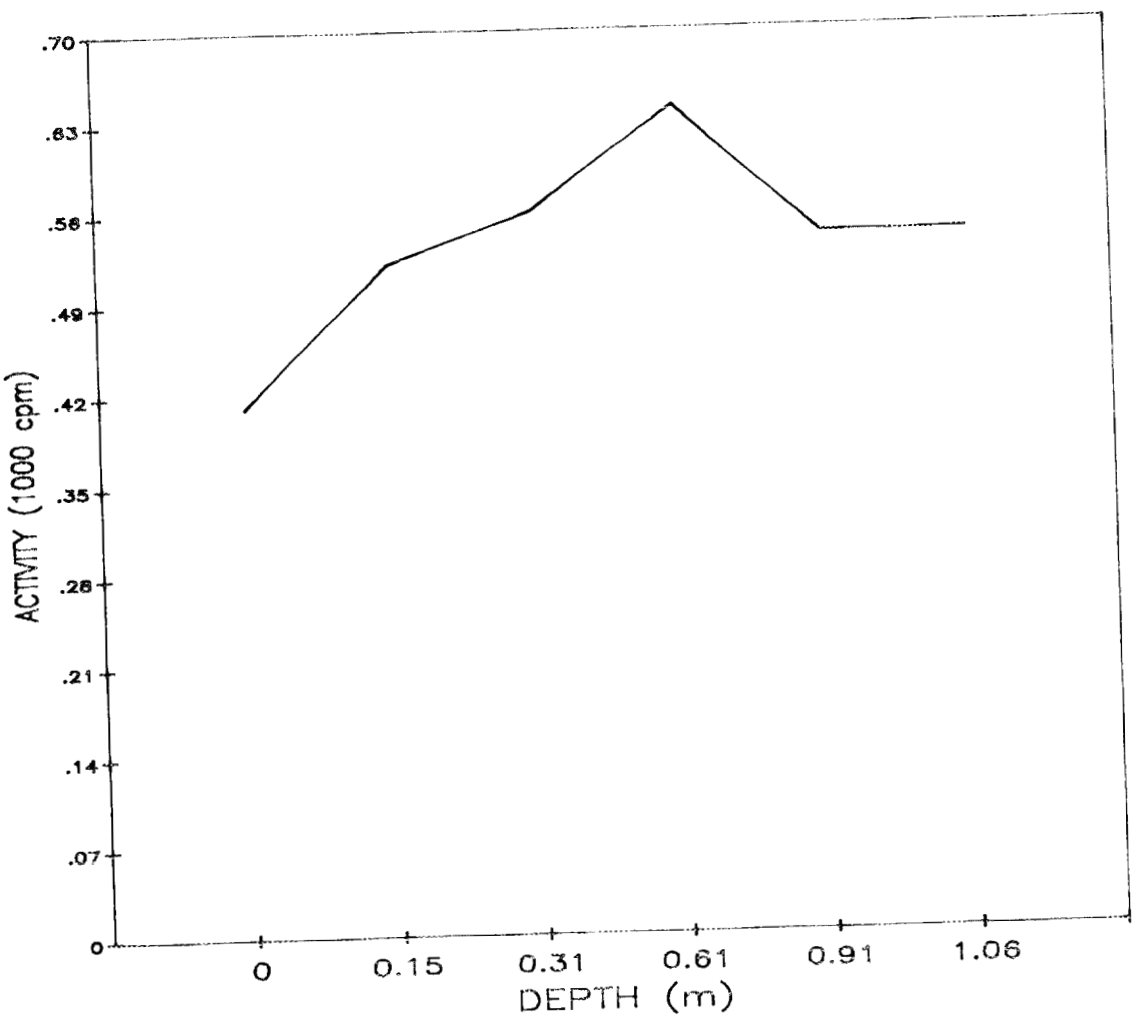

Fig. A.104. Gamma profile of auger hole 104.

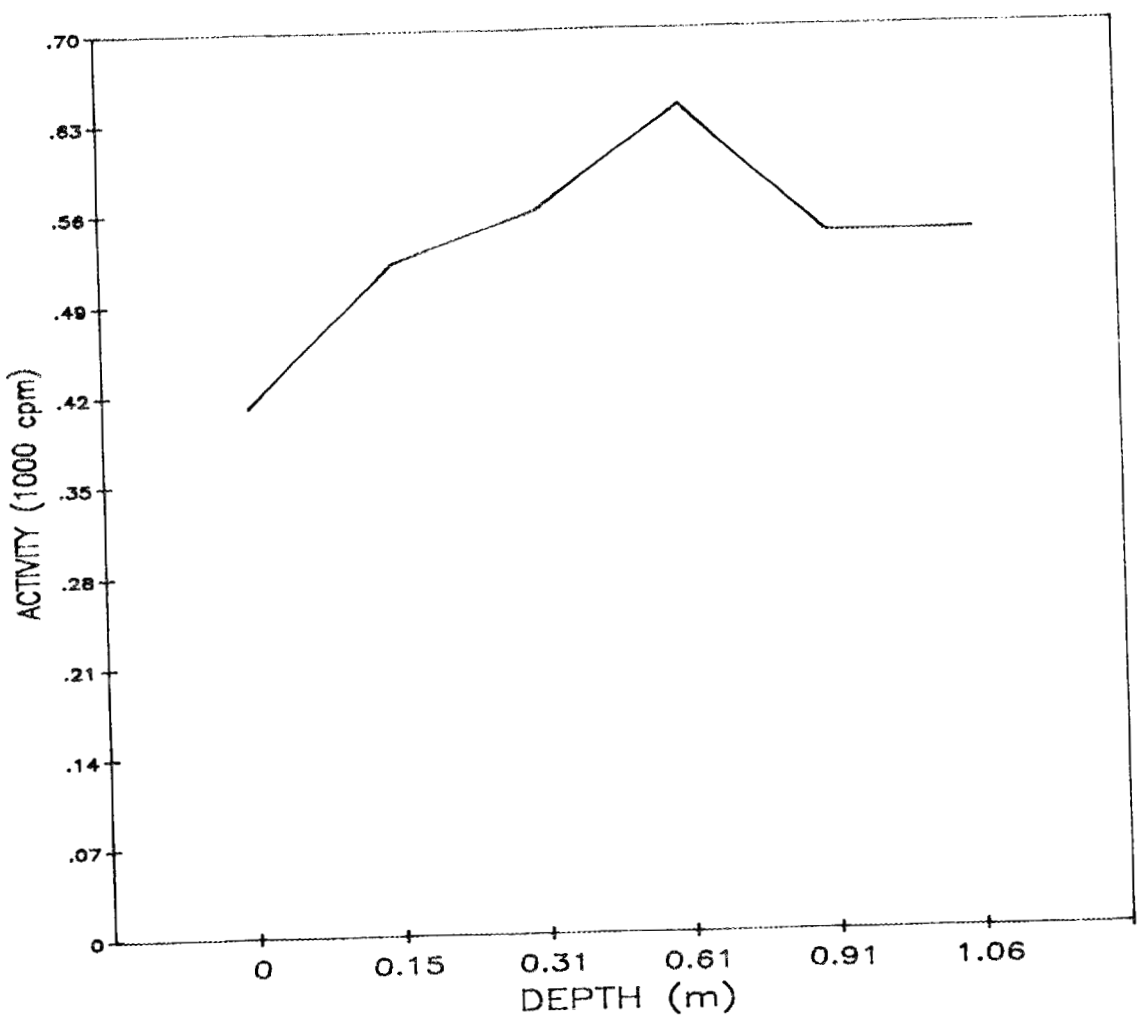

Fig. A.105. Gamma profile of auger hole 105.

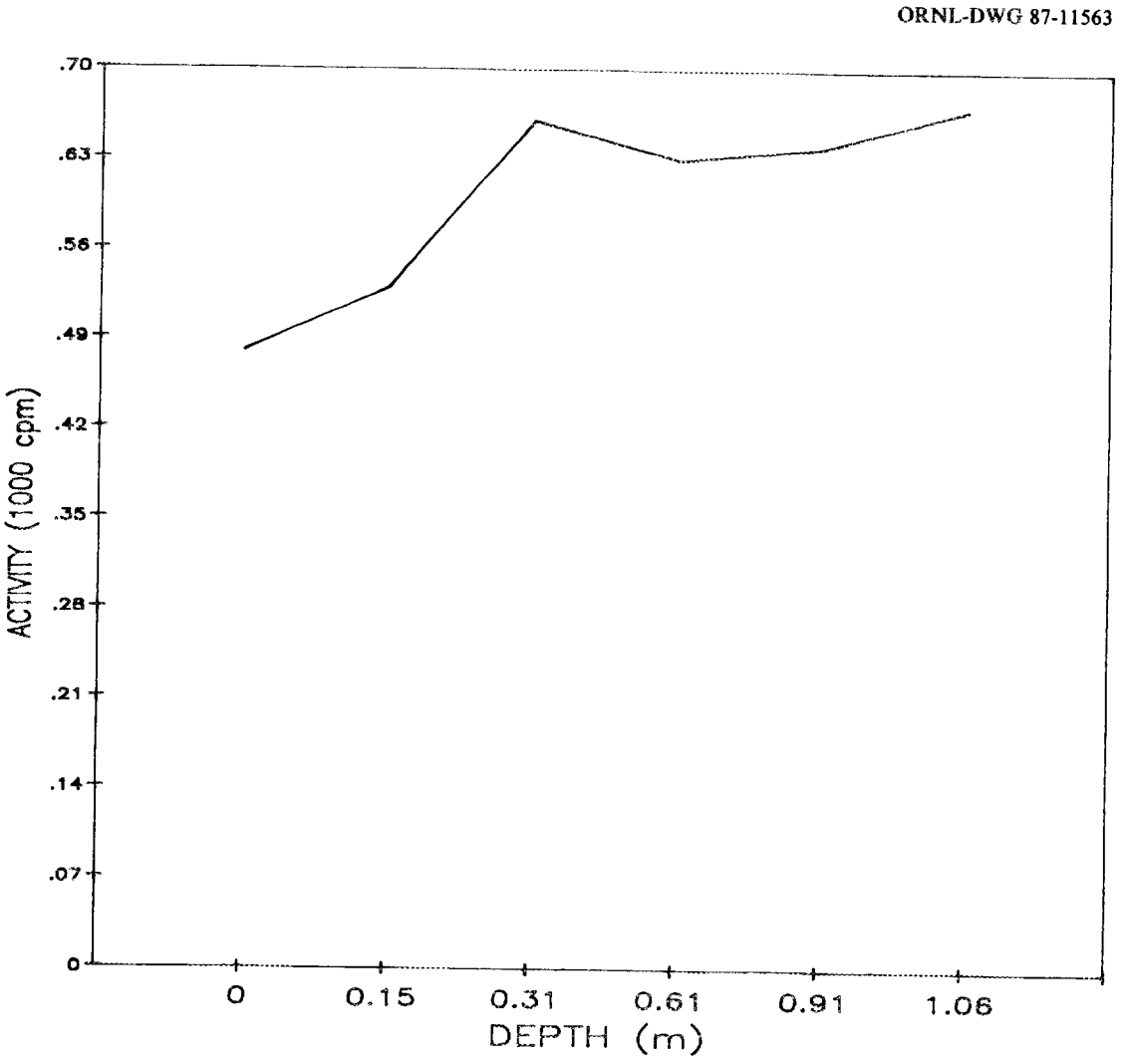

Fig. A.106. Gamma profile of auger hole 106.

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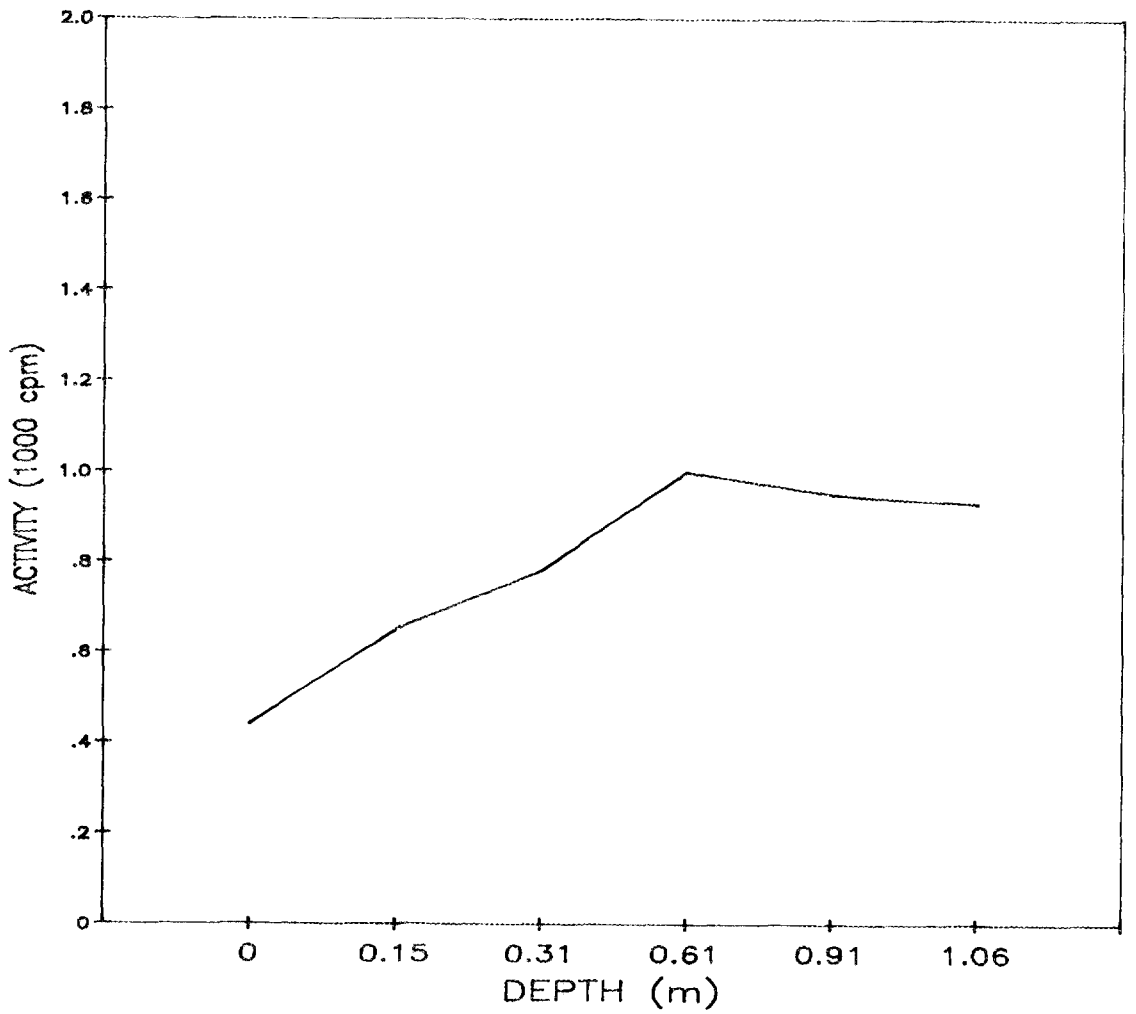

Fig. A.107. Gamma profile of auger hole 107.

ORNL-DWG 87-11565

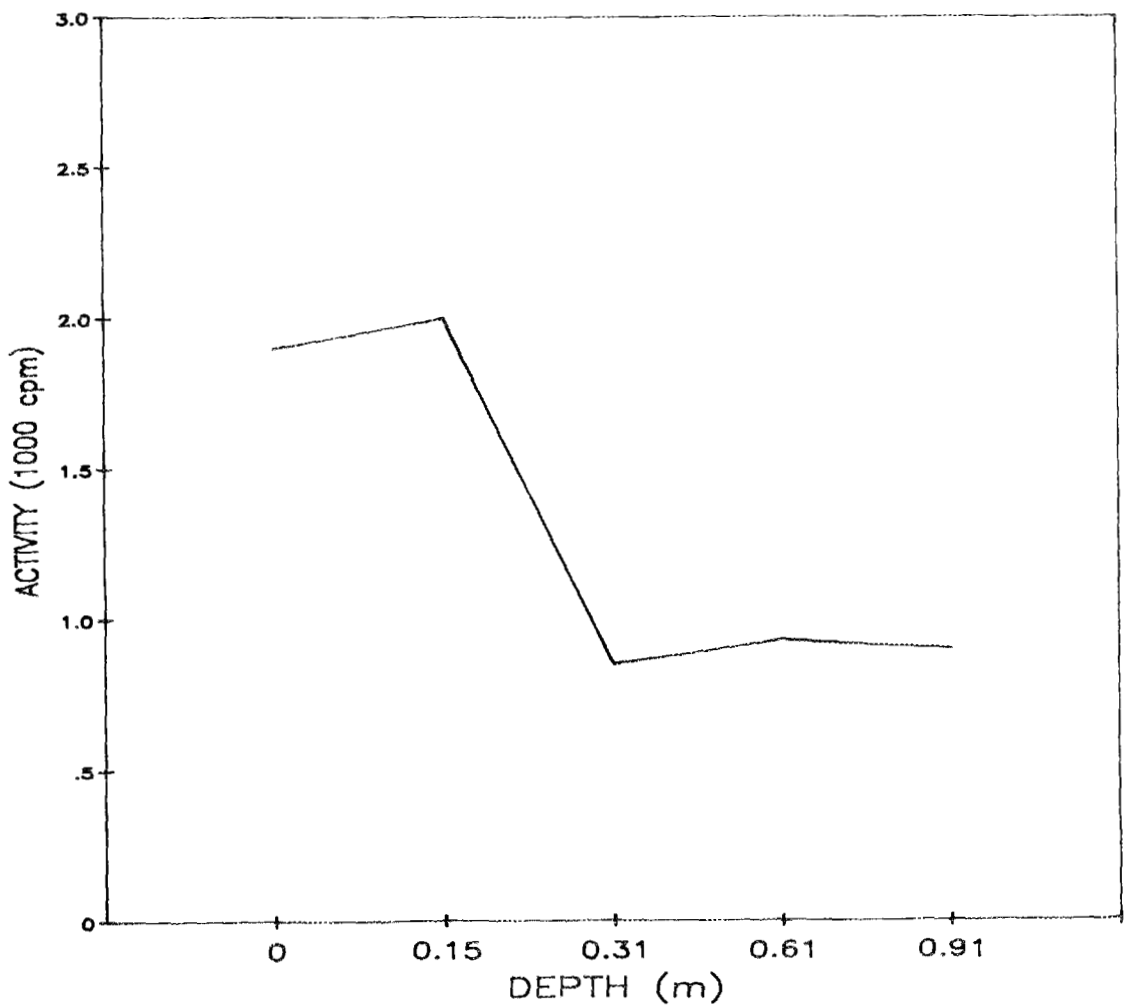

Fig. A.108. Gamma profile of auger hole 108.

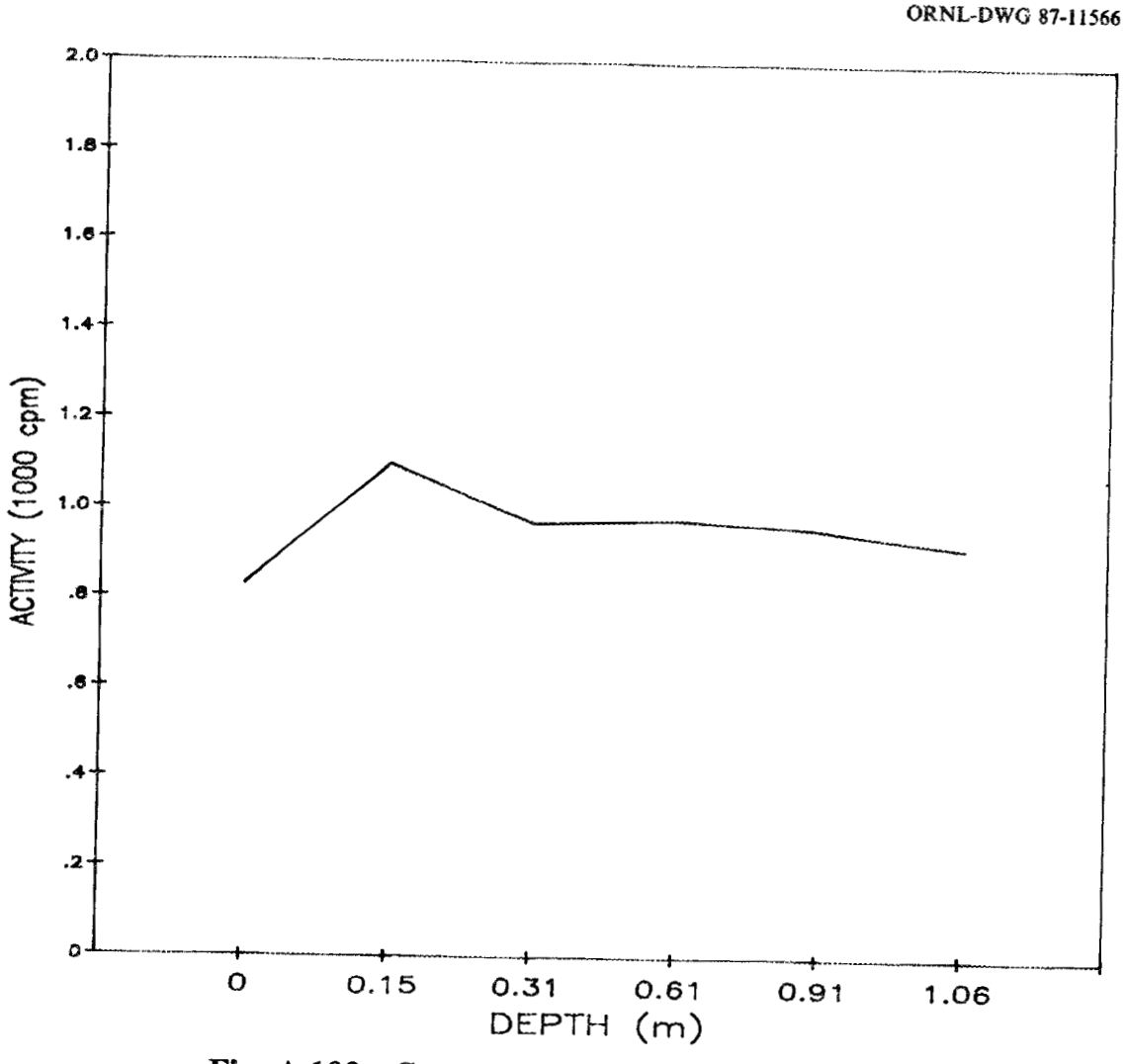

Fig. A.109. Gamma profile of auger hole 109.

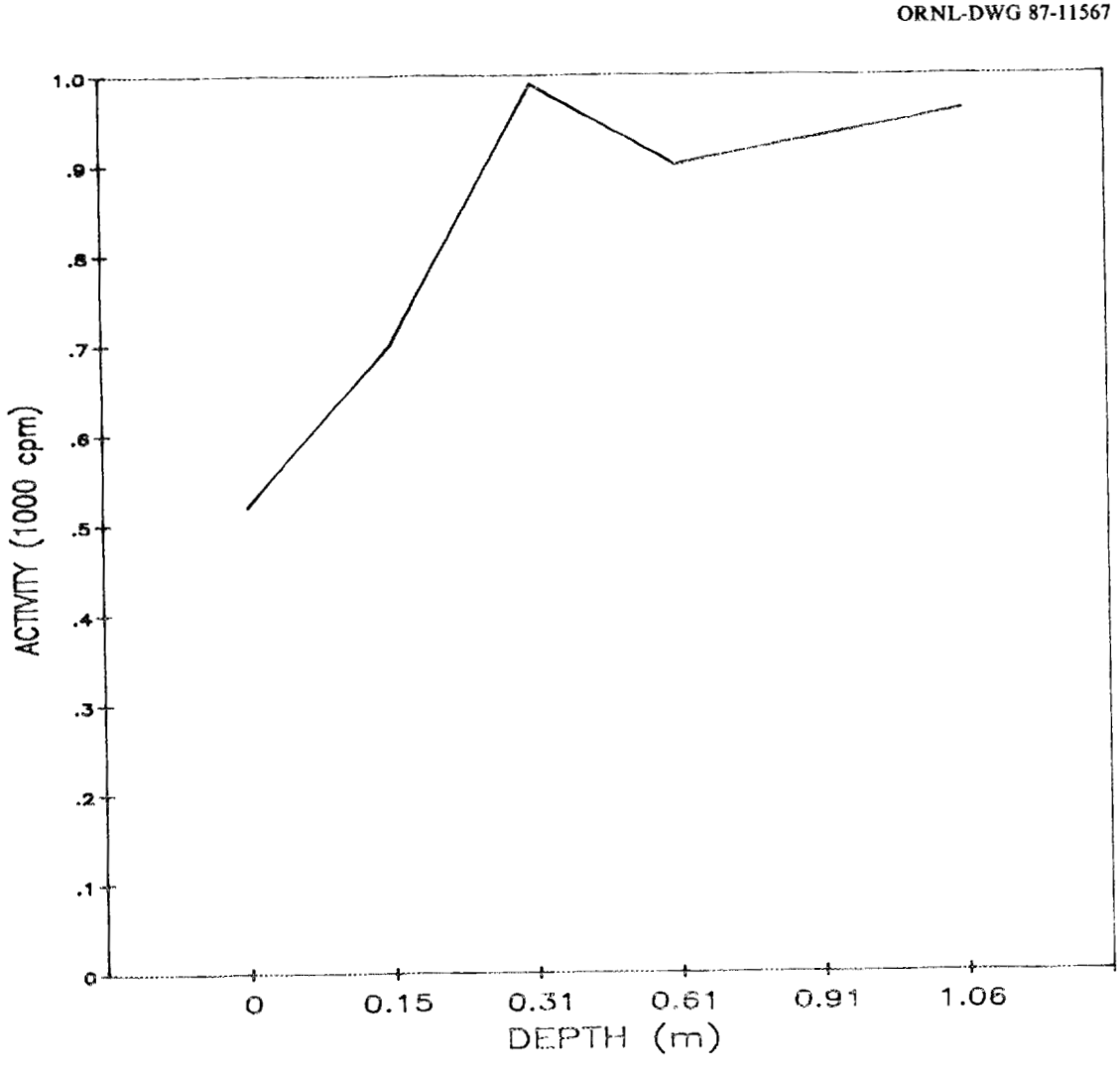

Fig. A.110. Gamma profile of auger hole 110.

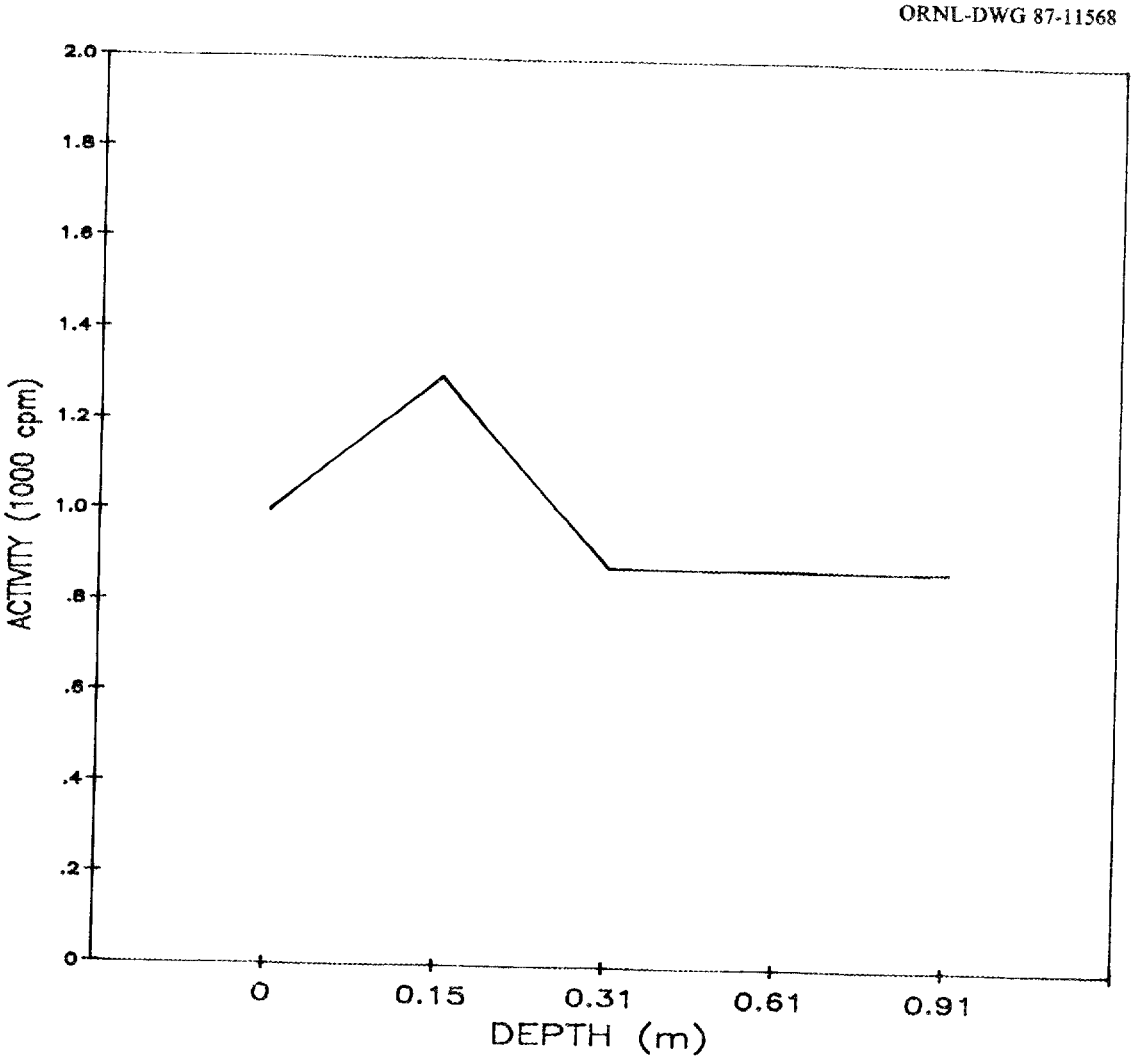

Fig. A.111. Gamma profile of auger hole 111.

ORNL-DWG 87-11569

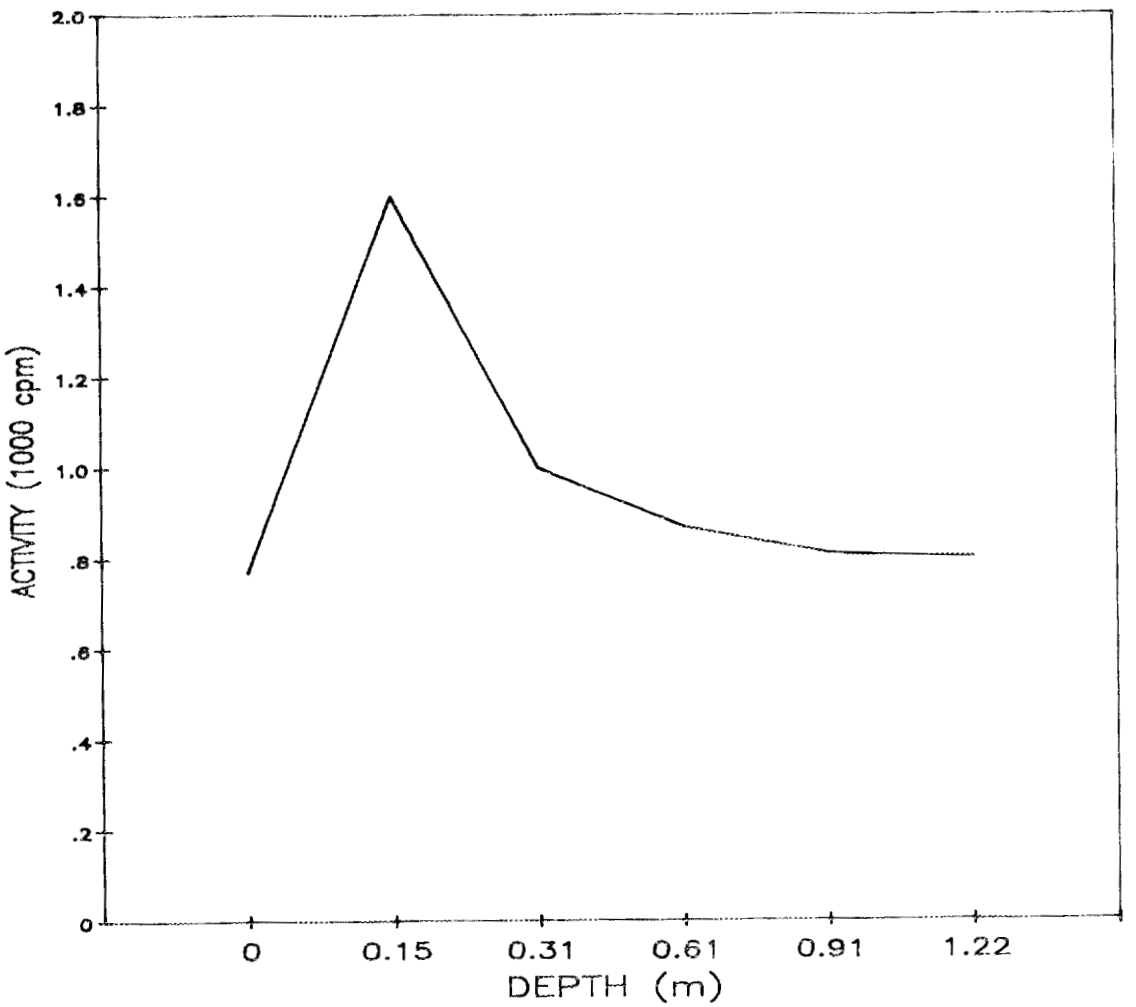

Fig. A.112. Gamma profile of auger hole 112.

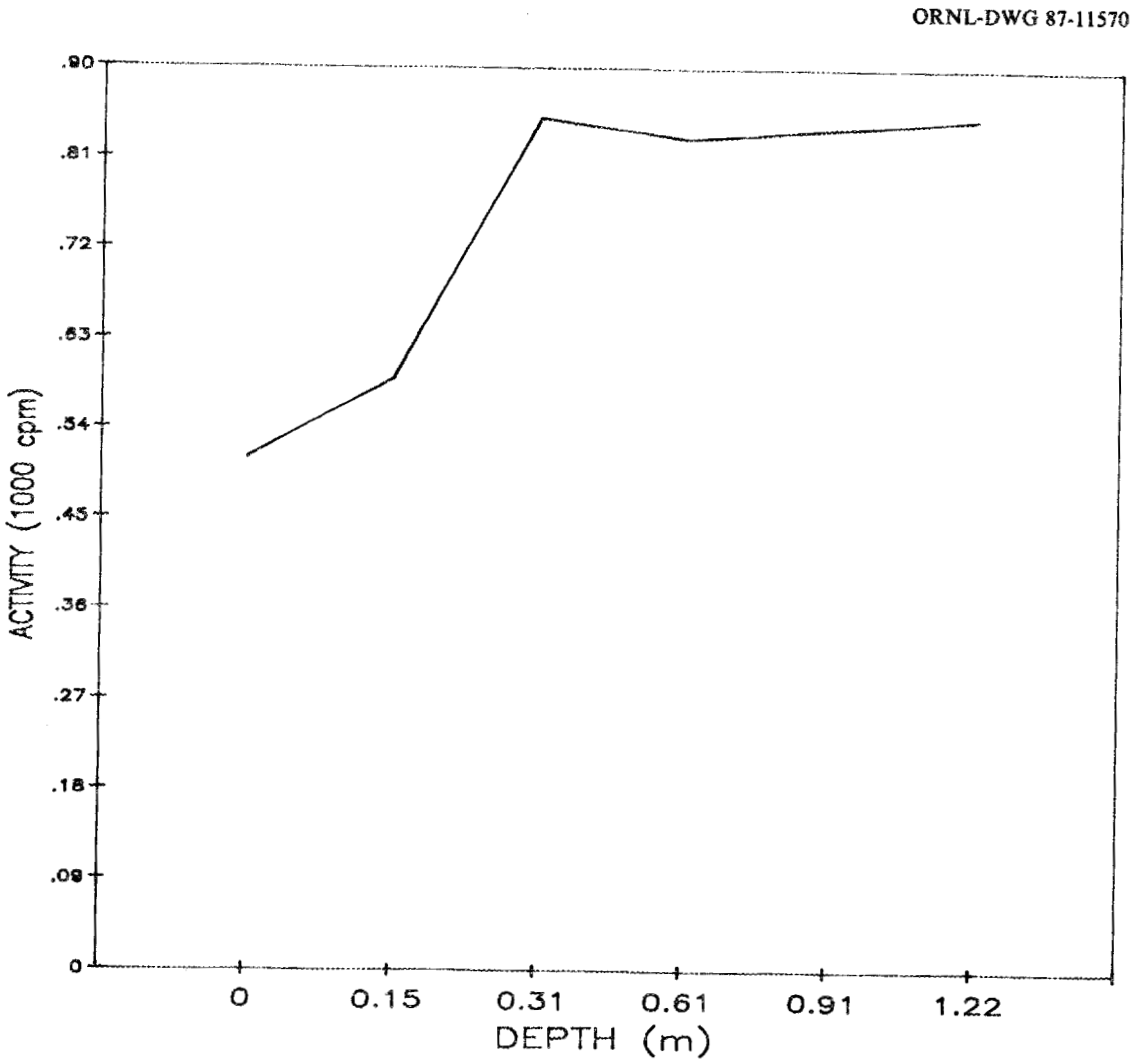

Fig. A.113. Gamma profile of auger hole 113.

ORNL-DWG 87-11571

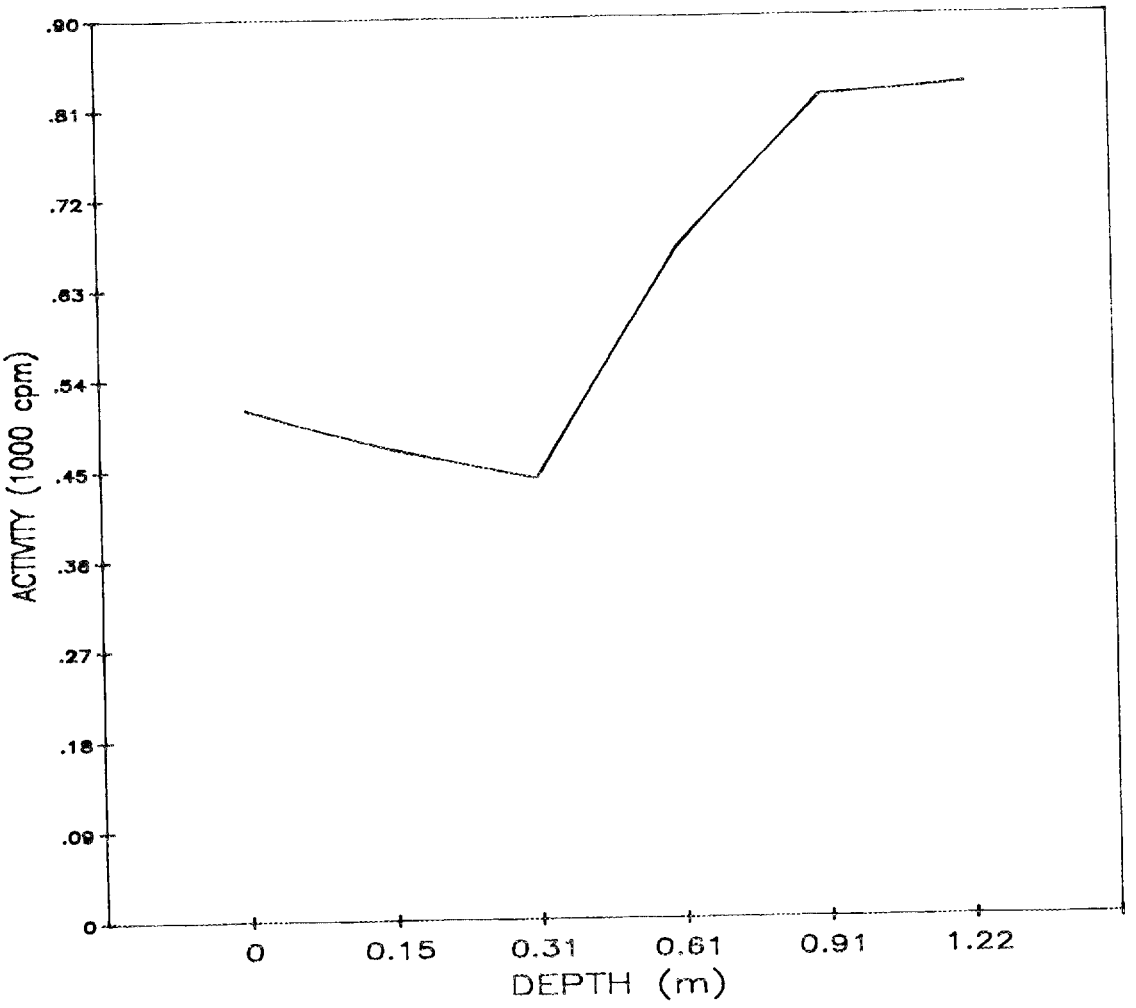

Fig. A.114. Gamma profile of auger hole 114.

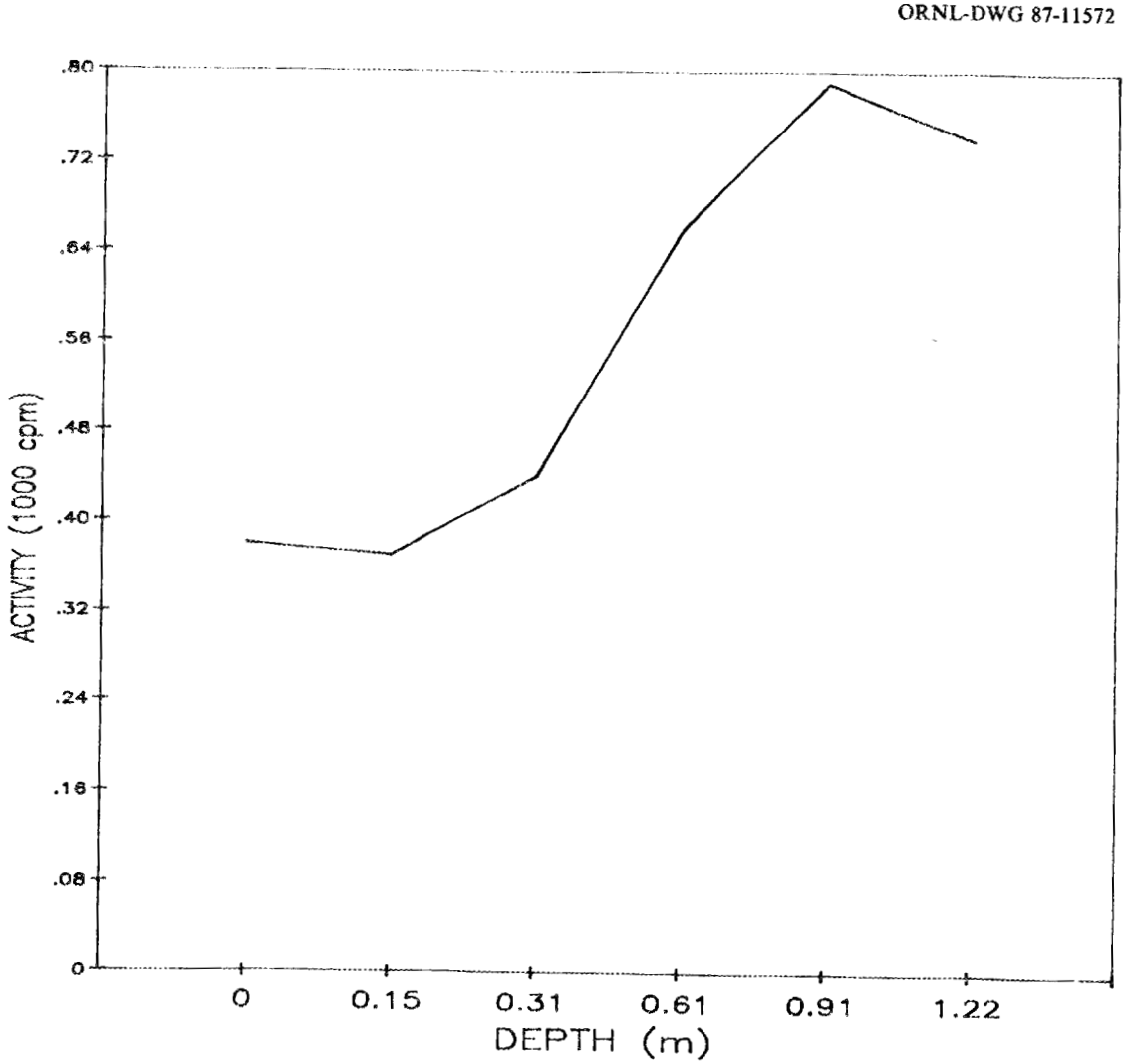

Fig. A.115. Gamma profile of auger hole 115.

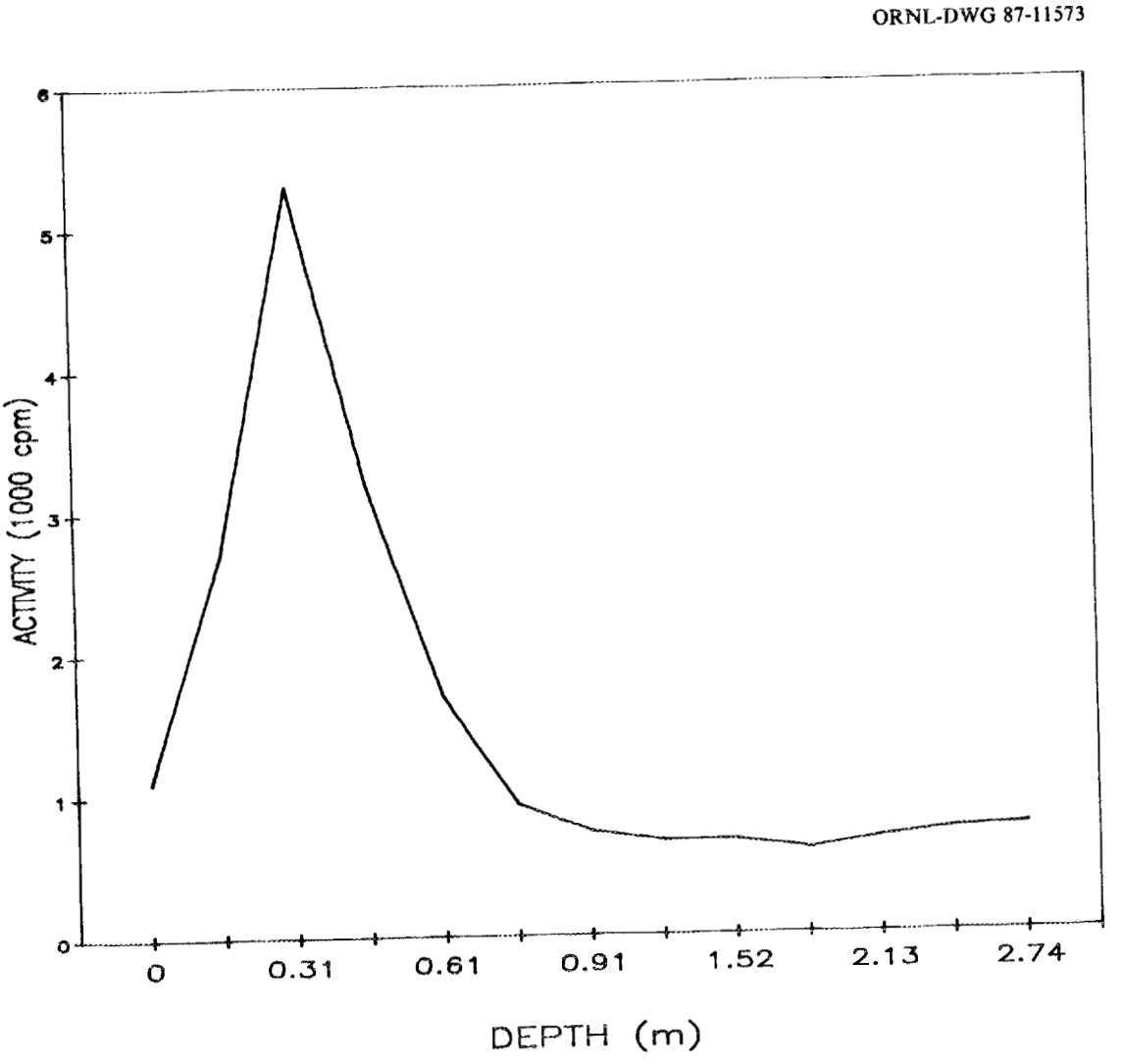

Fig. A.116. Gamma profile of auger hole 116.

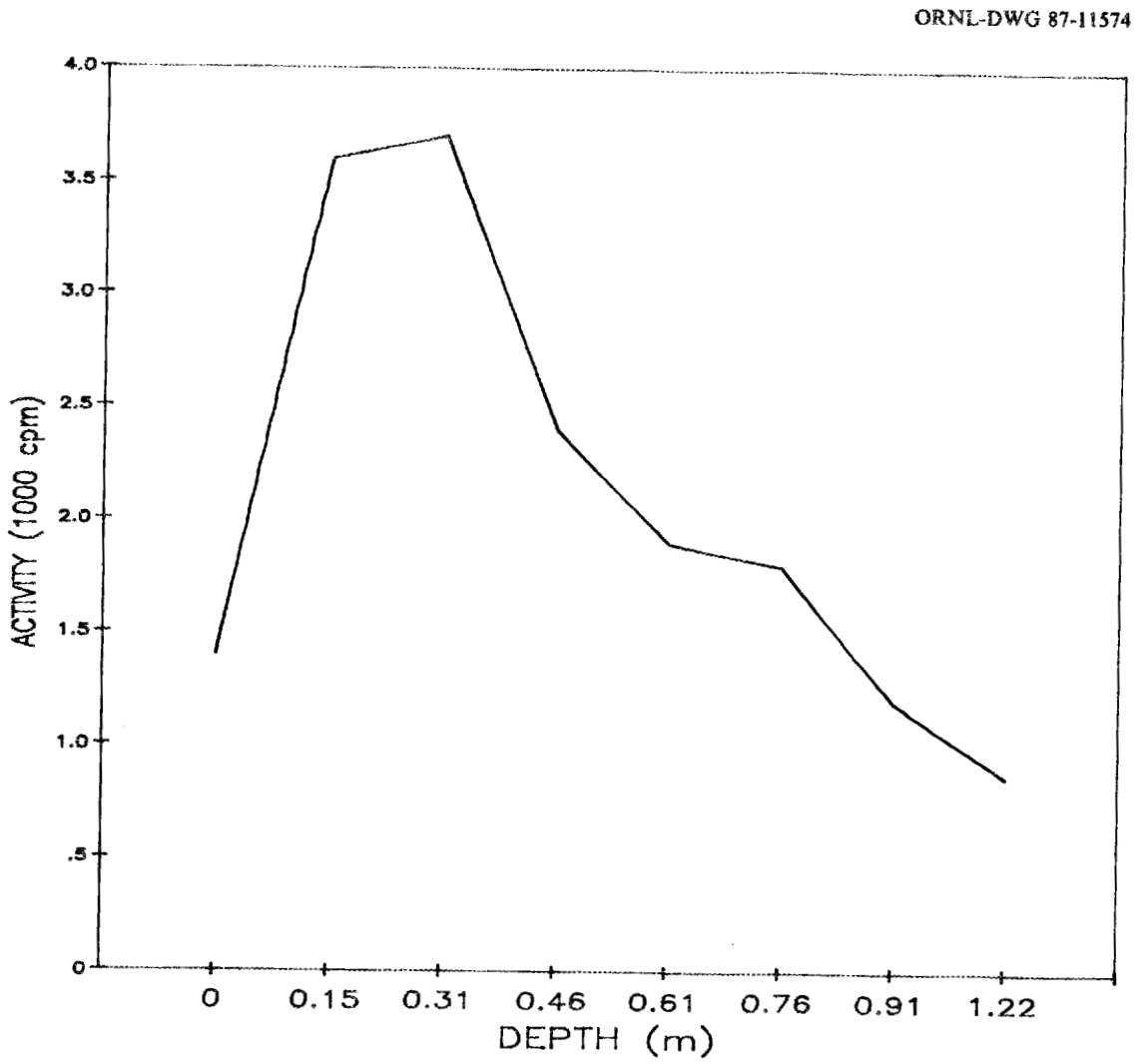

Fig. A.117. Gamma profile of auger hole 117.

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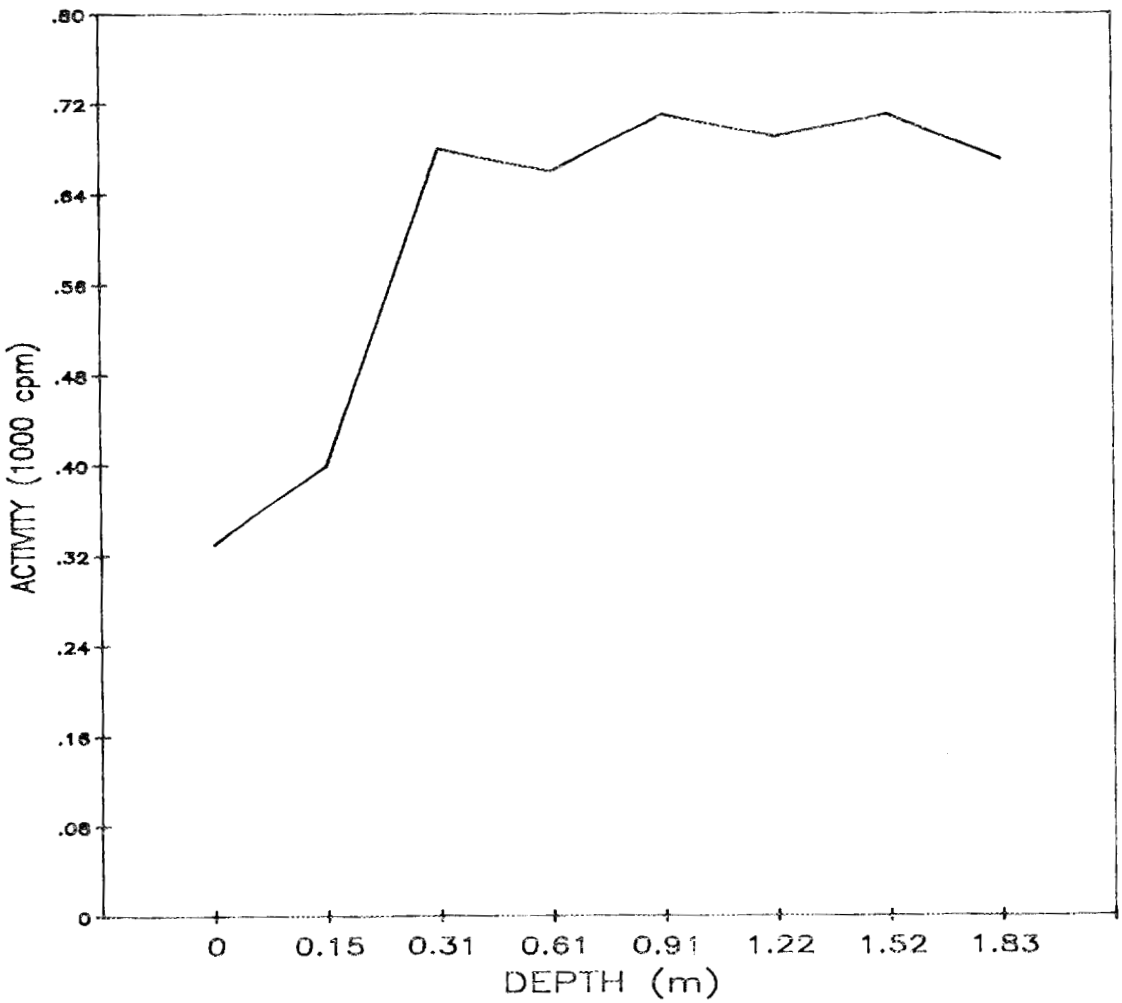

Fig. A.118. Gamma profile of auger hole 118.

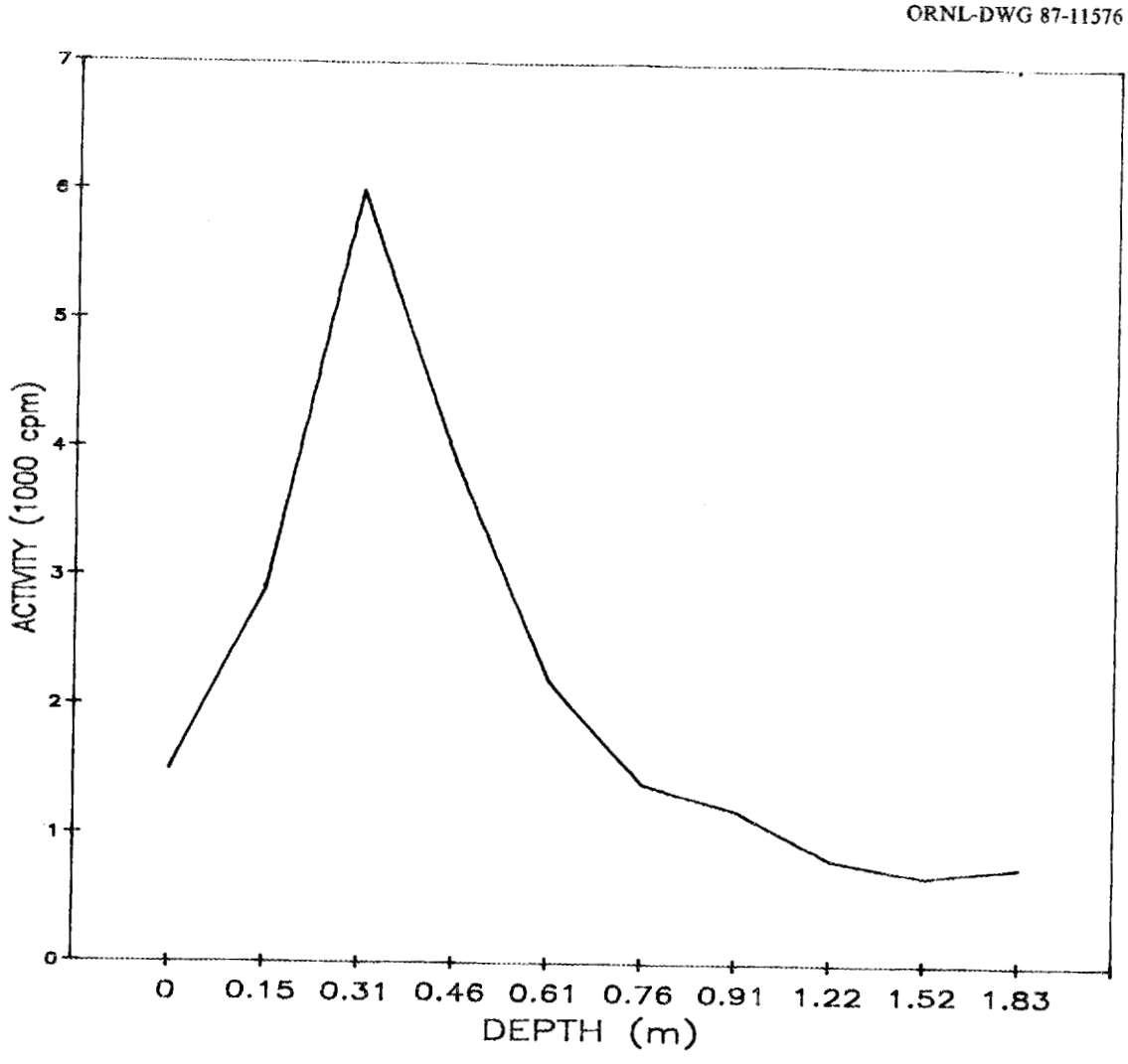

Fig. A.119. Gamma profile of auger hole 119.

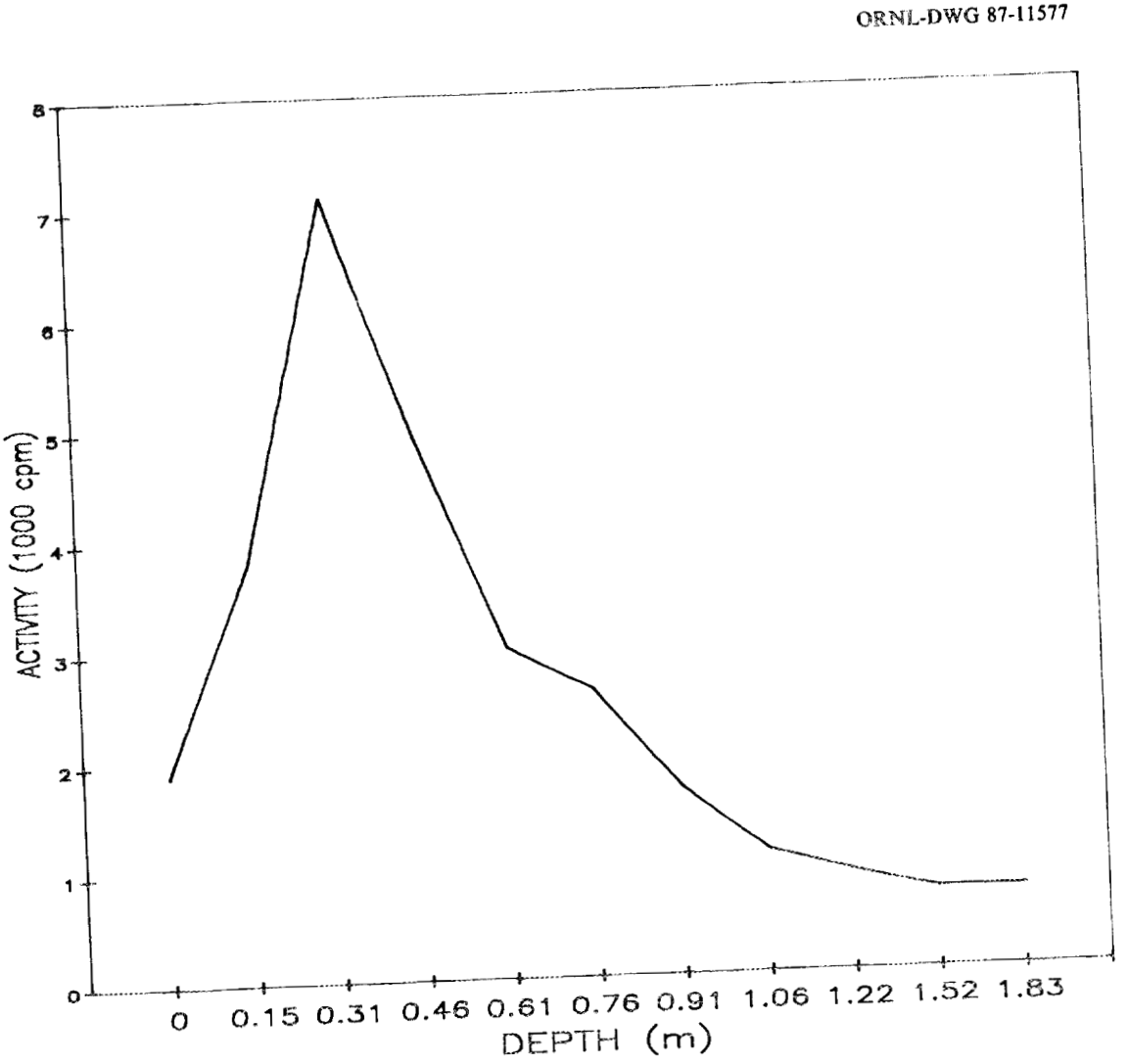

Fig. A.120. Gamma profile of auger hole 120.

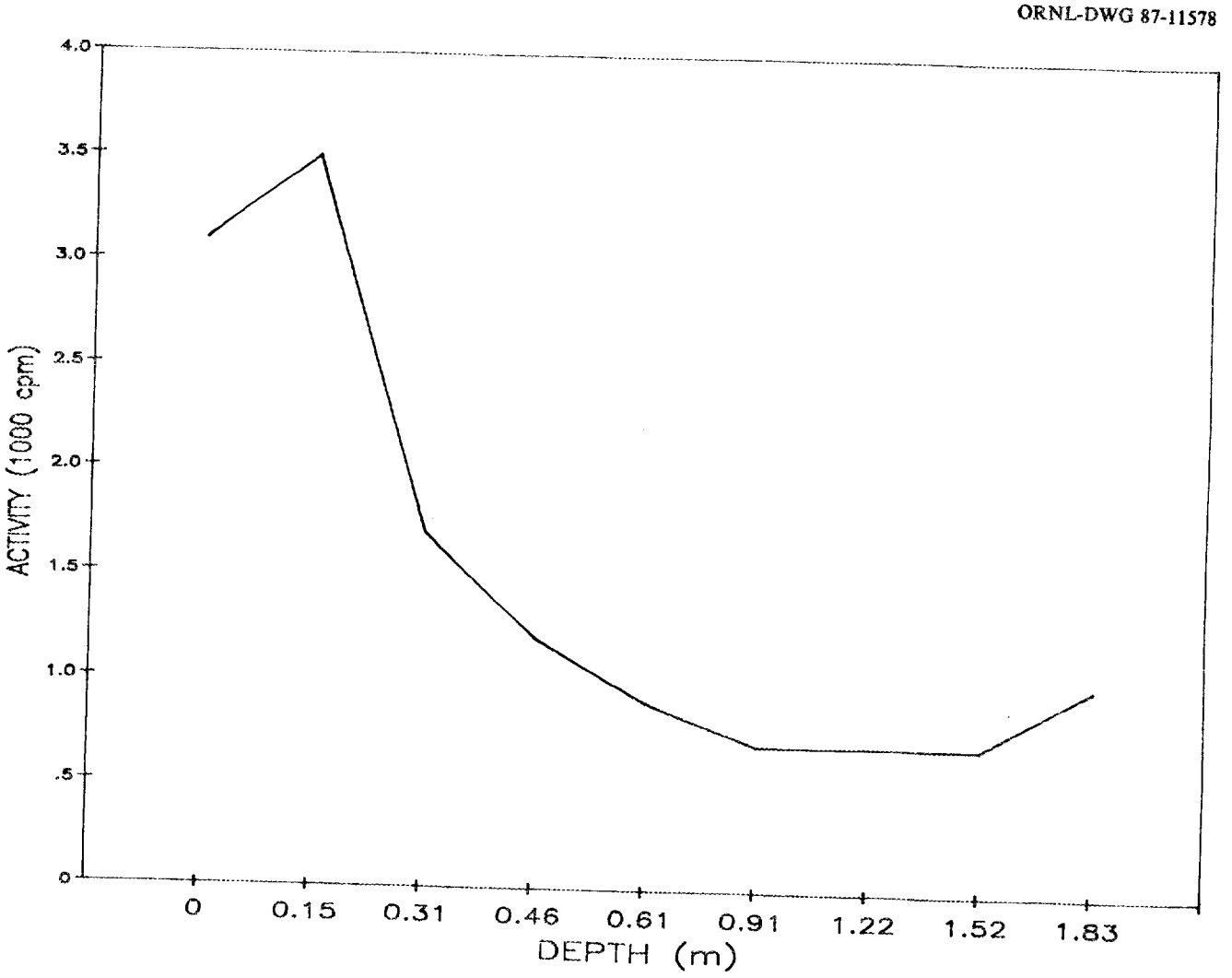

Fig. A.121. Gamma profile of auger hole 121.

ORNL-DWG 87-11579

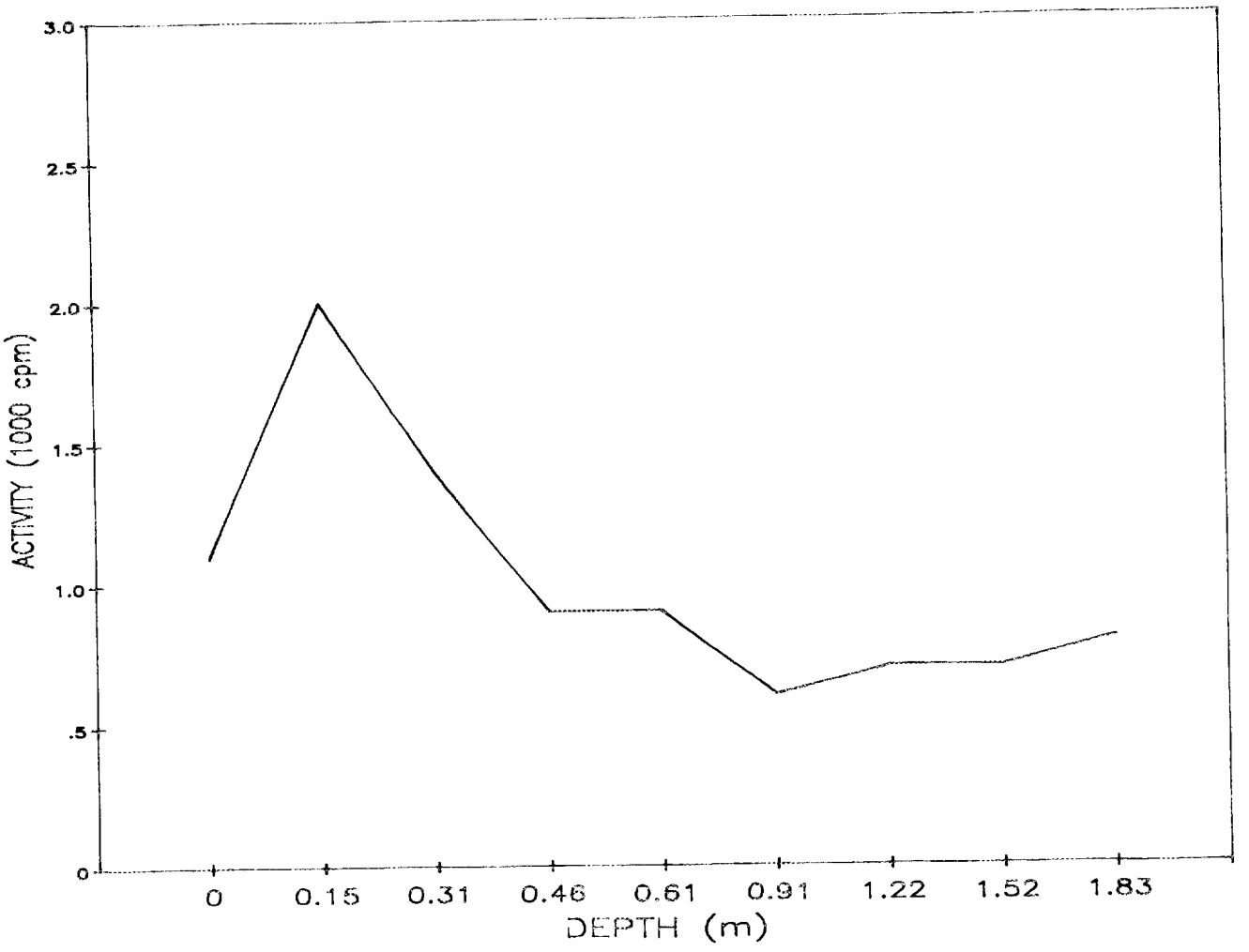

Fig. A.122. Gamma profile of auger hole 122.

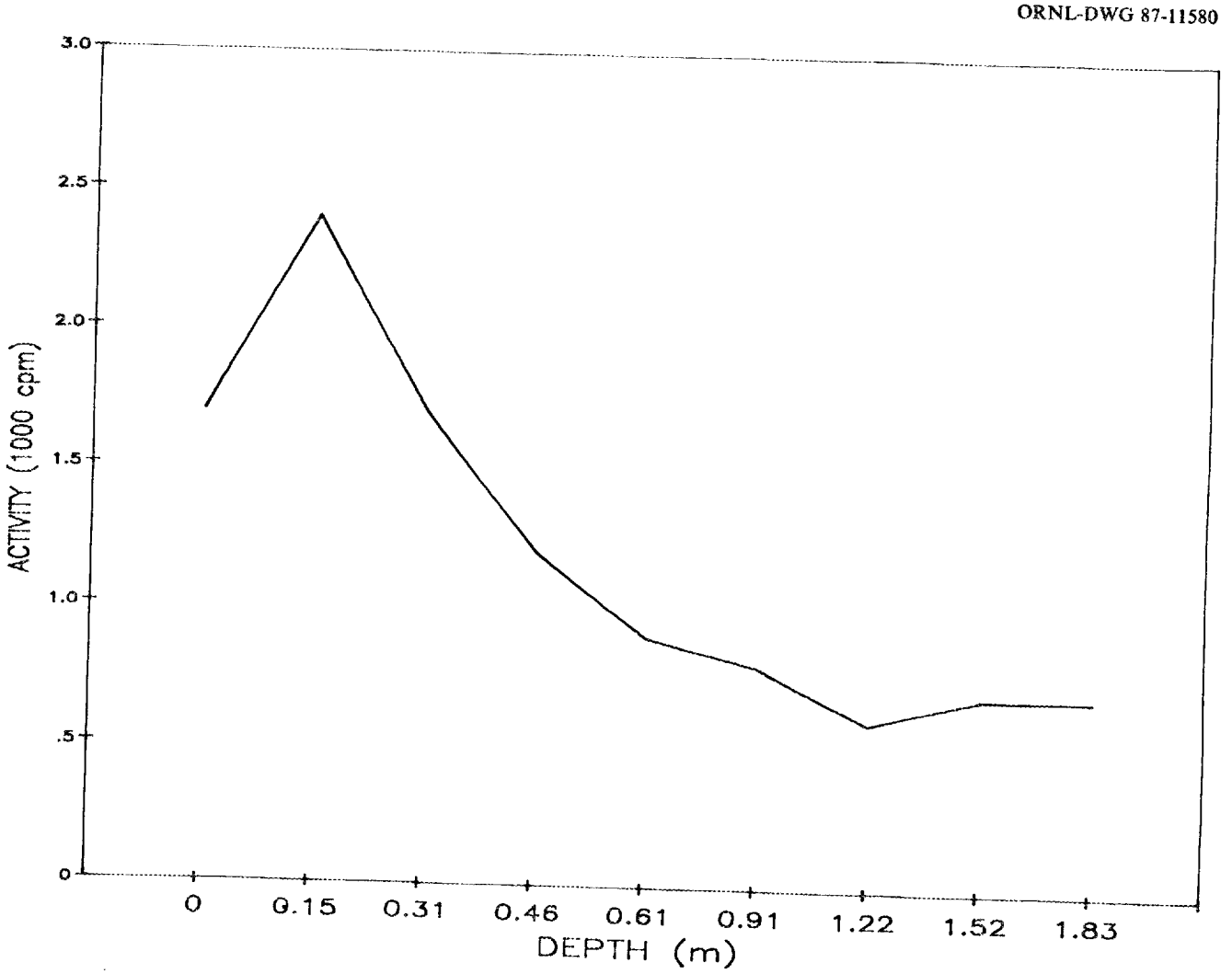

Fig. A.123. Gamma profile of auger hole 123.

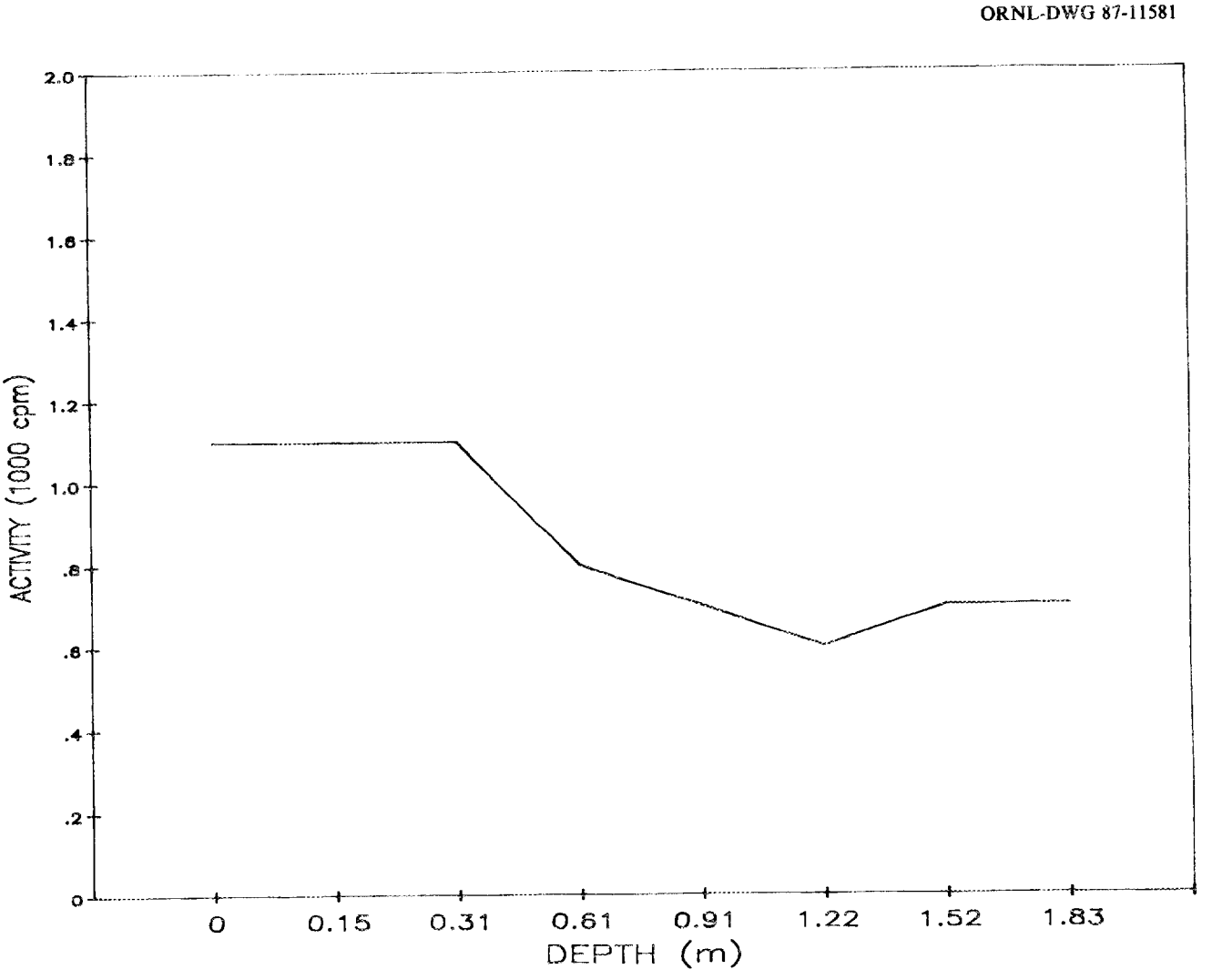

Fig. A.124. Gamma profile of auger hole 124.

ORNL-DWG 87-11582

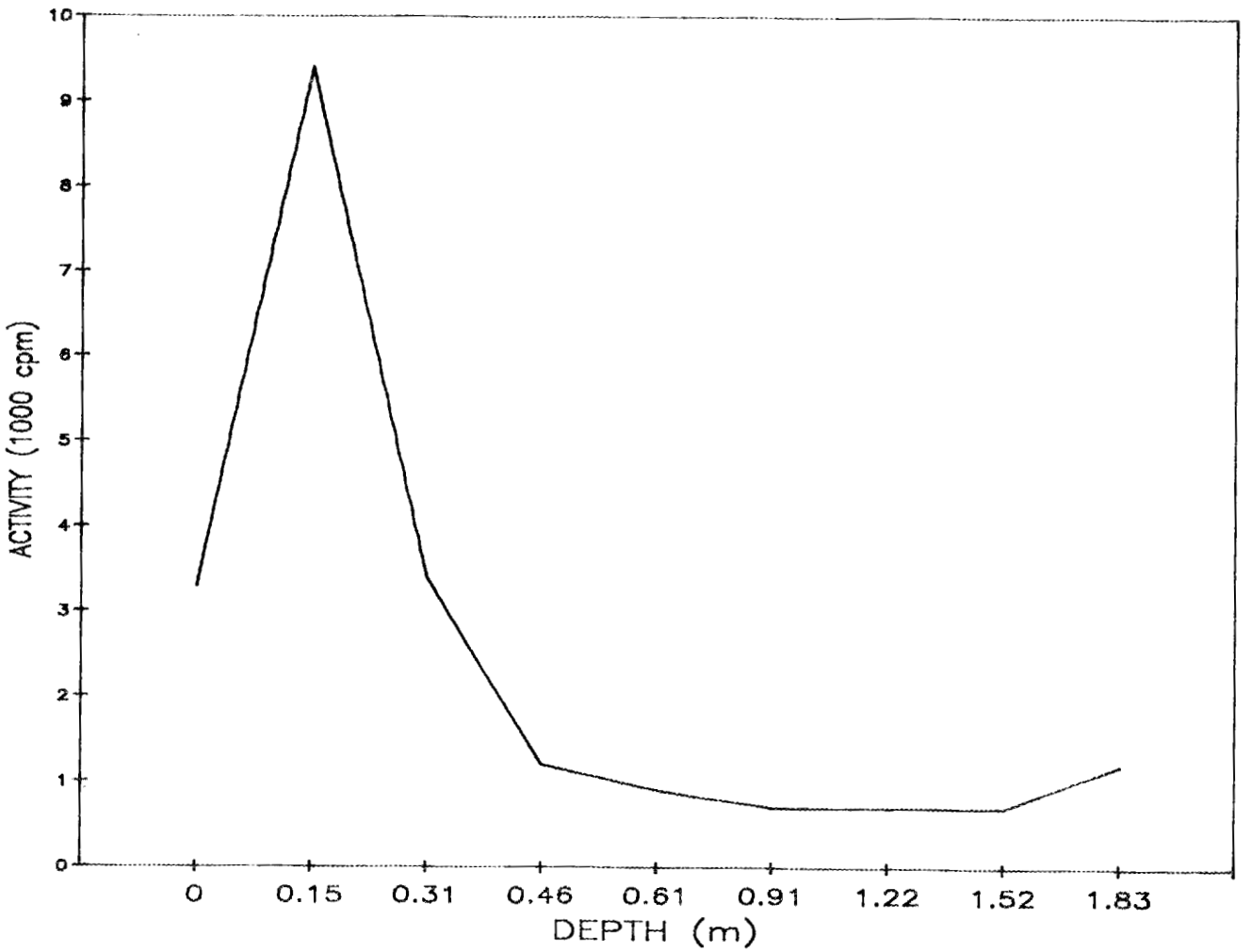

Fig. A.125. Gamma profile of auger hole 125.

ORNL-DWG 87-11583

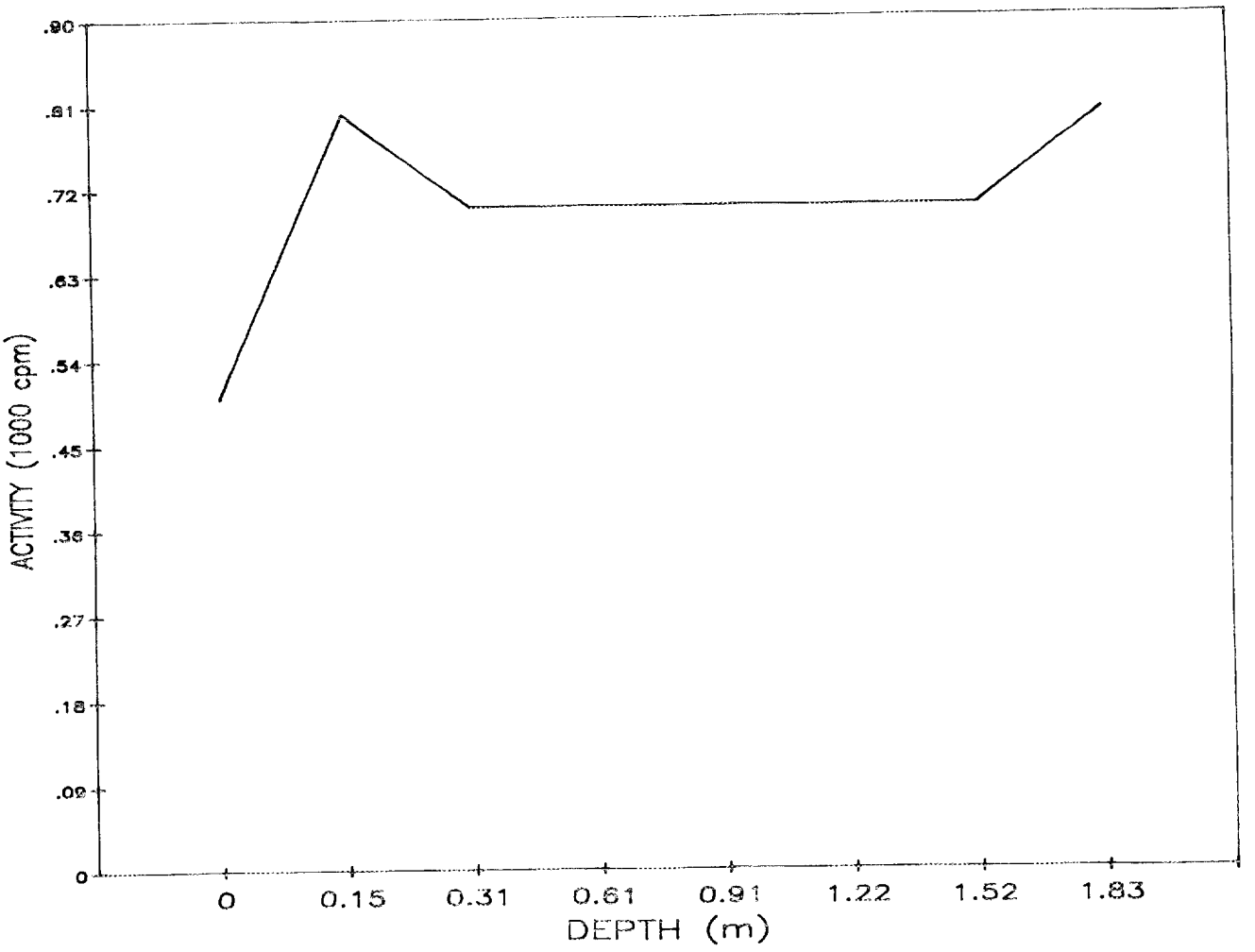

Fig. A.126. Gamma profile of auger hole 126.

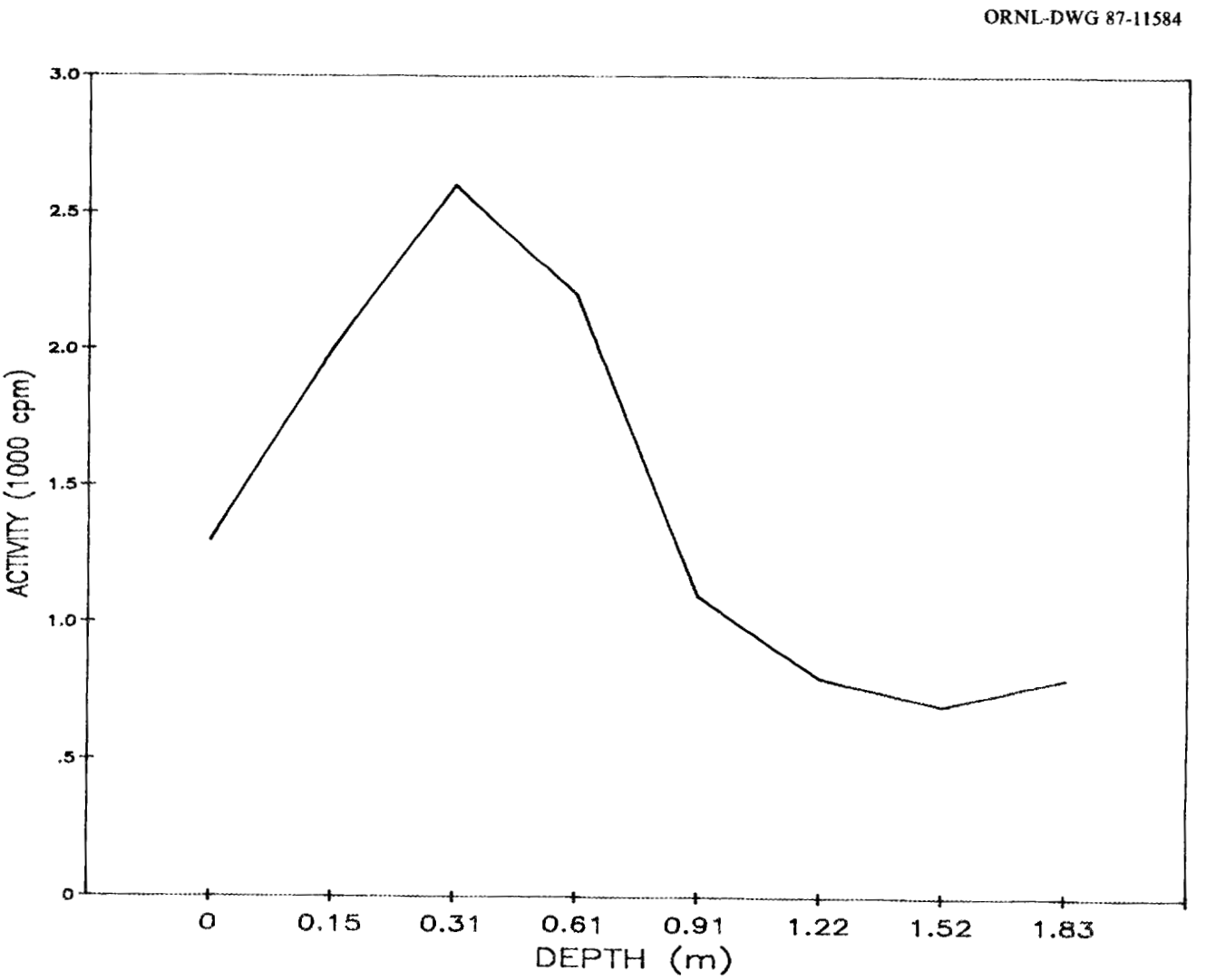

Fig. A.127. Gamma profile of auger hole 127.

ORNL-DWG 87-11585

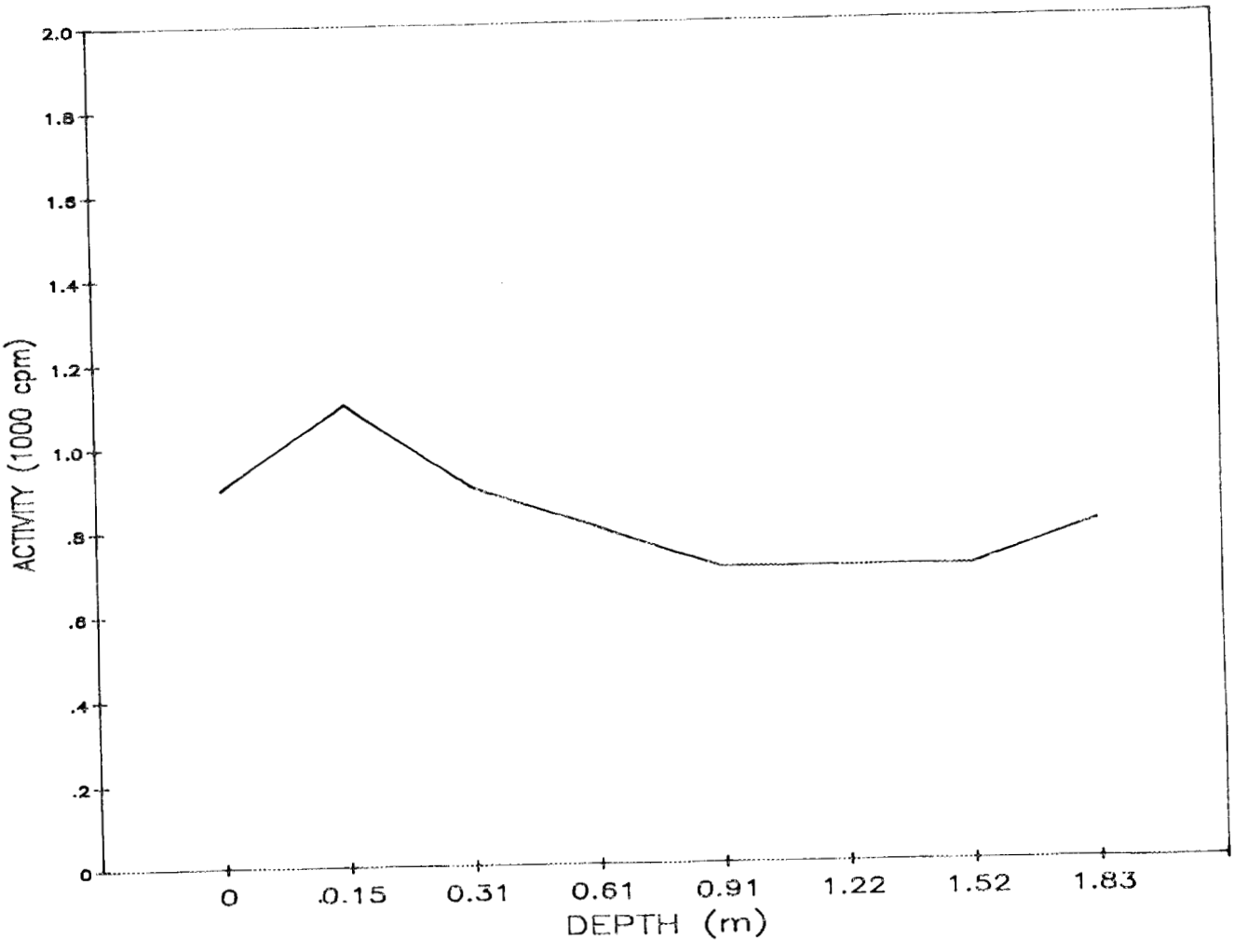

Fig. A.128. Gamma profile of auger hole 128.

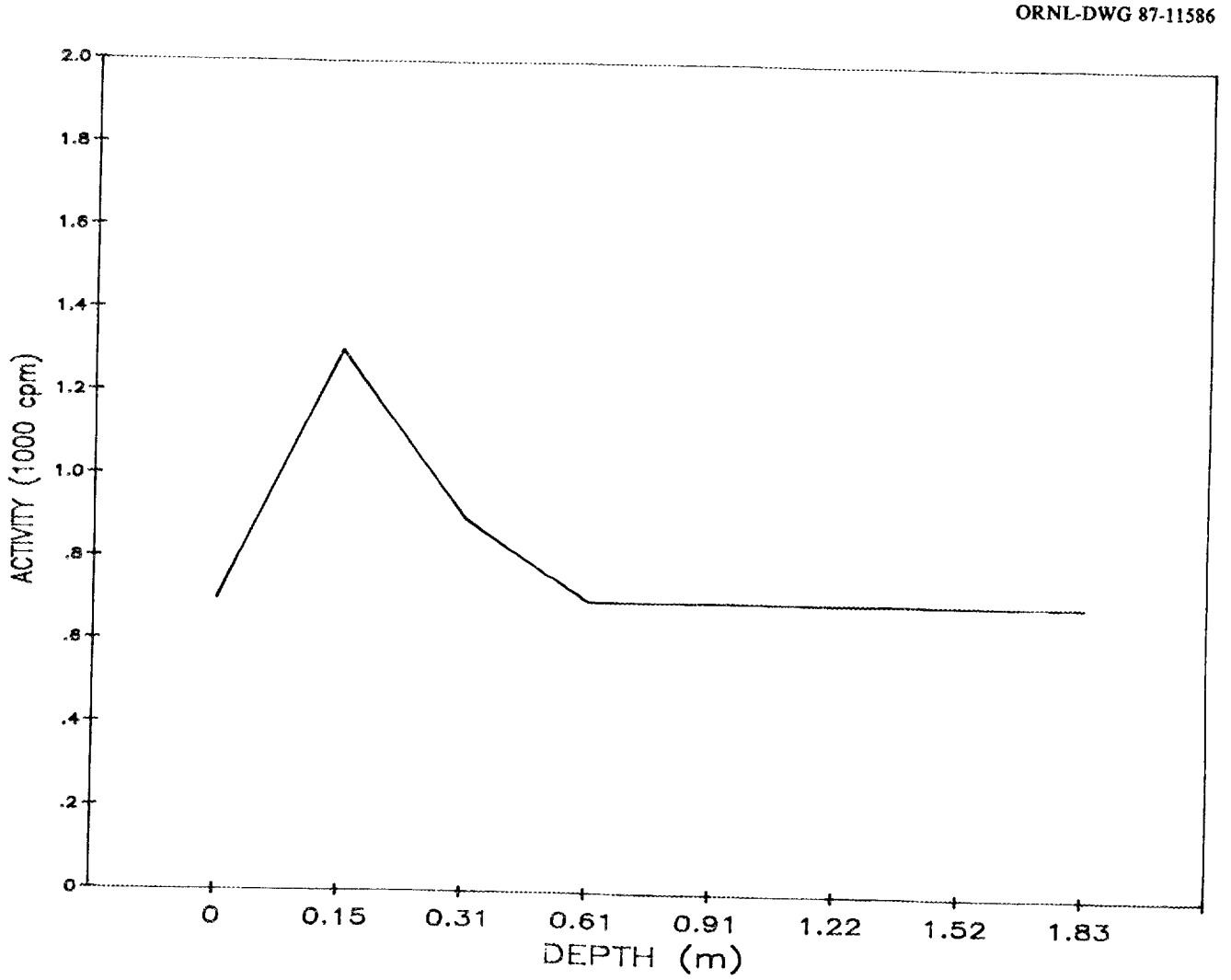

Fig. A.129. Gamma profile of auger hole 129.

ORNL-DWG 87-11587

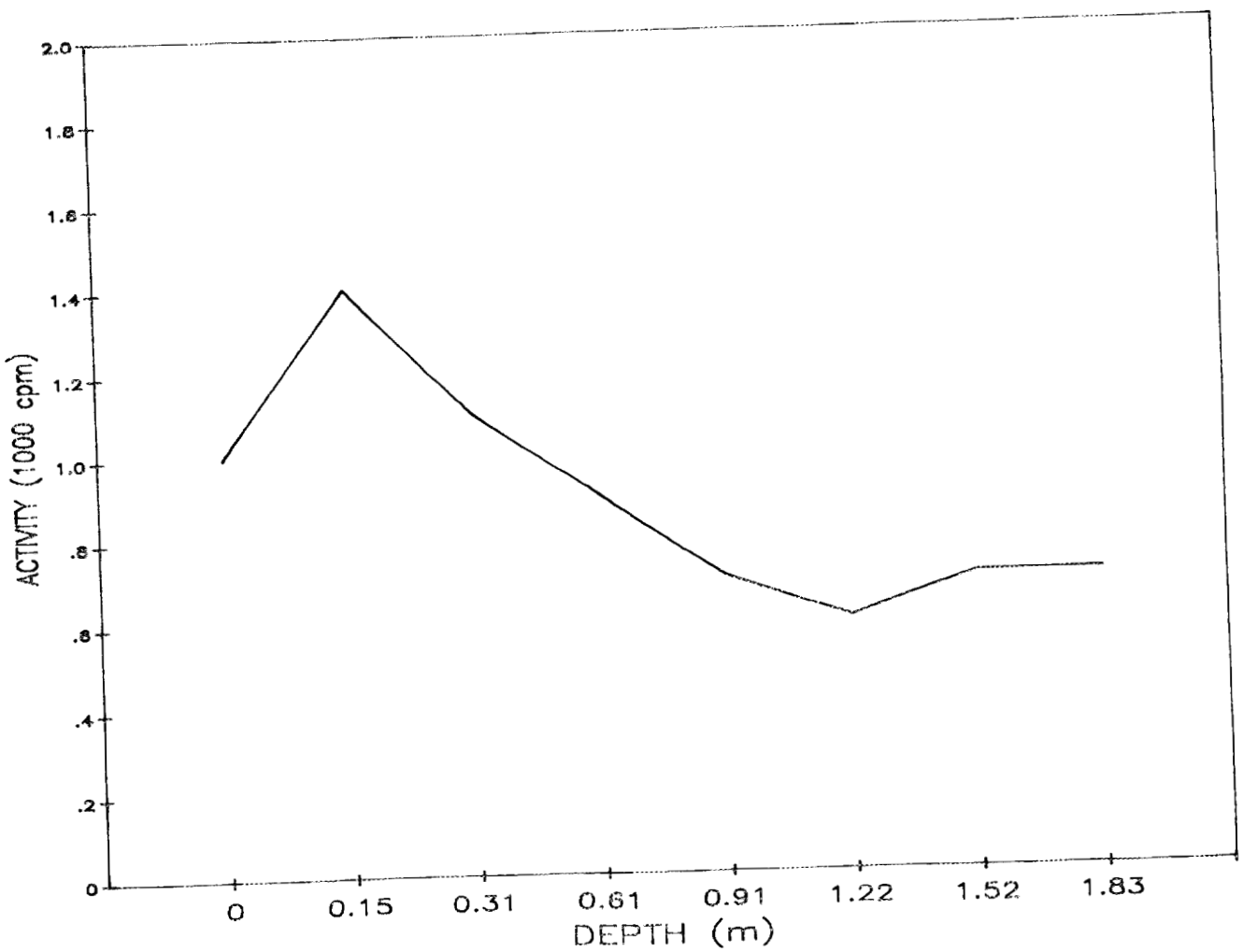

Fig. A.130. Gamma profile of auger hole 130.

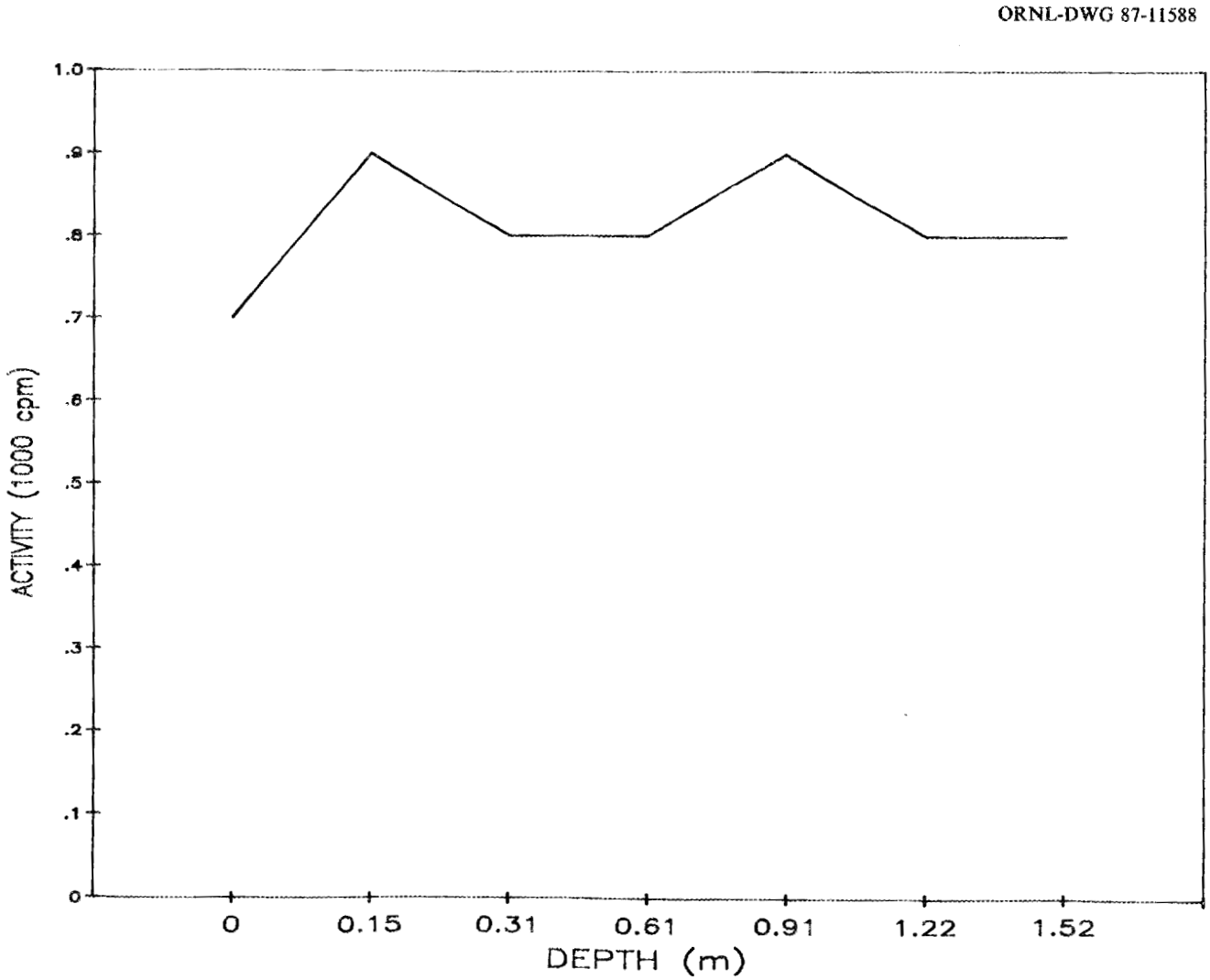

Fig. A.131. Gamma profile of auger hole 131.

ORNL-DWG 87-11589

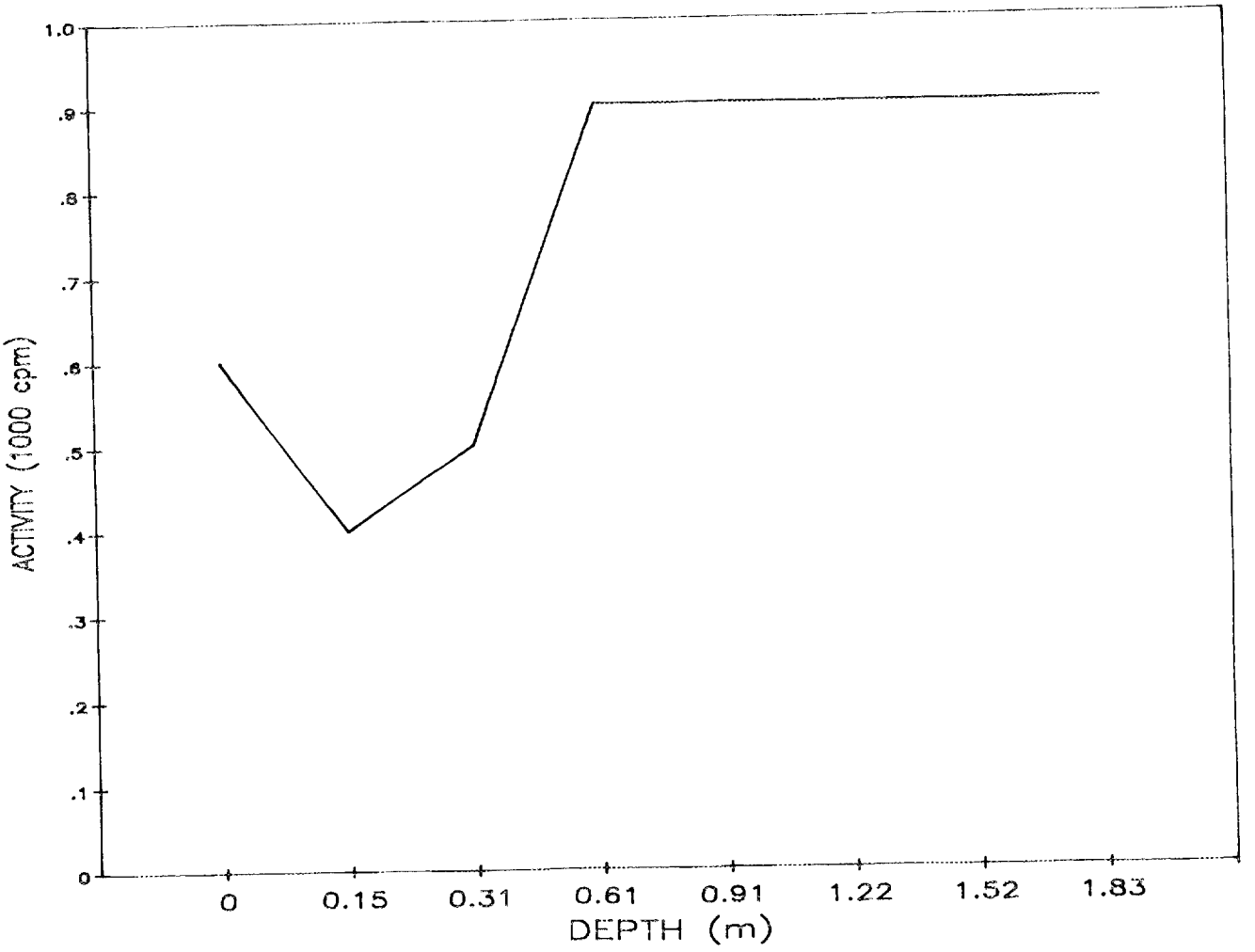

Fig. A.132. Gamma profile of auger hole 132.

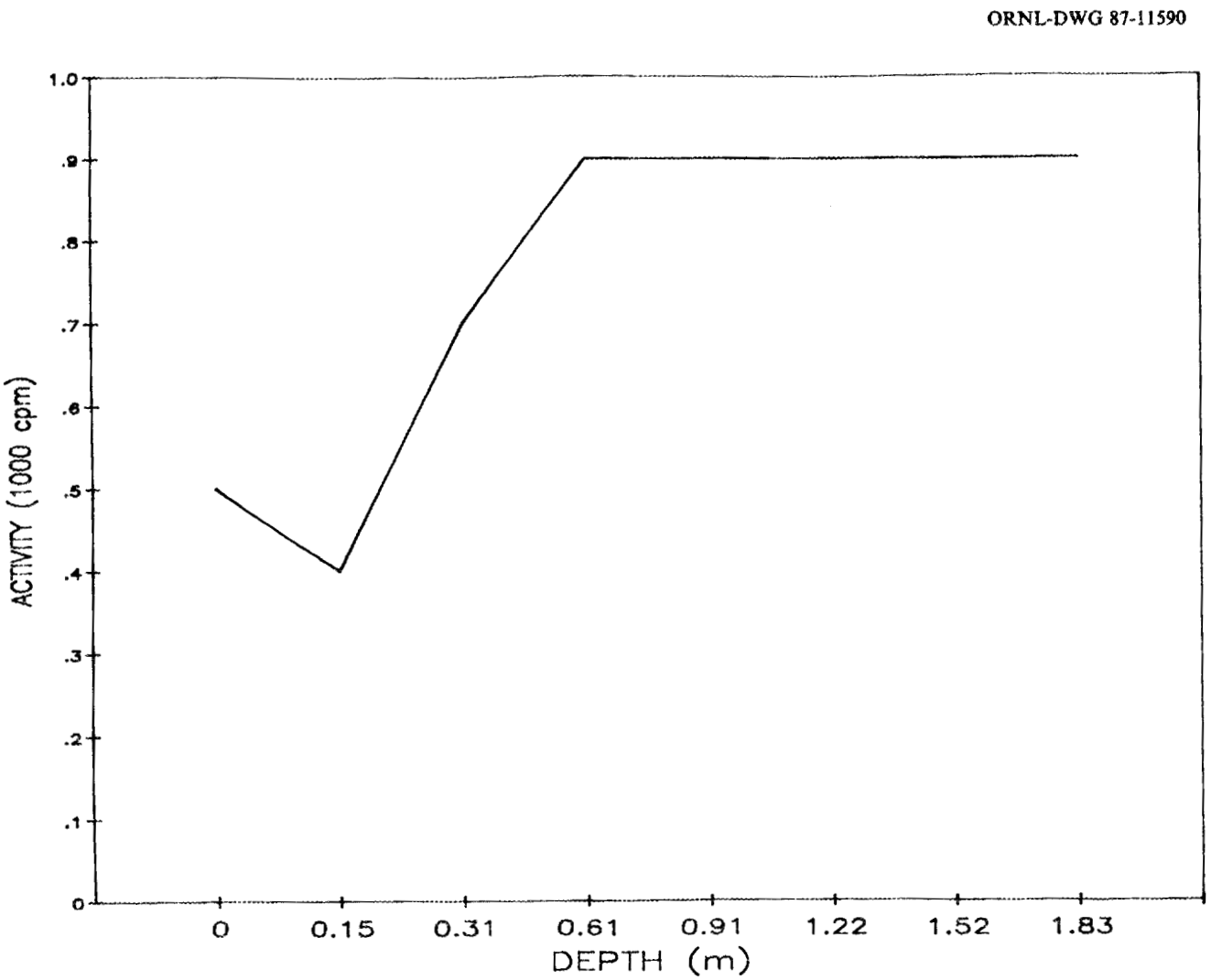

Fig. A.133. Gamma profile of auger hole 133.

ORNL-DWG 87-11591

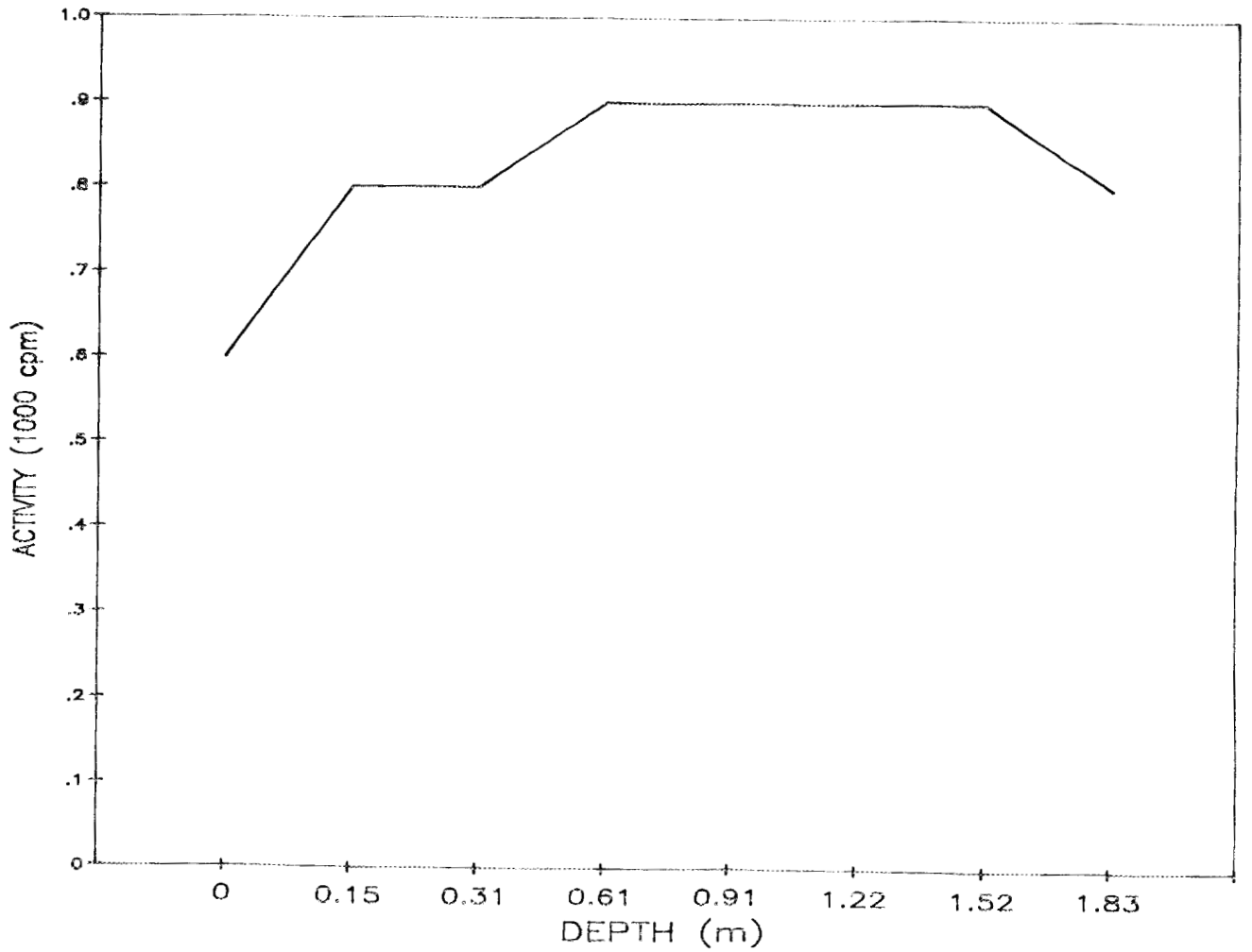

Fig. A.134. Gamma profile of auger hole 134.

ORNL-DWG 87-11592

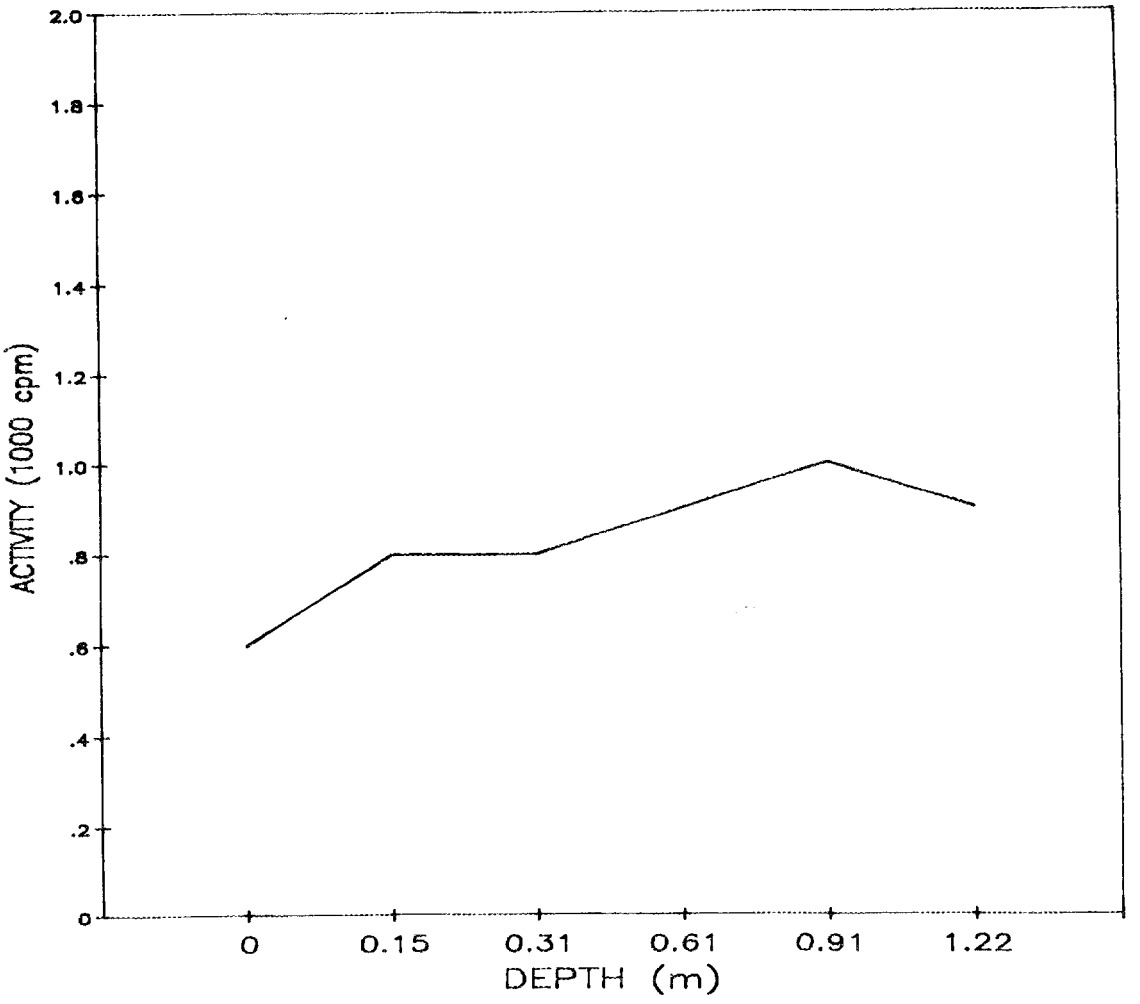

Fig. A.135. Gamma profile of auger hole 135.

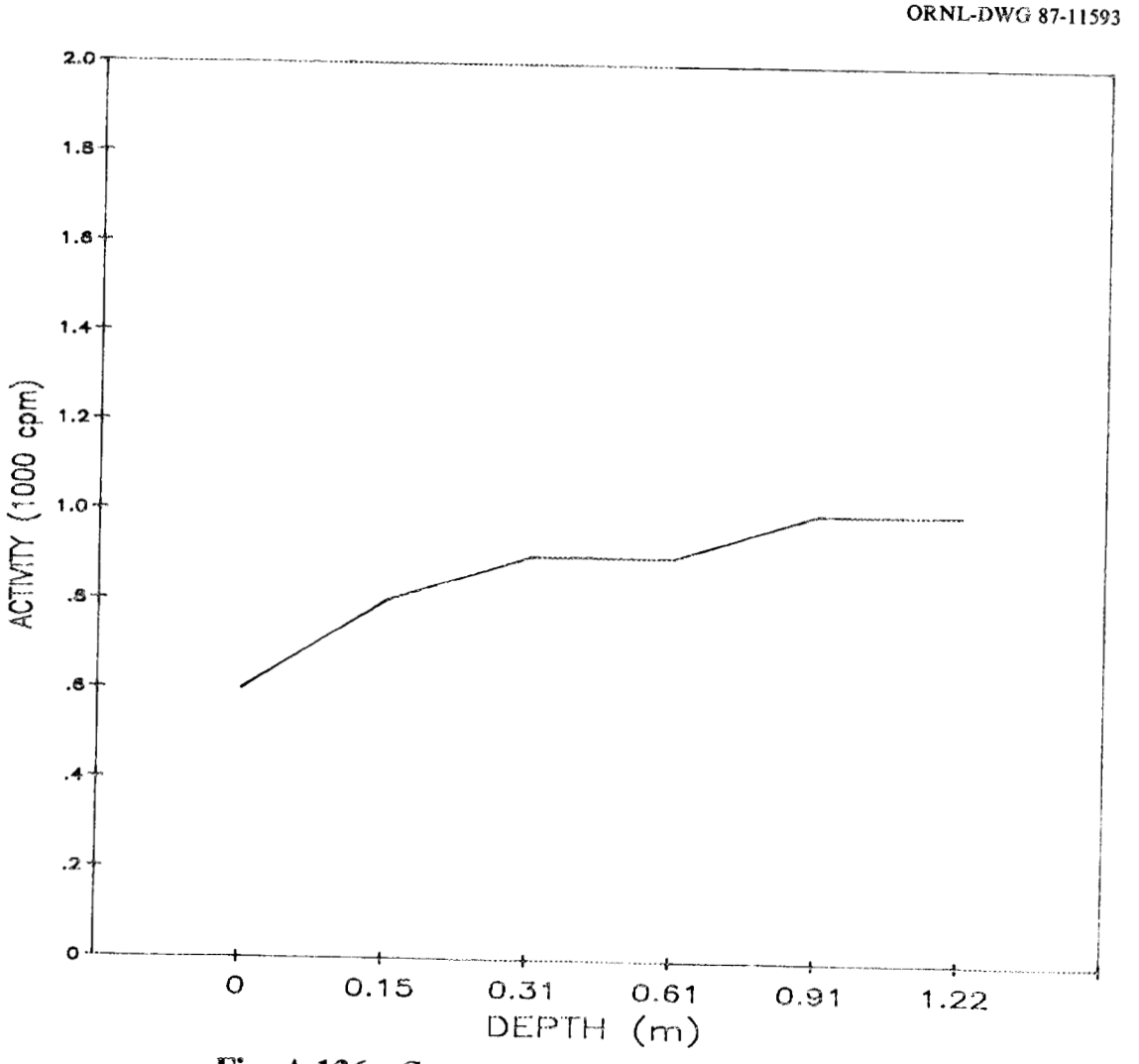

Fig. A.136. Gamma profile of auger hole 136.

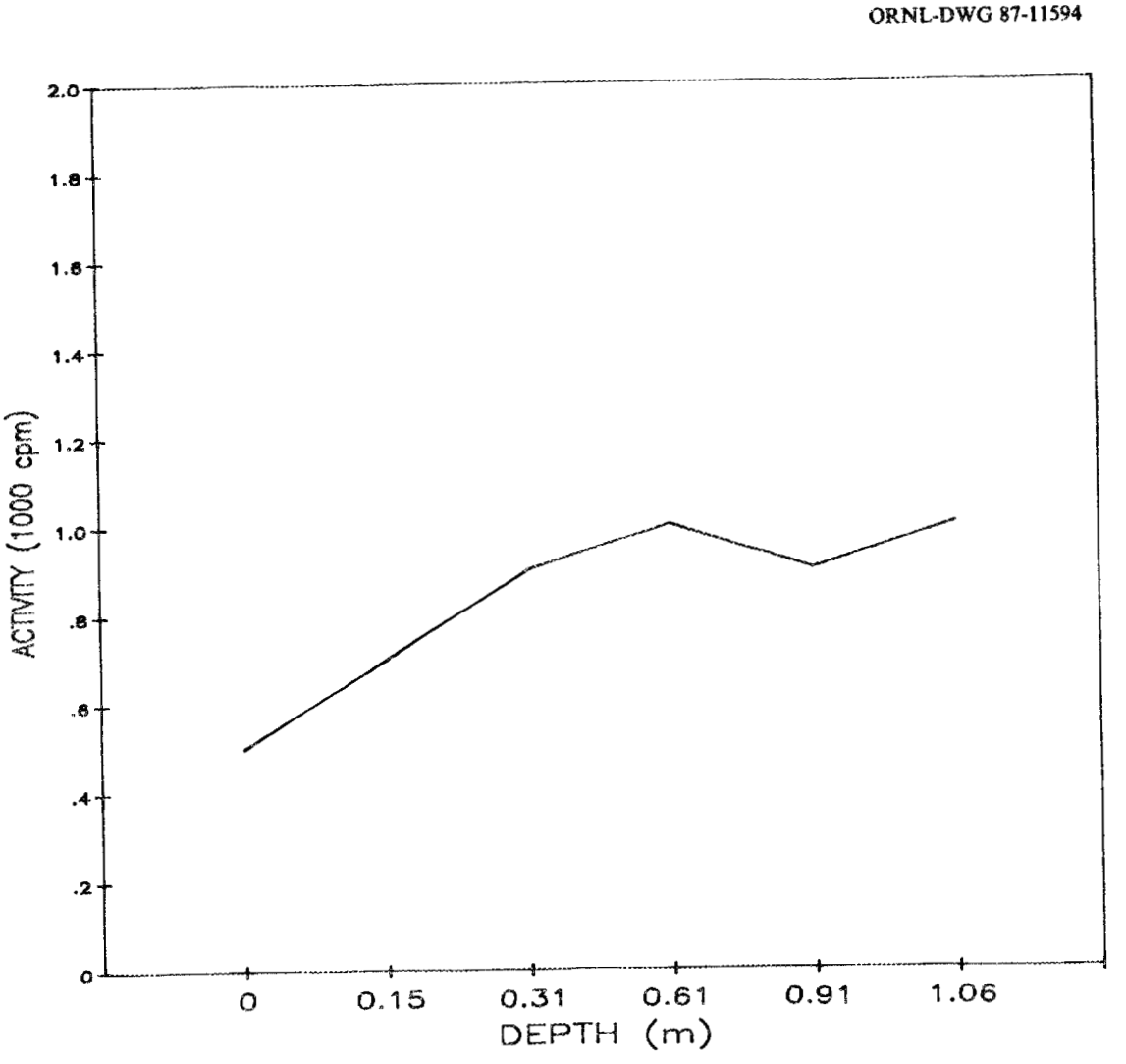

Fig. A.137. Gamma profile of auger hole 137.

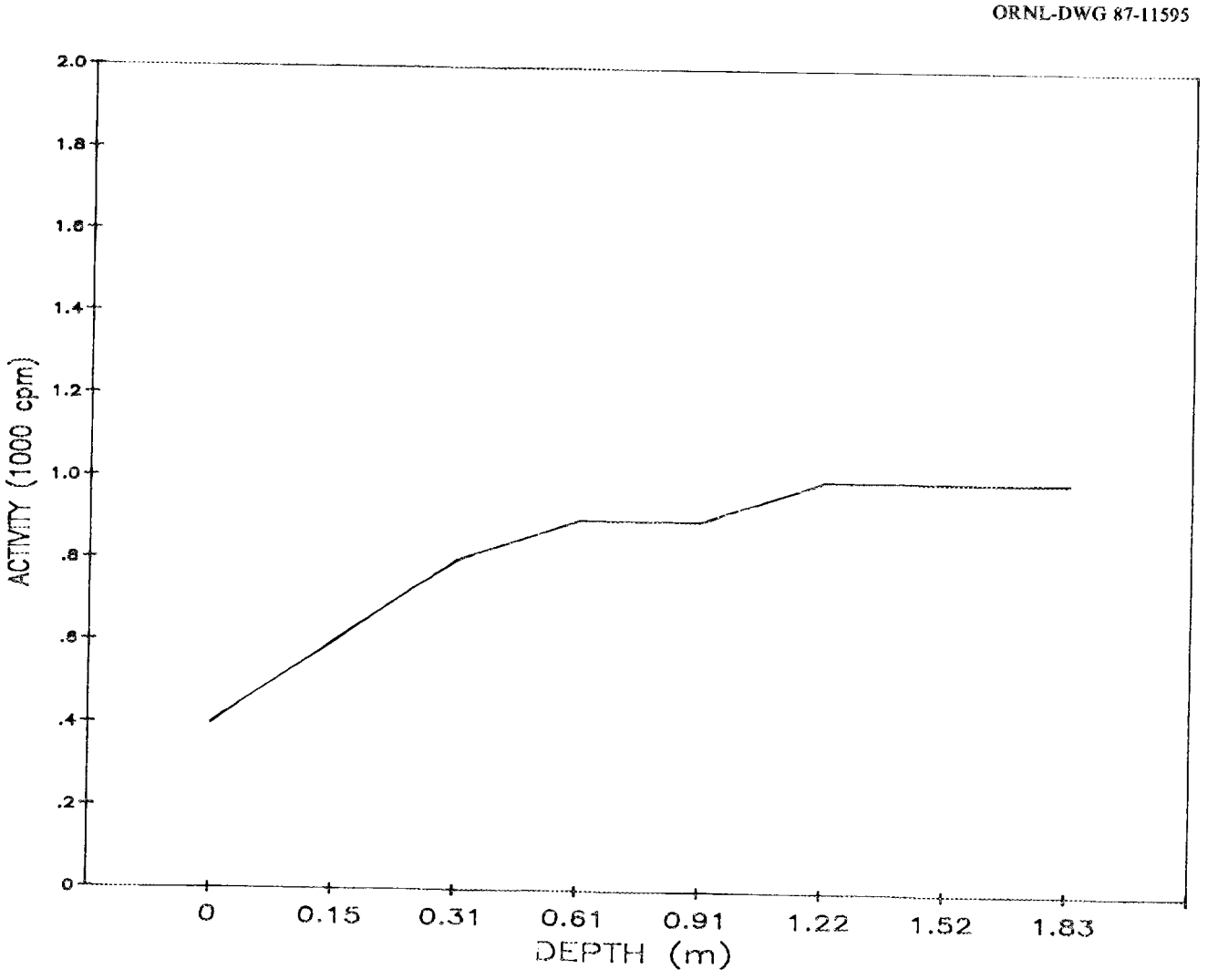

Fig. A.138. Gamma profile of auger hole 138.

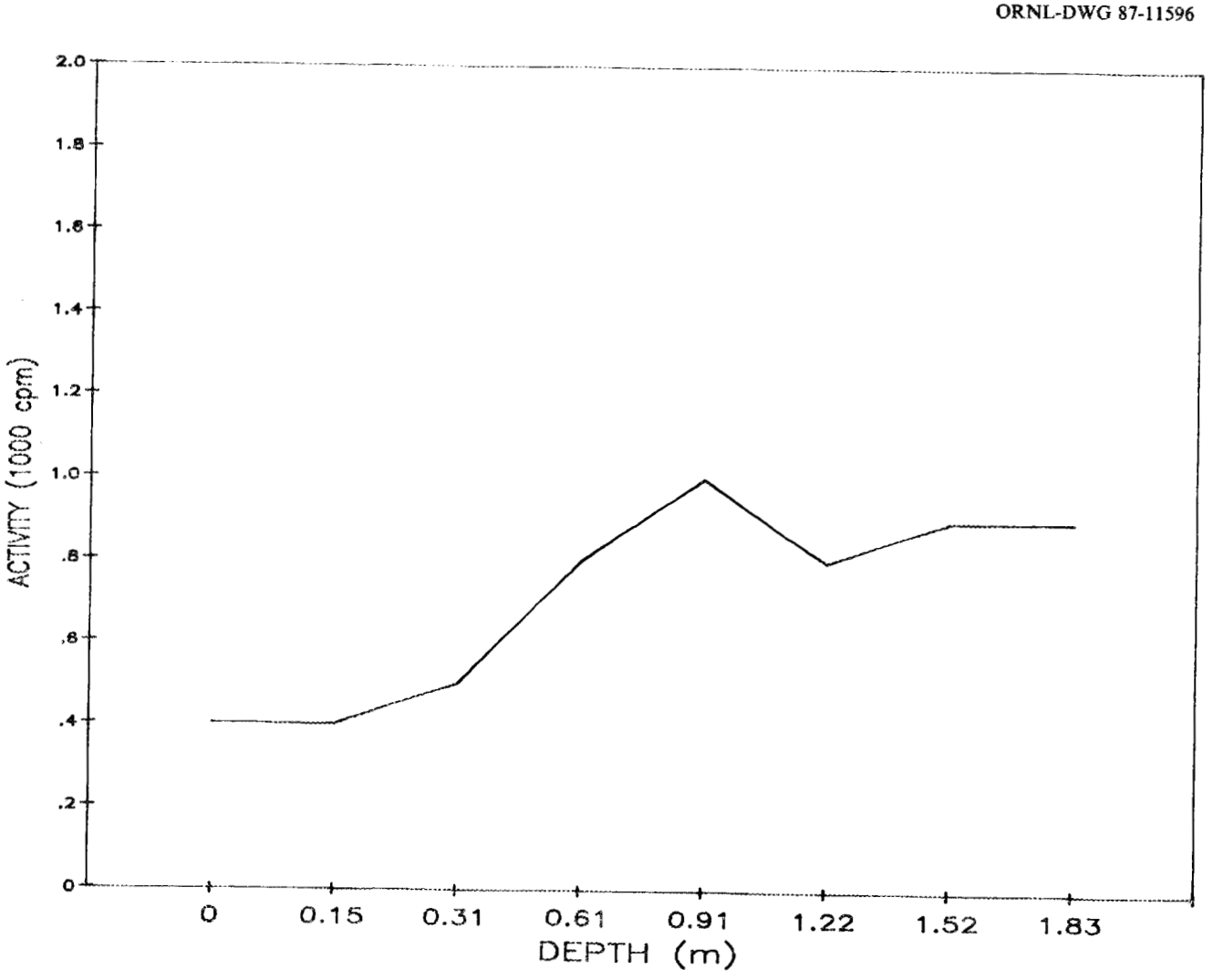

Fig. A.139. Gamma profile of auger hole 139.

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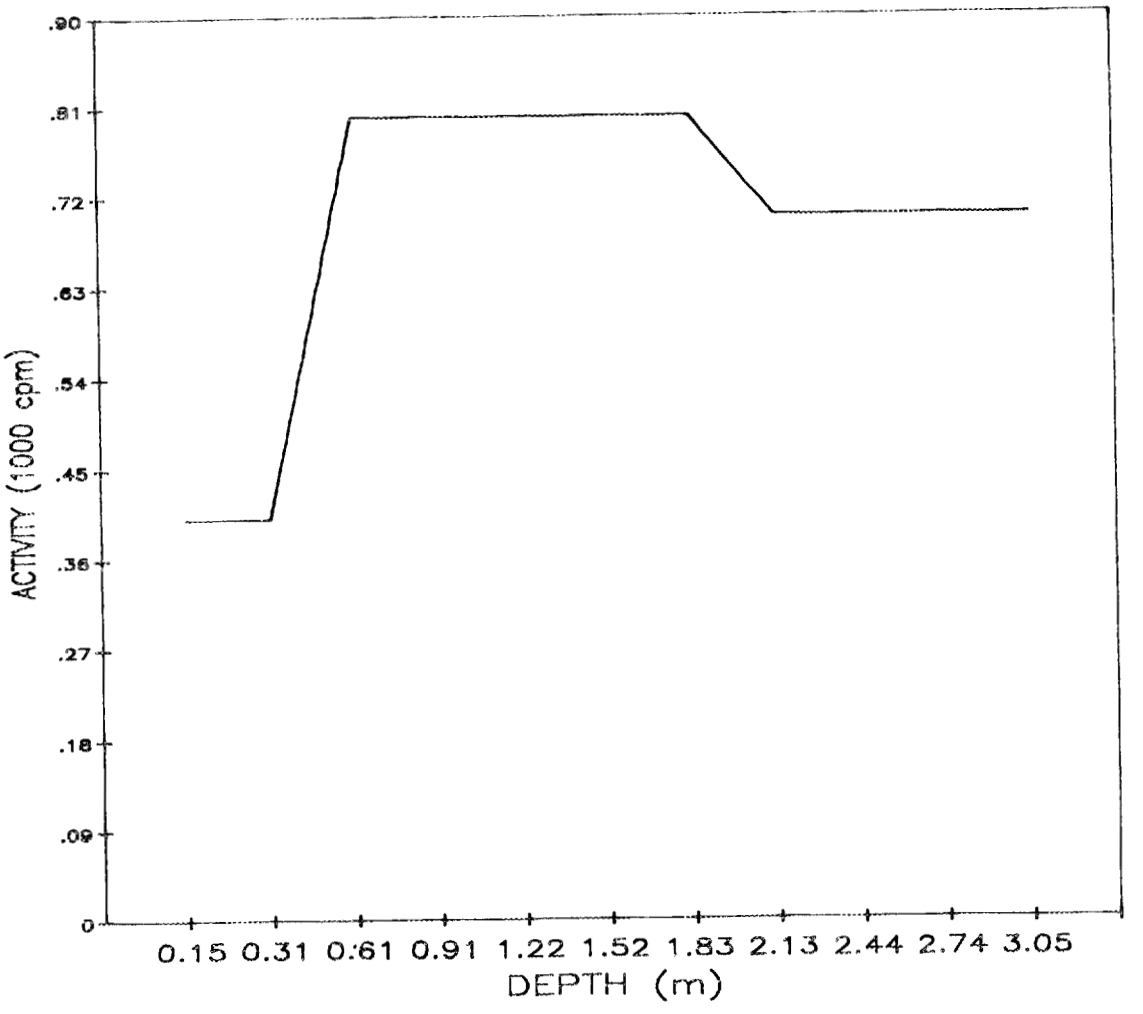


Fig. A.140. Gamma profile of auger hole 140.

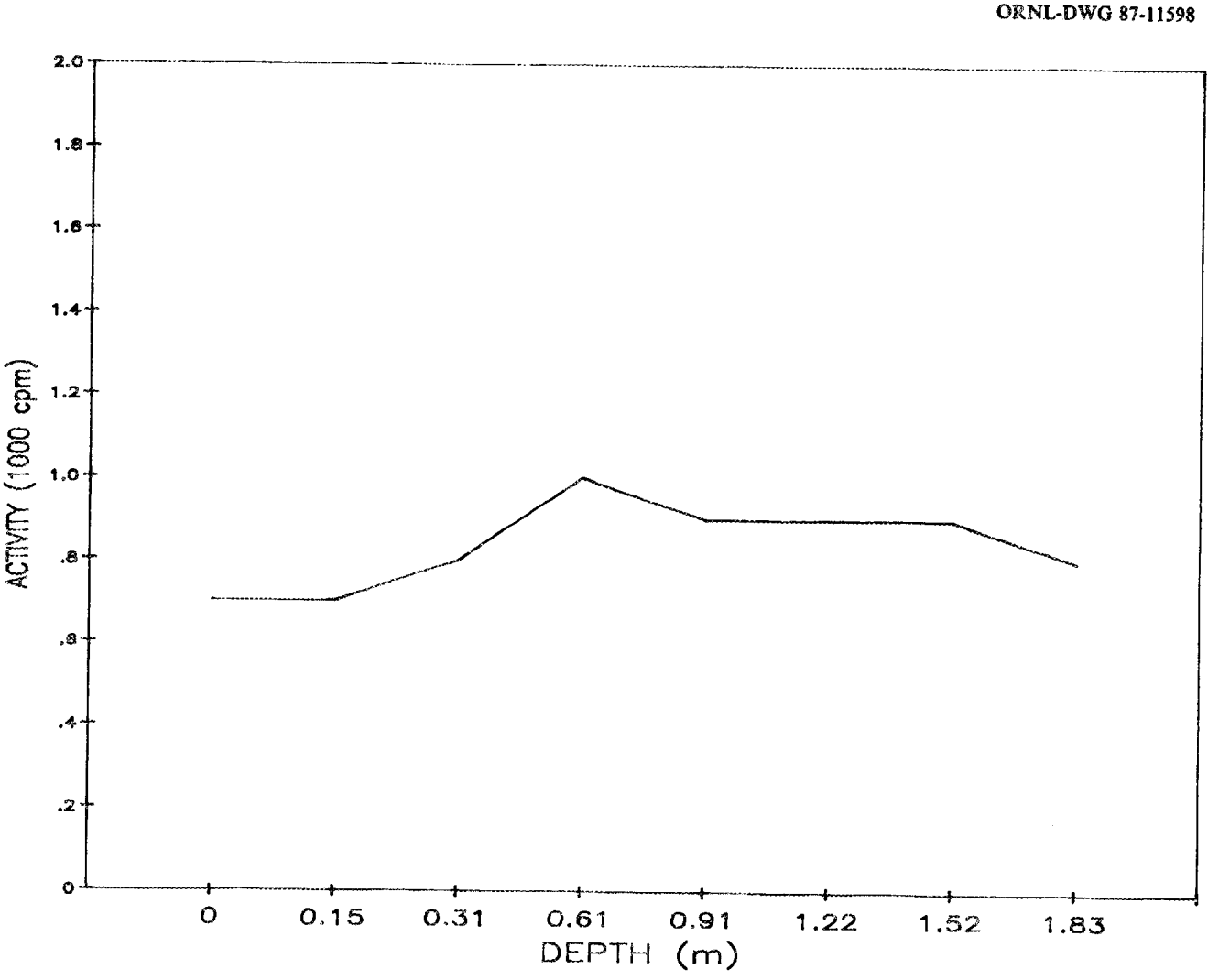
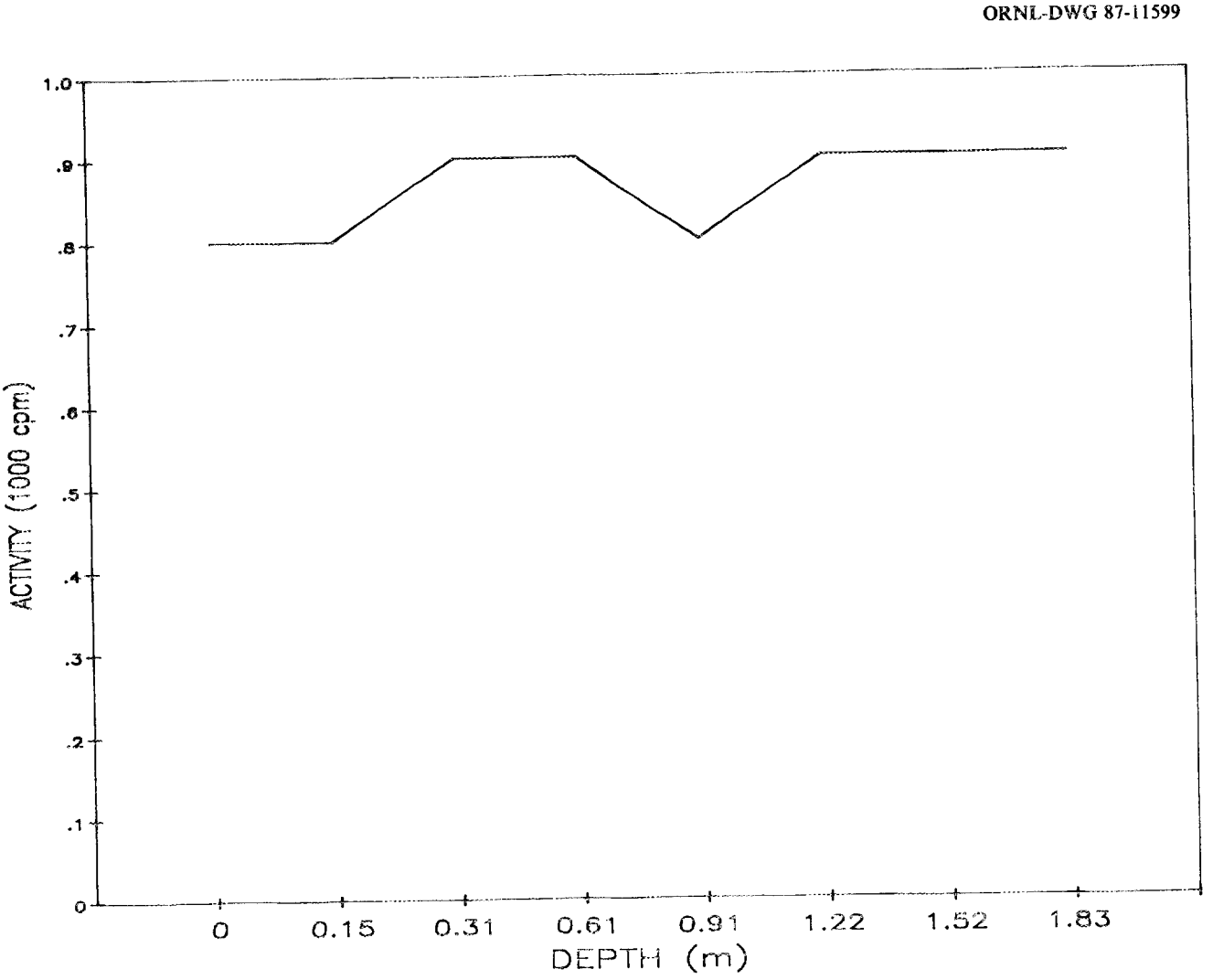


Fig. A.141. Gamma profile of auger hole 141.



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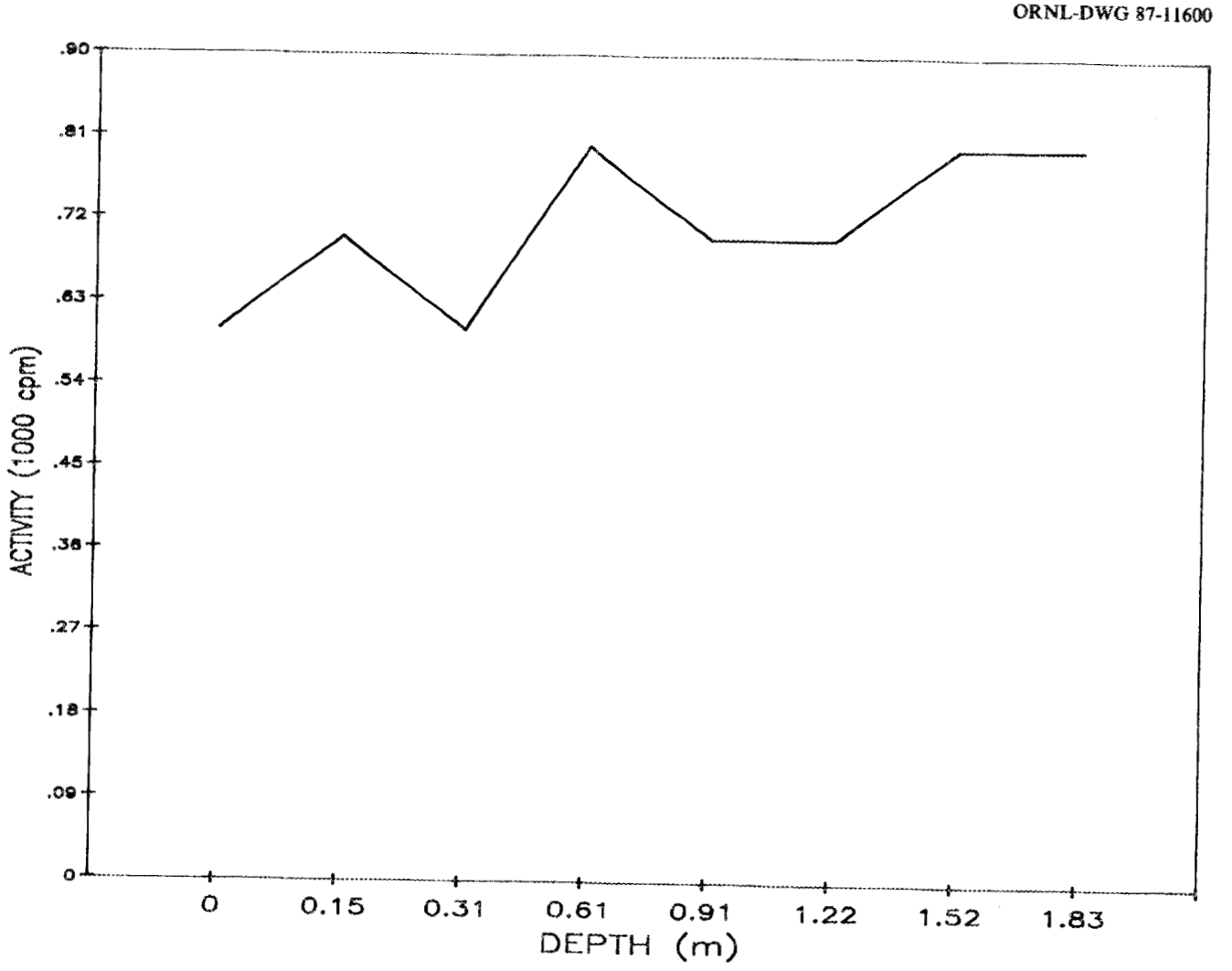

Fig. A.143. Gamma profile of auger hole 143.

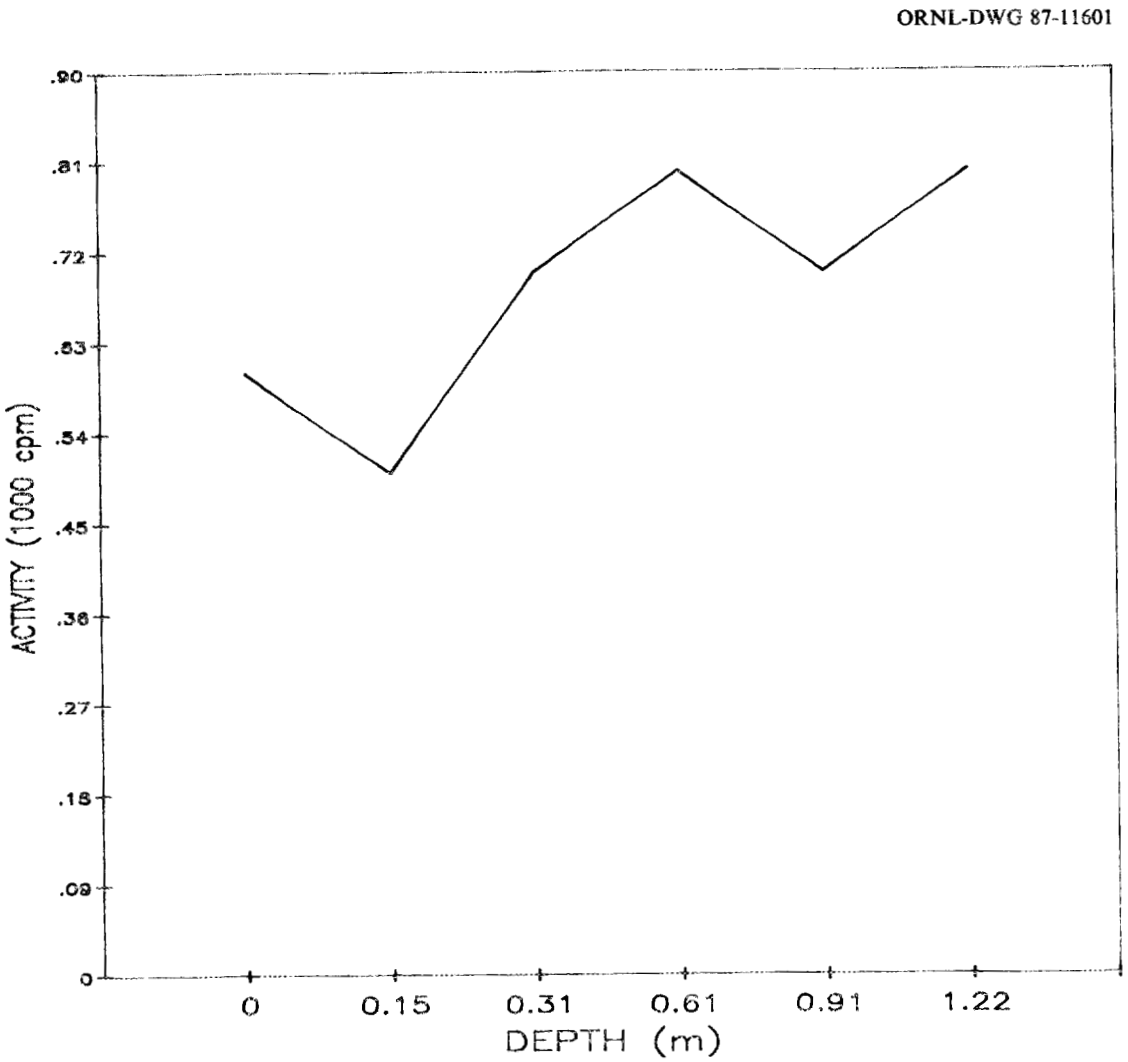

Fig. A.144. Gamma profile of auger hole 144.

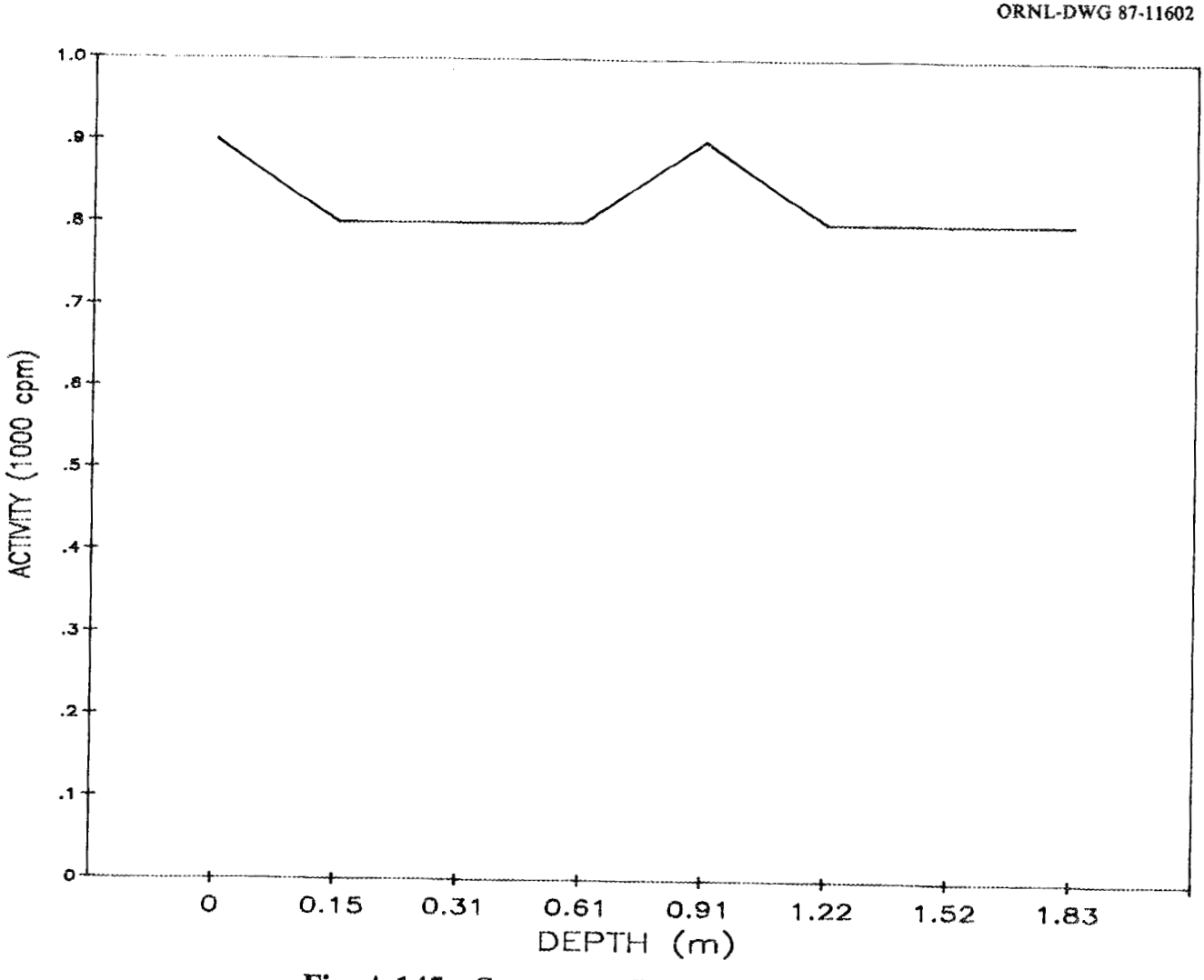

Fig. A.145. Gamma profile of auger hole 145.

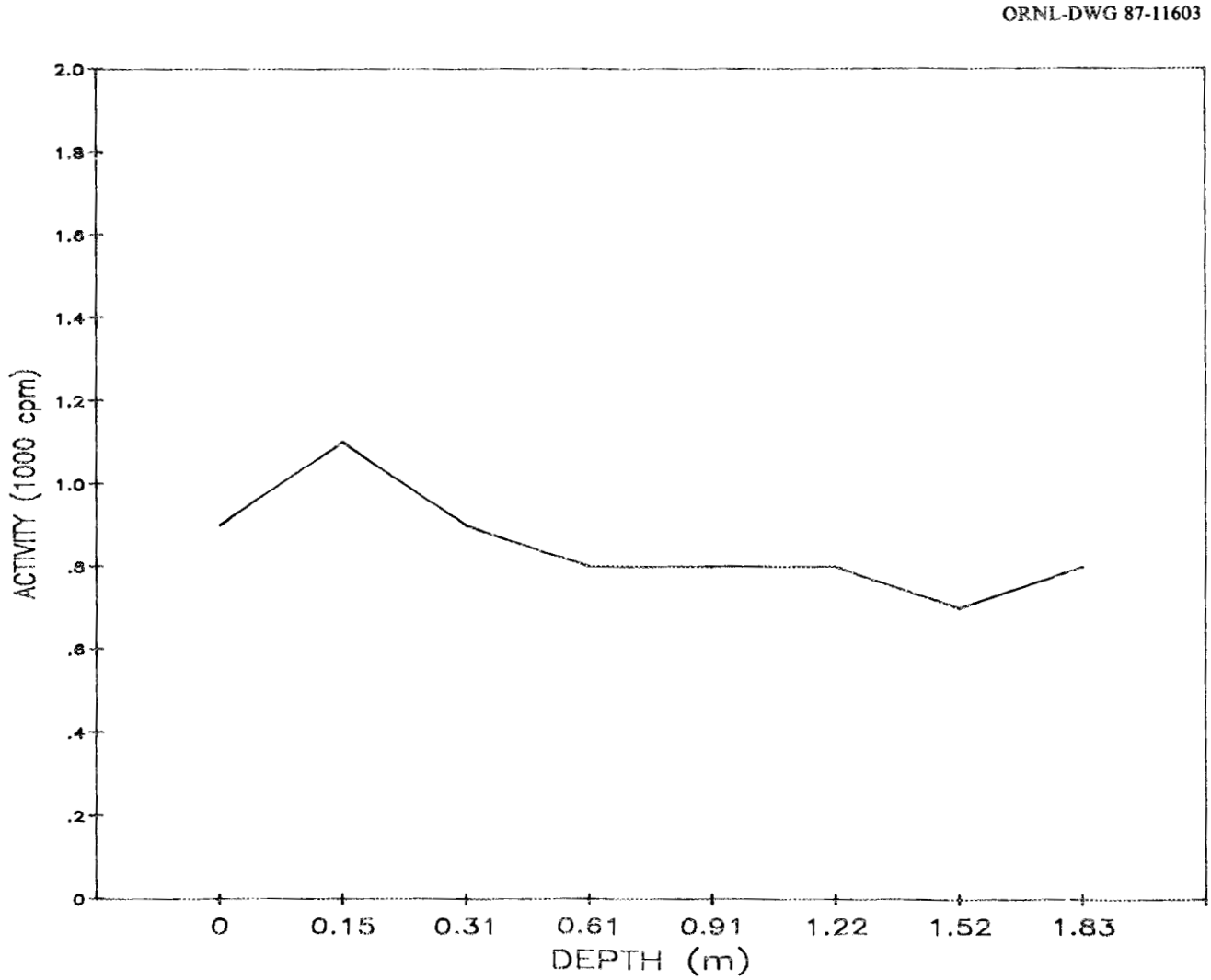

Fig. A.146. Gamma profile of auger hole 146.

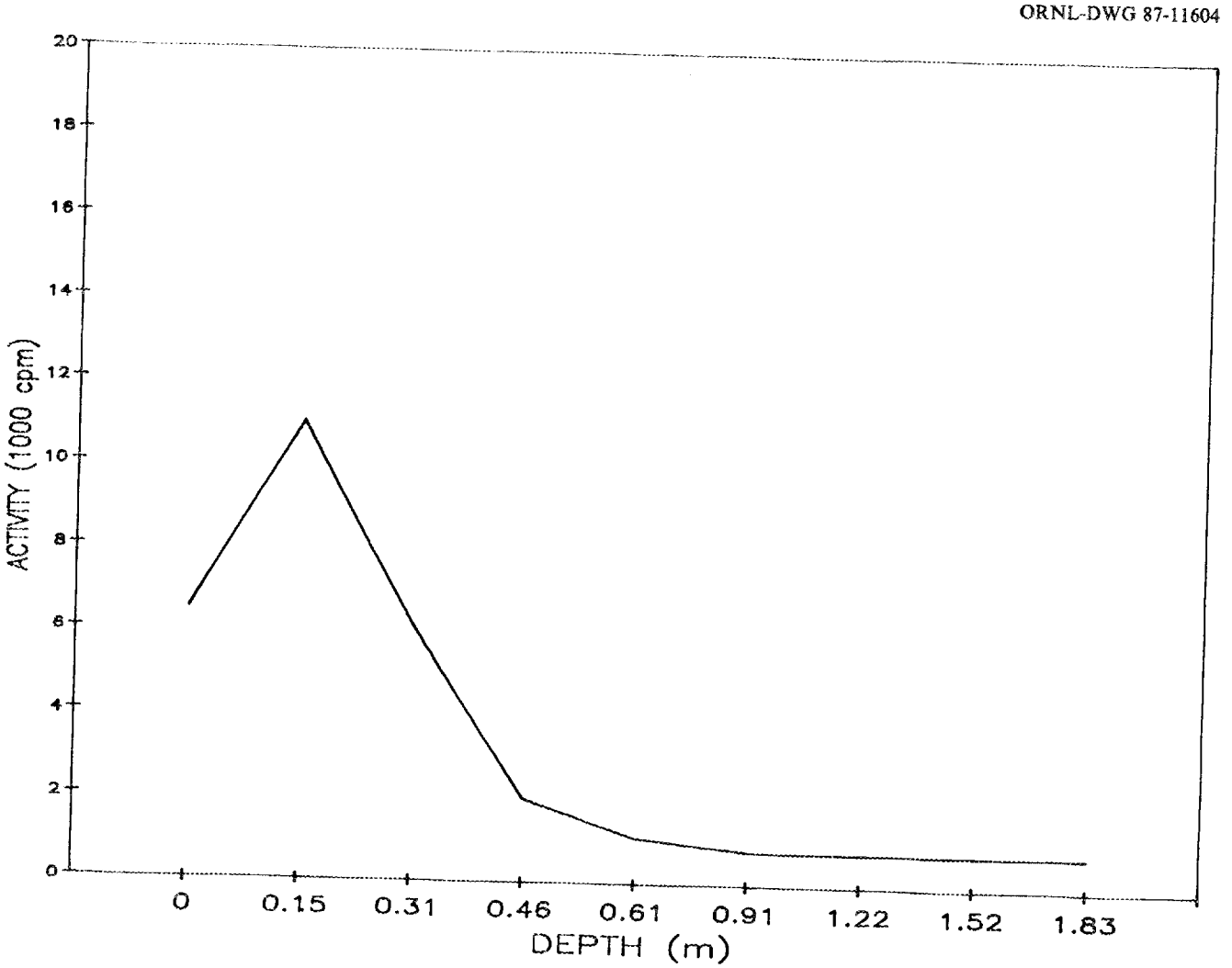

Fig. A.147. Gamma profile of auger hole 147.

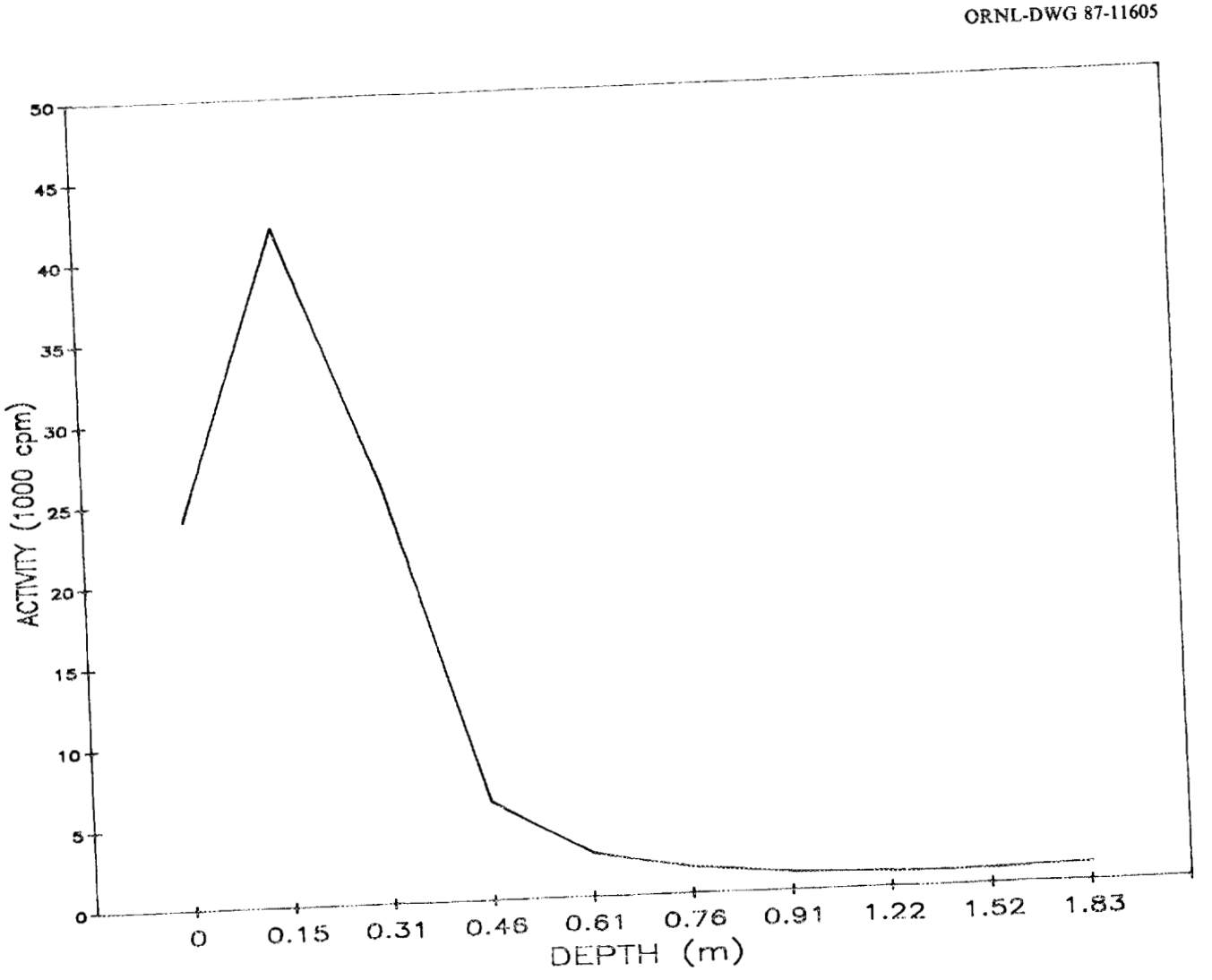

Fig. A.148. Gamma profile of auger hole 148.

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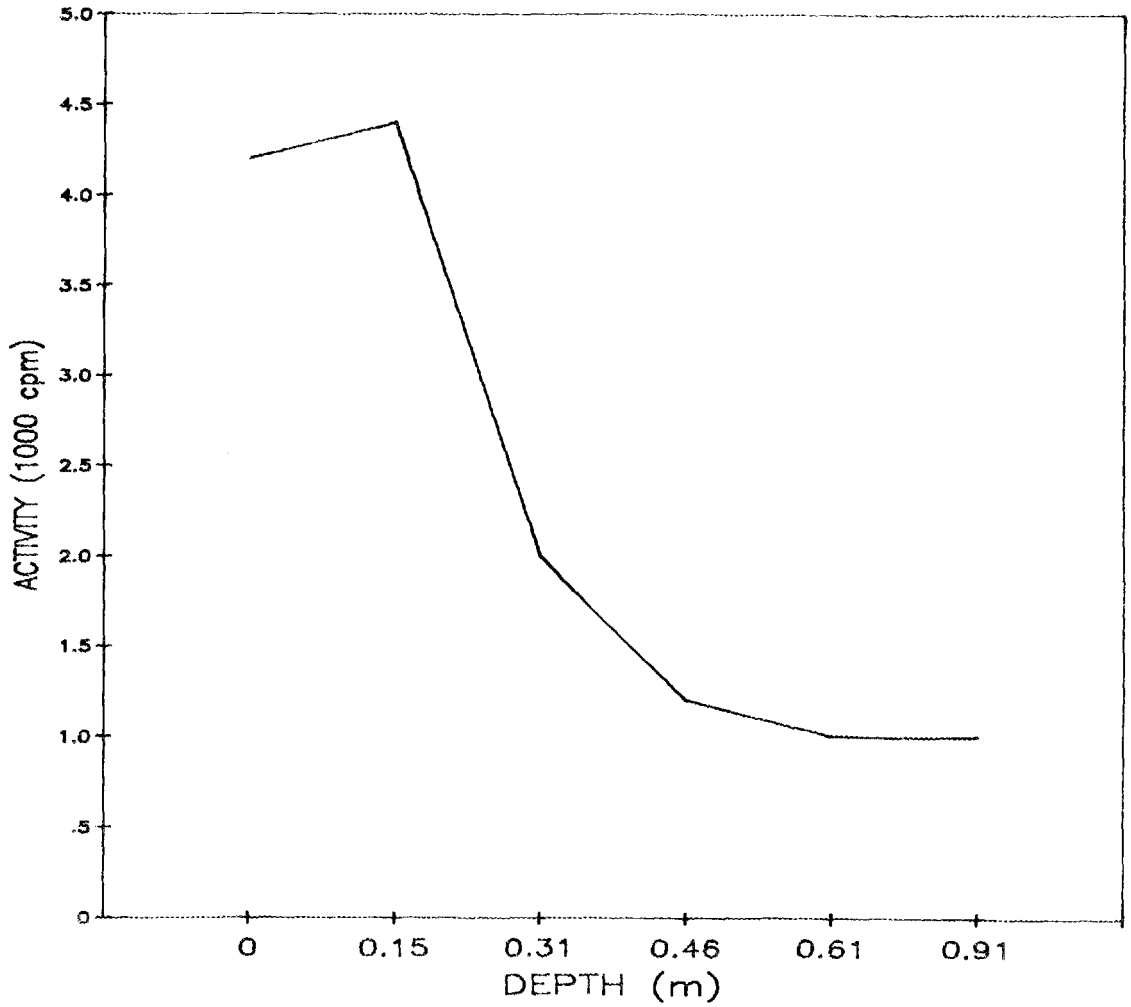

Fig. A.149. Gamma profile of auger hole 149.

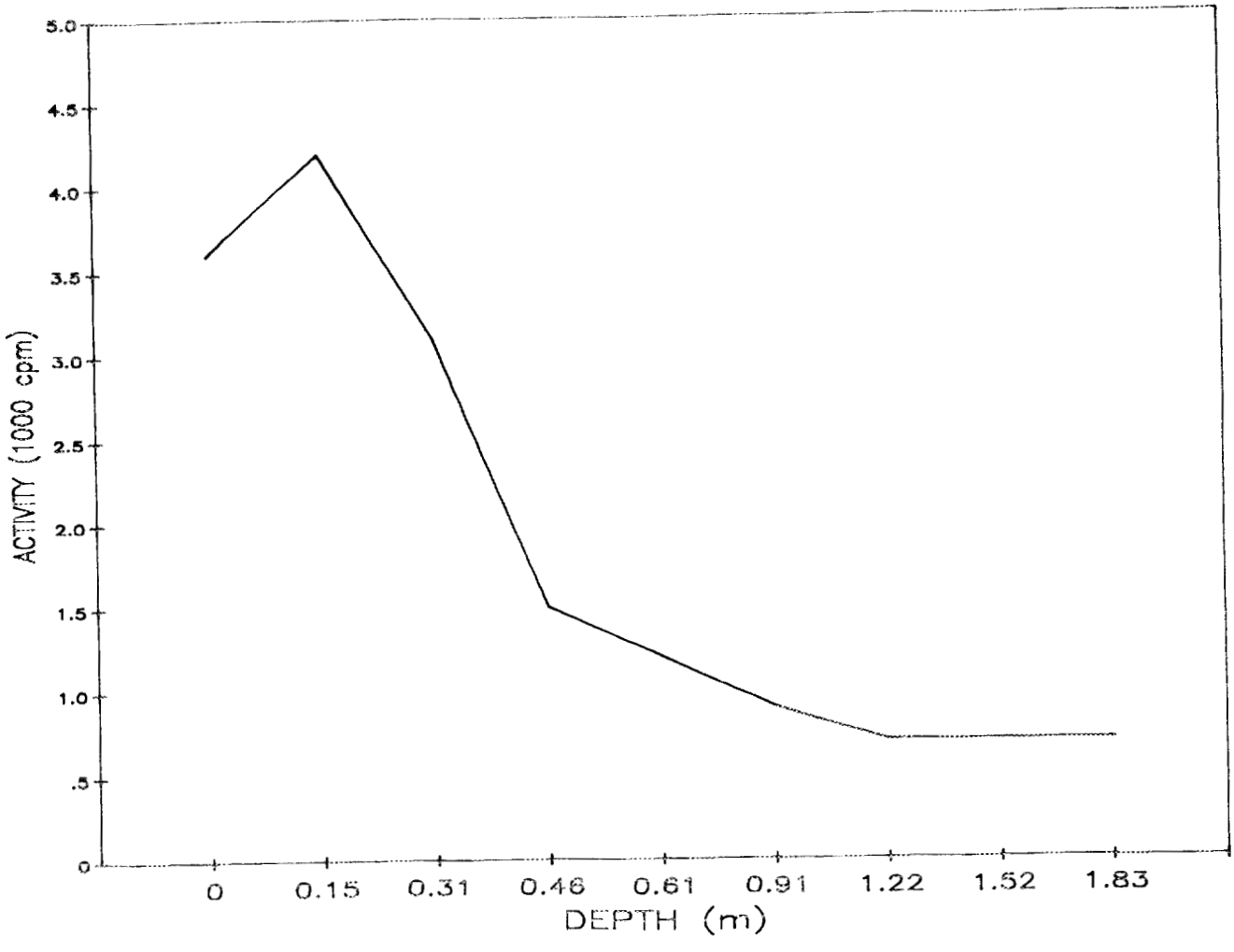

Fig. A.150. Gamma profile of auger hole 150.

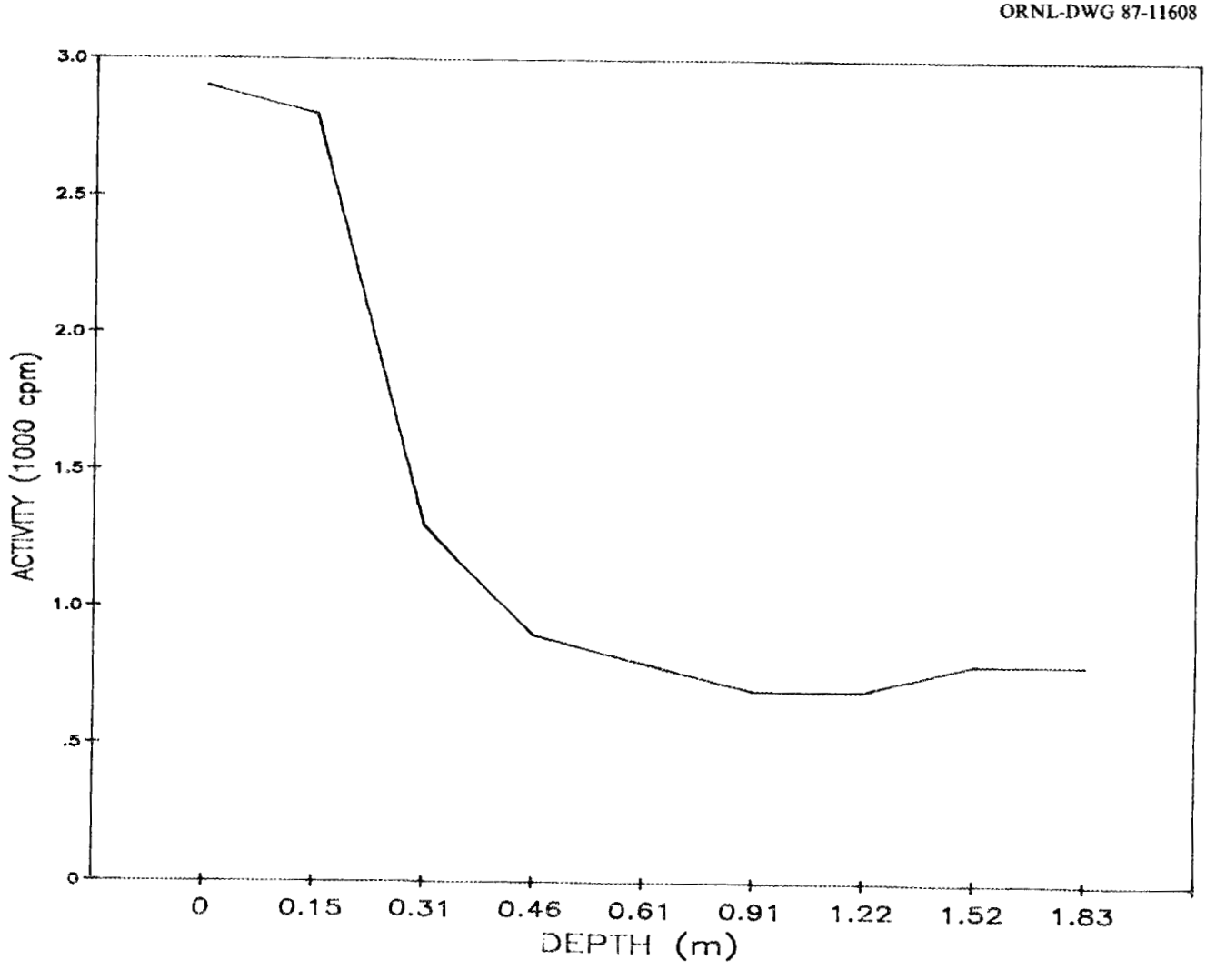

Fig. A.151. Gamma profile of auger hole 151.

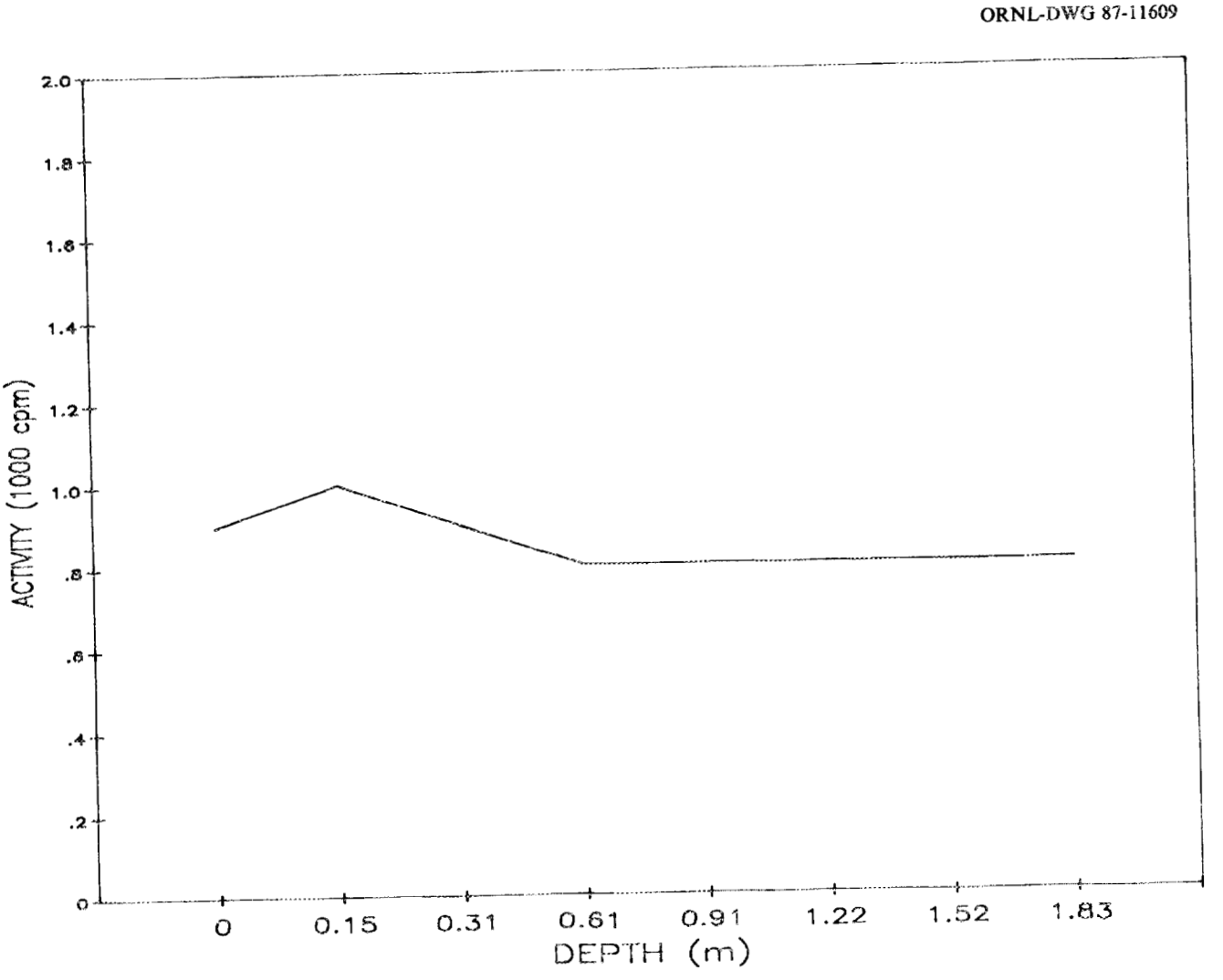

Fig. A.152. Gamma profile of auger hole 152.

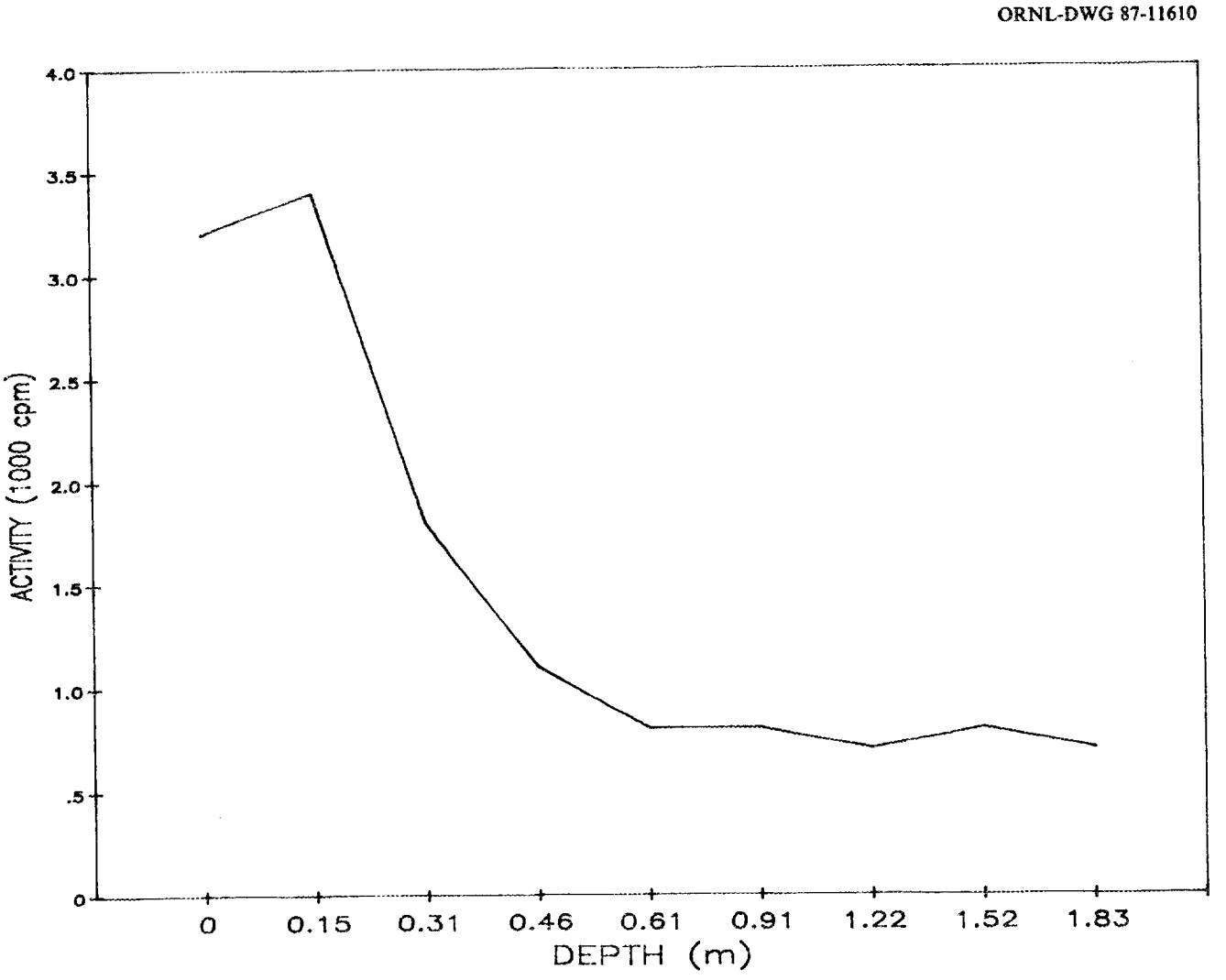

Fig. A.153. Gamma profile of auger hole 153.

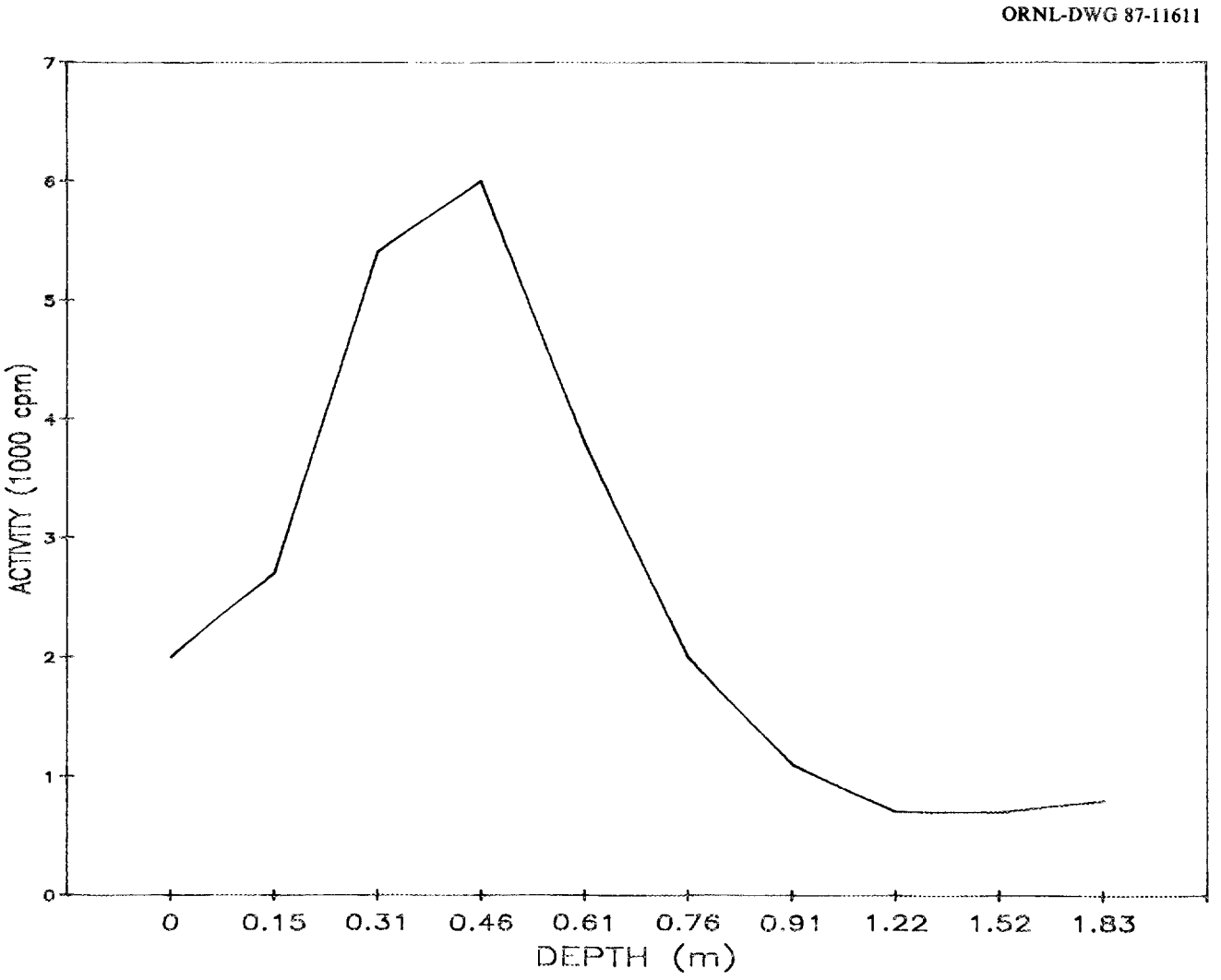

Fig. A.154. Gamma profile of auger hole 154.

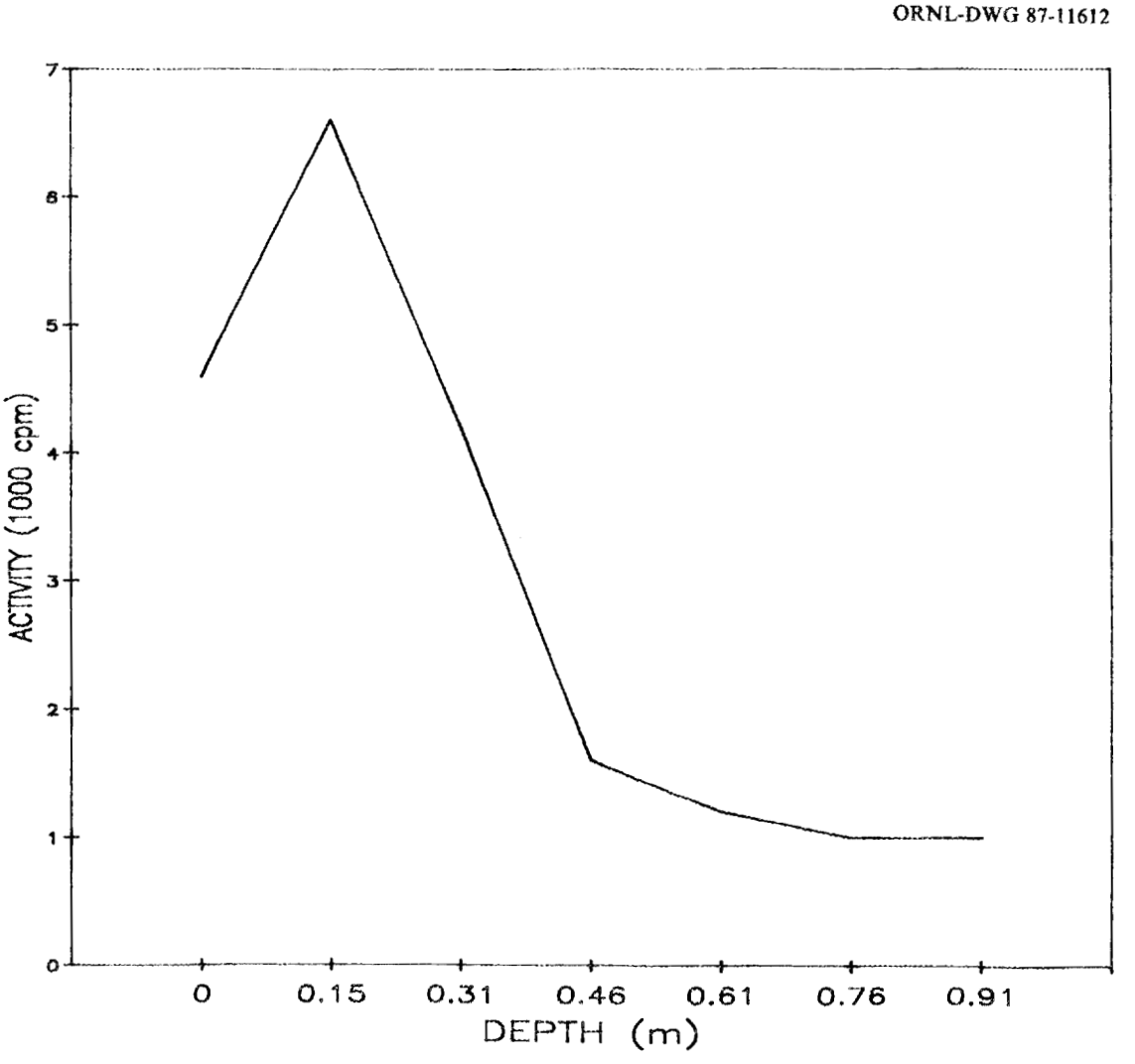

Fig. A.155. Gamma profile of auger hole 155.

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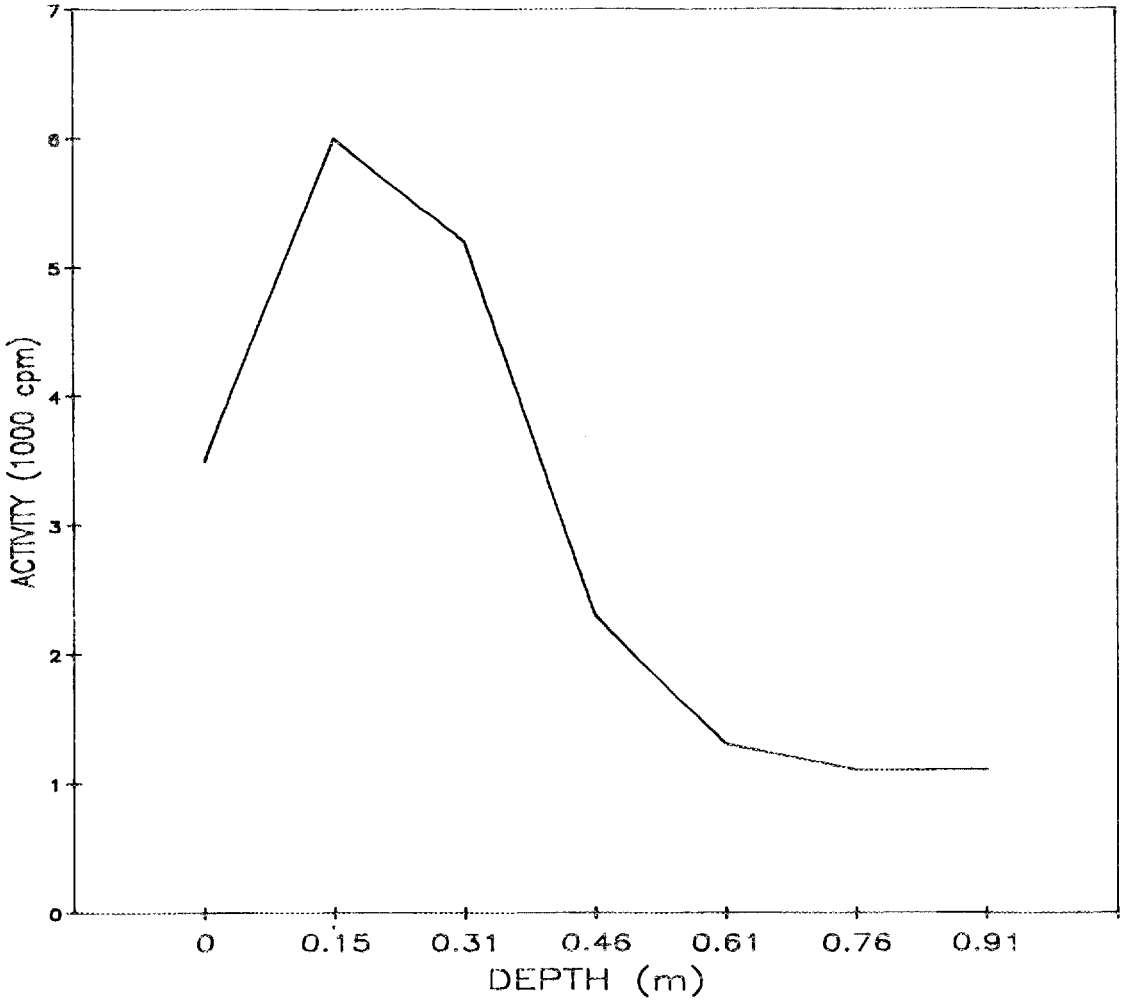

Fig. A.156. Gamma profile of auger hole 156.

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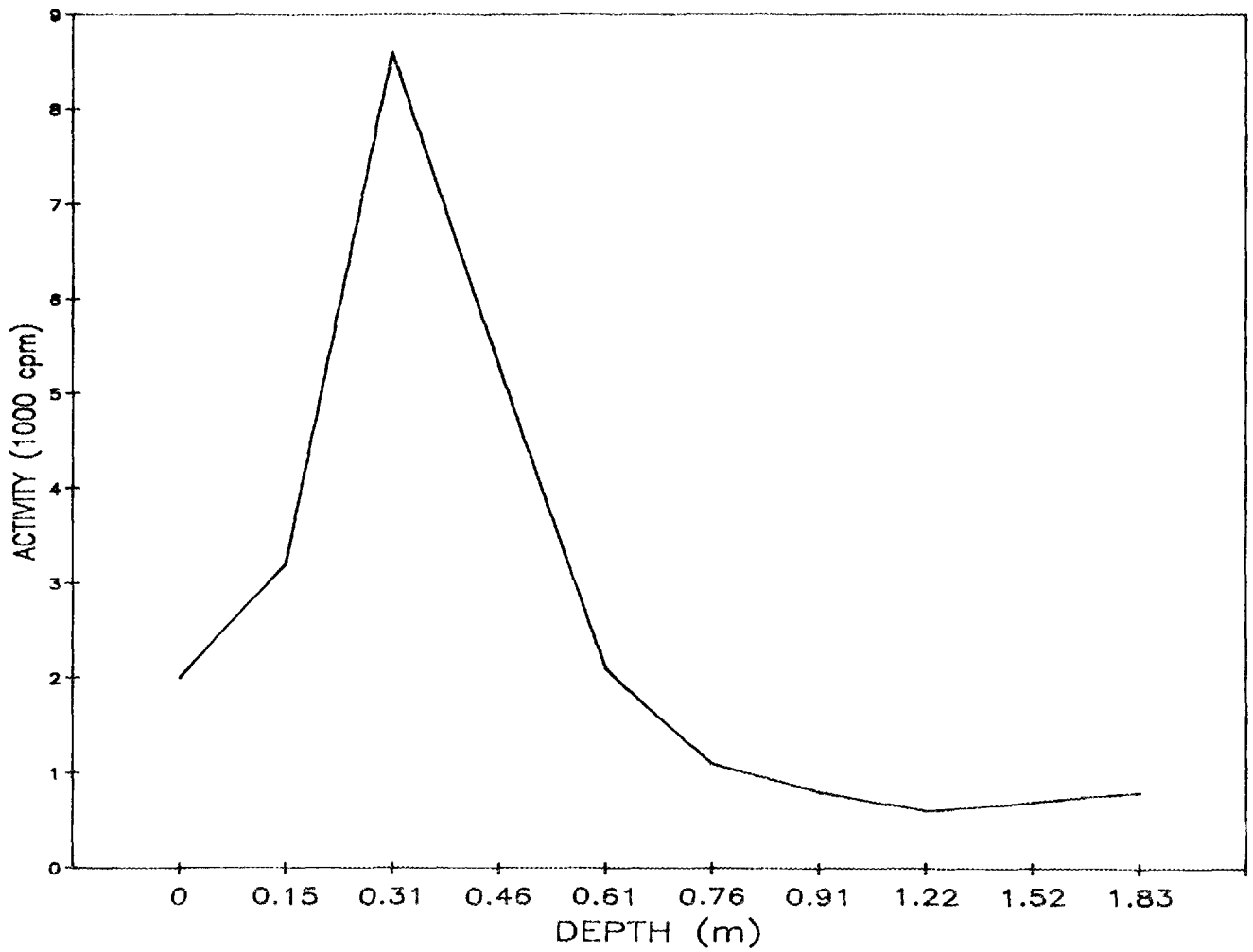

Fig. A.157. Gamma profile of auger hole 157.

ORNL-DWG 87-11615

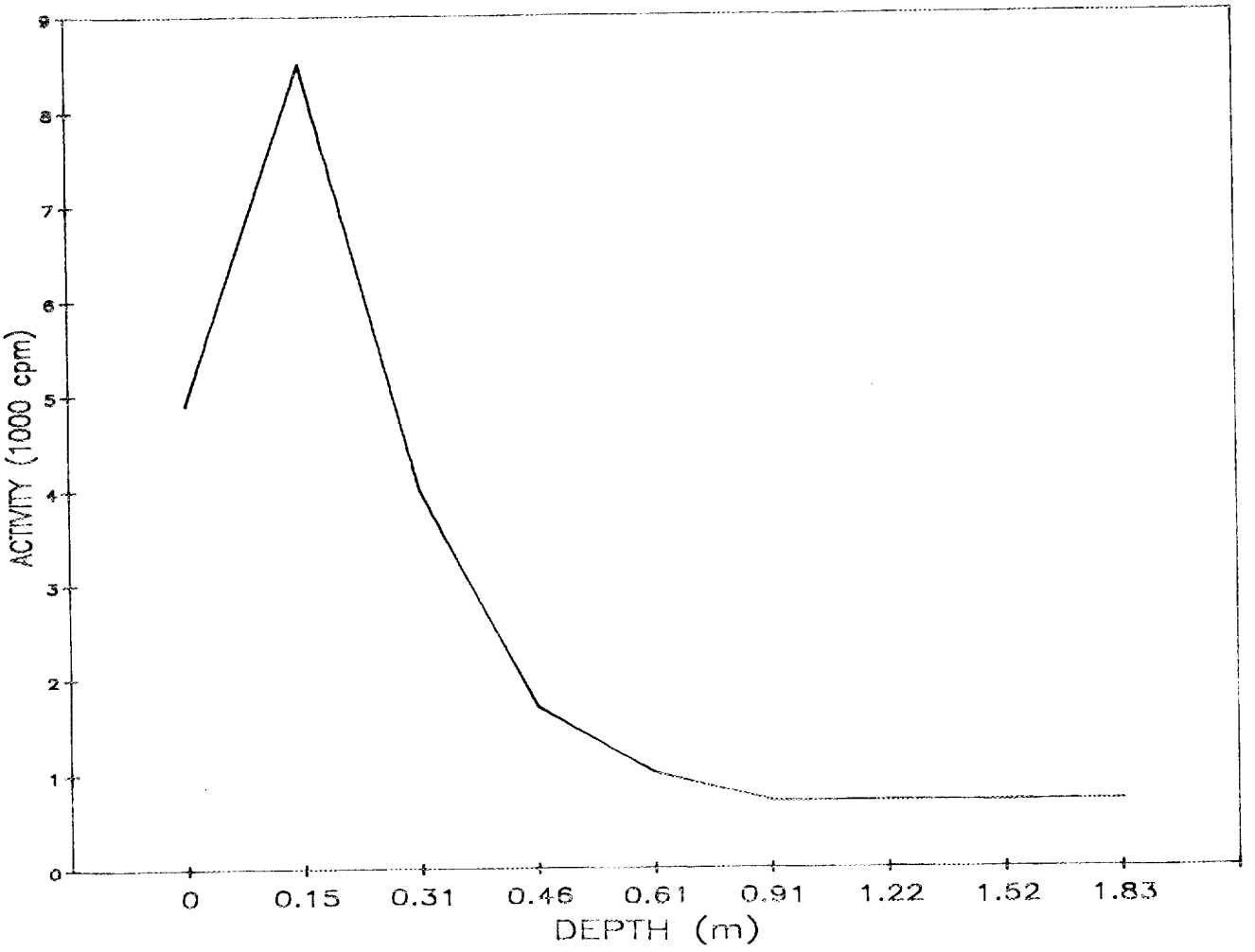

Fig. A.158. Gamma profile of auger hole 158.

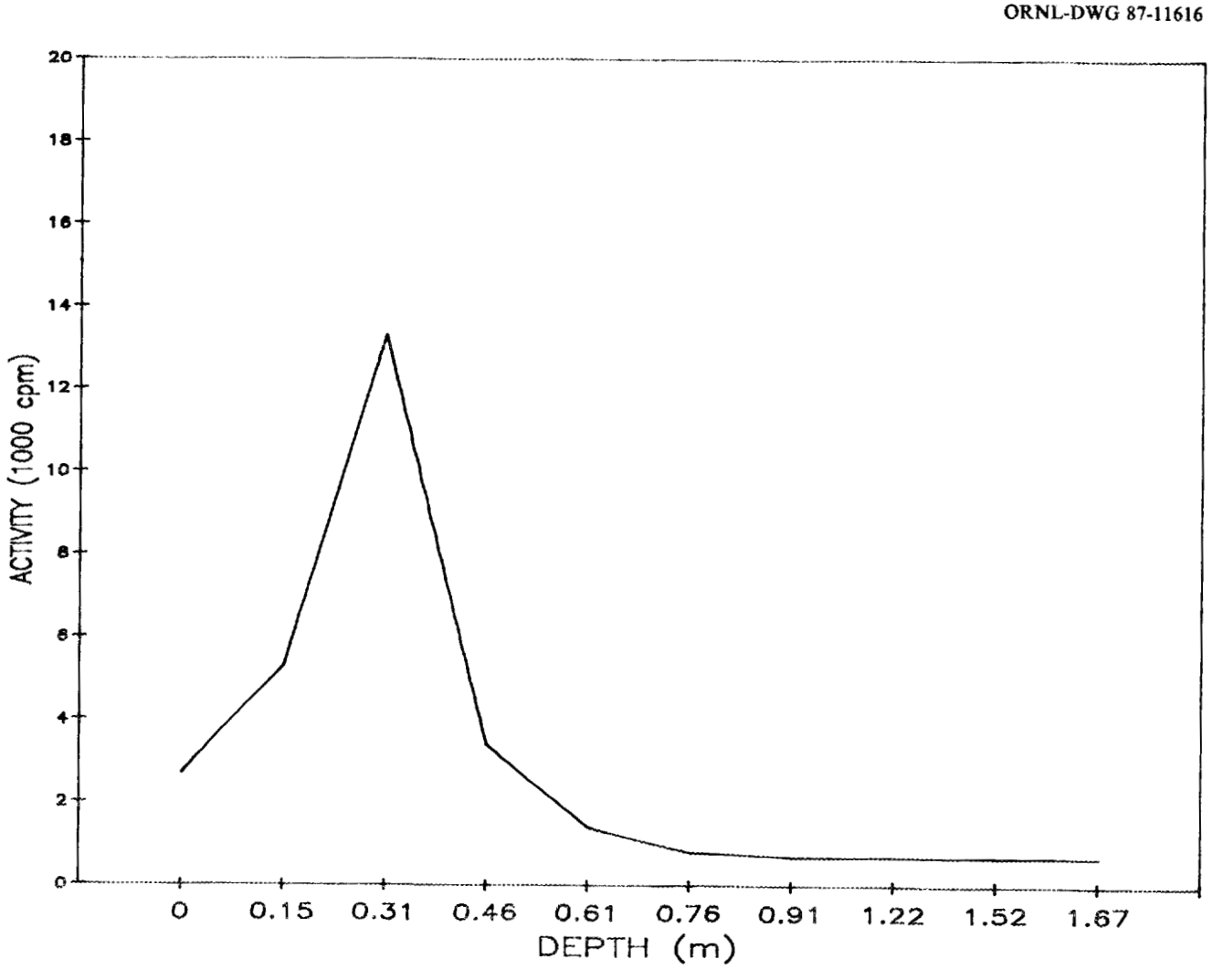

Fig. A.159. Gamma profile of auger hole 159.

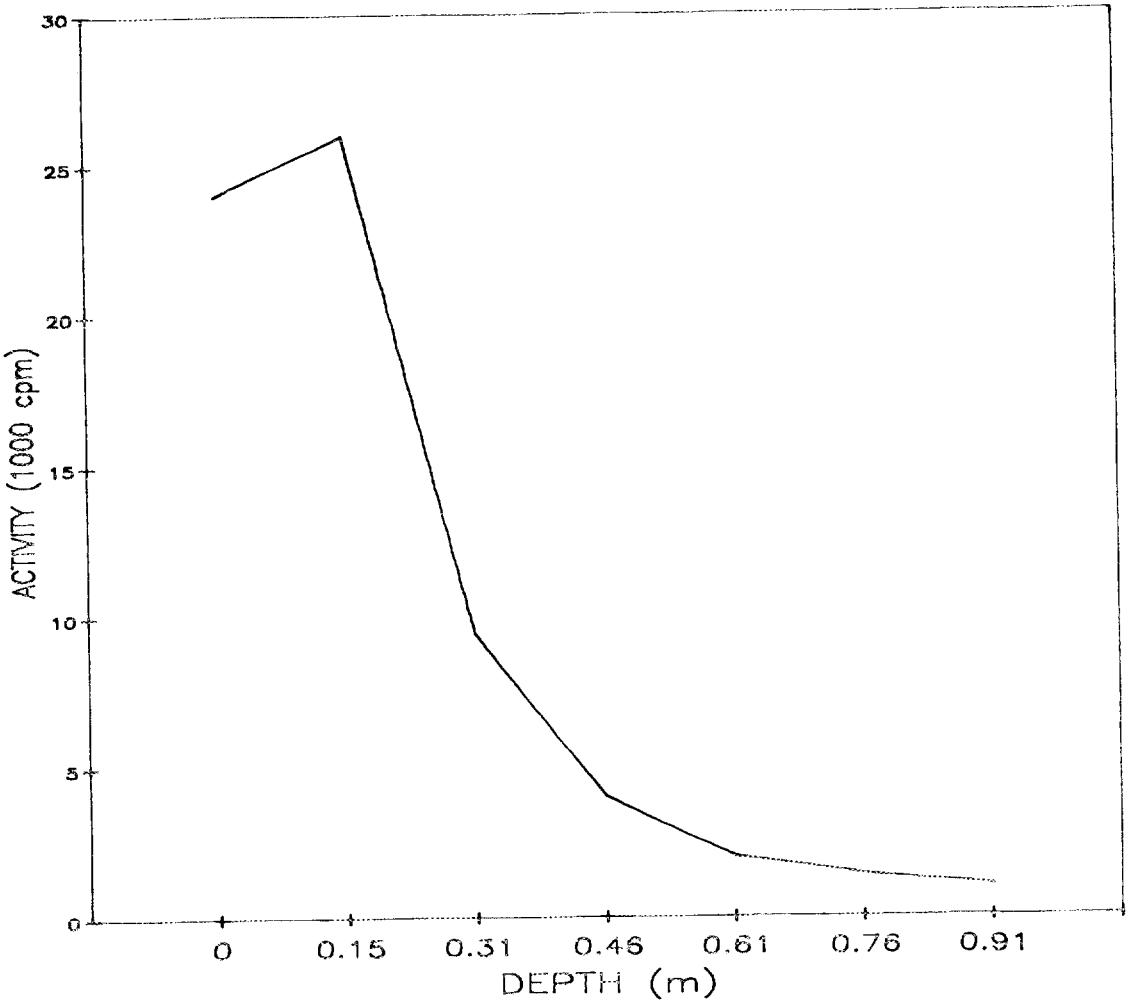

Fig. A.160. Gamma profile of auger hole 160.

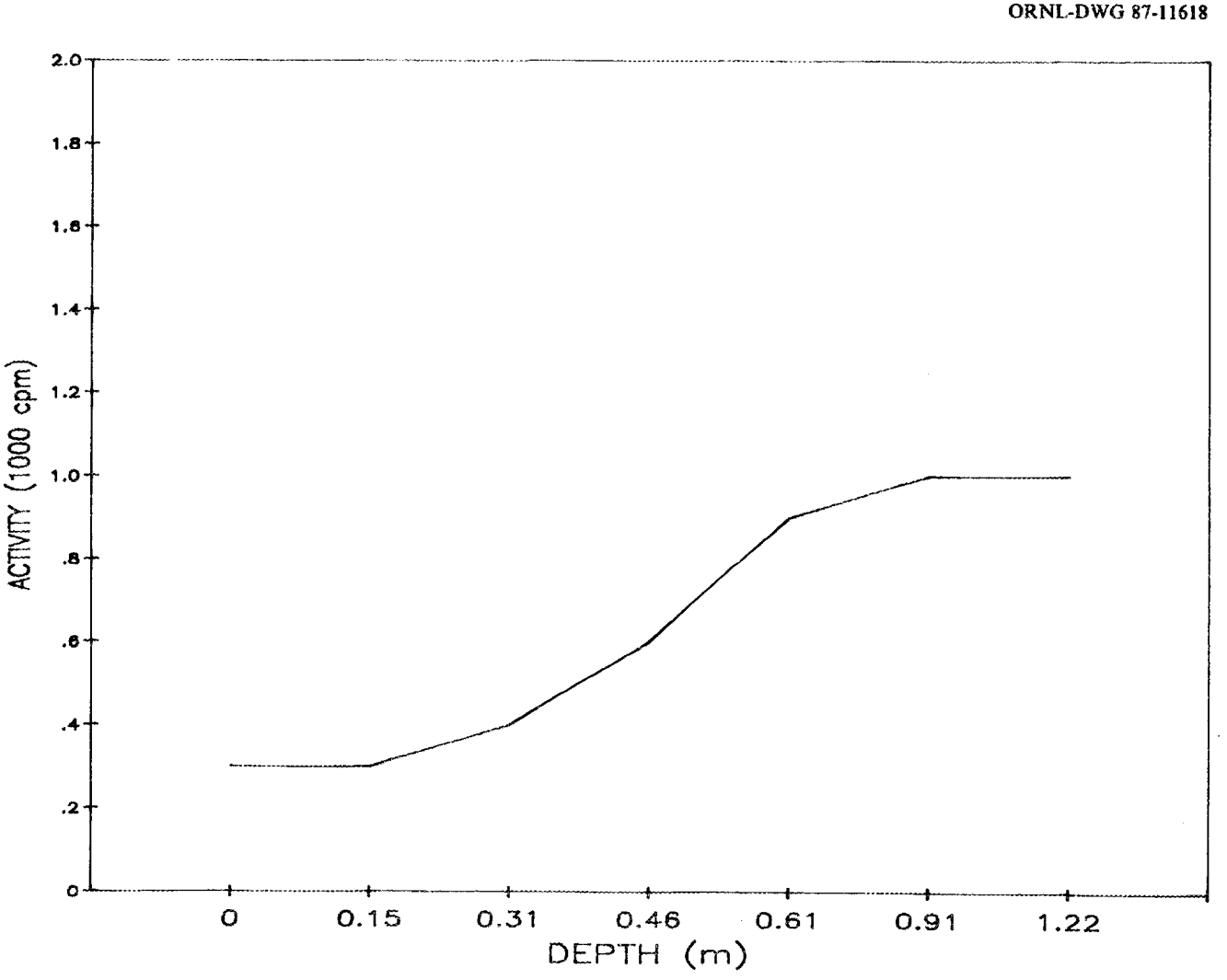

Fig. A.161. Gamma profile of auger hole 161.

ORNL-DWG 87-11619

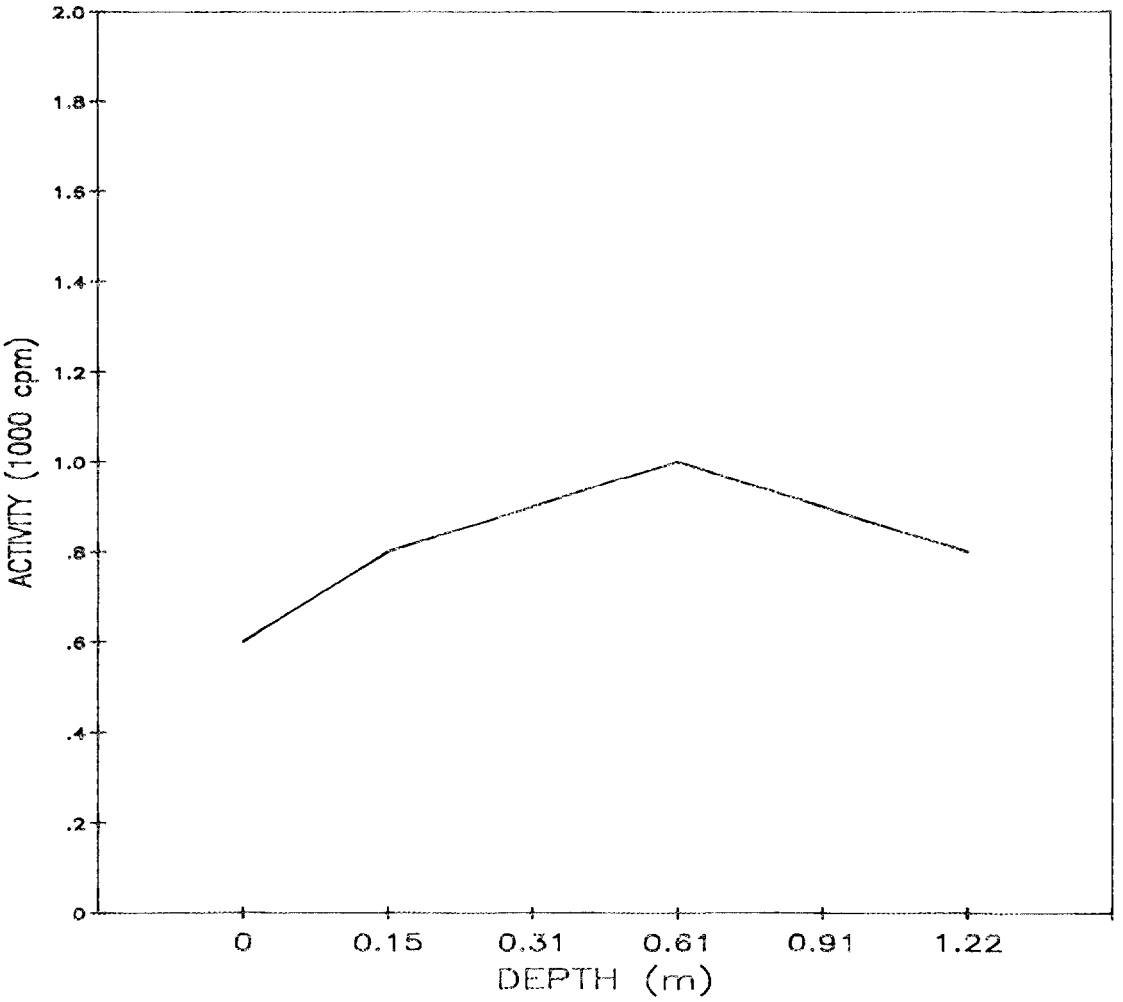

Fig. A.162. Gamma profile of auger hole 162.

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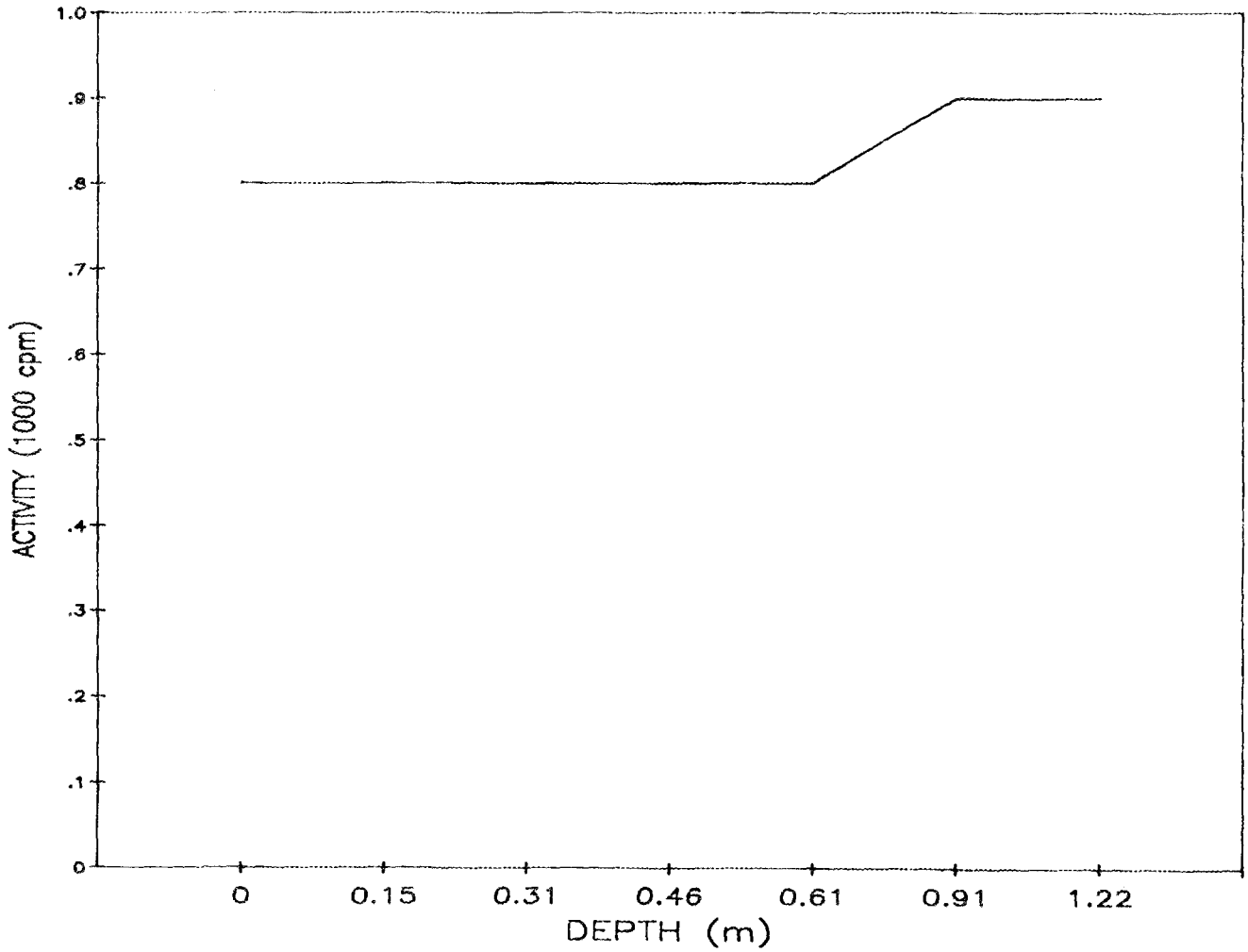

Fig. A.163. Gamma profile of auger hole 163.

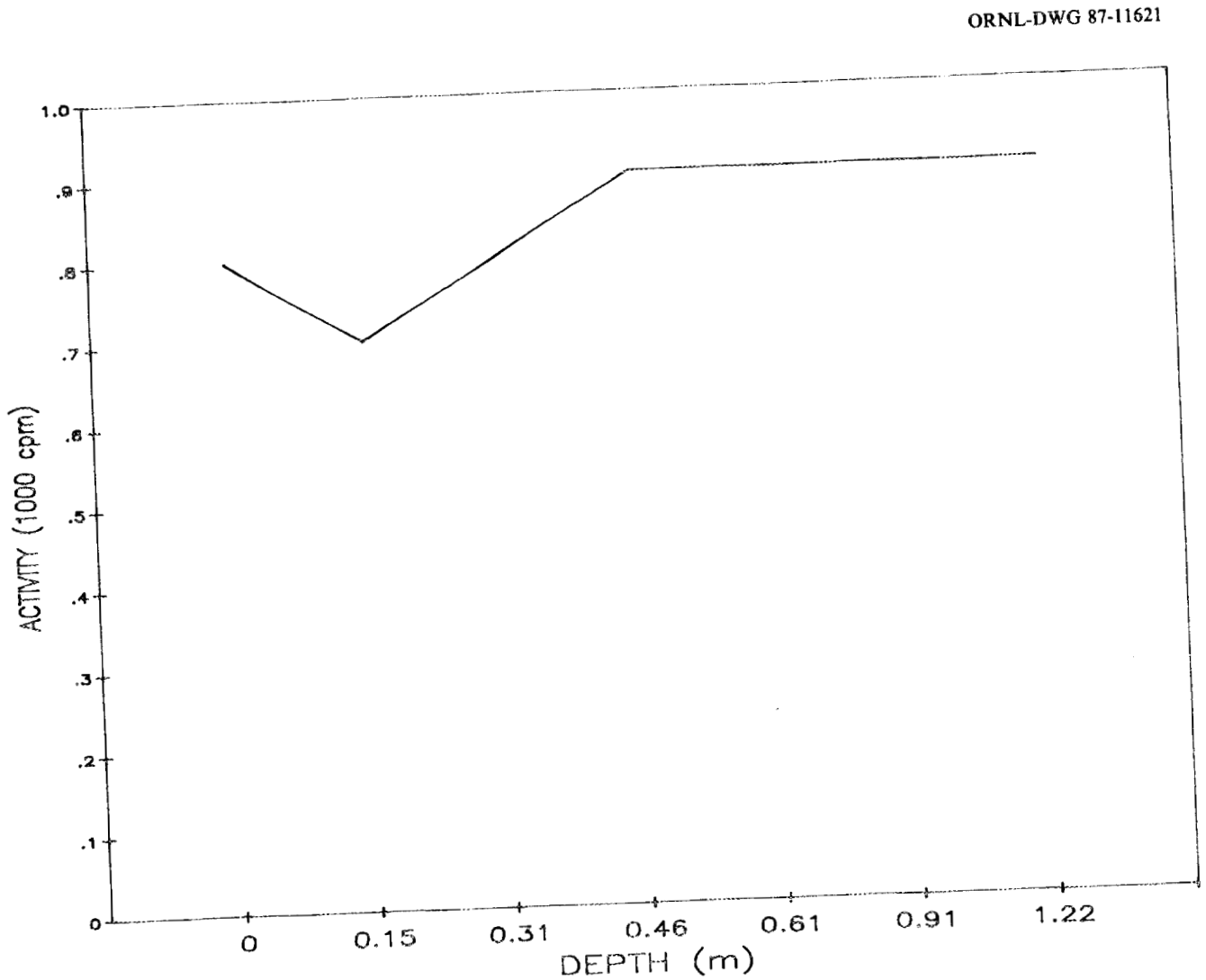

Fig. A.164. Gamma profile of auger hole 165.

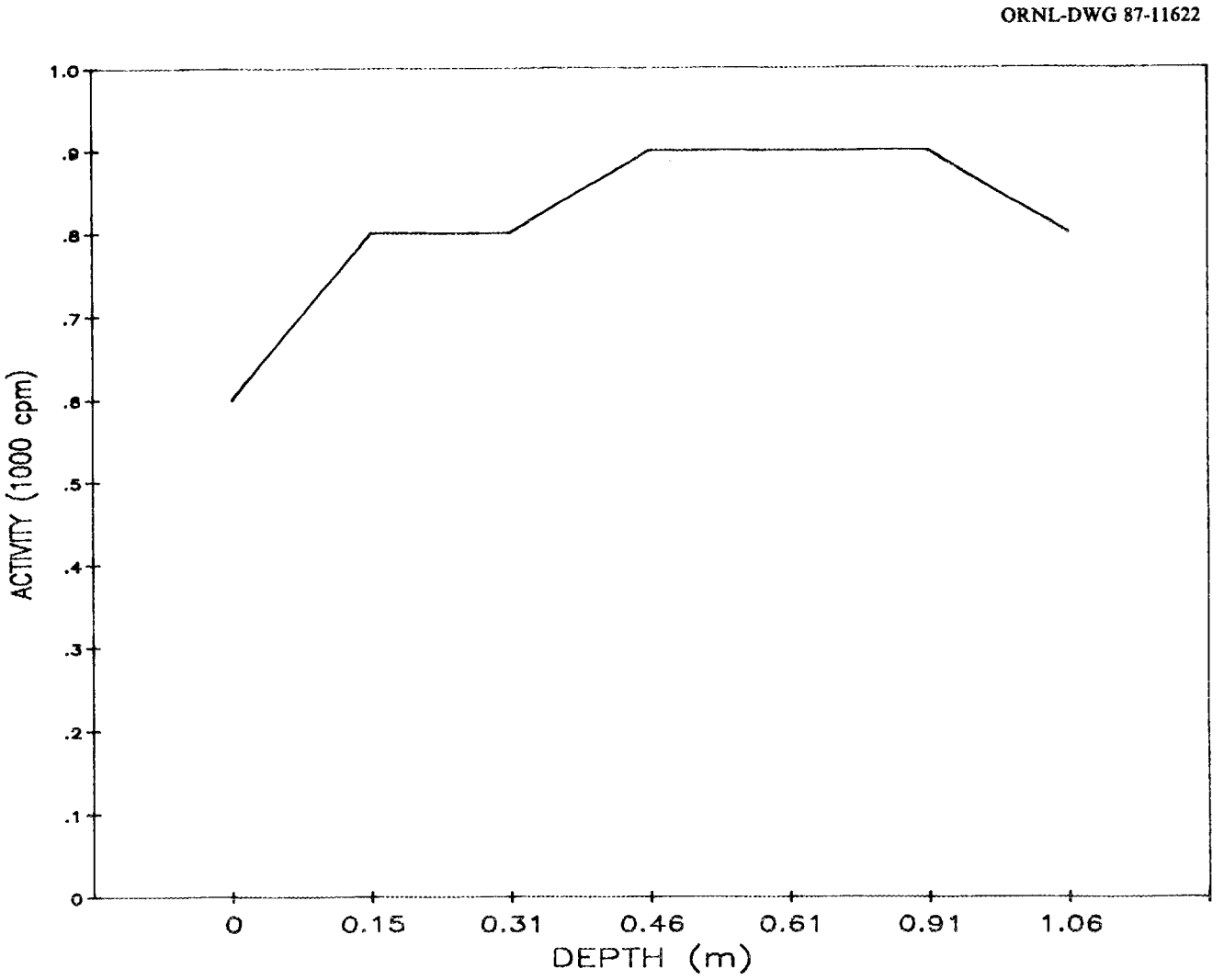

Fig. A.165. Gamma profile of auger hole 166.

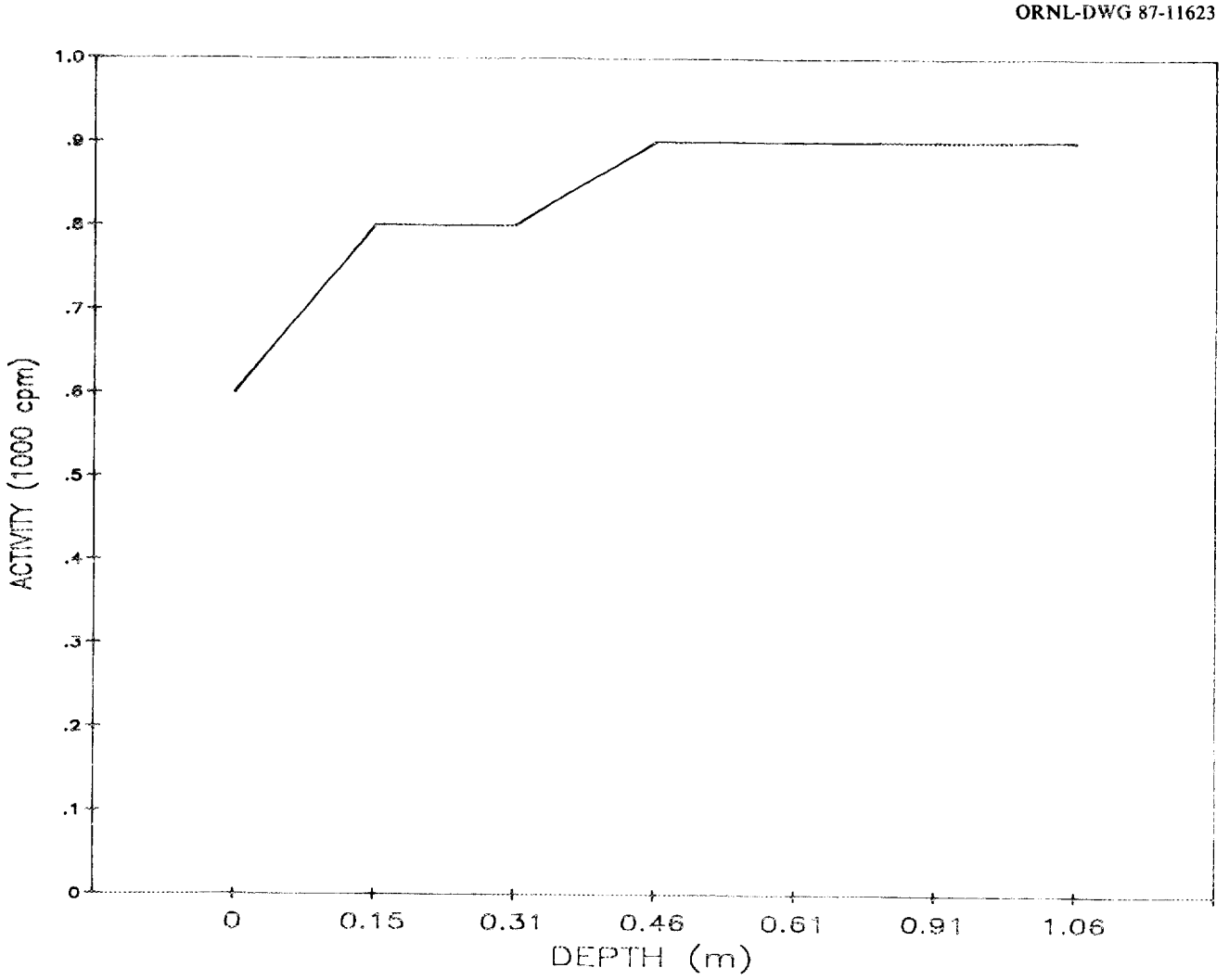

Fig. A.166. Gamma profile of auger hole 167.

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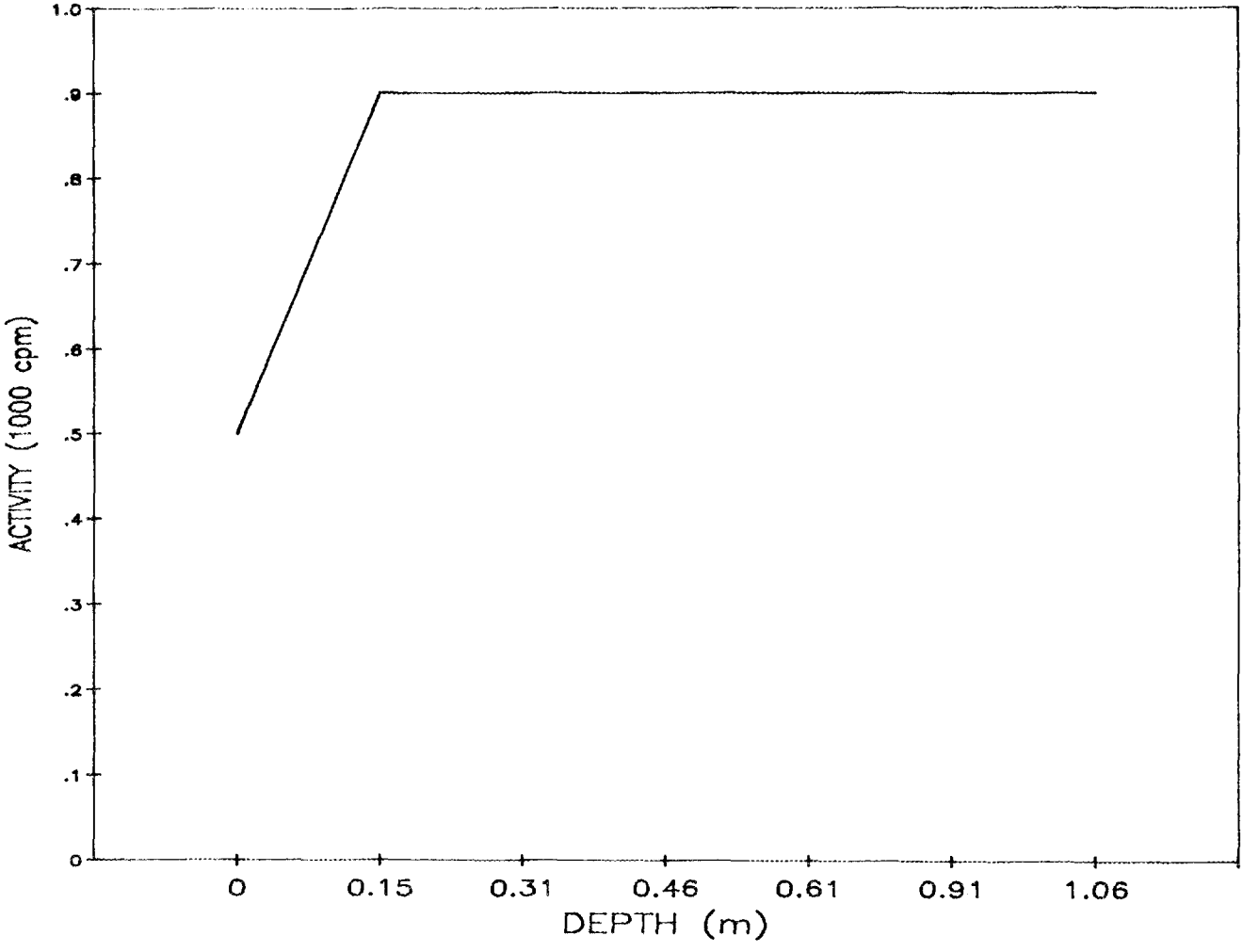

Fig. A.167. Gamma profile of auger hole 168.

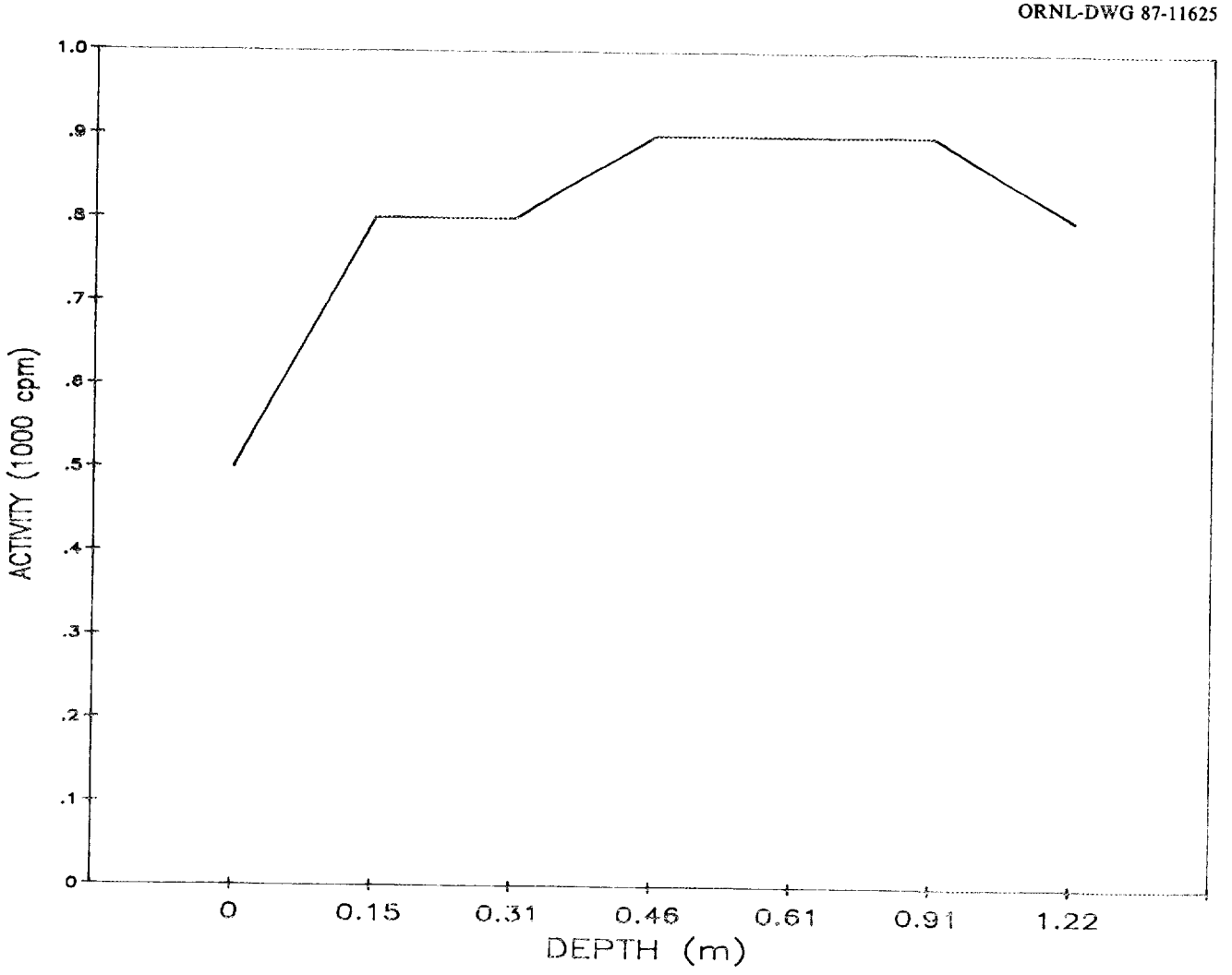

Fig. A.168. Gamma profile of auger hole 169.

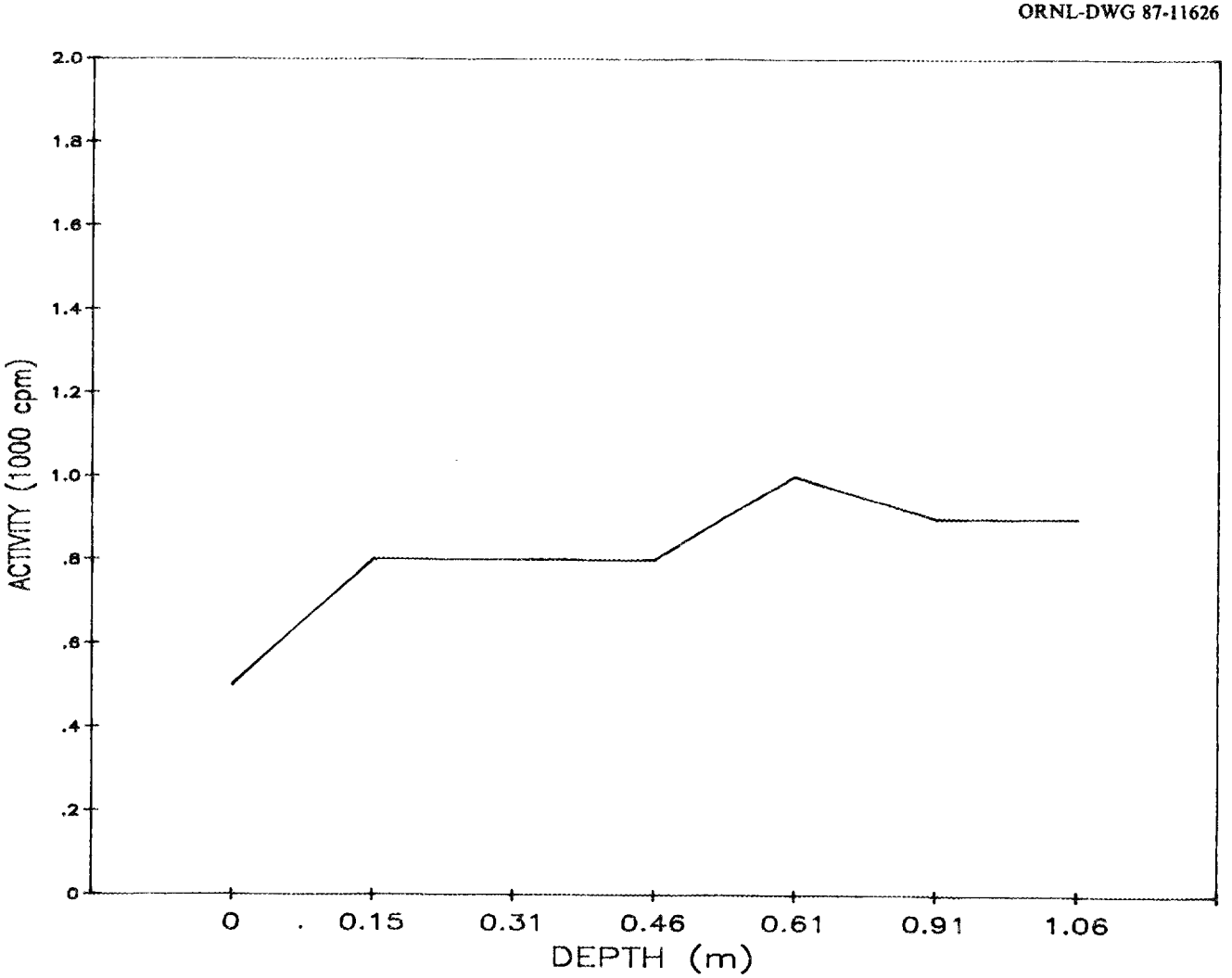

Fig. A.169. Gamma profile of auger hole 170.

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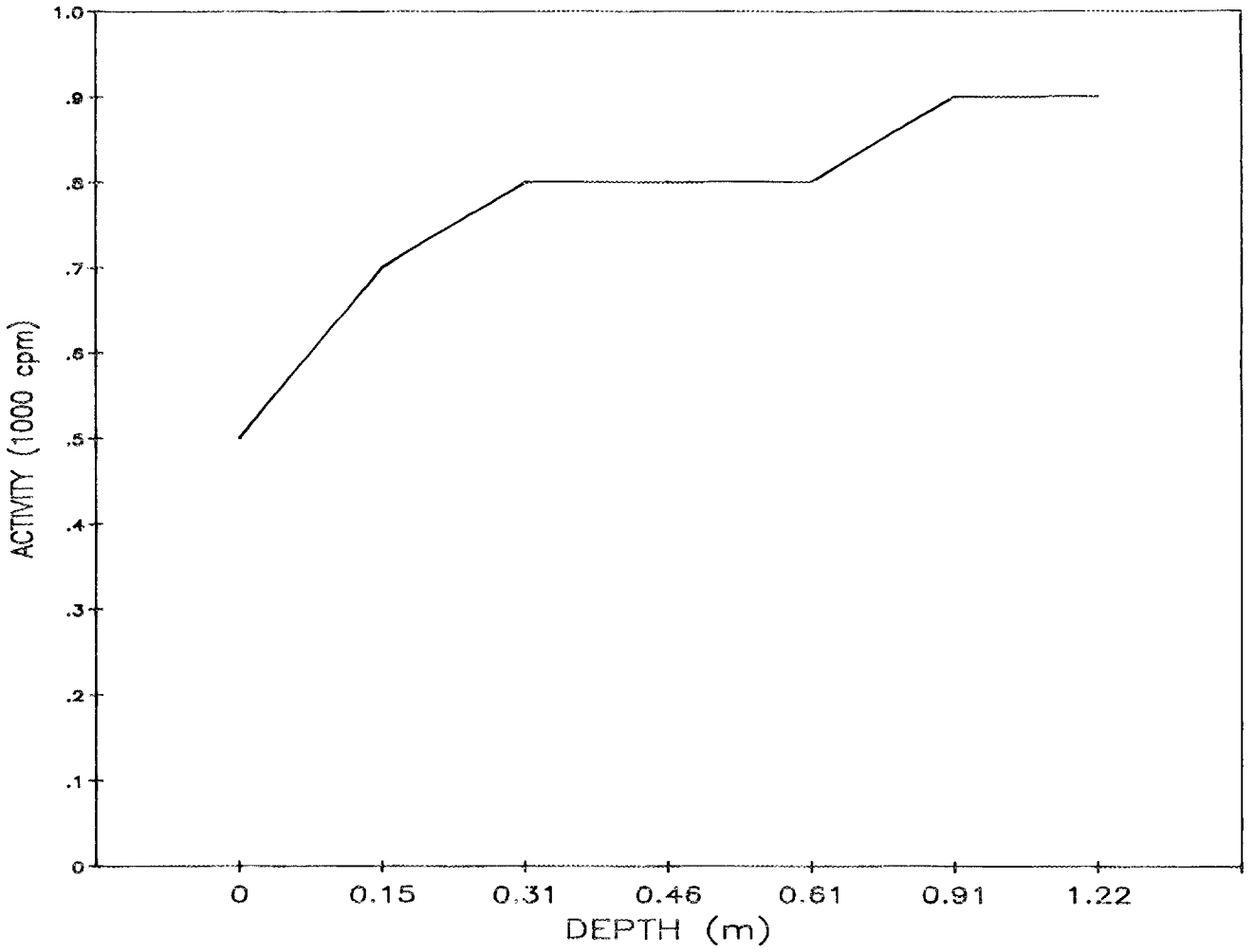

Fig. A.170. Gamma profile of auger hole 171.

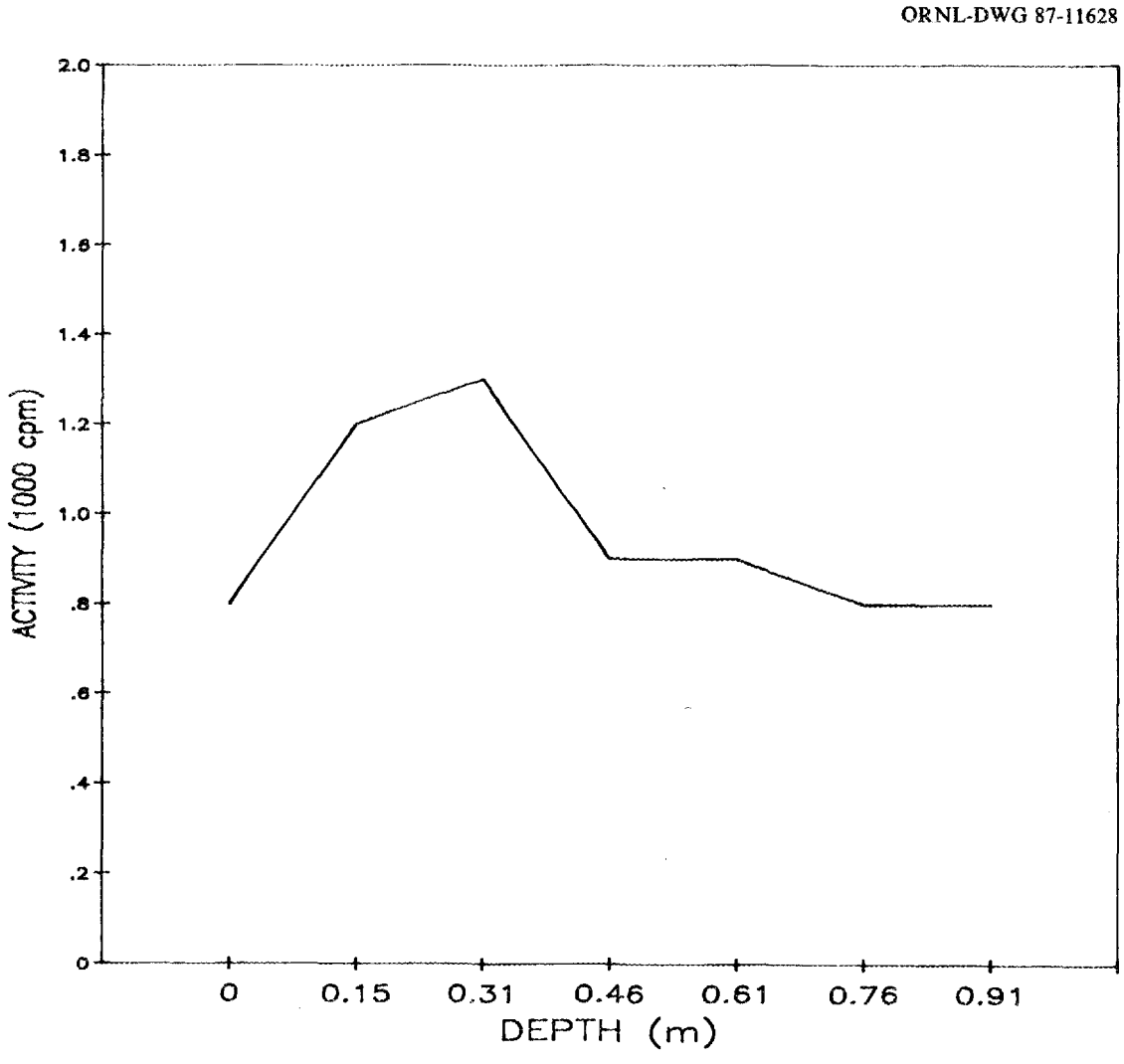

Fig. A.171. Gamma profile of auger hole 172.

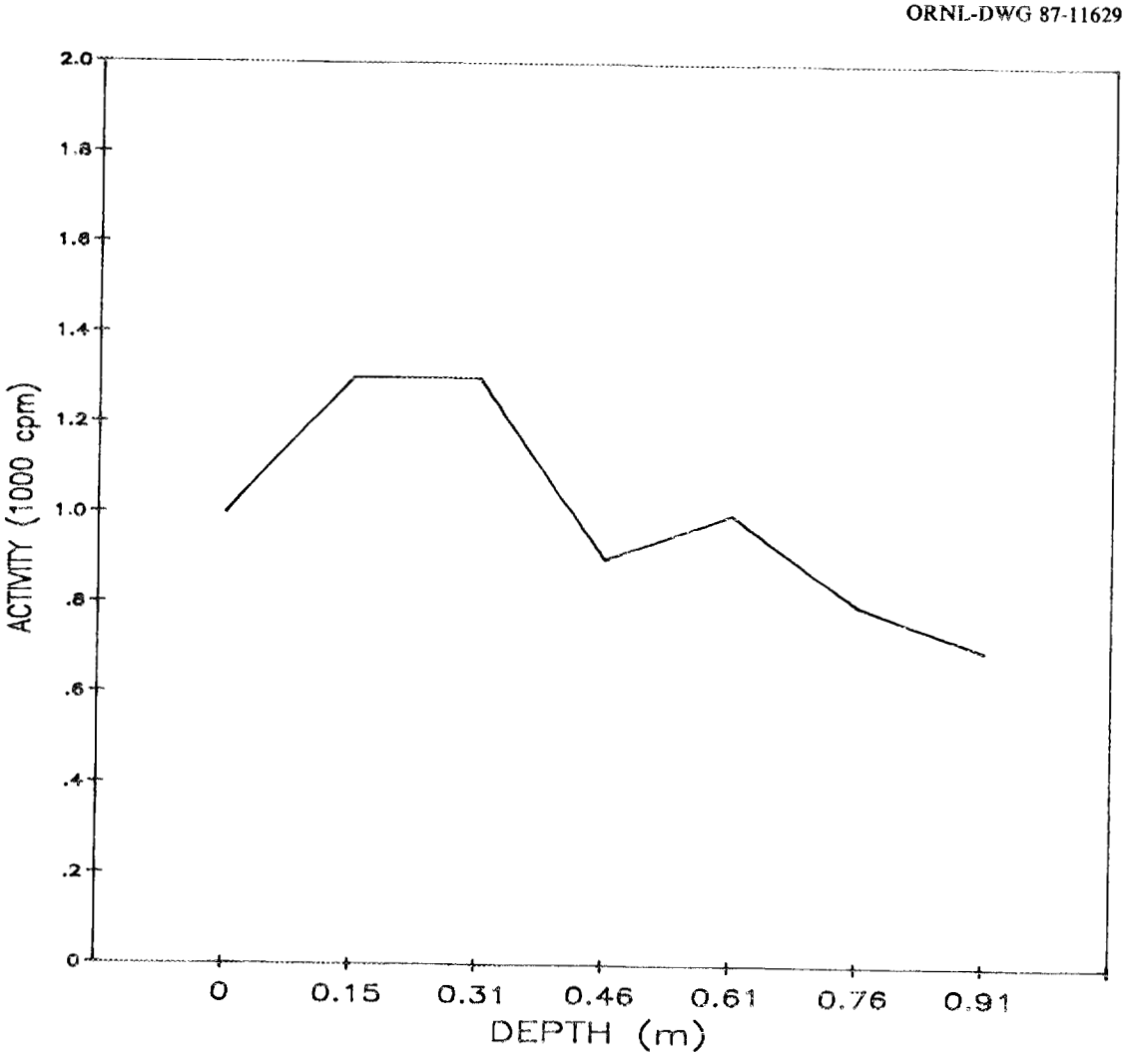

Fig. A.172. Gamma profile of auger hole 173.

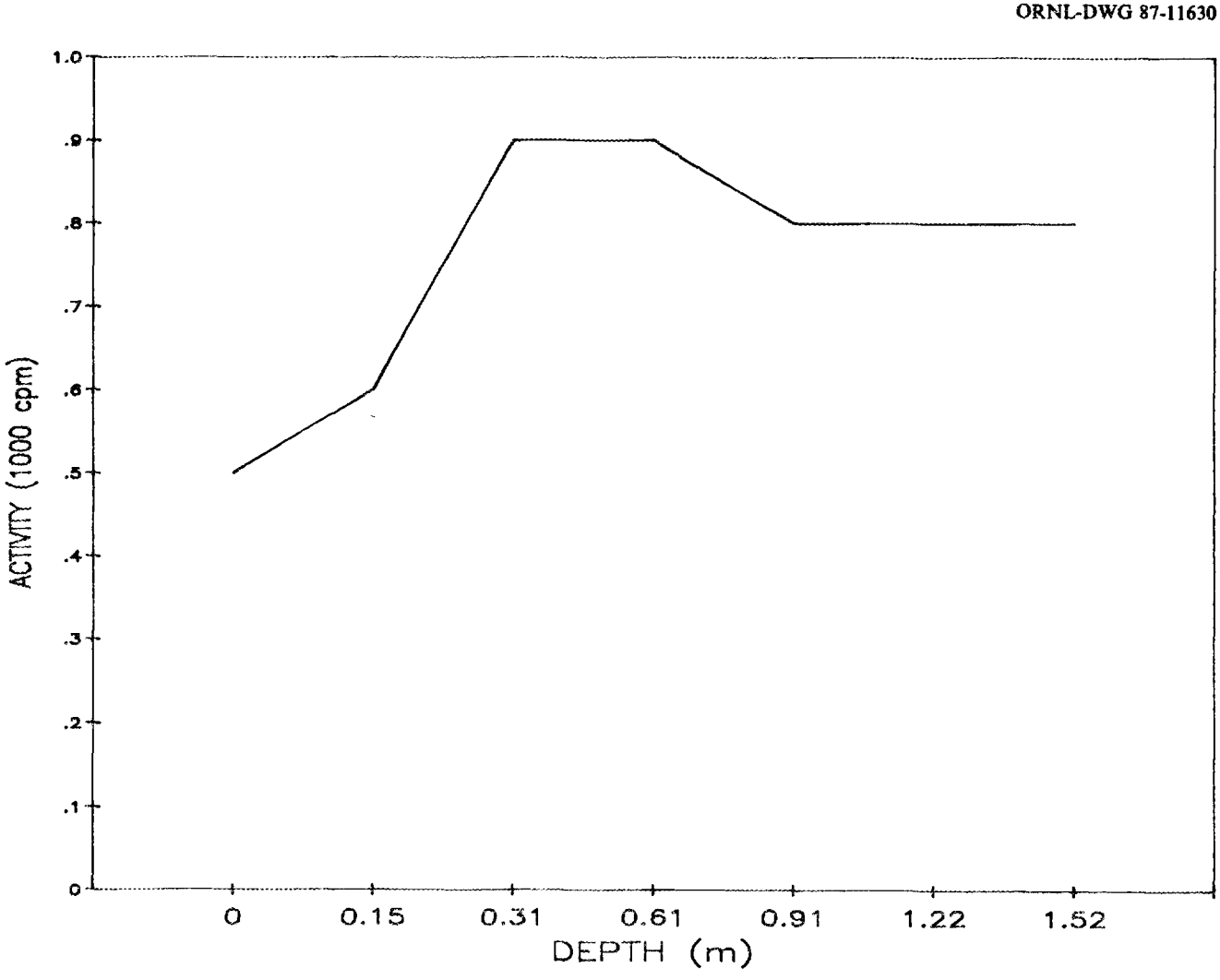

Fig. A.173. Gamma profile of auger hole 215.

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