Department of Energy
Los Alamos Area Office
Albuquerque Operations Office
Los Alamos, New Mexico 87544

DEC 12 1994

Mr. William Honker, Chief
RCRA Permits Branch
Hazardous Waste Management Division
U. S. Environmental Protection Agency
Region 6
1445 Ross Avenue, Suite 1200
Dallas, TX 75202-2733

Dear Mr. Honker:

Subject: List of Modifications for the Operable Unit (OU) 1086 Resource Conservation and Recovery Act Facility Investigation Work Plan

Enclosed is the response to questions raised in the informal List of Modifications provided by Ms. Barbara Driscoll for the subject OU. The modifications were discussed during a telephone conversation between Ms. Driscoll and Mr. Scott Kinkead, Field Team Manager for OU 1086, on November 1, 1994.

If you have any questions, please call me at (505) 665-7203.

Sincerely,

Theodore J. Taylor
Program Manager
Environmental Restoration Program

LAAMEP:7TT-057

Enclosure

cc:
See Page 2

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cc w/enclosure:
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Modifications
RFI Work Plan for Operable Unit 1086

1. The RFI Reports for this work plan are due as indicated below:

Report Date	SWMUs
7/30/95	**15-004(a,b,c,f), 15-007(b), 15-008(a,b), 15-009(e), 15-009(j), 15-012(b)**
7/30/96	**15-004(g), 15-007(a), 15-008(c), 15-009(f,i), 15-010(b,c), 15-011(a–c), 15-014(a,b,i–l)**
7/30/97	**15-006(c,d)**

The following SWMUs are to be sampled re the NOD Response, but there is no date indicated:

15-009(a) **15-010(a)**

Response: All SWMUs identified as needing RFI reports by 7/30/95 were addressed in the sampling campaign in FY94 and early FY95, except for SWMU 15-009(j), a septic tank that was pumped out and abandoned in 1992. The tank was not sampled because there are no contents to sample.

SWMU 15-009(a) Septic tank and sump are scheduled to be sampled in spring of 1995; RFI report will be prepared for release on 7/30/96.

SWMU 15-010(a) Potential release site is scheduled for sampling in Spring of 1995; RFI report will be prepared for release on 7/30/96.

2. Area of Concern (AOC) C-15-008 does not need to be added to Module VIII of the RCRA permit.

Response: LANL will not add AOC C-15-008 to the Module VIII RCRA permit.

3. Response 3(b) LANL has not answered the question. Where are the wells located?

Response: The three wells are located in OU 1130, approximately 1.8 mi. (3200 yd) ESE of OU 1086. The map referenced (Figure 3.6-1) incorrectly shows the wells lying due south of E-F site, when in fact they lie in a nearly easterly direction from E-F site. These wells and the associated discharge sink will be evaluated as part of OU 1130 as well as the LANL Canyons OU (OU 1049).

The three shallow wells (14.3–16.4 m cased depth) were installed in August 1989 to monitor vertical moisture movement in the canyon and discharge sink during rain events using a neutron moisture probe (Becker, Ph.D. Thesis, 1991). The data from these wells used in this reference are attached.

4. Response to questions 12, 13, and 15 (b). If nothing other than restroom waste was introduced into these tanks then why not request NFA? 15-009(b), 15-009(c), and 15-009(h) Why is there a schedule for sampling when there are no sampling plans? Are there other septic systems hooked up to these buildings or other drains other than restroom facilities which are hooked up to these septic systems?

Response: LANL requests that SWMU 15-009(b), a septic tank at R-45, be considered for No Further Action (NFA). Nothing other than sanitary waste was introduced into this septic tank. Therefore, the unit presents no threat to human health and the environment. If EPA accepts this NFA, LANL will incorporate SWMU 15-009(b) into Chapter 5 of the RFI Work Plan and will be removed from module VIII in the next Class 3 permit modification submitted by LANL.

LANL requests that SWMU 15-009(c), a septic tank at R-44, be considered for No Further Action (NFA). Nothing other than sanitary waste was introduced into this septic tank. Therefore, the unit presents no threat to human health and the environment. If EPA accepts this NFA, LANL will incorporate this SWMU into Chapter 5 of the RFI Work Plan and will be removed from module VIII in the next Class 3 permit modification submitted by LANL.

LANL requests that SWMU 15-009(h), a septic tank at R-306 (Ector), be considered for NFA. Only sanitary waste was introduced into this septic tank. Therefore, the unit presents no threat to human health and the environment. If EPA accepts this NFA, LANL will incorporate this SWMU into Section 5.3.7 of the RFI Work Plan and will be removed from module VIII in the next Class 3 permit modification submitted by LANL.

5. When was the last time firing site 15-006(a) was used and is it also being decommissioned?

Response: Firing site 15-006(a) (PHERMEX) is in continual use (several shots per month); this site is not scheduled for decommissioning until the latter part of the 21st century.

6. Is there a schedule for submitting the sampling plans mentioned in response #14?

Response: The sampling plans referred to (firing sites R-44, R-45) will be submitted on 1 June 1995.

7. SWMU 15-008(h)[15-009(h)], p. 6-10- Was the only function of this unit as a control center? If so, then LANL should request NFA rather than deferral.

Response: SWMU 15-009(h) drained only the restroom facilities at R306 (Ector). Explosives were not permitted inside the control room except in rare instances as sealed units (i.e., bagged squibs). HE shots were prepared, trimmed, and workers decontaminated themselves in a separate facility. LANL therefore requests that this SWMU should be considered for NFA. This SWMU was originally proposed for deferral because of the active nature of the Ector complex, not because contamination of the SWMU was suspected. This unit did not, nor does it currently, manage hazardous materials. The unit therefore poses no threat to human health and the environment. If EPA accepts this NFA proposal, LANL will include this SWMU in the next Class 3 permit modification request.

8. LANL's response to deficiency #22 is not complete. EPA has recommended taking samples to depth within each of the piles and LANL has responded by describing the piles more. What is the sampling proposed for this unit?

Response: SWMU 15-008(a), two debris piles on the canyon edge near E-F Site, have been sampled as follows: Three surface samples were collected on SWMU 15-008(a) during the FY94 sampling campaign. The two debris piles on the canyon edge, south of E-F Site, were sampled using hand augers. Three samples were collected at 0–10 in., 0–8 in., and 0–12 in. respectively. The first two samples were collected on the debris pile that extends from the top of the canyon edge to approximately 12 feet down the 2:1 slope. The third sample was collected on the smaller debris pile approximately 10 feet south of the first. Due to the shallow depth of the soil/tuff interface at this location, LANL proposes to sample as deep as possible at the established sampling locations in order to collect soil/tuff interface samples and establish a depth of debris for each pile. Soil/tuff interface is expected to lie between 1.5–4.0 feet at this SWMU.

9. The response to deficiency #33 is not clear. What does 7777777... and 4444... mean?

Response: The figures in question refer to the totals for the various samples to be found in the sampling table 9.1-1 on page 9-5. The entire table is attached.

10. Response #36 What is the depth of sampling?

Response: Surface sampling will be taken from 0–6 in. deep; subsurface samples will be taken from 18–24 in. deep at the surface disposal area of R44.

11. Unit 15-014(m) is listed in the permit to be sampled. What is the status of this unit?

Response: As is shown in Chapter 5 of the RFI Work Plan, this unit is proposed for NFA.

To recapitulate §5.3.7.1 of the Work Plan, SWMU 15-014(m) is a drain line and outfall from building 15-306 (Ector control center, figure 5.3-2) and is permitted under EPA 14A143. The drain line is a 1.5 in. O.D. PVC pipe fastened to the north wall of R-306. It empties into a roadside ditch, which is graded in the direction of Potrillo Canyon. NFA is recommended for this SWMU because neither hazardous materials nor hazardous constituents of materials have been used in the past and current discharges are regulated under non-RCRA statutes. If EPA concurs with this NFA recommendation, LANL will request that this SWMU be removed from Module VIII of the Class 3 permit in the next permit modification request.

The NPDES permit for this outfall specifies that the effluent is noncontact once-through cooling water, to which no chemicals (e.g., corrosion inhibitors) have been added. According to cognizant members of the Water Quality and Toxics Group at LANL (Michael Saladen, group ESH-18), water in this outfall originates as potable water and is used only to cool electrical equipment in the building.

TABLE 9.1-1

SAMPLING PLAN FOR MDA-N SWMU 15-007(a) AND AOC C-15-006 1 x 10^3 sq. ft.

	FIELD SCREENING										LABORATORY ANALYSIS							
	Alpha Beta Gamma	Uranium	Thorium	Silver	Beryllium	Lead	Mercury	HEs	VOCs		Uranium	Thorium	Silver	Beryllium	Lead	Mercury	VOCs	SVOCs
SWMU 15-007(a) Surface Samples	7	7	7	7	7	7	7	7			4	4	4	4	4	4		4
Subsurface Samples (0–24")	7	7	7	7	7	7	7	7	7		4	4	4	4	4	4	4	4
C-15-005, C-15-006 Suirface Samples	3	3	3	3	3	3	3				2	2	2	2	2	2		2
Subsurface Samples (0–24")	3	3	3	3	3	3	3		3		2	2	2	2	2	2	2	2
Subsurface Samples (soil/tuff interface)	7	7	7	7	7	7	7	7	7		4	4	4	4	4	4	4	4
Totals	27	27	27	27	27	27	27	21	17		16	16	16	16	16	16	10	16

INFLUENCE OF HYDRAULIC AND GEOMORPHOLOGIC COMPONENTS OF A SEMI-ARID WATERSHED ON DEPLETED URANIUM TRANSPORT

by

NAOMI MIRIAM BECKER

A thesis submitted in partial fulfillment of the
requirements for the degree of

Doctor of Philosophy
(Civil and Environmental Engineering)

at the
UNIVERSITY OF WISCONSIN-MADISON
1991

about 15 m downstream. Therefore, it appears that all runoff which flowed past the I-J gage infiltrated into the channel before reaching Skunk Works. It also appears that any runoff produced between the I-J and Skunk Works gages infiltrated into the overland and channel portions of the watershed between the two gages.

Infiltration Studies

In August 1989, three monitoring wells were installed in the vicinity of the discharge sink to monitor vertical moisture movement using a neutron moisture probe. The three wells were located upstream from (#1), at the upstream head (#2), and near the downstream edge (#3) of the discharge sink, Fig 2.9. All were located in the active channel.

Three 10.2-cm diameter boreholes were drilled to accommodate the 5.1-cm diameter aluminum casings. Well #1 was drilled at the Skunk Works road crossing. The hole was augered to 15.2 m, and 14.3 m of aluminum casing installed. Although the depth is uncertain, changes in drilling pressure indicated that a change in lithology occurred between 8.2 and 9.1 m depth, from alluvium to a weathered tuff. Moisture contents in the cuttings in this hole were low; no excess moisture was observed in the cuttings. The weathered tuff appeared as a silty clay.

Well #2 was drilled down to 18.6 m, and 16.4 m of aluminum casing was installed. Over 2 m of collapse occurred at the bottom of the hole between the time the auger was pulled and the casing installed. From the surface down to 3.0 to 3.6 m alluvium was encountered; weathered tuff was found to the bottom of the hole. The moisture content in the cuttings was dry (10-20 percent by volume) until a depth of 10.7 m. There the cuttings showed saturated conditions down to the bottom of the

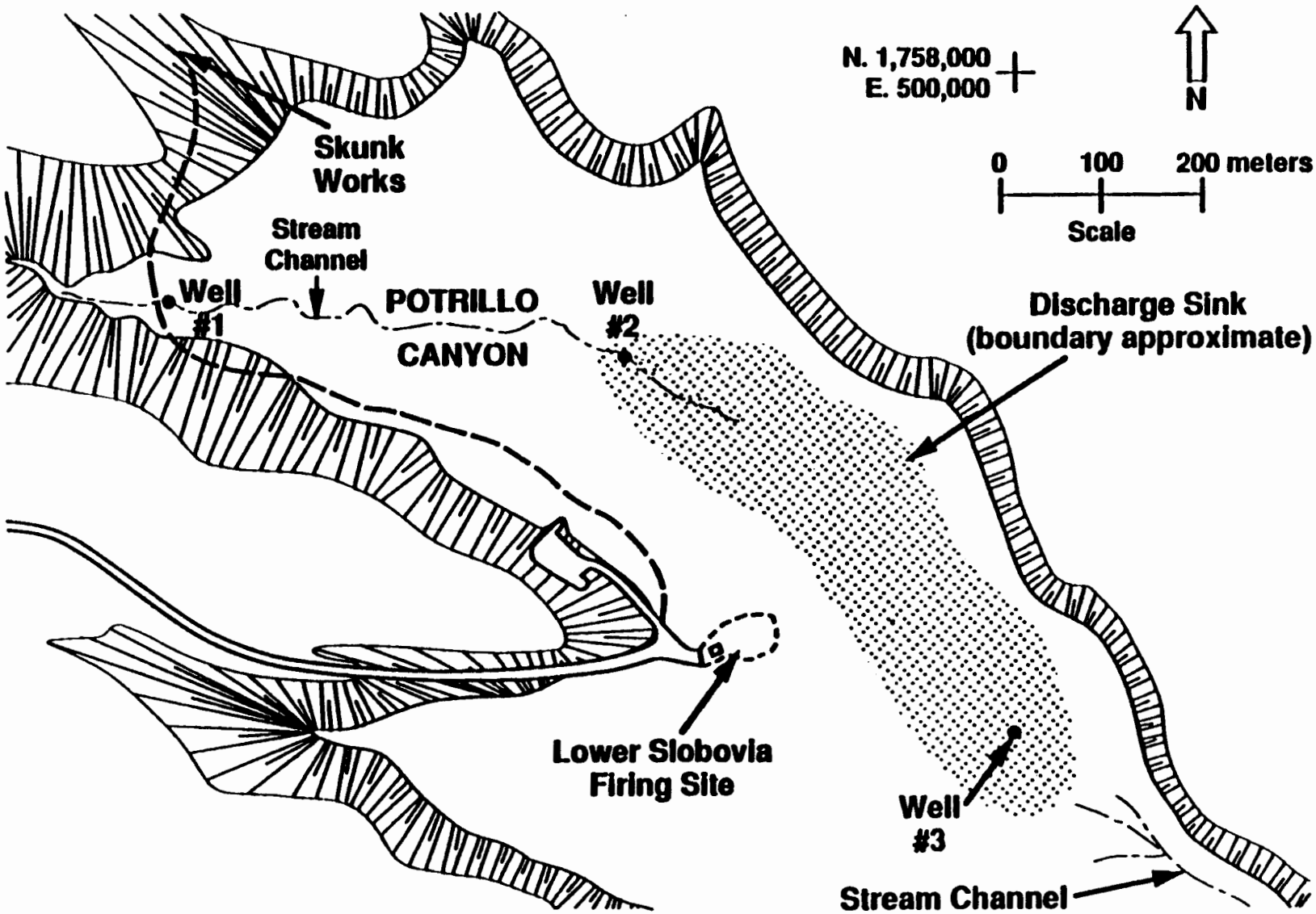

Fig 2.9 Location of Neutron Moisture Access Wells.

hole. The grainsize of the cuttings increased with depth to a silty sand (although still a weathered tuff) at the bottom of the hole.

Well #3 was drilled to a depth of 15.8 m, and 14.6 m of casing was installed. The lithology showed 0 to 4.6 m depth was alluvium, and from 4.6 to 15.8 m weathered Bandelier tuff was encountered. Moisture contents in the hole closely resembled those in Well #1.

In each well, the upper 1.5 to 3 m of casing are cemented up to the ground surface to prevent water from the channel flowing down the casing and producing spurious results. Therefore, to investigate moisture content in the near surface region a shallow well, from 1.5 to 2.7 m in depth, accompanies each deep well.

A Campbell Pacific neutron moisture probe, Model 503DR, was calibrated using the test calibration facility operated by the U.S. Geological Survey at the U.S. Department of Energy's Nevada Test Site. The calibration facility consists of three test tanks 1.2 m diameter and 1.5 m high filled with silica flour and silica sand mixture. Each tank had a unique volumetric moisture content; they were 20.7, 13.8, and 7.7 percent. A linear relationship between the probe's count rate and volumetric moisture content was developed by fitting a first order polynomial equation derived using the method of least squares. To adjust the curve to insitu conditions at Los Alamos, a field measurement was made, and the volumetric moisture content measured on a representative soil sample collected at the site of the probe measurement. The relation between count rate and volumetric moisture content, adjusted for Los Alamos alluvium conditions, was determined to be:

$$Y = 0.007\ X - 45.55$$

where Y = Volumetric moisture content in percent

and X = Probe count rate.

Although there is a linear relationship between the volumetric moisture content and count rate in the moisture range of 7.7 to 20.7 percent (Klenke and others, in press), the relationship is probably not linear below 7.7 percent. Applying the linear relationship to Los Alamos data below 7.7 percent predicted negative moisture contents. The same result was verbally reported by a geologist (Dan Blount, personal communication) from Raytheon Services of Nevada (a contractor to the U.S. Geological Survey in Nevada). Therefore, to obtain moisture contents below 7.7 percent (corresponding to about 7600 counts) separate field calibration studies need to be performed.

Moisture measurements were taken after the wells were installed on August 23, 1989, and again after 2 rain event sequences on September 7, and October 6, 1989. August 23 represents a relatively dry background condition; there was 0.5 mm rain on August 21, and no rain for several days before August 21. Prior to September 7, rainfall measured on September 2 was 13.2 mm, 5.6 mm on September 3, 1.0 mm on September 4, and 10.7 mm on September 5, totalling 30.5 mm. Before the October 6 reading, rain measured on October 2 was a trace, 13.0 mm on October 3, 15.8 mm on October 4, 12.7 mm on October 5, and a trace on October 6, totalling 41.5 mm before the measurement. Runoff was observed at the Skunk Works cumulative sampler on August 14 (it washed out the cumulative sampler) and after the October 2-6 sequence.

Results from neutron moisture probe logging from Well #1 are presented in Fig 2.10 through 2.12. In all plots, the solid boxes represent moisture measurements from the shallow well and open boxes are the deep well measurements. Neutron probe measurements are made every 0.3 m down to the bottom of the shallow wells and every 0.6 m from the last shallow well measurement to the bottom of the deep well. In the background log on August 23, Fig 2.10, the moisture content was 34 percent and 29 percent at 2.4 m and 2.7 m depths respectively. Moisture content then drops to below 7.7 percent from 2.7 to 11.6 m, increases to 11 percent at 11.6 m, decreases to 8 percent at 12.2 m and increasesto 16 percent at 14.0 m. On September 7, Fig 2.11, the volumetric moisture was 25 percent at 2.4 m, 15 percent at 2.7 m, below 7.7 percent from 2.7 to 10.7 m, increased to 15 percent at 11.3 m, was below 7.7 percent from 11.9 to 13.7 m, and increased to 29 percent at 14.3 m. On October 6, Fig 2.12, volumetric moisture exceeded 7.7 percent at: 2.4 m with 18 percent, 11.3 m with 13 percent, and 14.3 m with 30 percent. In summary, there appeared to be three zones which consistently exhibited moisture content above 7.7 percent; they were at 2.4 m, 11.3 m, and 14.3 m. Initial moisture content in the August 23 reading at the 2.4 m depth was 34 percent. The moisture declined at this depth to 25 percent in September, and to 18 percent in October. Moisture content at the 11.3 m depth remained relatively constant through the three readings, varying between 11 and 15 percent. The percent moisture at the 14.3 m depth increased from 16 percent in August to 30 percent in October. Increased moisture readings at these three depths consistently through the August-October period is probably related to some lithologic change, for example a slight increase in the clay content, along with a downward moisture flux from the surface region. Moisture, in general, declined

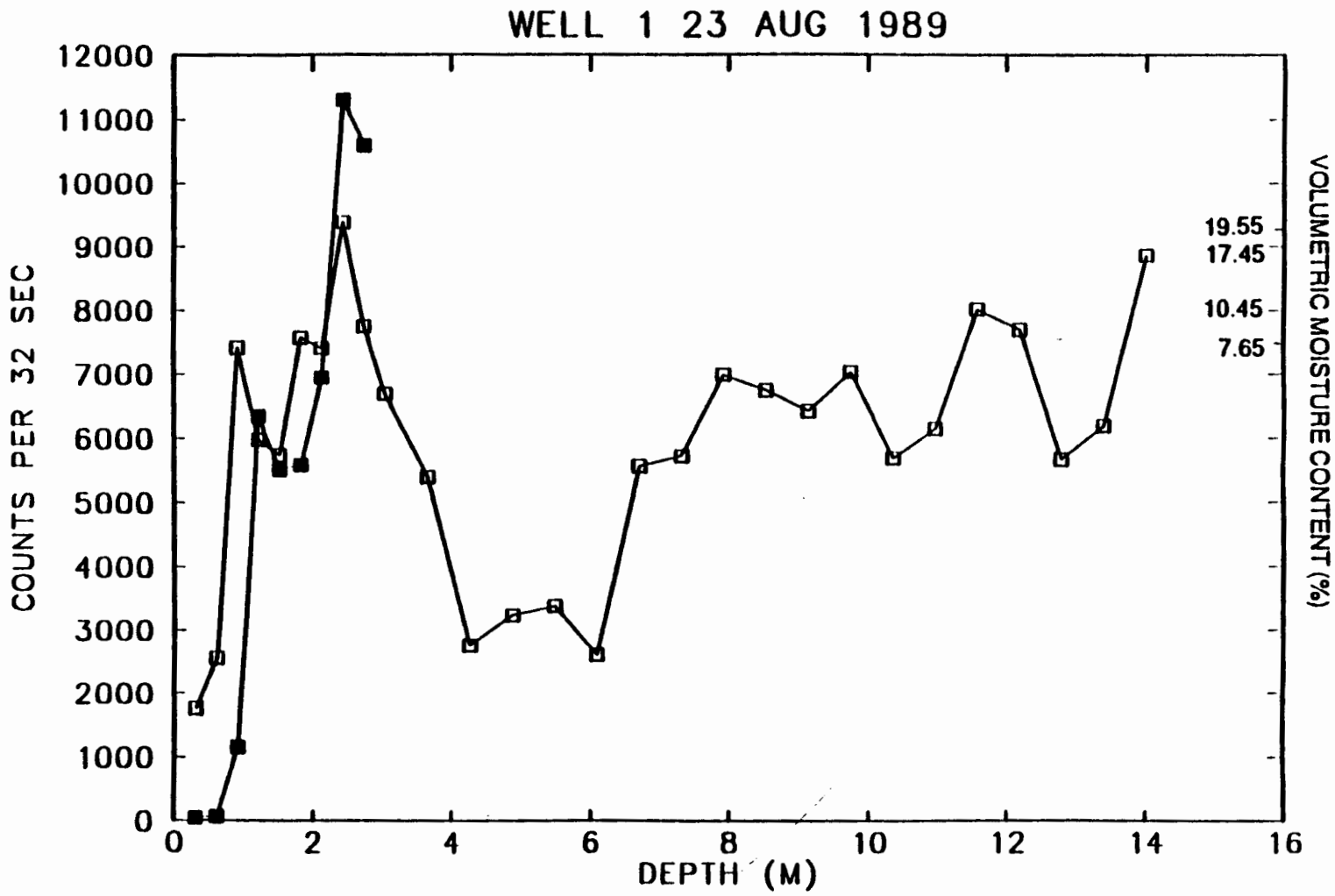

Fig 2.10 Moisture in Well #1 August 23, 1989 (Solid Box-shallow well reading, open box-deep well reading).

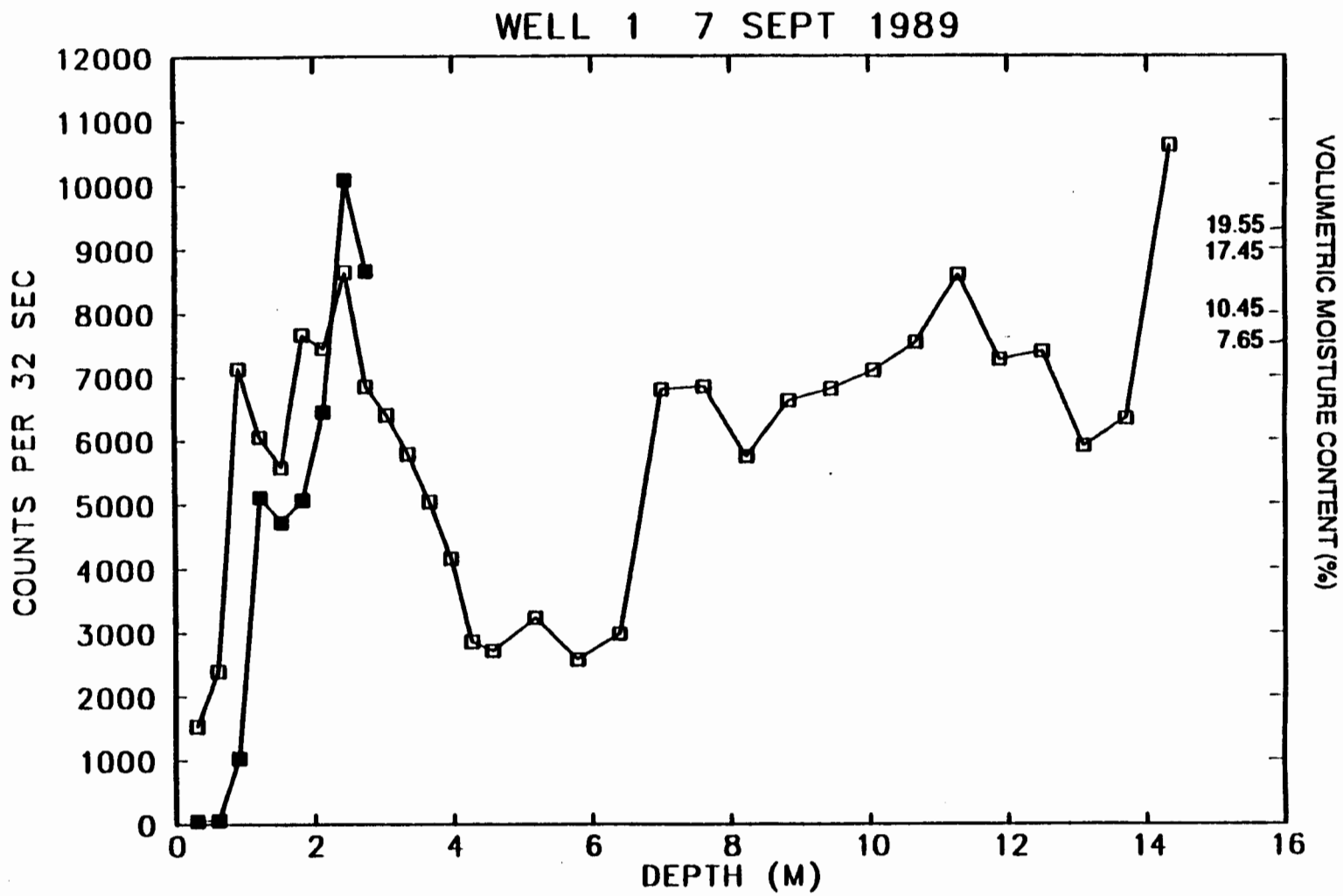

Fig 2.11 Moisture in Well #1 September 7, 1989 (Solid Box-shallow well reading, open box-deep well reading).

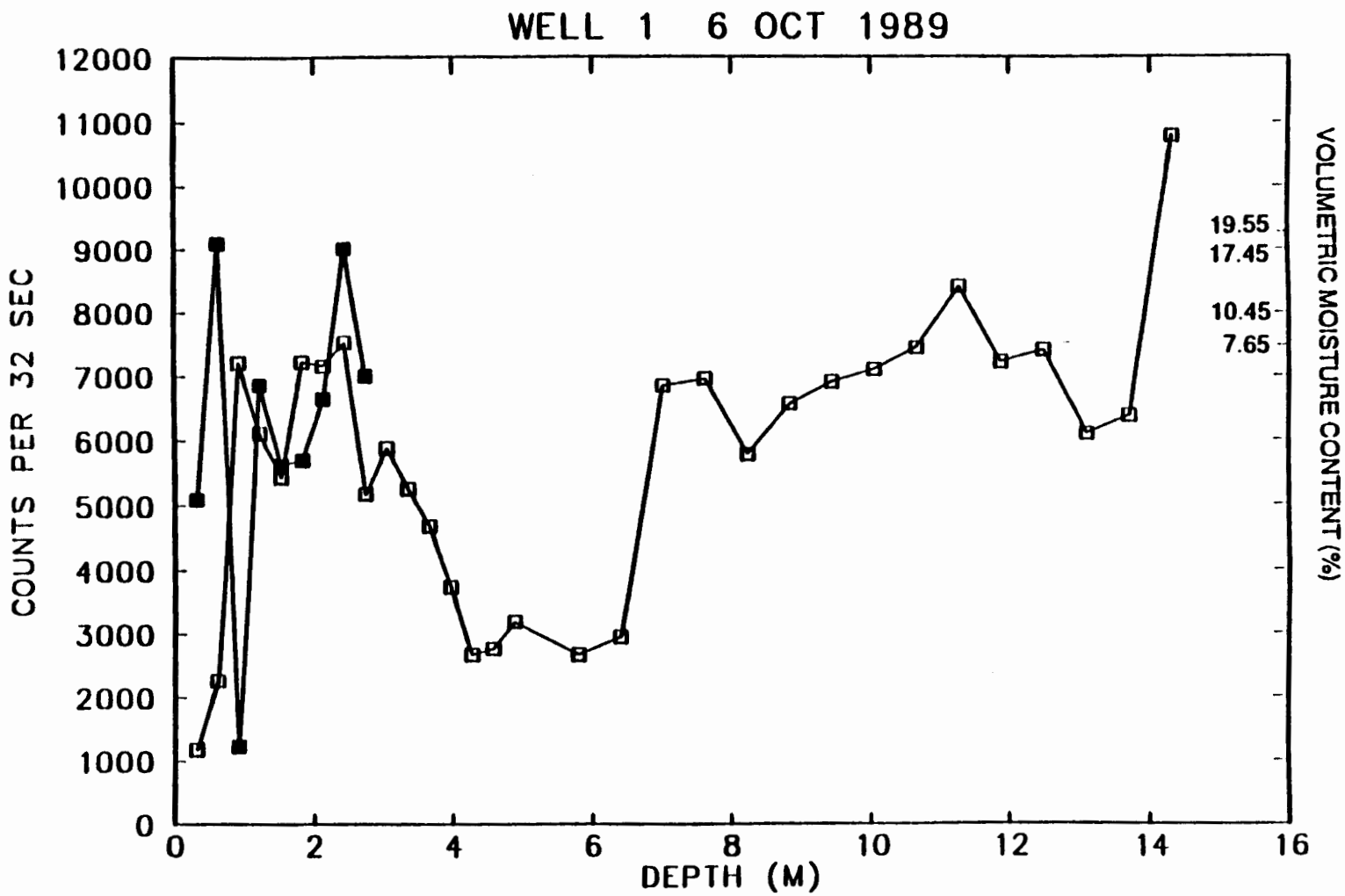

Fig 2.12 Moisture in Well #1 October 6, 1989 (Solid Box-shallow well reading, open box-deep well reading).

in the shallow zone and increased in the deep (14.3 m) level, reflecting a flux of moisture downward.

The moisture content in well #3 is shown in Fig 2.13 through 2.15. All moisture readings in this well were below 7.7 percent except for a reading of 18 percent at the 0.3 m depth level on October 6, Fig 2.15. There is evidence of an increase in moisture content with increasing depth in each log, although the moisture logs for September 7 and October 6 below 0.9 m depth are nearly identical, and the moisture log from August 24 varies only slightly from the later logs. The lack of variation in moisture content in this well indicates that there was little to no moisture flux recorded.

Volumetric moisture contents in Well #2 are shown in Fig 2.16 through 2.18. The moisture variation with depth was similar for all three dates. The moisture at most depths varied from 14 to 20 percent. Increased moisture above this range was consistently observed at three depths: at 0.6 m, at 2.7-3.0 m, and at 14.6-14.9 m. Moisture at 0.6 m varied from 29 percent on August 24 to 26 percent on September 7 and October 6. At the 2.7-3.0 m depth, the moisture varied from 29 to 32 percent on August 24 and declined to about 26 to 29 percent on October 6. At 14.6-14.9 m level, the moisture content remained constant at 31 percent for all three dates.

Well #2 is the most sensitive to moisture fluctuations due to its position in the discharge sink. It lies at the upstream end of the sink, in the path of nearly all runoff events and at the upstream end of the infiltration area. As shown in Table 2.3, significant volumes of water infiltrate in this region, on the order of thousands

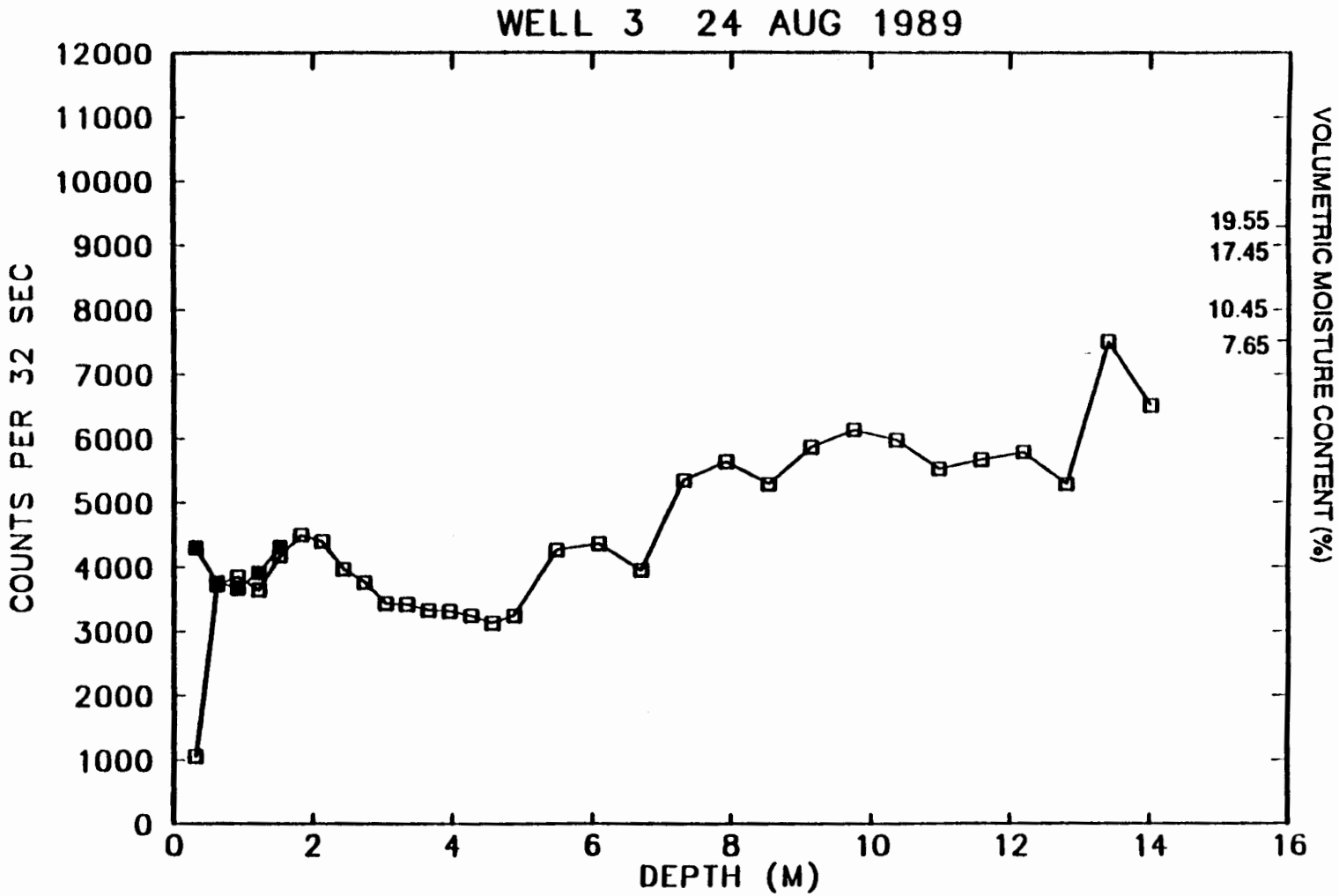

Fig 2.13 Moisture in Well #3 August 23, 1989 (Solid Box-shallow well reading, open box-deep well reading).

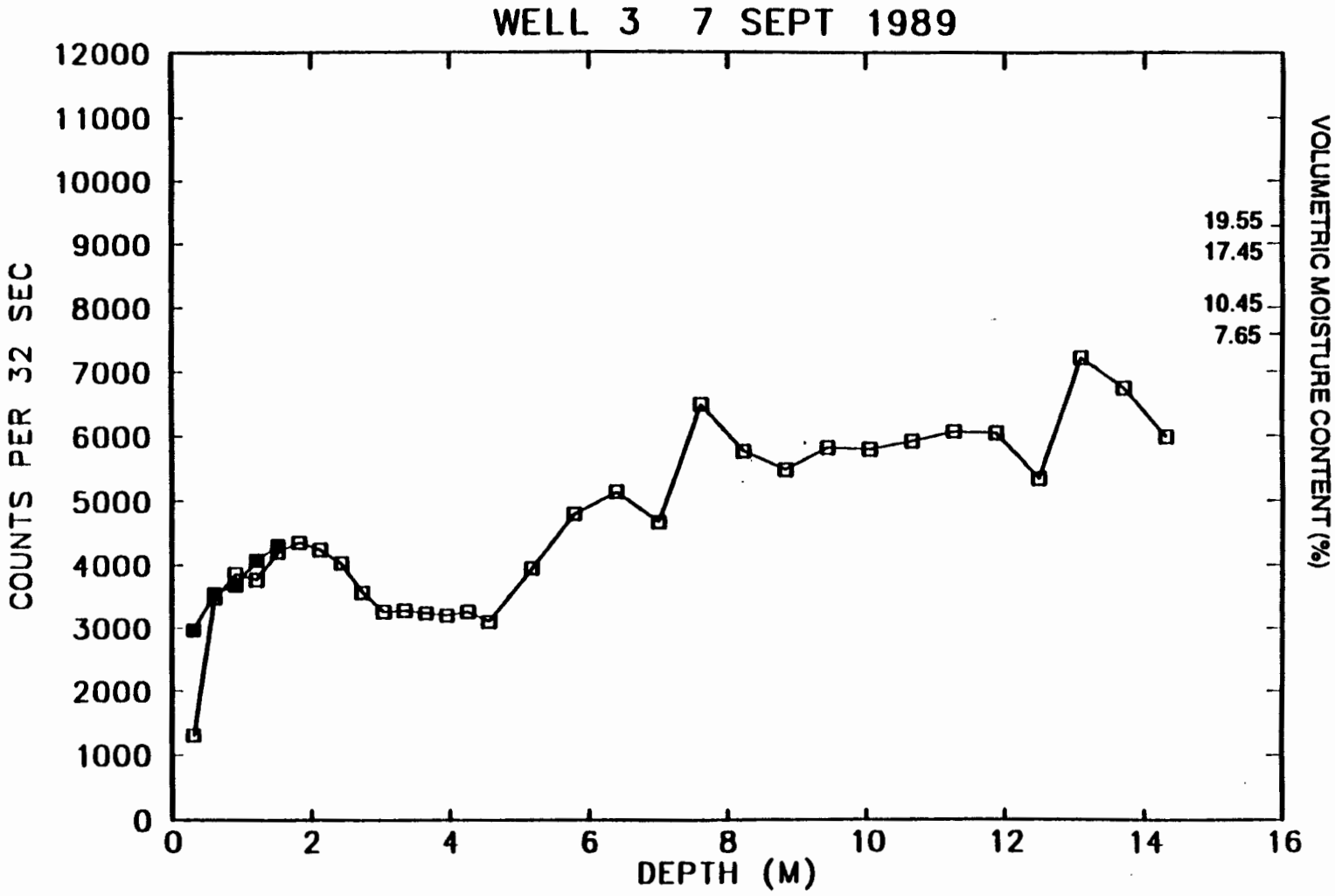

Fig 2.14 Moisture in Well #3 September 7, 1989 (Solid Box-shallow well reading, open box-deep well reading).

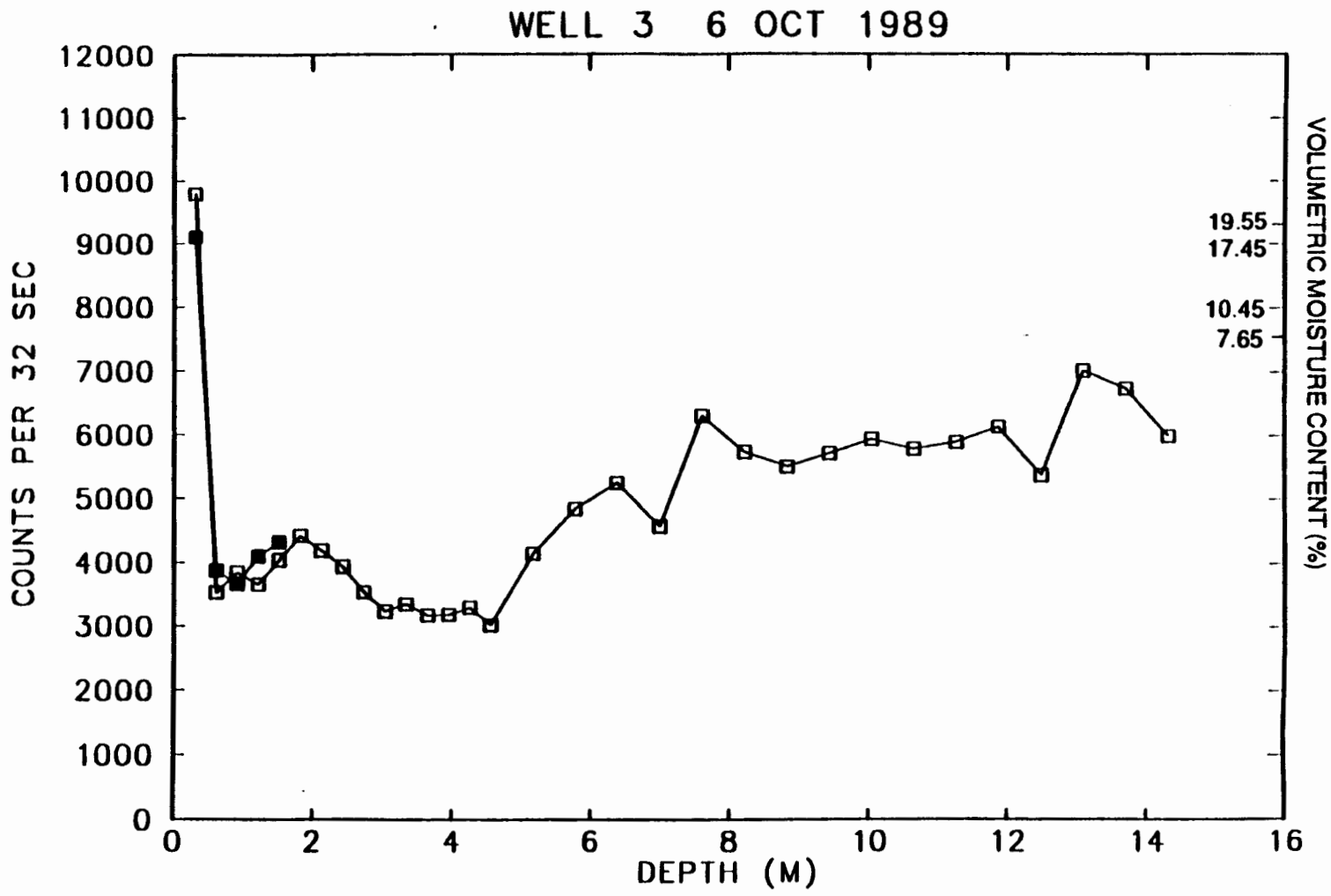

Fig 2.15 Moisture in Well #3 October 6, 1989 (Solid Box-shallow well reading, open box-deep well reading).

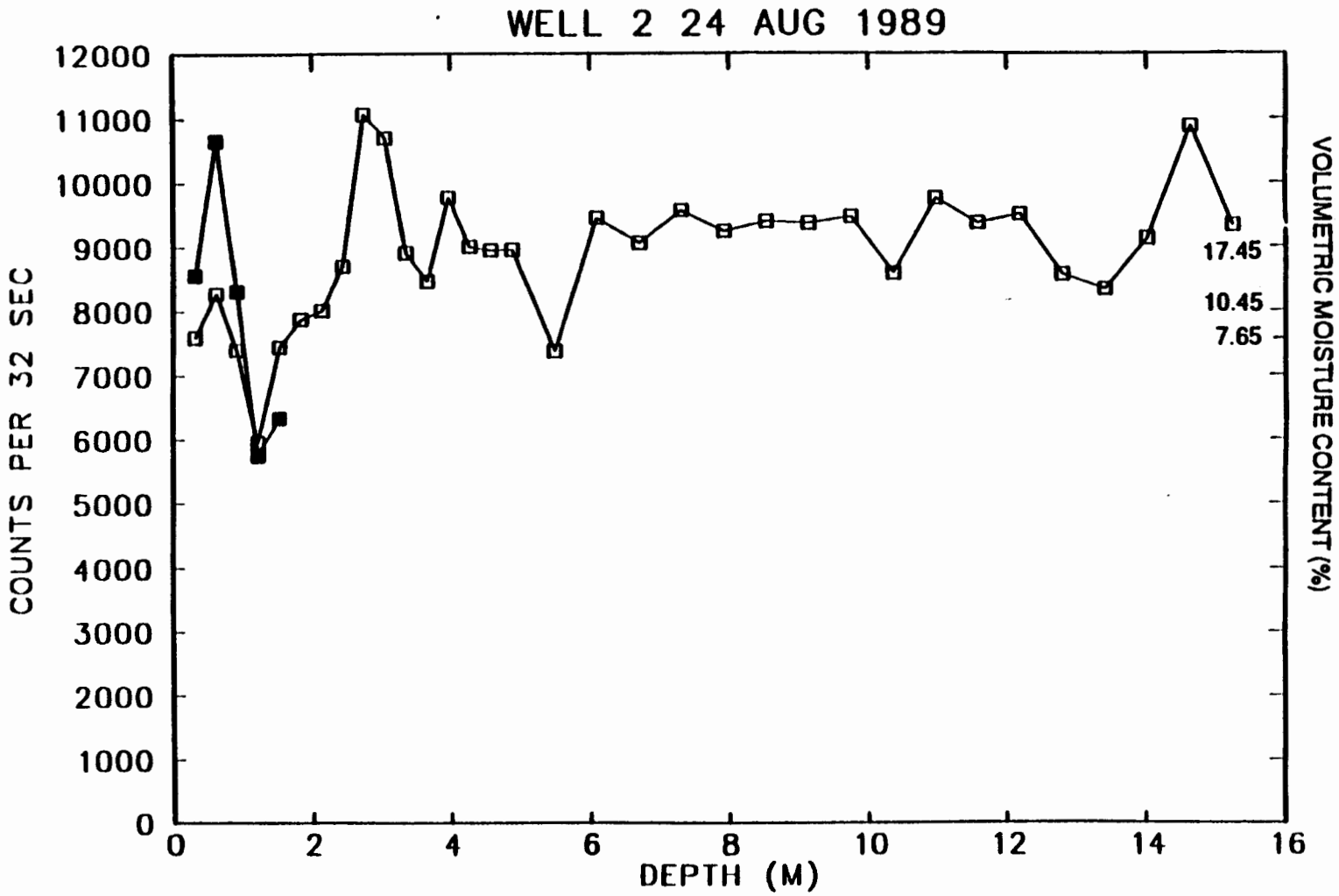

Fig 2.16 Moisture in Well #2 August 24, 1989 (Solid Box-shallow well reading, open box-deep well reading).

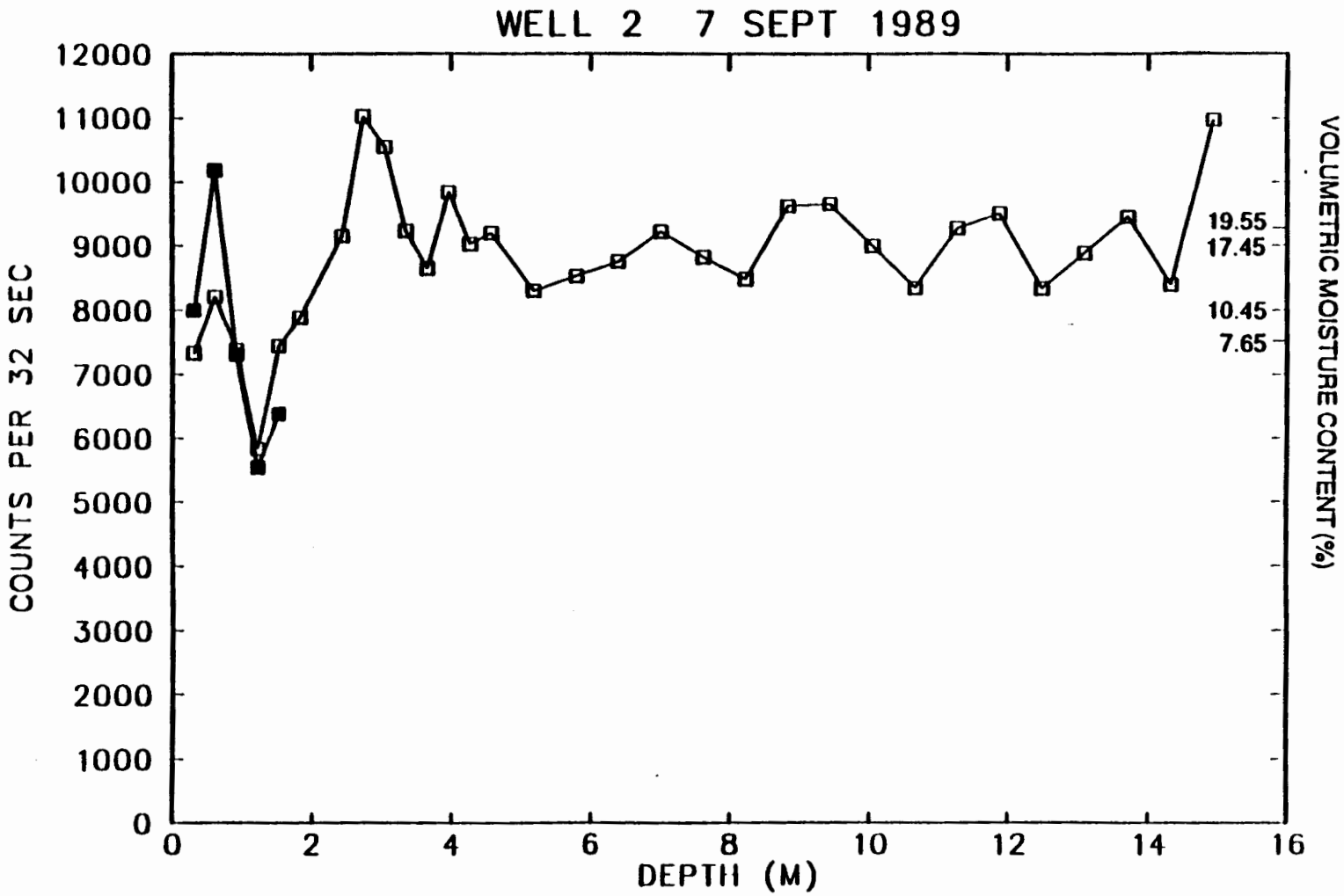

Fig 2.17 Moisture in Well #2 September 7, 1989 (Solid Box-shallow well reading, open box-deep well reading).

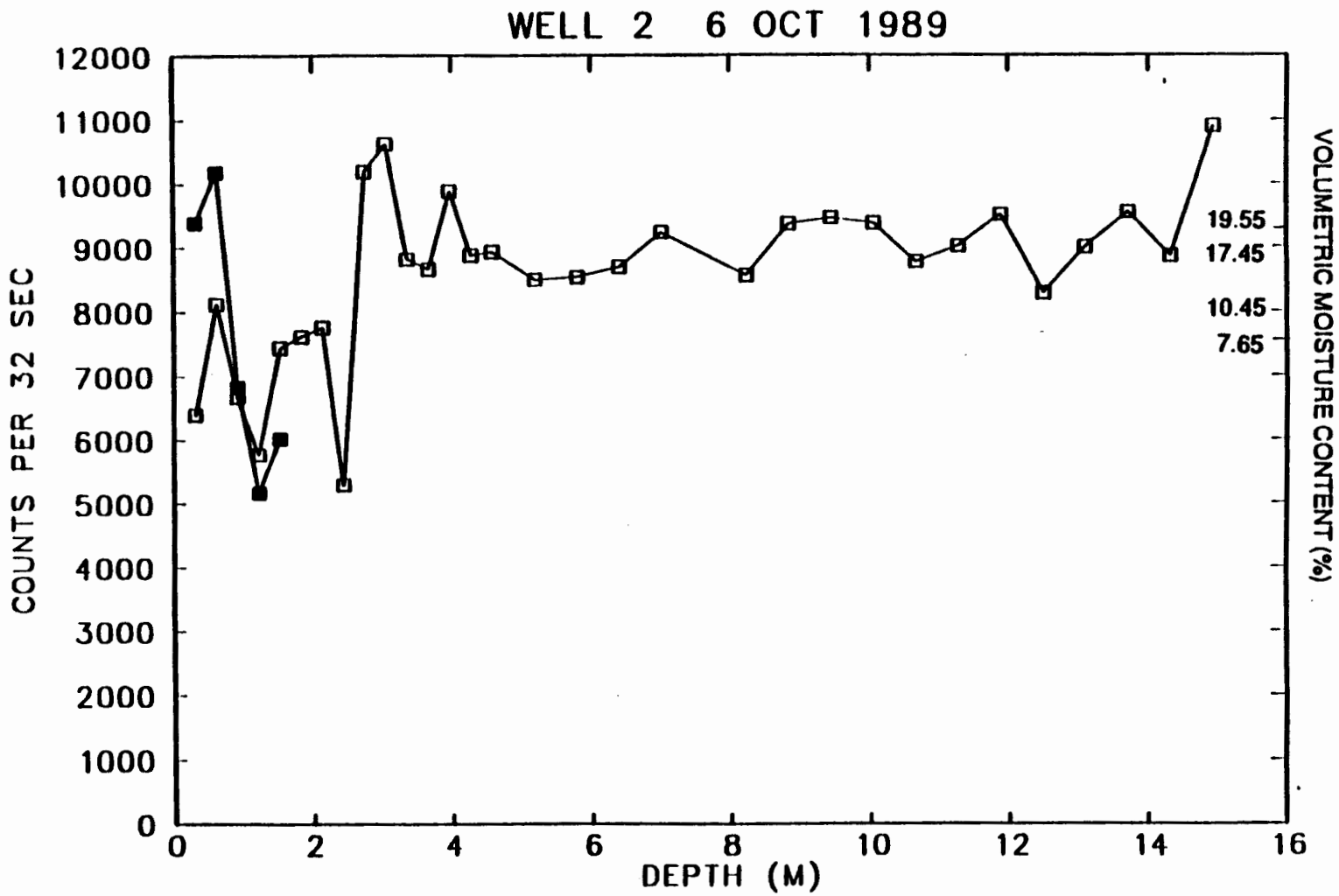

Fig 2.18 Moisture in Well #2 October 6, 1989 (Solid Box-shallow well reading, open box-deep well reading).

of cubic meters; therefore one would expect to see vertically moving moisture fronts in this well. Each well was logged one or two days following a runoff event. The nearly uniform moisture content with depth indicates that rates of moisture infiltration must be very rapid, on the order of hours. Moisture does not appear to be retained in the profile down to 15 m, but to be percolating to deeper depths, possibly to the water table.