



Research and Development

FOLLOW-UP

RADON MEASUREMENTS IN


14 MITIGATED SCHOOLS

Prepared for

Office of Radiation and Indoor Air

Prepared by

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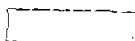
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FOLLOW-UP RADON MEASUREMENTS IN 14 MITIGATED SCHOOLS

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ABSTRACT

Radon measurements were conducted in 14 schools that had been mitigated between 1988 and 1991 to determine the long-term performance of radon mitigation systems installed in U.S. EPA selected research schools. The measurements were made between February and April 1992. A measurement protocol was developed based on current EPA guidelines, and measurements were made with alpha track detectors (ATDs), which were mailed to the schools along with placement and retrieval instructions.

The results from these follow-up ATD measurements indicate that, overall, active soil depressurization (ASD) systems have been very effective in maintaining low long-term radon levels in the 14 schools that were measured for this study. Of the 409 locations measured in these schools, only 17 (or 4 %) of the measurements in mitigated areas exceeded 4 pCi/L. Eight of these 17 measurements were in a basement, one was in a room where the ASD fan had been turned off, and another was in a room with building pressurization that is only operated while the building is occupied. If these ten measurements are dropped from the set, the percent of rooms above 4 pCi/L drops to less than two percent.

The results of the quality assurance audits and ATD spiking measurements indicate that the project data quality objectives were generally met. However, some schools were not able to expose the ATDs for the specified three-month period because of operational and administrative reasons. In addition, a number of the duplicate ATDs were not co-located within the room, contributing to some of the variations observed between duplicate results.

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1.0 INTRODUCTION AND PURPOSE

The U.S. Environmental Protection Agency's (EPA's) Air and Energy Engineering Research Laboratory (AEERL) has conducted radon mitigation research in nearly 50 public schools since 1987 (1,2). For this research project, AEERL has conducted numerous radon measurements in schools following the measurement protocol developed by EPA's Office of Radiation Programs (3). Several of the schools with radon concentrations above the EPA Action Guideline of 4 picocuries per liter (pCi/L, 1 pCi/L = 37 becquerels per cubic meter) were selected by AEERL for radon mitigation research and development projects.

Active soil depressurization (ASD) systems were installed in most of these schools researched by AEERL. The systems were usually installed as joint efforts between AEERL, its contractors, and school personnel. In some cases, the mitigation systems were installed entirely by one of these three parties. After the system was installed, radon levels were remeasured to determine the effectiveness of the mitigation system. These post-mitigation measurements were made shortly after the installation of the mitigation system. If the post-mitigation measurement indicated that radon levels were still above the EPA action level, appropriate modifications were made to the mitigation system and radon levels were remeasured.

To determine the long-term performance of these mitigation systems, radon measurements were conducted in 14 of these mitigated schools between February and April 1992. A measurement protocol was developed based on current EPA guidelines, and the measurements were made with alpha track detectors (ATDs) which were mailed to the schools along with placement and retrieval instructions. As Quality Assurance (QA) and Quality Control (QC) were required for this project, the work was performed under the AEERL's QA Plan Category III requirements. The data are supported by QA/QC documentation as required by the U.S. EPA policy.

2.0 MEASUREMENT METHODS AND PROCEDURES

The Work Assignment Manager provided a list of 15 schools located in nine different districts, including an estimate of the number of ATDs to be deployed in each school. The estimated number of detectors generally included all ground-contact rooms in the building even if the entire building had not been mitigated. It was felt that measurements made in all ground-contact rooms would determine whether radon levels had increased in any other building locations since the installation of the mitigation system.

Telephone contacts were made with each of the nine school systems to verify their participation in the measurement study. One of the 15 schools decided not to participate in the study. Upon confirming the involvement of the other 14 schools listed in Table 1, arrangements were made to ship the ATDs and instructions to designated contacts. From January 31st to February 7th, 1992, ATD packages were sent to each of the eight school contacts, for a total of 14 schools. The following items were included in the packages sent to the schools:

- 1) instructions and data sheets,
- 2) a completed sample data sheet,
- 3) a marked-up floor plan showing the proposed ATD deployment locations in the school, including those for duplicates,
- 4) ATDs, including control and duplicates, as separate packages,
- 5) ATD gold seals, and
- 6) a self-addressed return label and shipping form.

A total of 505 ATDs were sent out to the eight school districts. Fairfax County Public School District (Dranesville Elementary) chose to place the ATDs in only the mitigated areas of the building, so 40 of their 60 ATDs were returned unused. Appendix A includes a copy of the instruction sheets and a listing of all surveyed school systems, contacts, and number of ATDs shipped to each. During the course of the survey, each school was contacted by phone to establish placement and retrieval dates. It was requested that all ATDs and related documentation be returned by April 20, 1992.

Radtrak ATDs, supplied by Tech/Ops Landauer, Glenwood, IL, were used for the measurements. An order for over 600 ATDs was placed with Tech/Ops Landauer on January 6, 1992. Upon receipt, 102 ATDs were set aside for exposure, as spikes, with the EPA's National Air and Radiation Environmental Laboratory (NAREL) test facility located in Montgomery, AL.

Once the exposed ATDs and supporting documentation were returned to SC&A's offices, all ATDs were counted, checked for proper identification, and forwarded to Tech/Ops Landauer for processing. Upon receipt, the measurement results were sorted by school, radon levels, and descriptive statistics (i.e., maximum, minimum, average, and standard deviation). These preliminary results were sent to the appropriate school contact person in September 1992. Measurements above the 4 pCi/L EPA guideline were identified. Results of the spiked ATDs were compared to radon test chamber data supplied by the NAREL and are discussed in Section 5.0.

3.0 RESULTS AND DISCUSSION

Table 2 presents a summary of the results for each of the 14 schools. The table includes average radon concentrations for each school, along with the low and high radon levels. It also lists the total number of measurements above 4 pCi/L. Because a number of the measurements above 4 pCi/L were in unmitigated areas of the buildings, the next column lists the number of measurements that were above 4 pCi/L in the mitigated areas. The last column lists the number of days of ATD exposure. Except for the Walker Mill School, ATD exposure durations ranged from 53 to 83 days. The results of the Walker Mill School should be interpreted cautiously as the 27-day test duration was the minimum time recommended by Tech/Ops.

Attachment B details each ATD measurement by building and room along with the deployment locations shown on each floor plan. The tabulations also present the results of the control and duplicate ATDs. The following subsections summarize the results from each school. A brief description of the installed mitigation systems is also provided along with the

appropriate reference(s) for more detailed information on the radon research previously conducted in the school.

Lincolnshire

The mitigation system in this school was installed in 1990 and consists of four one-point ASD systems in each of the four pods. At the time of these measurements, no other mitigation systems had been installed in other portions of the building. See Reference 4 for detailed information on the initial pre- and post-mitigation radon levels and design details of the mitigation systems.

The average radon level in this school was 3.1 pCi/L, with a low of 0.8 pCi/L and a high of 5.8 pCi/L. Of the 29 measurements made in the school, eight were above 4 pCi/L. However, only three of these measurements (total of four, with one set of duplicates) were located in areas serviced by the ASD systems. All three of these measurements above 4 pCi/L were located in the same pod. Based on the initial diagnostics conducted at this school, it is suspected that the ASD system in this pod may need some additional sealing.

Paramount

The mitigation system in this school consists of two one-point ASD systems located in the main building and two two-point ASD systems located in the four-classroom addition. The mitigation systems were installed in 1988. See References 5 and 6 for detailed information on the initial pre- and post-mitigation radon levels and design details of the mitigation systems.

The average radon level in this school was 0.4 pCi/L, with a low of 0.4 pCi/L and a high of 0.6 pCi/L. These results indicate that the ASD system is performing exceptionally well over the long-term.

Smithberg

Because of the relatively poor subslab communication, this school has three individual ASD systems for a total of eight suction points. The mitigation systems were installed in 1988.

See References 5 and 6 for detailed information on the initial pre- and post-mitigation radon levels and design details of the mitigation systems.

The average radon level in this school was 0.5 pCi/L, with a low of 0.4 pCi/L and a high of 1.9 pCi/L, indicating that the ASD systems are also performing well over the long-term.

Hancock

In 1988, a one-point ASD system was installed in each of the two locker rooms, and a two-point ASD system was installed in one of the classroom wings. Mitigation of the remaining areas of the school was accomplished by supplying outdoor air through the ventilation system. For detailed information on the initial pre- and post-mitigation radon levels and design of the mitigation systems, see References 5 and 6.

The average radon level in this school was 2.0 pCi/L, with a low of 0.4 pCi/L and a high of 11.6 pCi/L. Of the 37 measurements made in the school, three were above 4 pCi/L. However, none of these measurements were located in areas serviced by the ASD systems.

Dishman-McGinnis

Six individual ASD systems were installed throughout the classroom area of this school in 1990. For detailed information on the initial pre- and post-mitigation radon levels and design details of the mitigation systems, see Reference 7.

The average radon level in this school was 1.6 pCi/L, with a low of 0.6 pCi/L and a high of 4.7 pCi/L. Of the 27 measurements, only one was above 4 pCi/L and this measurement was made in the office area which is not mitigated.

Potter Gray

This school has two two-point ASD systems and one one-point ASD system that were installed in 1990. Together, these ASD systems provide subslab depressurization for three of the five classroom areas. The office and cafeteria area are not mitigated.

The average radon level in this school was 1.6 pCi/L, with a low of 0.5 pCi/L and a high of 6.2 pCi/L. Of the 30 measurements, only three were above 4 pCi/L. None of the measurements above 4 pCi/L were located in mitigated areas.

W.R.McNeil

The mitigation systems in this school consists of three one-point ASD systems covering portions of the classroom area and one office. The mitigation systems were installed in 1990. The average radon level in this school was 3.0 pCi/L, with a low of 0.5 pCi/L and a high of 8.9 pCi/L. Of the 37 measurements made in the school, eight were above 4 pCi/L. Three of the measurements above 4 pCi/L were are located in mitigated areas, indicating that additional suction points might be needed in this school.

Dranesville

A one-point ASD system was installed in one wing of this school in 1991. For information the construction details of this school and mitigation system designs, refer to References 8 and 9, respectively. The average radon level in one wing was 0.7 pCi/L, with a low of 0.4 pCi/L and a high of 1.1 pCi/L, indicating that the ASD system is still performing very effectively.

Walker Mill

This school has one two-point ASD system and one one-point ASD system. In addition, mitigation of the Teacher's Room is achieved by pressurization through the ventilation system. The mitigation systems were installed in 1988. See References 5 and 6 for detailed information on the initial pre- and post-mitigation radon levels and design details of the mitigation systems.

The average radon level in this school was 2.1 pCi/L, with a low of 1.1 pCi/L and a high of 7.9 pCi/L. Of the 30 measurements made in this school, three were above 4 pCi/L. One of the elevated measurements is located in the room serviced by the one-point ASD system. After investigation of the ASD system, school personnel noted that the ASD fan for this

system was turned off. Radon levels in the Teacher's Room were also elevated. This is probably because the ventilation system only operates when the building is occupied and, thus, the 27 day measurement integrated the occupied and unoccupied periods. The room with the highest radon level (7.9 pCi/L) was not mitigated.

Two Rivers

The mitigation system in this school, installed in 1989, consists of three one-point ASD systems and one two-point system. See Reference 1 for detailed information on the initial pre- and post-mitigation radon levels and design details of the mitigation systems.

The average radon level in this school was 2.0 pCi/L, with a low of 1.3 pCi/L and a high of 9.4 pCi/L. Of the 39 measurements made in this school, three were above 4 pCi/L. None of these measurements were located in mitigated areas.

Glenview

This school has two seven-point mitigation systems and one one-point system. The systems were installed in 1989. For detailed information on the initial pre- and post-mitigation radon levels and design details of the mitigation systems, refer to Reference 1.

The average radon level in this school was 1.3 pCi/L, with a low of 1.3 pCi/L and a high of 1.4 pCi/L. These results show that even though mitigation of this school required several suction points, the ASD system has performed very consistently over time.

Seneca

The mitigation system in this school consists of one five-point ASD system located in the basement. The system was installed in 1990. For detailed information on the initial pre- and post-mitigation radon levels and design details of the mitigation systems, see Reference 10.

The average radon level in the basement of this school was 11.3 pCi/L, with a low of 0.6 pCi/L and a high of 20.8 pCi/L. These results indicate that the installed mitigation system is not reducing radon levels below the EPA guideline of 4 pCi/L. The original post-mitigation

measurements in this basement were about 4 pCi/L. However, the measurements were short-term and made during summer months with the basement ventilation system operating to supply outdoor air during the measurement period (which is not always the case during cold weather). In order to lower radon levels, it was recommended that the school install additional ASD suction points.

Dunn

This school has a one-point ASD system that is providing subslab depressurization for the entire building. The system was installed in 1990. For detailed information on the initial pre- and post-mitigation radon levels and design of the mitigation systems, see Reference 7.

The average radon level in this school was 0.8 pCi/L, with a low of 0.6 pCi/L and a high of 2.1 pCi/L. These results show that the ASD system is performing very effectively.

Speas

Only eight of the 35 rooms in this school have been mitigated. The mitigation system was installed in 1989 and consists of four two-point ASD systems located in these eight classrooms. For detailed information on pre-mitigation radon levels, see Reference 11.

The average radon level in this school was 6.2 pCi/L, with a low of 1.2 pCi/L and a high of 15.6 pCi/L. Of the 35 measurements made, 26 were above 4 pCi/L. However, radon levels in the mitigated area averaged 2.9 pCi/L and only two of these measurements were above 4 pCi/L.

4.0 QUALITY ASSURANCE FIELD AUDIT

SC&A conducted a field audit in four Washington County, MD, public schools to verify deployment procedures. This section includes only the results of the SC&A field audit. An analysis of the quality and reliability of the ATD radon measurement results compared to spiked measurements is presented separately in Section 5.0.

A total of 123 ATDs were sent to the Washington County Board of Education in late January 1992 to conduct measurements in four schools. Control (3 to 5%) and duplicate (7 to 10%) ATDs were also provided for each school. The four schools were audited on April 3, 1992, near the end of the three-month measurement period. The schools and distribution of ATDs included:

- a) Paramount Elementary School: 20 ATDs, plus 2 duplicates and 1 control;
- b) Lincolnshire Elementary School: 30 ATDs, plus 2 duplicates and 1 control;
- c) Smithberg/Kemp Horn Vocational Center: 20 ATDs, plus 2 duplicates and 1 control; and
- d) the Hancock High School: 40 ATDs, plus 3 duplicates and 1 control.

Four of the 123 ATDs (or 3.25%) could not be located during the audit. It is suspected that these ATDs were removed by students. All four missing ATDs had been placed in the boys' locker room and bathrooms at the Hancock High School and were placed at locations high above the floor (typically 10 feet or higher, 1 meter = 3.28 feet). In the elementary schools, the ATDs were generally placed at about eight feet above the floor. The ATDs were generally taped to the wall on the side of the room with the door to the hallway. Duplicate ATDs were located adjacent to the survey ATDs, wherever indicated on the floor plans. The control ATDs were kept unopened at central offices of the board of education. The master sheets for locating the ATDs in the schools were properly filled in (complete with bar code labels, etc.) and were kept at the central offices of the Board of Education.

The ATDs were scheduled to be picked up on April 15th. The foil envelopes, in which the ATDs were originally contained, were found to be in generally poor condition. The gold seals, however, were found in acceptable conditions. The procedure of reusing the foil envelopes for shipping the ATDs back is generally intended as a back-up assurance that no additional exposure occurs. Therefore, the poor condition of the foil envelopes is not expected to affect the quality of the results.

The auditor pointed out to school personnel that the control ATDs should have been opened and immediately sealed, so they have the same appearance as all of the other ATDs. The instruction sheet supplied with the ATDs, however, did not include this step. The ASD systems in all four schools appeared to be operating normally and the manometric gauges were all found to be over -1.0 inch water column (1 inch = 2.54 centimeters).

The audit revealed that instructions and procedures for measuring radon levels in these four schools were being adequately followed such that there should not be any major problems with the results and quality of the data. It is likely that the placement (about eight feet above the floor) of the detectors contributed to a high recovery rate (96.7%). These results should provide an adequate picture of radon concentrations in the rooms because of the air mixing from the ventilation systems.

5.0 RADON SPIKING MEASUREMENT RESULTS

A total of 102 ATDs were set aside for exposure as spikes with the EPA's NAREL facility located in Montgomery, AL. The spike ATDs were separated into two groups of 51 each, with one ATD held aside in each group to be returned as a control. It was requested that the cumulative exposure of the first group be on the order of 200 to 300 pCi/L - days and 50 to 100 pCi/L - days for the second group. Because of conflicting schedules at the NAREL facility, it was not possible to expose the ATDs to the desired cumulative exposure. As is noted below, the average radon concentration is nearly identical for both groups of ATDs. Once spiked, all exposed ATDs and related documentation were returned to SC&A. The ATD labels were marked to differentiate them from the school survey results. The markings, however, identified fictitious buildings assumed to be located in McLean and Reston, VA. The spiked ATDs were sent out to Tech/Ops Landauer for processing. Upon receipt of the results, the data were sorted by maximum, minimum, average, standard deviation, and were compared against the project's data quality objectives.

The results are summarized below for each exposure group. Attachment C presents the ATD results, analyses, and supporting data from the EPA-NAREL facility.

Group 1 ATDs: 200 - 300 pCi/L-days

A total of 50 ATDs were exposed from March 20th to March 30th, 1992. All ATDs sent to the NAREL for spiking were returned (i.e., 100% data completeness). The integrated exposure and average radon concentration were 198.0 ± 11.0 pCi/L-days, and 19.8 ± 1.1 pCi/L, respectively. The control ATD reported a radon concentration of 3.0 pCi/L. The results indicate that 1 ATD (2%) failed to pass the criterion of $\pm 25\%$ specified by the Project QA Plan. The overall average concentration of the 50 ATDs was calculated to be 19.3 ± 2.4 pCi/L, which is within $\pm 2.4\%$ of the average concentration reported by the EPA-NAREL facility. The ATD that failed was 29.8% lower when compared to the average EPA-NAREL radon concentration.

Group 2 ATDs: 50 - 100 pCi/L-days

A total of 50 ATDs were exposed from April 2nd to April 6th, 1992. All ATDs sent to the NAREL for spiking were returned (i.e., 100% data completeness). The integrated exposure and average radon concentration were 82.4 ± 4.4 pCi/L-days, and 20.6 ± 1.1 pCi/L, respectively. The control ATD reported a radon concentration of 7.5 pCi/L. The results indicate that 14 ATDs (28%) failed to pass the criterion of $\pm 25\%$ specified by the Project QA Plan. The overall average concentration of the 50 ATDs was calculated to be 23.1 ± 4.2 pCi/L, which is within $\pm 12.0\%$ of the average concentration reported by the EPA-NAREL facility. Individually, ATD results varied from -29.6% to +51.9% when compared to the average EPA-NAREL radon concentration.

A review of the results indicates that the ATDs exposed for the longer duration (10 days) performed better than those exposed for only 4 days, even though the average radon concentrations were nearly identical. This type of ATD response has been shown in other similar spiking tests. Based on a follow-up discussion with a NAREL representative, it was indicated that such differences disappear once exposure durations are extended beyond one month. In this project, all ATDs, with the exception of the Walker Mill School, were deployed for longer time periods, ranging from 53 to 83 days.

Table 3 presents a summary of the ATDs deployed as control and duplicates, except for two at the Rivers School (1.3 pCi/L), all control ATD results were less than 1.0 pCi/L. It should be noted that there was some confusion about the handling of the control ATDs. Some ATDs were not taken out of the bag and sealed with the foil. The duplicate results show some significant variations among six of the 30 deployed ATDs (20%). All such results are beyond the criterion of $\pm 25\%$ specified by the Project QA Plan. In addition to the inherent variability in the results, another obvious reason for the variability is that some of the duplicate ATDs were not always co-located side-by-side. The data sheets returned by the schools sometimes indicated different deployment locations within the same room. A total of six ATDs were reported to be either lost or destroyed. No specific explanations were provided, however.

6.0 SUMMARY AND CONCLUSIONS

The results from these follow-up ATD measurements indicate that, in the long-term, the ASD systems have been very effective in maintaining low radon levels in the 14 schools evaluated in this study. Of the 409 tested locations, only 17 (or 4 %) of the measurements in mitigated areas exceeded the 4 pCi/L EPA guideline. Eight of these 17 measurements were in one school basement, one was in a room where the ASD fan had been turned off, and another was in a room with building pressurization that is only operated while the building is occupied. If these ten measurements are dropped from the set, the percent of rooms above 4 pCi/L drops to less than 2 percent.

The results of the QA audits and ATD spiking measurements indicate that the project data quality objectives were generally met. However, some schools were not able to expose the ATDs for the specified three-month time period because of operational and administrative reasons. In addition, a number of the duplicate ATDs were not co-located, contributing to the variation between duplicates.

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Table 1. School Systems Participating in Measurement Study

District	City, state	Number of schools
Washington County Board of Education	Hagerstown, MD	4
Bowling Green Board of Education	Bowling Green, KY	3
Fairfax County Public Schools	Fairfax, VA	1
Prince Georges County Schools	Upper Marlboro, MD	1
Metro Public Schools	Nashville, TN	2
Seneca Elementary School	Salamanca, NY	1
Jefferson County Public Schools	Louisville, KY	1
Winston-Salem/Forsyth County Schools	Winston-Salem, NC	1

Table 2. ATD Results Summary

School district & state	School & number of measurement locations	Concentration (pCi/L)*			Total number of locations above 4 pCi/L	Number of locations above 4 pCi/L in mitigated areas	Number of days exposed
		Average	Low	High			
Washington County Board of Education, Maryland	Lincolnshire (29)	3.1+/-1.2	0.8	5.8	8	3	68
	Paramount (20)	0.4+/-0.05	0.4	0.6	0	0	68
	Smithberg (20)	0.5+/-0.3	0.4	1.9	0	0	68
	Hancock (37)	2.0+/-2.1	0.4	11.6	3	0	68
Bowling Green Board of Education, Kentucky	Dishman-McGinnis (27)	1.6+/-1.1	0.6	4.7	1	0	56
	Potter Gray (30)	1.6+/-1.4	0.5	6.2	3	0	56
	W.R. McNeil (37)	3.0+/-2.4	0.5	8.9	8	3	56
Fairfax County Public Schools, Virginia	Dranesville (20)	0.7+/-0.2	0.4	1.1	0	0	69
Prince Georges County Schools, Maryland	Walker Mill (30)	2.1+/-1.4	1.1	7.9	3	2	27
Metro Public Schools, Tennessee	Two Rivers (39)	2.0+/-1.7	1.3	9.4	3	0	83
	Glenview (25)	1.3+/-0.04	1.3	1.4	0	0	83
Seneca Elementary School, New York	Seneca (14)	11.3+/-5.5	0.6	20.8	11	8	62
Jefferson County Public Schools, Kentucky	Dunn (46)	0.8+/-0.3	0.6	2.1	0	0	54
Winston-Salem/ Forsyth County, North Carolina	Speas (35)	6.2+/-3.5	1.2	15.6	26	2	53

Table 3. Summary of Control and Duplicate ATD Results^(a)

School	Controls		Duplicates ^(b)	
	Results	Note	Results	Variation (\pm %)
Lincolnshire	0.4	2nd not deployed	2.6/2.7 4.2/4.2	3.8 0.0
Paramount	0.4		0.4/0.4 0.4/0.4	0.0 0.0
Smithberg	0.4		0.4/0.4 0.5/1.1	0.0 75
Hancock	0.4		1.4/1.7 2.3/3.0	19.3 26.4
Dishman	-	Not opened	1.0/0.8 2.1/1.9	22.2 10.0
Potter Gray	0.5		0.8/1.1 0.7/0.8	31.6 13.3
McNeil	0.5		0.7/0.8 1.5/1.5	13.3 0.0
Dranesville	0.4		0.7/0.6 0.4/0.4	15.3 0.0
Walker Mill	-	Not opened	2.0/1.1 2.2/3.7	58.1 50.8
Two Rivers	1.3		1.3/1.3 5.8/3.5	0.0 49.5
Glenview	-	No details	1.3/1.3 1.3/1.4	0.0 7.4
Seneca	-	Not opened	2.7/2.2 10.8/10.4	20.4 3.8
Dunn	0.6	Two not deployed	0.7/0.6 0.8/1.0	15.4 22.2
Speas	-	No details	4.4/4.6 4.9/5.8 10.0/11.4 7.3/6.0	4.4 16.8 13.1 19.5

^(a)Summary from results presented in Appendix B.

^(b)A total of 6 ATDs were reported to be either lost or destroyed; see results for the Hancock, Two Rivers, and Dunn schools.

Appendix A
Instruction Sheet and ATD Distribution List

A-1:	ATD Distribution Table.....	A-2
A-2:	Instruction Sheet.....	A-3
A-3:	School Follow-up Radon Measurements and Sample.....	A-6

A-1. ATD Distribution Table

Contact Name & School District	School Name	# of ATDs	Total # of ATDs in School District
Harold Winger Washington County Board of Education Hagerstown, MD	Lincolnshire	33	123
	Paramount	23	
	Smithberg	23	
	Hancock	44	
Kenneth Webb Bowling Green Board of Education Bowling Green, KY	Dishman-McGinnis	30	103
	Potter Gray	33	
	W.R. McNeil	40	
Doug Thorpe Fairfax County Public Schools Fairfax, VA	Dranesville	23	23
Dan Shiftlet Prince Georges County Schools Upper Marlboro, MD	Walker Mill	33	33
Tom Hatfield Metro Public Schools Nashville, TN	Two Rivers	44	72
	Glenview	28	
Joseph Hogan Seneca Elementary School Salamanoa, NY	Seneca	17	17
James Vaughn Jefferson County Public Schools Louisville, KY	Dunn Elementary	54	54
Andrew LaRowe Winston-Salem/Forsyth Cty Schools Winston-Salem, NC	Speas Elementary	40	40

A-2. Instruction Sheet

SCHOOL FOLLOW-UP RADON MEASUREMENTS

Instructions for the Deployment and Retrieval
of Alpha Track Detectors (ATDs) in Support of
ORD WA No. 2-13

School Information (Please complete)

School Name: _____ ID Code: _____

Full Address: _____

Contact Person: _____ Phone: () _____

Total number of rooms to be tested: _____

Total number of Duplicate and Control ATDs: _____

Total number of ATDs enclosed: _____

Measurement Dates: From: ____/____/____ To: ____/____/____.

Instructions/Notes: _____

General Instructions

Enclosed are the ATDs, a data sheet, ATD seals, and a self-addressed return label. It is important that the data sheet be completed as specified below. A filled-out sample data sheet is enclosed as an example. Address any questions to SC&A to: Ms. Patty McCloskey at 703/893-6592.

The placement of ATDs should follow the same procedure as that used during the deployment of charcoal canisters. Specifically, the ATDs may be suspended from a ceiling or placed on an interior wall that is at least 3 feet from a door, an outside window, or an outside wall and is out of direct sunlight. Place the ATDs in open areas normally occupied by people no closer than 12 inches from the ceiling, at least 3 feet away from floor surfaces, and at least 6 inches from other objects.

Do not place ATDs on or near heating or cooling units, fire places or woodstoves, in a closet or closed cabinets, between furniture and the wall, near doors and windows, near concrete or masonry walls, and near chalkboards. Since the ATDs will be deployed for 90 days, the locations should be out of normal reach so as to avoid tampering by students.

Specific Instructions

a) Deployment

- Once in each designated room, cut open the protective bag and remove the ATD detector. This begins the monitoring period. Save the bag and the bar code labels. The bar code labels are stapled into the top of the bag.
- Attach or suspend the ATD detector using the pig-tail in each classroom. Also place one ATD in each group or cluster of office space. Select an office which is centrally located or which is most often occupied (i.e., front office or principal's office). Tack or tape the ATD by its pigtail.
- Affix one of the bar code labels to the data sheet. Enter next to each label the starting date and time, location, and the room number. Specify where each ATD is being placed, e.g., "wall near bookshelf."
- Repeat the above steps for every room identified in the survey.
- Leave the ATDs in place for 3 months.

b) Deployment of Duplicate and Control ATDs

- In a selected number of rooms, designated on your floor plan, two ATDs will be placed side-by-side. The Duplicate ATDs are separately identified in an individual envelope.
- Use the same procedure as described in step a) above.
- Circle the bar code label to designate each duplicate ATD.
- A control ATD is provided in a sealed envelope. The control ATD should be kept intact (without opening) during the duration of the exposure. The control ATD will be identified in the data sheet by writing "control" in the Room No. box. The location box must state where the control ATD was kept during the duration of the exposure period, e.g., "West Wing/Maint. Office." The control ATD should be kept in the same building or complex which is being tested. The start/stop dates and times must be the same as the exposed ATDs.

c) Retrieval

- At the end of the 3-month period, retrieve the ATDs from each room.
- Affix the gold seal to the face of the ATD with the holes. This stops the monitoring period.
- Enter the date and time on the data sheet.
- If applicable, enter in the "Notes" column any unusual conditions.
- Follow these steps for all ATDs, including controls and duplicates.

d) Shipping

- Gather all ATDs, instructions, data sheets and protective bags.
- Be sure that the gold seal is affixed to each ATD.
- Place ATDs into protective bags and fold the bag over.
- Place all ATDs, completed data sheets, and the first page of these instructions in a sturdy cardboard box and securely seal the box. Note: Use the same box in which the ATDs were shipped to you.
- Affix the self-addressed return label to the box and make arrangements to ship the box back to:

S. Cohen & Associates, Inc.
1311 Dolley Madison Boulevard
McLean, VA 22101
Attention: Ms. Patty McCloskey

A-3. SCHOOL FOLLOW-UP RADON MEASUREMENTS

ATD Data Sheet

Page ____ of ____

School Name: _____ ID Code: _____

Full Address: _____

Contact Person: _____ Phone: () _____

Affix Barcode Label Below	Bldg./Room No.	Location in Room	Starting Date/Time	Ending Date/Time	Notes

Address any questions to: Ms. Patty McCloskey at 703/893-6592.

Return all ATDs to: SC&A, Inc.

1311 Dolley Madison Boulevard

McLean, VA 22101

A-6

— SAMPLE —

SCHOOL FOLLOW-UP RADON MEASUREMENTS




ATD Data Sheet

Page 1 of 1

School Name: George Washington High ID Code: _____

Full Address: 123 Main St., Lincoln, WA 12345

Contact Person: Thomas Jefferson Phone: (900) 123-4567

Affix Barcode Label Below	Bldg./Room No.	Location in Room	Starting Date/Time	Ending Date/Time	Notes
 *3518477*	West wing Rm - 101	Near Bookshelves	1/31/92 10 A.M.	5/1/92 4:15 PM	Heating system Repairs 4/3/92
	Typical entry For all ATDs - See below for others				
 *3179830*	West wing Rm - 101 Dup.	Near Bookshelves	1/31/92 10 AM	5/1/92 4:15 PM	see above note
	Duplicate ATD entry				
 *3518477*	West wing Maint. Office	Control ATD	1/31/92 10 AM	5/1/92 4:15 PM	Control ATD - not opened -
	Control ATD entry				

Address any questions to: Ms. Patty McCloskey at 703/893-6592.

Return all ATDs to: SC&A, Inc.
1311 Dolley Madison Boulevard
McLean, VA 22101

Appendix B

ATD Survey Results

	<u>Page</u>
LINCOLNSHIRE	B-2
PARAMOUNT	B-4
SMITHBERG	B-6
HANCOCK	B-8
DISHMAN-McGINNIS	B-10
POTTER GRAY	B-12
W.R.McNEIL	B-14
DRANESVILLE	B-16
WALKER MILL	B-18
TWO RIVERS	B-20
GLENVIEW	B-22
SENECA	B-24
DUNN ELEMENTARY	B-26
SPEAS ELEMENTARY	B-28

School Name: Lincolnshire
 Location: Hagerstown, MD
 ATD Survey Dates: 2/5/92 – 4/13/92
 Notes:

Code: MD – LES

ATD No.	– Location – Building/Room No.	Location in Room	Results (pCi/l)	Notes
3509123	Room 103	Inside door	2.6	
3509124	Room 108	Inside door	1.3	
3509125	Storage	Center	5.8	
3509126	Chapter 1	Right/rear	4.6	
3509129	Room 107	Inside door	2.4	
3509130	Music Room	Inside door	4.2	
3509131	Room 109	Inside door	1.8	
3509132	Kindergarten	Inside door	3.6	
3509135	Room 217	Inside door	4.4	
3509136	Room 105	Inside door	2.5	
3509139	Room 218	Inside door	3.8	
3509140	Room 111	Inside door	1.5	
3509159	Room 101	Inside door	2.5	
3509160	Room 104	Inside door	1.9	
3509165	Room 219	Inside door	2.9	
3509170	Room 220	Inside door	3.8	
3509182	Room 112	Inside door	4.2	
3509183	Room 115	Inside door	4.8	
3509186	Room 110	Inside door	1.0	
3509187	Room 113	Inside door	3.3	
3509188	Kitchen	Center	2.6	
3509191	Room 114	Inside door	4.2	
3509192	Phs. Ed. Area	Fire Alarm	4.0	
3509193	Library	Inside door	0.8	
3509194	Room 106	Inside door	2.5	
3509197	Multi-purpose Room	Emergency light	2.3	
3509198	Room 102	Inside door	2.6	
3509199	Room 216	Inside door	3.4	
3509205	Kindergarten		4.7	
3509133	Main Office		0.4	Control
3509134	Room 102	Inside door	2.7	Duplicate
3509141	Outdoors			Control: not opened
3509176	Room 112	Inside door	4.2	Duplicate
(These statistics do not include Duplicates, Controls, Lost or Destroyed ATDs)		Maximum:	5.8	
		Minimum:	0.8	
		Average:	3.1	
		Standard Deviation:	1.2	
		Number of ATDs calculated:	29	

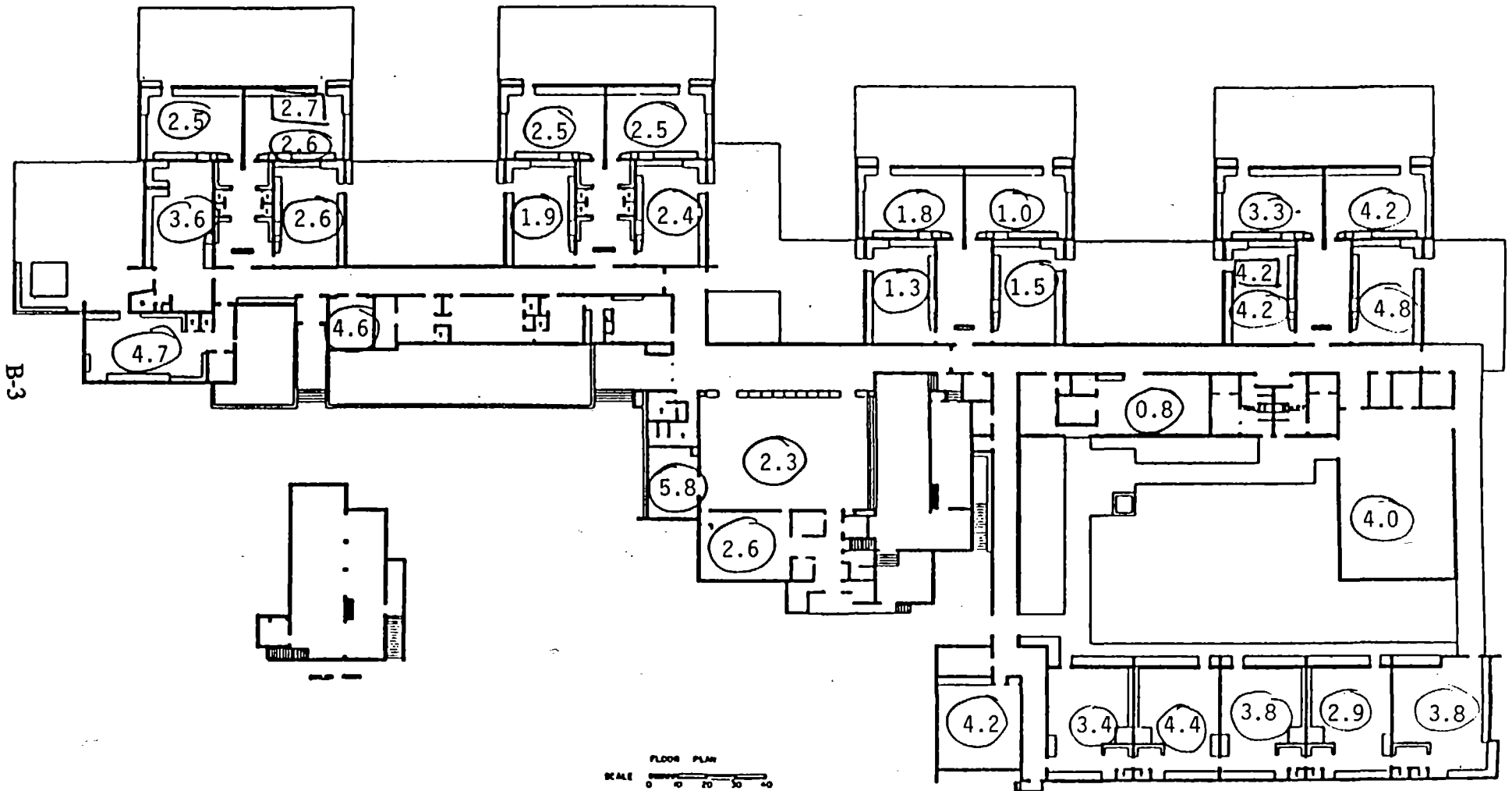
School Name: LINCOLNSHIRE

ATD Results: ① = pCi/l

ATD Duplicates: ① = pCi/l

NOTES: One ATD left outside unopened.

Unspecified location for one Control
measurement of 0.6 pCi/l. No
measurement for other Control ATD.



School Name: Paramount
 Location: Hagerstown, MD
 ATD Survey Dates: 2/5/92 - 4/14/92
 Notes:

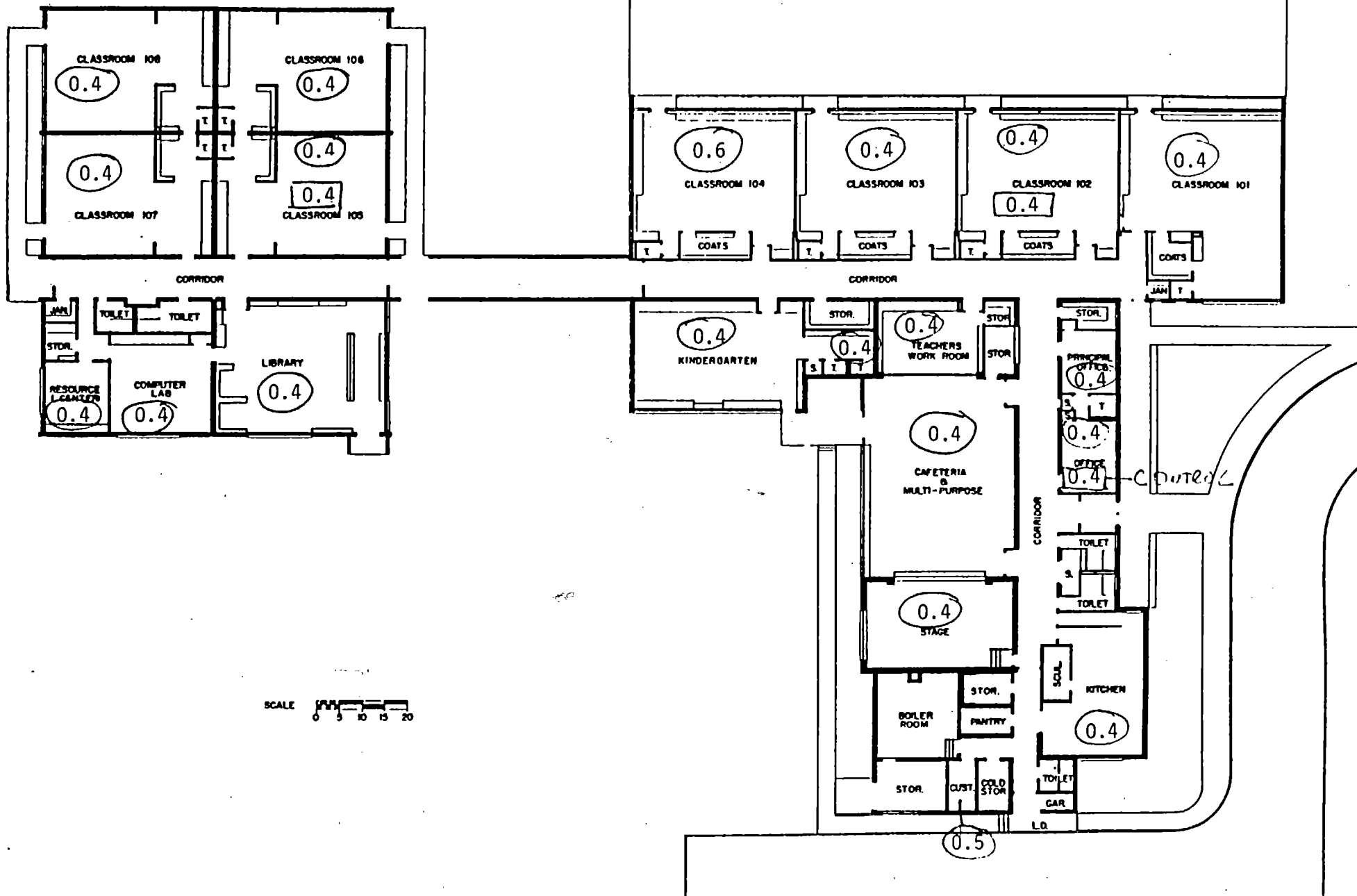
Code: MD-PES

ATD No.	Location - Building/Room No.	Location in Room	Results (pCi/l)	Notes
3509100	Resource Center	Over shelf	0.4	
3509101	Kindergarten closet	Over door	0.4	
3509111	Principal's Office	Light	0.4	
3509114	Kindergarten	Back of class	0.4	
3509115	Computer lab	Near clock	0.4	
3509116	Office	Merlin (?)	0.4	
3509118	Custodian	Over sink	0.5	
3509119	Library	Light, West side	0.4	
3509120	Room 102	Light near ext. exit	0.4	
3509122	Teacher's Work Room	Over copier	0.4	
3509128	Kitchen	Hood	0.4	
3509138	Stage	Front end near curtain	0.4	
3509143	Cafeteria	Near exit	0.4	
3509145	Room 108	Over blackboard	0.4	
3509148	Room 101	Over sink	0.4	
3509151	Room 107	Rear of room	0.4	
3509152	Room 105	Over teacher's desk	0.4	
3509153	Room 104	Front of room	0.6	
3509196	Room 103	Light	0.4	
3509203	Room 106	Over blackboard	0.4	
3509121	Room 105	Over teacher's desk	0.4 Duplicate	
3509147	Room 102	Light near ext. exit	0.4 Duplicate	
3509149	Office	Office	0.4 Control	

(These statistics do not include
 Duplicates, Controls, Lost or
 Destroyed ATDs)

Maximum:	0.6
Minimum:	0.4
Average:	0.4
Std. Dev.:	0.0
Number of ATDs calculated	20.0

NOTES: Control measurement as designated.



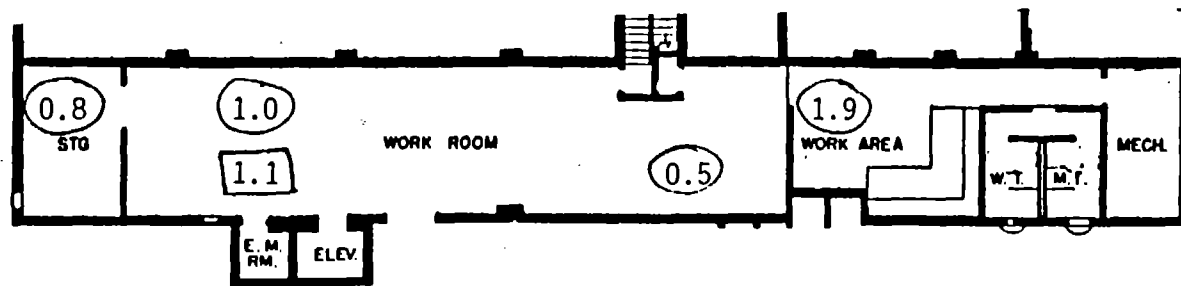
School Name: Smithberg
 Location: Hagerstown, MD
 ATD Survey Dates: 2/5/92 - 4/15/92
 Notes:

Code: MD-SKHS

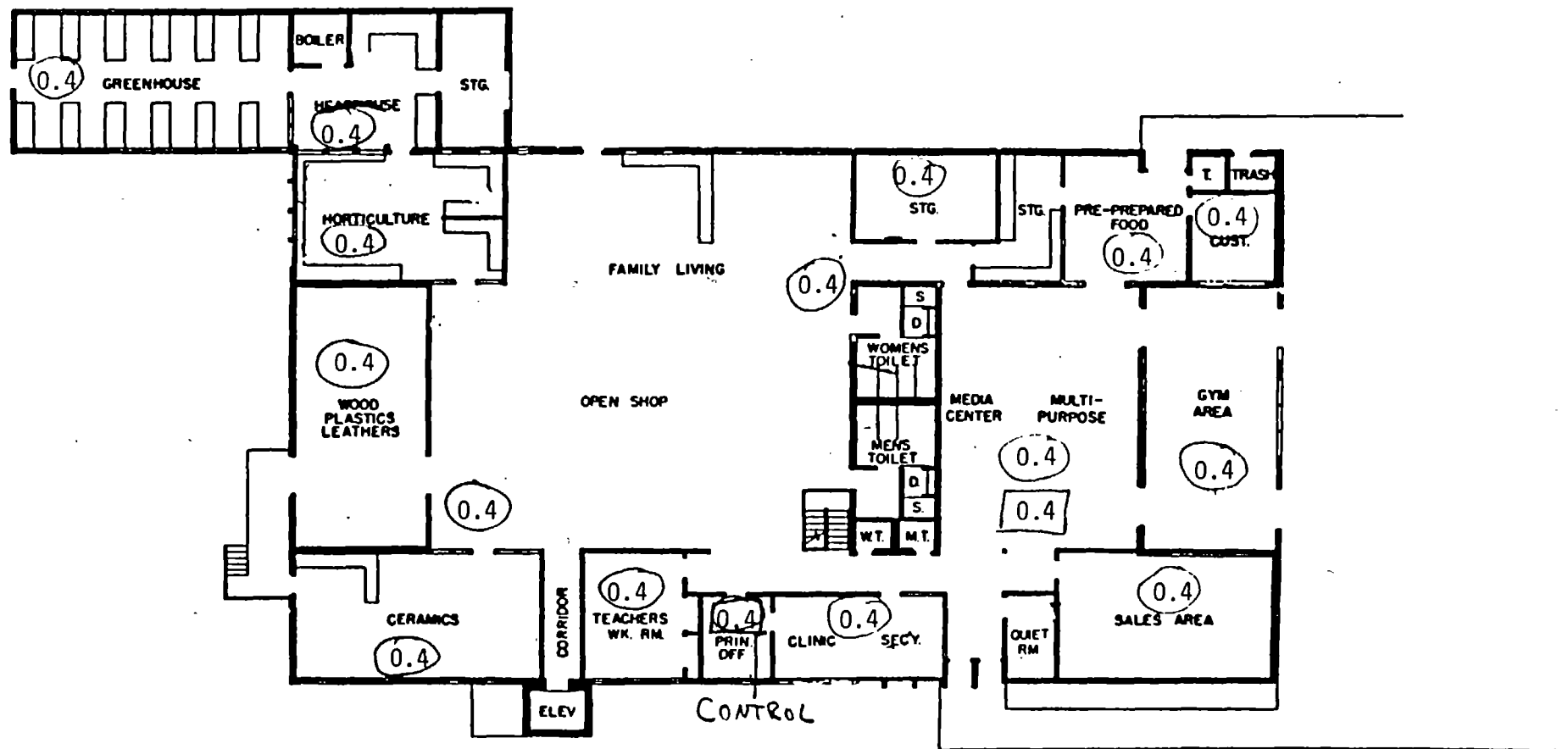
ATD No.	- Location - Building/Room No.	Location in Room	Results (pCi/l)	Notes
3509106	Stg.	Center of room	0.4	
3509107	Work Room	West	0.5	
3509108	Stg.	Center of room	0.8	
3509109	Head House	Entrance	0.4	
3509110	Sales Area	N.E. Corner	0.4	
3509112	Hort.	Near clock	0.4	
3509113	Open Shop	N.E. Corner	0.4	
3509117	Wood Plastics	East End door	0.4	
3509127	Clinic/Sec'y	Over mail	0.4	
3509137	Work Area	Center of room	1.9	
3509144	Multi-purpose room	From ceiling near water ftn	0.4	
3509150	Principal's Office	Over computer	0.4	
3509154	Teacher's Work Room	In corner	0.4	
3509206	Green House	Center of room	0.4	
3518443	Cust.	Center of room	0.4	
3518444	Ceramics	Over teacher's desk	0.4	
3518445	Pre-prepared food	Above cabinet	0.4	
3518447	Gym area	Center of room	0.4	
3518448	Work Room	East	1.0	
3518452	Open Shop	S.E. Corner	0.4	
3509099	Work Room	East	1.1	Duplicate
3518446	Multi-purpose room	From ceiling near water fountain	0.4	Duplicate
3518449	Office	Office	0.4	Control

(These statistics do not include
 Duplicates, Controls, Lost or
 Destroyed ATDs)

Maximum:	1.9
Minimum:	0.4
Average:	0.5
Standard Deviation:	0.3
Number of ATDs calculated:	20.0



GROUND FLOOR PLAN



FIRST FLOOR PLAN

SCALE 0 5 10 15 20 25

School Code: MD-SKHS

School Name: SMITHBERG

ATD Results: ① = pCi/l

ATD Duplicates: ① = pCi/l

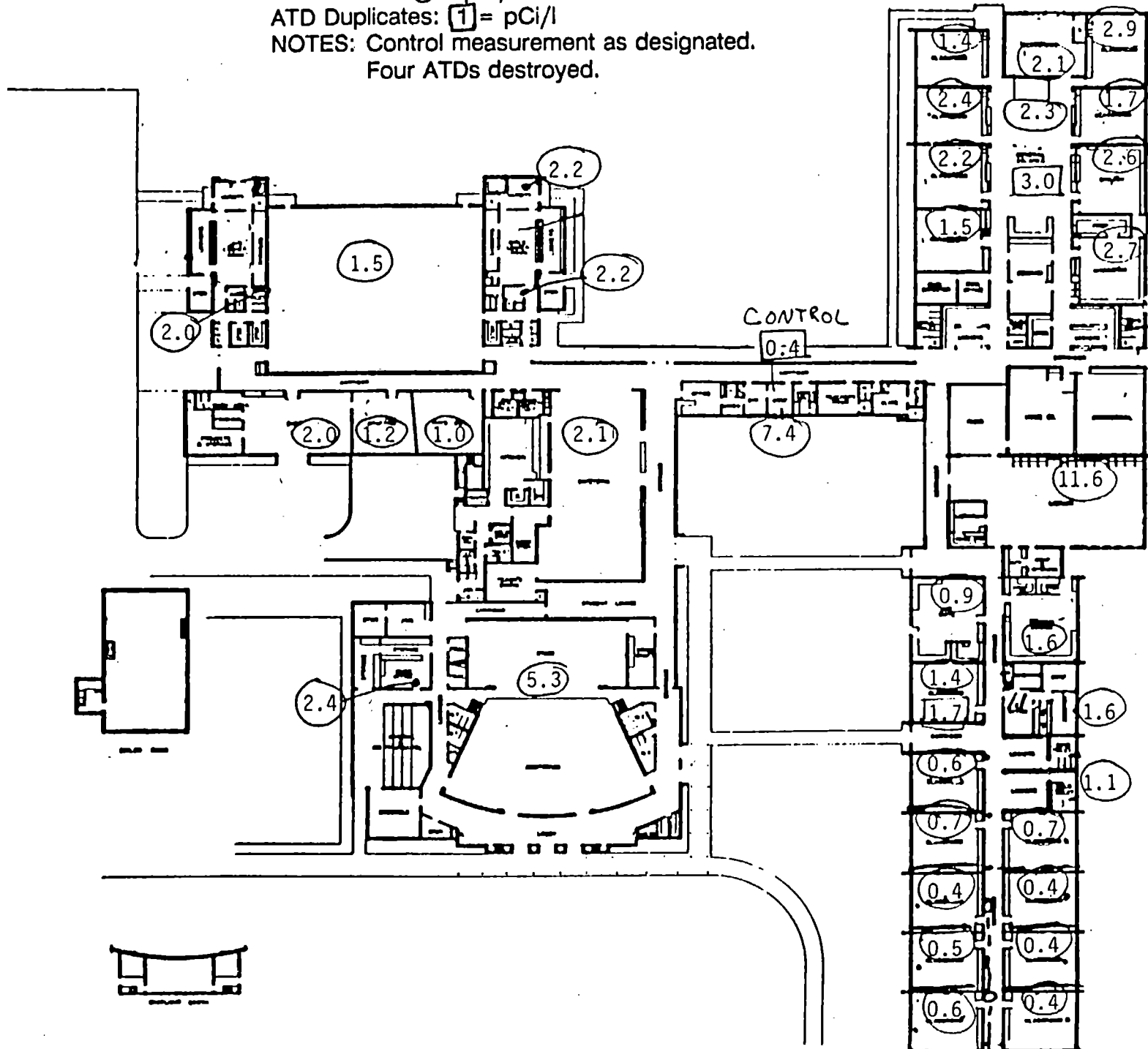
NOTES: Control measurement as designated.

School Name: Hancock High School
 Location: Hagerstown, MD
 ATD Survey Dates: 2/6/92 - 4/15/92
 Notes:

Code: MD-HHS

ATD No.	Building/Room No.	Location in Room	Results (pCi/l)	Notes
3518423	Cafeteria	Above snack line	2.1	
3518440	Coach's office	Clock	2.2	
3518441	Girl's side	Skylight	1.8	
3518442	Coach's Room	Clock	2.0	
3518450	Room 108	Over door	2.7	
3518451	A09	Front wall	0.7	
3518453	A03	Front	0.4	
3518454	Room 105	Over door	2.9	
3518455	A07	Front	0.5	
3518456	A02	Front	0.7	
3518457	A05	Front	0.4	
3518458	A-11	Over door	1.4	
3518459	Girl's	Sky light	1.1	
3518460	Room 4	Main entrance	1.0	
3518461	A06	Front	0.6	
3518462	A08	Above clock	0.4	
3518463	Vice Principal's Office	Over desk	1.6	
3518464	Room 107	Over door	2.6	
3518465	1ATV	Front wall	0.6	
3518466	Library	Over office door	11.6	
3518467	Boy's	Sky light		Destroyed
3518469	A01	Front	1.6	
3518470	A04	Front	0.4	
3518472	Varsity Girl's	Skylight	2.2	
3518473	Room 102	Above door	2.2	
3518476	Gym	Caf. ent. emerg. light	1.5	
3518478	Music Office	Over desk	2.4	
3518480	Room 106	Over door	1.7	
3518481	Room 103	Above door	2.4	
3518482	Sewing Room	Over desk	2.1	
3518483	Varsity Boys	Skylight		Destroyed
3518484	Gen. Ed.	Near Sewing Room	2.3	
3518485	Room 104	Above door	1.4	
3518486	A-12	Over cabinets	0.9	
3518487	Shop	Elec. Disc.	2.0	
3518488	Room 101	Above door	1.5	
3518490	Principal's Office	Over Desk	7.4	
3518494	Room 5	Clock	1.2	
3518495	Stage	Above Stage exit	5.3	
3518496	Boy's Side	Skylight		Destroyed
3518427	Office		0.4	Control
3518468	Boy's Side	Skylight		Duplicate - Destroy
3518474	A-11	Over door	1.7	Duplicate
3518479	Gen Ed.	Near Sewing Room	3.0	Duplicate
(These statistics do not include Duplicates, Controls, Lost or Destroyed ATDs)		Maximum:	11.6	
		Minimum:	0.4	
		Average:	2.0	
		Standard Deviation:	2.1	
		Number of ATDs calculated:	37	

School Code: MD-HHS
School Name: HANCOCK HIGH SCHOOL
ATD Results: (1) = pCi/l
ATD Duplicates: [1] = pCi/l
NOTES: Control measurement as designated.
Four ATDs destroyed.



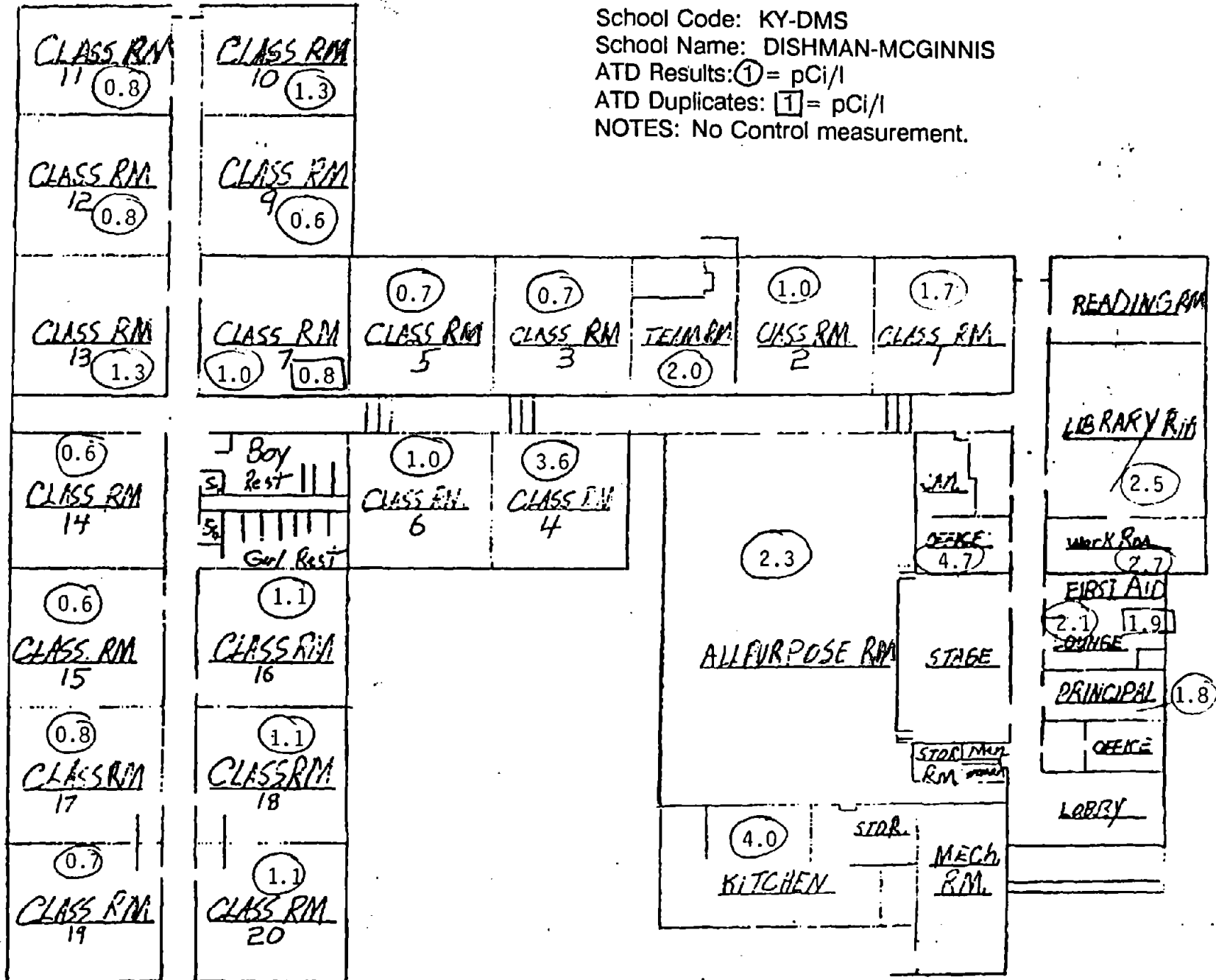
School Name: Dishman—McGinnis
 Location: Bowling Green, KY
 ATD Survey Dates: 2/18/92 – 4/14/92
 Notes:

Code: KY—DMS

ATD No.	— Location — Building/Room No.	Location in Room	Results (pCi/l)	Notes
3509208	Room #17	Center of room	0.8	
3509209	Old team new storeroom	Center of room	2.0	
3509210	Room #19	Center of room	0.7	
3509215	Office next to stage	Center of room	4.7	
3509219	Work Room/Teacher's Lounge	Center of room	2.1	
3509225	Principal's Office	Center front wall	1.8	
3509226	Room #11	Center of room	0.8	
3509234	Room #13	Center of room	1.3	
3509235	Gym	Right of standing stage	2.3	
3509236	Room #9	Center of room	0.6	
3509240	Room #20	Center of room	1.1	
3509241	Room #16	Center of room	1.1	
3509243	Room #1	Center of room	1.7	
3509245	Room #7	Right hand corner	1.0	
3509246	Room #4	Center of room	3.6	
3509247	Library	Center of room	2.5	
3509248	Room #5	Center of room	0.7	
3509250	Room #15	Center of room	0.6	
3509252	Library/Work Room	Center of room	2.7	
3509253	Room #14	Center of room	0.6	
3509255	Room #6	Center of room	1.0	
3509256	Kitchen	Center of room	4.0	
3509259	Room #10	Center of room	1.3	
3509260	Room #12	Center of room	0.8	
3509283	Room #2	Center of room	1.0	
3509297	Room #3	Center of room	0.7	
3509314	Room #18	Center of room	1.1	
3509278	Room #7	Right hand corner	0.8 Duplicate	
3509227	Work Room/Teacher's Lounge	Center of room	1.9 Duplicate	
3509229	Principal's Office	Cabinet	0.5 Control: not opened	
(These statistics do not include Duplicates, Controls, Lost or Destroyed ATDs)		Maximum:	4.7	
		Minimum:	0.6	
		Average:	1.6	
		Standard Deviation:	1.1	
		Number of ATDs calculated:	27	

School Code: KY-DMS
 School Name: DISHMAN-MCGINNIS
 ATD Results: ① = pCi/l
 ATD Duplicates: ① = pCi/l
 NOTES: No Control measurement.

B-11

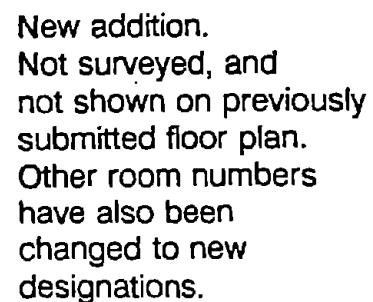


School Name: Potter Gray
 Location: Bowling Green, KY
 ATD Survey Dates: 2/18/92 – 4/14/92
 Notes:

Code: KY-PGS

ATD No.	– Location – Building/Room No.	Location in Room	Results (pCi/l)	Notes
3509155	Room 24 (old #20)	Center of room	1.6	
3509156	Kitchen	Center of room	6.2	
3509161	Library Work Room	Center of room	1.3	
3509162	Room 22 (old #18)	Center of room	0.8	
3509166	Room 7 (old #7)	Center of room	0.5	
3509167	Room 20 (old #16)	Center of room	1.2	
3509168	Room 11 (old #11)	Center of room	0.7	
3509172	Room 2 (old #2)	Center of room	2.0	
3509173	Room 5 (old #5)	Center of room	0.5	
3509177	Library	Center of room	1.0	
3509178	Principal's Office	Center left side wall	2.0	
3509180	Room back of Library	Center of room	1.4	
3509184	Room 18 (old #14)	Center of room	0.9	
3509185	First Aid Room	Center near front wall	1.9	
3509201	Room 12 (old #12)	Center of room	1.5	
3509204	Room 1 (old #1)	Center of room	0.7	
3509207	Room 8 (old #8)	Center of room	0.9	
3509211	Room 17 (old #13)	Center of room	0.6	
3509213	Room 19 (old #15)	Center of room	0.5	
3509218	Teacher's Lounge	Center of room	2.0	
3509220	Room 25 (old #21)	Center of room	4.1	
3509222	Room 9 (old #9)	Center of room	0.9	
3509223	Room 10 (old #10)	Center of room	1.0	
3509224	Gym	Center front of stage	2.8	
3509228	Room 3 (old #3)	Center of room	0.8	
3509230	Room 21 (old #17)	Center of room	0.7	
3509231	Room 26 (old #22)	Center of room	5.0	
3509238	Room 6 (old #6)	Center of room	0.7	
3509242	Room 23 (old #19)	Center of room	0.5	
3509251	Room 4 (old #4)	Center of room	3.4	
3509157	Principal's Office	File Cabinet	0.5 Control	
3509158	Room 22 (old #18)	Center of room	1.1 Duplicate	
3509163	Room 1 (old #1)	Center of room	0.8 Duplicate	
(These statistics do not include Duplicates, Controls, Lost or Destroyed ATDs)		Maximum:	6.2	
		Minimum:	0.5	
		Average:	1.6	
		Standard Deviation:	1.4	
		Number of ATDs calculated:	30	

NOTES: Control measurement as designated.

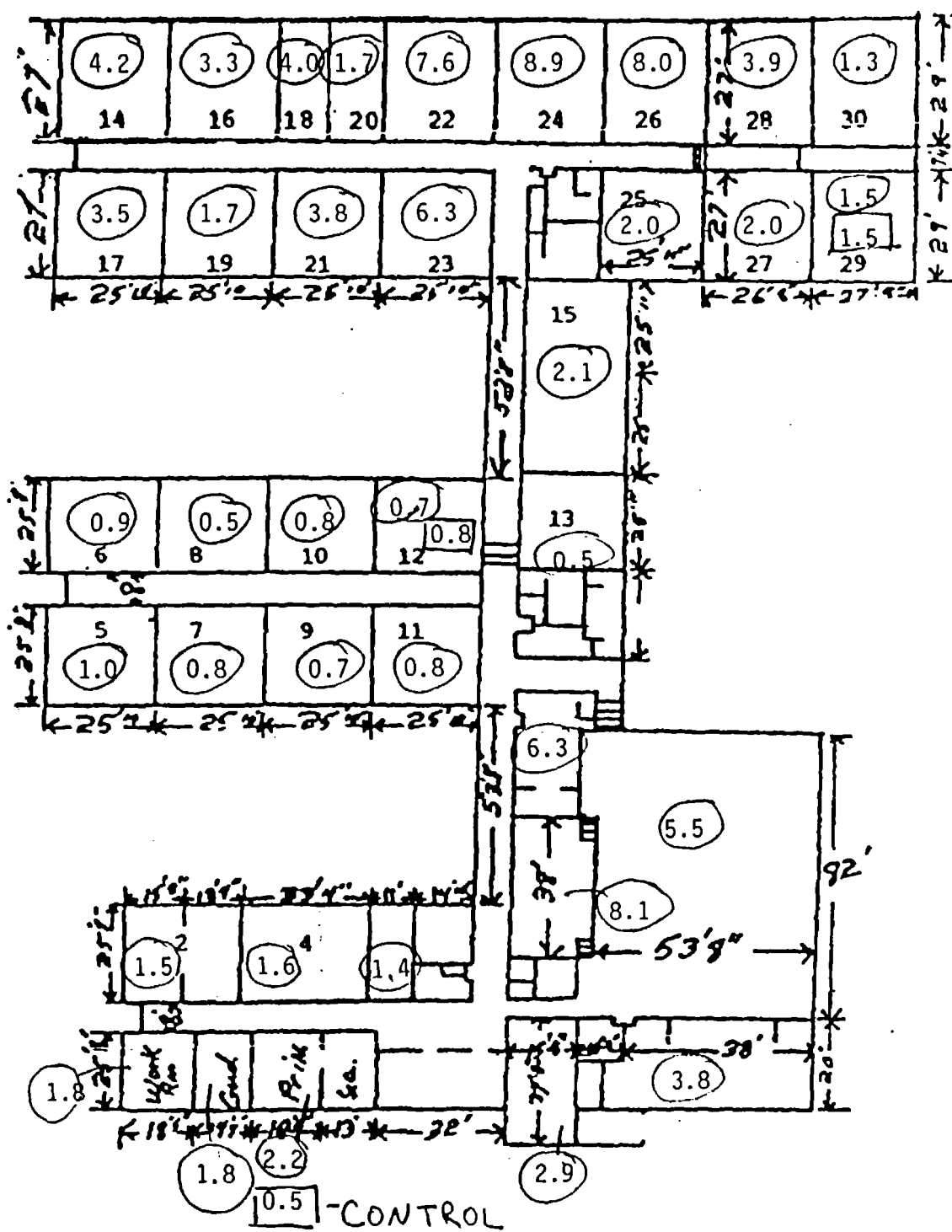


School Name: W.R. McNeil School
 Location: Bowling Green, KY
 ATD Survey Dates: 2/19/92 – 4/15/92
 Notes:

Code: KY–WRMS

ATD No.	– Location – Building/Room No.	Location in Room	Results (pCi/l)	Notes
3509233	Room #12	Center of room	0.7	
3509244	Room #15	Center of room	2.1	
3509249	Room #10	Center of room	0.8	
3509257	Room #24	Center of room	8.9	
3509261	Room #23	Center of room	6.3	
3509262	Room #28	Right corner inside wall	3.9	
3509263	Room #8	Center of room	0.5	
3509266	Room #9	Center of room	0.7	
3509267	Room #11	Center of room	0.8	
3509268	Teacher's Lounge	Center of room	1.4	
3509269	Room #25	Center of room	2.0	
3509271	Room #6	Center of room	0.9	
3509272	Gym	Center, front of stage	5.5	
3509273	Kitchen	Center of room	3.8	
3509275	Room #14	Center of room	4.2	
3509276	Room #20	Center of room	1.7	
3509277	Room #21	Center of room	3.8	
3509281	Room #27	Left corner inside wall	2.0	
3509282	Team Room off of Gym	Center of room	6.3	
3509284	Room #1	Center of room	1.8	
3509285	Boiler Room	Center of room	2.9	
3509286	Principal's Office	Center near side wall	2.2	
3509287	Room #3	Center of room	1.8	
3509289	Room #17	Center of room	3.5	
3509290	Room #13	Center of room	0.5	
3509301	Room #30	Right corner inside wall	1.3	
3509302	Room #5	Center of room	1.0	
3509303	Room #16	Center of room	3.3	
3509305	Room #7	Center of room	0.8	
3509306	Room #26	Center of room	8.0	
3509307	Stage	Front center of stage	8.1	
3509308	Room #4	Center of room	1.6	
3509309	Room #2	Center of room	1.5	
3509310	Room #19	Center of room	1.7	
3509311	Room #18	Center of room	4.0	
3509312	Room #29	Left corner inside wall	1.5	
3509313	Room #22	Center of room	7.6	
3509232	Room #12	Center of room	0.8 Duplicate	
3509237	Room #29	Left corner inside wall	1.5 Duplicate	
3509239	Principal's Office		0.5 Control	
(These statistics do not include Duplicates, Controls, Lost or Destroyed ATDs)		Maximum:	8.9	
		Minimum:	0.5	
		Average:	3.0	
		Standard Deviation:	2.4	
		Number of ATDs calculated:	37	

School Code: KY-WRMS
 School Name: W.R. MCNEIL SCHOOL
 ATD Results: ① = pCi/l
 ATD Duplicates: ① = pCi/l
 NOTES: Control measurement as designated.



School Name: Dransville Elementary School Code: VA-DES
 Location: Fairfax, VA
 ATD Survey Dates: 2/5/92 - 4/14/92
 Notes:

ATD No.	- Location -		Results (pCi/l)	Notes
	Building/Room No.	Location in Room		
3509000	Room 113	Bulletin board sidewall	0.6	
3509004	Room 108 - Language Arts	Sidewall	1.0	
3509008	Teacher's Lounge	Corner/Wall	0.5	
3509010	Room 115	Bulletin board front wall	0.5	
3509014	Room 111	Bulletin board	0.6	
3509020	Room 117	Backwall	0.4	
3509022	Composition classroom	Back bulletin board	0.6	
3509024	Library Office	Bulletin board	1.1	
3509025	Conference Room #3	Bulletin board	0.5	
3509026	Room 114	Bulletin board sidewall	0.4	
3509033	Room 112	Bulletin board	0.7	
3509037	Room 118	Corner bulletin board	0.8	
3509039	Theater	Front bulletin board	1.0	
3509041	Conference Room	Bulletin board	0.4	
3509085	Room 110	Bulletin board	0.9	
3509090	Audio/Visual Room	Sidewall bulletin board	1.0	
3509091	Room 116	Bulletin board backwall	0.9	
3509092	Library	Front Window	0.7	
3509097	Workroom	Corner/Wall	0.4	
3509098	Room 109	Sidewall bulletin board	0.7	
3509265	Room 109	Bulletin board	0.6 Duplicate	
3509279	Room 117	Backwall	0.4 Duplicate	
3509036	Workroom	Corner/Wall	0.4 Control	
(These statistics do not include Duplicates, Controls, Lost or Destroyed ATDs)			Maximum:	1.1
			Minimum:	0.4
			Average:	0.7
			Standard Deviation:	0.2
			Number of ATDs calculated:	20

NOTES: Control measurement as designated.

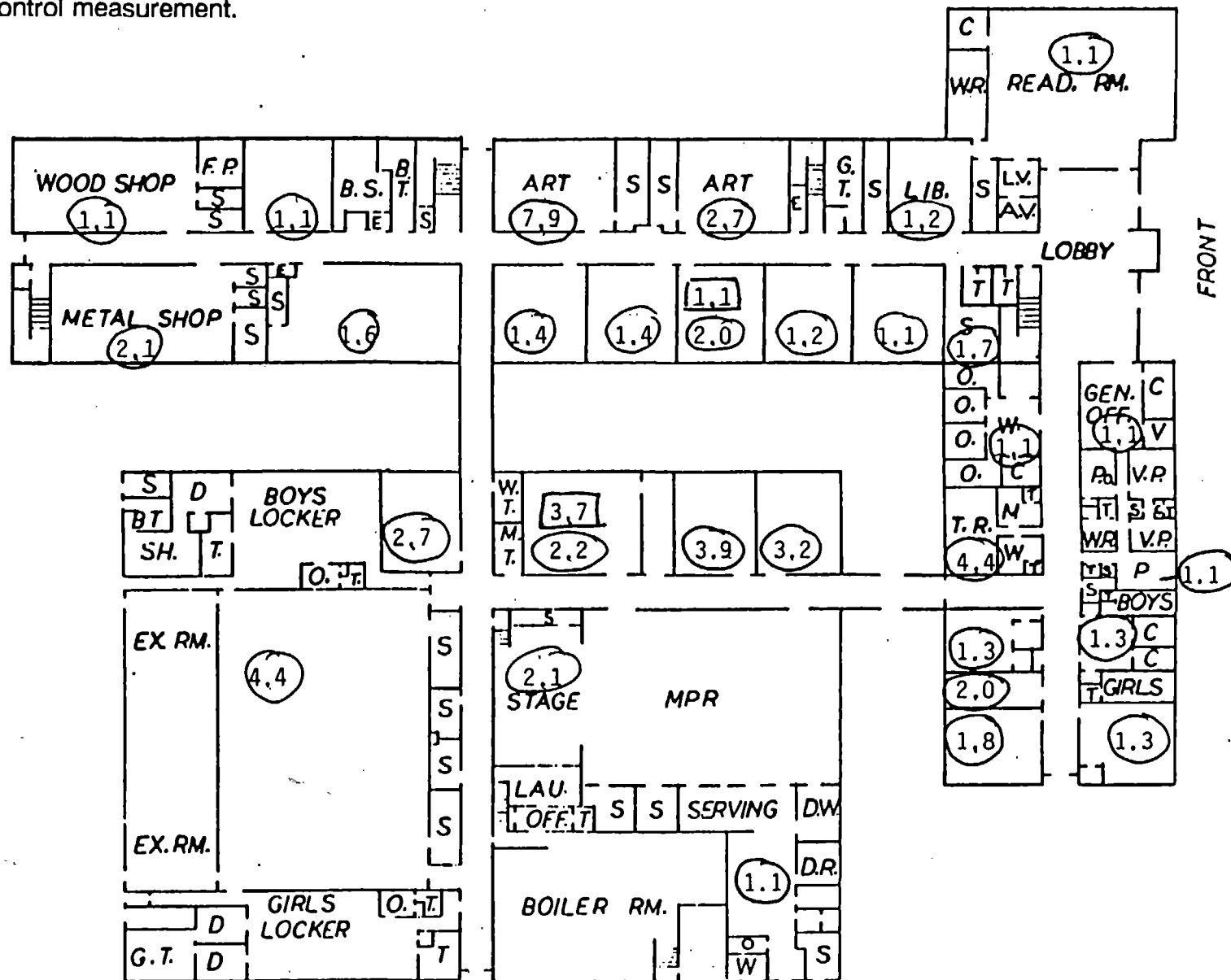


School Name: Walker Mill School
 Location: Upper Marlboro, MD
 ATD Survey Dates: 3/19/92 - 4/15/92
 Notes:

Code: MD-WMS

ATD No.	- Location -		Results (pCi/l)	Notes
	Building/Room No.	Location in Room		
3509038	Room 100 Conference	Above center door	2.0	
3509040	General Office	Over water (?)	1.1	
3509043	Room 115	Above cabinet by door	3.9	
3509044	Principal's Office	Ceiling center	1.1	
3509047	Room 108	Above cabinet by door	2.0	
3509048	Room 103	Right front corner	1.2	
3509049	Stage	Behind movie screen	2.1	
3509050	Conference Room	15' from door on right wall	1.7	
3509053	Room 100	Above movie screen	1.8	
3509054	Room 107	Ceiling center right	7.9	
3509055	Room 116	Above electric panels	2.1	
3509065	Room 104	Above cabinet	1.1	
3509066	Room 19 Exercise Room	Above 2nd row of lights on top	2.7	
3509067	Library	Above inside windows, behind corner	1.1	
3509069	Computer Room	8' from double doors above 2nd row of li	1.6	
3509070	Room 111	Above electric panels	1.1	
3509071	Guidance	Ceiling left corner	1.1	
3509073	Room 110	Above cabinet by door	1.4	
3509074	Room 113	Above cabinet by door	3.2	
3509075	Gym	Inside clock cage	4.4	
3509076	Room 106	Above cabinet by door	1.2	
3509080	Room 101	Right front corner	1.3	
3509081	Kitchen	Above refrig. by dishroom	1.1	
3509082	Room 105	Ceiling right rear	2.7	
3509083	Room 117	Corner by entrance door	2.2	
3509086	Room 109	Above teacher's desk by outside window	1.1	
3509087	Health Suite	Above clock	1.3	
3509093	Teacher's Lounge	Center of room	4.4	
3509095	Room 112	Ceiling rear right	1.4	
3509096	Room 102	Above inside windows	1.3	
3509045	Room 108	Above cabinet by door	1.1	Duplicate
3509077	Room 117	Corner by entrance door	3.7	Duplicate
3509088	Boiler Room			Control: not opened
(These statistics do not include Duplicates, Controls, Lost or Destroyed ATDs)		Maximum:	7.9	
		Minimum:	1.1	
		Average:	2.1	
		Standard Deviation:	1.4	
		Number of ATDs calculated:	30	

NOTES: No Control measurement.



School Name: Two Rivers
 Location: Nashville, TN
 ATD Survey Dates: 4/4/92 – 4/27/92
 Notes:

Code: TN–TRHS

ATD No.	– Location – Building/Room No.	Location in Room	Results (pCi/l)	Notes
3509315	South Wing Room 120	Center, from ceiling	1.3	
3509316	Vocational Wing/Upper Shop	Center, from ceiling	1.3	
3509317	Boys Locker Room	Center, from ceiling	6.8	
3509318	South Wing Room 121	Center, from ceiling	1.3	
3509319	North Wing Room 110	Center, from ceiling	1.3	
3509320	Home Economics Room	Center, from ceiling	1.3	
3509321	South Wing Room 129	Center, from ceiling	1.3	
3509322	Girl's Gym	Off backboard support	2.0	
3509323	South Wing Room 130	Center, from ceiling	1.3	
3509324	North Wing Room 109	Center, from ceiling	1.3	
3509325	North Wing Main Office	Center, from ceiling	1.3	
3509326	South Wing Room 122	Center, from ceiling	1.3	
3518402	Kitchen	Center, from ceiling	1.8	
3518403	North Wing Room 107	Center, from ceiling	1.3	
3518404	Gym (Boys) Stage Area	Steel Support	3.5	
3518406	Book Store Room	Center, from ceiling	1.4	
3518407	Boy's Dressing Room	Center, from ceiling		Destroyed
3518408	South Wing Room 131	Center, from ceiling	1.3	
3518409	Vocational Wing Band Room	Center, from ceiling	2.7	
3518411	North Wing Room 103	Center, from ceiling	1.8	
3518412	North Wing Room 105	Center, from ceiling	1.3	
3518413	South Wing Basement Art Supply	Center, from ceiling	2.3	
3518414	South Wing Room 128	Center, from ceiling	2.2	
3518416	North Wing Room 106	Center, from ceiling	1.3	
3518417	Girl's Dressing Room	Center, from ceiling	9.4	
3518418	South Wing Basement Music Room	Center, from ceiling	1.3	
3518421	North Wing Room 108	Center, from ceiling	1.4	
3518422	High Tech Lab Vocational Wing	Center, from structural steel	5.8	
3518426	South Wing Room 127	Center, from ceiling	1.3	
3518428	Boiler Room	Center, from ceiling	1.3	
3518431	South Wing Room 123	Center, from ceiling	1.8	
3518432	Teacher's Workroom	Center, from ceiling	1.3	
3518433	North Wing Asst. Principal Office	Center, from ceiling	1.3	
3518437	South Wing Basement Art Room	Center, from ceiling	1.3	
3518439	Boy's Gym	Off backboard support	2.9	
3518489	Girl's Locker Room	Center, from structural steel	2.3	
3518491	South Wing Room 126	Center, from ceiling	1.3	
3518493	Cafeteria	Center, from ceiling	1.4	
3518681	South Wing Room 125	Center, from ceiling	1.3	
3518686	South Wing Room 124	Center, from ceiling	1.3	
3518691	North Wing Room 106	Center, from ceiling	1.3 Duplicate	
3519696	High Tech Lab Vocational Wing	Center, from structural steel	3.5 Duplicate	
3518701	South Wing Room 126	Center, from ceiling	1.3 Duplicate	
3518707	Principal's Office			Control
(These statistics do not include Duplicates, Controls, Lost or Destroyed ATDs)		Maximum:	9.4	
		Minimum:	1.3	
		Average:	2.0	
		Standard Deviation:	1.7	
		Number of ATDs calculated:	39	

School Code: TN-TRHS

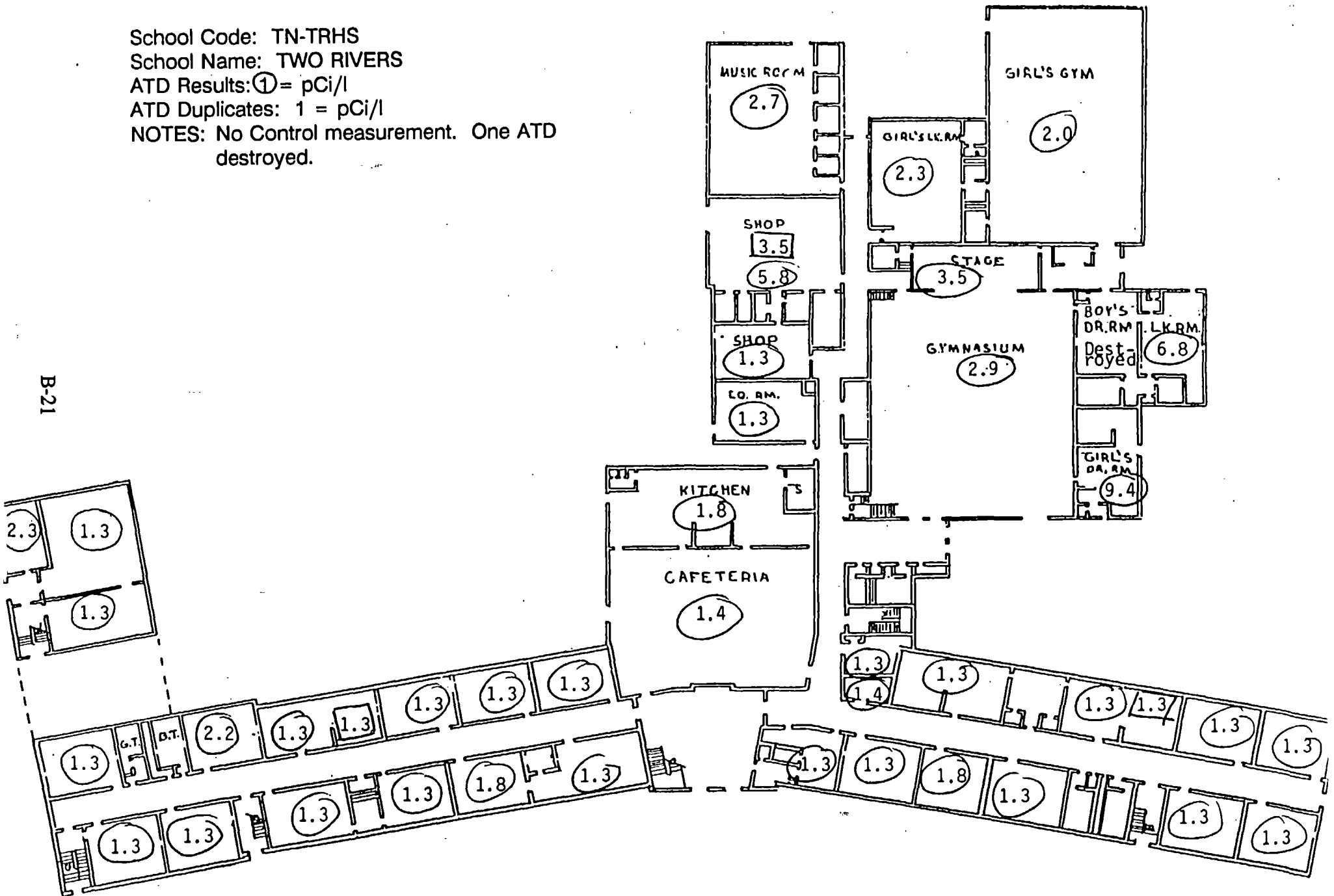
School Name: TWO RIVERS

ATD Results: ① = pCi/l

ATD Duplicates: 1 = pCi/l

NOTES: No Control measurement. One ATD destroyed.

B-21



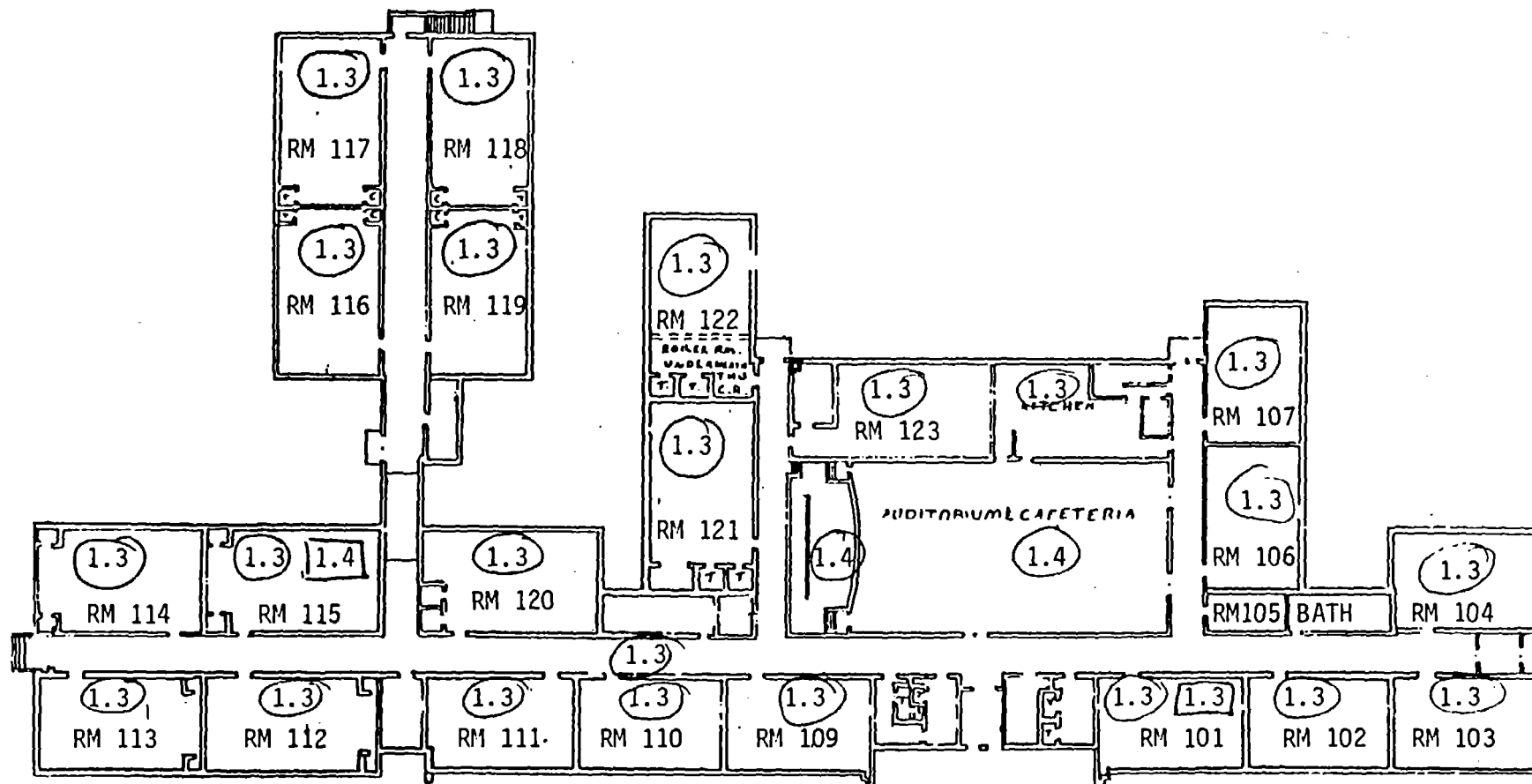
School Name: Glenview Elementary
 Location: Nashville, TN
 ATD Survey Dates: 4/4/92 - 4/27/92
 Notes:

Code: TN-GES

ATD No.	- Location -		Results (pCi/l)	Notes
	Building/Room No.	Location in Room		
3518661	North Wing Room 117	Center of room, from ceiling	1.3	
3518663	West Wing Room 112	Center of room, from ceiling	1.3	
3518664	West Wing Hallway	Center of hallway, from ceiling	1.3	
3518668	West Wing Room 113	Center of room, from ceiling	1.3	
3518669	West Wing Room 110	Center of room, from ceiling	1.3	
3518670	North Wing Room 119	Center of room, from ceiling	1.3	
3518674	West Wing Room 114	Center of room, from ceiling	1.3	
3518675	East Wing Room 103 Library	Center of room, from ceiling	1.3	
3518676	West Wing Room 120	Center of room, from ceiling	1.3	
3518680	West Wing Room 115	Center of room, from ceiling	1.3	
3518684	West Wing Room 109	Center of room, from ceiling	1.4	
3518685	North Wing Room 116	Center of room, from ceiling	1.3	
3518689	Cafeteria Stage	Suspended from curtain	1.4	
3518690	East Wing Room 102 Library	Center of room, from ceiling	1.3	
3518693	Cafeteria	Suspended from lights	1.4	
3518694	North Wing Room 122	Center of room, from ceiling	1.3	
3518695	North Wing Room 106	Center of room, from ceiling	1.3	
3518698	North Wing Room 121	Center of room, from ceiling	1.3	
3518699	East Wing Room 104	Center of room, from ceiling	1.3	
3518700	East Wing Office	Center of room, from ceiling	1.3	
3518704	North Wing Room 118	Center of room, from ceiling	1.3	
3518705	North Wing Room 107	Center of room, from ceiling	1.3	
3518706	Kitchen	Suspended from light	1.3	
3518708	North Wing Audio Visual Room	Center of room, from ceiling	1.3	
3518709	West Wing Room 111	Center of room, from ceiling	1.3	
3518660	East Wing	Principal's Office		Control
3518673	East Wing Office	Center of room, from ceiling	1.3 Duplicate	
3518679	West Wing Room 115	Center of room, from ceiling	1.4 Duplicate	
(These statistics do not include Duplicates, Controls, Lost or Destroyed ATDs)		Maximum:	1.4	
		Minimum:	1.3	
		Average:	1.3	
		Standard Deviation:	0.0	
		Number of ATDs calculated:	25	

School Code: TN-GES
School Name: GLENVIEW ELEMENTARY
ATD Results: ① = pCi/l
ATD Duplicates: [1] = pCi/l
NOTES: No Control measurement.

B-23

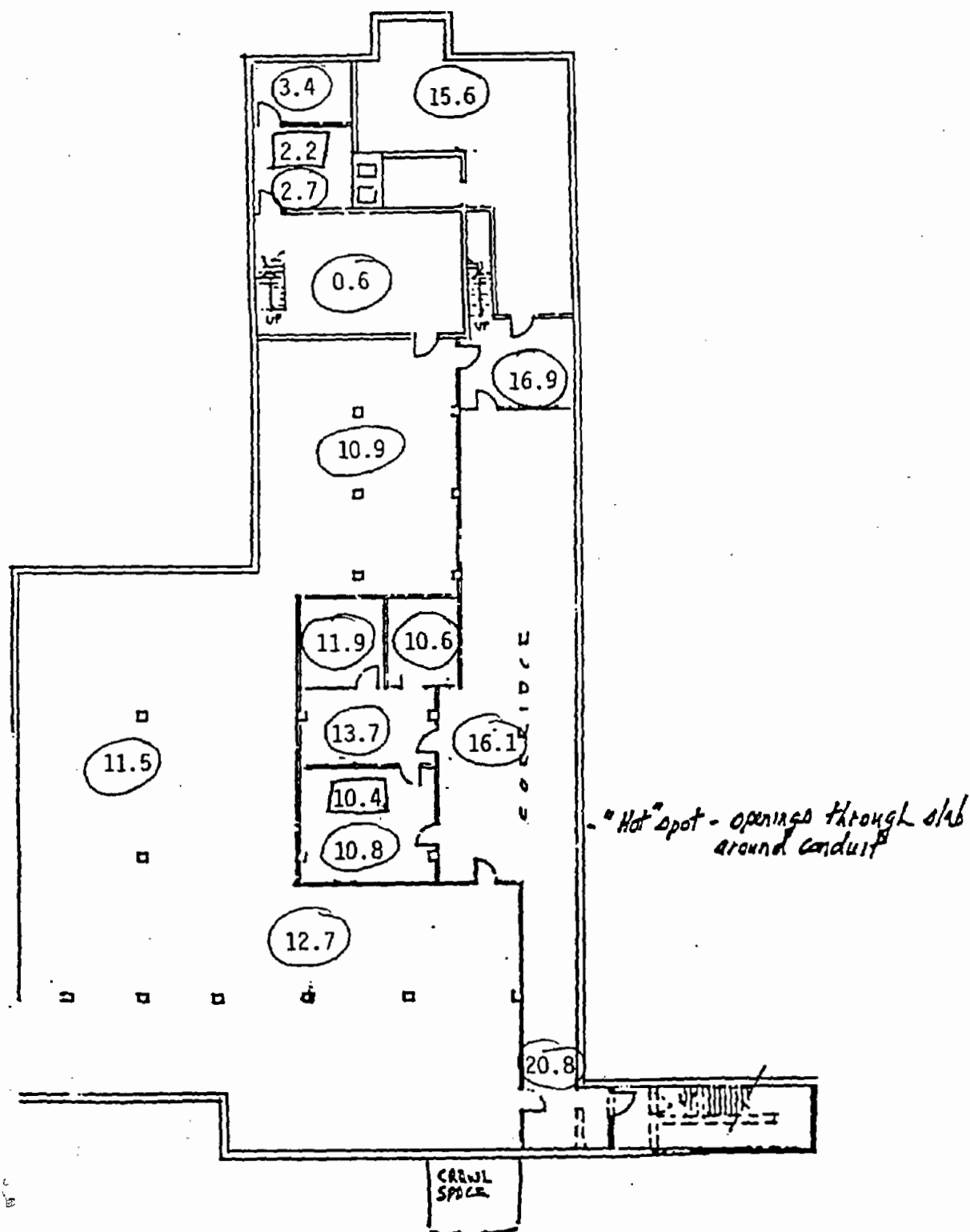


School Name: Seneca Elementary
 Location: Salamaoa, New York
 ATD Survey Dates: 2/18/92 - 4/20/92
 Notes:

Code: NY-SES

ATD No.	- Location - Building/Room No.	Location in Room	Results (pCi/l)	Notes
3518632	Room #13	Center 12" off ceiling	15.6	
3518633	Room #10	Center 12" off ceiling	11.5	
3518636	Room #14	Center 12" off ceiling	0.6	
3518637	Room #1	Center 12" off ceiling	10.8	
3518638	Room #5	Center 12" off ceiling	10.6	
3518641	Room #7 - Large Room	Center 12" off ceiling	16.1	
3518642	Room #9	Center 12" off ceiling	12.7	
3518643	Room #4	Center 12" off ceiling	13.7	
3518652	Room #15	Center 12" off ceiling	2.7	
3518653	Room #6	Center 12" off ceiling	11.9	
3518665	Room #12	Center 12" off ceiling	16.9	
3518687	Room #7 - By Stairwell	Center 12" off ceiling	20.8	
3518692	Room #16	Center 12" off ceiling	3.4	
3518697	Room #11	Center 12" off ceiling	10.9	
3518651	Room #15	Center 12" off ceiling	2.2 Duplicate	
3518657	Room #1	Center 12" off ceiling	10.4 Duplicate	
3518627	East Wing CSE Office			Control: not opened
(These statistics do not include Duplicates, Controls, Lost or Destroyed ATDs)		Maximum:	20.8	
		Minimum:	0.6	
		Average:	11.3	
		Standard Deviation:	5.5	
		Number of ATDs calculated:	14	

School Code: NY-SES
 School Name: SENECA ELEMENTARY
 ATD Results: ① = pCi/l
 ATD Duplicates: ① = pCi/l
 NOTES: No Control measurement.



BASEMENT PLAN

School Name: Dunn Elementary
 Location: Louisville, KY
 ATD Survey Dates: 2/26/92 - 4/20/92
 Notes:

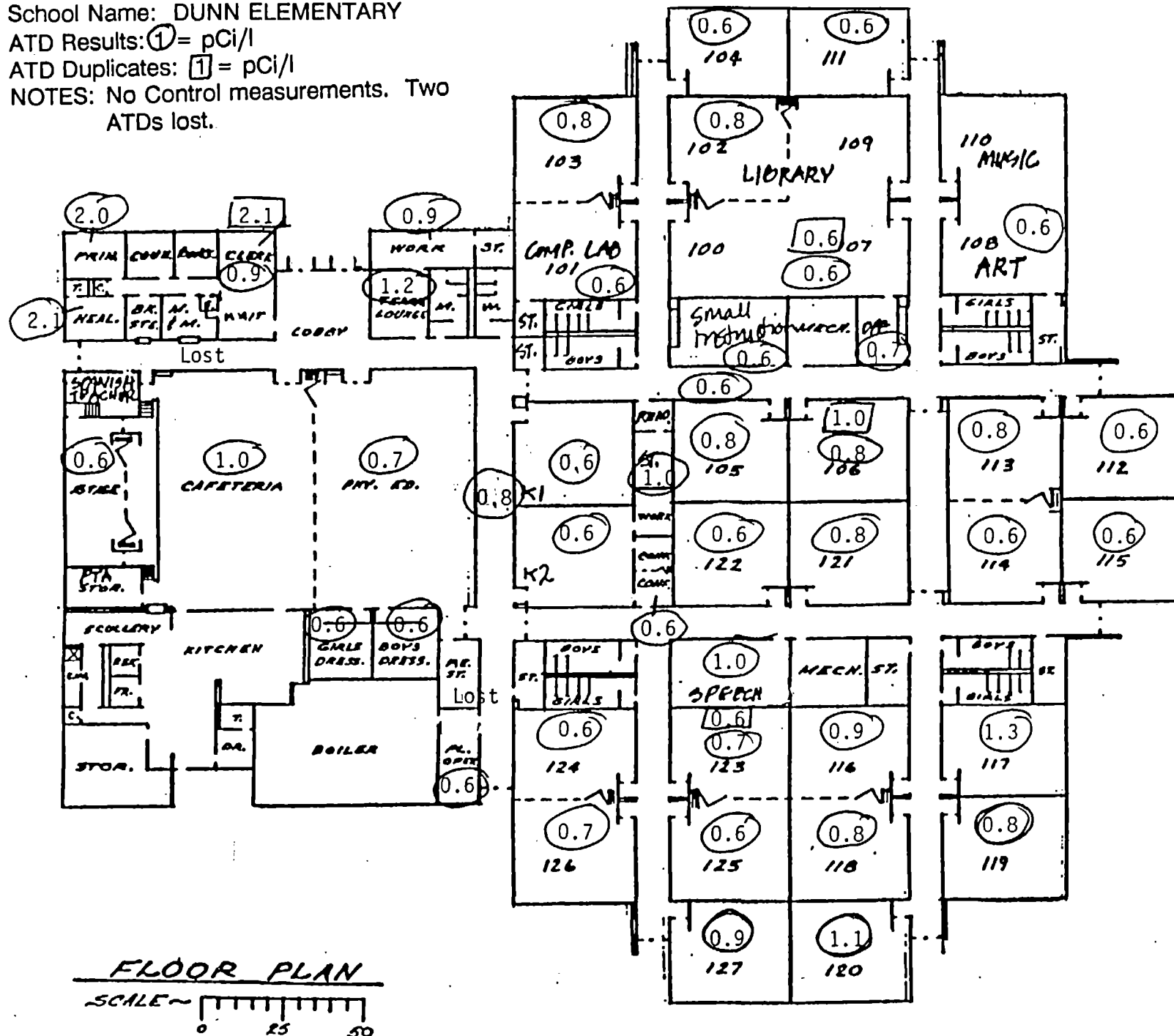
Code: KY-DES

ATD No.	Building/Room No.	Location in Room	Results (pCi/l)	Notes
3518551	Room 107	Shelves	0.6	Moved to 3' off floor
3518568	Room 122	TV frame	0.6	
3518572	Room 101	TV frame	0.6	
3518578	Kitchen	Clock	0.6	
3518580	Room 117	TV frame	1.3	
3518583	Room 106	Cabinet	0.8	
3518584	K1		0.6	
3518585	Media Office	Top of shelving	0.7	
3518589	Storage	Size of gray cabinet	1.0	
3518590	Refrigerator	Top rear	0.9	
3518592	Room 111	Brn. Cabinet	0.6	
3518595	Room 127	TV frame	0.9	
3518596	Room 104	Side cabinet	0.6	
3518605	Room 115	TV frame	0.6	
3518606	K2	TV frame	0.6	
3518607	Principal's Office	Under desk lip	2.0	
3518608	Mail Room	Top of door closer		Lost
3518609	Conference Room	Center, on ceiling	0.6	
3518610	Health	Top of door closer	2.1	
3518611	Small inst. (28)	Top of steel cabinet	0.6	
3518612	Teacher's Lounge	Top of door closer	1.2	
3518613	Room 112	TV stand	0.6	
3518614	P.V. Room	Buzzer	0.6	
3518615	Room 113	TV stand	0.8	
3518616	P.E.	Speaker bracket	0.7	
3518617	Room 105	TV frame	0.8	
3518618	Girl's Dressing Book Storage		0.6	
3518619	Room 120	TV frame	1.1	
3518621	Hallway	Wall - above lockers	0.6	
3518622	Boy's dressing, storage	Paper towel holder	0.6	
3518623	Room 102	Top speaker	0.8	
3518626	Room 103	Screen bracket	0.8	
3518628	Stage	Side curtain	0.6	
3518631	Room 114	TV frame	0.6	
3518634	Speech (30)	Side of cabinet	1.0	
3518635	Room 116	TV frame	0.9	
3518639	Room 119	TV frame	0.8	
3518640	Room 118	Brown cabinet	0.8	
3518644	Room 124	Right side of sink cab	0.6	
3518645	Room 121	TV frame	0.8	
3518646	Room 125	TV frame	0.6	
3518648	P.E. storage	Top of cabinet		Lost
3518649	Main Office - Clerk	Clock	0.9	
3518650	Cafeteria	Speaker bracket	1.0	
3518654	Room 108 - Art	TV stand	0.6	108/110 divided
3518656	Room 123	TV frame	0.7	
3518702	Room 126	TV frame	0.7	
3518703	Hall	Fire Alarm	0.8	
3518572			0.6	Control
3518573				Control
3518597				Control
3518604	Room 123	TV frame	0.6	Duplicate
3518630	Room 106	Cabinet	1.0	Duplicate
3518647	Room 107	Shelves	0.6	Duplicate
3518655	Clerk Area	Clock	2.1	Duplicate

(These statistics do not include
 Duplicates, Controls, Lost or
 Destroyed ATDs)

Maximum: 2.1
 Minimum: 0.6
 Average: 0.8
 Standard Deviation: 0.3
 Number of ATDs calculated: 46

NOTES: No Control measurements. Two ATDs lost.

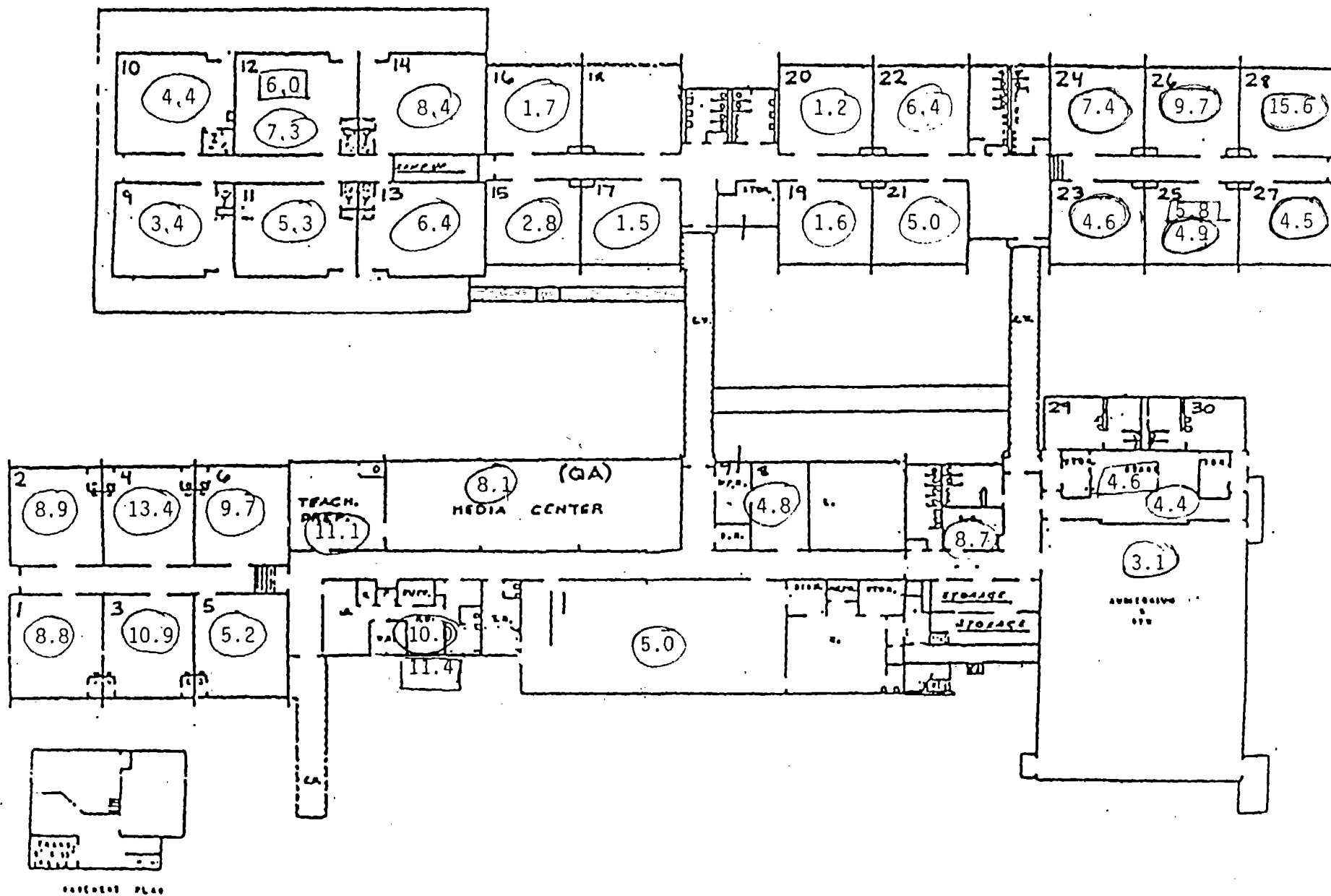


School Name: Speas Elementary
 Location: Winston-Salem, NC
 ATD Survey Dates: 3/5/92 - 4/27/92
 Notes:

Code: NC-SPEAS

ATD No.	Location - Building/Room No.	Location in Room	Results (pCi/l)	Notes
3518498	Room 25	Ceiling	4.9	
3518499	Room 15	Ceiling	2.8	
3518552	Room 3	Ceiling	10.9	
3518553	Guidance	Ceiling	2.3	
3518555	Principal's Office	E. Wall	10.0	
3518556	Room 8	Ceiling	4.8	
3518558	Room 9	Ceiling	3.4	
3518559	Room 19	Ceiling	1.3	
3518560	Media Center	Ceiling	8.1	
3518561	Room 17	Ceiling	1.5	
3518562	Room 23	Ceiling	4.6	
3518563	Stage	Back Wall	4.4	
3518564	Room 26	Ceiling	9.7	
3518565	Boiler Room	Ceiling E. Wall	8.7	
3518566	Room 27	Ceiling	4.5	
3518567	Gym	Front Wall	3.1	
3518569	Room 1	Ceiling	8.8	
3518570	Room 4	Ceiling	13.4	
3518571	Room 24	Ceiling	7.4	
3518574	Room 6	Ceiling	9.7	
3518575	Room 16	Ceiling	1.7	
3518577	Room 5	Ceiling	5.2	
3518579	Curriculum Coordinator	Ceiling	11.1	
3518581	Room 21	Ceiling	5.0	
3518582	Room 28	Ceiling	15.6	
3518586	Room 13	Ceiling	6.4	
3518588	Room 2	Ceiling	8.9	
3518593	Room 20	Ceiling	1.2	
3518594	Room 11	Ceiling	5.3	
3518598	Room 18	Ceiling	1.6	
3518599	Room 12	Ceiling	7.3	
3518600	Room 14	Ceiling	8.4	
3518601	Room 10	Ceiling	4.4	
3518602	Cafeteria	Ceiling	5.0	
3518603	Room 22	Ceiling	6.4	
3518514	Principal's Office	E. Wall		Control
3518515	Room 25	Ceiling	5.8	Duplicate
3518516	Stage	Back Wall	4.6	Duplicate
3518519	Principal's Office	E. Wall	11.4	Duplicate
3518520	Room 12	Ceiling	6.0	Duplicate
(These statistics do not include Duplicates, Controls, Lost or Destroyed ATDs)		Maximum:	15.6	
		Minimum:	1.2	
		Average:	6.2	
		Standard Deviation:	3.5	
		Number of ATDs calculated:	35	

School Code: NC-SPEAS
 School Name: SPEAS ELEMENTARY
 ATD Results: ① = pCi/l
 ATD Duplicates: ① = pCi/l
 NOTES: No Control measurement.



Appendix C

ATD Spiking Measurement Results and Data

Spiked ATDs - EPA-NAREL

Code: Fictitious homes, McLean, VA

Exposure Dates: 3/20/92 - 3/30/92

No. of exposed ATDs: 50

Cumul. Exposure: 198 +/- 11.0 pCi/L-days Ave. concent.: 19.8 +/- 1.1 pCi/L

ATDs

ATD No.	Location Building	Results (pCi/L)	Delta from mean concentration		out of specs. (> +/- 25%)
			(pCi/L)	(percent)	
3509052	Home 38	20.6	0.8	4.04	ok
3509056	Home 15	16.0	-3.8	-19.19	ok
3509057	Home 11	18.3	-1.5	-7.58	ok
3509058	Home 16	18.3	-1.5	-7.58	ok
3509060	Home 40	17.0	-2.8	-14.14	ok
3509061	Home 49	18.9	-0.9	-4.55	ok
3509062	Home 2	17.4	-2.4	-12.12	ok
3509064	Home 43	21.0	1.2	6.06	ok
3509068	Home 42	21.8	2	10.10	ok
3509094	Home 34	18.5	-1.3	-6.57	ok
3509164	Home 28	22.5	2.7	13.64	ok
3509169	Home 32	19.5	-0.3	-1.52	ok
3509171	Home 2	24.6	4.8	24.24	ok
3509174	Home 26	21.2	1.4	7.07	ok
3509181	Home 46	17.6	-2.2	-11.11	ok
3509189	Home 41	15.3	-4.5	-22.73	ok
3509190	Home 48	14.9	-4.9	-24.75	ok
3509195	Home 37	20.8	1	5.05	ok
3509200	Home 27	18.3	-1.5	-7.58	ok
3509202	Home 4	19.5	-0.3	-1.52	ok
3509264	Home 18	18.1	-1.7	-8.59	ok
3509270	Home 12	17.0	-2.8	-14.14	ok
3509288	Home 1	17.6	-2.2	-11.11	ok
3509292	Home 20	21.8	2	10.10	ok
3509294	Home 51	13.9	-5.9	-29.80	fail
3509295	Home 10	20.4	0.6	3.03	ok
3509296	Home 30	17.6	-2.2	-11.11	ok
3509299	Home 19	17.8	-2	-10.10	ok
3509300	Home 21	18.5	-1.3	-6.57	ok
3509304	Home 29	17.4	-2.4	-12.12	ok
3518410	Home 14	21.9	2.1	10.61	ok
3518415	Home 17	15.2	-4.6	-23.23	ok
3518419	Home 44	22.9	3.1	15.66	ok
3518420	Home 25	23.1	3.3	16.67	ok
3518424	Home 8	22.7	2.9	14.65	ok
3518429	Home 7	18.3	-1.5	-7.58	ok
3518430	Home 23	19.6	-0.2	-1.01	ok
3518435	Home 22	22.5	2.7	13.64	ok
3518436	Home 31	22.5	2.7	13.64	ok
3518528	Home 36	15.2	-4.6	-23.23	ok
3518658	Home 45	22.3	2.5	12.63	ok
3518659	Home 47	19.1	-0.7	-3.54	ok
3518667	Home 33	18.3	-1.5	-7.58	ok
3518671	Home 6	21.7	1.9	9.60	ok
3518672	Home 39	20.0	0.2	1.01	ok
3518677	Home 35	19.1	-0.7	-3.54	ok
3518678	Home 24	18.7	-1.1	-5.56	ok
3518682	Home 9	18.9	-0.9	-4.55	ok
3518683	Home 50	22.3	2.5	12.63	ok
3518688	Home 13	19.6	-0.2	-1.01	ok
3518425	Home 5	3.0 Control	n/a	n/a	
Relative bias:		n/a	-0.48	-2.42	
(Control ATD not		Maximum:	4.8	24.2	
used in stats.)		Minimum:	-5.9	-29.8	
		Average:	-0.5	-2.4	
		Standard Deviation:	2.4	12.4	

Spiked ATDs - EPA-NAREL

Code: Fictitious buildings, Reston, VA

Exposure Dates: 4/02/92 - 4/06/92

No. of exposed ATDs: 50

Cumul. Exposure: 82.4 +/- 4.4 pCi/L-days Ave. concent.: 20.6 +/- 1.1 pCi/L

ATDs

ATD No.	Location Building	Results (pCi/L)	Delta from mean concentration (pCi/L)	(percent)	out of specs. (> +/- 25%)
3518524	Bldg 41	24.3	3.7	17.96	ok
3518529	Bldg 9	29.6	9	43.69	fail
3518533	Bldg 51	20.2	-0.4	-1.94	ok
3518534	Bldg 49	30.1	9.5	46.12	fail
3518538	Bldg 7	16.6	-4	-19.42	ok
3518539	Bldg 30	31.3	10.7	51.94	fail
3518543	Bldg 23	29.6	9	43.69	fail
3518545	Bldg 38	17.6	-3	-14.56	ok
3518546	Bldg 45	24.3	3.7	17.96	ok
3519246	Bldg 20	25.1	4.5	21.84	ok
3519247	Bldg 46	17.3	-3.3	-16.02	ok
3519251	Bldg 11	27.6	7	33.98	fail
3519252	Bldg 13	21.9	1.3	6.31	ok
3519257	Bldg 33	24.0	3.4	16.50	ok
3519263	Bldg 36	21.4	0.8	3.88	ok
3519268	Bldg 6	17.3	-3.3	-16.02	ok
3519270	Bldg 19	24.2	3.6	17.48	ok
3519275	Bldg 29	26.1	5.5	26.70	fail
3519357	Bldg 27	18.8	-1.8	-8.74	ok
3519362	Bldg 22	25.1	4.5	21.84	ok
3519363	Bldg 40	19.9	-0.7	-3.40	ok
3519367	Bldg 18	21.4	0.8	3.88	ok
3519368	Bldg 17	18.3	-2.3	-11.17	ok
3519369	Bldg 8	18.8	-1.8	-8.74	ok
3519372	Bldg 1	27.1	6.5	31.55	fail
3519373	Bldg 37	30.8	10.2	49.51	fail
3519377	Bldg 12	20.4	-0.2	-0.97	ok
3519382	Bldg 10	18.3	-2.3	-11.17	ok
3540300	Bldg 15	18.7	-1.9	-9.22	ok
3540301	Bldg 43	26.5	5.9	28.64	fail
3540308	Bldg 2	23.4	2.8	13.59	ok
3540310	Bldg 26	21.8	1.2	5.83	ok
3540312	Bldg 42	22.9	2.3	11.17	ok
3540316	Bldg 4	17.1	-3.5	-16.99	ok
3540317	Bldg 16	23.9	3.3	16.02	ok
3540318	Bldg 44	19.7	-0.9	-4.37	ok
3540319	Bldg 39	28.1	7.5	36.41	fail
3540322	Bldg 32	20.8	0.2	0.97	ok
3540323	Bldg 25	14.5	-6.1	-29.61	fail
3540324	Bldg 28	21.3	0.7	3.40	ok
3540325	Bldg 47	29.6	9	43.69	fail
3540329	Bldg 21	25.5	4.9	23.79	ok
3540330	Bldg 24	22.9	2.3	11.17	ok
3540335	Bldg 34	22.3	1.7	8.25	ok
3540336	Bldg 35	20.3	-0.3	-1.46	ok
3540339	Bldg 3	22.3	1.7	8.25	ok
3540340	Bldg 14	23.9	3.3	16.02	ok
3540345	Bldg 50	30.7	10.1	49.03	fail
3540350	Bldg 48	23.9	3.3	16.02	ok
3540358	Bldg 5	26.0	5.4	26.21	fail
3519274	Bldg 31	7.5 Control	n/a	n/a	
Relative bias:		n/a	2.47	11.99	
(Control ATD not Maximum:		31.3	10.7	51.9	
used in stats.) Minimum:		14.5	-6.1	-29.6	
Average:		23.1	2.5	12.0	
Standard Deviation:		4.2	4.2	20.4	

SC&A, Inc.
For: Patty McCloskey

EXPOSURE SUMMARY

ALPHA TRACK

Start Date & Time: 03/20/92 @ 11:26 CST
Stop Date & Time: 03/30/92 @ 11:26 CST
Mean [Rn-222] in Chamber A: 19.8 +/- 1.1 pCi/L
Integrated Exposure: 198 +/- 11.0 pCi/L - Days
Temperature: 70 +/- 2 deg F
Relative Humidity: 50 +/- 5 %
Serial Number (AT): 3509052, 3509056, 3509057, 3509058, 3509060,
3509061, 3509062, 3509064, 3509068, 3509094,
3509164, 3509169, 3509171, 3509174, 3509181,
3509189, 3509190, 3509195, 3509200, 3509202,
3509264, 3509270, 3509288, 3509292, 3509294,
3509295, 3509296, 3509299, 3509300, 3509304,
3518410, 3518415, 3518419, 3518420, 3518424,
3518429, 3518430, 3518435, 3518436, 3518528,
3518658, 3518659, 3518667, 3518671, 3518672,
3518677, 3518678, 3518682, 3518683, 3518688

Trip Blank: 3518425

ALPHA TRACK

Start Date & Time: 04/02/92 @ 08:30 CST
Stop Date & Time: 04/06/92 @ 09:30 CST (Note Time Change 04/05/92)
Mean [Rn-222] in Chamber A: 20.6 +/- 1.1 pCi/L
Integrated Exposure: 82.4 +/- 4.4 pCi/L - Days
Temperature: 70 +/- 2 deg F
Relative Humidity: 50 +/- 5 %
Serial Number (AT): 3518524, 3518529, 3518533, 3518538, 3518539,
3518543, 3518545, 3518546, 3519246, 3519247,
3519251, 3519252, 3519257, 3519263, 3519268,
3519270, 3519275, 3519357, 3519362, 3519363,
3519367, 3519368, 3519369, 3519372, 3519373,
3519377, 3519382, 3540300, 3540301, 3540308,
3540310, 3540312, 3540316, 3540317, 3540318,
3540319, 3540322, 3540323, 3540324, 3540324,
3540325, 3540329, 3540330, 3540335, 3540336,
3540339, 3540340, 3540345, 3540350, 3540358

Trip Blank: 3519274

McLean
Home
810g 1-

ATD Exposure Data Sheet

FROM: Patty McCloskey
SC&A, Inc.
McLean, VA 22101
(703) 893-6592

TO: EPA-NAREL
Montgomery, AL
Attn: Mr. Sam Poppell

Number of ATDs shipped: 51Number of Control/Blanks: 1Date Shipped: 3/12/92Date Received at NAREL: 03/16/92 *Surp*Exposure Start: Date: 03/20/92 Time: 11:26 hr *CST*Exposure Stop: Date: 03/30/92 Time: 11:26 hr *CST*Date Shipped Out: 04/20/92

Attach supporting documentation or mail separately to the address below.

Ship to: Ms. Patty McCloskey
SC&A, Inc.
1311 Dolley Madison Boulevard
McLean, VA 22101

GROUP 1

(Cumulative Exposure - ~~50 to 100~~ pCi/l - days)
200 to 350

Enclosed ATD Serial Numbers:

3509052 ✓
3509056 ✓
3509057 ✓
3509058 ✓
3509060 ✓
3509061 ✓
3509062 ✓
3509064 ✓
3509068 ✓
3509094 ✓

3518528 ✓
3518658 ✓
3518659 ✓
3518667 ✓
3518671 ✓
3518672 ✓
3518677 ✓
3518678 ✓
3518682 ✓
3518683 ✓

3509164 ✓
3509169 ✓
3509171 ✓
3509174 ✓
3509181 ✓
3509189 ✓
3509190 ✓
3509195 ✓
3509200 ✓
3509202 ✓

3518688 ✓

3509264 ✓
3509270 ✓
3509288 ✓
3509292 ✓
3509294 ✓
3509295 ✓
3509296 ✓
3509299 ✓
3509300 ✓
3509304 ✓

3518410 ✓
3518415 ✓
3518419 ✓
3518420 ✓
3518424 ✓
3518425 Blank
3518429 ✓
3518430 ✓
3518435 ✓
3518436 ✓

ATD Exposure Data Sheet

FROM: Patty McCloskey
SC&A, Inc.
McLean, VA 22101
(703) 893-6592

TO: EPA-NAREL
Montgomery, AL
Attn: Mr. Sam Poppell

Number of ATDs shipped: 51

Number of Control/Blanks: 1

Date Shipped: 3/12/92

Date Received at NAREL: 03/16/92 *SNP*

Exposure Start: Date: 04/02/92 Time: 08:30 ^{hr} *ST*

Exposure Stop: Date: 04/06/92 Time: 09:30 ^{hr} *CST* * Time

Date Shipped Out: 04/20/92

*Change on
04/05/92*

Attach supporting documentation or mail separately to the address below.

Ship to: Ms. Patty McCloskey
SC&A, Inc.
1311 Dolley Madison Boulevard
McLean, VA 22101

GROUP 2
(Cumulative Exposure - 50 to 100 pCi/l - days)

Enclosed ATD Serial Numbers:

3518524 ✓
3518529 ✓
3518533 ✓
3518534 ✓
3518538 ✓
3518539 ✓
3518543 ✓
3518545 ✓
3518546 ✓
3519246 ✓

3519247 ✓
3519251 ✓
3519252 ✓
3519257 ✓
3519263 ✓
3519268 ✓
3519270 ✓

3519274

3519275 ✓
3519357 ✓

3519362 ✓
3519363 ✓
3519367 ✓
3519368 ✓
3519369 ✓
3519372 ✓
3519373 ✓
3519377 ✓
3519382 ✓
3540300 ✓

3540301 ✓
3540308 ✓
3540310 ✓
3540312 ✓
3540316 ✓
3540317 ✓
3540318 ✓
3540319 ✓
3540322 ✓
3540323 ✓

3540324 ✓
3540325 ✓
3540329 ✓
3540330 ✓
3540335 ✓
3540336 ✓
3540339 ✓
3540340 ✓
3540345 ✓
3540350 ✓

3540358 ✓