

2 Carson Valley Middle School

2.1 Summary



Short-term radon measurements were conducted in this school from March 18-20, 2009. The results obtained from these tests reflect the conditions that existed within this school and within these dates.

Tests were conducted in accordance with the US EPA's Guidance Document Radon Measurements in Schools, Revised Edition, EPA 402-R-92-014, July 1993.

These tests included all frequently occupied ground floor rooms within all structures on the campus, including the old gymnasium. Additional details on the methodology of these tests as well as room selection can be found in Section 1.2 of this report.

Locations tested:	84
Locations where devices retrieved:	84
Locations with short-term results at or above 4.0 pCi/L:	2
Rooms at or above 4.0 pCi/L:	Room 24 Lounge adjacent to Room 24
Survey anomalies:	Indication that windows in Rooms 1 and 3 had been opened for some period of time during the survey.

Quality control and quality assurance measures that were taken for this school, which are detailed in Section 13, indicate that confidence can be placed in the survey results for this facility.

2.2 Results

The results provided below in both tabular and pictorial form represent the radon levels within these locations that were present at the time of the survey and under the condition in which the building was being operated, including its HVAC system. Locations determined to have short-term radon levels at or above 4.0 pCi/L are shown in "bold" within the table and in red on the diagram.

All times indicated are Eastern Daylight Savings Time. Results indicated as <0.3 pCi/L are at the lower level of detection for the devices.

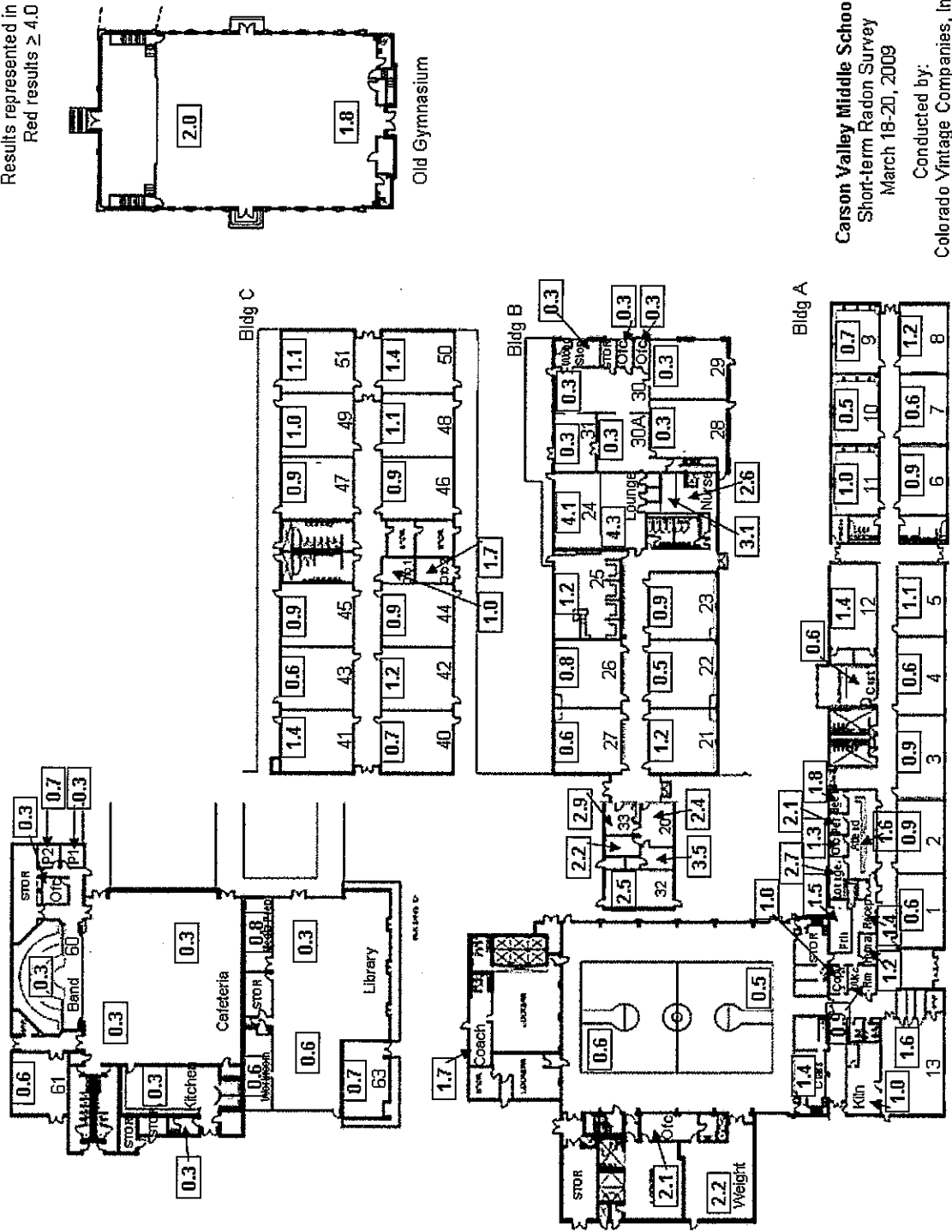
Table 3: Carson Valley Middle School Radon Survey Results

Room	Device	Start Date	Start Time	End Date	End Time	Result (pCi/L)
1	4328608	2009-03-18	10:00 pm	2009-03-21	12:00 am	0.6
2	4328614	2009-03-18	10:00 pm	2009-03-21	12:00 am	0.9
3	4328935	2009-03-18	10:00 pm	2009-03-21	12:00 am	0.9
4	4328918	2009-03-18	10:00 pm	2009-03-21	12:00 am	0.6
5	4328605	2009-03-18	10:00 pm	2009-03-21	12:00 am	1.1
6	4328916	2009-03-18	10:00 pm	2009-03-21	12:00 am	0.9
7	4328620	2009-03-18	10:00 pm	2009-03-21	12:00 am	0.6
8	4328643	2009-03-18	10:00 pm	2009-03-21	12:00 am	1.2
9	4328610	2009-03-18	10:00 pm	2009-03-21	12:00 am	0.7
10	4328617	2009-03-18	10:00 pm	2009-03-21	12:00 am	0.5
11	4328901	2009-03-18	10:00 pm	2009-03-21	12:00 am	1.0
12	4328602	2009-03-18	10:00 pm	2009-03-21	12:00 am	1.4
13	4328656	2009-03-18	10:00 pm	2009-03-21	12:00 am	1.6
21	4328625	2009-03-18	10:00 pm	2009-03-21	12:00 am	1.2
22	4328646	2009-03-18	10:00 pm	2009-03-21	12:00 am	0.5
23	4328672	2009-03-18	10:00 pm	2009-03-21	12:00 am	0.9
24	4328609	2009-03-18	11:00 pm	2009-03-21	12:00 am	4.1
25	4328657	2009-03-18	10:00 pm	2009-03-21	12:00 am	1.2
26	4328927	2009-03-18	10:00 pm	2009-03-21	12:00 am	0.8
27	4328905	2009-03-18	10:00 pm	2009-03-21	12:00 am	0.6
28	4328644	2009-03-18	11:00 pm	2009-03-21	12:00 am	< 0.3
29	4328645	2009-03-18	11:00 pm	2009-03-21	12:00 am	< 0.3
30	4328689	2009-03-18	11:00 pm	2009-03-21	12:00 am	< 0.3
30A	4328678	2009-03-18	11:00 pm	2009-03-21	12:00 am	< 0.3
30 Office 1	4328688	2009-03-18	11:00 pm	2009-03-21	12:00 am	< 0.3
30 Office 2	4328616	2009-03-18	11:00 pm	2009-03-21	12:00 am	< 0.3
31	4328632	2009-03-18	11:00 pm	2009-03-21	12:00 am	< 0.3
32	4328629	2009-03-18	10:00 pm	2009-03-21	12:00 am	2.5
40	4328634	2009-03-18	11:00 pm	2009-03-21	1:00 am	0.7
41	4328664	2009-03-18	11:00 pm	2009-03-21	1:00 am	1.4
42	4328679	2009-03-18	11:00 pm	2009-03-21	1:00 am	1.2
43	4328680	2009-03-18	11:00 pm	2009-03-21	1:00 am	0.6
44	4328681	2009-03-18	11:00 pm	2009-03-21	1:00 am	0.9
45	4328647	2009-03-18	11:00 pm	2009-03-21	1:00 am	0.9
46	4328633	2009-03-18	11:00 pm	2009-03-21	1:00 am	0.9
47	4328663	2009-03-18	11:00 pm	2009-03-21	1:00 am	0.9
48	4328671	2009-03-18	11:00 pm	2009-03-21	1:00 am	1.1
49	4328655	2009-03-18	11:00 pm	2009-03-21	1:00 am	1.0
50	4328623	2009-03-18	11:00 pm	2009-03-21	1:00 am	1.4
51	4328636	2009-03-18	11:00 pm	2009-03-21	1:00 am	1.1
61	4266743	2009-03-18	11:00 pm	2009-03-21	1:00 am	0.6
63	4328640	2009-03-18	11:00 pm	2009-03-21	1:00 am	0.7
Attendance	4328615	2009-03-18	10:00 pm	2009-03-21	12:00 am	1.6
Band	4266770	2009-03-18	11:00 pm	2009-03-21	1:00 am	< 0.3
Band Office	4266749	2009-03-18	11:00 pm	2009-03-21	1:00 am	< 0.3
Band Prac 1	4266773	2009-03-18	11:00 pm	2009-03-21	1:00 am	< 0.3

Room	Device	Start Date	Start Time	End Date	End Time	Result (pCi/L)
Band Prac 2	4269756	2009-03-19	12:00 am	2009-03-21	1:00 am	0.7
Beds	4328650	2009-03-18	11:00 pm	2009-03-21	12:00 am	3.1
Been	4328607	2009-03-18	10:00 pm	2009-03-21	12:00 am	1.8
Bldg C - Ofc 1	4328648	2009-03-18	11:00 pm	2009-03-21	1:00 am	1.0
Bldg C - Ofc 2	4328659	2009-03-18	11:00 pm	2009-03-21	1:00 am	1.7
Cafeteria 1	4266745	2009-03-18	11:00 pm	2009-03-21	1:00 am	< 0.3
Cafeteria 2	4266775	2009-03-18	11:00 pm	2009-03-21	1:00 am	< 0.3
Coach	4269761	2009-03-19	12:00 am	2009-03-21	12:00 am	1.7
Copier	4328910	2009-03-18	10:00 pm	2009-03-21	12:00 am	1.0
Couns - 20	4328630	2009-03-18	10:00 pm	2009-03-21	12:00 am	2.4
Couns - 33	4328631	2009-03-18	10:00 pm	2009-03-21	12:00 am	2.9
Custodian Ofc	4328649	2009-03-18	10:00 pm	2009-03-21	12:00 am	0.6
Gym 1	4328626	2009-03-18	10:00 pm	2009-03-21	12:00 am	0.6
Gym 2	4328638	2009-03-18	10:00 pm	2009-03-21	12:00 am	0.5
Gym Class	4328627	2009-03-18	10:00 pm	2009-03-21	12:00 am	1.4
Hyman	4328908	2009-03-18	10:00 pm	2009-03-21	12:00 am	1.2
Kiln	4328926	2009-03-18	10:00 pm	2009-03-21	1:00 am	1.0
Kitchen	4266748	2009-03-18	11:00 pm	2009-03-21	1:00 am	< 0.3
Kitchen Ofc	4266766	2009-03-18	11:00 pm	2009-03-21	1:00 am	< 0.3
Library 1	4328637	2009-03-18	11:00 pm	2009-03-21	1:00 am	0.6
Library 2	4328642	2009-03-18	11:00 pm	2009-03-21	1:00 am	< 0.3
Lounge	4328635	2009-03-18	10:00 pm	2009-03-21	12:00 am	4.3
Media Prep	4328652	2009-03-18	11:00 pm	2009-03-21	1:00 am	0.8
Nurse	4328651	2009-03-18	11:00 pm	2009-03-21	12:00 am	2.6
Ofc Wkroom	4328929	2009-03-18	10:00 pm	2009-03-21	12:00 am	0.9
Office	4328923	2009-03-18	10:00 pm	2009-03-21	12:00 am	1.3
Office Lounge	4328621	2009-03-18	10:00 pm	2009-03-21	12:00 am	2.7
Old Gym 1	4269762	2009-03-19	12:00 am	2009-03-21	1:00 am	2.0
Old Gym 2	4269759	2009-03-19	12:00 am	2009-03-21	1:00 am	1.8
Perkins	4328611	2009-03-18	10:00 pm	2009-03-21	12:00 am	2.1
Principal	4329000	2009-03-18	10:00 pm	2009-03-21	12:00 am	1.5
Reception	4328613	2009-03-18	10:00 pm	2009-03-21	12:00 am	1.4
Vasey	4328904	2009-03-18	10:00 pm	2009-03-21	12:00 am	2.2
Waderton	4328618	2009-03-18	10:00 pm	2009-03-21	1:00 am	3.5
Weight	4328604	2009-03-18	10:00 pm	2009-03-21	12:00 am	2.2
Weight Ofc	4328658	2009-03-18	10:00 pm	2009-03-21	12:00 am	2.1
Wood Shop	4328674	2009-03-18	11:00 pm	2009-03-21	12:00 am	< 0.3
Workroom	4266771	2009-03-18	11:00 pm	2009-03-21	1:00 am	0.6

Figure 2: Carson Valley Middle School Radon Survey Results

Results represented in pCi/L
Red results ≥ 4.0 pCi/L



Carson Valley Middle School
Short-term Radon Survey
March 18-20, 2009
Conducted by:
Colorado Vintage Companies, Inc.

2.3 Discussion

Two locations were found to have the potential of being at or above 4.0 pCi/L (Room 24 and the adjacent Lounge). These two locations are adjacent to each other and are in a room where a partition wall was recently constructed. It is possible that this room modification may have negatively impacted the HVAC system for these adjacent rooms.

Given the very low levels in other rooms to one side of Room 24 and the Lounge, it is also possible that there is an imbalance of the HVAC system that is providing more positive pressure to adjacent rooms (Rooms 21-27) which is reducing radon in those rooms, but at the expense of not providing adequate air supply to Rooms 24 and the Lounge.

It should also be noted that although the Nurse area, which is also adjacent to the Lounge, is below 4.0 pCi/L, the results are sufficiently high that when the concern is addressed within the Lounge area, that the Nurse area be included within that investigation.

With respect to the results for Rooms 1 and 3, where it was indicated that the windows had been opened for an unknown period of time, a review of results of rooms in this entire wing indicate low levels such that a retest of these specific rooms is not warranted.

2.4 Recommendations

- Confirm elevated radon levels within Room 24 and the Lounge with the use of a continuous radon monitor that, in addition to providing a confirmatory integrated measurement, it would also provide a more informative indication of the daytime to nighttime averages of radon exposure.
- Review HVAC system for the area within which these two rooms are located, including a review of the Nurse area.
 - Insure both the presence and capacity of air supply to these rooms
 - Adjust supply to maintain a 0.010 inch of water column positive pressurization within these rooms relative to the sub-grade.
 - Verify that positive pressure is maintained in all other rooms that are served by the air handler that serves Rooms 24 and the Lounge. If not, increase capacity of the air handler to insure positive pressure through adjustments to fresh air make-up and/or fan speed.
- After adequate HVAC adjustments have been accomplished, conduct short-term confirmatory measurements in all rooms served by the HVAC system that serves Rooms 24 and the Lounge.

Maintenance

Given the potential for this school to have elevated radon levels, a program should be instituted that:

1. Retest Rooms 24 and Lounge, once every year as recommended by US EPA protocols
2. Retest rooms after renovations, which would affect air flow and air supply, occur. This would include but not be limited to situations when:
 - HVAC system is modified, (retest rooms affected by HVAC that is modified)
 - Partition walls are added within a room,

- Insure that renovations include provisions for balanced air supply and return from newly created room.
 - Additions occur at this campus, whether they are new buildings or portable classrooms.
3. Maintain fresh air make-up in conformance with ASHRAE standards and state codes for schools and to insure an interior positive building pressure during occupied hours.
 4. Develop a database either specifically for this school or district wide for all schools that allows for the retention of future test results that clearly delineate:
 - a. Location
 - b. Date of test
 - c. Purpose of test (routine, post-mitigation or post renovation, etc.)
 - d. Method by which room nomenclature is maintained or a clear means of determining when names are changed or rooms added.