

Update to Gradient's Human Health Risk Assessment of Mercury Vapors in Wilder Hall

Prepared for
Jessica A. Nylund
Associate Vice President for Real Estate and Special Counsel
Dartmouth College
Hanover, NH 03755

Annette Chism
Senior Director, Environmental Health & Safety
Dartmouth College
Hanover, NH 03755

March 19, 2026



GRADIENT

www.gradientcorp.com

One Beacon Street, 17th Floor
Boston, MA 02108
617-395-5000

Abbreviations

ACGIH	American Conference of Governmental Industrial Hygienists
NIOSH	National Institute for Occupational Safety and Health
OSHA	Occupational Safety and Health Administration
PPE	Personal Protective Equipment
TLV	Threshold Limit Value
TWA	Time-weighted Average
UCLM	Upper Confidence Limit on the Mean
US EPA	United States Environmental Protection Agency

Table of Contents

	<u>Page</u>
1 Supplemental Risk Assessment for Wilder Hall	1
1.1 Introduction.....	1
1.2 Exposure Assessment	1
1.3 Risk Characterization	3
1.4 Conclusion	5
References	6

1 Supplemental Risk Assessment for Wilder Hall

1.1 Introduction

This report provides an update to Gradient's human health risk assessment of residual elemental mercury, including in its liquid and vapor forms, at Wilder Hall on the Dartmouth College campus in Hanover, New Hampshire. The prior risk assessment included an overview of historical mercury contamination in Wilder Hall, the risk assessment methodology used in the evaluation, the exposure scenarios considered, health effects associated with mercury exposures, as well as recently collected mercury vapor data from Wilder Hall. Based on the data evaluated in that report, Gradient concluded that potential mercury vapor exposures in Wilder Hall were unlikely to pose a risk to human health under both the "normal occupancy" and "destructive repair/renovation" scenarios (Gradient, 2025).

In December 2025, a burst radiator line in Wilder Hall caused a water leak that affected multiple rooms on several floors of the building. Air monitoring, cleanup, and abatement activities in response to the leak were conducted by Woodard & Curran and its subcontractors in and around Rooms 002, 106, and 203 (Woodard & Curran, 2026). The abatement activities are consistent with the "destructive repair/renovation" exposure scenario that was described in the previous risk assessment, which assumes that workers are intentionally disturbing building materials and are expected to encounter mercury vapors during work. Since the December 2025 data were not available at the time of the previous risk assessment, Gradient was asked to provide a supplemental risk evaluation based on mercury vapor data that were collected during response activities to the water leak incident.

1.2 Exposure Assessment

Demolition and abatement activities in response to the water leak took place from December 16-30 in rooms 002, 106, and 203 of Wilder Hall. During these activities, a total of 442 instantaneous mercury vapor readings were collected using a Jerome vapor analyzer, along with 12 personal breathing zone and 8 ambient air samples; these data are provided in Woodard & Curran (2026).

For purposes of risk evaluation, the 414 instantaneous readings that were associated with Rooms 002, 106, and 203 (*i.e.*, excluding readings taken in hallways or other rooms) are summarized in Table 1 below. While the majority of mercury vapor readings were below the American Conference of Governmental Industrial Hygienists (ACGIH)'s Threshold Limit Value (TLV) of 25 $\mu\text{g}/\text{m}^3$ (ACGIH, 2013), higher levels of mercury vapors were observed during floor demolition activities in Room 106 on December 22. In addition, a single reading above 25 $\mu\text{g}/\text{m}^3$ was observed during ceiling demolition activities in Room 002 on December 23. In addition to the range and average concentrations observed during each activity, Table 1 also presents the 95% upper confidence limit on the mean (UCLM), which was calculated separately for each of the impacted rooms. As described in the prior risk assessment, a UCLM represents an upper-end estimate of the average concentration of a chemical, and is often used in risk assessment as an exposure concentration (Gradient, 2025). Table 1 shows that the UCLMs in all three rooms were below 10 $\mu\text{g}/\text{m}^3$.

Table 1 Summary of Instantaneous Mercury Readings Collected During Water Leak Abatement Activities

Work Location	Work Activity	Work Dates	Number of Readings	Range of Vapor Readings ($\mu\text{g}/\text{m}^3$)	Average Conc. During Activity ($\mu\text{g}/\text{m}^3$)	95% UCLM Conc. ($\mu\text{g}/\text{m}^3$)
Room 002	Ceiling Demolition	12/23-12/24	22	0 – 71.80	6.81	5.20
	Cleaning	12/24, 12/29	10	0 – 17.11	10.09	
	Floor/Wall Demolition	12/23	36	0 – 1.55	0.18	
	Clearance	12/29	8	0 – 0.87	0.26	
Room 106	Ambient	12/18	9	0 – 0.77	0.22	7.85
	Ceiling Demolition	12/18	20	0 – 1.51	0.20	
	Final Clean	12/22-12/23	27	0 – 8.47	2.27	
	Floor Demolition	12/19, 12/22	45	0 – 149.1	21.53	
	Re-Check	12/29	9	0 – 2.76	1.03	
	Wall Demolition	12/19	45	0 – 1.43	0.12	
	Clearance	12/24	9	0 – 2.44	1.02	
	N/A	12/16-12/19	32	0 – 7.38	0.78	
Room 203	Floor Demolition	12/17-12/18	50	0 – 0.67	0.07	0.25
	Final Clean	12/18-12/19	27	0 – 0.68	0.13	
	Re-Check	12/29	9	0 – 2.16	1.56	
	Clearance	12/22	9	0 – 0.99	0.33	
	N/A	12/16-12/18	47	0 – 0.82	0.06	

Notes:

Conc. = Concentration; N/A = Not Applicable; UCLM = Upper Confidence Limit on the Mean; $\mu\text{g}/\text{m}^3$ = Micrograms per Cubic Meter.

Table 2 presents the personal breathing zone air samples that were collected by workers during demolition and abatement activities. Each personal air sample represents one worker's shift, and for each sample, the equivalent 8-hour time-weighted average (TWA) concentration is also provided, which is calculated assuming that zero exposure occurs outside of the indicated sample time during the remainder of the 8-hour shift, consistent with Occupational Safety and Health Administration (OSHA) policy (OSHA, 2023). For purposes of risk assessment, the 8-hour TWA concentrations represent the exposure concentration. As shown in Table 2, all except two of the 8-hour TWA concentrations were below $25 \mu\text{g}/\text{m}^3$. The two samples that exceeded $25 \mu\text{g}/\text{m}^3$ were collected during floor demolition and cleanup activities in Room 106.

Table 2 Summary of Personal Air Mercury Samples Collected During Water Leak Abatement Activities

Sample ID	Work Location and Activity	Work Date	Sampling Time (min)	Sample Result ($\mu\text{g}/\text{m}^3$)	8-Hour TWA Concentration ^a ($\mu\text{g}/\text{m}^3$)
2512219-001	Rm 203 demolition	12/17	264	<0.43	<0.43

Sample ID	Work Location and Activity	Work Date	Sampling Time (min)	Sample Result ($\mu\text{g}/\text{m}^3$)	8-Hour TWA Concentration ^a ($\mu\text{g}/\text{m}^3$)
2512219-002	Rm 203 demolition	12/17	256	<0.44	<0.44
2512219-003	Rm 203 and Rm 106 demolition	12/18	318	3.3	2.19
2512219-004	Rm 203 and Rm 106 demolition	12/18	321	1	0.67
2512219-005	Rm 106 demolition	12/19	358	0.72	0.54
2512219-006	Rm 106 demolition	12/19	354	0.97	0.72
2512260-001	Rm 106 demolition and cleaning	12/22	280	58	33.83
2512260-002	Rm 106 demolition and cleaning	12/22	280	59	34.42
2512260-003	Rm 002 demolition and Rm 106 cleaning	12/23	373	1.4	1.09
2512260-004	Rm 002 demolition and Rm 106 cleaning	12/23	373	<0.23	<0.23
2512260-005	Rm 002 demolition and cleaning	12/24	136	12	3.4
2512260-006	Rm 002 demolition and cleaning	12/24	136	29	8.22

Notes:

min = Minute; Rm = Room; TWA = Time-weighted Average; $\mu\text{g}/\text{m}^3$ = Micrograms per Cubic Meter.

a) Results above $25 \mu\text{g}/\text{m}^3$ are indicated in bold font.

1.3 Risk Characterization

As discussed in the prior Gradient assessment, the ACGIH TLV of $25 \mu\text{g}/\text{m}^3$ is applicable to the destructive repair or renovation scenario, where significant disturbance of building materials is expected to occur as part of normal work activities. It is assumed that these activities would be conducted using appropriate engineering controls (e.g., ventilation, dust mitigation measures) and other industrial hygiene measures (e.g., use of personal protective equipment [PPE]) recommended by agencies such as ACGIH and National Institute for Occupational Safety and Health (NIOSH). The abatement activities that took place in response to the December 2025 water leak met these assumptions, as engineering controls were employed in the impacted rooms and abatement workers were wearing PPE, including respirators with mercury filters (Woodard & Curran, 2026).

The data presented in Tables 1 and 2 show that mercury levels were below the ACGIH TLV for the majority of abatement activities. However, elevated mercury levels were observed during the demolition of the floor in Room 106 on December 22, 2025, as shown in Table 3 below. Of the 27 readings taken during floor demolition on December 22, 10 readings exceeded $25 \mu\text{g}/\text{m}^3$, including 3 readings that were above $100 \mu\text{g}/\text{m}^3$. As described in Woodard & Curran (2026), in response to elevated vapor readings, demolition work was stopped and mercury decontamination procedures (including ventilation and application of a mercury decontamination agent) were implemented until levels returned to below $25 \mu\text{g}/\text{m}^3$. Readings taken during this event showed that mercury vapor levels decreased to below $25 \mu\text{g}/\text{m}^3$ after one hour of mercury decontamination (see Table 3). The average mercury concentration associated with Room 106 floor demolition on this day was $34.71 \mu\text{g}/\text{m}^3$. On December 23, 2025, one mercury vapor reading of $71.80 \mu\text{g}/\text{m}^3$ (above the ACGIH TLV) was observed during ceiling demolition in Room 002, which is shown in Table 3. No other readings taken during ceiling demolition were above $25 \mu\text{g}/\text{m}^3$ and the average mercury concentration associated with this event on this date was $8.51 \mu\text{g}/\text{m}^3$.

Table 3 Mercury Vapor Readings from Room 106 Floor Demolition Activities on December 22 and Room 002 Ceiling Demolition Activities on December 23

Work Location and Activity	Date	Time	Mercury Vapor Concentration ^a (µg/m ³)
Room 106 Floor Demolition	12/22/2025	8:10	0.00
		8:14	15.87
		8:15	5.13
		8:15	17.41
		8:15	47.42
		8:16	16.01
		8:16	41.13
		8:17	12.33
		8:17	16.80
		10:27	0.00
		10:29	149.10
		10:30	25.37
		10:30	66.62
		10:30	117.80
		10:31	80.78
		10:31	88.65
		10:32	87.12
		10:32	105.50
		11:35	0.00
		11:37	2.99
		11:38	2.95
		11:38	5.60
		11:39	1.87
		11:39	9.52
		11:39	15.46
		11:40	2.67
		11:40	2.98
		Average	34.71
Room 002 Ceiling Demolition	12/23/2025	12:18	0
		12:21	0
		12:22	0
		12:22	0
		12:22	0
		12:23	0.96
		12:23	4.68
		12:24	0.68
		12:24	1.06
		13:47	0
		13:50	17.62
		13:50	71.80
		13:51	13.81
		Average	8.51

Notes:

µg/m³ = Micrograms per Cubic Meter.

a) Results above 25 $\mu\text{g}/\text{m}^3$ are shown in bold font.

Two personal air samples collected during the Room 106 floor demolition also showed elevated levels of mercury (in correlation with the elevated readings observed on the Jerome vapor analyzers), with 8-hour TWA concentrations of 33.83 and 34.42 $\mu\text{g}/\text{m}^3$ (see Table 2). These were the only samples above the ACGIH TLV of 25 $\mu\text{g}/\text{m}^3$. As discussed in the prior Gradient report, the ACGIH TLV is an air concentration of a chemical at which nearly all workers can be repeatedly exposed over a working lifetime without adverse health effects (ACGIH, 2020). Thus, an exceedance of the TLV does not indicate that an adverse health effect will occur. The United States Environmental Protection Agency (US EPA)/ATSDR Health Consultation for elemental mercury spills applies the ACGIH TLV as an action level that triggers evaluation and implementation of response actions to protect the health of potentially exposed persons (ATSDR, 2012). Based on the information available on the water leak abatement activities, such response actions (*i.e.*, decontamination procedures) were implemented during this activity. Further, personal air sampling was collected outside of workers' respirators, and therefore do not reflect air concentrations that were inhaled by workers.

Following abatement activities in all three rooms that were impacted by the water leak, mercury levels were confirmed to be below 3 $\mu\text{g}/\text{m}^3$ before the rooms were cleared for reoccupancy. This is demonstrated by the data in Table 1, which shows that the maximum mercury levels associated with "clearance" and "re-check" activities were 0.87 $\mu\text{g}/\text{m}^3$ in Room 002, 2.76 $\mu\text{g}/\text{m}^3$ in Room 106, and 2.16 $\mu\text{g}/\text{m}^3$ in Room 203. In addition, 8 ambient air samples were collected throughout all floors of Wilder Hall on December 29 and 30 after completion of abatement activities, all of which were non-detect (see Table 2 and Attachment D in Woodard & Curran, 2026).

1.4 Conclusion

Gradient performed a supplemental risk evaluation of mercury vapors released during demolition and abatement activities that were performed in December 2025 in Rooms 002, 106, and 203 of Wilder Hall in response to a water leak. For the majority of abatement activities, instantaneous readings and personal breathing zone air samples associated with the abatement activities were below the ACGIH TLV of 25 $\mu\text{g}/\text{m}^3$, indicating that those activities were unlikely to have posed a risk to the health of the workers. Elevated mercury levels were observed during Room 106 floor demolition activities that occurred on December 22, including multiple instantaneous readings and two personal breathing zone 8-hour TWA concentrations above 25 $\mu\text{g}/\text{m}^3$ (in addition, one instantaneous reading above 25 $\mu\text{g}/\text{m}^3$ was observed during ceiling demolition in Room 002 on December 23, but no other readings were elevated during this event and this was not associated with elevated personal air samples). This demonstrates that in some cases, disturbance of building materials in Wilder Hall has the potential to release mercury vapor at levels above recommended occupational exposure guidelines. Such work should continue to be performed under conditions that meet recommended industrial hygiene guidelines, such as use of proper engineering controls, PPE, and monitoring. Following abatement activities, mercury levels in all three impacted rooms were confirmed to be below 3 $\mu\text{g}/\text{m}^3$, which is the normal occupancy level for schools and commercial spaces.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2012. "Action Levels for Elemental Mercury Spills." Division of Toxicology and Environmental Medicine, Prevention, Response and Medical Support Branch, Emergency Response Team. Report to Joint EPA/ATSDR National Mercury Cleanup Policy Workgroup. 27p., March 22.

American Conference of Governmental Industrial Hygienists (ACGIH). 2020. "TLV/BEI Guidelines [Policy statement, development process, introduction, documentation]." Accessed at <https://www.acgih.org/tlv-bei-guidelines/tlv-chemical-substances-introduction>.

American Conference of Governmental Industrial Hygienists (ACGIH). 2013. "2013 Guide to Occupational Exposure Values." American Conference of Governmental Industrial Hygienists (ACGIH) (Cincinnati, OH). ACGIH Publication No. 0391. 256p.

Gradient. 2025. "Human Health Risk Assessment of Mercury Vapors in Wilder Hall." Report to Dartmouth College (Hanover, NH). 20p., December 10.

Occupational Safety and Health Administration (OSHA). 2023. "OSHA Technical Manual (OTM) Section II, Chapter 1: Personal Sampling for Air Contaminants." September 14. Accessed at <https://www.osha.gov/otm/section-2-health-hazards/chapter-1>.

Woodard & Curran. 2026. "Letter Report to P. Conklin (Dartmouth College) re: Mercury Monitoring and Asbestos Abatement Closeout Report, Wilder Hall, Dartmouth College, Hanover, NH." 78p., January 27.