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INTERIM REPORT:

**LEAD CONCENTRATIONS IN DRINKING WATER
AT CAROLINE ELEMENTARY SCHOOL
SLATERVILLE SPRINGS, NY**

April 2016

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April 12, 2016

**INTERIM REPORT:
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I. Background

Drinking water for Caroline Elementary School is supplied by an on-site groundwater well and disinfection system. The water system must meet the requirements of the NYS Sanitary Code Subpart 5-1. The Ithaca City School District (ICSD) is responsible for the operation of the water system; selected staff in the Facilities Department are certified water system operators. Regulatory oversight is provided by the Tompkins County Health Department (TCHD) Division of Environmental Health.

Requirements for controlling lead and copper in public water systems are contained in Section 5-1.40 to 49 of Subpart 5-1, Public Water Systems. Under these regulations, 90 percent of sample results must be at or lower than the lead action level of 15 ug/l, which is equivalent to 15 parts per billion (ppb). Action including public education, water monitoring, treatment or remediation must be taken when the 90th percentile requirement is exceeded. Since 2006, Caroline Elementary School has been on a 3-year monitoring schedule for lead and copper in accordance with these regulations.

Lead usually enters drinking water as a result of the corrosion, or wearing away, of materials containing lead in the water distribution system and household plumbing. Therefore, lead concentrations will vary throughout a water system. In a school's water systems, lead levels may increase when water in the plumbing system stands overnight, over the weekend, and throughout term breaks when there are no classes.

Schools that do not supply their own drinking water are not required to meet the specific regulations in the NYS Sanitary Code. In October 2006, EPA released revised technical guidance *3 T's for Reducing Lead in Drinking Water in Schools*. The Guidance provides information on how schools should test for lead in their drinking water and recommends corrective action be taken if a sample from a fixture exceeds 20 ppb.

There are differences in the procedures used when sampling for compliance with the NYS Sanitary Code and that recommended in the EPA *3 T's Guidance*. The regulations in the NYS Sanitary Code are aimed at identifying system-wide problems rather than problems at individual outlets. The EPA *3 T's Guidance* was designed to pinpoint problems at specific drinking fountains or other fixtures.

II. Recent Sampling History

Sampling requirements in 2015 for Caroline Elementary School included lead testing to be conducted between June 1 and September 30 at 5 locations. On August 25, 2015 before school was in session, the ICSD tested drinking water samples from Caroline Elementary Schools for lead (see Table 1). The result for one of the samples significantly exceeded the lead action

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level of 15 ppb. The 90th percentile was 75 ppb. TST-BOCES collected the samples for the ICSD. A letter report written by BOCES noted that for at least one location the water had not been used since the end of school in June and the sample was turbid. When water stands in the pipes unused for very long periods of time (many days), more lead can dissolve into the drinking water. Standing water likely contributed to the high August test result.

Consequently, 10 samples were collected in January 2016, following recommended flushing and sampling procedures. (See Table 1). With one exception (the sink in Rm. 27), all results were lower and the 90th percentile requirement was met. Results from the sink in Rm. 27 exceeded the action level of 15 ppb and one drinking water fountain (Rm. 53) was at the action level. The ICSD replaced the fixtures and piping at these locations.

In addition to replacing the two fixtures, the ICSD decided to hire an independent company to sample every fixture at Caroline Elementary School. The TCHD was not involved in the process. After school on the day before sampling, every fixture at Caroline Elementary School was simultaneously and vigorously flushed for several minutes. The entry-point valve was then shut off, turning off all water to the system. When the water was turned on the next morning, the water system had apparently depressurized over night. Ninety-one samples were collected on the morning on February 6. Samples from two locations had to be resampled for analysis. Those locations were resampled on February 9.

The results from this sampling event are included in Table 2. Of the 91 samples, 47 locations exceeded the action level of 15 ppb with an additional 2 locations at 15 ppb. Results ranged from a low of 1 ppb to 5000 ppb, with 14 locations at or exceeding 100 ppb. The location labeled "Boiler Room/Post Storage Tank Tap" (the closest sampling point to the source water) had a concentration of 68 ppb, but the Boiler Room sink sample had a concentration of 7.4 ppb.

When these results were received, the ICSD turned off all consumptive-use fixtures and provided certified bottled water to the school.

Sample results submitted to the TCHD in 2012, 2009 and 2006 had no results exceeding the action level (See Table 3). Previous samples were generally from different locations than the August 2015 and January 2016 samples.

A schematic of the Caroline School showing the ages of sections of the building is contained in Figure 1.

Several observations are important in reviewing this data:

- First, the procedures followed in the February 2016 school-wide sampling departed significantly from normal water system operation and standard sampling procedures. The

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vigorous flushing of the system, the shutting off of the water to the system and the reported depressurization of the Caroline Elementary School water system all may have created disruptive, turbulent or scouring conditions in the water pipes, potentially releasing lead-containing particles into the distribution system.

- The "Post Storage Tank Tap" in the Boiler Room contained 68 ppb lead (the location closest to the ground water source); however, other points in the system were below the action level. The Boiler Room "Entry Point" sample contained 7.4 ppb lead.
- The ICSD replaced the two fixtures in January 2016 that were at or above the action level. The February results for both of these locations were significantly higher than before the fixtures were changed.

These observations indicate that the February 2016 sample results do not accurately represent and may significantly exaggerate lead concentrations in the drinking water at Caroline Elementary School.

Note that the sampling locations located in the oldest part of the building (built in 1958) that were all at or below the action level of 15 ppb when sampled in 2006, 2009 and 2012 were also below the action level when sampled in February 2016.

III. TCHD Sampling – March 2016

In consultation with NYSDOH, the TCHD made arrangements to sample 13 locations at Caroline Elementary School during the week of February 29. The purpose of the sampling was to evaluate conditions at specific fixture locations. The sampling was not conducted for compliance with the NYSDOH lead and copper requirements. Therefore, the procedures in the EPA *3 T's Guidance* were followed.

Locations were selected based on the locations with the highest previous concentrations, the "entry point" and one sample that was slightly elevated. Since the fixtures had been turned off to prevent use, the ICSD carefully flushed the system prior to sampling and the TCHD flushed the sample locations the afternoon prior to sample collection in an effort to remove any sediments or other contaminants that had been introduced to the system during the February school-wide sampling. Both a first draw and a flushed sample were collected.

TCHD staff visually examined samples collected during the flushing the day before sample collection. Unlike during some previous sample collection, no turbidity issues were identified. However, the water flowed through a coffee filter and debris was noted in three of the samples collected for visual analysis. During the sample collection the following day (on March 3), it was noted that one of the fixtures leaked and others leaked while the sample was being collected, so the result would not accurately represent a "first draw" sample. Turbidity was measured when the sample was collected. When possible, the aerators were removed after sample

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collection. Sediment or debris was contained on all aerators, including at the two fixtures that had been recently replaced due to high results in January.

One location, the Boiler Room "Post Storage Tank Tap" is located in a confined space and was not sampled. This is the location closest to the ground water source. During the March sample collection, TCHD staff noted that the fixture appears to be a brass hose bib. This tap is located after chlorination and the water storage tank. Little information is known about the steel storage tank, which is original to the building.

The ICSD replaced the aerators at all sinks that were sampled.

IV. ICSD Sampling – March 2016

During the week of March 7, the ICSD collected samples at the same locations (with the exception of the Boiler Room location) previously sampled by TCHD. The same procedures were followed except that all fixtures in the water system were not flushed the day before sampling. Since the fixtures had been turned off to prevent use, the ICSD carefully flushed the sample locations the afternoon prior to sample collection in an effort to remove any sediments or other contaminants that had accumulated.

V. Findings

The results from the TCHD sampling event on March 3 are summarized in Table 4. The results from the ICSD sampling event on March 11 are summarized in Table 5. Results from several sampling events are summarized in Table 6.

There was debris noted either on the coffee filter during the pre-sampling flushing, in the sample itself or on the aerator for all locations sampled on 3/4/2016 with the exception of the Room 49 drinking fountain and the Boiler Room sink. Debris was noted on all aerators at sink faucets.

With the exception of the Boiler Room sink, all results from 3/4/16 were significantly better than the school-wide results on 2/6/2016. The 2/6/2016 results ranged from 2,200 to 7.4 ppb, with most results greater than 100 ppb. The first-draw results from 3/4/16 ranged from 30.6 to 7.6 ppb. All flushed samples were below the action level of 15 ppb and many were below detection limits.

The results from the ICSD sampling on 3/11/2016 were generally consistent with the 3/4/2016 results. The aerators were cleaned or changed after the 3/4/2016 sampling event, but the results are not necessarily lower for the later sampling. With one exception (Rm 27 sink), the flushed samples on 3/11/2016 were also below the action level.

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Changing the fixtures at the sink in Room 27 and the drinking fountain in Room 53 did not significantly improve results. (Note: both the faucet and the drinking fountain/bubbler were changed at both these locations). The flushed sample in Room 27 was slightly higher than the first draw sample.

VI. Interim Conclusions and Next Steps

- As shown by the significantly lower results in both March 2016 sampling events, the procedures for the February sampling event produced elevated results that do not represent normal conditions for Caroline.
- Given that the locations sampled in March were those with the highest lead concentrations in the February sampling, both March 2016 sampling events indicates flushing is generally effective in reducing lead levels below the action level of 15 ppb.
- Cleaning and changing the aerator does not produce a significant improvement in water quality.
- Changing the fixtures was not effective in reducing lead concentrations below the action level. The new fixtures meet the 2014 "lead free" requirements, but more information is needed to assess conditions at these locations.
- The flushed sample was higher than the first draw sample in Room 27 for the ICSD 3/11/16 sampling, indicating that there may be a problem with something in the plumbing near that location.
- It is unlikely that the source water is a significant contributor of lead. The 68 ppb found at the "Post Storage Tank Tap" (the closest sampling point to the source water) during the 2/6/2016 sampling could reflect leaching from the fixture, which is a brass hose bib, or water quality changes in the storage tank resulting from the vigorous flushing and depressurization of the system. A true source water tap was installed after this sampling was complete and sample results for lead and water quality parameters as required under the NYS Sanitary Code are pending.
- A plumbing profile needs to be developed before significant additional sampling is conducted or changes are implemented.
- Since lead concentrations tend to increase when water sits in the pipes, the TCHD recommends the fixtures be used for non-consumptive uses (e.g., hand washing) when possible under supervision.
- Drinking water fountains that exceeded the action level should remain bagged or turned off.



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INTERIM REPORT TABLES AND FIGURES:

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Table 1 – Caroline Lead Results (1/8/16 and 8/25/15)

Room	Location	1/8/16 Result in ppb (ug/L)	8/25/15 Result in ppb (ug/L)
53	Classroom Drinking Fountain	15**	nt
38	Classroom Sink	7.7	nt
27	Classroom Sink	21**	140*
17	Classroom Drinking Fountain	2.8	nt
13	Classroom Drinking Fountain	5.5	nt
83	Kitchen Sink Near Door	3.3	4.6
70	Nurses Room Sink	3.7	4.9
A16	Classroom Sink	6.1	3.5
A46	Classroom Sink	3.7	3.5
Between 58 and 50	Drinking Fountain	<1	nt
	90th Percentile	15	75

Action level for lead = **15 ppb**

nt = location not tested in August

* Rm 27, 8/25/16 - water was stagnant since the end of school in June, turbid sample

** Fixtures and piping changed at these locations after the January 2016 sampling.

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Table 2 – Caroline Lead Results (February 6-9, 2016) Page 1-3

Location	Location Description	Feb 2016 Result in ppb (ug/L)
Main Office	Sink	11
Room 60	Boiler Room Sink (Entry Point)	7.4
Hallway Near Boiler Room 60	Drinking Fountain Closer To Boiler Rm	1
Hallway Near Boys Room 58	Drinking Fountain Closer To Boys Rm	1
Room 58	Boy's Bathroom Porcelain Sink	5.3
Room 58	Boys Bathroom Metal Sink	39
Room 57	Custodial Closet Mop Sink	33
Room 56	Girls Bathroom Metal Sink	46
Room 56	Girls Bathroom Porcelain Sink	53
Room 53	Classroom Drinking Fountain	150
Room 53	Classroom Sink	120
Room 49	Classroom Drinking Fountain	120
Room 49	Classroom Sink	75
Room 47	Classroom Drinking Fountain	7
Room 47	Classroom Sink	14
Room 47/42	Bathroom Sink	24
Room 42	Classroom Drinking Fountain	7.8
Room 42	Classroom Sink	31
Room 38	Classroom Drinking Fountain - RUSH	49
Room 38	Classroom Sink	550
Room 38	Bathroom Sink	12
Room 33	Classroom Drinking Fountain	2.1
Room 33	Classroom Sink	10
Room 33	Bathroom Sink	56
Room 27	Classroom Drinking Fountain - RUSH	44.5
Room 27	Classroom Sink - RUSH	180
Room 27	Bathroom Sink	84
Room 24	Classroom Drinking Fountain	37
Room 24	Classroom Sink	17
Room 24/19	Bathroom Sink	3.1
Room 19	Classroom Drinking Fountain	5.5
Room 19	Classroom Sink	15
Room 17	Classroom Drinking Fountain	3.4

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Table 2 – Caroline Lead Results (February 6-9, 2016) Page 1-3

Location	Location Description	Feb 2016 Result in ppb (ug/L)
Room 17	Classroom Sink	13
Room 13	Classroom Drinking Fountain	8.7
Room 13	Classroom Sink	49
Room 12	Classroom Drinking Fountain	22
Room 12	Classroom Sink	18
Room 8	Library Drinking Fountain	3.2
Room 8	Library Sink	15
Room 83	Kitchen Sink in Center of Room	5
Room 83 (Kitchen)	Kitchen Sink Near Door	2.2
Room 64	Faculty Lounge Kitchen Sink	15
Room 65	Staff Bathroom Sink	2.8
Room 69	Staff Bathroom Sink	8.2
Room 70	Nurses Room Sink	27
Room 70	Nurses Bathroom Sink	52
Room A2	Girls Bathroom Sink- Closer To Door	17
Room A2	Girls Bathroom Sink In Corner	16
Between Rooms A2 & A3	Drinking Fountain In Hallway	100
Room A3	Custodial Closet Mop Sink	17
Room A4	Boys Bathroom Closer To Door	2.4
Room A4	Boys Bathroom In Corner	4.8
Room A5	Staff Bathroom Sink	22
Room A6	Classroom Drinking Fountain	12
Room A6	Classroom Sink	29
Room A8	Classroom Drinking Fountain	1.9
Room A8	Classroom Sink	6.2
Room A10	Classroom Drinking Fountain	12
Room A10	Classroom Sink	370
Room A16	Classroom Drinking Fountain	62
Room A16	Classroom Sink	1000
Room A10/A16	Bathroom Sink	4.1
Room A19	Classroom Drinking Fountain	7.2
Room A19	Classroom Sink	390
Room A19/A25	Bathroom Sink	3.1

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Table 2 – Caroline Lead Results (February 6-9, 2016) Page 1-3

Location	Location Description	Feb 2016 Result in ppb (ug/L)
Room A25	Classroom Drinking Fountain	53
Room A25	Classroom Sink	710
Room A28	Classroom Drinking Fountain	2.6
Room A28	Classroom Sink	20
Room A30	Classroom Drinking Fountain	2.3
Room A30	Classroom Sink	13
Room A34	Classroom Drinking Fountain	51
Room A34	Classroom Sink	22
Room A36	Classroom Drinking Fountain	11
Room A36	Classroom Sink	21
Room A38	Classroom Drinking Fountain	5.2
Room A38	Classroom Sink	24
Room A41	Music Room Drinking Fountain	24
Room A41	Music Room Sink	940
Room A41	Music Bathroom Sink	5000
Room A46	Classroom Drinking Fountain	57
Room A46	Classroom Sink	2200
Room A46	Metal Utility Sink	760
Room A53	Classroom Drinking Fountain	7.4
Room A53	Classroom Sink	11
Room A55	Classroom Drinking Fountain	119
Room A55	Classroom Sink	9
Room A46	Bathroom Sink	6.8
Boiler Room 60	Post Storage Tank Tap	68
Room 63	Faculty Lounge Water Cooler	1

Action level for lead = **15 ppb**

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Table 3 – Caroline Lead Results (2006-2016)

Room	Location	2/6-9/16 Result in ppb (ug/L)	1/8/16 Result in ppb (ug/L)	8/25/15 Result in ppb (ug/L)	9/20/12 Results in ppb (ug/L)	6/9/09 Result in ppb (ug/L)	9/14/06 Result in ppb (ug/L)
60	Drinking Fountain Near Boiler Rm	1	nt	nt	<1	<1	3.2
47	Classroom Drinking Fountain	75	nt	nt	8.4	9.7	14.6
83	Kitchen Sink Near Door	2.2	nt	nt	2.5	1.3	2
64	Faculty Lounge Kitchen Sink	16	nt	nt	1.8	<1	2.6
69	Staff Bathroom Sink	8.2	nt	nt	6.6	9.2	7.4
27	Classroom Sink - RUSH	180	21	140	nt	nt	nt
83	Kitchen Sink Near Door	5	3.3	4.6	nt	nt	nt
70	Nurses Room Sink	27	3.7	4.9	nt	nt	nt
A16	Classroom Sink	1000	6.1	3.5	nt	nt	nt
A46	Classroom Sink	2200	3.7	3.5	nt	nt	nt
53	Classroom Drinking Fountain	150	15	nt	nt	nt	nt
38	Classroom Sink	550	7.7	nt	nt	nt	nt
17	Classroom Drinking Fountain	3.4	2.8	nt	nt	nt	nt
13	Classroom Drinking Fountain	8.7	5.5	nt	nt	nt	nt

Action level for lead = **15 ppb**

nt = location not tested

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Table 4 – Caroline Lead Results - TCHD Sampling 3/4/2016

Location	Location Description	Sample # - FIRST DRAW	Sampled # - FLUSHED	TCHD Result (ppb) - 3/4/16	Debris in Sample (Y/N)	Debris in Aerator (Y/N)	Debris in Filter from 3/3/16 Flush (Y/N)	Turbidity (NTU) - 3/3/16	Make of Fixture	Notes
Room A46	Classroom Sink	1		7.6	Y	Y	N	0.27	Just	
			2	<3	N					
Room A41	Music Room Sink	3		30.6	Y	Y	N	0.25	Just	Leaking around cold water control when running
			4	<3	N					
Room A41	Music Room Drinking Fountain	5		7.8	Y	*	N	0.25	Just	Some of sample spilled by mouth of bottle
			6	<3	Y					
Room A25	Classroom Sink	7		18.2	N	Y	Y	1.39	Just	
			8	3.2	N					
Room A19	Classroom Sink	9		15.4	Y	Y	Y	0.29	Just	
			10	<3	N					
Room A16	Classroom Sink	11		9.8	Y	*	N	0.62	Just	No Aerator
			12	<3	Y					
Room A10	Classroom Sink	13		20.2	Y	Y	N	0.19	Just	Significant leaking around cold water control when running
			14	<3	N					
Room 27	Classroom Sink	15		20.2	N	Y	Y	0.54	Delta	New fixture
			16	14.7	N					
Room 38	Classroom Sink	17		12.2	Y	Y	N	0.41	Just	
			18	<3	N					
Room 49	Classroom Drinking Fountain	19		10.4	N	*	N	1.57	Just	Very small amount of sample spilled by mouth of bottle
			20	<3	N					
Room 53	Classroom Drinking Fountain	21		21	Y	*	N	0.49	Delta	New fixture. Some of sample spilled by mouth of bottle New fixture.
			22	<3	N					
Room 60	Boiler Room Post-Storage Tank Tap	23		Tap in confined space - did not sample						
			24							
Room 60	Boiler Room Sink (Entry Point)	25		16.1	N	NA	N	0.42	Unkown (T.S. vac brkr)	No aerator; slight leak at neck of fixture when running
			26	<3	N					

Note: Concentrations above the Action Level of 15 ppb are indicated in red.

* No aerator in drinking fountains, screen not easily accessible

NA = not applicable

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Table 5 – Caroline Lead Results - ICSD Sampling 3/11/2016

Location	Location Description	Sample # - FIRST DRAW	Sampled # - FLUSHED	ICSD Result (ppb) - 3/11/16	Debris in Aerator (Y/N)	Turbidity (NTU) - 3/11/16	Make of Fixture	Notes
Room A46	Classroom Sink	1		11.4	N	0.56	Just	
			2	1.42				
Room A41	Music Room Sink	3		21.7	N	0.27	Just	Did not leak around cold water control when running
			4	3.76				
Room A41	Music Room Drinking Fountain	5		4.93	*		Just	Very small amount of sample spilled by mouth of bottle
			6	1.65				Very small amount of sample spilled by mouth of bottle
Room A25	Classroom Sink	7		22	N	0.16	Just	
			8	2.72				
Room A19	Classroom Sink	9		12.8	N	0.34	Just	Greater than pencil thin (not aggressive flow)
			10	1.37				Greater than pencil thin (not aggressive flow)
Room A16	Classroom Sink	11		14.2	*	0.28	Just	No Aerator
			12	2.22				
Room A10	Classroom Sink	13		11.6	Y	0.2	Just	Significant leaking around cold water control when running
			14	1.76				
Room 27	Classroom Sink	15		18.5	N	0.33	Delta	New Fixture
			16	19.1				
Room 38	Classroom Sink	17		17.1	Y	0.17	Just	
			18	3.19				
Room 49	Classroom Drinking Fountain	19		Not Sampled on 3/11/16				
			20					
Room 53	Classroom Drinking Fountain	21		8.06	*	0.1	Delta	New fixture. Some of sample spilled by mouth of bottle
			22	1.66				New fixture. Some of sample spilled by mouth of bottle

Note: Concentrations above the Action Level of 15 ppb are indicated in red.

* No aerator in drinking fountains, screen not easily accessible

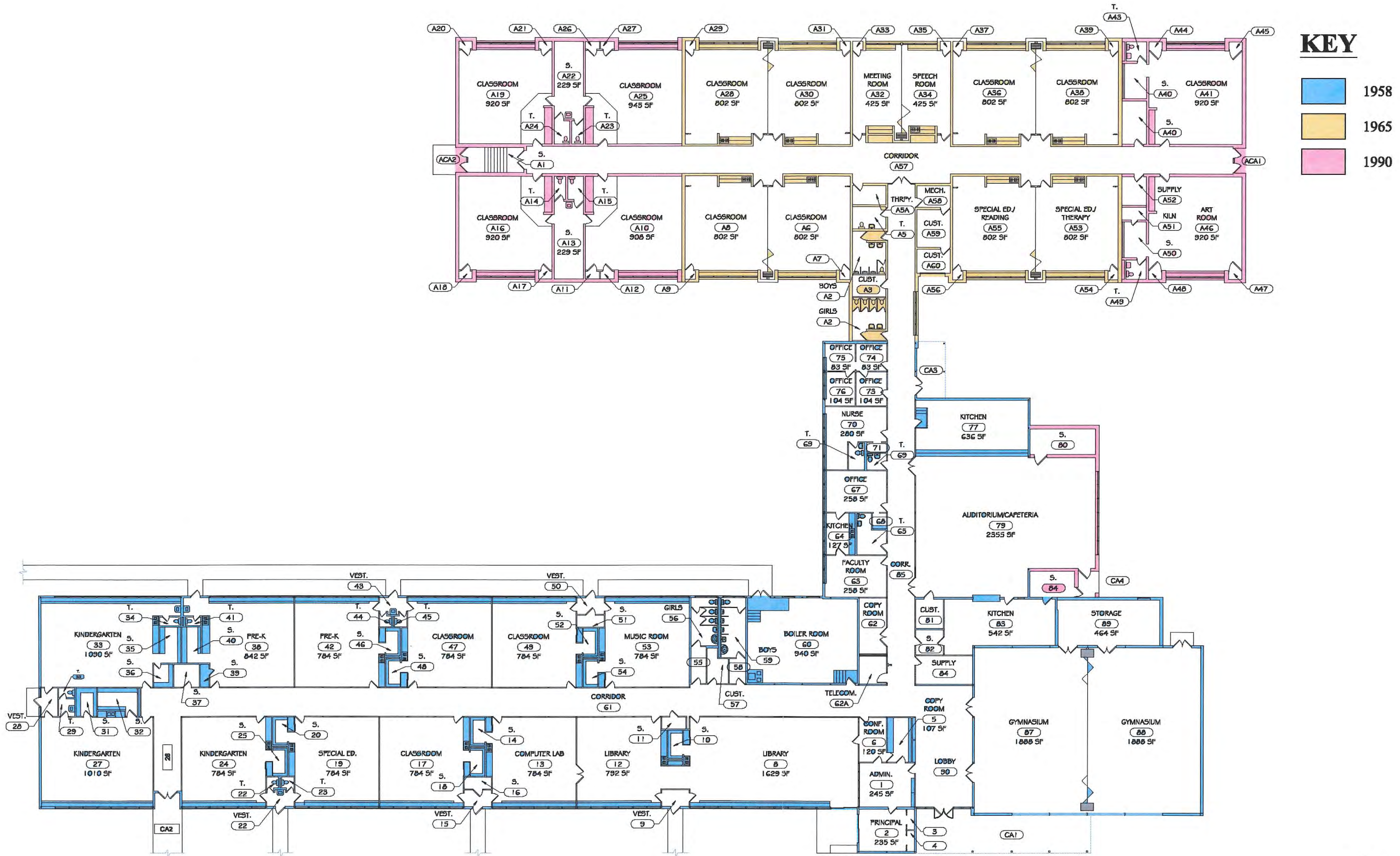
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Table 6 – Caroline Lead Results - Summary of Recent Results

Location	Location Description	Sample # - FIRST DRAW	Sampled # - FLUSHED	TCST BOCES Results ppb (ug/L) - 8/25/15	TCST BOCES Results ppb (ug/L) - 1/8/16	W2O Results ppb (ug/L) - 2/6 or 9/16	TCHD Result ppb (ug/L) - 3/4/16	ICSD Result ppb (ug/L) - 3/11/16	Notes
Room A46	Classroom Sink	1				2200	7.6	11.4	
			2				<3	1.42	
Room A41	Music Room Sink	3				940	30.6	21.7	
			4				<3	3.76	
Room A41	Music Room Drinking Fountain	5				24	7.8	4.93	
			6				<3	1.65	
Room A25	Classroom Sink	7				710	18.2	22	
			8				3.2	2.72	
Room A19	Classroom Sink	9				390	15.4	12.8	
			10				<3	1.37	
Room A16	Classroom Sink	11				1000	9.8	14.2	No Aerator
			12				<3	2.22	
Room A10	Classroom Sink	13				370	20.2	11.6	Significant leaking
			14				<3	1.76	
Room 27	Classroom Sink	15		140	21	180	20.2	18.5	New Fixture
			16				14.7	19.1	
Room 27	Classroom fountain					44.5			
Room 38	Classroom Sink	17			7.7	550	12.2	17.1	
			18				<3	3.19	
Room 49	Classroom Drinking Fountain	19				120	10.4		
			20				<3		
Room 53	Classroom Drinking Fountain	21			1.5	150	21	8.06	New fixture
			22				<3	1.66	
Room 53	Classroom Sink					120			
Room 60	Boiler Room Post-Storage Tank Tap	23							not sampled - confined space
			24						
Room 60	Boiler Room Sink (Entry Point)	25				7.4	16.1		No aerator
			26				<3		

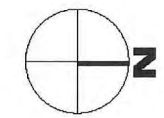
Note: Concentrations above the Action Level of 15 ppb are indicated in red.

INTERIM REPORT: FIGURE 1



KEY

- 1958
- 1965
- 1990



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