



Your Partner for a Healthy Community

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INTERIM REPORT:

**LEAD CONCENTRATIONS IN DRINKING WATER
AT ENFIELD ELEMENTARY SCHOOL
ITHACA, NY**

April 2016

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**INTERIM REPORT:
LEAD CONCENTRATIONS IN DRINKING WATER AT
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I. Background

Drinking water for Enfield 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, Enfield 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 water distribution systems and household plumbing. Therefore, lead concentrations will vary throughout a water system. In a school's water system, 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.

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II. Recent Sampling History

Sampling requirements in 2015 for Enfield Elementary School included lead testing to be conducted between June 1 and September 30 at 5 locations. In late August 2015 before school was in session, the ICSD tested drinking water samples from Enfield Elementary School for lead (see Table 1). The results for three of the samples significantly exceeded the lead action level of 15 ppb. The 90th percentile was 367 ppb. TST-BOCES collected the samples for the ICSD. A letter report written by BOCES noted that at most of the sample locations, the water had not been used since the end of school in June and the samples were 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 results.

Consequently, 10 samples were collected in January 2016, following recommended flushing and sampling procedures. (See Table 1). All results were significantly lower and the 90th percentile requirement was met. However, the result from one drinking fountain was slightly above the action level of 15 ppb. The ICSD replaced the fixture and piping at this location.

In addition to replacing the fixture, the ICSD decided to hire an independent company to sample every fixture at Enfield Elementary School. The TCHD was not involved in the process. After school on the day before sampling, every fixture at Enfield Elementary School was simultaneously and vigorously flushed for several minutes. The main shut off valve was then closed, turning off all water to the system. Sixty-five samples were collected on the morning on February 6. Samples from 2 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 65 samples, 10 locations exceeded the action level of 15 ppb with one additional location at 15 ppb. Results ranged from a low of 1 ppb to 640 ppb, with 5 locations at or exceeding 100 ppb. The location labeled "Boiler Room - Source Water" had a concentration of 48 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 Enfield School showing the ages of sections of the building is contained in Figure 1.

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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. Both the vigorous flushing of the water system, which may have created disruptive, turbulent or scouring conditions in the water pipes, and the subsequent closing of the main shut off valve, potentially released lead-containing particles into the distribution system.
- The "Source Water" sample contained 48 ppb lead (the location closest to the ground water source); however, other points in the system sampled as low as 1 ppb.
- The ICSD replaced one fixture in January 2016 at a location that was above the action level. The fixture is certified as "lead free", yet the February result for this location was significantly higher than before the fixture was changed.

These observations call into question whether the February 2016 sample results accurately represent typical lead concentrations in the drinking water at Enfield Elementary School.

III. TCHD Sampling – March 2016

In consultation with NYSDOH, the TCHD made arrangements to sample 8 locations at Enfield 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.

Sample locations were the fixtures with the highest previous concentrations, one fixture that had a slightly elevated concentration, and the source water tap. Since the fixtures had been turned off to prevent use, the ICSD carefully flushed the system approximately twenty-four hours 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 was filtered through a coffee filter and debris was noted in five of the eight samples collected for visual analysis. During the sample collection the following day (March 3) it was noted that some of the fixtures leaked, so the result would not accurately represent a "first draw" sample. Gray or black particles were identified in some samples. Turbidity was measured when the samples were collected. When possible, the aerators were removed after sample collection. Sediment or debris was contained on all aerators, including at a faucet that had been recently replaced due to the high results of its accompanying drinking fountain in January.

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As shown in Figure 2, the "Source Water" tap is located on a dead-end length of pipe extending down from the well inlet and appears to be a brass hose bib. Debris was identified in the water from this tap.

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 Room A11, the source water and entry point locations) previously sampled by TCHD. The same procedures were followed except that system-wide flushing was not done. However, since the fixtures remained covered to prevent use, the ICSD carefully flushed the sample locations the afternoon prior to sample collection in an effort to replicate conditions more representative of normal usage.

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 10 are summarized in Table 5. For historical comparison, several sampling events are summarized in Table 6.

There is no discernible trend when comparing the school-wide results from 2/6/2016 and the results from either 3/3/16 or 3/10/16 – some results are higher and some are lower. The same is true when comparing the 3/3/16 and 3/10/16 data. The aerators were cleaned or changed after the 3/3/2016 sampling event, but the results are not necessarily lower for the later sampling.

With the exception of the results from the "Source Water", the concentrations were lower when flushed for 30 seconds compared to the first draw samples; however, flushing did not consistently lower results below the action level. The flushed sample results for the "Source Water" tap (79.7 ppb) were significantly higher than the first draw results (26.5 ppb).

Results where the fixture was replaced (Room A13 drinking fountain) were not significantly improved and both the 3/3 and 3/10 first draw results were higher than the action level. The flushed sample results at this location were both below the action level.

Where possible, the aerators were changed after the TCHD sampling on 3/3/2016. At most locations, debris was again found on the aerators when the ICSD sampled on 3/10/2016.

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VI. Interim Conclusions and Next Steps

- 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 this location.
- It is unlikely that the source water is a significant contributor of lead. The 48 ppb found at the "Boiler Room - Source Water" during the 2/6/2016 sampling could reflect leaching from the fixture (a brass hose bib) and the sampling tap placement on a dead-end length of pipe extending down from the well inlet. This is also supported by the flushed sample result being significantly higher than the first draw sample results during the TCHD sampling on 3/3/16. A source water tap was installed above the well inlet on the main line after this sampling was complete and sample results for lead and water quality parameters as required under the NYS Sanitary Code are pending.
- At some locations, the lead concentrations in the flushed samples exceeded the action level, which may be an indication of problems with the plumbing.
- 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 under supervision for non-consumptive uses (e.g., hand washing) when possible.
- 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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April 2016

**INTERIM REPORT TABLES:
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Table 1 – Enfield Lead Results (1/8/16 and 8/25/15)

Location	Location Description	1/8/16 Result in ppb (ug/L)	8/25/15 Result in ppb (ug/L)
Main Office	Main Office Sink	6	nt
Room B9	Classroom Sink	3.4	95
Room 23	Sink	4.2	8.5
Room A13	Classroom Drinking Fountain	16*	640
Hallway	A Wing Drinking Fountain (New)	4.5	nt
Room 2	Classroom Sink	0.2	nt
Room 35	Kitchen Sink	2.2	4.5
Room 13	Room 13	3.6	nt
Girl's Toilet Room	Girl's Toilet Room	7.6	36
Room B	Room B	7.2	nt
	90th Percentile	7.6	367

Action level for lead = **15 ppb**

nt = location not tested in August

* Fixtures and piping changed at this location after the January 2016 sampling.

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

Location	Location Description	Feb 2016 Result in ppb (ug/L)
Main Office	Office Sink	4.0
Drinking Fountain	Right Side In Lobby	1.0
Drinking Fountain	Left Side In Lobby	1.0
Room B17	Custodial Closet Mop Sink	3.5
Room B14	Classroom Drinking Fountain	2.5
Room B14	Classroom Sink	8.4
Room B14	Bathroom Sink	1.8
Room B13	Classroom Drinking Fountain	1.3
Room B13	Classroom Sink	2.8
Room B13/B9	Bathroom Sink	1.5
Room B9	Classroom Drinking Fountain-RUSH	1.9
Room B9	Classroom Sink	2.7
Room B8	Classroom Drinking Fountain	1.5
Room B8	Classroom Sink	4.9
Room B8/B4	Bathroom Sink	1.6
Room B4	Classroom Drinking Fountain	2.2
Room B4	Classroom Sink	7.7
Room 29	Classroom Drinking Fountain	2.9
Room 29	Classroom Sink	13.0
Room 28	Boys Bathroom - Shorter Sink, Closer To Door - Hot Water	4.3
Room 28	Boys Bathroom - Taller Sink, Further From Door	2.3
Room 26	Mop Sink	2.9
Drinking Fountain	Hallway Between Rooms 26 & 25	12.0
Room 25	Girls Bathroom - Shorter Sink Closer To Door - RUSH	268.0
Room 25	Girls Bathroom - Taller Sink Further From Door	3.3
Room 23	Sink	2.6
Room 18	Women's Room Sink	1.5
Room 19	Men's Room Sink	2.1
Room 8	Classroom Drinking Fountain	3.3
Room 8	Classroom Sink	5.7
Room 6	Classroom Drinking Fountain	1.8
Room 6	Classroom Sink	3.1
Room A17	Art Room Drinking Fountain	7.9
Room A17	Art Room Sink	19.0
Room A17	Art Room Utility Sink	6.3
Room A16	Classroom Drinking Fountain	3.5
Room A16	Classroom Sink	7.6
Room A15	Classroom Drinking Fountain	6.6

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

Location	Location Description	Feb 2016 Result in ppb (ug/L)
Room A15	Classroom Sink	6.6
Room A14	Classroom Drinking Fountain	4.2
Room A14	Classroom Sink	8.0
Room A13	Classroom Drinking Fountain- RUSH	281.0
Room A13	Classroom Sink	9.7
Room A12	Classroom Drinking Fountain	190.0
Room A12	Classroom Sink	260.0
Room A11	Classroom Drinking Fountain	4.8
Room A11	Classroom Sink	50.0
Room A9	Boys Room - Closer To Door - Hot Water	51.0
Room A9	Boys Room 0 Further From Door	6.4
Room A8	Custodial Closet Mop Sink	8.5
Drinking Fountain	Hallway Between Room A7 & A8	3.0
Room A7	Girls Bathroom - Closer To Door - RUSH	4.9
Room A7	Girls Bathroom - Further From Door	6.6
Room 4	Classroom Drinking Fountain	1.8
Room 4	Classroom Sink	3.1
Room 2	Classroom Drinking Fountain	2.9
Room 2	Classroom Sink	1.0
Drinking Fountain	In Hallway By Room 2/ "Hall1"	82.0
Room 35 (Kitchen)	Kitchen Sink	1.3
Room 34	Classroom Drinking Fountain	3.1
Room 34	Classroom sink	10.0
Boiler Room	Tap	640.0
Library	Drinking Fountain - NOT FLUSHED	10.0
Library	Sink - NOT FLUSHED	15.0
Boiler Room	Source Water	48.0

Action level for lead = **15 ppb**

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Table 3 – Enfield Lead Results (2006-2016)

Location	Location Description	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)	7/24/12 Results in ppb (ug/L)	6/9/09 Result in ppb (ug/L)	9/14/06 Result in ppb (ug/L)
B14	Classroom Sink	8.4	nt	nt	8.3	4.3	4.41
23	Sink	2.6	4.2	8.5	4.1	3.4	3.45
Hallway	Drinking Fountain btw A7 & A8	3	4.5	nt	2.6	2.5	3.6
2	Classroom Sink	1	2	nt	3.1	3.8	3.26
35	Kitchen Sink	1.3	2.2	4.5	5.5	3.6	2.86
B9	Classroom Sink	2.7	3.4	95	nt	nt	nt
A13	Classroom Drinking Fountain	281	16*	640	nt	nt	nt
Girl's Toilet		†	7.6	36	nt	nt	nt
Main Office	Office Sink	4	6	nt	nt	nt	nt
13		†	3.6	nt	nt	nt	nt
B		†	7.2	nt	nt	nt	nt

Action level for lead = **15 ppb**

nt = location not tested

* Fixtures and piping changed at this location after the January 2016 sampling.

† Locations cannot be positively correlated with 2/16 sampling

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

Location	Location Description	Sample # - FIRST DRAW	Sampled # - FLUSHED	TCHD Result (ppb) - 3/3/16	Debris in Sample (Y/N)	Debris in Aerator (Y/N)	Debris in Filter from 3/2/16 Flush (Y/N)	Turbidity (NTU) - 3/3/16	Make of Fixture	Notes
Room A13	Classroom Drinking Fountain	1		24.9	N	*	Y	0.18	Central	New fixture as of 1/16; *W20 sample from 2/9/16
			2	3.9	N					New fixture as of 1/16
Room A12	Classroom Sink	3		33	N	Y	N	0.33	Just	
			4	3.4	N					
Room A12	Classroom Drinking Fountain	5		338	N	*	Y	0.55	Unknown	Leaking prior to 1st draw
			6	21	N					
Room A11	Classroom Sink	7		95.6	Y	Y	Y	0.86	Just	
			8	4.7	N					
Room A17	Art Room Sink	9		34.9	Y	Y	N	0.33	Just	
			10	4	N					
Hallway Drinking	By Room 2	11		231	N	*	N	0.46	American Standard	
			12	3.3	N					
Source Water (raw water)	Boiler Room	13		26.5	Y	*	Y	1.96		Poor flow - some spillage
			14	79.7	Y					Poor flow - some spillage
Entry Point Tap (E.P.)	"Boiler Room Tap"	15		78.3	N	*	Y	0.74		Tap leaking prior to 1st draw; Poor flow - some spillage
			16	5	N					Poor flow - some spillage

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 – Enfield Lead Results - ICSD Sampling 3/10/2016

Location	Location Description	Sample # - FIRST DRAW	Sampled # - FLUSHED	ICSD Result (ppb) - 3/10/16	Debris in Aerator (Y/N)	Turbidity (NTU) - 3/11/16	Make of Fixture	Notes
Room A13	Classroom Drinking Fountain	1		40	N	1.6	Central	New fixture as of 1/16
			2	4.63				
Room A12	Classroom Sink	3		48.9	Y	0.22	Just	
			4	4.02				
Room A12	Classroom Drinking Fountain	5		2420	*		Unknown	Leaking prior to 1st draw
			6	26.7				
Room A11	Classroom Sink	7		Sampled as a split sample with TCHD on 3/22/2016 - results pending				
			8					
Room A17	Art Room Sink	9		868	Y	1.77	Just	
			10	40.4				
Hallway Drinking	By Room 2	11		79.8	*	0.32	American Standard	
			12	19				
Source Water (raw water)	Boiler Room	13		Not sampled				
			14					
Entry Point Tap (E.P.)	"Boiler Room Tap"	15		Not sampled				
			16					

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

* No aerator in drinking fountains, screen not easily accessible

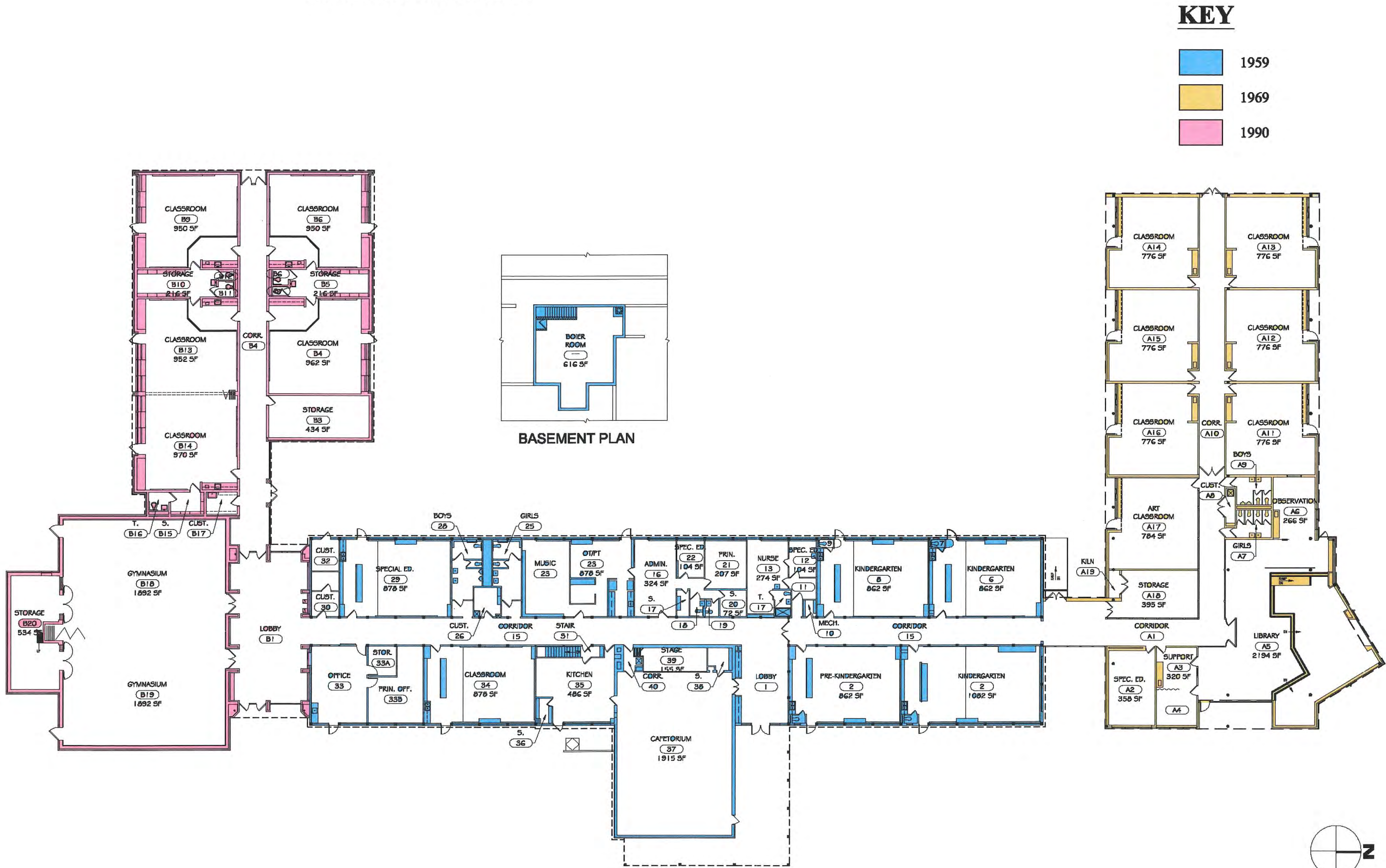
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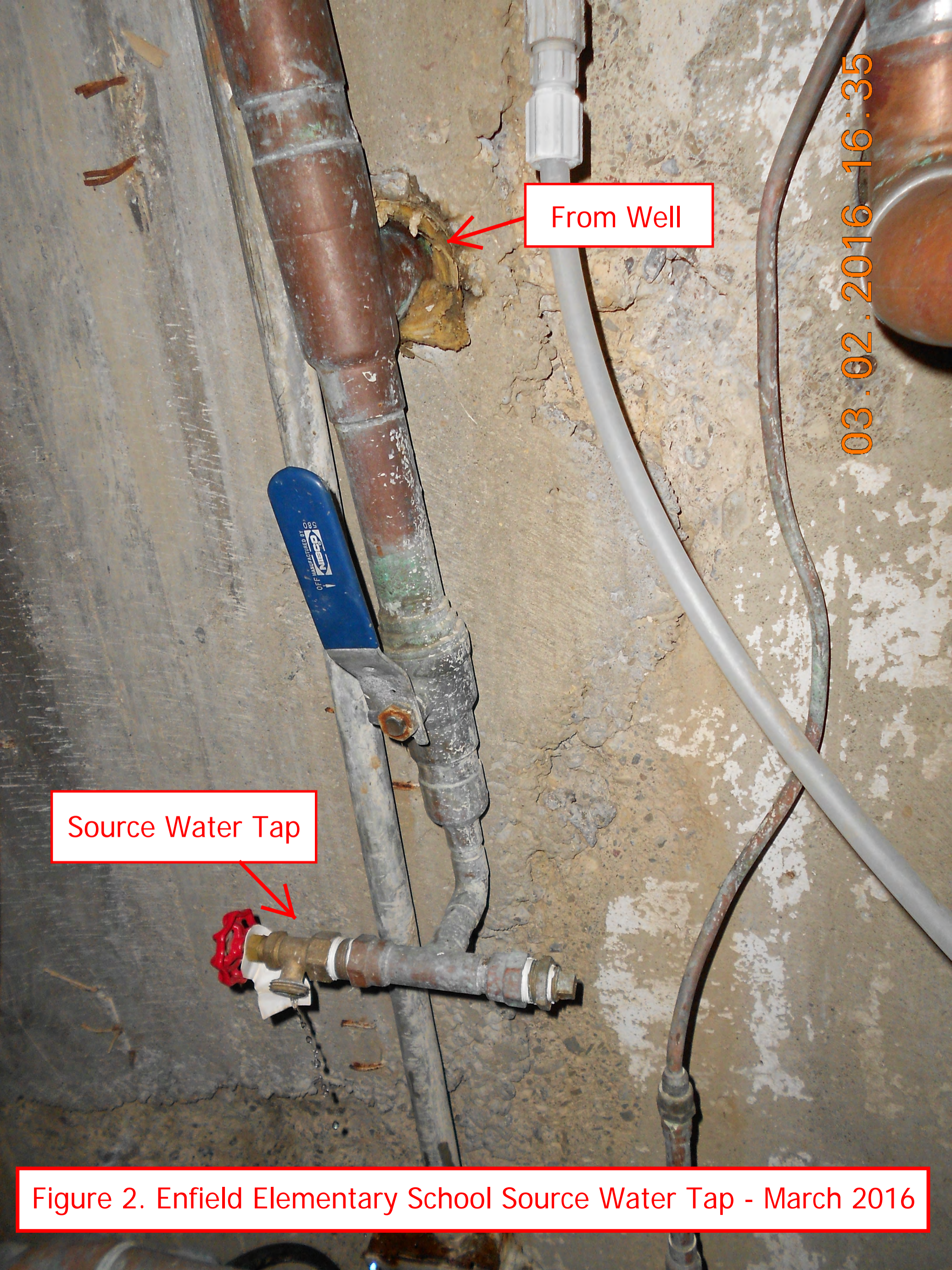
Table 6 – Enfield Lead Results - Summary of Recent Results

Location	Location Description	Sample # - FIRST DRAW	Sampled # - FLUSHED	TCST BOCES Results (ppb) - 8/25/15	TCST BOCES Results (ppbL) - 1/8/16	W2O Results (ppb) - 2/6-/16	TCHD Result (ppb) - 3/3/16	ICSD Result (ppb) - 3/10/16	Notes
Room A13	Classroom Drinking Fountain	1		640	16	281	24.9	40	New fixture as of 1/16
			2				3.9	4.63	
Room A12	Classroom Sink	3				260	33	48.9	
			4				3.4	4.02	
Room A12	Classroom Drinking Fountain	5				190	338	2420	
			6				21	26.7	
Room A11	Classroom Sink	7				50	95.6		
			8				4.7		
Room A17	Art Room Sink	9				19	34.9	868	
			10				4	40.4	
Hallway Drinking	By Room 2	11				82	231	79.8	
			12				3.3	19	
Source/Raw water	Boiler Room	13				48	26.5		
			14				79.7		
Entry Point Tap (E.P.)	"Boiler Room Tap"	15				640	78.3		
			16				5		

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

INTERIM REPORT: FIGURE 1





Source Water Tap

From Well

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Figure 2. Enfield Elementary School Source Water Tap - March 2016